Bio-Dri II™

Installation and Operation Manual

PNEG-1473

Date: 08-28-15

Intertek

Models:

System APBD2-L32L2 with VHD2-24AP-LP heater

System APBD2-L32N2 with VHD2-24AP-NG heater

All information, illustrations, photos and specifications in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

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Safety Guidelines

Safety guidelines shall be followed at all times. This manual is written to help you understand safe operating procedures and problems that can be encountered by the operator and other personnel when using this equipment. Save these safety guidelines for future reference.

As owner or operator, you are responsible for understanding the requirements, hazards and precautions that exist and to inform others as required. Unqualified persons must stay out of the work area at all times.

Alterations shall not be made to the equipment. Alterations can produce dangerous situations resulting in SERIOUS INJURY or DEATH.

This equipment shall be installed in accordance with the current installation codes and applicable regulations, which should be carefully followed in all cases. Authorities having jurisdiction shall be consulted before installations are made.

When necessary, you shall consider the installation location relative to electrical, fuel and water utilities.

Personnel operating or working around equipment shall read this manual. This manual shall be delivered with equipment to its owner. Failure to read this manual and its safety instructions is a misuse of the equipment.

ST-0001

Fuel Warning

⚠️ **WARNING**	***Do not use propane tanks which have previously been used for ammonia unless they have been purged according to procedures of the National LP Association.*** *** Be sure fuel supply system complies with all local codes for LP gas installations. DO NOT USE FLAME FOR LEAK TESTING.***

Power Warning

Be sure power is disconnected and locked out before installation. Failure to do so may cause serious injury or death.

IMPORTANT: *Heater must be interlocked with fan for safe operation.*

IMPORTANT: *Thermostat must be installed for safe operation.*

Proper Use of Product

This product is intended for drying livestock trailers. Any other use is a misuse of this product. This product has sharp edges. These sharp edges may cause serious injury. To avoid injury handle sharp edges with caution and use proper protective clothing and equipment at all times. Guards are removed for illustration only. All guards must be in place before and during operation.

Cautionary Symbols Definitions

Cautionary symbols appear in this manual and on product decals. The symbols alert the user of potential safety hazards, prohibited activities and mandatory actions. To help you recognize this information, we use the symbols that are defined below.

⚠ **DANGER** — This symbol indicates an imminently hazardous situation which, if not avoided, **will result in serious injury or death.**

⚠ **WARNING** — This symbol indicates a potentially hazardous situation which, if not avoided, **may result in serious injury or death.**

⚠ **CAUTION** — This symbol indicates a potentially hazardous situation which, if not avoided, **may result in minor or moderate injury.**

NOTICE — This symbol is used to address practices not related to personal injury.

This symbol indicates a general hazard.

This symbol indicates a prohibited activity.

This symbol indicates a mandatory action.

ST-0005

Safety Cautions

Use Personal Protective Equipment

• Use appropriate personal protective equipment:

Eye Protection

Respiratory Protection

Foot Protection

Hearing Protection

Head Protection

Fall Protection

Hand Protection

• Wear clothing appropriate to the job.

• Remove all jewelry.

• Tie long hair up and back.

ST-0004-1

Follow Safety Instructions

• Carefully read and follow all safety messages in this manual and safety signs on your machine. Keep signs in good condition. Replace missing or damaged safety signs. Replacement safety signs are available from the manufacturer.

• Learn how to operate the machine correctly. Do not operate without instruction.

• If you do not understand any part of this manual or need assistance, contact your dealer.

ST-0002-1

For Your Safety

- If you smell gas:

  1. Open windows

  2. Don't touch electrical switches

  3. Extinguish any open flames

  4. Immediately call your gas supplier

- The use and storage of gasoline and other flammable vapors and liquids in open containers in the vicinity of this appliance is hazardous.

- Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.

ST-0012-1

Install and Operate Electrical Equipment Properly

- Electrical controls should be installed by a qualified electrician and must meet the standards set by the National Electric Code, Canadian Electrical Code and all local and state codes.

- Electrical components, wiring, conduit and junction boxes must be suitable for temperatures in excess of 250°F (121°C).

- Disconnect and lock out all power sources before installing wires/cables or servicing equipment.

ST-0015-1

Install and Operate Gas-Fired Equipment Properly

- Gas-fired equipment should be installed by a qualified pipe fitter and must conform with local codes or in the absence of local codes, in accordance with the National Fuel Gas Code ANSI Z223.1/NFPA 54 or the Natural Gas and Propane Installation Codes, CAN/CSA B149.1.

ST-0016-1

Inhalation and Hot Surface Hazards

- Building doors are to remain open at all times when personnel are inside the building. All doors must be equipped with functioning interlocks that prevent operation of the heater when a door is opened.

- Never start drying cycle while people or animals are inside the building or trailer. Make sure everyone is clear of the area.

- Never enter the building or the trailer while the drying cycle is in progress. Temperatures inside the building will reach 175°F (79°C) and carbon monoxide levels will reach deadly levels. Do not enter the building or trailer for any reason while the drying cycle is running

- Do not enter the building or trailer until the purge cycle is completely finished and the building and trailer have been cleared of all toxic fumes.

- Surfaces may be hot. Do not touch. Burns may result.

ST-0013-1

Protect Your Equipment

- Temperatures at the outlet to the duct work can exceed 250°F (121°C). It is the responsibility of the operator to make sure that all surfaces that come in contact with the heated air are capable of tolerating temperatures in excess of 250°F (121°C).

- Do not leave the tractor in building during bake cycle. Remove tractor from building.

> 250°F
(121°C)

Building   Trailer   Building   Trailer

Tractor

ST-0014-1

Safety Sign-Off Sheet

Below is a sign-off sheet that can be used to verify that all personnel have read and understood the safety instructions. This sign-off sheet is provided for your convenience and personal record keeping.

Date	Employee Name	Supervisor Name

ST-0007
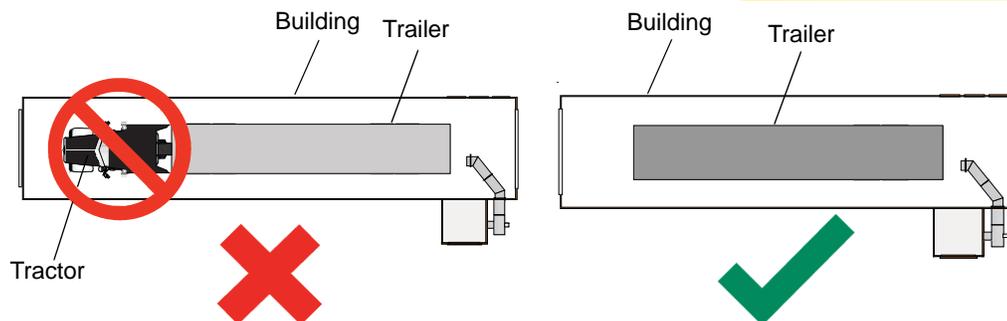
The safety decals on your equipment are safety indicators which must be carefully read and understood by all personnel involved in the installation, operation, service and maintenance of the equipment.

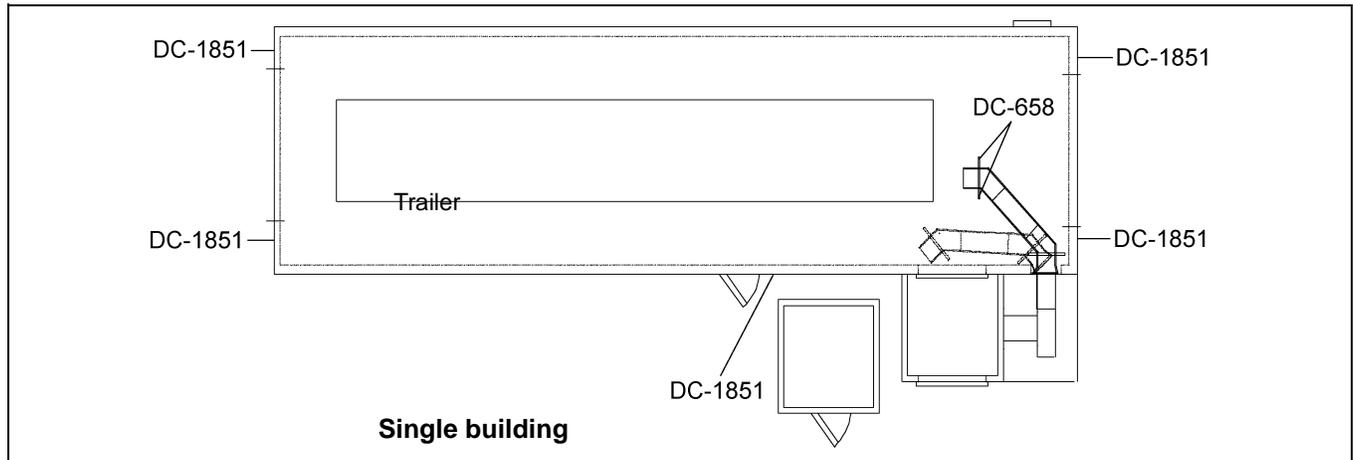| Location	Decal No.	Decal	Description
Building entry/ exit points	DC-1851	**DANGER** — DO NOT ENTER this building while system is in operation. Deadly gases and intense heat beyond door. Purge cycle must be ran to exhaust gases prior to entering the building. Failure to heed these warnings will result in serious injury or death. / **DANGER** — NE PAS PÉNÉTRER dans ce bâtiment lorsque le système est en cours de fonctionnement. Gaz mortels et chaleur intense passé cette porte. Un cycle de purge doit être exécuté pour évacuer les gaz avant de pénétrer dans le bâtiment. Le non-respect de ces avertissements entraînera des blessures graves ou la mort.	Heat and gas danger decal
Heater duct	DC-1852	**WARNING** — Hot Surfaces. Panels are hot during equipment operation; may cause severe burns. DO NOT TOUCH / **AVERTISSEMENT** — Surfaces brûlantes. Les panneaux sont très chauds pendant le fonctionnement; cela peut entraîner des brûlures graves. NE PAS TOUCHER	Hot surface warning decal
Fan/Heater unit	DC-2330	**WARNING** — Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment. / **AVERTISSEMENT** — Une installation, un réglage, une modification, un entretien ou une réparation incorrects peuvent entraîner des dommages, des blessures, voire la mort. Lisez attentivement les instructions d'installation, d'opération et d'entretien avant d'installer ou de réparer cet équipement.	Read manual warning decal
Fan/Heater unit	DC-2331	**WARNING** — The use and storage of gasoline and other flammable vapors and liquids in open containers in the vicinity of this appliance is hazardous. / **AVERTISSEMENT** — Il est dangereux d'utiliser ou de stocker de l'essence ou tout autre liquide ou vapeur inflammables dans des contenants ouverts à proximité de cet appareil.	Flammable vapor warning decal

To replace a damaged or missing decal, contact us to receive a free replacement.

GSI Decals
1004 E. Illinois St.
Assumption, IL. 62510
Phone: 1-217-226-4421

Decal Locations

ATTENTION: Decals should be placed as *Shown below*, at eye level. If a decal has been damaged or is missing, contact the manufacturer for a free replacement decal.

DC-1851	DC-1851
	DC-658
Trailer	
DC-1851	DC-1851
DC-1851	

Single building

Heater Access Door Decals

Location	Decal No.	Decal	Description
Above Access Door on Heater Housing	**DC-1949**	**WARNING** Stay clear of rotating blade. Blade could start automatically. Can cause serious injury. Disconnect power before servicing. GSI Group Inc. 217-226-4421 — **AVERTISSEMENT** Restez éloigné de la lame tournante. La lame peut se mettre en marche automatiquement. Peut causer de sérieuses blessures. Vérouillez le courant avant l'entretien. DC-1949	**Warning Rotating Blade, CE, CSA Harmonized**
Above Access Door on Heater Housing	**DC-1959**	**WARNING** Flame and pressure beyond door can cause serious injury. Do not operate with service door removed. Keep head and hands clear. GSI Group 217-226-4421 — **AVTERISSEMENT** La flamme et la pression au-delà de la porte peuvent causer des dommages sérieux. Ne pas faire fonctionner si la porte de service est enlevée. Gardez les mains et la tête éloignés. DC-1959	**Warning Fire (Small), CE, CSA Harmonized**
Above Access Door on Heater Housing	**DC-1971**	**AIRFLOW** AIRFLOW **CIRCULATION D'AIR** CIRCULATION D'AIR DC-1971	**Air Flow, CE, CSA Harmonized**

The main function of the Bio-Dri II™ is to heat a trailer to a specific temperature and keep it at that temperature for a set period of time. The system is comprised of two (2) 10 HP centrifugal fans (F), two (2) upstream modulated heaters (E), two (2) air inlet doors with actuator (D), duct assembly (C), two (2) portable 36" circulation fans (B), three (3) 39" galvanized shutters (A), two (2) Infrared temperature sensors (G), three (3) RTD air temperature sensors (H) and one RTD surface temperature sensor (I). *(See Figure 3A.)*

All trailers/equipment inside of building should be capable of withstanding temperatures above 250°.

Refer to the manuals supplied with each component of the system for safety and maintenance information for that component.
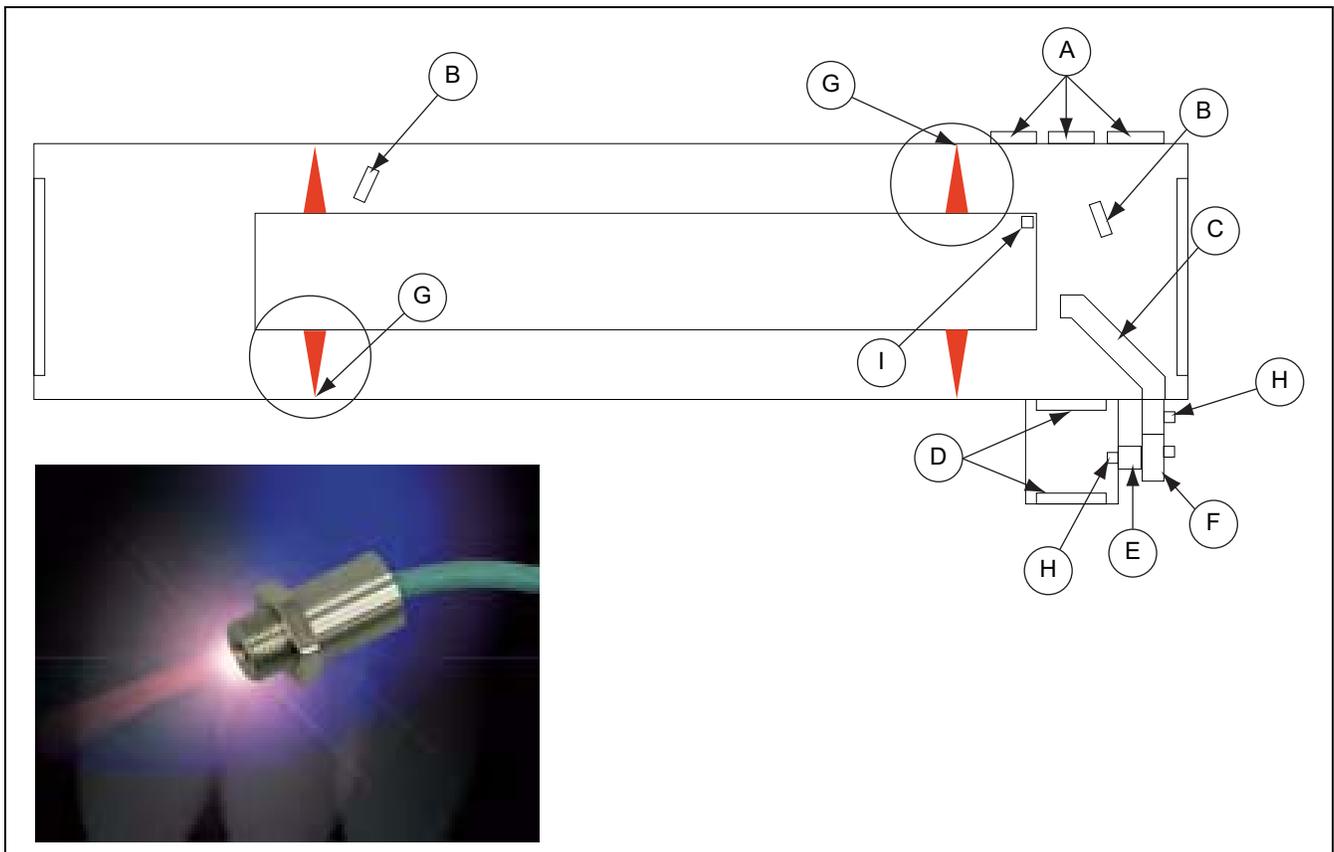
Figure 3A *System Overview*

Ref #	Description	Qty
A	39" Galvanized Shutters	3
B	Portable 36" Circulation Fans	2
C	Duct Assembly	1
D	Air Inlet Doors with Actuator	2
E	Upstream Modulated Heaters	2
F	10 HP Centrifugal Fans	2
G	Infrared Temperature Sensor	2
H	RTD Air Temperature Sensor	3
I	RTD Surface Temperature Sensor	1

3. Overview

When the system is started, it begins a pre-heat mode, which brings the trailer surface temperature to the set surface temperature. *(See Figure 3B.)*
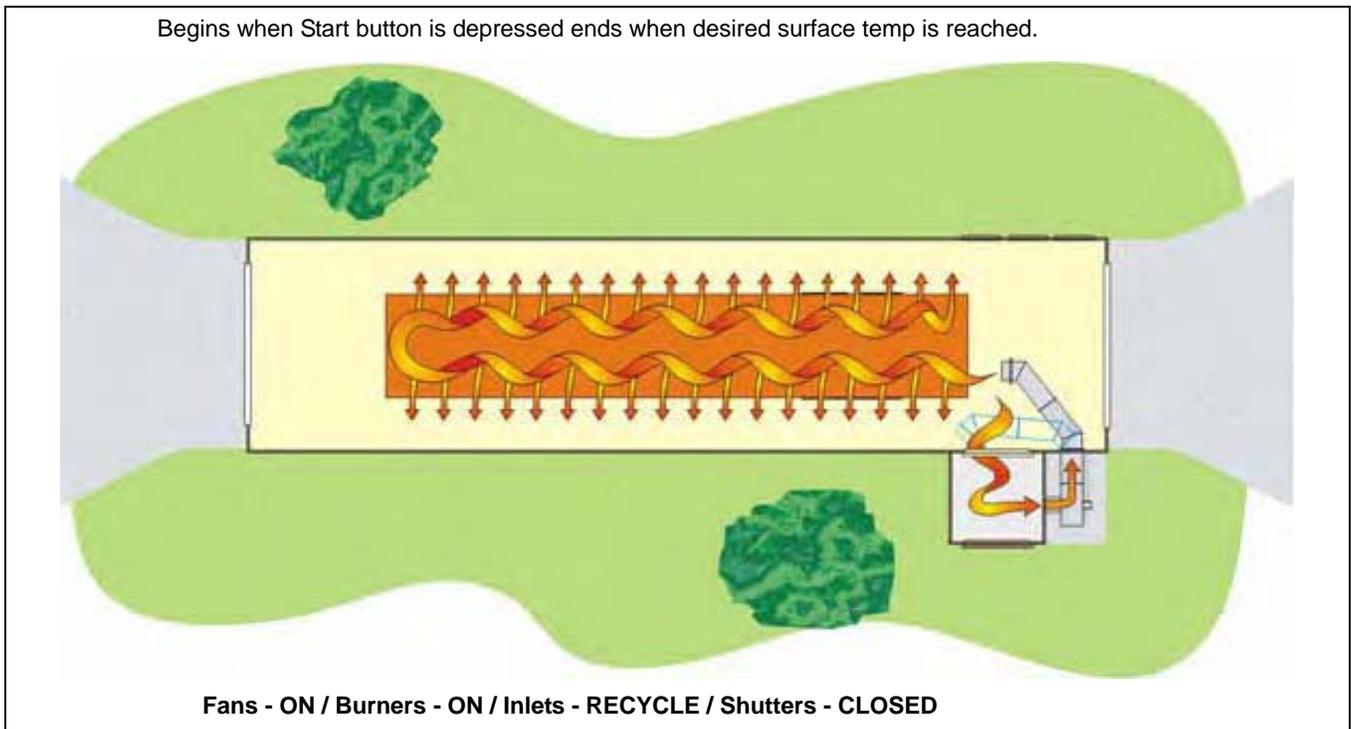

Begins when Start button is depressed ends when desired surface temp is reached.

Fans - ON / Burners - ON / Inlets - RECYCLE / Shutters - CLOSED

Figure 3B *Pre-Heat Mode*

Once the surface temperature is reached, Bake Mode starts and ends when the Bake Cycle Time expires. Bake Mode keeps the trailer at the set temperature for the allotted amount of time. *(See Figure 3C.)*

Begins when desired surface temp is reached ends when bake cycle time expires.

Fans - ON / Burners - ON / Inlets - RECYCLE / Shutters - CLOSED
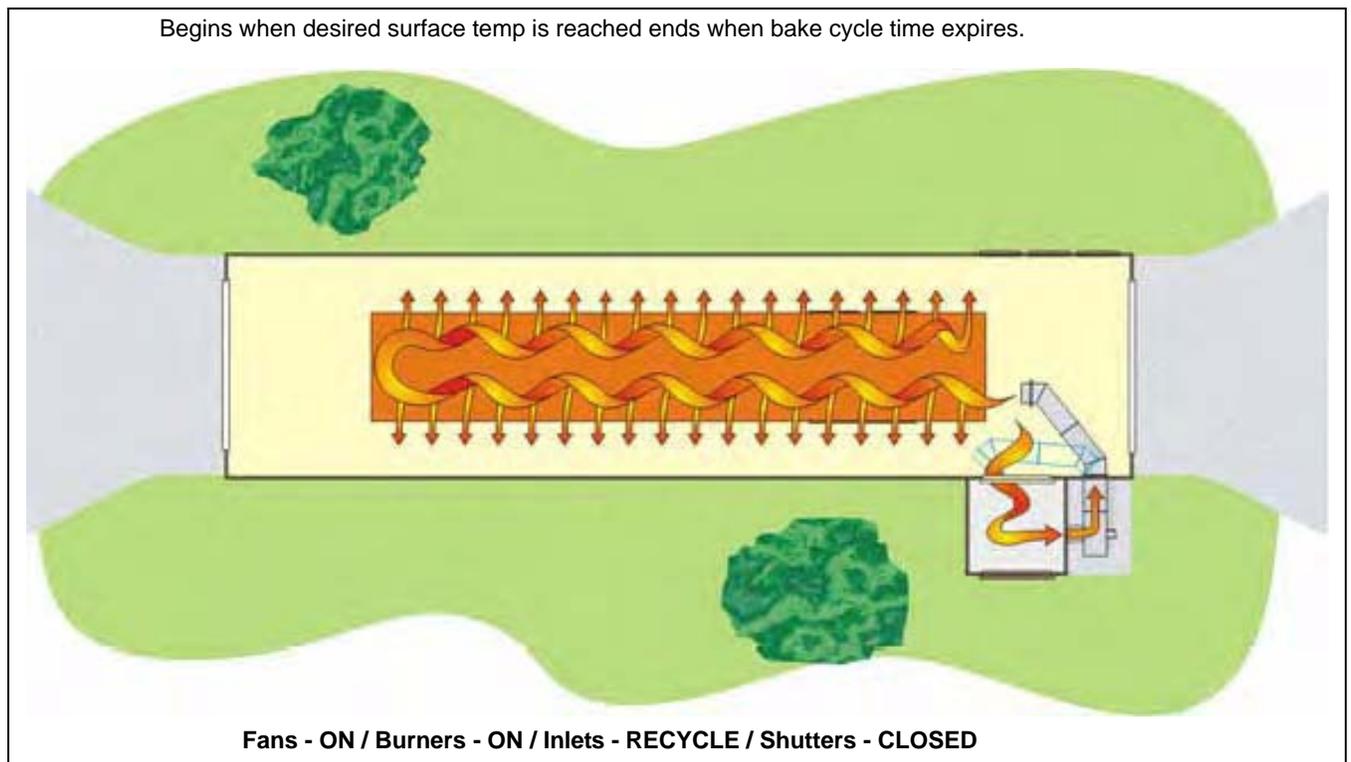
Figure 3C *Bake Mode*

Post Bake Mode starts after Bake Mode expires and ends when the Post Bake Time expires. Post Bake Mode gives you the flexibility to bake the trailer longer without having to run the heaters. *(See Figure 3D.)*
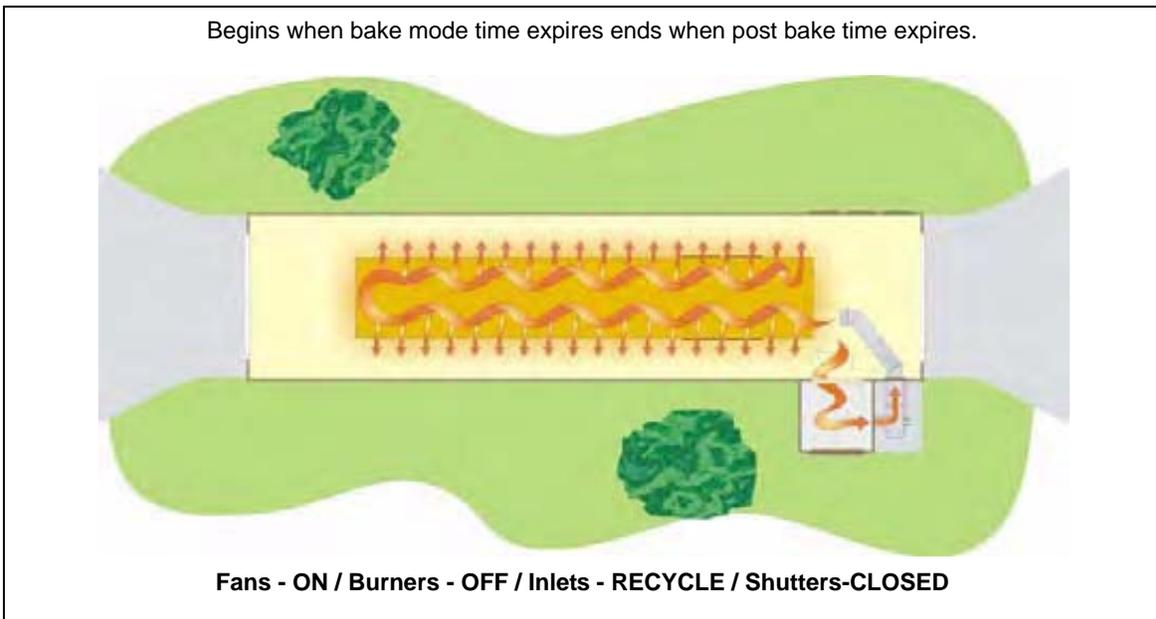
Begins when bake mode time expires ends when post bake time expires.

Fans - ON / Burners - OFF / Inlets - RECYCLE / Shutters-CLOSED

Figure 3D *Post Bake Mode (Optional)*

Purge Mode begins when Post Bake Mode Time expires and ends when the Purge Mode Time expires. Purge Mode exhaust the hot air and gases from the building and must run at least 8 minutes. *(See Figure 3E.)*

Begins when post bake mode time expires ends when purge mode time expires.

Fans - ON / Burners - OFF / Inlets - PURGE / Shutters - OPEN
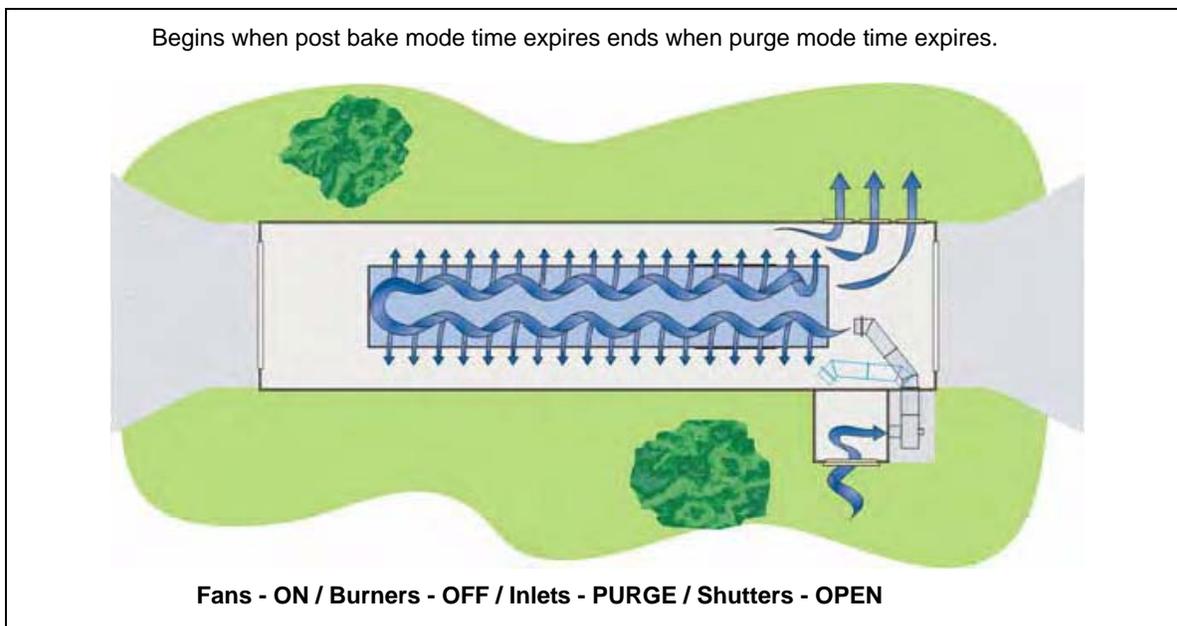
Figure 3E *Purge Mode*

NOTE: *A minimum amount of ventilation air must be supplied to the heated space during operation of the heater in the bake cycle mode to exceed 200 cfm per 1,000 cfh of natural gas based on the maximum capacity of the heater plus an allowance to sufficiently dilute the volatile organic compound (VOC) created by the process to maintain the lower explosive level below a 25% threshold value.*

Bio-Dri II™ Single Building Layout

> ⚠️ **DANGER** *Controls must be located in a separate building not connected to the trailer room.*

NOTE: *The parts pointed out on this page are listed .*

Figure 4A

Bio-Dri II™ Single Building Layout (Continued)

Ref #	Description
A	18'-0" Minimum
B	Trailer
C	5'-0" Hold this Dimension
D	39" Shutters R.O. 39-5/8" x 39-5/8" (3)
E	12' Door Both Ends
F	Mixing Air Chamber
G	5'-10" Minimum
H	Office building for controls (suggestion for placement and size) controls must be in a separate building not connected to the trailer room and be heated to above freezing in the winter.
I	1'-7" Floor height difference over the length of the trailer 4" rise per 10' run (2°).
J	The floor in this area must be flat for the duct to roll evenly.
k	10 HP Fans (2)

Bio-Dri II™ Building Rough Opening Detail
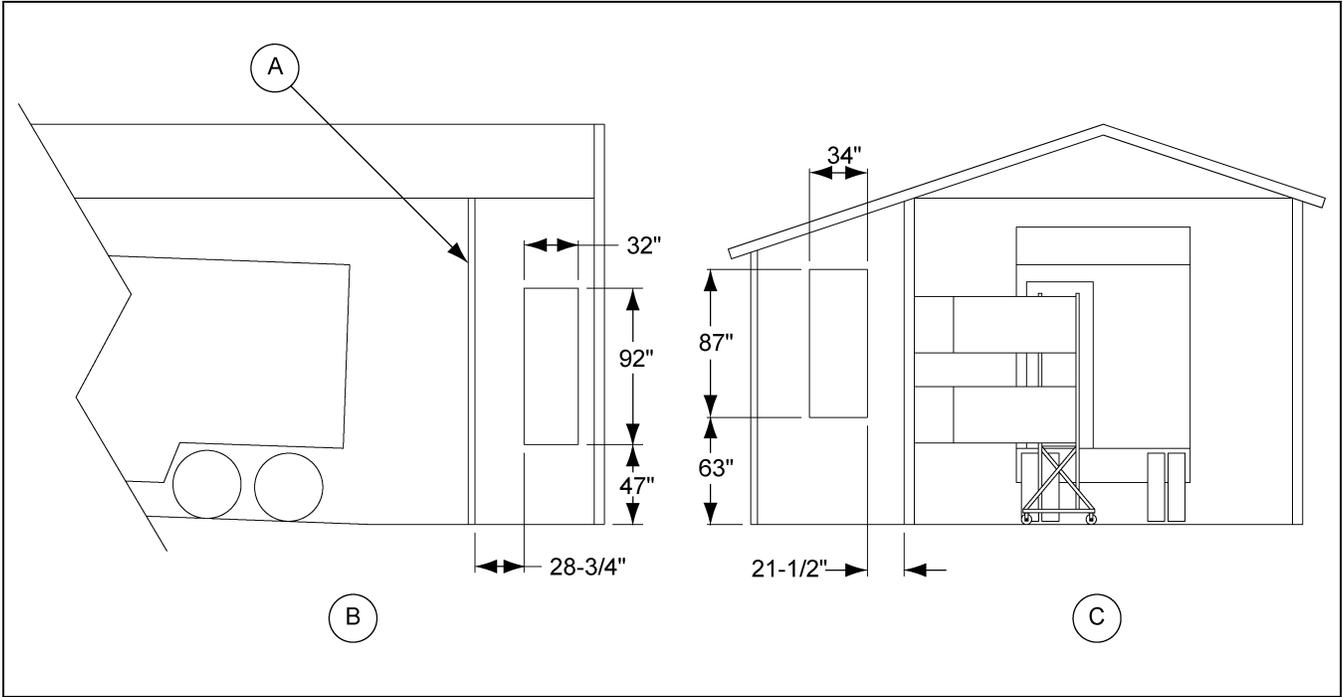
Figure 4B

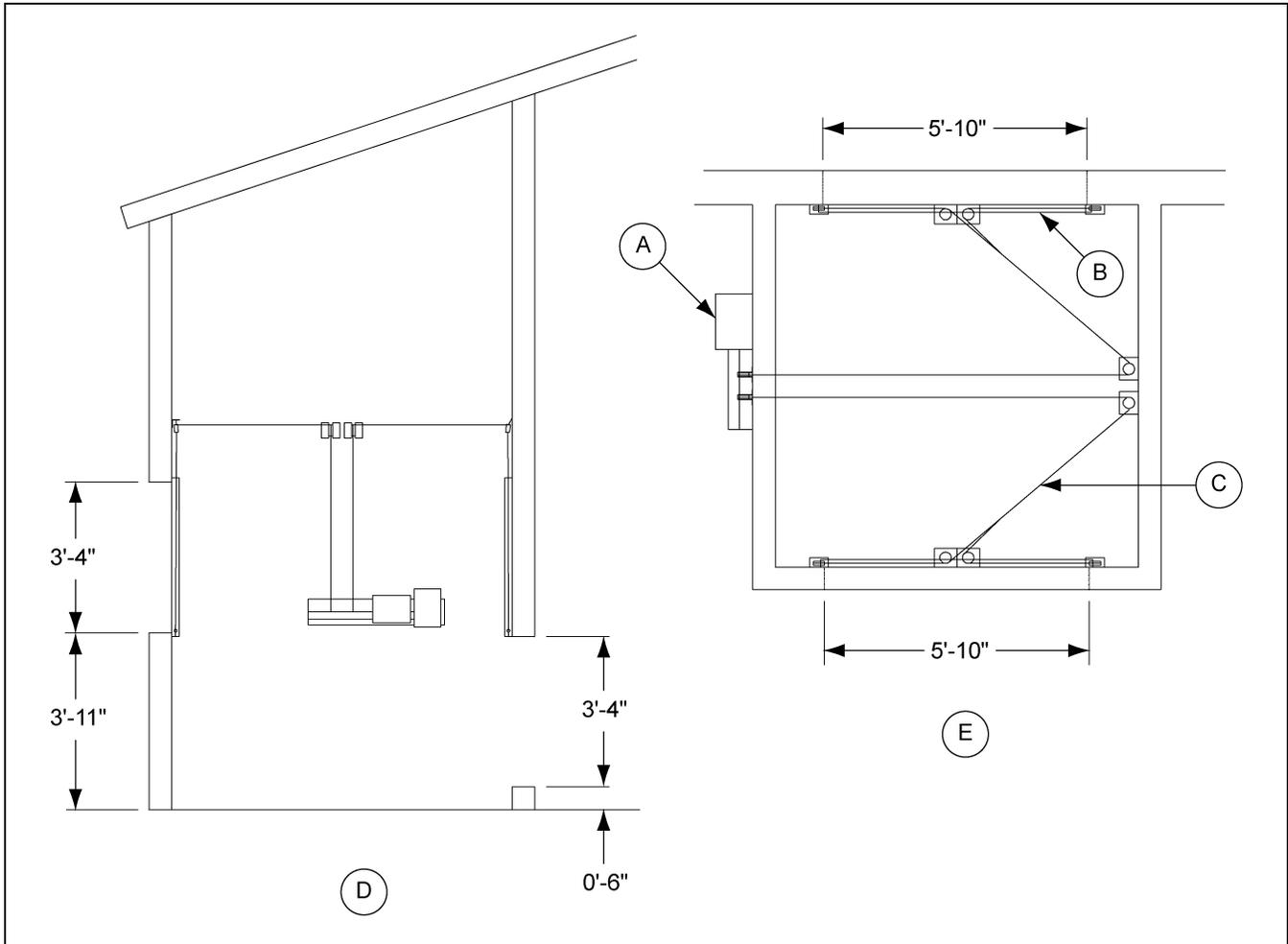| Ref #	Description
A	Stub Wall for Inlet Chamber
B	Duct Mounting Plate Rough Opening Detail
C	Inlet Mounting Plate Rough Opening Detail

Inlet System for Bio-Dri II™

Figure 4C

Ref #	Description
A	Curtain Machine
B	Inlet Door
C	Cable
D	Cross Section
E	Top View

