Operation,

and

Maintenance Instructions

for

Hanse Environmental, Inc.

VTC Series

Rev H 2018

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Introduction

The ***V**ibration **T**emperature **C**hamber* system offers you the ability to excite products with multi-axial impact vibration while simultaneously exposing your product-under-test to extreme temperatures at very rapid change rates. This combination has proven to be an extremely effective means of identifying failure-prone components and assemblies in the shortest possible time. The unique characteristics of the ***Hanse Environmental Inc.*** temperature and vibration systems are of key importance in achieving this effectiveness.

You are urged to ***carefully*** read the following pages, and particularly the **SAFETY** section, (immediately following), before installing or operating this equipment. This will result in safer operation, longer equipment life, more effective testing, and probably a lot less frustration too!

The staff and employees of ***Hanse Environmental, Inc.*** thank you for choosing our product. Please don't hesitate to call us with any questions or comments that you may have.

Hanse Environmental, Inc

235 Hubbard Street
Allegan, MI 49010
Phone: (269) 673-8638
Fax: 866-272-6515
Email: Info@HanseEnv.com
Web Site: www.HanseEnv.com

Safety Information

Your ***Hanse Environmental Inc.*** Equipment is provided with several safety systems designed to help prevent accidental damage to product and equipment, and avoid injury to personnel. Always operate this equipment in accordance with the procedures set forth in the **OPERATION** section of this manual. The safety systems described below should be checked at least once every 30 days, and any inoperative or questionable conditions must be corrected before resuming operation. Only properly trained personnel must do servicing of this equipment and its associated utility service! Compressed air, liquid nitrogen, and high voltages can all cause severe injury or death if not properly handled.

WARNING!

HIGH SOUND LEVELS!

The vibrators produce extreme sound power levels, which may cause temporary or permanent hearing damage, particularly after prolonged exposure. Do not attempt to operate vibration equipment with doors open unless all affected personnel wear adequate hearing protection!

WARNING!

EXTREME TEMPERATURES AND PRESSURES!

This equipment produces extreme temperatures and uses high pressure fluids. Failure to follow instructions and use proper safety precautions can cause injury or death.

WARNING!

ASPHYXIATION HAZARD!

This equipment uses LIQUID NITROGEN (LN_2), which can displace oxygen and cause severe injury or death due to a lack of oxygen.

ALWAYS allow adequate time for ventilation after opening doors before entering workspace! NEVER operate this equipment unless all exhaust ports are securely ducted to outside of building

Liquid Nitrogen Safety

Properties: Liquid Nitrogen

- Liquid Nitrogen has a boiling point of -195.8°C
- Volume of expansion liquid to gas (at 15°C, 1 atm.) = 682.1
- Sg = 0.808 (at -195.8°C).
- Density of liquid (normal boiling point, 1 atm.) = 0.807 g/cc
- Colorless, Odorless liquid similar in appearance to water.

Known or Expected Hazards

Temperature Related

- The **extremely low temperature** of the liquid can cause severe burn-like damage to the skin either by contact with the fluid, surfaces cooled by the fluid or evolving gases. The hazard level is comparable to that of handling boiling water.
- The low temperature of the vapor can cause damage to softer tissues *e.g*. eyes and lungs but may not affect the skin during short exposure.
- Skin can freeze and adhere to liquid nitrogen cooled surfaces causing tearing on removal.
- Soft materials *e.g*. rubber and plastics become brittle when cooled by liquid nitrogen and may shatter unexpectedly.

Vapor Related

- Large volumes of nitrogen gas are evolved from small volumes of liquid nitrogen (1 liter of liquid giving 0.7 m^3 of vapor) and this can easily replace normal air in poorly ventilated areas leading to the danger of asphyxiation. It should be noted that oxygen normally constitutes 21% of air. Atmospheres containing less than 10% oxygen can result in brain damage and death (the gasping reflex is triggered by excess carbon dioxide and not by shortage of oxygen), levels of 18% or less are dangerous and entry into regions with levels less than 20% is not recommended.

Risks

For an untrained person, the risk of injury is moderate with cryogenic burns the most likely injury. However in exceptional circumstances when large amounts of material are spilled in an enclosed space, asphyxiation may be fatal.

Who is likely to be injured?

The most likely injury is to the person using the material although following major spillage all inhabitants of a room may be affected.

Precautions

Operation

- Liquid nitrogen should never be used except in a well-ventilated area.
- Only containers or fittings (pipes, tongs *etc*.) that have been designed specifically for use with cryogenic liquids may be used as non-specialized equipment may crack or fail.
- Skin contact with either liquid nitrogen or items cooled by liquid nitrogen should be avoided as serious burns may occur. Care must be taken with gloves, wrist-bands or bracelets which may trap liquid nitrogen close to the skin.
- Plumbing components need to be brass, copper or stainless steel chosen to meet the extreme cold and pressure requirements. **You cannot use carbon steel!**

Personal Protective Equipment

The following equipment should be worn when handling or dispensing liquid nitrogen:

- Face shield or safety glasses.
- Dry insulated gloves when handling equipment that has been in contact with the liquid. *NB* there is dispute over the advisability of wearing gloves while handling liquid nitrogen because there is a possibility that gloves could fill with liquid and therefore prolong hand contacts which would make burns more severe. If gloves are worn they should be loose fitting and easily removed.
- Lab coat or overalls are advisable to minimize skin contact and also trousers *over* shoe/boot tops to prevent shoes filling in the event of a spillage.

Avoidance of Oxygen Depletion/ Asphyxiation

- **Liquid nitrogen should normally be used only in a well-ventilated area**.
- **Oxygen Sensors.** Oxygen sensors and alarms should be in place in any area where liquid nitrogen is to be used. Also recommended with the oxygen sensor is an interlock system to shut down safety valves if oxygen level drops below safe levels.
- **19.5% Oxygen is set by OSHA**

Training

- New users of liquid nitrogen should receive instruction in its use from trained members of the staff and should know the use of:
    - Oxygen alarms
    - Proper ventilation
    - Emergency ventilation
    - Evacuation plan
    - LN2 supply shutoff procedure.

Chamber Safety Features

Door Interlock Switches:

One door on each side is provided with a sensor, which will interrupt heat, cool, vibration, and optional humidity operation when the doors are open. These sensors are located near the top of each of the chamber doors. Operation of the vibration system with a door open can cause eardrum damage due to the high sound power levels produced. Do not open doors without switching off the vibration system first, and do not operate the equipment unless all door interlocks are functioning properly.

Note: door interlocks do not protect Access ports and plugs. They can also leak a significant amount of sound energy when open, although typically not enough to cause injury. Since they are provided for cables and hoses supporting product under test, it will often be necessary to operate the equipment with one or more of these port covers open. Packing the port with foam or other material rated for anticipated temperature ranges will greatly reduce noise leakage.

Be absolutely certain that no one is directly in front of an open access port before switching on the vibration system!

Interlock Safeties:

Multiple safety devices are interlocked such that heat, liquid nitrogen and vibration are inhibited when any of the safeties are activated. Safeties items include but are not limited to:

- Door closed limit switches
- High and Low air temperature limit controller
- Event control of heating and cooling
- Auxiliaries on motor starter
- Phase Load Monitor (PLR)

Temperature High/Low Limit Control:

A user-programmable limit is provided by the Watlow F4 alarms. Alarm 1 is setup for use with the product thermocouple (input 3). When the limit is tripped the safety valves and contactors power down to prevent additional temperature changes.

Vibration High Limit Control:

A user-programmable limit is provided by the Watlow F4 alarms. Alarm 2 is setup for use with the vibration signal (input 2). When the limit is tripped the safety valves power down and bring the vibration to a halt.

Secondary High Limit Control:

In addition to the user-programmable Hi/Lo limit control there is a Watlow series 97 (Older) or PM EZ-Zone Limit (New). It is a secondary adjustable control is provided to protect the chamber from high temperature damage. This device senses air temperature near the electric heat elements in the plenum area and will shut down the system if plenum temperatures exceed safe limits due to causes such as airflow obstruction or failure, heat controller failure, or excessive product loading with insufficient cooling (such as occurs when running out of LN_2).

This secondary limit can be reset by pressing the reset button located on the controller.

Specifications and Utility Requirements

Hanse Environmental Inc. builds multiple equipment sizes, with various optional features available, including modification of workspace height, heating and cooling capacity, and maximum vibration levels. Humidity and altitude chambers are also available upon request. Information shown is for standard VTC models. Your chamber may vary if special requests were made at time of purchase concerning workspace dimensions, product mass or temperature ramp rates, or non-standard line voltages. Other manufacturers, such as Watlow, provide their own manuals along with the chamber. Material data sheets are also provided.

Utility Requirements

- Electric: Requirements vary with model and local requirements. Listed below is our FLA on 480V 3 Phase.
- Liquid Nitrogen: Required pipe size and pressure is listed below in comparison chart.
- Compressed Air: Required pipe size, pressure, and flow requirements listed below in comparison chart. Clean dry air is required.

Service Connections

Please see Hanse "Site Preparation manual for VTC Chambers" for all service connections and dimensions.
This can be Downloaded from www.HanseEnv.com

Chamber Construction

Interior Chamber Liner

The chamber liner is constructed of 18 gauge, high nickel content, and series 300 stainless for maximum corrosion resistance. The liner is heliarc welded on all seams to insure a hermetic seal preventing moisture migration into the chamber during low-temperature operation. Provisions are made at all liner seams and corners to allow for thermal expansion during temperature cycling operation. All interior parts exposed to the chamber environments are fabricated of corrosion resistant materials.

Exterior Chamber

The exterior cabinet is composed of heavy-duty welded steel with 16 gauge sheet metal panels. Panel-to-chamber joints are sealed to prevent moisture migration into insulation area. The chamber exterior is finished with water-based enamel sprayed over cleaned, primed surface. The walls are insulated with Hanse Environmental's exclusive six-layer insulation for minimum heat and noise transfer to outside environment.

Chamber Doors Hardware and Windows

VTC-1.5 and below:

Single (1) front door of the same construction as the chamber that will give full access to the product under test. Doors close manual and are sealed with two silicone gaskets to maintain a moisture-proof seal under all chamber-operating conditions and to reduced noise levels. Hinges and latches are of heavy-duty design and are constructed of corrosion-resistant or plated materials.

One (1) 12" x 12" (30.5 cm x 30.5 cm) multi-pane windows are provided, one in each chamber doors. The multi-pane window assembly incorporates an integral desiccant to insure dryness and minimizes internal fogging at low chamber temperatures.

VTC-4 and VTC-6:

Two (2) doors both front and rear made of the same construction as the chamber that will give full access to the product under test. Doors close manual and are sealed with two silicone gaskets to maintain a moisture-proof seal under all chamber-operating conditions and to reduced noise levels. Hinges and latches are of heavy-duty design and are constructed of corrosion-resistant or plated materials.

Two (2) 20" x 20" (50.8 cm x 50.8 cm) multi-pane windows are provided, one in each chamber doors. The multi-pane window assembly incorporates an integral desiccant to insure dryness and minimizes internal fogging at low chamber temperatures.

VTC-9 and Above:

Front and rear bi-parting doors (a total of 4 bi-parting doors) of the same construction as the chamber that will give full access to the product under test. Doors latch closed pneumatically and are sealed with two silicone gaskets to maintain a moisture-proof seal under all chamber-operating conditions and to reduced noise levels. Hinges and latches are of heavy-duty design and are constructed of corrosion-resistant or plated materials.

Four (4) 12” x 24” (30.5 cm x 61.0 cm) multi-pane windows are provided, one in each chamber doors. The multi-pane window assembly incorporates an integral desiccant to insure dryness and minimizes internal fogging at low chamber temperatures.

Access Ports

The multiple 6” (15.2 cm) diameter stainless steel access ports with covers and plugs are provided to facilitated data acquisition wire and power wires to the product under test. The ports are welded on the interior, flanged, and sealed on the exterior. Ports are also provided with foam plug to minimize heat and noise transfer to outside environment. The port is covered with a hinged cover and fastener.

Chamber Lights

The chamber is provided with 120 v-halogen light(s) controlled from an external control switch. Lights are capable of rotating and pivoting to direct light as required for optimal viewing of product under test. Optional recessed lights in the chamber are optional and are fixed and use wide angle halogen bulbs the same type as standard lights.

Features and Performances

System Features

- High Rate Heating System - 3 phase, solid-state control rectifier, 0 crossover fire, proportional control of Open Nichrome heater wire balanced system.

- HighRate™ Liquid Nitrogen Cooling System: Direct atomization in control plenum, Infitrol™ proportional control valve for Models VTC-4 and up (Optional for VTC-1.5), and redundant solenoid safety valve.

- Adjustable Air Flow Plenum: For directing airflow to product. Minimum (4) 3" diameter ports for distributed airflow to product - Models VTC-4 and up. Vibration Exciters: LubeMist™ lubricated vibrators with adjustable ball valves, one for each pneumatic vibrator for low G-level performance using fewer vibrators. SoftStart™ designed vibrators minimize starting shock to products.

- Vibration Exciters - Lubricated vibrators with adjustable ball valves, one for each pneumatic vibrator for low G-level performance using fewer vibrators.

- Vibration Table Support Springs - one set of four (4), rated at 250 lbs. each total static load of 1000 lbs. (Other sizes available)

- Dual Full Opening Doors VTC-9 and above - (front and back) for easy access to product under test. Doors closed pneumatically and sealed with double "P" gaskets for ambient noise reduction and temperature insulation.

- Insulation – *Hanse Environmental, Inc.'s* exclusive six (6) insulation layers, staggered for superior thermal and noise insulation.

- Tempered Multi pane Viewing Windows - one in each door, front and back.

- Interior Light - Multiple Halogen lights.

- Round Access Ports - 6" diameter ports with #2 charcoal polyester virgin material port plugs. One lower port used for vibrator inlet and to exhaust compressed air.

- Programmable Vibration Control - Programmable vibration ramps, gRMS level, and test duration all synchronized with the temperature controller.

- Multi Accelerometer Monitoring - Four (4) accelerometers can be monitored simultaneously.

Performance

Overview

- Temperature Range: -100 to +200° C
- Temperature Change Rate: 70° C/min (-65 to +100° C with 50lb Aluminum Fin Coil Load).
- Temperature Control: ± 1° C after stabilization.
- Tri-Axial Vibration: Six-Degree-of-Freedom (6DoF) Vibration, non-coherent broadband vibration 5-10,000Hz 100 gRMS New. 90% of vibration energy in 5-4000Hz for maximum low energy in low frequency range. Ultra-Hi vibration performance option in Models VTC-16 and 25.

Vibration Table and Vibrators:

Vibration simulation is achieved using multiple pneumatically actuated pistons precisely oriented to act in conjunction with a carefully engineered set of aluminum plates to transmit broad frequency vibration patterns acting with six degrees of freedom at controlled intensity.

- Tri-Ax Vibration: Tri-axial non-coherent, six degree of freedom (6DoF) broadband vibration: 5 to 10000 Hz, 100 gRMS with unloaded table at ambient.
- Vibration Control: to within 0.5g within one (1) minute of settling.
- Tri-Ax Vibration Table: Mounting surface uses square bolt down pattern with stainless steel 3/8"-16 insert on 4" centers or on metric tables M10-1.5 inserts on 100mm centers. Ceramic insulation thermally isolates mounting surface from vibration base for improved temperature cycling and vibrator life.

Temperature Control System:

Heating is accomplished with resistive electric elements, while cooling is accomplished by direct injection of liquid nitrogen (LN_2). Electric heaters are carefully selected and arranged to provide extremely rapid temperature rates of change without exceeding safe design limits of heat elements. Liquid nitrogen is injected using helical dispersion nozzles to quickly vaporize the liquid, providing maximum cooling without exposing product under test to un-vaporized nitrogen droplets.

- Temperature Range: from –100 C to +200 C, (-148 F to +392 F). An extended range of –150 C to +400 C is available for an additional charge.
- Temperature Change Rate: 70 °C/min (-65 to +100 °C with 50lb Aluminum Fin Coil Load).
- Temperature Control: to within 1 C, (-148 F to +392 F). After stabilization.

Options

- Humidity: Direct Injection, 10 to 85% RH from 35 to 75°C, Capacitance sensor.
- HanseView™: System control of temperature and vibration. Control/Data Logger, and Control/Data Logger/Analyzer options.
- Vibration Fixtures: Specially designed for HALT/HASS applications.
- LN2 System: Complete installation, piping and controls
- Stand-Alone: Temperature Cycling Chambers or 6dof Vibration Tables in sizes shown below.
- Event Output: Eight event output relay software profile control.

Air circulation:

The chamber is equipped with non-corrosive fans providing air circulation to minimize chamber temperature gradients. Three phase motors drive the fans. Baffles provide input and output air openings to direct the airflow in the chamber.

