EAGLE MPplusII SERIES™

FIELD TO FRONT OFFICE SOLUTIONS

PRODUCT MANUAL

EAGLE RESEARCH® CORPORATION

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Table of Contents

INTRODUCTION

Overview

The MPplus II™ Volume Corrector / Pressure Recorder is Eagle Research Corporation's newest edition to the natural gas distribution product line. The MPplus II™ offers an intelligent, compact, robust, user-friendly, highly accurate, super low power, and reliable industrial microprocessor-controlled computer designed for measurement and monitoring applications. It can execute multiple processes including tasks such as complex math functions, control algorithms, etc., without host intervention.

Super Low Power Consumption along with flexibility, expandability, and reliability are the major factors in the MPplus II™ design philosophy. It is a balanced system, featuring flexible memory, I/O, power, and communications schemes. A harsh environment tolerance is also one of the MPplus II™ strengths. The operating temperature can range from -40°C to 70°C (-40°F to 158°F), and the MPPLUS II™ is housed in an outdoor rated polycarbonate enclosure. This allows the unit to exist where the work must be done, eliminating costly signal conditioning or expensive long sensor runs.

The MPplus II™ normally fed with a 5-30VDC supply, employs a low-power design. An optional 120/240 VAC unit includes an uninterruptible power supply. Should it lose power, the unit will sense the failure, automatically switch to battery power, and continue to operate at full capacity. Other supply options include solar arrays and thermoelectric generators for sites without conventional power.

The optional operator interface is a single-line liquid crystal display. A scroll switch or optional three (3) button keypad allows users to examine and diagnose problems at the remote site without a local host or terminal.

The MPplus II™ can calculate natural gas corrected volumes using AGA-5, AGA-7, AGA-8, and NX-19 reports. Eagle Research is committed to providing a complete solution for all gas flow, steam, and control applications.

Reliability

The MPplus II™ is robustly built to perform in a variety of industrial environments. Care is taken to maximize reliability by applying a plastic moisture barrier to all circuit boards, utilizing a hermetically sealed display, and providing outdoor rated packaging.

Hazardous Location Classifications

The MPplus II™ is designed for mounting in CSA Class I, Division 2 hazardous area locations (refer to the NFPA Electrical Code Book).

Four-Year Warranty

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

Returns

When a faulty product cannot be repaired in the field, contact Eagle Research Corporation for an RMA number and for return information. Packaging and shipping criteria will be established at that time.

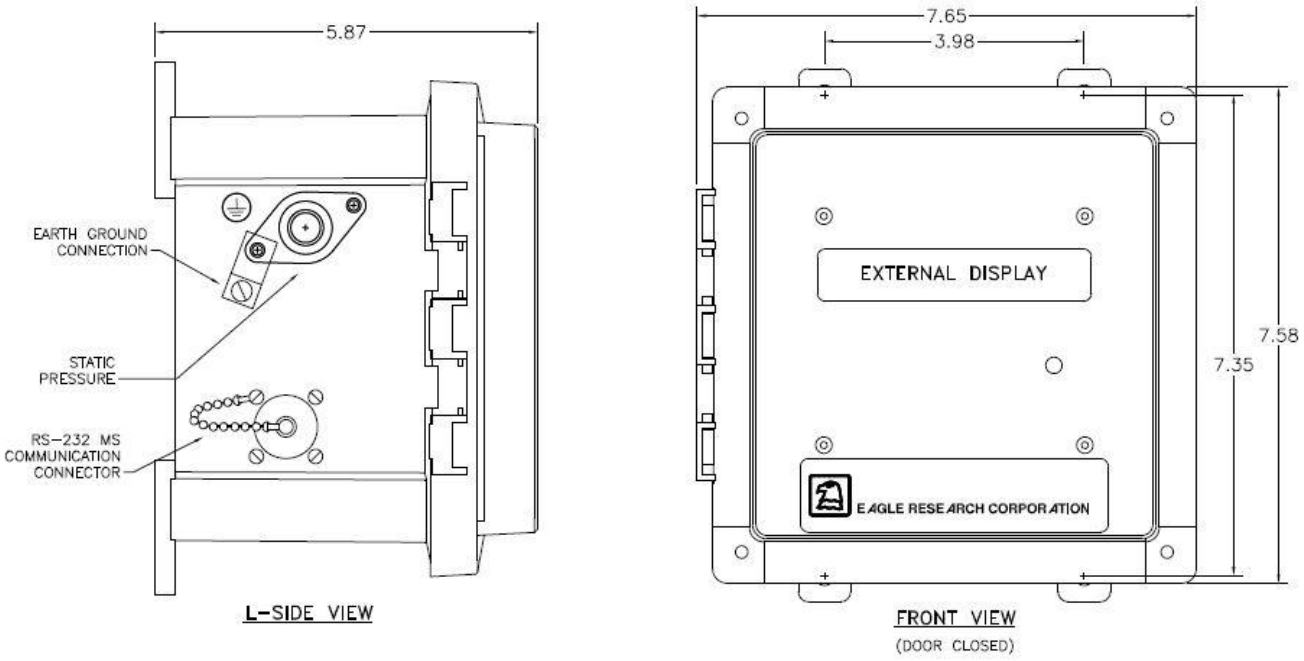
> ⚠ REMOVE ANY REPLACEABLE BATTERY OR BATTERY PACK FROM ANY UNIT PRIOR TO ITS RETURN SHIPPING. DAMAGE CAUSED BY LOOSE BATTERIES WITHIN UNITS WILL NOT BE COVERED BY THE MANUFACTURER, AND MAY VOID ANY WARRANTY THE UNIT IS STILL UNDER.

Enclosure Security

Quick-release door latches that may be padlocked are standard features of the MPplus II™ to prevent unwanted users from opening the enclosure. As an option, a magnetic door-ajar switch may be installed to initiate an alarm when the unit's door is opened.

Special Precautions

Take care when closing the door of the MPplus II™, being sure not to pinch any wires in the hinge of the door.



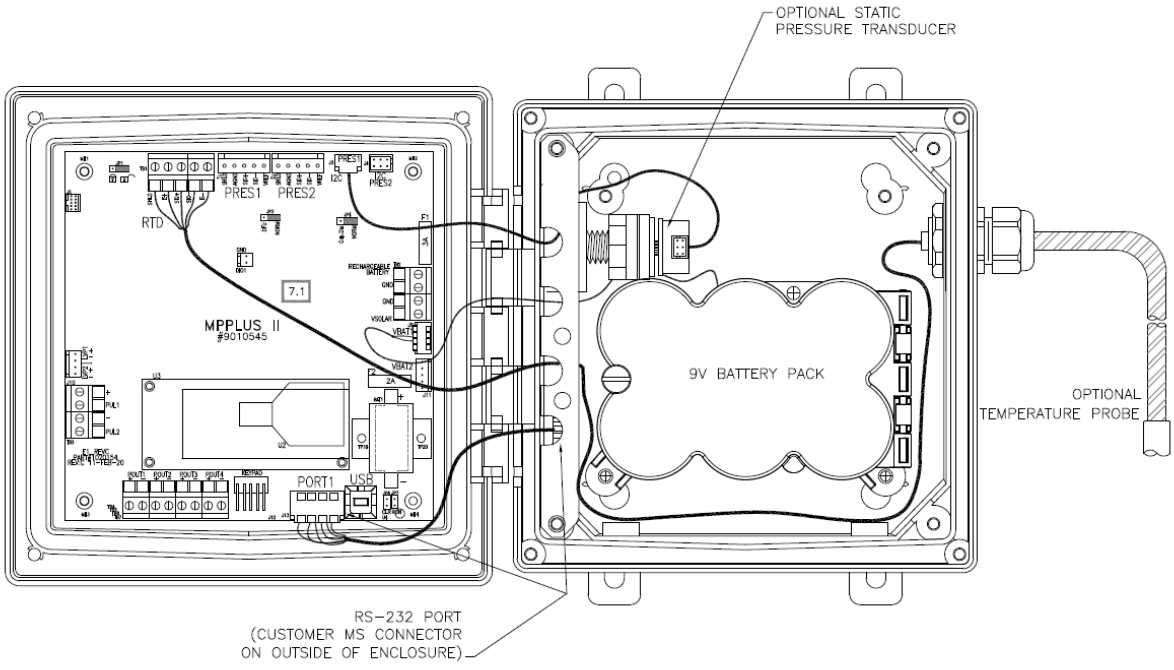


Figure 1 – The MPplus II™

TECHNICAL SPECIFICATIONS

The table below lists the technical specifications for the MPplus II™ Volume Corrector Units.

Features	Description				
Input Power	5-30 VDC. Two battery inputs on MTA connectors. One battery input for rechargeable batteries on screw terminals. One solar power input on screw terminals.				
Consumption	Mode	6V	9V	10.8V	12V
	Sleep	0.016mA	0.012mA	0.011mA	0.010mA
	Sleep w/ Display on	0.032mA	0.024mA	0.020mA	0.019mA
	Calculation	21.8mA	14.7mA	12.4mA	11.3mA
	Calculate and RS-232	25.4mA	16.8mA	14.7mA	13.1mA
Power Monitoring	Supply voltage monitoring through a/d with low supply voltage Interrupt				
Solar Charging	MPPT (Maximum Power Point Tracking) based solar charger supports up to 40W				
Backup Battery	3.6 VDC lithium backup battery: 10 years typical backup of database and time/date during normal use				
Processor	Ultra-Low-Power ARM Cortex-M4 32-bit MCU with hardware floating point support				
Memory	SRAM Memory: 2MB Flash Memory: 1MB				
Real time Clock	Battery-backed, quartz crystal controlled; +/- 1 sec/day typical accuracy; programmable time scheduled interrupt capability				
Internal Inputs	One ambient temperature input; one supply voltage input.				
Pulse Inputs	Two pulse inputs, software programmable for Form A or C; high or low speed. Each counter is a six-digit (0-999999) hardware counter with programmable interrupt support. Can be used for simple pulse accumulation, and for more complex applications such as card readers				
Pulse Outputs	Four Form A pulse outputs (Pulse 1 and 2 Optically Isolated, 3 and 4 FET driven.				
Analog Inputs	Two high-accuracy digital transducer inputs for local pressure transducer, 16-bit resolution, software calibration. Two strain gauge (mV) analog inputs through MTA connectors for local pressure transducer, 16-bit resolution, software calibration. Each input has five MTA pins.				
RTD Inputs	One 16-bit resolution RTD input through an MTA connector; 4-wire lead compensated with ground shield connection; five-pin MTA				
Communications	1 local serial port with RX, TX, RTS, CTS, and communication switch signals. Port 1 (RS-232 levels) typically connects to the MS connector to provide local communications via 6-pin MTA. Configurable speed up to 115,200 baud. 1 additional communication port for cellular modems or other communication devices. Configurable speed up to 115,200 baud. Multiple GPIO available on connector for various modem functionality. 1 USB port for local communications.				
Status LED	One software-controllable LED for various function indications				
Expansion Capability	Additional connectors provide redundant termination points to allow for configuration flexibility. One 10-position connector allows for expansion over the I^2C communication bus.				

TERMINAL SUMMARY

Feature	Terminal	Description
POWER INPUT	1	Solar Input (12-22 VDC)
	2	Ground
	3	Ground
	4	Rechargeable Lead Acid Battery
RTD	5	E-
	6	SIG -
	7	SIG+
	8	E+
	9	SHLD
PULSE INPUTS	10	+
	11	PUL1
	12	-
	13	PUL2
PULSE OUTPUTS	8	Pulse Out 1+
	8	Pulse Out 1-
	9	Pulse Out 2+
	10	Pulse Out 2-
	11	Pulse Out 3+
	12	Pulse Out 3 -
	13	Pulse Out 4 +
	14	Pulse Out 4 -

MPPLUS II™ SOFTWARE ADDRESSING

Description	Terminals	Software Address	Notes			
Pulse Outputs						
Pulse Output #1	14 & 15	1.1	Optically Isolated			
Pulse Output #2	16 & 17	1.2	Optically Isolated			
Pulse Output #3	18 & 19	1.3	FET Driven			
Pulse Output #4	20 & 20	1.4	FET Driven			
Power Input						
Battery #1	J9 (VBAT1)	6	Range 5 to 30 VDC			
Battery #2	J11 (VBAT2)	6				
Rechargeable Lead Acid Battery	4	6				
Solar	1	N/A				
Pulse Inputs		Form "A"		Form "C" Connected	Resistor Connected Integral Input On	Cap
Pulse Input #1	10, 11, & 12	1	1.1	1.0100	1.0010	1.0001
Pulse Input #2	13	2	2.1	2.0100	2.0010	1.0001
Pressure Inputs						
Digital Pressure Transducer #1	J3	1	High accuracy digital pressure transducer			
Digital Pressure Transducer #2	J4	2	High accuracy digital pressure transducer			
Digital Pressure Transducer #1 Temp	J3	11	High accuracy digital pressure transducer's internal temperature reading			
Digital Pressure Transducer #2 Temp	J4	12	High accuracy digital pressure transducer's internal temperature reading			
Analog Pressure Transducer #1	J1	3	Analog Strain gauge pressure transducer			
Analog Pressure Transducer #2	J2	4	Analog Strain gauge pressure transducer			
Communications						
Internal Port	J13	Port 1	RS-232 levels			
Socket Port	U2/U3	Port 2	Auxiliary communications port for cell modems and other communications devices			
USB Port	USB	USB?	USB Type B for local communications			
RTD Inputs						
RTD Input	5, 6, 7, 8, & 9	5	Range –40° to 160°F			
Ambient Temperature			Range –67° to 257°F			
	N/A	7	Can be read in the Extended System process			