Bio-Dri II™ Sensor and Accessories Location

NOTE: *The parts pointed out on this page are listed .*
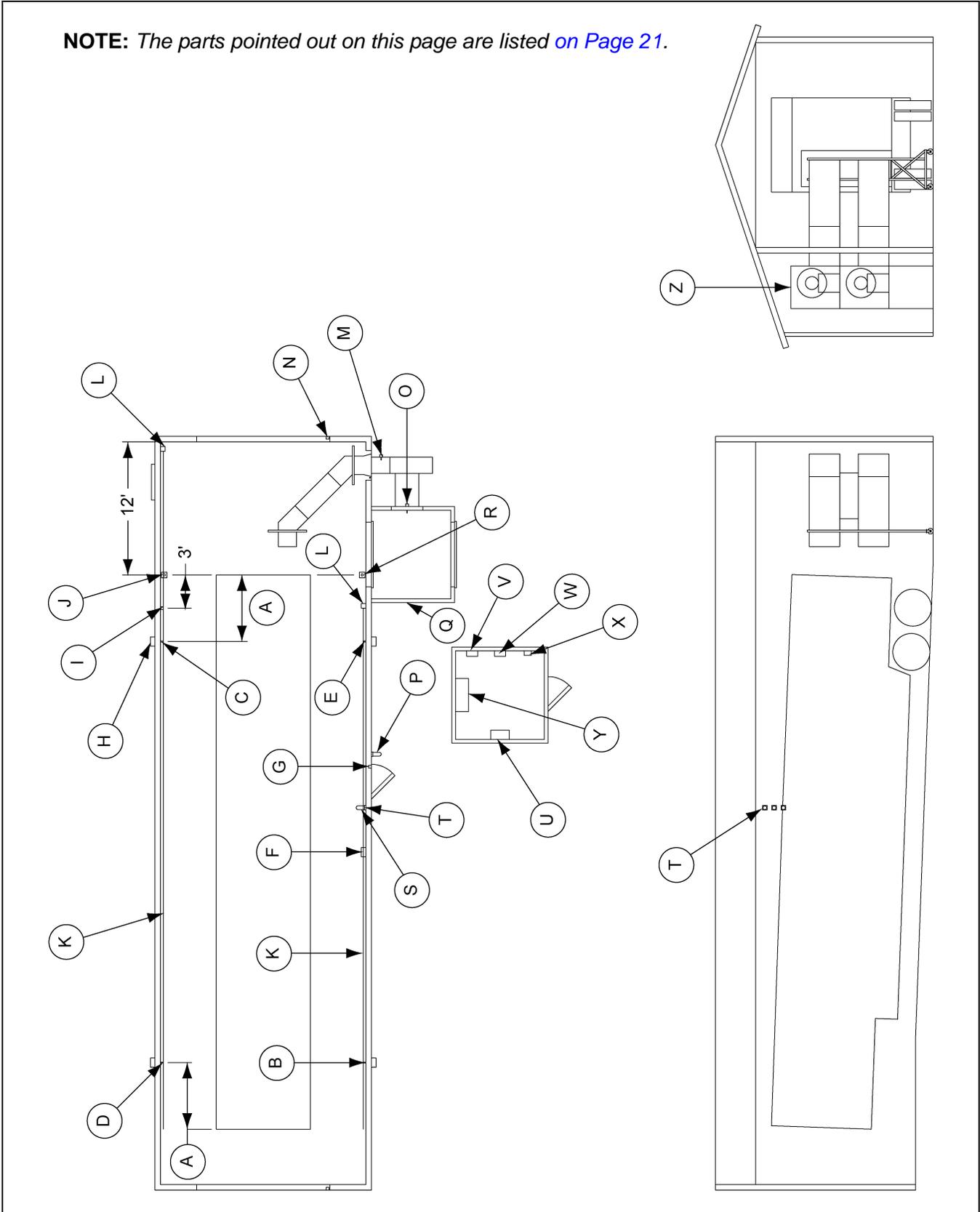
Figure 4D

Bio-Dri II™ Sensor and Accessories Location (Continued)

Ref #	Description
A	6' Approximately
B	Infrared Sensor #1 Front Left (Standard)
C	Infrared Sensor #2 Rear Right (Standard)
D	Infrared Sensor #3 Front Right (Optional)
E	Infrared Sensor #4 Rear Left (Optional)
F	Install high-limit temperature thermodiscs with enclosure in the middle of the room.
G	Small Door Contact
H	Install enclosure with sensor and heater on outside of wall. Install sensor head on inside as shown.
I	Connection Box for the Surface Sensor (AP-4180)
J	Truck Positioning Stand (Reflector Side) (AP-5310)
K	Cable must run the length of the building approximately 50' on each site.
L	E-Stop with Cable Pull 42" above Floor
M	Install (1) AP-4072 air sensor through 7/8" diameter hole (provided) in each exhaust extension side AP-5286A with sensor probe protruding into duct. Secure with FH-1309 nut.
N	Overhead Door Contact (Both Doors)
O	Install (1) AP-4072 air sensor through 7/8" diameter hole (provided) in inlet mounting plate AP-3940 between heaters with sensor probe protruding into mixing air chamber. Secure with FH-1309 nut.
P	Red Indicator Light Outside Building
Q	511FL Curtain Machine
R	Truck Positioning Stand (Sensor Side) (AP-5310A)
S	These inside indicator lights must be visible from semi-driver rear view mirror when pulling trailer into position.
T	Indicator lights Inside building Amber - Top Red - Middle Green - Bottom
U	Laptop Computer (Not Provided)
V	Fan Starter, Enclosed (AP-5277) (2)
W	Building Lighting Contactor (AP-5278)
X	Button Enclosure Start/Stop/Reset (AP-5279)
Y	Main PLC Control Panel (AP-5280)
Z	10 HP Fans Stacked on Top of each Other (2)

Heater Specifications

		24"
All Models	Inside Diameter	24-1/4"
	Bole Circle Diameter	25-3/4"
	Length	36"
	High Temp BTU Rating	2,100,000
	Low Temp BTU Rating	500,000
Propane	Maximum Fuel Flow (CFH)	1050
	Orifice	1/4
	Operating Pressure Range	2-10 PSI
	Min Line Size	1"
Natural Gas	Maximum Fuel Flow (CFH)	2210
	Orifice	5/16
	Operating Pressure Range	1-7 PSI
	Min Line Size	1"

NOTE: *Refer to the heater rating plate for determining the minimum gas supply pressure for obtaining the maximum gas capacity for which this heater is specified.*

Determining Maximum and Minimum Inlet Pressures

The inlet supply pressure should be verified by shutting off the manual supply valve ahead of the regulator, removing the 1/4" plug in from the tee upstream of the regulator, and installing a pressure gauge.
The manual supply valve can then be turned back to the open position. Read the pressure on the gauge. The gauge can either remain permanently installed, or it can be replaced with the 1/4" plug.

Machine to Earth Ground

It is very important that a machine to earth ground rod be installed at the fan. This is true even if there is a ground at the pole 15' away. This ground needs to be as close to the fan as possible, but no more than 8' away. The ground rod should be connected to the fan control panel with at least a #6 solid bare copper ground wire, or in accordance with local requirements. The machine to earth ground provides additional safety if there is a short. It also provides the grounding necessary for long life and operation of the solid state circuit boards used on control circuits and the electronic ignition systems.

Previously Installed Units

It is recommended that previously installed units be checked to see that a machine to earth ground has been installed by an electrician.

Fuel Connection

⚠️ **WARNING**	***Do not use propane tanks which have previously been used for ammonia unless they have been purged according to procedures of the national LP association.*** ***Investigate to be sure that the fuel supply system complies with all local codes for LP gas installations.***

NOTE: *Heater and individual shut off valve must be disconnected from the gas supply piping system during any pressure testing of the system at test pressures in excess of 1/2 PSI. The heater must be isolated from the gas supply piping by closing its individual manual shut off valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 PSI.*

Propane Vapor Models

1. Propane vapor models are designed to run directly off of supply tank or from a separate external vaporizer.

2. Run proper size line *(See Specifications on Page 22)* to pipe train on heater. Have a qualified gas service person inspect installation to be sure everything is installed according to local codes and ordinances. As part of the installation, the gas pipe installer must place a manual shut off valve in an appropriate location that allows access to the valve to shut off fuel to the heater in case of a fire or explosion at the heater.

3. After installation is complete check all connections for leaks.

Natural Gas Models

1. Natural gas models are similar to vapor models, but have a larger orifice to accommodate lower pressure, sometimes found with natural gas.

2. Run proper size line *(See Specifications on Page 22)* to pipe train on heater. Have a qualified gas service person inspect installation to be sure everything is installed according to local codes and ordinances. As part of the installation, the gas pipe installer must place a manual shut off valve in an appropriate location that allows access to the valve to shut off fuel to the heater in case of a fire or explosion at the heater.

3. After installation is complete check all connections for leaks.

NOTE: *Annual leakage tests and gas tightness checks for safety shut off valves should be performed for all fuel models.*

CSA Heater Electrical Installation

> ⚠️ **WARNING**   ***Always disconnect and lock out power before working on or around heater.***

Standard electrical safety practices and codes should be used when working with a heater. Refer to the National Electric Code Standard Handbook by the National Fire Protection Association. *A qualified electrician should make all wiring installations.*

IMPORTANT: *It is recommended that a low temperature limit control be installed in areas where freeze-up protection is needed in the event of burner shut down.*

Heater Power Connection

1. Connect power to fan control box.

2. Make field connections in fan box as shown in *Figure 9AD on Page 77*.

NOTE: *Please refer to Figure 9AD on Page 77 for the Bio-Dri II™ Heater Wiring Diagram and Page 78 for the Terminal Connections.*

Heater Service

All heaters are constructed of durable weather-resistant materials, so a minimum amount of service should be required. Before the unit is started for the first time each season there are a few items that need to be checked out. All damaged parts should be repaired or replaced.

1. Disconnect and lock out power to fan/heater. Open control box lid and inspect all components for moisture, vibration or rodent damage. Inspect and tighten all loose terminal connections. Replace any damaged wiring.

2. Remove burner orifice tube and inspect for dirt or foreign material. Clean out if necessary.

3. Inspect holes in burner ring for possible corrosion or plugging with dirt or rust. Clean if necessary.

4. Be sure primary air inlet screen is intact and clean for proper burn.

5. Check perforated ring on natural gas models to be sure it is clean and no holes are plugged.

6. Inspect flame sensor and ignitor and adjust or replace if necessary.

> ⚠️ **WARNING**   ***Always disconnect and lock out power before working on or around heater.***
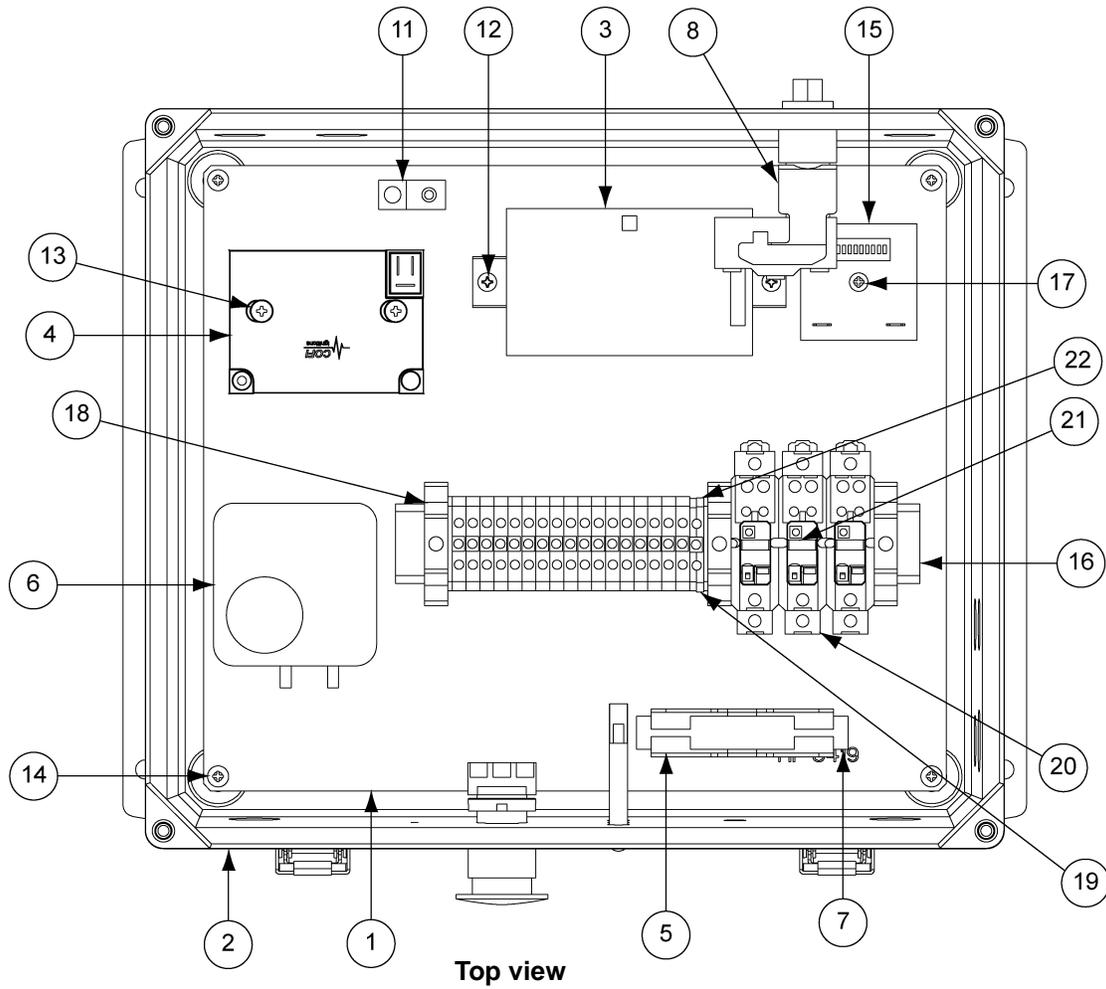
LP and NG Bio-Dri II™ Heater Parts
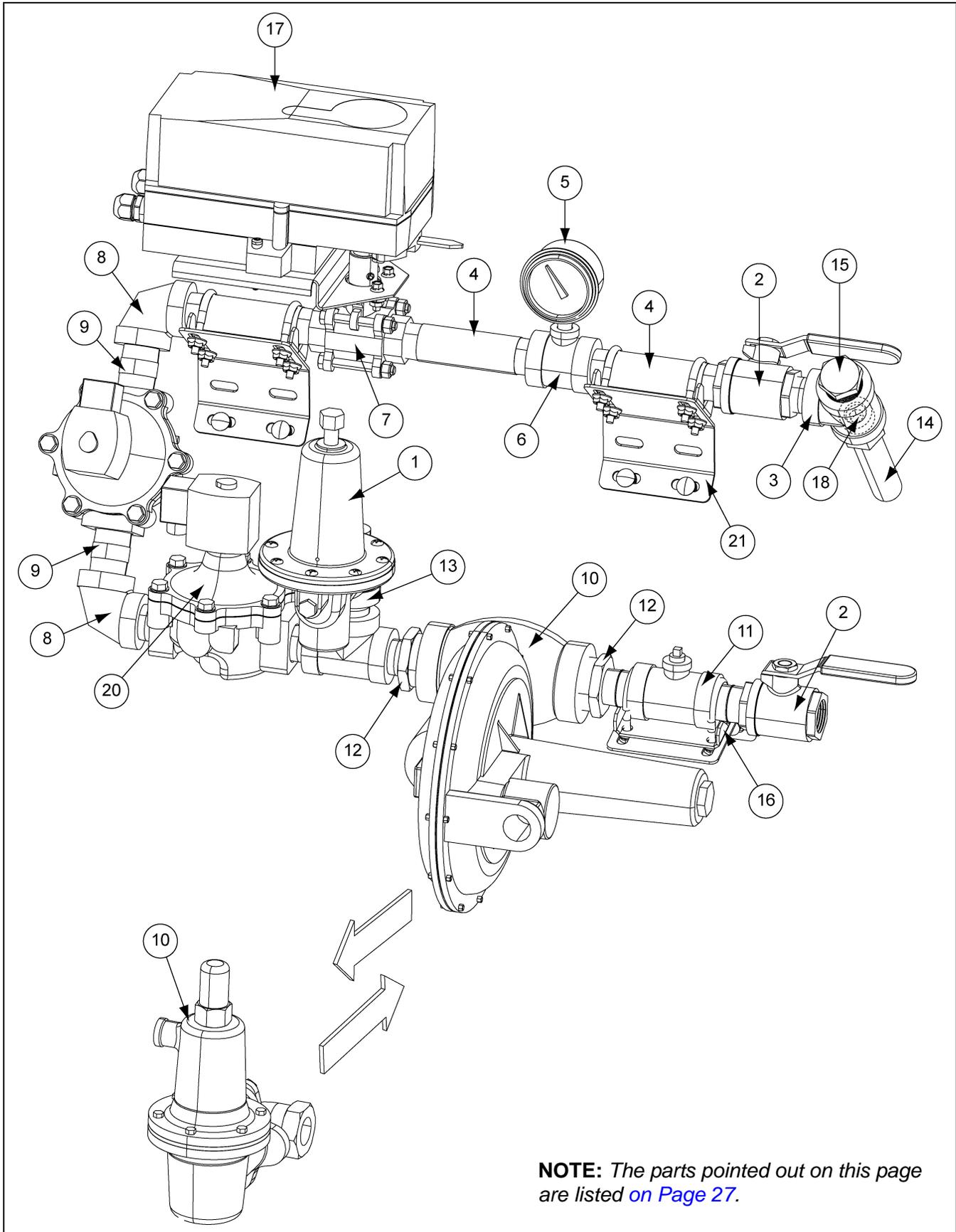
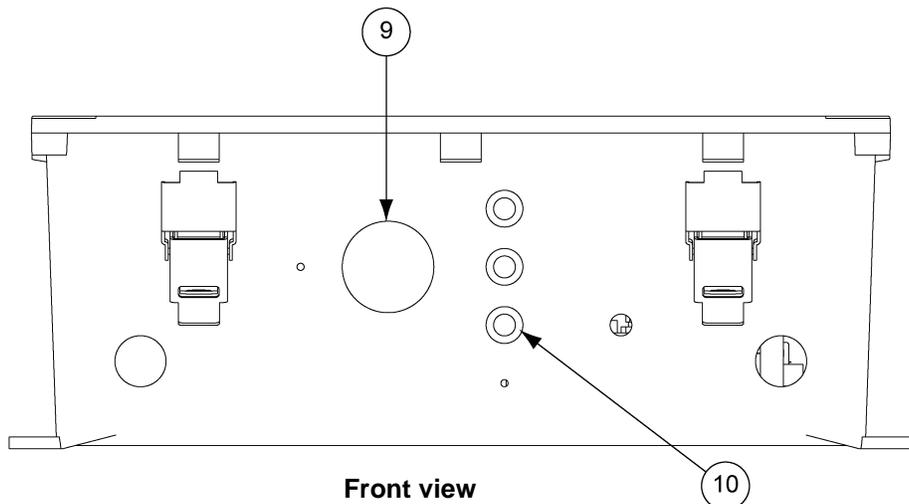**NOTE:** *The parts pointed out on this page are listed on Page 27.*

LP and NG Bio-Dri II™ Heater Parts (Continued)

NOTE: *The parts pointed out on this page are listed .*

NOTE: *NG Heater shown.*

LP and NG Bio-Dri II™ Heater Parts List

Ref #	Part #	Description
1	D03-0881	Valve, Relief - 15-50 PSI Spring LP, 1" NPT
2	D03-0838	Valve, 1" NPT Full Port, Lever, CSA, Brass
3	THH-4137	Tee, 1" x 1" x 1" SCH 40 Black
4	THH-4059	Nipple, 1" x 5-1/2" SCH 40 Black
5	D08-0022	Gauge, Pressure 0-15# Liquid Filled
6	THH-4152	Tee, 1" x 1" x 1/4" SCH 40 Black
7	HF-8424	1" Ball Valve for Use With Bulimo Mod Actuator
8	THH-4115	Elbow, 1"-90° SCH 40 Black
9	THH-4037	Nipple, 1" x 2-1/2" SCH 40 Black
10	D03-1163	Regulator, 1.5" NPT, Sensus, **NG**, 2-4.5 PSI
	D03-0880	Regulator, **LP** 5-20 PSI Spring, 0.5 Orifice, 3/4" NPT
11	D03-0935	Tee, 1" x 1" x 1/4" SCH 80 Black
12	D08-0007	Reducer, 1-1/2" x 1" Hex Bushing
13	THH-4163	Tee, 1" x 1/4" x 1" SCH 40 Black
14	HH-7026	Orifice Pipe 3/4" x 5-1/2"
15	D08-0014	Plug, Hex Head, Black Steel, 1" NPT
16	401-5503-8	Plumbing Mounting Bracket
17	D03-1139	Valve Actuator, 24 VDC, Enclosure-Nema X
18	406-2433-0	Orifice Plug, 1/2" NPT x 0.313" **(NG)**
	406-2430-6	Orifice Plug, 1/2" NPT x 0.188" **(LP)**
19	D03-0880	Regulator, LP 5-20 PSI Spring, 3/4" NPT
20	056-2224-6	Valve, Solenoid 1" NPT 115V Din 25 PSI Max Asco Rebuild Kit #31891
21	HF-8412	Bio-Dri II™ Pipe Train Support Bracket
22	HF-7103	24"-26" Flame Diverter
23	HF-983	18", 24" and 28" Collector
24	HH-3572	Casting, Heater 24" and 26" Gun
25	HF-7104	24"-26" Diverter Collar
26	HF-7464	Reducer, 3"-1-1/2" Conc Weld
27	HH-1650	Spark Plug
28	HF-7465	Bracket, Air Switch Venturi
29	HF-8437	Air Switch Venturi Ext Mounting Bracket, Bio-Dri II™ Heater
30	HF-7454	High-Limit Box Body
31	HF-7455	High-Limit Box Lid
32	D03-1168	Quanta UV Flame Sensor
33	THH-4064	Conduit, 1/2" Aluminum LRL Cond Body
34	HF-8431	Bio-Dri II™ Heater Control Box Sub-Assembly (See Parts Breakdown *Chart on Page 29*.)
N/S	HH-7054	Cone, 24"/26"/28" Burner S.S. (LP Only) - Not Shown

Bio-Dri II™ Heater Control Box Sub-Assembly (HF-8431)

Top view

Front view

NOTE: *The parts pointed out on this page are listed .*

Bio-Dri II™ Heater Control Box Sub-Assembly (HF-8431) Parts

Ref #	Part #	Description	Qty
1	HF-8419	Bio-Dri II™ Control Box Back Plate	1
2	C-8838	Enclosure, Heater Non-Metalic 14 x 12 x 7 NEMA 4X VYNC RVJ	1
3	HF-4624-DWH	Fenwal, Flame Board - CSA Version 15 Sec Purge, 3 Retries	1
4	GT3-1457	Single Pole Cofi Ignition Transformer CE Rated	1
5	C-8718	Single Pole Midget Fuse Block	1
6	056-2245-1	Switch, Air Pressure AA-A2-4-3	1
7	C-8715	1-1/2" x 13/32" Fuse Puller	1
8	TF-2049	High Pressure Gas Switch, ASCO 8-25 PSI	1
9	TF-1279	Switch, Emergency Stop Operator 080TER Emergency Stop/2 N.C. GE 230V	1
10	90-0009	Lamp, Oil Tight 1/4" Tab 120V Amber	3
11	E160-1137	Lug, Ground,#TA-2 (CSA)	3
12	S-7192	Screw, TCSF #8-32 x 5/8" PHP ZN	2
13	S-10176	Screw, TCSF #10-32 x 1-3/4" PHP ZN	2
14	S-8976	Screw, MS #10-32 x 3/8" PHP ZN Grade 2	4
15	FLX-3914	Timer, D.O.M. 1-1023 Sec Time Delay	1
16	406-2195-5	Din Rail x 9"	1
17	S-7124	Screw, TCSF #8-32 x 1" PHP	5
18	D01-0533	Terminal, Entrelec End Stop	3
19	D01-0534	Terminal, Entrelec Ground Block	1
20	GT3-1164	Relay, Base, SPDT Magnetron Relay, Allied #850-0803	3
21	GT3-1163	Relay, Control, SPDT 120 VAC Coil, Allied #850-0740	3
22	D01-0532	Terminal, Blank End Protector Grey	2
N/S	C-8719	Slow Blow 3A Midget Fuse 500 VAC, 10 KA I.R.	2
N/S	S-2786	Screw, TCSF #8-32 x 3/8" PHP ZN	4
N/S	D01-0531	Terminal, Block Entrelec 4 MM 22-10 AWG	17
N/S	C-8717	Push Mount Cable Tie Assembly	6
N/S	DC-1957	Decal, Tag, Attention, CE, CSA Harmonized (Check for Loose Wires)	1
N/S	D63-0013	Block, Contact N.C. G.E. (Use D63-0013AB for Allen-Bradley)	1
N/S	S-9111	Screw, TCSF #6-32 x 3/4" PHP ZN	2
N/S	HH-7046	Crimp, Disconnect 0.187" Female	4
N/S	D03-0099	Adapter, Tab 0.187" x 0.187"	2
N/S	048-1042-0	Plug, Hole 3/8"	1
N/S	D03-0230	Jumper, (Entrelec) #168/516/25	2
N/S	E305-0275	Wire, 5" (18 WHT) E106-1016, E106-1016	2'

Duct Assembly

Assembling the Top Duct

1. Attach duct vanes (C) to the duct exit large side (A) and duct exit small side (B) using two (2) flange bolts (D) and flange nuts (E) per each duct vane. *(See Figure 6A.)*
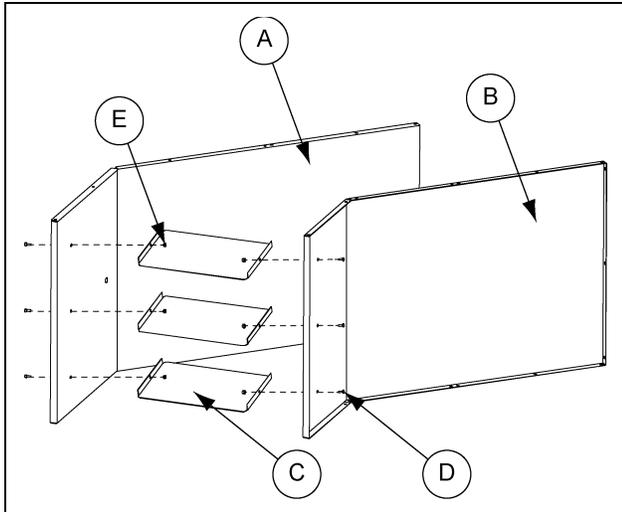

Ref #	Part #	Description
A	AP-3925	Duct Exit Large Side
B	AP-3924	Duct Exit Small Side
C	AP-3929	Duct Vane (3)
D	S-6606	5/16" x 3/4" Flange Bolt (6)
E	S-3611	5/16" Flange Nut (6)

Figure 6A

2. Attach the duct inlet large side (F) to the duct exit large side (A) and attach duct inlet small side (G) to the duct exit small side (B). Use three (3) 5/16" x 3/4" flange bolts (D) and flange nuts (E) per each duct side. *(See Figure 6B.)*
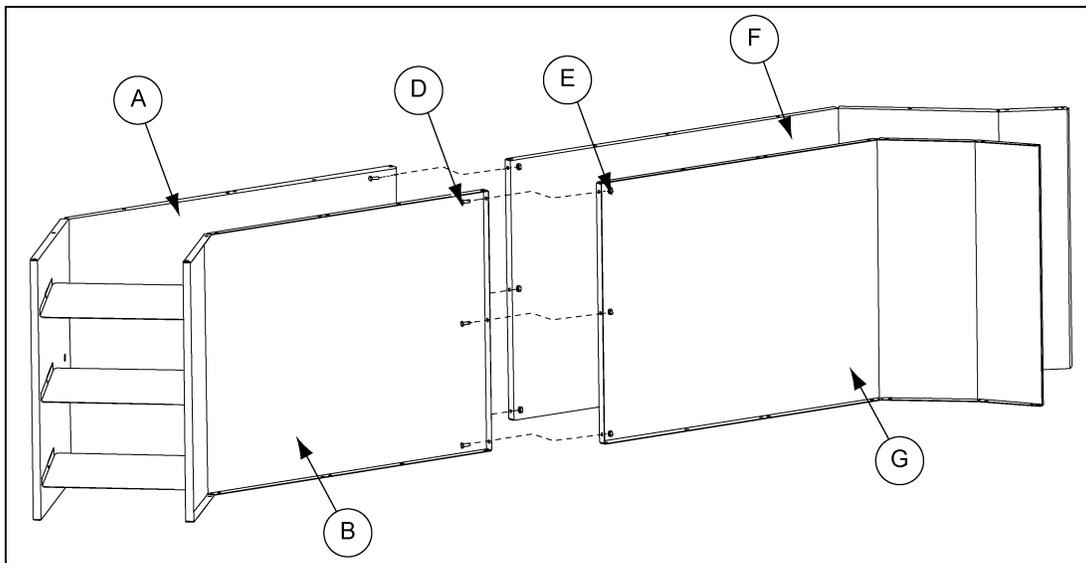
Figure 6B

Ref #	Part #	Description
A	AP-3925	Duct Exit Large Side
B	AP-3924	Duct Exit Small Side
D	S-6606	5/16" x 3/4" Flange Bolt (6)

Ref #	Part #	Description
E	S-3611	5/16" Flange Nut (6)
F	AP-3923	Duct Inlet Large Side
G	AP-3922	Duct Inlet Small Side

3. Attach duct exit top/bottoms (K) to the tops and bottoms of the duct exit large side (A) and duct exit small side (B) using four (4) 5/16" x 3/4" flange bolts (D) and flange nuts (E). **Note the location of bolts for this step, some holes will not be used until future steps.** *(See Figure 6C.)*

4. Attach duct inlet top/bottoms (L) to the tops and bottoms of the duct inlet large side (F) and duct inlet small side (G) using four (4) 5/16" x 3/4" flange bolts (D) and flange nuts (E). **Note location of bolts for this step, some holes will not be used until future steps.** *(See Figure 6C.)*

5. Insert tabs on both duct middle top/bottoms (H) under duct inlet top and bottoms (L) and duct exit top and bottom (K) and attach to duct tops and sides using sixteen (16) 5/16" x 3/4" flange bolts (D) and flange nuts (E). *(See Figure 6C.)*

6. Attach four (4) duct support horizontals (I) to duct top/bottoms and duct sides using two (2) 5/16" x 3/4" flange bolts (D) and flange nuts (E) per each horizontal support. *(See Figure 6C.)*

7. Attach pivot angle top (J) and pivot angle bottom (M) to the end of the inlet sides using four (4) 5/16" x 3/4" flange bolts (D) and flange nuts (E) per each angle. *(See Figure 6C.)*
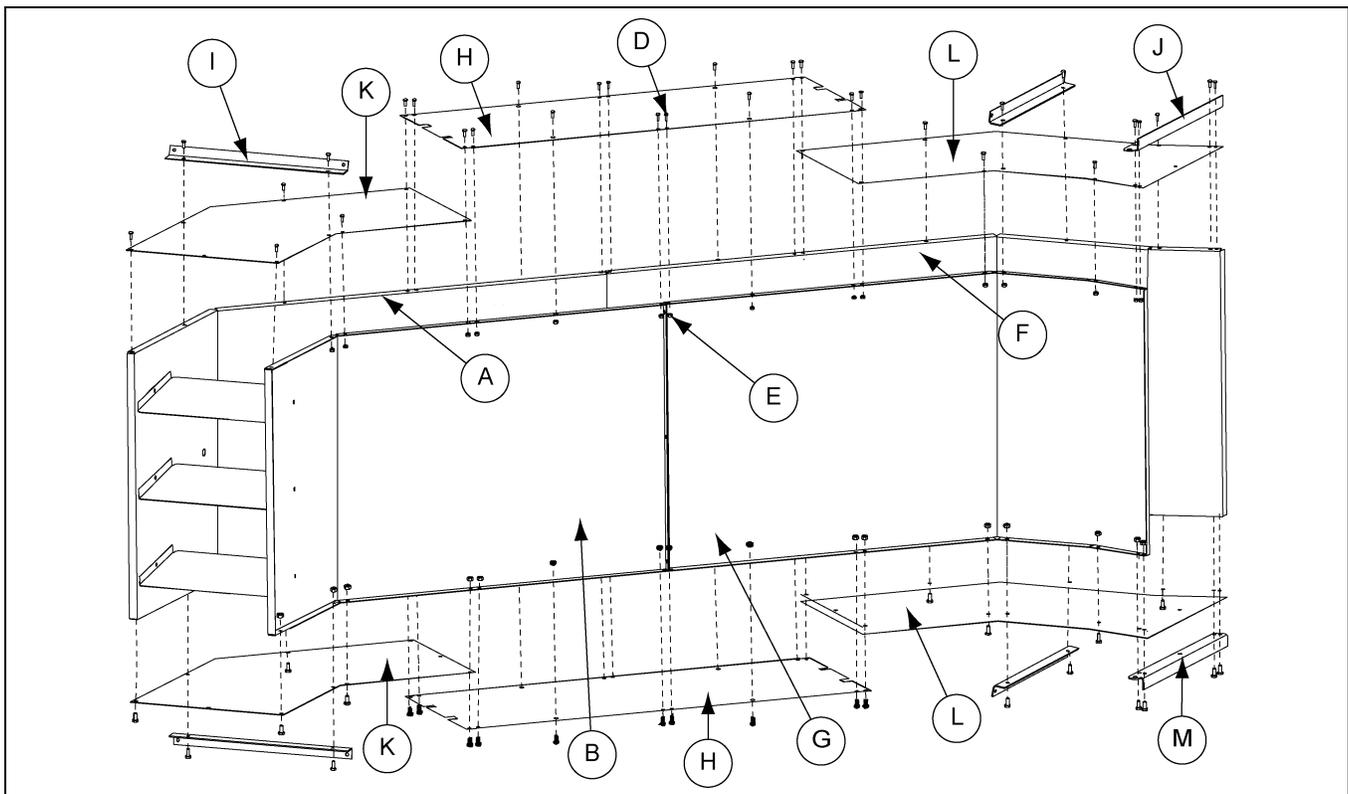
Figure 6C

Ref #	Part #	Description
A	AP-3925	Duct Exit Large Side
B	AP-3924	Duct Exit Small Side
D	S-6606	5/16" x 3/4" Flange Bolts
E	S-3611	5/16" Flange Nut
F	AP-3923	Duct Inlet Large Side
G	AP-3922	Duct Inlet Small Side

Ref #	Part #	Description
H	AP-3927	Duct Middle Top/Bottom (2)
I	AP-3937	Duct Support Horizontal (4)
J	AP-3931	Pivot Angle Top
K	AP-3928	Duct Exit Top/Bottom (2)
L	AP-3926	Duct Inlet Top/Bottom (2)
M	AP-3932	Pivot Angle Bottom

Assembling the Bottom Duct

1. Repeat *Steps 1-7 on Pages 30 and 31* to assemble the bottom duct assembly.

Installing the Duct Support Stands

1. Attach duct support left vertical (A) and duct support right vertical (B) to the four (4) duct support horizontals (C) using eight (8) 5/16" x 3/4" flange bolts (D) and 5/16" flange nuts (E). *(See Figure 6D.)* Repeat the same for opposite end (EXIT end).

