Setup Manual
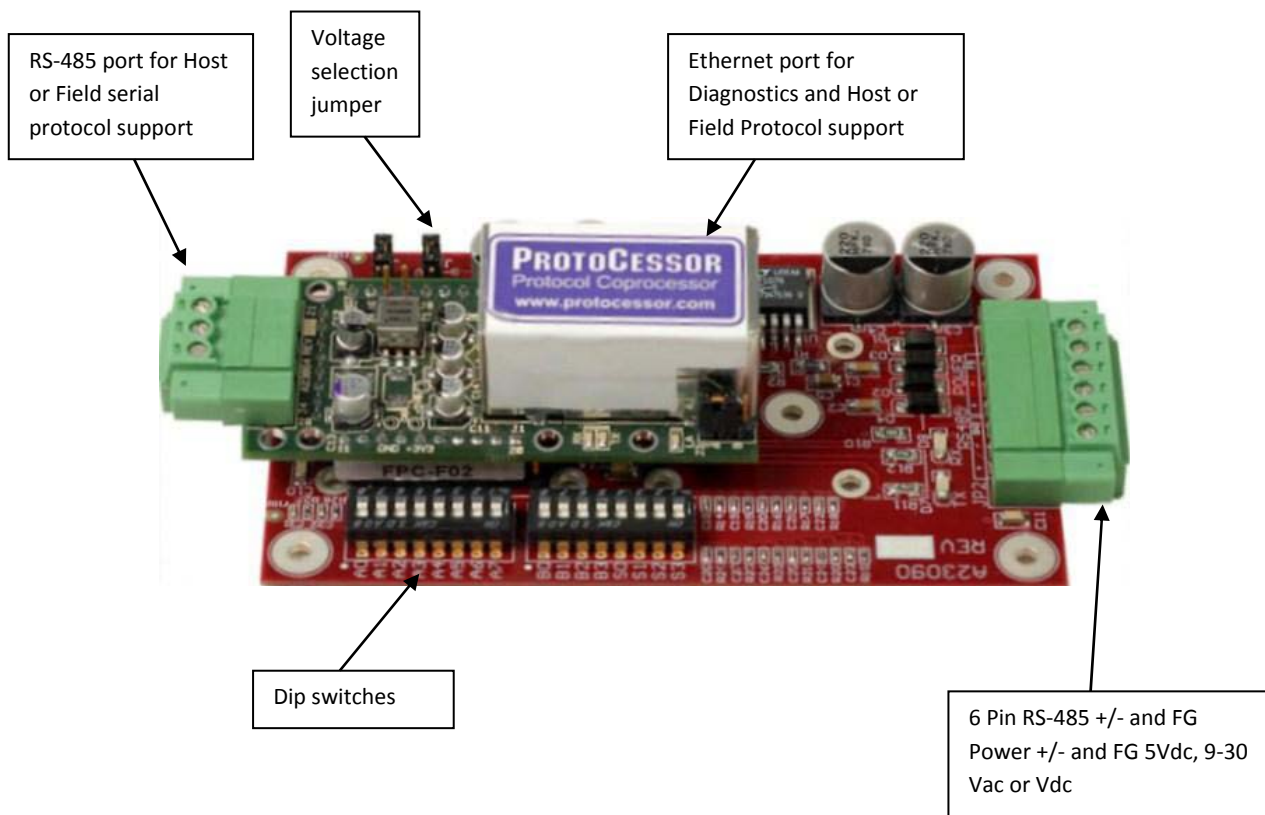# BACnet Protocol Gateway for TempTrac® and XR Water Heater Control

