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Operation and Maintenance Manual MCB Camp Lejeune Groundwater Treatment System

Volume V of VII

Submitted to:

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Submitted by:



**OHM Remediation
Services Corp.**
A Subsidiary of OHM Corporation

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OHM Project No. 16032

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VOLUME V

MISCELLANEOUS AND BUILDING EQUIPMENT

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- N. Signet 8510 Compak Flow Transmitter Instructions
- O. Installation and Operating Instructions for Model L-6 Float Switch (Bulletin E-20)
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APPENDIX P
TRANSFORMER



GE Specialty Transformers

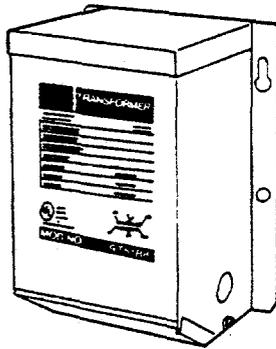
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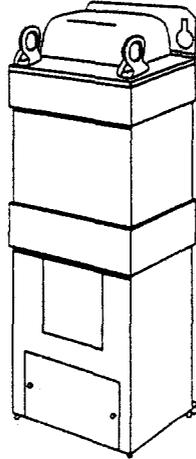
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1.5 SE

Dry Type General Purpose Transformers

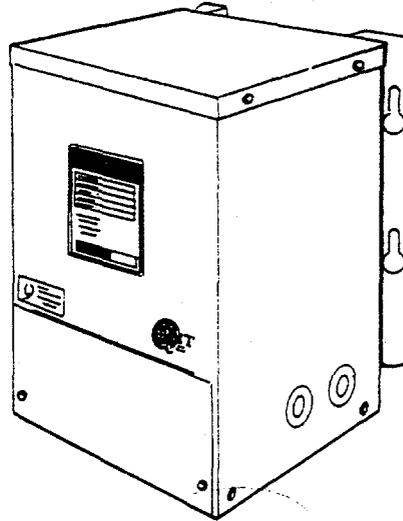
Types QB, QMS, ML, and QL
600 Volts and Below



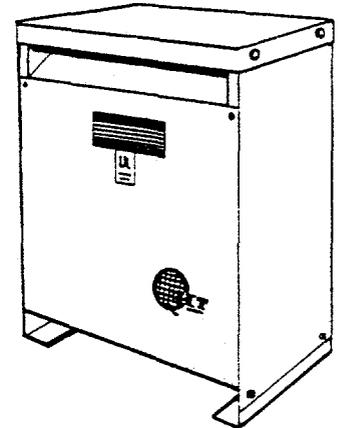
Type QB,
.050 kVA-3 kVA,
single-phase



Type ML,
3kVA-15 kVA
three-phase



Type QMS,
5 kVA-25 kVA,
single-phase



Type QL,
25 kVA-167 kVA,
single-phase
15 kVA-1500 kVA,
three-phase

General Information

The complete family of transformers from GE provide quiet, reliable transformer operation.

All of the dry-type transformers through 1,000 kVA are UL Listed under the requirements of Standard 506 and 1561. In addition, each transformer meets the requirements of ANSI C89.2-1986 and NEMA ST-20, 1986. Type QB, QMS, ML and three-phase QL models are also CSA certified.

General purpose transformers are rated 600 volts and below for supplying appliance, lighting and power loads from electrical distribution systems. Standard distribution voltages are 600, 480, and 240 volts; standard load voltages are 480, 240, 208, and 120 volts. The transformer is used to obtain the load voltage from the distribution voltage. Since no vaults are required for installation, these transformers can be located right at the load to provide the correct voltage for the application. This eliminates the need for long, costly, low-voltage feeders.

Construction

Types QB, ML and QMS

Core and coils are contained within a NEMA 3R nonventilated weatherproof enclosure. Type QB and QMS units feature encapsulated core and coils.

Type QL

Units are enclosed in a NEMA 2 drip-proof metal enclosure with natural-draft ventilation. Core-and-coil assembly is mounted on rubber isolation pads to reduce noise. Weathershield kits are available for conversion to a NEMA 3R enclosure suitable for outdoor service.

How to Select

- Establish phase and frequency.
- Determine the primary voltage—the voltage presently available.
- Determine the secondary voltage—the voltage needed at the load.
- Determine the kVA load, allowing room for expansion.
- Using the facts determined in the three steps, locate the transformer model in the listings on the following pages.

Voltage Tap Arrangement

Transformer taps compensate for high or low line voltages. Standard NEMA, ANSI three-phase taps are two 5 percent taps below normal on transformers smaller than 30 kVA. This arrangement provides a 10 percent range of tap voltage adjustment.

Most standard QL units rated 15 through 500 kVA have available six universal voltage taps—four 2½ percent below normal, and two 2½ percent above normal. This arrangement provides a 15 percent range of tap voltage adjustment.

Temperature Class

Industry standards classify insulation systems in accordance with the rating system shown below.

Insulation System Classification			
Ambient	+ Winding Rise	- Hot Spot	= Temp. Class
40°C	55°C	10°C	105°C
40°C	80°C	30°C	150°C
40°C	115°C	25°C	180°C
40°C	150°C	30°C	220°C

All standard, general purpose, GE transformers meet all applicable NEMA, ANSI, UL, and IEEE standards.

The design life of transformers having different insulation systems is the same, since the allowable temperature rise of an insulation material system is predicated on a specified life for all insulation. The lower temperature systems are designed for the same life as higher temperature systems.

Termination

Improved termination spacing and wiring compartment room gives greater flexibility in selecting various UL Listed connectors for either copper or aluminum cable. A listing of suitable connectors is packaged with each GE transformer.



GE Specialty Transformers

DEM - 1002

Dry Type General Purpose Transformers

Types QB, QMS, ML, and QL
600 Volts and Below

Sound Levels

All general purpose transformers are as quiet, or quieter than the 1986 ANSI and NEMA Standards for sound levels. Average sound levels are warranted not to exceed the values listed for each load rating shown in the adjacent table. Sound characteristics vary between transformers of identical voltage and kVA rating. The range of variation may be 4 to 8 decibels.

These values apply only to specified test conditions because the characteristic of the installation can cause them to be higher under operating conditions. Where acoustical noise is deemed to be of unusual concern, proper steps should be taken during installation to minimize audible noise transmission.

Sound Levels in Decibels^① (For 150°C Rise Models)

kVA	Sound levels in decibels ^①	
	ANSI-C89 Average	
0-9	40	
10-50	45	
51-150	50	
151-300	55	
301-500	60	

① Measured per ANSI C89.2-1986.

Wall Mounting Brackets (For 150°C Rise Models)

Separate, optional wall-mounting brackets are available as accessories on transformers through 75 kVA. Each kit consists of two brackets. **Note:** Not available for outdoor weather protected (G62) units.

kVA	Item No.	Qty.	Bracket Catalog Number (Includes 2 Per Set)
-----	----------	------	--

Single-phase

.050-25			Standard on all QB and QMS units
25			9T18Y5042
37.5-50			9T18Y5043

Three-phase

3-15			Standard on all ML units
15-50			9T18Y5042
75			9T18Y5043

Weathershield Kits (For 150°C Rise Models) UL Approved for Customer Installation Kits supplied with tamper resistant hardware

kVA	Item No.	Qty.	Kit Catalog Number
-----	----------	------	--------------------

Single-phase

25			9T18Y4317G12
37.5-50			9T18Y4317
75			9T18Y4317G02
100			9T18Y4317G03
167			9T18Y4317G04

Three-Phase

15			9T18Y4317G11
30, 45, 50			9T18Y4317G05
75, 112.5			9T18Y4317G06
150			9T18Y4317G07
225			9T18Y4317G08
300			9T18Y4317G09
400, 500			9T18Y4317G10

NOTES:

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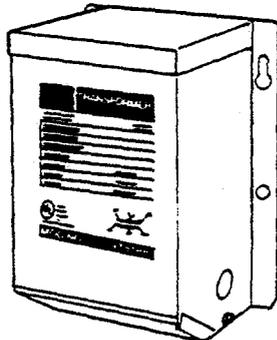


GE Specialty Transformers

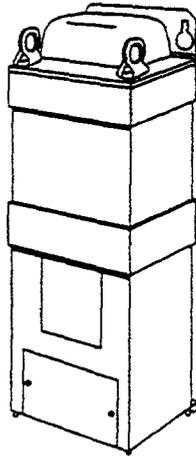
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Dry Type General Purpose Transformers

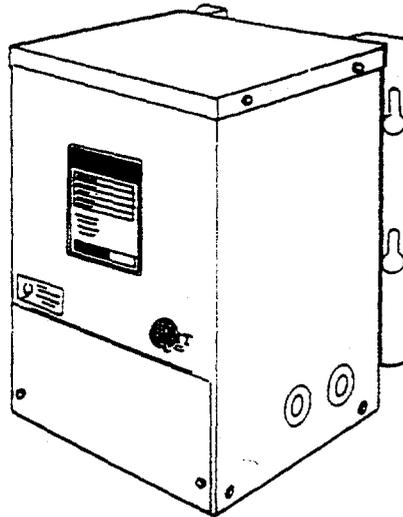
Dimensions and Weights



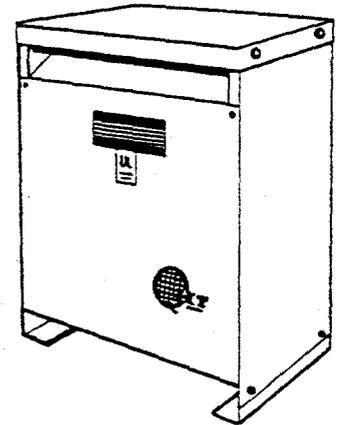
Type QB



Type ML



Type QMS



Type QL

kVA	Max. Height (in.)	Max. Width (in.)	Max. Depth (in.)	Approx. Net Wt. (Lbs.)
Type QB—Single-phase, 60, 50/60 Hertz				
.050	6 ¹ / ₈	5 ¹ / ₈	3 ¹ / ₂	6
.075	6 ³ / ₈	5 ¹ / ₂	3 ¹ / ₄	5
.100	6 ⁵ / ₈	5 ³ / ₈	3 ³ / ₄	6
.150	7 ¹ / ₈	6 ¹ / ₈	4 ¹ / ₄	10
.250	7 ³ / ₈	6 ³ / ₈	4 ¹ / ₄	10
.500	8 ³ / ₈	6 ⁷ / ₈	4 ⁷ / ₈	16
.750	9 ¹ / ₈	7 ¹ / ₈	5 ¹ / ₂	25
1.00	9 ³ / ₈	7 ³ / ₈	5 ¹ / ₂	25
1.50	11 ¹ / ₈	9 ³ / ₈	6 ² / ₃₂	40
2.00	11 ³ / ₈	9 ⁵ / ₈	6 ² / ₃₂	40
3.00	13 ¹ / ₈	9 ⁷ / ₈	6 ² / ₃₂	60

kVA	Max. Height (in.)	Max. Width (in.)	Max. Depth (in.)	Approx. Net Wt. (Lbs.)
Type QMS—Single-phase, 60 Hertz				
5	14 ¹ / ₂	10 ³ / ₄	11 ⁹ / ₃₂	102
7.5	15 ⁷ / ₈	11 ¹⁵ / ₁₆	12 ¹⁷ / ₃₂	140
10	17 ⁷ / ₃₂	12 ⁹ / ₃₂	12 ²³ / ₃₂	172
15	19 ¹⁷ / ₁₆	14 ³ / ₄	14 ¹⁷ / ₃₂	255
25	19 ²⁷ / ₃₂	16 ⁷ / ₁₆	15 ¹¹ / ₁₆	370

kVA	Max. Height (in.)	Max. Width (in.)	Max. Depth (in.)	Approx. Net Wt. (Lbs.)
Type QMS—Single-phase, 50/60 Hertz				
5	14 ¹ / ₂	10 ³ / ₄	11 ⁹ / ₃₂	109
7.5	15 ⁷ / ₈	11 ¹⁵ / ₁₆	12 ¹⁷ / ₃₂	150
10	17 ⁷ / ₃₂	12 ⁹ / ₃₂	12 ²³ / ₃₂	187
15	18 ¹⁷ / ₁₆	14 ³ / ₄	14 ¹⁷ / ₃₂	272
25	19 ²⁷ / ₃₂	16 ⁷ / ₁₆	15 ¹¹ / ₁₆	400

kVA	Max. Height (in.)	Max. Width (in.)	Max. Depth (in.)	Approx. Net Wt. (Lbs.)
Type ML—Three-phase, 60 Hertz				
3	22 ⁹ / ₁₆	7 ⁷ / ₃₂	6 ⁹ / ₁₆	68
6	25 ⁹ / ₁₆	9 ¹ / ₈	7 ⁷ / ₈	106
9	28 ¹⁵ / ₁₆	9 ¹ / ₈	7 ⁷ / ₈	153
15	31 ¹ / ₄	11 ³ / ₈	10 ⁷ / ₁₆	268

kVA	Max. Height (in.)	Max. Width (in.)	Max. Depth (in.)	Approximate Net Wt. (Lbs.)	
				Al	Cu
Type QL—Single-phase, 25-167 kVA, 60 Hertz					
25	25	16 ¹ / ₈	15 ¹ / ₂	185	—
37 ¹ / ₂	34 ⁷ / ₈	20 ¹ / ₄	22 ¹ / ₈	285	—
50	37 ¹ / ₂	20 ¹ / ₄	22 ¹ / ₈	385	—
75	38 ¹ / ₂	22 ¹ / ₂	27 ¹ / ₂	550	—
100	44 ¹ / ₂	26 ¹ / ₂	28 ¹ / ₄	685	—
167	51 ¹ / ₄	29	33 ³ / ₄	1130	—

kVA	Max. Height (in.)	Max. Width (in.)	Max. Depth (in.)	Approximate Net Wt. (Lbs.)	
				Al	Cu
Type QL—Three-phase, 15-1000 kVA, 60 Hertz					
15	27 ³ / ₈	19	16 ⁹ / ₁₆	185	200
30	32 ¹ / ₄	24	18 ⁷ / ₁₆	275	300
45	32 ¹ / ₄	24	18 ⁷ / ₁₆	325	360
50	32 ¹ / ₄	24	18 ⁷ / ₁₆	325	—
75	35 ³ / ₄	32	20 ¹¹ / ₁₆	465	515
112.5	40	32	23 ¹¹ / ₁₆	605	675
150	46	35	23 ¹¹ / ₁₆	790	880
225	48	38 ¹ / ₂	28 ¹⁵ / ₁₆	1030	1130
300	51 ³ / ₄	42 ¹ / ₂	30 ³ / ₄	1370	1535
400	58 ³ / ₈	47 ¹ / ₂	34 ³ / ₄	1900	—
500	58 ³ / ₈	47 ¹ / ₂	34 ³ / ₄	2100	—
750	76	60	50	3450	—
1000	76	60	50	4300	—

NOTES:



Try Type General Purpose Transformers Wiring Diagrams

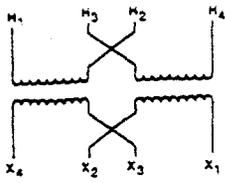


Diagram 1

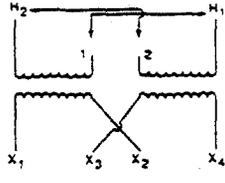


Diagram 8

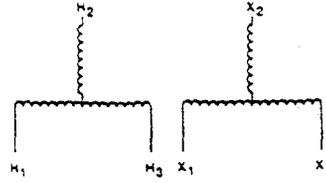


Diagram 15

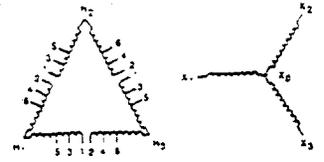


Diagram 22

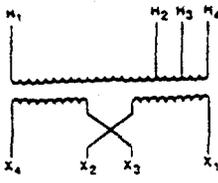


Diagram 2

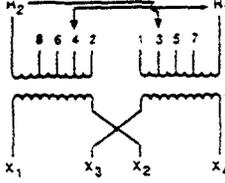


Diagram 9

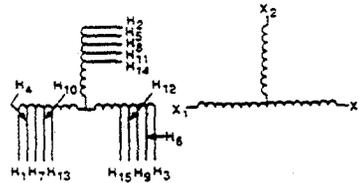


Diagram 16

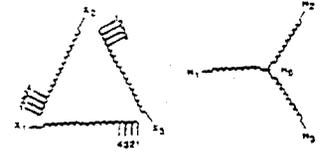


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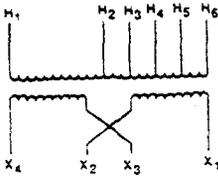


Diagram 3

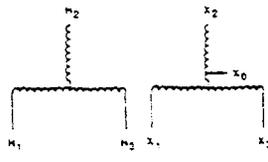


Diagram 10

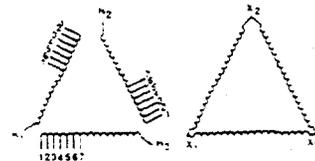


Diagram 17

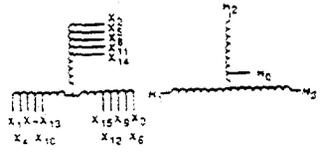


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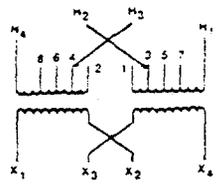


Diagram 4

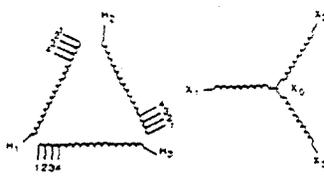


Diagram 11

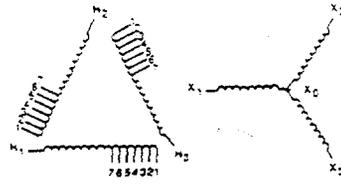


Diagram 18

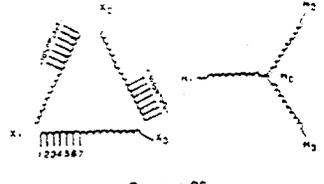


Diagram 25

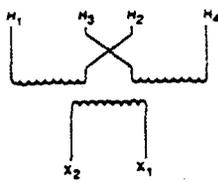


Diagram 5

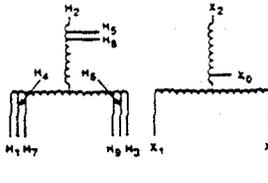


Diagram 12

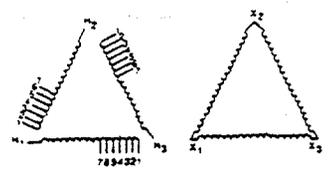


Diagram 19

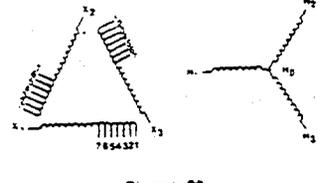


Diagram 26

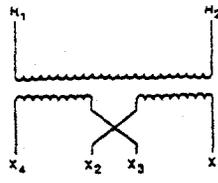


Diagram 6

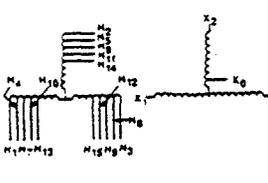


Diagram 13

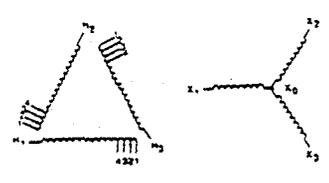


Diagram 20

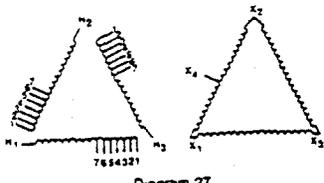


Diagram 27

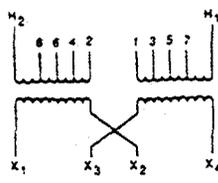


Diagram 7

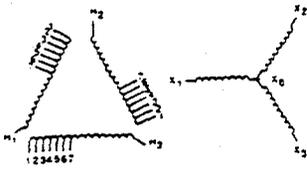


Diagram 14

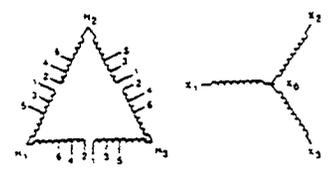


Diagram 21



GE Specialty Transformers

Dry Type General Purpose Transformers

Low Temperature Rise

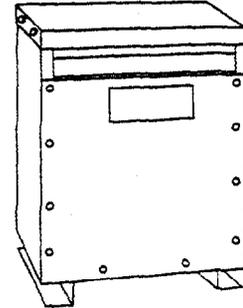
Description

These low temperature rise transformers utilize a UL recognized 220°C insulation system featuring either 80°C or 115°C temperature rise. They provide inherent overload capability and longer life than standard Type QL designs.

Available in both single- and three-phase ratings, GE Type QL low temperature rise transformers are UL Listed, File E79145.

Application

Type QL low temperature rise transformers can help cut operating expenses for systems requiring unit loading at 80 to 100 percent of nameplate rating, 24 hours a day, or where load growth is expected. Units with 115°C temperature rise can be operated continuously at 15 percent above nameplate rating without loss of transformer life. Units with 80°C temperature rise offer loading capability at 30 percent above nameplate rating.



Type QL low temperature rise transformer (closed view)

Single-phase Indoor^②, Type QL, 60 Hertz UL Listed

kVA	Item No.	Qty.	Catalog Number	480 Volts Delta Primary Secondary 208Y/120 Volts			① Tabs	Wiring Diagram No. DEM-1007	Approx. Net Wt. (Lbs.)
				Dimensions (inches)					
				Height	Width	Depth			

115°C Rise

15			9T23L2670	25	16 3/8	15 1/4	6	9	125
25			9T23L2671	34 1/8	20 1/4	22 1/8	6	9	285
37.5			9T23L2672	37 1/2	20 1/4	22 1/8	6	4	385
50			9T23L2673	38 1/8	22 1/2	27 1/2	6	4	550
75			9T23L2674	44 1/2	26 1/2	28 1/4	6	4	685
100			9T23L2675	51 1/4	29	33 3/4	6	4	1130

80°C Rise

15			9T23L3670	34 1/8	20 1/4	22 1/8	6	9	285
25			9T23L3670G81	37 1/2	20 1/4	22 1/8	6	4	385
37.5			9T23L3672	38 1/8	22 1/2	27 1/2	6	4	550
50			9T23L3673	44 1/2	26 1/2	28 1/4	6	4	685
75			9T23L3674	51 1/4	29	33 3/4	6	4	1130
100			9T23L3675	51 1/4	29	33 3/4	6	4	1130

Three-phase Indoor^②, Type QL, 60 Hertz UL Listed, CSA Certified

480 Volts Delta Primary Secondary 208Y/120 Volts									
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115°C Rise

15			9T23Q3571	27 3/8	19	16 9/16	6	18	185
30			9T23Q3572	32 1/4	24	18 1/16	6	18	325
45			9T23Q3573	35 1/4	32	23 1/16	6	18	465
50			9T23Q3564	35 1/4	32	23 1/16	6	18	465
75			9T23Q3574	40	32	23 1/16	6	18	605
112.5			9T23Q3575	46	35	23 1/16	6	18	775
150			9T23Q3576	48	38 1/2	28 15/16	6	18	1030
225			9T23Q3577	51 1/4	42 1/2	30 1/4	6	18	1370
300			9T23L1578	58 3/8	47 1/2	34 3/4	6	18	1900
400			9T23L1586	58 3/8	47 1/2	34 3/4	6	18	2100
500			9T23L1579	76	60	50	▲	21	3450

80°C Rise

15			9T23Q3071	32 1/4	24	18 1/16	6	18	275
30			9T23Q3072	32 1/4	24	18 1/16	6	18	325
45			9T23Q3073	35 1/4	32	23 1/16	6	18	465
50			9T23Q3064	35 1/4	32	23 1/16	6	18	465
75			9T23Q3074	40	32	23 1/16	6	18	605
112.5			9T23Q3075	48	38 1/2	28 15/16	6	18	1030
150			9T23Q3076	48	38 1/2	28 15/16	6	18	1030
225			9T23L8077	58 3/8	47 1/2	34 3/4	6	18	1900
300			9T23L8078	58 3/8	47 1/2	34 3/4	6	18	2100
500			9T23L8079	76	60	50	▲	21	3450

NOTES:

- ① Tap Arrangement:
6-(6) 2 1/2% taps: 2 above and 4 below rated primary voltage.
▲500 kVA has (2) 3.1% primary taps above and below rated voltage.
- ② Consult Factory for outdoor NEMA 3R enclosure.



GE Specialty Transformers

DEM - 1040

Integral Transformer and Distribution Center

Servicenter™ Mini-Unit Substations

Description

The Servicenter mini-unit substation from GE brings proven rugged, encapsulated transformer benefits together with GE advanced breaker techniques to provide one, highly reliable power supply package. This easily installed and serviceable unit incorporates a Type QMS transformer, a primary main circuit breaker, a secondary main circuit breaker, and a load-center-design breaker panel. Since these components don't have to be installed and interconnected separately, the contractor or user can reduce installation time and costs. Because of the single-unit concept, only one, handy Servicenter need be mounted.

Available in single-phase, 5 through 25 kVA, 600-volt class ratings, the GE Servicenter is a convenient, economical way to meet your

light industrial and temporary power requirements.

The transformer—The Servicenter utilizes GE transformer design which has twenty years of field proven experience behind it and a long track record for assuring consistent, reliable performance. Type QMS transformers employ a 180°C UL recognized insulation system with a 115°C rise.

The panel—The panel assembly includes the rugged GE Power Mark Plus™ circuit breaker load center interior, a Type TED primary main circuit breaker, and a Type THQL secondary main circuit breaker on units 5 through 15 kVA. Type TQD secondary main circuit breakers are used on the 25 kVA model. The load center will accept one- or two-pole common trip circuit breakers and ground fault breakers. All

Servicenters come equipped with the properly sized primary main and secondary main circuit breakers installed and prewired. Branch breakers are not included.

Application

The Servicenter can be used wherever 480-volt power is available and 120- or 240-volt branch circuits are required. The unit can be used in such applications as vending machine areas, and construction laboratory test areas, where temporary power is required, or where future expansion of branch circuits is planned.

UL Listed

The Servicenter carries a UL Label for unit substations, and is suitable for both indoor and outdoor installation.

NEC Requirements

The Servicenter conforms with Article 450-3 of the 1987 National Electric Code.

Single-phase

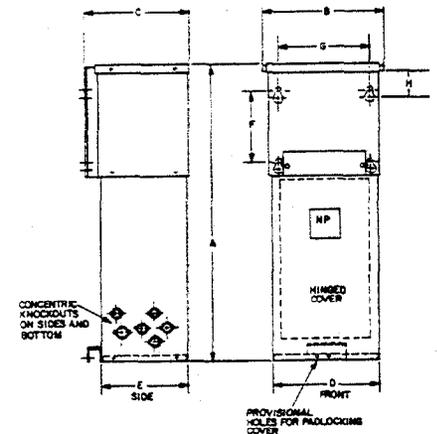
kVA	480 Volts Primary, Secondary 120/240 Volts, 60 Hz Ⓢ									
	Item No.	Qty.	Catalog Number	Maximum Branch Spaces				Total 1-pole Spaces	Breaker Ratings	
				1" THQL		1/2" THQP			Primary Main	Secondary Main
				1-pole	2-pole	1-pole	2-pole			
5			9T21S1050	6	3	12	4	12	25A	30A
7.5			9T21S1070	6	3	12	4	12	35A	40A
10			9T21S1100	8	4	16	6	16	50A	50A
15			9T21S1150	12	6	24	10	24	60A	70A
25			9T21S1250	20	10	8	2	24	100A	150A

600 Volts Primary, Secondary 120/240 Volts, 60 Hz Ⓢ										
kVA	Item No.	Qty.	Catalog Number	Maximum Branch Spaces				Total 1-pole Spaces	Breaker Ratings	
				1" THQL		1/2" THQP			Primary Main	Secondary Main
				1-pole	2-pole	1-pole	2-pole			
5			9T21S1052	6	3	12	4	12	20A	30A
7.5			9T21S1072	6	3	12	4	12	30A	40A
10			9T21S1102	8	4	16	6	16	40A	50A
15			9T21S1152	12	6	24	10	24	60A	70A

①(2) 5% below normal taps.

Dimensions

kVA	Catalog Number	Approximate Dimensions (Inches)									Approx. Wt. (LBS.)	
		A Max. Height	B Max. Width	C Max. Depth	D	E	F	G	H	Net	Shio	
5	9T21S1050, 1052	32 1/4	10 3/4	11	9 7/8	8 1/2	6	3 7/8	2 1/4	123	133	
7.5	9T21S1070, 1072	33 3/8	12	12 3/8	11	9 7/8	6 7/8	2 1/2	2 3/8	161	171	
10	9T21S1100, 1102	34 7/8	12 1/2	12 1/2	11 1/4	10	7 1/2	3 1/8	2 3/8	198	208	
15	9T21S1150, 1152	39	14 3/4	14 3/8	13 3/4	12	7 1/8	12 1/4	3 1/2	280	290	
25	9T21S1250	44	16 7/8	15 1/2	15 1/2	13 7/8	9	13 3/8	3 1/2	418	430	



NOTES:

6

APPENDIX Q
WELL HOUSES



301 BICKFORD STREET NEW LISBON, WISCONSIN 53950-1524 608-562-5900 FAX 608-562-5909

INSTALLATION INSTRUCTIONS FOR THE MODULAR TYPE BUILDINGS

1. REMOVE ALL CRATING FROM BUILDING.
2. ATTACH $\frac{1}{2}$ " X 2" NEOPRENE RUBBER GASKET SUPPLIED WITH BUILDING TO THE BOTTOM EDGE OF EACH PANEL, FLUSH WITH THE OUTSIDE SURFACE. IF YOUR BUILDING HAS AN OPTIONAL FLOOR THIS STEP IS OMITTED.
3. CAREFULLY SET BUILDING ON FOUNDATION. IF LIFTING BUILDING VIA THE LIFTING EYES IN ROOF, USE A SPREADER BAR "ASSEMBLY" TO MAINTAIN A VERTICAL LIFT.
4. SHIM, SQUARE AND ALIGN BUILDING AS NECESSARY FOR PROPER DOOR/DOOR FRAME ALIGNMENT PRIOR TO INSTALLATION OF ANCHOR BOLTS. ADJUST FRONT WALL AT BASE OF DOOR FRAME FOR PROPER FIT - SEE NOTE #4.
5. INSTALL ANCHOR BOLTS - SEE NOTES #1-3.
6. INSTALL ST. ST. THRESHOLD (FASTENERS ARE NOT PROVIDED - RECOMMEND USING PLASTIC ANCHORS WITH #10 X 1" TRUSSHEAD SCREWS). HOLES ARE PREDRILLED IN THRESHOLD FOR SCREWS. SILICONE UNDER THRESHOLD PRIOR TO INSTALLING SCREWS.
7. (OPTIONAL) RUN A BEAD OF RTV MARINE GRADE RUBBER SILICONE ALL AROUND THE BUILDING'S EXTERIOR (AND INTERIOR) BASE PERIMETER TO SEAL BUILDING TO FOUNDATION - SILICONE TO BE SUPPLIED BY OTHERS.

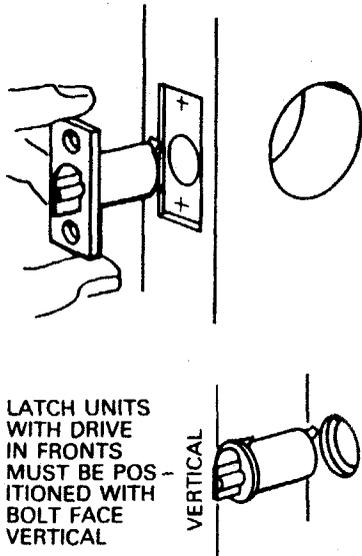
NOTES:

1. EFC DOES NOT RECOMMEND PREDRILLING HOLES IN FOUNDATION PRIOR TO RECEIPT OF BUILDING OR USING PRESET ANCHOR BOLTS.
2. ANCHOR BOLTS TO BE SUPPLIED AND INSTALLED BY OTHERS.
3. EFC RECOMMENDS $\frac{1}{2}$ " DIA. X $3\frac{1}{2}$ " LONG STAINLESS STEEL EXPANSION TYPE ANCHOR BOLTS ($5\frac{1}{2}$ " LONG IF BUILDING HAS AN OPTIONAL FLOOR).
4. THE DOOR'S LOCKSET MAY BE PACKAGED SEPARATELY TO PREVENT DAMAGE DURING SHIPMENT. IF SO, INSTALL LOCKSET PER MANUFACTURER'S INSTRUCTIONS. SILICONE AROUND LOCKSET TO SEAL - BOTH ON DOOR'S INTERIOR AND EXTERIOR SURFACES.
5. IF YOUR BUILDING IS PROVIDED WITH FRP OUTSIDE VENT COVERS FOR EXHAUST AND/OR INTAKE APPLICATIONS AND THESE COVERS ARE NOT ATTACHED TO THE BUILDING - USE THE EFC SUPPLIED NYLON DRIVE RIVETS TO FASTEN COVER(S) TO EXTERIOR SURFACE OF BUILDING (HOLES ARE PREDRILLED). CAREFULLY SILICONE AROUND OUTSIDE EDGE OF COVER'S FLANGE. USE MASKING TAPE AROUND PERIMETER (ON EXTERIOR WALL OF BUILDING AND COVER'S FLANGE) TO PROVIDE A GOOD APPEARANCE.
6. IF YOU HAVE ANY QUESTIONS OR PROBLEMS, PLEASE CONTACT LEVINE WETLEY OF EFC AT 608-562-5900.

INSTRUCTIONS FOR INSTALLING HEAVY DUTY CYLINDRICAL BORED LOCK

A INSTALL LATCH UNIT

AFTER PREPARING DOOR AND JAMB ACCORDING TO TEMPLATE PROVIDED - MOUNT LATCH UNIT IN DOOR.



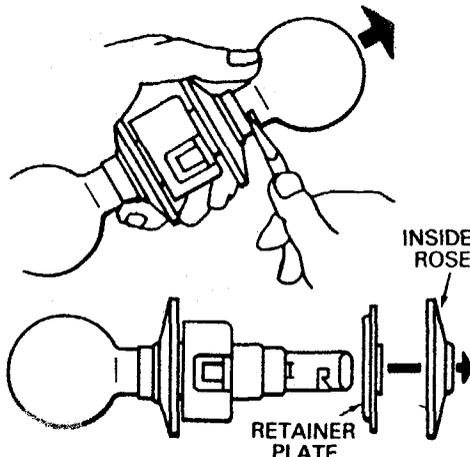
LATCH UNITS WITH DRIVE IN FRONTS MUST BE POSITIONED WITH BOLT FACE VERTICAL

VERTICAL

B REMOVE INSIDE KNOB OR HANDLE*

IF RECEIVED WITH KNOB OR HANDLE ENGAGED DEPRESS KNOB CATCH WITH SCREW DRIVER AND PULL KNOB OR HANDLE OFF SPINDLE.

* KNOB TRIM ILLUSTRATED



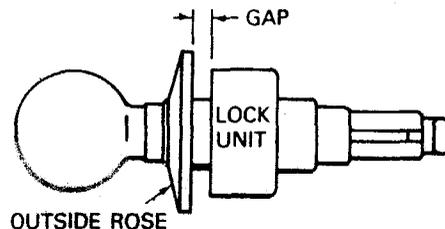
REMOVE ROSE AND RETAINER PLATE

NOTE: LOCKS WITH THREADED INSIDE ROSES DO NOT HAVE RETAINER PLATES. UNSCREW TO REMOVE.

C ADJUST FOR DOOR THICKNESS

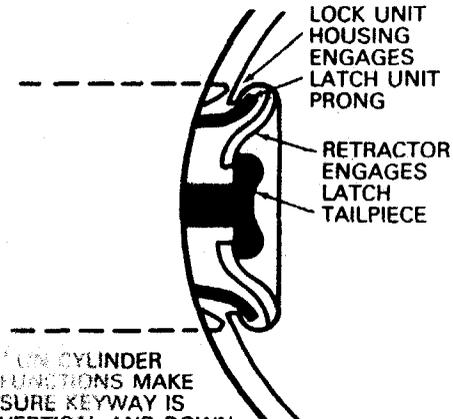
ROTATE OUTSIDE ROSE IN OR OUT DEPENDING ON DOOR THICKNESS. LOCK WILL FIT ANY DOOR FROM 1 3/8" TO 2"

1/8" GAP FOR 1 - 3/8" DOORS
1/4" GAP FOR 1 - 3/4" DOORS
3/8" GAP FOR 2" DOORS



D INSTALL LOCK UNIT*

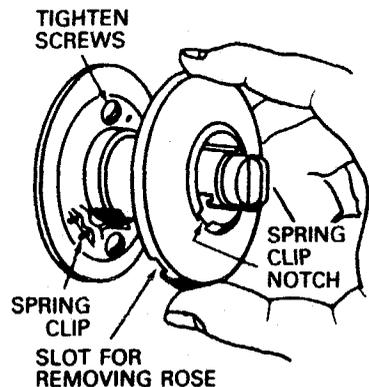
LOCK UNIT HOUSING MUST ENGAGE LATCH UNIT PRONGS AND RETRACTOR MUST ENGAGE LATCH TAILPIECE. NOTE: IF GUARD BOLT FUNCTION IS INSTALLED, DO NOT ATTEMPT TO MOUNT LOCK UNIT WHEN DOOR IS CLOSED. GUARD BOLT TAILPIECE WILL INTERFERE. NOTE: DEPRESS LATCH BOLT SLIGHTLY TO ALLOW RETRACTOR TO ENGAGE LATCH TAILPIECE



FOR CYLINDER FUNCTIONS MAKE SURE KEYWAY IS VERTICAL AND DOWN. SEE NOTE BELOW TO REVERSE CYLINDER

E ATTACH INSIDE ROSE

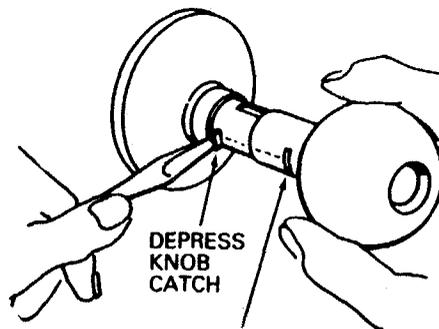
SNAP ON ROSES: SLIP ON RETAINER PLATE AND FASTEN WITH TWO MACHINE SCREWS. POSITION SPRING CLIP NOTCH AND SNAP ROSE OVER RETAINER PLATE.



THREADED TYPE ROSES: SLIP ROSE OVER SPINDLE AND SCREW DOWN FIRMLY USING TRIM WRENCH PROVIDED

F REPLACE INSIDE KNOB OR HANDLE

LINE UP SLOT IN KNOB WITH KNOB CATCH IN SPINDLE. SLIDE KNOB OR HANDLE ON TO SPINDLE. DEPRESS KNOB CATCH AND PUSH KNOB OR HANDLE INTO ENGAGED POSITION. NOTE: B KNOB BUTTON SETS SHOULD BE IN THE UNLOCKED POSITION WHEN REPLACING THE INSIDE KNOB OR HANDLE



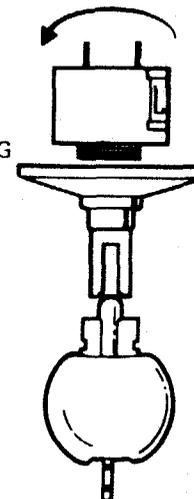
ALIGN SLOT

NOTE: WHEN A CYLINDER FUNCTION LOCK IS CORRECTLY INSTALLED, THE KEY SHOULD ENTER IN THIS POSITION.



IF NOT, REVERSE CYLINDER AS FOLLOWS:

1. WITH INSIDE KNOB UNLOCKED, INSERT A KEY INTO CYLINDER
2. TURN KEY ABOUT 45° DEGREE.
3. PRESS RETAINER THRU SLEEVE HOLE BY USING TOOL PROVIDED AND PULL KNOB OUT.
4. TURN LOCKSET TO OPPOSITE SIDE WHERE YOU WISH TO REVERSE.
5. PUT OUTSIDE KNOB WITH KEY-IN-CYLINDER BACK INTO SPINDLE UNTIL TAIL-PIECE CAN ENGAGE RETRACTOR (FEEL RETRACTS BY TURNING KEY SLIGHTLY)
6. TURN KEY ABOUT 45° DEGREE AND PUSH KNOB IN UNTIL RETAINER CLICKS INTO POSITION.

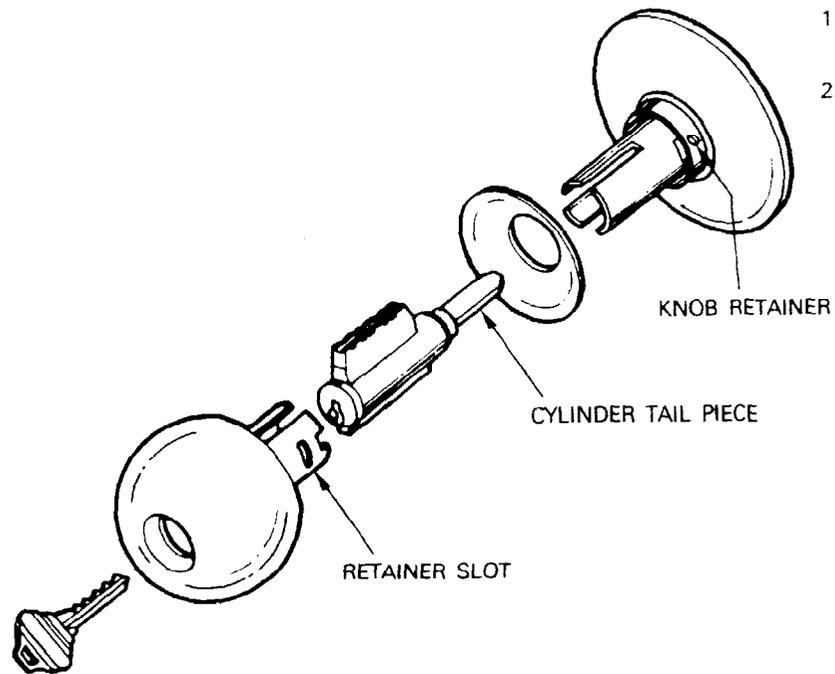


* TURN LOCKSET TO OPPOSITE SIDE WHERE YOU WISH TO REVERSE

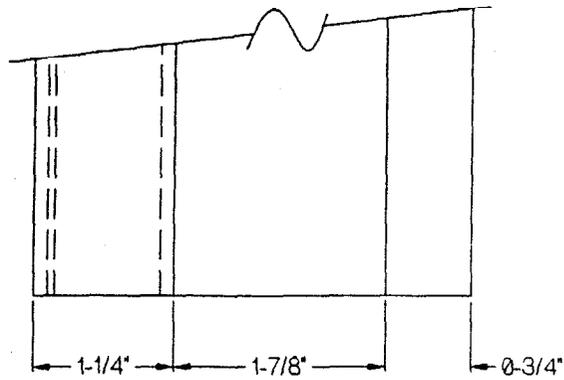
* OUTSIDE KNOB & CYLINDER ALWAYS BEING IN THIS POSITION

SEE REVERSE SIDE FOR CYLINDER KNOB ASSEMBLY

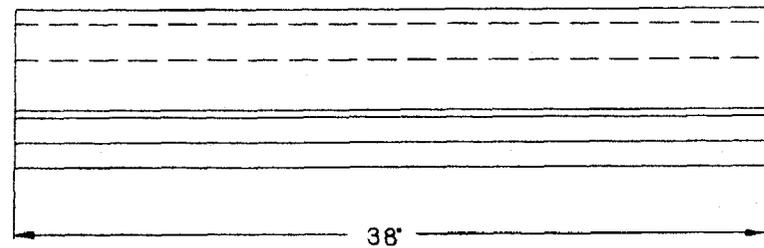
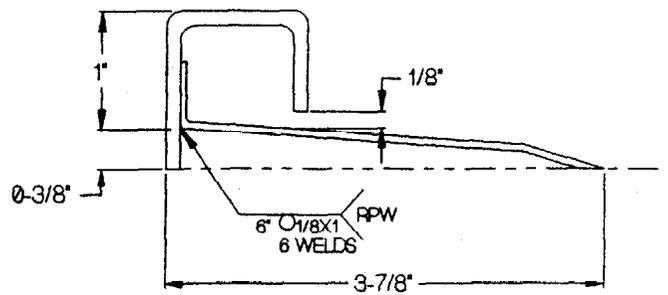
CYLINDER REASSEMBLY



1. PUSH KNOB WITH KEY-IN-CYLINDER BACK INTO SPINDLE UNTIL TAIL-PIECE CAN ENGAGE RETRACTOR (FEEL RETRACTS BY TURNING KEY SLIGHTLY)
2. TURN KEY ABOUT 45° DEGREE AND PUSH KNOB IN UNTIL RETAINER CLICKS INTO POSITION.



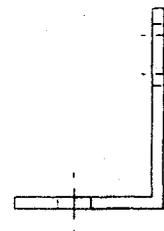
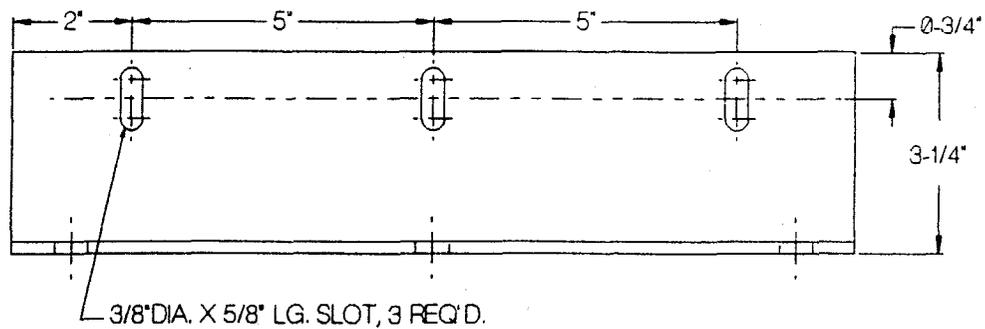
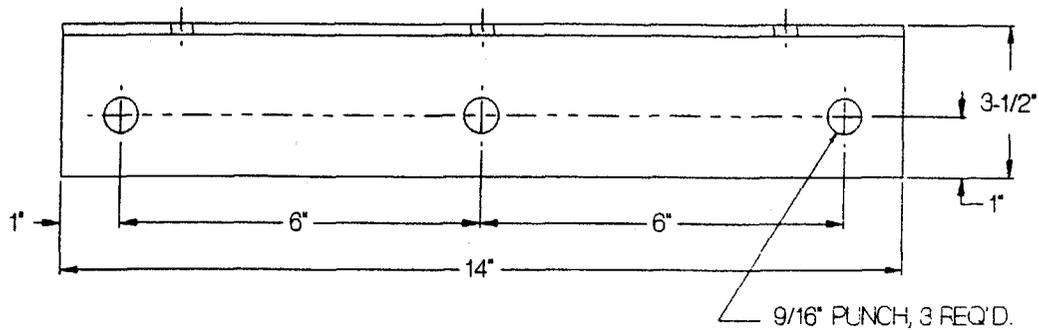
MATERIAL: TYPE 304 STAINLESS STEEL, 12 GAUGE
 NEOPRENE GASKET NOT SHOWN



THRESHOLD FOR STANDARD 3'-0" WIDE (O.I.C.) DOOR



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ANGLE BRACKET MOUNTING FLANGE

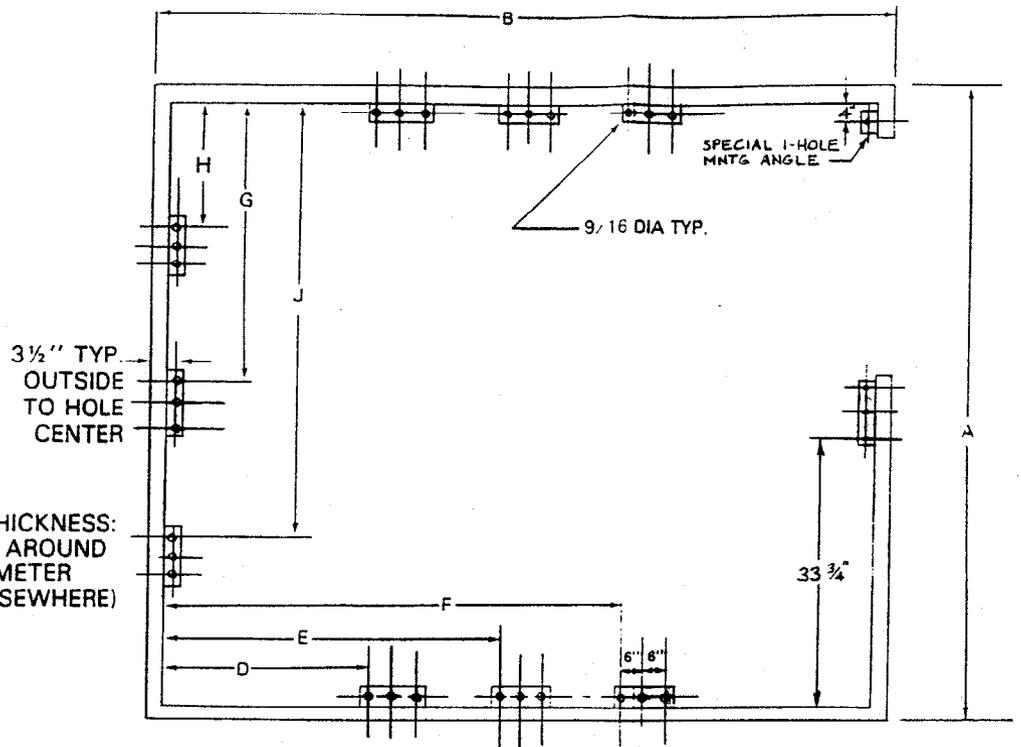
MATERIAL: TYPE 304 STAINLESS STEEL, 12 GAUGE



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SIZE AxB	C*	D	E	F	G	H	J
6x4	1½"	—	16"	—	28"	—	—
6x6	1½"	—	28"	—	28"	—	—
6x8	1½"	—	40"	—	28"	—	—
6x10	1½"	32"	—	72"	28"	—	—
6x12	1½"	40"	—	88"	28"	—	—
6x14	1½"	48"	—	104"	28"	—	—
8x4	13"	—	16"	—	40"	—	—
8x6	13"	—	28"	—	40"	—	—
8x8	13"	—	40"	—	40"	—	—
8x10	13"	32"	—	72"	40"	—	—
8x12	13"	40"	—	88"	40"	—	—
8x14	13"	48"	—	104"	40"	—	—
10x4	25"	—	16"	—	—	32"	72"
10x6	25"	—	28"	—	—	32"	72"
10x8	25"	—	40"	—	—	32"	72"
10x10	25"	32"	—	72"	—	32"	72"
10x12	25"	40"	—	88"	—	32"	72"
10x14	25"	48"	—	104"	—	32"	72"
12x4	37"	—	16"	—	—	40"	88"
12x6	37"	—	28"	—	—	40"	88"
12x8	37"	—	40"	—	—	40"	88"
12x10	37"	32"	—	72"	—	40"	88"
12x12	37"	40"	—	88"	—	40"	88"
12x14	37"	48"	—	104"	—	40"	88"
14x4	49"	—	16"	—	—	48"	104"
14x6	49"	—	28"	—	—	48"	104"
14x8	49"	—	40"	—	—	48"	104"
14x10	49"	32"	—	72"	—	48"	104"
14x12	49"	40"	—	88"	—	48"	104"
14x14	49"	48"	—	104"	—	48"	104"

*ASSUMES STANDARD 3'0" WIDE DOOR IS CENTERED IN FRONT PANEL.



3 ½" TYP. OUTSIDE TO HOLE CENTER

PANEL THICKNESS: 2" TYP. AROUND PERIMETER (1 ¼" ELSEWHERE)

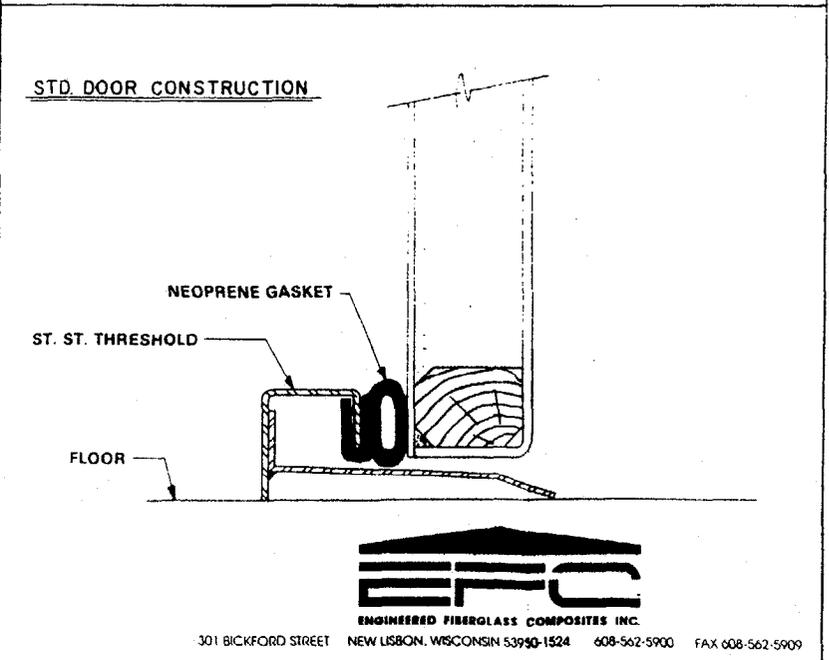
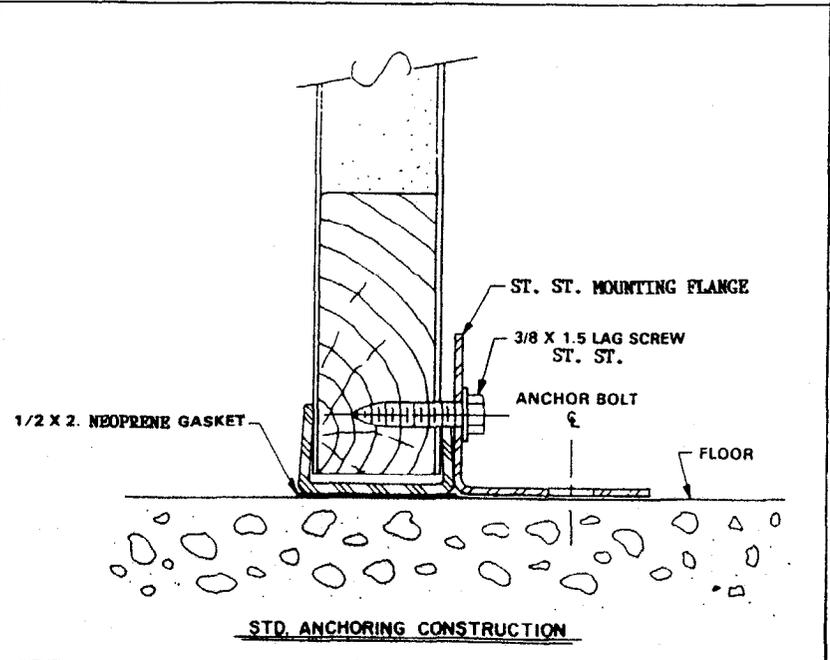
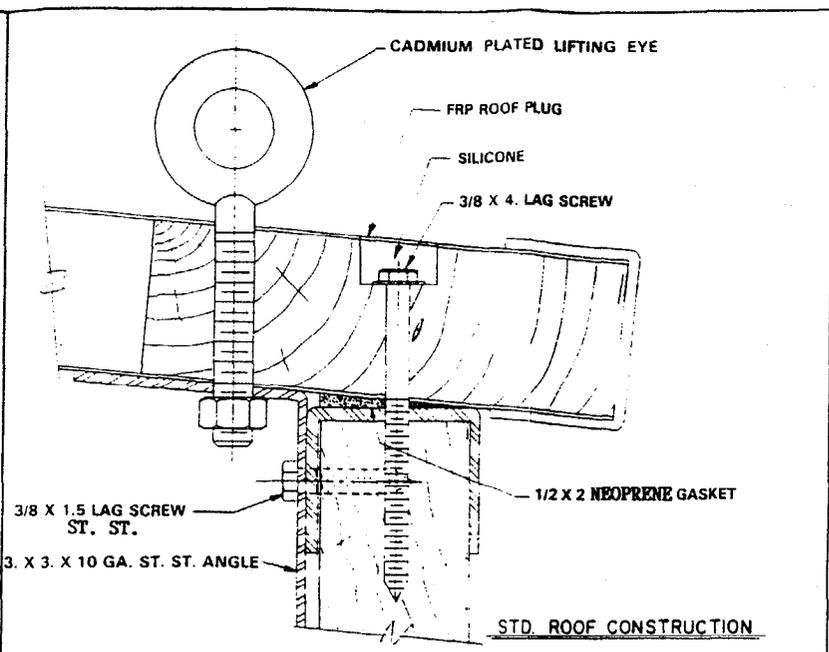
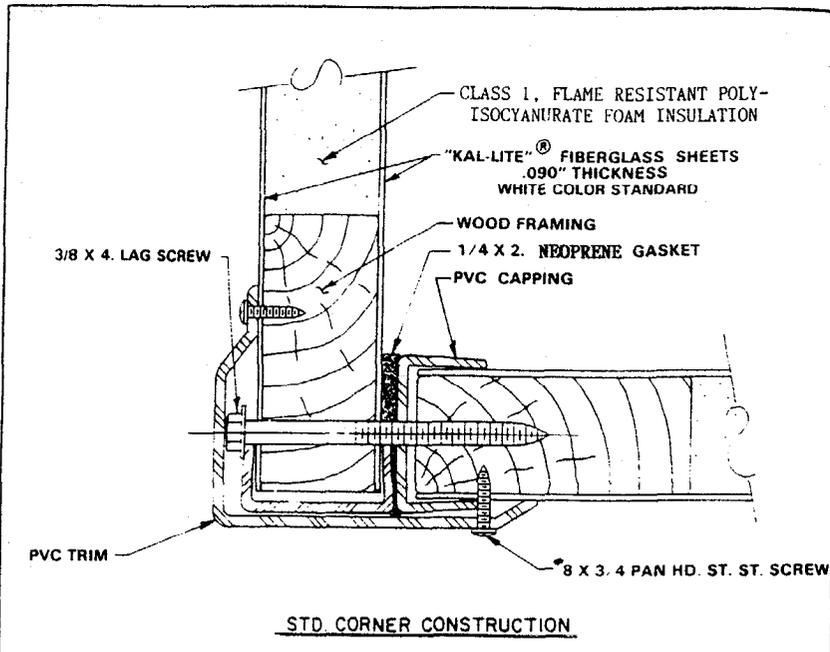
THE HOLES ARE ON 6 IN. CENTERS. PREPUNCHED FOR ½ IN. DIAMETER BOLTS. THE ANGLES ARE ATTACHED TO THE BUILDING WITH THREE 5/16" X 1 1/2" LAG SCREWS.

TYPICAL TIE DOWN DETAIL
NOT TO SCALE.

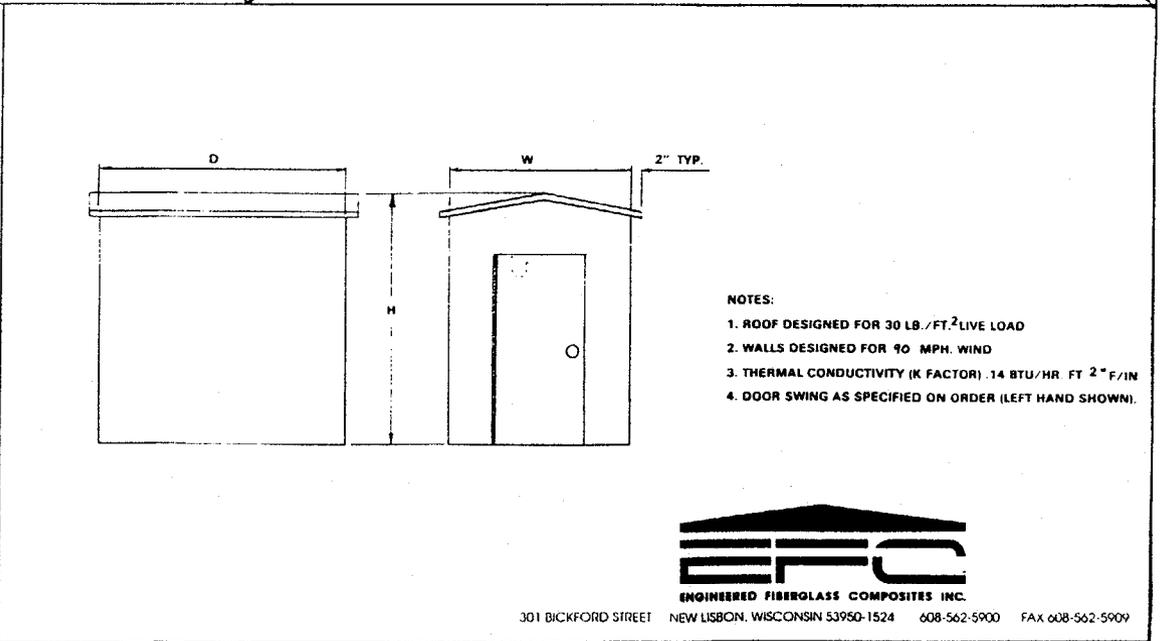
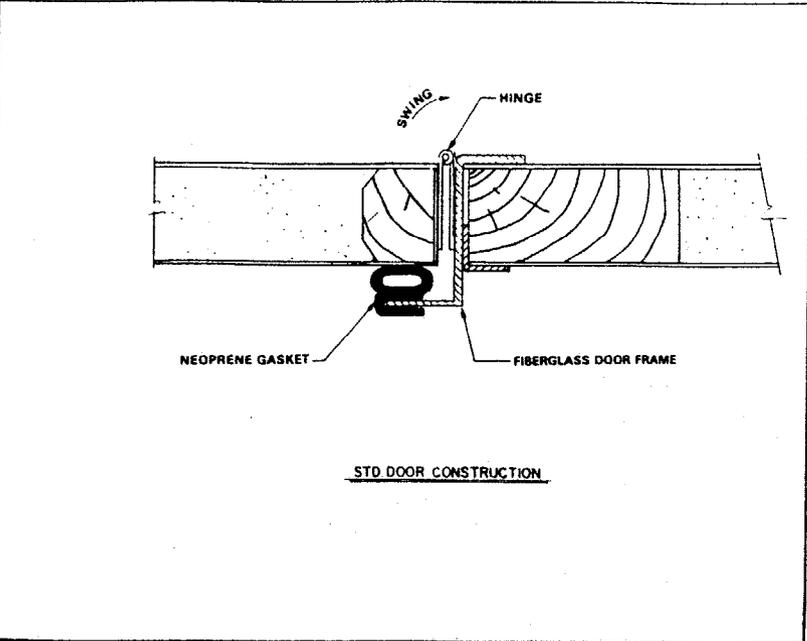
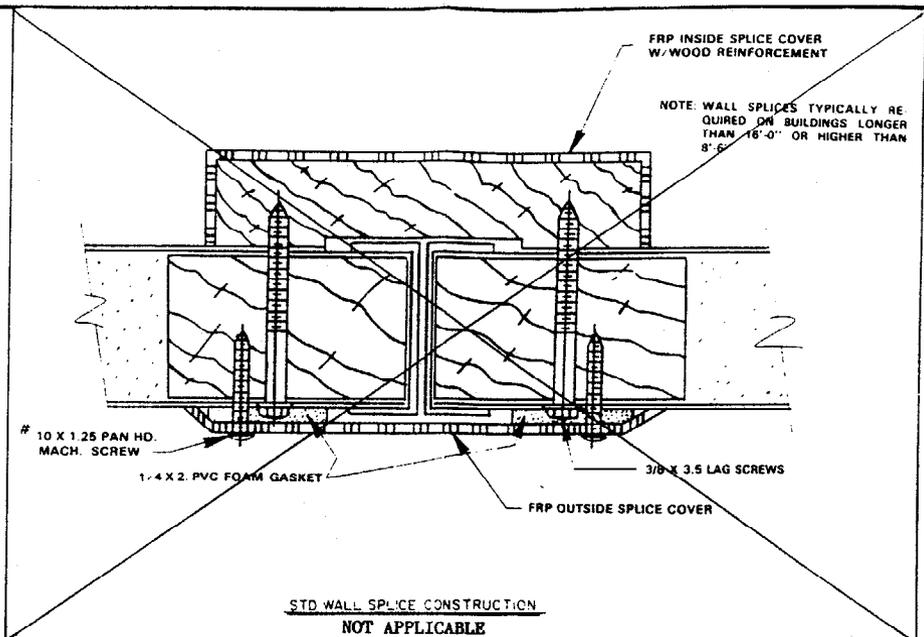
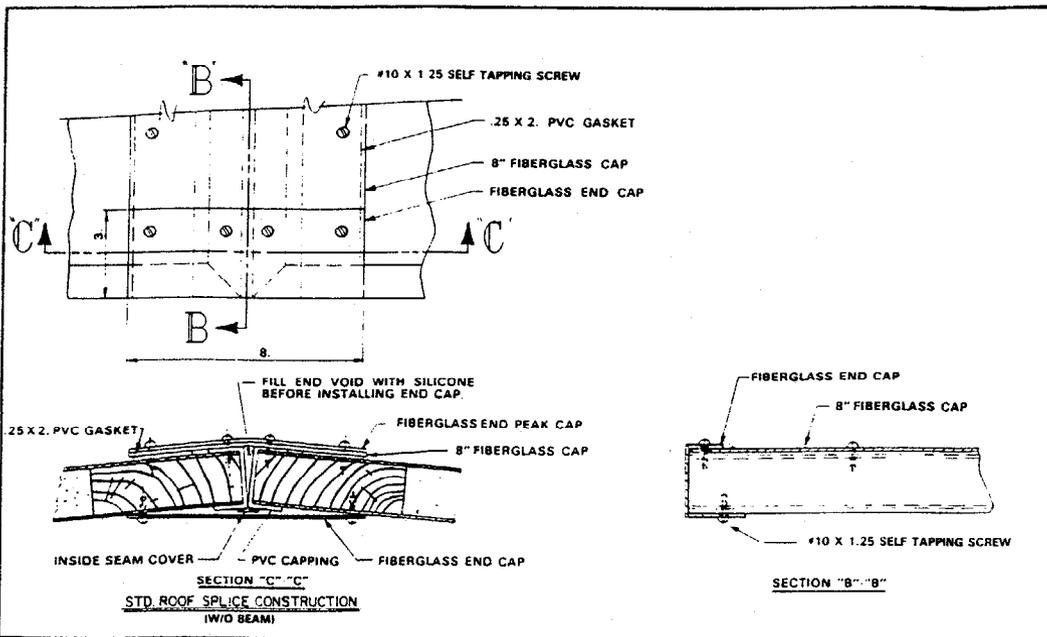
ANCHOR BOLTS ARE NOT PROVIDED WITH BUILDING

EFC DOES NOT RECOMMEND PREDRILLING HOLES IN FOUNDATION.





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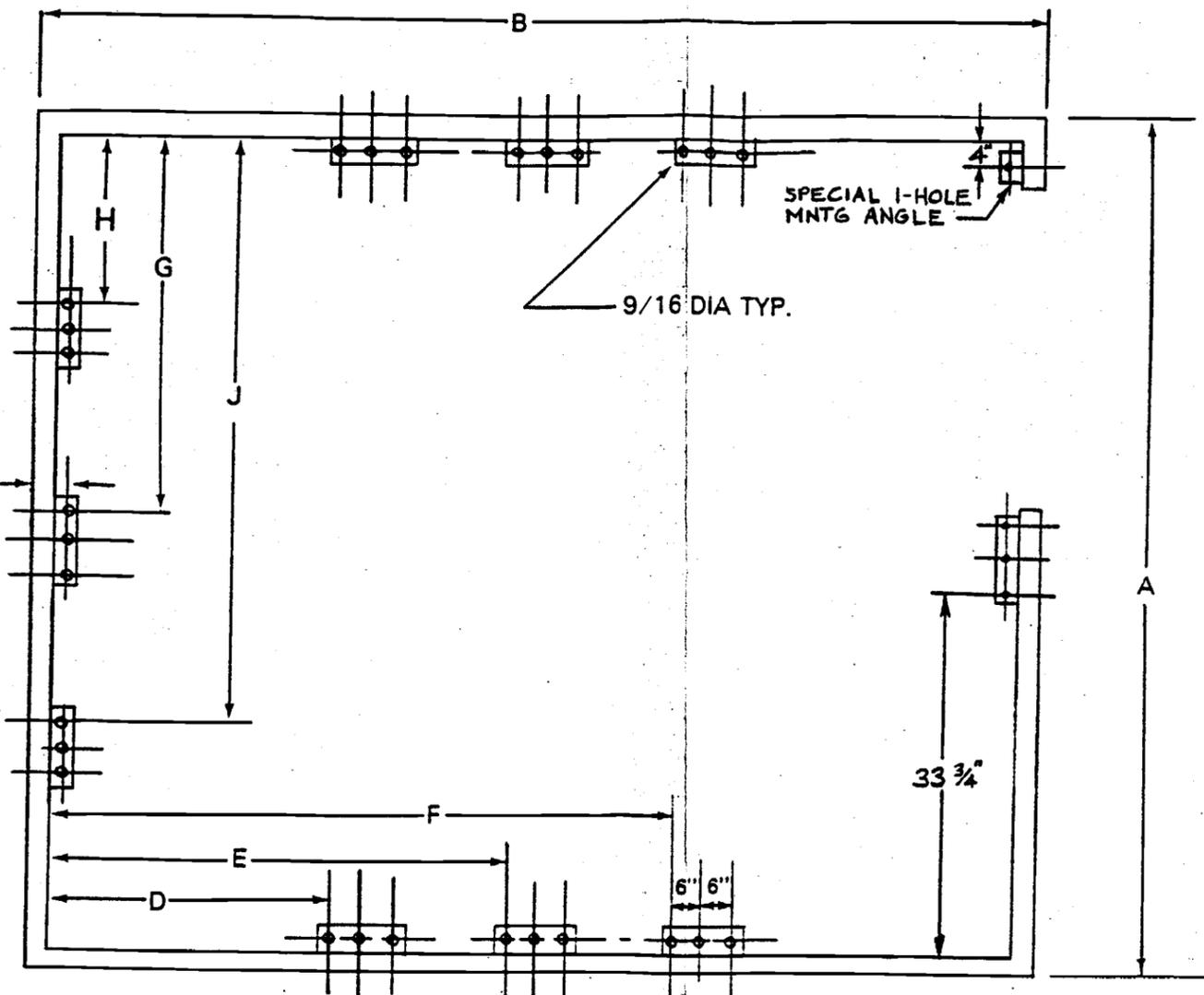
SIZE AxB	C*	D	E	F	G	H	J
6x4	1½"	—	16"	—	28"	—	—
6x6	1½"	—	28"	—	28"	—	—
6x8	1½"	—	40"	—	28"	—	—
6x10	1½"	32"	—	72"	28"	—	—
6x12	1½"	40"	—	88"	28"	—	—
6x14	1½"	48"	—	104"	28"	—	—
8x4	13"	—	16"	—	40"	—	—
8x6	13"	—	28"	—	40"	—	—
8x8	13"	—	40"	—	40"	—	—
8x10	13"	32"	—	72"	40"	—	—
8x12	13"	40"	—	88"	40"	—	—
8x14	13"	48"	—	104"	40"	—	—
10x4	25"	—	16"	—	—	32"	72"
10x6	25"	—	28"	—	—	32"	72"
10x8	25"	—	40"	—	—	32"	72"
10x10	25"	32"	—	72"	—	32"	72"
10x12	25"	40"	—	88"	—	32"	72"
10x14	25"	48"	—	104"	—	32"	72"
12x4	37"	—	16"	—	—	40"	88"
12x6	37"	—	28"	—	—	40"	88"
12x8	37"	—	40"	—	—	40"	88"
12x10	37"	32"	—	72"	—	40"	88"
12x12	37"	40"	—	88"	—	40"	88"
12x14	37"	48"	—	104"	—	40"	88"
14x4	49"	—	16"	—	—	48"	104"
14x6	49"	—	28"	—	—	48"	104"
14x8	49"	—	40"	—	—	48"	104"
14x10	49"	32"	—	72"	—	48"	104"
14x12	49"	40"	—	88"	—	48"	104"
14x14	49"	48"	—	104"	—	48"	104"

* ASSUMES STANDARD 3'0" WIDE DOOR IS CENTERED IN FRONT PANEL.

3½" TYP. OUTSIDE TO HOLE CENTER

PANEL THICKNESS: 2" TYP. AROUND PERIMETER (1¼" ELSEWHERE)

ANCHOR BOLTS ARE NOT PROVIDED WITH BUILDING



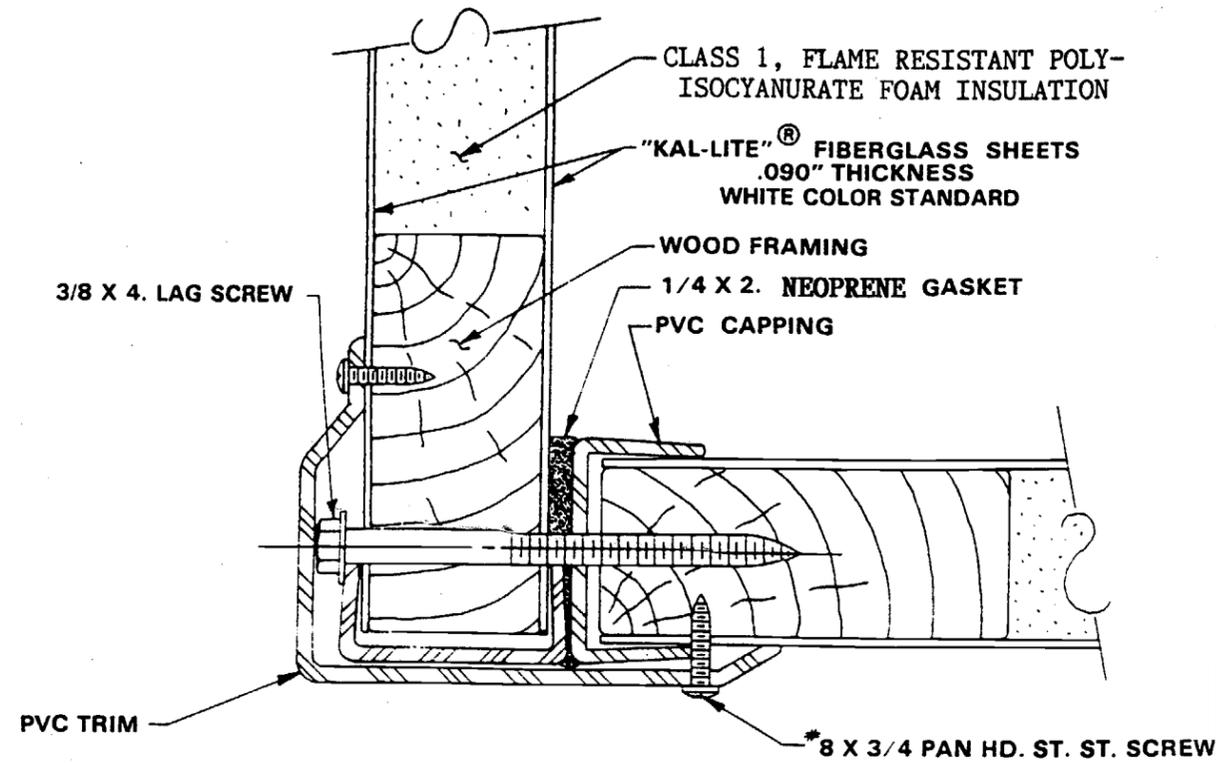
THE HOLES ARE ON 6 IN. CENTERS. PREPUNCHED FOR ½ IN. DIAMETER BOLTS. THE ANGLES ARE ATTACHED TO THE BUILDING WITH THREE 5/16" X 1 1/2" LAG SCREWS.

EFCC DOES NOT RECOMMEND PREDRILLING HOLES IN FOUNDATION.

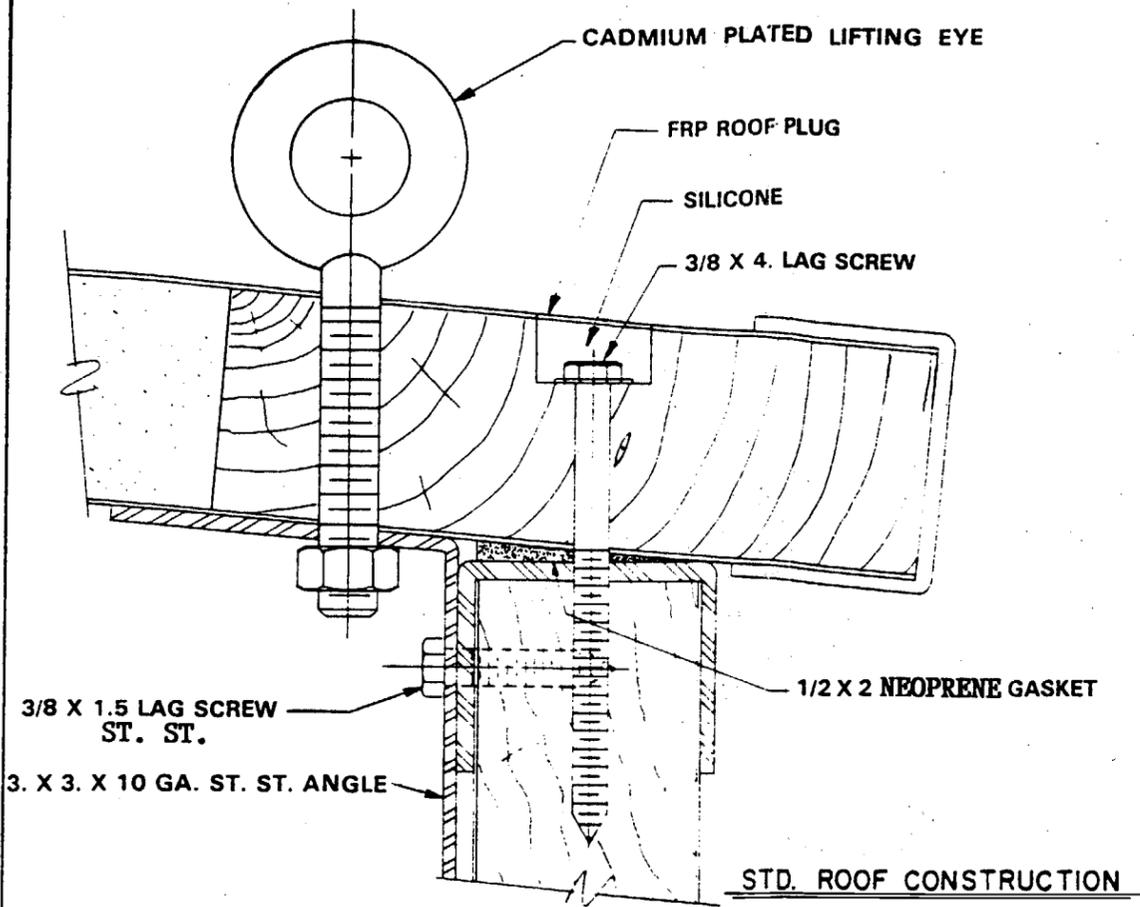
TYPICAL TIE DOWN DETAIL
NOT TO SCALE.



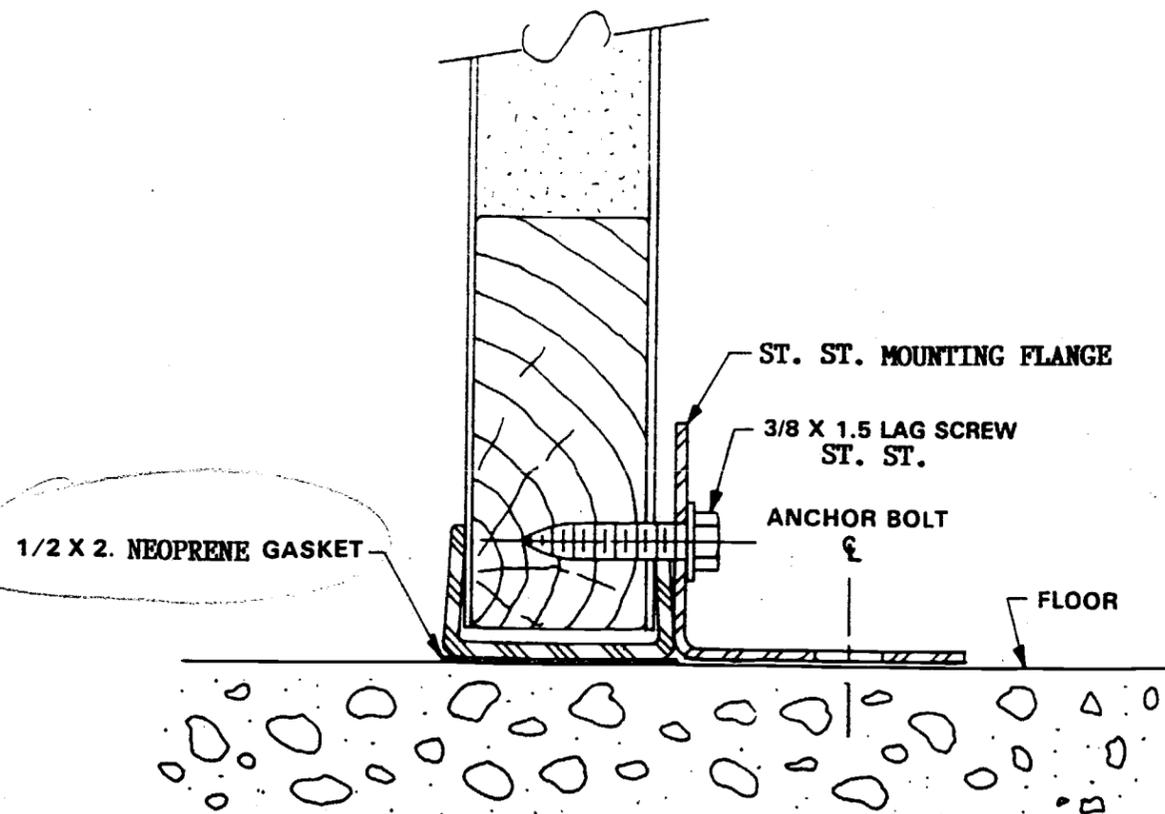
023514HR12



STD. CORNER CONSTRUCTION

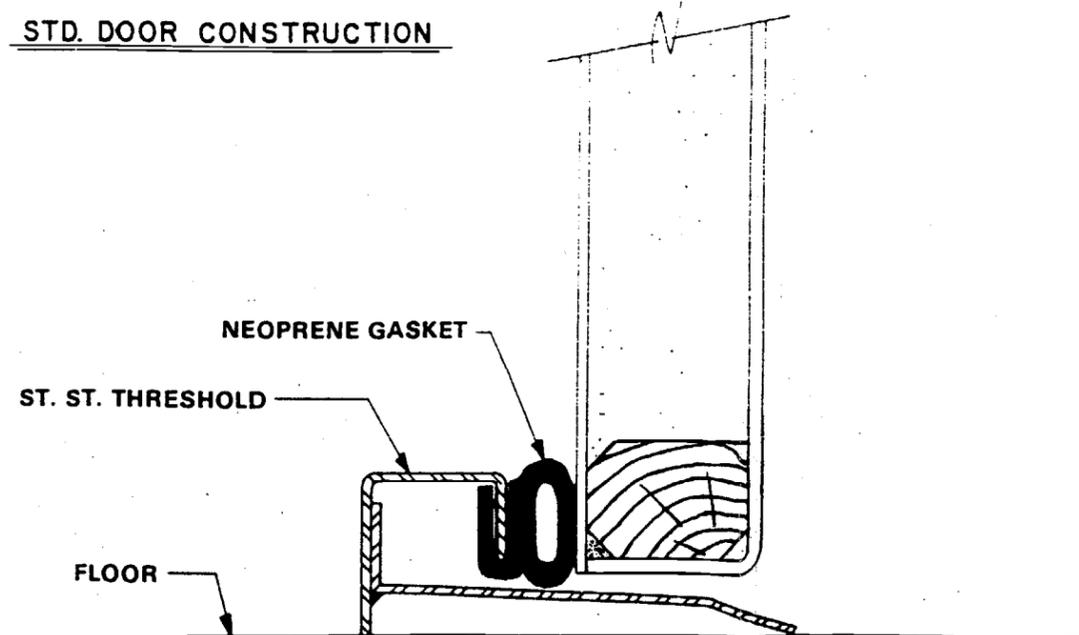


STD. ROOF CONSTRUCTION



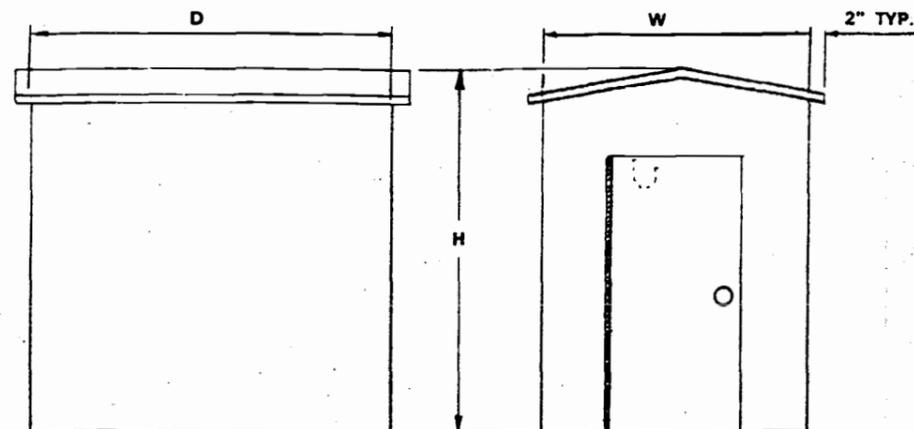
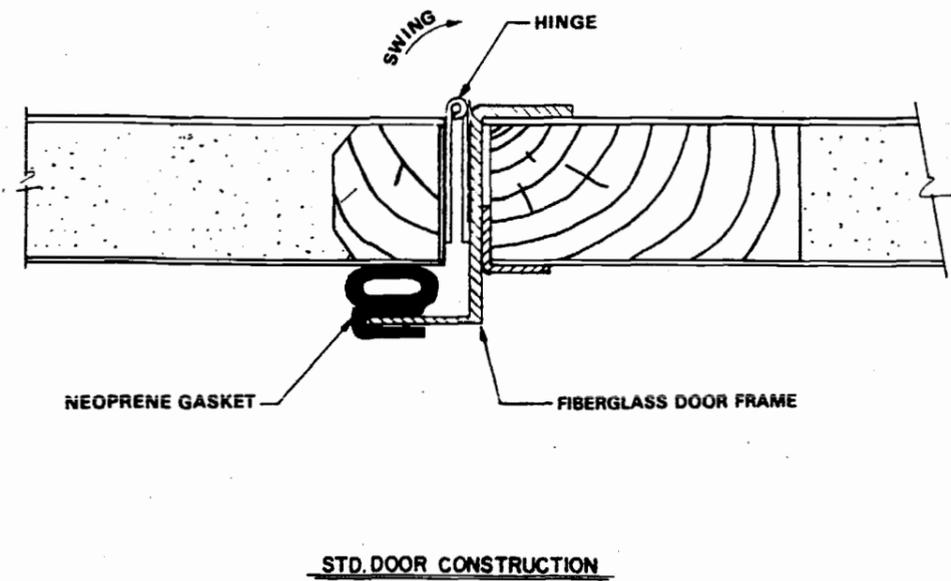
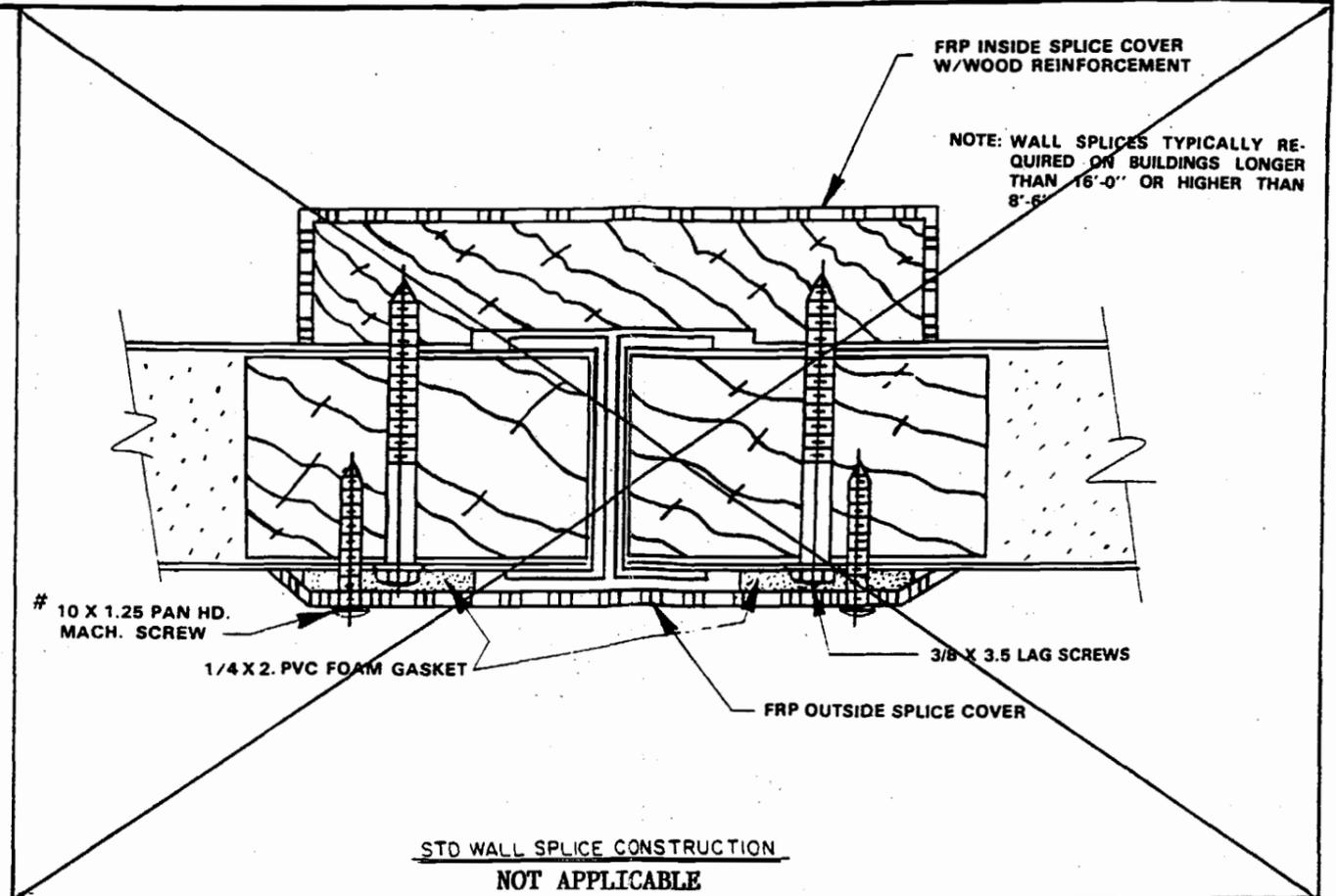
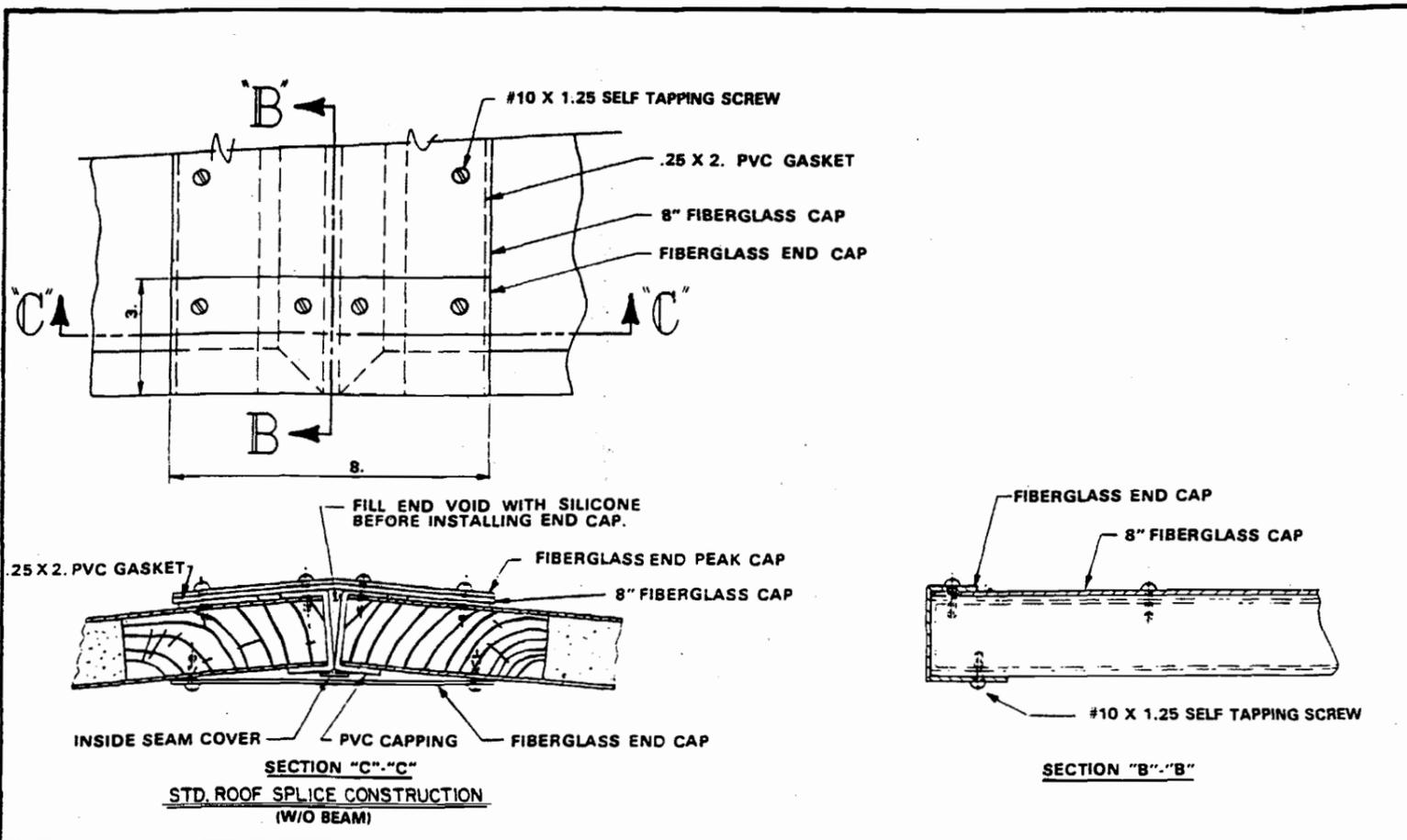
STD. ANCHORING CONSTRUCTION

STD. DOOR CONSTRUCTION



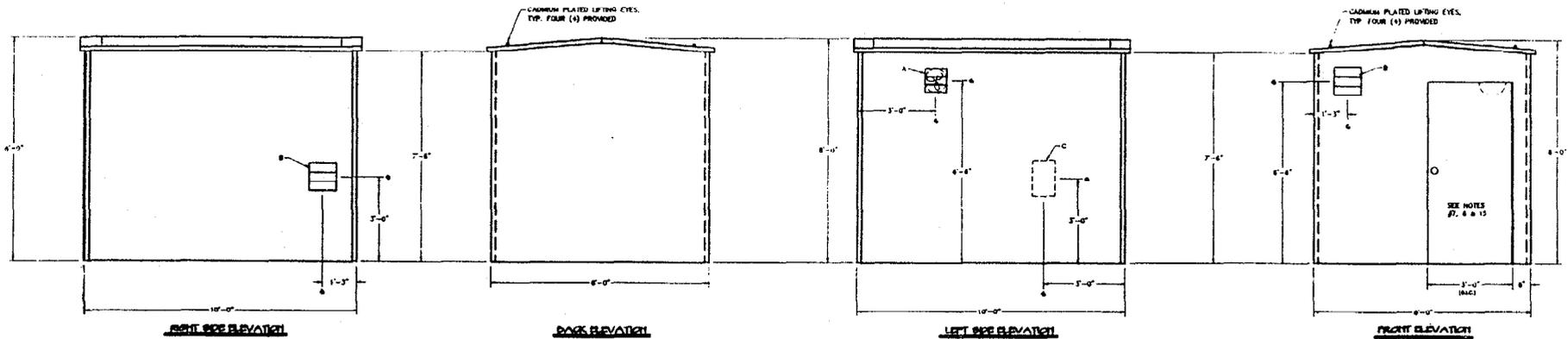
ENGINEERED FIBERGLASS COMPOSITES INC.

301 BICKFORD STREET NEW LISBON, WISCONSIN 53950-1524 608-562-5900 FAX 608-562-5909



- NOTES:
1. ROOF DESIGNED FOR 30 LB./FT.² LIVE LOAD
 2. WALLS DESIGNED FOR 90 MPH. WIND
 3. THERMAL CONDUCTIVITY (K FACTOR) .14 BTU/HR. FT² F/IN
 4. DOOR SWING AS SPECIFIED ON ORDER (LEFT HAND SHOWN).



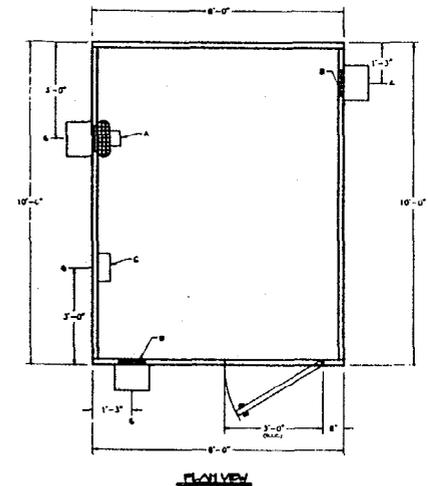


OPTIONAL EQUIPMENT LIST:

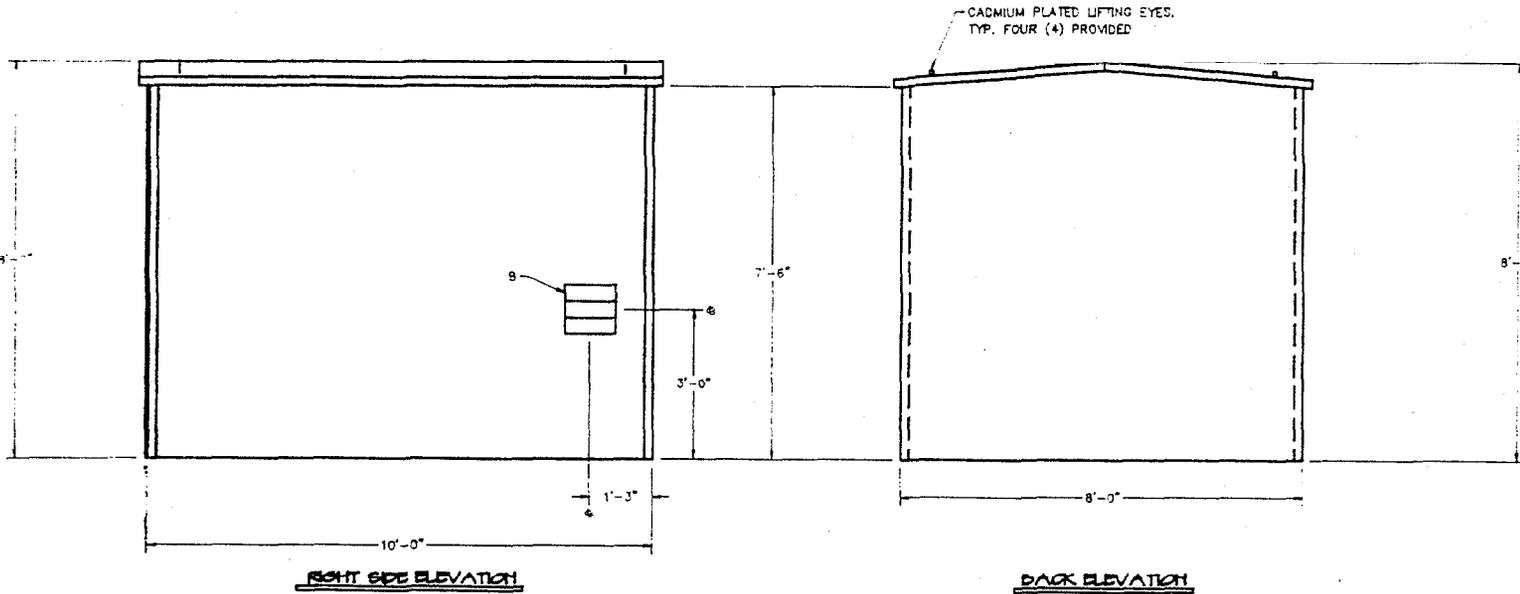
- A. (1) 10" DIAMETER EXHAUST FAN, 200 CFM FREE AIR, MOUNTED ON AN AUTOMATIC SWITCHER AND AN OSHA APPROVED INTAKE GUARD WITH A SCREENED FPM OUTSIDE VENT COVER. FAN IS DAYTON BRAND, STOCK #2018. NO CONTROL SWITCH, 2011 WIPED.
- B. (2) 10" x 10" QUANTITY OPERATED AIR INTAKE VENTS FROM ALUMINUM CONSTRUCTION HAVING A WHITE POLYESTER ENAMEL FINISH COMPLETE WITH A SCREENED FPM OUTSIDE VENT COVER FOR EACH. VENTS ARE DAYTON BRAND STOCK #4286.
- C. (1) 1500 WATT, 3150 BRUL 120 VOLT, WALL MOUNTED, FAN-FORCED ELECTRIC HEATER WITH BUILT-IN THERMOSTAT, RANGE 80-90 F, DAYTON BRAND, STOCK #6244, 2011 WIPED.

NOTES:

1. SET THE ETC MODULAR TYPE BUILDING BROCHURE FOR STANDARD CONSTRUCTION DETAILS, FEATURES, ETC.
2. ALL ELEVATION DRAINAGE ARE SHOWN AS OUTSIDE VENTS.
3. ROOF TO BE PEAGED, HAVE A 2" OVERHANG ALL AROUND AND BE PROVIDED WITH FOUR (4) CADMIUM PLATED LIFTING EYES.
4. BUILDING SHALL BE OF FIBERGLASS COMPOSITE CONSTRUCTION CONSISTING OF A STRUCTURAL FRAMEWORK WITH FIBERGLASS SHEETING MATERIAL FASTENED AND BONDED TO EACH SIDE.
5. BUILDING PANELS SHALL BE INSULATED WITH 1 1/2" THICK, CLASS 1, FLAME RESISTANT POLYISOCYANURATE FOAM HAVING A DENSITY OF 20/CM³, K-FACTOR OF 14 AND 88 B-WALLS OF 16MM. INSULATION SHALL BE CHANGICALLY BONDED TO STRUCTURAL FRAMEWORK AND FIBERGLASS SHEETING MATERIAL.
6. COLOR OF BUILDING TO BE STANDARD WHITE.
7. BUILDING SHALL INCLUDE ONE (1) STANDARD 3'-0" WIDE x 6'-0" HIGH (CLIC) FLUSH-FITTING SINGLE DOOR. DOOR SHALL BE OF FIBERGLASS COMPOSITE CONSTRUCTION INSULATED WITH 1 1/2" THICK, CLASS 1, FLAME RESISTANT POLYISOCYANURATE FOAM. DOOR SHALL BE INSTALLED WITH AN INTEGRAL FPM FRAME SHALL BE FURNISHED WITH THE FOLLOWING ITEMS:
 - a. CORROSION RESISTANT STEEL FRAME.
 - b. PLATED SAFETY STOP CHAIN.
 - c. STAINLESS STEEL CRIMINAL LOCKSET.
 - d. NEOPRENE DOOR SEAL GASKET (WEATHER-STRIPPING).
 - e. STAINLESS STEEL THRESHOLD WITH NEOPRENE GASKET.
8. ALL DOOR HARDWARE AND FASTENERS TO BE NON-CORROSIVE.
9. BUILDING SHALL BE SUPPLIED WITH STAINLESS STEEL BASE MOUNTING ANGLES AND 1/2" x 2" NEOPRENE BASE MOUNTING GASKET. SEE NOTE #9.
10. THE SCREENED FPM OUTSIDE VENT COVERS ARE SHOWN ON THE PLAN VIEW ONLY.
11. BUILDING SHALL BE SHIPPED COMPLETELY ASSEMBLED ON A FLATED TRAILER.
12. INSTALLATION INSTRUCTIONS SHALL BE FURNISHED WITH BUILDING WHEN SHIPPED.
13. ANCHOR BOLTS TO BE SUPPLIED & INSTALLED BY OTHERS.
14. QUANTITY REQUIRED = SIX (6) IDENTICAL BUILDINGS.
15. PLEASE SPECIFY IF LOCKSETS ARE TO BE KEVED ALIKE OR KEVED DIFFERENTIALLY.



ENGINEERED FIBERGLASS COMPOSITES INC.	
301 BICKFORD STREET NEW LISBON, WI 53950 PHONE: 608/262-5900	
DATE: 5-28-85	SCALE: 1/2" = 1'-0"
MOB CAMP LEASING, INC. - WELL HOUSE SOIL AND GROUNDWATER REMEDIATION	
MODULAR TYPE FIBERGLASS BUILDING MODEL #ETC-M-1120	ETC. LINE #

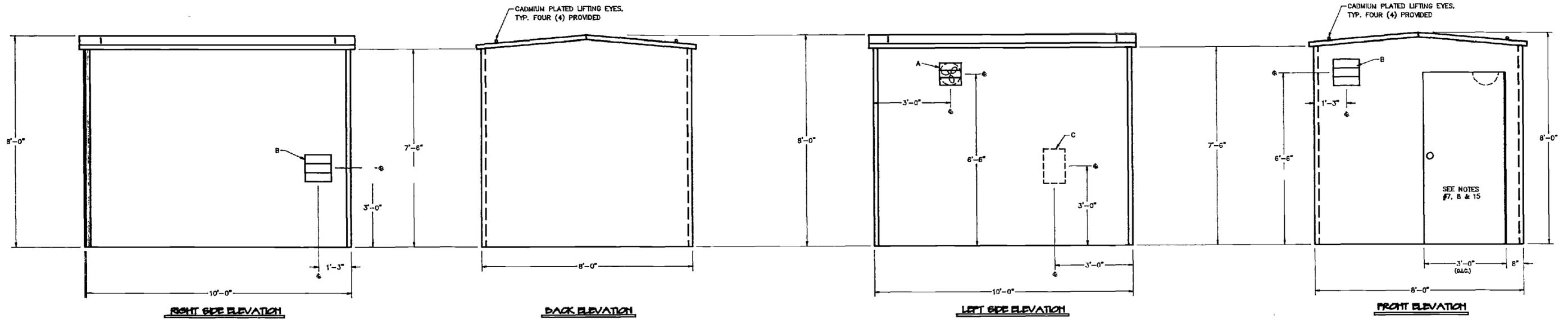


OPTIONAL EQUIPMENT LIST:

- A. (1) 10" DIAMETER EXHAUST FAN, 580 CFM FREE AIR, MOUNTED ON AN AUTOMATIC SHUTTER AND AN OSHA APPROVED INTAKE GUARD WITH A SCREENED FRP OUTSIDE VENT COVER. FAN IS DAYTON BRAND, STOCK #2C819. NO CONTROL SWITCH. NOT WIRED.
- B. (2) 10" x 10" GRAVITY OPERATED AIR INTAKE VENTS, PREMIUM ALUMINUM CONSTRUCTION HAVING A WHITE POLYESTER ENAMEL FINISH, COMPLETE WITH A SCREENED FRP OUTSIDE VENT COVER FOR EACH. VENTS ARE DAYTON BRAND STOCK #4C555.
- C. (1) 1500 WATT, 5120 BTUH, 120 VOLT, WALL MOUNTED, FAN-FORCED ELECTRIC HEATER WITH BUILT-IN THERMOSTAT, RANGE 50-90 F, DAYTON BRAND, STOCK #2E434. NOT WIRED.

NOTES:

1. SEE THE EFC MODULAR TYPE BUILDINGS BROCHURE FOR STANDARD CONSTRUCTION DETAILS, FEATURES, ETC.
2. ALL ELEVATION DRAWINGS ARE SHOWN AS OUTSIDE VIEWS.
3. ROOF TO BE PEAKED, HAVE A 2" OVERHANG ALL AROUND AND BE PROVIDED WITH FOUR (4) CADMIUM PLATED LIFTING EYES.
4. BUILDING SHALL BE OF FIBERGLASS COMPOSITE CONSTRUCTION CONSISTING OF A STRUCTURAL FRAMEWORK WITH FIBERGLASS SHEETING MATERIAL FASTENED AND BONDED TO EACH SIDE.
5. BUILDING PANELS SHALL BE INSULATED WITH 1 1/2" THICK, CLASS 1, FLAME RESISTANT POLYISOCYANURATE FOAM HAVING A DENSITY OF 2#/CU.FT., K-FACTOR OF .14 AND AN R-VALUE OF 10.65. INSULATION SHALL BE CHEMICALLY BONDED TO STRUCTURAL FRAMEWORK AND FIBERGLASS SHEETING MATERIAL.
6. COLOR OF BUILDING TO BE STANDARD WHITE.
7. BUILDING SHALL INCLUDE ONE (1) STANDARD 3'-0" WIDE x 6'-6" HIGH (O.I.C.) FLUSH-FITTING SINGLE DOOR. DOOR SHALL BE OF FIBERGLASS COMPOSITE CONSTRUCTION INSULATED WITH 1 1/2" THICK, CLASS 1, FLAME RESISTANT POLYISOCYANURATE FOAM. DOOR SHALL BE INSTALLED WITH AN INTEGRAL FRP FRAME SHALL BE FURNISHED WITH THE FOLLOWING ITEMS:
 - a. CONTINUOUS STAINLESS STEEL PIANO HINGE.
 - b. PLATED SAFETY STOP CHAIN.
 - c. STAINLESS STEEL CYLINDRICAL LOCKSET.
 - d. NEOPRENE DOOR SEAL GASKET (WEATHER-STRIPPING).
 - e. STAINLESS STEEL THRESHOLD WITH NEOPRENE GASKET.
8. ALL DOOR HARDWARE AND FASTENERS TO BE NON-CORROSIVE.
9. BUILDING SHALL BE SUPPLIED WITH STAINLESS STEEL BASE MOUNTING ANGLES AND 1/2" x 2" NEOPRENE BASE MOUNTING GASKET. SEE NOTE #13.
10. THE SCREENED FRP OUTSIDE VENT COVERS ARE SHOWN ON THE PLAN VIEW ONLY.
11. BUILDING SHALL BE SHIPPED COMPLETELY ASSEMBLED ON A FLATBED TRAILER.
12. INSTALLATION INSTRUCTIONS SHALL BE FURNISHED WITH BUILDING WHEN SHIPPED.
13. ANCHOR BOLTS TO BE SUPPLIED & INSTALLED BY OTHERS.
14. QUANTITY REQUIRED = SIX (6) IDENTICAL BUILDINGS.
15. PLEASE SPECIFY IF LOCKSETS ARE TO BE KEYED ALIKE OR KEYED DIFFERENTLY.

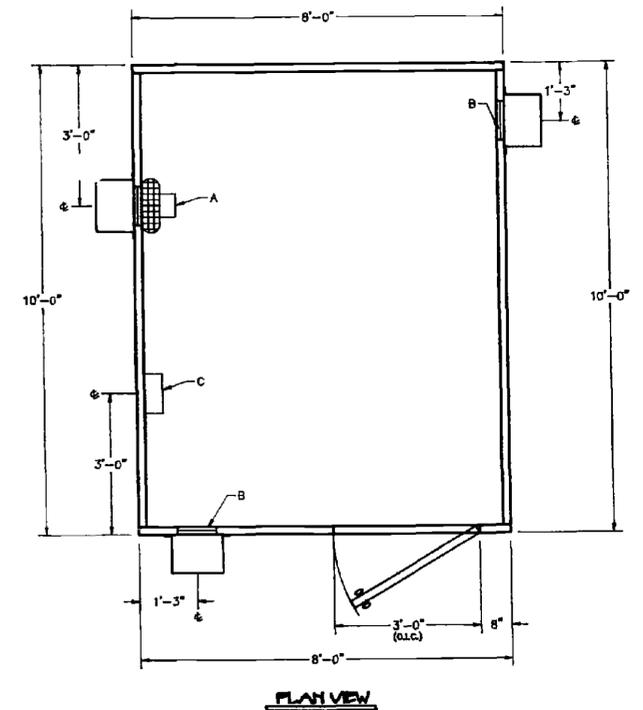


OPTIONAL EQUIPMENT LIST:

- A. (1) 10" DIAMETER EXHAUST FAN, 580 CFM FREE AIR, MOUNTED ON AN AUTOMATIC SHUTTER AND AN OSHA APPROVED INTAKE GUARD WITH A SCREENED FRP OUTSIDE VENT COVER. FAN IS DAYTON BRAND, STOCK #2C819. NO CONTROL SWITCH. NOT WIRED.
- B. (2) 10" x 10" GRAVITY OPERATED AIR INTAKE VENTS, PREMIUM ALUMINUM CONSTRUCTION HAVING A WHITE POLYESTER ENAMEL FINISH, COMPLETE WITH A SCREENED FRP OUTSIDE VENT COVER FOR EACH. VENTS ARE DAYTON BRAND STOCK #4C555.
- C. (1) 1500 WATT, 5120 BTUH, 120 VOLT, WALL MOUNTED, FAN-FORCED ELECTRIC HEATER WITH BUILT-IN THERMOSTAT, RANGE 50-90 F, DAYTON BRAND, STOCK #2E434. NOT WIRED.

NOTES:

1. SEE THE EFC MODULAR TYPE BUILDINGS BROCHURE FOR STANDARD CONSTRUCTION DETAILS, FEATURES, ETC.
2. ALL ELEVATION DRAWINGS ARE SHOWN AS OUTSIDE VIEWS
3. ROOF TO BE PEAKED, HAVE A 2" OVERHANG ALL AROUND AND BE PROVIDED WITH FOUR (4) CADMIUM PLATED LIFTING EYES.
4. BUILDING SHALL BE OF FIBERGLASS COMPOSITE CONSTRUCTION CONSISTING OF A STRUCTURAL FRAMEWORK WITH FIBERGLASS SHEETING MATERIAL FASTENED AND BONDED TO EACH SIDE.
5. BUILDING PANELS SHALL BE INSULATED WITH 1 1/2" THICK, CLASS 1, FLAME RESISTANT POLYISOCYANURATE FOAM HAVING A DENSITY OF 2#/CUFT., K-FACTOR OF .14 AND AN R-VALUE OF 10.85. INSULATION SHALL BE CHEMICALLY BONDED TO STRUCTURAL FRAMEWORK AND FIBERGLASS SHEETING MATERIAL.
6. COLOR OF BUILDING TO BE STANDARD WHITE.
7. BUILDING SHALL INCLUDE ONE (1) STANDARD 3'-0" WIDE x 6'-8" HIGH (O.I.C.) FLUSH-FITTING SINGLE DOOR. DOOR SHALL BE OF FIBERGLASS COMPOSITE CONSTRUCTION INSULATED WITH 1 1/2" THICK, CLASS 1, FLAME RESISTANT POLYISOCYANURATE FOAM. DOOR SHALL BE INSTALLED WITH AN INTEGRAL FRP FRAME SHALL BE FURNISHED WITH THE FOLLOWING ITEMS:
 - a. CONTINUOUS STAINLESS STEEL PIANO HINGE.
 - b. PLATED SAFETY STOP CHAIN.
 - c. STAINLESS STEEL CYLINDRICAL LOCKSET.
 - d. NEOPRENE DOOR SEAL GASKET (WEATHER-STRIPPING).
 - e. STAINLESS STEEL THRESHOLD WITH NEOPRENE GASKET.
8. ALL DOOR HARDWARE AND FASTENERS TO BE NON-CORROSIVE.
9. BUILDING SHALL BE SUPPLIED WITH STAINLESS STEEL BASE MOUNTING ANGLES AND 1/2" x 2" NEOPRENE BASE MOUNTING GASKET. SEE NOTE #13.
10. THE SCREENED FRP OUTSIDE VENT COVERS ARE SHOWN ON THE PLAN VIEW ONLY.
11. BUILDING SHALL BE SHIPPED COMPLETELY ASSEMBLED ON A FLATBED TRAILER.
12. INSTALLATION INSTRUCTIONS SHALL BE FURNISHED WITH BUILDING WHEN SHIPPED.
13. ANCHOR BOLTS TO BE SUPPLIED & INSTALLED BY OTHERS.
14. QUANTITY REQUIRED = SIX (6) IDENTICAL BUILDINGS.
15. PLEASE SPECIFY IF LOCKSETS ARE TO BE KEYED ALIKE OR KEYED DIFFERENTLY.



ENGINEERED FIBERGLASS COMPOSITES INC.
 301 BICKFORD STREET
 NEW LISBON, WI 53950 PHONE: 608/562-5900

SCALE	1/2" = 1'-0"	DESIGNED BY	KOPELSON PROBABY
DATE	5-26-85	DRAWN BY	
MGB CAMP LEJEUNE, NC - WELL HOUSE SOIL AND GROUNDWATER REMEDIATION		MODULAR TYPE FIBERGLASS BUILDING MODEL #EFC-96x120	
		EFC-0168-D	

02351HH01X



OPERATING INSTRUCTIONS & PARTS MANUAL

WALL HEATERS

MODELS 2E434A, 2E435A, 2E708A, 2E709A, 2E873A
2E874A AND 2E875A

FORM 5S1884

04041
0390/096/VP

READ AND SAVE THESE INSTRUCTIONS

READ CAREFULLY BEFORE ATTEMPTING TO ASSEMBLE, INSTALL, OPERATE OR MAINTAIN THE PRODUCT DESCRIBED. PROTECT YOURSELF AND OTHERS BY OBSERVING ALL SAFETY INFORMATION. FAILURE TO COMPLY WITH INSTRUCTIONS COULD RESULT IN PERSONAL INJURY AND/OR PROPERTY DAMAGE! RETAIN INSTRUCTIONS FOR FUTURE REFERENCE.

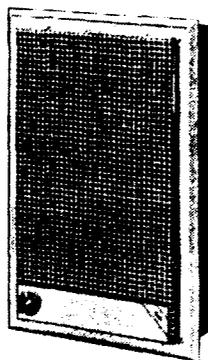


Figure 1—Model 2E434A

Description

The wall heaters provide fast supplemental room heat. The fan draws cool air in through the round opening in the grille frame and directs it across the nickel chromium elements for discharge through the rectangular top opening. An over-heat protective device automatically shuts the heater OFF if the discharge is blocked or an unsafe temperature rise is encountered for any reason. Heaters are equipped with manual reset thermal over-heat protector. On some models the manual reset is backed-up with a thermal fuse. The grille is "finger-proof" and can be easily removed for cleaning.

Unpacking

Remove rough-in box from carton. Leave heater in styro-foam package until you are ready for final installation.

General Safety Information

1. Make certain that the power source conforms to the electrical requirements of the heater. Disconnect

power before installing or servicing. If the power disconnect is out of sight, lock it in the open position and tag it to prevent unexpected application of power. Failure to do so could result in fatal electric shock.

WARNING: DO NOT DEPEND UPON A THERMOSTAT OR OTHER SWITCH AS THE SOLE MEANS OF DISCONNECTING POWER WHEN INSTALLING OR SERVICING THE HEATER. ALWAYS DISCONNECT POWER AT THE MAIN CURRENT CIRCUIT BREAKER AS DESCRIBED ABOVE. FAILURE TO DO SO COULD RESULT IN FATAL ELECTRIC SHOCK.

2. This heater is intended ONLY for permanent installation in accordance with the National Electrical Code (NEC), all applicable local codes and ordinances, and all sections of this manual. All wiring should be done by a qualified electrician, using copper wire only.
3. Special attention must be given to any grounding information pertaining to this heater. To prevent the risk of electrocution, the heater must be securely and adequately grounded. This should be accomplished by connecting a grounded conductor between the service panel and the green grounding screw provided on the heater. To ensure a proper ground, the grounding means must be tested by a qualified electrician.
4. Do not insert fingers or foreign objects into the heater. Do not block or tamper with the heater in any manner while it is in operation. Do not touch heater while in operation or just after it has been turned off, as some parts may be hot enough to cause injury.
5. This heater is intended for general heating applications ONLY. It must NOT be used in potentially dangerous locations such as flammable, explosive, chemical-laden or wet atmospheres.

Specifications

MODEL	BTUH	WATTS	VOLTS@ 60 HZ	AMPS	DIMENSIONS IN INCHES		
					H	W	D
> 2E434A 2E708A 2E873A	5120	1500	120	12.5	15½"	10"	4½"
2E435A 2E709A 2E874A	*5120/3839	1500/1125	240/208	6.2/5.4	15½	10	4½
2E875A	*6827/5120	2000/1500	240/208	8.3/7.2	15½	10	4½

(*) For 240 and 208 volts respectively.

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General Safety Information (Continued)

6. In cases in which property damage may result from malfunction of the heater, a backup system or a temperature sensitive alarm should be used.

WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT USE THIS HEATER WITH ANY SOLID STATE SPEED CONTROL DEVICE.

Installation

NOTE: Unit may be installed vertically or horizontally in the wall stud space. This unit is for wall mounting only. A 14½ x 9" wall opening is required. If recess mounting is impractical, use 2E443 surface mounted housing (not furnished).

Bottom of heater should be a minimum of 18 inches above the finished floor.

1. Horizontal mounting: (See Figure 2)
 - a. MAKE SURE THAT OUTLET CORNER IS AT THE TOP RIGHT HAND CORNER. In new construction place rough-in box between studs at desired height, and using wood screws, secure it

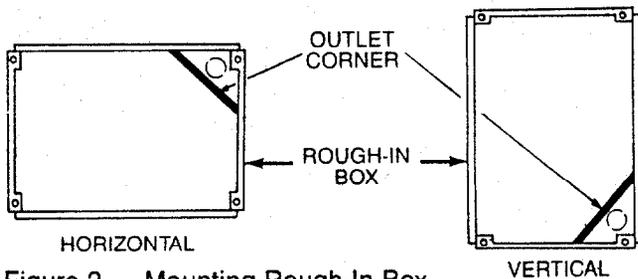


Figure 2 — Mounting Rough-In Box

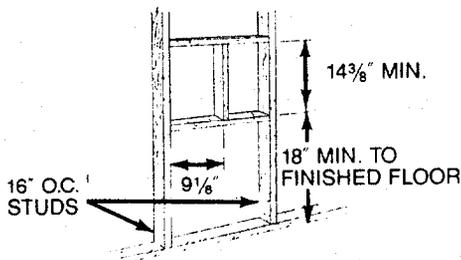


Figure 3 — Header Location

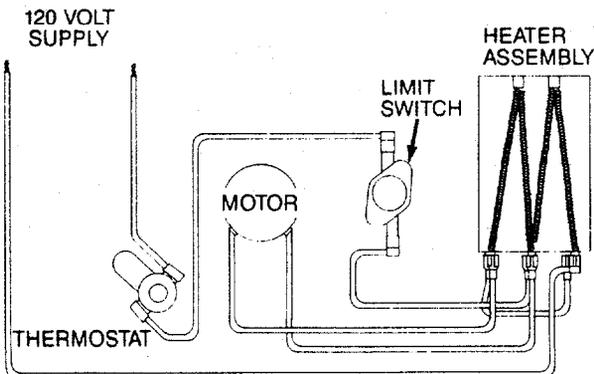


Figure 4 — Wiring Diagram for Models 2E434A, 2E708A & 2E873A

to studs, making sure that outer edges will be flush with finished wall. Bring in service lead through proper knock-out hole and attach ground lead to screw provided.

- b. For installation in existing walls, select desired location, ascertain location of studs and cut away wall using rough-in box as a pattern for hole size. Bring in service lead through proper knock-out hole and attach ground lead to screw provided. THEN, secure rough-in box to studs keeping outer edges flush with wall surface.
2. Vertical mounting: (See Figure 2)
 - a. MAKE SURE THAT OUTLET CORNER IS AT THE BOTTOM RIGHT HAND CORNER. Toe-nail two 2 x 4" headers, 32⅜ inches apart on center at the desired height (see Figure 3).
 - b. Proceed as outlined in step 1a or 1b above.
3. Connect service leads to heater (see Figure 4 or 5). Make sure all wiring conforms to National Electrical Code as well as all applicable local codes.
4. Assemble heater into rough-in box using the four screws supplied (see Figure 6.)

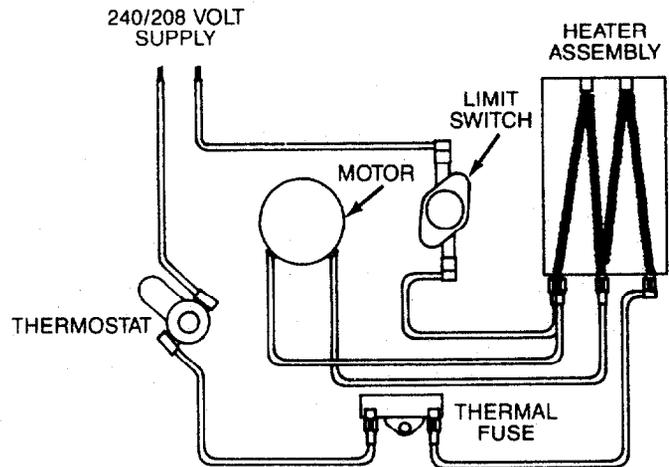


Figure 5 — Wiring Diagram for Models 2E435A, 2E709A, 2E874A & 2E875A

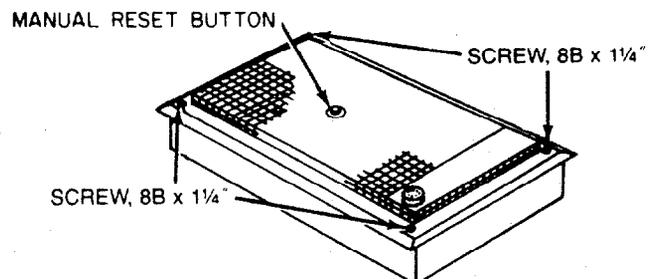


Figure 6 — Securing Heater

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Operation

Rotate the thermostat knob clockwise, until the heater comes ON. Heater operation is indicated by the rotating fan blade. After a few seconds of operation, warm air should be discharged out of the top or rectangular opening in the heater grille. Adjust thermostat setting to maintain desired room temperature. During proper operation, the heater will cycle ON and OFF periodically. The heater should not be blocked or covered in any manner.

LIMIT SWITCH

1. This unit is equipped with a manual-reset, high temperature limit switch. If no heat is delivered with thermostat set fully clockwise, turn thermostat fully counterclockwise, and check red reset button in center of front plate.
2. If reset button protrudes, it must be reset. Using a toothpick or similar piece of wood, push button IN where it should remain.
3. Turn thermostat fully clockwise and repeat above steps when heater resumes normal operation.
4. If the heater still does not function, or after a 10-20 minute cool-down period if button will not reset (remain in), have heater checked by qualified electrician.

NOTE: Due to the sensitivity of the limit switch, it may have tripped from vibration during shipment. It may be necessary to reset switch prior to initial start-up of heater.

5. The nameplate on heater has a plastic film on it for protection until after installation. To remove it, peel corners nearest logo first. For easier removal, pull flat

from nameplate with a stretching action instead of pulling perpendicularly. By doing this, the knob will not need to be removed and film should slip over it.

Maintenance

CAUTION: Before attempting any cleaning or maintenance on this heater, open the circuit to the heater by removing the fuse or opening the circuit breaker for the heater circuit. Lock in the open position to prevent unexpected application of power.

WARNING: AN INCORRECT CONNECTION MAY CAUSE AN ELECTRIC SHORT, PRODUCE AN ELECTRICAL SHOCK, OR BURN OUT THE HEATER, RESULTING IN PROPERTY DAMAGE AND/OR PERSONAL INJURY.

WARNING: ONLY QUALIFIED ELECTRICIANS OR SERVICEMEN SHOULD ATTEMPT TO REPAIR THIS UNIT. IMPROPER REPAIR AND/OR ASSEMBLY CAN CAUSE AN ELECTRICAL SHOCK HAZARD.

SIX MONTH

1. Remove four screws securing perforated grille and wipe dust from under grille. Replace perforated grille.
2. Remove heater from rough-in box and clean dust and dirt from rough-in box and underside of heater. Replace heater in rough-in box.

NOTE: In above cleaning operation, be careful not to bend or damage fan blade or element wire.

YEARLY

Add 2 to 3 drops of S.A.E. 10W or 20W oil to fan motor bearings.

LIMITED WARRANTY

DAYTON ONE-YEAR LIMITED WARRANTY. Wall heaters, Models 2E434A, 2E435A, 2E708A, 2E709A 2E873A, 2E874A & 2E875A, are warranted by Dayton Electric Mfg. Co. (Dayton) to the original user against defects in workmanship or materials under normal use for one year after date of purchase. Any part which is determined by Dayton to be defective in material or workmanship and returned to an authorized service location, as Dayton designates, shipping costs prepaid, will be, as the exclusive remedy, repaired or replaced at Dayton's option. For limited warranty claim procedures, see PROMPT DISPOSITION below. This limited warranty gives purchasers specific legal rights which vary from state to state.

LIMITATION OF LIABILITY. To the extent allowable under applicable law, Dayton's liability for consequential and incidental damages is expressly disclaimed. Dayton's liability in all events is limited to, and shall not exceed, the purchase price paid.

WARRANTY DISCLAIMER. Dayton has made a diligent effort to illustrate and describe the products in this literature accurately; however, such illustrations and descriptions are for the sole purpose of identification, and do not express or imply a warranty that the products are merchantable, or fit for a particular purpose, or that the products will necessarily conform to the illustrations or descriptions.

Except as provided below, no warranty or affirmation of fact, expressed or implied, other than as stated in "LIMITED WARRANTY" above is made or authorized by Dayton.

PRODUCT SUITABILITY. Many states and localities have codes and regulations governing sales, construction, installation, and/or use of products for certain purposes, which may vary from those in neighboring areas. While Dayton attempts to assure that its products comply with such codes, it cannot guarantee compliance, and cannot be responsible for how the product is installed or used. Before purchase and use of a product, please review the product application, and national and local codes and regulations, and be sure that the product, installation, and use will comply with them.

Certain aspects of disclaimers are not applicable to consumer products; e.g., (a) some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you; (b) also, some states do not allow limitations on how long an implied warranty lasts, consequently the above limitation may not apply to you; and (c) by law, during the period of this Limited Warranty, any implied warranties of merchantability or fitness for a particular purpose applicable to consumer products purchased by consumers, may not be excluded or otherwise disclaimed.

PROMPT DISPOSITION. Dayton will make a good faith effort for prompt correction or other adjustment with respect to any product which proves to be defective within limited warranty. For any product believed to be defective within limited warranty, first write or call dealer from whom product was purchased. Dealer will give additional directions. If unable to resolve satisfactorily, write to Dayton at address below, giving dealer's name, address, date and number of dealer's invoice, and describing the nature of the defect. Title and risk of loss pass to buyer on delivery to common carrier. If product was damaged in transit to you, file claim with carrier.

Manufactured for Dayton Electric Mfg. Co., 5959 W. Howard St., Chicago, IL 60648

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**ORDER REPLACEMENT PARTS
BY CALLING TOLL FREE**

1-800-323-0620

Please provide following information:

- Model Number
- Serial Number (if any)
- Part Description and Number as shown in Parts List.

Address parts correspondence to:

Dayton Electric Mfg. Co.
1250 Busch Parkway
Buffalo Grove, IL 60089

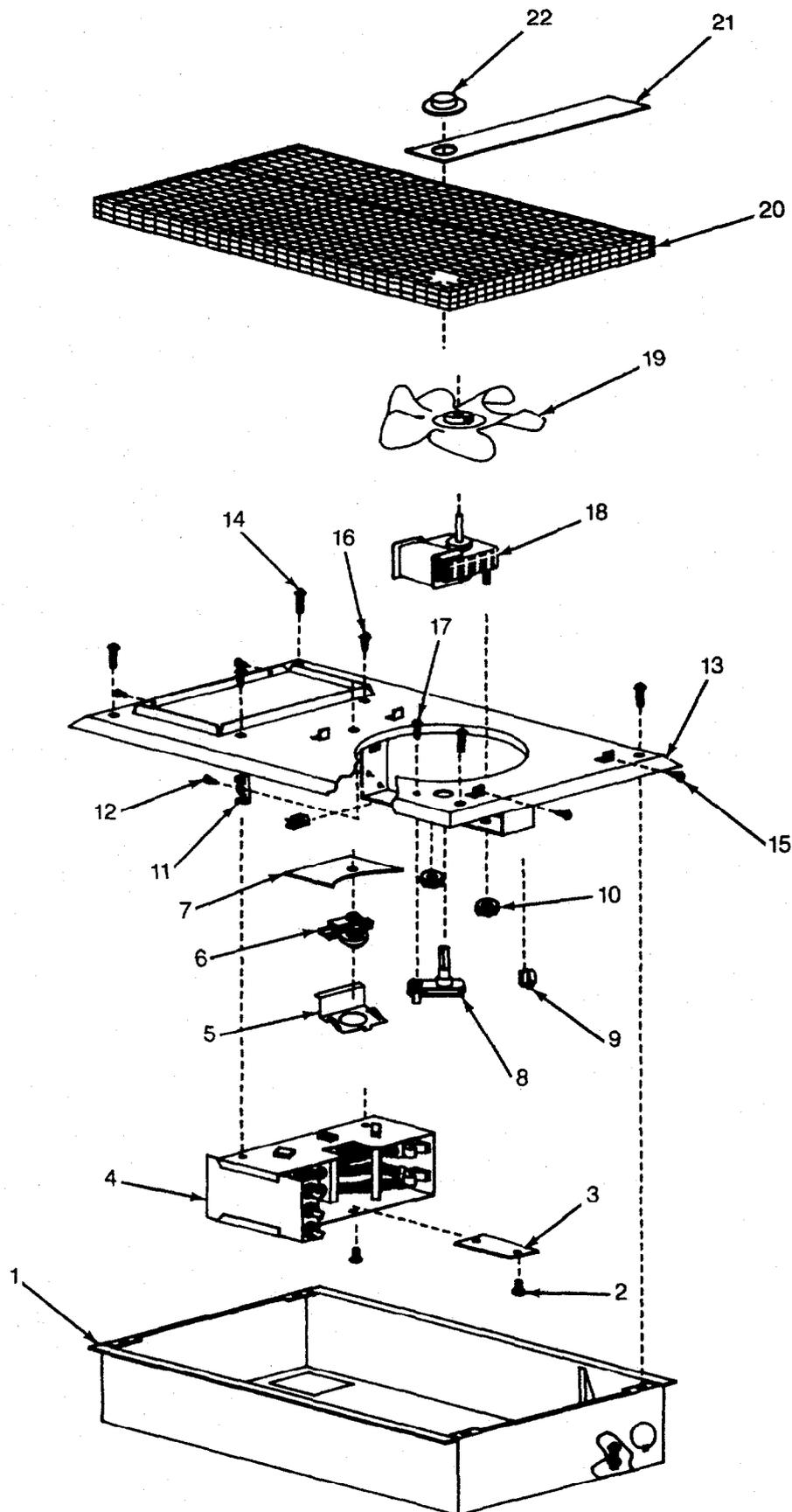


Figure 7 — Replacement Parts Illustration

Replacement Parts List

REF. NO.	DESCRIPTION	PART NO. FOR MODELS						
		2E434A	2E435A	2E708A	2E709A	2E873A	2E874A	2E875A
1	Rough-in box assembly	8534-8082	8534-8082	8534-8082	8534-8082	8534-8082	8534-8082	8534-8082
2	Screw, 8B x 3/8"	1235-0001	1235-0001	1235-0001	1235-0001	1235-0001	1235-0001	1235-0001
3	Mounting bracket	8536-8574	8536-8574	8536-8574	8536-8574	8536-8574	8536-8574	8536-8574
4	Heater assembly, 120V, 1500W	6101-8577	—	6101-8577	—	6101-8577	—	—
		—	6101-8578	—	6101-8578	—	6101-8578	—
5	Heater assembly, 240V, 1500W	—	—	—	—	—	—	2436-0002
		8536-8517	8536-8517	8536-8517	8536-8517	8536-8517	8536-8517	8536-8517
6	Bracket	—	—	—	—	—	—	—
		8536-8517	8536-8517	8536-8517	8536-8517	8536-8517	8536-8517	8536-8517
7	Limit switch	8541-8038	8541-8038	8541-8038	8541-8038	8541-8038	8541-8038	8541-8038
8	Insert	8711-8005	8711-8005	8711-8006	8711-8006	8711-8007	8711-8007	8711-8005
9	Thermostat assembly with lead	1230-8193	1230-8194	1230-8193	1230-8194	1230-8193	1230-8194	1230-8194
		2044-0057	2044-0057	2044-0057	2044-0057	2044-0057	2044-0057	2044-0057
10	Cable clip	—	—	—	—	—	—	—
		8541-8038	8541-8038	8541-8038	8541-8038	8541-8038	8541-8038	8541-8038
11	Hex nut, 6-32	*	*	*	*	*	*	*
12	Thermal fuse, 109°C, 15 amps.	—	8671-8036	—	8671-8036	—	8671-8036	8671-8036
		—	*	—	*	—	*	*
13	Screw, 6AB x 5/16"	□	□	□	□	□	□	□
14	Front panel assembly	1235-0052	1235-0052	1235-0052	1235-0052	—	—	1235-0052
		—	—	—	—	8852-8447	8852-8447	—
15	Screw, 8B x 1/4" bright	2415-0040	2415-0040	2415-0040	2415-0040	—	—	2415-0040
		—	—	—	—	8852-8449	8852-8449	—
16	Screw, 8AB x 3/8" bright	0812-0247	0812-0247	0812-0247	0812-0247	—	—	0812-0247
		—	—	—	—	8852-8450	8852-8450	—
17	Screw, 8AB x 3/8" black	—	—	—	—	—	—	—
		8767-8131	8767-8131	8767-8131	8767-8131	8767-8131	8767-8131	8767-8131
18	Phillips screw, 8-32 x 5/8"	*	*	*	*	*	*	*
19	Motor assembly with terminals	8767-8131	8767-8131	8767-8131	8767-8131	8767-8131	8767-8131	8767-8131
		1235-0008	1235-0008	1235-0008	1235-0008	1235-0008	1235-0008	1235-0008
20	Fan blade	—	—	—	—	—	—	—
		1230-0023	1230-0023	—	—	—	—	1230-0023
21	Screen grille, aluminum	—	—	8850-8021	8850-8021	—	—	—
		—	—	—	—	8683-8104	8683-8104	—
22	Screen grille, almond	6129-8152	6129-8152	6129-8152	6129-8152	6129-8152	6129-8152	6129-8152
		—	—	—	—	—	—	—
23	Screen grille, brown	—	—	—	—	—	—	—
		6112-8002	6112-8002	6112-8002	6112-8002	—	—	6112-8002
24	Nameplate	—	—	—	—	6112-8035	6112-8035	—
		—	—	—	—	—	—	—
25	Knob, black	6112-8002	6112-8002	6112-8002	6112-8002	—	—	6112-8002
		—	—	—	—	6112-8035	6112-8035	—
26	Knob, brown	—	—	—	—	—	—	—
		—	—	—	—	—	—	—

(□) Not available as a replacement part; replace complete heater assembly.
 (*) Standard hardware item, available locally.

Troubleshooting Chart

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Heater does not come on	<ol style="list-style-type: none"> 1. Thermostat set too low (too far counterclockwise) 2. Circuit breaker in main panel not closed 3. Circuit breaker in main panel does not stay closed 4. Resettable temperature limit switch in heater not closed 5. Open in wiring to heater 6. Thermostat 7. Thermal fuse (applicable units only) 	<ol style="list-style-type: none"> 1. Turn thermostat knob clockwise until heater operates. 2. Close circuit breaker. *3. A short circuit exists in the heater wiring 4. Manually close limit switch. (See Operation Section LIMIT SWITCH.) *If limit switch will not stay in, have the heater checked. *5. Open main circuit breaker. Check wiring continuity. *6. Open main circuit breaker to heater, jumper across thermostat terminals. Close main circuit breaker. If heater operates, thermostat should be replaced. Remove jumper before operating heater. *7. Open main supply circuit to heater. Check thermal fuse. If blown, determine cause and correct. Replace thermal fuse.
Fan blade does not turn	<ol style="list-style-type: none"> 1. Jammed fan blade 2. Leads not connected to fan motor 3. Winding in fan motor open 	<ol style="list-style-type: none"> 1. Remove fan blade obstruction. *2. Connect fan motor leads. *3. Replace fan motor.
Heater will not shut OFF	<ol style="list-style-type: none"> 1. Heat loss from room is greater than heater capacity 2. Thermostat 	<ol style="list-style-type: none"> 1. Close doors and windows. Provide additional insulation or additional heaters. *2. Rotate thermostat knob to extreme counterclockwise position. If heater continues to run, replace thermostat.
Heater discharges smoke	Dust, dirt and lint accumulated inside heater	Clean heater. See Six Month Maintenance Section for cleaning instructions.
Heater fan operating, but does not discharge warm air	<ol style="list-style-type: none"> 1. Open heater element 2. Wire loose from element assembly 3. Heater connected to wrong electrical service voltage 	<ol style="list-style-type: none"> *1. Replace heating unit assembly. *2. Replace wire. *3. Check supply voltage.

(*) WARNING: MUST BE CHECKED AND SERVICED BY QUALIFIED ELECTRICAL SERVICE PERSON!

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Service Record

DATE	MAINTENANCE PERFORMED	REPLACEMENT COMPONENTS REQUIRED

Notes

A large, empty rectangular box with a thin black border, occupying the majority of the page below the 'Notes' header. It is intended for handwritten or typed notes.

Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

Dayton® Utility Shutter-Mounted Exhaust Fans

Description

Dayton utility exhaust fans are designed for exhaust applications in stores, offices, factories, shops, farm buildings, greenhouses, etc. Efficient, easy-to-install exhaust fans with automatic shutters. Model 2C634, 7" Shutter fan fits in half of an 8 x 16" concrete block. Shutter flanges have eight pre-punched 1/4 x 1/2" diameter mounting holes for ease of installation. 7 to 18" diameter deep pitched, 3-wing fan blade. Fan guards have charcoal grey metallic polyester finish to resist corrosion. Wire guards comply with OSHA regulations. totally enclosed, sleeve bearing 115V, 60 Hz motors. Air deliveries based on AMCA test codes. Shipped completely assembled.

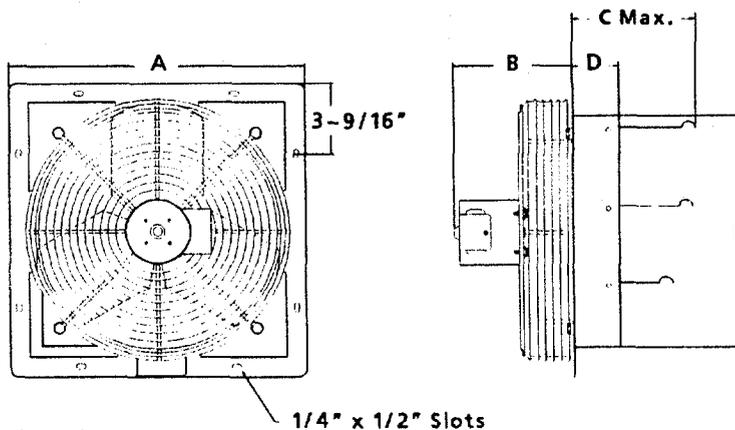


Figure 1 - Dimensions

Dimensions

Model	A Square	B	C	D	E
2C634B	11 1/8"	4 15/16"	6"	2 3/8"	8"
2C819B	13 1/8"	5 9/16"	5 1/8"	2 3/8"	10"
2C710B	15 1/8"	6"	6 1/8"	2 3/8"	12"
2C713B	19 1/8"	6 1/2"	6 1/8"	2 3/8"	16"
2C708B	21 1/8"	8 3/4"	6 1/8"	3"	18"

Unpacking

1. Inspect for any damage that may have occurred during transit.
2. Shipping damage claim must be filed with carrier.
3. Check all bolts, screws, setscrews, etc. for looseness that may have occurred during transit. Retighten as required.
4. Before installing, rotate the blade to be sure there are no obstructions which would interfere with proper operation. Adjust as required.

Performance

Model	Blade Dia.	CFM Free Air	Motor HP	Amps	RPM
2C634B	7"	120	1/30	1.0	1550
2C819B	10"	580	1/30	1.0	1550
2C710B	12"	775	1/30	1.0	1550
2C713B	16"	975	1/20	1.8	1550
2C708B	18"	1825	1/15	1.2	1050

General Safety Information

1. Follow all local electrical and safety codes, as well as the National Electrical code (NEC) and the Occupational Safety and Health Act (OSHA).
2. Always disconnect power source before working on or near a motor, or its connected load.
3. Protect the power cable from coming in contact with sharp objects.
4. Do not kink power cable and never allow the cable to come in contact with oil, grease, hot surfaces, or chemicals.
5. Make certain that the power source conforms to the requirements of your equipment.
6. The fan frame and motor must be electrically grounded to a suitable

electrical ground, such as a grounded water pipe or ground wire system.

Installation

1. The unit should be securely mounted in a rigid framework.

NOTE: Allowing the fan frame to flex or move will result in undue vibrations and possible premature motor, or fan blade failure.

⚠ WARNING Motor will restart without warning after protector trips.

Dayton® Utility Shutter-Mounted Exhaust Fans

Installation (Continued)

2. Install any auxiliary components.
3. Connect power to the motor, using an approved wiring method.

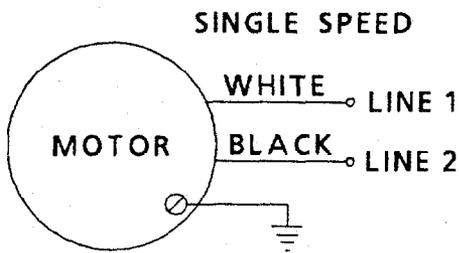


Figure 2 - Wiring Diagram: 115 Volt Connection

CAUTION Fan frame and motor must be securely and adequately grounded to a suitable electrical ground, such as a ground water pipe or ground wiring system!

4. Before activating the fan, double-check to ensure that there are no obstructions (framing, stud, shutter, etc.) which would interfere with proper fan operation.

Operation

1. Keep the area free of objects that could impede air flow on both the intake and exhaust side of fan.
2. For proper exhaust operation, a window, door, or louver should be opened on the opposite side of the area to be ventilated.
3. Turn the fan on, the shutter will open automatically. When the unit is turned off, the shutter will close.

Maintenance

MINOR AND ROUTINE:

1. Disconnect power source before servicing.
2. Lubricate the motor sleeve bearings every six months using S.A.E., 20 non-detergent oil.

3. Periodically clean the propeller blades, guard, motor and shutter of any accumulated dirt.

PARTS REPLACEMENT:

1. Refer to illustration of parts placement.
2. Disconnect power before servicing.
3. Remove the four screws holding the guard to the venturi panel. Remove the guard/motor/blade assembly.
4. Loosen the setscrew on blade hub and remove the fan blade.

CAUTION Do not repair damaged fan blades. They should be replaced with a properly balanced replacement.

5. Loosen the nuts holding motor on guard and remove motor.
6. Reassemble the unit in reverse order of disassembly.

CAUTION Fan blade is installed hub first on motor shaft, flush with end, and setscrew located over the flat area.

Troubleshooting Chart

Symptom	Possible Cause(s)	Corrective Action
Excessive noise	<ol style="list-style-type: none"> 1. Dry motor bearings 2. Loose fan blade 3. Crooked or damaged fan blade 	<ol style="list-style-type: none"> 1. Relubricate motor bearings 2. Tighten setscrews in hub 3. Replace fan blade
Fan inoperative	<ol style="list-style-type: none"> 1. Blown fuse or open circuit breaker 2. Defective motor 	<ol style="list-style-type: none"> 1. Replace fuse or reset circuit breaker 2. Repair or replace motor
Insufficient air flow	<ol style="list-style-type: none"> 1. Blocked intake or exhaust opening 2. Low voltage 	<ol style="list-style-type: none"> 1. Clear opening of obstruction or increase size of opening 2. Determine cause and correct

For Replacement Parts, call 1-800-323-0620

Use the following information:

- Model number
- Serial number (if any)
- Part descriptions and number as shown in parts list

Address parts correspondence to:

Parts Company of America
 1657 Shermer Road
 Northbrook, IL 60062-5362

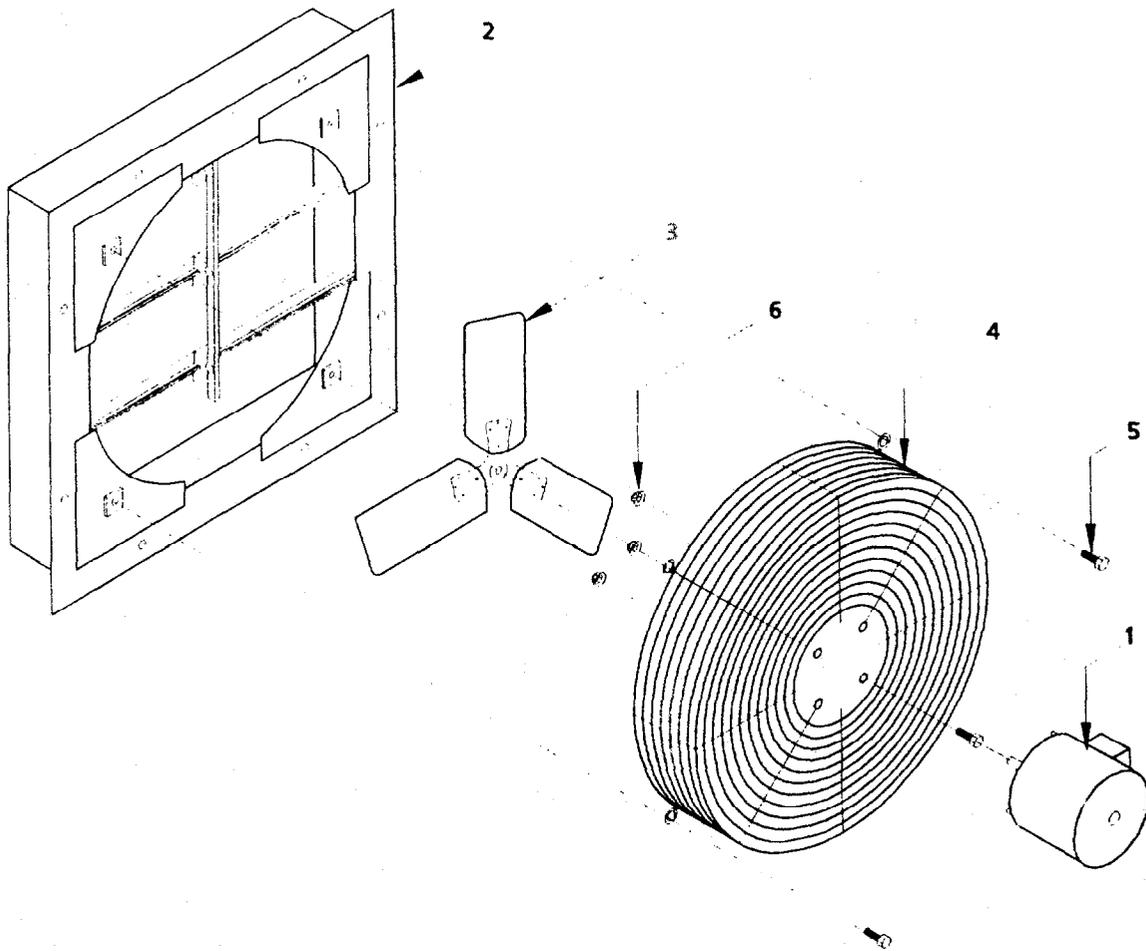


Figure 3 — Replacement Parts Illustration

Replacement Parts List

Ref. No.	Description	Part Number For Models:					Qty.
		Model 2C634B	Model 2C708B	Model 2C713B	Model 2C713B	Model 2C819B	
1	Motor	13070002	13076002	13070002	13072002	13070002	1
2	Shutter assembly	09410001	09414001	09412001	09413001	09411001	1
3	Fan blade	03124001	03174001	03172001	03173001	03125001	1
4	Intake guard	09602002	09606002	09604002	09605004	09603002	1
5	#10-16 x 5/8" SM Screw	*	*	*	*	*	4
6	#8-32 Spinlock nut	*	*	*	*	*	4

(* Standard hardware items, available locally.