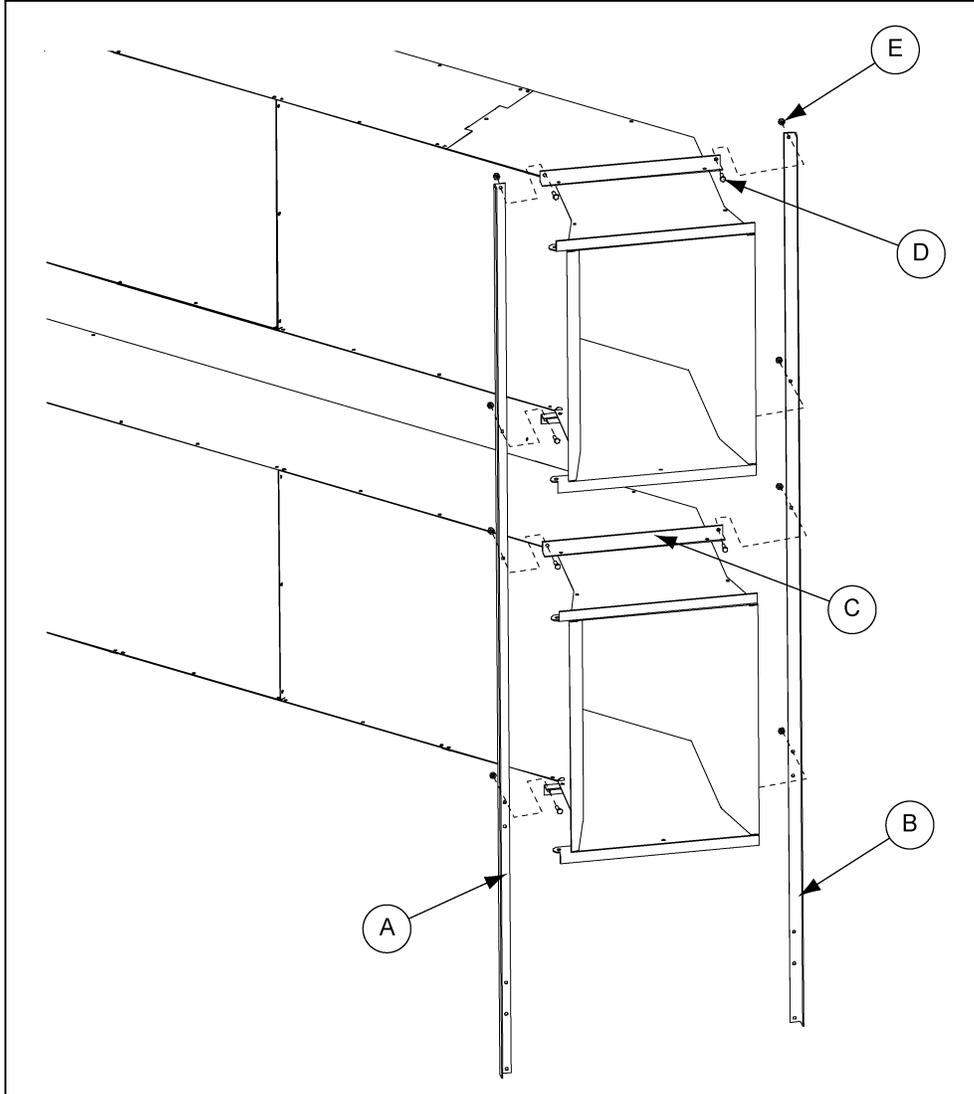   **NOTE:** *The floor area that the duct work will be rolling on must be level.*

Figure 6D

Ref #	Part #	Description
A	AP-3935	Duct Support Left Vertical (2)
B	AP-3936	Duct Support Right Vertical (2)
C	AP-3937	Duct Support Horizontal (4)
D	S-6606	5/16" x 3/4" Flange Bolt
E	S-3611	5/16" Flange Nut

2. Attach duct support big crosses (H) to duct support left vertical (A) and duct support right vertical (B) using four (4) 5/16" x 3/4" flange bolt (D) and 5/16" flange nut (E). Attach duct support small crosses (I) and caster assembly exit (F) to vertical supports as shown using six (6) 5/16" x 3/4" flange bolt (D) and flange nut (E) as shown. *(See Figure 6F on Page 34.)* Repeat on inlet side with caster assembly inlet (G). *(See Figures 6E below and 6F on Page 34.)*
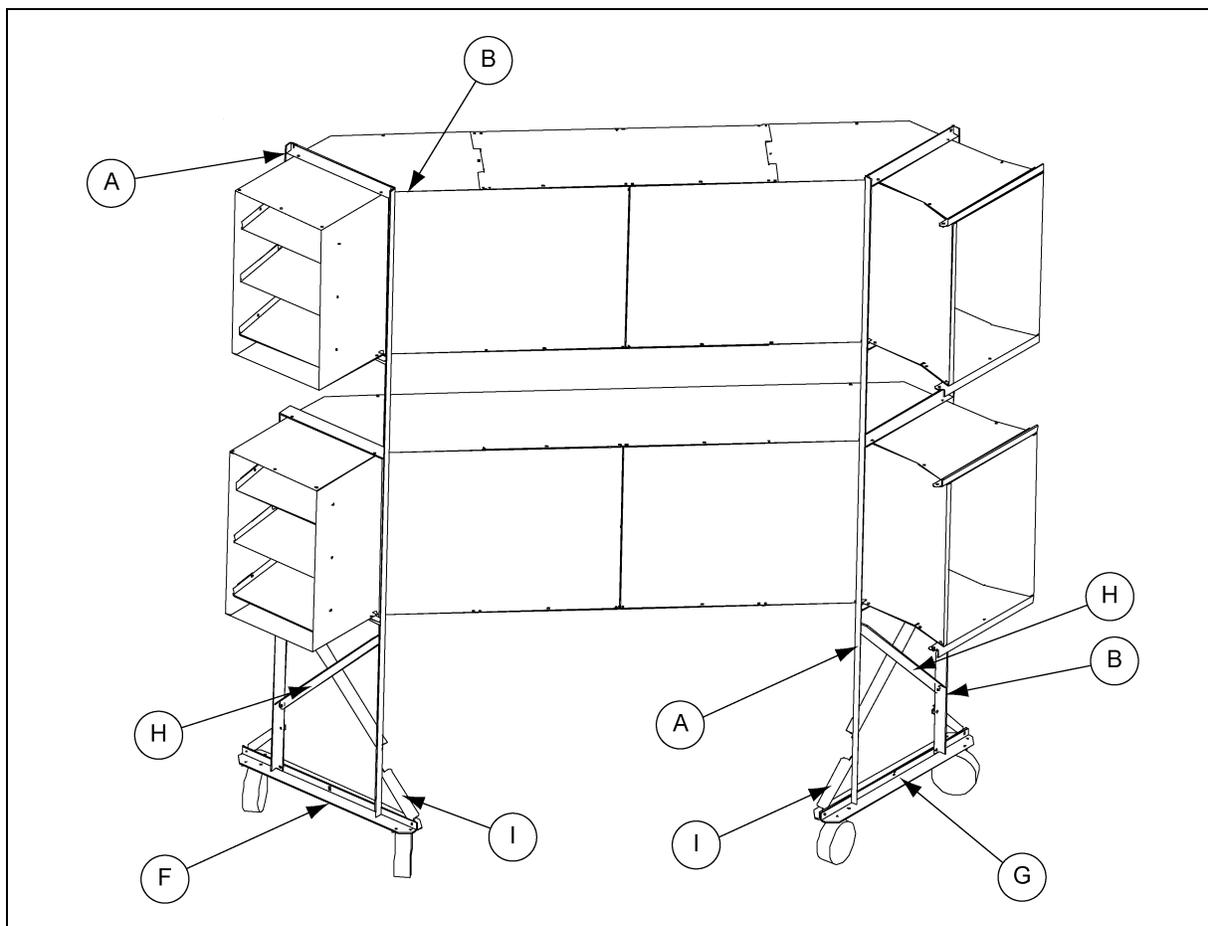
Figure 6E

Ref #	Part #	Description
A	AP-3935	Duct Support Left Vertical
B	AP-3936	Duct Support Right Vertical
F	AP-4049	Caster Assembly Exit
G	AP-4048	Caster Assembly Inlet
H	AP-3938	Duct Support Big Cross
I	AP-3939	Duct Support Small Cross

Standard **EXIT** caster to supports

Standard **INLET** caster to supports
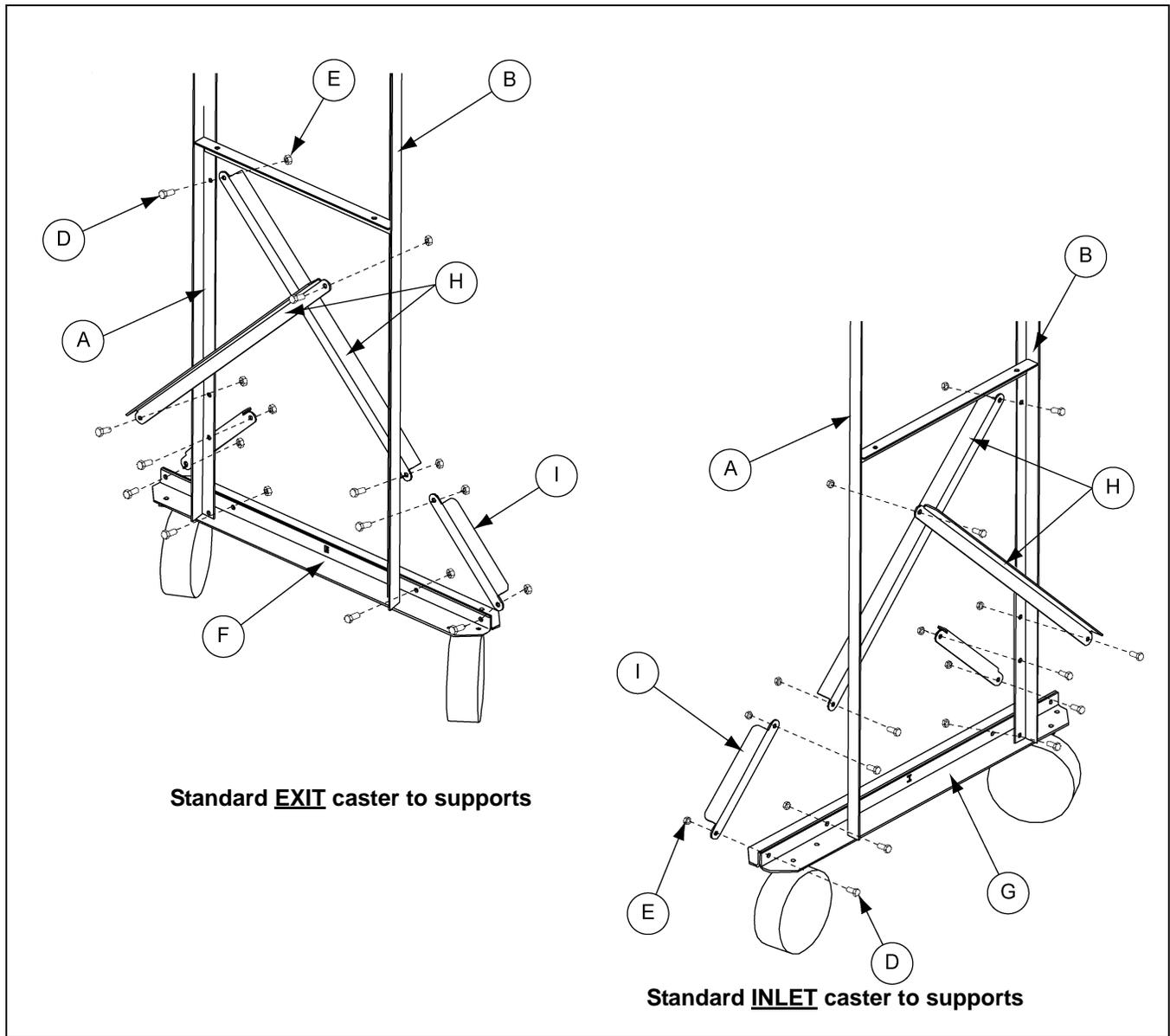
Figure 6F

Ref #	Part #	Description
A	AP-3935	Duct Support Left Vertical
B	AP-3936	Duct Support Right Vertical
D	S-6606	5/16" x 3/4" Flange Bolt
E	S-3611	5/16" Flange Nut
F	AP-4049	Caster Assembly Exit (Includes two (2) base angles and two (2) casters.)
G	AP-4048	Caster Assembly Inlet (Includes two (2) base angles and two (2) casters.)
H	AP-3938	Duct Support Big Cross (2)
I	AP-3939	Duct Support Small Cross (2)

Exhaust Extension Assembly

NOTE: *See building specification section on Page 16 for installing duct and inlet mounting plates to building (A and B).*
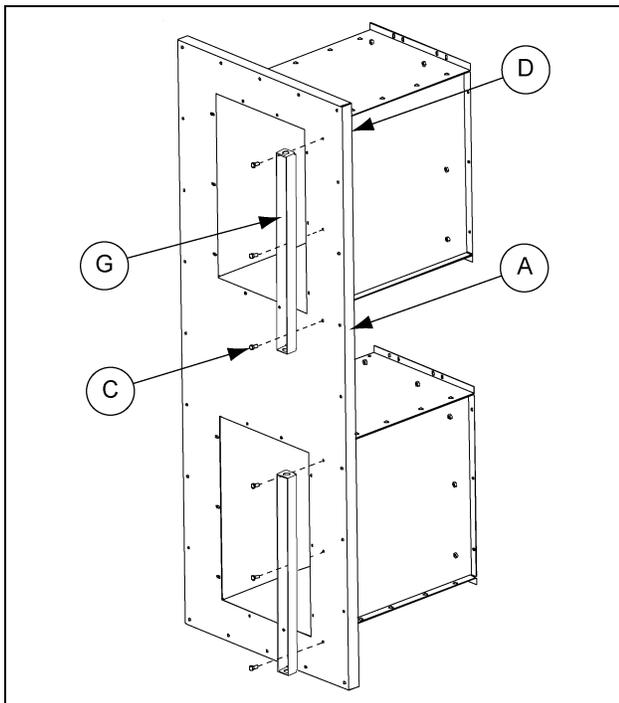
1. Attach four (4) exhaust extension sides (B and E) to the duct mounting plate (A) using three (3) 5/16" x 3/4" flange bolts (C) and 5/16" flange nuts (D) per each side. *(See Figure 6G.)*

NOTE: *Exhaust extension sides mount to the "flanged" side of the duct mounting plate.*
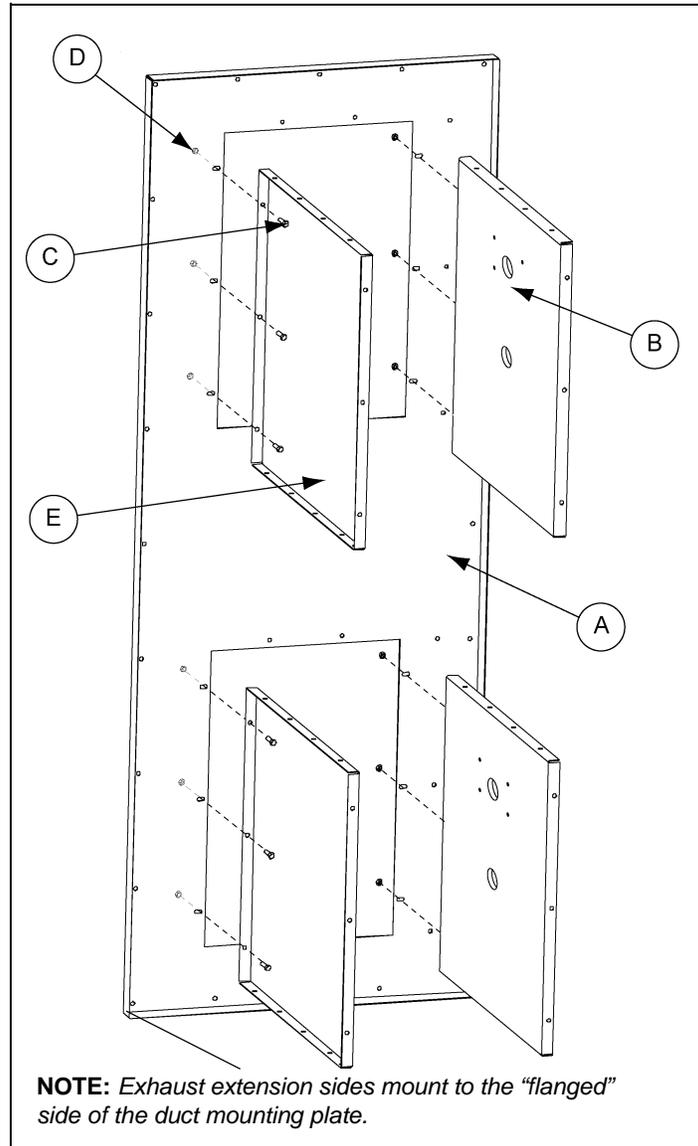
Figure 6G

Ref #	Part #	Description
A	AP-3930	Duct Mounting Plate
B	AP-5286A	Exhaust Extension Sides with Holes for Sensor Mounting (2)
C	S-6606	5/16" x 3/4" Flange Bolt
D	S-3611	5/16" Flange Nut
E	AP-5286	Exhaust Extension Sides (2)

6. Assembly

2. Attach four (4) exhaust extension top/bottoms (F) to exhaust extension sides (B and E) using eight (8) 5/16" x 3/4" flange bolts (C) and 5/16" flange nuts (D) per each side. *(See Figure 6H.)*
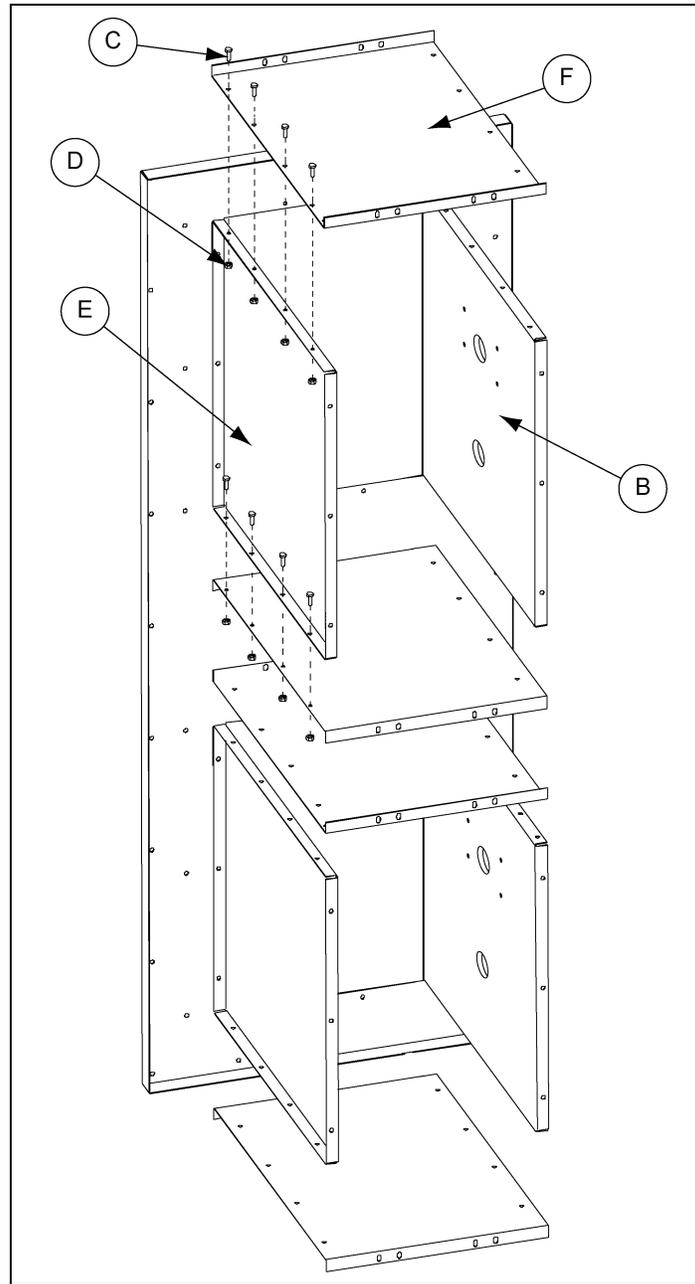
Figure 6H

Ref #	Part #	Description
B	AP-5286A	Exhaust Extension Sides with Holes for Sensor Mounting (2)
C	S-6606	5/16" x 3/4" Flange Bolt
D	S-3611	5/16" Flange Nut
E	AP-5286	Exhaust Extension Sides (2)
F	AP-5285	Exhaust Extension Top/Bottom (4)

3. Fasten the four (4) exhaust extension top/bottoms (F) to the duct mounting plate (A) using eight (8) 5/16" x 3/4" flange bolt (C) and 5/16" flange nut (D). *(See Figure 6I.)*
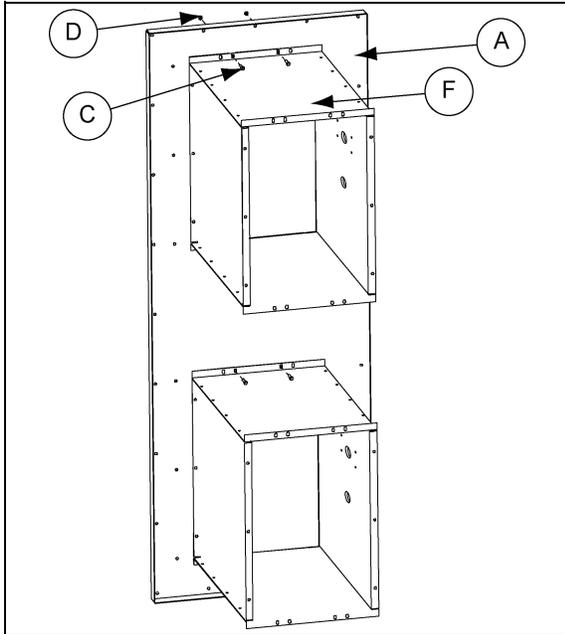
Ref #	Part #	Description
A	AP-3930	Duct Mounting Plate
C	S-6606	5/16" x 3/4" Flange Bolt
D	S-3611	5/16" Flange Nut
F	AP-5285	Exhaust Extension Top/Bottom (4)

Figure 6I

4. Attach duct pivot brackets (G) to duct mounting plate (A) using three (3) 5/16" x 3/4" flange bolt (C) and 5/16" flange nut (D) per each bracket. *(See Figure 6J.)*

Ref #	Part #	Description
A	AP-3930	Duct Mounting Plate
C	S-6606	5/16" x 3/4" Flange Bolt
D	S-3611	5/16" Flange Nut
G	AP-3933	Duct Pivot Brackets

Figure 6J

5. Follow **duct** mounting plate rough opening detail *on Page 18* and attach exhaust extension assembly to the outside of the rough opening using 3/8" x 3" lag screw (S-9046). The flanges on the duct mounting plate will face outward and J-channel for the outside metal will butt up against the flanges. (**NOTE:** *Different hardware may need to be used depending on the type of building materials used.*)

Fan and Heater Assembly

NOTE: *The heater inlet shall be located in accordance with the applicable building code or mechanical code for ventilation air.*

1. Attach three (3) fan support middles (B) to fan support sides (A) using twelve (12) 5/16" x 3/4" flange bolt (C) and 5/16" flange nut (D) per each side. *(See Figure 6K.)*
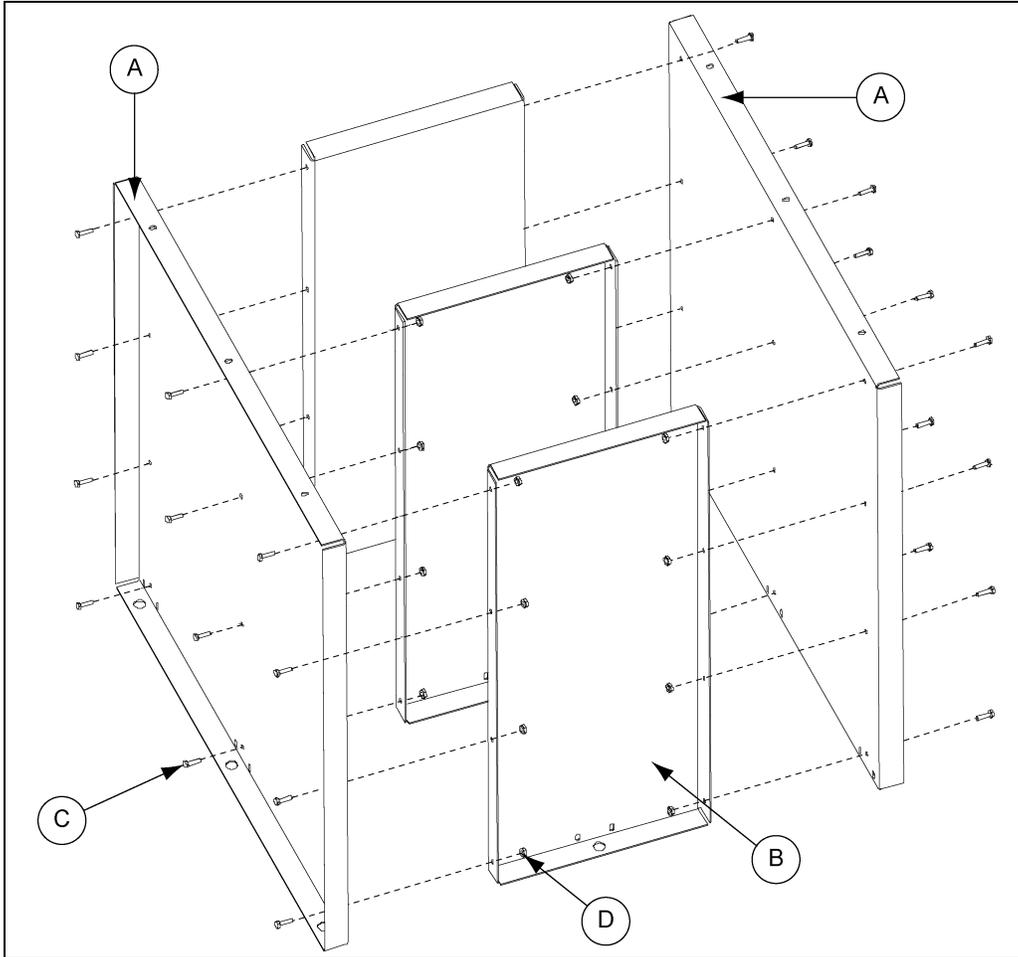

Figure 6K

Ref #	Part #	Description
A	AP-3943	Fan Support Side (2)
B	AP-5350	Fan Support Middle (3)
C	S-6606	5/16" x 3/4" Flange Bolt
D	S-3611	5/16" Flange Nut

2. Remove all the feet from both fan housings feet and re-install six (6) of the feet onto the fan support assembly (O) and two (2) of the feet onto the fan motor support (A). *(See Figures 6L and 6M on Pages 39 and 40.)*

3. Attach fan assembly to the fan support assembly using six (6) 5/16" x 3/4" flange bolts (C) and 5/16" flange nuts (D). **NOTE:** *Middle hole will need to be drilled through bottom flange in fan.*

4. Attach top fan to the bottom fan using six (6) 5/16" x 3/4" flange bolts (C) and 5/16" flange nuts (D). **NOTE:** *Middle holes do not exist and need to be drilled through both fan flanges.*

5. Attach two (2) fan motor support verticals (E) to three (3) fan motor support horizontals (F) using twelve (12) 5/16" x 3/4" flange bolt (C) and 5/16" flange nut (D). Then, attach the fan motor support assembly to the fan housing using eight (8) 5/16" x 3/4" flange bolts (C) and 5/16" flange nuts (D). *(See Figure 6L.)*
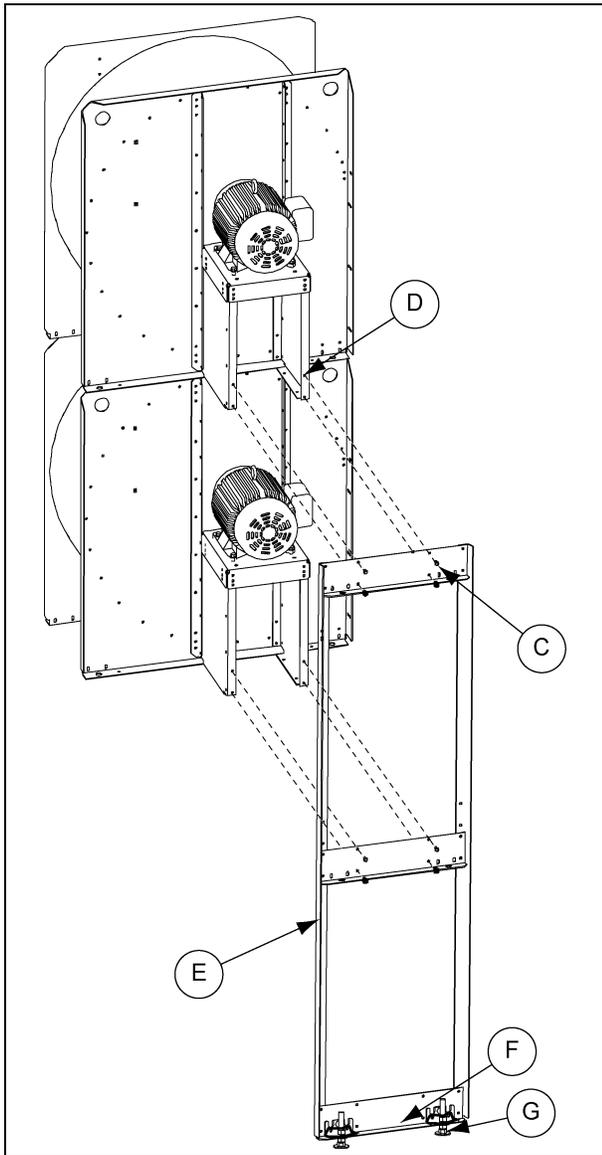

Figure 6L

Ref #	Part #	Description
C	S-6606	5/16" x 3/4" Flange Bolt
D	S-3611	5/16" Flange Nut
E	AP-3946	Fan Motor Support Vertical (2)
F	AP-3945	Fan Motor Support Horizontal (3)
G		Support Feet

6. Attach the exhaust extension assembly to the fan housings using ten (10) 5/16" x 3/4" flange bolts (C) and 5/16" flange nuts (D) per each duct. *(See Figure 6M on Page 40.)*

7. Follow **inlet** mounting plate rough opening detail *on Page 18* and attach inlet mounting plate (K) to the building using 3/8" x 3" lag bolt (S-9046). (**NOTE:** *Different hardware may need to be used depending on the type of building materials used.*)

8. Remove grills from fans and attach heater mounting plates (J) to the fan housings using the hardware that held the fan grills. *(See Figure 6M on Page 40.)*

9. Attach the heaters to the heater mounting plates (I) using eight (8) 5/16" x 3/4" flange bolts (C) and 5/16" flange nuts (D) per each heater. *(See Figure 6M on Page 40.)*

6. Assembly

10. Attach the heaters to the inlet mounting plates (K) and grill guard (Q) using eight (8) 5/16" x 3/4" flange bolts (C) and 5/16" flange nuts (D) per each heater (O). *(See Figure 6M.)*

   Use 5/16" x 3/4" flange bolts (C) and 5/16" flange nuts (D) for all hardware, except where noted.
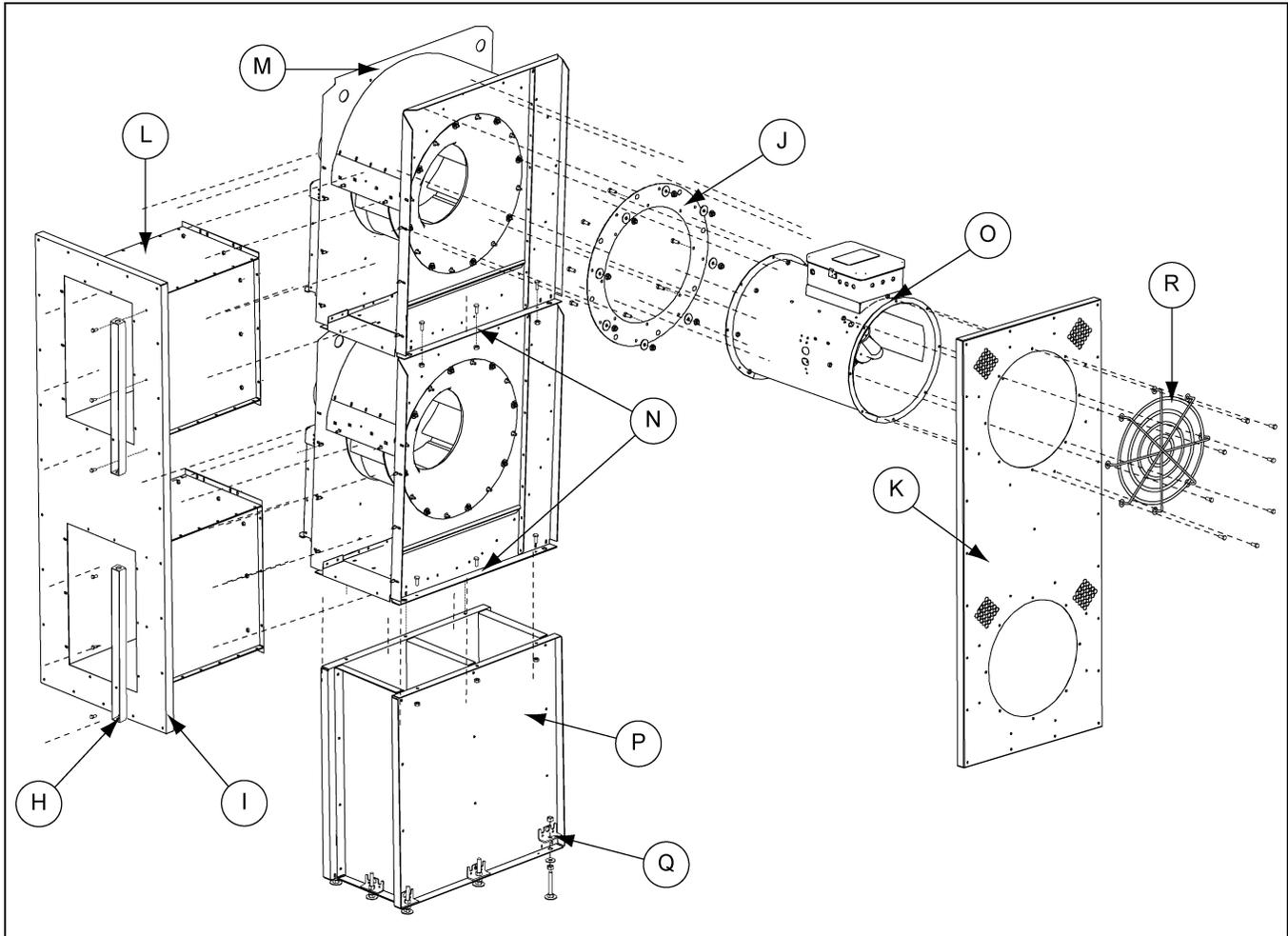

Figure 6M

Ref #	Part #	Description
H	AP-3933	Duct Pivot Brackets (2)
I	AP-3930	Duct Mounting Plate
J	C-7936-27	Heater Mounting Plate (Use fan grill hardware.)
K	AP-3940	Inlet Mounting Plate
L		Exhaust Extension Assembly
M		Fan Assembly
N		Field Drill Holes
O		Heater
P		Fan Support Assembly
Q		Re-locate feet from fan to fan support assembly.
R		Grill Guard

NOTE: *Lower heater not shown for clarity.*

11. Use proper lifting equipment to lift duct assembly into position and attach the pivot angle tops (T) and pivot angle bottom (U) on both duct assemblies to the duct pivot bracket (H) using one pivot rod (S). Secure with cotter pin (V). *(See Figure 6N.)*

    NOTE: *Ducts cutaway for clarity.*
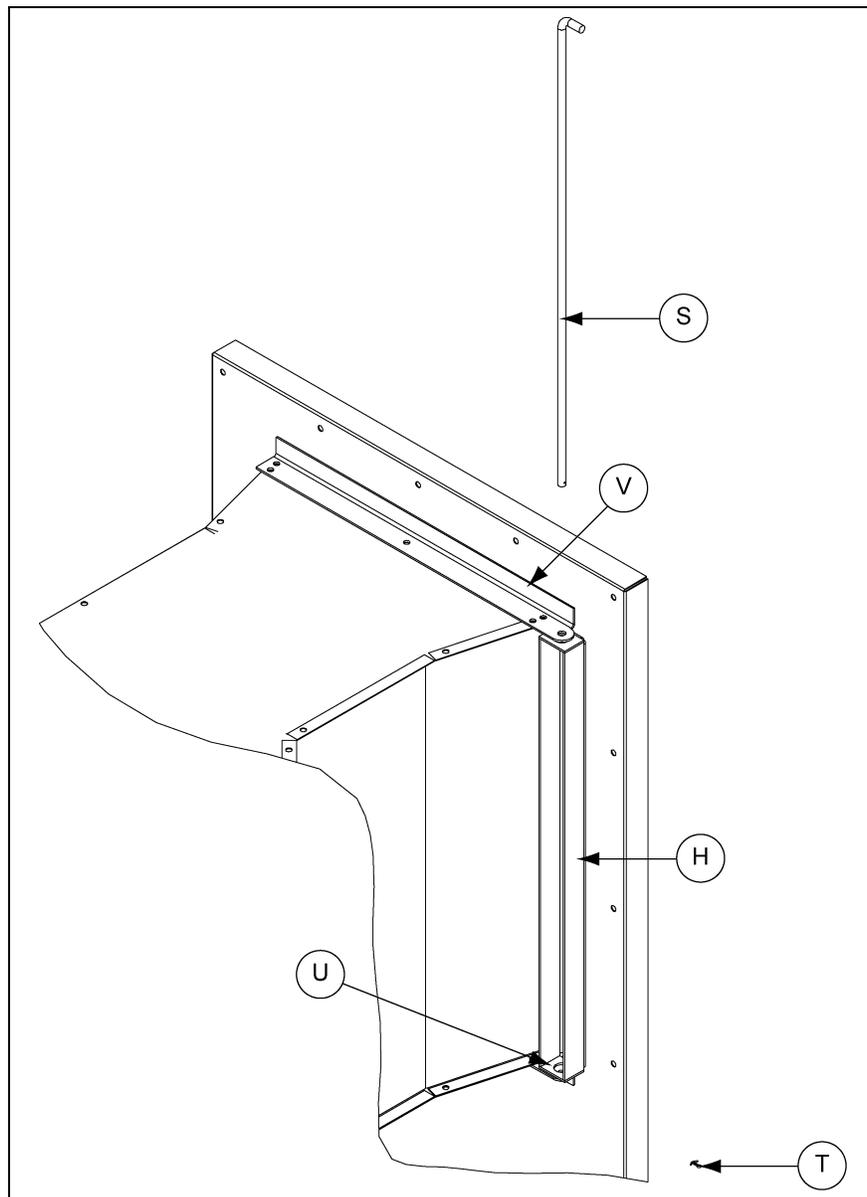
Figure 6N

Ref #	Part #	Description
H	AP-3933	Duct Pivot Bracket (1)
S	AP-3991	Pivot Rod (1)
T	AP-3931	Pivot Angle Top (1)
U	AP-3932	Pivot Angle Bottom (1)
V	S-9159	Cotter Pin (1)

Gas Piping Layout

1. Main shut-off valve must be supplied by the customer.

2. Hook-up wiring diagrams for heaters .

Vapor Propane Gas Pipe Layout (Guidelines Only)
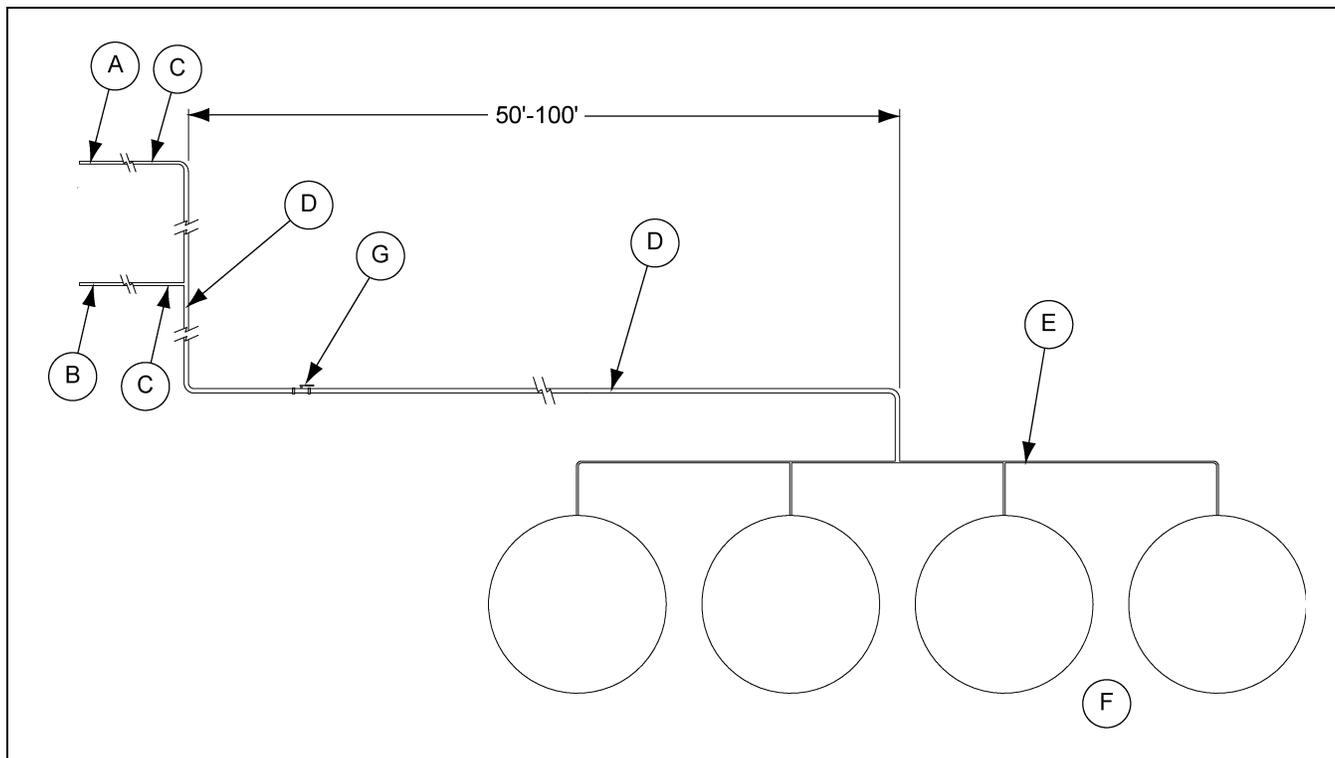
Figure 6O