MPPLUS II™ HARDWARE ADDRESSING

Comm Port 1 Settings		
Address	**Name**	**Default Value**
1.01	Config Number	0
1.02	Config Bits 1	0
1.03	Config Bits 2	0
1.04	Config Bits 3	0
1.05	Main Baud rate	115200
1.06	CMSW Baud rate	115200
1.07	HexAscii Timeout	10000
1.08	Aux Port Timeout	2000
1.09	RTS On Time (ms)	5
1.10	RTS Off Time (ms)	2
1.11	Modem Timeout(S)	300
1.12	Dial tone Wait(S)	0
1.13	Rings to Answer	1
1.14	Power Delay	0
1.15	Power Address 1	0
1.16	Power Address 2	0
1.17	Echo Port	-1
1.18	Echo Trig Char	0
1.19	SIM Card PIN	-1
1.20	TCP Listen Port	0
1.21	Rand Dial Delay	0
1.22	Clear Chan TO(S)	60
1.23	Clear Required(S)	10.0
1.24	Modbus Offset	0
1.25	Modbus Delay(ms)	10

Comm Port 2 Settings		
Address	**Name**	**Default Value**
2.01	Config Number	0
2.02	Config Bits 1	0
2.03	Config Bits 2	0
2.04	Config Bits 3	0
2.05	Main Baud rate	115200
2.06	CMSW Baud rate	115200
2.07	HexAscii Timeout	10000
2.08	Aux Port Timeout	2000
2.09	RTS On Time(ms)	5
2.10	RTS Off Time(ms)	2
2.11	Modem Timeout(S)	300
2.12	Dial tone Wait(S)	0
2.13	Rings to Answer	1
2.14	Power Delay	0
2.15	Power Address 1	0
2.16	Power Address 2	0
2.17	Echo Port	-1
2.18	Echo Trig Char	0
2.19	SIM Card PIN	-1
2.20	TCP Listen Port	0
2.21	Rand Dial Delay	0
2.22	Clear Chan TO(S)	60
2.23	Clear Required(S)	10.0
2.24	Modbus Offset	0
2.25	Modbus Delay(ms)	10

USB Settings		
Address	**Name**	**Default Value**
201.01	Config Number	0
201.02	Config Bits 1	0
201.03	Config Bits 2	0
201.04	Config Bits 3	0
201.05	Main Baud rate	115200
201.06	CMSW Baud rate	115200
201.07	HexAscii Timeout	10000
201.08	Aux Port Timeout	2000
201.09	RTS On Time(ms)	5
201.10	RTS Off Time(ms)	2
201.11	Modem Timeout(S)	300
201.12	Dial tone Wait(S)	0
201.13	Rings to Answer	1
201.14	Power Delay	0
201.15	Power Address 1	0
201.16	Power Address 2	0
201.17	Echo Port	-1
201.18	Echo Trig Char	0
201.19	SIM Card PIN	-1
201.20	TCP Listen Port	0
201.21	Rand Dial Delay	0
201.22	Clear Chan TO(S)	60
201.23	Clear Required(S)	10.0
201.24	Modbus Offset	0
201.25	Modbus Delay(ms)	10

Misc. Settings		
Address	**Name**	**Default Value**
401.01	Board Serial Num	1
401.02	Unit Serial Num	0
401.03	Amb Temp Slope	1.0
401.04	Amb Temp Offset	0.0
401.05	Clr DB Password	947332
401.06	EE Edit Password	3348
401.07	Clr All Password	4648
401.08	Syst Conf Bits 1	0
401.09	Syst Conf Bits 2	0
401.1	Syst Conf Bits 3	0
401.11	EBM800 Addr Port	4
401.12	EBM800 Data Port	3
401.13	EBM800ai del(ms)	1
401.14	Supply Volts Adr	0.0
401.15	Sup Volts Slope	0.001262
401.16	Sup Volts Offset	0.574507
401.17	Solar Charger Adr	0.0
401.18	Eavesdrop Config	0
401.19	Eavesdrop Show Pt	1
401.20	Eavesdrop on Port	2
401.21	Hr Pulse Out Adr	0

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, as the manufacturer cannot be held responsible for items damaged in transportation and accepted by the customer.

2. Carefully unpack the MPplus II™ from the shipping container. Verify that the box contains every item listed on the shipping order.

> ⚠ 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 or ankle strap. 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.

3. Open the front door by releasing the quick release latches of the enclosure and swinging the door out.

4. Examine the label on the inside right wall of the enclosure. It indicates the configuration and serial number of the unit.

Mounting the MPplus II™

Note: For Positive Displacement (Index-Mounted) applications see Appendix B.

The MPplus II™ may be mounted directly on a wall or, optionally, on a pipe (see Fig. 2). Mounting feet are provided for wall mounting, and plates with U-bolts are provided for pole mounting. Two-inch rigid iron pipe or conduit is required for pipe mounting. It is recommended that the pipe be placed 18 to 24 inches into the ground in a 6-inch wide concrete-filled hole. The length of the 2-inch mounting pipe or conduit will vary according to the site, but typical installations place the unit at about eye level for ease of operation.

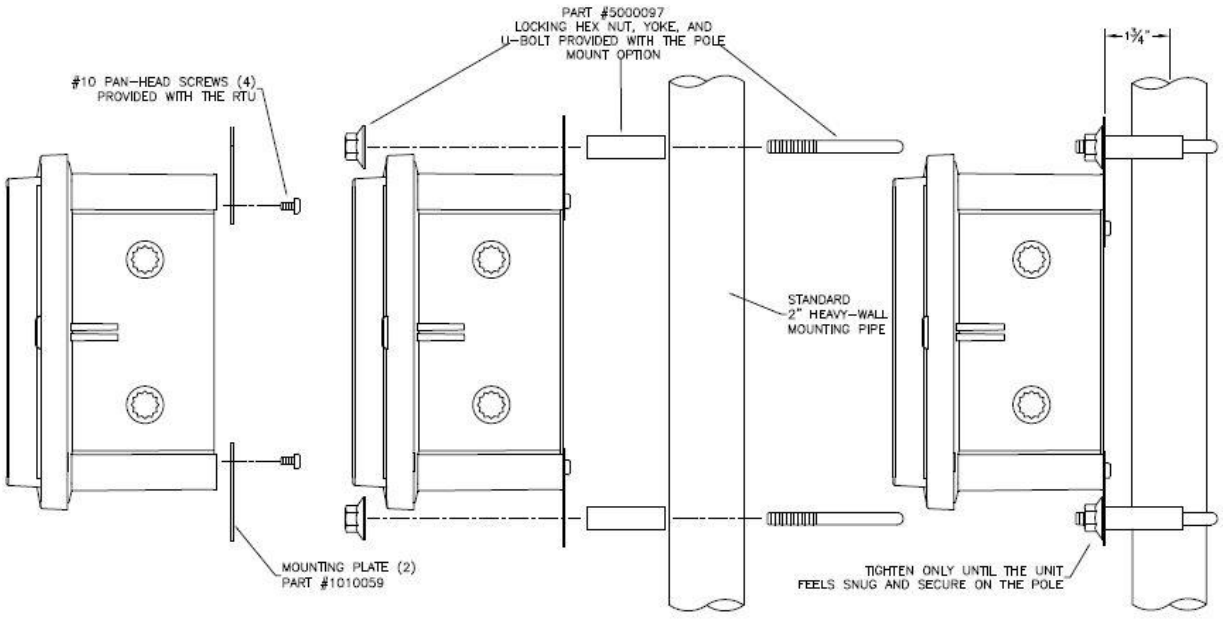


Figure 2 – Pole Mounting Detail

POWER FOR THE MPPLUS II™

*(Refer to **Figure 3** on page 14 for processor board power connections.)*

Power Options

The MPplus II™ has several power options available: Internal Battery Power Only; Local or Remote Solar Power Array or Supply; or some combination of these. In addition to the primary operating power for the MPplus II™ there is an onboard backup battery to maintain unit memory and clock.

Onboard Backup Battery

The onboard lithium backup battery in the MPplus II™ maintains power for approximately ten years to the memory section and the real time clock of the processor board when primary operating power is not present. Operation and interactivity with the processor are now available when the backup battery alone is in use, though this significantly decreases the battery life of the backup battery. The onboard battery is now field replaceable and protected by a black battery cover.

Internal Battery Power

Several internal battery packs are available for supplying primary power to the unit. The three basic kinds are **Alkaline** (non-rechargeable), **Lithium** (non-rechargeable), and **Lead-Acid** (rechargeable).

Alkaline and **Lithium** packs are typically used alone, without external power, and provide a one-time supply until drained of energy. Alkaline and Lithium battery life is determined by several factors, such as frequency of calculations and communication, cabinet temperature, etc. Connections on the MPplus II™ processor board are arranged such that, as one battery pack begins to lose power, a second pack may be connected before the first is removed, thus providing uninterrupted power.

WARNING: (see Figure 3) Do not connect the alkaline or Lithium battery packs to terminal 4. Irreparable damage may occur.

Lead-Acid batteries are rechargeable, and are typically used with a solar panel or array. With normal operating conditions, lead-acid batteries and their associated external supplies should provide long periods of unattended power to the unit. This would be more suitable for remote locations.

CAUTION: (see Figure 3) Do Not connect the lead-acid battery packs to connector J9 or J11 as charging will not occur.

Wiring the Power Input

WARNING: The operating voltage range for the MPplus II™ is 5-30 VDC. Do **NOT** exceed recommended input voltage of 30 VDC.

*(**See Figure 3** for processor board power connections.)*

If the unit is **internally battery powered only**, connect it as follows: Plug it into either J9 or J11 to power up the MPplus II™. When it is time to replace the pack, a second pack may be plugged into the other connector before removing the first so power is not interrupted.

WARNING: Whenever external power is applied to the MPplus II™, **NEVER** wire the non-rechargeable alkaline or lithium battery packs into terminal 4, as damage to the unit may occur.

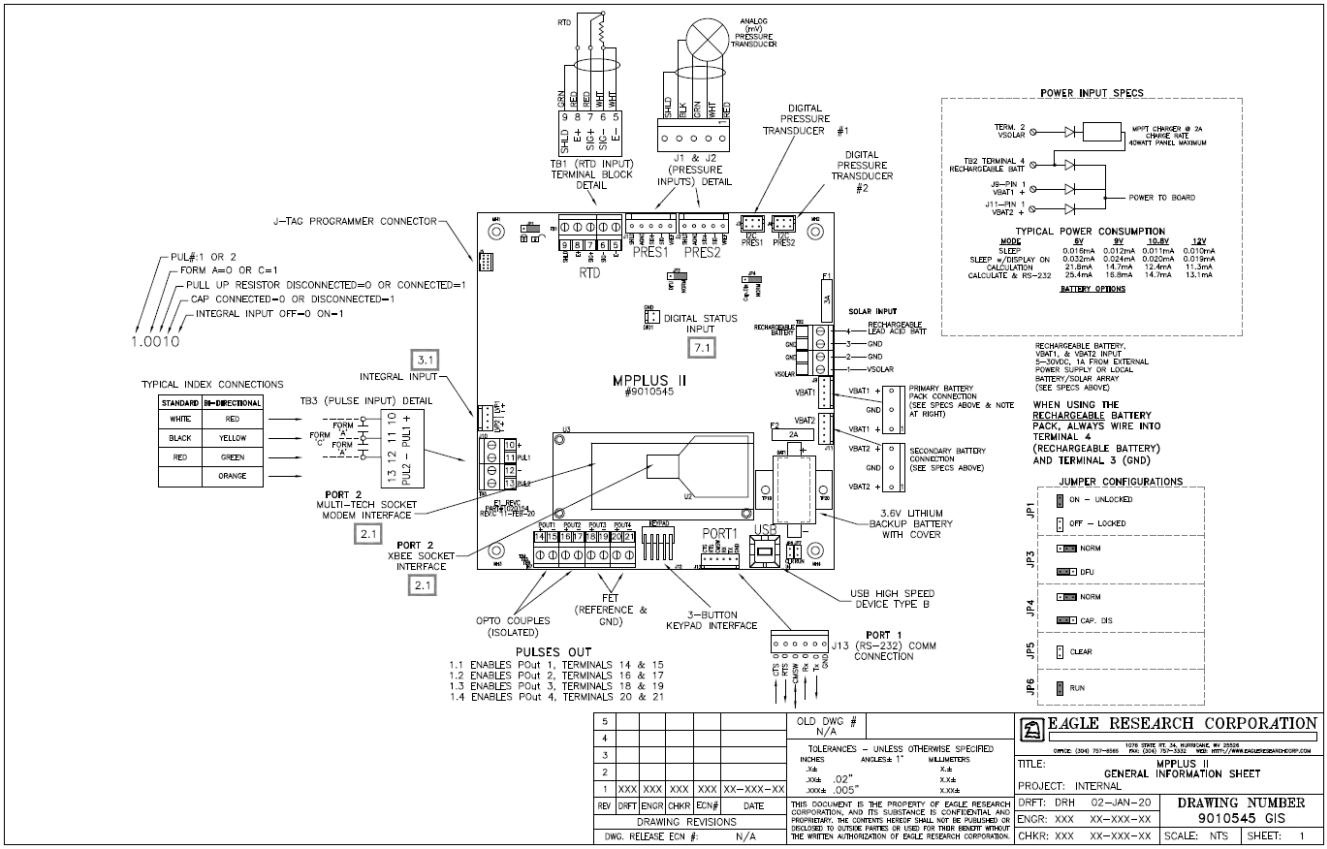


Figure 3 – Processor Board Detail

If the unit is **solar powered** with a local solar array feeding directly into it, follow this procedure. **First -** connect the internal lead-acid (rechargeable) battery pack to terminal 4. **Next** - connect the (+) lead of the solar array to terminal 1 (VSOLAR) and the (-) lead to terminal 2 (GND). Use the reverse procedure to power the unit down, disconnecting the solar array wires first. **Do not connect the internal lead-acid battery to J9 or J11, as charging will not occur**. **If for any reason an alkaline battery pack is used in this application, DO NOT connect the solar array as damage may occur.**

> **NOTE:** Upon first powering up the MPplus II™, the optional outside display will flash, indicating an alarm condition. In this case it means 'First Time Power' and is no cause for concern. To clear this alarm read the paragraph on 'Using the Scroll Switch' in the DISPLAY MODE section.

