



# ITT

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## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

**MODEL T4605F, T4606F & T4607F**

**Skotch<sup>®</sup> Trifecta<sup>®</sup> VALVE SYSTEM**

### WARNING

Valves and valve actuators supplied by ITT Engineered Valves, LLC are designed and manufactured using good workmanship and materials, and they meet the applicable industry standards. These valves are available with components of various materials, and they should be used only in services recommended herein or by a company valve engineer. Misapplication of the product may result in injuries or property damage. A selection of valve components of the proper material and consistent with the particular performance requirement is important for proper application.

Examples of misapplication or misuse of products include use in an application in which the pressure/temperature is exceeded or failure to maintain the equipment as recommended and use of products to handle caustic and/or hazardous substances when not designed for that purpose.

If valve exhibits any indication of leakage, do not operate. Isolate valve and either repair or replace.

## Record of Revisions

| Revision | Description | Date     |
|----------|-------------|----------|
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|          |             |          |

# TABLE OF CONTENTS

| <b>SECTION</b> |  | <b>PAGE</b> |
|----------------|--|-------------|
| I.             | Description .....                                    | 5           |
| II.            | Operation .....                                      | 6           |
| III.           | Installation .....                                   | 9           |
| IV.            | Commissioning .....                                  | 11          |
| V.             | Disassembly & Maintenance Instructions .....         | 11          |
| VI.            | Leak Testing .....                                   | 19          |
| VII.           | POC Switch Testing .....                             | 20          |
| VIII.          | Miscellaneous Instructions for Special Options ..... | 23          |
| IX.            | Spare Parts Order Information .....                  | 24          |
| X.             | Reference Information .....                          | 24          |

## **DRAWINGS**

|        |   |
|--------|---|
| 03-010 | Valve Assembly – Model T4600F Systems                       |
| 117374 | Dimensions - Series T4600F Gas Burner Valve System - NEMA 4 |
| 117375 | Dimensions - Series T4600F Gas Burner Valve System - NEMA 7 |
| 60-021 | Electrical Schematic - Fail in Last                         |
| 60-022 | Electrical Schematic - Fail Closed                          |
| 60-018 | Wiring Diagram - AC Solenoids                               |
| 60-024 | Wiring Diagram - DC Solenoids                               |
| 116763 | Wiring Diagram - GO Prox Switches                           |
| 117473 | Pneumatic Schematic – Fail Closed                           |
| 117474 | Pneumatic Schematic - Fail in Last                          |

**I. DESCRIPTION**

The Series T4600F Trifecta Burner Valve System provides all the isolation and venting functions necessary for automated operation of gas-fired burners in utility and industrial power plants. These include double block of the main gas line and venting the chamber between blocks to atmosphere. Hence, the term "Double Block and Vent" or "Double Block and Bleed". The vents are sized in accordance with Industrial Risk Insurers (IRI) and National Fire Protection Association (NFPA) recommendations. To satisfy code requirements, Proof of Closure (POC) switches utilizing valve seal overtravel are supplied as standard to prove the valve is closed. Optional switch to monitor valve open position can offer added feedback for plant DCS systems.

The Model T4605F valve system, which is the Fail-in-Last Position model, utilizes a dual coil momentary contact pilot solenoid valve for pneumatic operation and requires compressed air and electric power to open and close. The system fails in last position on loss of air or electric power. It will not hold this position indefinitely if air is lost.

Model T4605F valve systems can never be Factory Mutual (FM) approved due to the mode of failure.

The Model T4606F and T4607F valve systems, which are the Fail Closed models, utilize a solenoid operated spring return pilot solenoid for pneumatic operation and require compressed air and electric power to open. The system closes on a loss of pneumatic or electric power.

Model T4606F valves incorporating specific options are Factory Mutual approved for Natural Gas Safety Shutoff Valves per FM Approval Standard Class 7400. Valves meeting the requirements of FM are tagged as such.

Model T4607F valves are not Factory Mutual listed with valve configuration.

Outside of the solenoid valve that controls the actuator all other aspects of the valve system are the same between the all model numbers.

A single Skotch gas valve is typically installed in place of a multiple valves arrangement.

Consult order specification for detailed specifications of equipment supplied on each project.

**II. OPERATION**

Refer to solenoid assembly nameplate or purchase order specifications to determine appropriate line voltage and type. Operation is in accordance with referenced drawings.

Check specific order options and wiring diagrams (60-018 for AC voltage or 60-024 for DC voltage) for electrical terminals supplied inside the junction box.

**A. *Open Block Valves (Close Vent)***

T4605F, T4606F and T4607F valves follow similar opening protocol.

With pneumatic supply pressure regulated to a minimum of 70 psig and a maximum of 120 psig, apply line voltage across terminal points 1 and 2 for AC solenoids (Terminal points 18 and 19 for DC Solenoids) located in the junction box. This energizes the pilot solenoid, allowing pneumatic pressure into the cylinder.

As pressure is admitted to the cylinder, the outlet valve return spring is compressed and the outlet valve plug moves out of its seat ring. Concurrently, a cage slides down over a post until first a soft seal, then a metal back-up seal is made, closing the vent.

Upon vent closure, the piston continues to stroke. This pushes the inlet valve plug out of its seat ring, compressing the inlet valve return spring. Stroking stops when the actuator piston contacts a travel stop internal to the actuator. Flow commences only after the inlet plug clears its seat. Thus, no flow occurs until the vent is positively closed.

**B. Close Block Valves (Open Vent)**

How the valve is commanded Closed differs for the different model numbers.

For T4605F valves:

Deleting voltage from terminal 1 and 2, and applying voltage momentarily across terminals 2 and 3 for AC Solenoids (Terminals 20 and 21 for DC solenoids) energizes the exhaust coil and exhausts pneumatic pressure from the cylinder.

**CAUTION**

*Note: Never energize both solenoid coils simultaneously. Doing so, will permanently damage the coils.*

For T4606F and T4607F valves:

Deleting voltage across terminals 1 and 2 for AC Solenoids (Terminals 18 and 19 for DC solenoids) de-energizes the pilot solenoid and exhausts pneumatic pressure from the cylinder.

For all models:

Upon exhausting the cylinder, both inlet and outlet return springs move their respective plugs toward their seat rings. First the inlet valve soft seal makes, halting flow through the assembly, then its metal back-up. The inlet POC switch trips after the inlet block valve soft seal starts into its seat. Next the vent cage moves off its post, opening the vent and relieving downstream pressure. Finally, the outlet valve soft seal, followed by its metal back-up close, completing the cycle. Two independent blocks are formed between system inlet and outlet, with the chamber between the block valves ported to vent. The outlet POC switch trips after the outlet block valve soft seal starts into its seat.

**C. Notes**

The quick exhaust module is equipped with a built in speed control valve. It is located directly above the cylinder exhaust port and can be adjusted with a 1/8" hex Allen wrench. Turning the adjustment inward or clockwise slows the opening speed. **Note: The speed control function has no effect on closing speed.**

For Model T4605F valves, the solenoid pilot valve is a dual coil momentary contact type, rated for continuous duty at the service voltage. **Note: Never energize both solenoid coils simultaneously. Doing so, will permanently damage the coils.**

For Model T4606F & T4607F valves, the solenoid pilot valve is a maintained contact type, rated for continuous duty at the service voltage. Note that terminal number 3 inside the junction box is not supplied as the solenoid is a single coil spring return versus dual coil design.

Proof of Closure (POC) switches are provided for both the inlet and outlet valves to individually monitor the status of each block valve. The outlet valve POC is located on the top or actuator side and the inlet valve POC is located on the bottom of the valve assembly. Logic is shown on the referenced wiring diagram. POC switches change contact states prior to actual commencement of flow. Both POC switches should be used to prove valve closure. It is recommended they be monitored individually. Some valves may be equipped with an optional open limit switch that is located on the bottom of the valve assembly and is tripped by the inlet valve shaft. Valves with the optional open limit switch will have a total of three (3) switches on them.

Note: Assemblies supplied with DPDT Switches provide all terminal points noted on Wiring Diagram. Valves supplied with SPDT switches have a reduce number of terminals. Reference drawing (60-018 - AC, 60-024 - DC) for details.



### III. INSTALLATION

#### A. *Unpacking*

Do not remove protective plastic plugs until ready to install.

Verify no debris or foreign objects are inside the valve.

Transporting - use proper hoisting procedures to avoid damage to valve. If using a sling, it should be placed on the body, not the actuator cylinder.

#### **CAUTION**

*Note: Valve weighs over 515 lbs in base form. Use proper lifting safety precautions for transporting the valve.*

Purge the fuel gas line prior to installing the valve.

Purge all pneumatic air lines prior to connecting solenoids.

#### **CAUTION**

*Note: Do not lift or pull on the electrical conduit lines Doing so may cause the POC switches to come out of calibration.*

Historically many problems at start-up are due to mishandling of the valve and poor purging of the fuel lines and pneumatic control lines.

#### B. *Valve Installation*

#### **WARNING**

*Prior to installation and/or start-up, piping should be verified as being free of dirt, grit, welding slag, or other particulate contamination. Failure to do so may result in damage to valve internals.*

The T4600F Trifecta Valve System is typically supplied with a female NPT vent connection and flanged end connections. (Note: Other end configurations available upon request.) Refer to order specification or purchase order specifications for type supplied. Valve installation should be in accordance with standard practices for end connection provided. Flanges are raised face carbon steel per ANSI B16.5. Threads are per ANSI B2.1. Ensure the weight of the system is properly supported to prevent excessive stresses. Valve should not be supported by actuator tie rods. Valve may be installed in any orientation. Ensure flow direction is appropriate for intended installation. Valves incorporating welded ends should follow special precaution to insure weld heat does not damage valve seals and gaskets. Temperatures in these areas should be kept below 200° F.

**CAUTION**

*Vent pipe size should be equivalent to the vent fitting size supplied. Reducing vent size may result in insufficient flow capacity. Under NO circumstance should the vent be blocked or plugged.*

**C. Pneumatic/Electrical Hook Up**

Utilities required for operation are electrical power and clean dry compressed air. Wiring should be in accordance with referenced drawings and all applicable codes. Supply air should be connected to the 1/4" NPT inlet port on the solenoid quick exhaust module. Purge all pneumatic lines before connecting to the solenoid assembly. The control air lines should be filtered to 40 microns minimum. Supply air pressure should be 70 to 120 psig at all times.

**WARNING**

*Make certain electrical supply is isolated and tagged out before proceeding with electrical connections.*

Note: Some assemblies may include an optional filter regulator that must be mounted by the end user.

**CAUTION**

*Failure to maintain proper pneumatic air line pressure could result in damage to the valve.*

*Use suitable thread sealing compound only. Do not use PTFE tape.*

**CAUTION**

*The exhaust side of the solenoid should not be restricted. This will slow the closing rate of the valve. The exhaust module is supplied with an appropriate exhausting muffler that ensures proper closing rate. Please consult the factory for replacement.*

**IV. COMMISSIONING**

After installation, connections should be tested to confirm integrity. T4600F Systems are equipped with a 1/4" NPT test port in the protruding end of the outlet/vent shaft. See drawing 03-010. This port is directly connected to the valve's vent chamber and may be used to confirm seal integrity on start-up and during operation.

**V. DISASSEMBLY AND MAINTENANCE INSTRUCTIONS**

All T4600F Systems may be completely disassembled without removal from the piping. However, it is recommended that it be rebuilt in a shop with suitable fixturing, hoisting equipment and tools.

**NOTE:** Customers that do not feel comfortable with rebuilding and testing Skotch valves can have them rebuilt by the factory. Call the number located on the front cover or (800) 366-1111 and ask to speak to Skotch, Customer Service for quotation and instructions.

Item numbers refer to referenced drawing, 03-010.

**WARNING**

*Verify the T4600F gas valve is in CLOSED position. Ensure all manual isolation valves are closed and tagged out, all electrical circuits are de-energized and that the pneumatic supply and valve are isolated and depressurized before performing any work on the valves.*

**IMPORTANT:** Special tools are needed for disassembly and assembly. They should be procured before work begins.

Special tools include:

ITT P/N: 49089, Spring Compressor T4600F. Uses to compress the outlet return spring during disassembly and assembly.

ITT P/N: 49112, Tool Seat Ring Puller T4600F. Use to remove seat rings from valve body.

**A. Disassembly**

**WARNING**

*Individual valve components can be very heavy and difficult to remove. Use proper caution.*

A clean dry area should be provided for valve disassembly. Before disassembling the valves, the location of the junction box, vent and flange subassemblies should be marked to facilitate ease of reassembly. Commence system disassembly by removing accessories such as switch covers, solenoids, switches and junction boxes from mounting surfaces on the top and bottom of the valve. Uncouple the vent connection piping.

Continue as follows (Reference drawing 03-010):

Unscrew Hex Nuts (Item 13) from Tie Rods (Item 27) and remove Rods.

Remove Junction Box Bracket (Item 25) and slide off Actuator Top Cap (Item 24).

