

Eliminator EL 6.0 Installation Guide

by

Measurement Technology International Ltd.

Index

1 Starting Up.....	2
1.1 Introduction.....	2
1.2 Caution.....	2
2 Description.....	2
2.1 Unpacking and Inspection.....	3
3 Theory of Operation.....	3
3.1 Input Counting.....	3
3.2 Handle Switch.....	4
3.3 Motor Control.....	4
3.4 Solenoid Control.....	5
3.5 Hardwired Console Control.....	5
3.6 Serial Console Control.....	6
4 Installation.....	6
4.1 Field Wiring Detailed Description.....	6
4.2 EL6.0 Jumper Settings.....	8
4.3 Mechanical Installation Procedure.....	9
4.4 Software Configuration.....	9
4.5 ATC Temperature Probe Installation.....	11
4.6 Final Installation Check.....	11
4.7 Manual Calibration.....	12
4.8 Automatic Calibration.....	12
4.9 Sealing.....	13
5 Typical Electrical Installation Diagrams.....	14
6 World Wide Web.....	16

1 Starting Up...

1.1 Introduction

The EL 6.0 Pump register was conceived as an expandable system for application to any metering systems. It can be used as a retrofit or OEM installation. There is no limitation as to size of the meter whether large or small that can be accommodated. Built in ATC (Automatic Temperature Compensation) allows for use with most fuels. This guide shows all the inputs and outputs that are available for use in installing a EL6.0 unit. It does not extensively cover all scenarios that can exist. Please contact Measurement Technology if you have questions that are not covered by this document.

1.2 Caution

The EL 6.0 contains no user serviceable parts. Refer servicing to qualified service personnel.

The wiring to the EL 6.0 may contain more than 1 live circuit. To prevent electrical shock hazard be sure all circuits are dead before servicing. Refer installation and repair operations to qualified service personnel only.

Follow local electrical codes when installing this product.

****CAUTION****

All of the EL 6.0 circuit boards contain components that can be damaged by static electricity. When not in use, always store and transport in an anti-static container (such as its shipping bag). NEVER PACK IN STYROFOAM. Do not touch components on the boards with your hands.

2 Description

The EL 6.0 pump computer is designed to replace older mechanical pump computers as well as be implemented in OEM designs. It has been designed with extensive flexibility to meet most requirements.

2.1 Unpacking and Inspection

Every EL 6.0 is shipped from the factory with a packing list sealed inside the carton. When the container is opened this form should be in the bag with the other paperwork including this manual. Check the contents of the box using the packing list as a guide. Also inspect the contents for any shipping damage. If damage is evident do not attempt to install the device. Instead consult the factory for return and replacement instructions.

3 Theory of Operation

The following section depicts the theory behind the main operating features of the EL6.0 which enable the EL6.0 to function properly.

The EL6.0 is designed to replace the function of one or two mechanical heads. All control functions are built in to handle motor and solenoid control. Preset functions are built in as an option. Each unit can be configured as a single unit, a dual unit for two products or a dual unit for use with one product. Input is taken from encoders coupled to the meter shaft.

There is no preset input pulse rate. The input is designed to work with any size meter that has a rotating output shaft. Direction of rotation is programmable. Each side of a dual unit is programmable and can be different. For example: Side A can have a $\frac{3}{4}$ " meter turning clockwise and side B can have a $1\frac{1}{2}$ " meter turning counter clockwise. There is no limitation in programming the inputs.

Outputs control solenoids, both slow and fast flow, as well as motor switching without the need for relays.

The EL6.0 also has communications outputs for interfacing to older mechanical pulse style consoles or POS style systems requiring serial protocol communications.

3.1 Input Counting

The "correct" direction of rotation is programmable to be clockwise or counter clockwise. The factory setting for direction is counter clockwise when the shaft is viewed from the bottom of the unit. The direction of rotation of the shaft is converted to pulses on the output of the shaft encoder. The phase relation of the pulses determines the direction sensed by the EL6.0. The shaft encoder wiring consists of four wires as follows:

Wire Colour	Function
RED	+5 Volt power to encoder

GREEN	Ground
WHITE	Encoder channel 0 output (0-5 Volt level)
YELLOW	Encoder channel 1 "

If the encoder direction is reversed, the EL6.0 stops counting up and begins to record the number of pulses in the reverse direction. When the encoder stops and goes forward again the EL6.0 starts subtracting the reverse counts until the count is zero, then the unit begins to count up again on the display. In this way the unit can tolerate "backlash" on the pulser shaft with no ill effects. However, if the reverse count value becomes too high (255 counts) the unit will shut down, indicating a pulser error. If there are pulses missing on either channel, the missed pulse is counted as an error. If 50 error counts are made the unit will shut down.

