

6000 SERIES

Electronic Flow Corrector & Monitoring Devices

Installation and Operating Instructions

March 2003
Manual 900309

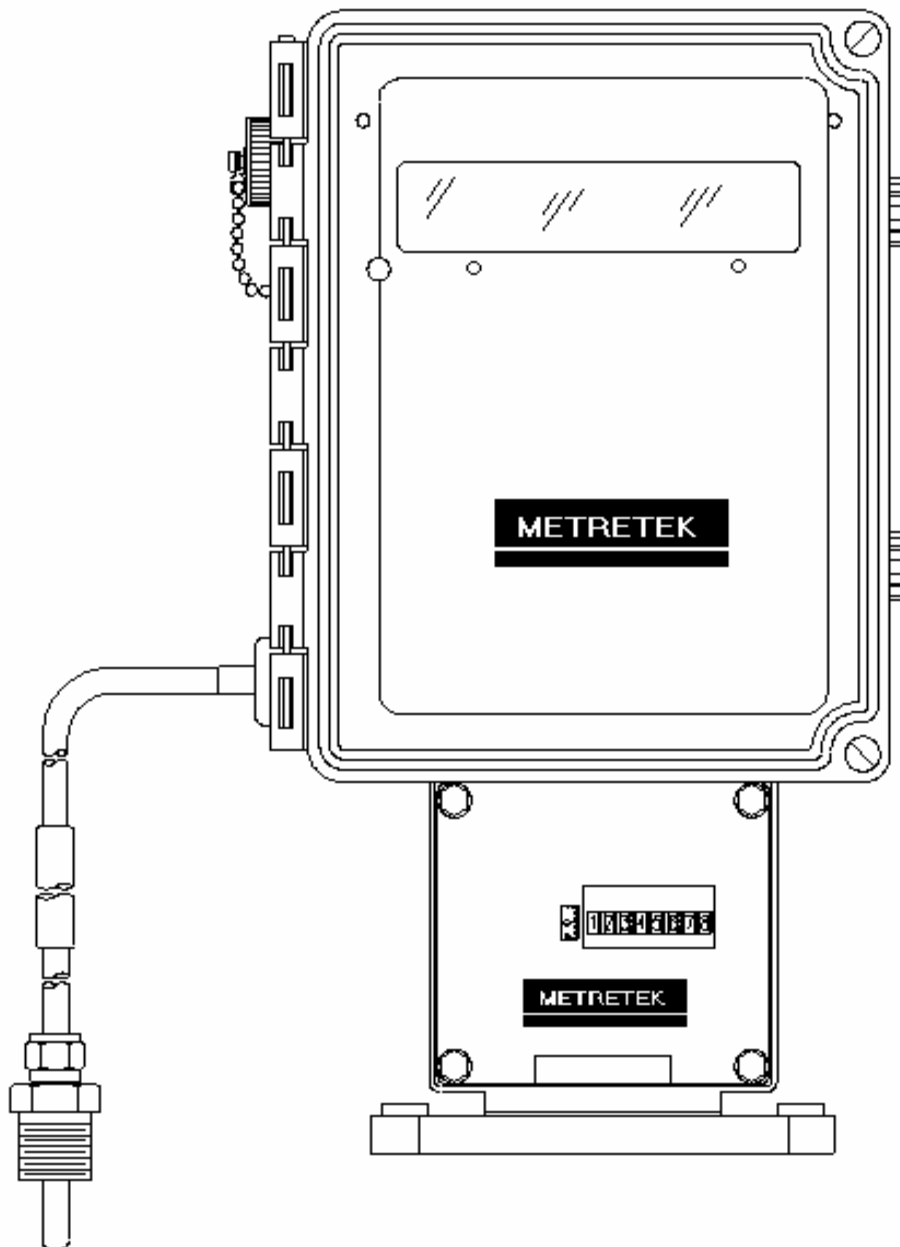


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OVERVIEW

The 6000 series product line are low-cost microprocessor-controlled, electronic devices for measuring gas flow and volumes or monitoring pressure and temperature for a system. With integral pressure and temperature transducers, the 6000 is designed for accuracy, reliability, and ease of maintenance. It can mount directly on a meter's index plate, or on a wall or pipe.

Low-power CMOS design and sophisticated power conservation circuitry allow the 6000 to operate one to three years on battery power.

Two status inputs are standard. A large 13-digit external LCD display with a magnetic scroll switch located on the enclosure exterior permits data viewing without opening the enclosure. Station parameter display and alarm display can be performed without any external device. The standard internal 2400/1200/300 baud modem provides remote configuration, calibration, and retrieval of data.

The operator can also use an industry-standard portable computer running Mtek Manager software to configure parameters. pcGas Meter Reader™ software allows the operator to download databases and perform extensive configuration. See section 5 on page 37 for information on these packages. The 6000 calculates corrected volume using AGA-7, AGA-3, AGA-5 and NX-19 or AGA-8 reports.

Optional equipment includes an external keypad and display for configuration and calibration, analog output modules, two additional pulse outputs, serial port modules, and various security options.

The 6000 product line consists of six models which cover a wide range of applications.

- ▶ The 6000 EFCV provides a live pressure and temperature reading in volume corrections for Positive Displacement meters (turbine, etc.)
- ▶ The 6000 EFCP provides a live pressure and a fixed temperature reading in volume corrections for Positive Displacement meters (turbine, etc.)
- ▶ The 6000 EFM provides a live pressure and temperature reading in volume corrections for Orifice meters.
- ▶ The 6000 EPR provides a live pressure reading for monitoring systems.
- ▶ The 6000 ETR provides a live temperature reading for monitoring systems.
- ▶ The 6000 EPTR provides a live pressure and temperature reading for monitoring systems.

HAZARDOUS LOCATIONS

The 6000 is Listed by Underwriter's Laboratories to bear the UL (US UL Listing) and C-UL (Canadian UL Listing) marks for use in a Class I, Division 2, Groups A-D hazardous locations, when installed in accordance with control drawing 400973. See Appendix E for details.

WARNING

Substitution of components may impair suitability for Class 1 Division 2 applications.

COMPLIANCE

The 6000 device complies with Part 15 and Part 68 of the FCC Rule (Approval pending). See Appendix E on page 64 for details.

ONE YEAR WARRANTY

Metrotek, Inc. warrants the products it manufactures to be totally free from any defects in materials and workmanship under normal operation and use. Metrotek, Inc. agrees to repair or replace any instrument which is defective due to faulty workmanship or material if returned to our factory with shipping charges prepaid, within one year of original purchase.

SECURITY OPTIONS

The 6000 comes standard with wire seal screws for the enclosure. Various security options are available to prevent unwanted users from opening the enclosure:

- A. Tamper screws
- B. Padlock quick release latch
- C. Padlock quick release latch and door ajar switch
- D. Door ajar switch

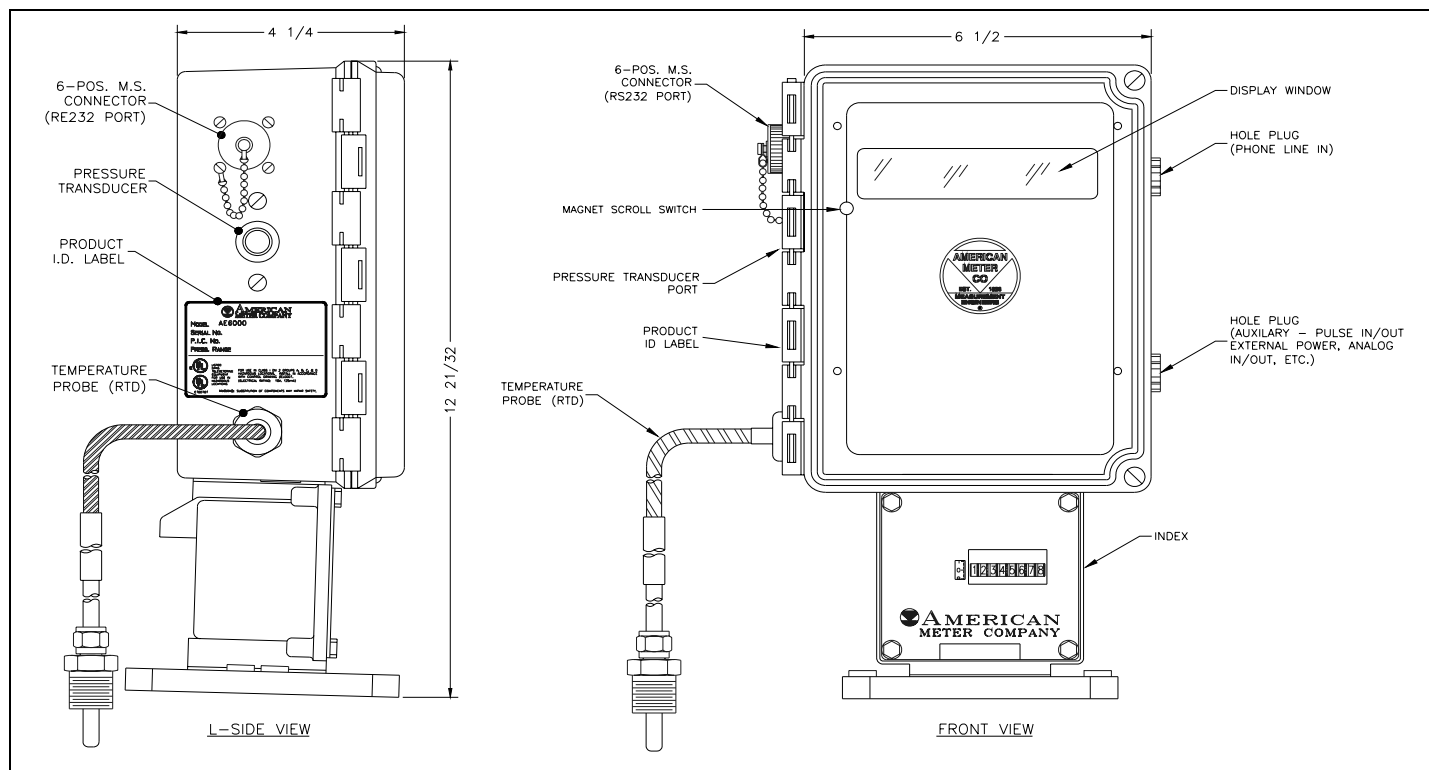


Fig. 1-1 : 6000 exterior view

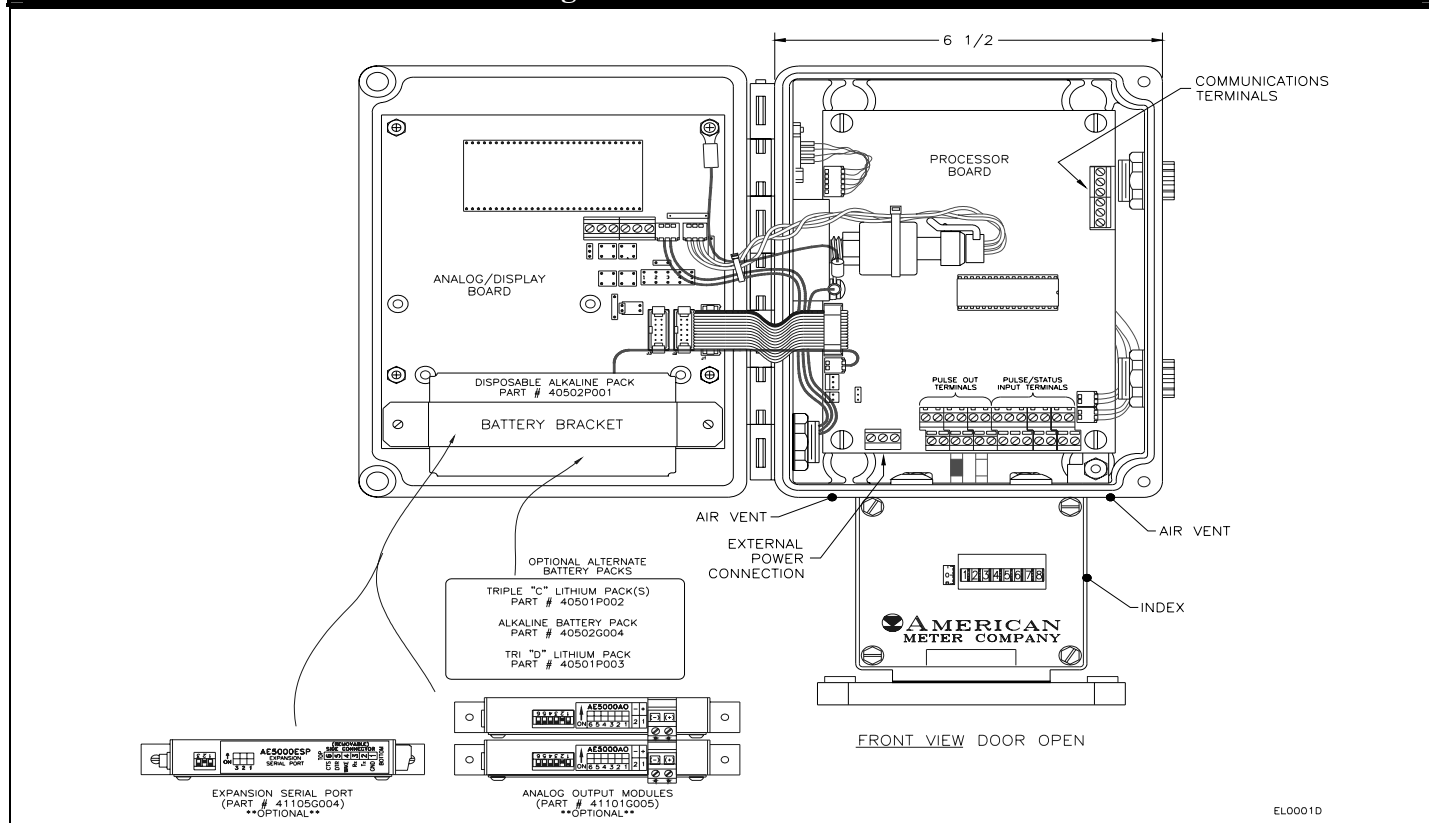


Fig. 1-2 : 6000 interior view

SECTION 1: Installation

UNPACKING

1. Thoroughly examine the box to verify it was not damaged in shipping. If you find damage, immediately file a claim with the shipper.
2. Carefully unpack the 6000 from the shipping container. Verify that the box contains every item listed on the shipping order.

Initial Check-Out / Power-Up Options

!!! CAUTION !!!

This unit contains certain electronic components that are sensitive to electrostatic discharge (ESD); therefore, proper precautions should be taken during maintenance operations to avoid ESD. It is recommended that the operator first touch the MS connector (RS-232C port) on the left side of the unit to dissipate any accumulated static charge. Additional precautions may be taken in order to minimize the possibility of ESD, including the use of a grounding wrist strap (i.e., 3M part number 2214).

If these precautions are not taken and the unit is subjected to severe ESD; it may revert to its default state. However, the unit will not exhibit any loss of data or degradation of performance.

1. Examine the label on the left side of the enclosure. It indicates the serial number and pressure range for your unit. Verify that these parameters match your requirements. If they do not, please contact your sales representative.
2. Open the front door by loosening the upper and lower right hand corner screws or quick release latches of the enclosure and swinging the door out. See Figures 1-1 and 1-2 on page 6.
3.
 - a. If the unit is battery powered, check the battery pack and connect it to the BATT 1 connector. The optional battery pack connects to the BATT 2 connector (Fig. 1-3 on page 8). Go to step 4.
 - b. If the unit is line powered, make sure that jumper JP12 is in the down position (PS) for power supply and connect the DC power input to the DC input screw terminals 1 (V+) and 2 (GND). (Fig. 1-3 on page 8).
4. When you first apply power, the display will show the first two capital letters of the first label followed by the value and then the units. For example, the label Corrected Volume MCF with a value of 00000000 would be displayed as **CV 00000000 MCF**.
5. You can now view selected parameter values on the display by using the scroll switch. The scroll switch is activated by the use of a magnet (one is shipped with the unit). See Display Mode in page 21 for information about this function.

WARNING

The operating voltage range is 7-18 VDC.
Do **NOT** exceed recommended input voltage of 18 VDC.

NOTE

The flashing outside display indicates an alarm condition (e.g. First Time Power). See page 22 for information on alarms.

POWER FOR THE 6000

A main 10.5 V, 7.1 AH disposable alkaline pack (part # 1011-0030C-001) supplies operating power to the device for approximately one year. If the main supply fails, an on-board back-up battery will power the unit's memory and real time clock. Backup power can maintain history data for up to seven years. When back-up power is used, the unit discontinues normal operation until the main battery pack is replaced.

WARNING

The operating voltage range is 7-18 VDC. Do **NOT** exceed recommended input voltage of 18VDC.

Optional Power Supplies

Several optional supplies are available:

- A. Alkaline battery pack - This industrial-grade pack (part # 1011-0031D-001) provides an approximate life expectancy of one year over the temperature range -20° F (-29° C) to 130° F (54° C). The 9.0V, 7.1 AH battery pack consists of 6 C-size, 1.5 volt industrial grade alkaline batteries. Its design provides for easy change-out of the batteries with certified replacements.
- B. TRI-D lithium battery pack - (part # 1011-0029C-001) provides an approximate life expectancy of three years. The 10.8V, 13.0 AH battery pack consists of three D-size, 3.6 volt lithium batteries.
- C. TRI-C lithium battery pack - (part # 1011-0028C-001) provides an approximate life expectancy of one year. The 10.8V, 5.2 AH battery pack consists of three C-size, 3.6 volt lithium batteries. A second lithium battery pack will extend life expectancy an additional year.

- D. 6000 UPS power supply - an uninterruptible 12 VDC power supply with battery back-up.
- E. SPS 50 solar system - 10 to 64 W systems available with battery backup; while selected system size depends on geographic location, degree of sun exposure, equipment power consumption, and site obstructions, most 6000 applications only require a 10W system.

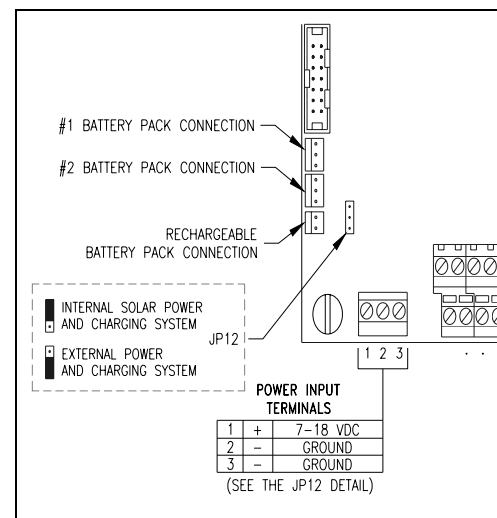


Fig. 1-3 : Power connections

MOUNTING THE EFC ON THE METER

1. Check the meter's rotation direction. Standard setup is clockwise rotation of the meter output shaft, as viewed from the top. The rotation of the unit can be changed to counterclockwise. Also, the input drive value for the unit can be changed.
2. Align the EFC's index base plate holes with the corresponding holes in the meter's index base plate. Secure the unit by bolting it to the meter. Ensure that the drive dogs are correctly aligned and not binding.
3. Plug all unused holes in the index base plate with the caps provided in the accessory package.

SETTING UP THE INDEX ASSEMBLY

Output Shaft Rotation

To change the rotation of the output shaft to counterclockwise (figure 1-4 on page 9):

1. Loosen set screw **e** on gear **E**.
2. Disengage gear **E** from counter gear **D**.
3. Tighten set screw **e**.
4. Loosen set screw **c** on gear **C**.
5. Engage gear **C** with counter gear **D**.
6. Tighten set crew **c**.
7. Take care to align the gears properly, and verify that they turn freely and do not bind.