When the outside display option is present, you can now view selected parameter values using the scroll switch or optional three (3) button keypad. The scroll switch is activated using a magnet (one is shipped with units having this option).

The table below shows the terminal wiring for power input.

Power Input Description	MPplus II Terminal Location
Screw Terminals (TB2)	
VSOLAR (solar power) GND (ground) GND (ground) Rechargeable Lead acid Battery	1 2 3 4
MTA	
VBAT1 VBAT2	**J9** Primary Pin1 +; Pin3 Gnd **J11 Secondary** Pin1 +; Pin3 Gnd

INTERNAL CONNECTIONS

Communications

To communicate with the MPplus II™, 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) that allows the software packages to communicate with the MPplus II™. The default Site ID number is 1. Site ID Changer, available through Field Manager™ or Talon™, 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. Virtual Keypad can also be used to change the Site ID from its default value.

In its standard configuration, the MPplus II™ is equipped with three communications ports – 1, 2, and USB. Port #1 can be configured to allow local communication using RS-232C. Port# 2 is used for a variety of external communications, such as cellular modems. It includes both Xbee and MultiTech socket interfaces for added flexibility. USB Type B can be used for high speed, local communications.

An optional RS-232C serial cable is required for local direct communications. Contact your factory representative for ordering information.

The table below shows the MTA wiring for Port 1.

PORT #1	MPplus II Pin Locations
RS-232C (CMSW pin grounded)	J13
CTS 1 (clear to send)	1
RTS 1 (request to send)	2
CMSW 1 (communications switch)	3 MTA pin numbers
Rx 1(receive)	4
Tx 1 (transmit)	5
GND 1 (ground)	6

Wiring the Pulse Inputs

The standard MPplus II™ configuration includes two pulse inputs that are software programmable for Form A or C, and high speed or low speed. These inputs can be used for meter indexes, simple pulse counters, or in more demanding applications such as card readers. The table below shows the terminal wiring for the pulse inputs.

Pulse Input Description	MPplus II Terminal Location
Pulse Input	**TB3**
+	10
Pulse 1	11
- 1 (no connection for Form A)	12 (no connection on 5 for Form A)
Pulse 2	13

Wiring the Pulse Outputs

The MPplus II™ comes standard with four multi-purpose, memory-mapped, digital Pulse Output lines. These outputs can be configured as simple discrete outputs or as precisely timed pulse outputs. (Solid-state 100mA max AC/DC)

Pulse Output Description	MPplus II Terminal Location
Pulse Out 1	**TB4**
Normally Open 1 (NO1)	14 Optically Isolated
Common 1 (Com1)	15
Pulse Out 2	**TB5**
Normally Open 2 (NO2)	16 Optically Isolated
Common 2 (Com2)	17
Pulse Out 3	**TB6**
Normally Open 3 (NO3)	18 FET Controlled
Common 3 (Com3)	19
Pulse Out 4	**TB7**
Normally Open 4 (NO4)	20 FET Controlled
Common 4 (Com4)	21

Wiring the Analog Inputs

The standard MPplus II™ configuration includes two pressure high – accuracy digital strain gauge (mV) inputs and two high accuracy digital transducer inputs and one RTD input with 4-wire lead compensation and ground shield connection. These are 16-bit resolution. In addition, there is a box temperature and supply voltage input. All analog inputs can be software calibrated. The table below shows the terminal wiring for the analog inputs.

Analog Input Description	MPplus II Terminal Location
Pres_1	
I2C connector	**J3**
Pres_2	
I2C connector	**J4**
Pressure 1	**J1**
Power 1 (VREF)	Pin 1
Analog Input 1 (SIG -)	Pin 2
Analog Input 1 (SIG +)	Pin 3 MTA pin numbers
Ground 1 (AGND)	Pin 4
Shield 1 (SHLD)	Pin 5
Pressure 2	**J2**
Power 2 (VREF)	Pin 1
Analog Input 2 (SIG -)	Pin 2
Analog Input 2 (SIG +)	Pin 3 MTA pin numbers
Ground 2 (AGND)	Pin 4
Shield 2 (SHLD)	Pin 5
RTD	**TB1**
E-	5
SIG -	6
SIG +	7 Terminal Numbers
E+	8
SHLD	9

Note: Inputs cannot be used for 4-20mA or 1-5V signals.

GROUNDING

Because of the potential for equipment damage and injury to personnel, certain practices should, and often must, be observed when installing field computer systems. Of these practices, proper grounding is possibly the single most important. This section was included 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 (NFPA), 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. Eagle Research Corporation makes no warranties or guarantees on the effectiveness or safety of any technique or suggestion here described.

All field computers, electronic utility interface, 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 materials) to which is securely tied all equipment chassis, metal cabinets, and intrinsic safety ground brackets. For equipment chassis and metal cabinets, a solid copper ground wire or ground strapping of an approved size and type is recommended to tie this equipment to the rod(s). For Intrinsic Safety systems it is recommended that two #12 AWG wires be run in parallel from individual ground terminals on each I.S. ground frame. Where more than one rod is used, as when some distance separates equipment, all rods should be bonded together with copper in an approved manner.

It should also be noted here that systems employing **Cathodic Protection** need to be approached differently when considering grounding measures. Eagle Research Corporation can help you define grounding procedures for any application.

References

- National Electrical Code
  - Article 250 - Grounding
  - Articles 500 & 501 - Hazardous (Classified) Locations
  - Article 504 - Intrinsically Safe Systems
- The IAEI Soares' Book on Grounding
- Polyphaser Corporation's catalog of Lightning/EMP & Grounding Solutions
  - www.polyphaser.com

OPERATING MODES

The MPplus II™ operates in any of the following five standard modes:

- Sleep/Wake-up
- Display
- Alarm
- Configuration
- Calibration
- Read Only

To access any operating mode (except for Read Only), press the Virtual Keypad key that corresponds to the mode you want:

conf - for configuration mode
alrm - for alarm mode
cal - for calibration mode
esc - to return to a previous mode from any other mode

Sleep/Wake-Up Mode

In normal operation the MPplus II™ maintains a powered down state (sleep mode) to conserve battery life. In this state the display can be configured to be turned off or to show the first label, **CV XXXXXXXX** for example, where **XXXXXXXX** is the most recent reading prior to the next wake-up interval. The unit executes processes depending upon the user's programmed wake-up interval. Shorter intervals result in more frequent data while longer intervals provide for longer battery life. The scheduled wakeups result in immediate power-down after performing calculations.

In addition to the scheduled wakeups for volumetric calculations, the MPPLUS II™ can be brought out of sleep mode by any of the following:

- Connecting a portable computer to the unit's serial communication port (MS connector)
- Connecting a USB cable into the onboard USB port.
- Scrolling the external display with a magnet on optional three (3) button keypad
- Calling the unit via modem

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

> **NOTE:** The MPplus II™ will not go to sleep if the RS-232C serial cable is connected. Battery life, in this case, may be drastically reduced.

Typically, the MPplus II™ remains fully awake and does not enter the sleep mode if it is powered with an external power supply. In this case, the **Wake-up Interval** parameter is set to **0**.

Display Mode

In display mode, only limited parameters with assigned labels and function keys can be viewed. With virtual keypad, the **up** and **down** keys will allow you to scroll through the display parameter list. You may use the **jump** key to directly view any of the assigned labels; press **jump** then enter the label number 1-64, followed by pressing **Ent**. You can use the function keys (**F0 - F9**) to view previously assigned parameters. Field Manager, Talon™ Lite or Talon SCE™ software can be used to assign function keys and labels to any parameter. Also, virtual keypad may be used to assign function keys.

Using the Scroll Switch

On units that feature the external display, a magnet may be used to easily access information without opening the door. Just below the display window, to the right, is a routed indention in the door. With the key chain magnet, supplied with these units, is held in the proximity of this 'dimple', the display will vary its information. Hold the magnet for 1 to 2 seconds over the dimple to wake up the unit. If the magnet is not held over the dimple long enough then the unit will go back to sleep. Swipe the magnet over the dimple to scroll to the next parameter.

When in an alarm condition, the external display will be flashing. To clear alarms, hold the magnet against the dimple until flashing stops.

Using the Three button keypad

Also available on units that feature the external display, is an optional three (3) button keypad. The three (3) button keypad can also be used to easily access information without opening the door. The up and down arrows scroll the display and the Eagle button acts as the enter button.

When in an alarm condition, the external display will be flashing. To clear alarms, press the up arrow and the Eagle button at the same to access the alarm mode. Pressing the Eagle button acknowledges alarms.

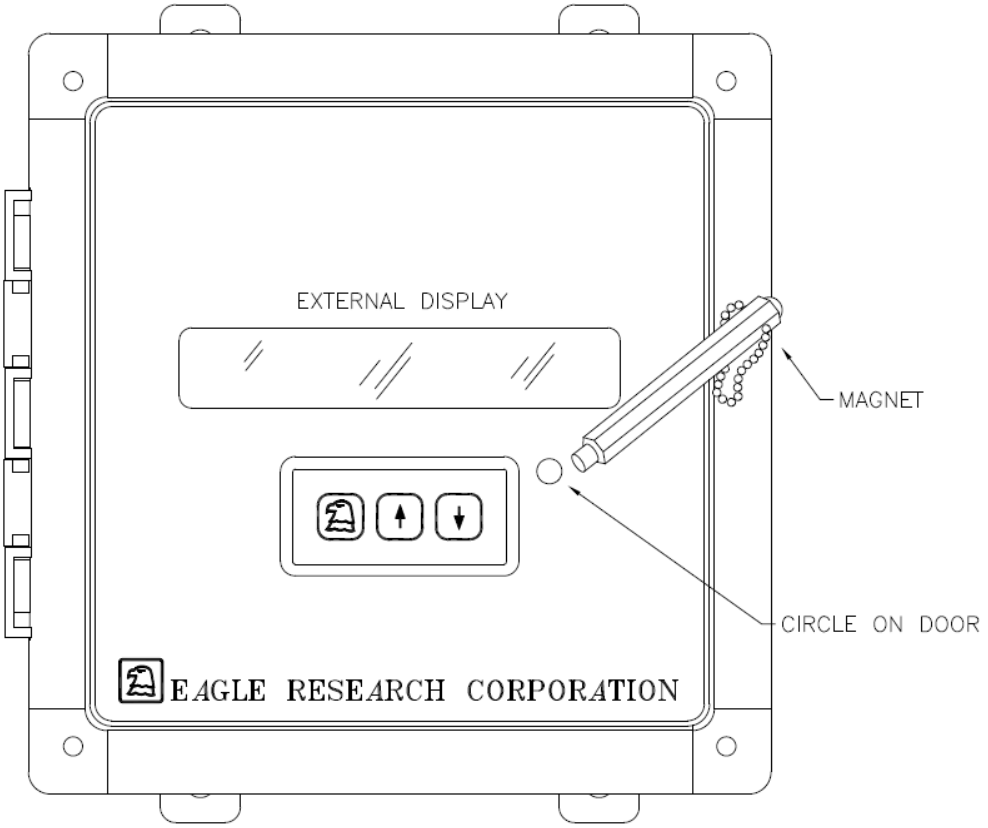


Figure 4 – Using the Scroll Switch or Three Button Keypad Feature

Alarm Mode

The MPplus II™ can be configured to activate an alarm when certain conditions are met or when user-defined limits are exceeded. Active alarm messages can be configured to show on the MPplus II display. The unit can also automatically call a host computer running Talon Software Suite to report the alarm. (see the section on SOFTWARE PACKAGES).

A history log is kept in the unit on each alarm condition, consisting of the following:

- Alarm Type
- Current value
- Time in alarm
- Date in alarm
- Alarm in Setpoint
- Extreme value

High and Low Aux Pressure

The MPplus II™ can be configured to monitor and alarm on any condition including, but not limited to, the following:

- First Time Power
- Low Supply Volts
- High and Low Meter Pressure
- High and Low Temperature
- High and Low Flow Rate
- Door Alarm
- High Current Day Volume
- High and Low Aux Pressure

NOTE: Additional hardware equipment and configuration may be required for some alarm monitoring applications.