Remove Actuator Shaft Wiper (Item 32), Actuator Shaft Seal (Item 33), Cylinder O-ring Seal (Item 36), Snap Ring (Item 38), Bushing (Item 39) and O-ring (Item 37) from Top Cap.

Grasp the wall and vent port of the Cylinder (Item 23), slide it over the Piston (Item 18) and off the assembly. Remove Cylinder O-ring Seal (Item 36) from valve body.

Use wrench to hold flats of actuator shaft on Outlet Valve Subassembly (Item 8) and loosen top Piston Nut (Item 22). Unscrew top Piston Nut (Item 22) from Outlet Valve Subassembly (Item 8).

Places the Spring Compressor (P/N 49089) on Piston (Item 18) and secure tie rods to valve body. Wrench tight the tie rods, in uniform increment, to compress the Outlet Return Spring (Item 17) and relieving the spring force on the bottom Piston Nut (Item 22). Unscrew the bottom Piston Nut (Item 22). Do not allow the Outlet Valve Subassembly to rotate during nut removal. Hold on flats of Actuator Shaft to keep from turning.

***CAUTION***

***After removing the bottom Piston Nut it is possible for the Outlet Valve Subassembly to fall from the bottom of the valve. Properly support the Outlet Valve until it is removed.***

Slowly unscrew tie rods of the Spring Compressor (P/N 49089). Note: the two tie rods must be removed uniformly. The spring will completely relax prior to disengagement.

Slide Washer (Item 21) and Piston (Item 18) off the Shaft of Outlet Valve Subassembly (Item 8).

Discard old Piston Gasket (Item 19) and clean surfaces of sealant.

Remove Piston Seals (Item 35) and Piston Bearing Strip (Item 20).

Remove Outlet Valve Return Spring (Item 17).

Unscrew Hex Nuts (Item 13) from Flange Studs (Item 12) taking note of the **Warning** below and slip Bottom Flange Subassembly (Item 10) out of Body Subassembly (Item 2). Care should be taken to unscrew the nuts evenly around the bolt circle, so Inlet Valve Spring (Item 9) does not bind during disassembly. The spring will completely relax before the nuts are unscrewed.

**WARNING**

*When removing the Hex Nuts (Item 13) from the Flange Studs (Item 12), remove the nuts from the long end of the exposed threads. Removing them from the short end will not properly unload the spring.*

Remove the Inlet Valve Return Spring (Item 9).

Grasp the shaft of the Inlet Valve Subassembly (Item 7) and pull it out of Inlet Seat Ring (Item 3).

**CAUTION**

*With the removal of Inlet Valve Subassembly, it is possible for the Outlet Valve Subassembly to fall from its seat ring. The Outlet Valve Subassembly should be properly supported.*

Remove Shaft Wiper (Item 32) and Shaft Seal (Item 33) from Bottom Flange Subassembly (Item 10). Care should be used not to scratch the bearing.

Discard old Bottom Flange Gasket (Item 11).

Remove Vent Seal (Item 30) from Inlet Valve Subassembly (Item 7). There is a small amount of retaining Loctite on the threads of vent seal retaining screw. Discard old Wave Springs.

Unscrew seal retainer screws and remove seal (Item 29) and retainer from Inlet Valve Subassembly (Item 7). There are retaining Loctite on the threads of the screws.

Remove Inlet Valve Seat Ring retaining screw (Item 6); there are retaining Loctite on the threads of the screws. Seat Ring Puller (P/N 49112) can be used to extract the Inlet Seat Ring. Insert puller behind the Seat Ring (item 3) while longer bar on lower flange of body (Item 2), turn hex nut on stud to pull the Seat Ring (item 3) from Lower Body (Item 2).

Discard old Seat Ring Gasket (Item 5) and clean surfaces of sealant.

Remove the Outlet Valve Subassembly (Item 8) through the bottom of the valve body.

Remove the Outlet Valve Retainer Screws from the Outlet Valve Subassembly (Item 8), there are retaining Loctite on the threads of screws (Item 6). Lift Outlet Seal Retainer and remove Seal (Item 31) from Outlet Valve Subassembly.

Remove Spring Bucket Subassembly (Item 14) by unscrewing Mounting Screws (Item 16); there are retaining Loctite on the threads. Remove Spring Bucket Gasket (Item 15) and clean the surfaces of sealant. Remove Vent Shaft Seals (Item 34) from Spring Bucket Sub Assembly (Item 14). Caution should be taken not to damage the bushing.

Remove the Outlet Valve Seat Retaining Screw (Item 6); there are retaining Loctite on the threads of the screws (Item 6). Seat Ring Puller (P/N 49112) can be used to extract the Outlet Seat Ring. Insert puller behind the Outlet Seat Ring (item 4) while long bar on upper flange of body (Item 1), turn hex nut on stud to pull the Outlet Seat Ring (item 4) from Upper Body (Item 1) through the top of the valve body.

Discard old Seat Ring Gasket (Item 5) and clean surfaces of sealant.

Discard all seals that were removed from valve.

## ***B. Maintenance***

Periodic leak testing of both block valves and verification of proper operation of both proof of closure switches and open limit switch (when equipped) is recommended per applicable codes. See Section VI for leak testing and Section VII for switch setting techniques.

Upon disassembly, all sealing and bearing surfaces, including metal back-up seats, should be inspected for nicks or other surface finish damage. Damaged items should be replaced. Prior to reassembly, scrape any remaining gasket material from mating surfaces. Wire brush and clean threads of retaining Loctite. Clean gasket surfaces with a good quality solvent.

### **C. Reassembly**

#### **Bottom Flange Subassembly**

Lubricate Shaft Wiper (Item 32), Shaft Seals (Item 33) and sealing surfaces in Bottom Flange Subassembly (Item 10) with a suitable lubricant, such as, Dow Corning 55. Install Shaft Wiper (Item 32) and Shaft Seals (Item 33) in Bottom Flange Subassembly (Item 10). Note the orientation of wiper and seal in Detail A of drawing 03-010.

#### **Inlet Valve Subassembly**

Use Loctite® 222 and recommended primer on cap screws that hold Seal (Item 29) and retainer. Uses Inlet Seat Ring (Item 3) as guide to set Seal (Item 29) and ensure Seal (Item 29) is concentrate on Inlet Valve Subassembly (Item 7).

Stack the three separate vent wave springs on top of one another, in a nested fashion. Ensuring the lap joint of the wave springs is staggered. Slide the wave springs and spring retaining over the vent post of Subassembly. Lay Vent Seal (Item 30) and seal retainer on top of post. Uses Loctite® 242 and recommended primer on hex head cap screw and secure Vent Seal (Item 30) in place.

#### **Outlet Valve Subassembly**

Uses Loctite® 222 and recommended primer on cap screws that hold Seal (Item 31) and retainer. Uses Outlet Seat Ring (Item 4) as guide to set Seal (Item 31) and ensure Seal (Item 31) is concentrate on Outlet Valve Subassembly (Item 8).

#### **Spring Bucket Subassembly**

Lubricate Vent Shaft Seals (Item 34) with a suitable lubricant, such as, Dow Corning 55. Install Vent Shaft Seals (Item 34) in Spring Bucket Subassembly. Note the orientation of the seals in Spring Bucket Subassembly (Item 14), refer to drawing 03-010 Detail B and C

#### **Actuator Shaft Bushing**

Lubricate O-Ring (Item 37), Shaft Wiper (Item 32) and Shaft Seal (Item 33) with a suitable lubricant, such as, Dow Corning 55. Install O-Ring (Item 37) in Actuator Top Cap (Item 24). Install Shaft Wiper (Item 32) and Shaft Seal (Item 33) in Bushing (Item 39). Note the orientation of wiper and seal in bushing, refer



to Detail D on drawing 03-010. Install Bushing (Item 39) in Actuator Top Cap (Item 24) and use Snap Ring (Item 38) to secure Bushing (Item 39) in place.

### **Valve Assembly**

Use a suitable gasket compound on all gaskets as noted, such as, Permatex Blue Adhesive Sealant (RTV).

Apply gasket compound to gasket side of Outlet Seat Ring (Item 4). Press the Seat Ring Gasket (Item 5) on to the Outlet Seat Ring (Item 4). Apply gasket compound to other side of Seat Gasket (Item 5). Fasten Outlet Seat Ring (with Gasket) into seat ring holder in Top Body (Item 1). Use Loctite® 242 and recommended primer on cap screws (Item 6). Place all screws in place than tighten in criss-cross pattern.

Lubricate the sealing surface of Outlet Seat Ring (Item 4) and circumference of Seal (Item 31). Slide in Outlet Valve Subassembly (Item 8) from bottom of valve body (Item 2). Care not to damage Outlet Valve Subassembly (Item 8) and it should be supported.

Apply gasket compound to the gasket side of Inlet Seat Ring (Item 3). Press on the Seat Ring Gasket (Item 5) and apply gasket compound to other side of Seat Gasket (item 5). Fasten Inlet Seat Ring (with Gasket) into seat ring holder in Bottom Body (Item 2). Use Loctite® 242 and recommended primer on cap screws (Item 6). Place all screws in place than tighten in criss-cross pattern.

Lubricate the sealing surface of Inlet Seat Ring (Item 3), circumference of Seal (Item 29) and face of Vent Seal (Item 30). Slide in Inlet Valve Subassembly (Item 7) from bottom of valve body (Item 2). Ensuring the post of Inlet Valve (Item 7) engaged the cage of Outlet Valve (Item 8). Engage Seal (Item 29) into Inlet Seat Ring (Item 3). Slide Inlet Valve Return Spring (Item9) on Inlet Valve Subassembly (Item 7). Install Bottom Flange Gasket (Item 11) on Bottom Flange Subassembly. Lubricate lower half of shaft on Inlet Valve (Item 7). Install Bottom Flange on shaft of Inlet Valve (Item 7). Note the orientation of Bottom Flange and rotate it to position. Secure flange in place using Stud (Item 12) and Nut (Item 13). Care should be taken to tighten the nuts evenly around the bolt circle, so Inlet Valve Spring (Item 9) does not bind during assembly. Verify Return Spring (Item 9) is in the recess pockets of Inlet Valve (Item 7) and Bottom Flange (Item 10). Tighten the flange nuts in a criss-corss pattern until snug; making certain flange is not cocked. Torque the nuts to 200 ft-lbs in criss-cross pattern and recheck.

Apply gasket compound to the gasket side of Spring Bucket Subassembly (Item 14). Press on Spring Bucket Gasket (Item 15) and apply gasket compound to other side of gasket. Lubricate the vent shaft of Outlet Valve Subassembly. Slide

Spring Bucket Subassembly with gasket onto the vent shaft of Outlet Valve Subassembly (Item 8). Care not to damage the Seals in Spring Bucket Subassembly as it slide over the threaded portion of the Outlet Valve Subassembly. Fasten Spring Bucket Subassembly into Top Body (Item 1). Use Loctite® 222 and recommended primer on cap screws (Item 16). Place all screws in place than tighten in crisscross pattern. Ensure to clean excess gasket compound that may spilled into o-ring groove of Top Valve Body (Item 1). Lubricate Cylinder Seal (Item 36) and install Cylinder Seal (Item 36) on groove of Top Valve Body (Item 1).

Apply gasket compound on the face of the vent shaft of Outlet Valve Subassembly (Item 8) Press on Piston/Shaft Gasket (Item 19) and apply gasket compound to other side of the gasket. Slide Outlet Return Spring (Item 17) over the Outlet Valve Subassembly and on the Spring Bucket Subassembly. Slide Piston (Item 18) over Outlet Valve Subassembly onto Outlet Return Spring (Item 17).

Place the Spring Compressor (P/N 49089) on Piston (Item 18) and secure tie rods to valve body. Wrench tight the tie rods, in uniform increment, to compress the Outlet Return Spring (Item 17). Install Washer (item 21) and Piston Nut (Item 22). Do not allow the outlet shaft to rotate during installation. Hold on flats of actuator shaft to keep from turning. With Piston firmly seated on vent shaft, fasten top piston nut and secure in place. Remove Spring Compressor.

Lubricate Piston Seals (Item 35) and Cylinder Seals (Item 36) with a suitable lubricant. Install Piston Seals (Item 35) and Piston Bearing Strip (Item 20) on Piston (Item 18). Note the orientation of the Piston Seals (Item 35) refer to drawing 03-010 and there is a 0.50" to 0.75" gap between either ends of the Bearing Strip (Item 20). Lubricate the inside of the Cylinder (Item 23). Place the cylinder over the actuator piston. Rotate cylinder to require orientation. Lubricate and install Cylinder Seal (Item 36) on Actuator Top Cap (Item 24). Lubricate the actuator shaft and place Top Cap on Actuator Shaft. Rotate the Actuator Top Cap to proper orientation. Place Junction Box Bracket on Top Cap in the correct orientation and fasten in place with Studs (Item 27) and Nut (Item 13). Initially tighten the flange nuts in a crisscross pattern until snug. Final torque the nuts to 200 ft-lb in a crisscross pattern and recheck.

Lubricate the solenoid mounting o-ring with a suitable o-ring lubricant and place on the actuator top cap. Mount the solenoid with quick exhaust subassembly to the actuator top cap using screws and lock washers.