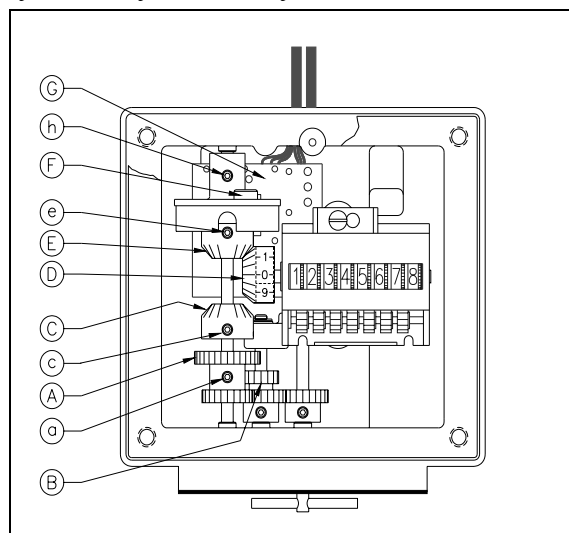


Fig. 1-4: Index box assembly

Input Drive Value

Fig. 1-4 above shows gearing in the correct position for 10, 100, 1,000 or 10,000 cubic feet/revolution (ft^3/rev) and 0.1, 1 and 10 cubic meters/revolution (m^3/rev). To change the input drive value to 5 ft^3/rev :

1. Loosen set screw **a** on compound gear **A**.
2. Lower gear **A** until its upper teeth engage the upper teeth of compound gear **B**.
3. Tighten set screw **a**.
4. Take care to align the gears properly, and verify that they turn freely and do not bind.

When changing an EFC in the field from a 10, 100, 1,000 or 10,000 ft^3/rev drive meter with a 5 ft^3/rev drive, the **CF per Pulse In or Meter Drive** parameter, must be changed to a value of 10 using pcGas software or the keypad / display.

NOTE

Electronic parameter **CF per Pulse In or Meter Drive**, should always equal the meter drive value EXCEPT for 5 ft^3/rev meters which should be set at 10. When switching to 5 ft^3/rev , the gear ratio is adjusted so that two revolutions of the input drive gear result in one revolution of the magnet and hub assembly, which sends a pulse signal to the instrument that equals 10 ft^3/rev . The value can be changed using pcGas software or the keypad / display (see Appendix Table A-16 on page 44 for addressing).

To change the input drive value to 10, 100, 1,000 or 10,000 ft^3/rev , return compound gear **A** to its original, factory-set position. Change the **CF Per Pulse In or Meter Drive** parameter using pcGas software or keypad / display (see Appendix Tables A-6 on page 44 for addressing).

NOTE

When you have changed the input drive value, be sure to remove the existing drive value label from the window and replace it with a new label that states the current input drive value. For your convenience, Metretek, Inc. supplies extra labels with the 6000 EFC.

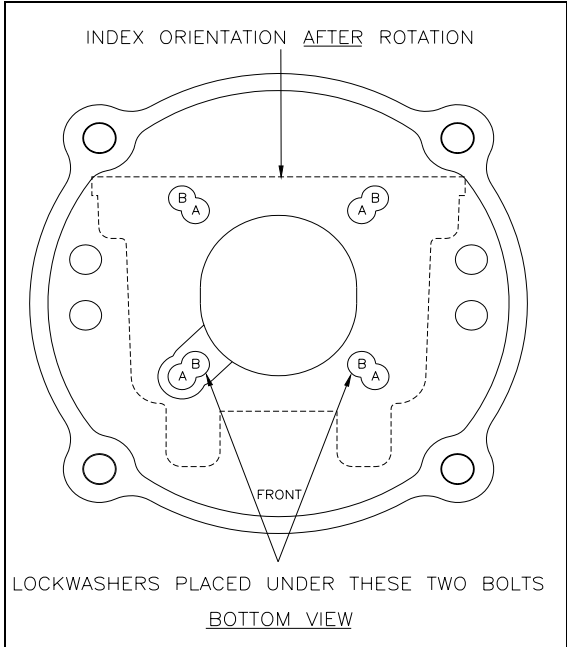


Fig. 1-5: Base Plate Showing Unit & Index Rotation

The index box assembly contains a reed switch (**G**) and a corresponding magnet (**F**). The magnet should be positioned so there is 0.07" - 0.1" clearance between the magnet and switch. To adjust this clearance, refer to Fig. 1-4 on page 9 and do the following:

1. Loosen set screw **h**.
2. Move the magnet until clearance is correct.
3. Retighten set screw **h**.
4. Verify the clearance is still correct.
If not, repeat the procedure.

UNIT AND INDEX ROTATION

In general, the label side of the index base plate (front) should face the front of the meter. This allows the 6000 EFC to also face the front of the meter. In certain applications, the 6000 EFC and index can be installed 180° from the standard position so that viewing of the 6000 EFC is acceptable. To rotate the unit and index, refer to Fig. 1-5 on page 10 and do the following:

1. Remove the 4 bolts at location **A**.
2. Rotate the base plate 180° clockwise so that the front label side is now facing the rear of the unit.
3. Insert the 4 bolts into location **B** with the two lockwashers as shown. Fig. 1-5 on page 10 shows the index orientation after the rotation is completed. (DO NOT OVERTIGHTEN).

COUNTER MASKING

Table 1-1 : Uncorrected Counter Masking For Eight-Digit Counter		
Drive	Uncorrected Value	RH Digits Masked
5FT ³ /REV	10	■ □ □ □ □ □ □ □
	100	□ □ □ □ □ □ ■ □
10 FT ³ /REV	10	■ □ □ □ □ □ □ □
	100	□ □ □ □ □ □ ■ □
100 FT ³ /REV	100	■ □ □ □ □ □ □ □
	1,000	□ □ □ □ □ □ ■ □
1,000 FT ³ /REV	100	■ □ □ □ □ □ □ □
	1,000	■ □ □ □ □ □ □ □
	10,000	□ □ □ □ □ □ ■ □

PULSE INPUT TO THE EFC

Magnetically operated reed switches inside the meter drive assembly send electronic pulses as the drive turns. These pulses represent uncorrected meter volume to the EFC.

To eliminate false counts that can result from the reed switch "bounce", the EFC uses a set/reset, dual-reed switch configuration. An input pulse is generated only when the opening and closing of the first switch is followed by the opening and closing of the second switch. The main counter input is also monitored for fault conditions. When enabled, if any of the dual-reed switches should be defective, the input pulses will automatically switch to the working counter input and the EFC will generate a **Faulty Counter** alarm. This function is enabled if the **Counter Fault Monitoring** parameter is set to **1** and disabled if set to **0**. The default value is **0** for disable. See Appendix Table A-16 on page 44 for addressing.

For units supplied with indexes, the main counter input is terminated at the UNIT (BLK) MTA connector and the uncorrected pulse wiring at the FIELD (WHT) MTA connector at the lower right hand corner of the board. Metrotek, Inc. can supply a remote index similar to the main index or a sandwich pulser for wall or pipe mount installations.

When the sandwich or external pulser option (1, 10, 20, or 50 pulse per revolution) is supplied, connect the N.O., COM, and N.C. wiring to terminals 18 (SET2), 17 (GND) and 16 (RST2) respectively.

The pulse input is software selectable for Form C (three-wire) or Form A (two-wire) connection. Mtek Manager and pcGas Meter reader software can be used to configure the pulse input. The optional external keypad / display can also be used to configure the pulse

input and other parameters. See Appendix Table A-16 on page 44 for addressing.

WALL AND PIPE MOUNTING

The 6000 can also mount directly on a wall or on a pipe. Mounting feet are provided for wall mounting. See Figure 1-6 on page 12.

For pipe mounting, approximately 10 feet of 2 inch rigid iron pipe or conduit is required. The pipe should be installed 18 to 24 inches in the ground in 6 inches wide sackrete / concrete. The length of the 2 inch mounting pipe or conduit will vary according to the site, but typical installations place the 6000 at about eye level for ease of operation. Mounting plates are provided for pipe mounting. Secure the 6000 to the pipe with the provided U-bolts, washers and hex nuts. See Figure 1-7 on page 12.

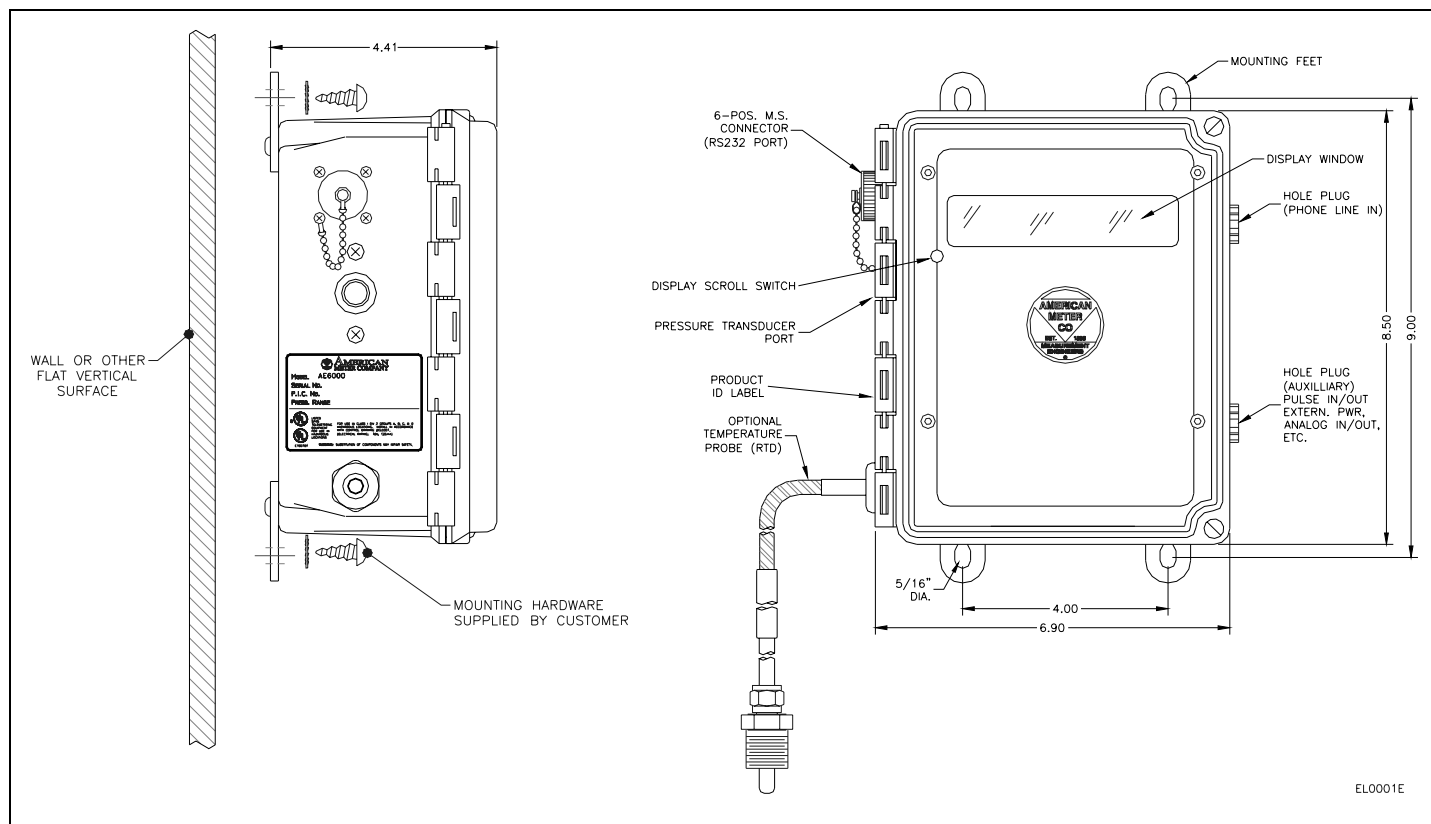


Fig. 1-6 : Wall mounting

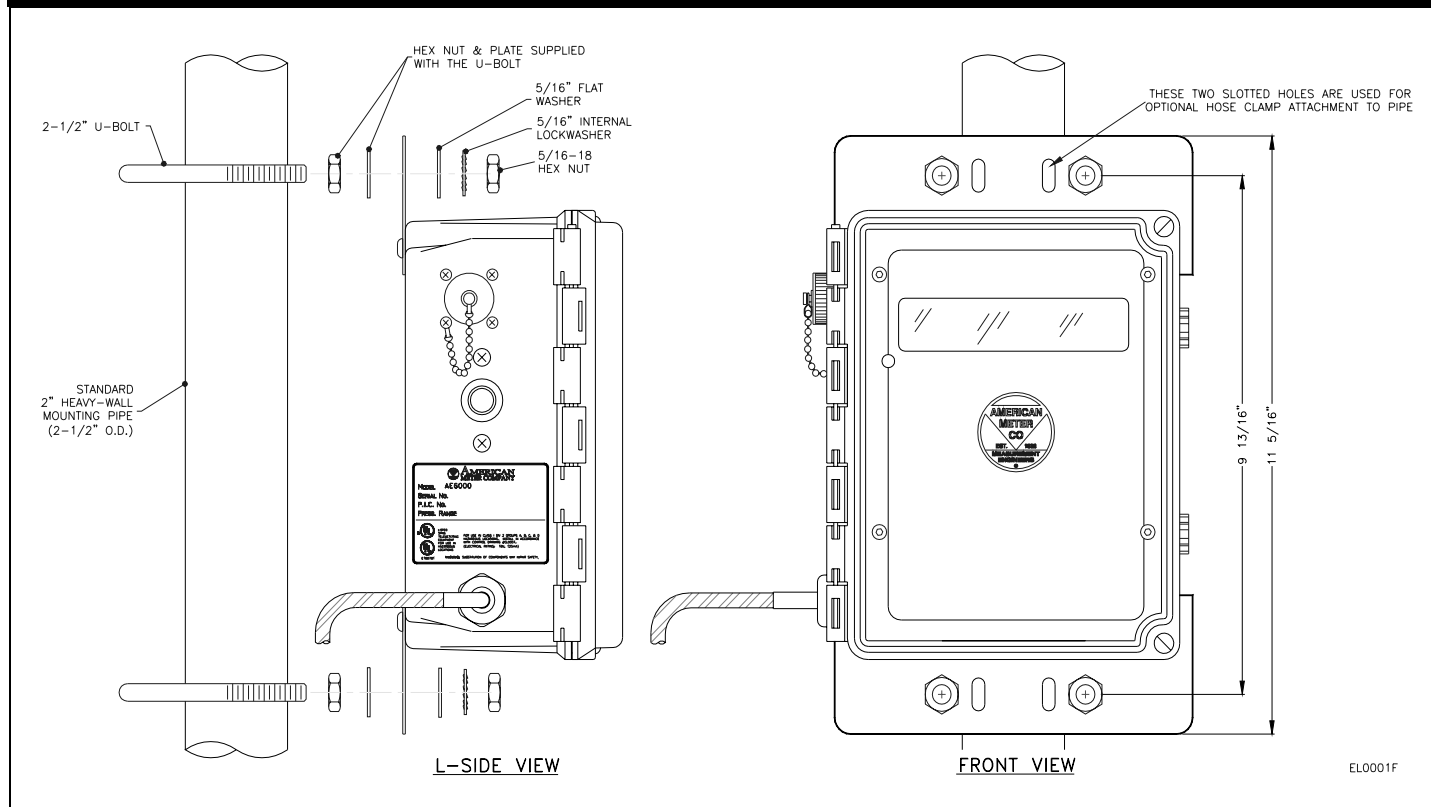


Fig. 1-7 : Pipe mounting

TRANSDUCERS IN THE 6000

The 6000 uses a precision strain gauge pressure transducer mounted inside the unit, combining maximum accuracy with low power consumption. To sense gas temperature, the 6000 employs a highly linear and stable device; a platinum resistive temperature detector (RTD). Case temperature sensing utilizes an on-board precision reference integrated circuit (IC).

CONNECTING THE PRESSURE TUBING

WARNING

You must **DEPRESSURIZE THE METER** and its associated piping before you make pressure piping connections. **FAILURE** to do so may result in **EXPLOSION** and **FIRE**, causing **SERIOUS PERSONAL INJURY** and **PROPERTY DAMAGE**.

Do NOT attempt to connect any piping or fittings to a meter or pipe under pressure.

Do NOT SMOKE while connecting gas or test pressure to the meter.

NOTE

Federal Standard 192.02 requires a shut-off valve between the pressure source and the instrument. A needle valve is supplied with the optional pressure piping kit for this purpose. Its rating is 1,500 PSIG MAOP.

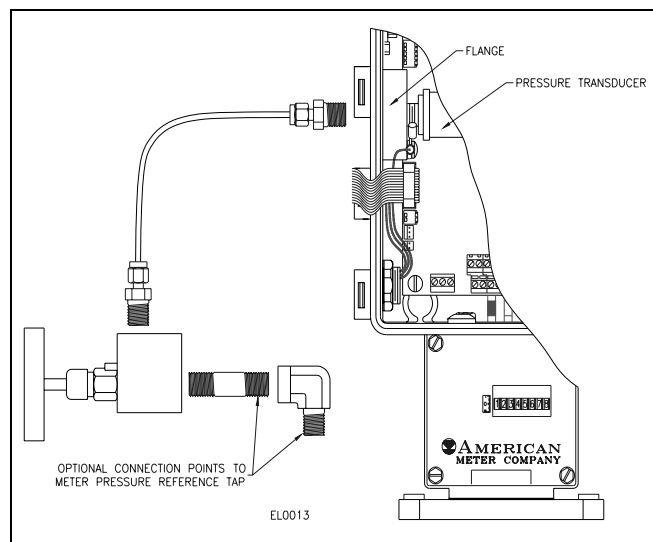


Fig. 1-8 : Pressure connections

As a minimum requirement, connect the pressure tubing as shown in Fig. 1-8 on page 13. An optional pressure tubing connection kit (part # 2019-0009B-001) can be shipped with each instrument. Fig. 1-9 on page 14 is the recommended pressure installation for ease of operation. Additional piping and valve are required for the installation and are not supplied. Use Teflon tape or pipe seal compound on all threaded connections. The tubing supplied in the kit may be longer than you need for your installation. You can cut or coil the tubing, but do not make any sharp bends in it (minimum radius is 3/4"). Tighten all the connections and perform a leak test once the meter and instrument are pressurized.