Viewing and Clearing Alarms from Virtual Keypad

(See the sections on ALARM MODE, & APPENDIX A: PARAMETER TABLES)

To enter alarm mode, press the **alrm** key in Virtual Keypad. In alarm 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 the **down** key. Repeatedly pressing the **down** key will cycle through the active alarm list.
Alarms can be locally acknowledged at the unit by pressing the **Ent** key in Virtual Keypad while an alarm message is displayed, or by polling with Field Manager, Talon™ Lite or Talon SCE™ 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 the **esc** key in Virtual Keypad.

When in an alarm condition, the optional external display will be flashing. To clear alarms, hold the magnet against the dimple until flashing stops or press the up arrow and the Eagle button at the same to access the alarm mode. Pressing the Eagle button acknowledges alarms.

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.

Low Supply Volts Alarm

If the supply voltage to the unit falls below the Low Supply Volts Alarm Set point 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 set points are user configurable with default values of 8.0 and 8.5 volts respectively for battery powered units.

High Meter Pressure Alarm

If the gas pressure should exceed the High-Pressure Alarm Set point, a **High-Pressure** alarm will be initiated. The alarm will remain active until the pressure falls below the High Pressure Reset parameter value. The set points are user configurable with default values of 999999 and 999999, respectively. These defaults essentially disable the alarm until user configured to be accurate for the site.

Low Meter Pressure Alarm

If the gas pressure should fall below the Low-Pressure Alarm Set point, a **Low-Pressure** alarm will be initiated. The alarm will remain active until the pressure rises above the Low Pressure Reset parameter value. The set points are user configurable with default values of -999999 and -999999 respectively. These defaults essentially disable the alarm until user configured to be accurate for the site.

High Gas Temperature Alarm

If the gas flow temperature should exceed the High Temperature Alarm Set point, a **High Temperature** alarm will be initiated. The alarm will remain active until the temperature falls below the High Temperature Reset parameter value. The set points are user configurable with default values of 999999 and 999999, respectively. These defaults essentially disable the alarm until user configured to be accurate for the site.

Low Gas Temperature Alarm

If the gas flow temperature should fall below the Low Temperature Alarm Set point, a **Low Temperature** alarm will be initiated. The alarm will remain active until the temperature rises above the Low Temperature Reset parameter value. The set points are user configurable with default values of -999999 and -999999 respectively. These defaults essentially disable the alarm until user configured to be accurate for the site.

High Flow Rate Alarm

If the flow rate should exceed the High Flow Rate Alarm Set point, 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 set points are user configurable with default values of 999999 and 99990, respectively. These defaults essentially disable the alarm until user configured to be accurate for the site.

Low Flow Rate Alarm

If the flow rate should fall below the Low Flow Rate Alarm Set point, 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 set points are user configurable with default values of -999999 and -999999 respectively. These defaults essentially disable the alarm until user configured to be accurate for the site.

Open Door Alarm

The **Open-Door** alarm is initiated when the door of the MPplus II™ opens. When this occurs, a full wake-up is triggered and the unit executes its processes. The alarm is inactive when the door is closed. The Door alarm requires purchase of additional door ajar switch.

High Current Day Volume Alarm

If the Current Day Volume should exceed the High Current Day Volume Alarm Set point, a **High Current Day Volume** alarm will be initiated. The alarm will remain active until the Current Day Volume falls below the Current Day Volume Reset parameter value. The set points are user configurable with default values of 999999 and 999999, respectively. These defaults essentially disable the alarm until user configured to be accurate for the site.

High Aux Pressure Alarm

If the gas pressure should exceed the High Aux Pressure Alarm Set point, a **High Aux Pressure** alarm will be initiated. The alarm will remain active until the pressure falls below the High Aux Pressure Reset parameter value. The set points are user configurable with default values of 999999 and 999999, respectively. These defaults essentially disable the alarm until user configured to be accurate for the site.

Low Aux Pressure Alarm

If the gas pressure should fall below the Low Aux Pressure Alarm Set point, a **Low Aux Pressure** alarm will be initiated. The alarm will remain active until the pressure rises above the Low Aux Pressure Reset parameter value. The set points are user configurable with default values of -999999 and -999999 respectively. These defaults essentially disable the alarm until user configured to be accurate for the site.

Configuration Mode

Configuration mode allows you to set up the MPplus II™ initial configuration, change any of the operating parameter values, and set alarm conditions and limits. Field Manager™ software, Talon™ Lite software, or Talon SCE™ software is required to perform configuration. See the online help files for operating instructions.

> **WARNING:** Care must be taken when editing parameters. Improper parameter editing may result in corruption of the database.

To enter configuration mode, press the **conf** key in Virtual Keypad. If the configuration mode is password protected, the MPPLUS II™ 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 unit's initial configuration, change any of the operating parameter values, set alarm conditions and limits, and assign function keys to various parameters. While in the configuration mode, the unit continues to operate normally. It continues to sample live pressure and temperature values, calculate corrected volume, and collect historical data.

Viewing Parameters

In configuration mode, any parameter value may be viewed. One method is to use the **Jump** key to directly view database items. Press **Jump** and then enter the address of the parameter **(PPSSII)** followed by pressing the **Ent** key. The top line on the display is the address **XX-XX-XX** and the bottom line is the value. Function key assignments are still valid, so often-viewed parameters may be accessed in this manner. The right and left allow horizontal movement between processes, and the **up** and **down** keys allow moving vertically within a process. Pressing **Jump** followed by the **right** arrow key will display the same item number in the next section. Likewise, pressing **Jump** followed by the **up**-arrow key will display the same item number in the previous section. Jumping to assigned labels is also supported as described in Display mode.

Editing Parameters

1. Enter configuration mode by pressing the **conf** key (use the password if required).
2. Display the desired parameter. Press the **jump** key, followed by the address of the parameter. The function keys can also be used to view assigned parameters.
3. With the desired parameter displayed, press the **edit** key. (The unit will display the current parameter value and prompt for a new value.) Use Virtual Keypad to enter the correct value and then press the **Ent** key to execute the change. Pressing the **esc** key when the unit prompts for the new value will abort the change. Pressing the **Ent** key if nothing has been typed, also leaves the parameter unchanged.

Assigning Function Keys

In configuration mode, any item can be assigned to a function key as follows:

1. Enter configuration mode by pressing the **conf** key (use the password, if required).
2. Display the desired parameter. Press & release the **jump** key, followed by the address of the parameter.
3. Assign a function key to the parameter. Press & release the **jump** key, then the **edit** key, and then the function key you wish to assign to the current item [**F0 - F9**].

Audit Trail

The MPplus II™ 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.

> **NOTE:** Once the audit trail is enabled (a value greater than "0"), the user cannot disable it without a full unit initialization. Reloading the database will not disable the audit trail.

The MPplus II™ 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 Talon™ Lite or Talon SCE™ software. When the audit trail is full, **Audit Trail Full** will appear if editing is attempted and the unit will not allow any changes. The audit trail must first be uploaded and reset by Field Manager, Talon™ Lite or Talon SCE™ software.

Memory (History Logging)

The MPplus II™ has a minimum of 512K x 8 Z-RAM for database, audit trail, and history logging, and 512K x 8 Flash memory allowing easy upgrade of run-time code. With the large memory capacity, a minimum of 32,000 historical inputs with time and date stamp can be stored. 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 the logging of data when an event occurs (e.g. alarms). An experienced user with Talon SCE™ software can define the type of data and collection period. Since the history data elements are stored in a block of memory, the size must be assigned at the time the history process is created in the unit; typically, when the database is downloaded at the factory.

NOTE: The size of the history 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 MPplus II™ memory assignment.

The memory required to store an entire history process data block is [Max pointers * (Max Record +1) *4].

Data may be collected remotely via the optional modem, or on-site through the MS connector on the side of the enclosure, or the USB port. Field Manager or Talon SCADA software is required for collection. The collected data can then be used for:

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

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. These are listed in the table below.

Key Combination	Description
Key Combination	Description
+/- and zero	System Passwords

Calibration Mode

Main calibration should be done using the software wizard built into the software provided with the unit. Instructions are included in the software. The following procedure is designed for use with Virtual Keypad.

Calibration mode allows the user to calibrate the analog inputs such as static pressure and temperature. While operating in the calibration mode the MPplus II™ continues to periodically update volume. The analog input value used for calculations is the value measured when calibration mode was initially entered. Once in calibration mode, the user can perform the following operations:

- Calibrate **zero** only
- Calibrate both **zero** and **span**

Of course, the option to change the calibration reference points is always available. Several other features make the software calibration routine attractive and more intuitive. In the MPplus II™, 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.

Calibrating Static Pressure and Temperature Transmitters

1. View the value of the transmitter to be calibrated on the display. The function keys can be used for quick access.
2. Press the blue **Cal** key. 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 #1** for example.
4. Apply the zero reference to the transmitter and wait for the reading to stabilize.
5. Press the blue **zero** key. The display now shows the following:

ZERO> XX.XX
NEW?>

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

6. Apply the span (full-scale) reference to the transmitter and wait for the reading to stabilize.
7. Press the blue **span** key. The unit now shows:

SPAN> XX.XX
NEW?>

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

8. Steps 4 through 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.

To permanently store the results of the calibration, press the **Ent** key, and the unit will prompt, **enter to accept Calibration**. Simply press the **Ent** key again to save the calibration. Press the **esc** key to abort the calibration. (Note: Pressing **esc** repeatedly from anywhere within the calibration procedure will back the operator out of calibration mode).

Read Only Mode

The MPplus II™ can be hardware set to be read only. This prevents configuration changes in the field after the unit has been programmed.
Placing JP1 in the locked position sets the MPplus II™ to read only. No changes can be sent down to the MPplus II™ either directly or through external communications until JP1 is unlocked.

MAINTENANCE

As with any device based on solid-state electronics, maintenance of the MPplus II™ 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 ensure the integrity of the door's seal and the various ports in the box's exterior. Excess moisture can ruin a field computer if allowed to accumulate within the enclosure. Although the circuit boards themselves are conformally 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 that the mounting arrangement for the unit is secure and provides a stable platform for termination of the pressure tubing, conduits, etc.
2. Verify the integrity of the enclosure lid seal. Check the lid gasket for deterioration, chemical or insect damage, tears, or compression.
3. Check for damaged cord grips and a missing or damaged MS connector (RS-232 port) cap.
4. Examine the RS-232C port itself. Ensure that the port's mounting screws are secure and provide firm support when attaching a serial cable.

Changing the Optional Internal Battery

IN THE EVENT A UNIT MUST BE RETURNED TO THE FACTORY FOR ANY REASON, REMOVE ANY REPLACEABLE BATTERY OR BATTERY PACK PRIOR TO ITS RETURN SHIPPING. DAMAGE CAUSED BY LOOSE BATTERIES WITHIN UNITS WILL NOT BE COVERED BY THE MANUFACTURER, AND MAY VOID ANY WARRANTY THE UNIT IS STILL UNDER.

(See the section on POWER FOR THE MPplus *II™)*

A: Disposable (Non-Rechargeable) Battery Packs

The disposable (alkaline) battery packs are used in cases where there is no external power source, such as a solar array. These packs, under normal operating conditions, will eventually drop below the voltage level needed to maintain unit power. Their lifespan is determined by a multitude of variables specific to each unit, and therefore difficult to predict.

To replace the disposable battery pack in the unit:

1. Open the front door by releasing the upper and lower quick-release latches on the device enclosure and swinging the door out.
2. Connect the new battery to the unused connector J11 'VBAT2' or J9 'VBAT1' (see Fig. 3).
3. Disconnect the old battery from the other connector in the unit. Power, in this case, is never removed from the unit, and no current data is lost due to temporary power down.
4. Remove the old battery from its mounting in the enclosure by pulling it from its dual lock mount and press the new pack firmly into place.
5. Use the magnet to wake-up the unit and verify that it is fully operational.
6. Properly dispose of the spent battery pack.

B: Rechargeable Battery Packs (charged by local solar array)

The rechargeable battery pack, under normal operating conditions, should provide as many as 10 years of productive service before needing to be replaced. When it becomes apparent that the rechargeable pack cannot maintain its charge during the hours without sunlight, replacement is in order.

CAUTION: The rechargeable battery pack must ONLY be wired into battery terminal 4 'RECHARGABLE LEAD ACID BATT'. The local solar array provides charging current ONLY to terminal 4. Do Not plug rechargeable packs into J9 'VBAT1' or J11 'VBAT2' as charging will not occur.

To replace the rechargeable battery pack in the unit:

1. Open the front door by releasing the upper and lower quick-release latches on the device enclosure and swinging the door out.
2. Disconnect the old battery from terminal 4 'RECHARGABLE LEAD ACID BATT' in the unit. This will result in a momentary power-down of the unit that will interrupt any measurements being recorded at the time. No historical records or configuration settings will be lost, though.
3. Remove the old battery from its mounting in the enclosure by ripping it off its dual lock mounting and press the new pack firmly back into place.
4. Connect the new, fully charged battery to the terminal 4 'RECHARGABLE LEAD ACID BATT' in the unit. **DO NOT CONNECT TO J9 'VBAT1' or J11 'VBAT2'**
5. Press any key to wake-up the unit and verify that it is fully operational. A **'first time power'** alarm will have been initiated. See the section on ALARM MODE.

Calibration

Calibration is a crucial element of any program of scheduled maintenance. However, because of the MPplus II™ design, software calibration does away with the need for laborious adjustments, thereby simplifying field calibration. See the section on CALIBRATION MODE.

SOFTWARE PACKAGES

Field Manager™, Talon™ Lite, and Talon SCE™

The Talon™ software system provides application solutions for Natural Gas, Water/Wastewater, Environmental Protection, Steam, and Electrical applications. Industrial/Commercial Measurement, Pressure/Temperature Monitoring, Supervisory Control, and Odorization are a few of the systems that utilize the software.