After re-installation of junction box, pneumatic and switches, the valve and switches should be tested per following procedures in Section VI and VII.

**VI. LEAK TESTING**

It is necessary to leak test each block valve and the vent valve individually to properly qualify the status of each seal. The valves are named in accordance to their position and function within the valve system.

**A. Inlet Valve**

1. Verify the valve is in the closed position.
2. Seal the outlet of the valve.
3. Pressurize the inlet with a maximum of 50 psig clean dry air, while monitoring the leak rate from the vent port. FM specifies a leak rate of 24 in<sup>3</sup>/hr (400 cc/hr) or less.

**B. Outlet Valve**

1. Verify the valve is in the closed position.
2. Seal the inlet side of the valve.
3. Pressurize the vent port with a maximum of 50 psig clean dry air, while monitoring the leak rate from the outlet port. FM specifies a leak rate of 24 in<sup>3</sup>/hr (400 cc/hr) or less.

**C. Vent Valve**

1. Verify the valve is in the full open position.
2. Seal the outlet side of the valve.
3. Pressurize the inlet with a maximum of 50 psig clean dry air, while monitoring the leak rate from the vent port. FM specifies a leak rate of 24 in<sup>3</sup>/hr (400 cc/hr) or less.

**VII. PROOF OF CLOSURE SWITCH TESTING**

The intent of the Proof of Closure (POC) switch is to trip during the closure overtravel (flow < 24 in<sup>3</sup>/hr) portion of the stroke. The switches should change contact state before flow commences from each individual valve. The Skotch Trifecta<sup>®</sup> Gas valve consist of two block valves with a corresponding proof of closure switch that must be tested individually.

The POC switches should be tested after the valve has been leak tested.

**A. Inlet Valve POC Switch**

1. Testing
  - a) With the valve in the closed position, verify the normally closed contacts are made.
  - b) Very slowly open the valve until the normally closed contacts are open. At this point stop the movement of the actuator and verify that flow has not commenced by pressurizing the inlet with a maximum pressure of 50 psig and monitoring flow from the outlet. The actuator can be opened slowly by regulating the air pressure to the actuator.
  - c) If there is evidence of flow the inlet valve switch needs to be adjusted.
2. Setting
  - a) With the valve in closed position, remove the inlet valve switch cover.

- b) Loosen the roller switch lever.
- c) Place a 1/8" shim between the inlet valve shaft and roller switch lever.
- d) While holding the roller firmly against the shim and shaft, rotate the switch actuator shaft until the normally closed contacts of the switch break. At this point, securely fasten the lever to the switch actuator shaft.
- e) Remove the spacer. The roller switch lever should be firmly resting on the inlet valve shaft and the normally closed contacts should be made. Note that the centerline of the roller should be aligned with the centerline of the inlet valve shaft.
- f) Stroke the valve to the open position. Allow the valve to close slowly while monitoring the flow rate from the outlet of the valve. Flow should cease ( $<24 \text{ in}^3/\text{hr}$ ) before the normally closed contacts make. If the normally closed contacts do not make, repeat starting at Section VII.A.2.b, but increase the shim thickness by 1/32". If the switch trips before flow commences, repeat starting at Section VII.A.2.b, but decrease the shim thickness by 1/32".
- g) Cycle the valve through several complete cycles while monitoring the switch contacts making certain they trip and reset.
- h) Replace the inlet valve switch cover.

**B. Outlet Valve POC Switch**

1. Testing
  - a) Remove the outlet valve switch cover.
  - b) With the valve in the closed position, verify the normally open contacts are made.
  - c) Very slowly open the valve until the normally open contacts are open. At this point stop the movement of the actuator and verify that flow has not commenced by pressurizing the vent with a maximum pressure of 20 psig and monitoring flow from the outlet. The actuator can be opened slowly by regulating the air pressure to the actuator.
  - d) If there is evidence of flow the outlet valve switch needs to be adjusted.
2. Setting
  - a) Verify the valve is in the closed position.
  - b) Loosen the two screws that hold the POC switch to the L-shaped bracket.
  - c) While monitoring the normally open contacts, move the switch downward towards the actuator top cap until the contacts are made. From this point, move the switch an additional 1/32" to 1/16" and tighten the switch mounting screws.
  - d) Cycle the valve open several times and confirm that the normally open contacts are made when the valve is in the closed position. If the contacts do not reset, then it is necessary to move switch downward an additional 1/32". Repeat until the switch resets.
  - e) Open the valve fully and allow the actuator to close slowly while monitoring the normally open contacts. When the switch trips, verify that there is no flow across the outlet valve by pressurizing the vent to 10 psig and monitoring flow out the outlet valve. If there is evidence of flow before the normally open contacts are

made, then the switch will have to be adjusted upward. If an adjustment is necessary, repeat procedure starting at section VII.B.2.d

**C. Open Limit Switch (If equipped)**

1. Testing
  - a) Verify the valve is in the closed position.
  - b) Slowly open the valve paying particular attention to when the open limit switch contacts change state (trip). They should trip when the valve is at or near full open or  $\geq 70\%$  of inlet valve stroke.
  - c) Slowly close the valve making certain the switch resets prior to the inlet valve POC switch tripping.
2. Setting
  - a) The switch setting is adjusted by repositioning the switch roller on the switch. Loosen the clamp screw and reposition as required.
  - b) When desired position is achieved tighten the clamp screw until the tab can not be moved.

**VIII. MISCELLANEOUS INSTRUCTIONS FOR SPECIAL OPTIONS**

Due to customer requirements, some Series T4000F Systems incorporate special options. Any special procedures not covered in the above material can be found in the Reference Section of this manual as addenda.

**IX. SPARE PARTS ORDERING INFORMATION**

Orders for T4000F Systems Spare Parts should be placed with

*ITT Engineered Valves, LLC  
33 Centerville Road  
Lancaster, PA 17603-2064*

*Phone: 717-509-2200*

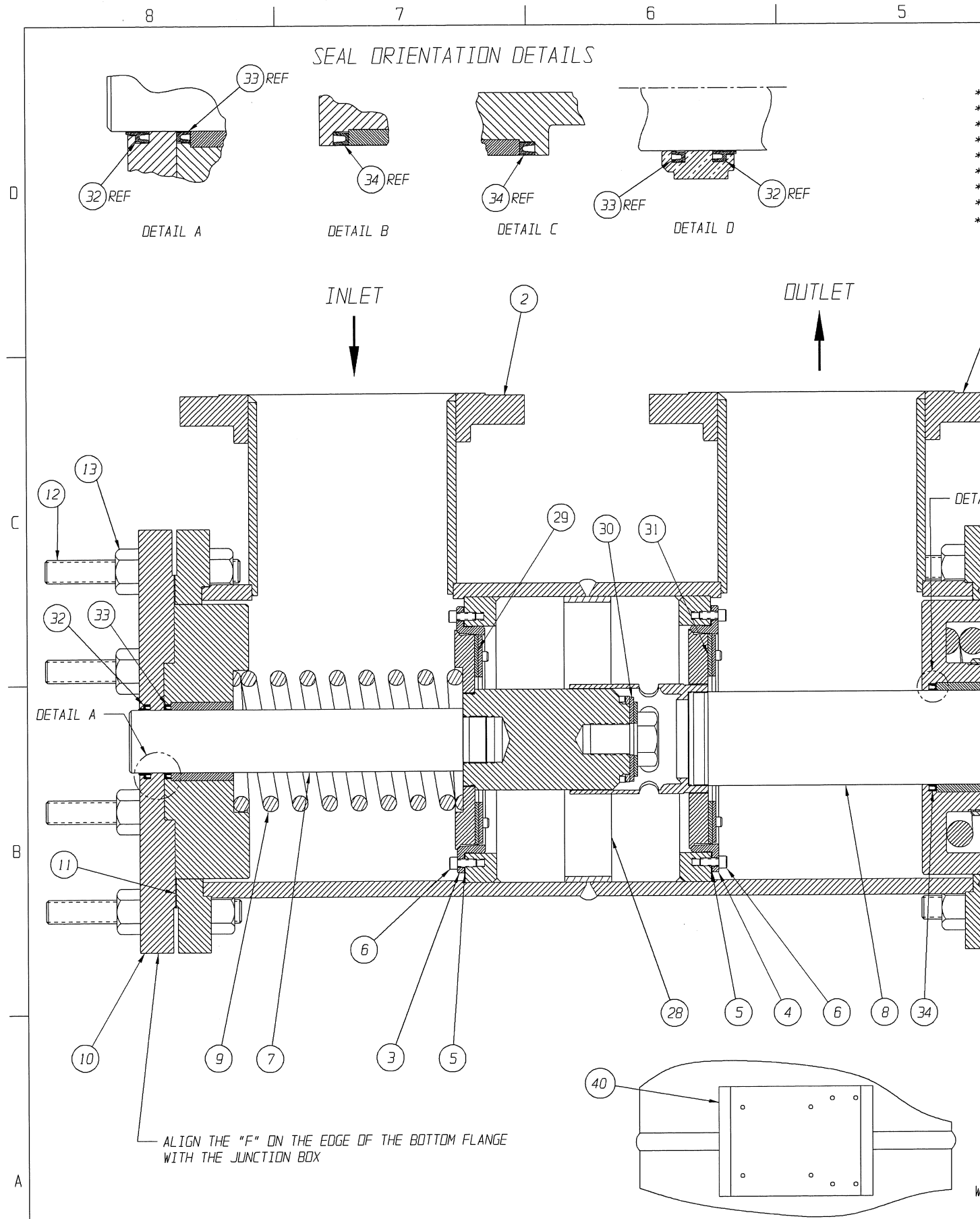
*Fax: 800-348-9000*

Please be advised that spare parts should be ordered directly from ITT Engineered Valves, as such materials are specially designed for Skotch Trifecta Valve Systems. Other replacement parts, although they may be similar in function, will void the FM rating. To maintain FM Approval, FM also requires technicians servicing/repairing the Skotch Trifecta Valve Systems to be trained by ITT Engineered Valves.

**X. REFERENCE INFORMATION**

The following pages contain drawings and reference information alluded to in above sections.





| LIST OF PARTS |      |                 |                           |
|---------------|------|-----------------|---------------------------|
| ITEM          | QTY. | ASSEMBLY NO.    | DESCRIPTION               |
| --            | --   | 03-010-01       | 03-010-02                 |
| --            | --   | PART NO. (BUNA) | PART NO. (VITON)          |
| * 29          | 1    | 41-047-01       | 41-047-02 VALVE SEAL      |
| * 30          | 1    | 41-048-01       | 41-048-02 VENT SEAL       |
| * 31          | 1    | 41-047-01       | 41-047-02 VALVE SEAL      |
| * 32          | 2    | 41-050-01       | 41-050-02 SHAFT WIPER     |
| * 33          | 2    | 41-049-01       | 41-049-02 SHAFT SEAL      |
| * 34          | 2    | 41-051-01       | 41-051-02 VENT SHAFT SEAL |
| * 35          | 2    | 41-053-01       | 41-053-02 PISTON SEAL     |
| * 36          | 2    | 41-052-01       | 41-052-02 CYLINDER SEAL   |
| * 37          | 1    | 41-077          | 41-078 O-RING             |

| LIST OF PARTS |          |      |                              |
|---------------|----------|------|------------------------------|
| ITEM          | DWG. NO. | QTY. | DESCRIPTION                  |
| 1             | 02-051   | 1    | BODY-TOP HALF SUBASSEMBLY    |
| 2             | 02-050   | 1    | BODY-BOTTOM HALF SUBASSEMBLY |
| 3             | 01-143   | 1    | INLET SEAT RING              |
| 4             | 01-144   | 1    | OUTLET SEAT RING             |
| * 5           | 40-017   | 2    | SEAT RING GASKET             |
| 6             | -        | 48   | 0.25-20 X .625 HEX HD SCREW  |
| 7             | 02-039   | 1    | INLET VALVE SUBASSEMBLY      |
| 8             | 02-043   | 1    | OUTLET VALVE SUBASSEMBLY     |
| ⑥ 9           | 47947    | 1    | INLET VALVE RETURN SPRING    |
| 10            | 02-033   | 1    | BOTTOM FLANGE SUBASSEMBLY    |
| * 11          | 40-016   | 1    | BOTTOM FLANGE GASKET         |
| 12            | -        | 8    | 3/4-10 UNC X 6 1/4 STUD      |
| 13            | -        | 32   | 3/4-10 HEX NUT               |
| 14            | 02-042   | 1    | SPRING BUCKET SUBASSEMBLY    |
| * 15          | 40-018   | 1    | SPRING BUCKET GASKET         |
| 16            | -        | 8    | 10-32 X 1 1/4 SOC HD SCREW   |
| 17            | 44-017   | 1    | OUTLET VALVE RETURN SPRING   |
| 18            | 06-079   | 1    | PISTON                       |
| * 19          | 40-019   | 1    | PISTON/SHAFT GASKET          |
| * 20          | 47-025   | 1    | PISTON BEARING STRIP         |
| 21            | 47-022   | 1    | THRUST WASHER                |
| 22            | -        | 2    | 2 5/8-12 HEX JAM NUT         |
| 23            | 07-010   | 1    | CYLINDER SUBASSEMBLY         |
| 24            | 06-112   | 1    | ACTUATOR TOP CAP             |
|               | 117354   | 1    | ACTUATOR TOP CAP             |
| 25            | 117676   | 1    | BRACKET, J-BOX MTG           |
| 26            | -        | -    | -                            |
| 27            | -        | 8    | 3/4-10 UNC X 20.75 STUD      |
| 28            | 52-053   | 1    | BACKING RING                 |
| 38            | 36-193   | 1    | SNAP RING                    |
| 39            | 47-051   | 1    | BUSHING                      |
| 40            | -        | 1    | TAG BRACKET                  |

- NOTES:
- SEE ORDER SPEC FOR MAIN VALVE AND ACCESSORIES SPECIFICATIONS.
  - \* - DENOTES RECOMMENDED SPARE PART.
  - BODY SHOWN IS OUTLET 0 DEGREES FROM INLET, VENT 0 DEGREES
  - REPAIR KIT INCLUDES ALL RECOMMENDED SPARES, USE KIT P/N 09-007-01 FOR BUNA SEALS, 09-007-02 FOR VITON SEALS.
  - EACH OF THE FOUR BRACKET LEGS SHOULD BE WELDED AS SHOWN
  - TAG BRACKET TYPICALLY LOCATED SAME SIDE AS JUNCTION BOX IN THE POSITION SHOWN. THE BRACKET MAY BE REPOSITIONED ON THE BODY AS REQUIRED BY THE PARTICULAR CONFIGURATION.