If both channels are tied together, direction cannot be sensed and the unit will count two counts for every input transition. This feature is useful for CNG applications where an electronic device is generating input pulses.

3.2 Handle Switch

The Handle switch input(s) on the EL6.0 are intrinsically safe. That is, the wiring does not have enough current flowing to cause ignition of an explosive gas mixture. The factory supplied handle switch on the EL6.0 is a micro switch. The switch has two wires as follows:

Wire Colour	Description
WHITE	Switch Output (0 Volts = "ON", 5 Volts = "OFF")
GREEN	Ground

The output of the switch closes the circuit to ground. The input to the EL6.0 is pulled up through a 10K resistor to 5 volts.

The factory switch may be substituted for any switch that is connected between the input (white lead) and ground (green lead). Switching the input (white lead) to ground indicates to the EL6.0 that the handle is "ON". The wiring of the switch must not come near any 110 volt circuitry. For example, you CANNOT use the existing pump handle switch in an installation where the switch is mounted in an explosion-proof box and other live wires exist in the same enclosure. Inside the explosion-proof box on the EL6.0 there is a relay for each handle switch that "mirrors" the intrinsically safe switch. These relays close when the handle is "ON" and open when the handle is "OFF". The contacts can be used to switch loads up to 5 amps at 220 VAC. Normally this output is used to signal a control system that the pump handle is "ON", requesting authorization to pump.

3.3 Motor Control

The EL6.0 has two motor control triacs built in, one for side "A" and one for side "B". Both triacs can switch loads of 110/220VAC up to 15 amps and can directly control a 3/4 hp motor.

NOTE: *Loads exceeding these ratings will damage circuitry and are not covered by warranty.*

The motor triacs turn on when the pump handle is on and the unit is "authorized", and when there are no error conditions. If the unit is configured as a 2 hose 2 product unit, the motor triacs operate independently of each other. If the unit is configured as a 2 hose 1 product unit, either handle will cause both motor outputs to be activated.

3.4 Solenoid Control

The EL6.0 has four solenoid control triacs built in, two for side "A" and two for side "B". One per side control the fast flow solenoid and one controls the slow flow solenoid for each side. All four triacs can switch loads of 110/220VAC at 2 amps. The motor solenoid triacs turn on 2 seconds after the pump handle is turned on and the unit is "authorized", and there are no error conditions. Optionally a two second delay can be programmed between motor start and solenoid operation to pressurize the line before the solenoid opens to prevent leak detector operation on submersible pumps.

The solenoid triacs always operate independently of each other. Normally the solenoid outputs are used to control solenoids and to indicate to a hardwired console that the pump is running.

Preset operating conditions are controlled by the slow flow solenoids. As a preset operating condition is met the fast flow solenoids turn off and the slow solenoids remain open until the preset amount is reached at which point they shut off.

3.5 Hardwired Console Control

The EL6.0 has been designed to interface easily with "hardwired" consoles. The term "hardwired" means the pump operation is controlled by individual wires carrying commands and status information to and from the pump. There are four signals required to "hardwire" a pump to a control system.

Signal Name	Description
PULSER OUT	Low voltage line sending sale info to the console

AUTHORIZE IN	110/220 volt signal from the console if OK to pump
PUMP RUNNING	110/220 volt signal from the pump indicating pump "ON"
AUTHORIZE REQUEST	Contact closure from the pump to indicate handle "ON"

Some control systems use current sensing on the authorize line to indicated "AUTHORIZE REQUEST. This saves a wire under ground. The EL6.0 can be wired to take advantage of this feature by wiring the handle switch in series with the authorize input line.

In order for the EL6.0 to function properly with a hardwired console the unit must be programmed to operate in "penny console" or "volume console" mode. The factory set mode is "stand alone".

The EL6.0 has been designed to support control and monitoring of its operation by a remote console or other form of control system. When serial communications are used, no "hardwired" wires are needed to control the pump. Instead the command and status information needed for control is sent digitally over only two or three low voltage wires. This method of control offers such added features as remote totalizer reading.