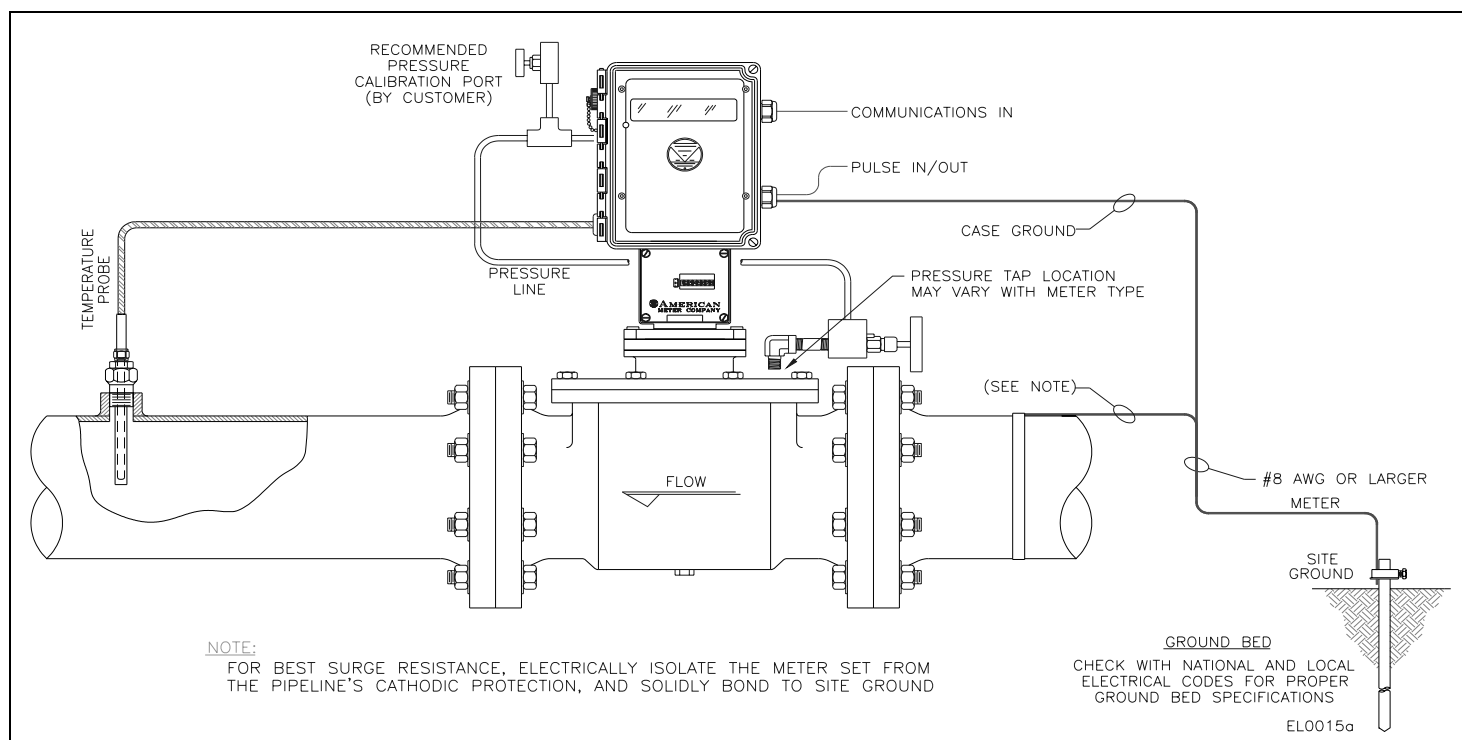


Fig. 1-9 : Typical Installation For 6000 EFC

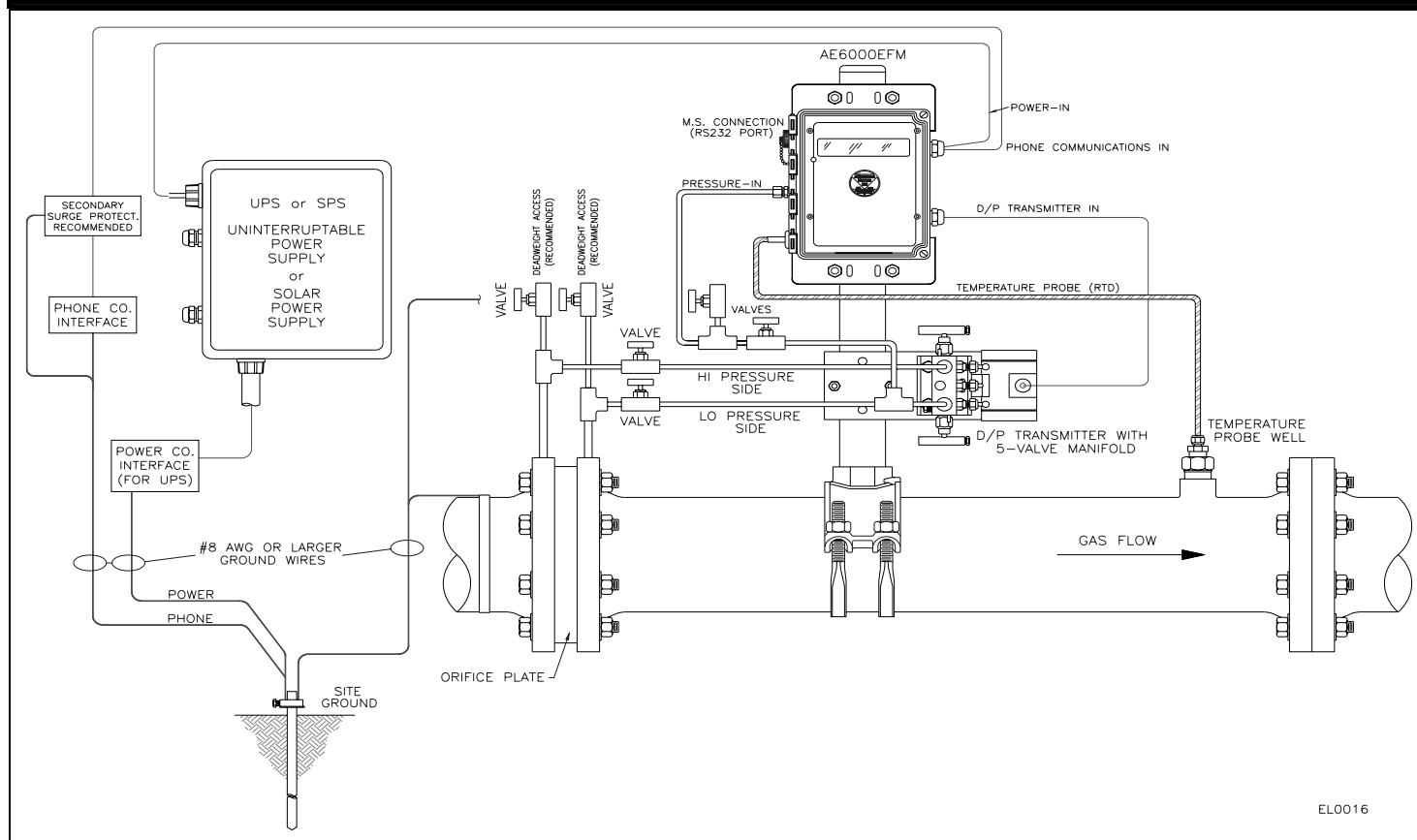


Fig. 1-10 : Typical Installation for 6000 EFM

INSTALLING THE THERMAL PROBE

A thermal (temperature) probe is connected to the 6000 by a 6-foot (2-meter) cable. You should coil excess cable to prevent possible damage. The probe is designed to fit into standard Metretek, Inc. thermowells. Optional 15-foot (4.5 meter) and 30-foot (9-meter) cables are available. See Fig 1-11 on page 15.

To install the thermal probe, use the supplied temperature probe adapter. Refer to Table 1-2 on page 15. Insert the probe into the thermowell and tighten the securing nut **FINGER TIGHT** only. The standard adapter is a $\frac{1}{2}$ " fitting. Users retrofitting instruments requiring the $\frac{5}{8}$ " adapter can order the adapter from Metretek, Inc..

Oil or ethylene glycol (antifreeze) should be used to improve heat transfer from the thermowell to the thermal probe. Be aware, however, that it is possible to cause hydraulic crushing of the probe. This can happen when there is little or no air in the thermowell above the probe. When the probe is fastened by tightening the securing nut, the space in the well decreases as the probe enters. As a result, hydraulic pressure may rise high enough to cause damage. **If you use oil or antifreeze, make sure there is enough air in the thermowell above the fluid to prevent crushing the probe.**

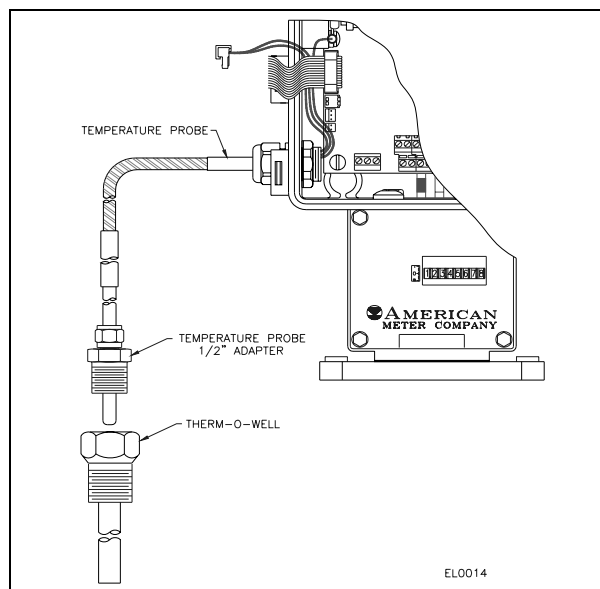


Fig. 1-11 : Temperature connection

It is recommended that the thermowell be installed in the meter outlet pipe one or two diameters from the meter outlet. The minimum size pipe in which the thermowell can be inserted through the pipe wall is four inches. For larger pipes, the insertion length of the thermowell must be sufficient to extend at least to the pipe center, but no further than 75% of the pipe's diameter. Thermowells should not be situated where they will be exposed to direct sunlight. A sunshield should be used for installations where this cannot be avoided.

Table 1-2: Thermowell Part Numbers		
Pipe Size	Insertion Length	Thermowell Part Number
4 in.	2 ½ in.	2019-0012B-012 ½" NPT 2019-0012B-008 ¾" NPT 2019-0012B-004 1" NPT
6 in. 8 in.	4 ½ in.	2019-0012B-013 ½" NPT 2019-0012B-009 ¾" NPT 2019-0012B-005 1" NPT
12 in. 14 in.	7 ½ in.	2019-0012B-014 ½" NPT 2019-0012B-010 ¾" NPT 2019-0012B-006 1" NPT
16 in. 20 in.	10 ½ in.	2019-0012B-015 ½" NPT 2019-0012B-011 ¾" NPT 2019-0012B-007 1" NPT

INSTALLING THE PULSE OUTPUT WIRING

The 6000 comes standard with two Form C PhotoMOS pulse output relays in addition to an uncorrected mechanical volume switch output. Two optional PhotoMOS relays can be supplied to provide up to four pulse outputs. See Fig. 1-12 on page 16 for optional relay location and wiring. PhotoMOS relays combine the advantages of conventional solid-state relays and electromechanical relays. The opto-electronic device and physical separation of the pulse output relays provide greater than 1,500 VAC isolation.

Wiring connections for the photoMOS Form C relays are made from terminals 7 to 9 for Pulse #1, terminals 4 to 6 for Pulse #2, terminals 13 to 15 for Pulse #3 and terminals 10 to 12 for Pulse #4. Please note that Form C relays (3-wire) may be connected as Form A (2-wire) by not wiring the normally-closed terminals. See Fig. 1-12 on page 16 for pulse output wiring location.

The corrected volume pulse outputs generated from the photoMOS relays can be scaled to any desired volume value. Typical values are 10, 100, 1,000, or 10,000 cubic feet per pulse, or the metric equivalents. The scaling factor is selected by the **Pulse Out CF Per Pulse** parameters. The pulse duration (width) is also configurable up to 5,000 ms. The **Pulse Output On-Time and Off-Time** parameters determine the pulse time for corrected volume, uncorrected volume and pressure corrected volume pulses. The **Alarm Pulse Time (ms)** parameter determines the pulse time for alarm outputs. See Appendix C starting on page 54 in this manual or Mtek Manager Help screen for description of this parameter.

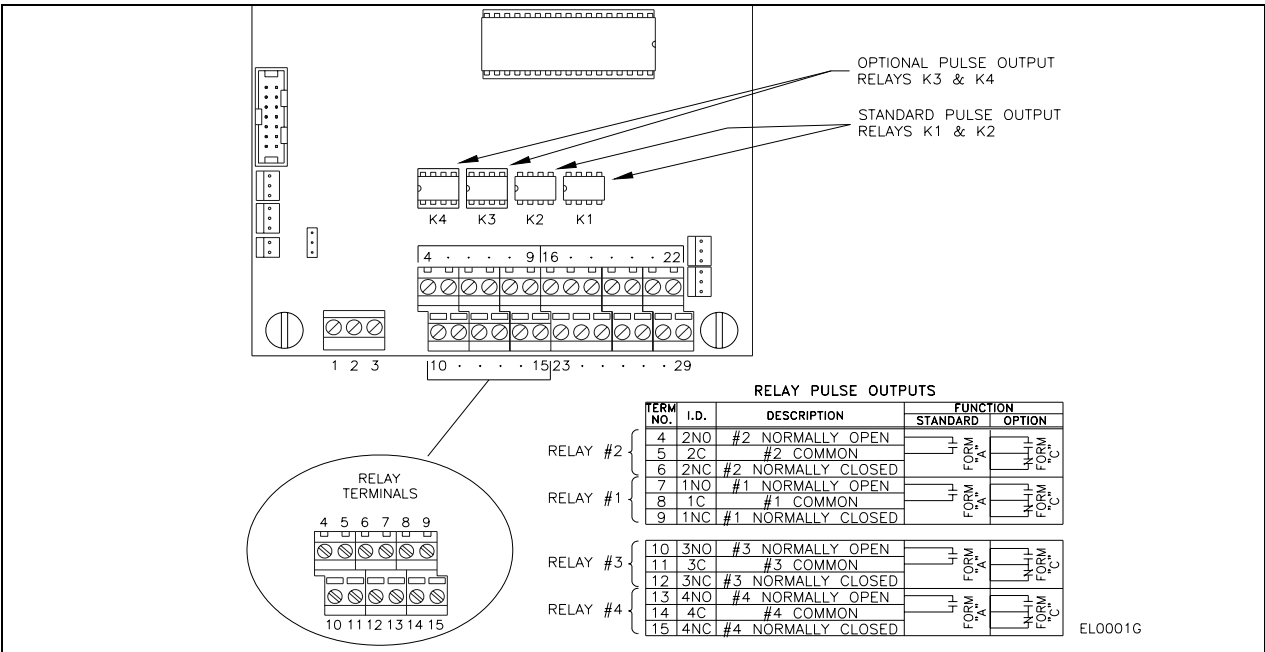


Fig. 1-12 : Pulse output wiring

Volume and Alarm Pulse Specifications

1. All pulse outputs are isolated from ground and each other. Provides 1,500 VAC between input and output/between contact sets.
2. 800 mW power dissipation.
3. AC/DC load voltage up to 400 volts.
4. Continuous load current up to 100 mA.

5. Peak load current up to 300 mA for 100 ms.
6. Typical configurations
 24VDC @ 33.33 mA (continuous)
 12VDC @ 66.66 mA (continuous)
7. Configurable pulse width from 1 to 5,000 milliseconds (ms).

**Uncorrected Mechanical Pulse Output
(Units with Metretek, Inc. Index)**

The uncorrected mechanical pulse output is derived from the Form C reed switch in the index assembly. As the magnet in the drive's assembly rotates past the Form C switch, a single uncorrected volume pulse output is generated. Volume per pulse is determined by the drive rate. Each uncorrected volume pulse is equal to the gas flow for one shaft revolution.

The pulse output can be wired as a Form A or Form C switch output. Use terminals 26 (normally open), 27 (common) and 28 (normally closed) for Form C output. To wire as Form A, use terminals 26 (normally open) and 27 (common) and make no connection to terminal 28 (normally closed). The duration (width) of each pulse is equal to the length of time the reed switch is in its closed position (depends on the rate of the meter). No configuration is necessary to enable the uncorrected mechanical pulse output.

Uncorrected Pulse Output Specifications

1. 3W contact rating (power dissipation).
2. Maximum switching voltage up to 30V.
3. Maximum switching current up to 200mA.
4. Maximum continuous current @ 500 mA.

NOTE

All pulse outputs are disabled in the standard unit to conserve power. The Alarm pulse output is a one time pulse output signal. No other alarm pulse will be generated until the alarm is cleared and becomes active again.

COMMUNICATIONS

To communicate with the 6000, the Site ID in the device must be the same as the Site ID entered in the software package. The Site ID is a unique identification number (1 to 65,535) which allows the Metrotek, Inc. software packages to communicate with the 6000. The default Site ID number is 1. Mtek Manager, Virtual Keypad option, and pcGAS Meter Reader can be used to enter a number other than the default. Refer to the respective software User's Manual for additional information on these and other functions. The optional external display and keypad can also be used to change the Site ID from its default value.

RS-232C Serial (Direct) Communications (9600 Baud)

In its standard configuration, the 6000 is equipped with one RS-232C serial port. An optional RS-232C serial cable (Part # 1002-0235C-001) is required for direct communications. The serial port allows an operator to configure and collect data with an industry-standard (IBM®, Compaq®, etc.) portable computer (Mtek Manager or pcGas Meter Reader software is required for this function). The 6000 communicates at 9600 baud with portable or host computers connected directly to the serial port. When communicating with the 6000, **Busy** will be displayed on the display. Table 1-4 on page 19 shows the diagnostic features of the Activity indicator when the cable is connected.

NOTE

Additional serial ports can be supplied.

WARNING

The 6000 will not go to sleep if the RS-232C serial cable is left connected and battery life will be affected drastically.

Modem Communications (2400 Baud)

NOTE

This modem complies with Part 15 of the FCC Rules. See Appendix E on page 64 for details.

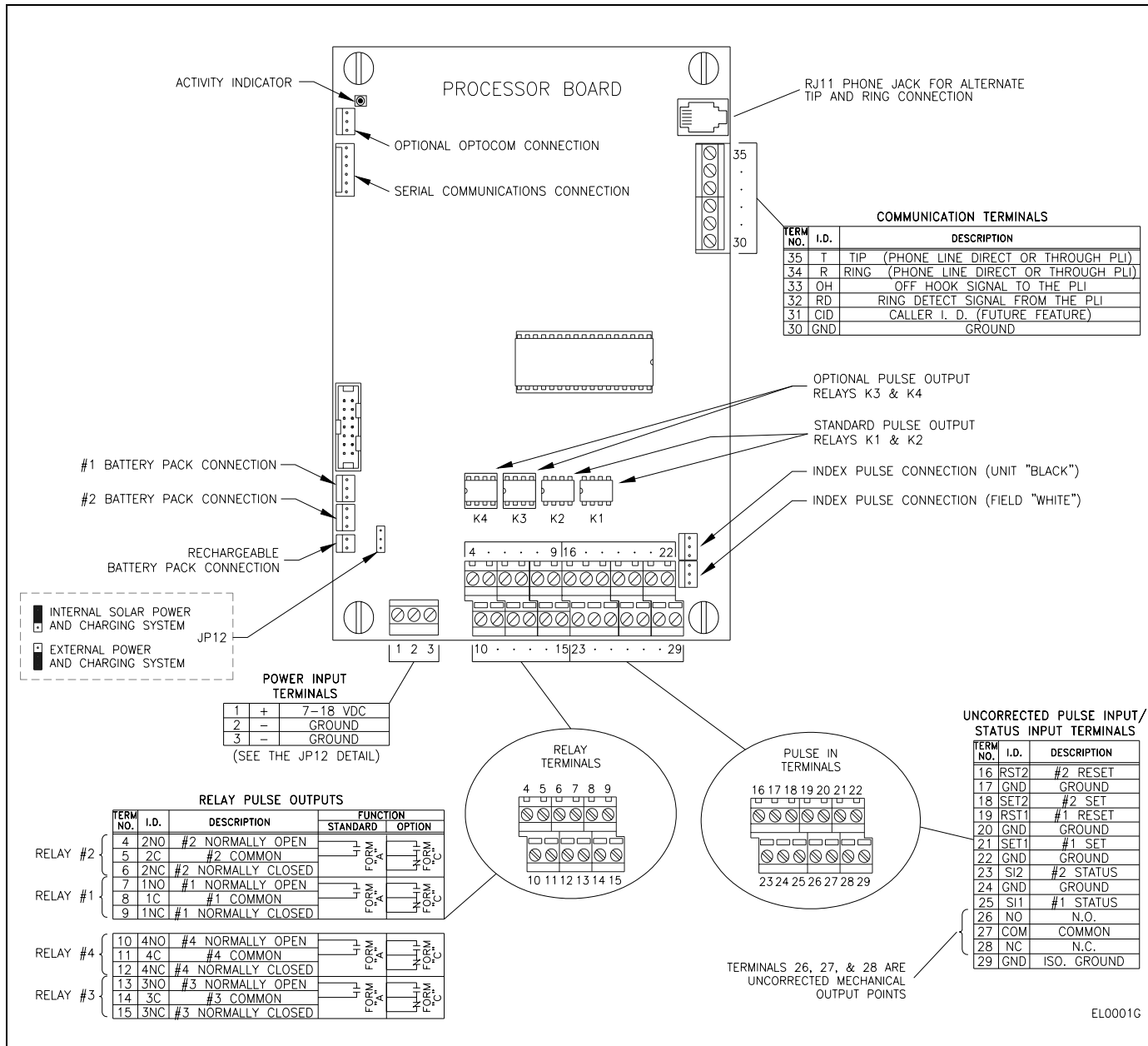
The internal Hayes compatible modem offers automatic answering and dialing. The modem communicates at 2400/1200/300 baud. The modem by itself can only be used in areas classified as non-hazardous or Class I, Division 2. To maintain the 6000's intrinsic safety classification in more hazardous areas such as Class I, Division 1, an optional Phone Line Interface (PLI) must be used. This device removes the high voltage ring-detect circuitry from the device and brings low-level signals into the hazardous area through intrinsic safety barriers.

Connecting the Telephone Line

If the 6000 is situated in a non-hazardous or Class I, Division 2 area, connect the tip and ring wires from the telephone company's terminal box to the TIP and RING terminals (35 and 34 respectively). An RJ-11 jack is also provided for ease of installation.

Phone line surge protection is highly recommended for telephone use. Metrotek, Inc. can supply an optional multistage phone line protector with the 6000. The module can be mounted in the UPS for line-powered units, or a separate enclosure can be supplied for the module when the unit is battery powered.

6000 Function (RS-232C cable connected)	Indicator Activity Indicator
RS-232C cable connected	1 long blink
Set #1 Pulse received	1 short blink
Reset #1 Pulse received	2 short blinks
Set #2 Pulse received	3 short blinks
Reset #2 Pulse received	4 short blinks
RS-232C cable disconnected	3 long blinks after a few seconds delay



EL0001G

Fig. 1-13: Terminal connections

Grounding

Because of the potential for damage to equipment and injury to personnel, certain practices should, and often must, be observed when installing electronic systems on natural gas metering sites. Of these practices, proper grounding is possibly the single most important. This document was written to point out general rules and practices, and *NOT* to supersede those defined in the **National Electrical Code** (NEC) published by the National Fire Protection Association, nor the **Classification of Gas Utility Areas for Electrical Installations** booklet published by the American Gas Association (AGA). A sound understanding of Federal, State and Local laws is fundamental to proper and legal installation work.

