



VP Process Inc.

Model: VP-EC-RDU-MINI
Modbus RTU
LCD Display



User Manual

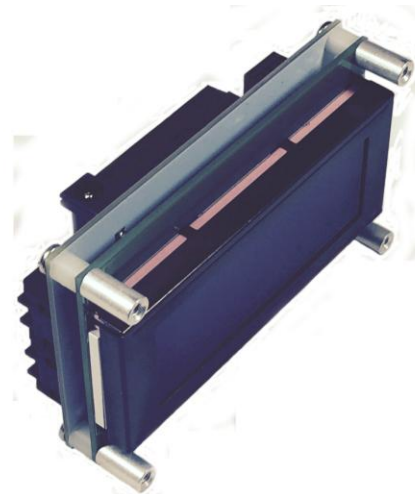
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VP-EC-RDU-MINI Modbus RTU LCD Display

Standard Features

- Low Power (12 - 24 VDC)
2.1 x 5mm Barrel Plug, RJ45 and Terminal Block Input
- On-Board Local Temperature Sensor
10K Thermistor
- RS-485 MODBUS RTU Protocol
- Programmable Baud Rates
9.6, 19.2, 57.6 and 115.2K
- Programmable Modbus ID
1 thru 253
- Large LCD Display
4 Line x 20 Character
White Letters, Blue Background
Programmable Contrast Adjustment
76.0 x 25.2mm Viewing Area
- User Interface
Password Protection
Blue Power On LED
3 Pushbuttons: Enter, Up, Down
- 3.9" Wide x 2.4" High x 1.5" Deep
- Modbus Functions:
03 Read Hold Registers
16 Write Holding Registers
- Simple To Implement
Write ASCII Characters to
Holding Registers using
Modbus Function 16



VP-EC-RDU-MINI Modbus RTU LCD Display

The VP-EC-RDU-MINI LCD Display is the perfect addition to any embedded controls system that uses the MODBUS protocol and has an RS485 port. The easy to read 4 line x 20 character display is simple to use. Just write ASCII characters to the applicable holding registers and the VP-EC-RDU-MINI does the rest.

The three user buttons can be read and programmed for different functions as required by the user's application. The local Temperature Sensor located on the main PCB can be read by Modbus Function 03, or can be simply displayed on the LCD.

The user interface is password protected (4 digit PIN). Once entered, the user can select by using the Up, Down and Enter pushbuttons:

- Program Modbus ID 1 thru 253
- Program Baud Rate (9.6, 19.2, 57.6, 115.2K)
- Adjust LCD Contrast
- Program LCD Backlight Enable
- Program Menu Reset Time
- Program New Password