Dayton® Utility Shutter-Mounted Exhaust Fans

Limited Warranty

Dayton One-Year Limited Warranty. Utility Shutter-Mounted Exhaust Fans, Models 2C634B, 2C708B, 2C713B, and 2C819B, are warranted by Dayton Electric Mfg. Co. (Dayton) to the original user against defects in workmanship or materials under normal use for one year after date of purchase. Any part which is determined to be defective in material or workmanship and returned to an authorized service location, as Dayton designates, shipping costs prepaid, will be, as the exclusive remedy, repaired or replaced at Dayton's option. For limited warranty claim procedures, see PROMPT DISPOSITION below. This limited warranty gives purchasers specific legal rights which vary from state to state.

Limitation of Liability. To the extent allowable under applicable law, Dayton's liability for consequential and incidental damages is expressly disclaimed. Dayton's liability in all events is limited to and shall not exceed the purchase price paid.

Warranty Disclaimer. Dayton has made a diligent effort to illustrate and describe the products in this literature accurately; however, such illustrations and descriptions are for the sole purpose of identification, and do not express or imply a warranty that the products are merchantable, or fit for a particular purpose, or that the products will necessarily conform to the illustrations or descriptions.

Except as provided below, no warranty or affirmation of fact, expressed or implied, other than as stated in the "LIMITED WARRANTY" above is made or authorized by Dayton.

Product Suitability. Many states and localities have codes and regulations governing sales, construction, installation, and/or use of products for certain purposes, which may vary from those in neighboring areas. While Dayton attempts to assure that its products comply with such codes, it cannot guarantee compliance, and cannot be responsible for how the product is installed or used. Before purchase and use of a product, please review the product application, and national and local codes and regulations, and be sure that the product, installation, and use will comply with them.

Certain aspects of disclaimers are not applicable to consumer products; e.g., (a) some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you; (b) also, some states do not allow a limitation on how long an implied warranty lasts, consequentially the above limitation may not apply to you; and (c) by law, during the period of this limited warranty, any implied warranty of implied merchantability or fitness for a particular purpose applicable to consumer products purchased by consumers, may not be excluded or otherwise disclaimed.

Prompt Disposition. Dayton will make a good faith effort for prompt correction or other adjustment with respect to any product which proves to be defective within limited warranty. For any product believed to be defective within limited warranty, first write or call dealer from whom the product was purchased. Dealer will give additional directions. If unable to resolve satisfactorily, write to Dayton at address below, giving dealer's name, address, date, and number of dealer's invoice, and describing the nature of the defect. Title and risk of loss pass to buyer on delivery to common carrier. If product was damaged in transit to you, file claim with carrier.

Manufactured for Dayton Electric Mfg. Co., 5959 W. Howard St., Niles, Illinois 60714 U.S.A.

APPENDIX R
ROLL UP DOORS



OPERATIONAL AND MAINTENANCE MANUAL

FDR

MODEL :

INSTALLED AT :

LOCAL DISTRIBUTOR OF OVERHEAD DOOR PRODUCTS :

OVERHEAD DOOR COMPANY OF NEW BERN
1902 TARA HILLS DRIVE
NEW BERN, NC 28561

MANUFACTURED BY: THE OVERHEAD DOOR CORPORATION
PENNSYLVANIA DIVISION

ORDER NO :

FIRE DOOR DROP TEST PROCEDURE

1. Release hood flame baffle by cutting a "S" hook on each hood baffle release chain. This will allow baffle to drop on curtain.
2. Remove door end cover from tension wheel end.
3. Drop test door by cutting a "S" hook on the door release chain. (If door equipped with thru the wall release chain, cut the "S" hook at side of wall opposite hood.)
 - A. Release lever arms should separate and drop away from tension wheel bolt.
 - B. On chain, crank or electric operated doors, the drop weight should rotate the cam to release dentil from drive mechanism.
 - C. During release, the tension wheel should rotate rapidly for approximately 1/2 turn, then hesitate as impact pawl engages end of barrel assembly, reducing spring torque from door. Tension wheel will continue to rotate until tension bolt strikes back of release arm lever, restoring spring torque to door at a reduced rate.
 - D. Door should close smoothly at a speed of approximately 2 feet per second. Curtain should come to a full closed position against floor.
 - E. Also, door must close of its own accord when raised to a height sufficient to allow emergency egress and released.
4. In order to place door back in service perform the following;

PUSH-UP OPERATION

- A. Raise door to fully open position. Clamp vise grips, under bottom bar, to the guide to keep door from lowering.
- B. Reapply correct amount of initial turns to tension wheel and secure with release arm lever.
- C. Reconnect door release chain using a new #12 wire size "S" hook and tighten sash chain firmly using turnbuckle.
- D. Remove vise grips from guide.
- E. Reconnect flame baffle release chain using a new #12 wire size "S" hook.
- F. Install door end cover.

HAND CHAIN AND HAND CRANK OPERATION

- A. Step on foot pedal and secure sash chain down to prevent foot pedal from rising.

SECTION I

RECOMMENDED PREVENTATIVE MAINTENANCE

ROLLING STEEL OR ALUMINUM DOORS

To keep door in good working conditions, every three months* oil all moving parts except the clutch mechanism on fire doors and the wool pile in the guides on rolling grilles or counter doors. The guides should be lubricated with a paste wax or silicone spray.

Every six months*, oil all exposed roller chains and on electric operators dry lube the limit switch shaft threads.

If electrically operated, every three months check the oil level in the gear reducer. If it is necessary to add oil, use gear oil as recommended by the operator installation instruction. At this time check tension of roller chain between operator and door sprocket, if too loose, loosen operator mounting bolts and slide operator to tighten chain. Retighten mounting bolts.

All bearings provided with grease fittings should be lubricated every six months*. If so equipped, find bearings located in the drive bracket and tension end of the counter balance.

On crank operated doors and grilles the crank assemblies are sealed with grease and should not require lubrication.

Fire doors should be drop tested every six months unless otherwise required by others.

- * The above frequency of lubrication is for normal operation. Severe duty or unusual operating conditions may require modification of the times between lubrication.

(2)

- B. Raise door to fully open position. Tie hand chain or hand crank mechanism down to keep door from lowering.
- C. Reapply correct amount of initial turns to tension wheel and secure with release arm lever.
- D. Reconnect door release chain using a new #12 wire size "S" hook and tighten sash chain firmly using turnbuckle.
- E. Reconnect flame baffle release chain using a new #12 wire size "S" hook.
- F. Install door end cover.
- G. Release foot pedal sash chain and hand chain or hand crank mechanism.

ELECTRIC OPERATION

- A. Run door motor in down direction until operation stops.
- B. Step on foot pedal and secure sash chain.
- C. Raise door to fully open position.
- D. Reapply correct amount of initial turns to tension wheel and secure with release arm lever.
- E. Reconnect door release chain using a new #12 wire size "S" hook and tighten sash chain firmly using turnbuckle.
- F. Reconnect flame baffle release chain using a new #12 wire size "S" hook.
- G. Install door end cover.
- H. Release foot pedal sash chain.

SECTION II

TROUBLE SHOOTING GUIDE FOR ROLLING STEEL OR ALUMINUM DOORS

1. DOOR IS HARD TO RAISE BUT EASY TO LOWER.
Solution: Springs require more turns. Raise door to fully opened position and add 1/8 turn at a time until the same resistance is felt lowering the door as is felt raising the door.
2. DOOR IS HARD TO LOWER BUT EASY TO RAISE.
Solution: Springs require less turns. Raise door to fully opened position and remove 1/8 turn at a time until results listed in example 1 are achieved.
3. DOOR HANGS UP AT ENTRANCE INTO GUIDES.
 - a. Bellmouths might be out of position away from the headplates allowing endlocks to wedge. Loosen attachment nut and locate edge of bellmouth snug against headplate and tighten.
 - b. Endlocks might have become loose and tilted out of position. Drill out loose fasteners and reattach with suitable fastener.
 - c. Curtain might have been bent and damaged enough to wedge in guides. In some cases the bellmouths can be removed from the guide entrance and the curtain lowered outside of the guides and straightened. Be careful not to allow curtain to rapidly unwind off the counter balance.
4. FIRE DOOR WILL NOT COME TO A FULLY CLOSED POSITION WHEN DROP-TESTED.
Solution:
 - a. Reduce spring 1/8 turn on the main springs while door is in the fully opened position and drop test. Repeat until satisfactory drop test is attained.
 - b. Curtain might be too tight in the guides. This could have happened from guides or curtains having become damaged. Curtain should rattle about 1/16 minimum gap for full length of each guide.

5. ELECTRIC OPERATOR STOPS TOO SOON OR NOT ENOUGH AT THE OPEN OR CLOSED POSITION.

Solution: Operator limit switch setting has become out of phase with the door. Reset the limit switches. See operator installation instructions for method of resetting limits. It would be wise to tighten the drive chain between operator and door sprockets to avoid the chain jumping and a repeat of this situation.

6. OPERATOR DOES NOT RUN AND CIRCUITS TO IT ARE OKAY.

- Solution:
- a. Limit switch jammed at an out of phase position. Reset limit switch per operator installation instructions.
 - b. Faulty limit switch. Replace old switch.
 - c. Chain throw-out is in position for manual operation. Make sure mechanism is in position for electric operation.
 - d. Interlock switch faulty. Replace old switch.

7. FIRE DOOR WILL NOT DROP WHEN TESTED.

- Solution:
- a. Too much or too little tension on door (electric, chain or crank operated) and drive mechanism won't disengage. Adjust tension with door in open position to correct.
 - b. On drive end, (electric, chain or crank operated) the gap between face of stationary Dentil Release Assembly and washer on governor drive hub assembly is incorrect not allowing drive to disengage. Set gap at 1/32" to 1/16" to correct. See page 13 of Fire Door Installation instructions.
 - c. Release chain not allowing door to release. Find area where chain is binding and correct.

LIMITED WARRANTY

The authorized distributor of Overhead Door Corporation products whose name appears below ("Seller") warrants the product sold under this warranty to be free from defects in material and workmanship under normal use and service. This warranty extends only to the original consumer ("Buyer"), and expires one year after the date of installation.

Seller's sole obligation under this warranty is limited to repairing or replacing any parts which shall be determined by Seller to be defective, and is conditioned upon Buyer giving notice of any such defect to Seller within the warranty period. If Seller concludes that repair or replacement is necessary, Seller will commence work within a reasonable time after the decision to repair or replace is made.

This warranty does not apply to any product which has been altered or repaired by any person not authorized by the Seller, or which has been subjected to misuse, neglect or accident.

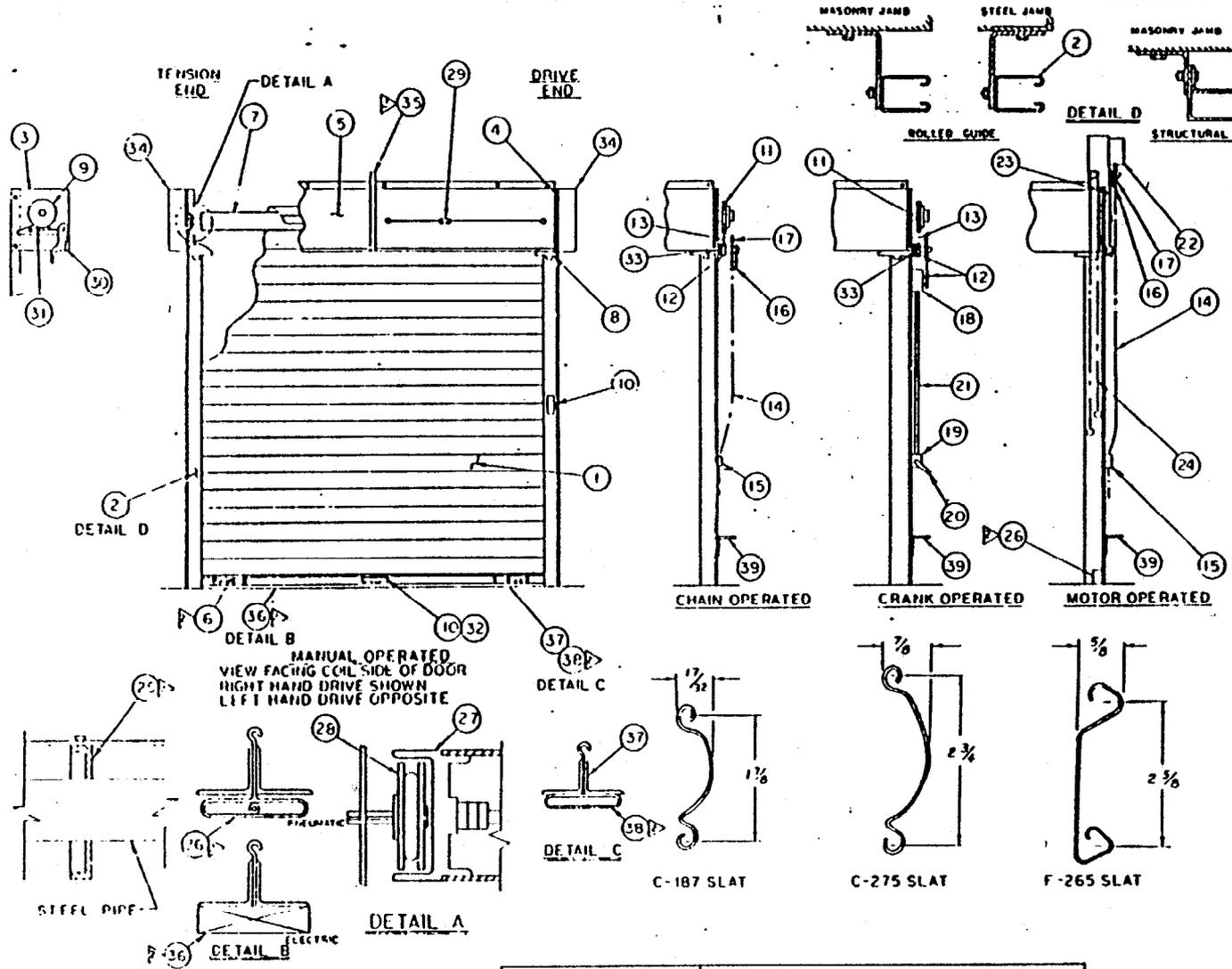
Seller has not established any informal dispute settlement procedure of type described in the Magnuson-Moss Warranty Act.

SELLER ASSUMES NO LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES. WARRANTIES IMPLIED BY LAW ARE LIMITED IN DURATION TO THE ONE YEAR PERIOD DESCRIBED ABOVE.

This warranty gives you specific legal rights, and you may have other rights which vary from state to state. Some states do not allow limitations on how long an implied warranty lasts, and some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

Inquiries to the Seller concerning this warranty should be directed to:

**OVERHEAD DOOR CO. OF NEW BERN, INC.
POST OFFICE BOX 12467
NEW BERN, NC 28561**



39	FOOT PEDAL (NOT REQD MAN OPER)	2
38	BOTTOM WEATHERSEAL	2
37	BOTTOM BAR ASSEMBLY	2
36	ELECTRIC OR PNEU SAFETY EDGE BOTTOM BAR	2
35	WOOD SUPPORT	2
34	MECHANISM COVERS	2
33	CLUTCH ASSY	2
32	U. L. LABEL	2
31	HORIZONTAL RELEASE ARM LEVER	2
30	VERTICAL RELEASE ARM	2
29	160°F FUSIBLE LINK	2
28	IMPACT DEVICE ASSY	2
27	IMPACT HOUSING	2
26	INTERLOCK SWITCH	2
25	BARREL W/IC	2
24	MOTOR TO MANUAL CHAIN RELEASE	2
23	50T MOTOR DRIVE SPROCKET	2
22	MOTOR OPERATOR - SEE ILLUSTRATED PART BREAKDOWN	2
21	DRIVE SHAFT	2
20	CRANK HANDLE	2
19	LOWER CRANK ASSY AND MOUNTING BRACKET	2
18	UPPER CRANK ASSY AND MOUNTING BRACKET	2
17	HAND CHAIN POCKET WHEEL (CHAIN AND ELECTRIC ONLY)	2
16	CHAIN GUIDE (CHAIN AND ELECTRIC ONLY)	2
15	CHAIN KEEPER (CHAIN AND ELECTRIC ONLY)	2
14	HAND CHAIN (CHAIN AND ELECTRIC ONLY)	2
13	DRIVE CHAIN 50 41, NO 50	2
12	DRIVE SPROCKET (SMALL) 14T	1
11	DRIVEN SPROCKET (LARGE) 22T, 29T, 40T	1
10	NAMEPLATE AND ORDER NO.	2
9	TENSION WHEEL	2
8	CURTAIN STOPS	2
7	BARREL ASSEMBLY	2
6	SLIDE BOLT ASSEMBLY	2
5	WOOD ASSEMBLY WITH FLAME DAPPLE	2
4	BRACKET, DRIVE END	2
3	BRACKET, TENSION END	2
2	GUIDE ASSEMBLY	2
1	CURTAIN ASSEMBLY	2
NO	DESCRIPTION	
	ROLLING FIRE DOOR	

ORDER NO	
ITEM NO	
TYPE AND DOOR MODEL	
ELECT OPR MODEL	
PROJECT	
LOCATION	
MANUFACTURING PLANT	

OVERHEAD DOOR CORPORATION
 DRAWING TITLE: **MAINTENANCE MANUAL DWG**
 DRAWING NO: **D-2855**
 DATE: **NA**
 MATERIAL: **NONE**

2 WHEN REQUIRED
 1/2 SPECIFY EDGE, OFFSET SIZE AND CHAIN SIZE.
 NOTES

WITH SAFETY SWITCH

FIGURE 1~TYPE D & DRAWBAR

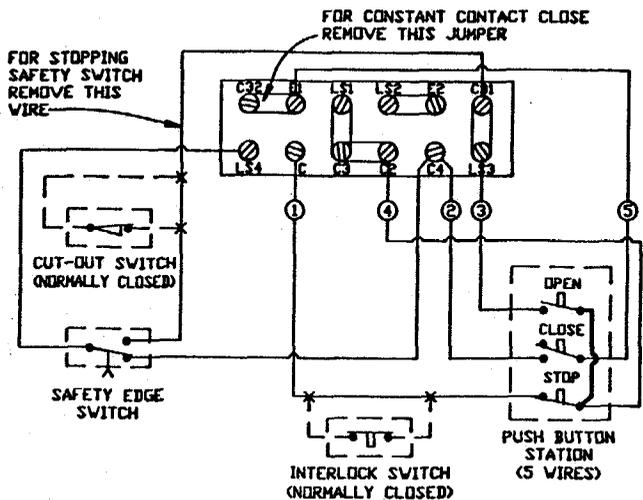
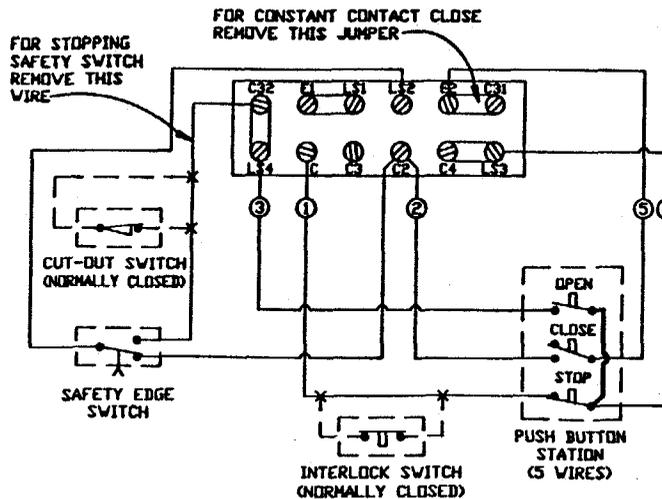


FIGURE 2~TYPE C



REVISION			
LETTER	DESCRIPTION	DATE	APPROVAL
-	REF PER DIN 100350	7/2/88	MJ
A	REV. PER ECO 10726	11/11/88	MJ

**TYPE C & TYPE D
WIRING DIAGRAM SELECTION**

- MODEL EL
WHEN INSTALLED AS SHOWN IN INSTRUCTION MANUAL, USE TYPE D WIRING DIAGRAM.
- MODEL FL/SFL
SEE INSTRUCTION MANUAL PAGE 8, FIGURE 8.
- MODEL L
SEE INSTRUCTION MANUAL PAGE 10, FIGURE 10.
- MODEL SDA
SAME AS FOR MODEL FL/SFL & L.
- MODEL RD-30M
SEE INSTRUCTION MANUAL PAGE 9, FIGURE 14.
- MODEL RDA
WHEN INSTALLED IN POSITIONS SHOWN IN INSTRUCTION MANUAL, USE TYPE C WIRING DIAGRAM.

FIGURE 3~TYPE D & DRAWBAR

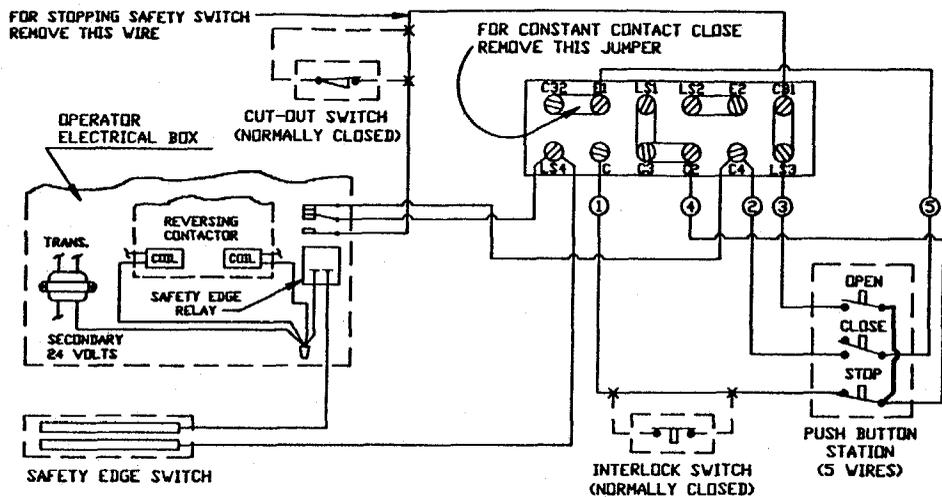
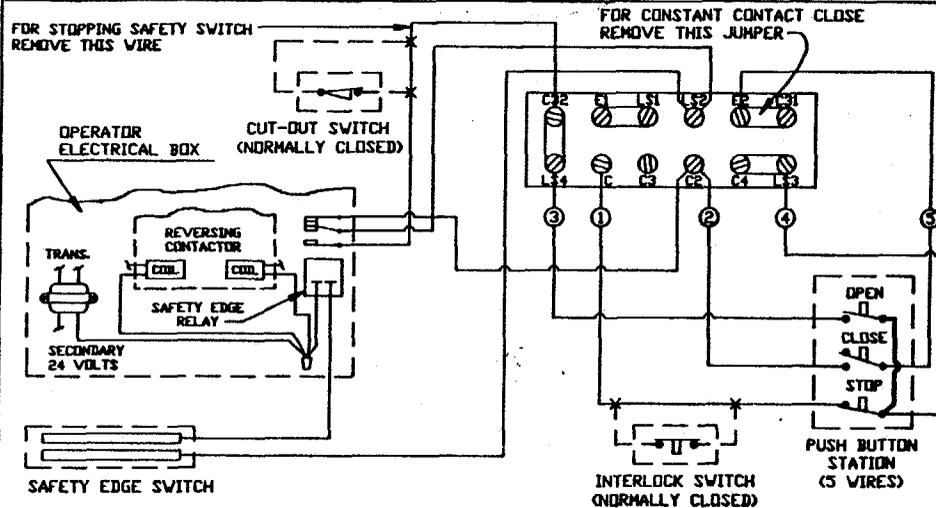
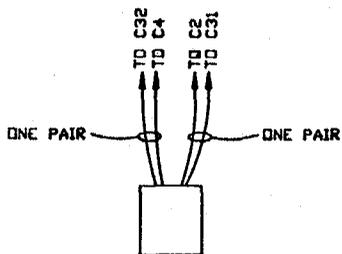


FIGURE 4~TYPE C



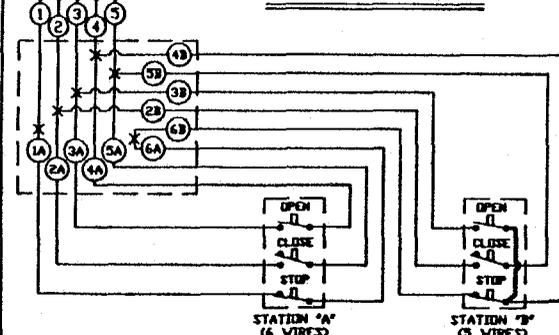
COMMERCIAL RECEIVER WIRING

(SEE NOTE 1)



TO OPERATOR TERMINALS

TWO-STATION WIRING



NOTES:

1. WHEN USING 4-WIRE RECEIVER (AS SHOWN) OPERATOR MUST BE WIRED FOR MOMENTARY CONTACT OPERATION.
2. IF STOPPING PNEUMATIC SAFETY EDGE SWITCH IS BEING USED, OPERATOR SHOULD BE WIRED FOR MOMENTARY CONTACT CLOSE.
3. IF REVERSING SAFETY EDGE SWITCH IS BEING USED, OPERATOR MUST BE WIRED MOMENTARY CONTACT OPEN.
4. ADJUST CUT-OUT SWITCH (IF USED) TO PREVENT DOR REVERSING AT THE FLOOR.
5. CIRCLED NUMBERS ARE FOR WIRE IDENTIFICATION ONLY.

OVERHEAD DOOR CORPORATION				
DATE	DATE	DRAWING TITLE:		
DRAWN BY	4/1/88	WIRING DIAGRAM, EXTERNAL CONTROL-MOMENTARY CONTACT OPEN AND CLOSE		
CHECKED BY		PROJECT NO.	DRAWING NUMBER	
APPROVED BY	MJ 5/11/88	NONE	B-107486	
		SCALE	WEIGHT	SHEET OF 2
		NONE	N/A	2

625 SERIES

Overhead Door Corporation 625 Series Stormtite™ doors are considered the finest insulated rolling service doors in the industry. They are ideally suited to a wide variety of applications where strength and energy efficiency are factors. Common applications include industrial warehouses, factories, distribution centers and vehicle maintenance garages.

FEATURES

NO CFCs or HCFCs

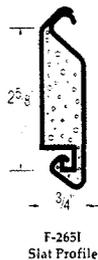
Our unique polyurethane foam insulation contains no environmentally damaging CFCs or HCFCs.

CUSTOM DESIGN

625 Series doors are computer designed to fit your specific requirements.

CURTAIN

Roll-formed curtain slats are interlocking and fully foamed-in-place with polyurethane insulation.



GUIDES

Guides of structural steel angle are weatherstripped with a vinyl weatherseal at each jamb.

HOOD

Heavy 24 gauge galvanized steel hood contains an internal hood baffle weatherseal.

ENVIRONMENTALLY FRIENDLY

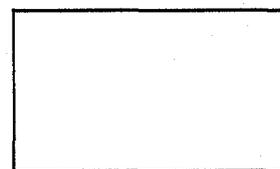


When you choose Overhead Door Corporation 625 Series insulated doors, you are buying a product that contains no environmentally damaging CFCs or HCFCs. These compounds have been used in the manufacturing of polyurethane and polystyrene insulation for many years. When it was proven that these compounds were damaging the earth's ozone layer,

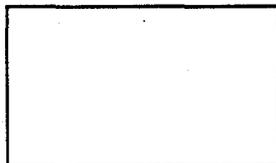
Overhead Door Corporation took immediate action. Extensive research and testing culminated in the introduction of the advanced polyurethane foam insulation we use today, the first in the industry to be totally free of CFCs and HCFCs.

ColorSpec^{OHD}

POWDER COAT PAINT OPTION



POLAR



BUCKSKIN



DOVE GRAY



DARK BRONZE



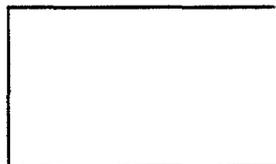
MIDNIGHT



CRIMSON



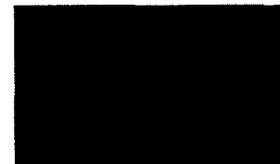
TANGERINE



CANARY



FOREST GREEN



PATRIOT BLUE

OHD ColorSpec offers you a spectrum of new colors available through a special powder coating process. All of these brilliant, new colors provide a rich, glossy finish to complement any architectural application and further enhance the appearance of all rolling service doors.

This optional powder coating process is not only more environmentally friendly than most traditional painting methods, but it also provides an extremely hard finish coat.* Select from any of ten OHD ColorSpec hues, or an alternative color may be specified.**

*Normal wear from metal to metal contact will occur over time.

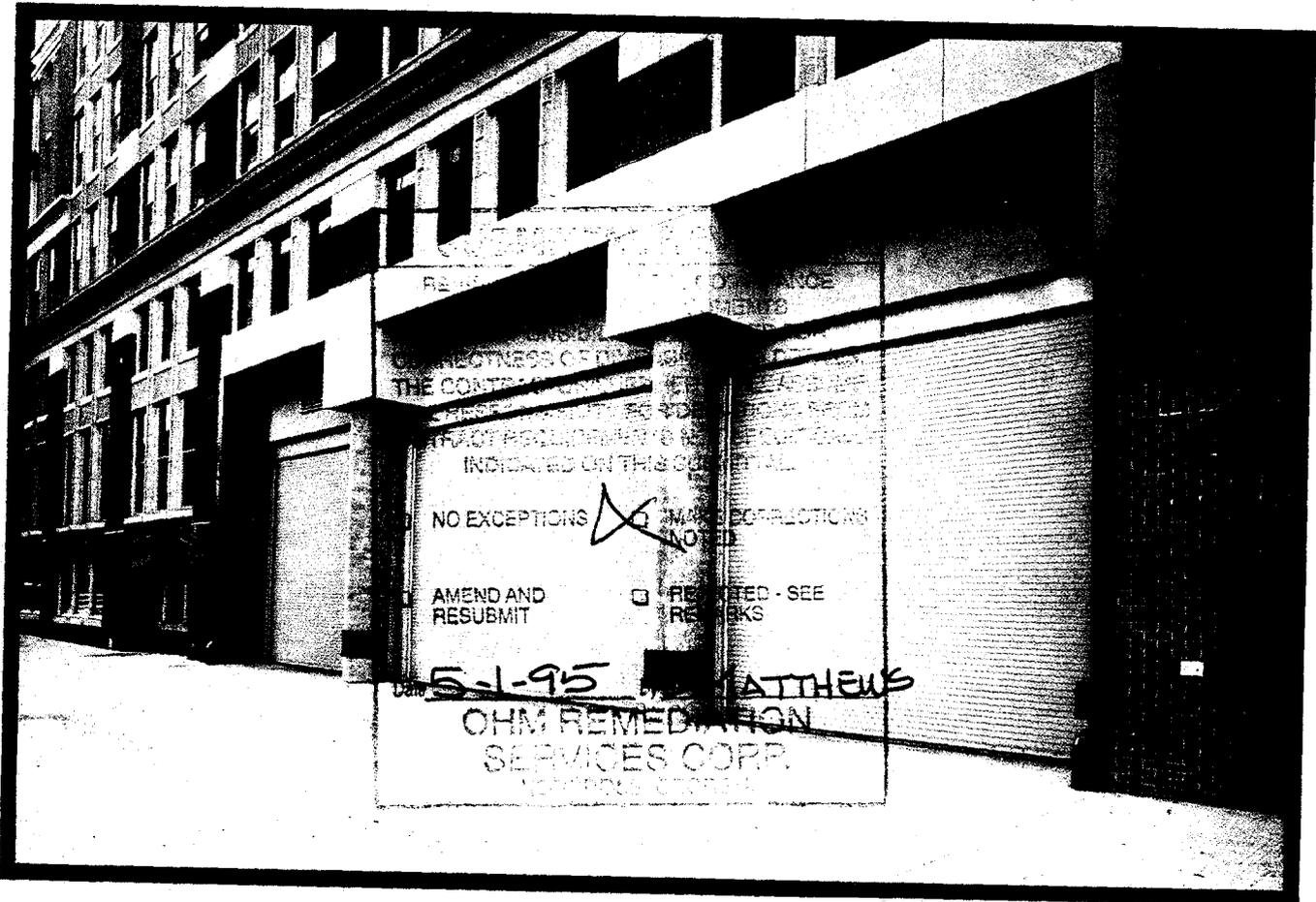
**Colors other than those shown here may require longer delivery times.

625 SERIES
STORMTITE™ INSULATED SERVICE DOORS

NORTHEAST CONSTRUCTION CO.
POST OFFICE BOX 548
JACKSONVILLE, NC 28541-0548

Approved
Approved as noted
Revise and Resubmit
By [Signature]
Date 11/3/95

Approval does not relieve supplier or subcontractor of his obligation to furnish and/or install this material in accordance with requirements of the contractual plans and specifications.



OVERHEAD DOOR CORPORATION



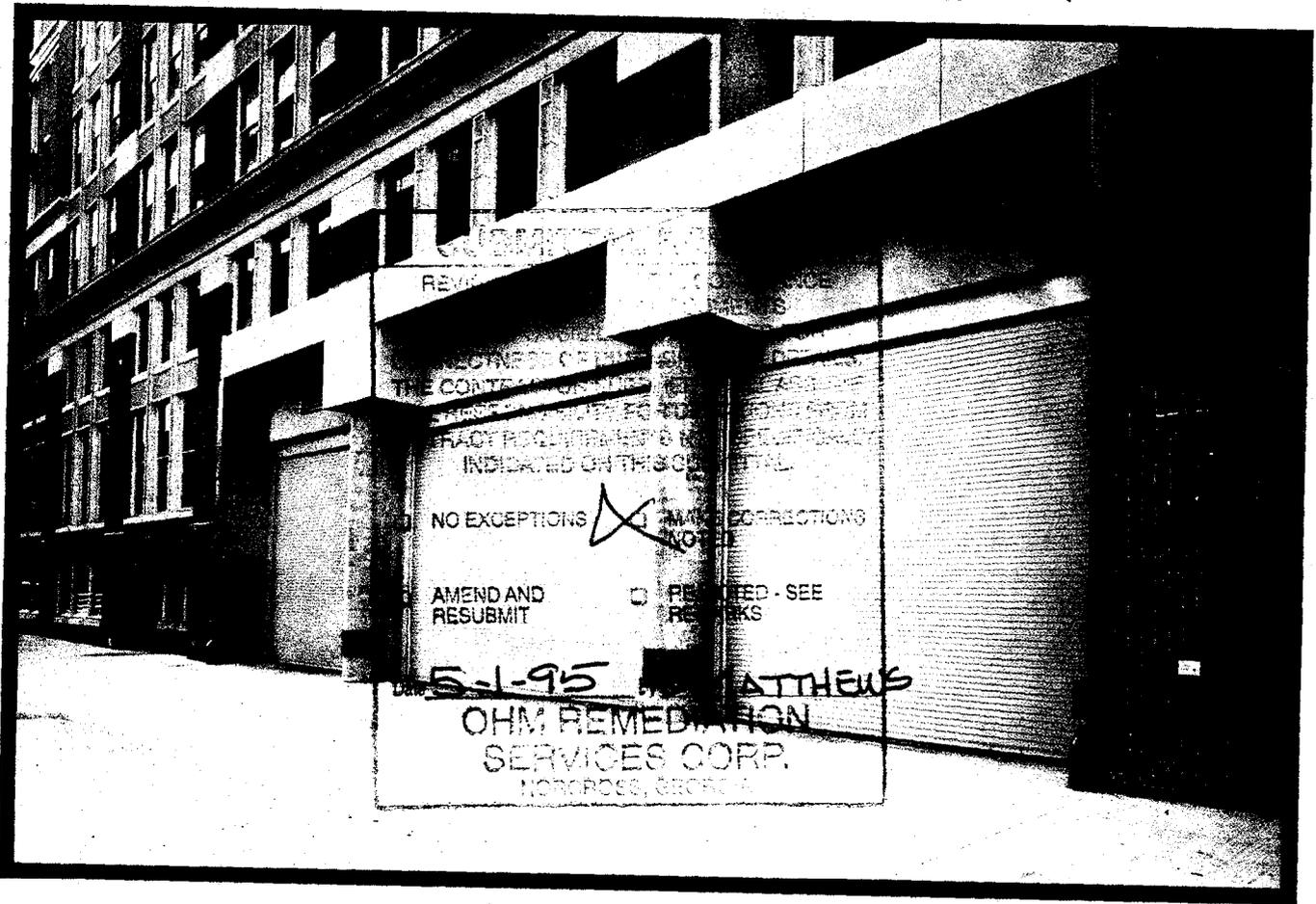
the original since 1921

625 SERIES
STORMTITE™ INSULATED SERVICE DOORS

NORTHEAST CONSTRUCTION CO.
POST OFFICE BOX 848
JACKSONVILLE, NC 28541-0848

Approved
Approved as noted
Revise and Resubmit
By [Signature]
Date 11/3/95

Approval does not relieve supplier or subcontractor of his obligation to furnish and/or install this material in accordance with requirements of the contractual plans and specifications.



OVERHEAD DOOR CORPORATION



the original since 1921

INSULATED SERVICE DOORS

ARCHITECTURAL SPECIFICATIONS

PART 1 GENERAL

1.01 Work Included

The rolling doors will be Series 625 as manufactured by Overhead Door Corporation.

1.02 Related Work

Opening preparation, miscellaneous or structural metal work, access panels, finish or field painting, field electrical wiring, wire, conduit, fuses, and disconnect switches are in the Scope of Work of other divisions or trades.

PART 2 PRODUCT

2.01 Curtain

Curtain slats will be interlocking, roll-formed, fully foamed-in-place, insulated, flat profile, type F-265I. The front and back slats shall be fabricated from minimum 24 gauge galvanized steel, per ASTM A-525. Endlocks will be attached to each end of alternate slats to prevent lateral movement.

2.02 Bottom Bar

The bottom bar will be two prime-painted steel angles, minimum thickness 1/8", bolted back to back to reinforce the curtain in the guides, and will have a bottom weatherseal. (Optional bottom bars in galvanized steel, stainless steel and aluminum, as the project requires.)

2.03 Guides

Guides will be three (3) structural steel angles with a minimum thickness of 3/16". Guides will be weatherstripped with a vinyl weatherseal at each jamb, on the exterior curtain side. (Interior curtain side weatherseal is an option.) Guides will be equipped with windlock bars as required to meet the minimum design windload of 20 PSF. (Greater windload designs are available as options on request.) (As an option, guides are available in galvanized, aluminum and stainless steel material.)

2.04 Brackets

Brackets will be 3/16" min. hot-rolled steel plates to support the counterbalance, curtain, and hood. (Galvanized steel plate is an available option.)

2.05 Counterbalance

The counterbalance will be helical torsion springs designed for standard 20,000 cycles. (Optional cycle designs are available, such as 50,000 or 100,000). The counterbalance is housed in a steel tube or pipe barrel, supporting the curtain with a deflection limited to .03" per foot of span (width). The counterbalance will be adjusted by means of an adjusting tension wheel.

2.06 Hood

The hood will be minimum 24 gauge galvanized steel. (Heavier steel gauges and aluminum or stainless steel material are available options.) Intermediate supports will be furnished to support the hood where required on wider openings. The hood will be supplied with an internal hood baffle weatherseal. (Lintel weatherseals are optional.)

2.07 Operation

Manual chain hoist is standard. (Electric motor and crank operation are optional.) *Overhead Door Corporation recommends the installation of a reversing safety edge to all electrically operated commercial doors. If a reversing edge is not chosen, the operator must be installed with a constant contact control switch.*

2.08 Locking

Manual chain hoist operated doors shall have chain keeper locks suitable for padlocking by others. (Cylinder locks are optional. Manufacturer's standard cylinder is supplied or masterkeyed cylinder may be furnished by others.)

When electric motor operation is chosen, and when cylinder and/or slide bolt locks are specified, inter-

lock switches are recommended to be specified to prevent door curtain travel when the lock rods are engaged in the guides.

2.09 Finish

Curtain slats and hood shall be galvanized per ASTM A-525 and shall receive a rust-inhibitive, roll-coating process, including bonderizing, baked-on prime paint to be .2 mils thick, and a baked-on polyester top coat to be .6 mils thick. All non-galvanized exposed ferrous surfaces will receive one coat of rust-inhibitive primer. All aluminum will be furnished in a mill finish (both clear and bronze anodized finishes are available options.) All stainless steel material will be furnished in a 2B mill finish. (#4 finish is an available option.) (OHD ColorSpec optional powder coating finish.)

PART 3 EXECUTION

3.01 Installation

The rolling service doors shall be installed in accordance with Overhead Door Corporation instructions and standards. Installation will be by authorized Overhead Door Corporation representatives.

QUICK REFERENCE

TRADE NAME, SERIES, MODEL	STORMTITE™ INSULATED 625, UFN
Common Project Types and Uses	Industrial warehouse, factory, distribution center, vehicle maintenance, or garage where energy efficiency is a consideration.
Operation	Available chain hoist, <i>crank or motor</i>
Wall Mounting Condition	Face-of-wall, <i>between jambs</i>
Windload Design	20 PSF <i>For greater PSF, consult factory</i>
Weatherseals	Bottom seal, exterior guide, and internal hood seals <i>Lintel and interior curtain side weatherseals</i>
Curtain	F-265I insulated (foamed-in-place) steel slats
Guide Types and Construction	3 steel angles with weatherseal for steel and masonry jambs
Bottom Bar Design	2 steel angles with weatherseal

Optional features shown in italics.



the original since 1921

The Industry leader for over 70 years

Model RDB

Commercial Operator For Rolling Doors and Grilles

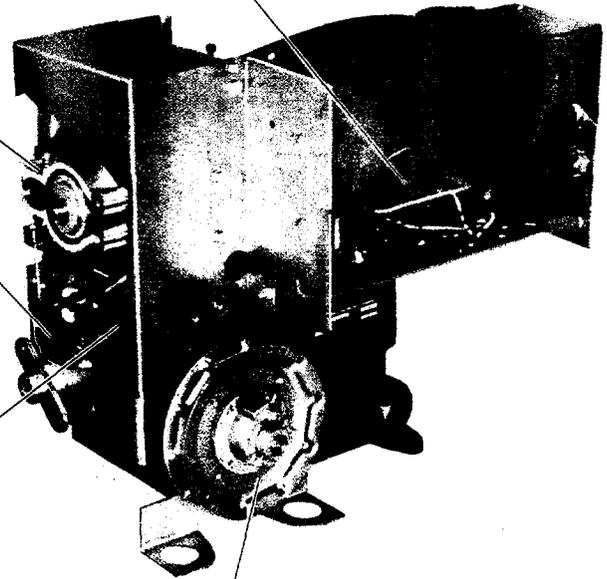
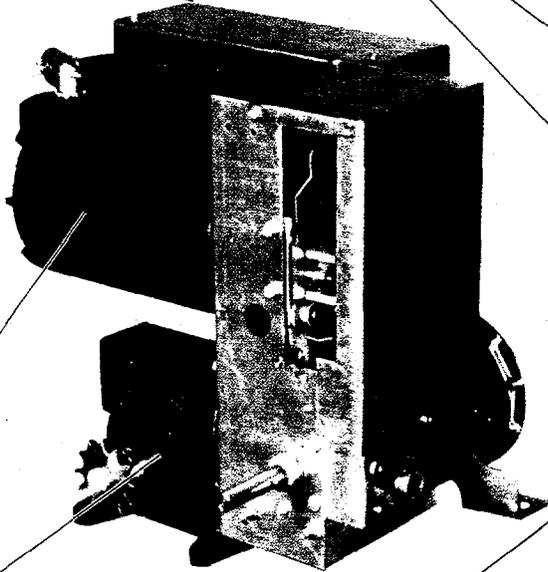
Exclusive Electrical Control Panel—No wiring modifications required for many options: Constant contact operation and use of sensing edge equipment and auxiliary timer equipment. Field changeable right to left.

Interlock Switch—Provided with the chain hoist.

Reversing Contactor—Heavy-duty for long life; electrically and mechanically interlocked.

Brake—Solenoid-actuated standard drum and shoe-type with 3 ft-lb of braking. Prevents coasting and ensures that door will stop and hold in any position. Stops on floor for good weather seal. No adjustment required.

Control Circuit—24V three-button "OPEN-CLOSE-STOP" control. Other voltages available. (Not shown.)



Power Train and Reduction—Worm gear running in oil bath.

Motor—Continuous-duty, high-starting torque, instant-reversing with automatic reset thermal overload for dependable performance even under the heaviest usage.

Limit Switches—Adjustable rotary-type with vernier adjustment. Remains synchronized with door during chain hoist operation. Allows easy addition of extra switches for accessory controls.

Chain Hoist & Disconnect—Hand chain 4/0 smooth chain for manual operation. Field changeable right to left.

Optional Clutch—Adjustable torque limiter-type. (Not shown.)

OPTIONS:

A wide variety of push-button stations, pull switches, sensing edges, key switches, treadle switches, timers and vehicle detectors are available as optional accessories. A complete line of optional radio controls is also available for remote operation.

The Model RDB commercial door operator is designed to use with light to heavy-duty rolling doors up to 860 square feet and rolling grilles up to 740 square feet. The Model RDB is available with either a 1/2, 1 or 2 HP motor.

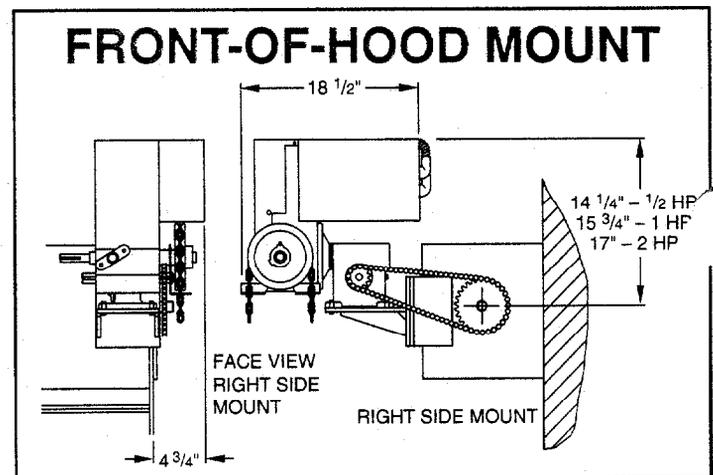
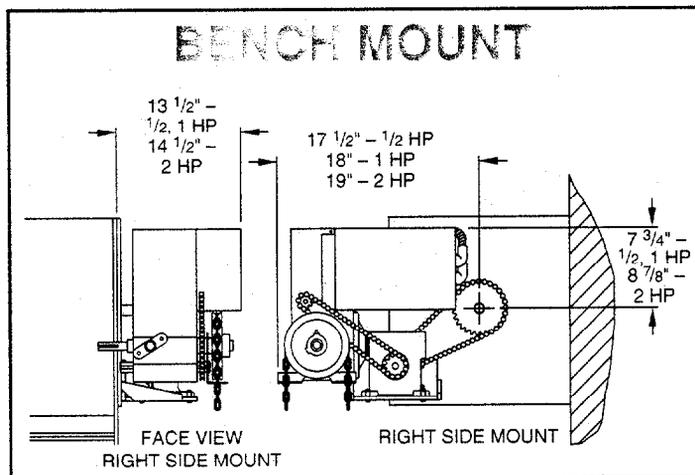
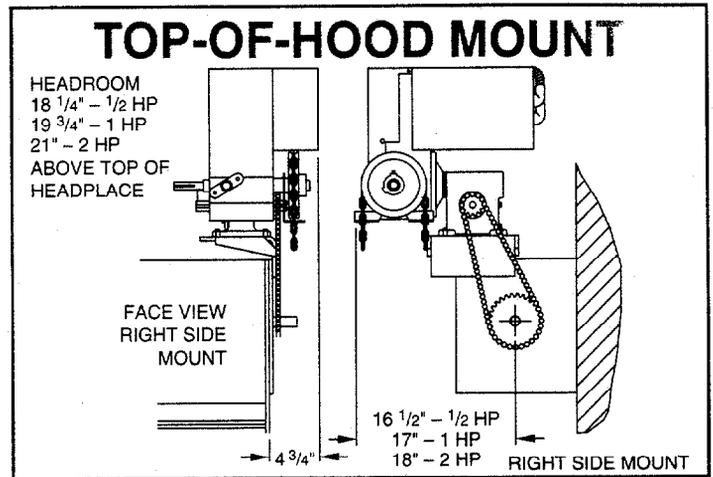
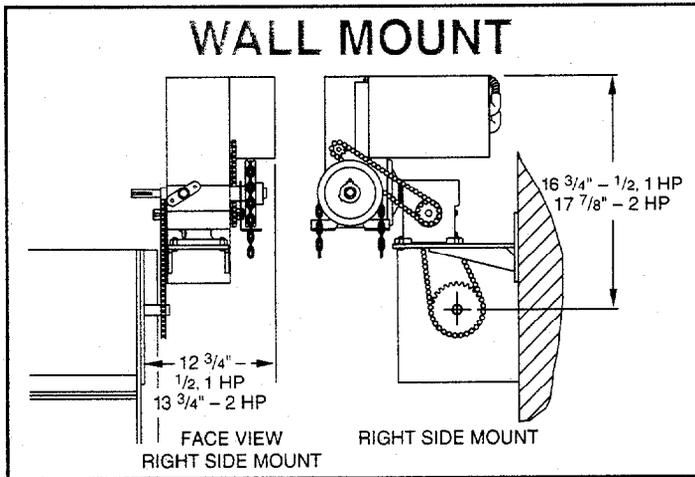
For more information contact:



the original since 1921

Model **RDB**

Mounting Data



SPECIFICATIONS

■ **Standard Voltages**

1/2HP, 1HP & 2 HP
 115/208/230V, single phase.
 1/2HP, 1HP & 2 HP
 208/230/460, three phase.

■ **U.L. Listed**



EXCLUSIVE FEATURES!

■ **Standard Control Features of 12-Terminal Control Panel**

Momentary contact on open
 Momentary contact on close
 Momentary contact on stop
 Constant pressure on open
 Constant pressure on close
 Constant pressure on close, release, and door opens
 Wiring for safety to stop
 Wiring for safety to reverse
 Wiring for external interlock
 Wiring for pass door safety switch

■ **Optional**

Push-Button Control Stations
 Many configurations to select from to meet the needs of any application

Universal Programmable Timer
 Ability to be programmed for multiple functions to provide flexibility in door automation control

Commercial Light Package
 Provides traffic lights and warning signals for safe door usage

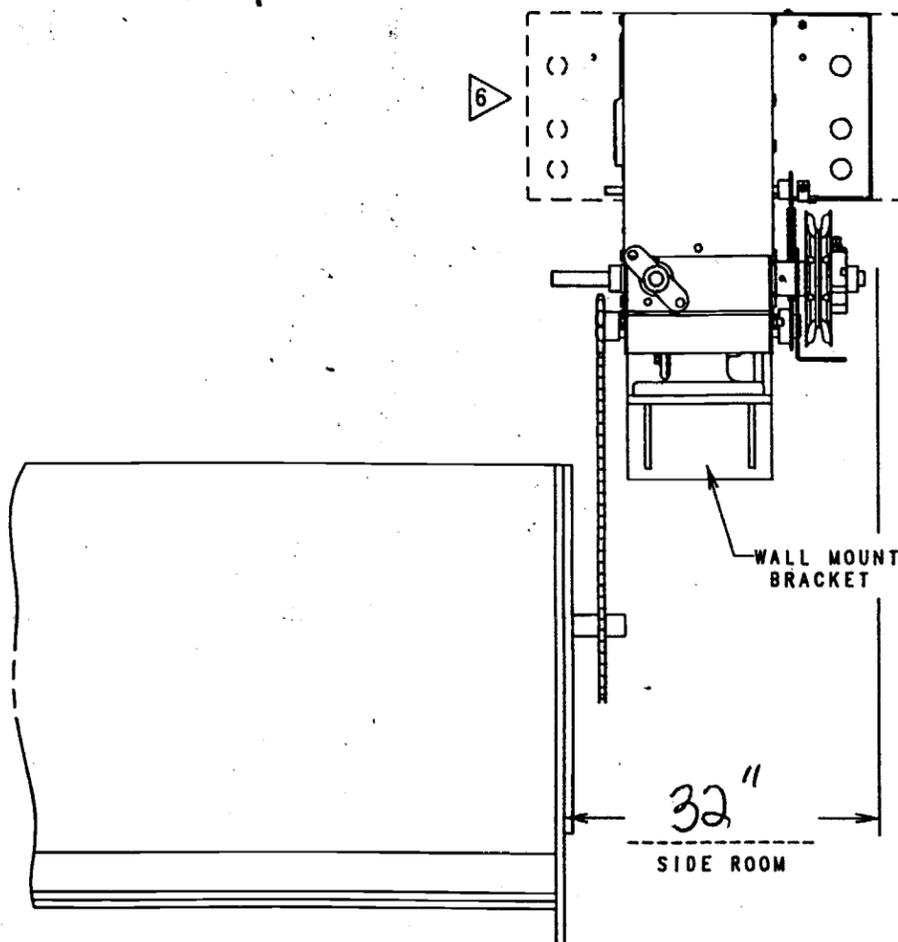
Radio Control Systems
 Engineered for years of reliable operation and versatility to provide the ultimate in service and convenience

Consistent with our policy of continuing product improvement, we reserve the right to change product specifications without notice or obligation. **LIMITED WARRANTY.** All Overhead Door Corporation products are sold with a one-year limited warranty for workmanship, materials, and installation by the distributor of The "OVERHEAD DOOR."

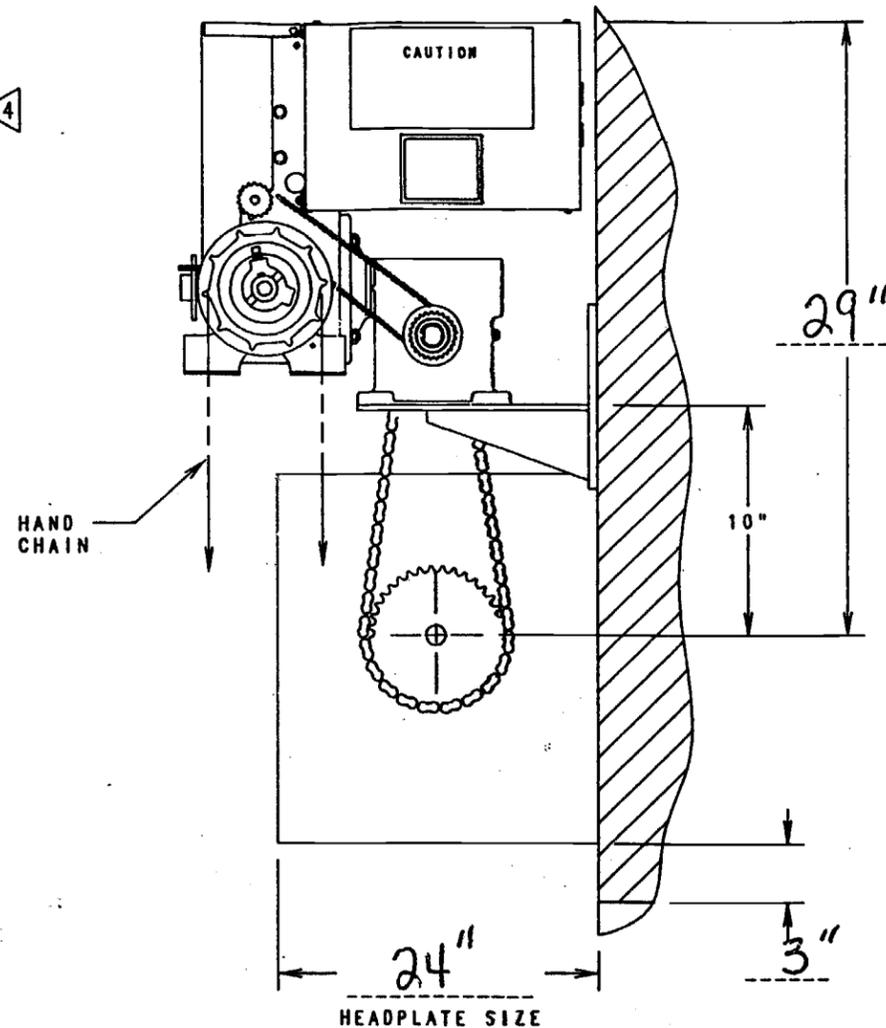
02351.HHB22

NOTES:

1. AVERAGE DOOR TRAVEL SPEED IS 8" PER SECOND.
2. PLEASE VERIFY VOLTAGE, PHASE & MOUNTING.
3. ALL OPTIONALS ARE AT ADDED COST.
4. A CLEARANCE OF 12" SHOULD BE ALLOWED FOR ACCESS TO ELECTRICAL BOX.
5. CONTROL VOLTAGE IS 24V. UNLESS OTHERWISE STATED.
6. ELECTRICAL BOX MAY BE LOCATED ON OPPOSITE SIDE.



FACE VIEW
RIGHT SIDE MOUNT



RIGHT SIDE MOUNT

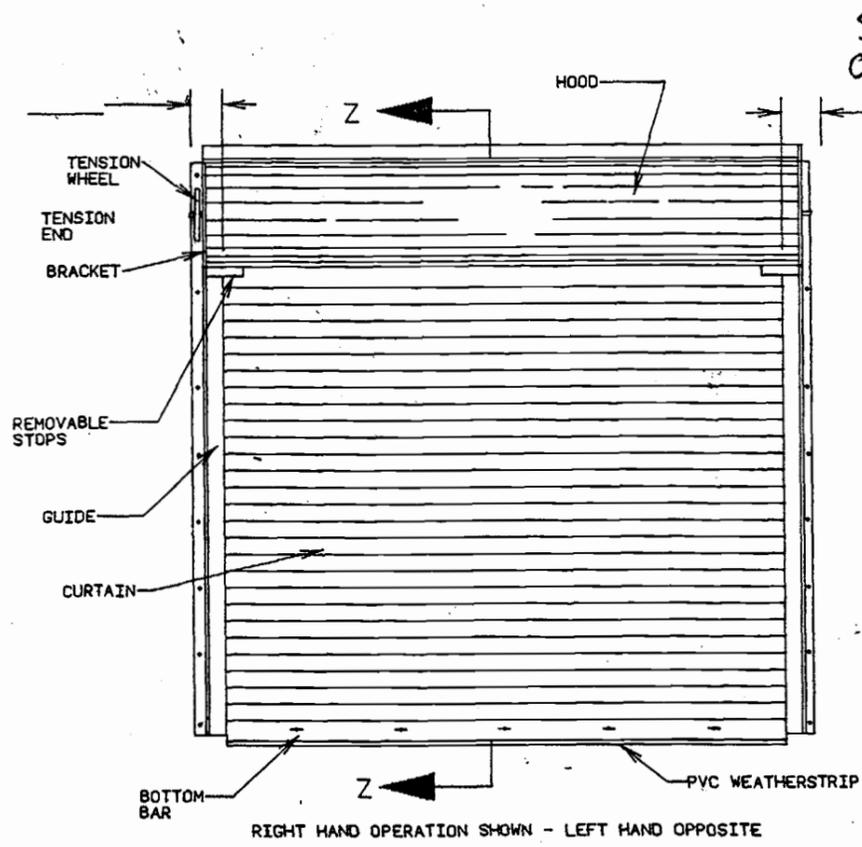
NOTES: EXTERIOR MOUNT NEMA 1 WITH HOOD COVER
 NEMA 4 & 12 3 BUTTON CONTROL
 ELECTRIC SAFETY EDGES
 OPERATOR - MODEL RDB - WALL MOUNT (ABOVE SHAFT)
 PROJECT SOIL AND GROUNDWATER REMEDIATION - MCB CAMP LEJEUNE
 ARCHITECT _____
 CONTRACTOR NORTHEAST CONSTRUCTION
 DISTRIBUTOR OHD NEW BERN, NC
 PLANT OHD LEWISTOWN, PA

480V 3Ø

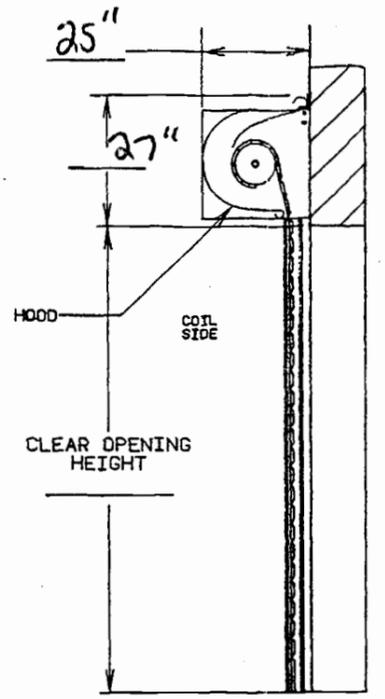
ARCHITECT DOOR NUMBER	QTY	FACTORY ORDER NUMBER	MOUNT							HAND		VOLTS					PHASE		CONTROL STATION SURFACE		
			BENCH	TOP OF HOOD	FRONT OF HOOD	WALL	SIDE	CENTER	DRAWBAR	L	R	115	208	230	460	575	SINGLE	THREE	3 BUTTON	KEY SWITCH	EXT. PUSHER 3 BUTTON
A	1	RDB				X	X				X									X	
B	1	RDB				X	X				X									X	

OWN. BY: _____ DATE: _____
 APPS. BY: _____ DATE: _____
 ENG. CERT. NO. _____ SHT. _____ OF _____



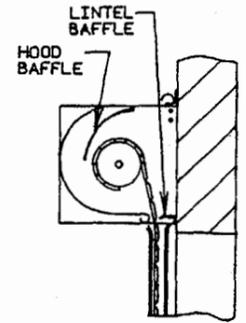


SEE OPERATOR DETAIL



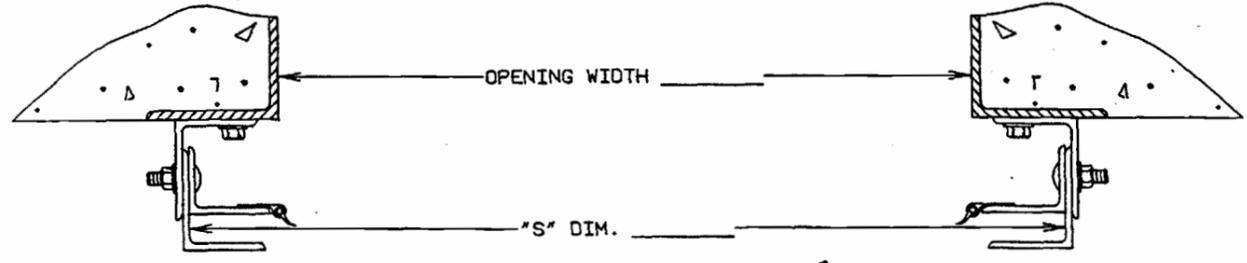
SECTION Z-Z

- NOTES:
1. CLEARANCES SHOWN ARE MAXIMUMS. LESSER CLEARANCES MAY BE POSSIBLE.
 2. DOOR IS DESIGNED TO WITHSTAND A MIN. OF 20 PSF EXTERNAL WINDLOAD. WINDLOCKS ARE PROVIDED AS REQUIRED.
 3. HOOD AND CURTAIN SHALL BE OF SAME TYPE MATERIAL & FINISH.
 4. FERROUS SURFACES ARE FACTORY PRIMED.
 5. ALL OPENING PREPARATION, ELECTRICAL POWER & FIELD PAINTING SHALL BE PROVIDED BY OTHERS.

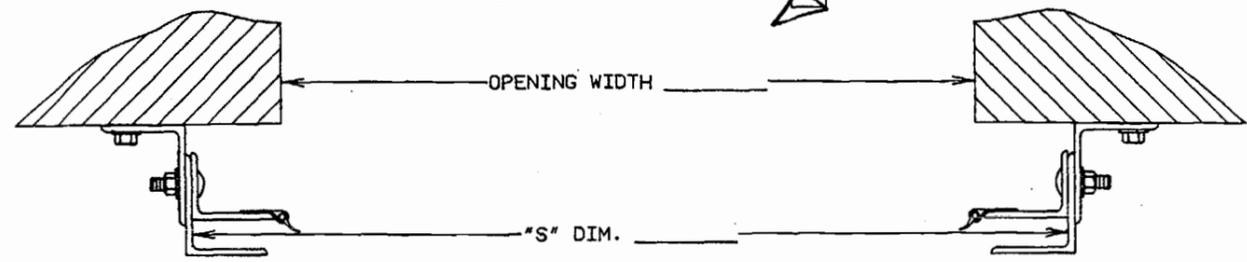


HEAD WEATHERSEAL (STANDARD)

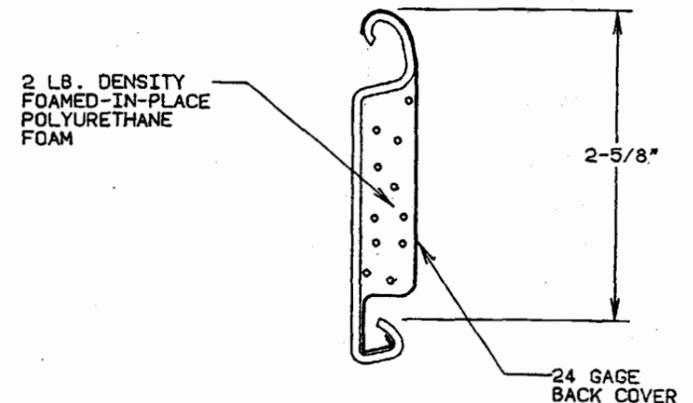
RIGHT HAND OPERATION SHOWN - LEFT HAND OPPOSITE



STEEL JAMB DETAILS



MASONRY/CONCRETE/WOOD JAMB DETAILS



SLAT DETAIL

NOTES:
EXTERIOR MOUNTED ELECTRIC OPERATORS

STORMTITE - INSULATED - MODEL	UFN
PROJECT	SOIL & GROUNDWATER REMEDIATION MCB, CAMP LEJEUNE
ARCHITECT	
CONTRACTOR	NORTHEAST CONSTRUCTION
DISTRIBUTOR	OHO NEW BERN, NC
PLANT	OHO LEWISTOWN, PA.

ADDED OPTIONS
COLOR = DOVE GREY
PRIMED PAINTED & GALVANIZED

ARCHITECT DOOR NUMBER	QTY	FACTORY ORDER NUMBER	OPENING SIZE		HAND		MOUNT				JAMB				WEATHERSTRIP			SLAT GAGE	"S" DIM.	ADDED OPTIONS
			WIDTH	HEIGHT	R	L	INT	EXT	MAS	CONC	STL	WOOD	JAMB	HEAD	BOTTOM BAR					
A	1	UFN	18'0"	18'0"	X								X	X	X	20	18'8"			
B	1	UFN	12'0"	16'0"	X								X	X	X	22	12'7"			

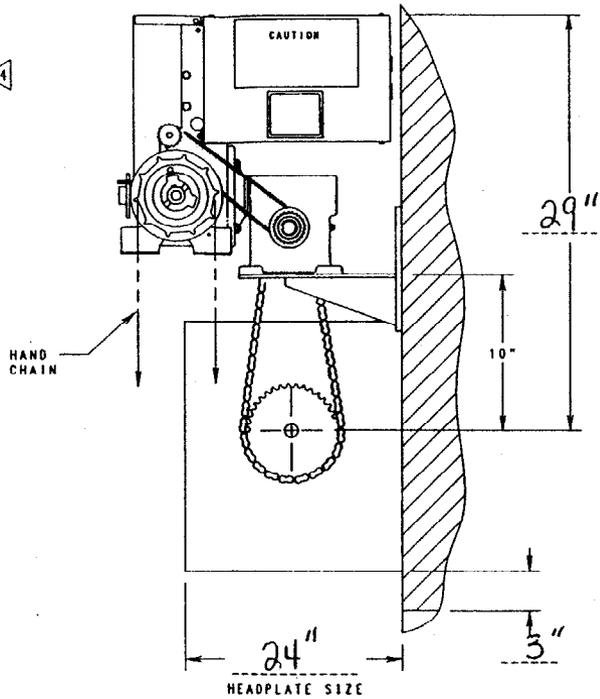
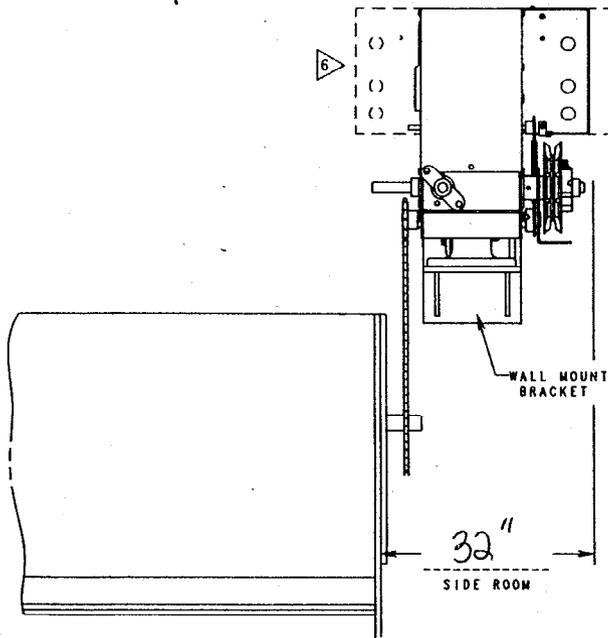
DWN. BY: _____ DATE: _____

APPD. BY: _____ DATE: _____

DWG NO. _____ SHT _____ OF _____

ENG. CERT. NO. _____





- NOTES:
1. AVERAGE DOOR TRAVEL SPEED IS 8" PER SECOND.
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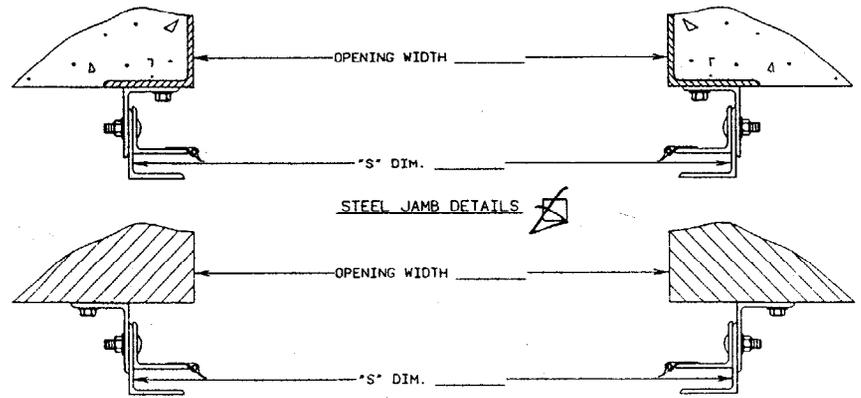
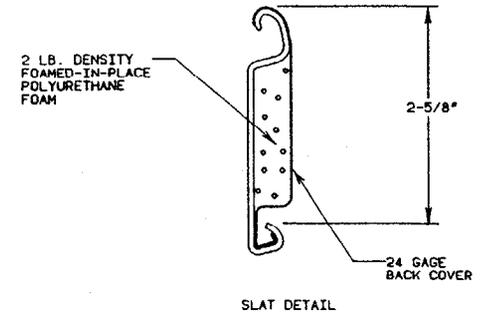
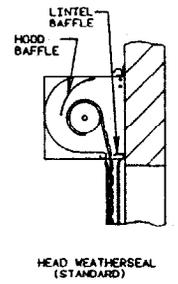
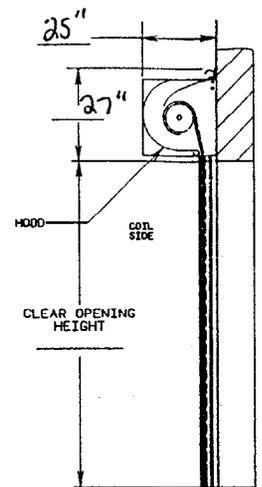
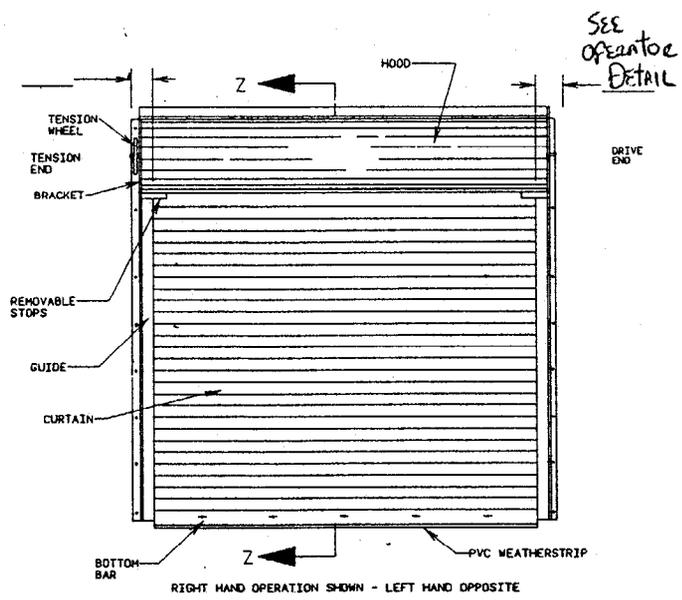
NOTES: EXTERIOR MOUNT NEMA 1 WITH HOOD COVER
 NEMA 4 & 12 3BUTTON CONTROL
 ELECTRIC SAFETY EDGES
 OPERATOR - MODEL RDB - WALL MOUNT (ABOVE SHAFT)
 PROJECT SOIL AND GROUNDWATER REMEDIATION - MCB CAMP LEJEUNE
 ARCHITECT _____
 CONTRACTOR NORTHEAST CONSTRUCTION
 DISTRIBUTOR OHD NEW BERN, NC
 PLANT OHD LEWISTOWN, PA

480V 3Ø

ARCHITECT DOOR NUMBER	QTY	FACTORY ORDER NUMBER	MOUNT					HAND		VOLTS					PHASE		CONTROL STATION SURFACE			
			BENCH	TOP OF HOOD	FRONT OF HOOD	WALL	SIDE	CENTER	DRAWBAR	L	R	115	208	230	460	575	SINGLE	THREE	3 BUTTON	KEY SWITCH	EXT. PUSH 3 BUTTON
A	1	RDB				X	X				X									X
B	1	RDB				X	X				X									X

OWN. BY: _____ DATE: _____
 APPR. BY: _____ DATE: _____
 ENG. NO. _____ SHT. _____ OF _____
 ENG. CERT. NO. _____





STORMTITE - INSULATED - MODEL <u>UFN</u>	
PROJECT	<u>SOIL & GROUNDWATER REMEDIATION</u> <u>MCB, CAMP LEJEUNE</u>
ARCHITECT	<u>NORTHEAST CONSTRUCTION</u>
CONTRACTOR	<u>OHO NEW BERN, NC</u>
DISTRIBUTOR	<u>OHO LEWISTOWN, PA.</u>
PLANT	<u>OHO LEWISTOWN, PA.</u>
OWN. BY:	_____ DATE: _____
APPD. BY:	_____ DATE: _____
DWG. NO.	_____ SH1 _____ OF _____
ENG. CERT. NO.	_____

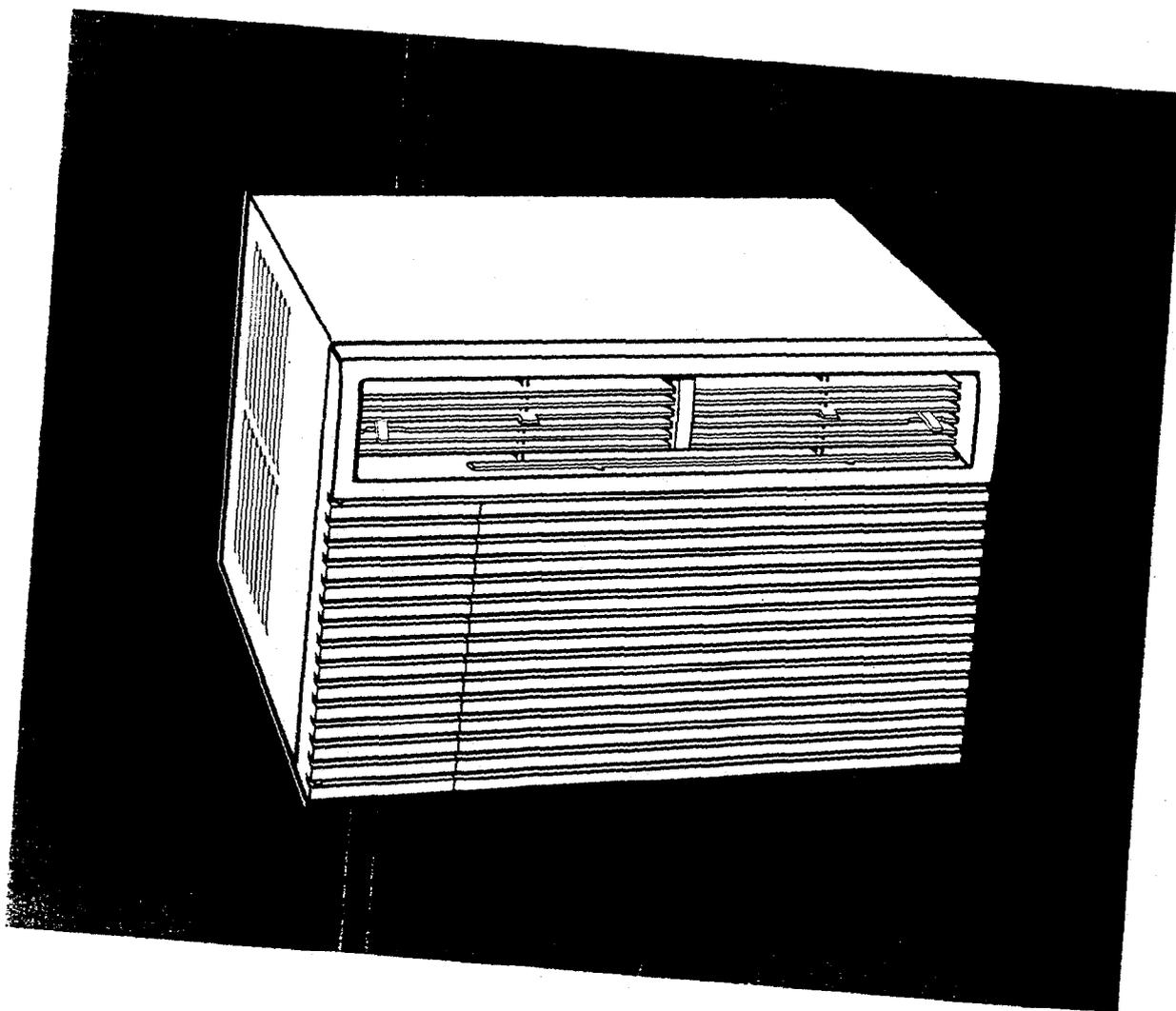
NOTES:
 EXTERIOR MOUNTED ELECTRIC OPERATORS
 COLOR DOVE GREY
 ADDED OPTIONS
PRIMED PAINTED & GALVANIZED
 " " "

ARCHITECT DOOR NUMBER	QTY	FACTORY ORDER NUMBER	OPENING SIZE		HAND		MOUNT		JAMB			WEATHERSTRIP		SLAT GAGE	"S" DIM.	ADDED OPTIONS
			WIDTH	HEIGHT	R	L	INT	EXT	MAS	CONC	STL	WOOD	JAMB				HEAD	BOTTOM BAR
A	1	UFN	18'0"	18'0"	X	X			X	X	X	X	20	18'8"		PRIMED PAINTED & GALVANIZED
B	1	UFN	12'0"	16'0"	X	X			X	X	X	X	22	12'7"		" " "



APPENDIX S
ROOM AIR CONDITIONING UNIT

SEARS
Kenmore
**OWNER'S
MANUAL**

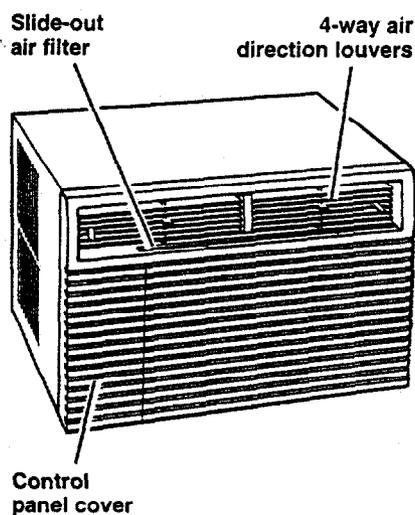


AIR CONDITIONERS

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Safety instructions

Safety instructions

⚠ WARNING

To reduce the risk of fire, electrical shock, or personal injury when using your air conditioner, follow these basic precautions:

- Read all instructions before using air conditioner.
- Complete all of the installation requirements as described in the Installation Instructions.
- Never allow children to operate or play with the air conditioner.
- Do Not operate the air conditioner with the front panel removed.
- Never clean air conditioner parts with flammable fluids. The fumes can create a fire hazard or explosion.

• FOR YOUR SAFETY •

DO NOT STORE OR USE GASOLINE OR OTHER FLAMMABLE VAPORS AND LIQUIDS IN THE VICINITY OF THIS OR ANY OTHER APPLIANCE. THE FUMES CAN CREATE A FIRE HAZARD OR EXPLOSION.

It is your responsibility to be sure your air conditioner:

- Is installed in a window that will hold the weight, and is secured according to the Installation Instructions.
- Is connected only to the proper kind of outlet, with the correct electrical supply and grounding. (See Installation Instructions.)
- Is the proper size for the area you want to cool.
- Is used only to do what window air conditioners are designed to do.
- Is not used by anyone unable to operate it properly.
- Is properly maintained.

Also, remove Energy Label and Consumer Checklist. Use a damp cloth to take off any glue residue. Do not use sharp instruments, flammable fluids, or abrasive cleaners. These can damage the material.

– SAVE THESE INSTRUCTIONS –

Operating instructions

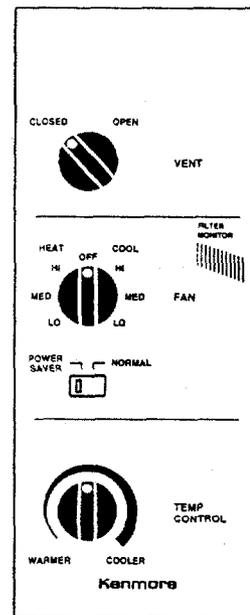
Starting your air conditioner

⚠ WARNING

Electrical Shock Hazard

- Plug unit only into grounded electrical outlet.
- Do not use an extension cord.
- Do not operate unit with front removed.

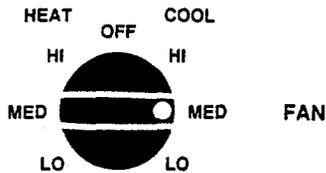
Failure to follow the above precautions could result in electrical shock or personal injury.



1. Set Vent Control to CLOSED for maximum cooling.
2. Set Fan Control to the desired setting.
3. Set Power Saver Switch to desired setting.
4. Turn Temp Control to desired setting. You can adjust the air conditioner's performance by turning the Temp Control counter-clockwise for more heating. Turn Temp Control clockwise for more cooling. You will need to experiment to find the setting which suits you best.

NOTE: If you turn your air conditioner off, wait at least three (3) minutes before turning it back on or you may blow a fuse or trip a circuit breaker.

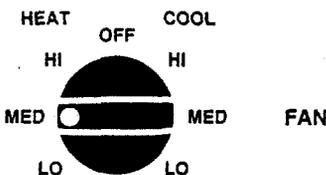
Fan control settings



COOL settings

The air conditioner cools the air running through the unit. Use the settings as follows:

- HI** for maximum cooling
MED for normal cooling
LO for sleeping comfort



HEAT settings

When the outside temperature is 45°F or above, the air conditioner operates as a heat pump and heats the air running through the unit. When the outside temperature is below 45°F, the unit switches itself to an electric-resistance heater to heat the air.

Use the settings as follows:

- HI** for maximum heating
MED for normal heating
LO for sleeping heating

NOTE: This product is not designed to be used as a primary heat source. It is intended for supplemental heating only.

The power saver switch



This switch has two settings—POWER SAVER and NORMAL.

POWER SAVER setting

To conserve energy, the fan runs only when cooling is needed. For example, the fan stops when the Temp Control setting is satisfied. For best results, use the NORMAL setting.

NORMAL setting

In this setting, the fan runs constantly. If the air becomes too warm (or too cool), adjust the Temp Control as needed.

The vent control

The Vent Control draws stale or smoky air from the room or circulates air in the room.



To exhaust room air

- Set Vent Control to OPEN.
- Set Fan Control to desired setting.
- Set Temp Control to desired setting.



To circulate room air

- Set Vent Control to CLOSED.
- Set Fan Control to desired setting.
- Set Temp Control to desired setting.

Filter monitor

(on some models)

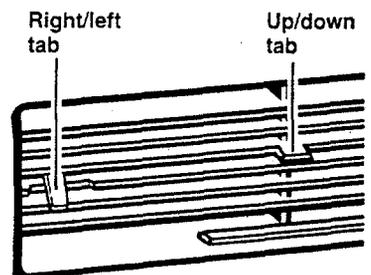
FILTER MONITOR



The Filter Monitor signals you when the filter needs to be cleaned. When the amount of dirt on the filter reaches a level that would affect cooling performance, a red flag in the unit will cover the lines on the control panel. The filter should then be cleaned (see page 4).

The Fan Control must be set on a HI setting for the Filter Monitor to work. If Fan Control is on another setting, turn setting to HI to check the filter. Then return to desired setting.

Changing air direction



The louvers in the top of the air conditioner control the direction of the cooled air. Move the Right/Left Tab to direct air horizontally. Move the Up/Down Tab to direct air vertically.

Super Thrust

To increase the distance of the airflow, use Super Thrust to close off one side of the louvers.

To use Super Thrust:

1. Move one of the up/down tabs completely up, closing the louvers on that side.
2. Adjust the tabs on the other set of louvers for the air direction you desire.

Cleaning and caring for your air conditioner

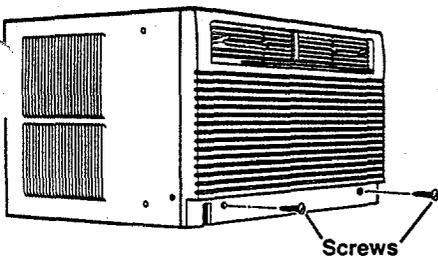
Proper use and care of your air conditioner will help ensure longer life of the unit and lower operating costs. Follow these instructions carefully. Call your local Sears store for an annual checkup.

⚠ WARNING

Electrical Shock and Fire Hazard

- Unplug power cord from receptacle before cleaning unit. Failure to do so could result in electrical shock or personal injury.
- Do not use flammable fluids, solvents, abrasive cleaners, or strong detergents. Fire or product damage could result.

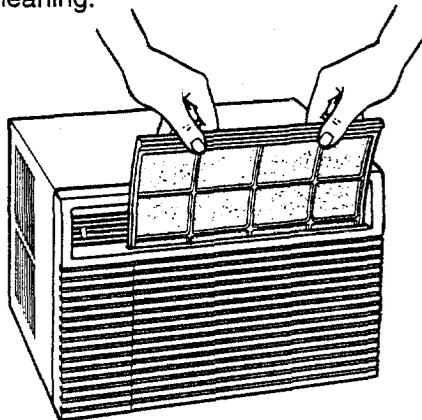
Cleaning the front panel



1. Unplug the power cord.
2. Remove the front panel from the unit when cleaning. Remove the two screws from the bottom edge of the front panel.
3. Lift the front panel slightly and pull it toward you.
4. Remove the slide-out air filter and clean it separately. (See "Cleaning the air filter" on this page.)
5. Clean front panel with warm water and a mild soap or detergent. Use a soft cloth. Rinse and dry.
6. Wipe control panel clean with a soft, dry cloth.
7. Replace front panel by pushing it straight on and then lowering it slightly to lock in place.
8. Plug in the power cord.

Cleaning the air filter

The filter is cleanable. A clean filter helps remove dust, lint, and other particles from the air. Check every two weeks to see if filter needs cleaning.



1. Remove filter by sliding it up and out the top of the front panel.
2. Clean filter using a vacuum cleaner.
-OR-
If very dirty, wash filter with warm water and a mild detergent. Air dry thoroughly before replacing.
3. Replace filter by sliding it back down into slot at top of front panel.

NOTE: The front panel does not have to be removed to clean filter.

Annual maintenance for your air conditioner

Your air conditioner needs annual maintenance to help ensure steady, top performance throughout the year. Call your local Sears store to:

- Inspect and clean the coils and condensate water passages.
- Check fan.

The compressor and fan motor are sealed and need no oiling. Expense of annual inspection is customer's responsibility.

-OR-

If you are familiar with electrical appliances, you can do the cleaning and maintenance yourself. If you choose to do so, follow these steps:

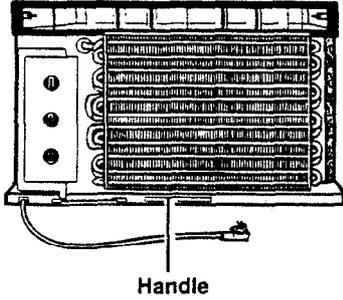
⚠ WARNING

Electrical Shock, Product Damage, and Personal Injury Hazard

- Unplug power cord from receptacle before performing any maintenance. Be sure no liquid gets into the motor, electrical control box, or compressor electrical terminals.
- Do not lift, push, or pull on any white beaded foam (expanded polystyrene) parts.
- Because your air conditioner weighs from 145 to 190 pounds, it is recommended that you have someone help you when you remove and reinstall your unit and that you both use proper lifting techniques.
- Handle the air conditioner with care. Watch out for the sharp metal fins on the front and rear coils.
- Do not use the collected water for drinking purposes. It is not sanitary.

Failure to follow the above precautions could result in electrical shock, product damage, or personal injury.

To further add to the value of your air conditioner, buy a Sears maintenance agreement.



1. Unplug power cord.
 2. Remove the front panel by lifting it slightly and then pulling it toward you.
 3. Slide unit out of cabinet by using the wire handle in the left-center of the base flange.
- NOTE:** Water may have collected inside the air conditioner cabinet and it could spill on the floor. Handle unit carefully.
4. Wrap the motor, connector plug, electrical control box, and compressor terminal box in plastic film and make sure no water or other liquid gets inside any of these parts. It could damage the insulation and cause serious mechanical problems.
 5. Carefully clean and hose out the base, condenser coil, and condensate pans. Clean at least once a year or more often if the condenser coil and pan collects dirt, sand, leaves, insects, or algae. Also, clean if you detect an odor coming from the air conditioner.
 6. Remove plastic film from motor and electrical parts.
 7. Replace unit in cabinet.
 8. Replace front panel by pushing it straight on and then lowering it slightly to lock into place.
 9. Plug in the power cord.

NOTE: It is a good idea to wait 24 hours before starting the unit again. This allows time for all areas to dry out. The water from rainfall or from normal operation does not harm these components.

Repairing paint damage

Check once or twice a year. This is very important, especially in areas near oceans or where rust is a problem. If needed, touch up with a good grade of enamel paint.

Energy saving tips

- Improve home insulation. Seal doors and windows. Close fireplace flue.
- Close blinds or drapes on sunny side of house. Add awnings.
- Check Filter Monitor often to see if filter is clean.
- Do not block airflow with drapes or furniture.
- Ventilate attic. High temperatures in the attic add to the cooling load.
- Try not to use heat producing appliances during the hottest part of the day.
- Turn lights and appliances off when not needed.
- Keep heat registers and cool-air returns closed.
- Use exhaust venting fans while cooking, doing laundry, and bathing.
- If you will be away for a long time, turn the Fan Control to OFF. The air conditioner will not come on until the Fan Speed Control is set to one of the cooling settings.
- If you will be away for a short time, set Fan Control to one of the POWER SAVER settings. The fan will only run when needed.

If you need service or assistance

We suggest you follow these steps:

1. Before calling for assistance ...

Performance problems often result from little things you can find and fix yourself without tools of any kind.

Air conditioner won't run:

- Is unit plugged into a live circuit with proper voltage?
- Is unit turned on?
- Is Temp Control set correctly?
- Has a household fuse blown or a circuit breaker tripped?
- Has the local power failed?

Unit blows fuses or trips circuit breaker:

- Are time-delay fuses being used?
- Is an extension cord being used?
(Do not use an extension cord to run your air conditioner.)

- Are you waiting three minutes after turning cooling circuit off before trying to restart unit?

Unit turns on and off, or does not cool room:

- Is filter clean?
- Are coils clean (both evaporator [inside] and condenser [outside])?
- Is there excessive moisture or heat (open vessel cooking, showers, etc.)?
- Try setting fan to higher speed.
- Try setting Temp Control to a cooler setting.
- Is Power Saver Switch set to POWER SAVER setting? Fan runs only when cooling to save energy. For best comfort, use the NORMAL setting.

Operating sounds:

- When your room air conditioner is operating normally, you will hear sounds such as:

- Droplets of water hitting the condenser, causing a "pinging" or "clicking" sound. Water droplets help to cool the condenser.

- Air movement from the fan, especially on high fan speed setting.

- Clicks from the thermostat cycle.

- Sounds also may be caused by house construction - such as vibration of the unit due to wall construction or unsteady window mounting area.

2. If you need assistance* ...

Call your local Sears store. If you must call or write, please provide: model number, serial number, date of purchase, and a complete description of the problem. This information is needed in order to better respond to your request for assistance.

SEARS Kenmore automatic air conditioner warranty

FULL ONE YEAR WARRANTY ON ROOM AIR CONDITIONER

For one year from date of purchase, when the Room Air Conditioner is operated and maintained for normal room cooling according to the owner's instructions attached to, or furnished with, the product, Sears will repair the Room Air Conditioner free of charge, if defective in materials or workmanship.

The customer pays for:

A. Service calls to:

1. Correct the installation of a Room Air Conditioner if it was not installed by Sears.
2. Replace house fuses or correct house wiring.
3. Clean or replace the filter.

B. Damage to the Room Air Conditioner caused by accident, misuse, fire, flood, or acts of God.

FULL FIVE YEAR WARRANTY ON SEALED REFRIGERATION SYSTEM

For five years from date of purchase, when the Room Air Conditioner is operated and maintained for normal room cooling according to the owner's instructions attached to, or furnished with, the product, Sears will repair the sealed system (consisting of refrigerant, connecting tubing, and compressor motor) free of charge, if defective in materials or workmanship.

WARRANTY SERVICE IS AVAILABLE BY CONTACTING THE NEAREST SEARS STORE OR SERVICE CENTER THROUGHOUT THE UNITED STATES.

This warranty applies only while this product is in use in the United States.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

SEARS, ROEBUCK AND CO., B/817 WA, Hoffman Estates, IL 60195

We service what we sell

"We Service What We Sell" is our assurance to you that you can depend on Sears for service, and Sears service is nationwide.

Your Kenmore has added value when you consider that Sears has a service unit near you, staffed by Sears trained technicians ... professional

technicians specifically trained on Sears appliances, having the parts, tools, and equipment to ensure that we meet our pledge to you ... "We Service What We Sell."

To further add to the value of your air conditioner, buy a Sears maintenance agreement.

Sears air conditioners are designed, made, and tested for years of dependable operation. Yet, any modern appliance may require service from time to time. The Sears warranty plus the Sears maintenance agreement provides protection from unexpected repair bills.



SEARS

REPAIR PARTS LIST

Model No.
106.9741971

To Call
Toll Free
For Parts:

**1-800-366-PART
(1-800-366-7278)**

For Service:

**1-800-4-REPAIR
(1-800-473-7247)**

Kenmore®

AIR CONDITIONER

Depending on your model, the model number of your air conditioner is found on the serial plate located on the front of the base pan or evaporator cover by removing the air conditioner front assembly or on the left side of the cabinet.

All repair parts listed are available for immediate purchase or special order when you visit your nearest Sears Service Center, or the Service Department at most Sears stores. To order parts by phone, call the toll free parts number listed to the left.

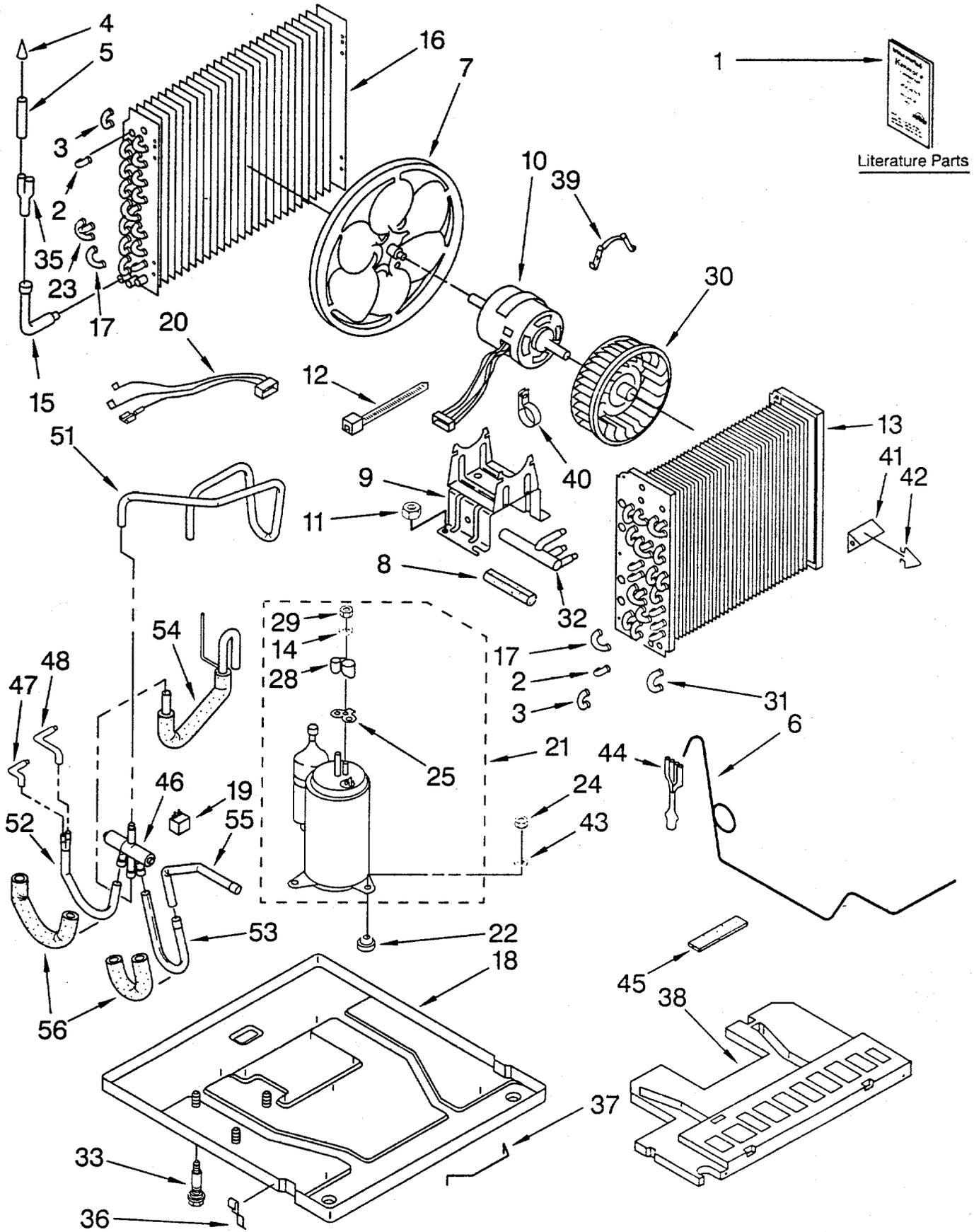
When requesting service or ordering parts, always provide the following information:

- ◆ Product Type
- ◆ Part Number
- ◆ Model Number
- ◆ Part Description

Sears, Roebuck and Co., Hoffman Estates, IL 60179 U.S.A.

UNIT PARTS

For Model: 106.9741971



UNIT PARTS

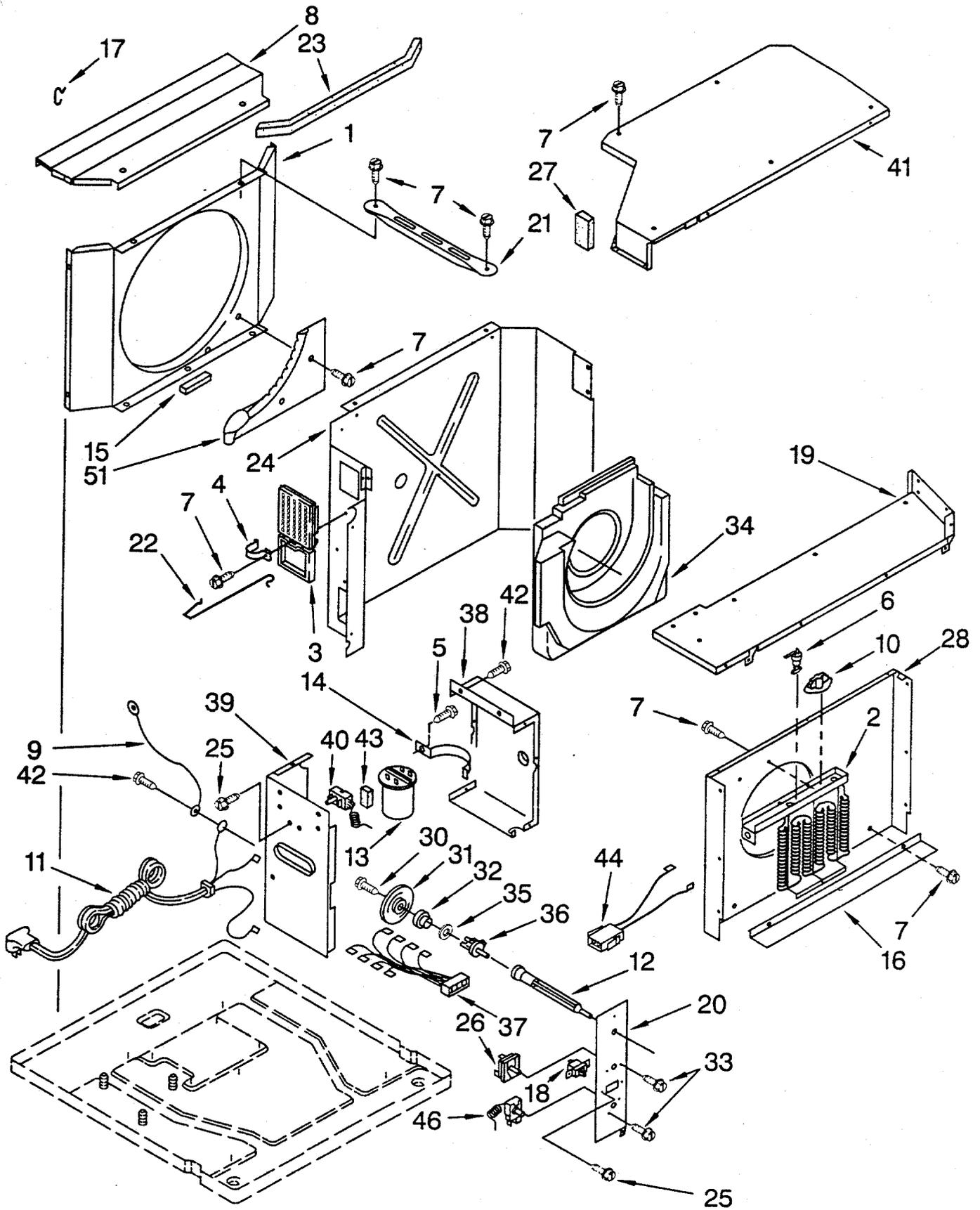
For Model: 106.9741971

Illus. No.	Part No.	DESCRIPTION	Illus. No.	Part No.	DESCRIPTION	Illus. No.	Part No.	DESCRIPTION
1		LITERATURE PARTS	12	602851	Tie, Cable	33	1165674	Bolt, Compressor
	LT1161324	Wiring Diagram	13	1161297	Evaporator	35	947364	Tube, Flow Divider
	LT1166163	Owners Manual	14	950037	Gasket, Nut	36	471088	Clamp (2)
	LT1168228	Tech Sheet	15	1158703	Tube, Connect	37	647971	Handle, Base
	LT1168222	Repair Parts List	16	1161519	Condenser	38	1160656	Pan, Drain
	LT1166070	Instructions, Installation	17	1156329	Bend, Return Condenser (1) Evaporator (6)	39	1157015	Clip, Motor (2)
2	708532	Bend, Return Condenser (17) Evaporator (13)	18	1161523	Base	40	1163775	Clamp, Wiring
3	708531	Bend, Return Condenser (6) Evaporator (8)	19	1159489	Coil, Solenoid	41	1166782	Anticipator
4	49599	Strainer, Tube	20	1164497	Harness, Wiring	42	642080	Clip, Anticipator
5	1163768	Tube, Outlet (Includes Illus. 4)	21	1161296	Compressor	43	1160880	Washer (3)
6	1161269	Tube, Restrictor (4)	22	950021	Grommet (3)	44	1163785	Distributor-4 Circuit
7	1161359	Blade, Fan (Condenser)	23	1158685	Return Bend 3-Way	45	1163759	Insul. Restrictor Tube
8	1160870	Seal, Suction Tube	24	858121	Locknut (3)	46	1162398	Valve, Reversing
9	1160672	Bracket, Fan Motor	25	950035	Gasket, Terminal Cover	47	1160357	Tube, Feeder
10	1166222	Motor, Fan	28	950036	Cover, Terminal	48	1160358	Tube, Feeder
11	1160408	Nut	29	950027	Nut, Terminal Cover	51	1164499	Tube Valve/Disc.
			30	1161358	Wheel, Blower (Evaporator)	52	1162089	Tube-Valve/Cond
			31	1158692	Bend, Return (1)	53	1162955	Tube-Valve/Evap.
			32	1158681	Manifold, Suction	54	1163907	Tube-Valve/Accum
						55	1161271	Tube, Connect
						56	1161416	Seal, Tubing (2)
						REFRIGERANT CHARGE		
						43 OZ.		

Production Compressor Requires Production Electrical Components.
Service Compressor Requires Service Electrical Components.
For Further Information, Refer to Standard Brand and Related Components.

AIRFLOW AND CONTROL PARTS

For Model: 106.9741971



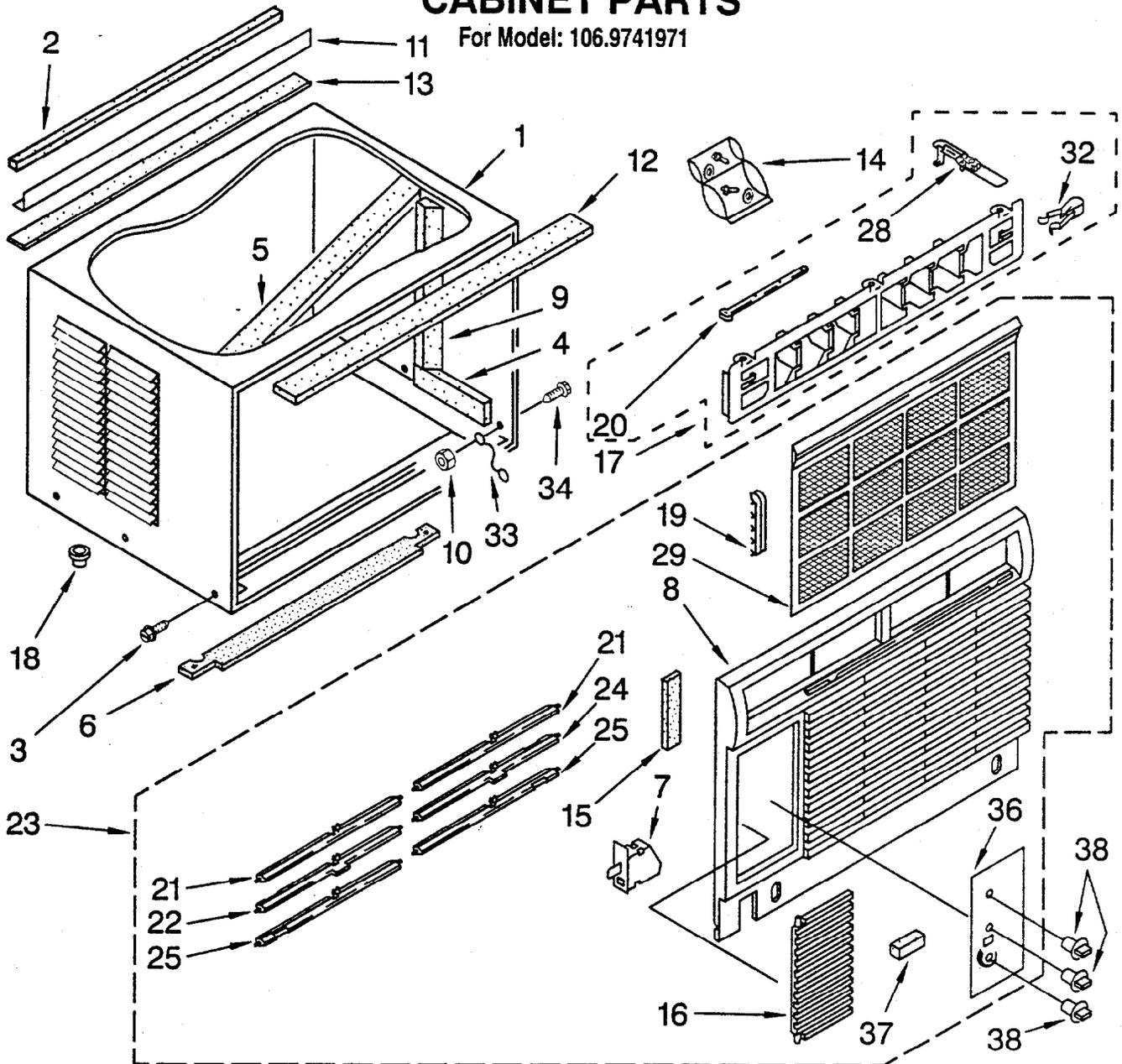
AIRFLOW AND CONTROL PARTS

For Model: 106.9741971

Illus. No.	Part No.	DESCRIPTION
1	1157403	Shroud, Condenser
2	1160715	Heating, Element
3	1160652	Door, Air
4	1160653	Spring, Door
5	1163469	Screw #8 - 5/8
6	1160510	Fuse, Link
7	488480	Screw #8-3/8
8	1157407	Top, Condenser
9	856094	Wire, Ground
10	1160509	Limit, Switch
11	1167648	Cable, Appliance
12	1161504	Control, Shaft
13	1180126	Capacitor
14	1167611	Bracket, Capacitor
15	1163332	Seal, Condensate Cup
16	1160716	Shield, Heat
17	1164511	Clip, Shroud (2)
18	950529	Switch-Sliding
19	1160709	Evap. Shroud Top
20	1161707	Panel, Control
21	1166169	Support, Unit (2)
22	1161333	Wire, Control Exhaust
23	1158732	Seal, Shroud
24	1161706	Dividing Wall
25	488624	Screw, 8x3/8
26	1157749	Switch Rotary
27	1162616	Seal, Anti-Rub
28	1161705	Shroud Assembly, Evaporator
30	489092	Screw 7-18 x 5/8
31	647882	Cam, Exhaust
32	647879	Bushing, Shaft
33	488734	Screw, 6-32 x .175 (2)
34	1160657	Housing, Air
35	1161313	Washer
36	854369	Shaft, Control Exhaust
37	1167522	Harness, Wiring - Control Box
38	1161714	Control Box (R.S.)
39	1164516	Control Box (L.S.)
40	1159905	Control, Temp.
41	1160710	Cover, Top
42	1157158	Screw #8 x 3/8
43	1159175	Spacer
44	1162061	Harness, Heater
46	1155801	Control, Temperature
51	1160684	Cup, Condensate

CABINET PARTS

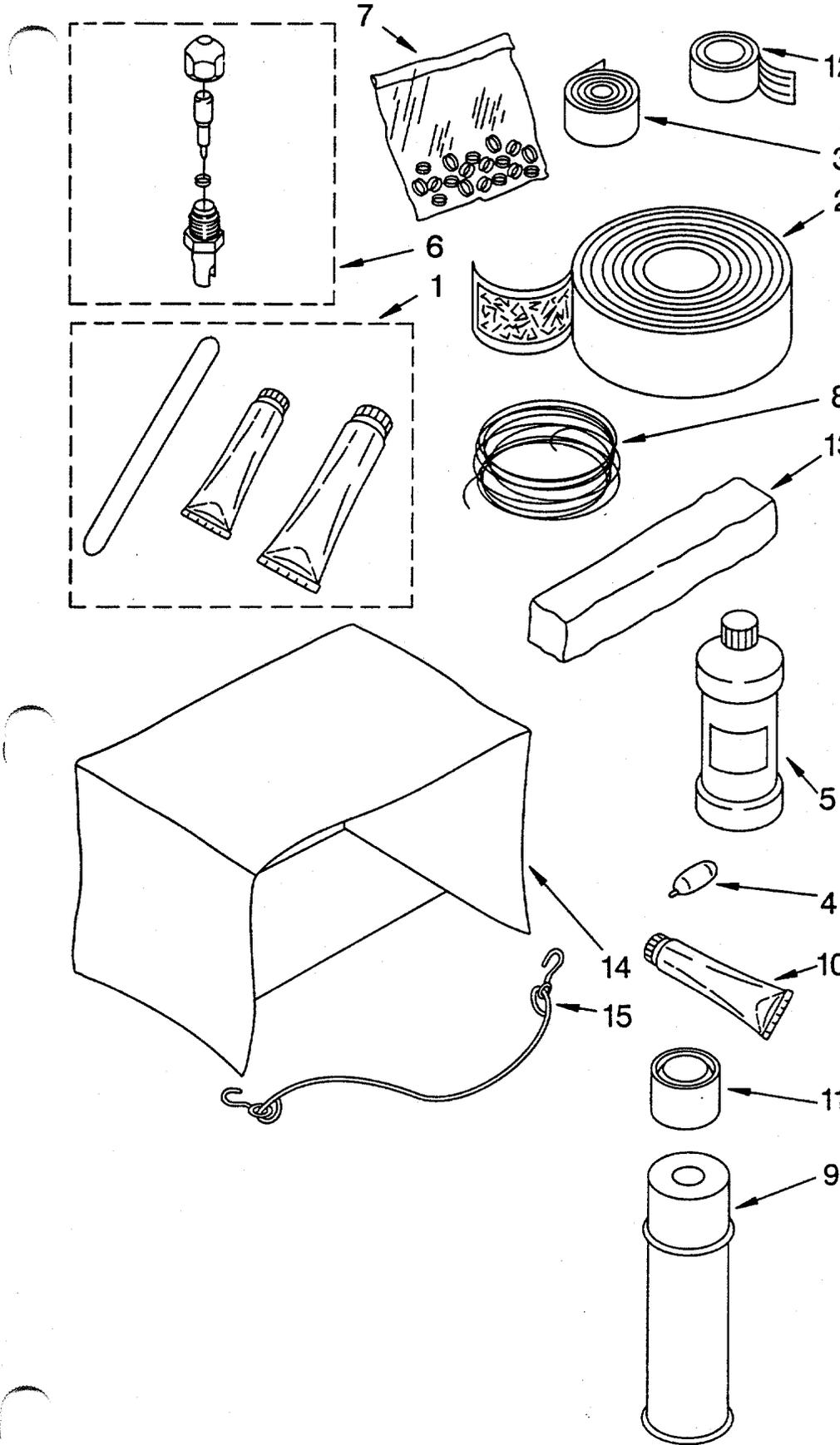
For Model: 106.9741971



Illus. No.	Part No.	DESCRIPTION	Illus. No.	Part No.	DESCRIPTION	Illus. No.	Part No.	DESCRIPTION
1	1161335	Cabinet	12	855265	Seal, Cabinet Top	24	1165929	Louver, Horizontal (Handle Right)
2	469877	Gasket, Meeting Rail	13	1163784	Seal, Top Mounting Angle	25	1165930	Louver, Horizontal (Notch Left)
3	488480	Screw, 8 x 1/2	14	1166387	Bag, Accessory		1165931	(Notch Right)
4	1160818	Insulation, Cabinet Side (2)	15	1163767	Seal (3)	28	1162078	Actuator, Vertical Louver (2)
5	1167203	Insulation, Cab.	16	1165933	Control, Door	29	1167297	Filter
6	1160768	Seal, Cabinet (Bottom)	17	1167096	Louver, Vertical	32	1167095	Spring, Detent (2)
7	1165934	Monitor, Filter	18	997285	Cup, Condensate Drain	33	857022	Wire, Ground
8	1165926	Frame, Front	19	1166672	Link, Horizontal Louver	34	488234	Screw, 8-32 x 1/4
9	1162099	Insulation, Cabinet Side (2)	20	1162077	Link, Vertical Louver (2)	36	1165911	Plate, Escutcheon
10	486529	Nut, Hex 8-32	21	1165927	Louver, Horizontal	37	470036	Spacer, Escutcheon
11	644271	Angle, Top Mounting	22	1165928	Louver, Horizontal (Handle Left)	38	1165998	Knobs, (3)
			23	1167305	Front, Complete			

OPTIONAL PARTS (NOT INCLUDED)

For Model: 106.9741971



Illus. No.	Part No.	DESCRIPTION
3	1	799833 Epoxy, Tube (Aluminum Repair)
2	2	505168 Tape, No Drip 30'
3	3	479502 Tape, Vinyl 36'
4	4	10943 Oil, Turbine 1 Oz.
5	5	99243 Oil, Turbine 8 Oz.
6	6	Valve, Access
	7	876764 3/16" Tube O.D.
	8	978025 1/4" Tube O.D.
	9	978026 5/16" Tube O.D.
	10	978027 3/8" Tube O.D.
	11	978028 1/2" Tube O.D.
	12	978029 5/8" Tube O.D.
	13	978030 3/4" Tube O.D.
	14	978865 Seal, Ring
	15	Access Valve (20-Pack)
	16	Wire, 25' Roll
	17	10875 Blue 16 Ga.
	18	242820 Black 14 Ga.
	19	242825 Red 14 Ga.
	20	242826 White 14 Ga.
	21	47261 Black 12 Ga.
	22	299885 Red 12 Ga.
	23	47263 White 12 Ga.
	24	813684 Adhesive, Insulation (24 Oz. Spray)
	25	279368 Adhesive, Insulation (2 Oz. Tube)
	26	485426 Paint, Touch-up Starlight Gray
	27	1/2 Pint (Lacquer)
	28	212643 Sealer, Permagem 4-1" Strips
	29	99344 Sealer, Permagem 1 lb. Bar
	30	Cover, Winter
	31	484066 28"x19"x31"
	32	484067 19"x12"x14"
	33	484069 27"x19"x6 to 27"
	34	484184 22"x15"x3 to 18"
	35	813610 Retainer, Cord (Winter Cover)

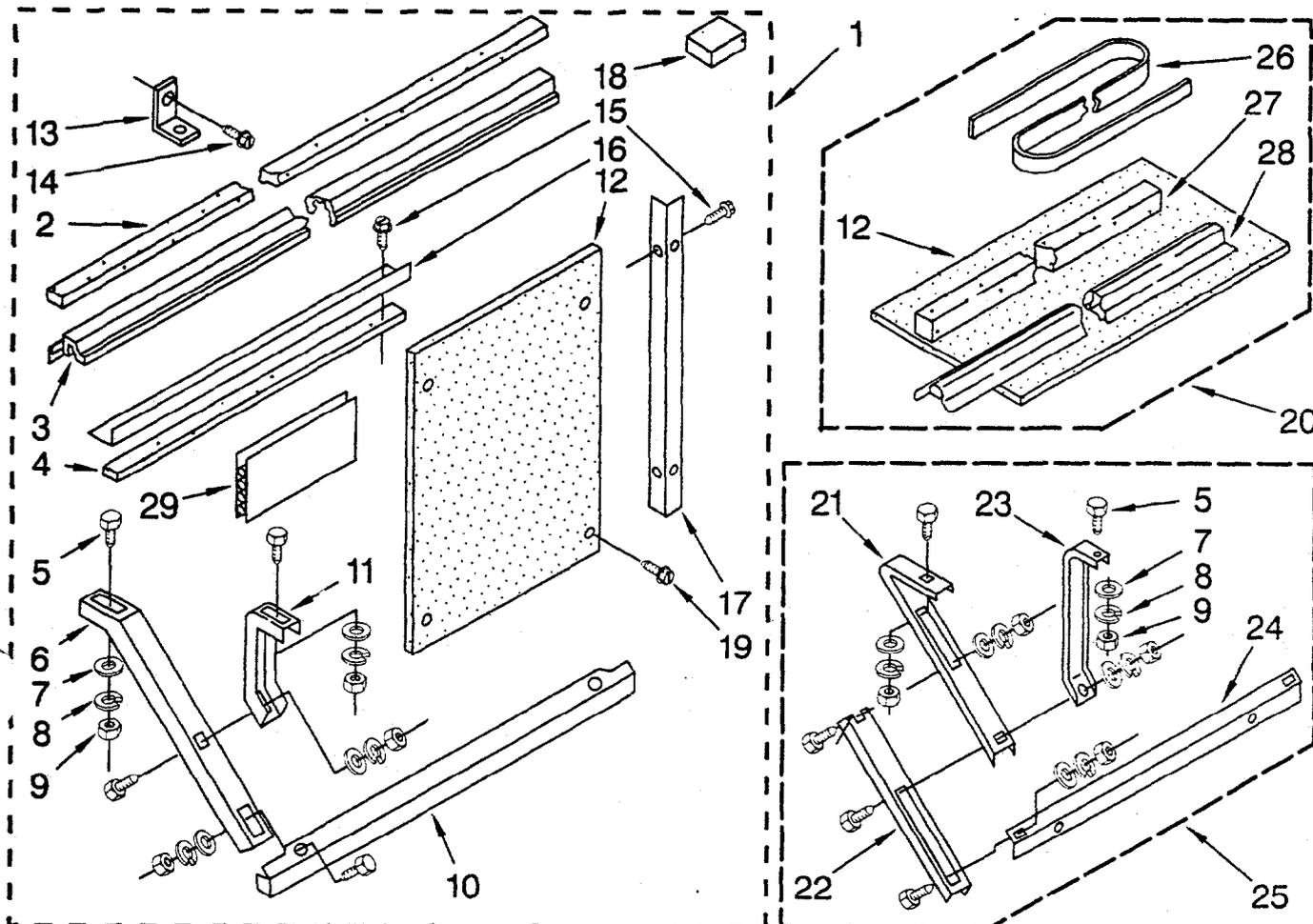
INSTALLATION PARTS

WINDOW MOUNTING KITS

For Model: 106.9741971

The Accessory Installation Kits illustrated below may or may not be included with your Air Conditioner. They have been made available only as an accessory to help you install the Air Conditioner where special circumstances may require them.

If one of these accessory kits has been installed with your Air Conditioner and repair parts are required at some later date, you may select the correct part number from this listing.



Illus. No.	Part No.	DESCRIPTION
1	1162147	Kit, Standard Installation
2	469877	Seal, Meeting Rail
3	1166388	Gasket, Sash
4	855265	Strip, Seal
5	488750	Bolt, 1/4 x 3/4 (6)
6	649945	Support, Cabinet (2)
7	488808	Washer (6)
8	486009	Lockwasher (6)
9	486035	Nut, Hex (6)
10	649947	Bracket, Support
11	649946	Support, Retainer (2)
12	1166266	Board, Filler
13	644228	Bracket
14	487371	Screw (Window Lock Bracket)
15	488624	Screw (Side & Top Angles to Cabinet)

Illus. No.	Part No.	DESCRIPTION
16	644271	Angle (Top)
17	644272	Angle (2)
18	995274	Spacer, Block (4)
19	1166265	Screw (Side Angle To Filler Board)
20	485679	Kit, Outside Support
21	644283	Support, Cabinet (2)
22	644284	Extension, Support (2)
23	644285	Retainer, Cabinet (2)
24	644281	Bracket, Support
25	485856	Kit, Wide Window
26	856979	Strip, Seal
27	470800	Seal, Meeting Rail

Illus. No.	Part No.	DESCRIPTION
28	485457	Gasket, Sash (54")
29	470168	Sealer, Gum Type

Following Parts Not Illustrated

LITERATURE PARTS	
LIT1166072	Instructions, Installation (Standard Mounting Kit)
LIT1155965	Instructions, Installation (Wide Window Kit)
LIT485707	Instructions, Installation (Outside Support Kit)

SEARS

REPAIR
PARTS
LIST

When requesting service
or ordering parts,
always provide the
following information:

- ◆ Product Type
- ◆ Model Number
- ◆ Part Number
- ◆ Part Description

Kenmore

For the repair or replacement parts you need

Call 7 am - 7 pm, 7 days a week

1-800-366-PART

(1-800-366-7278)



For in-home major brand repair service

Call 24 hours a day, 7 days a week

1-800-4-REPAIR

(1-800-473-7247)



For the location of a
Sears Repair Service Center in your area

Call 24 hours a day, 7 days a week

1-800-488-1222



For information on purchasing a Sears
Maintenance Agreement or to inquire
about an existing Agreement

Call 9 am - 5 pm, Monday-Saturday

1-800-827-6655



SEARS
REPAIR SERVICES

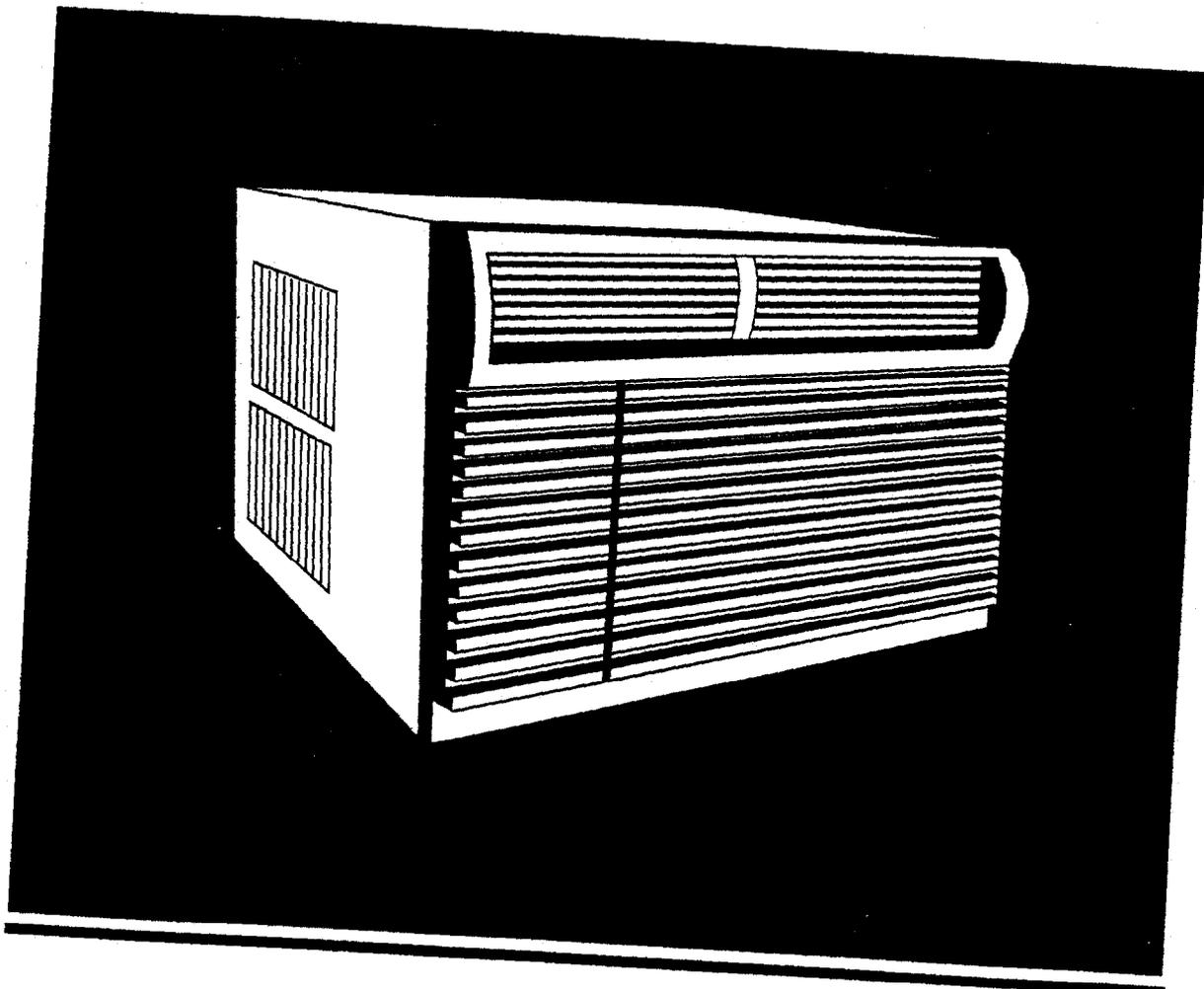
America's Repair Specialists

Sears, Roebuck and Co., Hoffman Estates, IL 60179 U.S.A.

SEARS

Kenmore

Installation Instructions



AIR CONDITIONER

Part No. 1166070

IMPORTANT:

Installer: Leave Installation Instructions with the homeowner.
Homeowner: Keep Installation Instructions for future reference.
Save Installation Instructions for local electrical inspector's use.

Before you start...

Proper installation is your responsibility. Make sure you have everything necessary for correct installation. It is the customer's responsibility to comply with the installation specifications provided.

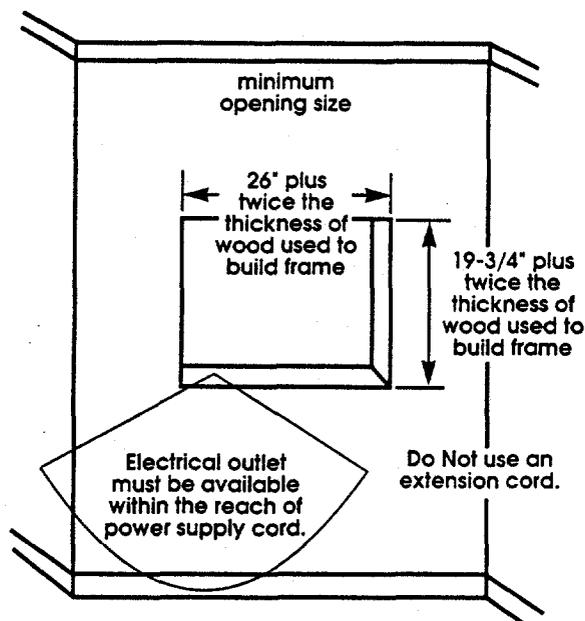
Grounded electrical outlet within reach of the power supply cord is required. See Electrical requirements.

Important: Observe all governing codes and ordinances.

Through-the-Wall Installation

Check location where air conditioner will be installed for opening size, electrical outlet and airflow.

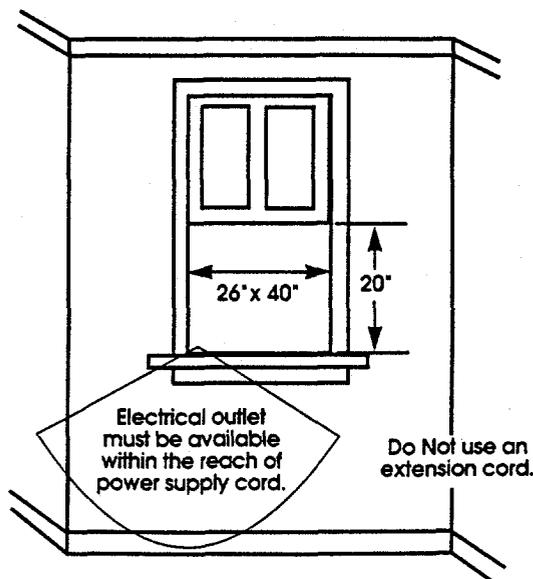
An electrical outlet must be available within reach of the power supply cord.



Window Installation

Check location where air conditioner will be installed. The location should provide:

- A window large enough
- Adequate wall support for weight of air conditioner
- An electrical outlet within reach of the power supply cord
- Free movement of air to rooms to be cooled.



⚠ WARNING

Electrical Shock Hazard

It is the customer's responsibility:

- To contact a qualified electrical installer.
- To assure that the electrical installation is adequate and in conformance with National Electrical Code, ANSI/NFPA 70 — latest edition*, and all local codes and ordinances.

Failure to do so could result in fire, electrical shock or other personal injury.

Personal Injury/Product Damage Hazard

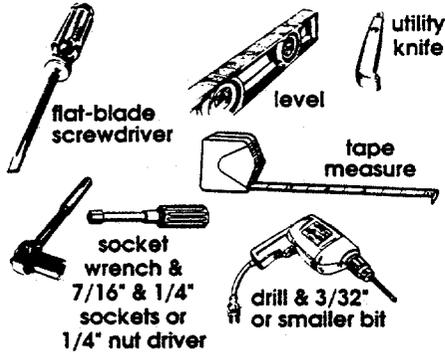
- Because of the weight and size of the air conditioner, more than one person is required to move, lift and safely install it.
- Handle air conditioner with care. Metal fins on front and rear coils are sharp.
- Do Not drink the water that collects inside the air conditioner. It is not sanitary.
- Maintain a firm hold on the air conditioner to prevent it from falling out of opening during installation.
- Do Not locate air conditioner where cabinet front is exposed to a heat source that raises the surface temperature above 120°F.

Failure to follow these instructions could result in personal injury or damage to air conditioner.

Copies of the standards listed may be obtained from:

*National Fire Protection Association
Batterymarch Park
Quincy, Massachusetts 02269

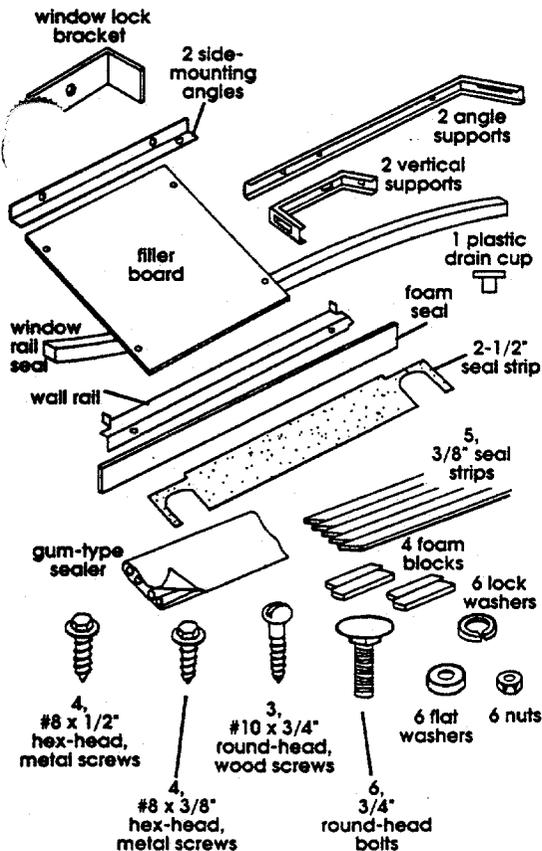
Tools and materials needed for installation:



Through-the-wall installations:

- wood preservative
- 10, #10 x 1" screws

Parts supplied for installation:



Installation parts are supplied for double-hung windows up to 40" wide. Installation up to 54" can be made with a special, wide window kit available from your Sears store or service center.

Electrical requirements

! WARNING

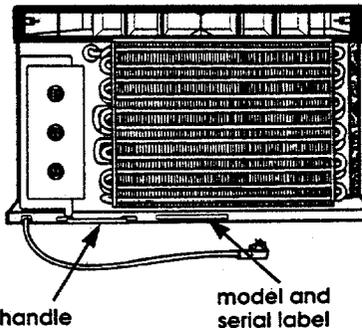
Electrical Shock Hazard

- Electrical ground is required on this appliance.
- Do Not ground to a gas pipe.
- Do Not modify the power supply cord plug. If it does not fit the outlet, have a proper outlet installed by a qualified electrician.
- Do Not have a fuse in the neutral or grounding circuit. A fuse in the neutral or grounding circuit could result in an electrical shock.
- Do Not use an extension cord with this appliance.
- Check with a qualified electrician if you are in doubt as to whether the appliance is properly grounded.
- Grounding wire must be connected to grounding screw located in lower right corner of air conditioner when air conditioner is in cabinet.

Failure to follow these instructions could result in serious injury or death.

If codes permit and a separate grounding wire is used, it is recommended that a qualified electrician determine that the grounding path is adequate.

A three-wire, single-phase, 60-Hz, AC-only electrical supply is required on a separate circuit. A time-delay fuse or circuit breaker is required.



The model and serial label is located behind the front panel on the front flange of the base.

Wiring requirements

! WARNING

Electrical Shock Hazard

Disconnect power supply cord from receptacle before servicing.

Failure to follow these instructions could result in serious injury or death.

Note: Refer to model and serial label for BTU capacity, amperage, voltage and refrigerant charge specifications.

Specific electrical requirements are listed in the chart. Follow the requirements for the type of plug on the power supply cord.

Plug type	Electrical requirements	Minimum receptacle wire size copper wire only
	230-volt (207 min.-253 max.) or 230/208-volt (197.6 min.-253 max.) 0 through 16-amps 20-amp time-delay fuse or circuit breaker	12 gauge
	230-volt (207 min.-253 max.) or 230/208-volt (197.6 min.-253 max.) 0 through 12-amps 15-amp time-delay fuse or circuit breaker	14 gauge
	230-volt (207 min.-253 max.) or 230/208-volt (197.6 min.-253 max.) 0 through 24-amps 30-amp time-delay fuse or circuit breaker	10 gauge
	115-volt (103.5 min., 126.5 max.), 0 through 12-amps 15-amp time-delay fuse or circuit breaker. 7.6 amps or higher - must use separate circuit.	14 gauge

Recommended grounding method

For your personal safety, this appliance must be grounded. This appliance is equipped with a power supply cord having a 3-prong grounding plug. To minimize possible shock hazard, the cord must be plugged into a mating, 3-prong grounding-type wall receptacle, grounded in accordance with the National Electrical Code, ANSI/NFPA 70 — latest edition*, and all local codes and ordinances. If a mating wall receptacle is not available, it is the personal responsibility and obligation of the customer to have a properly grounded, 3-prong wall receptacle installed by a qualified electrician.

Note: If your installation is through the wall, continue with instructions below.

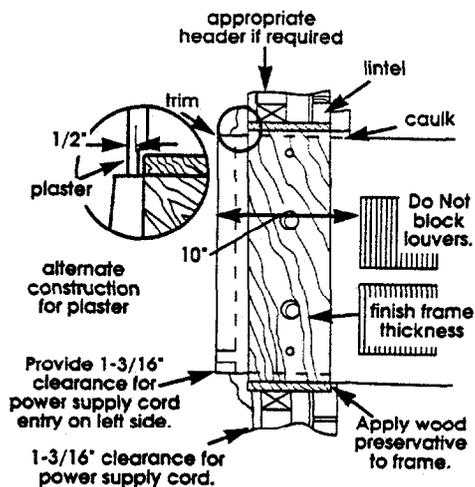
If your installation is through the window, go to "Window Installation," Page 5.

Now start...

With air conditioner in room where it will be installed.

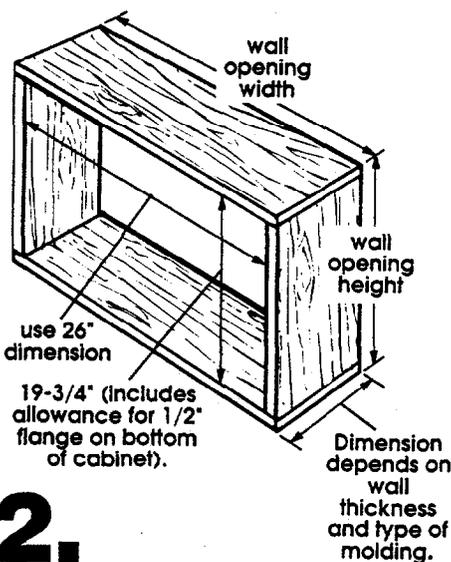
THROUGH-THE-WALL INSTALLATION

It is the customer's responsibility and obligation to have this product installed by a qualified technician familiar with through-the-wall room air conditioner installations.



Brick Veneer Construction

1. When using a wood, metal or plastic molding, the finish frame should line up with inside wall. If the plastered wall is to be flush with the cabinet and no molding is used, the finish frame must be set 1/2 inch into the wall.



2.

Cut opening through the wall. Remove insulation.

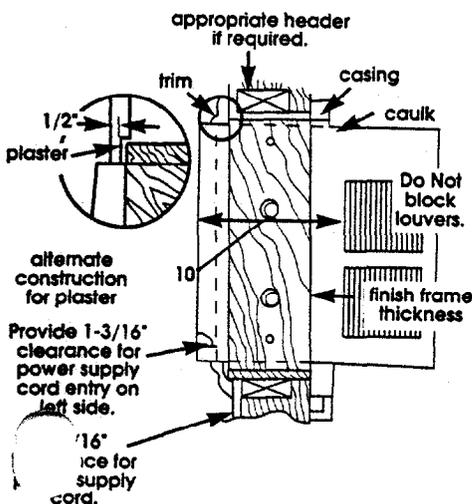
3.

Use 1 inch or heavier lumber for wood frame. Measure depth of wall opening and frame.

Apply wood preservative to the outside exposed surface.

4.

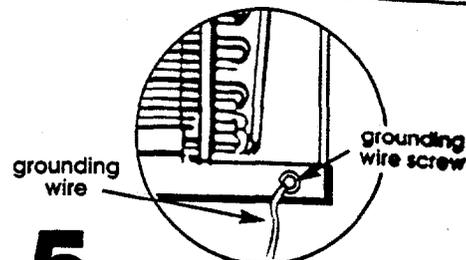
Insert the frame in the wall opening. Square and level frame. Nail frame securely to the wall studs.



Frame Construction

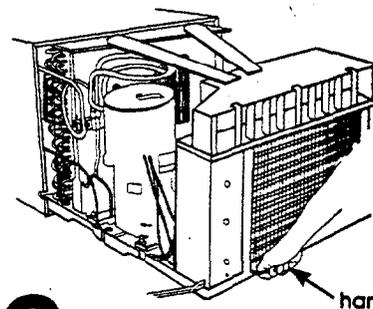
CAUTION

Floor Damage
Remove air conditioner from carton and place on cardboard.
Failure to do so may cause damage to floor covering.



5.

Remove grounding screw and grounding wire from front of air conditioner base. Save grounding screw for Step 13.



6.

Pull on handle; slide air conditioner out of cabinet and place on cardboard.

7.

Insert cabinet into wall opening. The top of the cabinet should extend 1/2 inch into room. If there is trim, the cabinet should extend 1/2 inch in front of trim.

CAUTION

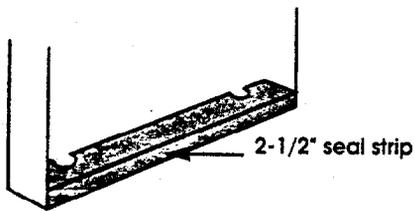
Property Damage
Check that air conditioner cabinet is tilted to the outside so that water will run to the outside.
Failure to do so may cause damage to floor covering or wall.

8.

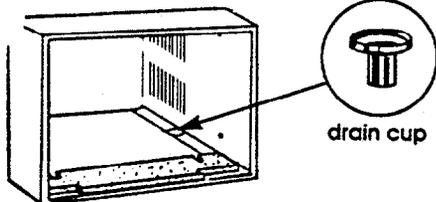
Place level inside cabinet on the right side. There should be a tilt to the outside of approximately one bubble. Place the level on the left side and check.

9. Use the insulation removed in Step 2 to seal opening between cabinet and frame.

10. Drill four holes on each side and two through the top of the cabinet into the frame. Use ten, #10 x 1" wood screws (not provided) to attach cabinet to frame. **Do Not overtighten screws or cabinet will distort and provide a poor air seal between cabinet and air conditioner.**



11. Place the 2-1/2" seal strip inside the cabinet as shown. Make seal flush with cabinet front edge. (This seal strip fits between the air conditioner base and the cabinet.)

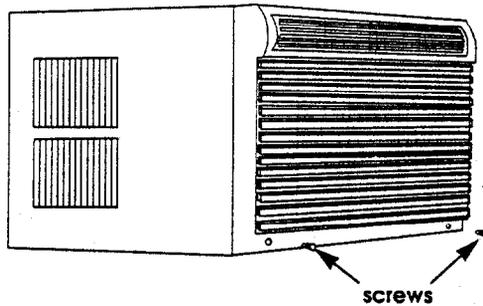


12. Place drain cup through hole in cabinet rail as shown.

! WARNING

Electrical Shock Hazard
Grounding wire from the air conditioner must be connected to the cabinet. Failure to do so could result in electrical shock.

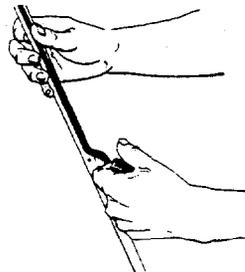
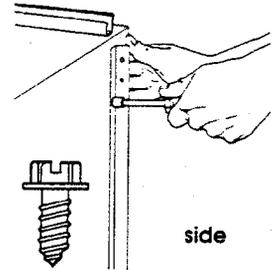
13. Insert air conditioner into cabinet, attach grounding wire to grounding screw. Put excess grounded wire between coil and cabinet.



14. Attach front by first removing the two, #8 x 3/8" screws from base. Replace front panel by pushing it straight on and then lowering it slightly to lock in place. Attach bottom of front by reinserting the two screws.

15. Caulk all outside wall openings around cabinet.

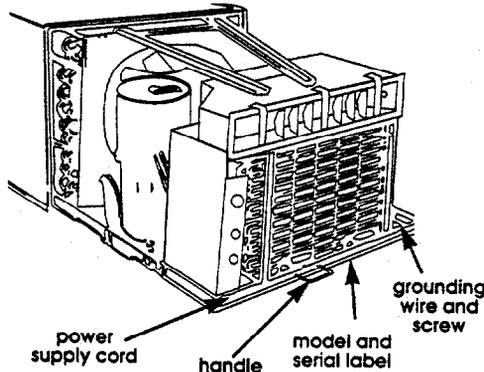
16. If needed, install molding around room side of cabinet.



3. Place side-mounting angles on cabinet so upright side is toward the front of air conditioner and seal is against cabinet. Attach side-mounting angles with two, hex-head, metal screws using 1/4" socket and socket wrench.

WINDOW INSTALLATION

Front view of unit with front panel and cabinet removed.

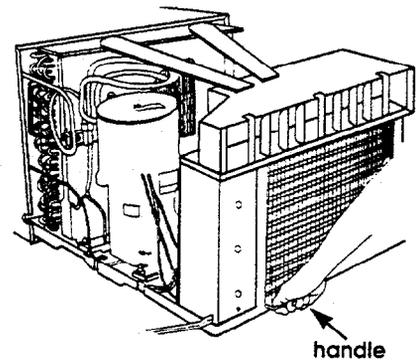


1. Remove grounding screw and grounding wire from front of air conditioner base. Save grounding screw for Step 20.

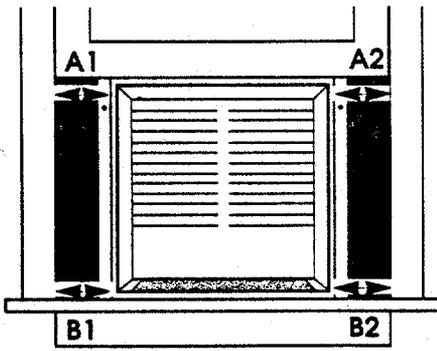
2. Attach 3/8" seal strip to the bottom of both side-mounting angles (side with two holes). Cut strips to length.

! CAUTION

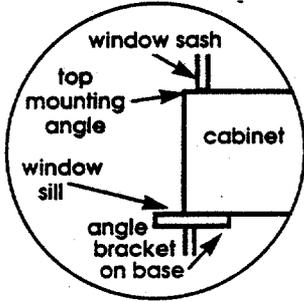
Floor Damage
Remove air conditioner from carton and place on cardboard. Failure to do so may cause damage to floor covering.



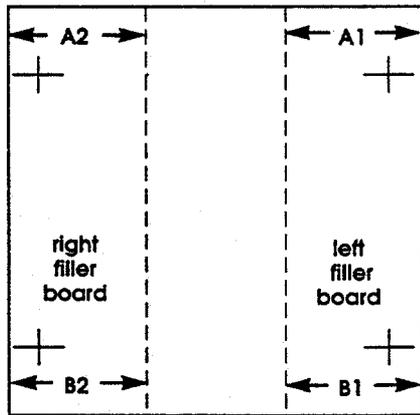
4. Pull on handle; slide air conditioner out of cabinet and place on cardboard.



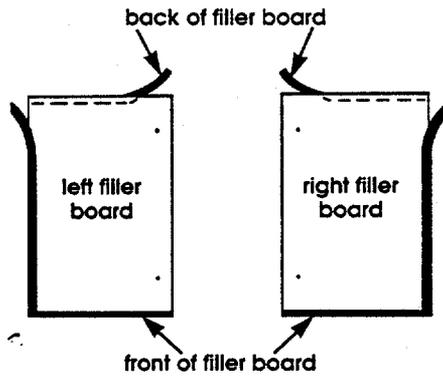
Side View



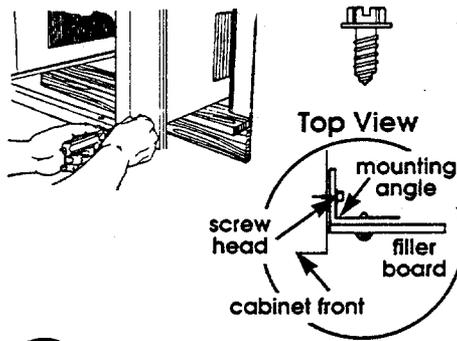
5. Place cabinet in window. Lower sash (window frame) to hold cabinet in place. Measure the distance between the side of the cabinet and inside of the window channel at the top and bottom of the cabinet. Adjust the cabinet until the distance on each side (top and bottom) is the same, so the cabinet is centered in the window. Write down the final measurement.



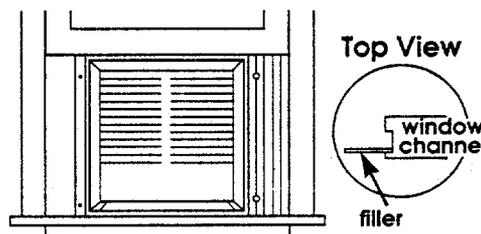
6. Add 1/8 inch to both open area measurements. Use a utility knife to cut filler boards to fit.



7. Apply 3/8" seal strips to bottom and outside of filler boards. The top seal goes on back side of filler boards.



8. Pull cabinet part way out of window. Attach one filler board to front of a side-mounting angle with 1/2" hex-head screws.

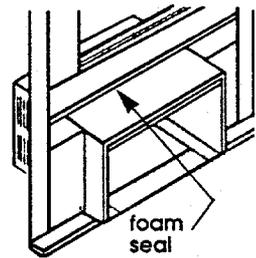
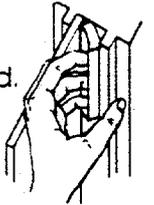


9. Place cabinet back into the window with filler board tight against window channel.

10. Insert other filler board into window channel on opposite side of cabinet. Push filler board against side-mounting angle and attach with 1/2" hex-head screws. Raise window sash.

11. From the outside, push filler boards as far forward in window channels as possible.

12. Measure the distance between the channel edge and the filler board. Cut foam blocks 1/4 inch wider. Insert blocks into channel behind filler boards.

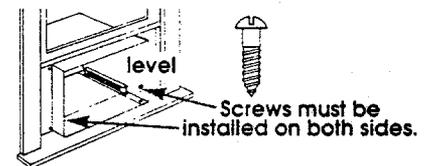


13. Measure from inside edge of window frame to other inside edge. Cut foam seal with square ends to fit.

Align foam seal with front edge of window sash and attach seal with adhesive side against underside of sash.

