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Installation and Operating Instructions

Well Watcher™
Level Measurement & Control System

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Well Watcher™

Level Measurement & Control System



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Section 1 INTRODUCTION

1.1 System Description

The AMETEK Drexelbrook Well Watcher™ Level Measurement System consists of an AMETEK Drexelbrook Model CDM Controller with Digital Meter used with a AMETEK Drexelbrook Model 750 Series Submersible Transmitter to provide digital indication of liquid level.

Model 750 Series Submersible Level Transmitter is a solid state instrument designed for direct submergence in liquid for quick, accurate and reliable level measurements. The transmitter indicates the level of liquid by continuously measuring hydrostatic pressure via its sensing element, an ion implanted silicon chip consisting of a full Wheatstone bridge circuit used with a 316L stainless steel diaphragm to seal the element from corrosive fluids. It then transmits the level via a 4-20 mA output signal. All the electronics are mounted in a submersible 316 stainless steel housing protected by a removable snubnose threaded sensing port.

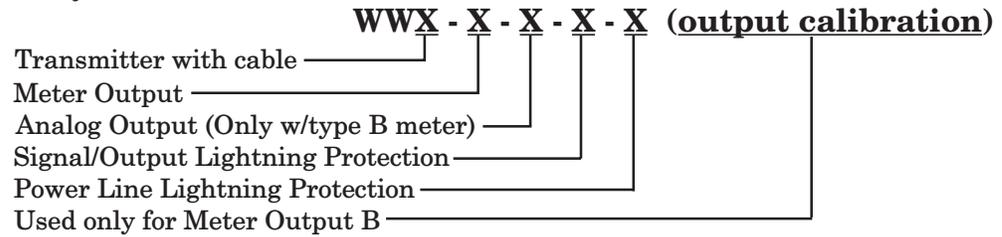
The electrical connection is a 3 wire, 20 gauge shielded waterproof cable which is vented at the surface end to reference atmospheric pressure. The cable support provides extra stability for longer lengths of cable or for use with agitated liquids.

Model CDM Controller with Digital Meter powers the transmitter with 24 Vdc, displays the level and has two relays, each with an adjustable high or low setpoint and hysteresis adjustment. The display provides a visual indication when setpoints are exceeded. Each setpoint actuates a Form A relay and can be programmed for NO (normally open) or NC (normally closed.) The relays provide on/off control of external control devices.

The optional analog output is adjustable over all or part of the display range via keypad setup. The analog output is proportional to the level measurement and can be used for external indicating, recording, and controlling; or with computing devices that accept analog signals.

1.2 Model Number

The system model number is



TRANSMITTER WITH CABLE

TRANSMITTER/DISPLAY RANGE	ATTACHED CABLE ¹
WWA = 0 to 14 ft (0 to 4.2M)	50 ft (16.2M)
WWB = 0 to 35 ft (0 to 10.5M)	75 ft (24.3M)
WWC = 0 to 69 ft (0 to 21.1M)	100 ft (32.4M)
WWD = 0 to 138 ft (0 to 42.2M)	200 ft (64.9M)
WWE = 0 to 230 ft (0 to 70.3M)	300 ft (97.3M)
WWF = 0 to 345 ft (0 to 105.4M)	425 ft (137.8M)
WWG = 0 to 460 ft (0 to 140.5M)	550 ft (178.4M)
WWH = 0 to 690 ft (0 to 211.0M)	750 ft (243.2M)

(1) Additional length of factory installed cable is available. Specify part #K515076 and additional length (feet) of cable required.

METER OUTPUT

- A = Two Relays
- B = Two Relays, Analog Output Specify Output & Calibrated Range²)
- C = Two Relays, RS232 Output

(2) Analog output from Type B meter will be set up and calibrated 4-20 mA for zero to full scale unless otherwise specified.

ANALOG OUTPUT

- 0 = None
- 1 = 0 to 20 mA
- 2 = 4 to 20 mA
- 3 = 0 to 10 Vdc
- 4 = 1 to 5 Vdc

LIGHTNING PROTECTION ON SIGNAL/OUTPUT LINES

- 0 = No Lightning Protection
- 1 = One Lightning & Surge Protector for Excitation/Signal Line, only between Meter & Level Transmitter
- 2 = One Lightning & Surge Protector for Analog Output Line, only between Meter & Receiving Instrument
- 3 = Two Lightning & Surge Protectors for Excitation/Signal Line & Analog Output Lines

LIGHTNING PROTECTION ON AC POWER LINE

- 0 = No Lightning Protection for Input Line to Meter
- 1 = Lightning & Surge Protector for 115 Vac Input Line to Meter
- 2 = Lightning & Surge Protector for 230 Vac Input Line to Meter

The standard Well Watcher™ Liquid Level measurement system consists of a 316SS, snub-nosed AMETEK 750 Series Submersible Transmitter with cable support, a fully calibrated microprocessor-based Controller/Meter in a NEMA 4X housing, and specified lengths of factory installed waterproof cable. Additional factory installed cable lengths are available, see note under *Transmitter with Cable*, above.

Section 2 INSTALLATION



Safety Information



Well Watcher™ is designed for use within installation Category II Environments as defined in IEC664: 1980/PD6499: -1981 and UL 873. This system is designed to prevent accidental shock to the operator when properly used. However, no design can insure the safety of an instrument improperly installed or used negligently. Read this manual carefully and completely before operating the instrument. Failure to read this manual in its entirety could result in damage to the instrument or injury to the operator.

To avoid possible shock hazard install in a grounded enclosure, prevent live parts being touched and ground the sensor sheath and housing. Follow wiring diagrams and local regulations. Installations where failure of this equipment may cause personal injury, property loss, equipment damage or financial loss, backup failsafe protection must be employed.

2.1 Unpacking & Inspection



Carefully remove the contents of the shipping carton and check each item against the packing list before destroying any packing material. If there is any shortage or damage, report it to the factory immediately.

The Well Watcher™ is calibrated with a specific Submersible Transmitter, and should be used only with the transmitter with which it was calibrated. The Transmitter Model Number is identified on the meter nameplate in the section labeled “USED WITH.”

Look for a correlation between the two instruments.

2.2 Operational Checkout

Before installing the Well Watcher™ Series 750 Transmitter, make sure the system is operating by doing a bench check.



WARNING:

Do not connect any wires while AC Power input is applied.



For temporary connections, refer to diagrams in **Wiring Section 2.4** of this manual. Connect AC power to the meter. Apply power and allow a five-minute warm-up.

With no pressure applied to the transmitter, the meter should display zero (or for “drawdown” the reading corresponding to the depth below ground level that the transmitter will be when installed.)

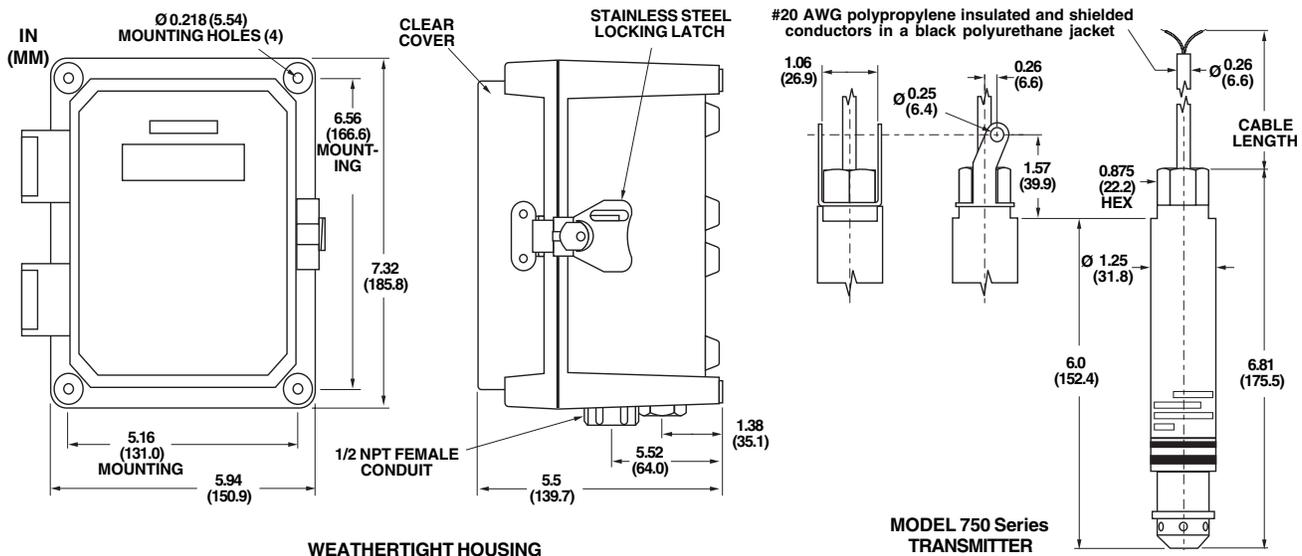
2.2 Operational Checkout (continued)

CAUTION: Do not simulate an increase in pressure by applying mechanical force to the sensing diaphragm of the transmitter. Excessive force will result in damage to or destruction of the transmitter.

When pressure is applied to the transmitter, the display should increase (or decrease if setup for “drawdown”), and then return to the original reading when pressure is removed. The Transmitter can be pressurized by lowering it into water or by applying air pressure from a calibration device. To apply air pressure unscrew the snubnose and replace it with a 1/2 “ NPT pressure fitting.

2.3 Mounting

2.3.1 Dimensions



2.3.2 Model 750 Series Transmitter

The Well Watcher™ Model 750 Series Transmitter can be suspended in a well or tank supported only by its attached shielded electrical cable. Ensure that the opening in the well or tank cover is large enough for possible future removal of the transmitter.

Additional support can be provided when the transmitter is being used under circumstances of excess stress, such as when submerged in agitated water or when suspended with electrical cable longer than 300 ft. The cable support feature on the transmitter provides this extra strain relief (see *Figure 2-1*).