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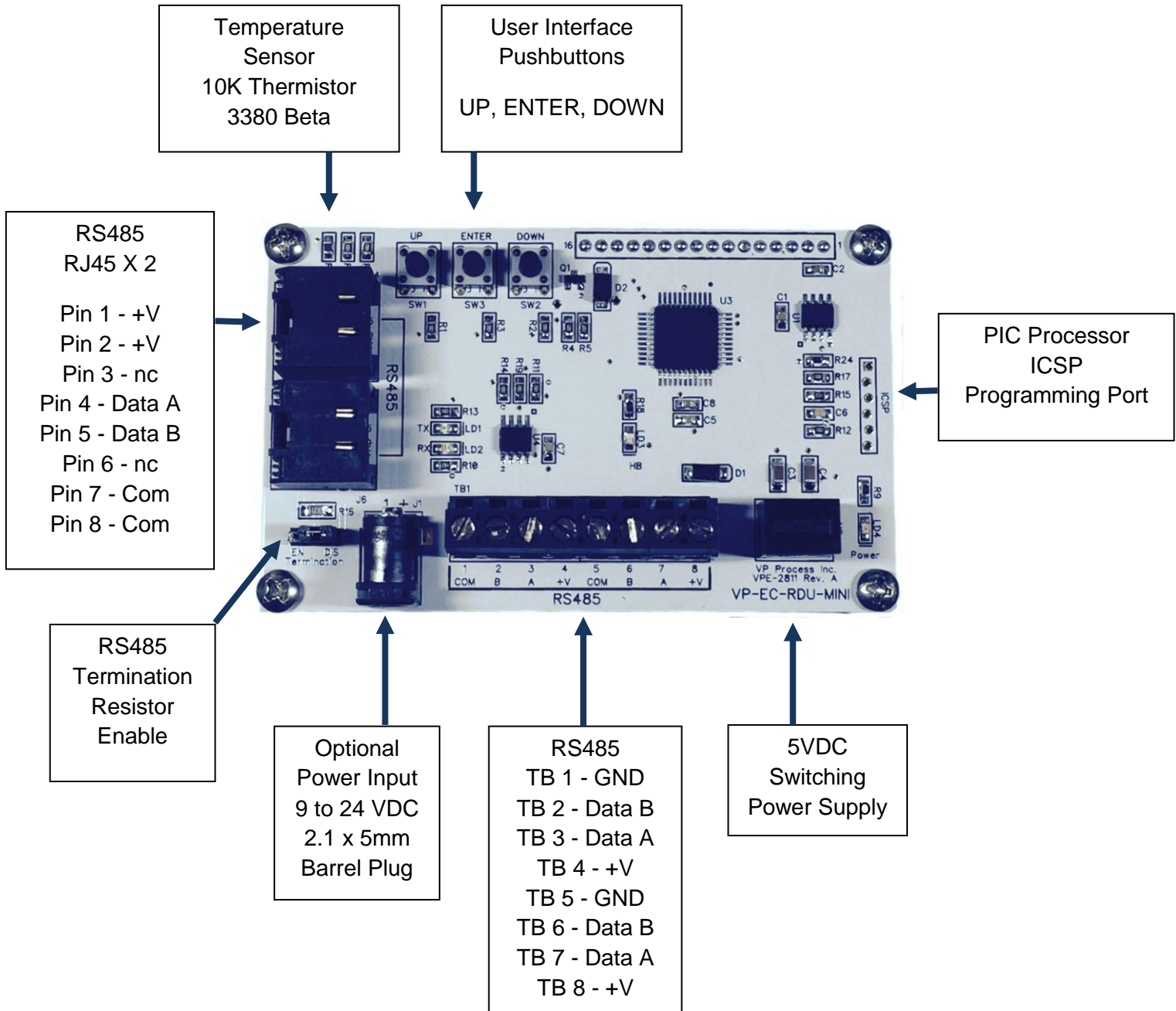


1. GENERAL SPECIFICATIONS

| | |
|------------------------|--|
| Power Input: | 24 VDC Nominal (9 –28 VDC), 45 mA Average @ 24 VDC 2.1 x 5 mm Barrel Plug or Terminal Block |
| RS485: | RS485 2 wire, Half Duplex, Data A, Data B Protocol N,8,1 Programmable Baud Rates (9.6, 19.2, 57.4, 115.2 K) RS485 LED's: TX (Amber), RX (Green) located on main PCB |
| LCD Display: | 20 Character x 4 Lines Type: STN-LCD Blue White Letters on Blue Background |
| Terminations: | 2 x 4 Point Terminal Block and 2 RJ45 Connectors |
| Temperature Sensor: | Located on the main printed circuit board 10K Thermistor, 3380 Beta Range: -20 to +70 °C (Steinhart-Hart Equation) |
| Operating Temperature: | -20 Deg °C to +70 °C Operating Temperature |
| Storage Temperature: | -40 Deg °C to +85 °C Storage Temperature |
| User Interface: | Three Pushbuttons: UP, DOWN, ENTER Programmable from Modbus Interface BLUE Power ON LED |
| Mounting: | Dimensions: 3.9" (W) x 2.4" (H) x 1.13" (D) Spacers: 6-32 Machine Screw |
| Menu Operation: | Press UP, DOWN and ENTER Simultaneously Standard Menu Displays: <ul style="list-style-type: none">• Display Modbus ID• Display RS485 Baud Rate• Display Local Temperature• Display Software Version• Enter "Setup Program" - Password Required Program Menu Displays: <ul style="list-style-type: none">▪ Program Modbus ID▪ Program RS485 Baud Rates▪ Adjust and save LCD Contrast▪ LCD Backlight Enable▪ Program Menu Reset Time▪ Program New Password |



2. FIELD CONNECTIONS





3. BASIC OPERATION

PUSHBUTTON OPERATION

There are three pushbuttons, UP, ENTER and DOWN. The basic operation is UP or DOWN to select the display, ENTER to start or exit a function.

If the backlight is OFF, any button press will turn the backlight ON.