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UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS IN BRACKETS [ ] ARE MILLIMETERS.

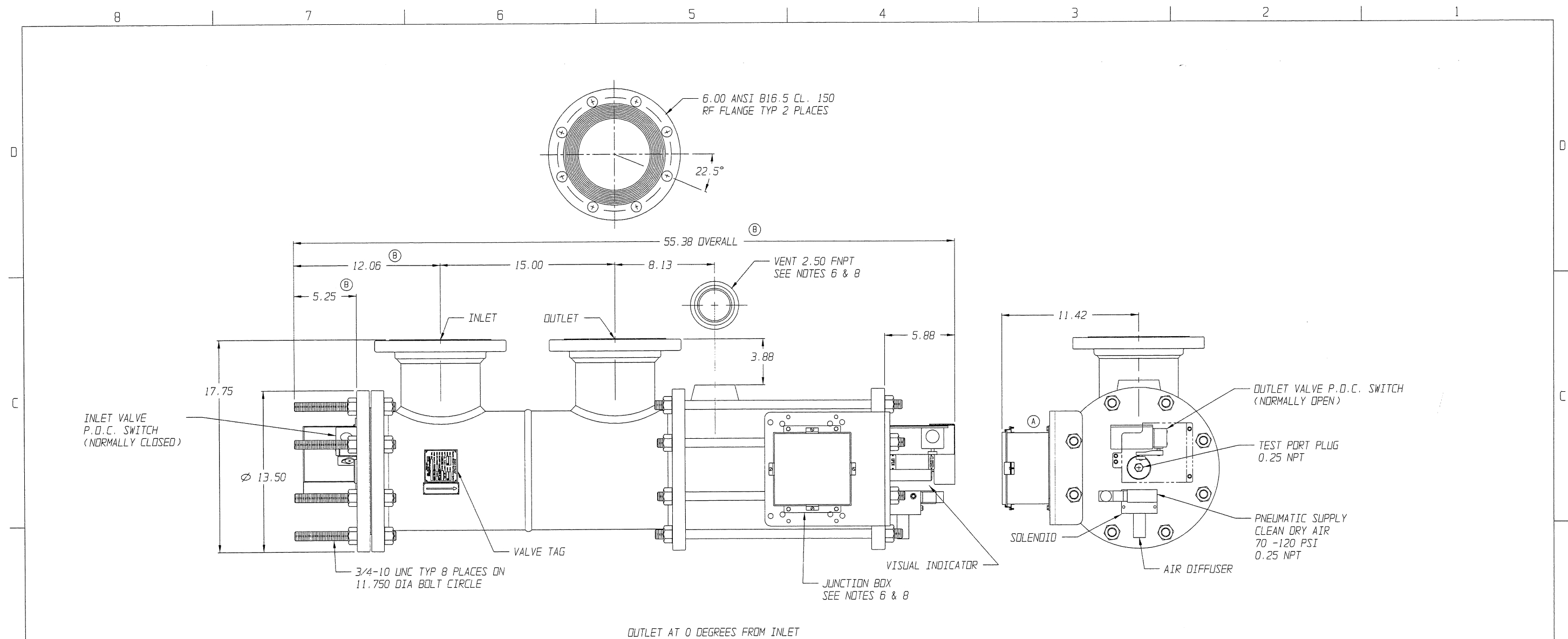
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|                        |                             |               |           |                                  |
|------------------------|-----------------------------|---------------|-----------|----------------------------------|
| THIRD ANGLE PROJECTION | UNLESS OTHERWISE NOTED INCH | WEIGHT 515LBS | SCALE 1/2 | MAIN VALVE ASSEMBLY SERIES T4600 |
|                        | MM                          | DATE 11/18/13 | BY DJS    |                                  |
|                        |                             | CHKD 11/18/13 | JAY       |                                  |
|                        |                             | APVD 11/18/13 | JAY       |                                  |

PATTERN NO. -

ITT LANCASTER, PA USA

SIZE D DRAWING NUMBER 03-010 SHEET 1 OF 1 G



- NOTES:
- CLEARANCE REQUIRED FOR IN-LINE DISASSEMBLY:  
13.50 DIA X 12.00 ABOVE TEST PORT PLUG  
13.50 DIA X 18.00 BELOW BOTTOM FLANGE STUDS.
  - SEE ORDER SPECIFICATION FOR MAIN VALVE ASSEMBLY AND ACCESSORIES/OPTIONS SPECIFICATIONS.
  - DIMENSIONS ARE FOR REFERENCE ONLY.
  - FLEXIBLE CONDUIT NOT SHOWN FOR CLARITY.
  - OUTLET SWITCH COVER TOP VIEW SHOWN IN PHANTOM FOR CLARITY.
  - VENT AND JUNCTION BOX LOCATION IS TYPICAL.
  - P.D.C.: "PROOF OF CLOSURE".
  - VENT CONNECTION AND JUNCTION BOX MAY BE ROTATED ABOUT VALVE CENTERLINE. SEE ORDER SPECIFICATION FOR LOCATION SUPPLIED.
  - ASSEMBLY SHOWN IS WITH OUTLET AT 0 DEGREES FROM INLET. SEE OTHER DETAILS FOR ADDITIONAL BODY ORIENTATIONS.

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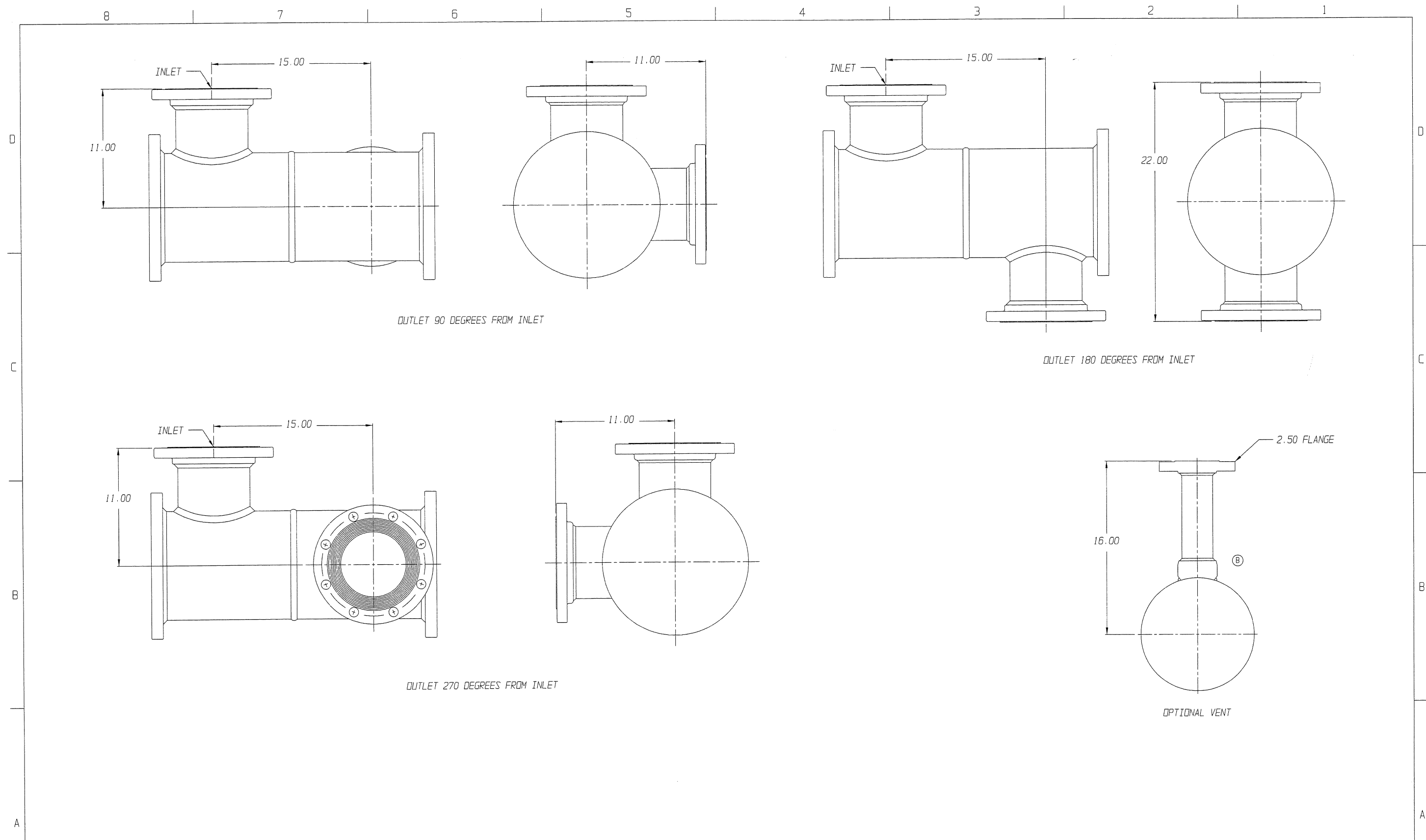
|  |   |        |                        |                            |
|--|---|--------|------------------------|----------------------------|
| THIRD ANGLE PROJECTION                                       | UNLESS OTHERWISE NOTED<br>INCH<br>MM  | WEIGHT | SCALE                  | DIMENSIONS T4600<br>NEMA 4 |
|  | X = ± 0.05<br>XX = ± 0.03<br>XXX = ± 0.005<br>S/A = ± 1/16<br>X* = ± .5<br>Y* = ± 1 |        | DATE BY<br>4/16/10 JLL |                            |
| UNLESS OTHERWISE SPECIFIED,<br>ALL DIMENSIONS ARE IN INCHES. | (XX) = ± (.76)<br>(XXX) = ± (.12)   | APVD   | 4/16/10 JLL            | SUPERSEDES: -              |