2.3.2 Model 750 Series Transmitter (continued)

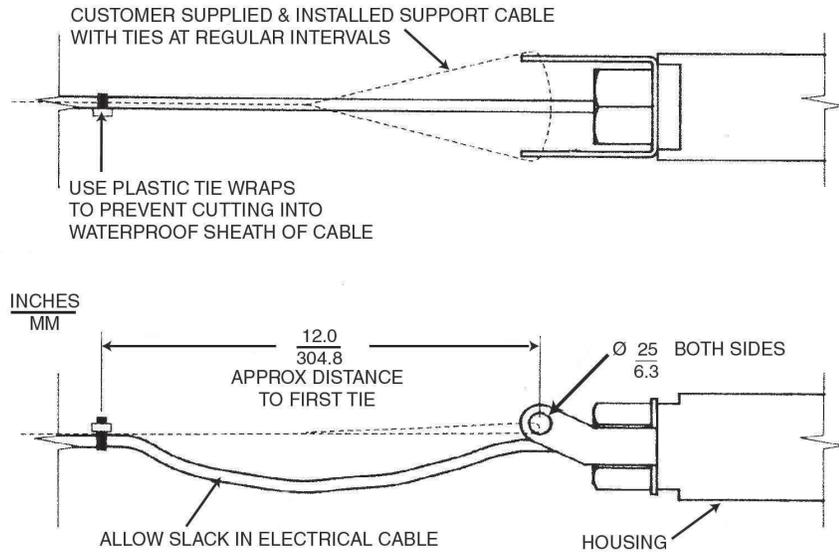


Figure 2-1

Transmitter Installation Considerations



CAUTION: The cable grommet is specially installed by factory-trained personnel to assure that it remains watertight. Any adjustment or removal of the grommet may destroy the watertight feature thus exposing the transmitter to water seepage, causing an electrical short and transmitter failure. Any adjustment or removal of the cable grommet voids the warranty.



CAUTION: The waterproof cable should not be kinked or nicked, which will allow water to seep into the cable and short out the transmitter.



CAUTION: The surface end of the cable should NOT be sealed since it references the transmitter to atmospheric pressure.



CAUTION: Do not allow transmitter to remain in liquid when it freezes solid. This will apply mechanical force to the sensing diaphragm of the transmitter. Excessive force will result in transmitter damage or destruction.

2.3.3 Well Watcher Controller/Meter

The meter/controller in the NEMA 4X housing can be mounted on a flat panel or wall with 4 #8 (4 mm) screws. 5/8" (15.9 mm) is captured by the housing.



NOTE: 1 3/8" (35 mm) of a 2" (50.8 mm) screw will be exposed.

2.3.4 Provide Signal Noise Isolation



The meter should not be mounted close to high current switching relays or in an enclosure containing such relays. Low voltage wiring (transmitter signal wires and analog output wires) should be separated from high voltage wiring (115, 230 & 440 Vac) and should be shielded.

2.4 Wiring

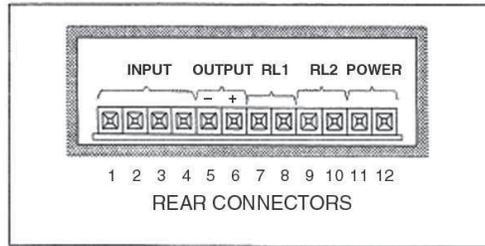


Figure 2-1
Meter Wiring Connectors



WARNING:

Do not connect any wires while AC Power input is applied.

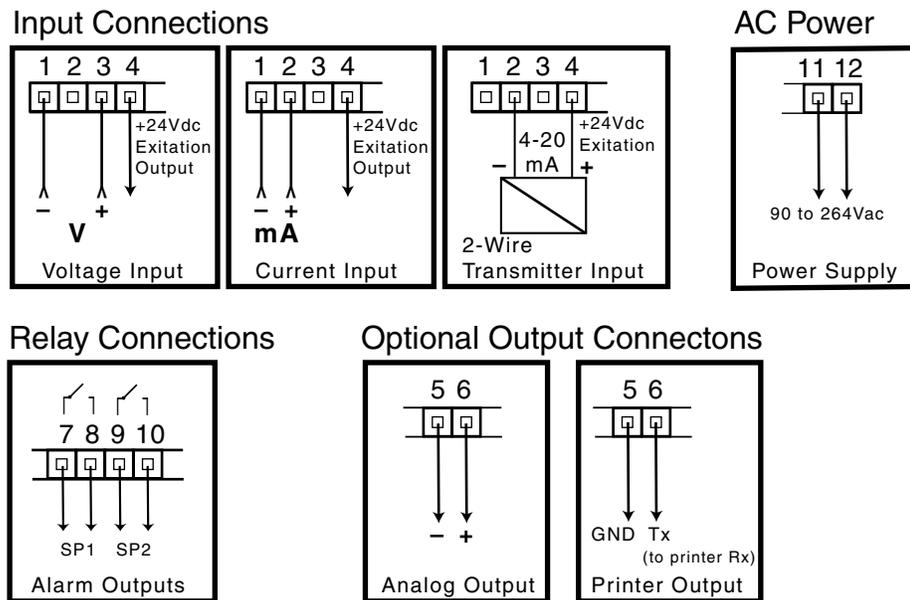


Figure 2-2
Each Connection To Meter

2.4.1 Surge Protection

Surge protectors are available as an option item (see **Parts & Accessories** in *Section 3* of this manual). It is strongly recommended to protect from secondary surges and lightning on outdoor installations. Install in accordance with the applicable drawing that is supplied with the surge protector and the following instructions:

2.4.1 Surge Protection (continued)



1. Lightning protection devices should be placed as close to the meter or transmitter as possible and wired in accordance with Local Electrical Codes in an approved watertight enclosure.
2. If the distance between the meter and transmitter, or meter and recorder is less than 100 ft., only one protector per line is needed.
3. Use No. 8 AWG ground wire or better from protector.
4. Keep ground wire less than one foot long and tie to a suitable ground rod or metal frame ground. Surge capability is only as good as the grounding method. **All ground connections must be installed.**
5. Install protectors in weathertight enclosures.
6. Run signal lines shielded and away from power lines.
7. Mount the fused switch panel as close to the meter as possible. Wire according to the Local Electrical Code.
8. Lead lines for 110 Vac and 220 Vdc protectors should be cut as short as practical.



CAUTION: This or any installation can not protect against a direct lightning strike, or secondary strikes of sufficient magnitude. AMETEK cannot accept liability for damage due to lightning or secondary surges.