POWER ON

As soon as power is applied to the VP-EC-RDU-MINI display, the screen will show:

**VP-EC-RDU-MINI
Press UP/DOWN/ENTER
Together
For Program Mode**

If valid data is written to the Holding Registers, then the display will show:

**LCD Line 1 Data
LCD Line 2 Data
LCD Line 3 Data
LCD Line 4 Data**

VP-EC-RDU-MINI Display Screens

To enter the display screen mode, Press the UP, DOWN and ENTER pushbutton simultaneously.

The display will show:

**VP-EC-RDU-MINI
Setup and
Programming
Select UP/DOWN**

Press the UP Button, the display will show:

**VP-EC-RDU-MINI
MODBUS ID

xxx**

where "xxx" is the current Modbus ID, range 1 thru 253



Press the UP Button, the display will show:

VP-EC-RDU-MINI
RS485
N,8,1
xxx

where "xxx" is the current Modbus Baud Rate
(9.6, 19.2, 57.4, 115.2 K)

Press the UP Button, the display will show:

VP-EC-RDU-MINI
Local Temperature

xx.x C

where "xx.x" is the current Temperature in Celcius

Press the UP Button, the display will show:

VP-EC-RDU-MINI
Software Version

x.x

where "x.x" is the current Software Version

Press the UP Button, the display will show:

VP-EC-RDU-MINI

Setup Program
Press ENTER

Enter the Program Menus, please see the next section

Press the UP Button, the display will show:

VP-EC-RDU-MINI
Exit
Return To Normal
Press ENTER

Exit the local display screens and return to normal operation.

NOTE: If the user does not press a pushbutton within the "Reset Menu Time", typically 60 seconds, the VP-EC-RDU will return to normal operation and wait for the next valid Modbus command.

If no valid commands are transmitted, the VP-EC-RDU will continue to show the last screen displayed. To re-enter the local and programming menus, the user must press UP, DOWN and ENTER simultaneously again.



4. PROGRAMMING OPERATION

PROGRAM MODE

To Enter the Program Mode, the user must press UP, DOWN and ENTER simultaneously to enter the local display mode. Press the UP button (Press and Release) until the local display shows:

VP-EC-RDU-MINI
Setup Program
Press Enter

Press ENTER:

VP-EC-RDU-MINI
Requires
Password
Press Enter

The VP-EC-RDU is Password protected, and ships from the factory with a default password value "0000"

The display will show the following:

0000
^
UP/DOWN for Value
ENTER for Next Digit

The Cursor ^ will start at the left most digit, and the UP / DOWN buttons are pressed until the desired value is reached. To accept the value, the user presses ENTER and the Cursor will advance to the next digit where the selection process is repeated until a 4 digits are entered.

For a value of "0000" (the default password value), the ENTER button is pressed 4 times.

The Display will show:

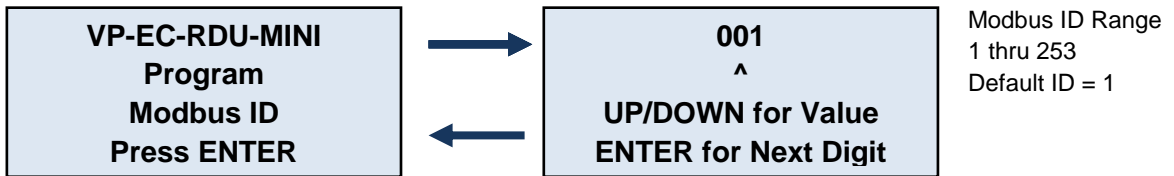
VP-EC-RDU-MINI
Setup
Program
Press UP / DOWN

The user is now in the setup program. For each of the following menu items, press ENTER to select the item, adjust the value with the UP or DOWN buttons, and press ENTER to exit the program and return to the previous screen.

