C6000

Installation Manual

Revision 2.02

computrol
FUEL SYSTEMS INC

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Introduction

The C6000 PCU from Computrol is a new generation Pump Control Unit designed with the latest in microprocessor technology featuring:

- multiple communication ports
- fully programmable messaging structure
- Flash Memory for data and program storage
- Complete field programmability

The installation requirements of the C6000 are similar to other Computrol Pump Control Units and well documented in this manual.

The scope of the C6000's capabilities and flexibility makes it most convenient to use the fuel control computer in conjunction with the ProFuel 2 Fuel Management Program for interactive configuration downloads and to take advantage of the full set of features.

System Architecture

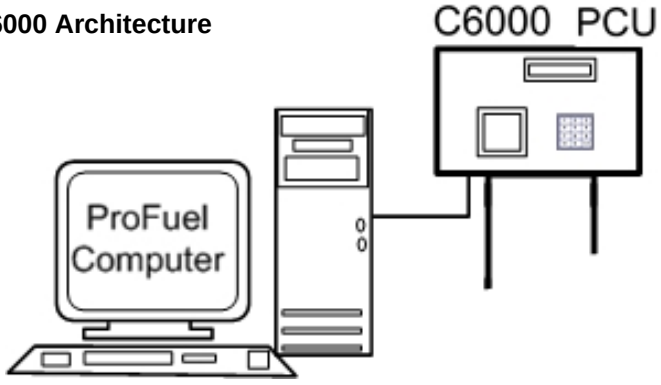
While many different configurations are possible all C6000 systems are based on the same primary components.

- **C6000 - Main Board** – provides LAN or serial communications with ProFuel
- **C6000 - Front Panel Controller** drives all input devices including card readers, displays and keypads.
- **C6000 – Pump Control Board** interfaces to the pump circuits to provide ON/OFF control and monitor delivery of the product.

The three boards are connected by a single, 4-wire trunk line using 2 wires for RS485 communications and 2 wires to distribute 12 volt dc power to each. The multi-drop configuration of this communications bus allows each board to take an address so the Main Board can always determine which board is communicating.

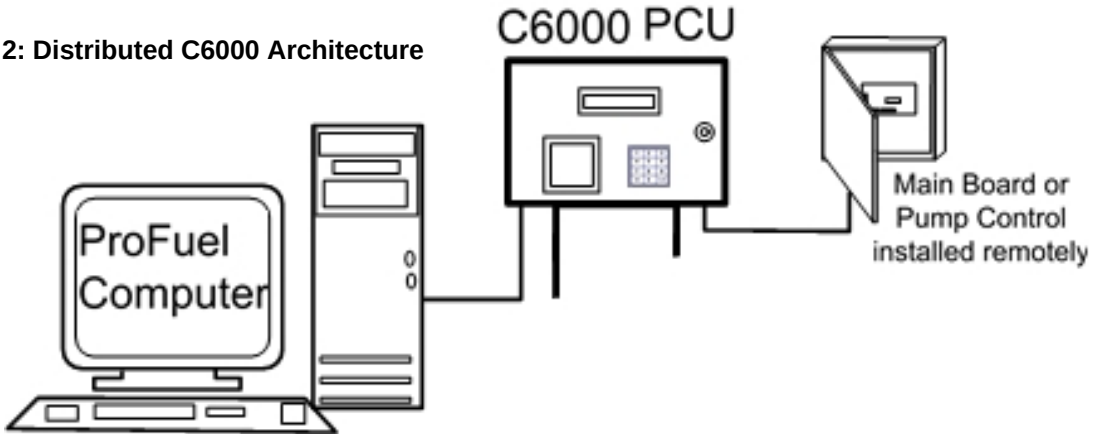
The basic C6000 unit will be comprised of a Main board, a Pump Control Board and Front Panel Controller. Other system components such as the power supply and the thermostatically controlled heater plate will also be in any Computrol enclosure.

Figure 1: Basic C6000 Architecture



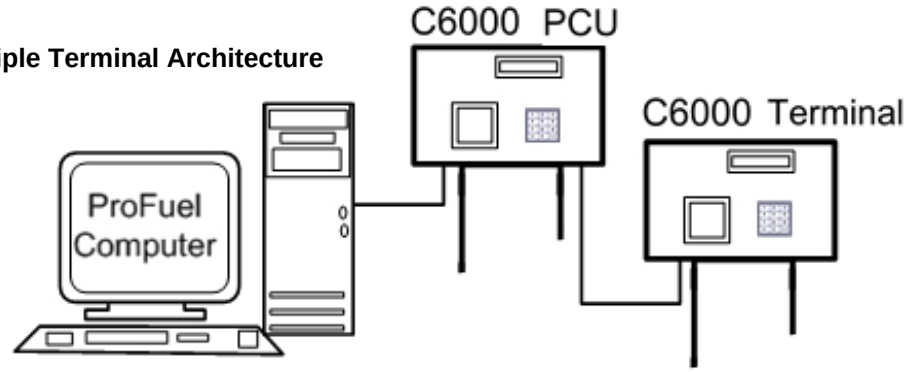
A basic design feature of the C6000 hardware provides the ability to separate the main components for installation. Installations can be proposed where the individual boards can be located in a building while the Front Panel board is installed on the island.

Figure 2: Distributed C6000 Architecture



Many C6000 applications may call for separate reader and display controls on a 2nd or 3rd fuel island on a site. A separate enclosure with a Front Panel and Pump Control board can be installed to serve as a terminal controlled by the Main Control board.

Figure 3: Multiple Terminal Architecture



The terminal configuration implements the same RS485 communications strategy used in a single enclosure system but with an additional Front Panel Board and Pump Control Board. They are given addresses on the multidrop-485 link and the Main Control Board programming allows the terminal to work as like a second PCU.

The standard distance for RS485 communications with remote boards or terminals is nominally 75 meters from a single voltage source. Installation of additional, local power sources will allow installers to communicate on much longer runs. The use of wireless RS485 communications modems, fibre-optic cable modems and other connectivity solutions is also possible.

These devices may be used to connect the Main Control Board with the ProFuel-2 Computer or to eliminate the need to install hard wire runs between the main components of the C6000 and any remotely installed components. Consult with Computrol representatives for more information about these options.

Features and Capabilities

While the C6000 software code is designed to make any of the hardware field configurable, Computrol's C6000 PCU is factory configured to different applications as required for individual customer specifications. Some of the optional hardware modules include

- Card Readers using Proximity from HID, Sensor Wiegand, Magnetic Stripe, Barium Ferrite from Securakey and Computrol Coil Card technologies
- Keypad only operation is also provided and keypad options include rubber or stainless steel buttons with different button configurations
- Control or 2, 4, 6, or 8 hoses
- Receipt Printer type.

The system features include:

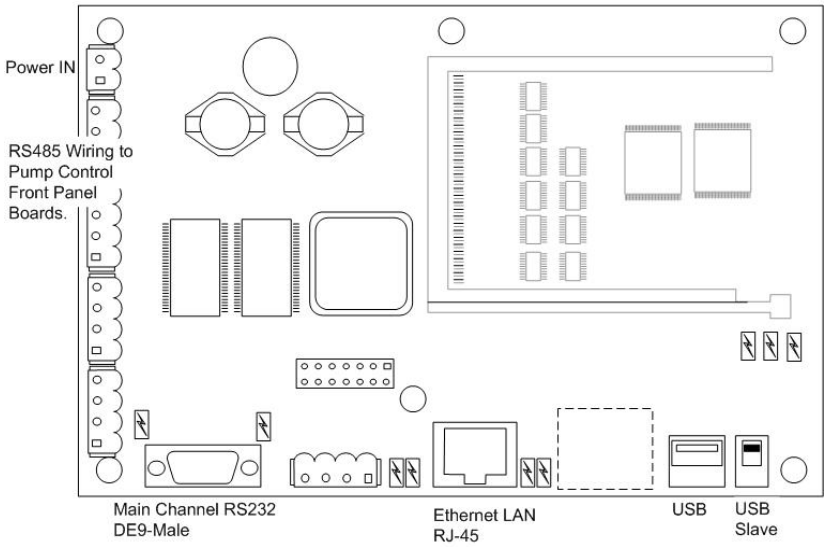
- Simultaneous control of up to 16 hoses
- Configurable hardware addresses
- High Speed Serial communication
- TCP/IP Ethernet LAN communications
- DIP Switch configurable Pulse Counter Circuits
- Optional voltage sense for pump control
- Pump timeouts for total time, no flow or fail to start
- User configurable user prompt sequences
- User configurable display prompt messages
- Outgoing messages for users (1 time or repeat)

Main Board

The Main Board is the primary component in the C6000 and is comprised of a reliable, high-speed processor with flash memory and a number of communications ports used for RS232, RS485, Ethernet LAN and USB. The Main board drives all of the functionality in the other boards and stores the main data files for uploading and updating with the ProFuel II Management Computer.

The Main Board's flash memory is loaded with the C6000 software which allows Computrol customers to fully customize the operation of the unit. Among other features the C6000 allows the user to configure different pump initiation sequences for individual users, send messages to individuals who fuel vehicles and capture accurate transaction details in a secure memory for subsequent reporting. The Main Control Board is the driver for the other system components which include the Front Panel Controller and the Pump Control Board.

Figure 4: C6000 Main Control Board



Connections to the C6000 Main Control board are clearly marked.

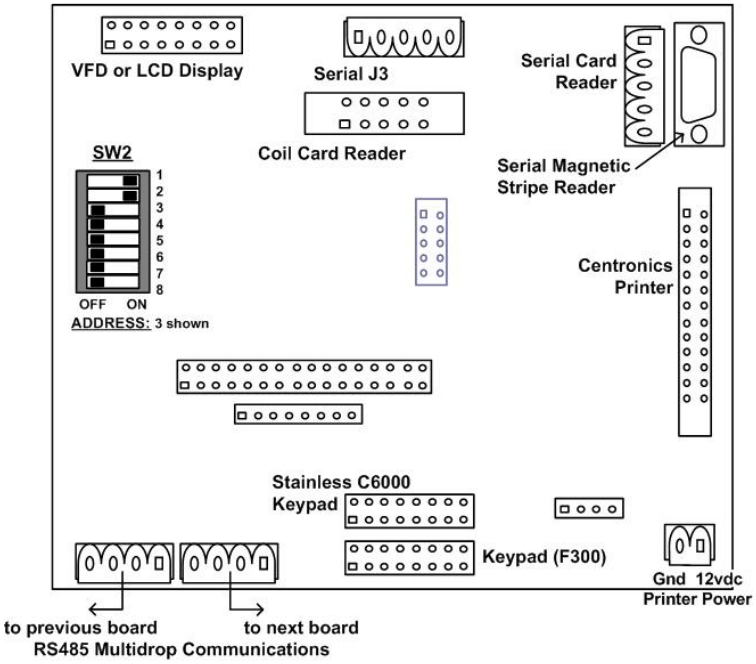
Front Panel Controller

This board takes it commands from the Main Controller Board over an RS485 connection and performs functions including:

- Display message tasks
- Card reader interface
- Keypad interface
- Receipt Print Control (option)

The Front Panel Board is the ‘user interface’ allowing system users to key in data, use cards or keyfobs, and follow the prompting provided by the display. This C6000 component is key in gathering the user information which enables the C6000 to authorize the dispensing of the products being controlled.

Figure 5: Front Panel Board (UI)



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The Front Panel Board is addressed using switches on the board so that it can communicate with the Main Control board on the RS485 bus. The architecture allows the board to identify itself as a uniquely numbered component so that several different Front Panel Boards (typically 1-5) can be connected to a single Main Control Board.

A small number of configuration options are set in the ProFuel II software and these will include:

PCU Number - determined by the existing data record and installation
UI Number - shown in red indicating its importance in this configuration.
Address - DIP switches set the board's unique address for this installation/site.
Card Reader – options include: Magnetic Stripe, Coil Cards, 34 or 26 bit HID Cards.
Enabled - check box allows the setting to be recorded prior to implementation.

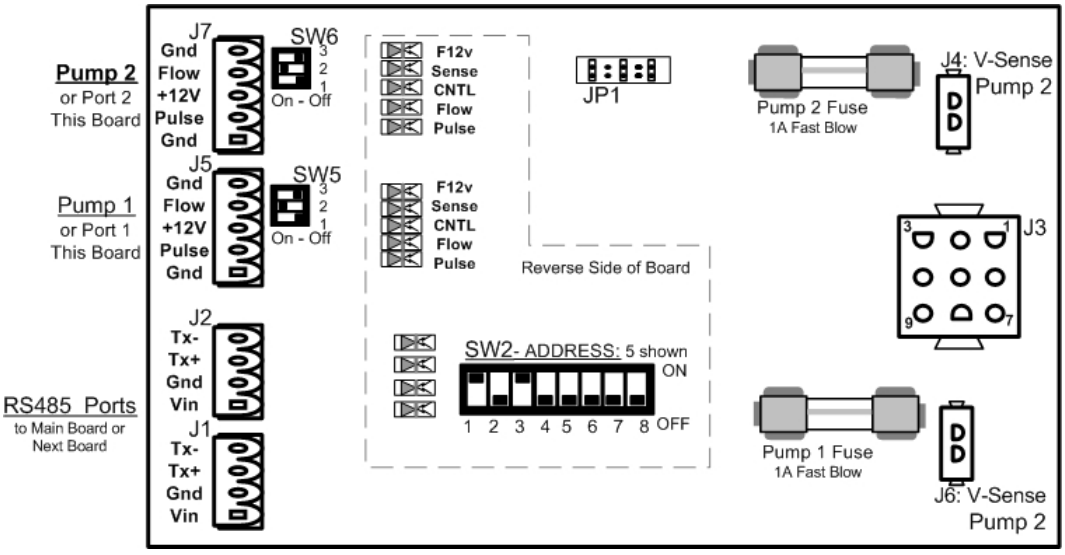
Refer to the ProFuel II Manual for PCU and UI setup for detailed information.

