FOR YOUR SAFETY
If you smell gas:

1. **Open windows.**
2. **DO NOT try to light any appliance.**
3. **DO NOT use electrical switches.**
4. **DO NOT use any telephone in your building.**
5. **Extinguish any open flame.**
6. **Leave the building.**
7. **Immediately call your local gas supplier after leaving the building. Follow the gas supplier's instructions.**
8. **If you cannot reach your gas supplier, call the Fire Department.**

⚠ WARNING

Fire Hazard

Keep all flammable objects, liquids and vapors the minimum required clearances to combustibles away from equipment.

Some objects will catch fire or explode when placed close to equipment.

Failure to follow these instructions can result in death, injury or property damage.

ROBERTS GORDON

Combat® DF-Series

Direct, Gas-Fired, Industrial Air Handler

Installation, Operation & Service Manual

DF40
DF75
DF150
DF270
DF410
DF700A
DF700B

⚠ WARNING

Improper installation, adjustment, alteration, service or maintenance can result in death, injury or property damage. Read the Installation, Operation and Service Manual thoroughly before installing or servicing this equipment.

Installation must be done by a contractor qualified in the installation and service of gas-fired heating equipment or your gas supplier.

Installer

Please take the time to read and understand these instructions prior to any installation. Installer must give a copy of this manual to the owner.

Owner

Keep this manual in a safe place in order to provide your serviceman with necessary information.

NOT FOR RESIDENTIAL USE

INTERTEK ETL CM LISTED C US

CANADA: 100% OUTSIDE AIR ONLY

Roberts-Gordon LLC
1250 William Street
P.O. Box 44
Buffalo, New York 14240-0044
Telephone: +1.716.852.4400
Fax: +1.716.852.0854
Toll Free: 800.828.7450

www.rg-inc.com

P/N 121100NA Rev B 09/12

POUR VOTRE SECURITE
Si vous sentez une odeur de gaz:

1. **Ouvrez les fenêtres.**
2. **N'essayez PAS d'allumer un appareil.**
3. **N'utilisez PAS d'interrupteurs électriques.**
4. **N'utilisez PAS de téléphone dans votre bâtiment.**
5. **Eteignez toute flamme nue.**
6. **Quittez le bâtiment.**
7. **Après avoir quitté le bâtiment, appelez immédiatement votre fournisseur local de gaz.**
   Suivez les instructions du fournisseur de gaz.
8. **Si vous ne pouvez pas joindre votre fournisseur de gaz, appelez le service d'incendie.**

⚠ AVERTISSEMENT

Risque d'incendie

Garder tous les objets, liquides ou vapeurs inflammables à la distance minimale de l'unité de chauffage requise avec les matériaux combustibles.

Certains objets prendront feu ou exploseront s'ils sont placés à proximité de l'unité de chauffage.

Le non respect de ces instructions peut entraîner la mort, des blessures corporelles ou des dommages matériels.

⚠ ATTENTION

L'installation, l'ajustement, l'altération, le démarrage ou l'entretien inadéquat peuvent causer la mort, des blessures ou des dégâts matériels. Lire entièrement le manuel d'installation, d'opération et d'entretien avant l'installation ou l'entretien de cet équipement.

L'installation doit être effectuée par un installateur éprouvé/contractant qualifié dans l'installation et la maintenance du système de chauffage par infrarouge activé au gaz.

ROBERTS GORDON

Combat® DF-Series

L'appareil de traitment de l'air à combustion directe, au gaz pour les applications industrielles

Manuel d'installation, d'opération, et d'entretien

DF40
DF75
DF150
DF270
DF410
DF700A
DF700B

Installateur

Prenez le temps de lire et comprendre ces instructions avant toute installation.
L'installateur doit remettre au propriétaire un exemplaire de ce manuel.

Propriétaire

Gardez ce manuel dans un endroit sûr pour fournir des informations au réparateur en cas de besoin.

Conçus pour les applications non-résidentielles

INTERTEK ETL CM C US LISTED

Canada: seulement avec 100% d'air externe

Roberts-Gordon LLC
1250 William Street
P.O. Box 44
Buffalo, New York 14240-0044
Téléphone: +1.716.852.4400
Fax: +1.716.852.0854
Numéro sans fraís: 800.828.7450

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P/N 121100FC Orig. 09/12

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Printed in the U.S.A.

TABLE OF FIGURES

SECTION 1: AIR HANDLER SAFETY

Your Safety is Important to Us! This symbol is used throughout the manual to notify you of possible fire, electrical or burn hazards. Please pay special attention when reading and following the warnings in these sections.

Installation, service and, at a minimum, annual inspection of air handlers must be done by a contractor qualified in the installation and service of gas-fired heating equipment.

Read this manual carefully before installation, operation or service of this equipment.

This air handler is designed for heating non-residential indoor spaces. Do not install in residential spaces. These instructions, the layout drawing, local codes and ordinances and applicable standards that apply to gas piping, electrical wiring, ventilation, etc. must be thoroughly understood before proceeding with the installation.

Protective gear is to be worn during installation, operation and service. Thin sheet metal parts have sharp edges. To prevent injury, the use of work gloves is recommended.

Before installation, check that the local distribution conditions, nature of gas and pressure and adjustment of the appliance are compatible.

The equipment must be applied and operated under the general concepts of reasonable use.

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

Children should be supervised to ensure that they do not play with the appliance.

For additional copies of the Installation, Operation and Service Manual, please contact Roberts-Gordon LLC.

Gas-fired appliances are not designed for use in atmospheres containing flammable vapors or dust or atmospheres containing chlorinated or halogenated hydrocarbons. Recirculated room air may be hazardous if containing flammable solids, liquids, and gases; explosive materials; and/or substances which may become toxic when exposed to heat (i.e. refrigerants, aerosols, etc.).

1.1 Description of Operation

This air handler is a direct, gas-fired, fresh-air appliance. It is designed for indoor or outdoor installation with fresh outdoor air delivered to the burner. Air handlers are designed to operate in temperatures as low as -30° F (-34° C). The air handler is factory-tested to fire with natural gas or LPG (check the air handler's rating plate for information on the appropriate gas). The burner flame will modulate to maintain the selected discharge air temperature or room air temperature, depending on the selected controls. *See Page 135, Section 19.2*. For maximum temperature rise, *See Page 146, Table 25*.

The air handler may be provided with several different controls and options to meet various application requirements. Be sure to read this entire manual before installation and start-up.

1.2 Inspection and Setup

The air handler is shipped fully assembled. The air handler was inspected and operated prior to shipment. Immediately upon receipt of the air handler, check the fuel and electrical characteristics of the air handler and verify that they match the fuel and electrical supply available. Verify that the specifications on the air handler rating plate match the order. Check the air handler for any damage that may have occurred during shipment. If any damage is found, file a claim with the transporting agency. Do not refuse shipment. Check the installation location to ensure proper clearances to combustibles. *See Page 8, Section 3.1*.

Any small options which do not come attached to the air handler (i.e. remote panel) will be found inside the air handler.

Larger accessories (i.e. legs, stand, filter section, inlet hood) may either ship with the air handler or separately. Check the bill of lading for information.

If the air handler must be temporarily stored (i.e. job site is not ready for installation of the air handler), the air handler should be set on 4" x 4" (10 cm x 10 cm) pieces of timber on the ground in a protected area. Cover the air handler to protect it from the environment.

1.3 Safety Labels and Their Placement

Product safety signs or labels should be replaced by product user if they are no longer legible. Please contact Roberts-Gordon LLC or your ROBERTS GORDON® independent distributor to obtain

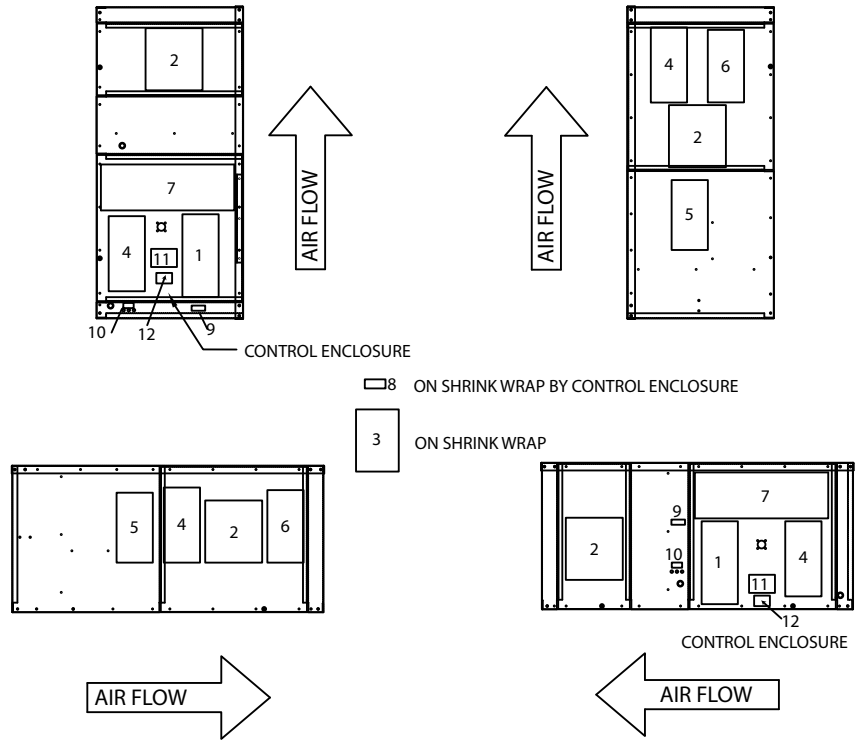
replacement signs or labels. *See Page 3, Figure 1 through Page 5, Figure 5*.

1.4 California Proposition 65

In accordance with California Proposition 65 requirements, a warning label must be placed in a highly visible location on the outside of the equipment (i.e., near equipment's serial plate). See label placement drawing on *Page 3, Figure 1 through Page 3, Figure 2* for label location. Avoid placing labels on areas with extreme heat, cold, corrosive chemicals or other elements. To order additional labels, please contact Roberts-Gordon LLC or your ROBERTS GORDON® independent distributor.

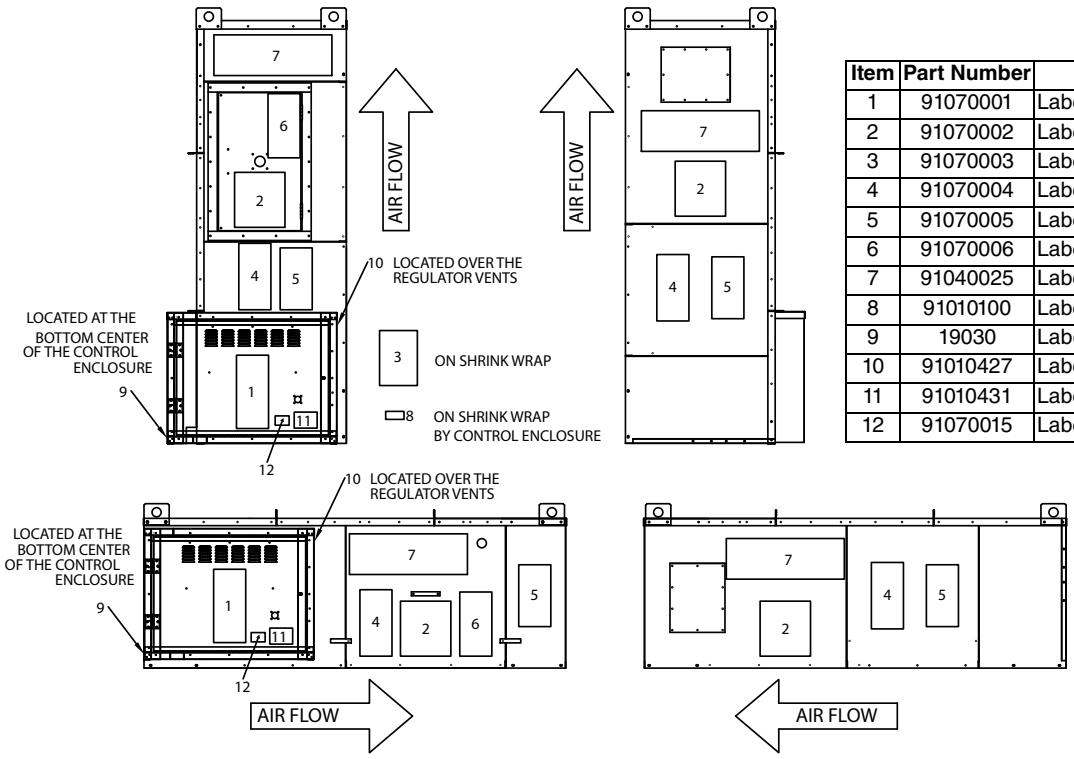
1.5 Label Placement

FIGURE 1: DF40



Item	Part Number	Description
1	91070001	Label Shock Hazard
2	91070002	Label Severe Injury Hazard
3	91070003	Label Crush Hazard
4	91070004	Label Fire Hazard
5	91070005	Label Falling Hazard
6	91070006	Label Burn Hazard
7	91040025	Label DF Logo
8	91010100	Label Manual Location
9	19030	Label Recommended Entry
10	91010427	Label Vent to Outdoors
11	91010431	Label Improper Installation
12	91070015	Label Proposition 65

FIGURE 2: DF75 and DF150



Item	Part Number	Description
1	91070001	Label Shock Hazard
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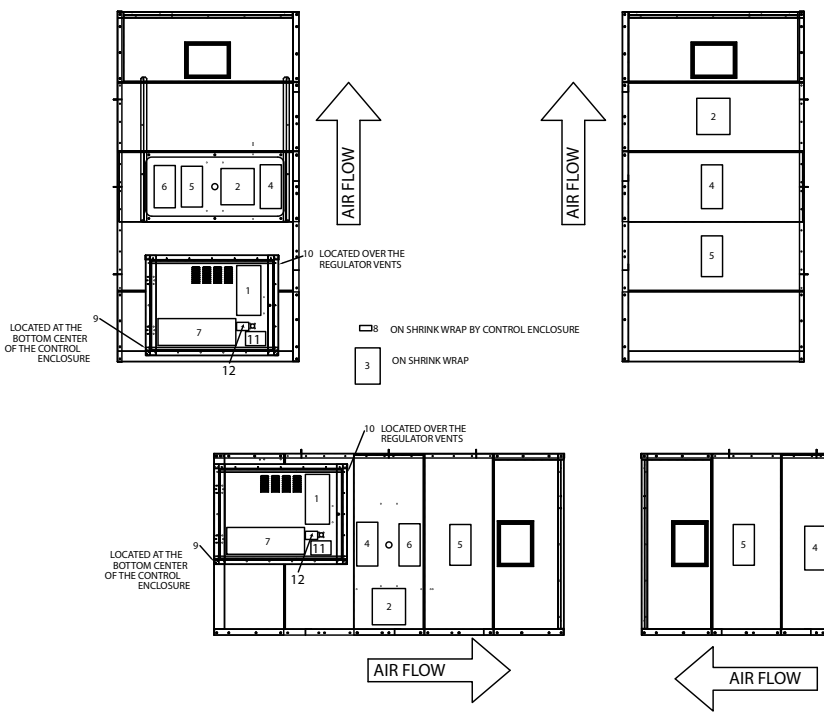
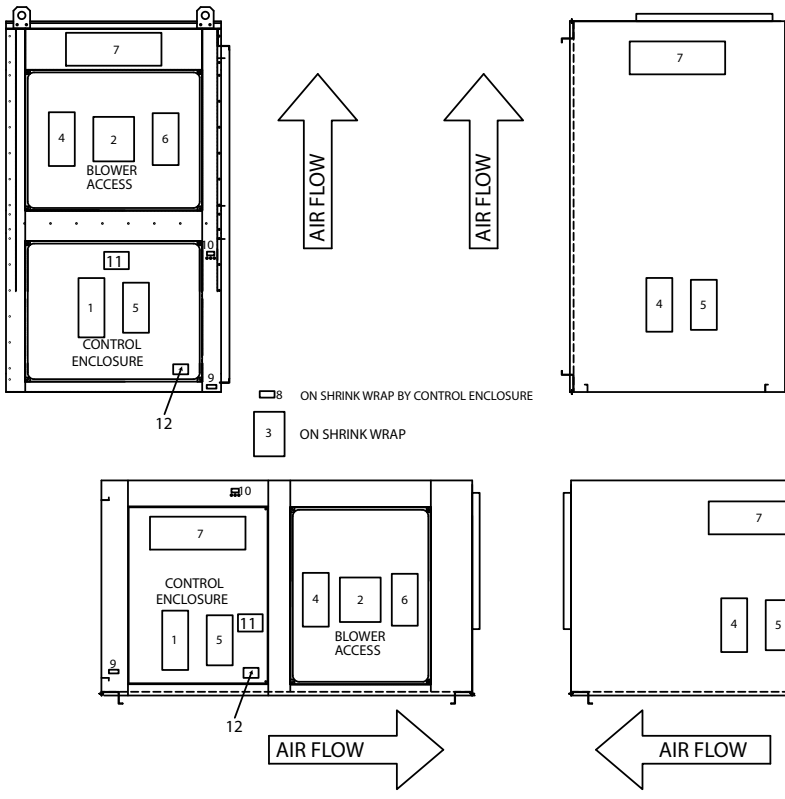
3	91070003	Label Crush Hazard
4	91070004	Label Fire Hazard
5	91070005	Label Falling Hazard
6	91070006	Label Burn Hazard
7	91040025	Label DF Logo
8	91010100	Label Manual Location
9	19030	Label Recommended Entry
10	91010427	Label Vent to Outdoors
11	91010431	Label Improper Installation
12	91070015	Label Proposition 65

FIGURE 3: DF270 and DF410



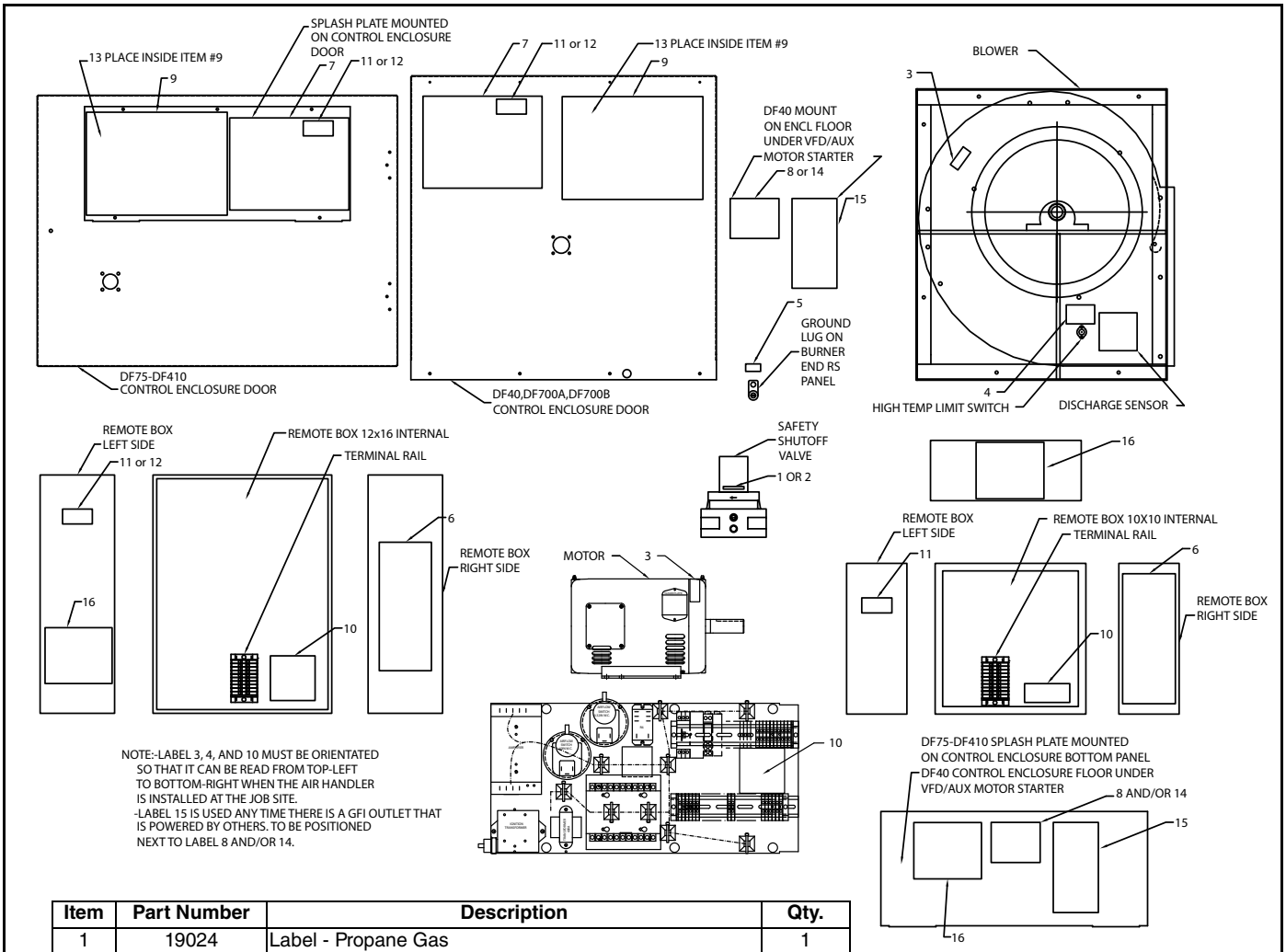
Item	Part Number	Description
1	91070001	Label Shock Hazard
2	91070002	Label Severe Injury Hazard
3	91070003	Label Crush Hazard
4	91070004	Label Fire Hazard
5	91070005	Label Falling Hazard
6	91070006	Label Burn Hazard
7	91040025	Label DF Logo
8	91010100	Label Manual Location
9	19030	Label Recommended Entry
10	91010427	Label Vent to Outdoors
11	91010431	Label Improper Installation
12	91070015	Label Proposition 65

FIGURE 4: DF700A and DF700B



Item	Part Number	Description
1	91070001	Label Shock Hazard
2	91070002	Label Severe Injury Hazard
3	91070003	Label Crush Hazard
4	91070004	Label Fire Hazard
5	91070005	Label Falling Hazard
6	91070006	Label Burn Hazard
7	91040025	Label DF Logo
8	91010100	Label Manual Location
9	19030	Label Recommended Entry
10	91010427	Label Vent to Outdoors
11	91010431	Label Improper Installation
12	91070015	Label Proposition 65

FIGURE 5: DF-Series Interior



Item	Part Number	Description	Qty.
1	19024	Label - Propane Gas	1
2	19025	Label - Natural Gas	1
3	19162	Label - Rotation	1
4	19161	Label - High Temperature Limit	1
5	19100	Label - Ground	1
6	91070009	Label - Electric Shock Hazard (Mini)	1
7	91010444	Label - DF Rating Plate	1
8	91010443	Label - DF Exhaust Fan Motor Control	1
9	90911300	9½" x 13" Clear Pouch	1
10	91010445	Label - DF Wire Connection Control Panel/Remote Panel	2
11	91010446	Label - ETL Certification Without Recirculation Z83.4	2
12	91010447	Label - ETL Certification With Recirculation Z83.18	2
13	80XXX	Wiring Diagram - Varies by Order	2
14	91040128	Label - Auxiliary Motor Starter	1
15	91010448	Label - Shock Hazard GFI	1
16	91010451	Label - Panel Shop Approval	1

SECTION 2: INSTALLER RESPONSIBILITY

⚠ WARNING

Explosion Hazard

Equipment must have access to uncontaminated air at all times.

Failure to follow these instructions can result in death, injury or property damage.

The installer is responsible for the following:

- To install and commission the air handler, as well as the gas and electrical supplies, in accordance with applicable specifications and codes. Roberts-Gordon LLC recommends the installer contact a local building inspector or Fire Marshal for guidance.
- To use the information given in a layout drawing and in the manual together with the cited codes and regulations to perform the installation.
- To install the heater in accordance with the clearances to combustibles.
- To furnish all needed materials not furnished as standard equipment.
- To plan location of supports.
- To provide access to air handler for servicing.
- To provide the owner with a copy of this Installation, Operation and Service Manual.
- To never use heater as support for a ladder or other access equipment and never hang or suspend anything from heater.
- To ensure there is adequate air circulation around the air handler and to supply air for combustion, ventilation and distribution in accordance with local codes.
- To assemble or install any accessories or associated duct work using best building practices.
- To properly size supports and hanging materials.
- To ensure heater is placed in an approved application.

2.1 Wall Tag

A laminated wall tag is available for the heater as a permanent reminder of the safety instructions and the importance of the required clearances to combustibles. Please contact Roberts-Gordon LLC or your ROBERTS GORDON® independent distributor to obtain the wall tag. Affix the tag on a wall near the heater (e.g. thermostat or control system).

A copy of the wall tag (P/N 91040101) is illustrated on the back cover. For an immediate solution, you may affix this copy on the wall near the heater.

Know your model number and installed configuration. Model number and installed configuration are found on the rating plate and in the Installation, Operation and Service Manual. *See Page 3, Figure 1 through Page 5, Figure 5*.

2.2 Corrosive Chemicals

⚠ CAUTION

Product Damage Hazard

Do not use equipment in area containing corrosive chemicals.

Refer to appropriate Material Safety Data Sheets (MSDS).

Failure to follow these instructions can result in product damage.

Roberts-Gordon LLC cannot be responsible for ensuring that all appropriate safety measures are undertaken prior to installation; this is entirely the responsibility of the installer. It is essential that the contractor, the sub-contractor, or the owner identifies the presence of combustible materials, corrosive chemicals or halogenated hydrocarbons* anywhere in the premises.

** **Halogenated Hydrocarbons** are a family of chemical compounds characterized by the presence of halogen elements (fluorine, chlorine, bromine, etc.). These compounds are frequently used in refrigerants, cleaning agents, solvents, etc. If these compounds enter the air supply of the burner, the life span of the air handler components will be greatly reduced. The location of the outside air supply must be carefully chosen to supply outside air, free of these compounds, to the burners whenever the presence of these compounds is suspect. Warranty will be invalid if the air handler is exposed to halogenated hydrocarbons.*

2.3 National Standards and Applicable Codes

All appliances must be installed in accordance with the latest revision of the applicable standards and national codes. This refers also to the electric, gas and venting installation. Note: Additional standards for installation in public garages, aircraft hangars, etc. may be applicable.

2.4 Required Equipment

When lifting of the equipment is required, the installing contractor is responsible for supplying or arranging for the appropriate lifting equipment so that the air handler and accessories may be placed in a safe manner.

The qualified installer or service technician is responsible for having the appropriate equipment for the safe installation and start-up of a direct-fired air handler. Tools required to commission the equipment include, but are not limited to, the following:

- Various screwdriver types and sizes
- Various adjustable wrenches
- Torque wrenches
- Pipe wrenches sized appropriately for the gas train components
- Drill motor and various drills
- U-tube manometer or gas pressure gauge
- Volt meter
- Clamp style ammeter
- Belt tension gauge

SECTION 3: CRITICAL CONSIDERATIONS

⚠WARNING

Fire Hazard

Keep all flammable objects, liquids and vapors the minimum required clearances to combustibles away from equipment.

Some objects will catch fire or explode when placed close to equipment.

Failure to follow these instructions can result in death, injury or property damage.

⚠WARNING

Explosion Hazard

Fresh air supply duct and burner housing must be purged with fresh air four times before every ignition.

Explosive vapors will ignite if not evacuated before ignition attempt.

Failure to follow these instructions can result in death, injury or property damage.

3.1 Required Clearances to Combustibles

Clearances are the required distances that combustible objects must be away from the air handler to prevent fire hazards. Combustibles are materials that may catch on fire and include common items such as wood, paper, rubber, fabric, etc. **Maintain clearances to combustibles at all times for safety.**

Check the clearances on each air handler being installed to make sure the product is suitable for your application and the clearances are maintained. Clearances to combustibles for models DF40-DF410 are 12"(30.5 cm) on the control enclosure side and 6"(15.2 cm) on all other surfaces. Clearances to combustibles for models DF700A and DF700B are 6"(15.2 cm) on all surfaces. Read and follow the safety guidelines below:

- Locate the air handler so that the air intakes are not too close to any exhaust fan outlets, gasoline storage, propane tanks or other contaminants that could potentially cause dangerous situations.
- Keep gasoline or other combustible materials including flammable objects, liquids, dust or vapors away from this air handler or any other appliance.
- Maintain clearances from heat sensitive material, equipment and workstations.

Clearances to combustibles do not denote clearances for accessibility. Minimum clearance for access is 48" (122 cm). Minimum clearance for accessibility applies to the control enclosure, blower access panel and filter access panel (when equipped).

The stated clearances to combustibles represent a surface temperature of 90° F (50° C) above room temperature (90° F [50° C] plus ambient temperature). Building materials with a low heat tolerance (i.e. plastics, vinyl siding, canvas, tri-ply, etc.) may be subject to degradation at lower temperatures. It is the installer's/owner's responsibility to assure that adjacent materials are protected from degradation.

• Maintain clearances from vehicles parked below the air handler. *See Page 11, Section 4.4*.

3.2 Purge of Supply Duct

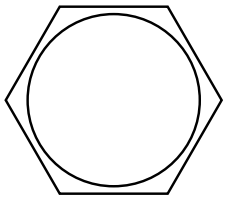
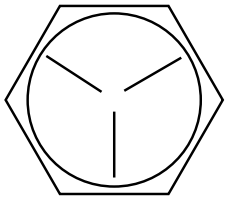
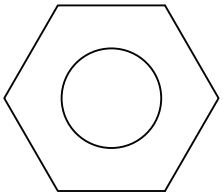
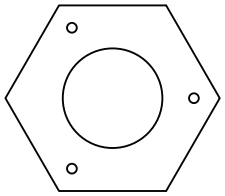
If this heating unit is to be installed indoors, and its outdoor air supply ducted from outdoors, ANSI Standards Z83.18 and Z83.4 require that all supply duct shall be purged a minimum of four times prior to any ignition attempt. If the volume of the outdoor air supply duct exceeds the heating unit's ability to complete the required four air changes prior to ignition, you must contact the factory to purchase an extended purge card of the appropriate duration to meet this requirement.

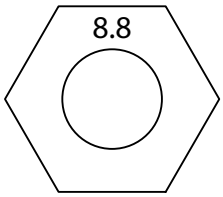
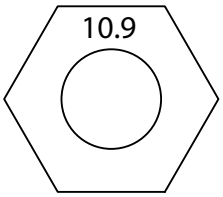
3.3 Hardware

Unless otherwise specified, all hardware must be torqued to settings on *Page 9, Table 1*.

Note: Inlet hood opening shall not be installed with inlet opening facing into the prevailing wind direction in order to help prevent the possibility of moisture entrainment.

Table 1: Recommended Torque Settings

Bolt Head Grade Marking		
Nut Grade Marking		
Bolt Size	**Grade 2**	**Grade 5**
10-24	27 in•lb	42 in•lb
1/4-20	65 in•lb	101 in•lb
5/16-18	11 ft•lb	17 ft•lb
3/8-16	19 ft•lb	30 ft•lb

Bolt Head Grade Marking		
Nut Grade Marking		
Bolt Size	**Grade 8.8**	**Grade 10.9**
M5	6Nm	9Nm
M6	10Nm	15Nm
M8	25Nm	35Nm
M10	50Nm	75Nm
M12	85Nm	130Nm
M16	215Nm	315Nm

SECTION 4: NATIONAL STANDARDS AND APPLICABLE CODES

4.1 Gas Codes

The type of gas appearing on the nameplate must be the type of gas used. Installation must comply with national and local codes and requirements of the local gas company.

United States: Refer to NFPA 54/ANSI Z223.1 - latest revision, National Fuel Gas Code.

Canada: Refer to CSA B149.1- latest revision, Natural Gas and Propane Installation Code.

4.2 Installation Codes

Installations must be made in accordance with the Standard for the Installation of Air-Conditioning and Ventilating Systems, NFPA 90A - latest revision for the installation of air conditioning and ventilating systems.

4.3 Aircraft Hangars

Installation in aircraft hangars must be in accordance with the following codes:

United States: Refer to Standard for Aircraft Hangars, NFPA 409 - latest revision.

Canada: Refer to Standard CSA B149.1 - latest revision, Natural Gas and Propane Installation Code.

- In aircraft storage and servicing areas, air handlers shall be installed at least 10’ (3 m) above the upper surface of wings or of engine enclosures of the highest aircraft which may be housed in the hangar. The measurement shall be made from the wing or the engine enclosure (whichever is higher from the floor) to the bottom of the air handler.
- In shops, offices and other sections of aircraft hangars communicating with aircraft storage or servicing areas, air handlers shall be installed not less than 8’ (2.4 m) above the floor.
- Suspended or elevated air handlers shall be so located in all spaces of aircraft hangars that they shall not be subject to injury by aircraft, cranes, movable scaffolding or other objects. Provisions shall be made to assure accessibility to suspended air handlers for recurrent maintenance purposes.
- Heating, ventilation, and air conditioning plants employing recirculation of air within aircraft storage and servicing areas shall have return air openings not less than (3m) 10ft above the floor. Supply air openings shall not be installed in the floor and shall be at least (152mm) 6 in. from the floor measured to the bottom of the opening.
- Personnel should be fully instructed that in the event of a serious gasoline or similar flammable liquid spill on the hangar floor, the fans should be shut off.

4.4 Parking Structures and Repair Garages

Installation in garages must be in accordance with the following codes:

United States: Standard for Parking Structures NFPA 88A - latest revision or the Code for Motor Fuel Dispensing Facilities and Repair Garages, NFPA 30A - latest revision.

Canada: Refer to CSA B149.1 - latest revision, Natural Gas and Propane Installation Code.

- Air handlers must not be installed less than 8’ (2.4 m) above the floor. Mininum clearances to combustibles must be maintained from vehicles parked below the air handler.
- When installed over hoists, minimum clearances to combustibles must be maintained from the upper most point of objects on the hoist.

4.5 Electrical

Electrical connection to air handler must be in accordance with the following codes:

United States: Refer to National Electrical Code®, NFPA 70 - latest revision. Wiring must conform to the most current National Electrical Code®, local ordinances, and any special diagrams furnished.

Canada: Refer to Canadian Electrical Code, CSA C22.1 Part 1 - latest revision.

4.6 Venting

The venting must be installed in accordance with the requirements within this manual and the following codes:

United States: Refer to NFPA 54/ANSI Z223.1-latest revision, National Fuel Gas Code.

Canada: Refer to CSA B149.1 - latest revision, Natural Gas and Propane Installation Code.

4.7 High Altitude

These air handlers are approved for installations up to 2000'(609.6 m) (in the US) and 4500'(1371.6 m) (in Canada) without modification. Consult factory if US installation is above 2000’(609.6 m) or Canadian installation is above 4500’(1371.6 m).

SECTION 5: SPECIFICATIONS

Dimension and estimated weight tables apply to both upright and horizontal units of the same model.

Unless otherwise requested, all direct-fired air handlers are set-up to accept an external static pressure (ESP) of 1 in wc (2.5 mbar). If more external static pressure is required, this needs to be requested with the order as required motor horsepower (HP) may increase from the specifications given *on Page 18, Table 8*.

The legend below details abbreviations used in this section and applies to *Page 12, Figure 6 through Page 17, Figure 11*.

Legend	
BD = Bottom Discharge	OA = Outside Air
CE = Control Enclosure	RA = Return Air (optional)
GC = Gas Connection	RD = Right Discharge
ED = End Discharge	TD = Top Discharge
LD = Left Discharge	OH = Opposite Hand

FIGURE 6: DF40 Upright Model Dimensions

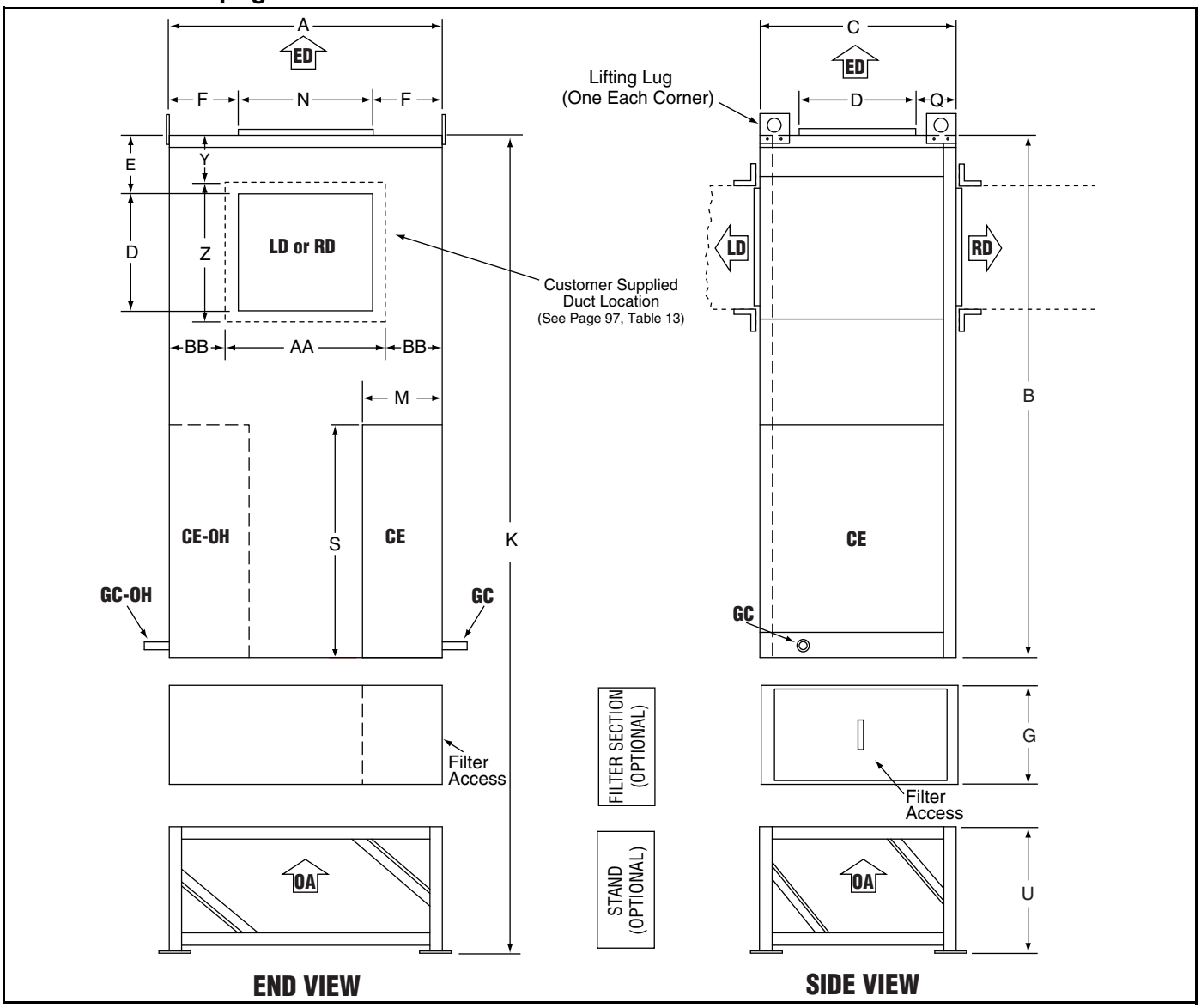


Table 2: DF40 Dimensions

Model		CFM	A	B	C	D	E	F	G	K	L	M	N	P	Q	S	U	W	X	Y	Z	AA	BB
DF40	(in)	1,000-	32.3	60.3	28.3	10.4	6.8	11.5	27.0	117.3	1.5	8.0	9.3	1.8	3.1	35.2	30.0	25.0	38.4	5.3	14	17.5	7.4
	(cm)	3,000	82.0	153.2	71.9	26.4	17.3	29.2	68.6	297.9	3.8	20.3	23.6	4.6	7.9	89.4	76.2	63.5	97.5	13.5	35.6	44.5	18.7
	(in)	4,000	32.3	60.3	28.3	13.8	7.6	8.2	27.0	117.3	1.5	8.0	15.8	1.8	3.1	35.2	30.0	25.0	38.4	7.5	14	17.5	7.4
	(cm)		82.0	153.2	71.9	35.1	19.3	20.8	68.6	297.9	3.8	20.3	40.1	4.6	7.9	89.4	76.2	63.5	97.5	19.0	35.6	44.5	18.7

FIGURE 7: DF40 Horizontal Model Dimensions

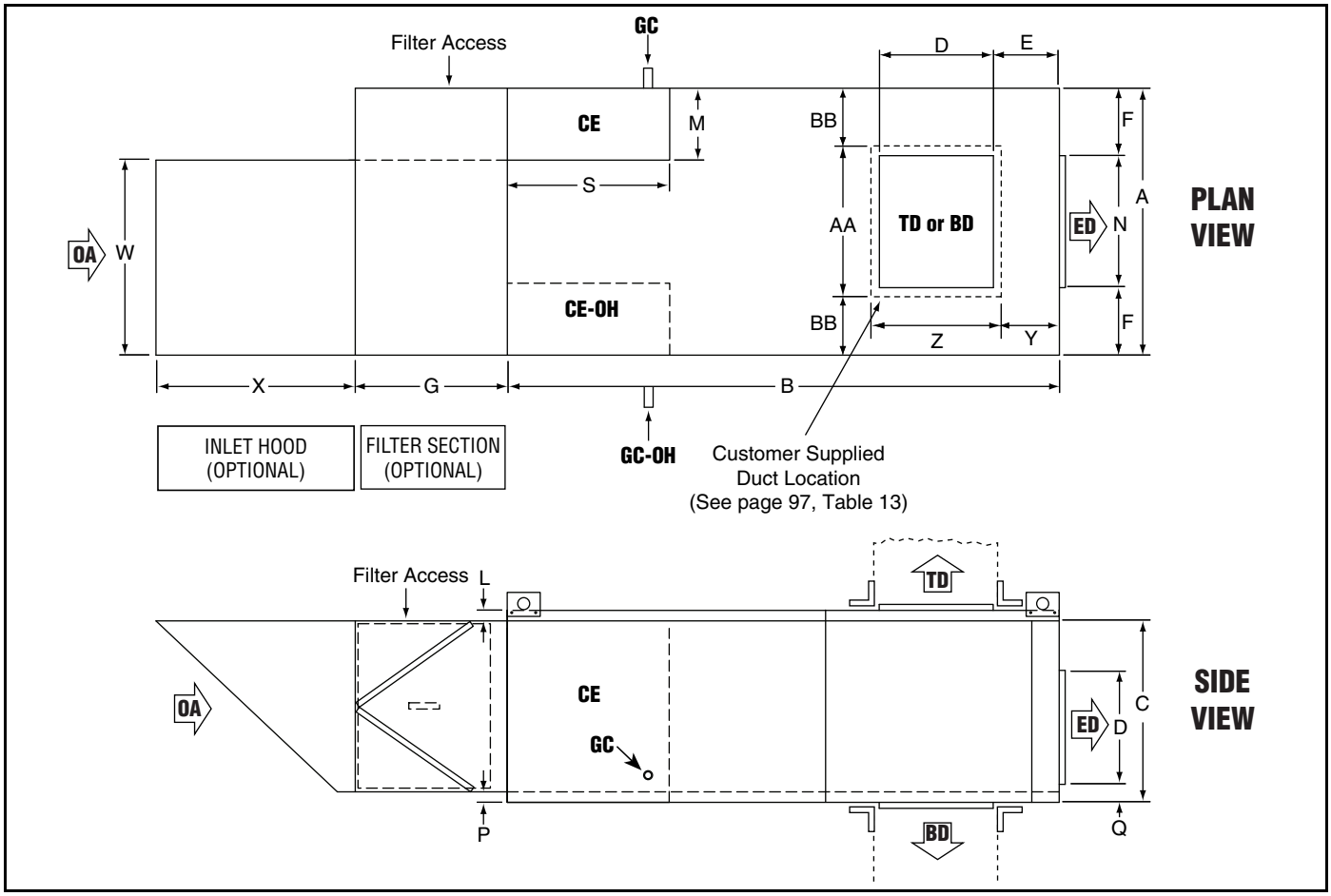


Table 3: DF40 Weights

Model		Air Handler	Stand	Inlet Hood	Splash Plate	Filter Section	Roof Curb	Discharge Head	Dampers	Suspension Kit	Legs (each)	Skid
DF40	(lb)	450	75	60	20	100	75	50	40	13	26	50
	(kg)	204.1	34.0	27.2	9.1	45.4	34	22.7	18.1	5.9	11.8	22.7

FIGURE 8: DF75, DF150, DF270 and DF410 Upright Model Dimensions

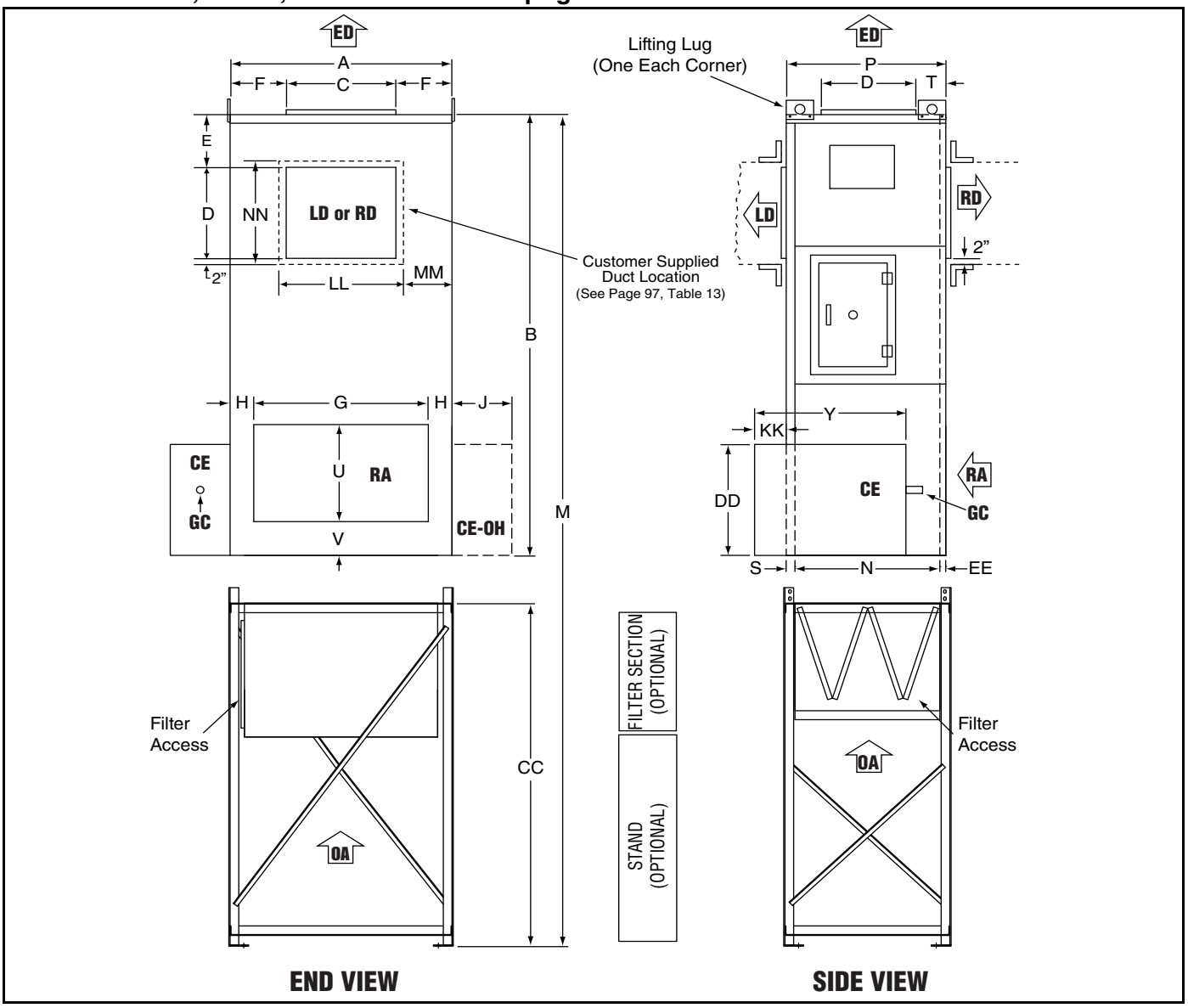


Table 4: DF75, DF150, DF270 and DF410 Dimensions

Model		A	B	C	D	E	F	G	H	J	M	N	P	Q	R
DF75/ DF150	(in)	44.2	92.3	22.0	19.0	10.5	11.1	37.9	3.2	14.0	*	29.6	32.7	48.1	35.1
	(cm)	112.3	234.4	55.9	48.3	26.7	28.2	96.3	8.1	35.6	*	75.2	83.1	122.2	89.2
DF270	(in)	56.0	116.2	31.5	31.5	13.8	12.3	44.3	6.0	17.0	188.2	52.6	56.1	69.6	23.3
	(cm)	142.2	295.1	80.0	80.0	35.0	31.2	112.5	15.2	43.2	477.8	133.6	142.5	176.8	59.2
DF410	(in)	68.0	116.2	36.8	36.8	17.0	15.6	56.3	6.0	17.0	188.2	56.6	60.1	69.6	23.3
	(cm)	172.7	295.1	93.5	93.5	43.2	39.6	143.0	15.2	43.2	477.8	143.8	152.7	176.8	59.2

Model		S	T	U	V	W	Y	Z	AA	BB	CC	DD	EE	FF	GG	HH	KK	LL	MM	NN
DF75/ DF150	(in)	1.6	3.0	10.0	3.4	56.4	37.2	34.0	38.8	28.8	*	28.6	1.5	1.1	41.0	0.5	6.5	25.3	9.5	25.3
	(cm)	4.1	7.6	25.4	8.6	143.2	94.5	86.3	98.6	73.2	*	72.6	3.8	2.8	104.1	1.3	16.5	64.3	24.1	64.3
DF270	(in)	1.5	3.9	26.5	6.0	89.3	44.0	31.0	49.7	52.8	72.0	33.0	2.0	1.1	52.0	0.4	N/A	35.3	10.4	35.3
	(cm)	3.8	9.9	67.3	15.2	226.8	111.8	78.7	126.2	134.1	182.9	83.8	5.1	2.8	132.1	1.0		89.5	26.4	89.5
DF410	(in)	1.5	3.9	30.5	6.0	86.9	44.0	31.0	64.1	56.8	72.0	33.0	2.0	1.1	66.4	0.4	N/A	40.8	13.6	40.8
	(cm)	3.8	9.9	77.5	15.2	220.7	111.8	78.7	162.8	144.3	182.9	83.8	5.1	2.8	168.7	1.0		103.5	34.5	103.5

Model*		M	CC (Stand Height)
DF75/ DF150	(in)	145.3	53.0
	(cm)	369.1	134.6
	(in)	164.3	72.0
	(cm)	417.3	182.9

FIGURE 9: DF75, DF150, DF270 and DF410 Horizontal Model Dimensions

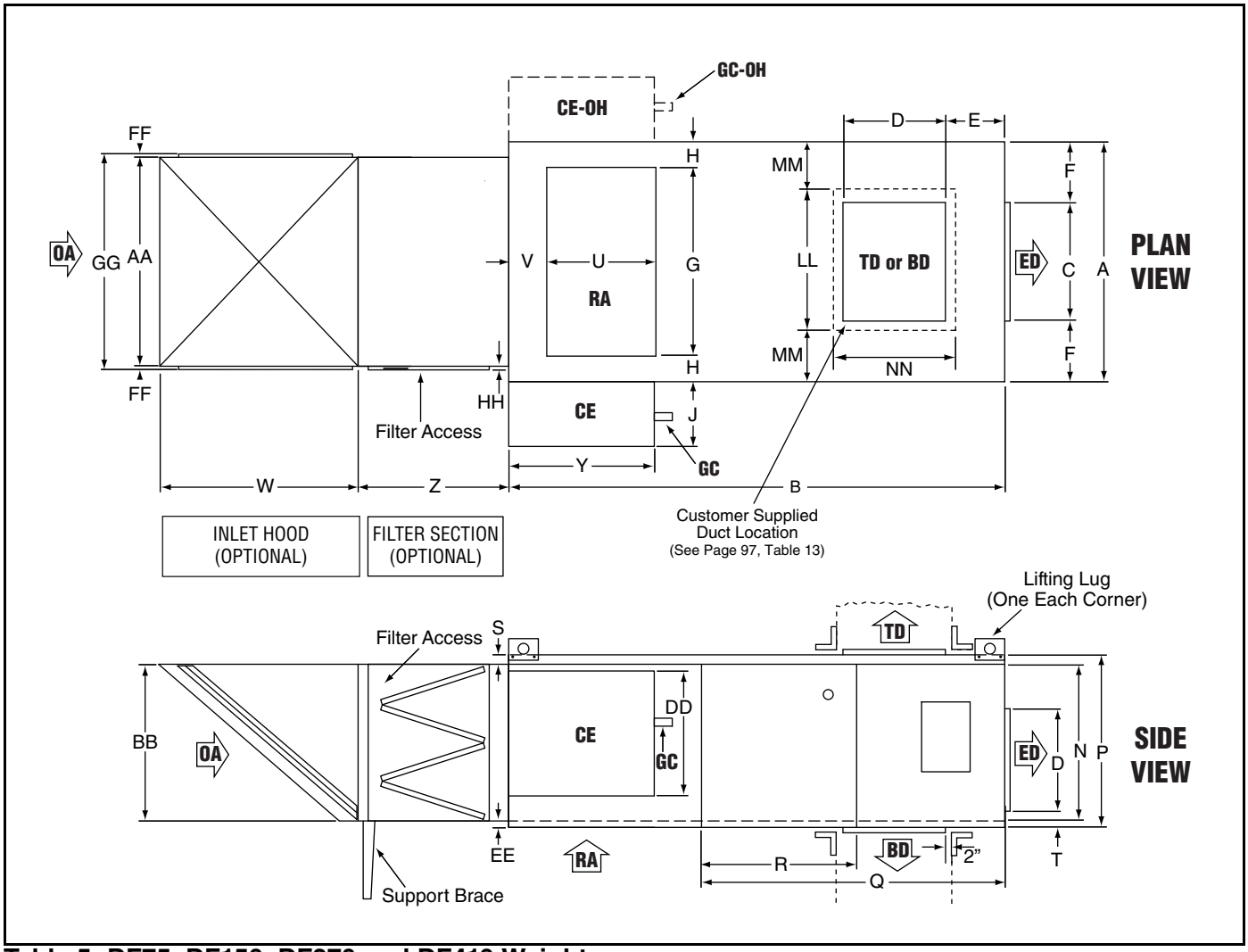


Table 5: DF75, DF150, DF270 and DF410 Weights

Model		Air Handler	Stand	Splash Plate	Filter Section	Inlet Hood		Roof Curb	Discharge Head	Legs (each)	Suspension Kit	Skid
						Filtered	Moisture Limiter					
DF75/ DF150	(lb)	700	*	40	100	110	120	110	80	26	140	140
	(kg)	317.5	*	18.1	45.4	49.9	54.4	49.9	36.3	11.8	63.5	63.5
DF270	(lb)	1400	230	60	220	190	210	150	120	26	N/A	340
	(kg)	638	104.3	27.2	99.8	86.2	95.3	68	54.4	11.8		154.2
DF410	(lb)	1650	300	60	270	240	260	160	160	26	N/A	365
	(kg)	748.4	136.1	27.2	122.5	108.9	117.9	72.6	72.6	11.8		165.6

Model		Dampers		
		Discharge	Inlet	
			Upper	Lower
DF270	(lb)	100	34	41
	(kg)	45.4	15.4	18.6
DF410	(lb)	150	46	61
	(kg)	68	20.9	27.7

Model		Stand*		Dampers
		53"	72"	
DF75/ DF150	(lb)	160	190	60
	(kg)	72.6	86.2	27.2

Note:

Inlet variation of screen mesh without filters has equal weight as inlet hood with filters.
Inlet dampers for MUA style use both the upper and lower dampers for DF270 and DF410.
Inlet dampers for FR, AM and VAV styles only use the upper damper for DF270 and DF410.
Model DF75 / DF150 damper weights apply to both discharge and inlet.

FIGURE 10: DF700A and DF700B Upright Model Dimensions

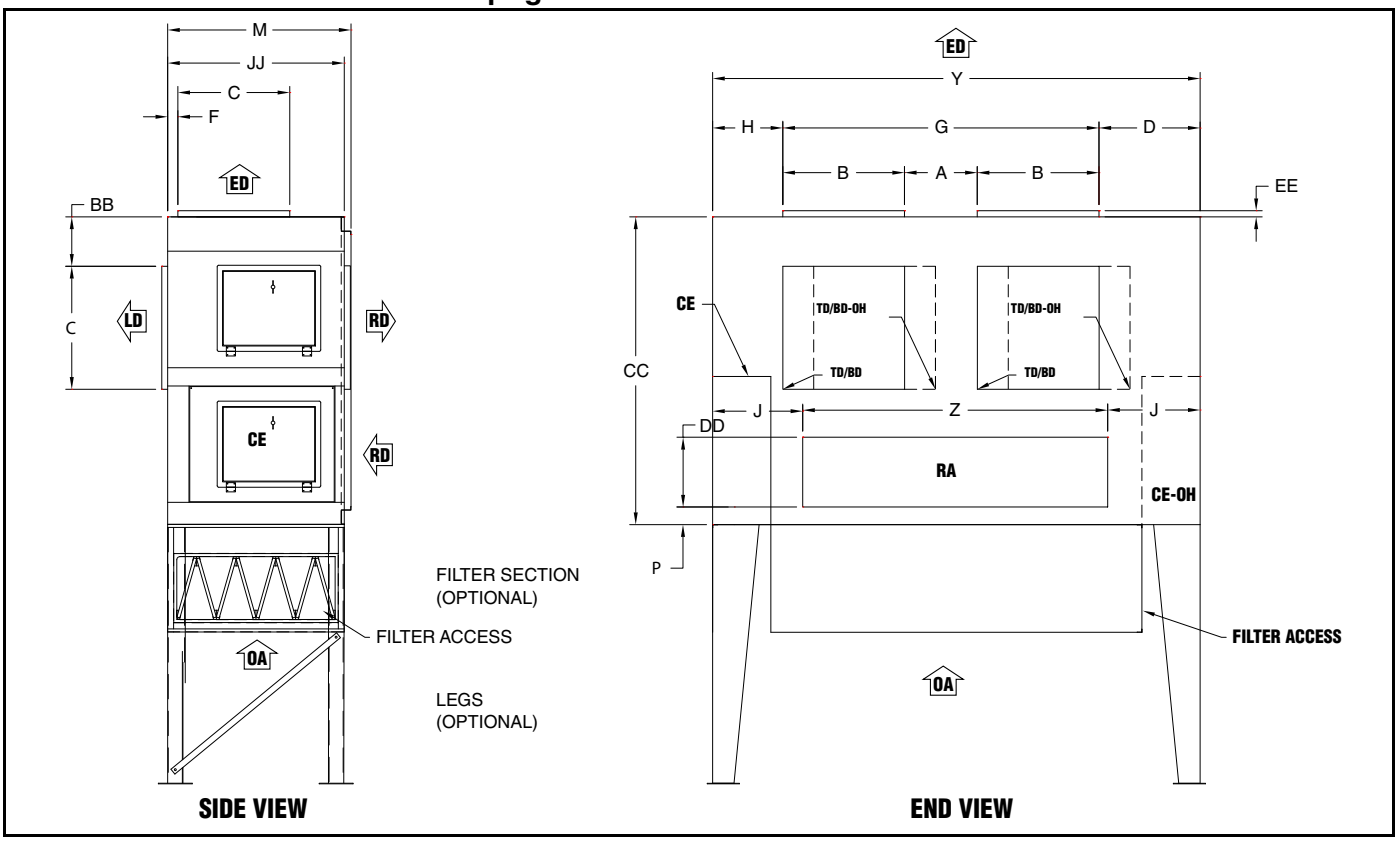


Table 6: DF700A and DF700B Dimensions

Model		A	C	D	F	G	H	J	M	P	V	W	X	Y	Z	BB	CC	DD	JJ
DF700A	(in)	31.8	31.8	37.5	14.5	88.0	34.5	20.3	60.25	9.8	86.0	137.5	35.0	160.0	119.5	15.5	100.1	24.9	58.0
	(cm)	80.8	80.8	95.3	36.8	223.5	87.6	51.6	153.0	24.9	218.4	349.3	88.9	406.4	303.5	39.4	254.3	63.2	147.3
DF700B	(in)	37.3	37.3	37.5	17.8	104.0	18.5	20.3	60.25	9.8	86.0	137.5	35.0	160.0	119.5	18.8	100.1	24.9	58.0
	(cm)	94.8	94.8	95.3	45.2	264.2	47.0	51.6	153.0	24.9	218.4	349.3	88.9	406.4	303.5	47.8	254.3	63.2	147.3

FIGURE 11: DF700A and DF700B Horizontal Model Dimensions

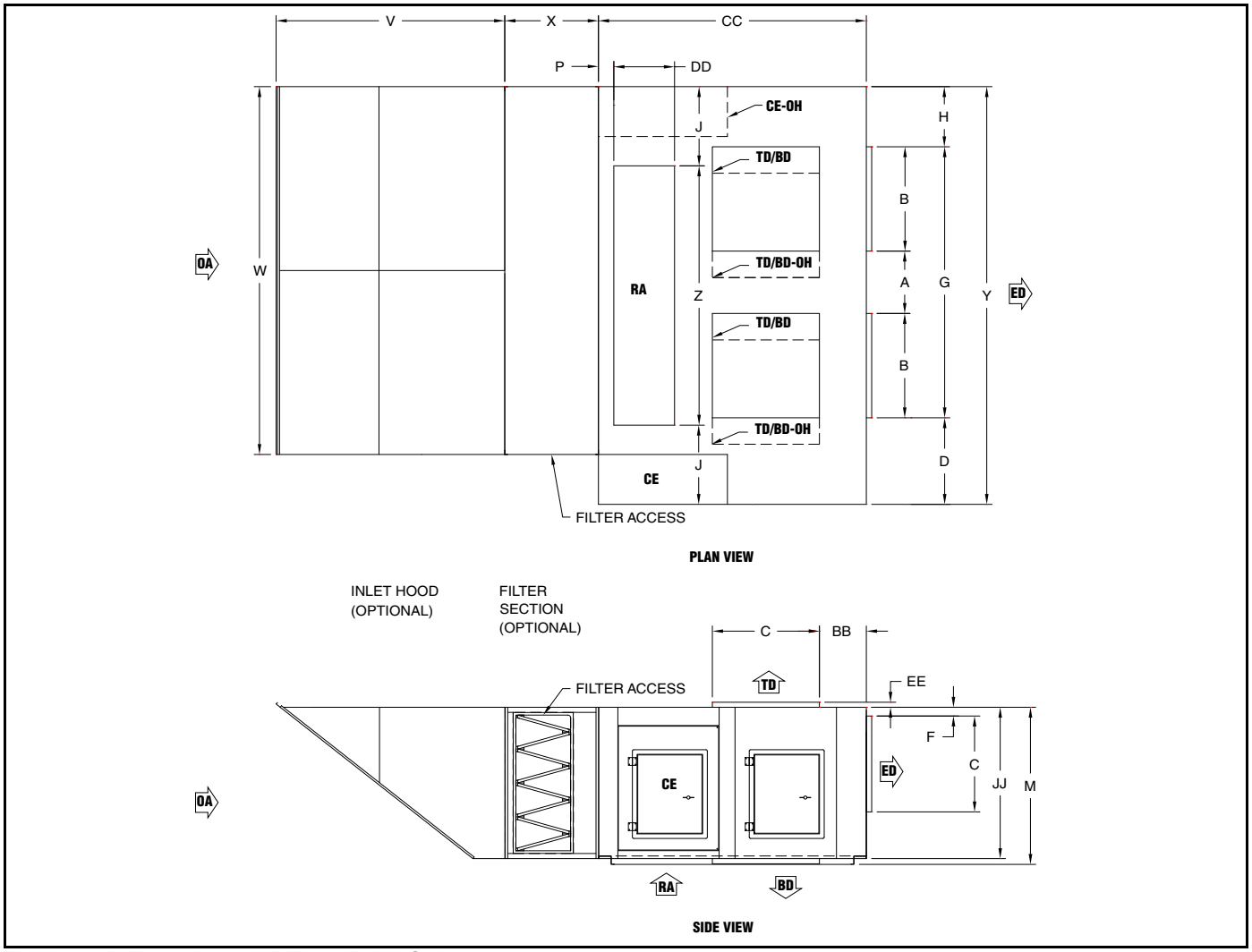


Table 7: DF700A and DF700B Weights

Model		Air Handler	Service Platform	Splash Plate	Filter Section		Inlet Hood			One Way Discharge Head	Roof Curb
					Upright	Horizontal	Filtered	Moisture Limiter	Screen Mesh		
DF700A	(lb)	3,350	325	170	550	580	600	710	480	215	267
	(kg)	1,520.0	147.4	77.1	249.5	263.1	272.2	322.0	217.7	97.5	121.1
DF700B	(lb)	3,800	325	170	550	580	600	710	480	355	267
	(kg)	1,723.7	147.4	77.1	249.5	263.1	272.2	322.0	217.7	161	121.1

Leg Weight	Leg Height													
	in	cm	in	cm	in	cm	in	cm	in	cm	in	cm	in	cm
	24.0	61.0	36.0	91.4	48.0	121.9	60.0	152.4	72.0	182.9	84.0	213.4	96.0	243.8
lbs	26.3		35.0		43.8		53.8		62.5		71.3		81.3	
kg	11.9		15.9		19.9		24.4		28.4		32.4		36.9	

Note: Leg weights are the same for DF700A and DF700B. Leg weights are per each leg.

Table 8: DF-Series Selection Guide

Airflow CFM ($m^3/_h$)	Model	Motor HP at Noted External Static Pressure (in wc)					dBA at Noted External Static Pressure (in wc)			Heat Input @ Max. Temperature Rise (Btu/h) x 1000		Minimum Inlet Gas Pressure in wc (mbar)***	Manifold Size in NPT (mm)
		0	0.25	0.50	0.75	1.00	0	0.50	1.00	NG	LPG		
1,000 (1,700)	DF40	2	2	2	2	2	62	66	70	97	76	7 (17.5)	0.75 (19)
2,000 (3,400)	DF40	2	2	2	2	2	60	66	70	194	151	7 (17.5)	0.75 (19)
3,000 (5,100)	DF40	3	3	3	3	3	60	65	70	292	227	7 (17.5)	0.75 (19)
4,000 (6,800)	DF40	3	3	3	3	3	62	65	70	389*	302	7 (17.5)	0.75 (19)
4,000 (6,800)	DF75	3	3	3	3	3	59	65	69	432	346	7 (17.5)	1.0 (25)
5,000 (8,500)	DF75	3	3	3	3	3	58	63	68	540	432	7 (17.5)	1.0 (25)
6,000 (10,200)	DF75	5	5	5	5	5	58	62	67	648	518	7 (17.5)	1.0 (25)
7,000 (11,400)	DF75	5	5	5	5	5	59	62	66	756*	605	7 (17.5)	1.0 (25)
8,000 (13,600)	DF75	5	5	5	5	5	60	63	66	800*	691	7 (17.5)	1.0 (25)
9,000 (15,300)	DF75	7.5	7.5	7.5	7.5	7.5	61	64	67	800*	778	7 (17.5)	1.0 (25)
10,000 (17,000)	DF75	7.5	7.5	7.5	7.5	7.5	62	65	68	800*	800	7 (17.5)	1.0 (25)
7,000 (11,900)	DF150	5	5	5	5	5	59	62	66	756	605	7 (17.5)	1.25 (32)
8,000 (13,600)	DF150	5	5	5	5	5	60	63	66	864	691	7 (17.5)	1.25 (32)
9,000 (15,300)	DF150	7.5	7.5	7.5	7.5	7.5	61	64	67	972	778	7 (17.5)	1.25 (32)
10,000 (17,000)	DF150	7.5	7.5	7.5	7.5	7.5	62	65	68	1,080	864	7 (17.5)	1.25 (32)
11,000 (18,700)	DF150	10	10	10	10	10	64	66	68	1,188	950	7 (17.5)	1.25 (32)
12,000 (20,400)	DF150	10	10	10	10	10	66	68	69	1,296	1,037	7 (17.5)	1.25 (32)
13,000 (22,100)	DF150	10	10	10	10	15	67	69	CF	1,404	1,123	7 (17.5)	1.25 (32)
14,000 (23,800)	DF150	10	10	15	15	15	69	CF	CF	1,512	1,210	7 (17.5)	1.25 (32)
12,000 (20,400)	DF270	7.5	7.5	7.5	7.5	7.5	66	70	73	1,296	1,037	9 (22.5)	1.5 (38)
14,000 (23,800)	DF270	10	10	10	10	10	69	70	73	1,512	1,210	9 (22.5)	1.5 (38)
16,000 (27,200)	DF270	10	10	10	10	10	70	72	76	1,728	1,382	9 (22.5)	1.5 (38)
18,000 (30,600)	DF270	15	15	15	15	15	70	74	77	1,944	1,555	9 (22.5)	1.5 (38)
20,000 (34,000)	DF270	15	15	15	15	15	70	74	77	2,160	1,728	9 (22.5)	1.5 (38)
22,000 (37,400)	DF270	20	20	20	20	20	71	74	77	2,376	1,901	9 (22.5)	1.5 (38)
25,000 (42,500)	DF270	20	20	20	20	20	72	75	77	2,700	2,160	9 (22.5)	1.5 (38)
25,000 (42,500)	DF410	15	15	15	15	15	70	72	74	2,700	2,160	11 (27.5)	2.0 (51)
27,500 (46,700)	DF410	15	15	15	15	15	71	73	75	2,970	2,376	11 (27.5)	2.0 (51)
30,000 (51,000)	DF410	20	20	20	25	25	73	75	76	3,240	2,592	11 (27.5)	2.0 (51)
32,500 (55,200)	DF410	20	20	20	20	25	75	76	77	3,510	2,808	11 (27.5)	2.0 (51)
35,000 (59,500)	DF410	20	25	25	25	25	77	77	79	3,780	3,024	11 (27.5)	2.0 (51)
37,500 (63,700)	DF410	25	25	30	30	30	78	79	79	4,050*	3,240	11 (27.5)	2.0 (51)
40,000 (68,000)	DF410	30	30	30	30	30	80	CF	CF	4,320*	3,456	11 (27.5)	2.0 (51)
35,000 (59,500)	DF700A	15	20	20	25	25	68	73	77	3,780	N/A	Consult Factory	1.5 - 3.0 (38 - 76)
37,500 (63,700)	DF700A	20	20	25	25	30	69	73	77	4,050			1.5 - 3.0 (38 - 76)
40,000 (68,000)	DF700A	20	25	25	30	30	70	73	77	4,320			1.5 - 3.0 (38 - 76)
42,500 (72,200)	DF700A	25	25	30	30	40	71	74	77	4,590			1.5 - 3.0 (38 - 76)
45,000 (76,500)	DF700A	30	30	30	40	40	72	74	77	4,860			1.5 - 3.0 (38 - 76)
47,500 (80,700)	DF700A	30	40	40	40	40	73	75	78	5,130			1.5 - 3.0 (38 - 76)
45,000 (76,500)	DF700B	20	20	25	25	30	72	74	77	4,860	N/A		1.5 - 3.0 (38 - 76)
47,500 (80,700)	DF700B	20	25	25	30	30	73	75	77	5,130			1.5 - 3.0 (38 - 76)
50,000 (85,000)	DF700B	25	30	30	40	40	74	75	77	5,400			1.5 - 3.0 (38 - 76)
52,500 (89,200)	DF700B	25	30	30	40	40	74	76	78	5,670			1.5 - 3.0 (38 - 76)
55,000 (93,400)	DF700B	25	30	40	40	40	75	77	78	5,940			1.5 - 3.0 (38 - 76)
57,500 (97,700)	DF700B	30	40	40	40	40	76	78	79	6,210			1.5 - 3.0 (38 - 76)
60,000 (101,900)	DF700B	30	40	40	40	50	77	78	80	6,480			1.5 - 3.0 (38 - 76)

**Temperature rise at this CFM is less than the maximum temperature rise.*

***dBA is measured at 10'(3m) from unducted discharge.*

****Maximum Inlet Gas Pressure:ANSI - Compliant Manifold (DF40 - DF410) = 14 in wc (34.9 mbar)*

ANSI- Compliant Manifold (DF700A and DF700B) = 5 psi (344.7 mbar)

FM and XL Insurance (formerly-IRI) - Compliant Manifold (All Models) = 5 psi (344.7 mbar)

Table 9: Estimated Pressure Drop of Accessory Components

Model	Airflow Range CFM ($m^3/_h$)	Inlet Hood with Filters		Filter Section		Inlet Hood with Moisture Limiters		Inlet Hood with Bird Screen	
		in wc	mbar	in wc	mbar	in wc	mbar	in wc	mbar
DF40	1,000-2,000 (1,700-3,400)	0.25	0.62	0.25	0.62	-	-	0.05	0.12
	3,000-4,000 (5,100-6,800)	0.40	1.0	0.50	1.25	-	-	0.05	0.12
DF75	4,000-6,000 (6,800-10,200)	0.25	0.62	0.25	0.62	0.10	0.25	0.05	0.12
	7,000-10,000 (11,400-17,000)	0.40	1.0	0.50	1.25	0.10	0.25	0.05	0.12
DF150	7,000-10,000 (11,400-17,000)	0.25	0.62	0.25	0.62	0.10	0.25	0.05	0.12
	11,000-14,000 (18,700-23,800)	0.40	1.0	0.50	1.25	0.10	0.25	0.05	0.12
DF270	12,000-16,000 (20,400-27,200)	0.25	0.62	0.25	0.62	0.10	0.25	0.05	0.12
	18,000-25,000(30,600-42,500)	0.40	1.0	0.50	1.25	0.10	0.25	0.05	0.12
DF410	25,000-30,000 (42,500-51,000)	0.35	0.87	0.75	1.87	0.10	0.25	0.05	0.12
	32,500-40,000 (55,200-68,000)	0.40	1.0	0.85	2.12	0.10	0.25	0.05	0.12
DF700A	35,000-40,000 (59,500-68,000)	0.25	0.62	0.25	0.62	0.04	0.10	0.05	0.12
	42,500-47,500 (72,200-80,700)	0.40	1.0	0.50	1.25	0.04	0.10	0.05	0.12
DF700B	45,000-50,000 (76,500-85,000)	0.25	0.62	0.25	0.62	0.04	0.10	0.05	0.12
	52,500-60,000 (89,200-101,900)	0.40	1.0	0.50	1.25	0.04	0.10	0.05	0.12

Model	Airflow Range CFM ($m^3/_h$)	Discharge Heads		Splash Plate		Inlet/Discharge Damper	
		in wc	mbar	in wc	mbar	in wc	mbar
DF40	1,000-2,000 (1,700-3,400)	0.10	0.25	0.05	0.12	0.10	0.25
	3,000-4,000 (5,100-6,800)	0.10	0.25	0.05	0.12	0.10	0.25
DF75	4,000-6,000 (6,800-10,200)	0.10	0.25	0.05	0.12	0.10	0.25
	7,000-10,000 (11,400-17,000)	0.10	0.25	0.05	0.12	0.10	0.25
DF150	7,000-10,000 (11,400-17,000)	0.10	0.25	0.05	0.12	0.10	0.25
	11,000-14,000 (18,700-23,800)	0.10	0.25	0.05	0.12	0.10	0.25
DF270	12,000-16,000 (20,400-27,200)	0.10	0.25	0.05	0.12	0.10	0.25
	18,000-25,000(30,600-42,500)	0.10	0.25	0.05	0.12	0.10	0.25
DF410	25,000-30,000 (42,500-51,000)	0.10	0.25	0.05	0.12	0.10	0.25
	32,500-40,000 (55,200-68,000)	0.10	0.25	0.05	0.12	0.10	0.25
DF700A	35,000-40,000 (59,500-68,000)	0.10	0.25	0.05	0.12	0.10	0.25
	42,500-47,500 (72,200-80,700)	0.10	0.25	0.05	0.12	0.10	0.25
DF700B	45,000-50,000 (76,500-85,000)	0.10	0.25	0.05	0.12	0.10	0.25
	52,500-60,000 (89,200-101,900)	0.10	0.25	0.05	0.12	0.10	0.25

SECTION 6: LIFTING AN AIR HANDLER

⚠ WARNING

Crush Hazard

Use proper lifting equipment and practices.

Failure to follow these instructions can result in death, injury or property damage.

The air handler must be installed in compliance with all applicable codes. The qualified installer or service technician must use best building practices when installing the air handler and any optional equipment. This appliance requires at least 4 CFM (6.8 m^3/h) of outside air per 1,000 Btu/h (0.293 kW). Any air handler that recirculates air from the heated space must use the return air opening to prevent any return air from passing over the burner.

Before installation, check that the local distribution condition, nature of gas and gas pressure, and the current state of adjustment of the appliance are compatible. If filters are not installed (via inlet hood or filter section), an air strainer must be installed on the inlet of the air handler with openings less than or equal to 5/8" (16 mm) in diameter. Air inlets must be installed in such a manner that their lowest edge is 19" (500 mm) above any surface. This applies to roof curbs, upright stands and suspended air handlers.

6.1 Lifting an Air Handler

6.1.1 Preparing to Lift the Air Handler

Prior to lifting the air handler, the following steps must be performed:

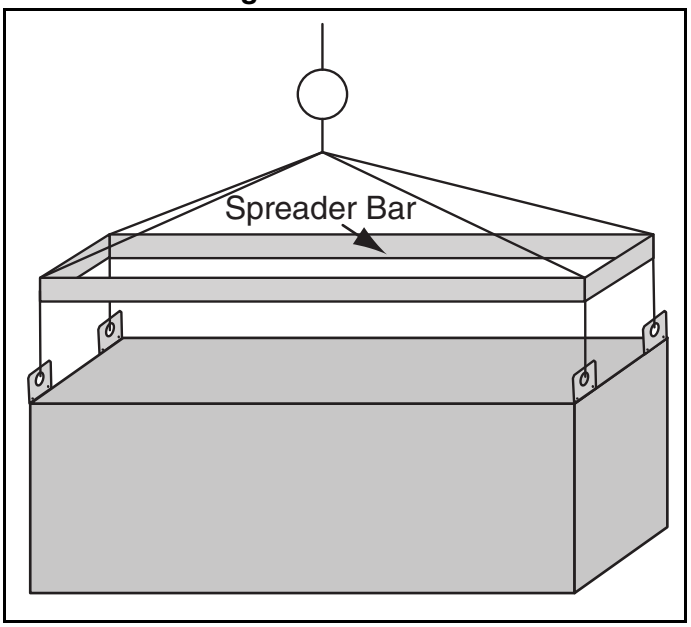
1. Remove all packaging or banding that attached the air handler to the skid and ensure that the air handler is no longer bound to the skid.
2. Remove all of the accessories or packages that were shipped on the same skid, inside the air handler or inside the control enclosure.
3. Inspect the air handler to:
   - Verify that there is no damage as a result of shipping.
   - Ensure that it is appropriately rated for the utilities available at the installation site.
   - Verify that the lifting lugs are intact, undamaged and secured to the air handler.
   - Ensure factory-installed hardware is torqued as specified.
4. Prepare the installation location to be ready to accept the air handler (i.e. roof curb, mounting stand or legs).
5. Verify the lifting equipment can handle the air handlers weight and the required reach. *See Page 20, Figure 12*. For air handlers weight, *see Page 13, Table 3* for model DF40. *See Page 15, Table 5* for models DF75-DF410. *See Page 17, Table 7* for models DF700A and DF700B.

6.1.2 Lifting a Horizontal Air Handler (All Models)

Lift the air handler into place using all four lifting lugs on the unit base. Use spreader bars to ensure that the lifting cables clear the sides of the air handler. *See Page 3, Figure 2*. The air handler must be kept level during the lift to prevent tipping, twisting or falling. If lifted improperly, product damage may occur.

Next, refer to the applicable portions of *Page 23, Section 7* through *Page 32, Section 10* for specific mounting instructions. For mounting of accessories, refer to the applicable portions of *Page 35, Section 11 through Page 93, Section 15*.

FIGURE 12: Lifting a Horizontal Air Handler



6.1.3 Lifting an Upright Air Handler (DF40-DF410)

All air handlers are shipped in the horizontal position.

Prior to lifting an upright air handler, the following steps must be performed (*See Page 21, Figure 13*):

Step 1: The air handler must be lifted using the two lifting lugs on the top of the discharge end and the two lifting lugs on the inlet end, using a spreader bar across the long axis. Lift the air handler off the skid and place it on a flat, clean, dry surface.