Whether your concern is natural gas distribution, gas pipeline transmission or production, Talon gives you the ability to create a powerful system that meets your specific needs. Its flexible design provides the option to purchase only the modules you need, and the ability to expand your system with additional features by adding new modules in the future.

Eagle Research Corporation designed the Talon™ family specifically to meet your needs, providing software modules for both central office and field operations. A separate manual on the Talon™ Suite of Software is available. Contact your sales representative.

APPENDIX A: PARAMETER TABLES

Each unit built is loaded with a variety of parameters, detailing the way the unit is designed to address a customer's needs. These parameters are defined in Tables, like the example below, and cover such options as Single & Dual Positive Displacement Metering, Single & Dual Orifice Metering, Single & Dual Pressure Monitoring, etc.

The parameter table shown here is **typical** of those associated with each unit manufactured and **may not accurately represent the configuration at your site.** For further information on the specific configuration for your unit(s), contact your factory representative.

Table A-1: Process Listing for Single Positive Displacement Metering

Process Number	Name	Type
1	Extended System	Extended System
2	Analog Inputs	Extended Analogs
3	Pressure Profile PRES1	Extended 3D Profile
4	Pressure Profile PRES2	Extended 3D Profile
5	Multi-Point Calibrate	Multi-Point Calibrate
6	Multi-Point Calibrate	Multi-Point Calibrate
7	Extended Counter	Extended Counter
8	AGA-7 Meter Run	Turbine (AGA-7)
9	Daily Average	Extended Sum / Avg
10	Hourly / Minutely Average	Extended Sum / Avg
11	Min / Max Pressure	Min / Max
12	Min / Max Corr Flow	Min / Max
13	Min / Max Temp	Min / Max
14	Min / Max UnCorr Flow	Min / Max
15	Ext Min / Max Daily	Ext Min / Max
16	Ext Min / Max Hourly	Ext Min / Max
17	Ext Totalizer	Ext Totalizer
18	Ext Totalizer	Ext Totalizer
19	Short History	Short History
20	Short History	Short History
21	Short History	Short History
22	Short History	Short History
22	Alarm Detector 1	Alarm

Process Number	Name	Type
24	Alarm Detector 2	Alarm
25	Alarm Detector 3	Alarm
26	Alarm Detector 4	Alarm
27	Alarm Detector 5 Spare	Alarm
28	Alarm Detector 6 Spare	Alarm
29	Alarm Detector 7	Alarm
30	Alarm Detector 8	Alarm
31	Alarm Histories	History8
32	Daily Histories	History16
33	Daily Histories 2	History16
34	Hourly Histories	History16
35	Hourly Histories 2	History16
36	Minutely Histories	History16
37	Monthly Histories	History16
38	Alarm Dialer	Auto Dialer
39	UnCorr Meter	Turbine (AGA-7)
40	Analog Out	Analog Out
41	Analog Out	Analog Out
42	Analog Out	Analog Out
43	Pt. Control	Pt. Control
44	Pt. Control	Pt. Control
45	Digital	Digital
46	Modbus Extended	Modbus Extended
47	Modbus	Modbus
48	EEPROM Items	Dummy
49	EEPROM Logic	Math
50	Modbus Master	Modbus Master
51	Modbus Master	Modbus Master
52	Dummy	Dummy
53	Pulse Math	Math
54	Pulse Out	Pulse Out
55	SatComm	SatComm
56	Modem Controller	Modem Controller
57	Math	Math
58	Ext Data Collector	Ext Data Collector
59	Auto Dialer Eagle Web	Auto Dialer

APPENDIX B: POSITIVE DISPLACEMENT APPLICATIONS

(see the section on GROUNDING)

Introduction

The MPplus II™ may be adapted to calculate flow based on pulses received from the optional index assembly installed on a meter drive. The index assembly may be mounted directly to the unit or may be located on the meter drive and wired over to the MPplus II™. Magnetically operated reed switches inside the index assembly send electronic pulses as the drive turns. These pulses represent uncorrected meter volume to the MPplus II™. With the integral static pressure transmitter(s) and temperature probe(s), accurate flow calculations may be obtained.

To eliminate false counts that can result from reed switch "bounce", the MPplus II™ 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.

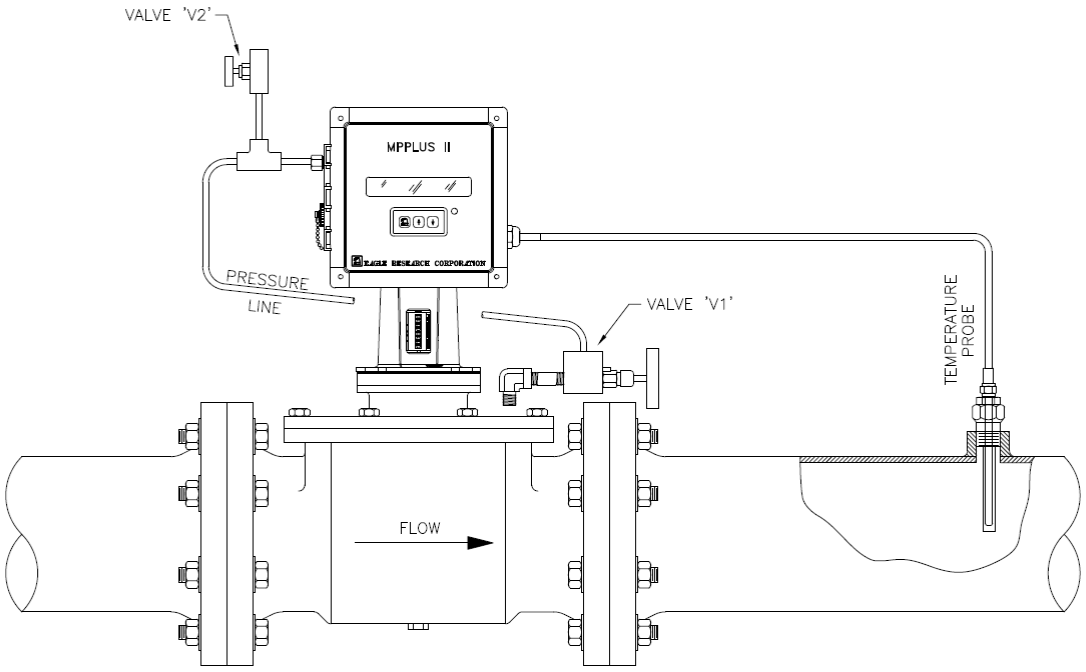
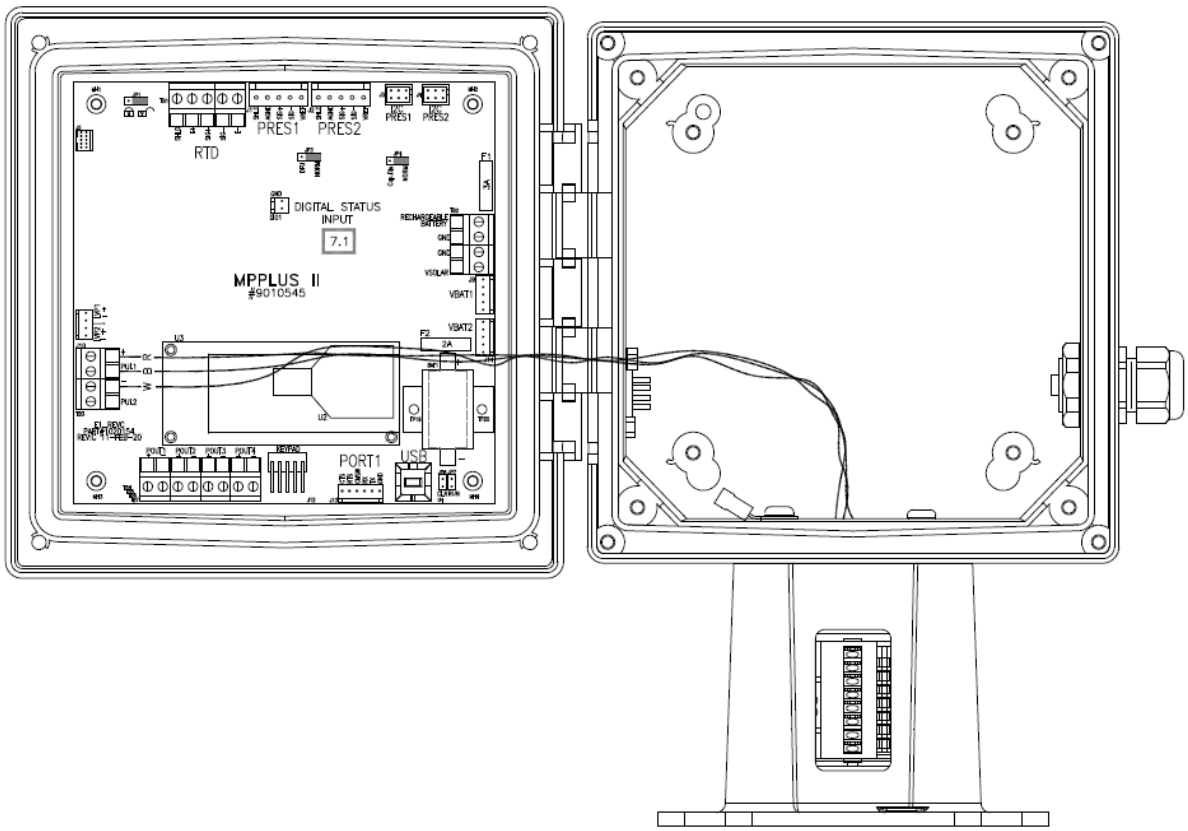


Figure 5 - Typical Positive Displacement Application for Gas

Index Assembly Wiring

The index assembly will typically wire into terminal block TB3, as shown in Figure 9.

The pulse input is software selectable for Form-C (3-wire, Low Speed), Form-A (2-wire, Low Speed) or Form-A (2-wire, High Speed) configuration. Field Manager, Talon™ Lite or Talon SCE™ software can be used to configure the pulse input.



TYPICAL INDEX CONNECTIONS

STANDARD	BI-DIRECTIONAL
WHITE	RED
BLACK	YELLOW
RED	GREEN
	ORANGE

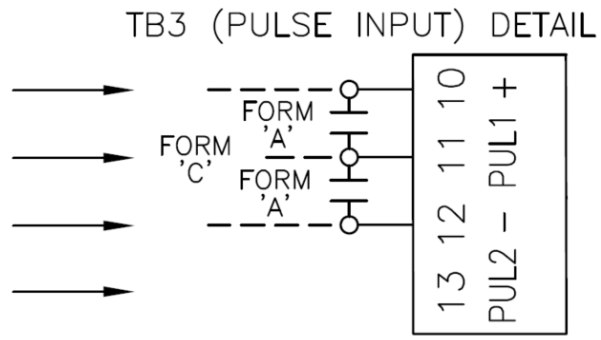


Figure 6 - Index Assembly Wiring

Mounting the MPplus II™ on the Meter

The index assembly permits installation of the MPplus II™ on a wide variety of meters. In general, the front of the MPplus II™ should face the front of the meter. In certain applications, MPplus II™ can be installed 180° from the standard position by removing all four (4) screws that attach the index base plate to the index housing. Replace the screws after you have repositioned the unit.
A reversible counter assembly permits the index to be used on either clockwise (CW) or counterclockwise (CCW) rotating meters. Perform the following checks before installing the unit:

1. Check the meter drive rotation by looking down on the meter-driving dog. Note whether it rotates clockwise (CW) or counterclockwise (CCW).

2. The standard index is setup for clockwise (CW) meter drives. The rotation of the unit can be changed for counterclockwise (CCW) meter drives. See Fig. 7 - Reversing the Index Rotation.
3. Determine the desired reading for the mechanical index and mask the index assembly. See Table C-1, and Fig. 8 - Counter Masking, on the following pages.

4. Align the index base plate holes with the corresponding holes in the top of the meter. Secure the unit by bolting it to the meter. Ensure that the drive dog and index wriggler are correctly aligned and not binding.

5. Plug all unused holes in the index base plate with the rubber plugs provided.

Reversing the Index Rotation

The default configuration of the counter is as shown in Step 1 of Fig 7, with the most significant digit at the top, and the least at the bottom. This would be used on meters having clockwise (CW) rotation. For meters having counterclockwise rotation, the counter assembly must be reversed as follows:

1. The unit is shown in its standard configuration – set up for a clockwise rotating meter.
2. Remove the two-hex/slotted screws holding the counter bracket to the upper bracket and remove the counter assembly.
3. Remove the magnet bar from the counter by gently pulling it away from the brass wriggler. Be careful not to flex the pliable bar assembly or plastic counter body more than necessary.
4. Flip the entire counter assembly end for end.
5. Press the magnet bar firmly onto the opposite brass wriggler, aligning its notch with the wriggler's roll pin. As before, take care not to stress the bar or counter any more than necessary. Make sure the magnet bar is firmly and squarely seated on the wriggler body.
6. Reinstall the counter assembly into the index housing in the reverse order it was removed. Being careful not to twist the upper bracket, snug down the two assembly screws. Make sure the counter turns freely before mounting onto the meter.