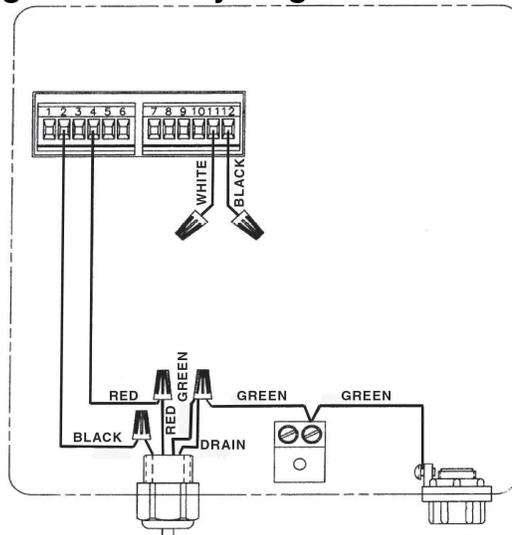


Figure 2-3
Wiring with NO lightning Protection Options

2.4.1 Surge Protection (continued)

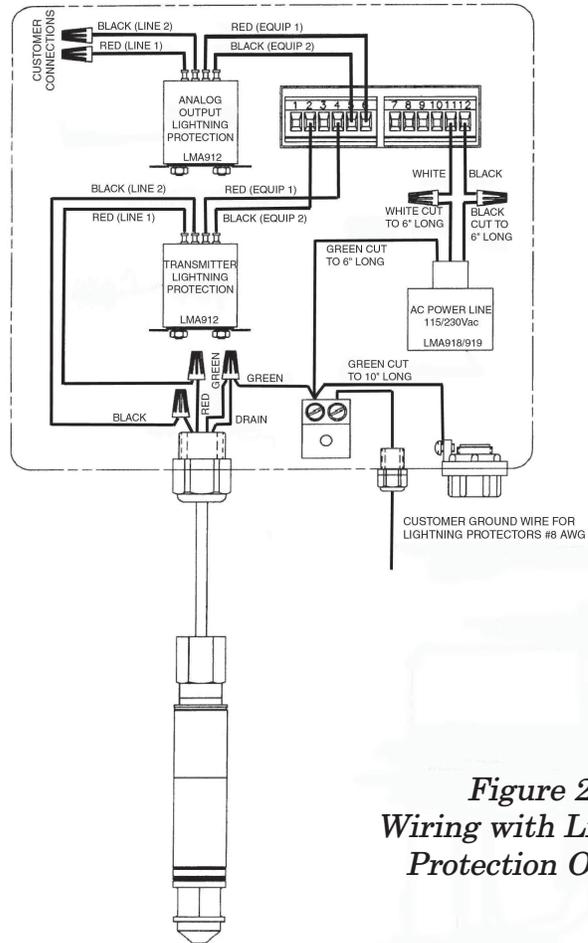


Figure 2-4
Wiring with Lightning
Protection Options

2.4.2 Lightning Protection Installation Concept

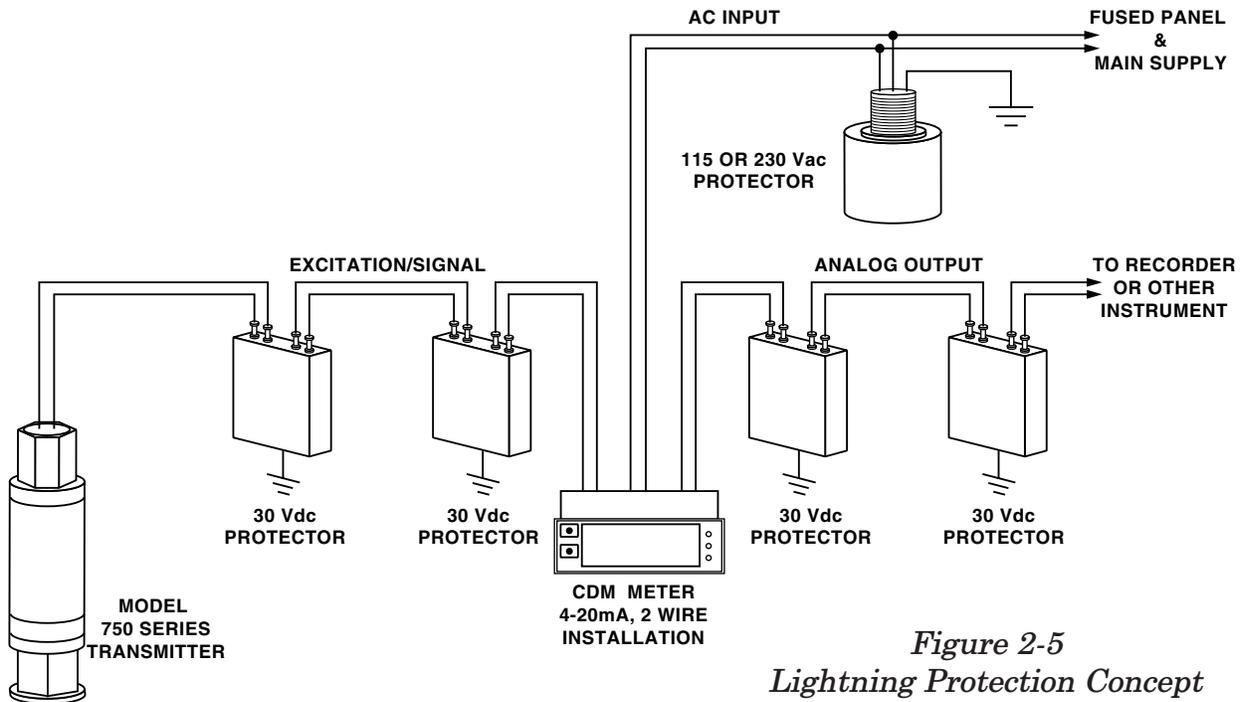


Figure 2-5
Lightning Protection Concept

2.4.2 Lightning Protection Installation Concept (continued)



1. Lightning protection devices should be placed as close to the instrument as possible.
2. If the distance between the meter and transmitter, or the meter and recorder is less than 100 ft., only 1 protector per line may be used.
3. This or any installation cannot protect against a direct lightning strike, or secondary strikes of sufficient magnitude. AMETEK Drexelbrook cannot accept responsibility for damage due to lightning or secondary surges.
4. Proper installation including grounding require detailed installation drawing. Consult factory.

2.5 Configuration

2.5.1 Display Concept

The display is a 4 digit LED displaying –1999 to 9999. There is a leading zero blanking control.

A selectable under-range and over-range limit forces the display to flash. This is over the full reading range.

2.5.2 Peak/Valley Display Concept

There are two independent memory storages. These can be set up for front key selection and reset. The capture width can be from 0.1 to 120 seconds.

2.5.3 Analog Output Concept

The optional analog output (0-20mA, 4-20mA, 0-10V or 1-5V) is adjustable over a user defined part of the reading via the keypad setup and can be referred to the reading or the peak/valley memory.

2.5.4 Setpoint Relays/Alarms Concept

Two Single Pole, Single Throw (SPST) relay outputs are programmable as high, low, or low with start-up disable alarm, on/off control with direct or reverse action; high or low deviation alarm and slope state detector alarm.

2.5.4 Setpoint Relays/Alarms Concept *(continued)*

The hysteresis is independently adjustable for each alarm from 0 to 8000 counts.

Alarm latching can be set for off, manual reset and fail-safe. The setpoint setting can be password protected.

To obtain maximum contact life, relay contacts should have arc suppression on the connector plug because no internal arc suppression is provided. Use 0.047 microfarad 500V ceramic disc in series with a 10 ohm, ½ Watt resistor.



NOTE:

The relays assume an NO (normally open) position when AC power is lost. Any control strategy should plan for power fail conditions.

Most applications require additional customer supplied relays, which are energized by the meter relay contacts and switch the electrical load.

2.5.5 Front Keys Function Selection Concept

The two front panel keys can have different functions determined by the user to perform one of several functions while in the normal measurement mode. These choices are programmed at the **Ky1**  and the **Ky2**  menus to be setup as desired, such as:

	
Alarm 1	Alarm 2
Alarm 1	Peak 1
Peak 1	Peak 2
Tare	Gross/Net
Alarm 1	Print
Peak 1	Print

*Table 2-1
Typical Front Panel
Key Functions*

When the printer output is not installed some key options are not shown. Tare and Gross/Net are used with weigh scale applications.

2.5.6 Keyboard Operation and Setup Considerations

2.5.6.1 Moving through the Menus

- a) Use the **↓** key to scroll down through the menus, scroll through a choice of parameters, or to set the intensified digit to the desired numerical value.
- b) Use the **▶** key to select a sub-menu, scroll to the next digit when entering a numerical value, save your choice of a parameter by pressing this key when the desired parameter is displayed, or to exit the setup mode press the **↵** key whenever the **End** prompt appears on the display.
e.g. To select one decimal point press the **↓** key when the display shows 999.9 under the **dECP** sub-menu.

2.5.6.2 Helpful Hints on using the Flow Chart

- a) The arrows on the flow chart match the arrow on the key that you need to press to go to the next step of the chart that you want.

EXAMPLE:

When you first enter the Setup mode the **Cal** prompt appears. At this time you may press either the **▶** key to go into the calibration sub-menu, or you may press the **↓** key to scroll down the main menu to the **Ky 1** prompt.

- b) Some of the prompts offer you one of two choices when you press the **▶** key to enter the parameter selection. You will be either choosing from a predefined list of parameters, or you will enter a numerical value. When it is a predefined list of parameters these are all listed in sequence on the flow chart, but when you need to enter a numerical value there is a short explanation of what the value will be controlling listed on the chart.

2.5.6.3 Entering a Numeric Value

- a) Whenever you select a prompt that requires a numeric value to be entered the farthest right hand digit will be lit brighter than the other digits (intensified).
- b) The value of this digit may be changed by pressing the **▶** key. Once the desired number is displayed; press the **▶** key to move over to the next digit (once moved, will now be intensified).

2.5.6.3 Entering a Numeric Value *(continued)*

c) When the farthest left digit is intensified and is displaying the desired number, press the key again and the prompt you first entered will be displayed.

d) If a mistake was made during entry press the key again to re-enter this parameter; otherwise press the key to scroll down to the next prompt.

EXAMPLE:

To enter the number 5000 at the **rdHI** prompt:

1. Press the key to enter the value, the display will show the previously entered value with the farthest right hand digit intensified.

2. Use the key to set this first digit to **0**; then press the key to go to next digit.

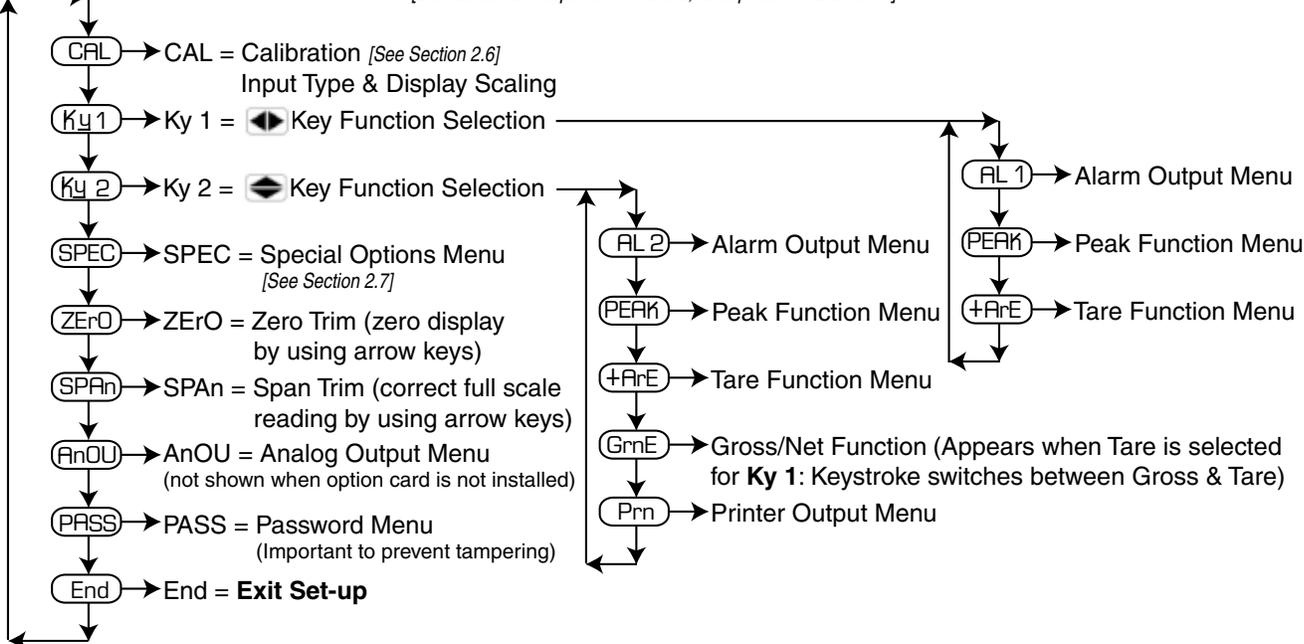
3. Repeat this for the next two digits; then at the farthest left hand digit enter a 5.