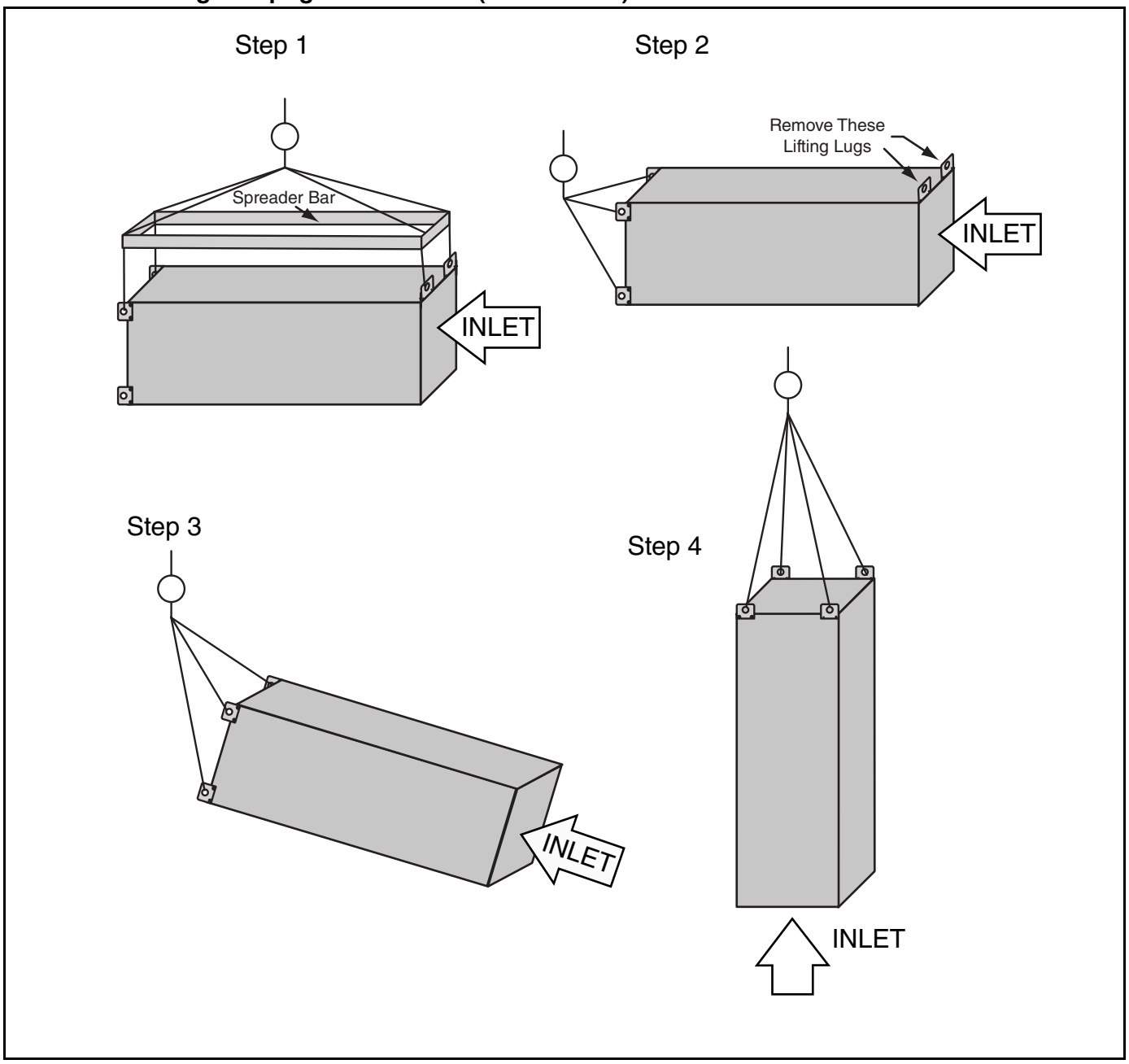
Step 2: Remove the lifting lugs on the inlet end of the air handler and re-install hardware.

Step 3: Use all four lifting lugs on the discharge end of the air handler to enable the air handler to be lifted into the upright position.

Step 4: Lift the air handler into upright position.

Step 5: Next, refer to the applicable portions of *Page 26, Section 8 through Page 28, Section 9* for specific mounting instructions.

FIGURE 13: Lifting an Upright Air Handler (DF40-DF410)

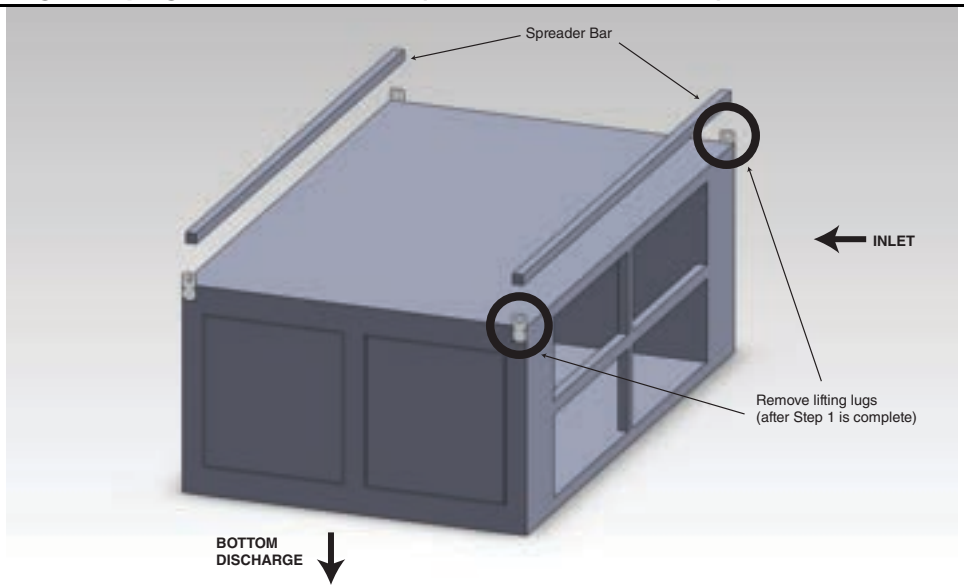


6.1.4 Lifting an Upright Air Handler (DF700A and DF700B)

All air handlers are shipped in the horizontal position. Prior to lifting an upright air handler, the following steps must be performed.

Step 1: The air handler must be lifted using the two lifting lugs at the discharge end and the two lifting lugs at the inlet end, using two spreader bars across the long axis. Lift the air handler off the skid and place it on a flat, clean, dry surface. *See Page 22, Figure 14*.

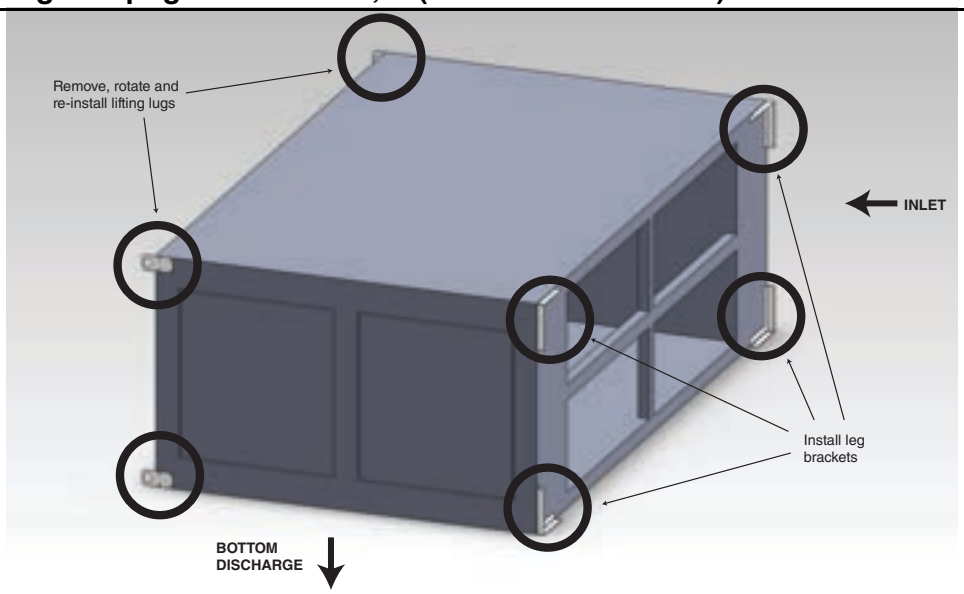
FIGURE 14: Lifting an Upright Air Handler, A (DF700A and DF700B)



Step 2: Remove the lifting lugs on the inlet end of the air handler and re-install the hardware. *See Page 22, Figure 14*.

Step 3: Remove the hardware from the bottom corner of the discharge end and re-install with lifting lugs that were removed in Step 2. The lifting lugs on the discharge end top must be removed, rotated 90 degrees counter clockwise, and re-installed. *See Page 22, Figure 15*.

FIGURE 15: Lifting an Upright Air Handler, B (DF700A and DF700B)



Step 4: Remove the leg bracket mounting hardware from the corners of the inlet side. Insert the leg brackets and re-install the hardware. *See Page 22, Figure 15*.

Step 5: Use the spreader bars and the four lifting lugs on the discharge end of the air handler to lift the air handler into the upright position.

Step 6: Lift the air handler onto the legs. *See Page 28, Section 9*.

SECTION 7: ROOF CURB

⚠ WARNING			
			
Crush Hazard **Use proper lifting equipment and practices.**	**Falling Hazard** **Use proper safety equipment and practices to avoid falling.**	**Severe Injury Hazard** **Use proper lifting practices and equipment.** **Equipment and accessories are heavy.**	**Cut/Pinch Hazard** **Wear protective gear during installation, operation and service.** **Edges are sharp.**
Failure to follow these instructions can result in death, injury or property damage.			

The roof curbs only support the burner and blower sections of the air handler. Roof curbs are shipped unassembled and require field assembly.

NOTE: Before installation, verify that you have the correct roof curb and that all required components are present. If any are missing, contact your ROBERTS GORDON® independent distributor.

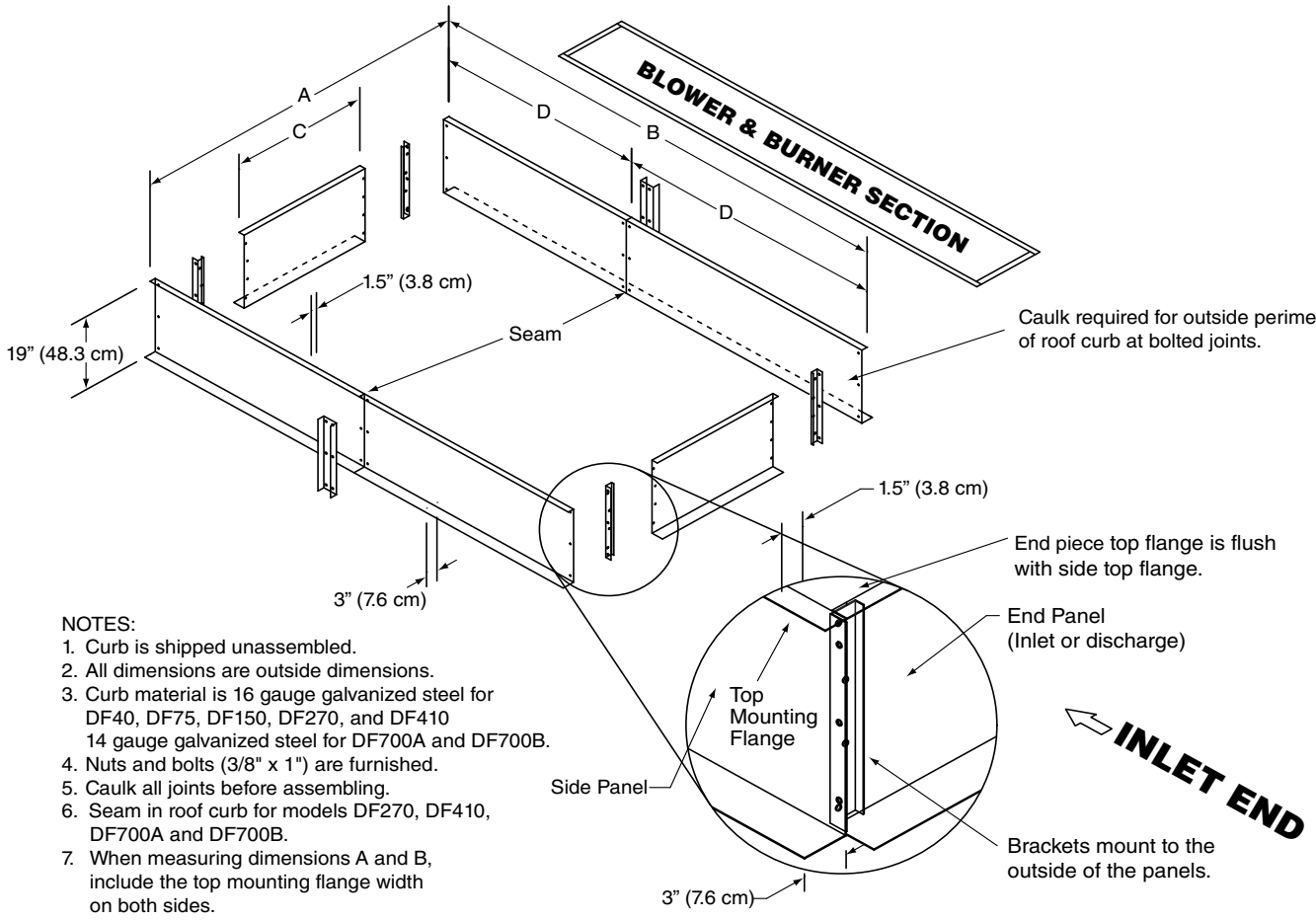
7.1 Roof Curb Assembly and Installation

Assemble roof curb according to the assembly drawing, on *Page 24*, *Figure 16*. Supplied hardware must be torqued to recommended specifications on *Page 9, Table 1*.

Place the curb on the roof in the position in which it will be installed. Check that the diagonal measurements are within 1/8"(3 mm) of each other. To ensure a weatherproof seal between the air handler and the curb, the curb must be level with no twist from end to end. Shim level as required and secure curb to roof deck using best building practices. The curb is self-flashing. Install roofing material as required.

NOTE: Check the installation location to ensure proper clearances to combustibles and clearance for access. *See Page 8, Section 3.1*.

FIGURE 16: Roof Curb Assembly



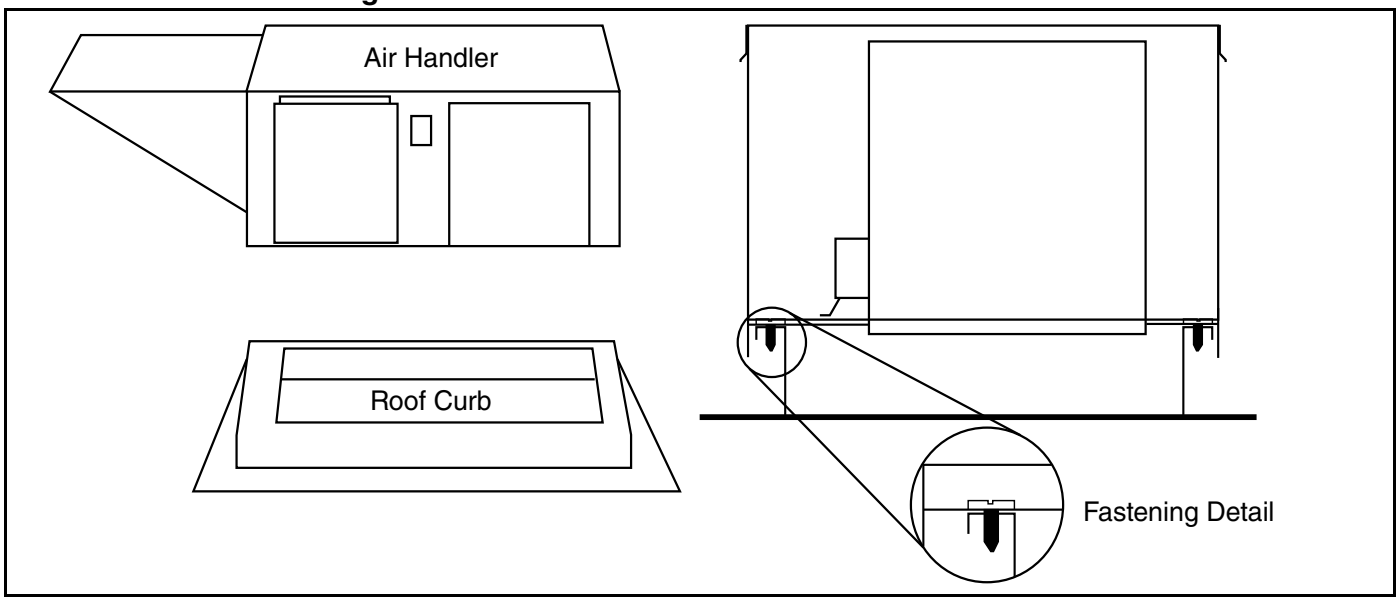
NOTES:
1. Curb is shipped unassembled.
2. All dimensions are outside dimensions.
3. Curb material is 16 gauge galvanized steel for DF40, DF75, DF150, DF270, and DF410
   14 gauge galvanized steel for DF700A and DF700B.
4. Nuts and bolts (3/8" x 1") are furnished.
5. Caulk all joints before assembling.
6. Seam in roof curb for models DF270, DF410, DF700A and DF700B.
7. When measuring dimensions A and B, include the top mounting flange width on both sides.

Model		Part Number	A	B	C	D	Weight (lbs)	Weight (kg)
DF40	**(in)** **(cm)**	77351.201	27.0 68.6	57.5 146.1	28.8 73.2	-	75	34
DF75 and DF150	**(in)** **(cm)**	77050.301	42.0 106.7	88.0 223.5	38.8 98.6	-	110	49.9
DF270	**(in)** **(cm)**	77250.301	53.0 134.6	113.0 287.0	49.8 126.5	56.5 143.5	150	68.0
DF410	**(in)** **(cm)**	77532	65.0 165.1	113.0 287.0	61.8 157.0	56.5 143.5	160	72.6
DF700A/ DF700B	**(in)** **(cm)**	80307	98.0 248.9	157.7 400.7	94.8 240.8	78.8 200.3	267	121.1

7.2 Air Handler Mounting to Roof Curb

After the curb has been installed, the air handler may be placed on the curb. *See Page 25, Figure 17*. After the air handler is in place, the installer must fasten the air handler to the curb. This is accomplished by drilling holes down through the floor of the air handler and into the curb. At least three #12 sheet metal screws (supplied by others) equally spaced on each side must be used to attach the air handler to the curb.

FIGURE 17: Curb Mounting



SECTION 8: UPRIGHT STAND MOUNTING (DF40-DF410)

⚠ WARNING			
			
Crush Hazard	**Falling Hazard**	**Severe Injury Hazard**	**Cut/Pinch Hazard**
Use proper lifting equipment and practices.	**Use proper safety equipment and practices to avoid falling.**	**Use proper lifting practices and equipment.** **Equipment and accessories are heavy.**	**Wear protective gear during installation, operation and service.** **Edges are sharp.**
Failure to follow these instructions can result in death, injury or property damage.			

A stand can be used when an upright air handler is to be installed on a concrete slab or on the floor. The stand for model DF40 is 30" (76.2 cm) tall; stands for models DF75 and DF150 are available at 53" (134.6 cm) or 72" (182.9 cm) tall; stands for models DF270 and DF410 are 72"(182.9 cm) tall. (Stands are not available for models DF700A and DF700B.) The stand must first be fastened to the concrete slab or floor before the air handler is mounted.

8.1 Upright Stand Installation

To attach the stand to a concrete slab, it must be secured with the use of studs, embedded in the concrete. Four 5/8" studs (minimum) must be installed in the slab, one for each corner of the stand. The stand has four 11/16" (17.4mm) holes drilled through the stand pads. *See Page 27, Figure 20*. Fasten the stand to the slab with four 5/8" hex nuts and lock washers (provided by others).

8.2 Attaching Air Handler to Stand

Once the stand is secured to a concrete slab, the air handler may be placed on the stand. Prior to lifting the air handler, apply the foam tape and remove the attaching hardware as described below. The ½" (12.7 mm) thick foam tape (provided by others) must be applied on the stand or filter section. The bolts on the air handler that correspond to the attaching location of the mounting stand must be removed and saved for re-installation to secure the air handler to the stand. Lift the air handler on to the mounting stand. *See Page 20, Section 6.1* for safe lifting practices. Once the air handler is placed on the stand, secure it with the attaching hardware that was removed prior to lifting it in to place. *See Page 26, Figure 18* (DF40) and *Page 26, Figure 19* (DF75-DF410).

NOTE: If using a filter section with an upright air handler and stand, the filter section must be set into the stand before the air handler is mounted on the stand. *See Page 51, Section 11.7*.

FIGURE 18: Upright Stand Detail (DF40)

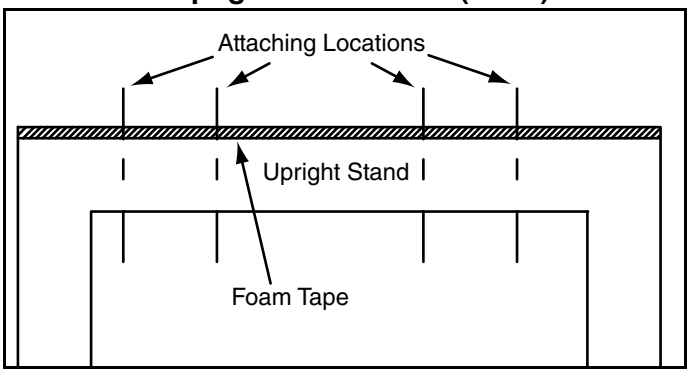


FIGURE 19: Upright Stand Detail (DF75-DF410)

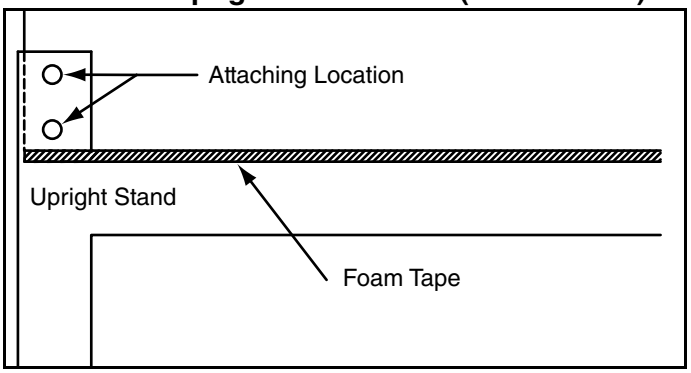
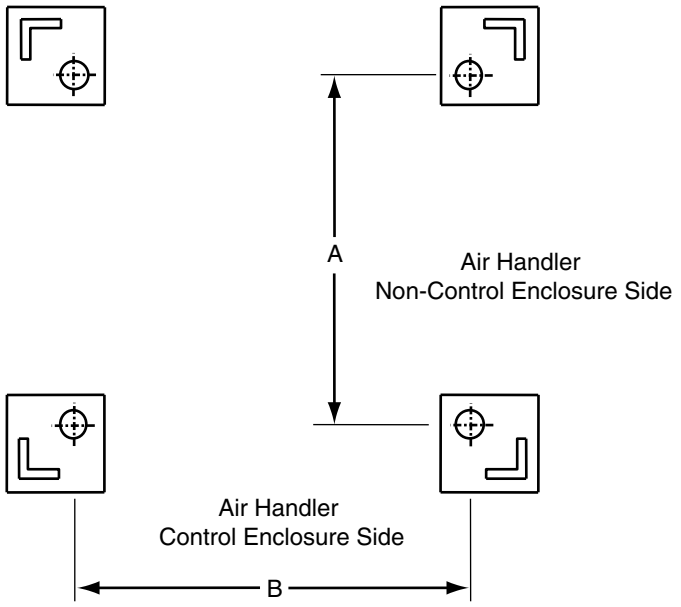


FIGURE 20: Upright Stand Mounting Detail



Model		Part Number	Height	A	B	Weight (lbs)	Weight (kg)
DF40	**(in)**	94000.3	30.0	27.1	22.8	75.0	34.0
	(cm)		76.2	68.9	57.8		
DF75 and DF150	**(in)**	91000.2	53.0	27.8	39.3	160.0	72.6
	(cm)		134.6	70.5	99.7		
	(in)	94000.7	72.0	27.8	39.3	190.0	86.2
	(cm)		182.9	70.5	99.7		
DF270	**(in)**	92000.3	72.0	51.1	51.5	230.0	104.3
	(cm)		182.9	129.8	130.8		
DF410	**(in)**	93000.3	72.0	63.5	55.8	300.0	136.1
	(cm)		182.9	161.3	141.6		

SECTION 9: LEG MOUNTING

⚠ WARNING			
			
Crush Hazard **Use proper lifting equipment and practices.**	**Falling Hazard** **Use proper safety equipment and practices to avoid falling.**	**Severe Injury Hazard** **Use proper lifting practices and equipment.** **Equipment and accessories are heavy.**	**Cut/Pinch Hazard** **Wear protective gear during installation, operation and service.** **Edges are sharp.**
Failure to follow these instructions can result in death, injury or property damage.			

Part numbers that end with a “[W]” indicate that the part can be ordered with either an unpainted galvanized finish or a white paint finish. To order with a galvanized finish, do not include the "W" at the end of the part number; to order with a white paint finish, include the "W" at the end of the part number.

9.1 Leg Mounting

Legs can be used when mounting an air handler on a concrete slab or directly on the floor. Leg mounting is available for all models in the horizontal configuration and also for the DF700A and DF700B in the upright configuration.

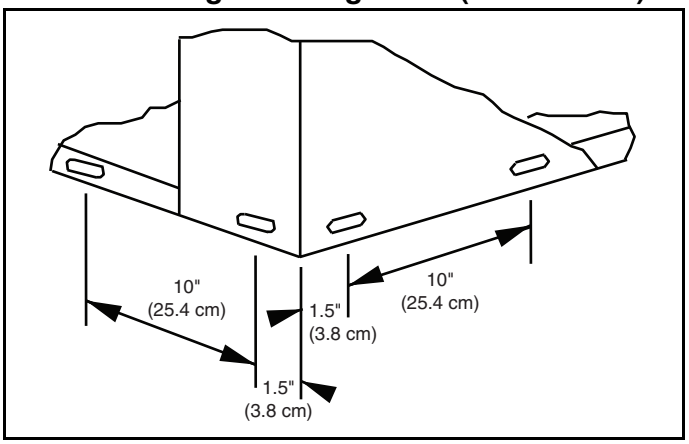
9.2 Leg Mounting - Horizontal Air Handler (DF40 - DF410)

The 46"(116.8 cm) legs must first be mounted to the air handler before being mounted to the concrete slab or floor. To attach the legs with the air handler must first be lifted with the provided lifting lugs. *See Page 20, Section 6.1* for safe lifting practices. In each corner of the bottom of the air handler, four leg-mounting holes will be found. *See Page 28, Figure 21*.

The legs can now be mounted one at a time to the inside of the corner by removing the hardware that occupies each of the bolt locations. Place the leg on the inside of the corner and attach with the previously removed hardware. Missing hardware needs to be added at each bolt location. The required hardware is a 5/16"-18 x 1" grade 5 bolt, a 5/16" flat washer, and a 5/16"-18 grade 5 flange nut.

On models DF270 and DF410, there is a bracket on the inside of each corner that is held in place by the two bolts closest to the corner. This bracket must be removed when the leg is attached to the air handler. Bracket can be discarded once legs are attached.

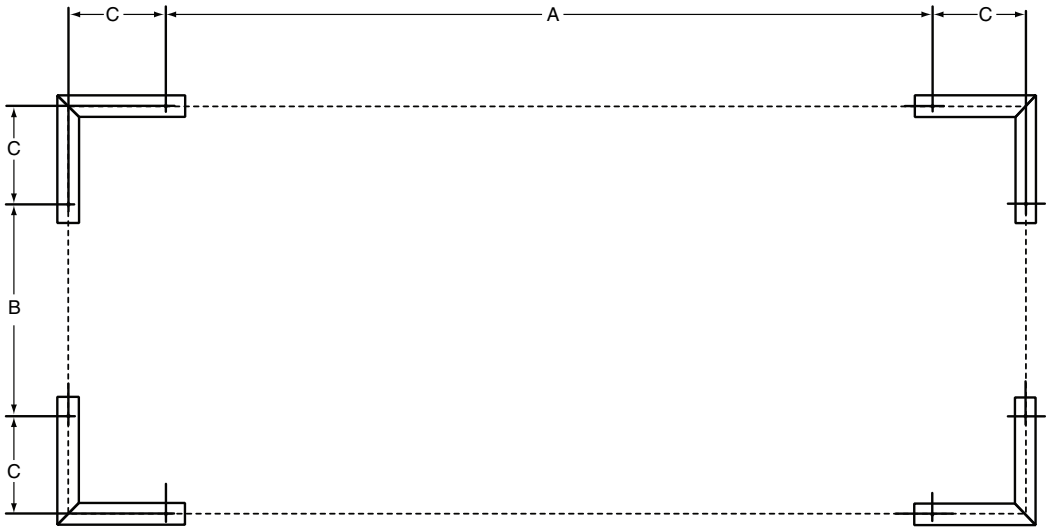
FIGURE 21: Leg Mounting Holes (DF40-DF410)



To attach the legs to a concrete slab, the base of each leg is equipped with two 1" holes. Studs capable of accepting 5/8" nuts must be installed in the concrete slab. For stud positioning, *See Page 29, Figure 22*.

The air handler may now be placed down over the slab studs. The legs should then be bolted down with 5/8" nuts. *See Page 29, Figure 23*.

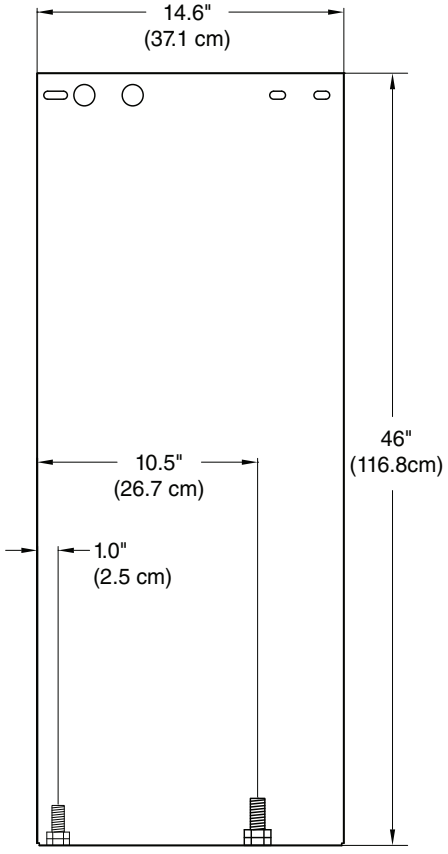
FIGURE 22: Stud Positioning



Model		Part Number	A	B	C	Weight* (lbs)	Weight* (kg)
DF40	**(in)** **(cm)**	77040.301W	38.8 98.5	10.8 27.4	9.5 24.1	26.0	11.8
DF75 and DF150	**(in)** **(cm)**	77040.301[W]	71.0 180.3	23.5 59.7	9.5 24.1	26.0	11.8
DF270	**(in)** **(cm)**	77040.301[W]	95.0 241.3	35.0 88.9	9.5 24.1	26.0	11.8
DF410	**(in)** **(cm)**	77040.301[W]	95.0 241.3	47.0 119.4	9.5 24.1	26.0	11.8

***NOTE:** Weight shown reflects per each leg.

FIGURE 23: Leg Bolt Detail



9.3 Leg Mounting - Upright Air Handler (DF700A and DF700B)

Legs are available in heights of 24"(61.0 cm), 36"(91.4 cm), 48"(121.9 cm), 60"(152.4 cm), 72"(182.9 cm), 84"(213.4 cm) or 96"(243.8 cm).

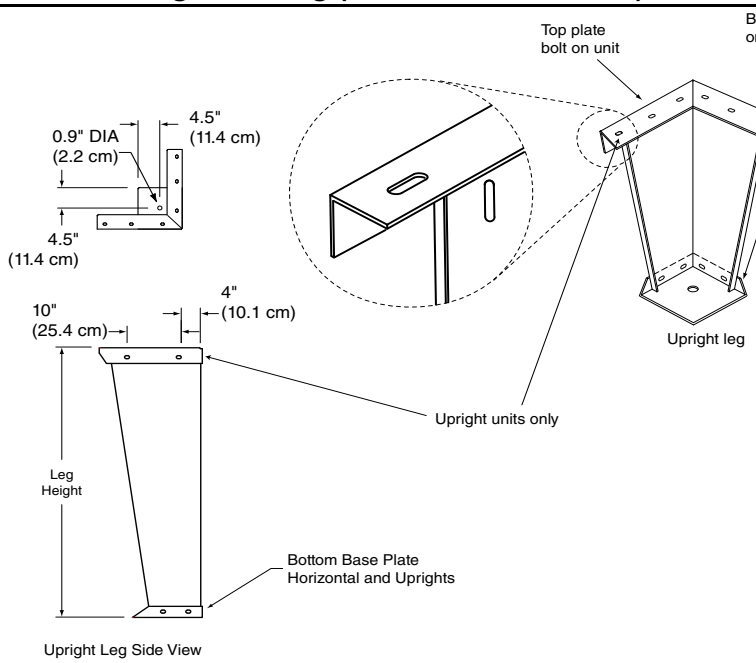
Bold text applies to upright air handlers only.

The legs are shipped unassembled. A bottom plate must be bolted to each leg with four 3/8" x 1" bolts, 3/8" flat washers and 3/8" x 16 nuts (See *Page 30, Figure 24*). **Bolt the top plate to the unit (while unit is in horizontal orientation) with four 3/8" x 1" bolts, 3/8" flat washers and 3/8" x 16 nuts.** The base plate has a 7/8" hole for a 3/4" stud. A 3/4" stud must be installed in the slab for each 7/8" hole. Fasten each leg to slab with four 3/4" hex nuts and lock washers (*See Page 31, Figure 26*). Once the legs are secured to a suitable base, the air handler now may be mounted. *See Page 20, Section 6.1* for safe lifting practices. **Lift the air handler by the lifting lugs into an upright position and guide it onto the legs.**

For units installed in the upright position, see *Page 31, Table 10*. The table provides recommended minimum leg heights to ensure adequate area at air handler inlet to maintain a reasonable air velocity.

NOTE: If using the filter section with the upright air handler and legs, the filter section must be attached to the air handler before it is mounted on the legs. *See Page 51, Section 11.7*.

FIGURE 24: Leg Mounting (DF700A and DF700B)



Leg Height		Part Number		Weight	
in	cm	Horizontal	Upright	(lbs)	(kg)
24	61.0	80306.1[W]	N/A	26.3	11.9
36	91.4	80306.2[W]	N/A	35.0	15.9
48	121.9	80306.3[W]	80306.3V[W]	43.8	19.9
60	152.4	80306.4[W]	80306.4V[W]	53.8	24.4
72	182.9	80306.5[W]	80306.5V[W]	62.5	28.4
84	213.4	80306.6[W]	80306.6V[W]	71.3	32.4
96	243.8	N/A	80306.7V[W]	81.3	36.9

Description	Part Number	Qty
Hardware Kit	80306H	1
3/8-16 x 1 Bolt Hex Grade 5	20517	44
3/8 Flatwasher	20515	44
3/8-16 Nut Flange	20513	44

NOTE: Weight shown reflects per each leg.

FIGURE 25: Horizontal Air Handler - Leg Pad Location (DF700A and DF700B)

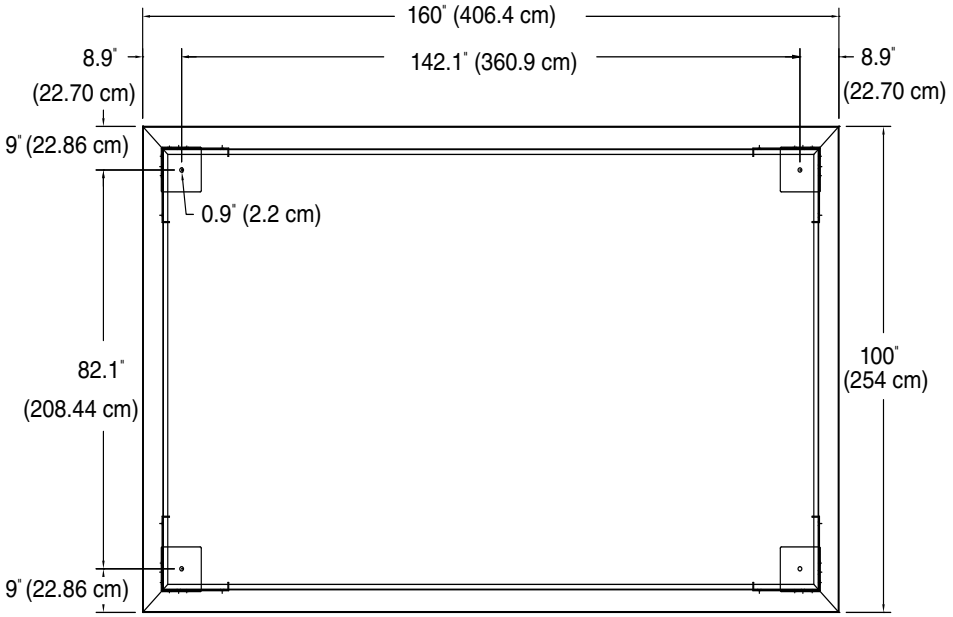


FIGURE 26: Upright Air Handler - Leg Pad Location (DF700A and 700B)

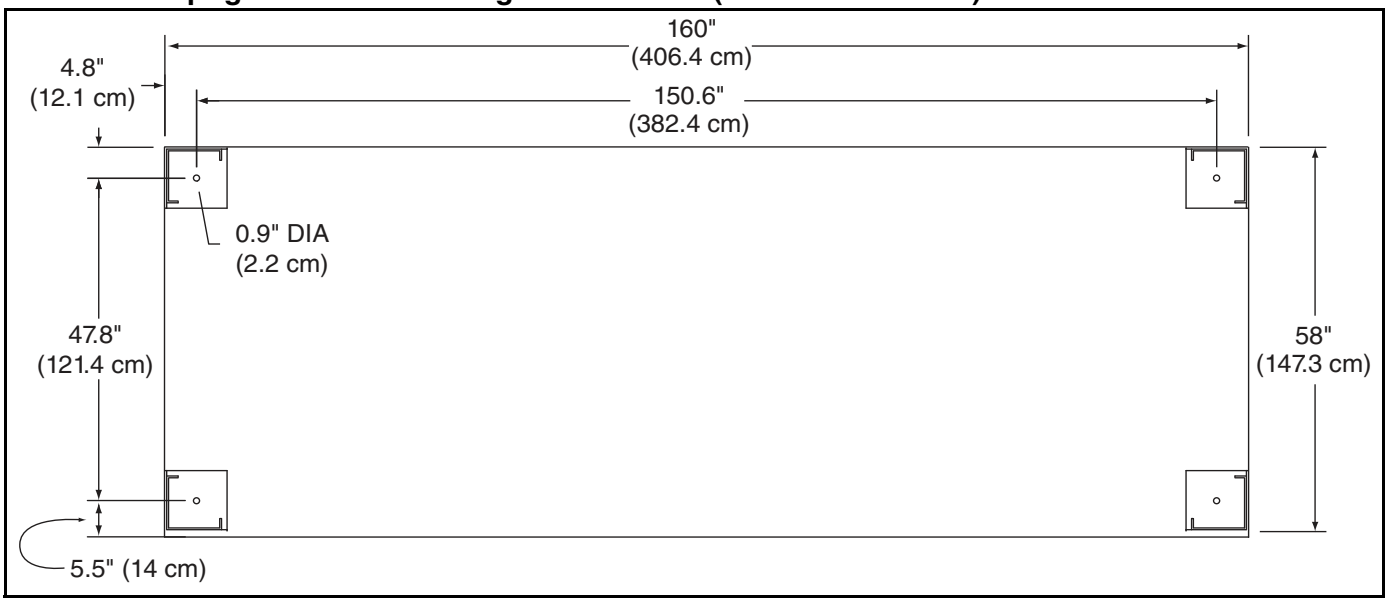


Table 10: Minimum Leg Height for Upright Air Handler (DF700A and DF700B)

Model	Airflow (CFM)		Minimum Leg Height	
			Without Filter Section	With Filter Section
DF700A	35,000	(in) (cm)	48 121.9	72 182.9
	37,500	(in) (cm)	48 121.9	84 213.4
	40,000	(in) (cm)	60 152.4	84 213.4
	42,500	(in) (cm)	60 152.4	84 213.4
	45,000	(in) (cm)	60 152.4	84 213.4
	47,500	(in) (cm)	60 152.4	96 243.8
DF700B	45,000	(in) (cm)	60 152.4	84 213.4
	47,500	(in) (cm)	60 152.4	96 243.8
	50,000	(in) (cm)	60 152.4	96 243.8
	52,500	(in) (cm)	72 182.9	96 243.8
	55,000	(in) (cm)	72 182.9	96 243.8
	57,500	(in) (cm)	72 182.9	96 243.8
	60,000	(in) (cm)	72 182.9	96 243.8

SECTION 10: INDOOR SUSPENSION MOUNTING - HORIZONTAL AIR HANDLER

⚠ WARNING		
		
Crush Hazard **Use proper lifting equipment and practices.**	**Crush Hazard** **Check blower assembly per maintenance section.** **Lack of blower assembly maintenance can cause excessive vibration.** **Excessive vibration can cause support failure.**	**Crush Hazard** **Hanging hardware must support equipment weight.** **Do not hang by lifting lugs.**
Failure to follow these instructions can result in death, injury or property damage.		

⚠ WARNING		
		
Falling Hazard **Use proper safety equipment and practices to avoid falling.**	**Severe Injury Hazard** **Use proper lifting practices and equipment.** **Equipment and accessories are heavy.**	**Cut/Pinch Hazard** **Wear protective gear during installation, operation and service.** **Edges are sharp.**
Failure to follow these instructions can result in death, injury or property damage.		

Suspension Kits are available for models DF40 - DF150. Kits are shipped unassembled and must be assembled prior to installation. Suspension Kits for models DF270 - DF700B are not available.

NOTE: Before installation, verify all required components are present. If any are missing, contact your ROBERTS GORDON® independent distributor.

10.1 Suspension Kit Assembly and Installation

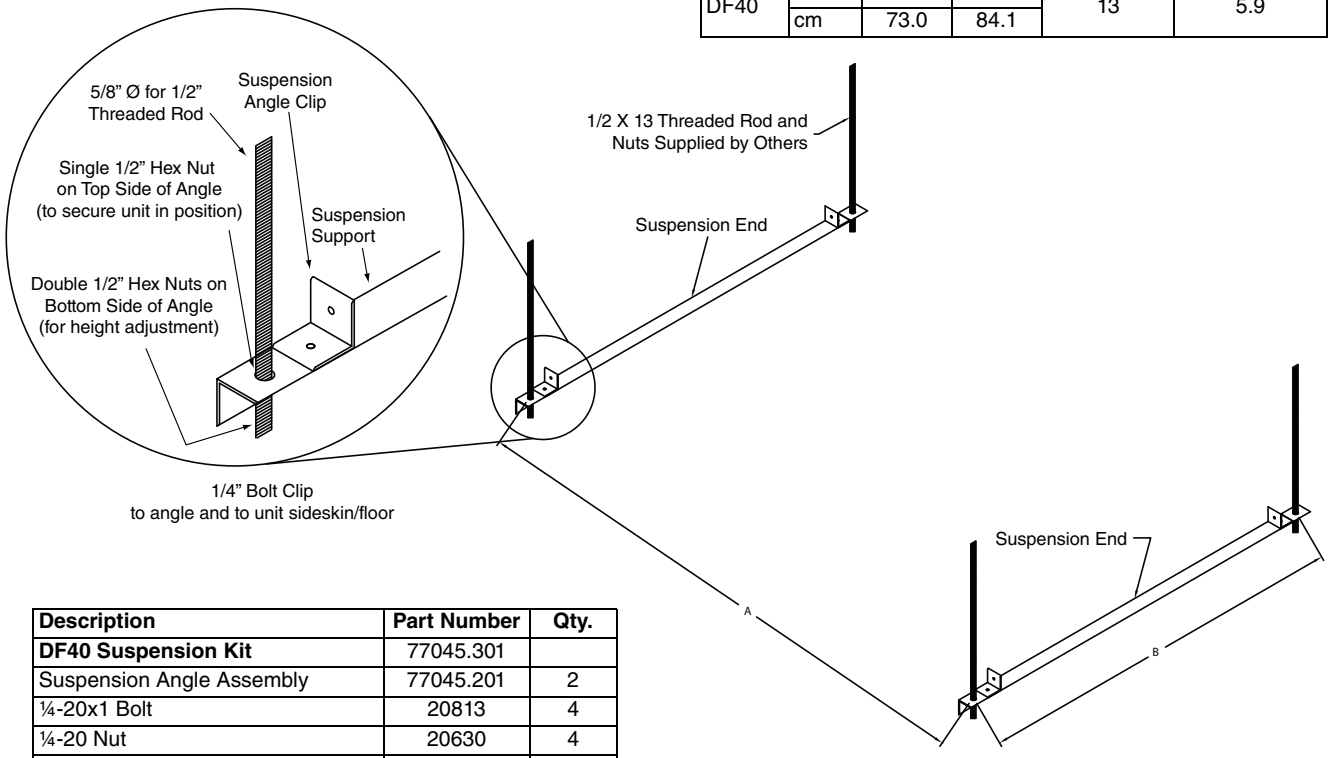
After the air handler is in place, the installer must fasten the air handler to the suspension frame. Once the suspension frame is secure, the air handler may be mounted. *See Page 20, Section 6* for safe lifting practices.

On model DF40, remove the 1/4" bolts from four corners of base on length of air handler. Slide suspension angle assembly onto both ends of the air handler aligning holes in angle tab with bottom holes. Once completed, reinstall hardware.

On model DF75 and DF150, drilling holes down through the floor of the air handler and into the suspension frame. At least three #12 sheet metal screws (supplied by others) equally spaced on each angle/side must be used to attach the air handler to the suspension frame.

FIGURE 27: Indoor Suspension (DF40)

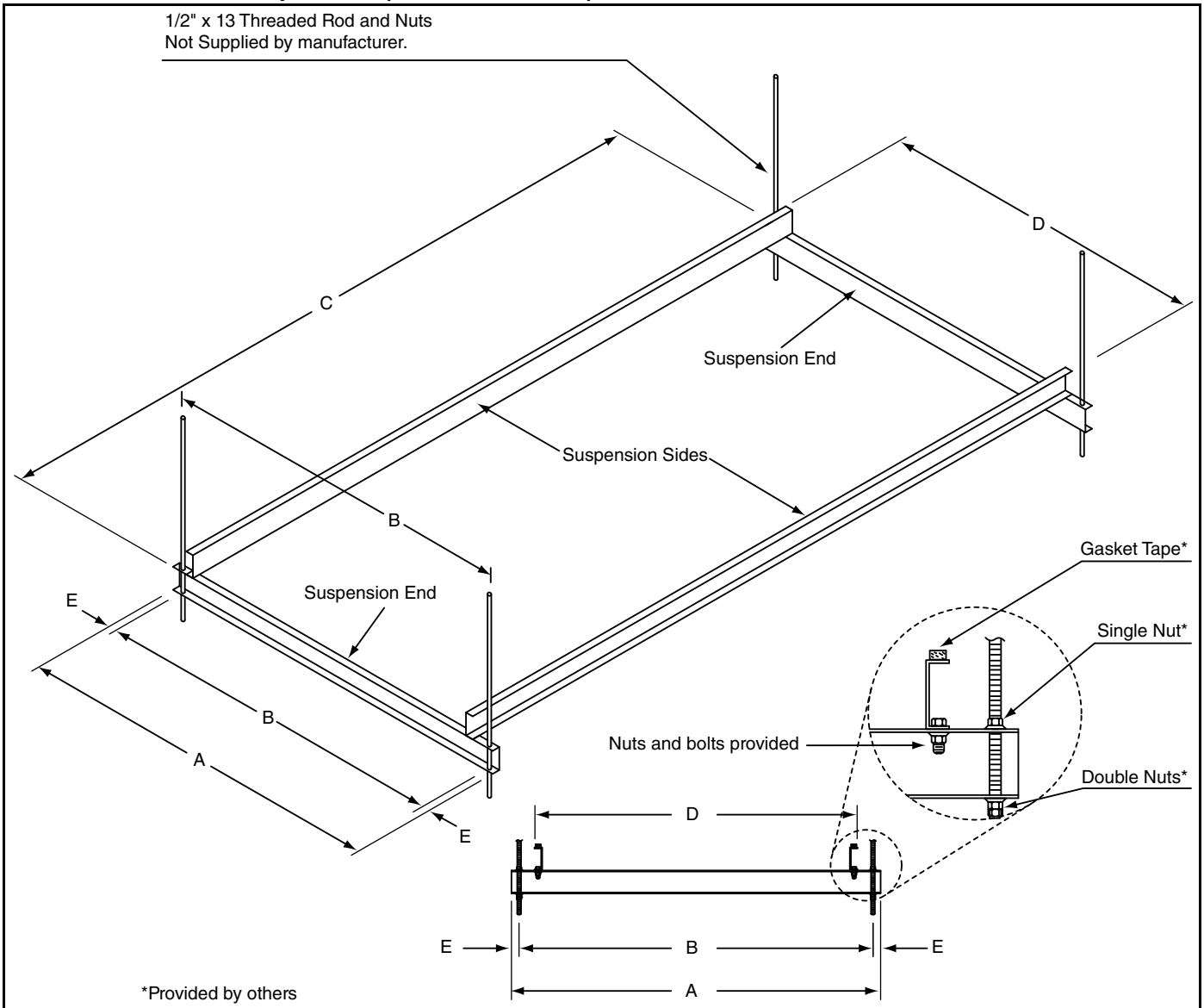
Model		A	B	Weight (lbs)	Weight (kg)
DF40	in	59.0	36.5	13	5.9
	cm	73.0	84.1		



Description	Part Number	Qty.
DF40 Suspension Kit	77045.301	
Suspension Angle Assembly	77045.201	2
¼-20x1 Bolt	20813	4
¼-20 Nut	20630	4
¼ Washer	20503	4

NOTE: Flush angle to end of unit.

FIGURE 28: Indoor Suspension (DF75 and DF150)



Description	Part Number	Qty.
DF75 and DF150 Suspension Kit	77046.301	
Suspension Sides	77047.103	2
Suspension Ends	77047.106	2
1/2"-13 x 1 Bolt HHCS	20524	4
Nut Flange 1/2-13	20493	4
3/4" x 1/8" Gasket Tape	92700017	15' (5m)

Model		A	B	C	D	E	Weight (lbs)	Weight (kg)
DF75 and DF150	**(in)**	48	46	90	42	1	140	63.5
	(cm)	121.9	116.8	228.6	106.7	2.5		

SECTION 11: FILTER SECTION

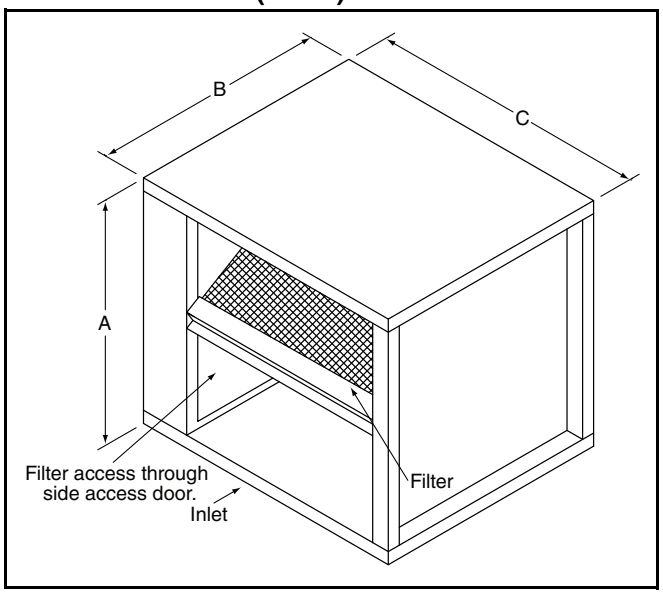
⚠ WARNING			
			
Crush Hazard	**Falling Hazard**	**Severe Injury Hazard**	**Cut/Pinch Hazard**
Use proper lifting equipment and practices.	**Use proper safety equipment and practices to avoid falling.**	**Use proper lifting practices and equipment.** **Equipment and accessories are heavy.**	**Wear protective gear during installation, operation and service.** **Edges are sharp.**
Failure to follow these instructions can result in death, injury or property damage.			

The DF40, DF700A and DF700B filter sections are shipped assembled. The DF75-DF410 filter sections are shipped unassembled and must be assembled prior to installation.

Part numbers that end with a “[W]” indicate that the part can be ordered with either an unpainted galvanized finish or a white paint finish. To order with a galvanized finish, do not include the "W" at the end of the part number; to order with a white paint finish, include the "W" at the end of the part number. If the filter section support is necessary, it may be installed prior to attaching the filter section to the air handler. *See Page 47, Section 11.4*.

NOTE: Check to be sure that all required components are present. If any are missing, contact your ROBERTS GORDON® independent distributor.

11.1 Filter Section (DF40)



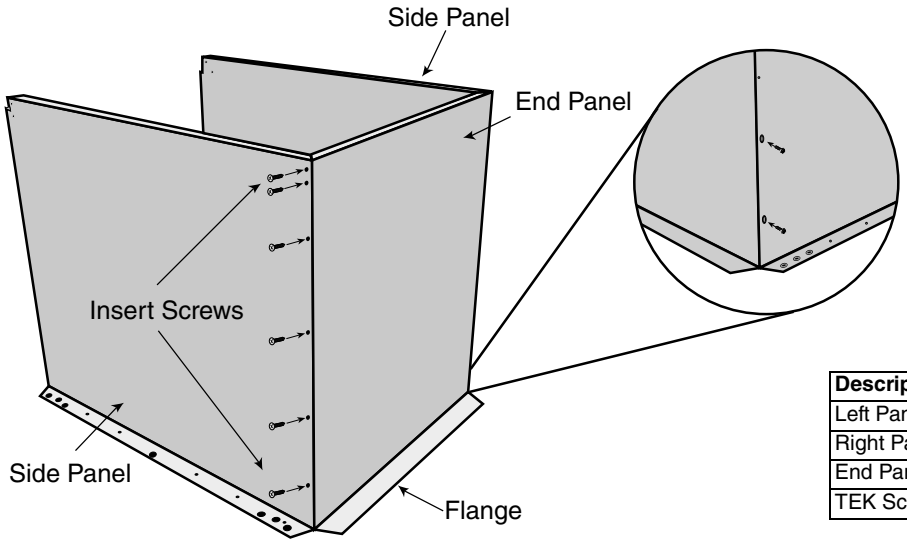
Part Number	Description		A	B	C	Weights	
						lbs	kg
77082.301W	Filter section with permanent aluminum mesh filters	in	28.3	27.0	32.3	100	45.4
77083.301W	Filter section with disposable polyester filters	cm	71.9	68.6	82.1		

Filter Size		Quantity	Part Number
in	20 x 25 x 2	2	22628
cm	50.8 x 63.5 x 5.1		
in	20 x 50 x 1	1	23628
cm	50.8 x 127 x 2.5		

11.2 Filter Section Assembly (DF75 and DF150)

Description	Part Number	Filter Section with Disposable Polyester Filters	Filter Section with Permanent Aluminum Mesh Filters
		77080.301[W]	77081.301[W]
		Quantity	Quantity
Disposable Polyester Filters 20" x 40" x 1"	23629	4	N/A
Permanent Aluminum Mesh Filters 20" x 20" x 1"	20628	N/A	8
Insulated Access Cover	77401.002[W]	1	1
Header Panel	77402.002[W]	1	1
Right Panel	77403.001[W]	1	1
Left Panel	77403.002[W]	1	1
Channel	77404.002	3	3
Support	77405.002	2	2
End Panel	77406.002[W]	1	1
Stiffener	77407.002[W]	1	1
Screw TEK3 #12 x 3/4" Washer HD	13404	38	38
Nut ¼"-20 Speed Grip	20499	4	4
Bolt ¼"-20 x ¾" HHCS	20504	4	4
¼" Flat Washer	20503	4	4
Fastener Rivnut 3/8"-16	91120106	10	10
3/8" Flatwasher	20515	10	10
3/8"-16 x 1" Bolt Hex Grade 5	20517	10	10

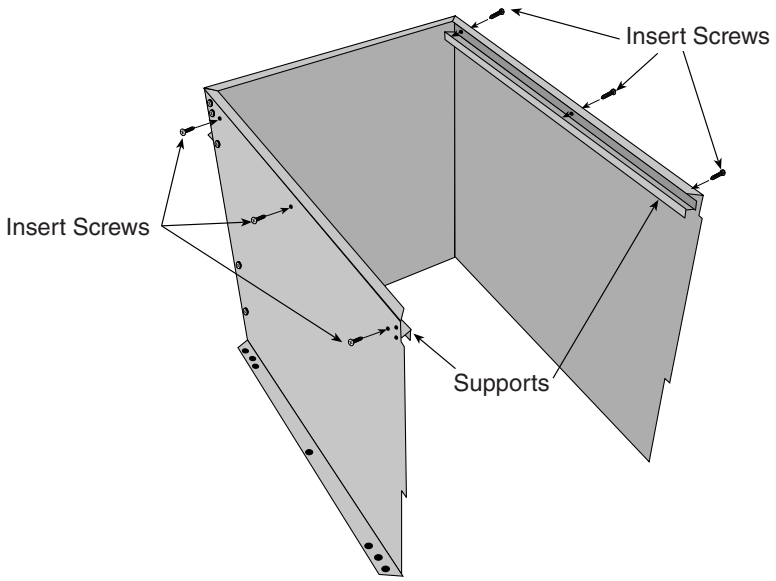
Step 11.2.1



Attach left panel and right panel to the end panel outside mounting flanges. Fasten together with 6 TEK screws on each side as shown.

Description	Part Number
Left Panel	77403.002[W]
Right Panel	77403.001[W]
End Panel	77406.002[W]
TEK Screw	13404

Step 11.2.2

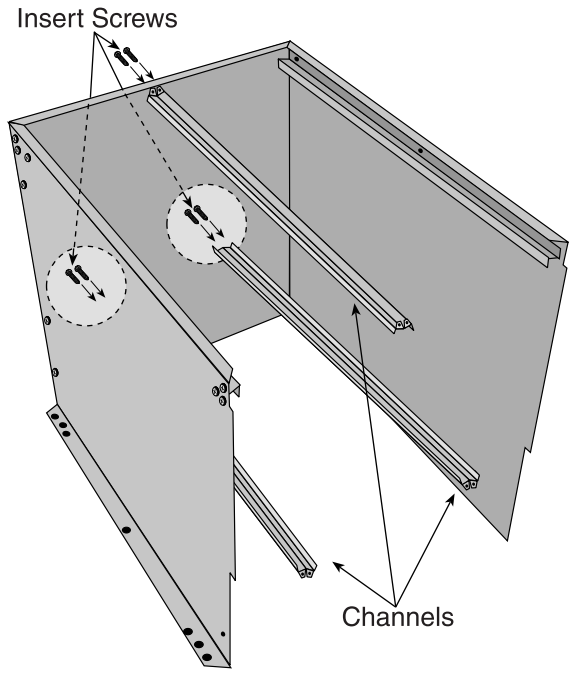


Make sure that the bottom flanges are facing out.

Attach supports to top inside of the left and right panels, making sure that the channel portion is facing down into the filter section.

Description	Part Number
Supports	77405.002
TEK Screw	13404

Step 11.2.3

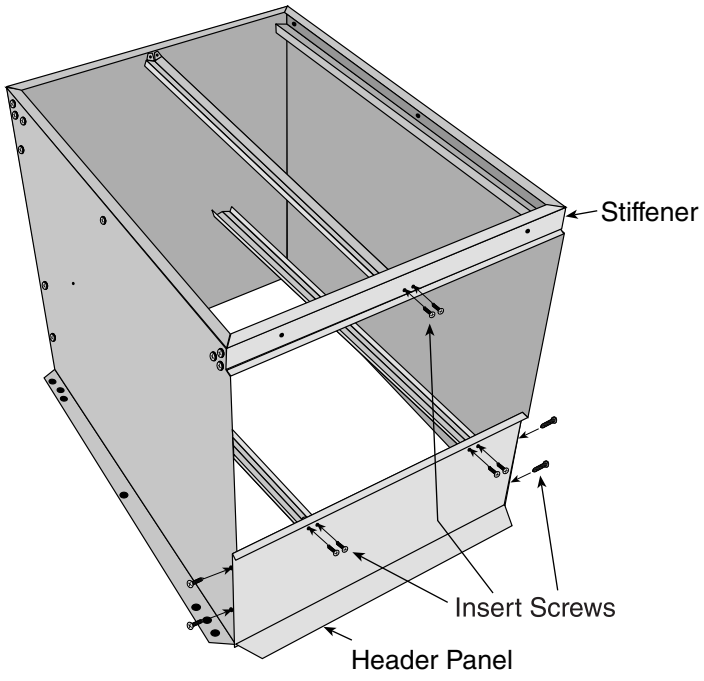


Attach channels to end plate. Make sure top channel is facing down and bottom channels are facing up.

NOTE: Channels "open" to the inside of the filter box.

Description	Part Number
Channels	77404.002
TEK screw	13404

Step 11.2.4



Description	Part Number
Header Panel	77402.002[W]
Stiffner	77407.002[W]
TEK screw	13404

Attach header in between the lower portion of the left and right side panels.

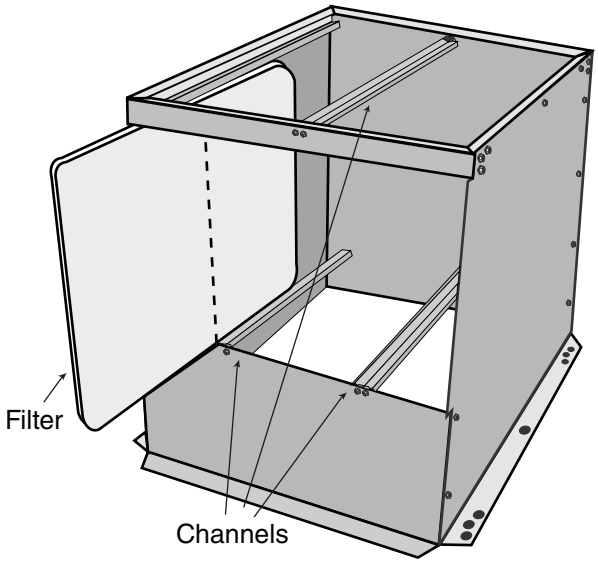
Attach stiffener in between top portion of left and right side panels.

Attach loose end of upper filter channel to stiffener; attach loose end of lower filter channels to header piece.

On the inlet of the filter section, rivnuts (P/N 91120106) are factory installed. With additional 3/8" hardware (P/N 20515 and P/N 20517) the filter section can be installed on the inlet of the unit. *See Page 51, Section 11.6* for additional information on filter section installation.

NOTE: For easier installation, the filter section may be mounted to the air handler at this point, prior to the addition of filters and access door. Refer to *Page 51, Figure 11.6* for installation instructions.

Step 11.2.5



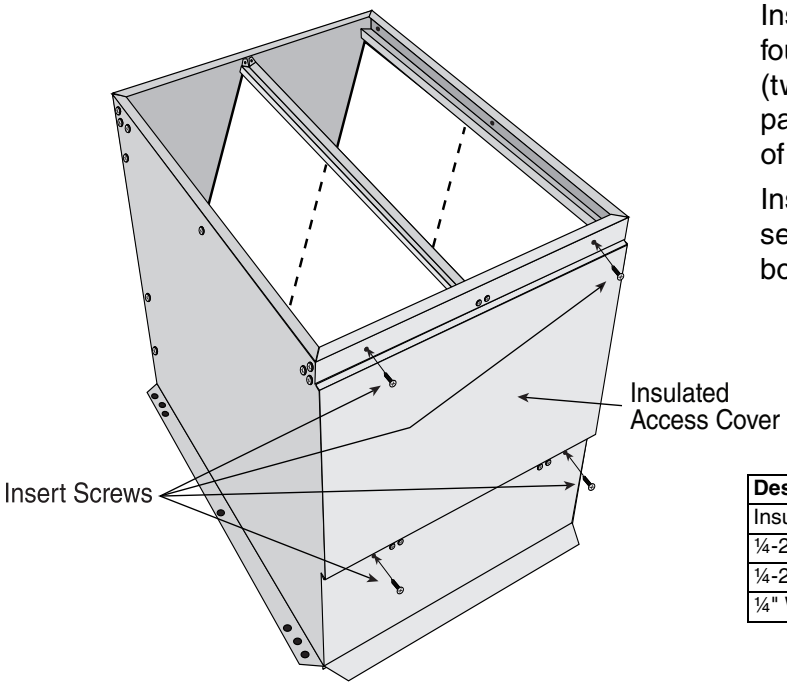
Slide filters into channels. Verify proper filter orientation.

For permanent aluminum mesh filters: Verify the arrow on the side of the filter points in the direction of the airflow.

For disposable polyester filters: Verify the white side is facing the inlet and the blue side is facing the discharge end.

Description	Part Number
Permanent Aluminum Mesh Filters	20628
Disposable Polyester Filters	23629

Step 11.2.6



Install cage nuts into each of the four corresponding square holes (two in stiffener, two in header panel) with the cages on the inside of the filter section.

Install insulated access cover and secure with four ¼-20 screws, ¼-20 bolts and ¼" washers.

Description	Part Number
Insulated Access Cover	77401.002[W]
¼-20 Screw	20499
¼-20 Bolt	20504
¼" Washer	20503

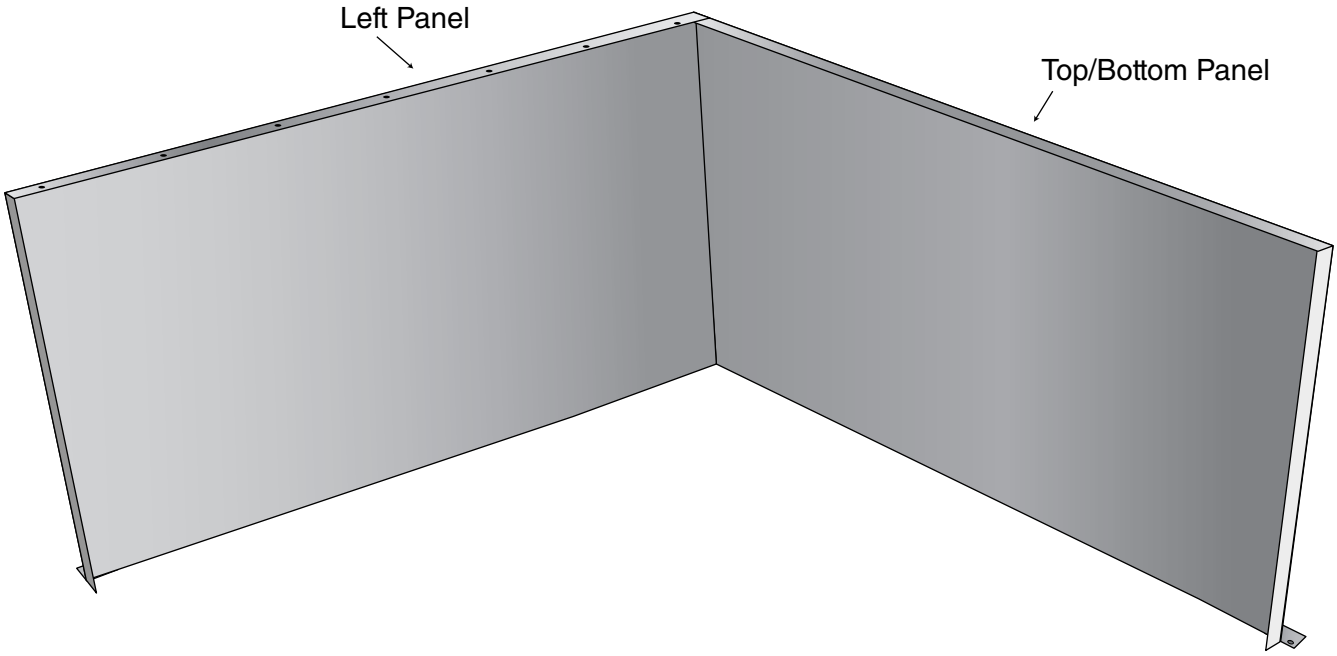
11.3 Filter Section Assembly (DF270 and DF410)

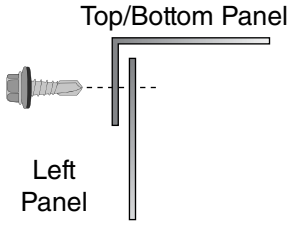
DF270 Filter Section			
Description	Part Number	Permanent Aluminum Mesh Filters 13205022 (Galvanized) 13205023 (Painted White)	Disposable Polyester Filters 13205020 (Galvanized) 13205021 (Painted White)
		Quantity	Quantity
Access Door	13205025	1	1
Right Panel	13205026	1	1
Left Panel	13205028	1	1
Top/Bottom Panel	13205029	2	2
Filter Rail	13205030	5	5
Side Filter Rail	13205031	2	2
Screw TEK3 #12 x ¾" Washer HD	13404	64	64
Nut ¼"-20 Speed Grip	20499	3	3
Hinge Butt 3 x 3 Zinc	20500	2	2
¼" Flat Washer	20503	3	3
Bolt ¼"-20 x ¾" HHCS	20504	3	3
Bolt Retainer Pushnut 1/4	20505	3	3
3/8" Flatwasher	20515	14	14
3/8"-16 x 1 Bolt Hex Grade 5	20517	14	14
10-24 KEPS Nut	20698	12	12
Permanent Aluminum Mesh Filter 20" x 25" x 1"	20629	12	N/A
Disposable Polyester Filter 20" x 50" x 1"	23628	N/A	6
Bolt 10-24 x ¾" HHCS	21699	6	6
10-24 x ½" HMS Bolt	27000	6	6
Fastener Rivnut 3/8"-16	91120106	14	14
Spacer Hinge Filter	13205032	8	8
Gasket Door Filter	13205035	11	11

DF410 Filter Section			
Description	Part Number	Permanent Aluminum Mesh Filters 13305022 (Galvanized) 13305023 (Painted White)	Disposable Polyester Filters 13305020 (Galvanized) 13305021 (Painted White)
		Quantity	Quantity
Access Door	13305025	1	1
Right Panel	13305026	1	1
Left Panel	13305028	1	1
Top/Bottom Panel	13305029	2	2
Filter Rail	13305030	7	7
Side Filter Rail	13305031	2	2
Screw TEK3 #12 x ¾" Washer HD	13404	86	86
Nut ¼"-20 Speed Grip	20499	3	3
Hinge Butt 3 x 3 Zinc	20500	2	2
¼" Flat Washer	20503	3	3
Bolt ¼"-20 x ¾" HHCS	20504	3	3
Bolt Retainer Pushnut 1/4	20505	3	3
3/8" Flatwasher	20515	14	14
3/8"-16 x 1" Bolt Hex Grade 5	20517	14	14
10-24 KEPS Nut	20698	12	12
Permanent Aluminum Mesh Filter 20" x 20" x 1"	20628	16	N/A
Permanent Aluminum Mesh Filter 20" x 25" x 1"	20629	8	N/A
Disposable Polyester Filter 20" x 60" x 1"	23631	N/A	8
Bolt 10-24 x ¾" HHCS	21699	6	6
10-24 x ½" HMS Bolt	27000	6	6
Fastener Rivnut 3/8"-16	91120106	14	14
Spacer Hinge Filter	13205032	8	8
Gasket Door Filter	13205035	12	12

Note: In the instructions, an "X" in a part number indicates a digit that changes based on model. Replace the "X" with a "2" for model DF270; replace the "X" with a "3" for model DF410. For further clarification, reference the individual table of components for each assembly at the begining of the instructions.

Step 11.3.1





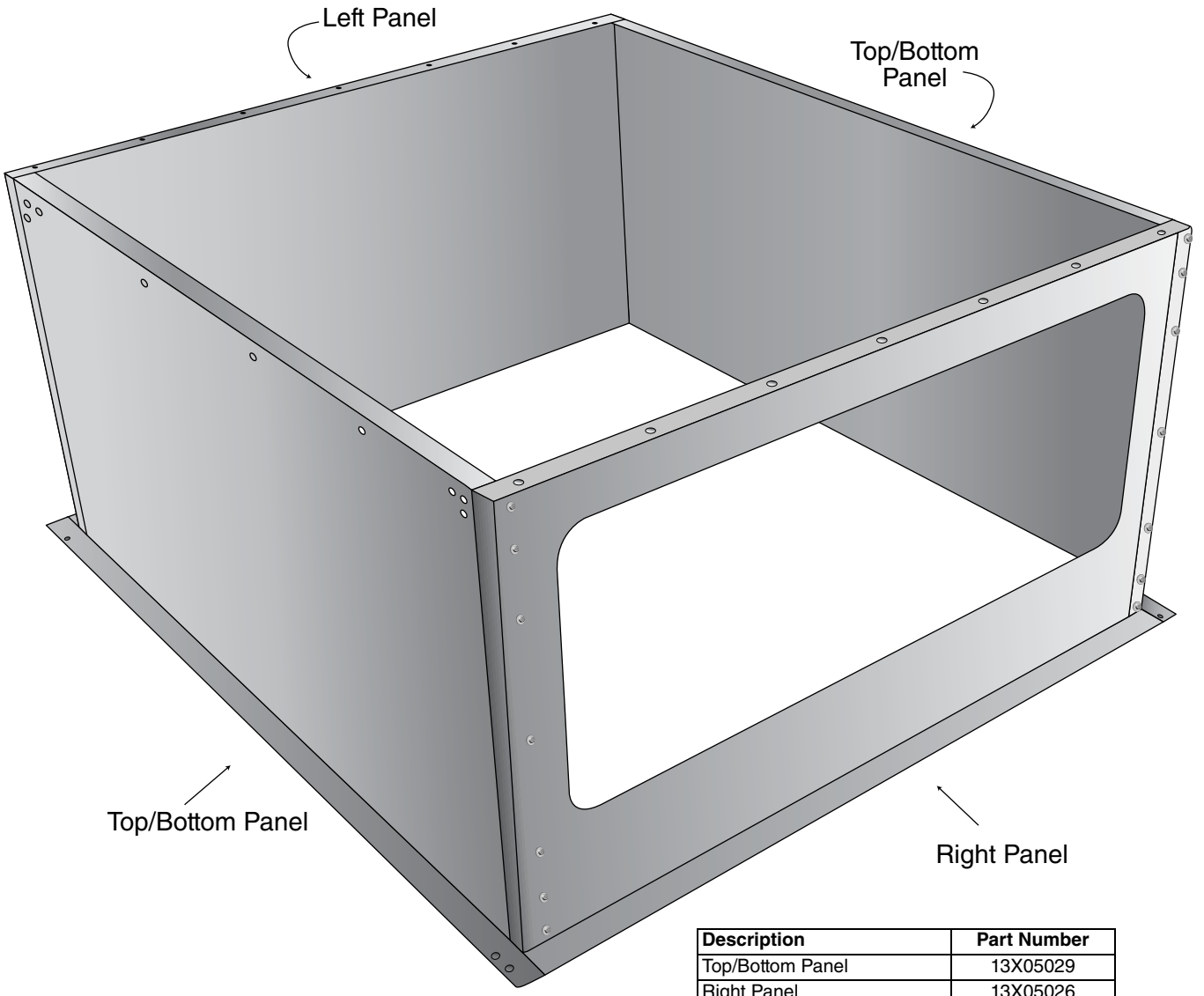
Description	Part Number
Top/Bottom Panel	13X05029
Left Panel	13X05028
TEK Screw	13404

For Model DF270: On a flat, clean and dry surface, attach the top/bottom panel and left panel of the filter section using five TEK self-tapping screws.

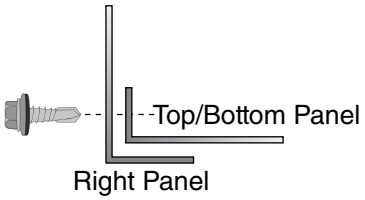
For Model DF410: On a flat, clean and dry surface, attach the top/bottom panel and left panel of the filter section using seven TEK self-tapping screws.

NOTE: Top/bottom panel overlaps the side panel for either model. Ensure that the larger flange on each panel is on the bottom facing outward.

Step 11.3.2



Description	Part Number
Top/Bottom Panel	13X05029
Right Panel	13X05026
TEK Screw	13404

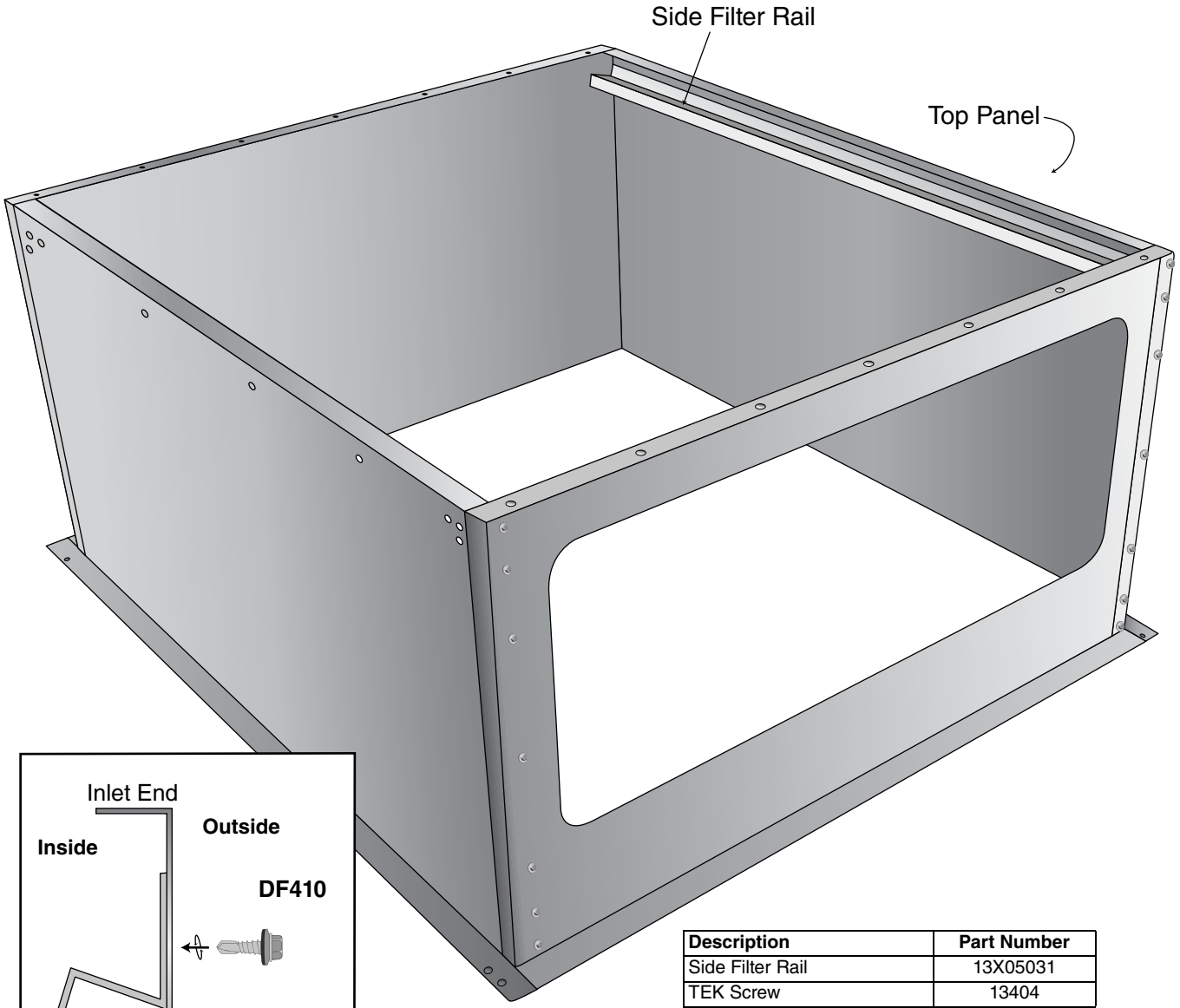


For Model DF270: Attach the top/bottom panel with five TEK self-tapping screws. Attach the right panel with five TEK self-tapping screws on each side.

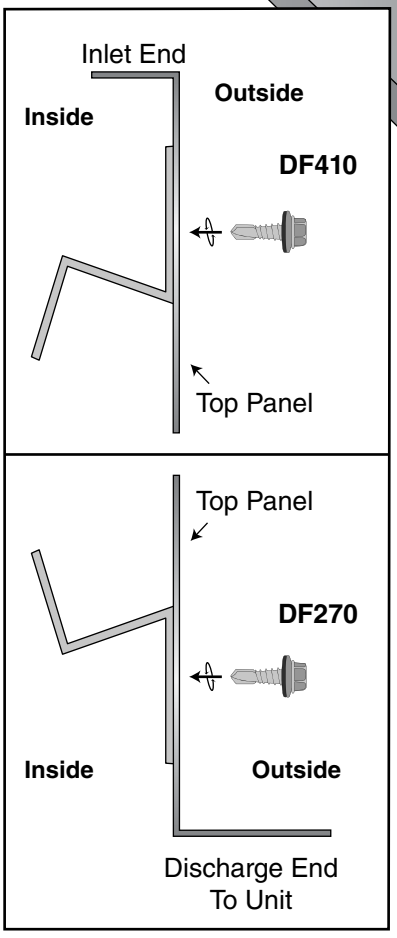
For Model DF410: Attach the top/bottom panel with seven TEK self-tapping screws. Attach the right panel with seven TEK self-tapping screws on each side.

NOTE: Side panels overlap the top/bottom panel on either model. Ensure that the larger flange on each panel is on the bottom facing outward.