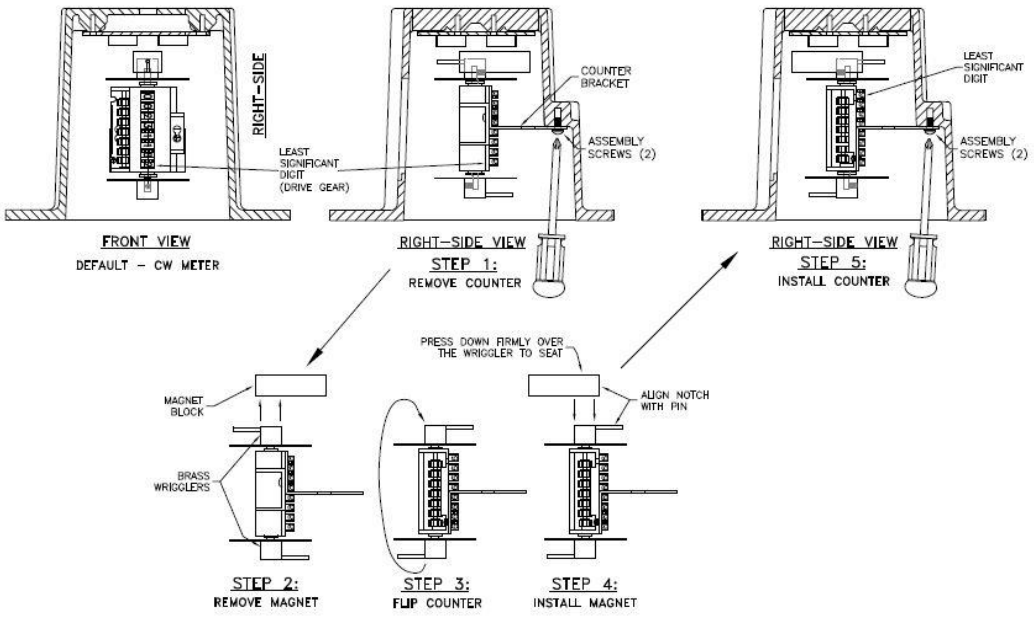


Figure 7 – Reversing the Index Rotation

Table C-1: 8 Digital Counter Masking

In the configuration shown in Figure 8, the index counter is positioned so the digits read from top to bottom (clockwise meter rotation as viewed from top). In this case, the desired mask can be used to hide those digits not needed from either end of the readout. Refer also to Table B-1.

1. Wipe any accumulated dust from the face of the counter with alcohol and allow it to dry.

2. Peel the backing from the chosen mask and apply. Note that the mask and the counter face both have a wider area above the readout, and a narrower one below.

3. Peel the backing from the cubic feet or meters per **revolution** label and place in the wide area above the readout.

4. Peel the backing from the cubic foot **resolution** label and place in the narrow area below the readout.

Note: In cases where the counter is reversed (for meters having counterclockwise rotation), the entire procedure is flipped 180°.

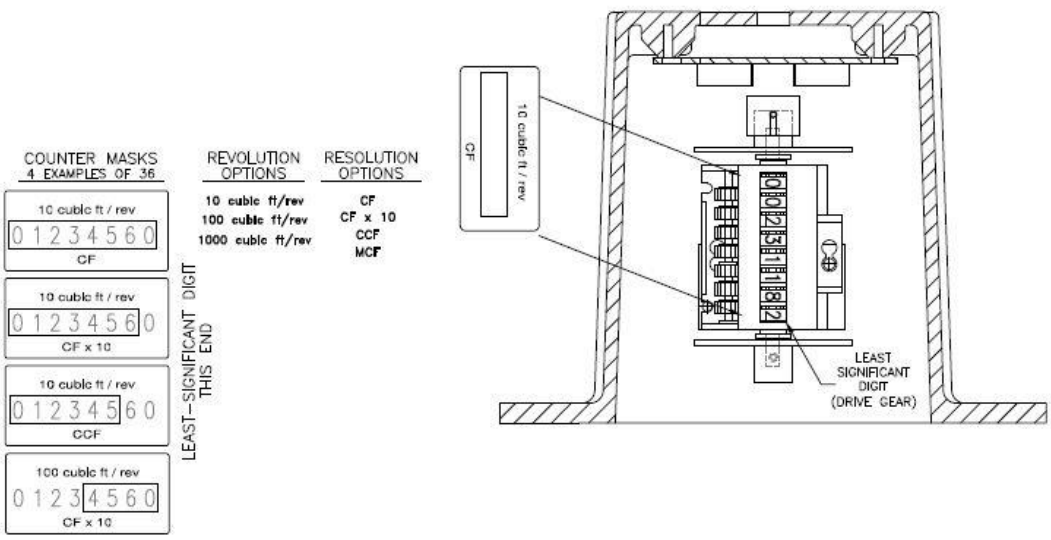
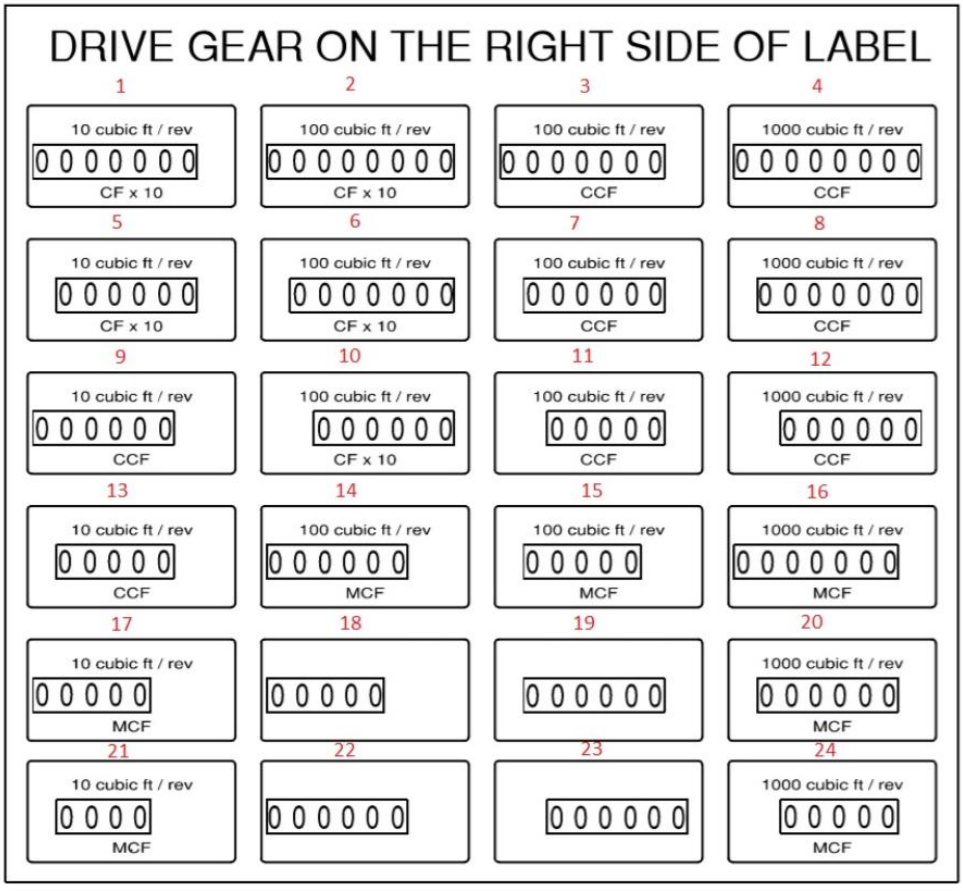


Figure 8 – Counter Masking Kit Application



Notes:

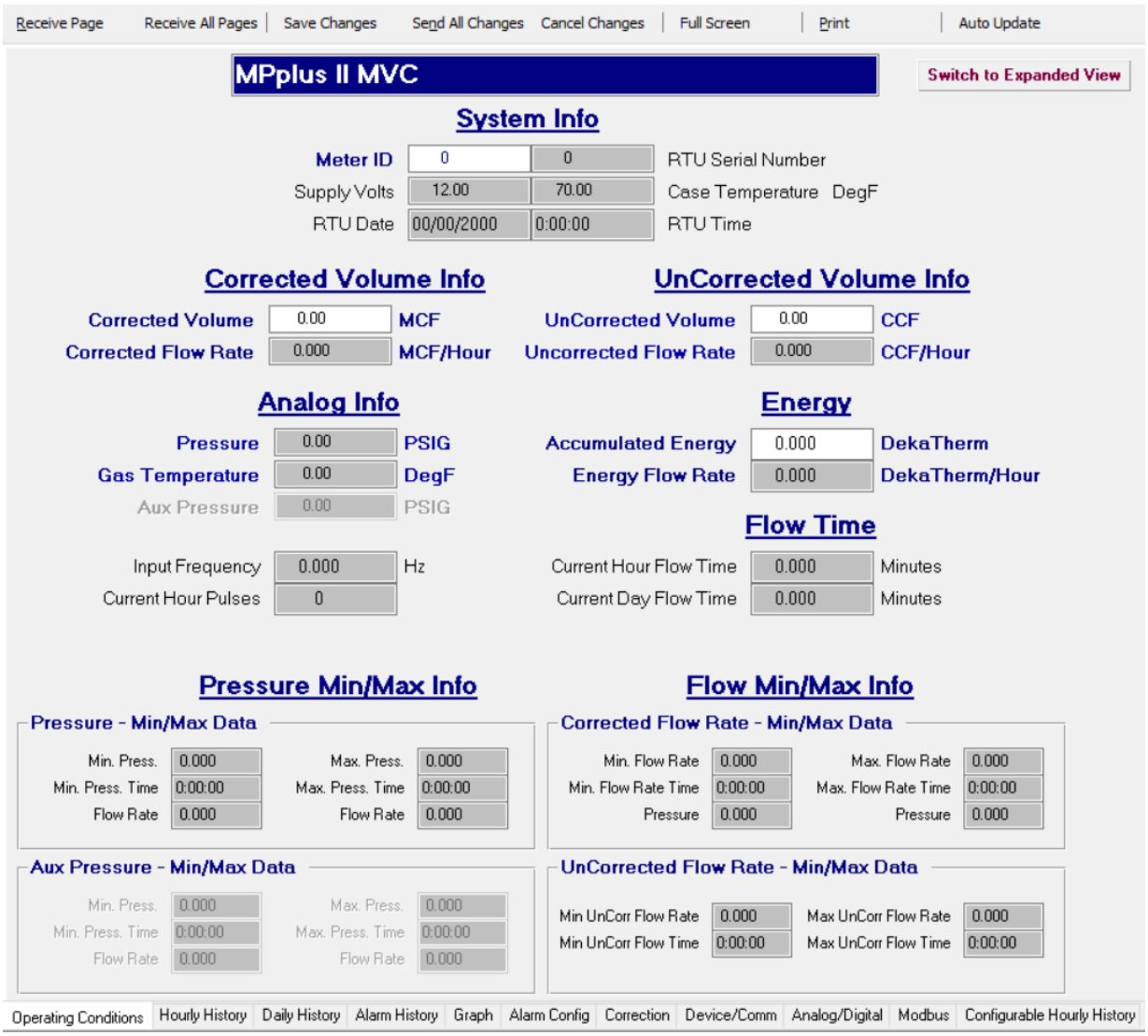
APPENDIX C: 60972 DATABASE

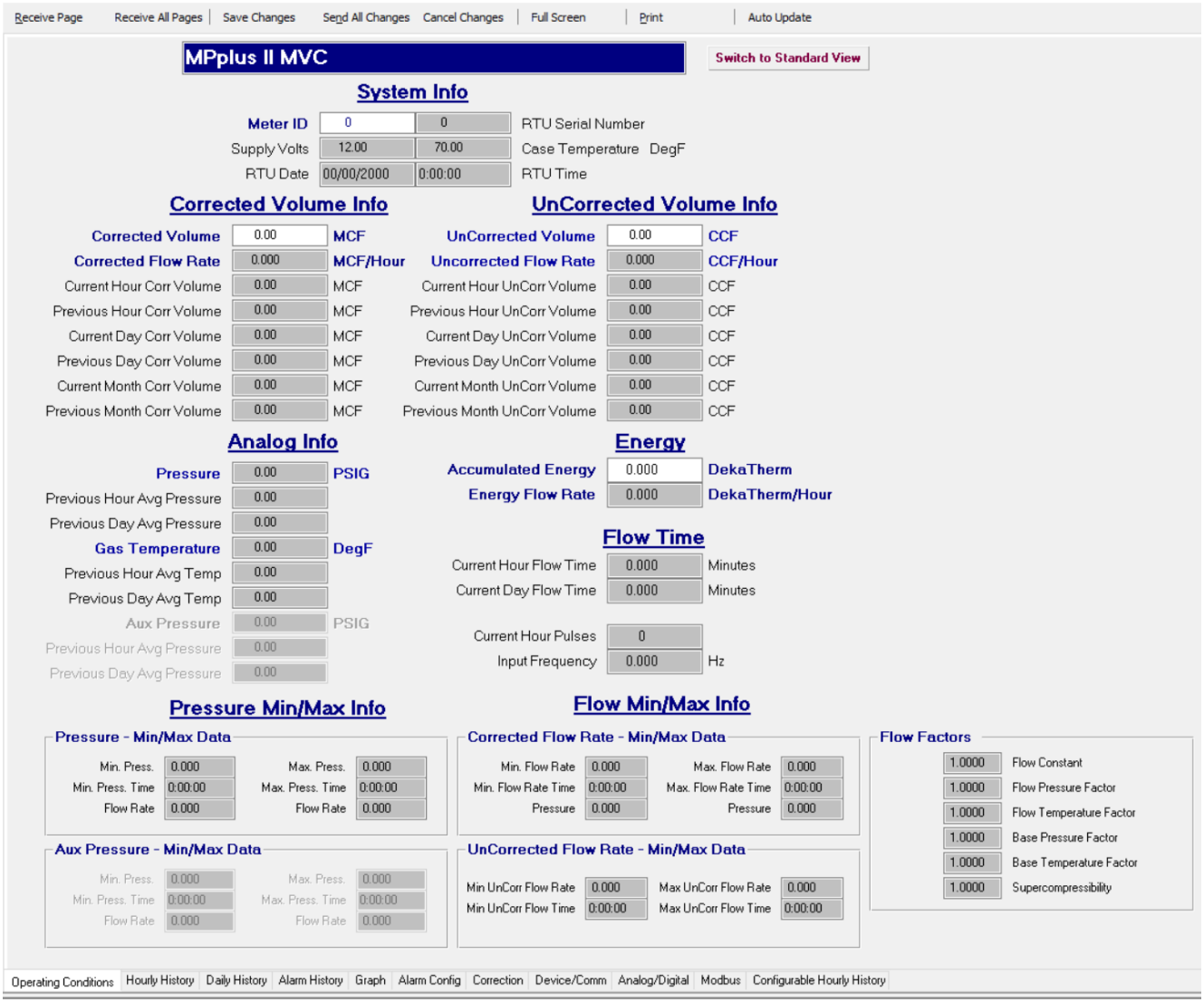
Introduction

The **MPplus II™** uses Edit Forms within each master database type to view and configure items with the ease of a graphical inferface. Items displayed on the Edit Forms are common items that need viewed or modified. The following desciptions will use Master Database 60972 as an example.