4. The display should now show **5000** with the **5** intensified; Press the key to exit.

5. The display will show **rdHI** again. Press the key to step to **End** and then press the key to exit setup.

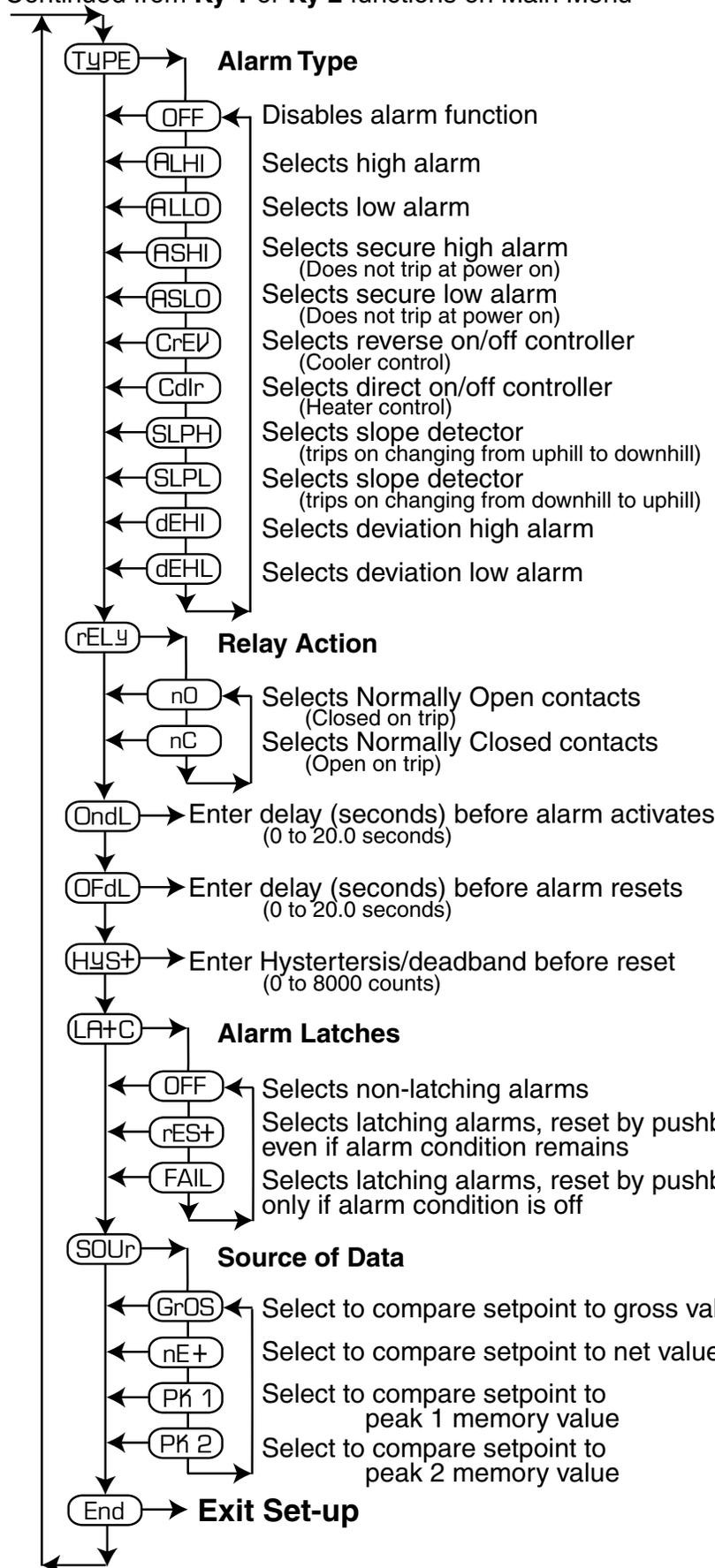
2.5.7 Using the Menu

Enter Set-up Main & Input Menu by simultaneously pressing both and keys.
[Discussion in sequence of menu, except where indicated]



2.5.7.1 Alarm Output Menu

Continued from **Ky 1** or **Ky 2** functions on Main Menu



Alarm Operation:

a) To display the current setpoint press the key defined as the alarm key for less than 2 seconds; the previously entered value will be displayed for approximately 2 seconds, then the meter will return to the normal measurement mode.

b) To change the current setpoint press the alarm key and hold it for more than 2 seconds until the farthest right hand digit is intensified. Then follow the procedure for entering a numerical value use the arrow keys.

c) To acknowledge a latched alarm press the alarm key for less than 2 seconds whenever the alarm LED is lit.

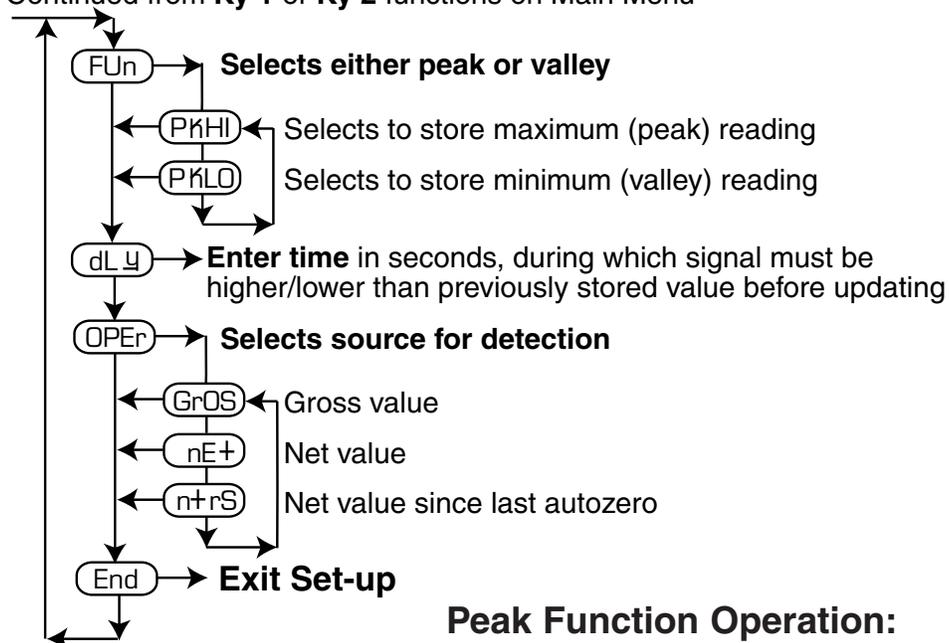


NOTE:

The reset will occur depending on the type of latching alarm defined in the alarm menu.

2.5.7.2 Peak Function Menu

Continued from **Ky 1** or **Ky 2** functions on Main Menu

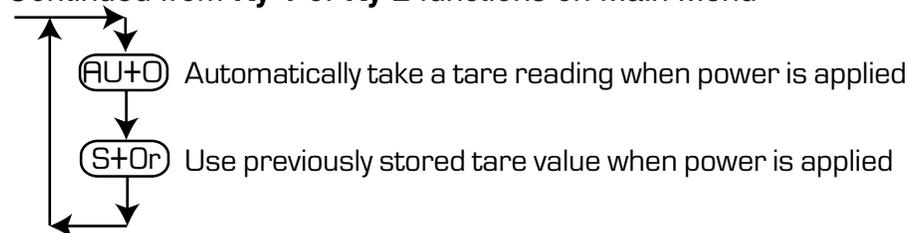


Peak Function Operation:

- a) To switch to the peak/valley display mode press the **PEAk** key, then the **FUn** (function) key. The appropriate **Alarm LED** will light indicating that you are in the peak/valley display mode.
- b) To reset the peak or valley when first entering the peak/valley mode; press the and hold in the **FUn** key for greater than 2 seconds. The value will be reset and the **Alarm LED** will be lit.
- c) To exit the peak/valley mode press the **FUn** key again for the display to return to the normal measurement mode and the **Alarm LED** will turn off.

2.5.7.3 Tare Menu

Continued from **Ky 1** or **Ky 2** functions on Main Menu



Tare Operation:

With a push of a front panel button, user may set the reading to zero, storing the tare value.

2.5.7.3.1 Tare/Auto-zero

This function is used with weigh scale applications.

- a) To zero the display press the **tArE** key; do this for any display reading

2.5.7.3.1 Tare/Auto-zero *(continued)*

- b) To automatically take a tare (zero the display) at initial power-up; select the **AutO** parameter in the **Tare Menu**.
- c) To revert to the previous tare value on initial power-up, select the **StOr** prompt in the **Tare Menu**.
- d) When Tare is set for **Ky 1**, then **Ky 2** is automatically set to the **Gross/Net Function!**
- e) When Tare is set for **Ky 2**, then **Ky 1** may still be defined by the user as the **AL 1** or **Peak Function**.

2.5.7.4 Gross/Net Function

This function is used with weigh scale applications, available only from the **Ky 2 Menu**.

- a) The **Net** value is displayed when the **AL 2** LED is on. (The net value is the display value after the tare value has been subtracted).
- b) To switch to the **Gross** display mode, press the  key and the display will change and the **AL 2** LED will turn off. (The Gross display is the reading before the Tare value has been subtracted).



NOTE:

The  key must be defined as the Tare key for this function to operate.