Pump Control Board

Each C6000 Pump Control Board is capable of controlling and monitoring 2 pumps or dispensers. Where more than 2 control circuits are required additional boards are inserted on the 485 link either in an existing enclosure or they are installed remotely. The new boards must have a unique address and the new configuration information is downloaded easily to the C6000 from the ProFuel II software.

The circuit board is compatible with all older style Computrol control and pulser wiring providing customers with a direct upgrade path to the C6000. The C6000 Pump Control board is not compatible with older PCU hardware.

Figure 6: Pump Control Board



The C6000 Pump Control Board, pictured above, includes connection points for:

Low Voltage Wiring

Pulsers – up to 3 pulser wires (+12vdc, Pulse In and Ground)

- **DIP switch SW5 and SW6** configure the board to read different pulse signals including pulses Krause and Gasboy or Veeder-Root Electronic pulsers as well as Fill-Rite and Veeder-Root Mechanical pulsers (see Page 10)
- **Pulse Ratios** are set in the ProFuel Software and the configuration is downloaded to the C6000.

Flow Switches - additional security against theft or broken pulser wiring is provided when the pump is fitted with a Flow Switch. These devices are not commonly used.

RS485 Ports In and Out – provide communications from the last board and to the next board in the RS485 Communication link. This allows the Main Control Board to communicate with each component of the PCU system network.

High Voltage Wiring

120/240 Volt AC Control Wiring from the Pump. Typically includes Hot and Switch-leg but may include Voltage Sense Wire as well.

Installation Instructions

The C6000 installation must be performed according to the instructions provided by Computrol and in accordance with all national and local electrical codes.

All wiring should be in steel conduit to avoid damage from lightening and power surges which might impair proper operation of the unit.

Site Preparations

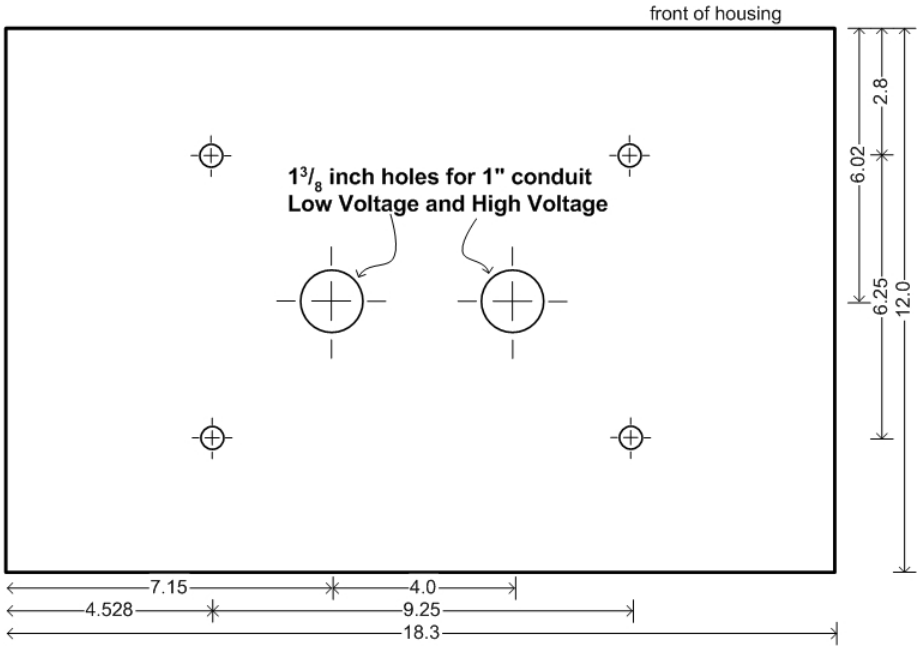
The C6000 is designed for installation outside areas classified as Class II Hazardous. This means that the unit must be at least 18 inches above grade and at least 18 inches away from all pump cavities. EYS seals must be used in accordance with all applicable electrical codes to prevent fire and explosions.

The wiring and conduit runs for a proper installation include:

- High Voltage Conduits
- Low Voltage Conduits

The bottom of the PCU housing facilitates 2 x 1" conduits. The left conduit is typically for Low Voltage. The conduit on the right is reserved for High Voltage wiring. A junction box (by others) in the pedestal is used to collect individual conduits so only 2 connect to the C6000 enclosure.

Figure 7: PCU Enclosure Mounting Holes



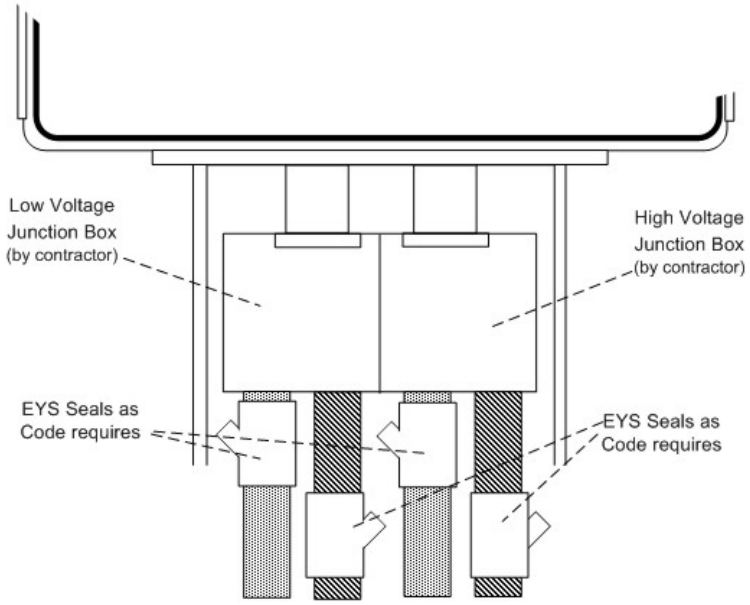
Low Voltage Circuits include:

- Communication wiring to remote C6000 components and where required cabling to the ProFuel Management Computer or modem location.
- Pulser wiring and Flow Switch wiring (optional) from the pump or dispenser.

High Voltage Circuits include:

- Power for Electronic Computer- a dedicated 120VAC supply for the C6000 PCU
- Pump Control Wiring
    - Hot and Switch-Leg for each pump where Load Current is less than 1 Amp
    - Hot, Switch-Leg and 'Voltage Sense' wire where Load Current exceed 1Amp.

Figure 8: Conduit Termination in Pedestal



Pulse Monitoring

- 2 wire or 3 wire pulse circuits as specified by pump supplier
- low conduit runs from each C6000 Pump Control Board to each pump or dispenser

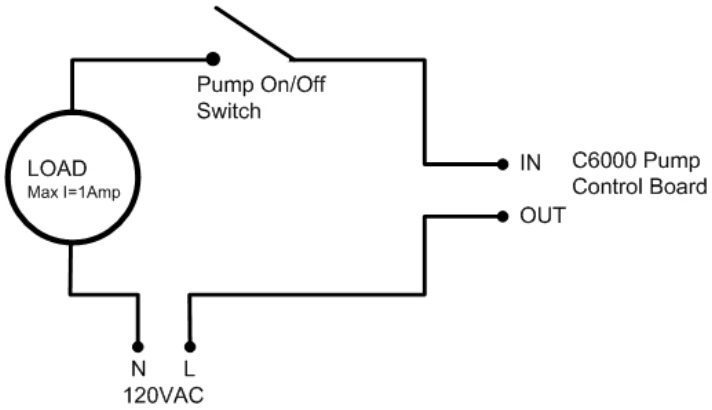
Communications

- Ethernet using TCP/IP, RS232 using 3-wire with software flow control or 8 wire to implement higher speeds using hardware handshaking for flow control

Pump Control Wiring

The Pump Control board in the C6000 is designed to control up to 2 pumps or dispensers using 120VAC circuits at less than 1 Amp. The basic configuration is shown in the following diagram.

Figure 9: Pump Wiring Basics



More detailed installation instructions are available.

The premise of the Pump Control board's operation is that once the pump is authorized a relay is powered to provide power to the pump Control Load. The Load is in some cases the pump as a whole powering up only when authorized.

In most modern cases however the Load is a solenoid or motor relay interrupted by the pump handle switch. Pumps of this type may have electronic heads or even older mechanical registers.

When the Pump Control board authorizes the Pump Load, it will run after the Pump Handle Switch has been moved to the ON position. The C6000 control circuits will use the Current Sense circuit or the Voltage Sense circuit to determine that the pump is running.

If the wiring does not allow the board to 'Sense' that the pump is ON and interrupt that 'Sense" with the Handle Switch then the system will not be considered operable.

The C6000 uses the sense to know the pump is on and must be able to sense immediately that the Pump Handle has been turned OFF and the transaction can be terminated normally.

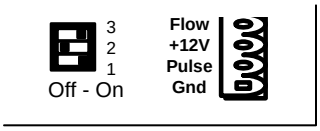
If assistance is required to specify the type of wiring required, consult with Computrol representatives.

Pulse Circuit Wiring

Accurate pulse counts are imperative and a wide range of pulse circuits are found in the field. The C6000 Pump Control Board provides a 3 position DIP switch for each pulser circuit to provide compatibility with a large number of different pulser types. Choose from the chart below.

Pulser Configuration Wiring and Switches

Figure 10: Pulser Connects and DIP SW



SW Pos 1 2 3	Compatible Pulsers	Wire Positions
0 1 0	Veeder-Root V/R 100:1	connect 12vdc, Pulse and Ground
0 1 0	Krause, D&H,	connect to 12vdc and Pulse
1 1 0	Gasboy 9800 series	connect to Gnd and Pulse
1 0 1	Veeder-Root V/R 10:1, LCII., FillRite Gasboy, OPW Pulsers	connect to Gnd and Pulse
0 1 0	Balcrank Oil Pulser	connect to 12V and Pulse
0 0 1	10K Input for Active12V (or 24V) Pulser	connect to Gnd and Pulse

Do not select both 2 and 3 - Use 2 or 3 only.

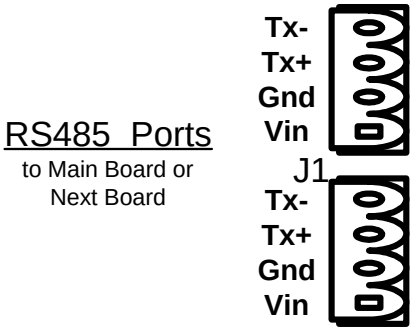
(Switch = 1 is ON)
(Switch = 0 is Off)

The chart shows most pulser types currently defined with the DIP switch settings and wiring connections required to which make them work properly.

Communications Wiring

Four types of communications are available for use in the C6000 system. All Communications from the Main Control Board to Front Panel boards and Pump Control boards, in any combination uses by Multi Drop RS485 wired as shown below.

Figure 11: C-Bus (RS485) Wiring



Connector Pin	Next Board	Last Board
Tx+	Tx+	Tx+
Tx-	Tx-	Tx-
Gnd	Gnd	Gnd
+12vdc	+12vdc	+12vdc

Main Communication Channel

Figure 12: Main Channel Communications RJ45

Communication to the ProFuel II Management computer can implement Ethernet LAN or RS232 in 3-wire format or 8-wire format to provide Hardware Handshaking.

Ethernet LAN Wiring Connection (Cat 5)

Pin #	Wire Color	Comment
Pin 1	Orange/White	Transmit (1&2) Orange
Pin 2	Orange	
Pin 3	Green/White	
Pin 4	Blue	Receive (3&6) Green
Pin 5	Blue/White	
Pin 6	Green	
Pin 7	Brown/White	Pins 4,5,7, and 8 are unused
Pin 8	Brown	

For Standard Cable all pins go straight through, ie: 1-1 , 2-2 , 3-3, 6-6
For Crossover Cable change 1 end so the connections include: 1-3, 2-6, 3-1 and 6 -2
Crossover Cables may be required to communicate directly to the PCU from a PC in situations where there is no HUB or existing network.

PCU Start Up

On power up with its factory configuration the PCU will initialize and show 'Computrol' on the display. This message will remain until a configuration file is sent to the unit via the communication link using the ProFuel 2 program.