! CAUTION

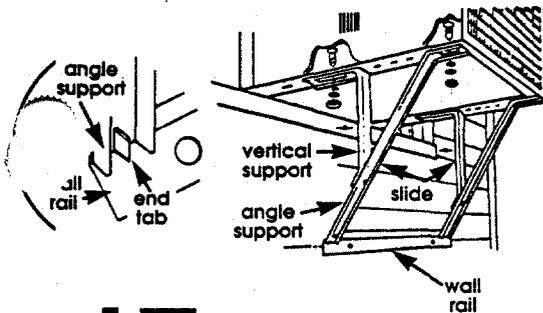
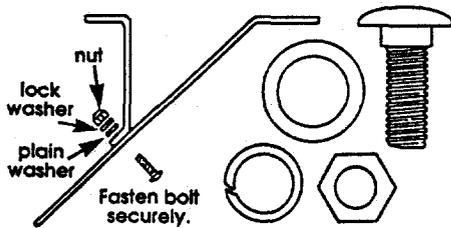
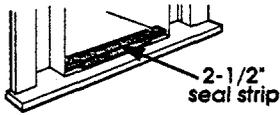
Property Damage
Check that air conditioner cabinet is tilted to the outside so that water will run to the outside. Failure to do so may cause damage to floor covering, window sill or wall.



14. Lower window sash. Place level inside cabinet on the right side. There should be a tilt to the outside of approximately one bubble. Place the level on the left side and check.

15. Use a 3/32" drill bit to drill starter holes through the holes in the cabinet and into the window sill. Fasten cabinet to the sill with two wood screws.

16. Place the 2-1/2" seal strip inside the cabinet as shown. Make seal flush with cabinet front edge. (This seal strip fits between the air conditioner base and the cabinet.)



17. Secure vertical and angle supports together. Attach supports to bottom of cabinet. But Do Not tighten bolts at this time. Attach wall rail to angle supports. Slide each support assembly toward house until wall rail is positioned firmly against wall.

Note: If your house is constructed of material that could be damaged by wall-mounting support, fasten a board between wall rail and house.

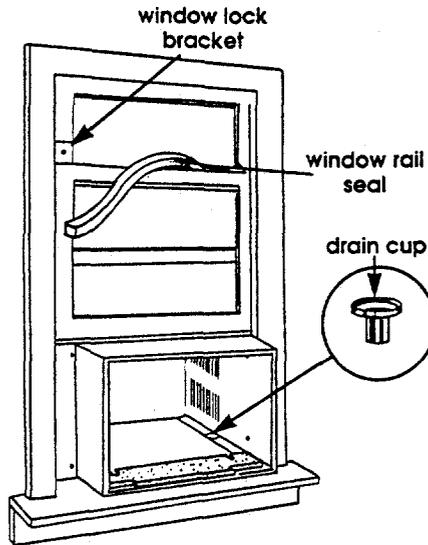
18. Tighten bolts securely with a 7/16" socket and socket wrench. Tighten angled support bolts last so wall rail fits tightly against house.

! WARNING

Personal Injury/Product Damage Hazard

Install window-lock bracket to prevent air conditioner from falling out window.

Failure to do so could result in personal injury or product damage.



19. Insert window rail seal behind the top of the lower window sash and against the glass of the upper window. Place window-lock bracket on top of lower window and against upper window sash. Use a 3/32" drill bit to drill a starter hole through the hole in the bracket. Attach window-lock bracket with wood screw. Seal small openings around window with gum-type

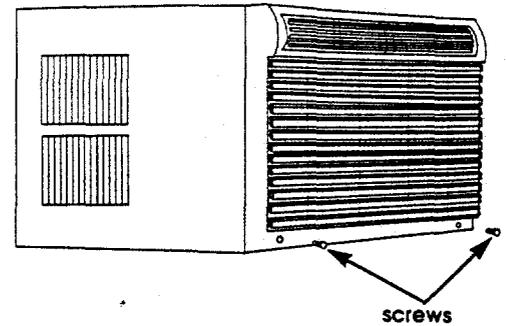
! WARNING

Electrical Shock Hazard

Grounding wire from the air conditioner must be connected to the cabinet.

Failure to do so could result in electrical shock.

20. Insert air conditioner into cabinet. Reattach grounding wire to grounding screw. Put excess grounding wire between coil and cabinet.



21. Attach front by first removing the two, #8 x 3/8" screws from base; then insert front tabs into top of cabinet and swing front in place. Attach bottom of front by reinserting the two screws.

screws

If your air conditioner is not operating properly...

Check that the circuit breaker is not tripped or house fuse blown. Check that power supply cord is securely plugged into the electrical outlet.

If you need assistance...

Call your local Sears store or Sears service center. When you call, you will need the air conditioner model and serial number. Both numbers can be found on the model and serial label located behind the front panel on the front flange of the base. (See Electrical requirements, Page 3, for location of label.)

SEARS

Sears, Roebuck and Co., D/817 WA
Hoffman Estates, IL 60195

APPENDIX T
BATHROOM FIXTURES

CHET ADAMS COMPANY

Telephone 1-800-849-6331/919-851-6331
Fax 919-851-6371

P. O. BOX 5218
CARY, N. C. 27512-5218

July 10, 1995

MAINTENANCE AND OPERATING INSTRUCTIONS

Project: RFQ. 16032-101122
Soil & Groundwater Rem., Site 6 and 82
Camp Lejeune, NC

Contractor: OHM Remediation Services Corp.
Norcross, GA

P.O.#: 1006496

Sales Rep: Chet Adams Company
Cary, NC

Manufacturer: Raywall Electric Products
Reznor

HEATERS

BASEBOARD HEATER

→ 1 - (Item #9) HQC51212 baseboard electric heater, 1250 watts, 5 ft. long,
115/1/60, with built in t'stat.

GAS UNIT HEATERS

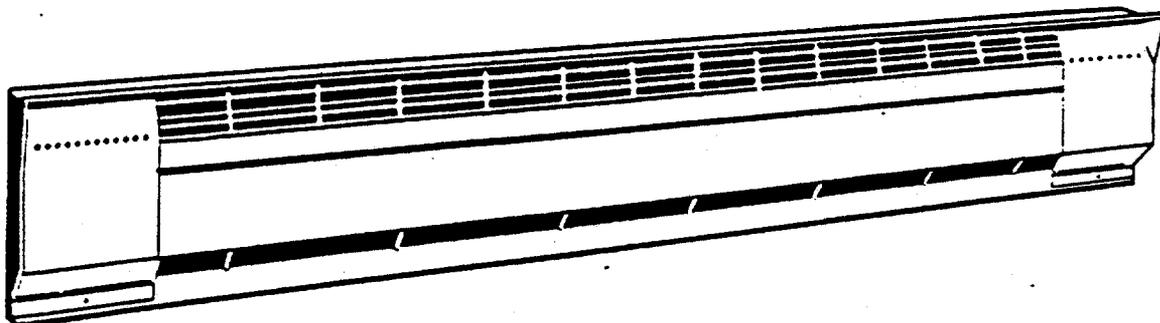
UH-1 thru 6

6 - Model F-75 propane gas unit heater, natural draft, 115/1/60, single
stage, 75 MBH input, 60 MBH output with 24 volt t'stat and discharge
louver.

To increase customer satisfaction and reduce call backs, leave these instructions with building occupant.



Installation & Operating Instructions "Heavy-Duty" Baseboard Heaters (HQC Series)†



Watts	Length Feet	BTU/Hr. Output	Model Number			
			240 Volt	120 Volt	208 Volt	277 Volt
Standard 250						
500	2	1706	HQC205	HQC20512	HQC205Y	HQC203
750	3	2559	HQC307	HQC30712	HQC307Y	HQC305
1000	4	3412	HQC410	HQC41012	HQC410Y	HQC407
1250	5	4265	HQC512	HQC51212	HQC512Y	HQC509
1500	6	5118	HQC815	HQC81512	HQC815Y	HQC811
2000	8	6924	HQC820	—	HQC820Y	HQC815
2500	10	8530	HQC1025	—	HQC1025Y	HAC1018
Deluxe 187						
375	2	1280	HQC203	HQC20312	HQC205	HQC20327
550	3	1876	HQC305	HQC30512	HQC307	HQC30527
750	4	2559	HQC407	HQC40712	HQC410	HQC40727
935	5	3190	HQC509	HQC50912	HQC512	HQC50827
1125	6	3838	HQC811	HQC81112	HQC815	HQC81127
1500	8	5118	HQC815	—	HQC820	HQC81527
1875	10	6398	HQC1018	—	HQC1025	HQC101827

†To reduce energy consumption of baseboard or other zonal electric heating systems . . . install NEW LiTronic™ Thermostats. See page 6 for more details.

TABLE OF CONTENTS

	Page		Page
Installation Instructions	2-3	Limited Warranty	5
Accessories	4	User's Guide	6
Trouble Shooting Guide	5		

5. WIRING INSTRUCTIONS

Note: 2' and 3' heaters are wired thru the left hand wiring compartment only! All other lengths (4', 5', 6', 8', and 10') may be wired through the left or right hand wiring compartment.

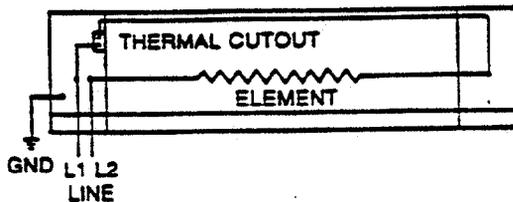
Refer to Installation and Wiring Instructions furnished with the Thermostat purchased for use with the Baseboard Heater.

All heaters have lead wires that are factory spliced with wire connectors.

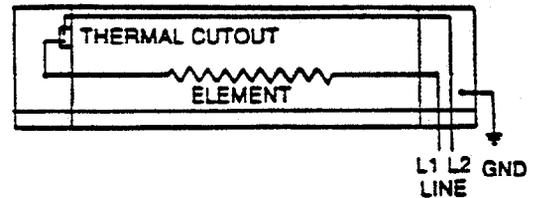
To complete heater connections, splice leads to line wires with line wire connectors as shown in diagrams. No wiring changes are required in opposite wiring compartment.

WIRING DIAGRAM

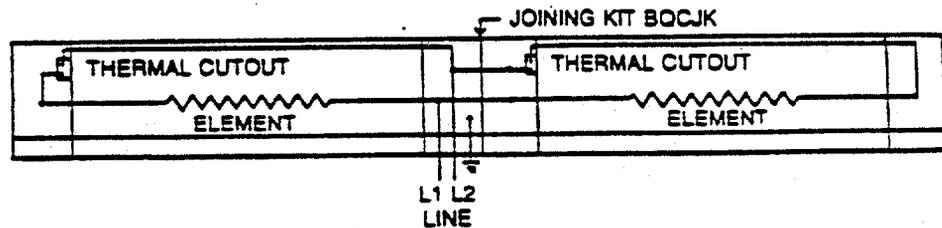
LEFT HAND CONNECTION



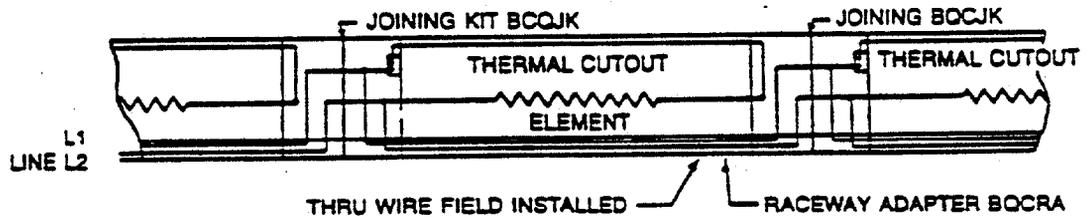
RIGHT HAND CONNECTION
(EXCEPT 2' AND 3' HEATERS)



WIRING TWO HEATERS FROM SINGLE LINE SERVICE



WIRING TWO OR MORE HEATERS FROM SINGLE LINE SERVICE
USING RACEWAY ADAPTERS (EXCEPT 2' AND 3' HEATERS)



Heaters to be connected must be on the same electrical branch circuits and must be connected in parallel. Heaters wired in series will not heat properly. To connect two heaters, bring wiring into either one of the two adjoining wiring compartments. Connect the heaters with joining kit (kit number BQCJK and wire per instructions). If field wiring does not enter directly into one of the two adjacent compartments, a raceway adaptor, BQCRA Series must be used.

IMPORTANT:

Do not wire adjoining heaters in series. Heaters wired in series will only reach 25% of normal temperature.

6. FINAL STEP:

- Clean off all construction dirt and debris from the inside of the heater. Failure to do this will cause wall smudging.
- After all wiring to the thermostats and heaters has been completed, turn on the electric power at the circuit breaker panel.



TPI Corporation

LIMITED WARRANTY

Products manufactured by TPI Corporation are warranted to the original consumer to be free from defects in material and workmanship for twelve (12) months from the original date of purchase. The TPI warranty does not cover products modified outside our factory, damage or failure caused by acts of God, abuse, misuse, use on other than rated voltage, abnormal usage, faulty installation, failure to provide suggested maintenance procedures enclosed with the product. Improper maintenance or any repairs other than these provided by an authorized TPI Corporation service center.

THERE ARE NO OBLIGATIONS OR LIABILITIES ON THE PART OF TPI CORPORATION FOR CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THE PRODUCT OR OTHER INDIRECT DAMAGES WITH RESPECT TO LOSS OF PROPERTY, REVENUES, OR PROFIT, OR COSTS OF REMOVAL, INSTALLATION OR REINSTALLATION.

ALL IMPLIED WARRANTIES WITH RESPECT TO TPI PRODUCTS, INCLUDING IMPLIED WARRANTIES FOR MERCHANTABILITY AND IMPLIED WARRANTIES FOR FITNESS, ARE LIMITED IN DURATION TO TWELVE (12) MONTHS FROM ORIGINAL DATE OF PURCHASE, EXCEPT THOSE PRODUCTS OR PARTS OF PRODUCTS WHICH ARE WARRANTED FOR LONGER PERIODS. ON SUCH PRODUCTS OR PARTS OF PRODUCTS ALL IMPLIED WARRANTIES FOR MERCHANTABILITY AND FITNESS ARE LIMITED TO THE DURATION OF THE EXTENDED WARRANTY PERIOD THEREON.

Some states do not allow the exclusion or limitation of incidental or consequential damages and some states do not allow limitations on how long an implied warranty lasts, so the above exclusions or limitations may not apply to you.

During the warranty period, TPI Corporation will, at its sole option, repair or replace any defective parts or products returned, freight prepaid, to the TPI Corporation factory or such other location as TPI Corporation may designate. Returned products must be packaged carefully and TPI Corporation shall not be responsible for damage in transit. When returning parts, the owner must provide the model number of the product and nature of difficulty being experienced. This warranty does not obligate TPI Corporation to bear the cost of labor in replacing any assembly, unit or component part thereof, nor does the company assume any liability for secondary charges, expenses for installing or removal, Freight or damages. There will be charges rendered for product repairs made after our warranty period has expired. Proof of purchase, including date, must accompany request for in-warranty service. In any event, TPI Corporation's maximum liability shall not in any case exceed the list price for the product claimed to be defective. This warranty gives to you specific legal rights and you may have other rights which may vary from state to state. For the name of your nearest authorized TPI Corporation service center, please write to TPI Corporation, P.O. Box 4973, Johnson City, Tennessee, 37602.

In addition to the Limited Warranty stated above covering general products, TPI Corporation extends this warranty on the following listed products, which are warranted to the original consumer from the original date of purchase for the total time periods indicated herein below:

HEATING PRODUCTS	
1. Elements in 198 Series Portable	Life of Heater
All Other Portable Heater Elements	10 years
2. Elements in Baseboards	10 years
3. Elements in Wall Heaters	1 year
4. All Other Products	1 year

VENTILATION PRODUCTS	
1. Series BD, EZ, CI and PAB Fans, except Motors, Controls, Belt, Bearings, and Pulleys.	10 years
2. Series PPDV, PDV, PGV and GV Fans, except Motors, and Controls.	2 years
3. All Other Products	1 year

HUMPHREY MECHANICAL, INC.

2421A N. MARINE BLVD. • JACKSONVILLE, NC 28546-6906 • (910) 455-1418

October 5, 1995

Northeast Construction Co., Inc.
Post Office Box 548
Jacksonville, NC 28541-0548

ATT: Mr. Tom Delong

REF: OHM Remediation Project
MCB, Camp Lejeune, North Carolina
Contract No. N62470-93-D-3032

SUBMITTAL REVIEW	
REVIEW IS FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS NO RESPONSIBILITY IS ASSUMED FOR CORRECTNESS OF DIMENSIONS OR DETAILS. THE CONTRACTOR/SUPPLIER SHALL ASSUME FULL RESPONSIBILITY FOR DEVIATIONS FROM CONTRACT REQUIREMENTS NOT SPECIFICALLY INDICATED ON THIS SUBMITTAL.	
<input type="checkbox"/> NO EXCEPTIONS	<input checked="" type="checkbox"/> MAKE CORRECTIONS NOTED
<input type="checkbox"/> AMEND AND RESUBMIT	<input type="checkbox"/> REJECTED - SEE REMARKS
Date <u>10-9-95</u> By <u>BM</u>	
OHM REMEDIATION SERVICES CORP. NORCROSS, GEORGIA	

SUB: Fixture submittals

Dear Mr. Delong:

I am sending you a copy of fixture and PRV submittals for this project. Please note that 36" shower base must have a 2" waste line to hook up to, the 3" on site will have to be changed. Also note that I am submitting a 70 series pressure regulator 25-75lb adjustable, set at 50lb.

The 1" PRV shown on M-13 doesn't make any sense. R.E. 1" PRV to deliver 20 GPM at psig set pressure and 7 psig fall-off. At this rate of flow, if someone takes a shower and the sink is running or the commode is flushed, that person can get scalded with hot water. Please review and comment as soon as possible.

Sincerely,

HUMPHREY MECHANICAL, INC.

Chuck Steed
Chuck Steed
Project Manager

CS/lm

* 3" WASTE LINE IS NOT TO BE CHANGED. REDUCE AS REQ'D.
* SET 1" PRV @ 50 PSIG - Run SUPPLY PIPING TO LAV. AND COMMODE 24" HIGHER THAN SUPPLY TO SHOWER TO BURN EXCESS HEAD.

American Standard

CADET™ II 1.6 10" R ROUND FRONT/ELONGATED TOILET

10" ROUGHING - VITREOUS CHINA

CADET™ II 1.6 10" R

- Vitreous china
- 10" roughing-in
- Round front or elongated siphon action bowl
- Close-coupled tank
- Speed Connect™ tank/bowl coupling system
- 2 bolt caps
- Flushes on 1.6 gallons

CADET II RF 1.6 10" R

2164.010

Round front toilet [254mm (10") roughing]

3054.018 Bowl

4010.010 Tank

CADET II EL 1.6 10" R

2174.010

Elongated toilet [254mm (10") roughing]

3059.012 Bowl

4010.010 Tank

Nominal Dimensions:

Round Front: 673 x 473 x 762mm
(26-1/2" x 18-5/8" x 30")

Elongated: 724 x 473 x 762mm
(28-1/2" x 18-5/8" x 30")

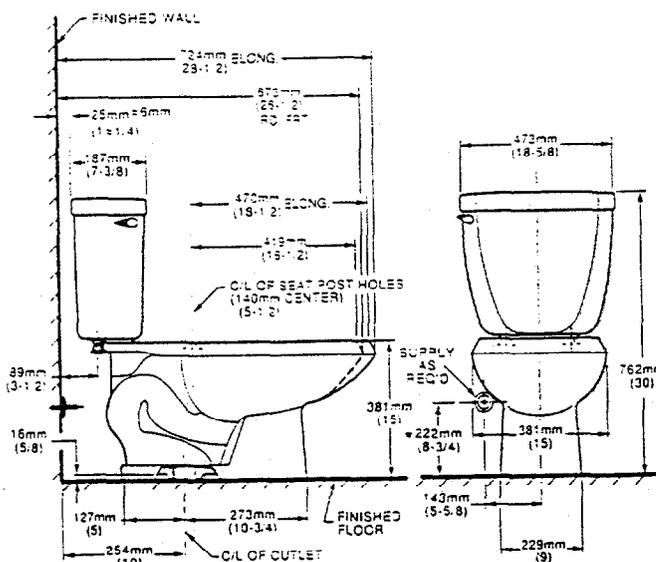


Fixture only, seat and supply by others

Hydraulic performance, water surface area, trap seal depth, ballpass diameter, and all fixture dimensions meet or exceed ANSI Standard A112.19.2 requirements.

To Be Specified

- Color:
- Seat: American Standard #5324.019 (elongated) or #5322.011 (round front) "Rise and Shine" (with easy to clean lift-off hinge system) solid plastic closed front seat with cover. See page TBU-001.
- Seat: American Standard #5311.012 (elongated) or #5308.014 (round front) "Laurel" molded closed front seat with cover. See page TBU-001.
- Seat: Pressalit seats for American Standard, closed front seat with cover (thermoset compound material). See pages TBU-002 through TBU-005.
- Alternate Seat:
- Supply with stop:



NOTES:
* DIMENSION SHOWN FOR LOCATION OF SUPPLY IS SUGGESTED.
THIS COMBINATION IS DESIGNED TO ROUGH-IN AT A MINIMUM DIMENSION OF 305MM (10") FROM FINISHED WALL TO C/L OF CUTLET.
SUPPLY NOT INCLUDED WITH FIXTURE AND MUST BE ORDERED SEPARATELY.
IMPORTANT: Dimensions of fixtures are nominal and may vary within the range of tolerances established by ANSI Standard A112.19.2.
These measurements are subject to change or cancellation. No responsibility is assumed for use of superseded or voided pages.

American Standard

PENLYN™
WALL-HUNG LAVATORY
 VITREOUS CHINA

PENLYN WALL-HUNG LAVATORY

- Vitreous china
 - Front overflow
 - Integral back splash
 - Faucet ledge.
- Shown with 4801.862 Amarelis Heritage faucet with Triune Cross handles (not included)

- Faucet holes on 203mm (8") centers (illus.):**
- 0372.029 For wall hanger (included)
 - 0372.052 For concealed arms support

- Faucet holes on 102mm (4") centers:**
- 0373.027 For wall hanger (included)
 - 0373.050 For concealed arms support

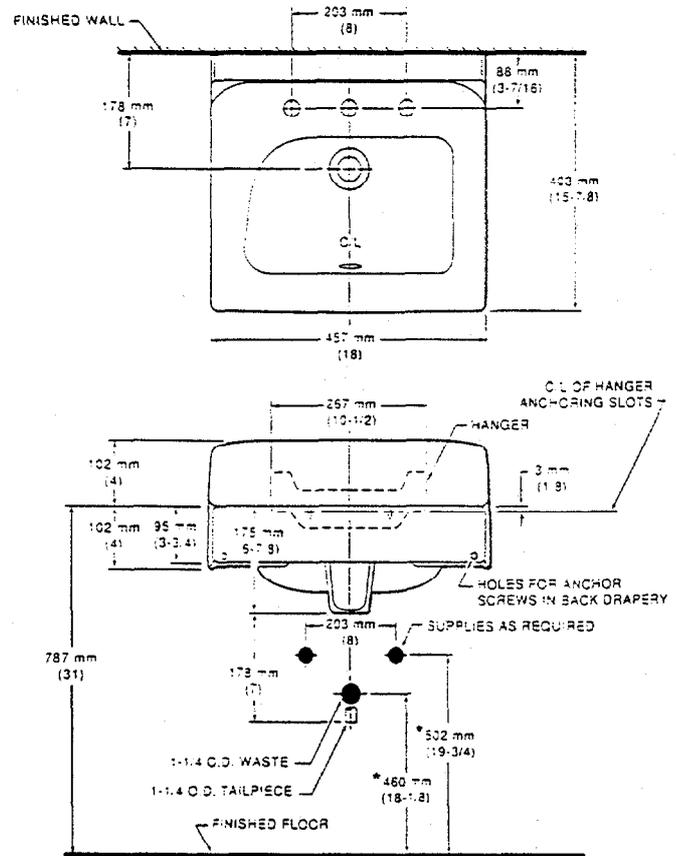
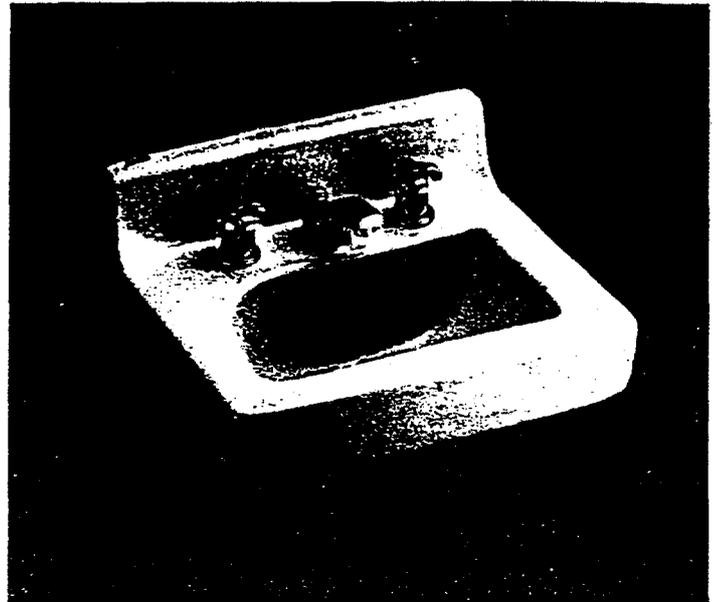
Nominal Dimensions:
 457 x 403mm (18" x 15-7/8")

Bowl sizes:
 340mm (13-3/8") wide,
 216mm (8-1/2") front to back,
 127mm (5") deep

Fixture Dimensions conform to ANSI Standard A112.19.2

- To Be Specified**
- Faucet*:
 - Faucet Finish:
 - Supplies:
 - 1-1/4" Trap:
 - Nipple:
 - Concealed Arms Support (by others):

* See faucet section for additional models available



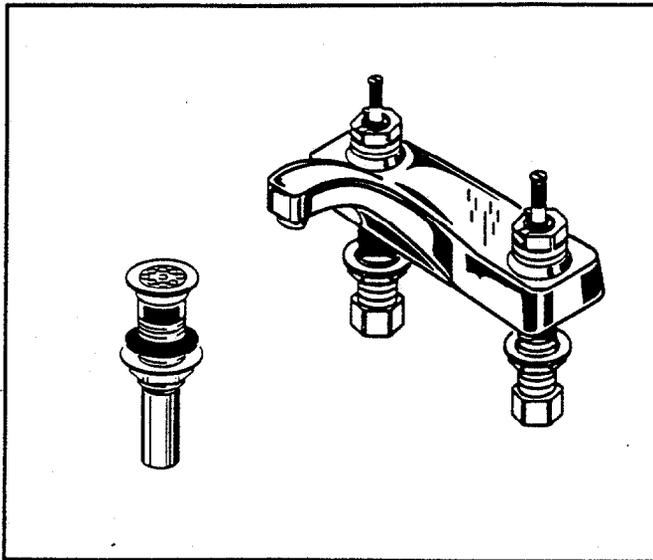
NOTES:
 * DIMENSIONS SHOWN FOR LOCATION OF SUPPLIES AND "P" TRAP ARE SUGGESTED. PROVIDE SUITABLE REINFORCEMENT FOR ALL WALL SUPPORTS. FITTINGS NOT INCLUDED AND MUST BE ORDERED SEPARATELY. IMPORTANT: Dimensions of fixtures are nominal and may vary within the range of tolerances established by ANSI Standard A112.19.2. These measurements are subject to change or cancellation. No responsibility is assumed for use of superseded or voided pages.

American Standard

HERITAGE

AMARILIS

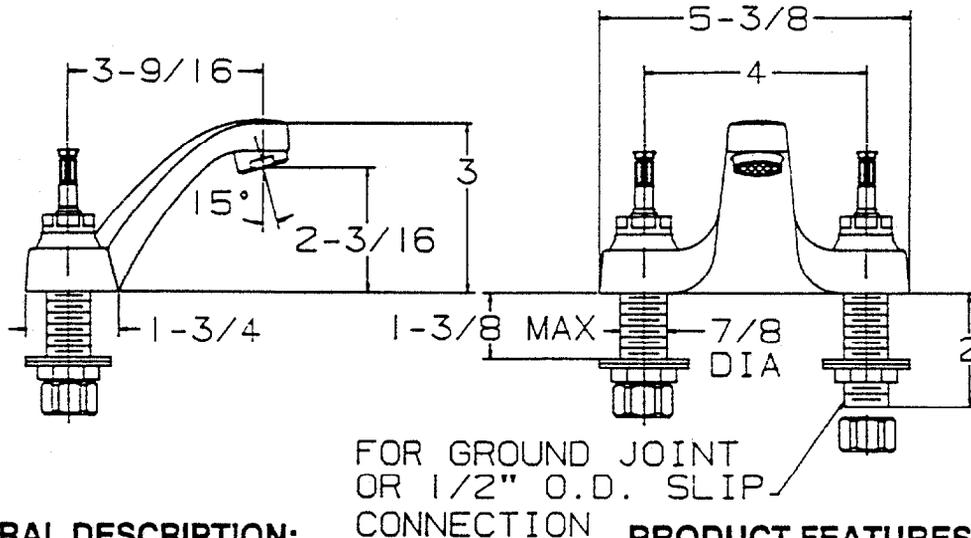
TWO-HANDLE CENTERSET LAVATORY FAUCET WITH CONVENTIONAL SPOUT AND GRID STRAINER DRAIN & FACTORY INSTALLED HANDLES



Shown without handles. See model #s for available factory installed handles. V = Vandal-Resistant, H = Standard

MODEL NUMBER:

- 5402.102H Centerset Lavatory Faucet
With brass crown handles.
- 5402.102V Centerset Lavatory Faucet
With vandal-resistant brass crown handles.
- 5402.112H Centerset Lavatory Faucet
With acrylic knob handles.
- 5402.142H Centerset Lavatory Faucet
With metal lever handles.
- 5402.142V Centerset Lavatory Faucet
With vandal-resistant metal lever handles.
- 5402.152H Centerset Lavatory Faucet
With metal cross handles.
- 5402.152V Centerset Lavatory Faucet
With vandal-resistant metal cross handles.
- 5402.172H Centerset Lavatory Faucet
With brass wrist blade handles.
- 5402.172V Centerset Lavatory Faucet
With vandal-resistant brass wrist blade handles.



GENERAL DESCRIPTION:

Durable cast brass construction throughout. Amarilis washerless ceramic disc valve cartridges - reversible for use with either lever or round handles. One-half inch male inlet shanks with brass coupling nuts and shank nuts. All brass drain bodies with 1 1/4" (32mm) tailpieces. Vandal-resistant faucets feature vandal-resistant aerators, drains and connections on factory-installed handles.

PRODUCT FEATURES:

Solid Brass Construction

Durable - Excellent in high use applications. Ideal for prolonged contact with water. Provides the finest surface for application of all colors and finishes.

Ceramic Disc Valving

Assures a lifetime of drip-free performance.

Low Lead

All brass components in contact with water supply contain no more than 3% lead content by weight.

Wide Selection of Styles and Configurations

Full range of interchangeable fittings for residential and institutional applications.

Choice of Finishes

Wide range of durable finishes.

SUGGESTED SPECIFICATION:

4" centerpiece lavatory faucet shall be cast brass construction with all brass shank nuts and coupling nuts. All brass components in contact with water supply shall contain no more than 3% lead content by weight. Shall also feature 1/4 turn washerless ceramic disc valve cartridges that are reversible for use with round or lever handles. Fitting shall be American Standard Model # _____.

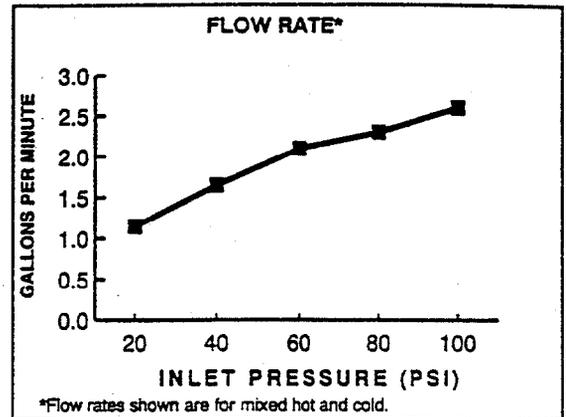
TWO-HANDLE CENTERSET LAVATORY FAUCET WITH CONVENTIONAL SPOUT AND GRID STRAINER DRAIN & FACTORY INSTALLED HANDLES

CODES AND STANDARDS

These products meet or exceed the following codes and standards:

ASTM
ANSI A112.18.1M
CSA B 125
NSF14

Operating torque for valve cartridge is less than ANSI A112.18.1M requirements.



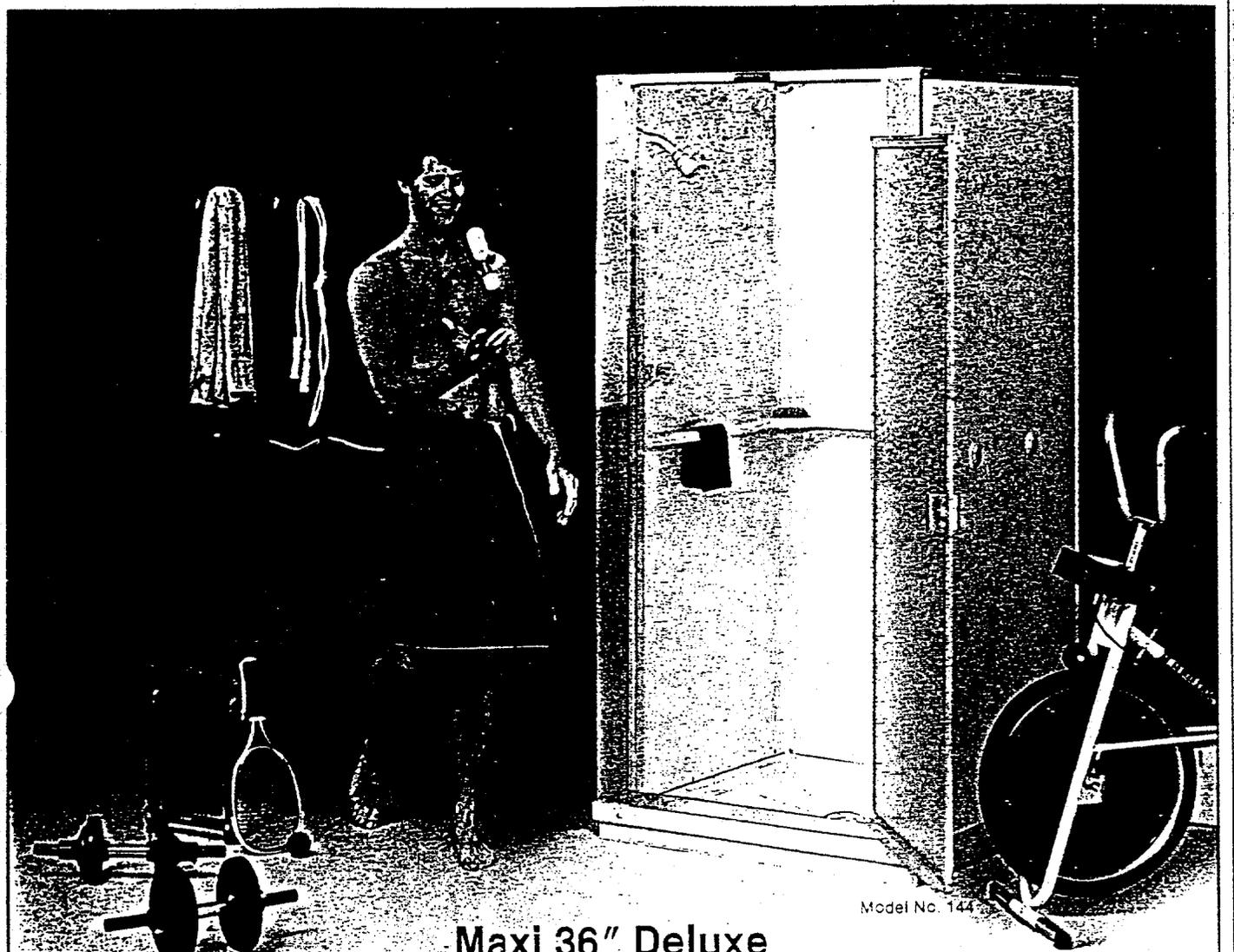
	Product Number	Description	Finish Options		
			Polished Chrome	Matte Chrome	Polished Brass
			002	003	099
	5402.102H	With brass crown handles. (Replaces 2103.886)			
	5402.102V	With brass crown vandal-resistant handles.			N/A
	5402.112H	With acrylic knob handles.		N/A	
	5402.142H	With metal lever handles. (Replaces 2103.137)			
	5402.142V	With metal lever vandal-resistant handles.			N/A
	5402.152H	With metal cross handles.			
	5402.152V	With metal cross vandal-resistant handles.			N/A
	5402.172H	With brass wrist blade handles.			
	5402.172V	With brass wrist blade vandal-resistant handles.			N/A

N/A = NOT AVAILABLE

 Complies with ANSI A117.1 Buildings & Facilities Providing accessibility and usability for physically handicapped people.

MUSTEE

FOR QUALITY
SHOWER CABINETS,
LAUNDRY TRAYS,
SHOWER RECEPTORS, BATH TUB
SURROUNDS, MOP BASINS
& ACCESSORIES.

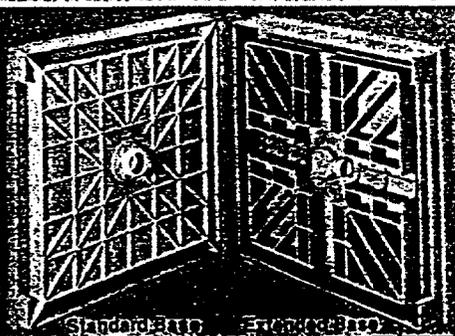
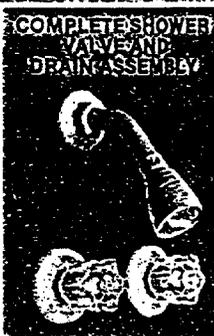


Model No. 144

Maxi 36" Deluxe **DURASTALL**[®] Fiberglass Shower Cabinets

You too will smile in a "Maxi Durastall" shower cabinet. These deluxe fiberglass cabinets feature an extra wide 28" entrance and over 25% more space than conventional models.

With this luxury and an array of safety/convenience group features, you'll enjoy years of satisfaction and trouble-free performance... remember, *Mustee puts it all together!*



MUSTEE DURASTALL® Shower Cabinets

- Leakproof Construction and Rust-Resistant Components.
- "Free Standing" . . . sturdy frame and wall panels.
- Complete Shower Valve and Drain Assemblies.
- Safety Convenience Group Features . . . reassurance for bathers of all ages.
- Contemporary Design . . . for any decor.
- Durable Fiberglass Wall Panels . . . beautiful, stain resistant and easy to clean.



FOUR POPULAR MODELS

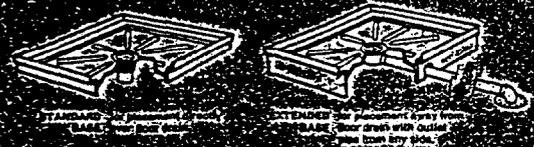
All cabinets include patented safety railing with built-in, self-draining soap dish and shampoo container. Floor surface designed with non-slip sunburst pattern. Center drain assembly includes drain seal for 2" ABS, PVC or iron pipe (see specification for notes for connecting to 2" copper DWV pipe). Decorative aluminum trim adds structural strength and beauty to "free standing" cabinet, permits installation without support of room side walls. Fiberglass panels are warm to the touch and entire cabinet is easily cleaned with non-abrasive liquid cleaner and damp cloth.

CHOICE OF OPTIONAL FLOOR BASE

Standard Base—used for conventional installation over sub-floor DWV pipe. Simply center base directly over sub-floor DWV pipe and follow illustrated instructions.

Extended Base—used for installation away from sub-floor DWV drain. The surface of this reinforced base is raised an additional 3" to enclose a patented drain assembly.

which can be swiveled 360 degrees. 1/2" DWV connecting pipe is inserted into drain assembly and leads through any of four knock-out side openings closest to sub-floor DWV drain. See photo on reverse side. Note: Connecting pipe not included.



CHOICE OF SHATTERPROOF DOOR ENCLOSURE

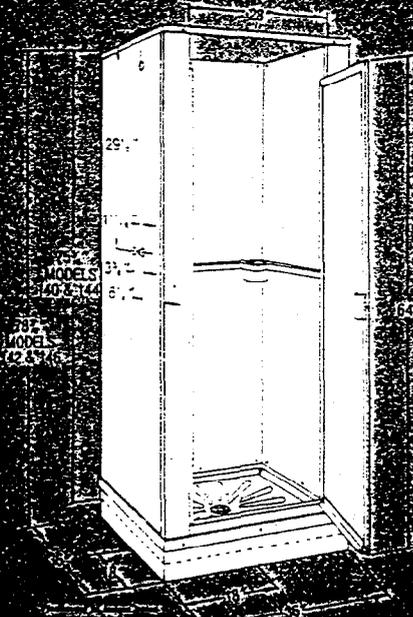
- Curtain models convertible to door enclosure.
- Door may be hung for left or right opening.
- Includes necessary hardware . . . quick and easy to install.



Classic door above adapts to 140 series Durastall shower cabinets.

Mustee's "extra-sturdy" **Classic Door**—semi-transparent, tempered glass encased in heavy gauge, rust-resistant aluminum frame with built-in towel rack. Order separately, part #46700.

Standard Door—packed with models 144 and 146 is semi-transparent, crystal styrene with same frame as "Classic" door minus towel rack. Fits all Mustee shower cabinets with 28" entrance. If ordered separately, part #44700.



SPECIFICATIONS

Model No.	Enclosure	Color	Size	Weight	Floor Base/Drain
140	Standard	White	63" x 28" x 75 1/2"	79 lbs.	Standard
142	Standard	White	65" x 28" x 75 1/2"	91 lbs.	Extended
144	Door	White	63" x 28" x 75 1/2"	66 lbs.	Standard
146	Door	White	65" x 28" x 75 1/2"	108 lbs.	Extended

Centered 1/2" DWV floor drain assembly. Order drain rack number #42001 (connecting to 2" copper DWV pipe). Durastall's patented under-drain or more of the following patents #3,669,743; #3,517,747 and patents pending.

Quality Plumbing Products

SOLD BY:



E.L. MUSTEE & SONS, INC.

5431 West 164th Street • Cleveland, Ohio 44142
Phone: (216) 267-3100

04/21/95
11:16 AM

JOB ID: 62548T

HARDWARE SCHEDULE
FOR
TOILET ACCESORIES-GROUND WATER
REMEDIATION BUILDING
CAMP LEJEUNE, N.C. 28542

GENERAL CONTRACTOR:
NORTHEAST CONSTRUCTION CO.
P.O. BOX 548
JACKSONVILLE, N.C. 28541

REGISTERED ARCHITECT:
DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NORFOLK, VIRGINIA

NORTHEAST CONSTRUCTION CO.
POST OFFICE BOX 548
JACKSONVILLE, NC 28541-0548

SUBMITTED BY:

B.A. HOFT, INC. (919)596-4446
7412 A.C.C. BLVD.
RALEIGH, N.C. 27613
PREPD. BY: SCOTT CUNNINGHAM, AHC

Approved
Approved as noted
Revise and Resubmit
By [Signature]
Date 5/15/95

Approval does not relieve supplier or subcontractor of his obligation to furnish and/or install this material in accordance with requirements of the contractual plans and specifications.

ARCHITECT and GENERAL CONTRACTOR PLEASE NOTE:

The hardware will be ordered IMMEDIATELY upon receipt of an APPROVED Hardware Schedule. Subsequent changes will be treated as an EXTRA and excess hardware will be turned over to the owner.

04/21/95
11:16 AM

SUBMISSION RECORD

JOB ID: 62548T

SUBMITTED FOR APPROVAL:

DATE: 04/20/95

04/21/95
11:16 AM

NOTES:

JOB ID: 62548T

BR BRADLEY

04/21/95
11:16 AM

JOB NO. 62548T

DOOR INDEX

DOOR NO.	HEADING ‡	ITEM NO.	KEYSET
RESTRM.101	1	1	

04/21/95

JOB NO. 62548T

H E A D I N G † 1

ITEM 1 1 DR. RESTRM.101

1	EA	MIRROR 780-2430	010	BR100
1	EA	PAPER TOWEL DISPENSER 250-15	020	BR110
1	EA	TOILET PAPER HOLDER 5071	030	BR120
2	EA	GRAB BAR 8120-00142	040	BR130

* END OF SCHEDULE *

TECHNICAL DATA

Bradley

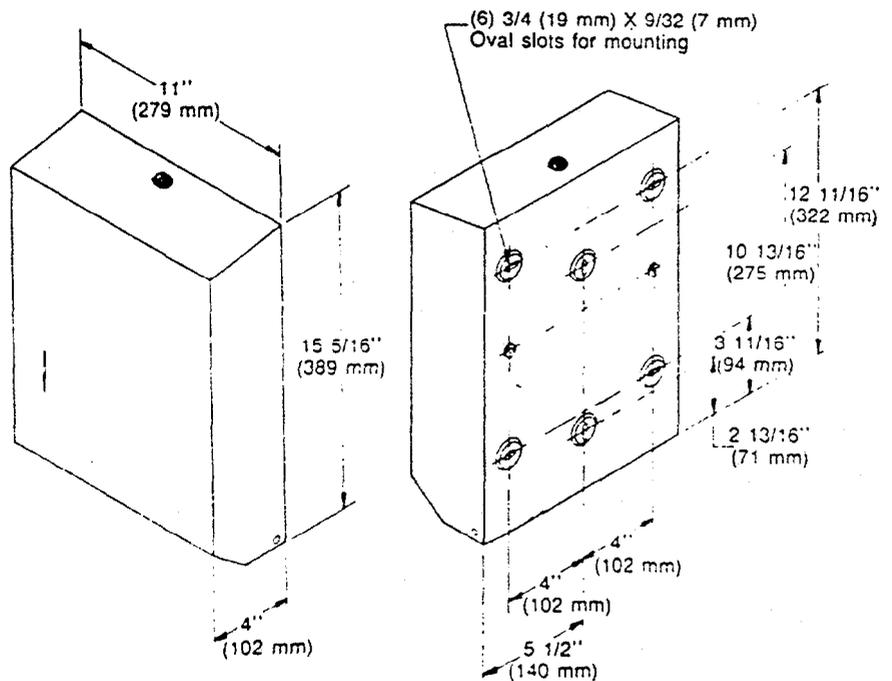
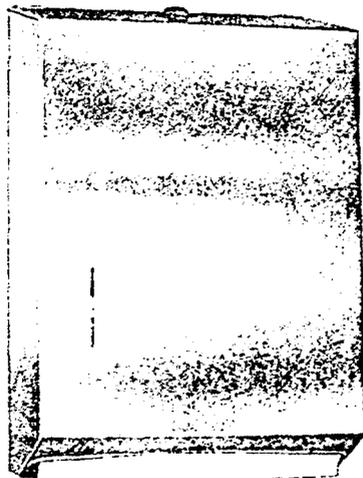
TOWEL DISPENSER

- ⊕ Surface Mounted
- ⊕ C-Fold/Multi-Fold Towels
- ⊕ Tumbler Lock

MODEL 250-15



When installed as specified below, unit meets Barrier-Free requirements



CONSTRUCTION: UNIT fabricated of type 304 (18-8), 22 gauge stainless steel with exposed surfaces in architectural satin finish. Smooth corners, free of burrs and sharp edges. Tumbler lock keyed like other Bradley units. Cabinet hinged at bottom to allow easy filling. Refill indicator slot on face of cabinet. Rolled edge on dispenser opening.

CAPACITY: 525 multi-fold or 400 C-fold paper towels.

OPERATION: Unit holds multi-fold or C-fold towels without use of special adaptor.

INSTALLATION: Secure to wall with mounting screws (included) at holes provided.

GUIDE

SPECIFICATION: Surface mounted towel dispenser shall be fabricated of type 304 (18-8), 22 gauge stainless steel with exposed surfaces in satin finish. Refill indicator on face of cabinet. Tumbler lock to secure hinged front panel. Towel dispenser capacity 500 multi-fold or 300 C-fold towels.

Overall dimensions: 11" W x 15-5/6" H x 4" D.

Surface Mounted Towel Dispenser shall be Bradley Model 250-15.

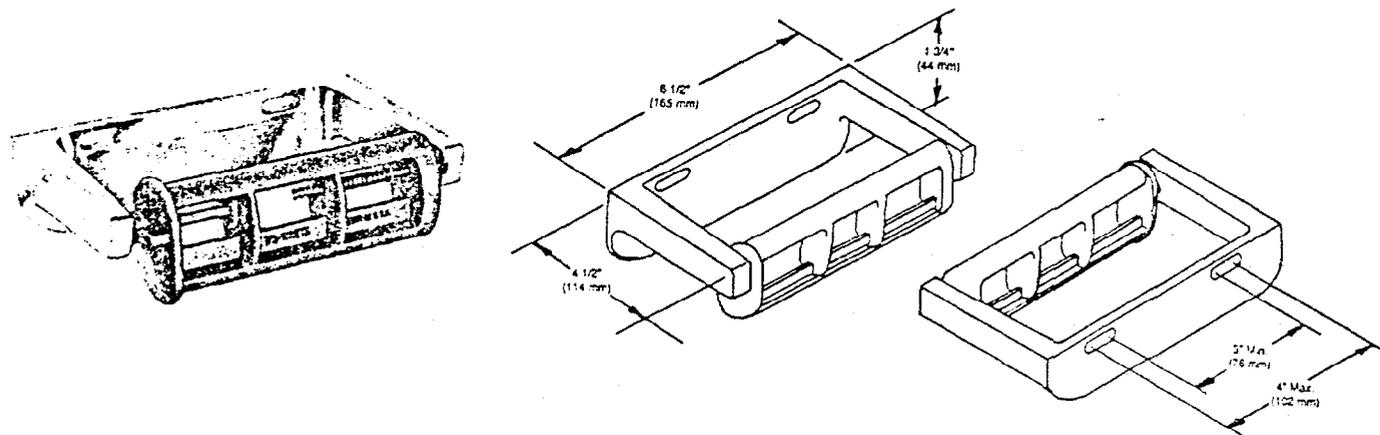
TECHNICAL DATA

Bradley

TOILET TISSUE DISPENSER

MODEL 5071

- Controlled Delivery—Rocking Action
- Single Roll (For Dual Roll See Model 5241)



CONSTRUCTION: BRACKET fabricated of die cast aluminum.
 SPINDLE fabricated of gray polystyrene. Stainless steel spring.

CAPACITY: One standard core toilet tissue roll through 5-1/2" in diameter.

OPERATION: Remove tissue roll core to access special locking mechanism for servicing. Stops on spindle control paper delivery. Spindle revolves only 1/2 turn for each dispensing operation and returns to original position.

INSTALLATION: Secure to wall with mounting screws (included) at holes provided.

OPTIONAL FEATURES:

<u>Feature</u>	<u>Suffix</u>
<input type="checkbox"/> Non-controlled delivery	-50

GUIDE

SPECIFICATION: Surface mounted toilet tissue dispenser shall be die cast aluminum with satin finish and hold one standard core toilet tissue roll. Stops control paper delivery.
 Overall dimensions: 6-1/2"W x 1-3/4"H x 4-1/2"D.
 Surface Mounted Toilet Tissue Dispenser shall be Bradley Model 5071.

5 TOILET TISSUE ROLLS. SEAT COVER DISP.

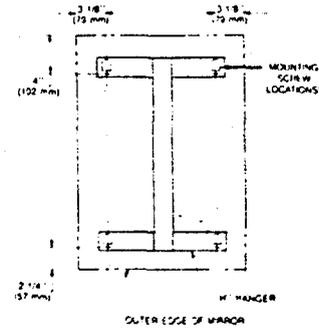
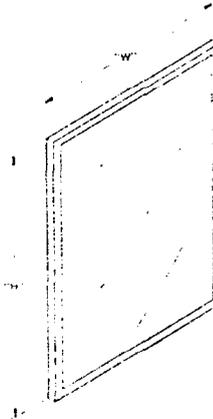
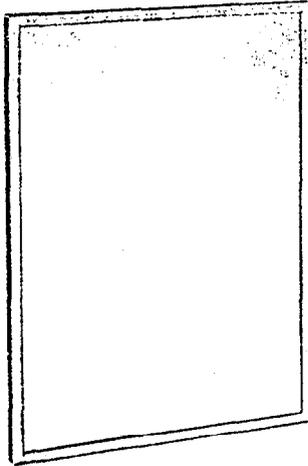
TECHNICAL DATA

Bradley

MIRROR

- ② Angle Frame--Welded Corners
- ② Theft Resistant Mounting

MODEL 780



7 MIRRORS SHELVES

CONSTRUCTION: **FRAME** fabricated of type 304 (18-8), one-piece roll-formed stainless steel, 3/4" x 3/4" angle with corners heliarc welded and ground smooth to satin finish. Continuous integral stiffener on all sides for added strength.

BACK fabricated of 20-gauge galvanized steel, secured to frame with concealed screws, equipped with integral horizontal hanging brackets.

MIRROR of first quality 1/4" float glass, triple silver plated with electro-copper plated layer and thermosetting infrared cured paint backing. Meets federal specification DD-M-00411b against silver spoilage and guaranteed for 15 years.

WALL HANGER fabricated of 18-gauge cold rolled steel, all welded construction to form rigid template.

INSTALLATION: Secure concealed mounting bracket to wall with screws (included) at holes provided. *NOTE: Provide in-wall backing at mounting screw locations. Position mirror over mounting bracket to engage hanger tabs. Slide mirror down and lock into position.

MOST COMMONLY SPECIFIED SIZES									
Width (Inches)	Height (Inches)	Overall Dimension (Inches)	Overall Dimension (Millimeters)	Standard Model Number	Width (Inches)	Height (Inches)	Overall Dimension (Inches)	Overall Dimension (Millimeters)	Standard Model Number
16"	20"	16 x 20	406 x 508	780-1620	24"	60"	24 x 60	610 x 1524	780-2460
16"	22"	16 x 22	406 x 559	780-1622	24"	72"	24 x 72	610 x 1829	780-2472
16"	24"	16 x 24	406 x 610	780-1624	30"	36"	30 x 36	762 x 914	780-3036
16"	30"	16 x 30	406 x 762	780-1630	30"	48"	30 x 48	762 x 1219	780-3048
18"	24"	18 x 24	457 x 610	780-1824	30"	60"	30 x 60	762 x 1524	780-3060
18"	30"	18 x 30	457 x 762	780-1830	30"	72"	30 x 72	762 x 1829	780-3072
18"	36"	18 x 36	457 x 914	780-1836	36"	24"	36 x 24	914 x 610	780-3624
24"	24"	24 x 24	610 x 610	780-2424	36"	36"	36 x 36	914 x 914	780-3636
24"	30"	24 x 30	610 x 762	780-2430	36"	48"	36 x 48	914 x 1219	780-3648
24"	36"	24 x 36	610 x 914	780-2436	36"	60"	36 x 60	914 x 1524	780-3660
24"	48"	24 x 48	610 x 1219	780-2448	36"	72"	36 x 72	914 x 1829	780-3672

Model 780 series channel framed mirrors can be fabricated to fit any architectural requirement. The above schedule is intended only as a guide to the most commonly used sizes. To specify sizes other than those indicated above, use the following formula: Model 780 - width in inches x height in inches. Example 780 - 3054.

OPTIONAL FEATURES:

NOTE: An inherent characteristic of a manufacturing process is distortion which may vary from mirror to mirror.

- | | | | |
|--|-----------|--|-----------|
| <input type="checkbox"/> 1/4" tempered glass mirror in lieu of polished float glass mirror | Suffix -2 | <input type="checkbox"/> Bright annealed 20-gauge stainless steel in lieu of polished float glass mirror | Suffix -5 |
| <input type="checkbox"/> Laminated glass | Suffix -3 | <input type="checkbox"/> Plexiglass | Suffix -6 |
| <input type="checkbox"/> Highly polished No. 8 architectural finish, 20-gauge stainless steel in lieu of polished float glass mirror | Suffix -4 | | |

GUIDE SPECIFICATION:

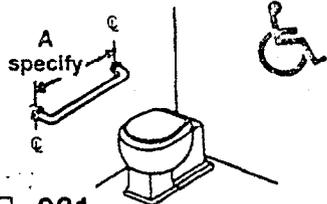
Mirror shall be framed with type 304 (18-8), one-piece roll-formed 3/4" x 3/4" stainless steel angle with continuous integral stiffener. Welded corners shall be polished to a uniform satin finish. Mirror shall be of first quality 1/4" float glass guaranteed for 15 years against silver spoilage and protected by a shock absorbing, waterproof filler. Back of unit shall be 20-gauge galvanized steel secured to frame with concealed screws, equipped with integral horizontal hanging brackets and separate wall hanger for concealed mounting.

Framed Mirror shall be Bradley Model 780-_____ " W x _____ " H (specify width and height).

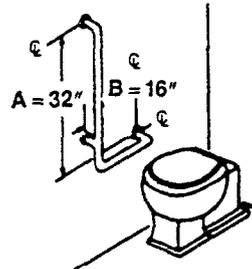
Grab Bar Applications

TYPICAL WATER CLOSET APPLICATIONS

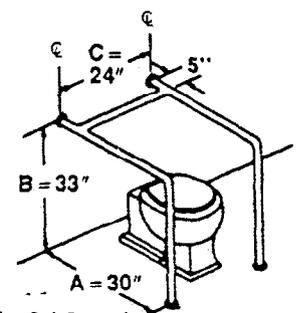
800 SERIES



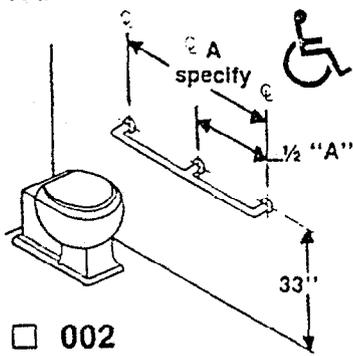
001
Specify length desired. See 048 and 049 for 45° mounting. 001 over 54" requires a center support and becomes 002.



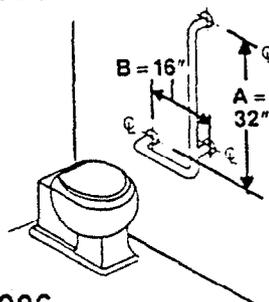
005
A dimension will always have stand off



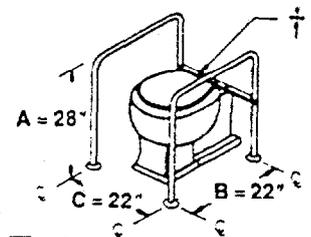
012
Confirm clearance between fixture or plumbing and grab bar in individual applications.



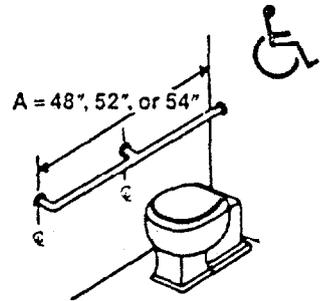
002



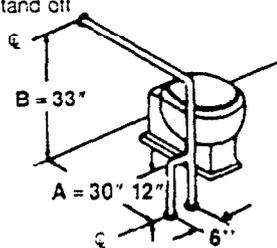
006
Opposite 005
A dimension will always have stand off



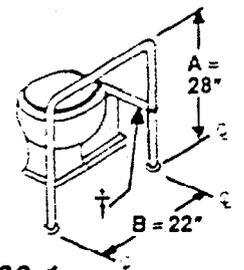
039
† Bar slides to accommodate various size water closets.



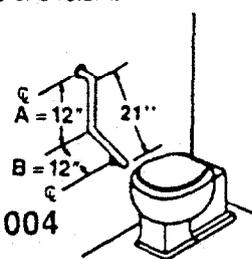
003 48" 52" 54"
Standard length 48", 52" or 54" with center post; only one end return.



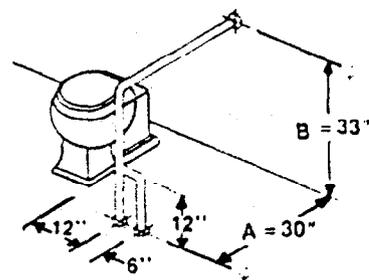
010



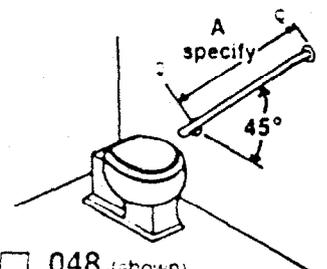
039-1
† Bar adjustable for right or left hand mounting.



004



011
Opposite 010



048 (shown)
 049 opposite hand



These units are highly recommended by barrier-free design experts because they provide the optimum approach path for wheelchair users. Consult applicable codes for specific requirements.

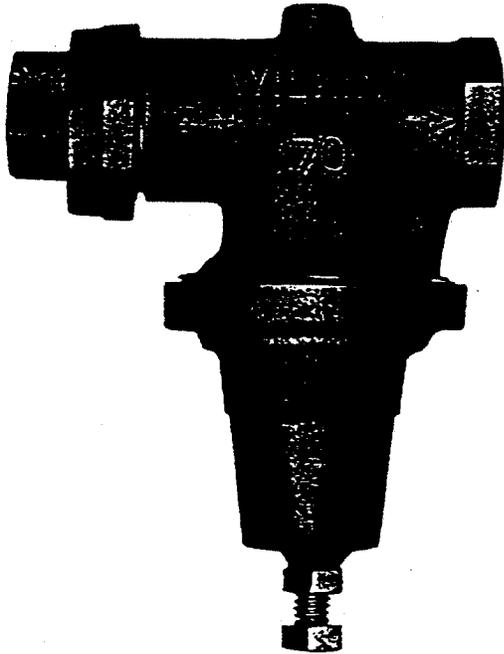
NOTE: When Grab Bar dimensions are modified, a support will be added to all sections longer than 54".

GRAB BAR 8

70 SERIES

Regulators

1/2" Thru 2"



MODEL 70

FEATURES

- Pressure rated 300 psi
- Spring range 25 to 75 psi, factory set at 50 psi
- Maximum temperature 180°F
- Union end connection standard available 3/4" thru 2" in copper sweat or 1/2" thru 2" in NPT
- Available with 1" union meter thread connection
- All bronze body and bell housing - provides durability and long life
- Built in by-pass - prevents buildup of excessive system pressure caused by thermal expansion
- Integral stainless steel strainer
- Nylon reinforced Buna-N diaphragm
- Balanced piston design
- May be installed in any position
- All internal parts corrosion resistant and included in a replaceable cartridge
- Serviceable in-line
- Available tapped and plugged for gauge (optional)
- Available tapped with gauge (optional)
- Available with BSP threads (optional)
- Approvals - ASSE (No. 1003), IAPMO®, CSA

OPTIONS

Model 70LU	Same as 70 series except less union, female by female NPT.
Model 70DU	Same as 70 series except double union female NPT.
Model 70DUC	Same as 70 series except double union female copper sweat.
Model 70DUCM	Same as 70 series except double union male copper sweat.
Model 70DM	Same as 70 series except double male meter thread (1" National Hose Thread), no union included.
Model 70SC	Same as 70 series except sealed cage bell and bronze adjusting screw.
Model 70SS	Same as 70SC series except with stainless steel spring and adjusting screw.

ACCESSORIES

Model 70DUSPC	Special plastic spacer nipple for use with 70 series double union regulators.
CR	Special inline strainer screen for use with 70 DUSPC.

*Note: 70DU series 1 1/4" thru 2" comes with the same internals as model #500.

70 SERIES

1/2" Thru 2"

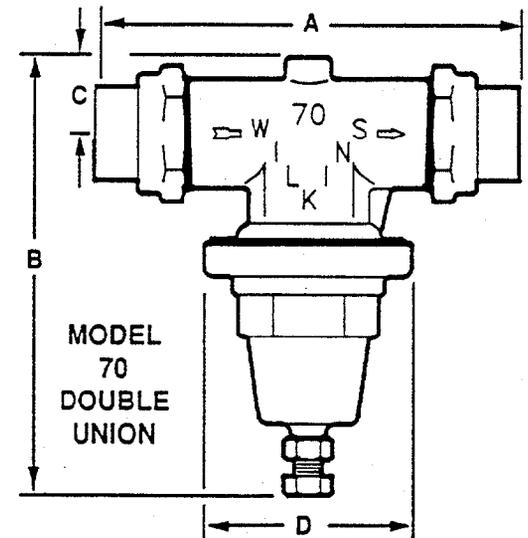
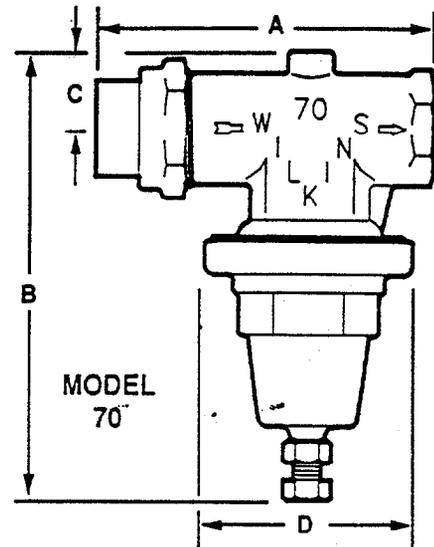
DIMENSIONS & WEIGHTS

AMERICAN STANDARD

MODEL	PIPE SIZE	CONNECTIONS	DIMENSIONS (in.)				SHIP. WT. lbs.
			A	B	C	D	
70	1/2"	SINGLE UNION	4.48	6.00	1.00	2.73	2.6
70	1/2"	LESS UNION	3.36	6.00	1.00	2.73	2.3
70	3/4"	SINGLE UNION	4.58	6.50	1.13	2.75	2.8
70	3/4"	DOUBLE UNION	5.92	6.50	1.13	2.75	3.4
70	3/4"	LESS UNION	3.27	6.50	1.13	2.75	2.5
70	1"	SINGLE UNION	5.83	6.75	1.10	3.35	4.0
70	1"	DOUBLE UNION	5.60	6.75	1.10	3.35	4.4
70	1"	LESS UNION	3.60	6.75	1.10	3.35	3.4
70	1 1/4"	DOUBLE UNION	8.38	8.00	1.75	3.92	7.6
70	1 1/2"	DOUBLE UNION	10.03	10.00	2.25	5.25	14.3
70	2"	DOUBLE UNION	12.28	11.00	2.38	6.50	20.2

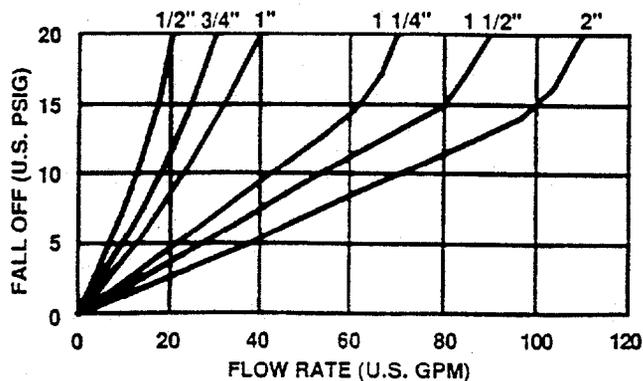
METRIC STANDARD

MODEL	PIPE SIZE (mm)	CONNECTIONS	DIMENSIONS (mm)				SHIP. WT. kgs.
			A	B	C	D	
70	15	SINGLE UNION	113.79	152.40	25.40	69.34	1.18
70	15	LESS UNION	85.47	152.40	25.40	69.34	1.04
70	20	SINGLE UNION	116.33	165.10	28.70	69.85	1.27
70	20	DOUBLE UNION	150.37	165.10	28.70	69.85	1.54
70	20	LESS UNION	83.19	165.10	28.70	69.85	1.13
70	25	SINGLE UNION	148.08	171.45	27.94	85.09	1.81
70	25	DOUBLE UNION	142.24	171.45	27.94	85.09	2.00
70	25	LESS UNION	91.44	171.45	27.94	85.09	1.54
70	32	DOUBLE UNION	212.85	203.20	44.45	99.57	3.45
70	40	DOUBLE UNION	254.76	254.00	57.15	133.35	6.49
70	50	DOUBLE UNION	311.91	279.40	60.45	165.10	9.16

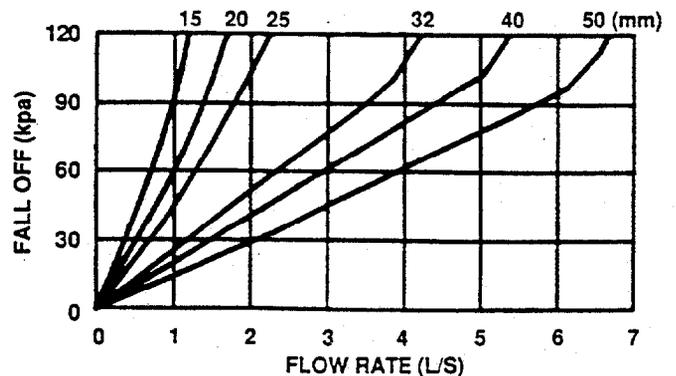


FLOW CHARACTERISTICS

AMERICAN STANDARD



METRIC STANDARD



04/21/95
11:00 AM

JOB ID: 62548

2

NORTHEAST CONSTRUCTION CO.
POST OFFICE BOX 548
JACKSONVILLE, NC 28541-0548

Approved
Approved as noted
Revise and Resubmit
By [Signature]
Date 4/21/95

HARDWARE SCHEDULE
FOR
GROUND WATER REMEDIATION BLDG.

CAMP LEJEUNE, N.C. 28542

Approval does not relieve supplier or subcontractor of his obligation to furnish and/or install this material in accordance with requirements of the contractual plans and specifications.

GENERAL CONTRACTOR:

NORTHEAST CONSTRUCTION CO.

P.O. 548
JACKSONVILLE, N.C. 28541

REGISTERED ARCHITECT:

DEPARTMENT OF THE NAVY

ATLANTIC DIVISION
NORFOLK, VIRGINIA

SUBMITTED BY:

B.A. HOFT, INC. (919)596-4446
7412 A.C.C. BLVD.
RALEIGH, N.C. 27613
PREP'D BY: SCOTT CUNNINGHAM, AHC

ARCHITECT and GENERAL CONTRACTOR PLEASE NOTE:

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04/21/95
11:00 AM

SUBMISSION RECORD

JOB ID: 62548

SUBMITTED FOR APPROVAL:

DATE: 04/20/95

04/21/95
11:00 AM

NOTES:

JOB ID: 62548

DM DORMA
FA FALCON
HA HAGER
LU LUND
XX MISC. MESSAGE

04/21/95
11:00 AM

KEYING LEGEND:

JOB ID: 62548

LOCKS SHALL BE MASTERKEYED AND CHANGE KEYED IN SETS AS NOTED.

KEYS FURNISHED: TWO (2) CHANGE KEYS PER LOCK

TWO (2) MASTERKEYS

TWO (2) CONSTRUCTION MASTERKEYS

KEYS SHALL BE STAMPED "U.S. PROPERTY-DO NOT DUPLICATE."

04/21/95
11:00 AM

JOB NO. 62548

DOOR INDEX

DOOR NO.	HEADING #	ITEM NO.	KEYSET
1	4	10	1AA
2	1	1	1AA
3	2	5	3AA
4	1	2	2AA
5	1	3	2AA
6	4	11	1AA
7	1	4	1AA
8	2A	8	4AA
9	2	6	4AA
10	3	9	
11	2	7	1AA
KEY CONTRL	5	12	

H E A D I N G # 1

1AA	ITEM 1	1 PR DR. 2	EXTERIOR FROM 105	RHR-A
2AA	ITEM 2	1 PR DR. 4	EXTERIOR FROM 102	RHR-A
2AA	ITEM 3	1 PR DR. 5	105 FROM 102	RHR-A
1AA	ITEM 4	1 PR DR. 7	EXTERIOR FROM 105	RHR-A
		PR-2-3'0" X 7'0" 1 3/4 HM-D X HM-F		
	24 EA	HINGE BB1191 4 1/2 X 4 1/2 NRP	630	010 HA100
	8 EA	FLUSH BOLT 282D-12" @ INACTIVE DOOR	626	020 HA200
	4 EA	LOCK LM531 X KN X IC7 @ ACTIVE DOOR	630	030 FA200
	8 EA	CLOSER 7601 PA X SN1	AL	040 DM300
	8 EA	KICKPLATE 190S X 8" X 34" X .050 @ PUSH SIDE	630	050 HA400
	8 EA	KICKPLATE 190S X 8" X 35" X .050 @ PULL SIDE	630	060 HA410
	4 EA	THRESHOLD 410S X 72" X MS X LA	AL	070 HA510
	4 EA	DOOR SWEEP 750SN X 36" X MS	AL	080 HA501
	4 SET	WEATHERSTRIPPING 891SV X 1/72" X 2/84" X MS	AL	090 HA511
	0	ASTRAGAL FURNISHED WITH METAL DOORS		100 XX100

H E A D I N G # 2

3AA	ITEM 5	1 SGL DR. 3	105 TO 103	LH
4AA	ITEM 6	1 SGL DR. 9	105 TO 100	LH
1AA	ITEM 7	1 SGL DR. 11	EXTERIOR TO 105	RH
		3'0" X 7'0" 1 3/4 HM-D X HM-F		
	9 EA	HINGE BB1191 4 1/2 X 4 1/2	630	010 HA110
	3 EA	LOCK LM531 X KN X IC7	630	020 FA200
	3 EA	CLOSER 7601 X SN1	AL	030 DM310
	3 EA	KICKPLATE 190S X 8" X 34" X .050 @ PUSH SIDE	630	040 HA400
	3 EA	KICKPLATE 190S X 8" X 35" X .050 @ PULL SIDE	630	050 HA410
	3 EA	THRESHOLD 410S X 36" X MS X LA	AL	060 HA500
	3 EA	DOOR SWEEP 750SN X 36" X MS	AL	070 HA501
	3 SET	WEATHERSTRIPPING 891SV X 1/36" X 2/84" X MS	AL	080 HA502

H E A D I N G # 2A

4AA	ITEM 8	1 SGL DR. 8	EXTERIOR FROM 100	RHR
		3'0" X 7'0" 1 3/4 HM-D X HM-F		

(Continued)

3	EA	HINGE BB1191 4 1/2 X 4 1/2 NRP	630	010 HA100
1	EA	LOCK LM531 X KN X IC7	630	020 FA200
1	EA	CLOSER 7601 FA X SN1	AL	030 IM300
1	EA	KICKPLATE 190S X 8" X 34" X .050 @ PUSH SIDE	630	040 HA400
1	EA	KICKPLATE 190S X 8" X 35" X .050 @ PULL SIDE	630	050 HA410
1	EA	THRESHOLD 410S X 36" X MS X LA	AL	060 HA500
1	EA	DOOR SWEEP 750SN X 36" X MS	AL	070 HA501
1	SET	WEATHERSTRIPPING 891SV X 1/36" X 2/84" X MS	AL	080 HA502

H E A D I N G # 3

ITEM 9 1 SGL DR. 10 105 TO 101 RH
 3'0" X 7'0" 1 3/4 HM-D X HM-F

3	EA	HINGE 1191 4 1/2 X 4 1/2	630	010 HA120
1	EA	PRIVACY LM301 X KN	630	020 FA210
1	EA	KICKPLATE 190S X 8" X 34" X .050 @ PUSH SIDE	630	030 HA400
1	EA	KICKPLATE 190S X 8" X 35" X .050 @ PULL SIDE	630	040 HA410
1	EA	STOP 232W	630	050 HA420
3	EA	SILENCERS 307D	GRAY	060 HA600
1	EA	THRESHOLD 410S X 36" X MS X LA	AL	070 HA501

H E A D I N G # 4

1AA ITEM 10 1 RUD DR. 1 EXTERIOR TO 105
 1AA ITEM 11 1 RUD DR. 6 EXTERIOR TO 105
 ROLL UP DOORS

2	EA	PADLOCK C955-1 X IC7		010 FA220
0		CONTRACTOR: PLEASE VERIFY LOCK SUBMITTED IS		020 XX105
0		APPROPRIATE FOR USE ON ROLL UP DOORS		030 XX106

H E A D I N G # 5

ITEM 12 1 DR. KEY CONTRL

1	EA	KEY CABINET NO.1200 X 30 CAPACITY	GRAY	010 LU100
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* END OF SCHEDULE *

DORMA 7600 Series

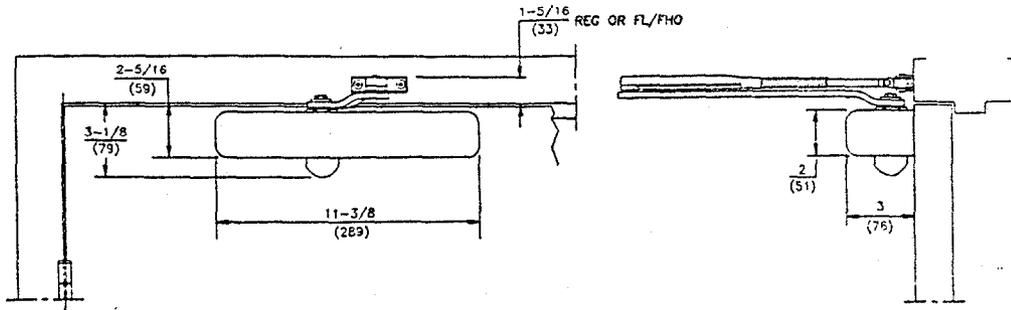
Surface Applied Door Closer



Value ... Accessibility ... Aesthetics!

DORMA's 7600 Series Closers are hydraulic surface-applied door closers with backcheck and full range adjustable spring force for interior or exterior doors, including doors that must comply with barrier-free codes.

Standard streamline or optional full metal cover gives this closer architecturally desirable aesthetics. Optional delayed action makes the 7600 particularly useful in hospitals, senior citizens' homes and apartment complex entrances.



Streamline cover has compact dimensions of $11\frac{3}{8}'' \times 2'' \times 3''$ projection. This corrosion-resistant cover conceals closer body and adjustment valves.

The DORMA 7600 closers are non-handed and are capable of opening to 180° . Top jamb application can open to 180° when reveal depth is 4" or less. Parallel arm bracket is packaged standard with the 7600 unit.

The 7601 has field adjustable spring power from sizes 1 to 5 to meet the 5 lbs. interior and 8.5 lbs. exterior maximum opening force requirements for barrier-free openings.

7601 closer is ideal for retrofit of existing DORMA 6600 and DORMA 7600 installations that do not meet barrier-free requirements. With the same mounting holes and templating, changeover from one to another is simple.

The 7605 closer is adjustable from size 5 to 6 with 50% additional closing power above size 6 for wide, tall, or heavy doors requiring reliable control.

Two noncritical adjusting valves (sweep and latch) with thermostatic properties work with a special hydraulic fluid to provide consistent closing speeds under a wide variety of temperatures.

Fully adjustable hydraulic backcheck prevents uncontrolled opening of the door from approximately 60° by providing a cushioning effect.

Optional adjustable delayed action (in lieu of backcheck) allows easy, unimpeded passage through a doorway.

A large variety of accessories are available to provide trouble-free installation for even the most difficult applications.

Certification:

The DORMA 7600 Series is listed by U.L. and U.L.C. under their continuing reinspection programs. The 7600 Series is certified to conform to the requirements of ANSI A156.4 Grade 1.

Specification:

All closers shall be DORMA 7600 Series hydraulic surface-applied rack and pinion closers. The closers will have aluminum alloy bodies with high compression steel springs and hardened rack and pinion for doors opening up to 180° maximum. The closers will have corrosion-resistant streamline covers. The closers will have two noncritical thermostatic valves to separately control sweep and latch speeds and provide constant closing speeds even under extreme temperatures. The closers will have hydraulic backcheck to prevent uncontrolled opening of the door from approximately 60° . All 7601 Series closers shall have adjustable spring power from sizes 1 to 5 to meet interior or exterior door barrier-free requirements. The 7605 closer will be adjustable from size 5 to 6 with 50% additional closing force above size 6. Bodies and arm assemblies to be corrosion-resistant and finished with a prime coat and top coat of polyurethane enamel paint. Parallel arm bracket to be packaged standard for regular arm/parallel arm combinations.

Optional Specification:

Closers to have adjustable hydraulic delayed action (in lieu of backcheck) from approximately 120° to 60° .

Closers to have full metal cover with compact dimensions of $11\frac{3}{8}'' \times 2\frac{3}{4}''$ and 3" projection.

Finishes:

Standard Sprayed Finishes: Primed for Painting (PR), Aluminum (AL), Dull Bronze (DB), Statuary Bronze (STAT), Dark Duranodic Bronze (DURC), Gold (GL), Black (BL).

Optional Special Color Sprayed Finishes: See DORMA finish chart.

Optional Plated Finishes: Bright Brass (US3), Satin Brass (US4), Bright Bronze (US9), Satin Bronze (US10), Oxidized Satin Bronze Oil Rubbed (US10B), Bright Nickel (US14), Satin Nickel (US15), Bright Chrome (US26), Satin Chrome (US26C).

Warranty: 25 Years.

For technical information, application details and accessory illustrations, see 7600 Series Technical Information and 7600/7800 Series Technical Drawings.

Note: Any door closer specified, installed, and adjusted to meet reduced opening force requirements may not have sufficient power to reliably close and latch a door.

DORMA Door Controls Inc.
Dorma Drive
Reamstown, PA 17567
Telephone: (800) 523-6463
Facsimile: (800) 274-9704

DORMA Door Controls Ltd.
1680 Courtney Park Drive, Unit 13
Mississauga, Ontario L5T 1R4
Telephone: (800) 387-4938
Facsimile: (905) 670-6850

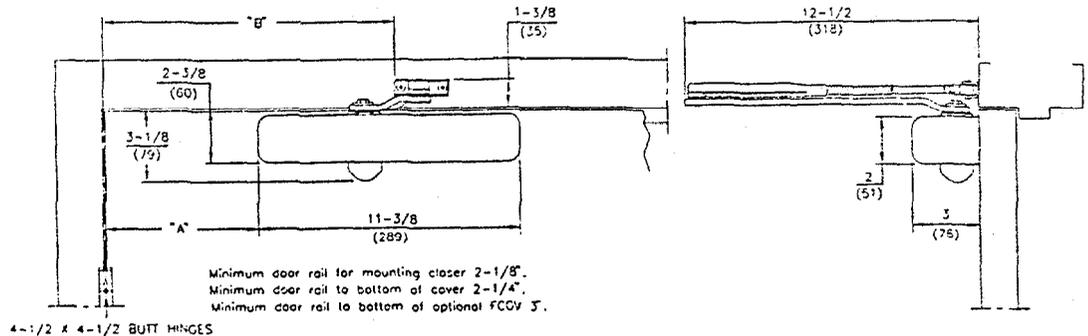
DORMA 7600 Series



Technical Drawings

Regular Installation

7601
7605



SIZE SELECTION CHART

CLOSER	INTERIOR/ EXTERIOR	DOOR WIDTH						
		2'-0" min.	2'-6" max.	3'-0" max.	3'-6" max.	4'-0" max.	4'-6" max.	5'-0" max.
7601	INTERIOR	✓	✓	⊗	⊗	⊗	N/A	N/A
	EXTERIOR	⊗	⊗	⊗	⊗	⊗	N/A	N/A
7605	INTERIOR	N/A	N/A	N/A	N/A	✓	✓	✓
	EXTERIOR	N/A	N/A	N/A	N/A	✓	✓	N/A

TEMPLATE REFERENCE	DIM "A"	DIM "B"	APPROX. MAXIMUM OPENING	APPROX. BACKCHECK RANGE	APPROX. DELAYED ACTION RANGE
TO 100'	6-1/2" (155)	12-1/2" (318)	120'	67"-120"	125"-62"
OVER 100'	2-3/8" (60)	2-3/8" (60)	150'	34"-100"	160"-62"

✓ - Recommended application

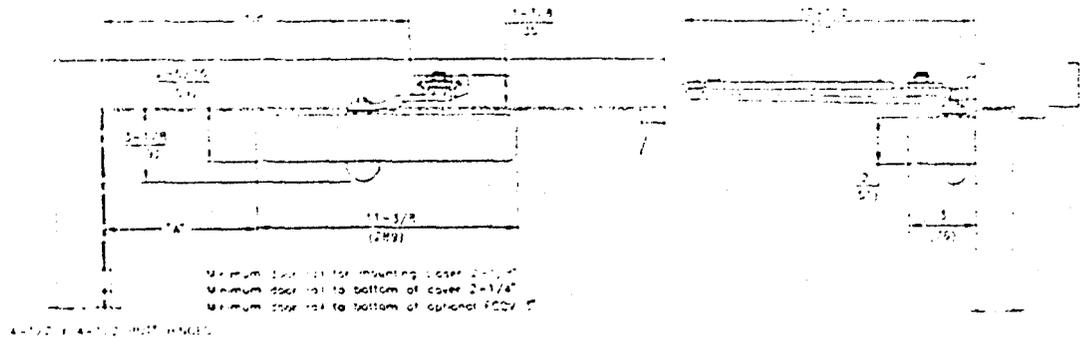
N/A - Not applicable / application not recommended

⊗ - Opening force 5 lbs. or less on interior doors / 8.5 lbs. or less on exterior doors for door width noted.

Note: Although DORMA 7600 Series closers have adjustable spring power to compensate for site conditions, it can not be guaranteed that adequate closing force will be obtained while complying with barrier free opening force restrictions.

Regular Installation x Friction Hold Open/ Fusible Link Hold Open (specify hand for fusible link)

7601 FHO
7605 FHO
7601 FL
7605 FL



SIZE SELECTION CHART

CLOSER	INTERIOR/ EXTERIOR	DOOR WIDTH						
		2'-0" min.	2'-6" max.	3'-0" max.	3'-6" max.	4'-0" max.	4'-6" max.	5'-0" max.
7601	INTERIOR	✓	✓	⊗	⊗	⊗	N/A	N/A
	EXTERIOR	⊗	⊗	⊗	⊗	⊗	N/A	N/A
7605	INTERIOR	N/A	N/A	N/A	N/A	✓	✓	✓
	EXTERIOR	N/A	N/A	N/A	N/A	✓	✓	N/A

TEMPLATE REFERENCE	DIM "A"	DIM "B"	APPROX. MAXIMUM OPENING	APPROX. BACKCHECK RANGE	APPROX. DELAYED ACTION RANGE	MINIMUM HOLD OPEN	MAXIMUM HOLD OPEN
TO 100'	5" (127)	13-1/2" (343)	110'	13"-112"	112"-45"	45"	112"
OVER 100'	2-3/8" (60)	2-3/8" (60)	150'	15"-150"	150"-81"	15"	112"

✓ - Recommended application

N/A - Not applicable / application not recommended

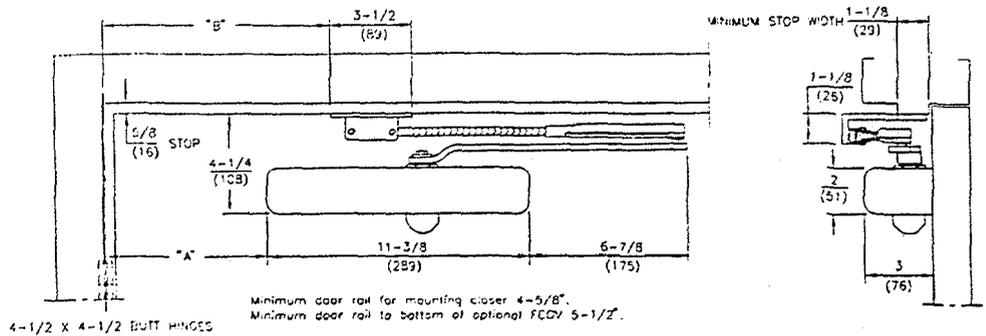
⊗ - Opening force 5 lbs. or less on interior doors / 8.5 lbs. or less on exterior doors for door width noted.

Note: Although DORMA 7600 Series closers have adjustable spring power to compensate for site conditions, it can not be guaranteed that adequate closing force will be obtained while complying with barrier free opening force restrictions.



13 Parallel Arm Installation
(660R bracket furnished standard)

7601 PA
7605 PA



SIZE SELECTION CHART

CLOSER	INTERIOR/ EXTERIOR	DOOR WIDTH					
		2'-0" min.	2'-6" max.	3'-0" max.	3'-6" max.	4'-0" max.	4'-6" max.
7601	INTERIOR	✓	⊖	⊖	⊖	N/A	N/A
	EXTERIOR	N/A	⊖	⊖	N/A	N/A	N/A
7605	INTERIOR	N/A	N/A	N/A	✓	✓	✓
	EXTERIOR	N/A	✓	✓	✓	✓	N/A

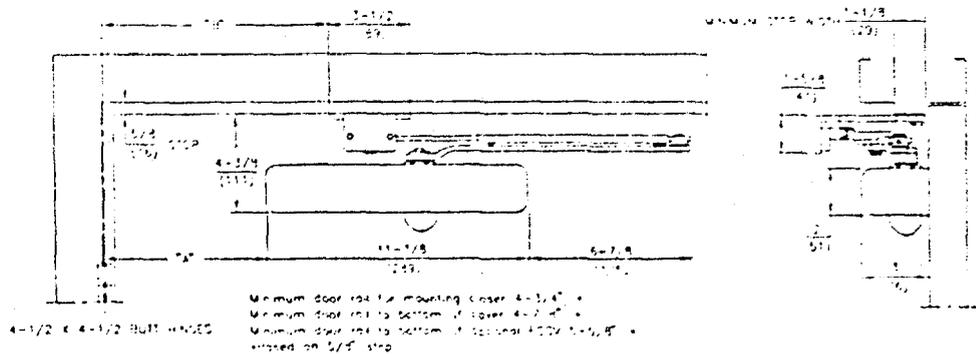
TEMPLATE REFERENCE	DIM "A"	DIM "B"	APPROX. MAXIMUM OPENING	APPROX. BACKCHECK RANGE	APPROX. DELAYED ACTION RANGE	MINIMUM DOOR WIDTH
TO 100"	5-7 3/8" (175)	9-7 3/8" (251)	110"	68"-110"	110"-75"	25"
OVER 100"	4-1 1/2" (114)	7-3 3/8" (197)	160"	95"-160"	160"-85"	24"

- ✓ - Recommended application
- N/A - Not applicable / application not recommended
- ⊖ - Opening force 5 lbs. or less on interior doors / 8.5 lbs. or less on exterior doors for door width noted.

Note: Although DORMA 7600 Series closers have adjustable spring power to compensate for site conditions, it can not be guaranteed that adequate closing force will be obtained while complying with barrier free opening force restrictions.

14 Parallel Arm Installation x
Friction Hold Open/
Fusible Link Hold Open
(Specify hand for fusible link)

7601 PAFHO
7605 PAFHO
7601 PAFL
7605 PAFL



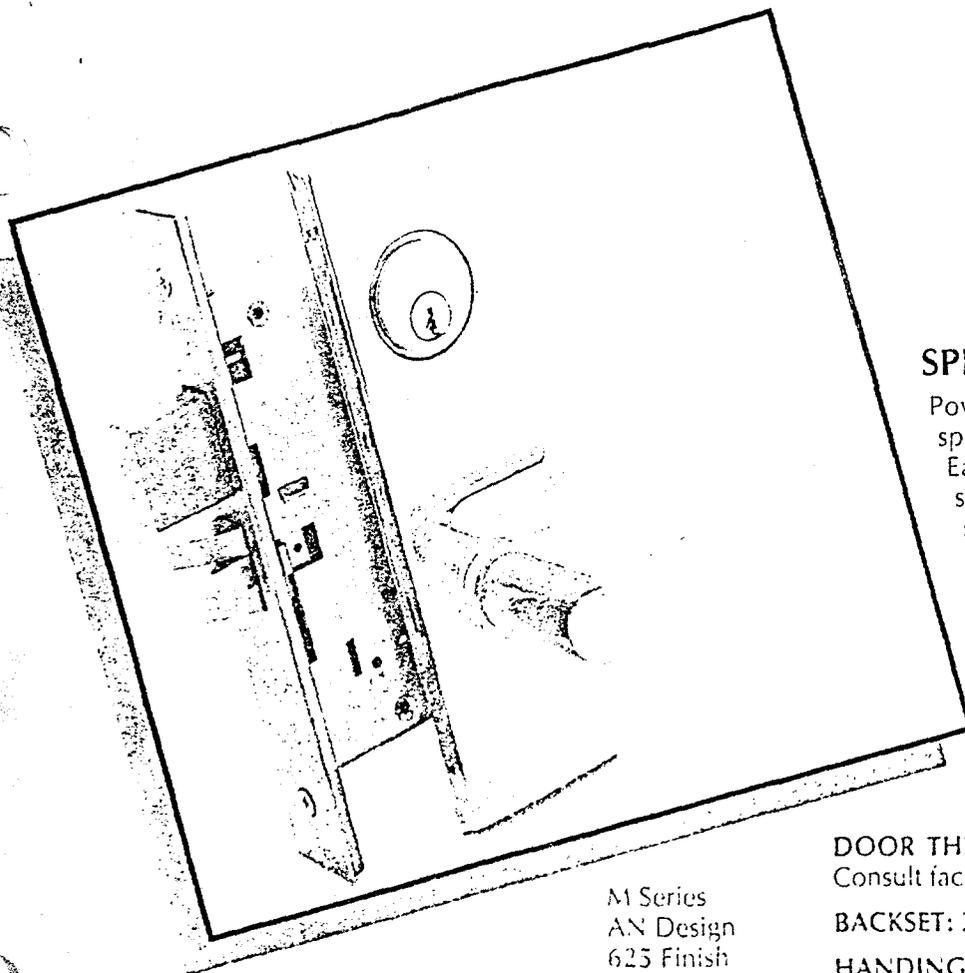
SIZE SELECTION CHART

CLOSER	INTERIOR/ EXTERIOR	DOOR WIDTH					
		2'-0" min.	2'-6" max.	3'-0" max.	3'-6" max.	4'-0" max.	4'-6" max.
7601	INTERIOR	✓	⊖	⊖	⊖	N/A	N/A
	EXTERIOR	N/A	⊖	⊖	N/A	N/A	N/A
7605	INTERIOR	N/A	N/A	N/A	✓	✓	✓
	EXTERIOR	N/A	✓	✓	✓	✓	N/A

REFERENCE	DIM "A"	DIM "B"	APPROX. MAXIMUM OPENING	APPROX. BACKCHECK RANGE	APPROX. DELAYED ACTION RANGE	MINIMUM HOLD OPEN	MAXIMUM HOLD OPEN	MINIMUM DOOR WIDTH
TO 100"	5-7 3/8" (175)	9-7 3/8" (251)	115"	65"-110"	116"-75"	45"	125"	26"
OVER 100"	5-1 1/2" (140)	7-3 3/8" (197)	160"	95"-160"	160"-83"	45"	125"	24"

- ✓ - Recommended application
- N/A - Not applicable / application not recommended
- ⊖ - Opening force 5 lbs. or less on interior doors / 8.5 lbs. or less on exterior doors for door width noted.

Note: Although DORMA 7600 Series closers have adjustable spring power to compensate for site conditions, it can not be guaranteed that adequate closing force will be obtained while complying with barrier free opening force restrictions.



M Series
AN Design
625 Finish

SPECIFICATIONS

Power Spring™ lever trims with individual spring in each trim to eliminate lever sag. Easily reversible in field. Stronger 10-32 screws with thread sealant for greater strength and resistance to loosening.

ATTACHMENT: Knob and rose trim require no surface applied screws. Inner and outer trims are designed to "bottom out" on 1 1/2" doors to prevent door collapse.

T-TURN: Normally furnished with a 1 1/4" T-turn. A 2" long lever for handicap areas is also available.

DOOR THICKNESS: 1 1/2" to 2" thick doors, standard. Consult factory for doors over 2" thick.

BACKSET: 2 1/4".

HANDING: Specify hand of door when ordering. See page 19.

STRIKES: Standard strike 4 1/2" x 1 1/4" reversible with straight lip, 1 1/2" lip-to-center, to meet ANSI A115.1 standard door frame preparation. Consult factory for other strike sizes and configurations.

CONSTRUCTION FEATURES

CASE: .090" thick, 5 3/4" high x 4 1/2" deep x 3/4" wide, made of cold rolled steel, plated with zinc chromate conversion to resist rust. Mechanism parts sintered steel, extruded brass, or cold rolled steel, zinc plated.

FRONT: .090" thick heavy steel front plate, adjustable for bevel of door.

FACEPLATES: (Scalps) 1 1/4" x 8" wrought brass, bronze or stainless steel.

HUBS: Sintered steel, impregnated and heat treated for strength and durability.

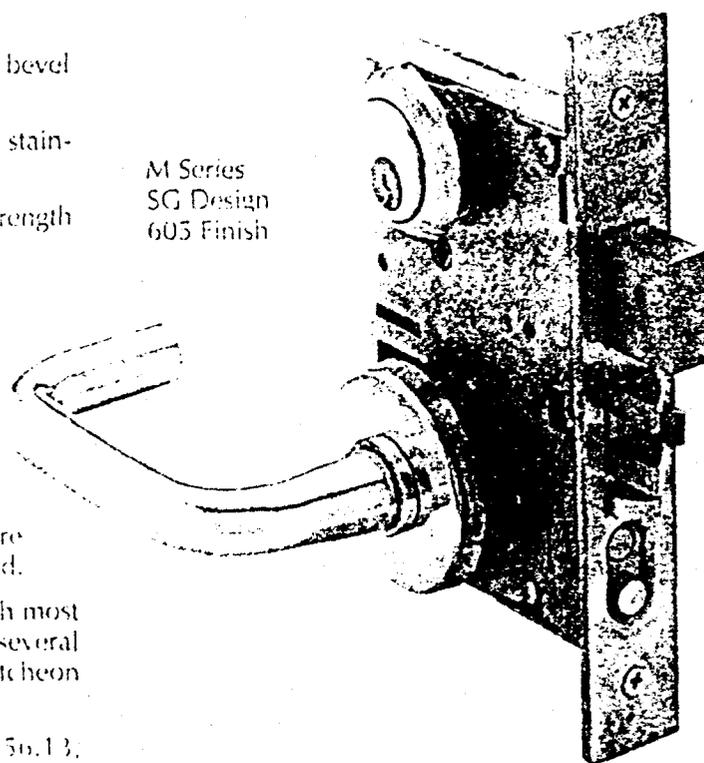
LATCH: 3/4" x 1" x 3/4" projection, anti-friction.

DEAD BOLT: 1" x 1 1/4" x 1" projection, with two hardened steel rollers.

CYLINDERS: 6 or 7 pin chambers in standard cylinder pinned in 5 unless otherwise specified. Also available with 6 or 7 pin interchangeable core cylinders. Keyed functions have threaded cylinder housings and plug machined of solid brass. Springs are phosphor bronze. Two nickel silver keys furnished standard.

TRIM: KNOBS: Heavy duty trim standard, compatible with most X and S Series. **LEVERS:** Cast, forged or wrought levers in several different styles. Trim also available as sectional or escutcheon design.

CERTIFICATION: UL Listed 3 Hour A Label, ANSI A156.13, Series 1000, Grade 1 operational, and when specified, Grade 1 security.



M Series
SG Design
605 Finish



To order NT Falcon Lock M Series Locksets, please consult page 19 for ordering information and assistance.

*8 indicates interchangeable core available.

Cat. No.	Function	Description	ANSI No. & Grade
M101		Passage/Closet Latchset Latch bolt by knobs at all times.	F01-1 F01-2
M301		Privacy Lock Latch bolt by knobs, dead bolt by turn inside or emergency key outside.	F02-1 F02-2
M311		Privacy, Bedroom or Bath Lock Latch bolt by knobs. Dead bolt by turn from inside and emergency key outside. Rotating inside knob retracts both bolts.	F19-1 F19-2
M371 8		Stoor Door Lock Latch bolt by knobs. Dead bolt by key from either side.	F14-1 F14-2
M381 8		Entry/Restroom Lock Deadlocking latch bolt by knobs except when outside knob is locked by key inside, then by key outside.	F09-1 F09-2
M411 8		Asylum Lock Deadlocking latch bolt by key from either side. Both knobs rigid.	
M451 8		Hotel/Motel Lock Deadlocking latch bolt by inside knob or key outside. Outside knob rigid. Dead bolt by turn inside or emergency key outside. Projecting dead bolt displays occupancy indicator and shuts out all keys except emergency. Rotating inside knob retracts both bolts.	F15-1 F15-2
M521 8		Entry/Office Lock Deadlocking latch bolt by knobs except when outside knob is locked by buttons in face, then by key outside.	F04-1 F04-2
M531 8		Entry/Office Lock Latch bolt by knobs except when outside knob is made inoperative by buttons in face. Dead bolt by key outside and turn inside. Rotating inside knob retracts both bolts. Deadlocking latch.	F10-1 F10-2 F12-1 F12-2 F20-1 F20-2

Cat. No.	Function	Description	ANSI No. & Grade
M541 8		Entry/Office Lock Latch bolt by knobs. Dead bolt by key outside or turn inside.	F21-1 F21-2
M561 8		Classroom Lock Deadlocking latch bolt by knobs. Outside knob locked by key outside. Inside knob always free.	F05-1 F05-2
M571 8		Dormitory Lock Latch bolt by knobs except when outside knob is locked by projecting dead bolt. Key outside retracts dead bolt and unlocks outside knob. Rotating inside knob retracts both bolts.	F13-1 F13-2
M581 8		Storeroom/Exit Lock Deadlocking latch bolt by inside knob or key outside. Outside knob rigid.	F07-1 F07-2
M621 8		Front Door Lock Latch bolt is operated by knob from either side except when outside knob is made inoperative by a stop or mechanical means other than key. Dead bolt is operated by turn inside. Key outside operates both bolts.	F08-1 F08-2
M631 8		Dormitory Lock Latch bolt by knob inside and key outside. Inside knob free. Outside knob rigid. Dead bolt by key outside. Rotating inside knob retracts both bolts. Deadlocking latch.	
M911 8		Safety Deadlock Dead bolt retracted by key outside or turn inside. Dead bolt projected by key outside.	
M921 8		Deadlock Dead bolt by key outside.	F18-1 F18-2
M931 8		Deadlock Dead bolt by key from either side.	F16-1 F16-2
M941 8		Deadlock Dead bolt by key outside or turn inside.	F17-1 F17-2
M961		Deadlock Dead bolt by turn inside.	
M12 M18		Dummy Single Pair	

PADLOCKS

NO. 955DL PADLOCK

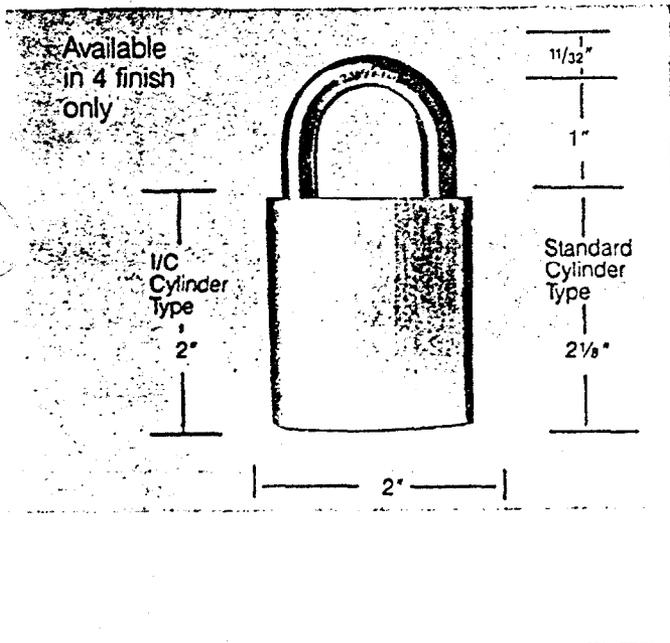
No. 955DL DEADLOCKING TYPE PADLOCK

A pin tumbler padlock manufactured from solid bar stock brass, with chrome-plated, case-hardened steel shackle. The entire cylinder assembly is removable for easier rekeying or quick cylinder change.

NOTE: Key is removable in locked position only with DL type padlocks.

Padlocks with longer shackles (2" or 6") available when specified. To order, specify as follows:

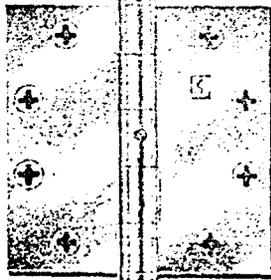
Example: 12 ea. No. 955DL with 6" shackle





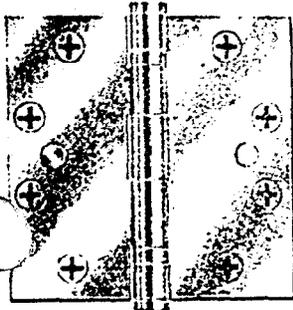
BASIC HINGE SELECTION

Three additional features that are commonly used are the Non-removable Pin (NRP), the Safety Stud (SH) and our Reverse Security Stud (RSS).

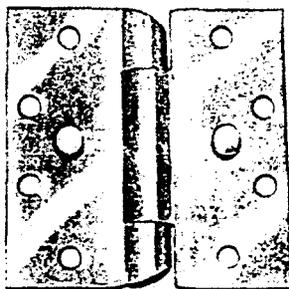


The non-removable pin (NRP) has a small set screw in the body of the barrel. This set screw is tightened down against the pin. The pin has a groove in the position where the set screw makes contact, allowing the set screw to seat. The set screw is positioned so it cannot be reached unless the door is

opened. If pin removal is necessary, the set screw is merely removed and the pin tapped from the bottom in the usual manner.



The safety stud (SH) is another feature which places a stud on one leaf and a locking hole on the other leaf; when the door is closed, the stud is anchored into the opposite leaf. Even if the hinge pin is removed, the door is secure because the leaves are locked together.



The reverse security stud (RSS) is a feature that has a stud projecting from the back of both leaves into the reinforcing plate of both the frame and the door. It is intended to keep the hinge locked in place from abuse of battering or trying to shear the hinge and screws. This feature is

primarily used in prisons and psychiatric areas.

One important point must be made here. *These features are intended as deterrents only.* If someone wants to gain entry through a door badly enough, eventually they will get through.

Another special function available is the **RAISED BARREL** hinge, this is used when the door is set deep back into the frame. There are three different types of applications: *Jamb Surface Mount, Raised Barrel for Square Edged Door and Raised Barrel for Beveled Edged Door.* The hinge knuckle is offset to allow it to clear the obstruction of the frame.

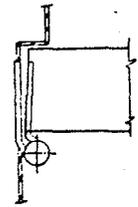
On the Jamb Surface Mount (JSM) application, the door is

mortised to accommodate both hinge leaves or what is sometimes referred to as double mortised. The Jamb Surface Mount may be applied to either a square or beveled edge door.

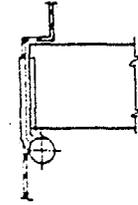
The Raised Barrel for Square Edged door (RBS) and the Raised Barrel for Beveled Edged (RBB) door applications are mortised into the frame and door as a standard full mortised hinge.

Depending on the depth of the frame, all three of these applications may restrict the degree of opening.

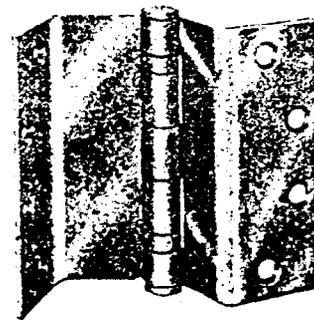
Another special feature hinge is the **Swing Clear** type. This is used mostly in hospitals and institutional buildings when the passage area must be the full width of the opening. One such case would be an eight foot wide corridor that requires the full opening for the passage of two beds or carts. With the use of swing clear hinges this passage can be accomplished.



Raised Barrel Beveled



Raised Barrel Square



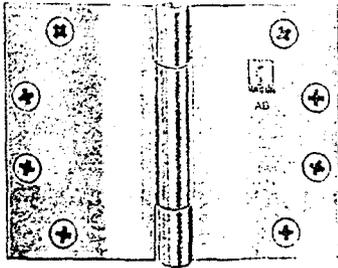
The hinges are designed to swing the door completely clear of the opening when the door is opened 95 degrees. The standard way to accomplish this degree of opening is to build a pocket in the wall to accept the door. This allows the door to be concealed in the wall and not obstruct the flow of traffic.

One additional point to remember: only on the Full Mortise hinges are there two dimensions, such as a 4 1/2" x 4 1/2". The first dimension indicates the height and the second dimension indicates the width when the hinge is in the open position. On all other classifications there is only one dimension, that is the height.



FULL MORTISE HINGES

Concealed Bearing Hinge • Heavy Weight • Template • Wide Throw
For use on Heavy Weight Door or Doors Requiring High Frequency Service



WTAB750

Steel with Steel Pin ANSI A8111

WTAB850

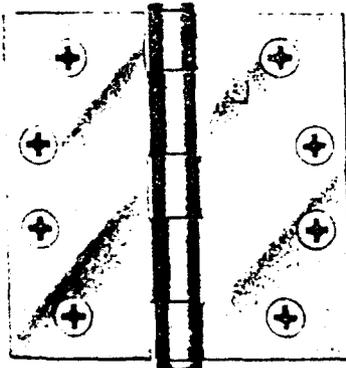
Brass ANSI A2111
 Stainless Steel with
 Stainless Steel Pin ANSI A5111

Three knuckle with concealed hinge bearings non-rising removable pin, concealed pin head and plug. Specify Screw Requirements.

Size Open (Inches)	4 1/2 x 5 4 1/2 x 6 4 1/2 x 7 4 1/2 x 8	5 x 6 5 x 7 5 x 8
Gauge of metal	.180	.190
Number of holes	8	8
Machine screw size	1/2 x 12-24	1/2 x 12-24
Wood screw size	1 1/4 x 12	1 1/4 x 12
Box quantity	1 1/2 pr (3 ea)	1 1/2 pr (3 ea)
Pair in a case	12	6
Average weight per case (lbs)		
Steel — Stainless	55	32
Brass	60	35

Plain Bearing • Standard Weight • Template

For use on Medium Weight Doors Requiring Low Frequency Service
Not for use with Door Closer



For Hospital type
 prefix "HT" to catalog
 number

1279

Steel with Steel Pin ANSI A8133

1191

Brass ANSI A2133
 Stainless Steel with
 Stainless Steel Pin ANSI A5133

Five knuckle non-rising removable pin with button top and plug. Specify Screw Requirements.

Size Open (Inches)	2 x 2	2 1/2 x 2 1/2	3 x 3	5 x 4 3 1/2 x 3 1/2	6 x 4 1/2 4 x 4	4 1/2 x 4 4 1/2 x 4 1/2	5 x 4 1/2 5 x 5	6 x 5 6 x 6
Gauge of metal	.083	.089	.097	.113	.129	.134	.145	.160
Number of holes	4	6	6	6	8	8	8	10
Machine screw size	1/2x8-32	1/2x8-32	1/2x10-24	1/2x10-24	1/2x12-24	1/2x12-24	1/2x12-24	1/2x14-20
Wood screw size	3/4x8	3/4x8	1x9	1x9	1 1/4x12	1 1/4x12	1 1/4x12	1 1/2x14
Box quantity	5 pr (10 ea)	5 pr (10 ea)	1 pr (2 ea)	1 pr (2 ea)	1 1/2 pr (3 ea)	1 1/2 pr (3 ea)	1 1/2 pr (3 ea)	1 1/2 pr (3 ea)
Pair in case	100	100	50	50	24	24	12	12
Average weight per case (lbs)								
Steel — Stainless	32	34	37	66	43	55	37	61
Brass	35	39	40	72	47	60	40	66

Furnished with screw hole location to conform to standards approved by (ANSI) A156.7—1988.

FULL MORTISE HINGES



Ball Bearing • Standard Weight • Template

For use on Medium Weight Doors or Doors Requiring Average Frequency Service

BB1279

Steel with Steel Pin ANSI A8112

BB1191

Brass ANSI A2112

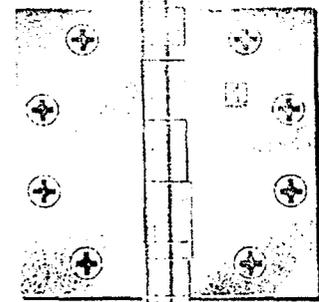
Stainless Steel with

Stainless Steel Pin ANSI A5112

Five knuckle two ball bearings non-rising removable pin with button tip and plug. Specify Screw Requirements.



For Hospital type prefix "HT" to catalog number



Size Open (Inches)	3 1/2 x 3 1/2	4 x 4	4 1/2 x 4 4 1/2 x 4 1/2	5 x 4 5 x 4 1/2 5 x 5	6 x 4 1/2 6 x 5 6 x 6
Gauge of metal	.119	.129	.134	.145	.160
Number of holes	6	8	8	8	10
Machine screw size	1/2 x 10-24	1/2 x 12-24	1/2 x 12-24	1/2 x 12-24	1/2 x 1/4-20
Wood screw size	1 x 9	1 1/4 x 12	1 1/4 x 12	1 1/4 x 12	1 1/2 x 14
Box quantity	1 pr (2 ea)	1 1/2 pr (3 ea)	1 1/2 pr (3 ea)	1 1/2 pr (3 ea)	1 1/2 pr (3 ea)
Pair in case	50	24	24	12	12
Average weight per case (lbs)					
Steel-Stainless	66	43	55	37	57
Brass	72	47	60	40	62

Ball Bearing • Heavy Weight • Template

For use on Heavy Weight Doors or Doors Requiring High Frequency Service

BB1168

Steel with Steel Pin ANSI A8111

BB1199

Brass ANSI A2111

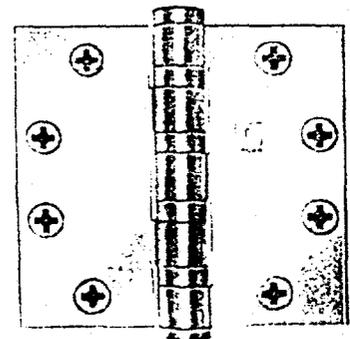
Stainless Steel with

Stainless Steel Pin ANSI A5111

Five knuckle four ball bearings non-rising removable pin with button tip and plug. Specify Screw Requirements.

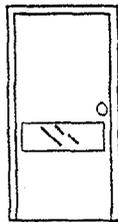


For Hospital type prefix "HT" to catalog number

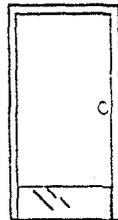


Size Open (Inches)	4 1/2 x 4 4 1/2 x 4 1/2	5 x 4 5 x 4 1/2 5 x 5	6 x 4 1/2 6 x 5 6 x 6	8 x 6 8 x 8
Gauge of metal	.180	.190	.190 Stainless Steel .203 Steel & Brass	.190 Stainless Steel .203 Steel & Brass
Number of holes	8	8	10	16
Machine screw size	1/2 x 12-24	1/2 x 12-24	1/2 x 1/4-20	1/2 x 1/4-20
Wood screw size	1 1/4 x 12	1 1/4 x 12	1 1/2 x 14	1 1/2 x 14
Box quantity	1 1/2 pr (3 ea)	1 1/2 pr (3 ea)	1 1/2 pr (3 ea)	1 1/2 pr (3 ea)
Pair in a case	12	12	12	6
Average weight per case (lbs.)				
Steel—Stainless	35	44		67
Brass	38	48	70	67
Stainless			65	62

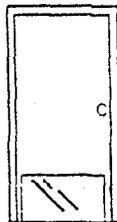
Furnished with screw hole location to conform to standards approved by (ANSI) A156.7—1988.
Hinge testing conform to ANSI - A156.1—1988.



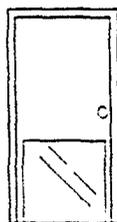
STRETCHER PLATE



MOP PLATE



KICK PLATE



ARMOR PLATE

190S/193S/194S/196R/198S/204S/ 214S/220S/223S/224S/225S

DOOR PROTECTION PLATES

STANDARD SIZE: Mop plate 4", 6" High; Kick Plate 8", 10", 12" High;
Armor Plate 14" to 48" High

PACKED: One per Bag with #6 x 5/8" Truss-Head Screws.

OPTION: AT EXTRA CHARGE, COUNTER SUNK HOLES, SPECIFY "CSK".

TO ORDER: Give number, size, height first and finish. Plates are sized on even inches. Odd size available, priced next size larger.

KICKPLATES 2" LESS THAN DOOR WIDTH
MOP PLATES 1" LESS THAN DOOR WIDTH

NUMBER	MATERIAL	THICKNESS	B&S GA.	US GA.	BEVEL	FINISH
190S	Metal*	.050"	16	18	None	**
193S	Metal*	.050"	16	18	B3E	**
194S	Metal*	.050"	16	18	B4E	**
196R	Metal*	.050"	16	18	None	**
198S	Metal(1)	.038"	—	20	None	32D
204S	Clear Plastic	1/8"	—	—	B4E	Clear "PC"
214S	Plastic Laminate(2)	1/8"	—	—	B4E	Black "PK" Brown "CO" Grey "PG"
220S	Metal*	.062"	14	16	None	**
223S	Metal*	.062"	14	16	B3E	**
224S	Metal*	.062"	14	16	NONE	**
225S	Kydex(2) ②	.081"	—	—	NONE	—

* Aluminum, Brass, Bronze, Stainless Steel.

** All Standard Finishes, see Page 1P.

Plates meet ANSI A156.6 for J101 Metal or J105 Plastic Armor Plate; J102 Metal or J106 Plastic Kickplate; J103 Metal or J107 Plastic Mop Plate.

1) Stainless Steel Only.

2) Color Selection, other than standard. Subject to Minimum Order Quantity: Price on Application.



WALL STOPS WITH CONCEALED MOUNTING

230W

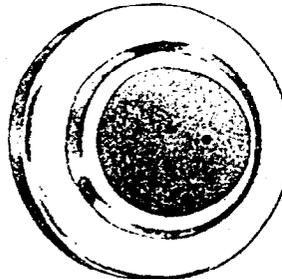
CONVEX WALL STOP

27/16" Diameter; 13/16" Projection

MATERIAL: Cast Brass, Bronze w/Rubber Bumper
FINISHES: 3,4, 10, 10B, 26 & 26D in stock. Other
Finishes on Special Order. Price on
Application.

PACKED: 10 Per Box w/#10 x 11/4" Mounting Screws,
Shield and Toggle®

OPTION: MS & Tampin Shield
Meets ANSI A156.16 for L12101



231W

CONVEX WALL STOP

27/16" Diameter; 13/16" Projection

MATERIAL: Cast Brass, Bronze w/Rubber Bumper
FINISHES: 3,4, 10, 10B, 26 & 26D in stock. Other
Finishes on Special Order. Price on
Application.

PACKED: 10 Per Box w/#10 x 11/4" Mounting Screws,
and 10/24 x 21/2" M.S. and Toggle Nut
Meets ANSI A156.16 for L12101

NOTE: For fastener details, refer to Page 20P.

232W

CONVEX WALL STOP

21/2" Diameter; 13/16" Projection

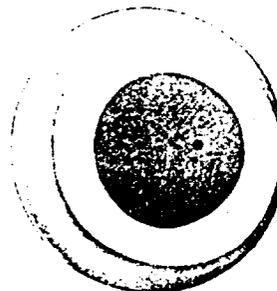
MATERIAL: Wrought Brass, Bronze or Stainless steel
w/Rubber Bumper

FINISHES: 3,4, 10, 10B, 26, 26D, 32 & 32D only.

PACKED: 10 Per Box w/#10 x 11/4" Mounting Screws,
Shield and Toggle®

OPTION: MS & Tampin Shield
Also Available in 50 Count Builder's Pack
SPECIFY: BL232W

Meets ANSI A156.16 for L22101 and L52101



233W

CONVEX WALL STOP

21/2" Diameter; 13/16" Projection

MATERIAL: Wrought Brass, Bronze or Stainless Steel
w/Rubber Bumper

FINISHES: 3, 4, 10 10B, 26, 26D, 32 & 32D only.

PACKED: 10 Per Box w/#10 x 11/4" Mounting Screws,
and 10/24 x 21/2" M.S. and Toggle Nut

Meets ANSI A156.16 for L22101 and L52101



250W

CONVEX WALL STOP

1" Diameter; 1/2" Projection

MATERIAL: Wrought Brass

FINISHES: 3,10B, 26 & 26D only.

PACKED: 20 Per Box w/#6 x 5/8" Mounting Screws,
and Shields



FLUSH BOLTS



281D

SLIDE FLUSH BOLT

FACE: 3/4" x 6"
 BOLT HEAD: 1/2"
 STRIKE: 7/8" x 1 3/4"
 MATERIAL: Brass
 FINISHES: 3, 4, 10, 10B, 26 & 26D only.
 PACKED: 10 per box w/#6 FHWS
 Meets ANSI A156.16 for L24201



282D(1)

(1) Fits ANSI A115 Door & Frame Prep.

282R



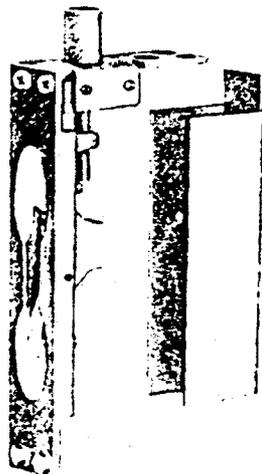
282D*

LEVER EXTENSION FLUSH BOLT

FACE: 1" X 6 3/4"
 BOLT HEAD: Flatted 1/2" RD
 THROW: 3/4"
 ROD BACKSET: 3/4"
 GUIDE: 1" x 2"
 STRIKE: 15/16" X 2 1/4"
 MATERIAL: Extruded Brass
 FINISHES: 3, 4, 10, 10B, 26 & 26D only
 PACKED: 2 per box w/#8 combination screws
 STANDARD ROD LENGTH: 282D, 12" Center of Face
 to Corner of Door.



For other centers, Specify 282R Rod.
 DIMENSIONS: 18", 25" & 30" Available.
 Bolt Head Not Included.



283D

283D*

LEVER EXTENSION FLUSH BOLT

(For Use on Wood Composite Door)
 FACE: 1" x 6 3/4"
 BOLT HEAD: Flatted 1/2" RD
 THROW: 3/4"
 ROD BACK SET: 3/4"
 STRIKE: 15/16" x 2 1/4"
 MATERIAL: Extruded Brass
 FINISHES: 3, 4, 10, 10B, 26 & 26D only
 PACKED: 2 per box w/#8 combination screws



*Meets ANSI A156.16 for L24251



MISCELLANEOUS PRODUCTS



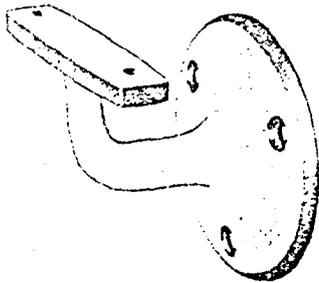
300D

CHAIN DOOR CHECK

WELDED STEEL TWIST TYPE CHAIN
W/HEAVY COMPRESSION SPRING AT END
OF CHAIN.

CLOTH BACKED LEATHERETT COVER.
BASE PLATE, CAST BRASS 1 1/2" X 1 1/2".
OVERALL LENGTH: 25 1/2" (Available 30 1/2")
AVAILABLE OPTION: Through door mtg. at
extra charge w/Grommet Nut sets
FINISH: 26D Only.

PACKED: 5 per box w/#10 x 1" OHWS.
Meets ANSI A156.16 For L02231

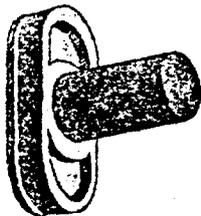


303W

HAND RAIL BRACKET

3 1/8" Diameter Base;
2 3/4" From Base to Center of Rail
MATERIAL: Cast Brass

FINISHES: All Standard, See Page iP.
PACKED: 5 each per box with #10 x 1 1/2" OHWS.



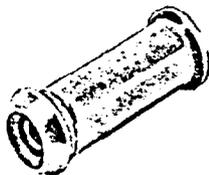
308D

DOOR SILENCER
3/8" x 3/4" Base; 3/4" Length
MATERIAL: Rubber
FOR WOOD FRAMES
PACKED: 100 per bag



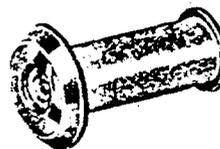
307D

DOOR SILENCER
1/2" Diameter; 1 1/16" Length
MATERIAL: Rubber
FOR METAL FRAMES
PACKED: 100 per bag



1755

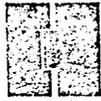
160° Door Viewer
Solid Brass
Adjustable For Doors 1 3/8" To 2 1/8" TK.
Requires 1/2" Hole in Door
Finish: 3 - 26D
Packed: 5 Per Box;
Meets ANSI A156.16 - L13221



1756

200° Door Viewer
Solid Brass
Adjustable For Doors
1 3/8" To 2 1/8" TK.
Requires 5/8" Hole in Door
Finish: 3 - 26D
Packed: 5 Per Box;
Meets ANSI A156.16 - L13221





SEALING SYSTEMS

SADDLE TYPE THRESHOLD



410S ONLY

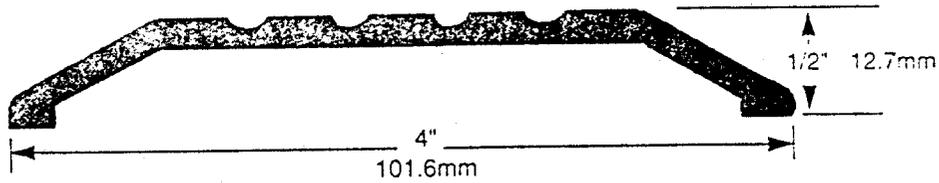
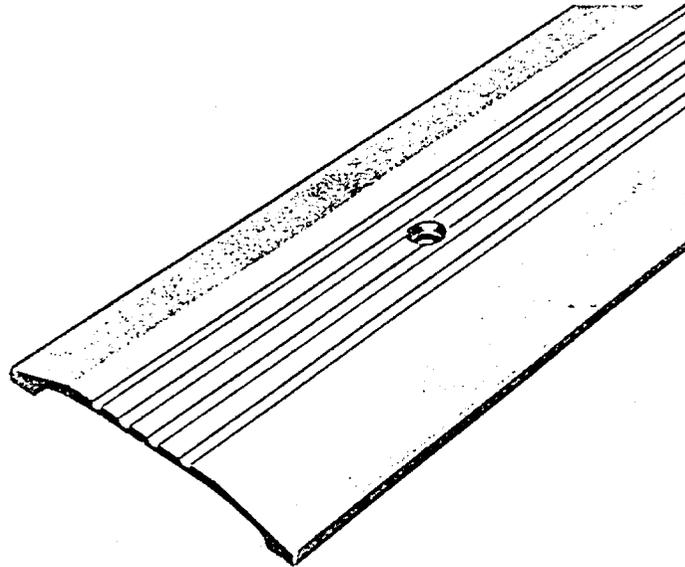
410S / 411S

SADDLE THRESHOLD

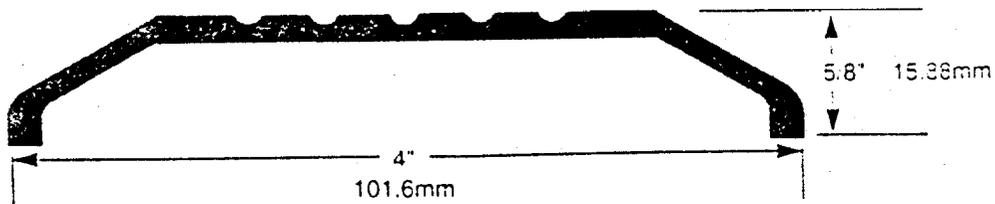
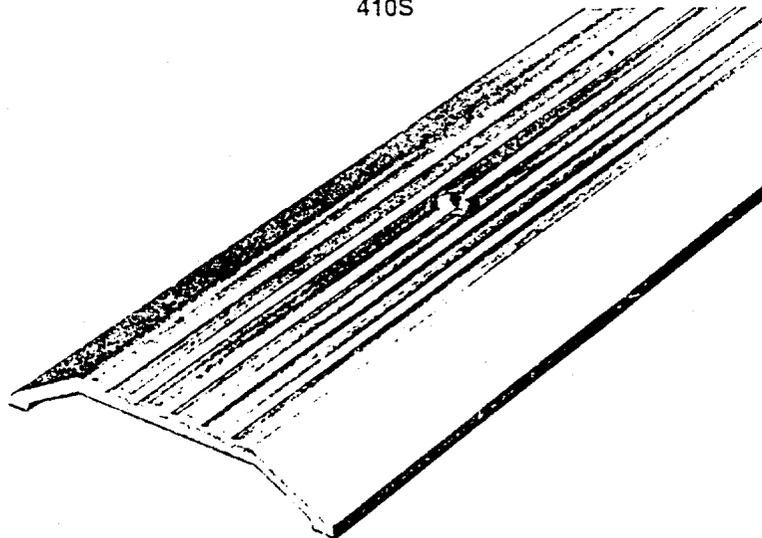
Meets ANSI 156.21, J32100 - Aluminum

Meets ANSI 156.21, J12100 - Bronze

- Constructed of strong, high quality extruded Grade 6063-T5 aluminum for dependable long lasting performance.
- Available in Bronze Extrusion.
- Available in a variety of configurations and lengths that meet the requirements of standard applications and building codes.
- All thresholds are furnished with appropriate size full threaded wood screws compatible with specified elevations.
- Threshold with fasteners are wrapped for individual protection.
- Available in AL, DU, BR Finishes.



410S



411S



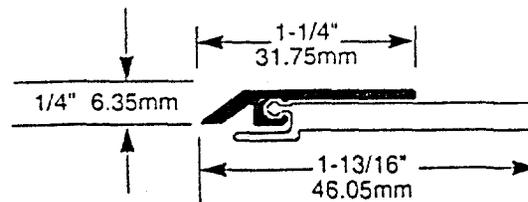
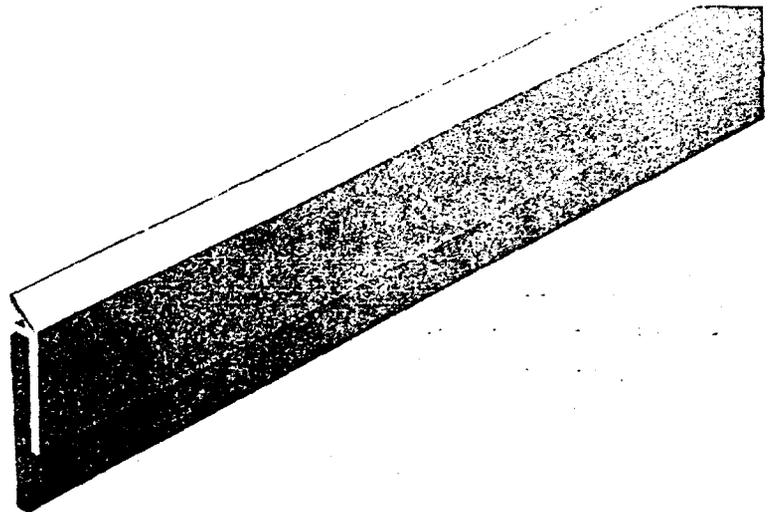
SEALING SYSTEMS

DOOR SWEEPS / BOTTOM

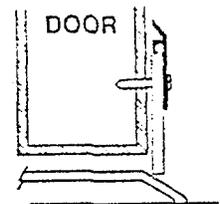


750SN DOOR SWEEP / BOTTOM

- Provides door bottom protection against weather, light, sound, insects and dust for new and existing doors.
- Constructed of extruded aluminum housing with a durable solid neoprene rubber seal for lasting performance.
- Door sweep creates a door positive contact seal with threshold or floor.
- Slotted holes for easy adjustment.
- See Price List for available finishes.
- Supplied with #6 sheet metal screws.
- Available in CA, DU, GL, BR Finishes.

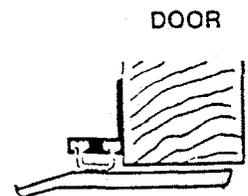
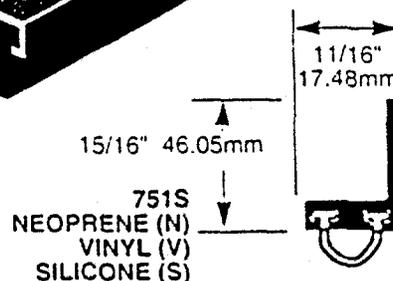
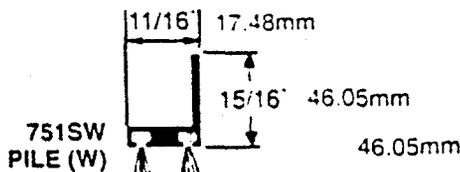
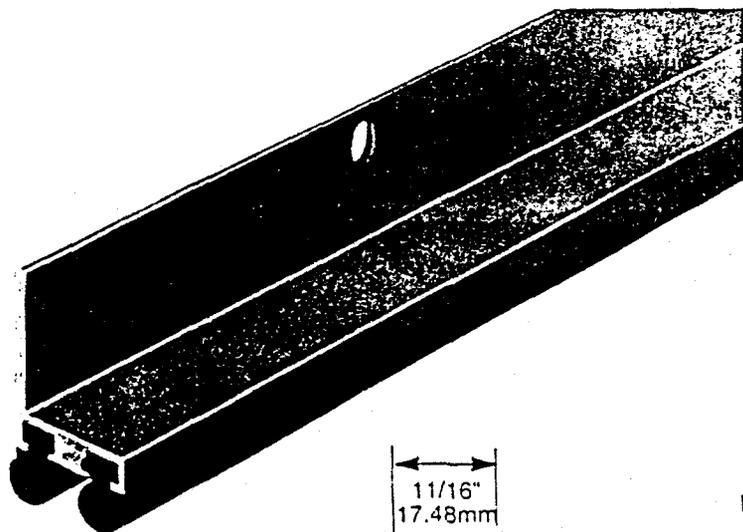


750S



751SN/SS/SV/SW DOOR SWEEP / BOTTOM

- Provides door bottom protection against weather, light, sound, insects and dust for new and existing doors.
- Constructed of extruded aluminum housing with a durable insert for lasting performance: 751SV - Vinyl; 751SW - Pile; 751SN - Neoprene; 751SS - Silicone.
- Door sweep creates a positive contact seal with threshold or floor.
- Slotted holes for easy adjustment.
- Supplies with #6 sheet metal screws.
- Available in AL, DU, GL Finishes.





HAGER®

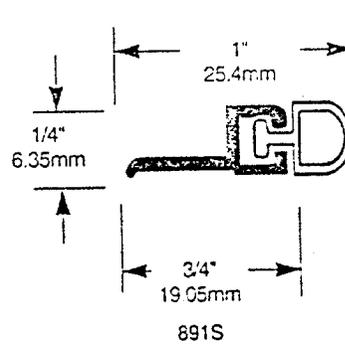
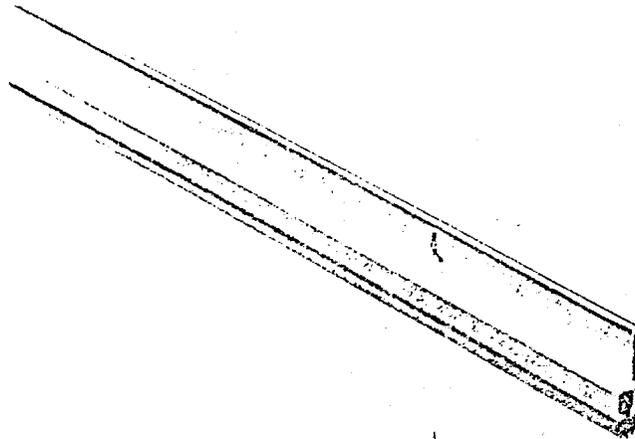
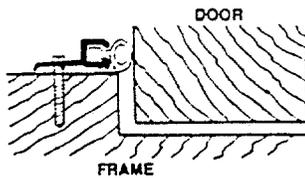
SEALING SYSTEMS

DOOR GASKETING



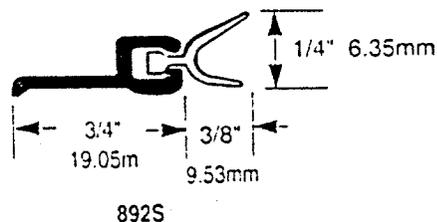
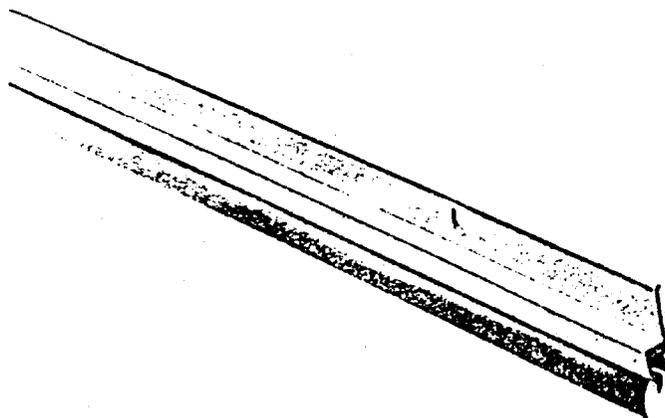
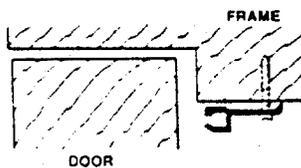
891SN/SS/SV JAMB-UP SEAL

- Protects against weather, light and sound infiltration on new and existing doors and frames without impairing door latching at normal closing force.
- Constructed of sturdy extruded aluminum housing with durable sealing member: 891SV - Vinyl; 891SN - Neoprene; 891SS - Silicone.
- Provides continuous seal along head and jambs.
- Slotted holes for easy adjustment.
- Supplied with #6 sheet metal screws.
- Available in AL, DU, GL Finishes.



892SV JAMB-UP SEAL

- Protects against weather, light and sound infiltration on new and existing doors and frames without impairing door latching at normal closing force.
- Constructed of sturdy aluminum housing with durable vinyl sealing member.
- Provides continuous seal along head and jambs.
- Slotted holes for easy adjustment.
- Supplied with #6 sheet metal screws.
- Available in CA, DU, GL Finishes.



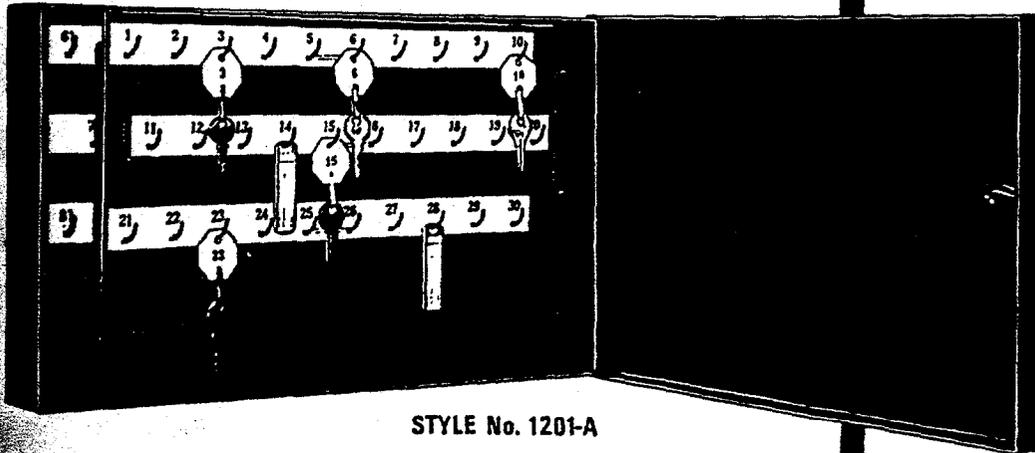
Lund De Luxe WALL CABINETS

A book index (No. 511-B) is furnished with all Lund De Luxe Wall Cabinets with the Two Tag Key System. This index is to be filed in the office letter file cabinet for key security.

Panel hooks and key tags are numbered consecutively from No. 1 up. Hooks on panels are 1/2" long.

See Page 4 for Two Tag Key System.

See Page 15 for Color Tags.



STYLE No. 1201-A

Wall cabinets are made from 18 gauge office furniture steel with electrically welded construction.

Finish is light office gray baked-on enamel.

Doors have chrome plated cylinder locks and continuous piano type hinges.

Cabinets can be furnished with dual locks and combination locks as a special feature at extra cost.

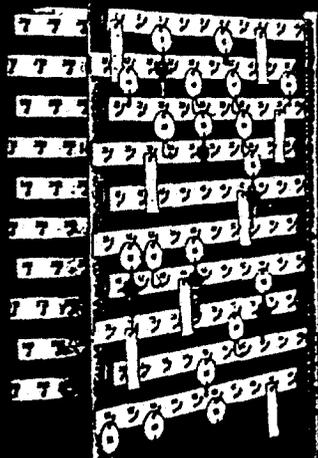
Index pockets on the door can also be furnished as a special feature at extra cost.

Special: Your present cabinet may be expanded. See Page 5 in Price List.

WALL KEY CABINETS

Size 17 1/8" W x 11" H x 2 1/2" D

- No. 1200 — 30 cap.
Expand up to 90 cap.
- No. 1201 — 60 cap.
Expand up to 90 cap.
- No. 1201-A — 90 cap.
No expansion.
- No. 1201-B — 120 cap.
No expansion.

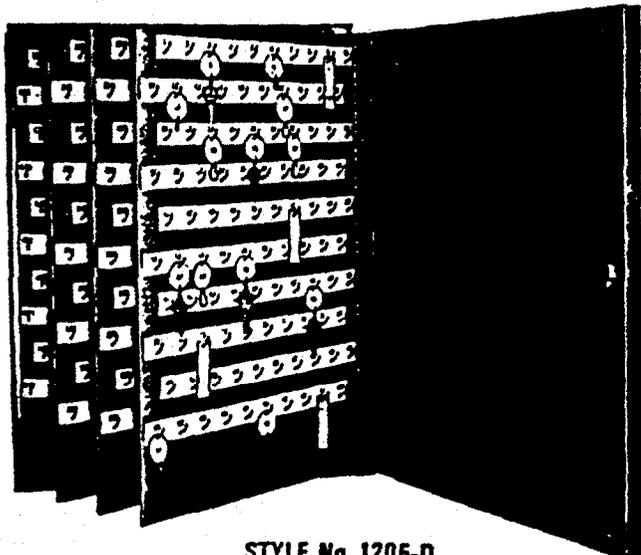


STYLE No. 1204-A

WALL KEY CABINETS

Size 17 1/8" W x 24 3/4" H x 2 1/2" D

- No. 1202 — 130 cap. Expand up to 300 cap.
- No. 1203 — 160 cap. Expand up to 300 cap.
- No. 1203-A — 200 cap. Expand up to 300 cap.
- No. 1204 — 250 cap. Expand up to 300 cap.
- No. 1204-A — 300 cap. No expansion.



STYLE No. 1205-D

WALL KEY CABINETS

Size 19 1/4" W x 24 3/4" H x 5" D

- No. 1205 — 350 cap. Expand up to 700 cap.
- No. 1205-A — 400 cap. Expand up to 700 cap.
- No. 1205-AA — 450 cap. Expand up to 700 cap.
- No. 1205-B — 500 cap. Expand up to 700 cap.
- No. 1205-C — 600 cap. Expand up to 700 cap.
- No. 1205-D — 700 cap. No expansion.



RECEIVED

APR 25 1995

7412 ACC Boulevard
Raleigh, NC 27613

PO Box 33415
Raleigh, NC 27636

April 22, 1995

Northeast Construction
229 Center Street
Jacksonville, NC 28541

RE: Ground Water Remediation Bldg.
Camp Lejeune, NC.

This is to certify that the hollow metal doors, frames, and accessories supplied by B. A. Hoft, Inc. for the above referenced project in Section 08110, pages one through eight, paragraphs therein, meet or exceed the BHMA/ANSI specifications as listed.

Sincerely,

B. A. HOFT, INC.

Scott Cunningham, AHC
Vice President

SC: jh

This is to certify that on the 22nd day of April, 1995, personally appeared before me, Scott Cunningham, AHC being by me first duly sworn, deposes and says that he signed the foregoing letter of certification, that he was authorized so to sign, and that the statements therein contained are true.

My commission expires:

May 18, 1997

THE CONTRACTOR'S FULLY EXECUTED CONTRACT WITH THE OWNER IS HEREBY ACCEPTED AND APPROVED BY THE CONTRACTOR.

NO EXCEPTIONS

AMEND AND RESUBMIT

Date: April 22, 1995 by Scott Cunningham

OHM REMEDIATION SERVICES CORP.

James A. Williams
NORTHEAST CONSTRUCTION CO.
POST OFFICE BOX 548
JACKSONVILLE, NC 28541-0548

Approved

Approved as noted

Revise and Resubmit

By [Signature]

Date 4/25/95

Approval does not relieve supplier or subcontractor of his obligation to furnish and/or install this material in accordance with requirements of the contractual plans and specifications.

Raleigh
919-851-7050

Durham
919-596-4446
Fax 919-596-9520

Distributors of:
Contract Hardware
Hollow Metal Doors & Frames
Wood Doors
Building Specialties

CURRIES

HOLLOW METAL DOORS AND FRAMES

DISTRIBUTED BY:

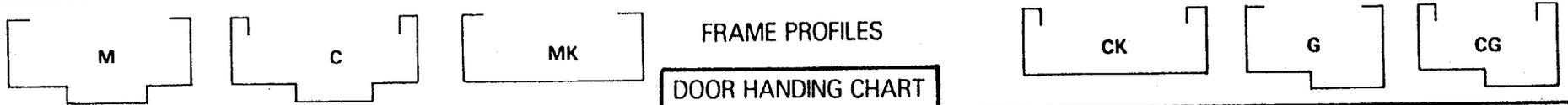
B.A. HOFT, INC.

P.O. BOX 90127 • RALEIGH, NC 27675-0127
7412 ACC BLVD. • RALEIGH, NC 27613

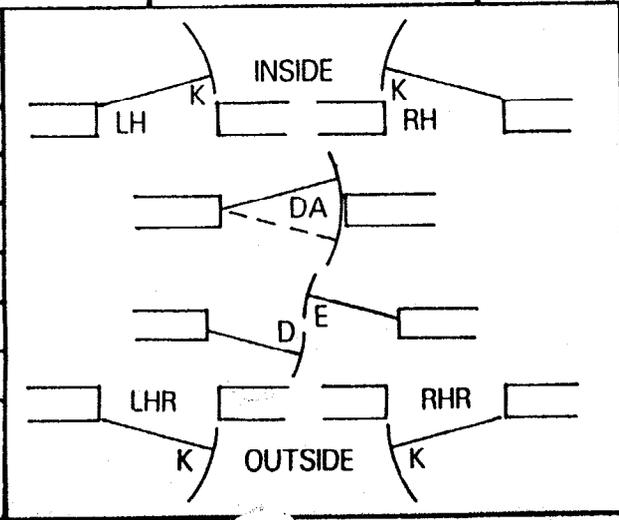
HOFT, INC. CONSTRUCTION CO.
POST OFFICE BOX 548
JACKSONVILLE, NC 28641-0548

Approved
Approved as noted
Revise and Resubmit
By [Signature]
Date 4/2/95

Approval does not relieve supplier or subcontractor of his obligation to furnish and/or install this material in accordance with requirements of the contractual plans and specifications.



RECORD OF SUBMITTALS	
SUBMITTED	RETURNED
1ST <u>4/2/95</u>	
2ND	
3RD	
4TH	
RECEIVED APPROVED DRAWINGS	
RECEIVED APPROVED HARDWARE	
DRAWN BY: <u>Scott Cunningham</u>	



JOB NO. <u>SC 62548</u>
PROJECT <u>Grand Water Redemption Bldg.</u>
LOCATION <u>Camp Lejeune, N.C.</u>
ARCHITECT <u>Dept. of the Navy</u>
CONTRACTOR <u>Northeast Const. Co.</u>
FINISH HARDWARE BY <u>B.A. Hoft, Inc.</u>
SHEET NO. <u>1</u> OF <u>3</u>

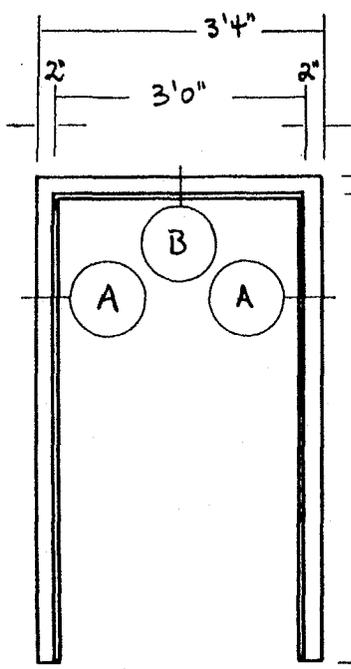
GENERAL NOTES:

1. Material shown on these drawings will be fabricated only after formal approval by the architect and contractor, receipt of approved hardware schedule and all necessary hardware templates. *Delivery runs 6 to 8 weeks after approvals.*
2. Doors and frames will be reinforced for surface mounted hardware as required. Drilling and tapping for attaching of surface mounted hardware by others. Doors and frames will be prepared and reinforced for mortise hardware. Holes for this hardware will be drilled and tapped at the factory except for trim mounting holes. Surface exit cylinder and thumb piece holes factory drilled only when ordered.
3. All doors and frames will receive an iron phosphate treatment and 1 coat of baked on prime paint.
4. Installation of glass and glazing by others.
5. All doors and frames will be marked with the architect's number unless specified otherwise.
6. ~~Unless otherwise noted, all frames will be supplied with 3M adhesive silencers (field applied after finish painting), 3 per strike jamb for single frames or 2 per head for double frames.~~
or
All frames will be prepared for push-in type silencers, 3 per strike jamb for single frames or 2 per head for double frames (supplied by others) or (installed).
7. Unless noted otherwise, all hollow metal frames shall be die-mitered, ~~Knock-down construction or set-up~~ and welded as specified.
8. The hardware locations indicated on the door and frame elevation are this manufacturer's standard locations for standard type hardware. Other hardware such as deadlocks, panic exit devices, etc., will also be located at this manufacturer's standard locations for that specific hardware unless advised otherwise.
9. All hollow metal doors to be undercut 5/8", unless noted otherwise.
10. on PAIRS of DOORS indicate ACTIVE LEAF in the handling column.
11. Store doors and frames at the building site under cover. place units on at least 4" wood sills or on the floors in a manner that will prevent rust and damage. Avoid use of non-vented plastic or canvas shelters, which create a humidity chamber. If the wrapper on the door becomes wet, remove immediately, Provide 1/4" space between doors to promote air circulation.
12. Frames in masonry construction to be filled with grout, when anti-freeze additives are added to the mortar, the insides of the frames shall be treated in the field by the general contractor with a bituminous asphalt material.
13. *Exterior doors and frames shall be galvanized (Alo).*

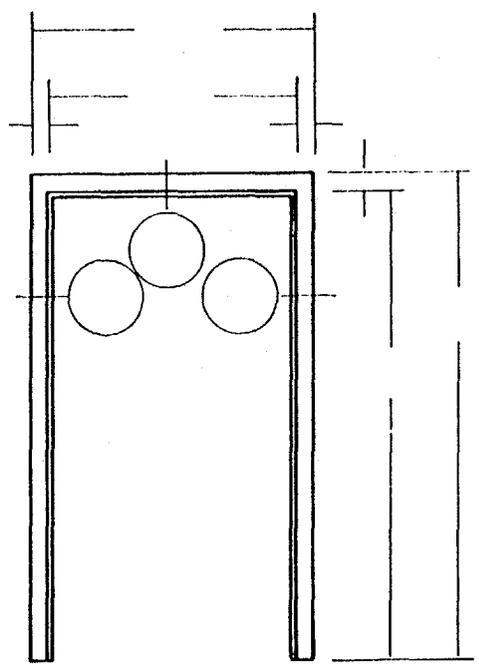
JOB NO.	PROJECT	LOCATION	SHEET NO. 2 OF 3
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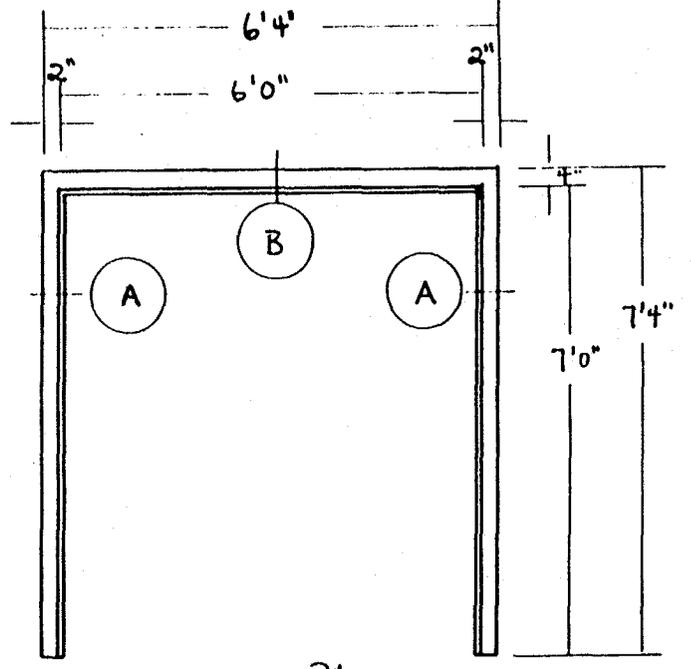
LOCATION				FRAME DATA									DOOR DATA								SPECIAL INFO				
	TO OR FROM		ARCH #	LABEL	DOOR OPENING SIZE	HAND	THICKNESS	QTY.	JAMB DEPTH	PROFILE	GAUGE	ELEV. SHT.	ANCHOR SHT.	QTY.	SERIES	EDGE	GAUGE	TYPE	SHEET	EXTERIOR	UNDERCUT	ASTRAG.	HWIDE		
1	Ext.	f	105	2	6°7°	RR	1 3/4	1	5 3/4	M	16	P4	4 MW	4	2	707	S	18	F	6	✓	5/8	F	1	
2	105	t	103	3	3°7°	L						ST		1				FL						2	
3	Ext.	f	102	4	6°7°	RR						P4		2				F		✓		F		3	
4	105	f	102	5	6°7°	RR						P4		2				HG				F		4	
5	Ext.	f	105	7	6°7°	RR						P4		2				F		✓		F		5	
6	Ext	f	100	8	3°7°	RR						ST		1				HG		✓				6	
7	105	t	100	9	3°7°	L						ST		1				HGL						7	
8	105	t	101	10	3°7°	R						ST		1				FL						8	
9	Ext.	t	105	11	3°7°	R	00	00	00	00	00	ST	00	00	00	1	00	00	00	F	00	✓	00		9
10																									10
11																									11
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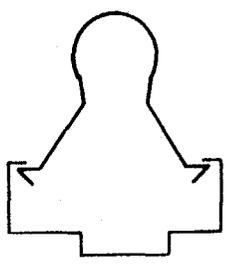
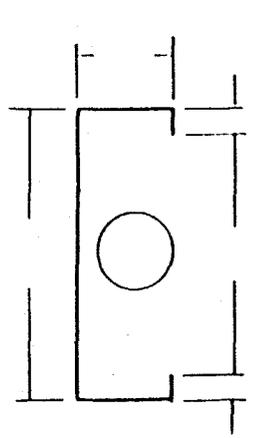
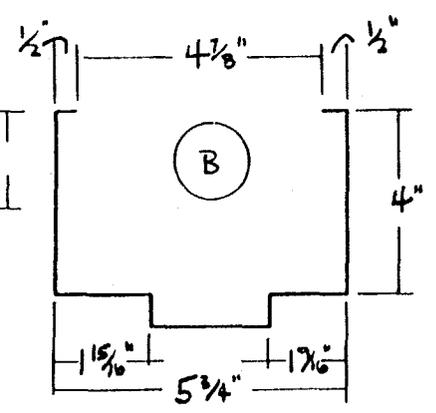
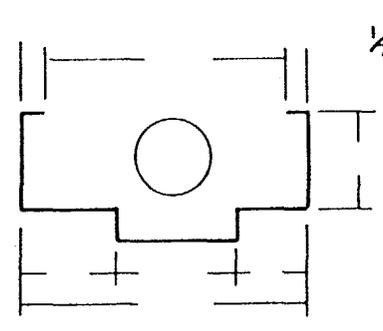
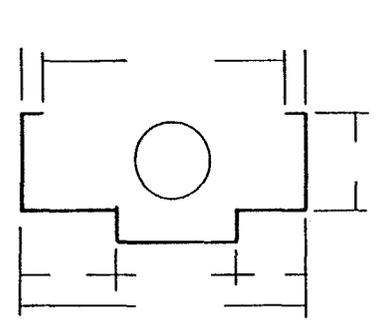
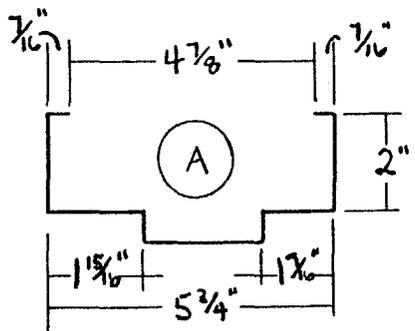
Elev. No. 54



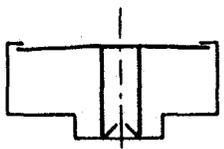
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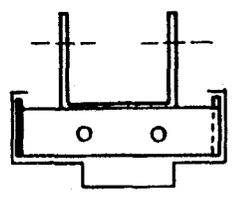
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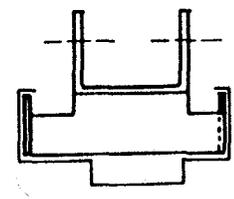
MW



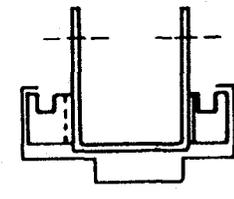
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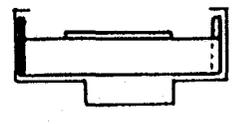
MP



MP



WS



SC

JOB NO.