Step 11.3.3



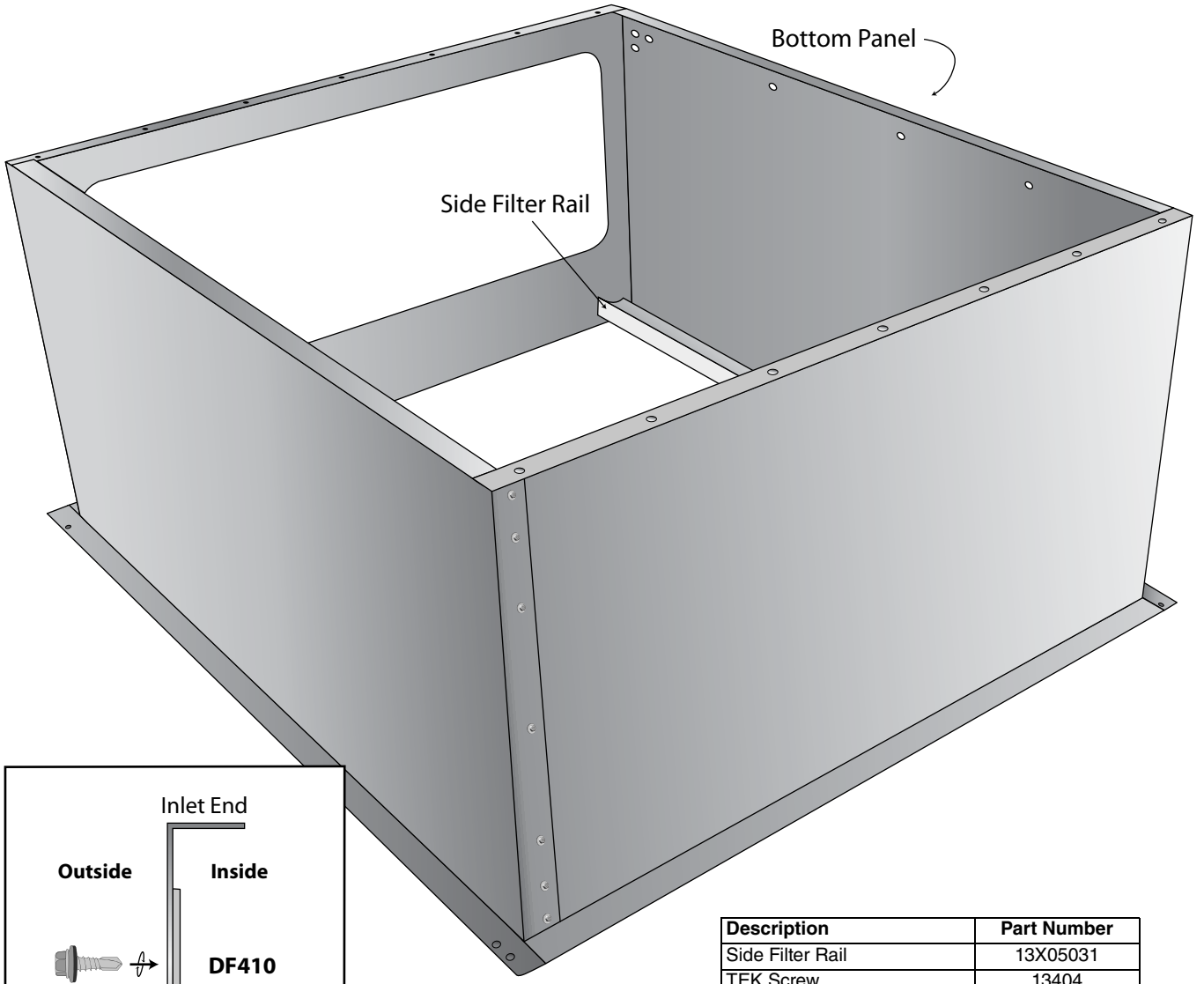
Description	Part Number
Side Filter Rail	13X05031
TEK Screw	13404



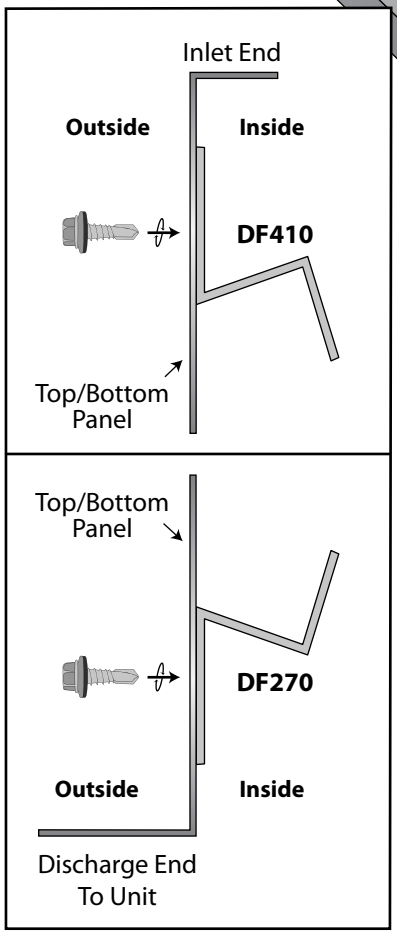
For Model DF270: Attach the side filter rail to the top panel with five TEK self-tapping screws. Line up filter rail holes with provided holes near the discharge end of the filter section panel.

For Model DF410: Attach the side filter rail to the top panel with six TEK self-tapping screws. Line up with provided holes near the inlet end of the filter section.

Step 11.3.4



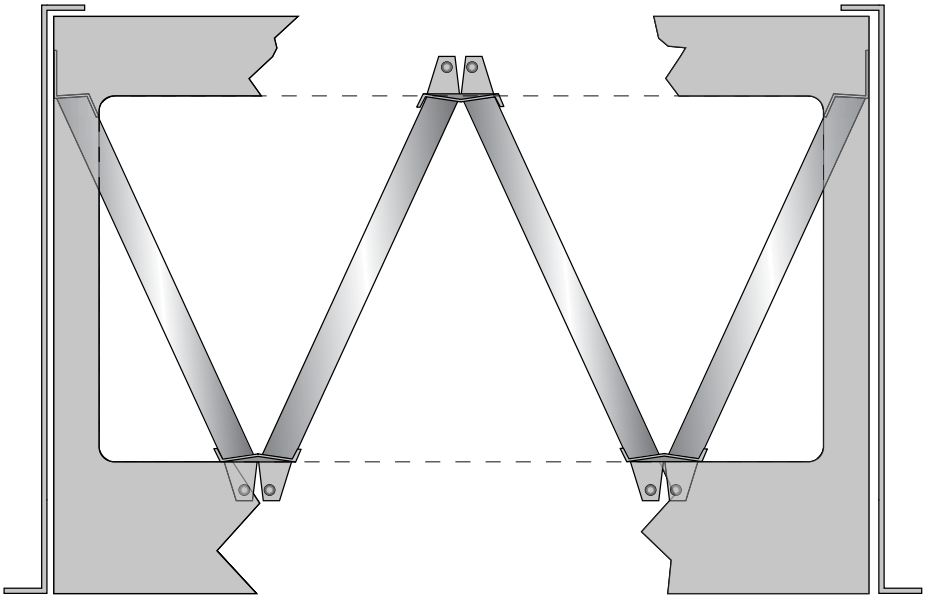
Description	Part Number
Side Filter Rail	13X05031
TEK Screw	13404



For Model DF270: Attach the side filter rail to the bottom panel with five TEK self-tapping screws. Line up filter rail holes with provided holes near the discharge end of the filter section panel.

For Model DF410: Attach the side filter rail to the bottom panel with seven TEK self-tapping screws. Line up with provided holes near the inlet end of the filter section.

Step 11.3.5

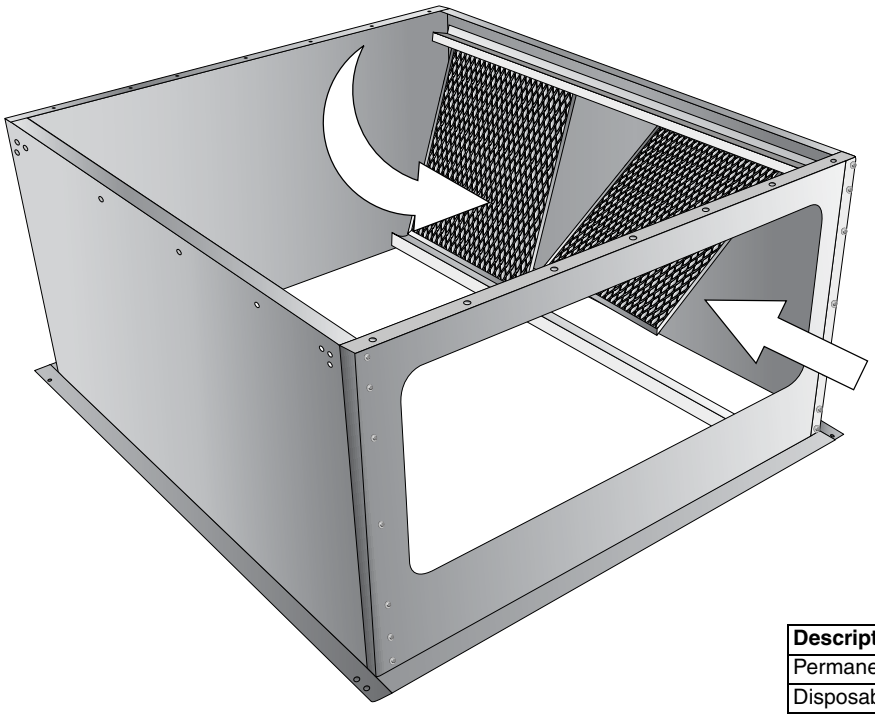


Attach the remaining filter rails with four TEK self-tapping screws, two on each side. Ensure that the rails face into the filter section.

NOTE: For easier installation, the filter section may be mounted to the air handler at this point, prior to the addition of filters and access door. Refer to *Page 51, Section 11.6* for installation instructions.

Description	Part Number
Filter Rail	13X05030
TEK Screw	13404

Step 11.3.6



Load filters into the filter section. Check that each filter in in the proper orientation.

For permanent aluminum mesh filters: Verify the arrow on the side of the filter points in the direction of the airflow.

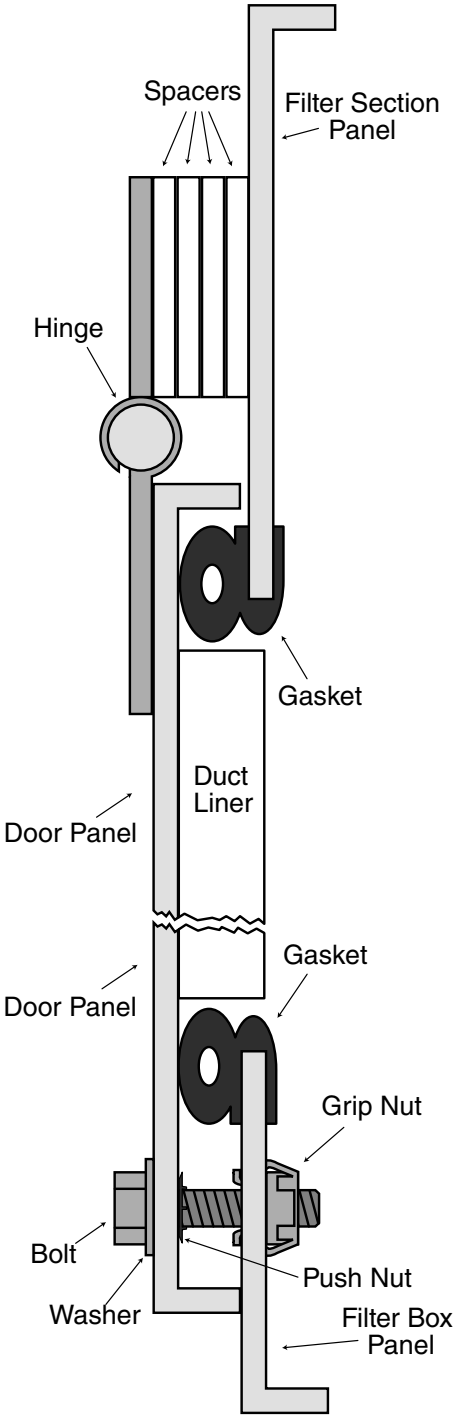
For disposable polyester filters: Verify the white side is facing the inlet and the blue side is facing the discharge end.

The end rows of filters need to be installed first.

NOTE: When the filter section is installed on the air handler, the top of one row of filters will support the bottom of the above row.

Description	Part Number
Permanent Aluminum Mesh Filters	20629 and/or 20628
Disposable Polyester Filters	23628/23631

Step 11.3.7



On right panel, apply provided gasket material to the filter access opening.

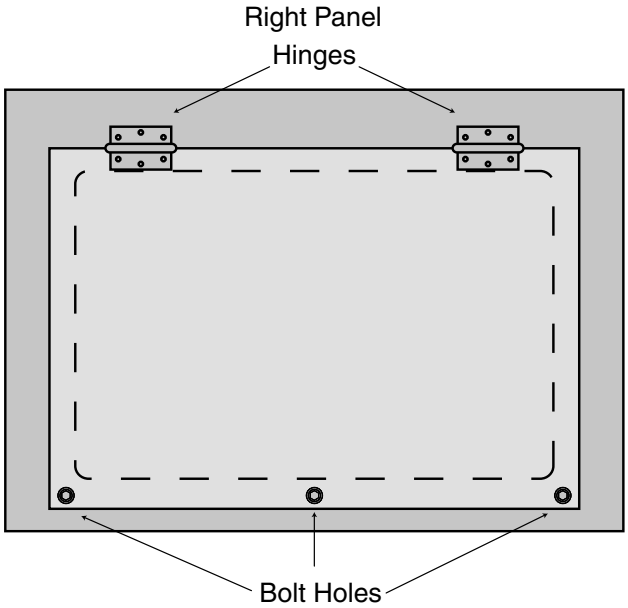
Attach filter access door with two hinges.

Attach the hinges to the door using three 10-24 x 1/2" bolts and 10-24 nuts. Attach the hinge to the filter section right panel using three 10-24 x 3/4" bolts and 10-24 nuts. Use four hinge spacers between the hinge and the right panel to keep the hinge aligned.

Press the ¼-20 grip-nuts into each of the three square cut outs in the filter section right panel on the opposite side of the filter access opening from the hinges.

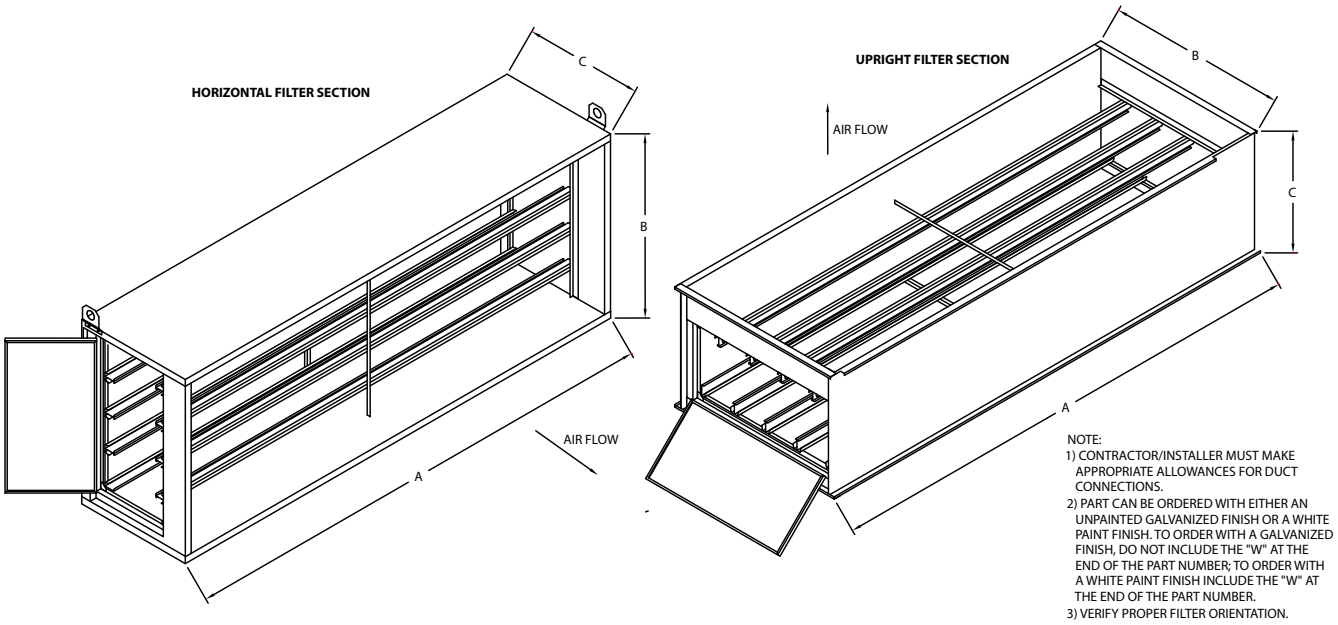
Place a ¼" washer on a ¼-20 bolt and insert it into one of the three bolt holes on the door panel. Place a push-nut on to the bolt from the inside of the door panel to keep the bolt from being separated from the door panel when it is open. Repeat for the other two bolt holes. Secure the door in the closed position by threading the three bolts in the door panel to the grip-nuts on the filter section right panel.

On the inlet of the filter section, rivnuts (P/N 91120106) are factory installed. With additional 3/8" hardware (P/N 20515 and P/N 20517) the filter section can be installed on the inlet of the unit. *See Page 51, Section 11.6.1* for additional information on filter section installation.



Description	Part Number
Gasket Material	13205035
Filter Access Door	13X05025
Hinge	20500
10-24 x ½" Bolt	27000
10-24 Nut	20698
Hinge Spacers	13205032
10-24 X ¾" Bolt	21699
¼-20 Grip-Nut	20499
¼" Washer	20503
¼-20 Bolt	20504
Push-Nut	20505

11.4 Filter Section (DF700A and DF700B)



NOTE:
1) CONTRACTOR/INSTALLER MUST MAKE APPROPRIATE ALLOWANCES FOR DUCT CONNECTIONS.
2) PART CAN BE ORDERED WITH EITHER AN UNPAINTED GALVANIZED FINISH OR A WHITE PAINT FINISH. TO ORDER WITH A GALVANIZED FINISH, DO NOT INCLUDE THE "W" AT THE END OF THE PART NUMBER; TO ORDER WITH A WHITE PAINT FINISH INCLUDE THE "W" AT THE END OF THE PART NUMBER.
3) VERIFY PROPER FILTER ORIENTATION.

Part Number	Style	Filters	Quantity		A	B	C	Weight lbs (kg)
80303.1[W]	Horizontal	20" x 140" x 1 (50.8 cm x 355.6 cm x 2.5 cm) Disposable Polyester	8	in	138.8	57.9	34.0	580 (263.1)
80310.1[W]		20" x 20" x 1" (50.8 cm x 50.8 cm x 2.5 cm) Permanent Aluminum Mesh	56	cm	352.6	147.1	86.4	
80303.2[W]	Upright	20" x 140" x 1 (50.8 cm x 355.6 cm x 2.5 cm) Disposable Polyester	8	in	143.0	53.6	34.9	550 (249.5)
80310.2[W]		20" x 20" x 1" (50.8 cm x 50.8 cm x 2.5 cm) Permanent Aluminum Mesh	56	cm	363.2	136.1	88.6	

11.5 Filter Section Support Assembly

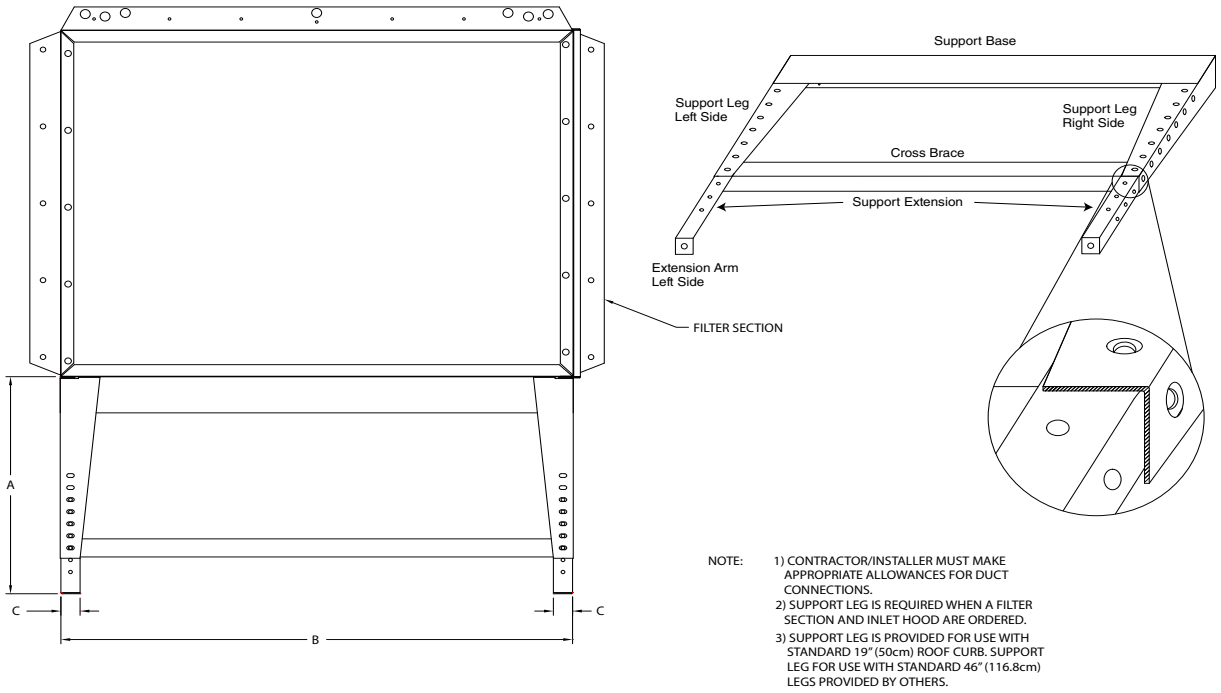
The filter section support assembly is used to add additional support to the air handler accessories that are not supported by the roof curb in a horizontal configuration (support leg for use with standard 46" [116.8cm] legs provided by others). For Models DF75 - DF410, when the air handler has both a filter section and an inlet hood, a filter section support assembly or its equivalent must be used. For Models DF700A and DF700B when a filter section is supplied, the support described on *Page 50, Section 11.5.2* or its equivalent must be used.

Description	Part Number	DF75 and DF150	DF270	DF410
		77412.001	77412.002	77412.003
		Quantity	Quantity	Quantity
Filter Box Support Base DF75 and DF150	77408001	1	N/A	N/A
Filter Box Support Base DF270	77408002	N/A	1	N/A
Filter Box Support Base DF410	77408003	N/A	N/A	1
Filter Box Support Leg LS DF75-DF410	77408011	1	1	1
Filter Box Support Leg RS DF75-DF410	77408012	1	1	1
Filter Box Support Ext LS,RS DF75-DF410	77408021	2	2	2
Filter Box Support Brace DF75 And DF150	77408031	1	N/A	N/A
Filter Box Support Brace DF270	77408032	N/A	1	N/A
Filter Box Support Brace DF410	77408033	N/A	N/A	1
Screw Tek3 #12x3/4 Washer	13404	11	14	16
1/4-20 x 1/2 Bolt Hex Head Cap Screw	20483	8	8	8
1/4-20 Nut Flange	20630	8	8	8
1/4 Flat Washer	20503	8	8	8

11.5.1 Filter Section Support Assembly Installation (DF75 - DF410)

It is best to assemble the support base and support arms to the filter section prior to attaching the filter section to the air handler but can also be assembled to a previously installed filter section. Refer to *Page 49, Figure 29*.

FIGURE 29: Filter Section Support Assembly



Model	Part Number		A Min	A Max	B	C	Weight lbs (kg)
DF75 and DF150	77412.001	**in**	16.0	24.0	38.8	1.5	16 (7.3)
		cm	40.5	60.8	98.4	3.7	
DF270	77412.002	**in**	16.0	24.0	49.6	1.5	18 (8.2)
		cm	40.5	60.8	126.0	3.7	
DF410	77412.003	**in**	16.0	24.0	64.1	1.5	20 (9.1)
		cm	40.5	60.8	162.7	3.7	

Step 1: Place the support base (P/N 7740800X) up to the bottom of the filter section towards the inlet end and line up the pre-drilled holes. Use TEK self-tapping screws (P/N 13404) in the middle of the support base (P/N 7740800X) to secure the support base in place.

Step 2: Line up the pre-drilled holes at the ends of the support base, the filter section and the support legs (P/N 7740900X) and attach the legs to the bottom of the filter section through the support base with TEK self-tapping screws (P/N 13404). Install TEK self-tapping screws (P/N 13404) at each of the remaining hole locations in the support base.

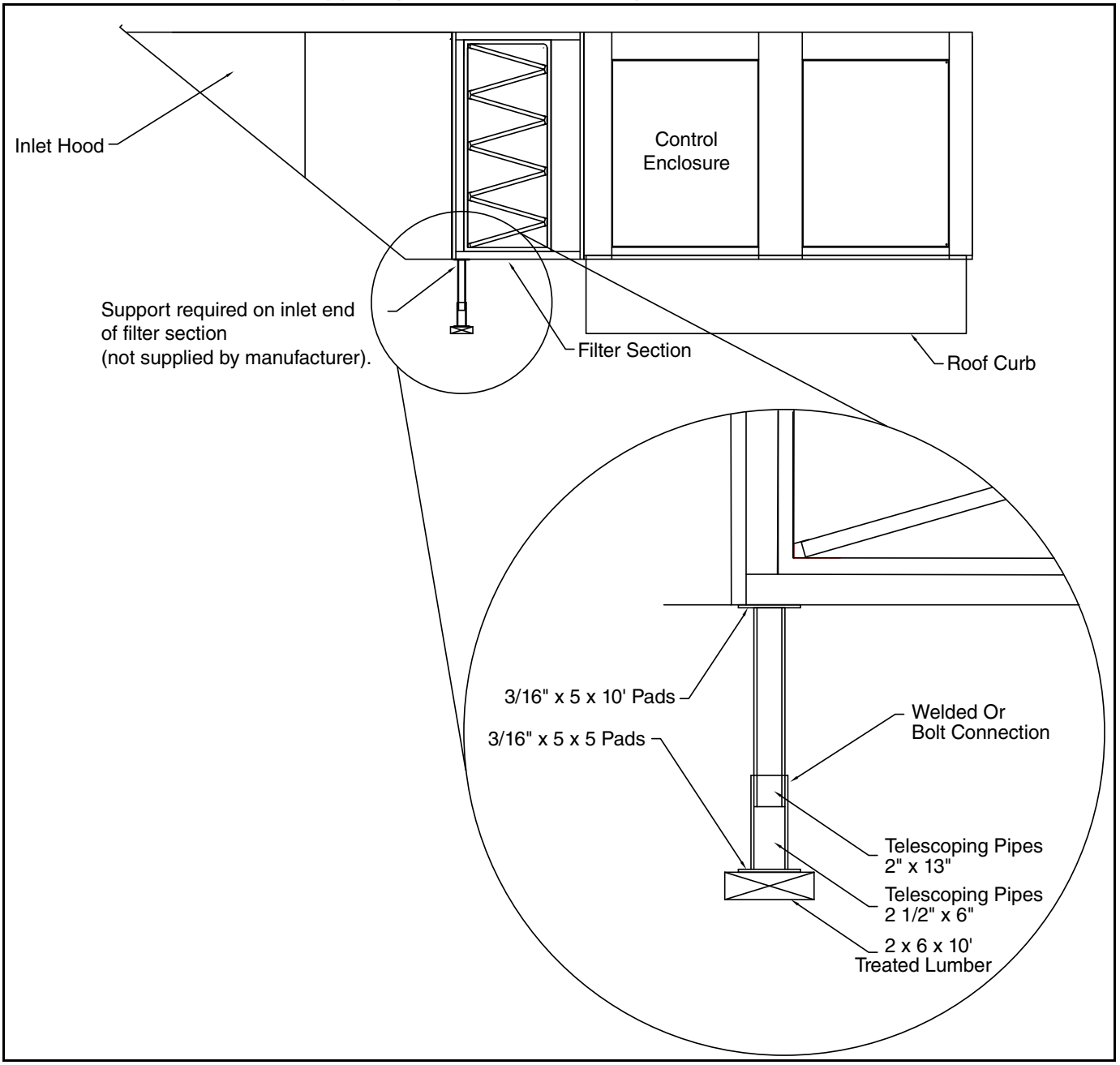
Step 3: Mount the filter section to the air handler as described on *Page 51, Section 11.6*.

Step 4: Line up the support extension (P/N 77410001) with the left support leg (P/N 77409001) and select the appropriate height alignment. Attach the support extension and left support legs and support brace (P/N 774110X) at the lowest overlap position with one ¼-20 bolt (P/N 20483) and flange nut (P/N 220630) on the front surface. Install a second ¼-20 bolt (P/N 20483) and flange nut (P/N 220630) directly above the first, securing all three parts together.
Repeat step 4 on the right side of the support assembly.

11.5.2 Filter Section Support Assembly (DF700A and DF700B)

For Models DF700A and DF700B, the filter section support assembly that is used is a field fabricated telescoping pipe assembly that rests on a treated piece of lumber. Refer to *Page 50, Figure 30* for fabrication details.

FIGURE 30: Filter Section Support (DF700A and DF700B)



11.6 Filter Section Installation - Horizontal Air Handlers

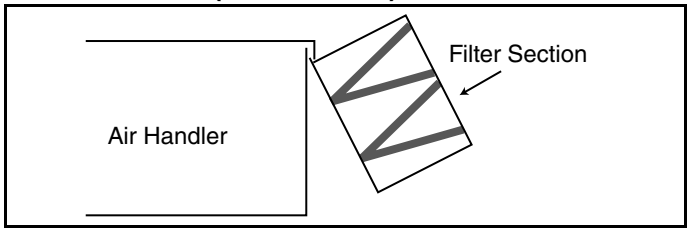
11.6.1 Filter Section Installation (DF40)

For installation directly onto the inlet of the air handler, remove the hardware on the inlet surface of the air handler that would prevent the filter section from being mated to the inlet of the air handler. Use the provided shims (one bottom and two sides) to reduce the size of the gap between the air handler and the filter section. Re-install the hardware (that was removed) through the filter section and the shims to mate the air handler to the filter section. Hardware must be torqued to recommended specifications *on Page 9, Table 1*. Caulk (provided by others) the sides, roof and bottom seams between the filter section and air handler. Apply 3" zip tape (provided by others) over the roof seam. Install the filters in proper orientation (*See Page 155, Section 21.6*) and attach the filter access door. Secure filter access door in the closed position.

11.6.2 Filter Section Installation (DF75 - DF410)

For installation directly onto the inlet of the air handler, foam tape (provided by others) must be applied to the air handler sides and bottom. To place the filter section, the top flange of the filter section will slide up under the top panel (drip edge) of the air handler. Refer to *Page 51, Figure 31*. All hardware in this top panel drip edge will need to be removed prior to placing the filter section on the air handler. Attach the sides of the filter section to the factory installed riv-nuts on the inlet of the air handler with the supplied hardware. Re-install the hardware from the top panel of the air handler through the top panel and top flange of the filter section. Additional TEK screws may be used along the bottom flange of the filter section to seal the bottom seam. Caulk (provided by others) the side and bottom seams between the filter section and air handler. If the filter section was installed prior to completing the filter section assembly, return to the filter section assembly instructions to complete the assembly. *See Page 39, Figure 11.2.5* for Models DF75 and DF150 or *Page 45, Figure 11.3.6* for Models DF270 and DF410.

FIGURE 31: Filter Section Installation on Horizontal Air Handler (DF75-DF410)



11.6.3 Filter Section Installation (DF700A and DF700B)

For installation directly onto the inlet of the air handler, install the provided hardware through the filter section to the riv-nuts in the air handler cabinet. Caulk (provided by others) the sides, roof and bottom seams between the filter section and air handler. Apply 3" zip tape (provided by others) over the roof seam. Install the filters in proper orientation (*See Page 155, Section 21.6*) and attach the filter access door. Secure filter access door in the closed position.

11.7 Filter Section Installation - Upright Air Handlers

11.7.1 Filter Section Installation (DF40)

For installation directly onto the inlet of the air handler, remove the hardware on the inlet surface of the air handler that would prevent the filter section from being mated to the inlet of the air handler. Use the provided shims (one bottom and two sides) to reduce the size of the gap between the air handler and the filter section. Re-install the hardware (that was removed) through the filter section and the shims to mate the air handler to the filter section. Caulk (provided by others) the sides, roof and bottom seams between the filter section and air handler. Install the filters in proper orientation (*See Page 155, Section 21.6*) and attach the filter access door. Secure filter access door in the closed position.

11.7.2 Filter Section Installation (DF75-DF410)

To install a filter section on an upright air handler that is stand mounted, the filter section must be installed in the stand prior to placing the air handler (*See Page 26, Section 8* for proper stand mounting). Place the filter section so that the outward flange is on the top side. Set the filter section into the stand. Place ½" foam tape (supplied by others) along the perimeter of the top of the flange. Place the air handler in the stand per the stand mounting instructions. *See Page 26, Section 8*.

11.7.3 Filter Section Installation (DF700 and DF700B)

To install a filter section on an upright air handler that is leg mounted, bolt the filter section to the inlet of the air handler. Rope caulk or foam tape (supplied by others) should be used around the perimeter of the mounting surface between the air handler and the filter section. Verify filters have been installed in the proper orientation. (*See Page 155, Section 21.6*) Place the air handler on the legs per the leg mounting instructions (*See Page 28, Section 9*).

SECTION 12: INLET HOOD

⚠ WARNING			
			
Crush Hazard	**Falling Hazard**	**Severe Injury Hazard**	**Cut/Pinch Hazard**
Use proper lifting equipment and practices.	**Use proper safety equipment and practices to avoid falling.**	**Use proper lifting practices and equipment.** **Equipment and accessories are heavy.**	**Wear protective gear during installation, operation and service.** **Edges are sharp.**
Failure to follow these instructions can result in death, injury or property damage.			

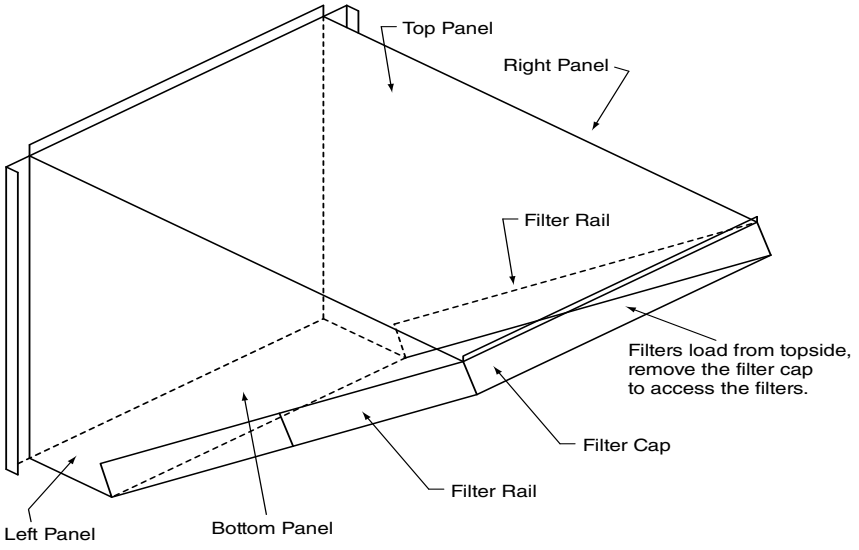
Inlet hoods are shipped unassembled and must be assembled prior to installation. The inlet hood may be installed either onto the inlet of the air handler or to an outside wall. After installing an inlet hood, all hardware must be torqued according to recommended specifications on *Page 9, Table 1*. In addition, all seams must be caulked (provided by others).

Part numbers ending with a "[W]" indicate that the part can be ordered with either an unpainted galvanized finish or a white paint finish. To order with a galvanized finish, do not include a "W" at the end of the part number; to order with a white paint finish, include a "W" at the end of the part number.

NOTE: Check to be sure that all required components are present. If any are missing, contact your ROBERTS GORDON® independent distributor.

12.1 Inlet Hood Assembly (DF40)

FIGURE 32: Inlet Hood Assembly (DF40)



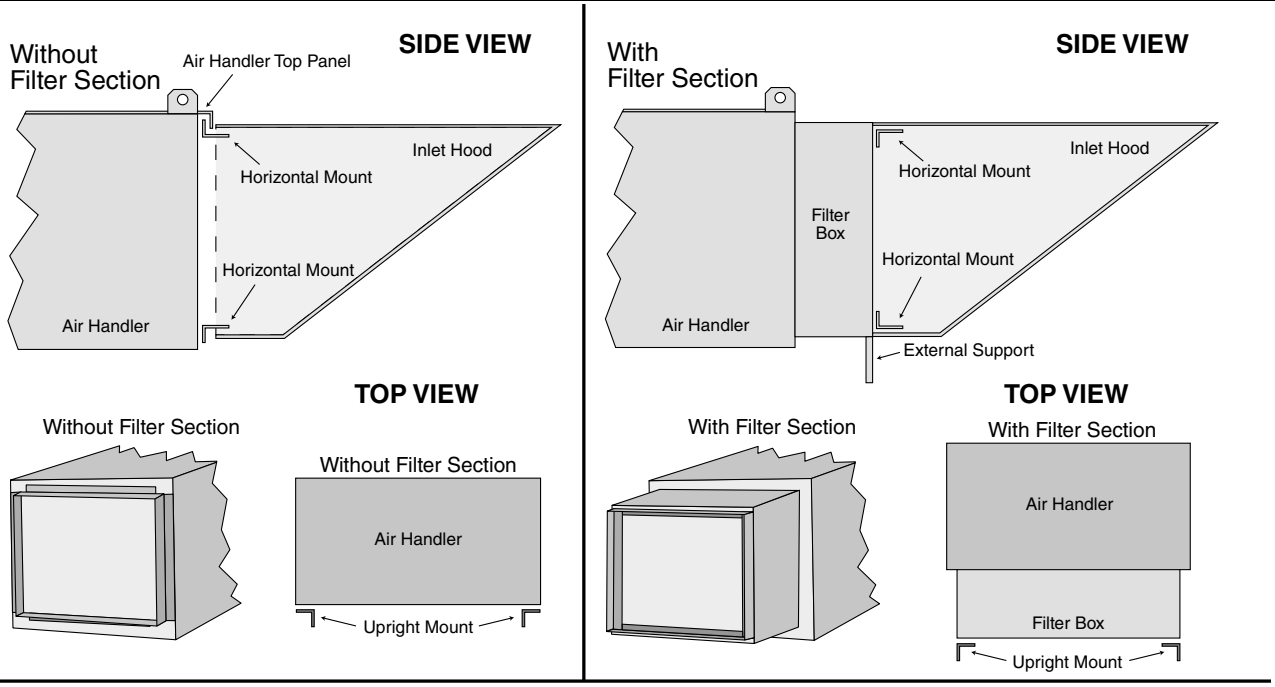
Description	Part Number	Qty.
DF40 Inlet Hood	**77030.301W**	
Top Panel	73031.002W	1
Filter Cap	73032.002W	1
Left Panel	73033.001W	1
Right Panel	73033.002W	1
Permanent Filters 20" x 25" x 2"	22628	2
10-24 x 3/4" Hex-Head, Cap-Screw Bolt	21699	18
10-24 Keps Nut	20698	18
TEK Screw	13404	8
Filter Channel	73035.002	2
Bottom Guide	73036.002	1
Bottom Panel	73034.002W	1

Note: Inlet hood is also available with screen mesh, no filters (P/N 13405059).

12.2 Inlet Hood Assembly (DF75 and DF150)

Description	Part Number	Inlet Hood with Permanent Aluminum Mesh Filters	Inlet Hood Without Filters, With Birdscreen	Inlet Hood with Moisture Limiter
		13505060 (Galvanized) 13505061 (Painted White)	13505058 (Galvanized) 13505059 (Painted White)	13505062 (Galvanized) 13505063 (Painted White)
		Quantity	Quantity	Quantity
Filter Rail Assembly	13505066	2	2	N/A
Top Inner Rail	13505068	1	1	1
Bottom Rail Assembly	13505072	1	1	N/A
Top Back Panel	13505075	1	1	1
Top Front Panel	13505076	1	1	N/A
Left Panel	13505080	1	1	1
Right Panel	13505081	1	1	1
Upright Mount	13505090	2	2	2
Horizontal Mount	13505091	2	2	2
Drip Rail	13505092	2	2	2
TEK Screw	13404	82	105	92
5/16-18 x 1 Bolt HHCS Grade 5	20507	5	5	5
5/16 Flat Washer	95211600	5	5	5
5/16 Nut Flange	20509	5	5	5
Permanent Filter 20"x20"x1"	20628	6	N/A	N/A
10-24 KEPS Nut	20698	8	8	N/A
A1 Snap Fastener	20900	6	N/A	N/A
10-24 x 1/2 HMS Bolt	27000	8	8	N/A
Fastener Rivnut 3/8-16	91120106	10	10	10
3/8 Flatwasher	20515	10	10	10
3/8-16 x 1 Bolt Hex Grade 5	20517	10	10	10
Foam Tape	92700017	14ft	14ft	14ft
Horizontal Mount for Birdscreen	13505087	N/A	2	N/A
Screen 38.75" x 59"	90740051	N/A	1	N/A
Fender Washer 1/4 x 1	95211550	N/A	12	N/A
Bottom Rail Assembly - ML	13505095	N/A	N/A	1
Top Front Panel - ML	13505096	N/A	N/A	1
Inner Support Rail - ML	13505097	N/A	N/A	1
Outer Support Rail - ML	13505098	N/A	N/A	1
Side Cover - ML	13505099	N/A	N/A	2
Moisture Limiter Media 12" x 60" x 5.5"	90740001	N/A	N/A	3

Step 12.2.1



For an air handler without a filter section: On the inlet of the air handler, install horizontal and upright mounts. The mounts will be installed via angles open towards the outside of the air handler.

For an air handler with a filter section: First, attach the filter section to the air handler. Then, bolt the inlet hood horizontal and upright mounts to the inlet of the filter section with the angles opening towards the inside of the filter section.

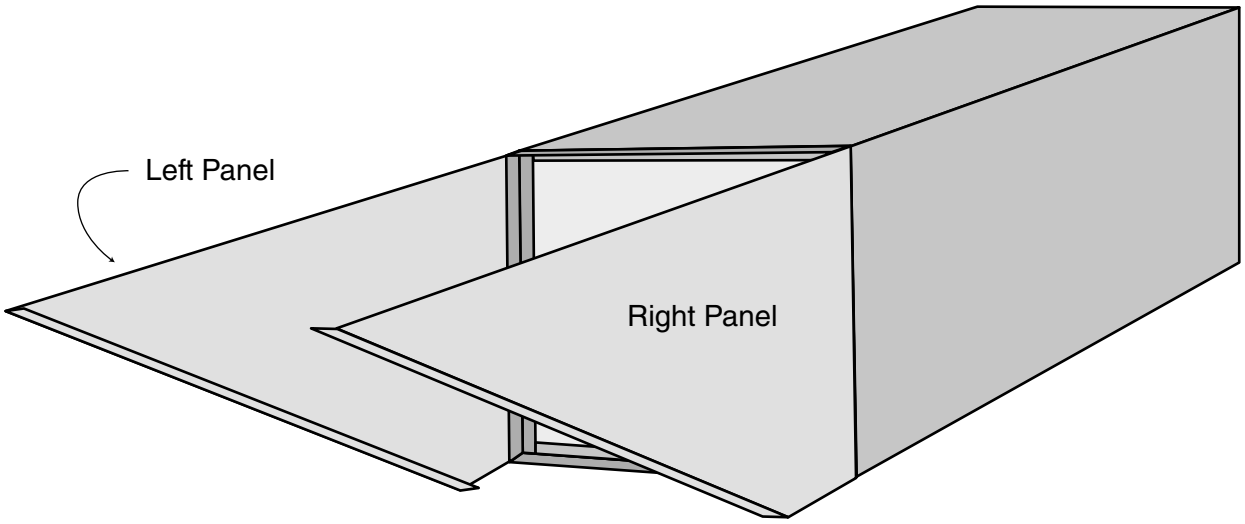
Upright mounts (P/N 13505090) are attached with five 3/8-16 bolts (P/N 20517) and flat washers (P/N 20515) each; the receiving riv-nut (P/N 91120106) will be factory installed on the air handler or filter section. Horizontal mounts (P/N 13505091) are attached using five TEK self-tapping screws (P/N 13404).

Prior to installing the mounts, seal the gap between the mating surfaces of the air handler/filter section and the mounts with the provided foam tape (P/N 92700017).

When installing the top horizontal mount directly to the air handler without a filter section, foam tape should NOT be used. In this case, the hardware on the lip of the air handler roof panel should be removed, the mount slid under the lip and hardware re-installed. Foam tape to be used on remaining three sides.

To install inlet hood on an exterior wall, drill holes every 8" (20.3cm) in the flanges of the inlet hood and mount with lag bolts (provided by others).

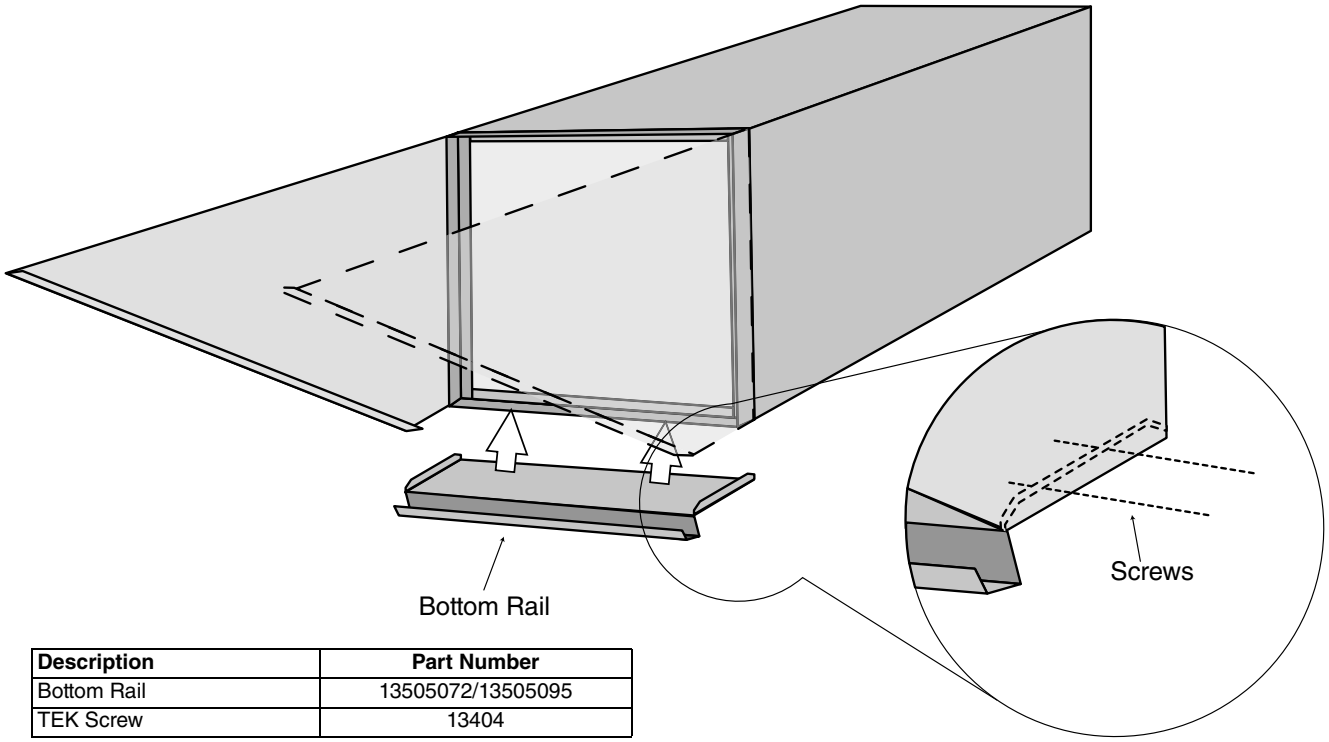
Step 12.2.2



Attach left panel and right to each side flange of the air handler/filter section using five TEK self-tapping screws. Ensure that the flanges on the panels break inward.

Description	Part Number
Left Panel	13505080
Right Panel	13505081
TEK Screw	13404

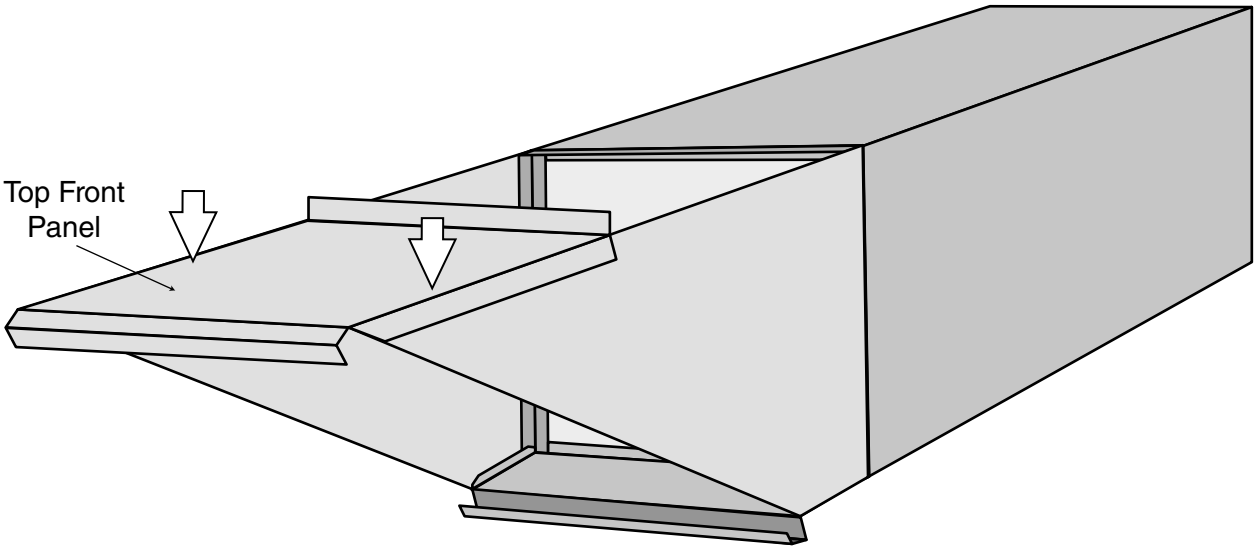
Step 12.2.3



Description	Part Number
Bottom Rail	13505072/13505095
TEK Screw	13404

Attach the bottom panel to the bottom attaching flange with five TEK self-tapping screws and to each side panel with two TEK self-tapping screws. Ensure that the side tabs of the bottom panel are to the inside of the side panels.

Step 12.2.4

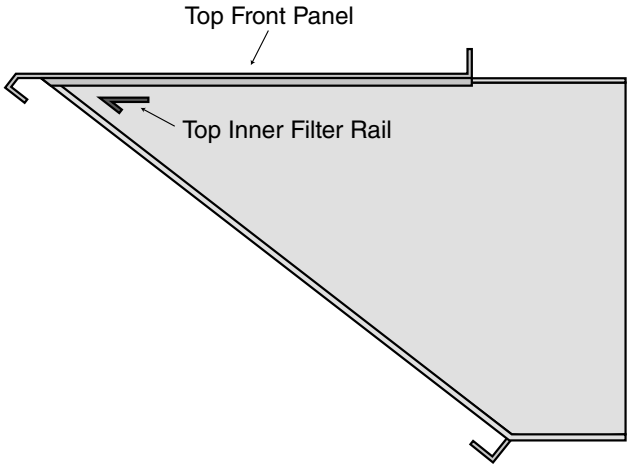


Attach top front panel to the sidewall panels using four TEK self-tapping screws on each side. Ensure that the side tabs of the top panel are to the outside of the side panels.

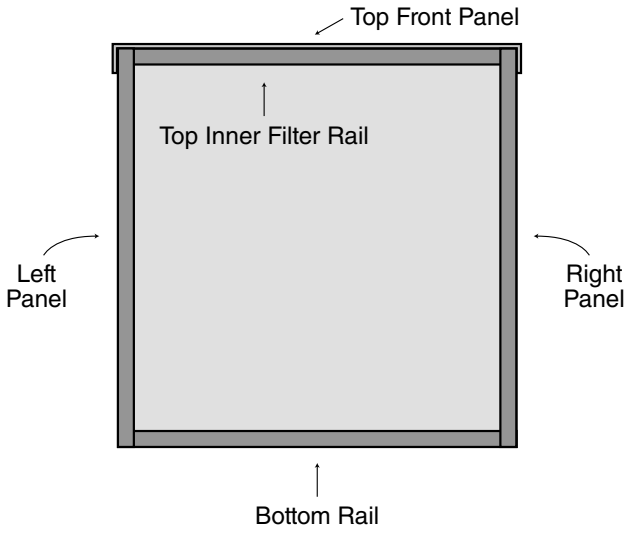
Description	Part Number
Top Front Panel	13505076/13505096
TEK Screw	13404

Step 12.2.5

SIDE VIEW



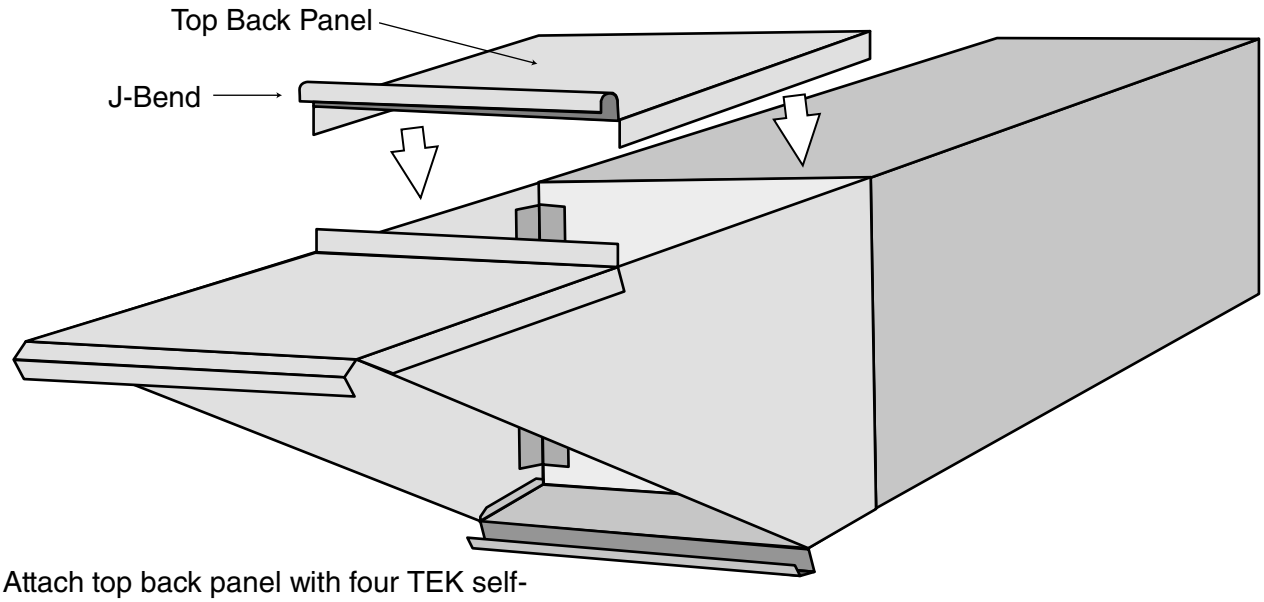
REVERSE INLET VIEW



Description	Part Number
Top Inner Filter Rail	13505068
TEK Screw	13404

Attach the top inner filter rail to the inside of the front top panel using four TEK self tapping screws. Ensure that the rail is installed with the ends tight against the flanges of the sidewall panels and the angle opening toward the inside of the inlet hood.

Step 12.2.6



Attach top back panel with four TEK self-tapping screws on each side, with five TEK self-tapping screws to the top attaching flange and with five 5/16-18x1 hex head cap screws, 5/16 washers and 5/16 flange nuts at the J-bend joint. Ensure that the side tabs of the roof panel are to the outside of the side panels and that the J-bend interlocks with the front roof panel.

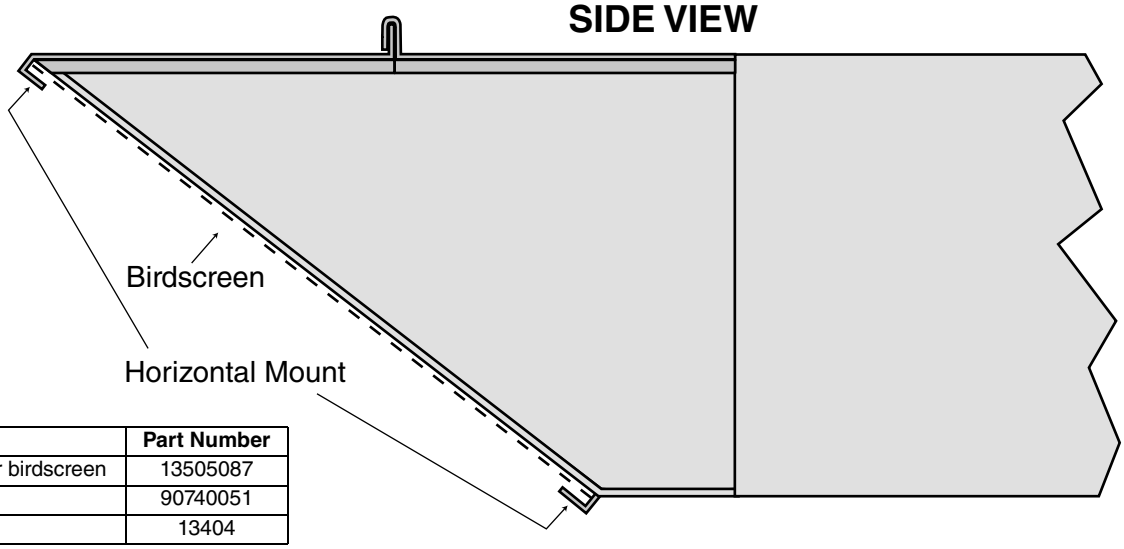
Description	Part Number
Top Back Panel	13505075
TEK Screw	13404
5/16-18x1 Hex Head Cap Screw	20507
5/16 Washer	95211600
5/16 Flange Nut	20509

For inlet hoods with permanent aluminum mesh filters, continue to step 12.2.8

For inlet hoods with birdscreen, no filters, continue to step 12.2.7

For inlet hoods with moisture limiter, continue to step 12.2.9

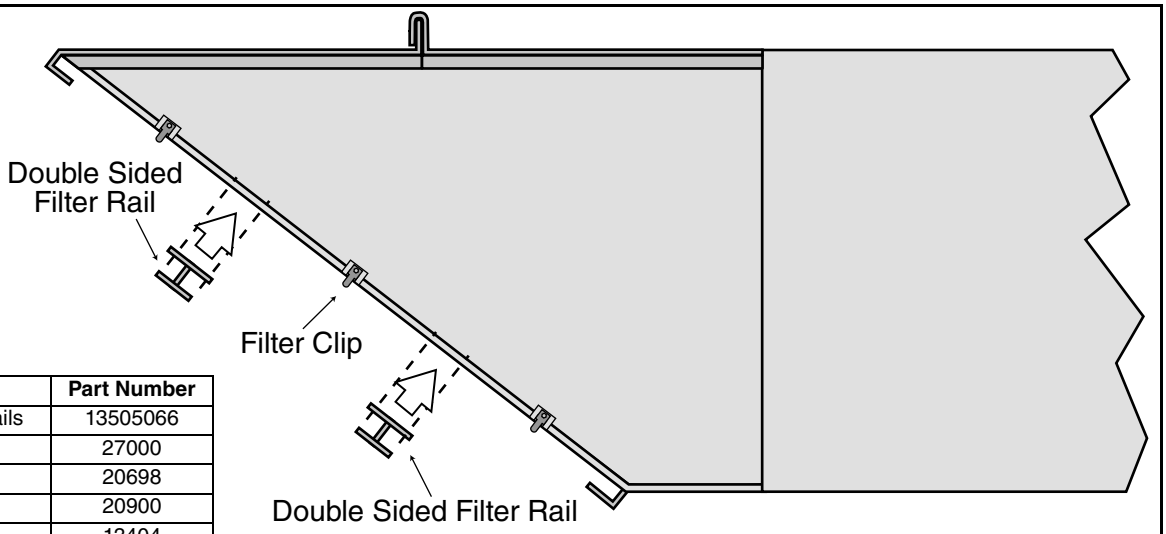
Step 12.2.7



Description	Part Number
Horizontal mount for birdscreen	13505087
Screen	90740051
TEK Screw	13404

Install horizontal mounting brackets for birdscreen on to face of inlet hood. Mount birdscreen with brackets and secure with self tapping screws and washers.

Step 12.2.8

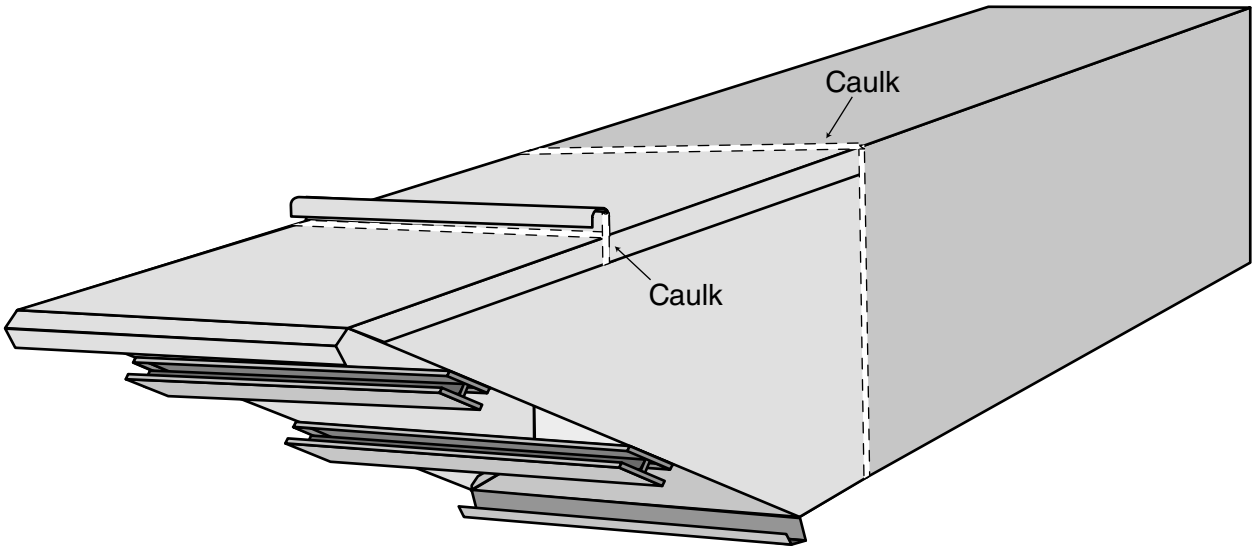


Description	Part Number
Double-Sided Filter Rails	13505066
#10-24 x 1/2" Bolt	27000
#10-24 Nut	20698
Snap Fastener	20900
TEK Screw	13404

Attach the double-sided filter rails horizontally to the face of the inlet hood using two #10-24 X ½" bolts and #10-24 nuts on each side. When attaching the filter rails, insert the bolt from the inside of the filter rail to allow for maximum clearance for the filters. Attach the snap fastener with one TEK self-tapping screw each. (First remove the washer as the washer will restrict the snap fastener, making it difficult to open.)

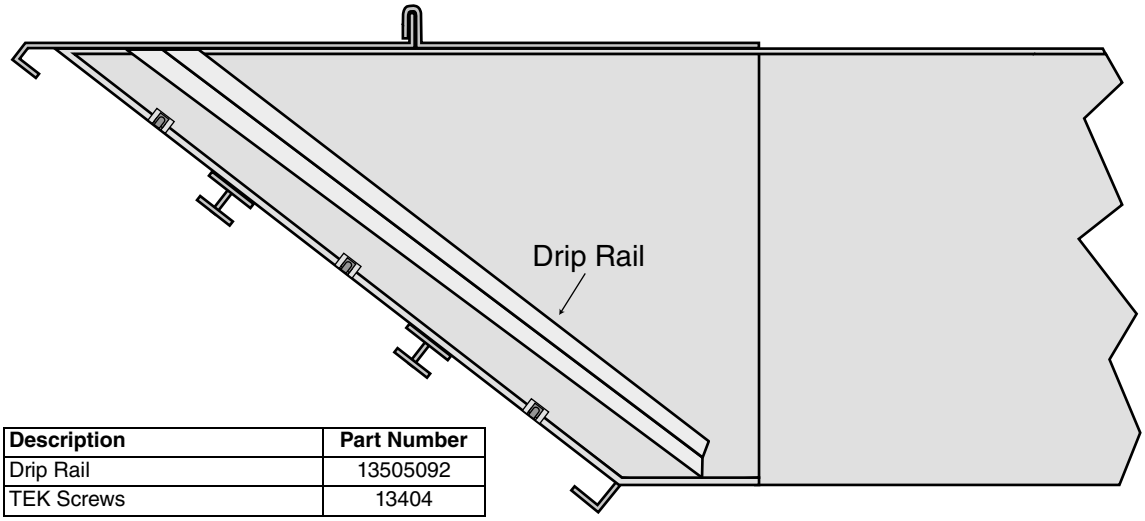
NOTE: Inlet hood with birdscreen does not require filters or snap fasteners.

Step 12.2.9



Caulk the seams between the inlet hood and the air handler/filter section and on the open sides of the J-bend that lock the roof panels together.

Step 12.2.10



Description	Part Number
Drip Rail	13505092
TEK Screws	13404

Attach drip rail to each side using five TEK self-tapping screws for each drip rail. Ensure that the drip rails are positioned above the filter clips (where applicable), using the provided holes in the sidewall panels. Apply caulk to the drip rails before attaching to the side panels.

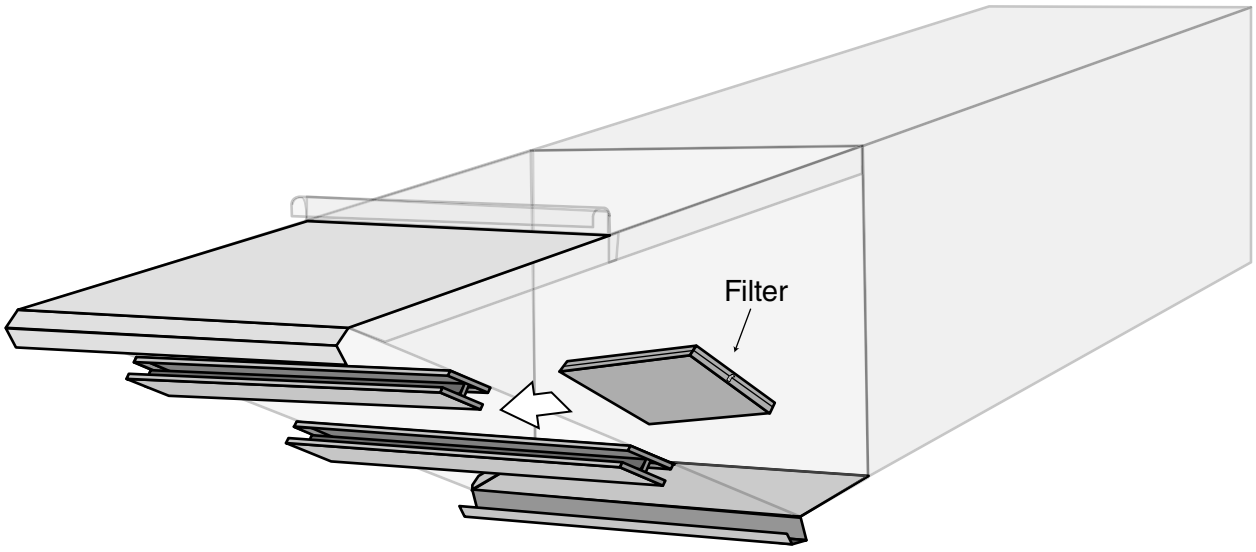
NOTE: Double sided filter rails or snap fasteners are not required for inlet hood with moisture limiter.

For inlet hoods with permanent aluminum mesh filters, continue to step 12.2.11

For inlet hoods with birdscreen, no filters, the instructions end here.

For inlet hoods with moisture limiter, continue to step 12.2.12

Step 12.2.11

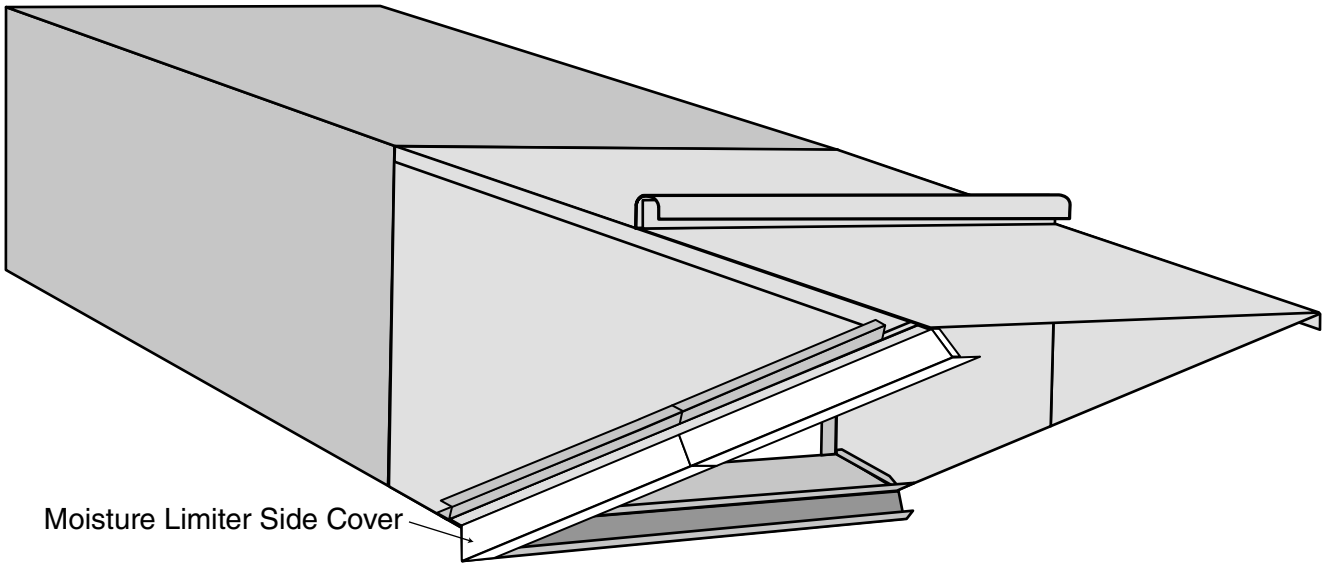


Description	Size		Part Number
Permanent Aluminum Mesh Filter	in	20 x 20 x 1	20628
	cm	50.8 x 50.8 x 2.5	

Load filters into the inlet hood, checking to see that each filter is in the proper orientation by verifying that the arrow on the side of the filter points in the direction of air flow. All of the arrows should be pointing towards the air handler when installed in the proper orientation. Once filters are installed, close filter clips installed previously (*See Page 58, Step 12.2.9*) to hold filters in place.

For inlet hoods with permanent alumimum mesh filters the instructions end here.

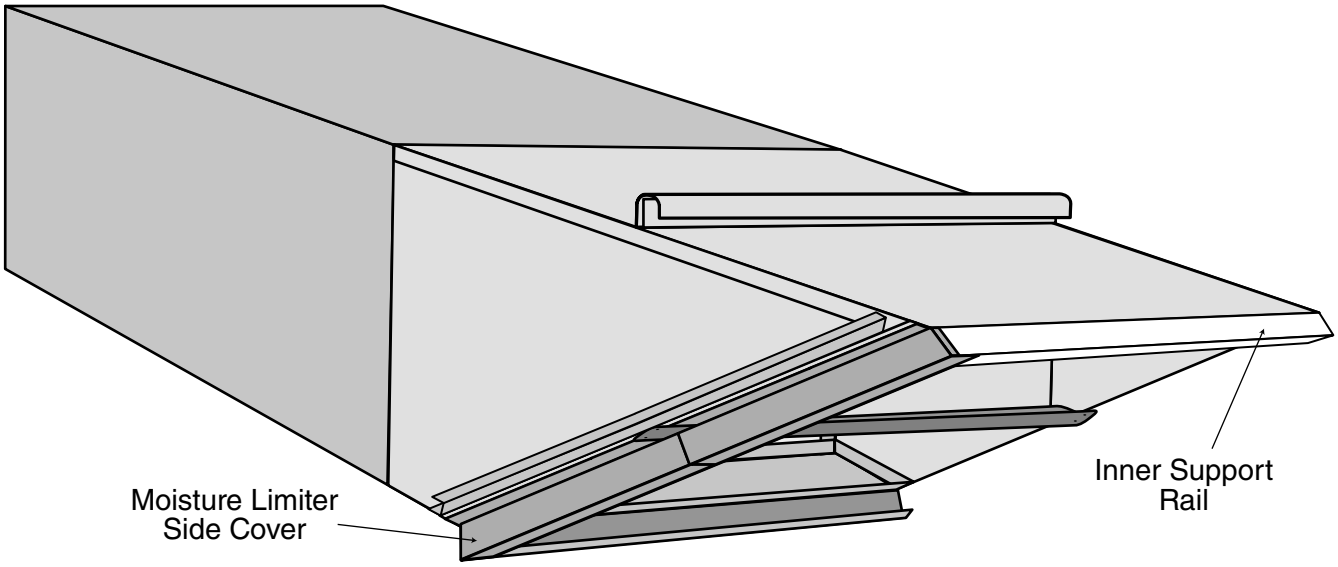
Step 12.2.12



Description	Part Number
Side Cover (ML)	13505099
TEK Screw	13404
#10-24x½" Bolt	27000
#10-24 Nut	26098

Attach side cover of moisture limiter frame to the left side of the inlet hood rain gutter using eight TEK screws. Attach to the bottom pan assembly with two #10-24x½" bolts and #10-24 nuts.

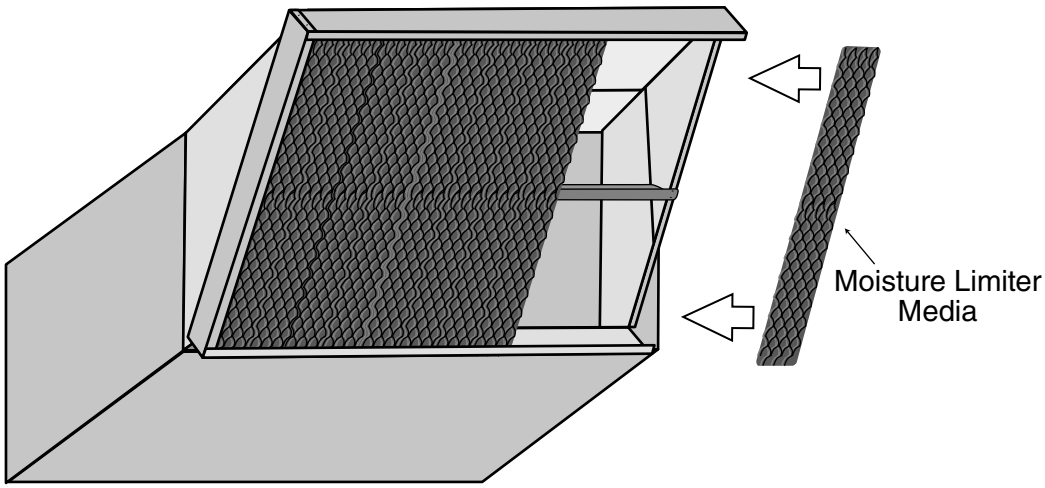
Step 12.2.13



Description	Part Number
Inner Support Rail	13505097
TEK Screw	13404
#10-24x½" Bolt	27000
#10-24 Nut	26098

Place the moisture limiter inner support rail under the top flange of the moisture limiter frame side cover and to the top of the inlet hood. Attach to the top of the inlet hood using nine #10-24x½" bolts and nine #10-24 nuts. Attach to the left side of the frame using two #10-24x½" bolts and two #10-24 nuts.

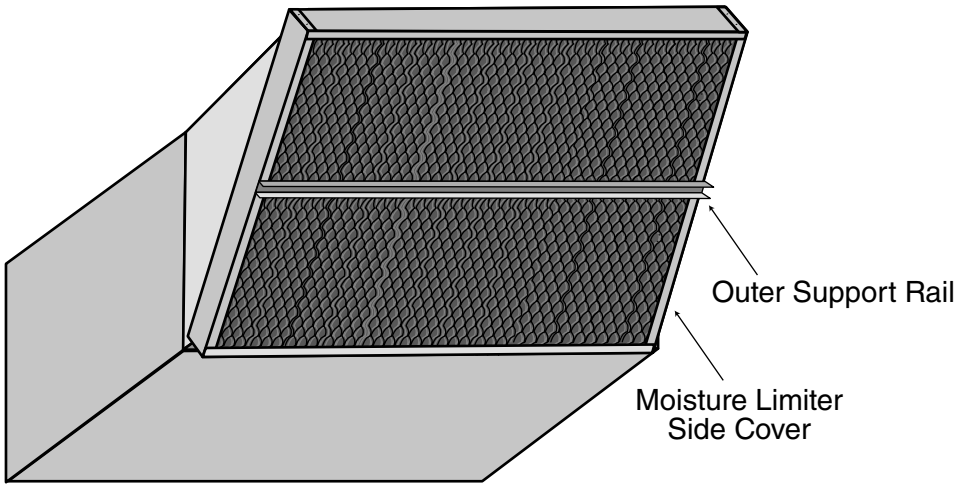
Step 12.2.14



Insert the 3 pieces of 12" (30.5cm) x 60" (152.4cm) moisture limiter media from the right side with the long dimension running top to bottom.

Description	Part Number
Moisture Limiter Media	90740001

Step 12.2.15



Place the moisture limiter frame side cover in order to have the flange at the top overlap the top of the frame. Attach to the inlet hood rain gutter using eight TEK screws. Attach to the bottom pan assembly and top with two #10-24x½" bolts and #10-24 nuts each. Attach front stiffeners to the left and right side of the moisture limiter frame using four TEK screws for each support.

Description	Part Number
Side Cover (ML)	13505099
Outer Support Rail	13505098
TEK Screw	13404
#10-24x1/2" Bolt	27000
#10-24 Nut	26098

12.3 Inlet Hood Assembly (DF270 and DF410)

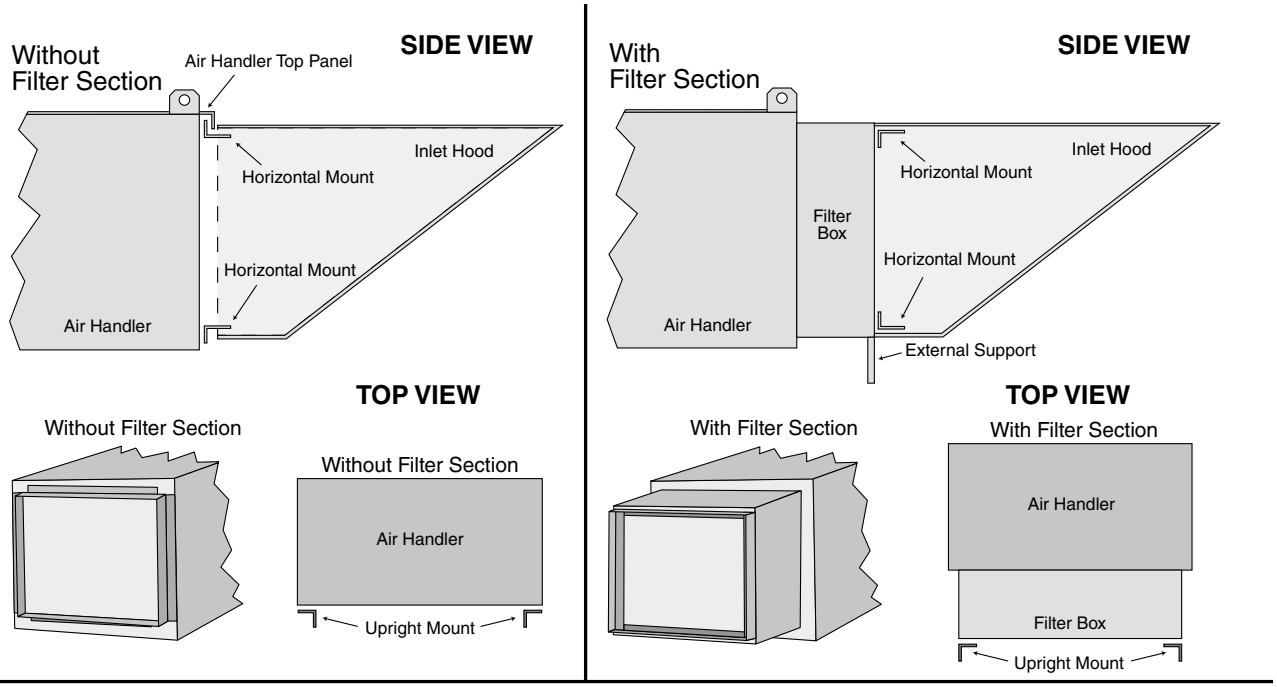
Description	Model	Inlet Hood with Permanent Aluminum Mesh Filters	Inlet Hood without filters, with Birdscreen	Inlet Hood with Moisture Limiter
	DF270	13205060 (Galvanized) 13205061 (Painted White)	13205058 (Galvanized) 13205059 (Painted White)	13205062 (Galvanized) 13205063 (Painted White)
	DF410	13305060 (Galvanized) 13305061 (Painted White)	13305058 (Galvanized) 13305059 (Painted White)	13305062 (Galvanized) 13305063 (Painted White)
	Part Number	Quantity	Quantity	Quantity
Double Sided Filter Rails	13X05066	4	4	N/A
Top Inner Filter Rail	13X05068	1	1	1
Bottom Rail	13X05072	1	1	N/A
Top Back Panel #1	13X05075	1	1	1
Top Middle Panel #2	13X05076	1	1	1
Top Front Panel #3	13X05077	1	1	N/A
Left Side Panel #1	13X05080	1	1	1
Right Side Panel #1	13X05081	1	1	1
Left Side Panel #2	13X05082	1	1	1
Right Side Panel #2	13X05083	1	1	1
Left Side Panel #3	13X05084	1	1	1
Right Side Panel #3	13X05085	1	1	1
Upright Mount	13X05090	2	2	2
Horizontal Mount	13X05091	2	DF270=6 / DF410=2	2
Drip Rail Upper Right	13305092	1	1	1
Drip Rail Upper Left	13305093	1	1	1
Drip Rail Lower Right	13305094	1	1	1
Drip Rail Lower Left	13305095	1	1	1
TEK Screw	13404	150	DF270=165 / DF410=175	DF270=152 / DF410=162
5/16"-18 x 1 Bolt HHCS Grade 5	20507	26	26	26
3/8" Flatwasher	20515	14	14	14
3/8"-16 x 1 Bolt Hex Grade 5	20517	14	14	14
5/16" Flat Washer	95211600	26	26	26
5/16" Nut Flange	20509	26	26	26
Permanent Aluminum Mesh Filter 20" x 25" x 1"	20629	DF270=10 / DF410=5	N/A	N/A
Permanent Aluminum Mesh Filter 20" x 20" x 1"	20628	DF270=0 / DF410=10	N/A	N/A
10-24 KEPS Nut	20698	16	16	16
A1 Snap Fastener	20900	10	N/A	N/A
10-24 x 1/2" HMS Bolt	27000	16	16	16
Fastener Rivnut 3/8"-16	91120106	14	14	14
Foam Tape	92700017	20’ (6m)	20’ (6m)	20’ (6m)
Birdscreen	9074005X	N/A	1	N/A
Birdscreen Mount*	13305087*	N/A	4*	N/A
Fender Washer 1/4" x 1"	95211550	N/A	16	N/A
Bottom Rail - ML**	######**	N/A	N/A	1
Left Side Cover - ML	13X05078	N/A	N/A	2
Right Side Cover - ML	13X05079	N/A	N/A	2
Top Front Panel #3 - ML	13X05096	N/A	N/A	1
Inner Rail - ML	13X05097	N/A	N/A	1
Outer Rail - ML	13X05098	N/A	N/A	1
Moisture Limiter 12" x 96" x 5.5"	90740002	N/A	N/A	DF270=4 / DF410=5

*For use on model DF410 Inlet Hoods only.