Major advantage of Hanse Environmental Inc. chamber is the air circulation design. This dynamic air circulation was designed to fit ***convection cooling design*** and minimize the excessive air for ***fan-forced cooling product.***

Adjustable Air Flow Plenum:

Thermally conditioned air exits through plenum. 3" ports are also provided to directly conditioned air to particular areas within the chamber's working volume.

Air Blower Motors:

Heavy-duty ball bearing type motors are used to drive the air circulator blower. The blowers are driven by mean of extended stainless shafts. The motors are mounted vertically, outside the thermally conditioned space to minimize stress on the motor.

NOTE: The direction of rotation of circulators (fans) is very important. The air circulation must be from the chamber workspace, through the circulators (fans) past the heaters and back to the chamber workspace. If a circulator is rotating in the wrong direction (clockwise), two of the three, three-phase power lines must be switched. The corrected direction should be counter-clockwise.

Electrical Control Consoles:

One primary supply voltage is required to operate the chamber. All other required voltage is produced by transformers and power supplies located in the main control console. The console is assembled for easy maintenance. All relays, contactors, and motor starters are located in the control console. A complete set of electrical schematics is provided with the chamber. The electrical boxes are located on the chamber side.

Optional Humidity System:

Water is injected and atomized to provide humidity control in the working volume. Chamber humidity level is controlled through the chamber controllers.

Chamber Controls and Instrumentation

Programmable Temperature Controller:

Product temperature, as well as air temperature are controlled by the unique, Watlow F4 temperature controller.

Temperature Sensors:

Chamber and product temperatures are measured by type T thermocouples. Back up air safety controller monitors a separate type T thermocouples.

Air Safety Controller:

The Watlow Series 97 temperature controller included monitors a Type T thermocouples. Controller has two independent set points for monitoring high and low temperature limits. These high and low temperature alarms are wired into the chamber's safety circuit.

Control Software:

HanseView Control allows for manual and profile control.
HanseView Analysis allows for manual and profile control as well as vibration analysis.

Vibration level Control:

A GRMS meter connected to an accelerometer provides instantaneous readout of vibration intensity in one axis. Additional accelerometers can be purchased and installed to provide multi-axis indication. Software included with the system allows reading and control of g levels.

- True RMS Vibration Meter: for user-selectable over-g limit protection with monitor and drive capability. Four inputs available with four outputs available. Optional display available. Single display for control only.
- Miniature, Low Impedance, Voltage Mode Control Accelerometer: one (1) Dytran model 3030B5, with a 3 meter. cable. This has 10-32 ends and comes with a 10-32 to BNC adapter.
- Current Source: for Control Accelerometer, one (1).

Operator Control Switches:

Door Open/Close	Opens or closes chamber doors
Light On/Off	Turns on and off chamber lights
Heat Enable	Overrides the Heating Event
Cool Enable	Overrides the Cooling Event
Vibration Enable	Overrides the Vibration Event
Emergency Power Off	Disables all chamber systems, turning power off to them

Note:
Some chambers have other optional control switches. Please see manual addendum for your custom options and controls.

Operation

Check chamber functions and your personal understanding of the system ***before*** installing product to be tested, by following these steps with an empty chamber.

A. Verify that all utilities are on-line before operating equipment.
   a. Compressed air is required to operate cooling, vibration systems, purge, and auto door latches on some models.
   b. Liquid nitrogen is required for proper cooling. (Empty or low LN_2 tanks produce a mixture of liquid and vapor which will not properly cool the chamber.)
   c. Proper voltage and phase electrical supply are necessary for full heating capability.

B. With all function switches in **OFF** position, turn **ON** main disconnect switch if not already on. Then open compressed air service valve and liquid nitrogen supply valve.

C. Connect Accelerometer to Input 1 this is default control channel

D. Be sure all doors are closed securely. Close doors by manually pushing closed as far as possible, then operate door close switch or manual door latch.

E. Some models are equipped with a programmable event to shut down the chamber at the end of a program. If fans do not start when reset switch is operated, check status of this event and also verify that all doors are closed and door sensors are properly sensing door closures.

F. Some Models with HanseView Analysis have optional output control This allows you to use 1 or more selectable accelerometers as control defiled in Test Profile.

Starting Chamber from Off. (SOP)

Items to check and do when starting the Hanse VTC chamber from a shut down. These are general guidelines, see your company safety person or supervisor for correct operations.

1. Turn all switches to OFF and doors set to open and ensure E-Stop is reset.
2. Turn on Main Power 480 volt(see local power) 3 Phase power.
3. If Equipped. Turn on APC UPS on machine. Press and hold center button (Does battery test then Online). If this does not power up check mains, breaker for transformer and it is plugged in to council.
4. If Equipped. The Pur-Air O2 monitor will take 4 minuets to start up, when ready you should see two led lights lit, Red and Yellow. Will hear tone when ready.
5. Check that you have compressed air and the dryer is on and any filters are good.
6. Start Hanse CPU and Hanse View. Make sure that the USB Hanse View Key key is installed and that you get communications with chamber. Comm Lights on Watlow F4 should be blinking.
7. Check Pressure at LN2 tank, ensure that it is at at or below 50 psi on pressure gauge. If pressure level ok turn on LN2 Liquid line for chamber.
8. Physically inspect the hammers and hoses. Check that hammers are not loose and hoses are connected and tight.
9. Check the sensors, thermocouples (put near light to see if temp changes up) and accelerometer and cable connections. If you are not using vibration it is best to remover the sensor and cable from chamber. Check Light are installed and set.
10. Check that all table bolts are tight and product and or fixture are ready for test.
11. Port covers or port plugs are in place.
12. Visual inspection of door gasket and any other items on the chamber for loose or missing parts.

Beginning Test

1. Load or write profile test to run in Hanse View.
2. Ensure UTT is set and ready for test.
3. Close doors and turn switch to closed.
4. Check that heat, cool, and vibration are switched in the auto mode.
5. “Run “ profile in the Hanse View software.
6. Monitor that all functions are operating (fans, heat cool, and vibration).

End of Test

1. Save data in Hanse View, “Save Data” icon on top bar.
2. Shut off LN2 main valve at tank. (do this step only if you are done with testing in the chamber and not running any further test).
3. Have Fan’s running and set the manual set point to 0° C and drain LN2 line. (do this step only if you are done with testing in the chamber and not running any further test).
4. Turn front control switches to off (Heat , Cool, and Vibration).
5. Letting fans run and check that the chamber has enough time to stabilize at ambient temp (if coming from cold or hot items can still be at temp trying to avoid condensation or hot parts.)

System Shutdown

1. Shut down system CPU.
2. Shut off Chamber mains.
3. If Equipped. Shut off APC UPS mounted on control council. (Center Button press and hold)

Temperature System Operation - Manual

See Watlow F4 Manual.

Temperature System Operation - Computer Control

See HanseView manual for control

Vibration System Operation

See HanseView manual for control
JC Systems 704 GRMS or Dytran 4007 Manual for details on true GRMS.

Calibration

Only qualified technical personnel should do calibration procedures with access to the equipment listed in each section.
Before beginning calibration procedures, warm up the equipment for at least 20 minutes.

Watlow F4-1 Temperature and Vibration

Restore Factory Values

Each controller is calibrated before leaving the factory. If at any time you want to restore the factory calibration values, use the last parameters in the menu: Restore In x (1 to 3) Cal. Press right arrow
No special equipment is necessary.

Following Chapter 9 of the Watlow F4 Manual:

Input 1 Thermocouple Input Procedure

Equipment

- Type J reference compensator with reference junction at 32°F (0°C), or type J thermocouple calibrator to 32°F (0°C).
- Precision millivolt source, 0 to 50mV minimum range, 0.002mV resolution.

Setup and Calibration

1. Connect the correct power supply to terminals 1, 2 and 3 (see the Wiring Chapter and the Appendix).
2. Connect the millivolt source to Input 1 terminals 62 (-) and 61 (+).
3. Enter 50.000mV from the millivolt source. Allow at least 10 seconds to stabilize. Press the Right Key once at the Calibrate Input 1 prompt (Factory Page). At the 50.00mV prompt press Right Key once and to store 50.00mV press the Up Key once.
4. Enter 0.000mV from the millivolt source. Allow at least 10 seconds to stabilize. At the 0.00mV prompt press Right Key once and to store 0.00mV press Up Key once.
5. Disconnect the millivolt source and connect the reference compensator or thermocouple calibrator to Input 1 terminals 62 (-) and 61 (+). With type J thermocouple wire, if using a compensator turn it on and short the input wires. When using a type J calibrator, set it to simulate 32°F (0°C). Allow 10 seconds for the controller to stabilize. Press Right Key once at the Calibrate Input x (1 or 2) prompt (Factory Page). At the 32°F Type J prompt press Right Key once and to store type J thermocouple calibration press Up Key once.
6. Rewire for operation and verify calibration.

Input 2 Voltage Input Procedure

Equipment

- Precision voltage source, 0 to 10V minimum range, with 0.001V resolution.

Setup and Calibration

1. Connect the correct power supply to terminals 1, 2 and 3 (see the Wiring Chapter and the Appendix).
2. Connect the voltage source to terminals 53 (+) and 58 (-) of the controller.

3. Enter 0.000V from the voltage source to the controller. Allow at least 10 seconds to stabilize. Press right arrow once at the Calibrate Input 2 prompt. At the 0.000V prompt press right arrow once and to store the 0.000V input press up arrow once.
4. Enter 10.000V from the voltage source to the controller. Allow at least 10 seconds to stabilize. Press right arrow once at the Calibrate Input 2 prompt (Factory Page). At the 10.000V prompt press right arrow once and to store the 10.000V input press up arrow once.

Input 3 Thermocouple Input Procedure

Equipment

- Type J reference compensator with reference junction at 32°F (0°C), or type J thermocouple calibrator to 32°F (0°C).
- Precision millivolt source, 0 to 50mV minimum range, 0.002mV resolution.

Setup and Calibration

1. Connect the correct power supply to terminals 1, 2 and 3 (see the Wiring Chapter and the Appendix).
2. Connect the millivolt source to Input 3 terminals 56 (-) and 55 (+).
3. Enter 50.000mV from the millivolt source. Allow at least 10 seconds to stabilize. Press the Right Key once at the Calibrate Input 3 prompt (Factory Page). At the 50.00mV prompt press Right Key once and to store 50.00mV press the Up Key once.
4. Enter 0.000mV from the millivolt source. Allow at least 10 seconds to stabilize. At the 0.00mV prompt press Right Key once and to store 0.00mV press Up Key once.
5. Disconnect the millivolt source and connect the reference compensator or thermocouple calibrator to Input 3 terminals 56 (-) and 55 (+). With type J thermocouple wire, if using a compensator turn it on and short the input wires. When using a type J calibrator, set it to simulate 32°F (0°C). Allow 10 seconds for the controller to stabilize. Press Right Key once at the Calibrate Input x (1 or 2) prompt (Factory Page). At the 32°F Type J prompt press Right Key once and to store type J thermocouple calibration press Up Key once.
6. Rewire for operation and verify calibration.

Output 1A Milliamperes (Not Required)

Equipment

- Precision volt/ammeter with 3.5-digit resolution.

Setup and Calibration

1. Connect the correct power supply to terminals 1, 2 and 3 (see the Wiring Chapter and the Appendix).
2. Connect the volt/ammeter to terminals 42 (+) and 43 (-).
3. Press the Right Key at the Calibrate Output 1A prompt. At the 4.000mA prompt press Right Key once. Use the Up Key or the Down Key to adjust the display to the reading on the volt/ammeter. The controller should stabilize within one second. Repeat until the volt/ammeter reads 4.000mA. Press Right Key to store the value.

4. Press the Right Key at the Calibrate Output 1A prompt. At the 20.000mA prompt press Right Key once. Use the Up Key or the Down Key to adjust the display to the reading on the volt/ammeter. The controller should stabilize within one second. Repeat until the volt/ammeter reads 20.000mA. Press Right Key to store the value.

Output 1B Milliamperes (Not Required)

Equipment

- Precision volt/ammeter with 3.5-digit resolution.

Setup and Calibration

1. Connect the correct power supply to terminals 1, 2 and 3 (see the Wiring Chapter and the Appendix).
2. Connect the volt/ammeter to terminals 39 (+) and 40 (-).
3. Press the Right Key at the Calibrate Output 1B prompt. At the 4.000mA prompt press Right Key once. Use the Up Key or the Down Key to adjust the display to the reading on the volt/ammeter. The controller should stabilize within one second. Repeat until the volt/ammeter reads 4.000mA. Press Right Key to store the value.
4. Press the Right Key at the Calibrate Output 1B prompt. At the 20.000mA prompt press Right Key once. Use the Up Key or the Down Key to adjust the display to the reading on the volt/ammeter. The controller should stabilize within one second. Repeat until the volt/ammeter reads 20.000mA. Press Right Key to store the value.

Output 2A Milliamperes (Not Required)

Equipment

- Precision volt/ammeter with 3.5-digit resolution.

Setup and Calibration

1. Connect the correct power supply to terminals 1, 2 and 3 (see the Wiring Chapter and the Appendix).
2. Connect the volt/ammeter to terminals 36 (+) and 37 (-).
3. Press the Right Key at the Calibrate Output 2A prompt. At the 4.000mA prompt press Right Key once. Use the Up Key or the Down Key to adjust the display to the reading on the volt/ammeter. The controller should stabilize within one second. Repeat until the volt/ammeter reads 4.000mA. Press Right Key to store the value.
4. Press the Right Key at the Calibrate Output 2A prompt. At the 20.000mA prompt press Right Key once. Use the Up Key or the Down Key to adjust the display to the reading on the volt/ammeter. The controller should stabilize within one second. Repeat until the volt/ammeter reads 20.000mA. Press Right Key to store the value.

Thermal Limit(s)

The Watlow 97 or EZ Zone PM Limit is a temperature Limit controller and should have a comparison calibration done once a year. If you will be using this instrument for data then you should perform the calibration procedure found in the Watlow 97 or PM limit manual.

Factory Calibration

All units leave the factory with no calibration. All units are checked and operate in conformance. All units should be calibrated to your ISO or requirements or your procedures after your installation

Calibration of the Dytran 4007 Quad Sensor Conditioner
(Chambers Post 2006)

1.0 SCOPE

This procedure is dedicated to the explanatory of calibration technique for 4007 Quad Sensor Conditioner.

2.0 APPLICABILITY

4007 series

3.0 EQUIPMENT

- Oscilloscope, no manufacture specified
- Dual Display Multimeter, Fluke 45
- LIVM Sensor Simulator, Dytran 4515
- DC Power Supply, no manufacture specified
- Function Generator, no manufacture specified
- Set of appropriate cables

4.0 CALIBRATION CERTIFICATE CONTENT

- Customer identification
- Unit Identification
- Environmental condition during calibration
- Sensor Supply Voltage (each channel)
- Sensor Drive Current (each channel)
- Filter @ 3kHz and 10kHz
- DC Voltage and Current
- List of equipment used
- Uncertainty of calibration and error

5.0 PROCEDURE

5.1 TEST SETUP

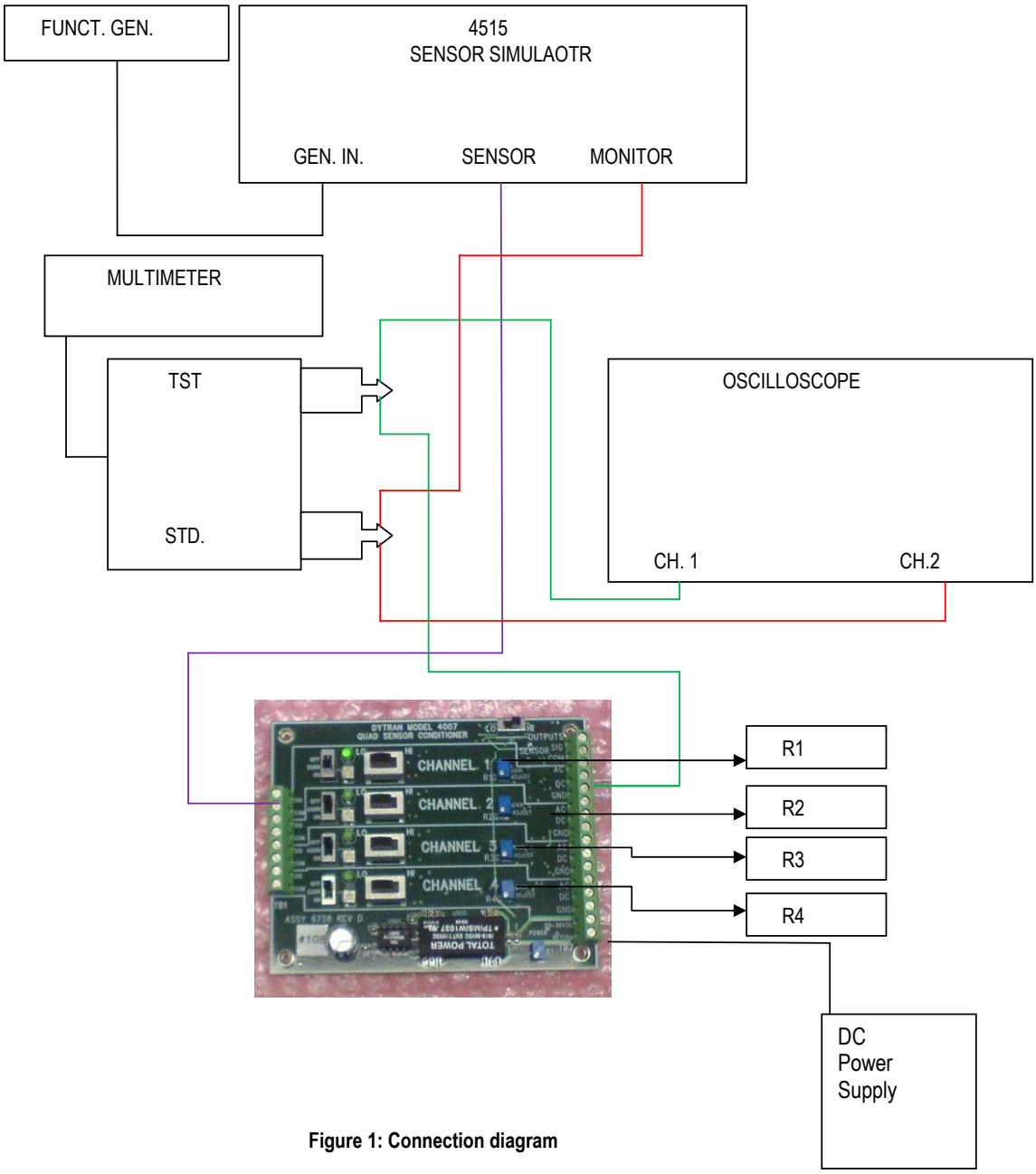


Figure 1: Connection diagram

IMI Model 682B03 ICP Vibration Transmitter

Some Models are fitted with a single channel ICP current source.