PROJECT

LOCATION

SHEET NO. 4 OF 8

CC-7

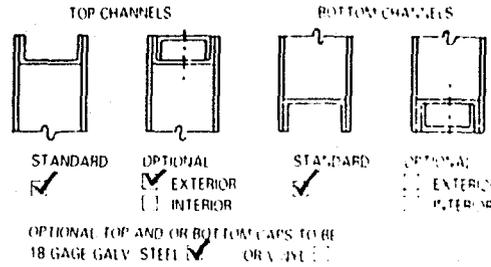
CUMMIS

C-005

707 Series

Specifications

Doors shall be 707 type as manufactured by Curtiss Mfg. Inc., Mason City, Iowa. Doors are to be manufactured of the finest quality 16-18-20 (specific gauge) cold rolled stretcher leveled steel. All doors shall be of full flush construction and either 1 1/4" - 1 1/8" thick. Doors shall be reinforced, stiffened, insulated, and sound deadened with a solid slab of expanded polystyrene foam permanently bonded to the inside of each face skin. Both lock and hinge rail edge of the door shall be welded, filled and ground smooth the full height of the door (707N) or both lock and hinge rail edge of the door may have an exposed hairline seam (707S). Lock rail shall be one piece full height 14 gauge pressed channel x elongated templating. Hinge rail shall be one piece full height 14 gauge pressed channel, formed and tapped for hinges. Top and bottom of door shall have 16 gauge steel closure channels. Doors shall have beveled (1/8" in 2") lock edge. All doors shall be bonderized and finished as standard with one coat of baked on prime coat paint. Minimum hardware reinforcement shall consist of: Closers - 12 gauge channel (5" x 16"). Overhead Holders - 12 gauge channel (5" x 24"). Rim Panics - 14" gauge channel (5" x 18"). Butts and Locks as previously specified herein. Checks and Pivots - 7 gauge x template requirements.

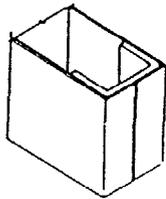
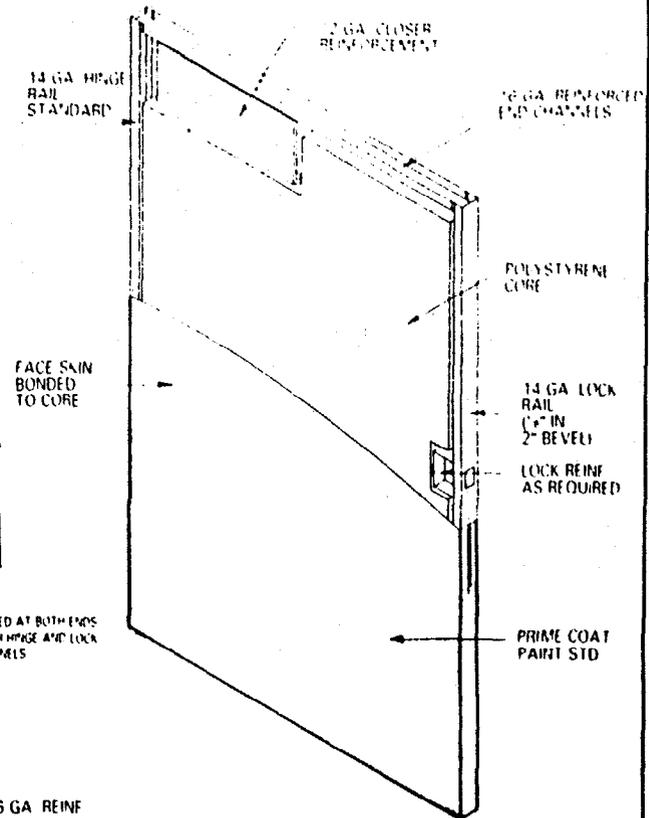
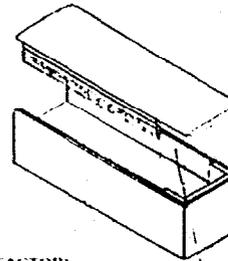


18 - GAUGE INTERIOR

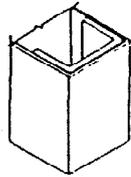
18 - GAUGE EXTERIOR

GALVANEAL AS NOTED

@ ext.



707S
Exposed hairline seam on center of door edge



707N
Seam welded, filled and ground smooth

707 DOOR CORE PROPERTIES

THERMAL CONDUCTIVITY (K FACTOR)
BTU-hr./sq.ft.F²/in. 0.24 at mean temp. of 40°F
0.25 at mean temp. of 70°F

U FACTOR 1.449

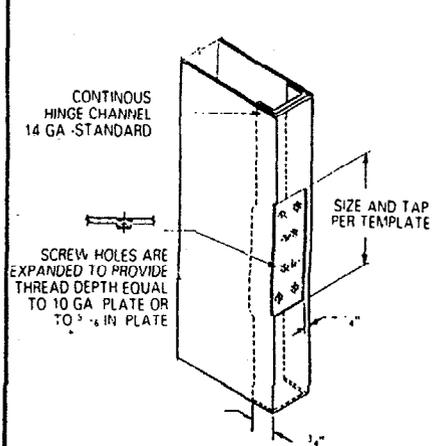
DENSITY 1.0 lbs. cu ft

CAPILLARITY RATING 0%

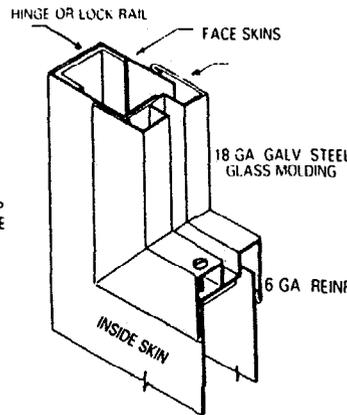
Non-toxic according to Federal Hazardous Substances Labeling Act regulations.

The 707 series door has an apparent U Factor of .21 and an R factor of 4.17.

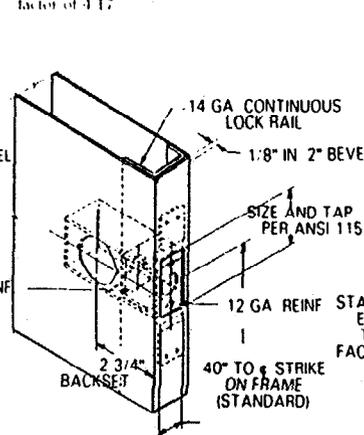
WELD CAP WATCHED AT BOTH ENDS TO BE FLUSH WITH HINGE AND LOCK CHANNELS



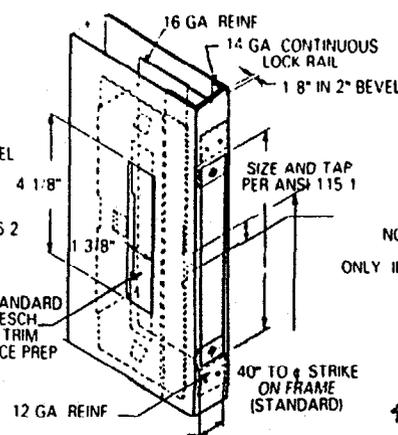
707 SERIES HINGE CHANNEL REINFORCING



STANDARD GLASS MOLDING

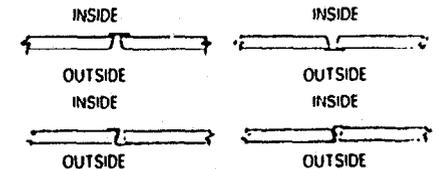


GOVT. 161 CYLINDRICAL LOCK REINFORCEMENT



GOVT. 86 MORTISE LOCK REINFORCEMENT

NOTE ASTRAGALS SUPPLIED BY HOLLOW METAL ONLY IF NOTED IN ASTRAGAL COLUMN SPECIFY F OR Z TYPE

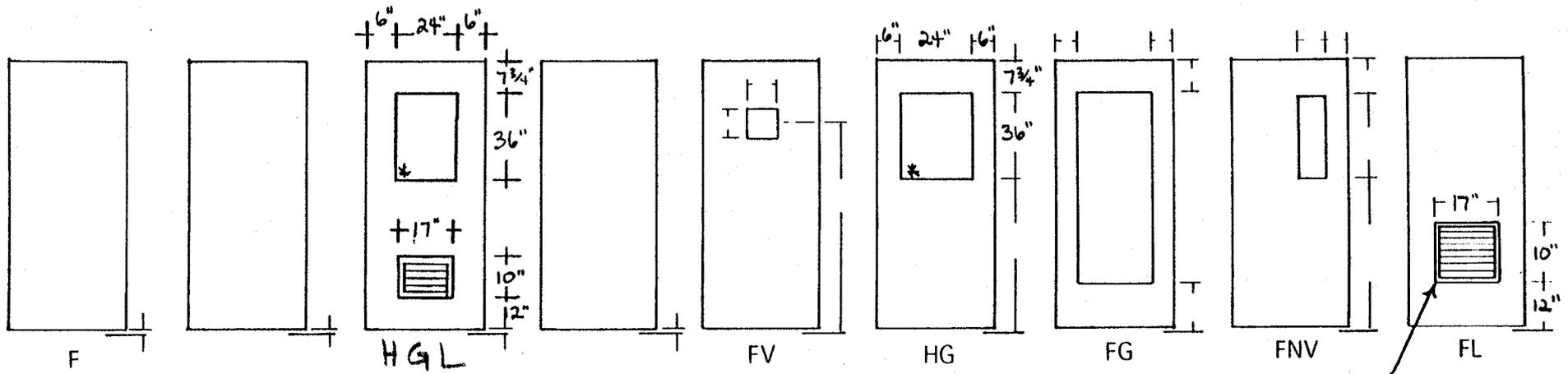


JOB NO.

PROJECT

LOCATION

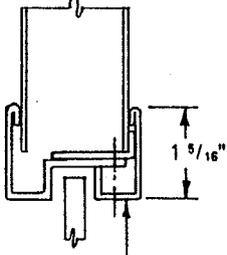
SHEET NO. 5 OF 8



* 1/4" glass by others

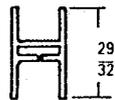
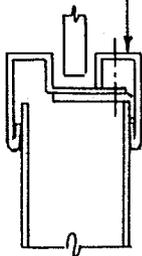
See sheet 8 for louver details

STANDARD GLASS MOLDING FOR ALL DOOR SERIES.

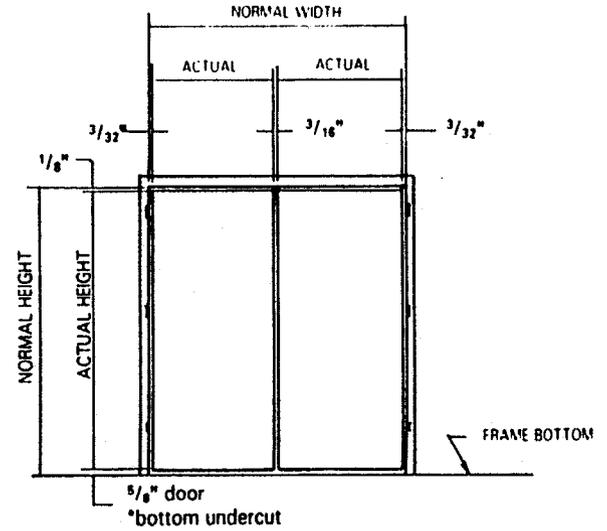
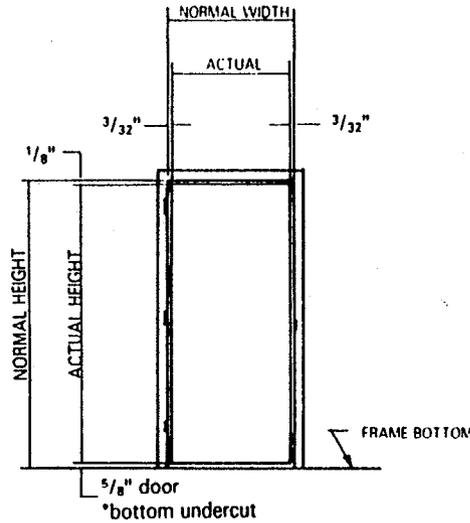


GLASS POCKET SIZED FOR 1/4" GLASS STD.

VISIBLE GLASS SIZE



STEEL MUNTIN



ALL GLASS AND GLAZING BY OTHERS

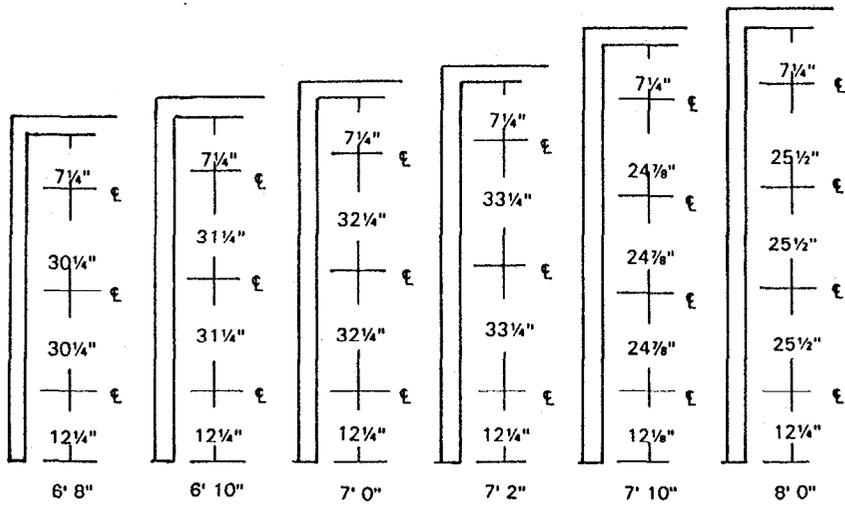
* NOTE 1/2" STD 1 3/4" DOORS - 3/4" STD ON 1 1/2" DOORS

JOB NO.

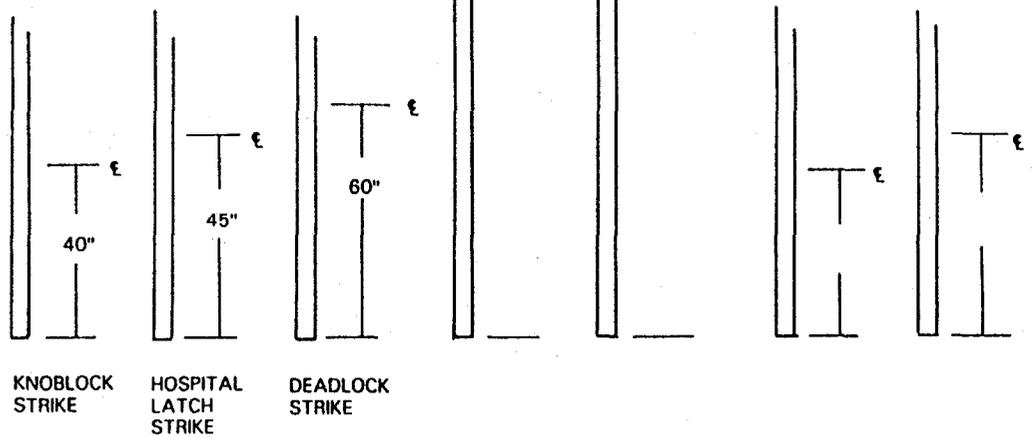
PROJECT

LOCATION

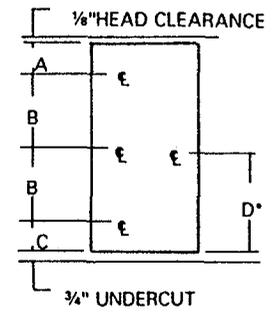
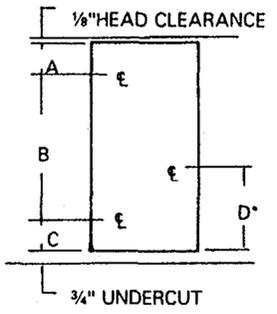
SHEET NO. 6 OF 8



HINGE AND STRIKE LOCATIONS FOR 1 3/4" FRAMES



Standard Locations For 1 3/4" Doors



TWO HINGES

SIZE	6'8"	7'0"	7'2"
A	9 7/8"	9 7/8"	9 7/8"
B	59 7/8"	63 7/8"	65 7/8"
C	9 7/8"	9 7/8"	9 7/8"
D*	39 9/16"	39 9/16"	39 9/16"

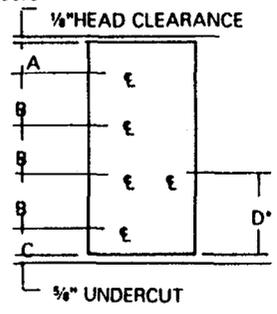
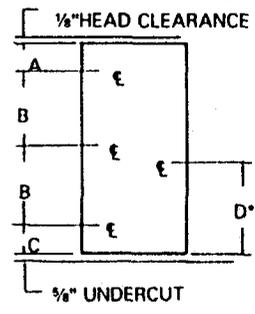
HINGE BACKSET 1/4"

THREE HINGES

SIZE	6'8"	7'0"	7'2"
A	9 7/8"	9 7/8"	9 7/8"
B	29 15/16"	31 15/16"	32 15/16"
C	9 7/8"	9 7/8"	9 7/8"
D*	39 9/16"	39 9/16"	39 9/16"

HINGE BACKSET 1/4"

Standard Locations For 1 3/4" Doors



THREE HINGES

SIZE	A	B	C	D*
6'8"	7 1/2"	30 1/4"	11 1/2"	39 1/2"
6'10"	7 1/2"	31 1/4"	11 1/2"	39 1/2"
7'0"	7 1/2"	32 1/4"	11 1/2"	39 1/2"
7'2"	7 1/2"	33 1/4"	11 1/2"	39 1/2"
7'10"	7 1/2"	37 1/4"	11 1/2"	39 1/2"
8'0"	7 1/2"	38 1/4"	11 1/2"	39 1/2"

HINGE BACKSET 1/4"

FOUR HINGES

SIZE	A	B	C	D*
6'8"	7 1/2"	20 1/2"	11 1/4"	39 1/2"
6'10"	7 1/2"	20 1/2"	11 1/2"	39 1/2"
7'0"	7 1/2"	21 1/2"	11 1/2"	39 1/2"
7'2"	7 1/2"	22 1/2"	11 1/4"	39 1/2"
7'10"	7 1/2"	24 1/2"	11 1/2"	39 1/2"
8'0"	7 1/2"	25 1/2"	11 1/2"	39 1/2"

HINGE BACKSET 1/4"

D* Dimension shown is for locks with a command ϵ and lock and strike (Ex. Gov't 161 cyl. lock)

JOB NO.	PROJECT	LOCATION	SHEET NO. 7 OF 8
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**Model 800
Inverted "Y" Blades**

Non-vision design recommended for schools, class "A" and institutional buildings.

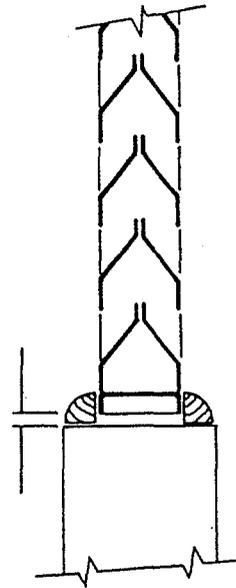
Material: 18 Ga. C.R. Steel

Available in Core, "C", "A" and "A-1" mounting styles.

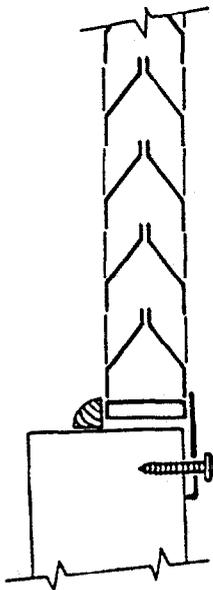
Screen: Removable or attached.



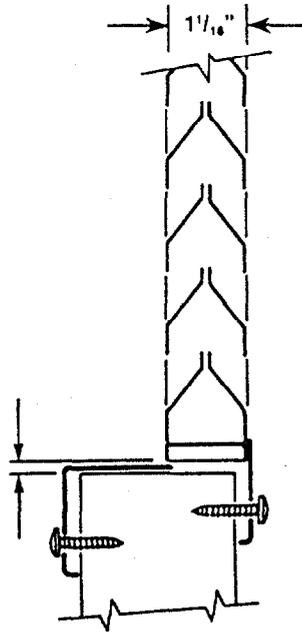
Model 800-A



Model 800
Basic blade unit only; for interior doors; or as transom louver held in place with wood or metal moulding (furnished by others).

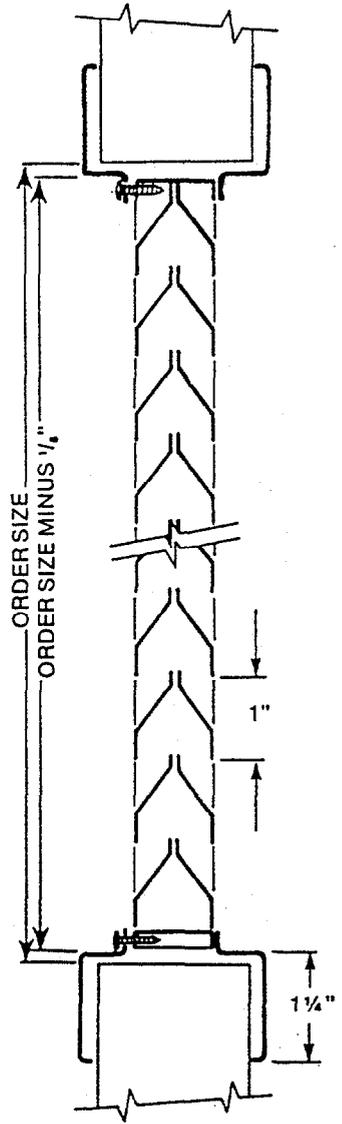
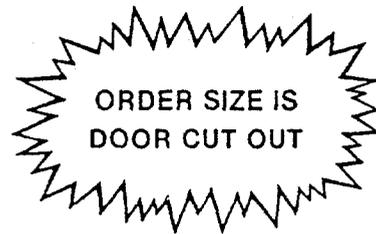


Model 800C
Basic blade unit with single flanged frame welded to face (corridor) side; for interior or exterior doors; wood or metal moulding (by others) used on opposite side.



Model 800A
Basic blade unit with flanged frame welded to face (corridor) side and separate flanged frame on opposite side; frame adjustable to fit any door thickness from 1 3/8" to 1 3/4".

Model 800



Model 800A1
Vandal-proof design; basic blade unit with flanged frame welded to face (corridor) side and separate removable flanged frame on opposite side; fits 1 3/4" thick doors only.

Air Louvers, Inc.

(213) 948-3495 ■ Fax (213) 949-4661
P.O. Box 988 ■ Pico Rivera, CA 90660-0988
Subsidiary of Louvers and Dampers, Inc.

PROJECT:	DATE:
LOCATION:	SCALE:
ARCHITECT:	DRWG. NO.
CONTRACTOR:	8 of 8

APPENDIX U
WATER HEATER

A. O. SMITH

Energy Saving Product

FEATURES

CODE COMPLIANCE: H.U.D., B.O.C.A., ASHRAE 90.1b-1992, and 1990 NAECA.

U.L. CERTIFIED to ANSI standards for Household Electric Storage Tank Water Heaters UL 174.

THICK FOAM INSULATION — Minimizes radiant heat loss. "R" value exceeds 16 on EES models (R-21 on EEH).

GLASS-LINED TANK — Glass, specifically developed by A. O. Smith ceramic research for water heater use, is fused to steel at 1600°F, providing corrosion protection for years of dependable use. Proven reliable in millions of water heaters for over 50 years.

DIP TUBE — Carries inlet water deep into tank.

ANODE — Heavy duty, tank-mounted, screw-in anode for longer tank life.

THERMOSTAT/HIGH LIMITS — Combination control provides sensitive temperature control and overheat protection. Factory preset at 120°F.

ELECTRIC ELEMENTS — Zinc-plated, copper sheath, screw-in type, direct immersion elements mean fast, efficient water heating. Phoenix™ elements available in limited voltages and wattages (consult Price Book).

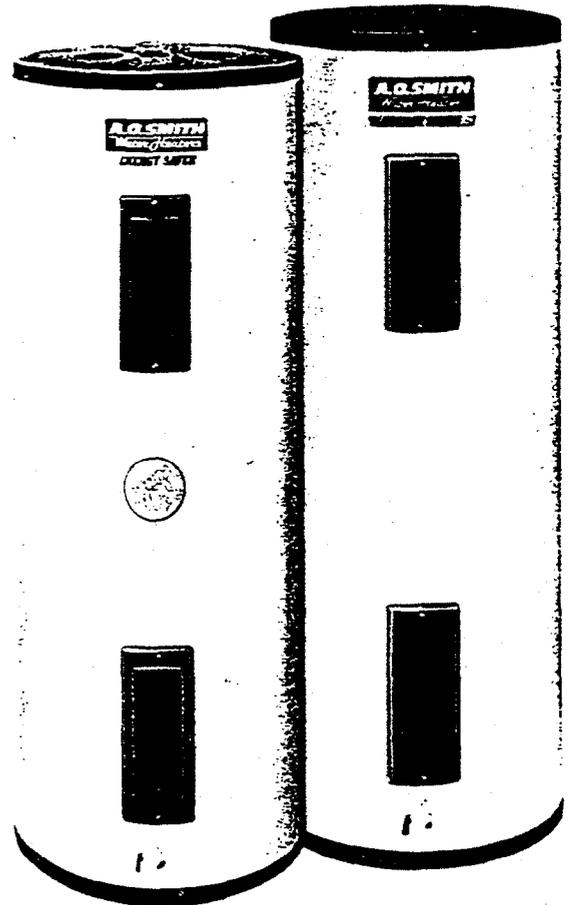
ELEMENT SPECIFICATIONS — Two 4500 watt, 240V, single phase elements, non-simultaneous with a recovery of 20.5 gph at 90°F temperature rise supplied as standard equipment on all models - except 20 gallon or less, single element models (see table). For other element wattages and voltages, consult factory - 40 amp maximum. For amp draws greater than 40 amps, see DEN/DEL models.

NON-METALLIC BOILER TYPE DRAIN VALVE (6 and 15 gallon models have a combination 3/4" inlet/drain fitting).



ENERGY SAVER

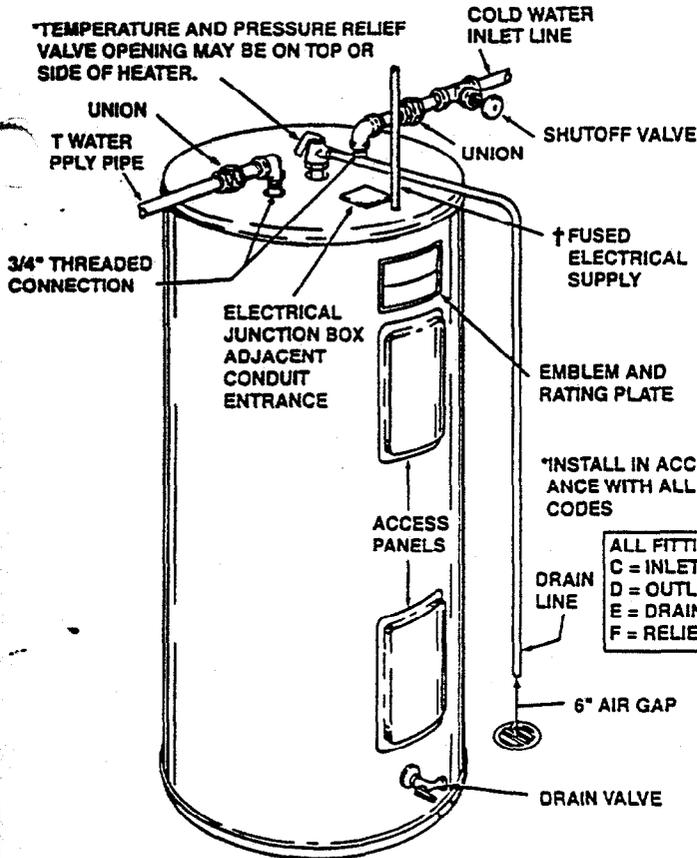
ELECTRIC
RESIDENTIAL WATER HEATERS
MODELS EES, EEH, EEST & ELJF



5 YEAR LIMITED TANK WARRANTY

If the tank should leak any time during the first 5 years, under the terms of the warranty, A. O. Smith will furnish a replacement heater. Installation, labor, handling and local delivery are extra. When used commercially, warranty is 1 year. **THIS OUTLINE IS NOT A WARRANTY.** For complete information, consult the written warranty or A. O. Smith Water Products Company.

ENERGY SAVER ELECTRIC GLASS-LINED WATER HEATER



TYPICAL INSTALLATION

† OVERCURRENT PROTECTION MUST BE SUPPLIED IN WATER HEATER CIRCUIT. CONSULT LOCAL CODE OR NEC-1984 FOR PROPER INSTALLATION.

↑ FUSED ELECTRICAL SUPPLY

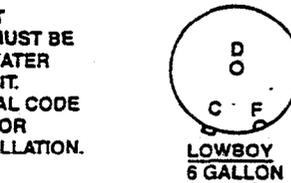
EMBLEM AND RATING PLATE

*INSTALL IN ACCORDANCE WITH ALL LOCAL CODES

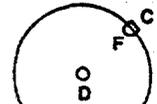
ALL FITTINGS 3/4" NPT
C = INLET OPENING
D = OUTLET OPENING
E = DRAIN VALVE OPENING
F = RELIEF VALVE OPENING

6" AIR GAP

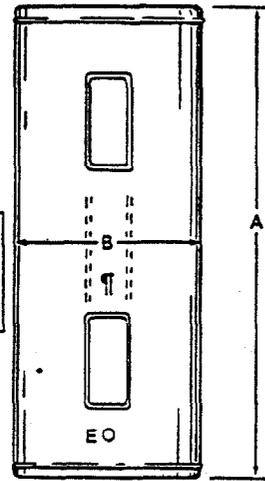
DRAIN VALVE



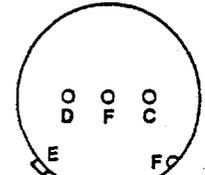
LOWBOY 6 GALLON



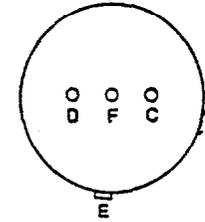
LOWBOY 15 GALLON



†† SINGLE DOOR ON LOWBOY MODELS
FRONT VIEW



LOWBOY 20-50 GALLON



STD./TALL 30-120 GALLON
TOP VIEW

All Dimensions In Inches

5-Year Model No.	Gal. Cap.	Element Wattage (Non-Simultaneous)		A Height	B Dia.	Approx. Ship. Wt. (Lbs.)
		Std. 240 Volts Upper/Lower	Max. 240 Volt Upper/Lower			
ENERGY SAVER MODELS						
EES-30	30	4500/4500	4500/4500	34 1/2	20 1/2	94
EES-40	40	4500/4500	6000/6000	44	20 1/2	115
EES-52	50	4500/4500	6000/6000	53 3/4	20 1/2	123
EEH-52	50	4500/4500	6000/6000	54	21 3/4	131
EES-66	66	4500/4500	6000/6000	59 3/4	21 3/4	172
EES-80	80	4500/4500	6000/6000	58 1/4	24	206
EES-120	120	4500/4500	6000/6000	61 3/4	29 1/2	336
ENERGY SAVER TALL MODELS						
EEST-30	30	4500/4500	6000/6000	45 1/4	18	94
EEST-40	40	4500/4500	6000/6000	59 1/4	18	114
EEST-52	55	4500/4500	6000/6000	58 3/4	19 1/2	132
ENERGY SAVER LOWBOY MODELS						
ELJF-6	6	— /1500*	— /2500	15 1/2	14 1/4	35
ELJF-15	15	— /1500*	— /2500	32 1/2	14 1/4	58
ELJF-20	19.9	— /2500*	— /6000	32 1/4	18	73
ELJF-30	30	4500/4500	6000/6000	31	21 3/4	106
ELJF-40	40	4500/4500	6000/6000	32 1/4	23 1/4	136
ELJF-50	50	4500/4500	6000/6000	32 1/4	25 1/4	171

*Single element models - Std. 120 volts.

SUGGESTED SPECIFICATIONS

This water heater(s) shall be A. O. SMITH Model(s) No. _____ electric heater, or an approved equal. Heater(s) shall be rated at _____ KW, _____ volts, single phase, 60 cycle AC and listed by Underwriters' Laboratories. Heater(s) shall have a maximum working pressure of 150 psi, a nominal storage tank capacity of _____ gallons with a separate 3/4" tapping for relief valve installation and a rigidly supported anode rod for maximum cathodic protection. All internal surfaces of the heater(s) exposed to water shall be glass-lined with an alkaline borosilicate composition fused-to-steel. Electric heating element(s) shall be zinc plated copper sheath, screw-in design. Element operation shall be double element, non-simultaneous (or single element); (or double element, simultaneous). The controls shall include a thermostat with each element and a high temperature cutoff. The jacket shall provide full size control compartments for performance of service and maintenance through front panel openings and enclose the tank with foam insulation. The drain valve shall be located in the front for ease of servicing (except 6, and 15 gallon have a combination 3/4" inlet/drain fitting). Outer jacket shall be baked enamel finish. Heater(s) shall have a 5 year limited warranty for residential installation; 1 year for commercial installation, as outlined in the written warranty. Fully illustrated instruction manual to be included. Heater(s) shall meet the minimum energy factor required by the Federal "National Appliance Energy Conservation Act of 1987".

A. O. Smith
Water Products Company
Irving, TX
A Division of A. O. Smith Corporation

A. O. Smith Corporation reserves the right to make product changes or improvements at any time without notice.

APPENDIX V

ROOF FANS AND EXHAUST FANS

Submitting Office Raleigh

Order No. 226-2213R

Salesman Bill Poole

Date 6/8/95

**PROJECT: SOIL AND GROUNDWATER
REMEDATION**

ENGINEER: OHM REMEDIAL SERVICES

CONTRACTOR: OHM REMEDIAL SERVICES

MFG: GREENHECK-SWARTWOUT

PRODUCTS: FANS

*Submit Info on
Roof Curbs*

SUBMITTAL REVIEW	
REVIEW IS FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS. NO RESPONSIBILITY IS ASSUMED FOR CORRECTNESS OF DIMENSIONS OR DETAILS. THE CONTRACTOR/SUPPLIER SHALL ASSUME FULL RESPONSIBILITY FOR DEVIATIONS FROM CONTRACT REQUIREMENTS NOT SPECIFICALLY INDICATED ON THIS SUBMITTAL.	
<input type="checkbox"/> NO EXCEPTIONS	<input checked="" type="checkbox"/> MAKE CONNECTIONS NOTED
<input type="checkbox"/> AMEND AND RESUBMIT	<input type="checkbox"/> REJECTED - SEE REMARKS
Date <u>6-12-95</u> by <u>B. Poole</u>	
OHM REMEDIATION SERVICES CORP. NORCROSS, GEORGIA	

We have exercised care in the preparation of this submittal. We believe it satisfies our interpretation of the designer's intent and scope. It contains the list of materials; quantities, sizes, style and the finish as we propose to furnish for this job. Please examine and check carefully that all items are exactly as required and that our interpretation of the applicable plans and/or specifications are consistent with the design. If any discrepancies are discovered, please notify us as soon as possible.

HOFFMAN . HOFFMAN,

P.O. BOX 77258
GREENSBORO, NC 27417-7258

3816 PATTERSON ST.
GREENSBORO, NC 27407



INC.

PHONE (919) 292-8777
FAX (919) 292-6822

BRANCH OFFICES:

Asheville, N. C. / Charlotte, N. C. / Raleigh, N. C. / Roanoke, Va. / Charleston, S. C. / Columbia, S. C. / Greenville, S. C.

SUBMITTAL DATA

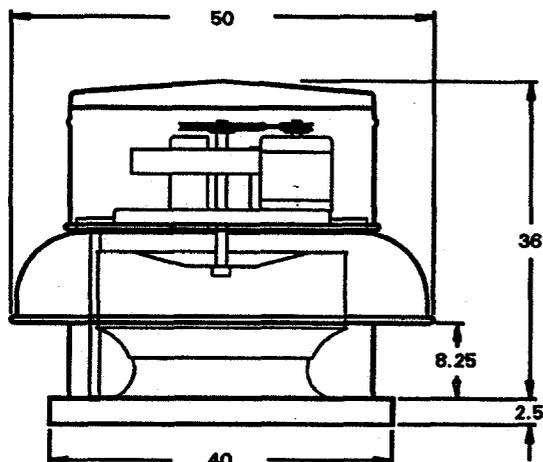
GB Belt Drive Centrifugal Roof Exhauster

Standard Construction Features

- A NEMA 1 disconnect switch with factory installed wiring from the motor to the disconnect box
- Birdscreen
- Aluminum curb cap with prepunched mounting hole
- Ball bearing motors
- Shock mounts
- Corrosion resistant fasteners
- Adjustable motor pulley
- Adjustable motor plate
- Fan shaft mounted in ball bearing pillow blocks
- Static resistant belts.

Options & Accessories Selected

- UL 705 electrical
- 8" Galvanized Roof Curb GPS 40-G8
- Gravity Damper WD-100 30x30



NOTES : All dimensions shown are in units of inches.

DIMENSIONS

Damper Size (In)	Roof Opening (In)	Approximate Weight (Lb)
30 x 30	32.5 x 32.5	208



PERFORMANCE

Qty.	Model	Volume (CFM)	SP (In WC)	FRPM	Power (BHp)	Motor Information			
						Hp	V/C/P	Enclosure	RPM
2	GB-300-50	13200	0.500	882	4.84	5	460/60/3	Totally Enclosed	1725/1140

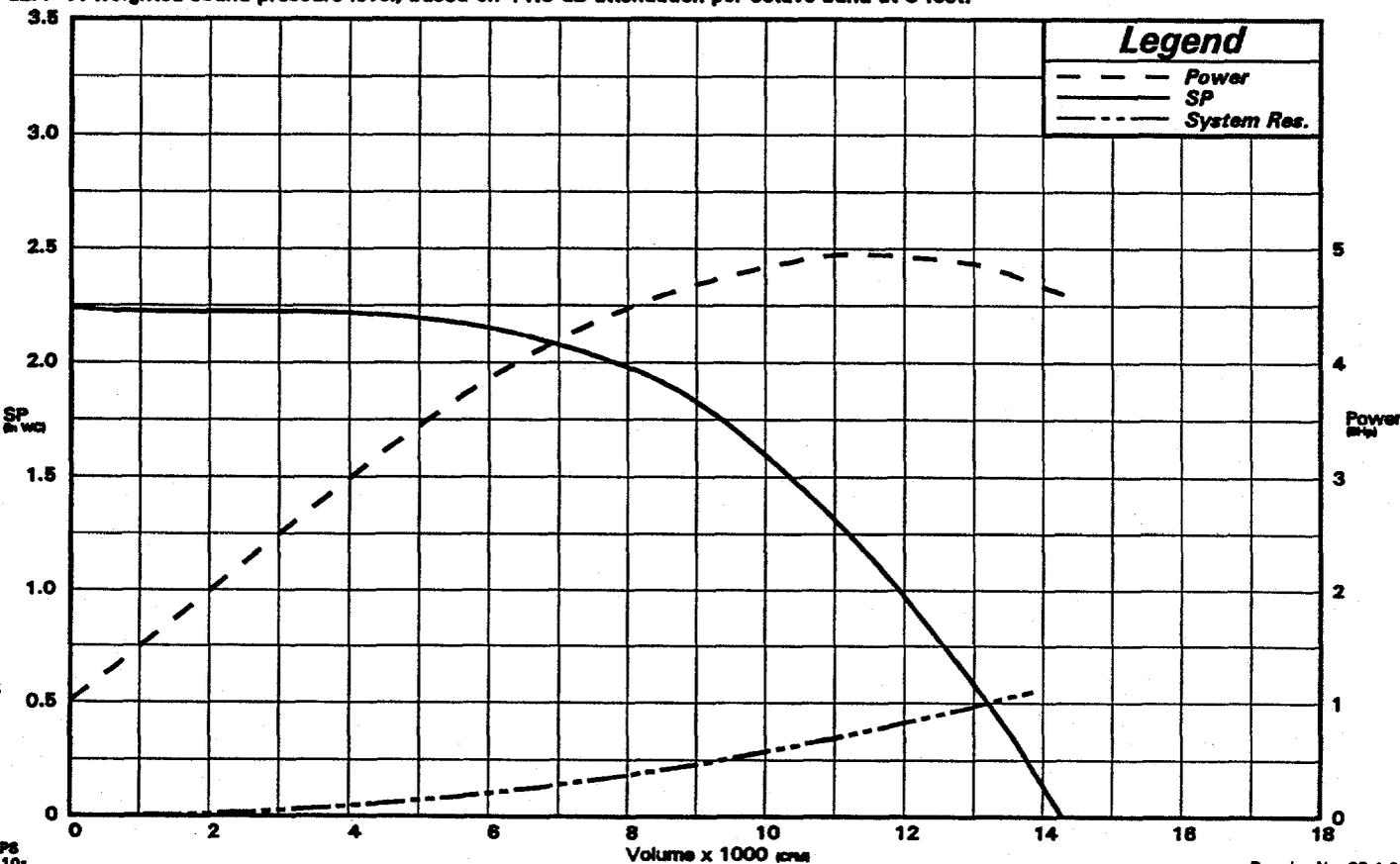
SOUND

Inlet Sound Power by Octave Band								LWA	dBA	Sones
63	125	250	500	1000	2000	4000	8000			
88	94	91	84	80	77	70	65	87	76	27

AIR DENSITY

Elevation (Ft)	Airstream Temp. (F)
0	70

LWA - A weighted sound power level, based on ANSI S1.4. Sones calculated using AMCA 301 at 5 feet.
 dBA - A weighted sound pressure level, based on 11.5 dB attenuation per octave band at 5 feet.



SWARTWOUT

Fiber-Aire Fiberglass Ventilators

There are no shortcuts to quality.

SWARTWOUT products are engineered and built for quality. More than 75 years of manufacturing gravity and powered ventilation products enables us to focus on the quality of our products' materials, workmanship, performance, and product life. Our fiberglass products are molded of tough, chemical-resistant resins and heavy-weave glass cloth. All products are designed for simple installation and maintenance. The result is products that deliver superior performance, with minimal downtime and maintenance, and the best full-life value of any ventilation product available.

Long-Life Fiberglass Ventilators

Swartwout offers several types of Fiber-Aire ventilators in a range of sizes and capacities to meet your exhaust ventilation requirements and applications. Each type of Fiber-Aire offers each of the following features:

- **Indestructible housings**
Molded fiberglass housings are virtually impossible to dent, crack, or break and resist weather, salt spray, and most chemicals.
- **Quiet, efficient operation**
Fiberglass housings absorb noise and vibration — unlike metal housings that amplify air and vibration noises. Venturi throat and outlet designs provide high efficiency and minimize loss from friction and turbulence.
- **Attractive appearance**
Low contour design hugs the roof line and molded-in blue color of roof units blends with the sky. Wall units are fawn tan in color and blend unobtrusively with most walls.
- **Easy installation**
Units easily set on curb or into wall and fasten with lag screws or bolts.
- **Low maintenance**
Ventilators do not tarnish or crack, and never need painting. Airfoil blower wheels are extruded aluminum with optional coatings available. Ten-year lubricated motors are mounted outside the air stream with motor covers that easily remove for inspection. Molded bases readily drain water onto the roof.
- **Safety**
Fiberglass housings are fire retardant and do not conduct electricity.

SWARTWOUT

Direct and Belt Drive Fiber-Aires

Direct drive or belt drive.

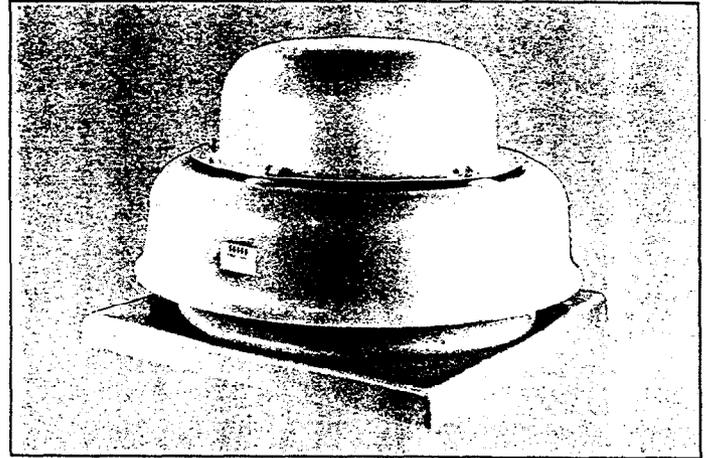
The SWARTWOUT Fiber-Aire is available with direct drive or belt drive for general ventilation requirements where a low noise level exhaust is desired. The fiberglass housing of the Fiber-Aire is virtually dent, crack, and break proof and is highly resistant to a wide array of chemicals. The motor is completely separated from the airstream, as are the belts and drive components of the belt driven model.

The fiberglass housing actually absorbs noise and vibration and specially molded throat and outlet designs minimize loss from friction and turbulence. The extruded aluminum, airfoil fan wheel used in Models 12 through 40, moves large volumes of air with maximum efficiency.

Belt driven Fiber-Aires offer the versatility of changing air capacities by changing the sheaves during or after installation. Both direct drive and belt drive Fiber-Aires feature easy to remove motor covers for simple inspection and maintenance. Extra low contour and molded-in sky blue color makes them inconspicuous from street level.

Direct drive electrical characteristics.

Disconnect switches for single- and three-phase motors can be furnished as specified. $\frac{1}{8}$ HP to $\frac{1}{2}$ HP, single-phase, 60 cycle motors are available in 115V or 230V. Three phase $\frac{1}{4}$ to $\frac{1}{2}$ HP motors are furnished 200V or 230/460V, 60 cycle. Two-speed motors are available in 115V, 60 cycle single-phase only. Explosion-proof (Class I, Group D or Class II, Group E, F, and G) housings are available on all $\frac{1}{8}$ HP and larger models in 115V, 60 cycle single-phase. Explosion-proof disconnect switches are not available. No starting equipment is furnished for direct drive models.



Belt drive electrical characteristics.

Safety disconnect switches can be furnished as accessories for belt drive units having standard single- or three-phase motors. Explosion-proof disconnect switches are not available. No starting equipment is furnished for belt drive models. All motors are 1725 RPM belted to the designated fan RPM. Single speed motors are available in 115 or 230 volts single-phase, and 200 or 230/460V three-phase, open-type with ball bearings sealed for life that require no lubrication. Two-speed motors are available for most models in 1725/1140 RPM. Most models are available with explosion-proof motors (Class I, Group D or Class II, Group E, F, and G).

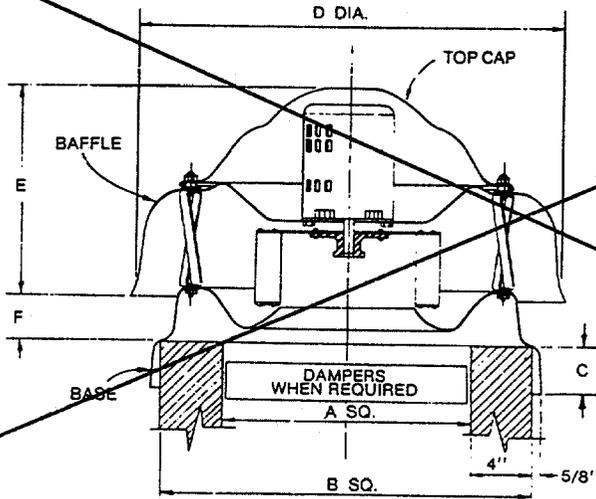
Suggested Specification

Furnish and install, where indicated on drawings, Fiber-Aire power roof ventilators Model No. _____ as manufactured by SWARTWOUT.

Housing shall be molded, shock-resistant and sound-absorbing, bonded blue reinforced fiberglass. Unit shall have a molded venturi type inlet and outlet with zinc irridited airflow guides. Units shall be (direct or belt) connected with 10-year lubricated motor mounted out of the air stream with ample air supply to the motor. Motor will drive an extruded aluminum airfoil, backwardly inclined, non-overloading type blower wheel.

Dimensional Data

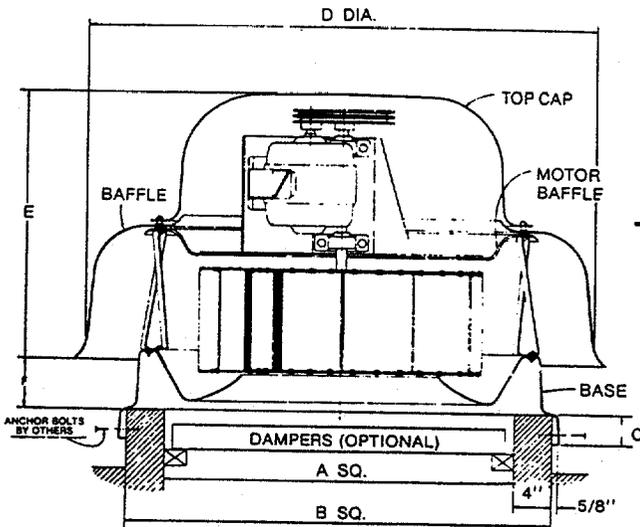
Fiber-Aire Direct Drive



Fiber-Aire Direct Drive

Model No.	DIMENSIONS IN INCHES					
	A	B	C	D	E	F
7FA 1	12	20	2	20%	10	2 1/4
7FA 2	12	20	2	20%	10	2 1/4
9FA 1	12	20	2	20%	10	2 1/4
10FA 1	16	24	3	27%	14	2 1/4
10FA 2	16	24	3	27%	14	2 1/4
12FA 1	16	24	3	27%	14	2 1/4
12FA 2	16	24	3	27%	14	2 1/4
12FA 3	16	24	3	27%	14	2 1/4
14FA 1	16	24	3	27%	14	2 1/4
14FA 2	16	24	3	27%	14	2 1/4
14FA 3	16	24	3	27%	14	2 1/4
18FA 1	20	28	3	34%	22	3 1/4
18FA 2	20	28	3	34%	22	3 1/4

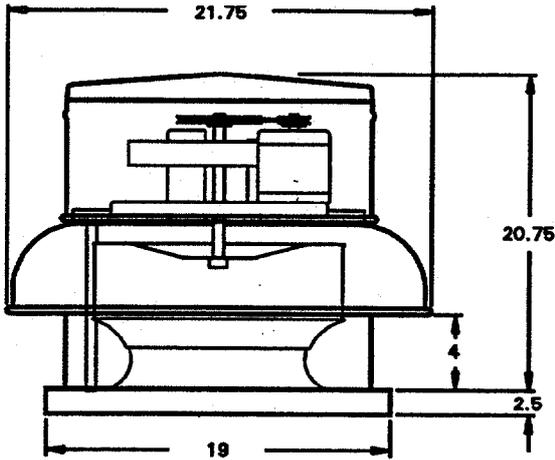
Fiber-Aire Belt Drive



Fiber-Aire Belt Drive

Model No.	DIMENSIONS IN INCHES					
	A	B	C	D	E	F
12FA 1B	16	24	3	27%	21	2 1/4
12FA 2B	16	24	3	27%	21	2 1/4
12FA 3B	16	24	3	27%	21	2 1/4
12FA 4B	16	24	3	27%	21	2 1/4
12FA 5B	16	24	3	27%	21	2 1/4
14FA 1B	16	24	3	27%	21	2 1/4
14FA 2B	16	24	3	27%	21	2 1/4
14FA 3B	16	24	3	27%	21	2 1/4
14FA 4B	16	24	3	27%	21	2 1/4
14FA 5B	16	24	3	27%	21	2 1/4
18FA 1B	20	28	3	34%	22	3 1/4
18FA 2B	20	28	3	34%	22	3 1/4
18FA 3B	20	28	3	34%	22	3 1/4
18FA 4B	20	28	3	34%	22	3 1/4
24FA 1B	28	36	3	42	22	4
24FA 2B	28	36	3	42	22	4
24FA 3B	28	36	3	42	22	4
24FA 4B	28	36	3	42	22	4
24FA 5B	28	36	3	42	22	4
24FA 6B	28	36	3	42	22	4
30FA 1B	36	44	3	52 1/2	27 1/2	5 1/4
30FA 2B	36	44	3	52 1/2	27 1/2	5 1/4
30FA 3B	36	44	3	52 1/2	27 1/2	5 1/4
30FA 4B	36	44	3	52 1/2	27 1/2	5 1/4
30FA 5B	36	44	3	52 1/2	27 1/2	5 1/4
30FA 6B	36	44	3	52 1/2	27 1/2	5 1/4
36FA 1B	44	52	3	62 1/2	31 1/2	8 1/2
36FA 2B	44	52	3	62 1/2	31 1/2	8 1/2
36FA 3B	44	52	3	62 1/2	31 1/2	8 1/2
36FA 4B	44	52	3	62 1/2	31 1/2	8 1/2
36FA 5B	44	52	3	62 1/2	31 1/2	8 1/2
36FA 6B	44	52	3	62 1/2	31 1/2	8 1/2
40FA 1B	44	52	3	62 1/2	31 1/2	8 1/2
40FA 2B	44	52	3	62 1/2	31 1/2	8 1/2
40FA 3B	44	52	3	62 1/2	31 1/2	8 1/2
40FA 4B	44	52	3	62 1/2	31 1/2	8 1/2
40FA 5B	44	52	3	62 1/2	31 1/2	8 1/2
40FA 6B	44	52	3	62 1/2	31 1/2	8 1/2
40FA 7B	44	52	3	62 1/2	31 1/2	8 1/2

46013 - 1/3 HP
 ROOF OPENING 20x20



GB Belt Drive Centrifugal Roof Exhauster

Standard Construction Features

- A NEMA 1 disconnect switch with factory installed wiring from the motor to the disconnect box
- Birdscreen
- Aluminum curb cap with prepunched mounting hole
- Ball bearing motors
- Shock mounts
- Corrosion resistant fasteners
- Adjustable motor pulley
- Adjustable motor plate
- Fan shaft mounted in ball bearing pillow blocks
- Static resistant belts.

Options & Accessories Selected

- UL 705 electrical
- Gravity Damper WD-100 10x10
- 8" Galvanized Roof Curb GPNS 19-G8

NOTES : All dimensions shown are in units of inches.



DIMENSIONS

Damper Size (In)	Roof Opening (In)	Approximate Weight (Lb)
10 x 10	12.5 x 12.5	30

PERFORMANCE

Qty.	Model	Volume (CFM)	SP (In WC)	FRPM	Power (BHp)	Motor Information			
						Hp	V/C/P	Enclosure	RPM
1	GB-80-4	500	0.250	1205	0.06	1/4	115/60/1	Open Drip Proof	1725

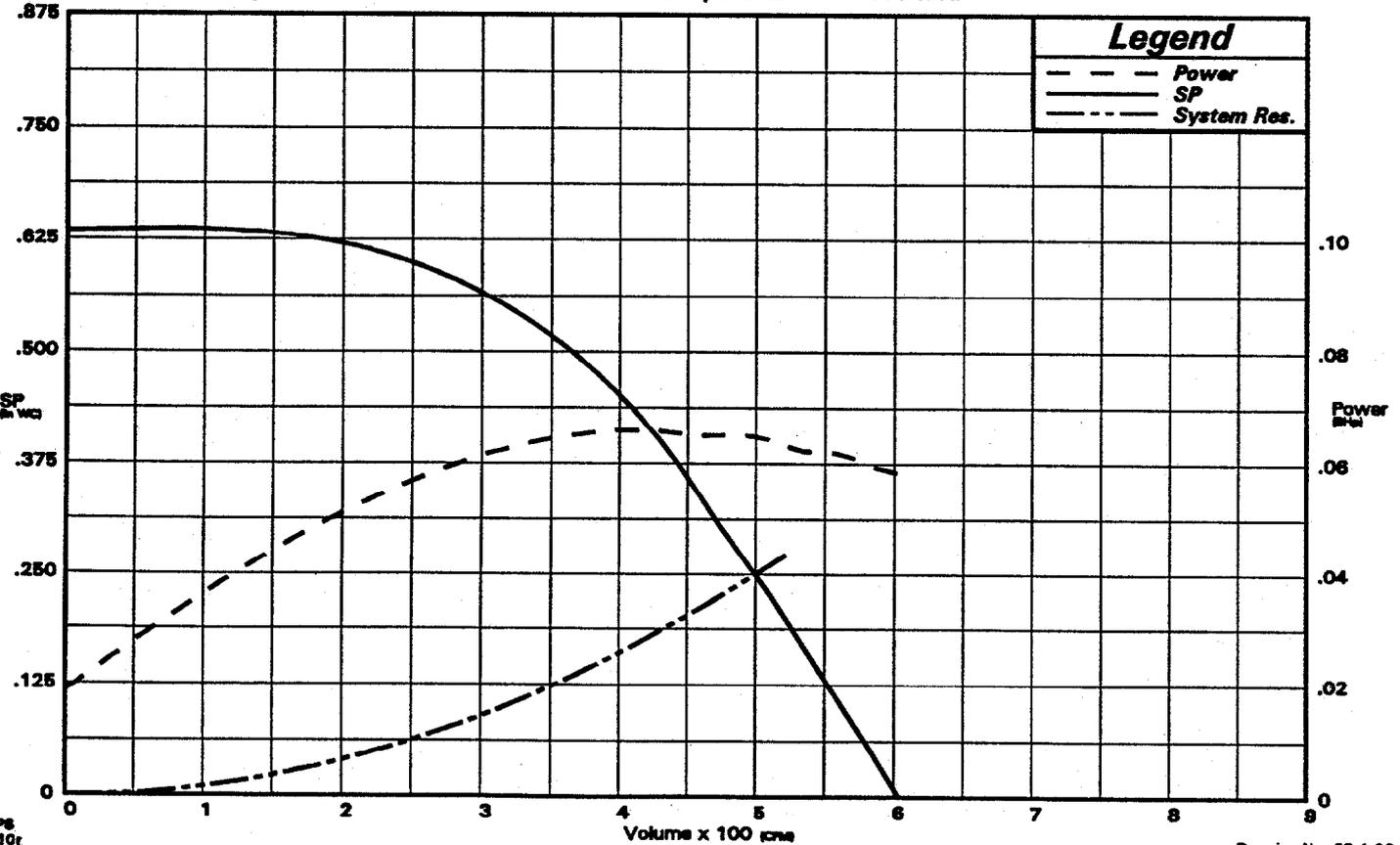
SOUND

Inlet Sound Power by Octave Band								LwA	dBA	Sones
63	125	250	500	1000	2000	4000	8000			
73	71	69	60	56	52	45	41	64	53	6.6

AIR DENSITY

Elevation (Ft)	Airstream Temp. (F)
0	70

LwA - A weighted sound power level, based on ANSI S1.4. Sones calculated using AMCA 301 at 5 feet.
 dBA - A weighted sound pressure level, based on 11.5 dB attenuation per octave band at 5 feet.



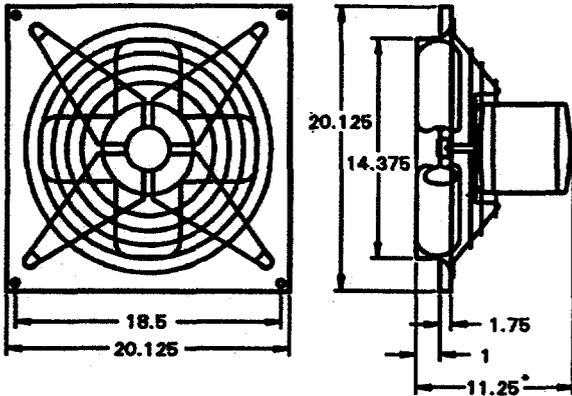
SE1 Sidewall Direct Drive Exhaust Fan

Standard Construction Features

- * Fan panels of galvanized steel
- * Aluminum fan blades
- * Zinc plated heavy gauge welded wire motor supports and fan guard
- * Motor mounted to support guard with neoprene isolators
- * Corrosion resistant fasteners
- * Motor side guard.

Options & Accessories Selected

- * UL 705 electrical



NOTES : All dimensions shown are in units of inches.
 * - Varies with Motor Selection



DIMENSIONS

Damper Size (In)	Wall Opening (In)	Approximate Weight (Lb)
16 x 16	(N/A)	27

PERFORMANCE

Qty.	Model	Volume (CFM)	SP (In WC)	FRPM	Power (BHp)	Motor Information			
						Hp	V/C/P	Enclosure	RPM
1	SE1-14-440-B8	561	0.450	1160	0.17	1/8	115/60/1	Totally Enclosed	1160

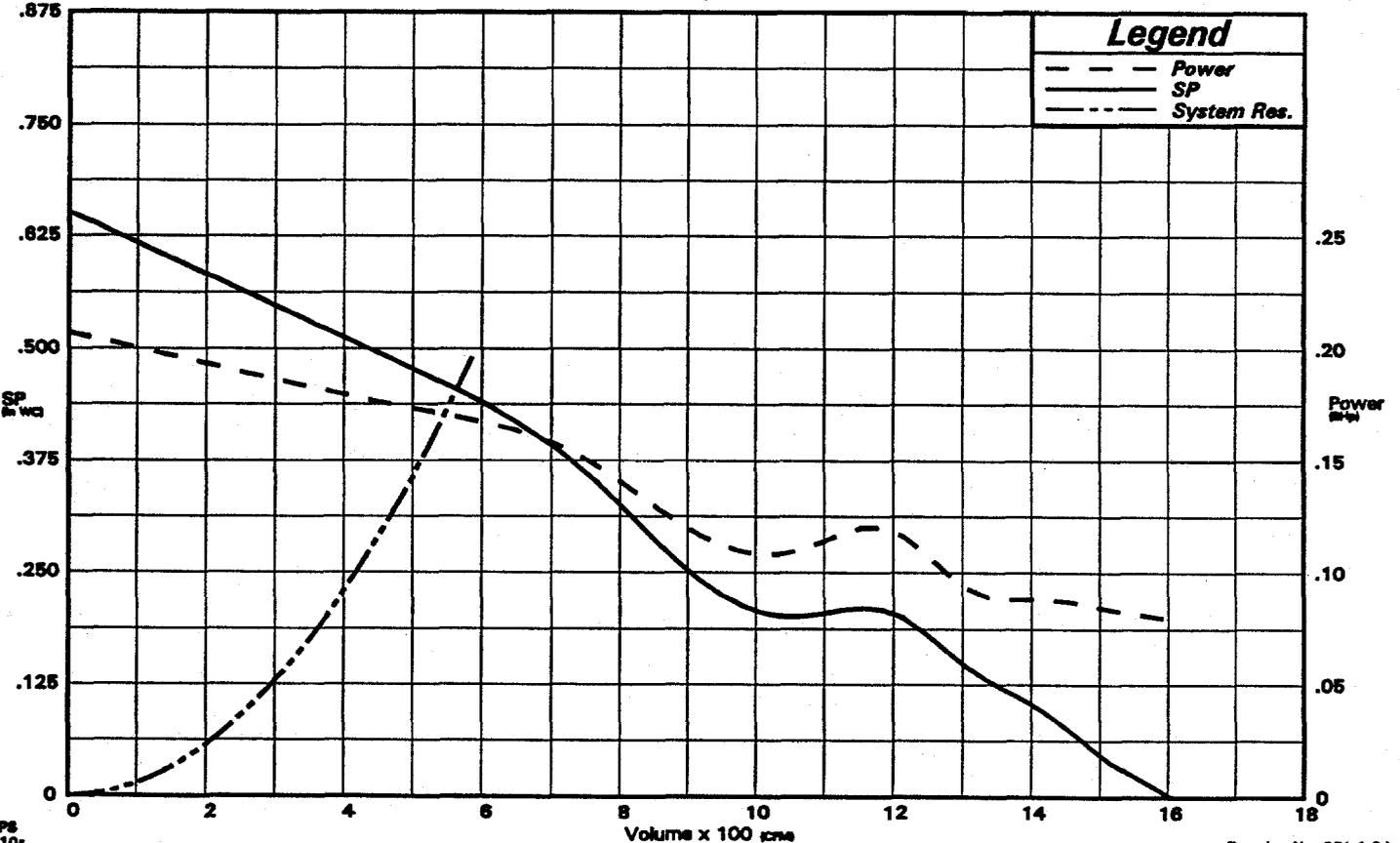
SOUND

Inlet Sound Power by Octave Band								LwA	dBA	Sones
63	125	250	500	1000	2000	4000	8000			
80	69	66	63	61	58	54	54	67	55	8.2

AIR DENSITY

Elevation (Ft)	Airstream Temp. (F)
0	70

LwA - A weighted sound power level, based on ANSI S1.4. Sones calculated using AMCA 301 at 5 feet.
 dBA - A weighted sound pressure level, based on 11.5 dB attenuation per octave band at 5 feet.



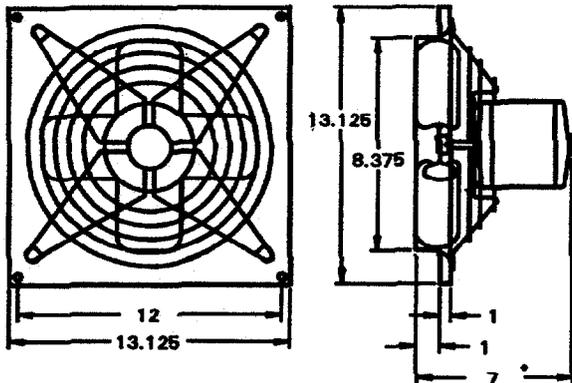
SE1 Sidewall Direct Drive Exhaust Fan

Standard Construction Features

- * Fan panels of galvanized steel
- * Aluminum fan blades
- * Zinc plated heavy gauge welded wire motor supports and fan guard
- * Motor mounted to support guard with neoprene isolators
- * Corrosion resistant fasteners
- * Motor side guard.

Options & Accessories Selected

- * UL 705 electrical



NOTES : All dimensions shown are in units of inches.
 * - Varies with Motor Selection



DIMENSIONS

Damper Size (In)	Wall Opening (In)	Approximate Weight (Lb)
10 x 10	(N/A)	12

PERFORMANCE

Qty.	Model	Volume (CFM)	SP (In WC)	FRPM	Power (BHp)	Motor Information			
						Hp	V/C/P	Enclosure	RPM
1	SE1-8-440-D	167	0.250	1550	0.03	1/25	115/60/1	Totally Enclosed	1550

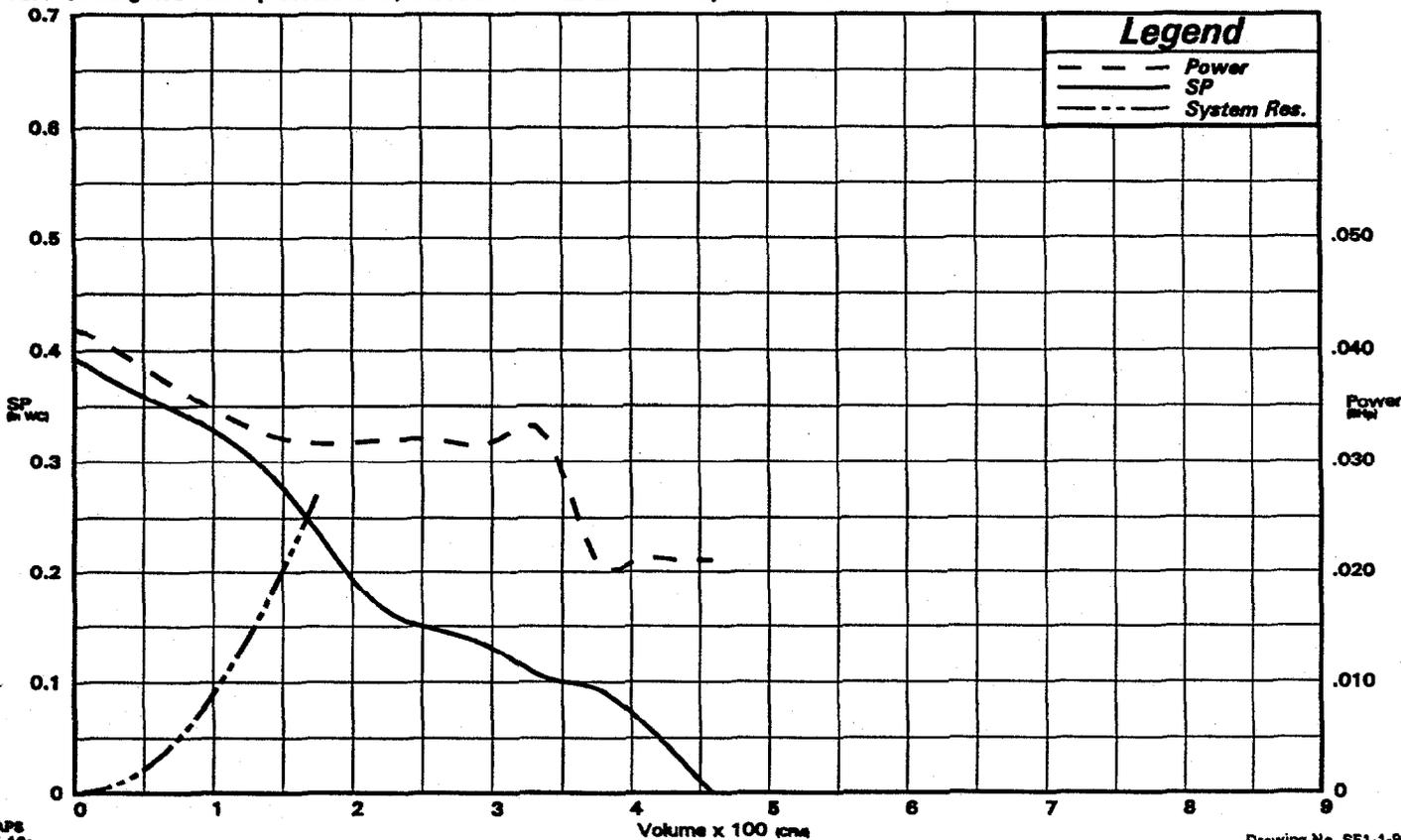
SOUND

Inlet Sound Power by Octave Band								LwA	dBA	Sones
63	125	250	500	1000	2000	4000	8000			
68	71	59	55	53	50	47	44	61	49	5.6

AIR DENSITY

Elevation (Ft)	Airstream Temp. (F)
0	70

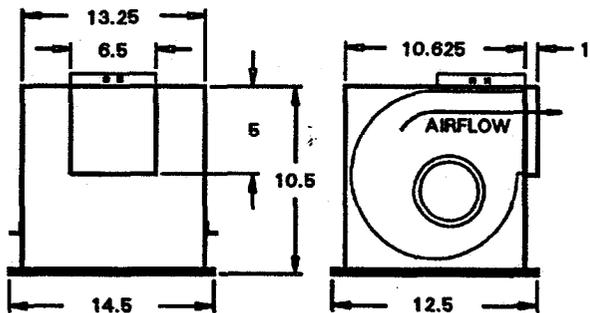
LwA - A weighted sound power level, based on ANSI S1.4. Sones calculated using AMCA 301 at 5 feet.
 dBA - A weighted sound pressure level, based on 11.5 dB attenuation per octave band at 5 feet.



SP Ceiling Exhaust Fan

Standard Construction Features

- Galvanized housings with sound absorbing insulation (Painted housing SP-5) • Aluminum grille with white enamel coating (Molded Polymer grille SP-5) • Duct connector with integral backdraft damper
- Forward curved wheel (Radial tip SP-6) • Plug in disconnect
- Shaded pole motor with thermal overload.



NOTES : All dimensions shown are in units of inches.



DIMENSIONS

Grille Size (In)	Roof Opening (In)	Approximate Weight (Lb)
(N/A)	(N/A)	15

PERFORMANCE

Qty.	Model	Volume (CFM)	SP (In WC)	FRPM	Power (BHp)	Motor Information			
						Hp	V/C/P	Enclosure	RPM
1	SP-117	172	0.250	1690	0.00	75 W	115/60/1	Open Drip Proof	1690

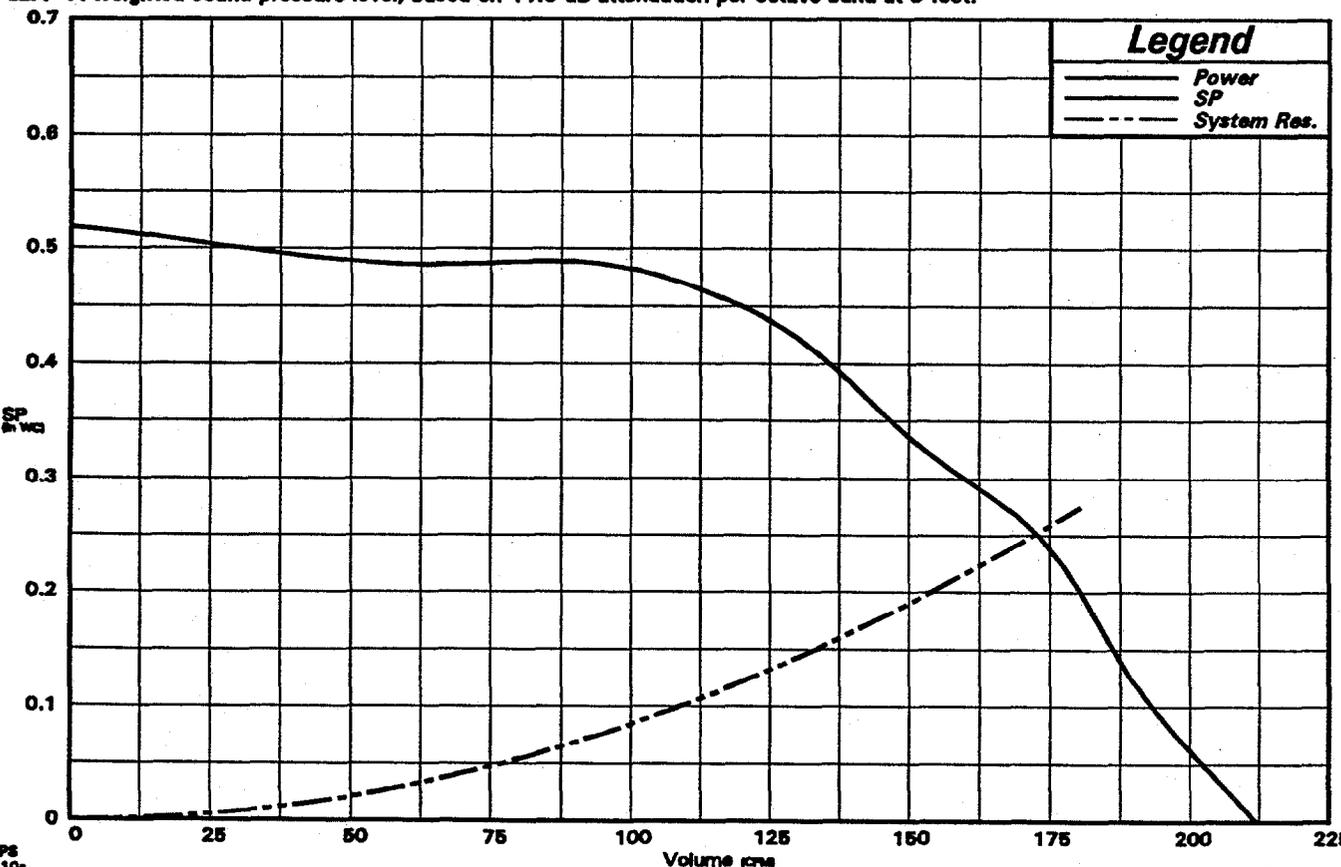
SOUND

Inlet Sound Power by Octave Band								LwA	dBA	Sones
63	125	250	500	1000	2000	4000	8000			
63	62	61	53	44	39	38	37	56	44	3.7

AIR DENSITY

Elevation (Ft)	Airstream Temp. (F)
0	70

LwA - A weighted sound power level, based on ANSI S1.4. Sones calculated using AMCA 301 at 5 feet.
 dBA - A weighted sound pressure level, based on 11.5 dB attenuation per octave band at 5 feet.

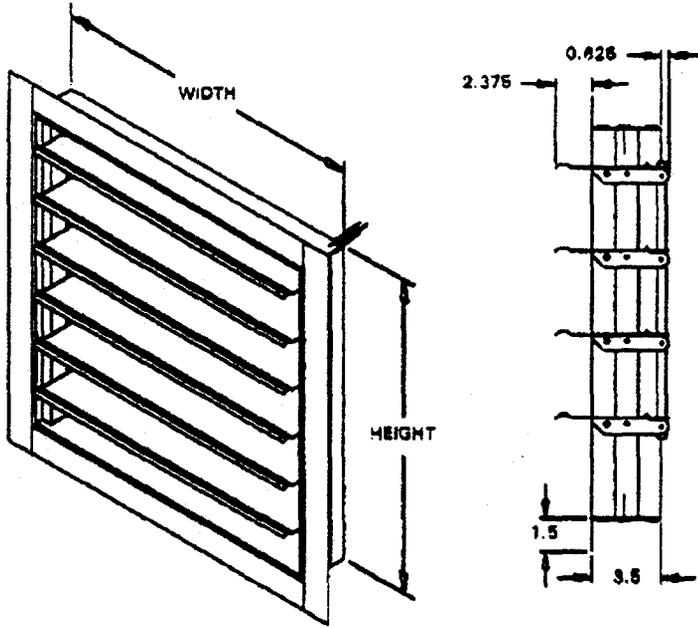




03/19/96

JOB : OHM

SYMBOL : EF-5



WD-320

Vertical Mount Exhaust Damper

Application & Design

WD-320 vertical mount exhaust damper is constructed of 18 gauge galvanized steel with prepunched mounting holes and a flangeless frame. The damper blades shall be .025 roll formed aluminum with vinyl seals on the closing edge and spring assisted for ease of opening. Axles shall be 3/16" diameter zinc plated steel mounted in acetal bushings.

NOTES : All dimensions shown are in units of inches.
Height & Width furnished approximately 1/4" under size.

Construction Features

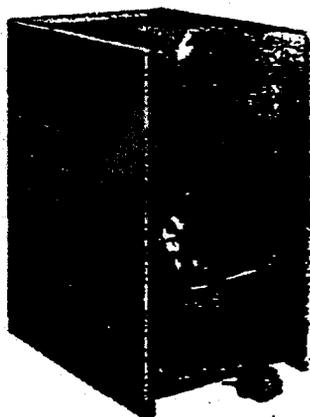
Frame Material	Galvanized	Motor Pack	None
Axle Material	Steel	Sizing	Nominal
Axle Bearings	Synthetic		

ID No.	Qty.	Width (in)	Height (in)
1	1	12	12

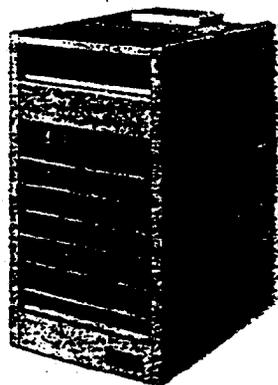
APPENDIX W
BUILDING GAS HEATERS



MODEL F INDOOR GRAVITY VENTED GAS-FIRED FAN TYPE UNIT



REAR VIEW



FRONT VIEW



DESCRIPTION

The Reznor Series 100, Model F gas-fired unit heaters are designed for 80% thermal efficiency for use with natural or propane gas in sizes from 25,000 to 400,000 BTUH gas input and are arranged for gravity venting. Model F units are designed for ceiling suspension with propeller fans for air delivery.

Standard features on the Model F Series include a manual match-lit pilot with 100% shut-off and a single-stage, 24-volt gas valve. A terminal strip connector facilitates field connection to a remote 24-volt thermostat for automatic operation. Each unit is provided with a fan control and required limit safety controls, including an energy cut-off (ECO) device and a blocked vent switch.

These units have been design-certified by the American Gas Association (A.G.A.) and approved by the Canadian Gas Association (C.G.A.) and bear the A.G.A. or C.G.A. label, and are approved for use in California.

NOTE: Model F units for California require the addition of spark pilot Option AH2 or AH3.

Warning: Gas-fired appliances are not designed for use in hazardous atmospheres containing flammable vapors or combustible dust, or atmospheres containing chlorinated or halogenated hydrocarbons.

Installations in public garages or airplane hangars are permitted when in accordance with ANSI Z223.1 and NFPA 54 codes or CAN1-B149 codes and enforcing authorities.

STANDARD FEATURES

- Orifices for natural gas
- Aluminized steel heat exchanger
- Aluminized steel burners with stainless steel insert
- 115-volt/60 Hertz supply voltage
- 115-volt, motor with internal overload protection
- Fan and limit safety controls
- Energy cut-off (ECO) device
- 24-volt control voltage transformer
- Terminal strip connector for 24-volt field wiring
- Single-stage combination gas valve
- Manual match-lit pilot with 100% shut-off
- Blocked vent shut-off system
- Convenient bottom burner access
- Full safety fan guard
- Horizontal directional louvers
- Horizontal/vertical vent outlet
- 2-point threaded hanger connections
- Baked enamel and aluminized steel finish

OPTIONAL FEATURES—FACTORY INSTALLED

- Burner orifices for elevations over 2000 ft.
- E-3 (409) stainless steel heat exchanger and burner
- Two-stage gas control (50%-low fire)—Sizes 75 thru 400
- Spark-ignited, intermittent safety pilot with electronic flame supervision and timed lockout (required for propane gas—manual reset)
- Manual summer/winter switch
- 208/230 single phase supply voltage
- Unit equipped for propane gas
- Burner air shutters
- Totally enclosed 115V motor
- Low ambient fan control relay
- 220-240 volt/50 Hertz electrical operation

OPTIONAL FEATURES—FIELD INSTALLED

- Power venter
- Vertical louvers
- Downturn air nozzles, 25°-65° or 50°-90° variable air deflection range (includes 4-point suspension kit)—See page 18
- 4-point suspension kit
- Thermostat and relay kits
- Air recirculation kits—See page 18
- Manual summer/winter switch
- Multiple heater control
- Unit-mounted thermostat bracket
- Stepdown transformer 230/115 or 460/115—See page 18
- Burner air shutters
- Low ambient fan control relay kit
- Hanger kit to suspend from 1" pipe (2 or 4 point)
- Single-stage and two-stage thermostats
- Thermostat guard with locking cover
- Manual shutoff valve and union

NOTE: Regulated combination gas valve consists of combination pilot solenoid valve, electric gas valve, pilot filter, pressure regulator, pilot shut-off, and manual shut-off, all in one body. Gas supply pressure must not exceed 0.5 PSI (8 oz.-14" w.c.). Minimum inlet pressure for natural gas is 5" w.c. Minimum inlet pressure for propane gas is 11" w.c.



HEATERS FOR COMMERCIAL - INDUSTRIAL USE

MODEL F TECHNICAL DATA

FOR ADDITIONAL MOUNTING HEIGHTS SEE PAGE 2

Model Number	25	50	75	100	130	165	200	250	300	400
BTUH Input	25,000	50,000	75,000	100,000	130,000	165,000	200,000	250,000	300,000	400,000
BTUH Thermal Output *	20,000	40,000	60,000	80,000	104,000	132,000	160,000	200,000	240,000	320,000
Gas Connection-Natural **	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"
Size of Std. Gas Valve - Vent Outlet	1/2" Rd.	1/2" Rd.	3/4" Oval	3/4" Oval	7/8" Oval	1" Oval	1" Oval	1 1/8" Oval	1 1/8" Oval	1 3/4" Oval
Control Amps (24-Volt)	.33	.33	.33	.33	.23	.23	.23	.23	.20	.20
Full Load Amps (115V)	3.0	3.0	3.0	2.8	2.0	2.0	2.0	2.5	2.0	2.0
Normal Power Consumption-Watts	60	95	135	195	250	275	300	280	375	485
Drawn @ 8' Mounting Ht.	95	95	115	60	69	78	85	96	108	120
CFM	380	650	980	1250	1800	2200	2800	3360	3900	4940
Outlet Velocity (FPM)	1423	853	1166	1358	932	1100	1217	1182	1428	1380
Motor Horsepower ***	Standard	1/50	1/35	1/15	1/30	1/20	1/20	1/20	1/8	1/4
	Optional Enclosed	-	1/15	1/15	1/8	1/8	1/8	1/8	1/6	1/2
Motor RPM	1550	1550	1550	1050	1050	1050	1050	850	850	850
Fan Diameter (in.)	10	10	12	14	14	16	20	22	22	24
Approx. Ship Wt. Lbs.	72	79	88	97	132	149	170	204	221	278
Approx. Ship Wt. Lbs.	89	96	107	118	155	172	196	232	249	311

* A.G.A. ratings for altitudes to 2000 feet. Above 2000 feet de-rate by orifice change, 4% for each 1000 feet above sea level. * C.G.A. ratings for altitudes to 2000 feet. High altitude units (2001 to 4500 feet) de-rated by 10% of maximum input.
 ** Gas connection for propane is 1/2" for all sizes. Sizes shown are for gas connection to a single-stage gas valve, NOT gas supply line size.
 *** All other information in this table is based on a heater equipped with a standard 115-volt/60Hz motor. (The standard motor for a Model 25 is an enclosed motor; all other standard motors are open motors. Optional enclosed motors are available in 115-volt only).
 NOTE: Not certified for residential use.

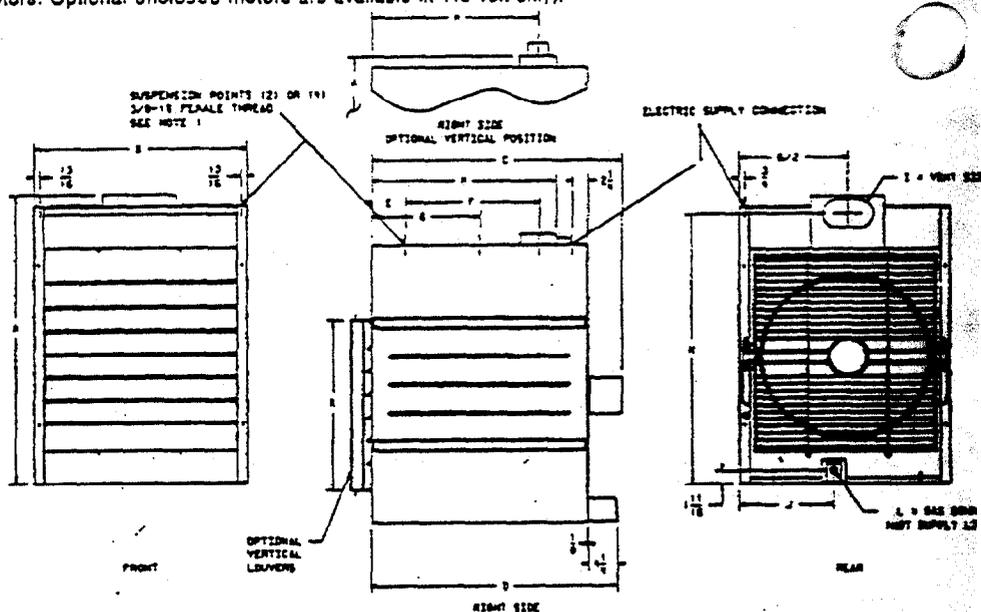
CLEARANCE FROM COMBUSTIBLES

REQUIRED CLEARANCES				
Model	Top	Flue Connector	Sides	Bottom Rear
F25-100	2'	6'	18"	12" 24"
F130-400	6'	6'	18"	12" 24"

* Measure top clearance as illustrated.

** When supplied with optional downflow nozzle, bottom clearance is 4". For service purposes, on standard units, bottom clearance exceeding 12" minimum is not required but may be desirable.

*** For servicing purposes only, rear must have 24" clearance.



MODEL F DIMENSIONS

MODEL NO.	A	B	C	D	E	F	G	H	I	J	K	L		M	N
												NAT.	PRQ.		
25	30 1/2"	15 1/2"	27 1/2"	31 1/2"	5 1/2"	14 1/2"	14 1/2"	19	4 Rnd	10 1/2"	16	1/2"	1/2"	21 1/2"	27 1/2"
50	30 1/2"	17 1/2"	30 1/2"	31 1/2"	5 1/2"	14 1/2"	14 1/2"	19	5 Oval	10 1/2"	16	1/2"	1/2"	21 1/2"	27 1/2"
75	40 1/2"	17 1/2"	35 1/2"	35 1/2"	4"	19 1/2"	15 1/2"	23 1/2"	7 Oval	11 1/2"	24	1/2"	1/2"	27	
100	40 1/2"	20 1/2"	36 1/2"	35 1/2"	4"	19 1/2"	15 1/2"	23 1/2"	8 Oval	11 1/2"	24	1/2"	1/2"	27	
130	43 1/2"	23 1/2"	36 1/2"	35 1/2"	4"	19 1/2"	15 1/2"	23 1/2"	8 Oval	14 1/2"	24	1/2"	1/2"	27	36 1/2"
165	43 1/2"	25 1/2"	36 1/2"	36 1/2"	4"	19 1/2"	15 1/2"	23 1/2"	10 Oval	12 1/2"	24	1/2"	1/2"	27	36 1/2"
200	43 1/2"	28 1/2"	36 1/2"	35 1/2"	4"	19 1/2"	15 1/2"	23 1/2"	10 Oval	12 1/2"	24	1/2"	1/2"	27	36 1/2"
250	43 1/2"	28 1/2"	36 1/2"	35 1/2"	4"	19 1/2"	15 1/2"	23 1/2"	12 Oval	13	24	1/2"	1/2"	27	36 1/2"

NOTE: 1. Use dimension "G" for 2-point suspension and "E" and "F" for 4-point. 2. Factory equipped 2-point suspension; 4-point is option.



Pilot, Gas and Air Control Descriptions

Gas-Fired Unit Heaters

PILOT IGNITION SYSTEMS

- **MANUAL PILOT:** Manual match-lit pilot with 100% shut-off. Pilot remains on 100% of time until pilot gas flow is shut off.
- **INTERMITTENT SPARK PILOT:** Automatic lighting of pilot with an electronic spark on a call for heat. Pilot gas flow is shut off between heat cycles. A.G.A. certified for use with natural and propane gas with outdoor units; A.G.A. certified for use with natural gas only on indoor units; C.G.A. approved for use with natural gas only on indoor and outdoor units.
- **INTERMITTENT SPARK PILOT WITH TIMED LOCKOUT:** Automatic lighting of pilot with an electronic spark on a call for heat. Pilot gas flow is shut off between heat cycles. Lockout device stops gas flow to the pilot if the pilot fails to light in 120 seconds. Reset of lockout requires manual interruption of the thermostat circuit. A.G.A. certified and C.G.A. approved for use with natural or propane gas on indoor and outdoor applications.

GAS CONTROL SYSTEMS

- **SINGLE-STAGE:** Single-stage gas valve which cycles on at 100% fire on a call for heat.
- **TWO-STAGE:** Two-stage gas valve which fires at 100% or 50%, as required by remote two-stage thermostat.
- **ELECTRONIC MODULATION (Models SCA/SCB; natural gas only):** Solid state control system, providing close temperature control through related manifold pressure. On a call for heat from a remote electronic thermostat, controls modulate between 50% and 100%. Remote thermostat is included.

AIR CONTROL SYSTEMS

- **AIR RECIRCULATION KIT (SINGLE-STAGE UNITS ONLY):** First stage control of thermostat energizes unit heater fan to recirculate warm stratified ceiling air. Second stage control of thermostat opens single-stage gas valve. Kits includes relay and two-stage thermostat (40°-90°F) shipped separately.
- **SPECIAL AIR RECIRCULATION KIT (SINGLE-STAGE UNITS ONLY):** Same as the basic kit, with the addition of a manual summer switch on thermostat for summer fan operation.

STEP-DOWN TRANSFORMERS

Models FE/BE/F/B
(KVA Requirements—All voltages)

Model	Unit Size							
	25	50	75	100	130-200	250	300	400
F (Heater Only)	.25	.25	.25	.50	.50	.50	.50	1.00
F with Field-Installed Venter Option	.25	.50	.50	.50	.75	.50	.75	1.00
FE	.25	.50	.50	.50	.75	.50	.75	1.00
B (Heater Only)	.50	.50	1.0	1.0				
B with Field-Installed Venter Option	.50	.50	1.0	1.0				
BE	.50	.50	1.0	1.0				

DOWNTURN NOZZLE OUTLETS

Gas-Fired Unit Heaters

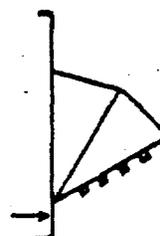
Optional Downturn Nozzle with 25° — 85° Range of Air Deflection

(Previously referred to as a 30° Nozzle.)



Optional Downturn Nozzle with 50° — 90° Range of Air Deflection

(Previously referred to as a 60° Nozzle.)



IMPORTANT:

On gas-fired fan models (Model F, FE and SCA), do not use vertical louvers in combination with 50°-90° range of air deflection.

INSTALLATION PROCEDURES

WARNING: Gas-fired appliances are not designed for use in hazardous atmospheres containing flammable vapors or combustible dust or atmospheres containing chlorinated or halogenated hydrocarbons. Installations in public garages or airplane hangars are permitted when in accordance with ANSI Z223.1 and NFPA 84 codes or CAN1-B149 and applicable authorities.

WARNING: Failure to provide proper venting could result in death, serious injury, and/or property damage. Unit must be connected to flue having proper draft to ensure safe and proper operation. Units must be properly vented to the outside of the building. Installation of any gravity vented heating equipment requires a properly operating vent system, correct provision of combustion air and regular maintenance and inspection.

WARNING: Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury, or death. Read the installation, operation and maintenance instructions thoroughly before installing or servicing any heating equipment.

FOR YOUR SAFETY

1. If you smell gas.
2. Open windows.
3. Do not touch electrical switches.
4. Extinguish any open flames.
5. Immediately call your gas supplier.

FOR YOUR SAFETY

The use and storage of gasoline or other flammable vapors and liquids in containers in the vicinity of this appliance is hazardous.

The unit shall be installed in accordance with the standards of the National Fire Protection Association or the National Fuel Gas Code for gas-fired unit heaters and duct furnaces, and these standards should be followed carefully. Authorities having jurisdiction should be consulted before installations are made to verify local codes and installation procedures. In the absence of such codes and procedures, the unit shall be installed in accordance with the National Fuel Gas Code ANSI Z223.1-(latest edition).

Installation in aircraft hangars should be made in accordance with ANSI/NFPA No. 409-(latest edition), Standard for Aircraft Hangars, and in public garages in accordance with NFPA No. 88A-(latest edition), Standard for Parking Structures, and NFPA No. 88B-(latest edition) for repair garages. ANSI/NFPA-409-(latest edition) specifies a clearance of 10 feet to the bottom of the heater from the highest surface of the top of the wings or engine enclosures, or whatever aircraft would be the highest to be housed in the hangar, and a minimum clearance of 8 feet from the floor in other sections of aircraft hangars, such as offices and shops which communicate with areas used for servicing or storage. The heaters must be located so as to be protected from damage by aircraft or other objects such as cranes and movable scaffolding.

NFPA-88-(latest edition) specifies overhead heaters must be installed at least 8 feet above the floor.

Clearances to combustible construction or material in storage from the heater and vent must conform with the National Fuel Gas Code ANSI Z223.1-(latest edition) pertaining to gas-burning devices, and such material must not attain a temperature over 160° F. by continued operation of the heater.

UNIT HEATER PLACEMENT

Fan type or blower type unit heaters without ductwork should be located with certain rules in mind. In general, units should be suspended 8 to 12 feet above the floor and arranged to blow toward or along exposed wall surfaces. Where two or more units are employed in the same space, a general scheme of air circulation should be maintained for best results.

Suspended unit heaters are most effective when located as close to the working zone as possible; this should also be kept in mind when determining the mounting height. Care should be taken to avoid directing the discharge air directly on the room occupants.

Any obstacle or obstruction which will cause deflection of the air supply should be avoided. Partitions, columns, counters, or other obstructions should be taken into consideration when locating units, in order to keep any deflected air or turbulence at a minimum.

In large areas, units should be located to discharge air along exposed walls, with other units provided to discharge air toward the center of the area. When units must be located in the center of the space, the air should be discharged toward the exposed walls.

Where infiltration of cold air is excessive, such as entrance doors or shipping doors, the unit should be located so that the air will discharge directly toward the source of cold air, from a distance of 15 to 20 feet.

CLEARANCES AND COMBUSTION AIR

Units must be installed so that clearances are provided to combustion air space, service and inspection, and for proper spacing from combustible construction.

All fuel-burning equipment must be supplied with the air that enters into the combustion process and is then vented to the outdoors. Sufficient air must enter the equipment location to replace that exhausted through the vent system. Modern construction methods involve the greater use of insulating improved vapor barriers and weatherstripping, with the result that buildings generally are much tighter structurally than they have been in the past. Combustion air supply for gas fired equipment can be affected by these construction conditions because infiltration that would have existed in the past may not be adequate.

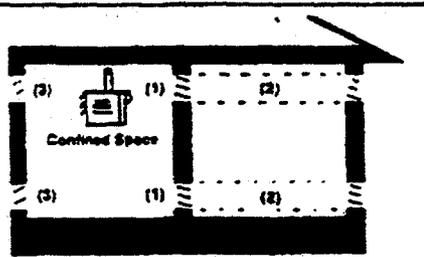
Extensive use of exhaust fans aggravates the situation. In the past, the infiltration of outside air assumed in heat loss calculations (one air change per hour) was assumed sufficient.

However, current construction methods utilizing more insulation and vapor barriers, tighter fitting and gasketed doors and windows or weatherstripping, and mechanical exhaust fans may now require the introduction of outside air through wall openings or ducts.

HEATERS LOCATED IN CONFINED SPACES

FIG. 1

Confined Space:
A space whose volume is less than 50 cubic feet per 1000 BTUH of the installed appliance input rating.



Do not install unit in confined space without providing wall openings leading to and from this space. Provide adequate openings near floor and ceiling for ventilation and air for combustion, as shown in Fig. 1 depending on combustion air source as noted below.

Add total BTUH of all appliances in the confined space and divide by figures below for square inch free area size of each (top and bottom) opening.

1. Air from inside building - openings 1 square inch free area per 1000 BTUH. Never less than 100 square inches free area for each opening. See (1) in Figure 1 above.
2. Air from outside through duct - openings 1 square inch free area per 2000 BTUH. See (2) in Figure 1 above.
3. Air direct from outside - openings 1 square inch free area per 4000 BTUH. See (3) in Figure 1 above.

NOTE: For further detail on supplying combustion air to confined space see: National Fuel Gas Code ANSI Z223.1- (latest edition) 5.3.3.

GAS PIPING AND PRESSURES

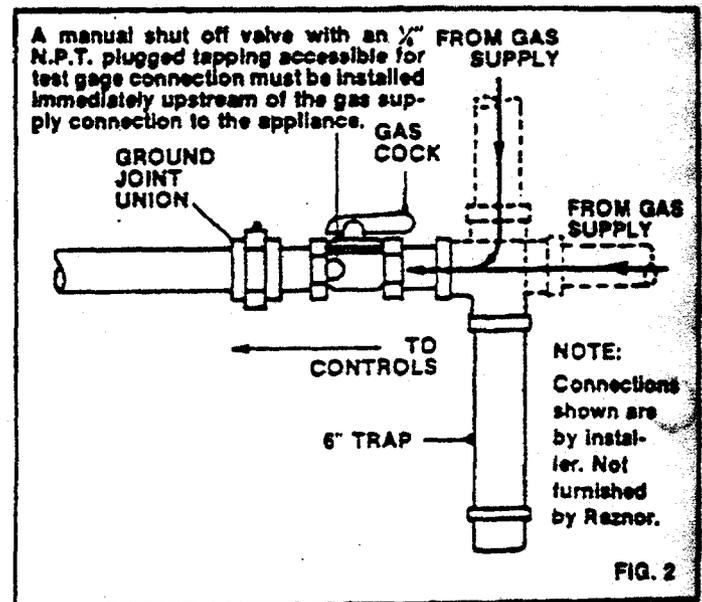
To provide adequate gas pressure at the furnace, refer to pipe sizing tables. The unit is equipped for a maximum gas supply pressure of 1/2 pound or 8 ounces. An additional service regulator external to the unit is required to reduce higher supply pressures to the 1/2 pound maximum.

WARNING! Never expose gas controls on unit to greater than 1/2 pound pressure! Pressure testing of the gas supply piping system must be carried out before connecting the furnace. A pipe cap or field-supplied high pressure gas cock must be used during proof testing of the system.

For Natural Gas: Manifold gas pressure is regulated by the combination valve to 3.5" water column. Inlet pressure to the valve must be a minimum of 5" water column or as noted on the rating plate and a maximum of 14" water column.

For Propane Gas: Manifold gas pressure is regulated by the combination valve to 10" water column. Inlet pressure to the valve must be a minimum of 11" water column and a maximum of 14" water column.

NOTE: Gas supply pressure greater than 14" W.C. or 1/2 pound requires an additional service regulator to be added to the unit or supply system.



SIZING GAS SUPPLY LINES

Length of Pipe	CAPACITY OF PIPING											
	Cubic Feet Per Hour. Based on 0.3" W.C. Pressure Drop.											
	Specific Gravity for Natural Gas-0.6 (1000 BTU/CU Foot) • Specific Gravity for Propane Gas-1.6 (2550 BTU/CU Foot)											
	Diameter of Pipe											
	1/2"		3/4"		1"		1-1/4"		1-1/2"		2"	
	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane
20'	92	58	190	116	350	214	530	445	1100	671	2100	1281
30'	73	45	152	93	285	174	590	360	890	543	1650	1007
40'	63	38	130	79	245	149	500	305	760	464	1450	885
50'	56	34	115	70	215	131	440	268	670	409	1270	775
60'	50	31	105	64	195	119	400	244	610	372	1105	674
70'	45	28	96	59	180	110	370	226	580	342	1050	641
80'	40	24	84	51	160	98	320	195	490	299	930	567
100'	38	23	79	48	150	92	305	186	460	281	870	531
125'	34	21	72	44	130	79	275	168	410	250	780	479
150'	31	19	64	39	120	73	250	153	380	232	710	433
175'	28	17	59	36	110	67	225	137	350	214	650	397
200'	26	16	55	34	100	61	210	128	320	195	610	372

NOTE: When sizing supply lines, consider possibilities of future expansion and increased heating requirements. Refer to National Fuel Gas Code for additional information on sizing.

All piping must be in accordance with requirements outlined in the pamphlets National Fuel Gas Code ANSI/Z223.1 (latest edition) published by the American Gas Association.

The National Fuel Code requires the installation of a trap with a minimum 3" drip leg. Local codes may require a minimum drip leg longer than this (typically 6").

Where regulations require and for ease of servicing, install a ground joint union and manual shut-off valve upstream of unit control system, as shown in Fig. 2

NOTE: All components of gas supply system must be leak tested prior to placing equipment in service. NEVER TEST FOR LEAKS WITH AN OPEN FLAME.

DUCT CONNECTIONS (BLOWER MODEL ONLY)

Propeller fan type unit heaters are not designed or approved for installation with discharge ducts. Static pressures created by such ducts can cause serious overheating, venting, or pilot and burner ignition problems.

Proper size duct work based on CFM and available pressure is a must for a good heating installation.

All warm air supply ducts should be equipped with dampers so that the system may be properly balanced.

Calculated heat loss is a pre-requisite to determining duct designs for any good warm air heating system. It is recom-

mended that a simplified method for heat loss calculation sponsored by a reputable organization, be followed. The recognized authority for such information is the Air Conditioning Contractors Association, 1228 17th St. N.W. Washington D.C. 20036. A manual covering duct sizing in detail may be purchased from them.

ELECTRICAL SUPPLY AND CONNECTIONS

All electrical wiring and connections including electrical grounding should be made in accordance with the National Electric Code ANSI/NFPA No. 70-(latest edition). Check any local ordinance or gas company requirements that apply.

A separate line voltage supply with fused disconnect switch should be run directly from main panel to the unit, making connection to leads in junction box. All external wiring must be within approved conduit and have a minimum temperature rise rating of 63°F. See wiring diagram in heater junction box. Conduit from disconnect switch must be run so as to not interfere with service panels of heater. The unit must be electrically grounded in accordance with the National Electrical Code, ANSI/NFPA No. 70-(latest edition).

Install room thermostat in accordance with directions furnished with thermostat. **IMPORTANT:** Make sure that the heat anticipator adjustment in the thermostat matches the total amp load of the 24V control circuit.

Thomas & Betts

STANDARD PRODUCT LIMITED WARRANTY

Reznor warrants to the original owner-user that this Reznor product will be free from defects in material or workmanship. This warranty is limited to twelve (12) months from the date of original installation, whether or not actual use begins on that date, or eighteen (18) months from date of shipment by Reznor, whichever occurs first.

MODEL FE, BE, F, B 10/5 YEAR EXTENDED LIMITED WARRANTY

The heat exchanger, drafthood, flue baffle assembly, burners, and flue collection box only for FE, BE, F, and B units shall have an extended nine (9) year non-prorated warranty in addition to the standard warranty.

All electrical and mechanical operating components, with the exception of blower belts on BE and B units, shall have an extended four (4) year non-prorated warranty in addition to the standard warranty.

MODEL OH/OB EXTENDED LIMITED WARRANTY

(Applies to new Model OH and OB Unit Heaters purchased after March 1, 1994.)

The heat exchanger shall have an extended four (4) year non-prorated warranty in addition to the standard warranty.

MODELS SCA AND SCB EXTENDED LIMITED WARRANTY

(Applies only to new Model SCA and SCB Unit Heaters purchased after November 1, 1992.)

The heat exchanger, burners, and all electrical and mechanical operating components (with the exception of blower belts on SCB Models) shall have an extended four (4) year non-prorated warranty in addition to the standard warranty.

LIMITATIONS AND EXCLUSIONS

Reznor's obligation under this warranty is limited to repair or replacement at Reznor's factory in Mercer, Pennsylvania, of any part or parts of this Reznor product identified by model or serial number which shall be returned to Reznor with transportation charges prepaid and which Reznor's examination shall disclose to its satisfaction to be defective. Reznor parts or products will not be accepted at Reznor's factory without an attached Return Materials Tag. Repaired or replacement parts will be shipped by Reznor F.O.B. Mercer, Pennsylvania.

1. This warranty does not cover labor or other costs incurred in repairing, removing, installing, servicing, or handling of parts or complete products.
2. This warranty will not apply if the input to the product exceeds the rated input as indicated on the name plate by more than 5%, or if the product in the judgment of Reznor has been subjected to misuse, negligence, accident, atmospheres containing halogenated hydrocarbons, corrosive atmospheres, atmospheres containing any contaminant (silicone, aluminum oxide, etc.) that adheres to the spark ignition pilot flame sensing probe causing interruption of normal operation, excessive thermal shock, physical damage, impact, abrasion, unauthorized alterations, or operation contrary to Reznor's printed instructions, or if the serial number has been altered, defaced or removed.
3. Reznor shall not be liable for any default or delay in performance of its warranty obligations hereunder caused by any circumstances beyond its control, including but not limited to judicial or government restrictions or restraints, strikes, fires, floods, or reduced supplies of raw materials, energy or parts.
4. Reznor will not be liable for any loss, damage, cost of repair, or incidental or consequential damages of any kind in connection with the sale, use or repair of any Reznor products. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, AND REZNOR DISCLAIMS ALL OTHER EXPRESS WARRANTIES AND ALL IMPLIED WARRANTIES, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND OF FITNESS FOR A PARTICULAR PURPOSE. No person is authorized to assume for Reznor any other warranty, obligation or liability.

Thomas & Betts



REZNOR

MERCER, PA. 16137



Model F and B Gas-Fired, Gravity-Vented Unit Heaters

INSTALLATION FORM RGM 434-A

Obsoletes 434-8

APPLIES TO:

Installation/Operation/Service

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FOR YOUR SAFETY

If you smell gas:

1. Open windows.
2. Don't touch electrical switches.
3. Extinguish any open flame.
4. Immediately call your gas supplier.

FOR YOUR SAFETY

The use and storage of gasoline or other flammable vapors and liquids in open containers in the vicinity of this appliance is hazardous.

WARNING: Gas-fired appliances are not designed for use in hazardous atmospheres containing flammable vapors or combustible dust, in atmospheres containing chlorinated or halogenated hydrocarbons, or in applications with airborne silicone substances. See Hazard Levels, Page 2.

WARNING: Improper installation, adjustment, alteration, service, or maintenance can cause property damage, injury or death. Read the installation, operation, and maintenance instructions thoroughly before installing or servicing this equipment.

GENERAL

Installation should be done by a qualified agency in accordance with the instructions in this manual and in compliance with all codes and requirements of authorities having jurisdiction. The instructions in this manual apply to the unit heater models shown on the right.

Model	Fuel	Vent	Air Delivery
F	Gas-Fired	Gravity	Propeller Fan
B	Gas-Fired	Gravity	Centrifugal Blower (heater may be attached to ductwork)

HAZARD INTENSITY LEVELS

- DANGER:** Failure to comply will result in severe personal injury or death and/or property damage.
- WARNING:** Failure to comply could result in severe personal injury or death and/or property damage.
- CAUTION:** Failure to comply could result in minor personal injury and/or property damage.

1. Installation Codes

The gas-fired unit heaters covered in this manual are design-certified by the American Gas Association and approved by the Canadian Gas Association for use with either natural or propane gas. The type of gas for which your heater is equipped and the correct firing rate are shown on the rating plate attached to your unit. Electrical characteristics are shown on the motor nameplate and on the unit rating plate.

In the United States, these units must be installed in accordance with the standard of the National Fire Protection Association or the National Fuel Gas Code ANSI Z223.1a (latest edition). The National Fuel Gas Code is available from the American Gas Association, 1515 Wilson Boulevard, Arlington, VA 22209. NFPA Publications are available from the National Fire Protection Association, Battery March Park, Quincy, MA 02269. A Canadian installation must be in accordance with the CAN/CGA B149.1 and B149.2 Installation Code for Gas Burning Appliances and Equipment. Canadian Codes are available from the Standards Department, Canadian Gas Association, 55 Scarsdale Road, Don Mills, Ontario M3B-2R3. Local authorities having jurisdiction should be consulted before installations are made to verify local codes and installation procedures.

Clearances from the heater and vent to combustible construction or material in storage must conform with the National Fuel Gas Code ANSI Z223.1a (latest edition) pertaining to gas-burning devices, and such material must not attain a temperature over 160°F by continued operation of the heater.

Special Installations (Aircraft Hangars/Garages)

Installations in aircraft hangars should be in accordance with ANSI/NFPA No. 409 (latest edition), Standard for Aircraft Hangars; in public garages in accordance with ANSI/NFPA No. 88A (latest edition), Standard for Parking Structures; and for repair garages in accordance with ANSI/NFPA No. 88B (latest edition), Standard for Repair Garages. ANSI/NFPA-88 (latest edition) specifies overhead heaters must be installed at least eight feet above the floor. In Canada, installations in aircraft hangars should be in accordance with the requirements of the enforcing authorities, and in public garages in accordance with CAN/CGA B149 codes.

ANSI/NFPA 409 (latest edition) specifies a clearance of ten feet to the bottom of the heater from the highest surface of the top of the wing or engine enclosure of whatever aircraft would be the highest to be housed in the hangar, and a minimum clearance of eight feet from the floor in other sections of aircraft hangars, such as the offices, and shops which communicate with areas used for servicing or storage. The heaters must be located so as to be protected from damage by aircraft or other objects such as cranes and movable scaffolding. In addition, the heaters must be located so as to be accessible for servicing, adjustment, etc.

2. Warranty

Refer to limited warranty information on the warranty card in the "Owner's Envelope".

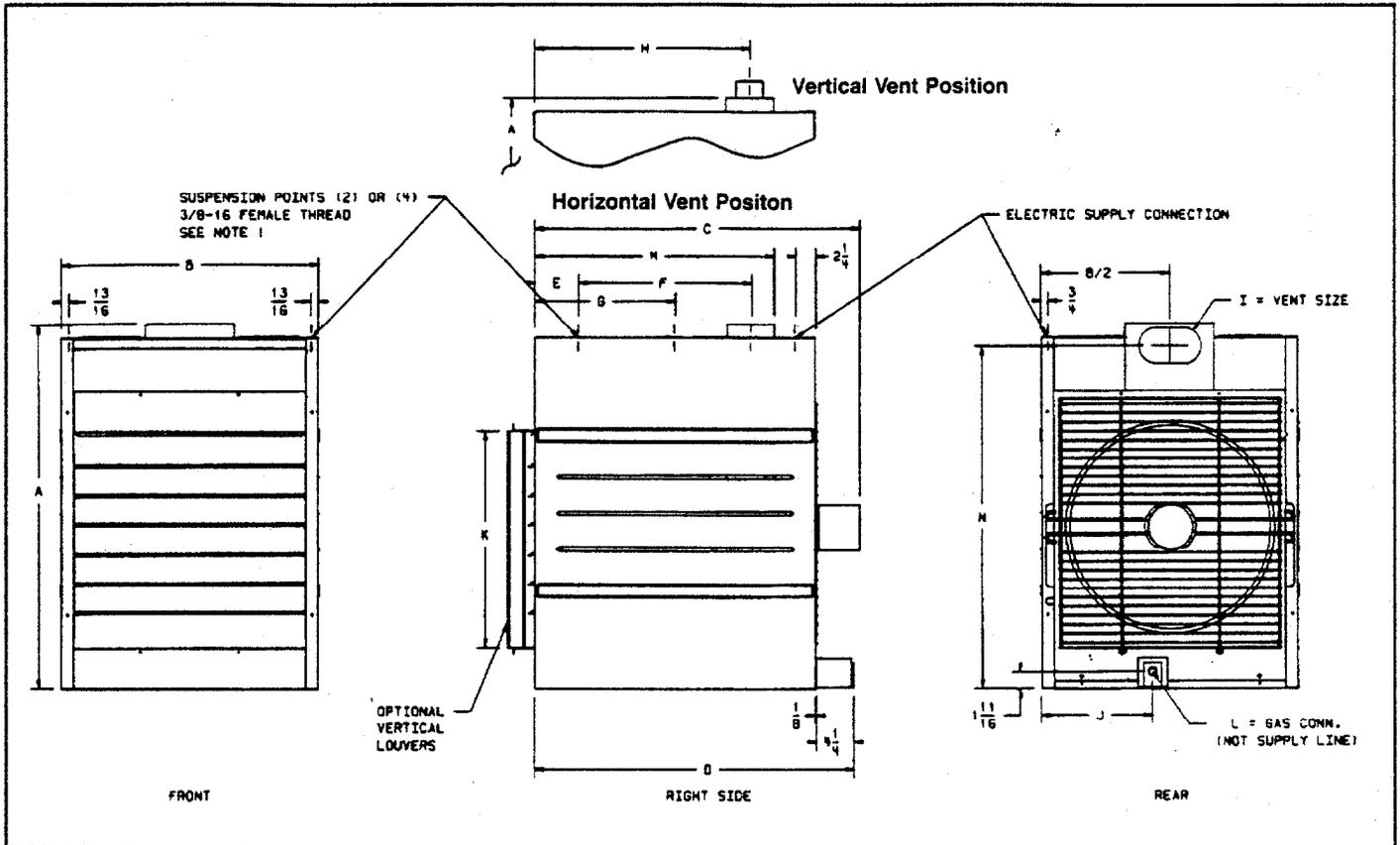
WARRANTY: Warranty is void if.....

- Unit Heaters are used in atmospheres containing flammable vapors or atmospheres containing chlorinated or halogenated hydrocarbons or airborne silicone substances.
- Wiring is not in accordance with the diagram furnished with the heater.
- Unit is installed without proper clearances to combustible materials or located in a confined space without proper ventilation and air for combustion. (See Paragraphs 6 and 7.)
- Fan-type unit heater is connected to a duct system.



3. Dimensional Data

Fan-Type, Gravity-Vented Unit Heater

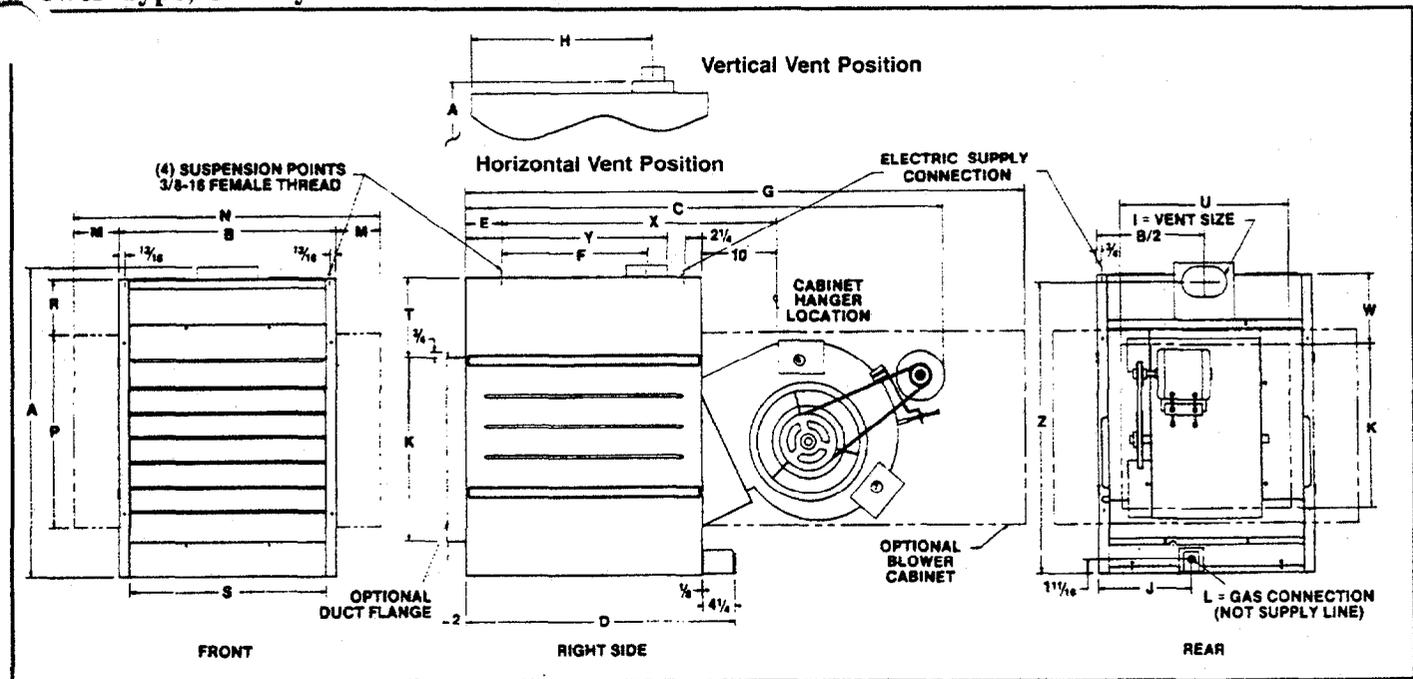


Size	A	B	C	D	E	F	G	H	I	J	K	L		M	N
												Nat	Pro		
25	30-5/32	13-9/16	27-1/16	31-7/16	5-27/32	14-7/16	14-1/32	19	4 Rnd	10-9/32	16	1/2	1/2	21-1/2	27-21/32
50	30-5/32	13-9/16	27-1/16	31-7/16	5-27/32	14-7/16	14-1/32	19	4 Rnd	10-9/32	16	1/2	1/2	21-1/2	27-21/32
75	30-5/32	15-9/16	27-1/16	31-7/16	5-27/32	14-7/16	14-1/32	19	5 Oval	10-17/32	16	1/2	1/2	21-1/2	27-21/32
100	30-5/32	17-9/16	30-7/16	31-7/16	5-27/32	14-7/16	14-1/32	19	6 Oval	12-29/32	16	1/2	1/2	21-1/2	27-21/32
125	32	23-5/16	30-7/16	31-7/16	5-27/32	14-7/16	14-1/32	17-15/16	7 Oval	14-7/16	16	1/2	1/2	21-1/2	28-1/2
165	40-5/32	20-5/16	35-7/16	35-15/16	4-7/8	19-15/32	15-23/32	23-13/32	8 Oval	14-9/32	24	1/2	1/2	27	36-25/32
200	40-5/32	23-5/16	36-3/16	35-15/16	4-7/8	19-15/32	15-23/32	23-13/32	8 Oval	14-13/32	24	1/2	1/2	27	36-25/32
250	40-5/32	28-13/16	36-3/16	35-15/16	4-7/8	19-15/32	15-23/32	21-13/16	10 Oval	12-11/32	24	1/2	1/2	27	38-3/8
300	40-5/32	28-13/16	36-11/16	35-15/16	4-7/8	19-15/32	15-23/32	21-13/16	10 Oval	12-11/32	24	3/4	1/2	27	38-3/8
400	40-5/32	37-1/16	37-5/16	35-15/16	4-7/8	19-15/32	15-23/32	21-13/16	12 Oval	13	24	3/4	1/2	27	38-3/8

Suspension Notes: Use Dimension "G" for two-point suspension and "E" and "F" for four-point suspension. (Two-point suspension is standard; four-point is optional. Four-point suspension is available either factory or field installed.)

3. Dimensional Data (cont'd)

Blower-Type, Gravity-Vented Unit Heater



Size	A	B	C ③	D	E	F④ Hanger	G ①③	H	I	J	K ①②	L	
												Nat	Pro
25	30-5/32	13-9/16	43-3/8	31-7/16	5-27/32	14-7/16	61-3/8	19	4 Rnd	10-9/32	16	1/2	1/2
50	30-5/32	13-9/16	50	31-7/16	5-27/32	14-7/16	61-3/8	19	4 Rnd	10-9/32	16	1/2	1/2
	30-5/32	15-9/16	50	31-7/16	5-27/32	14-7/16	61-3/8	19	5 Oval	10-17/32	16	1/2	1/2
100	30-5/32	17-9/16	50	31-7/16	5-27/32	14-7/16	61-3/8	19	6 Oval	12-29/32	16	1/2	1/2
125	32	23-5/16	47-1/2	31-7/16	5-27/32	14-7/16	65-29/32	17-15/16	7 Oval	14-7/16	16	1/2	1/2
165	40-5/32	20-5/16	61	35-15/16	4-7/8	19-15/32	76-1/8	23-13/32	8 Oval	14-9/32	24	1/2	1/2
200	40-5/32	23-5/16	66-1/2	35-15/16	4-7/8	19-15/32	76-1/8	23-13/32	8 Oval	14-13/32	24	1/2	1/2
250	43-9/16	28-13/16	66-1/2	35-15/16	4-7/8	19-15/32	76-1/8	21-13/16	10 Oval	12-11/32	24	1/2	1/2
300	43-9/16	28-13/16	66-1/2	35-15/16	4-7/8	19-15/32	76-1/8	21-13/16	10 Oval	12-11/32	24	3/4	1/2
400	43-9/16	37-1/16	66-1/2	35-15/16	4-7/8	19-15/32	76-1/8	21-13/16	12 Oval	13	24	3/4	1/2

Size	M ①	N ①	P ①	R ①	S ②	T ②	U ①	W ①	⑤ X Hanger	Y	Z
50	3-23/32	20-15/16	17-3/4	5-1/4	10-3/4	8-7/16	14-3/4	6-3/16	31-7/32	21-1/2	27-21/32
75	2-23/32	20-15/16	17-3/4	5-1/4	12-3/4	8-7/16	14-3/4	6-3/16	31-7/32	21-1/2	27-21/32
100	1-23/32	20-15/16	17-3/4	5-1/4	14-3/4	8-7/16	14-3/4	6-3/16	31-7/32	21-1/2	27-21/32
125	1-11/32	25-15/16	17-3/4	5-1/4	20-1/2	8-7/16	20-1/2	6-3/16	35-3/4	21-1/2	28-1/2
165	2-27/32	25-15/16	25-1/4	7-1/4	17-1/2	11-7/16	20-1/2	7-15/16	36-11/16	27	36-25/32
200	1-11/32	25-15/16	25-1/4	7-1/4	20-1/2	11-7/16	20-1/2	7-15/16	36-11/16	27	36-25/32
250	5-29/32	40-9/16	25-1/4	7-1/4	26	11-7/16	26	7-15/16	36-11/16	27	38-3/8
300	5-29/32	40-9/16	25-1/4	7-1/4	26	11-7/16	26	7-15/16	36-11/16	27	38-3/8
400	6-25/32	50-9/16	25-1/4	7-1/4	34-1/4	11-7/16	34-1/4	7-15/16	36-11/16	27	38-3/8

- | | |
|--|--|
| <p>① When equipped with optional blower cabinet.</p> <p>② When equipped with optional duct flange.</p> <p>③ Dimension includes a 3/4" flange on the rear of the blower cabinet.</p> <p>④ Use with 4-point suspension without blower cabinet.</p> | <p>⑤ Use with 4-point suspension with blower cabinet.</p> <p>⑥ Contactor is standard on Models 300 and 400; optional on other sizes.</p> <p>⑦ Contactor location with optional three phase motors on Sizes 50, 75, 100 and 125.</p> <p>⑧ Deduct 6-5/8" on Sizes 50, 75, and 100 when equipped with direct drive motor.</p> |
|--|--|

4. Uncrating and Preparation

This unit was test operated and inspected at the factory prior to crating and was in operating condition. If the heater has incurred any damage in shipment, file a claim with the transporting agency.

Check the rating plate for the gas specifications and electrical characteristics of the heater to be sure that they are compatible with the gas and electric supplies at the installation site. Read this booklet and become familiar with the installation requirements of your particular heater. If you do not have knowledge of local requirements, check with the local gas company or any other local agencies who might have requirements concerning this installation. Before beginning, make preparations for necessary supplies, tools, and manpower.

Check to see if there are any field-installed options that need to be assembled to the heater prior to installation. Each of the option packages includes a list of components and step-by-step instructions. For a brief description of optional hanger kits, refer to Paragraph 9. For a brief explanation of other frequently specified field-installed options, see Paragraphs 26-33. After becoming familiar with the instructions, assemble and install the options that are required for your heater.

Unless the crate bottom has been removed for option installation, leave it attached until after the heater has been suspended. If the crate bottom has been removed, the bottom of the heater must be supported with plywood or appropriately placed boards. Without adequate support, the bottom access panel could be damaged.

To protect the unit during shipping, the **blower model** has special supports that must be removed before installation. Follow these instructions to remove:

- Blower Support Legs -- Remove the two blower support legs and screws.
- Motor Shipping Block - Remove the wooden block located under the motor bracket. Find the two rubber pads shipped in the instruction envelope. Place these pads on the ends of the motor bracket bolts.
- Motor Shipping Plate -- Blower models that are equipped with motors of 3/4 HP or less have a metal shipping plate attached between the motor and the blower housing. Remove and discard the shipping plate. **Note:** On units factory equipped with an optional belt guard, the belt guard must be removed in order to reach the shipping plate.

5. Unit Heater Location

For best results, the heater should be placed with certain rules in mind. In general, a unit should be located from 8 to 12 feet above the floor. Units should always be arranged to blow toward or along exposed wall surfaces, if possible. Where two or more units are installed in the same room, a general scheme of air circulation should be maintained for best results.

Suspended heaters are most effective when located as close to the working zone as possible, and this fact should be kept in mind when determining the mounting heights to be used. However, care should be exercised to avoid directing the discharged air directly on the room occupants.

Partitions, columns, counters, or other obstructions should be taken into consideration when locating the unit heater so that a minimum quantity of airflow will be deflected by such obstacles.

When units are located in the center of the space to be heated, the air should be discharged toward the exposed walls. In large areas, units should be located to discharge air along exposed walls with extra units provided to discharge air in toward the center of the area.

At those points where infiltration of cold air is excessive, such as at entrance doors and shipping doors, it is desirable to locate the unit so

that it will discharge directly toward the source of cold air from a distance of 15 to 20 feet.

Units should not be installed closer than 18 inches from any wall.

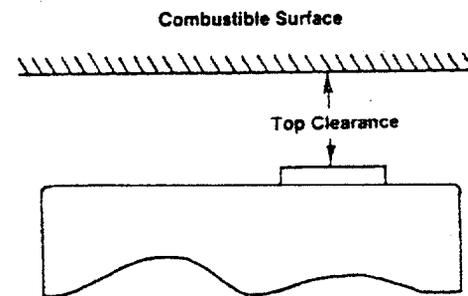
CAUTION: Do not locate the heater where it may be exposed to water spray, rain or dripping water.

6. Clearances and Combustion Air

Units must be installed so that the following clearances are provided for combustion air space, service and inspection, and for proper spacing from combustible construction.

Type	Model Size	Required Clearances				
		Top	Flue Connector	Sides	Bottom	Rear
Fan	25 - 125	2" *	6"	18"	12" **	24" ***
	165 - 400	6" *	6"	18"	12" **	24" ***
Blower	25 - 400	6" *	6"	18"	12" **	24" ***

Notes: * Measure Top Clearance as illustrated.



** When supplied with optional downturn nozzle, bottom clearance is 42". For service purposes, on standard units, bottom clearance exceeding minimum (12") is not required but may be desirable.

*** For servicing purposes only, rear **must** have 24" clearance.

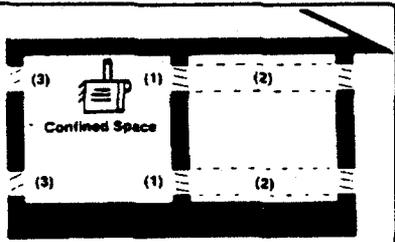
All fuel-burning equipment must be supplied with the air that enters into the combustion process and is then vented to the outdoors. Sufficient air must enter the equipment location to replace that exhausted through the heater vent system. In the past, the infiltration of outside air assumed in heat loss calculations (one air change per hour) was assumed to be sufficient. However, current construction methods utilizing more insulation, vapor barriers, tighter fitting and gasketed doors and windows or weather-stripping, and mechanical exhaust fans may now require the introduction of outside air through wall openings or ducts.

The requirements for combustion and ventilation air depend upon whether the unit is located in a confined or unconfined space. An "unconfined space" is defined as a space whose volume is not less than 50 cubic feet per 1000 BTUH of the installed appliance. **Under all conditions**, enough air must be provided to ensure there will not be a negative pressure condition within the equipment room or space. For specific requirements for confined space installation, see Paragraph 7.

7. Combustion Air Requirements for a Heater Located in a Confined Space

Do not install a unit in a confined space without providing wall opening leading to and from the space. Provide openings near the floor and ceiling for ventilation and air for combustion as shown in Figure 1, depending on the combustion air source as noted in Items 1, 2, and 3 below the illustration.

Figure 1 - Confined Space: A space whose volume is less than 50 cubic feet per 1000 BTUH of the installed appliance input rating



Add total BTUH of all appliances in the confined space and divide by figures below for square inch free area size of each (top and bottom) opening.

- 1. Air from inside the building** -- openings 1 square inch free area per 1000 BTUH. Never less than 100 square inches free area for each opening. See (1) in Figure 1.
- 2. Air from outside through duct** -- openings 1 square inch free area per 2000 BTUH. See (2) in Figure 1.
- 3. Air direct from outside** -- openings 1 square inch free area per 4000 BTUH. See (3) in Figure 1.

NOTE: For further details on supplying combustion air to a confined space, see the National Fuel Gas Code ANSI Z223.1a (latest edition).

8. Horizontal/Vertical Vent Outlet

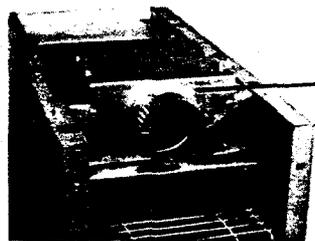
All heaters are designed for either a horizontal or vertical vent outlet. Sizes 25, 50, 75, 100, 165, and 200 are shipped with the vent outlet installed in the horizontal position. Sizes 125, 250, 300, and 400 require field assembly of the vent outlet. When the outlet is in the horizontal position, it is recommended that a 12-18" piece of straight pipe be connected to the outlet before installing an elbow.

WARNING: Sizes 125, 250, 300 and 400 require field assembly of the flue outlet. Follow the instructions carefully. Failure to provide proper venting could result in death, serious injury and/or property damage.

8.1 Horizontal/Vertical Vent Outlet -- Sizes 25, 50, 75, 100, 165 and 200

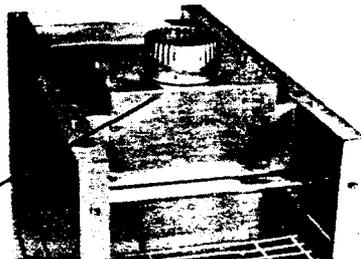
The heater in these sizes is shipped with the vent outlet in the horizontal position. If a vertical vent outlet connection is needed, reverse the positions of the flat cover plate and the flue collar assembly. See Figure 2.

Figure 2 - Vent Outlet Positions



Sizes 25, 50, 75, 100, 165, and 200 - Vent is factory assembled in the horizontal position.

Sizes 25, 50, 75, 100, 165, and 200 - Change the position of the flue collar assembly for a vertical vent outlet



IMPORTANT INSTALLATION NOTE: The instructions and illustrations in Sections 8.2 and 8.3 show the vent outlet being assembled in the horizontal position. To assemble the vent outlet in the vertical position, follow the instructions REVERSING the positions of the flue collar assembly and the cover.

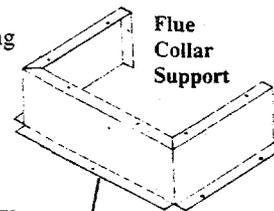
8.2 Assembly Instructions for Vent Outlet - Size 125

A size 125 heater requires field assembly of the vent outlet. The three sheet metal pieces and a parts bag including the instructions and screws are shipped attached to the drafthood of the heater.

- Remove the two center screws (one on each side) that are holding the three flue outlet pieces in place during shipping. Use these screws and the 16 screws (#10x1/2" sheet metal screws) in the plastic bag.

2. Attach the Flue Collar Support - Size 125

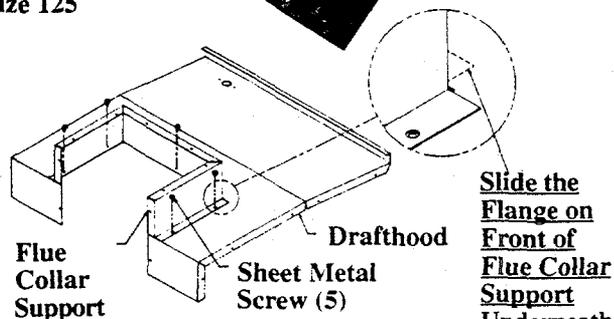
- Position the support with the opening toward the back of the heater
- Slide the flange on the front of the flue collar support **under** the drafthood (top of the heater)
- Fasten with five sheet metal screws



Front Flange

(slide front flange under top of heater)

Figure 3A - Size 125



Slide the Flange on Front of Flue Collar Support Underneath the Drafthood

3. Attach the Flue Collar Assembly - Size 125 (See Installation Note, page 6)

- Position the flue collar assembly over the rear opening
- Fasten with four sheet metal screws

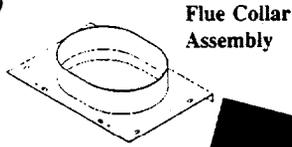
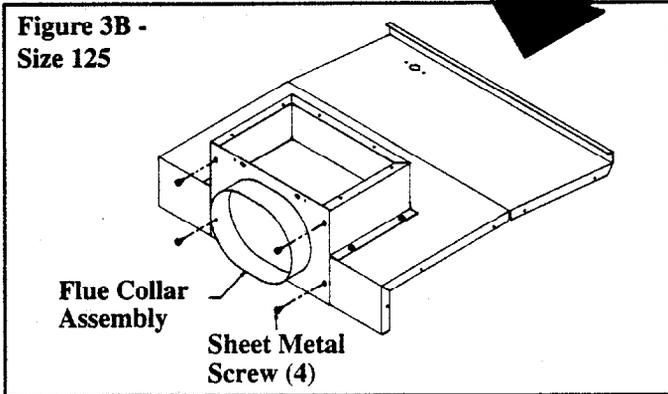


Figure 3B - Size 125

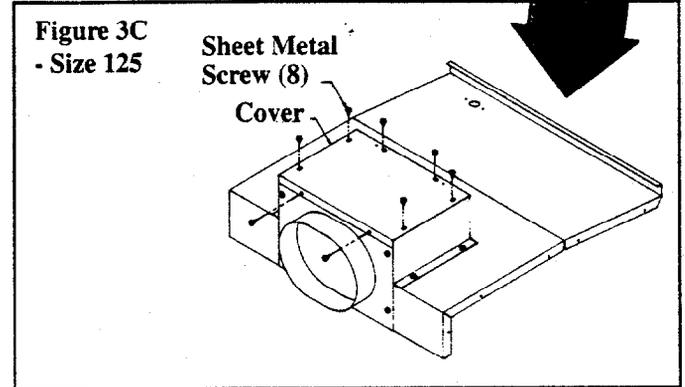


4. Attach the Cover - Size 125

- Position the flat cover over the top opening
- Fasten on the top and back with eight sheet metal screws



Figure 3C - Size 125



8.3 Assembly Instructions for Vent Outlet - Sizes 250, 300 and 400

The vent outlet on these heaters requires field assembly. The three sheet metal pieces and a parts bag including the instructions and screws are shipped attached to the drafthood of the heater.

1. Remove the two center screws (one on each side) that are holding the three flue outlet pieces in place during shipping. Use these screws and the 24 screws (#10x1/2" sheet metal screws) in the plastic bag.
2. **Attach the Flue Collar Support - Sizes 250, 300, 400**
 - Position the support around the hole in the drafthood with the opening toward the back of the heater
 - Fasten with nine sheet metal screws

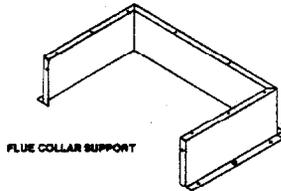
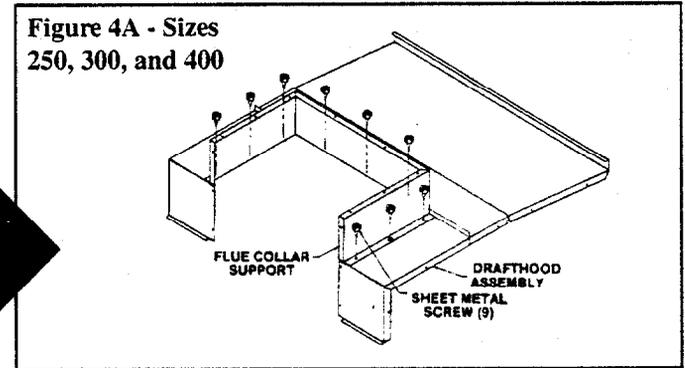


Figure 4A - Sizes 250, 300, and 400



3. Attach the Flue Collar Assembly - Sizes 250, 300, 400 (See Installation Note, page 6)

- Position the flue collar assembly over the rear opening
- Fasten with seven sheet metal screws

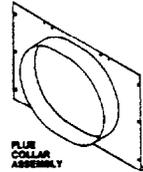
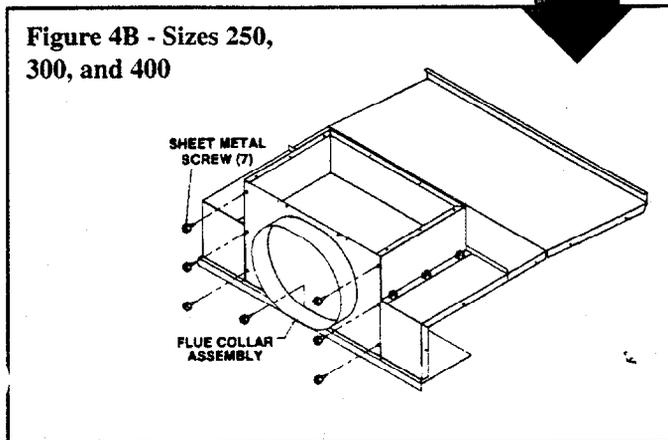


Figure 4B - Sizes 250, 300, and 400



4. Attach the Cover - Sizes 250, 300, 400

- Position the flat cover over the top opening
- Fasten on the top and back with ten sheet metal screws

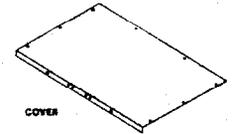
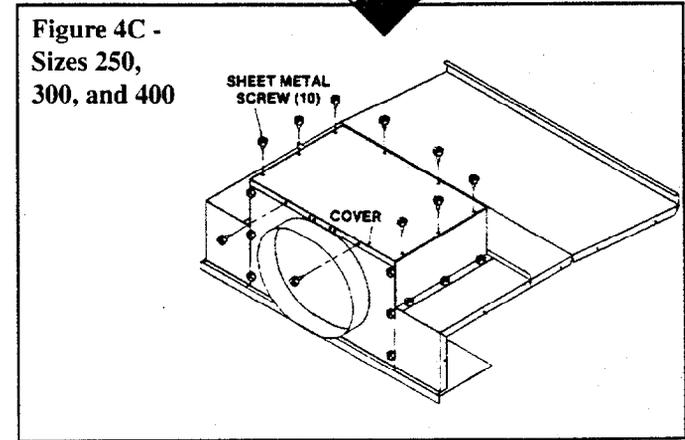


Figure 4C - Sizes 250, 300, and 400



9. Suspending the Unit

Before suspending the unit, check the supporting structure to be used to verify that it has sufficient load-carrying capacity to support the weight of the unit.

Model Type	Net Weight (lbs)									
	Size									
	25	50	75	100	125	165	200	250	300	400
Fan	72	79	88	97	127	149	170	204	221	276
Blower	93	100	114	126	150	201	235	273	296	390

NOTE: If the installation includes an optional stepdown transformer kit (Option CF or CG), the stepdown transformer bracket is part of the heater suspension and must be installed prior to hanging the heater. Follow the instructions on the installation sheet included with the option kit.

A **fan-type unit heater** is equipped with standard two-point suspension. A 3/8-16 threaded hanger bracket assembly is located on each side of the heater. If a fan-type unit has been ordered with optional, factory-installed, four-point suspension (Option BJ6), it will have two threaded hanger brackets on each side.

A **blower-type heater** is equipped with standard four-point suspension. Two 3/8-16 threaded hanger bracket assemblies are located on each side of the unit. Each hanger bracket assembly is designed for threaded rod attachment.

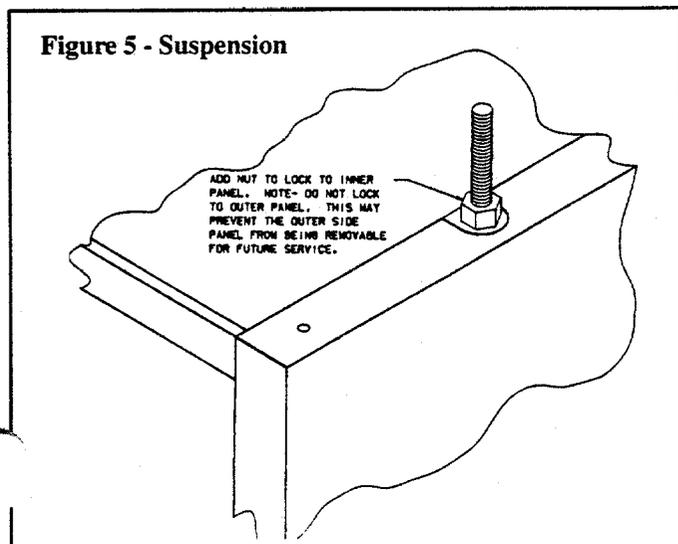
For both "standard" and "optional" suspension point dimensions, see Dimension Tables in Paragraph 3.

WARNING: Suspend the heater only from the threaded hanger brackets. Do not suspend from the heater side panel.

When the heater is lifted for suspension, the bottom must be protected. If the wooden crate bottom has been removed, the bottom of the heater will have to be supported with plywood or the appropriately placed material. If the bottom is not supported, the bottom access panel could be damaged. Also, when lifting a blower unit, support the blower and motor to prevent the unit from tipping.

All blower models have legs that support the blower assembly during shipping. After the unit is suspended, these legs should be removed.

Be sure that the threaded hanger rods are locked to the heater as shown in Figure 5.



If an **optional downturn air nozzle** is used, the unit must be suspended from four points to ensure level suspension. Two hanger brackets are included in the downturn option package and must be field-installed on fan-type units with standard two-point suspension. For additional information, refer to Paragraph 27 and the instructions that are furnished with the option package.

When **blower-type** units are equipped with an **optional blower/filter cabinet**, there are two suspension points on the blower cabinet hanger bar. Suspend a unit equipped with a blower/filter cabinet from four points, using the two heater hanger bracket assemblies closest to the front of the heater and the two suspension points on the blower/filter cabinet.

If one of the four optional, field-installed hanger kits has been ordered for your heater, it will have been shipped separately. Each option package includes a list of components and complete, step-by-step assembly instructions.

Optional, Field-Installed Hanger Kits:

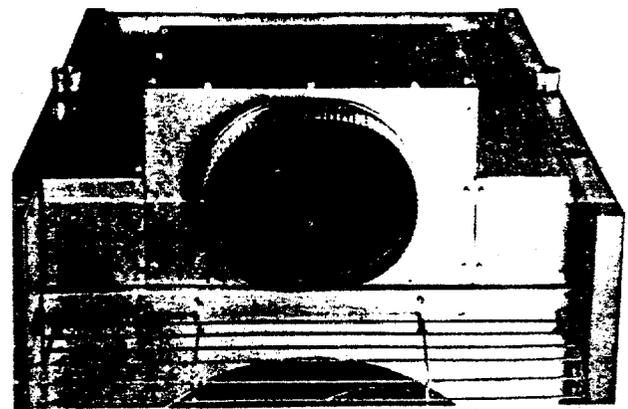
1) Four-Point Suspension (fan models only) - Option CK7

This option kit is designed to convert a fan-type heater from standard two-point suspension to four-point suspension. The kit contains two additional hanger brackets.

2) Two-Point Swivel Connectors (fan models only) - Option CK8 (See Figure 6.)

The purpose of this option kit is to adapt the standard hanger bracket so that the heater can be suspended from 1", threaded, stationary pipe. The swivel connector screws "into" the threaded hanger bracket on the heater and "onto" the 1" threaded pipe used for hanging the heater. The kit includes two swivel hanger connector assemblies and two lock washers.

Figure 6 - Two-Point Suspension with Swivel Connections (fan models only)



3) Four-Point with Swivel Connectors (fan models only) - Option CK9 (See Figure 7)

This option package is designed to convert a fan-type heater from standard two-point suspension to four-point suspension with swivel connectors. By installing this kit the standard fan-type heater can be hung from four 1", threaded, stationary pipes. The kit includes two hanger bracket assemblies, four swivel hanger connector assemblies and four lock washers.

4) Four-Point Swivel Connectors - Option CK10 (See Figure 7)

This option package is used on a heater that is already equipped with four-point suspension to adapt it for suspension from four 1", threaded,

stationary pipes. The kit includes four swivel hanger connector assemblies and four lock washers.

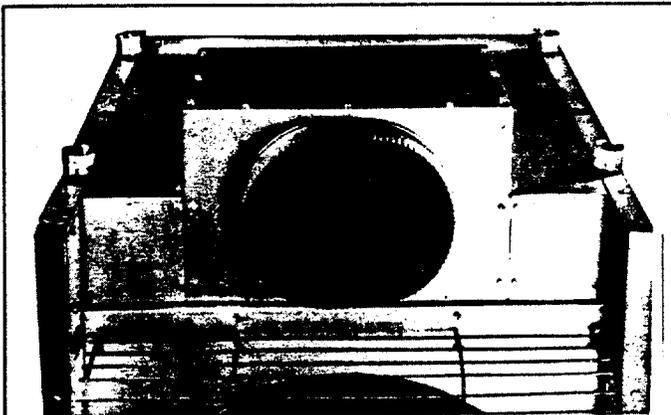


Figure 7 - Four-Point Suspension with Swivel Connections (Applies to both fan and blower models)

10. Venting

DANGER: Failure to provide proper venting could result in death, serious injury, and/or property damage. This heater must be installed with a vent connection and proper vent to the outside of the building. Install vent in accordance with Part 7, Venting of Equipment, of the National Fuel Gas Code, ANSI Z223.1 (latest edition) or applicable provision of national, state or local codes. A Canadian installation must be in accordance with the CAN/CGA B149.1 and B149.2, Installation Code for Gas Burning Appliances and Equipment, and applicable local codes. Also, follow venting recommendations listed below.