3.6 Serial Console Control

The EL6.0 can support different electrical and serial protocol schemes. The currently supported protocols are:

Protocol	Description
DLINK	Two wire protocol for MTI control systems (public domain)
MNET	Three wire protocol for KRAUS* MICON heads
	*Kraus is a registered Trademark of Kraus Industries

In order for the EL6.0 to function properly with a serial console, the unit must be programmed to operate in correct serial mode. The factory set mode is "stand alone"

4 Installation

The installation process of the EL6.0 initially consists of knowing the origins of the field wires, jumper settings, and the configuration of software.

4.1 Field Wiring Detailed Description

The field wiring on the EL6.0 consists of up to 22 wires for a dual head configuration, 17 wires for a single. A description of each wire follows:

<i>Wire Color/Gauge</i>	<i>Description</i>
Black 16g	Main Power – Power to the EL6.0 computer should be connected to 110/220V 50/60Hz hot/L1 depending on 110/220 volt version option
White 16g	Head Neutral/L2 – Neutral line (or L2 if 220V) should be connected to neutral/L2. This line is also the neutral reference for the authorized input lines.
Yellow 14g	Side A Motor power input – 110/220V Hot/L2 power for the side A motor. Maximum input load is 15A @ 110/220Vac $\frac{3}{4}$ Hp
Blue 14g	Side A motor power Switched output – 110/220V power to the side A motor. Maximum load is 15A @ 110/220Vac $\frac{3}{4}$ Hp. This line is switched by a triac.
Green 16g	Earth Safety Ground – Connect to Earth
Grey #7 18g	Fast Flow Solenoid A output – Power output for the control of side A fast flow solenoid. Can supply up to 2A @ 110/220Vac. This line is switched by a triac.
Red #2 18g	Side A Solenoid Power Input – Power input for side A solenoids both fast and slow.
White/Red #1 18g	Side A Slow Flow Solenoid Output – Switched power output for the slow flow solenoid. Can supply up to 2A @ 110/220/Vac. This line is switched by a triac.
Orange #9 22g	Authorize Side A – 110/220Vac input to allow hardwired console or card system to allow sales on side A

<i>Wire Color/Gauge</i>	<i>Description</i>
Blue #11 #12 18g	Side A Handle Contacts – These two wires are switched together whenever A side handle switch is active. They can be used to signal authorize request to a console or card system. Maximum load is 5A @ 110/220Vac. These lines are connected to relay contacts.
Yellow #5 Red #15 Green #17 Black #16	Communications/Pulser Wiring – These four lines are used in conjunction with internal jumpers (on power supply) to provide pulser or serial communications for console or card lock. See section 4.2 for the wiring configuration verses jumper selections.

ADDITIONAL WIRES PRESENT ON DUAL CONFIGURED HEAD

Wire Number/Color/Gauge	Description
Yellow #13, #14 18g	Side B Handle Contacts – These two wires are switched together whenever B side handle switch is active. They can be used to signal authorize request to a console or card system. Maximum load is 5A @ 110/220Vac. These lines are connected to relay contacts.
Brown #10 22g	Authorize Side B Output - 110/220V input to allow hard wired console or card system to allow sales on side B.

Wire Number/Color/Gauge	Description
Violet #8 18g	Fast Flow Solenoid B Output -- Power output for the control of side B fast flow solenoid. Can supply up to 2A @110/220Vac. This line is switched by a triac.
Red 14g	Motor B Output -- Power output for the control of side B motor. Can supply up to 15 @110/220Vac $\frac{3}{4}$ Hp. This line is switched by a triac
Black 14g	Motor B Power -- Power input for side B motor. Can be 110/220Vac.
Orange #4 18g	Side B Slow Flow Solenoid Power Input -- Power input for side B solenoids both fast and slow.
White/Green #3 18g	Side B Slow Flow Solenoid Output -- Switched power output for the slow flow solenoid. Can supply up to 2A @ 110/220/Vac. This line is switched by a triac.