Detailed instructions on the ProFuel program are provided in the ProFuel 2 User Manual which accompanies the program on delivery. The logical order of database record setup is:

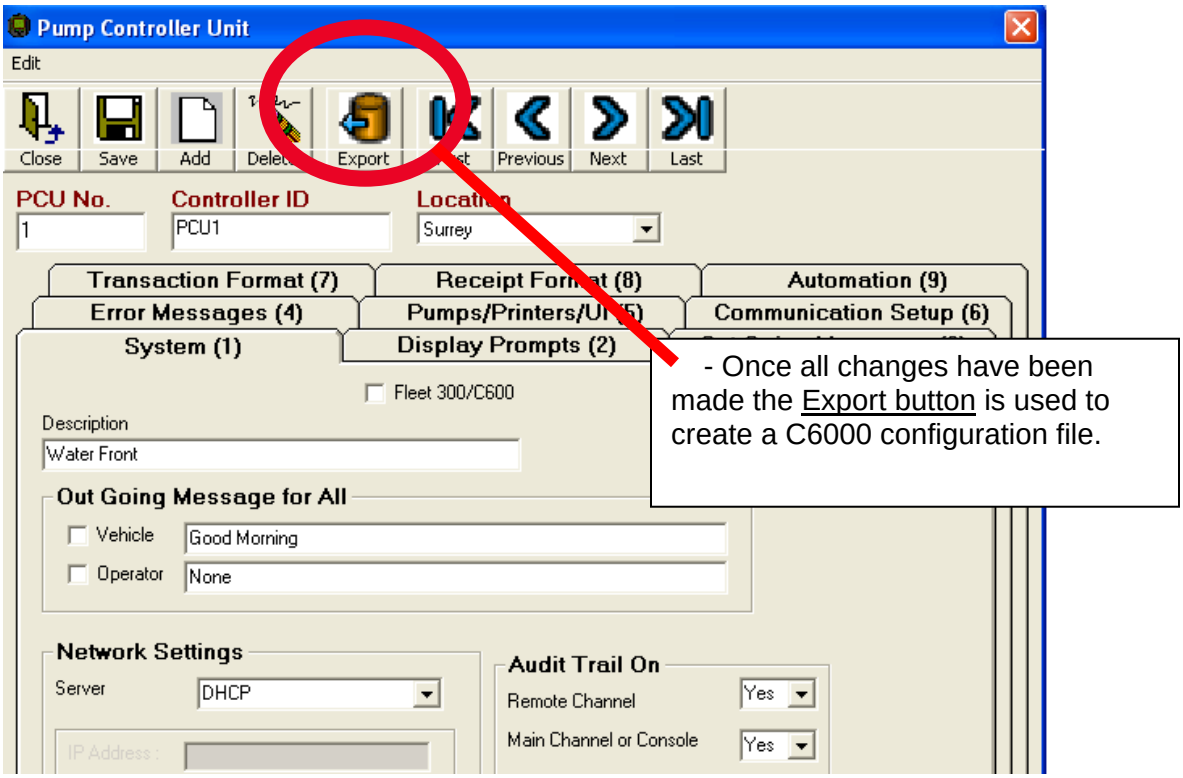
- Products
- Product Groups
- Locations
- Location Groups
- Tanks

The entries into the database for the above are very straight forward and require little explanation. This is especially true when setting up a database for testing.

PCUs are the next Database records to be setup and these much more complex. The operation of the C6000 PCU is totally dependant and determined by the data entered into the PCU Database and while there are default values for many fields the proper operation of a specific PCU requires careful attention be given this section of the ProFuel setup.

Separately the Accounts and Users must be set up as well. For finalizing the commissioning of the PCU itself a single Account and User Card or Number need be setup initially.

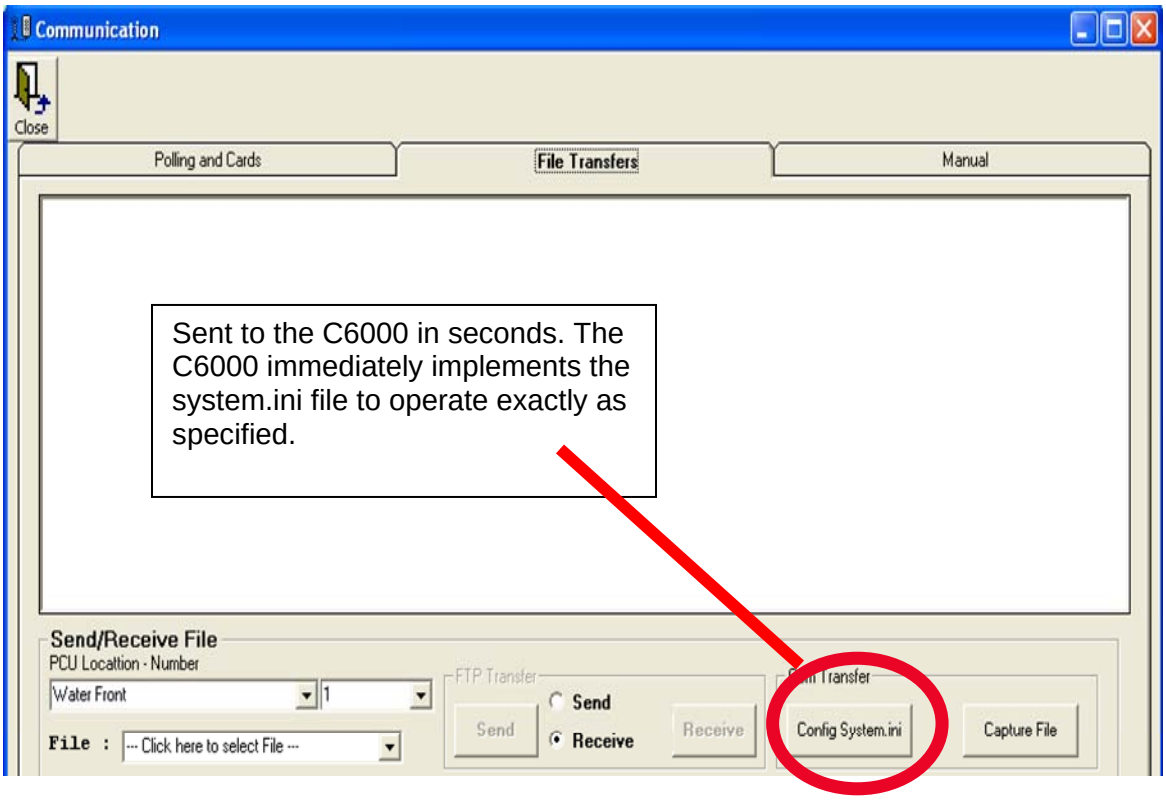
Figure 13: Export PCU System File



Once completed the setup must be sent to the PCU for the changes to take effect. This is accomplished by:

1st Exporting the PCU system information to a file called system.ini for each PCU
2nd Entering the Communications screen and selecting File Transfers
3rd Select the PCU which is to be configured
4th Use the Config System.ini button to automatically transfer the information to the PCU.

Figure 14: Send System File to PCU



Once the system has been downloaded and reset the new configuration will take effect and the pumps can be tested to ensure they are secure and counting accurately.

Test each of the pumps by:

1 ensure the pump will not turn on without authorization from the PCU
2 perform 2-3 transactions with at least a small amount of fuel being delivered before turning the pump off.
3 use the manual communications link to login (typically user=root and password=root) and use the L T A command to check the transactions that are displayed.

If the value of fuel dispensed is correct and the termination code for the transaction is Normal then the system is wired correctly and the basic features of fuel control have been initialized properly.

Note If no product is counted check the pulser wiring and the pulser circuit configuration DIP switches on the Pump Control Board.

Note If product is not accurately counted then check that the pulse ratio on the PCU/Pump Configuration screen matches the ration set in the pump or pulser. Typically the error is a decimal location so 10 gallons is counted as 1 or 100.

Larger transactions must be performed and checked to ensure volume limits are working on a per card basis where Transaction Limits or Polling Limits are implemented.

Changing the Communication Port to a Network Connection.

If the unit is to communicate on the network a number of steps are required depending on the type of network and this information must be provided and supported by the IT professionals who determined the network parameters.

When a PCU is configured to communication using its Ethernet port, the original serial communications setup is also configured. This means that once downloaded with a system.ini file which specifies the Ethernet connection is to be used the comm. port will continue to function.

Take advantage of this fact at the time of set up by following the steps below. This should be completed only after stable communications has been established.

1 on the PCU's System (1) screen select DHCP as a server setting
2 Open the Communication setup (6) screen and select the radio button for TCP/IP
3 Save the changes
4 Use the Export button to create the System.ini file with the updated configuration
5 Change the Communications Setup (6) screen back to use COM Port as the means of communication. This is required so the new information can be sent to the PCU which at this time has not been configured to use the Ethernet for communication. Save the change.
6 Follow the procedure for sending the system.ini file to the PCU by opening the Communication screen selecting File Transfers and clicking the Config System.ini button.
7 Make sure the PCU is connected properly to the network and cycle the power on the PCU so it will initialize the Ethernet port and attempt to find a DHCP server.
8 Use Manual Communications to log on to the PCU and use the Print Status command and make note of the IP address shown.
9. Disconnect the serial communications cable
10 Open the Communications Setup (6) screen and after clicking the TCP/IP radio button, enter the IP address in the Host Address box provided. Save the changes.
11 Close the PCU setup screen and return to the Communication screen.
12 Use the Manual Communications button, click on Connect to PCU after selecting the proper PCU and the system will negotiate the connection.
13 Type root as a UserID and root as the password (unless different information has been configured.) and use the PCU 6000 commands such as P S for Print Status and L T A for List Transaction All.

The PCU should respond to the commands and the PCU is properly configured for Ethernet communications.

Computrol C6000 Pump Control Unit Firmware Upgrade

Using RS232 Serial Communications Port

What you need before you start.

- PC Computer with RS232 Com Port
- HyperTerminal Installed (typically part of O/S install)
- Cabling required for connecting to C6000 PCU.
- Firmware file to be installed.

In preparation for performing the upgrade:

- Poll the transactions or otherwise ensure a backup is created
- Ensure an updated version of ProFuel 2 is ready to download a configuration to the PCU. (Not all firmware upgrades will require a new system.ini but to be sure check with your technical support team.)
- Typically the C6000 is factory set to use 9600 Baud, 8 Bits, 1 Stop Bit, Parity None, and Xon-Xoff Flow Control. Confirm the connection information store in the ProFuel 2–PCU Communications Setup (6) screen. The information includes is the Com Port last used and TCPIP address if required.

Procedure for upgrade the firmware in a C6000

a. Connect to the PCU and ensure clean communications is possible
b. Logon with User ID and Password (typically ‘root’ and ‘root’)
c. Once logged on type ‘reboot’ and the C6000 will restart showing messages such as the one shown below

Figure 15: PCU - Reboot Dialogue

```
> reboot
....PHY: AMD AM79C874
... waiting for auto-negotiation.....
Ethernet eth0: MAC address 00:50:c2:56:d0:0e
IP: 192.168.1.111/255.255.255.0, Gateway: 192.168.1.1
Default server: 192.168.2.79

RedBoot(tm) bootstrap and debug environment [ROM]
Computrol release, version Rev_2 1.0.2 - built 11:34:46, Mar  6 2006

Copyright (C) 2000, 2001, 2002, Red Hat, Inc.

RAM: 0x80000000-0x82000000, [0x8001bf60-0x81fdfa00] available
FLASH: 0xbe000000 - 0xc0000000, 256 blocks of 0x00020000 bytes each.
== Executing boot script in 5.000 seconds - enter ^C to abort
^C
```

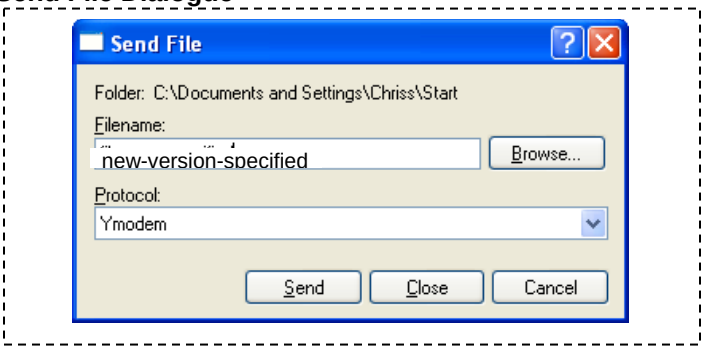
d. As shown above, use CTRL+C (^C) when prompted. This will stop the C6000 from executing its boot script (ie starting to run the firmware it has on board)
e. The prompt RedBoot> will appear

The file transfer described in the next few steps will take approximately 20 minutes at 9600 Baud but only a minute or so at 115200K Baud. You can not use a higher speed unless you are connected directly to the C6000. If you wish to use a higher communications speed, skip to step 'o' (page 4) then return to step 'f' when done. To use the existing baud rate proceed now to step 'f'.

f. Type "Load –m ymodem<enter>"

g. The C6000 is waiting to receive a file. Use HyperTerminal to send the file containing the new firmware. This done by Clicking On Transfer or using the keystroke ALT+T, then selecting the option to Send or typing 'S' at which time the following screen will appear.

Figure 16: Send File Dialogue



h. Enter the filename to be sent, <new-version-specified> is used as an example only) or browse to the location in which it has been stored. Select Ymodem as the Protocol and press the Send button.

i. A standard data transmission screen will be displayed showing progress when the complete file has been transmitted the screen will appear similar to the following.