Ref #	Description
A	To upper burner 2.1 million BTU/HR 15 PSI required at burner.
B	To lower burner 2.1 million BTU/HR 15 PSI required at burner.
C	1" Gas Hose
D	1-1/2" Gas Pipe
E	5/8" Gas Pipe
F	1000 Gallon Tanks 18-20 PSI at Tanks (4)
G	Manual Shutoff Valve (Supplied by Customer)

Natural Gas Pipe Layout (Guidelines Only)
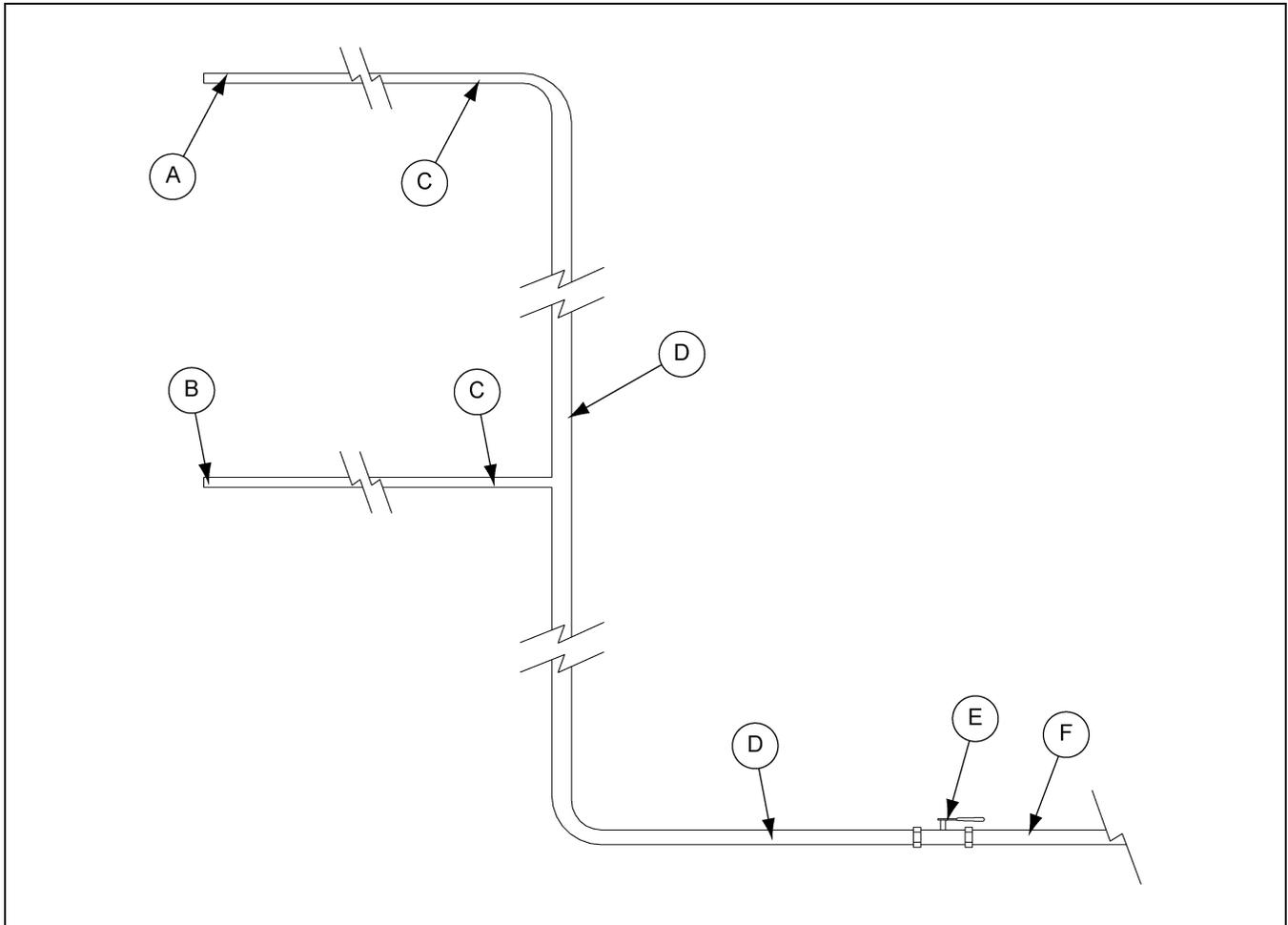
Figure 6P

Ref #	Description
A	To upper burner 2.1 million BTU/HR 10 PSI required at burner.
B	To lower burner 2.1 million BTU/HR 10 PSI required at burner.
C	1" Gas Hose
D	2" Gas Pipe
E	Manual Shutoff Valve (Customer Supplied)
F	To Natural Gas Supply

Inlet Door Assembly

NOTE: *See building specification section on Page 19 for mounting inlet door tracks.*

1. Slide two (2) rollers (B) into each inlet door track assembly (A).

2. Slide rollers (B) shafts through brackets on inlet door assembly (C).

3. Mount inlet door track assembly (A) to the wall.
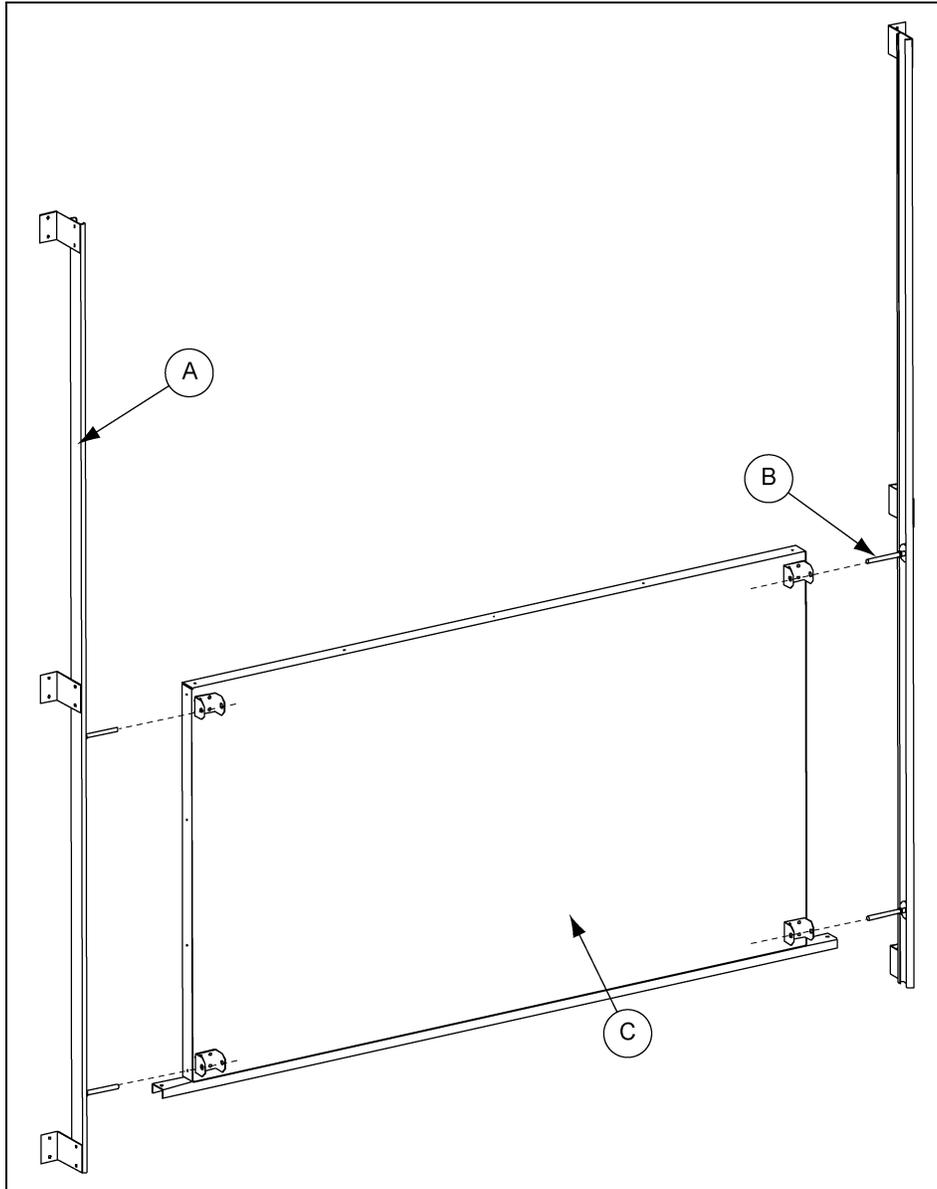
Figure 6Q

Ref #	Part #	Description
A	AP-4002	Inlet Door Track Assembly (Includes Track and Standoff Brackets) (2)
B	AP-3963	Rollers (4)
C	AP-4003	Inlet Door Assembly (Includes Both Sides of Door and Roller Brackets)

Installing the Truck Positioning Sensors

1. Locate the mounting posts 12' from the end of the building along both walls.

2. Install the sensors (A) on the post along the wall that has the ducts.

    a. Using pipe clamps, install each sensor (A) on opposite sides of the pipe.

    b. Position duct work along the wall.

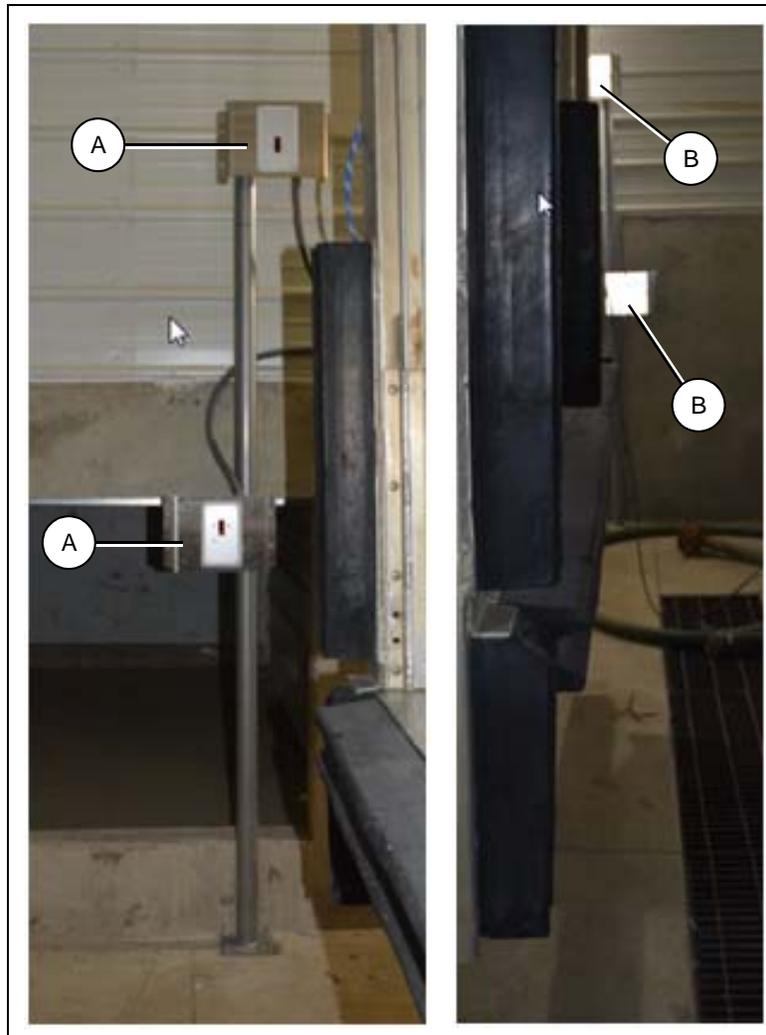   c. If the duct work is blocking a sensor (A), move them up or down until they have a clear line of site to the reflectors (B) on the opposite side. *(See Figure 7A.)*

Figure 7A

Ref #	Description
A	Sensors
B	Reflectors

3. Install the reflectors (B) onto the pipe directly across from the sensors (A). Position the reflectors (B) so the sensors (A) align in the middle of the reflector (B).

Installing the Walkthrough Door Contacts

Door contacts must be installed onto each walkthrough door.

IMPORTANT: *The door contact side surfaces must align flush and parallel and the facing surfaces must be within a maximum of 1/4" apart. The writing on the face of each door contact must be in the same orientation.*

1. Install one door contact mounting bracket (A) to the door using the horizontal slots.

2. Install one door contact mounting bracket (A) to the door jamb (G) using the vertical slots.

3. Install the moving door contact (E) to the bracket installed on the door.

4. Install the fixed door contact (F) to the bracket installed on the door jamb (G).

   NOTE: *The contact cord must be mounted on the bottom.*

5. Use the slots to adjust sensors and brackets as needed to align properly. *(See Figure 7B.)*
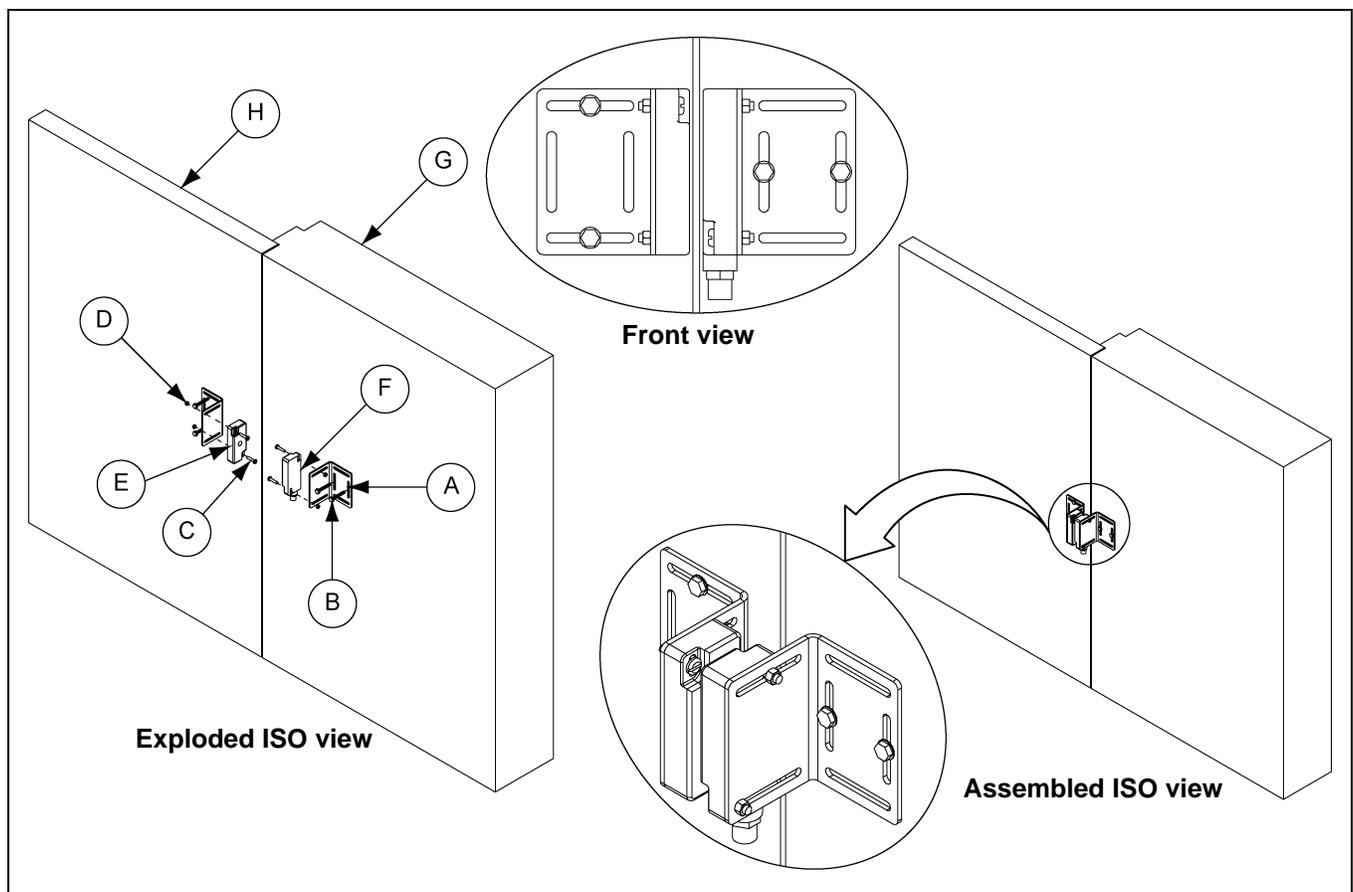
Figure 7B

Ref #	Part #	Description
A	AP-5363	Man Door Contactor Bracket (2)
B	S-7419	Screw, SDS #10-16 x 1-1/4" HWH (4)
C	2FH0775	Screw, MS #8-32 x 3/4" PHS ZN (4)
D	S-6525	Hex Nut #8-32 ZN Grade 2 (4)

Ref #	Description
E	Door Contactor - Moving (1)
F	Door Contactor - Fixed (1)
G	Walk Through Door Jamb (1)
H	Walk Through Door (1)

Installing the Overhead Door Contacts

Door contacts must be installed onto each overhead door. *(See Figure 7C.)*

IMPORTANT: *The door contact side surfaces must align flush and parallel and the facing surfaces must be within a maximum of 1/4" apart. The writing on the face of each door contact must be in the same orientation.*

1. Install the jamb bracket (A) to the overhead door jamb (G).

2. Install the door bracket (B) to the door.

3. Install the moving door contact (F) to the bracket installed on the door.

4. Install the fixed door contact to the bracket installed on the door jamb.

   NOTE: *The contact cord must be mounted on the bottom.*

5. Use the slots to adjust sensors and brackets as needed to align properly.
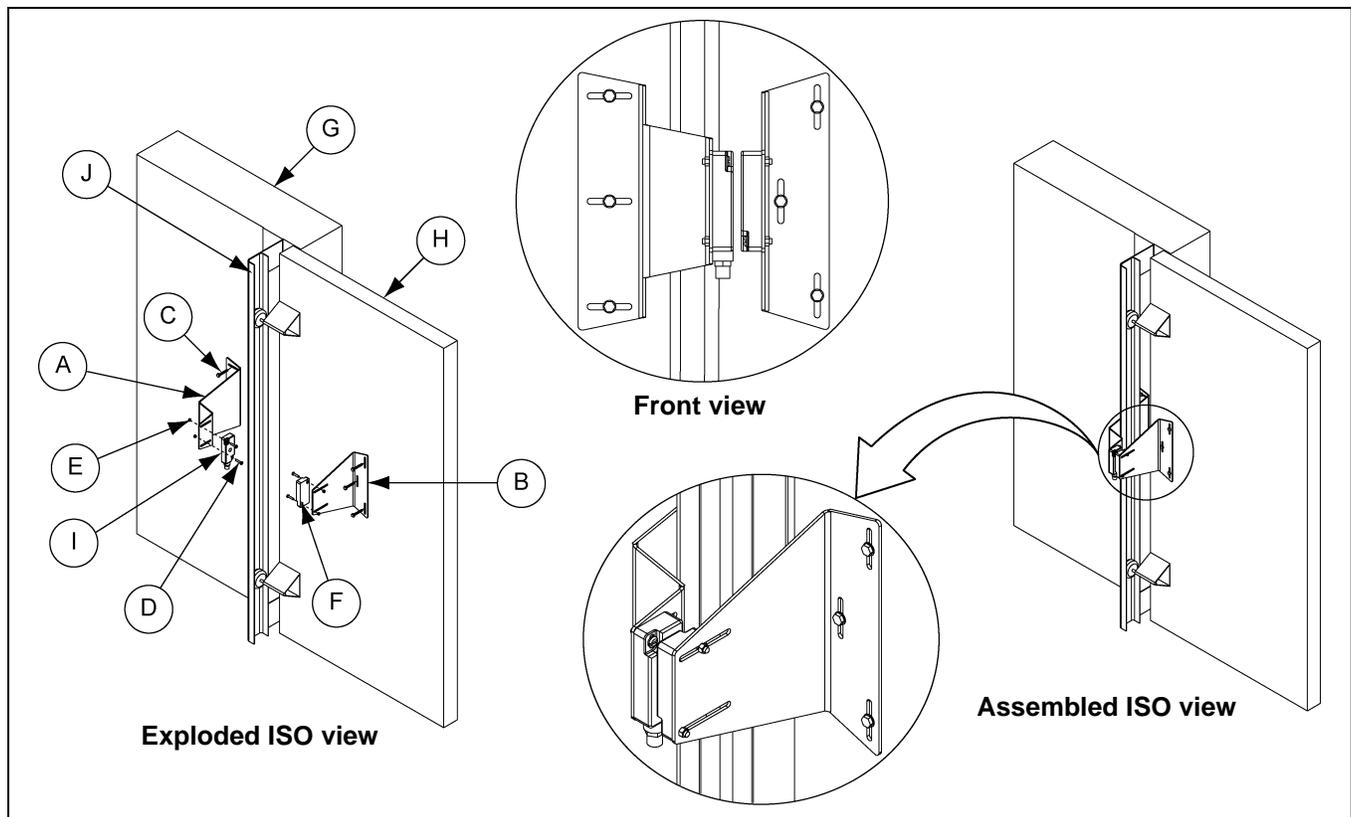
Figure 7C

Ref #	Part #	Description
A	AP-5364	Overhead Door Contact - Jam Bracket (1)
B	AP-5365	Overhead Door Contact - Door Bracket (1)
C	S-7419	Screw, SDS #10-16 x 1-1/4" HWH (6)
D	2FH0775	Screw, MS #8-32 x 3/4" PHS ZN (4)
E	S-6525	Hex Nut #8-32 ZN Grade 2 (4)

Ref #	Description
F	Door Contactor - Moving
G	Overhead Door Jam (1)
H	Overhead Door (1)
I	Door Contactor - Fixed (1)
J	Door Track

Installing the Pull Cable Emergency Stop

1. Install the eye screws 42" from the floor the length of the building along both walls. Space the eye screws 10' apart. Route the cable around doors by installing pulleys as necessary.

2. Connect the cable to emergency stop using cable clamps.

3. Pull cable taught without triggering the pull cord mechanism and fasten to the end eye screw. Adjust the turnbuckle to provide the proper pretention in the cable that will center the arrow in the indicator dial.

4. Pull the cord to ensure it triggers the emergency stop at varying points along the building.

Installing Air Temperature Sensors

Exhaust RTD Temperature Sensors

The two (2) RTD sensors are installed on the exhauster extension sides, one in the upper duct and one in the lower duct. The modulation valves on each heater will automatically adjust to maintain these two (2) sensors to a temperature of 250° F.

To install the RTD air temperature sensor (AP-4072): *(See Figure 7D.)*

1. Insert the (AP-4072) RTD air sensor through the 7/8" diameter hole (provided) in each exhaust extension side (AP-5286A) with the sensor probe protruding into the duct.

2. Secure with (FH-1309) nut.

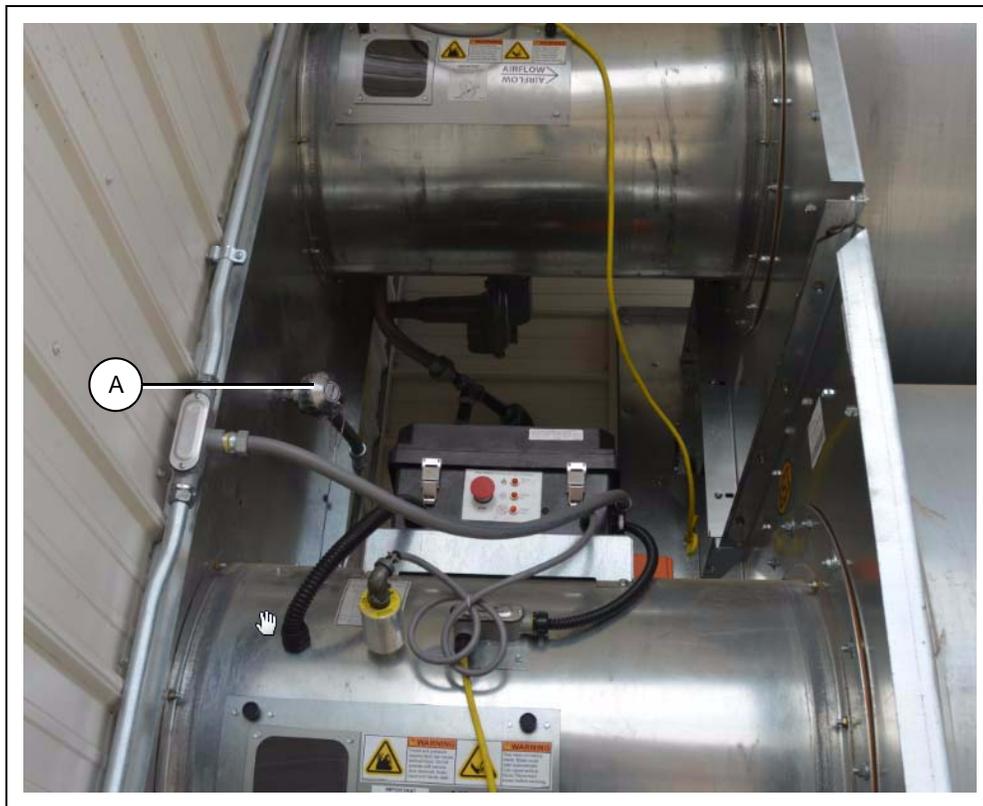| Ref #	Description
A	RTD Air Temperature Sensors

Figure 7D *RTD Air Temperature Sensor (AP-4072)*

Air Mixing Chamber RTD Sensor

The air mixing chamber RTD temperature sensor is used to cycle the heaters ON and OFF. When the mixing chamber temperature reaches 175°F, the heaters shut off. The temperature will then begin to drop and when it falls to 170°F, the heaters will turn back ON again. This process will continue throughout the pre-heat and bake cycles, maintaining the air mixing chamber temperature between 170°F-175°F.

NOTE: *The air mixing chamber temperature High and Low limits are adjustable, but require either ADMIN or AP level access.*

To install the chamber room RTD sensor: *(See Figure 7E.)*

1. Insert the (AP-4072) air sensor through the 7/8" diameter hole (provided) in the inlet mounting plate (AP-3940) located between the heaters. Ensure the sensor probe protrudes into the air mixing chamber.

2. Secure with (FH-1309) nut.

Figure 7E *Air Mixing Chamber RTD Sensors*

Ref #	Description
A	Air Mixing Chamber RTD Sensors

Installing Auxiliary Temperature Sensors

Surface Temperature Sensor

The surface temperature sensor is considered to be the most accurate of the auxiliary temperature sensors. Once the trailer is pulled into position in the building, the operator must remove the surface sensor from where it hangs on the wall (with 20' cord) and place it in the rear, right hand, corner of the trailer. This is considered to be the most difficult part of the trailer to heat up and therefore, the last section of the trailer to reach temperature. It must be carefully placed on the floor of the trailer, so that the pressure switch is activated, signaling the PLC the sensor is in place prior to starting the cycle. The set temperature of this sensor is usually 160°F, but can be adjusted.

To install and adjust the surface temperature sensor: *(See Figure 7F.)*

1. Locate the surface temperature sensor next to the truck positioning sensors in the building.

2. Use a screw driver to turn the screws to increase or decrease the amount of the pressure switch protrudes from the sensor.

   NOTE: *The limit switch in the sensor can be disabled in the control if it is not working properly.*

**Figure 7F** *Surface sensor located in trailer corner.*

IR Temperature Sensors

The IR temperature sensors monitor the temperature of the sides of the trailer. They usually reach the bake set point temperature first, as the sides of the trailer are easier to heat than the trailer floor. Each Bio-Dri II™ unit comes with two (2) IR temperature sensors. Two (2) additional IR temperature sensors are optional.

In order to reach "Bake Mode", all the auxiliary temperature sensors must reach the 160°F set point. At that point, the cycle changes from "Pre-Heat Mode" to "BakeMode". If at any time during the bake cycle, any one of the auxiliary temperature sensors falls below the bake set point temperature, the bake time will temporarily stop and then resume again once the temperature increases to the bake set point.

To install the IR temperature sensors: *(See Figure 7G.)*

1. Locate the standard IR sensors (A) on opposite sides and at opposite ends of the trailer.

2. If adding the optional two (2) IR sensors (B), locate them opposite from the standard IR sensors.
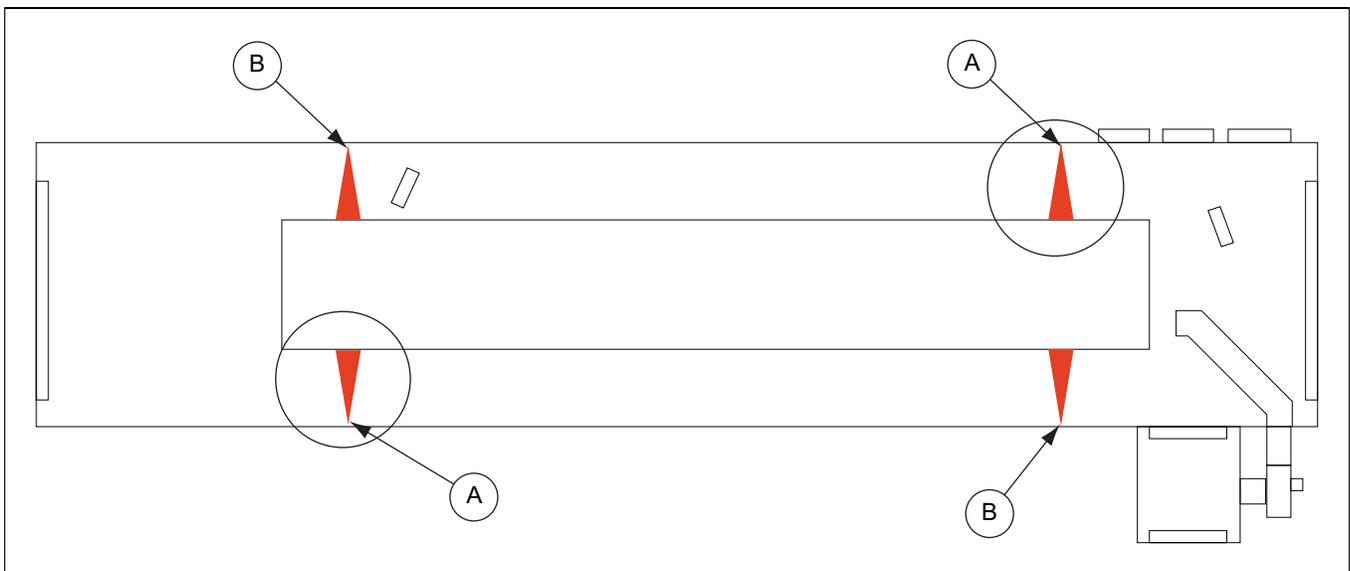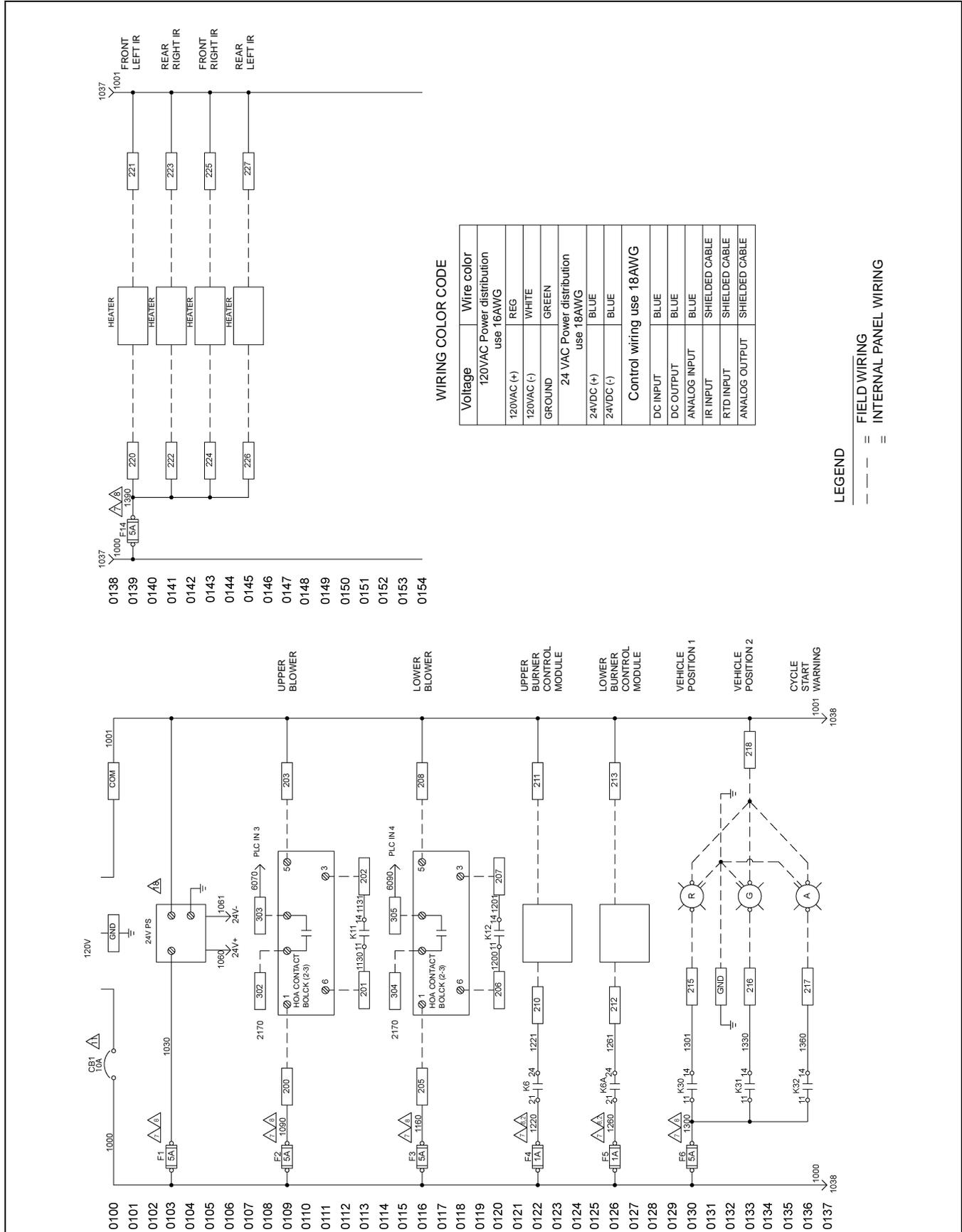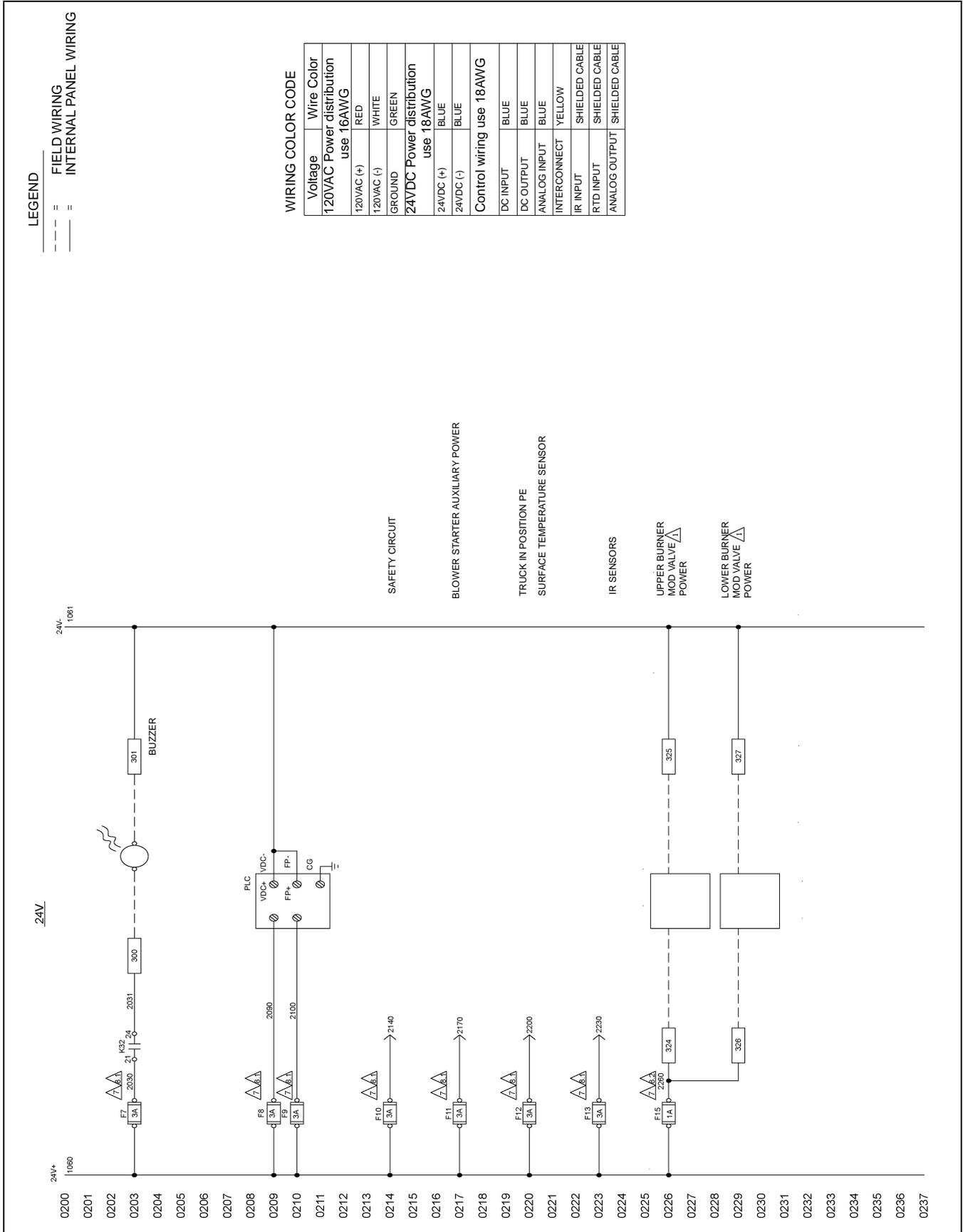