PATTERN NO. -

ITT LANCASTER, PA USA

|      |                |        |     |
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| SIZE | DRAWING NUMBER | SHEET  | REV |
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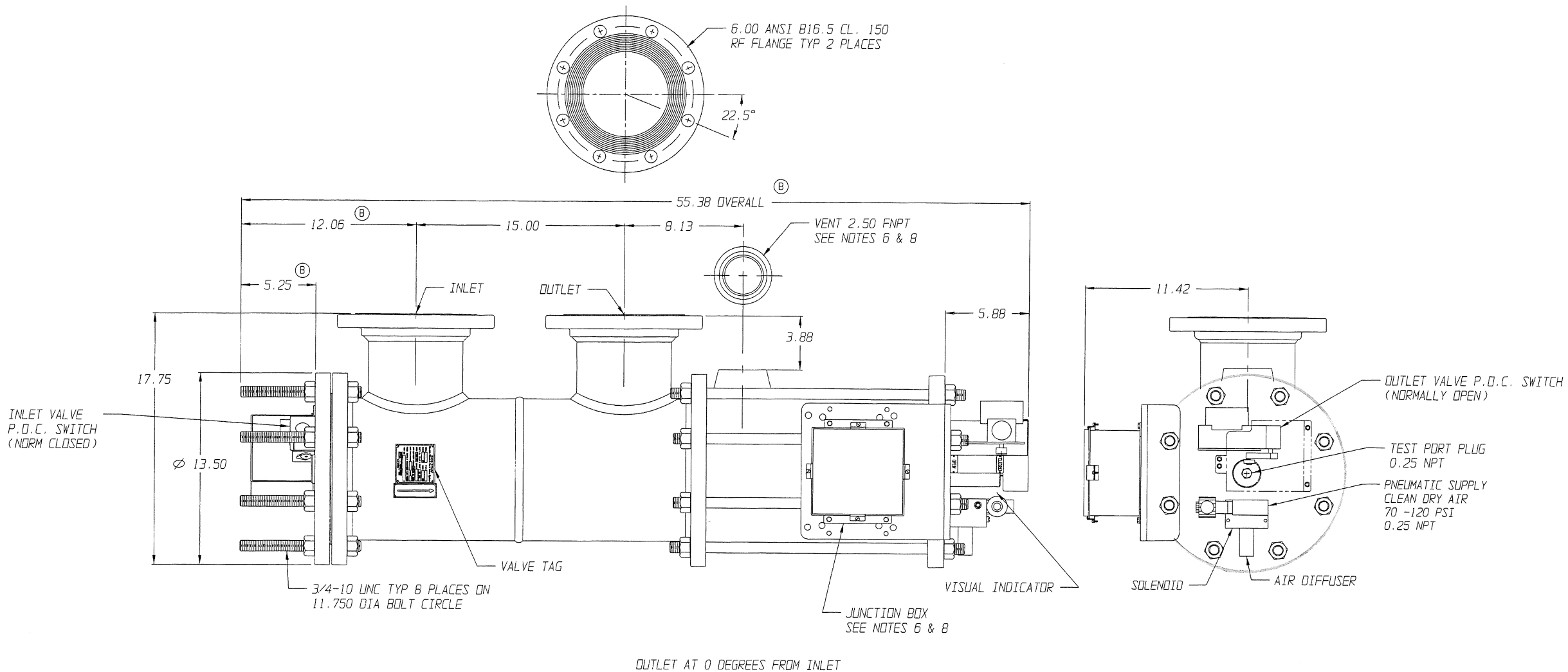
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|   |   |         |       |                            |               |
|---|---|---------|-------|----------------------------|---------------|
| THIRD ANGLE PROJECTION  | UNLESS OTHERWISE NOTED<br>INCH<br>MM  | WEIGHT  | SCALE | DIMENSIONS T4600<br>NEMA 4 | PATTERN NO. - |
|   | .X = ± 0.06<br>.XX = ± 0.03<br>.XXX = ± 0.005<br>.X = ± 1/16<br>.X = ± 1/8<br>.X = ± 1/4    | DATE    | BY    | ITT<br>LANCASTER, PA USA   | SIZE          |
| UNLESS OTHERWISE SPECIFIED,<br>ALL DIMENSIONS ARE IN INCHES   | (X) = ± [ .75]<br>(XX) = ± [ .5]<br>(XXX) = ± [ .125]<br>X = ± 5°<br>X = ± 10°<br>X = ± 15° | 4/16/10 | DLK   | DRAWING NUMBER             | SHEET         |
| FOR ALL DIMENSIONS AND SHARP EDGES, UNLESS OTHERWISE SPECIFIED, DIMENSIONS TO BE BY EXCEPT AS NOTED | APVD  | 4/16/10 | DLK   | 117374                     | 2 OF 2        |
|   |   |         |       | REV                        | B             |

8 7 6 5 4 3 2 1



OUTLET AT 0 DEGREES FROM INLET

- NOTES:
1. CLEARANCE REQUIRED FOR IN-LINE DISASSEMBLY:  
13.50 DIA X 12.00 ABOVE TEST PORT PLUG  
13.50 DIA X 18.00 BELOW BOTTOM FLANGE STUDS.
  2. SEE ORDER SPECIFICATION FOR MAIN VALVE ASSEMBLY AND ACCESSORIES/OPTIONS SPECIFICATIONS.
  3. DIMENSIONS ARE FOR REFERENCE ONLY.
  4. FLEXIBLE CONDUIT NOT SHOWN FOR CLARITY.
  5. OUTLET SWITCH COVER TOP VIEW SHOWN IN PHANTOM FOR CLARITY.
  6. VENT AND JUNCTION BOX LOCATION IS TYPICAL.
  7. P.D.C.: "PROOF OF CLOSURE".
  8. VENT CONNECTION AND JUNCTION BOX MAY BE ROTATED ABOUT VALVE CENTERLINE. SEE ORDER SPECIFICATION FOR LOCATION SUPPLIED.
  9. ASSEMBLY SHOWN IS WITH OUTLET AT 0 DEGREES FROM INLET. SEE OTHER DETAILS FOR ADDITIONAL BODY ORIENTATIONS.

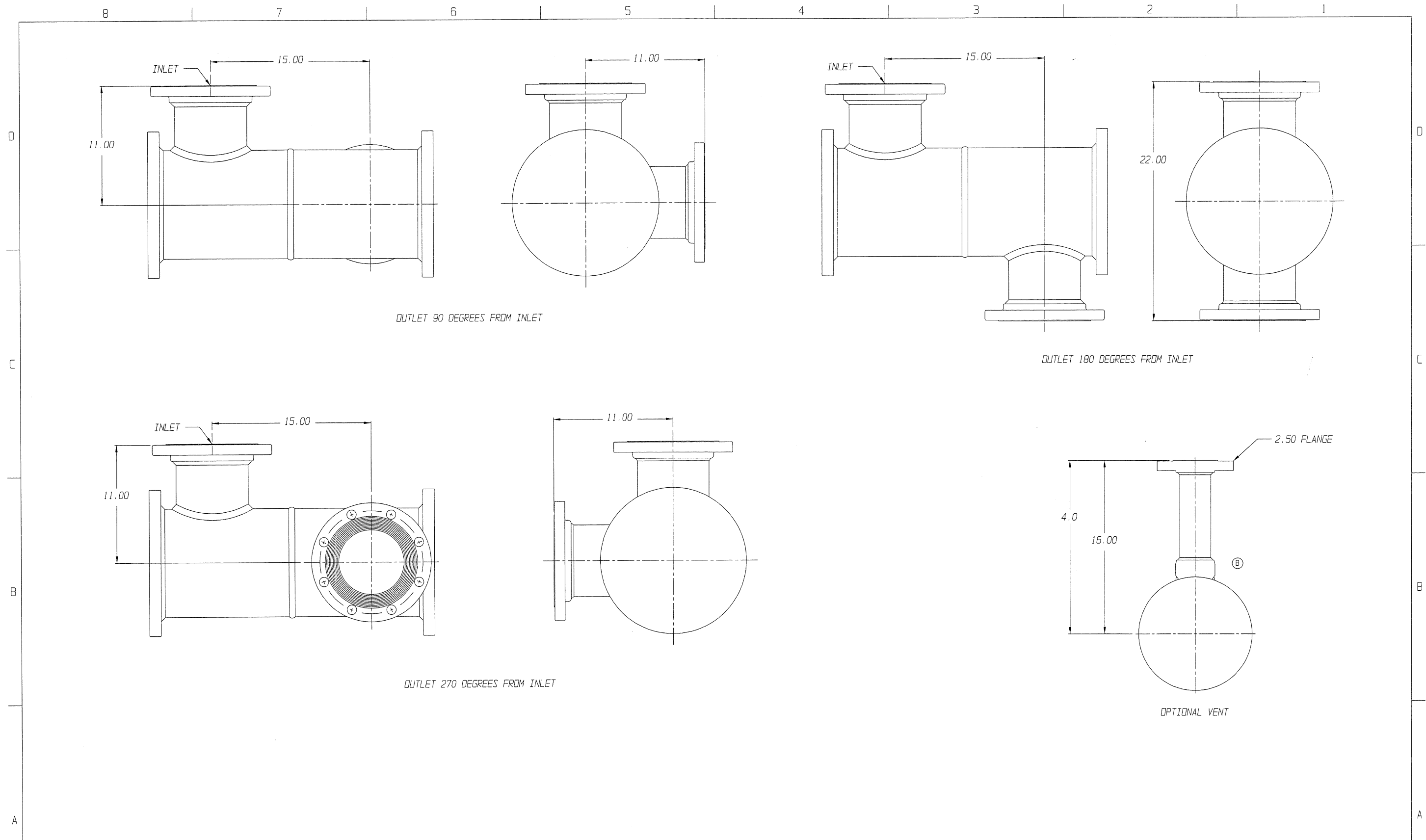
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|   |  |  |                               |                            |                          |
|---|--|--|-------------------------------|----------------------------|--------------------------|
| THIRD ANGLE PROJECTION                                      | UNLESS OTHERWISE NOTED<br>INCH<br>X = ± 0.05<br>XX = ± 0.03<br>XXX = ± 0.02<br>X.X = ± 0.01<br>X.XX = ± 0.005<br>X.XXX = ± 0.001 | MM<br>(X) = ± 0.25<br>(XX) = ± 0.13<br>(XXX) = ± 0.12<br>X* = ± 0.15<br>X** = ± 0.10 | WEIGHT<br>SCALE<br>DATE<br>BY | DIMENSIONS T4600<br>NEMA 7 | ITT<br>LANCASTER, PA USA |
| UNLESS OTHERWISE SPECIFIED,<br>ALL DIMENSIONS ARE IN INCHES | REMOVE ALL DIMENSIONS FROM THIS DRAWING<br>UNLESS OTHERWISE NOTED  | APVD<br>4/16/10  | CHKD<br>4/16/10               | DWN<br>4/16/10             | DRAWING NUMBER<br>117375 |
| SUPERSEDES: -   |  |  | SHEET REV<br>1 OF 2 B         |                            |                          |

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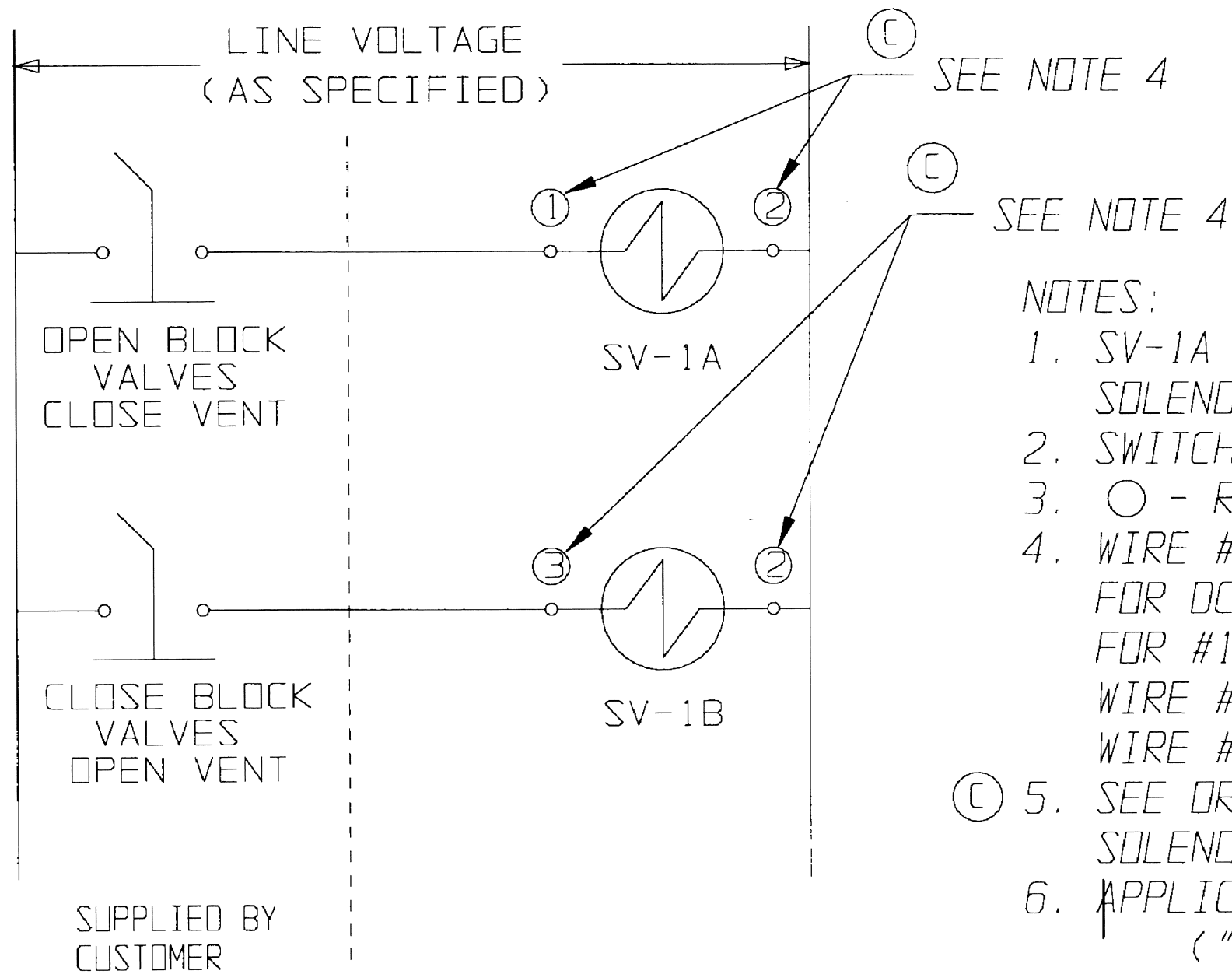
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|---|---|------------------------|------------------|----------------------------|
| THIRD ANGLE PROJECTION                                    | UNLESS OTHERWISE NOTED<br>INCH MM   | WEIGHT                 | SCALE            | DIMENSIONS T4600<br>NEMA 7 |
|   | X = ± 0.06<br>XX = ± 0.03<br>XXX = ± 0.02<br>X/X = ± 0.015<br>X* = ± .5°<br>X* = ± 1° | DATE BY<br>4/16/10 JLL | APVD 4/16/10 JLL | ITT LANCASTER, PA USA      |
| UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES. | REMOVE ALL BARRS AND SHIP EXCEPT AS NOTED.  | APVD 4/16/10 JLL       | SUPERSEDES: -    | SIZE D                     |

|      |                |        |     |
|------|----------------|--------|-----|
| SIZE | DRAWING NUMBER | SHEET  | REV |
| D    | 117375         | 2 OF 2 | B   |

PATTERN NO. -

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**FILE COPY**

NOTES:

1. SV-1A AND SV-1B FORM A DUAL COIL SOLENOID VALVE CONTROLLING GAS FLOW.
2. SWITCHES ARE MOMENTARY CONTACT TYPE.
3. ○ - REPRESENTS A WIRE #.
4. WIRE #'S SHOWN ARE FOR AC SOLENOIDS. FOR DC VOLTAGE, SUBSTITUTE WIRE #18 FOR #1, WIRE #19 FOR SV-1A COIL WIRE #2, WIRE #20 FOR #3, AND WIRE #21 FOR SV-1B COIL WIRE #2.
- ① 5. SEE ORDER SPECIFICATION FOR SOLENOID VOLTAGE RATING.
6. APPLICATION - ALL T4X05 SYSTEMS ("X" DENOTES LINE SIZE).