**For model DF270 P/N=13205095; for model DF410 P/N=13305100

Note: In the above chart, an "X" in a part number indicates a digit that changes based on model. Replace the "X" with a "2" for model DF270; replace the "X" with a "3" for model DF410. For further clarification, reference individual chart of components in each step.

Step 12.3.1



For an air handler without a filter section: On the inlet of the air handler, install horizontal and upright mounts. The mounts will be installed via angles open towards the outside of the air handler.

For an air handler with a filter section: First, attach the filter section to the air handler. Then, bolt the inlet hood horizontal and upright mounts to the inlet of the filter section with the angles opening towards the inside of the filter section.

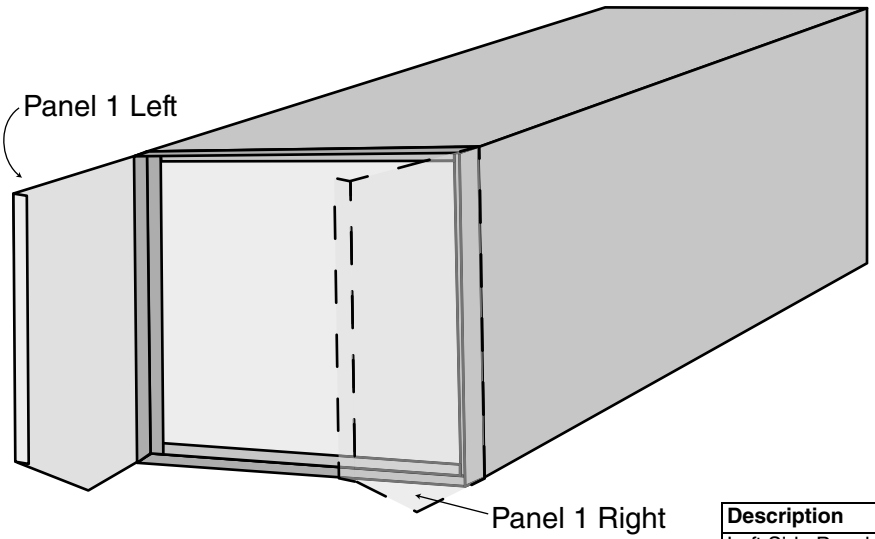
Upright mounts (P/N 13X05090) are attached with seven 3/8-16 bolts (P/N 20517) and flat washers (P/N 20515) each; the receiving riv-nut (P/N 91120106) will be factory installed on the air handler or filter section. Horizontal mounts (P/N 13505091) are attached using nine TEK self-tapping screws (P/N 13404).

Prior to installing the mounts, seal the gap between the mating surfaces of the air handler/filter section and the mounts with the provided foam tape (P/N 92700017).

When installing the top horizontal mount directly to the air handler without a filter section, foam tape should NOT be used. In this case, the hardware on the lip of the air handler roof panel should be removed, the mount slid under the lip and hardware re-installed. Foam tape to be used on remaining three sides.

To install inlet hood on an exterior wall, drill holes every 8" (20.3cm) in the flanges of the inlet hood and mount with lag bolts (provided by others).

Step 12.3.2

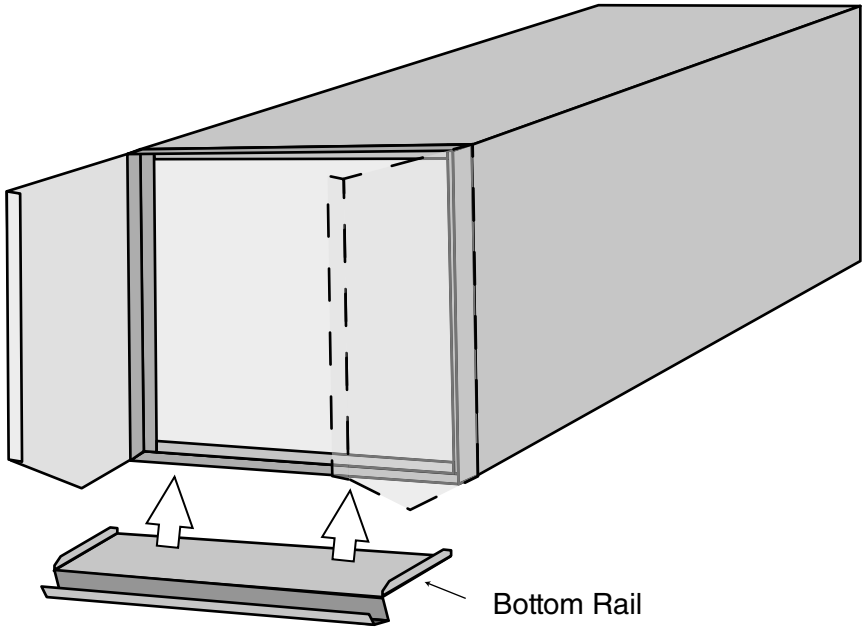


Description	Part Number
Left Side Panel #1	13205080 / 13305080
Right Side Panel #1	13205081 / 13305081
TEK Screws	13404

Attach an innermost sidewall panel 1 to each side attaching flange using seven TEK self-tapping screws.

NOTE: Flanges face inward.

Step 12.3.3



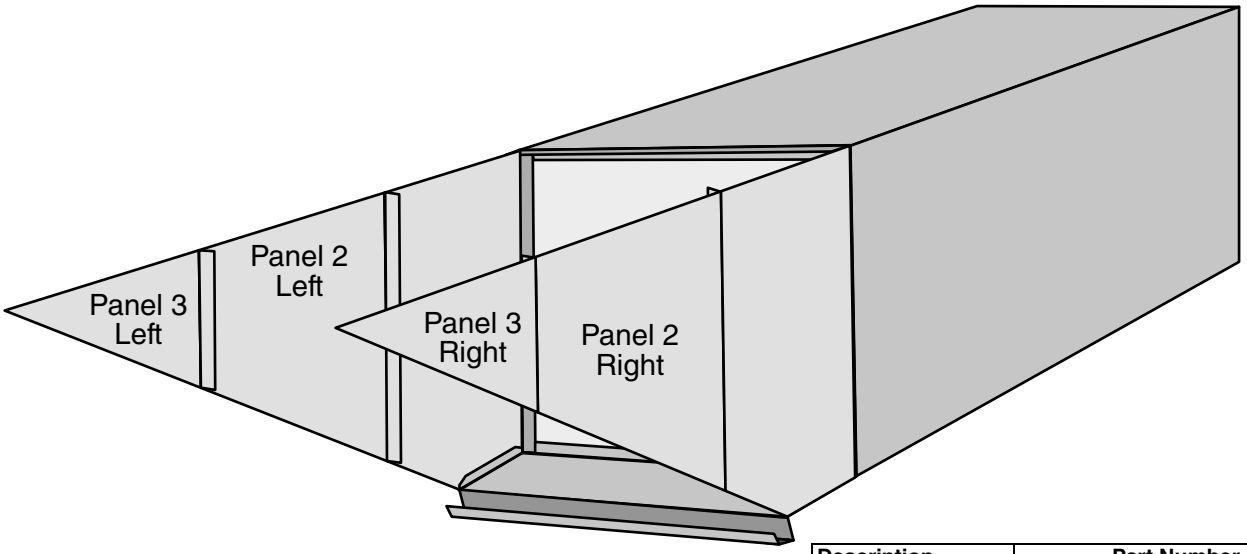
For Model DF270: Attach the bottom panel to the bottom mounting flange with seven TEK self-tapping screws. Attach to each side panel with two TEK self-tapping screws.

For Model DF410: Attach bottom panel to the bottom mounting flange with nine TEK self-tapping screws. Attach to each side panel with two TEK self-tapping screws.

NOTE: Ensure that the side tabs of the bottom panel are to the inside of the side panels.

Description	Part Number
Bottom Rail	13205072 / 13305072 / 13205095 / 13305100
TEK Screws	13404

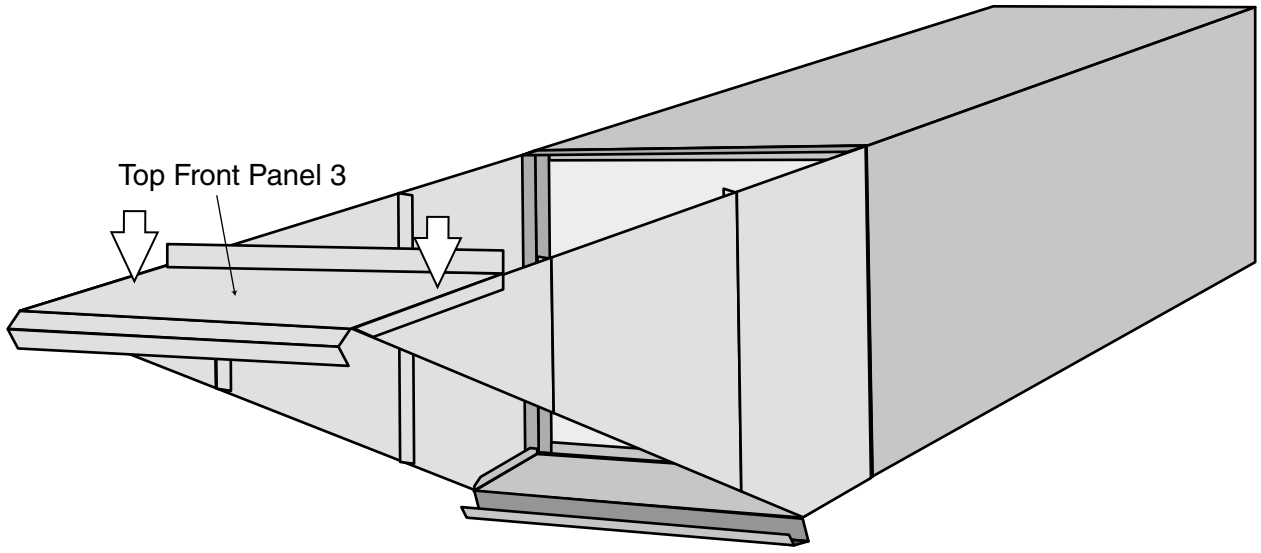
Step 12.3.4



Description	Part Number
Left Side Panel #2	13205082 / 13305082
Right Side Panel #2	13205083 / 13305083
Left Side Panel #3	13205084 / 13305084
Right Side Panel #3	13205085 / 13305085
5/16"-18x1 Bolt	20507
5/16" Flat Washer	95211600
5/16" Nut Flange	20509

Attach the middle sidewall panels (left panel, right panel) with four 5/16"-18x1 bolt, 5/16 flat washer, 5/16" flange nut each. Attach outermost sidewall panels (left panel, right panel) to each side of the inlet hood using three 5/16"-18x1 bolt, 5/16" flat washer, 5/16" flange nut.

Step 12.3.5

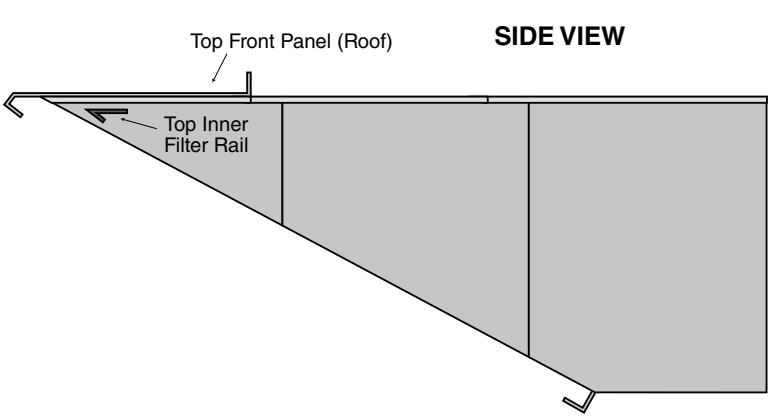


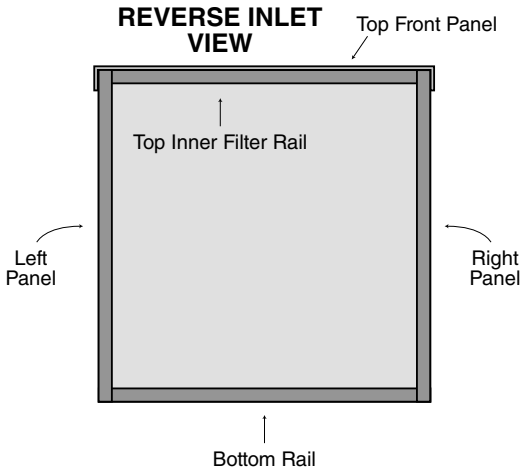
Description	Part Number
Top Front Panel #3	13205077 / 13305077 / 13205096 / 13305096
TEK Screw	13404

Attach top front panel to the sidewall panels using four TEK self-tapping screws on each side.

NOTE: Ensure that the side tabs of the top panel are to the outside of the side panels.

Step 12.3.6





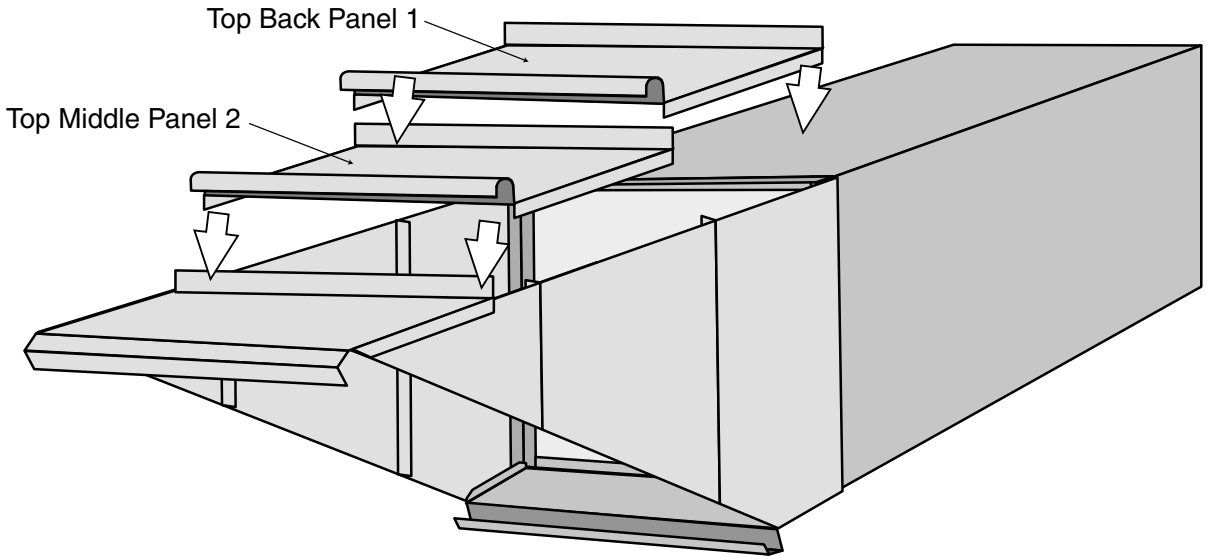
For Model DF270: Attach top inner filter rail to the inside of the top front panel using five TEK self tapping screws.

For Model DF410: Attach top inner filter rail to the inside of the top front panel using six TEK self tapping screws.

NOTE: Ensure the rail is installed with the ends tight against the flanges of the sidewall panels and the angle opening toward the inside of the inlet hood.

Description	Part Number
Top Inner Filter Rail	13205068 / 13305068
TEK Screw	13404

Step 12.3.7



Attach top middle panel with five TEK self-tapping screws on each side and with six 5/16-18x1 bolts, 5/16 washers and 5/16 flange nuts at the J-bend joint.

For Model DF270: Attach top back panel with five TEK self-tapping screws on each side, seven TEK self-tapping screws to the top mounting flange and with six 5/16-18x1 bolts, 5/16 washers and 5/16 flange nuts at the J-bend joint.

For Model DF410: Attach top back panel with five TEK self-tapping screws on each side, nine TEK self-tapping screws to the top mounting flange and with six 5/16-18x1 bolts, 5/16 washers and 5/16 flange nuts at the J-bend joint.

NOTE: Ensure that the side tabs of the roof panels are to the outside of the side panels and that the J-bends interlock the panel with the roof panel in front of it.

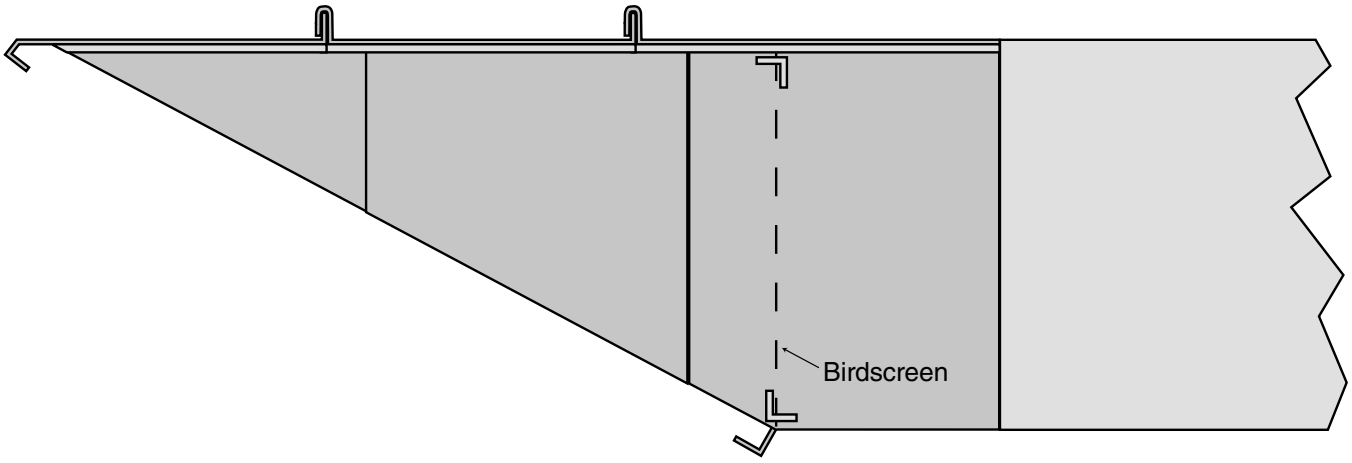
Description	Part Number
Top Middle Panel #2	13205076 / 13305076
Top Back Panel #1	13205075 / 13305075
TEK Screw	13404
5/16"-18x1 Bolt	20507
5/16" Flat Washer	95211600
5/16" Nut Flange	20509

For inlet hoods with permanent aluminum mesh filters, continue to *Step 12.3.9*

For inlet hoods with birdscreen, no filters, continue to *Step 12.3.8*

For inlet hoods with moisture limiter, continue to *Step 12.3.10*

Step 12.3.8

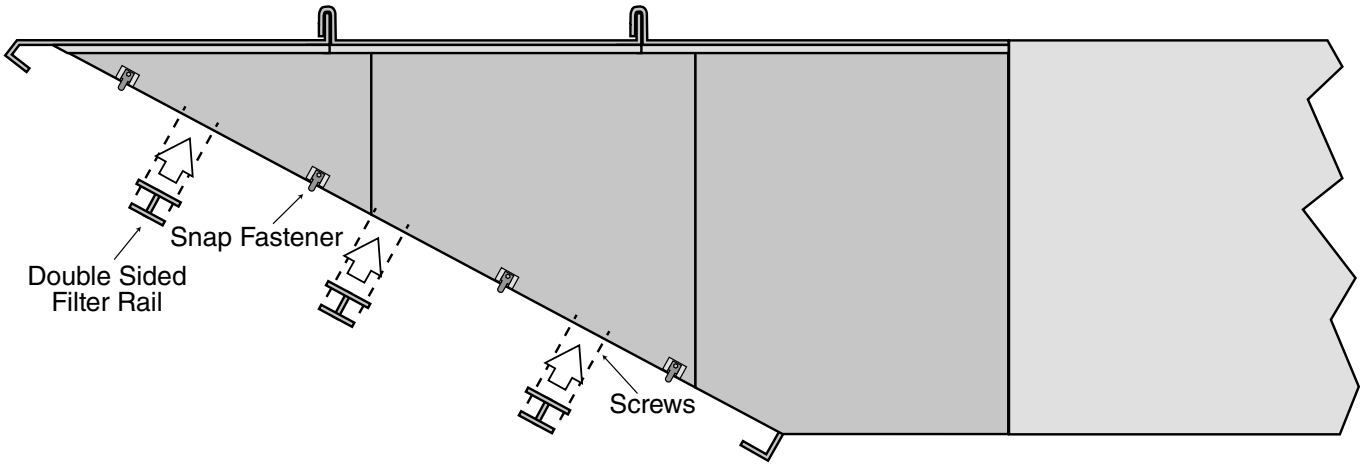


Install birdscreen mounts into inlet hood opening. Mount birdscreen into brackets and secure with self tapping screws and washers.

*For Model DF410 only.

Description	Part Number
Birdscreen	90740052 / 90740053
Birdscreen Mount	13205091 / 13305087*
Fender Washer	95211550
TEK Screw	13404

Step 12.3.9

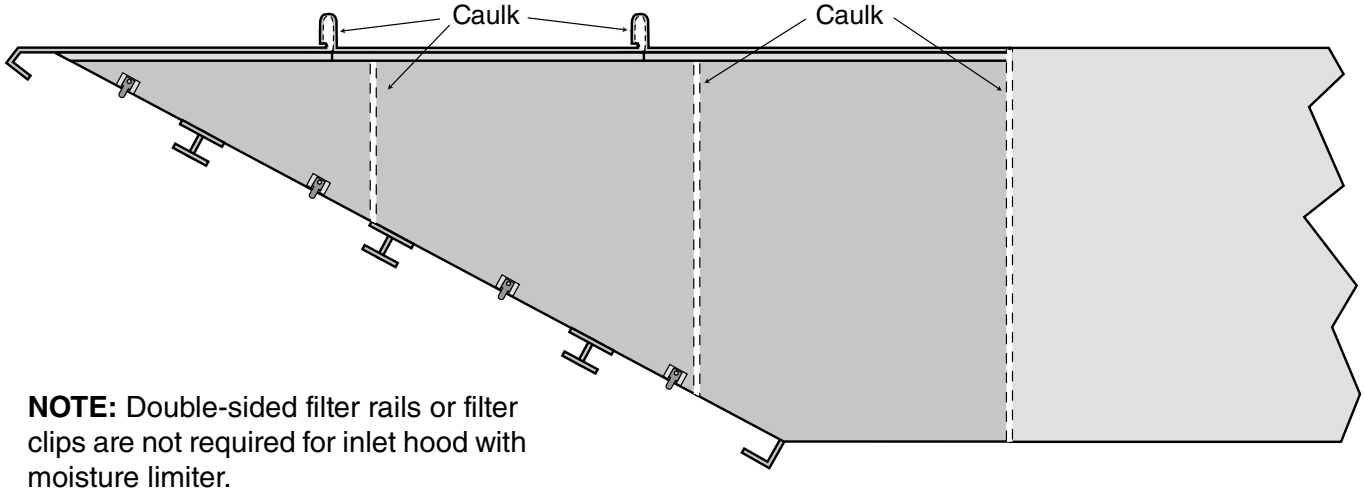


Attach the double-sided filter rails horizontally to the face of the inlet hood using two #10-24x½" bolts and #10-24 nuts on each side. When attaching the filter rails, insert the bolt from the inside of the filter rail to allow for maximum clearance for the filters. Attach the filter clips with TEK self-tapping screws. (First remove the washer as the washer will restrict the filter clip, making it difficult to open.)

NOTE: Inlet hoods with birdscreen does not require filters or snap fasteners.

Description	Part Number
Double-Sided Filter Rails	13205066 / 13305066
#10-24x½" Bolt	27000
#10-24 Nut	20698
TEK Screw	13404
A1 Snap Fastener	20900

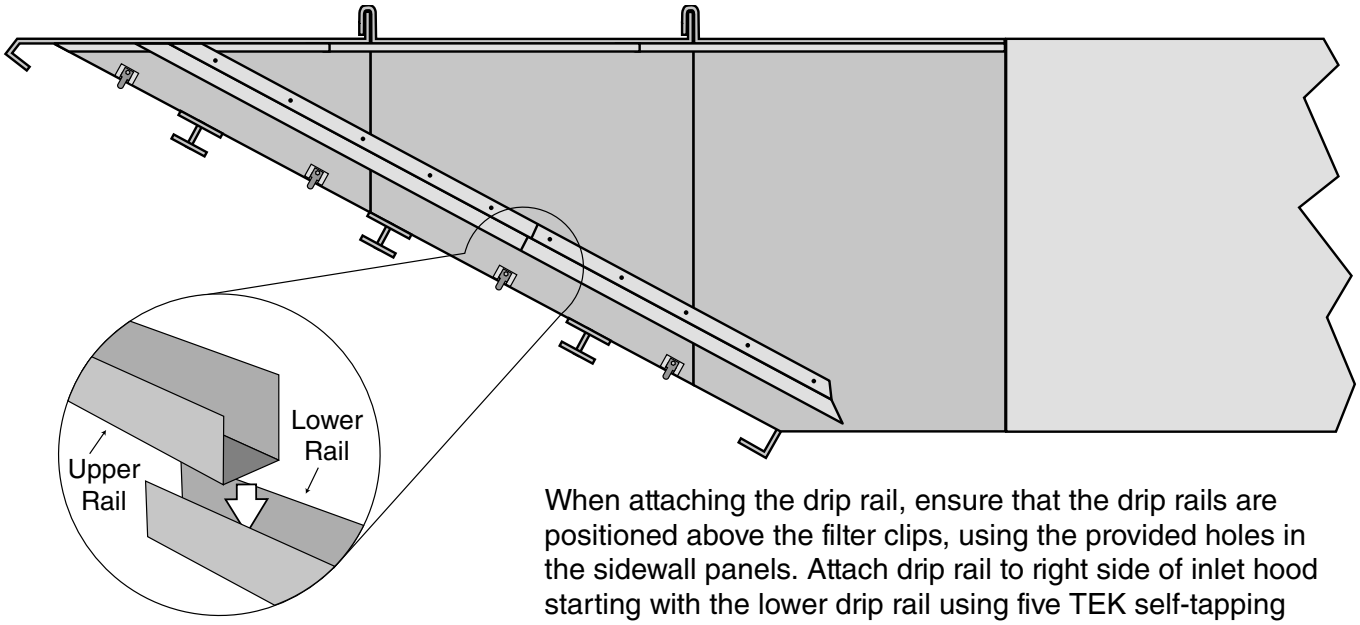
Step 12.3.10



NOTE: Double-sided filter rails or filter clips are not required for inlet hood with moisture limiter.

Caulk the seams between the inlet hood and the air handler/filter section and on the open sides of the J-bends that lock the roof panels together.

Step 12.3.11



When attaching the drip rail, ensure that the drip rails are positioned above the filter clips, using the provided holes in the sidewall panels. Attach drip rail to right side of inlet hood starting with the lower drip rail using five TEK self-tapping screws. Attach the upper right side rail by sliding it inside the lower drip rail where they overlap use five TEK self-tapping screws. Attach drip rail to left side of inlet hood starting with the lower drip rail using five TEK self-tapping screws. Attach the upper right side drip rail by sliding it inside the lower drip rail where they overlap use five TEK self-tapping screws. Apply caulk to the drip rails before attaching to the side panels.

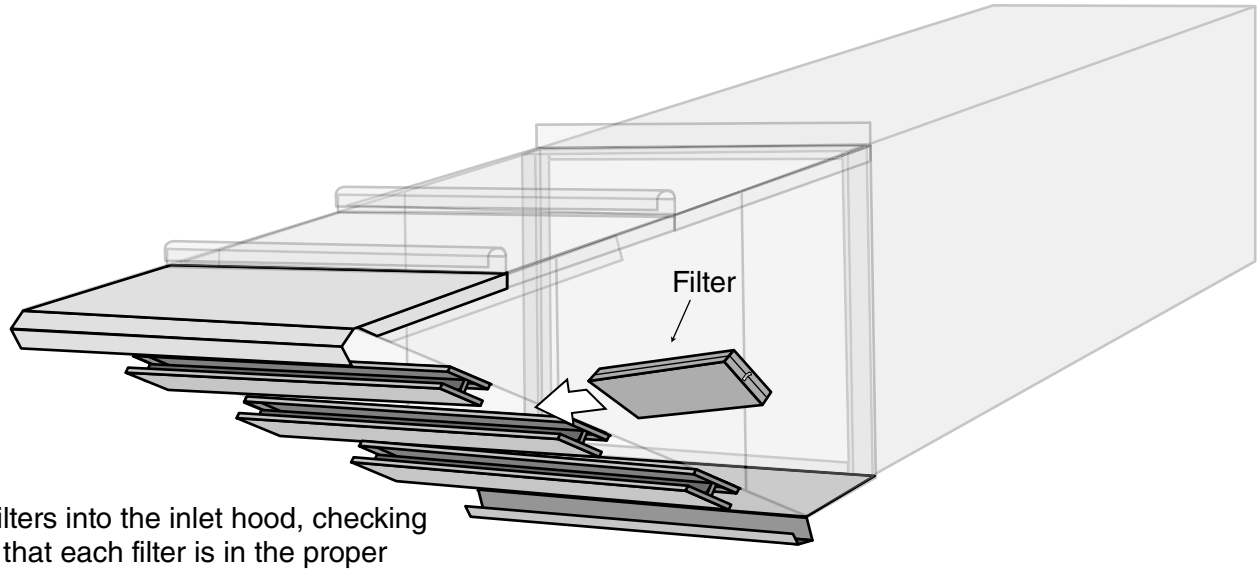
Description	Part No.
Drip Rail Upper Right	13305092
Drip Rail Upper Left	13305093
Drip Rail Lower Right	13305094
Drip Rail Lower Left	13305095
TEK Screw	13404

For inlet hoods with permanent aluminum mesh filters, continue to *Step 12.3.12*

For inlet hoods with birdscreen, no filters, the instructions end here.

For inlet hoods with moisture limiter, continue to *Step 12.3.13*

Step 12.3.12

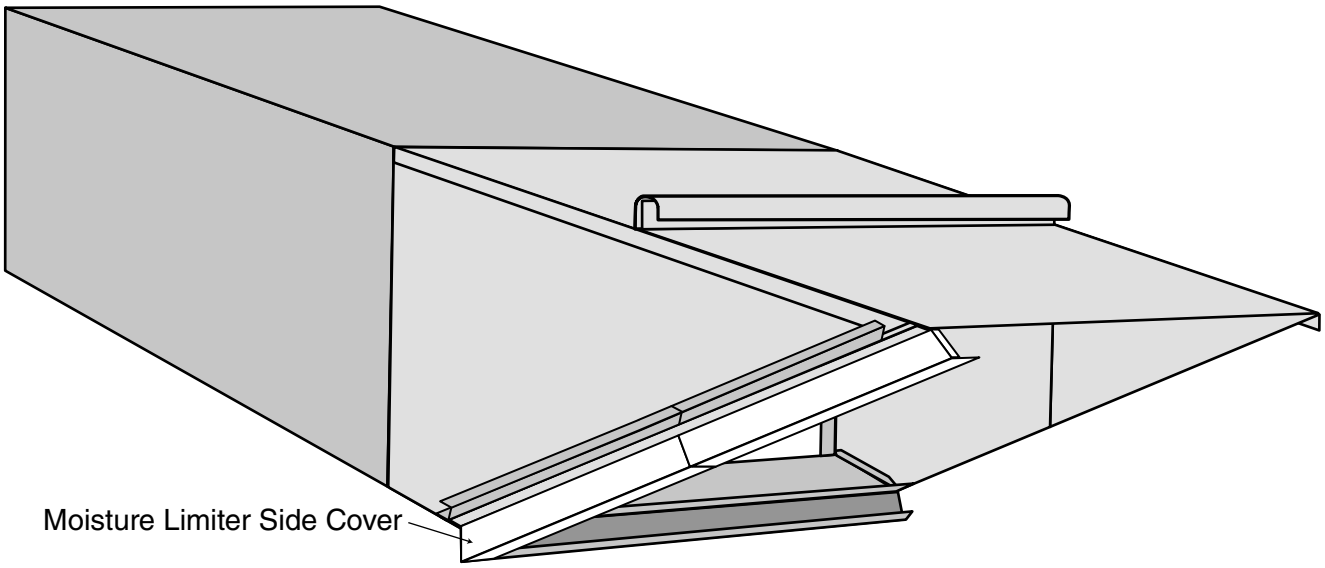


Load filters into the inlet hood, checking to see that each filter is in the proper orientation by verifying that the arrow on the side of the filter points in the direction of air flow. All of the arrows should be pointing towards the air handler when installed in the proper orientation. Once filters are installed, close snap fasteners installed previously (*See Page 68, Step 12.3.9*) to hold filters in place.

Description	Size		Part Number
Permanent Aluminum Mesh Filter	in	20 x 25 x 1	20629
	cm	50.8 x 63.5 x 2.5	
	in	20 x 20 x 1	20628
	cm	50.8 x 50.8 x 2.5	

For inlet hoods with permanent aluminum mesh filters, the instructions end here.

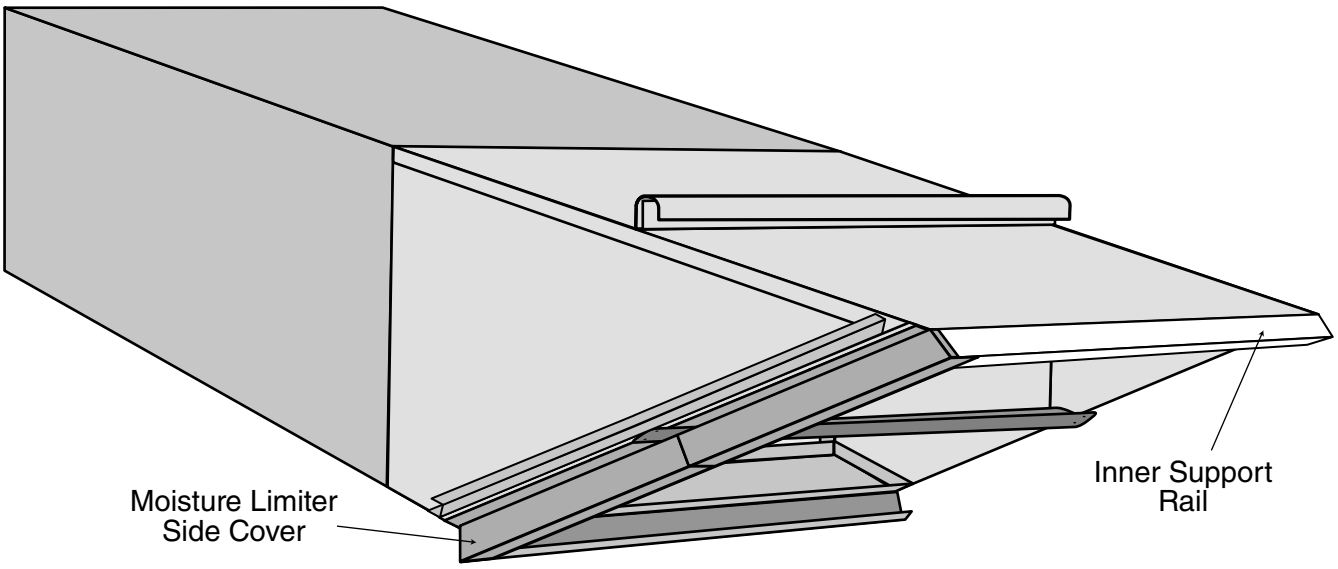
Step 12.3.13



Attach side cover of moisture limiter frame to the left side of the inlet hood drip rail using eight TEK screws. Attach to the bottom pan assembly with two #10-24x½" bolts and #10-24 nuts.

Description	Part Number
Left Side Cover (ML)	13205078 / 13305078
TEK Screw	13404

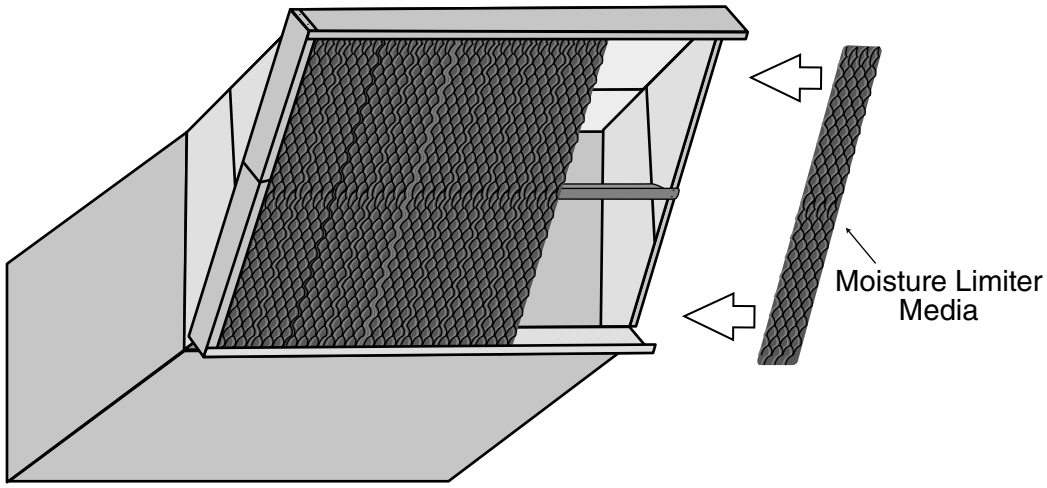
Step 12.3.14



Place the moisture limiter inner support rail under the top flange of the moisture limiter frame side cover and to the top of the inlet hood. Attach to the top of the inlet hood using nine #10-24x½" bolts and #10-24 nuts. Attach to the side cover of the frame using two #10-24x½" bolts and #10-24 nuts.

Description	Part Number
Inner Support Rail	13205097 / 13305097
TEK Screw	13404
#10-24x1/2" Bolt	27000
#10-24 Nut	26098

Step 12.3.12

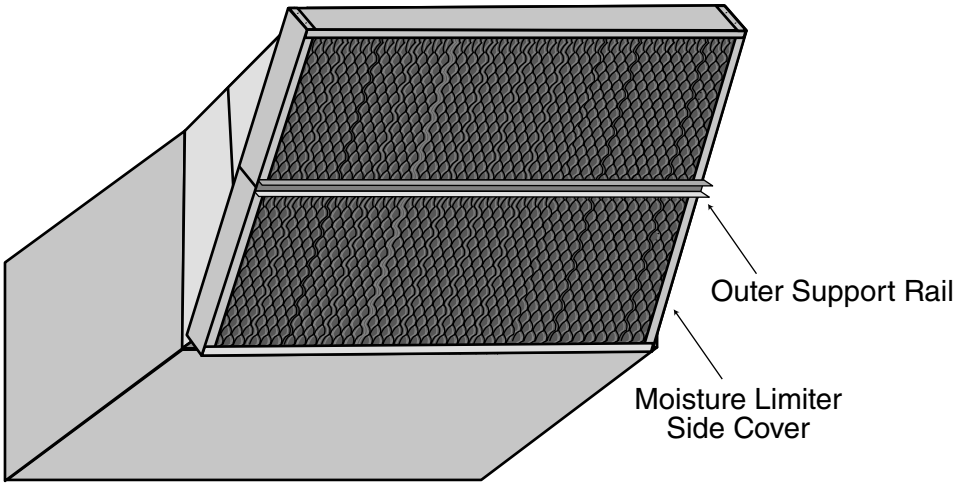


For Model DF270: Insert 4 pieces of 12" (30.5cm) x 96" (243.8cm) moisture limiter media from the right side with the long dimension running top to bottom.

For Model DF410: Insert 5 pieces of 12" (30.5cm) x 96" (243.8cm) moisture limiter media from the right side with the long dimension running top to bottom.

Description	Part Number
Moisture Limiter Media	90740002

Step 12.3.13



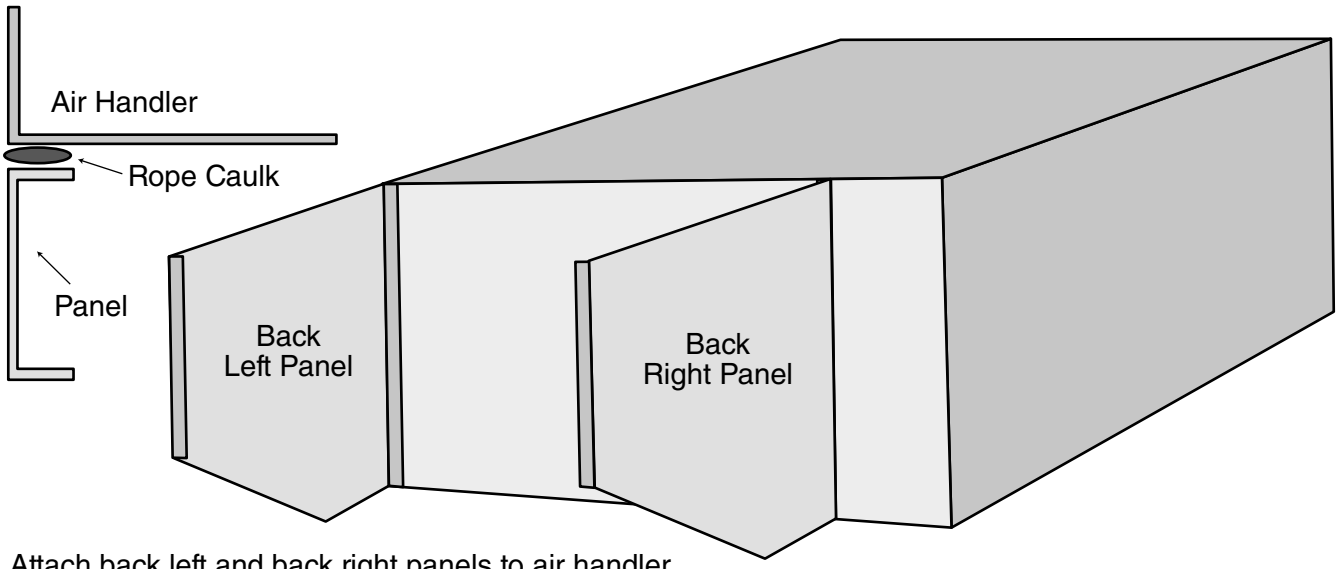
Place the moisture limiter frame side cover to the flange at the top overlaps the top of the frame. Attach to the inlet hood drip rail using eight TEK screws. Attach to the bottom pan assembly and top with two #10-24x½" bolts and #10-24 nuts each. Attach front stiffeners to the left and right side of the moisture limiter frame using four TEK screws for each support.

Description	Part Number
Right Side Cover	13205079 / 13305079
Outer Support Rail	13205098 / 13305098
TEK Screw	13404

12.4 Inlet Hood Assembly (DF700A and DF700B)

Description	Part Number	Inlet Hood Without Filters	Inlet Hood With Moisture Limiter	Inlet Hood With Permanent Aluminum Mesh Filters
		80305.1 (Galvanized) 80305.1W (Painted White)	80305.2 (Galvanized) 80305.2W (Painted White)	80305.3 (Galvanized) 80305.3W (Painted White)
		Quantity	Quantity	Quantity
Inlet Top Brace	300164	1	1	1
Back Left Panel	300214	1	1	1
Back Right Panel	300215	1	1	1
Front Left Panel	300216	1	1	1
Front Right Panel	300217	1	1	1
Front Top Panel	300218	1	1	1
Back Top Panel	300220	1	1	1
Intermediate Roof Brace	300222	1	1	1
Left Intermediate Bracket	300223	1	1	1
Right Intermediate Bracket	300224	1	1	1
Intermediate Horizontal Brace	300225	1	1	1
Hex Head Cap Screw 5/16-18 x ¾"	20507	72	72	72
Flange Nut 5/16"-18	20509	47	47	47
Flat Washer 5/16"	95211600	72	72	72
Hex Nut #10-24	20548	7	9	32
Screw #10-24 x ½"	20699	7	9	32
Zip Tape Flashing 3"	14502	24' (7.3 m)	24' (7.3 m)	24' (7.3 m)
Support Bracket	10008	2	N/A	N/A
Horizontal Brace	300226	1	N/A	N/A
Right Inlet Bracket	300227	1	N/A	N/A
Left Inlet Bracket	300228	1	N/A	N/A
Moisture Limiter Frame Bottom Retainer	300177	N/A	1	N/A
Moisture Limiter Frame Left Side	300297	N/A	1	N/A
Moisture Limiter Frame Right Side	300298	N/A	1	N/A
Moisture Limiter Frame Top	300299	N/A	1	N/A
Moisture Limiter Frame Bottom	300300	N/A	1	N/A
Moisture Limiter Frame Rear Stiffener	300301	N/A	2	N/A
Moisture Limiter Frame Front Stiffener	601450	N/A	2	N/A
Moister Limiter Frame Bottom Pan	300505	N/A	1	N/A
Zip Screws	20003	N/A	10	N/A
¼"-14 x ¾" TEK Screw	28319	N/A	32	N/A
Moisture Limiter 12" x 96" x 5.5"	90740002	N/A	12	N/A
Bottom Permanent Pan	300295	N/A	N/A	1
Permanent Vertical Bracket	300296	N/A	N/A	1
Intermediate Filter Rail	601193	N/A	N/A	6
Top Filter Rail	601194	N/A	N/A	1
Bottom Filter Rail	601195	N/A	N/A	1
Latch	20900	N/A	N/A	8
TEK Screw #10 x 1/2"	20539	N/A	N/A	12
Permanent Aluminum Mesh Filter 24" x 24" x 2"	20627	N/A	N/A	24
Fastener Rivnut 3/8"-16	91120106	10	10	10
3/8" Flatwasher	20515	10	10	10
3/8"-16 x 1" Bolt Hex Grade 5	20517	10	10	10

Step 12.4.1



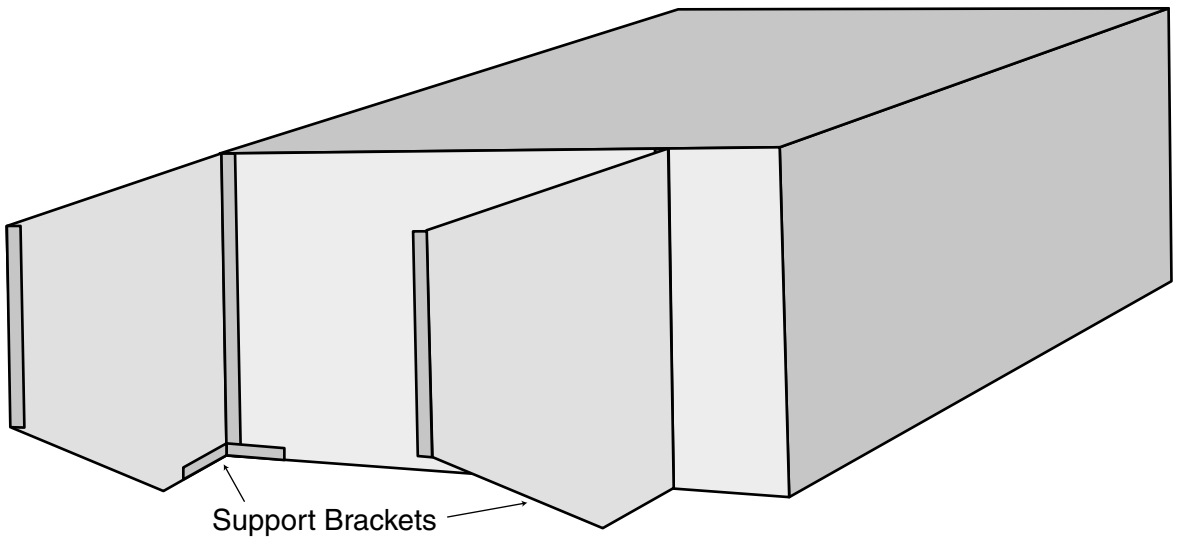
Attach back left and back right panels to air handler using five 5/16-18x1 bolts and 5/16" washers. Use rope caulk between the mating surfaces of the air handler and the side panels.

NOTE: Rope caulk provided by others.

Description	Part Number
Back Left Panel	300214
Back Right Panel	300215
5/16"-18x1 Bolt	20507
5/16" Washer	95211600

For inlet hoods with open face, see *Step 12.4.2A*, then continue to *Step 12.4.3*.
For inlet hoods with moisture limiter, see *Step 12.4.2B*, then continue to *Step 12.4.3*.
For inlet hoods with permanent aluminum mesh filters, see *Step 12.4.2C*, then continue to *Step 12.4.3*.

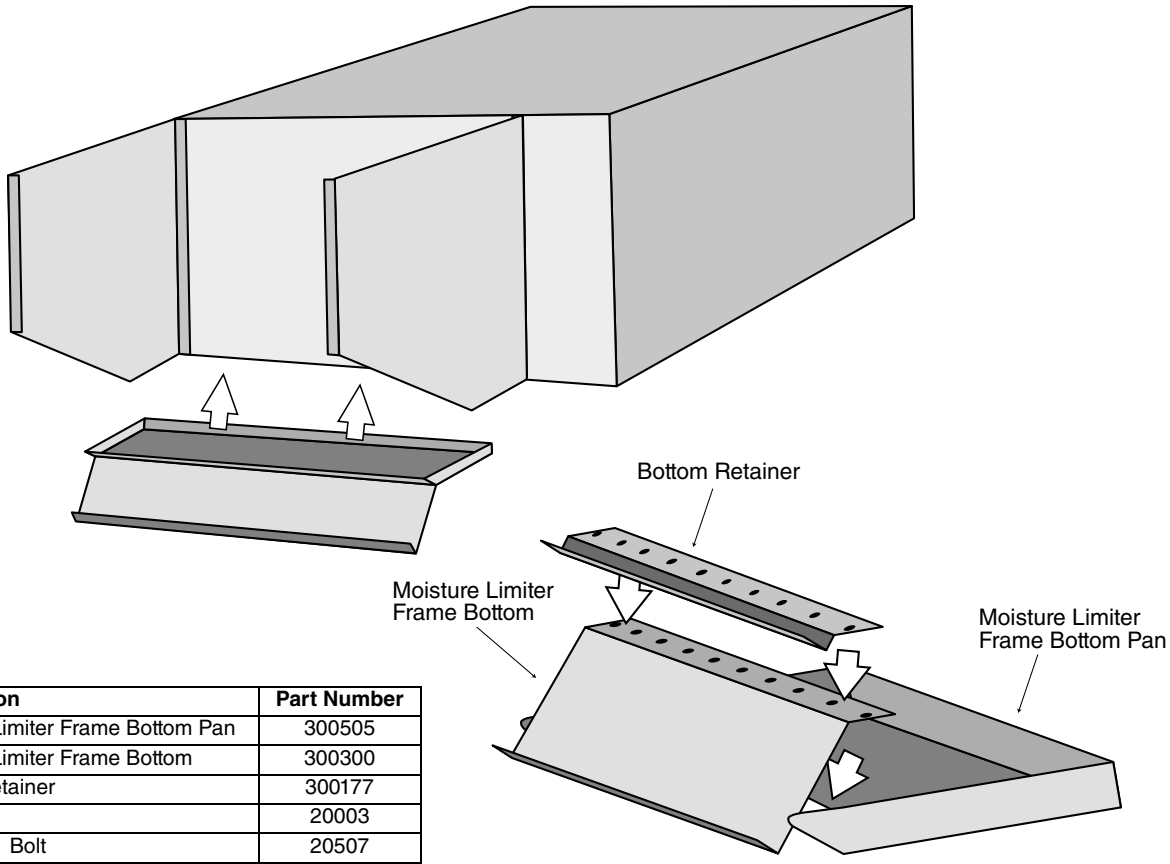
Step 12.4.2A For Inlet Hood with Open Face



Attach support brackets to the bottom inside corner of the inlet hood. Attach to the air handler using existing hardware in the air handler cabinet. Attach to the bottom inside corner of the rear side panels using two 5/16-18x1 bolts, 5/16" washers and 5/16" flange nuts.

Description	Part Number
Support Brackets	10008
5/16"-18x1 Bolts	20507
5/16" Washers	20511
5/16" Nuts	20509

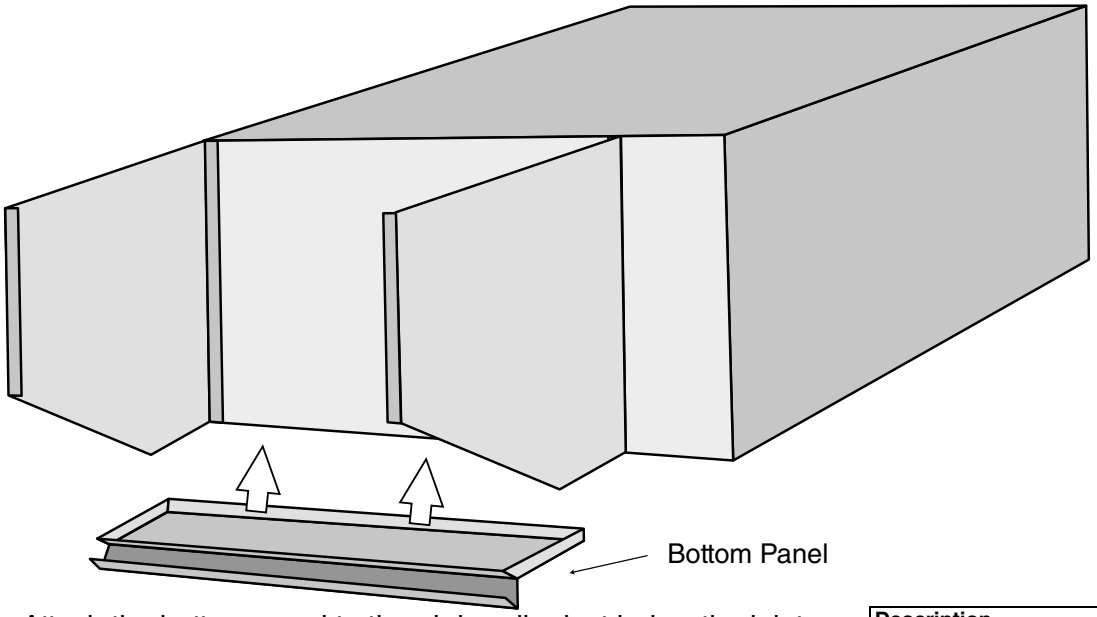
Step 12.4.2B For Inlet Hood with Moisture Limiter



Description	Part Number
Moisture Limiter Frame Bottom Pan	300505
Moisture Limiter Frame Bottom	300300
Bottom Retainer	300177
Zip Screw	20003
5/16"-18x1 Bolt	20507
5/16" Washer	95211600
5/16" Flange Nut	20509

Attach the moisture limiter frame bottom pan to the moisture limiter frame bottom and bottom retainer using ten zip screws. Attach the bottom pan assembly to the air handler just below the inlet opening and inside of the side panels installed previously (*See Page 74, Step 12.4.1*). Attach to the air handler using existing hardware in the air handler cabinet. Attach to the side panels using two 5/16-18x1 bolts, 5/16" washers and 5/16" flange nuts. Use rope caulk between the mating surfaces of the air handler and the bottom panel.

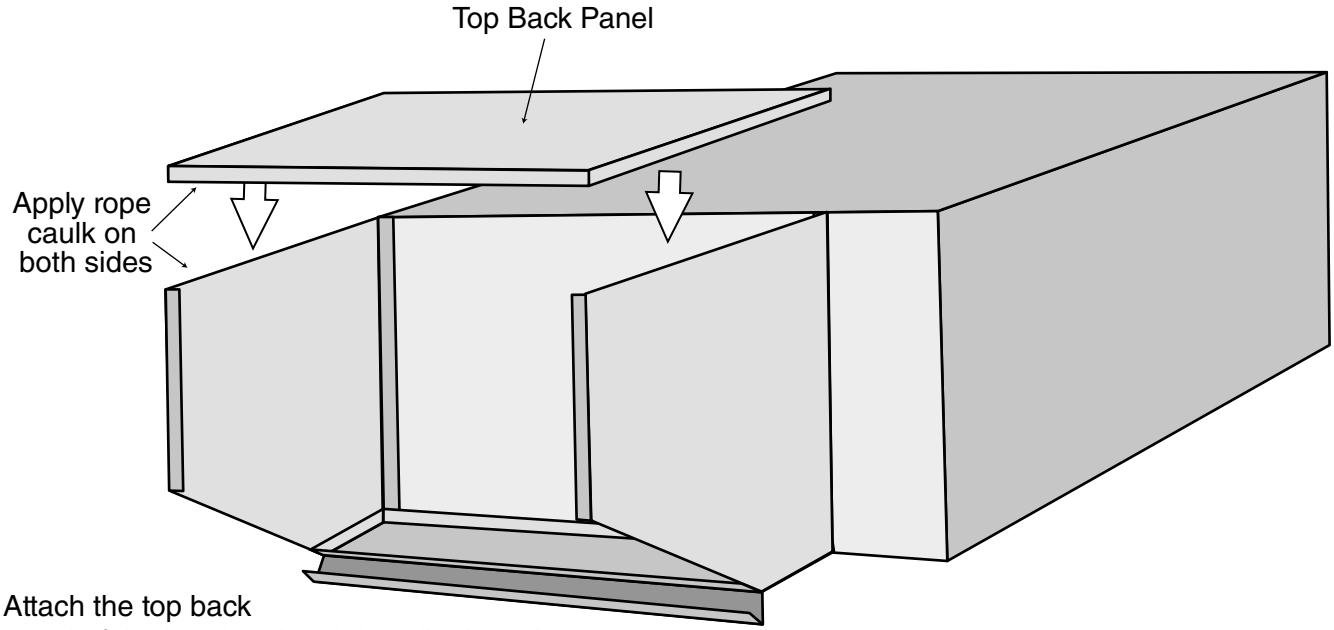
Step 12.4.2C For Inlet Hood with Permanent Aluminum Mesh Filters



Attach the bottom panel to the air handler just below the inlet opening and inside of the side panels installed previously (*See Page 74, Step 12.4.1*). Attach to the air handler using existing hardware in the air handler cabinet. Attach to the side panels using two 5/16-18x1 bolts, 5/16" washers and 5/16" flange nuts. Use rope caulk between the mating surfaces of the air handler and the bottom panel.

Description	Part Number
Bottom Panel	300295
5/16"-18x1 Bolt	20902
5/16" Washer	95211600
5/16" Flange Nut	20509

Step 12.4.3

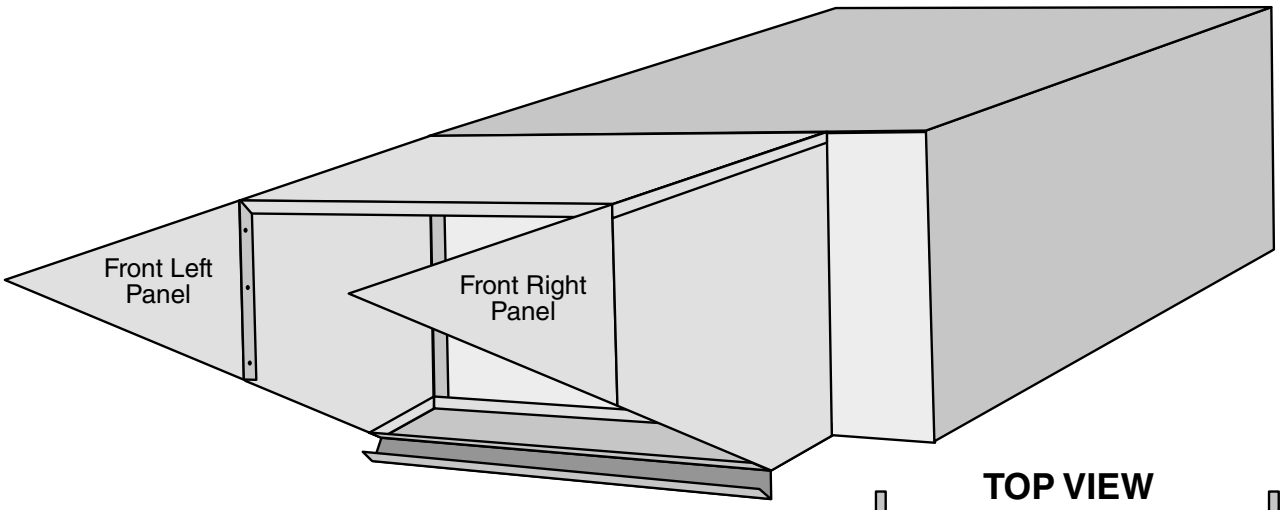


Attach the top back panel of the hood to the air handler just above the inlet opening and overlapping the side panels installed previously (*See Page 74, Step 12.4.1*). Attach to the air handler using fifteen 5/16-18x1 bolts and 5/16" washers. Attach to the side panels using four 5/16-18x1 bolts, 5/16" washers and 5/16" flange nuts on each side. Use rope caulk between the mating surfaces of the air handler and the rear top panel.

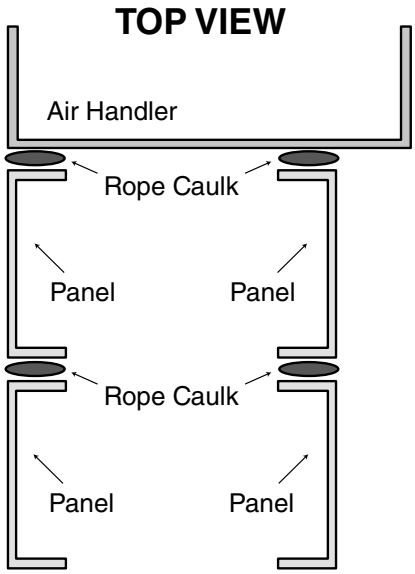
Description	Part Number
Top Back Panel	300220
5/16"-18x1 Bolt	20507
5/16" Washer	95211600
5/16" Flange Nut	20509

NOTE: Rope caulk provided by others.

Step 12.4.4



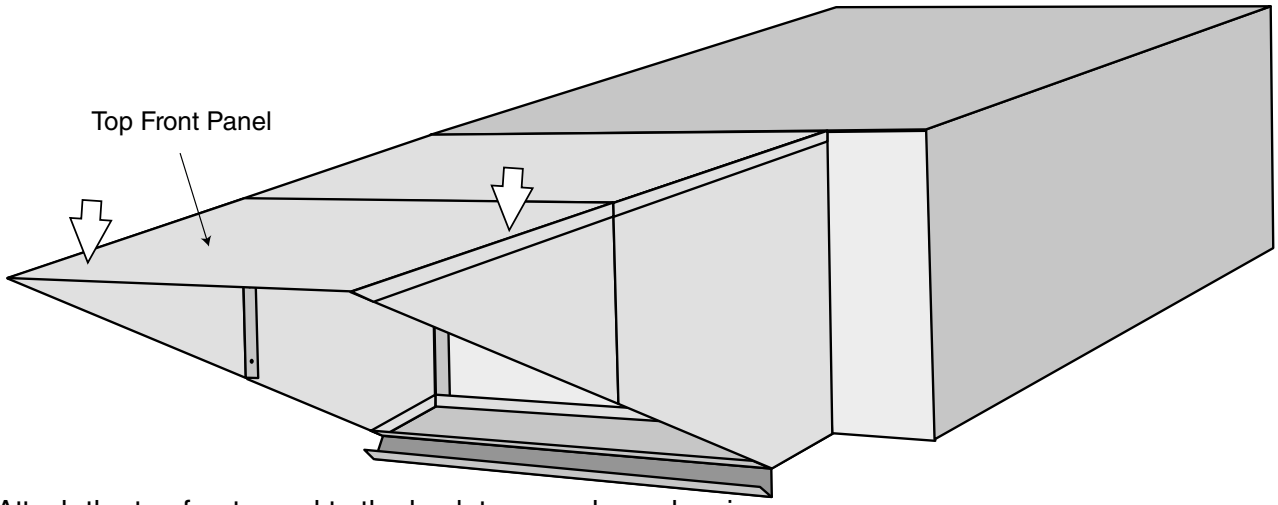
Description	Part Number
Front Left Panel	300217
Front Right Panel	300216
5/16"-18x1 Bolt	20507
5/16" Washer	95211600
5/16" Flange Nut	20509



Attach left and right front panels to left and right rear panels using three 5/16-18x1 bolts, 5/16" washers and 5/16" flange nuts each. Use rope caulk between the mating surfaces of front and rear panels.

NOTE: Rope caulk provided by others.

Step 12.4.5



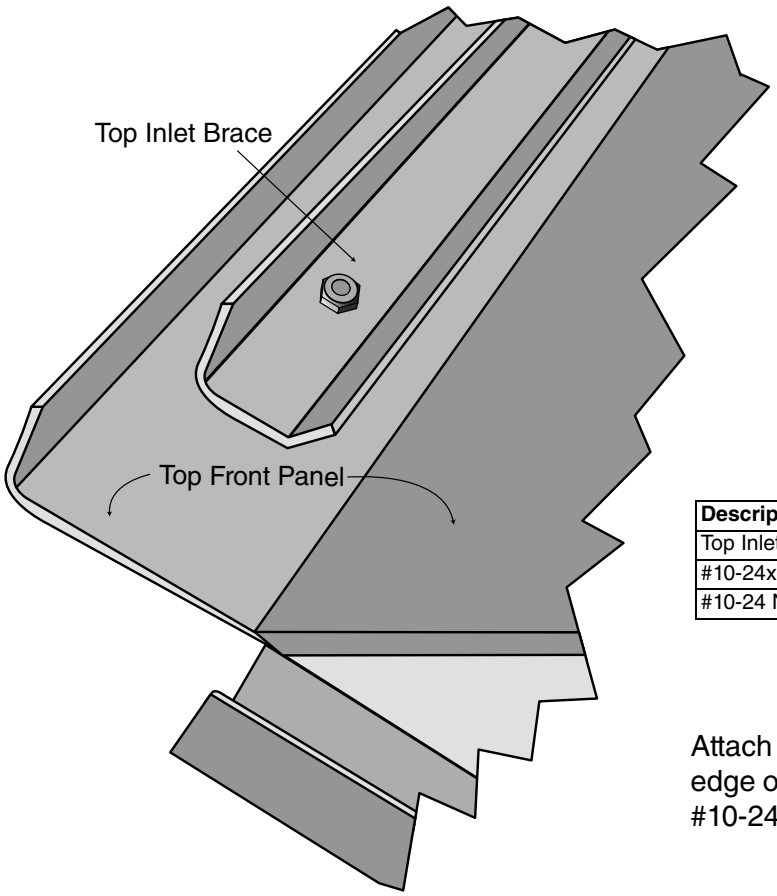
Attach the top front panel to the back top panel, overlapping the side panels installed previously (*See Page 77, Step 12.4.4*). Attach to the side panels using four 5/16-18x1 bolts, 5/16" washers and 5/16" flange nuts on each side and back top panel using nine 5/16-18x1 bolts, 5/16" washers and 5/16" flange nuts. Use rope caulk between the mating surfaces of front and rear panels.

NOTE: Rope caulk provided by others.

Description	Part Number
Front Top Panel	300218
5/16"-18x1 Bolt	20507
5/16" Washer	95211600
5/16" Flange Nut	20509

For inlet hoods with open face or moisture limiter, see *Step 12.4.6A*, then continue to *Step 12.4.7*.
For inlet hoods with permanent aluminum mesh filters, see *Step 12.4.6B*, then continue to *Step 12.4.7*.

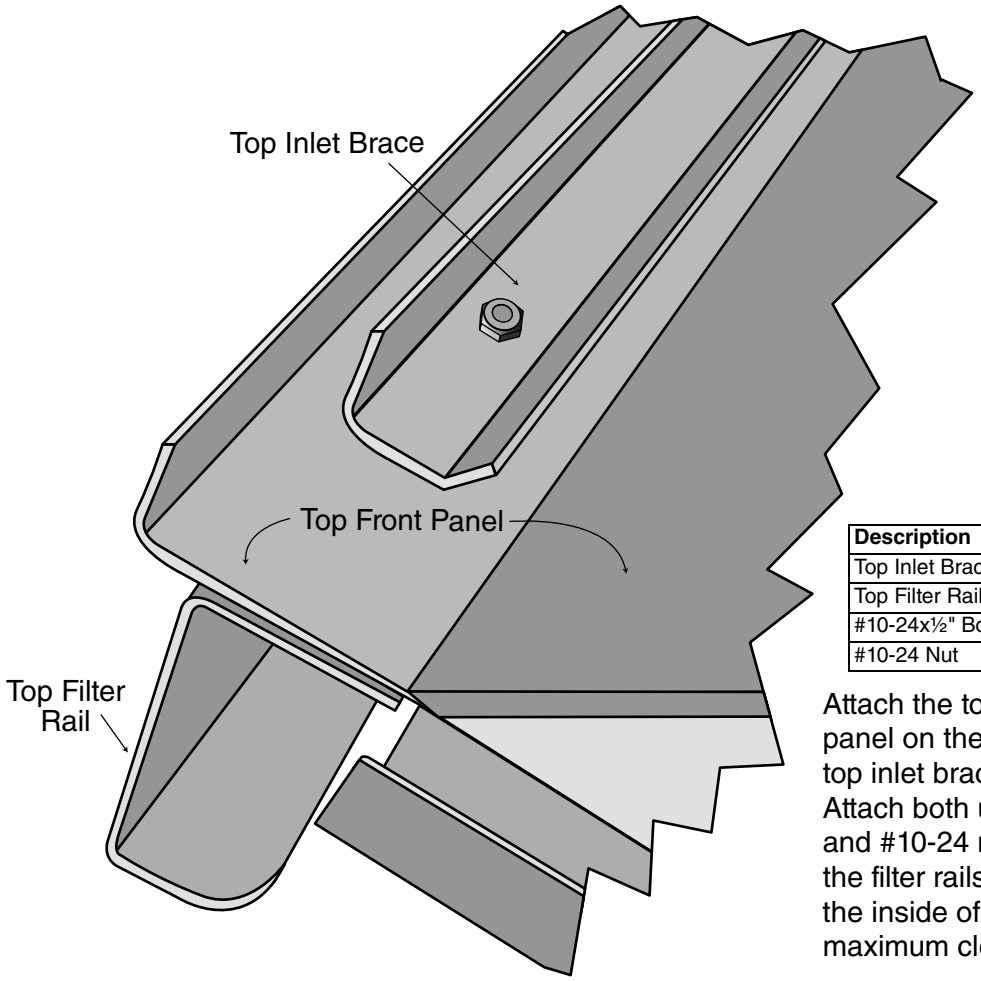
Step 12.4.6A For Inlet Hoods with Open Face or with Moisture Limiter



Description	Part Number
Top Inlet Brace	300164
#10-24x½" Bolt	20699
#10-24 Nut	20548

Attach the top inlet brace to the rear outside edge of the front top panel. Attach using five #10-24x½" bolts and #10-24 nuts.

Step 12.4.6B Inlet Hoods with Permanent Aluminum Mesh Filters

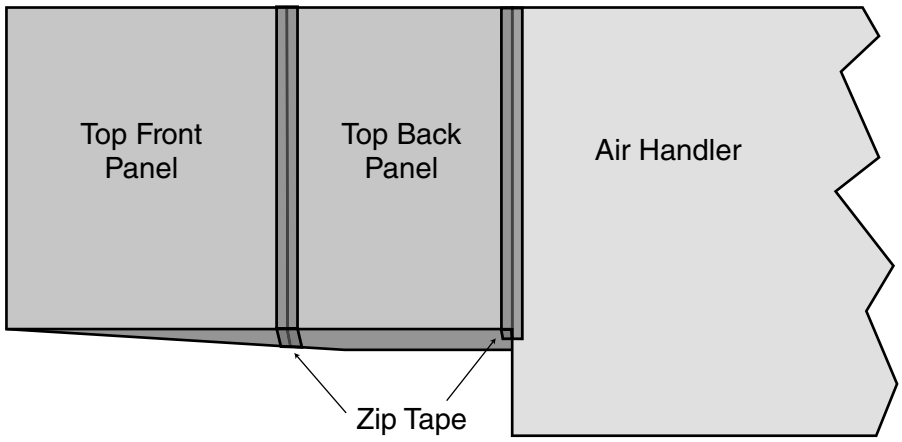


Description	Part Number
Top Inlet Brace	300164
Top Filter Rail	601194
#10-24x½" Bolt	20699
#10-24 Nut	20548

Attach the top filter rail to the top front panel on the front inside edge and the top inlet brace on the rear outside edge. Attach both using five #10-24x½" bolts and #10-24 nuts. When attaching any of the filter rails, always insert the bolt from the inside of the filter rail to allow for maximum clearance for the filters.

Step 12.4.7

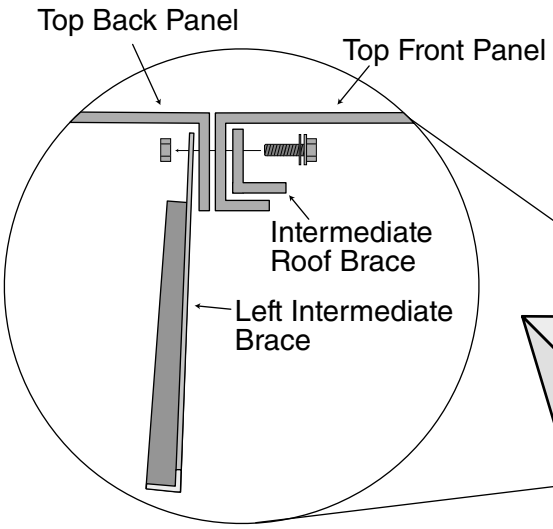
PLAN VIEW



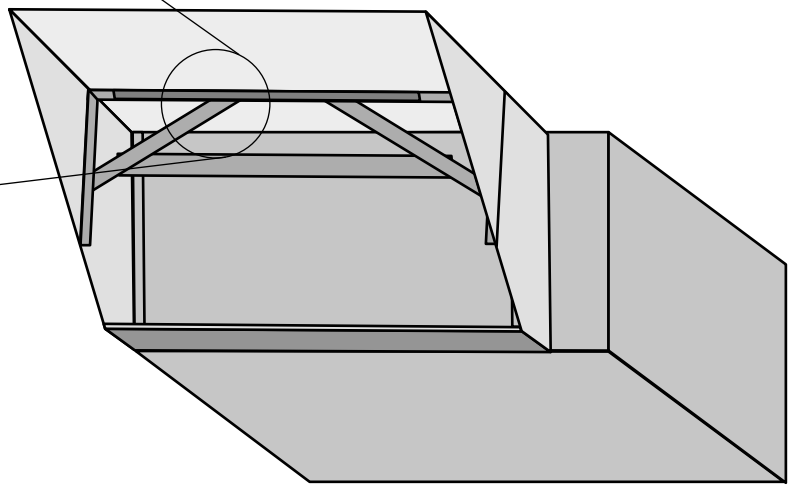
Apply 3" zip tape flashing centered over the top seams. These seams are located between the air handler and the rear top panel of inlet hood and also between the front and back top panels of the inlet hood.

Description	Part Number
Zip Tape Flashing	14502

Step 12.4.8



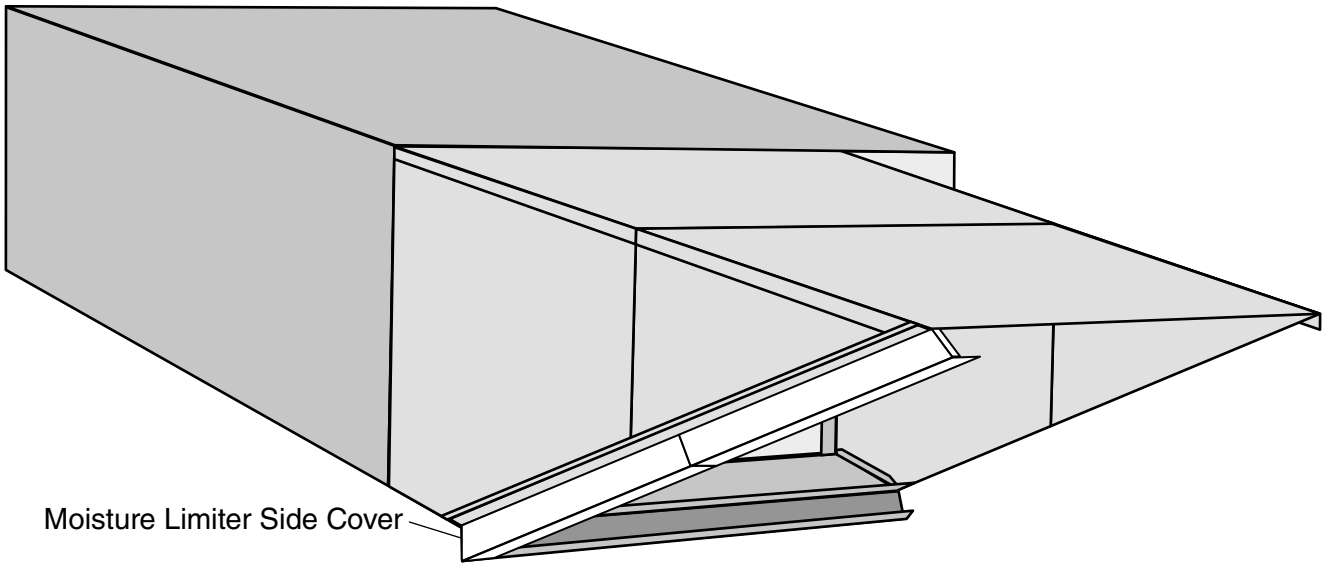
Assemble inner support frame. Attach the intermediate roof brace with existing seam hardware to the seam of the front and back top panels with the angle opening away from the air handler. Attach the left and right intermediate roof braces with the seam hardware at the connecting points with the angle opening towards the air handler. Attach the intermediate roof brace with the angle opening away from the air handler, to each of the side support left and right intermediate braces using a 5/16-18x1 bolts, 5/16" washer and a 5/16" flange nut on each side.



Description	Part Number
Intermediate Roof Brace	300222
Left Intermediate Roof Brace	300223
Right Intermediate Roof Brace	300224
Intermediate Roof Brace	300225
5/16"-18x1 Bolt	20902
5/16" Washer	95211600
5/16" Flange Nut	20509

For inlet hoods with open face, the instructions end here.
For inlet hoods with moisture limiters, continue with *Step 12.4.9 - Step 12.4.14*.
For inlet hoods with permanent aluminum mesh filters, continue with *Step 12.4.15 - Step 12.4.18*.

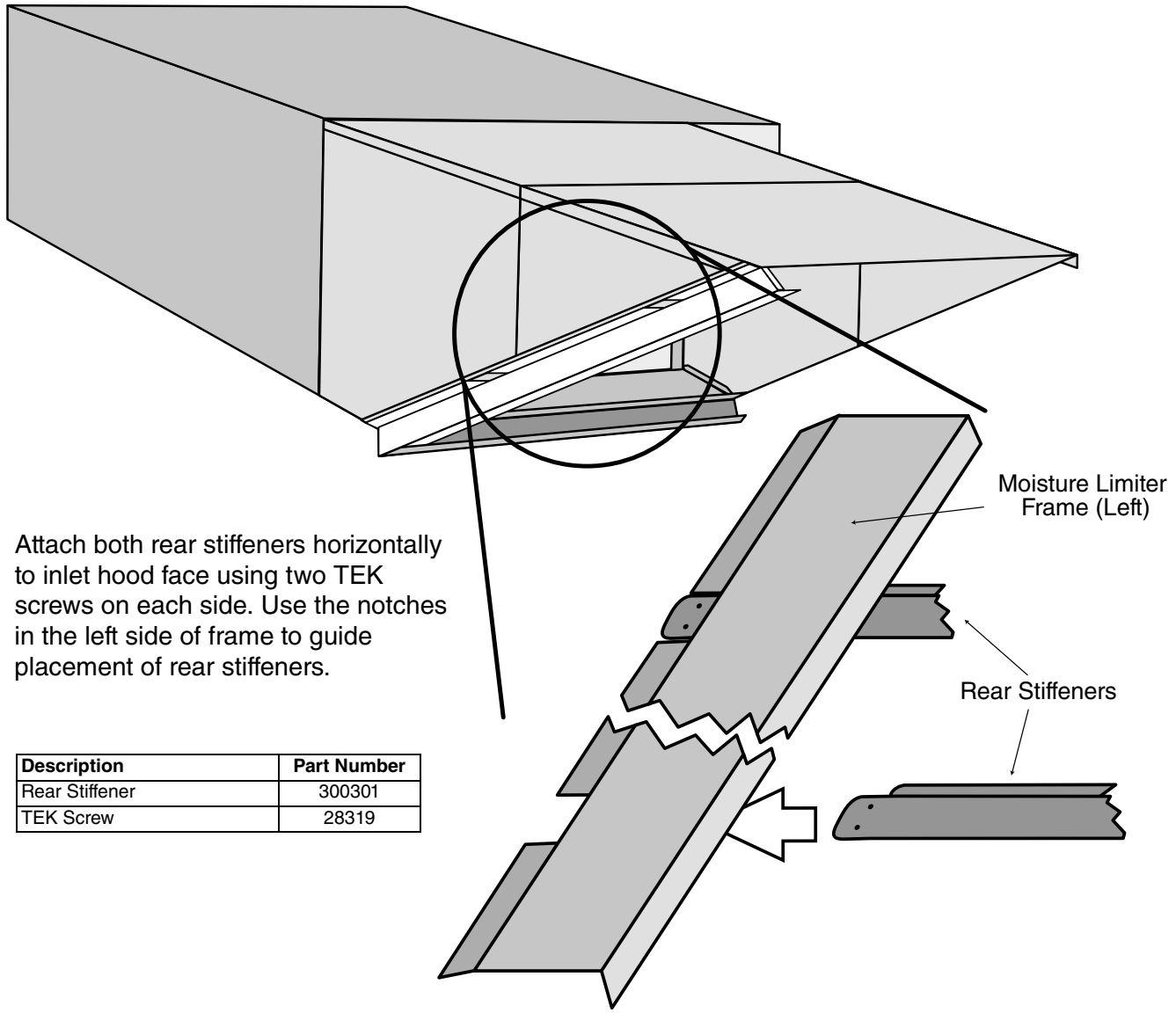
Step 12.4.9 Inlet Hoods with Moisture Limiters



Attach left side of moisture limiter frame to the left side of the inlet hood drip rail using eight TEK screws. Attach to the bottom pan assembly with two #10-24x½" bolts and #10-24 nuts.