See Addendum section for info on this unit service and settings.

704-GRMS System Calibration (Chambers Pre 2006)

Note: Material Taken from the JC 704 Calibration Procedure manual

Background:

The calibration of the Model 704_GRMS consists of setting 0 Grms and 100 Grms vibration levels.

The output is calibrated for 0 Grms input and should produce 0.0 vdc output corresponding to 0 Grms.

The output gain of the GRMS Model-704 is adjusted to produce 1.0 vdc for the equivalent of 100 Grms at the input to the GRMS Model-7004. (All predicted on a 10 mv/Grms accelerometer).

Calibration Procedure

EQUIPMENT REQUIRED:

True RMS DVM (Digital Volt Meter), Sinewave Generator, 4 ea. 2K ohm, 1% resistors (Dummy Loads), 1 ea. 1K ohm, 1% resistor, Accelerometer Simulator (Build simulator as shown on page 48).

HOOK UP:

Connect 117VAC to Line inputs: TB3 - 1 (Hot), - 2 (Neutral) & - 3 (GND).

Apply power to the unit.

MEASURE THE DC SUPPLY VOLTAGES:

Connect the negative meter lead to TB1 pin 2, 4, 6, 8 or 10 (0 VDC).

NOTE:

Leave the negative meter lead connected during the remainder of the procedure.

Measure the - 15.0 VDC by connecting the positive meter lead to pin 4 of either U12 or U13.

Measure the + 15.0 VDC by connecting the positive meter lead to pin 7 of either U12 or U13.

MEASURE THE ACCELEROMETER SOURCE CURRENTS:

Place a 2K ohm resistor in series with the positive meter lead.

Place the resistor/meter in series with the “X” accelerometer input. Measure & record the constant current.

The current at each input must be 5.2mA, +/- 0.3mA. (4.9mA - 5.5mA)

This can be done by using the free lead of the resistor as a probe and inserting it into the center (+)
conductor of the associated inputs BNC connector.

Replace the 2K ohm resistor with the 1K ohm resistor. Measure each of the accelerometer inputs again. The reading must be exactly the same as that measured with the 2K resistor +/- 0.00mA.

FILTERING:

Single stage Low Pass cutoff filter. (See figure on page 6 for filter dip switch settings).
Filter In: 3DB down (.707) @ 2500 HZ
Filter Out: 3DB down (.707) @ approximately 25000 HZ

0.0 VDC OUTPUT ADJUSTMENT:

Connect 2K ohm, 1% resistors to: “X” (TB2 pins 1 & 2), “Y” (TB2 pins 3 & 4), “Z” (TB2 pins 5 & 6)
and “PT” (TB2 pins 7 & 8).
Connect positive meter lead to: TB1 pin 3 (“X”), adjust pot R15 for 0.0 Vdc output.
TB1 pin 5 (“Y”), adjust pot R16 for 0.0 Vdc output.
TB1 pin 7 (“Z”), adjust pot R 14 for 0.0 Vdc output.
TB1 pin 9 (“PT”), adjust pot R17 for 0.0 Vdc output.
Repeat until all outputs read 0.0 VDC.
Connect positive meter lead to TB1 pin 1 (“Average”), adjust pot R42 (20K pot) for 0.0 Vdc output.

1.0 VDC OUTPUT ADJUSTMENT:

Set bits 1, 2, 3 & 4 of dip switch S1 (Filter) to the “Out” (OFF) position.
“X”: Remove 2K ohm, 1% resistor from “X” input (TB2-1 & 2) and connect the generator.
Set Generator output to 250HZ Sine wave at 1.0 V rms (must be true rms).
Connect positive meter lead to TP4 and verify 1.0 V rms.
Connect positive meter lead to “X” output, TB1 pin 3.
Adjust pot R11 for 1.0 VDC.
Remove generator from “X” input (TB2-1 & 2) and reinstall 2K ohm, 1% resistor.

“Y”: Remove 2K ohm, 1% resistor from “Y” input (TB2-3 & 4) and connect generator.
Set Generator output to 250HZ Sine wave at 1.0 V rms (must be true rms).
Connect positive meter lead to TP3 and verify 1.0 V rms.
Connect positive meter lead to “Y” output, TB1 pin 5.
Adjust pot R12 for 1.0 VDC.
Remove generator from “Y” input (TB2-3 & 4) and reinstall 2K ohm, 1% resistor.

“Z”: Remove 2K ohm, 1% resistor from “Z” input (TB2-5 & 6) and connect generator.
Set Generator output to 250HZ Sine wave at 1.0 V rms (must be true rms).
Connect positive meter lead to TP2 and verify 1.0 V rms.
Connect positive meter lead positive meter lead to “Z” output, TB1 pin 7.
Adjust pot R41 for 1.0 VDC.
Remove generator from “Z” input (TB2-5 & 6) and reinstall 2K ohm, 1% resistor.

“PT”: Remove 2K ohm, 1% resistor from “PT” input (TB2-7 & 8) and connect generator. (Next Page)

Set Generator output to 250HZ Sine wave at 1.0 V rms (must be true rms).
Connect positive meter lead to TP1 and verify 1.0 V rms.
Connect positive meter lead to “PT” output, TB1 pin 9.
Adjust pot R13 for 1.0 VDC.
Remove generator from “PT” input (TB2-7 & 8) and reinstall 2K ohm, 1% resistor.

AVERAGE OUTPUT ADJUSTMENT:

Remove the 2K ohm, 1% resistor and connect the Simulator to the “X” input (TB2-1&2)
Connect positive meter lead to TB1-3 and verify 1.0 Vdc.
Connect positive meter lead to TB1- 1. Average (X, Y, Z output).
Adjust pot R23 for 0.3333 Vdc.
Remove simulator from “X” input (TB2 1&2) and install the 2K ohm, 1% resistor.

Remove the 2K ohm, 1% resistor and connect the Simulator to the “Y” input (TB2-3&4)
Connect positive meter lead to TB1-5 and verify 1.0 Vdc.
Connect positive meter lead to TB1- 1. Average (X, Y, Z output).
Check TB1-1 for 0.3333 Vdc.
Remove simulator from “Y” input (TB2 3&4) and install the 2K ohm, 1% resistor.

Remove the 2K ohm, 1% resistor and connect the Simulator to the “Z” input (TB2-5&6)
Connect positive meter lead to TB1-7 and verify 1.0 Vdc.
Connect positive meter lead to TB1- 1. Average (X, Y, Z output).
Check TB1-1 for .3333 Vdc.
Remove simulator from “Y” input (TB2 5&6) and install the 2K ohm, 1% resistor.

FILTER ADJUSTMENTS:

Remove the 2K ohm, 1% resistor and connect the generator to the “X” input (TB2 - 1 & 2).
Set Generator output to 2500Hz at 1.0 V rms (must be true rms).
Connect the positive meter lead to the “X’ output TB1 - 3.
Set S1, bit 4 to the “IN” (ON) position.
Adjust pot R45 for a meter reading of 0.707 Vdc.
Remove the generator and connect the 2K ohm, 1% resistor to the “X” input (TB2 - 1 & 2).

Remove the 2K ohm, 1% resistor and connect the generator to the “Y” input (TB2 - 3 & 4).
Set Generator output to 2500Hz at 1.0 V rms (must be true rms).
Connect the positive meter lead to the “Y” output TB1 - 5.
Set S1, bit 3 to the “IN” (ON) position.
Adjust pot R46 for a meter reading of 0.707 Vdc.

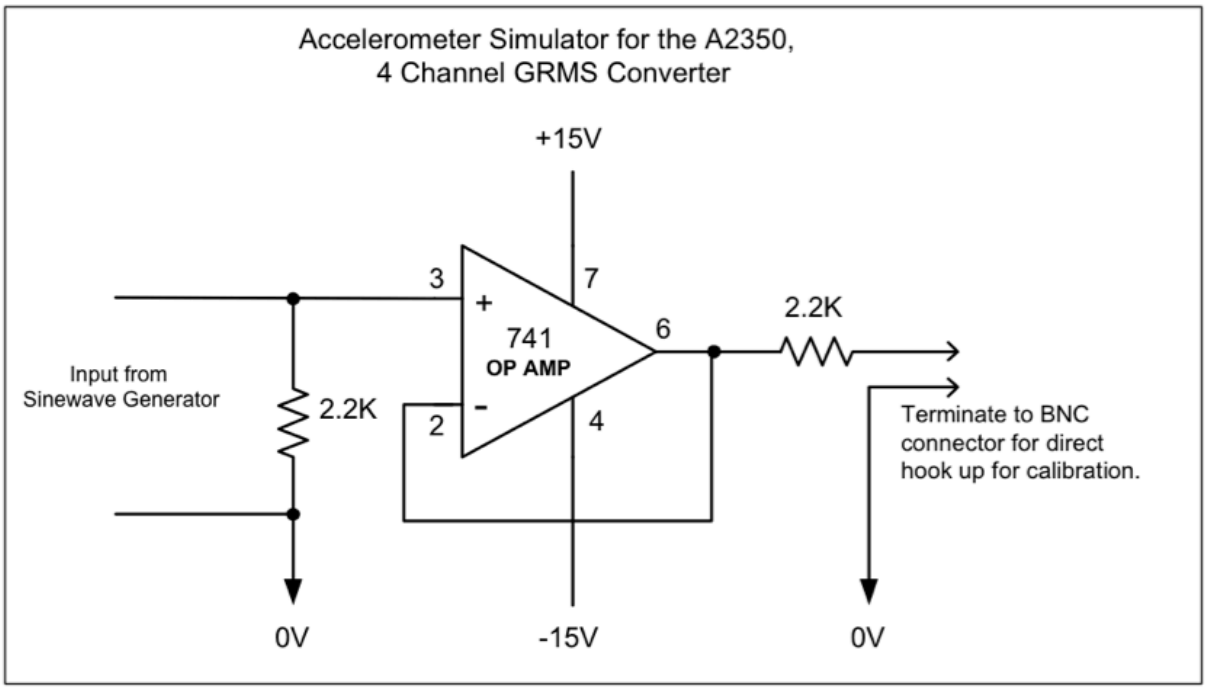
Remove the generator and connect the 2K ohm, 1% resistor to the “Y” input (TB2 - 3 & 4).

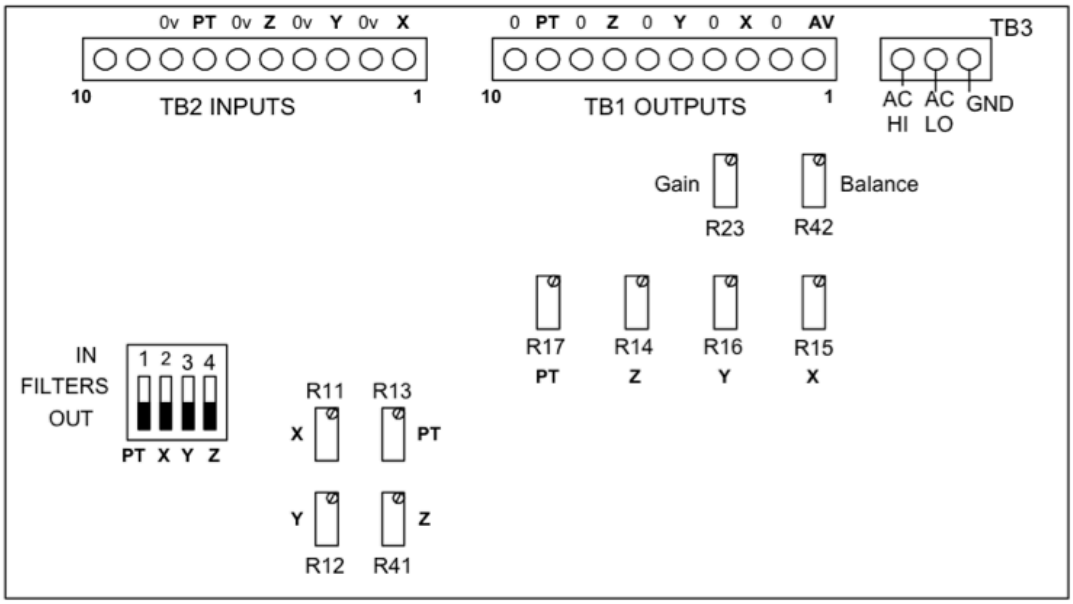
Remove the 2K ohm, 1% resistor and connect the generator to the “Z” input (TB2 - 5 & 6).
Set Generator output to 2500Hz at 1.0 V rms (must be true rms).
Connect the positive meter lead to the “Z” output TB1 - 7.
Set S1, bit 2 to the “IN” (ON) position.
Adjust pot R47 for a meter reading of 0.707 Vdc.
Remove the generator and connect the 2K ohm, 1% resistor to the “Z” input (TB2 - 5 & 6).

Remove the 2K ohm, 1% resistor and connect the generator to the “PT” input (TB2 - 7 & 8).
Set Generator output to 2500Hz at 1.0 V rms (must be true rms).
Connect the positive meter lead to the “PT” output TB1 - 7.
Set S1, bit 1 to the “IN” (ON) position.
Adjust pot R48 for a meter reading of 0.707 Vdc.
Remove the generator and connect the 2K ohm, 1% resistor to the “PT” input (TB2 - 7 & 8).

Set switch S1 bits 1 - 4 to the “OUT” (OFF) position.