All 6000 and gas meter equipment should be kept at the same ground potential so that unexpected voltages anywhere on the system are quickly shunted away to earth. This calls for a common ground rod (or "bed" of grounding equipment) to which is securely tied all equipment chassis, metal cabinets, and intrinsic ground brackets. Solid copper ground wire or ground strapping of an approved size and type must be used to tie this equipment to the rod(s). Where more than one rod is used, as when equipment is separated by some distance, all rods should be bonded together in an approved manner.

One practice which has caused some misunderstanding in the proper implementation of gas line grounding is **CATHODIC PROTECTION**. Due to corrosive action of the soil in some areas, pipelines are protected by cathodic systems. In a nutshell, cathodic protection systems cause corrosive agents in the soil to be drawn away from buried pipelines and (collected) in an anode bed nearby. The anode bed, much

easier to replace and less costly than the pipeline, is thereby sacrificed in place of the pipe. **NOTE THAT THE ANODE BED AND THE GROUNDING BED SPOKEN OF EARLIER ARE TWO SEPARATE AND UNRELATED SYSTEMS WHICH ARE IN NO WAY PHYSICALLY CONNECTED.** Only the buried part of the pipeline needs to be protected, so above-ground lines (and any equipment mounted on them) can be isolated with insulating flanges made for the purpose. If a meter leg or other pipeline structure is isolated with these flanges, it may be necessary to bond the underground sections with a jumper in order to maintain a uniform cathodic voltage on them. Note that these insulating flanges are not guaranteed to prevent high-potential arcing, as from nearby lightning strikes. For this reason, it is recommended that a low-inductance, flat copper grounding strap (example; PolyPhaser 3.0" STRAP) be attached to the above-ground section of line to which our electronic equipment is mounted, and run over to the ground bed. Note: PolyPhaser also provides clamps and fittings for attaching this strap.

REFERENCES

- National Electrical Code (NFPA):
Article 250 - Grounding
Articles 500 & 501- Hazardous (Classified)
Article 504 - Intrinsically Safe Systems
- The IAEI Soares' Book on Grounding
(Available through the NFPA)
- PolyPhaser Corp. Catalog of Lightning /
EMP & Grounding Solutions Minden,
Nevada (800) 325-7170
- Advance Products & Systems Inc.
Pipeline Isolation Kits
Lafayette, Louisiana (800) 315-6009
- John Hoss Company
Pipeline Isolation Kits
Tulsa, Oklahoma (800) 331-3404

SECTION 2 : Operating Modes

The 6000 operates in any of five modes:

- Sleep
- Display
- Alarm
- Configuration (requires Virtual keypad, Mtek Manager or pcGas Meter Reader software, or the optional external keypad and display)
- Calibration (requires Virtual keypad or Mtek Manager software or the optional external keypad and display)

Sleep/Wake-Up Mode

In normal operation, the 6000 maintains a powered-down state (sleep mode) to conserve battery life. In this state, the display will show the label and the most recent value prior to the next wake-up interval. The unit will be updated depending upon the user's programmed wake-up interval. The default wake-up interval is 10 minutes. See Appendix Tables A-16 through A-20 starting on page 46 for a list of common 6000 items including this parameter. Shorter intervals result in more frequent data; longer intervals provide for longer battery life. The scheduled wake-ups result in immediate power-down after performing calculations.

In addition to the scheduled wake-ups, the 6000 can be brought up from its sleep mode by any one of the following:

- Connecting a portable computer to the unit's serial communication port.
- Scrolling the external display with a magnet.
- Pressing any key on the optional keypad.
- Opening the enclosure door.
- Change in state of the status inputs.
- Calling the unit via modem.
- Waking up on a specified number of pulses set by the Wake Up On Pulse

parameter. See Appendix Table A-16 on page 46 for the **Wake Up On Pulse (event driven)** parameter address and the **Wake Up on Pulse (event driven)** section on page 59 for more details on this feature.

- Waking up on a limit violation set by analog minimum or maximum setpoints. This is only valid when analog sampling is enabled. See Analog Sampling on page 28 for details.

The unit will enter alarm mode if brought from its sleep mode by any of the first three methods. See the section on Alarm mode on page 22 for information on viewing and clearing alarms.

Once the unit is awake, it will automatically power-down in one minute after the operator stops interacting with it.

NOTE

The 6000 will not go to sleep if the RS-232C serial cable is connected and battery life will be affected drastically.

Display Mode

This is the normal mode of operation, and is activated when you wake-up the unit. In this mode, the display normally shows a two-character label and a value. You can view the next displayed label without having to open the front door by touching the scroll switch with a magnet.

In display mode, only limited parameters with assigned labels can be viewed. See Appendix Tables A-6 through A-10 starting on page 41 for a list of display mode parameters for your device.

Alarm Mode

The 6000 can be configured to activate an alarm when certain conditions are met or when user defined limits are exceeded. You can display active alarm messages on the optional external keypad and display or alarm codes on the standard display. The unit can also automatically call a host computer running Metrotek, Inc. software programs to report alarms.

A history log is kept in the device on each alarm condition consisting of:

- Current value
- Type of alarm (high, low etc.)
- Setpoint value (alarm limit)
- Time of alarm
- Date of alarm
- Time out of alarm
- Date out of alarm
- Extreme value alarm

Appendix Tables A-11 through A-15 on page 43 show the standard alarms and codes for your device.

In addition to the standard alarms, you can program the 6000 to monitor and report on almost any condition, such as meter tampering, liquid level, valve status, heater status, etc.

NOTE

Additional hardware equipment and configuration would be required for custom alarm monitoring.

Viewing and clearing alarms using the magnet

Alarms in the 6000 can be recognized by the flashing outer display. This is an indication that one or more of the standard alarms were initiated (see Appendix Tables A-11 through A-15 on page 43 for a list of alarms and codes for your device). To view and clear the alarms using the magnet:

1. Apply the magnet to the scroll switch until the outer display shows **AL XXXXXX**. (See Appendix Tables A-11 through A-15 on page 43 for a list of alarms and codes for your device). The alarms are described starting on page 23.
2. To view another alarm, apply and remove the magnet briefly. The unit should advance to the next alarm code if other alarms are active.
3. To clear an alarm, hold the magnet on the scroll switch for approximately five seconds until the display flashes **OK**, indicating the alarm was cleared.
4. If more than one alarm is active, the display will show the next alarm code. Apply the magnet to the scroll switch for approximately five seconds and clear the alarm.
5. The user can now view the standard display parameters in Appendix Table A-6 through A-10 starting on page 41.

NOTE

The ability to clear alarms with a magnet is default in the 6000. This function can be disabled using Metrotek, Inc.'s software packages or the optional external keypad and display. If disabled, the user would not have access to clear alarms; only to view parameters.

Current Day Flow Alarm (EFC & EFM)

If the current day's total volume should exceed the Current Day High Volume Alarm Setpoint, a **Current Day Flow** alarm will be initiated. The alarm will remain active until the value for the current day volume is reset the next day at roll time. The setpoints are user configurable with default values of 100000 and 99990 respectively (see Appendix Tables A-16 through A-17 starting on page 44 for parameter addressing for your device). For transport or interruptible customers, this parameter can be used to alarm when an account has exceeded a predetermined daily volume allocation.

Faulty Counter Alarm (EFC)

This alarm is only valid for EFC units with mechanical index. If any of the dual-reed switches in the index assembly fail, pulses to the unit would automatically switch to a working counter input. When this happens, the unit generates a **Faulty Counter** alarm (see the section on Pulse Input to the EFC on page 11 for more details).

First Time Power Alarm

First Time Power alarm is defined as the re-application of power after interruption of the power source. For example, whenever the battery is disconnected and then subsequently reconnected, the unit records the First Time Power event.

High Flow Rate Alarm (EFC & EFM)

If the flow rate should exceed the High Flow Rate Alarm Setpoint, a **High Flow Rate** alarm will be initiated. The alarm will remain active until the flow rate falls below the High Flow Rate Reset parameter value. The setpoints are user configurable with default values of 100000 and 99990 respectively (see Appendix Tables A-16 through A-17 starting on page 44 for parameter addressing for your device).

High Differential Pressure Alarm (EFM)

If the differential pressure should exceed the High Differential Pressure Alarm Setpoint, a **High Differential Pressure** alarm will be initiated. The alarm will remain active until the differential pressure falls below the High Differential Pressure Reset parameter value. The setpoints are user configurable with default values of 1500 and 1480 respectively (see Appendix Table A-17 on page 45 for parameter addressing for your device).

High Pressure Alarm

If the gas pressure should exceed the High Pressure Alarm Setpoint, a **High Pressure** alarm will be initiated. The alarm will remain active until the pressure falls below the High Pressure Reset parameter value. The setpoints are user configurable with default values of 1500 and 1480 respectively (see Appendix Tables A-16 through A-20 starting on page 44 for parameter addressing for your device).

High Temperature Alarm

If the gas flow temperature should exceed the High Temperature Alarm Setpoint, a **High Temperature** alarm will be initiated. The alarm will remain active until the temperature falls below the High Temperature Reset parameter value. The setpoints are user configurable with default values of 200 and 180 respectively (see Appendix Tables A-16 through A-20 starting on page 44 for parameter addressing for your device).

Low Differential Pressure Alarm (EFM)

If the differential pressure should fall below the Low Differential Pressure Alarm Setpoint, a **Low Differential Pressure** alarm will be initiated. The alarm will remain active until the differential pressure rises above the Low Differential Pressure Reset parameter value. The setpoints are user configurable with default values of -100 and -80 respectively (see Appendix Table A-17 on page 45 for parameter addressing for your device).

Low Flow Rate Alarm (EFC & EFM)

If the flow rate should fall below the Low Flow Rate Alarm Setpoint, a **Low Flow Rate** alarm will be initiated. The alarm will remain active until the flow rate rises above the Low Flow Rate Reset parameter value. The setpoints are user configurable with default values of -100 and -80 respectively (see Appendix Tables A-16 through A-17 starting on page 44 for parameter addressing for your device).

Low Pressure Alarm

If the gas pressure should fall below the Low Pressure Alarm Setpoint, a **Low Pressure** alarm will be initiated. The alarm will remain active until the pressure rises above the Low Pressure Reset parameter value. The setpoints are user configurable with default values of -100 and -80 respectively (see Appendix Table A-16 through A-17 starting on page 44 for parameter addressing for your device).

Low Supply Volts Alarms

If the supply voltage to the unit falls below the Low Supply Volts Alarm Setpoint value, a **Low Supply Volts** alarm will be initiated. The alarm will remain active until the supply voltage is greater than the Low Supply Volts Alarm Reset parameter. The setpoints are user configurable with default values of 8.5 and 8.8 volts respectively for battery powered units (see Appendix Tables A-16 through A-20 starting on page 44 for parameter addressing for your device).

Low Temperature Alarm

If the gas flow temperature should fall below the Low Temperature Alarm Setpoint, a **Low Temperature** alarm will be initiated. The alarm will remain active until the temperature rises above the Low Temperature Reset parameter value. The setpoints are user configurable with default values of -100 and -80 respectively (see Appendix Tables A-16 through A-20 starting on page 44 for parameter addressing for your device).

Lost Differential Pressure Alarm (EFM)

A **Lost Differential Pressure** alarm is generated when the differential pressure circuitry is pegged. This can occur if the differential pressure transmitter is defective, or disconnected from the analog board causing differential pressure readings to be above or below the range of the transducer.

Lost Pressure Alarm

A **Lost Pressure** alarm is generated when the pressure circuitry is pegged. This can occur if the pressure transducer is defective, or disconnected from the analog board causing pressure readings to be above or below the range of the transducer.

Lost Temperature Alarm

A **Lost Temperature** alarm is generated when the temperature circuitry is pegged. This can occur if the thermal (temperature) probe is defective, or disconnected from the analog board causing temperature readings to be above or below the range of the probe.

LowVlt Shutdown

If the supply voltage should fall and reaches approximately 6.0 volts, an interrupt will be triggered and the unit will enter Low Voltage (Critical) Shutdown mode. **Low batt** will be displayed on the display. This is an indication that the supply voltage is absolutely too low to operate the unit properly. The battery must be changed at this point or adequate supply voltage applied. In this mode, all operation ceased, and the unit operates in a protective mode. The on-board battery will continue to protect the unit's memory, therefore data prior to entering this mode will be maintained. The supply voltage is monitored constantly and the unit will reset itself should the supply voltage becomes greater than 6.0 volts. If the unit is left alone without applying adequate supply voltage, the battery will continue to drain and the outside display will eventually go blank.

When sufficient supply voltage is applied and the unit powers-up, a **LowVolt Shutdown** alarm will be recorded.

Open Door Alarm (Optional door ajar switch)

The **Open Door** alarm is initiated when the door of the 6000 opens. When this occurs, a full wake-up is triggered and the 6000 executes its processes. The alarm is inactive when the door is closed.

Software Error Alarm

If there is a fault in the software, the **Software Error** alarm will initiate.

Memory (History Logging)

The 6000 has a total of 96K (Main 64K bank and Auxiliary 32K bank) of RAM for database, audit trail, and history logging. With the large memory capacity, over 81,000 bytes of non-volatile memory is reserved for storing historical meter data. The non-editable history file provides the user with time-related data logged in any variation of selectable intervals: minute, daily, weekly, and monthly. An event-driven history mode allows data logging when an event occurs (e.g., alarms). The type of data and collection period can be defined by an experienced user with pcGas Host software. Since history data elements are stored in a memory block, the size has to be assigned at the time the history process is created in the device, typically when the database is downloaded at the factory.

NOTE

The size of the block **CANNOT** be changed once the history process has been created in the unit. A complete download would be required to reset the database and change the device's memory assignment.

The total number of records (entries) the device can log depends on the number of items you wish to log:

$$\# \text{ of Record} = \frac{81,000}{4 \times (\# \text{ of items to log} + 1)}$$

NOTE

Since there are two individual data banks, you may not be able to access all of the memory. The configuration must be optimized to utilize most or all of the memory.

Data may be collected over the telephone lines via the modem, on-site through the enclosure side connector (RS-232C serial port), and/or optionally through the optical port (Mtek Manager or pcGas Meter Reader software are required for collection). The collected data can then be used for:

1. Billing information
2. Measurement reports for utility and customer management.
3. System analysis using flow rate and pressure.
4. Support for estimating gas volume consumption in cases of meter or instrument malfunction.

Configuration Mode

Configuration mode allows you to set-up the 6000's initial configuration, change any of the operating parameter values, and set alarm conditions and limits. Virtual keypad, Mtek Manager software, pcGas Meter Reader software, or the optional external keypad and display is required to perform configuration.

Virtual Keypad or Optional External Keypad and Display Operation

To access any operating mode:

1. Wake-up the device.
2. Press the keypad key that corresponds to the mode you want (Fig. 2-1 on page 29)

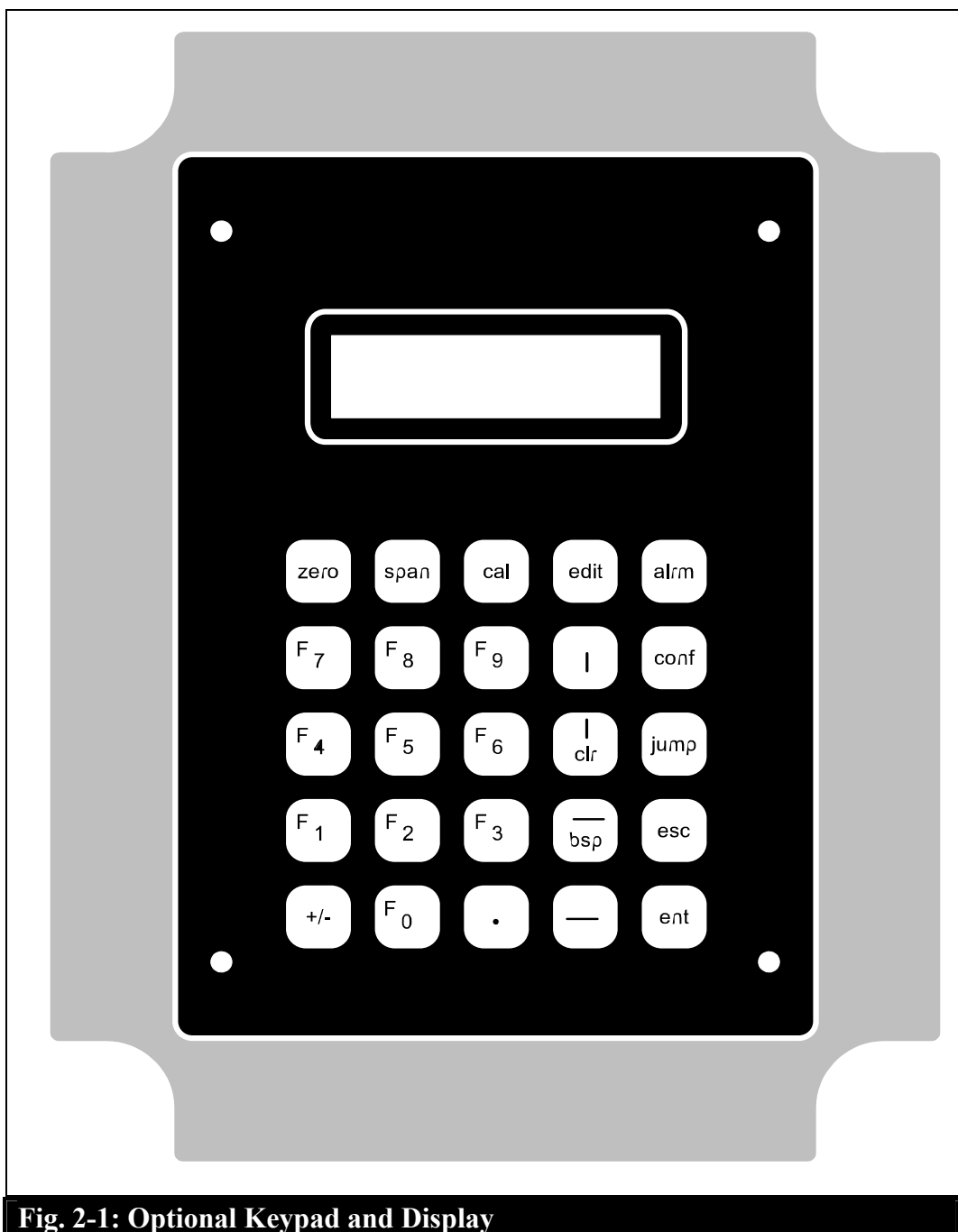
conf	for configuration mode
alm	for alarm mode
cal	for calibration mode
esc	to go back to the previous mode from any other mode

Pressing the ↑ and ↓ keys allow you to scroll through the parameter labels. You may use the **jump** key to directly view any of the assigned labels; press **jump**, then enter the label number, followed by pressing **ent**. You can use the function keys (**F0 - F9**) to view previously assigned parameters. (pcGas Meter Reader or Mtek Manager software lets you assign function keys and labels to any parameter.) To enter configuration mode, press **conf**. If configuration mode is password protected, the 6000 will display **ENTER PASSWORD?**. Only a valid password entry would then be given access to this mode. Configuration mode allows you to set-up the device's initial configuration, change any of the operating parameter values, set alarm conditions and limits, or assign function keys to a parameter. While in the configuration mode, the device continues to operate normally; it continues to collect pulses, sample live pressure and temperature values, calculate corrected volume,

and collect historical data.

Editing Parameters

1. Enter configuration mode by pressing **conf** (use the password if required).
2. Display the desired parameter: press **jump** followed by the address of the parameter, then press **ent** (see Appendix Tables A-6 through A-10 starting on page 39 and A-16 through A-20 starting on page 42 for the addresses for your device). The function keys can also be used to view an assigned parameter.
3. With the desired parameter displayed, press **edit**; the unit will display the current parameter value and prompt for a new value. Use the keypad to enter the correct value and then press **ent** to execute the change. Pressing **esc** when the device prompts for the new value will abort the process. Pressing **ent** if nothing has been typed, also leaves the parameter unchanged.