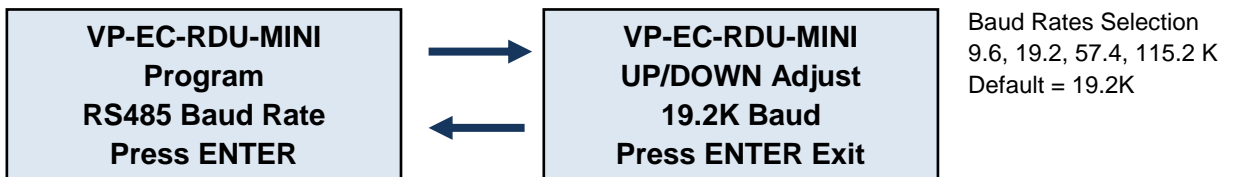
Press UP to continue:



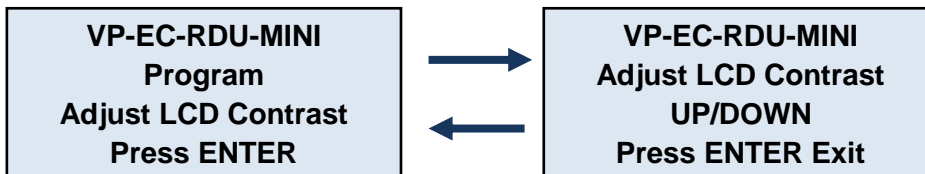
Modbus ID:



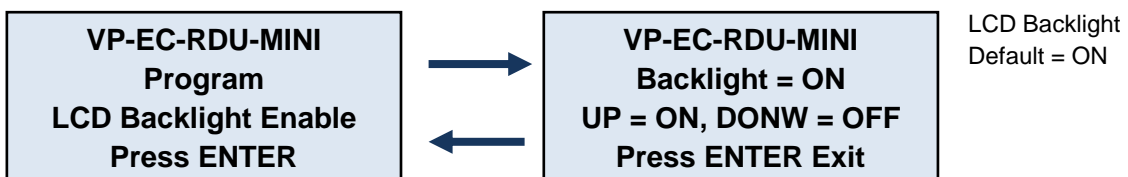
RS485 Baud Rate:



LCD Contrast:



LCD Backlight Enable:



Normally the LCD Backlight is ON. If programmed OFF, then the backlight is on whenever a pushbutton is pressed and stays on during the Menu Reset Time. If no buttons are pressed during the Menu Reset Time, the backlight will turn OFF again.



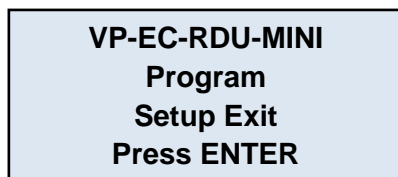
Menu Reset Time:



Password:



Exit Program Mode and return to Normal Display Operation



5. TEMPERATURE SENSOR

There is no calibration required for the Temperature Sensor. The VP-EC-RDU has been programmed with a Steinhart-Hart equation for calculating the temperature value based on the Thermistor reading and Thermistor Beta value (B 0/50 = 3380). A 1% Thermistor is used and typically the accuracy is +/- 1 °C over the operating range of -20 to +70 °C.

The temperature value can be read via Holding Register Address 50 (0x0032).
The reading has a x100 scaler, ie: 25.0 Deg C would have a value of 2500.

6. PUSHBUTTONS

The VP-EC-RDU has 4 user pushbuttons that can be read via the pushbutton Holding Register.

| HR VALUE | DESCRIPTION |
|----------|-----------------------------|
| 0 | No buttons pressed |
| 4 | UP button pressed |
| 2 | DOWN button pressed |
| 1 | ENTER button pressed |

If more than one button is pressed, the button values are added together and display in the holding register.



7. RS485 AND MODBUS

MASTER – SLAVE:

Only a master can initiate a transaction. The display is a slave and will never initiate communication. The host system initiates transactions to write ASCII data to the corresponding registers. The host system shall also check status of the display pushbuttons periodically if required for the user's application.

PACKET IDENTIFICATION:

Any message (packet) starts with a silent interval of 3.5 characters. Another silent interval of 3.5 characters marks message end. Silence interval between characters in the message needs to be kept less than 1.5 characters. Both intervals are from the end of Stop-bit of previous byte to the beginning of the Start-bit of the next byte.

PACKET LENGTH:

According to the Modbus specification, the packet length shall be maximum 253 bytes including address and CRC. Maximum length of packet (serial line PDU including address byte and 2 bytes CRC) supported by the sensor is 28 bytes. Packets of larger size are rejected without any answer from sensor even if the packet was addressed to the sensor.

MODBUS DATA MODEL:

- Read Holding register (read 16 bit word).
- Write Multiple Holding Registers

SUPPORTED FUNCTION

| | |
|----------|----|
| FUNCTION | 03 |
| FUNCTION | 16 |

EXCEPTION RESPONSES:

Slave will send answer to the master only in the case of valid message structure. Nevertheless, it can send exception response because of detection of:

- Invalid function code.
- Invalid data address (requested register doesn't exist in given device).
- Invalid data.
- Error in execution of requested function.