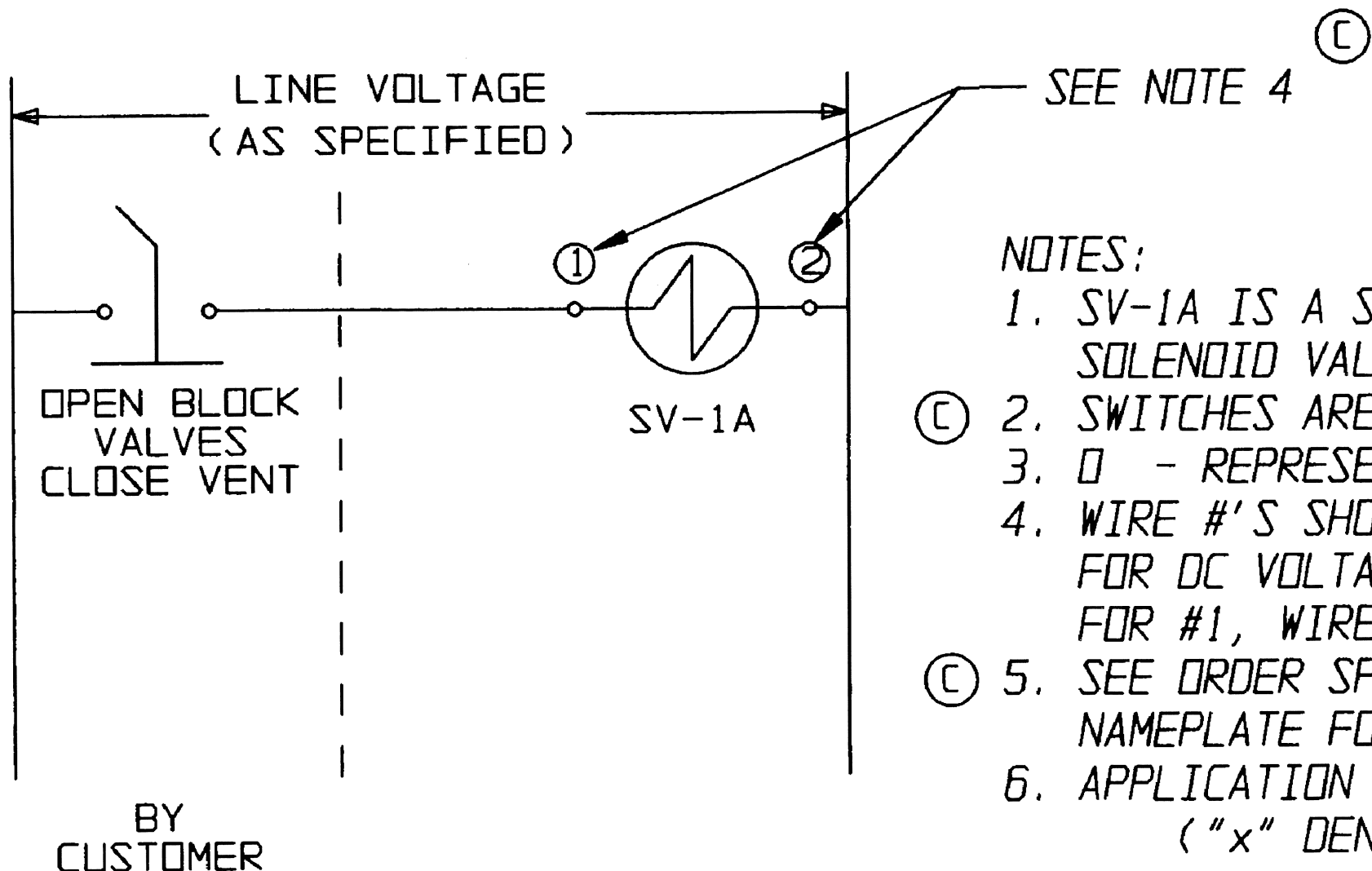
WR# -

PART NO. -

PATTERN NO. -

|     |          |         |     |      |      |  |        |       |  |  |                          |     |
|-----|----------|---------|-----|------|------|--|--------|-------|--|--|--------------------------|-----|
| -   | -        | -       | -   | -    | -    | TOLERANCES EXCEPT AS NOTED DECIMALS<br>.XX ± .02<br>.XXX ± .005<br>ANGLES ±10°-30'<br>REMOVE ALL BURRS AND SHARP EDGES<br>ALL MACHINED SURFACES TO BE 125/ EXCEPT AS NOTED | WEIGHT | SCALE | ELECTRICAL SCHEMATIC<br>GAS BURNER VALVE<br>PNEUMATIC - FAIL IN LAST | ITT Engineered Valves<br>ITT Fluid Technology Corporation<br>Lancaster, Pa<br>SHEET 1 OF 1 |                          |     |
| -   | -        | -       | -   | -    | -    |  | DATE   | BY    |  |  | A      60-021      REV C |     |
| C   | 10/24/94 | 1035    | JRB | MJB  | MJB  |  | DWN    | 1/89  |  |  |                          | GCS |
| B   | 10/90    | -       | JRB | -    | -    |  | CHKD   | 1/89  |  |  |                          | JRB |
| A   | 1/89     | -       | JRB | -    | -    | APVD   |        |       | SUPERSEDES: -  |  |                          |     |
| REV | DATE     | ECN NBR | BY  | CHKD | APVD |  |        |       |  |  |                          |     |

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- NOTES:
1. SV-1A IS A SINGLE COIL SPRING RTN SOLENOID VALVE CONTROLLING GAS FLOW.
  - ② 2. SWITCHES ARE MAINTAINED CONTACT TYPE.
  3. 0 - REPRESENTS A WIRE NUMBER.
  4. WIRE #'S SHOWN ARE FOR AC SOLENOIDS. FOR DC VOLTAGE, SUBSTITUTE WIRE #18 FOR #1, WIRE #19 FOR #2.
  - ⑤ 5. SEE ORDER SPECIFICATION OR SOLENOID NAMEPLATE FOR SOLENOID VOLTAGE RATING.
  6. APPLICATION - ALL T4x06 SYSTEMS ("x" DENOTES LINE SIZE).

③ BY CUSTOMER  
 THIS IS A FACTORY MUTUAL CONTROLLED DOCUMENT. CHANGES MUST BE APPROVED BY FM PRIOR TO IMPLEMENTING.

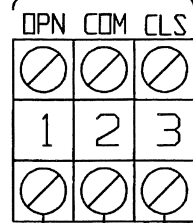
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|-------|---------|---------|-----|------|------|---|--------|-------|---------------|---|--|--|---|--------|-------|
| WR# - |         |         |     |      |      | PART NO. -  |        |       | PATTERN NO. - |   |  |  |   |        |       |
| -     | -       | -       | -   | -    | -    | TOLERANCES EXCEPT AS NOTED<br>DECIMALS<br>.XX ± .02<br>.XXX ± .005<br>ANGLES ± 30°-30'<br>REMOVE ALL BURRS AND SHARP EDGES<br>ALL MACHINED SURFACES TO BE 125 ✓ EXCEPT AS NOTED | WEIGHT | SCALE |               | ELECTRIC SCHEMATIC<br>GAS BURNER VALVE<br>PNEUMATIC - FAIL CLOSED |  |  | <b>Engineered Valves</b><br>ITT Fluid Technology Corporation<br>Lancaster, Pa<br>SHEET 1 OF 1 |        |       |
| C     | 10/1/94 | 1002    | JRB | JRB  | JRB  |   | DATE   | BY    |               |   |  |  |   |        |       |
| B     | 10/90   | -       | JRB | -    | -    |   | DWN    | 1/89  | GCS           |   |  |  |   |        |       |
| A     | 1/89    | -       | JRB | -    | -    |   | CHKD   | 1/89  | JRB           |   |  |  |   |        |       |
| REV   | DATE    | ECN NBR | BY  | CHKD | APVD |   | APVD   |       |               | SUPERSEDES:-  |  |  | A   | 60-022 | REV C |

Ⓢ Ⓢ

SEE NOTE 1 & 3

### PILOT SOLENOID



Ⓢ Ⓢ

SEE NOTE 1 & 3

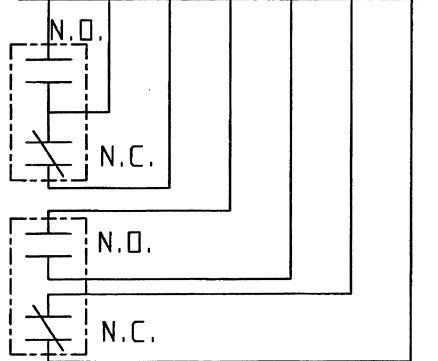
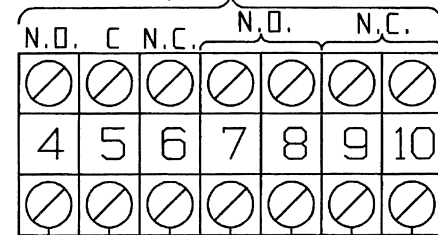
SV-1A  
SOLENOID COIL TO  
OPEN BLOCK VALVES  
& CLOSE VENT

Ⓢ Ⓢ

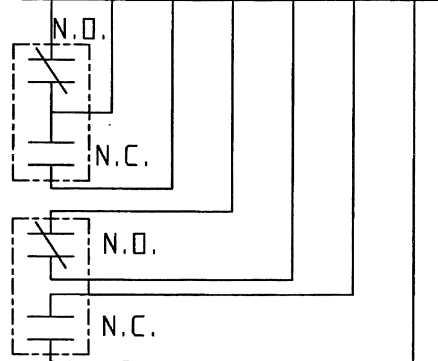
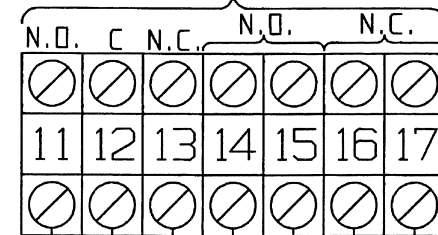
SEE NOTE 1 & 3

SV-1B  
SOLENOID COIL TO  
CLOSE BLOCK VALVES  
& OPEN VENT

### INLET VALVE PROOF OF CLOSURE SWITCH



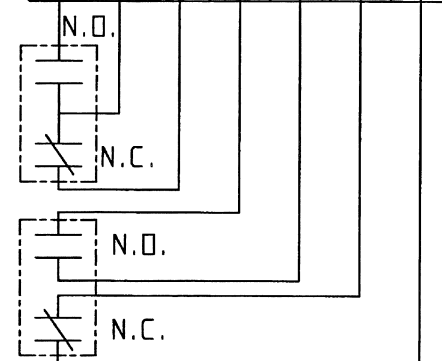
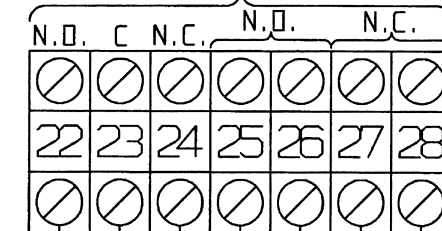
### OUTLET VALVE PROOF OF CLOSURE SWITCH



Ⓢ SEE NOTE 6

### OPTIONAL

### VALVE OPEN LIMIT SWITCH



### SWITCH LOGIC Ⓢ

| SWITCH TYPE                      | INLET VALVE<br>P.O.C. SWITCH |     |      |       | OUTLET VALVE<br>P.O.C. SWITCH |       |        |        | VALVE OPEN<br>LIMIT SWITCH |       |        |        |
|----------------------------------|------------------------------|-----|------|-------|-------------------------------|-------|--------|--------|----------------------------|-------|--------|--------|
| TERMINALS                        | 4-5                          | 5-6 | 7-8* | 9-10* | 11-12                         | 12-13 | 14-15* | 16-17* | 22-23                      | 23-24 | 25-26* | 27-28* |
| BLOCK VALVES CLOSED<br>VENT OPEN | — —                          | — — | — —  | — —   | — —                           | — —   | — —    | — —    | — —                        | — —   | — —    | — —    |
| BLOCK VALVES OPEN<br>VENT CLOSED | — —                          | — — | — —  | — —   | — —                           | — —   | — —    | — —    | — —                        | — —   | — —    | — —    |

\* Ⓢ THESE TERMINALS ONLY PROVIDED ON ORDERS SUPPLIED Ⓢ WITH DPDT SWITCH CONTACT CONFIGURATION.