Assigning Function Keys

In configuration mode, any parameter can be assigned to a function key. To assign a function key:

1. Enter configuration mode by pressing **conf** (use the password, if required).
2. Display the desired parameter. Press **jump** followed by the address of the parameter, then press **ent** (see Appendix Tables A-16 through A-20 starting on page 42 for parameter addressing for your device).
3. Assign a function key to the parameter. Press **jump**, **edit**, and then the function key you wish to assign to the current item [**F0** - **F9**].

NOTE

There are pre-defined function keys for your device - see Appendix Tables A-6 through A-10 starting on page 39).

Audit Trail

The 6000 maintains an electronic audit trail file that records all parameter changes and calibrations performed on the unit. Each entry is identified with the date and time the event occurred. The contents of this file cannot be changed, providing a secure, non-editable audit trail.

In the standard 6000 configuration, the audit trail is disabled. You can enable audit trail logging using Metretek, Inc. software or editing the **Audit Trail Enable/Disable** parameter to **250** using the keypad and display.

NOTE

Once the audit trail is enabled, it cannot be disabled without downloading a new database with this feature disabled.

Once enabled, the device maintains the audit trail file with a maximum of 250 records. You can upload the information from the unit to a portable or host computer using Mtek Manager or pcGas Meter Reader software. Once the audit trail is full, the device will not allow any other changes to parameters; the audit trail must first be uploaded and reset by the host software.

Wake-Up on Pulse (Event Driven)

The 6000 EFC employs a wake-up on pulse (event driven wake-up) mode in which the unit can be configured to wake-up on a specified number of pulses (meter revolutions). During wake-up, pressure, temperature, and the rest of the analog channels are sampled, and the unit executes the processes and run calculations.

In this mode, the EFC should be configured to wake-up on the number of specified pulses along with a hourly wake-up to record history data. See Appendix Tables A-16 for the address of the **Wake Up On Pulse (event driven)** and **Wake Up Interval (Seconds)** parameters.

Analog Sampling

The 6000 has the ability to sample the dynamic analog input variable channels at intervals from 1-99 seconds. Once enabled, the unit samples pressure, temperature, case temperature, and the external 1-5 volts or 4-20 ma channels once for each selected interval.

NOTE

Battery voltage is NOT sampled at this rate.

The sample's minimum and maximum values are then checked against their corresponding High and Low Setpoints. If the device determines these conditions were exceeded, it "wakes up" and finds the average of all samples accumulated since the last process execution, displays this analog mean, and applies it to any necessary calculations.

To enable, set **Analog Sampling Rate** parameter to 1-99 seconds.

Example: A value of 1 will produce a 1 Hz (once per second) and a value of 10 a 10 Hz (once every 10 seconds) sampling rate. Set to 0 to disable.

NOTE

Analog sampling will impact battery life in battery operated systems. It is only recommended for AC or properly sized Solar power systems.

Special Key Combinations

There are a number of special key combinations that allow the user to view system information and perform certain tasks very easily. They are:

- F0** and **span** Displays the 6000 run (calculation) time. The unit must wake-up by itself at least once before a correct reading is displayed.
- and **cal** System information (ROM version, unit S/N, calculated Checksum)
- and **edit** Toggles keypad beeper on and off
- ent** and **zero** Power-down as soon as possible. The unit will not power down if the RS-232 serial cable is connected.
- +/-** and **zero** System Functions (requires password)

Assigning the number of displayed digits

The number of displayed digits for the parameters listed in Appendix Tables A-6 through A-10 are user-configurable. The total number of digits before and after the decimal point can be from 0 to 8. Mtek Manager or pcGas Meter Reader are required to change the number of displayed digits.

Viewing and Clearing Alarms

To enter alarm mode, press **alarm**. In this mode, you can view and acknowledge any alarm. If alarms are active, the unit will display the first alarm message. If there are more alarms, you can view them by pressing ↓. Repeatedly pressing ↓ cycles through the active alarm list.

Alarms can be acknowledged by pressing **ent** while a particular alarm message is displayed or by polling with Metretek, Inc. software.

Unless the parameter's limits are violated again, the unit will not include acknowledged alarms in its list the next time the user enters alarm mode. To exit alarm mode without acknowledging the alarm, simply press **esc**.

Calibration Mode

Calibration mode allows the user to calibrate the pressure transducer and temperature probe. While operating in the calibration mode, the 6000 continues to store pulses and periodically updates volume, pressure, and temperature data using the values measured when calibration mode was initially entered. Once in calibration mode, the user can perform the following operations:

1. Calibrate **zero** only.
2. Calibrate **span** only.
3. Calibrate both **zero** and **span**.

Of course, the option to change the calibration reference points is available at all times. Several other features make the software calibration routine attractive and more intuitive. In the 6000, unit calibration is software-based; there is no need for laborious operator adjustments. Software calibration does away with the need for repetitive potentiometer adjustments, thereby simplifying field calibration procedures.

In order to perform calibration, you will need a pressure source, temperature source, and accurate reference indicators. You will also need the Virtual keypad or the optional external keypad and display.

Calibrating the Pressure Transducer

NOTE

Pressing **esc** repeatedly from anywhere within the calibration procedure will back the operator out of calibration mode.

1. Display the line pressure by pressing **F3** or jumping to 030302.
2. Press **cal**. Enter your password at the optional **PASSWORD?** prompt, if required.

3. The unit will enter calibration mode. The display will alternate between **CALIBRATING** and the parameter label (**Pressure** for example).
4. Close the shut-off valve between the pressure source and the pressure transducer.
5. Open the pressure sensing line on the unit to the atmosphere, and wait until the line is fully vented and the reading is stable.
6. Press **zero**. The display now shows:

ZERO> XX.XXX
NEW?>

XX.XXX represents the unit's default zero value. If the current zero reference matches the unit's default, simply press **ent** to collect the new point. Otherwise, key in the value of the current reference before pressing **ent**. The unit should display **Calculating . . .** briefly, and then display the new point. Pressing **esc** instead of **ent** at this point aborts the operation and returns you to the calibration prompt.

7. Apply the span (full scale) reference to the pressure sensor and wait for the reading to stabilize
8. Press **span**. The unit now shows:

SPAN> XX.XXX
NEW?>

As with the zero point, if the external reference matches the default span value, simply press **ent**. Otherwise, key in the current value of the external reference, then press **ent**. After pressing **ent**, the display reading should immediately adjust to reflect the new calibration point. Pressing **esc** instead of **ent** at this point aborts the operation and returns the operator to the calibration prompt.

9. Steps 4 - 8 are required only once. They may be repeated as often as necessary while in calibration, but only the most recent point will be saved on completion of calibration.
10. To permanently store the results of the calibration press **ent**, and the unit will prompt **Enter to accept Calibration**. Simply press **ent** again to save the calibration. Press **esc** to abort the calibration.

Calibrating the Temperature Transducer

NOTE

Pressing **esc** repeatedly from anywhere within the calibration procedure will back the operator out of calibration mode.

1. Display the line temperature parameter by pressing **F4** or jumping to 020304.
2. Press **cal**. Enter your password at the optional **PASSWORD?** prompt, if required.
3. The unit will enter calibration mode. (The display will alternate between **CALIBRATING** and the parameter label (**Flow Temp** for example).
4. Place the unit's temperature probe into a bath of crushed ice. Stir the bath continuously and wait for the temperature reading to stabilize.
5. Press **zero**. The display now shows:

ZERO> XX.XXX
NEW?>

XX.XXX represents the unit's default zero value. If the current zero reference matches the unit's default, simply press **ent** to collect the new point. Otherwise, key in the value of the current reference before pressing **ent**. The unit should display **Calculating . . .** briefly, and then display the new point. Pressing **esc** instead of **ent** at this point aborts the operation and returns you to the calibration prompt.

6. Place the unit's temperature probe and precision thermometer into a high temperature bath. Do not exceed the maximum temperature (170° F). Wait for the bath reading to stabilize.

7. Press **span**. The unit now shows:

SPAN> XX.XXX
NEW?>

As with the zero point, if the external reference matches the default span value, simply press **ent**. Otherwise, key in the current value of the external reference, then press **ent**. After pressing **ent**, the display reading should immediately adjust to reflect the new calibration point. Pressing **esc** instead of **ent** at this point aborts the operation and returns the operator to the calibration prompt.

8. Steps 4 - 7 are required only once. They may be repeated as often as necessary while in calibration, but only the most recent point will be saved on completion of calibration.
9. To permanently store the results of the calibration press **ent**, and the unit will prompt **Enter to accept Calibration**. Simply press **ent** again to save the calibration. Press **esc** to abort the calibration.

Calibrating the Differential Pressure Transmitter (EFM Only)

NOTE

Pressing **esc** repeatedly from anywhere within the calibration procedure will back the operator out of calibration mode.

1. Display the differential pressure by pressing **F8** or jumping to 040302.
2. Press **cal**. Enter your password at the optional **PASSWORD?** prompt, if required.
3. The unit will enter calibration mode. The display will alternate between **CALIBRATING** and the parameter label (**Diff Press "H20** for example).
4. Open both pressure connection valves.
5. Open bypass valve and close both high pressure and low pressure transmitter connection valves on manifold.
6. Slowly open the high pressure transmitter connection valve and allow the transmitter's output to stabilize.
7. Press **zero**. The display now shows:

ZERO> XX.XXX
NEW?>

XX.XXX represents the unit's default zero value. If the current zero reference matches the unit's default, simply press **ent** to collect the new point. Otherwise, key in the value of the current reference before pressing **ent**. The unit should display **Calculating . . .** briefly, and then display the new point. Pressing **esc** instead of **ent** at this point aborts the operation and returns you to the calibration prompt.

8. Apply the span (full scale) reference to the differential pressure sensor and wait for the reading to stabilize

9. Press **span**. The unit now shows:

SPAN> XX.XXX
NEW?>

As with the zero point, if the external reference matches the default span value, simply press **ent**. Otherwise, key in the current value of the external reference, then press **ent**. After pressing **ent**, the display reading should immediately adjust to reflect the new calibration point. Pressing **esc** instead of **ent** at this point aborts the operation and returns the operator to the calibration prompt.

10. Steps 5 - 9 are required only once. They may be repeated as often as necessary while in calibration, but only the most recent point will be saved on completion of calibration.
11. To permanently store the results of the calibration press **ent**, and the unit will prompt **Enter to accept Calibration**. Simply press **ent** again to save the calibration. Press **esc** to abort the calibration.
12. Confirm that the bypass valve is open.
13. Slowly open the high pressure valve.
14. Open the low pressure valve.
15. Close the bypass valve.

SECTION 3 : OPTIONAL EQUIPMENT

Analog Output (AO) Option

The Analog Output Module (part # 1019-0010B-002) provides a two-wire, loop-powered, optically-isolated, precision 4-20mA output. This module interfaces with the 6000 series product line to provide a 4-20mA output for flow rate, pressure, or numerous other control and monitoring applications. Up to two modules can be installed in the 6000 in place of the batteries.

Power for the digital interface section of the AO is selectable by using the DIP switches, and can be supplied by Vcc of the 6000 or from the main supply voltage. The AO module interfaces to an 6000 series product via the standard I²C serial interface bus. The 6000 unit requests the desired mA output from the AO module using this bus. An I²C digital I/O chip is used to send the information to the analog output section of the AO board.

The analog output section of the board derives its power from the current loop, and is optically isolated from the digital control interface section. The analog output section receives commands from the digital I/O chip through opto-isolators. Commands are in the form of a serial data stream. The AO module provides 4-20mA output signals with a resolution of 1 part in 65536 (16 bit), or 0.00024mA. The D/A also allows for over-ranging of the output to a minimum of 3.5mA and a maximum of 24mA. The field interface to the D/A is a simple two-wire connection. Reverse polarity protection is provided.

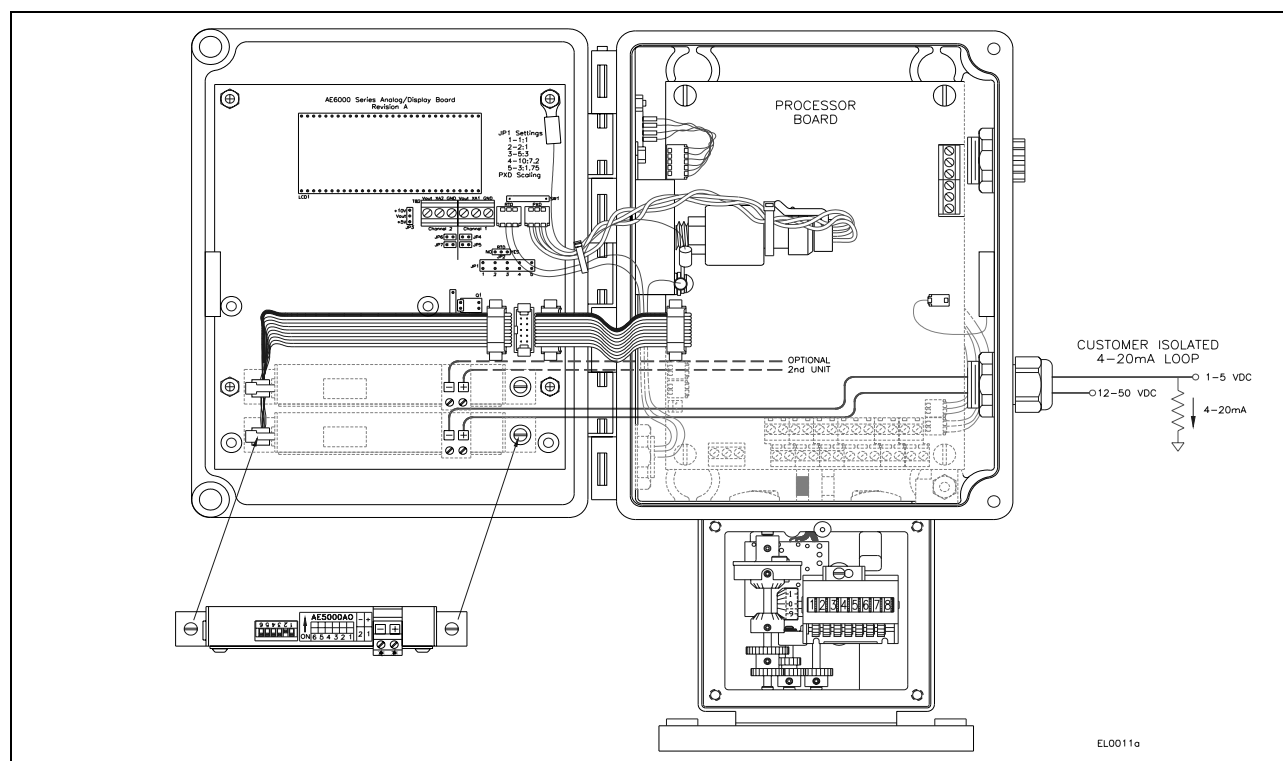


Fig. 3-1 : Analog Output Option

6000 Analog Output Specifications

Environmental

Operating Temperature	-40°F to +160°F
Operating Humidity	0 to 100%

Electrical Isolation

500 V DC or AC RMS (sine wave) between digital interface and 4-20 mA loop.

Current Loop Output

Maximum Output Current	24mA
Minimum Output Current	3.5mA
Maximum Supply Voltage	50V
Minimum Supply Voltage	8V
Resolution	16 bits, 0.00024 mA
Full Scale %Error (software calibrated at 4 and 20 mA and tested at room temperature)	±0.01% max
Temperature Drift	±0.00044 mA/°F max
Error caused by RFI	<1% of span shift with 2.8W 150MHz applied at 1.7'

Installing the Analog Output Loop

The external wiring to the AO module is very simple. A ribbon cable connects the AO module to the display / analog board. Commands are sent to the module via the cable by the 6000 device. The 4-20mA current loop is a simple two-wire connection. +24 volts DC nominal is connected to the “+” terminal (pos. 1) and the “-”, or return terminal (pos. 2), is connected to the field instrument to which the 4-20mA signal is being sent.

Calibrating the Analog Output

Several features make the Analog Output software calibration routine attractive and more intuitive. In the 6000 device, unit calibration can be software-based; there is no need for laborious operator adjustments. Software calibration does away with the need for repetitive potentiometer adjustments, thereby simplifying field calibration procedures. The display / keypad or Virtual Keypad software are necessary to perform Software calibration.

NOTE

Pressing **esc** repeatedly from anywhere within the calibration procedure will back the operator out of calibration mode.

1. Display the Analog Output parameter on the inside display. The common function key assignment for **Analog Output #1** is **F6**, and **F7** for **Analog Output #2**.
2. Press **cal**. Enter your password at the optional **PASSWORD?** prompt, if required.
3. The unit will enter calibration mode and the display will show the current value and mA representation of the analog output signal. For example,

Eng: 48.000

mA: 11.680

where **48.000** is the analog output reading representing **11.680** mA. The top line will alternate between four different readouts **Eng: 48.000**, **UP/DN TO CHANGE**, **CALIBRATING**, and the parameter label (**Analog Output #1** in this case), while the bottom line will always show the mA value.

4. Connect a multimeter in series with the loop to measure the current. The field instrument which the loop is driving can also be used to read the output if desired.
5. Pressing \uparrow will increment the output current to represent 0%, 25%, 50%, 75%, & 100% of the analog output parameter to check the calibration. Pressing \downarrow will decrement the output current. Therefore, 0% = 4mA, 25% = 8mA, 50% = 12mA, 75% = 16mA, & 100% = 20mA.
6. If adjustments are needed, press **zero**. The display now shows:

zero: x.xxx
04.000 +y.yyy mA

x.xxx represents the default zero value (low scale) and **y.yyy** is the adjustment made to 4mA for the analog output signal. The adjustment can either be positive or negative shown by + or - respectively. The top line will alternate between **zero: x.xxx** and **UP/DN TO ADJUST**. This is the zero adjusted value to calibrate the analog output to 4mA.

7. Press \uparrow or \downarrow to increase or decrease the output until the meter reads 4mA or the current zero reference matches the field equipment. Press **ent** to collect the new point.
8. Press **span**. The display shows:

span: x.xxx
20.000 +y.yyy mA

x.xxx represents the default span value (full scale) and **y.yyy** is the adjustment made to 20mA for the analog output signal. The adjustment can either be positive or negative shown by + or -

respectively. The top line will alternate between **span: x.xxx** and **UP/DN TO ADJUST**. This is the span adjusted value to calibrate the analog output to 20mA.

9. Press \uparrow or \downarrow to increase or decrease the output until the meter reads 20mA or the current span reference matches the field equipment. Press **ent** to collect the new point.
10. Steps 5 - 9 are required only once. They may be repeated as often as necessary while in calibration, but only the most recent point will be saved on completion of calibration.
11. To permanently store the results of the calibration press **ent**, and the unit will prompt **Enter to accept Calibration**. Simply press **ent** again to save the calibration. Press **esc** to abort the calibration.

SECTION 4 : MAINTENANCE

As with any device based on solid-state electronics, actual maintenance of the 6000 should be minimal. However, there are certain guidelines that, if followed, will minimize device failure and increase the product's service life.

Enclosure Maintenance

Enclosure maintenance is a program of routine inspections to insure the integrity of the lid's seal and the various ports in the box's exterior. Excess moisture can ruin an 6000 if allowed to accumulate within the enclosure. Although the circuit boards themselves are conformal coated to protect against humidity, the wiring interconnections and various exposed metal surfaces are susceptible to corrosion in extreme cases of interior humidity. Here are some checks you should periodically make of the enclosure:

1. Ensure the unit's mounting arrangement is secure and provides a stable platform for termination of the pressure tubing.
2. Verify the integrity of the enclosure lid seal. Check the lid gasket for deterioration, chemical damage, tears, or compression.
3. Check for damaged cord grips and missing or damaged RS-232C port caps. Liquid must not be allowed to accumulate within the interior of the enclosure.
4. Examine the RS-232C port. Ensure the port's mounting screws are secure and provide firm support when attaching a serial cable.

Changing the Battery

To replace the battery in the unit:

1. Open the front door by loosening the upper and lower right hand corner screws of the device enclosure and swinging the door out (see Fig 1-1 and 1-2 on page 6).
2. Attach the new battery to connector BATT 1 or BATT 2 (see Fig. 1-3 on page 8).
3. Disconnect the old battery from the other connector in the unit.
4. Press any key to wake-up the unit and verify that it is fully operational.

Calibration

Calibration is a crucial element of any scheduled maintenance program. However, because of the unit's design, software calibration does away with the need for laborious adjustments, simplifying field calibration. See the section on Calibration for more details.