Operating Conditions View

The 60972 database has two Operating Conditions tabs available. Standard and Expanded, the view can be toggled by clicking the "Switch to Expanded View" or "Switch to Standard View"





Operating Conditions Explanations

Station Name Banner: The configured Station Name is displayed here

Meter ID: user defined numeric value to reference the installed equipment

RTU Serial Number: Eagle reference for the equipment

Supply Volts: Current DC voltage the power supply is providing

Case Temperature: Temperature read from processor of the enclosure

RTU Date: Current Date MM/DD/YYYY of the equipment

RTU Time: Current Time HH:MM:SS of the equipment

Corrected Volume: Total volume after all correction that has been calculated. Measurement units for this field can be configured on the Correction Tab.

Corrected Flow Rate: Current rate that gas is flowing at. Can be configured to display Per Day, Per Hour, or Per Minute for the units. Units can be configured on the Correction Tab.

UnCorrected Volume: Total raw volume calculated. Measurement units for this field can be configured on the Correction Tab.

UnCorrected Flow Rate: Current rate that gas is flowing at. Can be configured to display Per Day, Per Hour, or Per Minute for the units. Units can be configured on the Correction Tab.

Pressure: Current meter pressure reading

Gas Temperature: Current gas temperature reading

Accumulated Energy: Total Energy calculated. Measurement units for this field can be configured on the Correction Tab.

Energy Flow Rate: Current rate that gas is flowing at. Can be configured to display Per Day, Per Hour, or Per Minute for the units. Units can be configured on the Correction Tab.

Min/Max Pressure Info: Maximum and minimum values the pressure transducers have reached throughout the gas day.

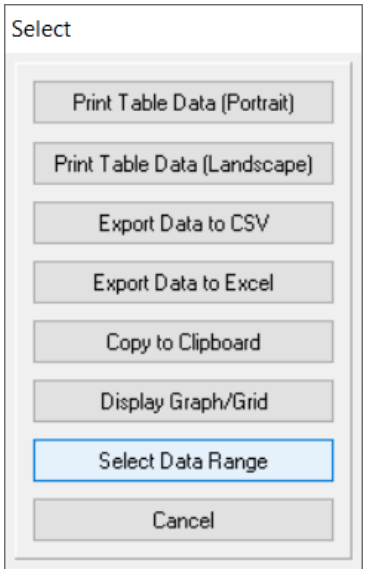
Min/Max Flow Info: Maximum and minimum values the flow rated achieved during the gas day

Flow Factors: Individual factors used in the calculations. Flow Constant is comprised of all factors including supercompressibility squared.

Hourly History Tab

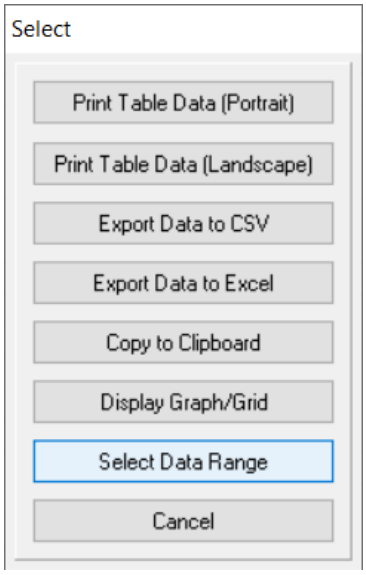
The Hourly History Tab displays all archive records stored on a 60-minute interval. Certain columns will display the Summation, Average, Min, and/or Max values at the bottom. The Hourly history grid is defaulted to display all data that has been downloaded over time.

Changing the Time/Date selection the grid displays: Double left click anywhere on the grid. A window will appear, choose the Select Data Rage selection and set a specific time period or use the quick select option for common scaling like previous month and previous week.



Daily History Tab

The Daily History Tab displays all archive records stored on a 1440-minute interval. The daily record creation time is determined by the Gas Day Roll Time on the Device/Comm Tab. Certain columns will display the Summation, Average, Min, and/or Max values at the bottom. The Hourly history grid is defaulted to display all data that has been downloaded over time.



Changing the Time/Date selection the grid displays: Double left click anywhere on the grid. A window will appear, choose the Select Data Rage selection and set a specific time period or use the quick select option for common scaling like previous month and previous week.

Alarm History Tab

The Alarm History Tab displays all archive records stored from when events/alarms occurred. Most alarms are configured to store the historical record as the alarm goes back to a normal state to capture the Min/Max value that was reached. Storing alarms as the event occurs or as the event ends can be configured on the Alarm Config Tab while using the Advanced List View selection.

Graph Tab

The Graph tab displays a linear graph representing the last 7 days of Hourly records that have been downloaded. Double Left click to select a new Time/Date range.

Uncheck any items to remove them from being displayed in the graph.

Alarm Config Tab Standard View

The Alarm Config tab lists all available alarms that can be configured by the user.

The Setpoint In Value is used to trigger the alarm/event as the threshold is crossed.

There are two methods available for ending an alarm/event: 1) Setpoint Out Value 2) Hysteresis Value. (Use the Alarm End Variable is combo to toggle between selections)

1) Setpoint Out Value : This is the default method. As the value crosses the configured threshold the alarm/event will be ended. For example, if a High Pressure Setpoint In Value is configured to 100 and the Setpoint Out Value is set to 95 then the alarm/event would end as it drops below 95.

2) Hysteresis Value: This method uses a standard value that references the Setpoint In value. For example, If a High Pressure Setpoint In Value is configured to 100 and a hysteresis value is entered as 5 then the alarm/event would end as the pressure drops below 95.

A delay can be configured to help avoid nuisance alarms/events. The delay is configured in seconds and when enabled the alarm state must be true for the programmed amount of seconds before the alarm/event will trigger.

Alarm Config Tab Expanded View

The Alarm Config tab has an option to change the view to have expanded options. This can be enabled by Changing the Alarm View on the top right of the page to Expanded View.

Once enabled the user will be able to select how the units logs the events/alarms to history and whether the unit dials out as the alarm occurs or as it ends. The unit can be configured to log and dial both as the alarm begins and ends if desired.

Correction Tab

The Correction tab is used for configuring the measurement parameters.

Meter Type: The type of device to configure the unit as

1) Instrument Drive / Pulse Input

    a. This selection is used with the Eagle Horizontal Index and Vertical Index assemblies, also to be used with externally provided Form-A and Form-C pulses.

2) Integral / End Mount

    a. This selection is used with the Eagle Integral Mount bracket and sensor assembly for direct mounting using the internal thermowell and pickup sensor cavity

3) Volume Accumulator / Totalizer

a. This selection is used with the Eagle Horizontal Index and Vertical Index assemblies, also to be used with externally provided Form-A and Form-C pulses. This selection keeps the unit from performing correction on the pulses received. Typically used when receiving a corrected pulse from another device and the goal is to accumulate what is being received. In this mode pressure and temperature inputs can be used and will track throughout the database but will not be used in calculating a corrected volume. Corrected and UnCorrected volume will track together at a 1:1 ratio.

Meter Setup: This section is used to configure the pulse input

Pulse Configuration:

- Form-C (3-wire Low Speed) – used with Eagle mechanical 8 digit index
- Form-A (Low/High Speed) – Used for 2 wire pulse inputs that are NOT driven by open collector outputs
- Form-A w/ 1k Pull Up Resistor – used for 2 wire pulse inputs that are driven by an open collector output

Meter Drive Rate – used for configuring the value of each pulse received on the input

- Cubic Units/Pulse: example, if an instrument drive is 100 cubic feet per revolution and the Eagle LDVI is being used them 100 would be input into the field.
- Pulses/Cubic Unit: example, if an instrument drive is 100 cubic feet per revolution and the Eagle LDVI is being used them 0.01 would be input into the field. Also known as a k-factor its the inverse, 1/100=0.01. Alternatively is using an ultrasonic meter that has a defined pulse per foot this can be entered.

Flow Rate Update Interval: Used to determine the interval at which the flow rate is calculated, can be used to smooth out the flow rate on meters that are not flowing at a consistent rate. When set to every scan the flow rate will be updated once a second if the unit is always awake or will be updated at every wake up based on the Wake Up Interval Seconds. When set to 2 seconds or higher the unit will account for all pulses during that period before updating the flow rate.

No Pulse Zero Flow Timeout: Used to hold a flow rate for a period of time before dropping that rate to be zero. When this setting is configured for 10 minutes the unit

will continue to hold the last flow rate for up to ten minutes before dropping to a zero flow rate if no new pulses have been received.

Main Pulse In Use: This is a notification that the unit is operating normally. There is an extra set of reed switched in the pulser board that is being compared to the main set of switches. Should the main set of switches have one fail then as the unit recognizes a difference of 5 pulses between the two sets it will automatically switch the pulse input to the back up to keep measurement going and will then notify the user will a new banner identifying that a failure has occurred.

Accumulation Multipliers: Used to set the units for Corrected, Uncorrected, and flow variables

Units Mode – used to switch between Cubic Feet and Cubic Meters

Corrected Flow Accumulation Multiplier – Set the accumulation units to one of the following: CF, CFx10, CCF, MCF, MCFx10. This setting determines how the volume is displayed and totalized in the history and edit forms. When a selection is changed the appropriate LCD label will also be automatically changed at that time.

UnCorrected Flow Accumulation Multiplier – Set the accumulation units to one of the following: CF, CFx10, CCF, MCF, MCFx10. This setting determines how the volume is displayed and totalized in the history and edit forms. When a selection is changed the appropriate LCD label will also be automatically changed at that time.

Corr / UnCorr / Energy Flowing Units – Set the flow units to one of the following: Per Day, Per Hour, or Per Minute. This setting determines how the flow rates are displayed throughout the database.

Flow factors: Factors being used in the measurement calculation.

Flow Constant: also known as the total correction factor.

Reset Values: Used to clear historical records and/or current values from the unit. (note: this does not clear them from the site on Field Manager, it only clears the current values and historical buffers in the units memory) Once a selection is chosen and sent the removed data is NOT recoverable.

Methods and Parameters: Used to select the supercompressibility method and input gas qualities.

Corrected Pulse Output Setup: Used to configure up to two pulse outputs representing Corrected volume usage to other devices.

Pulse Out On ms: This field represents the amount of time the pulse is to be active (pulse width), configured in milliseconds.

Pulse Out Off ms: This field represents the amount of time to wait between pulses before sending the next pulse, configured in milliseconds.

Current/Test Pulses To Output: Dual use field. In normal state this will accumulate up and when the value reaches a 1 it will pulse and reset to 0. To use in a test state input an integer value and click Send AI Changes. Test example, if a value of 10 is input and sent to the unit then 10 pulses will immediately be sent out from the configured channels using the pulse out on and off times.

Out Cubic Unit/Pulse: Use to configure the value represented per each pulse out. This is independent of the accumulation multipliers.

AGA-7 Maintenance Mode: use to freeze inputs to work on the lines or do maintenance where it is not acceptable to stop flow or trigger alarms.

Options:

Store All History Volumes as: used to store volume data as floating point numbers or as simple integers. Selecting Integers will not use decimals in the data.

Store Hourly Values for: used to choose hourly history column selection to store either the number of pulses received during that interval or the instantaneous frequency of the pulse rate. If storing the instantaneous frequency the unit must be configured to always be awake.

Device/Comm Tab

ID/Ref: User defined, locally stored ID that can be up to 15 alpha numeric characters

Meter ID: user defined numeric reference

Employee ID: user defined numeric reference for an employee

Unit Installation Date: use to set a start up date for the device MMDDYY

Battery Installation Date: use to manage tracking battery changes

Unit Parameters: This section has common configuration settings within

Wake Up Interval: Determines the rate at which the unit calculates. Default setting is 10 minutes (600 seconds). In between the wake up interval the unit will be in sleep mode

(LED off) and only run calculations at the time of wake up (LED on). This setting is a critical power saving feature.