When a BAS interface with TempTrac or the XR requires a protocol other than the standard Modbus RTU, PVI Industries offers a premapped gateway from FieldServer Technologies. The ProtoCessor ProtoNode RER currently supports BACnet IP or MSTP. Consult factory for other protocols.
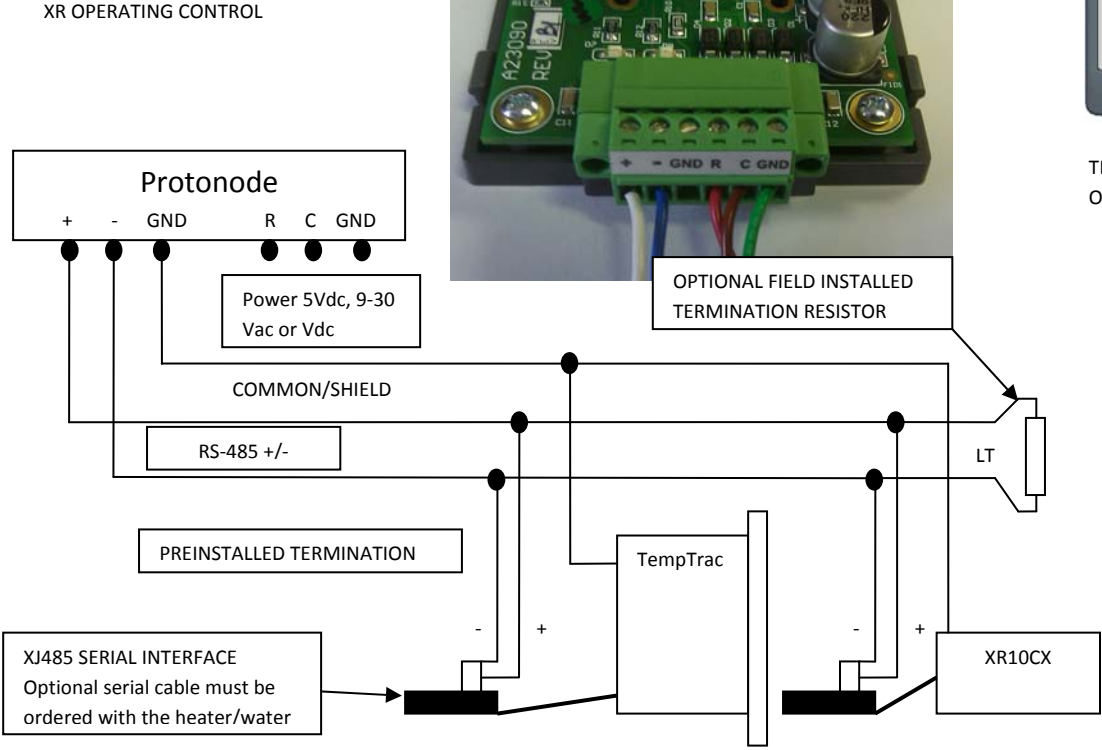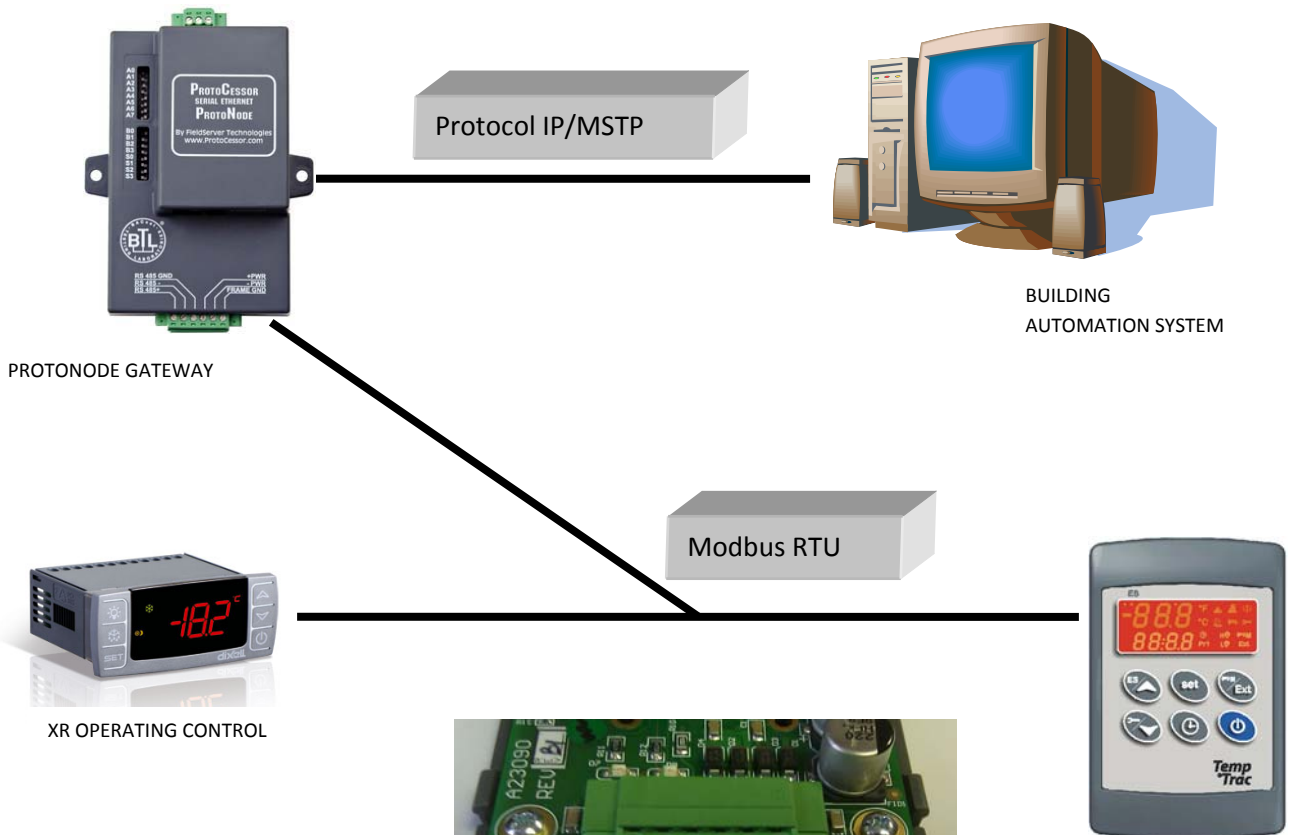
This manual is meant to be a general overview of the application of this gateway, for additional information please visit: *www.protocessor.com* or contact FieldServer Technologies at 800-317-8319 **Email:** *sales@protocessor.com* for technical assistance.