Description	Part Number
Left Moisture Limiter Frame	300297
TEK Screw	28319
Bottom Pan Assembly	300505
#10-24x½" Bolt	20699
#10-24 Nut	20548

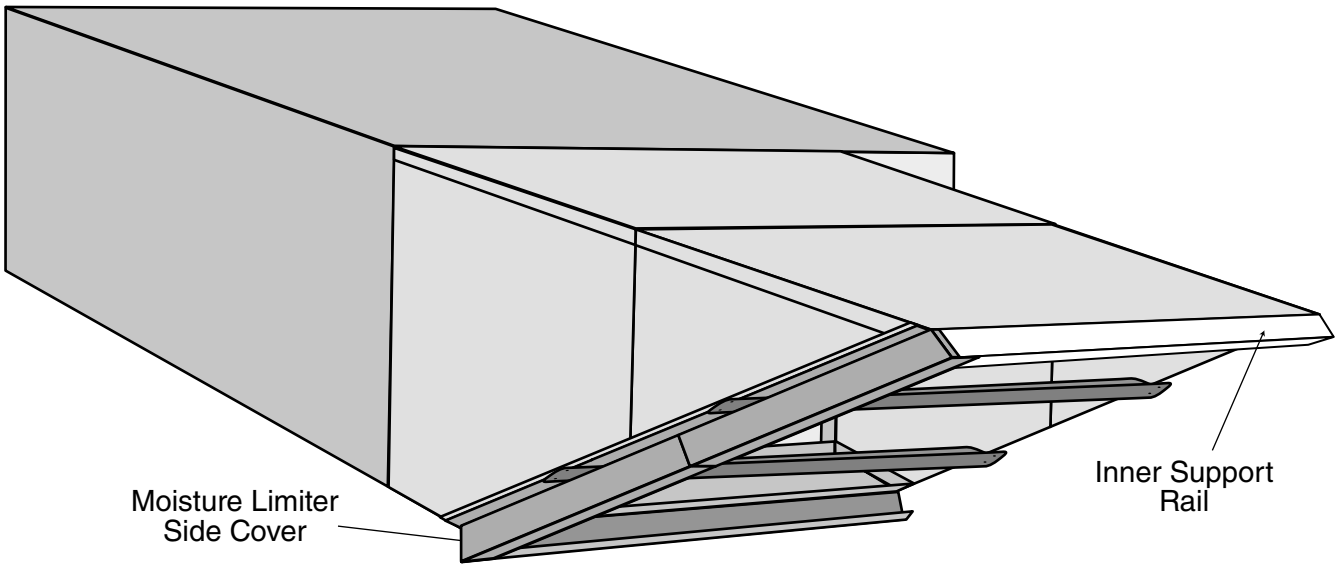
Step 12.4.10



Attach both rear stiffeners horizontally to inlet hood face using two TEK screws on each side. Use the notches in the left side of frame to guide placement of rear stiffeners.

Description	Part Number
Rear Stiffener	300301
TEK Screw	28319

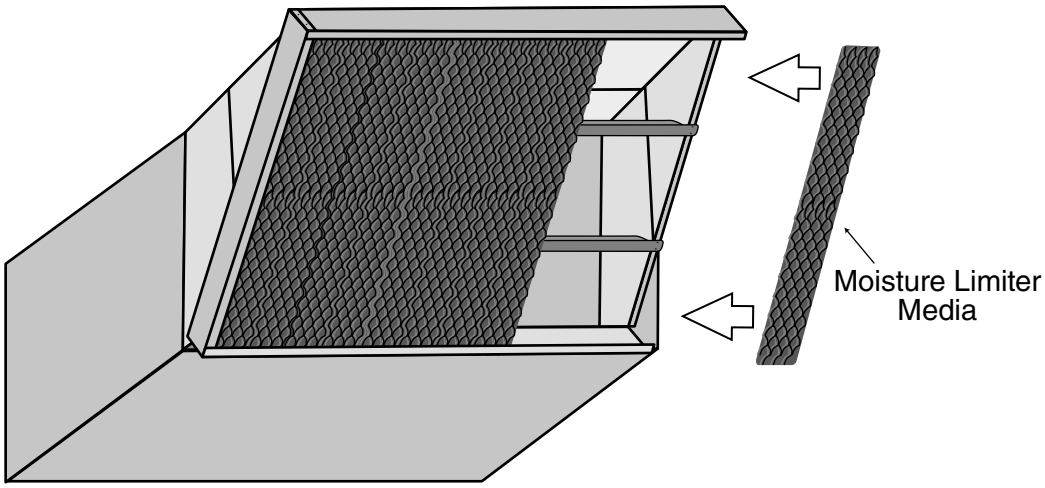
Step 12.4.11



Place the moisture limiter frame top under the top flange of the moisture limiter frame left side and to the top of the inlet hood. Attach to the top of the inlet hood using nine #10-24x½" bolts and #10-24 nuts. Attach to the left side of the frame using two #10-24x½" bolts and two #10-24 nuts.

Description	Part Number
Moisture Limiter Frame Top	300299
Moisture Limiter Frame Left	300297
#10-24x½" Bolt	20699
#10-24 Nut	20548

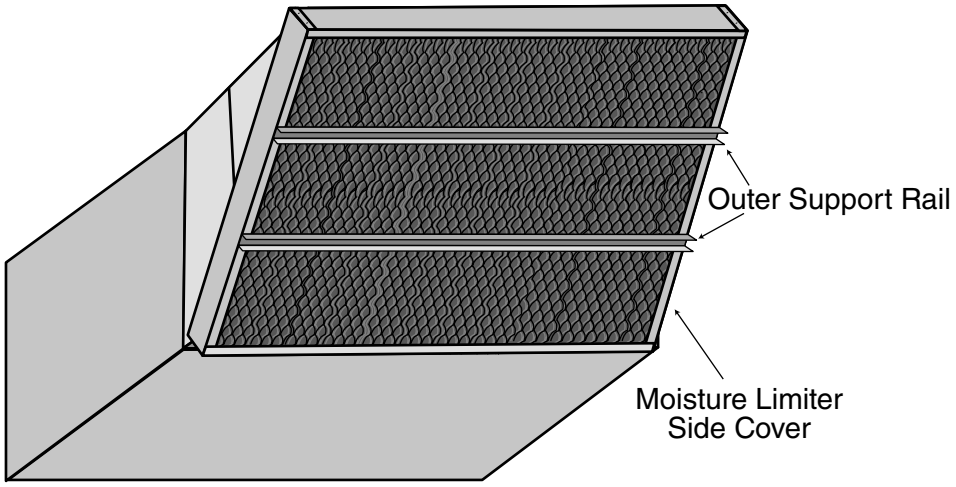
Step 12.4.12



Insert 12 pieces of 12" (30.5cm) x 96" (243.8cm) moisture limiter media from the right side with the long dimension running top to bottom.

Description	Part Number
Moisture Limiter Media	90740002

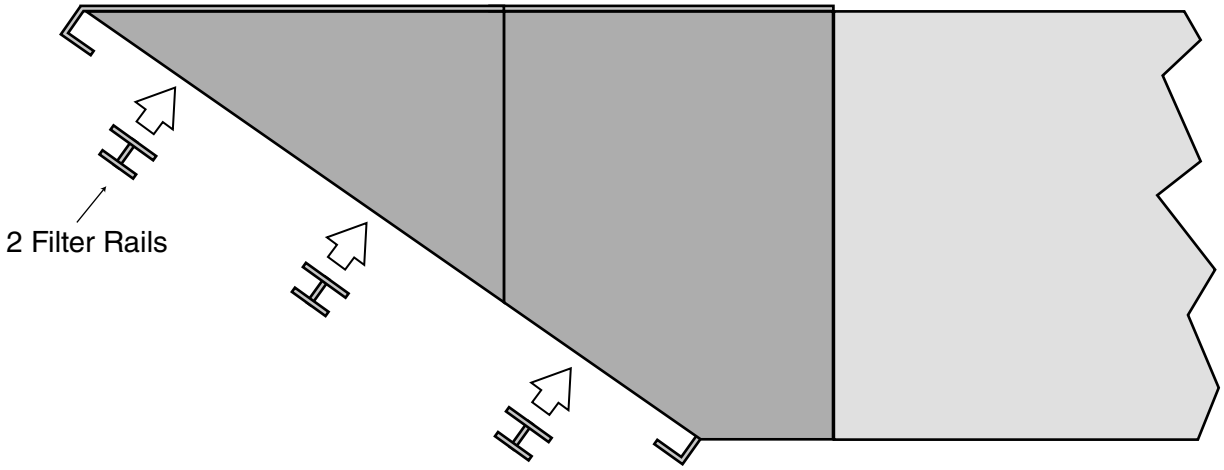
Step 12.4.13



Place the moisture limiter frame right side so that the flange at the top overlaps the top of the frame. Attach to the inlet hood drip rail using eight TEK screws. Attach to the bottom pan assembly and top with two #10-24x½" bolts and #10-24 nuts each. Attach front stiffeners to the left and right side of the moisture limiter frame using four TEK screws for each support.

Description	Part Number
Moisture Limiter Frame Right	300289
TEK Screws	28319
#10-24x½" Bolt	20699
#10-24 Nut	20548
Front Stiffeners	601450

Step 12.4.14 For Inlet Hoods With Permanent Filters

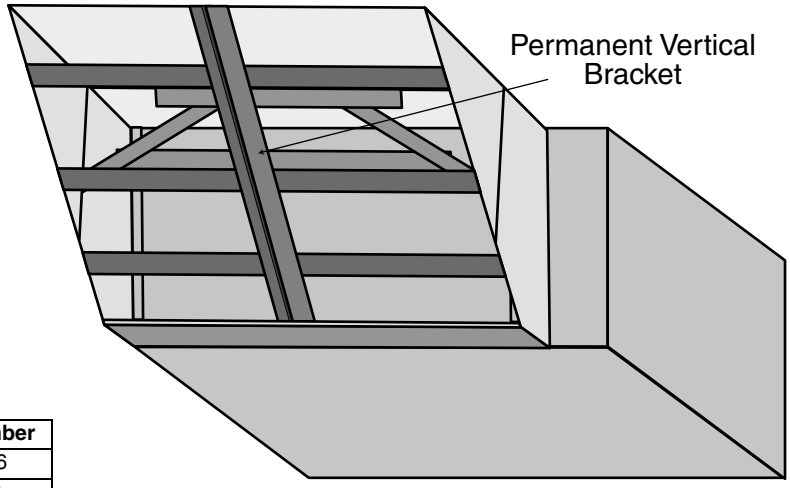


Attach 3 pair of filter rails horizontally to the face of the inlet hood. Attach using two #10-24x½" bolts and #10-24 nuts on each side. When attaching any of the filter rails, always insert the bolt from the inside of the filter rail to allow for maximum clearance for the filters.

Description	Part Number
Filter Rail	601193
#10-24x½" Bolt	20699
#10-24 Nut	20548

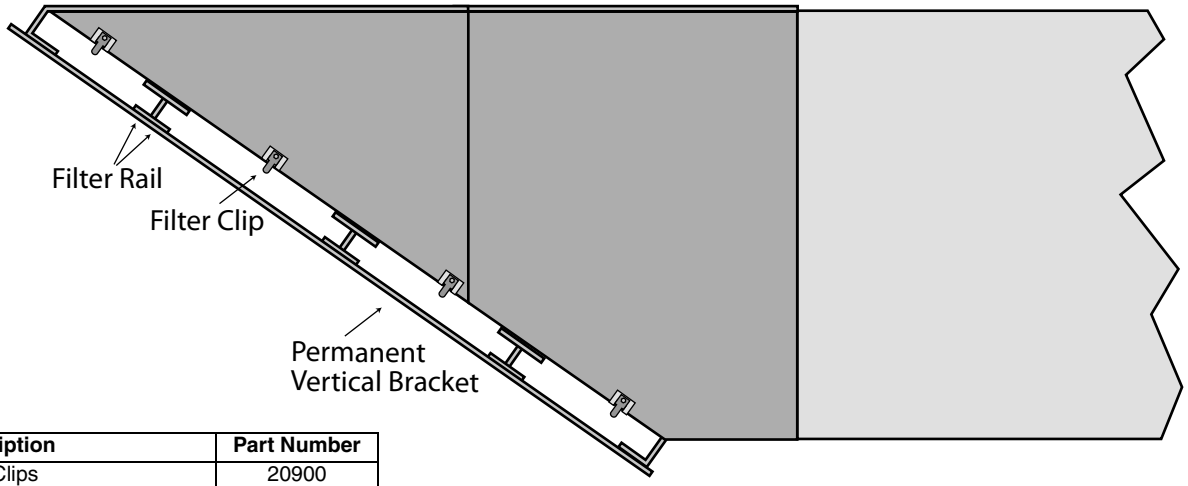
Step 12.4.15

Attach the permanent vertical bracket vertically to the face of the inlet hood. Attach to the filter rails using a #10-24x½" bolt and a #10-24 nut at each filter rail, use two at each back-to-back pair of filter rails. When attaching any of the filter rails, always insert the bolt from the inside of the filter rail to allow for maximum clearance for the filters.



Description	Part Number
Permanent Vertical Bracket	300296
#10-24x½" Bolt	20699
#10-24 Nut	20548

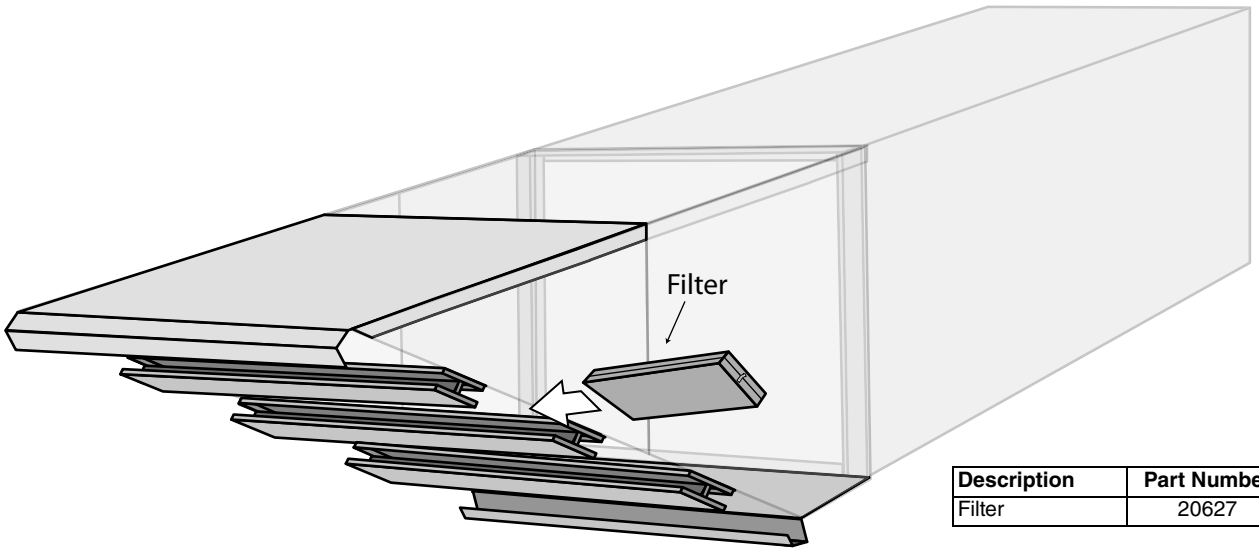
Step 12.4.16



Description	Part Number
Filter Clips	20900
TEK Screw	20539

Attach filter clips on both sides of the hood, between the filter rails using the holes provided. Attach using a TEK screw for each clip.

Step 12.4.17



Description	Part Number
Filter	20627

Load filters into the inlet hood, checking to see that each filter is in the proper orientation by verifying that the arrow on the side of the filter points in the direction of air flow. All of the arrows will be pointing towards the air handler when installed in the proper orientation. Close the filter clips installed previously (*See Page 84, Step 12.4.17*) to hold the filters in place once they are installed.

12.5 Inlet Hood Installation

The inlet hood may be installed either onto the inlet of the air handler or to an outside wall.

12.5.1 Inlet Hood Installation to Wall

Use lagbolts to install the inlet hood to an exterior wall. Once the inlet hood is in place, the edges must be sealed to the wall with the proper sealant. For models DF75-DF700B, assemble the hood prior to mounting, then mount as described below.

12.5.2 Inlet Hood Installation to Air Handler (DF40)

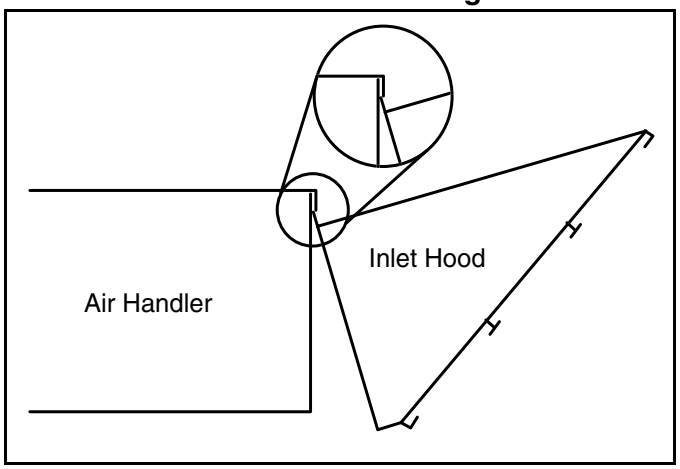
First remove the hardware in the top drip edge of the air handler. Tuck the top flange of the hood behind the top drip edge. *See Page 85, Figure 33*. Replace the hardware, screw together the top drip edge of the air handler, top flange of the inlet hood and the air handler wall panel.

NOTE: After installing the inlet hood, all hardware must be tightened with a torque wrench. The roof, side and bottom seams must be caulked (supplied by others).

12.5.3 Inlet Hood Installation to Air Handler (DF75-DF700B)

Inlet hoods are assembled onto the air handler. For Models DF75 and DF150 *See Page 54, Step 12.2.1*. For Models DF270 and DF410 *See Page 63, Step 12.3.1*.

FIGURE 33: Inlet Hood Positioning



SECTION 13: SERVICE PLATFORM (DF700A AND DF700B)

⚠ WARNING			
			
Crush Hazard	**Falling Hazard**	**Severe Injury Hazard**	**Cut/Pinch Hazard**
Use proper lifting equipment and practices.	**Use proper safety equipment and practices to avoid falling.**	**Use proper lifting practices and equipment.** **Equipment and accessories are heavy.**	**Wear protective gear during installation, operation and service.** **Edges are sharp.**
Failure to follow these instructions can result in death, injury or property damage.			

13.1 Service Platform Installation

Step 1:

Attach service platform channels (P/N 61006) to air handler legs using four ½"-13x1¼" bolts (P/N 20903), ½" washers (P/N 20523) and ½"-13 nuts (P/N 20493) on each channel.

Step 2:

Attach the frame assembly (P/N 610008) to the platform channels (P/N 61006) using four ½"-13x1¼" bolts (P/N 20903), ½" washers (P/N 20523) and ½"-13 nuts (P/N 20493) on each side.

Step 3:

Attach the access side hand rail assembly (P/N 610004) to the air handler and top of service platform channel using six ¼"-20x1" bolts (P/N 20801), ¼" washers (P/N 20503) and ¼"-20 flange nuts (P/N 20489). Attach two 5/16" eye bolts through the access opening side of the hand rail.

Step 4:

Attach the front hand rail (P/N 610005) to the deck with four 3/8"-16x1 bolts (P/N 20517), 3/8" washers (P/N 20515) and 3/8"-16 nuts (P/N 20517). Attach two 5/16" eye bolts (P/N 20688) through the access opening side of the hand rail.

Step 5:

Assemble the non access side hand rail (P/N 610003) so that the long axis angles open opposite the short axis angles and all angles should open towards the center of the hand rail assembly. Attach angle pieces using one 3/8"-16x1 bolt (P/N 20517), 3/8" washer (P/N 20515) and 3/8"-16 nut (P/N 20517) in each corner.

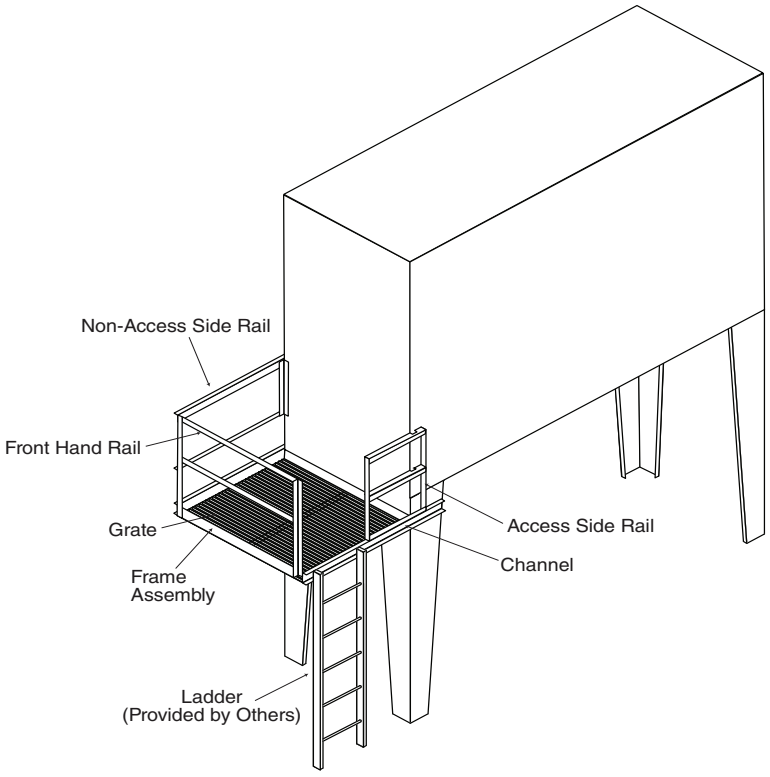
Step 6:

Attach the non access side hand rail to the front hand rail with two 3/8"-16x1 bolts (P/N 20517), 3/8" washers (P/N 20515) and 3/8"-16 nuts (P/N 20517). Attach the non access side handrail to the air handler using three ¼" self tapping screws (P/N 28418).

Step 7:

Place the grates (P/N 30877) in place so that the seam between them is parallel to the front hand rail. String the chain (P/N 20456) across the service platform opening between each set of eye bolts, using the provided hook (P/N 20687) at one end and the provided snap hook (P/N 20689) on the other.

FIGURE 34: Service Platform Installation



DF700A/700B Service Platform 80308[W]		
Description	**Part Number**	**Qty.**
Non-Access Side Rail	610003	1
Front Hand Rail	610005	1
Access Side Rail	610004	1
Channel	610006	2
Frame Assembly	610008	1
Bolt, Eye	20688	4
Hook	20687	2
Snap Hook	20689	2
Chain	20456	8’
Nut, 3/8" - 16	20513	10
Washer, 3/8"	20515	10
3/8" - 16x1	20517	10
1/4" - 20x1	20801	9
Nut, 5/16" - 18	20509	8
1/4" Flange, Nuts	20489	9
1/2" - 13x1-1/4"	20903	16
Nut, 1/2" - 13	20493	16
1/2" Washer	20523	16
Grate	30877	2
1/4" TEK Screw	28418	9

NOTE: Ladder not included.

SECTION 14: DAMPERS

⚠ WARNING			
			
Crush Hazard **Use proper lifting equipment and practices.**	**Falling Hazard** **Use proper safety equipment and practices to avoid falling.**	**Severe Injury Hazard** **Use proper lifting practices and equipment.** **Equipment and accessories are heavy.**	**Cut/Pinch Hazard** **Wear protective gear during installation, operation and service.** **Edges are sharp.**
Failure to follow these instructions can result in death, injury or property damage.			

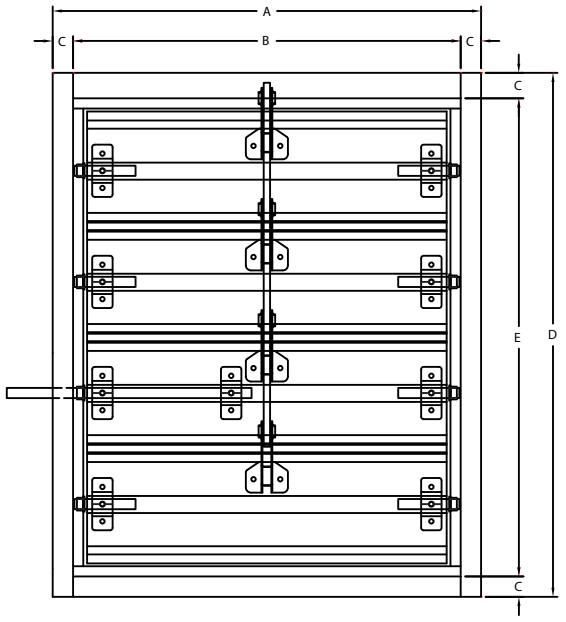
14.1 Discharge Damper

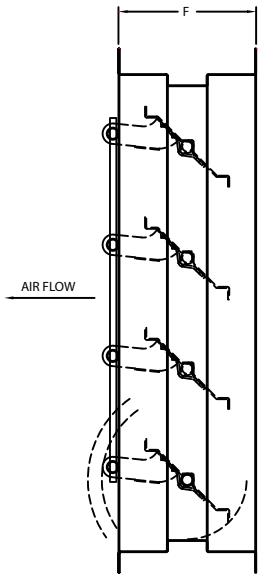
Discharge dampers are shipped loose. Discharge dampers are designed to be mounted downstream of the air handler in ductwork. A qualified contractor/installer must make appropriate allowances for duct connections.

To install the discharge damper on an interior wall, drill holes every 8"(20.5cm) in the flanges on all four sides of the discharge damper to accommodate lag bolts (provided by others).

Discharge dampers are not recommended to be mounted directly to the air handler. Discharge dampers are not available for Models DF700A and DF700B.

FIGURE 35: Motorized Discharge Damper (DF40 - DF410)





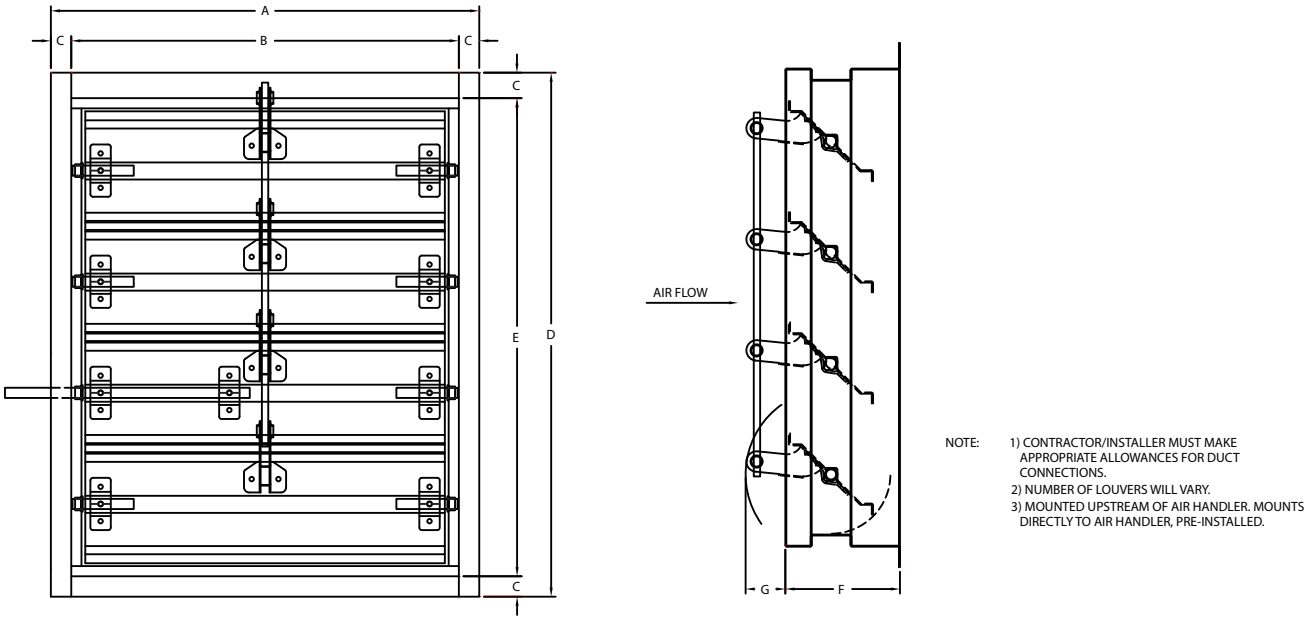
NOTE: 1) CONTRACTOR/INSTALLER MUST MAKE APPROPRIATE ALLOWANCES FOR DUCT CONNECTIONS.
2) NUMBER OF LOUVERS WILL VARY.
3) MOUNTED DOWNSTREAM OF AIR HANDLER IN DUCT WORK. DOES NOT MOUNT DIRECTLY TO AIR HANDLER. FIELD WIRED TO PROVIDED TERMINALS ON CONTROL PANEL.

Model	Part Number		A	B	C	D	E	F	Weight lbs (kg)
DF40	77014.301	**in**	21.0	19.0	1.0	19.0	17.0	9.0	40 (18.1)
		cm	53.3	48.3	2.5	48.3	43.2	22.9	
DF75/DF150	77018.301	**in**	27.0	25.0	1.0	23.5	21.5	8.0	60 (27.2)
		cm	68.6	63.5	2.5	59.7	54.6	20.3	
DF270	80922.2	**in**	37.0	34.0	1.5	36.0	33.0	10.0	100 (45.4)
		cm	94.0	86.4	3.8	42.0	83.8	25.4	
DF410	77537.2	**in**	42.0	39.0	1.5	42.0	39.0	10.0	150 (68)
		cm	106.7	99.1	3.8	106.7	99.1	25.4	

14.2 Inlet Damper

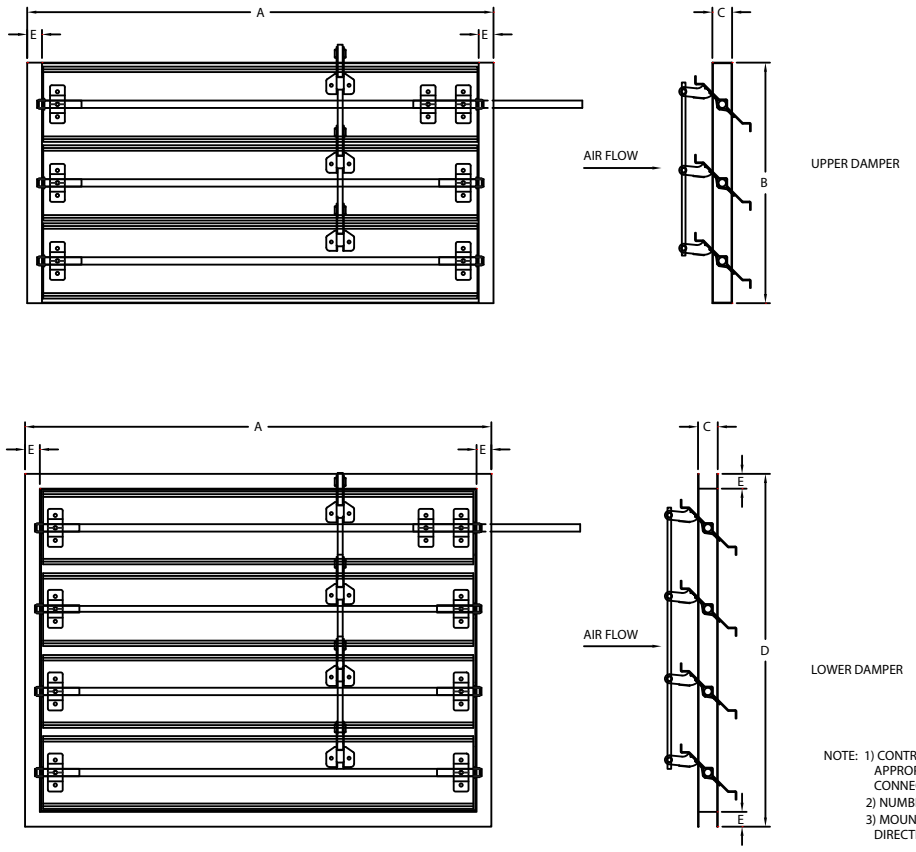
Inlet dampers are factory mounted to the inlet of the air handler (covering the inlet opening). The inlet damper has four outward-turned flanges. Based on air handler style, damper may include upper and lower damper.

FIGURE 36: Motorized Inlet Damper (DF40 - DF150)



Model	Part Number		A	B	C	D	E	F	G	Weight lbs (kg)
DF40	77019.301	**in**	21.0	19.0	1.3	25.7	23.4	5.0	3.3	40 (18.1)
		cm	53.3	48.3	3.3	65.2	59.5	12.7	8.3	
DF75/DF150	80900	**in**	33.3	30.8	1.3	29.0	26.3	5.0	3.3	60 (27.2)
		cm	84.5	78.1	3.2	73.7	66.7	12.7	8.3	

FIGURE 37: Motorized Inlet Damper (DF270 and DF410)

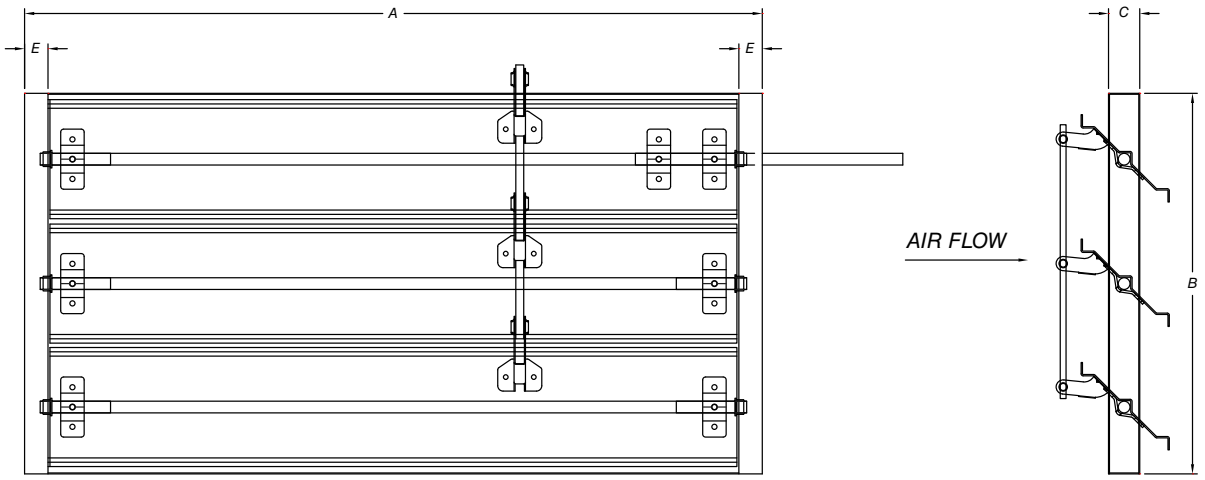


NOTE: 1) CONTRACTOR/INSTALLER MUST MAKE APPROPRIATE ALLOWANCES FOR DUCT CONNECTIONS.
2) NUMBER OF LOUVERS WILL VARY.
3) MOUNTED UPSTREAM OF AIR HANDLER. MOUNTS DIRECTLY TO AIR HANDLER, PRE-INSTALLED.

Model		A	B	C	D	E
DF270	in	47.3	24.4	2.0	29.5	1.5
	cm	120.0	63.0	5.1	74.9	3.8
DF410	in	59.3	24.4	2.0	33.5	1.5
	cm	150.6	63.0	5.1	85.1	3.8

Model	Part Number	Style	Dampers Used	Weight lbs(kg)
DF270	80920	MUA	Upper and Lower	75(34)
DF410	77530			107(48.1)
DF270	80920U	FR/AM/VAV	Upper Only	34(15.4)
DF410	77530U			46(20.9)

FIGURE 38: Motorized Inlet Damper (DF700A and DF700B)



NOTE: 1) CONTRACTOR/INSTALLER MUST MAKE APPROPRIATE ALLOWANCES FOR DUCT CONNECTIONS.
2) NUMBER OF LOUVERS WILL VARY.
3) MOUNTED UPSTREAM OF AIR HANDLER. MOUNTS DIRECTLY TO AIR HANDLER, PRE-INSTALLED.

Model	Part Number	Style		A	B	C	D	E	Damper Quantity
DF700A/ DF700B	80204.1	MUA	in	59.3	24.4	2.0	33.5	1.5	4
			cm	150.6	63.0	5.1	85.1	3.8	
	80204.2	AM	in	59.3	24.4	2.0	33.5	1.5	2
			cm	150.6	63.0	5.1	85.1	3.8	
		FR	in	59.3	24.4	2.0	33.5	1.5	
			cm	150.6	63.0	5.1	85.1	3.8	
		VAV	in	59.3	24.4	2.0	33.5	1.5	
			cm	150.6	63.0	5.1	85.1	3.8	

SECTION 15: DISCHARGE HEADS AND SPLASH PLATES

⚠ WARNING			
			
Crush Hazard	**Falling Hazard**	**Severe Injury Hazard**	**Cut/Pinch Hazard**
Use proper lifting equipment and practices.	**Use proper safety equipment and practices to avoid falling.**	**Use proper lifting practices and equipment.** **Equipment and accessories are heavy.**	**Wear protective gear during installation, operation and service.** **Edges are sharp.**
Failure to follow these instructions can result in death, injury or property damage.			

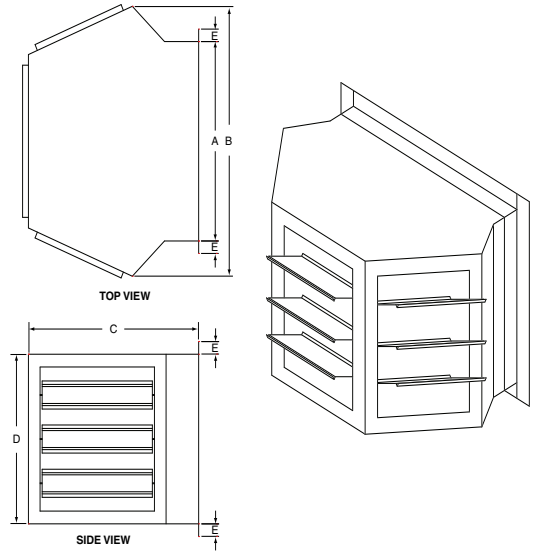
Part numbers that end with a “[W]” indicate that the part can be ordered with either an unpainted galvanized finish or a white paint finish. To order with a galvanized finish, do not include the "W" at the end of the part number; to order with a white paint finish, include the "W" at the end of the part number.

15.1 One-Way and Three-Way Discharge Head Installation

All discharge heads are shipped assembled. The discharge head is designed for mounting to the face of the air handler (covering the discharge opening) or to an interior wall. All discharge heads must be field supported (by others). The discharge head has four outward-turned flanges. If the discharge head is to be installed to the face of the air handler, install hardware (provided by others) on all four sides of the discharge head.

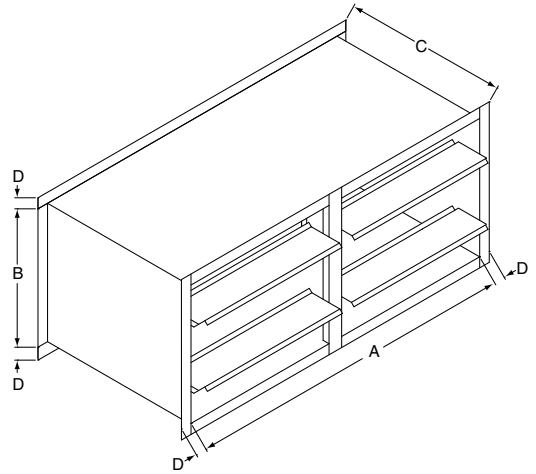
To install the discharge head on an interior wall, drill holes every 8"(20.5cm) in the flanges on all four sides of the discharge heads to accommodate lag bolts (supplied by others). Sheet metal (supplied by others) may be required. *See Page 93, Figure 39* for the three-way discharge head available for Models DF40 - DF410. *See Page 94, Figure 40* for the one-way discharge head available for Models DF700A and DF700B.

FIGURE 39: Three-Way Discharge Head (DF40 - DF410)



Model		A	B	C	D	E	Part Number	Weight	
								lbs	kg
DF40	(in)	19.0	40.8	23.8	21.0	2.0	77349.301	50	22.7
	(cm)	48.3	103.5	60.3	53.3	5.1			
DF75 and DF150	(in)	22.4	40.8	24.0	19.4	2.0	77049.301	80	36.3
	(cm)	56.9	103.5	61.0	49.3	5.1			
DF270	(in)	31.9	43.3	21.5	33.9	2.0	77249.201	120	54.4
	(cm)	81.0	109.9	54.6	86.1	5.1			
DF410	(in)	36.9	48.3	22.5	36.9	2.0	77549.201	160	72.6
	(cm)	93.7	122.6	57.2	93.7	5.1			

FIGURE 40: One-Way Discharge Head (DF700A and DF700B)



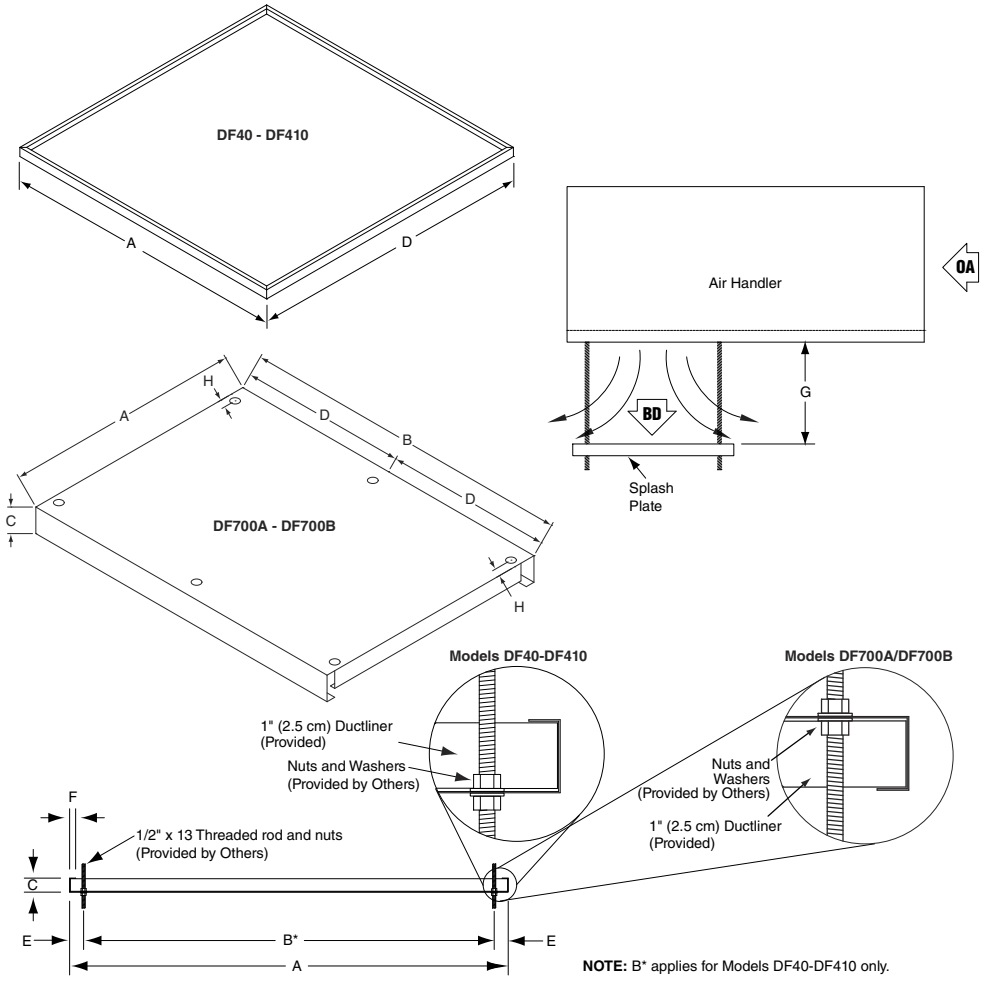
Model		A	B	C	D	Part Number	Weight	
							lbs	kg
DF700A	(in)	87.8	39.8	30	3.0	80300	215	97.5
	(cm)	222.9	101.1	76.2	7.6			
DF700B	(in)	103.8	48.5	30	2.0	80301	335	161
	(cm)	263.5	123.2	76.2	5.1			

15.2 Splash Plate Installation

The splash plate is designed to hang directly from a horizontal air handler with a bottom discharge. Before the splash plate can be installed on the air handler, first drill four holes (DF40-DF410) or six holes (DF700A and DF700B) in the air handler floor. These holes should be approximately 5/8"(15.9 mm) in diameter to accommodate 1/2" (3/4" Model DF700A and DF700B) hanger rods (supplied by others). These holes should be located as shown in the diagram on *Page 96, Figure 42*.

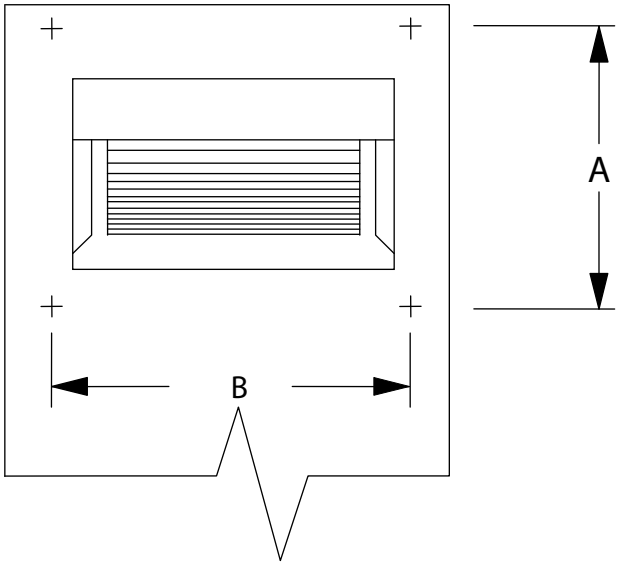
To attach all of the hanger rods to the splash plate, start by threading a flanged nut onto each hanger rod. Then, slip each hanger rod down through a hole located in each corner of the splash plate. Next, feed a flanged nut onto the rod below the splash plate (For models DF40-DF410, *See Page 95, Figure 41*. For models DF700A and DF700B, *See Page 95, Figure 41*). The hanger rods should be attached to the air handler in the same manner as the splash plate, with a flanged nut on both sides of the air handler floor. Adjusting the nuts will level the splash plate. Torque hardware after leveling.

FIGURE 41: Splash Plate



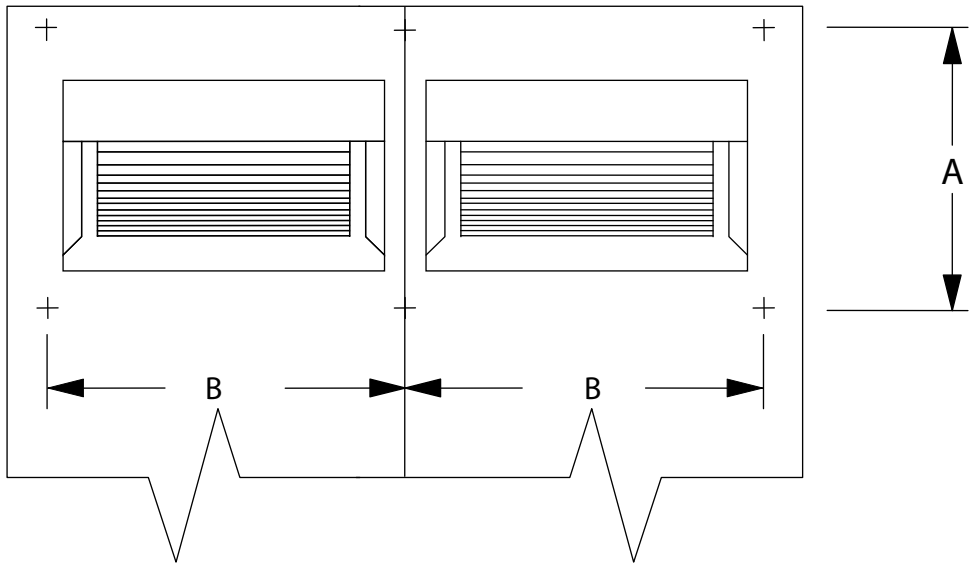
Part Number	Model		A	B	C	D	E	F	G (min)	G (max)	H	Weight lbs	Weight kg
77354.301W	DF40	(in)	22.0	19.5	0.9	25.0	1.3	0.6	15.0	20.0	N/A	20.0	9.1
		(cm)	55.9	49.5	2.2	63.5	3.2	1.6	38.1	50.8			
77053.301[W]	DF75/ DF150	(in)	44.0	41.5	0.9	44.0	1.3	0.6	18.0	27.0	N/A	40.0	18.1
		(cm)	118.8	105.4	2.2	111.8	3.2	1.6	47.5	68.6			
77253.301[W]	DF270	(in)	54.8	51.3	1.8	54.8	1.8	0.8	25.0	38.0	N/A	60.0	27.2
		(cm)	139.1	130.2	4.4	139.1	4.4	2.0	63.5	96.5			
	DF410	(in)							30.0	45.0	N/A		
		(cm)							76.2	114.3			
80302[W]	DF700A/ DF700B	(in)	51.0	110.4	3.0	55.2	2.0	1.0	25.0	38.0	1.8	170.0	77.1
		(cm)	129.5	280.4	7.6	140.2	5.1	2.5	63.5	96.5	4.6		

FIGURE 42: Hole Location (DF40-DF410)



Model		DF40	DF75 and DF150	DF270	DF410
A	(in)	19.5	41.5	51.3	51.25
	(cm)	49.5	105.4	130.2	130.2
B	(in)	22.5	41.5	51.3	51.25
	(cm)	57.2	105.4	130.2	130.2

FIGURE 43: Hole Location (DF700A and DF700B)



Model		DF700A	DF700B
A	(in)	47	47
	(cm)	119.4	119.4
B	(in)	53.5/107	53.5/107
	(cm)	135.7	135.7

SECTION 16: DUCT CONSIDERATIONS

⚠ WARNING

Falling Hazard	Cut/Pinch Hazard
Use proper safety equipment and practices to avoid falling.	**Wear protective gear during installation, operation and service.** **Edges are sharp.**

Failure to follow these instructions can result in death, injury or property damage.

The air handler has been designed to operate at the specific air volume and external static pressure that was ordered (air handlers set-up to accept an external static pressure (ESP) of 1 in wc (2.5 mbar). This static pressure is generated by any additional components that are added to the heater (i.e. inlet hood, filter section, dampers, ductwork, discharge heads, etc). Additional static pressure beyond that ordered will affect the performance of the air handler and lessen the air volume that can be delivered.

Proper engineering methods need to be employed when calculating duct and component static pressure (i.e. 2009 ASHRAE Handbook - Fundamentals, Chapter 21). Accessory pressure drops are available on *Page 19, Table 9*.

The system ductwork must comply with Sheet Metal and Air Conditioning Contractors Nationals Association (SMACNA) or any other recognized standards.

As a general rule, all discharge ducts should have a straight run of at least 3 hydraulic duct diameters after the air handler before adding any fittings, elbows, restrictions, etc. Return ducts should have the same straight run before attaching to the unit.

Hydraulic duct diameter for round ducts:

Dh = d

Hydraulic duct diameter for rectangular ducts:

Dh = 2*H*W/H+W

Dh - hydraulic diameter

d - round duct inside diameter

H - rectangular duct height

W - rectangular duct width

16.1 Inlet Duct Work

Inlet duct work height and width must be no smaller than the air handler inlet height and width and supply only fresh air to the air handler. (*See Page 12, Section 5* for inlet dimensions).

16.2 Return Duct Work

Inlet duct work height and width must be no smaller than the air handler inlet height and width and supply only fresh air to the air handler. (*See Page 12, Section 5* for inlet dimensions).

16.3 Discharge Duct Work

Units with twin blower should have a common discharge duct. Refer to *Page 97, Table 11* for minimum discharge duct sizes by model. Refer to *Page 97, Table 12* for discharge duct size required for connecting to heater (BD ro RS), these dimensions provide clearance for duct flange to blower mounting bolts.

Table 11: Minimum Recommended Duct Size

Model		Height	Width
DF40	(in) (cm)	14 35.6	15.6 39.7
DF75 and DF150	(in) (cm)	24 61.0	24 61.0
DF270	(in) (cm)	32 81.3	32 81.3
DF410	(in) (cm)	38 96.5	38 96.5
DF700A	(in) (cm)	32 81.3	88 223.5
DF700B	(in) (cm)	38 96.5	104 264.2

Table 12: Discharge Duct Size Recommendations to Connect to Heater (for BD/RD)

Model		Height	Width
DF40	(in) (cm)	14 35.6	17.5 44.5
DF75 and DF150	(in) (cm)	25.3 63.5	25.3 63.5
DF270	(in) (cm)	40 101.6	35.3 89.5
DF410	(in) (cm)	47 119.4	40.8 103.5
DF700A	(in) (cm)	32 81.3	88 223.5
DF700B	(in) (cm)	38 96.5	104 264.2

NOTE: Dimension clearance to clear blower mounting bolts.

SECTION 17: GAS PIPING

⚠WARNING

Explosion Hazard

Leak test all components of gas piping before operation.

Gas can leak if piping is not installed properly.

Do not high pressure test gas piping with air handler connected.

Failure to follow these instructions can result in death, injury or property damage.

17.1 Gas Manifolds

All gas piping to the air handler must comply with:

United States: Refer to NFPA 54/ANSI Z223.1 - latest revision, National Fuel Gas Code.

Canada: Refer to CSA B149.1 - latest revision, Natural Gas and Propane Installation Code.

The air handlers are available with three gas manifold options.

- American National Standards Institute (ANSI) compliant manifold: (*See Page 99, Figure 44* for DF40. *See Page 99, Figure 45* for DF75 - DF410. *See Page 101, Figure 48* for DF700A and DF700B).
- Factory Mutual (FM)-compliant manifold: (*See Page 99, Figure 44* for DF40. *See Page 100, Figure 46* for DF75 - DF410. *See Page 101, Figure 49* for DF700A and DF700B).
- XL Insurance (former IRI)-compliant manifold: (*See Page 99, Figure 44* for DF40. *See Page 100, Figure 47* for DF75 - DF410. *See Page 102, Figure 50* for DF700A and DF700B).

17.2 Gas Piping and Pressures

The air handler is equipped with a gas manifold suitable for connection to supply pressure of up to:

- 14 in wc maximum (34.9 mbar) (DF40-DF410 with ANSI-compliant manifold.)
- 5 p.s.i. maximum (All DF700A and DF700B manifolds; DF40-DF410 with FM or XL Insurance-compliant manifold).

When gas supply exceeds the above-listed maximum gas pressures, an additional high pressure gas regulator will be required to assure that the correct gas pressure is supplied to the regulator. Pressure should be measured between the high pressure gas regulator and safety shut off valve.

Minimum gas pressure as indicated on data plate must be measured with the burner operating in high fire.

Table 13: Gas Manifold Size

Model	DF40	DF75	DF150	DF270	DF410	DF700A	DF700B
Gas NPT Connection	¾"	1"	1¼"	1½"	2"	1½" - 3"	

NOTE: Vent valves fitted on XL Insurance-compliant manifolds must be piped to the atmosphere in accordance with applicable codes.

17.3 Main Gas Regulator Venting

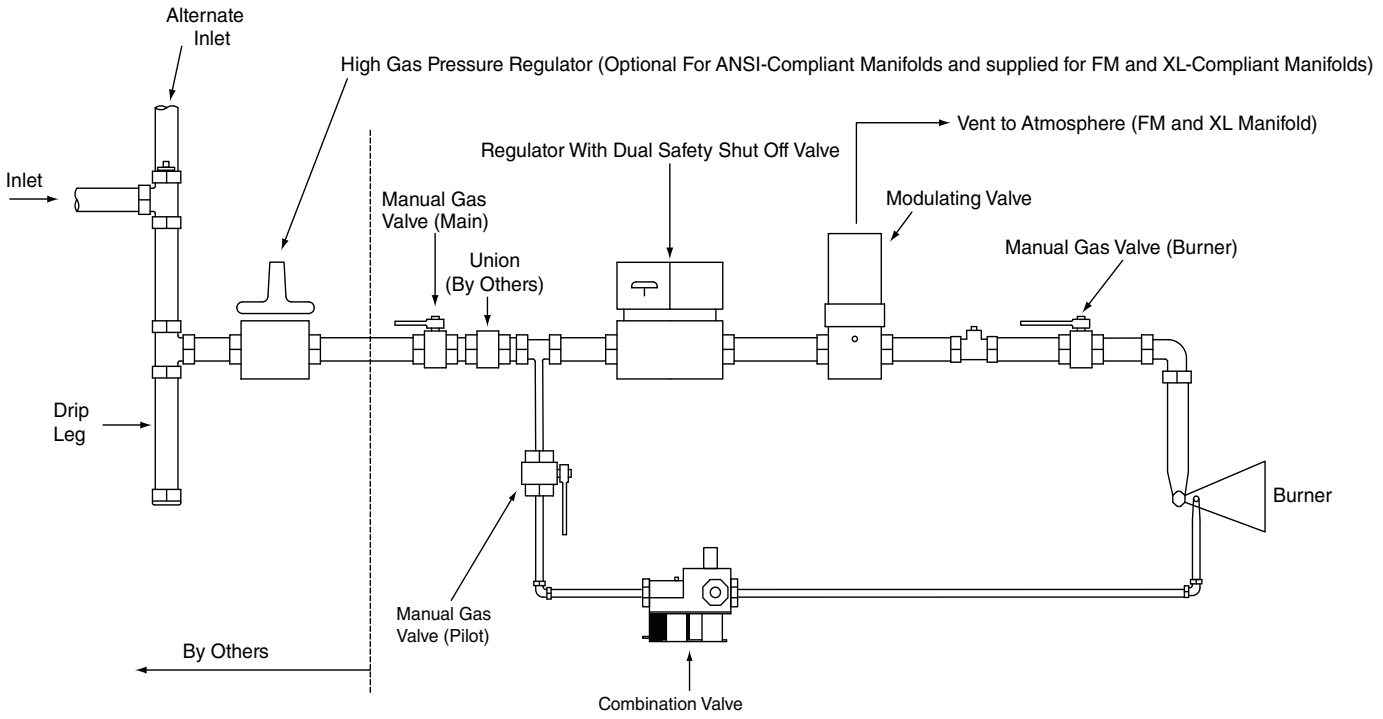
The main regulator used on 1¼" and larger manifolds must be piped to the atmosphere outside the structure. This is the responsibility of the installer.

17.4 Vent Line Installation

The following may be used as a guideline for installation, but all applicable codes and regulations must be followed.

- Natural gas and LPG are toxic and flammable substances. They must be released where they will not cause personal injury or property damage. The end of the vent line must be located where it is safe to release gas.
- Pipe the vent line outside the structure.
- Use as short a vertical run of pipe as possible.
- Do not run pipe from a high point to a lower point to avoid obstacles.
- Use a minimum number of bends.
- Do not downsize the pipe from the origination point.
- Make sure vent line is free from obstructions.
- Do not group lines together into a common header.
- The outside termination must have a weatherproof cap or be directed downward for protection from the elements and must be screened to prevent the entry of any objects.

FIGURE 44: ANSI/FM/XL-Compliant Manifolds (DF40)



NOTE: Vent valves must be piped to the atmosphere in accordance with applicable codes.

FIGURE 45: ANSI-Compliant Manifold (DF75-DF410)

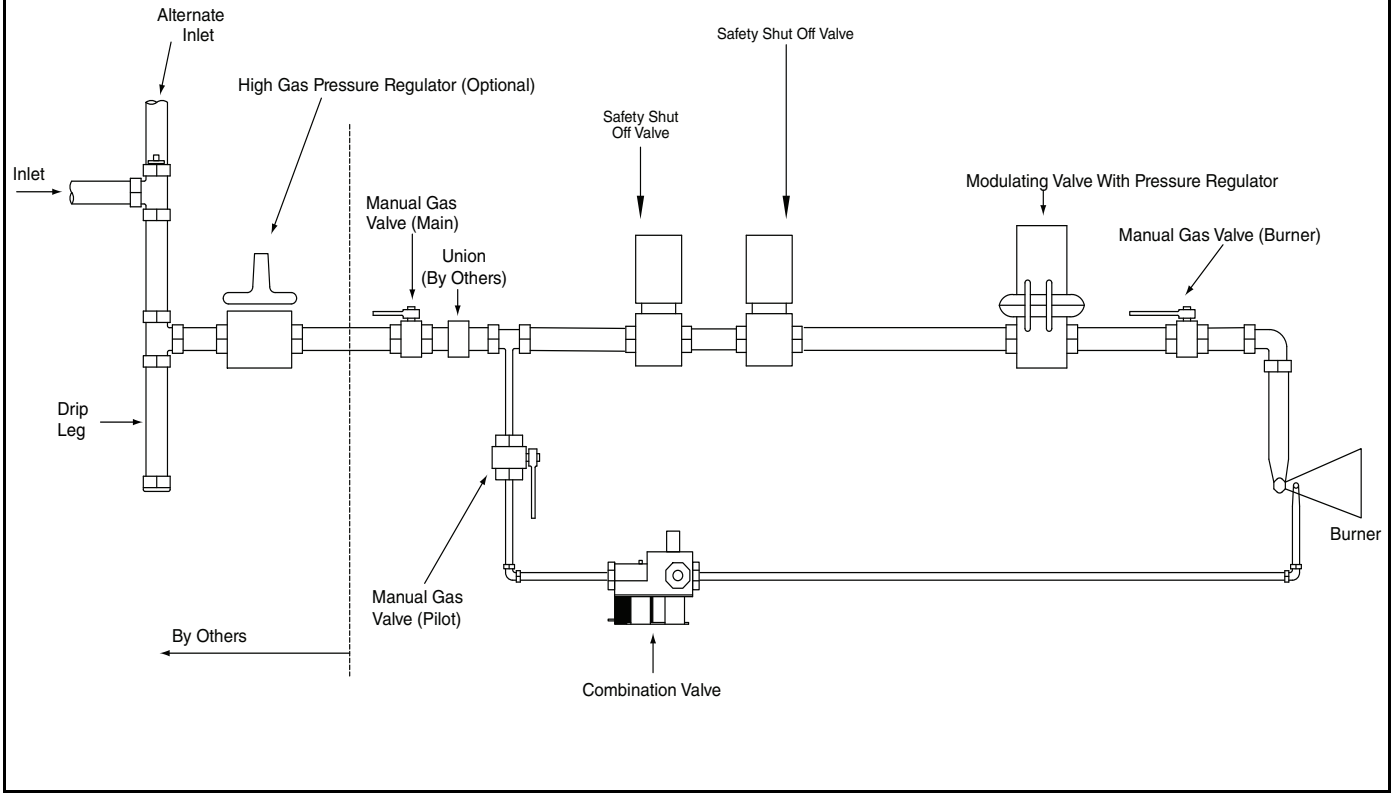
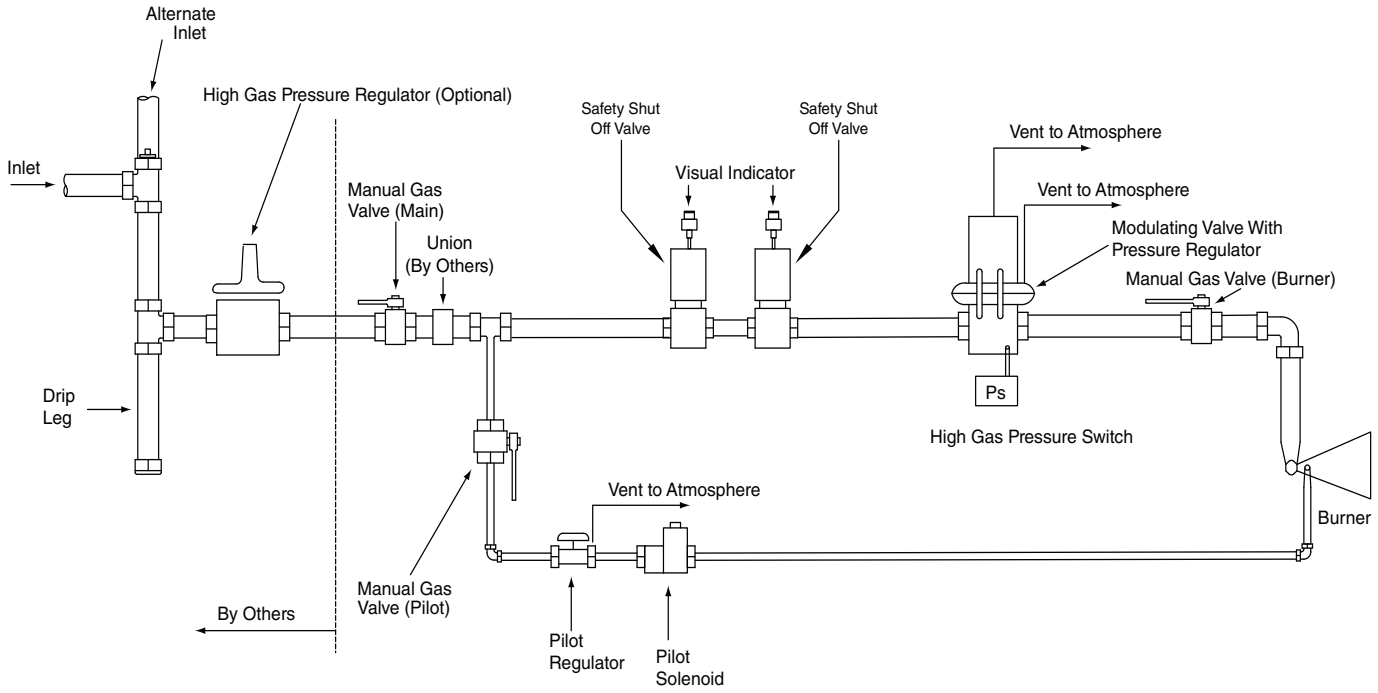
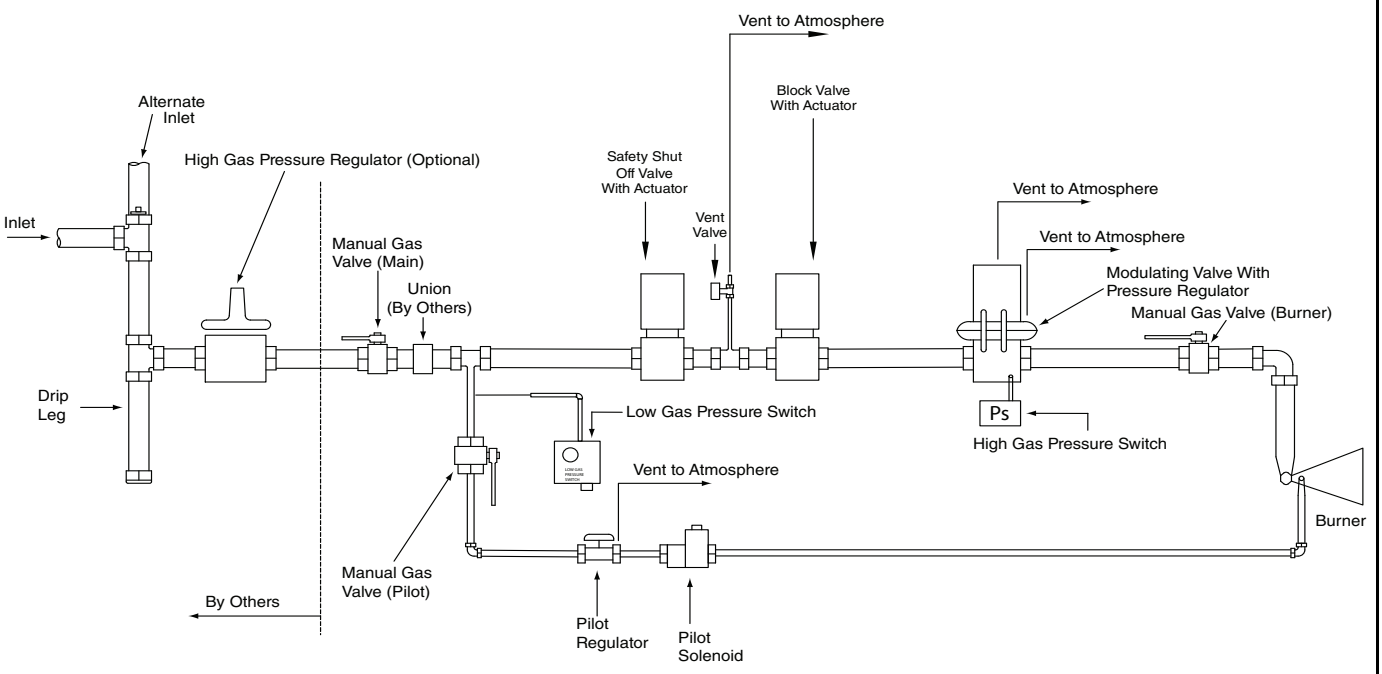


FIGURE 46: FM-Compliant Manifold (DF75-DF410)



NOTE: Vent valves must be piped to the atmosphere in accordance with applicable codes.

FIGURE 47: XL Insurance (Former IRI)-Compliant Manifold (DF75-DF410)



NOTE: Vent valves must be piped to the atmosphere in accordance with applicable codes.

FIGURE 48: ANSI-Compliant Manifold (DF700A and DF700B)

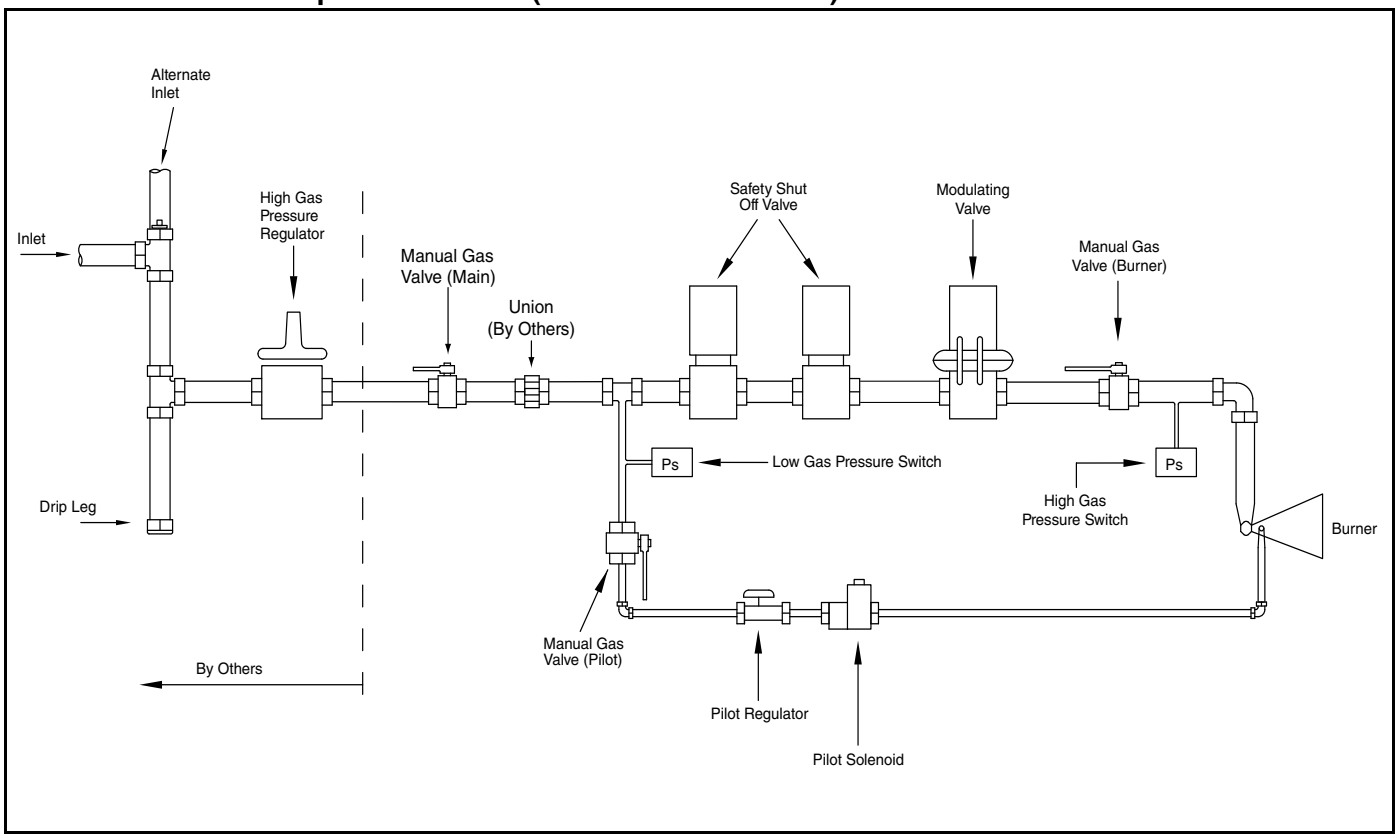
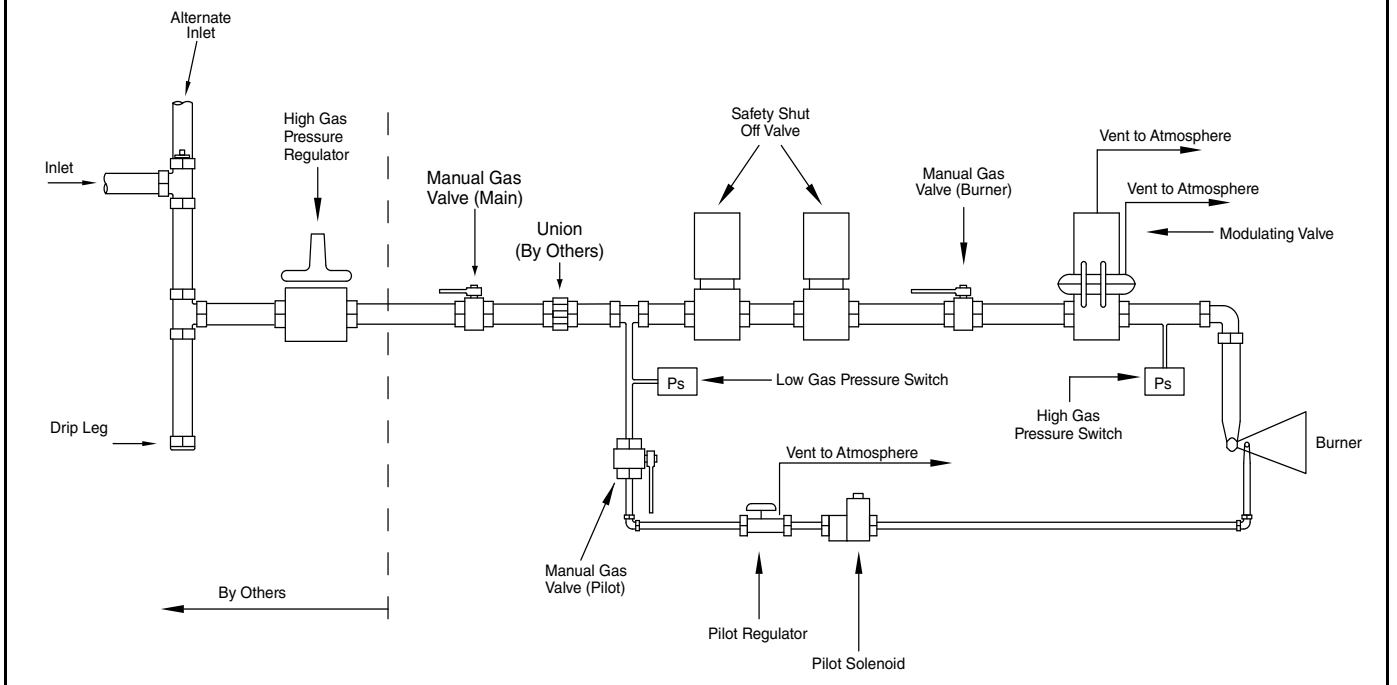
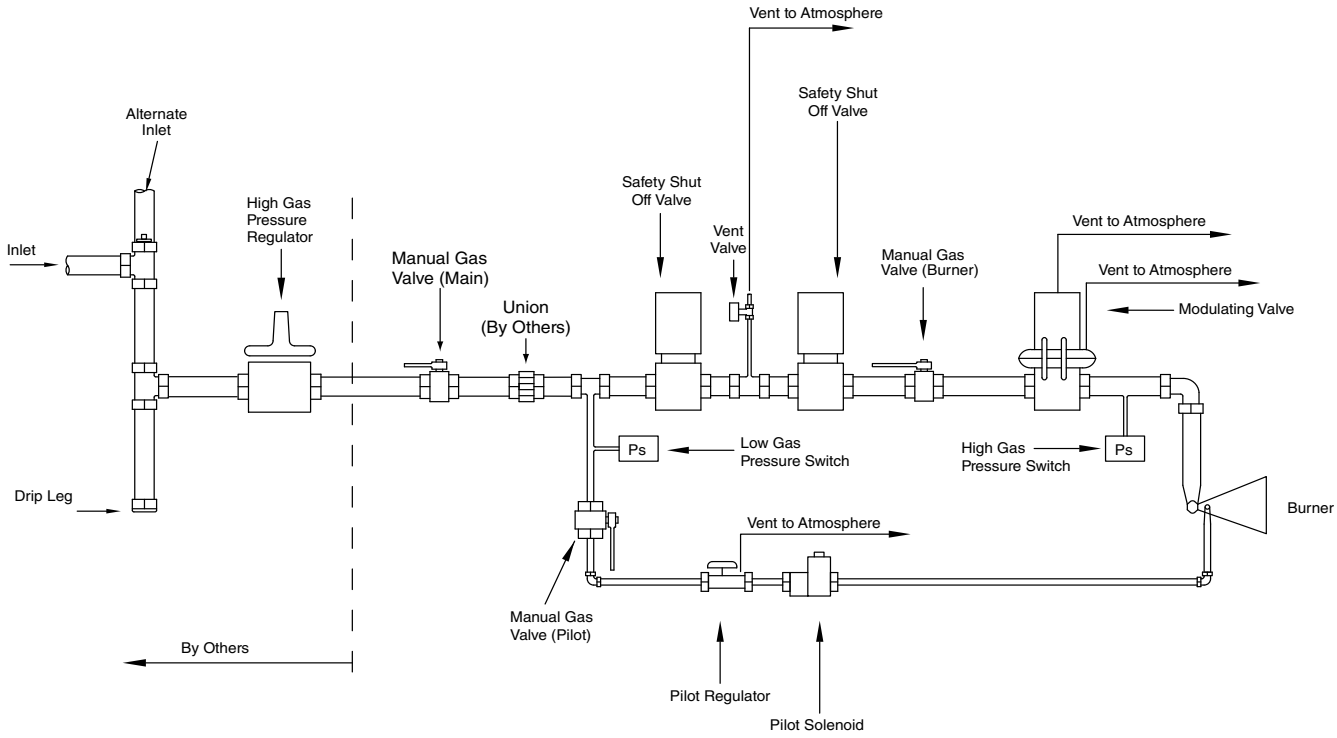


FIGURE 49: FM-Compliant Manifold (DF700A and DF700B)



NOTE: Vent valves must be piped to the atmosphere in accordance with applicable codes.

FIGURE 50: XL Insurance (Former IRI)-Compliant Manifold (DF700A and DF700B)



NOTE: Vent valves must be piped to the atmosphere in accordance with applicable codes.

17.5 Gas Piping

The gas manifold extends through the side of the control cabinet for models DF40-DF410. For models DF700A and DF700B, a qualified contractor/installer must make appropriate hole in the control enclosure for the gas pipe connection. The factory piping terminates with a female pipe connection in the manual gas valve. Be sure that the fuel supply pipe connected at this point is large enough to ensure the proper gas flow and line pressure at the inlet of the air handler. The piping must comply with:

United States: Refer to NFPA 54/ANSI Z223.1 - latest revision, National Fuel Gas Code.

Canada: Refer to CSA B149.1 - latest revision, Natural Gas and Propane Installation Code.

Gas supply piping must conform to best building practices and local codes. During installation of the gas piping, be sure that piping does not restrict accessibility to the air handler or its removable access doors.

Lockable manual shut-off valve must be added by the installer in compliance with Occupational Safety and Health Administration (OSHA) regulations.

17.6 Pressure Test Ports

There are 1/8"(3.2 mm) and 1/4"(6.4 mm) pressure test ports located on the manifold. The test ports are available to measure the manifold inlet gas pressure and the burner gas pressure during burner setup.

17.6.1 Manifold Inlet Gas Pressure

The pressure port for measuring manifold inlet pressure is located on the inlet side of the first safety shutoff valve. Refer to the unit rating plate for the acceptable inlet gas pressure.

17.6.2 Burner Gas Pressure

A pressure tap is used to measure negative airflow at the burner and to set high fire gas pressure. On air handlers equipped with a M611 modulating valve (Model DF40), the pressure tap is located on a tee between the M611 valve and the burner. *See Page 103, Figure 51 and Page 148, Figure 94*. On air handlers equipped with the MR212 modulating valve (Models DF75-DF700B), the pressure tap could be located on the downstream side of the MR212 valve, on a T-fitting coming off the outlet pressure tap on the MR212 valve or between the MR212 valve and the burner. *See Page 103, Figure 52* and *Page 147, Figure 92*.