4.2 EL6.0 Jumper Settings

The equalizer has three field settable jumpers (JP4, JP5 and JP1) for setting console communications. In addition to jumper settings, the EL60 must be software configured. There are two options as shown below:

TO SELECT KRAUS SERIAL COMMUNICATIONS

JP4 *-* * (Shunt 1 & 2)
 JP5 * *-* (Shunt 2 & 3)
 JP1 * * (No Shunt Installed)
 J15 *-* (Shunt installed)
 J16 *-* (Shunt installed)

Wiring:	Red	#15	= DCC (Common)
	Black	#16	= TTP (Serial input to pump)
	Yellow	# 5	= TTC (Serial output from pump)

TO SELECT PENNY / VOLUME PULSER

JP4	* *-*	(Shunt 2 & 3)
JP5	*-* *	(Shunt 1 & 2)
JP1	*-*	(Shunt 1 & 2) if +12 V as the common voltage remove JP1 if switching reverse polarity
J15	* *	(Shunt removed)
J16	* *	(Shunt removed)

Wiring:	Red	#15	= Pulser output SIDE A
	Black	#16	= +12V pulser power for side B
	Green	#17	= Pulser output SIDE B
	Yellow	# 5	= +12V Pulser Power for side A

The factory default jumper setting is PENNY / VOLUME PULSER OUTPUT.

4.3 Mechanical Installation Procedure

For specific instructions on the mechanical installation details of the EL6.0, please refer to the supplemental instructions supplied with each custom installation kit for various specific pump make and model types.

4.4 Software Configuration

(also see Eliminator Operation Manual)

<i>Mode</i>	<i>Parameter</i>	<i>Options</i>
00	View Totals	
01	Set No Flow Time Out	00 -99
02	Set Hose Expansion	00-30
03	Set Price Security Code	
04	Set General Security Code	
05	Set Audit Security Code	

Mode	Parameter	Options
06	Set Totals Security Code	
07	Toggle Continuous Display Test	
08	Diagnostic Input and Output Monitor	
09	Reset All to Factory Defaults	
10	Set Sale Decimal Points	0 to 6
11	Set Price Decimal Points	0 to 6
12	Tell Version	
14	Setup of Operation Mode	Stand alone,POS,Console
15	Console Pulses Per Unit	1, 10, 100, 1000
16	Console Pulse Width	1, 2, 4, 8, 32
17	Set Address	00 - 32
18	Set Hose Count	
	SIDE A HOSE ONLY	
20	ATC Function	Off, Gas, Diesel
21	Slow Down Point (Preset)	10 - 990
22	Auto Calibrate	
23	Set Display Mode	Price, Commercial, Bulk
24	Change Pulser Direction	CW, CCW
25	Set Volume Decimal Point	0 - 6
26	Set Price	
27	Set Turbine Preset	ON, OFF
28	Adjust Temperature Offset	-0.9 - 0.9
29	View Audit Counters	
	SIDE B HOSE ONLY	
30	ATC Function	Off, Gas, Diesel
31	Slow Down Point (Preset)	10 - 990
32	Auto Calibrate	
33	Set Display Mode	Price, Commercial, Bulk

Mode	Parameter	Options
34	Change Pulser Direction	CW,CCW
35	Set Volume Decimal Point	0 -6
36	Set Price	
37	Set Turbine Preset	ON,OFF
38	Adjust Temperature Offset	-0.9 -0.9
39	View Audit Counters	

4.5 ATC Temperature Probe Installation

The temperature probe(s) must be installed as close to the meter as possible, either on the inlet or outlet side (Refer to local Weights and Measures Regulations). In addition, the supplied thermal well must be installed as close as possible to the temperature probe. The well must be positioned so that it can be filled with conductive fluid and can be easily reached by Weights and Measures (W&M) inspectors.

When installing probes and thermal wells the following points should be adhered to:

- * A thermal well must be installed in the fuel flow for each probe. The well must be mounted as close as possible to the probe (not more than 12 inches away). The well must be mounted so that it can be filled with thermally conductive oil (i.e. it must be less than 45 degrees from vertical) and it must be accessible so that a thermometer can be placed into it.
- * There must be a probe in the fuel flow for each product being metered. The probe can be located anywhere in the flow before or after the meter. In the case of a single product twin hose, a single probe can be used but it must be installed so that the fuel for both meters flows by the probe.
- * The well and probe fittings are 1/8 inch NPT fittings. These fittings require that at least five threads are present at the joint. If the wall being tapped is too thin, the fitting must be soldered.
 - * Do not drill or tap piping while on the pump. Instead, remove, tap and clean before reinstalling. Metal shavings left after drilling and tapping could damage the pump or dispenser components.