2.5.7.5 Printer Output Menu

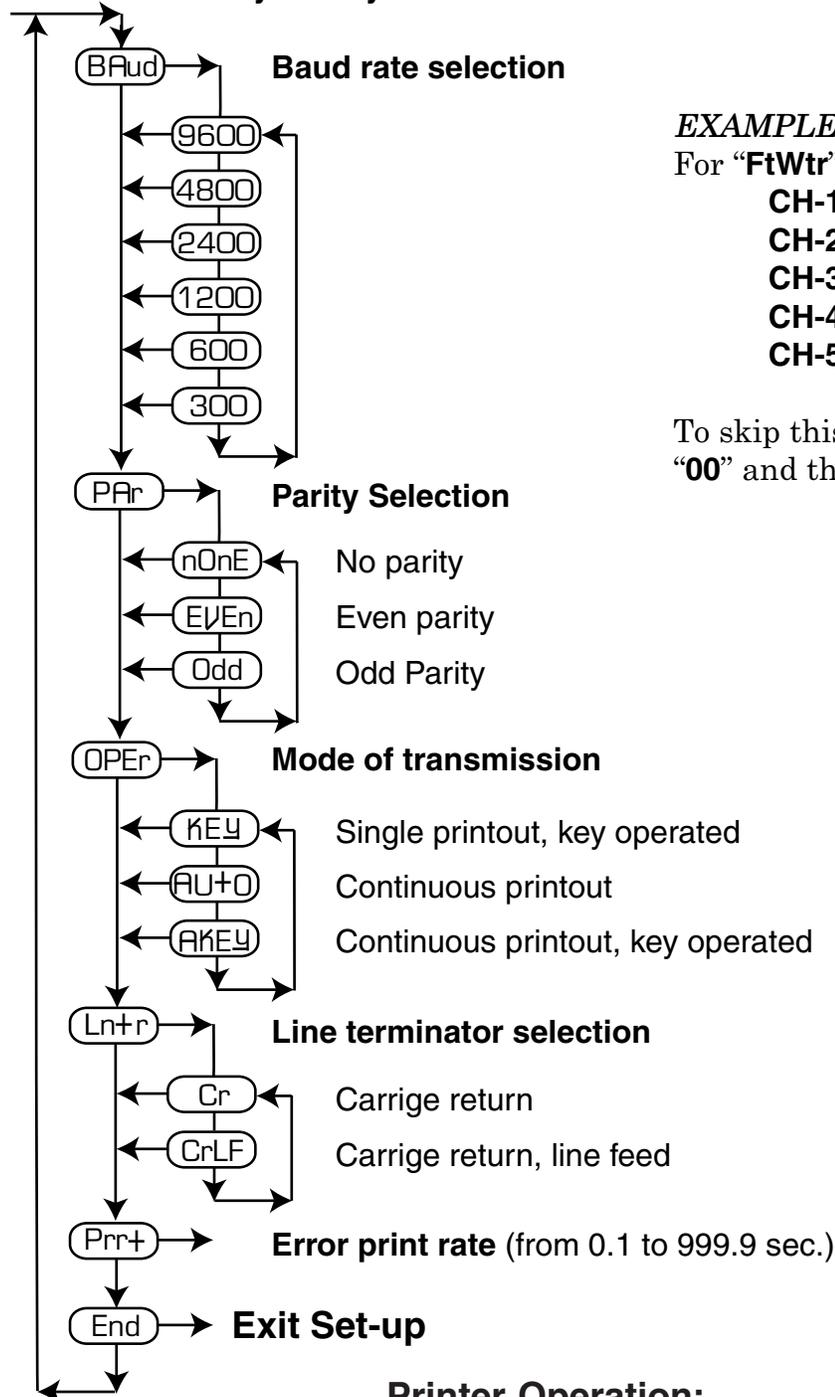
With the optional RS232 printer output you can select three modes of transmission:

1. Continuous printing.
2. Single printout, key operated.
3. Continuous printout, key operated.

Also selectable is the baud-rate, print rate and line terminator. Up to five characters can be programmed to print after each data point. This is done by selecting **CH-1**, **CH-2**, **CH-3**, **CH-4** and **CH-5** using the **Print Output Menu** and entering the equivalent ASCII code (0-255 decimal) for the character required.

2.5.7.5 Printer Output Menu *(continued)*

Continued from **Ky 1** or **Ky 2** functions on Main Menu



EXAMPLE of creating print characters:

For “**FtWtr**” select the following,

- CH-1** = 070 for **F**
- CH-2** = 116 for **t**
- CH-3** = 087 for **W**
- CH-4** = 116 for **t**
- CH-5** = 114 for **r**

To skip this option set all characters to “00” and the meter will print data only.

Printer Operation:

- a) To transmit one printout press the  key once whenever the **Prn** and **kEy** parameters were selected under Setup.
- b) To start/stop a continuous printout press the  key when the **Prn** and **AkEy** parameters were selected under Setup.
- c) To always have a continuous printout select **AUTO** under the **Print Output Menu**.

2.5.7.6 Zero & Span Trim

Continued from **ZErO & SPAn** on main menu

This function is the digital equivalent of the zero and full scale potentiometers on a discrete component panel meter. It is to be used for fine tuning the display if it isn't reading the exact numbers that you desired after your programming is completed. It is only recommended to use this if your calibration is within +/- 100 counts of your desired reading. If you are off by more than this it is most likely that there is something wrong with the signal or there is a programming error. (In this case consult the factory).

2.5.7.6.1 Zero Trim [ZErO]

To adjust the unit to display zero press the  key at the **ZErO** prompt; the display will show the present input reading with the farthest right hand digit intensified. Use the  key to adjust the display to read zero or your lowest desired reading.



NOTE:

You must continuously press and release the key to cause display to change.

Use the  key to change the up & down direction of the  key. Once you are satisfied with the display reading; press and hold the  key for more than 2 seconds. The meter will store the changes and return to the normal measurement mode.

2.5.7.6.2 Span Trim [SPAn]

To adjust the unit to display the desired high display reading press the  key at the **SPAn** prompt; the display will show the present input reading with the farthest left hand digit intensified. Use the  key to adjust the display to read the desired value.



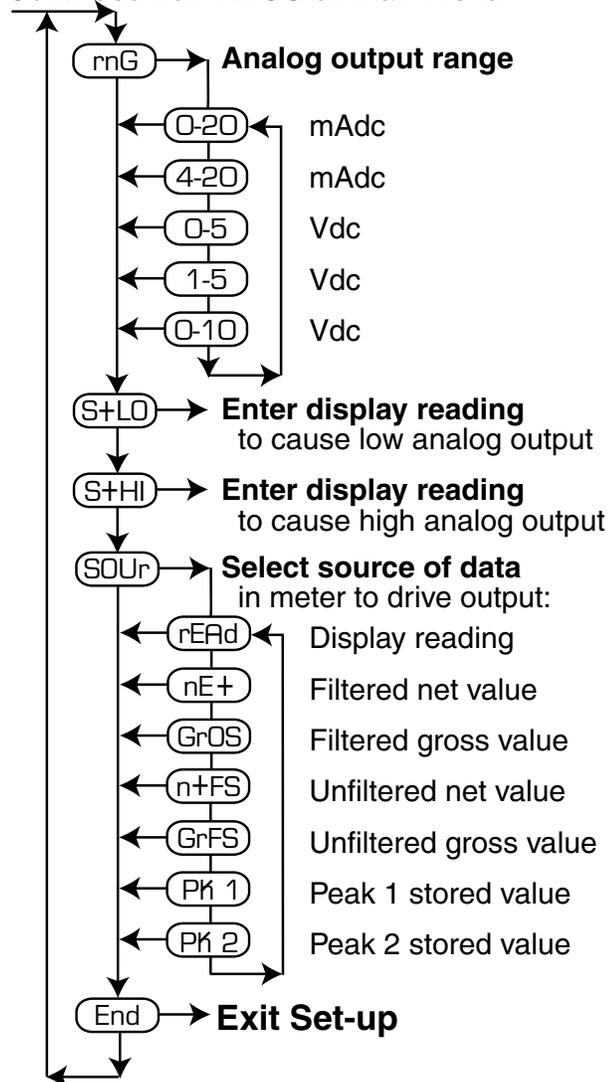
NOTE:

You must continuously press and release the key to cause the display to change.

Use the  key to change the up & down direction of the  key. Once you are satisfied with the display reading; press and hold the  key for more than 2 seconds. The meter will store the changes and return to the normal measurement mode.

2.5.7.7 Analog Output Menu

Continued from **AnOU** on Main Menu



EXAMPLE of Analog Output Programming:

Assume you wish to have a 4 to 20 mA output at display values of 0 to 5000 and to track the normal display reading...

1. At the **AnOU** prompt press the **key**; display will show **rnG**.
2. Press that same key again, the display will show **0-20** or some previously set value.
3. Press the **key** to scroll until **4-20** appears on the display; press the **key** to save this, and display will now show **rnG**.
4. Press the **key** once to step to the **StLO** prompt.
5. Press the **key** and the display will show **0000** with the right hand zero intensified (or some previously stored value); if it isn't **0000**, use the **key** to change the numbers to zero and use the **key** to scroll across the display to save that value; display will show **StLO** again
6. Press the **key** once to step to **StHI** prompt.
7. Press the **key** and the display will show **9999** with the right hand nine intensified.
8. Change this to **5000** using the arrow keys. Remember when you are at the left hand digit you must press the **key** when the chosen number is displayed so the unit will save this and exit to the **StHI** prompt.
9. Press the **key** once to step to the **SOUr** prompt; press the **key** to enter and verify that this is set to **rEAd**.
10. After the source for the analog output is defined; the analog output setup is complete.
11. Press the **key** once to step to the **End** prompt and then press the **key** to **Exit**.

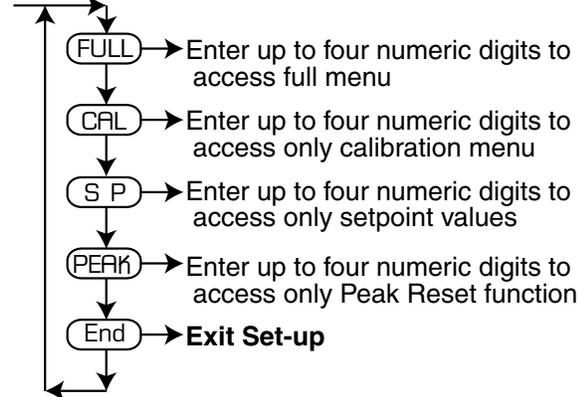
2.5.7.8 Password Menu



Safety Information:

All functions are selected from the front of the meter. Safety of the configuration is the responsibility of the installing engineer. Use the program lock through the password function to protect from anyone tampering of critical operations.

Continued from **PASS** on Main Menu



To prevent tampering by unauthorized personnel, the password menu controls access to either all of the menu or just limit access to some of the functions. A password may be any numeric code from 1 to 9999. Once a password has been entered the unit will ask for the password whenever the protected function is employed.

OPERATING EXAMPLE:

To enter a password at the **FULL** prompt, then:

1. Press both keys simultaneously to enter setup; the unit will display the prompt **PASS**.
2. Press the key; display will show 0000 with the right hand zero intensified.
3. Enter the passcode using the arrow keys.
4. When the left-hand digit is intensified and is ready, press the key again. The unit will now allow the desired operation.

2.6 Calibration

As with **Keyboard Operation & Setup** in *Section 2.5.6*, calibration can be performed using the two front keys.