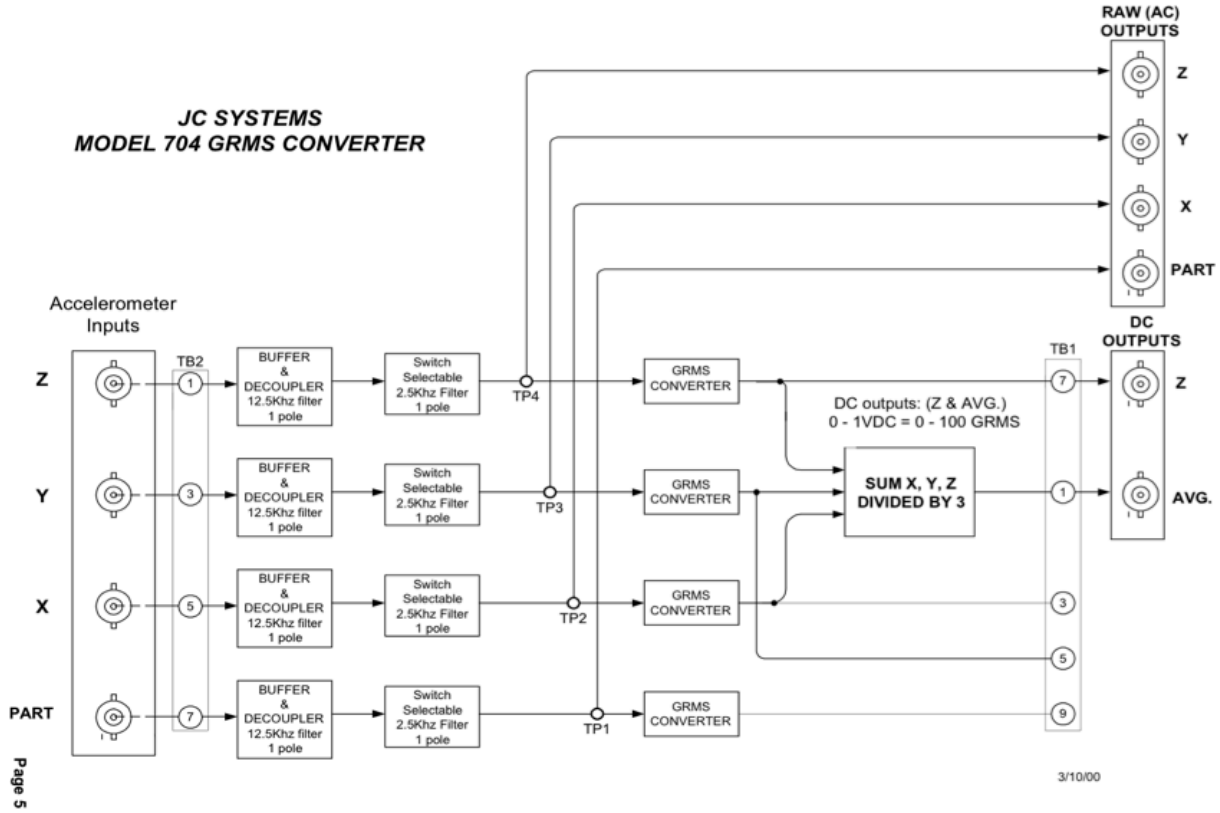
Simulator Circuit



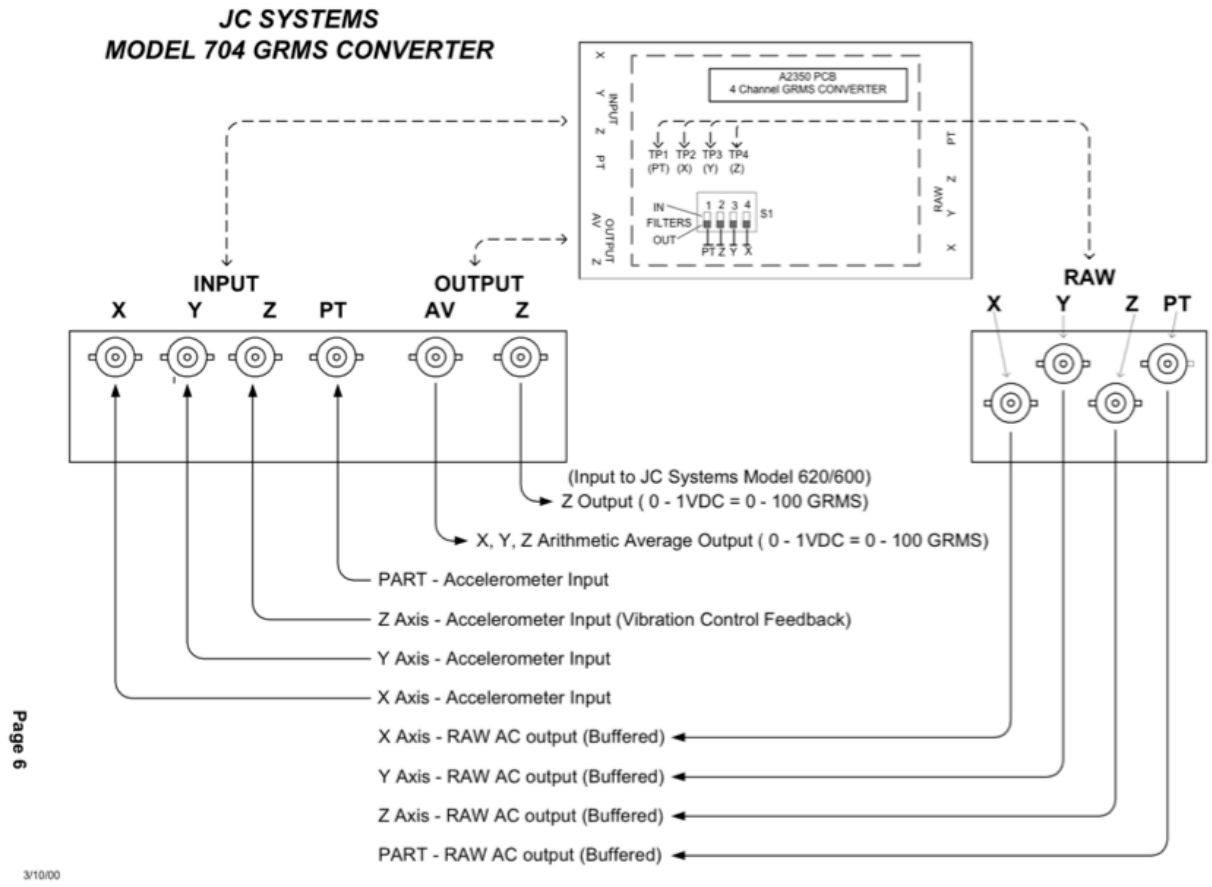


A2350
4 Channel GRMS Converter PCB

Block Diagram



Input and Output Diagram



Sensors

Accelerometers & Cables

Accelerometers should be calibrated on a yearly bases by a calibration lab. Accelerometers do need replacement when worn. We recommend keeping one to two spars available at all times. We recommend a 3030B5 made by Dytran. You may also use any standard 10 mv/g Accelerometer please make sure it has proper specs for the environment you are going to be putting it into.

The accelerometer cable also needs to be checked regularly for abnormal ware. These should be replaced yearly to provide best readings. Keeping one to two spars available at all times is recommended. The stock ones are 10-32 to BNC using a teflon or high temp jacket.

Thermocouples

Thermocouples (T/C) do breakdown over time. It is recommended to check the accuracy of your Thermocouple against known T/C. Also make sure to check the insulation of the T/C for abnormal ware. Any ware that the two separate wires that make up a T/C touch create a new measurement point. Replacement of the T/C is advised. Our standard T/C is a 70XTSUC120A made by Watlow. This T/C is a Type T with non-grounding tip.

Ultrasonic Humidification Systems

System Description

The humidification systems provided with Hanse Environmental, Inc. chambers utilize the latest in ultrasonic nebulization principles to generate the moisture required in the chamber. The Ultrasonic Nozzle uses air and water under pressure. Atomized water leaving the nozzle is hit by the air reflected by the resonator as sound waves, nebulized into very small particles, like a fog, and rapidly absorbed by the air. The resonator is adjusted at the factory for maximum atomization and proper fog pattern. The fog pattern can be narrowed by moving the resonator further from the nozzle tip, and conversely, widened by moving the resonator closer to the tip.

Installation

The nozzle(s) are installed at the factory for proper distribution of the moisture introduced into the chamber. Even though the nozzles are designed for the temperature extremes experienced in the normal operation of the chamber, it is recommended that the nozzle(s) be removed when humidification testing is not being performed. The nozzle(s) mounting brackets are designed for ease of installation and removal. The direction of the nozzle(s) has been determined at the factory to maximize the distribution of the moisture within the chamber and should be maintained in the configuration.

The nozzle(s) are provided with hose connections that can be made within the confines of the chamber when installing or removing them. This will reduce the time required to go into humidification testing

Operation

The water and air supply to the nozzle(s) is regulated by in line pressure regulators. The water pressure to the nozzle(s) is adjusted at the factory to provide the proper amount of moisture to the chamber. The air regulator should be adjusted to maintain the air pressure to the nozzle(s) a minimum of 15 psi above the water line pressure. This is necessary to provide enough air pressure to open the water valve internal to the nozzle and allow atomization to begin. The air and water supplies to the nozzle(s) are controlled by 24V DC control valves.

The valves are controlled by the mode of operation of the chamber. When the humidification mode is disabled, Events 3 and 4, the water supply is turned off and the line(s) are vented to drain. Similarly, the air lines are turned off and ported to exhaust also. This prevents inadvertent operation of the system.

When humidity is called for, Events 3 and 4 enabled, and the nozzle(s) have been installed in the chamber, the water valve opens applying pressure to the nozzle(s).

In addition, when the set point is above the humidity level in the chamber, the air valve opens which applies air pressure to the nozzle(s). This air pressure results in the opening of the water valve internal to the nozzle(s) and the atomization process is started.

As the humidity level in the chamber reaches the set point, the control system will start controlling the air valve to take control of the humidity level in the chamber. The valve will remove air pressure from the nozzle(s) for longer and longer periods to control the humidity level within the set point parameters.

If the humidity function is turned off, Events 3 and 4, then the system reverts back to the condition described above and the air and water lines are ported to exhaust condition. At this point the nozzle(s) can be safely removed from the chamber once they have cooled off.

Maintenance

The humidification nozzle(s) do not require routine maintenance. The water supplied to them should be free of debris and suspended solids, and it is recommended that a 10 micron filter be installed between the chamber and the water supply. This will prevent premature plugging of the nozzle tip.

System Maintenance

A qualified technician should do maintenance of this equipment. High voltage electrical systems, high-pressure gas and mechanical systems all represent a potential for injury or death. The main power ***must*** be turned off at the main disconnect and all gas supplies should be turned off prior to servicing this equipment. Follow all lockout and tag out procedures before performing maintenance on any Electrical pneumatic or ln2 system

It is a good practice to keep a maintenance log for the chamber. The log should contain the tasks that must be accomplished and when they were performed.

Monthly Maintenance

The following is a list of maintenance tasks that should be performed on a **monthly** basis.

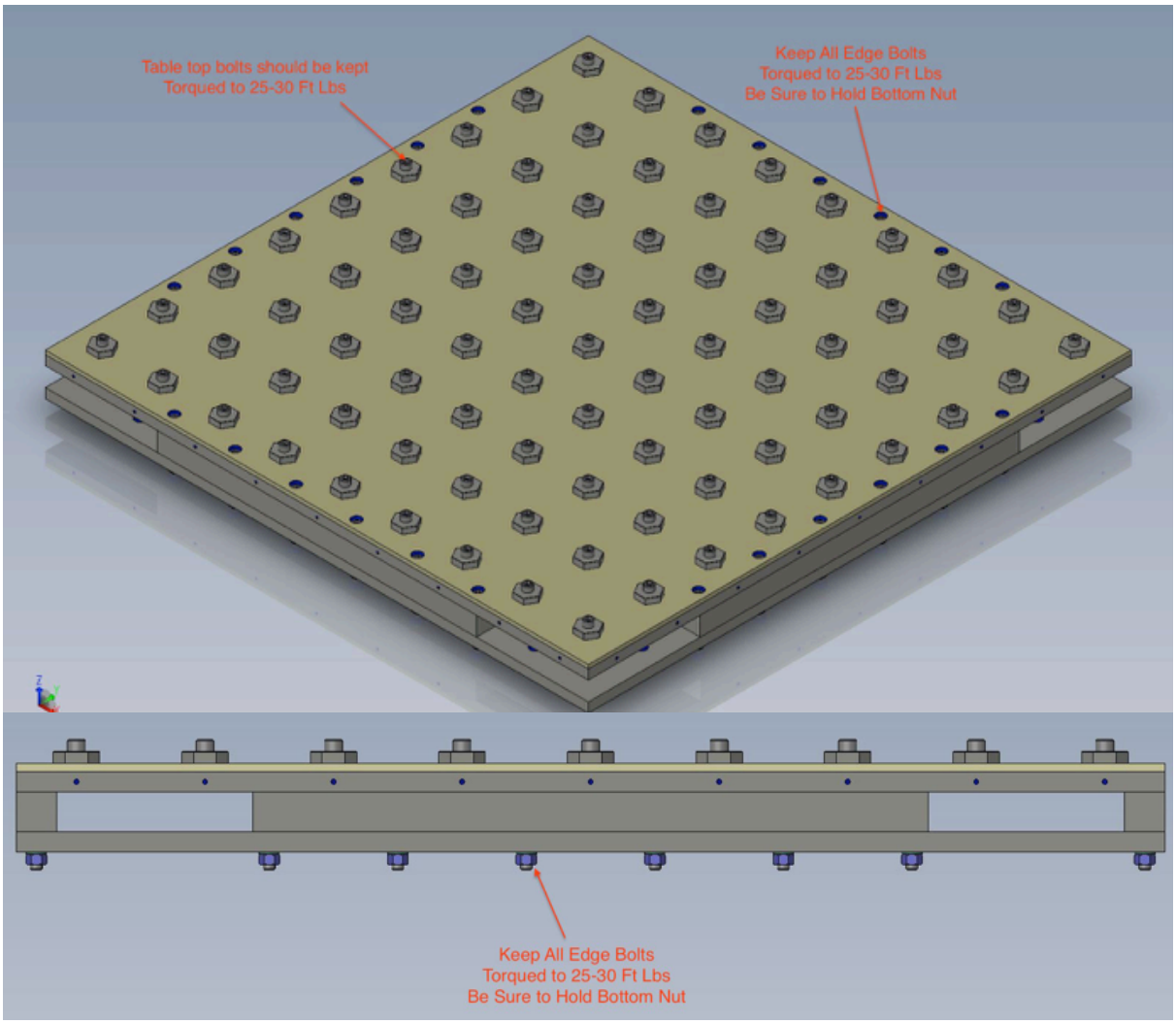
1. The proper function of the safety control devices should be checked on a regular basis. Replace any items that may be damaged or worn.
    a. Door Limits
    b. Safety Matts (Optional)
    c. Door bump guards (Optional)
    d. E-Stop
2. Check the temperature safety circuit high temperature trip point by lowering the setting of the temperature safety and programming the chamber set point 15 degrees higher to verify that the product safety trips at the high temperature it was set for. Check the temperature safety circuit low temperature trip point by raising the setting of the product safety and programming the chamber set point 15 degrees lower to verify that the product safety trips at the low temperature it was set for.
3. The electrical compartment should be kept clean and vacuumed if necessary.
4. The current draws of the major components should be checked with an amp. probe and recorded for future reference and to determine if there is any irregularity. Extreme caution must be taken whenever working with high voltage components.
5. The pneumatic vibration pistons should be checked for tightness and retightened if necessary to 125 ft./lb. torque for the large pneumatic pistons and 25 ft./lb. torque for the small pneumatic pistons.
6. Check the four screws on the bottom of the pneumatic pistons to insure that they are tight.
7. The airlines to the pneumatic pistons should be checked for tightness.
8. The chamber lights should be checked and replaced if burned out – 20 watts, 110V, halogen bulbs.
9. Check the door safety switches by leaving the left hand door of the front of the chamber open and turning the door switch to the closed position. Repeat the procedure on the rear door.

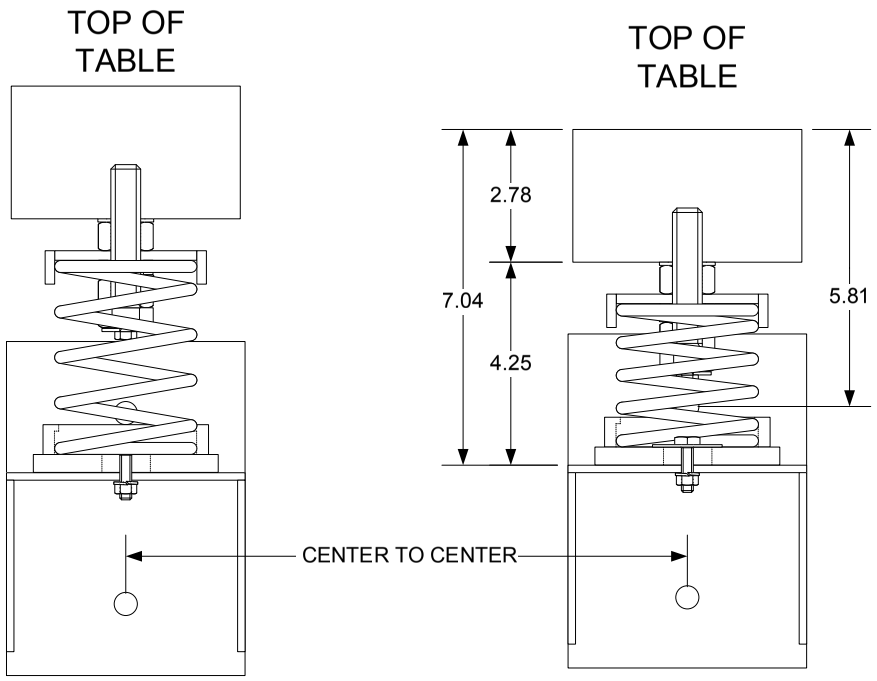
10. The seals and gaskets on the doors floors and ports should be inspected for adequate sealing. Remove any foreign material that may be embedded in the gasket. Worn or damaged gasket must be replaced.
11. Check all the fasteners on the chamber and tighten, if necessary, any loose fasteners.
12. Check the blower wheel set screws for tightness.