*****CAUTION*****

Do Not operate electric drills or other devices which may pose a fire hazard within 25 feet of gas pump. Fittings to be modified MUST BE REMOVED FROM THE PUMP BEFORE DRILLING, SOLDERING OR WELDING!

After the installation has been completed, the housing should be installed on the EL6.0. Weights and Measures personnel should then be contacted. The housing can be sealed using a sticker. Probe fittings and probe connectors can be sealed against tampering using wire seals.

4.6 Final Installation Check

Apply AC power to the pump and observe that the displays light and the green power light comes on steadily. The displays should show the last sale data and pricing. Using the remote control (press "0", "0"), check the temperature reading for each side and that the correct product type is displayed for each side in the status display. Then dispense a small amount of fuel from each side and ensure no error status is reported. Place the supplied notification and EL6.0 identification labels on the side of the pump next to the make and model plates.

4.7 Manual Calibration

Manual Calibration is not necessary when using the EL6.0 register. All calibration is done via automatic calibration. (see next section 4.8)

4.8 Automatic Calibration

This feature allows set up of the electronic calibration value needed to correct for small errors in the mechanical calibration of the meter automatically.

To Perform Automatic Calibration of Side "A"

- 1) Dispense a known volume whether that be a 20 liter test can, 200 liter, 250 liter, 500 liter, 1500 liter or any approved calibration device. The display may show more or less than the amount dispensed. In some instances the display may show 0 or an abnormally large number. This is normal, disregard whatever number the display shows.
- 2) Using mode "22" (32 for side B) . The display will show "Calibr" Enter your audit code again

to confirm that you are changing the calibration factor. This will stop inadvertant changes being made accidentally. Enter the value of product dispensed to the accuracy of the display. Example: If the test can is 20 liters enter as close to the value shown on the neck of the can perhaps 20.030. Press enter key twice.

- 3) The calibration factor is calculated automatically. Dispense a known amount and verify.

There are no limitations as to the amount dispensed for calibration. It is dependent on the calibration device you are using.

NOTE: THE NUMBER OF DECIMALS SHOWN ON THE VOLUME DISPLAY HAS TO BE SET BEFORE YOU CALIBRATE.

To Perform Automatic Calibration of Side "B"

- 1) Dispense a known volume whether that be a 20 liter test can, 200 liter, 250 liter, 500 liter, 1500 liter or any approved calibration device. The display may show more or less than the amount dispensed. In some instances the display may show 0 or an abnormally large number. This is normal, disregard whatever number the display shows.
- 2) Using mode "32" the display will show "Calibr" Enter your audit code again to confirm that you are changing the calibration factor. This will stop inadvertant changes being made accidentally. Enter the value of product dispensed to the accuracy of the display. Example: If the test can is 20 liters enter as close to the value shown on the neck of the can perhaps 20.030. Press enter key twice.
- 3) The calibration factor is calculated automatically. Dispense a known amount and verify.

There are no limitations as to the amount dispensed for calibration. It is dependent on the calibration device you are using.

NOTE: THE NUMBER OF DECIMALS SHOWN ON THE VOLUME DISPLAY HAS TO BE SET BEFORE YOU CALIBRATE.

4.9 Sealing

After the installation has been completed, the plastic housing should be installed on the EL6.0 using screws provided. W&M personnel should then be contacted, so that the housing, probe fittings and probe connectors can be sealed against tampering (using wire and / or tape seals) as indicated below:

Seal Location

Seal Type

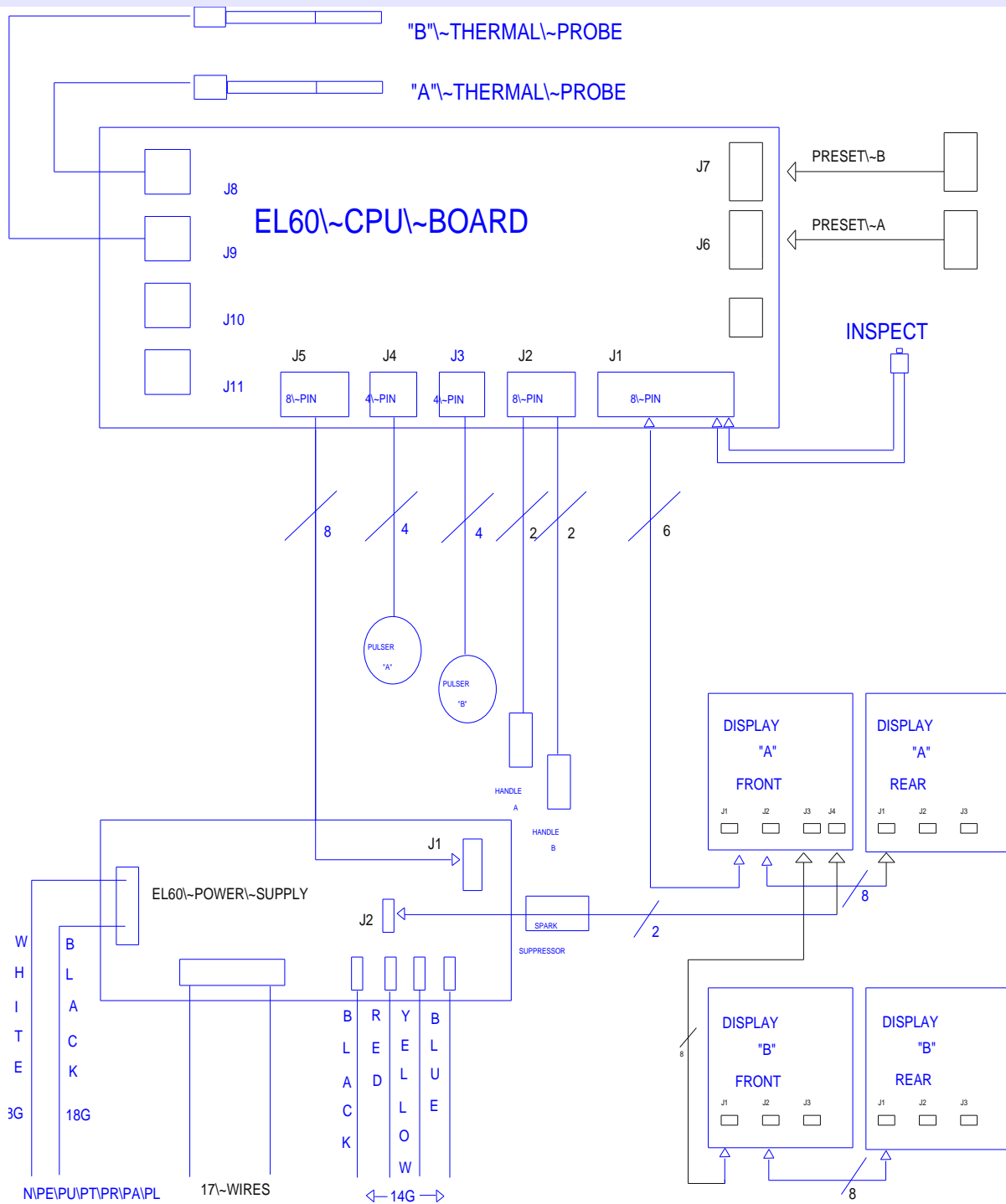
Probe fitting
Probe plug
Plastic housing

Wire seal
Wire seal
Tape seal

At the present time Weights and Measures (Canada) does not provide a full approval on AUDIT TRAIL ELECTRONIC SEALING. Therefore DIP switch #1 on the CPU housing must be placed in the "OFF" position to disable the remote control access to audited parameter settings. See programming manual section 5.2 for more information on the function of this switch.

After W & M has approved the pump for operation with ATC, the tape over the " Corrected to 15 C" notice on the face plates must be removed.

5 Typical Electrical Installation Diagrams



APPENDIX A SPECIFICATIONS

ATC

Compensation Fluid Densities	Gasoline 730 kg/m ³ Diesel 840 kg/m ³
VCF Range	VCF Zero Temperature 15 Degrees Celsius -60.0 to +50.0 C
Peak Gross Flow Rate	180 units/minute @ .001 resolution 1800 units/minute @ .01 resolution
Gross Display Maximum Resolution	.000001 units
Temperature Display Resolution	.1 C
Temperature Accuracy	+/- .3 °C overall
Probe Interchangeability	+/- .1 °C
Operating Temperature	-50 to +70° C
Operating Humidity	10 to 90% RH (non condensing)
Physical	
Length	9/23 inches/cm
Width	16/40 inches/cm
Overall Height	13/33 inches/cm
Weight	26/12.5 lb/Kg

APPENDIX B – TROUBLESHOOTING

6 World Wide Web

Measurement Technology International :

www.measurementtech.com