SECTION 5 : SOFTWARE PACKAGES

Important Note: pcGas Meter Reader and pcGas Customer Monitor applications are DOS based programs. They are available for a one-time charge but are sold 'as is' and are not being changed or upgraded in any way by Metretek. While these programs may be of value to certain users, Metretek makes no warranty as to their performance. Metretek strongly encourages the use of the MTEK Manager and DC2000 32 bit Windows™ applications.

pcGas Meter Reader Software

pcGas Meter Reader is a flexible, yet simple software package that allows personnel responsible for site-specific configuration or data collection to conveniently interact with the unit. pcGas Meter Reader can be purchased to interface with the unit, but does not replace pcGas Host software; a user cannot use it to download processes to an MTEK6000 with blank system memory. However, it does allow a convenient method of viewing and/or modifying general site-specific database information (most of which are shown in Appendix A).

Trend Graphics, and AutoPoll are standard features with pcGas Meter Reader. Manuals for Meter Reader and Meter Reader Utilities are provided with each registered copy of the program. Refer to these manuals for additional information.

pcGas Meter Utility Package

The pcGas Meter Reader Utility Package is supplied, upon request, with your unit. The utility package consists of the following:

- **Site I.D. Changer** - View or change the Site I.D. stored in the device.

- **Label Changer** - View and change label and function key definitions.
- **Virtual Keypad** - Emulates the keypad in the 6000 product. Can be used for configuration and calibration.

pcGas Customer Monitor

pcGas Customer Monitor lets personnel responsible for collecting data to conveniently interact with the unit. No data can be modified in the unit with this software - it only provides a convenient method of viewing and reading history data stored in the unit.

MTEK Manager

The MTEK Manager software is an integrated group of utilities designed for configuration and management of the MTEK6000 corrector as well as the AE5000/6000 product lines. The software utilizes MS Access™ compatible databases for all of its data, and is suitable for managing small groups of correctors.

Version 2.x is licensed for end-use pursuant to Metretek's standard licensing fees and terms. This package has all of the tools required to configure the flow calculation parameters, edit the labels and function keys, and adjust any other parameters that affect the way the corrector operates. It also has applets to view/acknowledge alarms, view audit trail entries, view real time data, and calibrate the unit. This software also has the ability to retrieve, view, and print the historical data from the correctors.

It also adds the ability to perform remote access using a dialup phone system. Included is an auto-polling application that can be used to schedule polls to the configured stations, as well as answer incoming calls. Data export to DC2000™ can also be automated after data is collected.

DC2000

The MTEK6000 is fully compatible with Metretek's DC2000. DC2000 is Metretek's flagship collection and management software system for energy data. DC2000's scalability and flexibility enables users to choose from a wide range of functions and data throughput configurations. This protects your investment by letting you continuously adapt your system to operate in proportion to your business needs. See your authorized Metretek representative for complete details on DC2000 capabilities and licensing terms.

APPENDIX A: PROCESS CONFIGURATION STANDARD

The 6000 uses Process configuration for database organization and management.

Table A-1: Process Listing for 6000 EFCV and EFCP

ID Name	Type
1 System	System
2 Analog Inputs	Extended Analog
3 Press Profile	Ext. 3D Profile
4 Counter Inputs	Counter
5 AGA-7 Meter	Turbine (AGA-7)
6 Avg Daily Press	Sum/Avg
7 Avg Daily Temp	Sum/Avg
8 Avg Hourly Press	Sum/Avg
9 Avg Hourly Temp	Sum/Avg
10 Min/Max Press	Min/Max
11 Min/Max Flow	Min/Max
12 Digital Status	Digital
13 Alarm Detector 1	Alarm
14 Alarm Detector 2	Alarm
15 Alarm Detector 3	Alarm
16 Alarm Detector 4	Alarm
17 Alarm Histories	History8
18 Daily Histories	History8
19 Hourly Histories	History8
20 Alarm Dialer	Auto Dialer
21 UnCorr Meter	Turbine (AGA-7)
22 Press Only Meter	Turbine (AGA-7)
23 Analog Output #1	Analog Output
24 Analog Output #2	Analog Output
25 EEPROM Settings	EEPROM

Table A-2: Process Listing for 6000 EFM

ID Name	Type
1 System	System
2 Analog Inputs	Extended Analog
3 Press Profile	Ext. 3D Profile
4 DP Profile	Ext. 3D Profile
5 AGA-3 Meter	Orifice (AGA-3)
6 Avg Daily Press	Sum/Avg
7 Avg Daily DP	Sum/Avg
8 Avg Daily Temp	Sum/Avg
9 Avg Hourly Press	Sum/Avg
10 Avg Hourly DP	Sum/Avg
11 Avg Hourly Temp	Sum/Avg
12 Min/Max Press	Min/Max
13 Min/Max Flow	Min/Max
14 Digital Status	Digital
15 Alarm Detector 1	Alarm
16 Alarm Detector 2	Alarm
17 Alarm Detector 3	Alarm
18 Alarm Detector 4	Alarm
19 Alarm Detector 5	Alarm
20 Alarm Histories	History8
21 Daily Histories	History8
22 Hourly Histories	History8
23 Alarm Dialer	Auto Dialer
24 Analog Output #1	Analog Output
25 Analog Output #2	Analog Output
26 EEPROM Settings	EEPROM

Table A-3: Process Listing for 6000 EPR

ID Name	Type
1 System	System
2 Analog Inputs	Extended Analog
3 Press Profile	Ext. 3D Profile
4 Avg Daily Press	Sum/Avg
5 Avg Hourly Press	Sum/Avg
6 Avg 1 Min Press	Sum/Avg
7 Min/Max Press	Min/Max
8 Digital Status	Digital
9 Alarm Detector 1	Alarm
10 Alarm Detector 2	Alarm
11 Violation Check	Pt. Control
12 Alarm Histories	History8
13 Daily Histories	History8
14 Hourly Histories	History8
15 10 Min Histories	History8
16 1 Min Histories	History8
17 Analog Output #1	Analog Output
18 Analog Output #2	Analog Output
19 Alarm Dialer	Auto Dialer
20 EEPROM Settings	EEPROM

Table A-4: Process Listing for 6000 ETR

ID Name	Type
1 System	System
2 Analog Inputs	Extended Analog
3 Avg Daily Temp	Sum/Avg
4 Avg Hourly Temp	Sum/Avg
5 Avg 1 Min Temp	Sum/Avg
6 Min/Max Temp	Min/Max
7 Digital Status	Digital
8 Alarm Detector 1	Alarm
9 Alarm Detector 2	Alarm
10 Violation Check	Pt. Control
11 Alarm Histories	History8
12 Daily Histories	History8
13 Hourly Histories	History8
14 10 Min Histories	History8
15 1 Min Histories	History8
16 Analog Output #1	Analog Output
17 Analog Output #2	Analog Output
18 Alarm Dialer	Auto Dialer
19 EEPROM Settings	EEPROM

Table A-5: Process Listing for 6000 EPTR

ID Name	Type
1 System	System
2 Analog Inputs	Extended Analog
3 Press Profile	Ext. 3D Profile
4 Avg Daily Press	Sum/Avg
5 Avg Hourly Press	Sum/Avg
6 Avg 1 Min Press	Sum/Avg
7 Avg Daily Temp	Sum/Avg
8 Avg Hourly Temp	Sum/Avg
9 Avg 1 Min Temp	Sum/Avg
10 Min/Max Pressure	Min/Max
11 Min/Max Temp	Min/Max
12 Digital Status	Digital
13 Alarm Detector 1	Alarm
14 Alarm Detector 2	Alarm
15 Alarm Detector 3	Alarm
16 Violation Check	Pt. Control
17 Alarm Histories	History8
18 Daily Histories	History8
19 Hourly Histories	History8
20 10 Min Histories	History8
21 1 Min Histories	History8
22 Analog Output #1	Analog Output
23 Analog Output #2	Analog Output
24 Alarm Dialer	Auto Dialer
25 EEPROM Settings	EEPROM

Table A-6: Standard display mode and function keys for 6000 EFCV and EFCP

Label I.D.	Description	Address
F1 1 CV	Corr Volume MCF	051102
F2 2 UV	Uncor Volume MCF	051108
F3 3 PR	PPressure PSG	030302
F4 4 FT	Flow Temp F	020304
5 FR	Flow Rate MCH	050302
6 UF	Uncorr Flow MCH	050306
7 CU	Cubic Unit/p CFP	050802
8 BP	Base Press PSA	050505
9 BT	Base Temp F	050506
10 FC	Flow Constant	050601
11 PD	Prev Day vol MCF	050903
12 CD	Curr Day vol MCF	050905
13 PS	Press Scale PSG	020402
F5 14 SV	Supply Volts VDC	020309
15 CT	Case Temp F	020302
16 PO	Pr Only vol MCF	221102
F6 17 AO	Analog Output #1	230302
18 AO	AOut Hi Scale #1	230402
19 AO	AOut Lo Scale #1	230403
F7 20 AO	Analog Output #2	240302
21 AO	AOut Hi Scale #2	240402
22 AO	AOut Lo Scale #2	240403
23 OD	Open Door status	120302
24 S1	Status input #1	120401
25 S2	Status input #2	120402

Table A-7: Standard display mode and function keys for 6000 EFM

Label I.D.	Description	Address
F1 1 CV	Corr Volume MCF	051102
F8 2 DP	Diff Press "H2O	040302
F3 3 PR	PPressure PSG	030302
F4 4 FT	Flow Temp F	020304
5 FR	Flow Rate MCH	050302
6 PD	Pipe Diameter IN	050607
7 OD	Orifice Diam IN	050608
8 BP	Base Press PSA	050505
9 BT	Base Temp F	050506
10 FC	Flow Constant	050601
11 PD	Prev Day vol MCF	050903
12 CD	Curr Day vol MCF	050905
13 PS	Press Scale PSG	020402
14 DS	Dp Scale "H2O	020405
F5 15 SV	Supply Volts DC	020309
16 CT	Case Temp F	020302
F6 17 AO	Analog Output #1	240302
18 AO	AOut Hi Scale #1	240402
19 AO	AOut Lo Scale #1	240403
F7 20 AO	Analog Output #2	250302
21 AO	AOut Hi Scale #2	250402
22 AO	AOut Lo Scale #2	250403
23 OD	Open Door status	140302
24 S1	Status input #1	140401
25 S2	Status input #2	140402

Table A-8: Standard display mode and function keys for 6000 EPR

Label I.D.	Description	Address
F3 1 PR	PRESSURE PSG	030302
2 PS	Press Scale PSG	020402
3 HI	High press In al	090605
4 HO	High press Out al	090606
5 LI	Low press In al	090705
6 LO	Low press Out al	090706
F5 7 SV	Supply Volts DC	020309
8 CT	Case Temp F	020302
F6 9 AO	Analog Output #1	170302
10 AO	AOut Hi Scale #1	170402
11 AO	AOut Lo Scale #1	170403
F7 12 AO	Analog Output #2	180302
13 AO	AOut Hi Scale #2	180402
14 AO	AOut Lo Scale #2	180403
15 OD	Open Door status	080302
16 S1	Status input #1	080401
17 S2	Status input #2	080402

Table A-9: Standard display mode and function keys for 6000 ETR

Label I.D.	Description	Address
F4 1 FT	Flow Temp F	020304
2 HI	High temp In al	080605
3 HO	High temp Out al	080606
4 LI	Low temp In al	080705
5 LO	Low temp Out al	080706
F5 6 SV	Supply Volts DC	020309
7 CT	Case Temp F	020302
F6 8 AO	Analog Output #1	160302
9 AO	AOut Hi Scale #1	160402
10 AO	AOut Lo Scale #1	160403
F7 11 AO	Analog Output #2	170302
12 AO	AOut Hi Scale #2	170402
13 AO	AOut Lo Scale #2	170403
14 OD	Open Door status	070302
15 S1	Status input #1	070401
16 S2	Status input #2	070402

Table A-10: Standard display mode and function keys for 6000 EPTR

Label I.D.	Description	Address
F3 1 PR	PRESSURE PSG	030302
2 PS	Press Scale PSG	020402
3 HI	High press In al	140405
4 HO	High press Out al	140406
5 LI	Low press In al	140505
6 LO	Low press Out al	140506
F4 7 FT	Flow Temp F	020304
8 HI	High temp In al	140605
9 HO	High temp Out al	140606
10 LI	Low temp In al	140705
11 LO	Low temp Out al	140706
F5 12 SV	Supply Volts DC	020309
13 CT	Case Temp F	020302
F6 14 AO	Analog Output #1	220302
15 AO	AOut Hi Scale #1	220402
16 AO	AOut Lo Scale #1	220403
F7 17 AO	Analog Output #2	230302
18 AO	AOut Hi Scale #2	230402
19 AO	AOut Lo Scale #2	230403
20 OD	Open Door status	120302
21 S1	Status input #1	120401
22 S2	Status input #2	120402

Table A-11: Standard alarms for 6000 EFCV and EFVP

Alarms	Alarm Code
First Time Power	130401
Low Supply Volts	130501
High Flow Rate	130601
Low Flow Rate	130701
High Pressure	140401
Low Pressure 140501	
Current Day Flow	140601
Faulty Counter	140701
*High Temperature	150401
*Low Temperature	150501
Lost Pressure	150601
*Lost Temperature	150701
LowVolt Shutdown	160401
Open Door	160501
Software Error	160601

*6000 EFCV only

Table A-12: Standard alarms for 6000 EFM

Alarms	Alarm Code
First Time Power	150401
Low Supply Volts	150501
High Flow Rate	150601
Low Flow Rate	150701
High Pressure	160401
Low Pressure 160501	
High Diff Pressure	160601
Low Diff Pressure	160701
High Temperature	170401
Low Temperature	170501
Current Day Flow	170601
Lost Pressure	180401
Lost Temperature	180501
Lost Diff Pressure	180601
LowVolt Shutdown	180701
Open Door	190401
Software Error	190501

Table A-13: Standard alarms for 6000 EPR

Alarms	Alarm Code
First Time Power	090401
Low Supply Volts	090501
High Pressure	090601
Low Pressure 090701	
Lost Pressure	100401
LowVolt Shutdown	100501
Open Door	100601
Software Error	100701

Table A-14: Standard alarms for 6000 ETR

Alarms	Alarm Code
First Time Power	080401
Low Supply Volts	080501
High Temperature	080601
Low Temperature	080701
Lost Temperature	090401
LowVolt Shutdown	090501
Open Door	090601
Software Error	090701

Table A-15: Standard alarms for 6000 EPTR

Alarms	Alarm Code
First Time Power	130401
Low Supply Volts	130501
High Pressure	130601
Low Pressure 130701	
High Temperature	140401
Low Temperature	140501
Lost Pressure	140601
Lost Temperature	140701
LowVolt Shutdown	150401
Open Door	150501
Software Error	150601

Table A-16: Common parameter addresses for 6000 EFCV & EFCP

Common Parameters		Addresses			
Alarm Pulse Output Enable / Disable	130203	140203	150203	160203	
Alarm Pulse Time (ms)	130204	140204	150204	160204	
Analog Sampling Rate (seconds)	010314				
Atmospheric Pressure	050509	210509	220509		
Audit Trail Logging Enable	010313				
Base Pressure	050505	210505	220505		
Base Temperature	050506	210506	220506		
Calibration Password	010308				
Configuration Password	010309				
Corrected Pulse Out Enable/Disable	050206				
Corrected Pulse Output - Cubic Unit Per Pulse	050208				
Corrected Volume	051103	051102	051101		
Corrected Volume (Pressure Only)	221103	221102	221101		
Corrected Volume & Flow Multiplier	050508	210508	220508		
Counter Fault Monitoring	040103				
Counter Input Mode (0=FormC, 1=FormA)	040501				
Cubic Unit Per Pulse In or Meter Drive	050802	210802	220802		
Current Day High Volume Alarm Setpoint	140605				
Current Day High Volume Reset	140606				
Date (Month, Day, Year)	010306				
Fixed Supercompressibility Value	050606		220606		
Flow Rate Update Interval	050704	210704	220704		
Flow Units	051003	211003	221003		
Gas Day Roll Time HHMM (Hours, Minutes)	050901	210901	220901	170208	
High Flow Rate Alarm Setpoint	130605				
High Flow Rate Alarm Reset	130606				
High Pressure Alarm Setpoint	140405				
High Pressure Alarm Reset	140406				
High Temperature Alarm Setpoint	150405				
High Temperature Alarm Reset	150406				
Low Flow Rate Alarm Setpoint	130705				
Low Flow Rate Alarm Reset	130706				
Low Pressure Alarm Setpoint	140505				
Low Pressure Alarm Reset	140506				
Low Temperature Alarm Setpoint	150505				
Low Temperature Alarm Reset	150506				
Low Supply Volts Alarm Setpoint	130505				
Low Supply Volts Alarm Reset	130506				
Meter Correction Factor	050507	210507	220507		
Percent CO2	050510	210510	220510		
Percent N2	050511	210511	220511		
Pressure Corrected Pulse Enable/Disable	220206				
Press. Corr. Pulse Output - Cubic Unit / Pulse	220208				
Site I.D.	010101				
Specific Gravity	050307	210307	220307		
Supercompressibility Calculated or Fixed	050203		220203		
Time HHMMSS (Hours, Minutes, Seconds)	010305				
Uncorrected Pulse Out Enable/Disable	210206				
Uncorrected Pulse Output - Cubic Unit per Pulse	210208				
Uncorrected Volume	051109	051108	051107		
Uncorrected Volume & Flow Multiplier	050210	210210	220210		
Volume Pulse Output High Time (ms)	250407				
Volume Pulse Output Low Time (ms)	250408				
Wake Up Interval (Seconds)	010303				
Wake Up On Pulse (event driven)		040601			

NOTE: See Appendix C for a description of these parameters

Table A-17: Common parameter addresses for 6000 EFM

Common Parameters		Addresses		
Alarm Pulse Output Enable / Disable		150203, 160203, 170203, 180203, 190203		
Alarm Pulse Time (ms)		150204, 160204, 170204, 180204, 190204		
Analog Sampling Rate (seconds)		010314		
Atmospheric Pressure		050509		
Audit Trail Logging Enable		010313		
Base Pressure		050505		
Base Temperature		050506		
Calibration Password		010308		
Configuration Password		010309		
Corrected Pulse Out Enable/Disable		050206		
Corrected Pulse Output - Cubic Unit Per Pulse		050208		
Corrected Volume		051103	051102	051101
Corrected Volume & Flow Multiplier		050508		
Current Day High Volume Alarm Setpoint		170605		
Current Day High Volume Reset		170606		
Date (Month, Day, Year)		010306		
Fixed Supercompressibility Value		050606		
Flow Units		051003		
Gas Day Roll Time HHMM (Hours, Minutes)		050901	210208	
High Differential Pressure Alarm Setpoint		160605		
High Differential Pressure Alarm Reset		160606		
High Flow Rate Alarm Setpoint		150605		
High Flow Rate Alarm Reset		150606		
High Pressure Alarm Setpoint		160405		
High Pressure Alarm Reset		160406		
High Temperature Alarm Setpoint		170405		
High Temperature Alarm Reset		170406		
Low Differential Pressure Alarm Setpoint		160705		
Low Differential Pressure Alarm Reset		160706		
Low Flow Rate Alarm Setpoint		150705		
Low Flow Rate Alarm Reset		150706		
Low Pressure Alarm Setpoint		160505		
Low Pressure Alarm Reset		160506		
Low Temperature Alarm Setpoint		170505		
Low Temperature Alarm Reset		170506		
Low Supply Volts Alarm Setpoint		150505		
Low Supply Volts Alarm Reset		150506		
Meter Correction Factor		050507		
Orifice Diameter	050608			
Percent CO ₂		050510		
Percent N ₂		050511		
Pipe Diameter		050607		
Power-down Time-out		010307		
Site I.D.		010101		
Specific Gravity		050307		
Supercompressibility Calculated or Fixed		050203		
Time HHMMSS (Hours, Minutes, Seconds)		010305		
Volume Pulse Output High Time (ms)		260407		
Volume Pulse Output Low Time (ms)		260408		
Wake Up Interval (Seconds)		010303		

NOTE: See Appendix C for a description of these parameters

Table A-18: Common parameter addresses for 6000 EPR

Common Parameters	Addresses	
Alarm Pulse Output Enable / Disable	090203	100203
Alarm Pulse Time (ms)	090204	100204
Analog Sampling Rate (seconds)	010314	
Audit Trail Logging Enable	010313	
Calibration Password	010308	
Configuration Password	010309	
Date (Month, Day, Year)	010306	
Gas Day Roll Time HHMM (Hours, Minutes)	130208	
High Pressure Alarm Setpoint	090605	
High Pressure Alarm Reset	090606	
Low Pressure Alarm Setpoint	090705	
Low Pressure Alarm Reset	090706	
Low Supply Volts Alarm Setpoint	090505	
Low Supply Volts Alarm Reset	090506	
Power-down Time-out	010307	
Site I.D.	010101	
Time HHMMSS (Hours, Minutes, Seconds)	010305	
Wake Up Interval (Seconds)	010303	110410
Wake Up Interval For Limit Viol (seconds)	110610	