FIGURE 51: Plug Tapping (DF40)

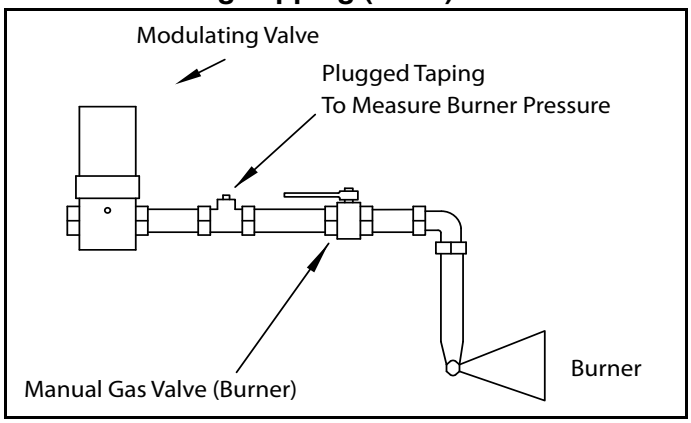
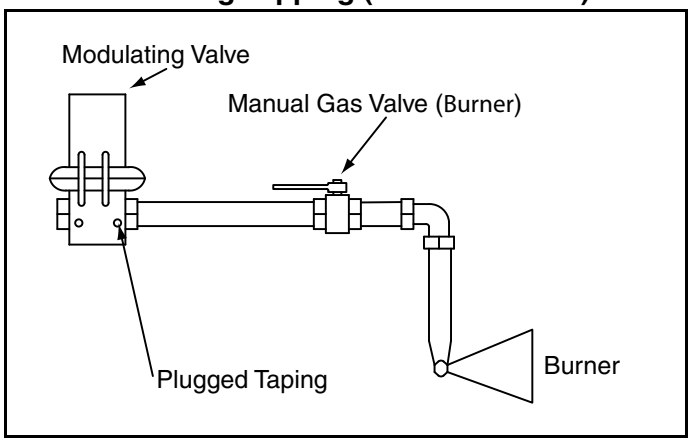


FIGURE 52: Plug Tapping (DF75 - DF700B)



17.7 Line Pressure Test - Leak Testing

The air handler and its individual shut-off valve must be disconnected from the gas supply piping systems during any pressure testing of that system at test pressures in excess of 14 in wc (34.9 mbar). The air handler must be isolated from the gas supply piping system by closing its individual manual gas valve that is located immediately upstream of the safety shut-off gas valve.

SECTION 18: ELECTRICAL

⚠ DANGER

Electrical Shock Hazard

Disconnect electric before service.

More than one disconnect switch may be required to disconnect electric from equipment.

Equipment must be properly grounded.

Failure to follow these instructions can result in death or electrical shock.

Each air handler is equipped with a wiring diagram which will vary depending on the type of remote panel supplied (See *Page 106 through Page 112*, *Figure 53 through Figure 59*). Depending on the air handler configuration and optional equipment ordered, an option sheet may also be included. This option sheet overwrites the wiring diagram between the electrical terminals indicated.

Air handlers can also be supplied as building management system (BMS)-ready. In this case, a remote panel is not supplied. See wiring diagrams on *Page 113 and Page 115*, *Figure 60 and Figure 62*.

Note: Spark testing or shorting of the control wires by any means will render the transformers inoperative.

18.1 Wiring and Electrical Connections

All electrical wiring and connections, including electrical grounding, must comply with:

United States: Refer to National Electrical Code®, NFPA 70 - latest revision. Wiring must conform to the most current National Electrical Code®, local ordinances, and any special diagrams furnished.

Canada: Refer to Canadian Electrical Code, CSA C22.1 Part 1 - latest revision.

Check rating plate on air handler for supply voltage and current requirements.

If any of the original control wire supplied with the air handler must be replaced, replace it with type MTW 105°C, 600 V, 16 gauge wire or equivalent, except for temperature control wiring, which must be a minimum of 20 AWG Type Beldon 5401FE CMR 75C shielded or equivalent.

For all other wires, replace with the equivalent size and type of wire that was originally provided with the air handler.

18.2 Remote Panel

The remote panel must be wired as shown on the electrical schematic. For wire gauge sizes, *see Page 104, Table 14*. All power supply and motor wiring must be minimum type THWN with a 167° F (75° C) temperature rise.

18.2.1 Remote Panel Mounting Distance

If the interconnection wiring between the remote panel and the air handler control enclosure is run in a single conduit, the wire run can be as long as 100' (30 m). If the interconnection wiring between the remote panel and the air handler control enclosure is run in two conduits (separating the shielded cable and the 120 V power supply for the remote panel), the wire run can be as long as 200' (60 m). For longer wire runs, consult the factory. Care should be used to avoid running the interconnect wiring near large industrial loads or high voltage wire runs as that may further limit the length of the interconnect wire run.

Table 14: Control Voltage Wiring For All Control Systems

Volts	Wire Gauge	Max Wire
120	18	150’ (45 m)
120	16	250’ (75 m)
120	14	350’ (106 m)

NOTE: Wiring for temperature controls must be run in shielded cable as indicated on the wiring diagram.

18.3 Motor Current Draw

For current requirements of the motor, refer to *Page 105, Table 15*. For specific current requirements, see rating plate located on the blower motor. Current draw may be adjusted downward by reducing blower rotations per minute (RPM) or by increasing external static pressure.

18.4 Control Current Draw

The maximum current draw for an air handler’s controls and accessories is 3A.

18.5 Safety Systems

Safety systems are required for proper performance of the air handler. The air handler shall not be permitted to operate with any safety system disabled. If a fault is found in any of the safety systems, then the system shall be repaired only by a contractor qualified in the installation and service of gas fired heating equipment, using only components that are sold and supplied by Roberts-Gordon LLC. Refer to *Page 105, Table 16* for a brief description of each safety device, its location and its switching voltage.

Table 15: Full Load Current Draw

Electrical Characteristics	Motor Size HP(kW)										
	2(1.5)	3(2.2)	5(4.0)	7.5(5.5)	10(7.5)	15(11)	20(15)	25(18.5)	30(22.5)	40(30.0)	50(37.5)
230/1/60	12.0	16.0	23.0	31.0	39.0	-	-	-	-	-	-
208/3/60	5.9	8.7	14.0	21.7	29.0	41.0	50.0	65.0	77.0	104	130
230/3/60	5.6	8.0	13.8	20.0	26.8	38.0	48.0	60.0	72.0	95	121
460/3/60	2.8	4.0	6.9	10.0	13.4	19.0	24.0	30.0	36.0	47.5	60.5
575/3/60	2.2	3.1	5.5	7.7	10.0	16.2	19.2	24.5	29.6	38.8	49.2

Table 16: Safety Systems

Safety Controls	Location	Voltage
Manual Reset High-Temp Limit (All Models)	Blower Discharge	120
Pressure Switches (All Models)	Air Handler Control Enclosure	120
Flame Control (DF75/DF150/DF270/DF410/DF700A/DF700B)	Air Handler Control Enclosure	120
Flame Control (DF40)	Air Handler Control Enclosure	24
Discharge Temperature Monitor (All Models)	Blower Discharge	24
AM Resistor (AM/VAV Style)	Air Handler Control Enclosure	24

18.5.1 Manual Reset High Temperature Limit Switch

If for any reason, the temperature of the air at the discharge of the blower reaches the limit set point of 160° F (71.1° C) for Models DF40-DF410 or 150° F (65.6° C) for Models DF700A and DF700B, the high temperature limit switch will open the circuit to the burner system and discontinue all burner functions. Events that could result in excessive discharge air temperatures include if the burner modulation amplifier is defective (i.e. temperature sensor goes open circuit) or if a surge in gas pressure reaches the burner. Restarting of the burner can only be accomplished after the limit has cooled down and the reset button on the switch has been depressed. This switch is located on the blower housing inside the air handler.

18.5.2 Pressure Switches

The low airflow velocity pressure switch monitors the airflow (differential pressure) across the burner. When the airflow across the burner reaches the proper velocity (volume) for combustion, the switch closes. When the switch closes, it permits the flame safeguard relay to begin ignition. This switch is factory set at 0.32 in wc. The high velocity pressure switch will open if the airflow across the burner reaches its maximum allowable limit. This switch is factory set at 1.40 in wc. The pressure switch is a safety device, which cannot be field-adjusted or tampered with.

18.5.3 Gas Pressure Switches

Gas pressure switches are standard on certain models (UL & FM compliant gas trains above 2,500 MBH and XL compliant gas trains above 400 MBH) and are also available as an option on the others.

The function of the gas pressure switches is to protect against insufficient, lack of gas pressure and excessive pressure in the system.

On the low gas pressure switch side, this switch opens its internal switch which shuts the burner down and prevents its operation due to insufficient gas pressure.

On the high gas pressure switch side, its internal switch will open, shutting down the burner due to excessive gas pressure passing through the gas train.

The settings of the gas pressure switches are field adjustable. The one monitoring the incoming gas pressure is the low gas pressure switch.

The low gas pressure switch must be set to the minimum required gas pressure as indicated on the data plate.

The high gas pressure switch must be set to 1 in w.c. (2.5 mbar) above high fire setting established during commissioning.

18.5.4 Flame Control

This device will check for both pilot flame and main flame within the burner. When a flame signal from the pilot flame is available, it will allow the main gas valve to open.

Models DF40 - DF150 operate with intermittent pilot (pilot stays lit during burner operation). Models DF270 - DF700B operate with interrupted pilot (pilot turns off after flame is established). The flame sensor observes main flame only.

Model DF40 uses a flame rod to detect the flame (minimum flame current 1µA); Models DF75 - DF700B use an ultraviolet (UV) light scanner (5.0 Vdc flame signal).

If a pilot flame is not present, the electrical signal cannot be sent and the pilot burner gas valve will close. The relay is equipped with a 10-second trial for ignition. If ignition does not occur, the flame

safeguard relay will lockout, and must be manually reset. DF40 will reset upon power restoration. (See the Trouble-Shooting Guide - *Page 162, Section 23*)

18.5.5 Discharge Temperature Sensor

This device senses the discharge temperature of the air at the blower. The discharge temperature sensor reports the discharge temperature to the temperature control amplifier which modulates the burner to the temperature set on the remote panel selector. Should this system fail, the manual high temperature limit switch will turn the burner off. BMS-ready air handlers do not come equipped with this sensor and must be field-supplied.

18.5.6 Positive Low Fire Start

This feature forces the burner to start in low fire rather than high fire during the air handler's start-up sequence of operations. The burner maintains its low fire setting for 10 seconds (as per timer setpoint) before it begins to modulate.

FIGURE 53: Wiring Diagram Key

Notes:

1. Wire Over 24vac To Be A Minimum Of
   16 Awg Flexing Type Mtw, 105c, 600v Or Equivalent
   Colors 115vac: Phase-red, Neutral-white,
   Ground-green
   Colors 24vac: Blue
2. Control Wire To Be A Minimum Of 20 Awg Type
   Belden 5401fe Cmr 75c Shielded Or Equivalent
3. Power Supply And Motor Wires To Be Sized To Nfpa79,
   Latest Edition
   Colors All Voltages: Phase(s)-black, Ground-green

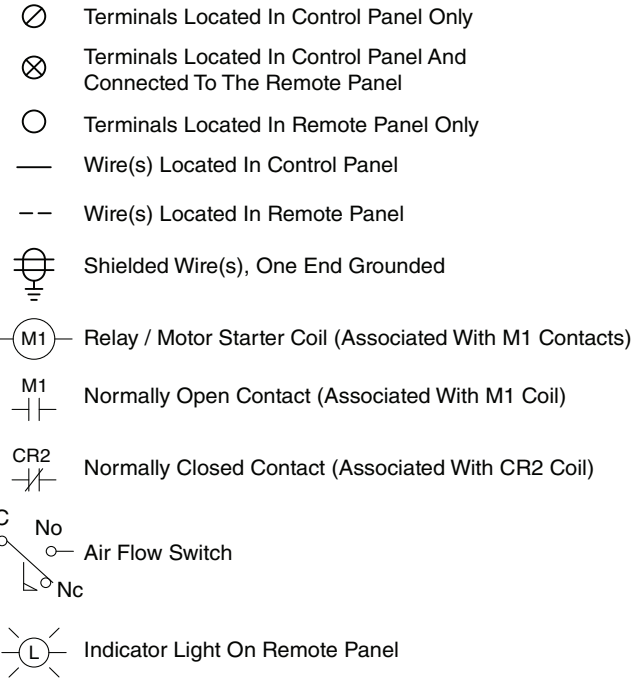
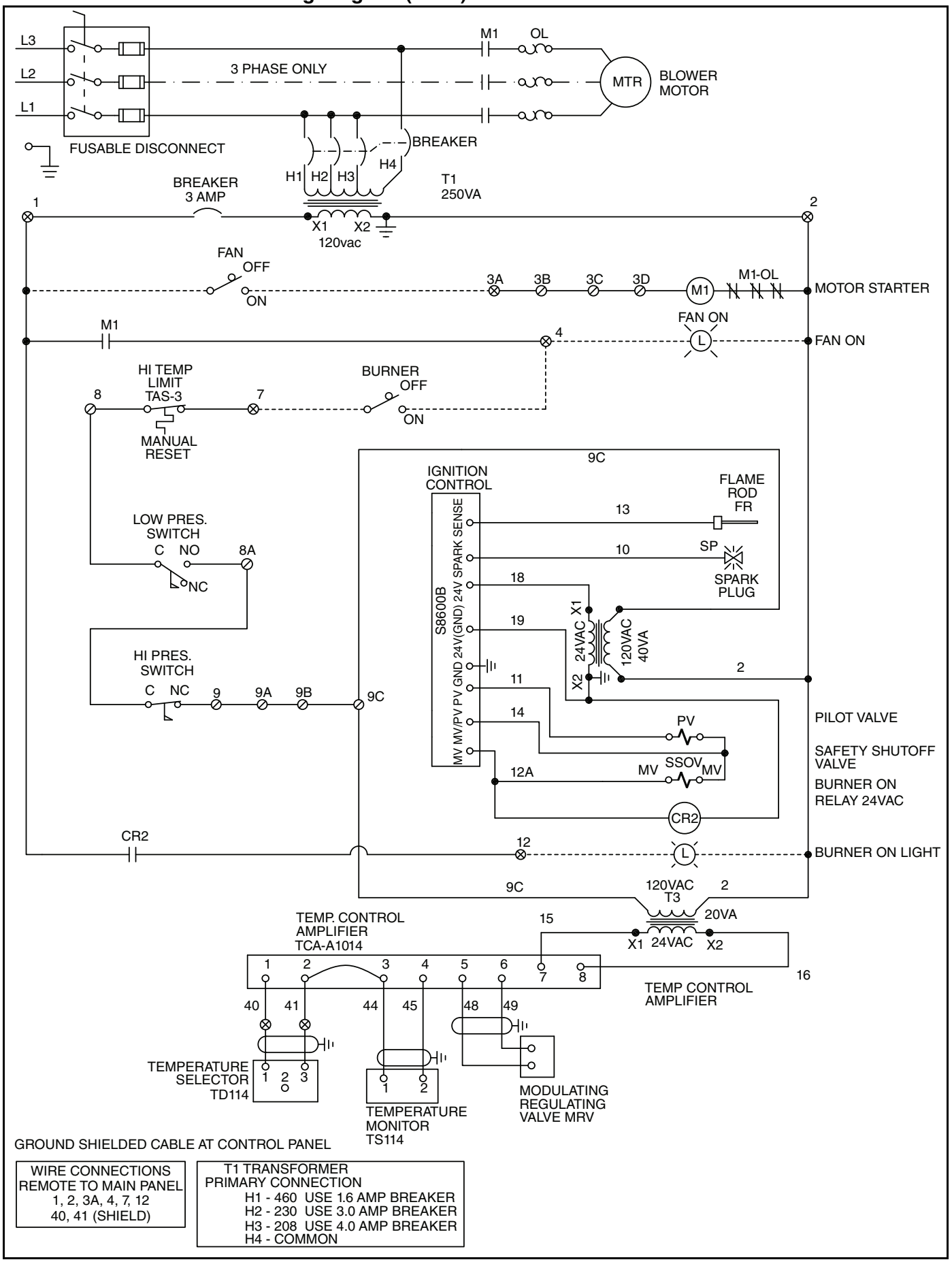


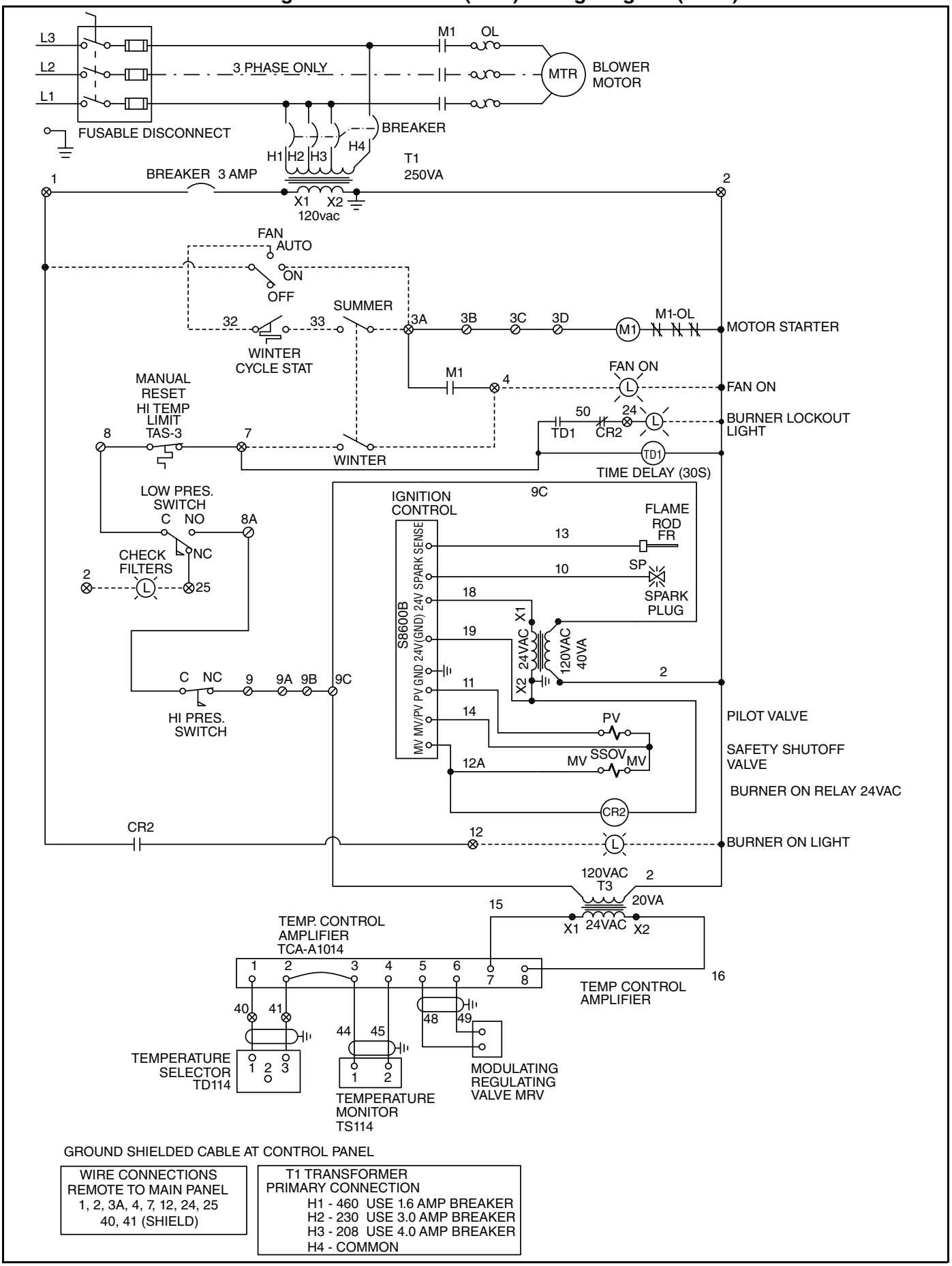
FIGURE 54: Basic Remote Wiring Diagram (DF40)



WIRE CONNECTIONS REMOTE TO MAIN PANEL
1, 2, 3A, 4, 7, 12
40, 41 (SHIELD)

T1 TRANSFORMER PRIMARY CONNECTION
H1 - 460 USE 1.6 AMP BREAKER
H2 - 230 USE 3.0 AMP BREAKER
H3 - 208 USE 4.0 AMP BREAKER
H4 - COMMON

FIGURE 55: Standard Discharge Control Remote (SDC) Wiring Diagram (DF40)



GROUND SHIELDED CABLE AT CONTROL PANEL

WIRE CONNECTIONS REMOTE TO MAIN PANEL 1, 2, 3A, 4, 7, 12, 24, 25 40, 41 (SHIELD)

T1 TRANSFORMER PRIMARY CONNECTION H1 - 460 USE 1.6 AMP BREAKER H2 - 230 USE 3.0 AMP BREAKER H3 - 208 USE 4.0 AMP BREAKER H4 - COMMON

FIGURE 56: Deluxe Temperature Control Remote (DTC) Wiring Diagram (DF40)

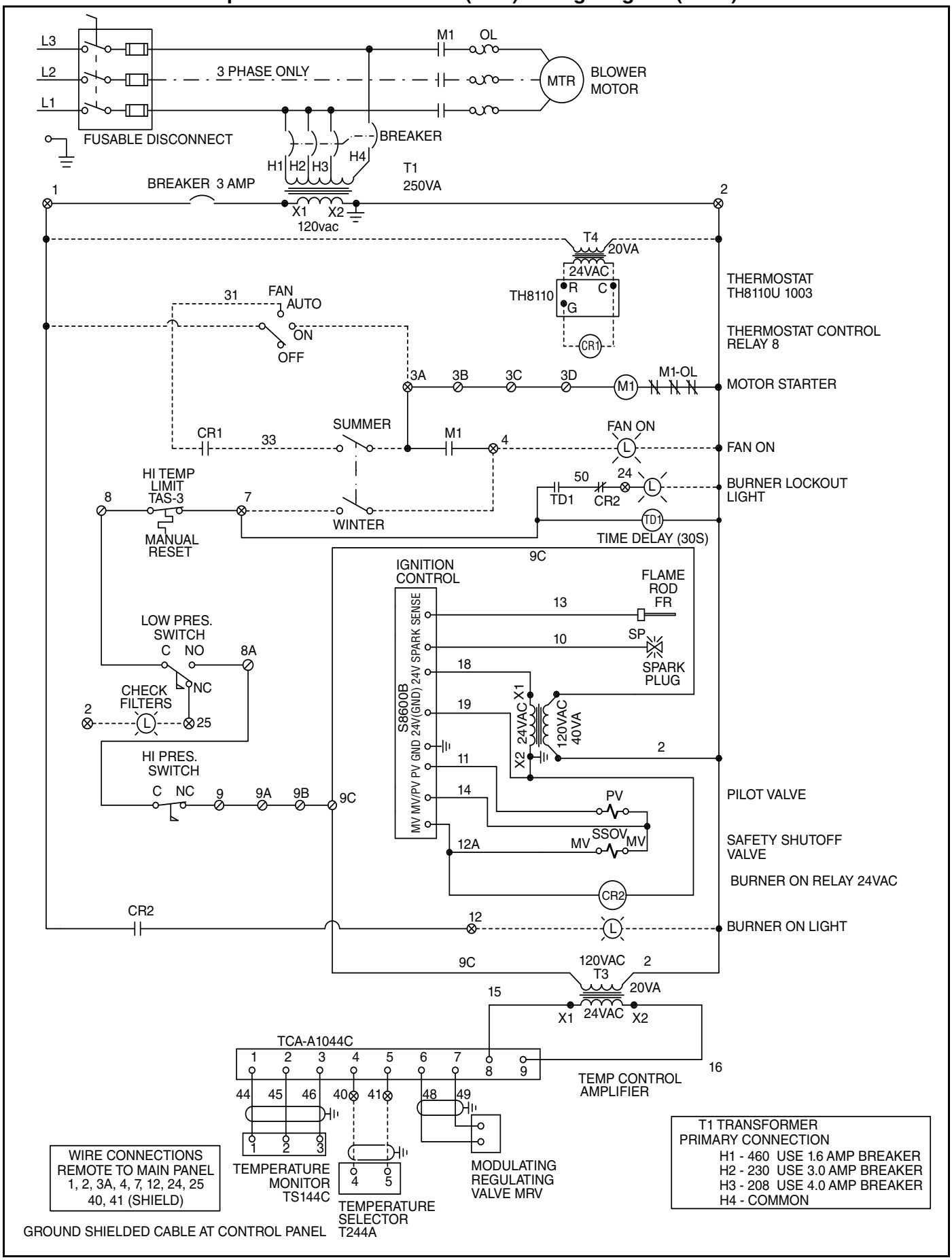


FIGURE 57: Basic Remote Wiring Diagram (DF75 - DF700B)

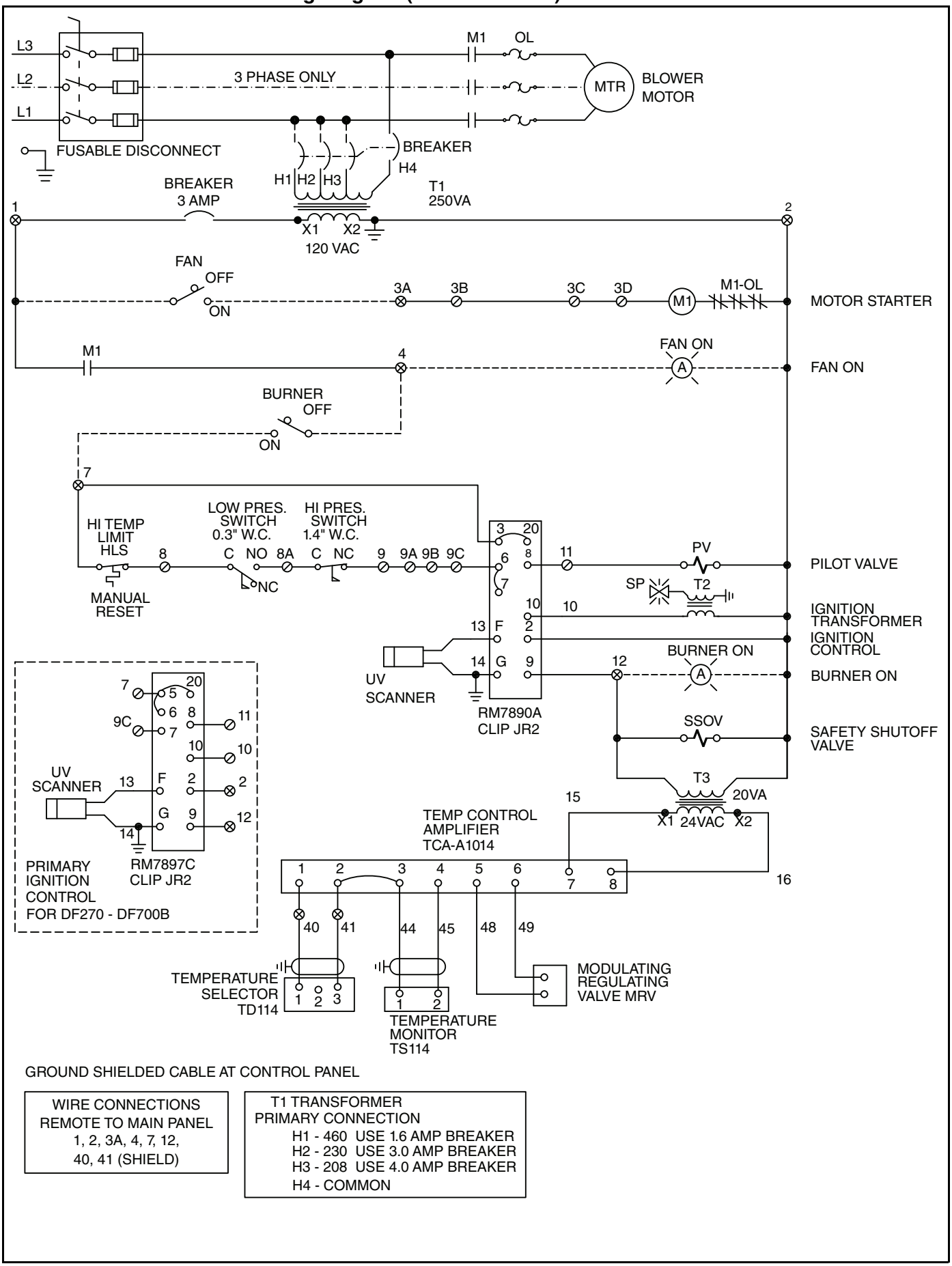


FIGURE 58: Standard Discharge Control Remote (SDC) Wiring Diagram (DF75 - DF700B)

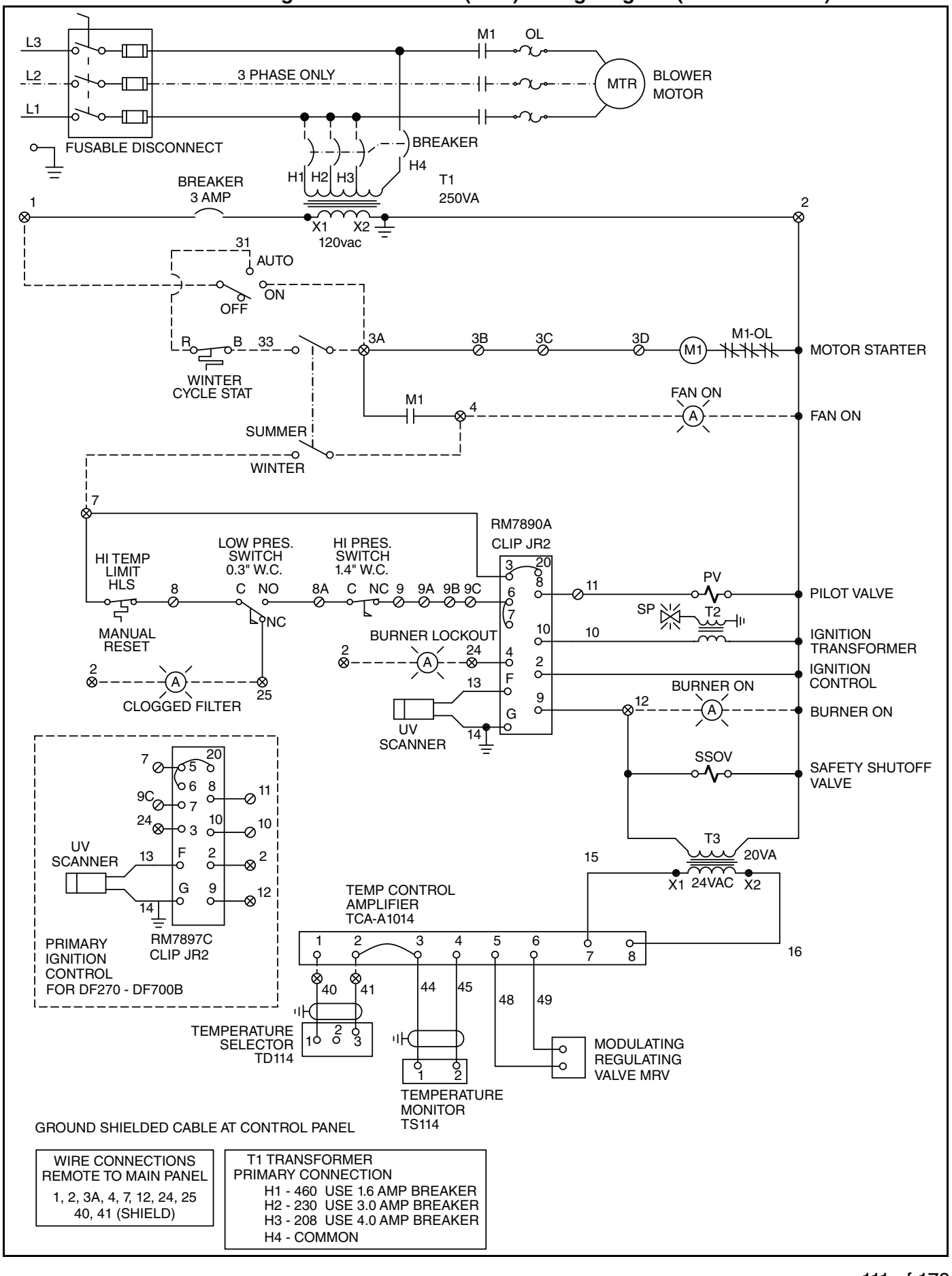


FIGURE 59: Deluxe Temperature Control Remote (DTC) Wiring Diagram (DF75 - DF700B)

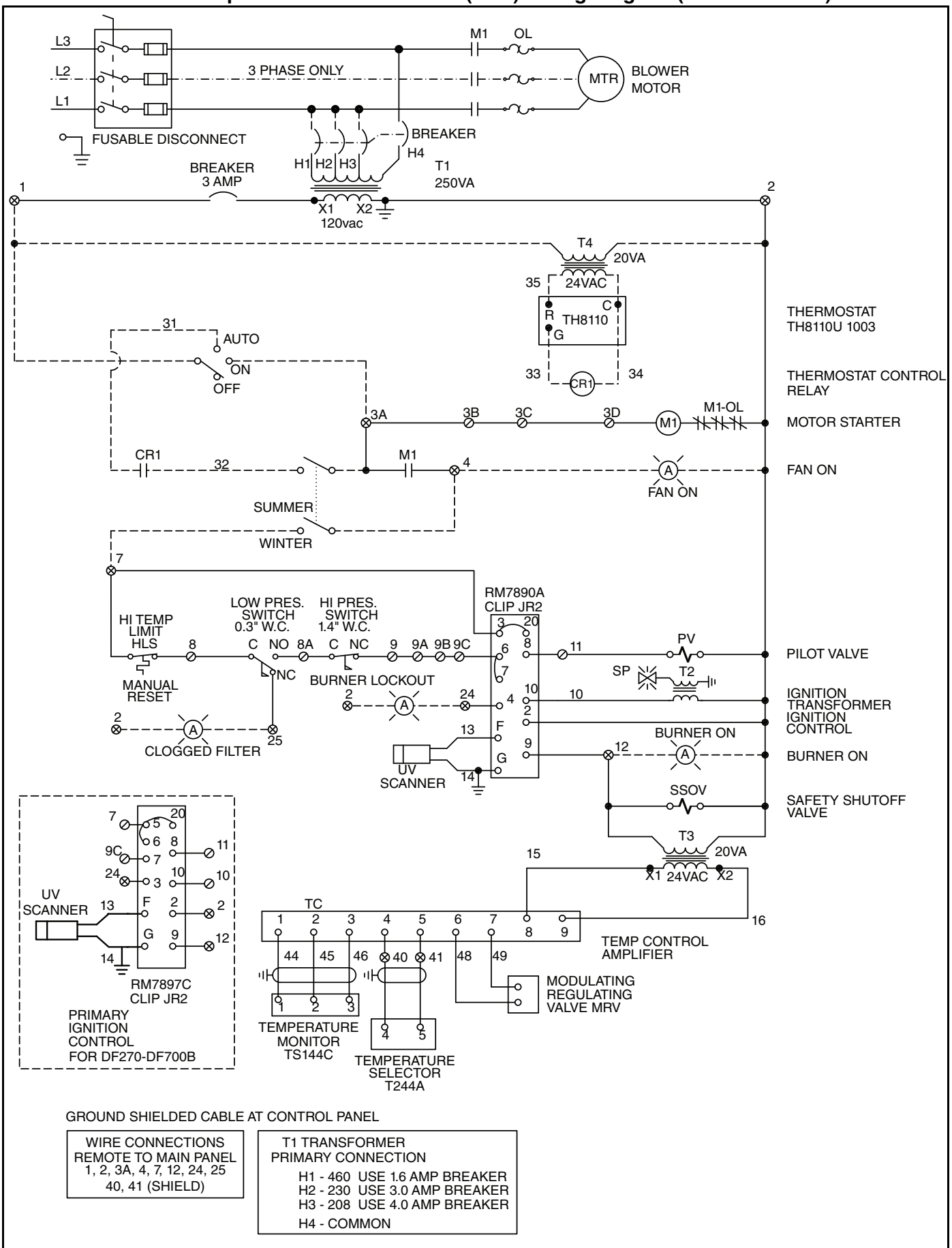


FIGURE 60: BMS-Ready Control MUA Style (DF40)

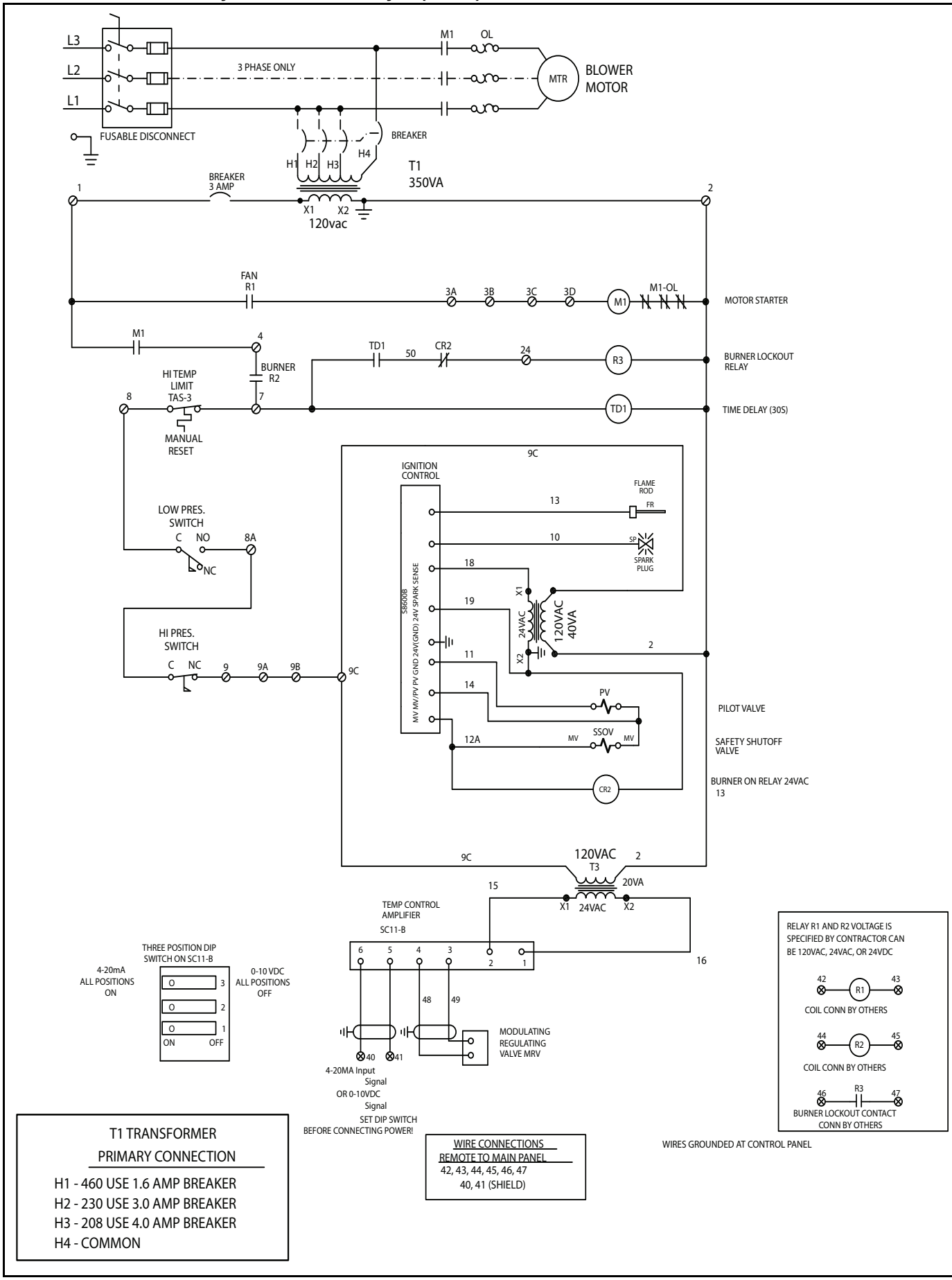


FIGURE 61: BMS-Ready Control MUA/FR Style Units (DF75 - DF700B)

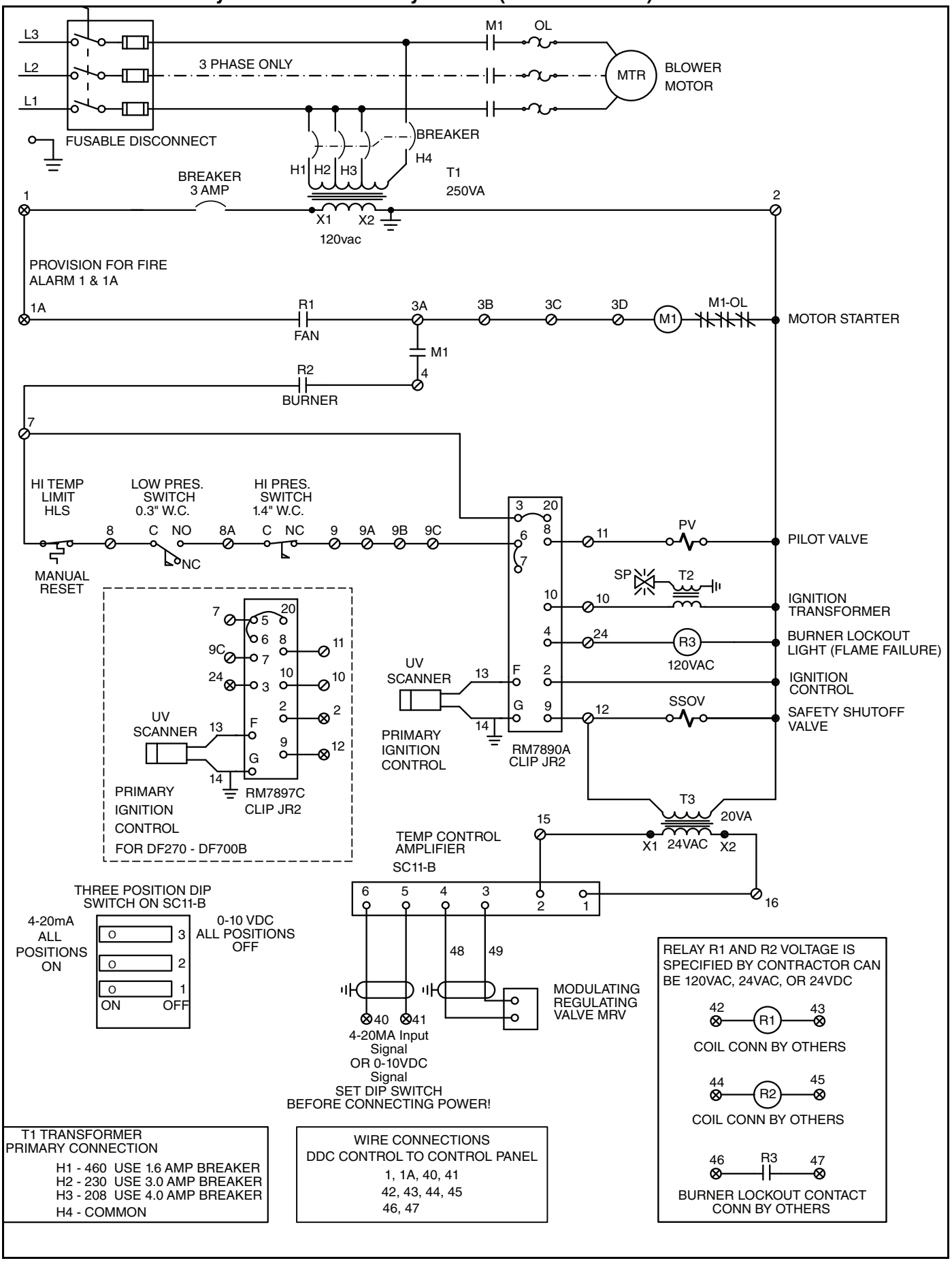
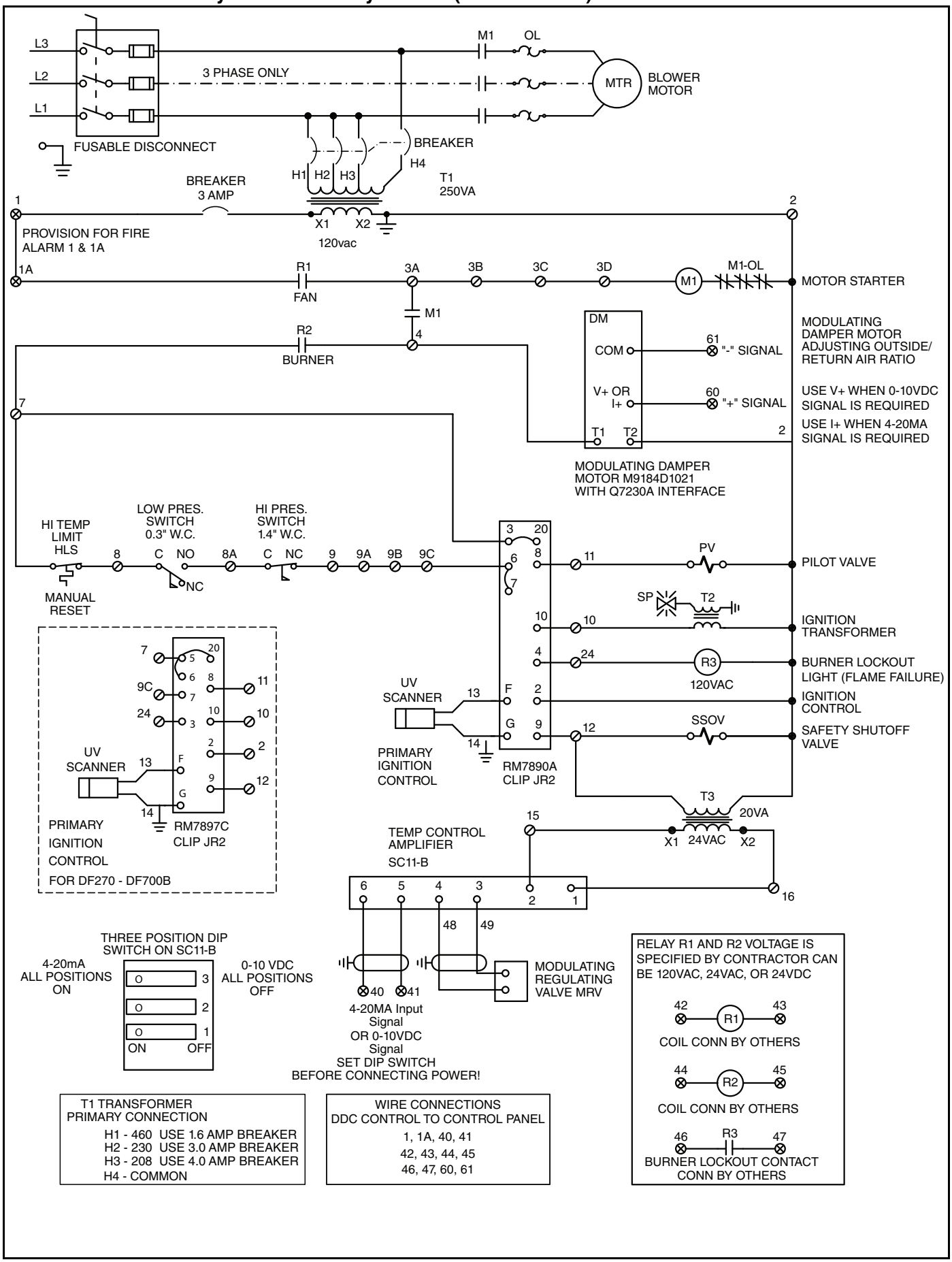


FIGURE 62: BMS-Ready Control AM Style Units (DF75 - DF150)



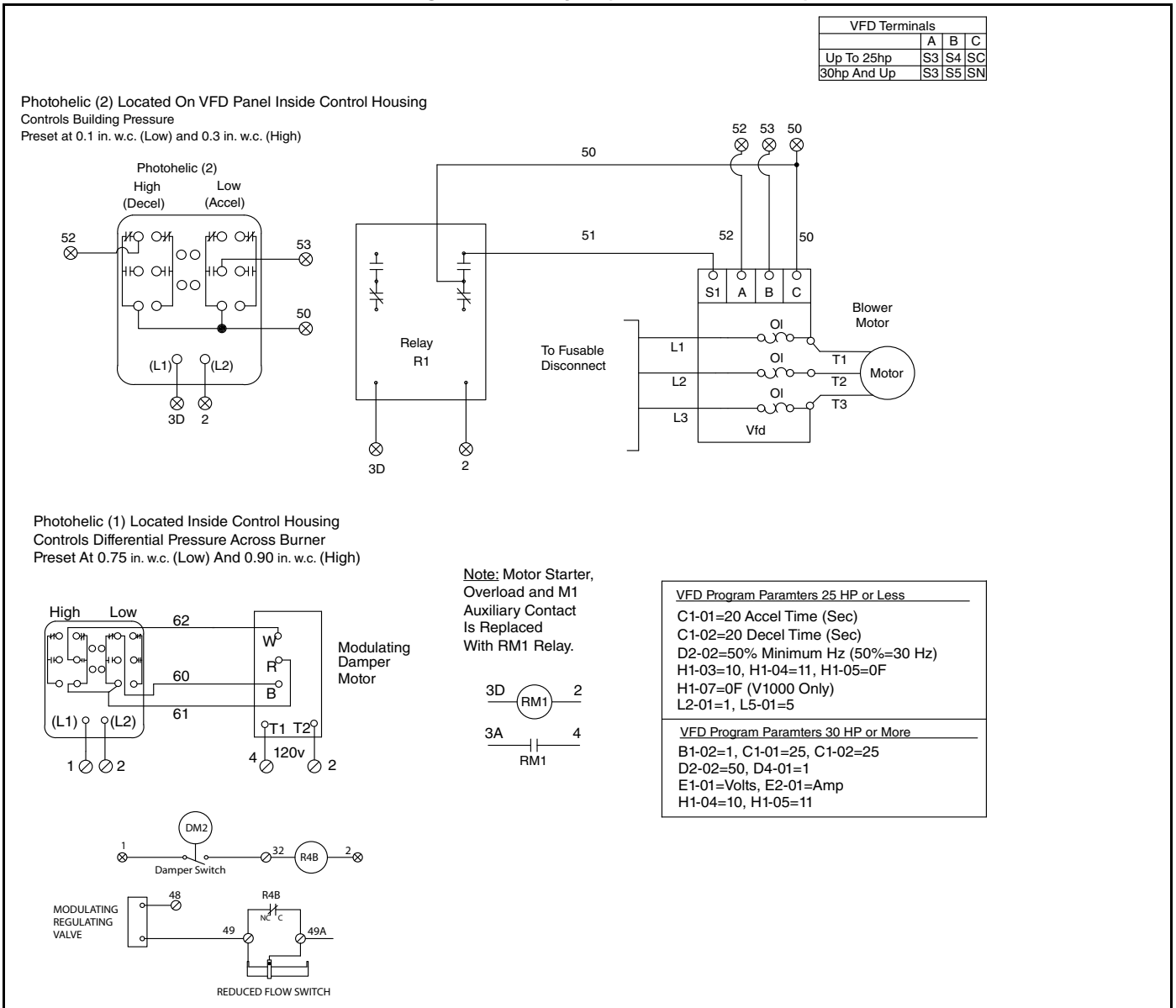
18.6 Additional Control Wiring

Depending on the style of the air handler (MUA, FR, AM or VAV), there may be additional control wiring that will be factory installed when the air handler is ordered. Any additional control wiring that is added to the air handler will be on the supplemental option sheet. On the MUA style, there are no additional controls unless an optional feature is added. The FR style air handler uses a fixed damper and also does not require additional control wiring unless an optional feature is added.

The VAV style air handler controls a floating damper and a variable frequency drive (VFD) and requires additional control wiring, *See Page 116, Figure 63* for the additional VAV style wiring for models DF75 and DF150 and *See Page 117, Figure 64* for additional VAV style wiring for models DF270 and DF700B.

The AM style air handler controls a floating damper and requires additional control wiring, *See Page 122, Figure 69* for the additional AM style wiring for Models DF75 and DF150 and *See Page 122, Figure 70* for additional AM style wiring for Models DF270 and DF700B.

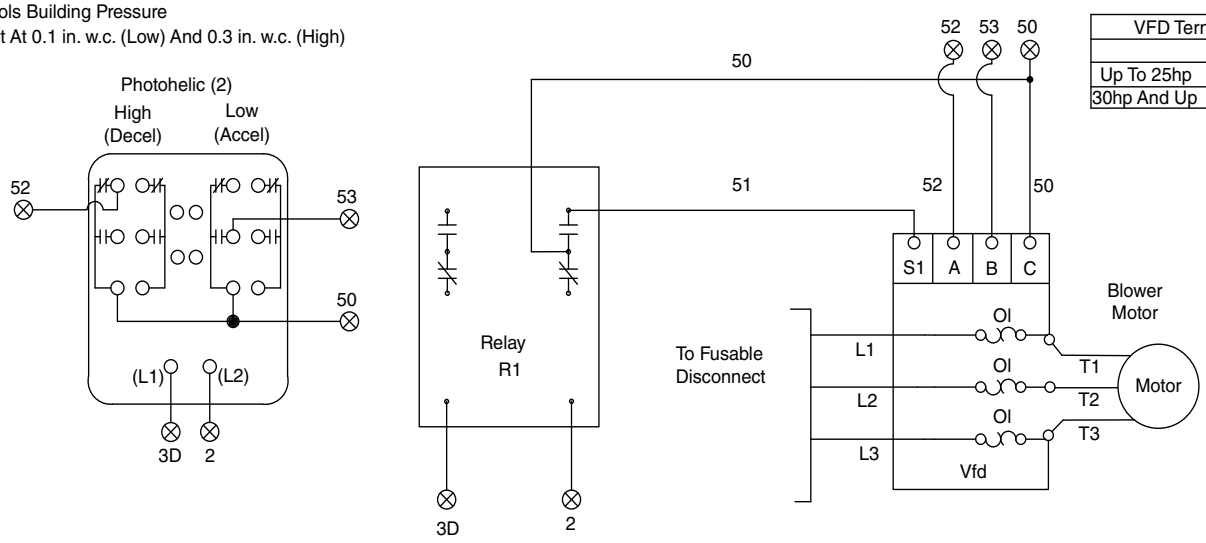
FIGURE 63: Additional Control Wiring for VAV Style (DF75 and DF150)



Part Number	Description	Models
VAV	VAV Control Wiring	DF75 and DF150

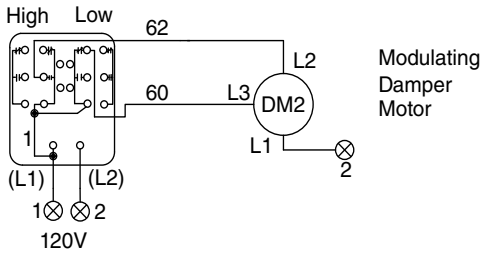
FIGURE 64: Additional Control Wiring for VAV Style (DF270-DF700B)

Photohelic (2) Located On VFD Panel Inside Control Housing
Controls Building Pressure
Preset At 0.1 in. w.c. (Low) And 0.3 in. w.c. (High)

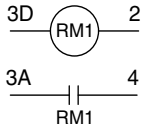


VFD Terminals			
	A	B	C
Up To 25hp	S3	S4	SC
30hp And Up	S3	S5	SN

Photohelic (1) Located Inside Control Housing
Controls Differential Pressure Across Burner
Preset At 0.75 in. w.c. (Low) And 0.90 in. w.c. (High)



Note: Motor Starter, Overload And M1 Auxiliary Contact Is Replaced With RM1 Relay.

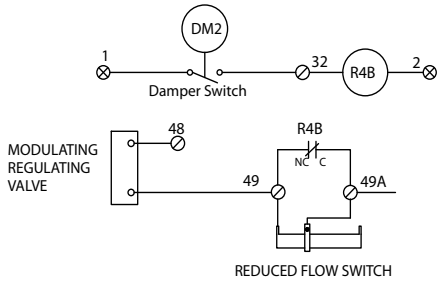


VFD Program Paramters 25 HP or Less

C1-01=20 Accel Time (Sec)
C1-02=20 Decel Time (Sec)
D2-02=50% Minimum Hz (50%=30 Hz)
H1-03=10, H1-04=11, H1-05=0F
H1-07=0F (V1000 Only)
L2-01=1, L5-01=5

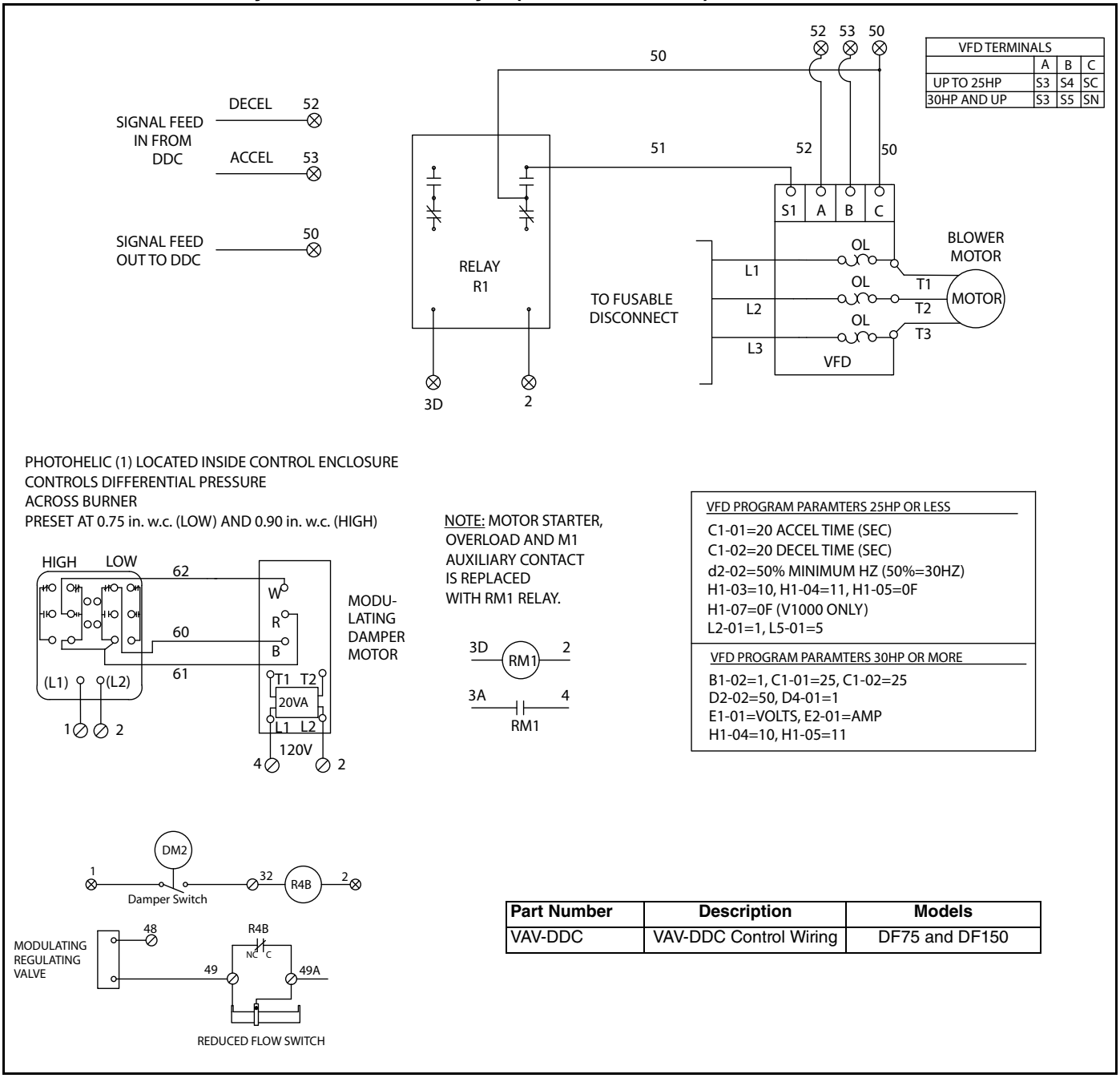
VFD Program Paramters 30 HP or More

B1-02=1, C1-01=25, C1-02=25
D2-02=50, D4-01=1
E1-01=Volts, E2-01=Amp
H1-04=10, H1-05=11



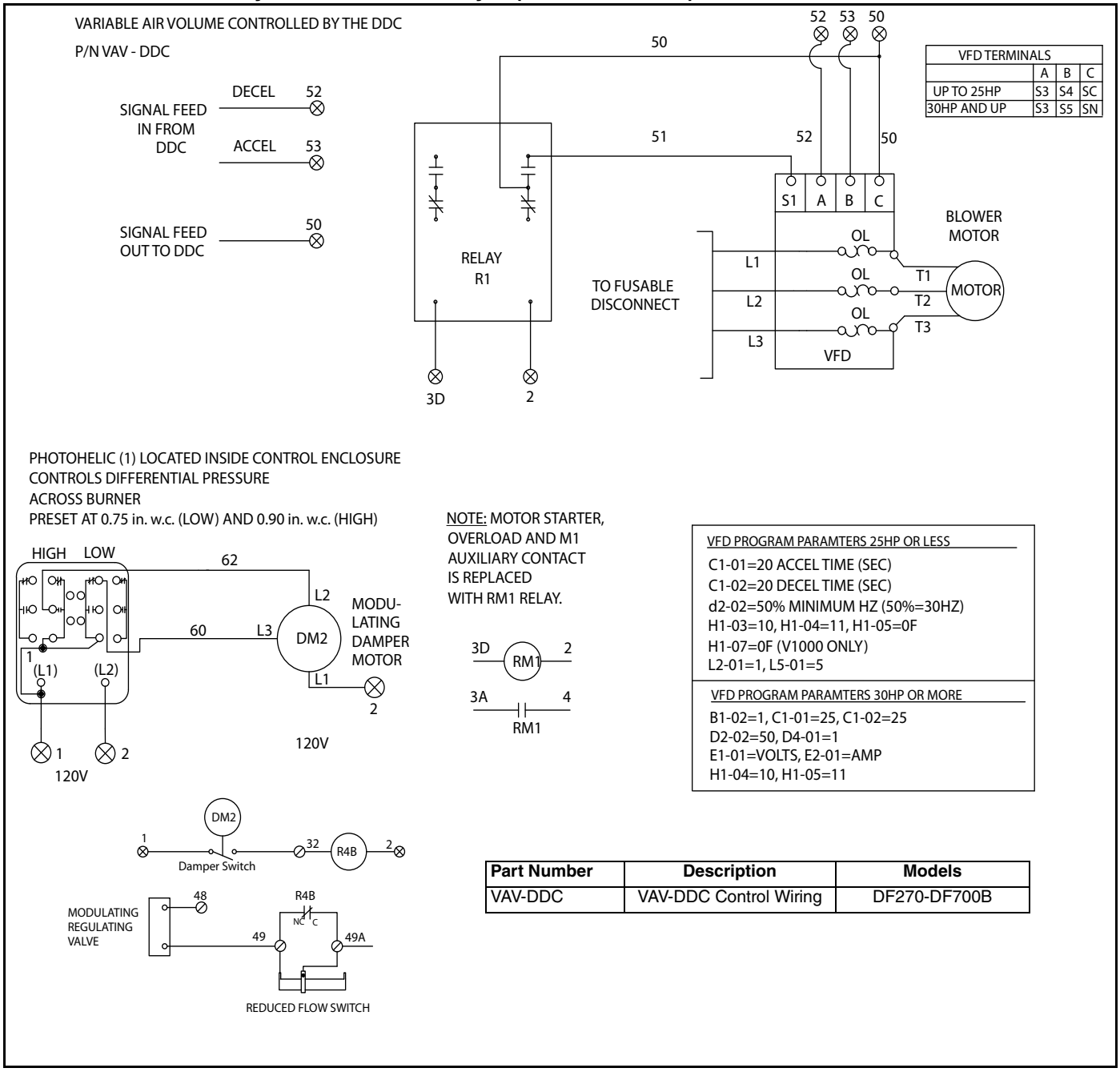
Part Number	Description	Models
VAV	VAV Control Wiring	DF270-DF700B

FIGURE 65: BMS-Ready Control for VAV Style (DF75 and DF150)



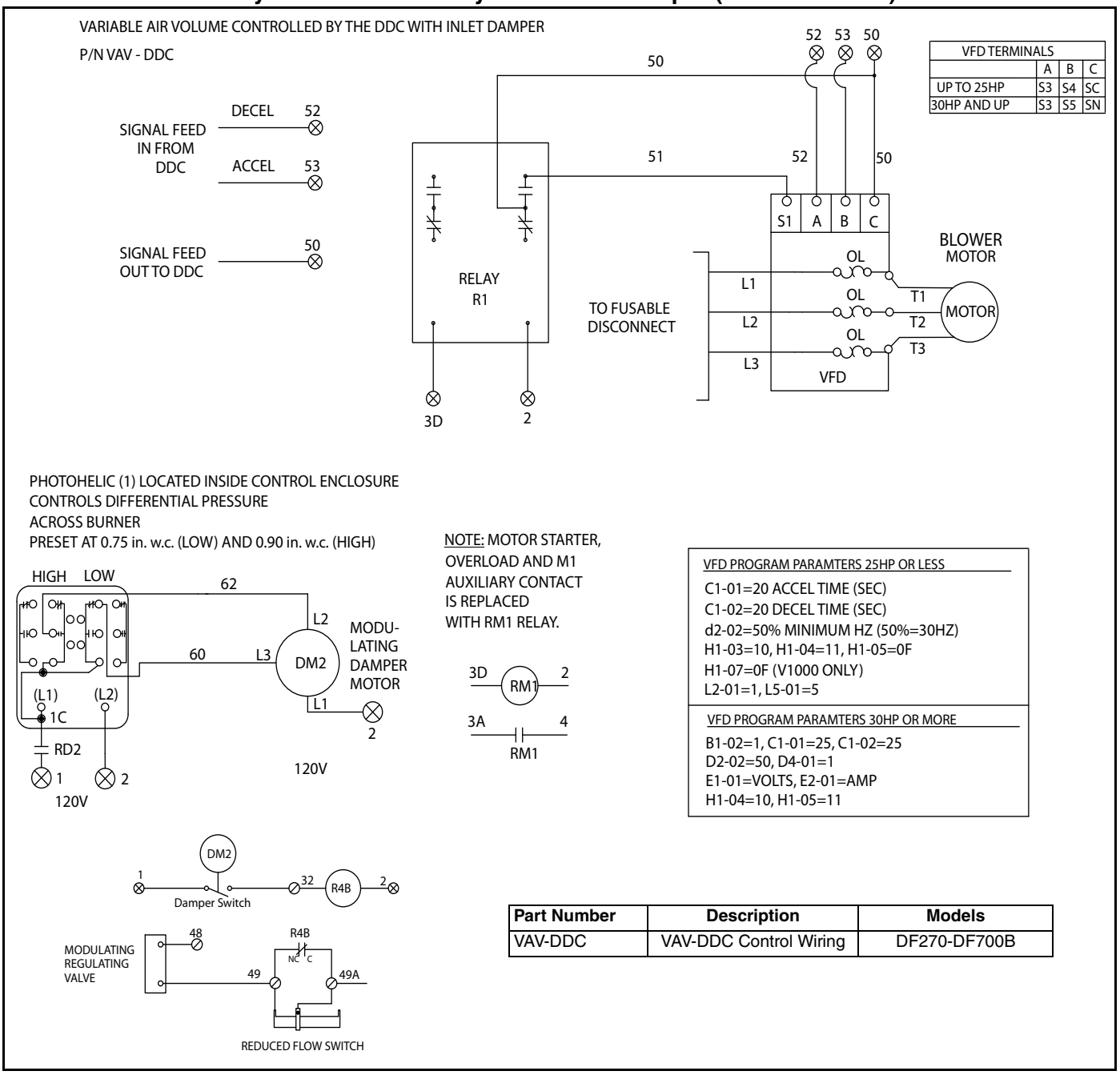
Part Number	Description	Models
VAV-DDC	VAV-DDC Control Wiring	DF75 and DF150

FIGURE 66: BMS-Ready Control for VAV Style (DF270-DF700B)



Part Number	Description	Models
VAV-DDC	VAV-DDC Control Wiring	DF270-DF700B

FIGURE 67: BMS-Ready Control for VAV Style with Inlet Damper (DF270-DF700B)



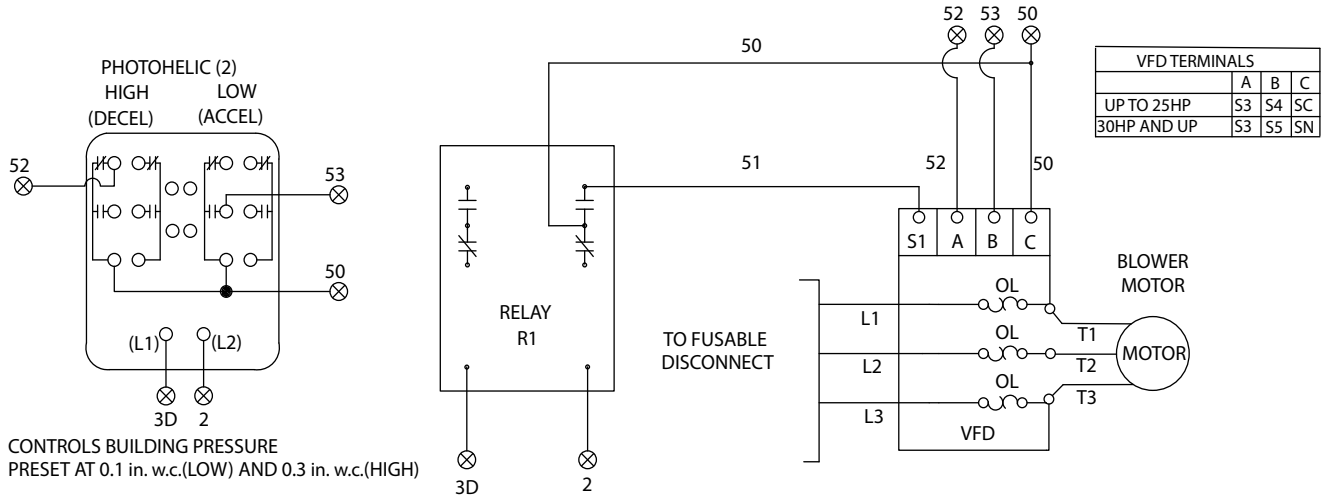
Part Number	Description	Models
VAV-DDC	VAV-DDC Control Wiring	DF270-DF700B

FIGURE 68: Additional Control Wiring for VAV Style with Inlet Damper (DF270-DF700B)

VARIABLE AIR VOLUME WITH INLET DAMPER

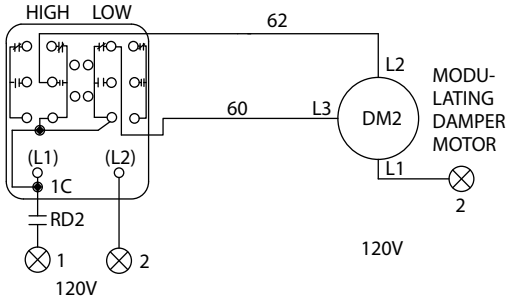
P/N VAV

PHOTOHELIC (2) LOCATED INSIDE CONTROL ENCLOSURE

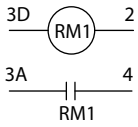


VFD TERMINALS			
	A	B	C
UP TO 25HP	S3	S4	SC
30HP AND UP	S3	S5	SN

PHOTOHELIC (1) LOCATED INSIDE CONTROL ENCLOSURE
CONTROLS DIFFERENTIAL PRESSURE
ACROSS BURNER
PRESET AT 0.75 in. w.c. (LOW) AND 0.90 in. w.c. (HIGH)



NOTE: MOTOR STARTER, OVERLOAD AND M1 AUXILIARY CONTACT IS REPLACED WITH RM1 RELAY.

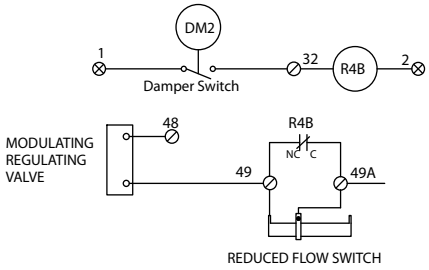


VFD PROGRAM PARAMTERS 25HP OR LESS

C1-01=20 ACCEL TIME (SEC)
C1-02=20 DECEL TIME (SEC)
d2-02=50% MINIMUM HZ (50%=30HZ)
H1-03=10, H1-04=11, H1-05=0F
H1-07=0F (V1000 ONLY)
L2-01=1, L5-01=5

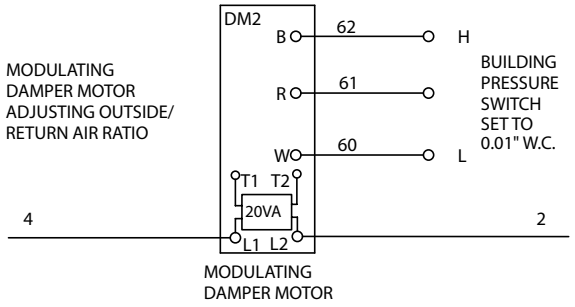
VFD PROGRAM PARAMTERS 30HP OR MORE

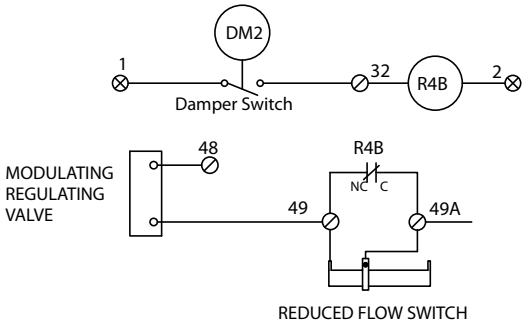
B1-02=1, C1-01=25, C1-02=25
D2-02=50, D4-01=1
E1-01=VOLTS, E2-01=AMP
H1-04=10, H1-05=11



Part Number	Description	Models
VAV	VAV Control Wiring	DF270-DF700B

FIGURE 69: AM Style for DF75 and DF150





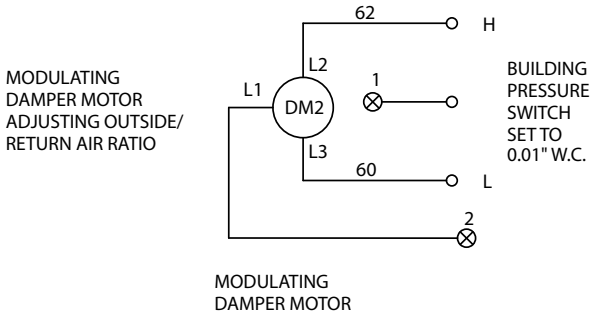
OPERATION:
BULDING PRESSURE INCREASES, DAMPER GRADUALLY OPENS RETURN AIR SUPPLY UNTIL DESIRED BULDING PRESSURE HAS BEEN OBTAINED.
BUILDING PRESSURE DECREASE CONTROLS REVERSE

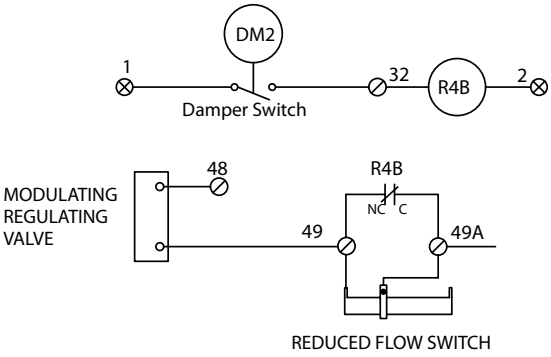
THIS REPLACES THE MRV WIRING LOCATED ON THE MAIN DIAGRAM
DAMPER SWITCH CHANGES WHEN UNIT RECIRCULATING DAMPER IS IN THE FULL RECIRCULATING POSITION

ADJUSTMENTS:
1) MAKE NORMAL HIGH AND LOW FIRE ADJUSTMENTS WITH SWITCH CLOSED AS OUTLINED IN THE MANUAL
2) THE REDUCED HIGH FIRE SETTING IS PRESET AT THE FACTORY AND MUST NOT BE ADJUSTED.

Part Number	Description	Models
AM	AM Control Wiring	DF75 and DF150

FIGURE 70: AM Style for DF270-DF700B





OPERATION:
BULDING PRESSURE INCREASES, DAMPER GRADUALLY OPENS RETURN AIR SUPPLY UNTIL DESIRED BULDING PRESSURE HAS BEEN OBTAINED.
BUILDING PRESSURE DECREASE CONTROLS REVERSE

THIS REPLACES THE MRV WIRING LOCATED ON THE MAIN DIAGRAM
DAMPER SWITCH CHANGES WHEN UNIT RECIRCULATING DAMPER IS IN THE FULL RECIRCULATING POSITION

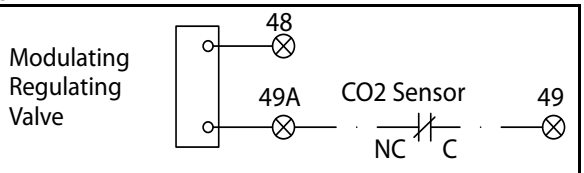
ADJUSTMENTS:
1) MAKE NORMAL HIGH AND LOW FIRE ADJUSTMENTS WITH SWITCH CLOSED AS OUTLINED IN THE MANUAL
2) THE REDUCED HIGH FIRE SETTING IS PRESET AT THE FACTORY AND MUST NOT BE ADJUSTED.

Part Number	Description	Models
AM	AM Control Wiring	DF270-DF700B

18.7 Carbon Dioxide Interlocks

All air handlers that recirculate air from the heated space require either a control to limit the temperature rise in proportion to the amount of outdoor air or the use of a room carbon dioxide sensor. The carbon dioxide sensor is field provided and set to maintain a CO2 concentration below 5,000 ppm. For the additional wiring to accommodate this requirement for the FR and MUA style air handler, *See Page 123, Figure 71*. For the additonal wiring to accommodate this requirement for the AM and VAV style air handlers *See Page 123, Figure 72* for DF75 and DF150. See *Page 123, Figure 73* for models DF270-DF700B.

FIGURE 71: CO2 Sensor Interlock for FR and MUA Style

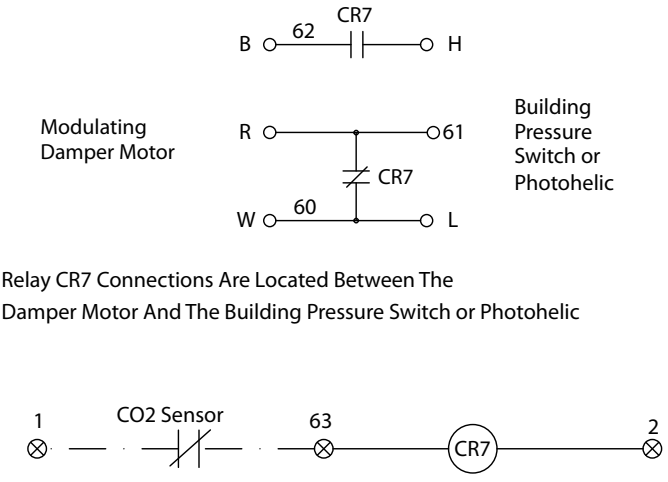


This Replaces The MRV Wiring
Located On The Main Diagram

- · — · — · — CO2 Sensor Wiring By Others

Part Number	Description	Models
13205105	CO2 Sensor Interlock	FR and MUA

FIGURE 72: CO2 Sensor Interlock for AM and VAV Style (DF75 and DF150)



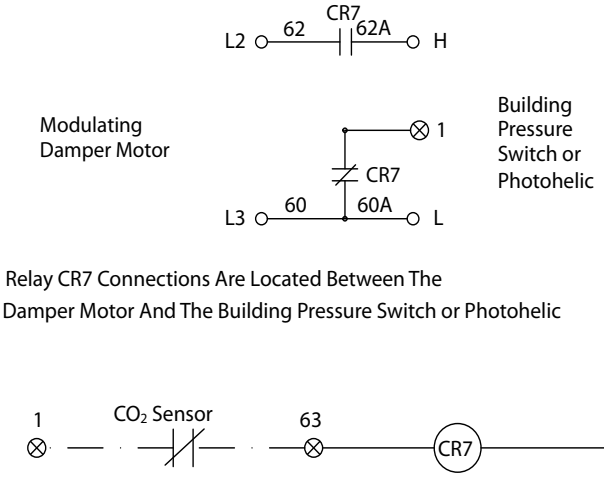
Relay CR7 Connections Are Located Between The
Damper Motor And The Building Pressure Switch or Photohelic

Operation:
Damper Is Forced Into 100% Outside Air Until
CR7 Is Energized By The CO2 Sensor
Allowing The Damper To Modulate
When The CO2 Sensor Reaches The Set Point
The Sensor Contacts Will Open Deenergizing CR7

· — · — CO2 Sensor Wiring By Others

Part Number	Description	Models
13205106	CO2 Sensor Interlock	DF75 and DF150

FIGURE 73: CO2 Sensor Interlock for AM and VAV Style (DF270-DF700B)



Relay CR7 Connections Are Located Between The
Damper Motor And The Building Pressure Switch or Photohelic

Operation:
Damper Is Forced Into 100% Outside Air Until
CR7 Is Energized By The CO2 Sensor
Allowing The Damper To Modulate
When The CO2 Sensor Reaches The Set Point
The Sensor Contacts Will Open Deenergizing CR7

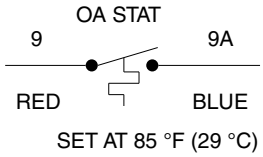
· — · — CO2 Sensor Wiring By Others

Part Number	Description	Models
13205106	CO2 Sensor Interlock	DF270-DF700B

18.8 Control Options

18.8.1 Mild Weather Outside Air Stat

This option is designed to turn the burner off when the incoming outside air is at or above the temperature setpoint. The blower is allowed to run for continued ventilation. The mild weather outside air stat is located in the control enclosure. It has an adjustable setting between -20° F (-29° C) and 100° F (38° C).