Figure 7G

Ref #	Description
A	Standard IR Sensors
B	Optional IR Sensors

120V Power

WIRING COLOR CODE

Voltage	Wire color
120VAC Power distribution use 16AWG	
120VAC (+)	REG
120VAC (-)	WHITE
GROUND	GREEN
24 VAC Power distribution use 18AWG	
24VDC (+)	BLUE
24VDC (-)	BLUE
Control wiring use 18AWG	
DC INPUT	BLUE
DC OUTPUT	BLUE
ANALOG INPUT	BLUE
IR INPUT	SHIELDED CABLE
RTD INPUT	SHIELDED CABLE
ANALOG OUTPUT	SHIELDED CABLE

LEGEND

— — — = FIELD WIRING

———— = INTERNAL PANEL WIRING

24V Power

Externally Sourced
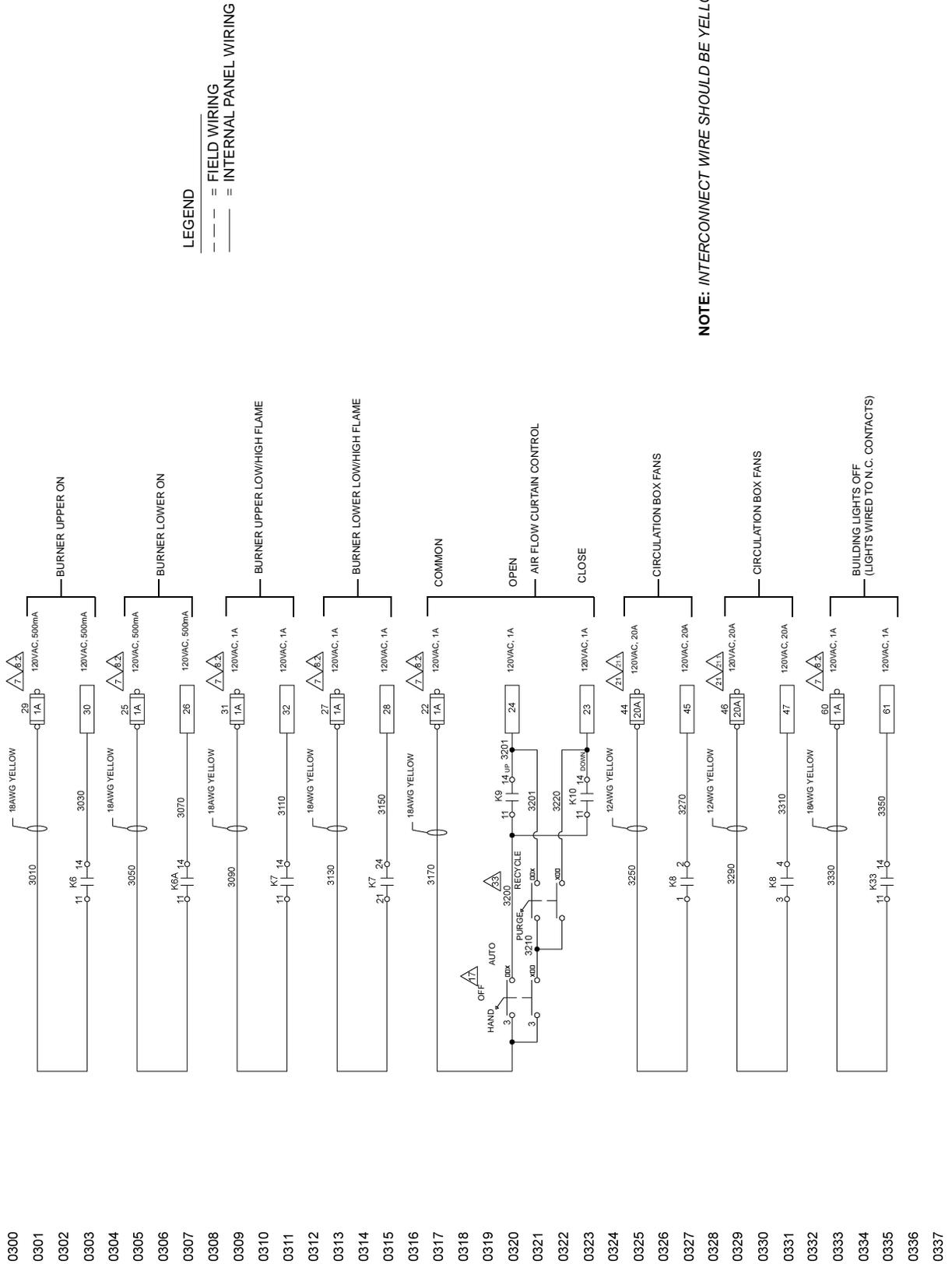
Externally Sourced (Continued)

LEGEND
– – – = FIELD WIRING
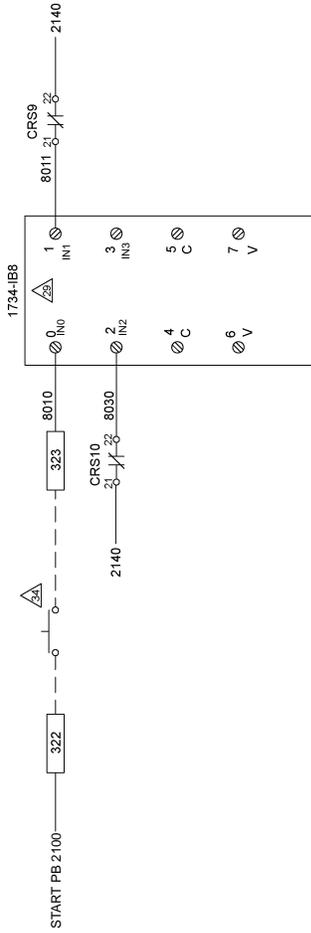——— = INTERNAL PANEL WIRING
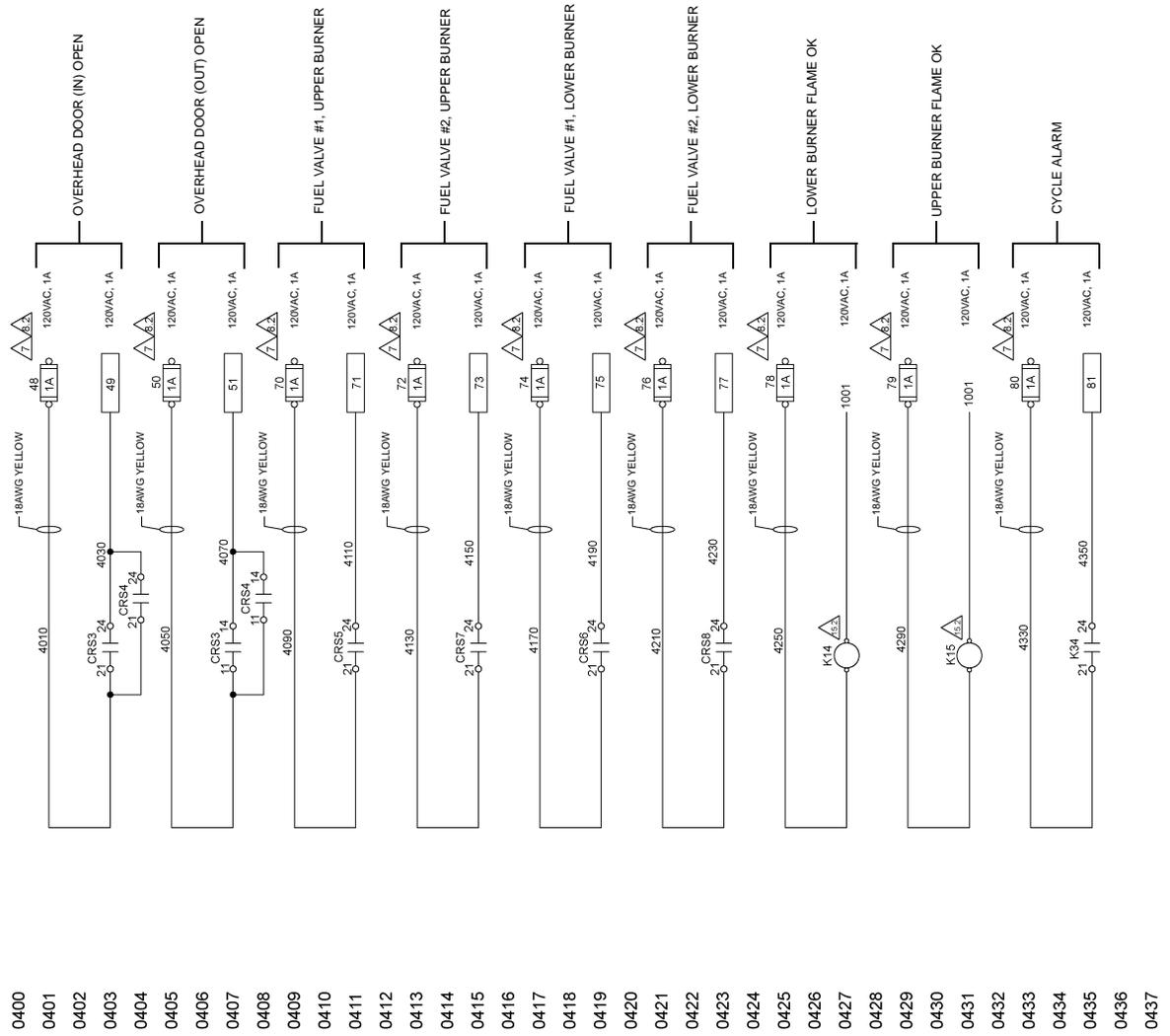
NOTE: *INTERCONNECT WIRE SHOULD BE YELLOW.*

EXTERNALLY SOURCED

Reference	Label
OVERHEAD DOOR (IN) OPEN	48 / 49
OVERHEAD DOOR (OUT) OPEN	50 / 51
FUEL VALVE #1, UPPER BURNER	70 / 71
FUEL VALVE #2, UPPER BURNER	72 / 73
FUEL VALVE #1, LOWER BURNER	74 / 75
FUEL VALVE #2, LOWER BURNER	76 / 77
LOWER BURNER FLAME OK	78 / 1001
UPPER BURNER FLAME OK	79 / 1001
CYCLE ALARM	80 / 81

Safety Circuit

PLC Inputs

WIRING COLOR CODE

Voltage	Wire Color
120VAC Power distribution use 16AWG	
120VAC (+)	RED
120VAC (-)	WHITE
GROUND	GREEN
24VAC Power distribution use 18AWG	
24VDC (+)	BLUE
24VDC (-)	BLUE
Control wiring use 18AWG	
DC INPUT	BLUE
DC OUTPUT	BLUE
ANALOG INPUT	BLUE
IR INPUT	SHIELDED CABLE
RTD INPUT	SHIELDED CABLE
ANALOG OUTPUT	SHIELDED CABLE

LEGEND
— — — = FIELD WIRING
———— = INTERNAL PANEL WIRING

SAFETY RELAY TRIPPED

UPPER BURNER CONTROL BOARD FLAME OK

LOWER BURNER CONTROL BOARD FLAME OK

UPPER FAN STARTER AUX

LOWER FAN STARTER AUX

SURFACE TEMPERATURE SWITCH IN POSITION

CABLE SWITCH 1 TRIPPED

CABLE SWITCH 2 TRIPPED

OVERHEAD DOOR (IN) TRIPPED

OVERHEAD DOOR (OUT) TRIPPED

MAN DOOR 1 OPENED TRIPPED

MAN DOOR 2 OPENED TRIPPED

MAN DOOR 3 OPENED TRIPPED

PANEL E-STOP PUHSED

VEHICLE POSITION PHOTOEYE REAR

VEHICLE POSITION PHOTOEYE FRONT

PLC INPUTS

IN0 IN1 IN2 IN3 IN4 IN5 IN6 IN7 IN8 IN9 IN10 IN11 IN12 IN13 IN14 IN15

5021
6030 6050
303 305 307 105 115 125 135 145 155 165 175 311 1061 314 1061
6070 6090 6110 5070 5071 5072 5073 5074 5140 5141 5142 6290 312 6310 315
302 304 306 310 313

K15 14 K14 14
11 11

2140 2140 2170 2170 2170 2200

REFERENCE PAGE 1

PAGE 5

0600
0601
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0637

PLC Outputs

LEGEND
--- = FIELD WIRING
—— = INTERNAL PANEL WIRING

WIRING COLOR CODE

Voltage	Wire Color
120VAC Power distribution use 16AWG	
120VAC (+)	RED
120VAC (-)	WHITE
GROUND	GREEN
24VAC Power distribution use 18AWG	
24VDC (+)	BLUE
24VDC (-)	BLUE
Control wiring use 18AWG	
DC INPUT	BLUE
DC OUTPUT	BLUE
ANALOG INPUT	BLUE
IR INPUT	SHIELDED CABLE
RTD INPUT	SHIELDED CABLE
ANALOG OUTPUT	SHIELDED CABLE

UPPER BURNER ON

BURNERS LOW/HIGH

BLOWER (UPPER) STARTER

BLOWER (LOWER) STARTER

CIRCULATION FANS RELAY

CURTAIN UP

CURTAIN DOWN

SURFACE TEMPERATURE SENSOR CONFIRM

BUILDING LIGHTS OFF

VEHICLE POSITION 1

VEHICLE POSITION 2

CYCLE START WARNING

CYCLE STARTED PL

LOWER BURNER ON

CYCLE ALARM

PLC OUTPUTS

| OUT0 | OUT1 | OUT2 | OUT3 | OUT4 | OUT5 | OUT6 | OUT7 | OUT8 | OUT9 | OUT10 | OUT11 | OUT12 | OUT13 | OUT14 | OUT15 |

0700
0701
0702
0703
0704
0705
0706
0707
0708
0709
0710
0711
0712
0713
0714
0715
0716
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0730
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0732
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0734
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0736
0737

Analog Inputs

24V DIGITAL INPUT

1734-IB8

START PB 2100

322

CRS10
21 22

2140

323   8010

CRS9
21 22

8011   2140

△34

△29

IN0 0 / IN1 1
IN2 2 / IN3 3
C 4 / C 5
V 6 / V 7

ANALOG INPUT

1734-SC-IF4U

△2

IR SENSOR #1

2230   400
1061   401

OUT-mV/mA
AMB
GND

+8..36 VDC
GND

402   8131   410 → 2230
403   8151   411 → 1061

CH 0+ 0
CH 2+ 1
CH 0- 2
CH 2- 3

IR SENSOR #2

2230   405
1061   406

OUT-mV/mA
AMB
GND

+8..36 VDC
GND

407   8171   415 → 2230
408   8191   416 → 1061

8170
8190
8150

CH 1+ 4
CH 3+ 5
CH 1- 6
CH 3- 7

IR SENSOR #3 (OPTIONAL)

412 → 2230
413 → 1061

IR SENSOR #4 (OPTIONAL)

417 → 2230
418 → 1061

WIRING COLOR CODE

Voltage	Wire Color
120VAC Power distribution use 16AWG	
120VAC (+)	RED
120VAC (-)	WHITE
GROUND	GREEN
24VAC Power distribution use 18AWG	
24VDC (+)	BLUE
24VDC (-)	BLUE
Control wiring use 18AWG	
DC INPUT	BLUE
DC OUTPUT	BLUE
ANALOG INPUT	BLUE
IR INPUT	SHIELDED CABLE
RTD INPUT	SHIELDED CABLE
ANALOG OUTPUT	SHIELDED CABLE

LEGEND

– – – = FIELD WIRING
──── = INTERNAL PANEL WIRING

0800
0801
0802
0803
0804
0805
0806
0807
0808
0809
0810
0811
0812
0813
0814
0815
0816
0817
0818
0819
0820
0821
0822
0823
0824
0825
0826
0827
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0829
0830
0831
0832
0833
0834
0835
0836
0837

RTD Inputs

Analog Outputs

ANALOG OUTPUTS

LOWER BURNER MODULATING VALVE

UPPER BURNER MODULATING VALVE

1734-OE2V

Terminal	Label
1 OUT1	BLACK 10011 — 445
3 GND	SHLD 10031 — 446
5 C	RED 10051 — 447
7 V	
0 OUT0	BLACK 10010 — 440
2 GND	SHLD 10030 — 441
4 C	RED 10050 — 442
6 V	

WIRING COLOR CODE

Voltage	Wire Color
120VAC Power distribution use 16AWG	
120VAC (+)	RED
120VAC (-)	WHITE
GROUND	GREEN
24VAC Power distribution use 18AWG	
24VDC (+)	BLUE
24VDC (-)	BLUE
Control wiring use 18AWG	
DC INPUT	BLUE
DC OUTPUT	BLUE
ANALOG INPUT	BLUE
IR INPUT	SHIELDED CABLE
RTD INPUT	SHIELDED CABLE
ANALOG OUTPUT	SHIELDED CABLE

LEGEND
– – – = FIELD WIRING
——— = INTERNAL PANEL WIRING

1000
1001
1002
1003
1004
1005
1006
1007
1008
1009
1010
1011
1012
1013
1014
1015
1016
1017
1018
1019
1020
1021
1022
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1024
1025
1026
1027
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Panel Layout

> **WARNING**
>
> *Holes can only be drilled through the bottom of the control box. Do not drill holes through the back of the panel or sides.*
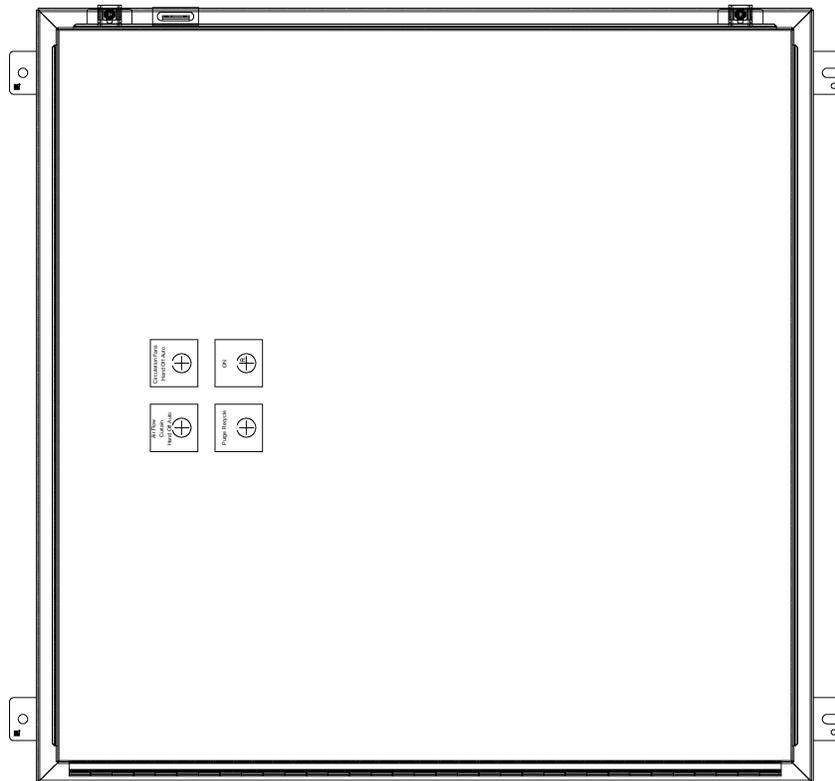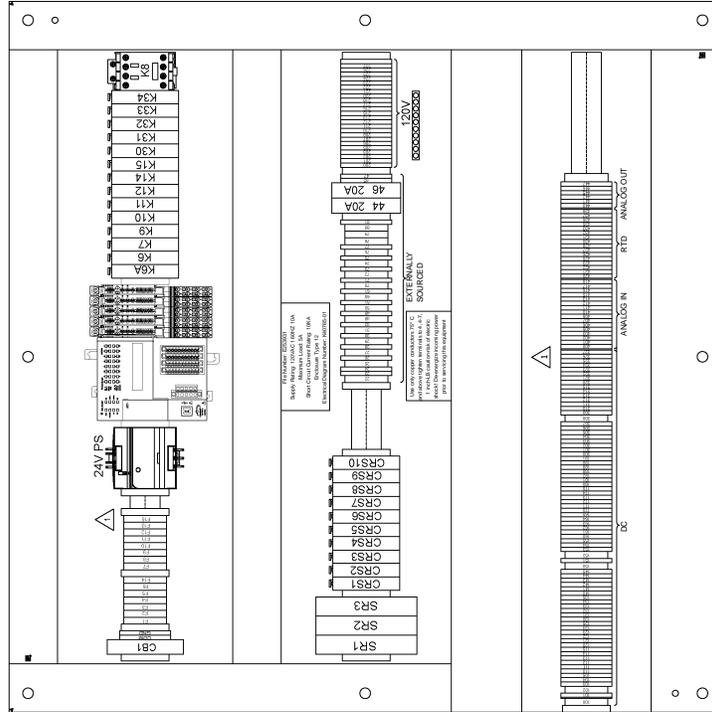
Top and bottom panels

Bio-Dri II™ Cycle Start/Stop Control (AP-5279)

Figure 9A *Front View*
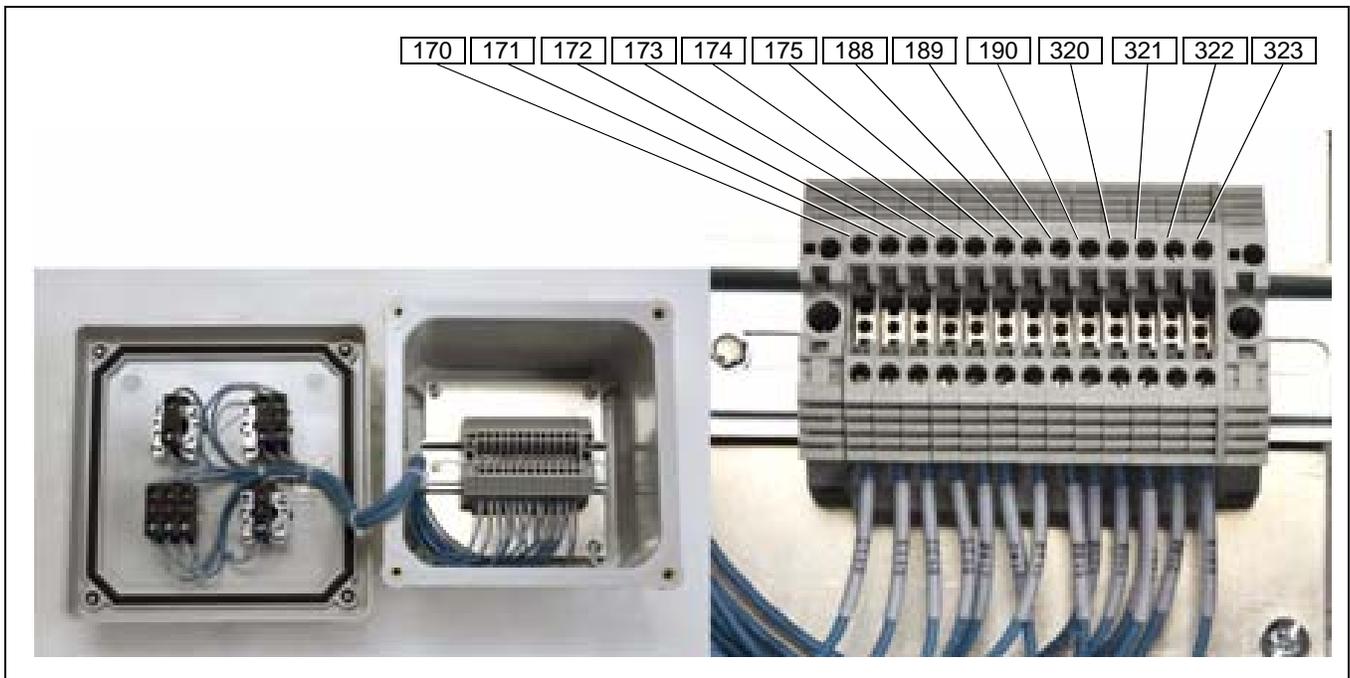
Figure 9B *Inside View*

Centrifugal Fan Starter Contactor (AP-5277)
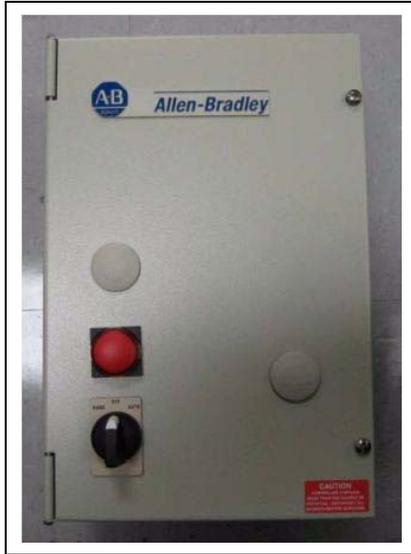
Figure 9C *Front View*
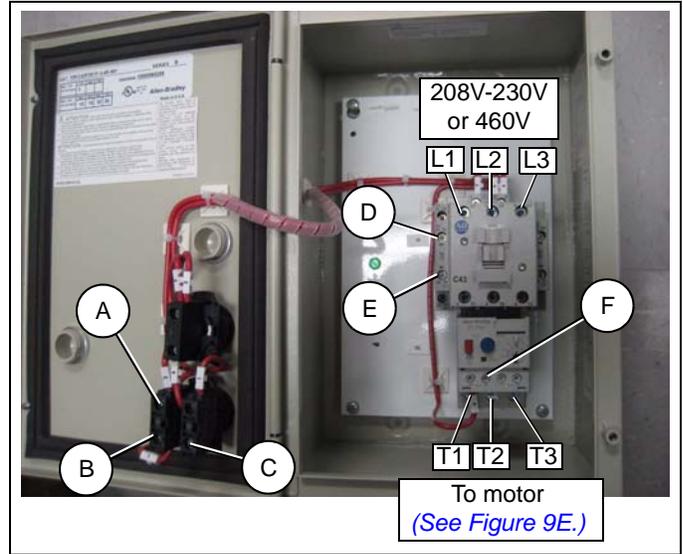
Figure 9D *Inside View*

Ref #	Upper Fan	Lower Fan
A	202	207
B	200	205
C	201	206
D	302	304
E	303	305
F	203	208
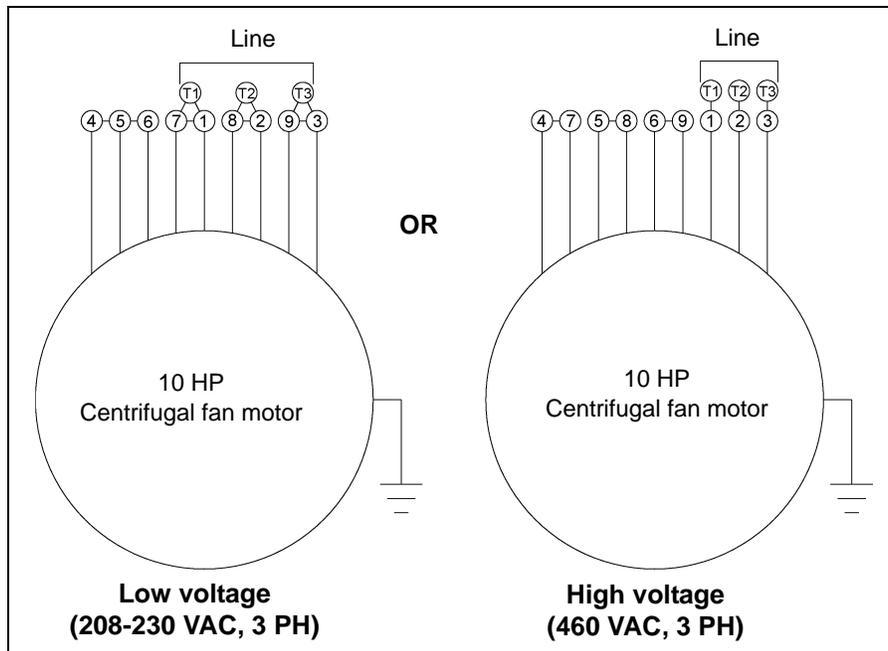
Figure 9E *Centrifugal Fan Motor Wiring Diagram*

Trailer Surface Temperature Sensor (AP-4180)

Figure 9F *Trailer Surface Temperature Sensor (AP-4180)*
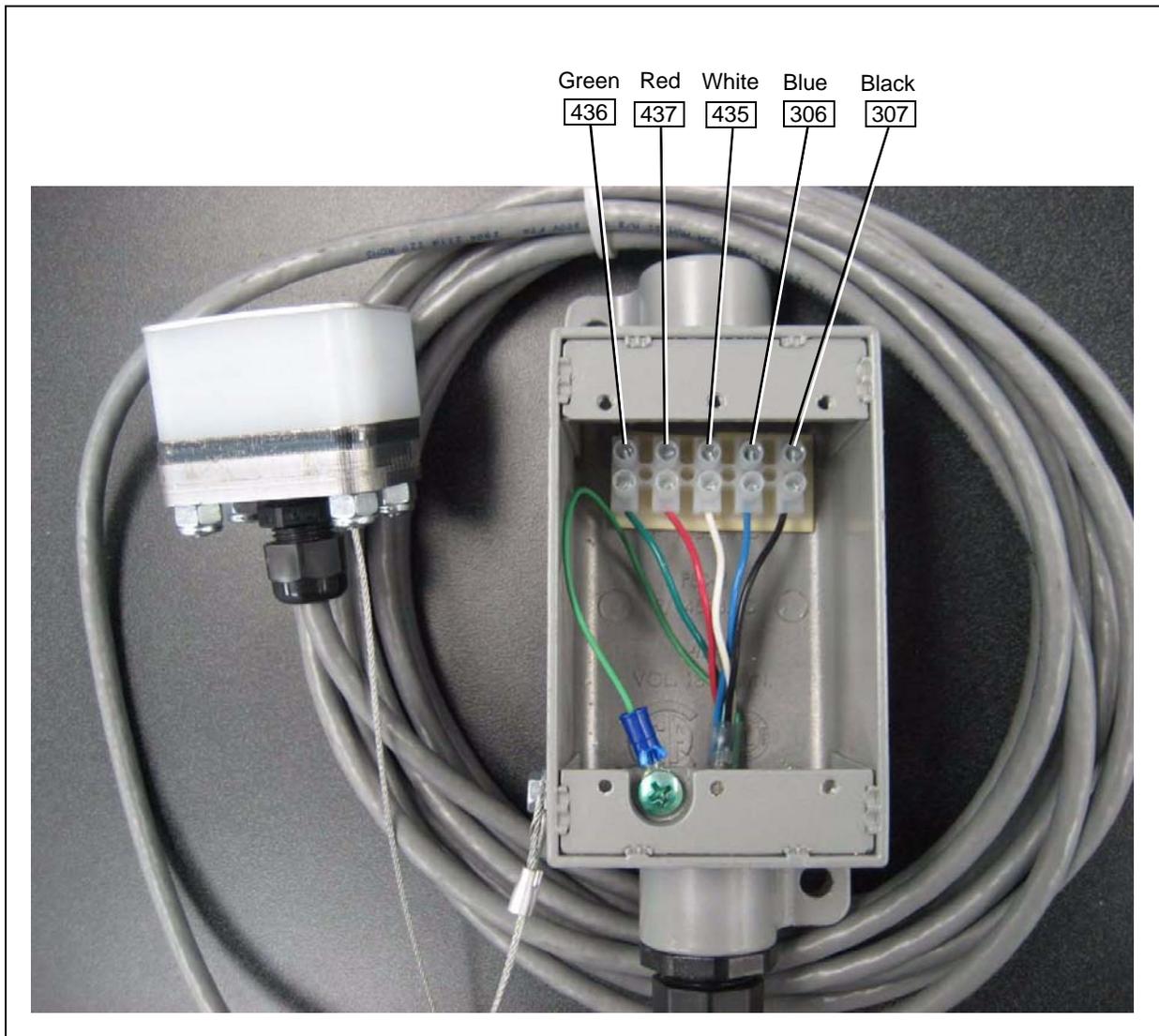
Figure 9G *Close-Up View*

RTD Temperature Sensor for Ducts and Air Mixing Chamber (AP-4072)
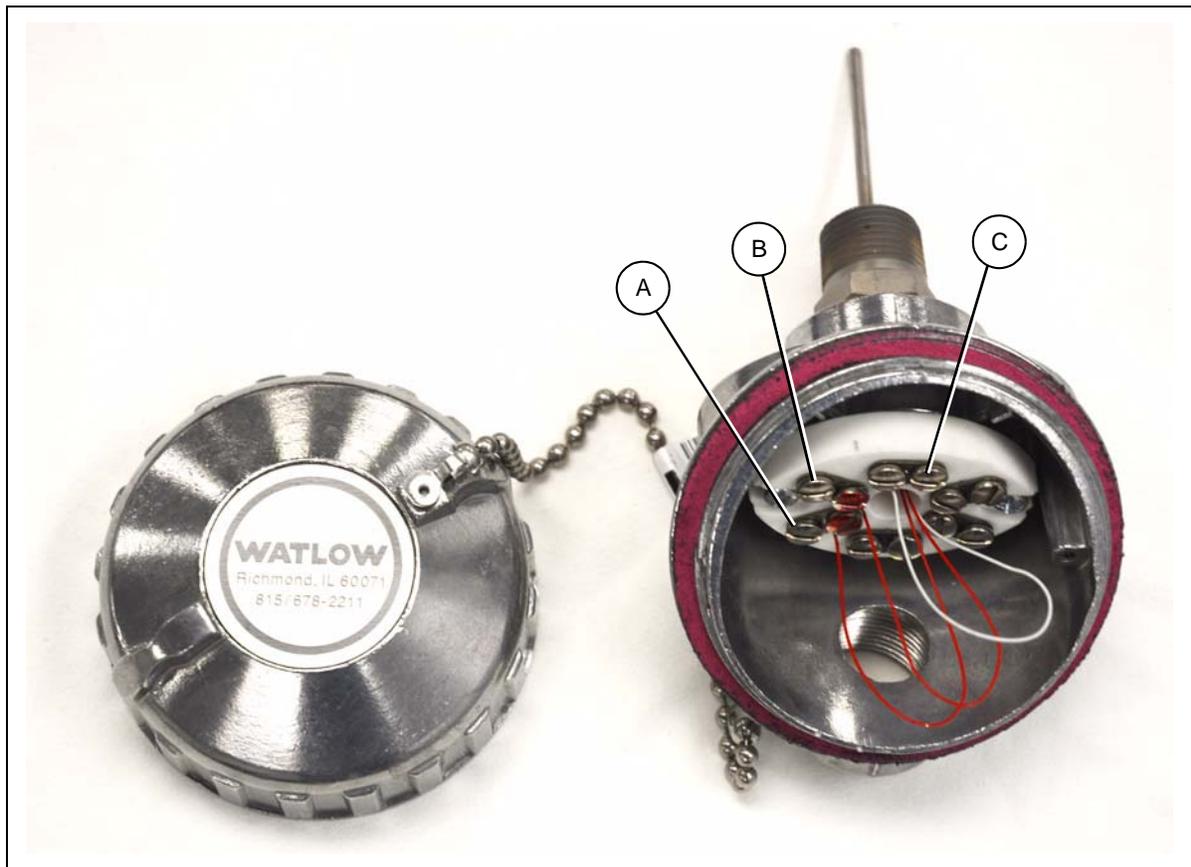
Figure 9H *RTD Temperature Sensor for Ducts*

Ref #	Wire Color	Upper Duct	Lower Duct	Mixing Chamber
A	Red	421	426	431
B	Red	422	427	432
C	White	420	425	430

Room High Temperature Limit and Cycle Start Warning Buzzer

Figure 9I *Room High Temperature Limit Buzzer Front View*
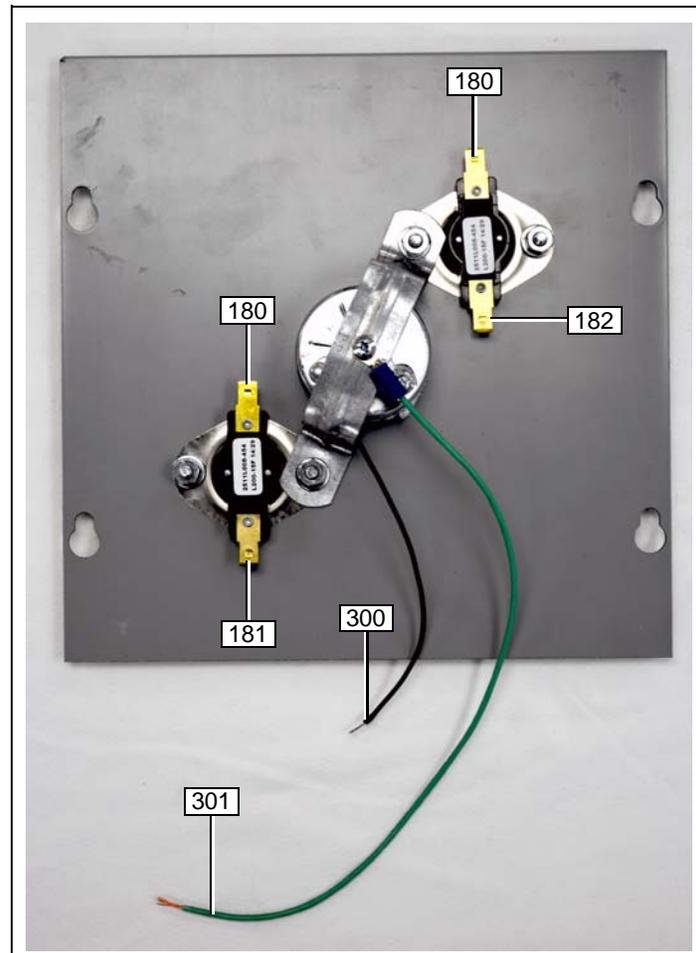
Figure 9J *Room High Temperature Limit and Cycle Start Warning Buzzer*

Door Contacts for Two (2) Garage Doors and up to 3 Man Doors

NOTE: *Only three (3) are supplied.*

Figure 9K *Door Contacts*
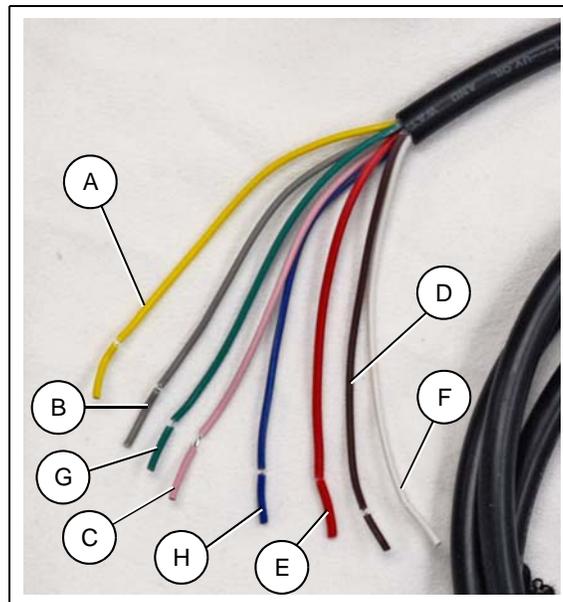
Figure 9L *Door Contacts Wires*

Ref #	Wire Color	Garage (Enter)	Garage (Exit)	Man Door 1	Man Door 2*	Man Door 3**
A	Yellow	125	135	145	155	165
B	Gray	120	130	140	150	160
C	Pink	121	131	141	151	161
D	Brown	122	132	142	152	162
E	Red	124	134	144	154	164
F	White	123	133	143	153	163
G	Green	Not Used				
H	Blue	Not Used				

* If man door 2 is not used, place jumper across terminals 150-151 and 152-153.