Ⓢ THIS IS A FACTORY MUTUAL CONTROLLED DOCUMENT. CHANGES MUST BE APPROVED BY FM PRIOR TO IMPLEMENTING.

Ⓢ Ⓢ

### NOTES:

- SOLENOID VOLTAGE IS AC. CONSULT ORDER SPECIFICATION OR SOLENOID NAMEPLATE FOR SOLENOID VOLTAGE RATING.
- ALL SWITCHES SHOWN WITH BLOCK VALVES IN CLOSED POSITION & VENT OPEN.
- SV-1A & SV-2A REPRESENT THE MAGNETIC COILS ON THE SOLENOID. FOR FAIL CLOSED VALVES (MODEL 4X06), ONLY SV-1A IS SUPPLIED. THIS IS A MAINTAINED CONTACT SOLENOID. WHEN ENERGIZED THE VALVE OPENS. FAIL-IN-LAST VALVES (MODEL 4X05), SV-2A IS USED IN ADDITION TO SV-1A. THESE REQUIRE MOMENTARY CONTACTS IN THIS APPLICATION. BOTH COILS CANNOT BE ENERGIZED SIMULTANEOUSLY OR DAMAGE WILL OCCUR. "X" IN MODEL NUMBER DENOTES VALVE LINE SIZE.
- WIRING SHOWN FOR DPDT SWITCHES. FOR SPDT DELETE WIRE NUMBERS 7,8,9,10,14,15,16,17,25,26,27 AND 28. SEE ORDER SPECIFICATION FOR TYPE AND RATING.
- APPLICABILITY - ALL T4000 SYSTEMS WITH AC SOLENOIDS.
- NOT NORMALLY SUPPLIED.

ECN#-

PART NO. -

PATTERN NO. -

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|     |          |         |     |      |      |
|-----|----------|---------|-----|------|------|
| REV | DATE     | ECN NBR | BY  | CHKD | APVD |
| D   | 10/13/95 |         | JRW | MJO  | MJO  |
| C   | 10/4/94  | 1017    | JRB | MJO  | MJO  |
| B   | 10/90    |         | JRB |      |      |
| A   | 01/89    |         | JRB |      |      |

TOLERANCES EXCEPT AS NOTED DECIMALS .XX ± .02 .XXX ± .005 ANGLE ± .50° REMOVE ALL BURRS AND SHARP EDGES ALL MACHINED SURFACES TO BE .125 EXCEPT AS NOTED

WEIGHT -  
SCALE NONE  
DATE BY  
DWN 01/89 GCS  
CHKD 01/89 JRB  
APVD.

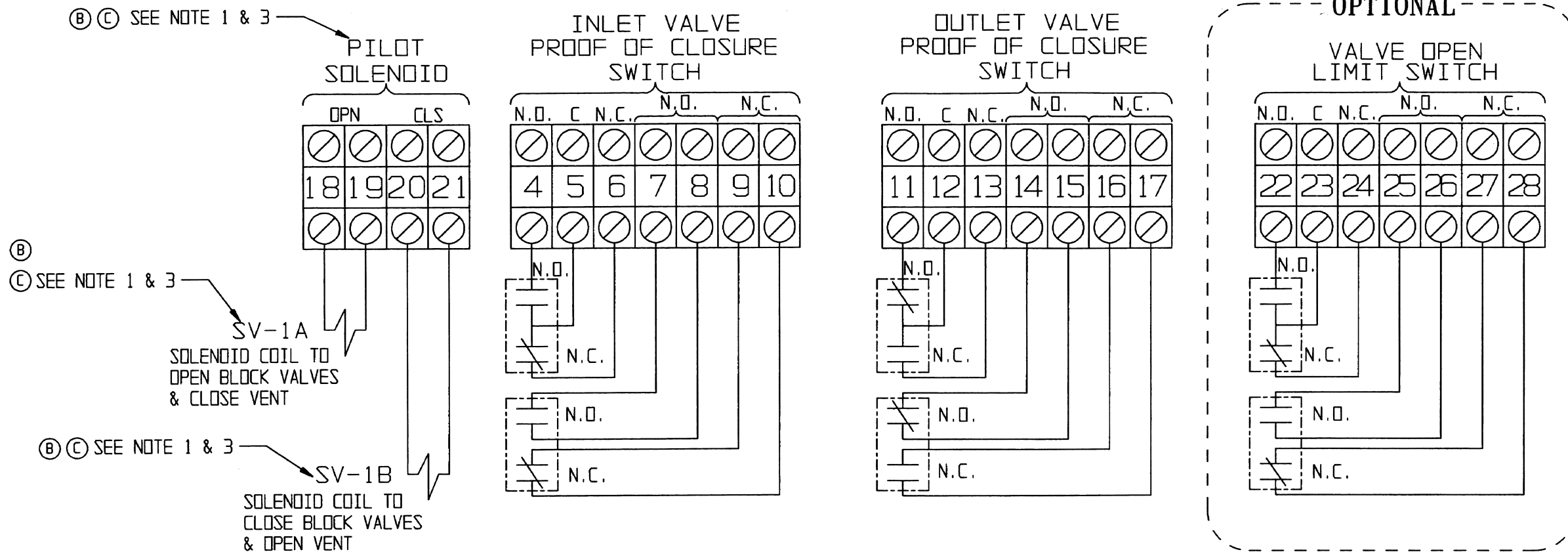
WIRING DIAGRAM  
GAS BURNER VALVE  
PNEUMATIC - AC SOLENOIDS  
SUPERSEDES:-

**ITT Engineered Valves**  
ITT Fluid Technology Corporation  
Lancaster, Pa  
SHEET 1 OF 1

SIZE C DRAWING NUMBER 60-018 REV D



© SEE NOTE 6



SWITCH LOGIC ©

| SWITCH TYPE                   | INLET VALVE P.O.C. SWITCH |     |      |       | OUTLET VALVE P.O.C. SWITCH |       |        |        | VALVE OPEN LIMIT SWITCH |       |        |        |
|-------------------------------|---------------------------|-----|------|-------|----------------------------|-------|--------|--------|-------------------------|-------|--------|--------|
| TERMINALS                     | 4-5                       | 5-6 | 7-8* | 9-10* | 11-12                      | 12-13 | 14-15* | 16-17* | 22-23                   | 23-24 | 25-26* | 27-28* |
| BLOCK VALVES CLOSED VENT OPEN | — —                       | — — | — —  | — —   | — —                        | — —   | — —    | — —    | — —                     | — —   | — —    | — —    |
| BLOCK VALVES OPEN VENT CLOSED | — —                       | — — | — —  | — —   | — —                        | — —   | — —    | — —    | — —                     | — —   | — —    | — —    |

\* THESE TERMINALS ONLY PROVIDED ON ORDERS SUPPLIED © WITH DPDT SWITCH CONTACT CONFIGURATION.

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© NOTES:

- SOLENOID VOLTAGE IS DC. CONSULT ORDER SPECIFICATION OR SOLENOID NAMEPLATE FOR SOLENOID VOLTAGE RATING.
- ALL SWITCHES SHOWN WITH BLOCK VALVES IN CLOSED POSITION & VENT OPEN.
- SV-1A & SV-2A REPRESENT THE MAGNETIC COILS ON THE SOLENOID. FOR FAIL CLOSED VALVES (MODEL 4X06), ONLY SV-1A IS SUPPLIED. THIS IS A MAINTAINED CONTACT SOLENOID. WHEN ENERGIZED THE VALVE OPENS. FAIL-IN-LAST VALVES (MODEL 4X05), SV-2A IS USED IN ADDITION TO SV-1A. THESE REQUIRE MOMENTARY CONTACTS IN THIS APPLICATION. BOTH COILS CANNOT BE ENERGIZED SIMULTANEOUSLY OR DAMAGE WILL OCCUR. "X" IN MODEL NUMBER DENOTES VALVE LINE SIZE.
- WIRING SHOWN FOR DPDT SWITCHES. FOR SPDT DELETE WIRE NUMBERS 7,8,9,10,14,15,16,17,25,26,27 AND 28. SEE ORDER SPECIFICATION FOR TYPE AND RATING.
- APPLICABILITY - ALL T4000 SYSTEMS WITH DC SOLENOIDS.
- NOT NORMALLY SUPPLIED.

WR# -

PART NO. -

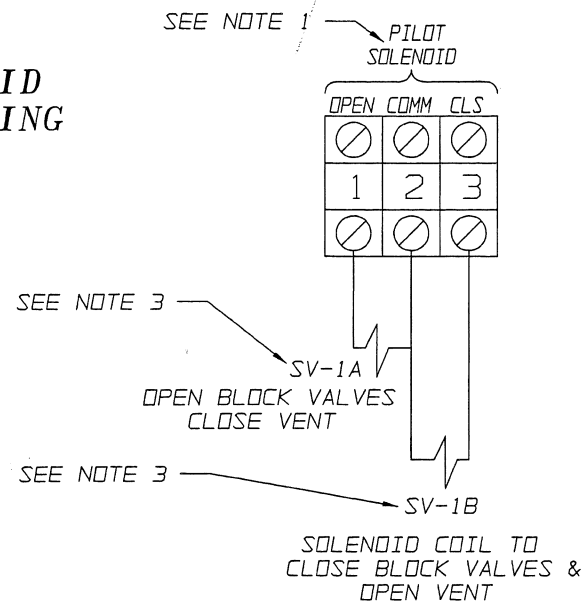
PATTERN NO. -

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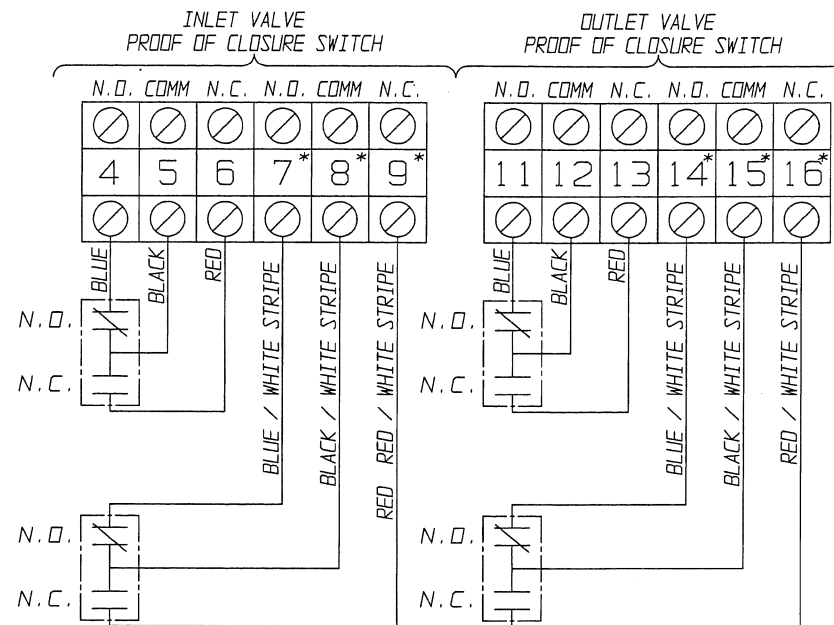
|   |          |         |            |          |  |
|---|----------|---------|------------|----------|--|
| TOLERANCES EXCEPT AS NOTED DECIMALS .XX ± .02 .XXX ± .005 ANGLES ± .50° REMOVE ALL BURRS AND SHARP EDGES ALL MACHINED SURFACES TO BE 125 UNLESS NOTED | WEIGHT - | SCALE - | DATE 01/89 | BY GCS   | WIRING DIAGRAM GAS BURNER VALVE PNEUMATIC - DC SOLENOIDS |
| REV A 10/90   | DATE     | EDN NBR | BY JRB     | CHKD JRB | APVD   |

|   |                       |       |
|---|-----------------------|-------|
| <b>Engineered Valves</b><br>ITT Fluid Technology Corporation<br>Lancaster, Pa<br>SHEET 1 OF 1 |                       |       |
| SIZE C  | DRAWING NUMBER 60-024 | REV C |