Safe operation of any gravity-vented gas equipment requires a properly operating vent system, correct provision for the combustion air (See Paragraphs 6-7) and regular maintenance and inspection (See page 27). See Hazard Levels, page 2.

Heaters have the following vent outlet sizes:

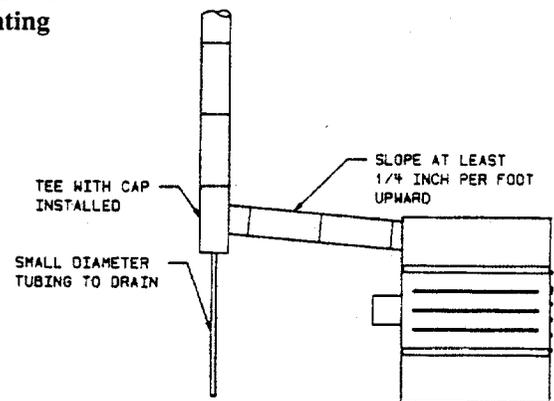
NOTE: Standard units manufactured prior to 10/89 (Serial No. Date Code prior to AOJ) have a round fixed vertical vent outlet in the sizes listed. Units manufactured prior to 10/89 with Option BT1 have the horizontal/vertical vent outlet.

Model Size	Size Configuration of Horizontal/Vertical Vent Outlet
25 - 50	4" Round
75	5" Oval
100	6" Oval
125	7" Oval
165 - 200	8" Oval
250 - 300	10" Oval
400	12" Oval

Venting Requirements - All Models

1. Provide a minimum clearance of 18" between the drafthood relief opening and any obstruction. Do not expose the relief opening to wind drafts from any source such as from an overhead door or adjacent air handling equipment.
2. The unit is equipped with a built-in draft diverter, consequently an external draft diverter **MUST NOT** be installed in the vent connector or any internal alterations made. Do not install a manual damper or other fixed restriction in the vent connector.
3. Vent pipe should be a minimum of 24 gauge galvanized steel or other non-corrosive material. Double wall, Type B vent such as Metalbestos or Amerivent is recommended. Where it is necessary to run the vent pipe through an exterior wall of combustible materials, a suitable thimble must be used. The vent pipe shall have a clearance of at least six inches from combustible materials, or as is specified by the double-wall vent pipe manufacturer.
4. With the outlet on the heater in the horizontal position, it is recommended that a 12-18" piece of straight pipe be connected to the flue collar before installing an elbow. The horizontal vent pipe run should have a uniform rise of at least 1/4" per foot of horizontal run in the direction of discharge. The length of the lateral run must not exceed lengths showing in the vent tables of the National Fuel Gas Code or the Canadian Installation Code for Gas Burning Appliances (See Tables 1 and 2).
5. Lateral runs should be supported every six feet using a non-combustible material, such as strap steel or chain. Do not rely on the drafthood or heater for support of either horizontal or vertical vent pipe.
6. Vent connectors serving Category I heaters shall not be connected into any portion of a mechanical draft system operating under positive pressure.

Figure 8 - Venting



6. Where it is necessary to use a long run of vent pipe, or where the vent pipe is exposed to cold air, condensation within the pipe may occur. There are two ways to overcome or eliminate this problem.
 - (a) Prevent condensation by insulating the pipe so that the temperature of the flue products never drops below 250°F.
 - (b) Use double-wall, Type B vent pipe which is recommended for the reduction or elimination of condensate problems. Where extreme conditions are present and condensate is anticipated, install a trap for collecting condensate. (See Figure 8.)
7. The vent connection may be made into a suitable permanent chimney or into a gas vent. The effective area of the vent connector, gas vent or chimney when connected to a single appliance shall not be less than the area of the appliance drafthood outlet or in accordance with approved venting methods. The effective area of the gas vent

10. Venting (cont'd)

or chimney when connected to more than one appliance shall not be less than the area of the largest vent connector plus 50% of the areas of additional vent connectors or in accordance with approved venting methods.

Minimum permissible height of the vertical vent is five feet providing no horizontal vent pipe connector is used. If a horizontal vent connector is necessary, consult Tables 1 and 2 or the National Fuel Gas Code or the Canadian Installation Code for Gas Burning Appliances, for the maximum permissible length of a horizontal pipe run (vent connector) for a given vertical height of gas vent.

Table 1

Maximum Horizontal Run for Double Wall Type B Connector and Double-Wall Type B Vent							
Model Sizes	25/50	75	100	125	165/200	250/300	400
Vertical	Vent Diameter						
Height of Vent	4"	5"	6"	7"	8"	10"	12"
7'	2'	6'	6'	6'	6'	6'	6'
9'	6'	6'	7'	16'	16'	16'	16'
10'	8'	10'	16'	20'	20'	20'	20'
15'	12'	16'	16'	30'	30'	30'	30'
20'	16'	20'	30'	30'	30'	30'	30'
30'	18'	20'	40'	40'	40'	40'	40'

Table 2

Maximum Horizontal Run for Single Wall Metal Pipe							
Model Sizes	25/50	75	100	125	165/200	250/300	400
Vertical	Vent Diameter						
Height of Vent	4"	5"	6"	7"	8"	10"	12"
6'	2'	2'	2'	2'	2'	2'	2'
8'	2'	5'	5'	10'	10'	10'	10'
10'	2'	5'	10'	15'	15'	15'	15'
15'	2'	5'	10'	15'	20'	20'	20'
20'	N.R.	10'	15'	20'	20'	20'	20'

The gas vent or chimney should extend at least three feet above the highest point where it passes through a roof of a building and at least two feet higher than any portion of a building or obstruction within a horizontal distance of ten feet. A suitable weather cap should be installed on the end of the vent pipe to prevent rain or snow from entering the open end. See illustrations in Figures 9, 10, and 11.

Figure 9 - Venting Arrangement through a Ceiling

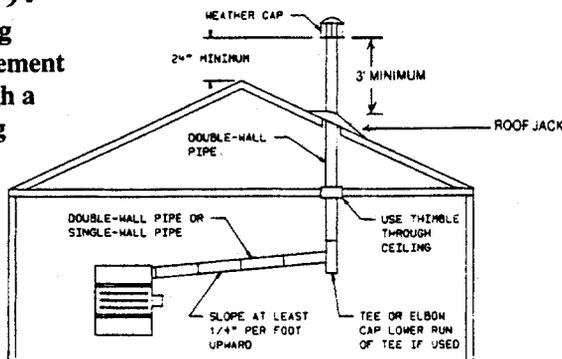


Figure 10 - Venting Arrangement with Vent Run

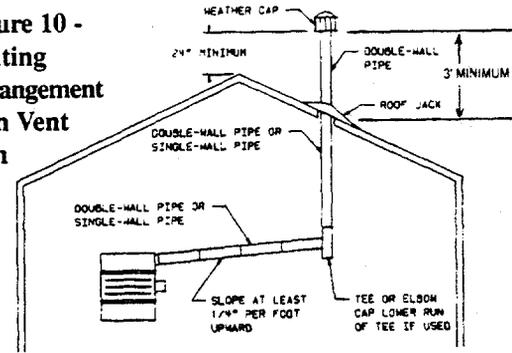
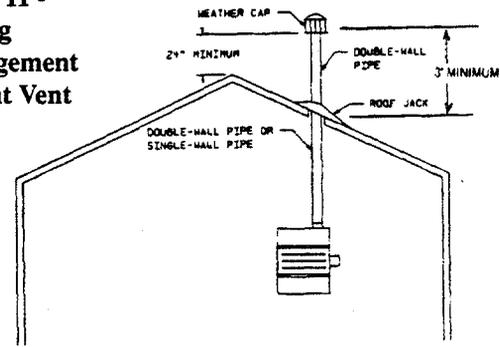


Figure 11 - Venting Arrangement without Vent Run



8. If the unit heater is installed in a space served by a large exhaust fan, be sure that the exhaust fan does not affect the operation of the heater or the satisfactory venting of its products of combustion.

If a negative pressure exists, as evidenced by a downdraft, a factory-designed mechanical motor drive venter (Option CA) should be installed. (The addition of a power venter allows for horizontal venting and alters the venting requirements including the vent pipe size and length. For additional installation information on an optional power venter, refer to Paragraph 28. Complete information is included in the venter package.)

In severe negative pressure conditions, makeup air equipment may be necessary.

11. Gas Piping and Pressures

WARNING

This appliance is equipped for a maximum gas supply pressure of 1/2 pound, 8 ounces, or 14 inches water column. Supply pressure higher than 1/2 pound requires installation of an additional service regulator external to the unit.

PRESSURE TESTING SUPPLY PIPING

Test Pressures Above 1/2 PSI: Disconnect the heater and manual valve from the gas supply line which is to be tested. Cap or plug the supply line.

Test Pressures Below 1/2 PSI: Before testing, close the manual valve on the heater.

All piping must be in accordance with requirements outlined in the National Fuel Gas Code ANSI/Z223.1a (latest edition), published by the American Gas Association or CAN/CGA-B149.1 and B149.2, published by the Canadian Gas Association (See Paragraph 1). Gas supply piping installation should conform with good practice and with local codes.

Unit heaters for natural gas are orificed for operation with gas having a heating value of 1000 (+ or - 50) BTUH per cubic ft. If the gas at the installation does not meet this specification, consult the factory for proper orificing.

Pipe joint compounds (pipe dope) shall be resistant to the action of liquefied petroleum gas or any other chemical constituents of the gas being supplied.

Install a ground joint union and manual shut-off valve upstream of the unit control system, as shown in Figure 12. The 1/8" plugged tapping in the shut-off valve provides connection for supply line pressure test gauge. The National Fuel Gas Code requires the installation of a trap with a minimum 3" drip leg. Local codes may require a minimum drip leg longer than 3" (typically 6").

Gas connection sizes are included in the Dimensional Tables in Paragraph 3. After all connections are made, disconnect the pilot supply at the control valve and bleed the system of air. Reconnect the pilot line and leak-test all connections by brushing on a soap solution.

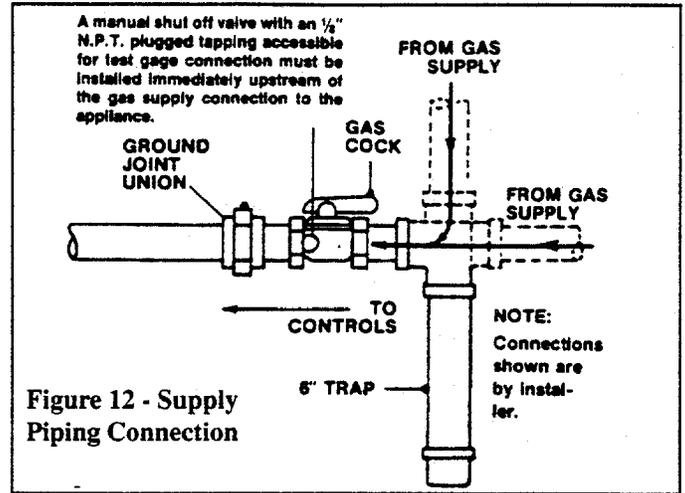


Figure 12 - Supply Piping Connection

WARNING: All components of a gas supply system must be leak tested prior to placing equipment in service. NEVER TEST FOR LEAKS WITH AN OPEN FLAME. Failure to comply could result in personal injury, property damage or death.

Manifold or Orifice Pressure Settings

Measuring manifold gas pressure cannot be done until the heater is in operation. It is included in the steps of the "Check-Test-Start" procedure in Paragraph 25. The following warnings and instructions apply.

WARNING: Manifold gas pressure must never exceed 3.5" w.c. for natural gas and 10" w.c. for propane gas.

For Natural Gas: Manifold gas pressure is regulated by the combination valve to 3.5" w.c. Inlet pressure to the valve must be a minimum of 5" w.c. or as noted on the rating plate and a maximum of 14" w.c.

Sizing Gas Supply Lines

CAPACITY OF PIPING												
Cubic Feet per Hour based on 0.3" W.C. Pressure Drop												
Specific Gravity for Natural Gas — 0.6 (1000 BTU/Cubic Foot)												
Specific Gravity for Propane Gas — 1.6 (2550 BTU/Cubic Foot)												
Length of Pipe	Diameter of Pipe											
	1/2"		3/4"		1"		1-1/4"		1-1/2"		2"	
	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane
20'	92	56	190	116	350	214	730	445	1100	671	2100	1281
30'	73	45	152	93	285	174	590	360	890	543	1650	1007
40'	63	38	130	79	245	149	500	305	760	464	1450	885
50'	56	34	115	70	215	131	440	268	670	409	1270	775
60'	50	31	105	64	195	119	400	244	610	372	1105	674
70'	46	28	96	59	180	110	370	226	560	342	1050	641
90'	40	24	84	51	160	98	320	195	490	299	930	567
100'	38	23	79	48	150	92	305	186	460	281	870	531
125'	34	21	72	44	130	79	275	168	410	250	780	476
150'	31	19	64	39	120	73	250	153	380	232	710	433
175'	28	17	59	36	110	67	225	137	350	214	650	397
200'	26	16	55	34	100	61	210	128	320	195	610	372

NOTE: When sizing supply lines, consider possibilities of future expansion and increased heating requirements. See National Fuel Gas Code for additional information on supply pipe sizing.

11. Gas Piping and Pressures (cont'd)

Manifold Pressure Settings (cont'd)

For Propane Gas: Manifold gas pressure is regulated by the combination valve to 10" w.c. Inlet pressure to the valve must be a minimum of 11" w.c. and a maximum of 14" w.c.

Before attempting to measure or adjust manifold gas pressure, the inlet (supply) pressure must be within the specified range for the gas being used both when the heater is in operation and on standby. Incorrect inlet pressure could cause excessive manifold gas pressure immediately or at some future time.

Instructions to Check Manifold Pressure:

1) With the manual valve (on the combination valve) positioned to prevent flow to the main burners, connect a manometer to the 1/8" pipe outlet pressure tap in the valve. NOTE: A manometer (fluid-filled gauge) is recommended rather than a spring type gauge due to the difficulty of maintaining calibration of a spring type gauge.

2) Open the valve and operate the heater. Measure the gas pressure to the manifold. Normally adjustments should not be necessary to the factory preset regulator.

If adjustment is necessary, set pressure to correct settings by turning the regulator screw IN (clockwise) to increase pressure. Turn regulator screw OUT (counterclockwise) to decrease pressure.

Consult the valve manufacturer's literature provided with the heater for more detailed information.

12. Electrical Supply and Connections

All electrical wiring and connections, including electrical grounding **MUST** be made in accordance with the National Electric Code ANSI/NFPA No. 70 (latest edition) or, in Canada, the Canadian Electrical Code, Part I-C.S.A. Standard C22.1. In addition, the installer should be aware of any local ordinances or gas company requirements that might apply.

Check the rating plate on the heater for the supply voltage and current requirements. A separate line voltage supply with fused disconnect switch should be run directly from the main electrical panel to the heater.

external wiring must be within approved conduit and have a minimum temperature rise of 63°F. Conduit from the disconnect switch must be run so as not to interfere with the service panels of the heater.

The electrical supply connects at the top back of the heater in the left corner (left when facing the back of the heater). A threaded hole is provided for a standard 1/2" electrical fitting. See Figure 13.

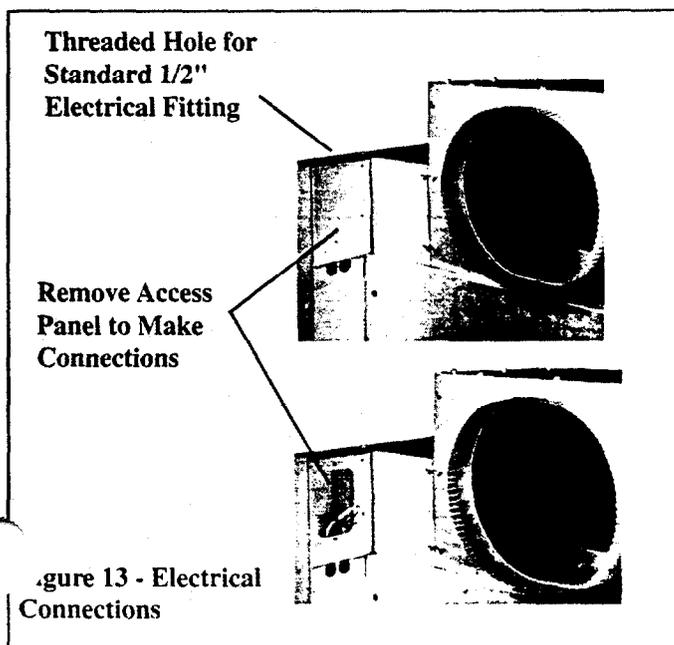
The wiring access panel is easily removed for field connections. Consult the wiring diagram supplied with your heater. Replace the panel after the wiring connections are made.

CAUTION: If any of the original wire as supplied with the appliance must be replaced, it must be replaced with wiring material having a temperature rating of at least 105°C, except for blocked vent switch, limit control, energy cutoff, and sensor lead wires which must be 150°C. See Hazard Levels, page 2.

If the heater has field-installed options that require electrical connections, consult the instruction sheet and wiring diagram supplied in the option package.

Specific wiring diagrams that include standard and factory-installed options are included with the heater. **Typical wiring diagrams are on the next six pages**, showing standard single-stage heating with standard match-lit pilot and optional intermittent spark pilot with and without lockout.

The operating sequence of the heater can be found on the heater wiring diagram and is published in Paragraph 25, Check Installation and Start-Up.



CAUTION: FAN-TYPE MODEL FOR OPTIONAL 50 HERTZ OPERATION

A fan-type heater with Option AK11 is designed for operation from a 220-240V/50Hz/single phase power source. Connection to any other voltage or frequency source may cause failure of the equipment and/or damage to persons or property.

In the event that this product is purchased or destined for export markets, the buyer is responsible for meeting any and all local codes covering installation and labeling of the product. The equipment as provided by the manufacturer is A.G.A. design-certified and comes with English-only labels and installation instructions.

TYPICAL WIRING DIAGRAMS -- Pages 13 - 18

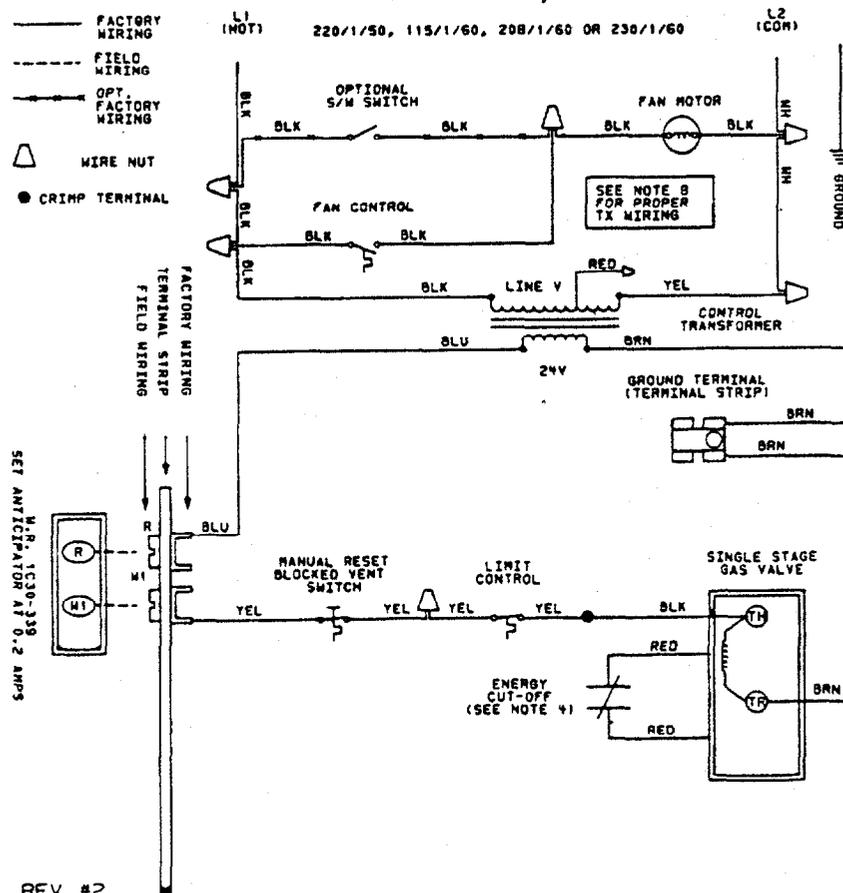
FAN-TYPE, GRAVITY-VENTED, MODEL SIZES 25-400 WITH MATCH LIT PILOT, SINGLE STAGE HEATING, NATURAL /PROPANE

Operating Sequence

1. Set the thermostat at its lowest setting.
2. Follow lighting instructions and establish pilot.
3. Turn on power to the unit.
4. Set the thermostat at desired setting.
5. Thermostat calls for heat, firing unit at full rate.
6. Fan control senses heat exchanger temperature, energizing the fan motor.

Wiring Notes

1. The following controls are field installed options: thermostat.
2. The following controls are factory installed options: summer/winter switch
3. Dotted wiring installed by others.
4. **Warning:** An ECO circuit interruption is a major failure caused by a malfunction of the primary safety controls or mis-wiring, and will require correction of the cause of failure and the replacement of the fan and limit control wiring before the unit can be returned to service.
5. **Caution:** If any of the original wire as supplied with the appliance must be replaced with wiring material having a temperature rating of at least 105°C, except for energy cutoff, limit control, and blocked vent switch wires which must be 150°C.
6. Use 18 ga. wire for all wiring on the unit.
7. Line and fan motor branch wire sizes should be of a size to prevent voltage drops beyond 5% of the supply line voltage.
8. On 230V units, the control transformer has a dual voltage primary.
For 230V units, use black and yellow leads (cap red).
On 208V units, the control transformer has a dual voltage primary.
For 208V units, use black and red leads (cap yellow).
On 115V units, the control transformer is single voltage primary.
For 115V units, use black and yellow leads.



W.D. 113192

REV #2

Field Control Wiring Length and Gauge		
Total Wire Length	Distance from Unit to Control	Minimum Recommended Wire Gauge
150'	75'	#18 gauge
250'	125'	#16 gauge
350'	175'	#14 gauge

CAUTION: If any of the original wire as supplied with the appliance must be replaced, it must be replaced with wiring material having a temperature rating of at least 105°C, except for blocked vent switch, limit control, energy cutoff, and sensor lead wires which must be 150°C. See Hazard Levels, page 2.

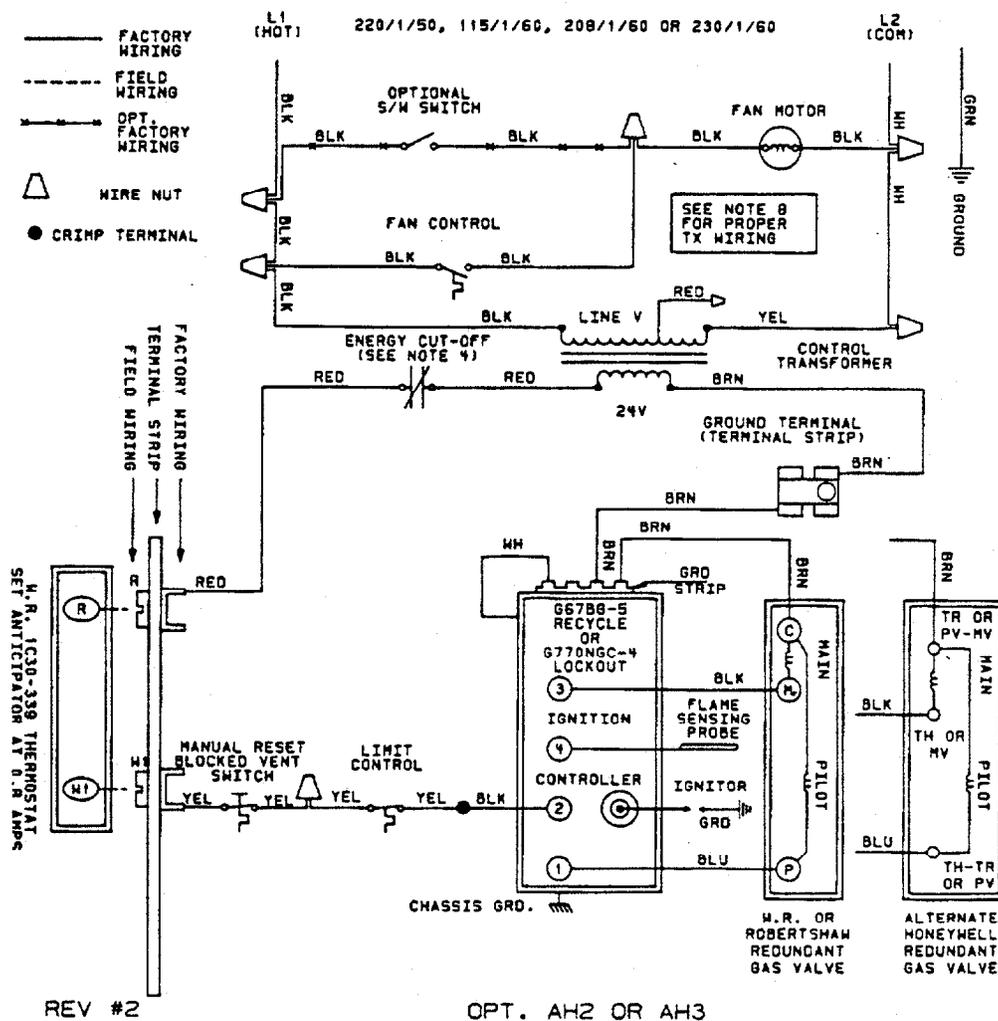
FAN-TYPE, GRAVITY-VENTED, MODEL SIZES 25-400 WITH INTERMITTENT SPARK PILOT WITH OR WITHOUT TIMED LOCKOUT, SINGLE STAGE HEATING, NATURAL /PROPANE

Operating Sequence

1. Set the thermostat at its lowest setting.
2. Follow lighting instructions and establish pilot.
3. Turn on power to the unit.
4. Set the thermostat at desired setting.
5. Thermostat calls for heat, firing unit at full rate.
6. Fan control senses heat exchanger temperature, energizing the fan motor.

Wiring Notes

1. The following controls are field installed options: thermostat.
 2. The following controls are factory installed options: summer/winter switch
 3. Dotted wiring installed by others.
 4. **Warning:** An ECO circuit interruption is a major failure caused by a malfunction of the primary safety controls or mis-wiring, and will require correction of the cause of failure and the replacement of the fan and limit control wiring before the unit can be returned to service.
 5. **Caution:** If any of the original wire as supplied with the appliance must be replaced with wiring material having a temperature rating of at least 105°C, except for energy cutoff, limit control, and blocked vent switch wires which must be 150°C.
 6. Use 18 ga. wire for all wiring on the unit.
 7. Line and fan motor branch wire sizes should be of a size to prevent voltage drops beyond 5% of the supply line voltage.
 8. On 230V units, the control transformer has a dual voltage primary.
For 230V units, use black and yellow leads (cap red).
- On 208V units, the control transformer has a dual voltage primary.
For 208V units, use black and red leads (cap yellow).
- On 115V units, the control transformer is single voltage primary.
For 115V units, use black and yellow leads.



BLOWER-TYPE, GRAVITY-VENTED, MODEL SIZES 25-100 WITH MATCH LIT PILOT, SINGLE STAGE HEATING, NATURAL /PROPANE, DIRECT DRIVE

operating Sequence

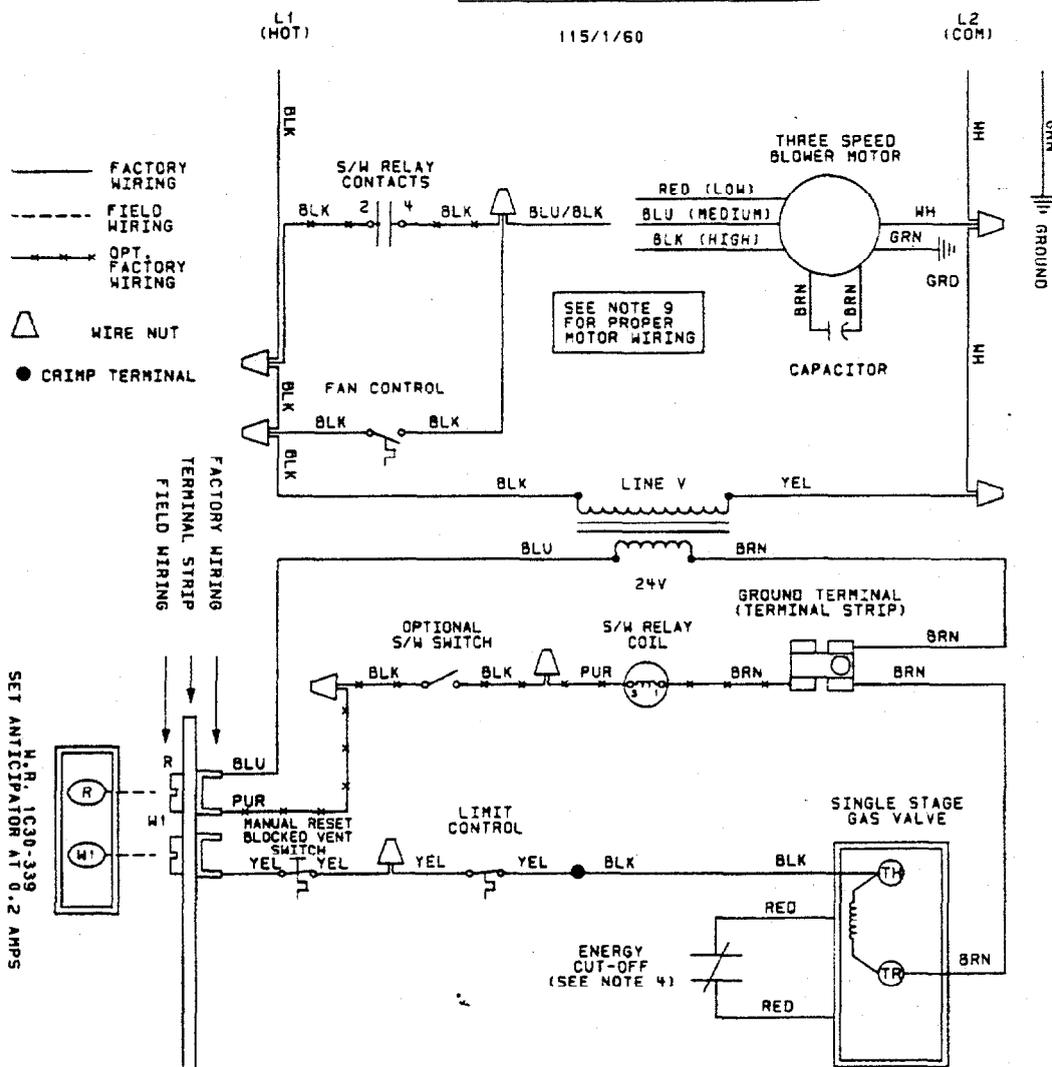
1. Set the thermostat at its lowest setting.
2. Follow lighting instructions and establish pilot.
3. Turn on power to the unit.
4. Set the thermostat at desired setting.
5. Thermostat calls for heat, firing unit at full rate.
6. Fan control senses heat exchanger temperature, energizing the blower motor.

Wiring Notes

1. The following controls are field installed options: thermostat.
2. The following controls are factory installed options: summer/winter switch
3. Dotted wiring installed by others.
4. **Warning:** An ECO circuit interruption is a major failure caused by a malfunction of the primary safety controls or mis-wiring, and will require correction of the cause of failure and the replacement of the fan and limit control wiring before the unit can be returned to service.
5. **Caution:** If any of the original wire as supplied with the appliance must be replaced with wiring material having a temperature rating of at least 105°C, except for energy cutoff, limit control, and blocked vent switch wires which must be 150°C.
6. Use 14 ga. wire for blower circuit wiring on the unit.
7. Use 18 ga. wire for all wiring except blower motor circuit.
8. Line and blower motor branch wire sizes should be of a size to prevent voltage drops beyond 5% of the supply line voltage.
9. Three-speed motor connections are as follows:

Model Size	Speed	Use these Two Motor Wires
25	*Medium	*Blue and White
	Low	Red and White
50	*High	*Black and White
	Medium	Blue and White
75	*High	*Black and White
	*Medium	*Blue and White
100	*High	*Black and White
	Medium	Blue and White

* Factory-wired speed



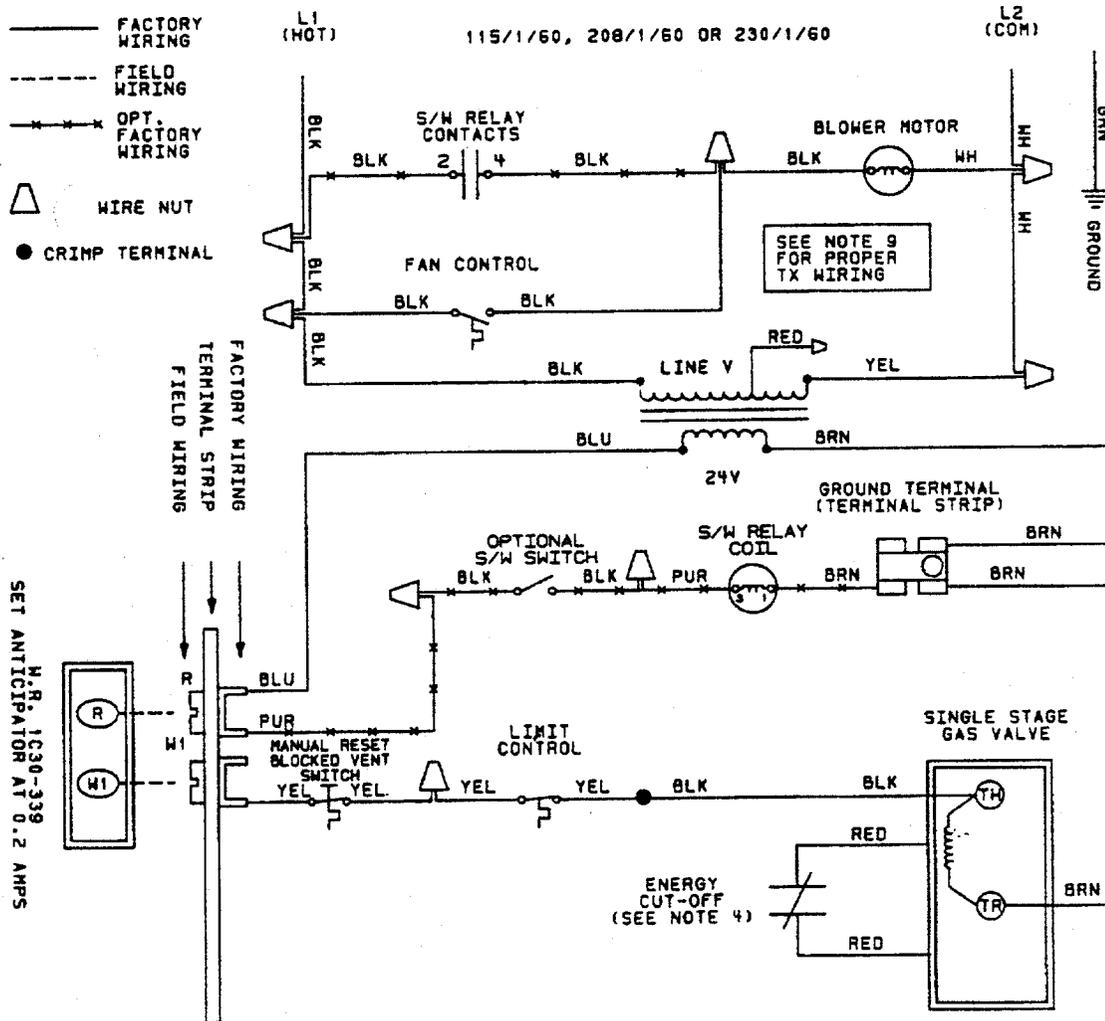
BLOWER-TYPE, GRAVITY-VENTED, MODEL SIZES 50-250 WITH MATCH LIT PILOT, SINGLE STAGE HEATING, NATURAL /PROPANE, BELT DRIVE (Note: Belt drive is standard on Sizes 125-400; Optional on Sizes 50-100.)

Wiring Notes

Operating Sequence

1. Set the thermostat at its lowest setting.
2. Follow lighting instructions and establish pilot.
3. Turn on power to the unit.
4. Set the thermostat at desired setting.
5. Thermostat calls for heat, firing unit at full rate.
6. Fan control senses heat exchanger temperature, energizing the blower motor.

1. The following controls are field installed options: thermostat.
2. The following controls are factory installed options: summer/winter switch
3. Dotted wiring installed by others.
4. **Warning:** An ECO circuit interruption is a major failure caused by a malfunction of the primary safety controls or mis-wiring, and will require correction of the cause of failure and the replacement of the fan and limit control wiring before the unit can be returned to service.
5. **Caution:** If any of the original wire as supplied with the appliance must be replaced with wiring material having a temperature rating of at least 105°C, except for energy cutoff, limit control, and blocked vent switch wires which must be 150°C.
6. Use 14 ga. wire for blower motor circuit wiring on unit.
7. Use 18 ga. wire for all wiring on the unit except for blower motor circuit.
8. Line and blower motor branch wire sizes should be of a size to prevent voltage drops beyond 5% of the supply line voltage.
9. On 230V units, the control transformer has a dual voltage primary.
For 230V units, use black and yellow leads (cap red).
On 208V units, the control transformer has a dual voltage primary.
For 208V units, use black and red leads (cap yellow).
On 115V units, the control transformer is single voltage primary.
For 115V units, use black and yellow leads.



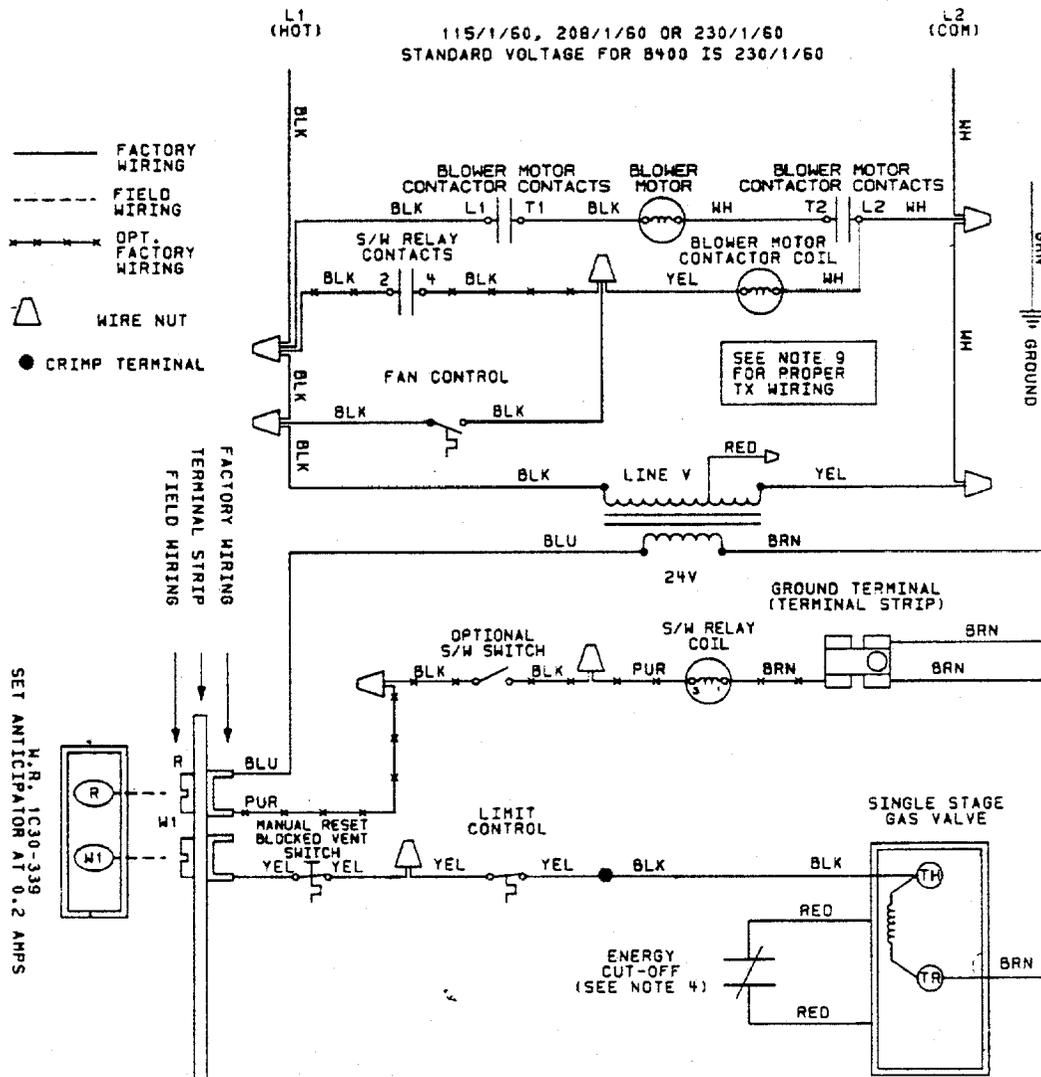
BLOWER-TYPE, GRAVITY-VENTED, MODEL SIZES 165-400 WITH MATCH LIT PILOT, SINGLE STAGE HEATING, NATURAL /PROPANE, BELT DRIVE, BLOWER MOTOR CONTACTOR (Note: Motor contactor is standard on Sizes 300 and 400; Optional on other sizes.)

Operating Sequence

1. Set the thermostat at its lowest setting.
2. Follow lighting instructions and establish pilot.
3. Turn on power to the unit.
4. Set the thermostat at desired setting.
5. Thermostat calls for heat, firing unit at full rate.
6. Fan control senses heat exchanger temperature, energizing the blower motor.

Wiring Notes

1. The following controls are field installed options: thermostat.
2. The following controls are factory installed options: summer/winter switch
3. Dotted wiring installed by others.
4. **Warning:** An ECO circuit interruption is a major failure caused by a malfunction of the primary safety controls or mis-wiring, and will require correction of the cause of failure and the replacement of the fan and limit control wiring before the unit can be returned to service.
5. **Caution:** If any of the original wire as supplied with the appliance must be replaced with wiring material having a temperature rating of at least 105°C, except for energy cutoff, limit control, and blocked vent switch wires which must be 150°C.
6. Use 14 ga. wire for blower motor circuit wiring on unit.
7. Use 18 ga. wire for all wiring on the unit except for blower motor circuit.
8. Line and blower motor branch wire sizes should be of a size to prevent voltage drops beyond 5% of the supply line voltage.
9. On 230V units, the control transformer has a dual voltage primary.
For 230V units, use black and yellow leads (cap red).
- On 208V units, the control transformer has a dual voltage primary.
For 208V units, use black and red leads (cap yellow).
- On 115V units, the control transformer is single voltage primary.
For 115V units, use black and yellow leads.



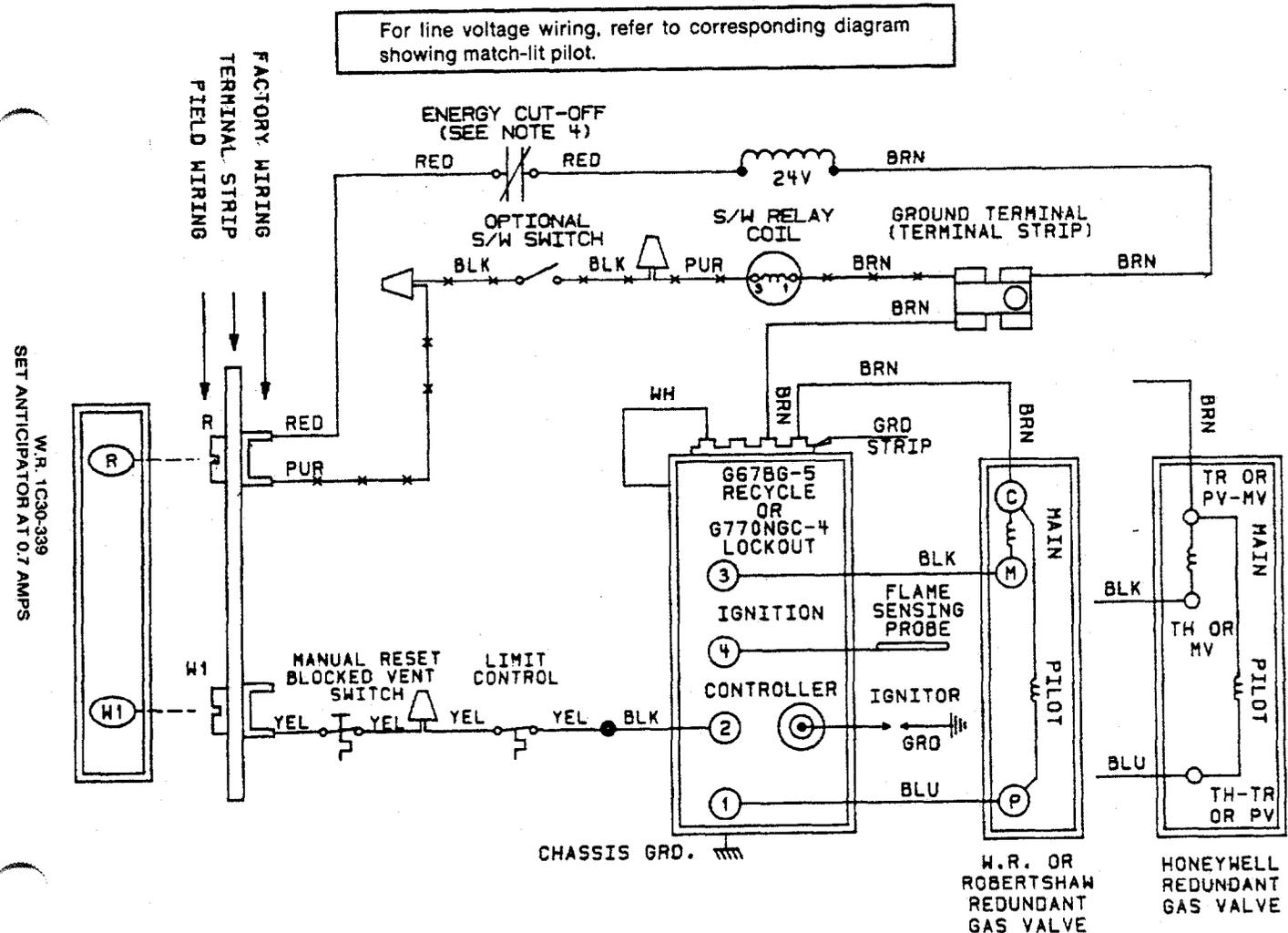
BLOWER-TYPE, GRAVITY-VENTED, MODEL SIZES 25-400 WITH INTERMITTENT SPARK PILOT WITH OR WITHOUT TIMED LOCKOUT (For line voltage wiring, refer to the corresponding diagram showing match-lit pilot.)

Operating Sequence

1. Set the thermostat at its lowest setting.
2. Follow lighting instructions and establish pilot.
3. Turn on power to the unit.
4. Set the thermostat at desired setting.
5. Thermostat calls for heat, firing unit at full rate.
6. Fan control senses heat exchanger temperature, energizing the blower motor.

Wiring Notes

1. The following controls are field installed options: thermostat.
2. The following controls are factory installed options: summer/winter switch
3. Dotted wiring installed by others.
4. **Warning:** An ECO circuit interruption is a major failure caused by a malfunction of the primary safety controls or mis-wiring, and will require correction of the cause of failure and the replacement of the fan and limit control wiring before the unit can be returned to service.
5. **Caution:** If any of the original wire as supplied with the appliance must be replaced with wiring material having a temperature rating of at least 105°C, except for energy cutoff, limit control, and blocked vent switch wires which must be 150°C.
6. Use 14 ga. wire for blower motor circuit wiring on unit.
7. Use 18 ga. wire for all wiring on the unit except for blower motor circuit.
8. Line and blower motor branch wire sizes should be of a size to prevent voltage drops beyond 5% of the supply line voltage.
9. On 230V units, the control transformer has a dual voltage primary.
For 230V units, use black and yellow leads (cap red).
On 208V units, the control transformer has a dual voltage primary.
For 208V units, use black and red leads (cap yellow).
On 115V units, the control transformer is single voltage primary.
For 115V units, use black and yellow leads.

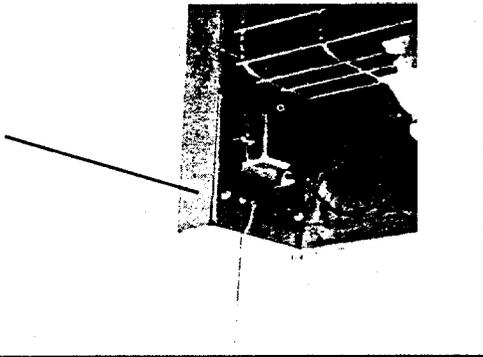


13. Thermostat and Thermostat Connections

A thermostat is not standard equipment but is an installation requirement. Use either an optional thermostat available with the heater or a field-supplied thermostat. Install according to the thermostat manufacturer's instructions. Make sure that the heat anticipator setting on the thermostat is in accordance with the amperage value noted on the wiring diagram of your heater.

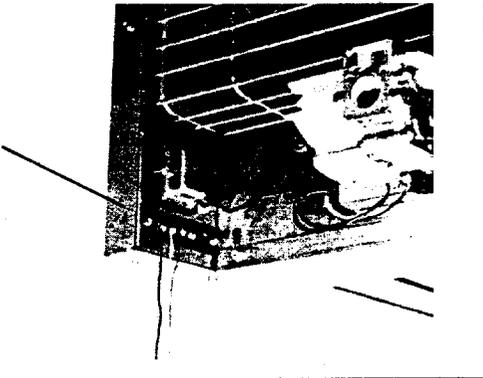
Terminal Strip Connections - The standard heater is equipped with a two-screw terminal connector strip (See Figure 14) for easy connection to the low voltage controls (24V).

Figure 14 - Two Screw Terminal Connector Strip for 24-Volt Wiring



When factory-installed options require two-stage thermostat control, the heater is equipped with a SP-ST relay and a four-screw terminal connector strip (See Figure 15).

Figure 15 - Optional Four Screw Terminal Connector Strip for 24-Volt Wiring

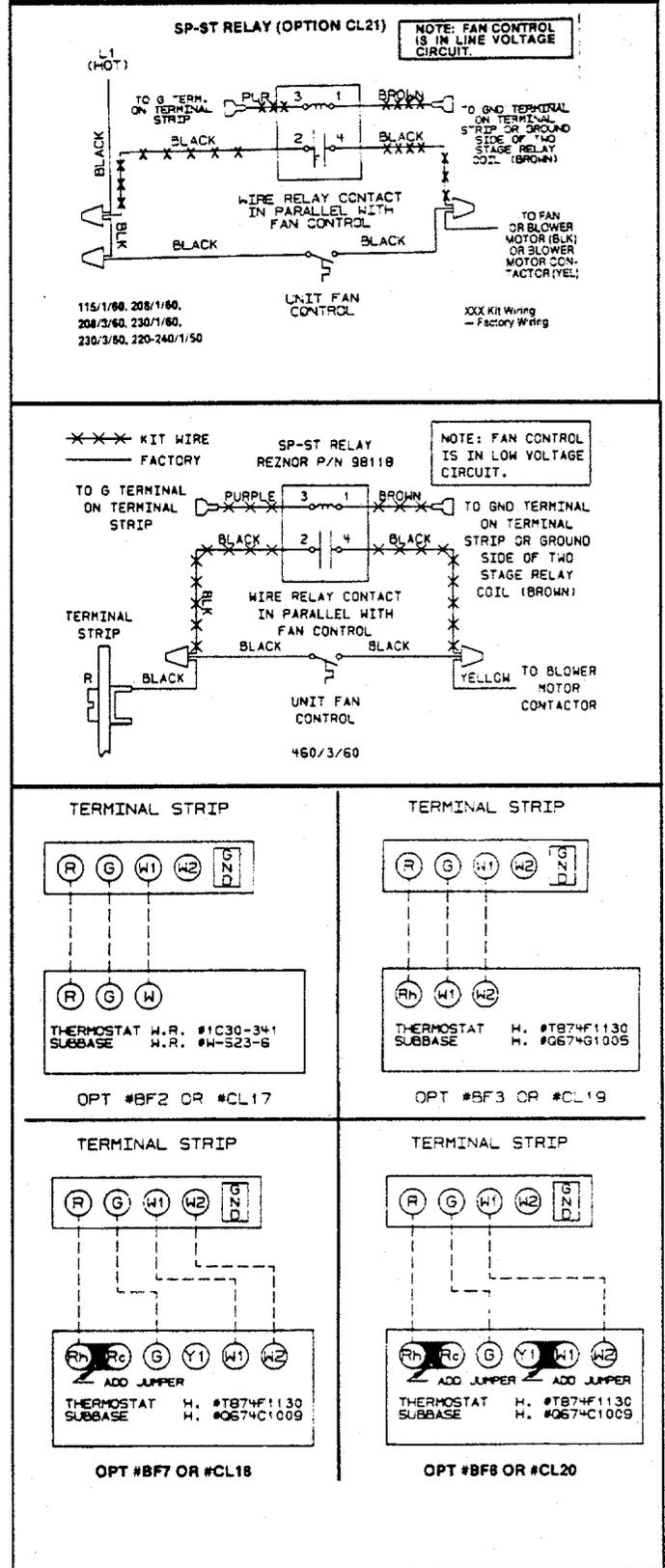


If your heater requires field installation of the four-screw terminal strip and the relay, follow the instructions packaged with the relay or thermostat option.

There are some unique wiring requirements with the installation of the optional controls (relay and two-stage). Figure 16 illustrates the wiring of the relay and the connections required for optional thermostat control.

Multiple Heater Control - These unit heaters are not designed for multiple unit connection to one thermostat. If you require that more than one unit be controlled by a single thermostat, it will be necessary to use relays in the circuit. Options CL31 and CL32 provide the necessary parts and instructions for multiple heater control. For more information on these options, see Paragraph 32.

Figure 16 - Wiring Diagrams for Optional Controls



14. Fan Motor

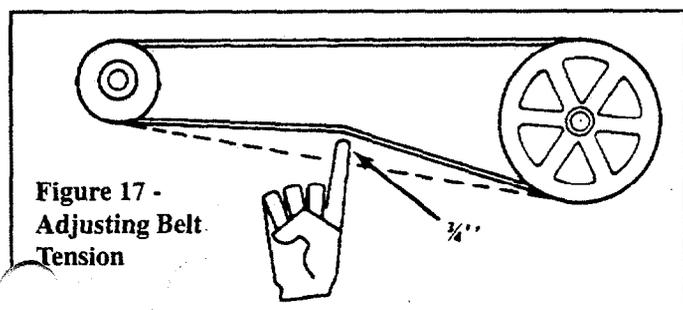
Fan motors are equipped with thermal overload protection of the automatic reset type. Should the motor refuse to run, it may be because of improper current characteristics. Make certain that the correct voltage is available at the motor.

NOTE: If the unit is equipped with an optional totally enclosed motor, the horsepower may be larger than the standard motor. Refer to the motor nameplate to verify horsepower.

15. Blower Motor

Blower Model Sizes 25-100 are standardly equipped with a direct drive motor; an optional belt drive motor is available on Sizes 50-100. Blower Model Sizes 125-400 have an adjustable belt drive motor.

As part of the Check/Test/Start (Paragraph 25), check the belt for proper tension. Proper belt tension is important to the long life of the belt and motor. A loose belt will cause wear and slippage. Too much tension will cause excessive motor and blower bearing wear. Adjust the belt tension by turning the adjusting screw on the motor base until the belt can be depressed 1/2-3/4". (See Figure 17.) After correct tension is achieved, re-tighten the locknut on the adjusting screw.



Most blower motors are equipped with thermal overload protection of the automatic reset type. If a motor is not equipped with thermal overload protection, the unit will be equipped with a starter. The adjustable setting on the starter will be factory set to match the amp draw of the motor and sealed. No change should be made to starter set unless the original motor is replaced.

Starters are supplied from the factory for manual reset operation. If an overload condition is experienced, the condition must be corrected, and the starter must be manually reset.

After the installation is complete including all ductwork, check the amp draw of the motor with an amp meter to verify that the motor amp rating on the motor nameplate is not being exceeded. Amps may be adjusted downward by reducing blower speed or by increasing the duct system static pressure. The temperature rise must be within the range specified on the unit rating plate.

16. Blower Speed Adjustment

The blower speed may be adjusted to achieve the desired outlet temperature, as long as the adjustment is within the temperature rise and the static pressure limits shown on the heater rating plate. **Direct drive motors** are factory set as indicated in the chart below. **Belt drive motors** are factory set at the mid-point between maximum and minimum blower speeds.

If the duct resistance is low, the blower may deliver too high an air volume; or if the heater is operated without ductwork, it may deliver sufficient excess air to overload the motor, causing the overload protection to cycle the motor. Reducing the blower speed will correct these conditions. If ductwork is added to an installation, it may be necessary to increase the blower speed. Decreasing blower speed will increase

outlet temperature; increasing blower speed will decrease outlet temperature.

Blower Model Sizes 25-100 with Direct Drive

Direct drive blower motors have multi-speed taps for speed adjustment. If your installation requires an adjustment of the blower speed, the motor may be re-wired to an alternate tap by following these instructions.

1. Turn off the gas and the electric power.
2. Remove the left (left when facing the back of the unit) outer side panel of the heater to reveal the wiring connections.
3. Consult the wiring diagram on the heater and follow the chart below to choose the wire for the desired adjustment. The asterisk(*) indicates the factory-wired speed.

Model Size	Speed	Use these Two Motor Wires
25	*Medium	*Blue and White
	Low	Red and White
50	*High	*Black and White
	Medium	Blue and White
75	High	Black and White
	*Medium	*Blue and White
	Low	Red and White
100	*High	*Black and White
	Medium	Blue and White
	Low	Red and White

4. Cut the crimped cap from the end of the wire that you intend to use and strip the insulation.
5. Disconnect the factory-wired connection and re-wire, using the newly stripped wire.
6. Put a wire nut on the end of the blower motor wire that was disconnected.
7. Replace the heater side panel and turn on the gas and the electric.

Blower Model Sizes 50-400 with Belt Drive

The belt drive on these units is equipped with an adjustable pulley which permits adjustment of the blower speed. Follow these instructions to adjust the blower speed.

1. Turn off the gas and the electric power.
2. Loosen belt tension and remove the belt.
3. Loosen the set screw on the side of the pulley away from the motor.
4. **To increase the blower speed, decreasing outlet temperature,** turn the adjustable half of the pulley inward. **To decrease the blower speed, increasing the outlet temperature,** turn the adjustable half of the pulley outward. One turn of the pulley will change the speed 8-10%.
5. Tighten the set screw on the flat portion of the pulley shaft.
6. Replace the belt and adjust the belt tension. Adjust tension by turning the adjusting screw on the motor base until the belt can be depressed 1/2-3/4". (See Figure 17.) Re-tighten the lock nut on the adjusting screw.
7. Turn on the gas and electric. Light the heater following the instructions on the lighting instruction plate.
8. Check the motor amps with an amp meter. The maximum motor amp rating on the motor nameplate must not be exceeded.

CAUTION: An external duct system static pressure not within the limits shown on the rating plate or improper adjustment of the motor pulley or belt may overload the motor.

17. Blower Rotation

Each blower housing is marked for proper rotation. Rotation may be changed on single-phase motors by re-wiring in the motor terminal box. Three-phase motors may be reversed by interchanging two wires on the 3-phase supply connections.

18. Fan Control

1. A fan control provides the following:
 - (a) Delay of fan or blower operation to prevent the discharge of cold air.
 - (b) Fan or blower operation as long as the unit is hot.
2. The fan control provides additional safety by keeping the fan or blower in operation in the event that the gas valve fails to close when the thermostat is satisfied.
3. To be sure that the fan or blower can continue to operate, the power supply to the heater **MUST NOT** be interrupted except when servicing the unit.
4. If the customer wants the heater off at night, the gas valve circuit **SHOULD BE OPENED** by a single pole switch wired in series with the thermostat. Some thermostats are provided with this feature.
5. Multiple units controlled from a single thermostat are shut off in the same manner. For proper operation, be sure the fan control wiring is observed.

WARNING: If you turn off the power supply, turn off the gas. See Hazard Levels, page 2.

NOTE: Low ambient temperatures (less than 40°F) may cause false cycling of the fan/blower. To prevent this, a time delay relay can be added to the unit (available with single-stage gas valve only) to activate the fan/blower electrically independent of the heat exchanger or the room temperature. The low ambient fan control relay can be factory installed; Option BF8 will appear on the heater wiring diagram. Or, the relay can be field installed; order Option CQ3 (P/N 112779). This relay is in addition to the fan control **The fan control is a safety device and should never be removed from the heater circuit.**

19. Blocked Vent Switch

The blocked vent switch is a heat-activated, manually reset, safety device that interrupts the electric supply to the gas valve when the vent is 100% blocked. The sensor is located near the relief opening of the draft hood. The switch is located on the front top of the draft hood.

If the sensor detects heated flue gases in the draft hood relief opening area, the blocked vent safety device will activate to shut down the heater. The cause for the switch shutting down the heater must be determined and corrected. The blocked vent switch is designed to activate when the vent is blocked but may also be affected by a negative building pressure or an inadequate vent system.

After the problem has been corrected, push the manual reset button on the blocked vent switch to restart the heater.

WARNING: In the event the Blocked Vent Sensor causes the heater to shut off, determine and correct the cause. Failure to do so could result in personal injury or death.

NOTE: Effective April 1991, all gravity vented unit heaters include a blocked vent shut-off system. Units manufactured prior to April 1991 do not include a blocked vent shut-off system.

20. Limit and Energy Cutoff Controls

All models are equipped with an automatic, non-adjustable reset limit control that acts to interrupt the electric supply to the redundant main operating valve in case of motor failure or lack of air flow due to restrictions at the inlet or outlet. The ECO control acts as a super high limit, giving redundant safety control and is calibrated to open at a much higher temperature than the standard automatic reset limit.

WARNING: An ECO circuit interruption is a major failure caused by a malfunction of the primary safety controls or miswiring, and will require correction of the cause of failure and the replacement of the fan and limit control and wiring before the unit can be returned to service. See Hazard Levels, page 2.

An ECO interruption can be caused by the failure of the automatic reset limit in combination with the following:

1. Automatic gas valve stuck in the open position.
2. Restricted airflow over the heat exchanger due to motor failure, loose fan blade, broken blower belt, or defective fan control.
3. Failed or ruptured gas pressure regulator.
4. Improper wiring.

21. Gas Valve

Main operating valve is powered by the 24-volt control circuit through thermostat and safety controls. The main control valve is of the diaphragm type with magnetic pilot servo bleed operators, providing regulated gas flow preset at the factory. The valve body also incorporates a magnetic valve providing pilot gas control for the optional electronic ignitor system and redundant or dual valve safety shutoff function.

CAUTION: The operating valve is the prime safety shutoff. All gas supply lines must be free of dirt or scale before connecting the unit to ensure positive closure. See Hazard Levels, page 2.

22. Pilot and Ignition Systems

The match-lit standing pilot is standard equipment. The safety pilot function is actuated by a thermocouple in the pilot flame.

The optional pilot on these heaters is a spark ignited intermittent safety pilot system that shuts off the pilot gas flow between heat cycles (Option AH2). The ignition controller in the spark pilot system provides the high voltage spark to ignite the pilot gas and also acts as the flame safety device. After ignition of the pilot gas, the control electronically senses the pilot flame. (A separate solid metal probe in the pilot burner assembly is employed for the flame sensing function. A low voltage

22. Pilot and Ignition Systems (cont'd)

electrical signal is imposed on that metal probe which is electrically grounded from ground. When the pilot flame impinges on the flame sense probe, the flame acts as a conduction path to ground. The pilot flame rectifies and completes the DC circuit. The ignition controller acknowledges the flame and energizes the main gas valve.)

If you are installing a propane unit with spark pilot, it will have Option AH3 which in addition to the Option AH2 safety devices, incorporates a lockout device that stops the gas flow to the pilot if the pilot fails to light in 120 seconds. The spark pilot system with lockout requires manual reset by interruption of the thermostat circuit. Natural gas units may be equipped with either Option AH2 or AH3.

Refer to the wiring diagram supplied with the heater for pilot system identification and proper wiring.

23. Burners

These unit heaters have individually formed steel burners with accurately die-formed ports to give controlled flame stability without lifting or flashback with either natural or propane gas. The burners are lightweight and factory mounted in an assembly which permits them to be removed as a unit for inspection or service.

24. Burner Air Adjustment

All sizes of these unit heaters that are equipped with standard aluminum burners are designed to operate without burner air shutters when fueled with either natural or propane gas. However, Sizes 165 through 400 equipped with optional stainless steel burners (Option AD2) require air shutters (Option AE1) when used with propane gas (Option AA2).

Optional air shutters, either factory or field installed, are available for all size models for use where unusual conditions cause excess primary air flow.

Before making any adjustments to the air shutters, allow the heater to operate for about fifteen minutes. The air shutter adjustment screws can be reached by opening the bottom panel. (Remove the two screws located at the rear of the bottom panel and allow the panel to hinge

down from the front.) The adjustment screws for the air shutters are visible at the rear of the burner rack. See Figure 18.

When making the adjustment, close the air shutters no more than is necessary to eliminate the problem condition.

Observe the flame for yellow-tipping. A limited amount of yellow-tipping is permissible for liquefied petroleum gases. Other fuels should not display any yellow-tipping.

Two adjustment screws are used (See Figure 18). Rotating the screws clockwise closes the shutters, reducing the primary air supply. Counterclockwise rotation opens the shutters, increasing the primary air supply. The two adjustment screws should be rotated alternately to open or close the shutters. Attempting to gain adjustment by not alternating between the two screws may cause the shutters to bind.

After proper adjustment has been completed, eliminating the problem condition, close the bottom panel and replace the retaining screws.

Figure 18 - Air Shutter Adjustment Screws -- Alternate Turning Screws When Adjusting Shutter



DANGER: Failure to install and/or adjust air shutters according to directions could cause property damage, personal injury, and or death.

25. Check Installation and Start-Up

Check the installation prior to start-up:

- Check suspension. Unit must be secure and level.
- Blower Model** - Check to be sure that all shipping supports have been removed. Rubber feet must be on the motor bracket bolts. See Paragraph 4.
- Check clearances from combustibles. Requirements are shown in Paragraph 6.
- Check vent system to be sure that it is installed according to the instructions in Paragraph 10.
- Check piping for leaks and proper gas line pressure. Bleed gas lines of trapped air. See paragraph 11.
- Check electrical wiring. Be sure all wire gauges are as recommended. A service disconnect switch should be used. Verify that fusing or circuit breakers are adequate for the load use.
- Check that any field-installed options have been included in the installation.
- Blower Model** - Check belt tension. See Paragraph 15.

Start-Up

Typical Operating Sequence for Units with Standard Standing (Match-Lit) Pilot:

1. Turn on the manual gas valve.
2. Follow the lighting instructions and establish pilot. To light the pilot, either use the "lighter" hole in the bottom panel of the heater (Figure 19) or open the bottom panel (Figure 20).

To open the bottom panel, unscrew the two sheet metal screws located at the rear of the bottom panel.

The bottom panel will hinge down from the front of the heater.

Close the bottom panel after establishing pilot flame.

Figure 19



Figure 20



3. Turn on the power, energizing the control transformer in series with the limit control.
4. Set the thermostat to call for heat, energizing the main gas valve.
5. Fan control senses heat exchanger temperature, energizing the fan or blower motor.
6. When the thermostat is satisfied, the main gas valve is de-energized, shutting off the gas supply to the main burner.
7. When the unit has cooled, the fan control opens, shutting off the blower or fan motor.

Typical Operating Sequence for Units with Optional Spark Pilot System with or without Timed Lockout:

1. Set the thermostat at its lowest setting.
2. Turn on the main and pilot manual gas valves.
3. Turn on the power to the unit.
4. Set the thermostat at the desired setting.
5. Thermostat calls for heat, firing the unit at full rate after pilot proving sequence.
6. Fan Control senses heat exchanger temperature, energizing the fan or blower motor.
7. If the flame is extinguished during the main burner operation, the safety switch closes the main valve and recycles the spark. On units equipped with a lockout device (Option AH3), if the pilot is not established within 120 seconds, the unit locks out and must be reset by interrupting the power to the control circuit. (See lighting instructions on the heater.)

Check installation after start-up:

- With the unit in operation, measure manifold gas pressure. Manifold pressure for natural gas should be 3.5" w.c. and 10" w.c. for propane gas. See Paragraph 11.
- Turn the unit off and on, pausing two minutes between each cycle. Observe for smooth ignition.
- Check drafthood relief opening for positive pressure.
- Blower Model** - Check motor amps with an amp meter. The maximum amp rating on the motor nameplate must not be exceeded.
- Place 'Owner's Envelope' containing Limited Warranty Card, this booklet, and any optional information in an accessible location near the heater. Follow the instructions on the envelope.

DANGER: The gas burner in this gas-fired equipment is designed and equipped to provide safe and economically controlled complete combustion. However, if the installation does not permit the burner to receive the proper supply of combustion air, complete combustion may not occur. The result is incomplete combustion which produces carbon monoxide, a poisonous gas that can cause death. Safe operation of indirect-fired gas burning equipment requires a properly operating vent system which vents all flue products to the outside atmosphere. **FAILURE TO PROVIDE PROPER VENTING WILL RESULT IN A HEALTH HAZARD WHICH COULD CAUSE SERIOUS PERSONAL INJURY OF DEATH.**

Always comply with the combustion air requirements in the installation codes and in Paragraphs 6 and 7. Combustion air at the burner should be regulated only by manufacturer-provided equipment. **NEVER RESTRICT OR OTHERWISE ALTER THE SUPPLY OF COMBUSTION AIR TO ANY HEATER.** Indoor units installed in a confined space must be supplied with air for combustion as required by Code and in Paragraph 7 of this heater installation manual. **MAINTAIN THE VENT SYSTEM IN STRUCTURALLY SOUND AND PROPERLY OPERATING CONDITION.**

OPTIONAL EQUIPMENT

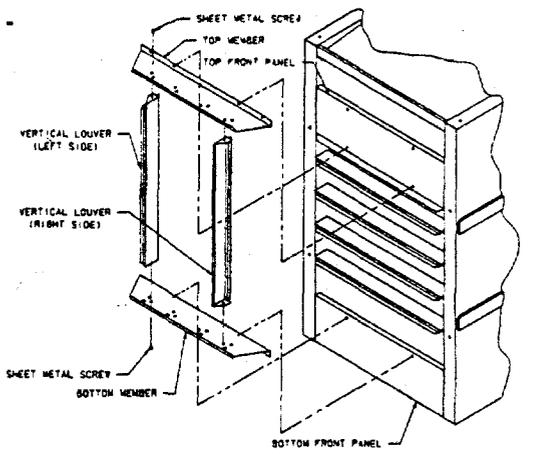
This section contains a brief description of the more frequently specified field-installed options. All option packages include complete assembly and installation instructions.

26. Optional Vertical Louvers - Option CD1

The purpose of the addition of optional vertical louvers is to increase the air pattern spread. The vertical louver assembly is designed to be field assembled and installed. Refer to the instructions packaged with Option CD1 for a list of components and step-by-step installation instructions. (Do not add optional vertical louvers to a fan-type heater with downturn nozzle Option CD3. See Paragraph 27.)

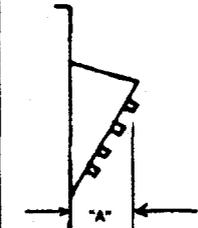
CAUTION: To avoid getting burned, adjust louvers prior to heater operation. If louvers need re-adjusting after start-up, wear protective gloves.

Figure 21 - Optional Vertical Louvers



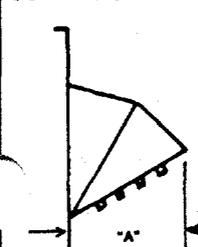
27. Optional Downturn Air Nozzles - Options CD2, CD3, CD4, and CD5

OUTLET NOZZLE OPT. CD2 AND CD4



Sizes	"A"	Range of Air Deflection
25-125	9"	25°-65°
165-400	13"	25°-65°

OUTLET NOZZLE OPT. CD3 AND CD5



Sizes	"A"	Range of Air Deflection
25-125	16-1/2"	50°-90°
165-400	23-1/2"	50°-90°

Figure 22 - Optional Downturn Nozzles

Unit heaters may be specified with optional downturn air nozzles to direct the discharge tempered air. The nozzles are shipped separately for field assembly and installation. The horizontal louvers are removed from the heater and re-installed into the outlet of the downturn nozzle.

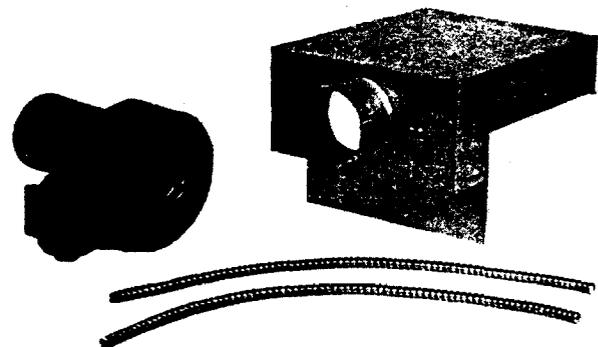
The addition of a downturn nozzle requires four-point heater suspension. Two hanger brackets are included with downturn nozzle options and must be added to fan-type heaters with standard two-point suspension. Suspension point dimensions are found in Dimension Charts in Paragraph 3. On fan-type heaters, do not install Option CD5 or use vertical louvers with Option CD3.

28. Optional Power Venter - Option CA

Option CA is a motorized vent exhauster that is designed to permit the operation of these gravity-vented heaters in areas of negative pressure up to 0.15" w.c. or where horizontal venting is required.

NOTE: Do not install an Option CA venter on a heater equipped with voltage option AK11, 220-240/1/50 Hertz.

Figure 23 - Venter Assembly and Adapter



The option package includes complete installation and wiring instructions. The venter is wired so that when the thermostat calls for heat, the thermostat contacts close the circuit which, after a delay of approximately 40 seconds, starts the venter. When the venter starts, air from the venter blower closes an air flow switch that is built into the venter. The closing of the air flow switch completes the electric circuit to the burner controls, opening the gas valve. When the thermostat is satisfied, the thermostat closes the gas valve and de-energizes the time delay relay. Approximately 40 seconds after the thermostat is satisfied, the air flow switch resets to the open position.

The addition of the optional power venter changes the vent size requirements of the heater. The vent sizes and allowable vent lengths are listed in the installation instructions included in the option package.

The option package also includes two hanger brackets to convert a fan-type heater to four-point suspension. Four-point suspension is required to maintain the unit in a level position without putting stress on the gas valve or piping.

29. Optional Duct Flange - Option CD9 (Blower Models only)

Blower-type unit heaters may be connected to ductwork. The duct flange option is designed to adapt the heater outlet (supply side) for connection to ductwork.

Ductwork connection sizes are shown in the chart on the right.

Follow the installation instructions included with the option package.

Blower Model Size	Duct Connection Sizes (inches) with Optional Duct Flange							
	25-50	75	100	125	165	200	250-300	400
Height	15-7/8	15-7/8	15-7/8	15-7/8	23-7/8	23-7/8	23-7/8	23-7/8
Width	10-3/4	12-3/4	14-3/4	20-1/2	17-1/2	20-1/2	26	34-1/4

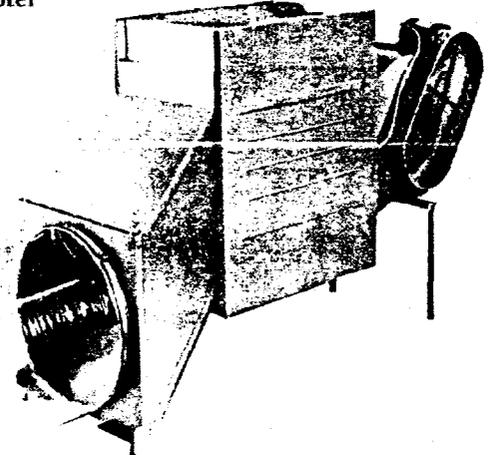
30. Optional Polytube Adapter - Options CD6, CD8, and CD11 (Blower Models only)

The polytube adapter option is designed to adapt this blower-type heater for use with polytube ductwork. The use of polytubes for air distribution is common in greenhouse applications and some industrial applications. A polytube distribution system delivers warm air to a specific area, reducing the need for complete area heating. The polytube adapter is available in three installation designs making it adaptable to many applications and building structures.

WARNINGS: This adapter is to be used only on units equipped with a blower. At no time should the free area in the polytube be less than the listed minimum. Failure to comply with these warnings could result in severe personal injury, death and/or property damage.

Figure 24 - Polytube Adapter

Illustration shows Option CD8, Polytube Adapter for Floor-Mounted Heater. Options CD6 and CD11 are for Suspended Heaters.



The following chart shows specification information covering the use of polytubes with these blower-type unit heaters.

MODEL	CFM AT .25" ESP	POLYTUBE DIAMETER (INCHES)	MINIMUM FREE AREA (SQ. INCHES)	SUGGESTED HOLE SIZES AND LOCATIONS					
				HOLES	LENGTH OF POLYTUBE				
					50 FT.	75 FT.	100 FT.	125 FT.	150 FT.
75	925	18	110	Number	37 pairs	75 pairs	75 pairs	—	—
				Diameter	1-1/2"	1"	1"	—	—
				Spacing	16"	12"	16"	—	—
100	1235	18	145	Number	50 pairs	50 pairs	100 pairs	94 pairs	—
				Diameter	1-1/2"	1-1/2"	1"	1"	—
				Spacing	12"	18"	12"	16"	—
125	1540	18	185	Number	40 pairs	60 pairs	60 pairs	125 pairs	—
				Diameter	1-7/8"	1-1/2"	1-1/2"	1"	—
				Spacing	15"	15"	20"	12"	—
165	2035	24	240	Number	50 pairs	50 pairs	75 pairs	75 pairs	75 pairs
				Diameter	1-7/8"	1-7/8"	1-1/2"	1-1/2"	1-1/2"
				Spacing	12"	18"	16"	20"	24"
200	2465	24	300	Number	42 pairs	42 pairs	60 pairs	60 pairs	100 pairs
				Diameter	2-1/4"	2-1/4"	1-7/8"	1-7/8"	1-1/2"
				Spacing	14"	21"	20"	25"	18"
250	3085	24	360	Number	40 pairs	60 pairs	60 pairs	60 pairs	60 pairs
				Diameter	2-1/2"	2"	2"	2"	2"
				Spacing	15"	15"	20"	25"	30"
300	3700	24	425	Number	75 pairs	75 pairs	75 pairs	75 pairs	75 pairs
				Diameter	2"	2"	2"	2"	2"
				Spacing	9"	12"	16"	20"	24"
400	4935	24	550	Number	60 pairs	60 pairs	60 pairs	100 pairs	100 pairs
				Diameter	2-1/2"	2-1/2"	2-1/2"	1-7/8"	1-7/8"
				Spacing	10"	15"	20"	15"	18"

The polytube adapter option package does not include polytubing. Polytubing can be obtained from a supply distributor such as FOF Products, Inc., P. O. Box E, 1505 Racine Street, Delevan, WI 53115; ACME Engineering Co., P.O. Box 978, Muskogee, OK 74402; or any local greenhouse supply distributor. Some local code authorities require the polytube material to be a listed material. Consult code authority having jurisdiction and the polytube supplier to determine the appropriate polytube material and recommended methods of suspension.

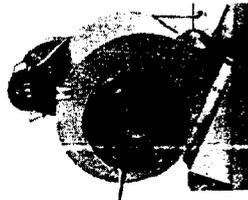
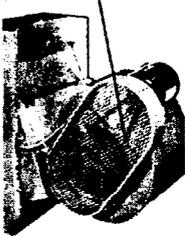
31. Optional Guards - Options CD10 and CD12 (Blower Models only)

These guard options are designed to provide complete protection from the rotating drive and/or blower components. Option CD12 is designed for use with Sizes 25-100 with standard direct drive motor. This kit includes only the blower inlet guard.

Option CD10 is designed for use on Sizes 50-400 with a belt driven motor and includes both the belt guard and the blower inlet guard.

Figure 25 - Optional Guards

Optional Belt Guard Installed

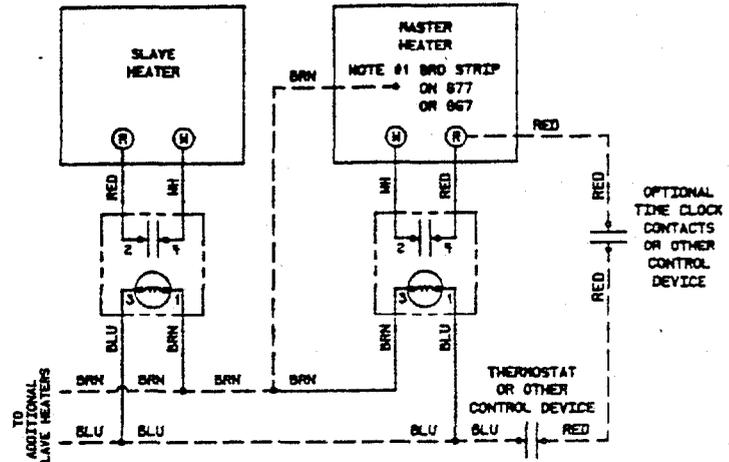


Optional Blower Inlet Guard Installed

32. Optional Multiple Heater Control - Options CL31 and CL32

The multiple heater control options are designed to permit the control of up to six heaters (one master and five slave units) with a single thermostat or a time clock and single/multiple thermostats.

Figure 26 - Multiple Heater Control Wiring with Options CL31 and/or CL32



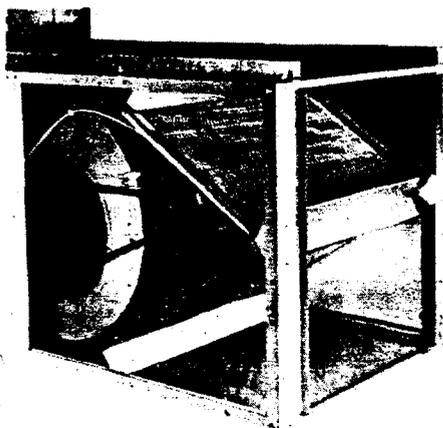
FIELD WIRING HAVING A MINIMUM TEMPERATURE RATING OF AT LEAST 105 DEGREES C. SHALL BE USED. SUPPLY CIRCUIT WIRING SHALL HAVE A MINIMUM SIZE OF 18 AWG.
 NOTE #1: ON STANDING PILOT MODELS, ATTACH TO BROWN WIRE ON GAS VALVE.
 --- FIELD SUPPLIED WIRING

Optional Blower/Filter Cabinet - Options CW1, CW2, or CW3 (Blower Models Only)

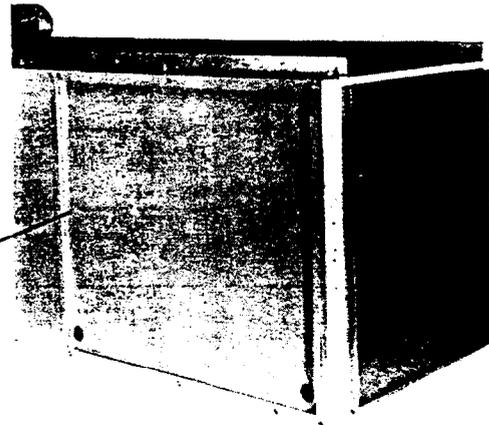
The blower/filter cabinet option is available for all sizes. The blower/filter cabinet is shipped separately for field assembly and installation. The cabinet is adaptable for use with either 1" or 2" filters and may be connected to a return air duct (includes 3/4" duct flange). Option CW1 does not include filters; CW2 includes 1" permanent aluminum filters; and CW3 includes 2" permanent aluminum filters.

Model Size	Qty	Filter Size	Replacement P/N	
			1" Filter	2" Filter
25-125	1	20 x 20	101608	101621
165-200	1	16 x 25	101609	101622
	1	20 x 25	101610	101623
250-300	2	16 x 20	101607	101620
	2	20 x 20	101608	101621
400	2	16 x 25	101609	101622
	2	20 x 25	101610	101623

Figure 27 - Optional Field-Installed Blower/Filter Cabinet



Blower Cabinet with Filters (Option CW2 or CW3) -- side panel removed to illustrate interior of cabinet



Blower Cabinet without Filters (Option CW1)

SERVICE AND MAINTENANCE

WARNING: If you turn off the power supply, turn off the gas. See Hazard Levels, page 2.

This unit will operate with a minimum of maintenance. To ensure long life and satisfactory performance, a heater that is operated under normal conditions should be inspected and cleaned at the start of each heating season. If the heater is operating in an area where an unusual amount of dust or soot or other impurities are present in the air, more frequent maintenance is recommended.

The following procedures should be carried out at least annually (See Paragraphs 34-43 for specific instructions.):

1. Clean all dirt and grease from the primary and secondary combustion air openings.
2. **Fan Models** - Clean the fan blade, fan guard, and motor.
3. **Blower Models** - Clean the blower, the belt guard, the inlet guard, and motor of all dirt and grease. Check the blower belt for tension and wear. Replace a worn belt that may fail before the next scheduled maintenance check.
4. Clean the heat exchanger both internally and externally.
5. Check the pilot burner and main burners for scale, dust, or lint accumulation. Clean as needed.
6. Check the vent system for soundness. Replace any parts that do not appear sound.
7. Check the wiring for any damaged wire. Replace damaged wiring. (See Paragraph 12 for replacement wiring requirements.)

NOTE: Use only factory-authorized replacement parts.

34. Burner Rack Removal

These unit heaters have a convenient bottom access panel. The pilot is attainable with the bottom panel open. With the access panel removed, the burner rack assembly will hinge down for removal. Use the following step-by-step instructions for removal of the bottom access panel and the complete burner rack assembly.

Instructions for Burner Rack Removal (See Figures 28-33.)

1. Shut the gas supply off ahead of the combination valve.
2. Turn off electric supply.
3. Remove the two sheet metal screws located at the rear of the bottom panel.
4. Allow bottom panel to hinge down from the front.
5. Push in one of the two spring-loaded hinge pins located at the front of the bottom panel (inside), and completely remove the bottom panel.
6. The bottom of the pilot is now

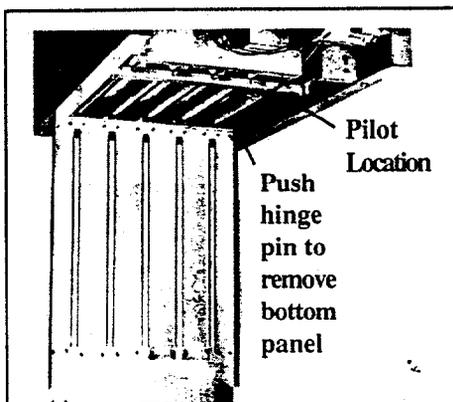
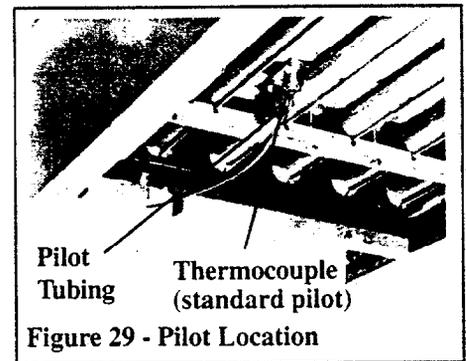


Figure 28 - Bottom Access Panel Open

visible. Do the following:

- (a) Disconnect the pilot tubing from the pilot burner.
- (b) For standing pilot, disconnect the thermocouple from the valve.
- (c) For optional spark pilot, disconnect the flame sensing wire and high tension (spark) lead from the ignition controller.



- 7A. **Heaters manufactured beginning 8/91** (Serial No. Date Code AQH) - The burner rack support is indexed as illustrated in Figure 30. While supporting the burner rack, remove the screws (two or

Burner Rack Support with Indexing

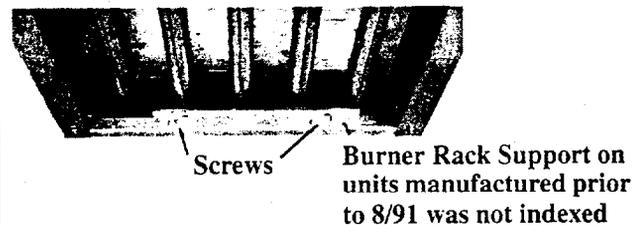
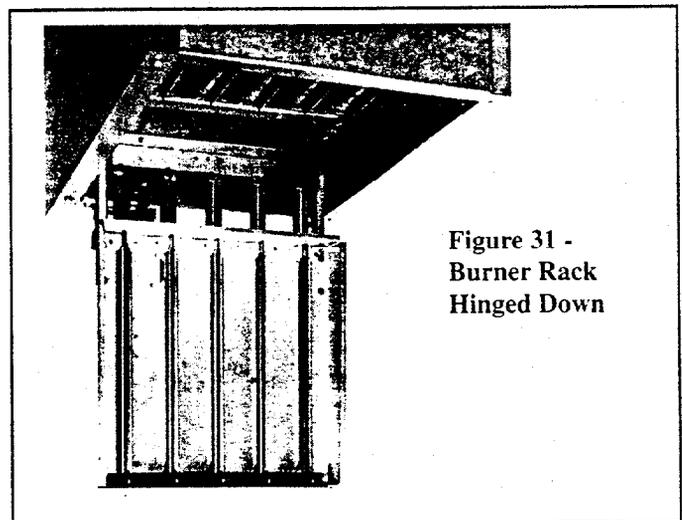


Figure 30 - Burner Rack Support and Retaining Screws

three) that hold the burner rack support. (For screw location, refer to Figure 30.) Remove the burner rack support allowing the burner rack assembly to swing down (See Figure 31).

- 7B. **Heaters manufactured prior to 8/91** (Serial No. Date Code AQH) Loosen the sheet metal screws (two or three) located at the front of the burner rack assembly. See Figure 30. These screws retain the burner rack support. While supporting the burner rack assembly, slide the burner rack support and remove it from the screws, allowing the burner rack assembly to swing down (See Figure 31).
8. **To Remove the Burner Rack** -- With the burner rack assembly "hanging" down, lift up on the rear and slide the assembly up and out of the manifold support brackets.



34. Burner Rack Removal (cont'd)

Figure 32 - Burner Orifices

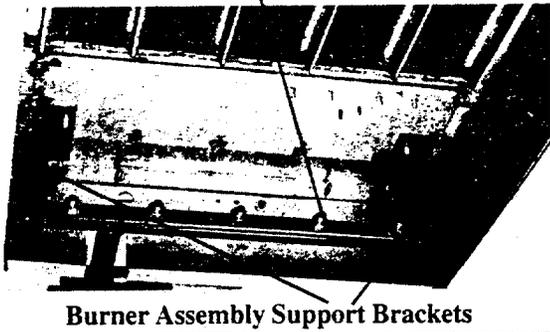
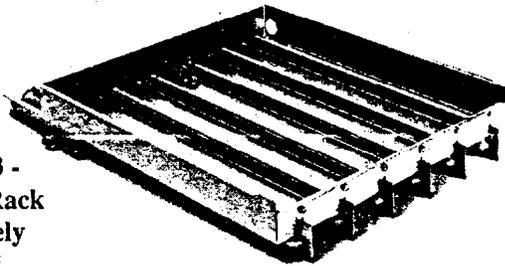


Figure 33 - Burner Rack Completely Removed



9. To remove the individual burners:

- a. Remove the flash carryover (one screw per burner).

With the burner rack upside down, remove the sheet metal screws (located at the rear) that retain the burner holddown.

- c. Lift the rear of the burner upward slightly and pull back, removing the individual burners.

- d. To replace individual burners, reverse the above procedure.

10. To replace the burner rack assembly and the bottom panel, reverse the above procedure (Steps 1-8).

Individual burners may be cleaned using air pressure. Use an air nozzle to blow out scale and dust accumulation from the burner ports. Alternately, blow through burner ports and venturi.

CAUTION: Eye protection is recommended.

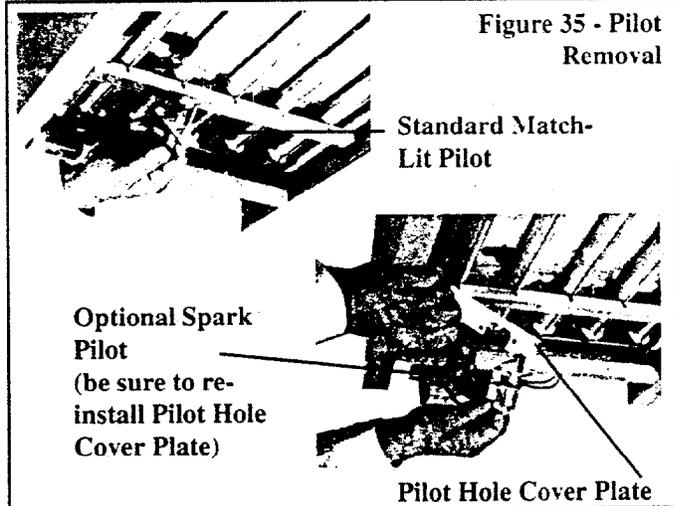
Use a fine wire to dislodge any stubborn particles. Do not use anything that might change the port size.

When any service is completed, be careful to reassemble correctly to ensure that no unsafe conditions are created. When re-lighting, always follow the lighting instructions on the heater.

35. Pilot and Ignition System

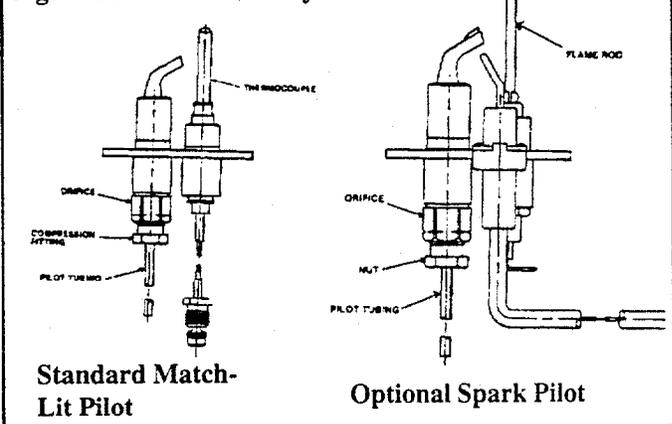
The pilot can be serviced by opening the bottom access panel of the heater. Follow the first four steps of instructions for Burner Rack Removal, Paragraph 34. Remove the pilot for maintenance or service, such as checking the wiring and cleaning the orifice.

Figure 35 - Pilot Removal



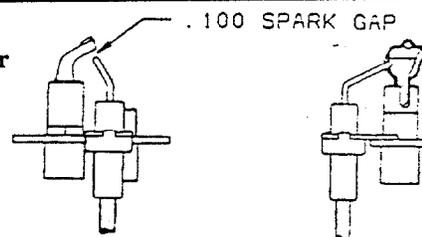
In the event the pilot flame is short and/or yellow, check the pilot orifice for blockage caused by lint or dust accumulation. Remove the pilot orifice and clean with air pressure. Check and clean the aeration slot in the pilot burner.

Figure 36 - Pilot Assembly



If the heater is equipped with an optional spark pilot, check the spark gap. Spark gap must be maintained to .100". (See Figure 37.) When re-installing the pilot of a heater with optional spark ignition, be sure to include the pilot hole cover plate (See Figure 35).

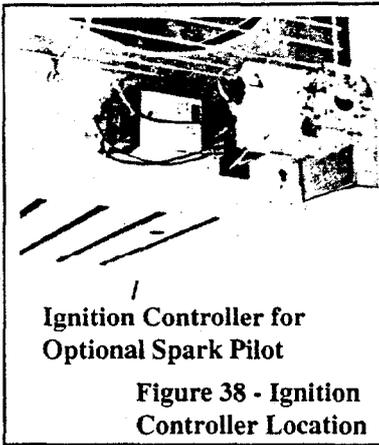
Figure 37 - Pilot Burner Spark Gap (Optional Spark Pilot)



The ignition controller of the optional intermittent electronic ignition pilot system is visibly located on the back of the heater. (See Figure 38.) Do not attempt to disassemble the ignition controller. There are no field replaceable components in the control enclosure. However, each heating season the lead wires should be checked for insulation deterioration and good connections.

Proper operation of the electronic spark ignition system requires a minimum flame signal of .2 microamps as measured by a microammeter.

CAUTION: Due to high voltage on pilot spark wire and pilot electrode, do not touch when energized. See Hazard Levels, page 2.



Ignition Controller for Optional Spark Pilot

Figure 38 - Ignition Controller Location

For further information and check out procedure on the optional intermittent electronic ignition pilot system, refer to the manufacturer's control operating instructions supplied with the heater.

36. Burner Orifices

Heaters are shipped with orifices of proper size and type for gas and altitude specified on the order. When ordering replacement orifices, give BTUH content, specific gravity of gas, and altitude, as well as model and serial number of the heater.

Main Burner Orifices (sea level)						
Model Size	Natural Gas			Propane Gas		
	Drill Size	Orifice P/N	Qty	Drill Size	Orifice P/N	Qty
25	51	39650	2	60	95936	2
50	47	84853	3	1.2MM	63003	3
75	45	38678	4	1.3MM	64676	4
100	44	11833	5	55	11830	5
125	44	11833	6	55	11830	6
165	35	11831	5	1.65MM	96344	5
200	35	11831	6	1.65MM	96344	6
250	35	11831	8	1.65MM	96344	8
300	35	11831	9	1.65MM	96344	9
400	35	11831	12	1.65MM	96344	12
Pilot Orifice	Natural - P/N 103034			Propane - P/N 98695		

WARNING: Do not use this table for gas conversion. Additional parts are required; contact your Reznor Distributor.

37. Flash Carryover (See Figure 39)

The burner carryover system receives its gas supply from the main burner ports. Check the carryover assembly and also the main burner ports for cleanliness. Clean with air pressure.

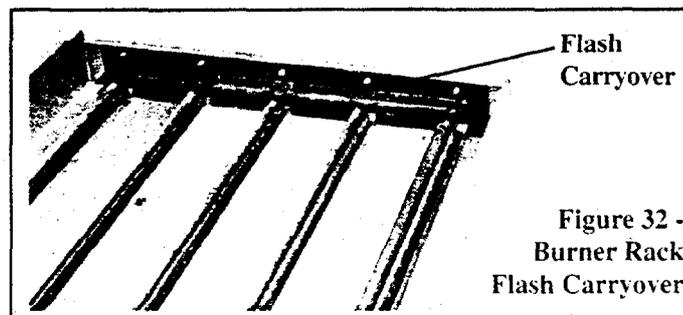


Figure 32 - Burner Rack Flash Carryover

CAUTION: Wearing eye protection when cleaning this heater is recommended.

38. Heat Exchanger

The outside of the heat exchanger can be cleaned from the front of the heater with an air hose and/or a brush. Remove all accumulated dust and grease deposits.

The inner surfaces of the heat exchanger can be reached for cleaning with the burner rack removed. (See Paragraph 34.) Cleaning can be done with a long furnace brush or a heavy wire to which steel wool has been attached. Brush up and down inside each heat exchanger tube until all foreign material is removed. A flashlight is helpful in examining the upper section of the tube.

39. Fan or Blower

Remove dirt and grease from the motor.

On fan model units, remove dirt and grease from the fan guard and blades. Use care when cleaning the fan blades to prevent causing misalignment or imbalance. Check that the hub of the fan blades is secure to the shaft.

On blower models, remove the grease and dirt from the blower housing and check the belt for wear and proper tension (See Paragraph 15.)

Lubricate if the motor has oil cups or grease fittings. The motor supplied as standard has lifetime lubrication and sleeve bearings.

On blower models, check current draw to motor rating plate.

Fan Models: Follow these instructions for replacement of the fan guard, fan motor or fan blades.

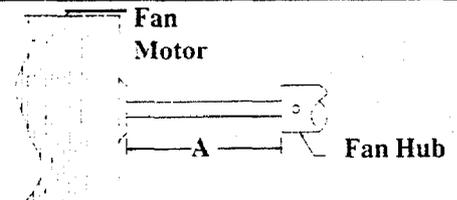
1. If the heater is installed, turn off the gas and disconnect the electric power.

2. Remove the left outer side panel (left when facing the rear of the unit). Disconnect the fan motor wires.

3. Depending on the date that the heater was manufactured, it will have either a lower-half fan guard only, two-piece full fan guard, or a one-piece full fan guard. If the unit has a two piece fan guard, remove the tension mounted upper half fan guard and the four screws that hold the lower half. If the unit has a one-piece fan guard, remove all of the screws that retain the fan guard. Remove the assembled parts (the fan guard, the motor, and the fan blade).

4. Disassemble and replace whatever parts are needed and reassemble using whatever part(s) are being replaced and the original parts. If the fan guard is being replaced, it is **important** that the same hardware be used for attaching the motor to the fan guard as was used with the original guard. These screws are especially made to cut through the coating on the fan guard to provide adequate grounding for the motor.

Figure 40 - Proper Position of the Fan Blade on the Motor Shaft



Be sure the fan blade is in proper position on the shaft. Position the fan as shown in Figure 40) according to the chart on the right.

Model Size	Electrical Supply	Set Screw Torque In-Lbs	"A" Hub to Motor
25	60 Hz	80 + or - 10	1-1/4"
50	60 Hz	80 + or - 10	3/8"
75	60 Hz	80 + or - 10	1/8"
25,50,75	50 Hz	80 + or - 10	3-1/4"
100-125	50 or 60 Hz	120 + or - 10	2-1/2"
165-400	50 or 60 Hz	150 + or - 10	2-1/2"

39. Fan or Blower (cont'd)

Fan Blade Replacement Instructions (cont'd)

Position the assembly on the heater. Attach the fan guard at the center mounts. (**IMPORTANT:** If replacing the fan guard, use the screws that held the original fan guard. These specially designed screws will cut through the coating on the fan guard to provide a ground for the fan motor.)

Rotate the fan blade to check for adequate clearance. If adjustment is required, loosen the mounting screws, re-position the fan guard, and tighten the screws. Rotate the fan blade and re-check for adequate clearance. Repeat this procedure until the assembly is positioned properly.

5. If necessary, drill the required upper and lower fan guard mounting holes. Attach the fan guard at all upper and lower mounting points using either the screws removed or field-installed sheet metal screws.

6. Reconnect the fan motor wires and replace the outer side panel.

7. Restore power to the heater and turn on the gas. Light, following the instructions on the lighting instruction plate. Check for proper operation.

40. Vent System

Check the vent system at least once a year. Inspection should include all joints, seams, and the vent cap. Replace any defective parts.

41. Operating Gas Valve

The gas valve requires no field maintenance except careful removal of external dirt accumulation and checking of wiring connections. Instructions for testing pressure settings are in Paragraph 11.

CAUTION: The operating valve is the prime safety shutoff. All gas supply lines must be free of dirt or scale before connecting to the unit to ensure positive closure. See Hazard Levels, page 2.

42. Fan, Limit, and ECO Controls

If it is determined that the fan or limit controls or the ECO device needs replacing, use only factory-authorized replacement parts that are designed for your heater.

WARNING: An ECO circuit interruption is a major failure caused by a malfunction of the primary safety controls or mis-wiring, and will require correction of the cause of the failure and the replacement of the fan and limit controls and wiring before the heater can be returned to service. See Hazard Levels, page 2.

Instructions for replacing fan or limit control and ECO device:

1. Turn off the electric power and shut off the gas supply.
2. Remove the outer left side panel (left when facing the back of the unit). Remove the access panel.
3. Remove defective controls and install new controls in the same mounting holes. Use only factory-authorized replacement parts.
4. Replace access panel and side panel.
5. Turn on the electric power and the gas supply.
6. Relight following the lighting instructions on the heater.

Limit Control
Fan Control
ECO Device

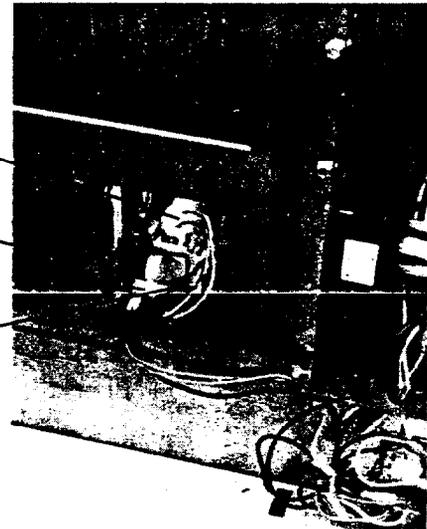


Figure 41 - Side Panel and Access Panel Removed Revealing Controls

43. Blocked Vent Switch

The manual reset blocked vent switch is located on the front top of the drafthood. The sensor is located near the relief opening of the drafthood.

If the blocked vent switch should require replacing, use a factory-authorized replacement switch with the designated temperature setting for the heater.

Model Size	Blocked Vent Switch			
	Standard Single-Stage Gas Controls		Optional Two-Stage Gas Controls	
	Temperature Setting	P/N	Temperature Setting	P/N
25	200°F	112751	N/A	N/A
50	225°F	112752	N/A	N/A
100-400	275°F	121275	225°F	112752

44. Troubleshooting

TROUBLE	PROBABLE CAUSE	REMEDY
Pilot will not light (match lit system)	<ol style="list-style-type: none"> Pilot cock turned off. Air in gas line. Incorrect lighting procedure. Dirt in pilot orifice. Extremely high or low gas pressure. Bent or kinked pilot tubing. Failed E.C.O. device. 	<ol style="list-style-type: none"> Open valve. Disconnect pilot line at shutoff. Bleed air from gas supply line. Follow instructions on the heater. Remove and clean with compressed air or solvent (do not ream). Check line pressure (See Paragraph 11). Replace tubing. Replace E.C.O. device (See Paragraph 42).
Pilot will not light (spark ignition system)	<ol style="list-style-type: none"> Manual valve not open. Air in gas line. Dirt in pilot orifice. Gas pressure too high or too low. Kinked pilot tubing. Pilot valve does not open. No spark: <ol style="list-style-type: none"> Loose wire connections Transformer failure. Incorrect spark gap. Spark cable shorted to ground. Spark electrode shorted to ground. Drafts affecting pilot. Ignition control not grounded. Faulty ignition controller. Optional lockout device interrupting control circuit by above causes. Activated blocked vent switch. 	<ol style="list-style-type: none"> Open manual valve. Bleed gas line. Remove and clean with compressed air or solvent (do not ream). Adjust supply pressure. (See Paragraph 11). Replace tubing. If 24 volt available at valve, replace valve. <ol style="list-style-type: none"> Be certain all wires connections are solid. Be certain 24 volts is available. Maintain spark gap at .100". Replace worn or grounded spark cable. Replace pilot if ceramic spark electrode is cracked or grounded. Make sure all panels are in place and tightly secured to prevent drafts at pilot. Make certain ignition control is grounded to furnace chassis If 24 volt is available to ignition controller and all other causes have been eliminated, replace ignition control. Reset lockout by interrupting control at thermostat. Correct venting problem. Reset switch (See paragraph 19).
Pilot lit but gas valve will not open. (All manual valves are open) (Match lit system)	<ol style="list-style-type: none"> Power not turned on or thermostat not calling for heat. Circuit to magnetic valve open. Faulty transformer. Faulty or dirty thermocouple or safety pilot switch, or failed E.C.O. device. Faulty thermostat (See manufacturer's instructions.) Faulty magnetic valve. High gas pressure. Activated blocked vent switch. 	<ol style="list-style-type: none"> Turn on power, check fuses, turn up thermostat. Check wiring and connections at transformer and thermostat. Replace transformer. Clean and test with millivolt meter or test kit. Replace defective part. Replace thermostat. Replace valve or magnetic head. Maximum gas pressure 8 oz. or 14" w.c. (See Paragraph 11). Correct venting problem. Reset switch. (See Paragraph 19.)
Pilot lights, main valve will not open (Spark Ignition system)	<ol style="list-style-type: none"> Manual valve not open. Main valve not operating. <ol style="list-style-type: none"> Defective valve. Loose wire connections. Ignition control does not power main valve. <ol style="list-style-type: none"> Loose wire connections. Flame sensor grounded. (Pilot lights - spark continues) Gas pressure incorrect. Cracked ceramic at sensor. Faulty ignition controller. 	<ol style="list-style-type: none"> Open manual valve. If 24 volt is measured at valve connections and valve remains closed, replace valve. Check and tighten all wiring connections. Check and tighten all wiring connections. <ol style="list-style-type: none"> Be certain flame sensor lead is not grounded or insulation or ceramic is not cracked. Replace as required. Set supply pressure at 5" w.c. to 14" w.c. for natural gas and 11" w.c. to 14" w.c. for propane gas. Replace sensor. See Paragraph 34. If all checks indicate no other cause, replace ignition controller. DO NOT ATTEMPT TO REPAIR IGNITION CONTROLLER. THIS DEVICE HAS NO FIELD REPLACEABLE PARTS.
No heat (Heater Operating)	<ol style="list-style-type: none"> Incorrect manifold pressure or orifices. Cycling on limit control. Improper thermostat location or adjustment. 	<ol style="list-style-type: none"> Check manifold pressure (See Paragraph 11). Check air throughput (See Paragraph 16). See thermostat manufacturer's instructions.
Cold air delivered On Start-up	<ol style="list-style-type: none"> Fan control improperly wired Defective fan control 	<ol style="list-style-type: none"> Connect as per wiring diagram. Replace fan control.
During Operation	<ol style="list-style-type: none"> Incorrect manifold pressure. 	<ol style="list-style-type: none"> Check manifold line pressure (See Paragraph 11).
Motor will not run	<ol style="list-style-type: none"> Circuit open. Fan control inoperative. Defective motor or capacitor. 	<ol style="list-style-type: none"> Check wiring and connections. Replace fan control. Replace motor or capacitor.
Motor turns on and off while burner is operating (See Motor cuts out on overload below)	<ol style="list-style-type: none"> Fan control improperly wired. Defective fan control. Poor contact between fan control and heat exchanger tube. Surface contact is required. Motor overload device cycling on and off. Low ambient temperature (less than 40°F) causing false cycling. 	<ol style="list-style-type: none"> Connect as per wiring diagram. Replace fan control. Check for bent mounting or loose mounting screws. Check motor load against motor rating plate. Replace motor if needed. Install fan delay relay kit (See Paragraph 18.)
Fan motor cuts out on overload	<ol style="list-style-type: none"> Low or high voltage supply. Defective motor. Poor air flow. Defective bearing or lubrication. 	<ol style="list-style-type: none"> Correct electric supply. Replace motor. Clean motor, fan and fan guard. Lubricate bearings or replace motor.
Blower motor cuts out on overload	<ol style="list-style-type: none"> Improper motor pulley and/or adjustment. Improper static pressure in the duct system. Low voltage. 	<ol style="list-style-type: none"> See instructions in Paragraph 16. Adjust duct system dampers. Check power supply.

FOR SERVICE OR REPAIR, FOLLOW THESE STEPS IN ORDER:

FIRST: Contact the installer.

Name _____

Address _____

Phone _____

SECOND: Contact the nearest distributor (See telephone Yellow Pages.)

THIRD: Contact: REZNOR, a Unit of Thomas & Betts Corporation
150 McKinley Avenue
Mercer, PA 16137
Phone: (412) 662-4400

Model No. _____

Unit Serial No. _____

Date of Installation _____

Thomas & Betts

APPENDIX X
VENTILATION LOUVERS

SUBMITTAL COVER SHEET

AIROLITE®

P.O. BOX 666 MARIETTA, OHIO 45750-0666 TELEPHONE 614/373-7676 FAX 614/373-6666

PROJECT: ROUNDWATER TREATMENT PLANT DATE: 6/1/95

ARCHITECT: _____ AIROLITE JOB NO: _____

CUSTOMER: NORTHEAST CONSTR. CO. CUSTOMER P.O. NO: _____

REPRESENTATIVE: KUESTER SALES CO. TELEPHONE: 704/ 334-7264 FAX: 704/ 372-9169

CUSTOMER NOTE

Shop drawings are submitted for your convenience in securing (1) design review and approval, and (2) field verified quantities and sizes. Aiolite cannot begin fabrication until each of the following sections is completed and executed. Changes made after fabrication has started will result in additional charges for interruptions, delays, and labor and material costs incurred because of the change.

DESIGNER REVIEW AND APPROVAL

Fabrication cannot begin until this section is executed by the authorized design professional and returned to The Aiolite Company.

Approved Approved as Noted Revise and Resubmit

By _____ Date _____

NORTHEAST CONSTRUCTION CO.
POST OFFICE BOX 648
JACKSONVILLE, NC 28541-0548

X

Approved
Approved as noted
Revise and Resubmit

By [Signature]
Date 6/6/95

6-12-95 [Signature]

Approval does not relieve supplier or subcontractor of his obligation to furnish and/or install this material in accordance with requirements of the contractual plans and specifications.

FIELD VERIFIED QUANTITIES AND SIZES

Submittal details reflect Aiolite's best interpretation of the contract documents provided. All quantities and sizes must be field verified to ensure coordination with field conditions. Fabrication cannot begin until this section is completed by an authorized field representative. Execution represents that quantities and sizes are field verified and that Aiolite is authorized to fabricate in strict accordance with these details and any corrections noted.

By _____ Date _____

Release For Immediate Fabrication Hold Fabrication Until Further Notice

LOUVER SCHEDULE

NOTE: ALL QUANTITIES AND DIMENSIONS MUST BE VERIFIED IN FIELD NOT BY THE AIROLITE COMPANY

ITEM	QUAN	TYPE	LOUVER SIZE W X H	SECT QUAN	SECTION SIZE W X H	OPENING SIZE W X H	LOCATION DESIGNATION
	4	K609	48" wide x 60" high <i>47 1/2" 59 1/2"</i>			48 1/2" w x 60 1/2" h <i>48 60</i>	
	2	3	K609		12" wide x 12" high <i>11 1/2" 11 1/2"</i>	12 1/2" w x 12 1/2" h <i>12 x 12</i>	

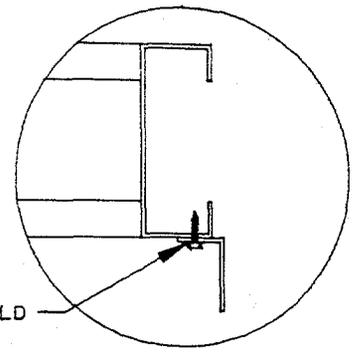
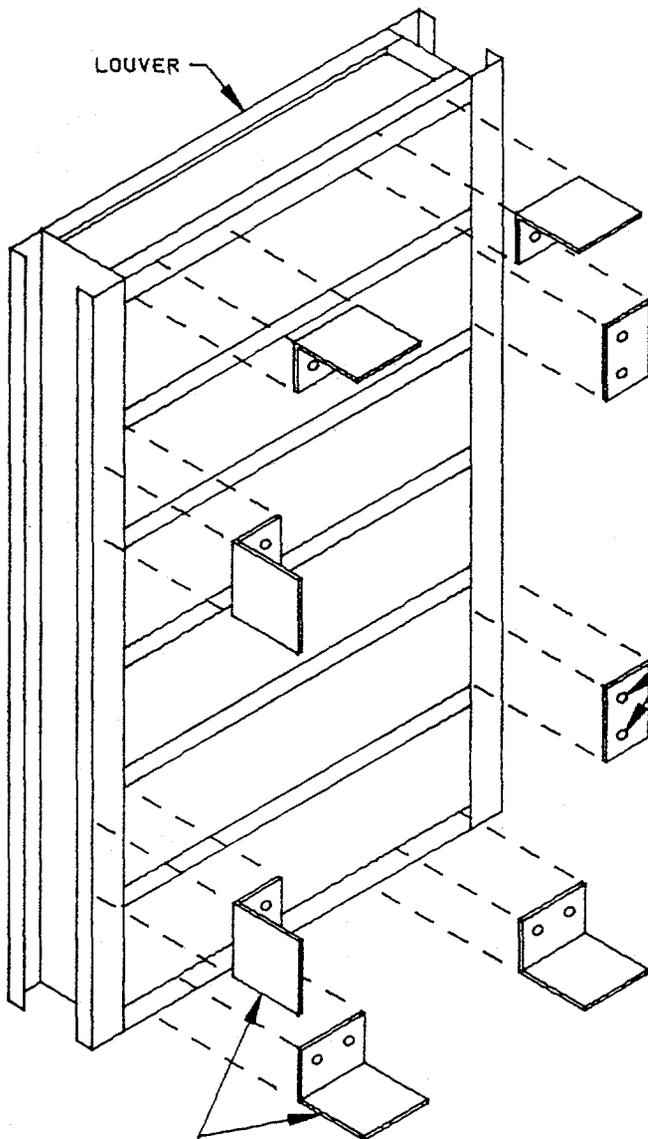
NOTES: 1) Please advise color selection from attached chart
2) Review above louver and opening dimensions

LOUVER FINISH	INSTALLATION METHOD	SCREEN	OPERATION
<input type="checkbox"/> NATURAL	<input type="checkbox"/> NOT BY AIROLITE <input checked="" type="checkbox"/> INTERIOR 1-1/2" LONG CLIP ANGLES APPROX. 20" O.C. <input type="checkbox"/> HOLES IN JAMB <input type="checkbox"/> INTERIOR 1-1/2" FLAT FLANGE <input type="checkbox"/> EXTERIOR 1-1/2" FLAT FLANGE <input type="checkbox"/> INTERIOR 1-1/2" ANGLE <input type="checkbox"/> EXTERIOR 1-1/2" ANGLE <input type="checkbox"/>	<input type="checkbox"/> NONE <input checked="" type="checkbox"/> INTERIOR <input type="checkbox"/> EXTERIOR	<input type="checkbox"/> HAND, WING NUT <input type="checkbox"/> CHAIN, SPECIFY CHAIN LENGTH BELOW LOUVER _____ <input type="checkbox"/> CHAIN W/FUSIBLE LINK, SPECIFY CHAIN LENGTH BELOW LOUVER _____ <input type="checkbox"/> CRANK PER DRAWING <input type="checkbox"/> MOTOR VOLTAGE _____ <input type="checkbox"/> SPRING RETURN <input type="checkbox"/> POWER DRIVE BOTH DIRECTIONS _____ <input type="checkbox"/> MODULATING
<input type="checkbox"/> PRIME COAT			
<input type="checkbox"/> BAKED ENAMEL SPECIFY COLOR SELECTION: _____		MESH	
<input checked="" type="checkbox"/> KYNAR 500 <input type="checkbox"/> KYNAR 500 XL SPECIFY COLOR SELECTION: _____		<input checked="" type="checkbox"/> INSECT <input type="checkbox"/> 1/2" MESH BIRD <input type="checkbox"/> 1/4" MESH BIRD	
<input type="checkbox"/> ETCH-LACQUER ¹		MATERIAL	
CLEAR ANODIZE ¹ 204-R1 .15-R1	NOTE: ANGLE / FLANGE SHIPPED LOOSE FOR FIELD ATTACHMENT.	<input type="checkbox"/> GALV. STEEL <input type="checkbox"/> EXPANDED ALUMINUM <input checked="" type="checkbox"/> ALUMINUM <input type="checkbox"/>	
¹ AVAILABLE ONLY ON ALUMINUM LOUVERS.	FINISH	FINISH	
	<input checked="" type="checkbox"/> NATURAL <input type="checkbox"/>	<input checked="" type="checkbox"/> NATURAL <input type="checkbox"/>	

LOUVERS ASSEMBLED
FIELD BY WELDING

THE AIROLITE COMPANY
MARIETTA, OHIO

AIROLITE ORDER NO. _____
SHEET _____ OF _____ 11-94



ATTACHED IN FIELD

JAMB

HORIZONTAL SECTION

LOUVER

HOLES FOR ATTACHMENT TO WALL
CONDITIONS DRILLED IN FIELD NOT
BY AIROLITE. ANCHORS NOT BY AIROLITE.

ANGLES SUPPLIED WITH (2) 7/32"
DIA. HOLES AND 5/8"-#10 IND. HEX.
WASHER HEAD S.M. SCREWS FOR ANGLE
ATTACHMENT TO LOUVER. LOUVER DRILLED
IN FIELD NOT BY AIROLITE USING HOLES
IN CLIP ANGLE AS TEMPLATE.

VIEW SHOWN IS FROM
INTERIOR SIDE OF LOUVER

1" X 1 1/2" X 1 1/2" LONG
20" O.C. ALL AROUND SHIPPED
LOOSE.

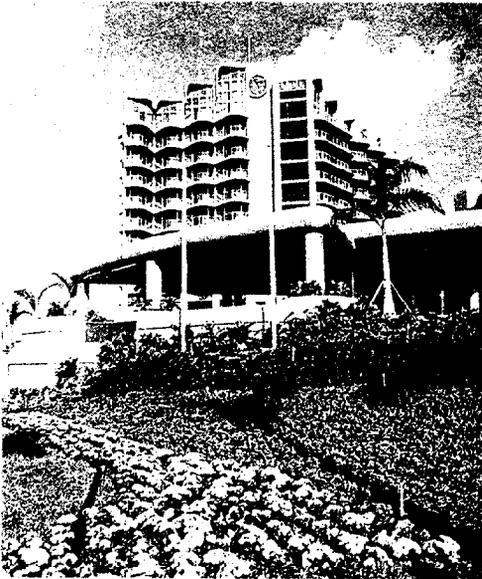
MATERIAL NOTE:
ALUM. LOUVERS - 12 GA.(.081") ALUM.
GALV. LOUVERS - 16 GA.(.063") GALV. STEEL

1" X 1 1/2" X 1 1/2" CLIP ANGLES, ALL
AROUND LOUVER, SHIPPED LOOSE, FOR FIELD
ATTACHMENT.

AIROLITE

Extruded Aluminum Architectural Louvers

Stationary louvers with visible mullions may be joined with an extruded aluminum "I" connector as detailed on page 15. Continuous blade louvers utilize concealed blade braces and hidden vertical supports in place of jamb frames to present uninterrupted horizontal blade appearance.



Stat Palms Hotel & Casino Nassau, Bahamas

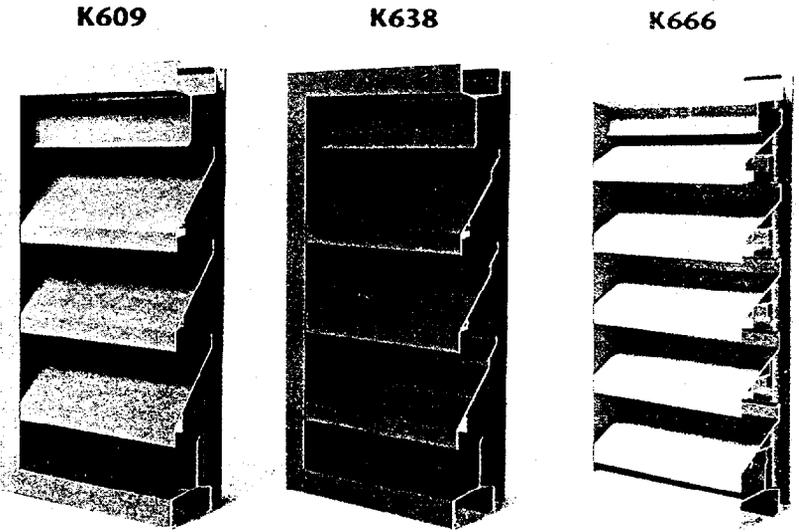
Recommended Specification:

Furnish and install architectural blade Louver Type K638 as designed and manufactured by The Airolite Company, Marietta, Ohio USA. Louvers shall be constructed entirely of extruded aluminum, alloy 6063-T5. Blades and frames shall be minimum .081" (2.06mm) wall thickness. Louver assemblies shall be 4" (101.6mm) deep with 45 degree stationary blades. Each louver shall be fitted with 1/2" (12.7mm) mesh x .063" (1.60mm) diameter aluminum bird screen in a rewirable extruded aluminum frame.

Blades shall be joined to each jamb frame and vertical stiffening member with two fillet welds each 1" (25.4mm) long produced with the Pulsed Gas Metal Arc Welding process (GMAW/MIG) with a minimum .125" (3.175mm) throat. Frames shall be joined at each corner with a full length GMAW fillet weld with a minimum .125" (3.175mm) throat. Manufacturer shall submit theoretical calculations prepared by a professional engineer specializing in the application of welding technology demonstrating that each weld will withstand minimum 526 pounds of force in shear.

Louvers shall be factory primed and finished-after-assembly with a Kynar 500 (PVF₂) resin coating in a color selected from the manufacturer's standard color chart.

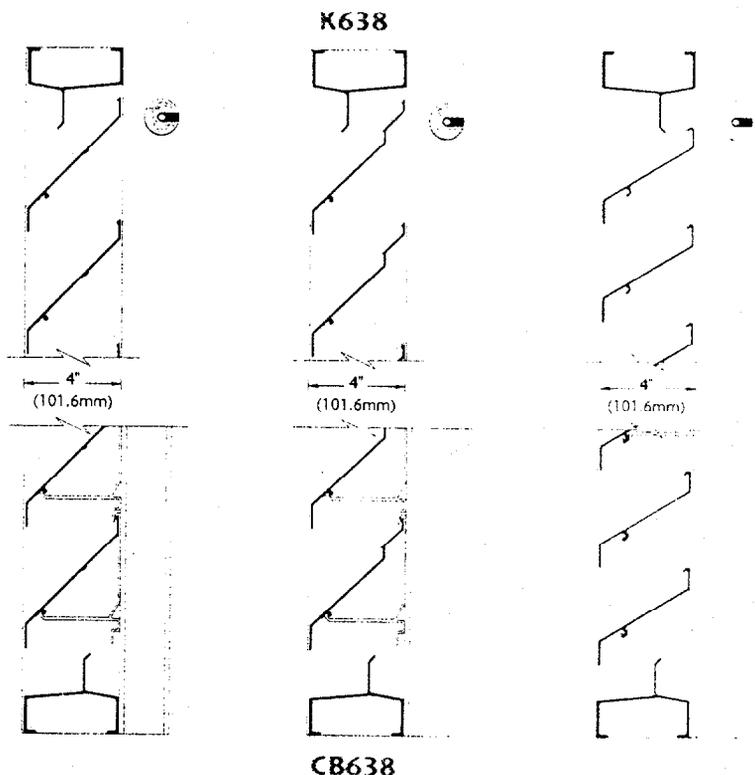
Louvers shall bear Air Movement and Control Association (AMCA) Certified Ratings Seals for air performance and water penetration ratings. Manufacturer shall submit AMCA Licensed data on a 4' x 4' (1.22m x 1.22m) unit demonstrating that it provides a minimum of 7.96 square feet (0.740 sq m) of free area and shall intake 770 FPM (235 m/min) free area velocity at a static pressure drop not exceeding 0.08" (2.0mm) H₂O per square foot of free area at a velocity of 770 FPM (235 m/min) when tested for 15 minutes per AMCA Standard 500.



Visible Mullion Louver Types:

Continuous Blade Louver Types:

	K609	K638	K666
Material:	Extruded Aluminum (Alloy 6063-T5)	Extruded Aluminum (Alloy 6063-T5)	Extruded Aluminum (Alloy 6063-T5)
Stationary Blade:	.081" (2.06mm)	.081" (2.06mm)	.081" (2.06mm)
Frame:	.081" (2.06mm)	.081" (2.06mm)	.081" (2.06mm)
Louver Depth:	4" (101.6mm)	4" (101.6mm)	4" (101.6mm)
Blade Angle:	45°	45°	30°
Performance Ratings:	AMCA Licensed	AMCA Licensed	Tested to AMCA Standard 500
Free Area – 4' x 4' Unit:	7.96 sq. ft. (0.740 sq m)	7.96 sq. ft. (0.740 sq m)	8.87 sq. ft. (0.824 sq m)
Percent Free Area:	50%	50%	55%
Beginning Point of Water Penetration – .01 oz./sq. ft. Free Area:	770 FPM (235 m/min) 6,129 CFM (174 m ³ /min) 0.08" H ₂ O (2.0mm H ₂ O)	770 FPM (235 m/min) 6,129 CFM (174 m ³ /min) 0.08" H ₂ O (2.0mm H ₂ O)	740 FPM (226 m/min) 6,564 CFM (186 m ³ /min) 0.09" H ₂ O (2.3mm H ₂ O)



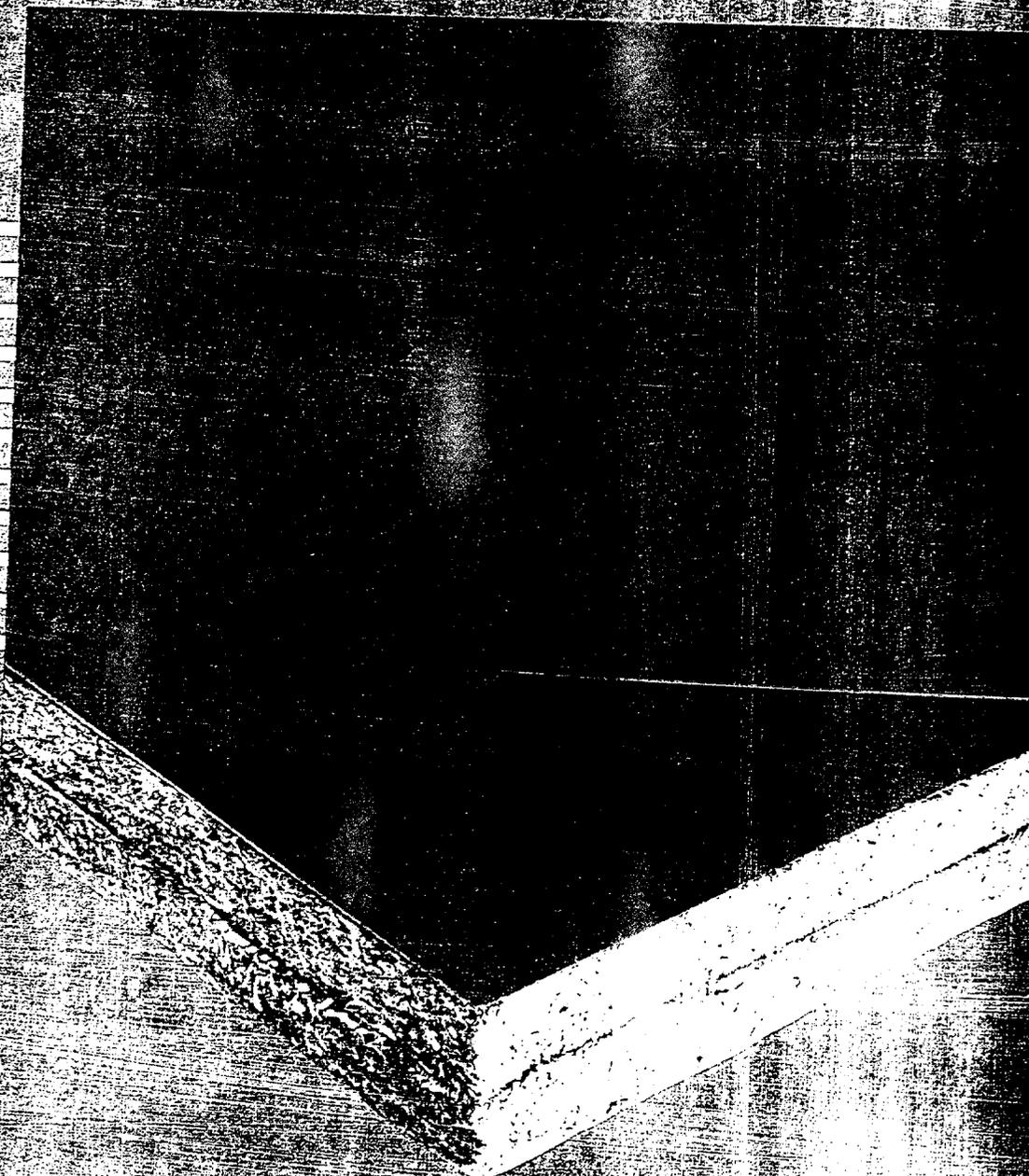
ALL-WELDED ASSEMBLY

TELEPHONE 614-373-7676 FAX 614-373-6666

APPENDIX Y
ROOF INSULATION

COLEX

Cellular and
High Density
Fiberboard
Roof Insulation



Celotex® High Density Fiberboard Roof Insulation

DESCRIPTION

Celotex High Density Fiberboard Roof Insulation is a uniform density non-asphaltic board with good insulating properties composed of interlocking fibers produced by mechanical fiberizing of a blend of strong natural fibers and treated for additional strength and moisture resistance. The board is further treated on the top face to reduce asphalt bitumen absorption.

Celotex High Density Fiberboard Roof Insulation is a general-purpose roof insulation which is especially well-suited for installations requiring unusual strength and rigidity.

RECOMMENDED USES AND LIMITATIONS

Celotex High Density Fiberboard Roof Insulation is for use under fully adhered, loose-laid and ballasted or mechanically fastened single-ply roofing systems. It can also be used as a general-purpose roof insulation under conventional built-up and modified bitumen roofing systems, and as a separation layer over existing roofs in reroofing applications.

In reroofing application, Celotex requires that all wet areas in the old roof be cut out and replaced. Also, before **High Density Fiberboard Roof Insulation** is installed, remove all loose and protruding gravel. This procedure prevents damage and maintains the integrity and insulation value of the insulation board.

Do not apply flame directly to High Density Fiberboard Roof Insulation when installing a modified bitumen system.

Can be used over foam plastic roof insulation, as recommended by NRCA Bulletin No. 9.

ADVANTAGES

Structural Rigidity. Increases strength and rigidity of the entire roof structure. Dimensionally stable. Resists cracking, warping and buckling. Uniform in thickness and density.

Rugged, Crush-Resistant. Withstands normal deck traffic and wheeling loads without fracturing. Resists damage from rough handling in transporting, hoisting and installation.

Excellent Bond with Felts. Suitable for fully **mopped built-up roof systems.** High resistance to bitumen absorption, assuring proper retention of bitumen on board surface for tight, permanent adhesion of roofing felts.

Insulating Value. Provides additional insulating value to enhance the total "R" value of an assembly.

Available. Suitable as a nailable base for back-nailing roofing ply sheets.

Table 1
STANDARD THICKNESSES, THERMAL VALUES
AND FLUTE SPANABILITY

Nominal Thickness, Inches	THERMAL VALUES		Maximum Flute Spanability
	C-Value ⁽¹⁾	R-Value ⁽²⁾	
1/2"	0.77	1.3	1 3/8"
3/4"	0.53	1.9	2 1/8"
1"	0.40	2.5	2 3/8"
1 1/2"	0.26	3.8	4 3/8"
2"	0.20	5.0	4 3/8"

(1) C = Btu/°F • ft² • h (2) R = °F • ft² • h/Btu

Table 2
TYPICAL PHYSICAL PROPERTIES

PROPERTY	TEST METHOD	VALUE
Water Absorption	ASTM C208, C209	7% Volume Max.
Weight/Sq. Ft., 1" Thick		1.7 Lbs. Max.
Linear Expansion	ASTM C208, C209	0.5% Max.

SIZES

Celotex High Density Fiberboard Roof Insulation is available in thicknesses from 1/2" to 2". It is produced in 4' x 4' and 4' x 8' boards.

COMPLIANCES

ASTM C208, ASTM C209
Federal Specification LLL-I-535B (cancelled 4-18-85)

Underwriters Laboratories, Inc. Listed by Underwriters Laboratories for Class A Celotex-1 loose-laid and ballasted single-ply roofing system **only**.

Factory Mutual. Class 1 Approval per FMRC Standard 4450/4470 for Class 1 Construction. High Density Fiberboard Roof Insulation has met all FM Class 1 test criteria subject to conditions of FM Report J.I.1P6A3AM.

Refer to The Celotex Roof Insulation Manual for recommended fastener patterns and application instructions for roof insulation over various types of decks. **Installation must be according to Celotex specifications.**

In all applications, use of High Density Fiberboard Roof Insulation must be approved by the specific roof membrane manufacturer.

NOTE: For all single-ply roofing systems, install membrane and membrane fastening system according to membrane manufacturer's application instructions.

Fiberboard Cant and Edge and Solid Laminated Base Board products are also available. Refer to the current Roof Insulation Catalog or contact your local Celotex Office.

See back page for Warnings, Cautions and Storage recommendations.

1994 Commercial Roof Insulation

07220/RMA
BuyLine 4892

R — Install it with pride. It will perform.

Rmax — Delivery from 3 plants across the U.S.



Max — Made to exacting specifications.
Maximum quality.

NORTHEAST CONSTRUCTION CO.
POST OFFICE BOX 848
JACKSONVILLE, NC 28541-0848

Approved
Approved as noted
Revise and Resubmit
By [Signature]
Date 4/21/94



Maximum Value. It's in our name.

Approval does not relieve supplier or subcontractor of his obligation to furnish and/or install this material in accordance with requirements of the contractual plans and specifications.

MULTI-MAX® FA

Roofing Insulation for Single Ply, BUR, and Modified Bitumen Systems



Product Description:

Rmax Multi-Max FA is a highly efficient thermal insulation board composed of a rigid closed cell polyisocyanurate foam core bonded to glass fiber mat facers.

Compliances:

FEDERAL SPECIFICATION – HH-I-1972/2

FACTORY MUTUAL – Class 1 Roof Insulation per FM Standard 4450. Subject to the conditions of approval as a Roof Insulation when installed as described in the current edition of the FMRC Approval Guide.

UNDERWRITERS LABORATORIES – Classified (Class A) Foamed Plastic as roof deck construction material. Meets UL Standards 790, 1256 and/or 263 – Contact Rmax Sales for latest information.

Applications:

Rmax Multi-Max FA with glass fiber mat facers is superior for use with the many types of single ply membranes, built-up and modified bitumen membranes and metal panel roofing systems available. Multi-Max FA is approved for use in new roofing constructions and limited retrofit recover roofing constructions over steel, wood, non-combustible, and certain types of nailable roof decks. Designers and installers of Rmax Multi-Max FA roofing insulation products are referred to Rmax publication "TR-0101A", "General Notes for Use and Installation of Rmax Roofing Insulations" for details not covered here.

Fully Adhered Single Ply Systems:

Use Multi-Max FA with confidence under fully adhered single ply membranes with the insulation secured to the roof deck with either mechanical fasteners or hot bitumen adhesive when approved by the membrane supplier.

Mechanically Attached Single Ply Systems:

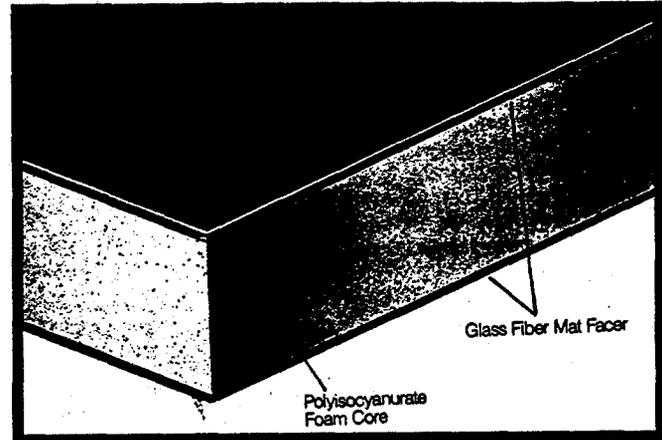
Attach the Multi-Max FA to the roof deck with a minimum of four (4) FM approved mechanical fasteners per four foot by eight foot (4' x 8') sheet of insulation. Additional fasteners in the insulation may be required by the membrane supplier. Apply the mechanically attached membrane according to membrane supplier's specifications.

Loose Laid Ballasted Single Ply Systems:

Multi-Max FA is laid into position on the roof deck without fastening or otherwise securing the insulation. The membrane and ballast are then installed according to the membrane supplier's specifications. Ballast, placed at the specified rate, restrains the entire roof system.

Built-Up Bitumen Membrane Systems:

Multi-Max FA is recommended for use under built-up bitumen, either asphalt or coal tar, membranes when the insulation is secured to the roof deck by industry accepted methods. Rmax recommends that when Multi-Max FA is used under a BUR membrane system, it be protected by an overlay of mineral fiberboard, wood fiberboard, perlite, or a venting base sheet as specified in the NRCA "Technical Bulletin #9".



Modified Bitumen Membrane Systems:

Multi-Max FA is excellent for use under modified bitumen membrane systems. Rmax recommends that when Multi-Max FA is used under a hot bitumen adhered modified membrane system, it be protected by an overlay of mineral fiberboard, wood fiberboard, perlite, or a venting base sheet as specified in the NRCA "Technical Bulletin #9". Please note that Rmax requires a suitable overlay of mineral fiberboard, wood fiberboard, or perlite to be applied to the insulation prior to application of a torch-down modified bitumen system.

Standing-Seam Metal Roof Systems:

Rmax Multi-Max FA is suitable for use under metal roof panel systems fastened through the insulation to a roof deck and structure below the insulation. Fastening clips and all other items required to secure and close the metal roof covering must be fastened securely to the roof deck and structure. Consult metal panel manufacturer/supplier for details.

Standard Sizes and Packaging:

- WIDTH: 48" • LENGTH: 48" or 96"
- THICKNESSES: Refer to Thermal Properties Data below.

Bundles, approximately 48" high, are banded and covered in plastic bags for easy handling. NOTE: All Rmax products must be tarped, placed on skids, and kept completely dry before and throughout construction.

Typical Physical Properties – See page 8.

WARNING

Polyisocyanurate is an organic material which will burn when exposed to an ignition source of sufficient heat and intensity, and may contribute to flames spreading. Note: Rmax does not assume any responsibility or liability for the performance of any products other than those manufactured by Rmax.

THERMAL PROPERTIES & PRODUCT DATA								
"R" means resistance to heat flow. The higher the R-value, the greater the insulating power.								
Nominal Thickness	Thermal Value 1,2		Wt. Per Sq. (lbs.)	48" x 96"				Flute Spanability
	C	R		Bundle		Truckload		
				Pieces	Sq. Ft.	Pieces	Sq. Ft.	
1.5"	.10	10.0	25	32	1,024	704	22,528	3 3/8"
1.6"	.09	11.1	27	30	960	660	21,120	3 3/8"
1.8"	.08	12.5	30	26	832	572	18,304	3 3/8"
2.0"	.07	14.3	34	24	768	528	16,896	3 3/8"
2.3"	.06	16.7	38	20	640	440	14,080	3 3/8"
2.5"	.056	18.0	42	19	608	418	13,376	3 3/8"
2.6"	.052	19.2	43	18	576	396	12,672	3 3/8"
2.7"	.05	20.0	45	17	544	374	11,968	3 3/8"
3.0"	.044	22.5	51	16	512	352	11,264	3 3/8"
3.3"	.04	25.0	55	14	448	308	9,856	3 3/8"
3.5"	.038	26.3	59	13	416	286	9,152	3 3/8"
4.0"	.033	30.3	67	12	384	264	8,448	3 3/8"

Notes:

1. Thermal values may vary for California shipping zone, consult Rmax for latest information.

2. Thermal values determined by using ASTM C518 test method at 75 degrees F mean temperature on material conditioned according to PIMA Conditioning Procedure 101.

Firestone

MB BASE SHEET

INTRODUCTION:

Firestone MB Base Sheet is a high-performance asphalt saturated fiberglass reinforced roofing base ply which has been designed to provide superior durability and ease of application. By using only pure roofing grade asphalt without any fillers, Firestone MB Base Sheet offers greater flexibility and better workability than typical base sheets which contain large amounts of mineral fillers. By using an extra heavy fiberglass mat, Firestone MB Base Sheet provides twice the breaking strength (44 lbf/in.) as compared to typical ASTM D-4601, Type I base sheets (22 lbf/in.).

Firestone MB Base Sheet may be attached to an acceptable roofing substrate with either Firestone Insulation Plates and Fasteners with a minimum 25# mopping of Type III or Type IV Asphalt. Firestone MB Base Sheet may be used as a base ply under either torch-applied APP or mop-applied SBS modified bitumen membranes, offering the following superior performance features:

- **SUPERIOR STRENGTH:** Minimum 44 lbf/in. breaking strength. Meets or exceeds ASTM D-4601, Type II.
- **EASY LAY-OUT:** 100% pure asphalt saturation provides greater flexibility and smoother roll-out.

PRODUCT TECHNICAL SPECIFICATIONS:

- Breaking Strength:** Minimum 44 lbf/in. when tested in either machine or cross direction.
- Pliability:** No failure when tested over a 1/2" radius per ASTM D-146.
- Filler Content:** No fillers used in asphalt saturant.
- Water Vapor Permeance:** Maximum 15 @ 73°F.
- Glass Mat:** Minimum 1.7 lbs./100 sq. ft. prior to saturation.
- Code Compliances:** Underwriters Laboratories classified G-2 base sheet.

PACKAGING AND SHIPPING SPECIFICATIONS:

- Roll Width:** 36 inches.
- Roll Length:** 108 feet.
- Roll Area:** 324 square feet (3 square coverage).
- Roll Weight:** Approximately 82 lbs. per roll.
- Rolls Per Pallet:** 16 rolls with cores in each corner.
- Pallet Packaging:** Stretch wrapped on 37" x 37" 4-way pallets.
- Rolls Per Truckload:** 560 rolls (35 pallets).

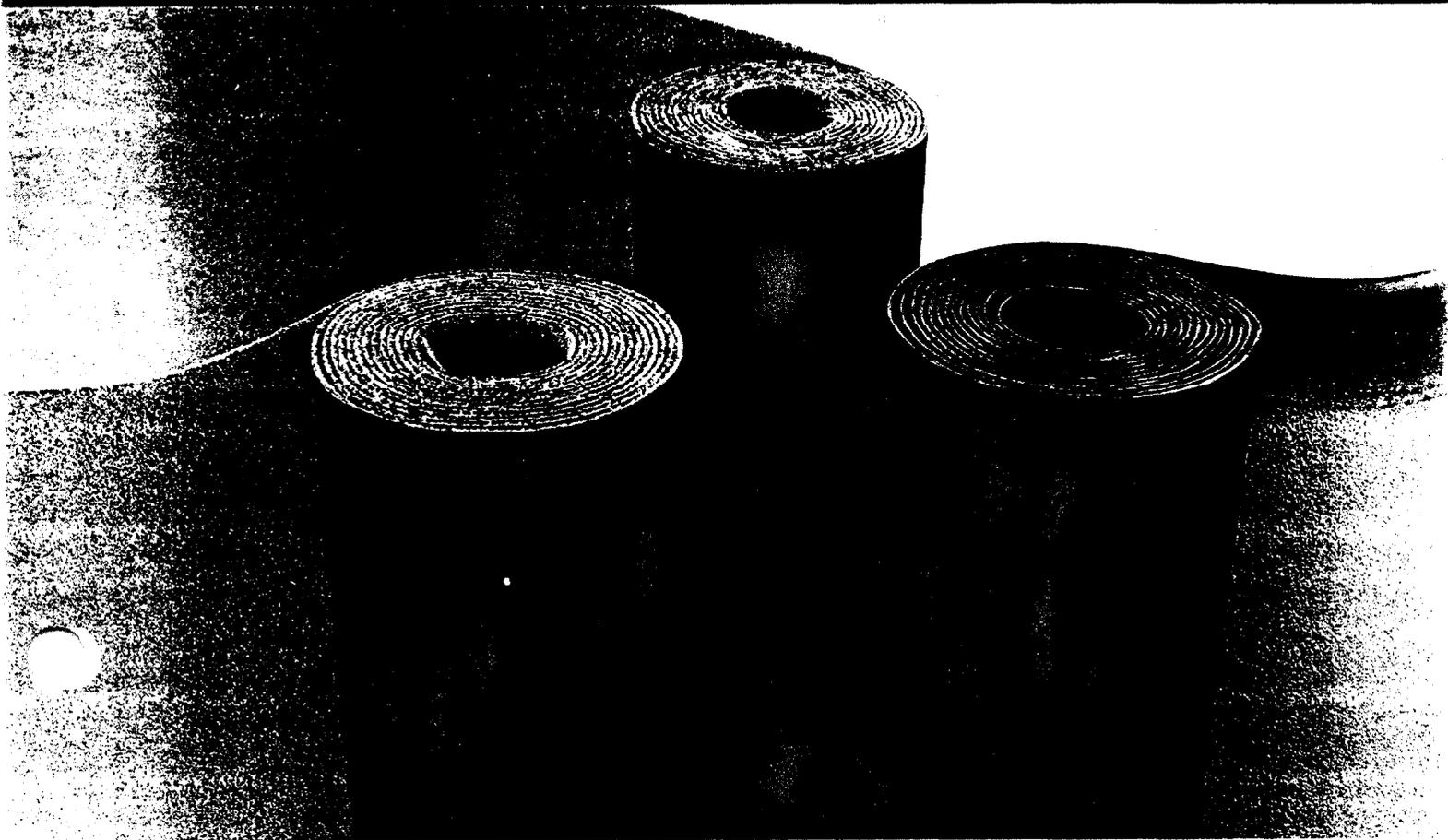
Firestone
BUILDING PRODUCTS
NOBODY COVERS YOU BETTER.®

525 Congressional Boulevard • Carmel, IN 46032-5607
1-800-428-4442 1-317-575-7000 Fax: 1-317-575-7100

FIRESTONE

SBS

GRANULE SURFACED MODIFIED BITUMEN



Firestone SBS Modified Bitumen membrane is a roofing system that's ideal for applications in all climates.

Modified with Styrene-Butadiene-Styrene rubber and reinforced with a 170 gm/m² polyester fabric, Firestone SBS is a mop down product with a granular surface that performs equally well in the Northern United States and Canada as well as the south.

- Firestone SBS is an asphalt modified with rubber polymers, providing improved elongation.

- The roof of choice in Canada, Northern Europe and in most severe climates, SBS offers proven performance in colder regions.

- Installed using conventional built up roofing equipment and techniques, it's today's high tech version of a built up roof.

- Manufactured under ideal conditions in computer-controlled, state of the art plants, resulting in the most consistent quality.

- The factory applied granule surfacing looks great, offers ultra-violet protection and saves labor costs.

Firestone
BUILDING PRODUCTS

NOBODY COVERS YOU BETTER.™

525 Congressional Boulevard

Carmel, IN 46032-5607

800-428-4442 317-575-7000



GRANULE SURFACED MODIFIED BITUMEN

Firestone SBS Physical Properties.

Property	Test* Method	Minimum** Performance
Thickness	N.A.	150 mils +/- 10%
Breaking Strength	ASTM-D-412	600 p.s.i.
Ultimate Elongation	ASTM-D-412	80%
Water Resistance	ASTM-D-618, D-570	<1.0 gram water absorption <1% dimensional change
Low Temperature Flexibility	CGSB 37-GP-56M	-22°F
Water Vapor Transmission	ASTM-E-93	<1.0 gram/m2 at 24 hours
Dynamic Impact	CGSB 37-GP-56M	Pass
Static Puncturing	CGSB 37-GP-56M	Pass
Lap Joint Strength	CGSB 37-GP-56M	Pass
Accelerated Weathering	ASTM G-23, D-2565	Pass

* Proposed CGSB 37-GP-56M
** As manufactured

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 525 Congressional Boulevard
 Carmel, IN 46032-5607
 800-428-4442 317-575-7000

 **MEMBRANE FOR ROOFING SYSTEMS** R-9516
 CLASSIFIED BY
 UNDERWRITERS LABORATORIES INC.
 AS TO AN EXTERNAL FIRE EXPOSURE ONLY
 61P2

ASPHALT FOR

BUILT-UP ROOFING.

07500/TRU
BuyLine 7221

OWENS
CORNING Trumbull



Consistent High Quality Asphalt

You Can Depend On.

Components Of High Performance Roofing.

Reputation For Quality.