** If man door 3 is not used, place jumper across terminals 160-161 and 162-163.

Pull Cord Emergency Stop
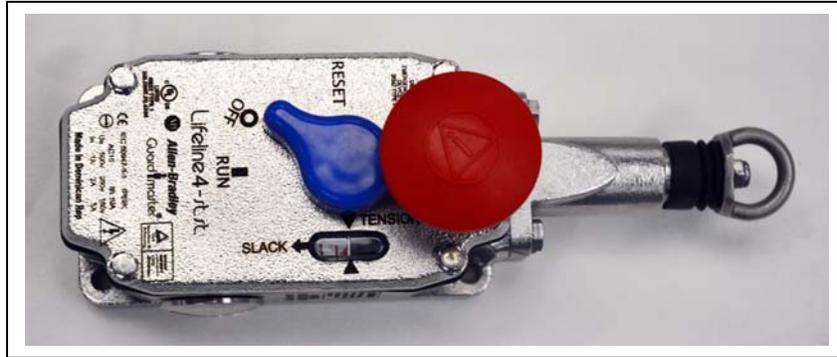
Figure 9M *Front View*
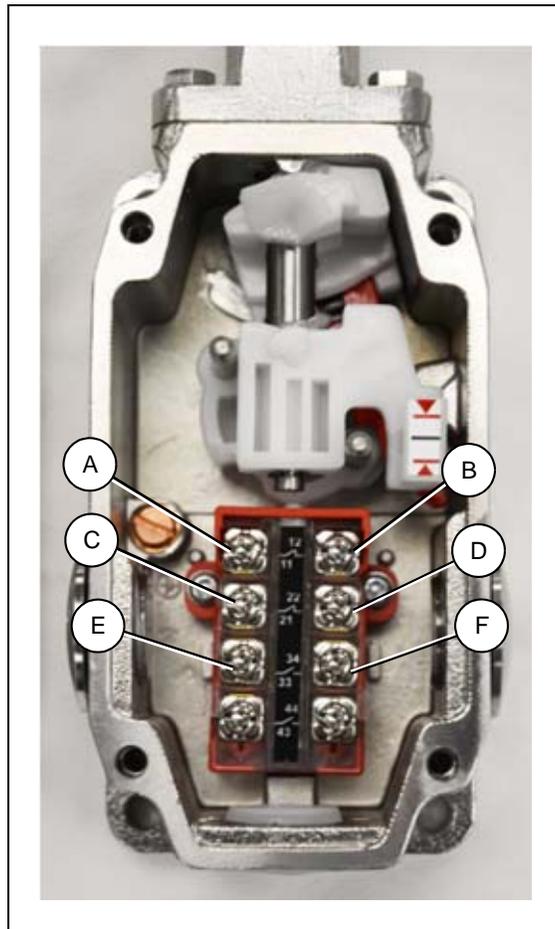
Figure 9N *Inside View*

Ref #	E-Stop Side 1	E-Stop Side 2
A	100	110
B	101	111
C	102	112
D	103	113
E	104	114
F	105	115

PhotoEye Sensor for Truck Positioning (AP-4040)
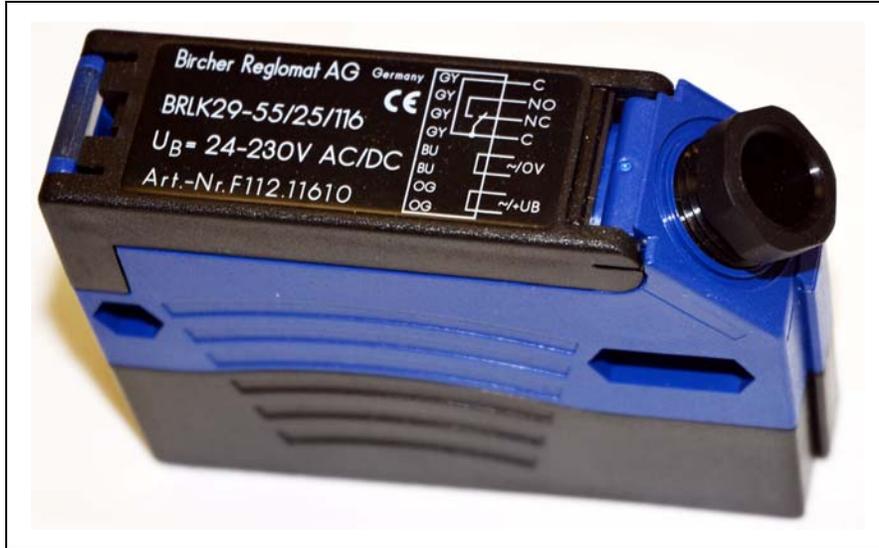
Figure 9O *PhotoEye Sensor for Truck Positioning*
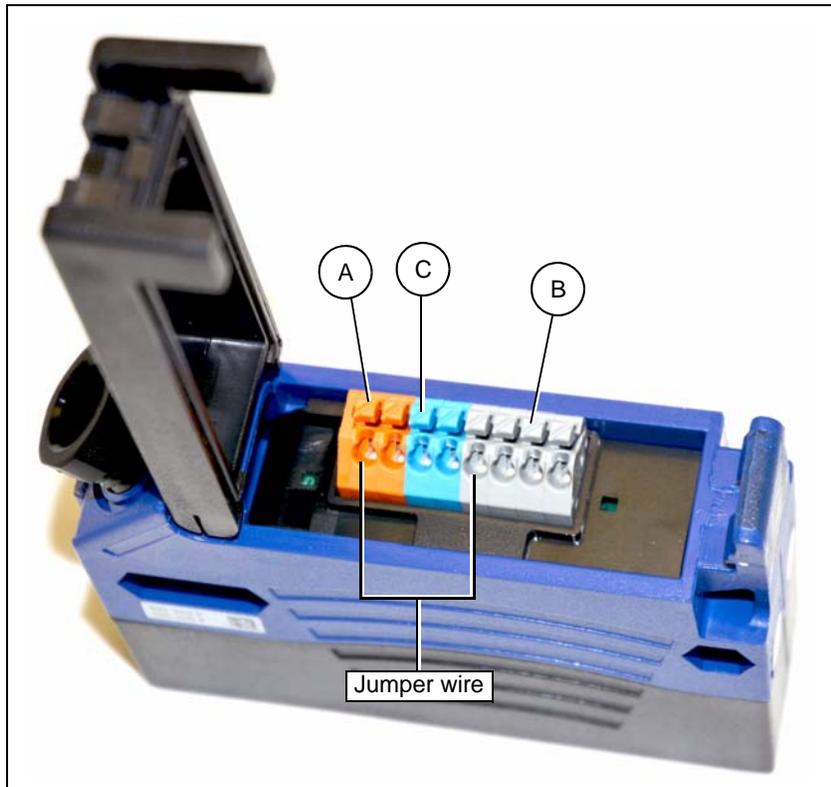
Figure 9P *PhotoEye Sensor Jumpers*

Ref #	Rear PhotoEye	Front PhotoEye
A	310	313
B	311	314
C	312	315

Infrared (IR) Temperature Sensor for Trailer Sides

Figure 9Q *Front View*
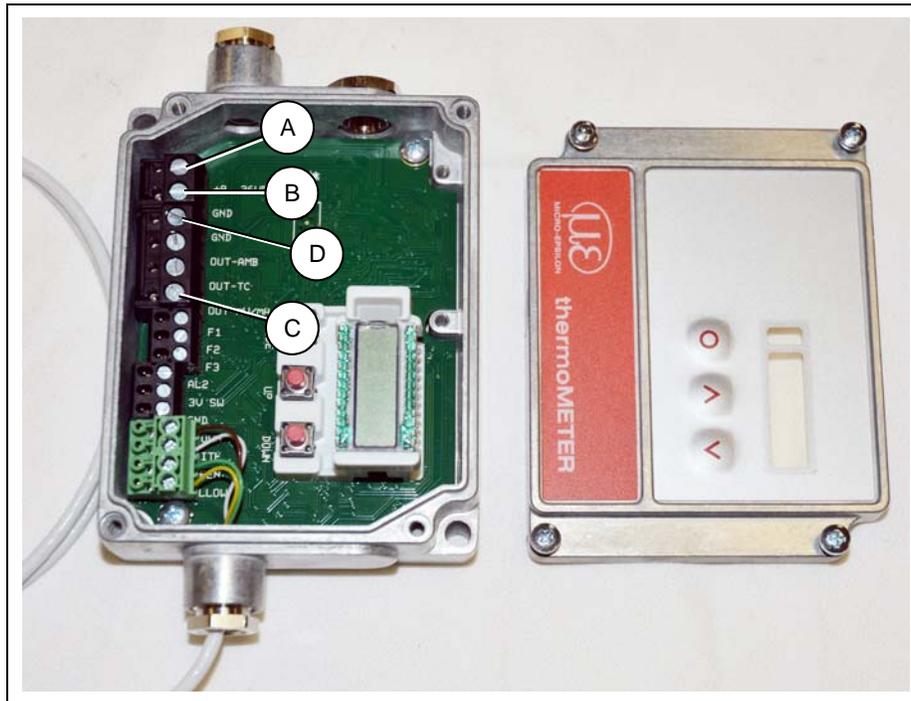
Figure 9R *Inside View*

Ref #	Front Left IR #1	Rear Right IR #2	Front Right IR #3	Rear Left IR #4
A	400	405	412	417
B	401	406	413	418
C	402	407	410	415
D	403	408	411	416

Heater for IR Temperature Sensor Enclosure

Figure 9S *Temperature Sensor Enclosure*
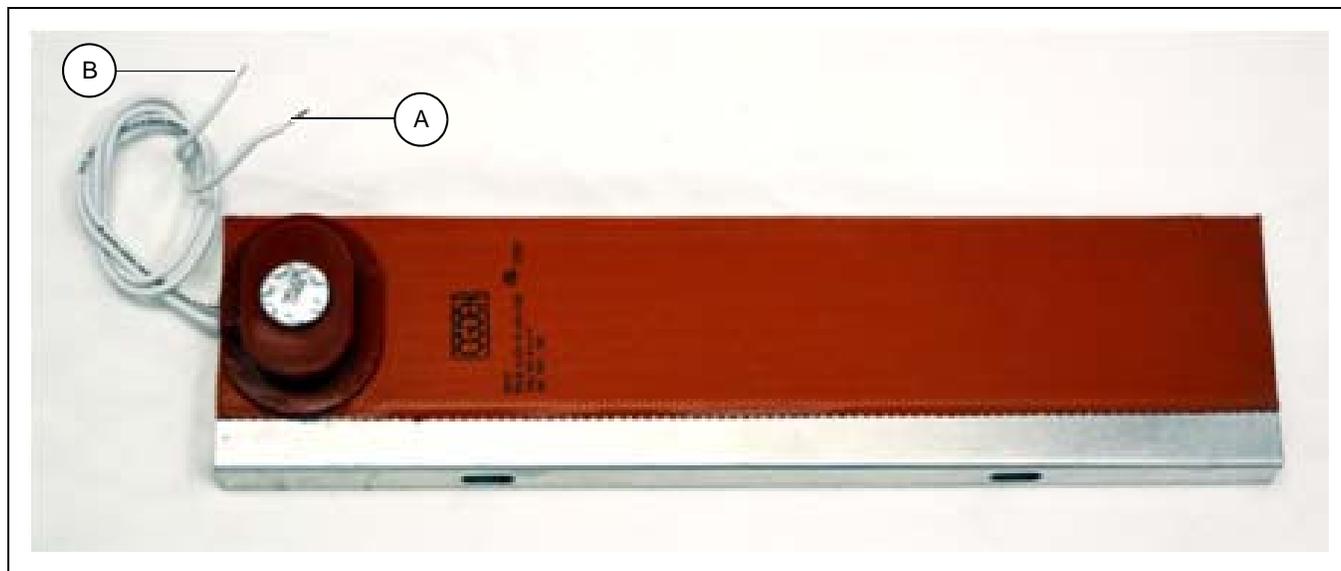
Figure 9T *Heater for IR Temperature Sensor*

Ref #	Front Left IR	Rear Right IR	Front Right IR	Rear Left IR
A	220	222	224	226
B	221	223	225	227

Indicator Lights (Red, Green and Amber)

Figure 9U *Indicator Lights*
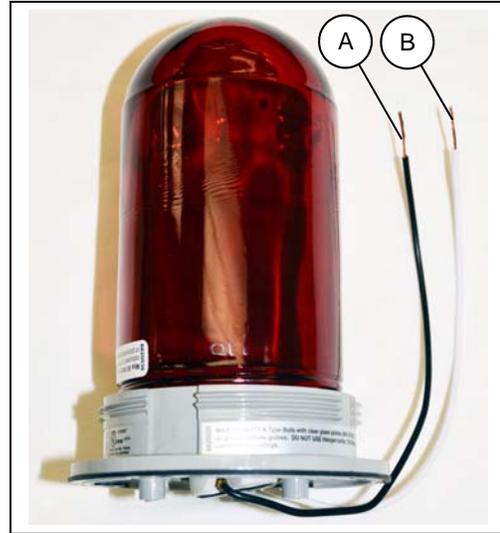
Figure 9V *Light*

Ref #	Red Light Outside	Red Light Inside	Green Light Inside	Amber Light Inside
A	215	215	216	217
B	218	218	218	218

Overhead Door Wiring
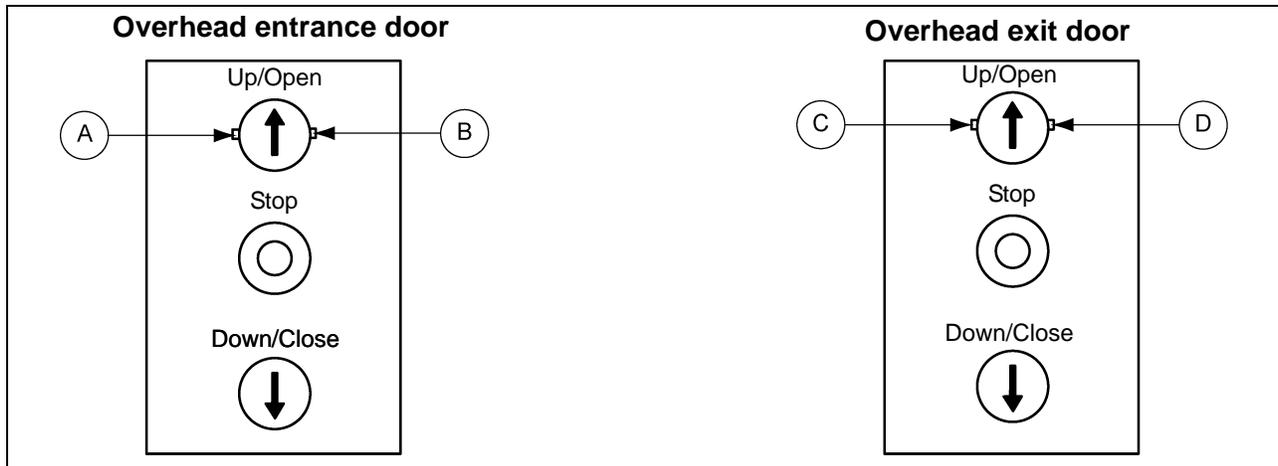
Figure 9W

Wire the "Up" Button of each overhead door in parallel with the terminals in the PLC panel as shown below.

Ref #	Overhead Door	Terminal # in PLC Panel
A	Entrance	48
B	Entrance	49
C	Exit	50
D	Exit	51

Building Lights and Contactor (AP-5278)
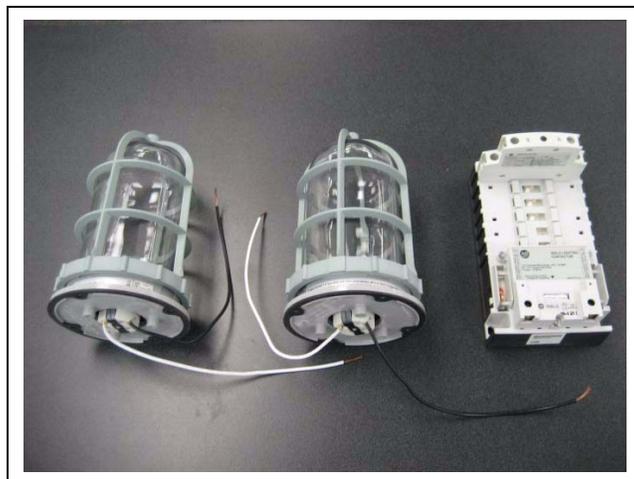
Figure 9X *Building Lights and Contactor*
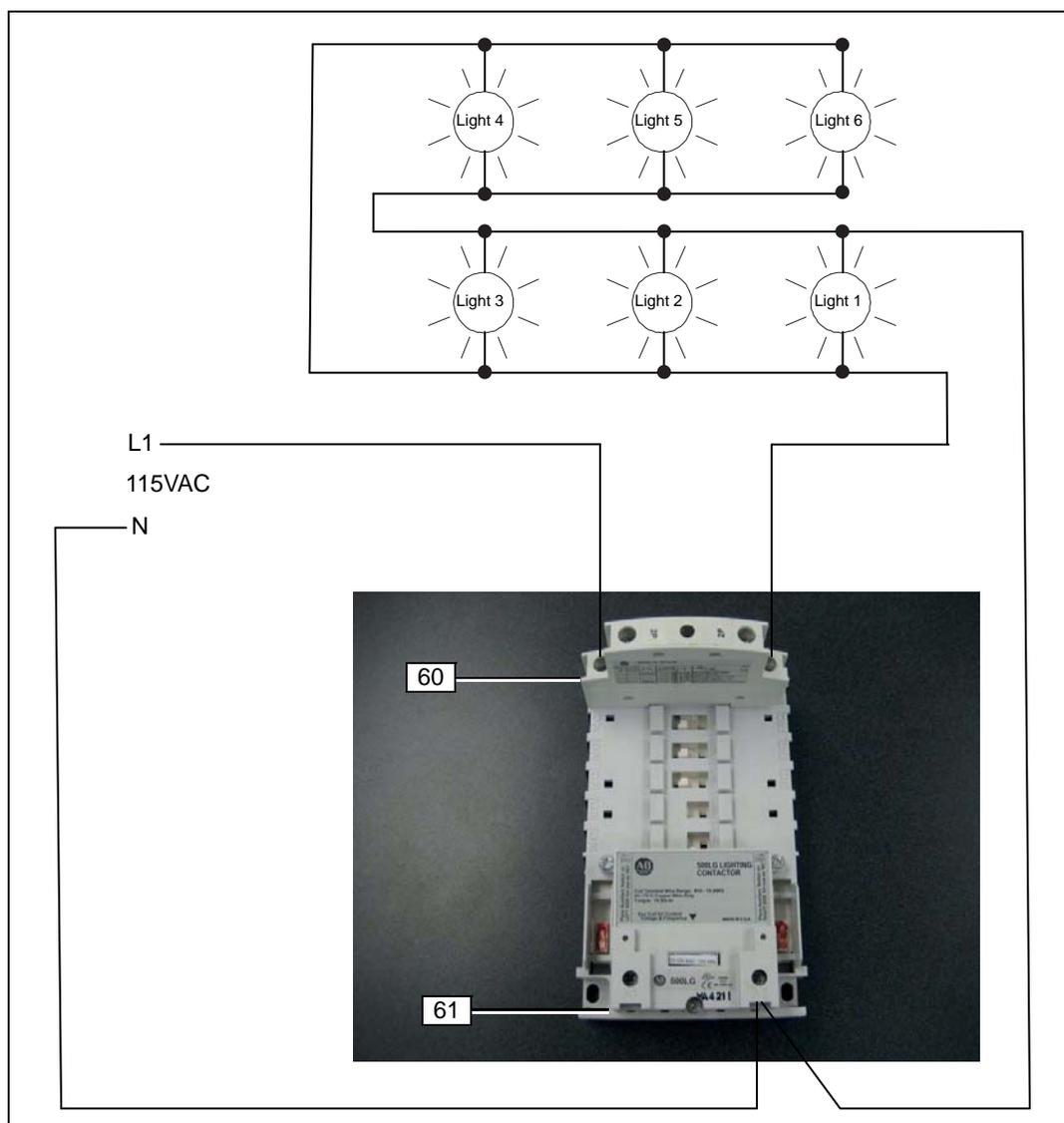
Figure 9Y *Light Connections for Building Lights and Contactor*

511FL AT Newell Actuator for Inlet Door
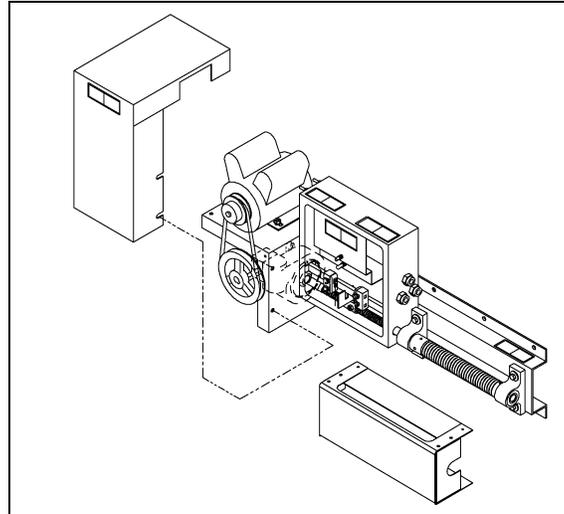
Figure 9Z *511FL AT Newell Actuator for Inlet Door*
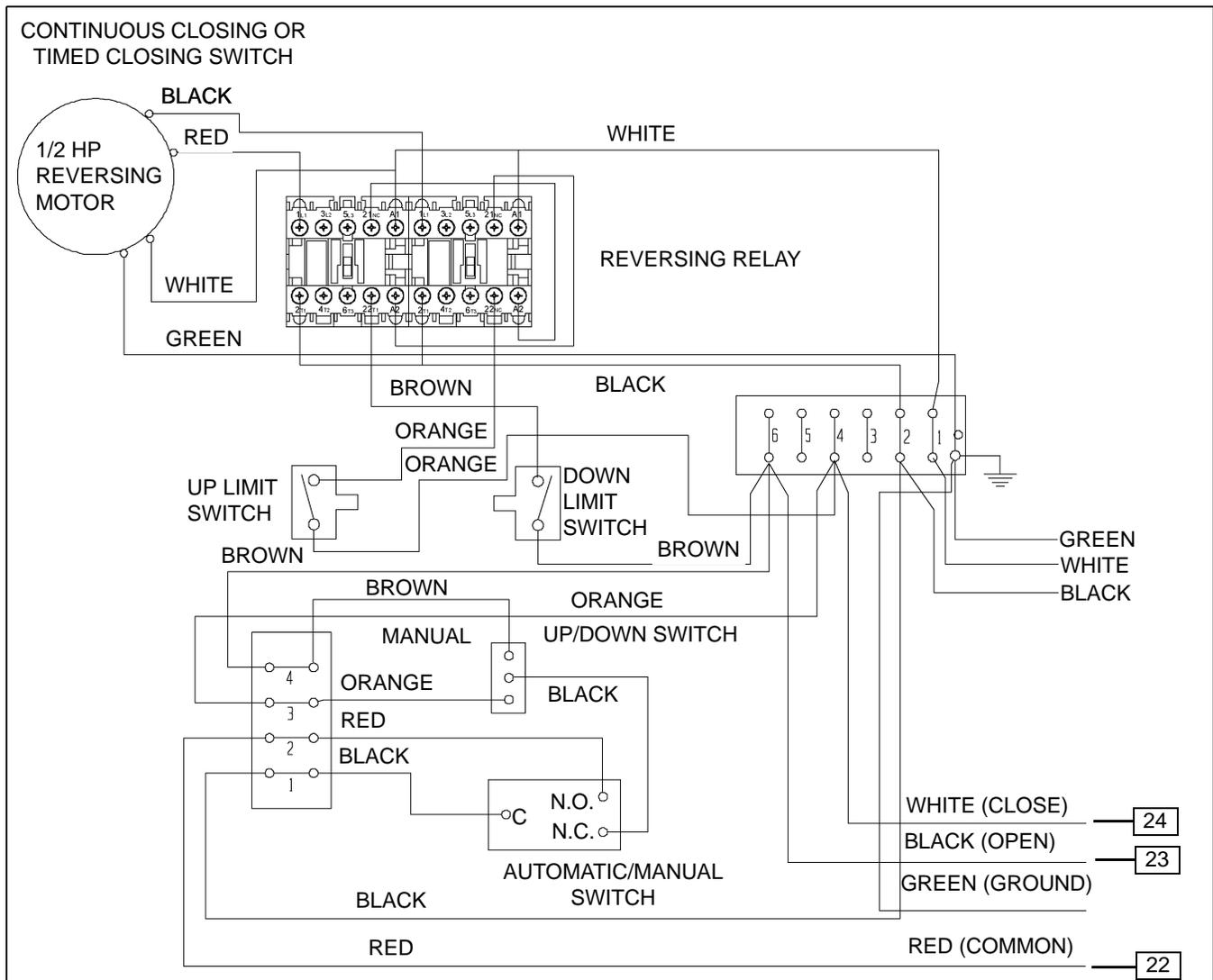
Figure 9AA *511 Wiring Diagram*

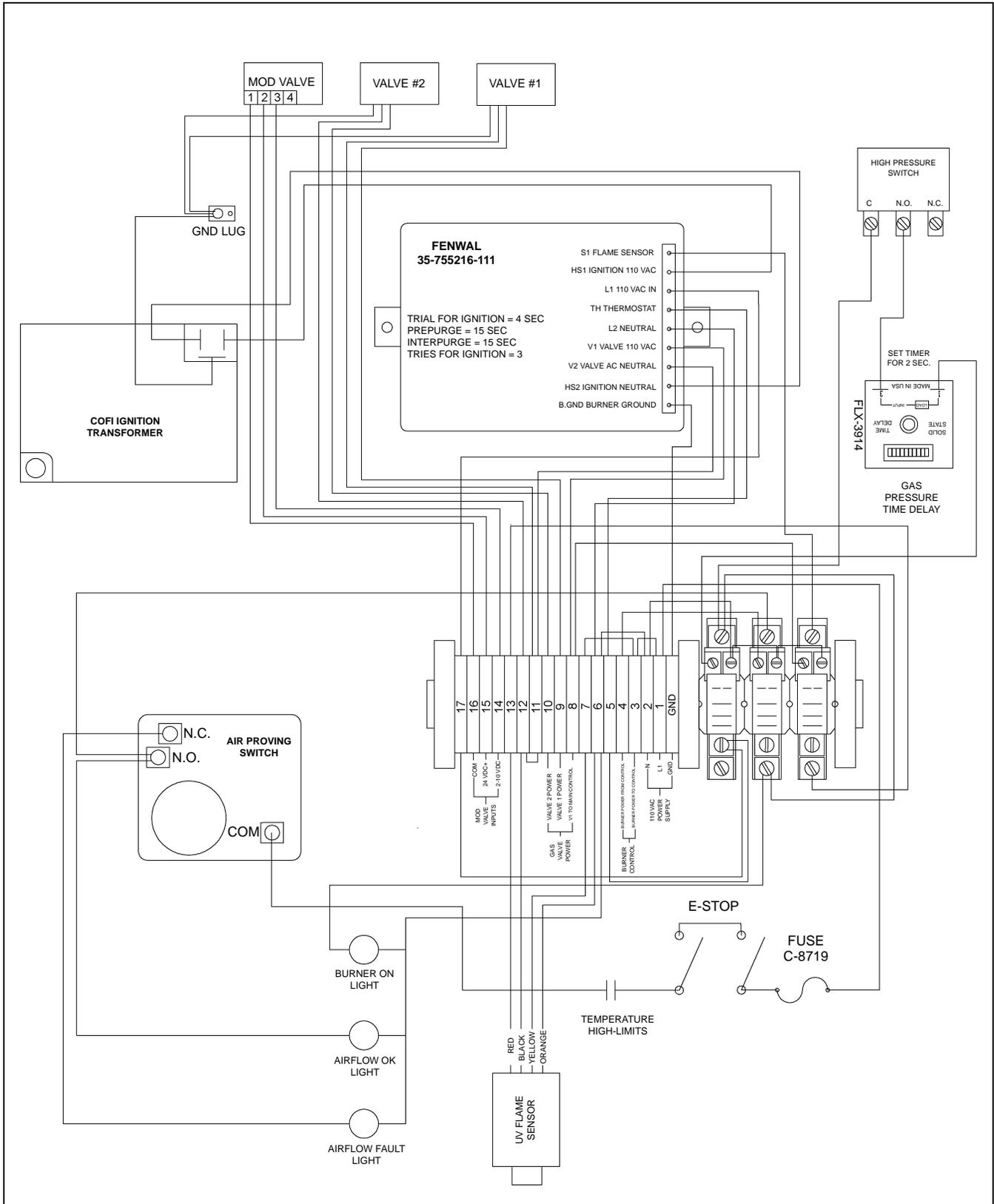# 36" Galvanized Box Fan for Circulation (GBD3619-HH)

Figure 9AB *36" Galvanized Box Fan*
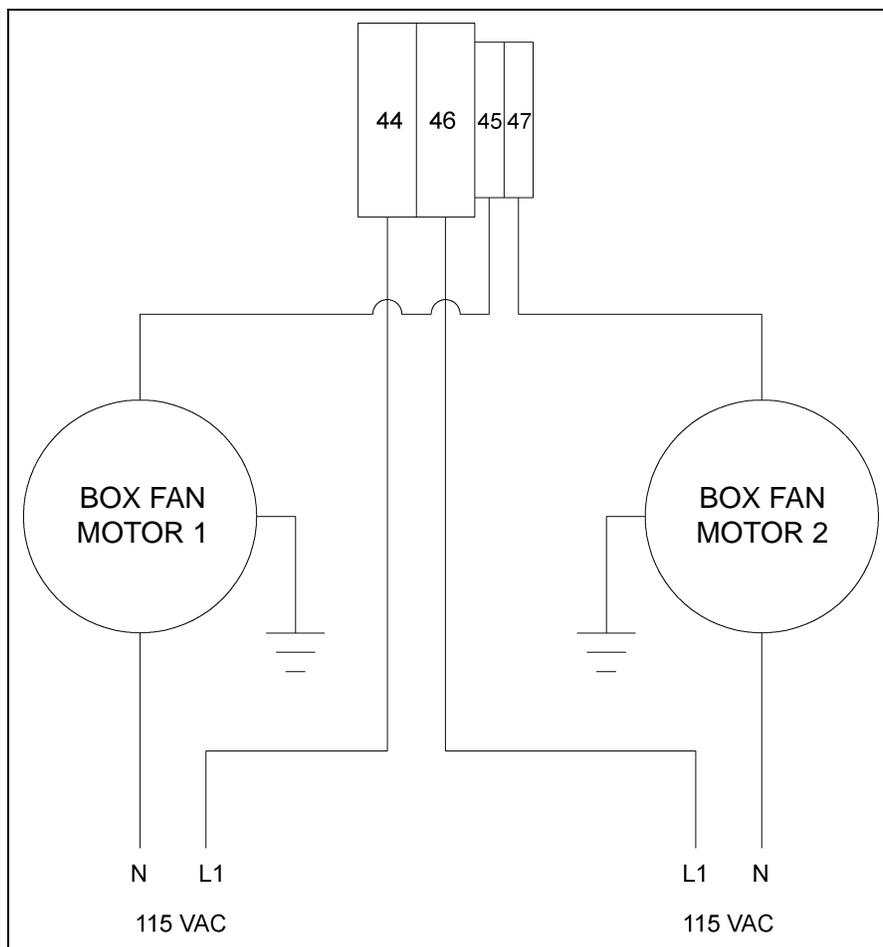
Figure 9AC *Box Fan Wiring Hook-Up Diagram*

24" Heater with Mod Valve (VHD2-24AP-LP or VHD2-24AP-NG)

for terminal connection table.

Figure 9AD *Bio-Dri II™ Heater Wiring Diagram*

Terminal Connection Table

	Burner Control Box Terminal	Main Control Box Terminal	Additional Notes
Upper Burner	3	30	
	4	29	
	8	70	Jumper Terminal 70 to 72 and 72 to 79
	9	71	
	10	73	
	14	440	
	15	324	
	16	441 and 325	
Lower Burner	3	26	
	4	25	
	8	74	Jumper Terminal 74 to 76 and 76 to 78
	9	75	
	10	77	
	14	445	
	15	326	
	16	446 and 327	

Wiring Alarm Contacts to Alert of a System Shut Down

A set of contacts are provided in the main PLC panel that can be wired to a remote alarm signal device (not provided) such as a light, buzzer or phone dialer. Any time the Bio-Dri II™ system shuts down for any reason during a cycle, the contacts in the PLC panel will close, causing the signal device to alarm the operator at a remote location.

Wire the alarm signal device to the PLC panel contacts as shown in *Figure 9AE*.
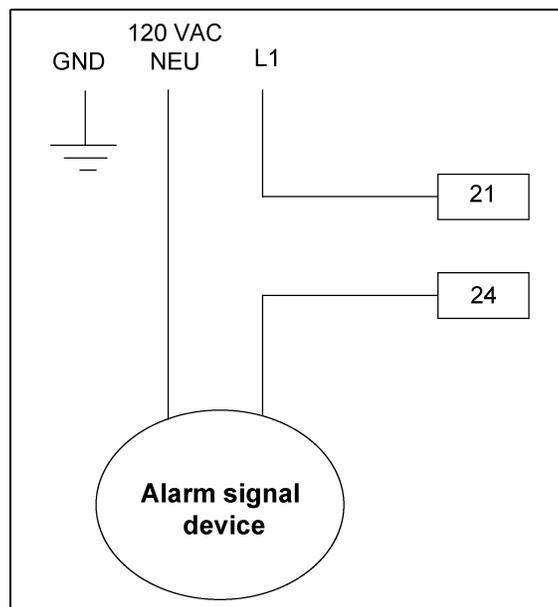
Figure 9AE

Setting the Thermometer Sensor

Press the MODE key to choose the feature and the UP and DOWN keys to choose the parameters for that feature.

1. Press the MODE key until the feature MV5 is displayed to select the output signal. Press the UP or DOWN key to change the parameter to 4 to 20.

2. Press the MODE key until the feature "U" is displayed. Press the DOWN key to change the temperature unit to °F.

3. Press the MODE key until one bar "/" is displayed. Press the UP or DOWN key to set the temperature for the lower alarm limit to -58°F.

4. The display light should change from blue to green, indicating it is not in alarm state. After 10 seconds, it will time out and go back to the normal display. *(See Figure 10A.)*

Figure 10A

Testing the Safety Circuits

Once the Bio-Dri II™ wiring is complete between the control panel and all safety circuits, using a multi-meter, check continuity across all of the safety circuits shown *on Page 56*. The circuits should be checked with the power to the control panel OFF and with each door shut and the contacts aligned *(See Pages 46 and 47)* or in the case of a pull cord switch, the switch must be in the reset position. In the case of the E-Stop button, it must be pulled out prior to checking continuity.

There are three (3) individual contacts for each door, pull switch or E-Stop button. The top circuit is normally closed and should show "continuity". The middle circuit is also normally closed and should show "continuity". The bottom circuit is normally open and should show "no continuity". For example, on the top wiring diagram *on Page 56*, "CS1" refers to cord switch 1. When this cord switch is reset, check continuity across terminals 100 and 101 for the top normally closed circuit. Check continuity across terminals 102 and 103 for the middle normally closed circuit. And finally check continuity across terminals 104 and 105 for the bottom normally open circuit. Repeat this process of checking continuity for CS2 (Cord Switch 2), OD1 (Overhead Door 1 - Entry Door), OD2 (Overhead Door 2 - Exit Door), MD1 (Man Door 1), MD2 (Man Door 2), MD3 (Man Door 3) and E-Stop (E-Stop button on Cycle Start/Stop Panel). If there is no Man Door 2 or Man Door 3, be sure to place jumper wires across the two (2) top normally closed circuits.