Figure 17: Send File Confirmation

j. On completion of the download the C6000 will respond with the following technical jargon or similar followed by the prompt RedBoot> indicating the next command can be issued.

```
CCC  Entry point: 0x80040000, address range: 0x80040000-
0x8011d998
xyzModem - CRC mode, 1(SOH)/891(STX)/0(CAN) packets, 4 retries
RedBoot>
```

k. The command 'fis create <new-version-specified>' should be typed at the prompt where FIS CREATE is a command and <new-version-specified> is the file that was just downloaded. This step is to inform the C6000 that the file just downloaded is a file which can be run as a program.

l. The next command tells the C6000 that it should run the new file when it reboots. The command is 'FCONFIG' and a snapshot of the resulting conversation is shown below:

Note: bold, underlined text is typed using the keyboard while smaller text is sent from the PCU. Hitting the <enter> key in response to a line displayed means the line will be unchanged.

Figure 18: PCU Application Config (FIS)

```
RedBoot>  ........ ..... ..... fconfig
Run script at boot: true   ... <enter>
Boot script:
.. fis load SR_V07
.. go -c
Enter script, terminate with empty line
>> ..  ..... fis load  <new-version-specified>  <enter>
>> .. ..... go -c <enter>
>>  ..... <enter> (entering a blank line indicates no more lines are to be entered)
Boot script timeout (1000ms resolution): 5      <enter>
Use BOOTP for network configuration: false      <enter>
Gateway IP address:    . .....                  <enter>
Local IP address:  ..... .....                  <enter>
Local IP address mask:    ....                  <enter>
Default server IP address: 192.168.2.79         <enter>
Console baud rate: 9600  .....                  <enter>
GDB connection port: 9000  ...                  <enter>
Force console for special debug messages: false <enter>
MAC 0 hardware address (ESA): 0x00:0x50:0xC2:0x56:0xD0:0x0E <enter>
Network debug at boot time: false               <enter>
Update RedBoot non-volatile configuration - continue Y  enter Y or the .
changes will not be stored
RedBoot> reset
```

m. The reset command will be executed and in approximately 1 minute, the unit will be ready to communicate and resume operations using the new firmware.

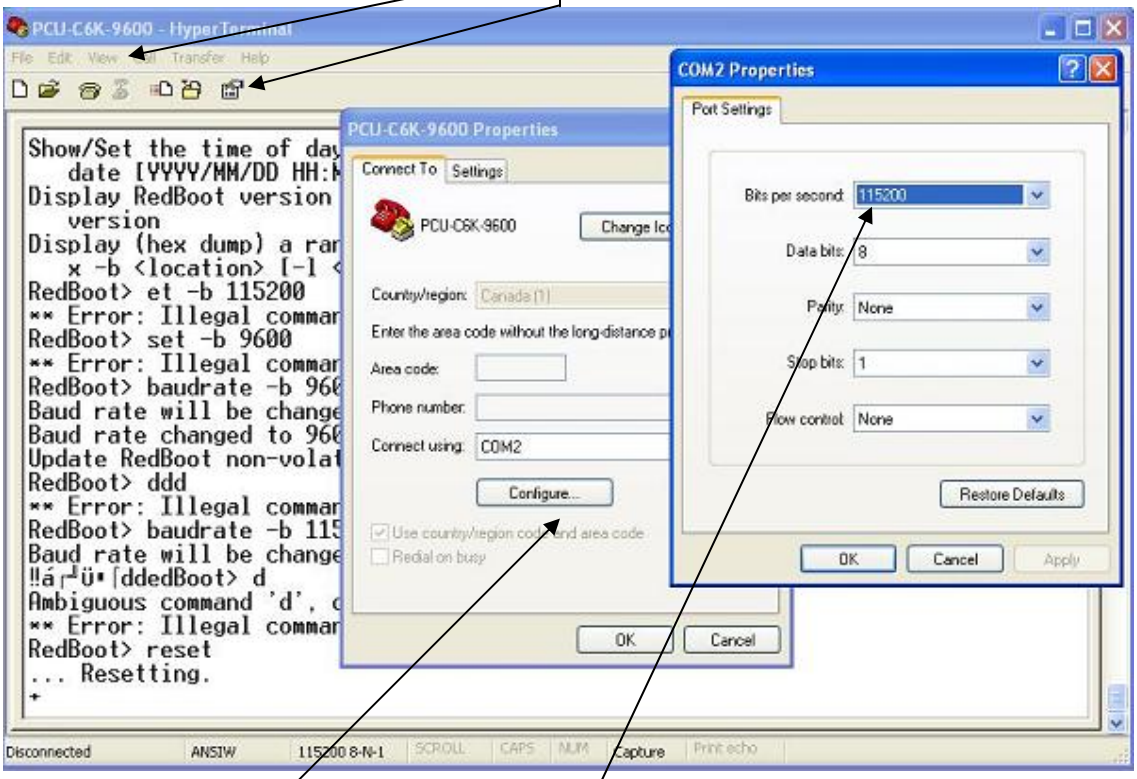
n. After entering the login and password; use the Print Version command to confirm the upgrade was done successfully.

Baud Rate Changes – use only if the PC is connected directly to the Serial port. Modems, line drivers and other communications devices may be configured for the lower speed.

o. To change the baud rate type 'baudrate –b 115200'

p. The unit will respond but the characters will be garbled because the properties for HyperTerminal are still at 9600 Baud. To change the communications speed in HyperTerminal click on the Off Hook phone icon and then Properties.

Figure 19: HyperTerminal Baud Change



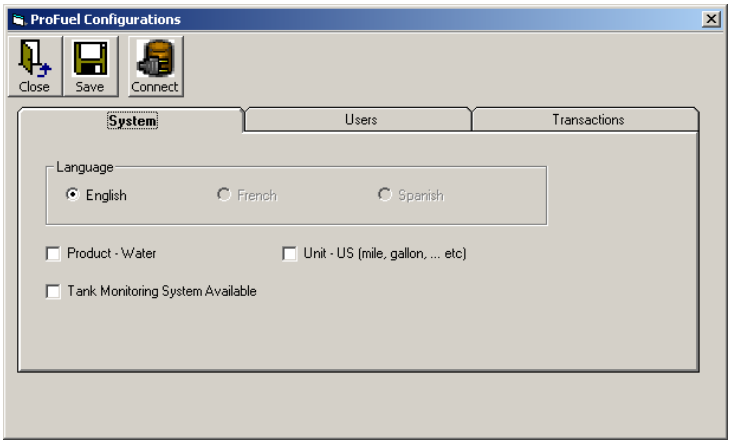
Click on Configure and change the Baud rate to 9600. Click OK and Click OK

Return to step F to transfer the firmware at the new Baud Rate.
Remember to test the system using the old baud rate.

Connecting to a Network Database

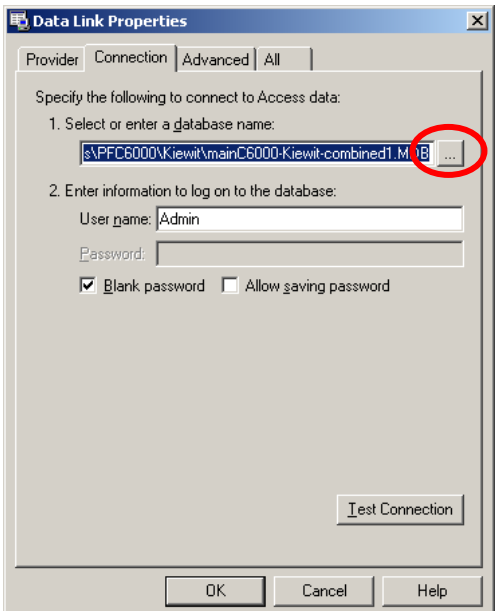
Click on the word ProFuel at the top Left and click on System Settings.

Figure 20: ProFuel Configuration - Connect



Use the Connect button.

Click OK on the Screen that appears



Use the button circled to browse the network and locate the locations specified as having the new database, select it and click OK. The system returns to this screen. Use the Test Connection button to confirm that the location will work.

Save and Close

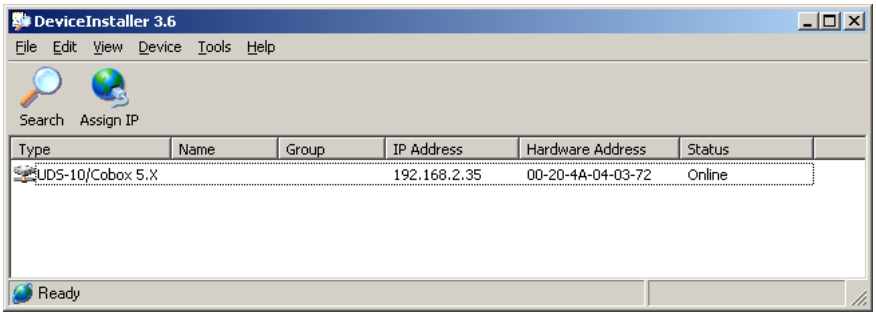
Connecting to Lantronix UDS10 from Computrol Pump Control Units

It is best to plug the UDS10 device in near your personal computer and configure the device using the following steps before installing in its final working place.

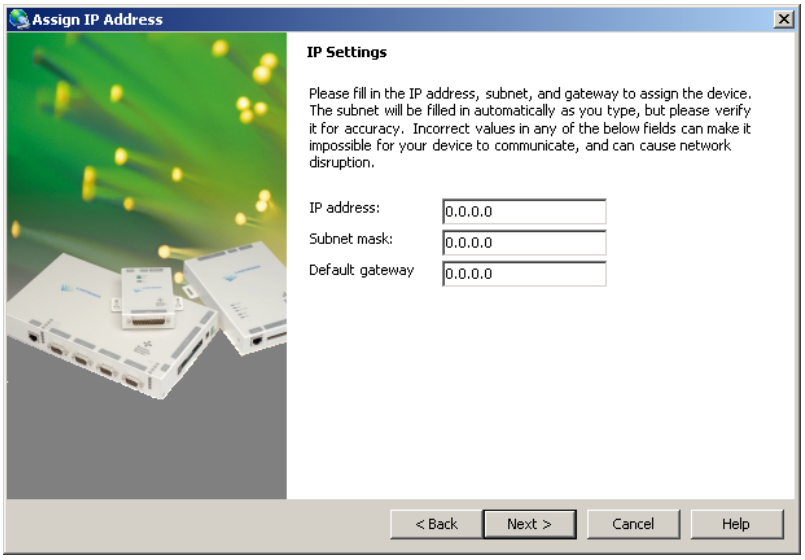
Install the Lantronix Configuration Software and the Redirector Module from the manufacturer's CD.

With the UDS10 Plugged into a power source and connected to the network, use the START button and All Programs (Programs) to select the Lantronix Device Installer

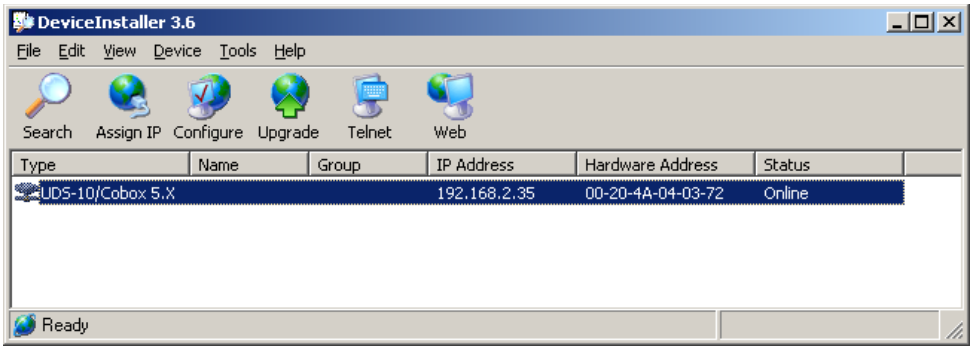
Use the search button and the program will display the units it can find.



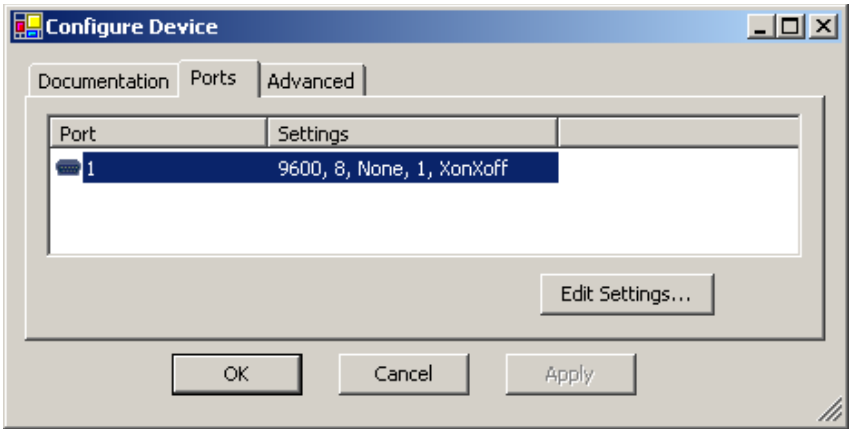
If more than one appears use the Hardware Address to confirm that it is the one you are trying to setup. Use the Assign IP button to ensure the IP address is set properly and write it down for reference later.