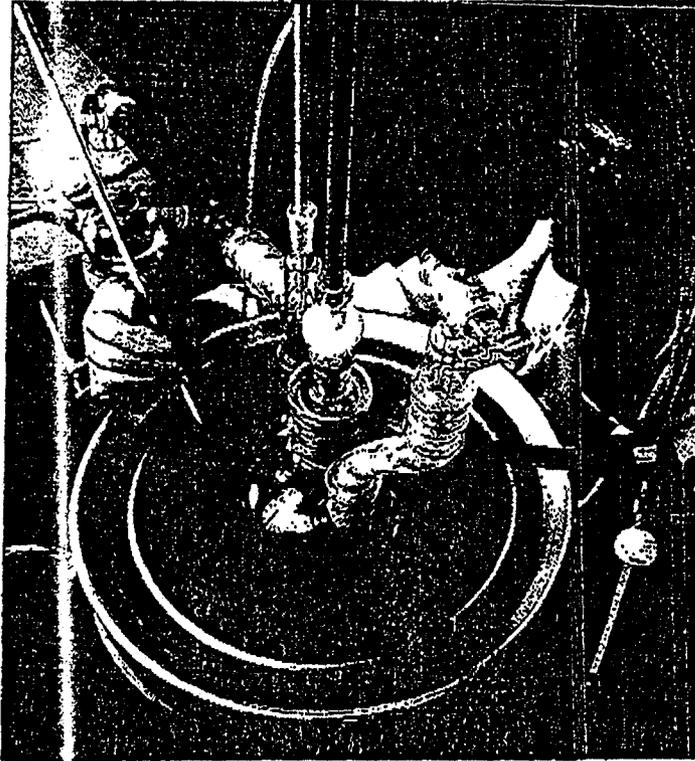
In 1927, Owens-Corning's Trumbull Division was founded on a single portable rig. Today, we are the largest manufacturer of industrial asphalt in the nation, producing thousands of tons of asphalt marketed around the world. Trumbull Division's growth and stability is the result of an unyielding commitment to producing quality, effective roofing systems that last.

Proximity To Customers.

A strategic network of 17 production plants ensures timely, cost efficient distribution of Trumbull products coast-to-coast. And each plant maintains its own storage facilities with access to terminals so our customers can fill tank trucks in our yards.

Assured Availability.

Unlike many asphalt refiners which depend upon a single source of supply, Trumbull Division has established a network of domestic and international suppliers. This eliminates dependency on a single source and allows us to negotiate competitively.



Laboratory Proven.

To help assure consistent quality, every Trumbull plant tests incoming raw materials and outgoing finished products at an on-site laboratory. Samples are then retested at our Summit, Illinois technical laboratory, one of a select group of labs in the nation to be certified by the American Association of State Highway Testing Officials in association with the National Bureau of Standards.

A Commitment To Advanced Technology.

Pioneering research and development has made Trumbull Division the unchallenged leader in the industrial asphalt industry. This position is secured through our stringent quality control and process improvements which translate into superior products and service for our customers.

Pioneering R & D has made

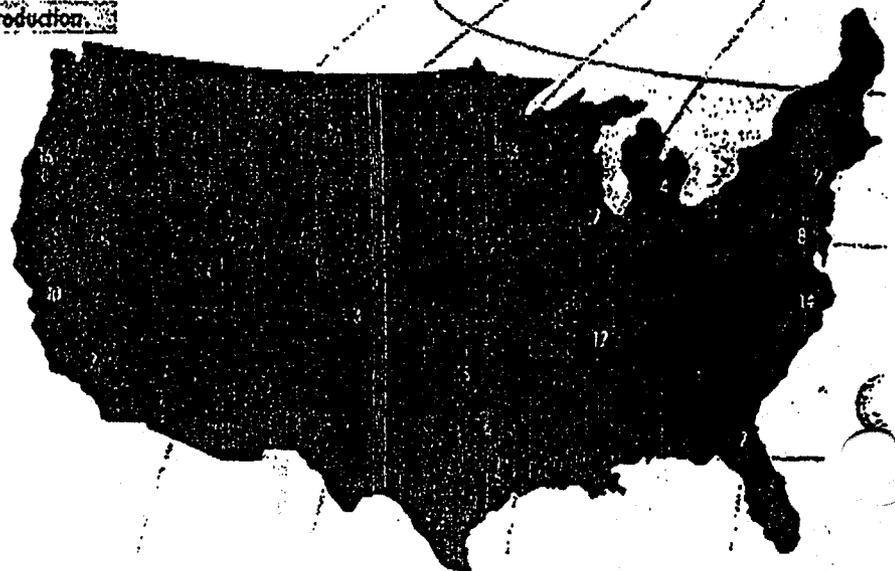
Owens-Corning's Trumbull

Division the unchallenged

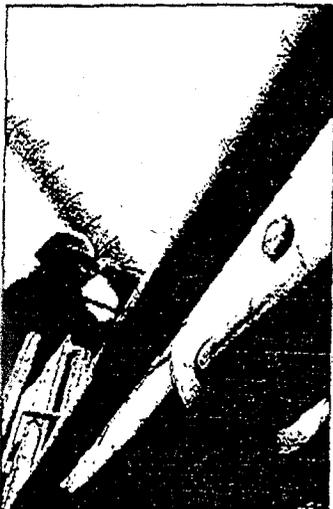
leader in asphalt production.

Plant Locations.

1. Atlanta, Georgia
2. Compton, California
3. Denver, Colorado
4. Detroit, Michigan
5. Houston, Texas
6. Irving, Texas
7. Jacksonville, Florida
8. Jersey, New Jersey
9. Kearny, New Jersey
10. Martinez, California
11. Medina, Ohio
12. Memphis, Tennessee
13. Minneapolis, Minnesota
14. Monticello, North Carolina
15. Oklahoma City, Oklahoma
16. Portland, Oregon
17. Summit, Illinois



Standard Trumbull Asphalt Specification.



Trumbull Division has grown
from a single rig in 1921
to the largest manufacturer of
asphalt materials in the nation.

Specification.

Built-Up Roofing Asphalt as manufactured by Trumbull Division will be used. All Built-Up Roofing Asphalt as supplied by Trumbull Division will have the following information printed on the carton or bill of lading for bulk asphalt:

1. ASTM type asphalt
2. Manufacturing plant
3. Manufactured date
4. Flash point
5. EVT @ 125 cps & 75 cps

This material will comply with ASTM D312-6 specification for Built-Up Roofing Asphalt.

1. Physical Properties.

Flash point of the asphalt will be 525°F or greater, well above the ASTM minimum of 475°F.

2. Application.

Applying asphalt at the Equiviscous Temperature plus or minus 25°F will yield the best viscosity at point of application to ensure proper adhesion, water proofing and application rate. Application conditions on the roof deck will vary with ambient temperature and wind conditions. In cold conditions, (either ambient temperature or wind chill factor), the temperature at point of application should be near the high end of the EVT range. In warm conditions, (either ambient temperature or high sun load), the

temperature at point of application should be near the low end of the EVT range.

3. Heating Instructions.

- A. Do not heat the asphalt closer than 25°F of the material's flash point, as noted on the cartons or bill of lading (for bulk asphalt).
- B. To minimize "fall back," keep liquid asphalt at the lowest possible temperature and for the shortest period of time prior to application. Guidelines on this are:
 1. Maximum heating temperature 500°F.
 2. Never maintain material above 475°F for 4 hours or more.
 3. Prolonged storage temperature should not exceed 325°F.

4. Storage Precautions.

The Trumbull container is meant to be a form only, it is not intended for unprotected long-term storage.

To assure asphalt usability and a reasonable storage time, these precautions must be followed:

- A. Protect all asphalt containers (fiber cartons and steel drums) from rain, snow and prolonged exposure to direct sunlight.

- B. Provide sufficient ventilation to avoid excessive heat build-up in closed storage areas.
- C. All asphalt containers must be stored upright and out of water. Any asphalt containers that tip over will flow. This is true of Type IV as well as dead level. The hotter the weather, the quicker the asphalt will flow.
- D. Do not stack fiber cartoned asphalt. Asphalt steel drums may be double stacked if pellets are used to separate the stacks.

5. General.

Trumbull Division does not specifically recommend the type of asphalt to be used on any particular roof. The selection of the type of asphalt must be made by the specifier based on many variables including, but not limited to, roof pitch, type of construction, local roofing practices and weather conditions.



OWENS-CORNING
WORLD HEADQUARTERS
FIBERGLAS TOWER
TOLEDO, OHIO 43659

1-800-323-8301

Description.

Trumbull's standard built-up roofing asphalt comes in four types:

Type I — DEAD LEVEL

Type II — FLAT

Type III — STEEP

Type IV — SPECIAL STEEP

Product is available in either cartons or bulk. All four types meet their specific requirements for ASTM D312. **PermaMap**[®] modified asphalt, our highest performing asphalt, is available in packaged form throughout the country and is available in bulk form at selective manufacturing facilities.

Consistent Quality.

Trumbull Division's advanced processing methods meet ASTM and roofing manufacturer's specifications relative to all feedstock types despite potential fluctuations in type or grade of raw materials.

Features.

EVT shown on each carton and bill of lading for bulk shipments.

Consistent, high flash material.

All products meet ASTM D312.

Printed cartons.

17 Plants.

Testing in each plant and at Summit, Illinois laboratory.



Trumbull Division's asphalt

serve as both a waterproof-

ing medium and adhesive in

built-up roofing systems.

Benefit:

Assures proper adhesion, waterproofing and application rate.

Proper temperature range needed to apply product safely at the EVT; flash point typically 75°F to 100°F higher than the 475°F minimum.

Each shipment meets or exceeds the physical requirements of the specified roofing grade asphalt.

Clearly identifies manufacturer, type, flash point, EVT, production location and production date.

Convenient, accessible availability from coast-to-coast.

All Trumbull Division's products are assured to meet ASTM requirements.

Extending Our Commitment.

Product Data.

Uses: Trumbull's Built-Up Roofing Asphalt is the waterproofing medium used with organic and glass felts in a conventional built-up roof. As an interply mopping, it also acts as an adhesive to hold the plies together. It is also used as an adhesive to secure the roof insulation to the deck.

Owens-Corning's commitment to quality roofing systems extends beyond our Trumbull Division. It includes our **Fiberglas**[®] Roof Insulation and BUR felts for use in conjunction with our asphalt.

It includes our **Certified Roofing Contractors (CRC)** — a force of specially trained installers. Each roof they install is inspected by an independent auditor to assure they meet the most exacting industry standards.

And it includes the strongest warranty program in the industry.

Physical Requirements — ASTM D312 - 89.

	Type I		Type II		Type III		Type IV		Test Method
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Softening Point (°F)	135	151	153	176	185	205	210	225	ASTM
Flash Point (°F)	475	-	475	-	475	-	475	-	ASTM D92
Penetration, Units:									
@ 32°F	3	-	6	-	6	-	6	-	ASTM D5
@ 77°F	18	60	18	40	15	35	12	25	
@ 115°F	90	180	-	100	-	90	-	75	
Ductility @ 77°F, cm	100	-	3.0	-	2.5	-	1.5	-	ASTM D113
Solubility in Trichloroethylene%	99	-	99	-	99	-	99	-	ASTM D2042

Asphalts shall be homogeneous and free of water and shall conform to these physical properties.

Typical Physical Characteristics For Owens-Corning's Trumbull Asphalt.

	Type I	Type II	Type III	Type IV	PermaMap [®]
Softening Point (°F)	140-145	165-175	195-205	210-225	215-235
Flash Point (°F)	525-600	525-600	525-600	525-600	525-600
Penetration, Units:					
@ 32°F	6-12	6-12	6-10	6-10	7-12
@ 77°F	20-35	18-30	16-24	13-22	18-30
Ductility @ 77°F, cm	13	4.5	3.25	2.5	7.0
Solubility in Trichloroethylene %	99.8	99.8	99.8	99.8	97.5
Application Temperature For Hand Mopping					
EVT @ 125 CPS = 25°F	350	375	410	440	375
For Machine Spreader					
EVT @ 75 CPS = 25°F	370	395	430	460	395

*Note: EVT is Equiviscous Temperature, the temperature at which the liquidity of the asphalt gives the contractor the best opportunity of achieving interply moppings in the 25 pound per square range. This viscosity and consequently, the temperature is different for hand mopping versus machine application.

PAC-CLAD

Availability

Technical Data

Color Consistency: Will not change color more than (5) NBS Units per ASTM D 2905-78.

Cement or Mortar: Will not adhere or mar the finish.

Hardness: F Minimum-National Coil Coaters Association Technical Bulletin No. 11-12.

Adhesion: Cross Hatch 1/6" (no removal)—National Coil Coaters Association Technical Bulletin No. 11-5.

Formability: Can be formed without film fracture using normal metal shop practices to a 1 to 2-T bend radius (depending on base metal and gauge) with no cracking or finish removal per ASTM D 1737-62 (1973).

Reverse Impact: No removal when taped. National Coil Coaters Association Technical Bulletin No. 11-6 impact force 70 in/lbs.

Humidity: Accelerated Tests: 2,000 hours at 100% relative humidity value acceptable per ASTM D 714-56 (1974) and ASTM D 2247-68 (1973).

Life Expectancy: 20 years plus. Architectural Tests. Weatherometer Method 6152 after 5,000 hours exposure value, acceptable per FED TEST METHOD 141.

Installation

PAC-CLAD can be cut, formed, nailed, screwed, or riveted using hand or power tools. Fabricate and install in accordance with drawings and normal sheet metal practices using hand or power tools. Keep cutting edges sharp, clean, and properly aligned. Exercise care during fabrication and installation to avoid damage.

Maintenance

Maintenance is not required. This finish is a member of the Teflon® family, and is self-cleaning. If cleaning is desired, it can be washed with a mild soap and water followed by a clean-water rinse.

PAC-CLAD Steel Aluminum

	24 ga.	.032	.040	.050	.063	.080
DARK BRONZE	●	●	●	●	●	●
MANSARD BROWN	●	●	●	●		
SIERRA TAN	●					
MATTE BLACK	●	●	●	●	●	●
SANDSTONE	●	●	●	●		
COLONIAL RED	●					
BURGUNDY	●					
MEDIUM BRONZE	●	●	●	●	●	
MILITARY BLUE	●					
SLATE GRAY	●	●				
TERRA COTTA	●					
MIDNIGHT BRONZE			●			
MUSKET GRAY	●					
INTERSTATE BLUE	●					
FOREST GREEN	●	●				
ARCADIA GREEN	●	●				
TEAL	●					
STONE WHITE	●	●	●	●	●	
CARDINAL RED	●					

PAC-CLAD Metallic Colors

ZINC	●
SILVER	●
COPPER PENNY	●
AGED COPPER	●

PAC-CLAD METALLIC Kynar 500® finishes are available from stock at a moderate extra cost. PAC-CLAD Copper Penny is a NON WEATHERING finish.

● Denotes available from stock.

Samples

These color reproductions are as accurate as modern printing technology will permit. Material samples are available on request, at no charge. CALL TOLL FREE —800/323-1960 nationwide.

Textures

PAC-CLAD is available with a smooth texture or a standard E-5 stucco embossed pattern, available at extra cost.

Kynar 500® is a registered trademark of the Pennwalt Corporation.



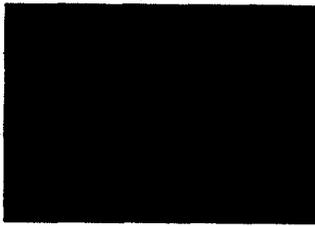
Headquarters
955 Estes Avenue
Elk Grove Village, IL 60007
Outside Illinois: 800-323-1960
In Illinois: 708-228-7150
FAX: 800-722-7150

9060 Junction Drive
Annapolis Junction
Maryland 20701
800-344-1400
FAX: 301-953-7627

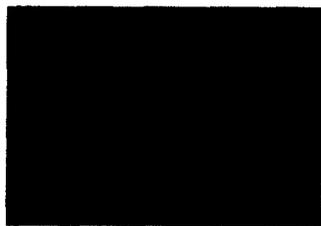
4295 Hays Drive
Tyler, TX 76703
800-441-8661
FAX: 903-581-8592

PAC-CLAD®

**Kynar 500® pre-finished galvanized steel and aluminum
for roofing, curtainwall and storefront applications**



DARK BRONZE*



MANSARD BROWN

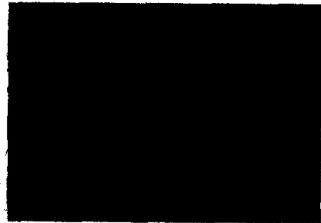


SIERRA TAN

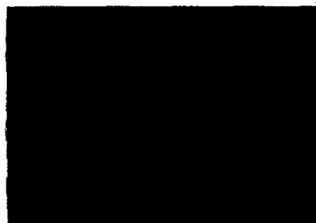


MATTE BLACK*

SANDSTONE



COLONIAL RED



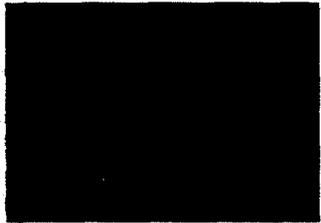
BURGUNDY



MEDIUM BRONZE



MILITARY BLUE



SLATE GRAY



TERRA COTTA



MIDNIGHT BRONZE



MUSKET GRAY



INTERSTATE BLUE



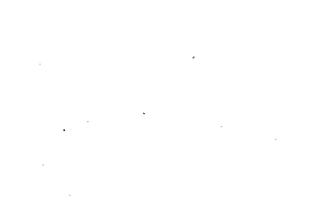
FOREST GREEN



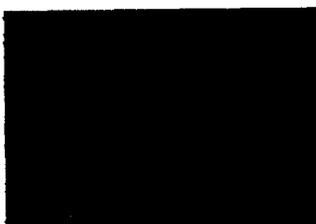
ARCADIA GREEN



TEAL



STONE WHITE



CARDINAL RED

*Chips represent colors on 24 Ga. galvanized steel only. Consult actual samples for these colors on aluminum sheet.

PAC-CLAD® Metallic Kynar 500® Colors



ZINC



SILVER



COPPER PENNY



AGED COPPER

PAC-CLAD METALLIC Kynar 500® finishes are available from stock at a moderate extra cost. PAC-CLAD Copper Penny is a NON-WEATHERING finish.

See availability chart on reverse side.

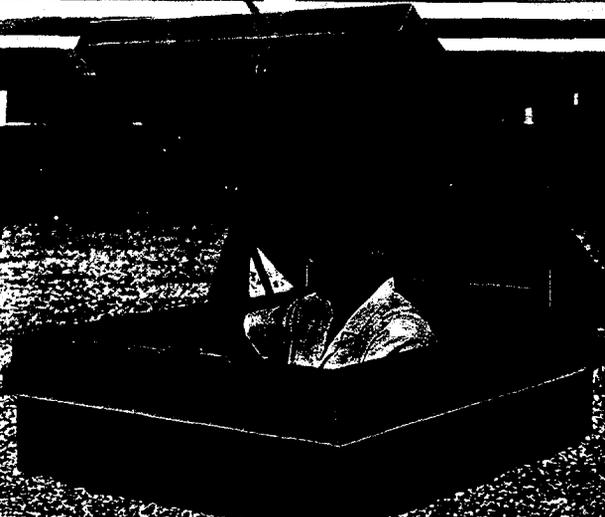
Roof Scuttles



Advantages and Features

To make getting to and from the roof easier and more convenient there is a full range of Bilco roof scuttles. All afford the safety and ease of operation which have firmly established them as the finest products of their type. They are ruggedly built to withstand rough usage and to support a live load of 40 pounds per square foot. The cover is of box-type design, pivoted on heavy pintle hinges and all hardware is zinc plated and chromate sealed.

Installation of a Bilco scuttle is simply a matter of placing the unit over the roof opening and securing it to the roof deck through the holes provided in the base flange. Roofing felts are inserted under the integral capflashing. The capflashing, full welded corner joints, and thermoplastic rubber gasket, are features that assure weathertightness. Insulation in the cover is 1" glass fiber protected by a metal liner and 1" rigid fiberboard is provided on the exterior of the curb.



One Hand Operation:
Unique Type S Bilco Design gives the ladder user the security of one hand on the ladder and effortless control of the cover to its closed and latched position.



Type "S"

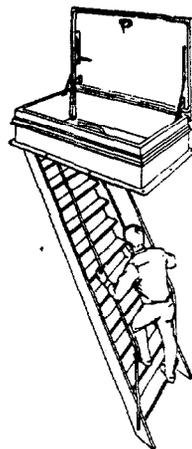


Shown with
Bilco LadderUP
Safety Post

For Ladder Access
Size 2'6" x 3'0"



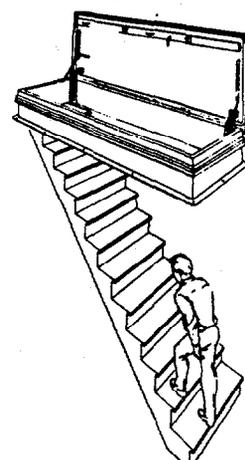
Type "NB"



For Ship Stair
Size 2'6" x 4'6"



Type "L"



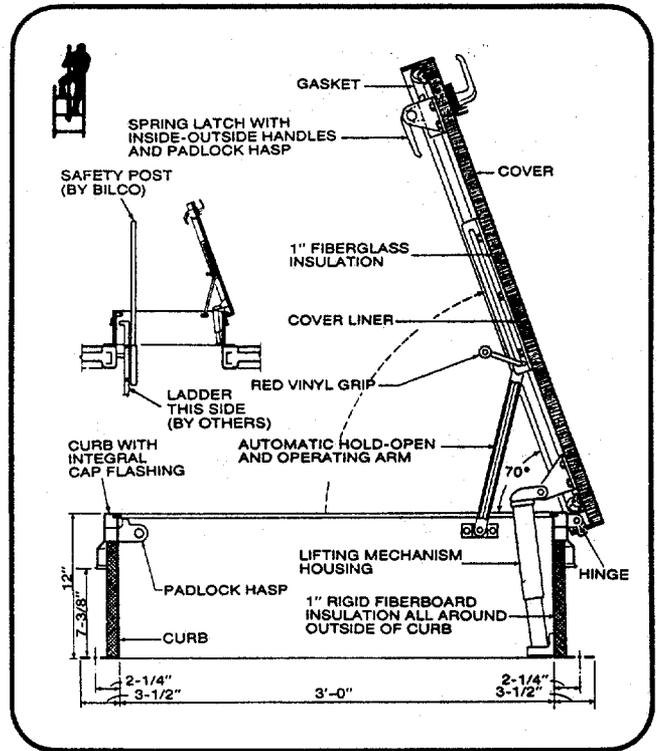
For Service Stair
Size 2'6" x 8'0"



Roof Scuttles



"S"
For Ladder Access
Size 2'6" x 3'0"



STANDARD SIZES AND WEIGHTS

(See following page for specifications)

METALS	Gauge of Metal		TYPE S		TYPE GS		TYPE NB		TYPE L	
	Cover & Curb	Cover Liner	Type No.	Wt. Lbs.	Type No.	Wt. Lbs.	Type No.	Wt. Lbs.	Type No.	Wt. Lbs.
Galv. (paint bond) (Red Oxide Primer)	14 Ga.	22Ga.	S-20	170			NB-20	245	L-20	408
Aluminum, (Mill Finish)	11 Ga.	18 Ga.	S-50	100	GS-50	152	NB-50	140	L-50	225
Copper, (Copper Lacquer Finish)	48 oz.	16 oz.	S-70	187						

APPENDIX Z
AUTODIALER

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SENSAPHONE® EXPRESS II

.....

USER'S MANUAL

version 0.30 ds

.....

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CHAPTER 1: INTRODUCTION

Welcome to the Sensaphone Express II by Phonetics, Inc. Express II is a powerful environmental and process monitoring system. It handles your current monitoring, alarm and control needs, and is able to grow when your application grows.

Express II comes standard with 8 universal inputs and one relay output. Input capacity is expandable up to 40 channels. Output capacity may be expanded up to 16 channels.

Express II can call up to 48 Phone Contacts, using pulse or Touch-Tone dialing. Dialing Schedules and Phone Contact List features enable you to create a priority dialing list depending on which input is in alarm, the time of day, and day of week. Call progress detection ensures that no time is wasted on busy or no answers during the dialout sequence.

PROGRAMMING EXPRESS II

Express II's unique programming style allows you to quickly and easily access all programmable parameters. The parameters are organized into 10 categories. From there, programming is completely voice guided in a menu-style format. You simply enter the category number for the parameters you want to program and enter values as prompted. All programming can be accomplished using the local keypad, or remotely using a Touch-Tone™ phone.

If there are any questions that arise during installation or operation, please contact:

Phonetics, Inc.
901 Tryens Road
Aston, PA 19014
Phone: (610) 558-2700
FAX: (610) 558-0222

ABOUT THIS MANUAL

This manual is comprised of the instructions and commands necessary to install and program Express II. In addition, summary and application chapters are included to help you speed programming and to understand Express II's features.

NOTES

CHAPTER 2: INSTALLATION

This chapter provides information to install the Sensaphone Express II. Please read the entire chapter before starting.

Within the packaging will be a Warranty Registration card. Please take the time to fill this out and mail. The Limited 1 Year Warranty is explained in the back of this manual.

CAUTION: Express II is a sensitive electronic device. Personnel and work area should be grounded before handling this device. Do not install Express II near strong electrostatic, electromagnetic, magnetic or radioactive fields.

OPERATING ENVIRONMENT

Express II should be mounted and operated in a safe environment. The temperature range the Express II can operate in is 32°F to 120°F (-18°C to 55°C). If Express II needs to operate below freezing, a strip heater should be added.

MOUNTING Express II

When you receive Express II, carefully remove it from the box. On the top and bottom of the enclosure are mounting holes to attach the unit to the wall. Mount Express II in an upright position on a wall so that you can easily gain access to the front panel. There must be a power outlet nearby. The dimensions of the enclosure are: total width = 12.40", total depth = 7.94", total length = 15.96". Decide where you will be mounting Express II and drill holes according to Figure 1 below:

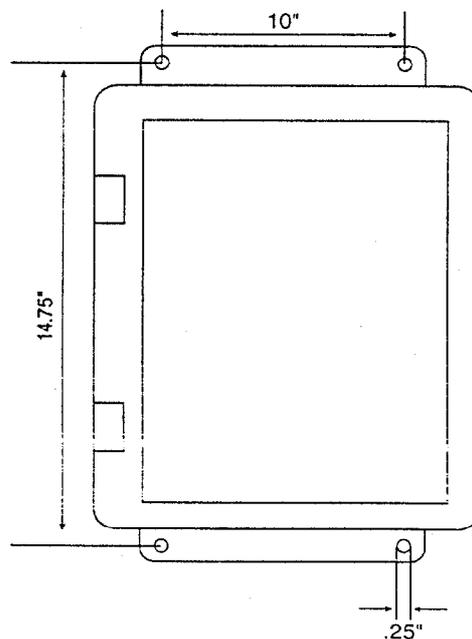


Figure 1: Mounting dimensions

STRAIN RELIEF

Strain relief clamps are provided on the Express II enclosure to prevent wiring from being pulled from the circuit board or damaged when passing through the enclosure. To use the strain relief, thread wires through the clamp and the clear rubber bushing. Position the bushing in the clamp and tighten the screws on either side so that the wiring does not move. See Figure 2 below:

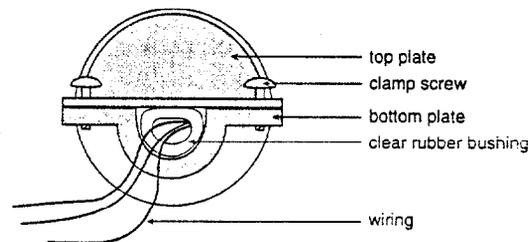


Figure 2: Strain relief clamp

POWERING UP

Express II is provided with a 12V AC power transformer. This should be plugged into a 117V AC outlet, $\pm 20\%$, 60HZ.

The transformer is prewired to the terminals labelled AC.

GROUNDING AND POWER SURGE PROTECTION

Express II should be earth grounded by connecting a true earth ground to the terminal labelled EG. This is not essential for Express II to operate, but it is necessary to prevent possible damage by a lightning strike.

The Sensaphone® Express II can be damaged by power surges and lightning through the telephone line and the power supply. Although Express II has built-in surge protection, we strongly recommend that additional protection be obtained for the unit and for any electronic equipment that is attached to your power supply and telephone lines. Power surge protection is especially important if you live in a lightning-prone area. Surge protection is available through Phonetics. Call for details.

BACKUP BATTERY

Express II has a 12V 3AH sealed lead-acid rechargeable battery. This will provide approximately 6-8 hours backup time. The battery comes pre-wired with the red wire attached to the BAT IN(+) terminal and the black wire attached to the BAT IN(-) terminal.

The battery is recharging whenever the power switch is turned on and the unit is plugged in.

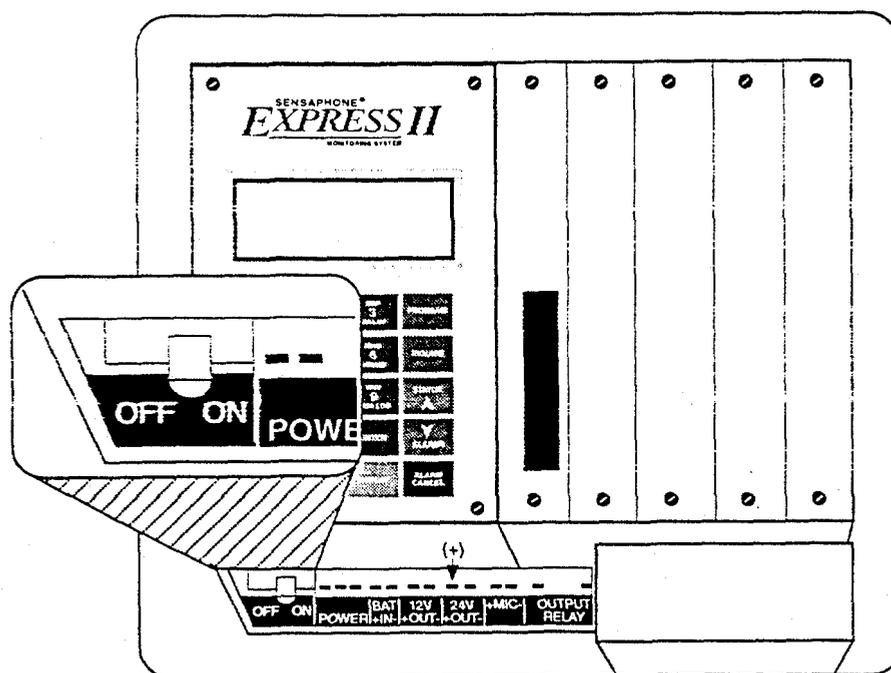
NOTE: Have battery serviced by qualified service personnel only.

Also included is a 3V lithium battery for memory storage to retain user-recorded messages and programming. The lifetime of the lithium battery is 2 years of use.

TURNING Express II ON

Now that Express II has power, the ON-OFF switch may be turned on.

When the unit is turned off, it is disabled, but your voice messages and programming are retained by the 3V lithium battery. When in the off position, the 3V lithium battery is in use, but the 12V battery is not



On/Off Switch Location

PHONE LINE INSTALLATION

Connect Express II to a standard 2-wire phone line. Express II dials using pulse or tone, with loop start only. Express II will operate with all standard telephone systems that accept pulse or tone dialing and will recognize ringer frequencies from 16 to 60 Hz.

NOTE:

Certain private telephone systems and public switching equipment may not accept Express II dialing or may generate an unacceptable ring signal. In those cases, a dedicated line may be required for Express II. Consult the supplier of your telephone system if you encounter problems.



NOTICE

The Canadian Department of Communications label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective operational and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

CAUTION: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

The Load Number (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device to prevent overloading. The termination on a loop may consist of any combination of devices subject only to the requirement that the total of the Load Numbers of all the devices does not exceed 100. For the Sensaphone Express II the Load Number is 8.



NOTES

CHAPTER 3: INPUTS

Express II comes standard with 8 universal inputs. The input capacity may be expanded in sets of 8 inputs. There are 5 sets for a total of 40 universal input channels that are possible. The inputs, both included and expanded, may be configured to accept the following type sensors:

- Normally closed dry contact (digital)
- Normally open dry contact (digital)
- Pulse count
- 4-20 mA (analog)
- 0-5 Volts (analog)
- Temperature
 - 2.8K F thermistor (analog)
 - 2.8K C thermistor (analog)
 - 10K F thermistor (analog)
 - 10K C thermistor (analog)
- Time accumulator

The standard 8 input terminal block is located to the right of the built-in keypad in the first card slot. Above the terminal block are a row of 8 LED's that indicate the status of the inputs to on-site personnel.

HOW THE INPUTS WORK

Express II reads the value of each input by measuring the voltage across the input and the common terminals. When the shunts are positioned for a specific type of sensor, Express II uses a different circuit to measure the appropriate reading for that sensor.

Dry Contact - These types of sensors can be either Normally Open or Normally closed. If a normally open sensor becomes closed, a contact occurs. This causes an alarm. Conversely, if a normally closed sensor becomes open, the contact disappears, and this condition causes an alarm. Typical dry contact sensors include magnetic reed switches and water detection sensors.

Pulse Count - This configuration will allow the input channel to count pulses. A typical sensor is a flow meter that uses a turbine to measure flow by accumulating pulses. Max pulse rate is 1Hz.

4-20 mA - This configuration connects the input signal to a 237 Ohm load resistor. This allows Express II to measure the current at the input. Any powered or unpowered sensor that puts out 4-20mA can be wired. Any input range can be specified by the user. Typical sensors include pressure gauges, analog flow meters, and temperature gauges. Input resolution is 12 bits.

0-5 Volts - This configuration connects the input signal directly to Express II's analog to digital converter for measuring the output of 0 to 5V transducers. Any sensor that puts out 0-5V can be wired. Any input range can be specified by the user. Typical sensors include pressure gauges, voltage meters, and flow meters. Express II can read the voltage between 0 Volts and 5 Volts in

increments of .00122 Volts. Input resolution is 12 bits.

Thermistor - Two kinds of thermistors may be used with Express II: a 2.8K thermistor or a 10K thermistor. The range for an input measuring temperature for 2.8k is +200 °F to -85 °F and for 10k is +300 °F to -80 °F. This configuration type connects the input signal to a 5V reference through a 6.34K pull-up resistor.

Time accumulator - This mode will accumulate the total amount of time that the input sensor is in the closed position. This would be useful to maintain total run time for a device.

LEDs

Each input has a corresponding LED that indicates input status. The LEDs are located above the terminal block. When an LED is green, that indicates that the input is OK and no alarms exist. When an LED is blinking green, alarm recognition time is in effect on the corresponding input. When an LED is blinking red, that indicates that an unacknowledged alarm exists on the corresponding input. When an LED is steady red, it indicates that an alarm has been acknowledged but still exists on the corresponding input. If the input is disabled, the LED goes off for that input.

CONFIGURING THE INPUTS

Each of the inputs must be configured so that Express II will know what type of signal it must read. To configure the inputs, you must position the shunts that are located on the input card directly above the input terminal block. The inputs may be configured in one of three ways:

1. 4-20mA
2. Thermistor, digital, or pulse
3. 0-5V

To configure the input as 4-20mA, place the shunt to enclose the two bottom pins (B position).

To configure the input as thermistor, digital, or pulse, place the shunt to enclose the two top pins (A position).

To configure the input as 0-5V, remove the shunt.

WIRING THE INPUTS

To use a dry contact or temperature sensor on an input, wire one lead to the numbered screw of input terminal and the other lead to the corresponding common screw. See Figure 4:

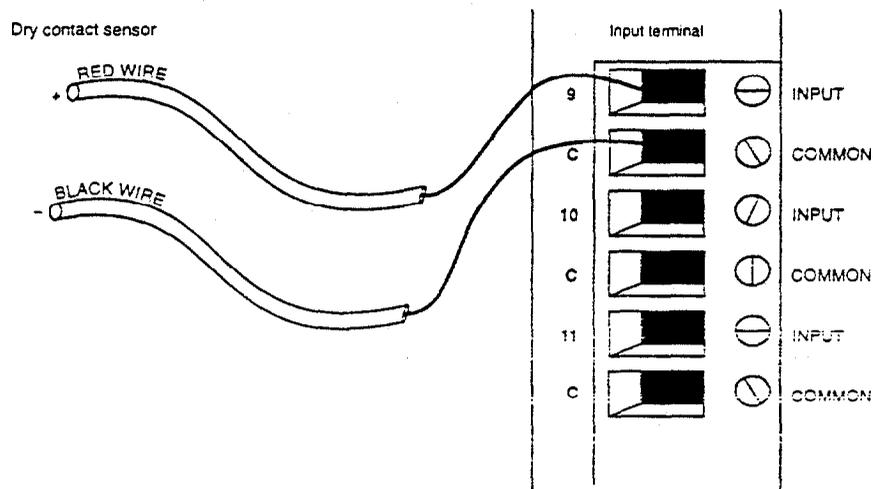


Figure 4: Dry contact sensor

To use a 4-20mA sensor on an input, you must supply power to it. You may power a 4-20mA sensor using the Express II internal power supply, or you may wire the sensor to an external power supply.

NOTE: The number of internally powered sensors will affect battery backup time during a power failure. To use the internal power supply, wire the positive lead from the sensor to the unit 24V power supply. Wire the negative lead to a numbered input terminal screw. See Figure 5.

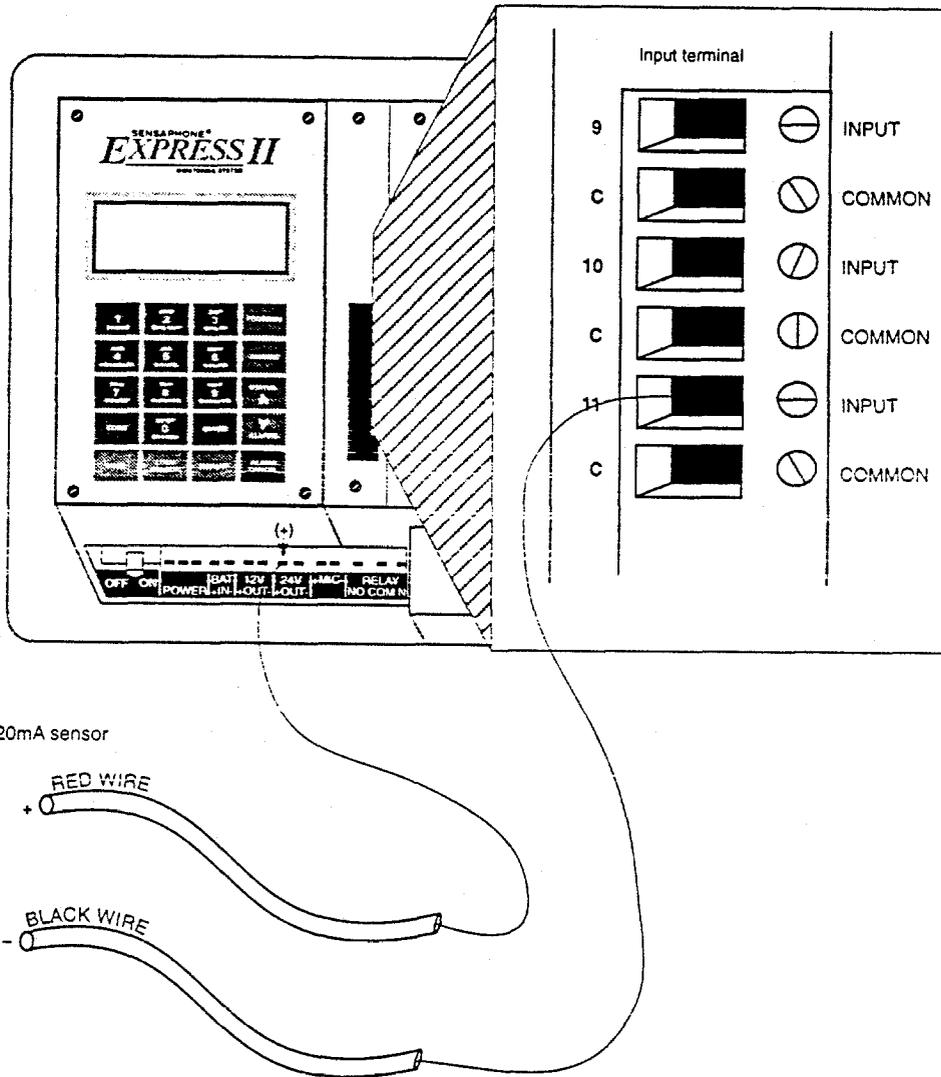


Figure 5: 4-20mA transducer using internal power supply

To use an external power supply, wire the positive lead from the sensor to the positive terminal on the external power source. Wire the negative lead from the sensor to a numbered input screw on Express II. Next, connect the power supply to Express II by wiring the negative terminal on the power supply to a common screw on Express. See Figure 6.

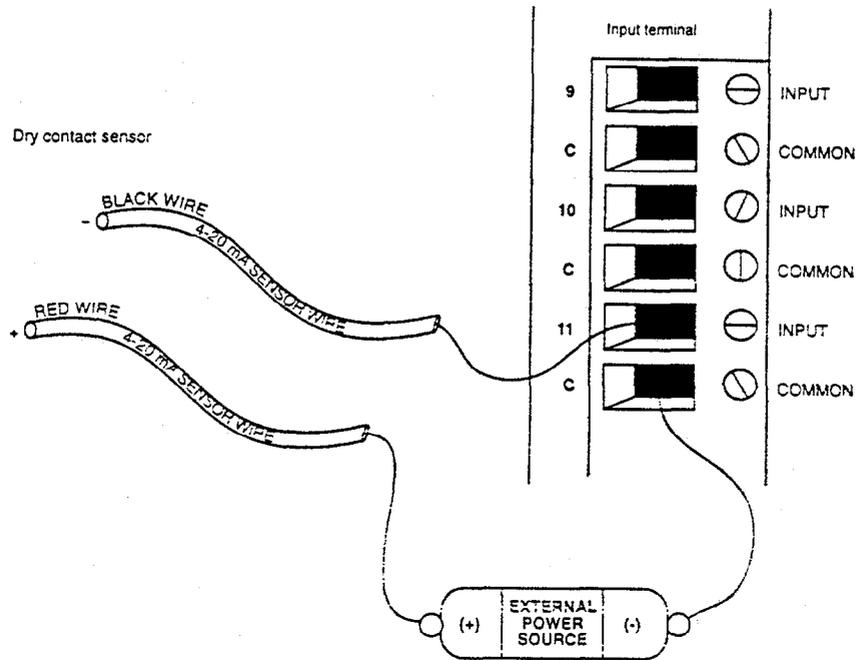


Figure 6: 4-20mA sensor using external power source

To use a 0-5V sensor with Express II, wire the sensor signal lead to a numbered terminal screw on the unit. Then, wire the sensor common to the corresponding common screw on Express II. See Figure 7.

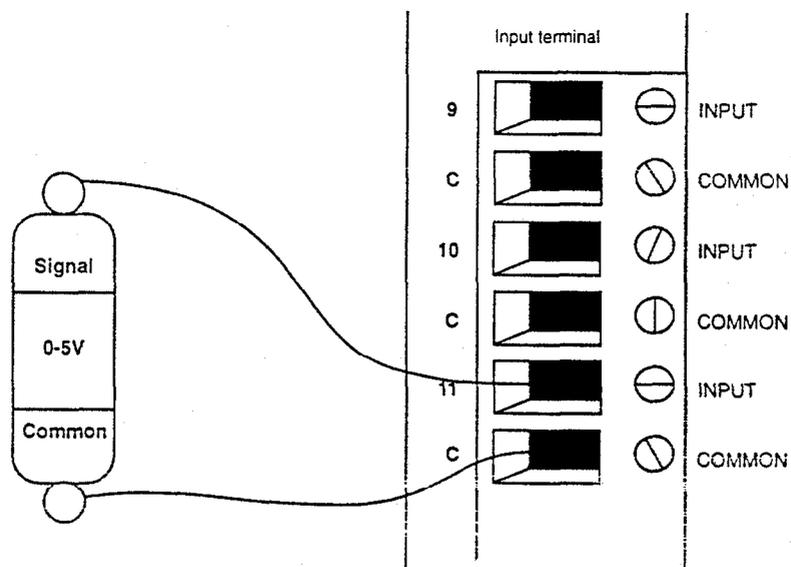


Figure 7: 0-5V sensor

NOTE: All wiring should comply with section 17 of the UL requirements.

INSTALLING INPUT EXPANSION CARDS

To install an input expansion card:

1. Turn the unit off. Damage may occur to the motherboard or to the input card if installed while power is still on.
2. Remove the screws and blank plate of the first available slot from left to right. See Figure 9 below. **NOTE:** Always install cards side by side—do not skip a slot.

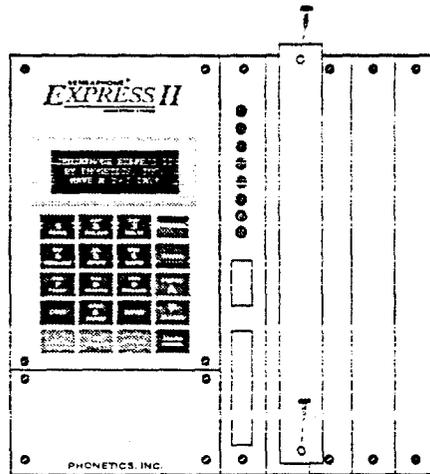


Figure 9: Remove blank plate

3. Hold the card with the LED's at the top, and line up the DIN connector plug on the card with the DIN connector socket on the motherboard. See Figure 10.

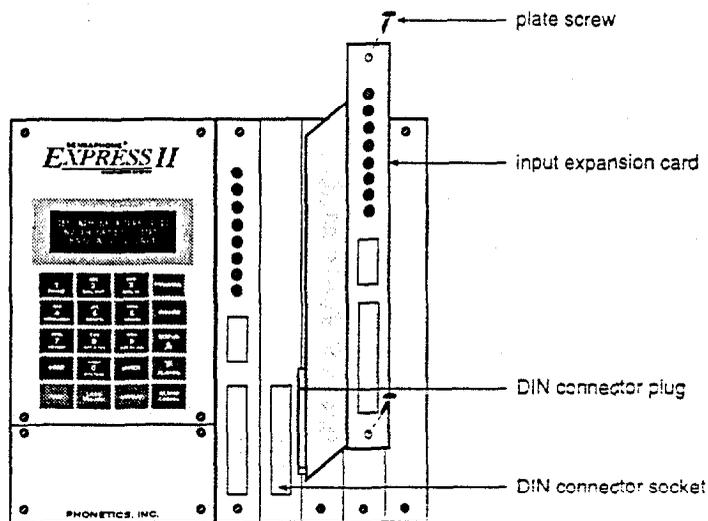


Figure 10: Line up and insert card

4. Insert the DIN connector plug into the DIN connector socket and press down slightly to connect.
5. Replace the screws.
6. Turn the unit on.
7. Configure and wire the inputs as described in this chapter.

NOTE: When installing a combination of input and output cards, always install the input cards grouped together in the left slots and the output cards to the right of them. If you install an input expansion card after an output card has been installed, you must disconnect the output card, install the input card in its place, and reinstall the output card to the right of it.

INPUT SPECIFICATIONS

Voltage Range:	0 to +5 VDC
Input Resolution:	12 Bit or 0.00122V
A/D Converter Typical Total Unadjusted Error	± 1 LSB
Accuracy (Temperature)	$\pm 1^\circ\text{F}$ typical using 2.8K temperature sensor
Accuracy (4-20mA)	$\pm 1.25\%$
Min/Max Input Voltage	-0.5VDC to +5.5VDC
Max Pulse Frequency	1.0Hz
Noise Filtering	2300Hz low pass filter -20db/Decade



2.8K THERMISTOR LOOK-UP TABLE

DEGREES (Celsius)	DEGREES (Fahrenheit)	RESISTANCE (Ohms)
-50	-58	188.83K
-40	-40	94.47K
-30	-22	49.64K
-20	-4	27.21K
-10	14	15.51K
0	32	9.15K
5	41	7.11K
10	50	5.57K
15	59	4.40K
20	68	3.50K
25	77	2.80K
30	86	2.26K
35	95	1.83K
40	104	1.49K
45	113	1.22K
50	122	1.01K
55	131	0.84K
60	140	0.70K
65	149	0.58K
70	158	0.49K

10K THERMISTOR LOOK-UP TABLE

DEGREES (Celsius)	DEGREES (Fahrenheit)	RESISTANCE (Ohms)
-37	-35	203.60K
-35	-30	173.60K
-32	-25	148.30K
-29	-20	127.10K
-26	-15	109.20K
-23	-10	94.07K
-21	-5	81.23K
-18	0	70.32K
-15	5	61.02K
-12	10	53.07K
-9	15	46.27K
-6	20	40.42K
-4	25	35.39K
-1	30	31.06K
2	35	27.31K
4	40	24.06K
7	45	21.24K
10	50	18.79K
13	55	16.65K
16	60	14.78K
18	65	13.15K
21	70	11.72K
24	75	10.46K
27	80	9.35K
30	85	8.38K
32	90	7.52K
35	95	6.75K
38	100	6.08K
41	105	5.48K
44	110	4.95K
47	115	4.47K
49	120	4.05K
52	125	3.67K
55	130	3.33K
58	135	3.01K
60	140	2.76K
63	145	2.52K
66	150	2.30K
69	155	2.10K
71	160	1.92K
74	165	1.76K
77	170	1.61K
80	175	1.48K
83	180	1.36K
86	185	1.25K
88	190	1.16K
91	195	1.07K
94	200	0.98K
97	205	0.91K

NOTES



CHAPTER 4: OUTPUTS

Express II comes standard with one on-board relay output. The output capability may be expanded up to 16 relay outputs.

HOW THE OUTPUTS WORK

Relay outputs are used to switch equipment on or off. They may be programmed to control in two ways: Manual and Auto.

Manual - When configured as manual, the output may be turned on or off by the user. This may be accomplished using the local keypad or via Touch-Tone™ phone.

Auto - Output zero is the only output with the "Auto" option available. When this option is programmed, output zero will activate when any alarm exists and will deactivate when the alarm is acknowledged.

WIRING THE OUTPUTS

The standard on-board relay output, output #0, is located on the orange terminal strip and to the far right of the ON/OFF switch, see page 5. It is labeled "Output Relay." It is a single-pole, single-throw, latching relay.

NOTE: All wiring should comply with section 17 of the UL requirements.

STRAIN RELIEF

Strain relief clamps are provided on the Express II enclosure to prevent wiring from being pulled from the circuit board or damaged when passing through the enclosure. To use the strain relief, thread wires through the clamp and the clear rubber bushing. Position the bushing in the clamp and tighten the screws on either side so that the wiring does not move. See Figure 11 below:

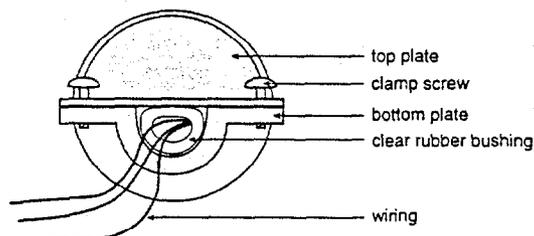


Figure 11: Strain relief clamp

.....

INSTALLING OUTPUT EXPANSION CARDS

To install an output expansion card:

1. Turn the unit off. Damage may occur to the motherboard or to the output card if installed while power is still on.
2. Remove the screws and blank plate of the first available slot from left to right.

NOTE: Always install cards side by side — do not skip a slot.

3. Hold the card with the LED's at the top with the DIN connector plug on the card lined up with the DIN connector socket on the motherboard.
4. Insert the DIN connector plug into the DIN connector socket and press down slightly to connect.
5. Turn the unit on.

Wire the outputs as described in this chapter. See Chapter 5 for programming information.

NOTE: When installing a combination of input and output cards, always install the input cards grouped together in the left slots and the output cards to the right of them. If you install an input expansion card after an output card has been installed, you must disconnect the output card, install the input card in its place, and reinstall the output card to the right of it.

RELAY OUTPUT SPECIFICATIONS

TYPE:	Latching, SPST
Related Load:	2A at 250VAC 2A at 30VDC
Carry Current:	2A
Maximum Operating Voltage:	250VAC 125VDC
Maximum Operating Current:	2A (AC/DC)
Maximum Switching Capacity:	500VA, 60W

CHAPTER 5: PROGRAMMING

Express II features a unique voice-guided, menu-based programming method. Programmable parameters are organized into ten categories, with main menus encompassing several levels of sub-menus. The ten primary categories (designated on Express II's keypad, see fig. 5-1a) are:

- 1 • PHONE - phone contacts information
- 2 • DIAL OUT - outgoing communications
- 3 • DIAL IN - incoming (call-in) communications
- 4 • MESSAGES - alarm, output and ID message recording
- 5 • INPUTS - input configuration
- 6 • SOUND - sound monitoring and listen in
- 7 • POWER - power failure and battery low monitoring
- 8 • OUTPUTS - output control setup
- 9 • DATA LOG - input log and activity log setup
- 0 • SYSTEM - other system parameters

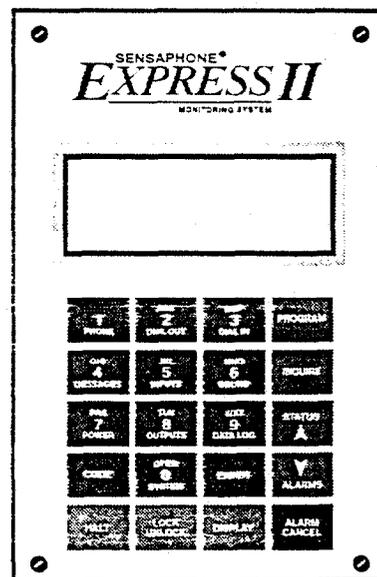


Figure 5-1a: Express II
Local Display and Keypad

Programming "How To": Moving Through the Menus

All programming actions begin by pressing the PROGRAM key, followed by one of the primary category keys (listed above).

These two key presses lead directly to Express II's voice guided instructions, accompanied by text selections shown in the local display. From this point, menu selections can be made by pressing the number keys, followed by the ENTER key. Press "0" (zero) to exit a numbered-list menu.

The CODE key allows you to navigate between menus during programming. To repeat a menu while programming, press the CODE key once. To return to a previous menu, press the CODE twice. *To return to the main menu at any time, press CODE until the main menu is reached.*

You may also make your programming selections using the local display. Each option conveyed through an audible voice message will also be listed as text on the local display. If you press the arrow keys on the keypad, an arrow will appear next to a selection (if it is not already present, as in some selection listings). This arrow can be repositioned next to any of the options by pressing the down arrow on the ALARMS key. To move back up the list, press the up arrow on the STATUS key. When the arrow appears next to your selection, press the ENTER key.

In the demonstrations that follow, each illustrated sequence shows how options are selected from a list, while moving through Express II's multilevel menu system.

Programming the PHONE Parameters

The PHONE parameters allow you to program when, how and to which location Express II will dial out during an alarm. Express II is capable of dialing out to 48 different locations, in the event of an alarm.

Phone parameters are divided into three, separately-programmed categories— Calling Schedule, Phone Contacts, and Communications Type.

- **Calling Schedule** – the day and time settings during which specified groups of Phone Contacts will be called, in the event of an alarm.
- **Phone Contacts** – the telephone numbers to which Express II will dial out, in the event of an alarm. Up to 48 telephone numbers can be used, and may include Special Dialing codes.

Calling Schedule

Calling Schedule allows you to assign Phone Contacts to specific calling groups to accommodate shift work schedules. Time is measured using the “24 hour” format. There are 3 calling schedules from which to choose. The default is “All,” indicating that no grouping of Phone Contacts is in effect and that dial-out will occur around the clock, at all times.

Calling schedule 1 - All

This schedule programs Express II to call all the Phone Contacts that are programmed regardless of the time of day, or day of week. This is the default setting. Phone Contacts from 1-48 are called regardless of time, day or day of week

Calling schedule 2 - Days and Nights

This schedule allows Express II to create two groups for dialing out: a daytime set of Phone Contacts (Monday to Friday), and a nighttime/weekend set of Phone Contacts (Friday night to Monday morning).

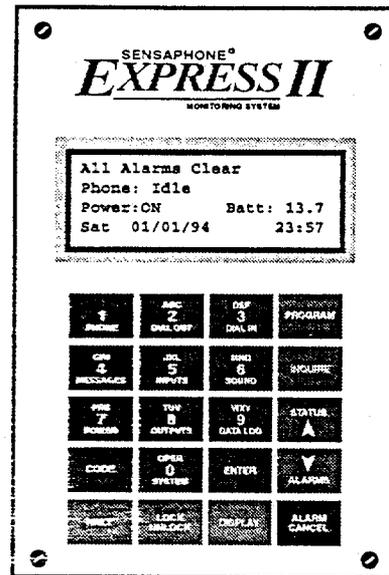


Figure 5-1: Express II Local Display and Keypad

PHONE PARAMETERS

Calling Schedule:

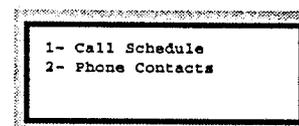
- 1) Press PROGRAM



- 2) Press PHONE.



- 3) A new list appears in the local display.



Press 1 for Call Schedule.



- Phone Contacts from 1-24 are called during the day (Monday to Friday).
- Phone Contacts from 25-48 are called during the night and weekend.

Calling schedule 3 - Day, Night, Wknds

This schedule allows you to program Express II to call a set of Phone Contacts during the day (Monday to Friday), a set of Phone Contacts during the night (Monday to Thursday), and a set of Phone Contacts for the weekend (Friday night through Monday morning).

- Phone Contacts from 1-16 are called during the day (Monday to Friday).
- Phone Contacts from 17-32 are called during the night (Monday to Thursday).
- Phone Contacts from 33-48 are called during the weekend (Friday night to Monday morning).

Day and night starting times are separately programmed to control how Express II differentiates day and night periods.

Programming Day and Night Starting Times

If option 2 (Days and Nights), or 3 (Day, Night and Wknds) was selected, then you will be prompted to set the starting times for day hours/minutes and night hours/minutes. After you have separated your Phone Contacts into groups, setting the day and night starting times allows you to define when one shift ends and another begins. This way, dial-out can occur in any 24 hour period, to report an alarm around the clock.

It is important to note that time is programmed using the "24 hour" format: A day hour set to "5" is equal to 5:00 am. A night hour set to "17" is equal to 5:00 pm. The default setting is 7 hours, 0 minutes for day hours, and 19 hours, 0 minutes for night hours.

24-Hour Time: PM Conversion

1:00 pm equal to 13 hours	7:00 pm equal to 19 hours
2:00 pm equal to 14 hours	8:00 pm equal to 20 hours
3:00 pm equal to 15 hours	9:00 pm equal to 21 hours
4:00 pm equal to 16 hours	10:00 pm equal to 22 hours
5:00 pm equal to 17 hours	11:00 pm equal to 23 hours
6:00 pm equal to 18 hours	

- 4) A new list appears in the local display. Select one option:

```

1- All
2- Days and Nights
3- Day, Night, Wknds
  
```

Press 1 if selecting All.



Press 2 if selecting Days and Nights.



Press 3 if selecting Day, Night, Wknds.



- 5) If option 2 or 3 is selected, current starting times, first for day, and then for night, will be displayed, along with the option to reset these times. *To keep current settings, just press the ENTER key.*

To change settings, use the number keys on the keypad and press ENTER. When Express II says, "Enter day hours," enter the hour (0 to 23); then press ENTER. The new hour will appear in the local display.

```

Current: 7
Enter day hours:
  
```

When Express II says, "Enter day minutes," enter the minutes (0 to 59); then press ENTER.

```

Current: 0
Enter day minutes:
  
```

Phone Contacts

Express II can store up to 48 telephone numbers, with up to 40 digits permitted for each. These numbers will be dialed in the event of an alarm. Special dialing codes that use a pause, pound, asterisk or other code may be incorporated into the telephone number as required, to access various phone and beeper systems. (Refer to this chapter, Special Dialing section.)

Communications Type

Express II is capable of dialing out over standard telephone lines in either Voice or Beeper mode. When dialing out in Voice mode, Express II will recite the prerecorded alarm message when its outgoing call is answered. When dialing out in beeper mode, no message will be recited. The default setting is Voice.

- 6) Next, current starting times for night hours and night minutes are displayed, along with the option to reset these times. **To keep current settings, press the ENTER key.**

To change settings, use the number keys on the keypad and press ENTER. When Express II says, "Enter night hours," enter the hour (0 to 23); then press ENTER. (Remember..."19" is the same as 7:00 pm, using a 24-hour system.)

Current:	19
Enter night hours:	

When Express II says, "Enter night minutes," enter the new time; then press ENTER.

Current:	0
Enter night minutes:	

Phone Contacts:

After the Call Schedule has been set, the local display returns to the previous menu.

1- Call Schedule
2- Phone Contacts

- 1) Press 2 for Phone Contacts.



Special Dialing

Special dialing consists of dialing codes that are commonly used when accessing a beeper or pager system, or in order to reach a dial tone for connection to an outside line. To incorporate a Special Dialing code, press the CODE key, followed by the number key shown below. Insert the code or combinations of codes where required in the telephone number.

Code 1

Generates a two second pause.

Code 2

Waits for a dial tone before proceeding.

Code 4

Forces the Express II to wait until the telephone is answered.

Code 5

Sends two digits to appear on the display of a beeper or pager, indicating which input is in alarm. (In the case of multiple alarms, only the first alarm is displayed.)

Code 6

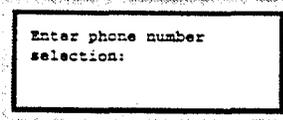
Sends the pound (#), as required in some dialing sequences.

Code 7

Sends the asterisk (*), as required in some dialing sequences.

Note: (Code 3 is not available.)

- 2) Allocate a number to each contact, assigning them a position in the calling schedule. Assign phone contact a position number (1-48). Enter the number corresponding to that position using the number keys. Then press the ENTER key.

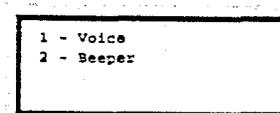


Enter phone number
selection:

"phone number selection" refers to the contact's position number.

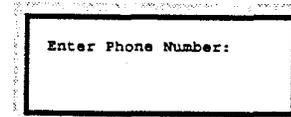
(Keep in mind the Calling Schedule currently in place, since this determines when a Phone Contact is able to dial out.)

- 3) When the Phone Contact has been assigned a number value, two choices appear in the local display. Using the number keys, select the appropriate option.



1 - Voice
2 - Beeper

- 4) Now that Voice or Beeper mode has been established, the local display prompts you to enter the complete dial-out telephone number. Up to 40 digits are possible, including 1 and the area code, or any Special Dialing codes that are required to reach the target telephone or beeper system.



Enter Phone Number:

When the complete dial-out telephone number is entered, press the ENTER key.

The local display returns to the previous menu. Repeat steps shown above to program additional Phone Contacts.

To return to the main menu, press CODE twice.

DIAL OUT

The following parameters control how Express II communicates when it dials out for an alarm.

Dialing method - This parameter determines whether Express II will dial out using tone or pulse dialing. The programming choices for this parameter are automatic, pulse, or tone.

Automatic instructs Express II to determine whether to dial out in tone or pulse automatically. **NOTE:** You must have a dedicated phone line for Express II to use the Automatic method. If you have Express II installed on an office system that requires dialing an access number to reach an outside line, you **MUST** program this parameter as Tone or Pulse. The default is AUTOMATIC. 1 = Pulse; 2 = Tone; 3 = Automatic.

Retries on busy - This determines how many times Express II will hang up and retry calling a phone number when it detects a busy signal. This parameter may be programmed from 0-15. The default is 0.

Message repeats - When Express II dials out and the call has been answered, this parameter determines how many times the unit will recite the recorded alarm message per call. This parameter may be programmed from 0 to 10 repetitions. The default is 3.

Maximum number of calls - This parameter determines the maximum number of calls Express II will make if the unit does not receive acknowledgment. The maximum calls may be programmed from 0 to 65,535. The default is 100. If the Express II has only one phone number programmed to dial out for a particular alarm, it will limit the maximum calls to 15 regardless of the Maximum number of calls programmed.

Call delay time - This parameter is the length of time that Express II will wait after an alarm is recognized before it starts the dial out sequence. (Note: This is not the same as input recognition time.) The call delay time only dictates the delay before the first call. To set the delay time between calls, see Intercall Delay Time. This parameter may be programmed from 0 to 12 hours. The default for the call delay time is 30 seconds.

Intercall delay time - If an alarm call has not been acknowledged, the intercall delay time is the length of time between each phone call that Express II will wait

DIAL OUT PARAMETERS

Dialing Method:

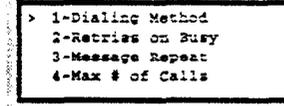
- 1) Press PROGRAM.



- 2) Press DIAL-OUT.



DIAL-OUT menu will then appear on local display.



- 3) Press 1 for Dialing Method.



Press 1 for Pulse.

Press 2 for Tone.

Press 3 for Automatic.

Retries on Busy:

Return to Dial-Out menu.

- 1) Press 2 for RETRIES ON BUSY.



- 2) Press the amount of retries desired using the number keys. Press ENTER.



Message Repeats:

Return to Dial-Out menu.

- 1) Press 3 for MESSAGE REPEATS.

before dialing the next phone number. This parameter may be programmed from 0 to 12 hours. The default is 30 seconds.

- 2) Then, enter number of times the message will repeat itself for each call during an alarm.

Maximum Number of Calls:

Return to Dial-Out menu.

- 1) Press 4 for MAXIMUM # OF CALLS.
- 2) Enter the total number of outgoing calls allotted for an alarm.(prior to acknowledgement)

Call Delay Time:

Return to Dial-Out menu.

- 1) Press 5 for CALL DELAY TIME.
- 2) Enter Hours.
- 3) Enter Minutes.
- 4) Enter Seconds.

Intercall Delay Time:

Return to Dial-Out menu.

- 1) Press 6 for INTERCALL DELAY TIME.
- 2) Enter Hours.
- 3) Enter Minutes.
- 4) Enter Seconds.

DIAL IN

The following parameters determine how Express II will communicate when the unit is called.

RINGS UNTIL ANSWER - This parameter determines the number of rings that must occur before Express II will answer. This value can be from 1 to 15. The default is 1 ring.

TELEPHONE ANSWERING DEVICE compatibility (TAD) - Express II can be used on the same telephone line that also has a telephone answering device, such as an answering machine, modem or FAX. The TAD feature is especially useful because it integrates the operation of the Express II with your telephone answering device in a way that retains the full flexibility of each system. This allows you to have on-demand telephone access to the Express II, for obtaining a Status Report, or for issuing call-in commands, while your telephone answering device is set to receive outside calls. Programming for use with a telephone answering device (TAD) is always used in conjunction with RINGS UNTIL ANSWER, detailed on this page.

NOTE: The TAD feature only applies to answering devices connected to the same telephone line as the Express II.

USING TAD:

By enabling this feature, you will be able to bypass the answering device and access Express II for a status report or programming. If there are no other devices hooked up to the phone line, this feature should be disabled. The default is disabled.

- 1) Make sure the TAD feature is enabled. The default setting is disabled, so you must enable it initially.
- 2) Determine the number of rings your telephone answering device uses to answer the telephone. Most answering devices require 4 rings; others are selectable.
- 3) Program the Express II RINGS UNTIL ANSWER to a greater number than that of the number of rings set on your answering device.

Example:

Telephone answering device: rings = 4.

Express II: RINGS UNTIL ANSWER = 6.

Using the procedure just outlined, all incoming calls will be answered by the telephone answering device, allowing it to

DIAL IN PARAMETERS

Rings Until Answer:

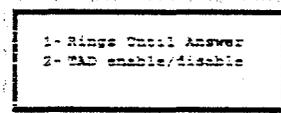
- 1) Press Program.



- 2) Press DIAL IN.



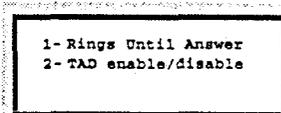
DIAL IN menu will appear on local display.



- 3) Press 1 for RINGS UNTIL ANSWER.
- 4) Enter the number of rings desired before EXPRESS II answers. (1-15)
Read section on TAD, pg. 26 - 27, before programming RINGS UNTIL ANSWER.

TAD:

Return to DIAL IN menu.



- 1) Press 2 for TAD.
- 2) Press 1 to enable.
Press 2 to disable.

operate normally.

Explanation: The pattern of one ring, followed by a second call (within 30 seconds), signals the Express II to answer your incoming call, excluding the telephone answering device.

NOTE: If the Express II unit shares the same telephone line with a telephone answering device, and during certain time periods, frequent, incoming calls are expected on that line, then you may want to temporarily disable the TAD feature. If you leave the TAD enabled, it will not adversely affect normal operation, but if two outside telephone calls are received within the same 30 second time window, the Express II unit will interpret this pattern as a signal to answer the telephone. If this occurs, press ALARM/CANCEL key on the unit to hang up.

MESSAGES

Message length - This parameter determines how many seconds long each message can be. A message can be 5, 7, or 11 seconds long. (Note: The shorter the message length, the better the quality of the recording. We recommend that you program this parameter to 5 seconds for optimum clarity.) This parameter determines the length for all messages. The default is 5 seconds.

NOTE: Do not change the message length parameter after you have recorded voice messages. If you do so, you will automatically erase all programmed voice messages and reset them to the default.

Voice messages - Express II allows you to program your own voice for the ID (identification) and dial out alarm messages. This means that when Express II calls you during an alarm, you will receive your personalized voice message to indicate exactly what alarm condition exists. Depending on what the input is monitoring, you may program a warning message, or provide vital monitoring data. Recording your own messages provides a valuable, expeditious communication link between Express II and service personnel.

NOTE: Output messages can only be recorded when an output card has been purchased for use with Express II.

MESSAGE PARAMETERS

Messages:

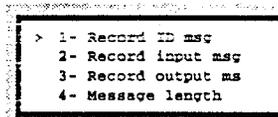
- 1) Press Program.



- 2) Press Messages.



Messages menu will then appear on local display.



- 4) Press 1 to record ID message.
Speak message after beep.
- 5) Press 2 to record input messages.
Enter the input number to which the message corresponds.
Speak message after beep.
- 6) Press 3 to record output message.
Enter the output number to which the message corresponds.
Speak message after beep.
- 7) Press 4 for message length.
Enter 5, 7, or 11.(the default is 5)
Messages can be cut short by pressing Enter during recording.

INPUTS

Express II comes standard with 8 universal inputs. The input capacity may be expanded up to a total of 40 universal channels. The following parameters determine how each input functions. The parameters apply to both the standard and expanded inputs.

Enable/Disable Inputs - This function allows you to enable or disable an alarm on an input to cause a dial out. An enabled input will respond to an alarm and allow dial out. A disabled input will not initiate a dial out if an alarm occurs. The default setting for all inputs is enabled.

Input Type - Express II's inputs are universal inputs. This means that they may be configured to accept the following type sensors:

- 1 = Normally closed dry contact (digital)
- 2 = Normally open dry contact (digital)
- 3 = Pulse count
- 4 = 4-20 mA (analog)
- 5 = 0-5 Volts (analog)
- 6 = Temperature:
 - 1) 2.8K F thermistor (analog)
 - 2) 2.8K C thermistor (analog)
 - 3) 10K F thermistor (analog)
 - 4) 10K C thermistor (analog)

7 = Time accumulator

The default input type is 2 (normally open dry contact)

High and Low Limits - Express II allows you to program high and low limits for inputs defined as an analog input type or pulse count. Inputs defined as normally open or normally closed cannot be programmed to have high or low limits. During voice prompted programming, high and low limits will only be prompted when the input is defined as an analog type or pulse count. The limits are -9999 to +9999. Express II defaults to these limits.

Input Recognition Time- The input recognition time is the length of time an input must have an alarm continuously before Express II will recognize the condition. If an alarm is tripped and then clears within the recognition time, it is not recognized as a valid alarm. Express II will not dial out.

INPUT PARAMETERS

The first step in programming the INPUT parameters is to enter the number of the input for which you intend to program.

- 1) Press Program.



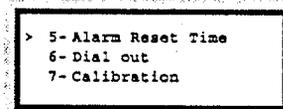
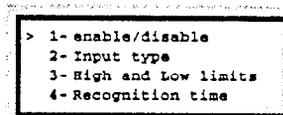
- 2) Press Input.



- 3) Press the input number(1-40).

Press Enter.

The Input menu will then appear on the local display.



Enable/Disable Inputs:

- 1) At the Input menu, select Enable/disable by pressing 1 on the keypad. Or, by pressing arrow keys until the ">" symbol, on the local display, is next to Enable/disable.
- 2) Press 1 to disable.
Press 2 to enable.

Input Type:

- 1) Press 2 at the Input menu, to select Input Type.(or on local display as described in Enable/disable inputs)

This feature is useful to prevent dial outs for momentary blips or on self-correcting equipment. Each input can be programmed with a different recognition time. You may program the recognition time from 0 seconds to 12 hours. The default is 3 seconds.

Alarm Reset Time- After an alarm is acknowledged, Express II stops the dial out sequence. However, the alarm condition will still exist until the alarm clears itself or some action occurs to clear the alarm. If the alarm is not cleared after a certain amount of time, Express II can be programmed to restart the dial out sequence. This is called the alarm reset time. This parameter may be programmed from 0 seconds to 12 hours.

Setting the alarm reset time to 0 seconds will disable it. This means that once the alarm has been acknowledged, it will not retrip an alarm regardless of how long it exists. The default for this parameter is 0 seconds.

For example, you program the alarm reset time for input 1 to 2 hours. An alarm occurs on input 1 and Express II dials out. The alarm is acknowledged but the condition still exists. Two hours later, the alarm condition still has not been cleared. Express II will restart the dial out.

Dial Out Selection- You may program Express II to dial specific phone contacts according to which input is in alarm. This is the Dial Out Selection. For example, input 6 can be programmed to initiate calling to Phone Contact 1, 3, 4, and 16. Meanwhile, an alarm on input 2 can initiate calling to Phone numbers 2 - 13. This parameter allows you to have specialized personnel being called only for specific alarms. To return to the default, all contacts, press '9' '9' and then press ENTER.

A list of Input Types will then appear on the local display.

```
> 1- Normally closed
  2- Normally open
  3- Pulse count
  4- 4-20 mA
```

```
5- 0-5 Volts
> 6- Temperature
  7- Time accumulator
```

2) Key in the appropriate Input type.

(the default is 2: normally open dry contact)

Press 1 for normally closed.

Press 2 for normally open.

Press 3 for pulse count.

Press 4 for 4-20 milliamp.

-Enter table low limit, press Enter.

-Enter table high limit, press Enter.

Press 5 for 0-5 Volts.

-Enter table low limit, press Enter.

-Enter table high limit, press Enter.

Press 6 for temperature.

-Press 1 for 2.8K °F thermistor.

-Press 2 for 2.8K °C thermistor.

-Press 3 for 10K °F thermistor.

-Press 4 for 10K °C thermistor.

Press 7 for time accumulator.

Recognition Time:

1) Return to Input menu. Press 3 for Recognition Time.

2) Enter hours.

Enter minutes.

Enter seconds.

.....

High/Low Limits:

- 1) Return to Input menu. Press 4 for High/Low Limits.
- 2) Enter low limit.
Enter high limit.

Alarm Reset Time:

- 1) Return to Input menu. Press 5 for Alarm Reset Time.
- 2) Enter hours.
Enter minutes.
Enter seconds.

Dial Out Selection:

- 1) Determine the Dial Out Selection for each input before you begin programming.
- 2) Return to Input menu. Press 6 for Dial Out Selection.
- 3) Enter list of dial out selection.
Press individual position numbers. (1-48)
Press Enter.
- 4) When all position numbers in list are entered, press Enter again.
- 5) The default is all contacts.
Press '9' '9' for the default.

NOTE:

Each input's set of parameters can be programmed independently of the other inputs. But, the input number must be entered *before* programming the parameters.

SOUND

Express II allows you to listen to sound levels through its built-in microphone when you call in for a status report. Express II also monitors the sound levels through its built-in microphone. When the current sound level suddenly exceeds the normal sound level, Express II can be programmed to dial out with a high sound alarm.

Listen-in time - The listen-in time is the amount of time you can listen to sounds at the microphone site when you call in for a status report. The programming range is from 0 to 255 seconds. The default time is 15 seconds.

Enable/disable sound monitoring - This parameter determines whether Express II will initiate the dial out sequence if it detects a high sound. If the sound is enabled, Express II will dial out. If the sound is disabled, Express II will not dial out for high sound. 1 = enabled; 0 = disabled. The default is enabled.

Sound sensitivity - This parameter allows you to change the sensitivity of the sound monitoring. This may be useful to desensitize Express II if it is installed in an area with relatively high sound level, or where loud noises occur but are not associated with an alarm. Also, this feature allows you to increase sensitivity in situations where you want to monitor lower sound levels. The sensitivity range for sound alarm monitoring is 1 to 100. A value of 1 is the most sensitive; 100 is the least sensitive. The default is 50.

Sound recognition time - The sound recognition time is the length of time that a high sound condition must exist continuously before Express II will recognize the condition. If the high sound stops before the recognition time is up, it is not recognized as a valid alarm. Express II will not dial out. This feature is useful to prevent dial outs for momentary occurrences of high sound. You may program the recognition time from 0 seconds to 1 minute. The default is 8 seconds.

Sound Alarm Reset Time - After a sound alarm is acknowledged, Express II stops the dial out sequence. However, the high sound condition will still exist until the alarm clears itself or some action occurs to clear the alarm. If the high sound is not cleared after a certain amount of time, Express II can be programmed to restart the dial out sequence. This is called the sound alarm reset time. This parameter may be programmed from 2 seconds to 12 hours.

SOUND PARAMETERS

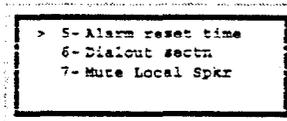
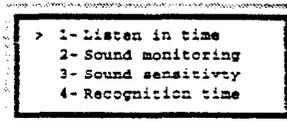
- 1) Press Program.



- 2) Press Sound.



The Sound Parameters menu will then appear on the local display.



Listen-in Time:

- 1) Press 1 for Listen-in Time.
- 2) Enter seconds.(0-255)

Sound Monitoring:

- 1) Press 2 for Sound Monitoring.
- 2) Press 1 to enable.
Press 0 to disable.

Sound Sensitivity:

- 1) Press 3 for Sound Sensitivity.
- 2) Enter value.(0-100)

Recognition Time:

- 1) Press 4 for Recognition.
- 2) Enter hours.
Enter minutes.
Enter seconds.

Alarm Reset Time:

- 1) Press 5 for Alarm Reset Time.

If the alarm reset time is programmed to 0 seconds, the feature is disabled. Express II will not restart the dial out regardless of how long the alarm exists.

Sound Dial Out Selection - You may program Express II to dial specific phone contacts if a high sound alarm occurs. This is the Sound Dial out selection. To return to the default, all contacts, press '9' '9', and then press ENTER.

Mute Local Speaker - When the Express II detects an alarm, it announces the alarm locally for the duration of the Call Delay. If the Mute Local Speaker is enabled, it is silent for that time period. The default is Disabled.

- 2) Enter hours.
Enter minutes.
Enter seconds.

Dial Out Selection:

- 1) Return to the Sound Parameters menu. Press 6 for Dial Out Selection.
- 2) Enter the position numbers, (1-48), of the phone contacts to be called in the event of a high sound level alarm.
- 3) Enter list of dial out selection.
Press individual position numbers.
(1-48)
Press Enter.
- 4) When all position numbers in list are entered, press Enter again.
- 5) The default is all contacts.
Press '9' '9' for the default.

Mute Local Speaker:

- 1) Press 7 for Mute Local Speaker at the Sound menu.
- 2) Press 1 to disable.
Press 2 to enable.

POWER

Express II monitors AC power failure and low battery condition. Power monitoring and low battery monitoring is explained below.

Power Failure

Power monitoring enable/disable - This command enables or disables the power failure detection. When enabled, Express II will monitor power and dial out if a valid failure occurs. When disabled, Express II will not dial out for a power failure. 1 = enabled, 0 = disabled. The default is enabled.

Power recognition time - The power recognition time is the length of time that a power failure must exist continuously before Express II will recognize it as an actual alarm and initiate the dial out sequence. Power recognition time may be programmed from 0 seconds to 12 hours. The default is 5 minutes.

Alarm reset time - After power failure is acknowledged, Express II stops the dial out sequence. However, the power failure condition will still exist until power is restored. If the power is not restored after a certain amount of time, Express II can be programmed to restart the dial out sequence. This is called the alarm reset time. This parameter may be programmed from 0 seconds to 12 hours.

If the alarm reset time is programmed to 0 seconds, the feature is disabled. Express II will not restart the dial out regardless of how long the alarm exists.

Dial Out Selection - You may program Express II to call a specific set of Phone Contacts for power failure only. This is called the Dial out selection. To return to the default setting, all contacts, press '9' '9', and then press ENTER.

Battery Low

Battery monitoring enable/disable - This command enables or disables the battery low detection. When enabled, Express II will monitor battery condition and dial out if it becomes low. When disabled, Express II will not dial out for a battery low condition. The default is enabled.

Alarm reset time - After battery low condition is acknowledged, Express II stops the dial out sequence. However, the low battery condition will continue to exist until it is recharged. If the battery is not recharged after a certain amount of time, Express II can be programmed to restart the dial out sequence. This is called the alarm reset time. This

POWER PARAMETERS

AC POWER

- 1) Press Program.

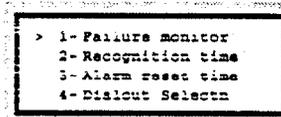


- 2) Press Power.



- 3) Power menu will appear. Press 1 for AC Power Parameters.

The AC Power menu will then be displayed.



Power monitoring:

- 1) Press 1 for Failure Monitoring at the AC Power menu.
- 2) Press 1 to disable.
Press 2 to enable.

Power Recognition Time:

- 1) Press 2 at the AC Power menu.
- 2) Enter hours.
Enter minutes.
Enter seconds.

Alarm Reset Time:

- 1) Return to the AC Power menu.
Press 3 for Alarm Reset time.
- 2) Enter hours.
Enter minutes.
Enter seconds.

Dial Out Selection:

- 1) Press 4 at the AC Power menu for Dial Out Selection.

parameter may be programmed from 0 seconds to 12 hours.

If the alarm reset time is programmed to 0 seconds, the feature is disabled. Express II will not restart the dial out regardless of how long the alarm exists.

Dial Out Selection - You may program Express II to call a specific set of Phone Contacts for battery low only. This is called the Dial out selection. To return to the default, all contacts, press '9' '9', and then press ENTER.

- 2) Enter the list of position numbers, (1-48), for those contacts to be dialed by Express II in the event of AC Power Failure. (Failure monitor must be *enabled*.)
- 3) Enter list of dial out selection.
Press individual position numbers. (1-48)
Press Enter.
- 4) When all position numbers in list are entered, press Enter again.
- 5) The default is all contacts.
Press '9' '9' for the default.

BATTERY

- 1) Return to the Power menu. Press 2 for Battery Parameters.

The Battery menu will then be displayed.

```
> 1- Battery monitor
  2- Alarm reset time
  3- Dialout selectn
```

Battery Monitoring:

- 1) Press 1 for Battery monitor at the Battery menu.
- 2) Press 1 to disable.
Press 2 to enable.

Alarm Reset Time:

- 1) Return to the Battery menu. Press 2 for Alarm Reset Time.
- 2) Enter hours.
Enter minutes.
Enter seconds.

Dial Out Selection:

- 1) Press 3 for Dial Out Selection at the Battery menu.
- 2) Enter the list of position numbers, (1-48), for the phone contacts to be

.....

dialed by Express II in the event of
Battery Failure.(Battery monitor must
be *enabled*.)

3) Enter list of dial out selection.

Press individual position numbers.
(1-48)

Press Enter.

4) When all position numbers in list are
entered, press Enter again.

5) The default is all contacts.

Press '9' '9' for the default.

OUTPUTS

Up to 16 outputs may be installed in Express II.

Manual - This type of output is turned on/off manually by the user.

Auto-any alarm - Output #0 is switched on automatically.

OUTPUT PARAMETERS

- 1) Press Program.



- 2) Press Output.



- 3) Enter output number.(0-16)

- 4) Press 1 for manual.

Press 1 for OFF.

Press 2 for ON.

- 5) Press 2 for automatic-any alarm.
Only for output # 0.

DATA LOG

Express II has two logging features, the Input Log and the Activity Log. The data log features are used with a printer hooked up to the serial port. If either data log is enabled, Express II will send information to the serial port to be printed.

Input Log - Logs the input values on a user-defined basis.

Activity Log - Logs all system and alarm activity. This includes programming changes, alarms occurring and clearing, acknowledgments, any call-ins to the unit and alarm dial outs.

NOTE:

Once datalogging is enabled, the system will automatically default to an RS232 rate of 9600 baud. If your target printer is not configured to 9600 baud, call Phonetics for more information(610-558-2700).

DATA LOG PARAMETERS

Input Log:

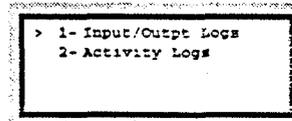
- 1) Press Program.



- 2) Press Data Log.



Data Log menu will appear on local display.



- 3) Press 1 for Input Log.
- 4) Press 1 to enable.
Press 2 to disable.
- 5) Enter Log time.
Enter hours, minutes, and seconds.

Activity Log:

- 1) Return to the Data Log menu.
Press 2 for Activity Log.
- 2) Press 1 to enable.
Press 2 to disable.

SYSTEM

The following parameters determine the functioning of various system features.

Password - The password is a security feature that you may program to prevent unauthorized access to Express II's programming. The password may be any combination of up to 6 digits.

Acknowledgment code - The acknowledgment code is the number, up to 6 digits, you enter when you acknowledge an alarm using a Touch-Tone phone. This code is also used when you call Express II back using a Touch-Tone phone to acknowledge an alarm. **NOTE:** This code cannot be used from a pulse (rotary) phone.

Halt mode delay time - Halt mode allows you to disable all inputs and prevent dial out for a user-programmed time. Halt mode is useful if you must perform periodic tests or other activities that would trip false alarms and initiate dial out. Halt mode can be programmed from 0 seconds to 12 hours.

NOTE: If you program the halt mode time to zero, the halt mode feature is disabled. The default is 1 hour.

Callback acknowledgment - This parameter determines whether you can simply call Express II back to acknowledge an alarm or if you must also enter the acknowledgment code. When callback acknowledgment is enabled, you may acknowledge an alarm from either a pulse or Touch-Tone phone. No code needs to be entered, you just call the unit back after receiving the alarm call. When callback acknowledgment is disabled, you must use a Touch-Tone phone to acknowledge the alarm by entering the acknowledgment code, or acknowledge the alarm locally.

Call cancel - This feature determines whether Express II will continue dialing out for an alarm after the alarm has physically cleared. When call cancel is enabled, Express II will stop the dial out process when the alarm clears, regardless if the alarm has been acknowledged. When call cancel is disabled, Express II will continue dialing out for the alarm until it receives acknowledgment, even if the alarm clears in the meantime.

Auto test - This feature allows you to simulate an alarm on an input to test the dial out procedure. **NOTE:** Auto test will make actual phone calls to the Phone Contacts using the specifications you programmed. You must acknowledge the alarm as if it were real.

SYSTEM PARAMETERS

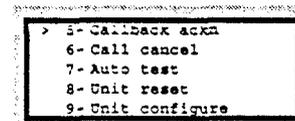
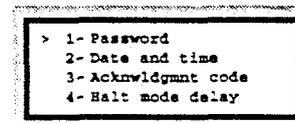
- 1) Press Program.



- 2) Press System.



- 3) System menu will be displayed.



Password:

- 1) Press 1 to program password.
- 2) Enter password.(up to 6 digits)
The default is no password.

Date and Time:

- 1) Press 2 to set Clock.
- 2) Enter: day, month, year, hours, minutes, seconds, and day of the week.

Acknowledgment Code:

- 1) Press 3 for Acknowledgment Code.
- 2) Enter code. (6 digits; the default is '555')

Halt Mode Delay Time:

- 1) Press 4 for Halt Mode Delay Time.
- 2) Enter minutes.

Callback Acknowledgment:

- 1) Press 5 for Callback Acknowledge.

Unit reset- Factory use only.

Unit configuration- Factory use only.

2) Enter 1 to enable.

Enter 0 to disable.

Call Cancel:

1) Press 6 for Call Cancel enabling.

Auto Test:

1) Press 7 for Auto Test.

2) Enter input number.

SECURITY

Express II allows you to lock the keyboard using the system password to prevent unauthorized personnel from making programming changes using the keypad or via Touch-Tone™ phone. Inquiry, status and alarm reports may be obtained without the password.

The keyboard may only be locked locally using the keypad. You cannot lock the keypad remotely via Touch-Tone™ phone.

When programming locally, you must unlock the keypad if it is locked, and relock when finished.

When programming remotely via Touch-Tone™, you must enter the password to access the programming. The keypad remains locked locally.

SECURITY PARAMETERS

Lock:

- 1) Press Program.
- 2) Press Lock/Unlock key.



- 3) Enter System password.
- 4) Express II will indicate: "Locked" or "Unlocked" in a voiced response.

Unlock:

REPEAT LOCK INSTRUCTIONS

NOTE:

Programming is allowed only when the keyboard is Unlocked. System Inquiry will not include password.

NOTES

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CHAPTER 6: OPERATION

After installation and programming is completed, the Express II is fully operational. This chapter explains the sequence of events that occur during an alarm dialout to illustrate how the Express II operates.

Alarm Detection, Dial-out and Acknowledgment

Generally, an alarm event is structured in the following manner:

- I. Express II detects a change at the sensor.
- II. A valid alarm is recognized.
- III. Dial-out begins.
- IV. The alarm is acknowledged.

Often, an alarm does not proceed through all stages: either an alert condition does not persist long enough to be considered valid, or a valid alarm is cancelled.

The following table explains the alarm detection, dial-out and acknowledgment features and lists important variable factors affecting their operation.

I. Express II Detects a Change at the Sensor	Variable Factors	Indicator Light
<ul style="list-style-type: none"> • Express II detects a change in the monitored condition (from the sensor wired to one of the inputs). This is considered an <i>alert condition</i>, and does not qualify as a valid alarm at this point. • The condition continues throughout the programmed Recognition Time. If the condition (or sensor) reverts to its normal state before the Recognition Time is reached, no alarm will occur. 	<p><i>Input Type and Configuration</i></p> <p><i>Recognition Time: Activated</i></p>	<p><i>Changes from steady green to blinking green</i></p>
II. A Valid Alarm Is Recognized	Variable Factors	Indicator Light
<ul style="list-style-type: none"> • The condition must persist long enough to meet or exceed the programmed Recognition Time. When Recognition Time has expired, (or if set to zero), and the alarm condition continues, the Express II will determine that a valid alarm exists. • When a valid alarm is determined, Call Delay is activated (if not set to zero), forcing the Express II to wait for a programmed period of time before starting the dial-out process. Call Delay applies to the period just prior to dial-out, before the first telephone call is made. • Call Delay provides the opportunity to cancel a valid alarm at the Express II's installation site, before dial-out occurs. An audible voice message indicates which of the inputs is in alarm. If on-site personnel acknowledge the alarm within the Call Delay time, the Express II will not dial out. (Local Voice Mute is disabled, so that alarm messages can be heard at the site.) 	<p><i>Recognition Time: Expired</i></p> <p><i>Valid Alarm: Exists</i></p> <p><i>Call Delay: Activated</i></p> <p><i>Alarm Message: Audible, On-site Activated</i></p> <p><i>Local Voice Mute: Disabled</i></p>	<p><i>Changes from blinking green to blinking red.</i></p>



III. Dial-out Begins	Variable Factors	Indicator Light
<ul style="list-style-type: none">• The dial-out process is activated as soon as the Call Delay time expires (if the alarm has not been cancelled at the Express II's installation site.) The dial-out begins with the first selected telephone number, and proceeds sequentially, through the remaining telephone numbers listed in the dialout selection.• Call Progress, an automatic feature, enables the Express II to detect whether or not the telephone call is answered. After 10 rings, or if a busy signal is encountered, the Express II will hang up, wait the programmed Intercall Time, and proceed to dial the next telephone number.• When the telephone is answered, the Express II will immediately begin reciting a message that indicates which of the inputs is in alarm. The Express II will request acknowledgement, if it has not yet occurred.• When the telephone is answered, the programmed Voice Repetitions determine the number of times per call the Express II recites the alarm message.• If the alarm is not acknowledged with the first dial-out telephone call, the Express II waits the duration of Intercall Time before dialing the next telephone number. Intercall Time is the programmed waiting period in between each dial-out telephone call.• If no telephone calls are answered, the Express II dials out sequentially, through the remaining telephone numbers and continues to cycle until the programmed Maximum Number of Calls is reached.	<p><i>Call Delay: Expired</i></p> <p><i>Call Progress: Activated</i></p> <p><i>Alarm Messages: By Telephone</i></p> <p><i>Voice Repetitions: Activated</i></p> <p><i>Intercall Time: Activated</i></p> <p><i>Max Calls: Activated</i></p>	<p><i>Red light continues blinking</i></p> <p><i>Red light continues blinking</i></p>

IV. The Alarm is Acknowledged	Variable Factors	Indicator Light
<ul style="list-style-type: none"> • At any time after a valid alarm is determined, the alarm may be acknowledged at the Express II's installation site, by pressing ALARM CANCEL. • When the Express II dials out and the call is answered using a Touch-Tone telephone, it may be instantly acknowledged by pressing "555" (the default code) or by entering a programmable code. • The alarm message repeats for the number of programmed Voice Repetitions. If "555" has been entered, the Express II will say: "OK." The alarm is considered acknowledged and the dialout will stop. (If the alert condition continues to exist, then Reset Time may reactivate the dial out process—refer to Reset Time, page 32-33.) • If the Express II does not receive the Touch-Tone code, it recites the following: "No Acknowledgment." • After the acknowledgment period, it says: "Press any key for unit activity." If a key is pressed, the unit enters command mode. If no key is pressed it will hang up. • The recipient of this message must call the Express II back within the period programmed for Intercall Time, in order to acknowledge the alarm. If local voice mute is off, the unit will beep at the installation site while waiting for this call. 	<p><i>Local, On-site Acknowledgment</i></p> <p><i>Touch-Tone Acknowledgment: Fast Code 555</i></p> <p><i>Touch-Tone Acknowledgment: Default Code 555</i></p> <p><i>Tone or Pulse Callback Acknowledgment: Within Intercall Time</i></p>	<p><i>Red light blinks until alarm is acknowledged</i></p>



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CHAPTER 7: REACHING EXPRESS II BY TELEPHONE

Express II is at your disposal whenever you need it - no matter where you are. And it is as easy as dialing your Touch Tone™ telephone! All you need is your Express II's phone number and a Touch Tone™ telephone.

Simply follow these first steps to reach Express II's built-in, voice guided system. The voice guided system is comprised of a main menu and proceeding sub-menus. It works much the same as when programming Express II. The only difference is that you use the telephone dial pad instead of the Express II keypad.

Phone-in Parameters:

Dial the phone line that is connected to your Express II unit.

Express II will pick-up and 'say':

"Hello, this is... *(programmed ID message that you record)*"

"Press 1 for Status."

" 2 for Alarm."

" 3 to Inquire Programming."

" 4 to Change Programming."

" 5 to Exit."

The Main Menu:

"Press 1 for Status."

The response for this function is the same as the response for "Inquire" "Status" at the local keypad.

"2 for Alarm."

The response for this function is the same as the response for "Inquire" "Alarm" at the local keypad.

"3 to Inquire Programming."

Press 3 for a list of the 10 programming categories. Once a category is chosen, the menus and responses are identical to inquiring programming at the local keypad. See Chapter 5.

"4 to Change Programming."

Press 4 for a list of the 10 programming categories. Once a category is chosen, the menus and responses are identical to programming at the local keypad. See Chapter 5.

.....

"5 to Exit."

Press 5 and the unit will respond, "Have a good day!" The unit will then hang-up.

Special Keys:

Press the 'star' button(*) once to repeat the current menu.

Press the 'star' button(**) twice to repeat the previous menu.

Use the 'pound' button(#) as the Enter key.

To EXIT return to the main voice menu. Press 5. Hang-up the telephone.

Security:

The unit's local keypad may not be "Unlocked" or "Locked" over the phone. This will not effect any Phone-in parameters, but if the local keypad is "Locked" you must know the Password to gain access over the telephone. Press pound sign (#) after the password.

Note:

The ID message must be recorded after installation. There is no default ID message, although, it may be programmed over the phone.
Input Calibration cannot be programmed over the phone.

.....

CHAPTER 8: OTHER KEYPAD FUNCTIONS

Inquire Programming:

The same menu system that is used for programming the Express II is also used to verify programming. To check the programming of a particular parameter, just follow the same steps as if programming, except start with the INQUIRE key instead of the PROGRAM key. The Express II will prompt you with the same menu choices as if you were programming until you have reached the desired information. Express II will 'speak' the programming parameters and display them at the same time.

Inquire Status:

General status information can also be requested from the keypad. If you press INQUIRE and then STATUS, the Express II will first give you information from internal functions, then ask what else you want status information from. You will be given the choice of Inputs, Outputs, Microphone (only valid remotely) or to print a status to a local printer. If you choose input, or output, the Express II will then ask for a channel number for input or output.

Inquire Alarms:

To check alarm information, press INQUIRE and then ALARMS. If there are any unacknowledged alarms, the Express II will recite which input alarms have not been acknowledged.

Halt mode delay time - Halt mode allows you to disable all inputs and prevent dial out for a user-programmed time. Halt mode is useful if you must perform periodic tests or other activities that would trip false alarms and initiate dial out. Halt mode can be programmed from 0 seconds to 12 hours.

To initiate Halt mode press HALT. To exit Halt mode press ALARM CANCEL.

NOTE: If you program the halt mode time to zero, the halt mode feature is disabled. The default is 1 hour.

NOTES



PHONE CONTACT LIST

Position Number	Name of Contact	Phone number	Voice/Beeper
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			

Position Number	Name of Contact	Phone number	Voice/Beeper
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			



NOTES



PROGRAMMING SUMMARY

I. PHONE

A. Calling Schedule

1. all
2. days and nights
 - a. enter day hours; enter day minutes
 - b. enter night hours; enter night minutes
3. day, night, and weedends
 - a. enter day hours; enter day minutes
 - b. enter night hours; enter night minutes

B. Phone Contacts

1. enter position number / "phone number selection"(1-48)
 - a. voice
 - b. beeper
2. enter phone number

.....

II. DIAL OUT

- A. Dialing method
 - 1. pulse
 - 2. tone
 - 3. automatic
- B. Retries on Busy
 - 1. enter number of retries on busy
- C. Message Repeats
 - 1. enter number of times alarm message will repeat for each call
- D. Maximum Number of Calls
 - 1. enter total number of outgoing calls during an alarm
- E. Call Delay Time
 - 1. enter hours
 - 2. enter minutes
 - 3. enter seconds
- F. Intercall Delay Time
 - 1. enter hours
 - 2. enter minutes
 - 3. enter seconds



III. DIAL IN

A. Rings Until Answer

1. enter number of rings until Express II answers
(see section on TAD, pages 26-27)

B. Telephone Answering Device (TAD)

1. enable
2. disable

.....

IV. MESSAGES

- A. Record ID Message
 - 1. speak message
- B. Record Input Message
 - 1. enter input number
 - 2. speak message
- C. Record Output Message
 - 1. enter output number
 - 2. speak message
- D. Message Length
 - 1. enter 5
 - 2. enter 7
 - 3. enter 11

V. INPUTS

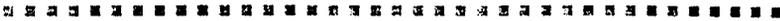
- A. Enter Input Number (1-40)
 - 1. enable/disable
 - 2. input type
 - a. normally closed
 - b. normally open
 - c. pulse count
 - d. 4-20 milliamp
 - 1. enter table low limit
 - 2. enter table high limit
 - e. 0-5 volt
 - 1. enter table low limit
 - 2. enter table high limit
 - f. temperature
 - 1. 2.8K °F thermistor
 - 2. 2.8K °C thermistor
 - 3. 10K °F thermistor
 - 4. 10K °C thermistor
 - g. time accumulator
 - 3. recognition time
 - a. enter hours
 - b. enter minutes
 - c. enter seconds
 - 4. high/low limits
 - a. enter low limit
 - b. enter high limit
 - 5. alarm reset time
 - a. enter hours
 - b. enter minutes
 - c. enter seconds
 - 6. dial out selection
 - a. enter position numbers (1-48)
 - 1. press enter twice



.....

VI. SOUND

- A. Listen-in Time
 - 1. enter seconds (0-255)
- B. Sound Monitoring
 - 1. disable
 - 2. enable
- C. Sound Sensitivity
 - 1. enter value (0-100)
- D. Recognition Time
 - 1. enter hours
 - 2. enter minutes
 - 3. enter seconds
- E. Alarm Reset Time
 - 1. enter hours
 - 2. enter minutes
 - 3. enter seconds
- F. Dial Out Selection
 - 1. enter position numbers (1-48)
- G. Mute Local Speaker
 - 1. disable
 - 2. enable



VII. AC POWER

A. AC Power

- 1. failure monitor
 - a. enable
 - b. disable
- 2. power recognition time
 - a. enter hours
 - b. enter minutes
 - c. enter seconds
- 3. alarm reset time
 - a. enter hours
 - b. enter minutes
 - c. enter seconds
- 4. dial out selection
 - a. enter position numbers (1-48)

B. Battery

- 1. battery monitor
 - a. disable
 - b. enable
- 2. alarm reset time
 - a. enter hours
 - b. enter minutes
 - c. enter seconds
- 3. dial out selection
 - a. enter position numbers (1-48)



.....

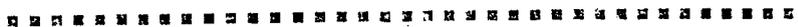
VIII. OUTPUTS

A. Enter Output Number

1. manual

a. off

b. on



IX. DATA LOG

A. Input Log

1. enable
2. disable

a. log time

1. enter hours
2. enter minutes
3. enter seconds

B. Activity Log

1. enable
2. disable



XI. SECURITY

- A. Lock
 - 1. enter system password
- B. Unlock
 - 2. enter system password





NOTES

APPENDIX AA

MISCELLANEOUS ELECTRICAL EQUIPMENT

LETTER OF TRANSMITTAL

SOUTHERLAND
ELECTRIC CO.
HWY 17N
JAX. N.C. 28541

DATE <u>12-19-95</u>	JOB NO. <u>16032</u>
ATTENTION <u>OWEN D. CLARK</u>	
RE: <u>MCB CAMP LEJEUNE</u>	

FROM: OHM CORP.
5335 TRIANGLE PKWY
NORCROSS, GA. 30092
Attn: BUTCH MATTHEWS

GENTLEMEN:

WE ARE SENDING YOU Attached Under separate cover via FED-EX the following items:
 Shop drawings Prints Plans Samples Specifications
 Copy of letter Change order _____

COPIES	DATE	NO.	DESCRIPTION
<u>1</u>	<u>12/19/95</u>	<u>10</u>	<u>WATT HR. METERS</u>

THESE ARE TRANSMITTED as checked below:

- For approval
- For your use
- As requested
- For review and comment
- Approved as submitted
- Approved as noted
- Returned for corrections
- _____
- Resubmit _____ copies for approval
- Submit _____ copies for distribution
- Return _____ corrected prints

REMARKS _____

cc: ROICC - 1 COPY
BAKER ENG'S 1 COPY
STONE & WEBSTER - 1 COPY
ALAN WHITT - 1 COPY

COPY TO FILE

SIGNED *Butch Matthews*

OHM REMEDIATION SERVICES CORPORATION
5335 TRIANGLE PARKWAY, SUITE 450
NORCROSS, GEORGIA 30092
(404) 729-3900

SOIL AND GROUND WATER REMEDIATION
OPERABLE UNIT NO. 2, SITES 6 AND 82
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

CONTRACT NO. N62470-93-C-3032

SPECIFICATION SECTION: 16462

SUBMITTAL FOR: PAD-MOUNTED TRANSFORMER

<u>ITEM NO.</u>	<u>SPEC PAR</u>	<u>SD-NO/ITEM DESCRIPTION/MANUFACTURER</u>
1	1.3.2A	SD-02 WATTHOUR DEMAND METERS - GENERAL ELECTRIC
2	1.3.2A	SD-02 METER SOCKET - MILBANK
3	1.3.2A	SD-02 CURRENT TRANSFORMERS - GENERAL ELECTRIC

SUBMITTAL REVIEW	
REVIEW IS FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS NO RESPONSIBILITY IS ASSUMED FOR CORRECTNESS OF DIMENSIONS OR DETAILS. THE CONTRACTOR/SUPPLIER SHALL ASSUME FULL RESPONSIBILITY FOR DEVIATIONS FROM CONTRACT REQUIREMENTS NOT SPECIFICALLY INDICATED ON THIS SUBMITTAL.	
<input checked="" type="checkbox"/> NO EXCEPTIONS	<input type="checkbox"/> MAKE CORRECTIONS NOTED
<input type="checkbox"/> AMEND AND RESUBMIT	<input type="checkbox"/> REJECTED - SEE REMARKS
Date <u>12-19-95</u> By <u>TBM</u>	
OHM REMEDIATION SERVICES CORP. NORCROSS, GEORGIA	

WATTHOUR METERS AND WATTHOUR DEMAND METERS — POLYPHASE
 60 HZ • TWO- AND THREE-STATOR • SOCKET- AND BOTTOM-CONNECTED

ITEM # (1)
 Pages 1-3
 1.3.2A
 2.2.1.2B(1)

VM-60 Family of Watthour Demand Meters

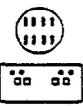
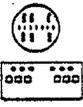
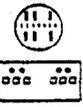
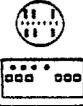
For Use with Instrument Transformers

With Type M-30 Demand Registers

DATA TABLE

Class 10^⑤, 2.5-ampere Meters^②; with Class 2, 4-dial, Secondary-reading Registers^①

Polyphase Express catalog numbers are high-lighted in red. See page 11 for explanation of Polyphase Express program.

Meter Type and Circuit	Volts	Time Interval (Minutes)	Full-scale kW	Multiplier, K, ④	Socket-connected	Bottom-connected
					Catalog Number	Catalog Number
VM-63 (Forms 5S, 5A) 2-stator 3-wire, 3-phase 	120	15 30	2 2	TF TF	700X10G2 700X10G3	700X16G1 700X16G2
	240	15 30	4 4	TF TF	700X10G8 700X10G9	700X16G11 700X16G12
	480	15 30	8 8	TF TF	700X10G20 700X10G21	700X16G26 700X16G27
VM-64 ④⑤ (Forms 9S, 9A) 3-stator 4-wire, 3-phase 	120	15 30	3 3	TF TF	701X16G9 701X16G10	701X22G9 701X22G10
	240 ^⑥	15 30	6 6	TF TF	701X16G11 701X16G12	701X22G11 701X22G12
VM-65 ④⑤ (Forms 6S, 6A) 2-stator 4-wire Y, 3-phase 	120	15 30	3 3	TF TF	700X25G2 700X25G3	700X31G2 700X31G3
	240 ^⑥	15 30	6 6	TF TF	700X25G16 700X25G17	700X31G15 700X31G16
VM-66 ④ (Forms 8S, 8A) 2-stator 4-wire Δ, 3-phase 	240	15 30	4 4	TF TF	700X39G1 700X39G8	700X45G2 700X45G5

- ① For meters with 5 dial registers, order "Similar to Cat. No. . . . (4 dial) except with 5 dial".
- ② Meters are available with dual-class M-30 registers. Refer to page 46 for available ratios.
- ③ TF = Transformer Factor = CT ratio x VT ratio. If no VT is used, TF = CT ratio.
- ④ All V-64-S, VM-64-S and VW-64-S meters in Class 10 rating require a 13-jaw socket with circuit-closing device. The Form 9S has four voltage connections, one of which is common to all three voltage coils. The meter has three KYZ blades available for a pulse-initiator output. Form 10S is also available which omits KYZ terminals and provides six separate voltage terminals. The Form 10S model is normally required for reactive metering (phase-shifting transformers or Q-hour metering). Unless Form 10S is specified, Form 9S will be furnished.
 The 13-jaw socket, when wired for a Class 10, V-65-S meter, does not provide correct connections for the V-64-S, and vice versa. For wiring diagrams refer to Instructions GEH-2758.

- ⑤ For meters rated Class 20, TA2.5, order "Similar to Cat. No. . . . (Class 10) except Class 20".
- ⑥ Types VM-64 and VM-65 240-volt meters will operate correctly on 480Y/277-volt systems. If meter nameplates are to be marked "480Y/277V," the order must so specify.
- ⑦ Type VM-65-S meters have 13-terminal construction (Form 6S) and must be used with 13-jaw sockets. If special 7-terminal construction (Form 7S) is desired, order "Similar to Cat. No. . . . (of 13-terminal meter) except with 7-terminal construction." Refer to GET-2669 for connection diagrams and the corresponding form numbers.
- ⑧ When a 480Y/277-volt circuit is metered with VT's the usual VT ratio is either 2.4:1 or 2.5:1 and the meter is rated 120 volts. If 4:1 VT's are connected line-to-neutral, for this application a 69-volt meter must be specified.
- ⑨ Type VM-66-S meters have 13-terminal construction (Form 8S) and must be used with 13-jaw sockets. If special 7-terminal construction (Form 24S) is desired, order "Similar to Cat. No. . . . (of 13-terminal meter) except with 7-terminal construction." Refer to GET-2669 for connection diagrams and the corresponding form numbers.

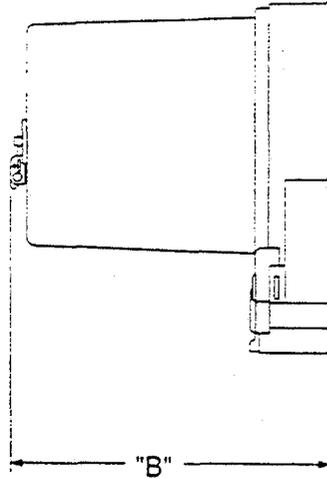
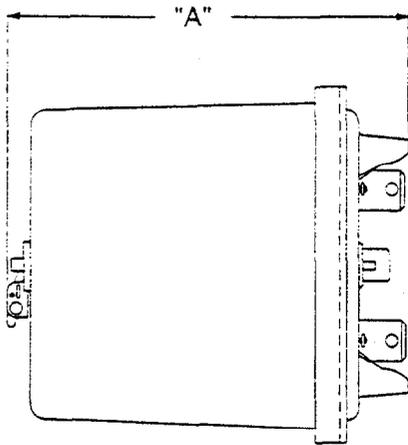
WEIGHTS

Type	Approx Weight in Lbs.	
	Shipping	Net
M-60, socket-connected	12	10
A-60, bottom-connected	14	12

REFERENCES:
 Ordering Directions See Page 14
 Publications See Page 10
 Type M-30 Registers See Page 46



COVER HEIGHTS (IN INCHES)



	Socket-connected		Bottom-connected	
	Glass	LEXAN	Glass	LEXAN
	Dim. "A" Maximum	Dim. "A" Maximum	Dim. "B" Maximum	Dim. "B" Maximum
Standard Reset	6 9/16	6 1/2	8 7/8	8 13/16
Keylock	6 11/16	6 5/8	9	8 5/16
Prog./Batt. Port.		6 3/8		8 11/16

I-70 AND V-60		Socket	Bottom-connected
		Dim. "A" Maximum	Dim. "B" Maximum
SINGLE-PHASE			
I-70		3 5/8	4 9/16
I-70	with M-30 or M-50	6	6 11/16
	with M-90	6	8 3/8
	with M-90A	6	.....
	with TM-900 LEXAN	5 3/64	.....
	with TMR-900 LEXAN	5 3/64	.....
	with TM-91 or TMR-92 LEXAN	7 1/4	.....
POLYPHASE			
V-60	2-stator	5 7/8	6 3/16
	with M-30 or M-50	7 3/4	9 3/8
	with M-90	7 3/4	8 3/8
	with M-90A	8 3/8	8 15/16
	with TM-91 or TMR-92 LEXAN	8 3/4	8
V-64	3-stator	6 1/4	6 1/2
	with M-30 or M-50	8 3/8	9 3/16
	with M-90	8 3/8	9 3/16
	with M-90A	8 3/4	8 15/16
	with TM-91 or TMR-92 LEXAN	9 1/2	8 3/8



Types M-30 and M-50 Indicating Demand Registers

60 Hz

TYPE M-30 INDICATING DEMAND REGISTER

Single Class—Single Scale

Application

The Type M-30 demand register is used to measure maximum kilowatt demand. Demand measurement is made on a block-interval basis, utilizing a single, sweep pointer.

The Type M-30 register is available as a separate device for mounting on most types of GE watthour meters and Type MD totalizers. The register will mount directly on all GE magnetic-suspension watthour meters.

Dual Class—Dual Scale

Application

Dual-class, dual-scale Type M-30 indicating demand registers provide a scale-changing function in one register to allow matching the scale to the load. The registers are shipped with the lower scale showing.

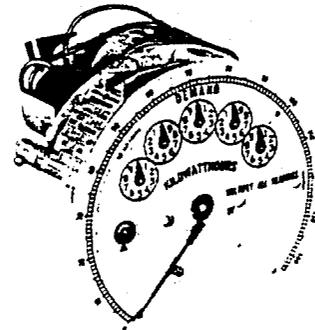
Operation

The scale is changed by removing the six support screws which attach the scale and multiplier plates. These two plates are turned over and reattached.

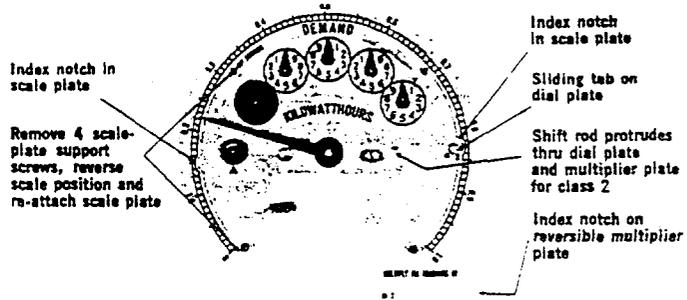
The gear shifting is done by a shift rod (see Fig. 2), which comes through the dial plate and through the multiplier plate in the lower scale position. When the multiplier plate is turned over and reattached, it pushes the rod against a spring to shift the demand scale and multiplier plates are printed on both sides. The multiplier plate is marked Class 2 on one side and Class 6 on the other.

Interlock

Notches on the multiplier plate and on the scale plate (see Fig. 2) engage with a movable tab in the dial plate located where these come together on the right in Fig. 2. It is not possible to assemble these parts in the Class 2 gear position while the Class 6 scale is showing, or vice versa.



(Photo 1236147)
Fig. 1. Type M-30 indicating demand register



(Photo 1233276)
Fig. 2. Dual scale M-30 register—Class 2 position with multiplier plate

Accuracy

The Type M-30 dual-class register operates at an accuracy within ± 1 percent full-scale on both scales.

ORDERING DIRECTIONS

Refer to page 45.

REFERENCES:
Renewal Parts GEF-3594
Instruction Book GEH-1529

TYPE M-50 INDICATING REGISTER

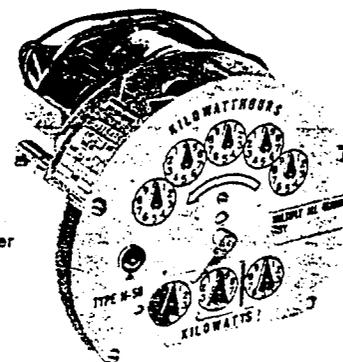
Application

The Type M-50 demand register is used to indicate maximum kilowatt demand. It is very similar to the type M-30 demand register except for decimal dial presentation of the demand rather than single, sweep-pointer presentation. Demand measurement is made on a block-interval basis.

The Type M-50 register is available as a separate device for mounting on most types of GE watthour meters and Type MD totalizers. The register will mount directly on all GE magnetic-suspension watthour meters.

ORDERING DIRECTIONS

Refer to page 45.



(Photo 1236145)
Fig. 1. Type M-50 indicating demand register

REFERENCES:
Renewal Parts GEF-4385
Instruction Book GEH-2785

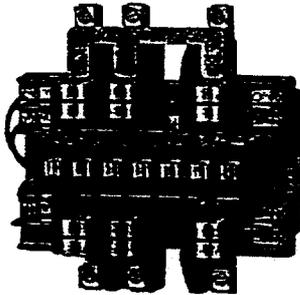


20 AMP/TRF. RATED
5, 6, 8 & 13 TERMS.
RINGLESS/RINGTYPE

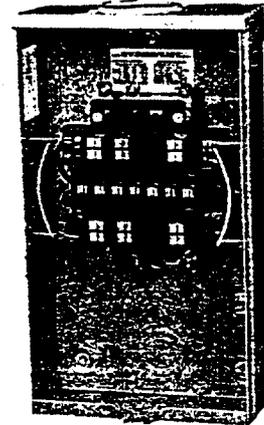
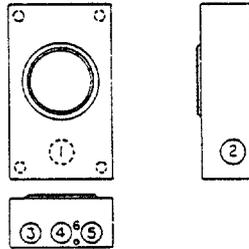
MILBANK

ITEM # (2)

1.3.2A
2.2.1.2B(3)



Block Assembly for SC7237
(Prefix "SC" designates
sleeve conn. #4 wire max.)



S7237-RL

RINGLESS ORDERING INFORMATION

NO. OF TERMS	METER FORM ⑤	RINGLESS CAT. NO.	HUB	LUG CU/AL	BY-③ PASS	DIMENSIONS			CONCENTRIC K.O.'S					
						D"	W"	H"	1	2	3	4	5	6
5	3S	S1290-(*)	①	②	YES	3 5/16"	8"	14"	1 1/2"	1 1/2"	1 1/4"	1 1/4"	1 1/4"	1 1/4"
6	4S	S1299-(*)	①	②	YES	3 5/16"	8"	14"	1 1/2"	1 1/2"	1 1/4"	1 1/4"	1 1/4"	1 1/4"
8	5S	S7235-(*)	①	②	YES	3 5/16"	8"	14"	1 1/2"	1 1/2"	1 1/4"	1 1/4"	1 1/4"	1 1/4"
13	6.8.9 & (ALT) 10S	S7237-(*)	①	②	YES	3 5/16"	8"	14"	1 1/2"	1 1/2"	1 1/4"	1 1/4"	1 1/4"	1 1/4"

RING-TYPE ORDERING INFORMATION

NO. OF TERMS	METER FORM ⑤	RING-TYPE CAT. NO.	HUB	LUG CU/AL	BY-③ PASS	DIMENSIONS			CONCENTRIC K.O.'S					
						D"	W"	H"	1	2	3	4	5	6
5	3S	S1291-(*)	①	②	YES	3 5/16"	8"	14"	1 1/2"	1 1/2"	1 1/4"	1 1/4"	1 1/4"	1 1/4"
6	4S	S1300-(*)	①	②	YES	3 5/16"	8"	14"	1 1/2"	1 1/2"	1 1/4"	1 1/4"	1 1/4"	1 1/4"
8	5S	S7544-(*)	①	②	YES	3 5/16"	8"	14"	1 1/2"	1 1/2"	1 1/4"	1 1/4"	1 1/4"	1 1/4"
13	6.8.9 & (ALT) 10S	S7545-(*)	①	②	YES	3 5/16"	8"	14"	1 1/2"	1 1/2"	1 1/4"	1 1/4"	1 1/4"	1 1/4"

FACTORY INSTALLED HUBS

SMALL HUB OPENING	
HUB SIZE	CAT. SUFFIX
Plain Top	— O
1"	— WL
1 1/4"	— YL
1 1/2"	— ZL
2"	— DL
2 1/4"	— EL
hub opening	— RL
closing plate	— XL

- ① For proper hub selection, see hub suffix chart.
 - ② Units are supplied with compression type connectors (#10 max.). If sleeve type connectors (#4 max.) are preferred, change catalog prefix to "SC" (i.e. SC7445-XL).
 - ③ Units are supplied with plunger type bypass. Specify on order if no bypass is desired.
 - ④ Ring type units are priced with MR2 sealing ring. See accessories page for other choices.
 - ⑤ See general engineering section for meter form diagrams.
- Contact general office for ordering information if "UL" label required.

TYPE JAB-0, 600 VOLTS

Indoor Current, HY-BUTE #60 Molded, For Use on Pad-mounted Distribution Transformers

JAB-0

50—60 Hz 200—3000 Amperes BIL—10 kV

1.3.2A
2.2-1.2B(4)

ITEM # (3)
PAGES 1-7

APPLICATION

The Type JAB-0 current transformer is designed especially for use on pad-mounted distribution transformers from 75 kVA through 2000 kVA. The JAB-0 has an oval-shaped window measuring 3 1/2 x 4 1/2 inches to allow installation over the secondary bushings of pad transformers.

CONSTRUCTION AND INSULATION

The Type JAB-0 is constructed using molded insulation for the transformer body. It is available in two different outside configurations, "Grecian Urn" (Fig. 1) or rectangular (Fig. 2), to provide a wide selection of mounting flexibility.

WINDOW

The window of this transformer consists of an oval-shaped nylon tube measuring 3 1/2 x 4 1/2 inches. This unique shape allows the JAB-0 CT to be installed on the secondary bushing of a pad transformer. The 4 1/2-inch dimension allows clearance over the blade, while the 3 1/2-inch dimension provides ample clearance from the porcelain bushing.

Two butyl channel sections are molded and bonded to the top and bottom areas of the nylon tube (see Figs. 1 and 2). A locking device called "The Grabber" is designed into the slots in these two butyl sections to permit mounting of the JAB-0 CT directly onto the secondary blade of the distribution transformer (see Fig. 3). These sections are easily removed if this feature is not desired. Simply peel them away from the nylon tube with a pair of pliers. Without these sections, the oval-shaped window will accommodate four

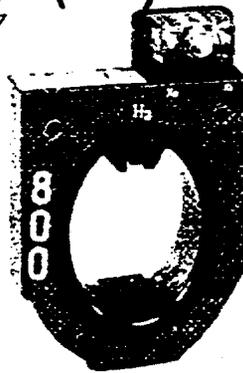


Fig. 1. Type JAB-0 with oval window and "Grecian Urn" outside shape



Fig. 2. Type JAB-0 with window and rectangular outside shape

1 1/4-inch diameter, six 1 1/4-inch diameter, or eight 1 1/4-inch diameter cables.

FOR HIGHER-VOLTAGE APPLICATION (12 TO 15 KV)

See page 15-15, item 12.1.

CORE

See page 15-13, item 2.2.

SECONDARY WINDING

The secondary winding is made of heavy enamel-insulated copper wire. It is evenly distributed around the core, thus reducing leakage flux and giving the best possible accuracy. It also minimizes the effect of stray fields from adjacent buses.

SECONDARY TERMINALS

The secondary terminals mounted on top of the transformer, conveniently positioned for access from the front. The terminals are of bronze and have excellent durability and corrosion resistance.

They are of the clamp type with a large hole of 0.275-inch diameter, making it easy to connect large or multiple secondary wires. There is no need for crimp connectors, and the possibility of a stray strand making a short circuit is practically eliminated.

The terminals are rugged and cannot be bent or fractured. There are no connectors to fall off. The cupped setscrew provides excellent electrical contact and increases the holding power without cutting the wire.

An external secondary terminal block secures a stud that is in between the two terminals, which is used as the short-circuit device pivot and as a means to attach and secure the secondary cover.

POLARITY

See page 15-14, item 6.1.

NAMEPLATE

See page 15-14, item 5.3.

DATA TABLE

Current Ratio in Amperes Pri:Sec	"Grecian Urn" Outside Shape				Rectangular Outside Shape				ANSI Accuracy Class, 60 Hz					Continuous-thermal-current Rating Factor	
	Catalog Number	Approx. Wt. in Lb.		Catalog Number	Approx. Wt. in Lb.		Burdens per ANSI					30°C Ambient	55°C Ambient		
		Ship.	Net		Ship.	Net	B-0.1	B-0.2	B-0.5	B-1	B-2				
200:5	750X036202	7-8 1/4	6-7 1/4	750X036302	7 1/2-8 3/4	6 1/2-7 3/4	0.3						1.0	2.9	
300:5	750X036203	7-8 1/4	6-7 1/4	750X036303	7 1/2-8 3/4	6 1/2-7 3/4	0.3	0.3					2.0	1.5	
400:5	750X036204	7-8 1/4	6-7 1/4	750X036304	7 1/2-8 3/4	6 1/2-7 3/4	0.3	0.3					4.0	2.9	
500:5	750X036205	7-8 1/4	6-7 1/4	750X036305	7 1/2-8 3/4	6 1/2-7 3/4	0.3	0.3					3.0	2.2	
600:5	750X036206	7-8 1/4	6-7 1/4	750X036306	7 1/2-8 3/4	6 1/2-7 3/4	0.3	0.3	0.3				3.0	2.2	
800:5	750X036208	7-8 1/4	6-7 1/4	750X036308	7 1/2-8 3/4	6 1/2-7 3/4	0.3	0.3	0.3				2.0	1.5	
1000:5	750X036210	7-8 1/4	6-7 1/4	750X036310	7 1/2-8 3/4	6 1/2-7 3/4	0.3	0.3	0.3				2.0	1.5	
1200:5	750X036212	7-8 1/4	6-7 1/4	750X036312	7 1/2-8 3/4	6 1/2-7 3/4	0.3	0.3	0.3				2.0	1.5	
1500:5	750X036215	7-8 1/4	6-7 1/4	750X036315	7 1/2-8 3/4	6 1/2-7 3/4	0.3	0.3	0.3	0.3			2.0	1.5	
2000:5	750X036220	7-8 1/4	6-7 1/4	750X036320	7 1/2-8 3/4	6 1/2-7 3/4	0.3	0.3	0.3	0.3	0.3		1.5	1.1	
3000:5	750X036230	7-8 1/4	6-7 1/4	750X036330	7 1/2-8 3/4	6 1/2-7 3/4	0.3	0.3	0.3	0.3	0.3		3.3	1.0	



JAB-0

TYPE JAB-0, 600 VOLTS

Indoor Current, HY-BUTE 60 Molded, For Use on Pad-mounted Distribution Transformers

50—60 Hz

200—3000 Amperes

BIL—10 kV

MOUNTING

The Type JAB-0 is available in two different outside configurations. One has the shape of a "Grecian Urn" with rounded corners on the bottom and with the two lower mounting holes eliminated. Three of these units can be mounted in a triangular pattern, with one unit upside down, so that they will fit on many pad-transformer bushing spacings. The other model has a rectangular outside shape for installation around the secondary bushings of larger pad transformers having wide bushing spacings. This model can also be mounted horizontally below the secondary bushing, with the cables coming up through the window for installation where the phase-to-phase spacing will not permit vertical over-the-blade mounting without interference.

The Type JAB-0 can be mounted on, or secured to, the pad transformer in several different ways. Mounting holes in the corners, together with special brackets, can be used to support the current transformer, centering it around the porcelain ing. Or, with the JAB-0's exclusive feature called "The Grabber," the CT can be supported and securely held in place on the pad transformer's bushing blade. "The Grabber" consists of two butyl sections molded and bonded to the inside of the primary tube, but not connected to the remainder of the butyl insulation. These sections each contain a slot, allowing the transformer to be mounted over the edges of the bushing blade. The butyl slots are carefully dimensioned to fit the

width of the secondary blade of the distribution transformer with which it will be used. On transformers rated 800 amperes and below, butyl fingers within the slots help to hold the JAB-0 CT securely in position.

The butyl slotted sections center the blade in the CT window and maintain adequate clearance distances between the blade and the nearest grounded surface on the CT.

MOUNTING METHODS (FIGS 5-9)

Figure 5 shows three JAB-0 CT's of the "Grecian Urn" style mounted on pad transformers which have adequate bushing spacing to allow the use of this design in an upright mounting position. The three CT's are mounted on the secondary blades using the "Grabber" feature. The rectangular model can also be used in this configuration but requires that the lower unit be inverted. See Fig. 6.

Figure 7 shows three of the "Grecian Urn" models flush-mounted on pad transformers with less bushing spacing. The closer bushing spacing requires the use of the "Grecian Urn" Type JAB-0. The JAB-0 CT's are mounted on the blades using the slotted butyl sections on the inside of the window to secure it into position and to provide adequate clearances from the blade.

On the very small pad transformers where spacing is even more restricted, the "Grecian Urn" designs can still be used. One such mounting is the so-called "stacked" arrangement as shown in Fig. 8.

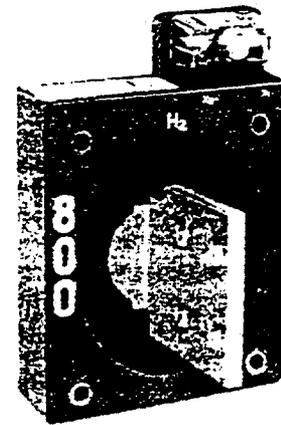


Fig. 3. Type JAB-0 mounted on secondary blade of a pad-mounted distribution transformer

Here the JAB-0 current transformers are placed over the two outside bushings (X₁ and X₃) of the pad transformer by use of the butyl slotted sections. The third JAB-0 CT for the X₂ bushing is then "stacked" in front of the other two current transformers. The "stacked" CT will then block off two holes of the four-hole nest on the secondary blade. When this is objectionable, an accessory bolt-on blade can be provided to allow access to a four-hole NEMA pad. Many distribution transformer manufacturers will also provide an extended third blade if the need is recognized at the time the order is placed. If the extended blade is a part of the distribution transformer, the need for the accessory blade extension is not required.

SUGGESTED CURRENT RATING SELECTION GUIDE TO MATCH PAD TRANSFORMER THERMAL CAPABILITY

Rating of Pad (kva)	Distribution-transformer Low Voltage Ratings					
	240 Volts	240 Volts with 120-volt Mid-tap	208Y/120 and 216Y/125 Volts	480 Volts	480Y/277 and 460Y/265 Volts	600 Volts
75	300:5	300:5	300:5	200:5	200:5	.....
112.5	300 to 400:5	300 to 400:5	300 to 400:5	200:5	200:5	200:5
150	300 to 500:5	300 to 500:5	300 to 500:5	300:5	300:5	200:5
225	300 to 600:5	300 to 600:5	300 to 600:5	300 to 400:5	300 to 400:5	300:5
300	400 to 800:5	400 to 800:5	400 to 800:5	300 to 500:5	300 to 500:5	300 to 400:5
500	1000 to 2000:5	1200 to 2000:5	1200 to 2000:5	400 to 800:5	400 to 800:5	300 to 600:5
750	2000 to 3000:5	2000 to 3000:5	2000 to 3000:5	1000 to 1200:5	1000 to 1200:5	1000:5
1000	3000:5	3000:5	4000:5 (JAD-0) ①	1200 to 1500:5	1200 to 1500:5	1000 to 1200:5
1500	4000:5 (JCD-0) ①	4000:5 (JCD-0) ①	4000:5 (JCD-0) ①	2000:5	2000:5	1200 to 1500:5
2000	.....	.....	.....	3000:5	3000:5	2000 to 3000:5
2500	.....	.....	.....	4000:5 (JAD-0) ①	4000:5 (JAD-0) ①	.....
Number of Current Transformers and Voltage Transformers Required						
	CT-2 VT-None	CT-3 VT-None	CT-3 VT-None	CT-2 VT-2	CT-3 VT-2 or -3	CT-2 VT-2

① Not available in Type JAB-0 current transformers.



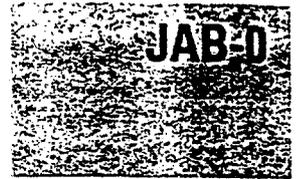
TYPE JAB-0, 600 VOLTS

Indoor Current, HY-BUTE#60 Molded, For Use on Pad-mounted Distribution Transformers

50—60 Hz

200—3000 Amperes

BIL—10 kV



For large bushing spacings the JAB-0 CT can either be placed: (1) directly on the blade by use of the grabber slots, (2) directly on the porcelain bushing between the blade and the tank wall, or (3) centered on the bushing by use of the special "U" brackets bolted to the CT mounting holes and secured to the bushing flange bolts on the distribution transformer (as shown in Fig. 9). Due to the variety and arrangement of the bolted bushing flange constructions available, it will be necessary to provide detailed dimensional information when placing orders for special "U" brackets.

For diagonal or other types of secondary terminal arrangements where there are a wide variety of horizontal and vertical terminal spacings used, refer to Figs. 10-13. These charts show mounting limitations dependent on horizontal and vertical center-line to center-line blade spacings.

Customers who do not want to mount the JAB-0 CT's directly onto the distribution transformer bushings or blade and

who require the use of the full window area, can remove the butyl grabber sections (see "WINDOW" page 15-88). For these installations, the customer with either have to fabricate brackets or shelves to hold the CT's on a horizontal plane below the secondary bushings, or else allow them to slide down the cables until they are supported by them. The rectangular JAB-0 design must be used for any cantilever mounting. "U" shaped mounting brackets (see Fig. 9) for the rectangular design can also be furnished.

For REA and REC applications requiring an insulated secondary compartment, use clamp-type brackets as shown in Fig. 4.

MOUNTING ON THREADED SECONDARY STUDS

A clamp-type bracket, Cat. No. 9930972001, (see Fig. 4) is available that permits the Type JAB-0 CT to be mounted on the insulated bushing of a stud-type secondary terminal of a pad-mounted distribution transformer. This bracket is made from epoxy-coated mild steel and is

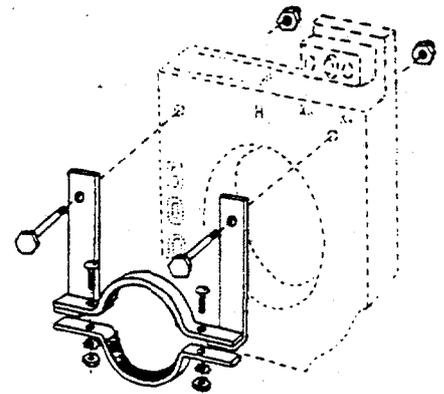


Fig. 4. Clamp-type bracket, Cat. No. 9930972001

attached to the JAB-0 CT using bolts and nuts in the two top mounting holes. The bracket clamps over the insulating boot and secondary bushing of the distribution transformer. Because the clamp is insulated with an epoxy-coating, it provides a totally insulated secondary compartment for sales purposes.

JAB-0

TYPE JAB-0, 600 VOLTS

Indoor Current, HY-BUTE+60 Molded, For Use on Pad-mounted Distribution Transformers

50—60 Hz

200—3000 Amperes

BIL—10 kV

MOUNTING DIMENSIONS

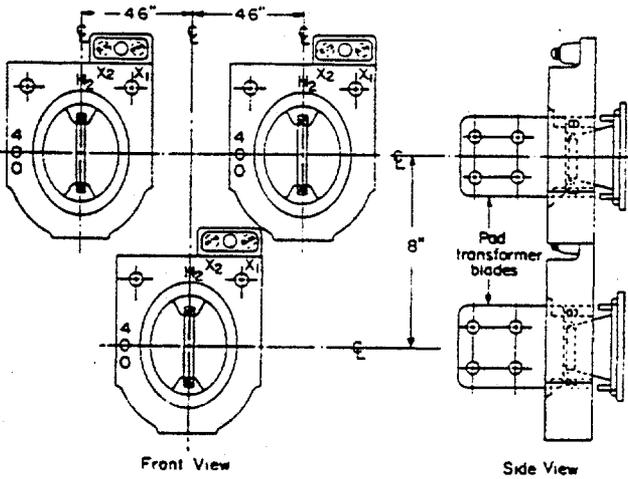


Fig. 5. Three Grecian Urn models mounted upright on pad transformers having adequate spacing

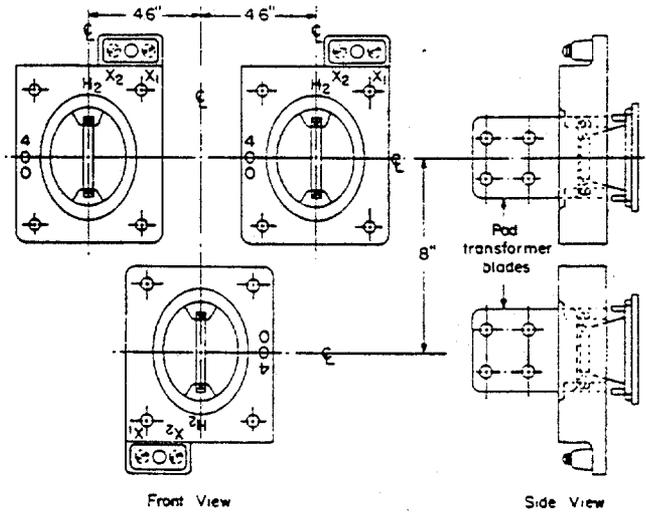


Fig. 6. Three rectangular models (one inverted) mounted on pad transformers having adequate spacing

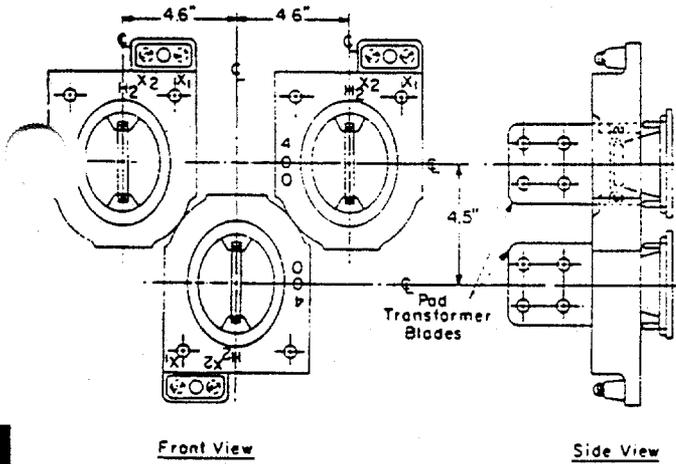


Fig. 7. Three Grecian Urn models (one inverted) mounted on pad transformers having confined spacing

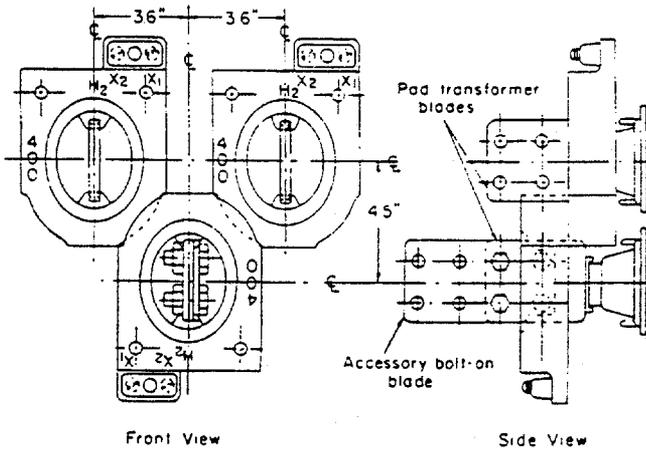


Fig. 8. Three Grecian Urn models (one inverted) mounted in "stacked" arrangement on pad transformers having very restricted spacing

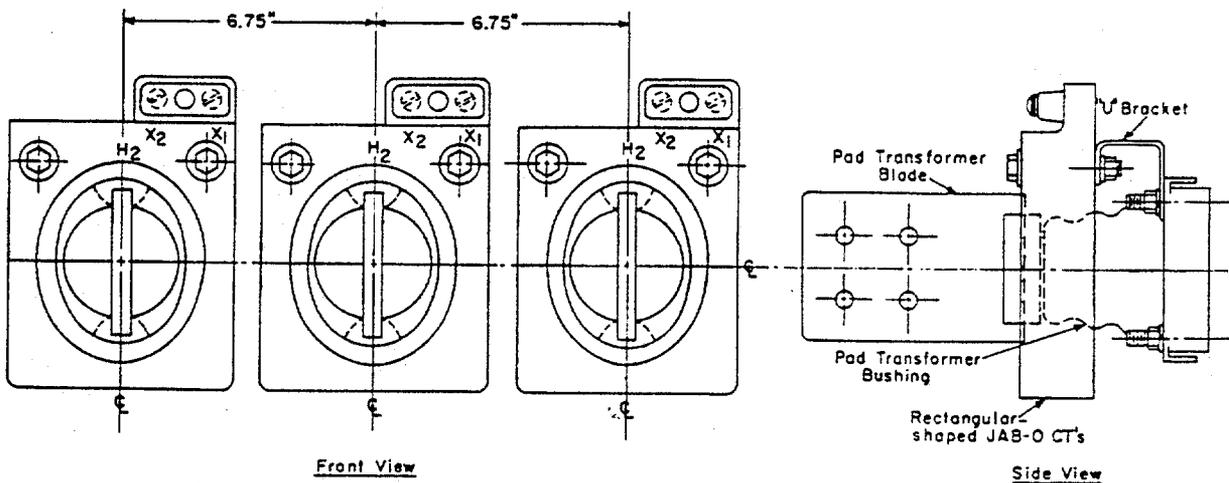


Fig. 9. Three rectangular-shaped JAB-0 CTs mounted to the distribution transformer with special "U" brackets

TYPE JAB-0, 600 VOLTS

Indoor Current, HY-BUTE #60 Molded, For Use on Pad-mounted Distribution Transformers

50—60 Hz

200—3000 Amperes

BIL—10 kV

JAB-0

APPLICATION CHARTS

Vertical Distance Center-Line to Center-Line (Inches)	Horizontal Distance Center-Line to Center-Line (Inches)				
	3.6	4.6	5.0	5.5	6.0 and Up
3.5	Mount below bushing over cable				
4.0	Stacked Arrangement (X ₂ Stacked & Inverted) (See Fig. 8)				
4.5					
5.0					
5.75	Flush Mounting With X ₂ Inverted (See Fig. 7)				
6.375					
7.0	Flush Mounting Any Arrangement (No Stacking Required)				
7.187					
7.75					
8.5					
9.0					

Note: CT window is centered on blade or bushing

Fig. 10. Pad-mounted JAB-0 CT, Grecian Urn model, staggered bushing pattern

Vertical Distance Center-Line to Center-Line (Inches)	Horizontal Distance Center-Line to Center-Line (Inches)				
	3.6	4.6	5.0	5.5	6.0 and Up
3.5	Mount below bushing over cable				
4.0	Stacked Arrangement (X ₂ Unit Stacked)				
4.5					
5.0					
5.75	Flush Mounting With X ₂ Unit Inverted (See Fig. 8)				
6.375					
7.0	Flush Mounting Any Arrangement (No Stacking Required)				
7.187					
7.75					
8.5					
9.0					

Fig. 11. Pad-mounted JAB-0 CT, rectangular model, staggered bushing pattern

Vertical Distance Center-Line to Center-Line (Inches)	Horizontal Distance Center-Line to Center-Line (Inches)				
	3.6	4.6	5.0	5.5	6.0 and Up
4.5	Δ	X ₁ Upright X ₂ Inverted X ₃ Stacked & Inverted			
6.0					
7.0	All Upright (No Stacking Required)				
8.0					

Δ Another combination for this box only is: X₁ Upright, X₃ Inverted, and X₂ Stacked & Inverted

Fig. 12. Pad-mounted JAB-0 CT, Grecian Urn model, diagonal secondary bushing pattern

Vertical Distance Center-Line to Center-Line (Inches)	Horizontal Distance Center-Line to Center-Line (Inches)				
	3.6	4.6	5.0	5.5	6.0 and Up
4.5	Mount below bushing over cable	X ₁ Upright X ₃ Inverted X ₂ Stacked & Inverted			
6.0					
7.0	All Upright (No Stacking Required)				
8.0					

Fig. 13. Pad-mounted JAB-0 CT, rectangular model, diagonal secondary bushing pattern

CHARACTERISTIC RATIO CORRECTION FACTOR AND PHASE-ANGLE CURVES AT 60 HZ

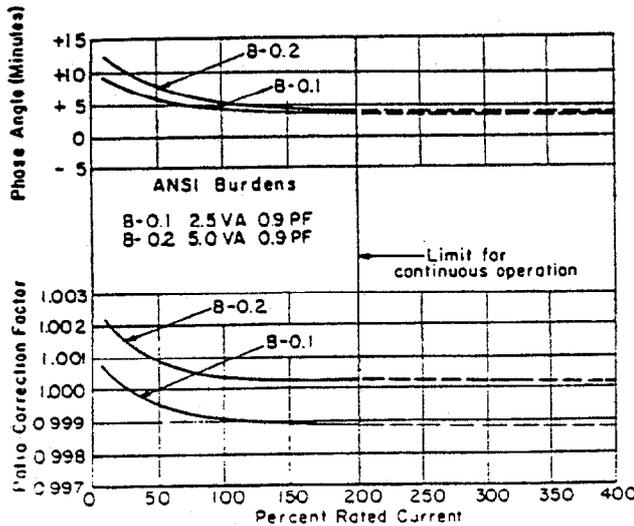


Fig. 14. 400 : 5 amperes

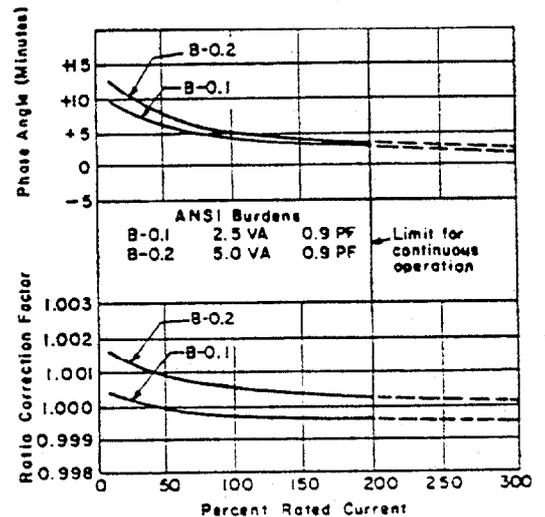


Fig. 15. 500 : 5 amperes



CHARACTERISTIC RATIO CORRECTION FACTOR AND PHASE-ANGLE CURVES AT 60 HZ (Cont'd)

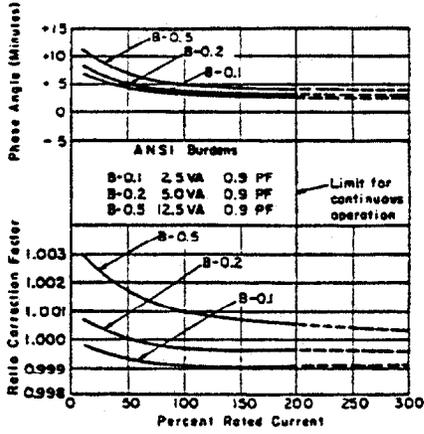


Fig. 16. 600 : 5 amperes

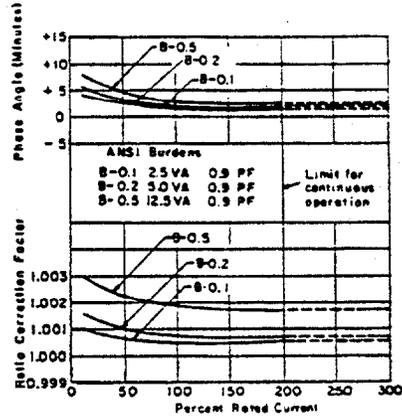


Fig. 17. 800 : 5 amperes

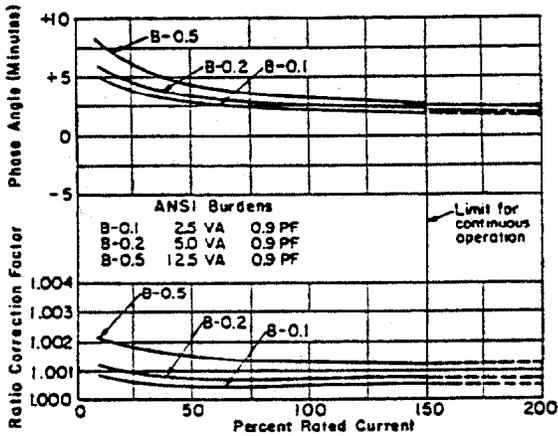


Fig. 18. 1200 : 5 amperes

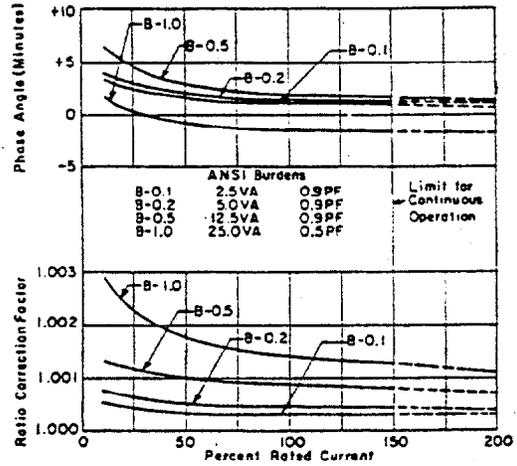


Fig. 19. 1500 : 5 amperes

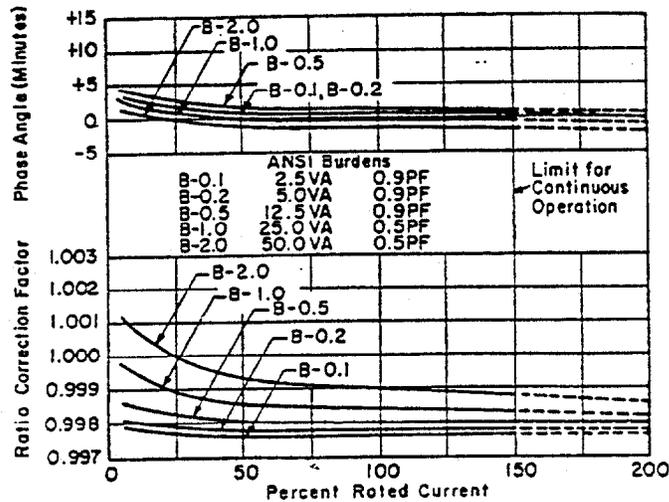


Fig. 20. 2000 : 5 amperes and 3000 : 5 amperes

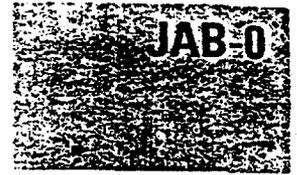
TYPE JAB-0, 600 VOLTS

Indoor Current, HY-BUTE 60 Molded, For Use on Pad-mounted Distribution Transformers

50—60 Hz

200—3000 Amperes

BIL—10 kV



OUTLINE DIMENSIONS

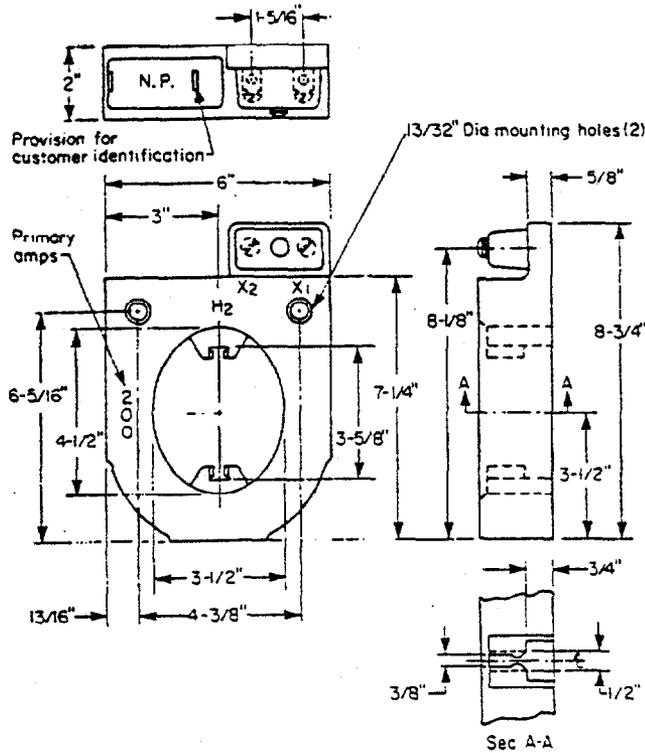


Fig. 21. Grecian Urn model, 300 amperes and below

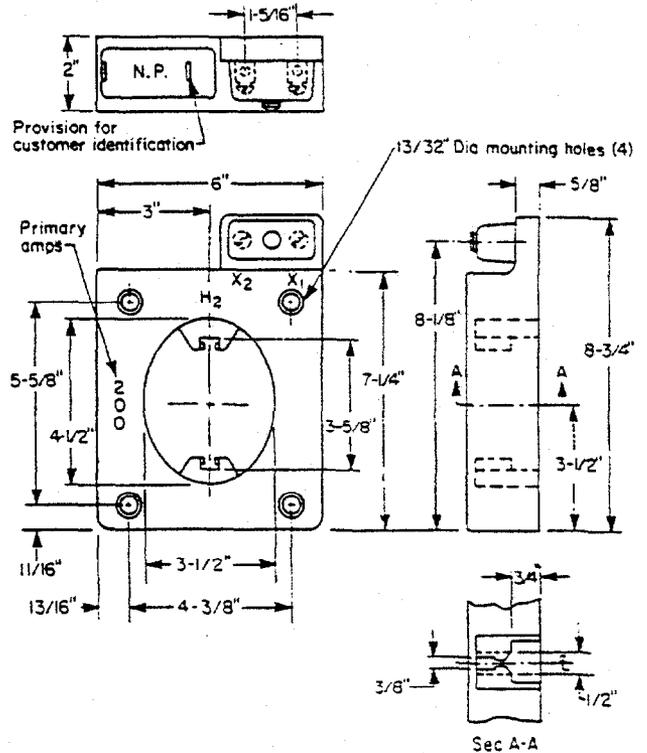


Fig. 22. Rectangular model, 300 amperes and below

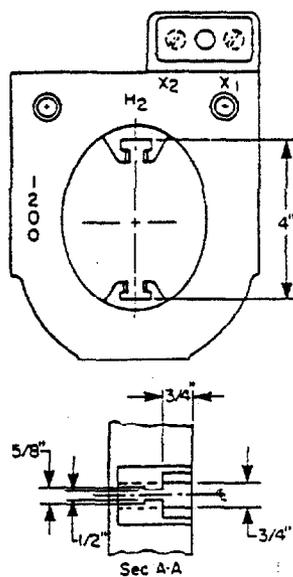


Fig. 23. Grecian Urn model, 400 amperes and above. See Fig. 21 for other dimensions

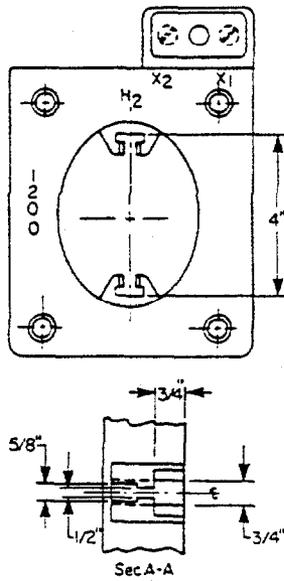


Fig. 24. Rectangular model, 400 amperes and above. See Fig. 22 for other dimensions

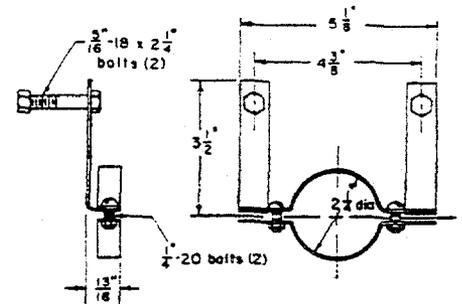


Fig. 25. Clamp-type bracket for mounting JAB-0 CT on stud-type secondary bushings of pad-mounted distribution transformers



SOIL AND GROUNDWATER REMEDIATION
OPERABLE UNIT NO. 2, SITES 6 AND 82
MARINE CORPS BASE, CAMP LEJEUNE, N.C.