RTU transmission mode is the only mode supported by the VP-EC-RDU Display

DEFAULT CONFIGURATION:

- 8 - bit binary
- 1 start bit
- 8 data bits, least significant bit first
- NO Parity
- 1 Stop bit

BAUD RATE: Programmable 9.6K, 19.2K, 57.4K or 115.2K Baud



8. HOLDING REGISTERS

HOLDING REGISTERS

FUNCTION "03" and Function "16"

Read / Write Registers

| Dec | Hex | | |
|-----|--------|------------|---|
| 00 | 0x0000 | LCD Line 1 | ASCII Character 1 High Byte, Character 2 Low Byte |
| 01 | 0x0001 | LCD Line 1 | ASCII Character 3 High Byte, Character 4 Low Byte |
| 02 | 0x0002 | LCD Line 1 | ASCII Character 5 High Byte, Character 6 Low Byte |
| 03 | 0x0003 | LCD Line 1 | ASCII Character 7 High Byte, Character 8 Low Byte |
| 04 | 0x0004 | LCD Line 1 | ASCII Character 9 High Byte, Character 10 Low Byte |
| 05 | 0x0005 | LCD Line 1 | ASCII Character 11 High Byte, Character 12 Low Byte |
| 06 | 0x0006 | LCD Line 1 | ASCII Character 13 High Byte, Character 14 Low Byte |
| 07 | 0x0007 | LCD Line 1 | ASCII Character 15 High Byte, Character 16 Low Byte |
| 08 | 0x0008 | LCD Line 1 | ASCII Character 17 High Byte, Character 18 Low Byte |
| 09 | 0x0009 | LCD Line 1 | ASCII Character 19 High Byte, Character 20 Low Byte |
| 10 | 0x000A | LCD Line 2 | ASCII Character 1 High Byte, Character 2 Low Byte |
| 11 | 0x000B | LCD Line 2 | ASCII Character 3 High Byte, Character 4 Low Byte |
| 12 | 0x000C | LCD Line 2 | ASCII Character 5 High Byte, Character 6 Low Byte |
| 13 | 0x000D | LCD Line 2 | ASCII Character 7 High Byte, Character 8 Low Byte |
| 14 | 0x000E | LCD Line 2 | ASCII Character 9 High Byte, Character 10 Low Byte |
| 15 | 0x000F | LCD Line 2 | ASCII Character 11 High Byte, Character 12 Low Byte |
| 16 | 0x0010 | LCD Line 2 | ASCII Character 13 High Byte, Character 14 Low Byte |
| 17 | 0x0011 | LCD Line 2 | ASCII Character 15 High Byte, Character 16 Low Byte |
| 18 | 0x0012 | LCD Line 2 | ASCII Character 17 High Byte, Character 18 Low Byte |
| 19 | 0x0013 | LCD Line 2 | ASCII Character 19 High Byte, Character 20 Low Byte |
| 20 | 0x0014 | LCD Line 3 | ASCII Character 1 High Byte, Character 2 Low Byte |
| 21 | 0x0015 | LCD Line 3 | ASCII Character 3 High Byte, Character 4 Low Byte |
| 22 | 0x0016 | LCD Line 3 | ASCII Character 5 High Byte, Character 6 Low Byte |
| 23 | 0x0017 | LCD Line 3 | ASCII Character 7 High Byte, Character 8 Low Byte |
| 24 | 0x0018 | LCD Line 3 | ASCII Character 9 High Byte, Character 10 Low Byte |
| 25 | 0x0019 | LCD Line 3 | ASCII Character 11 High Byte, Character 12 Low Byte |
| 26 | 0x001A | LCD Line 3 | ASCII Character 13 High Byte, Character 14 Low Byte |
| 27 | 0x001B | LCD Line 3 | ASCII Character 15 High Byte, Character 16 Low Byte |
| 28 | 0x001C | LCD Line 3 | ASCII Character 17 High Byte, Character 18 Low Byte |
| 29 | 0x001D | LCD Line 3 | ASCII Character 19 High Byte, Character 20 Low Byte |
| 30 | 0x001E | LCD Line 4 | ASCII Character 1 High Byte, Character 2 Low Byte |
| 31 | 0x001F | LCD Line 4 | ASCII Character 3 High Byte, Character 4 Low Byte |
| 32 | 0x0020 | LCD Line 4 | ASCII Character 5 High Byte, Character 6 Low Byte |
| 33 | 0x0021 | LCD Line 4 | ASCII Character 7 High Byte, Character 8 Low Byte |
| 34 | 0x0022 | LCD Line 4 | ASCII Character 9 High Byte, Character 10 Low Byte |
| 35 | 0x0023 | LCD Line 4 | ASCII Character 11 High Byte, Character 12 Low Byte |
| 36 | 0x0024 | LCD Line 4 | ASCII Character 13 High Byte, Character 14 Low Byte |
| 37 | 0x0025 | LCD Line 4 | ASCII Character 15 High Byte, Character 16 Low Byte |
| 38 | 0x0026 | LCD Line 4 | ASCII Character 17 High Byte, Character 18 Low Byte |
| 39 | 0x0027 | LCD Line 4 | ASCII Character 19 High Byte, Character 20 Low Byte |