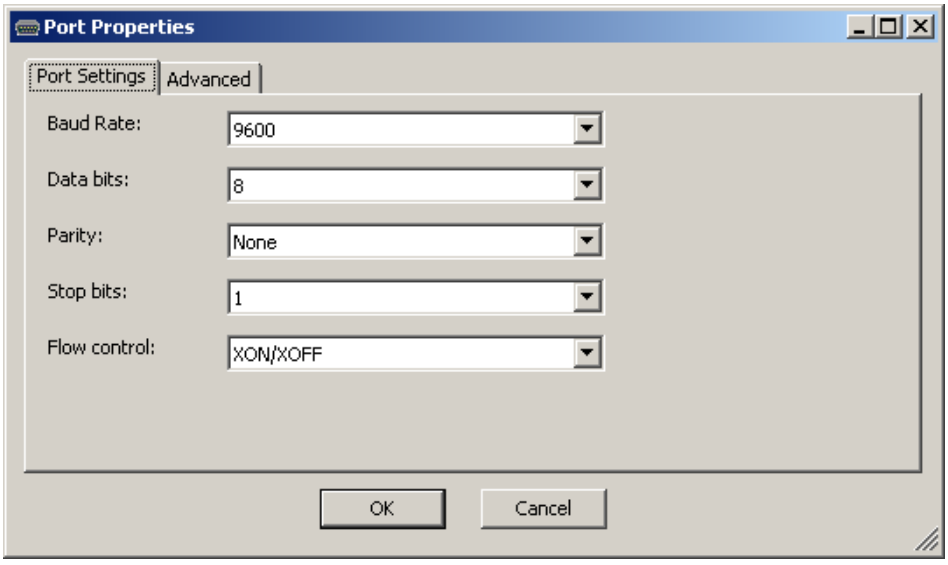
You will return to the original screen and when you select the device you wish to configure the Configure button will appear. Click Configure.



The configuration screen appears, at which time you should select a port and edit the settings. (some UDS10s come with a second comm. port).



Using the Edit Settings button will cause the following screen to appear.



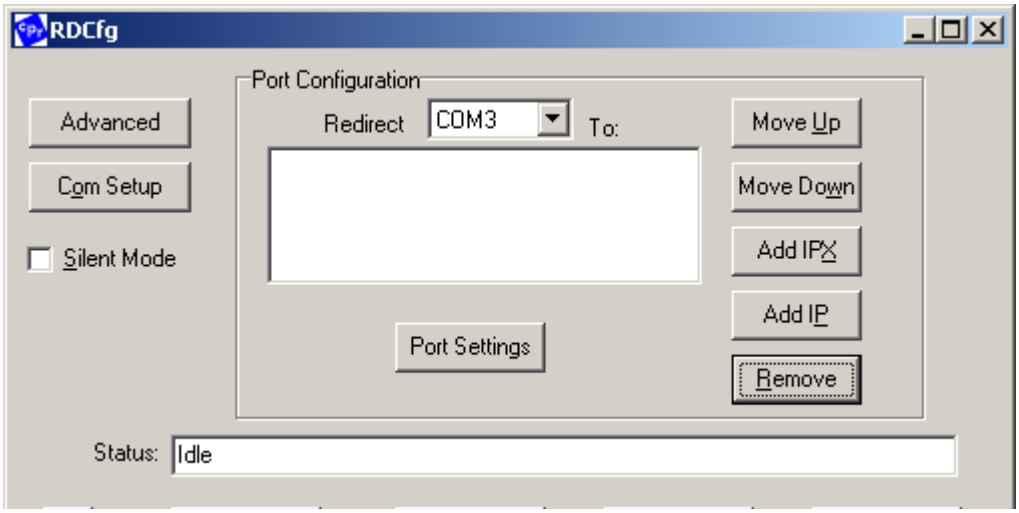
Make the appropriate changes as required noting that:

Fleet 300 PCUs use 1200 Baud 8,None, 1 Xon-Xoff
C600 PCUs use 1200 or 2400 Baud 8, None, 1, Xon/Xoff
C6000 PCUs are shipped using 9600 Bd, 8, None, 1, Xon-Xoff but can be configured on site using **ProFuel 2** to use almost any set of serial communication parameters.

Click OK and when the previous screen comes forward click Apply. Write down the IP address that was assigned and click Close.

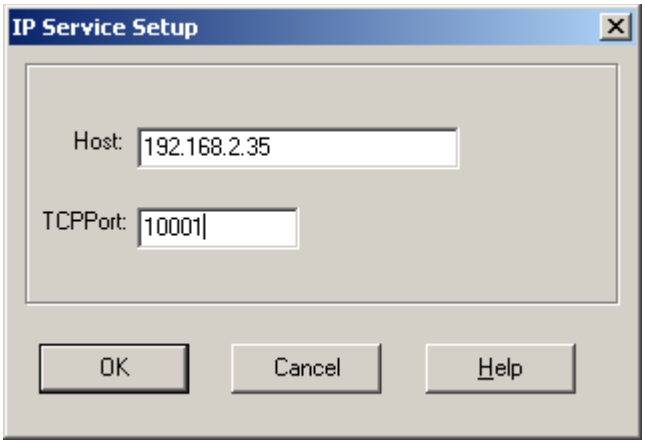
Use the Redirector program to continue

Open the **Redirector program** using the START button and Programs to find Lantronix .



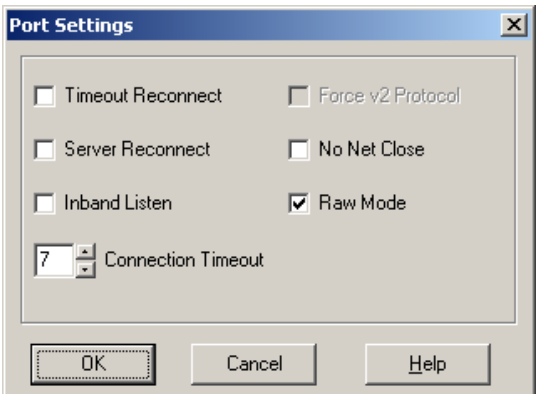
This program is used to send the serial communication port signals over the LAN to the UDS10 where the signals will be converted back to RS232 Serial communications signals. ProFuel 2 does not need the redirector program though is may be useful for initial tests.

Use the Add IP button and enter the IP address you assigned. Also enter the TCP/IP Port as 10001.



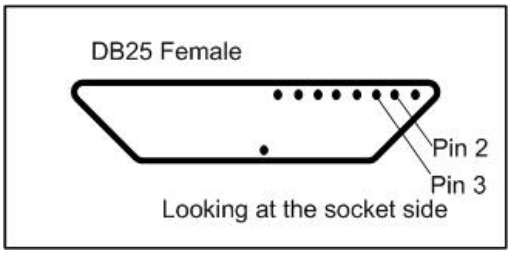
Click OK and continue.

Click on the Port Settings button and check the Raw Mode check box.



Click OK and return to the Redirector Main screen click save and exit.

Use HyperTerminal to test the communications by setting the HyperTerminal session to the Com port selected and the speed you set. You can perform a loop back test using a staple to short Pin 2 and 3 together in the UDS10 25 PIN comm. port.



With the jumper in place the characters you type will echo on the screen. When you remove the jumper the echo will cease.

This confirms that the UDS10 is ready for installation at the working location. Connect the device to the Computrol PCU Serial Port and to the LAN. Test it from a computer on the network.

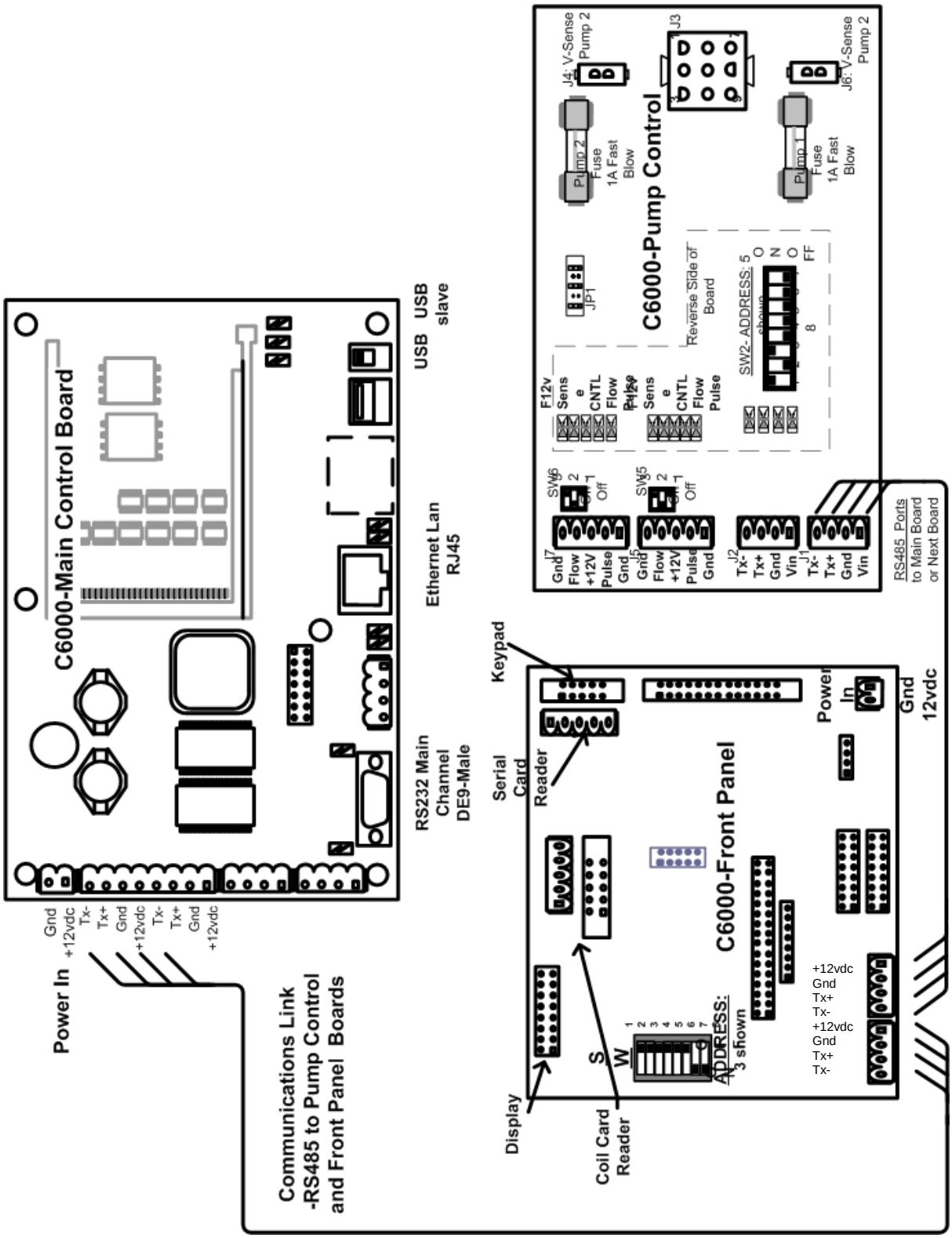
If the PCU does not respond it may be because the RX and TX lines on the PCU have been reversed for communications with a modem or other device previously. (or it may have been installed incorrectly)

Reversing the terminals in a Fleet 300 or C600 should be done before re-visiting other settings or doing other tests.

A C6000 will be wired correctly if a standard AT MODEM communications cable is used. This is a DB25-Male to DB9 Female cable.