The ProtoCessor ProtoNode can be user configured with the following specifics: IP address, serial address, baud rate and one of three register profiles.

HARDWARE DESCRIPTION

RS-485 port for Host or Field serial protocol support

Voltage selection jumper

Ethernet port for Diagnostics and Host or Field Protocol support

Dip switches

6 Pin RS-485 +/- and FG Power +/- and FG 5Vdc, 9-30 Vac or Vdc

SYSTEM OVERVIEW TEMPTRAC & XR

Protocol IP/MSTP

PROTONODE GATEWAY

BUILDING
AUTOMATION SYSTEM

Modbus RTU

XR OPERATING CONTROL

TEMPTRAC
OPERATING CONTROL

Protonode

| + | - | GND | | R | C | GND |

Power 5Vdc, 9-30
Vac or Vdc

OPTIONAL FIELD INSTALLED
TERMINATION RESISTOR

COMMON/SHIELD

RS-485 +/-

LT

PREINSTALLED TERMINATION

TempTrac

XJ485 SERIAL INTERFACE
Optional serial cable must be
ordered with the heater/water

- +   - +

XR10CX

Note: Wiring for the RS485 serial network should be made in a "daisy chained" 2 wire shielded/twisted pair.

Dip switches A0 to A7 configure the serial address. The table below lists the settings up to 10. The full 257 address settings can be found in the **ProtoCessor Getting Started (T17007)** manual at www.protocessor.com.

A7	A6	A5	A4	A3	A2	A1	A0	Address
Off	Off	Off	Off	Off	Off	Off	Off	0
Off	Off	Off	Off	Off	Off	Off	On	1
Off	Off	Off	Off	Off	Off	On	Off	2
Off	Off	Off	Off	Off	Off	On	On	3
Off	Off	Off	Off	Off	On	Off	Off	4
Off	Off	Off	Off	Off	On	Off	On	5
Off	Off	Off	Off	Off	On	On	Off	6
Off	Off	Off	Off	Off	On	On	On	7
Off	Off	Off	Off	On	Off	Off	Off	8
Off	Off	Off	Off	On	Off	Off	On	9
Off	Off	Off	Off	On	Off	On	Off	10

Baud	B3	B2	B1	B0
Auto$_3$	Off	Off	Off	Off
110	Off	Off	Off	On
300	Off	Off	On	Off
600	Off	Off	On	On
1200	Off	On	Off	Off
2400	Off	On	Off	On
4800	Off	On	On	Off
9600	Off	On	On	On
19200	On	Off	Off	Off
20833	On	Off	Off	On
28800	On	Off	On	Off
38400	On	Off	On	On
57600	On	On	Off	Off
76800	On	On	Off	On
115200	On	On	On	Off

Dip switches B0 to B3 configure baud rate.
The table on the right lists the settings.