**HOLDING REGISTERS****FUNCTION "03" and Function "16"****Read / Write Registers**

| Dec | Hex | |
|------------|------------|----------|
| 40 | 0x0028 | Not Used |
| 41 | 0x0029 | Not Used |
| 42 | 0x002A | Not Used |
| 43 | 0x002B | Not Used |
| 44 | 0x002C | Not Used |
| 45 | 0x002D | Not Used |
| 46 | 0x002E | Not Used |
| 47 | 0x002F | Not Used |
| 48 | 0x0030 | Not Used |
| 49 | 0x0031 | Not Used |

HOLDING REGISTERS**FUNCTION "03"****Read Only Registers**

| Dec | Hex | |
|------------|------------|---|
| 50 | 0x0032 | Temperature Deg.C x 100 Scale ie: 25 Deg C reads 2500 |
| 51 | 0x0033 | Modbus ID |
| 52 | 0x0034 | Baud Rate |
| 53 | 0x0035 | LCD Contrast Value |
| 54 | 0x0036 | LCD Backlight Enable |
| 55 | 0x0037 | Not Used |
| 56 | 0x0038 | Menu Reset Time |
| 57 | 0x0039 | Password |
| 58 | 0x003A | Pushbutton Values |
| 59 | 0x003B | Not Used |



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If VP Process Inc. is to do the repair work for you, you may send the instrument, prepaid, to VP Process Inc. ATTN: Service Department. Always include your address, purchase order number, shipping and billing information, and a description of the defect, as you perceive it. If you wish to set a limit to the authorized repair cost, please state a "not to exceed" figure. If you must have a price quotation before you can authorize the repair cost, so state, but understand that this involves extra cost and extra handling delay. The Company's policy is to perform all needed repairs to restore the instrument to full operating condition.

To expedite the repair operation, it is required to call in advance to VP Process Inc 250.769.8220, obtain a Return Materials Authorization number (RMA#), describe the nature of the problem and provide a purchase order number. If this is the first time you are dealing directly with the factory, you will be asked to provide credit references, prepay, or authorize COD shipment. Pack the instrument and all its accessories (preferably in its original packing). Enclose your Purchase Order, shipping and billing information, RMA#, and any special instructions.



13. CONTACT INFORMATION

VP Process Inc.

TEL: 1-250-769-8220

WEB: www.vpprocess.com

Email: info@vpprocess.com

14. STANDARD WARRANTY

VP Process Inc. warrants equipment manufactured and sold by us to be free from defects in materials and workmanship for a period of one year from date of shipment from VP Process Inc. Any parts found defective within that period will be repaired or replaced, at our option, free of charge, f.o.b. factory. This warranty does not apply to those items which by their nature are subject to deterioration or consumption in normal service, and which must be cleaned, repaired or replaced on a routine basis.

Warranty is voided by abuse including rough handling, mechanical damage, and operation, alteration, or repair procedures not in accordance with instruction manual. This warranty indicates the full extent of our liability, and we are not responsible for removal or replacement costs, local repair costs, transportation costs, or contingent expenses incurred without our prior approval.

VP Process Inc.'s obligation under this warranty shall be limited to repairing or replacing, and returning any product which VP Process Inc. material review board examination shall disclose to its satisfaction to have been defective. To receive warranty consideration, all products must be returned to VP Process Inc. its manufacturing facilities with transportation charges prepaid.

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