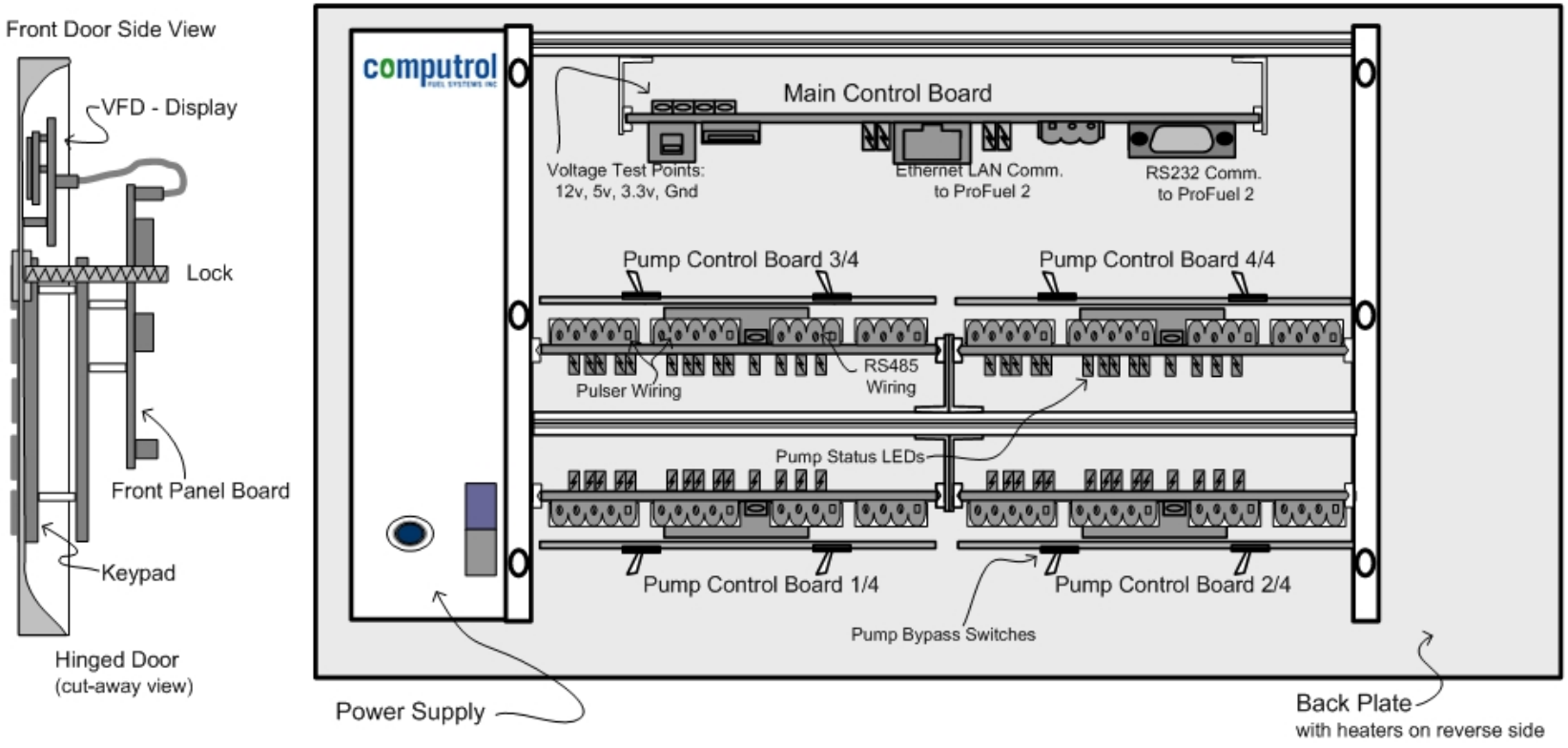
END Instructions

RS485 Communications Wiring Between Boards



C6000 Pump Control Unit

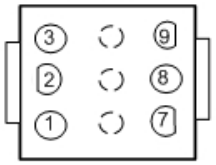
Standard and Retro-fit Chassis Mounting - Completed



C6000 Pump Control Unit
Typical Mechanical Pump Wiring

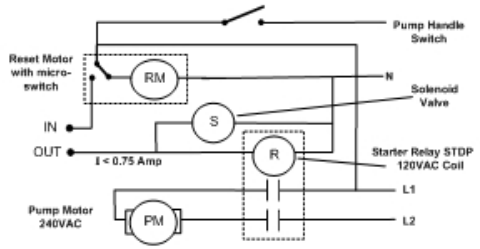
Pump Control Board (PCB) B

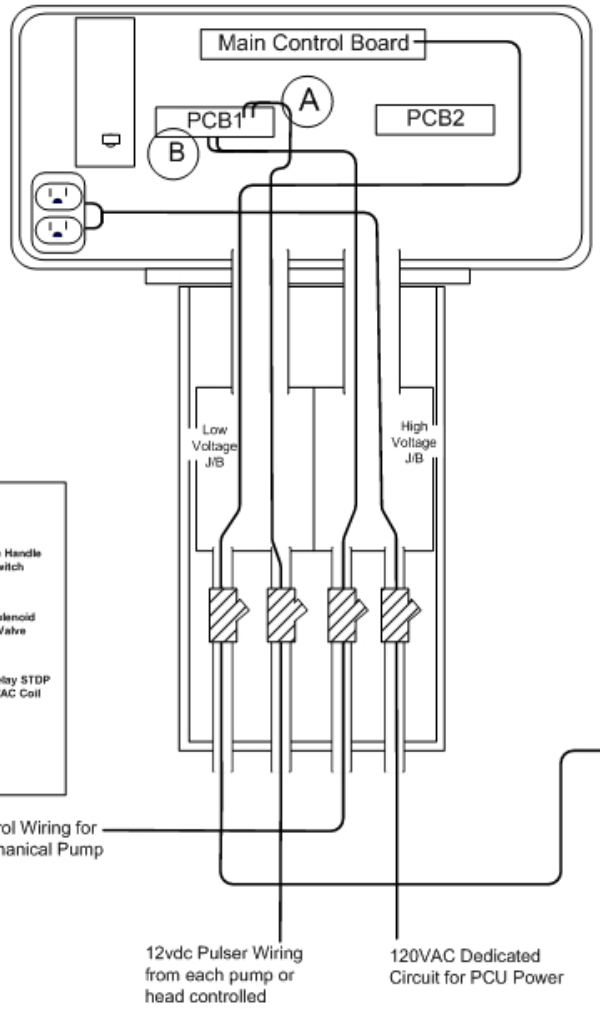
PCB Connector Plug - High Voltage
1-Yellow Pump 1 - Current Sense OUT
2-Blue Pump 1 - Relay Optional
3- Black Pump 1 - Line IN
7-Yellow Pump 1 - Current Sense OUT
8-Blue Pump 1 - Optional
9- Black Pump 1 - Line IN
- Repeat for pumps 3-4, 5-6 and 7-8 on individual Pump Control Board Plugs
- All circuits fused at 1Amp.



Pump Control Plug Top View

Typical Mechanical Pump Control Wiring.





Pump Control Wiring for typical Mechanical Pump Shown.

12vdc Pulser Wiring from each pump or head controlled

120VAC Dedicated Circuit for PCU Power

Pump Control Board (PCB) A

Pin Connections - Low Voltage
1-Ground Pump 1
2-Pulse Signal In Pump 1
3-+12vdc Pump 1
4-Flow Switch Pump 1 or Jumper
5-Flow Switch Common Pump 1
6-10 repeat for Pump 2
1-5 repeat for Pump 3 in PCB-2
6-10 repeat for Pump 4 on PCB-2

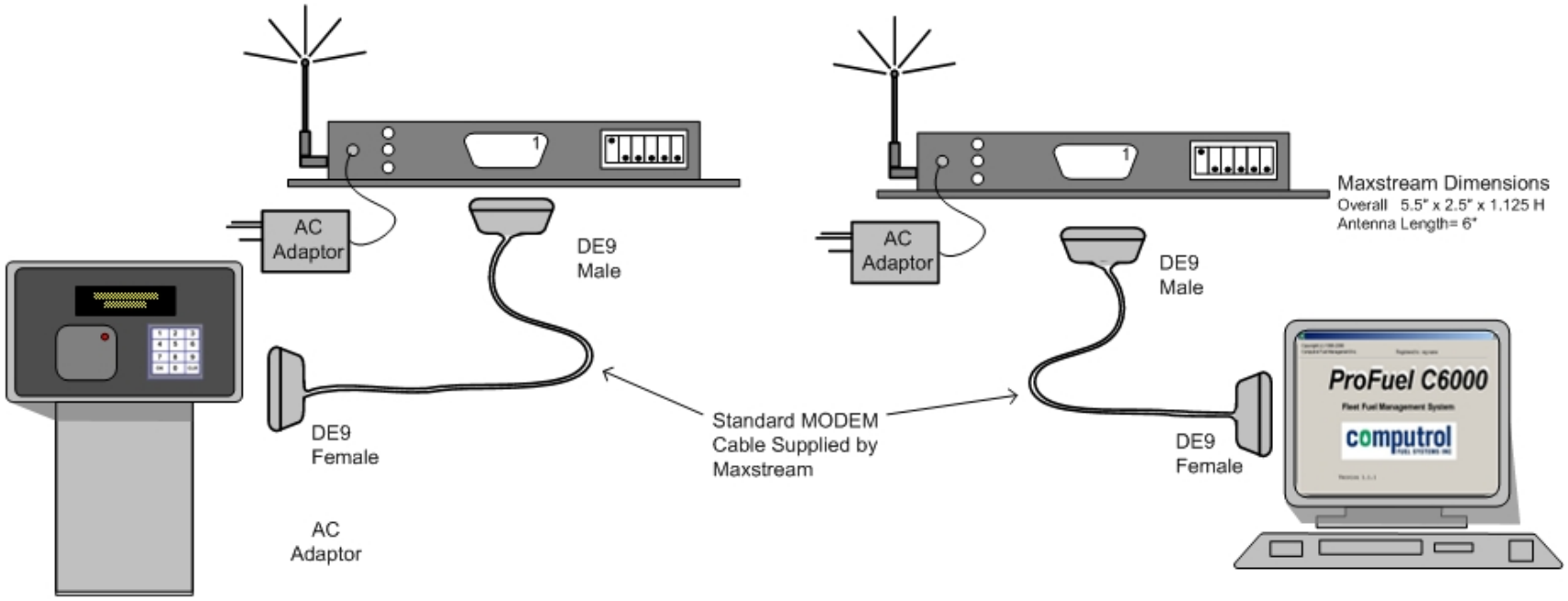
DIP Switch Settings

SW Pos 1 2 3	Pulsers	Wire Positions Used
0 1 0	VeederRoot 100:1	12vdc, Pulse and Ground
0 1 0	Krause, D&H,	12vdc and Pulse
1 1 0	Gasboy 9800 Series	Gnd and Pulse
1 0 1	VederRoot 10:1,	Gnd and Pulse
1 0 1	LCII., FillRite	Gnd and Pulse
1 0 0	Balcrank Oil Pulser	12vdc and Pulse
1 0 0	12v Pulser 10K Input	Gnd and Pulse

Main Controller Communications C
RJ45 - for TCPIP Ethernet (main)
TB-A - RS232 Comm to PC (main)
TB-B – RS232 Audit Trail (remote)
TB-C - RS485 comm to IPC

Computrol Communication Wiring

- Connections To Maxstream Wireless Modem



Notes:

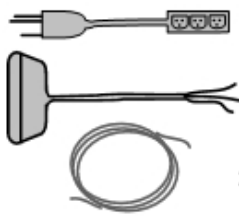
- Use X-CTU Configuration Program to set Modem Configuration
  READ - Parameters are displayed- Once Baud is changed in Modem (Write) it is necessary to change Baud used in PC Setting to match.

For ALL PCUs - C600, Fleet 300 and C6000
SET - DT-Destination Address to be identical in each pair
RR-Retries= 25
TT-Streaming Liimit=FF
FL-Flow Control = Software or XON/XOFF

For C6000 PCU	For Fleet 300 and C600 PCUs
SET - RN-Delay Slots=1	RN-Delay Slots=8
SET BD-Baud Rate= 9600 Bd	Choose Setting by PCU type
9600 is std. used for shipping.	For Fleet 300=1200 Bd
	For C600=2400 Bd

- Loop-Back Jumper (Red) can be used for testing.
- Typically Antenna installed to exit PCU housing through secured hole (by others).

Accessories from Computrol



Optional AC Extension Cord
3 Ports Length=1ft

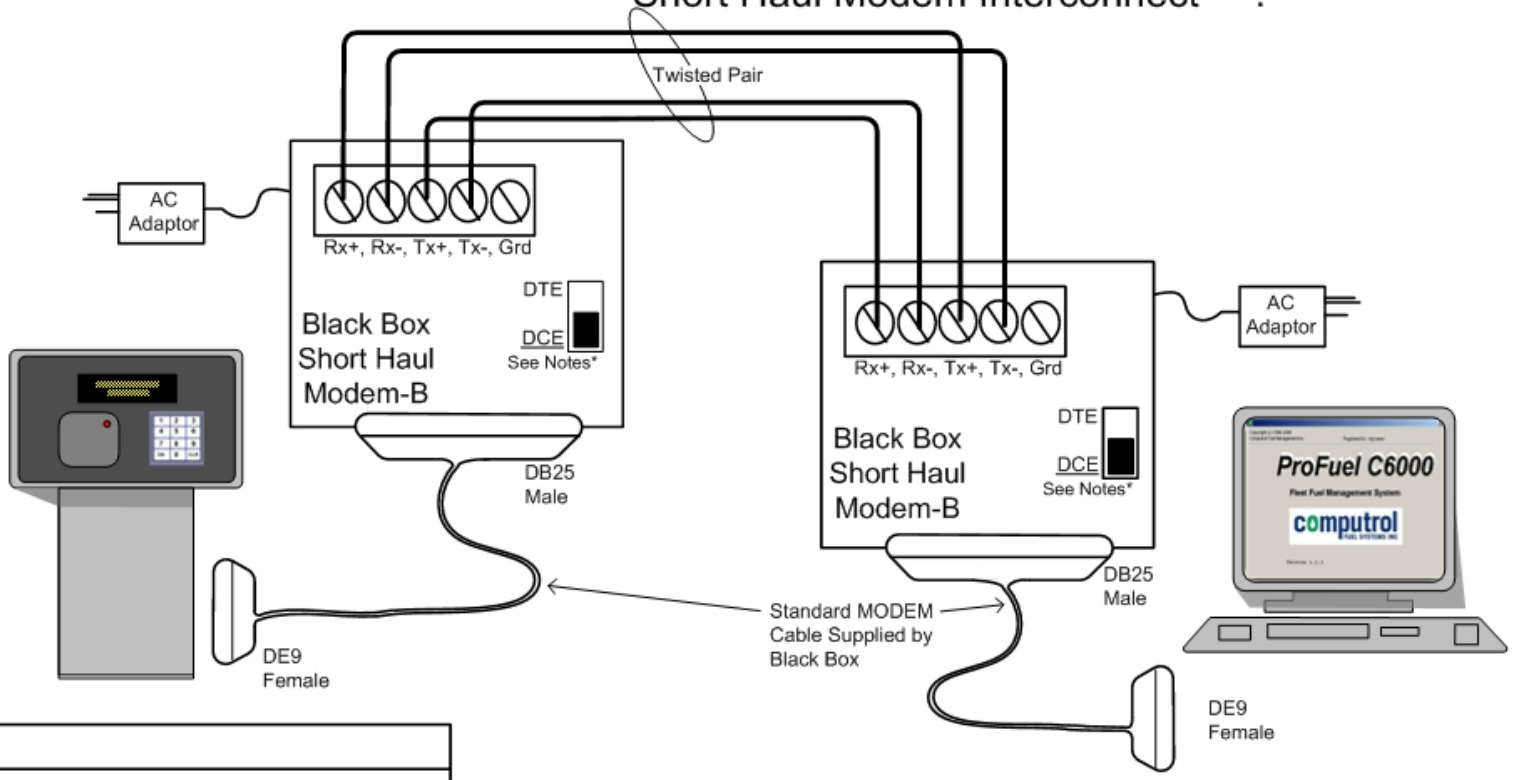
RS232 Pigtail for C600/Fleet 300
3-wire TX,Rx, Gnd

25 Ft Antenna Extension for best Line-of-Sight.

/drawings/C6K-COMM-MAXSTREAM.VSD June 28, 2006

C6000 Pump Control Unit - Communication Wiring Connections

Short Haul Modem Interconnect .