Gas Day Roll Time: used to configure the time that a daily record begins. Example, if 10AM is selected then the daily record will reflect the gas that flowed between 10:00:00 AM to 9:59:59 AM of the next day.

Audit Trail: used to enable capturing changes made by users within the unit. Audit Trail buffer is 250 records. To Download the Audit Trail "Upload Audit Trail/Events During Poll" must be checked under Security/Config within Field Manager. Enabled as a default.

Ignore Audit Trail Full: used to allow changes to continue to be made once the buffer is full (enabled) or to stop changes from being made until the buffer is downloaded (disabled).

Calibration Password: used to set a Calibration password on the unit, once set calibration will not be allowed without first inputting the password

Configuration Password: used to set a Configuration password on the unit, once set configuration changes will not be allowed without inputting the password.

Display Mode Timeout: used to configure the amount of time it takes to revert back to normal display mode after a user has put it in Config mode. For example, a user navigates through Virtual Keypad to view a PPSSII using Config Mode and forgets to press ESC when done, 10 minutes (default) later the unit will revert to normal mode automatically

Power Down Timeout: used to determine how long a unit will stay awake every time a magnet is swiped or a keypad button is pressed. Default value is 60 seconds.

Calibration Mode Timeout: used to determine how long a unit will stay in calibration mode before exiting. Example, a user puts a unit in calibration mode to do maintenance and forgets to take it back out the unit will automatically end that mode after the timeout, default is 30 minutes.

Auto Daylight Saving Time: used to enable the Auto Daylight Saving Time feature in the unit. When enabled the unit will automatically handle time forward and time back while maintaining the proper record count.

EEPROM Items: Used to change common EEPROM items without the need to use the EEPROM Editor.

Com1 Main Baud Rate: used to set the baud rate for comm port 1

Com1 CMSW Baud Rate: used to set the local communications baud rate. Example, this is the baud rate the local 6 pin comm cable will utilize. Default 115200

Com 2 Main Baud Rate: used to set the baud rate for communications port 2. Comm Port two is connected to the two communications sockets on the processor board

Com2 Config Bits 1: currently used to configure preset eeprom settings for cellular modems.

Com2 Config Bits 2: currently used to configure preset eeprom settings for cellular modems.

Com2 Config Bits 3: currently used to configure preset eeprom settings for the RS232/RS485 add on board.

Com 2 TCP Listen Port: used to configure the inbound TCP listening port for Multitech modems

Com2 Power Address 1: used to configure the power control address for attached devices.

Com2 Power Address 2: used to configure the power control address for attached devices.

Modem Brand: used to select the type of attached cellular modem. Once selected other configurable options will become viewable. Example, if multitech is selected the option to configure the APN, Model, and Carrier type will appear

APN: Access Point Name, value provided by carrier. Double left click to the right to input the proper values using an editable label. For this label to update properly on a unit that did not originally set the value the Edit Labels/Fkeys feature must be used to receive the labels out of the unit currently.

Call Out Parameters (Unit to Host): used to configure a unit to dial on interval and/or on alarm/events to a host system.

Call Out Mode Enable/Disable: Turns the unit to host dialer on/off

Force Immediate Call-out: used to trigger the unit to immediately attempt a dial out to the host system. Requires all items to be configured before attempting.

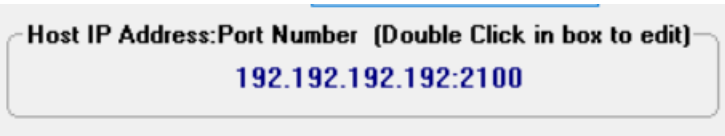
Call Out Port: Port that will be used to attempt a dial out. Com2 is the default for cellular modems.

Call-out Baud Rate: baud rate that will be used to communicate with the attached device. Default is 115200.

Call Out Mode: used to set the type of dial out to attempt, must be set based on the device type.

Dial Method: used to configure the way the dial out number is configured in the unit.

- String Dial Input: double click the IP address/Port to input a new IP and Port



- POTS Dial Input: Please see process manual for configuration method

Call-out Interval: used to set the time between the unit dialing the host. The unit will attempt to dial the host at the frequency programmed. This can be left to disabled if only Alarm dial outs are desired.

Host Poll Completion Acknowledge: uses a flag in the unit that has to be cleared by the host system at the end of the poll. Requires Talon & setup in Talon.

Call Out Message: used for sending out a CONNECT message when a TCP connection is established with the host. Required for use with Autosol.

Wake Unit to call-out: used when specific times are scheduled for call in. When enabled the unit will wake and power comm equipment at the exact time defined to dial out, when disabled the unit will wake and power the comm equipment at the time of the next scheduled wakeup. For example, if the unit is configured with a 10 minute wake up interval and is set to dial out to a host at 11:04, when enabled the unit would start dialing at 11:04, when disabled the unit would start dialing at 11:10.

Alarm Call-out: Enable to let the unit dial out on alarms, disable to only have the unit dial on interval.

Retry Interval: Time between the unit attempting redials if the initial one was not successful

Number of Retries: Amount of time the unit will attempt to dial the host after a failed initial dial

Next Call-out Date: Used to configure the next date for the unit to attempt a dial to the host. Configure in military time with format MMDDYY

Next Call-out Time: Used to configure the next time for the unit to attempt to dial the host. Configure in military time with format HHMMSS. This time will stay static once configured to dial at the same time everyday.

Last Call-out Date: Read only, displays the last date the unit attempted a dial out to the host

Last Call-out Time: Read only, displays the last time the unit attempted a dial out to the host

Redial Mode: Read only, status of the dial mode the unit is currently in

Dial Out Triggered: Read only, state of the dialer

Manual Dial Triggered: Read only, shows if a user has triggered a dialout manually

Periodic Dial Triggered: Read only, shows if the unit is currently trying to dial on a scheduled interval call

Next Dial Time: Read only, next dial time for pending retry

Remaining Retries: Read only, number of retires left in the cycle before the unit reschedules the time to the next interval

Dial Out Retries: number of retires the unit has attempted over time

Dial Out Failures: Number of initial call & retry failures over time

Information Parameters

Unit Serial Number: Serial number for the whole unit

Database Revision: Revision of the database loaded in the unit

Firmware Version: Revision of the Firmware loaded in the unit

Unit Display: The LCD display can stay ON while the unit sleeps and will refresh at the programmed wake up interval showing the first programmed label.

Display ON Time: Configured in military time, this field is the time to turn ON the display for viewing every day.

Display OFF Time: Configured in military time, this field is the time to turn OFF the display for viewing every day.

Auto-Scroll: Used to allow the unit to scroll through programmed labels while the unit is awake

Auto-Scroll Interval: The time between automatic label changes, configured in seconds

Auto-Scroll Pause Interval: Time to pause when a magnet or keypad is used to view a display item

Communications Equipment

Comm Wake Windows: Wake windows are used to turn on attached communications devices like cellular modems for specific periods of time. Up to four windows can be configured. Time much be in order and cannot wrap to the next day.

Wake Start Time: The beginning time for the communications equipment to turn ON.

Wake End Time: The stopping time for the communications equipment to be turned back OFF

Force Comm Equipment ON: used in conjunction with Maximum Force Wake Minutes field to turn ON the comm equipment for the specified time. The equipment will automatically turn OFF when the timer has expired

Minutes Since Force Wake: Read only timer counting how long the comm equipment has been ON

Hourly Wake Seconds: Used to turn ON communications at the top of every hour for the programmed amount of seconds. Example, if 600 is programmed the comm equipment will turn on for the first 10 minutes of every hour.

Autodial Wake Seconds: used to leave communications on for the programmed number of seconds after a dial out has occurred. Typically, only used when the unit dials out on alarm but not interval. Example, the autodial wake seconds feature is set to 1800 seconds and an alarm event occurs. The unit will turn on the comm equipment and start a dial out, once the dial has finished the unit would leave the comm equipment on for 30 minutes to allow the host to call it back and interrogate

Allow RTU to Sleep During Wake Windows: Used to let the main processor board sleep while the cellular modem stays active. This reduces the average current consumption.

Keep Awake Seconds After Comm: used to leave the communications active for the programmed number of seconds once messages have stopped being received

Minimum Voltage for Communications: When supply voltage drops below the configured value the communications equipment will be turned off until it has risen above the Reset Voltage for Communications configured setting

Reset Voltage for Communications: used as the setpoint to which the communications equipment will be turned back on after falling below the Minimum Voltage for Communications

Minutes Since Wake Disabled: Timer indicating how long the communications equipment has been disabled due to voltage being too low

Power Supply: Selectable combo box for the type of power supply being used. When Solar is selected a charging status bar will appear in above the setting.

Analog/Digital Tab

Inputs 1: Used to configure up to two pressure and one temperature

Connected to: used to program the input in use for the specific channel. Any pressure input can be configured to any Analog Definition. This keeps the user from having to rewire or move a connector.

High Range (span): The Span or maximum value the input is rated for

Low Range: The zero value or minimum value when the input is at its lowest reading

Raw Read: The value returned by the device before applying calibration and/or characterization to the input

Profile Read: The value after characterization, only applies to analog transducers

Calibrated Read: The value after characterization and calibration have been applied

Internal Temp: Reading from the transducer for the gas temperature, only applies to digital transducers

Reading is Fixed/Live: Used to make an input read static. To use change the combo box to Fixed and set the desired fixed value in the Fixed Read field, then Send All Changes. When setting the input back to live the Fixed Read field does not need modified.

Fixed Read: The value that will be used when an input is set to be fixed

Profile Use/Bypass: Analog transducers require a Profile with matching serial number be sent to the unit for its characterization data

Profile Serial Number: The number of the profile loaded into the unit, must match the white sticker on the transducer, number starts with an E. Only applies to analog transducers.

Profile Range: The scale or maximum that the transducer is rated for, must match the scale indicated on the white sticker applied to the transducer. Only applies to analog transducers

Units: Read only description of the units being used on the input

Inputs 2: Used to configure the Digital Input

Digital IN: used to enable the open door switch/door ajar switch.

Calibration Information: Used to track the time between the last calibration and the next scheduled one.

Last Calibration Date: Identifies the last MMDDYYYY that the unit was calibrated

Last Calibration Time: Identifies the last HHMMSS that the unit was calibrated

Calibration Interval: Identifies the selection for the amount of time between calibrations. This field can be modified on the Edit Form and can be modified upon being prompted after performing a calibration

Calibration Due Date: This field represents the net scheduled calibration based off the interval selected and the last calibration date

Days Remaining: Represents the amount of days until calibration is recommended based of the user configured Calibration Interval

Modbus Tab

Modbus Type: Used to select between Standard and advanced modbus configuration. Only configure Advanced or Standard DO NOT configure both to be enabled and have port selections.

Standard Modbus Type: This view is used for configuring a small number of defined registers using the combo box selections.

Advanced Modbus Type: Used when flexibility is desired. Two predefined maps available, these maps can be easily modified and expanded upon.

Modbus Setup: Used to select between Standard and advanced modbus configuration.

Modbus ID Type: Select between 1 byte or 2 byte modbus addressing. Note that Standard 1 byte is the most common

Modbus Address: This field represents the unique modbus identifier that the device will respond to if present in the message received

Modbus Mode: Modbus RTU. Modbus ASCII, and Modbus TCP protocols are all supported.

Modbus Flag: Used to enable or disable modbus protocol on the selected port, when disabled the port will be in Eagle Hex-ASCII protocol

Modbus Communication Port: used to select the comm port that modbus will be enabled on, for onboard cellular modem Port 2 should be selected

Modbus Port Parity: For selections not listed in the combo box please contact Eagle Research Corp's support line

Modbus Type: Selection to choose between whether floats and doubles occupy a single register or two registers

Byte Order: Determines the byte order of the data returned in messages

Record Numbers: Determines the archive record number to start with, either 0 or 1

Undefined Registers: Used to determine what happens when an undefined register is requested in a modbus message. Return Exception message will cause the unit to reply with an error code. The Return Zeros selection will process the message and any undefined register will be populated with a 0 for its data.

History/Archive Storage: Determines whether the records timestamps reflect the Start of the period for the interval data or the End of the period.

Read/Write Access: Read/Write allow registers to be queried and changed by a host while Read only blocks the Host from making changes to registers

Single Integer/Double Integer/Floating Point Register Start: The beginning value for register mapping that separates the different data types

Single Integer/Double Integer/Floating Point Register End: The ending value for register mapping that separates the different data types

Offsets: The value added to a message request to get the proper address defined in the unit, typically only used with Standard/Modicon.

Modbus Option Flags: Used to set custom modbus options, this value may change depending on selections chosen above

Max Disable Seconds: Eagle products have a feature called a Modbus Switch. This switch allows a user to communicate with a device that normally stays in modbus protocol with Field Manager. The switch register can be written to disable modbus and enable Hex-ASCII. Once the switch register has changed the protocol modbus will be enabled after the Max disable seconds time has lapsed and communication have stopped.

Configurable History

The Configurable Hourly History tab can be used to create a custom archive history. Using the combo box selections allows for mapping the record columns in a custom order. Once configured the records will start populating on the hour. This tab is not linked to the Collect History button so the Poll History button on the Configurable Hourly History tab must be used to receive the records. Scada systems that do not want to poll all of the predefined history should use this method.