Daily Maintenance

The following is a list of maintenance tasks that should be performed on a **daily** basis.

1. Check the air oiler to insure that there is enough oil to provide lubrication to the pneumatic pistons.
2. Check the bolts on the top of the vibration table to insure that they are tight.
3. Check the high and low temperature settings of the air temperature limit to insure that they are set to the appropriate settings.
4. Make sure that the LN2 supply is on and that there is sufficient LN2 to perform you're testing.
5. Make sure that the air to the chamber is turned on.





NOTE: WORKING INTERNAL DIMENSION IS THE IMPORTANT FACTOR. THIS IS DETERMINED BY TABLE TOP HEIGHT.

THERE ARE TWO TABLE TOP HEIGHTS MEASURED FROM BOTTOM OF PLENUM TO THE TOP OF THE TABLE. THIS PROVIDES THE FOLLOWING WORK SPACE HEIGHTS

1. 38" 45.25" TO PLATFORM ON BRACKET
2. 50" 57.25" TO PLATFORM ON BRACKET

THE TOP HOLE IS 1 INCH ABOVE PLATFORM ON BRACKET

THE PLATFORM OF THE BRACKET SHOULD BE PLACED AN ADDITIONAL 7.25" TOWARDS FLOOR TO PROVIDE SPACE FOR SPRINGS AND TABLE HEIGHT. AS DIAGRAMED TO THE LEFT.

THESE ARE THE MEASUREMENTS FOR THE PLACEMENT OF THE VIBRATION TABLE MOUNTING BRACKETS FOR DIFFERENT SIZE TABLES.

1.	72" X 72" TABLE	30 15/16" FROM CENTER OF CENTER LINER	61.875 CENTER TO CENTER
2.	48" X 48" TABLE	18 15/16" FROM CENTER OF CENTER LINER	37.875 CENTER TO CENTER
3.	36" X 36" TABLE	12 15/16" FROM CENTER OF CENTER LINER	25.875 CENTER TO CENTER
4.	24" X 24" TABLE	11 15/16" FROM CENTER OF CENTER LINER	23.875 CENTER TO CENTER

	HANSE ENVIRONMENTAL INC.			
	VTC-X TABLE MOUNT ASSEMBLY			
PETER HANSE	SIZE B	FSCM NO	DWG NO 09-160201	REV D
05/08/2005	SCALE 1/4 : 1		SHEET 1 OF 1	

HANSE HALT HASS
Environmental, Inc.

December 26, 2012

From time to time, we get complaints from customers regarding galling of stainless steel fasteners. Here is an excerpt from the Industrial Fastener Institute's Standards Book:

Thread galling seems to be the most prevalent with fasteners made of stainless steel, aluminum, titanium and other alloys which self-generate an oxide surface film for corrosion protection. During fastener tightening, as pressure builds between the contacting and sliding thread surfaces, protective oxides are broken, possibly wiped off and interface metal high points shear or lock together. This cumulative clogging-shearing-locking action causes increasing adhesion. In the extreme, galling leads to seizing – the actual freezing together of the threads. If tightening is continued, the fastener can be twisted off or its threads ripped out.

During minor galling, the fastener can still be removed, but in severe cases of galling, a strong bond between the bolt and nut can prevent removal of fasteners. Unfortunately, little is known on how to control it, but here are two ways to minimize this effect:

Decreasing installation RPM speed will cause less friction and decrease heat generation.
Lubrication used prior to assembly can dramatically reduce or eliminate galling. Recommended lubricants should contain higher amounts of molybdenum disulfide, such as graphite which is very commonly used as a solid lubricant or special anti-galling lubricants sold by chemical companies.

We provide anti-seize compound with all of our bolts and **strongly encourage** you to use it to reduce the aggravation of galling. Contrary to popular belief, galling of stainless steel is not a symptom of a "cheap" fastener – it is prevalent in all types of stainless steel, aluminum and titanium fasteners. You can be assured that the stainless steel fasteners we provide with our products are manufactured of high quality.

Save yourself a lot of grief and always use a thread lubricant when working with stainless steel fasteners.

Sincerely,

Peter Hanse
Vice President

Hanse Environmental, Inc.
235 Hubbard St
Allegan, MI 49010
Website: www.HanseEnv.com

Phone +1 269-673-8638
Fax +1 269-673-8632
Toll Free +1 866-424-8673
Email: Info@HanseEnv.com

Performing Auto Calibration LN2 Valve Identification of Parts (Worchester with Proximity Positioner)

Valve Drive Kit

Valve C44 Cryogenic Ball Valve

Positioner And Ports

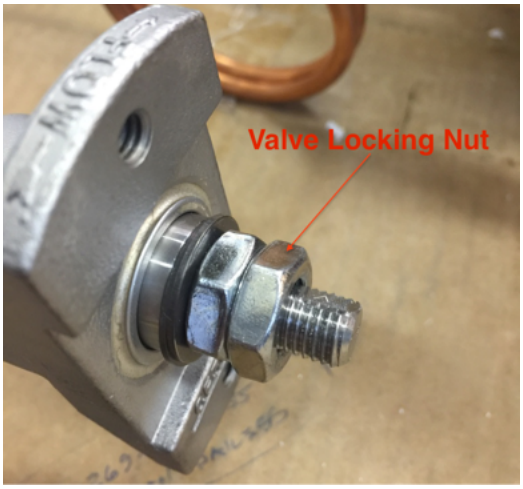
Actuator And Ports

We have have used several different suppliers for Valves and Positioners on our VTC series units.
Please ensure the models you have for correct programing. If you are unsure, Please contact the Hanse or your local Agent to help Identify for correct procedure.

This is not for VJ (Vacuum Jacket) Valves

Pre Auto Calibration Checks

1. Check that valve locking nut is installed
2. Check that Actuator end stop jam nuts are tight
3. Confirm you have 100 PSI at Positioner
4. Turn off Ln2 since during auto calibration valve will open and close
5. Perform only auto calibration recommended by Hanse Environmental Inc.
    1. After instal of chamber auto calibration 1 is only one recomended



Auto Calibration Background

There are four auto calibrations available on Proximity positioner. At factory we have performed Auto Calibration 2 and this should only be done again after valve changed in field. It is recommended to run Auto Calibration 1 when chamber is installed.

First Auto Calibration (Auto 2)
First auto calibration is usually used when the positioner has not been set, such as the initial setting with valve at the valve company or replacement with other product in the field.

Notice: When the positioner is installed on the valve in the field after setting, we recommend using AUTO1 calibration rather than AUTO2 calibration. This is because the AUTO 2 calibration parameters have been factory set to the optimum settings.

Auto 1 Calibration (AUTO1)
In this mode, all parameters necessary for valve operation are set except KP, KI, KD. It is used to re-execute calibration by users in the field after being supplied the positioner unit whose parameters were set by the valve company.

	Zero Point	End Point	KP, KI, KD	RA/DA
AUTO1	°	°	x	x
AUTO2	°	°	°	°
AUTO3	x	x	°	°

KP

This is a proportion constant value that is correction by error %. If this value is too big, their can be hunting, even though it finds position by the input signal. If the value is too small, accuracy gets worse.

KI

This is an integral constant value adding or subtracting the correction that is corrected error % on the previous correction signal. If this value is too big, there can be oscillation. If it is too small, the time to find the exact position increases.

KD

This is a differential constant value adding the previous correction signal with the changing correction signal by the error % change rate.

RA/DA

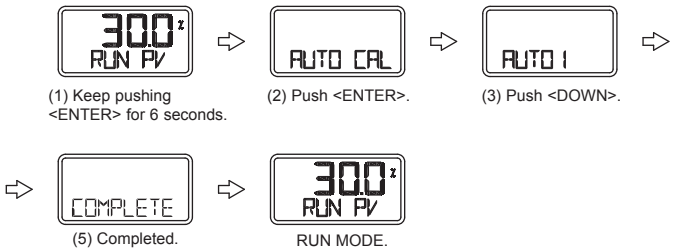
Direct acting (DA) or Reverse acting (RA).

Auto calibration of Proximity Positioner Ln2 Valve.

Perform Auto Calibration 1

In this mode, all parameters necessary for valve operation are set except KP, KI, KD. It is used to re-execute calibration by users in the field after being supplied the positioner unit whose parameters were set by the valve company.

1. Power Up valve and ensure compressed air 100 PSI is at Supply Line
2. During auto calibration valve will open and close so ensure that you have Liquid nitrogen off
3. Push <ENTER> for 6 seconds in RUN mode and AUTO CAL message should appear.
4. Push <ENTER> and then AUTO1 mode is displayed.
5. Push <ENTER> again at AUTO1 mode and Auto 1 calibration is started.
6. When Auto 1 calibration is done, 'COMPLETE' message appears on the LCD. After 4 seconds the procedure returns to RUN mode and the valve stroke by current input signal is displayed as a percentage.



Perform Auto Calibration 2

All parameters necessary to operate valve are set. This calibration is used when the positioner is first installed with valve. Refer back to First Auto Calibration.

1. Power Up valve and ensure compressed air 100 PSI is at Supply Line
2. During auto calibration valve will open and close so ensure that you have Liquid nitrogen off
3. Push <ENTER> for 6 seconds in RUN mode and AUTO CAL message should appear.
4. Push <ENTER> and then AUTO1 mode is displayed. Use Up/Down keys to change to AUTO2
5. Push <ENTER> again at AUTO2 mode and Auto 2 calibration is started.
6. When Auto 2 calibration is done, 'COMPLETE' message appears on the LCD. After 4 seconds the procedure returns to RUN mode and the valve stroke by current input signal is displayed as a percentage.

Perform Auto Calibration 3

All parameters necessary to operate valve are set except zero and end point. This function is used to re-execute auto calibration without changing the zero and end point after adjusting them manually.

1. Power Up valve and ensure compressed air 100 PSI is at Supply Line
2. During auto calibration valve will open and close so ensure that you have Liquid nitrogen off
3. Push <ENTER> for 6 seconds in RUN mode and AUTO CAL message should appear.
4. Push <ENTER> and then AUTO1 mode is displayed. Use Up/Down keys to change to AUTO3
5. Push <ENTER> again at AUTO3 mode and Auto 3 calibration is started.
6. When Auto 3 calibration is done, 'COMPLETE' message appears on the LCD. After 4 seconds the procedure returns to RUN mode and the valve stroke by current input signal is displayed as a percentage.

BIAS Calibration

BIAS is the standard value of motor control in the positioner. It is affected by supply pressure, KP and other values. BIAS should be re-adjusted if supply pressure or KP is changed, otherwise accuracy will decrease.

1. Press and hold <ENTER> for 6 seconds in RUN mode and AUTO CAL message should appear.
2. Scroll with <DOWN> button until BIAS mode is displayed.
3. Push <ENTER> and BIAS calibration is started.
4. When BIAS calibration is done, 'COMPLETE" message appears on the LCD. After 4 seconds the procedure is returned to RUN mode.

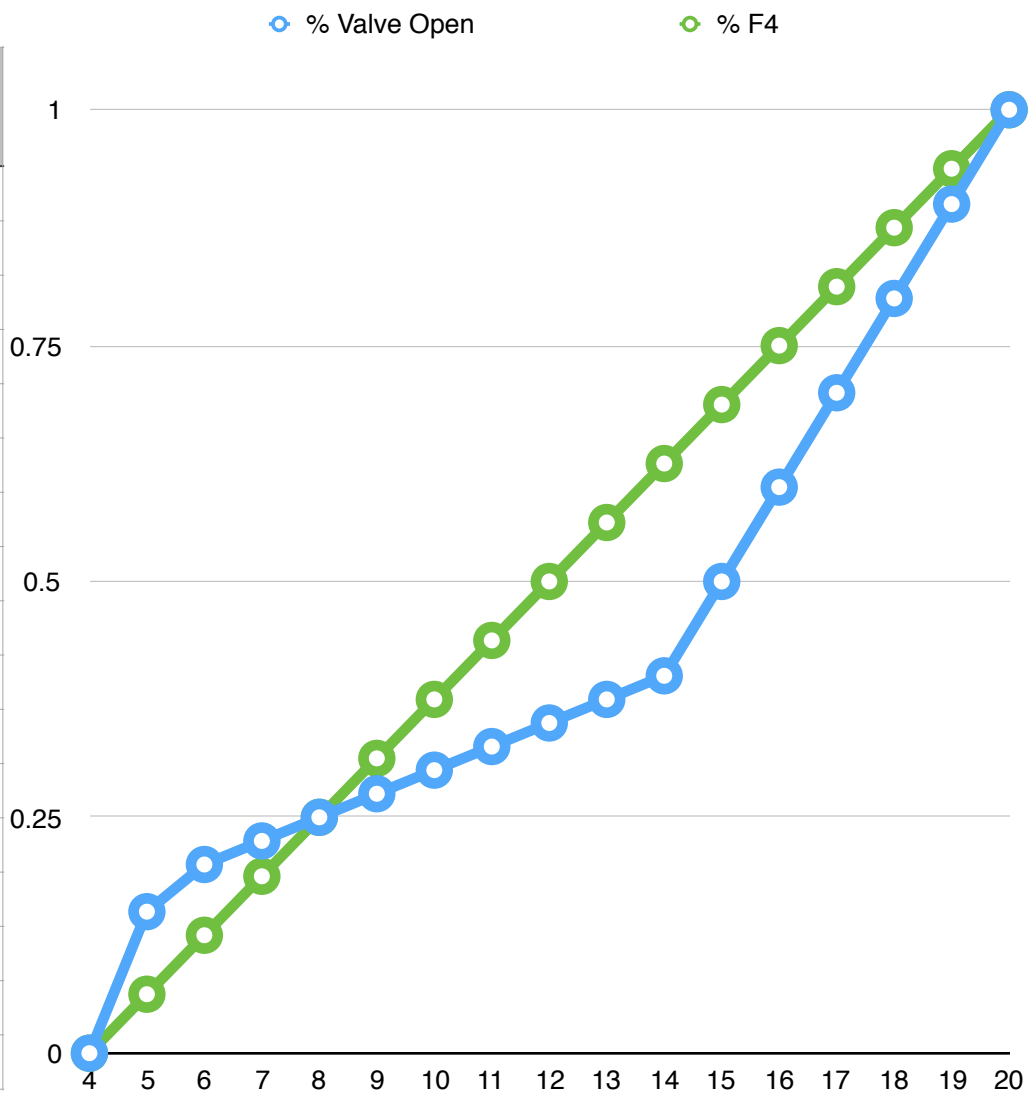
Programing Custom Valve Curve

The new Liquid Nitrogen (LN2) control ball valve allows for using custom valve curves. This allow for non linear valve opening. We have developed the curve recommended based on cooling input into chamber. To install the custom valve curve follow the procedure bellow.

The procedure is for the Proximity valve positioner 275ER-D5000 and 1” Ln2 C44 ball valves used on VTC-9 and above. Please follow procedure closely if setting entered wrong it may cause valve operation to not follow new curve.