MOUNTED AT PROFILE PLATE

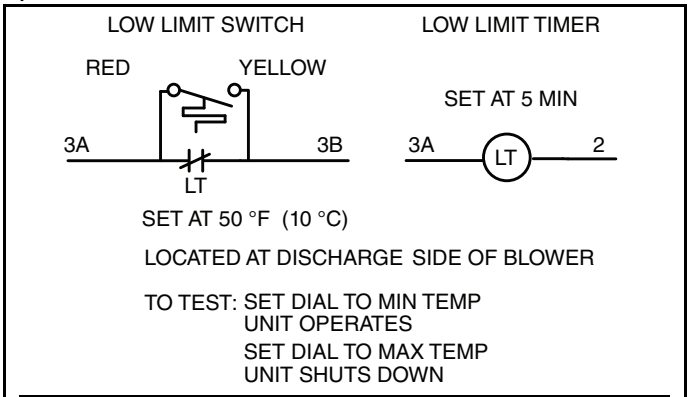
TO TEST: SET DIAL TO MAX TEMP
UNIT OPERATES

SET DIAL TO MIN TEMP
UNIT SHUTS DOWN

Part Number	Description	Models
80930	Mild Weather Outside Air Stat	All Models

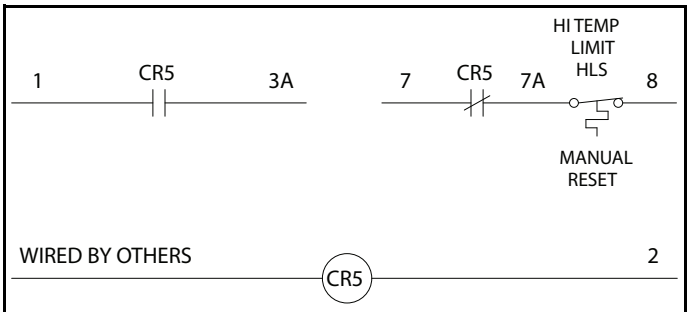
18.8.2 Low Temperature Limit with Override Timer

This option is designed to turn the unit off when air is discharged below the temperature setpoint for a period in excess of timer setpoint. The low temperature limit switch is located in the air handler's control enclosure. The low temperature limit switch has an adjustable setting between -20° F (-29° C) and 100° F (38° C). The timer by-passes the low temperature limit switch for the first 5 minutes to allow the burner to establish a flame when the air handler is turned on. If the air handler's discharge temperature falls to the predetermined low temperature limit setpoint, after the 5 minute establishing period, the air handler's blower will be turned off. To reset the low temperature limit switch, set the fan switch to off and then on again. The air handler will return to the normal sequence of operations.



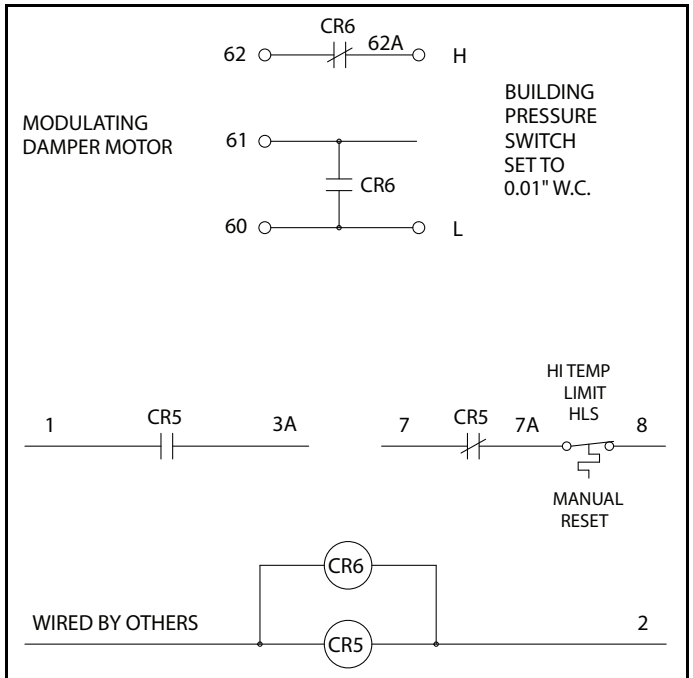
Part Number	Description	Models
01003	Low Temperature Limit with Override Timer	All Models

FIGURE 74: CO Sensor Interlock for FR and MUA



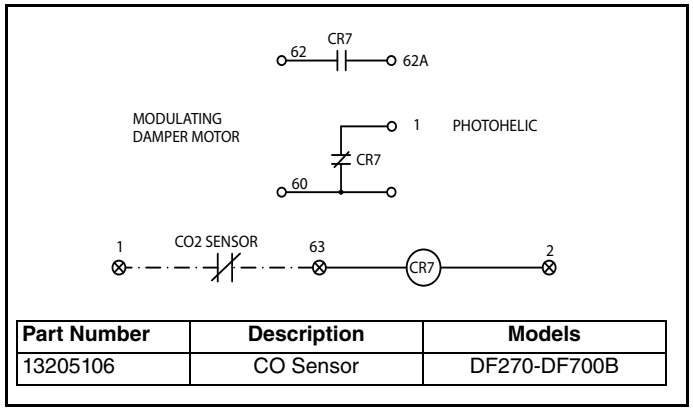
Part Number	Description	Models
01003	Low Temperature Limit with Override Timer	All Models

FIGURE 75: CO Sensor Interlock for AM and VAV



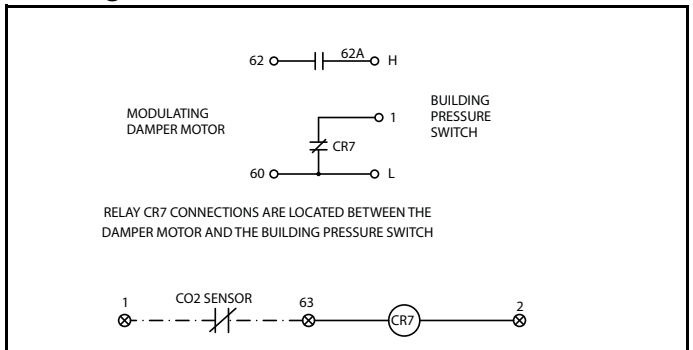
Part Number	Description	Models
01003	Low Temperature Limit with Override Timer	All Models

FIGURE 76: CO Sensor Interlock for AM and VAV with Photohelic



Part Number	Description	Models
13205106	CO Sensor	DF270-DF700B

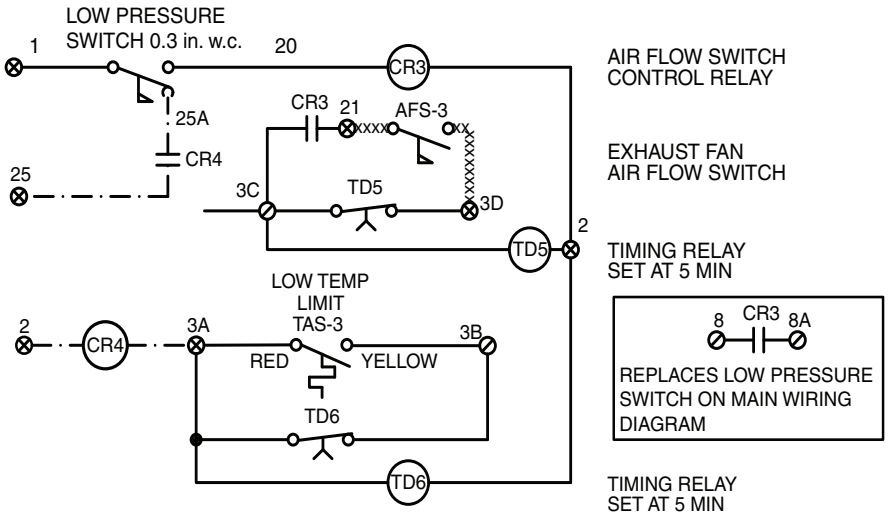
FIGURE 77: CO Sensor Interlock for AM with Building Pressure



Part Number	Description	Models
13205106	CO Sensor	DF270-DF700B

18.8.3 MUA / Exhaust Failsafe Interlock

This option incorporates the low temperature limit with override timer and an exhaust fan airflow switch monitor. The exhaust fan airflow switch is field provided and field wired as per the option sheet supplied with the unit. When the air handler is turned on there is a 5 minute establishing period for the low temperature limit switch and the exhaust fan interlock. If the air handler's discharge temperature falls to the predetermined low temperature limit setpoint, after the 5 minute establishing period, the air handler fan will be turned off. If there is a failure of the exhaust fan to activate the field supplied airflow switch, after the 5 minute establishing period, the air handler fan will be turned off. To reset the MUA/ exhaust failsafe interlock, set the fan switch to off and then on again. The air handler will return to the normal sequence of operations.



-AFS-3: FIELD LOCATE ON EXHAUST FAN, SWITCH PROVIDIED BY OTHERS
-LOW TEMP LIMIT LOCATED AT DISCHARGE SIDE OF BLOWER
-TO TEST: SET DIAL TO MIN TEMP UNIT OPERATES
SET DIAL TO MAX TEMP UNIT SHUTS DOWN

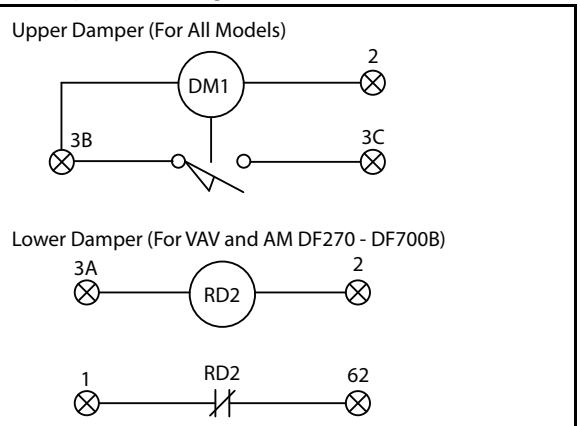
NOTE: -LOW PRES. SWITCH (BETWEEN WIRES 1 AND 20) REPLACES LOW PRES. SWITCH (BETWEEN WIRES 8 AND 8A)
-CR3 RELAY NORMALLY OPEN CONTACTS REPLACE LOW PRESSURE SWITCH ON MAIN WIRING DIAGRAM (BETWEEN WIRES 8 AND 8A)

xxxxxxxxxx FIELD WIRED BY OTHERS
— · — · — CLOGGED FILTER WIRING FOR SDC (80010) AND DTC (80000) REMOTE PANELS

Part Number	Description	Models
01004	MUA/Exhaust Failsafe Inlock	All Models

18.8.4 Motorized Inlet Damper

The motorized inlet damper covers the outside air inlet of the air handler. When the air handler blower is turned on, the damper motor is energized and opens the damper. The damper motor has an auxiliary switch that prevents the blower from starting until that damper has opened sufficiently to allow the required air volume to pass through the air handler.

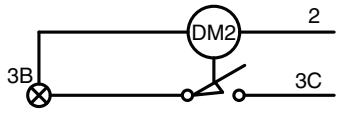


-FR uses upper only
-MUA uses upper with a mechanically connected lower

Part Number	Description	Models
77019.301	Inlet Damper	DF40
80900	Inlet Damper	DF75 and DF150
80920	MUA Inlet Damper	DF270
80920U	FR/AM/VAV Inlet Damper	DF270
77530	MUA Inlet Damper	DF410
77830U	FR/AM/VAV Inlet Damper	DF410
80204.1	MUA/VAV Inlet Damper	DF700A and DF700B
80204.2	FR/AM Inlet Damper	DF700A and DF700B

18.8.5 Motorized Discharge Damper

The motorized discharge damper is mounted in the duct downstream from the discharge opening of the air handler. When the air handler fan is turned on the damper motor is energized and opens the damper. The damper motor has an auxiliary switch that prevents the blower from starting until that damper has opened sufficiently to allow the required air volume to pass through the air handler. Discharge dampers are not available for models DF700A and DF700B.

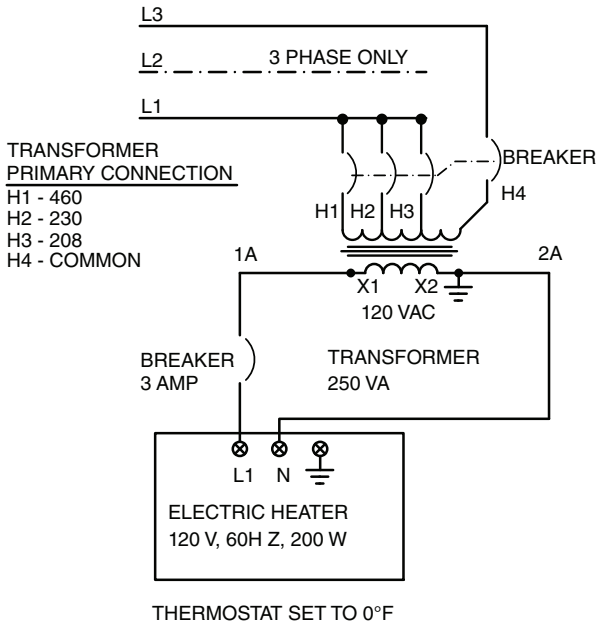


(Mounted On Discharge Side)

Part Number	Description	Models
77014.301	Discharge Damper	DF40
77018.301	Discharge Damper	DF75 and DF150
80922.2	Discharge Damper	DF270
77837.2	Discharge Damper	DF410

18.8.6 Control Enclosure Heater

The control enclosure heater is an electric heater that keeps the temperature in the control enclosure within the range for the control components. This option is intended for extremely cold climates, but recommended for instalations below 15°F (-9°C). The air handler controls are rated to perform at temperatures as low as -30° F (-34° C). In environments where the air handler may be exposed to lower temperatures, a control enclosure heater may be required.

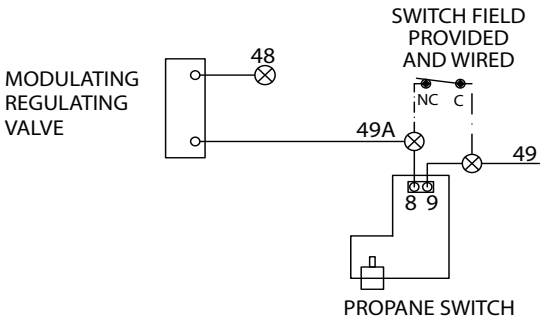


THERMOSTAT SET TO 0°F

Part Number	Description	Models
08110	Control Enclosure Heater	All Models

18.8.7 Propane Switch Kit

The propane switch kit provides the end user with the ability to run the air handler on either natural or propane gas. When the end user wants to switch from natural to propane gas, a switch (field wired and provided by others) will open contacts powering the modulating regulating valve. Power will be sent through the propane switch kit where the signal will be reduced and then sent to the modulating regulating valve. This will cause the modulating regulating valve to open less for the propane, allowing for the same temperature rise.



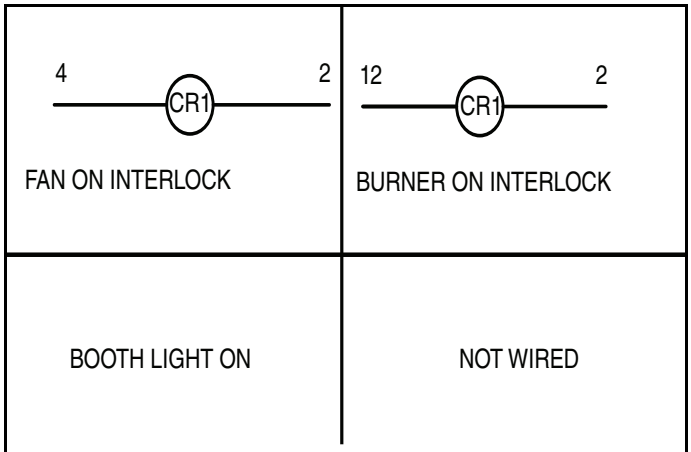
THIS REPLACES THE MRV WIRING
LOCATED ON THE MAIN DIAGRAM

ADJUSTMENTS:
1) MAKE NORMAL HIGH AND LOW FIRE ADJUSTMENTS WITH SWITCH CLOSED AS OUTLINED IN THE MANUAL
2) OPEN SWITCH, REMOVE THE BRASS CAP FROM RHEOSTAT AND ADJUST TO REDUCE HIGH FIRE SETTING, REPLACE CAP.

Part Number	Description	Models
17854	Propane Switch Kit	All Models

18.8.8 Auxiliary Relay

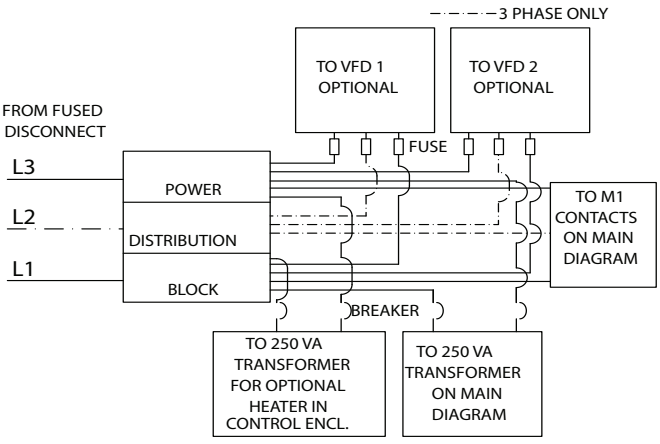
An auxiliary relay may be added to an air handler for either an interlock or a customer defined purpose. Refer to the option sheet supplied with the air handler to indicate whether the relay is wired for an intended purpose or left unwired for a future interface. Each relay will be double pole double throw (DPDT) type. Maximum switching capacity on the normally open contact is 8A, and for the booth light relay, P/N 80916.2, 15A.



Part Number	Description	Models
80916	Aux Relay, Fan On	All Models
80916.1	Aux Relay, Burner On	All Models
80916.2	Aux. Relay Booth Light On	All Models
80916.3	Aux Relay, Not Wired	All Models

18.8.9 Single Point Connection

When a variable frequency drive or auxiliary motor starter (both used for controlling an exhaust fan) or an enclosure heater or ground fault interrupt (GFI) recceptade are ordered, the installer/service technician must bring in separate power wires and fused disconnect (provided by others) to power these options. The single point connection allows the installer/service technician to bring only one set of power wires into the air handler. Additional fusing is also provided to protect the variable frequency drive, enclosure heater, and/or GFI.



Part Number	Description	Models
Various	DF Single Point Connection	All Models

18.8.10 Service Receptacle Powered by Others

This option provides a service receptacle. It includes ground-fault interrupter (GFI) receptacle mounted on the interior or exterior of the control enclosure. Power to the receptacle is supplied by the installer.

18.8.11 Room Override Stat

For use with Basic II HVAC remote or Standard Discharge Control remote. This option provides additional thermostat capability based on room temperature. The thermostat senses room temperature, and resets the discharge air to a higher temperature whenever the temperature falls below settings indicated on the temperature selection dial (located on remote panel). Override temperature can be set 0°F to 40°F above the temperature selection dial on the remote panel.

18.9 Optional Exhaust Motor Starters, Variable Frequency Drives

FIGURE 78: J-1000 1 Pot 7.5HP or Less

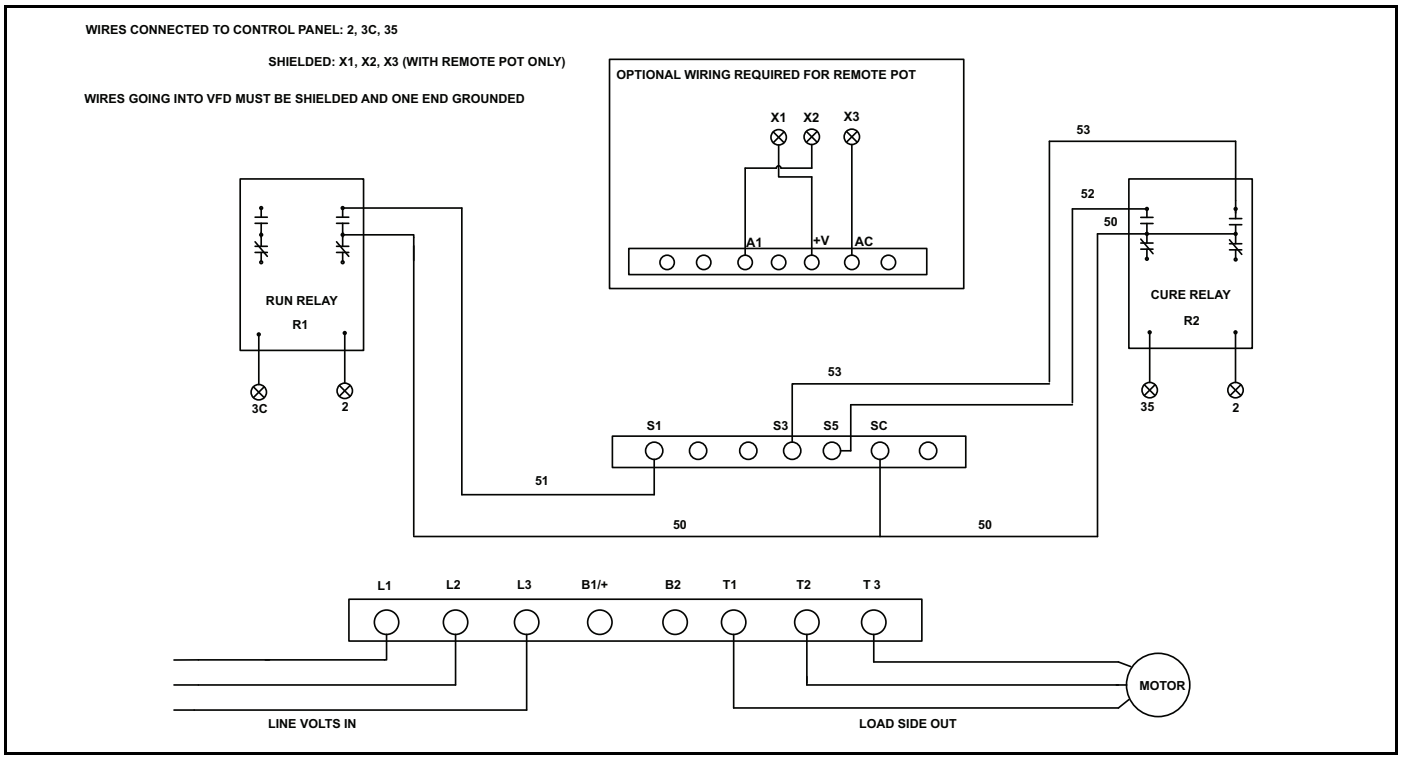


FIGURE 79: V-1000 1 Pot 10-25HP

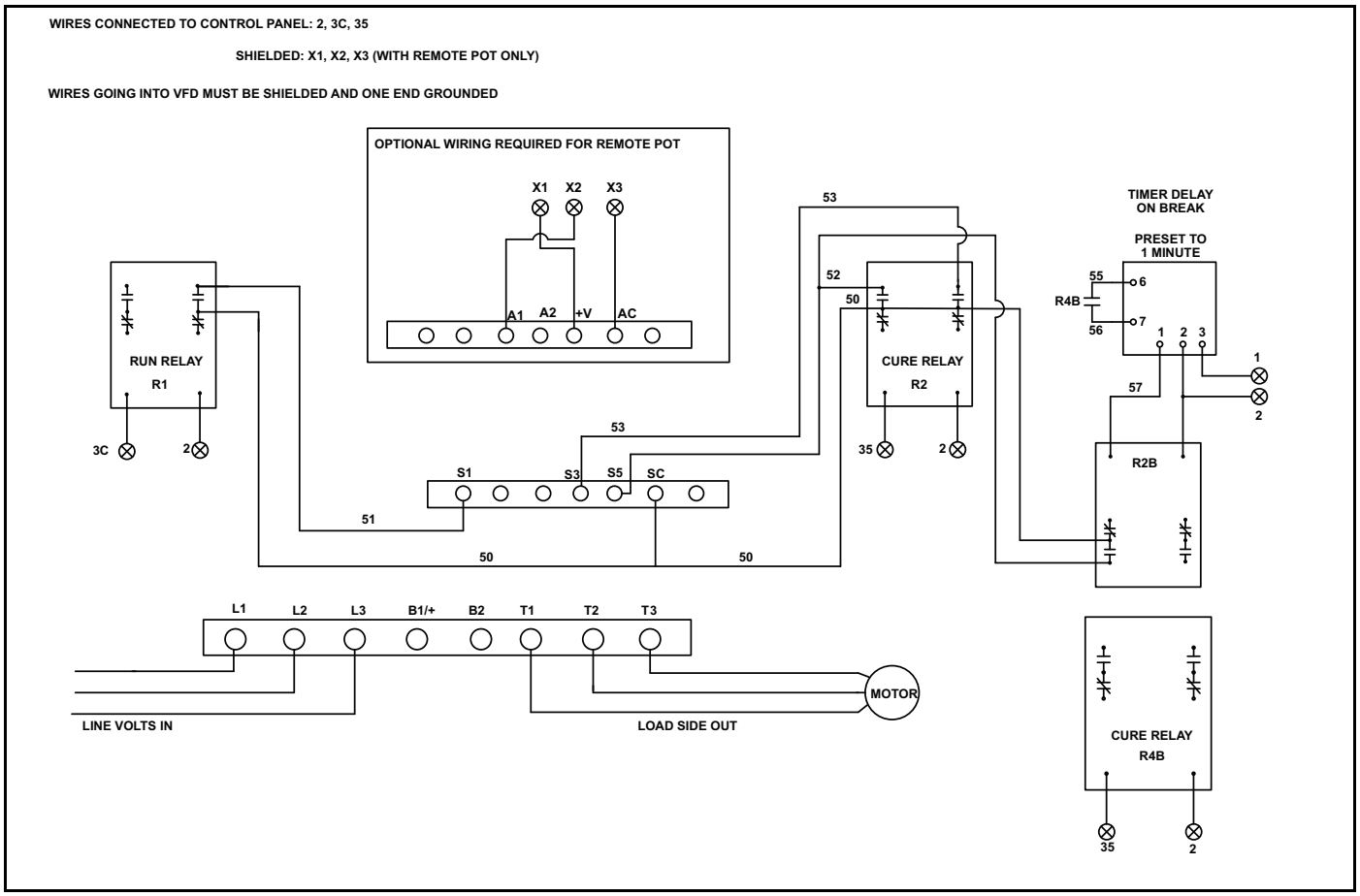


FIGURE 80: P7 1 Pot 30HP or More

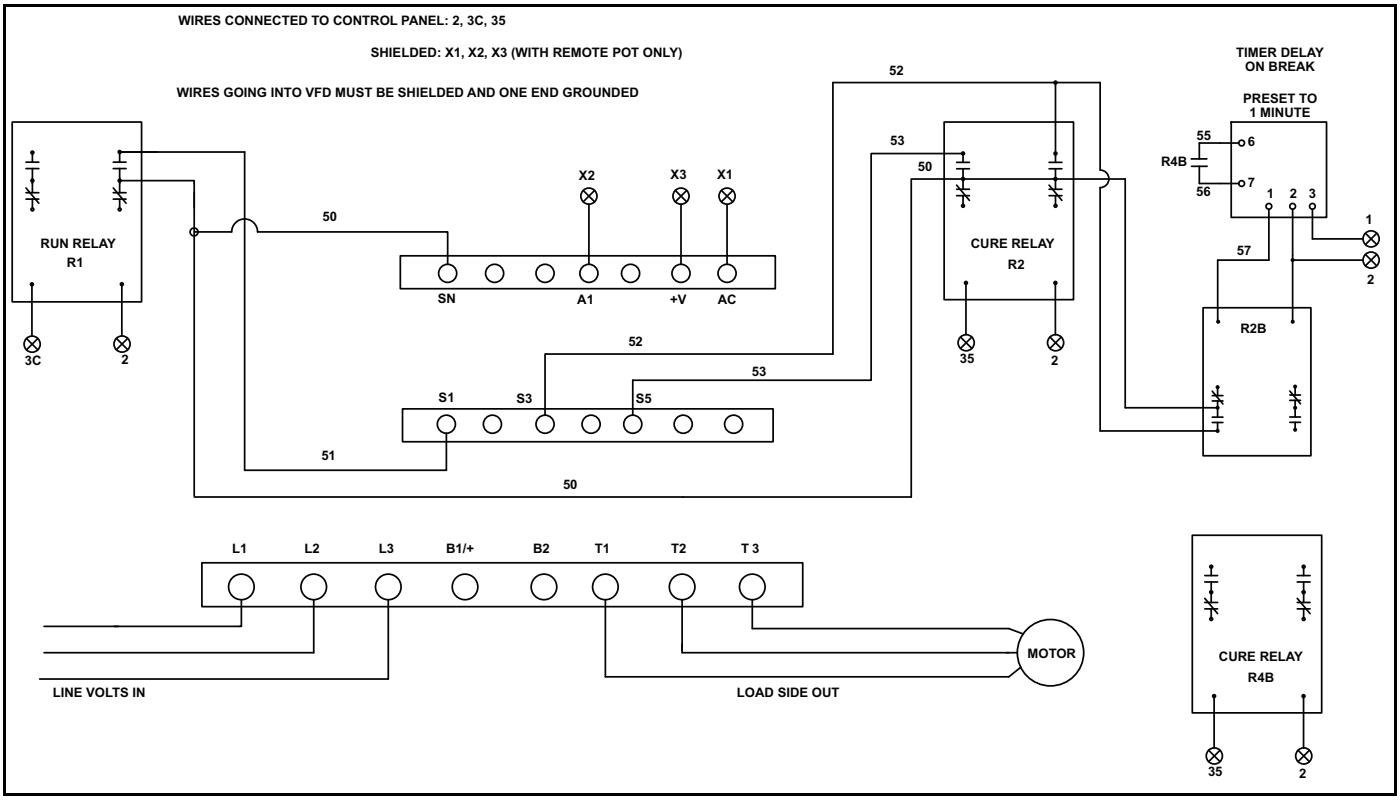


FIGURE 81: J-1000 VFD 7.5HP or Less with Photohelic

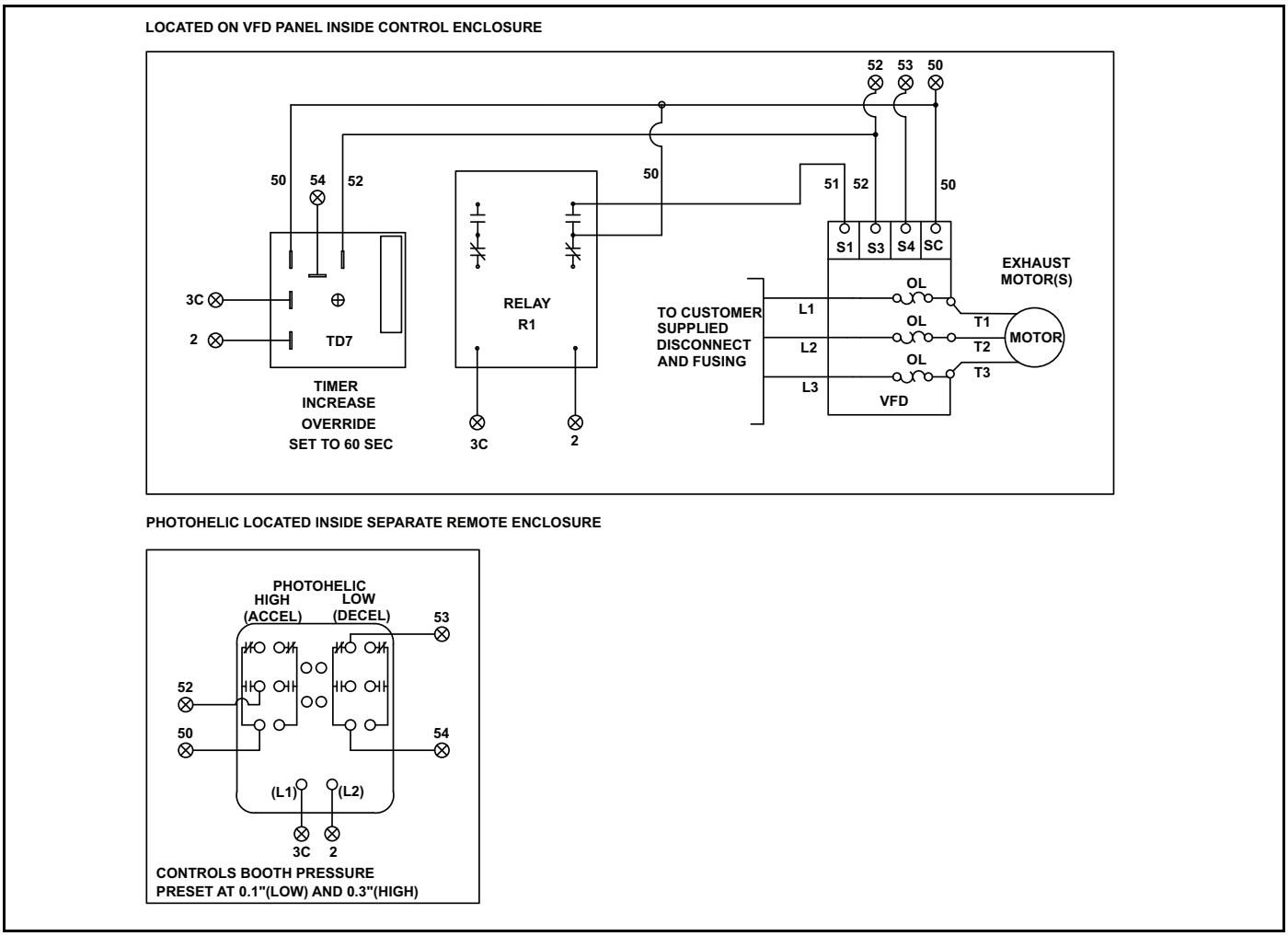
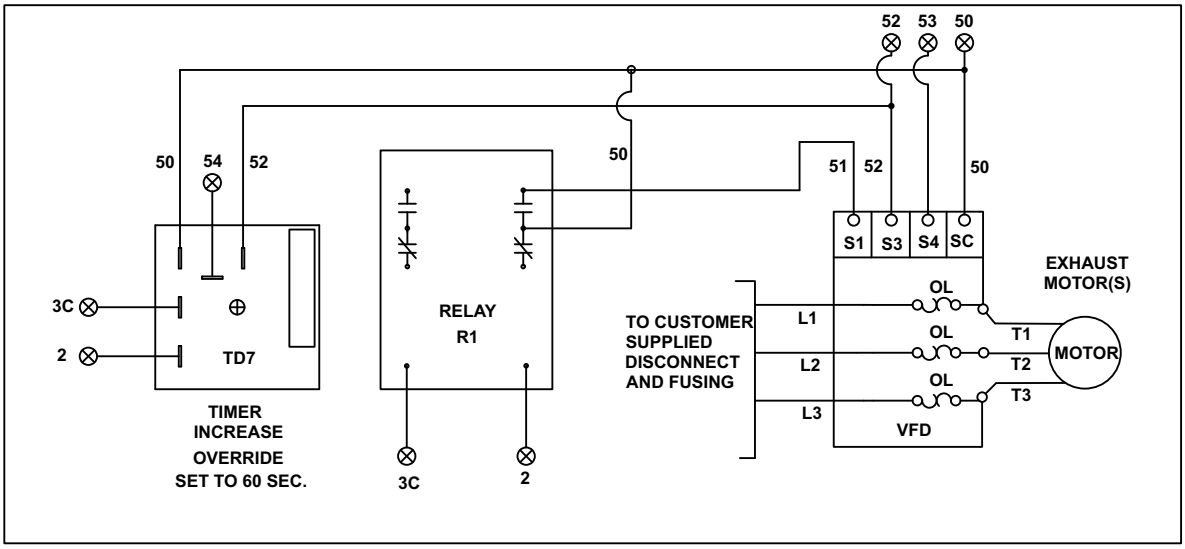


FIGURE 82: V-1000 VFD 10 to 25HP with Photohelic

LOCATED ON VFD PANEL INSIDE CONTROL ENCLOSURE



PHOTOHELIC LOCATED INSIDE SEPARATE REMOTE ENCLOSURE

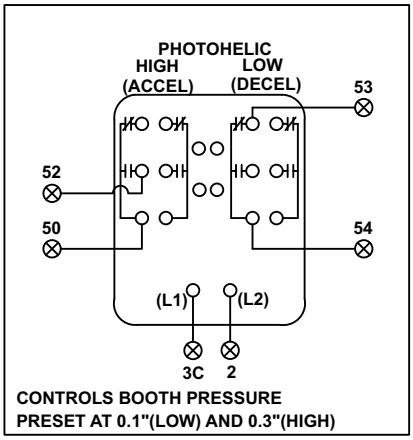
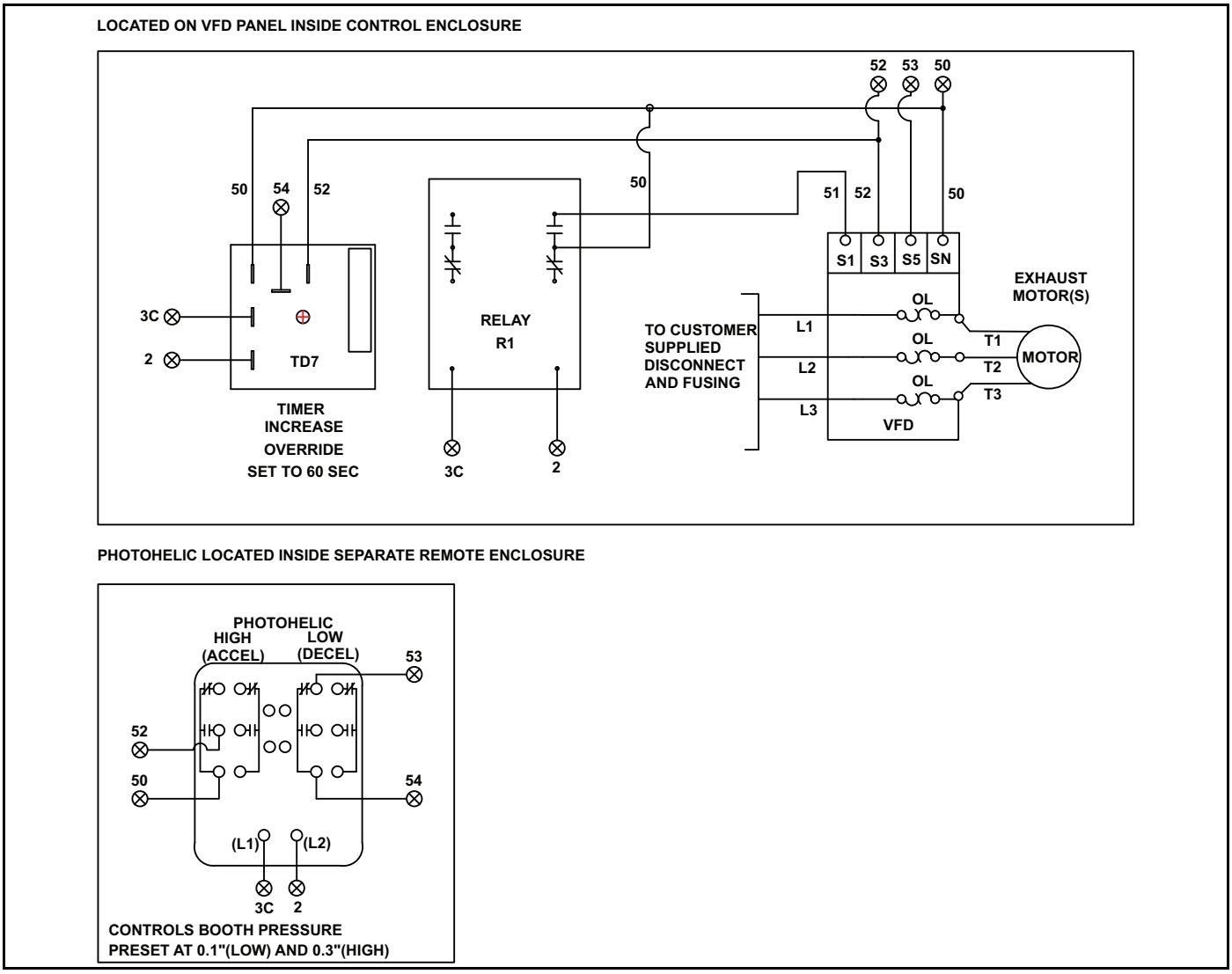


FIGURE 83: P7 30HP or More with Photohelic



18.10 Disconnect Fuse Sizing

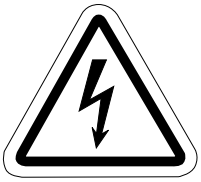
The fuse classification must be determined by the service disconnect rating plate and all applicable codes. Fuse sizing is determined by the motor size, control current and supply voltage. Fuses that are being replaced must be replaced with the same type, size and class of fuse that was supplied with the air handler. For additional information or to confirm original fuse specifications, consult the factory.

Table 17: Minimum and Maximum Fuse Size by Motor Size and Supply Voltage

	Electrical Characteristics				
Motor Size HP(kW)	**208/3/60**	**230/3/60**	**460/3/60**	**575/3/60**	**230/1/60**
2(1.5)	7.3-10.2	6.9-9.6	3.4-4.8	2.6-3.6	13.3-18.6
3(2.2)	10.1-14.2	9.3-13.0	4.6-6.5	3.7-5.2	17.3-24.2
5(3.7)	15.4-21.6	15.1-21.1	7.5-10.6	6.1-8.5	24.3-34.0
7.5(5.6)	23.1-32.4	21.3-29.8	10.6-14.9	8.3-11.6	32.3-45.2
10(7.5)	30.4-42.6	28.1-39.3	14.0-19.7	10.6-14.8	40.3-56.4
15(11.2)	42.4-59.4	39.3-55.0	19.6-27.5	16.8-23.5	-
20(14.9)	51.4-72.0	49.3-69.0	24.6-34.5	19.8-27.7	-
25(18.6)	66.4-93.0	61.3-85.8	30.6-42.9	24.5-34.3	-
30(22.4)	78.4-109.8	73.3-102.6	36.6-51.3	29.6-41.4	-
40(30.0)	105.4-147.6	96.3-134.8	48.14-67.4	39.4-55.2	-
50(37.5)	131.4-184.0	122.3-171.2	61.14-85.6	49.8-69.7	-

SECTION 19: SEQUENCE OF OPERATION

⚠ DANGER



Electrical Shock Hazard

Disconnect electric before service.

More than one disconnect switch may be required to disconnect electric from equipment.

Equipment must be properly grounded.

Failure to follow these instructions can result in death or electrical shock.

⚠WARNING

Carbon Monoxide Hazard

Do not recirculate air from the heated space over burner.

Air supply to burner must be from outside.

Failure to follow these instructions can result in death or injury.

19.1 Air Handler Configuration

Based on the air handler application, the air handler may be configured in any of the four styles described in the upcoming sections. These configurations are available on all air handlers, except the DF40 which is only available in the MUA style. For a comparison of these configurations, *see Page 134, Table 18 and Page 134, Figure 84*.

19.1.1 Make-Up Air (MUA) Style

The MUA style air handler has a constant speed blower that is designed to deliver a constant volume of air to the heated space. This style air handler supplies 100% outside air to the heated space and is not capable of supplying return air.

19.1.2 Fixed Recirculation (FR) Style

The FR style air handler has a constant speed blower that is designed to deliver a constant volume of air to the heated space. In all cases, however, the air being delivered directly over the burner for combustion must always be 100% outside air. The air handler delivers 20% outside air and 80% of return air. The outside air is heated then mixed with the return air prior to being delivered to the heated space.

19.1.3 Air Management (AM) Style

The AM style air handler has a constant speed blower that is designed to deliver a constant volume of air to the heated space. A building pressure sensor is used to detect the differential pressure between the outside and the heated space. The total volume of air delivered by the air handler may at times consist of 0% to 80% return air. An automatic control is provided for the outdoor air and return air dampers. A diaphragm pressure switch is used to sense a positive space pressure (room or duct). This diaphragm switch is mounted in the control enclosure. More or less outdoor air is brought into the space to satisfy the pressure setpoint. Most installations require a setpoint of 0.02 in wc to 0.03 in wc to achieve adequate pressure control in the building space. 5/16" diameter tubing connected to the positive pressure port of the switch must run to the inside of the building. 5/16" diameter tubing connected to the negative pressure port of the switch must run to the outside of the building.

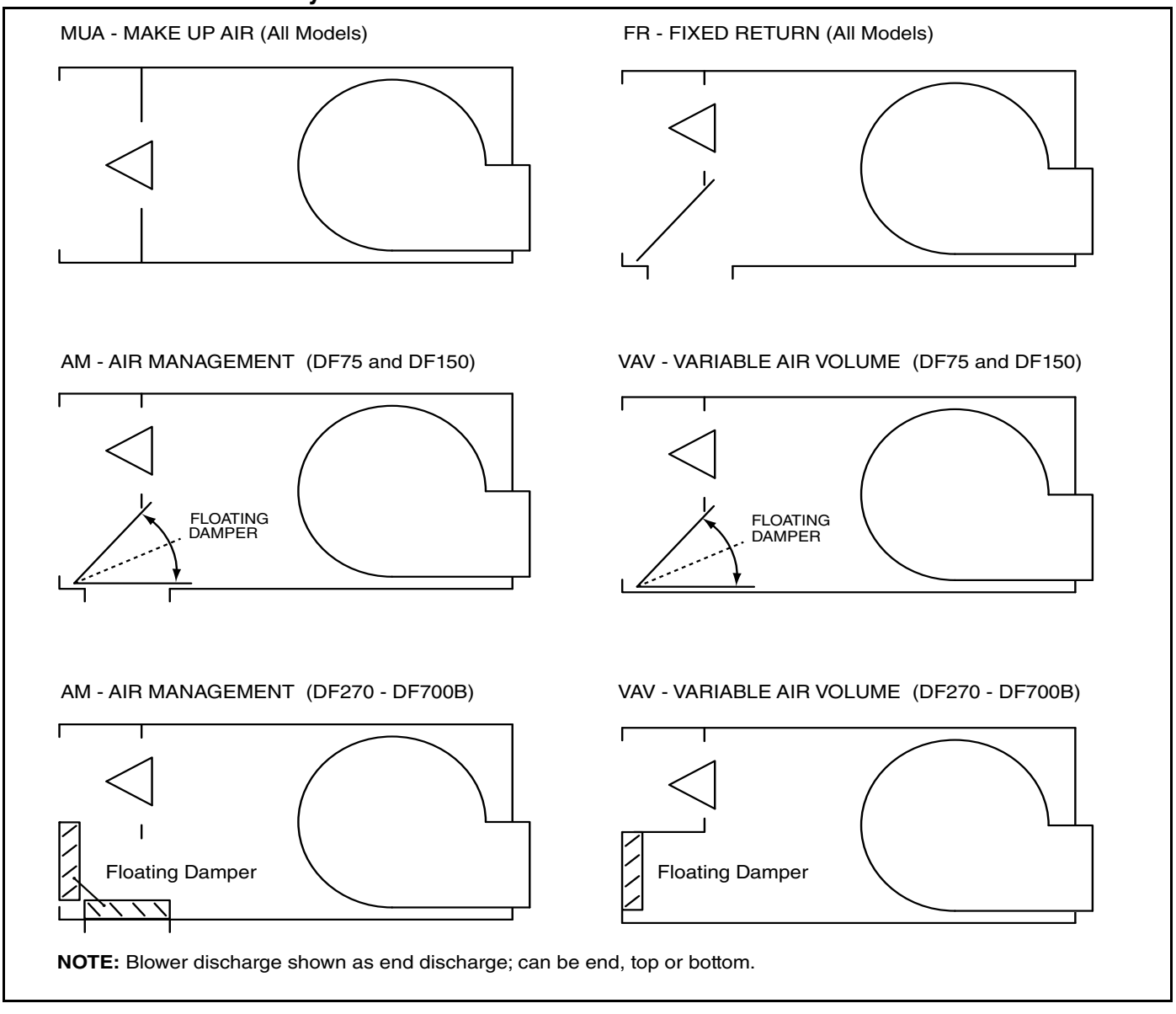
19.1.4 Variable Air Volume (VAV) Style

The VAV style air handler uses a building pressure sensor to detect differential pressure between the outside and the heated space. The air handler will deliver 100% outside air and will not deliver return air. The air handler will ensure proper air velocity over the burner by using a photohelic air sensor to measure the pressure drop across the burner and by using a damper to modify the airflow when a pressure change is required. A second photohelic air pressure sensor is used to measure the differential pressure between the outside and the heated space. Most installations require a setpoint of 0.02 in wc to 0.03 in wc to achieve adequate pressure control in the building. The second pressure sensor is used to provide a control signal to the variable frequency drive that, in turn, controls the blower speed. 5/16" diameter tubing connected to the positive pressure port of the pressure sensor must run to the inside of the building. 5/16" diameter tubing connected to the negative pressure port of the pressure sensor must run to the outside of the building.

Table 18: Configuration Chart

Air Handler Configuration	Air Flow	Air Volume	Control
MUA	100% Outside Air	Constant	-
FR	Non-adjustable ratio of 20% outside air and 80% return air	Constant	-
AM	Adjustable ratio of 20% outside air and 80% return air to 100% outside air and 0% return air	Constant	Building Pressure Controls Outside/ Return Air Ratio
VAV	100% Outside Air	Variable 50% - 100%	Building Pressure Controls Air Volume Requirement

FIGURE 84: Air Handler Styles



NOTE: Blower discharge shown as end discharge; can be end, top or bottom.

19.2 HVAC Remote Panels and Panel Options

The remote panel should be mounted in the heated space in a convenient location for controlling the air handler. Do not locate a remote panel that contains temperature sensing equipment in an area directly affected by the air handler or another heat source as it may interfere with the operation of the air handler.

19.2.1 Basic II HVAC Remote

This control is typically used for air handlers providing make-up air. The burner flame modulates to maintain a constant discharge air temperature as selected on the temperature selection dial.

FAN ON/BURNER ON Mode:

The air handler (blower and burner) operates continuously, discharging air at the setpoint on the discharge temperature selection dial. The burner flame modulates to maintain a constant discharge air temperature as selected on the temperature selection dial.

FAN ON/BURNER OFF Mode:

Only the blower operates continuously to provide unheated air. The burner remains off regardless of temperature on the temperature selection dial.

FAN ON indicator:

Indicates that the unit is supplying power to the blower motor via the M1 motor starter.

BURNER ON indicator:

Indicates that the unit has supplied power to open the main gas safety shut off valve.

19.2.2 Standard Discharge Control (SDC) Remote

This control is typically used for air handlers providing space heating. The burner flame modulates to maintain a constant discharge air temperature as selected on the temperature selection dial. While in "auto" mode, a space temperature thermostat controls the operation of the air handler to maintain the desired space temperature.

AUTO/WINTER Mode:

The air handler (blower and burner) cycle on and off to maintain space temperature as selected on the room thermostat. When the air handler is operating, air is being discharged at the setpoint on the discharge temperature selection dial. The burner flame modulates to maintain a constant discharge air temperature as selected on the temperature selection dial. The discharge air temperature setting must be higher than the thermostat setting.

ON/WINTER Mode:

The air handler (blower and burner) operate continuously to provide heated air. When the air handler is operating, air is being discharged at the setpoint on the discharge temperature selection dial. The burner flame modulates to maintain a constant discharge air temperature as selected on the temperature selection dial. The unit disregards the thermostat setpoint while in this mode.

ON/SUMMER Mode:

Only the blower operates continuously to provide unheated air. The burner remains off regardless of temperatures on the temperature selection dial and thermostat.

FAN ON indicator:

Indicates that the air handler is supplying power to the blower motor via the M1 motor starter.

BURNER ON indicator:

Indicates that the air handler has supplied power to open the main gas safety shut off valve.

BURNER LOCKOUT indicator:

The burner control module has experienced a fault and will need to be reset. The burner control module must be reset at the air handler. Refer to *Page 149, Section 21* and *Page 162, Section 23* to determine the cause of the fault.

CHECK FILTER indicator:

The airflow in the unit is insufficient to activate the low pressure switch. This is most commonly caused by dirty filters, but could also indicate other obstructions in the air stream.

19.2.3 Deluxe Temperature Control (DTC) Remote

This control is typically used for providing automatic day/night space heating. The burner flame modulates and varies the discharge air temperature to maintain the space temperature set on the Selectrastat dial. The 7-day programmable touchscreen thermostat provides nighttime setback for unoccupied space heating.

AUTO/WINTER Mode:

Occupied time: Blower and burner cycle operate continuously to maintain a constant space temperature as selected on the Selectrastat dial. The burner flame fully modulates and varies the discharge air temperature to maintain the space temperature.

Unoccupied time: Blower and burner cycle on and off to maintain space temperature as selected on the touchscreen thermostat (night setback).

ON/WINTER Mode:

Blower and burner operate continuously to maintain a constant space temperature as selected on the Selectrastat dial. The burner flame modulates and varies the discharge air temperature to maintain the space temperature.

ON/SUMMER Mode:

Only the blower operates continuously to provide unheated air. The burner remains off regardless of temperatures on the temperature selection dial and thermostat.

FAN ON indicator:

Indicates that the air handler is supplying power to the blower motor via the M1 motor starter.

BURNER ON indicator:

Indicates that the air handler has supplied power to open the main gas safety shut off valve.

BURNER LOCKOUT indicator:

The burner control module has experienced a fault and will need to be reset. The burner control module must be reset at the air handler. Refer to *Page 149, Section 21* and *Page 162, Section 23* to determine the cause of the fault.

CHECK FILTER indicator:

The airflow in the air handler is insufficient to activate the low pressure switch. This is most commonly caused by dirty filters but could also indicate other obstructions in the air stream.

Table 19: Factory Preset Schedule on TH8110 Thermostat

	Monday - Friday			Saturday - Sunday		
	Time	**Temperature**	**Fan Setting**	**Time**	**Temperature**	**Fan Setting**
Wake	6:00 AM	68°F	Fan On	6:00 AM	62°F	Fan Auto
	The air handler will run continuously. Temperature controlled by Maxitrol stat.			The air handler will run when the thermostat calls for heat.		
Leave	Unused			Unused		
Return	Unused			Unused		
Sleep	5:00 PM	62°F	Fan Auto	5:00 PM	62°F	Fan Auto
	The air handler will run when the thermostat calls for heat.			The air handler will run when the thermostat calls for heat.		

19.2.4 BMS-Ready Control Option

The BMS-ready option provides inputs to receive control signals from a customer determined control system. Each BMS input is capable of receiving a 4-20mA or 0 - 10VDC from the control system. On all air handlers, the burner modulation will be controlled by the control system. For AM/VAV style air handlers, the control system can also control the modulating damper.

19.3 Basic Air Handler Sequence of Operation

While the control transformer is energized, the secondary side supplies 115 VAC to the control circuit. When the fan switch is in the "on" position, the M1 motor starter is energized and starts the blower motor. The M1 motor starter auxiliary contact supplies voltage to the burner switch and "Fan On" light. When the burner switch is in the "on"/"winter" position, power is supplied to the flame control module and the burner control circuit. The burner control circuit includes the high temperature limit switch and the low and high airflow pressure switches. Once the burner control circuit is satisfied, then the flame control module will execute the burner ignition sequence. Once the pilot flame is ignited and sensed by the UV scanner, the flame control module will open the safety shutoff valve to ignite the main flame. When the safety shutoff is opened, 115 VAC is applied to the "Burner On" light and T3 transformer, the secondary side supplies 24 VAC to the temperature control amplifier. The temperature control amplifier controls the modulating valve based on the discharge temperature monitor (and also the room temperature monitor, in the case of a DTC remote panel).

On DDC/BMS-ready systems, no temperature control amplifier is installed. Discharge temperature monitoring and modulation valve adjustment are done by the customer supplied control system.

19.3.1 Flame Control

The flame control is a safety device and not servicable. See *Page 138, Figure 86 through Page 140, Figure 88* for detailed sequence of operation.

The RM 7890 and RM 7897 must be configured prior to replacement. This is done by removing certain configuration jumpers on the upper left corner of the flame control, located behind the blue cover. *See Page 137, Figure 85*.

FIGURE 85: Selectable Configuration Jumpers

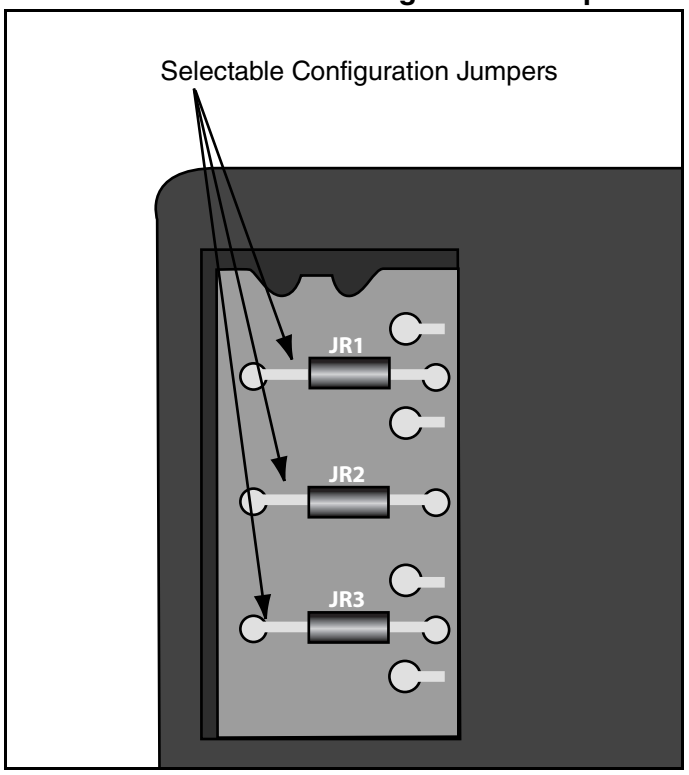


Table 20: Site-Configuration Jumper Options

Jumper Number	7890	7897
JR1	Intact	Intact
JR2	Remove	Remove
JR3	Intact	Intact

FIGURE 86: S8600 Flame Control (DF40)

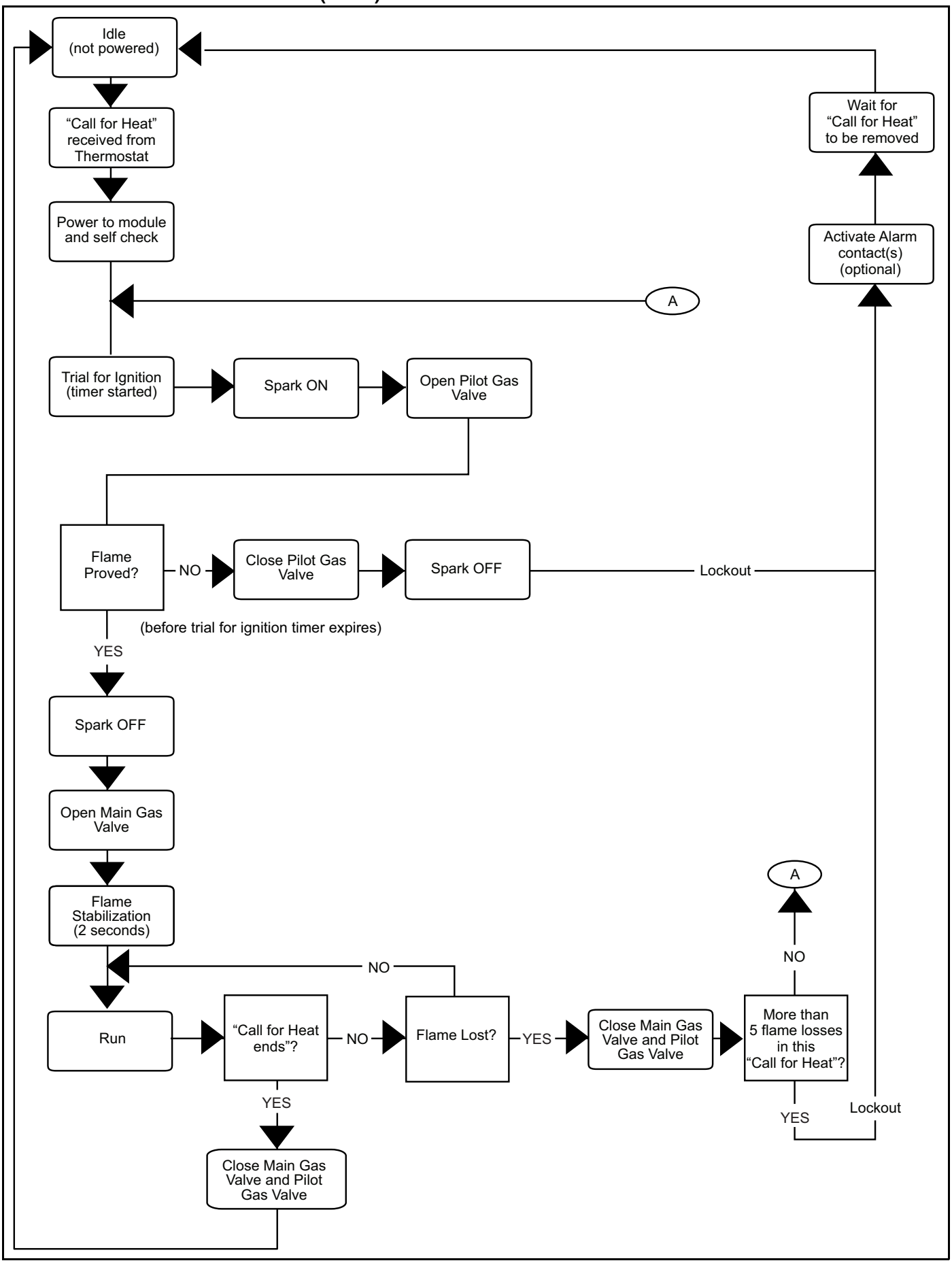
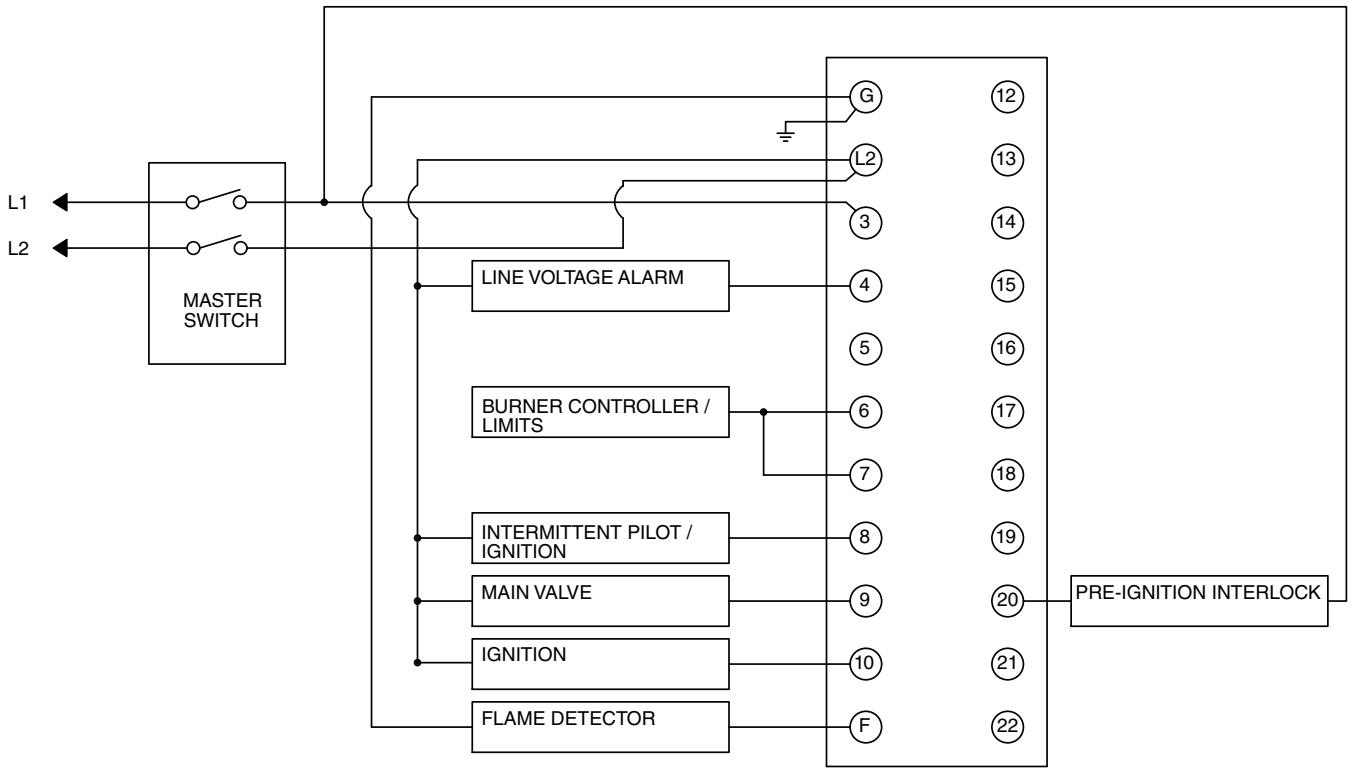
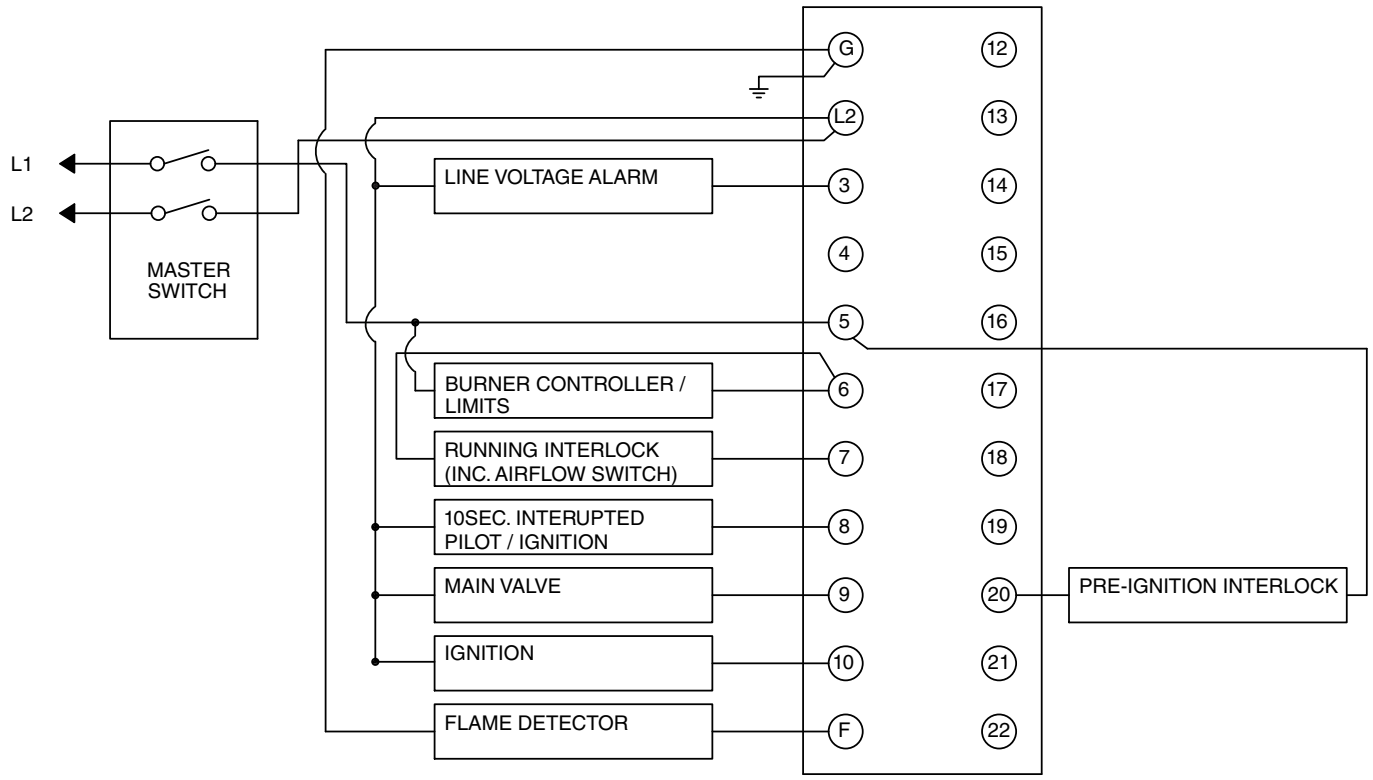


FIGURE 87: RM7890 Flame Control (DF75 and DF150)



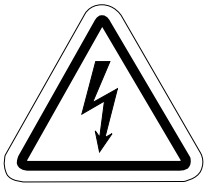
LED Display	Initiate (Initial Powerup Only)	Standby	Safe-Start	Pilot Flame Establishing Period (10 Sec)	Main Flame Establishing Period	Run	Standby
	● Power ❍ ❍ ❍ ❍	● Power ❍ ❍ ❍ ❍	● Power ❍ ❍ ❍ ❍	● Power ● Pilot ● Flame ❍ Main ❍ Alarm	● Power ● Pilot ● Flame ● Main ❍ Alarm	● Power ● Pilot ● Flame ● Main ❍ Alarm	● Power ❍ ❍ ❍ ❍
Burner Start				Ignition ⑩			
				Intermittent Pilot ⑧⑩			
					Main Valve ⑨		
Operating Controller and Limits			Limits and Burner Control Closed ⑥⑦				
Flame Signal		Safe Start Check			Flame Proving		SSC
	Preignition Interlock (PII)						PII

FIGURE 88: RM7897 Flame Control (DF270 - DF700B)



	Initiate (Initial Powerup only)	Standby	Prepurge (7 Sec)	Pilot Flame Establishing Period (10 Sec)	Main Flame Establishing Period	Run	Postpurge	Standby
LED Display	● Power ❍ ❍ ❍ ❍	● Power ❍ ❍ ❍ ❍	● Power ❍ Pilot ❍ Flame ❍ Main ❍ Alarm	● Power ● Pilot ● Flame ❍ Main ❍ Alarm	● Power ● Pilot ● Flame ● Main ❍ Alarm	● Power ❍ Pilot ● Flame ● Main ❍ Alarm	● Power ❍ ❍ ❍ ❍	● Power ❍ ❍ ❍ ❍
Burner			Burner/Blower Motor ⑤					
				⑩Ignition				
				Interrupt/Pilot ⑧				
					Main Valve »⑨			
Operating Controls and Interlocks			Limits and Burner Controller Closed Ⓛ to ⑨					
				Running Interlock ⑥ to ⑦				
		Preignition Interlock Closed		⑤ to ⑳				PII
Flame Signal		Safe Start Check			Flame Proving			SSC

SECTION 20: START-UP PROCEDURES

⚠ DANGER	
	
Electrical Shock Hazard **Disconnect electric before service.** **More than one disconnect switch may be required to disconnect electric from equipment.** **Equipment must be properly grounded.**	**Severe Injury Hazard** **Do not enter equipment while in operation.** **Equipment may start automatically.** **Do not operate with door open.** **Installation, operation and service must be done by a trained technician only.**
Failure to follow these instructions can result in death, electrical shock or injury.	

⚠ WARNING			
			
Explosion Hazard **Leak test all components of equipment gas piping before operation.** **Gas can leak if piping is not installed properly.** **Do not high pressure test gas piping with equipment connected.**	**Carbon Monoxide Hazard** **Do not recirculate air from the heated space over burner.** **Air supply to burner must be from outside.**	**Falling Hazard** **Use proper safety equipment and practices to avoid falling.** **Do not use any part of equipment as support.**	**Burn Hazard** **Allow equipment to cool before service.** **Internal components of equipment may still be hot after operation.**
Failure to follow these instructions can result in death, injury or property damage.			

Installation Code and Annual Inspections:
All installation and service of ROBERTS GORDON® equipment must be performed by a contractor qualified in the installation and service of equipment sold and supplied by Roberts-Gordon LLC and conform to all requirements set forth in the ROBERTS GORDON® manuals and all applicable governmental authorities pertaining to the installation, service, labeling and operation of the equipment.
To help facilitate optimum performance and safety, Roberts-Gordon LLC recommends that a qualified contractor conduct, at a minimum, annual inspections of your ROBERTS GORDON® equipment and perform service where necessary, using only replacement parts sold and supplied by Roberts-Gordon LLC.
Check installation site to ensure all codes and engineering specifications are correct. This section of the manual is intended to be used as an instructional guide to the commissioning of the direct fired air handler. Fill out the start up sheet on *Page 171, Section 24* as each step of the procedure is performed.

This procedure must be completed by the commissioning contractor and returned to Roberts-Gordon LLC. If the document is not returned, the manufacturing date will be used as the warranty start date.

20.1 Installation of Recirculating Air Handler

Every direct-fired air handler which recirculates room air (i.e., AM and FR styles) must utilize either a control system which limits temperature rise in proportion to the amount of outdoor air, or a room carbon dioxide sensor, installed per the manufacturer's recommendations. The normally-closed contacts of this sensor must be wired in as per the CO_2 interlock diagram, maintaining the room concentration of CO_2 below 5,000 ppm. Select the CO2 interlock diagram based on air handler configuration and model. *See Page 123*, *Figure 71 through Page 123, Figure 73*.

With the AM and VAV package, a temperature rise limiting resistor comes prewired. *See Page 122, Figure 69 and Figure 70*. When the air handler goes into full recirculation, the resistor is activated, lowering the maximum temperature rise to comply with government standards. For the FR package, the gas valve is preset to the proper temperature rise. *See Page 146, Table 25*.

20.2 Mechanical

This appliance requires at least 4 CFM (6.8m^3/h) of outside air per 1,000 Btu/h (0.293 kW).

Before installation, check that the local distribution condition, nature of gas and pressure, and the current state of adjustment of the appliance are compatible.

If filters are not installed (via inlet hood or filter section), an air strainer must be installed on the inlet of the air handler with openings less than or equal to 5/8" (16 mm) in diameter.

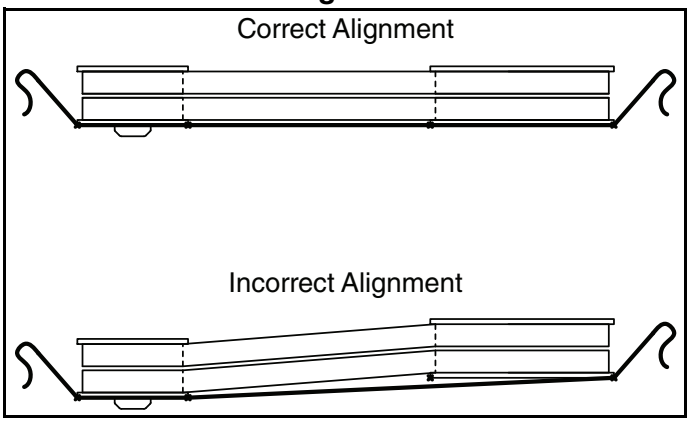
Air inlets must be installed with the lowest edge 19" (500 mm) above any surface. This applies to roof curbs, upright stands and suspended air handlers.

20.2.1 Sheave Alignment

Sheaves are factory aligned. On all air handlers, check sheave alignment as follows (*See Page 142, Figure 89*).

1. Tie a string to the vertical channel next to the blower shaft bearing. (as shown)
2. Wrap the string around the blower sheave and across both sheave surfaces as shown.
3. Adjust until all four contact points (triangle) touch the sheave surfaces. "IN" or "OUT" adjustment of the motor sheave and/or motor adjustment may be required.
4. Pull the string away from the motor sheave and then move it slowly back towards the sheave, making sure the string remains straight while touching all contact points.
5. Remove string before turning air handler on.

FIGURE 89: Sheave Alignment



20.2.2 Belt Tension

- Belt tension should be checked with a belt-tension gauge when one is available. Follow the belt tension gauge instructions.
- When a tension gauge is not available, measure the belt span of the belts (*See Page 144, Figure 91*).
- Allow for 1/64" (0.39 cm) of deflection for each inch of center distance length for the charted pounds of force. Check *Page 143, Table 21* for proper deflection force.
    - EXAMPLE: A 40" (101.6 cm) shaft center distance would dictate 40"/64" or 5/8" (1.59 cm) of deflection. With a standard B belt and a motor sheave measuring between 5.8" (14.7 cm) and 8.6" (21.8 cm), the belt will have proper tension if a 5/8" deflection can be achieved with a minimum of 6-3/8 inch lbs. and a maximum of 8-3/4 inch lbs. of pressure as measured with a belt tensioning gauge.

FIGURE 90: Belt Tension

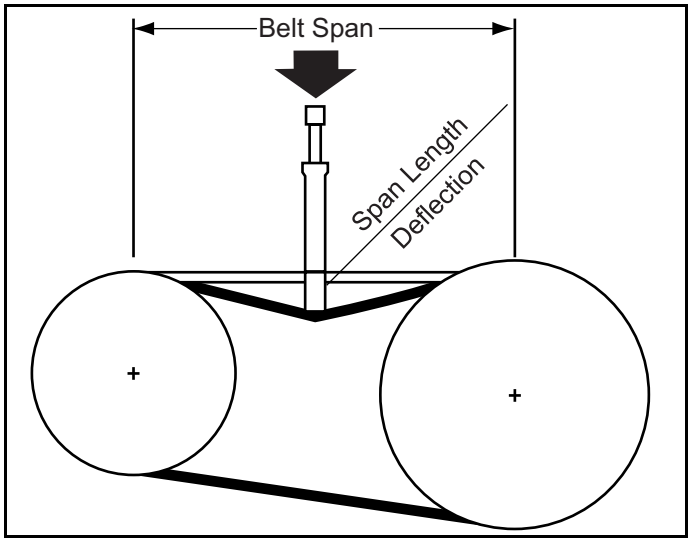


Table 21: Deflection Force B Belts (in lbs)

Belt Cross-Section	Motor Sheave Dimension Range (in) - (cm)	TYPE B		TYPE B-X (High HP)	
		Min.	Max.	Min.	Max.
B	3.4 - 4.2	4	5 1/2	5 3/4	8
	4.4 - 5.6	5 1/8	7 1/8	6 1/2	9 1/8
	5.8 - 8.6	6 3/8	8 3/4	7 3/8	10 1/8

NOTE: If drive belts squeal during start-up, increase belt tension to the highest allowed value. Re-check tension during each inspection.

20.2.3 Air Temperature Sensing

The sensing probe is factory mounted in the blower housing (Not included if customer orders BMS-ready).

20.3 Electrical

1. Check motor starter for proper overload settings. The overload setting should meet full load amps (FLA) of motor.
2. Measure the supply voltage with the air handler off and then on. For a system that is powered with three phase power, measure the voltage of each phase.
3. Verify correct blower rotation.
4. While the blower is running and the burner is off, measure the total system current draw with an ammeter. Measure the system current draw again after the burner adjustments are made and with the burner and blower both on.
5. If applicable, compare all variable frequency drive (VFD) programming parameters with specifications provided on electrical drawing.

20.4 Airflow

The air flow switches are factory calibrated safety devices for burner air flow. If an air flow switch does not close, the problem may not be the air flow switch. It could be an indication of an air flow problem (wrong filters, duct restrictions, etc.).

20.4.1 Differential Pressure

In order to verify proper airflow across the burner, the differential pressure across the profile plate needs to be measured. Attach a manometer to the pressure test ports where the pressure switch is attached and measure the differential pressure with a manometer. This reading must be 0.9 in wc +/- 0.1 in wc. (2.24mbar +/- 0.25 mbar)

To adjust the differential pressure that was measured in the step above, use the adjustable sheave. To decrease the speed of the blower and the differential pressure, turn the adjustable half of the sheave inward (increase diameter). To increase the speed of the blower and the differential pressure measured at the burner, rotate the adjustable half of the sheave outward (decrease diameter). Both sides of the sheave must be turned equal, multiple grooves must be adjusted equal.

After any adjustment, it is necessary to re-check the alignment, belt tensions and verify that all sheave set screws are tightened to the specified torque value before engaging the blower. *See Page 144, Table 22* and *Table 23*. Typically, all sheaves have two set

screws to secure the sheave to the motor shaft. Some sheaves may be press fit onto the motor shaft. On the three belt sheaves, there are three set screws on the locking collar to hold the size adjustment. On the two belt sheaves, there are four setscrews that hold the size adjustment. On the single belt sheaves, there are two set screws to hold the size adjustment.

Table 22: Motor Sheave Drive Torque Specifications

Setscrew Size	Allen Wrench	Torque Settings	
		in•Lbs	ft•Lbs
1/4"	1/8"	87	7.3
5/16"	5/32"	120	10.0
3/8"	3/16"	290	24.2

Table 23: Motor and Blower Bushing Torque Specifications

Bolt Size (on Bushing)	Torque Settings	
	in•Lbs	ft•Lbs
#10	60	5
1/4"	108	9
5/16"	192	16
3/8"	360	30
1/2"	720	60

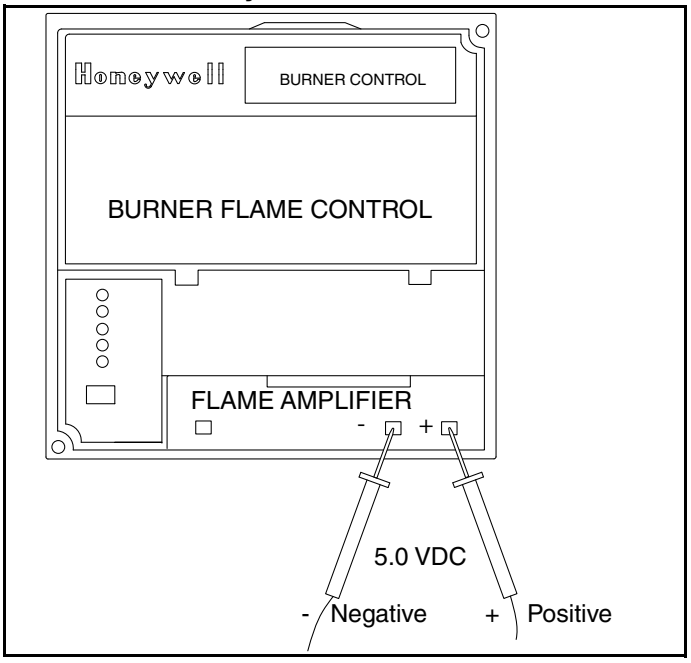
20.4.2 Burner Pressure

1. A pressure tap is used to measure differential at the burner and to set high fire gas pressure. On air handlers equipped with a M611 modulating valve (Model DF40), the pressure tap is located on a tee between the M611 valve and the burner. *See Page 103, Figure 51*. On air handlers equipped with the MR212 modulating valve (Models DF75-DF700B), the pressure tap could be located on the downstream side of the MR212 valve, on a T-fitting coming off the outlet pressure tap on the MR212 valve or between the MR212 valve and the burner. *See Page 103, Figure 52 and Page 148, Figure 93*.
2. Measure the burner pressure with the inlet manual gas valve off.
   - Open the manual shut off located between the modulating valve and the burner.
   - Turn the blower on and record the negative pressure on a u-tube manometer or gas pressure gauge. This reading is used for high fire burner pressure adjustment.
3. After taking the burner pressure reading, temporarily leave the manometer attached to the 1/8" tap. It will be used later to check high fire gas pressure.