CONTRACT NO. N62470-93-C-3032

SECTION 16402 INTERIOR WIRING SYSTEM
OHM REMEDIATION SERVICES CORPORATION

X X
X
7-18-95 BM

*REFER TO
ATTACHED
COMMENTS

OHM REMEDIATION SERVICES CORPORATION
5335 TRIANGLE PARKWAY, SUITE 450
NORCROSS, GEORGIA 30092
(404) 729-3900

SOIL AND GROUND WATER REMEDIATION
OPERABLE UNIT NO. 2, SITES 6 AND 82
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

CONTRACT NO. N62470-93-C-3032

SPECIFICATION SECTION: 16402

SUBMITTAL FOR: INTERIOR WIRING SYSTEM

<u>ITEM NO.</u>	<u>SPEC PAR</u>	<u>SD-NO/ITEM DESCRIPTION/MANUFACTURER</u>
1A	1.3.1G	SD-02 TOGGLE SWITCHES - PASS & SEYMOUR
1B	1.3.1G	SD-02 SAFETY SWITCHES - GENERAL ELECTRIC
2	1.3.1H	SD-02 RECEPTACLES - PASS & SEYMOUR
3	1.3.1I	SD-02 CIRCUIT BREAKERS - GENERAL ELECTRIC
4	1.3.1J	SD-02 COMBINATION MOTOR CONTROLLERS - GENERAL ELECTRIC
5	1.3.1K	SD-02 DRY TYPE TRANSFORMERS - GENERAL ELECTRIC
6	1.3.1M	SD-02 GROUND RODS - ERITECH, INC.
7	1.3.2A	SD-04 PANELBOARD DRAWINGS - GENERAL ELECTRIC
8	1.3.2B	SD-04 DRY TYPE TRANSFORMER DRAWINGS - GENERAL ELECTRIC

ITEM # (1A)

1.5/16
2.7/1

Pass & Seymour
LT legrand

Specification Grade AC Switches

15, 20 & 30A.; 120-277V. AC



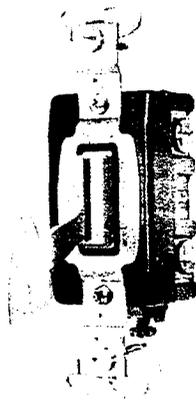
15AC1-I



20AC3-I



20AC1



15AC1-L

Specification Grade Standard Switches

Rating		Toggle Color	Catalog Numbers			
A.	V. AC		Single Pole	Double Pole	Three Way	Four Way
15	120-277	Brown	15AC1	15AC2	15AC3	15AC4
15	120-277	Ivory	15AC1-I	15AC2-I	15AC3-I	15AC4-I
20	120-277	Brown	20AC1	20AC2	20AC3	20AC4
20	120-277	Ivory	20AC1-I	20AC2-I	20AC3-I	20AC4-I
30	120-277	Brown	30AC1	30AC2	30AC3	
30	120-277	Ivory	30AC1-I	30AC2-I	30AC3-I	

A. switches are also available in Gray and White. Specify brown catalog number with color suffix: Gray-GRY, and White-W.

JA. switches are also available in Black, Gray, Red and White. Specify brown catalog number with color suffix: Black-BK, Gray-GRY, Red-RED, and White-W.

Lighted Toggle Switches (Glow when OFF)

Rating	V. AC	Toggle Color	Catalog Numbers
15	120-277	Clear	15AC1-CSL
15	120-277	Ivory	15AC1-ISL
20	120-277	Clear	20AC1-CSL
20	120-277	Ivory	20AC1-ISL
			15AC3-CSL
			15AC3-ISL
			20AC3-CSL
			20AC3-ISL

Pilot Lighted Switches (Glow when ON)

Rating	V. AC	Toggle Color	Catalog Numbers
15	120	Clear	15AC1-CPL
15	120	Red	15AC1-RPL
20	120	Clear	20AC1-CPL
20	120	Red	20AC1-RPL
30	120	Red	30AC1-RPL
			20AC2-CPL
			20AC2-RPL
			20AC3-CPL
			20AC3-RPL
			30AC3-RPL

Lock Switches

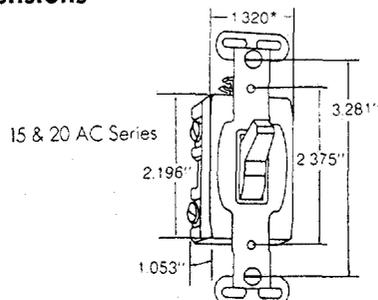
Rating		Toggle Color	Catalog Numbers			
A.	V. AC		Single Pole	Double Pole	Three Way	Four Way
15	120-277	Gray	15AC1-L		15AC3-L	
20	120-277	Gray	20AC1-L	20AC2-L	20AC3-L	20AC4-L

Lock Switch Keys

(One key furnished with each switch).

Description	Cat. No.
Fits AC Switches	500K

Dimensions



Compliances

Consult reference certification chart on page G-10.



*Note: 30AC is 1.437\"/>

HP Conversion Table

15 Amp.	½ Horsepower at 120V. AC 2 Horsepower at 240V. AC
20 Amp.	1 Horsepower at 120V. AC 2 Horsepower at 240V. AC
30 Amp.	2 Horsepower at 120V. AC 2 Horsepower at 240V. AC



GE Safety Switches

DEM - 0201

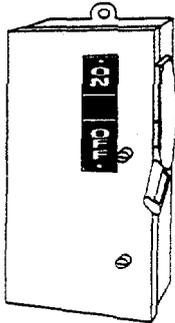
1216
273

Spec-Setter™ Safety Switches

General Duty Safety Switch, Single-throw

Max. System Voltage	Ampere Rating	Switch Type	UL Listed Fusing		Enclosure Type	DEM Number
			Class	Withstanding Rating (rms Sym Amps)		
250Vac 250Vdc	30-200	Fusible	H K	10,000	1 3R	DEM-0202
			H K	10,000		
	400-600	H K	10,000			
		H K	10,000			
30-200	No Ⓛ Fuse	H K	10,000			
		H K	100,000			
400-600	No Ⓛ Fuse	H K	10,000			
		H K	10,000			

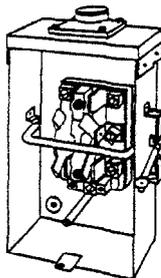
ITEM # (1E)
PAGES 1-3



TH3362SS

Heavy Duty Safety Switch, Single-throw

Max. System Voltage	Ampere Rating	Switch Type	UL Listed Fusing		Enclosure Type	DEM Number
			Class	Withstanding Rating (rms Sym Amps)		
600Vac 250Vdc	30-1200	Fusible	H K	10,000	1 3R 4,4X 5, 12 Mill Duty	DEM-0203 0204 0205
			H K	200,000		
		No Ⓛ Fuse	H K	10,000		
			H K	10,000		



TC10323R

Double-throw Safety Switch

Max. System Voltage	Ampere Rating	Switch Type	Class	Withstanding Rating (rms Sym Amps)	Enclosure Type	DEM Number
600Vac 250Vdc	30-600	No Fuse	—	—	1②	DEM-0206

① Non-fusible switch withstand ratings apply when protected by corresponding listed fuse type.

② 100-200 amp also available as Type 3R (General Duty only).

Enclosure Types

Type 1 enclosures are suitable for indoor use primarily to provide protection against contact with the enclosed equipment and where unusual service environments do not exist.

Type 3R enclosures are intended for outdoor use to provide a degree of protection against falling rain, sleet, and external enclosure ice formation.

Type 4, 4X enclosures are intended for indoor or outdoor use to provide a degree of protection against windblown dust and

rain, and splashing or hose-directed water and external enclosure ice formation. Additionally, these enclosures meet 4X description by providing a degree of protection against corrosion.

Type 5, 12 enclosures are intended for indoor use primarily to provide a degree of protection against settling airborne and circulating dust, falling dirt and dripping, non-corrosive liquids.



DEM - 0204

GE Safety Switches

Spec-Setter™ Safety Switches, Heavy Duty Type TH

30-1200 Amperes
480 and 600 Volts ac.
600 Volts dc

Table with columns for Schematic Diagram, Max. Ampere Rating, Indoor/Outdoor types, Water and Dust-tight types, Drip and Dust-tight types, and Horsepower Ratings (ac/dc).

600 Volts—Fusible

Table for 600 Volts—Fusible switches, including Two-pole, 600 Volts dc and Three-pole, 480, 480Y/277 and 600 Volts ac—250 Volts dc.

600 Volts—No Fuse

Table for 600 Volts—No Fuse switches, including Two-pole, 600 Volts dc and Four-pole, 480 and 600 Volts ac.

- ① 200-600 amp devices available factory reversed for bottom feed. Add "B" suffix to Catalog Number (e.g., TH3365B). UL Listed.
② 30-200 amp devices have removable closing cap. Larger ampere devices require field cut openings. Order hubs separately.
③ Type TH electrical performance does not apply to Type TC switches. Class "L" fuses are ac only.
④ Not CSA Certified.
⑤ 250 volts ac or 250 volts dc only. Compact enclosure.
⑥ Use molded case switch in circuit breaker enclosure.
⑦ Use four poles of six-pole switch.
⑧ Not CSA Certified.

NOTES:



GE Safety Switches

DEM - 0212

Spec-Setter™ Safety Switches, Dimensions

TH, Type 4/4X, 12 and Mill Duty Enclosures

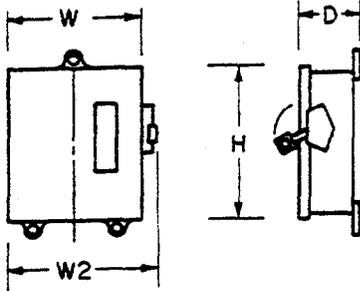


Fig. 1

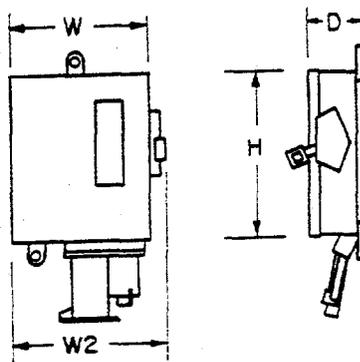


Fig. 2

Approximate Dimensions In inches

Switch Catalog Number	W	H	D	W2
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TH, Type 4/4X — Figure 1

TH2221SS	7 ³ / ₈	11 ³ / ₈	5 ¹ / ₁₆	8 ¹ / ₂
TH2222SS	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₂
TH2261SSDC	9 ³ / ₈	13 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
TH2262SSDC	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
TH2263SSDC	13 ¹ / ₂	25 ³ / ₈	5 ¹ / ₁₆	14 ¹ / ₄
TH3221SS	7 ³ / ₈	11 ³ / ₈	5 ¹ / ₁₆	8 ¹ / ₂
TH3222SS	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
TH3223SS	13 ¹ / ₂	25 ³ / ₈	5 ¹ / ₁₆	14 ¹ / ₄
TH3224SS	14 ¹ / ₂	35 ³ / ₈	5 ¹ / ₁₆	15 ¹ / ₄
TH3225SS	24 ³ / ₈	59 ³ / ₁₆	8 ³ / ₈	25 ³ / ₄
TH3226SS	24 ³ / ₈	59 ³ / ₁₆	8 ³ / ₈	25 ³ / ₄
TH3321SS	7 ³ / ₈	11 ³ / ₈	5 ¹ / ₁₆	8 ¹ / ₂
TH3322SS	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
TH3361SS	9 ³ / ₈	13 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
TH3362SS	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
TH3363SS	13 ¹ / ₂	25 ³ / ₈	5 ¹ / ₁₆	14 ¹ / ₄
TH3364SS	14 ¹ / ₂	35 ³ / ₈	5 ¹ / ₁₆	15 ¹ / ₄
TH3365SS	24 ³ / ₈	59 ³ / ₁₆	8 ³ / ₈	25 ³ / ₄
TH3366SS	24 ³ / ₈	59 ³ / ₁₆	8 ³ / ₈	25 ³ / ₄
TH4321SS	7 ³ / ₈	11 ³ / ₈	5 ¹ / ₁₆	8 ¹ / ₂
TH4322SS	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
TH4323SS	13 ¹ / ₂	25 ³ / ₈	5 ¹ / ₁₆	14 ¹ / ₄
TH4324SS	13 ¹ / ₂	35 ³ / ₈	5 ¹ / ₁₆	15 ¹ / ₄
TH4325SS	24 ³ / ₈	59 ³ / ₁₆	8 ³ / ₈	25 ³ / ₄
TH4326SS	24 ³ / ₈	59 ³ / ₁₆	8 ³ / ₈	25 ³ / ₄
THN2261SSDC	9 ³ / ₈	13 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
THN2262SSDC	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
THN2263SSDC	13 ¹ / ₂	25 ³ / ₈	5 ¹ / ₁₆	14 ¹ / ₄
THN3361SS	9 ³ / ₈	13 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
THN3362SS	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
THN3363SS	13 ¹ / ₂	25 ³ / ₈	5 ¹ / ₁₆	14 ¹ / ₄
THN3364SS	14 ¹ / ₂	35 ³ / ₈	5 ¹ / ₁₆	15 ¹ / ₄
THN3365SS	24 ³ / ₈	59 ³ / ₁₆	8 ³ / ₈	25 ³ / ₄
THN3366SS	24 ³ / ₈	59 ³ / ₁₆	8 ³ / ₈	25 ³ / ₄

TH, Type 12 — Figure 1

TH2221J	7 ³ / ₈	11 ³ / ₈	5 ¹ / ₁₆	8 ¹ / ₂
TH2222J	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₂
TH2261JDC	9 ³ / ₈	13 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
TH2262JDC	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
TH2263JDC	13 ¹ / ₂	25 ³ / ₈	5 ¹ / ₁₆	14 ¹ / ₄
TH3221J	7 ³ / ₈	11 ³ / ₈	5 ¹ / ₁₆	8 ¹ / ₂
TH3222J	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
TH3223J	13 ¹ / ₂	25 ³ / ₈	5 ¹ / ₁₆	14 ¹ / ₄
TH3224J	14 ¹ / ₂	35 ³ / ₈	5 ¹ / ₁₆	15 ¹ / ₄
TH3225J	24 ³ / ₈	59 ³ / ₁₆	8 ³ / ₈	25 ³ / ₄
TH3226J	24 ³ / ₈	59 ³ / ₁₆	8 ³ / ₈	25 ³ / ₄
TH3321J	7 ³ / ₈	11 ³ / ₈	5 ¹ / ₁₆	8 ¹ / ₂
TH3322J	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
TH3361J	9 ³ / ₈	13 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
TH3362J	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
TH3363J	13 ¹ / ₂	25 ³ / ₈	5 ¹ / ₁₆	14 ¹ / ₄
TH3364J	14 ¹ / ₂	35 ³ / ₈	5 ¹ / ₁₆	15 ¹ / ₄
TH3365J	24 ³ / ₈	59 ³ / ₁₆	8 ³ / ₈	25 ³ / ₄
TH3366J	24 ³ / ₈	59 ³ / ₁₆	8 ³ / ₈	25 ³ / ₄
TH4321J	7 ³ / ₈	11 ³ / ₈	5 ¹ / ₁₆	8 ¹ / ₂
TH4322J	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
TH4323J	13 ¹ / ₂	25 ³ / ₈	5 ¹ / ₁₆	14 ¹ / ₄
TH4324J	14 ¹ / ₂	35 ³ / ₈	5 ¹ / ₁₆	15 ¹ / ₄
TH4325J	24 ³ / ₈	59 ³ / ₁₆	8 ³ / ₈	25 ³ / ₄
TH4326J	24 ³ / ₈	59 ³ / ₁₆	8 ³ / ₈	25 ³ / ₄
TH2261JDC	9 ³ / ₈	13 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
TH2262JDC	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
TH2263JDC	13 ¹ / ₂	25 ³ / ₈	5 ¹ / ₁₆	14 ¹ / ₄
THN3361J	9 ³ / ₈	13 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
THN3362J	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
THN3363J	13 ¹ / ₂	25 ³ / ₈	5 ¹ / ₁₆	14 ¹ / ₄
THN3364J	14 ¹ / ₂	35 ³ / ₈	5 ¹ / ₁₆	15 ¹ / ₄
THN3365J	24 ³ / ₈	48 ¹ / ₁₆	8 ³ / ₈	25 ³ / ₄
THN3366J	24 ³ / ₈	48 ¹ / ₁₆	8 ³ / ₈	25 ³ / ₄

Approximate Dimensions In inches

Switch Catalog Number	W	H	D	W2
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TH, Type Mill Duty — Figure 1

TH2221M, MSS	7 ³ / ₈	11 ³ / ₈	5 ¹ / ₁₆	9 ¹ / ₂
TH2222M, MSS	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	11 ¹ / ₂
TH2223M, MSS	13 ¹ / ₂	25 ³ / ₈	5 ¹ / ₁₆	15 ¹ / ₄
TH2224M, MSS	14 ¹ / ₂	35 ³ / ₈	5 ¹ / ₁₆	16 ¹ / ₄
TH2261MDC, MSSDC	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	11 ¹ / ₄
TH2262MDC, MSSDC	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	11 ¹ / ₄
TH2263MDC, MSSDC	13 ¹ / ₂	25 ³ / ₈	5 ¹ / ₁₆	15 ¹ / ₄
TH3321M, MSS	7 ³ / ₈	11 ³ / ₈	5 ¹ / ₁₆	9 ¹ / ₄
TH3322M, MSS	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	11 ¹ / ₄
TH3323M, MSS	13 ¹ / ₂	25 ³ / ₈	5 ¹ / ₁₆	15 ¹ / ₄
TH3324M, MSS	14 ¹ / ₂	35 ³ / ₈	5 ¹ / ₁₆	16 ¹ / ₄
TH3325M, MSS	24 ³ / ₈	59 ³ / ₁₆	8 ³ / ₈	25 ³ / ₄
TH3326M, MSS	24 ³ / ₈	59 ³ / ₁₆	8 ³ / ₈	25 ³ / ₄
TH3361M, MSS	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	11 ¹ / ₄
TH3362M, MSS	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	11 ¹ / ₄
TH3363M, MSS	13 ¹ / ₂	25 ³ / ₈	5 ¹ / ₁₆	15 ¹ / ₄
TH3364M, MSS	14 ¹ / ₂	35 ³ / ₈	5 ¹ / ₁₆	16 ¹ / ₄
TH3365M, MSS	24 ³ / ₈	59 ³ / ₁₆	8 ³ / ₈	25 ³ / ₄
TH3366M, MSS	24 ³ / ₈	59 ³ / ₁₆	8 ³ / ₈	25 ³ / ₄
THN2261MDC, MSSDC	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	11 ¹ / ₄
THN2262MDC, MSSDC	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	11 ¹ / ₄
THN2263MDC, MSSDC	13 ¹ / ₂	25 ³ / ₈	5 ¹ / ₁₆	15 ¹ / ₄
THN3361M, MSS	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	11 ¹ / ₄
THN3362M, MSS	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	11 ¹ / ₄
THN3363M, MSS	13 ¹ / ₂	25 ³ / ₈	5 ¹ / ₁₆	15 ¹ / ₄
THN3364M, MSS	14 ¹ / ₂	35 ³ / ₈	5 ¹ / ₁₆	16 ¹ / ₄
THN3365M, MSS	24 ³ / ₈	48 ¹ / ₁₆	8 ³ / ₈	25 ³ / ₄
THN3366M, MSS	24 ³ / ₈	48 ¹ / ₁₆	8 ³ / ₈	25 ³ / ₄

THR, Copper Lug — Figure 1

THR3361JCL	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
THR3362JCL	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
THR3363JCL	13 ¹ / ₂	25 ³ / ₈	5 ¹ / ₁₆	14 ¹ / ₄
THR3364JCL	14 ¹ / ₂	35 ³ / ₈	5 ¹ / ₁₆	15 ¹ / ₄
THR3365JCL	24 ³ / ₈	59 ³ / ₁₆	8 ³ / ₈	25 ³ / ₄
THR3366JCL	24 ³ / ₈	59 ³ / ₁₆	8 ³ / ₈	25 ³ / ₄
THN3361JCL	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
THN3362JCL	9 ³ / ₈	19 ³ / ₈	5 ¹ / ₁₆	10 ¹ / ₄
THN3363JCL	13 ¹ / ₂	25 ³ / ₈	5 ¹ / ₁₆	14 ¹ / ₄
THN3364JCL	14 ¹ / ₂	35 ³ / ₈	5 ¹ / ₁₆	15 ¹ / ₄
THN3365JCL	24 ³ / ₈	48 ¹ / ₁₆	8 ³ / ₈	25 ³ / ₄
THN3366JCL	24 ³ / ₈	48 ¹ / ₁₆	8 ³ / ₈	25 ³ / ₄

TH, 6-pole — Figure 1

TH6621	19	14 ³ / ₈	6	19 ¹ / ₂
TH6622	19	24 ³ / ₈	6	19 ¹ / ₂
TH6623	19	24 ³ / ₈	6	19 ¹ / ₂
TH6624	26 ¹ / ₄	35 ³ / ₈	6	27
TH6661	19	14 ³ / ₈	6	19 ¹ / ₂
TH6662	19	24 ³ / ₈	6	19 ¹ / ₂
TH6663	19	24 ³ /<		

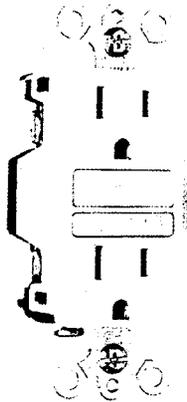
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28.3

ITEM # (3)

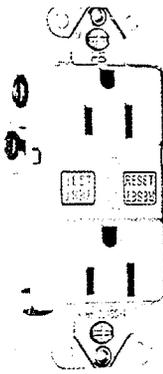
Pass & Seymour
LEGRAND®

Ground Fault Circuit Interrupter Receptacles

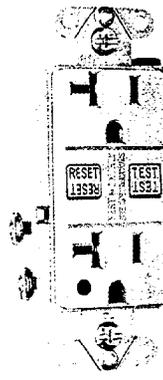
Standard & Specification Grade 15 & 20A., 120V.



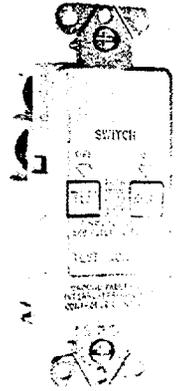
1591-RW



1591-SI



2091-SHGGRY



2081-SI

Standard Grade

Push-In Back and Side Wired Duplex

Rating			Description	NEMA Config.	Catalog Number
Amps	Feed-Thru Amps	Volts AC			
15	20	120	Feed-Thru, Brown	5-15R	1591-R
15	20	120	Feed-Thru, Ivory	5-15R	1591-RI
15	20	120	Feed-Thru, White	5-15R	1591-RW
15	20	120	Feed-Thru for 4600 Enclosure	5-15R	**1591-R46

**Available in Brown only.

Features

- Shallow design for easy installation.
- Choice of push-in or screw conductor termination.
- Open access screw conductor termination. Will accept solid or stranded wire.
- Easily accessible ground terminal not obstructed by mounting strap.
- Deeply cut, thick headed terminal screws improves screw driver grip.
- Large, easy to operate test/reset buttons.
- Supplied with matching plate.
- Combination slotted/Phillips head mounting and terminal screws.

Specification Grade

Side Wired Only Duplex

Rating			Description	NEMA Config.	Catalog Number
Amps	Feed-Thru Amps	Volts AC			
15	20	120	▲ Feed-Thru, Brown	5-15R	*1591-S
20	20	120	▲ Feed-Thru, Brown	5-20R	2091-S

▲ For colors other than Brown, specify brown catalog number with color suffix as follows: Black-BK, Gray-GRY, Ivory-I, Red-RED (20A. only), White-W.

* Available with Indicator Light in Brown, Ivory-I, White-W. Add suffix -L to base catalog number. Example: 1591-SWL.

Features

- Shallow design.
- Screw terminals.
- 15 and 20 Amp.
- Hospital Grade available.
- Combination slotted/Phillips head mounting and terminal screws.
- Indicator light (power up) available.

Hospital Grade

Side Wired Only Duplex

Rating			Description	NEMA Config.	Catalog Number
Amps	Feed-Thru Amps	Volts AC			
15	20	120	▲ Feed-Thru Receptacle	5-15R	*1591-SHG
20	20	120	▲ Feed-Thru Receptacle	5-20R	*2091-SHG

* Available with indicator light in 15A Ivory -I and 20A Ivory -I. Red -RED, add suffix -L to base catalog number. Example: 1591-SHGL.

▲ For colors other than Brown, specify brown catalog number with color suffix as follows: Gray-GRY, Ivory-I, Red-RED, White-W.

GFCI Switch/Motor Control

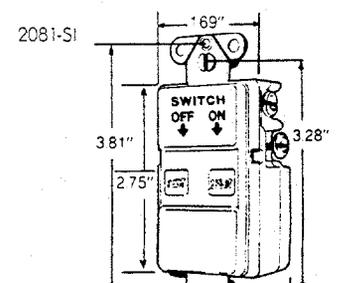
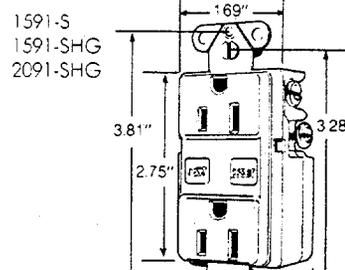
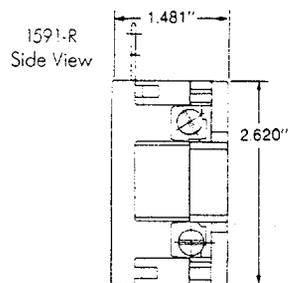
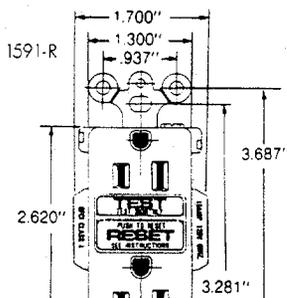
Rating		Description	Catalog Number
A.	V. AC		
20	120	GFCI, Switch/Motor Control, Ivory with Screw Terminals	2081-SI
20	120	GFCI, Switch/Motor Control, White with Screw Terminals	2081-SW

Application

UL Listed as a miscellaneous motor controller with a 1½ HP switch rating. Provides hardwire GFCI protection for swimming pool equipment, spas, hot tubs, etc. with convenient on/off switching and reset capability. Also approved for use as an industrial motor controller. Combination slotted/Phillips head mounting and terminal screws.

Dimensions

Compliances UL943 & UL498 (except 2081-S Series)



ITEM # (2)

111
29.3
GE Panelboards

Circuit Breaker Interrupting Ratings

Molded Case Circuit Breakers Interrupting Ratings

Molded Case Circuit Breakers						Federal Specs C/S Class W-C-375B	UL Listed Interrupting Ratings in Thousand Amps								
Construction	Frame	Trip Range (Amps)	No. Poles	Rated Volts			rms Symmetrical ac volts								
				ac	dc		120	120/240	240	277	480Y/277	480	600	125	250
HQ Frames	THQB THQL	15-70	1	120/240	—	12a	10	10	—	—	—	—	—	—	—
		15-125	2	120/240	—	12a	—	10	—	—	—	—	—	—	—
		15-100	2, 3	240	—	12b	—	—	10	—	—	—	—	—	—
HHQ Frames	THHQL THHQB	15-70	1	120/240	—	14a	22	22	—	—	—	—	—	—	—
		15-125	2	120/240	—	14a	—	22	—	—	—	—	—	—	—
		15-100	2, 3	240	—	14b	—	—	22	—	—	—	—	—	—
XQ Frames	TXQL, TXQB	15-30	1, 2	120/240	—	15a	—	65	—	—	—	—	—	—	—
		15-30	3	240	—	15b	—	—	65	—	—	—	—	—	—
Standard Frames	TEY	15-100	1	277	125	—	—	—	65	14	—	—	—	10	—
		15-100	2, 3	480Y/277	250	—	—	—	65	—	14	—	—	—	10
	TEB	15-100	1	120	125	12a	10	10	—	—	—	—	—	5	—
		15-100	2	240	250	12b	—	—	10	—	—	—	—	—	5
	TED	15-100	1	277	125	13a	—	—	—	14	—	—	—	—	10
		15-100	2	480	250	13b	—	—	—	—	—	—	—	—	—
		15-150	3	480	—	13c	—	—	—	—	—	—	—	—	—
		15-100	3	600	—	16a	—	—	—	—	—	—	—	—	—
		110-150	3	600	—	N/A	—	—	—	—	—	—	—	—	—
		110-150	3	600	—	N/A	—	—	—	—	—	—	—	—	—
	TFJ	70-225	2, 3	240	—	12c	—	—	10	—	—	—	—	—	—
		70-225	2	480	250	20a	—	—	25	—	—	—	—	—	—
		70-225	2	480	250	20a	—	—	25	—	—	—	—	—	—
		70-225	3	600	—	20a	—	—	25	—	—	—	—	—	—
	SFH	70-250	3	600	—	20a, 22a	—	—	65	—	—	—	—	—	—
		70-250	3	600	—	21a, 23a	—	—	100	—	—	—	—	—	—
	TJD	250-400	2, 3	240	250 ^③	14c	—	—	22	—	—	—	—	—	—
	TJJ	125-400	2, 3	600	250 ^③	21a	—	—	42	—	—	—	—	—	10
		125-400	2, 3	600	250 ^③	21a	—	—	42	—	—	—	—	—	10
	TJK6	250-600	2, 3	600	250 ^③	21a	—	—	42	—	—	—	—	—	10
TKM8	300-800	2, 3	600	250 ^③	21a	—	—	42	—	—	—	—	—	10	
	600-1200	2, 3	600	—	21a	—	—	42	—	—	—	—	—	—	
SKH8	300-800	3	600	—	21a, 23a	—	—	65	—	—	—	—	—	—	
	600-1200	3	600	—	21a, 23a	—	—	65	—	—	—	—	—	—	
Hi-Break [®] Frames	THED	15-30	1	277	125	13a	—	—	65	65	—	—	—	20 ^③	—
		15-100	2	480	250	22a	—	—	—	—	—	—	—	—	20 ^③
		110-150	3	480	—	—	—	—	—	—	—	—	—	—	—
		15-100	3	600	—	—	—	—	—	—	—	—	—	—	—
		110-150	3	600	—	—	—	—	—	—	—	—	—	—	—
		125-225	2, 3	240	—	—	—	—	—	—	—	—	—	—	—
	THFK	70-225	2, 3	600	250 ^③	20a	—	—	65	—	—	—	—	—	20 ^③
		70-225	2, 3	600	250 ^③	23a	—	—	65	—	—	—	—	—	20 ^③
Hi-Interrupting Circuit Breakers	TEL	15-150	3	480	—	13b	—	—	100	—	—	—	—	—	—
		70-225	3	600	—	—	—	—	100	—	—	—	—	—	—
		250-400	3	480	—	—	—	—	85	—	—	—	—	—	—
		250-400	3	480	—	—	—	—	85	—	—	—	—	—	—
Fuseless Current Limiting Circuit Breakers	THLC1	15-150	3	480	—	—	—	—	200	—	—	—	150	—	—
		125-225	3	480	—	—	—	—	200	—	—	—	150	—	—
		250-400	3	480	—	—	—	—	200	—	—	—	150	—	—
Fused Current Limiting Frames	TB1	15-100	2, 3	600	—	26a	—	—	200 ^③	—	—	—	200 ^③	—	—
		125-400	2, 3	600	—	26a	—	—	200 ^③	—	—	—	200 ^③	—	—
		300-600	3	600	—	26a	—	—	200 ^③	—	—	—	200 ^③	—	—
		600-800	3	600	—	26a	—	—	200 ^③	—	—	—	200 ^③	—	—
Molded Case Circuit Breakers w/MicroVersaTrip [®] 4-Function	TJ4V	150-600	3	600	—	21a	—	—	42	—	—	—	—	—	
		800-1200	3	600	—	21a	—	—	42	—	—	—	—	—	
		150-600	3	600	—	23a	—	—	100	—	—	—	—	—	
		800-1200	3	600	—	23a	—	—	100	—	—	—	—	—	

① UL Listed for only 100,000 AIC when internally mounted accessories are used.

② DC ratings above 10,000 AIC are not UL Listed.

③ 3-pole devices are not dc rated.

Molded Case Switches Short Circuit Withstand Rating

Underwriters Laboratories is now listing molded case switches with short circuit withstand ratings when protected by specified protective devices. Previously the maximum short circuit withstand rating for molded case switches was six times the continuous current rating of the switch.

Publication GIZ-2691-27 lists molded case switches and their UL Listed short circuit withstand ratings which are marked on each switch. Protective devices for the switch must be on the line side of the switch.

13 PANELBOARDS



ITEM # (A)

15.11
29
272

Panelboard Application

Standards

All GF panelboards meet the latest revision of the following standards.

- National Electrical Code-Ref. Article 384.
- UL67 panelboards. UL50 cabinets and boxes. UL943 GFCI. UL489 molded case circuit breakers. UL98 fusible switches.
- CSA listing for Spectra Series™ Power Panelboards.

Note—only panelboards containing all UL Listed devices can be UL labeled.

- NEMA PB1.
- Federal Specifications
 - Panelboards, W-P-115a.
 - Type 1 – Circuit breaker equipped
 - Class 1 – Panelboards
 - Class 2 – Load centers
 - Molded case circuit breakers, WC-375B/GEN.
 - Fusible switches, W-S-865c.

Application

The following classifications and limitations of panelboards have been established by the Underwriters Laboratories and the National Electrical Code. *Note*—an overcurrent protective device is a circuit breaker pole or single fuse. Panelboards have no fire wall ratings.

Lighting Panelboards

- More than 10 percent of panelboard circuits are rated 30 amperes or less, for which neutral connections are provided.
- Maximum 42 overcurrent protective devices per panel (including subfeeds but not main overcurrent protective devices). If more than 42 are required, two or more separate panelboards must be used. Example: A 2-pole device is considered as two overcurrent devices.
- When two or more separate panelboards are used, sub-feed lugs or thru-feed lugs (of same capacity as incoming mains) must be included in all sections except one. Cables or bus bars for interconnection are not included.

Distribution Panelboards

There is no limitation as to the number and rating of branch circuits, except as determined by available enclosures.

Service Entrance Equipment

- Must be located near the point of entrance of building supply conductors.
- Lighting and appliance panels must have one but not more than two main disconnects with a current rating equal to or less than panelboard rating.
- Distribution panels may have up to six operating handles to entirely disconnect panelboard from the source.
- Must include connector for bonding and grounding neutral conductor.
- A service entrance-type UL label must be factory installed and will be provided on the equipment (when specified).

Interrupting Ratings—Circuit Breakers

Panelboards have integrated short circuit ratings. When fully rated, the rating is that of the lowest rated device in the panelboard. When series connected rated, the rating is that of the main and branch-tested/UL Listed combination. See table on page 13-5.

Short-circuit Ratings—Fusible Switch Units

The interrupting rating of the fuse must equal or exceed the short-circuit rating of the switch. If it is lower, then the interrupting rating of the switch is the same as the fuse. Switches have no short-circuit rating if renewable fuses are used.

1.2.1J
2.12 - 2.15

GE ELECTRICAL DISTRIBUTION AND CONTROL
 P.O. BOX 95054
 RTE 317
 RALEIGH, NC 27625

DATE : 11/29/94 PAGE : 1
 TIME : 22:35:25 v4.1
 TELEPHONE: (919) 954-4126
 FAX: 8*597-4140

BILL OF MATERIAL: SOIL & GROUND WATER A.11

PROP: 623-31352A

TO: _____

ITEM # (4)
 PAGES 1-19

Valued customer, We are pleased to quote as follows,
 Unless specifically referred to, no addendums are included

ITEM	QTY	CAT #/NAME	DESCRIPTION
1	7		Enclosed NEMA Starter(10G1) SIM TO CR308B404DTAA EX/W 1 CPT 480-120 1 2 PRI & 1 SEC FUSEING 1 3-POS SEL. SW. SPRING RETURN 1 R CLIPS 3 HEATERS
2	3		Enclosed NEMA Starter(10G1) SIM TO CR308B404DTAA EX/W 1 CPT 480-120 1 2 PRI & 1 SEC FUSEING 1 3-POS SEL. SW. SPRING RETURN 1 R CLIPS 3 HEATERS
3	6		Enclosed NEMA Starter(10G1) SIM TO CR308C404DTAA EX/W 1 CPT 480-120 1 2 PRI & 1 SEC FUSEING 1 3-POS SEL. SW. SPRING RETURN 1 R CLIPS 3 HEATERS
4	5		Enclosed NEMA Starter(10G1) SIM TO CR308D404ETAA EX/W 1 CPT 480-120 1 2 PRI & 1 SEC FUSEING 1 3-POS SEL. SW. SPRING RETURN 1 R CLIPS 3 HEATERS

 NAME : SOIL & GROUND WATER A.11
 PROP # : 31352A

DATE : 11/29/94
 PAGE : 2
 v4.1

AM	QTY	CAT #/NAME	DESCRIPTION
5	3		Enclsd NEMA Starter(10G1) SIM TO CR308D404ETAA EX/W 1 CPT 480-120 1 2 PRI & 1 SEC FUSEING 1 3-POS SEL. SW. SPRING RETURN 1 R CLIPS 3 HEATERS
6	6		Enclsd NEMA Starter(10G1) SIM TO CR308D404ETAA EX/W 1 CPT 480-120 1 2 PRI & 1 SEC FUSEING 1 3-POS SEL. SW. SPRING RETURN 1 R CLIPS 3 HEATERS
7	3		Enclsd NEMA Starter(10G1) SIM TO CR308C404DTAA EX/W 1 CPT 480-120 1 2 PRI & 1 SEC FUSEING 1 3-POS SEL. SW. SPRING RETURN 1 R CLIPS 3 HEATERS
8	3		Gen Purpose Control (10G) SIM TO CR306J402TAA EX/W 1 PUSH BUTTON 3 HEATERS

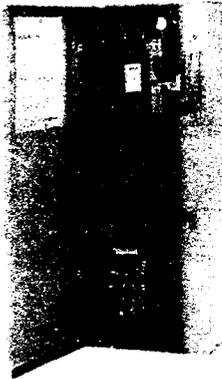


GE NEMA Rated Full Voltage Starters

CR387 Non-Reversing Combination Mag-Break® Magnetic Starters

200 Horsepower Maximum
NEMA Sizes 0-5
600 Volts Maximum
50/60 Hertz

1 NEMA FULL VOLTAGE STARTERS



Typical CR387 starter with Mag-Break protector with current limiter

Application

The CR387 non-reversing starters are designed for more accurate fault protection for motor circuits by utilizing Type TEC Mag-Break motor circuit protectors. The Mag-Break motor circuit protector provides protection on low-level faults, the most prevalent type of motor circuit fault. When 100,000 Ampere interrupting capacity is required on sizes 0-4, a current limiter can be added. Refer to factory installed modifications. The enclosure remains the same with or without the current limiter.

Features

- **Type TEC Mag-Break motor circuit protector** – provides protection against low-level faults. Has adjustable trip.
- **Meets NEC standards** – continuous current ratings and adjustable instantaneous trip ranges meet NEC standards on motor full-load and locked rotor currents.
- **Can eliminate nuisance tripping and provide fault protection** – by setting the Mag-Break instantaneous trip point just above transient motor inrush current.
- **Less than one cycle clearing time** – to open and clear a fault.
- **Refer to page 1-4 for features of basic starter.**

Ordering Directions

1. Order by complete Catalog Number.
Example: A size 2 combination starter is required to control a 15-hp, 230-Volt, 60-Hertz non-reversing motor with FLA of 42.0. The starter will include a Mag-Break motor circuit protector, 230-240 Volt, 60-Hertz coil, and a three-leg block overload. Order 1 – CR387D103EAAA at **\$1122.00, GO-10G1**, and 3 – CR123C460B heaters. **List Price \$9.00 each, GO-10H**. Packaged in quantities of three; must be ordered in multiples of three. Select heaters from appropriate tables on pages 1-69 to 1-73.
2. Order special features or forms not listed by complete description using a listed Catalog Number as reference. Example: Similar to CR387D103EAAA except with OFF-ON selector switch in cover.
Total **List Price** **\$1170.00, GO-10G1**.

Reversing and Multi-Speed Forms

Refer to page 1-36 for listing of reversing forms in NEMA Sizes 0-5 with Mag-Break protector. For information on two-speed controllers, contact nearest GE Electrical Distribution & Control sales office or local franchised distributor.

References: Instructions

NEMA Size	Publication Number
0,1	GEH-5193
2	GEH-4776
3	GEH-4806
4	GEH-4807
5	GEH-4839

Factory Installed Modifications	pages 1-52 to 1-58
Field Installed Modification Kits	pages 1-59 to 1-63
Heater Selection Tables	pages 1-69 to 1-73

CR387 Non-Reversing Combination Mag-Break® Magnetic Starters

200 Horsepower Maximum NEMA Sizes 0-5 600 Volts Maximum 50 60 Hertz

1 NEMA FULL VOLTAGE STARTERS

GE Fastrac™ Program items are printed in red type.

CR387 Three-phase, Three-pole Forms, NEMA Types 1, 3R, 12, 4, and 4X Three-leg Protection, 60 Hertz①

List price includes a holding interlock, pressure terminals for the line and load connections, plus a 3-leg block type overload relay (manual reset).

One NO isolated contact on the overload relay is available as an option at **\$24.00, GO-10G**. To order, change letter "A" to "L" as third from last letter of Catalog Number listed in the table for Types 1, 4 and 12 (no external reset) forms.

Example: CR387C223DAAA becomes CR387C223DLAA. If same feature is required for other forms, order by description.

Three heaters should be ordered as separate items. **List Price \$9.00 each, GO-10H**. Packaged in quantities of three; must be ordered in multiples of three. Select heaters by using tables on pages 1-69 to 1-73.

NEMA Size	Maximum Horsepower Rating Ⓞ		Enclosed Continuous Ampere Rating	Circuit Interrupter Rating (Amperes)	NEMA Type 1 General Purpose		NEMA Type 3R Rainproof, Sleet-resistant	NEMA Type 12 Dust-light, Driplight Industrial Use Ⓞ		NEMA Type 4 Watertight, Dust-light (Stainless Steel) Ⓞ	NEMA Type 4X Watertight, Dust-light Corrosion Resistant Polymerc	List Price GO-10G	
	Voltage (60 Hertz)	Horsepower			Catalog Number CR387	List Price GO-10G		No External Reset	External Reset				Catalog Number CR387
0	200-208	1/2	18	3	B123AAAA	762.00	-	B223AAAA	B223AAUA	906.00	B423AAAA	B423ATAA	1336.00
		1-3/4			7	B123BAAA	762.00	B623BAAA	B223BAAA		B223BAUA	B423BAAA		B423BTAA
		3	15	B123CAAA	762.00	B623CAAA	B223CAAA	B223CAUA	B423CAAA	B423CTAA			
		7-1/2	27	30	C123DAAA	1122.00	C623DAAA	C223DAAA	C223DAUA	C423DAAA	C423DTAA	1368.00	
		10	45	50	D123EAAA	1422.00	D623EAAA	D223EAAA	D223EAUA	D423EAAA	D423ETAA	2070.00	
1	230-240	1	18	3	B103AAAA	762.00	-	B203AAAA	B203AAUA	906.00	B403AAAA	B403ATAA	1336.00
		1-3/4			7	B103BAAA	762.00	B603BAAA	B203BAAA		B203BAUA	B403BAAA		B403BTAA
		3	15	B103CAAA	762.00	B603CAAA	B203CAAA	B203CAUA	B403CAAA	B403CTAA			
		7-1/2	27	30	C103DAAA	1122.00	C603DAAA	C203DAAA	C203DAUA	C403DAAA	C403DTAA	1368.00	
		15	45	50	D103EAAA	1422.00	D603EAAA	D203EAAA	D203EAUA	D403EAAA	D403ETAA	2070.00	
2	460-480	1	18	3	B104AAAA	762.00	B604AAAA	B204AAAA	B204AAUA	906.00	B404AAAA	B404ATAA	1336.00
		3			7	B104BAAA	762.00	B604BAAA	B204BAAA		B204BAUA	B404BAAA		B404BTAA
		5	15	B104CAAA	762.00	B604CAAA	B204CAAA	B204CAUA	B404CAAA	B404CTAA			
		7-1/2	27	30	C104DAAA	1122.00	C604DAAA	C204DAAA	C204DAUA	C404DAAA	C404DTAA	1368.00	
		10	45	50	D104EAAA	1422.00	D604EAAA	D204EAAA	D204EAUA	D404EAAA	D404ETAA	2070.00	
3	575-600	1	18	3	B105AAAA	762.00	B605AAAA	B205AAAA	B205AAUA	906.00	B405AAAA	B405ATAA	1336.00
		3			7	B105BAAA	762.00	B605BAAA	B205BAAA		B205BAUA	B405BAAA		B405BTAA
		5	15	B105CAAA	762.00	B605CAAA	B205CAAA	B205CAUA	B405CAAA	B405CTAA			
		7-1/2	27	30	C105DAAA	1122.00	C605DAAA	C205DAAA	C205DAUA	C405DAAA	C405DTAA	1368.00	
		10	45	50	D105EAAA	1422.00	D605EAAA	D205EAAA	D205EAUA	D405EAAA	D405ETAA	2070.00	
4	115 or 120 Volts Separate Control	1	18	3	B105AAAA	762.00	B605AAAA	B205AAAA	B205AAUA	906.00	B405AAAA	B405ATAA	1336.00
		3			7	B105BAAA	762.00	B605BAAA	B205BAAA		B205BAUA	B405BAAA		B405BTAA
		5	15	B105CAAA	762.00	B605CAAA	B205CAAA	B205CAUA	B405CAAA	B405CTAA			
		7-1/2	27	30	C105DAAA	1122.00	C605DAAA	C205DAAA	C205DAUA	C405DAAA	C405DTAA	1368.00	
		10	45	50	D105EAAA	1422.00	D605EAAA	D205EAAA	D205EAUA	D405EAAA	D405ETAA	2070.00	
5	115 or 120 Volts Separate Control	1	18	3	B105AAAA	762.00	B605AAAA	B205AAAA	B205AAUA	906.00	B405AAAA	B405ATAA	1336.00
		3			7	B105BAAA	762.00	B605BAAA	B205BAAA		B205BAUA	B405BAAA		B405BTAA
		5	15	B105CAAA	762.00	B605CAAA	B205CAAA	B205CAUA	B405CAAA	B405CTAA			
		7-1/2	27	30	C105DAAA	1122.00	C605DAAA	C205DAAA	C205DAUA	C405DAAA	C405DTAA	1368.00	
		10	45	50	D105EAAA	1422.00	D605EAAA	D205EAAA	D205EAUA	D405EAAA	D405ETAA	2070.00	

Note: See pages 1-30 to 1-32 for dimension data.
 ① Pricing for 50-Hertz forms (at standard voltages) is the same as shown in table for 60 Hertz. Listed prices for 460-480 Volt also apply to 380-415 Volt, 50 Hertz. See page 1-2 for 380-415 Volt horsepower ratings.
 ② Motor full-load current should not exceed continuous Ampere rating of starter.
 ③ NEMA Types 4 and 12 starters are UL listed to include Class II Groups F and G, Division 2 only, and Class III Hazardous Locations.

References: Instructions

NEMA Size	Publication Number
0, 1	GEH-5193
2	GEH-4776
3	GEH-4806
4	GEH-4807
5	GEH-4839

Factory Installed Modifications pages 1-52 to 1-58
Field Installed Modifications pages 1-59 to 1-63
Heater Selection Tables pages 1-69 to 1-73

4

Mag-Break® Circuit Breakers

Motor Circuit Protectors

Adjustable Magnetic Trip, Non-interchangeable
3-1200 Amperes
480 or 600 Volts ac, 250 Volts dc

High Interrupting Capacity

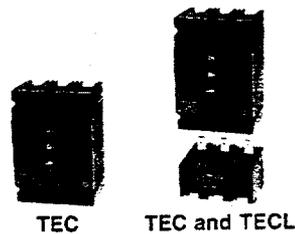
Unfused, three-pole
Type TEML, 3-150 Amperes
65 kA at 480 Volts ac
25 kA at 600 Volts ac
100 kA at 240 Volts ac

TEML For Replacement Use Only
For New Designs, use Spectra RMS™
Mag-Break® Motor Circuit Protectors

Ampere Rating	Adjustable Trip Range (Amps)		Complete Breaker (includes line and load lugs)	
	Lo	Hi	Catalog Number	List Price, GO-1480
30	8	39	TEML36003	\$1080.00
	18	90	TEML36007	1090.00
	42	198	TEML36015	1090.00
	90	390	TEML36030	1090.00
100	300	1300	TEML36100	1750.00
150	450	2000	TEML36150	2730.00

Types TEC, TECL

Ampere Rating	Adjustable Trip Range (Amps)		Complete Breaker (includes line and load lugs)				Add-on Limiter Three-Pole 100.000 Amps RMS IC	
			Two-pole ①, 480V ac		Three-pole, 600V ac		Catalog Number	List Price, GO-141
	Lo	Hi	Catalog Number	List Price, GO-141	Catalog Number	List Price, GO-141		
30	8	39	TEC24003	\$338.00	TEC36003	\$388.00	TECL36003	\$231.00
	18	90	TEC24007	318.00	TEC36007	388.00	TECL36007	231.00
	42	198	TEC24015	318.00	TEC36015	388.00	TECL36015	231.00
	90	390	TEC24030	318.00	TEC36030	388.00	TECL36030	231.00
	180	660	TEC24050	377.00	TEC36050	464.00	TECL36050	231.00
	300	1300	TEC24100	413.00	TEC36100	498.00	TECL36100	524.00
150	600	2700	TEC24150	447.00	TEC36150	545.00	TECL36150 ③	1079.00



Types TFC, TJC, TKC

Ampere Rating	Adjustable Trip Range (Amps)		Complete Breaker (includes line and load lugs)		
			Three-pole		
	Lo	Hi	Catalog Number	List Price, GO-135B	
225	600	1400	TFC36225	\$ 1448.00	
	1000	2250	TFC36225A	1448.00	
400	330	1100	TJC36400E	2599.00	
	550	1670	TJC36400F	2599.00	
	1000	3300	TJC36400G	2599.00	
	1200	4000	TJC36400B	2599.00	
600	1000	3300	TJC36800G	3676.00	
	1800	6000	TJC36800H	3676.00	
800	3000	6000	TKC36800L ②	4890.00	
	5000	10000	TKC36800M ②	4890.00	
1200	3000	6000	TKC361200L ②	8412.00	
	5000	10000	TKC361200M ②	8412.00	

Type TBC with Current Limiters

Ampere Rating	Adjustable Trip Range (Amps)		Complete Breaker (includes line and load lugs)		Standard Replacement Current Limiters	
			Three-pole		Catalog Number	List Price, GO-135B
	Lo	Hi	Catalog Number	List Price, GO-135B		
225	550	1670	TBC43225F14F	\$3810.00	TB10F14	\$377.00
	400	3300	TBC43400F14G	5148.00		
600	3000	6000	TBC63600J14L	7443.00	TB10BJ14	543.00
800	2400	6000	TBC83800K22 ③	8622.00	TB15K22	543.00

② -pole furnished in three- case.
balanced three-phase inrush current will trip the circuit breaker at lower than indicated currents. For motors

over 350 hp, use Spectra RMS™ SK frame or circuit breakers with MicroVersa Trip® Plus trip units.

③ TEC in combination with 150 amp, TECL not UL recognized.
Accessories: See pages 4-39 to 4-54.

4 MOLDED CASE CIRCUIT BREAKERS

5

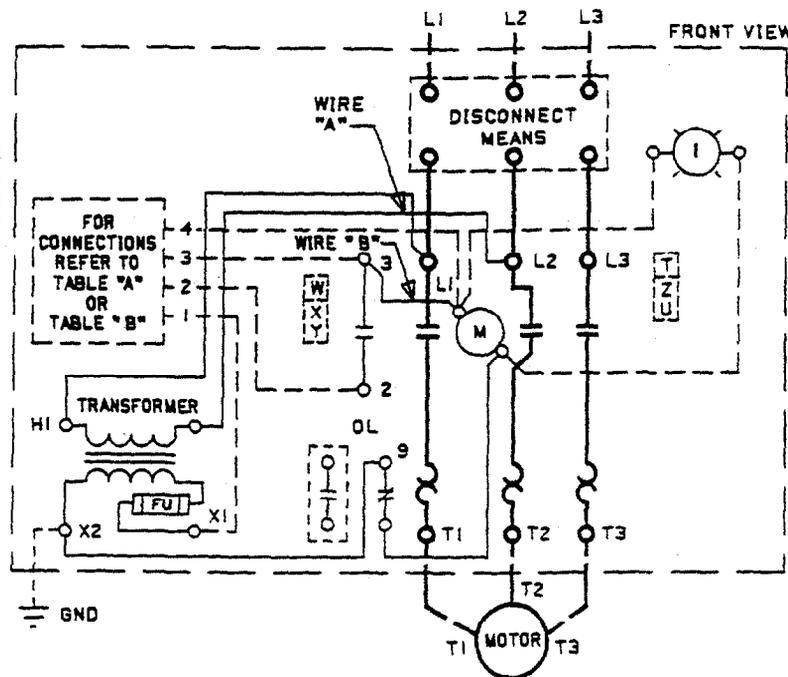


REV NO.	TITLE
CONT ON SHEET	SH NO.

WIRING INSTRUCTIONS FOR:
CR 306, 307, 308 & 387 FULL VOLTAGE, NON-REVERSING
MAGNETIC STARTERS WITH CONTROL TRANSFORMER

FIRST MADE FOR NEMA SIZE 00, 0 & 1

TABLE A	TABLE B
STANDARD PILOT DEVICES	OIL-TIGHT PILOT DEVICES
START-STOP 	START-STOP
PUSHBUTTONS OFF ON 	PUSHBUTTONS OFF ON
(OMIT WIRE "B")	(OMIT WIRE "B")
2 POSITION SELECTOR SWITCH	2 POSITION SELECTOR SWITCH
HAND OFF AUTO 	HAND OFF AUTO
(OMIT WIRE "B")	(OMIT WIRE "B")
REMOTE DEVICE	REMOTE DEVICE
3 POSITION SELECTOR SWITCH	3 POSITION SELECTOR SWITCH



REVISIONS

TORQUE LINE AND LOAD TERMINALS AS SHOWN AT RIGHT

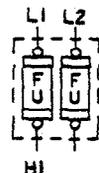
CR306	25	LB-IN	25	LB-IN
CR307	AS MARKED	25	LB-IN	
CR308	35	LB-IN	25	LB-IN
CR387	AS MARKED	25	LB	

USE 75°C COPPER CONDUCTORS ONLY. FOR FIELD WIRING.

-NOMENCLATURE-

M-LINE CONTACTOR
 OL-THERMAL OVERLOAD RELAY
 I-INDICATING LIGHT
 FU-FUSE
 X-INDICATES CONTACT CLOSED

CONTROL CIRCUIT FUSING



EXTRA SECONDARY FUSE



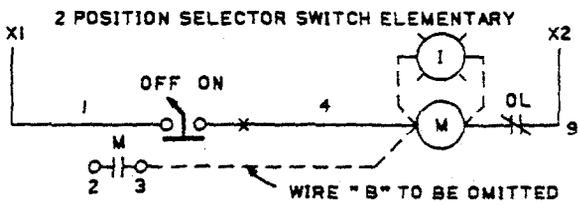
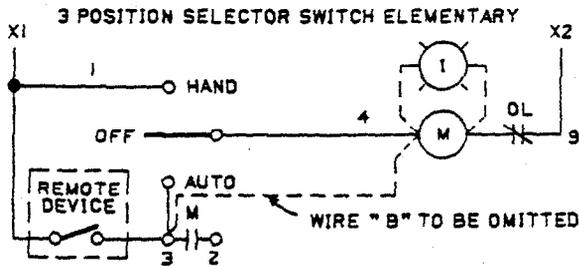
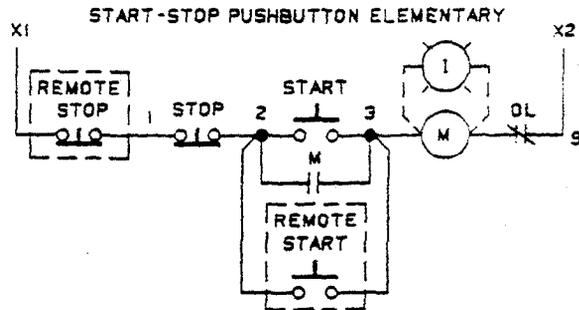
FOR CSA - GND. KIT
 1/2 IN. CONDUIT 55-2134098001
 3/4 IN. CONDUIT 55-2134098002

NOTE: REFER TO THE NATIONAL ELECTRICAL CODE. ADDITIONAL CONTROL CIRCUIT OVER-CURRENT PROTECTION MAY BE REQUIRED.

FOR 1-PHASE OPERATION-CHANGE CONNECTION OF WIRE "A" FROM L2 TO L3. CONNECT LINE TO L1 AND L3 AND LOAD TO T1 AND T3.

FOR STARTER WITHOUT DISCONNECT MEANS-WIRE LINE DIRECT TO L1, L2 AND L3 ON STARTER.

FOR EXTRA AUXILIARY CONTACTS- A MAXIMUM OF 4 CONTACTS MAY BE ADDED AT POSITIONS T,U,W,X,Y, & Z FOR SIZE 0 & 1 ONLY.



Sept. 29, 1983
 C. Devisser 55-179677-1637
 85-1834 W. H. M. M. M.

6	7
FT	
622	
WP	
813	

PRINTS TO

MADE BY
 C. DEVISSER 3-20-69

ISSUED
 September 29, 1983

APPROVALS
 J. T. M.

GE E D & C
 BLOOMINGTON ILL.

DIV OR DEPT.
 55-179677

LOCATION
 CONT ON SHEET

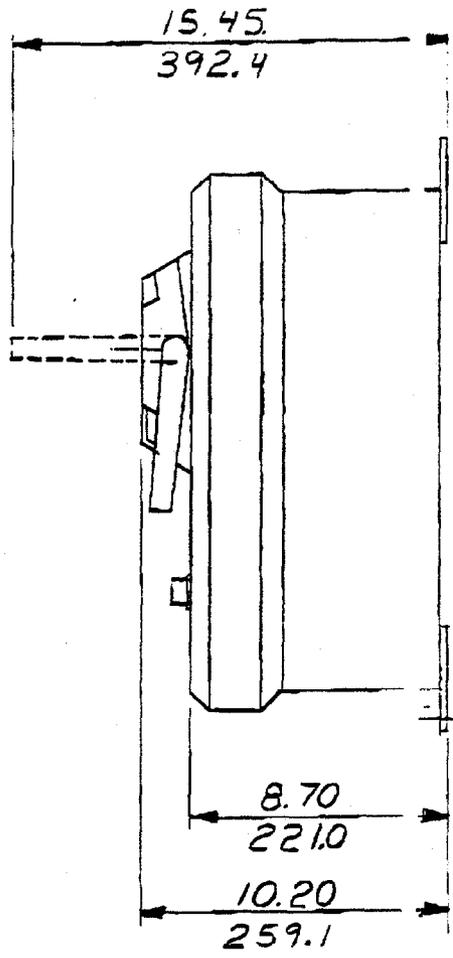
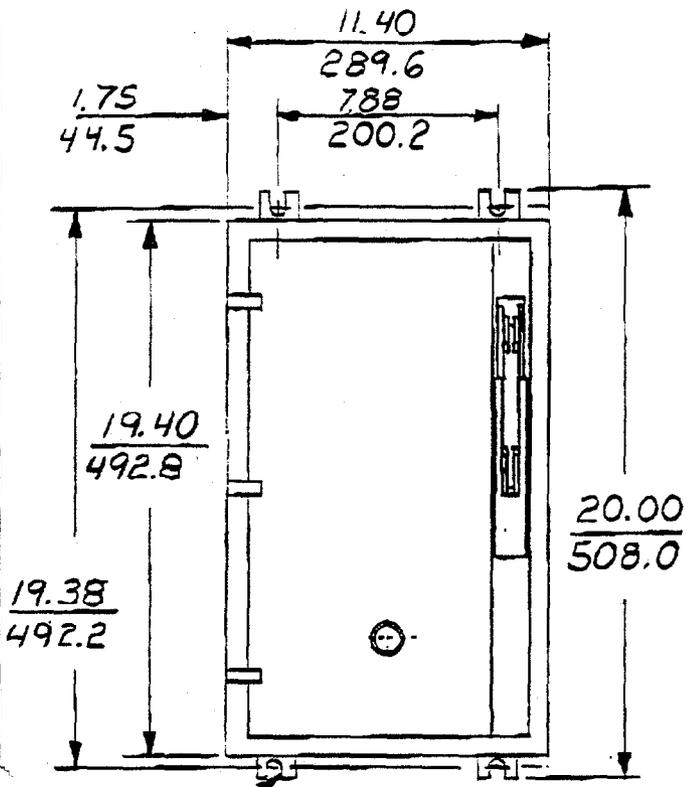
SH NO.

CODE IDENT NO.

REV NO.
CONT ON SHEET SH NO.

TITLE
OUTLINE
FIRST MADE FOR CR207C4 (NEMA 4X)

REVISIONS



4 POINT MOUNTING FOR 3/8 SCREWS

1

622
FT

DUAL DIMENSIONS INCHES / MILLIMETERS

(LW) 387C404CTAA
387B404DTAA
387B404BTAA

PRINTS TO

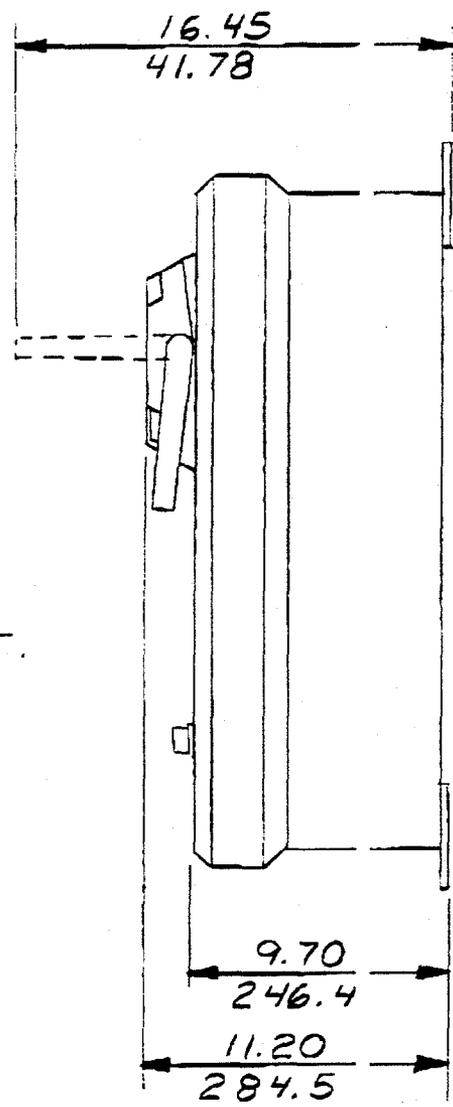
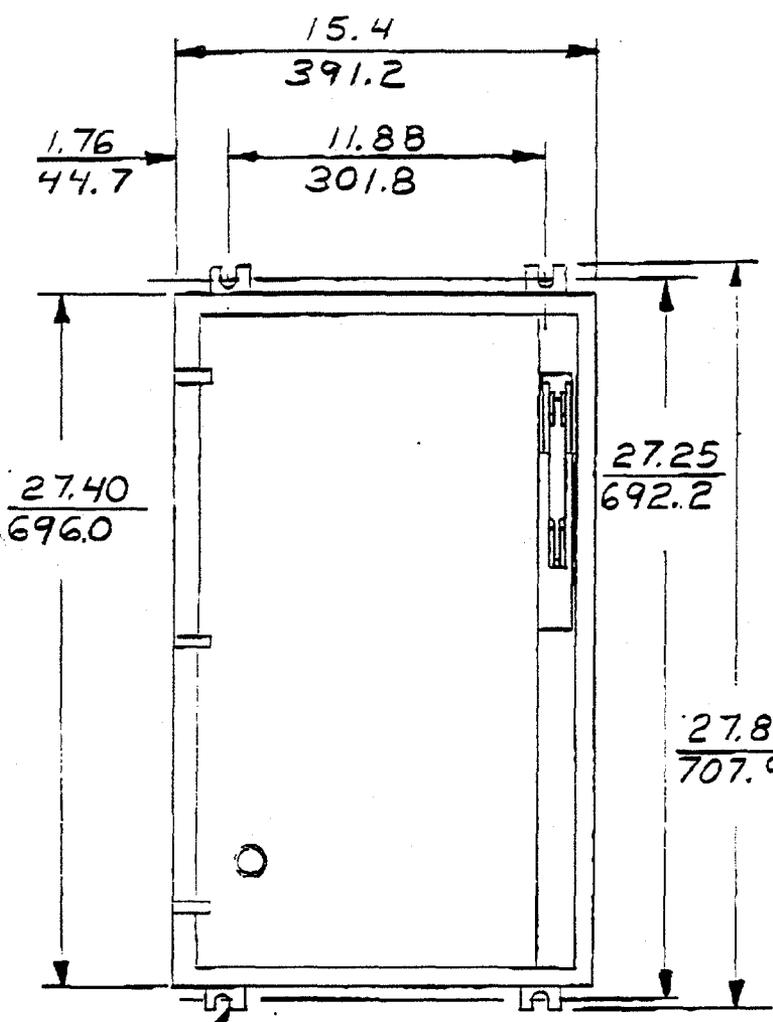
MADE BY <i>Charles Thomas</i> 26 Mar 79	APPROVALS <i>[Signature]</i>	GPC	DIV OR DEPT.	55-202448
ISSUED May 10, 1979		BLOOMINGTON, ILL.	LOCATION	CONT ON SHEET
				SH NO.

REV NO.
CONT ON SHEET SH NO.

TITLE
OUTLINE
FIRST MADE FOR CR207E4

(NE MA 4X)

REVISIONS



4 POINT MOUNTING FOR 3/8 SCREWS

①

387E404ETAALW DUAL DIMENSION

INCHES
MILLIMETERS

622
FT

PRINTS TO

MADE BY
Charles G. Lehman 11 Apr 1979
ISSUED
May 10, 1979

APPROVALS
[Signature]

G.P.C.
BLOOMINGTON, ILL. LOCATION

DIV OR DEPT. 55
CONT ON SHEET 202472
SH NO. CODE IDENT NO.



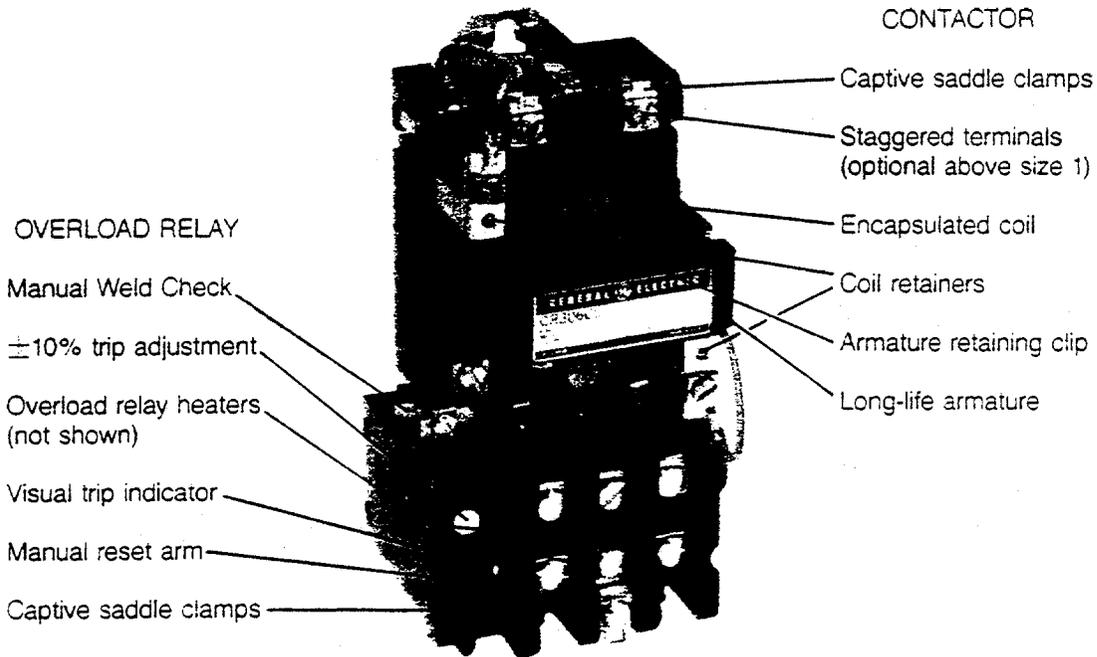
GE NEMA Rated Full Voltage Starters

CR306, CR386 Non-Reversing Magnetic Motor Starters

1600 Horsepower Maximum
NEMA Sizes 00-9
600 Volts Maximum
50/60 Hertz

Basic 300-Line Features

1 NEMA FULL VOLTAGE STARTERS



Typical Size 1 Motor Starter

GE's full voltage (600-Volt maximum) magnetic motor starter has an encapsulated coil and a 3-leg overload relay to protect against overloads in all phases. It is on standard specifications of major manufacturers. The line offers features and benefits most asked for by users.

Forms available include reversing and non-reversing, two-speed, and combination, sizes 00-9.

- **Tool-less contactor disassembly (Sizes 00-4)** — allows quick access for inspection and maintenance. Just release two retainers and pull a clip to get at magnet, coil and contacts.
- **Saddle clamp terminals (Sizes 00-1)** — accommodate ring, spade and stripped wire leads and carry permanent stamped-in identification. Staggered arrangement (standard in sizes 00-1, optional in sizes 2-4) makes wiring easier and helps prevent shorting between phases.
- **Current-carrying components** — contact tips are weld-resistant, silver cadmium oxide (fine silver on sizes 00 and 0 only). Contacts are installed in a wedge configuration for positive make with minimum bounce.
- **Optional PF capacitor terminals** — permit easy connection of power factor correction capacitors between contactor and overload relay for energy conservation.
- **Class 20 overload protection.**
- **Visual trip indicator with manual reset** — to avoid surprise restarts. Reset occurs on arm upstroke so a tripped condition can't be overridden by holding the arm down.
- **Manual weld check** — provides a convenient test against welding of overload relay contacts. Just depress the weld check operator to trip the relay, run a simple continuity test across the relay contacts, then depress the manual reset to return the starter to service.
- **Optional isolated NO contact on the overload relay** — provides means of direct interface with programmable controller or computer to monitor performance and diagnose faults.
- **Dual bimetals** — anticipate overloads, responding to rising current and temperature with faster tripping on severe overloads for better motor protection. Trip points are factory-calibrated for accuracy.
- **±10% trip adjustment** — by turning a dial in the overload relay face allows "tuning" the protection to the motor on the spot.
- **Largest selection of modifications and accessory kits** — includes auxiliary contacts, coils, fifth-coil addition, vertical and horizontal mechanical interlocks, surge suppressors, control circuit fusing, NEMA Type enclosures, push buttons, selector switches, indicating lights, control transformers, space heaters and more.

CR306, CR386 Non-Reversing Magnetic Motor Starters

1600 Horsepower Maximum
NEMA Sizes 00-9
600 Volts Maximum
50/60 Hertz



Typical CR306 Size 4 magnetic motor starter

Application

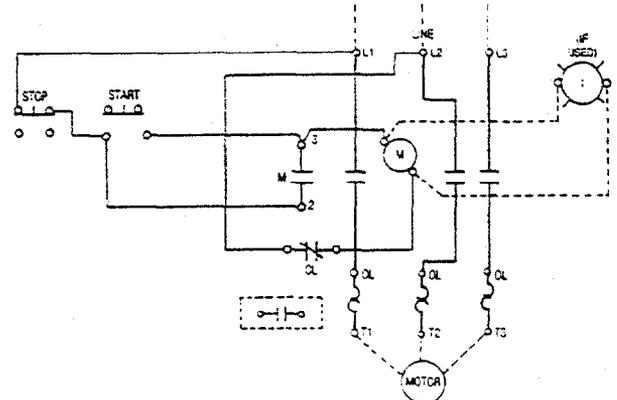
GE's magnetic motor starters listed here may be used for starting full-voltage, non-reversing, single-speed ac motors up to 1600 horsepower, 600 Volts maximum, providing protection to the motor against running or stalled overloads.

Their compact size and ease of wiring make them especially suitable for motor control centers, custom-type control panels, and switchgear equipment. Refer to page 1-4 for features of basic starter.

Ordering Directions

- Specify starter by complete Catalog Number.
Example: CR306C103 is a Size 1 starter with 230-240-Volt, 60-Hertz coil and in Type 1 general purpose enclosure @ **\$246.00, GO-10G.**
- The final letter of the Catalog Number denotes extra auxiliary contacts (sometimes referred to as auxiliary interlocks). Order the desired extra auxiliary contacts by replacing the final letter with one from first column of auxiliary interlock table (see page 1-58).
Example: CR306C103AAB is Size 1 starter with one extra normally open, auxiliary contact @ **\$312.00, GO-10G.**
- Starter forms are available with coils of other ratings than those shown on pages 1-6 to 1-7. Refer to coil suffix table, page 1-3 for information. To order forms with other coil ratings, insert suffix from coil table in place of fifth and sixth numbers of listed starter Catalog Number shown on pages 1-6 to 1-7.
Example: A CR306C102 NEMA Size 1, three-pole starter in Type 1 enclosure with 24-Volt, 60-Hertz coil becomes a CR306C124 Catalog Number.
- For continuous rated motors with a service factor of 1.15 to 1.25 select the heater with maximum motor Amperes equal to or immediately greater than the actual full-load current taken directly from the nameplate of motor. Order heaters by complete Catalog Number from appropriate heater tables on pages 1-69 to 1-73. **List Price \$9.00 each, GO-10H.** Packaged in quantities of three; must be ordered in multiples of three.

Schematic Diagram



Typical Schematic Diagram for CR306 Starter (NEMA Sizes 00-6)

- Order special modifications or forms not listed by complete description using a listed Catalog Number as reference.
Example: Similar to CR306C104 except with 480/120-Volt control transformer and red indicating light in cover.
Total List Price \$483.00, GO-10G.
- Two-phase, four-wire forms are available. Contact nearest GE Electrical Distribution & Control sales office for pricing and ordering information.

Standard Coil Ratings

Standard Voltages (60 Hertz):

24, 115-120, 200-208, 230-240, 265-277, 460-480 and 575-600

Standard Voltages (50 Hertz):

110, 220, 380, 440 and 550

For price adders on special voltage and/or frequency coils, refer to page 1-54.

50-Hertz Starters

Pricing of starters for use on 50 Hertz at standard voltages is the same as shown in table for 60 Hertz. Refer to page 1-2 for three-phase horsepower ratings at 380 Volts, 50 Hertz.

References:

NEMA Size	Publication Number
00-9	GEH-5190
0	GEH-4774
1	GEH-4806
2	GEH-4807
3	GEH-4839
4	GEH-5198
5-9	GEH-5108

- Factory Installed Modifications page 1-52 to 1-58
Field Installed Modification Kits page 1-59 to 1-63
Heater Selection Tables page 1-69 to 73

NEMA FULL VOLTAGE

CR306 Non-Reversing Magnetic Motor Starters

25 Horsepower Maximum
NEMA Sizes 00-3
600 Volts Maximum
50/60 Hertz
Single-phase

1 NEMA FULL VOLTAGE STARTERS

GE Fastrac™ Program items are printed in red type.

CR306 Single-phase, Two-pole Forms, NEMA Types Open, 1, 3R, 12, 4 and 4X, 60 Hertz ①

List price includes a holding interlock. One heater (per starter) for sizes 00-2 and two heaters (per starter) for size 3 should be ordered as separate items. **List Price \$9.00 each, GO-10H.**

Packaged in quantities of three; must be ordered in multiples of three. Select heaters by using tables on pages 1-69 to 1-73.

NEMA Size	Continuous Ampere Rating	Maximum Horsepower②		Open Type		NEMA Type 1 General Purpose		NEMA Type 3R Rainproof Sleet-resistant		NEMA Type 12 ③ Dust-tight, Driptight Industrial Use		NEMA Type 4 Watertight, Dust-tight (Stainless Steel) ③		NEMA Type 4X Watertight, Dust-tight Corrosion-resistant (Polymeric) ③	
		Voltage (60 Hertz)	Horsepower	Catalog Number CR306	List Price, GO-10G	Catalog Number CR306	List Price, GO-10G	Catalog Number CR306	List Price, GO-10G	Catalog Number CR306	List Price, GO-10G	Catalog Number CR306	List Price, GO-10G	Catalog Number CR306	List Price, GO-10G
00	9	115-120 230-240	1/4 1	H002 H003	\$162.00 162.00	H102 H103	\$174.00 174.00	Use NEMA Size 0		Use NEMA Size 0		Use NEMA Size 0		Use NEMA Size 0	
0	18	115-120 230-240	1 2	J002 J003	183.00 183.00	J102 J103	195.00 195.00	J602 J603	\$267.00 267.00	J202 J203	\$267.00 267.00	J402 J403	\$408.00 408.00	J402TAA J403TAA	\$408.00 408.00
1	27	115-120 230-240	2 3	K002 K003	213.00 213.00	K102 K103	225.00 225.00	K602 K603	297.00 297.00	K202 K203	297.00 297.00	K402 K403	441.00 441.00	K402TAA K403TAA	441.00 441.00
1P	36	115-120 230-240	3 5	K002BMA K003BMA	279.00 279.00	K102BKA K103BKA	291.00 291.00	K602BKA K603BKA	363.00 363.00	K202BKA K203BKA	363.00 363.00	K402BKA K403BKA	507.00 507.00	-	-
2	45	115-120 230-240	3 7 1/2	L002 L003	387.00 387.00	L102 L103	447.00 447.00	L602 L603	579.00 579.00	L202 L203	579.00 579.00	L402 L403	879.00 879.00	L402TAA L403TAA	879.00 879.00
3	90	115-120 230-240 460-480 575-600	7 1/2 15 25 25	M002 M003 M004 M005	642.00 642.00 642.00 642.00	M102 M103 M104 M105	762.00 762.00 762.00 762.00	M602 M603 M604 M605	918.00 918.00 918.00 918.00	M202 M203 M204 M205	918.00 918.00 918.00 918.00	M402 M403	1374.00 1374.00	M402TAA M403TAA	1374.00 1374.00

- ① Pricing for 50-Hertz forms (at standard voltages) is the same as shown in table for 60 Hertz. Listed prices for 460-480 Volt also apply to 380-415 Volt, 50 Hertz. See page 1-2 for 380-415 Volt horsepower ratings.
- ② Motor full-load current should not exceed continuous Ampere rating of starter.

- ③ NEMA Types 4 and 12 starters are UL listed to include Class II Groups F and G, Division 2 only, and Class III hazardous locations.
- ④ External reset not included on standard forms.
- ⑤ Catalog Numbers and list prices for NEMA Type 4X forms do not include conduit hubs.

References:
Instructions

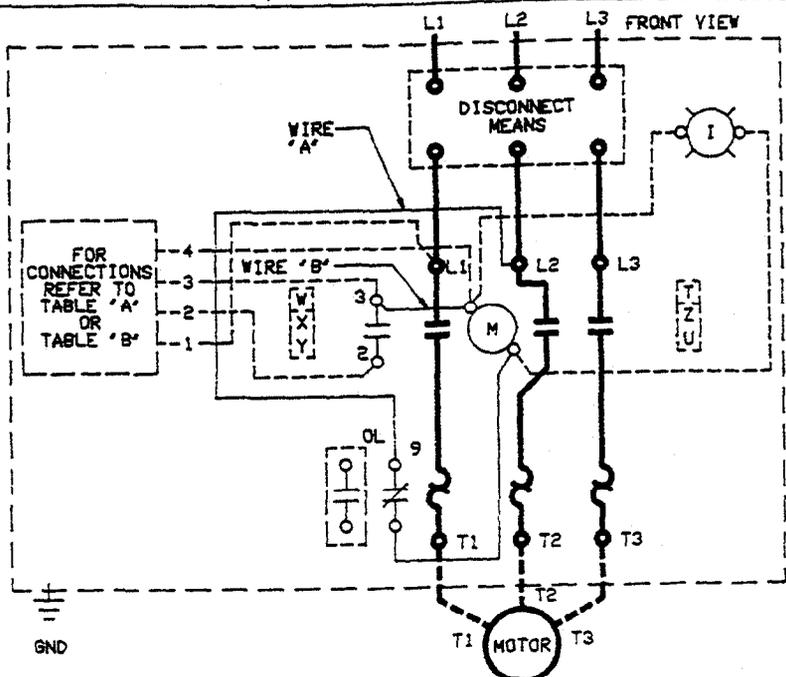
NEMA Size	Publication Number
1	GEH-5190
2	GEH-4774
3	GEH-4806

Factory Installed
Modifications pages 1-52 to 1-58
Field Installed
Modification Kits pages 1-59 to 1-63
Heater Selection
Tables pages 1-69 to 1-73



REV. NO.	TITLE
CONT ON SHEET	SH NO.
WIRING INSTRUCTIONS FOR CR 306, 307, 308 & 387 FULL VOLTAGE NON-REVERSING MAGNETIC STARTERS.	
FIRST MADE FOR NEMA SIZE 00, 0 & 1	

TABLE A STANDARD PILOT DEVICES	TABLE B OIL-TIGHT PILOT DEVICES
START-STOP 1 BLACK 2 WHITE 3 RED	START-STOP 1 2 3
PUSHBUTTONS OFF ON 1 WHITE 4 BLACK (OMIT WIRE 'B')	PUSHBUTTONS OFF ON 1 4 (OMIT WIRE 'B')
2 POSITION SELECTOR SWITCH HAND OFF AUTO 1 RED 3 WHITE 4 BLACK (OMIT WIRE 'B')	2 POSITION SELECTOR SWITCH HAND OFF AUTO 1 3 4 (OMIT WIRE 'B')
REMOTE DEVICE 1 3	REMOTE DEVICE 1 3
3 POSITION SELECTOR SWITCH 1 3	3 POSITION SELECTOR SWITCH 1 3



REVISIONS
8 J. CREASEY AN 93-2433

-NOMENCLATURE-
 M-LINE CONTACTOR
 OL-THERMAL OVERLOAD RELAY
 I-INDICATING LIGHT
 FU-FUSE
 X-INDICATES CONTACT CLOSED

USE 75°C COPPER CONDUCTORS ONLY, FOR FIELD WIRING.

FOR CSA - GND KIT
 1/2 IN. CONDUIT 55-2134036001
 3/4 IN. CONDUIT 55-2134036002

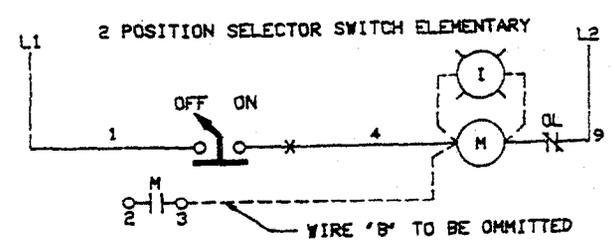
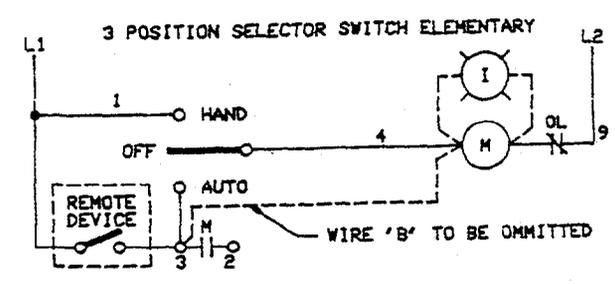
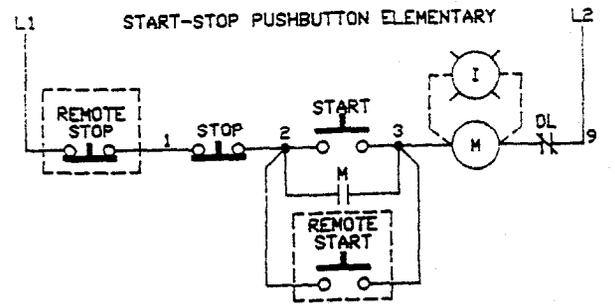
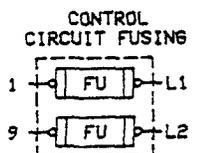
NOTE: ADDITIONAL OVER-CURRENT PROTECTION MAY BE REQUIRED. REFER TO THE NATIONAL ELECTRICAL CODE OR LOCAL ELECTRICAL CODE AS REQUIRED.

FOR 1-PHASE OPERATION-CHANGE CONNECTION OF WIRE 'A' FROM L2 TO L3. CONNECT LINE TO L1 AND L3 AND LOAD TO T1 AND T3.

FOR STARTER WITHOUT DISCONNECT MEANS - WIRE LINE DIRECT TO L1, L2 AND L3 ON STARTER.

FOR EXTRA AUXILIARY CONTACTS- A MAXIMUM OF 4 CONTACTS MAY BE ADDED AT POSITIONS T, U, W, X, Y & Z FOR SIZE 0 & 1 ONLY.

FOR SEPARATE CONTROL SOURCE - OMIT WIRE 'A' AND CONNECT SEPARATE CONTROL SOURCE TO 9 ON OL AND TO 1 ON PILOT DEVICE. WIRE 'A' IS OMITTED AT FACTORY ON ALL STARTERS WITH A COIL VOLTAGE OF 120V OR LESS.



TORQUE LINE AND LOAD TERMINALS AS SHOWN AT RIGHT	LINE	LOAD
CR306	20 LB-IN	20 LB-IN
CR307	AS MARKED	20 LB-IN
CR308	35 LB-IN	20 LB-IN
CR387	AS MARKED	20 LB-IN

ACAD DISK/FILE C89/179340

MADE BY C. DEVISSER 20/MAR/68
 REISSUED April 21, 1993

APPROVAL

GE E D & C
 BLOOMINGTON, IL

ON OR DEPT
 LOCATION
 55-179340
 CONT ON SHEET FL SH NO. 1

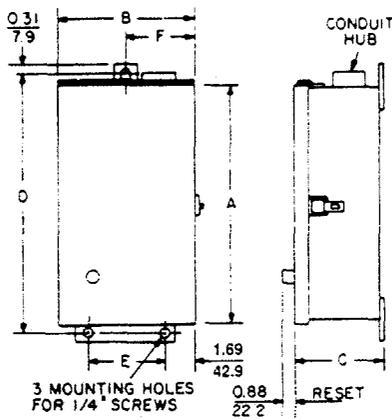
OFFS PRINTS TO

13

CR306 Non-Reversing Magnetic Motor Starters

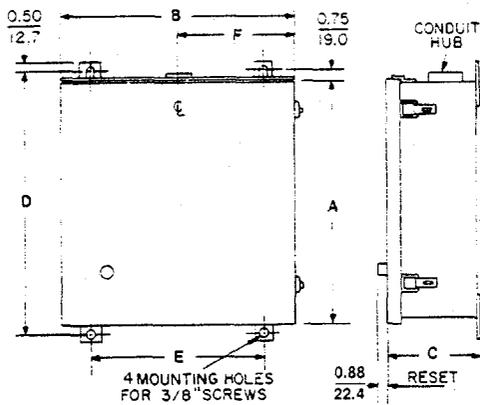
200 Horsepower Maximum
NEMA Sizes 00-5
600 Volts Maximum

Dual Dimensions $\frac{\text{Inches}}{\text{Millimeters}}$ and Weights (For Estimating Only) – CR306, NEMA Types 3R, 4 & 4X



Type 3R, CR306 NEMA Sizes 00-2

NEMA Size	Approximate Dimensions							
	A		B		C		D	
	In.	mm	In.	mm	In.	mm	In.	mm
0.1	14.50	368.3	6.38	162.1	4.75	120.6	15.00	381.0
2	16.50	419.1	7.75	196.8	6.50	165.1	17.00	431.8
NEMA Size	E		F		Approximate Shipping Wt., Lb			
	In.	mm	In.	mm				
	0.1	3.00	76.2	3.19		81.0	2 1/2	
2	4.38	111.2	3.88	98.6	15			



Type 3R, CR306 NEMA Sizes 3-5

NEMA Size	Approximate Dimensions							
	A		B		C		D	
	In.	mm	In.	mm	In.	mm	In.	mm
3	22.00	558.8	17.19	436.6	7.25	184.2	23.50	596.9
4	26.00	660.4	17.19	436.6	7.25	184.2	27.50	698.5
5	42.00	1066.8	22.00	558.8	10.25	260.4	43.50	1104.9
NEMA Size	E		F		Approximate Shipping Wt., Lb			
	In.	mm	In.	mm				
	3	11.00	279.4	3.6		217.9	43	
4	11.00	279.4	3.6	217.9	48			
5	16.00	406.0	11.0	279.4	157			

Types 4 and 4X, CR306 NEMA Sizes 0-5

NEMA Size	Approximate Dimensions												Approximate Shipping Wt., Lb	
	High				Wide				Deep					
	Type 4		Type 4X		Type 4		Type 4X		Type 4		Type 4X		Type 4	Type 4X
	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm		
0.1	15.62	396.7	10.50	266.7	6.38	162.0	7.50	190.5	4.75	120.6	7.00	177.8	16	Contact nearest GE Electrical Distribution & Control sales office
2	17.62	447.5	14.50	368.3	7.75	196.8	7.50	190.5	6.50	165.1	7.00	177.8	20	
3	24.50	622.3	19.38	492.8	17.00	431.8	11.40	289.4	7.25	184.2	8.70	221.0	125	
4	28.50	723.9	25.38	644.6	17.00	431.8	11.40	289.4	7.25	184.2	8.70	221.0	132	
5	44.50	1130.3	-	-	22.00	558.8	-	-	10.25	260.4	-	-	135	

NEMA FULL VOLTAGE

CR123C, CR123F Motor Starter Heaters

NEMA FULL VOLTAGE

Magnetic Starters – Full Voltage Heater Selection Information

To prevent overloading the starter do not select heater(s) for a motor of larger rating than the maximum given on the nameplate for the starter.

For continuous rated motors, with a service factor of 1.15 to 1.25, select the heater with maximum motor Amperes equal to or immediately greater than the motor full-load current (provides a maximum of 125 percent protection). For continuous rated motors with no service factor, multiply the full-load current of the motor by 0.90 and use this value to select the heater.

To protect the heater and starter during a short circuit, provide motor-branch-circuit protection in accordance with Table 430-152 in Article 430 of the National Electrical Code. In no case should the fuse rating exceed 4 times the motor full-load current for single-element fuses, or 2.25 times for dual-element fuses, or the fuse size listed in heater table under Maximum Fuse Rating.

Caution: Overload relays, when furnished with automatic reset, should not be used with two-wire, maintained contact pilot devices such as pressure, float and limit switches, as inadvertent restarting of the motor can occur.

How To Select Heaters

The table below should be used to determine which column of motor full-load Amperes applies for heater selection. Select in order, the basic device – including Catalog Number and description, the NEMA Type of enclosure, and the column to be used in the proper table by NEMA Size.

If full-load Amperes of the motor falls between two ratings, select heaters for the higher rating.

Ordering Information

All CR123C and 123F heaters are packaged three to a carton. Items of these heaters being ordered for either customer's stock or any other purpose, are to be specified in multiples of three (such as 3, 6, 9, 12, 15, etc.). Minimum order quantity is three.

Heater Catalog Number	Maximum Fuse Rating
CR123C (All) CR123F (All)	See Table 430-152

Base Catalog Number Starter/Overload Relay	Description	NEMA Type Enclosure	Quantity Heaters Required	Heater Table Column Page 1-70
CR306	Single phase, 2 pole, Size 00-2	Open	1	W P W P
	Single phase, 2 pole, Size 00-2	1, 3R, 4, 12		
	Single phase, 2 pole, Size 3	Open		
	Single phase, 2 pole, Size 3	1, 3R, 4, 12		
CR306	3 phase, 3 pole, 3-leg protection standard, size 00-5	Open	3	M U C U
	ambient compensated, size 00, 0, 1, 2 & 5	Open		
	ambient compensated, size 3	Open		
	ambient compensated, size 4	Open		
CR306, CR307, CR308, CR387	3 phase, 3 pole, 3-leg protection standard, size 00-5	1, 3R, 4, 12	3	M U C U
	ambient compensated, size 00, 0, 1, 2 & 5	1, 3R, 4, 12		
	ambient compensated, size 3	1, 3R, 4, 12		
	ambient compensated, size 4	1, 3R, 4, 12		
CR309	3 phase, 3-3 pole, 3-leg protection standard, size 00-5	Open	3-Reverser 5-Two-speed	M U C U
	ambient compensated, size 00, 0, 1, 2 & 5	Open		
	ambient compensated, size 3	Open		
	ambient compensated, size 4	Open		
CR309, CR310, CR311, CR390	3 phase, 3-3 pole, 3-leg protection standard, size 00-5	1, 3R, 4, 12	3-Reverser 5-Two-speed	M U C U
	ambient compensated, size 00, 0, 1, 2 & 5	1, 3R, 4, 12		
	ambient compensated, size 3	1, 3R, 4, 12		
	ambient compensated, size 4	1, 3R, 4, 12		
CR324	Panel mounted		See tables, page 1-71	
All NEMA Sizes 6-9	3 phase, 3-leg protection, standard		See tables, page 1-71	
CR124	Single element, panel mounted		See tables, page 1-72	
CR124	Single element, ambient compensated, standard and quick trip		See tables, page 1-73	



GE NEMA Rated Full Voltage Starters

CR123C, CR123F Motor Starter Heaters

NEMA FULL VOLTAGE STARTERS

Magnetic Starters — Full Voltage

NEMA Sizes 00, 0 and 1

Maximum Motor Full-load Amperes				Heater Catalog Number
A	B	C	D	
0.48	0.46	0.45	0.43	CR123C054A
0.55	0.50	0.49	0.48	CR123C060A
0.57	0.57	0.53	0.53	CR123C066A
0.65	0.62	0.59	0.58	CR123C071A
0.69	0.68	0.65	0.64	CR123C078A
0.83	0.80	0.76	0.74	CR123C087A
0.97	0.91	0.84	0.84	CR123C097A
1.03	0.99	0.93	0.92	CR123C109A
1.12	1.09	1.04	1.02	CR123C118A
1.26	1.22	1.15	1.10	CR123C131A
1.40	1.31	1.27	1.23	CR123C148A
1.46	1.46	1.39	1.38	CR123C163A
1.63	1.59	1.55	1.49	CR123C184A
1.79	1.74	1.73	1.67	CR123C196A
1.97	1.93	1.89	1.79	CR123C220A
2.25	2.13	2.05	1.98	CR123C239A
2.43	2.37	2.28	2.24	CR123C258A
2.60	2.52	2.47	2.43	CR123C301A
2.96	2.87	2.79	2.75	CR123C326A
3.57	3.39	3.31	3.25	CR123C356A
3.86	3.59	3.70	3.43	CR123C379A
4.43	4.31	4.06	4.03	CR123C419A
4.87	4.57	4.47	4.43	CR123C466A
5.37	5.31	4.95	4.94	CR123C526A
5.99	5.86	5.49	5.36	CR123C592A
6.39	6.19	5.91	5.77	CR123C630A
6.87	6.61	6.47	6.35	CR123C695A
7.71	7.61	7.20	6.92	CR123C778A
8.72	8.46	8.22	7.99	CR123C867A
9.50	9.35	8.72	8.47	CR123C955A
10.5	10.4	9.67	9.19	CR123C104B
11.7	11.3	10.4	10.0	CR123C113B
12.2	11.9	11.0	10.7	CR123C125B
13.5	13.0	12.4	12.0	CR123C137B
15.1	14.5	13.2	12.9	CR123C151B
17.5	17.4	15.4	15.1	CR123C163B
18.9	18.6	17.1	16.3	CR123C180B
20.8	20.5	18.1	17.9	CR123C198B
22.4	22.3	20.0	19.7	CR123C214B
25.5	24.7	21.5	21.2	CR123C228B
26.2	25.7	22.5	22.3	CR123C250B
27.0	27.0	23.9	23.5	CR123C273B
-	-	26.3	25.6	CR123C303B
-	-	27.0	27.0	CR123C330B

NEMA Size 1P

Maximum Motor Full-load Amperes		Heater Catalog Number
A	B	
14.2	14.2	CR123C151B
17.3	17.3	CR123C163B
18.7	18.7	CR123C180B
20.6	20.6	CR123C198B
22.5	22.5	CR123C214B
24.7	24.7	CR123C228B
25.5	25.5	CR123C250B
26.7	26.7	CR123C273B
27.9	27.9	CR123C303B
32.1	32.1	CR123C330B
36.0	36.0	CR123C366B

Catalog Number	List Price Each, GO-JOB
CR123C (All)	\$5.00
CR123F (All)	\$5.00

All CR123C and 123F heaters are packaged three to a carton. Items of these heaters, being ordered for either customer's stock or any other purpose, are to be specified in multiples of three (such as 3, 6, 9, 12, 15, etc.). Minimum order quantity is three.

NEMA Size 2

Maximum Motor Full-load Amperes				Heater Catalog Number
A	B	C	D	
5.92	5.79	-	-	CR123C592A
6.23	6.12	5.85	5.72	CR123C630A
6.63	6.49	6.47	6.30	CR123C695A
7.72	7.59	7.35	7.04	CR123C778A
8.96	8.71	8.06	7.91	CR123C867A
9.92	9.19	9.03	8.80	CR123C955A
10.4	10.1	9.61	9.27	CR123C104B
11.7	11.2	10.5	9.99	CR123C113B
12.1	11.9	11.6	11.1	CR123C125B
13.5	12.6	12.5	12.1	CR123C137B
14.7	14.5	13.6	13.1	CR123C151B
18.3	17.7	16.7	15.5	CR123C163B
20.1	19.1	17.3	16.3	CR123C180B
22.3	21.4	18.7	18.0	CR123C198B
25.0	22.9	20.4	19.7	CR123C214B
27.7	24.7	22.7	21.6	CR123C228B
29.3	25.9	24.7	23.9	CR123C250B
30.7	27.1	26.3	25.5	CR123C273B
32.7	30.2	29.5	28.2	CR123C303B
35.6	34.8	32.5	31.6	CR123C330B
39.4	38.7	36.7	34.7	CR123C366B
45.0	45.0	41.9	37.3	CR123C400B
-	-	43.2	40.6	CR123C440B
-	-	45.0	45.0	CR123C460B

NEMA Size 4

Maximum Motor Full-load Amperes			Heater Catalog Number
C	D	E	
32.2	32.0	32.0	CR123F357B
34.0	34.2	34.2	CR123F395B
36.3	36.7	36.7	CR123F430B
44.6	43.9	43.9	CR123F487B
48.1	46.6	46.6	CR123F567B
53.9	52.6	52.6	CR123F614B
57.1	55.6	55.6	CR123F658B
60.0	58.7	58.7	CR123F719B
69.3	67.1	67.1	CR123F772B
71.7	70.5	70.6	CR123F848B
79.9	76.0	76.3	CR123F914B
92.3	88.7	88.7	CR123F104C
97.0	93.4	93.4	CR123F114C
108.0	102.0	105.0	CR123F118C
138.0	130.0	114.0	CR123F133C
131.0	122.0	123.0	CR123F149C
135.0	131.0	131.0	CR123F151C
-	135.0	135.0	CR123F174C

NEMA Size 5

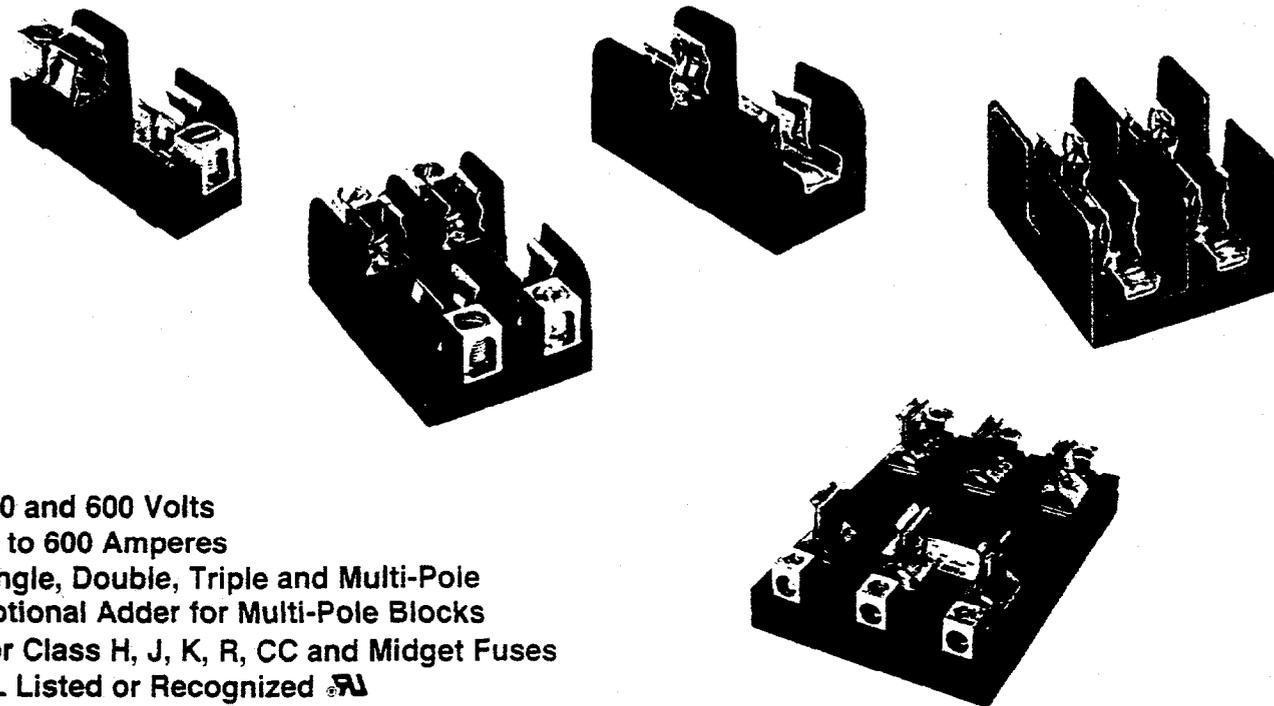
Maximum Motor Full-load Amperes		Heater Catalog Number
C	D	
118	115	CR123C592A
128	125	CR123C630A
138	135	CR123C695A
155	151	CR123C778A
168	164	CR123C867A
184	179	CR123C955A
200	195	CR123C104B
221	215	CR123C113B
237	231	CR123C125B
262	255	CR123C137B
270	270	CR123C151B

NEMA Size 3

Maximum Motor Full-load Amperes				Heater Catalog Number
A	B	C	D	
20.2	19.4	-	-	CR123F199B
21.0	20.1	-	-	CR123F218B
21.8	21.1	19.3	18.4	CR123F233B
24.5	24.6	22.1	21.1	CR123F243B
25.7	25.2	23.4	22.1	CR123F270B
29.2	29.2	27.0	25.7	CR123F300B
33.5	32.9	29.1	28.0	CR123F327B
37.0	35.1	31.8	31.3	CR123F357B
39.2	38.4	33.9	33.3	CR123F395B
42.7	40.4	37.6	34.3	CR123F430B
45.7	45.7	41.9	40.9	CR123F497B
48.4	48.9	47.7	44.7	CR123F567B
54.9	54.7	52.1	51.0	CR123F614B
62.7	58.6	55.8	52.0	CR123F658B
67.5	63.4	59.7	55.1	CR123F719B
77.1	72.3	68.1	63.3	CR123F772B
81.5	76.6	71.5	66.1	CR123F848B
96.3	93.8	78.2	73.5	CR123F914B
100.0	100.0	87.5	82.0	CR123F104C
-	-	100.0	100.0	CR123F114C

Gould Shawmut

Fuse Blocks



250 and 600 Volts
30 to 600 Amperes
Single, Double, Triple and Multi-Pole
Optional Adder for Multi-Pole Blocks
For Class H, J, K, R, CC and Midget Fuses
UL Listed or Recognized 
CSA Certified

Wire Connectors

Three types of wire connectors are used. Screw type is for copper wire with terminals. Pressure plate type is for copper wire and eliminates need for wire terminal because wire is held captive under a steel pressure plate. Recommended where vibration is a factor. Box type connectors are the most durable and versatile connectors for stranded or solid wire. Aluminum box connectors will accept both aluminum and copper wire. Copper box connectors are for copper wire only. Lug and stud connectors are available for 60-400A fuse blocks. Consult factory for availability.

Insulators

Fuse block insulators are either phenolic or molded polycarbonate. All blocks exceed the rated voltage clearance and creepage requirements of UL and CSA for general industrial control equipment. All blocks have successfully passed high current withstand short circuit tests and are suitable for application up to the interrupting rating of the fuse class used. Insulator dielectric strength has been

tested and verified to be in excess of 2500 volts, hence fuse blocks can be used in circuits higher than their marked "rated" voltage (AC or DC).

Versatile Segmented Fuse Blocks

Gould Shawmut Fuse Blocks feature a unique adder block which can be snapped on to form multi-pole segmented blocks of as many poles as desired. Adder blocks are available for 30, 60 and 100 ampere ratings. Multiple pole blocks thus formed save valuable space, are permanent and can be added to in the future.

Choice of Fuse Clips

All clips are one piece made of high conductivity tin-plated copper for low resistance connections and cool operation. Spring reinforced clips are available in 30, 60, 100, 200, 400 and 600A ratings for all classes and non-spring reinforced clips are available in 30 and 60A sizes only for H, K and J classes. Spring reinforced clips are recommended if frequent fuse replacement is expected.

Gould Shawmut Fuse Blocks

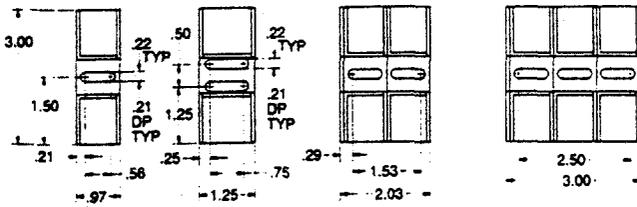


Fig. 1

Fig. 2

Fig. 3

Fig. 4

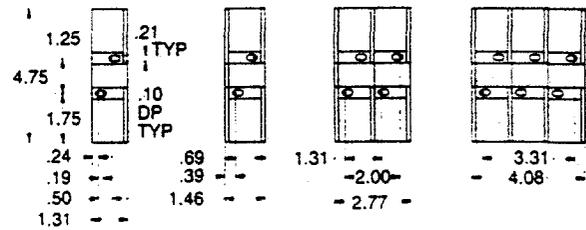


Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fuse Clips



Screw Type 30A



Pressure Plate Type 30A

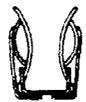


Box Type 30 & 60A

Connectors



Non-Spring Reinforced



Spring Reinforced



Class R 30 & 60A

Fuse Block Dimensions—250 Volt Class H, K and R—30 and 60 Ampere

AMPERE RATING	POLES	CONNECTOR		CATALOG NUMBER			FIG
				TYPE OF CLIP			
		TYPE	WIRE RANGE	CLASS H&K NON-SPRING REINFORCED	CLASS H&K SPRING REINFORCED	CLASS R SPRING REINFORCED	
30 Polycarbonate	Adder	Box	Al/Cu #14-#2	20300	20305	20305R	1
	1			20301*	20306*	20306R*	2
	2			20302	20307	20307R	3
	3			20303	20308	20308R	4
	Adder	Screw	Cu #14-#10	20310	20315	20315R	1
	1			20311*	20316*	20316R*	2
	2			20312	20317	20317R	3
	3			20313	20318	20318R	4
	Adder	Pressure Plate	Cu #14-#10	20320	20325	20325R	1
	1			20321*	20326*	20326R*	2
	2			20322	20327	20327R	3
	3			20323	20328	20328R	4
Adder	Box	Cu** #14-#4	—	20355	20355R	1	
1			—	20356*	20356R*	2	
2			—	20357	20357R	3	
3			—	20358	20358R	4	
60 Polycarbonate	Adder	Box	Al/Cu #14-#2	20600	20605	20605R	5
	1			20601	20606	20606R	6
	2			20602	20607	20607R	7
	3			20603	20608	20608R	8
	Adder	Box	Cu** #14-#4	—	20655	20655R	5
	1			—	20656	20656R	6
	2			—	20657	20657R	7
	3			—	20658	20658R	8

Note: To convert 30A adder pole to single pole, use end barrier #U09322.

*1-pole, 30A block does not accept adder pole.

**Fuse blocks have copper box connectors and clips and are for copper wires only. These are specifically designed with the same coefficient of expansion as copper wire for improved heat cycling and meet or exceed OEM "no aluminum" specifications.

8

GOULD SHAWMUT

Fuse Blocks

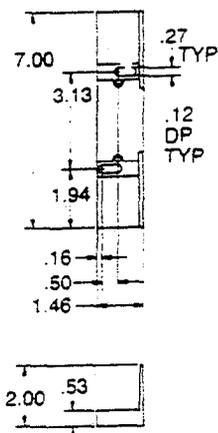


Fig. 1

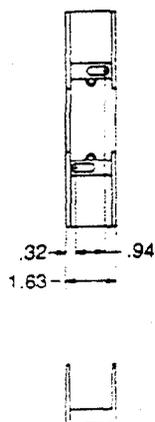


Fig. 2

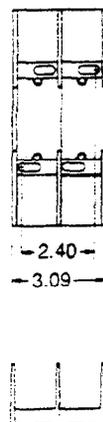


Fig. 3

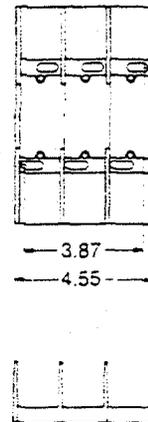


Fig. 4

Recommended mounting screws for all 30A and 60A fuse blocks - 1/4" (.250" dia.)

600 Volt, 30 and 60 Ampere Class H, K and R Fuse Blocks

AMPERE RATING	POLES	CONNECTOR		CATALOG NUMBER			FIG
				TYPE OF CLIP			
		TYPE	WIRE RANGE	CLASS H&K NON-SPRING REINFORCED	CLASS H&K SPRING REINFORCED	CLASS R SPRING REINFORCED	
30 Polycarbonate	Adder 1 2 3	Box	Al/Cu #14-#2	60300	60305	60305R	1
				60301	60306	60306R	2
				60302	60307	60307R	3
				60303	60308	60308R	4
	Adder 1 2 3	Screw	Cu #14-#10	60310	60315	60315R	1
				60311	60316	60316R	2
				60312	60317	60317R	3
				60313	60318	60318R	4
	Adder 1 2 3	Pressure Plate	Cu #14-#10	60320	60325	60325R	1
				60321	60326	60326R	2
				60322	60327	60327R	3
				60323	60328	60328R	4
Adder 1 2 3	Box	Cu* #14-#4	-	60355	60355R	1	
			-	60356	60356R	2	
			-	60357	60357R	3	
			-	60358	60358R	4	
60 Polycarbonate	Adder 1 2 3	Box	Al/Cu #14-#2	60600	60605	60605R	1
				60601	60606	60606R	2
				60602	60607	60607R	3
				60603	60608	60608R	4
	Adder 1 2 3	Box	Cu* #14-#4	-	60655	60655R	1
				-	60656	60656R	2
				-	60657	60657R	3
				-	60658	60658R	4

Note: To convert 30A or 60A adder pole to single pole, use end barrier #U09361.

* Fuse blocks have copper box connectors and clips and are for copper wires only. These are specifically designed with the same coefficient of expansion as copper wire for improved heat cycling and meet or exceed OEM "no aluminum" specifications.



GE Specialty Transformers

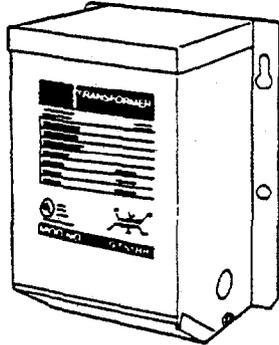
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PAGES 1-6

DEM - 1001

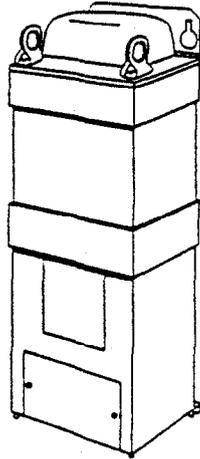
1.2.14
2.11
1.5.3E

Dry Type General Purpose Transformers

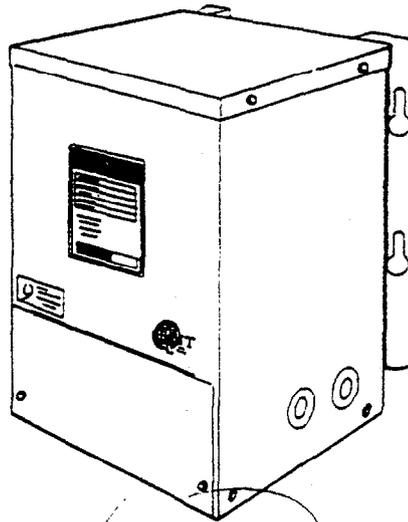
Types QB, QMS, ML, and QL
600 Volts and Below



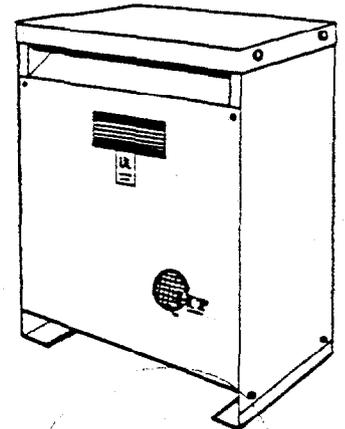
Type QB,
.050 kVA-3 kVA,
single-phase



Type ML,
3kVA-15 kVA
three-phase



Type QMS,
5 kVA-25 kVA,
single-phase



Type QL,
25 kVA-167 kVA,
single-phase
15 kVA-1500 kVA,
three-phase

General Information

The complete family of transformers from GE provide quiet, reliable transformer operation.

All of the dry-type transformers through 1,000 kVA are UL Listed under the requirements of Standard 506 and 1561. In addition, ~~all transformer meet the requirements of ANSI 9892-1989~~ ~~NEMA 3R-20-1986~~ Type QB, QMS, ML and three-phase QL models are also CSA certified.

General purpose transformers are rated 600 volts and below for supplying appliance, lighting and power loads from electrical distribution systems. Standard distribution voltages are 600, 480, and 240 volts; standard load voltages are 480, 240, 208, and 120 volts. The transformer is used to obtain the load voltage from the distribution voltage. Since no vaults are required for installation, these transformers can be located right at the load to provide the correct voltage for the application. This eliminates the need for long, costly, low-voltage feeders.

Construction

Types QB, ML and QMS

Core and coils are contained within a NEMA 3R nonventilated weatherproof enclosure. Type QB and QMS units feature encapsulated core and coils.

Type QL

Units are enclosed in a NEMA 2 drip-proof metal enclosure with natural-draft ventilation. Core-and-coil assembly is mounted on rubber isolation pads to reduce noise. Weathershield kits are available for conversion to a NEMA 3R enclosure suitable for outdoor service.

How to Select

- Establish phase and frequency.
- Determine the primary voltage—the voltage presently available.
- Determine the secondary voltage—the voltage needed at the load.
- Determine the kVA load, allowing room for expansion.
- Using the facts determined in the three steps, locate the transformer model in the listings on the following pages.

Voltage Tap Arrangement

Transformer taps compensate for high or low line voltages. Standard NEMA, ANSI three-phase taps are two 5 percent taps below normal on transformers smaller than 30 kVA. This arrangement provides a 10 percent range of tap voltage adjustment.

Most standard QL units rated 15 through 500 kVA have available six universal voltage taps—four 2½ percent below normal, and two 2½ percent above normal. This arrangement provides a 15 percent range of tap voltage adjustment.

Temperature Class

Industry standards classify insulation systems in accordance with the rating system shown below.

Insulation System Classification			
Ambient	→ Winding Rise	→ Hot Spot	→ Temp. Class
40°C	55°C	10°C	105°C
40°C	80°C	30°C	150°C
40°C	115°C	25°C	180°C
40°C	150°C	30°C	220°C

~~All standard general purpose GE transformers meet all applicable NEMA, ANSI, UL, and IEEE standards.~~

The design life of transformers having different insulation systems is the same, since the allowable temperature rise of an insulation material system is predicated on a specified life for all insulation. The lower temperature systems are designed for the same life as higher temperature systems.

Termination

Improved termination spacing and wiring compartment room gives greater flexibility in selecting various UL Listed connectors for either copper or aluminum cable. A listing of suitable connectors is packaged with each GE transformer.



GE Specialty Transformers

DEM - 1002

Dry Type General Purpose Transformers

Types QB, QMS, ML, and QL
600 Volts and Below

Sound Levels

All general purpose transformers are as quiet, or quieter than the 1986 ANSI and NEMA Standards for sound levels. Average sound levels are warranted not to exceed the values listed for each load rating shown in the adjacent table. Sound characteristics vary between transformers of identical voltage and kVA rating. The range of variation may be 4 to 8 decibels.

These values apply only to specified test conditions because the characteristic of the installation can cause them to be higher under operating conditions. Where acoustical noise is deemed to be of unusual concern, proper steps should be taken during installation to minimize audible noise transmission.

Sound Levels in Decibels^① (For 150°C Rise Models)

kVA	Sound levels in decibels ^①	
	ANSI-C89 Average	
0-9	40	45
10-50	45	50
51-150	50	55
151-300	55	60
301-500	60	65

① Measured per ANSI C89.2-1986.

Wall Mounting Brackets (For 150°C Rise Models)

Separate, optional wall-mounting brackets are available as accessories on transformers through 75 kVA. Each kit consists of two brackets. **Note:** Not available for outdoor weather protected (G62) units.

kVA	Item No.	Qty.	Bracket Catalog Number (Includes 2 Per Set)
-----	----------	------	--

Single-phase

.050-25			Standard on all QB and QMS units
25			9T18Y5042
37.5-50			9T18Y5043

Three-phase

3-15			Standard on all ML units
15-50			9T18Y5042
75			9T18Y5043

Weathershield Kits (For 150°C Rise Models) UL Approved for Customer Installation Kits supplied with tamper resistant hardware

kVA	Item No.	Qty.	Kit Catalog Number
-----	----------	------	--------------------

Single-phase

25			9T18Y4317G12
37.5-50			9T18Y4317
75			9T18Y4317G02
100			9T18Y4317G03
167			9T18Y4317G04

Three-Phase

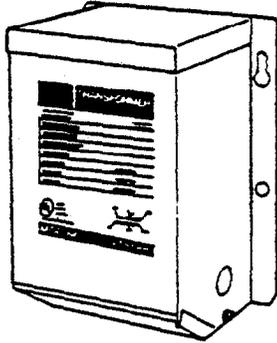
15			9T18Y4317G11
30, 45, 50			9T18Y4317G05
75, 112.5			9T18Y4317G06
150			9T18Y4317G07
225			9T18Y4317G08
300			9T18Y4317G09
400, 500			9T18Y4317G10

NOTES:

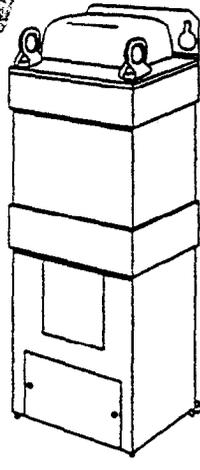


Try Type General Purpose Transformers

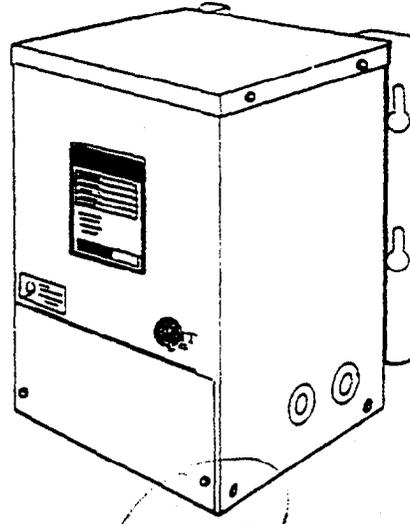
Dimensions and Weights



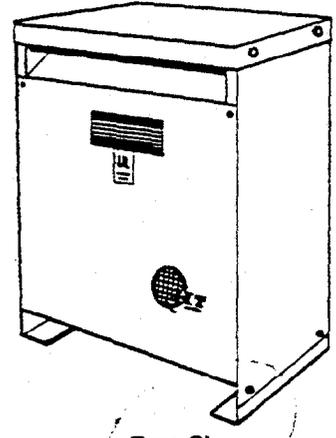
Type QB



Type ML



Type QMS



Type QL

kVA	Max. Height (in.)	Max. Width (in.)	Max. Depth (in.)	Approx. Net Wt. (Lbs.)
Type QB—Single-phase, 60, 50/60 Hertz				
.050	6 ¹ / ₂	5 ¹ / ₂	3 ¹ / ₄	6
.075	6 ³ / ₄	5 ¹ / ₂	3 ¹ / ₄	6
.100	6 ³ / ₄	5 ¹ / ₂	3 ¹ / ₄	6
.150	7 ¹ / ₂	6 ¹ / ₂	4 ¹ / ₄	10
.250	7 ³ / ₄	6 ¹ / ₂	4 ¹ / ₄	10
.500	8 ³ / ₄	6 ¹ / ₂	4 ¹ / ₄	16
.750	9 ¹ / ₂	7 ¹ / ₂	5 ¹ / ₂	25
1.00	9 ³ / ₄	7 ¹ / ₂	5 ¹ / ₂	25
1.50	11 ¹ / ₂	9 ³ / ₄	6 ² / ₃₂	40
2.00	11 ¹ / ₂	9 ³ / ₄	6 ² / ₃₂	40
3.00	13 ¹ / ₂	9 ³ / ₄	6 ² / ₃₂	60

kVA	Max. Height (in.)	Max. Width (in.)	Max. Depth (in.)	Approx. Net Wt. (Lbs.)
Type QMS—Single-phase, 60 Hertz				
5	14 ¹ / ₂	10 ³ / ₄	11 ¹ / ₂	102
7.5	15 ¹ / ₂	11 ¹⁵ / ₁₆	12 ¹⁷ / ₃₂	140
10	17 ¹ / ₂	12 ² / ₃₂	12 ² / ₃₂	172
15	19 ¹ / ₂	14 ¹ / ₄	14 ¹⁷ / ₃₂	255
25	19 ² / ₃₂	16 ¹ / ₈	15 ¹ / ₁₆	370

kVA	Max. Height (in.)	Max. Width (in.)	Max. Depth (in.)	Approx. Net Wt. (Lbs.)
Type QMS—Single-phase, 50/60 Hertz				
5	14 ¹ / ₂	10 ³ / ₄	11 ¹ / ₂	109
7.5	15 ¹ / ₂	11 ¹⁵ / ₁₆	12 ¹⁷ / ₃₂	150
10	17 ¹ / ₂	12 ² / ₃₂	12 ² / ₃₂	187
15	18 ¹ / ₂	14 ¹ / ₄	14 ¹⁷ / ₃₂	272
25	19 ² / ₃₂	16 ¹ / ₈	15 ¹ / ₁₆	400

kVA	Max. Height (in.)	Max. Width (in.)	Max. Depth (in.)	Approx. Net Wt. (Lbs.)
Type ML—Three-phase, 60 Hertz				
3	22 ¹ / ₈	7 ¹ / ₂	6 ¹ / ₈	68
6	25 ¹ / ₈	9 ¹ / ₂	7 ¹ / ₈	106
9	28 ¹ / ₈	9 ¹ / ₂	7 ¹ / ₈	153
15	31 ¹ / ₄	11 ¹ / ₂	10 ¹ / ₈	268

kVA	Max. Height (in.)	Max. Width (in.)	Max. Depth (in.)	Approximate Net Wt. (Lbs.)	
				Al	Cu
Type QL—Single-phase, 25-167 kVA, 60 Hertz					
25	25	16 ¹ / ₂	15 ¹ / ₂	185	—
37 ¹ / ₂	34 ¹ / ₈	20 ¹ / ₄	22 ¹ / ₈	285	—
50	37 ¹ / ₂	20 ¹ / ₄	22 ¹ / ₈	385	—
75	38 ¹ / ₂	22 ¹ / ₂	27 ¹ / ₂	550	—
100	44 ¹ / ₂	26 ¹ / ₂	28 ¹ / ₂	685	—
167	51 ¹ / ₂	29	33 ¹ / ₂	1130	—

kVA	Max. Height (in.)	Max. Width (in.)	Max. Depth (in.)	Approximate Net Wt. (Lbs.)	
				Al	Cu
Type QL—Three-phase, 15-1000 kVA, 60 Hertz					
15	27 ¹ / ₈	19	16 ⁹ / ₁₆	185	200
30	32 ¹ / ₄	24	18 ¹ / ₁₆	275	300
45	32 ¹ / ₄	24	18 ¹ / ₁₆	325	360
50	32 ¹ / ₄	24	18 ¹ / ₁₆	325	—
75	35 ¹ / ₄	32	23 ¹¹ / ₁₆	465	515
112.5	40	32	23 ¹¹ / ₁₆	605	675
150	46	35	23 ¹¹ / ₁₆	790	880
225	48	38 ¹ / ₂	28 ¹ / ₁₆	1030	1180
300	51 ¹ / ₄	42 ¹ / ₂	30 ¹ / ₄	1370	1535
400	58 ³ / ₈	47 ¹ / ₂	34 ³ / ₈	1900	—
500	58 ³ / ₈	47 ¹ / ₂	34 ³ / ₈	2100	—
750	76	60	50	3450	—
1000	76	60	50	4300	—

NOTES:



GE Specialty Transformers

Dry Type General Purpose Transformers
Winding Diagrams

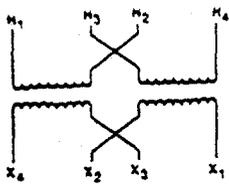


Diagram 1

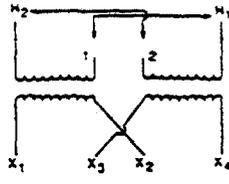


Diagram 8

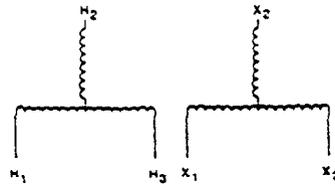


Diagram 15

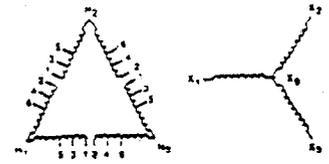


Diagram 22

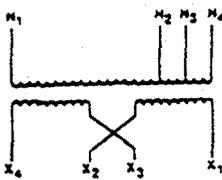


Diagram 2

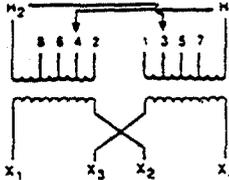


Diagram 9

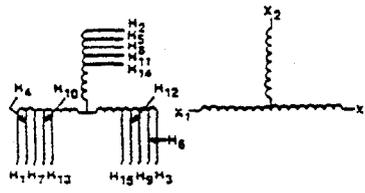


Diagram 16

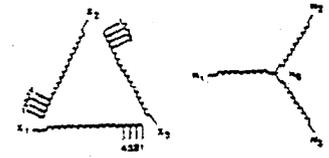


Diagram 23

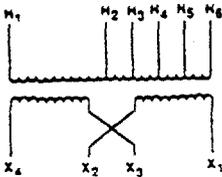


Diagram 3

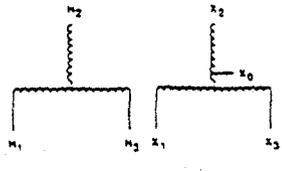


Diagram 10

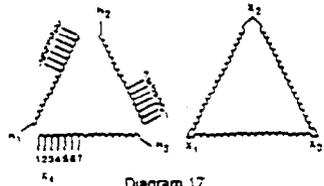


Diagram 17

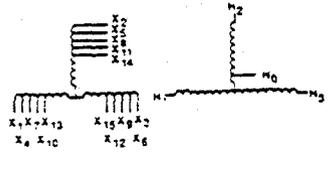


Diagram 24

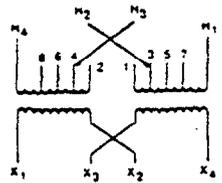


Diagram 4

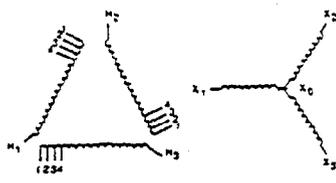


Diagram 11

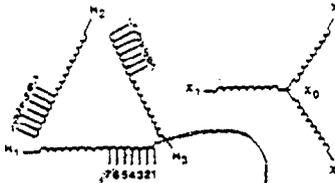


Diagram 18

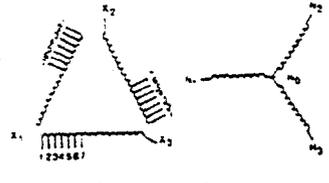


Diagram 25

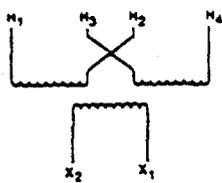


Diagram 5

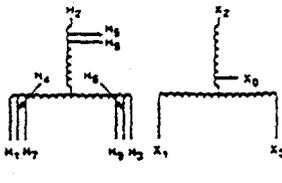


Diagram 12

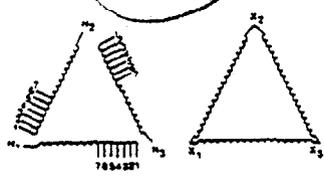


Diagram 19

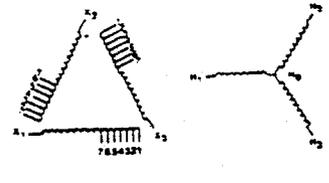


Diagram 26

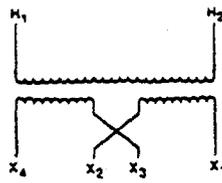


Diagram 6

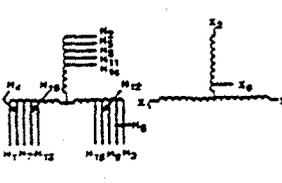


Diagram 13

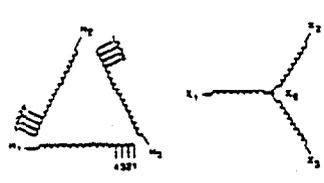


Diagram 20

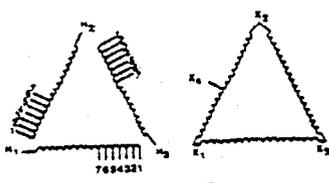


Diagram 27

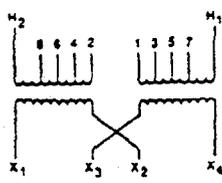


Diagram 7

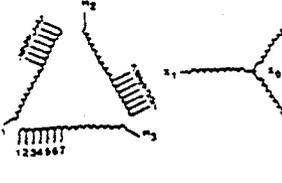


Diagram 14

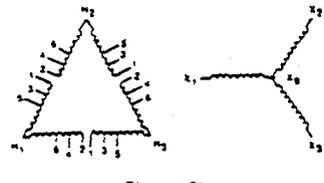


Diagram 21



Dry Type General Purpose Transformers

Low Temperature Rise

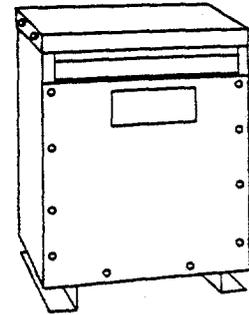
Description

These low temperature rise transformers utilize a UL recognized 220°C insulation system featuring either 80°C or 115°C temperature rise. They provide inherent overload capability and longer life than standard Type QL designs.

Available in both single- and three-phase ratings, GE Type QL low temperature rise transformers are UL Listed, File E79145.

Application

Type QL low temperature rise transformers can help cut operating expenses for systems requiring unit loading at 80 to 100 percent of nameplate rating, 24 hours a day, or where load growth is expected. Units with 115°C temperature rise can be operated continuously at 15 percent above nameplate rating without loss of transformer life. Units with 80°C temperature rise offer loading capability at 30 percent above nameplate rating.



Type QL low temperature rise transformer (closed view)

Single-phase Indoor², Type QL, 60 Hertz UL Listed

kVA	Item No.	Qty.	Catalog Number	480 Volts Delta Primary Secondary 208Y/120 Volts Dimensions (inches)			① Taps	Wiring Diagram No. DEM-1007	Approx. Net Wt. (Lbs.)
				Height	Width	Depth			

115°C Rise

15			9T23L2670	25	16 ¹ / ₈	15 ¹ / ₄	6	9	185
25			9T23L2671	34 ¹ / ₈	20 ¹ / ₄	22 ¹ / ₈	6	9	285
37.5			9T23L2672	37 ¹ / ₂	20 ¹ / ₄	22 ¹ / ₈	6	4	385
50			9T23L2673	38 ¹ / ₈	22 ¹ / ₂	27 ¹ / ₂	6	4	550
75			9T23L2674	44 ¹ / ₂	26 ¹ / ₂	28 ¹ / ₄	6	4	685
100			9T23L2675	51 ¹ / ₄	29	33 ³ / ₄	6	4	1130

80°C Rise

15			9T23L3670	34 ¹ / ₈	20 ¹ / ₄	22 ¹ / ₈	6	9	285
25			9T23L3670G8 ¹	37 ¹ / ₂	20 ¹ / ₄	22 ¹ / ₈	6	4	385
37.5			9T23L3672	38 ¹ / ₈	22 ¹ / ₂	27 ¹ / ₂	6	4	550
50			9T23L3673	44 ¹ / ₂	26 ¹ / ₂	28 ¹ / ₄	6	4	685
75			9T23L3674	51 ¹ / ₄	29	33 ³ / ₄	6	4	1130
100			9T23L3675	51 ¹ / ₄	29	33 ³ / ₄	6	4	1130

Three-phase Indoor², Type QL, 60 Hertz UL Listed, CSA Certified

480 Volts Delta Primary Secondary 208Y/120 Volts

115°C Rise

15			9T23Q3571	27 ³ / ₈	19	16 ⁹ / ₁₆	6	18	185
30			9T23Q3572	32 ¹ / ₄	24	18 ¹ / ₁₆	6	18	325
45			9T23Q3573	35 ³ / ₈	32	23 ¹ / ₁₆	6	18	465
50			9T23Q3564	35 ³ / ₈	32	23 ¹ / ₁₆	6	18	465
75			9T23Q3574	40	32	23 ¹ / ₁₆	6	18	605
112.5			9T23Q3575	46	35	23 ¹ / ₁₆	6	18	775
150			9T23Q3576	48	38 ¹ / ₂	28 ¹ / ₁₆	6	18	1030
225			9T23Q3577	51 ¹ / ₄	42 ¹ / ₂	30 ³ / ₄	6	18	1370
300			9T23L1578	58 ³ / ₈	47 ¹ / ₂	34 ³ / ₄	6	18	1900
400			9T23L1566	58 ³ / ₈	47 ¹ / ₂	34 ³ / ₄	6	18	2100
500			9T23L1579	76	60	50	4	21	3450

80°C Rise

15			9T23Q3071	32 ¹ / ₄	24	18 ¹ / ₁₆	6	18	275
30			9T23Q3072	32 ¹ / ₄	24	18 ¹ / ₁₆	6	18	325
45			9T23Q3073	35 ³ / ₈	32	23 ¹ / ₁₆	6	18	465
50			9T23Q3064	35 ³ / ₈	32	23 ¹ / ₁₆	6	18	465
75			9T23Q3074	40	32	23 ¹ / ₁₆	6	18	605
112.5			9T23Q3075	48	38 ¹ / ₂	28 ¹ / ₁₆	6	18	1030
150			9T23Q3076	48	38 ¹ / ₂	28 ¹ / ₁₆	6	18	1030
225			9T23L8077	58 ³ / ₈	47 ¹ / ₂	34 ³ / ₄	6	18	1900
300			9T23L8078	58 ³ / ₈	47 ¹ / ₂	34 ³ / ₄	6	18	2100
500			9T23L8079	76	60	50	4	21	3450

NOTES:

- ① Tap Arrangement:
6-(6) 2¹/₂% taps: 2 above and 4 below rated primary voltage.
▲500 kVA has (2) 3.1% primary taps above and below rated voltage.
- ② Consult Factory for outdoor NEMA 3R enclosure.



Integral Transformer and Distribution Center

Servicenter™ Mini-Unit Substations

Description

The Servicenter mini-unit substation from GE brings proven rugged, encapsulated transformer benefits together with GE advanced breaker techniques to provide one, highly reliable power supply package. This easily installed and serviceable unit incorporates a Type QMS transformer, a primary main circuit breaker, a secondary main circuit breaker, and a load-center-design breaker panel. Since these components don't have to be installed and interconnected separately, the contractor or user can reduce installation time and costs. Because of the single-unit concept, only one, handy Servicenter need be mounted.

Available in single-phase, 5 through 25 kVA, 600-volt class ratings, the GE Servicenter is a convenient, economical way to meet your

light industrial and temporary power requirements.

The transformer—The Servicenter utilizes GE transformer design which has twenty years of field proven experience behind it and a long track record for assuring consistent, reliable performance. Type QMS transformers employ a 180°C UL recognized insulation system with a 115°C rise.

The panel—The panel assembly includes the rugged GE Power Mark Plus™ circuit breaker load center interior, a Type TED primary main circuit breaker, and a Type THQL secondary main circuit breaker on units 5 through 15 kVA. Type TQD secondary main circuit breakers are used on the 25 kVA model. The load center will accept one- or two-pole common trip circuit breakers and ground fault breakers. All

Servicenters come equipped with the properly sized primary main and secondary main circuit breakers installed and prewired. Branch breakers are not included.

Application

The Servicenter can be used wherever 480-volt power is available and 120- or 240-volt branch circuits are required. The unit can be used in such applications as vending machine areas, and construction laboratory test areas, where temporary power is required, or where future expansion of branch circuits is planned.

UL Listed

The Servicenter carries a UL Label for unit substations, and is suitable for both indoor and outdoor installation.

NEC Requirements

The Servicenter conforms with Article 450-3 of the 1987 National Electric Code.

Single-phase

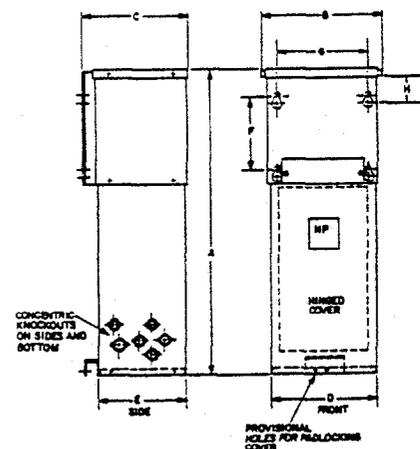
kVA	480 Volts Primary, Secondary 120/240 Volts, 60 Hz ⊕									
	Item No.	Qty.	Catalog Number	Maximum Branch Sources				Breaker Ratings		
				1" THQL		½" THQP		Total 1-pole Spaces	Primary Main	Secondary Main
1-pole	2-pole	1-pole	2-pole							
5			9T21S1050	6	3	12	4	12	25A	30A
7.5			9T21S1070	6	3	12	4	12	35A	40A
10			9T21S1100	8	4	16	6	16	50A	50A
15			9T21S1150	12	6	24	10	24	60A	70A
25			9T21S1250	20	10	8	2	24	100A	150A

600 Volts Primary, Secondary 120/240 Volts, 60 Hz ⊕										
kVA	Item No.	Qty.	Catalog Number	Maximum Branch Sources				Breaker Ratings		
				1" THQL		½" THQP		Total 1-pole Spaces	Primary Main	Secondary Main
1-pole	2-pole	1-pole	2-pole							
5			9T21S1052	6	3	12	4	12	20A	30A
7.5			9T21S1072	6	3	12	4	12	30A	40A
10			9T21S1102	8	4	16	6	16	40A	50A
15			9T21S1152	12	6	24	10	24	60A	70A

Ⓜ (2) 5% below normal taps.

Dimensions

kVA	Catalog Number	Approximate Dimensions (Inches)								Approx. Wt. (Lbs.)	
		A Max. Height	B Max. Width	C Max. Depth	D	E	F	G	H	Net	Ship
5	9T21S1050, 1052	32 1/4	10 3/4	11	9 3/8	8 1/2	6	8 9/16	2 1/4	123	133
7.5	9T21S1070, 1072	33 3/8	12	12 3/8	11	9 3/8	6 3/16	9 1/2	2 9/16	161	171
10	9T21S1100, 1102	34 7/8	12 1/8	12 1/2	11 1/4	10	7 1/2	9 1/16	2 3/8	198	208
15	9T21S1150, 1152	39	14 3/4	14 3/8	13 3/4	12	7 1/2	12 1/4	3 1/4	280	290
25	9T21S1250	44	16 3/4	15 1/2	15 3/8	13 3/8	9	13 3/8	3 1/4	418	430



NOTES:

General Transformers

Type General Purpose Transformers

Temperature Rise

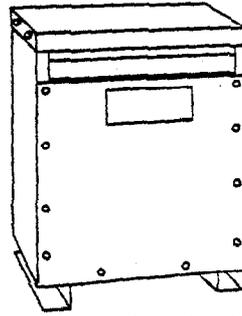
Option

Temperature rise transformers utilize a UL listed 220°C insulation saturating either 80°C temperature rise. Provide inherent capability and more than standard designs.

Available in both single- and three-phase ratings. GE Type temperature rise transformers are UL Listed, UL 145.

Application

Type QL low temperature rise transformers can help cut operating expenses for systems requiring unit loading at 80 to 100 percent of nameplate rating, 24 hours a day, or where load growth is expected. Units with 115°C temperature rise can be operated continuously at 15 percent above nameplate rating without loss of transformer life. Units with 80°C temperature rise offer loading capability at 30 percent above nameplate rating.



Type QL low temperature rise transformer (closed view)

Three-phase or 2, Type QL, 60 Hertz Listed

Item No.	Catalog Number	480 Volts Delta Primary Secondary 208Y/120 Volts			Taps	Winding Diagram No. DEM-1007	Approx. Net Wt. (Lbs.)
		Dimensions (Inches)					
		Height	Width	Depth			
	9T23L2670	25	16 1/8	15 1/4	6	9	185
	9T23L2671	34 1/8	20 1/4	22 1/8	6	9	285
	9T23L2672	37 1/2	20 1/4	22 1/8	6	4	385
	9T23L2673	38 1/8	22 1/2	27 1/2	6	4	550
	9T23L2674	44 1/2	26 1/2	28 1/4	6	4	685
	9T23L2675	51 1/4	29	33 3/4	6	4	1130

Rise							
	9T23L3670	34 1/8	20 1/4	22 1/8	6	9	285
	9T23L3670GB1	37 1/2	20 1/4	22 1/8	6	4	385
	9T23L3672	38 1/8	22 1/2	27 1/2	6	4	550
	9T23L3673	44 1/2	26 1/2	28 1/4	6	4	685
	9T23L3674	51 1/4	29	33 3/4	6	4	1130
	9T23L3675	51 1/4	29	33 3/4	6	4	1130

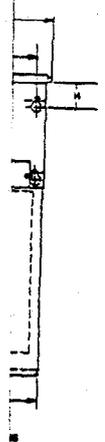
Three-phase or 2, Type QL, 60 Hertz Listed, CSA Certified

480 Volts Delta Primary Secondary 208Y/120 Volts							
Rise							
	9T23Q3571	27 1/8	19	18 1/8	6	18	185
	9T23Q3572	32 1/4	24	18 1/8	6	18	325
	9T23Q3573	35 1/4	32	23 1/8	6	18	465
	9T23Q3564	35 1/4	32	23 1/8	6	18	465
	9T23Q3574	40	32	23 1/8	6	18	605
	9T23Q3575	46	35	23 1/8	6	18	775
	9T23Q3576	48	38 1/2	28 1/8	6	18	1030
	9T23Q3577	51 1/4	42 1/2	30 1/4	6	18	1370
	9T23L1578	58 1/8	47 1/2	34 3/4	6	18	1900
	9T23L1566	58 1/8	47 1/2	34 3/4	6	18	2100
	9T23L1579	76	60	50	A	21	3450

Rise							
	9T23Q3071	32 1/4	24	18 1/8	6	18	275
	9T23Q3072	32 1/4	24	18 1/8	6	18	325
	9T23Q3073	35 1/4	32	23 1/8	6	18	465
	9T23Q3064	35 1/4	32	23 1/8	6	18	465
	9T23Q3074	40	32	23 1/8	6	18	605
	9T23Q3075	48	38 1/2	28 1/8	6	18	1030
	9T23Q3076	48	38 1/2	28 1/8	6	18	1030
	9T23L8077	58 1/8	47 1/2	34 3/4	6	18	1900
	9T23L8078	58 1/8	47 1/2	34 3/4	6	18	2100
	9T23L8079	76	60	50	A	21	3450

NOTES:

- 1 Tap Arrangement: 6-(6) 2 1/2% taps: 2 above and 4 below rated primary voltage. 4500 kVA has (2) 3.1% primary taps above and below rated voltage.
- 2 Consult Factory for outdoor NEMA 3R enclosure.



Wt.
Shro
133
171
208
290
430

1.5.14
517

GROUND RODS & ACCESSORIES

TYPE 61

COPPERBONDED POINTED GROUND RODS

ITEM # (6)



- Perfectly bonded rods last longer, drive easier and will not crack.
- Stop corrosion, while providing the lowest possible resistance to ground.
- Copper exteriors, molecularly bonded to nickel-sealed high-strength steel cores, exceed the requirements of ANSI/UL 467-1984 (ANSI C33.8-1972) and CSA.
- Identification: Company name, length, diameter, catalog number, UL logo and control number are roll-stamped within 12" of chamfered end on each rod for easy inspection after installation.
- Copper Jacket: standard copper plating thickness exceeds UL and ANSI specs. of .010".
- The rods exceed a tensile strength of 75,000 pounds per square inch and straightness tolerance of .010" per linear foot.

Catalog Number	Nominal Diameter X Length	Standard Bundle	Master Bundle	Weight per 100
613852*	3/8" x 5'	20	100	160
613862	3/8" x 6'	20	100	198
613882	3/8" x 8'	20	100	236

611255*	1/2" x 5'	10	100	296
611265	1/2" x 6'	10	100	310
611285*	1/2" x 8'	10	100	444
611380*	1/2" x 8'	10	100	553
611200	1/2" x 10'	10	100	605
611300	1/2" x 10'	10	100	690

615830	5/8" x 3'	--	50	253
615840	5/8" x 4'	10	100	338
615850	5/8" x 5'	10	100	422
615860*	5/8" x 6'	10	100	509
615880*	5/8" x 8'	10	100	680
615883***	5/8" x 8'	10	100	680
615800*	5/8" x 10'	10	100	844
615803***	5/8" x 10'	10	100	844
615812	5/8" x 12'	10	100	1018
615815	5/8" x 15'	10	100	1266

613460	3/4" x 6'	5	50	744
613480*	3/4" x 8'	5	50	1004
613400*	3/4" x 10'	5	50	1240
613412	3/4" x 12'	5	50	1488
613415	3/4" x 15'	5	50	1860

614400	1" x 10'	3	25	1266
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*Standard Inventory Items.
 ***13 mil minimum REA Listed rods.



1.25A
2.9

GENERAL ELECTRIC
CONTRACTOR EQUIPMENT

TRANSMITTAL

DATE 06/22/95

ITEM # (7)

JOB NAME		PAGES 1-13		REV NO.
SOIL & GROUND WATER A.5		G.E. REQUISITION NUMBER		FACTORY ORDER NO.
CUSTOMER ORDER NUMBER		G.E. REQUISITION NUMBER		FACTORY ORDER NO.
FACTORY ADDRESS				

SOLD TO

CONTRACTOR

OWENS ELECTRICAL SUPPLY CO.
P.O. BOX 3427 (28406)
824 SOUTH KERR AVENUE
WILMINGTON NC 28402-

DRAWINGS ARE FOR --> APPROVAL RECORD

APPROVAL DRAWINGS ARE ATTACHED. COMPLETE DETAILS WERE AVAILABLE AND WE HAVE ASSUMED APPROVAL WITHOUT CHANGE. MANUFACTURING INSTRUCTIONS ARE BEING PREPARED AND WE WILL SCHEDULE OUR MANUFACTURE UPON RECEIPT OF APPROVED DRAWINGS. PRESENT MANUFACTURE SCHEDULES AFTER RECEIPT OF APPROVED DRAWINGS ARE SHOWN BELOW.

APPROVAL DRAWINGS ARE ATTACHED. DETAILS ARE MISSING WHICH MUST BE FURNISHED TO PROCEED WITH THIS ORDER. RELEASE FOR MANUFACTURE WILL BE EXPEDITED BY FURNISHING THE DETAILS REQUESTED AND RETURNING THE DRAWINGS "APPROVED OR "APPROVED AS NOTED". PRESENT RELEASE PLUS MANUFACTURE SCHEDULES AFTER RECEIPT OF APPROVED DRAWINGS ARE SHOWN BELOW.

PANELBOARDS ___ WKS. SWITCHBOARDS ___ WKS. SWITCHGEAR ___ WKS. BUSWAY ___ WKS.