There are three ways to calibrate the Well Watcher controller:

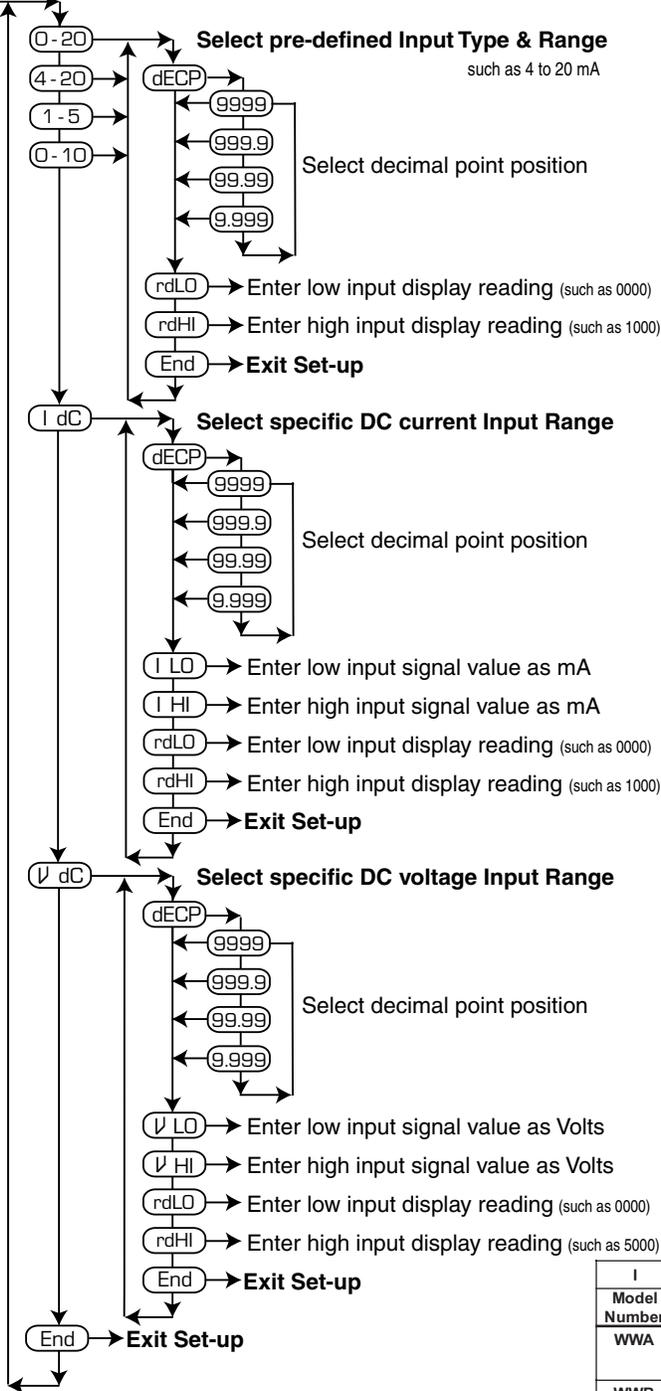
- Selecting a predefined Input Type and Range such as 4-20.
- Automatic Calibration in **Special Options Menu** *Section 2.7*
- Through the Infrared (IR) sensor for Remote Setup.

2.6.1 Zero & Span

Technically, Zero & Span trimming could be considered a calibration function, but in an effort to follow the sequence of the menu, these two functions are covered under **Zero & Span Trim** in *Section 2.5.7.5*.

2.6.2 Calibration Using Predefined Values

Continued from CAL on Main Menu



Calibration

Following the **Main & Input Menu** flow chart, go to **CAL** under **Select pre-defined Input Type & Range**.

Select **4-20**, the decimal location, the reading **LOW (rdLO)**, and the reading **HIGH (rdHI)**, values.

The display resolution recommended in *Table 2-1* should be used. In that table, the columns include:

- I WellWatcher Model Number
- II Transmitter used; cable lengths are in parentheses ().
- III Input type to be selected is 4-20mA
- IV Decimal point location and display reading entered for inches of water level measurements
- VI Decimal point location and display reading entered for feet of water level measurements
- VIII Decimal point location and display reading entered for meters of water level measurements
- V, VII, & IX The recommended display resolution (count by).

Table 2-2
Well Watcher System
Input Type & Display Scaling

I Model Number	II Transmitter	III Input Type 4-20mA	IV Inches of Water	V Count by	VI Feet of Water	VII Count by	VIII Meters of Water	IX Count by
WWA	750B0006RLS(50)	rdLO	00.0	1	0.00	1	0.00	5
		rdHI	166.4	1	13.86	1	4.226	5
WWB	750B0015RLS(75)	rdLO	00.0	2	0.00	2	0.00	1
		rdHI	415.9	2	34.66	2	10.56	1
WWC	750B0030RLS(100)	rdLO	00.0	5	0.00	5	0.00	2
		rdHI	831.9	5	69.32	5	21.13	2
WWD	750B0060RLS(200)	rdLO			0.00	1	0.00	5
		rdHI			138.6	1	42.26	5
WWE	750B0100RLS(300)	rdLO			0.00	2	0.00	5
		rdHI			231.1	2	70.43	5
WWF	750B0150RLS(425)	rdLO			0.00	2	0.00	1
		rdHI			346.6	2	105.6	1
WWG	750B0200RLS(550)	rdLO			0.00	5	0.00	1
		rdHI			462.2	5	140.9	1
WWH	750B0300RLS(750)	rdLO			0.00	5	0.00	2
		rdHI			693.2	5	211.3	2

2.6.3 Automatic Calibration

Allows user to set up the meter with known calibration inputs. See **Special Options Menu** in *Section 2.7*.

2.6.4 Calibration Using IR Remote Setup

The Well Watcher CDM Controller can be configured and calibrated with the use of the optional LED pen.

In the front panel there is an Infrared (IR) sensor used as a receiver from the LED pen connected to a desktop or laptop computer (PC). Software and instructions are supplied with the LED pen. This capability allows the meter programming to be achieved without any physical connection to the meter.

2.6.5 Calibration for Drawdown

To perform calibration for drawdown in a water well, the distance “D” of the transmitter below ground level must be known. This measurement is used to calculate the meter settings. The transmitter must then be fixed at this location and left there.

The meter settings are selected by **Calibration using Pre-defined Values** in Section 2.6.2. Use the reading LOW **rdLO** and the reading HIGH **rdHI** values as calculated below:

$$\text{rdLO} = \text{D}$$

$$\text{rdHI} = \text{D} - (\text{rdHI value read from Table 2-1, previous page})$$

Where **D** is the distance the transmitter is below ground and (**rdHI** from Table 2-1) is in inches, feet or meters of water.

EXAMPLE:

A model WWB is installed with the transmitter set at 57 feet below ground level.

I	II	III	IV	V	VI	VII	VIII	IX
Model Number	Transmitter	Input Type 4-20mA	Inches of Water	Count by	Feet of Water	Count by	Meters of Water	Count by
WWA	750B0006RLS(50)	rdLO	00.0	1	0.00	1	0.00	5
		rdHI	166.4	1	13.86	1	4.226	5
WWB	750B0015RLS(75)	rdLO	00.0	2	34.66	2	0.00	1
		rdHI	415.9	2	34.66	2	0.00	1
WWC	750B0030RLS(100)	rdLO	00.0	5	89.32	5	0.00	2
		rdHI	831.9	5	89.32	5	21.13	2
WWD	750B0060RLS(200)	rdLO			0.00	1	0.00	5
		rdHI			138.6	1	42.26	5
WWE	750B0100RLS(300)	rdLO			0.00	2	0.00	5
		rdHI			231.1	2	70.43	5
WWF	750B0150RLS(425)	rdLO			0.00	2	0.00	1
		rdHI			346.6	2	105.6	1
WWG	750B0200RLS(550)	rdLO			0.00	5	0.00	1
		rdHI			462.2	5	140.9	1
WWH	750B0300RLS(750)	rdLO			0.00	5	0.00	2
		rdHI			693.2	5	211.3	2

D = 57.00, so...

$$\text{rdLO} = 57.00$$

$$\text{rdHI} = 57.00 - (34.66) \text{ or } \text{rdHI} = 22.34$$

Under **CAL** select **4-20**

Select **dECP**, set **99.99**

Select **rdLO**, set **57.00**

Select **rdHI**, set **22.34**

End

Then set the display resolution as follows.