20.5 Gas Piping and Initial Pressure Settings

1. Perform a pressure test on all gas supply lines to the air handler per applicable codes. **Make sure to isolate all gas controls before pressure testing the system.**
2. Verify supply pressure does not exceed maximum rated gas pressure as stated on the rating plate.
3. Set the supply gas pressure at the step down regulator (normally outside of the enclosure if one is installed) according to the nameplate rating inlet gas pressure specifications.
4. Only after performing steps 1-3, verify pilot pressure.
   - Place a u-tube manometer or gas pressure gauge on the tee at the downstream side of the pilot pressure regulator.
   - Open the main gas valve and close the gas valve downstream of the MR valve.
   - Set the burner switch to "on" and adjust the pilot pressure regulator to 1.0 in wc for natural gas or 0.5 in wc for LPG.
   - Verify that the burner flame control has a flame signal of 5.0 VDC / DF75-DF700B. *See Page 144, Figure 91*.

FIGURE 91: Honeywell Flame Module



5. Adjust air handler high fire gas pressure.
   - Determine the high fire gas pressure by adding the manifold pressure for maximum input (from the rating plate) and the burner negative pressure (from the measurement made in the burner pressure section of this procedure). Record this value for use in adjustment step.

For example:

Differential pressure= -1.0 in wc

Maximum manifold pressure (from rating plate)= 2.0 in wc

High fire gas pressure= 2.0 + (-1.0) in wc

High fire gas pressure= 1.0 in wc

   - Force the burner into high fire. Refer to the burner mode setting chart *on Page 145, Table 24*, for the specific amplifier and action required to place it into high fire mode.
   - Open both manual gas valves at the air handler.
   - Set the pressure at the burner side of the modulating valve to the calculated value (from the begining of this step), by removing high fire adjustment cap and rotating the regulator adjustment screw. A clockwise rotation increases manifold pressure. Temperature rise should not exceed maximum as listed *on Page 146, Table 25*. For Model DF40, the high fire gas pressure is set by adjusting the regulator upstream of the M611 valve. *See Page 148, Figure 94*.
   - Reconnect any wires that were used for adjustment.
6. Maximum discharge temperature is 160° F (71° C) for models DF40-DF410; 150° F (65.6° C) for models DF700A and DF700B.
7. Low fire adjustment
   - **NOTE:** High fire gas pressure must be set BEFORE adjusting low fire. There are three critical items to consider before adjusting low fire:
     A. Low fire adjustment does not regulate gas pressure.
     B. If the low fire adjustment screw is set to maximum, high fire regulation problems will occur.
     C. The burner control system must be forced into low fire per the "Burner Mode by Amplifier Type" table. *See Page 145, Table 24*.
   - Low fire is set at the MR212 valve using the adjustment screw under the low fire adjustment cap screw (loosen locking screw before adjustment), *See Page 147, Figure 92*, or on the M611 valve using the brass adjusting screw on the front side, *See Page 148, Figure 93*. The burner must be forced into low fire first. Then rotate the adjustment screw until there is a continuous blue ribbon across the entire burner. A counter clockwise rotation increases the flame size. Low fire temperature rise must not exceed 12° F (7° C). Tighten locking screw when finished.
   - Reconnect any wires that were removed for adjustment.
8. Once gas pressure and high/low fire adjustments are made, the gas setup is completed. All taps and instruments must be removed and all caps and plugs must be replaced.

Table 24: Burner Mode by Amplifier Type

Amplifier Type	High Fire Mode	Low Fire Mode
Series 14	Remove wire #45 from terminal #4 on the amplifier	Remove wire #16 from terminal #8 on the amplifier
Series 44	Remove wires #40 and #45 from terminals #2 and #4 on the amplifier	Remove wire #16 from terminal #9 on the amplifier
SC11 Signal Conditioner	Set BMS to max fire or remove inputs wires #40 and #41 from terminals #6 and #5 and connect a 9VDC battery to the signal conditioner	Remove wire #16 from terminal #1 on the signal
Series 94	Disconnect selector ribbon cable from the amplifier.	Remove wire #16 from terminal #2 on the amplifier
Series MP2	Set system to maximum temperature	Remove wire #16 from terminal #2 on the amplifer

20.6 Safety Shut Off Valve Check

After the initial start up and gas pressure adjustment, verify gas soundness of each SSOV (Safety Shut Off Valve). This check must be repeated after the first 100 hours of operation.

20.7 Temperature Control System Calibration

The temperature control system components are factory calibrated to a base resistance so that component replacement will not upset the system calibration. If the temperature control system should require field calibration, refer to the provided temperature control amplifier product information sheet.

Table 25: Maximum Temperature Rise

Model		Natural Gas		LPG	
		°F	°C	°F	°C
DF40		90	50	70	38.9
DF75-DF150	Non-Recirculating	100	55	80	44.5
	Recirculating	49	27.2	42	23.4
DF270-DF410	Non-Recirculating	100	55	80	44.5
	Recirculating	73.5	40.8	63	35
DF700A-DF700B	Non-Recirculating	100	55	N/A	N/A
	Recirculating	73.5	40.8	N/A	N/A

FIGURE 92: MR 212 Valve (DF75-DF700B)

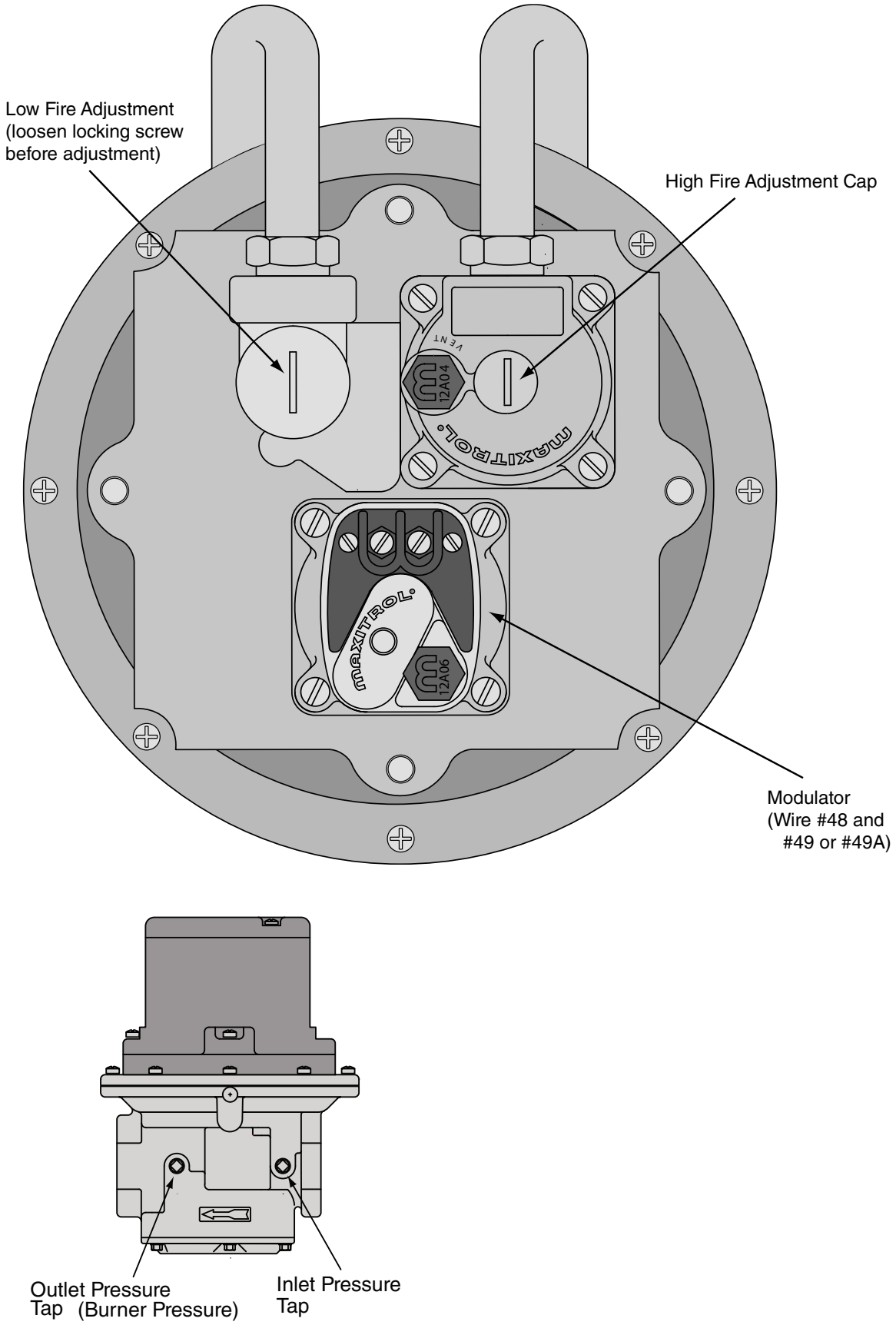
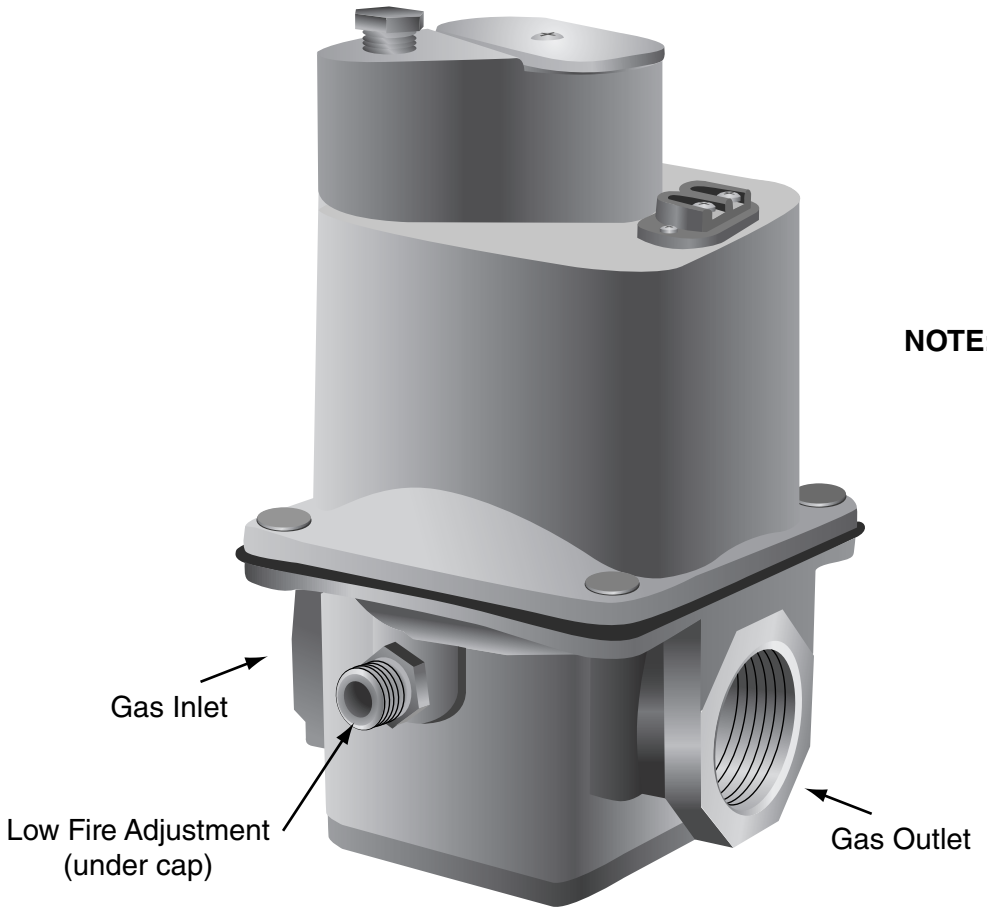
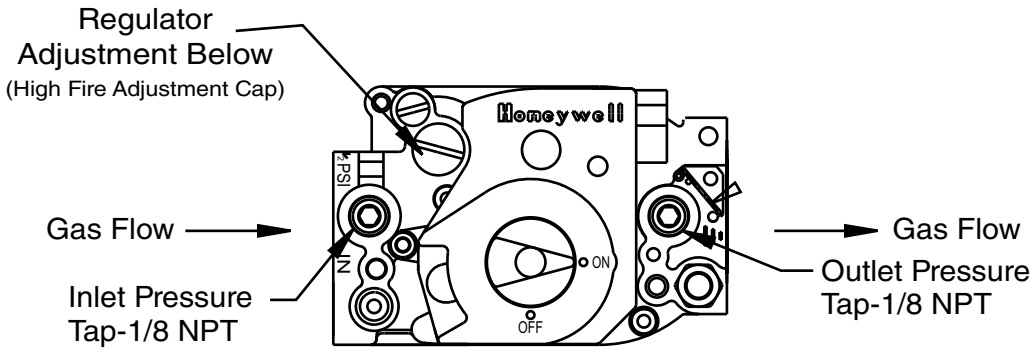


FIGURE 93: M611 Valve (DF40)



NOTE: Modulating only.

FIGURE 94: Regulator (DF40)



SECTION 21: MAINTENANCE

⚠ DANGER	
	
Electrical Shock Hazard **Disconnect electric before service.** **More than one disconnect switch may be required to disconnect electric from equipment.** **Equipment must be properly grounded.**	**Severe Injury Hazard** **Do not enter equipment while in operation.** **Equipment may start automatically.** **Do not operate with door open.** **Installation, operation and service must be done by a trained technician only.**
Failure to follow these instructions can result in death, injury or property damage.	

⚠ WARNING		
		
Explosion Hazard **Leak test all components of equipment gas piping before operation.** **Gas can leak if piping is not installed properly.** **Do not high pressure test gas piping with equipment connected.**	**Falling Hazard** **Use proper safety equipment and practices to avoid falling.** **Do not use any part of equipment as support.**	**Burn Hazard** **Allow equipment to cool before service.** **Internal components of equipment may still be hot after operation.**
Failure to follow these instructions can result in death, injury or property damage.		

Prior to any maintenance or service of the air handler, shut off, lockout and tagout the electrical disconnect and gas valve that supplies the unit in accordance with OSHA regulations and allow ample time for the air handler to cool. After maintenance is performed or air handler is serviced, the air handler shall be re-commissioned to the start-up procedure as outlined on *Page 141, Section 20*.

Installation Code and Annual Inspections:
All installation and service of ROBERTS GORDON® equipment must be performed by a contractor qualified in the installation and service of equipment sold and supplied by Roberts-Gordon LLC and conform to all requirements set forth in the ROBERTS GORDON® manuals and all applicable governmental authorities pertaining to the installation, service and operation and labeling of the equipment.
To help facilitate optimum performance and safety, Roberts-Gordon LLC recommends that a qualified contractor conduct, at a minimum, annual inspections of your ROBERTS GORDON® equipment and perform service where necessary, using only replacement parts sold and supplied by Roberts-Gordon LLC.

21.1 General

First 8 Hours of Operation	Check belts and adjust as required (*See Page 143, Section 20.2.2*). Though belts were properly adjusted at the factory, they will stretch after the first few hours of operation.
First 100 Hours of Operation	Re-check belt tension and adjust if necessary.
Annual Fall Start-Up	Follow entire start-up procedure at this time and check control settings and operation.

21.2 Unit Exterior

Cabinet Exterior	After installation, touch up scratches. Periodic painting should be done thereafter as required. The caulk around weather enclosures and over field joints should be inspected annually. Re-apply caulk as needed to maintain integrity. Warning labels and logo labels should be legible and accurate. Please contact Roberts-Gordon LLC or ROBERTS GORDON® independent distributor if you need replacement warning labels or logo labels. *See Page 3, Figure 1 through Page 4, Figure 4*.
Unit Location	Verify that no flammable objects, liquids or vapors are present near the air handler. Do not hang anything from or place anything on the air handler. Keep the area under and around the air handler free of all objects. *See Page 8, Section 3* for Clearances to Combustibles.

21.3Blower Section

Blower Wheel	Inspect blower wheel and clean as necessary. A small build up of dust can cause a significant decrease in blower performance. Check for excessive vibration, repair as required. Critical labels are located on or near the blower housing. Contact Roberts-Gordon LLC or ROBERTS GORDON® independent distributor if you need replacement labels. *See Page 5, Figure 5*.

Drive Belts and Sheaves	Check for belt ride in the groove. In multiple groove drives, belt ride should be uniform. Check groove wear area for wear. Side wall of groove should be straight, not dished out. Bottom of groove should not show signs of belt contact. Sheave alignment, set screw torque and belt tension should be checked after 8, 24, and 100 hours of intitial start-up. Visually inspect belts and sheaves for excessive wear. If belts have a slick, glazed look, the belts are slipping. Check drive capacity and belt tension. Never replace only one belt in a used set, as used belts will elongate. Replace the entire set if replacement is necessary. *See Page 142, Section 20.2.1 and Page 143, Section 20.2.2*.
Blower Bearing Lubrication	Blowers with spider bracket bearings are pre-lubricated and do not require any re-lubrication during their entire service life. Blowers that use pillow block bearings; should be re-lubricated every 3,000 hours of operation or 6 months, whichever occurs first. The recommended lubricant is Shell Alvania #2 or S3 grease. To re-lubricate the blower pillow block bearings, be sure that the grease fittings on the bearing housing (or air handler cabinet wall in the case of extended grease lines) are clean. Apply the recommended grease to the fitting with a low-pressure grease gun and add slowly while the shaft is spun by hand. Do not over-grease. Over-greasing will reduce the service life of the bearings. Consult the blower manufacturer for grease capacity recommendations as capacities vary by model. *See Page 160, Table 31* for blower manufacturer based on blower frame.

Motors

Inspection:

1. Inspect motor every 3 months or 500 hours of operation, which ever occurs first. Keep the motor clean and vent openings clear.

Lubrication:

1. Motors with grease fittings must be lubricated based on the table below.

Table 26: Motor Lubrication Intervals

NEMA Frame Size (Motor HP)	Rated at 1800 RPM
Up to 210 incl. (3 - 5 HP)	6,000 hrs
Over 210 to 280 incl. (7.5 - 20 HP)	4,750 hrs
Over 280 to 360 incl. (25 - 50 HP)	3,700 hrs

NOTE: *These intervals are based on severe duty. Over lubricating bearings could result in reduced motor life.*

2. A high grade ball or roller bearing grease must be used. Recommended grease for standard service is Polyrex EM (Exxon Mobil). Other compatible greases include; Texaco Polystar, Rykon Premium #2, Pennzoil Pen 2 Lube and Chevron SRI.
3. Motors without grease fittings are sealed for life and do not require relubrication.

Instructions for Lubricating

Before greasing, be sure fittings are clean and free from dirt. Remove grease relief plug or plate and, using a low-pressure grease gun, pump in the required grease. Do not over-grease. Overgreasing will reduce the service life of the motor. Consult the motor manufacturer for grease capacity recommendations as capacities vary by motor. Relubrication intervals are specified in the table above. After relubricating, allow motor to run for 10 minutes before replacing relief hardware.

NOTE: In general it is not recommended to mix greases of different brands. The mixing of different types of thickeners may destroy the composition and physical properties of the grease. In the event that a different grease is required by the end user, the following steps can be taken. Using the instructions for lubrication, open grease outlet and purge the system as much as possible of the old or unwanted grease. Repeat this same operation after 1 week of service. Consult Roberts-Gordon LLC or the motor manufacturer for further recommendations on grease compatibility.

21.4 Manifold and Controls

Manifold	Periodically check gas control assembly and internal and external piping for leaks. Relief vent lines to outdoors on gas controls should be checked to ensure against blockage caused by insects or any other substance. Clean as required. All gas piping to the air handler must comply with the National Fuel Gas Code - NFPA54, latest edition and all local codes. Verify gas soundness of each SSOV (Safety Shut Off Valve). This test must be repeated after the first 100 hours of operation. *See Page 99, Figure 44 through Page 102, Figure 50*.
Air Flow Switch	An annual check of the tubes attached to the air flow switch should be made to ensure against blockage caused by insects or any other substance. Clean as required. *See Page 143, Section 20.4*.
Electric Components	Check for physical damage on any of the electric components and verify all electrical connections are secure. Ensure equipment is properly grounded. *See Page 143, Section 20.3 and Page 157, Figure 99/Page 160, Figure 100*
Temperature Sensors	Calibrate space, outdoor air, and discharge air sensors as required. *See Page 143, Section 20.2.3*

21.5Burner

An annual inspection of the burner and components must be made to ensure proper and safe operation. For the most part, the burner is self cleaning. However, if the application is extremely dirty or dusty, it may become necessary to periodically clean the burner. Inspect and clean the burner in accordance with the following recommended procedures:

1. To avoid damaging the valves, disconnect the burner piping from the manifold, at the union in the control enclosure, and cover the exposed end of the manifold. *See Page 99, Figure 44 through Page 102, Figure 50*
2. Unscrew the UV scanner from the side of the burner and clean the lens with a soft cloth. *See Page 105, Section 18.5.4*.
3. Remove the ignition cable from the igniter on the side of the burner, and then remove the spark igniter. Clean the igniter contacts with a wire brush. Set the gap to 0.078" (2.0mm).
4. Inspect each of the stainless steel mixing plates to see that all of the air holes are free of debris. Clean with a wire brush as necessary. *See Page 154, Figure 95 through Page 154, Figure 97*.
5. The burner orifices may need to be drilled to unplug any closed orifices. *See Page 154, Figure 95 through Figure 97*. Use a pin vise with the appropriate drill, *See Page 154, Table 27*, to clean debris from the orifices. An electric drill is not suggested because it is easy to snap drill bits off in the orifices. *See Page 99, Figure 44 through Page 102, Figure 50*.
6. Reinstall the UV scanner and the spark igniter. The UV scanner should be installed only finger tight as over tightening can result in damaging the lens. Reconnect the burner piping to the manifold at the union.

FIGURE 95: 6" (15.3 cm) Straight Cast Iron

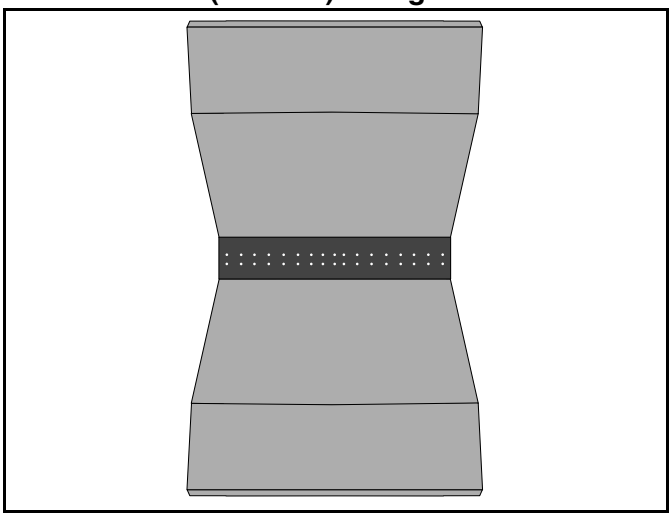


FIGURE 96: 12" (30.5 cm) Straight Cast Iron

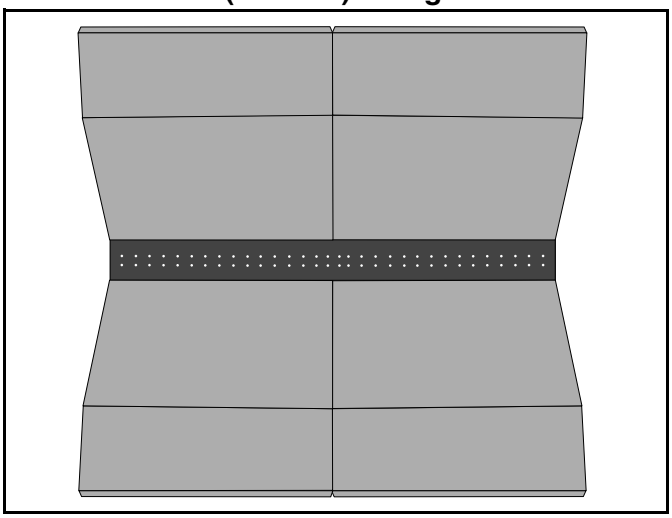


FIGURE 97: 12" (30.5 cm) Tee Cast Iron

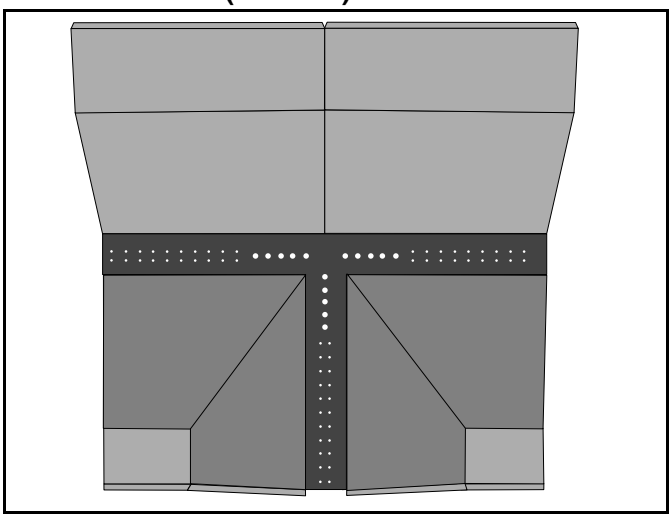


Table 27: Burner Selections

Model	Burner Length	Style	Qty.	Drill Size
DF40	6" (15.3 cm)	6" (15.3 cm) Straight	1	47
DF75	1 ft (30.5 cm)	12" (30.5 cm) Straight	1	47
DF150	2 ft (61 cm)	12" (30.5 cm) Straight	2	47
DF270	3.5 ft (167.6 cm)	12" (30.5 cm) Straight	1	47
		6" (15.3 cm) Straight	3	47
DF410	5.5 ft (167.6 cm)	12" (30.5 cm) Straight	1	47
		12" (30.5 cm) Tee	3	43, 47
DF700A DF700B	6 ft (182.9)	12" (30.5 cm) Tee	4	43, 47
	7 ft (213.4 cm)	6" (15.3 cm) Straight	2	47
		12" (30.5 cm) Tee	4	43, 47
	8 ft (243.8 cm)	12" (30.5 cm) Straight	2	47
		12" (30.5 cm) Tee	4	43, 47
	9 ft (274.3 cm)	12" (30.5 cm) Tee	6	43, 47

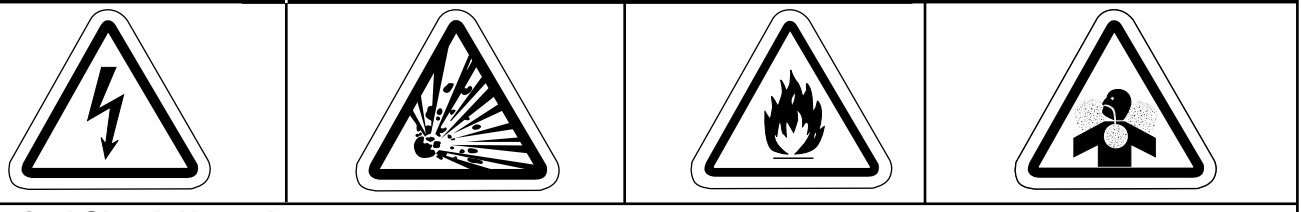
*Btu/hr/ft 800,000

21.6 Optional Equipment

Dampers	Check linkage when applicable and tighten set screws as required. All moving parts of dampers should be cleaned and then thoroughly lubricated with a light molybdenum oil in aerosol can. Dampers furnished with stainless steel side seals should also have the seals lubricated generously. Dampers should then be manually operated several times until linkages and blades operate freely. Reconnect linkages and check dampers for proper operation. *See Page 126, Section 18.8.4 and Page 126, Section 18.8.5*.
Filters	Filters should be checked for dirt restriction on a monthly basis (or as required). Replace filters with filters of equal specification when they appear dirty. **NOTE:** When using Roberts-Gordon LLC supplied disposable polyester filters, they must be inserted with the white media side facing the inlet of filter section. When using Roberts-Gordon LLC supplied permanent aluminum mesh or disposable filters, they must be inserted with the arrow on the filter pointing in the direction of airflow (toward the air handler). See inlet hood or filter section for filters.
Evaporative/DX Cooling	If applicable, refer to separate maintenance literature.

SECTION 22: REPLACEMENT PARTS

⚠ DANGER | **⚠ WARNING**



Electrical Shock Hazard | Explosion Hazard | Fire Hazard | Carbon Monoxide Hazard

Use only genuine ROBERTS GORDON® replacement parts per this installation, operation and service manual.

Failure to follow these instructions can result in death, electric shock, injury or property damage.

⚠ WARNING

Severe Injury Hazard

Use proper lifting practices and equipment.

Equipment and accessories are heavy.

Failure to follow these instructions can result in death, injury or property damage.

⚠ WARNING

Cut/Pinch Hazard

Wear protective gear during installation, operation and service.

Edges are sharp.

Failure to follow these instructions can result in injury.

Replacement parts list is for general direct fired applications and MAY NOT BE APPLICABLE for your specific unit configuration. Before ordering replacement parts, please contact factory to make sure that the replacement parts are the direct replacement for your specific unit.

FIGURE 98: Control Panel Layouts

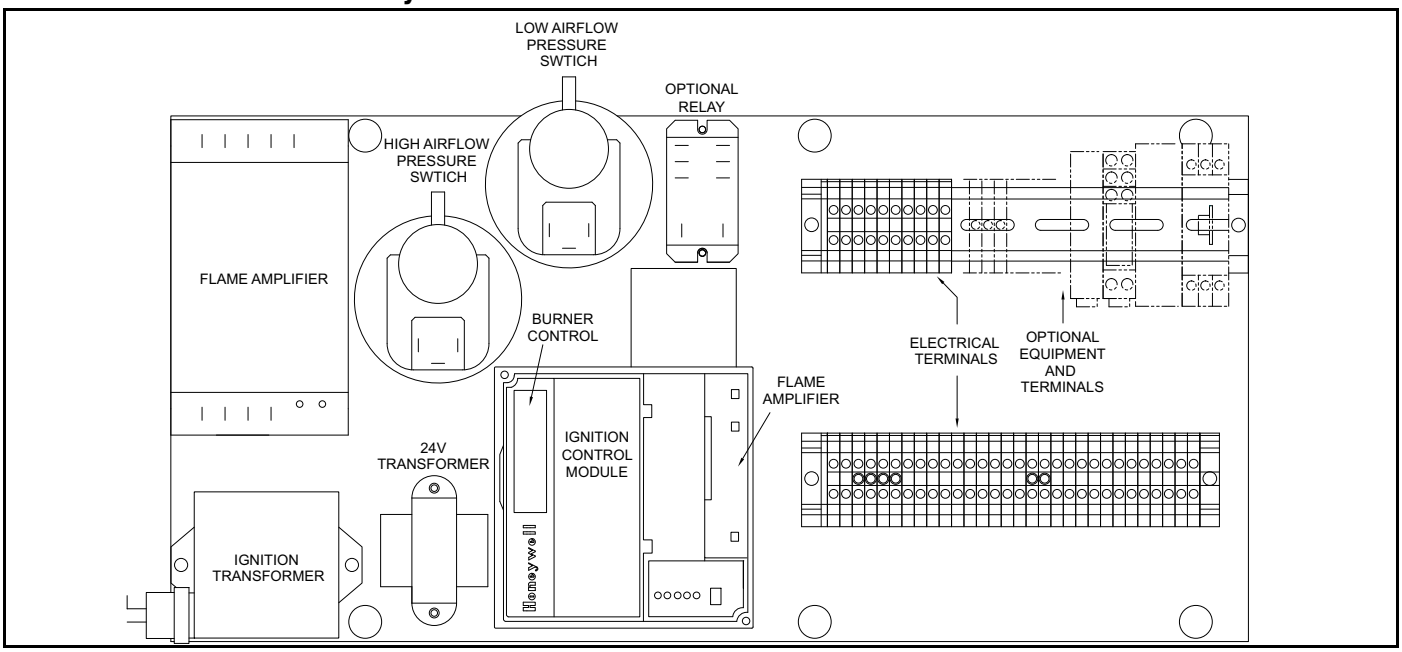


Table 28: Control Panel

Description	Models	Part Number
Pressure Switch Low Airflow	All Models	90439802
Pressure Switch High Airflow	All Models	90439814
Maxitrol 1014U (Temp Control Amp)	Units with Basic and SDC Remotes	07332
Maxitrol 1044 (Temp Control Amp)	Units with DTC Remotes	07336
Mixing Tube	All Models (*See Page 160, Figure 100*)	07380
Discharge Air Sensor 1014	Units with Basic and SDC Remotes (not shown) (*See Page 160, Figure 100*)	07350
Discharge Air Sensor 1044	Units with DTC Remotes (not shown) (*See Page 160, Figure 100*)	07410
24 V Transformer 40 VA	All Models	90407100
Ignition Transformer	All Models	90407219
Belimo LF120-S US	DF40-DF410	07097
Belimo NF120-S US	DF75-DF410	07095
Actuator 90 in. Lb Floating	DF270 - DF700B	90667110
Actuator 90 in. Lb 4-20mA	DF270 - DF700B	90667120
Actuator 90 in. Lb 24V	DF270 - DF700B	90667130
Ignition Control Module	DF40	07630
Ignition Control Module RM7890	DF75 and DF150 (remove jumper - *See Page 137, Section 19.3.1*)	07122
Ignition Control Module RM7897	DF270 - DF700B (remove jumper - *See Page 137, Section 19.3.1*)	07130
Flame Amplifier R7849A	DF75 - DF700B	07123
Flame Rod	DF40	07590
UV Scanner	DF75 - DF700B	07060
Purge Timer 7 seconds	DF270 - DF700B	07133
High Temperature Limit Switch	All Models	07063
Igniter	All Models	07640
Relay 15Amp	All Models	07100
Relay 8Amp	All Models	90447110
Relay Socket	All Models	90447200

FIGURE 99: Power Panel Layout

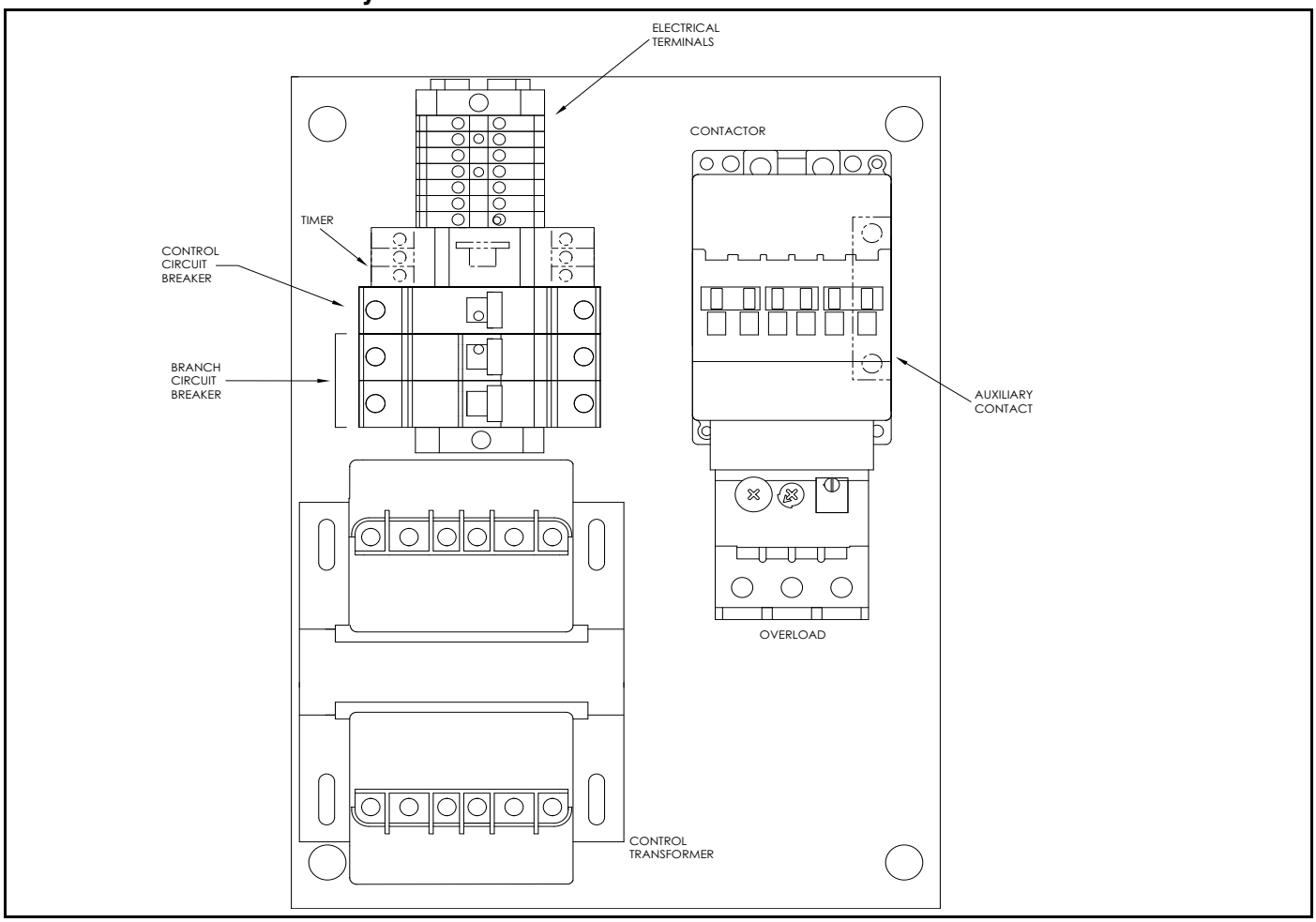


Table 29: Power Panel

Voltage	Description	DF40-DF410								
		2HP	3HP	5HP	7.5HP	10HP	15HP	20HP	25HP	30HP
208/3/60	Disconnect	08036		08040				08038	08041	
	Contactor	90600200			90600205	90600210		90600215		90600220
	Aux Contact	N/A				90447000				
	Overload	90446010			90446025	90446035	90446040	90446045	90446050	90446055
	Branch Circuit Breaker	91300500								
	Control Circuit Breaker	90300490								
	250 VA Ctrl Transformer	90407200								
	350VA Ctrl Transformer	90407205								
	Timer	90445000								

Voltage	Description	DF40-DF410								
		2HP	3HP	5HP	7.5HP	10HP	15HP	20HP	25HP	30HP
230/3/60	Disconnect	08036		08040				08038	08041	
	Contactor	90600200			90600205	90600210		90600215		90600220
	Aux Contact	N/A				90447000				
	Overload	90446005	90446015	90446020	90446025	90446030	90446035	90446045	90446050	
	Branch Circuit Breaker	91300510								
	Control Circuit Breaker	90300490								
	250 VA Ctrl Transformer	90407200								
	350VA Ctrl Transformer	90407205								
	Timer	90445000								

Voltage	Description	DF40-DF410								
		2HP	3HP	5HP	7.5HP	10HP	15HP	20HP	25HP	30HP
460/3/60	Disconnect	08039						08037		
	Contactor	90600200					90600205		90600210	
	Aux Contact	N/A							90447000	
	Overload	90446005		90446005	90446015	90446020	90446025	90446030	90446035	
	Branch Circuit Breaker	91300520								
	Control Circuit Breaker	91300490								
	250 VA Ctrl Transformer	90407200								
	350VA Ctrl Transformer	90472050								
	Timer	90445000								

Voltage	Description	DF40-DF410								
		2HP	3HP	5HP	7.5HP	10HP	15HP	20HP	25HP	30HP
575/3/60	Disconnect	08039						08037		
	Contactor	90600200						90600205		90600210
	Aux Contact	N/A							90447000	
	Overload	90446000		90446005	90446015	90446020	90446025	90446030	90446035	
	Branch Circuit Breaker	91300530								
	Control Circuit Breaker	91300490								
	250 VA Ctrl Transformer	9047210								
	350VA Ctrl Transformer	90407215								
	Timer	90445000								

Voltage	Description	DF40-DF410				
		2HP	3HP	5HP	7.5HP	10HP
230/1/60	Disconnect	08036		08040		08038
	Contactor	90600200		90600205	90600210	
	Aux Contact	N/A			90447000	
	Overload	90446015	90446020	90446030	90449035	90446040
	Branch Circuit Breaker	91300510				
	Control Circuit Breaker	91300490				
	250 VA Ctrl Transformer	90407200				
	350VA Ctrl Transformer	90407205				
	Timer	90445000				

Voltage	Description	DF700A/DF700B					
		15HP	20HP	25HP	30HP	40HP	50HP
208/3/60	Disconnect	25102			25107		
	Contactor	30886		30887	25065		25066
	Aux Contact	30888					
	Overload	27276			25077	25078	
	Branch Circuit Breaker	18559					
	Control Circuit Breaker	18493					
	250 VA Ctrl Transformer	08105					
	350VA Ctrl Transformer	-					
	Timer	-					

Voltage	Description	DF700A/DF700B					
		15HP	20HP	25HP	30HP	40HP	50HP
230/3/60	Disconnect	25098	25102		25107		
	Contactor	30885	30886	30887	25065		25066
	Aux Contact	30888					
	Overload	27275	27276		25077	25078	
	Branch Circuit Breaker	18559					
	Control Circuit Breaker	18493					
	250 VA Ctrl Transformer	08105					
	350VA Ctrl Transformer	-					
	Timer	-					

Voltage	Description	DF700A/DF700B					
		15HP	20HP	25HP	30HP	40HP	50HP
430/3/60	Disconnect	25086	25098			25107	
	Contactor	25264	30883	30884	30885	30886	30887
	Aux Contact		30888				
	Overload	27273	27274			27276	
	Branch Circuit Breaker	18559					
	Control Circuit Breaker	18493					
	250 VA Ctrl Transformer	08105					
	350VA Ctrl Transformer	-					
	Timer	-					

Voltage	Description	DF700A/DF700B					
		15HP	20HP	25HP	30HP	40HP	50HP
575/3/60	Disconnect	07204	07242			07243	
	Contactor	25264	30883	30884	30885	30886	30887
	Aux Contact		30888				
	Overload	27273	27274			27276	
	Branch Circuit Breaker	18559					
	Control Circuit Breaker	18493					
	250 VA Ctrl Transformer	08105					
	350VA Ctrl Transformer	-					
	Timer	-					

Table 30: Manifold Components

Model	DF40	DF75	DF150	DF270	DF410	DF700A and DF700B			
Manifold Size NPT	.75"	1.0"	1.25"	1.5"	2.0"	1.5"	2.0"	2.5"	3.0"
Safety Shut Off Valve (SSOV)	-	ANSI 90076020	ANSI 90076021	ANSI 90076022	ANSI 90076023	25248	22253	22254	22254
	-	FM,XL(IRI) 90076010	FM,XL(IRI) 90076011	FM,XL(IRI) 90076012	FM,XL(IRI) 90076013				
SSOV Actuator	-	-	-	-	-		07160	07160	07160
SSOV Adapter	-	07196	07197	07198	07199		22252	22250	22251
Modulating Valve	07440	07485.3	07490.3	07500.3	07500.3	07500.6	07505.6	07510.6	07515.6
Regulator	07185								
Pilot Regulator	07552	07552	07552	07552	07552	28311	28311	28311	28311
Pilot Solenoid	07523	07522	07522	07522	07522	07522	07522	07522	07522
Manual Gas Valve (Main)	62019	62021	62034	62035	62023	30004	30005	30006	30007
Manual Gas Valve (Pilot)	62016	62016	62016	62016	62016	30000	30000	30000	30000

FIGURE 100: Blower Layout

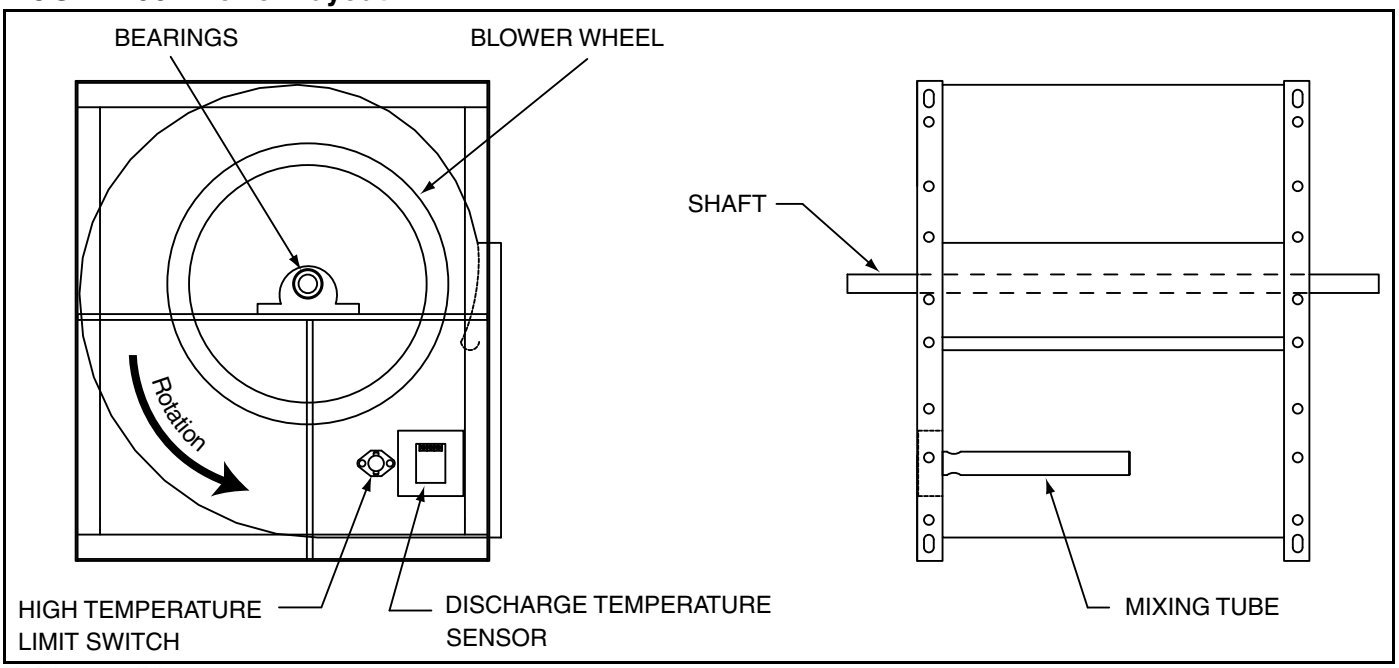


Table 31: Blower

Model		DF40		DF75 / DF150	DF270	DF410	DF700A	DF700B
Blower	Delhi Green	G9	G12	918	925	930	925-2	930-2
	Lau Gray	9-9	12-12	18-18	25-25	30-30	2-25-25	2-30-30
Assembly Part Number		62924	62923	62920	62037	62420	08510	08509
Bearing		-	-	05544	05545	05546	Contact Factory	
					05545T	05546T		
					05545L	05546L		
Shaft		-	-	05593	05594	05596	Contact Factory	
					05594T	05596T		
					05594L	05596L		
Wheel		-	-	06020	06025	06026	Contact Factory	
					06025T	06026T		
					06025L	06026L		

NOTE: Colors refer to blower frame.

Table 32: Remote Panel

Description	Remote Panel	Part Number
Rocker Switch Center Off DPDT	SDC & DTC	22038
Rocker Switch DPST	All	22039
Remote Temperature Selector	DTC	22664
Thermostat with Timer	DTC	22670
Amber Status Light	All	18663
Temperature Selector	Basic Remote & SDC	07345
Thermostat	SDC	83200052
20VA Transformer	DTC	90436900
Terminal Block	All	91300121

Table 33: V-Belt

Description	Part Number
B78 Belt	4312
B81 Belt	4315
B101 Belt	4318
B105 Belt	4320
B110 Belt	4323
B130 Belt	4328
B118 Belt	4349
BX128 Belt	4352
B130 Belt	4353
BX140 Belt	4355
BX74 Belt	4362
BX78 Belt	4363
BX76 Belt	4364
B74 Belt	4365
BX123 Belt	4510

SECTION 23: TROUBLESHOOTING

⚠ DANGER	
	
Electrical Shock Hazard	**Severe Injury Hazard**
Disconnect electric before service. **More than one disconnect switch may be required to disconnect electric from equipment.** **Equipment must be properly grounded.**	**Do not enter equipment while in operation.** **Equipment may start automatically.** **Do not operate with door open.** **Installation, operation and service must be done by a trained technician only.**
Failure to follow these instructions can result in death, electrical shock or injury.	

⚠ WARNING				
				
Explosion Hazard	**Fire Hazard**	**Falling Hazard**	**Burn Hazard**	**Cut/Pinch Hazard**
Turn off gas supply to equipment before service.	**Keep all flammable objects, liquids and vapors the minimum required clearances to combustibles away from equipment.** **Some objects will catch fire or explode when placed close to equipment.**	**Use proper safety equipment and practices to avoid falling.** **Do not use any part of equipment as support.**	**Allow equipment to cool before service.** **Internal components of equipment may still be hot after operation.**	**Wear protective gear during installation, operation and service.** **Edges are sharp.**
Failure to follow these instructions can result in death, injury or property damage.				

23.1 Initial Checks

When encountering any abnormal operation or fault conditions of the equipment, all troubleshooting should start with the following initial checks. If a problem is discovered in these initial checks it must be corrected before moving on in the trouble shooting.

1. Compare voltage and phase of supply power on site with rating plate information.
2. Review wiring between remote panel and control panel. Do the electrical connections match the supplied wiring diagram?
3. Compare gas type and supply pressure on site with rating plate information.
4. Check for proper blower rotation on air handler and any exhaust blowers.
   - Blowers powered with a three phase motor can be reversed by swapping any two incoming power legs. For blowers powered by a single phase motor refer to the motor rating plate for reversing instructions.

23.2Motor and Blower

PROBLEM	POSSIBLE CAUSE	SOLUTION
Motor does not operate	Main disconnect switch is OFF	Turn disconnect to ON
	Blown fuse(s) in disconnect	Replace fuse(s)
	Blown fuse(s)/breaker tripped in control transformer	Replace fuse(s)/reset breaker (with disconnect off)
	Fan switch on, Power on terminals 3 / 3A	Check wiring between remote panel and air handler. Replace switch.
	Cool down timer TD4 (if equipped) does not reset. Power on 3A?	Replace TD4 timer
	Optional: Damper does not open	Check that damper is not obstructed Check that linkage is tight and secure Verify that 120 V at terminal 3B Replace damper actuator
	Time delay relay defect. Power on terminal 3D after set time delay?	Replace time delay relay TR1
	Motor starter (contactor) does not operate. Power on terminal 3D and 2?	Replace starter
	Tripped motor overload. Power out to MUA motor when motor starter is energized?	Reset Check for proper FLA setting Replace overload If applicable: Tighten screws on heater packs or overload.
	Optional: Low limit switch set to high	Re-adjust low limit switch setting
Blower does not operate	Belts broken or loose?	Replace/tighten belts
	Loose motor or blower sheaves (pulleys)	Reinstall and properly torque setscrews
	Blower bearings, do they turn freely?	Replace bearing(s)

23.3Burner

PROBLEM	POSSIBLE CAUSE	SOLUTION
Flame control does not try for ignition	Auxiliary contact "M1" not closed. Power on termainal "4"?	Properly mount contact or replace
	Burner/winter switch closed? Power on terminal "7"?	Replace switch
	High temp limit switch tripped? Power on terminal "8"?	Manually reset or replace
	Low airflow pressure switch contacts not made. Power on terminal "8A"?	Check blower operation Reconnect tubes to pressure switch Clean pressure test tubes Check filters/duct work for restrictions
	High airflow pressure switch contacts not made. Power on terminal "9"?	Check blower FLA and compare to data plate. Cabinet pressure too high check system setup and for restrictions down stream of blower.
	Optional: Mild weather stat, dial set to low	Set dial higher Replace stat
	Optional: High gas pressur switch	Manual reset Verify gas pressure
	Optional: Low gas pressure switch	Manual reset Verify gas pressure
	No power between terminals 3 and L2 (neutral) or 6 and L2 (neutral) for RM7890A (5 and L2 (neutral) or 7 and L2 (neutral) for RM7897C) of the burner control base	Verify wiring
	Flame control defect	Replace
Burner Lockout	Failure to ignite pilot or main flame Flame control failure	Reset the flame control module at the unit and proceed to the next step, observing the unit to indicate at which step lockout condition occures.
No PILOT flame	UV flame sensor indicating pressence of flame before ignition. Flame indicator light present? Is there 5VDC on UV flame amplifier?	Separate spark wire and UV scanner wires. Replace UV flame sensor, UV flame amplifier or burn control.
	No spark	Check wiring from burner control to ignition transformer. Check high tension wire to spark plug. Replace ignition transformer.
	No gas	Open manual gas shut off valves. Check wiring from burner control to pilot gas valve. Verify inlet gas pressure. Adjust pilot gas pressure. Replace pilot gas valve. Check burner pilot opening for obstruction.
Pilot flame does not stay lit	Improper pilot gas pressure	Adjust pilot gas pressure.
	UV flame scanner does not dedect flame, Is there 5VDC on UV flame amplifier?	Replace UV scanner Replace UV flame amplifier
	UV flame scanner dirty	Clean UV scanner

Burner (continued)

PROBLEM	POSSIBLE CAUSE	SOLUTION
No main flame	Manual shut off valve closed	Open manual shut off valve
	Safety Shut Off Valve not operating. Is there positive gas pressure downstream of SSOV?	Check wiring from burner control to SSOV Verify inlet gas pressure Replace SSOV
	Minimum gas supply pressure	Verify minimum gas supply pressure as per data plate is available
	Burner openings obstructed	Remove obstruction Clean burner orifices holes
	Improper burner lower fire adjustment on modulating valve	Adjust low fire as per the relevant Maxitrol temperature control instructions

23.4 Temperature Controls

If temperature control problems occur and are not remidied in the troubleshooting procedure, refer to the trouble shooting table for the unit specific temperature control amplifier.

1. For units with the Maxitrol series 14 temperature control amplifier, refer to the Field Service Check List for Series A1014 Amplifiers. Series 14 Amplifiers are supplied on units epuipped with Basic and SDC style remote panels.
2. For units with the Maxitrol series 44 temperature control amplifier, refer to the Field Service Check List for Series A 1044 Amplifiers. Series 44 Amplifiers are supplied on units epuipped with DTC remote panels.

If problems persist after performing the troubleshooting procedure and the temperature control amplifier troubleshooting procedure contract the factory.

23.5A1014 Amplifier - Field Checklist

SYMPTOM		POSSIBLE CAUSE
A.	No Gas Flow	1. Modulating valve improperly installed.
B.	Continuous Low Fire (electronics problem).	2. Short circuit or no voltage to the amplifier. 3. Open circuit in TD114. Remote Temperature Selector circuit or wiring. 4. Short circuit in TS114, Discharge Air Sensor circuit or wiring. 5. Faulty amplifier.
C.	Continuous Low Fire (electronics ok)	6. Short circuit or open circuit in Modulator Coil. 7. Plunger missing, jammed or improperly installed.
D.	Incorrect Minimum Fire Erratic or Pulsating Flame.	8. Incorrect by-pass metering valve adjustment. 9. Excessive negative burner pressure.
E.	Continuous High Fire (electronics problem).	10. Short circuit in TD114 Remote Temperature Selector circuit or wiring. 11. Open circuit in TS114/TS10765. Discharge or Inlet Air Sensor Circuit or wiring. 12. Jumper not connected across amplifier terminals 2 and 3.
F.	Continuous High Fire (electronics ok).	13. Foreign object holding valve open. 14. Plunger jammed.
G.	Incorrect Maximum Fire.	15. Inlet pressure too low. 16. Incorrect outlet pressure adjustment of Pressure Regulator.
H.	Erratic or Pulsating Flame.	17. Hunting 18. Erratic air patterns or improper TS114 location. 19. Wiring is run next to high voltage switching circuits causing induced voltages. 20. Faulty Amplifier or erratic voltage supply.
I.	Incorrect Discharge Air Temperature	21. Inlet Air Sensor is used. 22. Incorrect Wiring. 23. System out of calibration. 24. Improper TS114 location. 25. Room Override Thermostat circuit closed.
J.	Burned out Transformer.	26. Short circuit in modulator coil. 27. Short circuit between amplifier and modulator valve.
K.	Discharge Air Temperature too Low when T115 is Operative	28. Too low an Override Temperature setting. 29. Burner capacity may be insufficient.

FIELD TEST	REMEDY
1. Arrow on side of Valve should point in direction of gas flow.	1. Install properly.
2. Check for 24VAC at amplifier terminals 7 & 8. 3. Inspect for loose or broken wires between amplifier terminals 1 & 2, and TD114 terminals 1 & 2, and TD114 terminals 1 & 3. 4. Connect test resistor as described in Preliminary Circuit Analysis, in Maxitrol product information sheet. Follow procedure outlined. 5. Check items 2, 3, and 4.	2. Prove the power source. 3. Tighten connections or replace wiring. 4. If modulating voltages are obtained, Check TS114 circuit for shorts. Replace TS114 if necessary. 5. If items 2, 3, and 4 check out and modulating voltages are still not obtained, amplifier may be assumed faulty. Replace.
6. Measure resistance across modulator terminals with connecting wires detached. 7. Inspect. Plunger should be installed per diagrams in Maxitrol information sheet and operate freely in solenoid sleeve.	6. Replace modulator head if not approximately 45-55 ohms for M611 Valve and 60-80 ohms for MR212 Valve. 7. Clean or replace plunger if necessary. Install per Maxitrol product information sheet.
8. See valve adjustments in Section 19.5. 9. Measure manifold pressure as outlined in Section 19.4.	8. Adjust to proper minimum fire. 9. If reading is greater than 1.0 in wc negative pressure, check for clogged filters or other inlet air restrictions. Consult factory for other solutions.
10. Inspect for shorts at or between Amplifier terminals 1 & 2 or TD114 terminals 1 & 3. 11. Check TS114/TS10765 for open internal circuit. Connect test resistor as described in Preliminary Circuit Analysis, in Maxitrol product information sheet. Follow procedure outlined. 12. Inspect	10. Correct wiring if shorts exist. 11. If modulating voltages are obtained, check TS114/TS10765 for open circuits. Replace TS114/TS10765. 12. Correct the wiring.
13. Remove button plate and inspect valve and seat. 14. Inspect. Plunger should be smooth, clean, and operate freely in solenoid sleeve.	13. Clean seat. Clean valve or replace if necessary. 14. Clean, or if necessary, replace plunger.
15. Read pressure at inlet to modulating valve using a manometer with unit operating at full fire. Pressure should be equal to the sum of outlet pressure setting plus pressure drop of the valve (see Maxitrol capacity chart). 16. Read manifold pressure using manometer and compare with recommendation of equipment manufacturer.	15. Increase inlet pressure if possible. 16. See valve adjustments in Section 19.5.
17. Adjust sensitivity control counter-clockwise. 18. Connect test resistor as described in Preliminary Circuit Analysis, in Maxitrol product information sheet. Turn TD114 selector dial so heater goes through its entire modulating range. 19. Temporarily wire each of TD114, TS114, and MR212 externally and observe heater/equipment operation. 20. With test resistor connected (per item #18) and TD114 locally connected (per item #19), turn TD114 selector dial through entire modulating range. Observe D.C. voltage across modulator terminals.	17. If flame stabilizes, adjust sensitivity control to maintain an even flame. 18. If the flame is steady throughout the entire modulating range, the TS114 must be moved. 19. If smooth operation results, isolate effected wiring from source of induced voltage. 20. If erratic or unstable DC voltages are obtained throughout the modulating range, the amplifier may be assumed faulty. Replace. If erratic operation is noted only over a small range of 2 or 3 volts, the voltage source may contain surges. Consult factory.
21. Inlet Air Sensor changes 1°, for each 3.5°, 5°, or 8° outside temperature change from 60° (pre-determined - turndown varies with model used). 22. Check wiring diagrams per maxitrol product.* 23. Sensed temperature (thermometer next to TS114) does not correspond to TD114 setting. 24. Sensed temperature (thermometer next to TS114) does not represent average discharge air temperature. 25. Remove Override Thermostat lead from terminal 2 of TD114. *information sheet	21. Sensed temperature will vary from TD114 dial settings. This is intentional. 22. Correct wiring. 23. See calibration procedure. 24. Move TS114 to location where average representative temperature can be sensed. 25. TD114 dial setting, then check thermostat setting and/or check wiring for shorts.
26. Measure resistance across modulator terminals with red lead wires disconnected. 27. Inspect wiring.	26. Replace modulator head if less than 40 ohms. 27. Correct wiring if short is found.
28. Check “Override Temperature Selector” of TD114. 29. Check for high fire (Maximum manifold pressure specified for heater).	28. Reset to correct temperature. 29. If on high fire, control can do no more. Heater unable to furnish additional heat to raise temperature.

23.6A44 Amplifier - Field Service Checklist

SYMPTOM		POSSIBLE CAUSE
A.	No gas flow.	1. Valve improperly installed.
B.	Continuous low fire (electronics ok).	2. Open circuit in modulator coil. 3. Plunger missing, jammed or improperly installed. 4. Ruptured main or balancing diaphragm.
C.	Continuous Low Fire (electronics problem)	5. No voltage to the amplifier. 6. Short in modulator coil circuit. 7. Short in TS144 circuit. 8. Faulty amplifier.
D.	Incorrect Low Fire	9. Incorrect by-pass metering valve adjustment. 10. Excessive negative burner pressure.
E.	Continuous Minimum Discharge Air Temperature	11. Faulty amplifier. 12. Short in T244 or TS244/TD244 circuit 13. Incorrect space temperature calibration.
F.	Incorrect Max. or Min. Discharge Air Temperature.	14. Improper TS144 location. 15. Incorrect discharge air temperature calibrations
G.	Continuous High Fire (electronics ok)	16. Foreign material holding valve open. 17. Plunger jammed.
H.	Continuous High Fire. (electronics problem)	18. Open circuit in TS144
I.	Incorrect High Fire	19. Inlet pressure too low. 20. Incorrect outlet pressure adjustment.
J.	Continuous Maximum Discharge Air Temperature	21. Faulty amplifier. 22. Open circuit in T244 to TS244/TD244 23. Incorrect space temperature calibration.
K.	Burned out Transformer. No Voltage to Amplifier	24. Short in modulator coil circuit.
L.	Incorrect Space Temperature.	25. Incorrect maximum discharge air temperature setting (A1044). 26. Incorrect minimum discharge air temperature setting (A1044). 27. Insufficient burner capacity. 28. Incorrect space temperature calibration.

*Control circuits external to the Series 44 can cause burner malfunction. Always check manual valve to be certain gas is on, and check limit controls for normal operation.

FIELD TEST	REMEDY
1. Arrow on side of valve should point in direction of gas flow.	1. Install properly.
2. Remove wires connected to amplifier terminals 6 & 7 and measure resistance. MR212 (60-80 ohms), M611 (45-55 ohms). 3. Inspect - plunger should be installed per Maxitrol product information sheet and operate freely in solenoid sleeve. 4. Disassemble valve for inspection of internal parts.	2. If proper resistance values are not observed, replace modulator head or repair wiring. 3. Clean or replace plunger if necessary and install per Maxitrol product information sheet. 4. Replace diaphragm if ruptured.
5. Check for 24VAC at amplifier terminals 8 & 9. 6. Measure resistance per item 2. 7. Remove wires connected to amplifier terminals 1, 2, & 3. Measure resistance across wires 1 & 3, then 2 & 3. Meter should read greater than 2500 ohms. 8. Follow procedures outlined in "PRELIMINARY CIRCUIT ANALYSIS" (Sections I & II) in Maxitrol product information sheet.	5. Provide 24VAC to amplifier. Refer to item 24. 6. If proper resistance values are not observed, replace modulator head or repair wiring. 7. If readings are incorrect, replace the TS144 or repair wiring. 8. If power source and modulator coil check out (items 5 & 6) but proper modulating voltages cannot be obtained, then amplifier may be assumed at fault. Install replacement amplifier.
9. See Valve Adjustments - Section 19.5. 10. Measure manifold pressure as outlined in Section 19.4.	9. Adjust to proper low fire. 10. If greater than 1.0 in wc negative pressure, check equipment for clogged filters & other inlet air restrictions. For other solutions, consult factory.
11. Follow procedures outlined in "PRELIMINARY CIRCUIT ANALYSIS" (sections I & II), in Maxitrol product information sheet. 12. Remove wires connected to amplifier terminals 4 & 5. Set T244 or TD244 to maximum setting. Measure resistance across wires. Meter should read 6000 ohms +/- 1000 (T244). If TS244/TD244 are used, meter should read 4500 ohms +/- 1000 (TS244) and 2100 ohms +/- 150 (TD244). 13. Follow procedures outlined in "PRELIMINARY CIRCUIT ANALYSIS" (Sections IV), in Maxitrol product information sheet.	11. If amplifier is proven at fault, install replacement amplifier. 12. If reading is incorrect, replace the T244, TS244/TD244 or repair wiring. 13. If proper action is obtained, first check item 12. Recalibrate if necessary See section 19.7.
14. Compare sensed temperature reading at TS144 with average discharge air temperature. 15. Follow procedures outlined in "PRELIMINARY CIRCUIT ANALYSIS" (Sections IV), in Maxitrol product information sheet.	14. Move TS144 to location where average temperature can be sensed. 15. If proper temperatures are not observed, refer to temperature calibration procedures, in Maxitrol product information sheet.
16. Remove button Plate and inspect valve and seat 17. Inspect - plunger should be smooth and clean and operate freely in solenoid sleeve.	16. Clean, replace valve and/or seat if necessary. 17. Clean, or if necessary, replace plunger.
18. Measure resistance per item 7.	18. If readings are incorrect, replace the TS144 or repair wiring.
19. Read inlet pressure at valve, using a manometer with heater operating at full fire. Pressure should be at least equal to the sum of: outlet pressure setting and pressure drop of the valve (See Maxitrol Capacity Chart Bulletin) plus 1.0 in wc. 20. Read outlet pressure using manometer and compare with recommendation of equipment manufacturer.	19. Increase inlet pressure if possible or change to larger valve. Consult factory about possibility of using special spring to reduce pressure drop on selected installations. 20. See valve adjustments in section 19.5.
21. Follow procedure outlined in "PRELIMINARY CIRCUIT ANALYSIS" (Sections I & II), in Maxitrol product information sheet. 22. Measure resistance per item 12. 23. Follow procedures outlined in "PRELIMINARY CIRCUIT ANALYSIS: (Section IV), in Maxitrol product information sheet.	21. If amplifier is proven at fault, install replacement amplifier. 22. If reading is incorrect, replace the T244, TS244/TD244 or repair wiring. 23. If proper action is obtained, first check item 22. Recalibrate if necessary. Refer to Temperature Calibration Proceedures in Maxitrol product information sheet
24. Measure resistance per item 2.	24. If proper resistances are not observed, replace modulator head or repair wiring.
25. Check to see if heater is delivering air at maximum discharge air setting. 26. Check to see if heater is delivering air at maximum discharge air setting. 27. Check to see if heater is operating at high fire. 28. Place thermometer next to T244 or TS244. Compare space temperature reading with T244 or TD244 dial setting.	25. If desired temperature is not reached, increase maximum discharge air temperature setting. 26. If desired space temperature is not reached, decrease minimum discharge air temperature setting. 27. If desired space temperature is not reached with heater at high fire, it may be undersized. Consult manufacturer. 28. If temperature reading is incorrect, check items 25, 26, & 27, then recalibrate if necessary.

SECTION 24: COMBAT® DF-SERIES START-UP PROCEDURES

ROBERTS GORDON

COMBAT® DF-SERIES START-UP PROCEDURES

Date of Installation: _____ **Model #** _____ **Serial #** _____

Installed at:		**Service Company:**	
Name:	_____	**Name:**	_____
Address:	_____	**Address:**	_____
Phone:	_____	**Phone:**	_____
Fax:	_____	**Fax:**	_____

Notice: Please return a completed copy to Roberts-Gordon . If this document is not returned, the manufacturing date will be used as the warranty start date.

⚠ WARNING

			
Explosion Hazard **Leak test all components of equipment gas piping before operation.** **Gas can leak if piping is not installed properly.** **Do not high pressure test gas piping with equipment connected.**	**Carbon Monoxide Hazard** **Do not recirculate air from the heated space over burner.** **Air supply to burner must be from outside.**	**Falling Hazard** **Use proper safety equipment and practices to avoid falling.** **Do not use any part of equipment as support.**	**Burn Hazard** **Allow equipment to cool before service.** **Internal components of equipment may still be hot after operation.**

Failure to follow these instructions can result in death, injury or property damage.

⚠ DANGER

Electrical Shock Hazard

Disconnect electric before service.

More than one disconnect switch may be required to disconnect electric from equipment.

Equipment must be properly grounded.

Failure to follow these instructions can result in death or electrical shock.

General Pre-Startup Inspection

Check installation site to ensure all codes and engineering specifications are correct. Place a check next to line items completed or enter data.

1. Check all nuts, bolts and fasteners to ensure they are tight. OK ____ Loose____ (Specify.)

2. Check sheaves, set screws and bearing collars. Make sure they are tight. OK ____ Loose ____ (Specify.)

3. Compare voltage on unit rating plate to job site voltage. Job Site Voltage _____/____/_____.

4. Compare gas type and supply pressure on unit rating plate to job site gas supply. Job Site Gas Type____ Supply Pressure_____

5. Check lifting brackets to make sure they are tight and secure before lifting heater. OK ____ .

6. For FR, AM models: CO2 sensor installed? OK ____

7. Verify safety switches and all electrical accessories are in proper working order. OK ____

ROBERTS GORDON® COMBAT® DF-SERIES START-UP PROCEDURES (continued)

The following procedures reference pages and tables from the DF Installation, Operation and Service Manual (P/N 121100NA). Contact the local ROBERTS GORDON® independent distributor or Roberts-Gordon LLC for a manual.

At Start-up:
Verify proper belt tension and sheave alignment per instructions on Page 142, Section 20.2.
OK _____.

Verify proper torque on all sheaves per table on Page 144, Table 23.
OK _____.

Air Temperature Sensing:
1. The sensing probe is factory mounted in the blower housing. (Advance to next section.)

Electrical (Page 143, Section 120.3)
1. Check all motor starters for proper overload settings. The overload should not exceed Full Load Amps for the motor. _____ A.

2. What is the supply voltage to the air handler?
   Air Hander Off _____ #1_____#2 _____ #3 _____
   Air Hander On _____ #1_____#2 _____ #3 _____

3. Verify correct fan rotation. OK _____.

4. What is total system current draw?
   Motor current draw (Burner Off)? _____.
   Burner and motor current draw? _____.

5. Compare all variable frequency drive (VFD) programming parameters with specifications provided on electrical drawing. OK _____.

6. For VFD systems, make sure to set programming parameters for proper overload protection (See VFD Instruction Manual). OK _____.

7. If more than one exhaust motor is used with one VFD, each motor must have its own overload protection. OK _____.

Differential Pressure: (Page 143, Section 20.4.1)
1. In order to verify proper airflow across the burner, the differential pressure across the profile plate needs to be measured. Attach a manometer to the pressure test ports where the air pressure switch is attached and measure the differential pressure with a manometer. This reading must be 0.9 in wc +-0.1 in wc (2.24 +/- 0.25 mbar)
Record differential box pressure _____ in. wc/mbar

Burner Pressure: (Page 144, Section 20.4.3)
1. A pressure tap between the Maxitrol modulating valve and the burner is used to measure negative airflow at the burner and to set high fire gas pressure. This tap could also be located on the Maxitrol valve itself, manual shut off valve or "T" fitting. See unit data plate on control enclosure door for high fire setting.

2. Record burner pressure with inlet manual gas valve off and blowers on _____ in wc/mbar

Gas Piping and Initial Pressure Setting: (Page 144, Section 20.5)
1. Perform a pressure test on all gas supply lines to air handler per local codes. OK _____.

2. Verify supply pressure does not exceed maximum rated gas pressure as stated on the rating plate. OK_____.

3. Set the supply gas pressure at the step down regulator (normally outside of the enclosure if one is installed), according to the rating plate inlet gas pressure specifications.
   Fuel Type: _____ Pressure: _____.

4. Only after performing steps 1-3, open the main gas valve and close the manual gas valve downstream of the MR valve. Set the burner switch to on. Verify pilot pressure, and flame signal of 5.0 VDC. OK _____.

   (To adjust pilot flame, set pilot regulator to 1.0 in wc (2.5 mbar) natural gas or 0.5 in wc (1.25 mbar) L.P. gauge pressure.

5. Open both manual gas valves at air handler. Force the burner into high fire. See Page 145, Table 25, "Burner Mode By Amplifier Type". Read the gas pressure at the MR valve and set according to the determined high fire gas pressure in Table 22. The small cap screw is for high fire on MR212 valve only. Take a reading of the temperature rise. Temperature rise must be in accordance with Table 26.
   High Fire Discharge Temperature _____°F/°C
   _____Manifold Pressure for Maximum Input (from rating plate)
   _____Burner Pressure
   _____High Fire Gas Pressure Setting

There are three critical items to consider before adjusting low fire:

A. Low fire adjustment does not regulate gas pressure.

B. If the low fire adjustment screw is set to maximum, high fire regulation problems will occur.

C. The burner control system must be forced into low fire per Maxitrol's instruction for the given amplifier/temperature control system. See Page 145, Table 25, "Burner Mode By Amplifier Type". *

7. Low fire is set at the MR212 valve using the adjustment screw under the large cap screw, or on the M611 valve using the brass adjusting screw on the side. The burner must be forced into low fire first. The low fire ribbon across the burner must be adjusted. OK_____.

Once gas pressure and high/low fire adjustments are made, the gas setup is completed. All taps and instruments must be removed and all caps and plugs must be replaced.

Please leave all manuals and a copy of this sheet with the air handler!

Technician's Name:_____

Signature:_____

Date:_____

SECTION 25: THE ROBERTS GORDON® COMBAT® DF-SERIES WARRANTY

ROBERTS-GORDON LLC WILL PAY FOR:

Within 24 months from date of purchase by buyer or 27 months from date of shipment by Roberts-Gordon LLC (whichever occurs first), replacement parts will be provided free of charge for any part of the product which fails due to a manufacturing or material defect.

Roberts-Gordon LLC will require the part in question to be returned to the factory. Roberts-Gordon LLC will, at its sole discretion, repair or replace after determining the nature of the defect and disposition of part in question.

ROBERTS GORDON® Replacement Parts are warranted for a period of 12 months from date of shipment from Roberts-Gordon LLC or the remaining ROBERTS GORDON® COMBAT® DF-Series warranty.

ROBERTS-GORDON LLC WILL NOT PAY FOR:

Service trips, service calls and labor charges.

Shipment of replacement parts.

Claims where the total price of the goods have not been paid.

Damage due to:

- Improper installation, operation or maintenance.
- Misuse, abuse, neglect, or modification of the ROBERTS GORDON® COMBAT® DF-Series in any way.
- Use of the ROBERTS GORDON® COMBAT® DF-Series for other than its intended purpose.
- Incorrect gas or electrical supply, accident, fire, floods, acts of God, war, terrorism, or other casualty.
- Improper service, use of replacement parts or accessories not specified by Roberts-Gordon LLC.
- Failure to install or maintain the ROBERTS GORDON® COMBAT® DF-Series as directed in the Installation, Operation and Service Manual.
- Relocation of the ROBERTS GORDON® COMBAT® DF-Series after initial installation
- Use of the ROBERTS GORDON® COMBAT® DF-Series in a corrosive atmosphere containing contaminants.
- Use of the ROBERTS GORDON® COMBAT® DF-Series in the vicinity of a combustible or explosive material.
- Any defect in the ROBERTS GORDON® COMBAT® DF-Series arising from a drawing, design, or specification supplied by or on behalf of the consumer.
- Damage incurred during shipment. Claim must be filed with carrier.

WARRANTY IS VOID IF:

The ROBERTS GORDON® COMBAT® DF-Series is not installed by an contractor qualified in the installation and service of gas fired heating equipment.

You cannot prove original purchase date and required annual maintenance history.

The data plate and/or serial number are removed, defaced, modified or altered in any way.

The ownership of the ROBERTS GORDON® COMBAT® DF-Series is moved or transferred. This warranty is non-transferable.

Roberts-Gordon LLC is not permitted to inspect the damaged equipment and/or component parts.

READ YOUR INSTALLATION, OPERATION AND SERVICE MANUAL.

If you have questions about your equipment, contact your installing professional. Should you need Replacement Parts or have additional questions, call or write:

Roberts-Gordon LLC
1250 William Street
P.O. Box 44
Buffalo, New York 14240-0044
+1.716.852.4400
On the web at: www.rg-inc.com

Roberts-Gordon LLC's liability, and your exclusive remedy, under this warranty or any implied warranty (including the implied warranties of merchantability and fitness for a particular purpose) is limited to providing replacement parts during the term of this warranty. Some jurisdictions do not allow limitations on how long an implied warranty lasts, so this limitation may not apply to you. There are no rights, warranties or conditions, expressed or implied, statutory or otherwise, other than those contained in this warranty.

Roberts-Gordon LLC shall in no event be responsible for incidental or consequential damages or incur liability for damages in excess of the amount paid by you for the ROBERTS GORDON® COMBAT® DF-Series . Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, so this limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from jurisdiction to jurisdiction.

Roberts-Gordon LLC shall not be responsible for failure to perform under the terms of this warranty if caused by circumstances out of its control, including but not limited to war, fire, flood, strike, government or court orders, acts of God, terrorism, unavailability of supplies, parts or power. No person is authorized to assume for Roberts-Gordon LLC any other warranty, obligation or liability.

LIMITATIONS ON AUTHORITY OF REPRESENTATIVES:

No representative of Roberts-Gordon LLC, other than an Executive Officer, has authority to change or extend these provisions. Changes or extensions shall be binding only if confirmed in writing by Roberts-Gordon LLC's duly authorized Executive Officer.

ROBERTS GORDON
Warm Air Heating

OWNER WARRANTY REGISTRATION CARD

Mail or Fax to:
Roberts Gordon LLC • 1250 William Street, P.O. Box 44 • Buffalo, NY 14240-0044 • Phone: 716-852-4400 • Fax: 716-852-0854
Toll Free: 800-828-7450 • www.rg-inc.com

About the Owner:
Name:_____
Address:_____City:_____State:_____Zip Code:_____
Phone:_____ Fax:_____ E-mail:_____

About the Installer:
Name:_____
Address:_____City:_____State:_____Zip Code:_____
Phone:_____Fax:_____E-mail:_____

Purchased From (if different than installer):
Name:_____
Address:_____City:_____State:_____Zip Code:_____
Phone:_____ Fax:_____ E-mail:_____

About your Heater:
Model#:_____ Serial #:_____ Fuel:_____Installation Date:_____

Type of Installation (check one):

o Automotive	o Manufacturing	o Warehouse	o Recreational	o Aircraft
o Public Building	o Office	o Retail	o Agricultural	o Other_____

Installation Code and Annual Inspections: All installations and service of ROBERTS GORDON® equipment must be performed by a contractor qualified in the installation and service of equipment sold and supplied by Roberts-Gordon LLC and conform to all requirements set forth in the ROBERTS GORDON® manuals and all applicable governmental authorities pertaining to the installation, service, operation and labeling of the equipment.

To help facilitate optimum performance and safety, Roberts-Gordon LLC recommends that a qualified contractor, at a minimum, annually inspect your ROBERTS GORDON® equipment and perform service where necessary, using only replacement parts sold and supplied by Roberts-Gordon LLC.

This product is not approved for residential use.

Printed in the U.S.A.

Attach this information to the wall near the ROBERTS GORDON® remote panel or equipment controls.

ROBERTS GORDON®

Read the Installation, Operation and Service Manual thoroughly before installation, operation or service.

OPERATING INSTRUCTIONS

1. Stop! Read all safety instructions on this information sheet.
2. Open the manual gas valve in the air handler supply line.
3. Turn on electric to the air handler.
4. Set temperature selector and, if equipped, thermostat, to desired setting.
5. Set FAN switch to "ON".
6. Set BURNER switch to "ON".

TO OPERATE AS VENTILATOR

1. Stop! Read all safety instructions on this information sheet.
2. Turn on electric to the air handler.
3. Set FAN switch to "ON".

TO TURN OFF THE AIR HANDLER

1. If equipped, set the thermostat to the lowest setting.
2. Set BURNER switch to "OFF".
3. Set FAN switch to "OFF".

IF THE AIR HANDLER WILL NOT OPERATE, FOLLOW THESE INSTRUCTIONS, TO HELP ENSURE YOUR SAFETY

1. If equipped, set the thermostat to the lowest setting.
2. Set BURNER switch to "OFF".
3. Set FAN switch to "OFF".
4. Turn off electric to the air handler.
5. Close the manual gas valve in the air handler supply line.
6. Call your registered contractor qualified in the installation and service of gas-fired heating equipment.

⚠ WARNING

Fire Hazard

Keep all flammable objects, liquids and vapors the required clearances to combustibles away from equipment.

Some objects can catch fire or explode when placed close to equipment.

Failure to follow these instructions can result in death, injury or property damage.

CLEARANCES TO COMBUSTIBLES

Clearances to combustibles for Models DF40-DF410 are 12" (30.5 cm) on the control enclosure side and 6" (15.2 cm) on all other surfaces.

Clearances to combustibles for Models DF700A and DF700B are 6" (15.2 cm) on all surfaces.

Clearances to combustibles do not denote clearances for accessibility. Minimum clearance for access is 48" (122 cm) on all models. Minimum clearance for accessibility applies to the control enclosure, blower access panel and filter access panel (when equipped).

Roberts-Gordon LLC
1250 William Street
P.O. Box 44
Buffalo, NY 14240-0044 USA
Telephone: +1.716.852.4400
Fax: +1.716.852.0854
Toll Free: 800.828.7450

Installation Code and Annual Inspections: All installation and service of ROBERTS GORDON® equipment must be performed by a contractor qualified in the installation and service of equipment sold and supplied by Roberts-Gordon LLC and conform to all requirements set forth in the ROBERTS GORDON® manuals and all applicable governmental authorities pertaining to the installation, service, operation and labeling of the equipment. To help facilitate optimum performance and safety, Roberts-Gordon LLC recommends that a qualified contractor conduct, at a minimum, annual inspections of your ROBERTS GORDON® equipment and perform service where necessary, using only replacement parts sold and supplied by Roberts-Gordon LLC.
Air handlers are approved for installation up to 2000' (610 m).

For installations at elevations above 2000' (610 m), consult factory.

Further Information: Applications, engineering and detailed guidance on systems design, installation and equipment performance is available through ROBERTS GORDON® representatives. Please contact us for any further information you may require, including the Installation, Operation and Service Manual.

These products are not for residential use.

www.rg-inc.com **www.robertsgordon.com** Printed in U.S.A. P/N 91040101 Rev B