Address
Baud
Select

Off---On
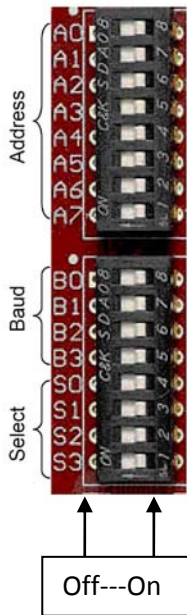
Available Registers When Single Gateway Monitors Multiple Controls			
Control	**Description**	**Modbus Address**	**Alternate Protocol Address**
TempTrac	Set Point Read/Write	40769	1
TempTrac	Temp. Probe 1 Read Only	40257	90
TempTrac	Temp. Probe 2 Read Only	40259	91
TempTrac	Temp. Probe 3 Read Only	40261	92
TempTrac	On(Write 257)/Off(Write 255) Read/Write	41281	95
TempTrac	Relay States(bit 1,2&3 bits on-relay closed)	42050	93
TempTrac	Alarm Notification(bit 5 on-alarm)	43329	94
TempTrac	Hours of Operation	40849	104
XR	Temp. Probe 1 Read Only	40257	90
XR	Set Point Read/Write	40864	101
XR	Temp. Probe 2 Read Only	40267	102
XR	Alarm Notification(bit on-alarm)	10517	103

Dip switches S0 to S3 select the register profile to be used.

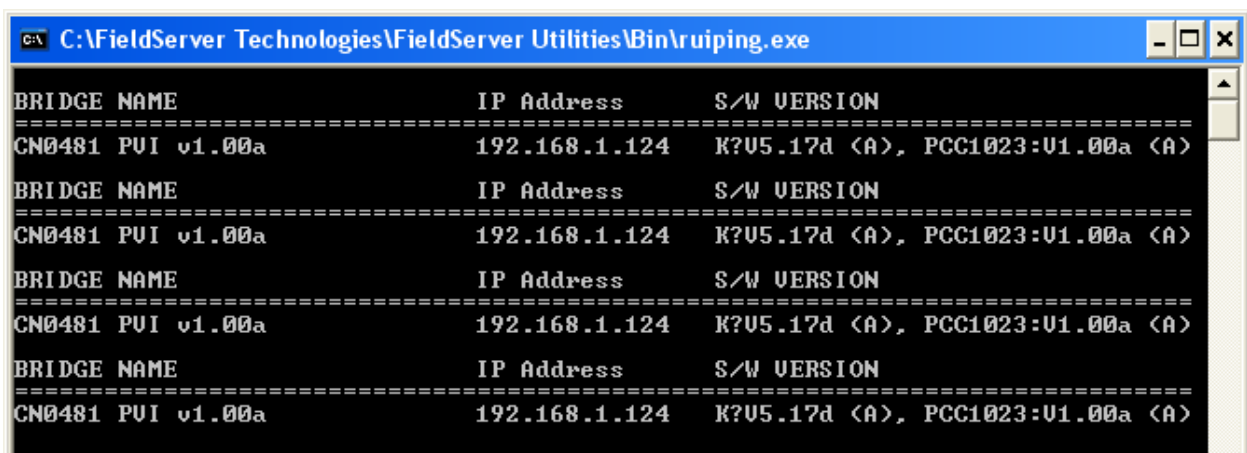| S3	S2	S1	S0	Configuration	Notes
Off	Off	Off	On	One gateway monitors a single TempTrac or XR Control	See page 6 and 7 for register list. All registers with function code (04) are analog/16 bit integers.
Off	Off	On	Off	One gateway monitors multiple TempTrac or XR Controls (maximum 8 TempTrac or XR)	See above table for registers. Registers with function code (01) are binary. Water heater node addresses are 1 through 8 respectively. Refer to full register list (pages 6 and 7) for more details.

PROTONODE GATEWAY NETWORK INTEGRATION

The default Protonode IP address may not fit within the existing network address pool. The following instruction will detail the method for changing the Protonode IP.

Make sure that the FST Utilities is downloaded on the computer. (http://fieldserver.com/techsupport/utility/utility.php)

- Connect an ethernet cross-over cable between the PC and ProtoCessor or connect the Protonode and the PC to the Hub/switch using a standard Ethernet cable.

- The Default IP Address of the Protonode **is 192.168.1.24**, Subnet Mask is **255.255.255.0.**

- If the PC and the Protodode are on different IP Networks, assign a Static IP Address to the PC on the 192.168.1.0 network.