Setting the Control Panel Safety Relays

Once the safety circuits have been successfully tested, the control panel safety relays must be set. Also, any time the settings are changed or the circuit is modified, the control panel safety relays must be re-set. You must follow the process exactly as described below:

1. Cycle main power "ON" to the control panel.

2. Set the DI Relay Logic setting to "0".

3. Set the EMD Relay Range setting to "0" and the Time setting to "1".

4. Cycle main power "OFF" to the control panel.

5. Cycle main power "ON" to the control panel.

6. Set the DI Relay Logic setting to "2". *(See Figure 10B on Page 81.)*

7. Set the EMD Relay Range setting to "3" and the Time setting to "1". *(See Figure 10B on Page 81.)*

8. Cycle main power "OFF" to the control panel.

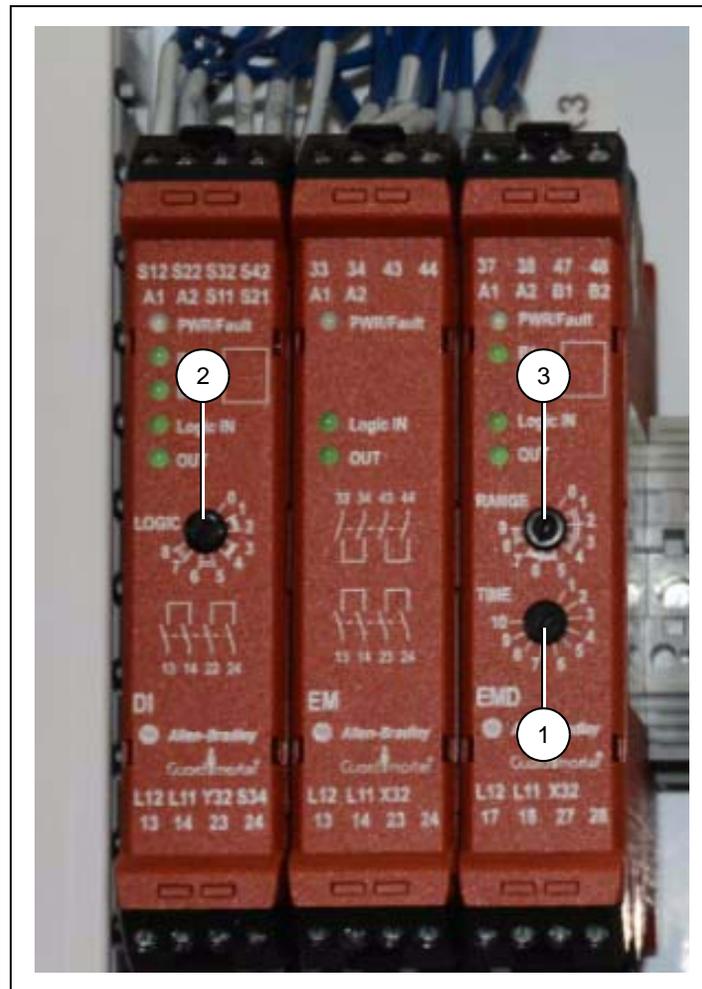9. Cycle main power "ON" to the control panel.

Figure 10B

Indicator Lights on the Control Panel Safety Relays

The top light for all three (3) control panel safety relays indicates that power is ON when the green light is ON. If the red light is ON, it indicates there is a safety fault situation.

For the DI Relay, if the "IN 1" green light is not ON, it means there is an open circuit with one or more of the normally closed circuits for either CS1, CS2, OD1, OD2 or MD1. If the green light is ON, it means this circuit is satisfied.

For the DI Relay, if the "IN 2" green light is not ON, it means there is an open circuit with one or more of the normally closed circuits for either MD2, MD3 or E-Stop. If the green light is ON, it means this circuit is satisfied.

For the DI Relay, if the "OUT" green light is not ON, it means one or both of the safety circuits above are not satisfied.

For the DI Relay, if the "OUT" green light is flashing, it means the safety circuits above are both satisfied, but the "RESET" button on the Cycle Start/Stop panel must be pushed. Once the "RESET" button is pushed, the red Safety Fault light ON this panel should go out.

For the DI Relay, if the "OUT" green light is ON solid, it means the safety circuits above are both satisfied and the system is ok and ready to run.

Installing the Bio-Dri II™ Software

Installing the PLC Software

The software for the PLC is located on the supplied SD card.

1. Turn OFF the power to the PLC control.

2. Insert the SD card (A) into the SD card slot on the PLC.

3. Turn ON power to the PLC control. The PLC is updated when all the lights turn green.

4. Remove the SD card (A) from the PLC. **NOTE:** *Do not leave the SD card (A) in the PLC or it will reload every time the power is cycled, reverting all settings to the default.*
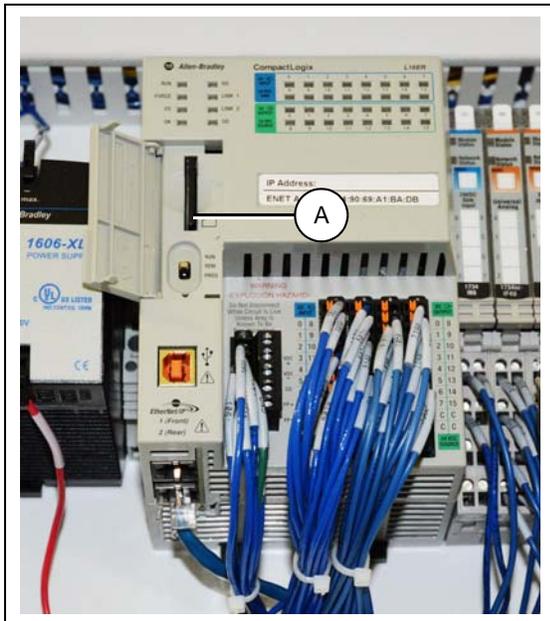

Ref #	Description
A	SD Card

Figure 11A

Updating the PLC Software

Updates to the software may be available for download from the website.

Before you begin

1. Make sure the SD card is formatted to FAT32. (32 Bit file allocation table.)

2. Make sure to have a computer with an SD card port.

3. Make sure the computer has access to the internet.

To download .zip file:

1. Insert the SD card into the SD card port on the computer.

2. Go to www.automatedproductionsystems.com/downloads.

3. Right click on the software link and select download to the SD card.

    IMPORTANT: *Do not remove the SD card until the file transfer is complete.*

4. Once the file is downloaded, eject the SD card from the computer.

5. Install the updated software to the PLC.

Installing the Oracle VM Virtual Box Software

1. Insert the USB thumb drive into the USB slot on the computer.

2. Navigate to the thumb drive and open the file "instructions.txt".

3. Follow the instructions listed in the "instructions.txt" file.

NOTE: *This process will take 20 to 40 minutes depending on the computer speed.*

Starting the Virtual Machine

After installing the virtual box software, you now have to open the Bio-Dri Virtual Machine. A Virtual Machine emulates a computer, but it will look like a software window on the host computer.

1. To start the Biodri software, click on the Desktop Icon. *(See Figure 11B.)*
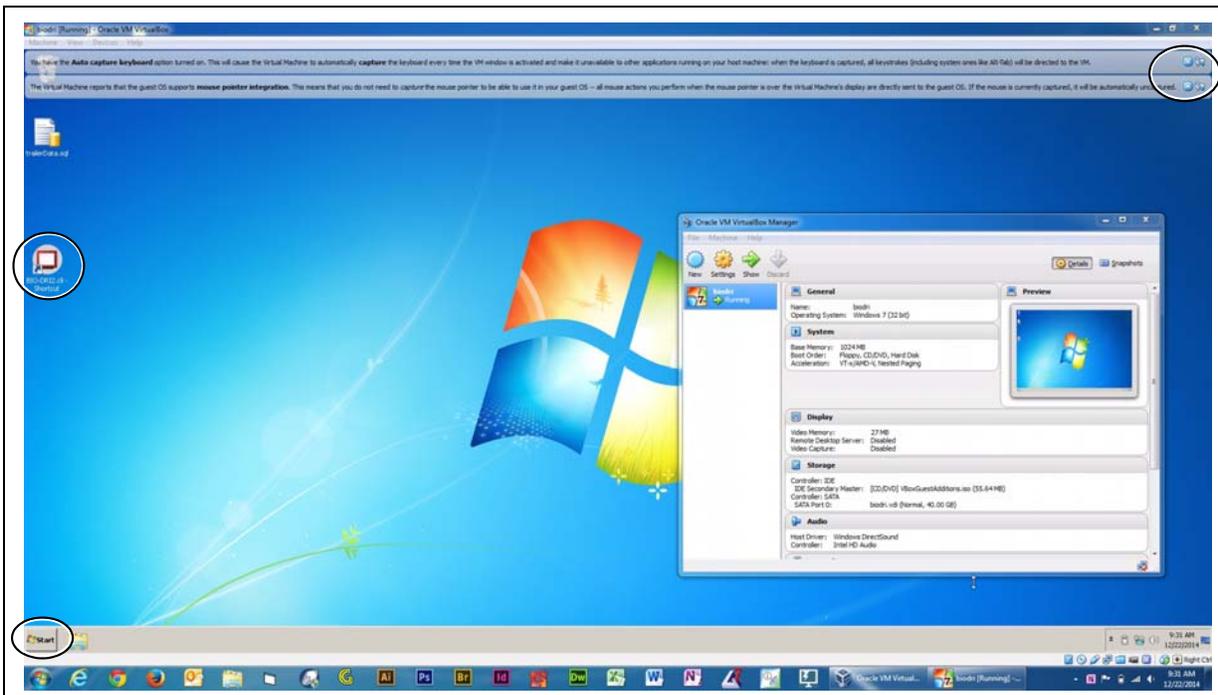
Figure 11B

2. Upon initial setup, you will need to set the network to be used. Select Change Network Settings. *(See Figure 11C.)*
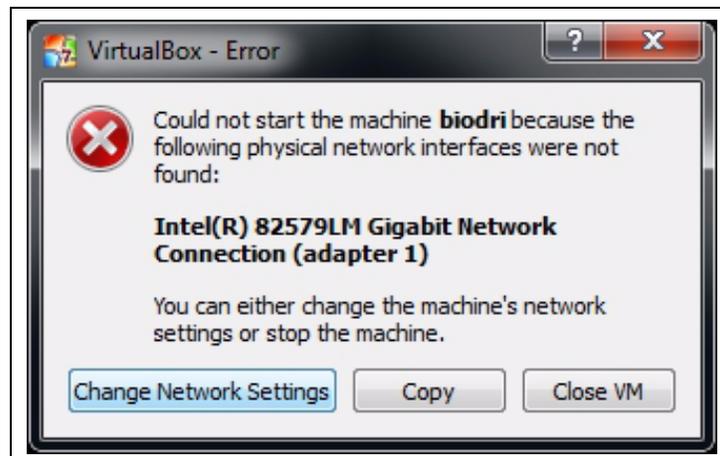

Figure 11C

3. In the settings window, select Network.

4. From the Adapter 1 Tab, select the network connection from the "Name" drop down list. **NOTE:** *The network name will be different for each computer. In most cases, you want to choose the wired connection. To help identify the wired connection, look for "Ethernet" in the name. To identify a wireless connection, you can look for the adapter with the "-N" in the name that identifies a wireless protocol. (See Figures 11D and 11E.)*
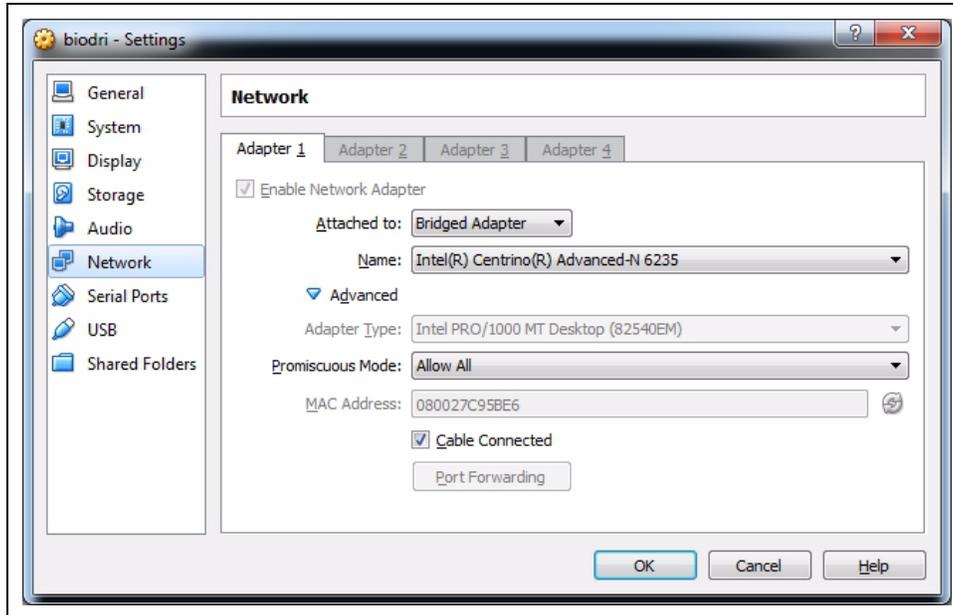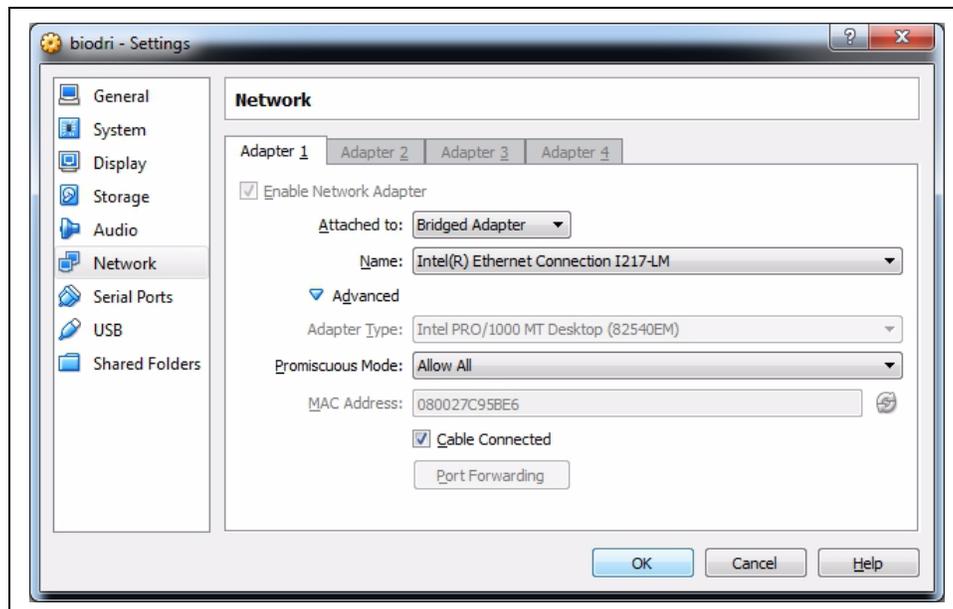

Figure 11D *Wireless Connection*

Figure 11E *Wired Connection*

5. Click ok.

6. When the Virtual Machine opens, a notification may pop up. To close these notifications, select the "Do not show again" icon on the right.

7. To shut down the virtual machine. Select "Start - Shutdown"

Powering on the Bio-Dri II™ System

After the unit components have been installed and the building is clear of personnel and livestock, you can turn ON the power to the system.

1. Make sure the Emergency Stop buttons on the main control box is in the fully-retracted position (unlocked).

2. Once the button is flashing, push the **Start** button.

   NOTE: *The amber light will flash and a pulsing buzzer will sound for 15 seconds to warn that the system is about to start.*

Configuring the Bio-Dri II™ System

The system must be configured before any baking process can be started. The data entered during the configuration process will be the ranges the system will use as maximum and minimum settings.

To log in for daily operation:

1. From the Initial Log In screen, click **Log In**.

   a. User name: **User**

   b. Password: (no password, enter nothing here)
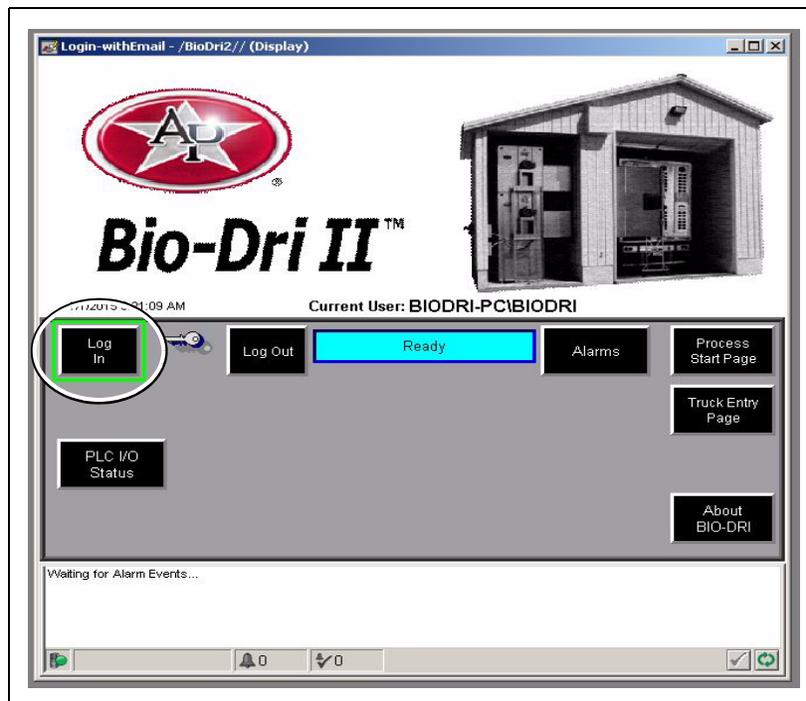
**Figure 11F** *Initial Log In Screen*

To configure the ADMIN system settings, you will need to log out and log back in using the ADMIN log in account information.

1. From the Initial Log In screen, click **Log In**.

   a. User name: **Admin**

   b. Password: **biodri**

NOTE: *When you are finished configuring the system settings, you will need to log out and log back in using the USER log in account information.*

To configure the system settings:
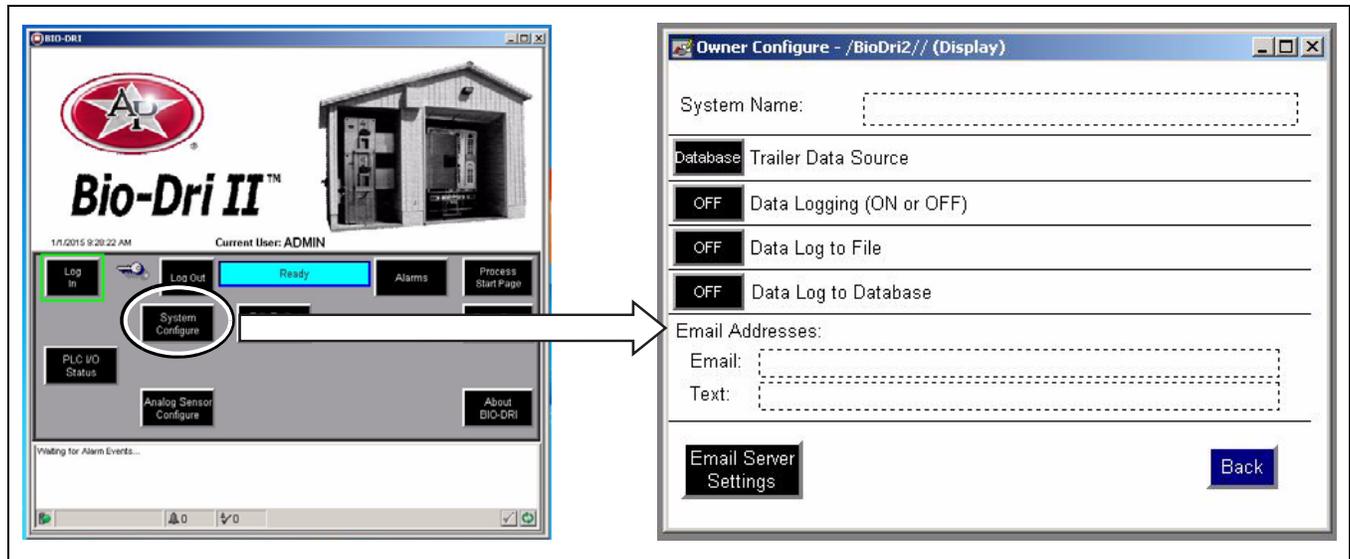
Figure 11G *System Configure Screen (ADMIN Level Access)*

1. From the Home screen, click **System Configure**.

   a. System Name - Enter the e-mail address that is unique to the Bio-Dri II™ System.

   b. Data Logging (ON or OFF) - Click the button to toggle data logging ON or OFF.

   c. Data Log to File - Click the button to toggle the data log file ON or OFF. Turning this ON will create a log file on the local hard drive.

   d. Data Log to Database - Click the button to toggle data log to database ON or OFF. Turning this ON will create a log file to a database server.

   e. E-mail Addresses: Enter the e-mail address and phone number that will receive notifications via e-mail and text.

   NOTE: *Make sure the phone number entered can receive texts and contains the correct suffix for the cell phone service provider that is being used.*
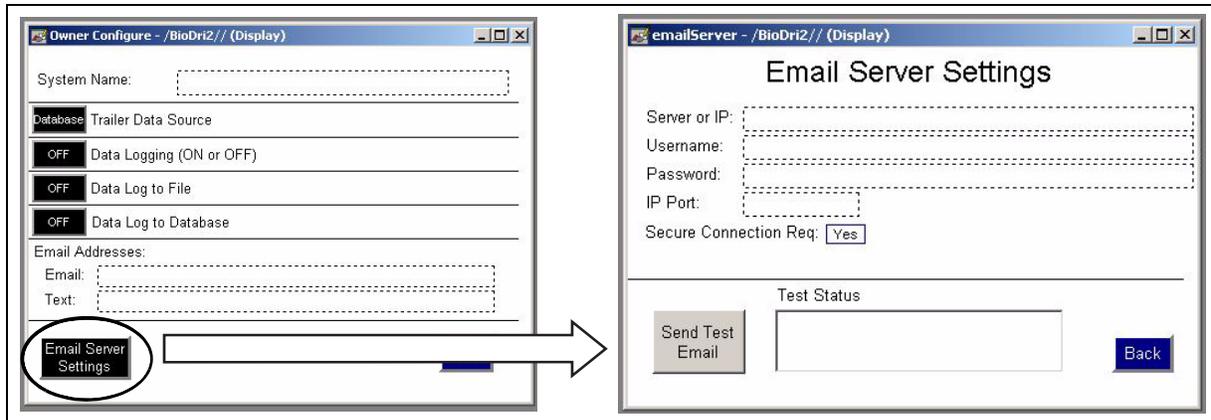
To configure the E-mail Server settings:

Figure 11H *E-Mail Server Screen*

1. From the System Configure screen, click **E-Mail Server Settings**.

    a. Server Name or IP - Enter the server name or the IP address of the server.

    b. User name - Enter the user name for the account.

    c. Password - Enter the password for the account.

    d. IP Port - Enter the IP address for the account.

    e. Secure Connection Req. - Check the box if a secure connection is required.

    f. To recieve a "pass" or "fail" text message, enter the phone number in the box.

      NOTE: *Ensure the correct suffix is added to the end of the number for the cell phone service provider that is being used. For example, a Verizon customer would look like this: 2171234567@vtest.com. The suffix will vary for each cell phone service provider.*
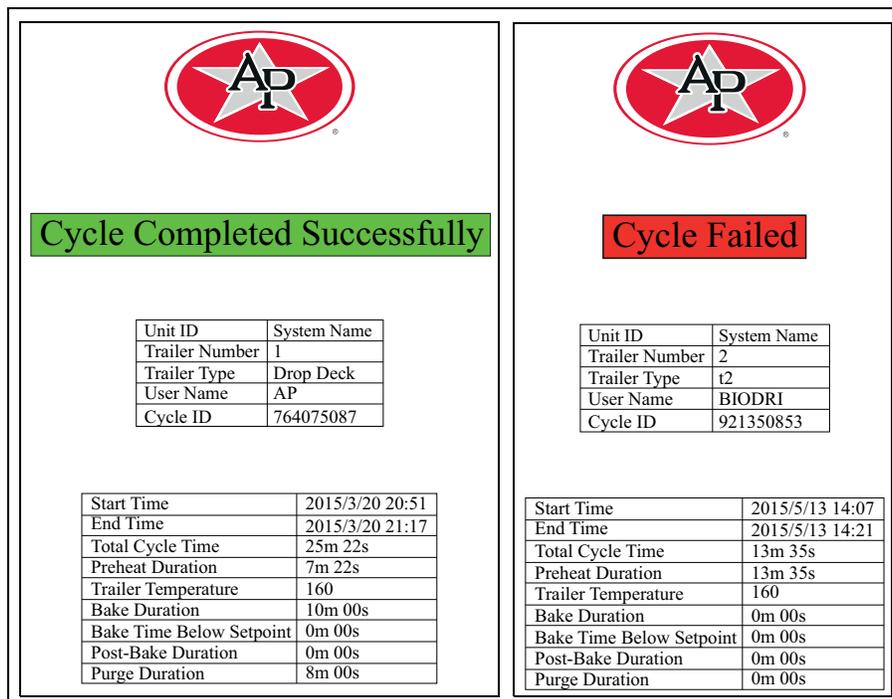

Figure 11I *E-Mail Pass/Fail Examples*

Configuring the Analog Sensors

The system must be configured before any baking process can be started. The data entered during the configuration process will be the ranges the system will use as maximum and minimum settings.

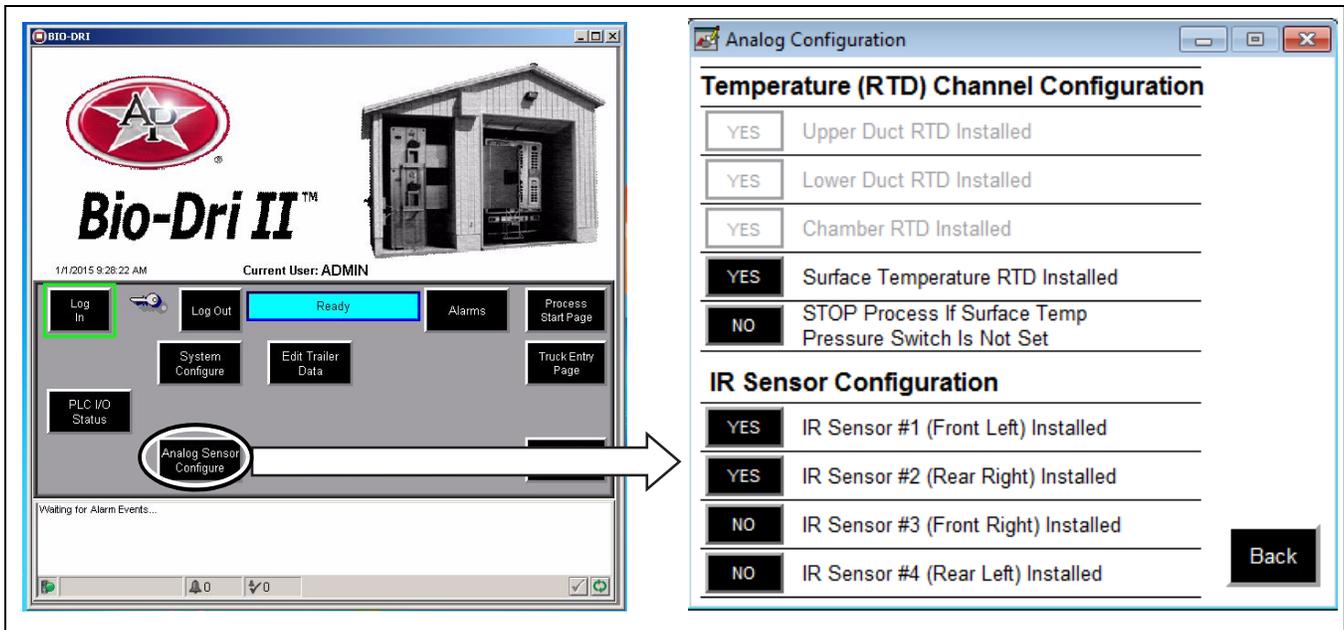To configure the analog sensors:

Figure 11J *Analog Configuration Screen (ADMIN Level Access)*

1. From the Home screen, click **Analog Sensor Configure**.

2. Enter the Temperature (RTD) Channel Configurations:

    a. Upper Duct RTD always Installed.

    b. Lower Duct RTD always Installed.

    c. Chamber RTD always Installed.

    d. Surface Temperature RTD Installed - Select Yes or No.

    e. STOP Process if Surface Temp Pressure Switch is Not Set - Select Yes or No.

3. Enter the IR Sensor Configuration.

    a. IR Sensor #1 (Front Left) Installed - Select Yes or No.

    b. IR Sensor #2 (Rear Right) Installed - Select Yes or No.

    c. IR Sensor #3 (Front Right) Installed - Select Yes or No.

    d. IR Sensor #4 (Rear Left) Installed - Select Yes or No.

Configuring a New Trailer

Each trailer will need to be entered into the system to be assigned a trailer number and to configure the settings for that trailer. These settings only need to be configured once; the system will remember the settings when the trailer ID number is entered.
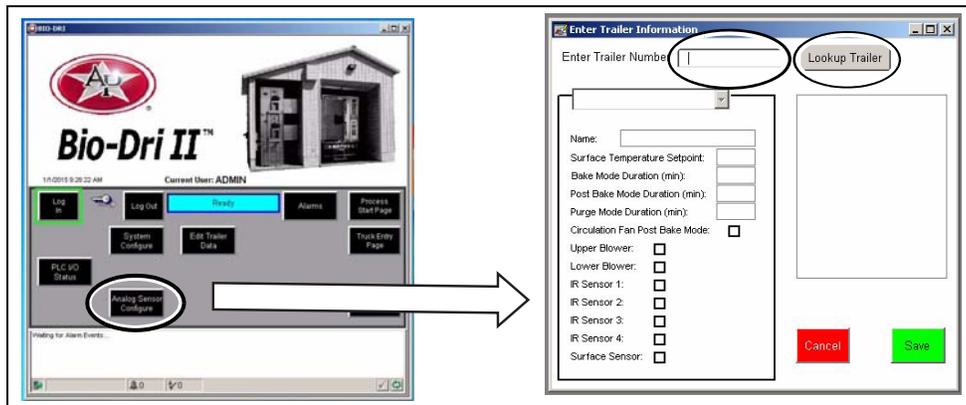
Figure 11K *Trailer Information Screen (ADMIN Level Access)*

1. From the home screen, click **Edit Trailer Data**.

2. Enter the new trailer number and click **Lookup Trailer**.

   NOTE: *A message will appear stating that the trailer number does not exist and you will need to select a trailer type or enter the data for the new trailer type.*

3. From the drop down menu, select the trailer type. If the trailer type exists, the information fields will fill in with the correct parameters for that trailer type.

4. If the trailer type does not exist, enter the trailer type into the **Name** field and set the following parameters:

   a. Surface Temperature Set Point - The required surface temperature that the trailer surface must maintain during the Bake Mode. The temperature setting can range between 100° to 200°F (38° to 93°C).

   b. Bake Mode Duration (min.) - The duration of time in minutes that the trailer is required to maintain the surface temperature set point. The time can be set between 0 and 99 minutes.

   c. Post Bake Mode Duration (min.) - The duration of time in minutes that is desired to continue baking the trailing after the heaters have stopped. The time can be set between 0 and 999 minutes.

   d. Purge Mode Duration (min.) - The duration of time in minutes required to purge the gases and hot air from the building. The time can be set between 8 and 99 minutes.

   e. Circulation Fan Post Bake Mode - Check this box to use the fans to circulate the air during the post bake cycle.

   f. Upper Blower - Check this box to turn ON the upper fan and heater. For a short trailer, this may need to be unchecked.

   g. Lower Blower - Check this box to turn ON the lower fan and heater. For a tall trailer, this may need to be unchecked.

   h. IR Sensor 1 - Check this box to mark the front left sensor.

   i. IR Sensor 2 - Check this box to mark the rear right sensor.

   j. IR Sensor 3 - Check this box to mark the front right sensor (if used).

   k. IR Sensor 4 - Check this box to mark the rear left sensor (if used).

   l. Surface Sensor - Check this box to mark there is a surface sensor.

5. Click **Save**.

11. Operator Section

To configure the AP system settings, you will need to log out and log back in using the AP System log in information located with the software documentation.
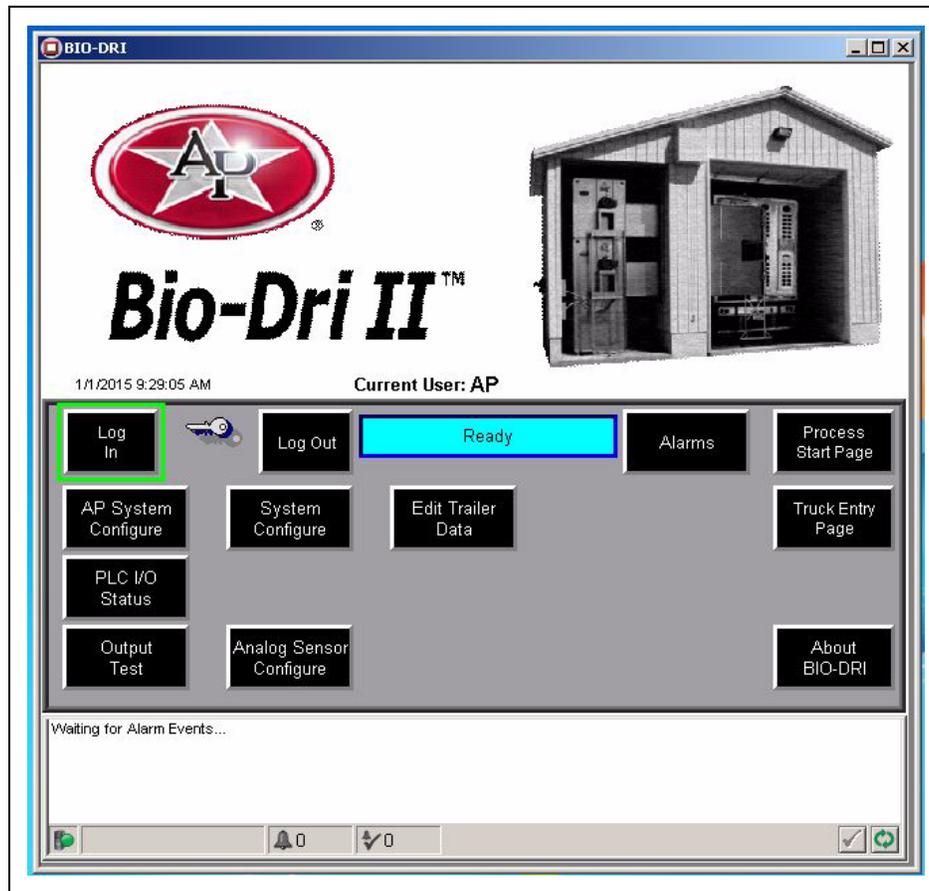

Figure 11L *Home Screen (AP Level Access)*

1. From the Home screen, click **AP System Configure**.

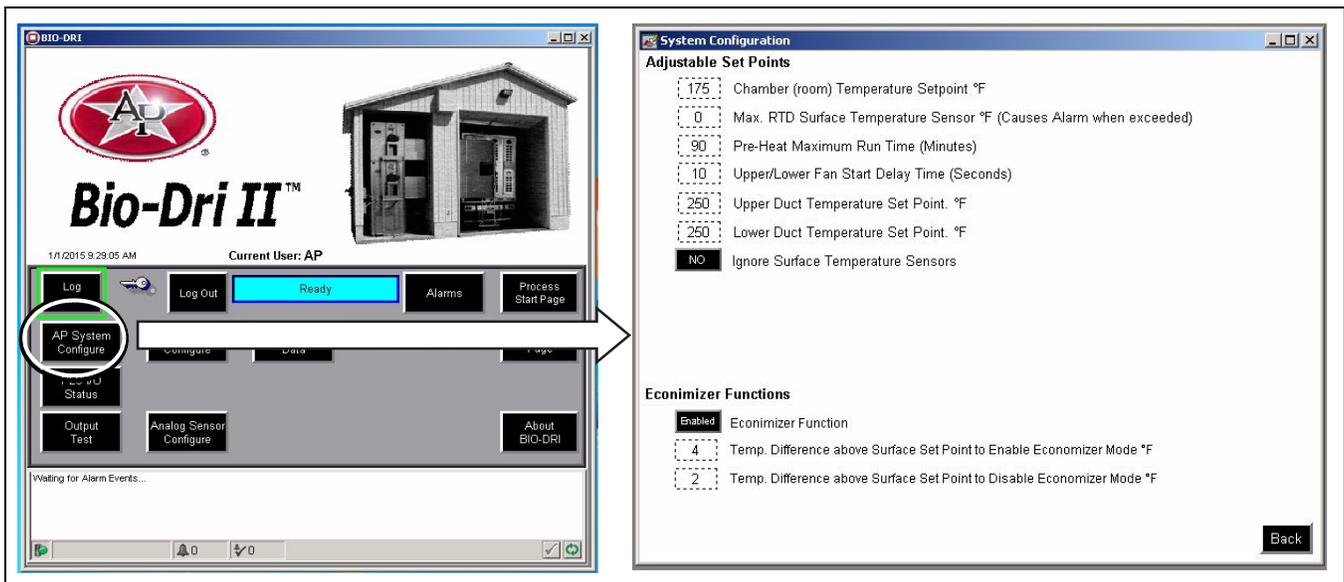2. Enter the Adjustable Set Points:

Figure 11M *AP System Configuration Screen (AP Level Access)*

3. Enter the Economizer Functions: This function turns the burners OFF temporarily if all the chosen trailer sensors are satisfied according to the settings listed below.

   a. **Economizer Function:** This setting turns the features ON and OFF.

   b. To difference the above surface set point to enable economizer mode.

   c. To difference the above surface set point to disable economizer mode

Understanding the Bio-Dri II™ Building Indicator Lights and Buzzer

Green and Red Lights (Truck Positioning Indicator)

When a truck and trailer are moved into an empty Bio-Dri II™ building, as the truck first pulls into the bay and blocks both front and rear truck positioning sensors, the Bio-Dri II™ will switch to "Truck Positioning Mode", which will last for 2 minutes.