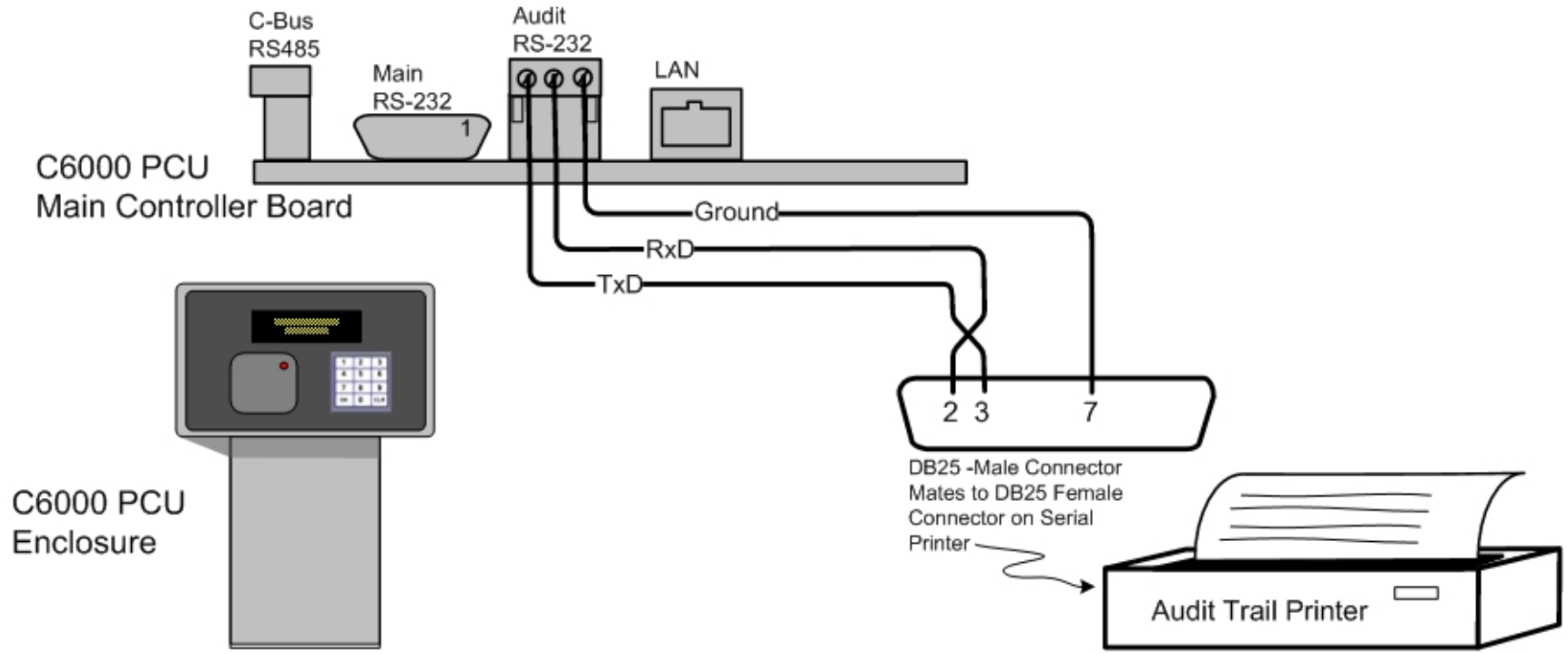
Notes:

- Wire as shown. If TD or RD LED is RED then reverse the polarity of TX+ and RX-
- *Set DTE/DCE Switch to DCE to connect to C6000 PCU.
  *Set to DTE for Modem or DCE for PC Comm. Port
- 120VAC Adapter provided by Black Box (not shown)
- Loop-Back Switch can be used for testing.
- PCU C6000 Communication Settings: 3 Wire: 9600 Baud;N;8;1
  Use Xon/Xoff Flow Control, RTS/DTR Control (JP1) = Disable
- Requires 120VAC receptacle for power adapter provided

/drawings/C6K-COMM-SHORTHAULMODEMB.VSD June 19, 2006

Computrol Communication Wiring

- Connections To Serial Audit Trail Printer



Typical Audit Trail Printer Dimensions
Overall 18.5" x 12" x 5" H
Installation requires 120VAC receptacle.

Notes:

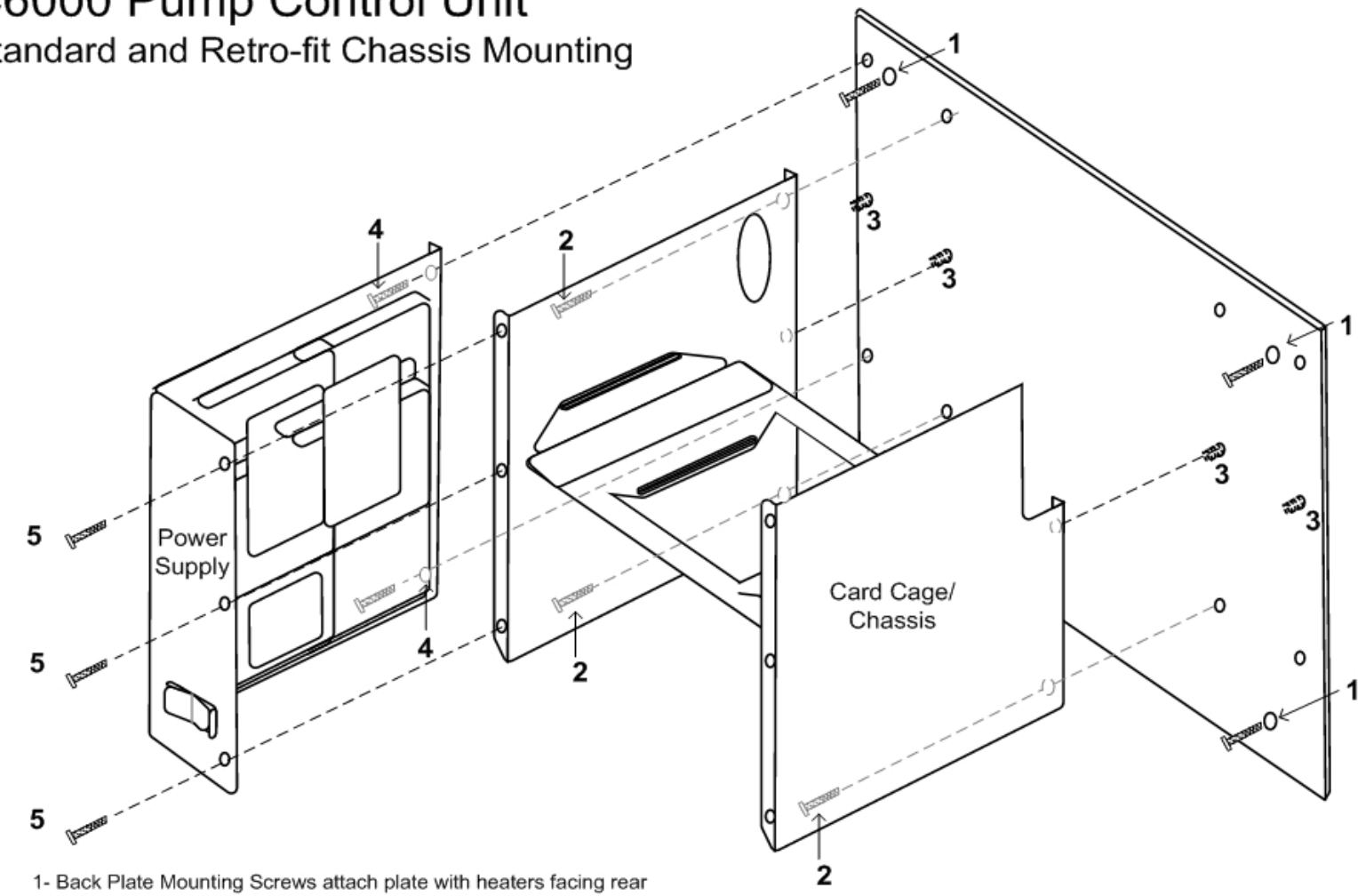
See ProFuel 2's PCU configuration screen System (1) to configure
- Audit trail Remote =Yes.
- Save
- Export
- Send <System.ini> to PCU

Configure Printer for appropriate Baud Rate using documentation provided with printer. Baud rate is typically factory set to 9600.
Printer should print all transactions stored. including invalid card,

/drawings/C6K-COMM-AUDITPRINTER.VSD October 07, 2006

C6000 Pump Control Unit

Standard and Retro-fit Chassis Mounting

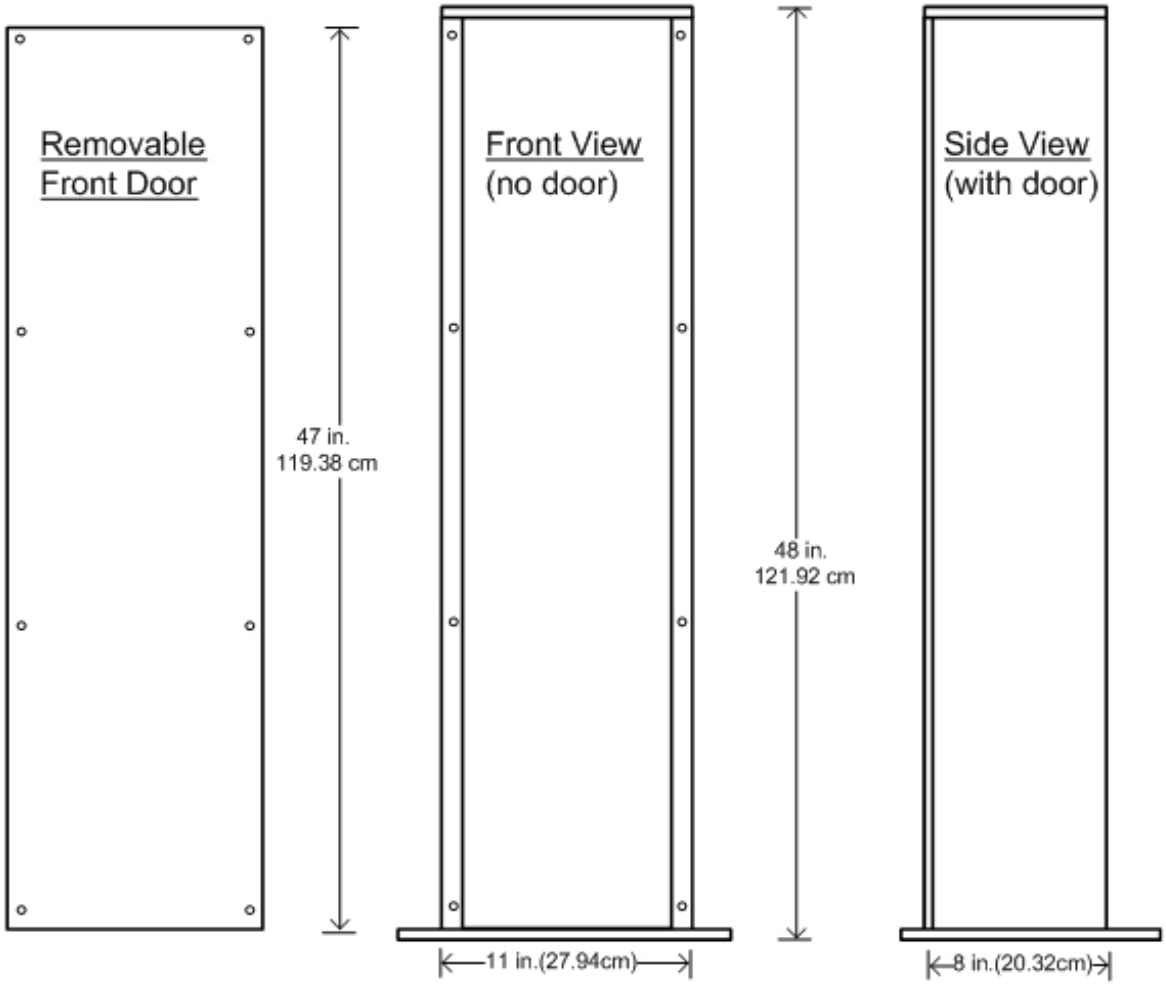


1- Back Plate Mounting Screws attach plate with heaters facing rear inside of Housing (3 of 4 shown)
2- Card Cage mounting screws attach to Back Plate
3- Mounting Stud used for Cage and Power Supply mounting alignment
4- Power Supply Module Mounting Screws attach module to back plate
5-Power Supply Module screws attach module to cage

computrol FUEL SYSTEMS INC

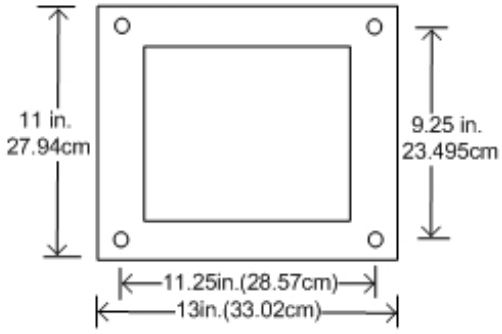
Computrol Welded Steel Mounting Pedestal