- Open the "RUIPING" Utility. If the IP Address of the Protonode module appears on the screen, the Protonode is running.
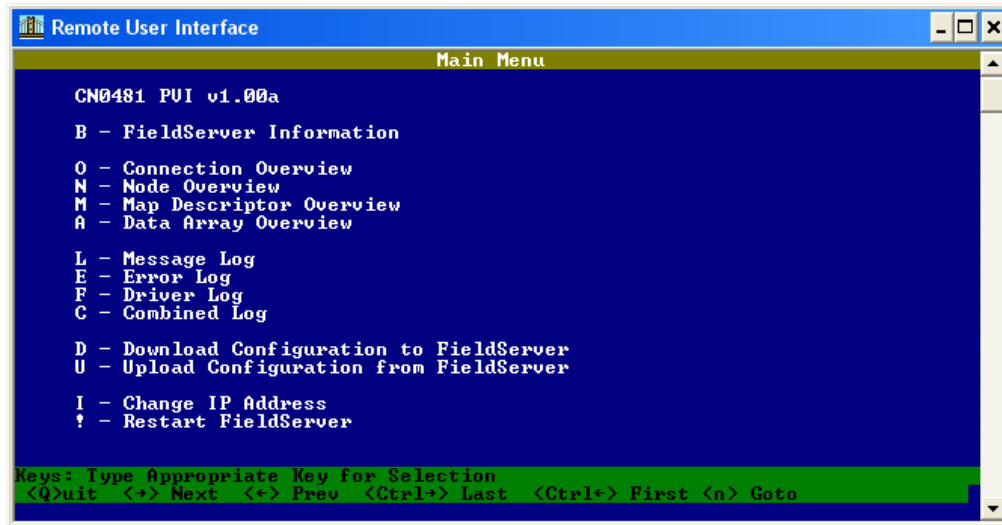
```
C:\FieldServer Technologies\FieldServer Utilities\Bin\ruiping.exe

BRIDGE NAME               IP Address    S/W VERSION
===============================================================
CN0481 PVI v1.00a         192.168.1.124  K?V5.17d (A), PCC1023:V1.00a (A)
BRIDGE NAME               IP Address    S/W VERSION
===============================================================
CN0481 PVI v1.00a         192.168.1.124  K?V5.17d (A), PCC1023:V1.00a (A)
BRIDGE NAME               IP Address    S/W VERSION
===============================================================
CN0481 PVI v1.00a         192.168.1.124  K?V5.17d (A), PCC1023:V1.00a (A)
BRIDGE NAME               IP Address    S/W VERSION
===============================================================
CN0481 PVI v1.00a         192.168.1.124  K?V5.17d (A), PCC1023:V1.00a (A)
```

PROTONODE GATEWAY NETWORK INTEGRATION

- Start the debugging utility, "RUINET" (Remote User Interface). The following screen will appear:

- If it is necessary to change the Protonode IP from the default address 192.168.1.24, select "I" from the Main Menu of the Remote User Interface and enter the new address. Restart the Protonode to load the new settings.

FULL REGISTER LIST FOR TEMPTRAC

When a gateway is paired with one control, the full register list is accessible. See the available register list below. All registers are function code 04 and analog/16bit Integers.