The green light will turn ON, indicating that the driver should continue to pull the truck and trailer forward.

If the driver pulls the truck and trailer too far forward, both front and rear truck positioning sensors will be open and the red light will flash, indicating that the driver should back up.

When the truck and trailer are in the correct position, the front sensor will be blocked and the rear sensor will be open and the red light will remain on solid, indicating that the driver should stop.

Amber Light and Buzzer (Start Warning Indicator)

When the "Cycle Start" button is pushed, the start cycle will count down from 15 seconds. The amber light and buzzer will pulse during this countdown as an alarm to anyone that might accidently be inside. After the 15 seconds countdown, the centrifugal fans will start to begin the cycle.

Red Light (Cycle Run Indicator)

When the Bio-Dri II™ cycle starts the red light will turn ON and remain ON until the cycle is complete or alarms out for any reason.

Green and Red Lights (Cycle Pass/Fail Indicator)

After a cycle is complete without fail, the green light will turn ON and remain ON for up to 30 minutes and the red light will turn OFF, indicating a Pass Cycle. If a cycle fails to complete, the red light will turn ON and begin to flash for up to 30 minutes, indicating a Fail Cycle.

Green Light (Surface Sensor in place Indicator)

After a cycle is complete, if the green light is flashing, it indicates that the surface sensor has not been removed from the back of the trailer. After removing the surface sensor, the green light should remain ON solid for up to 30 minutes after the cycle.

Operating the Bio-Dri II™ System

Positioning the Trailer

The trailer must be correctly positioned in order for it to be baked properly. The positioning lights will signal you when the trailer is in the correct location.

1. Move the trailer into the baking chamber and follow the signal lights to determine when the trailer is in the correct position.

    a. Green Light - Keep moving trailer forward until the red light is illuminated.

    b. Red Light - Stop, the trailer is in position.

    c. Red Flashing Light - Move trailer backwards until the red light stops flashing.

2. Remove the tractor from the building.

⚠️ **WARNING**	*Do not leave the tractor attached to the trailer. It must be removed from the baking chamber.*

Placing the RTD Temperature Surface Sensor on the Trailer

The RTD temperature surface sensor is used to measure the surface temperature of the trailer. One sensor is provided, with a 20' cord.

1. Place the sensor on the trailer.

    a. Place at the back right corner of trailer. It must be resting upright and perfectly flat, so the pressure switch is activated, in order to monitor an accurate temperature. The Bio-Dri II™ will not start if the surface sensor pressure switch is not activated.

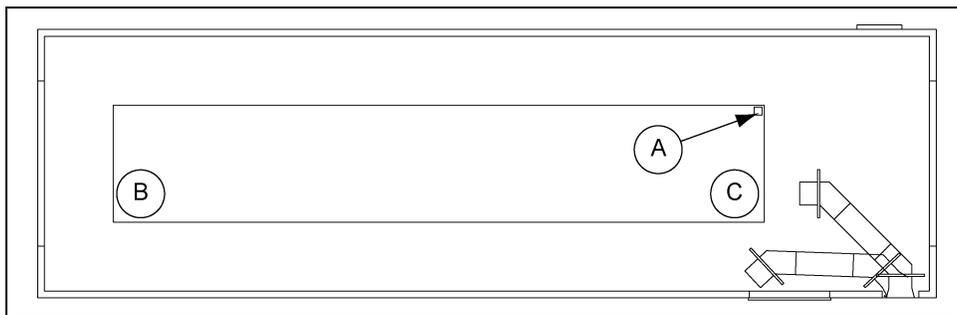| ⚠️ **CAUTION**	*Remember to remove the surface sensor from the back of the trailer before removing the trailer from the building, to prevent damage to the surface sensor.*

Figure 11N

Ref #	Description
A	Surface Temperature Sensor Location
B	Front of Trailer
C	Rear of Trailer

Emergency Stop

In an Emergency, to stop the process, do one of the following:

1. Press any of the **Emergency Stop** button on the cycle start/stop panel.

2. Pull the E-stop cord in the building or push the E-stop button on the pull-cord control panel.

3. Open a door.

Stopping a Drying Cycle

Every time the system is stopped for any reason, the Purge Cycle must operate for 8 minutes before you can start a new cycle.

To stop a drying cycle:

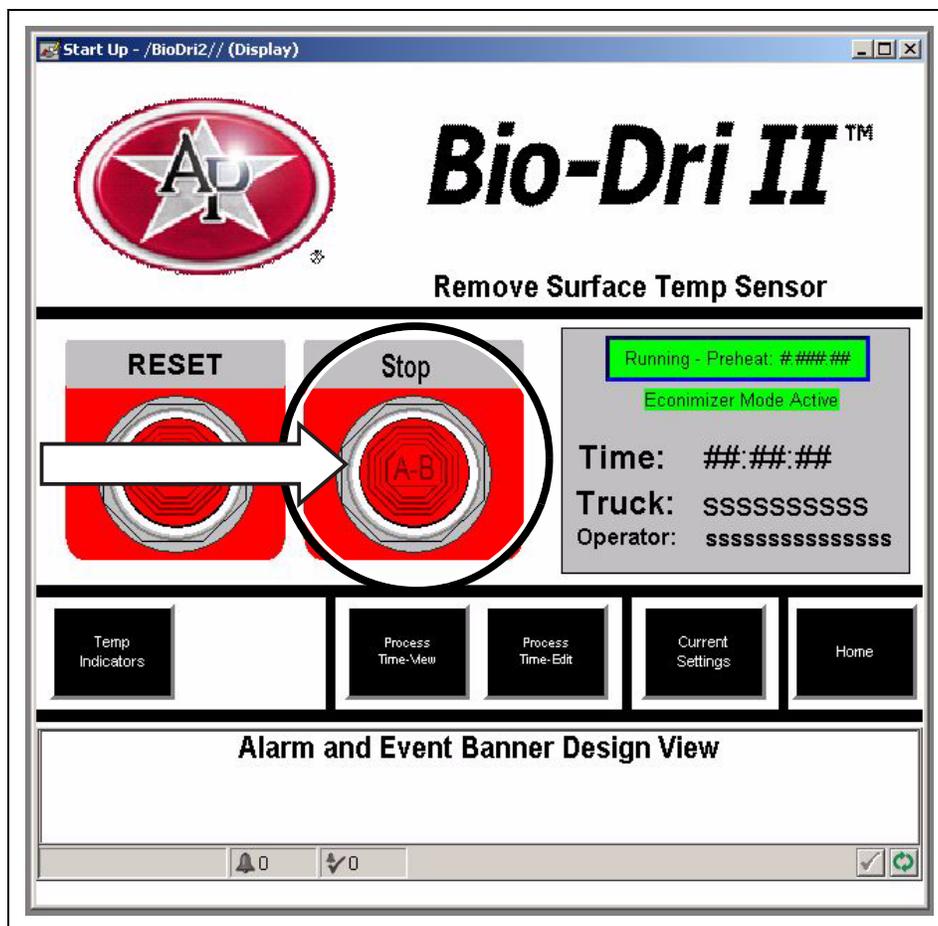1. From the Start Process Screen, click **STOP**.

Figure 11O *Start Process Screen*

NOTE: *The drying cycle will also stop if the system enters into an alarm state or in the event of a safety interlock interruption.*

Heater Modulation Gas Valve Calibration

When starting up the Bio-Dri II™ for the first time, the modulation gas valve for each heater must be calibrated. This can only be accomplished when logged into the Bio-Dri II™ program under the "AP" level user security setting. A trailer must be parked in the Bio-Dri II™ building prior to calibration. The air inlet door must be in the "Recycle" position.

The maximum opening of the gas modulation valve is the % opening that will result in a 130°F temperature rise. The minimum opening of the modulation valve is the % opening that will result in a 75°F temperature rise. Temperature rise is the temperature increase of the air as it passes through each heater. This is obtained by subtracting the chamber temperature from the duct temperature. This is shown on the "Temperature Monitor" screen as "RISE" below the temperature bar for both the upper duct and lower duct. The term "OUT" is considered to be the current % opening of each gas modulation valve. This is shown on the "Temperature Monitor" screen as "OUT" below the temperature bar and the "RISE". Note the location of the "MAX" and "MIN" below the temperature bars, just beneath the "OUT".

After logging into the computer under the "AP" level user, go to the "Process Start" page. From the "Process Start" page, click "Temp Indicators". Move the "Temp Indicators" page over to the right so it can be viewed simultaneously with the "Process Start" page.

Read the present value (PV) of the upper duct, lower duct and chamber temperature. They should all be reading the same within a few degrees and should match closely with the actual ambient temperature outside. If not, check and correct the wiring between all three (3) of these RTD temperature air sensors.

Changing the Gas Modulation Valve "MAX" and "MIN" % Open Settings

Before checking polarity of the gas modulation valve actuators, change the "MAX" and "MIN" % open settings for each duct to 100% open. By changing them both to the same setting, it forces the gas modulation valve to move to that position immediately. To change the setting, click on the value to highlight it and then enter the new value. You must press the **Enter** button on the keyboard each time a value is changed to save the new value. You should see the "OUT" value change to this new value that was entered.

Checking Polarity of the Gas Modulation Valve Actuators

The Bio-Dri II™ is now ready to start for the first time. Refer to "Starting the Cycle" *on Page 96*. The fans will start first in a staggered fashion and if the heaters then ignite at 100% open, the polarity of the gas modulation valve actuator is correct. If they do not ignite, make sure all gas valves in the gas supply line and heater pipe train are turned ON. If they still do not ignite, the polarity of the gas modulation valves may be backwards. To change the polarity remove the orange cover from the gas modulation valve actuator to expose the polarity switch. This is the black dial with the screwdriver slot. With a screwdriver, turn the dial from "1" to "0". *(See Figure 11P on Page 95.)* The heaters will always attempt to ignite three (3) times. If they do not ignite by the third attempt, the heaters will lock out. To reset them, re-cycle power by pushing in the E-Stop button on the front of the heater control box for 30 seconds. Then, pull the E-Stop button back out and it will attempt to ignite three (3) more times. Once both fans and heaters have started, the pressure regulators should be adjusted immediately. Adjust to 7 PSI for natural gas or 10 PSI for vapor propane.

Figure 11P

Adjusting the Maximum % Open Setting of each Gas Modulation Valve to 130°F Temp Rise

Begin by changing the "MAX" and "MIN" % open settings to 60% for each duct. Next, monitor the temperature rise of each duct as shown on the "Temperature Monitor" screen and adjust the "MAX" and "MIN" % open settings together until 130°F temperature rise is achieved. This process must be done quickly within the first 5 minutes, before the duct temperature goes over 270°F causing the system to overheat and shut down. If the "RISE" is higher than 130°F, lower the setting for "MAX" and "MIN" % open to 55%. Wait 10 seconds for the temperature rise to stabilize. If still too high, lower the "MAX" and "MIN" % open another 5%. Remember to adjust both the "MAX" and "MIN" % open settings to the same value, in order to force the gas modulation valves to immediately move to that position. Once a 130°F temperature rise is achieved for both ducts, the "MAX" % open setting is complete. Do not expect the value for the upper and lower ducts to be the same due to slight variations in the assembly of the gas modulation valves. Record this value on paper for the "MAX" % open setting of each duct.

Adjusting the Minimum % Open Setting of each Gas Modulation Valve to 75°F Temp Rise

Next, adjust the "MAX" and "MIN"% open value to 10% lower than the "MAX" setting from above. Wait 20 seconds for the temperature rise to stabilize. If the "RISE" is higher than 75°F, lower the setting for "MAX" and "MIN" % open by 5%. Wait 10 seconds for the temperature rise to stabilize. Remember to adjust both the "MAX" and "MIN" % open setting to the same value, in order to force the gas modulation valves to immediately move to that position. Once a 75°F temperature rise is achieved for both ducts, the "MIN" % open setting is complete. Do not expect the value for the upper and lower ducts to be the same due to slight variations in the assembly of the gas modulation valves. Record this value on paper for the "MIN" % open setting of each duct.

Final Maximum and Minimum % Open Setting of each Gas Modulation Valve

Change the "MAX" % open setting of each duct to the final value recorded from the Maximum % Open Adjustment above. Change the "MIN" % open setting of each duct to the final value recorded from the minimum % open adjustment above.

The heater modulation gas valve calibration is now complete. The "MAX" and "MIN" % open values can be slightly reduced at any time to prevent occasional overheat situations. The "MIN" % open values can be slightly increased at any time if problems with heater re-ignition occur after reaching maximum chamber temperature. However, increasing "MIN" % open values may result in an overheat situation. It is better to look for the root cause of heater re-ignition problems, which could be caused by faulty UV flame sensor, igniter, air proving switch or tubing and possible insufficient fresh air.

Starting the Cycle

⚠️ **DANGER** | ***Never start a cycle while people or animals are inside of the building or the vehicle. Make sure everyone is out of the building.***

Before you begin:

- Make sure the surface sensor is correctly located.
- Enter the trailer identification number.
- Make sure the E-Stop is in the operating position.
- Make sure the START button is flashing to indicate everything is ready.

1. Press the START button.

Monitoring the Temperatures

The temperature monitor displays the current temperatures of the sensors and their set points.

To view the current temperatures:
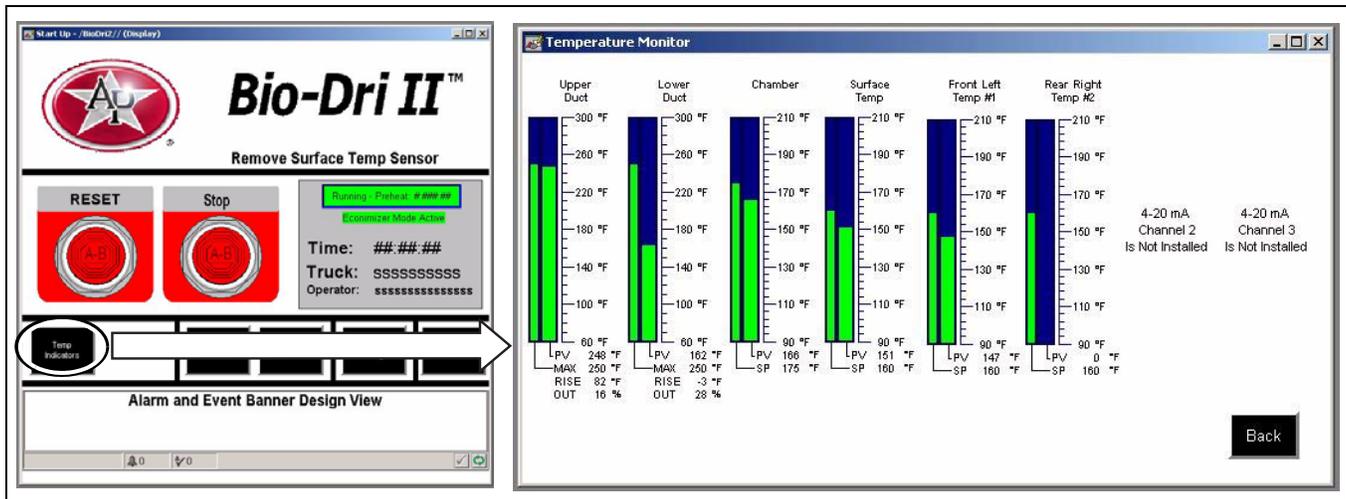
Figure 11Q *Current Temperature Monitor*

1. From the Process Start Page, click **Temp Indicators**.

   NOTE: *Definition of the Screen Terms.*

   PV = Preset Value

   MAX = Maximum duct temperature. If the temperature increases to more than the set maximum value, the system will shut down and go into alarm mode.

   SP = Chamber set point or surface temperature set point.

   NOTE: *You can expand the window to view the Temperature Monitor and the Time Settings screens next to the Process Start Page.*

Monitoring the Cycle Process Time

The Process Time Monitor displays the modes of the current baking cycle and the time elapsed for each mode.

To view the current status of the cycle process:
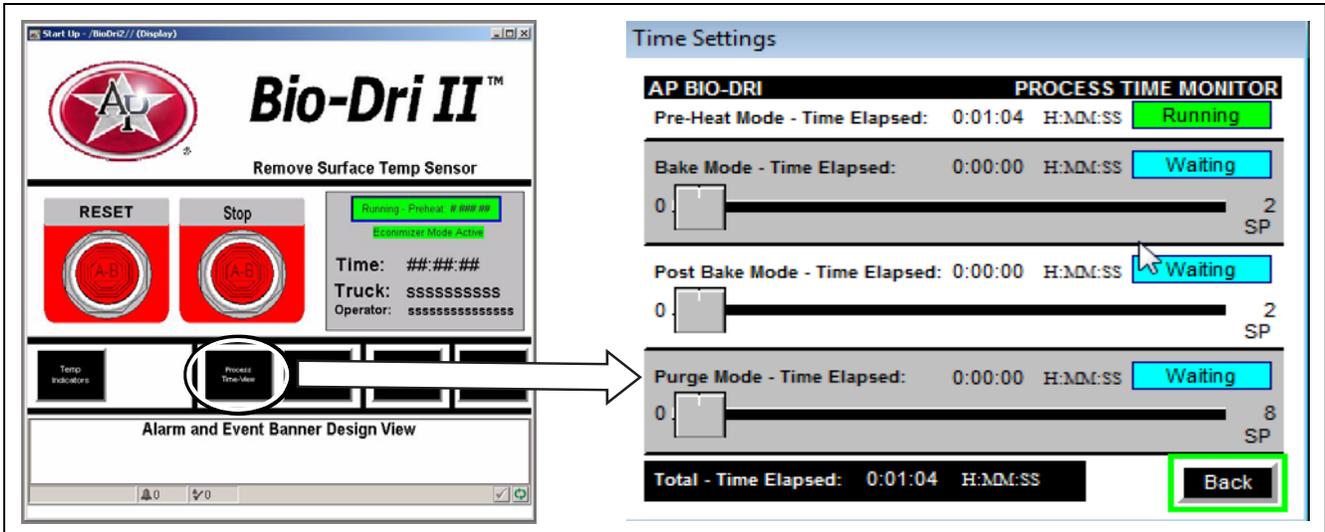

Figure 11R *Process Time View*

1. From the Process Start Page, click **Process Time View.**

   NOTE: *You can expand the window to view the Temperature Monitor and the Time Settings screens next to the Process Start Page.*
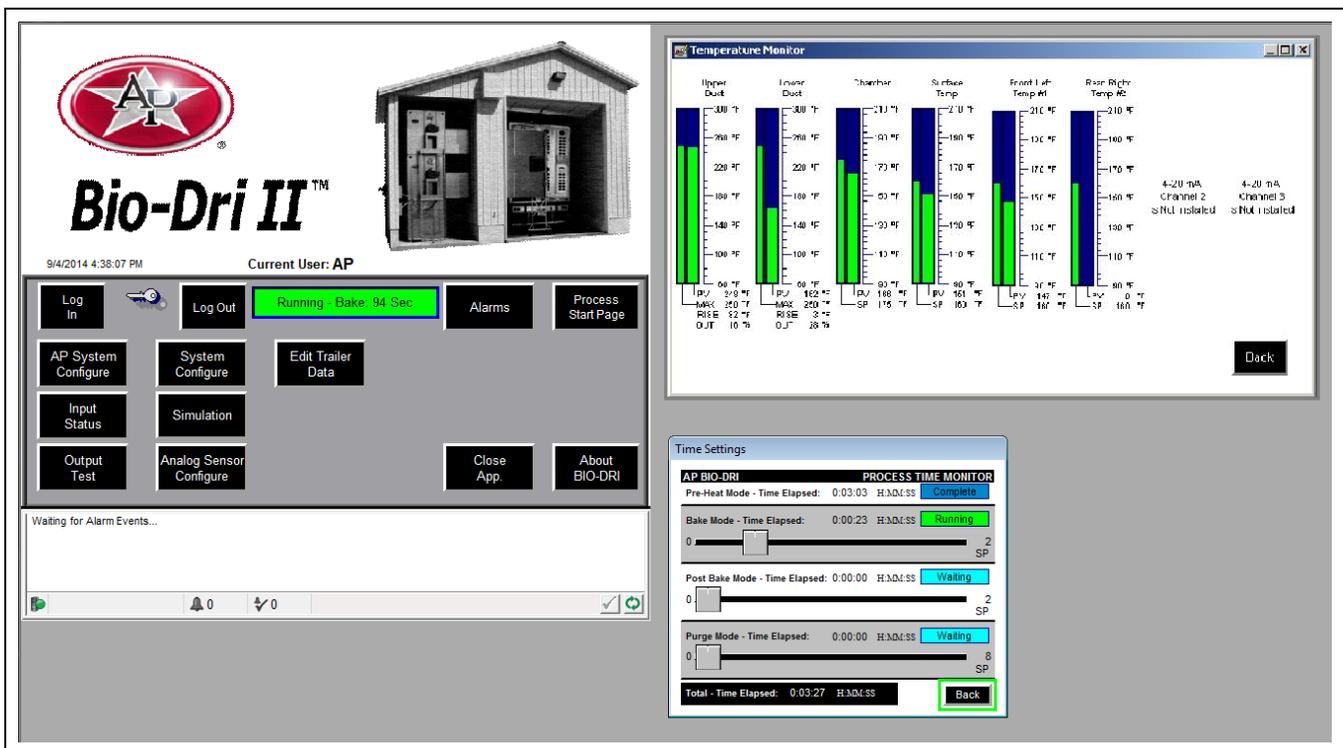
Figure 11S *Screen Layout for Monitoring*

Viewing Current Settings

The current settings page will show you the information for the current trailer that is selected.

To view the current settings:
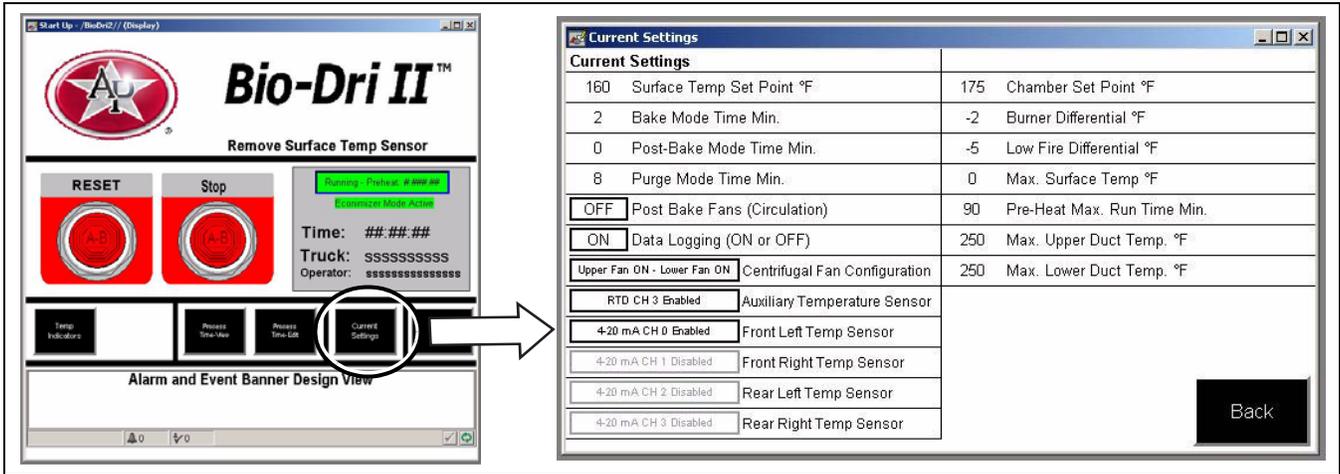
Figure 11T *Current Settings*

1. From the Process Start Page, click the **Current Settings** button.

Changing the Time of the Current Process

You can override the set times for the Bake and Post-Bake modes. The Purge mode can only be set to a minimum of 8 minutes.

To override the current settings:
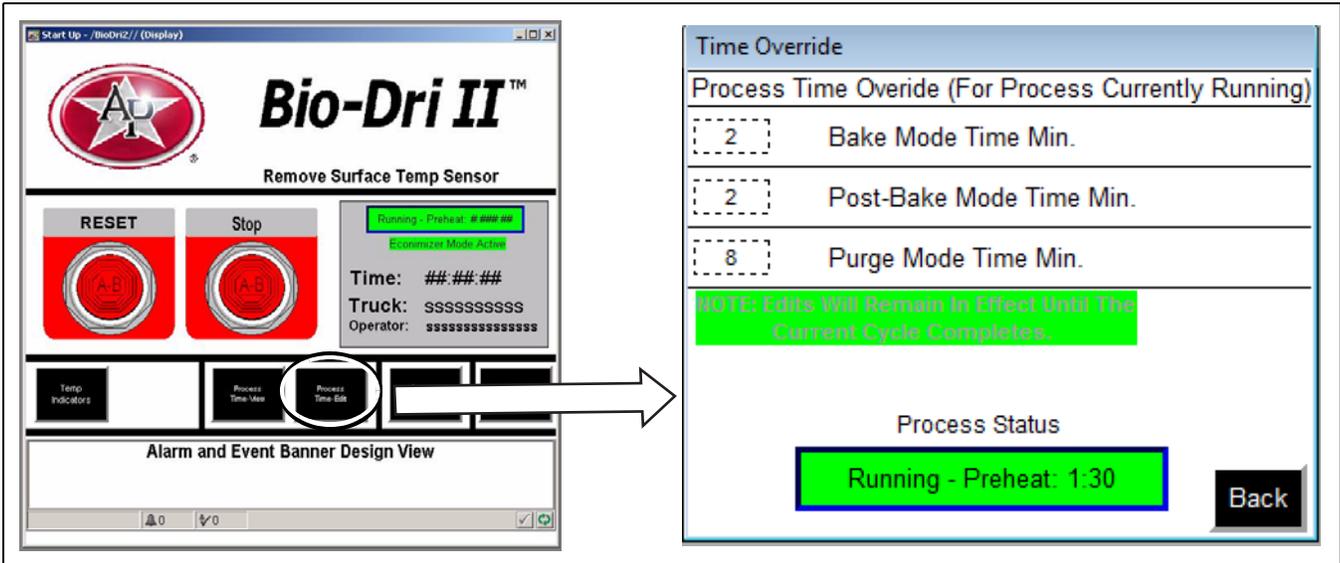
Figure 11U *Time Override*

1. From the Process Start Page, click **Process Time Edit**.

2. Enter the desired time for the override for the Bake and Post-Bake modes and click enter. (They use the computer keyboard.)

Clearing an Alarm

Alarms occur when there is an error detected by the system. Alarms are displayed at the bottom of the Startup screen.

To clear an alarm:
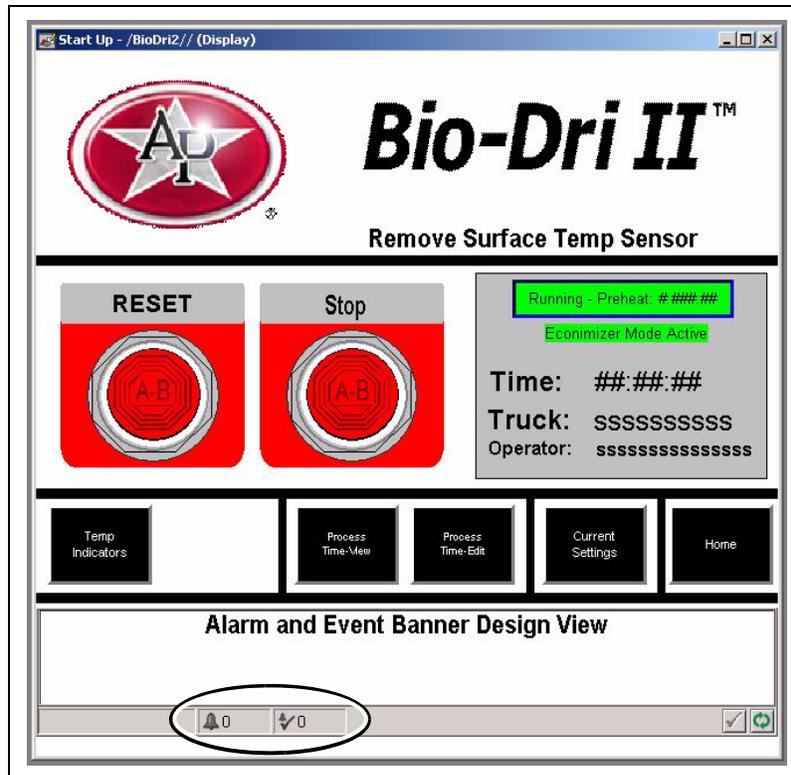
Figure 11V *Acknowledging an Alarm*

1. Read the Alarm Code and refer to the troubleshooting section *on Page 100* to identify any physical action needed to clear the alarm.

2. Once the alarm has been addressed, click the alarm at the bottom of the screen and hit the check mark to acknowledge the alarm.

12. Troubleshooting

Hardware Failure HDF:xxx

Code	Message	Description	Solution 1	Solution 2
HDF:001	4-20 CH 0 Out of range	4-20 CH-0 Reading is out of range (open circuit).	Check physical connections.	Replace sensor
HDF:002	4-20 CH 1 Out of range	4-20 CH-1 Reading is out of range (open circuit).	Check physical connections.	Replace sensor
HDF:003	4-20 CH 2 Out of range	4-20 CH-2 Reading is out of range (open circuit).	Check physical connections.	Replace sensor
HDF:004	4-20 CH 3 Out of range	4-20 CH-3 Reading is out of range (open circuit).	Check physical connections.	Replace sensor
HDF:005	RTD CH 0 Out of range	RTD CH-0 Reading is out of range (open circuit).	Check physical connections.	Replace sensor
HDF:006	RTD CH 1 Out of range	RTD CH-1 Reading is out of range (open circuit).	Check physical connections.	Replace sensor
HDF:007	RTD CH 2 Out of range	RTD CH-2 Reading is out of range (open circuit).	Check physical connections.	Replace sensor
HDF:008	RTD CH 3 Out of range	RTD CH-3 Reading is out of range (open circuit).	Check physical connections.	Replace sensor
HDF:009	Centrifugal fan upper stopped.	The upper fan is reporting a stop condition.	Verify fan operation.	None
HDF:010	Centrifugal fan lower stopped.	The lower fan is reporting a stop condition.	Verify fan operation.	None
HDF:011	Safety interlock.	The safety interlock signal to input 0 has been lost.	Verify state of all safety devices.	Check physical connections.
HDF:012	Fault - Surface temp pressure switch open.	Surface temp pressure switch open.	Verify aux. sensor is on surface.	Check physical connections.

Safety SFTY:xxx

Code	Message	Description	Solution 1	Solution 2
SFTY:000	Safety relay tripped	A safety relay has been tripped.	Ensure all the safety relays are working properly.	None
SFTY:001	Cord switch #1 tripped	Safety cord #1 has been tripped.	Verify the cord connected to the E-stop is retracted.	None
SFTY:002	Cord switch #2 tripped	Safety cord #2 has been tripped.	Verify the cord connected to the E-stop is retracted.	None
SFTY:003	Overhead door #1 tripped	Overhead door contact #1 is not aligned.	Verify the door is closed and the contacts are aligned.	Replace door contacts
SFTY:004	Overhead door #2 tripped	Overhead door contact #2 is not aligned.	Verify the door is closed and the contacts are aligned.	Replace door contacts
SFTY:005	Man door #1 tripped	Man door contact #1 is not aligned.	Verify the door is closed and the contacts are aligned.	Replace door contacts
SFTY:006	Man door #2 tripped	Man door contact #2 is not aligned.	Verify the door is closed and the contacts are aligned.	Replace door contacts
SFTY:007	Man door #3 tripped	Man door contact #3 is not aligned.	Verify the door is closed and the contacts are aligned.	Replace door contacts
SFTY:008	Main pb tripped	Main power breaker is tripped.	Verify the E-stop is fully retracted.	None
SFTY:009	Room overtemperature tripped	The room temperature high-limit has been exceeded.	Raise the set point for the room temperature high-limit.	Replace the sensor

Interlock INT:xxx

Code	Message	Description	Solution 1	Solution 2
INT:001	Interlock - Setting incompatibility.	A setting mismatch has been detected.	Verify channel enable/disable 4-20 and RTD match the hardware setup.	None

Message MSG:xxx

Code	Message	Description	Solution 1	Solution 2
MSG:001	Upper duct flame out	The flame out upper signal has been received.	Verify operation of connected equipment.	None
MSG:002	Lower duct flame out	The flame out lower signal has been received.	Verify operation of connected equipment.	None

Set Point Exceeded SPE:xxx

Code	Message	Description	Solution 1	Solution 2
SPE:001	ERR-MAX pre-heat run time set point exceeded.	The process has timed out prior to reaching surface temperature set point.	Increase the run time set point.	Verify integrity of chamber and heating equipment.

Over Temperature Limit OTL:xxx

Code	Message	Description	Solution 1	Solution 2
OTL:001	4-20 mA CH 0 Over temp limit.	4-20 mA CH 0 has exceeded 200°.	Reset after cool down below set point.	Verify set points and heating equipment.
OTL:002	4-20 mA CH 1 Over temp limit.	4-20 mA CH 1 has exceeded 200°.	Reset after cool down below set point.	Verify set points and heating equipment.
OTL:003	4-20 mA CH 2 Over temp limit.	4-20 mA CH 2 has exceeded 200°.	Reset after cool down below 200°.	Verify set points and heating equipment.
OTL:004	4-20 mA CH 3 Over temp limit.	4-20 mA CH 3 has exceeded 200°.	Reset after cool down below 200°.	Verify set points and heating equipment.
OTL:005	RTD CH 0 Over temp limit.	RTD CH 0 has exceeded the MAX upper duct set point.	Reset after cool down below 200°.	Verify set points and heating equipment.
OTL:006	RTD CH 1 Over temp limit.	RTD CH 1 has exceeded the MAX lower duct set point.	Reset after cool down below 200°.	Verify set points and heating equipment.
OTL:007	RTD CH 2 Over temp limit.	RTD CH 2 has exceeded 200°.	Reset after cool down below 200°.	Verify set points and heating equipment.
OTL:008	RTD CH 3 Over temp limit.	RTD CH 3 has exceeded 200°.	Reset after cool down below 200°.	Verify set points and heating equipment.

NOTES

GSI Group, LLC Limited Warranty

The GSI Group, LLC ("GSI") warrants products which it manufactures to be free of defects in materials and workmanship under normal usage and conditions for a period of 12 months after sale to the original end-user or if a foreign sale, 14 months from arrival at port of discharge, whichever is earlier. The end-user's sole remedy (and GSI's only obligation) is to repair or replace, at GSI's option and expense, products that in GSI's judgment, contain a material defect in materials or workmanship. Expenses incurred by or on behalf of the end-user without prior written authorization from the GSI Warranty Group shall be the sole responsibility of the end-user.

Warranty Extensions:

The Limited Warranty period is extended for the following products:

	Product	Warranty Period
AP Fans and Flooring	Performer Series Direct Drive Fan Motor	3 Years
	All Fiberglass Housings	Lifetime
	All Fiberglass Propellers	Lifetime
AP and Cumberland	Flex-Flo/Pan Feeding System Motors	2 Years
Cumberland Feeding/Watering Systems	Feeder System Pan Assemblies	5 Years **
	Feed Tubes (1-3/4" and 2.00")	10 Years *
	Centerless Augers	10 Years *
	Watering Nipples	10 Years *
Grain Systems	Grain Bin Structural Design	5 Years
Grain Systems Farm Fans Zimmerman	Portable and Tower Dryers	2 Years
	Portable and Tower Dryer Frames and Internal Infrastructure †	5 Years

* Warranty prorated from list price:
 0 to 3 years - no cost to end-user
 3 to 5 years - end-user pays 25%
 5 to 7 years - end-user pays 50%
 7 to 10 years - end-user pays 75%

** Warranty prorated from list price:
 0 to 3 years - no cost to end-user
 3 to 5 years - end-user pays 50%

† Motors, burner components and moving parts not included. Portable dryer screens included. Tower dryer screens not included.

GSI further warrants that the portable and tower dryer frame and basket, excluding all auger and auger drive components, shall be free from defects in materials for a period of time beginning on the twelfth (12th) month from the date of purchase and continuing until the sixtieth (60th) month from the date of purchase (extended warranty period). During the extended warranty period, GSI will replace the frame or basket components that prove to be defective under normal conditions of use without charge, excluding the labor, transportation, and/or shipping costs incurred in the performance of this extended warranty.

Conditions and Limitations:

THERE ARE NO WARRANTIES THAT EXTEND BEYOND THE LIMITED WARRANTY DESCRIPTION SET FORTH ABOVE. SPECIFICALLY, GSI MAKES NO FURTHER WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE IN CONNECTION WITH: (I) PRODUCT MANUFACTURED OR SOLD BY GSI OR (II) ANY ADVICE, INSTRUCTION, RECOMMENDATION OR SUGGESTION PROVIDED BY AN AGENT, REPRESENTATIVE OR EMPLOYEE OF GSI REGARDING OR RELATED TO THE CONFIGURATION, INSTALLATION, LAYOUT, SUITABILITY FOR A PARTICULAR PURPOSE, OR DESIGN OF SUCH PRODUCTS.

GSI shall not be liable for any direct, indirect, incidental or consequential damages, including, without limitation, loss of anticipated profits or benefits. The sole and exclusive remedy is set forth in the Limited Warranty, which shall not exceed the amount paid for the product purchased. This warranty is not transferable and applies only to the original end-user. GSI shall have no obligation or responsibility for any representations or warranties made by or on behalf of any dealer, agent or distributor.

GSI assumes no responsibility for claims resulting from construction defects or unauthorized modifications to products which it manufactured. Modifications to products not specifically delineated in the manual accompanying the equipment at initial sale will void the Limited Warranty.

This Limited Warranty shall not extend to products or parts which have been damaged by negligent use, misuse, alteration, accident or which have been improperly/inadequately maintained. This Limited Warranty extends solely to products manufactured by GSI.

Prior to installation, the end-user has the responsibility to comply with federal, state and local codes which apply to the location and installation of products manufactured or sold by GSI.

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This equipment shall be installed in accordance with the current installation codes and applicable regulations, which should be carefully followed in all cases. Authorities having jurisdiction should be consulted before installations are made.

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