NOTE: See Appendix C for a description of these parameters

Table A-19: Common parameter addresses for 6000 ETR

Common Parameters	Addresses	
Alarm Pulse Output Enable / Disable	080203	090203
Alarm Pulse Time (ms)	080204	090204
Analog Sampling Rate (seconds)	010314	
Audit Trail Logging Enable	010313	
Calibration Password	010308	
Configuration Password	010309	
Date (Month, Day, Year)	010306	
Gas Day Roll Time HHMM (Hours, Minutes)	120208	
High Temperature Alarm Setpoint	080605	
High Temperature Alarm Reset	080606	
Low Temperature Alarm Setpoint	080705	
Low Temperature Alarm Reset	080706	
Low Supply Volts Alarm Setpoint	080505	
Low Supply Volts Alarm Reset	080506	
Power-down Time-out	010307	
Site I.D.	010101	
Time HHMMSS (Hours, Minutes, Seconds)	010305	
Wake Up Interval (Seconds)	010303	100410
Wake Up Interval For Limit Viol (seconds)	100610	

NOTE: See Appendix C for a description of these parameters

Table A-20: Common parameter addresses for 6000 EPTR

Common Parameters	Addresses		
Alarm Pulse Output Enable / Disable	130203	140203	150203
Alarm Pulse Time (ms)	130204	140204	150204
Analog Sampling Rate (seconds)	010314		
Audit Trail Logging Enable	010313		
Calibration Password	010308		
Configuration Password	010309		
Date (Month, Day, Year)	010306		
Gas Day Roll Time HHMM (Hours, Minutes)	180208		
High Pressure Alarm Setpoint	140405		
High Pressure Alarm Reset	140406		
High Temperature Alarm Setpoint	140605		
High Temperature Alarm Reset	140606		
Low Pressure Alarm Setpoint	140505		
Low Pressure Alarm Reset	140506		
Low Temperature Alarm Setpoint	140705		
Low Temperature Alarm Reset	140706		
Low Supply Volts Alarm Setpoint	130505		
Low Supply Volts Alarm Reset	130506		
Power-down Time-out	010307		
Site I.D.	010101		
Time HHMMSS (Hours, Minutes, Seconds)	010305		
Wake Up Interval (Seconds)	010303	160410	
Wake Up Interval For Limit Viol (seconds)	160610		

NOTE: See Appendix C for a description of these parameters

Table A-21: Standard history data stored in the 6000 EFCV and EFCP

40 days of daily corrected volume
 40 days of daily uncorrected volume
 40 days of daily maximum flow rate
 40 days of daily minimum flow rate
 40 days of daily average pressure
 40 days of daily average temperature
 40 days of hourly corrected volume
 40 days of hourly uncorrected volume
 40 days of hourly average pressure
 40 days of hourly average temperature
 40 days of hourly instantaneous supply voltage (snapshots).
 40 days of hourly case temperature (snapshots)

Table A-22: Standard history data stored in the 6000 EFM

40 days of daily corrected volume
 40 days of daily differential pressure
 40 days of daily maximum flow rate
 40 days of daily minimum flow rate
 40 days of daily average pressure
 40 days of daily average differential pressure
 40 days of hourly corrected volume
 40 days of hourly average differential pressure
 40 days of hourly average pressure
 40 days of hourly average temperature
 40 days of hourly instantaneous supply voltage (snapshots).
 40 days of hourly case temperature (snapshots)

Table A-23: Standard history data stored in the 6000 EPR

40 days of daily average pressure
40 days of daily maximum pressure
40 days of daily minimum pressure
40 days of hourly average pressure
40 days of hourly instantaneous supply voltage (snapshots).
40 days of hourly case temperature (snapshots)
15 days of 10-minute pressure (snapshots)

Table A-24: Standard history data stored in the 6000 ETR

40 days of daily average temperature
40 days of daily maximum temperature
40 days of daily minimum temperature
40 days of hourly average temperature
40 days of hourly instantaneous supply voltage (snapshots).
40 days of hourly case temperature (snapshots)
15 days of 10-minute temperature (snapshots)

Table A-25: Standard history data stored in the 6000 EPTR

40 days of daily average pressure
40 days of daily maximum pressure
40 days of daily minimum pressure
40 days of daily average temperature
40 days of daily maximum temperature
40 days of daily minimum temperature
40 days of hourly average pressure
40 days of hourly average temperature
40 days of hourly instantaneous supply voltage (snapshots).
40 days of hourly case temperature (snapshots)
15 days of 10-minute pressure (snapshots)

Table A-26: Supercompressibility parameter addresses for 6000 EFCV and EFCP

Common Parameters	Addresses			Supercompressibility Method		
				NX-19	AGA-8 Method 1	AGA-8 Method 2
Atmospheric Pressure	050509	210509	220509	Yes	Yes	Yes
Base Pressure	050505	210505	220505	Yes	Yes	Yes
Base Temperature	050506	210506	220506	Yes	Yes	Yes
Percent CO ₂	050510	210510	220510	Yes	Yes	Yes
Percent N ₂	050511	210511	220511	Yes	No	Yes
Specific Gravity	050307	210307	220307	Yes	Yes	Yes
BTU Content	050514	210514	220514	No	Yes	No
TH Ref Heat Value	051206	211206	221206	No	Yes	No
TD Ref Heat Value	051207	211207	221207	No	Yes	No
PD Ref Molar Density	051208	211208	221208	No	Yes	No
TGR Ref Molar Density	051209	211209	221209	No	Yes	Yes
PGR Ref Molar Density	051210	211210	221210	No	Yes	Yes
% H ₂	051211	211211	221211	No	Yes	Yes
% CO	051212	211212	221212	No	Yes	Yes

NOTE: See Appendix C for a description of these parameters

Table A-27: Supercompressibility parameter addresses for 6000 EFM

Common Parameters	Addresses	Supercompressibility Method		
		NX-19	AGA-8 Method 1	AGA-8 Method 2
Atmospheric Pressure	050509	Yes	Yes	Yes
Base Pressure	050505	Yes	Yes	
Base Temperature	050506	Yes	Yes	Yes
Percent CO2	050510	Yes	Yes	Yes
Percent N2	050511	Yes	No	Yes
Specific Gravity	050307	Yes	Yes	Yes
BTU Content	050514	No	Yes	No
TH Ref Heat Value	051206	No	Yes	No
TD Ref Heat Value	051207	No	Yes	No
PD Ref Molar Density	051208	No	Yes	No
TGR Ref Molar Density	051209	No	Yes	Yes
PGR Ref Molar Density	051210	No	Yes	Yes
% H2	051211	No	Yes	Yes
% CO	051212	No	Yes	Yes

NOTE: See Appendix C for a description of these parameters

Table A-28 : 6000 EFCV & EFCP		Pulse	Out Wiring		
Terminal	Terminal Definition		Pulse Description	Address	Value
7 (NO1)	Normally open relay #1	}	Corrected Volume Pulse Output	050206	35.8
8 (COM1)	Common relay #1				
9 (NC1)	Normally closed relay #1				
4 (NO2)	Normally open relay #2	}	Alarm Pulse Output	130203	35.7
5 (COM2)	Common relay #2			140203	
6 (NC2)	Normally closed relay #2			150203	
				160203	
13 (NO3)	Normally open relay #3	}	Optional Pressure Corrected Volume Pulse Output	220206	35.3
14 (COM3)	Common relay #3				
15 (NC3)	Normally closed relay #3				
10 (NO4)	Normally open relay #4	}	Optional Uncorrected Volume Pulse Output	210206	35.2
11 (COM4)	Common relay #4				
12 (NC4)	Normally closed relay #4				

Table A-29: 6000 EFM		Pulse	Out Wiring		
Terminal	Terminal Definition		Pulse Description	Address	Value
7 (NO1)	Normally open relay #1	}	Corrected Volume Pulse Output	050206	35.8
8 (COM1)	Common relay #1				
9 (NC1)	Normally closed relay #1				
4 (NO2)	Normally open relay #2	}	Alarm Pulse Output	150203	35.7
5 (COM2)	Common relay #2			160203	
6 (NC2)	Normally closed relay #2			170203	
				180203	
				190203	
13 (NO3)	Normally open relay #3	}	Optional		35.3
14 (COM3)	Common relay #3				
15 (NC3)	Normally closed relay #3				
10 (NO4)	Normally open relay #4	}	Optional		35.2
11 (COM4)	Common relay #4				
12 (NC4)	Normally closed relay #4				

Table A-30: 6000 EPR				
Terminal	Terminal Definition	Pulse Description	Address	Value
7 (NO1)	Normally open relay #1	Spare		35.8
8 (COM1)	Common relay #1			
9 (NC1)	Normally closed relay #1			
4 (NO2)	Normally open relay #2	Alarm Pulse Output	090203 100203	35.7
5 (COM2)	Common relay #2			
6 (NC2)	Normally closed relay #2			
13 (NO3)	Normally open relay #3	Optional		35.3
14 (COM3)	Common relay #3			
15 (NC3)	Normally closed relay #3			
10 (NO4)	Normally open relay #4	Optional		35.2
11 (COM4)	Common relay #4			
12 (NC4)	Normally closed relay #4			

Table A-31: 6000 ETR				
Terminal	Terminal Definition	Pulse Description	Address	Value
7 (NO1)	Normally open relay #1	Spare		35.8
8 (COM1)	Common relay #1			
9 (NC1)	Normally closed relay #1			
4 (NO2)	Normally open relay #2	Alarm Pulse Output	080203 090203	35.7
5 (COM2)	Common relay #2			
6 (NC2)	Normally closed relay #2			
13 (NO3)	Normally open relay #3	Optional		35.3
14 (COM3)	Common relay #3			
15 (NC3)	Normally closed relay #3			
10 (NO4)	Normally open relay #4	Optional		35.2
11 (COM4)	Common relay #4			
12 (NC4)	Normally closed relay #4			

Table A-32:6000 EPTR Pulse Out Wiring				
Terminal	Terminal Definition	Pulse Description	Address	Value
7 (NO1)	Normally open relay #1	} Spare		35.8
8 (COM1)	Common relay #1			
9 (NC1)	Normally closed relay #1			
4 (NO2)	Normally open relay #2	} Alarm Pulse Output	130203	35.7
5 (COM2)	Common relay #2		140203	
6 (NC2)	Normally closed relay #2		150203	
13 (NO3)	Normally open relay #3	} Optional		35.3
14 (COM3)	Common relay #3			
15 (NC3)	Normally closed relay #3			
10 (NO4)	Normally open relay #4	} Optional		35.2
11 (COM4)	Common relay #4			
12 (NC4)	Normally closed relay #4			

APPENDIX B: CALCULATIONS

AGA-7 Volume Calculations

The 6000 EFC performs volume calculations based on the Ideal Gas Law. Boyle's Law is used for pressure and Charles's Law for temperature. These laws state that the volume of any definite weight of a perfect gas varies inversely with change in absolute pressure and directly with change in absolute temperature. The unit can perform such calculations for turbine, rotary, and diaphragm displacement meters.

$$V_c = V_u \times \frac{(P_m + P_a)}{P_b} \times \frac{T_b + 459.67}{T_m + 459.67} \times (F_{pv})^2$$

Where:

V_c = Volume corrected to base conditions

V_u = Uncorrected line volume

P_m = Measured line pressure (psig)

P_a = Atmospheric pressure

P_b = Base pressure

T_b = Base temperature ($^{\circ}\text{F}$)

T_m = Measured line temperature ($^{\circ}\text{F}$)

F_{pv} = Supercompressibility factor

The unit makes continuous correction for the specified gas composition based on actual sensed pressure and temperature.

NOTE

All of the AGA factors can be based on either flowing or constant values.

The supercompressibility factor can be calculated from either NX-19 or AGA-8 Gross Methods 1 and 2 reports and applied to the volume equation.

NX19 Supercompressibility Report

The EFC is configured with values for specific gravity, mol percent of N2 and CO2.

AGA-8 Supercompressibility Gross Method 1

The EFC is configured with values for BTU content, specific gravity and mol percent of CO2.

AGA-8 Supercompressibility Gross Method 2

The EFC is configured with values for specific gravity and mol percent of N2 and CO2.

**APPENDIX C:
PARAMETER DESCRIPTION**

The parameters relative to the operation and configuration of the 6000 are listed below (See Appendix Tables A-16 through A-20 for the addresses of these parameters).

Alarm Pulse Output Enable/Disable

The EFC can generate a generic pulse output on any alarm condition. This parameter enables the pulse output through Relay #2. Enter **35.7** to enable or **0.0** to disable. The Default value is **0**.

Alarm Pulse Time (ms)

This parameter sets the output band width in milliseconds (ms) for pulse outputs generated by an alarm condition. The user should take care in assigning a value for this parameter. The value should always be less than the Wakeup Interval Parameter, else the unit will stay awake for the duration of the pulse. Range 0 to 32,000 ms. The Default value is **70**.

Analog Sampling Rate (seconds)

This parameter sets the rate at which the unit will sample its dynamic analog input variable channels. When enabled, the unit samples pressure, temperature, case temperature and the external analog transmitters values once for each selected interval.

The sample's minimum and maximum values are then checked against their corresponding High and Low Setpoints. If the unit determines that these conditions were exceeded, it "wakes up" and finds the average of all samples accumulated since the last process execution, displays this analog mean, and applies it to any necessary subsequent calculation.

To enable analog sampling, set this parameter to 1-99 seconds. Set to 0 to disable analog sampling.

Atmospheric Pressure

If the station is configured for ABSOLUTE pressure, enter **0**. Enter the actual atmospheric pressure for GAUGE pressure. The default value is **14.4** for gauge and **0** for absolute.

Audit Trail Logging Enable

This parameter enables Audit Trail logging in the 6000. Examples of audit trail events include editing any item at the device, and logging the time it enters calibration mode. After the maximum number of events (250) have been logged, no more parameters can be changed in the unit until the audit trail is uploaded and reset by the pcGAS software. This parameter is disabled at the factory. The user may enable Audit Trail logging by entering **250**. Default value is **0** for disable.

NOTE

Once the audit trail is enabled, the user cannot disable it without reloading the database.

Base Pressure

The Base Pressure parameter appears as a factor in the Corrected Volume calculation. It is one of the factors used to correct the flowing volume, as registered by the meter itself, to the base volume used for billing purposes. The normal pressure ranges for this parameter are given below:

English	-	11.000 to 16.000 psi
Metric I	-	75.842 to 110.316 kPa
Metric II	-	0.832 to 1.210 kg/cm ²

The standard value for this parameter is 14.730 psia, 101.560 kPa, or 1.114 kg/cm², depending upon the system of units chosen for the particular device. Default value is **14.73**.

Base Temperature

The Base Temperature parameter appears as a factor in the Corrected Volume calculation. It is one of the factors used to correct the flowing volume, as registered by the meter itself, to the base volume used for billing purposes. The default value of this parameter is 60.000 degrees F for an English-based unit, or 15.556 degrees C for a metric-based unit. The Default value is **60**.

Calibrate Mode Time-out

The fractional portion of this parameter is the Calibrate Mode Time-out. It controls how long the unit will remain powered up in the calibration mode if no key is being pressed. For example, a calibration time-out of 30 minutes would be entered as XX.30. The default value is 60.30.

Calibration Password

A password can be entered to prevent unauthorized users from accessing calibration mode. The value may be up to six digits long (including the decimal point and sign). The Default value is **0**.

Configuration Password

A password can be entered to prevent unauthorized users from accessing configuration mode. The value may be up to six digits long (including the decimal point and sign). The Default value is **0**.

Corrected Pulse Output -Cubic Unit / Pulse

This parameter should reflect the value of the corrected pulse output sent from the station to an external device. For example, if each output pulse represents 1000 cubic feet, then this parameter should be set to 1000. The Default value is **1000**.

Corrected Pulse Out Enable/Disable

Corrected pulses can be sent to an external device by enabling the Pulse Output Channel. The rate at which pulses are generated is determined by the Corrected Pulse Out – CF

per Pulse parameter. To enable Relay #1 for pulse output, enter a value of **35.8**. Enter **-1** to disable. The Default value is **-1**.

Corrected Volume

The corrected volume is calculated based upon AGA report #7 or #8 and reflects the corrected volumetric flow taking the base conditions into consideration. The Default value is **0**.

Corrected Volume (Pressure Only)

The corrected volume is calculated based upon AGA report #7 and reflects the corrected volumetric flow taking only the Pressure base conditions into consideration. The temperature factors have no effect. The Default value is **0**.

Corrected Volume and Flow Multiplier

This multiplier specifies the output value for corrected volume and flow. For example, if the device is to measure flow in thousands of cubic feet (MCF), select Thousands (1000's) of units from the picklist. The Default value is **1000**.

Ten Thousands (10,000's) of units	10000
Thousands (1000's) of units	1000
Hundreds (100's) of units	100
Tens (10's) of units	10
Single (1's) units	1

Counter Fault Monitoring (EFC Only)

This parameter can be used to enable or disable fault monitoring on the main counter #1. Form C or 3-wire input is required for this function. In this mode, two working counters are monitored for discrepancies. A “Delta” value will be accumulated which reflects any discrepancies between the counters. If any of the dual-reed switches should be defective, and the “Delta” exceeds the Counter Fault Threshold parameter, the input pulses will automatically switch to either working single-ended counter. The EFC will generate a **Faulty Counter** alarm. To enable, set this parameter to **1** and to disable set to **0**. The default value is **0** for disable.

Cubic Unit/Pulse In or Meter Drive

This parameter determines the volume unit represented by one input pulse, and is normally set to equal the drive (CF/Rev) of the meter. Standard indexes produce one pulse per revolution; therefore, the CF/Pulse will equal the drive rate of the meter. The Default value is **1000**.

For instruments utilizing remote pulsing devices, this value can also be determined by dividing the CF/Rev of the meter by the number of pulses per revolution generated by the remote pulser.

For example: Consider a 3GT meter with a 100 CF/Rev drive and a 50 Pulse/Rev Imac Pulsamatic Transmitter. The CF/Pulse is determined as follows:

$$\begin{aligned}\text{CF/Pulse} &= 100 \text{ CF/Rev} * 1/50 \text{ Rev/Pulse} \\ &= 2 \text{ CF/Pulse}\end{aligned}$$

NOTE FOR METERS WITH 5 CF/REV DRIVE RATES:

Re-position the input compound gear to the correct position, and set this parameter to a value of 10. Refer to the instruction manual or contact Metretek, Inc. for assistance in positioning the compound gear.

Current Day High Volume Alarm Reset

After the Current Day's Total is exceeded, the setpoint at which the unit exits this condition is entered in this location. The Default value is **1,000,000**.

Current Day High Volume Alarm Setpoint

This parameter specifies the setpoint at which the unit determines whether the Current Day Flow Total is in an alarm condition. For transport or interruptible customers, this parameter can be used to alarm when an account has exceeded a predetermined daily volume allocation. The Default value is **999,990**.

Date (Month, Day, Year)

This is the current Date in the unit (MMDDYY). It is updated on each process scan.

Fixed Supercompressibility Value

If supercompressibility is Fixed, this parameter should be set to the desired fixed value. If supercompressibility is Calculated, any value entered will be ignored. The Default is **1**.

Flow Rate Update Interval (s)

This parameter determines how often the flow rate gets updated in the EFC. However, it has no control over Volume updates. Volume is updated every time the unit wakes up from the sleep mode or when the processes execute. It is of the form XXX.YYM where the integer portion (XXX) is the time interval in seconds before displaying a new flow rate. The digits after the decimal point (YYM) represent the period to wait without receiving pulses before generating a zero flow rate. The first two digits are minutes and the third digit (M) is fraction of a minute. A two-minute period would be entered as XXX.020, a ten-minute period as XXX.010 and a six-second period as XXX.002. The maximum allowed period is 27 minutes. The default value is **0.010**.

Flow Units

The flow units parameter reflects the time used to represent the flow rate. For example, if the flow rate represents cubic feet per hour, this parameter should be set to Hour. The Default value is **2**.