Control Label	Description	Range	Modbus Address TempTrac	Alternate Protocol Address
St1	Set point1	LS1÷US1	40769	1
St2	Set point2	LS2÷US2	40770	2
St3	Set point3	LS3÷US3	40771	3
St5	Set point5 Set point 3 alternate	-20÷70°F	40772	4
Hy1	Differential for set1	-22÷22°F	40773	5
LS1	Minimum set point1	-40°F÷SET	40774	6
US1	Maximum set point1	SET ÷ 230°F	40775	7
AC1	Anti-short cycle delay for output 1	0÷30 min.	40776	8
S2c	Configuration of Set2: dependent on set1 or independent	diP; ind	40777	9
Hy2	Differential for set2	-22÷22°F	40778	10
LS2	Minimum set point2	-40°F÷SET2	40779	11
US2	Maximum set point2	SET2 ÷ 230°F	40780	12
AC2	Anti-short cycle delay for output 2	0÷30 min.	40781	13
S3c	Configuration of Set3: dependent on set1 or independent	diP; ind	40782	14
Hy3	Differential for set3	-22÷22°F	40783	15
LS3	Minimum set point3	-40°F÷SET3	40784	16
US3	Maximum set point3	SET3 ÷ 230°F	40785	17
AC3	Anti-short cycle delay for output 3	0÷30 min.	40786	18
o3P	Probe selection for output 3	Pb1 / Pb2	40787	19
SSE	Set point shift for output 3 enable disable	Yes / No	40788	20
Hy5	Differential for set point 5	-22÷22°F	40789	21
AC5	Anti-short cycle delay for output 3 alternate set point	0÷30 min.	40790	22
ACA	Time delay between the St3 to St5 set point shift	0÷15 min.	40791	23
S4c	Configuration of Set4: dependent on set1 or independent	diP; ind	40792	24
St4	Analogue output set point	-100÷100°F	40793	25
SR	Analogue output band width	-100÷100°F	40794	26
TH4	Outlet temperature threshold for forcing to 4ma the analog output	-40°F ÷ 230°F	40795	27
HY4	Differential for restart working of analog output	-45 ÷ -1 °F	40796	28
Ac4	Anti-short cycle delay for output 4	0÷30 min.	40797	29
PS4	Analog output percentage LSB=101 for (nu)	0÷100, nu	40798	30
PP4	Analog output percentage with fault probe 1	0÷100, nu	40799	31
tt	Outdoor temperature threshold for dynamic reset of SET1	-40÷230°F	40800	32
rr2	Outdoor temperature band width	-100÷100°F	40801	33
rr1	Maximum shift of SET1	-100÷100°F	40802	34
tt2	Outdoor temperature threshold to open all the loads	-40÷230°F	40803	35
Ht2	Differential for restart working of controller	-45 ÷ -1 °F	40804	36
i1P	Digital input 1 polarity	CL÷OP	40805	37
i2P	Digital input 2 polarity	CL÷OP	40806	38
i2d	Digital input 2 alarm delay	0÷255 min.	40807	39
i3P	Digital input 3 polarity	CL÷OP	40808	40
i3d	Digital input 3 alarm delay	0÷255 min.	40809	41
CF	Temperature measurement unit	°C ÷ °F	40810	42
rES	Resolution (integer/decimal point) only for °C	in ÷ de	40811	43
dS2	Default showing for display #2	Pb2, Pb3	40812	44
dS1	Default showing for display #1	Pb1; tiM	40813	45
ALC	Temperature alarms configuration: dependent on SET1 or independent	rE÷Ab	40814	46
ALL	minimum temperature alarm, referred to TP1	-40÷230°F	40815	47
ALU	MAXIMUM temperature alarm, referred to TP1	-40÷230°F	40816	48