Positioner

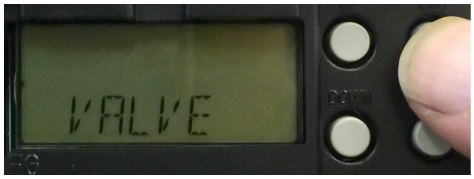
Positioner Custom Number	mA	% Valve Open	% F4
	4	0	0%
0	5	15%	6.25%
1	6	20%	12.5%
2	7	22.5%	18.75%
3	8	25%	25%
4	9	27.5%	31.25%
5	10	30%	37.5%
6	11	32.5%	43.75%
7	12	35%	50%
8	13	37.5%	56.25%
9	14	40%	62.5%
10	15	50%	68.75%
11	16	60%	75%
12	17	70%	81.25%
13	18	80%	87.5%
14	19	90%	93.75%
15	20	100%	100%



1	Turn off Ln2 feed	
2	Turn power ON to chamber	
3	Open top cover of Proximity Valve Positioner	 
4	Press and Hold Enter Key Until AUTO CAL shown on display	
5	Press Up until you get to VALVE onscreen Press Enter	
6	Press Down until you find USER SET on Screen Press Enter	

8	Use UP/Down Arrows to Enter P0 Set = 15% Press Enter	
9	Use UP/Down Arrows to Enter P1 Set = 20% Press Enter	
10	Use UP/Down Arrows to Enter P2 Set = 22.5% Press Enter	
11	Use UP/Down Arrows to Enter P3 Set = 25% Press Enter	
12	Use UP/Down Arrows to Enter P4 Set = 27.5% Press Enter	
13	Use UP/Down Arrows to Enter P5 Set = 30% Press Enter	
14	Use UP/Down Arrows to Enter P6 Set = 32.5% Press Enter	
15	Use UP/Down Arrows to Enter P7 Set = 35% Press Enter	

16	Use UP/Down Arrows to Enter P8 Set = 37.5% Press Enter	
17	Use UP/Down Arrows to Enter P9 Set = 40% Press Enter	
18	Use UP/Down Arrows to Enter P10 Set = 50% Press Enter	
19	Use UP/Down Arrows to Enter P11 Set = 60% Press Enter	
20	Use UP/Down Arrows to Enter P12 Set = 70% Press Enter	
21	Use UP/Down Arrows to Enter P13 Set = 80% Press Enter	
22	Use UP/Down Arrows to Enter P14 Set = 90% Press Enter	

23	Use UP/Down Arrows to Enter P15 Set = 100% Press Enter	
24	At VALVE Down until CHAR EQ is shown Press Enter May Also Show CHAR LIN, CHAR USR Will Display *HAR when you can change	
25	Press Up/Down until *HAR USR shown press enter	
26	Press Esc until RUN PV is shown	

Vacuum Jacked Valves

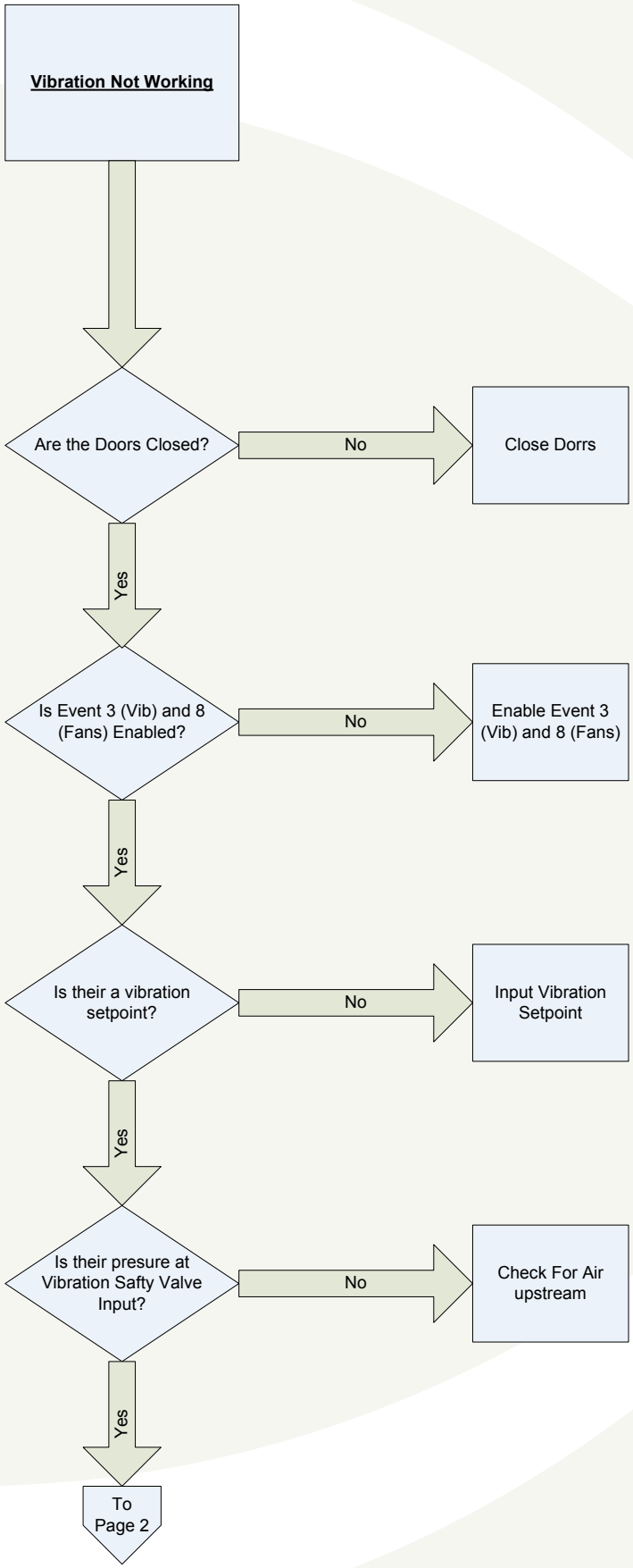
Vacuum Jacked Valves are controlled by a ITV (I/P) for control valve, and and a solenoid valve and regulator for safety valve located in the air council. 45 PSI should be maximum. Inspect chamber for for type of bayonet for pipe install.

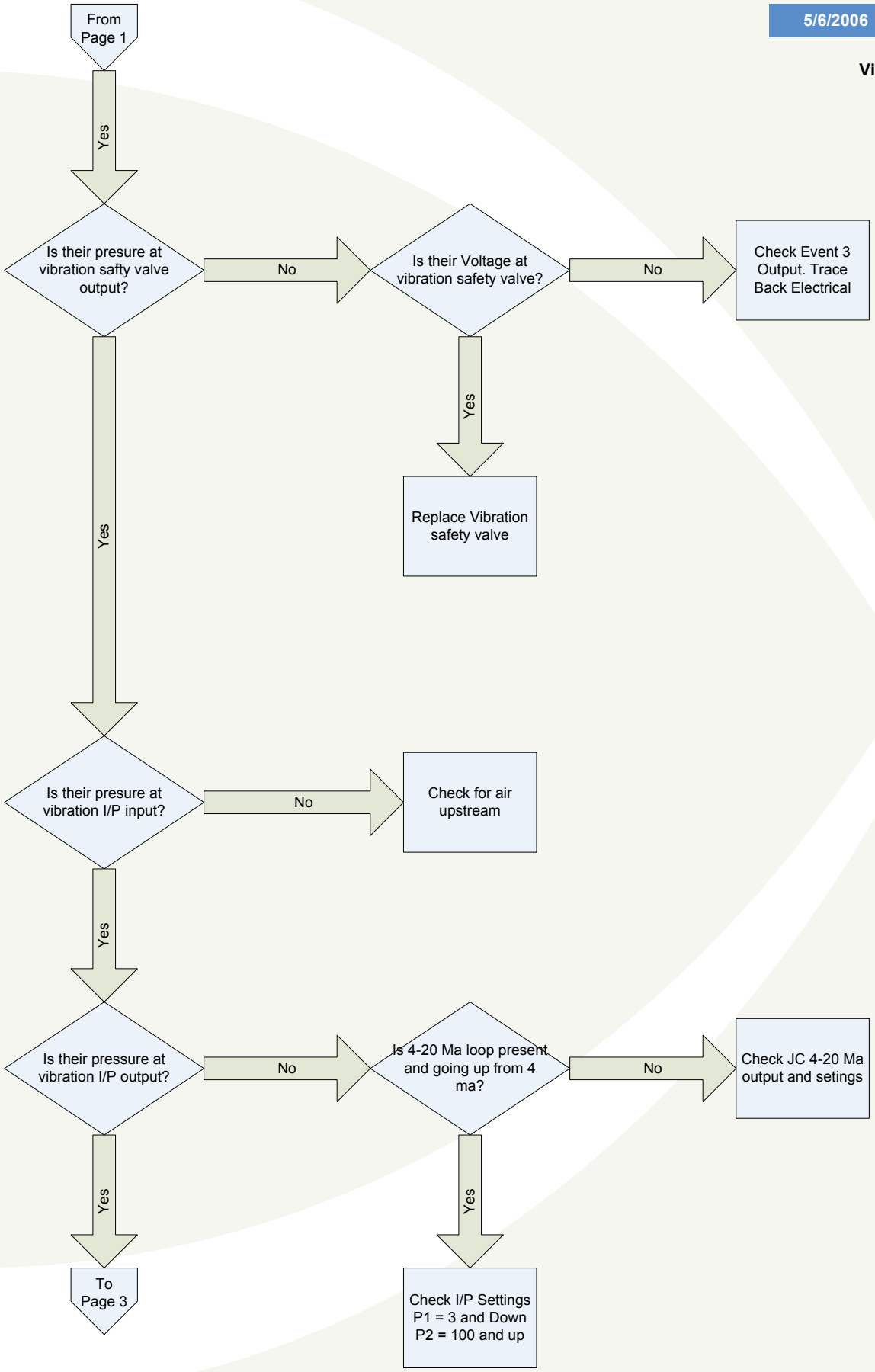
Maintenance

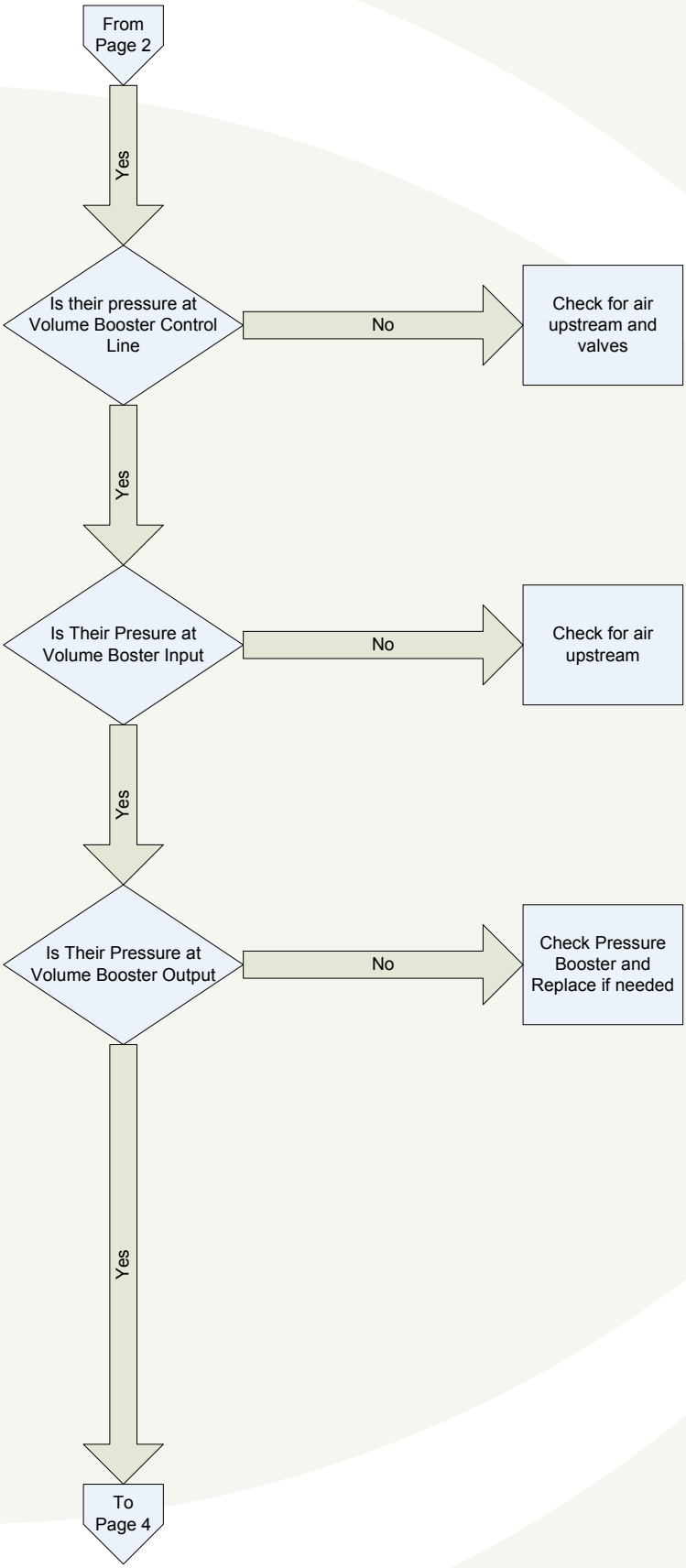
The humidification nozzle(s) do not require routine maintenance. The water supplied to them should be free of debris and suspended solids, and it is recommended that a 10 micron filter be installed between the chamber and the water supply. This will prevent premature plugging of the nozzle tip.

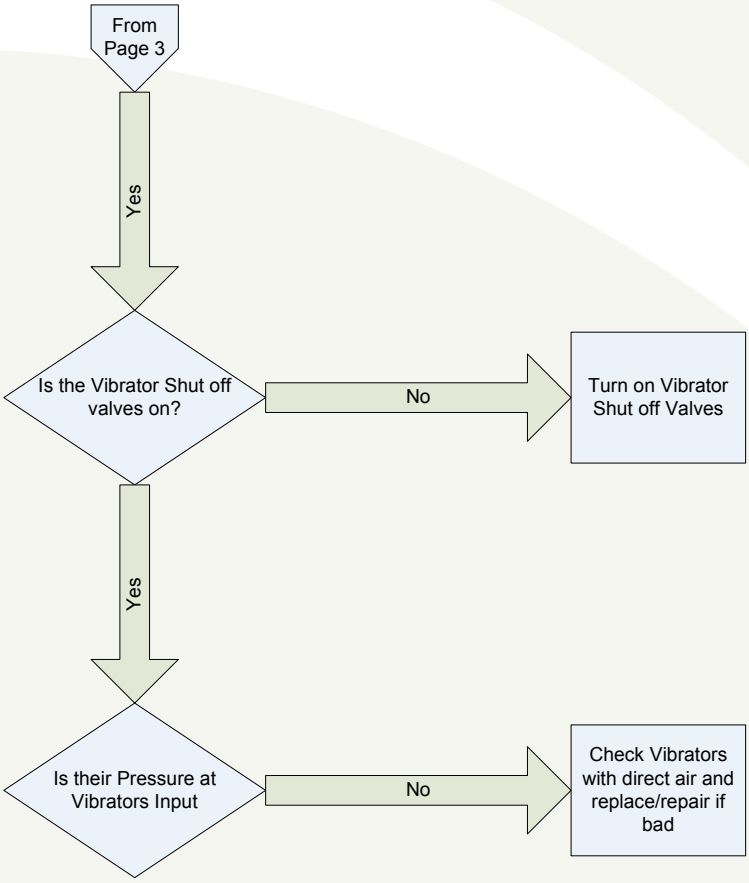
Units with Steam Humidifier, See OE manuals for your system.

Vibration Flow chart









SMC I/P Regulator

VTC-1.5 I/P and Oiler

Service Notes:

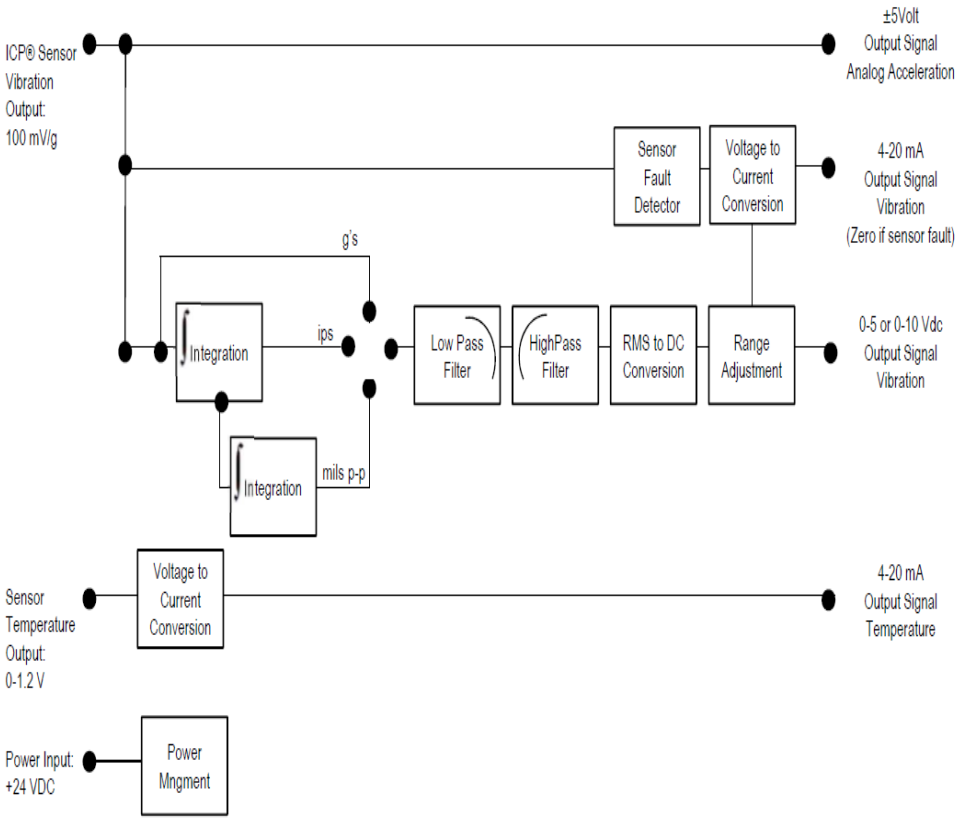
Addendum:

The following addendum are not for all systems. Please check if your system has any of the following options.