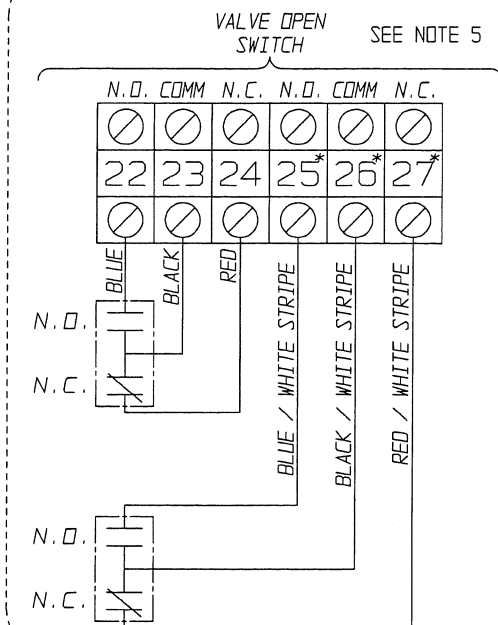
### A.C. SOLENOID VOLTAGE WIRING DIAGRAM



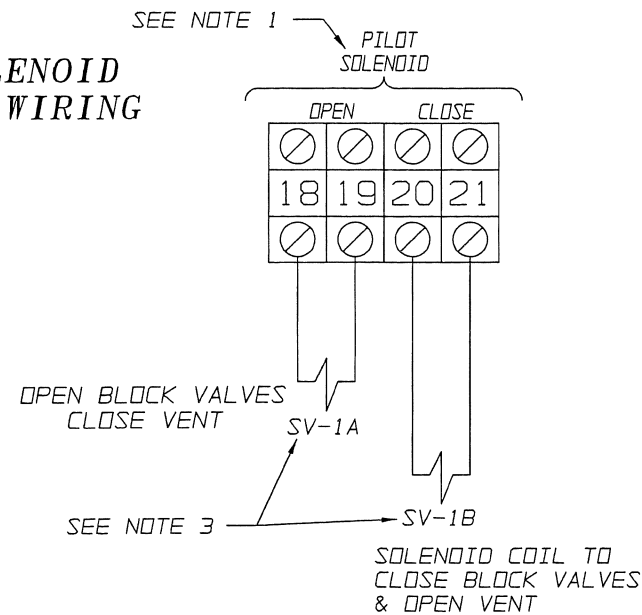
### SWITCH WIRING DIAGRAM



### OPTIONAL



### D.C. SOLENOID VOLTAGE WIRING DIAGRAM



### SWITCH LOGIC

| SWITCH TYPE                      | INLET VALVE P.O.C. SWITCH |     |       |       | OUTLET VALVE P.O.C. SWITCH |       |        |        | VALVE OPEN SWITCH |       |        |        |
|----------------------------------|---------------------------|-----|-------|-------|----------------------------|-------|--------|--------|-------------------|-------|--------|--------|
| TERMINALS                        | 4-5                       | 5-6 | 7-8 * | 8-9 * | 11-12                      | 12-13 | 14-15* | 15-16* | 22-23             | 23-24 | 25-26* | 26-27* |
| BLOCK VALVES CLOSED<br>VENT OPEN | +                         | -   | +     | -     | +                          | -     | +      | -      | +                 | -     | +      | -      |
| BLOCK VALVES OPEN<br>VENT CLOSED | -                         | +   | -     | +     | -                          | +     | -      | +      | -                 | +     | -      | +      |

\* THESE TERMINALS ONLY PROVIDED ON ORDERS SUPPLIED WITH DPDT SWITCH CONTACT CONFIGURATION.

### NOTES:

- SEE ORDER SPECIFICATION FOR SOLENOID VOLTAGE RATING.
- ALL SWITCHES SHOWN WITH BLOCK VALVES IN CLOSED POSITION AND VENT OPEN.
- SV-1A AND SV-1B REPRESENT THE MAGNETIC COILS ON THE SOLENOID. FOR FAIL CLOSED VALVES (MODEL T4X06), ONLY SV-1A IS SUPPLIED. THIS IS A MAINTAINED CONTACT SOLENOID. WHEN ENERGIZED THE VALVE OPENS. FAIL IN LAST POSITION VALVES (MODEL T4X05), SV-1B IS USED IN ADDITION TO SV-1A. THESE REQUIRE MOMENTARY CONTACTS IN THIS APPLICATION. BOTH COILS CANNOT BE ENERGIZED SIMULTANEOUSLY OR DAMAGE WILL OCCUR. "X" IN MODEL NUMBER DENOTES VALVE LINE SIZE.
- WIRING SHOWN FOR DPDT SWITCHES. FOR SPDT DELETE WIRE NUMBERS 7, 8, 9, 14, 15, 16, 25, 26 AND 27. SEE ORDER SPECIFICATION FOR TYPE AND RATING.
- NOT NORMALLY SUPPLIED.

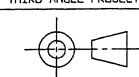
ECN# 12642

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UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS IN BRACKETS ARE MILLIMETERS.

PATTERN NO. -

THIRD ANGLE PROJECTION



UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES

UNLESS OTHERWISE NOTED

INCH  
X = ± 0.06  
XX = ± 0.02  
XXX = ± 0.005  
X\* = ± 0.015  
X\*\* = ± 0.0025

MM  
CX = ± [ .76 ]  
CX\* = ± [ .51 ]  
CX\*\* = ± [ .12 ]

REMOVE ALL BURS AND SHARP EDGES. MOUNTED SURFACES TO BE EXCEPT AS NOTED.

WEIGHT SCALE

DATE BY  
DWN 9/2/09 JLL  
CHKD 9/2/09 JLL  
APVD 9/2/09 JLL

WIRING DIAGRAM  
T4000F GAS BURNER VALVE  
WITH GO PRX SWITCHES  
AC & DC SOLENOIDS

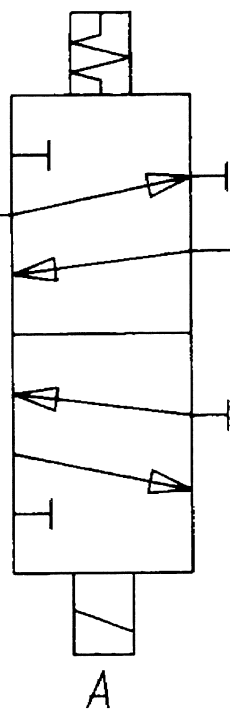
ITT  
Engineered Valves Group  
Lancaster, PA USA

SIZE DRAWING NUMBER SHEET REV  
D 116763 1 OF 1 C

SUPERSEDES:-

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INLET, 1/4 NPT  
 DRY, CLEAN REGULATED  
 PNEUMATIC SUPPLY  
 FILTERED TO 40 MICRONS  
 OR LESS



CYLINDER

EXHAUST  
 WITH MUFFLER  
 3/4 NPT

ECN#2515

PART NO. -

PATTERN NO. -

TOLERANCES  
 EXCEPT AS NOTED  
 DECIMALS  
 .XX ± .02  
 .XXX ± .005  
 ANGLES ±0.50°  
 REMOVE ALL BURRS  
 AND SHARP EDGES  
 ALL MACHINED  
 SURFACES TO BE  
 125 ✓ EXCEPT AS  
 NOTED

WEIGHT  
 -

SCALE  
 NTS

| DATE          | BY  |
|---------------|-----|
| DWN 10/28/97  | JDN |
| CHKD 10/29/97 | MJC |
| APVD 10/29/97 | MJC |

PNEUMATIC SUPPLY  
 GAS BURNER VALVE  
 T4200 - T4600  
 VERSA SINGLE COIL

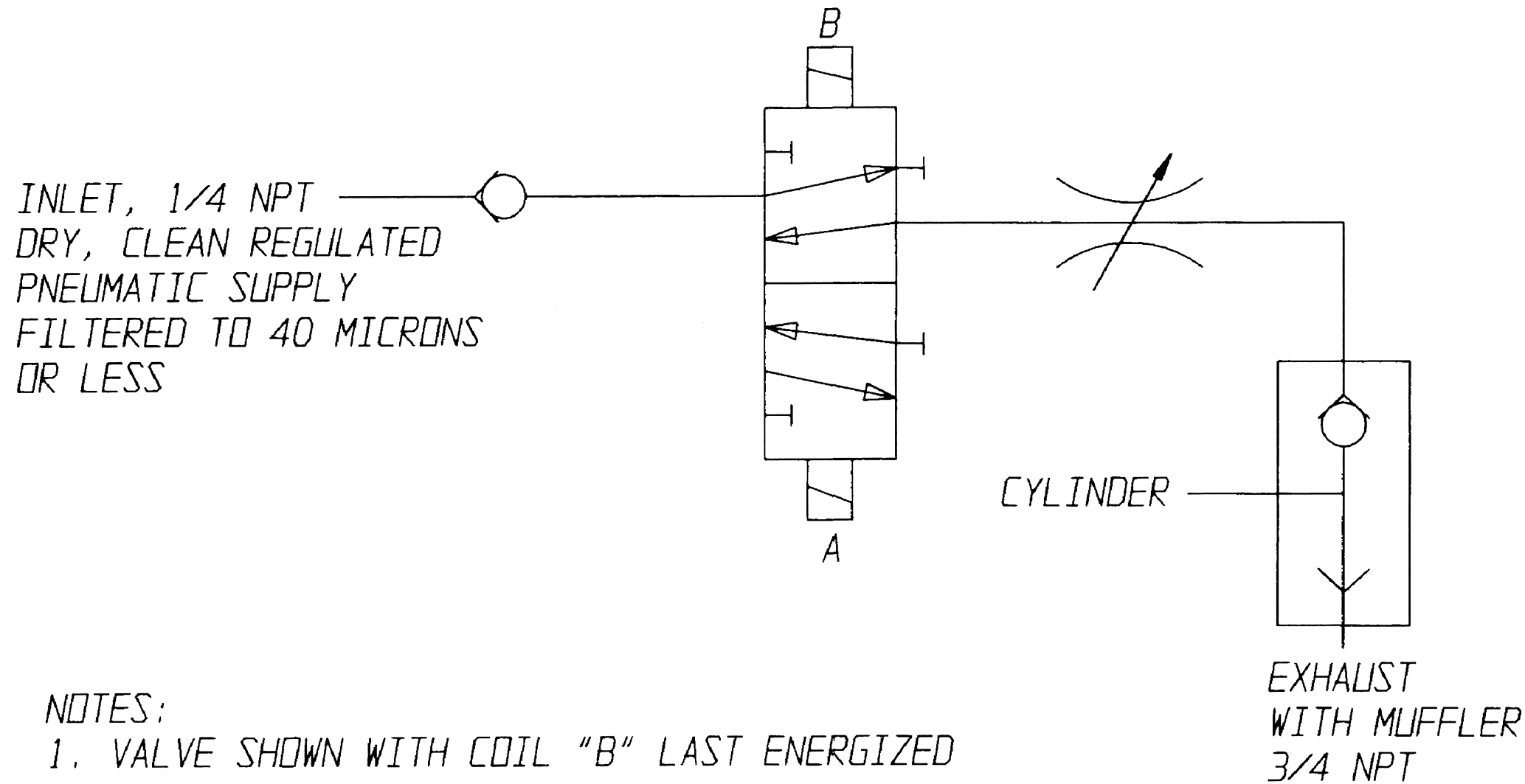
SUPERSEDES:-

**ITT Engineered Valves**

ITT Fluid Technology Corporation  
 Lancaster, Pa  
 SHEET 1 OF 1

| SIZE | DRAWING NUMBER | REV |
|------|----------------|-----|
| A    | 117473         | -   |

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NOTES:  
1. VALVE SHOWN WITH COIL "B" LAST ENERGIZED

ECN#2515

PART NO. -

PATTERN NO. -

|   |              |       |  |   |                |
|---|--------------|-------|--|---|----------------|
| <p>TOLERANCES EXCEPT AS NOTED DECIMALS<br/>.XX ± .02<br/>.XXX ± .005<br/>ANGLES ±0.50°<br/>REMOVE ALL BURRS AND SHARP EDGES ALL MACHINED SURFACES TO BE 125 EXCEPT AS NOTED</p> | WEIGHT       | SCALE | <p>PNEUMATIC SUPPLY GAS BURNER VALVE<br/>T4200 - T4600<br/>VERSA DUAL COIL</p> | <p><b>ITT Engineered Valves</b><br/>ITT Fluid Technology Corporation<br/>Lancaster, Pa<br/>SHEET 1 OF 1</p> |                |
|   | -            | NTS   |  |   |                |
|   | DATE         | BY    |  |   |                |
|   | DWN 10/28/97 | JDN   |  |   |                |
| CHKD 10/21/97   | mjt          |       |  |   |                |
| APVD 10/25/97   | mjt          |       | SUPERSEDES: -  | SIZE  | DRAWING NUMBER |
|   |              |       |  | A   | 117474         |
|   |              |       |  |   | REV            |
|   |              |       |  |   | -              |