Control Label	Description	Range	Modbus Address TempTrac	Alternate Protocol Address
AFH	Differential for temperature alarm recovery	1÷45°F	40817	49
ALd	Temperature alarm delay	0÷255 min.	40818	50
dAO	Delay of temperature alarm at start up	0 ÷ 23h 50 min.	40819	51
oF1	First probe calibration	-21÷21°F	40820	52
P2P	Second probe presence	yes; no	40821	53
oF2	Second probe calibration	-21÷21°F	40822	54
P3P	Third probe presence	yes; no	40823	55
oF3	Third probe calibration	-21÷21°F	40824	56
Hur	Current hour	0 ÷ 23	40825	57
Min	Current minute	0 ÷ 59	40826	58
dAY	Current day	Sun ÷ SAt	40827	59
E1	Energy saving start on Sunday	0 ÷ 23h 50 min. - nu	40828	60
S1	Energy saving stop on Sunday	0 ÷ 23h 50 min. - nu	40829	61
Sb1	Set back temperature on Sunday	-40÷40°F	40830	62
E2	Energy saving start on Monday	0 ÷ 23h 50 min. - nu	40831	63
S2	Energy saving stop on Monday	0 ÷ 23h 50 min. - nu	40832	64
Sb2	Set back temperature on Monday	-40÷40°F	40833	65
E3	Energy saving start on Tuesday	0 ÷ 23h 50 min. - nu	40834	66
S3	Energy saving stop on Tuesday	0 ÷ 23h 50 min. - nu	40835	67
Sb3	Set back temperature on Tuesday	-40÷40°F	40836	68
E4	Energy saving start on Wednesday	0 ÷ 23h 50 min. - nu	40837	69
S4	Energy saving stop on Wednesday	0 ÷ 23h 50 min. - nu	40838	70
Sb4	Set back temperature on Wednesday	-40÷40°F	40839	71
E5	Energy saving start on Thursday	0 ÷ 23h 50 min. - nu	40840	72
S5	Energy saving stop on Thursday	0 ÷ 23h 50 min. - nu	40841	73
Sb5	Set back temperature on Thursday	-40÷40°F	40842	74
E6	Energy saving start on Friday	0 ÷ 23h 50 min. - nu	40843	75
S6	Energy saving stop on Friday	0 ÷ 23h 50 min. - nu	40844	76
Sb6	Set back temperature on Friday	-40÷40°F	40845	77
E7	Energy saving start on Saturday	0 ÷ 23h 50 min. - nu	40846	78
S7	Energy saving stop on Saturday	0 ÷ 23h 50 min. - nu	40847	79
Sb7	Set back temperature on Saturday	-40÷40°F	40848	80
oP1	working hours limit of relay 1 (set to 0 to disable)	0÷9999h	40849	81
oP2	working hours limit of relay 2 (set to 0 to disable)	0÷9999h	40850	82
oP3	working hours limit of relay 3 (set to 0 to disable)	0÷9999h	40851	83
ou1	working hours actual of relay 1	0÷9999h; when enabled	40852	84
ou2	working hours actual of relay 2	0÷9999h; when enabled	40853	85
ou3	working hours actual of relay 3	0÷9999h; when enabled	40854	86
1on	The output 1 is always on or depending on temperature	rEG=1,1;YES=0,1; no=0,0	40855	87
2on	The output 2 is always on or depending on temperature	rEG=1,1;YES=0,1; no=0,0	40856	88
3on	The output 3 is always on or depending on temperature	rEG=1,1;YES=0,1; no=0,0	40857	89
	Probe 1 temperature (return water or tank control sensor)	Degrees F/C (read only)	40257	90
	Probe 2 temperature (supply water or tank outlet)	Degrees F/C (read only)	40259	91
	Probe 3 temperature (outdoor temp or system temp with OnTrac)	Degrees F/C (read only)	40261	92
	States of Relays 1,2&3	Bit 0,1 and 2 (read only)	42050	93
	Digital input alarms	Bit 5 (read only)	43329	94
	On/Off (bit 0 of MS 1on 0off, LS 1enable 0 disable)		41281	95
	Keyboard Lock (bit 4 of MS 1lock 0un, LS 1enable 0 disable)		41281	95
	Reset audible alarm (bit 5 of MS 1reset. LS 1enable 0 disable)		41281	95
Adr	Serial address	1 to 248	40858	96
rEL	Software release	(read only)	40859	97
Ptb	Parameter map code	(read only)	40860	98

ASSIGNING WATER HEATER ADDRESSES

In order to set up the network communication system, each water heater's TempTrac control must be assigned an address. *In installations with multiple TempTrac controls, a different address must be assigned to each TempTrac.*

The following instructions are specific to the TempTrac®. If your water heater uses a different control refer to the programming instruction for that control to set the address.

1. On the face of the TempTrac control, enter the programming mode by pressing and holding the "**set"** and "**down arrow"** keys together for 3 seconds.

2. The upper LED readout should read "St1" with a numeral (the St1 setting) appearing in the lower LED readout.

   IMPORTANT: If the lower readout indicates "Pof", the TempTrac control is locked for programming. To unlock the control, press and hold the "**up arrow**" and "**down arrow**" keys together until the lower LED readout indicates "Pon". The TempTrac control is now unlocked. Repeat step 1 to proceed with assigning the TempTrac address.

3. Press the **"down arrow"** key.

4. "Pr2" will appear in the upper LED readout and "Pas" will appear in the lower LED readout. Press the "**set**" key to begin entering the password to allow programming.

5. In the lower LED, the value "0 - -" (zero, dash, dash) with a flashing zero will be displayed.

6. The programming password is "321". Use **up arrow** key to input each digit in the security code. Confirm each digit by pressing "**set**" key. After each confirmation, the next digit will begin to flash.

7. After entering the third digit and pressing "**set**", "Pr2" will appear in the upper LED readout. Press the "**down arrow**" key three times and the parameter "Adr" will appear in the upper LED readout. The lower LED readout will indicate the default address "1". (See image to the right.)

8. Press the "**set**" key once and the number will begin to blink. Use the "**up arrow**" key to set the address from (1 to 20). When the proper address is indicated in the lower LED, press "**set**" key.