TYPICAL DRAWINGS ATTACHED:

DRAWING SCHEDULE

MAIL DRAWINGS AS FOLLOWS (ONE COPY IF THIS TRANS FOR CUST. SERVICE)

CUSTOMER DRAWINGS

CONTRACTOR DRAWINGS

OFF CODE SALES PERSON DWGS

OFF CODE SERVICE PERSON DWGS

CUSTOMER SERVICE

GENERAL ELECTRIC
ELECTRICAL DISTRIBUTION & CONTROL

PANELBOARD
DRAWING

FACTORY ORDER NO	JOB NAME	REV	DATE	PAGE
	SOIL & GROUND WATER A.S		07/06/95	11
REQUISITION NO	PROPOSITION NO	FRONT DATE	BOX DATE	INTERIOR DATE
	623 31352			

ITEM 11

MDP

QTY 1 SCP PLUS POWER PANEL 3P4W 277/480V

25,000 AMPS RMS SC FULLY RATED

SUITABLE FOR SERVICE ENTRANCE

MAIN 1200 AMP MAIN LUGS LOC BOTTOM

1-LUG/PH 3-CABLE/LUG 250 MCM-600 MCM

BRANCHES 4 - 225A 3P SFHA
2 - 225A 3P SFHA SPACE

OPTIONS 1 - GROUND WITH MAIN LUG

INTERIOR

BOX DACB3133 H 65 7/8" W 31" D 11 1/2"

FRONT ACF3133S SURFACE MOUNTING

COMMENTS

CUSTOMER SPEC. LAYOUT

DEVICE LAYOUT IS CUSTOMER SPECIFIED

GENERAL ELECTRIC
ELECTRICAL DISTRIBUTION & CONTROL

PANEL BOARD
DRAWING

FACTORY ORDER NO	JOB NAME	REV	DATE	PAGE
	SOIL & GROUND WATER A.5	0	07-06-95	11
REQUISITION NO	PROPOSITION NO	FRONT DATE	BOX DATE	INTERIOR DATE
	623 31352 0			

PRINT SEQ. # 11 ITEM # 11 SCP+
3P4W 480Y/277V AC BOTTOM SURFACE MK:MDP

PANELX= 27, MAINX= 9, BRANCHX= 10, SUBFEEDX= 0
FEATUREX= 0, NEUTRALX= 8

CKT #		CKT #
	(NEUTRAL)	
1	225A 3P SFHA	2
	225A 3P SFHA	
7	225A 3P SFHA	8
	225A 3P SSFHA	
13	225A 3P SFHA	14
	225A 3P SSFHA	
	FILLER	FILLER
	1200A 3P MLO (MAIN)	

NOTE: ***** LAYOUT IS CUSTOMER SPECIFIED *****

GENERAL ELECTRIC
ELECTRICAL DISTRIBUTION & CONTROL

PANELBOARD
DRAWING

FACTORY ORDER NO	JOB NAME	REV	DATE	PAGE
	SOIL & GROUND WATER A.5		06/22/95	12
REQUISITION NO	PROPOSITION NO	FRONT DATE	BOX DATE	INTERIOR DATE
	623 31352			

ITEM 12 PANEL 1

QTY 1 A-SERIES TYPE AD 3P4W 277/480V

25,000 AMPS RMS SC FULLY RATED

MAIN 225 AMP MAIN LUGS LOC BOTTOM

1-LUG/PH 1-CABLE/LUG #6 -350 MCM

BRANCHES

- 3 - 40A 3P THED6
- 1 - 60A 3P THED6
- 5 - 15A 3P THED6
- 5 - 20A 3P THED6

OPTIONS

- 1 - GROUND MAIN LUG TGL20
- 4 - GROUND-BOX BONDED TGL2

INTERIOR ADF3422MBX AXS5

BOX AB55B H 55 1/2" W 20" D 5 3/4"

FRONT AF55S SURFACE MOUNTING

DEVICE LAYOUT IS CUSTOMER SPECIFIED

GENERAL ELECTRIC
ELECTRICAL DISTRIBUTION & CONTROL

PANEL BOARD
DRAWING

FACTORY ORDER NO	JOB NAME			REV	DATE	PAGE
	SOIL & GROUND WATER A.5			0	06-22-95	12
REQUISITION NO	PROPOSITION NO	FRONT DATE	BOX DATE	INTERIOR DATE		
	623 31352	0				

PRINT SEQ. # 12 ITEM # 12 TYPE: AD
 3P4W 480Y/277V AC BOTTOM SURFACE MK: PANEL 1
 25,000 AMPS. RMS SYM SC FULLY RATED - H 55 1/2" W20" D 5 3/4"

LOAD WIRE SPACE			
CKT #	225A PANEL END FILLER		CKT #
1	40A 3P THED6	15A 3P THED6	2
7	60A 3P THED6	20A 3P THED6	8
13	15A 3P THED6	40A 3P THED6	14
19	40A 3P THED6	15A 3P THED6	20
25	15A 3P THED6	20A 3P THED6	26
31	15A 3P THED6	20A 3P THED6	32
37	20A 3P THED6	20A 3P THED6	38
225A MAIN LUGS WITH NEUTRAL			
LINE WIRE SPACE			

NOTE: ***** LAYOUT IS CUSTOMER SPECIFIED *****

GENERAL ELECTRIC
ELECTRICAL DISTRIBUTION & CONTROL

PANEL BOARD
DRAWING

FACTORY ORDER NO	JOB NAME	REV	DATE	PAGE
	SOIL & GROUND WATER A.5		06/22/95	13
REQUISITION NO	PROPOSITION NO	FRONT DATE	BOX DATE	INTERIOR DATE
	623 31352			

ITEM 13

PANEL 2

QTY 1 A-SERIES TYPE AD 3P4W 277/480V

25,000 AMPS RMS SC FULLY RATED

MAIN 225 AMP MAIN LUGS LOC BOTTOM

1-LUG/PH 1-CABLE/LUG #6 -350 MCM

BRANCHES 15 - 20A 1P THED
5 - 40A 3P THED6
4 - 70A 3P THED6

OPTIONS 1 - GROUND MAIN LUG TGL20
4 - GROUND-BOX BONDED TGL2

INTERIOR ADF3422MBX AX55

BOX AB55B H 55 1/2" W 20" D 5 3/4"

FRONT AF55S SURFACE MOUNTING

DEVICE LAYOUT IS CUSTOMER SPECIFIED

GENERAL ELECTRIC
ELECTRICAL DISTRIBUTION & CONTROL

PANEL BOARD
DRAWING

FACTORY ORDER NO	JOB NAME			REV	DATE	PAGE
	SOIL & GROUND WATER A.5			0	06-22-95	13
REQUISITION NO	PROPOSITION NO	FRONT DATE	BOX DATE	INTERIOR DATE		
	623	31352	0			

PRINT SEQ. # 13 ITEM # 13 TYPE: AD
 3P4W 480Y/277V AC BOTTOM SURFACE MK: PANEL 2
 25,000 AMPS. RMS SYM SC FULLY RATED - H 55 1/2" W20" D 5 3/4"

LOAD WIRE SPACE			
CKT #	225A PANEL END FILLER		CKT #
1	40A 3P THED6	70A 3P THED6	2
7	40A 3P THED6	70A 3P THED6	8
13	40A 3P THED6	70A 3P THED6	14
19	40A 3P THED6	70A 3P THED6	20
25	40A 3P THED6	20A 1P THED	26
		20A 1P THED	28
		20A 1P THED	30
31	20A 1P THED	20A 1P THED	32
33	20A 1P THED	20A 1P THED	34
35	20A 1P THED	20A 1P THED	36
37	20A 1P THED	20A 1P THED	38
39	20A 1P THED	20A 1P THED	40
41	20A 1P THED	20A 1P THED	42
225A MAIN LUGS WITH NEUTRAL			
LINE WIRE SPACE			

NOTE: ***** LAYOUT IS CUSTOMER SPECIFIED *****

GENERAL ELECTRIC
ELECTRICAL DISTRIBUTION & CONTROL

PANEL BOARD
DRAWING

FACTORY ORDER NO	JOB NAME	REV	DATE	PAGE
	SOIL & GROUND WATER A.5		06/22/95	14
REQUISITION NO	PROPOSITION NO	FRONT DATE	BOX DATE	INTERIOR DATE
	623 31352			

ITEM 14

PANEL 3

QTY 1 A-SERIES TYPE AD 3P4W 277/480V

25,000 AMPS RMS SC FULLY RATED

MAIN 225 AMP MAIN LUGS LOC BOTTOM

1-LUG/PH 1-CABLE/LUG #6 -350 MCM

BRANCHES 12 - 20A 1P THED
2 - 25A 3P THED6
5 - 15A 3P THED6
3 - 20A 3P THED6

OPTIONS 1 - GROUND MAIN LUG TGL20
4 - GROUND-BOX BONDED TGL2

INTERIOR ADF3422MBX AXS5

BOX AB55B H 55 1/2" W 20" D 5 3/4"

FRONT AF55S SURFACE MOUNTING

DEVICE LAYOUT IS CUSTOMER SPECIFIED

GENERAL ELECTRIC
ELECTRICAL DISTRIBUTION & CONTROL

PANEL BOARD
DRAWING

FACTORY ORDER NO	JOB NAME			REV	DATE	PAGE
	SOIL & GROUND WATER A.5			0	06-22-95	14
REQUISITION NO	PROPOSITION NO	FRONT DATE	BOX DATE	INTERIOR DATE		
	623	31352	0			

PRINT SEQ. # 14 ITEM # 14 TYPE: AD
 3P4W 480Y/277V AC BOTTOM SURFACE MK: PANEL 3
 25,000 AMPS. RMS SYM SC FULLY RATED - H 55 1/2" W20" D 5 3/4"

LOAD WIRE SPACE			
CKT #	225A PANEL END FILLER		CKT #
1	25A 3P THED6	25A 3P THED6	2
7	15A 3P THED6	15A 3P THED6	8
13	20A 1P THED	20A 1P THED	14
15	20A 1P THED	20A 1P THED	16
17	20A 1P THED	20A 1P THED	18
19	20A 1P THED	20A 1P THED	20
21	20A 1P THED	20A 1P THED	22
23	20A 1P THED	20A 1P THED	24
25	15A 3P THED6	15A 3P THED6	26
31	15A 3P THED6	20A 3P THED6	32
37	20A 3P THED6	20A 3P THED6	38
225A MAIN LUGS WITH NEUTRAL			
LINE WIRE SPACE			

NOTE: ***** LAYOUT IS CUSTOMER SPECIFIED *****

GENERAL ELECTRIC
ELECTRICAL DISTRIBUTION & CONTROL

PANEL BOARD
DRAWING

FACTORY ORDER NO	JOB NAME			REV	DATE	PAGE
	SOIL & GROUND WATER A.5				06/22/95	15
REQUISITION NO	PROPOSITION NO	FRONT DATE	BOX DATE	INTERIOR DATE		
	623 31352					

ITEM 15

PANEL 4

QTY 1 A-SERIES TYPE AD 3P4W 277/480V

25,000 AMPS RMS SC FULLY RATED

MAIN 225 AMP MAIN LUGS LOC BOTTOM

1-LUG/PH 1-CABLE/LUG #6 -350 MCM

BRANCHES 18 - 20A 1P THED SPACE
 1 - 40A 3P THED6
 1 - 70A 3P THED6
 4 - 15A 3P THED6
 1 - 35A 3P THED6
 1 - 60A 3P THED6

OPTIONS 1 - GROUND MAIN LUG TGL20
 4 - GROUND-BOX BONDED TGL2

INTERIOR ADF3422MBX AXSS

BOX AB55B H 55 1/2" W 20" D 5 3/4"

FRONT AF55S SURFACE MOUNTING

DEVICE LAYOUT IS CUSTOMER SPECIFIED

GENERAL ELECTRIC
ELECTRICAL DISTRIBUTION & CONTROL

PANEL BOARD
DRAWING

FACTORY ORDER NO	JOB NAME			REV DATE	PAGE
	SOIL & GROUND WATER A.5			0	06-22-95 15
REQUISITION NO	PROPOSITION NO	FRONT DATE	BOX DATE	INTERIOR DATE	
	623	31352	0		

PRINT SEQ. # 15 ITEM # 15 TYPE: AD
 3P4W 480Y/277V AC BOTTOM SURFACE MK: PANEL 4
 25,000 AMPS. RMS SYM SC FULLY RATED - H 55 1/2" W20" D 5 3/4"

LOAD WIRE SPACE					
CKT #	225A PANEL END FILLER				CKT #
1	40A 3P THED6		60A 3P THED6		2
7	70A 3P THED6		15A 3P THED6		8
13	15A 3P THED6		15A 3P THED6		14
19	35A 3P THED6		15A 3P THED6		20
25	20A 1P THED	SPACE	20A 1P THED	SPACE	26
27	20A 1P THED	SPACE	20A 1P THED	SPACE	28
29	20A 1P THED	SPACE	20A 1P THED	SPACE	30
31	20A 1P THED	SPACE	20A 1P THED	SPACE	32
33	20A 1P THED	SPACE	20A 1P THED	SPACE	34
35	20A 1P THED	SPACE	20A 1P THED	SPACE	36
37	20A 1P THED	SPACE	20A 1P THED	SPACE	38
39	20A 1P THED	SPACE	20A 1P THED	SPACE	40
41	20A 1P THED	SPACE	20A 1P THED	SPACE	42
225A MAIN LUGS WITH NEUTRAL					
LINE WIRE SPACE					

NOTE: ***** LAYOUT IS CUSTOMER SPECIFIED *****

GENERAL ELECTRIC
ELECTRICAL DISTRIBUTION & CONTROL

PANEL BOARD
DRAWING

FACTORY ORDER NO	JOB NAME		REV	DATE	PAGE
	SOIL & GROUND WATER A.5			06/22/95	16
REQUISITION NO	PROPOSITION NO	FRONT DATE	BOX DATE	INTERIOR DATE	
	623 31352				

ITEM 16 PANEL A

QTY 1 A-SERIES TYPE AQ 3P4W 120/208V
10,000 AMPS RMS SC FULLY RATED

MAIN 150 AMP 3P TGD CB LOC TOP
1-LUG/PH 1-CABLE/LUG #1 -300 MCM

BRANCHES 2 - 20A 2P THQB
1 - 50A 2P THQB
28 - 20A 1P THQB
8 - 20A 1P THQB SPACE

OPTIONS 3 - GROUND-BOX BONDED TGL2

INTERIOR AGF3422ATX AXS5

BOX AB49B H 49 1/2" W 20" D 5 3/4"

FRONT AF49S SURFACE MOUNTING

DEVICE LAYOUT IS CUSTOMER SPECIFIED

GENERAL ELECTRIC
ELECTRICAL DISTRIBUTION & CONTROL

PANEL BOARD
DRAWING

FACTORY ORDER NO	JOB NAME	REV	DATE	PAGE
	SOIL & GROUND WATER A.5	0	06-22-95	16
REQUISITION NO	PROPOSITION NO	FRONT DATE	BOX DATE	INTERIOR DATE
	623 31352	□		

PRINT SEQ. # 16 ITEM # 16 TYPE: AQ
 3P4W 208Y/120V AC TOP SURFACE MK: PANEL A
 10,000 AMPS. RMS SYM SC FULLY RATED - H 49 1/2" W20" D 5 3/4"

LINE WIRE SPACE					
CKT #	225A NEUTRAL ONLY			CKT #	
150A 3P TGD MAIN					
1	20A 1P THQB		20A 1P THQB	2	
3	20A 1P THQB		20A 1P THQB	4	
5	20A 1P THQB		20A 1P THQB	6	
7	20A 1P THQB		20A 1P THQB	8	
9	20A 1P THQB		20A 1P THQB	10	
11	20A 1P THQB		20A 1P THQB	12	
13	20A 1P THQB		20A 1P THQB	14	
15	20A 1P THQB		20A 1P THQB	16	
17	20A 1P THQB		20A 1P THQB	18	
19	20A 1P THQB		20A 1P THQB	20	
21	20A 1P THQB		20A 1P THQB	22	
23	20A 1P THQB		20A 1P THQB	24	
25	20A 2P THQB		50A 2P THQB	26	
29	20A 1P THQB		20A 1P THQB	30	
31	20A 1P THQB		20A 1P THQB	32	
33	20A 1P THQB	SPACE	20A 2P THQB	34	
35	20A 1P THQB	SPACE			
37	20A 1P THQB	SPACE	20A 1P THQB	SPACE	38
39	20A 1P THQB	SPACE	20A 1P THQB	SPACE	40
41	20A 1P THQB	SPACE	20A 1P THQB	SPACE	42
225A PANEL END FILLER					
LOAD WIRE SPACE					

NOTE: ***** LAYOUT IS CUSTOMER SPECIFIED *****

OHM REMEDIATION SERVICES CORPORATION
5335 TRIANGLE PARKWAY, SUITE 450
NORCROSS, GEORGIA 30092
(404) 729-3900

SOIL AND GROUND WATER REMEDIATION
OPERABLE UNIT NO. 2, SITES 6 AND 82
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

CONTRACT NO. N62470-93-C-3032

SPECIFICATION SECTION: 16402

SUBMITTAL FOR: INTERIOR WIRING SYSTEM

<u>ITEM NO.</u>	<u>SPEC PAR</u>	<u>SD-NO/ITEM DESCRIPTION/MANUFACTURER</u>
1A	1.3.1A	SD-02 CONDUIT (GRS) - TRIANGLE WIRE & CABLE
1B	1.3.1A	SD-02 CONDUIT (PVC SCH 40) & FITTINGS - LCP
1C	1.3.1A	SD-02 CONDUIT (FLEX/L.T. FLEX STEEL) - ALFLEX
1D	1.3.1A	SD-02 FITTINGS - APPLETON
1E	1.3.1A	SD-02 FITTINGS - ARLINGTON INDUSTRIES
1F	1.3.1A	SD-02 FITTINGS - KINDORF
1G	1.3.1A	SD-02 FITTINGS - STEEL CITY
1H	1.3.1A	SD-02 FITTINGS - WHEATLAND
1I	1.3.1A	SD-02 FITTINGS - BRIDGEPORT
2A	1.3.1B	SD-02 OUTLET BOXES & COVERS - RACO
2B	1.3.1B	SD-02 OUTLET BOXES & HANGERS/HOOKS/BODIES - APPLETON
2C	1.3.1B	SD-02 FS/FD BOXES - MULLBERRY
3	1.3.1C	SD-02 JUNCTION BOXES & COVERS - AUSTIN
4	1.3.1D	SD-02 WIRE (THWN/THHN) - SENATOR
5A	1.3.1E	SD-02 WIRE CONNECTORS - BUCHANAN
5B	1.3.1E	SD-02 INSULATING TAPE - SCOTCH/3M
6A	1.3.1F	SD-02 DEVICE PLATES - PASS & SEYMOUR
6B	1.3.1F	SD-02 WEATHERPROOF DEVICE COVERS - EAGLE

HOT DIPPED GALVANIZED RIGID STEEL CONDUIT (RWB)

131A
331

INDUSTRY STANDARDS:

UL 6 - Rigid Metal Electrical Conduit
Federal Spec. WWC-581-E - Conduit, Metal, Rigid, and Intermediate
ANSI Standard C80-1 - Rigid Steel Conduit, Zinc Coated

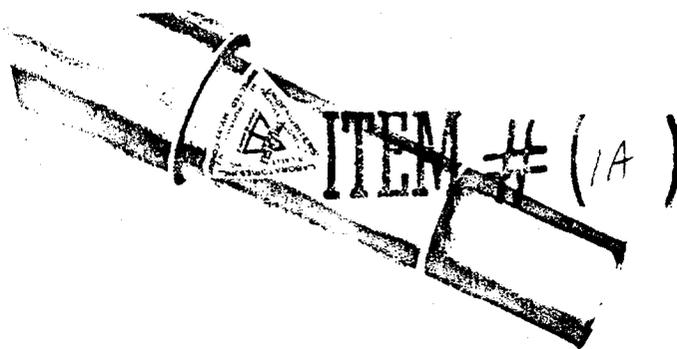
APPLICATIONS:

Galvanized Rigid Metal Conduit shall be installed in accordance with the National Electrical Code's Article 346 - "Rigid Metal Conduit."

- Under all atmospheric conditions and occupancies
- In concrete, in direct contact with earth or in areas subject to severe corrosive influences.
- In or under cinder fill where subject to permanent moisture when protected on all sides by a layer of non-cinder concrete not less than 2 inches thick; when the conduit is not less than 18 inches under the fill.

CONSTRUCTION:

Triangle PWC hot-dipped galvanized rigid steel conduit is produced from high grade raw steel pipe which has been thoroughly cleaned prior to final coating to insure permanent adhesion. It is completely protected from any corrosion by a special protection process:



1. The interior as well as the exterior are coated with a solid, unbroken layer of zinc. The tenacious bond between the zinc and steel layers is formed by the co-mingling of steel and zinc into a transitional steel/zinc alloy layer, providing the superior protective bonding of an alloyed interface.
2. The threads on the conduit are zinc coated after cutting by Triangle's exclusive Galv-Coat process.
3. The conduit is coated with a durable bichromate finish or other suitable treatments which prevent oxidation and white rust.

GALVANIZED ELECTRICAL METALLIC TUBING (EMT)

INDUSTRY STANDARDS:

UL 797 - Electrical Metallic Tubing
Federal Spec. WW-C-563-A - Conduit, Metal, Rigid; Electrical, Thin-Wall Steel Type
ANSI Standard C80-3 - Electrical Metallic Tubing, Zinc Coated.

APPLICATIONS:

Electrical Metallic Tubing shall be installed in accordance with the National Electrical Code's Article 348 - "Electrical Metallic Tubing".

- Exposed and concealed work
- In concrete, in direct contact with the earth, or in areas subject to severe corrosive influences when protected by corrosion protection and judged suitable for the condition.

CONSTRUCTION:

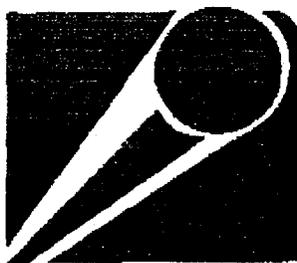
Triangle PWC thin wall conduit or electrical metallic tubing (EMT) is produced from high grade flat steel. It is electrically welded giving a perfectly true tube of uniform thickness and strength. The tubing, which is threadless and lighter in



weight than heavy wall conduit, is thoroughly pickled and cleaned to remove all scale and foreign substances adhering to its surfaces.

The exterior of the pipe is then given a uniform protective coating of pure zinc by the electro-galvanizing process. The galvanizing equipment is so planned and arranged that the outside of the pipe, from one end to the other, is uniformly coated with the zinc. On the inside surface a thick, tough, elastic coating of enamel is applied, producing an exceptionally smooth, glass-like finish, which facilitates easy and rapid fishing of wires.

13.1A
2.2.2



**LCP NATIONAL
PLASTICS, INC.**

LCP National Plastics, Inc.
3421 Vestal Road
Vestal, NY 13850
(607) 729-9381
(800) 836-4350
Fax (607) 729-8130

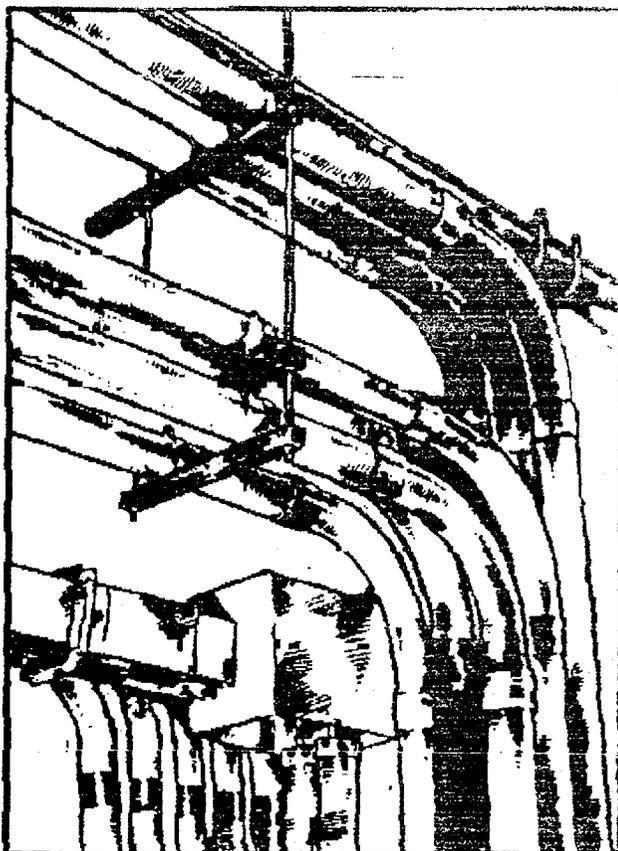
P.O. Box 156
Highway 421
Coffax, NC 27235
(910) 996-2711
(800) 866-0149
Fax (910) 996-0665

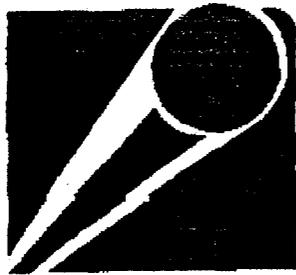
LCP National Plastics
is an Employee Owned
American Company.

ITEM # (IE)
PAGES 1-7

PVC Electrical Conduit and Fittings

Schedule 40 and 80





LCP NATIONAL PLASTICS, INC.

Standards

LCP National PVC Electrical Conduit is manufactured from virgin PVC compounds with a cell class of 13324 as determined by ASTM-D-1784 complying with the industry standards. Our PVC Electrical Conduits are subject to in-process quality control to assure compliance with appropriate manufacturing and performance standards. Typical physical properties of compound and conduit are listed. PVC Electrical Conduit and accessories meet the requirements and carry appropriate UL Listing & Labels as established by:

- Underwriters Laboratories (UL) Standard 651 (Conduit)
- Underwriters Laboratories (UL) Standard 514 (Accessories)
- National Electrical Manufacturers Association (NEMA) TC-2 (Conduit)
- National Electrical Manufacturers Association (NEMA) TC-3 (Accessories)
- General Service Administration (GSA) WC-1094A
- National Electrical Code - Article 347
- CSA - C22.2 No. 2112

Properties

Physical Properties	ASTM Test Method	Value
Specific Gravity	D792	1.40
Tensile Strength, psi @ 73.4°F	D638	6000
Impact (Izod) ft. lbs./in. of Notch @ 73.4°F	D256	1.2
Flexural Strength, psi	D650	14,700
Compressive Strength, psi	D695	9000
Hardness (Shore "D")	D676	88

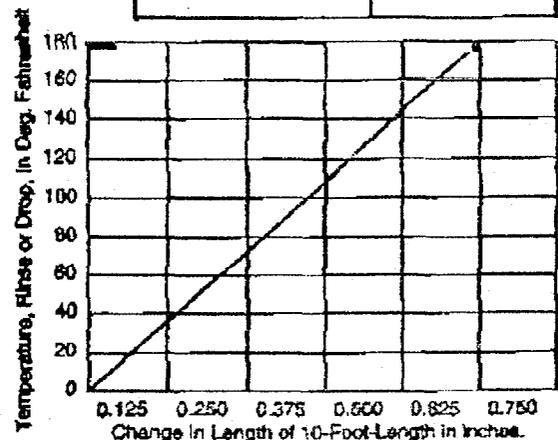
Thermal Properties	ASTM Test Method	Value
Heat Distortion in °F at 254 psi	D658	172°
Thermal Conductivity-- BTU/Ft ² °F/in.		1.3
Coefficient of Thermal Expansion in /in./°F at 73.4°F	D696	2.85 x 10 ⁻⁶
Coefficient of Thermal Expansion in /in./°C at 23°C	D696	5.13 x 10 ⁻⁶

Electrical Properties	ASTM Test Method	Value
Dielectric Strength volts/mil	D149	1100
Dielectric Constant 60 Cps @ 30°C 1000 Cps @ 30°C	D150	4.00
Power Factor 60 Cps @ 20°C, 1000 Cps @ 20°C	D150	1.83

Miscellaneous Properties	ASTM Test Method	Value
Water Absorption -- % in 24 hours @ 72°F	D670	.03%
Flammability		self-extinguishing

Expansion/Contraction Considerations

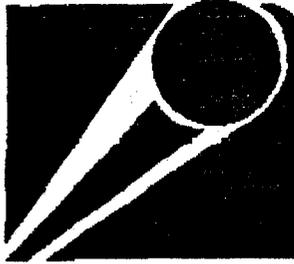
The possibility of a constantly changing temperature on an installation site requires precautions against expansion and contraction. LCP National offers an expansion coupling that should be installed near the end of the run or fixture to guard against expansion/contraction stresses. Expansion at various temperature ranges is shown below. The coefficient of linear expansion of LCP National PVC Conduit is 2.85×10^{-6} in./in./°F.



Physical Properties

	ASTM Test Method	Imperial		S.I.	
		Unit	Value	Unit	Value
PHYSICAL					
Specific Gravity	D792		1.35		1.35
Hardness	D676	Durometer D	78	Durometer D	78
Izod Impact Strength @ 78°F	D258	ft. lb./in. notch	5.0	J/in notch	266.9
Tensile Strength @ 78°F	D638	psi	6000	MPa	41.4
Compressive Strength	D695	psi	8600	MPa	59.3
Flexural Strength	D790	psi	11500	MPa	79.3
THERMAL					
Coefficient of Thermal Conductivity	G177	BTU/sec/in ² /°F/in	0.11	W/(m. °C)	8230
Coefficient of Linear Expansion	D698	per °F x 10 ⁻⁶	6.5	per °C x 10 ⁻⁶	9.9
Heat Distortion Temperature at 264 psi (1.82 MPa)	D648	°F	140	°C	6.0
ELECTRICAL					
Dielectric Strength	D149	volts/mil	1213	MV/m	48
Dielectric Constant	D150	60 cps at 30°C	3.55	60 Hz at 30°C	3.55
	D150	1000 cps at 30°C	3.22	1000 Hz at 30°C	3.22
Power Factor	D150	60 cps at 30°C	4.04	60 Hz at 30°C	4.04
	D150	1000 cps at 30°C	4.71	1000 Hz at 30°C	4.71
OTHERS					
Flammability	D635		Self- Extinguishing		Self- Extinguishing
Water Absorption in 30 days		%	0.6	%	0.6
Colour			Medium Gray		Medium Gray
Light Transmission	D791		Opaque		Opaque

4



**LCP NATIONAL
PLASTICS, INC.**

HEAVY WALL PVC UL-RIGID PVC CONDUIT

Schedule 40

For underground applications, encased in concrete or direct burial. Also for use in exposed or concealed applications above ground.

- U.L. Listed
- Sunlight resistant
- Rated for use with 90 C conductors
- Reduced emissions of smoke and HCL
- Superior weathering characteristics
- CSA Listed

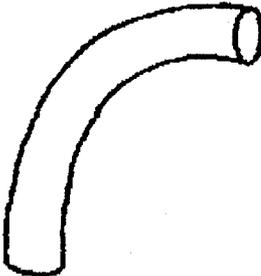
Nom Size	Cat No	O.D.	I.D.	Wall	Wt Per 100 Feet	Feet Per Bundle
1/2	333700510	.840	.622	.109	17	6000
3/4	333700710	1.050	.824	.113	23	3200
1	333701010	1.315	1.049	.133	34	2600
1 1/4	333701210	1.680	1.380	.140	46	3000
1 1/2	333702010	1.900	1.610	.145	55	2250
2	333702510	2.375	2.067	.154	73	1400
2 1/2	333703010	2.875	2.469	.203	125	1020
3	333703510	3.500	3.068	.216	164	630
3 1/2	333704010	4.200	3.548	.226	198	420
4	333704010	4.500	4.026	.237	234	380
5	333705010	5.563	5.047	.258	318	330
6	333706010	6.625	6.065	.280	412	220

Rigid non-metallic conduit is normally supplied in standard 10' lengths with one belled end per length. For specific requirements, it may be produced in lengths shorter or longer than 10', with or without belled ends.

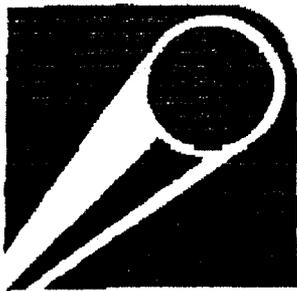




LCP 40 U.L. CONDUIT ELBOWS PVC STANDARD RADIUS ELBOWS

 <p>90 Degrees</p>	SIZE	PART NUMBER	STD RADIUS INCHES	CARTON QUANTITY	UNIT PRICE
	1/2	1310005	4.000	50	.89
	3/4	1310007	4.500	25	.98
	1	1310010	5.750	25	1.52
	1 1/4	1310012	7.250	20	2.16
	1 1/2	1310015	8.250	25	2.93
	2	1310020	9.500	20	4.25
	2 1/2	1310025	10.500	10	7.72
	3	1310030	13.000	30	13.53
	3 1/2	1310035	15.000	30	18.70
4	1310040	16.000	25	23.43	
5	1310050	24.000	25	41.24	
6	1310060	30.000	25	65.85	
 <p>45 Degrees</p>	SIZE	PART NUMBER	STD RADIUS INCHES	CARTON QUANTITY	UNIT PRICE
	1/2	1320005	4.000	50	.81
	3/4	1320007	4.500	25	.90
	1	1320010	5.750	25	1.43
	1 1/4	1320012	7.250	20	1.99
	1 1/2	1320015	8.250	25	2.75
	2	1320020	9.500	20	4.10
	2 1/2	1320025	10.500	10	7.63
	3	1320030	13.000	30	13.02
	3 1/2	1320035	15.000	30	14.73
4	1320040	16.000	25	21.70	
5	1320050	24.000	25	34.82	
6	1320060	30.000	25	50.63	
 <p>30 Degrees</p>	SIZE	PART NUMBER	STD RADIUS INCHES	CARTON QUANTITY	UNIT PRICE
	1/2	1322005	4.000	50	1.19
	3/4	1322007	4.500	25	1.23
	1	1322010	5.750	25	1.50
	1 1/4	1322012	7.250	20	2.10
	1 1/2	1322015	8.250	25	2.88
	2	1322020	9.500	20	4.53
	2 1/2	1322025	10.500	10	8.59
	3	1322030	13.000	30	14.63
	3 1/2	1322035	15.000	30	16.56
4	1322040	16.000	25	24.40	
5	1322050	24.000	25	39.14	
6	1322060	30.000	25	45.64	

* Note: 3" & 6" diameter fittings are palletized. 2 1/2" & 1 1/4" elbows available by special order.



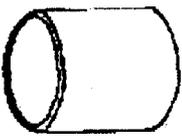
LCP NATIONAL

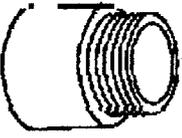
45° PVC SPECIAL RADIUS BENDS, CONT'D (EPC-40)

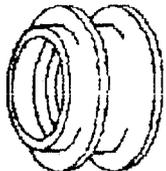
	SIZE	PART NO.	CARTON QUANTITY	UNIT PRICE
	36" Radius	1	1319136	100	5.58
	1 1/4	1319166	100	7.35
	1 1/2	1319186	100	9.19
	2	1319236	100	11.49
	2 1/2	1319256	-50	14.36
	3	1319336	-50	17.95
	3 1/2	1319354	-50	22.44
	4	1319436	50	28.04
	5	1319536	25	43.55
	6	1319636	25	65.84

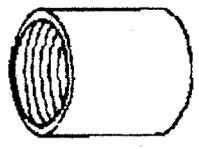
	SIZE	PART NO.	CARTON QUANTITY	UNIT PRICE
	48" Radius	1	1319136	100	6.25
	1 1/4	1319166	100	8.41
	1 1/2	1319186	100	10.51
	2	1319236	100	13.24
	2 1/2	1319256	-50	16.42
	3	1319336	-50	20.53
	3 1/2	1319354	-50	25.67
	4	1319436	50	32.08
	5	1319536	25	48.77
	6	1319636	25	73.74

PVC FITTINGS FOR TYPE 40 (EPC-40)

	SIZE	PART NO.	CARTON QUANTITY	UNIT PRICE
	Coupling	1/2	1329005	200	1.27
3/4		1329007	150	.33
1		1329010	50	.51
1 1/4		1329012	30	.88
1 1/2		1329015	30	.96
2		1329020	45	1.24
2 1/2		1329025	20	2.40
3		1329030	35	3.40
3 1/2		1329035	25	4.31
4		1329040	18	5.37
5		1329050	6	14.12
6		1329060	4	18.55

	SIZE	PART NO.	CARTON QUANTITY	UNIT PRICE
	Terminal Adapter	1/2	1336005	200
3/4		1336007	125	.64
1		1336010	50	.89
1 1/4		1336012	70	1.14
1 1/2		1336015	40	1.23
2		1336020	75	1.77
2 1/2		1336025	35	3.21
3		1336030	25	4.89
3 1/2		1336035	40	6.38
4		1336040	30	7.47
5	1336050	10	16.28	
6	1336060	8	21.49	

	SIZE	PART NO.	CARTON QUANTITY	UNIT PRICE
	End Bells	1	1379010	100
1 1/4		1379012	100	2.31
1 1/2		1379015	100	2.31
2		1379020	100	3.50
2 1/2		1379025	-50	3.78
3		1379030	-50	4.21
3 1/2		1379035	-50	4.54
4		1379040	50	5.03
5		1379050	25	7.74
6		1379060	25	8.48

	SIZE	PART NO.	CARTON QUANTITY	UNIT PRICE
	Female Adapter	1/2	1335005	200	.50
3/4		1335007	150	.64
1		1335010	50	.89
1 1/4		1335012	30	1.14
1 1/2		1335015	30	1.28
2		1335020	45	1.70
2 1/2		1335025	20	3.21
3		1335030	35	4.89
3 1/2	1335035	25	6.38	
4	1335040	18	6.42	
5	1335050	6	16.28	
6	1335060	4	21.49	

ULTRATITE

LIQUID-TIGHT FLEXIBLE STEEL CONDUIT

ITEM # (1C)

1.3.1A
2.1.3.1

SPECIFICATIONS

Type UL Liquid-tight UL U.L. Listed

Trade Size: Inches	Coil Length in Feet	Reel Lengths in Feet	Approx. Weight per 100 ft.	Inside Diameter		Outside Diameter		Approx. Inside Bend Diameter
				Min.	Max.	Min.	Max.	
3/8"	100	600/1000	28	.484	.504	.690	.710	4"
1/2"	100	500/1000	34	.622	.642	.820	.840	6.5"
3/4"	100	500/1000	48	.820	.840	1.030	1.050	8.5"
1"	100	400	80	1.041	1.066	1.290	1.315	13"
1 1/4"	50	250	102	1.380	1.410	1.630	1.660	16"
1 1/2"	50	150	103	1.575	1.600	1.865	1.900	18"
2"	50	100	145	2.020	2.045	2.340	2.375	22.25"
2 1/2"	25		197	2.480	2.505	2.840	2.875	29.25"
3"	25		265	3.070	3.100	3.460	3.500	35"
3 1/2"	25		310	3.500	3.540	3.960	4.000	40"
4"	25		370	4.000	4.040	4.460	4.500	48"

Conforms to the provisions of Article 351 of the National Electrical Code under "Liquidtight Flexible Metal Conduit." Sizes 3/8" through 1 1/4" have a continuous copper ground wire built into the core. Sizes 1 1/2" through 4" must be installed using a separate ground wire to conform to Article 351. Suitable for direct burial. U.L. / CSA dual listed product manufactured to the above specifications available upon request.

PVC jacket is made with a sunlight resistant UL compound. UL Ultratite is approved for use in temperatures from -10°C to +60°C. U.L. Listed per U.L. Standard for Safety 360; U.L. Listed File #E78759. Approved by Canadian Standards Association; certification #L553-04-1

Type EF Liquid-tight Not Listed

Trade Size: Inches	Coil Length in Feet	Reel Lengths in Feet	Approx. Weight per 100 ft.	Inside Diameter		Outside Diameter		Approx. Inside Bend Diameter
				Min.	Max.	Min.	Max.	
3/8"	100	600	21	.480	.540	.690	.710	4"
1/2"	100	500/1000	22	.622	.642	.820	.840	5"
3/4"	100	500/1000	33	.820	.840	1.030	1.050	6"
1"	100	400	58	1.041	1.066	1.290	1.315	8"
1 1/4"	50	250	74	1.380	1.410	1.630	1.660	9"
1 1/2"	50	150	106	1.575	1.600	1.865	1.900	11"
2"	50	100	140	2.020	2.045	2.340	2.375	14"
2 1/2"	25		194	2.480	2.505	2.840	2.875	19"
3"	25		222	3.070	3.100	3.460	3.500	23"
3 1/2"	25		275	3.500	3.540	3.960	4.000	26"
4"	25		325	4.000	4.040	4.460	4.500	28"

For use in limited space where extra flexibility is needed. PVC jacket is made with a sunlight resistant compound. EF Ultratite is approved for use in temperatures from -10°C to +60°C.

NOTES

For both Types UL and EF, sizes and lengths indicated are standard products. For sizes and lengths not listed, please consult the factory. Applicable specifications, standards and codes as of print date.



GALFLEX

U.L. LISTED REDUCED WALL FLEXIBLE STEEL CONDUIT

SPECIFICATIONS

Trade Size	Coil Length in Feet	Reel Lengths in Feet	Approx. Weight per 100ft	Inside Diameter		Outside Diameter		Approx. Inside Bend Diameter
				Min.	Max.	Min.	Max.	
5/16"	100/250/500	1000	35	.312		.70	.510	1 1/2"
3/8"	100/250/500	1000	38	.375	.593	.660	.610	1 3/8"
1/2"	100	1000	25	.625	.645	.860	.920	2 1/8"
3/4"	100	500/1000	33	.812	.835	1.045	1.105	3"
1"	50		52	1.000	1.040	1.300	1.380	3 3/4"
1 1/4"	50		65	1.250	1.300	1.550	1.630	4 1/4"
1 1/2"	25		80	1.500	1.575	1.850	1.950	5 3/8"
2"	25		100	2.000	2.080	2.50	2.450	5 3/8"
2 1/2"	25		150	2.500		3.060	3.060	7 3/4"
3"	25		190	3.000		3.60	3.560	11 1/2"
3 1/2"	25		270	3.500		4.060	4.060	13"
4"	25		400	4.000		4.60	4.560	18"

Meets Underwriters Laboratories Standard 1.
Complies with NEC Article 350.
Complies with Federal Specification WW-C-566C.
Galflex U.L. File #E43113.

The Canadian Standards Association lists 5/16" and 3/8" Galflex. Our CSA certification number is L33009.
Underwriters Laboratories does not list reduced wall steel in 3 1/2" and 4" sizes.

NOTE

Sizes and lengths indicated are standard products. For sizes and lengths not listed, please consult the factory.

Available From:



2630 El Presidio Street, Long Beach, CA 90810 (213) 979-4611 Telex 69-8384 Fax (213) 631-3602



CF-2

1.2.1A
1.5.4

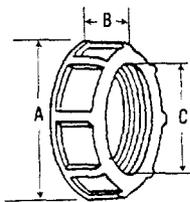


ITEM # (ID)

Rigid Conduit and IMC Bushings

Std. Pkg.

2500
1000
1000
500
200
100
100
50
50
20
20
10
10



Catalog No.	Size	A	Dimensions B	C	Wt. Lbs. Per 100	Ctn. Qty.	Std. Pkg.
Bushings—Malleable Iron							
BU50	1/2	1 1/16	1 1/32	1 9/32	2.0	100	1000
BU75	3/4	1 1/4	3/8	1 3/16	3.2	100	1000
BU100	1	1 5/8	1/2	1	8.2	50	500
BU125	1 1/4	2	1/2	1 11/32	11.0	50	200
BU150	1 1/2	2 5/16	1/2	1 9/16	13.0	50	200
BU200	2	2 29/32	9/16	2	24.0	25	100
BU250	2 1/2	3 1/4	3/4	2 1/2	36.0	10	50
BU300	3	3 7/8	13/16	3	45.0	10	50
BU350	3 1/2	4 9/16	13/16	3 17/32	85.0	5	20
BU400	4	5 1/16	13/16	4	100.0	5	20
BU500	5	6 5/16	1	4 7/8	155.0	1	10
BU600	6	7 7/16	1	5 7/8	265.0	1	10

Bushings—Insulated—Malleable Iron—150°C Temperature Rating

BU50 I	1/2	1 1/16	1 3/32	1 9/32	2.3	100	1000
BU75 I	3/4	1 1/4	7/16	1 3/16	2.7	100	1000
BU100 I	1	1 5/8	1/2	1 1/2	7.0	50	500
BU125 I	1 1/4	2	1/2	1 11/32	12.0	50	200
BU150 I	1 1/2	2 5/16	1/2	1 9/16	13.0	50	200
BU200 I	2	2 29/32	9/16	2	23.0	25	100
BU250 I	2 1/2	3 1/4	3/4	2 1/2	37.0	10	50
BU300 I	3	3 7/8	13/16	3	41.0	10	50
BU350 I	3 1/2	4 9/16	13/16	3 17/32	87.5	5	20
BU400 I	4	5 1/16	13/16	4	102.5	5	20
BU500 I	5	6 5/16	1	4 7/8	160.0	1	10
BU600 I	6	7 7/16	1	5 7/8	271.0	1	10

Capped Bushings—Malleable Iron

BUC50	1/2	1 1/16	1 1/32	—	2.7	100	1000
BUC75	3/4	1 1/4	3/8	—	4.0	100	1000
BUC100	1	1 5/8	1/2	—	8.0	50	500
BUC125	1 1/4	2	1/2	—	12.8	50	200
BUC150	1 1/2	2 5/16	1/2	—	16.0	10	100
BUC200	2	2 29/32	9/16	—	26.0	10	100
BUC250	2 1/2	3 1/4	3/4	—	44.0	5	50
BUC300	3	3 7/8	13/16	—	51.0	5	25
BUC350	3 1/2	4 9/16	13/16	—	96.0	5	25
BUC400	4	5 1/16	13/16	—	110.0	5	20

Impact Resistant Plastic Bushings—105°C Temperature Rating

BBU50	1/2	1 1/16	1 3/32	1 9/32	0.6	100	400
BBU75	3/4	1 5/16	1 3/32	1 25/32	0.8	100	400
BBU100	1	1 9/16	9/16	1	1.5	50	200
BBU125	1 1/4	1 29/32	9/16	1 5/16	2.3	25	100
BBU150	1 1/2	2 3/16	9/16	1 9/16	3.0	25	100
BBU200	2	2 11/16	5/8	2	4.0	25	50
BBU250	2 1/2	3 3/16	23/32	2 13/32	7.8	10	20
BBU300	3	3 27/32	3/4	3	10.0	10	20
BBU350	3 1/2	4 11/32	3/4	3 13/32	13.0	5	10
BBU400	4	4 27/32	25/32	3 29/32	11.0	5	10
BBU500	5	6 3/8	1	4 15/16	44.0	—	2
BBU600	6	7 1/2	1	5 7/8	50.0	—	2

1000
300
500
200
100
100
100
50
50
25
5
5



1000
500
500
500
500
250
100
100
50
50



1000
1000
500
500
100
100
50
50
20



Discount Schedule CF-2
Refer to Pricing Index for Prices.



1701 W. Wellington Ave.
Chicago, Illinois 60657

Wellington Ave.
Illinois 60657

ITEM # (1E)

12.1A
2.2.4

STANDARDS & SPECIFICATIONS

PRODUCT GROUP	UL STANDARD NUMBER	UL FILE NUMBER	UL CONTROL NUMBER	CSA FILE NUMBER	FED SPEC NUMBER	NEMA STANDARD
Liquid-Tight Fittings	UL 514B	E60812	351F	49636	W-F-408D W-F-406D	FB-1
EMT Fittings	UL 514B	E20643	365D	49636	W-F-406C W-F-408D	FB-1
Non-metallic Cable Connectors	UL 514B	E28474	388D	49636	W-F-406C	FB-1
Flexible Cord Connectors	UL 514B	E105706	1B64	49636	W-F-406B	FB-1
Armored Cable Connectors	UL 514B	E18304	372D	49636	W-F-406C	FB-1
Service Entrance Cable Fittings	UL 514B	E66990	282F	49636	W-F-406C	FB-1
Grounding and Bonding Equipment	UL 467	E75814	910F	49636	W-F-406C	FB-1
Conduit Bodies	UL 514A UL 514B	E28474	5B36	49636	W-F-406	FB-1
Conduit Fittings-Rigid	UL 514B	E60812	351F	49636	W-F-406C W-F-408D	FB-1
MC Cable Connectors	UL 514B	E123751	388E	49636	W-F-406B	FB-1
Grounding Lugs	UL 514B	E86540	910F	49636	W-F-406B	FB-1
Flush Device Box Covers	UL 514A	E48106	910F	49636	W-F-406	FB-1

Arlington's metallic SNAP-TITE® products have been tested and listed by UL in accordance with UL's new 1996 ground fault requirements.



Arlington Industries, Inc.

1/800/233/4717. FAX 717/562/0646. STAUFFER INDUSTRIAL PARK. SCRANTON, PA 18517

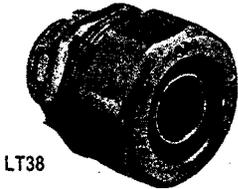
1.3.1A
3.11

LIQUID TIGHT

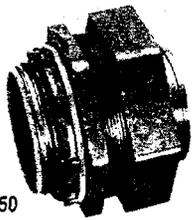
STRAIGHT ZINC DIE-CAST CONNECTORS

ITEM # (IE)

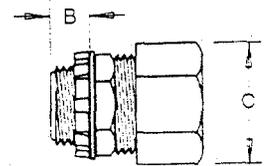
For use with metallic and non-metallic liquid-tight conduit, type B.



LT38



LT250



CATALOG NUMBER	UPC/DCI/MFG #01 8997	TRADE SIZE	KO SIZE	UNIT PKG	STD PKG	DIM A	DIM B	DIM C
LT38	32380	3/8	1/2	25	100	1.440	.400	1.260
LT50	32500	1/2	1/2	25	100	1.500	.520	1.385
LT75	32750	3/4	3/4	10	50	1.562	.500	1.720
LT100	32100	1	1	5	25	1.785	.593	1.900
LT125	32125	1-1/4	1-1/4	5	25	1.900	.536	2.290
LT150	32150	1-1/2	1-1/2	2	10	2.008	.587	2.633
LT200	32200	2	2	2	10	2.103	.593	3.156
*LT250	32250	2-1/2	2-1/2	1	1	3.205	.825	4.218
*LT300	32300	3	3	1	1	3.437	.920	4.830
*LT350	32350	3-1/2	3-1/2	1	1	3.660	.920	5.470
*LT400	32400	4	4	1	1	3.875	.987	5.925

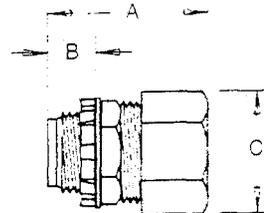
*Provided with insulated throat.



WITH INSULATED THROAT



LT38A	32381	3/8	1/2	25	100	1.533	.493	1.260
LT50A	32501	1/2	1/2	25	100	1.593	.613	1.385
LT75A	32751	3/4	3/4	10	50	1.656	.593	1.720
LT100A	32101	1	1	5	25	1.878	.686	1.900
LT125A	32121	1-1/4	1-1/4	5	25	1.975	.639	2.290
LT150A	32151	1-1/2	1-1/2	2	10	2.101	.680	2.633
LT200A	32201	2	2	2	10	2.196	.686	3.156
LT250	32250	2-1/2	2-1/2	1	1	3.025	.775	4.205
LT300	32300	3	3	1	1	3.205	.920	4.910
LT350	32350	3-1/2	3-1/2	1	1	3.437	.920	5.470
LT400	32400	4	4	1	1	3.875	.987	5.925



ASSEMBLY INSTRUCTIONS

Arlington Industries' reusable Liquid-Tight Fittings may be secured to conduit while fully assembled due to our no spin ferrule. Simply loosen nut, and screw onto conduit by hand. A positive liquid-tight seal is provided by our pressure sensitive internal gland when the nut is tightened. A liquid-tight seal is also assured between the fitting and box by a polypropylene sealing ring.

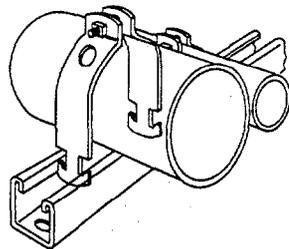


Arlington Industries, Inc.

1/800/233/4717. FAX 717/562/0646. STAUFFER INDUSTRIAL PARK. SCRANTON, PA 18517

12.1A
3.2.4

ITEM # (IF)



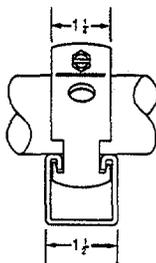
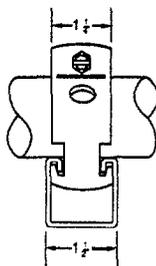
C-105 and C-106 Pipe Straps

Kindorf Pipe Straps are designed to be twist inserted anywhere along the slot of the channel. Pipes can be placed as closely as pipe couplings permit.

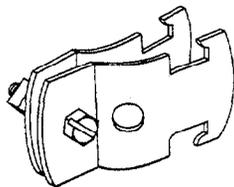
Some unique features of the straps include:

- Bolt head is combination slot and hex head for flexibility of attachment
- Square nut is captivated on the shoulder for easy one-handed tightening
- Straps are interchangeable with 1/2" strut, for broader application
- Straps are shipped assembled so counting and sorting are easier
- Both O.D. and I.D. dimensions are shown on the strap for easy identification

D



Interchangeable strap fits both 1 1/2" and 1"

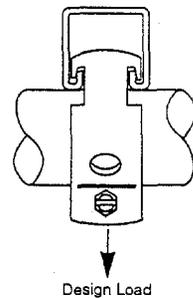


All Kindorf Straps are pre-assembled for easy handling and sorting

Kindorf Straps for Rigid Conduit, IMC and Pipe

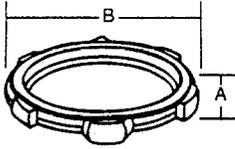
Steel Straps—Galv-Kröm Finish

Cat. No.	Rigid Conduit or Pipe Size	Steel Strap Thickness	Design Load (lbs.)	Wt. lbs./C	Additional Use of Strap
C-106-3/4	3/4"	14 ga.	600	13	3/4" emt
C-105-3/4	3/4"	14 ga.	600	12	3/4" o.d.
C-105-1/2	1/2"	14 ga.	600	13	3/4" o.d.
C-105-3/4	3/4"	14 ga.	600	15	1" o.d.
C-105-1	1"	14 ga.	600	17	1 1/4", 1 1/2" o.d.
C-105-1 1/4	1 1/4"	14 ga.	600	19	1 1/2" o.d.
C-105-1 1/2	1 1/2"	12 ga.	800	28	1 3/4", 2" o.d.
C-105-2	2"	12 ga.	800	31	2 1/4", 2 1/2" o.d.
C-105-2 1/2	2 1/2"	12 ga.	800	36	2 1/2" emt; 2 3/4", 2 1/2" o.c
C-105-3	3"	12 ga.	800	42	3" emt; 3 3/8", 3 1/2", 3 3/4"
C-105-3 1/2	3 1/2"	1/2"	1000	56	3 3/4" emt; 3 3/4", 4", 4 1/4"
C-105-4	4"	1/2"	1000	64	4" emt; 4 3/8", 4 1/2", 4 3/4"
C-105-4 1/2	4 1/2"	1/2"	1000	72	5", 5 1/4", 5 1/2" o.d.
C-105-5	5"	1/2"	1000	76	5 1/4", 5 1/2" o.d.
C-105-6	6"	1/2"	1000	89	6 1/4", 6 3/8", 6 1/2" o.d.
C-105-8	8"	1/2"	1000	114	8 1/2", 8 3/4", 8 1/2" o.d.



13-1A
13-1B

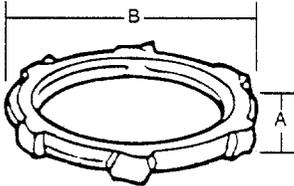
ITEM # (16)



Locknuts—Steel/Zinc Plated

Cat. No.	Size	Dimensions (in.)	
		A (min.)	B (max.)
LN-100	½"	—	—
LN-101	½"	0.125"	1.140"
LN-102	¾"	0.140"	1.420"
LN-103	1"	0.170"	1.770"
LN-104	1½"	0.170"	2.281"
LN-105	1½"	0.170"	2.598"
LN-106	2"	0.187"	3.175"
LN-107	2½"	0.375"	3.562"
LN-108	3"	0.375"	4.250"
LN-109	3½"	0.438"	4.803"
LN-110	4"	0.438"	5.402"
LN-111	5"	0.500"	6.674"
LN-112	6"	0.561"	7.934"

U.L. File No. E-1275

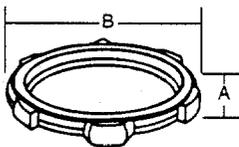


Locknuts—Die Cast Zinc

Cat. No.	Size	Dimensions (in.)	
		A (min.)	B (max.)
LN-201	½"	0.125"	1.140"
LN-202	¾"	0.140"	1.420"
LN-203	1"	0.170"	1.770"
LN-204	1½"	0.170"	2.281"
LN-205	1½"	0.170"	2.598"
LN-206	2"	0.187"	3.175"
LN-207	2½"	0.375"	3.562"
LN-208	3"	0.375"	4.250"
LN-209	3½"	0.438"	4.803"
LN-210	4"	0.438"	5.402"

CSA File No. LR-12798

U.L. File No. E-1275



Sealing Locknuts—Steel/Zinc Plated

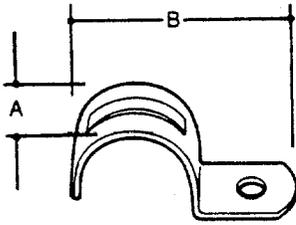
Cat. No.	Size	Dimensions (in.)	
		A (min.)	B (max.)
LS-101	½"	0.26"	1.12"
LS-102	¾"	0.27"	1.37"
LS-103	1"	0.28"	1.75"
LS-104	1½"	0.32"	2.06"
LS-105	1½"	0.32"	2.37"
LS-106	2"	0.32"	2.87"
LS-107	2½"	0.32"	3.43"
LS-108	3"	0.32"	4.12"
LS-109	3½"	0.32"	4.62"
LS-110	4"	0.32"	5.18"

U.L. File No. E-1275

H

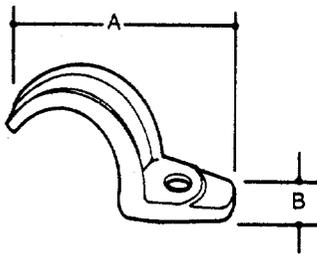
1.5.1A
2.5.14

ITEM # (16)



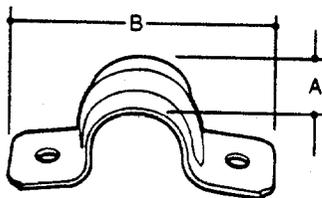
One Hole Straps—Steel/Zinc Plated

Cat. No.	Size	A	B
HS-100-SC	3/8"	3/2"	1 7/8"
HS-101	1/2"	1"	1 3/4"
HS-102	3/4"	1"	2 1/4"
HS-103	1"	1"	2 1/2"
HS-104	1 1/4"	1"	3 3/4"
HS-105	1 1/2"	1 3/8"	3 3/4"
HS-106	2"	1 3/4"	3 7/8"
HS-107	2 1/2"	1 1/2"	5 1/8"
HS-108	3"	1 3/8"	5 3/8"
HS-109	3 1/2"	1 3/8"	6 1/4"
HS-110	4"	1 3/4"	6 3/4"



Pipe Straps—Malleable Iron/Zinc Plated

Cat. No.	Size	A	B
HS-400	3/8"	1 1/2"	1 1/2"
HS-401	1/2"	2 1/4"	1 1/2"
HS-402	3/4"	2 3/4"	1 3/4"
HS-403	1"	2 3/4"	1 7/8"
HS-404-SC	1 1/4"	3 3/4"	1 1/2"
HS-405	1 1/2"	3 3/4"	1 1/2"
HS-406	2"	4 1/2"	1 1/2"
HS-407	2 1/2"	5 1/4"	1 3/4"
HS-408	3"	6 3/8"	1 7/8"
HS-409	3 1/2"	7 1/2"	2 1/4"
HS-410	4"	8 3/8"	2 1/2"
HS-411	5"	10 1/2"	2 3/4"



Two Hole Strap—Steel/Zinc Plated

Cat. No.	Size	A	B
HS-901	1/2"	3/4"	2 1/4"
HS-902	3/4"	3/4"	2 1/4"
HS-903	1"	3/4"	3 1/2"
HS-904	1 1/4"	3/4"	3 3/4"
HS-905	1 1/2"	3/4"	4 1/4"
HS-906	2"	3/4"	4 3/8"
HS-907	2 1/2"	1"	5 1/2"
HS-908	3"	1"	6 3/8"
HS-909	3 1/2"	1"	7 3/8"
HS-910	4"	1"	8 1/4"

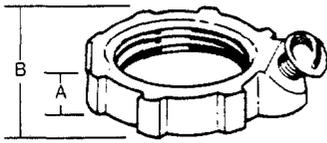
H

Steel City®

Rigid/Intermediate Grade Conduit Fittings

1.3.1A
2.2.4

ITEM # (15)



Grounding Locknuts—Malleable Iron/Zinc Plated

Cat. No.	Size	Dimensions (in.)	
		A (min.)	B (max.)
LG-401	½"	0.125"	1.140"
LG-402	¾"	0.140"	1.420"
LG-403	1"	0.170"	1.770"
LG-404	1¼"	0.170"	2.281"
LG-405	1½"	0.170"	2.598"
LG-406	2"	0.187"	3.175"
LG-407	2½"	0.375"	3.562"
LG-408	3"	0.375"	4.250"
LG-409	3½"	0.438"	4.803"
LG-410	4"	0.438"	5.402"

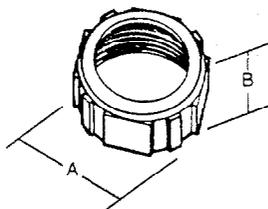
U.L. File No. E-1275



- ½"-2"—Iron/Zinc Plated
- 2½"-4"—Die Cast Zinc

Insulated Grounding Bushings

Cat. No.	Size	Grounding Lug Wire Capacity	A	B
BG-801	½"		1½"	½"
BG-802	¾"	#14-#4 CU	1¾"	½"
BG-803	1"	or	1¾"	¾"
BG-804	1¼"	#12-#4 AL	1¾"	¾"
BG-805	1½"		2¾"	¾"
BG-806	2"		2¾"	¾"
BG-807	2½"	#14-1/0 CU	3¾"	¾"
BG-808	3"	or #12-1/0 AL	3¾"	¾"
BG-809	3½"	#6-250 MCM	4¾"	¾"
BG-810	4"	CU or AL	4¾"	2½"



Bushings—Iron/Zinc Plated

Cat. No.	Size	A	B
BU-401	½"	1½"	¾"
BU-402	¾"	1¾"	¾"
BU-403	1"	1¾"	¾"
BU-404	1¼"	1¾"	¾"
BU-405	1½"	2¾"	¾"
BU-406	2"	2¾"	¾"
BU-407	2½"	3¾"	¾"
BU-408	3"	3¾"	¾"
BU-409	3½"	4¾"	¾"
BU-410	4"	4¾"	¾"
BU-411	5"	4¾"	¾"

U.L. File No. E-1275

Thomas & Betts

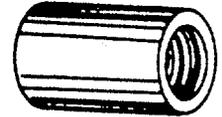
Rigid and EMT Conduit Fittings



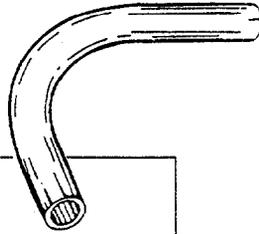
Wheatland TUBE COMPANY
DIVISION OF JOHN MANEELY COMPANY

12.1A
22.4

ITEM # (1H) Rigid Couplings



EMT Elbows 90°-45°



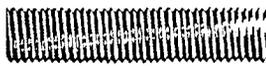
GALVANIZED					
PIPE SIZE (IN.)	MIN. UL RADIUS (IN.)	OFFSET	WT. * PER 100	WT. * PER CTN.	STD. CTN. (QTY.)
1/2	4	6%	26	13	50
3/4	4 1/2	7 1/8	46	23	50
1	5 1/2	9%	92	23	25
1 1/4	7 1/4	10 1/2	135	27	20
1 1/2	8 1/4	12%	200	30	15
2	9 1/2	14%	280	28	10
2 1/2	10 1/2	18%	500	250	50
3	13	20	750	375	50
3 1/2	15	23%	1014	355	35
4	16	26%	1300	455	35

* Sizes 2 1/2" and larger shipped in palletized cartons or bulk.
* 90° Elbow only.

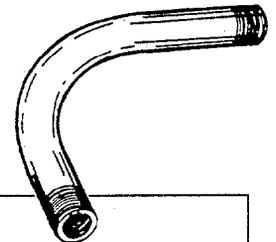
GALVANIZED					
PIPE SIZE (IN.)	STD. CTN. (QTY.)	OUTSIDE DIAM. (IN.)	LENGTH (IN.)	WT. PER 100	WT. PER CTN.
1/2	100	1.010	1 1/8	12	12
3/4	50	1.250	1 1/8	18	9
1	30	1.525	2	30	9
1 1/4	25	1.869	2 1/8	37	9
1 1/2	25	2.155	2 1/8	52	13
2	20	2.650	2 1/4	72	15
2 1/2	24	3.250	3 1/8	170	41
3	16	3.870	3 3/4	210	34
3 1/2	12	4.500	3 3/4	340	41
4	10	4.875	3 3/4	300	30
5	BULK	6.000	3 3/4	475	BULK
6	BULK	7.200	4	765	BULK

Manufactured to U.S. Specifications.

Rigid Running Thread



Rigid Conduit Elbows 90°-45°



PIPE SIZE (IN.)	FEET PER CTN.	WT. PER 100 FT.	WT. PER CTN.
1/2	102	18	19
3/4	102	29	30
1	102	42	43
1 1/4	60	62	37
1 1/2	75	85	64
2	60	103	62
2 1/4	36	141	51
2 1/2	30	180	54
3	24	249	60
3 1/2	12	383	46
4	9	496	45
4 1/2	6	631	38
5	6	722	43

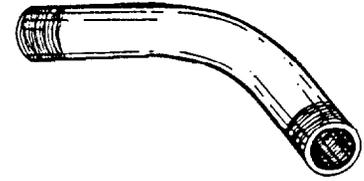
3 Foot Lengths: TYPE "C" Galvanized Electroplated Threads

GALVANIZED						
PIPE SIZE (IN.)	MIN. UL RADIUS (IN.)	OFFSET		WT. * PER 100	WT. * PER CTN.	STD. CTN. (QTY.)
		ANGLE	LENGTH			
1/2	4	6%	1 1/8	70	35	50
3/4	4 1/2	7 1/8	1 1/8	112	56	50
1	5 1/2	9%	1 3/8	192	48	25
1 1/4	7 1/4	11%	1 3/4	320	64	20
1 1/2	8 1/4	12 1/8	1 3/4	413	62	15
2	9 1/2	15 1/2	2 1/8	670	67	10
2 1/4	10 1/2	19%	2 1/4	1200	600	50
3	13	21 1/2	2 3/4	1900	665	35
3 1/2	15	24%	3 1/8	2800	700	25
4	16	25%	3 1/4	3100	775	25
5	24	37 1/8	4 1/4	6800	BULK	BULK
6	30	49%	5 1/4	11400	BULK	BULK

* Sizes 2 1/2" and larger shipped in palletized cartons or bulk. * 90° Elbow only. Thread protector each end and identifying label.



RIGID CONDUIT Elbows*
Special Large Radius 90°-45°
GALVANIZED



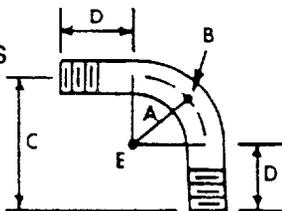
	12" RADIUS	15" RADIUS	18" RADIUS	24" RADIUS	30" RADIUS	36" RADIUS	42" RADIUS	48" RADIUS
PIPE SIZE (IN.)	WGT. EACH (LBS.)	WGT. EACH (LBS.)	WGT. EACH (LBS.)	WGT. EACH (LBS.)	WGT. EACH (LBS.)	WGT. EACH (LBS.)	WGT. EACH (LBS.)	WGT. EACH (LBS.)
1	4	6	5	6	9	9	12	13
1½	6	7	7	9	12	13	16	18
1½	8	9	10	11	15	16	19	21
2	10	10	11	14	20	22	24	26
2½	15	19	18	23	27	32	39	44
3		25	23	32	37	45	52	57
3½		STD.	31	35	42	54	62	69
4			38	45	54	64	73	81
5				STD.	85	94	100	120
6					STD.	131	140	160

*WEIGHTS for Standard and Special Large Radius 90° elbows are approximate. To estimate weight for 60°, deduct 20%; for 45°, deduct 30%; for 30°, deduct 40%.

Dimensions of Special Large Radius 90° Elbows*

	1-2½	1-3	1-4	1-4	1-5	1-6	1-6	1-6
WHEN RADIUS "A" IS:	12"	15"	18"	24"	30"	36"	42"	48"
OFFSET "C" IS:	1'9"	2'0"	2'4"	2'11"	3'5"	3'11"	4'6"	5'0"
STRAIGHT END "D" IS:	9"	9"	10"	11"	11"	11"	12"	12"
LENGTH UNBENT IS:	3'0"	3'6"	4'0"	4'11"	5'9"	6'6"	7'6"	8'4"

MEASURING SPECIAL RADIUS ELBOWS



Locate center of elbow B. Subtract straight section D from each end and find point E. Radius A is the distance between B and E.

Offset C is measured as shown.

Underwriter's Laboratories, Inc. No. 6 American National Standards Institute, C80, 1, and Federal Specifications WW C581e and WF 408C apply where applicable.

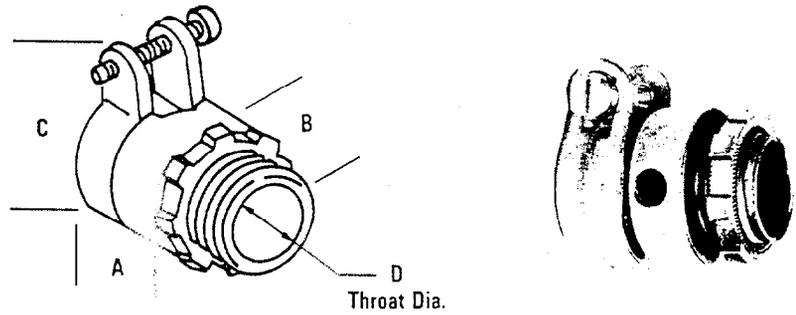
WHEATLAND TUBE COMPANY
900 HADDON AVENUE, SUITE 500
COLLINGSWOOD, NEW JERSEY 08108-2162
(609) 854-5400

*Dimensions apply to 90° elbows only. Inquire for other Radii.

ITEM # (11) 1.3.1A 2.2.4

Flexible Metal Conduit And Armored Cable

Squeeze Connectors



Application

To connect flexible metal conduit or armored cable to box or enclosure

Sizes

3/8" (1/2" knockout) thru 2"

Material

403-DC thru 416-DC: zinc die cast with steel locknut

403-DC2 thru 416-DC2: zinc die cast with die cast locknut

Standard Finish

Chromate conversion coating

Dimensions

Refer to dimension chart

Certifications

403-DC thru 416-DC, 403-DC2 thru 416-DC2:

File No. E9391

Federal specification W-F-406D.

File No. LR39354

407-DC, 408-DC, 407-DC2, 408-DC2

Zinc Die Cast

Catalog Number	Trade Size	Size K.O.	Cable/Conduit Range		Amt. Unit	Amt. Std. Pkg.	Wgt. Per C	Nominal Dimensions			
			Min.	Max.				A	B	C	D
403-DC	3/8"	1/2"	.560"	.610"	50	500	6.1	9/16	9/16	13/16	.440
407-DC	1/2"	1/2"	.860"	.920"	50	200	9.6	15/16	7/16	13/8	.610
408-DC	3/4"	3/4"	1.045"	1.105"	25	100	12.6	1 1/8	1/2	13/4	.813
410-DC	1"	1"	1.300"	1.380"	10	100	20.8	1 1/2	13/16	2 1/16	.990
412-DC	1 1/4"	1 1/4"	1.550"	1.630"	10	100	30.6	1 5/8	1 1/16	2 1/4	1.240
414-DC	1 1/2"	1 1/2"	1.850"	1.950"	5	50	38.8	1 7/8	3/4	2 5/8	1.490
416-DC	2"	2"	2.350"	2.450"	Bulk	10	55.0	1 5/8	13/16	3 1/8	1.990
403-DC2	3/8"	1/2"	.560"	.610"	50	500	6.4	9/16	9/16	13/16	.440
407-DC2	1/2"	1/2"	.860"	.920"	50	200	9.8	15/16	7/16	13/8	.610
408-DC2	3/4"	3/4"	1.045"	1.105"	25	100	13.3	1 1/8	1/2	13/4	.813
410-DC2	1"	1"	1.300"	1.380"	10	100	21.0	1 1/4	13/16	2 1/16	.990
412-DC2	1 1/4"	1 1/4"	1.550"	1.630"	10	100	31.0	1 5/8	1 1/16	2 1/4	1.240
414-DC2	1 1/2"	1 1/2"	1.850"	1.950"	5	50	34.0	1 7/8	3/4	2 5/8	1.490
416-DC2	2"	2"	2.350"	2.450"	Bulk	10	40.0	1 5/8	13/16	3 1/8	1.990



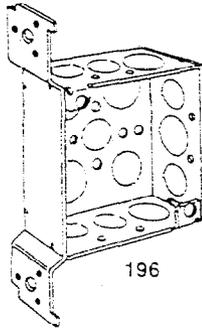
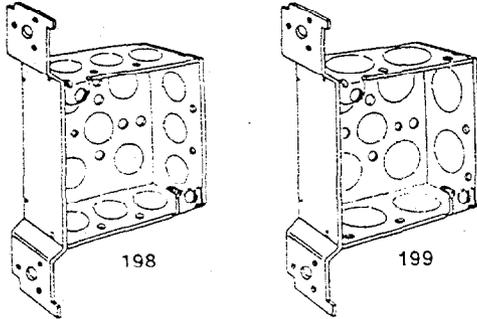
Bridgeport Fittings, Inc.
705 Lordship Boulevard, Stratford, CT 06497
203/377-5944 Fax: 203/381-3488

ITEM # (2A)

1.3.1B
3.1.5

B8

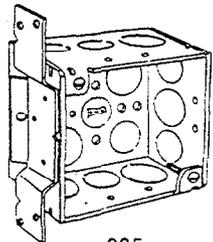
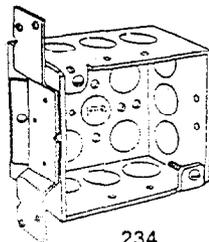
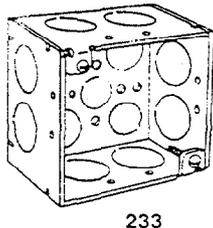
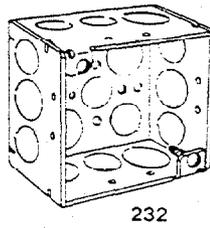
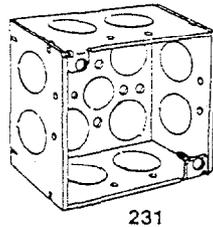
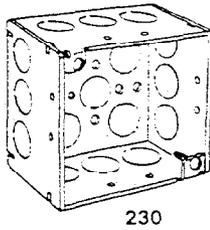
STEEL 4" SQUARE BOXES
CONDUIT KO'S



RACO No.	Description Bracket & Setback	Knockouts		Std. Pkg.	Wt. per C
		Side	Bottom		

1 1/2" DEEP
FOR METAL OR WOOD STUDS
21.0 cubic inches

198	FM brkt.	9-1/2"	5-1/2"	25	81.4
199	FM brkt.	6-3/4"	1-1/2" 4-3/4"	25	81.2
196	FM brkt.	6-1/2" 3-3/4"	3-1/2" 2-3/4"	25	81.2



2 1/8" DEEP
30.3 cubic inches

230	-	12-1/2"	5-1/2"	25	89.8
231	-	8-3/4"	1-1/2" 4-3/4"	25	92.0
232	-	8-1/2" 4-3/4"	3-1/2" 2-3/4"	25	90.2
233	-	8-1"	3-1/2" 2-3/4"	25	90.2
234	FA brkt.	9-1/2"	5-1/2"	25	102.4
235	FA brkt.	6-1/2" 3-3/4"	3-1/2" 2-3/4"	25	102.4



RACO INC • POST OFFICE BOX 4002 • SOUTH BEND, INDIANA 46634 • TELEPHONE 219 234-7151

Attention of: To Whom it May concern

Subject: Letter of Certification

Regarding:

Gentlemen:

We certify that our Outlet and Switch Boxes and our Conduit Fittings are manufactured under standard commercial processing and testing methods designed to assure that the finished product complies with appropriate standards and/or specifications as indicated:

Outlet and Switch Boxes

Federal Specification W-J-800C(3)
Federal Standard 128b
Underwriters Laboratories, In., (UL-514)

Conduit Fittings

Federal Specifications W-F-406B(1); W-F-408c(1); W-C-586B
Underwriters Laboratories, Inc. (UL-514); (UL-467)
A.N.S.I. C-80.4

We further certify that, where these products are listed under the re-examination and follow-up service procedure of Underwriters Laboratories, Inc., the products bear the UL logo die stamped on them. The UL logo and Four Element listing mark will appear on the smallest shipping carton where the size of the product makes die stamping impracticable.

Underwriters Laboratories, Inc., certifies our inspection equipment and makes quarterly inspections at our plant.

Our own Quality Control Department inspects all of our products periodically through-out all stages of manufacture using Military Standard 105-D sampling procedures.

RACO INC

F.J. Racy

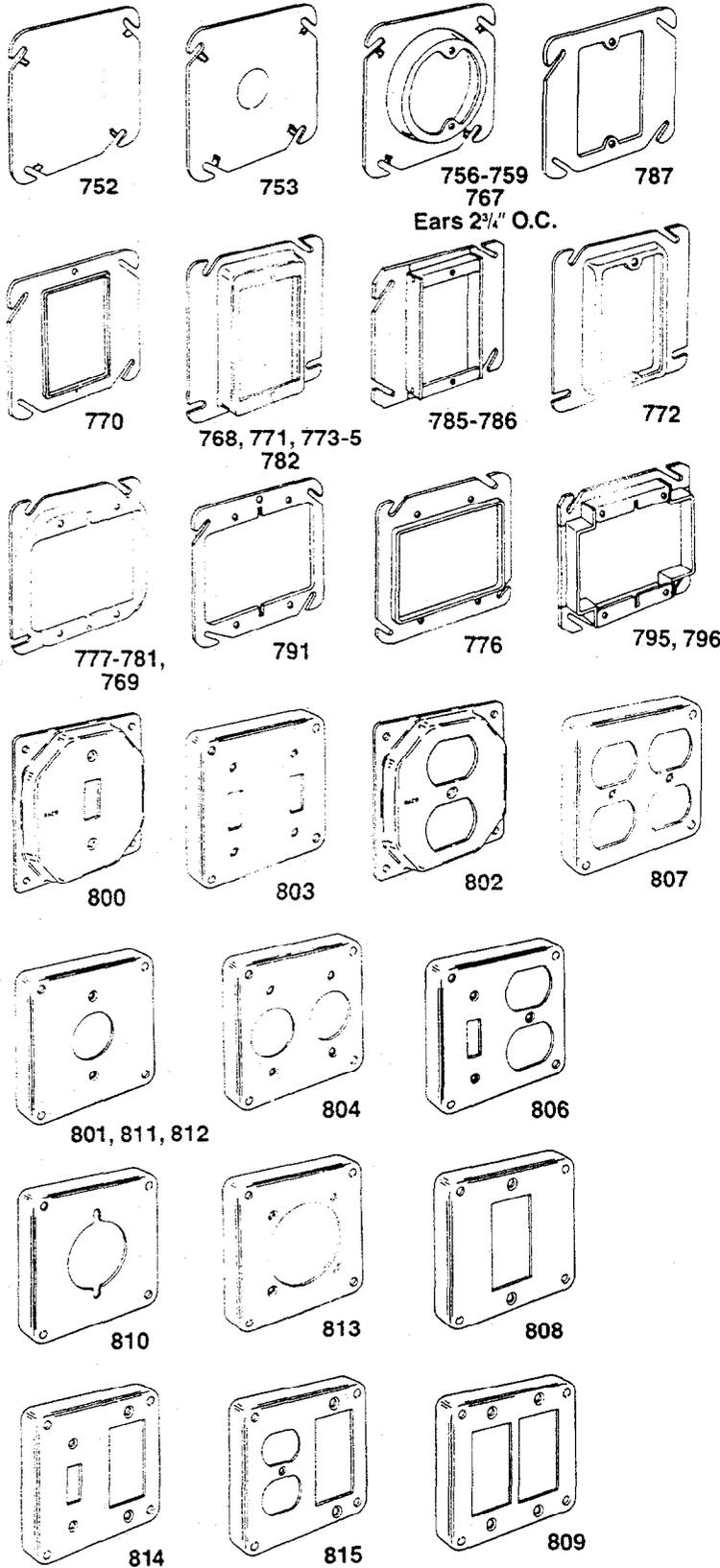
Vice President, Marketing/Sales

STEEL 4" SQUARE COVERS

ITEM # (2A)

B11

1.3.1E
3.1.5



RACO No.	Description	Cu. in.	Std. Pkg.	Wt. per C
752	Flat, blank		50	29.6
753	Flat, 1/2" KO		50	29.5
767	Raised 1/2" open	3.0	25	25.9
756	Raised 3/8" open	4.0	100	26.4
759	Raised 3/4" open	5.0	25	27.4
757	Raised 1" open	6.8	25	31.2
758	Raised 1 1/4" open	8.5	25	36.0

COMBINATION SQUARE-DRAWN & TILE COVERS One Device

787	Flat		50	16.8
770	Raised 1/4"	1.5	50	23.4
771	Raised 1/4"	1.5	100	17.8
772	Raised 1/2", Drawn	3.5	100	22.3
782	Raised 1/2", Tile	3.5	25	25.0
768	Raised 5/8"	4.5	50	25.7
773	Raised 3/4"	5.5	50	29.1
774	Raised 1"	7.5	25	33.0
775	Raised 1 1/4"	9.5	25	38.0
785	Raised 1 1/2"	11.3	25	48.8
786	Raised 2"	14.5	25	59.4

Two Device

791	Flat		50	10.4
776	Raised 1/4"	3.3	50	17.4
777	Raised 1/4"	3.0	50	13.8
778	Raised 1/2"	5.5	50	17.7
769	Raised 5/8"	7.3	50	20.2
779	Raised 3/4"	8.8	50	23.0
780	Raised 1"	12.0	25	30.8
781	Raised 1 1/4"	15.0	25	33.2
795	Raised 1 1/2"	15.5	25	42.3
796	Raised 2"	20.5	25	60.2

EXPOSED WORK - RAISED 1/2"

7.3 Cubic Inch Capacity

800	1 toggle switch	25	38.0
803	2 toggle switches	25	42.2
802	1 duplex receptacle	25	35.2
807	2 duplex receptacles	25	34.2
801	1 receptacle 1.406 Dia.	25	40.2
811	30A twist-lok 1.719 Dia.	25	39.4
812	20A recept. 1.594 Dia.	25	39.0
804	2 recept. 1.406 Dia.	25	38.5
806	1 dup. & 1 toggle switch	25	37.8
805	1 recept. & 1 tog. switch	25	40.2
810	30-50A recept. 2.156 Dia.	25	37.2
813	30-60A recept. 2.625 Dia.	25	34.0
808	1 GFCI	25	40.0
814	1 GFCI & 1 toggle switch	25	40.0
815	1 GFCI & 1 duplex recept.	25	40.0
809	2 GFCI	25	40.0

TECHNICAL DATA

Raised device covers list an overall dimension. A cover 1/8" deeper often is needed to locate the cover flush with the front of the drywall.

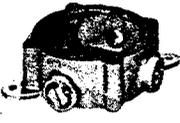
ITEM # (10)

1.2.1B
3.1.5

A-25

GS Conduit Outlet Boxes, Covers, and Hangers: Malleable Iron

UNILETS® for Use with Threaded Rigid Metal Conduit and IMC.
NOTE: Refer to page 29 for Wiring Capacity Tables.

Description		Size (Inches)	Length (A)	Catalog Number
		GS - 1-3/4" inside depth, with mounting lugs (Form 20) Four threaded universal 3/4" hubs, four 3/4" to 1/2" reducers, and three 1/2" close-up plugs. Four 1" threaded openings and three 1" close-up plugs.		
GSU-20	GSU-100	1/2 or 3/4	-	GSU-20
		1	-	GSU-100
GS - Cast Covers				
Furnished with gasket and screws. Enclosed and gasketed for raintight fit.				
		Hub Covers	1/2 3/4	1.75" (4.4cm) 1.75" (4.4cm)
		Cover	Blank	1.06" (2.6cm)
				GSK-50-20 GSK-75-20 GSK-BC-20
		GS - Cover, Lamp Receptacle Furnished with gasket and screws		
			-	1.63" (4.1cm) GSK-LR20
	GS-20 - Connection Block Furnished with mounting screws. 5-Wire, 20-Amp 300 Volt			
				CB205
	GS - Gasket, Neoprene			
				GS-GK20-R
GS - Flexible Fixture Gangers - Form 20				
Furnished with gasket and screws.				
		Ball		
		Cushion		
		Ball Type		
		Ball Type — 15° swing in all directions, supports 250 lbs.	-	3.00" (7.6cm) GSK-50-20B 3.25" (8.2cm) GSK-75-20B
		Cushion Type, enclosed and gasketed — 8° swing in all directions. Cushions 40 lbs., supports 250 lbs.	-	2.00" (5.0cm) GSK-50-20C 2.00" (5.0cm) GSK-75-20C

Unilet® Conduit Outlet Bodies: LBD and LBDN. Conduit Outlet Boxes: JB, GS, and SEH

For use with Rigid Steel, Rigid Aluminum, IMC, and EMT Conduit.

Features: LBD and LBDN

① Serve as pulling fittings—ideal for heavy, difficult-to-bend conductors.

Make 90° bends in conduit—straight pull through hubs in either direction.

- Use as service entrance fitting.
- Complete with gasketed covers.

Features: JB Series

② Raintight when enclosed and gasketed with hub or blank covers.

- For exposed or concealed use.
- Blind cover screw holes prevent conductor damage during installation, provide water-tightness.
- Available in three inside depths—1-5/16", 2-1/16", and 3-1/8".
- Order with or without mounting lugs.
- Furnished with four tapped holes and two close-up plugs.
- Malleable iron or aluminum.
- Cushion fixture hangers enclosed and gasketed (vaportight).

Features: GS Series

③ Raintight when enclosed and gasketed with hub or blank covers.

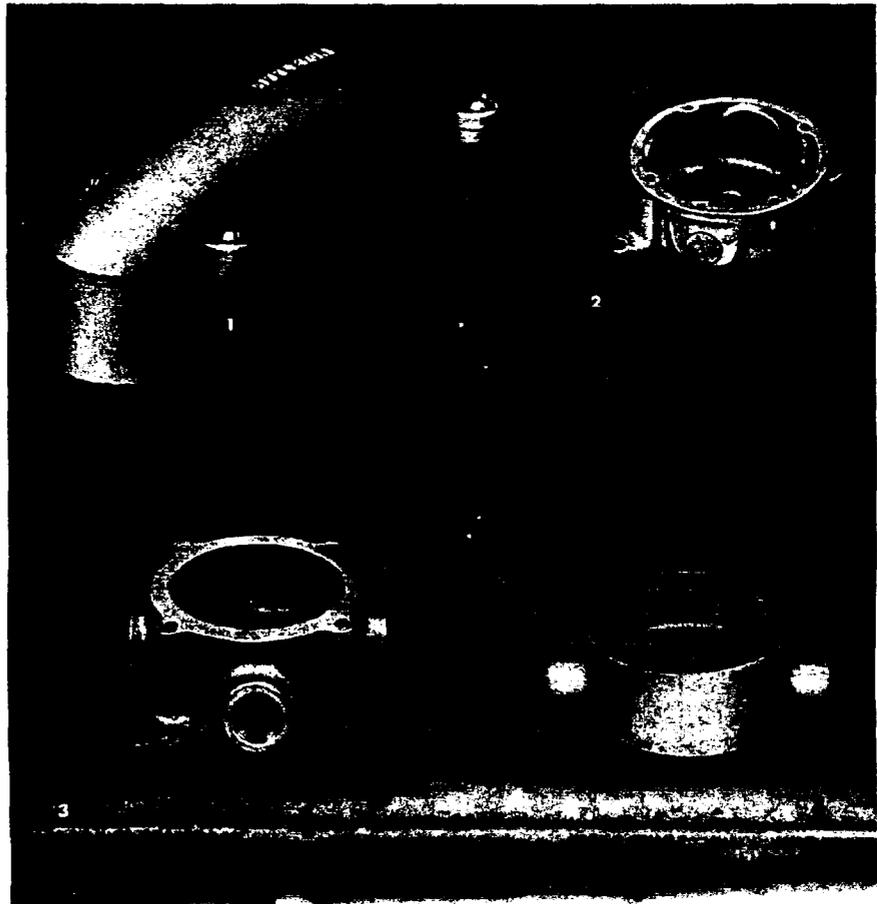
- Extra wide mating surfaces of GS box and cover provide greater gasket contact for more positive seal.
- For exposed or concealed use.
- GSU-20 will take connection block.
- Universal design—furnished with 4 threaded universal 3/4" hubs, four 3/4" to 1/2" screws, and 2 close-up plugs.
- Furnished with mounting lugs.
- Cushion fixture hangers enclosed and gasketed (vaportight).

Features: SEH Series

- ④ Economy cast conduit outlet box.
- Take wiring devices designed for 4" octagonal outlet boxes.
- Two 8-32 screw holes tapped on 3-1/2" centers.

Standard Materials

- LBD and LBDN Unilets and covers: malleable iron (some in aluminum).
- JB, GS, and SEH conduit outlet boxes and covers plus JB and GS fixture hangers: malleable iron.
- JB-A boxes and covers: copper-free aluminum.
- Gaskets: Neoprene or composition fiber.



Standard Finishes

- LBD and LBDN malleable iron bodies and covers: triple-coat—(1) zinc electroplate, (2) dichromate and (3) epoxy powder coat.
- LBD and LBDN aluminum bodies and covers: epoxy powder coat.
- Malleable iron conduit outlet boxes, GS fixture hangers, 3/4" JB, GS and SEH hub covers: triple-coat—(1) zinc electroplate, (2) dichromate, and (3) epoxy powder coat.
- JB fixture hangers, JB and GS 1/2" hub and blank covers and SEH blank cast cover: zinc electroplate and clear chromate.
- SEH blank steel cover: zinc electroplate.
- Aluminum JB conduit outlet boxes: epoxy powder coat.

- PVC Coating available upon request—consult factory.

Compliances

- UL Standard 514.
- Federal Spec. W-C-586B.
- LBDN complies with NEC 370-18(a).
- Suitable for classified location use in Class I, Division 2 areas, if installed in compliance with NEC 501-4(b).
- Appleton malleable iron conforms to ASTM A47-77, Grade 32510.
- Appleton aluminum products are produced from a high strength copper-free (4/10ths or 1% max.) alloy.

AL Flexible Fixture Hanger Parts and AL Dimensions

UNILETS® for Use with Threaded Rigid Metal Conduit and IMC.

Type	Conduit Size (Inches)	Support Weight	Catalog Number
------	-----------------------	----------------	----------------

AL—Hanger Bodies



ALA



ALC

ALA 1/2
3/4

ALA50
ALA75

ALC 1/2
3/4
1

ALC50
ALC75
ALC100



ALL



ALT

ALL 1/2
3/4

(Refer to Cushion and Ball Fixture Stems below)

ALL50
ALL75

ALT 1/2
3/4
1

ALT50
ALT75
ALT100



AL—Ball Fixture Stem

1/2
3/4

250 lbs. (112.5 kg)

BJ50
BJ75



AL—Cushion Fixture Stems

Fixture stem tapped for 3/4"; 3/4" to 1/2" reducer furnished for 1/2" stems.
With setscrew for locking fixture stem.

3/4 or 1/2
3/4 or 1/2
3/4 or 1/2

3-12 lbs. (1.4-5.4 kg)
12-48 lbs. (5.4-21.6 kg)
48-120 lbs. (21.6-54.0 kg)

CJC75-12
CJC75-48
CJC75-120



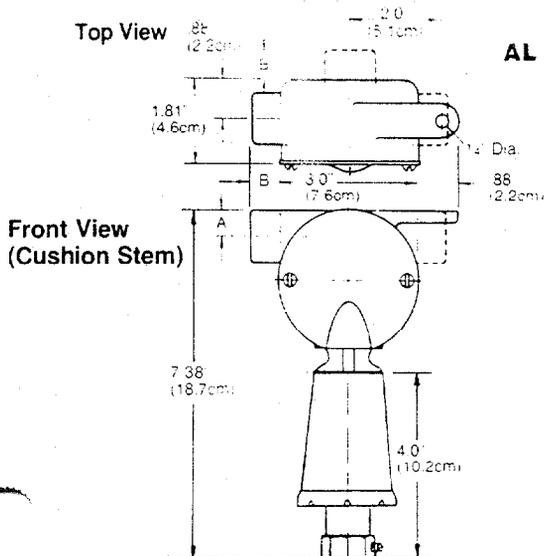
AL—Porcelain Connection Block

2 Wire, 20 Amp, 277 Volt
Maximum Wire Size
Two No.10 AWG Large Terminal
Two No.14 AWG Small Terminal

CB202

CSA Listed

AL Fixture Hanger Dimensions



Conduit Trade Size	Dim. in Inches		Dim. in Centimeters	
	A	B	A	B
1/2"	.56	.69	1.4	1.8
3/4"	.69	.69	1.8	1.8
1"	.88	.81	2.2	2.1

Flexible Fixture Hangers: Receptacle and Hook and Loop; Malleable Iron.

Unilets® for Use with Threaded Rigid Metal Conduit and IMC.

1.2.1B
3.1.5

ITEM # (2B)

E

		Conduit Hub Size (Inches)	Voltage	Takes Hubbell Plug	Catalog Numbers
		GHPHP and GHPHT—Receptacle Hangers			
		Furnished with assembled FS box, EFHM safety lock, receptacle, and steel cover. Supports 200 lbs.			
		3/4	120	L5-15P	Pendant GHPHP12
		3/4	208,240	L6-15P	GHPHP24
		3/4	277	L7-15P	GHPHP27
		3/4	480	L8-20P	GHPHP48
					Feed-Thru GHPHT12
					GHPHT24
					GHPHT27
					GHPHT48

		Size (Inches)	Length (A)	Support Wt., Lbs. and (Kilograms)	Catalog Number
FH—Hanger Loops					
With 5/8" wire opening.					
		FHLM—Male			
			1/2	3.88" (9.2cm)	350 lbs. (157.5 kg)	FHLM-50
		3/4	4.13" (10.5cm)		FHLM-75
FHLF—Female					
		1/2	3.25" (8.3cm)	350 lbs. (157.5 kg)	FHLF-50
		3/4	3.25" (8.3cm)		FHLF-75
FH—Hanger Hooks					
With 5/8" wire opening, 3/8" jaw opening.					
		FHMM—Male			
			1/2	3.88" (9.8cm)	200 lbs. (90.0 kg)	FHMM-50
		3/4	4.13" (10.5cm)		FHMM-75
FHMF—Female					
		1/2	3.25" (8.3cm)	200 lbs. (90.0 kg)	FHMF-50
		3/4	3.25" (8.3cm)		FHMF-75

		Size (Inches)	Length (A)	Support Wt., Lbs. and (Kilograms)	Catalog Number
FHSN—Conduit Suspension Hanger					
With safety strap—clamps around rigid conduit or IMC. Has 3/8" jaw opening.					
		1/2	3.13" (7.9cm)	150 lbs. (67.5 kg)	FHSN-50
		3/4	3.25" (8.3cm)		FHSN-75
		1	3.38" (8.6cm)		FHSN-100

		Size (Inches)	Length (A)	Support Wt., Lbs. and (Kilograms)	Catalog Number
EF—Safety Support Hooks					
With 3/8" jaw opening.					
		EFHM—Male			
			1/2	2.63" (6.7cm)	200 lbs. (90.0 kg)	EFHM-50
		3/4	2.94" (7.5cm)		EFHM-75
EFHF—Female					
		1/2	2.00" (5.1cm)	200 lbs. (90.0 kg)	EFHF-50
		3/4	2.05" (5.2cm)		EFHF-75

		Size (Inches)	Length (A)	Support Wt., Lbs. and (Kilograms)	Catalog Number
FHS—Support for Fixtures, Dummy Side					
Straddles conduit, max. 1-1/4"; 11/32" dia. mounting holes for 1/4" bolts spaced 3-1/4" apart.					
		1/2 or 3/4	3.31" (8.4cm)	350 lbs. (157.5 kg)	FHS5075

Refer to Pricing Index for price, weight, and standard package



1701 W. Wellington Ave.
Chicago, Illinois 60657

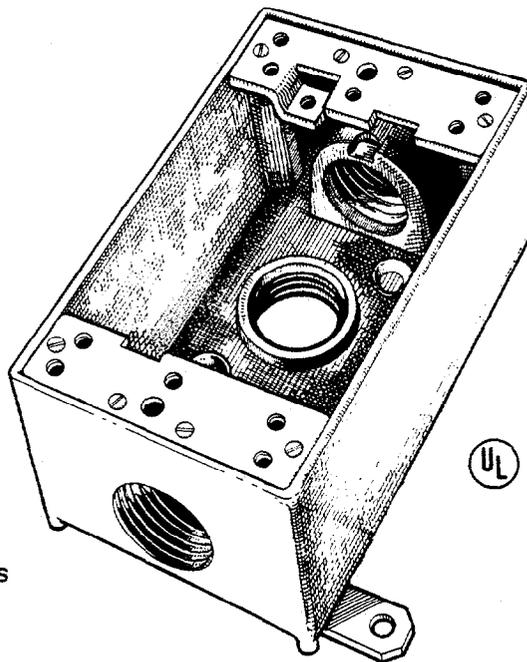
ITEM # (7C)

1.3.1B
3.15
29.2B7

Royal Mountie® Single Gang Boxes Suitable For Wet Locations

(Swivel Lug) 2.75" x 4.5" x 2.0" Deep

- Heavy duty die cast aluminum, .094" thick, with baked aluminum finish.
- For use in all indoor and outdoor damp or wet locations, with all standard FS, outlet, lampholder or splice box covers.
- 2 close-up plugs supplied with each box.
- UL listed.
- Complies with Federal Specification WC-586C.



CUBIC CAPACITY: 3 outlet boxes — Catalog numbers 30203 and 30206 — are 19 cubic inches; all others on this page are 18 cubic inches.

PACKAGING: 50 units per carton.

WEIGHT: 60 lbs. per 100 units.

ALSO AVAILABLE IN GREEN: add letter G to Catalog number.
(Example: 30203G)



- 3 OUTLETS** 1 in each end, 1 in back.
- 1/2" I.P.S. — Catalog No. 30203 (old no. B-23L)
 - 3/4" I.P.S. — Catalog No. 30206 (old no. B-33L)



- 4 OUTLETS** 2 in one end, 1 in other end, 1 in back.
- 1/2" I.P.S. — Catalog No. 30209 (old no. B-24L)
 - 3/4" I.P.S. — Catalog No. 30212 (old no. B-34L)



- 5 OUTLETS** 2 in each end, 1 in back.
- 1/2" I.P.S. — Catalog No. 30215 (old no. B-25L)
 - 3/4" I.P.S. — Catalog No. 30218 (old no. B-35L)



- 5 OUTLETS/SIDE ENTRANCE** 1 outlet in each end, 1 in each side, 1 in back.
- 1/2" I.P.S. — Catalog No. 30221 (old no. B-25SL)
 - 3/4" I.P.S. — Catalog No. 30224 (old no. B-35SL)



- 6 OUTLETS/SIDE ENTRANCE** 1 outlet in each end, 2 in one side, 1 in other side, 1 in back.
- 1/2" I.P.S. — Catalog No. 30227
 - 3/4" I.P.S. — Catalog No. 30228

Deep Box 3 OUTLETS



1 outlet in each end, 1 in back.
Cubic capacity: 23 cubic inches.
Dimensions: 2.75" x 4.5" x 2.625" Deep. (Ground screw hole is in bottom of box — not as shown above)

- 1/2" I.P.S. — Catalog No. 30583
- 3/4" I.P.S. — Catalog No. 30584 (old no. BD-33)
- 1" I.P.S. — Catalog No. 30589 (old no. BD-13)

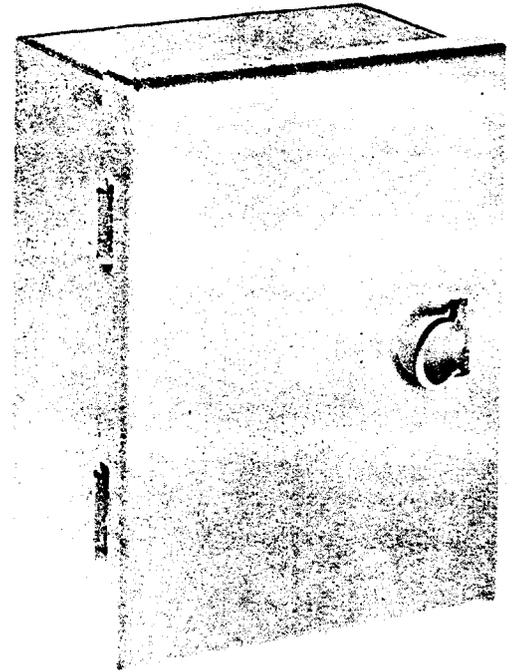
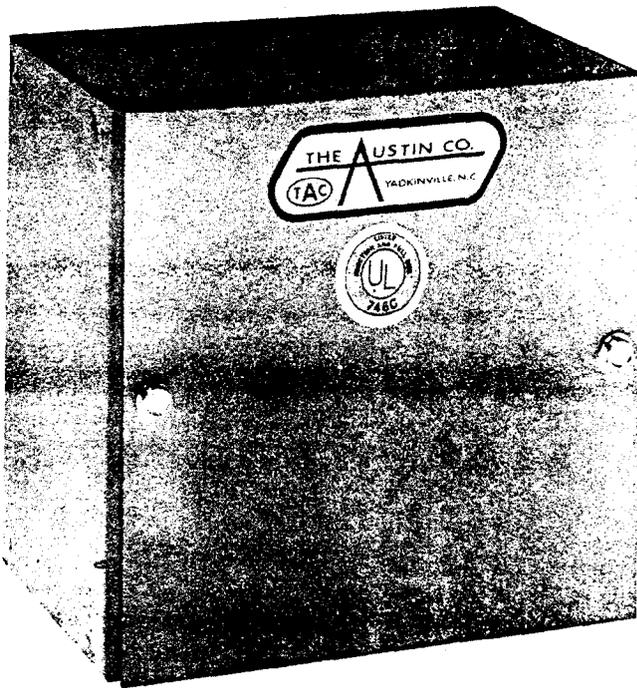
NOTE: Detachable Lugs

NOTE: Covers for Weatherproof Boxes are shown in COVERS section, pages B13 through B19; plugs are shown in ACCESSORIES section, page B30.

Austin Screw Cover and Hinge Cover Boxes

1.3.10
2.3

ITEM # (3)
PAGES 1-6



APPLICATION: Austin screw cover and hinge cover boxes are Underwriters Laboratories approved and listed for Junction box and Pull box applications. All boxes meet the general purpose, indoor requirements for a NEMA type one rating.

CONSTRUCTION: Austin screw cover and hinge cover boxes are fabricated in accordance with U.L. specifications from code gauge steel. Boxes are furnished standard without knockouts. If knockouts are desired, a combination $\frac{1}{2}$ " and $\frac{3}{4}$ " knockout will be provided. These can be easily tapped out during field installation.

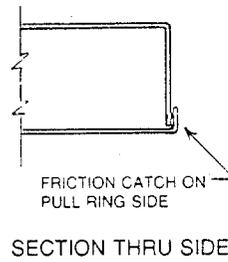
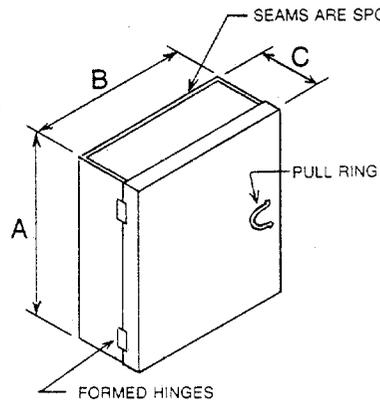
FINISH: Austin screw cover and hinge cover boxes are provided standard in galvanized steel. A gray finish is available on request.

MODIFICATIONS: The Austin Company can provide special knockouts or knockout arrangements, cutouts, holes, hubs, special materials, special finishes, and custom box size or construction. We specialize in custom work of any kind in gray finish, galvanized steel, stainless steel, or aluminum. Please consult the factory for assistance on special pricing and delivery.

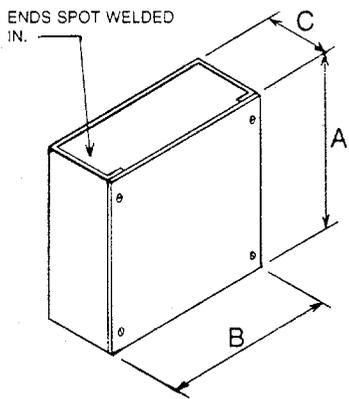
NOTE: Hinge cover boxes with a maximum dimension of:

- 15", are made with fabricated hinges and a pull ring catch
- 36", are made with butt hinges and an AB-10 latch
- 37" and over are made with a continuous hinge and an AB-6 latch.

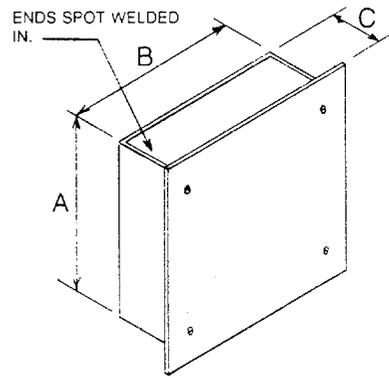




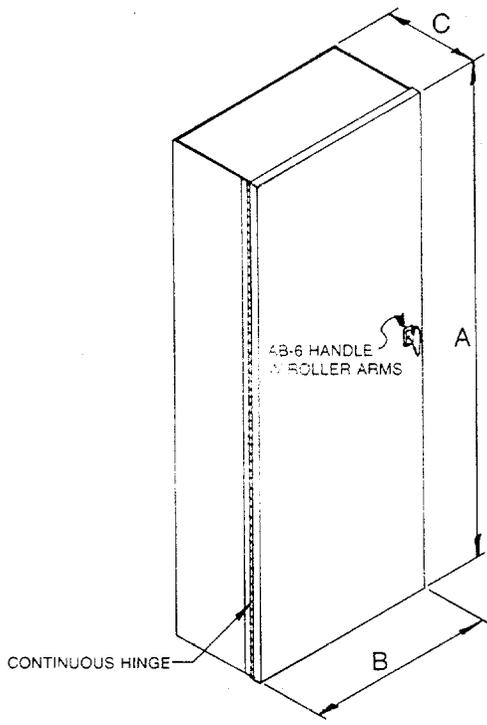
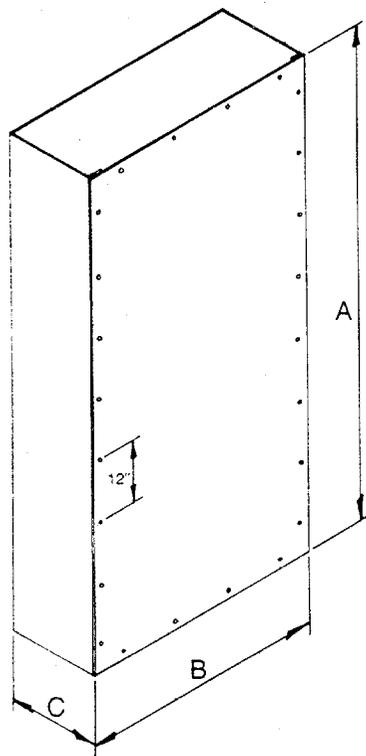
SECTION THRU SIDE



SURFACE



FLUSH



Bundle Sizes For Screw Cover Galv. Boxes

Enclosure Size AxBxC	Standard Bundle	Catalog Number	Bundle Weight	Enclosure Size AxBxC	Standard Bundle	Catalog Number	Bundle Weight
4x4x4	10	AB-444SB	20	15x15x6	3	AB-15156SB	48
6x6x4	10	AB-664SB	30	18x15x6	3	AB-18156SB	51
8x6x4	10	AB-864SB	40	18x18x6	3	AB-18186SB	60
8x8x4	10	AB-884SB	50	24x18x6	2	AB-24186SB	52
10x8x4	10	AB-1084SB	50	24x24x6	2	AB-24246SB	78
10x10x4	10	AB-10104SB	70	30x24x6	2	AB-30246SB	96
12x12x4	5	AB-12124SB	45	12x12x8	5	AB-12128SB	60
15x12x4	5	AB-15124SB	55	18x18x8	3	AB-18188SB	69
18x12x4	3	AB-18124SB	39	24x18x8	2	AB-24188SB	58
15x15x4	5	AB-15154SB	70	24x24x8	2	AB-24248SB	84
18x15x4	3	AB-18154SB	48	30x24x8	2	AB-30248SB	102
6x6x6	10	AB-666SB	40	36x24x8	2	AB-36248SB	120
8x8x6	10	AB-886SB	60	30x30x8	2	AB-30308SB	176
10x8x6	10	AB-1086SB	70	24x24x10	2	AB-242410SB	96
10x10x6	10	AB-10106SB	90	24x24x12	2	AB-242412SB	106
12x12x6	5	AB-12126SB	55	36x36x12	2	AB-363612SB	274
15x12x6	5	AB-15126SB	65				
18x12x6	3	AB-18126SB	48				

Screw Cover Boxes

Enclosure Size AxBxC	Catalog Number	Weight	Enclosure Size AxBxC	Catalog Number	Weight
4x4x3	AB-443SB	2	36x36x6	AB-36366SB	110
6x6x3	AB-663SB	3	48x36x6	AB-48366SB	128
4x4x4	AB-444SB	2	48x48x6	AB-48486SB	234
6x4x4	AB-644SB	2	8x8x8	AB-888SB	7
6x6x4	AB-664SB	3	10x10x8	AB-10108SB	10
8x6x4	AB-864SB	4	12x12x8	AB-12128SB	12
10x6x4	AB-1064SB	5	15x12x8	AB-15128SB	15
12x6x4	AB-1264SB	6	18x12x8	AB-18128SB	17
8x8x4	AB-884SB	5	24x12x8	AB-24128SB	23
10x8x4	AB-1084SB	5	15x15x8	AB-15158SB	17
12x8x4	AB-1284SB	6	18x15x8	AB-18158SB	20
10x10x4	AB-10104SB	7	18x18x8	AB-18188SB	23
12x10x4	AB-12104SB	7	24x18x8	AB-24188SB	29
12x12x4	AB-12124SB	9	24x24x8	AB-24248SB	42
15x12x4	AB-15124SB	11	30x24x8	AB-30248SB	51
18x12x4	AB-18124SB	13	36x24x8	AB-36248SB	60
24x12x4	AB-24124SB	15	48x24x8	AB-48248SB	110
15x15x4	AB-15154SB	14	30x30x8	AB-30308SB	88
18x15x4	AB-18154SB	16	36x30x8	AB-36308SB	102
18x18x4	AB-18184SB	17	36x36x8	AB-36368SB	119
24x18x4	AB-24184SB	23	48x36x8	AB-48368SB	135
24x24x4	AB-24244SB	35	48x48x8	AB-48488SB	249
30x24x4	AB-30244SB	43	12x12x10	AB-121210SB	14
36x24x4	AB-36244SB	51	18x12x10	AB-181210SB	19
6x6x6	AB-666SB	4	18x18x10	AB-181810SB	25
8x6x6	AB-866SB	5	24x18x10	AB-241810SB	31
12x6x6	AB-1266SB	7	24x24x10	AB-242410SB	48
8x8x6	AB-886SB	6	36x24x10	AB-362410SB	67
10x8x6	AB-1086SB	7	30x30x10	AB-303010SB	96
12x8x6	AB-1286SB	9	36x30x10	AB-363010SB	111
10x10x6	AB-10106SB	9	36x36x10	AB-363610SB	128
12x10x6	AB-12106SB	10	48x36x10	AB-483610SB	145
12x12x6	AB-12126SB	11	48x48x10	AB-484810SB	265
15x12x6	AB-15126SB	13	12x12x12	AB-121212SB	16
18x12x6	AB-18126SB	16	18x12x12	AB-181212SB	21
24x12x6	AB-24126SB	21	24x12x12	AB-241212SB	27
15x15x6	AB-15156SB	16	18x18x12	AB-181812SB	28
18x15x6	AB-18156SB	17	24x18x12	AB-241812SB	34
18x18x6	AB-18186SB	20	24x24x12	AB-242412SB	53
24x18x6	AB-24186SB	26	36x24x12	AB-362412SB	70
24x24x6	AB-24246SB	39	30x30x12	AB-303012SB	103
30x24x6	AB-30246SB	48	36x36x12	AB-363612SB	137
36x24x6	AB-36246SB	56	48x36x12	AB-483612SB	154
48x24x6	AB-48246SB	101	48x48x12	AB-484812SB	280
30x30x6	AB-30306SB	81			
36x30x6	AB-36306SB	94			

NOTE: Replace "SB" Suffix with:

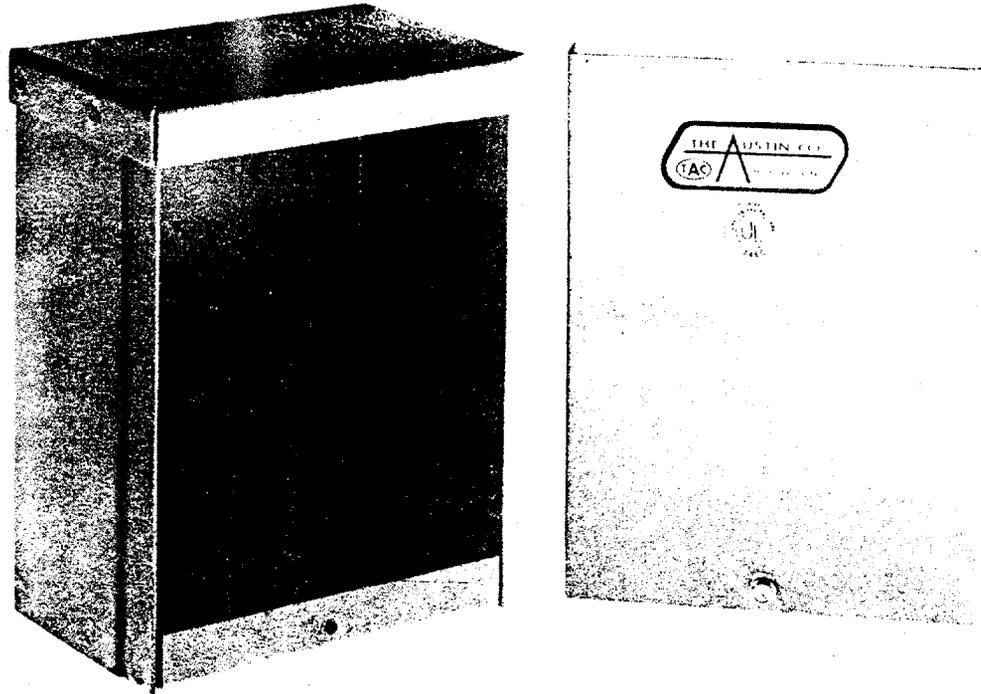
SBK	Screw Cover w KO's
SBGK	Screw Cover Gray w KO's
SBG	Screw Cover Gray
SBL	Screw Cover Flush

HC	Hinge Cover
HCK	Hinge Cover w KO's
HCG	Hinge Cover Gray
HCGK	HC Gray w KO's



P.O. Box 1160, Yadkinville, N.C. 27055 919-468-2851

Austin Rainproof Boxes

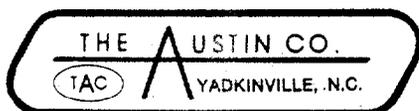


APPLICATION: Austin rainproof boxes are U.L. approved and listed for use in wiring box or junction box applications. They are designed to protect the contents from rain and sleet outdoors, and dripping water indoors. All boxes meet the requirements for a NEMA type 3R rating.

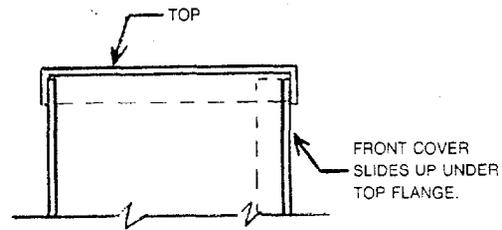
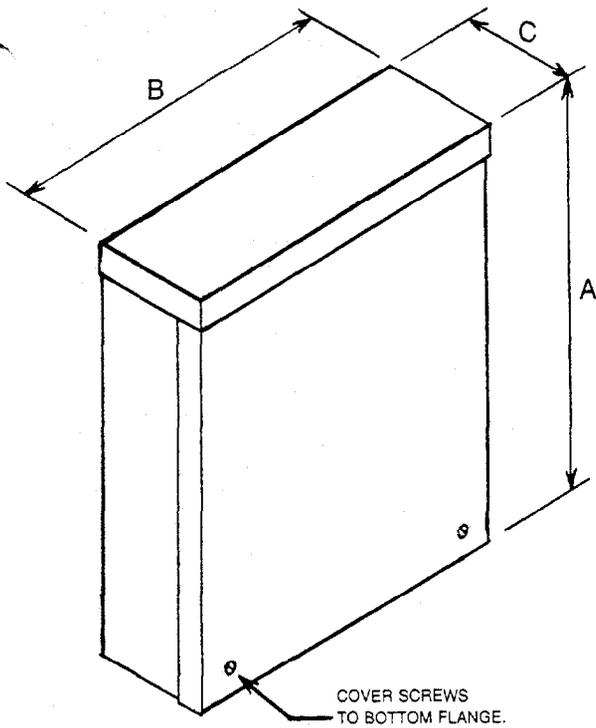
CONSTRUCTION: Austin rainproof boxes are fabricated, in accordance with U.L. specifications, from code guage steel. A dripshield along the top prevents water from entering the enclosure. A slip-on, seamless cover is provided, which is attached by screws along the bottom edge.

FINISH: Austin rainproof boxes are provided standard in galvanized steel. A gray finish is available on request.

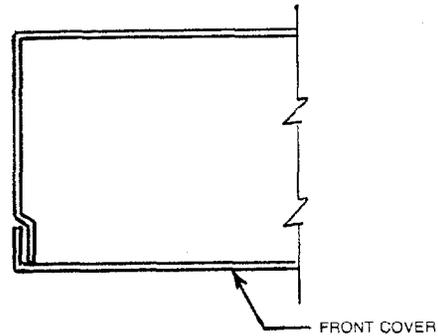
MODIFICATIONS: The Austin Company can provide special knockouts or knockout arrangements, cutouts, holes, hubs, special materials, special finishes, and custom box size or construction. We specialize in custom work of any kind in gray finish, galvanized steel, stainless steel, or aluminum. Please consult the factory for assistance on special pricing and delivery.



P.O. Box 1160, Yadkinville, N.C. 27055 919-468-2851



SECTION THRU TOP



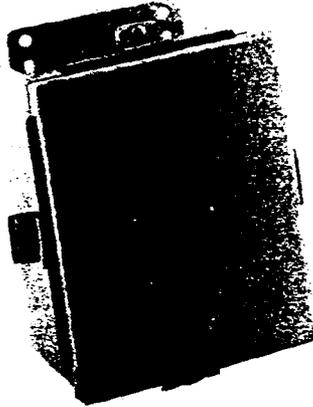
SECTION THRU SIDE

Rainproof Boxes

Enclosure Size AxBxC	Standard Bundle	Catalog Number	Bundle Weight
Bundle Sizes			
6x6x4	10	AB-664RB	40
8x8x4	10	AB-884RB	50
10x10x4	10	AB-10104RB	70
12x12x4	5	AB-12124RB	50
8x8x6	10	AB-886RB	60
10x10x6	10	AB-10106RB	90
12x12x6	5	AB-12126RB	60
18x12x6	3	AB-18126RB	48
Standard Sizes			
6x6x4		AB-664RB	4
8x6x4		AB-864RB	4
8x8x4		AB-884RB	5
10x8x4		AB-1084RB	6
12x8x4		AB-1284RB	7
10x10x4		AB-10104RB	7
12x12x4		AB-12124RB	10
6x6x6		AB-666RB	4
8x8x6		AB-886RB	6
10x10x6		AB-10106RB	9
12x12x6		AB-12126RB	12
15x12x6		AB-15126RB	13
18x12x6		AB-18126RB	16
18x15x6		AB-18156RB	19
18x18x6		AB-18186RB	21
24x24x6		AB-24246RB	40
18x15x8		AB-18158RB	20
18x18x8		AB-18188RB	23
24x18x8		AB-24188RB	35
24x24x8		AB-24248RB	44
24x24x10		AB-242410RB	48

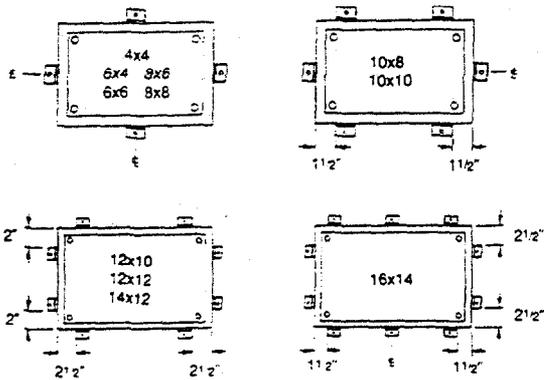
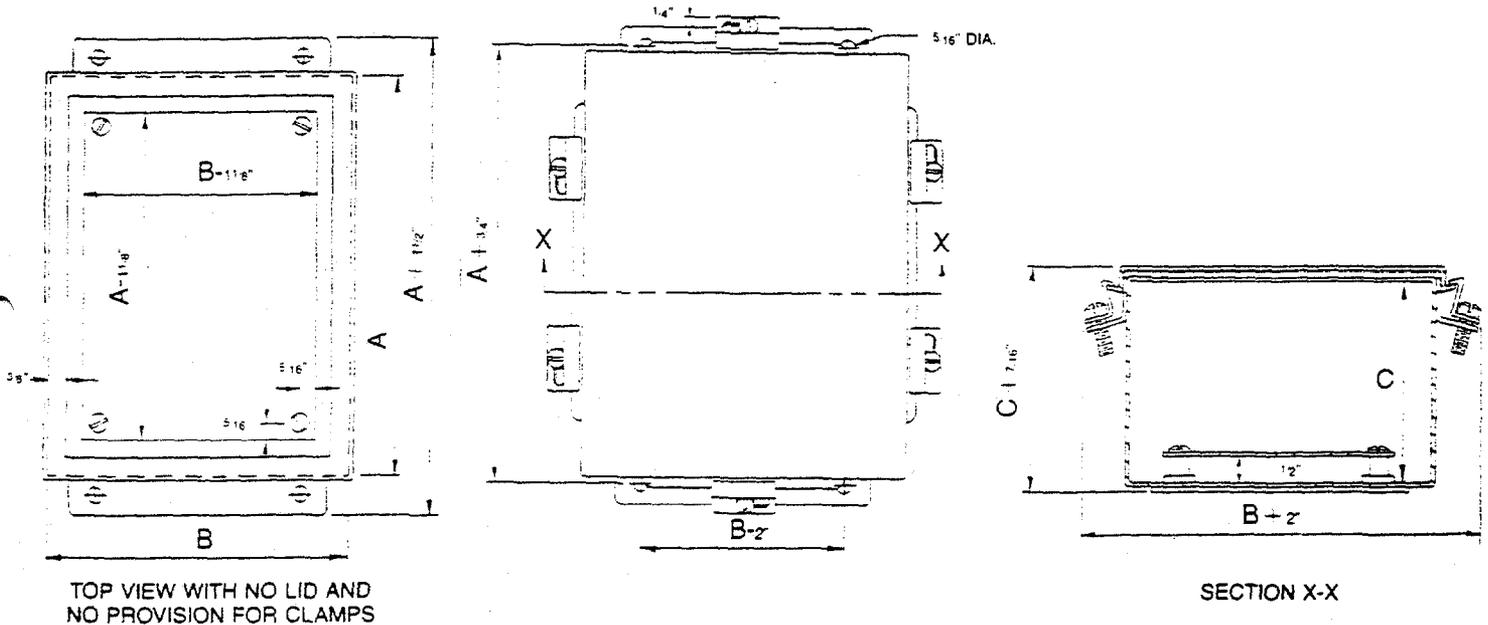


Austin "JFCX" Stainless Steel NEMA Type 4X Clamp Cover Boxes



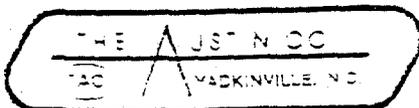
Austin "JFCX" stainless steel, NEMA 4X clamp cover boxes are U.L. listed and are fabricated from code gauge stainless steel (Type 304). The neoprene gasket is attached to the cover with an oil resistant adhesive. The lid is held in place by external screw clamps on all four sides. The screw clamps are easy to operate and have no loose parts. All seams are continuously welded and ground smooth. The boxes are provided with external mounting feet. Weldnuts are provided with enclosures 6x4x3 and larger for mounting panels and terminal kits. These enclosures conform to NEMA and UL types 12, 13, and 4X specifications.

Note: All external screw clamps are fabricated from stainless steel.



Austin "JFCX" Stainless Steel NEMA Type 4X Clamp Cover Boxes

Enclosure Size AxBxC	Catalog Number	Panel Catalog Number
6x6x4	AB-664JFCX	AB-66JP
8x6x3 1/2	AB-863JFCX	AB-86JP
8x8x4	AB-884JFCX	AB-88JP
10x8x4	AB-1084JFCX	AB-108JP
12x10x5	AB-12105JFCX	AB-1210JP
12x12x6	AB-12126JFCX	AB-1212JP
14x12x6	AB-14126JFCX	AB-1412JP
16x14x6	AB-16146JFCX	AB-1614JP



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6

ITEM # (4)

1.3.1D
2.4.3
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**MADE
IN THE
USA**

THHN

Thermoplastic Insulated, Sheathed With Nylon or UL-listed equivalent.
Heat, Moisture, Oil & Gasoline Resistant¹.

600 volt. Copper.

All sizes rated THWN-2; all stranded sizes rated MTW; sizes
14-6 AWG rated AWM (105°C).

AWG sizes 14 through 1 rated VW-1 and larger sizes rated for CT use.



E51583

APPLICATIONS

Senator Type THHN or THWN-2 conductors are primarily used in conduit and cable trays for services, feeders, and branch circuits in commercial or industrial applications as specified in the National Electrical Code². When used as Type THHN, conductor is suitable for use in dry locations at temperatures not to exceed 90°C. When used as Type THWN-2, conductor is suitable for use in wet or dry locations at temperatures not to exceed 90°C or not to exceed 75°C when exposed to oil or coolant. When used as Type MTW, conductor is suitable for use in wet locations or when exposed to oil or coolant at temperatures not to exceed 60°C or dry locations at temperatures not to exceed 90°C (with ampacity limited to that for 75°C conductor temperature per NFPA 79). Conductor temperatures not to exceed 105°C in dry locations when rated AWM and used as appliance wiring material. Voltage for all applications is 600 volts.

SPECIFICATIONS

Senator Type THHN or THWN-2 or MTW (also AWM) meets or exceeds all applicable ASTM specifications, UL standard 83, UL standard 1063 (MTW), Federal Specification J-C-30B, and requirements of the National Electrical Code.

CONSTRUCTION

Senator Type THHN or THWN-2 or MTW copper conductors are annealed (soft) copper, insulated with a tough, heat and moisture resistant polyvinyl chloride (PVC), over which a nylon (polyamide) or UL-listed equal jacket is applied. Available in black, white, red, blue, green, yellow, brown, orange, or grey. Some colors standard, some subject to economic order quantity. Sizes 1-19 through 1,000 kcmil available in black only.

Senator
WIRE & CABLE CO.

¹ Oil and gasoline resistance II as defined by Underwriters Laboratories.

² 1993 Edition.

Conductor		Insulation Thickness (mils)	Jacket Thickness (mils)	Nominal O.D. (mils)		Approx. Net Weight Per 1000' (lbs.)		Allowable Ampacities+			Standard Package
Size (AWG or kcmil)	No. Strands			Sol.	Str.	Sol.	Str.	60°C	75°C	90°C	
**12	19*	15	4	119	128	23	24	20	20	20	DNF°
**10	19*	20	4	150	161	37	38	30	30	30	DQF^
**8	19	30	5		212		63	40	50	55	F
**6	19	30	5		250		95	55	65	75	E
4	19	40	6		319		153	70	85	95	C
3	19	40	6		346		189	85	100	110	BC
2	19	40	6		378		234	95	115	130	C
1	19	50	7		435		300	110	130	150	B
1/0	19	50	7		474		372	125	150	170	B
2/0	19	50	7		518		463	145	175	195	B
3/0	19	50	7		568		576	165	200	225	B
4/0	19	50	7		624		719	195	230	260	B
250	37	60	8		694		849	215	255	290	B
300	37	60	8		747		1010	240	285	320	B
350	37	60	8		797		1172	260	310	350	B
400	37	60	8		842		1332	280	335	380	B
500	37	60	8		925		1652	320	380	430	B
600	61	70	9		1024		1990	355	420	475	C
750	61	70	9		1126		2468	400	475	535	C
1000	61	70	9		1275		3263	455	545	615	C

* Solid construction available in sizes 14, 12, & 10 as Types THHN or THWN-2 only.
 ** Also suitable for 105°C appliance wiring material (AWM).
 Four 500' spools per carton.
 Two 500' spools per carton.
 Allowable Ampacities:
 Allowable ampacities shown are for general use as specified by the National Electrical Code, 1993 Edition, sections 310-15.
 60°C - When terminated to equipment for circuits rated 100 amperes or less or marked for #14 through #1 conductors. MTW wet locations or when exposed to oil or coolant.
 75°C - When terminated to equipment for circuits rated over 100 amperes or marked for conductors larger than #1. THWN-2 when exposed to oil or coolant. MTW dry locations.
 90°C - THHN dry locations. THWN-2 wet or dry locations.
 A - AWG sizes 14 through 14 rated AWM. Larger sizes rated for CT use.

STANDARD PACKAGE CODE
 B = 1000' Reel
 C = 500' Reel
 D = 2500' Spool
 E = 1000' Spool
 F = 500' Spool
 N = 2000' Carton
 O = 250' Carton

THHN or THWN-2 or MTW or AWM

RECOMMENDED SAMPLE SPECIFICATIONS:

(MTW OR THHN OR THWN-2)

Conductors shall be UL-Listed Type MTW or THHN or THWN-2 gasoline and oil resistant II, suitable for operations at 600 volts as specified in the National Electrical Code. Conductors shall be annealed copper, insulated with high-heat and moisture resistant PVC, jacketed with abrasion, moisture, gasoline, and oil resistant nylon or UL-listed equivalent, as manufactured by Senator Wire & Cable Company or approved equal.

(AWM)

Conductors shall be UL-Listed Type THHN or THWN-2 or MTW or AWM, suitable for operation at 600 volts at conductor temperatures not to exceed 105°C.

Senator

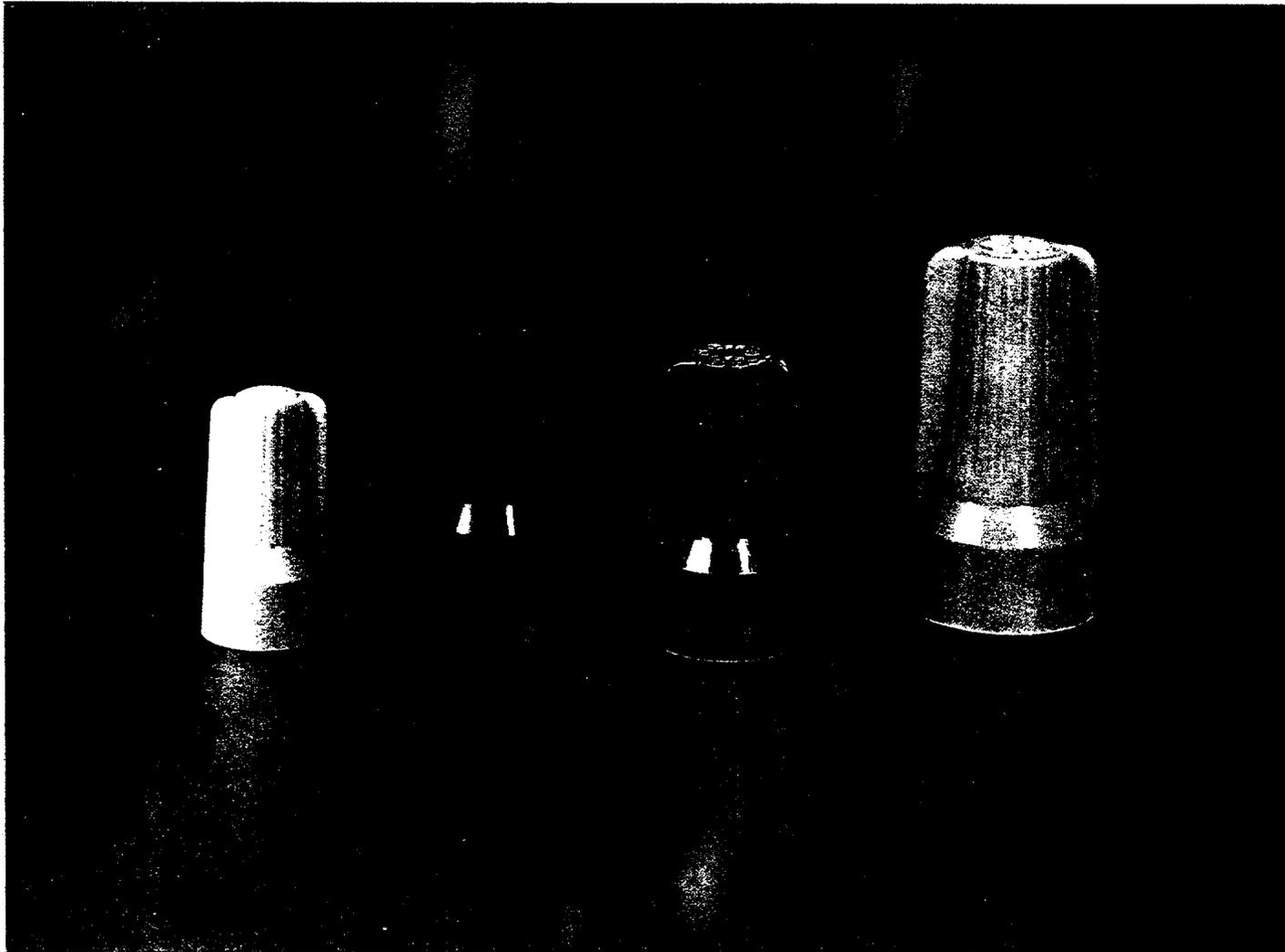
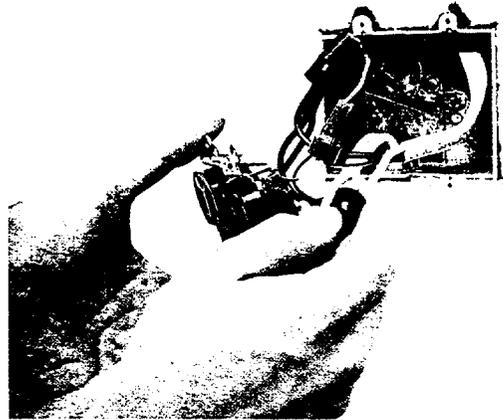
WIRE & CABLE CO.
 P.O. Box 797
 Carrollton, GA 30117
 404/832-4776

B-Cap Connectors

1.3.1E
2.5

Buchanan offers a full line of live-spring B-Cap connectors for a wide variety of construction and maintenance applications. Insulated with a tough, durable Nylon that offers superior aging characteristics, these twist-on connectors feature a unique fin shape for easy gripping, easy twisting. Rated for 105°C, they offer a wide throat design for easier installation on multiple wire combinations or larger wire sizes, as well as a longer skirt for added insulating protection. **DESIGNED TO MEET THE NEW, TOUGHER UL STANDARD 486C, ALL B-CAP WIRE COMBINATIONS ARE APPROVED FOR 600 VOLTS (1000V FOR SIGNS AND FIXTURES).** Available in three color-coded sizes to cover a full range of wire combinations. The red, universal B-2 continues to offer the widest range of approved wire combinations. The most versatile wire connector in the industry, the B-2, B-Cap covers from two # 18's through five # 12's. The small size of the yellow B-1 makes it perfect for those tight spots. And the blue-grey B-4 is the heavyweight that replaces other blue and grey combinations. Plus, the Green-B connector from Buchanan is perfect for those grounding applications. Buchanan has it all!

ITEM # (SA)



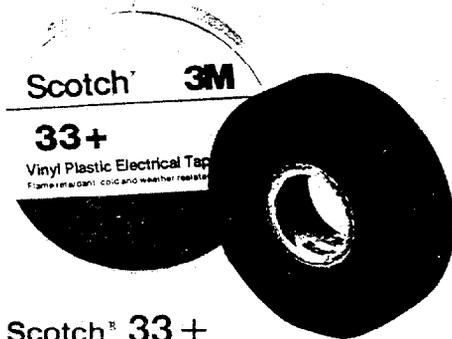
Tapes

Section A

Vinyl Plastic • Plastic Tape Displays • Rubber • Silicone •
Copper • Glass Cloth • Varnished Cambric • Reinforced
Polyester • Vinyl Mastic Pads and Rolls • Corrosion
Protection Tapes • Electrical Insulation Putty • Fire and
Electric Arc Proofing Tape

1.3.1
2.5

ITEM # (5B)



Scotch® 33+
Vinyl Plastic Electrical Tape

One tape for all jobs, 33+ is a premium-grade, 7-mil tape that applies well at -18°C/0°F and has an operating range up to 105°C/220°F.

Flame-retardant, hot-and cold-weather resistant, 33+ matches ratings of most wire and cable insulations. It resists ultraviolet rays, abrasion, moisture, alkalis, acids and corrosion. Use 33+ Tape as a primary insulation for wire cable splices up to 600 volts — and for fixture and wire splices up to 1000 volts. Use it also to maintain the electrical and high-temperature integrity of your electrical systems. 33+ provides an excellent abrasive-resistant jacket for high-voltage cable splices and terminations.

Meets requirements of ASTM D-3005-72, Type 1, UL 510 and HHI-595C. CSA Bulletin No. 561A (105°C).

Roll Size	Packing		
	Roll	Carton	Case
3/4 in. x 66 ft.*	1/Can	10	100
3/4 in. x 44 ft.			
3/4 in. x 20 ft.	10/Ctn.		

*Also available in a dispenser. Product is 33 + D. Other widths and lengths available upon request.

FOR PRICES, SEE PRICE PAGE SECTION A.



Scotch® 33
Vinyl Plastic Electrical Tape

33 is a 7-mil, strong, stretchy, general-purpose tape.

A sound balance of physical and electrical properties provides 33 Tape with the right "feel" for jobs which require holding, protecting and insulating. Tough vinyl backing shrugs off moisture, sunlight, heat and cold. Its adhesive grabs instantly and hugs tightly without creeping or end-lifting. 33 is well suited to make envelopes for resin-pressure splicing.

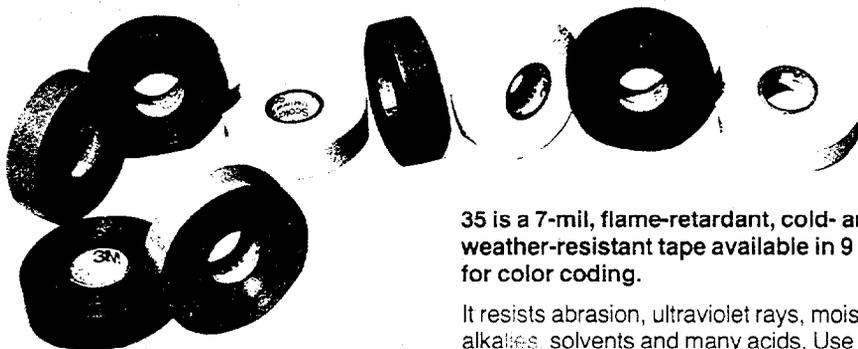
Meets requirements of UL 510, MIL-I-7798A and CSA.

Roll Size	Packing		
	Roll	Carton	Case
1 1/2 in. x 44 ft.	1/Box	10	100
3/4 in. x 36 yds.		12	48

Other widths and lengths available upon request.

FOR PRICES, SEE PRICE PAGE SECTION A.

NOTE: MIL-1-7798A is a cancelled spec.



Scotch® 35
Vinyl Plastic Electrical Tape
for Color Coding

35 is a 7-mil, flame-retardant, cold- and weather-resistant tape available in 9 colors for color coding.

It resists abrasion, ultraviolet rays, moisture, alkalis, solvents and many acids. Use 35 Tape indoors and in weather-protected outdoor applications such as phase identification, identifying motor leads, piping systems, marking safety areas, insulating splices and

terminations and harnessing. 35 is recommended for PVC and polyethylene-jacketed cables.* Colors are red, yellow, blue, brown, gray, white, green, orange and violet.**

Meets requirements of UL 510 and CSA.

*Do not use on neoprene jacketed cable.

**3/4-inch x 66 foot rolls only.

Roll Size	Packing		
	Roll	Carton	Case
3/4 in. x 66 ft.	1/Can	10	100
1/2 in. x 20 ft.	1/Cello Pack	10	100

Other widths and lengths available upon request.

FOR PRICES, SEE PRICE PAGE SECTION A.



Scotch® 88
Vinyl Plastic Electrical Tape

88 is a heavy-duty, 8.5-mil, flame-retardant, cold- and weather-resistant tape with superior cold-weather handling features.

Extra thickness provides added electrical properties, quicker insulation buildup and abrasion resistance. 88 Tape remains workable on cold days — even at -18°C/0°F — and doesn't get goeey on hot days. It is remarkably conformable for wrapping irregular surfaces — inside or outside. 88 resists ultraviolet rays, moisture, alkalis, acids and corrosion.

Meets requirements of ASTM D-3005-72, Type II, UL 510, MIL-I-24391 and CSA.

Roll Size	Packing		
	Roll	Carton	Case
3/4 in. x 66 ft.	1/Can	10	100
3/4 in. x 44 ft.			
1 1/2 in. x 44 ft.	1/Box		
3/4 in. x 36 yds.	1/Box	12	48

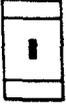
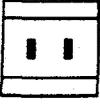
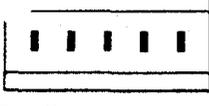
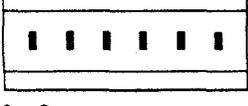
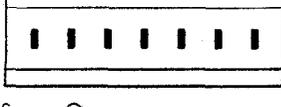
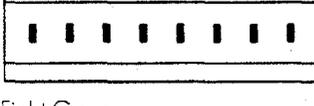
Other widths and lengths available upon request.

FOR PRICES, SEE PRICE PAGE SECTION A.

Wall Plates

Standard Size Plastic & Metal

ITEM # (6A)

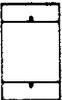
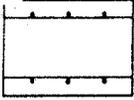
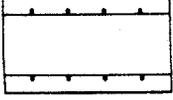
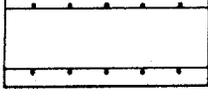
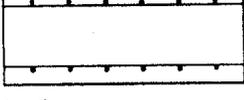
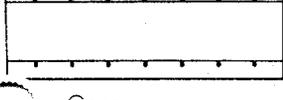
Description	Thermoset				Thermoplastic		Metal		
	Color	Line	No-Line	Ribbed	Line	No-Line	Material	Line	No-Line
Toggle Switch									
 One Gang	Ivory Black Gray Red White Brown	P1-I P1-BK P1-GRY P1-RED P1-W P1	SP1-I SP1-GRY SP1-W SP1	D1-I D1	RP1-I RP1-BK RP1-GRY RP1-RED RP1-W RP1	SRP1-I SRP1-GRY SRP1-RED SRP1-W SRP1	Alum. Brass 430S/S 302S/S	A1 B1 S1 S1-N	SL1
 Two Gang	Ivory Black Gray Red White Brown	P2-I P2-BK P2-GRY P2-RED P2-W P2	SP2-I SP2-GRY SP2-W SP2	D2-I D2	RP2-I RP2-BK RP2-GRY RP2-RED RP2-W RP2	SRP2-I SRP2-GRY SRP2-RED SRP2-W SRP2	Alum. Brass 430S/S 302S/S	A2 B2 S2 S2-N	SL2
 Three Gang	Ivory Black Gray Red White Brown	P3-I P3-BK P3-GRY P3-RED P3-W P3	SP3-I SP3-GRY SP3-W SP3	D3-I D3	RP3-I RP3-BK RP3-GRY RP3-RED RP3-W RP3		Alum. Brass 430S/S 302S/S	A3 B3 S3 S3-N	SL3
 Four Gang	Ivory Black Gray Red White Brown	P4-I P4-GRY P4-W P4	SP4-I SP4-GRY SP4-W SP4	D4-I D4	RP4-I RP4-BK RP4-GRY RP4-RED RP4-W RP4		Alum. Brass 430S/S 302S/S	A4 B4 S4 S4-N	SL4
 Five Gang	Ivory Gray White Brown	P5-I P5-GRY P5-W P5					Brass 430S/S 302S/S	B5 S5 S5-N	
 Six Gang	Ivory Gray White Brown	P6-I P6-GRY P6-W P6					430S/S 302S/S	S6 S6-N	
 Seven Gang	Ivory Gray White Brown	*S601-I *S601-GRY *S601-W *S601-X					430S/S	S601	
 Eight Gang	Ivory Gray White Brown	*S602-I *S602-GRY *S602-W *S602-X					430S/S	S602	
Duplex Receptacle									
 One Gang	Ivory Black Gray Red White Brown	P8-I P8-BK P8-GRY P8-RED P8-W P8	SP8-I SP8-GRY SP8-W SP8	D8-I D8	RP8-I RP8-BK RP8-GRY RP8-RED RP8-W RP8	SRP8-I SRP8-GRY SRP8-RED SRP8-W SRP8	Alum. Brass 430S/S 302S/S	A8 B8 S8 S8-N	SL8

*430 Stainless Steel Painted.

Wall Plates

Standard Size Plastic & Metal

ITEM # (6A)

Description	Thermoset				Thermoplastic		Metal		
	Color	Line	No-Line	Ribbed	Line	No-Line	Material	Line	No-Line
Sierraplex®/GFCI Fits all Sierraplex Devices and GFCI's (Continued)									
 Five Gang	Ivory Black Gray Red White Brown	P265-I P265-BK P265-GRY P265-RED P265-W P265					302S/S	S265-N	
 Six Gang	Ivory Black Gray Red White Brown	P266-I P266-BK P266-GRY P266-RED P266-W P266					302S/S	S266-N	
Blank Plate Box Mounted									
 One Gang	Ivory Black Gray Red White Brown	P13-I P13-GRY P13-W P13	SP13-I SP13-GRY SP13-W SP13	D13-I D13	RP13-I RP13-BK RP13-GRY RP13-RED RP13-W RP13		Alum. Brass 430S/S 302S/S	A13 B13 S13 S13-N	SL13
 Gang	Ivory Gray White Brown	P23-I P23-GRY P23-W P23	SP23-I SP23-GRY SP23-W SP23				Alum. Brass 430S/S 302S/S	A23 B23 S23 S23-N	SL23
 Three Gang	Ivory Gray White Brown	P33-I P33-GRY P33-W P33					430S/S 302S/S	S33 S33-N	
 Four Gang	Ivory Gray White Brown	P43-I P43-GRY P43-W P43					302S/S	S43-N	
 Five Gang							302S/S	S53-N	
 Six Gang							302S/S	S63-N	
 n Gang							430S/S	S6013	

Compliances UL & CSA Listed.

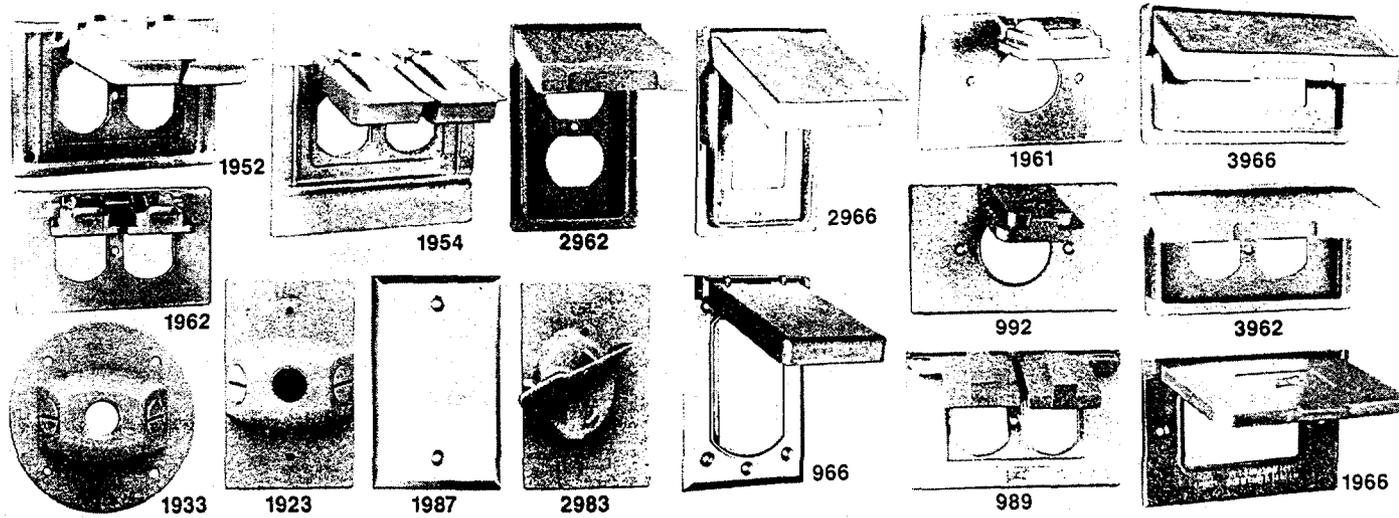


Protective Covers

ITEM # (IE)

1.3.1F
2.9.3

Covers for flush or surface mount installations where wiring devices need protection. Choice of plastic or metal construction.



Features

- Plastic covers are molded of thermoplastic material for protection against impact as well as weather and ocean humidity.
- Metal covers are corrosion resistant materials suitable for exposure to weather.
- Gaskets provided to seal cover edges as well as device openings.
- Corrosion resistant mounting screws furnished.
- Single device covers take either single receptacle or switch.
- Mount on flush or surface single gang boxes.
- UL File Nonmetallic E33216 QCMZ. Metal E92003 QCIT.
- Nonmetallic Covers CSA approved 9294 and 20899. 1966 CSA approved, 46664. 966 CSA approved, 10016. 992 and 989 CSA approved, 9294.

Ordering Information — Specification Grade Protective Covers

Style	Description	For Device	Catalog Numbers
	Plastic 1 Gang Gray Wet Locations Snap Cover	Single Device	S1951
	Wet Locations Snap Covers	Duplex Receptacle	S1952
	Oversize Wet Locations Snap Covers	Duplex Receptacle	1954-box
	Vertical Wet Locations Snap Cover	Duplex Receptacle	S2962
	Horizontal Wet Locations Snap Cover		S3962
	Vertical Wet Locations Snap Cover	Decorator/GFCI*	S2966
	Horizontal Wet Locations Snap Cover		S3966
	Stay Open Cover	Single Device	S1961
	Stay Open Covers	Duplex Receptacle	S1962
	Vertical Lampholder Cluster Cover	—	S1923
	Round Lampholder Cluster Cover	—	S1933
	Gray Protective Cover Can Be Padlocked	Toggle Switch	S2983
	Metal 1 Gang Gray Blank	Blank	1987-box**
	Snap Cover	Single Device	S992
	Snap Covers	Duplex Receptacle	S989
	Vertical Snap Cover	Decorator/GFCI*	966-box
	Horizontal Wet Locations Snap Covers		1966-box

Dimensions

- 1954 4⁹/₁₆" x 4⁹/₁₆"
- 1923 4³/₄" x 2⁶¹/₆₄" x 1⁵/₁₆"**
- 1933 4⁵/₁₆" Dia. x 1⁵/₁₆"**
- 2962 4²²/₃₂" x 2⁶¹/₆₄" x 7⁸/₁₆"**
- 3962 2⁶¹/₆₄" x 4³/₄" x 7⁸/₁₆"**
- 2983 2⁶¹/₆₄" x 4³/₄" x 1⁹/₁₆"**

*Including Gasket
**Including Gasket and Handle.

*Not for combination devices.

**UL Standards do not apply.