Under **CAL** select **SPEC**

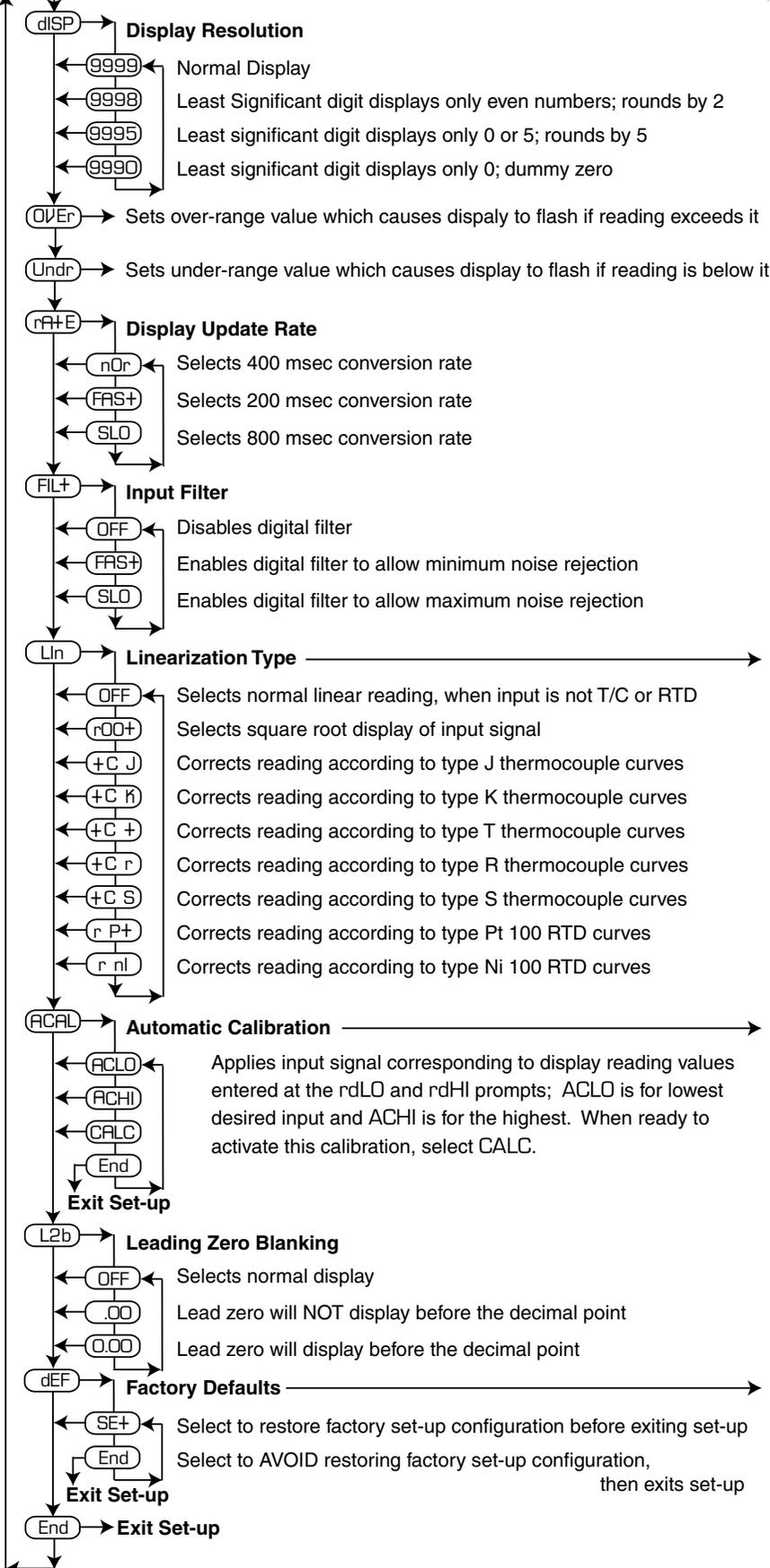
Select **dISP**, set **9998**

End

After setup for drawdown it maybe necessary to turn the power off and then back on to “reboot” the meter.

2.7. Special Options Menu

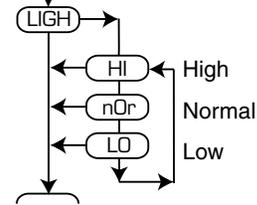
Continued from **SPEC** on Main Menu



Display Brightness [LIGH]

To adjust brightness settings

Continued from **SPEC** on Main Menu, step down to **LIGH** & select:



2.7.1 Linearization [LIn]

2.7.1.1 Linear Input

Select **OFF** for normal linear input signals.

2.7.1.2 Flow Input

With signals from differential transmitters, flow rate can be displayed by selecting **r00t** at the **LIn** prompt. The meter will then use this equation to derive the display reading:

$$Display = \sqrt{Flow} \times \sqrt{rdHI}$$

Flow is defined first by entering the **rdLO** and **rdHI** prompts based upon data supplied by the transmitter manufacturer. The meter will then take the square root of the present flow input and then multiply this by the square root of the **rdHI** prompt which is the maximum flow rate.

Since this method of calculation is being used to compensate for a nonlinear flow rate the readout responds differently than a normal linear reading. The following table gives five points on the curve to demonstrate this:

Table 2-3
Linearized Flow Input

% Of Signal	% of Read-out
0.0	0.0
25.0	50.5
50.0	70.7
75.0	86.6
100.0	100.0

EXAMPLE:

4-20mA represents 0 to 100.0 gallons per minute;

the **CAL** menu is set for **4-20**

rdLO = 000.0; **rdHI** = 100.0; **r00t** is selected at **LIn** prompt

Then the input versus the readout would be:

Table 2-4
Example of
Linearized Flow Input

Input mA	Display
4	0.0
8	50.5
12	70.7
16	86.6
20	100.0

2.7.1.3 Temperature Input

T/C or RTD linearizations are selected for input signals from those types of nonlinear transmitter inputs. The meter would then apply the appropriate linearization to the signal.

2.7.1.3 Temperature Input (continued)

EXAMPLE:

A 4-20mA transmitter is being used with a Type J T/C for the temperature range of -200C to +750C, but is not linearizing the output. Select the following:

- 1) Under **CAL** menu select **4-20**; set **rdLO** to **-200**; set **rdHI** to **0750**
- 2) Under **Special Options Menu**, set **tC J** at the **Lin** prompt

The meter will now apply a Type J linearization to the signal before displaying it.

2.7.2 Automatic Calibration [ACAL]

This function allows you to calibrate the unit to an applied signal. You may calibrate to a low signal (zero) and then at a later time calibrate to the high signal (span). Then at any time that you want to make this calibration effective you can activate it.

EXAMPLE:

A practical application for this would be for level indication of a tank. When the tank is empty you could do the low (zero) calibration point. Then later in the day, or even later in the week, you can perform the high (span) calibration. This way you don't have to interfere with the normal process of filling and emptying the tank in order to calibrate the meter. You can perform the calibration at any convenient time in your normal process.

- a) Under the **CAL** menu select either **I dC** or **V dC**; whichever type is appropriate for your input signal.
- b) enter the low calibration point (zero) at the **rdLO** prompt and the high calibration point at the **rdHI** prompt.
- c) Exit the Setup mode and reset power to the meter. It will now read the approximate engineering units based upon the data entered in the **CAL** menu. You may proceed with the actual calibration to the applied inputs at any time as described in the following steps.
- d) Under the **SPEC** menu go to the **ACAL** prompt and press the  key; the display will show **ACLO**.

2.7.2 Automatic Calibration [ACAL] (continued)

e) Press that key again, the unit will go through a reset cycle, during which the display will light all segments and decimal points.

f) The display will now show **CALO** (Calculation 1) alternating with the input reading at this time.



NOTE:

Make sure that the input applied is the input that you want to read out as the value entered at the **rdLO** prompt.

g) Press the  key. The unit will return to the normal measurement mode. If you are ready to also do the span at this time proceed immediately with the next step. As mentioned above the next step may be done at any convenient time.

h) Enter the **ACAL** menu again but step to the **ACHI** prompt.

i) Press the  key; the display will go through the reset function. The display will show **CAHI** (Calculation 2) alternating with the input reading.



NOTE:

Make sure that the input applied is the input that you want to read out as the value entered at the **rdHI** prompt.

j) Press the  key. The unit will then return to the normal measurement mode. If you want to activate these calculations then enter the **ACAL** menu one more time. At the **CALC** prompt press the  key. The meter will activate the calculations and go through the reset procedure one last time.

The unit is now calibrated exactly to your process signals.

2.7.3 Factory Defaults [dEF]

At times it may be desirable to reset all programming in the unit and start over again. For example, if the unit isn't performing as expected and you have lost track of what menus you have been changing. There is a simple procedure to accomplish this:

a) Enter the **SPEC** menu and step down to the **dEF** prompt. Press the  key; display will show **Set**.

b) Press that key again; the display will go through the reset, which lights all segments and decimal points.

The unit will now be set for factory defaults

Section 3 Spare Parts and Accessories

K223000	Seal plug for K554168 strain relief
K223001	Seal plug for K554127 strain relief
K542043	Meter with relays
K542046	Meter with relays and analog output
K542047	Meter with relays and RS232 output
K540247	Cable strain relief cord grip for NEMA 4X weathertight housing 0.11 in. to 0.26 in.
K554149	Metal conduit connector for NEMA 4X weathertight housing ½ inch NPT
K554168	Cable strain relief cord grip for NEMA 4X weathertight housing 0.20 in. to 0.35 in.
K574533	Analog output circuit board
K574534	RS232 output circuit board
K902502	Infrared LED pen and software for Computer setup
LMA912	Lightning and surge protector for excita- tion and signal lines to the milliamper transmitter or meter analog output lines to other instruments
LMA918	Lightning and surge protector for 115Vac input line to the meter
LMA919	Lightning and surge protector for 230Vac input line to the meter
750SB0006RLS(50)	Transmitter with cable for WWA
750SB0015RLS(75)	Transmitter with cable for WWB
750SB0030RLS(100)	Transmitter with cable for WWC
750SB0060RLS(200)	Transmitter with cable for WWD
750SB0100RLS(300)	Transmitter with cable for WWE
750SB0150RLS(425)	Transmitter with cable for WWF
750SB0200RLS(550)	Transmitter with cable for WWG
750SB0300RLS(750)	Transmitter with cable for WWH

3.1 Ordering Parts

When ordering replacement parts,
supply the following information:

- 1) Part description and part number.
- 2) Quantity of each item required.
- 3) Shipping instructions and address.



Contact your local AMETEK Drexelbrook representative,

or Mail, Telephone or Fax Orders to:

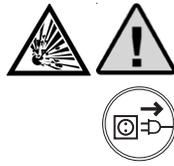
AMETEK Drexelbrook

205 Keith Valley Road

Horsham, PA 19044

(215) 674-1234; FAX: (215) 674-2731

Section 4 TROUBLESHOOTING



WARNING:

If the Well Watcher system is located in a hazardous environment, do not open the enclosure cover or make/break any electrical connections without first disconnecting electrical power at the source. Ensure that the wiring, electrical fittings and conduit connections conform to the electrical codes for the specific location and hazard level.

4.1 Monitor Mode

For Troubleshooting purposes the meter offers a special monitor mode to see direct input signal. This monitor mode is entered by pressing simultaneously both keys (as for entering start-up menu) and keeping the keys pressed for 2 seconds.

First you will see **CAL** then the meter will display direct input signal in V/mA (-10.50/+10.50V or -19.99/22.00mA depending on the selected range), disregarding all scaling, decimal points, tare, filtering, etc. The blinking of the alarm LED will advise you that it is in the monitor mode.

To return to normal operation press any key. Meter will automatically return, however, to normal operation in 10 minutes.

4.2 First Inspection

Check all wiring to the terminal block in the rear of the meter for correct connections, broken wires, loose or corroded connections, or obvious short circuits.

Check for proper power voltage at both meter and source.

Now go to **Troubleshooting Chart**, *Table 4-1* on next page.