9. The address is programmed. After approximately 10 minutes, the LED readouts will return to the default temperature reading mode.

- **Power** LED comes on and remains solid.

- **LA** starts flashing about once per second. This tells us that PIC (Peripheral Interface Controller) number 1 in the ProtoCessor has powered up successfully.

- **LB** starts flashing about once per second. This tells us that PIC number 2 in the ProtoCessor has powered up successfully.

- **GP105** will go on solid within 45 – 60 seconds after power up, signifying normal operation. ProtoCessor will be able to come up in RUINET shortly after this LED comes on. During the first 45-60 seconds the LED should be dark.

- Upon successful operation of **GP105 t**he ProtoCessor will go through diagnostics of the field port communications.

- The FFP-ETH module is operational after this point.

- **RX** Field Port LED: On normal operation, the **RX** LED will flash when a message is received on the field port of the ProtoCessor.

- **TX** Field Port LED: On normal operation, the **TX** LED will flash when a message is sent on the field port of the ProtoCessor.
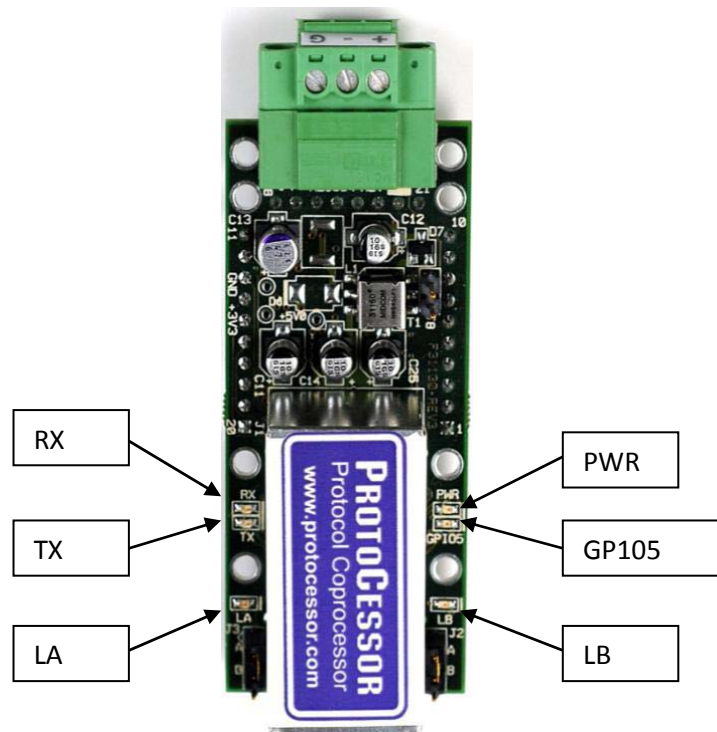
PROTONODE GATEWAY NETWORK INTEGRATION

Once the network is configured the Connection Overview of the RUINET utility will show the messages as they move across the network.

- Select "O" for Connect Overview to see the number of messages on each protocol. If the Protonode is communicating correctly with the device then the display will show Tx and Rx messages without any errors.

TROUBLESHOOTING TIPS

- If **PWR** LED does not come on and LA and LB don't flash, call or email ProtoCessor support support@ProtoCessor.com.
- If **PWR** LED does not come on but the LA and LB flash, then the **PWR** LED is broken.
- If **LA** and **LB** don't start to flash there could be a problem with the ProtoCessor and you need to contact support@ProtoCessor.com .
- If **GP105** never comes on then you need to contact ProtoCessor support.
- If **TX** and or **RX** don't flash, it may represent a problem with the field wiring or Configuration problems in the ProtoCessor on field side or incorrect polling parameters (such as COMM properties like baud, parity, and etc).
- The Protonode is unable to find one or more controls in the RS485 network.
    - o The individual controls may not be programmed with the correct and unique node address. See the respective control manual for details.
- The Protonode has no communication with the controls in the RS485 network.
    - o Check the RS485 wiring for correct wiring method. See page 12 of this manual for details.

It is a good idea to Ping both Protonode gateway to be certain the intended address are accessible before engaging in additional troubleshooting.

More information for the ProtoCessor/ ProtoNode can be found at: **Web:** *www.protocessor.com*

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Tel: 408-964-4433, **FAX:** 408-262-9042, **Toll-Free**: 800-317-8319 **Email:** *sales@protocessor.com*