Minute	1
Hour	2
Day	3

Gas Day Roll Time HHMM (Hours, Minutes)

This item is used in Daily and Monthly history modes to determine when the gas day ends. The time is entered in military time. For example, a standard roll time of 8:00AM is entered as 800.0. The Range is 0 to 2359. The default value is **800**.

High Differential Pressure Alarm Setpoint

The setpoint at which the unit determines that there is a High Differential Pressure alarm condition. The Default value is **1500**.

High Differential Pressure Alarm Reset

After a High Differential Pressure alarm occurs, the setpoint at which the unit exits this condition is entered in this location. The Default value is **1480**.

High Flow Rate Alarm Reset

After a High Flow Rate alarm occurs, the setpoint at which the unit exits this condition is entered in this location. The Default value is **1,000,000**.

High Flow Rate Alarm Setpoint

The setpoint at which the unit determines that there is a High Flow Rate alarm condition. The Default value is **999,990**.

High Pressure Alarm Setpoint

The setpoint at which the unit determines that there is a High Pressure alarm condition. The Default value is **1500**.

High Pressure Alarm Reset

After a High Pressure alarm occurs, the setpoint at which the unit exits this condition is entered in this location. The Default value is **1480**.

High Temperature Alarm Reset

After a High Temperature alarm occurs, the setpoint at which the unit exits this condition is entered in this location. The Default value is **180**.

High Temperature Alarm Setpoint

The setpoint at which the unit determines that there is a High Temperature alarm condition. The Default value is **200**.

Low Differential Pressure Alarm Reset

After a Low Differential Pressure alarm occurs, the setpoint at which the unit exits this condition is entered in this location. The Default value is **-80**.

Low Differential Pressure Alarm Setpoint

The setpoint at which the unit determines that there is a Low Differential Pressure alarm condition. The Default value is **-100**.

Low Flow Rate Alarm Reset

After a Low Flow Rate alarm occurs, the setpoint at which the unit exits this condition is entered in this location. The Default value is **-80**.

Low Flow Rate Alarm Setpoint

The setpoint at which the unit determines that there is a Low Flow Rate alarm condition. The Default value is **-100**.

Low Pressure Alarm Reset

After a Low Pressure alarm occurs, the setpoint at which the unit exits this condition is entered in this location. The Default value is **-80**.

Low Pressure Alarm Setpoint

The setpoint at which the unit determines that there is a Low Pressure alarm condition. The Default value is **-100**.

Low Supply Voltage Alarm Reset

After a Low Supply Voltage alarm occurs, the setpoint at which the unit exits this condition is entered in this location. The Default is **8.0**.

Low Supply Voltage Alarm Setpoint

The setpoint at which the unit determines that there is a Low Supply Voltage alarm condition. The Default is **8.5**.

Low Temperature Alarm Reset

After a Low Temperature alarm occurs, the setpoint at which the unit exits this condition is entered in this location. The Default is **- 80**.

Low Temperature Alarm Setpoint

The setpoint at which the unit determines that there is a Low Temperature alarm condition. The Default is **-100**.

Meter Correction Factor

The Meter Correction Factor parameter will ordinarily be 1. The actual number is a ratio that indicates the measurement accuracy of the meter to which the device is attached. A setting of 1 indicates that the meter exhibits no measurement error. This parameter should not be changed from the default value of 1, unless the meter has been tested and its exact measurement error is known. The range is 0.95 to 1.05. The Default value is **1**.

Percent CO2

This parameter reflects the content of carbon dioxide (CO2) currently present in the gas. This number should be updated only after taking an analysis. If the content is unknown, a zero (0) should be entered. The Range is 0 to 100. The Default is **0**.

Percent N2

This parameter reflects the content of nitrogen (N2) currently present in the gas. This number should be updated only after taking an analysis. If the content is unknown, a zero (0) should be entered. The Range is 0 to 100. The Default is **0**.

Percent O2

This parameter reflects the content of oxygen (O2) currently present in the gas. This number should be updated only after taking an analysis. If the content is unknown, a zero (0) should be entered. The Range is 0 to 100. The Default is **0**.

Pressure Corrected Pulse Enable/Disable

Corrected (press only) pulses can be sent to an external device by enabling the Pulse Output Channel. The rate at which pulses are generated is determined by the Press. Corr. Pulse Output - CF per Pulse parameter. To enable Relay #3 for pulse output, enter a value of **35.3**. An optional relay is required for the pulse output. Enter **-1** to disable. The Default value is **-1**.

Press. Corr. Pulse Output - CF per Pulse

This parameter should reflect the value of the pressure (only) corrected pulse output sent from the station to an external device. For example, if each output pulse represents 1000 cubic feet, then this parameter should be set to 1000. The Default value is **1000**.

Site I.D.

The Site I.D. is unique to each device. It is the access code number that allows the user with a portable or Host computer to communicate with the unit. The Range is 1 to 65,535. The Default value is **1**.

Specific Gravity

Enter the specific gravity at the station. The Range is 0.554 and 1.000 inclusive. The Default value is **0.6**.

Supercompressibility Calculated or Fixed

This parameter is used to set the mode for supercompressibility calculations. If it is set to 0, then a new supercompressibility value will be calculated each time the process executes. If set to 1, the unit will use the value set in the Fixed Supercompressibility Value parameter for calculations. The Default value is **0**.

Time HHMMSS (Hours, Minutes, Seconds)

This is the current military time in the unit. It is updated on each process scan.

Uncorrected Pulse Out Enable/Disable

Uncorrected pulses can be sent to an external device by enabling the Pulse Output Channel. The rate at which pulses are generated is determined by the Uncorrected Pulse Output - CF per Pulse parameter. An optional relay is required for the pulse output. To enable Relay #4 for pulse output, enter a value of **35.2**. Enter **-1** to disable. The Default value is **-1**.

Uncorr Pulse Output - CF per Pulse

This parameter should reflect the value of the uncorrected pulse output from the station to an external device. For example, if each output pulse represents 1000 cubic feet, then this parameter should be set to 1000. The Default is **1000**.

Uncorrected Volume

The uncorrected index represents the total index volume registered by the station. When changing this number, you will normally enter the number which appears on the mechanical index attached to the station. The Default value is **0**.

Uncorrected Volume & Flow Multiplier

This multiplier specifies the output value for uncorrected volume and flow. For example, if the device is to measure flow in thousands of cubic feet (MCF), select Thousands (1000's) of units from the picklist. The Default value is **1000**.

Ten Thousands (10,000's) of units	10000
Thousands (1000's) of units	1000
Hundreds (100's) of units	100
Tens (10's) of units	10
Single (1's) units	1

Wake Up Interval (seconds)

This parameter specifies the time (in seconds) that the unit will wake up, execute the station processes and perform all calculations. Because the setting of this parameter directly affects battery life, care should be exercised to ensure that this item is set to the longest interval possible for satisfactory operation. The default values are as follow:

Battery or Solar unit

600 seconds - (Use if the unit powers up and down and the Wake up on pulse parameter (EFC only) is set to 0). The unit will wake up every 10 minutes execute the station processes and calculate a new flow rate.

3600 seconds - (Use if the Wake up on pulse parameter is not 0 to allow for history recording - EFC's only).

AC or Solar units

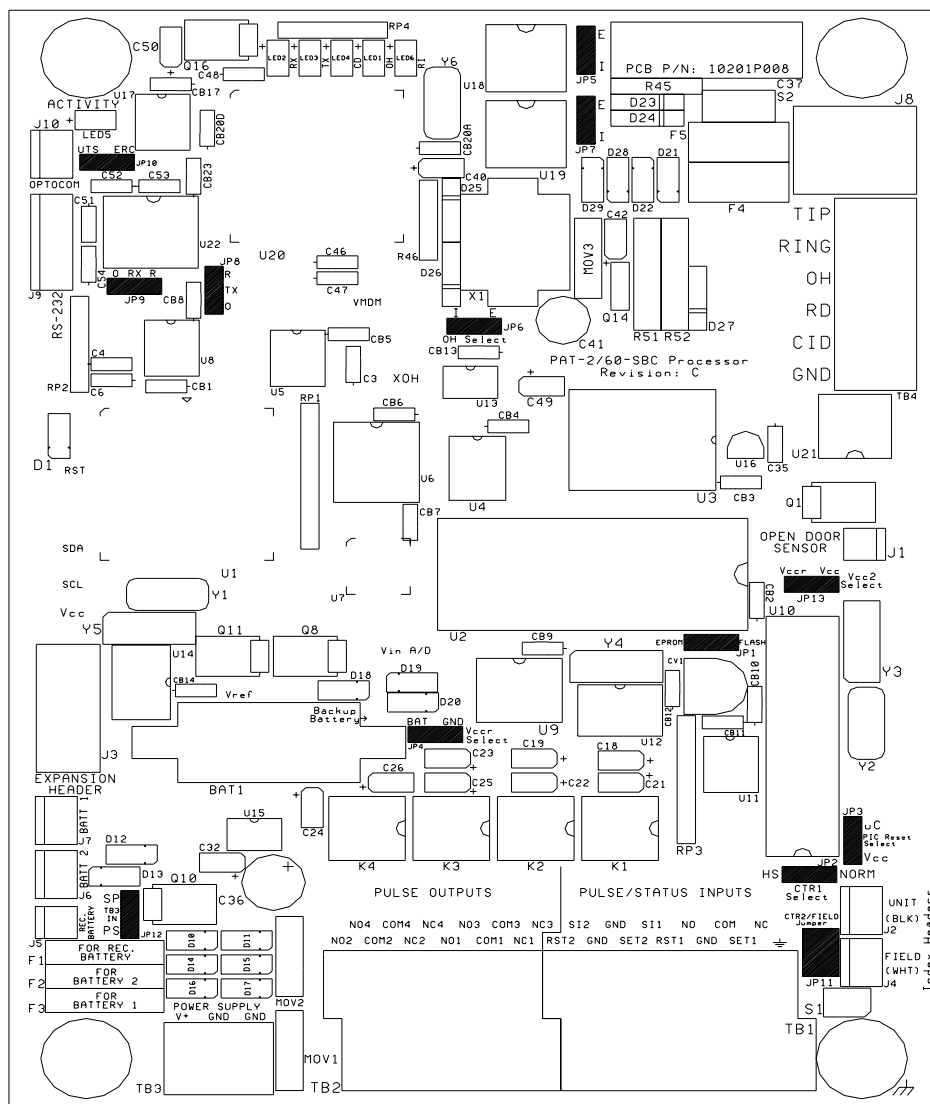
0 seconds - (Use if the unit is powered up at all times). Calculations will be performed on each process scan (approximately every 5.0 seconds).

Wake Up On Pulse - event driven (EFC)

If this parameter is greater than 0, the EFC will wake-up on the specified number of pulses (meter revolutions). During wake-up, pressure, temperature, and the rest of the analog channels are sampled, and the unit executes the processes and run calculations. It is disabled if set to 0. In this mode, the EFC should be configured to wake up on the number of pulses entered along with an hourly scheduled wake-up to record history data. Therefore, the wake up interval (seconds) parameter should be set to 3600. The Default value is **0**.

APPENDIX D : BOARD JUMPER POSITIONS

60-SBC Revision C – Processor Board



1. EEPROM/FLASH Selection

- JP1 ☐ EEPROM
JP1 ☐ FLASH

2. Counter 1 Mode

- JP2 ☐ Normal
JP2 ☐ High Speed (Note 1)

3. Backup Battery Disconnect

- JP4 ☐ Battery connected to RAM & Clock
JP4 ☐ Clear RAM & Clock

4. Phone Line Interface Selection

- JP5 ☐ JP7 ☐ Internal PLI
JP5 ☐ JP7 ☐ External PLI

5. Serial Port Mode Selection

- JP8 ☐ RS-232
JP8 ☐ OPTOCOM

6. OPTOCOM Receive Line

- JP10 ☐ Normal (ERC)
JP10 ☐ Inverted (UTS)

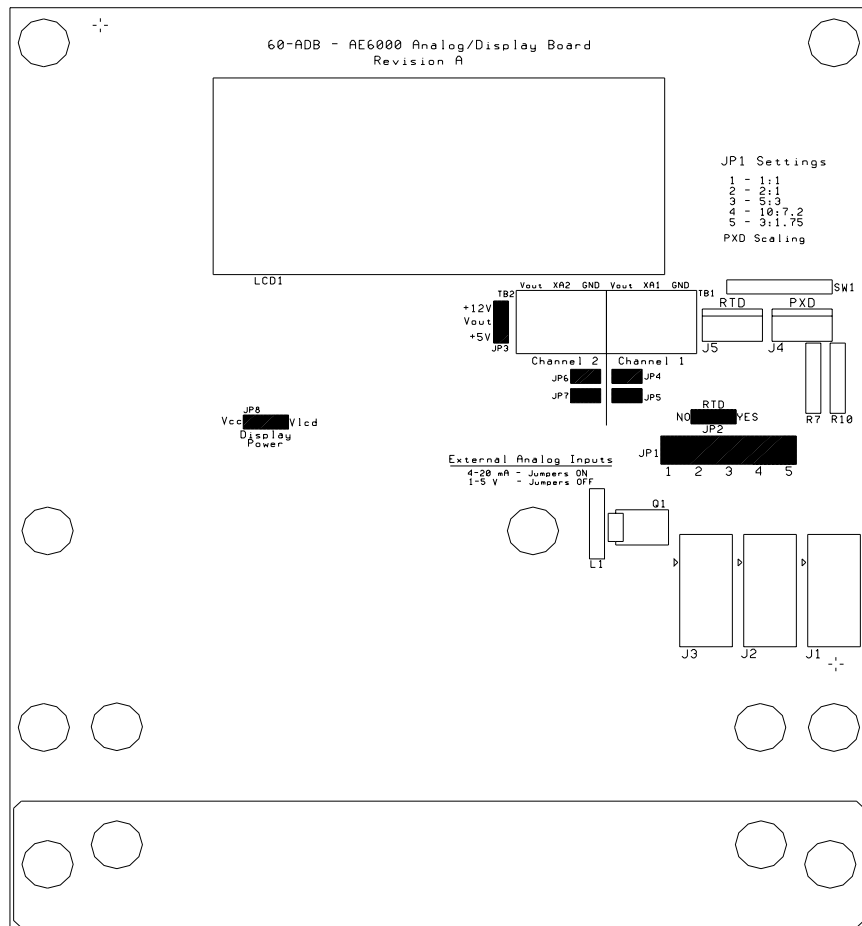
7. Power Terminal Input Option

- JP12 ☐ Power Supply
JP12 ☐ Solar Panel

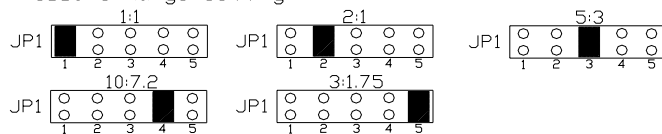
8. Counter 2 / Field Index Connection

- JP11 ☐ Field Index not connected to Counter 2 (Default)
JP11 ☐ Field Index connected to Counter 2

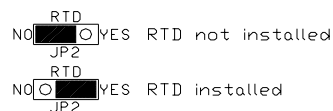
60-ADB Revision A – Analog / Display Board



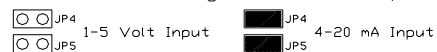
1. Pressure Range Setting



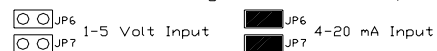
2. RTD Presence



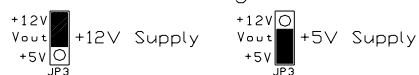
3. External Analog Channel 1 Input Selection



4. External Analog Channel 2 Input Selection

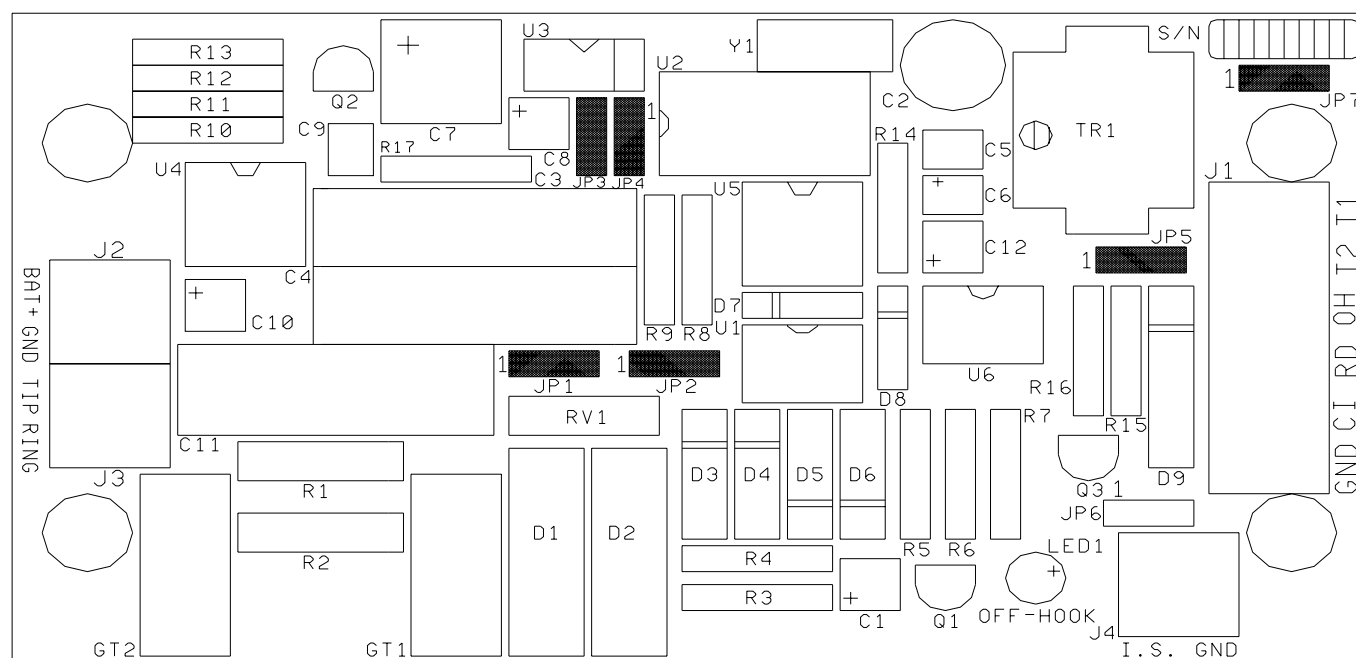


5. External Analog Power Selection




Note: JP8 is not installed



50-PLI Revision B - Phone Line Interface



1. PLI Configuration

- JP1, JP2, JP7  – Standard PLI configuration (default)
 – Surge protection only – no PLI function

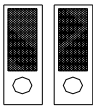
2. Barrier Configuration

- JP5  – PLI used without barriers
 – PLI used with barriers (default)

3. System Ground

- JP6  – System GND isolated from Earth GND
 – System GND connected to Earth GND

4. Default

- JP3 & JP4  – Default setting

**APPENDIX E : Certifications (CSA, UL
and FCC Drawings and Statements**

**CONSUMER INFORMATION AND FCC
REQUIREMENTS**

1. The Federal Communication commission (FCC) has established rules which permits this device to be directly connected to the telephone network. Standardized jacks are used for these connections. This equipment should not be used on party lines or coin lines.
2. If this device is malfunctioning, it may also be causing harm to the telephone network; this device should be disconnected until the source of the problem can be determined and unit repair as been made. If this is not done, the telephone company may temporarily disconnect service.
3. The telephone company may make changes in its technical operations and procedures. If such changes affect the compatibility or use of this device, the telephone company is required to give adequate notice of the changes.
4. If the telephone company requests information on what equipment is connected to its lines, inform them of:
 - (a) The telephone number that this unit is connected to
 - (b) The ringer equivalence number [0.6B]
 - (c) The USOC jack required [Not Applicable]
 - (d) The FCC Registration Number Pending

Items (b) and (d) are indicated on the label. The ringer equivalence number (REN) is used to determine how many devices can be connected to your telephone line. In most areas, the sum of the RENs of all devices on any line should not exceed five (5.0). If too many devices are attached, they may not ring properly.

Service Requirement

5. In the event of equipment malfunction, all repairs should be performed by our Company or an authorized agent. It is the responsibility of users requiring services to report the need for service to our Company or to one of our authorized agents.

Service can be obtained at:

Metretek, Inc.
300 North Drive,
Melbourne, Florida 32934
Telephone: (321)-259-9700

This device complies with Part 15 and Part 68 of the FCC Rules. Operation is subjected to the following two conditions:

[1] This device may not cause harmful Interference, and

[2] This device must accept any interference received, including interference that may cause undesired operations.

FCC Reg No: Pending
REN: 0.6B