Introduction

The 682 Series is a 4-20mA Din Rail Signal Conditioner designed to interface with IMI Sensor's ICP® Accelerometer. Acceleration, Velocity, or Displacement can be converted to a 4-20mA signal by simple DIP Switch selection internal to the Din Rail enclosure. An additional standard feature of the 682 Series is the ability to convert the temperature output from an accelerometer (when equipped) to 4-20mA. Signal Filtering can be easily configured in the field by installing factory calibrated Filter Modules into sockets located inside the enclosure.

Block Diagram



Pin Descriptions:

DC Power – Pins 1 to 3:

Pin 1 +Power
Pin 2 -Power/Common
Pin 3 Earth Ground

ICP® Accelerometer – Pins 4 to 6:

Pin 4 Shield
Pin 5 + ICP® Accelerometer
Pin 6 - ICP® Accelerometer

Temperature Sensor – Pins 7 to 8:

Pin 7 + Temperature Sensor
Pin 8 - Temperature Sensor (- ICP® Accelerometer)

Raw Vibration (RV) – Pins 9 to 10, and BNC Jack:

Pin 9 + RV
Pin 10 - RV

4 to 20mA Temperature Output – Pins 11 to 12:

Pin 11 + 4 to 20mA Temperature Output
Pin 12 - 4 to 20mA Temperature Output

4 to 20mA Vibration Output – Pins 13 to 14:

Pin 13 + 4 to 20mA Vibration Output
Pin 14 - 4 to 20mA Vibration Output

0-5/10Vdc Vibration Output – Pins 15 to 16:

Pin 15 + 0-5/10Vdc Vibration Output
Pin 16 - 0-5/10Vdc Vibration Output

Model Number	4-20MA DIN RAIL SIGNAL CONDITIONER/TRANSMITTER	Revision: A
682B03		ECN #: 32835

ELECTRICAL	ENGLISH	SI
Power Supply Voltage	23 - 25 Vdc	23 - 25 Vdc
Power Supply Current	100mA max.	100mA max.
ICP® Input Signal	100mV/g [3]	100mV/g [3]
ICP® Sensor Excitation	18Vdc/4mA, ±1V/±1mA [7], [8]	18Vdc/4mA, ±1V/±1mA [7], [8]
Temperature Sensor Input	0 - 1.2V Full Scale [6]	0 - 1.2V Full Scale [6]
Vibration Output (milliamps)	4-20mA	4-20mA
Zero	4mA ±2% of Span	4mA ±2% of Span
Span	16mA ±5.0%	16mA ±5.0%
Vibration Output (volts)	0-5/10Vdc	0-5/10Vdc
Zero	0Vdc ±2% of Span	0Vdc ±2% of Span
Span	5/10Vdc ±5.0%	5/10Vdc ±5.0%
Temperature Output (milliamps)	4-20mA	4-20mA
Zero	4mA ±2% of Span	4mA ±2% of Span
Span	16mA ±5.0%	16mA ±5.0%
Raw Vibration Output	±1% of Input Vibration	±1% of Input Vibration
Input Channels	1	1
Frequency Response:	3Hz to 10kHz [2],[4],[5]	3Hz to 10kHz [2],[4],[5]
Fault Current Output	<1mA	<1mA
ENVIRONMENTAL		
Warm Up	<2 minutes	<2 minutes
Operating Temperature Range	32 to 158°F	0 to 70°C
Storage Temperature Range	-40 to 257°F	-40 to 125°C
Relative Humidity	<95% (Non-Condensing)	<95% (Non-Condensing)
MECHANICAL		
Case Dimension W x H x D:	0.9 x 3.9 x 4.5 in.	22.5 x 99 x 114.5 mm
Weight	6.4 oz. max.	181 grams
Material	Polyamide	Polyamide
Input/Output Electrical Connectors	Removable Screw Terminals	Removable Screw Terminals
Raw Vibration Connector	BNC Jack	BNC Jack
Screw Terminal Wire Size	24 – 14 AWG	0.2 – 2.5 mm^2
Din Rail Mount	1.38 in.	35mm
INDICATOR		
Power LED	GREEN	GREEN
Fault LED	RED	RED
Acceleration	GREEN	GREEN
Velocity	GREEN	GREEN
Displacement	GREEN	GREEN

All specifications are at room temperature unless otherwise specified.

OPTIONAL VERSIONS

Optional versions have identical specifications and accessories as listed for the standard model except where noted below. More than one option may be used.

N/A

NOTES:

1) Internal DIP Switch Selection:
- Acceleration: 5.00g, 10.00g, 20.00g
- Velocity: 0.50 in/sec, 1.00 in/sec, 2.00 in/sec
- Displacement: 10.0 mils p-p, 20.0mils p-p, 40.0 mils p-p
- Peak or RMS
- 0-5 or 0-10Vdc Output

2) Frequency Response Tolerances:
Acceleration: -3dB at 3Hz ±0.5Hz, -3dB at 10kHz ±0.5kHz
Velocity: -3dB at 3.5Hz ±0.5Hz, -3dB at 10kHz ±0.5kHz
Displacement: -3dB at 3.5Hz ±0.5Hz, 1000Hz max.

3) Output measurement range is based upon input from a 100mV/g accelerometer and will be scaled inversely proportional to any percentage deviation of this input.

4) Output Current/Voltage will fluctuate at frequencies below 5 Hz.

5) Attenuation is –40dB/Decade

6) Requires an accelerometer with TO option output.

7) Jumper selectable for 18Vdc Regulated, 24Vdc Power Supply Voltage, or ICP® Sensor Excitation Disabled.

8) 4mA Constant Current Diode is Internal to 682BX3.

CERTIFICATIONS:

CE See PCB Declaration of Conformance PS051 for details.

Form DD030 Rev.F 2/23/99

Drawn: LH	Engineer: NF	Sales: EGY	Approved: EB	Spec Number:
Date: 4/29/10	Date: 4/24/10	Date: 4/24/10	Date: 4/26/10	40536

IMI SENSORS
A PCB PIEZOTRONICS DIV.

3425 Walden Avenue, Depew, NY 14043 800-959-4464 Fax (716) 684-3823 E-Mail: imisales@pcb.com

Model 682B03

ICP® Vibration Transmitter

Installation and Operating Manual

**For assistance with the operation of this product,
contact PCB Piezotronics, Inc.**

Toll-free: 800-959-4464
24-hour SensorLine: 716-684-0001
Fax: 716-684-3823
E-mail: imi@pcb.com
Web: www.imi-sensors.com

Warranty, Service, Repair, and Return Policies and Instructions

The information contained in this document supersedes all similar information that may be found elsewhere in this manual.

Total Customer Satisfaction – PCB Piezotronics guarantees Total Customer Satisfaction. If, at any time, for any reason, you are not completely satisfied with any PCB product, PCB will repair, replace, or exchange it at no charge. You may also choose to have your purchase price refunded in lieu of the repair, replacement, or exchange of the product.

Service – Due to the sophisticated nature of the sensors and associated instrumentation provided by PCB Piezotronics, user servicing or repair is not recommended and, if attempted, may void the factory warranty. Routine maintenance, such as the cleaning of electrical connectors, housings, and mounting surfaces with solutions and techniques that will not harm the physical material of construction, is acceptable. Caution should be observed to insure that liquids are not permitted to migrate into devices that are not hermetically sealed. Such devices should only be wiped with a dampened cloth and never submerged or have liquids poured upon them.

Repair – In the event that equipment becomes damaged or ceases to operate, arrangements should be made to return the equipment to PCB Piezotronics for repair. User servicing or repair is not recommended and, if attempted, may void the factory warranty.

Calibration – Routine calibration of sensors and associated instrumentation is recommended as this helps build confidence in measurement accuracy and acquired data. Equipment calibration cycles are typically established by the users own quality regimen. When in doubt about a calibration cycle, a good “rule of thumb” is to recalibrate on an annual basis. It is also good practice to recalibrate after exposure to any severe temperature extreme, shock, load, or other environmental influence, or prior to any critical test.

PCB Piezotronics maintains an ISO-9001 certified metrology laboratory and offers calibration services, which are accredited by A2LA to ISO/IEC 17025, with full traceability to SI through N.I.S.T. In addition to the normally supplied calibration, special testing is also available, such as: sensitivity at elevated or cryogenic temperatures, phase response, extended high or low frequency response, extended range, leak testing, hydrostatic pressure testing, and others. For information on standard recalibration services or special testing, contact your local PCB Piezotronics distributor, sales representative, or factory customer service representative.

Returning Equipment – *Following these procedures will insure that your returned materials are handled in the most expedient manner*. Before

returning any equipment to PCB Piezotronics, contact your local distributor, sales representative, or factory customer service representative to obtain a Return **Warranty, Service, Repair, and Return Policies and Instructions** Materials Authorization (RMA) Number. This RMA number should be clearly marked on the outside of all package(s) and on the packing list(s) accompanying the shipment. A detailed account of the nature of the problem(s) being experienced with the equipment should also be included inside the package(s) containing any returned materials.

A Purchase Order, included with the returned materials, will expedite the turn-around of serviced equipment. It is recommended to include authorization on the Purchase Order for PCB to proceed with any repairs, as long as they do not exceed 50% of the replacement cost of the returned item(s). PCB will provide a price quotation or replacement recommendation for any item whose repair costs would exceed 50% of replacement cost, or any item that is not economically feasible to repair. For routine calibration services, the Purchase Order should include authorization to proceed and return at current pricing, which can be obtained from a factory customer service representative.

Warranty – All equipment and repair services provided by PCB Piezotronics, Inc. are covered by a limited warranty against defective material and workmanship for a period of one year from date of original purchase. Contact PCB for a complete statement of our warranty. Expendable items, such as batteries and mounting hardware, are not covered by warranty. Mechanical damage to equipment due to improper use is not covered by warranty. Electronic circuitry failure caused by the introduction of unregulated or improper excitation power or electrostatic discharge is not covered by warranty.

Contact Information – International customers should direct all inquiries to their local distributor or sales office. A complete list of distributors and offices can be found at www.pcb.com. Customers within the United States may contact their local sales representative or a factory customer service representative. A complete list of sales representatives can be found at www.pcb.com. Toll-free telephone numbers for a factory customer service representative, in the division responsible for this product, can be found on the title page at the front of this manual. Our ship to address and general contact numbers are:

PCB Piezotronics, Inc.
3425 Walden Ave.
Depew, NY14043 USA
Toll-free: (800) 828-8840
24-hour SensorLine[SM]: (716) 684-0001
Website: www.pcb.com
E-mail: info@pcb.com

PCB工业监视和测量设备 - 中国RoHS2公布表

PCB Industrial Monitoring and Measuring Equipment - China RoHS 2 Disclosure Table

部件名称	有害物质					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
住房	O	O	O	O	O	O
PCB板	X	O	O	O	O	O
电气连接器	O	O	O	O	O	O
压电晶体	X	O	O	O	O	O
环氧	O	O	O	O	O	O
铁氟龙	O	O	O	O	O	O
电子	O	O	O	O	O	O
厚膜基板	O	O	X	O	O	O
电线	O	O	O	O	O	O
电缆	X	O	O	O	O	O
塑料	O	O	O	O	O	O
焊接	X	O	O	O	O	O
铜合金/黄铜	X	O	O	O	O	O
本表格依据 SJ/T 11364 的规定编制。						
O： 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。						
X： 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。 铅是欧洲RoHS指令2011/65/ EU附件三和附件四目前由于允许的豁免。						

CHINA RoHS COMPLIANCE

Component Name	Hazardous Substances					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Chromium VI Compounds (Cr(VI))	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)
Housing	O	O	O	O	O	O
PCB Board	X	O	O	O	O	O
Electrical Connectors	O	O	O	O	O	O
Piezoelectric Crystals	X	O	O	O	O	O
Epoxy	O	O	O	O	O	O
Teflon	O	O	O	O	O	O
Electronics	O	O	O	O	O	O
Thick Film Substrate	O	O	X	O	O	O
Wires	O	O	O	O	O	O
Cables	X	O	O	O	O	O
Plastic	O	O	O	O	O	O
Solder	X	O	O	O	O	O
Copper Alloy/Brass	X	O	O	O	O	O

This table is prepared in accordance with the provisions of SJ/T 11364.

O: Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB/T 26572.

X: Indicates that said hazardous substance contained in at least one of the homogeneous materials for this part is above the limit requirement of GB/T 26572.
Lead is present due to allowed exemption in Annex III or Annex IV of the European RoHS Directive 2011/65/EU.

DOCUMENT NUMBER: 21354
DOCUMENT REVISION: C
ECN: 45605

IMI SENSORS
A PCB PIEZOTRONICS DIV.

SENSORS AND INSTRUMENTATION FOR MACHINE CONDITION MONITORING

682 Series 4-20mA Din Rail ICP® Signal Conditioner

CE

Operating Guide with Enclosed Warranty Information

3425 Walden Avenue, Depew, New York 14043-2495

Phone (716) 684-0003

Fax (716) 684-3823

Toll Free Line 1-800-959-4IMI

MANUAL NUMBER: 60419
MANUAL REVISION: A
ECN NUMBER: 43384

IMI SENSORS
A PCB PIEZOTRONICS DIV.

Table of Contents

Warranty/Servicing

General Features

- External transmitters, signal conditioners, and ICP® power supplies can be eliminated by direct connection of the sensor to the Din Rail Signal Conditioner.
- Optional 500Vdc Input to Output Electrical Isolation.
- Selectable 24Vdc Unregulated, 18Vdc regulated, 4mA excitation to power sensor
- 4-20mA Output Signals for Vibration and Temperature.
- Selectable 0-5 or 0-10Vdc Output Signal for Vibration.
- Internal DIP switch selectable vibration ranges include:

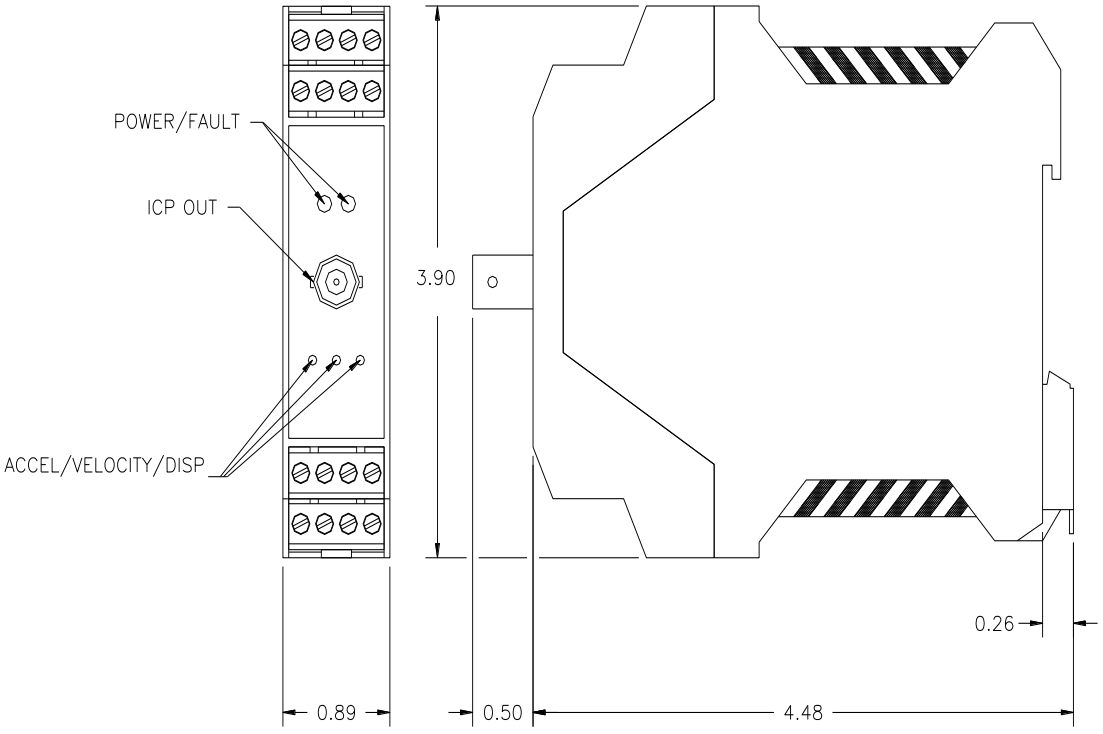
Acceleration (g's)	Velocity (in/sec)	Displacement (mils p-p)
5.00	0.50	10.0
10.00	1.00	20.0
20.00	2.00	40.0

- Internal DIP switch selection for Peak or RMS.
- Utilization of Filter Modules for field configuration of High and Low pass 2-pole filtering.
- Analog output signal connections (RV) for conducting frequency analysis and machinery diagnostics.
- LED indicators for Power, Sensor Fault, Acceleration, Velocity, and Displacement.
- Electronic Sensor Fault Indication via 4-20mA output by providing a 0mA signal.
- Configurable for ICP® Sensor Power disable to accommodate existing applications.
- Removable Terminal Blocks for easy wiring.
- 35mm (1.38in.) Din Rail Mount configuration.
- Space saving 22.5mm (0.9in.) wide design.