Section 4 TROUBLESHOOTING (continued)

4.3 Troubleshooting Analysis

TroubleShooting Chart			
Problem/Symptom	Typical Cause	Check/Action	Reference Section
No Display	No power to meter	Expect 90-264Vac across rear connector terminal 11 &12	2.4 Wiring; Fig. 2-1, 2-2
	Incorrect power to meter		
	Damaged meter	Return to factory	4.4 Equipment Return
Incorrect Display	Wrong transmitter connections	Wiring diagram	2.4 Wiring; Fig. 2-3, 2-4
	Wrong set-up	Calibration flow diagram	2.6 Calibration
	Defective transmitter	Replace transmitter	
Incorrect setpoint	Alarm not set correctly	Alarm type, NO, NC, hysteresis, setpoint settings	2.5.7.1 Alarm Output Menu
Relay output inoperative	Incorrect connections	Wiring diagram	2.4 Wiring; Fig. 2-3, 2-4
	Contacts shorted or open due to electrical overload	Return to factory	4.4 Equipment Return
Relay chatter	Electrical pickup	Setpoint Relays/Alarms	2.5.4 Setpoint Relays Alarms Concept
		Signal Noise Isolation	2.3.4 Signal Noise Isolation
Analog output does not track display	Incorrect set-up	Calibration flow diagram	2.6 Calibration
	Defective analog printed circuit board	Replace analog printed circuit board	
Display drifting	Water in cable creating short circuit	Look for kink or damaged cable; with transmitter wires disconnected, resistance between red or black lead and shield should be more than 15Megohms	2.3.2 Transmitter Mounting; 2.4 Wiring; Fig. 2-3, 2-4
Display varies when relays switch on.	Electrical pickup	Setpoint Relays/Alarms	2.5.4 Setpoint Relays Alarms Concept
		Signal Noise Isolation	2.3.4 Signal Noise Isolation

***Table 4-1
Troubleshooting Analysis of Well Watcher System***

4.4 Factory Assistance



AMETEK Drexelbrook can answer any questions about the Well Watcher System. Call Customer Service at 1-800-553-9092 (US and Canada) or + 215-674-1234 (International).

If you require assistance and attempts to locate the problem have failed:



- **Contact** your local Drexelbrook representative,
- **Call** the Service department toll-free at 1-800-527-6297 (US and Canada) or + 215-674-1234 (International),
- **FAX** the Service department at + 215-443-5117, or
- **E-Mail** to drexelbrook.service@ametek.com



Please provide the following information:

Instrument Model Number _____

Sensing Element Model Number and Length _____

Original Purchase Order Number _____

Material being measured _____

Temperature _____

Pressure _____

Agitation _____

Brief description of the problem _____

Checkout procedures that have failed _____

4.5 Field Service



Trained field servicemen are available on a time-plus-expense basis to assist in start-ups, diagnosing difficult application problems, or in-plant training of personnel. Contact the service department for further details.

4.6 Customer Training



Periodically, AMETEK Drexelbrook instrument training seminars for customers are held at the factory. These sessions are guided by Drexelbrook engineers and specialists, and provide detailed information on all aspects of level measurement, including theory and practice of instrument operation. For more information about these valuable workshops, write to AMETEK Drexelbrook, attention: Communications/ Training Group, or call direct + 215-674-1234.

4.7 Equipment Return

In order to provide the best service, any equipment being returned for repair or credit must be pre-approved by the factory.



In many applications, sensing elements are exposed to hazardous materials.

- **OSHA mandates** that our employees be informed and protected from hazardous chemicals.
- **Material Safety Data Sheets (MSDS)** listing the hazardous materials to which the sensing element has been exposed **MUST** accompany any repair.
- It is your responsibility to fully disclose all chemicals and decontaminate the sensing element.



To obtain a return authorization (RA#), contact the Service department at 1-800-527-6297 (US and Canada) or + 215-674-1234 (International).

Please provide the following information:

Model Number of Return Equipment _____

Serial Number _____

Original Purchase Order Number _____

Process Materials that equipment has been exposed to _____

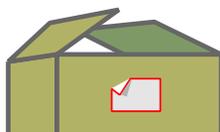
MSDS sheets for any hazardous materials

Billing Address _____

Shipping Address _____

Purchase Order Number for Repairs _____

Please include a purchase order even if the repair is under warranty. If repair is covered under warranty, you will not be charged.



Ship equipment freight prepaid to:
AMETEK-DREXELBROOK.
205 KEITH VALLEY ROAD
HORSHAM, PA 19044-1499
COD shipments will not be accepted.

Section 5 SPECIFICATIONS

5.1 Well Watcher CDM Controller with Digital Meter

ENVIRONMENTAL

Warm up time 1 minute; 5 minutes for T/C
Operating temperature -10°C to 60°C
Storage temperature -40°C to 85°C
Humidity 0 to 90% non-condensing

MECHANICAL

Housing NEMA 4X Weathertight
Material Fiberglass Reinforced Polyester with Transparent Polycarbonate Cover
Unit weight 4 lbs. (Does not include Transmitter & Cable)

CONVERSION

Measuring System Continuous integration charge balancing converter
Internal resolution 1 Part over 200,000
Conversion Time Set to 200, 400, or 800 m/sec.
Response Time for a Step Change 1.0 second to rated accuracy
Digital Filter Walking Window mean value; select: slow, normal, fast
Normal Mode Rejection Ratio 60 dB at 50 and 60 Hz (without digital filter)
Common Mode Rejection Ratio >135 dB from input to supply

ELECTRICAL

AC Supply Voltage 100 to 240 Vac at 47-70 Hz Nominal; 90 Min., 264 Max.
Maximum Power Consumption 4 VA
Isolation >2500 Vrms
Excitation Supply 24 Vdc +/- 5% at 30 mA max.: Short Circuit Protected
Relay Outputs Normally Open; 250 Vac at 5A, 24 Vdc at 1A

Current Input:

Zero Drift +/- 40 ppm/ of full scale
Span Drift +/- 70 ppm/ of range
Input Resistance <20 ohms

Analog Output:

Current source 0 to 20 mA or 4 to 20 mA; Load Resistance 0 to 550 ohm
Voltage 0 to 10 Vdc; Output Impedance 10 ohm
Accuracy Voltage and Current +/- 0.1% of Full Scale
Isolation Voltage and Current 500 Vrms

Section 5 SPECIFICATIONS (continued)

RS232 serial Output:

*Table 5-1
Well Watcher
Controller
Specifications*

	MEASURING RANGE	RESOLUTION	ACCURACY / F.S.
VOLTAGE	0 to 10 Vdc	0.01%	+/-0.06
	1 to 5 Vdc	0.02%	+/-0.06
	+/-1.000 V f.s.	0.01%	+/-0.06
	+/-10.50 V f.s.	0.01%	+/-0.06
CURRENT	4 to 20 mA	0.01%	+/-0.06
	0 to 20 mA	0.01%	+/-0.06
	+/-1.00 mA	0.01%	+/-0.06
	+/-22.00 mA f.s.	0.01%	+/-0.06

5.2 Well Watcher 750 Transmitter

FUNCTIONAL SPECIFICATIONS

- Range Limits** Reference Model Code
- Output** 4-20 mAdc, limited to 30 mAdc
- Power Supply** 12 to 40Vdc w/polarity protection
- Temperature Limits:** (Damage will occur if submerged in liquid that freezes)
 - Maximum Operating** . 32°F to 140°F (0°C TO 60°C)
 - Compensated** 32°F to 122°F (0°C to 50°C)
 - Storage** -22°F to 176°F (-30°C to 80°C)
- Overrange** 300%
- Loop Resistance** 600 ohms max @ 24 volts

PERFORMANCE SPECIFICATIONS

- Zero Offset** +1.0% FS, Set at 25°C
- Span** +1.0% FS, Set at 25°C
- Accuracy** +0.25% FS, Including linearity Best Fit Straight Line (BFSL), hysteresis, and repeatability.
- Stability** +0.5% FS/ six months
- Temperature Effect** Maximum 1% output change for 25°C temperature change within the compensated range.
- Power Supply Effect** +0.005% FS per Volt
- Overrange Effect** +0.15% FS per 200% of max. range

PHYSICAL SPECIFICATIONS

Materials of Construction

- Cable Jacket** Polyurethane
- Diaphragm** Type 316L Stainless Steel
- Cover** Type 316 Stainless Steel
- Nut/Washer** Type 316 Stainless Steel
- Cable Grommet:** Viton
- Snub Nose** Nylon 6/6
- Electrical Connection** 20 AWG Shielded Cable, Assembled at factory only
- Weight** 1 pound (454 g).
- Media Compatibility** Any media compatible with materials listed above

Section 5 SPECIFICATIONS (continued)

5.3 Approvals

Pending

5.4 Warranty Policy

AMETEK Drexelbrook ["Seller"] warrants these products for a period of two years from the date of shipment that all products manufactured by the seller are free from defects of material and workmanship when used within the service, range, and purpose for which they were manufactured. Seller will, at its option, re-pair, replace, or refund the purchase price of parts found by Seller to be defective in material or work-manship provided that written notice of such defect requesting instructions for repair, replacement, or refund is received by Seller at the address below within the warranty period and provided that any in-structions thereafter given by Seller are complied with.

This warranty shall not apply (i) to the performance of any system of which Seller's products are a component part, (ii) to deterioration by corrosion or any cause of failure other than defect of material or workmanship, or (iii) to any of Seller's products or parts thereof which have been tampered with or altered or repaired by anyone except Seller or someone authorized by Seller, or subjected to misuse, neglect, abuse or improper. use or misapplication such as breakage by negligence, accident, vandalism, the elements, shock, vibration, or exposure to any other service, range, or environment of greater severity than that for which the products were designed.

SELLER MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED. INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF FITNESS OR OF MERCHANTABILITY WITH RESPECT TO ITS PRODUCTS, OR ANY PART THEREOF, OTHER THAN AS EXPRESSLY SET FORTH ABOVE. NOR SHALL SELLER HAVE INCURRED ANY OTHER OBLIGATIONS OR LIABILITIES OR BE LIABLE FOR ANY ANTICIPATED OR LOST PROFITS, INCIDENTAL DAMAGES, CONSEQUENTIAL DAMAGES, TIME CHARGES, OR ANY OTHER LOSSES INCURRED IN CONNECTION WITH THE PURCHASE, INSTALLATION, REPAIR, OR OPERATION OF ITS PRODUCTS (INCLUDING ANY PARTS REPAIRED OR REPLACED.)

This warranty does not extend to anyone other than the original Buyer from the Seller.

AMETEK[®]
DREXELBROOK

205 Keith Valley Road Horsham, PA 19044

An ISO 9001 Certified Company

US Sales
24 Hour Service
International
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