Installation and Wiring

Installation

The 682 Series is designed to be mounted on a 35mm Din Rail. Do not install in a harsh area where it can be exposed to cleaning fluids or machine oils. IMI Sensors recommends mounting the 682BX3 in a type NEMA 4 enclosure to protect the electronics from contamination.



Dimension Drawing

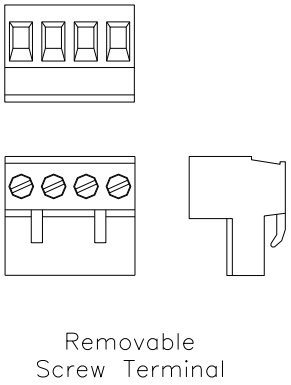
The Power LED is Green which turns on when the unit is powered. The Fault LED is red which turns on when the sensor input is either open or shorted. The Acceleration, Velocity, and Displacement LED is Green which turns on when the corresponding dip switches shown on page 8 are set.

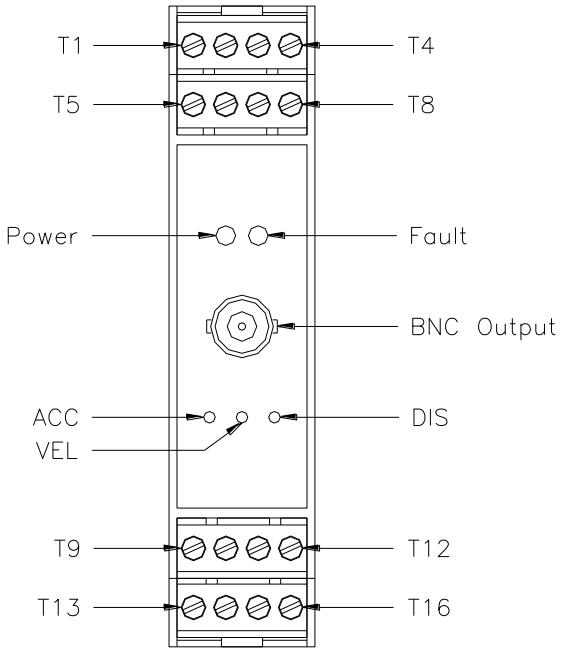
Connector and Pinout Diagram

The 682 Series uses plug-in type screw terminal connectors for all input and output connections.

Strip off 8mm of insulation from the connection wire ends. Using a screwdriver, remove the terminal block from the enclosure in either the up or down direction, terminate the wire in the correct location. Do not exceed a torque of 0.5Nm. Re-install the terminal block.

This easy to assemble connection method allows devices to be exchanged easily and the electrical connection to be visibly isolated.



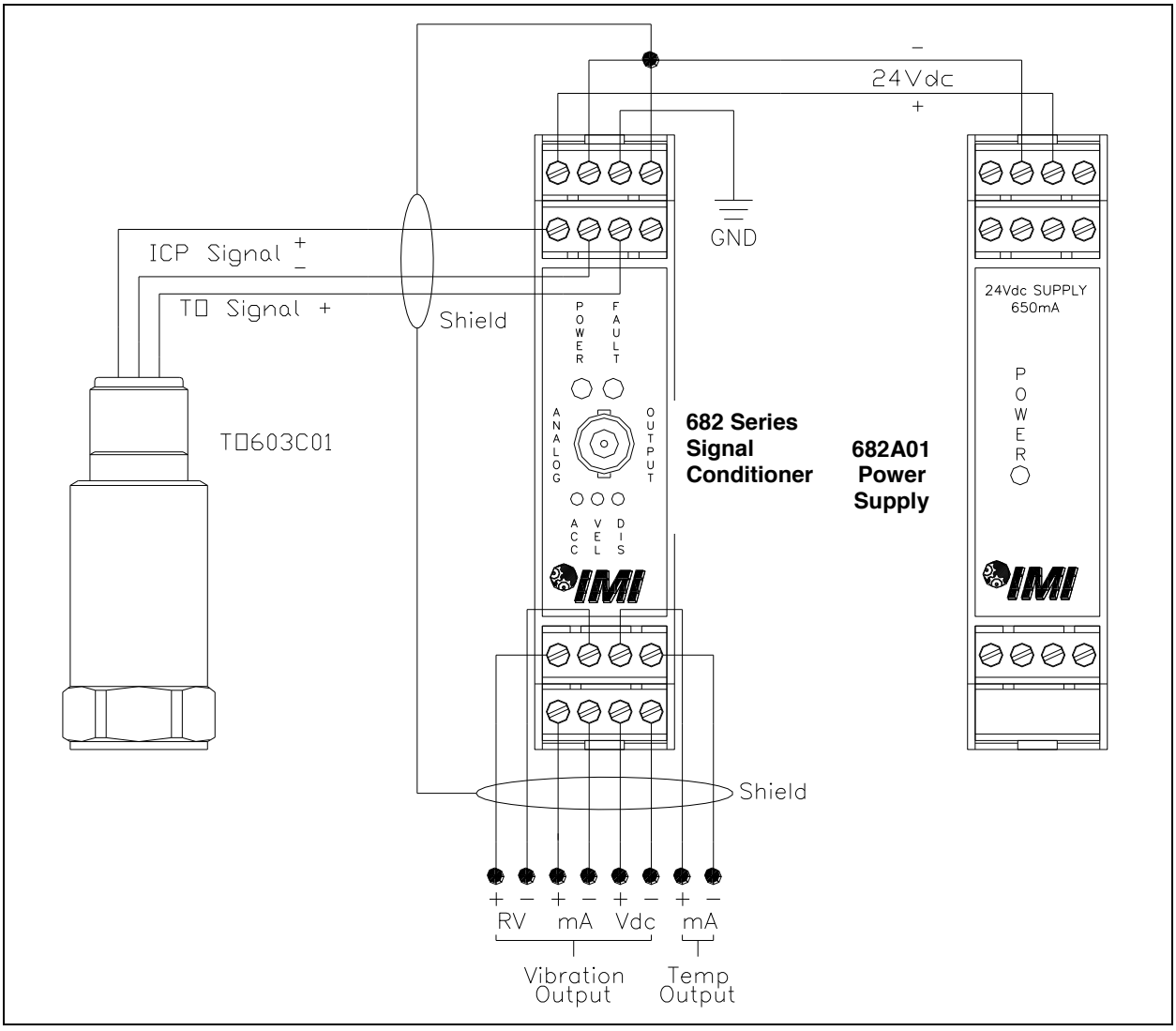


Pin Location Diagram

WARNING

AC and DC input signals and power supply voltages could be hazardous. DO NOT connect live wires to screw terminal plugs, and DO NOT insert, remove, or handle screw terminal plugs with live wires connected.

Typical Wiring Diagram



CE

To Maintain Conformance, Earth Ground, Power Supply Common, and I/O Shields must be connected together.

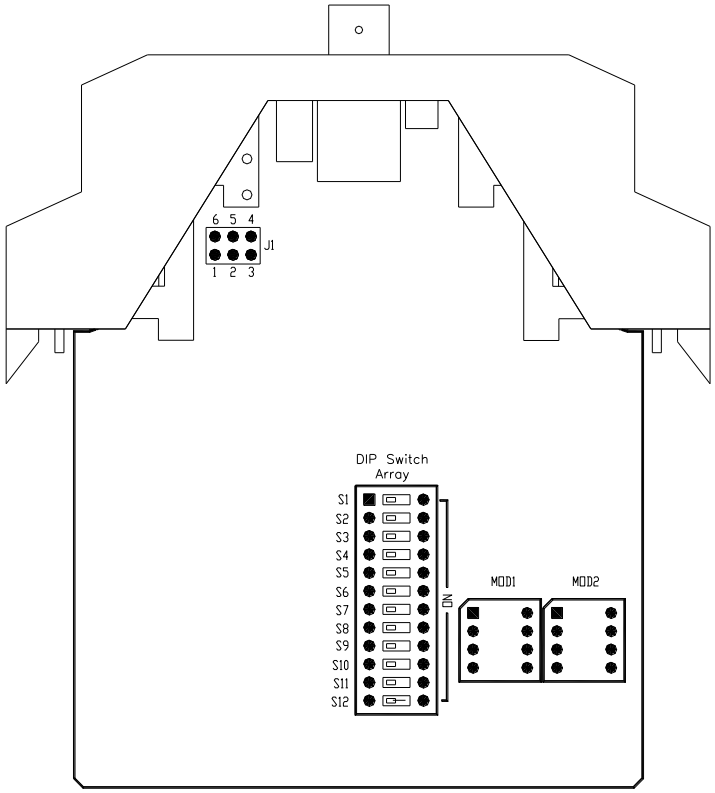
Note: If using the 682 Power Supply, mount the 682 Signal Conditioner to the left of the power supply with a recommended minimum separation distance of 4" where applicable.

Configuring the 682 Series

Internal PC Board Diagram

The Internal PC Board Diagram shows the location of the internal DIP Switch, Filter Modules, and Sensor Power Select Jumper. The DIP switch is used to configure the signal conditioner for various sensor and vibration ranges. The Filter Modules are installed to set the High and Low cutoff frequencies. The Jumper selects unregulated, regulated, or no ICP® power to the accelerometer.

The PC Board is accessible through the front of the indicator by removing the Screw Terminal Connectors and disengaging the tabs on the TOP and BOTTOM of the meter with a screwdriver. Once disengaged, the PC Board can be slid out for configuration.



DIP Switch and Filter Module Descriptions:

S1 and S2: Acceleration Mode

S3 and S4: Velocity Mode

S5 and S6: Displacement Mode

S7: RMS

S8: Peak

S9: 20g, 2ips, 40mils

S10: 10g, 1ips, 20mils

S11: 5g, 0.5ips, 10mils

S12: Off = 0-5Vdc Output, On = 0-10Vdc Output

Internal DIP Switch Setting

The Internal DIP Switch of the 682 Series must be configured for the Full Scale Output of the ICP® Sensor connected to it. This is accomplished by removing the front cover and sliding the PC Board out of the Signal Conditioner. Once removed, the DIP switch should be configured per one of the conditions in the following table.

Range Setting	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11
5g RMS	ON	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON
5g Peak	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON
10g RMS	ON	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF
10g Peak	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF
20g RMS	ON	ON	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF
20g Peak	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF
0.5 in/sec RMS	OFF	OFF	ON	ON	OFF	OFF	ON	OFF	OFF	OFF	ON
0.5 in/sec Peak	OFF	OFF	ON	ON	OFF	OFF	OFF	ON	OFF	OFF	ON
1.0 in/sec RMS	OFF	OFF	ON	ON	OFF	OFF	ON	OFF	OFF	ON	OFF
1.0 in/sec Peak	OFF	OFF	ON	ON	OFF	OFF	OFF	ON	OFF	ON	OFF
2.0 in/sec RMS	OFF	OFF	ON	ON	OFF	OFF	ON	OFF	ON	OFF	OFF
2.0 in/sec Peak	OFF	OFF	ON	ON	OFF	OFF	OFF	ON	ON	OFF	OFF
10 mils p-p	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	ON
20 mils p-p	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	ON	OFF
40 mils p-p	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	ON	OFF	OFF

S12	OFF	0-5Vdc Output
S12	ON	0-10Vdc Output

Note: Factory Default Setting is 1.0in/sec Peak, 0-5Vdc Output

Filter Module Location

The Filter Modules are utilized to set the cutoff frequency of the internal band pass filter circuit. The 682 Series comes standard with Modules preinstalled. If a different cutoff frequency is desired, the preinstalled module can be removed by simply pulling it out of the MOD socket, and replacing it with a different module. The module is labeled with the type of filter, Low Pass or High Pass, and the cutoff frequency. Module location is as follows:

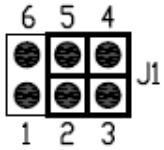
MOD1: Low Pass (LP) Filter Module Location
MOD2: High Pass (HP) Filter Module Location

Warning: Do not make any adjustments to the internal potentiometers. These potentiometers are used for factory calibration and adjusting them will require return of the 682 Series unit to the factory for recalibration.

Sensor Power Jumper Configuration:

Regulated 18Vdc/4mA Power

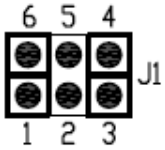
Jumper 2-5 and 3-4



Unregulated 24Vdc Supply/4mA Power

(Factory Default)

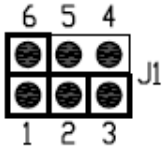
Jumper 1-6 and 3-4



Note: If there is no DC bias on the input signal, this will trigger the Open/short detection which subtracts 4mA from output

Sensor Power Disabled
(No ICP® Power to Accelerometer)

Jumper 1-6 and 2-3



Warning 1 – ESD sensitivity

The power supply/signal conditioner should not be opened by anyone other than qualified service personnel. This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid injury.

Warning 2 – ESD sensitivity

This equipment is designed with user safety in mind; however, the protection provided by the equipment may be impaired if the equipment is used in a manner not specified by PCB Piezotronics, Inc.

Caution 1 – ESD sensitivity

Cables can kill your equipment. High voltage electrostatic discharge (ESD) can damage electrical devices. Similar to a capacitor, a cable can hold a charge caused by triboelectric transfer, such as that which occurs in the following:

- *Laying on and moving across a rug,*
- *Any movement through air,*
- *The action of rolling out a cable, and/or*
- *Contact with a non-grounded person.*

The PCB solution for product safety:

- *Connect the cables only with the AC power off.*
- *Temporarily "short" the end of the cable before attaching it to any signal input or output.*

Caution 2 – ESD sensitivity

ESD considerations should be made prior to performing any internal adjustments on the equipment. Any piece of electronic equipment is vulnerable to ESD when opened for adjustments. Internal adjustments should therefore be done ONLY at an ESD-safe work area. Many products have ESD protection, but the level of protection may be exceeded by extremely high voltage.

Ordering Information

IMI Part Number: **682A X 3**

Frequency Response/Isolation*

0	3Hz to 10kHz (Standard)
1	3Hz to 1kHz
2	10Hz to 10kHz
3	10Hz to 1kHz
4	3Hz to 10kHz with 500Vdc I/O Isolation
5	3Hz to 1kHz with 500Vdc I/O Isolation
6	10Hz to 10kHz with 500Vdc I/O Isolation
7	10Hz to 1kHz with 500Vdc I/O Isolation

Ordering Example: 682B13
This is a 4-20mA Din Rail ICP® Signal Conditioner with the following:
Frequency Response: 3Hz to 1kHz
I/O Isolation: None

Additional Options Available – Please Inquire

Warranty

IMI instrumentation is warranted against defective material and workmanship for 1 year unless otherwise expressly specified. Damage to instruments caused by incorrect power or misapplication, is not covered by warranty. *If there are any questions regarding power, intended application, or general usage, please consult with your local sales contact or distributor.* Batteries and other expendable hardware items are not covered by warranty.

Service

Because of the sophisticated nature of IMI instrumentation, field repair is typically **NOT** recommended and may void any warranty. If factory service is required, return the instrumentation according to the "Return Procedure" stated below. *A repair and/or replacement quotation will be provided prior to servicing at no charge.* Before returning the unit, please consult a factory IMI applications engineer concerning the situation as certain problems can often be corrected with simple on-site procedures.

Return procedure

To expedite returned instrumentation, contact a factory IMI applications engineer for a RETURN MATERIAL AUTHORIZATION (RMA) NUMBER. Please have information available such as model and serial number. Also, to insure efficient service, *provide a written description of the symptoms and problems with the equipment to a local sales representative or distributor, or contact IMI if none are located in your area.*

Customers outside the U.S. should consult their local IMI distributor for information on returning equipment. For exceptions, please contact the International Sales department at IMI to request shipping instructions and an RMA. For assistance, please call (716) 684-0003, or fax us at (716) 684-3823. You may also receive assistance via e-mail at **imi@pcb.com** or visit our web site at **www.pcb.com**.

Customer Service

IMI, a division of PCB Piezotronics, guarantees **Total Customer Satisfaction**. If, at any time, for any reason, you are not completely satisfied with any IMI product, IMI will repair, replace, or exchange it at no charge. You may also choose, within the warranty period, to have your purchase price refunded.

IMI offers to all customers, at no charge, 24-hour phone support. This service makes product or application support available to our customers, day or night, seven days a week. When unforeseen problems or emergency situations arise, call the **IMI Hot Line at (716) 684-0003**, and an application specialist will assist you.

PCB PIEZOTRONICS INC. IMI DIVISION

3425 Walden Avenue, Depew, NY 14043-2495
Phone: (716) 684-0003 • USA Fax: (716) 684-3823 • INTL Fax: (716) 684-4703