P/N 90-041



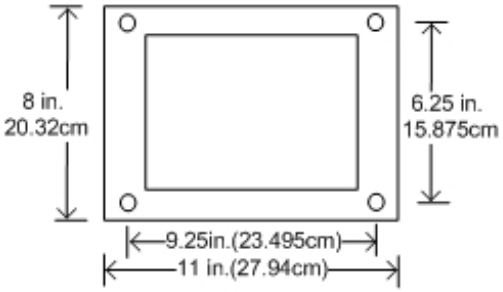
Bottom Mounting Plate

(4 holes 14.2875mm)



Top Mounting Plate

(4 holes 9.525mm tap UN coarse)



Filename PEDESTAL-48.VSD Dated: October 17, 2006

Notes:
- Bottom and Top Mounting Plates are 3/16 in. Steel - All other Steel is 16 gauge min. - Front Plate Mounting Screws are 10/32 - PCU to Top Plate Mounting Bolts are provided - also available in stainless steel

computrol FUEL SYSTEMS INC www.computrolfuel.com

Welded Steel Mounting Pedestal

Troubleshooting the C6000 PCUs

Introduction to Troubleshooting the C6000

The C6000 - Pump Control Unit (PCU) is proven technology designed and manufactured by Computrol Fuel Systems. Computrol has over 25 years experience and a reputation for building reliable computer control networks for water and fuel distribution.

These fluid control networks, even one with only a single PCU, are dependant on the functions of a number of devices working together. Some of the components and devices may include:

- **Pump Control Units,**
- **Telephone Modems,**
- **Network hubs or routers,**
- **Electrical transformers and relays,**
- **Pumps and Pulsers,**
- **Wire and terminations,**
- **Cards and Readers**

All of the fuel control network components provided by Computrol are proven to be reliable and carry the electrical approvals the industry requires. As with any computerized electronics, these devices can suffer damage from power surges, improper installation, age or mistreatment. More common such as those temporary failures, characteristic of a processor locking up, can be resolved by a reset or power restart.

C6000 Normal Operation

The Computrol C6000 PCU provides keys to its normal operation including it normal functions. The functions of a working PCU include:

- reading cards or accepting keypad input
- displaying LCD messages in sequence as programmed
- securing pumps until properly authorized
- counting volume delivered and terminating transactions
- communicating transaction data to printers and the ProFuel management computer.

Indications of Normal Operation

The Display Message – will be “Present Card” or some other text, as programmed. After approximately 1 minute of inactivity the display will start scrolling in screen saver mode. The message ‘Computrol’ indicates the PCU has not initialized the display.

The Status LEDs (inside) - With the door open, LEDs will be visible on the boards. Most LEDs will light to indicate the presence of specific power or signals while others indicate working communications between the boards.

Pump Control Board LEDs – each pump control circuit (2 per board) has a set of LEDs used to indicate the status of the transaction processes. During a transaction:

- **Control LED** (red)-will light to indicate the PCU has authorized the pump for use.
- **Sense LED** (green) – will light to indicate the PCU can see the pump is running
- **Pulse LED** (red) – will flash ON and OFF as the pulser signal goes high then low. If pulses are fast the LED may seem to be ON solid. The LED will be seen to flash when pulses slow down.

Communications with ProFuel – The ProFuel 2 Management computer should be able to communicate with the PCU on demand. When considering reports that a PCU's operation is not normal in any way, a test should be done to confirm that the unit is communicating normally with the ProFuel 2 computer. Virtually any computer with a Com Port for RS232 communications can be used.

Performing an automated Polling, sending card authorizations and connecting to the unit 'Manually' using either ProFuel2 or Hyper-terminal are all valid methods of testing the PCU communications.

Card Reading – when a card and reader is installed on the system, the PCU should respond to any card presentation by changing the message displayed to prompt the user to enter other data or to state that the card is invalid. If the card is found to be invalid on 3 sequential presentations, the PCU will create a transaction which can be listed on screen to determine that the card reader is working properly.

All messages on the display are configurable by the system manager using the ProFuel program's PCU configuration screens. The messages become part of the PCU configuration file (system.ini). The INI file modifies parameters within the standard PCU operation. This means that standard troubleshooting techniques can be applied.

Hardware Introduction

There are 3 primary boards in the C6000 PCU. Each has LEDs to indicate the presence of voltage and valid communication signals. The 3 boards include the

- **C6000 Main Control Board** which can manage any number of other boards to provide multi-hose control and multiple reader or keypad authorization terminals.
- **C6000 Pump Control Board** which controls 2 hoses per board
- **C6000 Front Panel (UI)** board which manages the Keypad, Display and readers to provide access to the pumps at the authorization access point.

The diagram below shows the layout of the primary boards and other components in the C6000 enclosure (not shown). The door holds cluster of components including the display, keypad and card reader. The door's pinch-and-remove hinges allow the door to be removed from the enclosure easily once the ground wiring has been detached. This means the complete door can be swapped out in a few seconds.

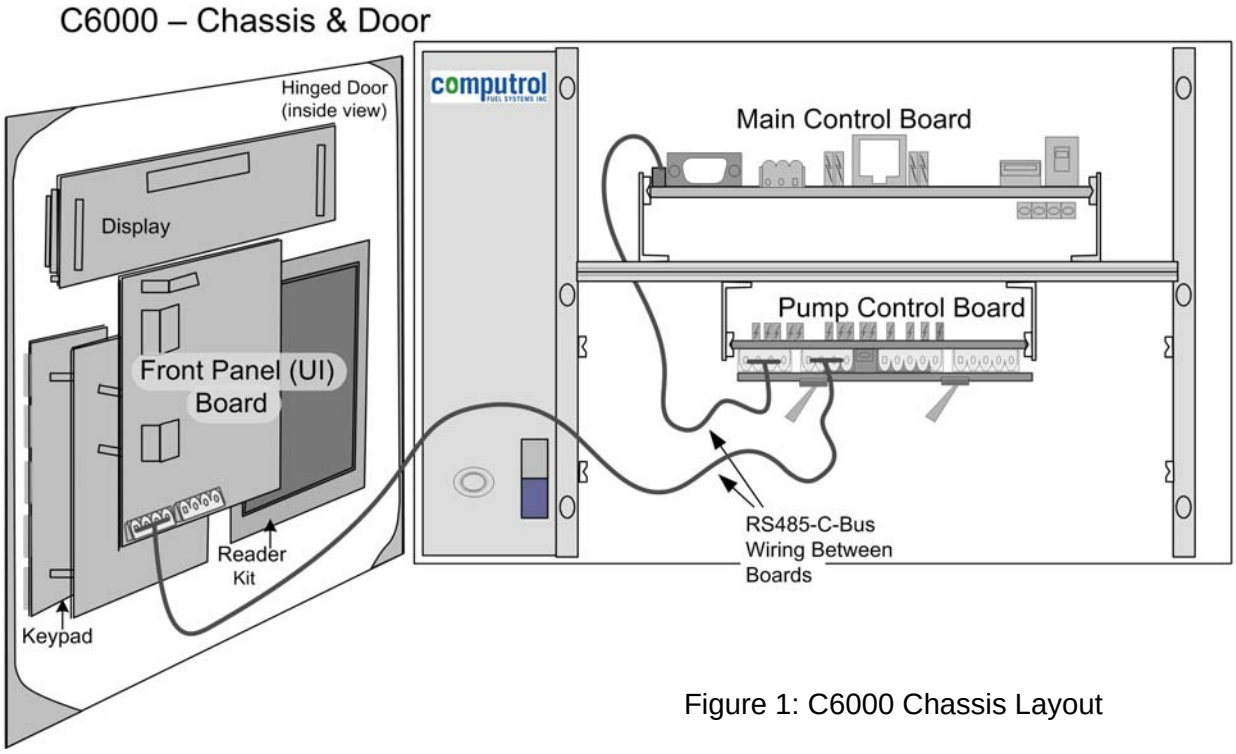


Figure 1: C6000 Chassis Layout

Some sites may demand that the C6000 components be distributed to provide card reader terminals on more than one fuel island or separate enclosures for the Pump Control board or the Main Control board.

A second fuel island will be controlled by the existing Main Control board. The second enclosure needs only the door mounted components with heaters etc. The 4-wire RS-485, C-Bus wiring connects the 2nd Front Panel UI board to the existing Main Control board which controls activity on both islands. To further reduce wiring costs, a Pump Control board can be located in each enclosure.

C6000 Main Control Board

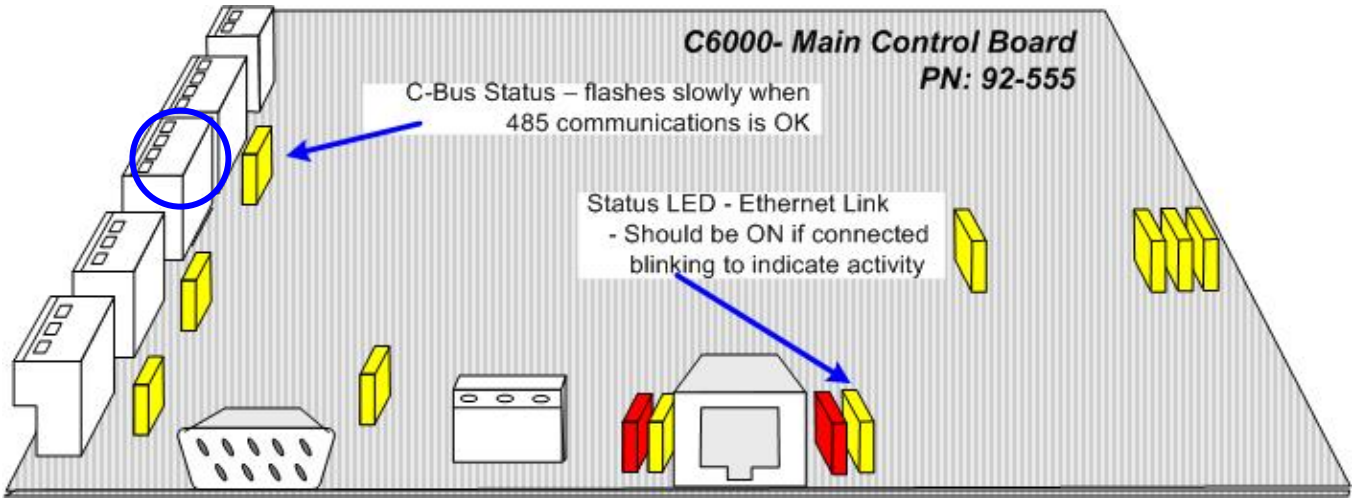


Figure 2: C6000 Main Board Status LEDs

Main Control Board Status LEDs

Main Control Board (C-Bus) Status LED flashes slowly to indicate that the board is communicating with the Pump Control Board or the Front Panel UI board.

The Main Control board operates on a the information in a configuration file called <system.ini>. Every new board creates an 'empty' system.ini file which specifies only that the unit will communicates at 9600 Baud on the Serial Port on-board.

The ProFuel 2 program is used to create the ini file for the PCU and once the file is loaded to the board the PCU will act as it was programmed. The file contains information on the number of pumps, the type of pump operation, the messages to be displayed and many other parameters including the Ethernet settings.

When a complete ini file loaded the Main Control board will begin communicating with the Pump Control board and the Front Panel board. The C-Bus Status LED will flash slowly as soon as the communications is established.

On Power-Up the Main Controller will run internal boot procedures to initialize communications ports and set up other functions. This initialization may take from 20 seconds in a PCU which is not configured to up to 2 minutes for Ethernet LAN initialization where no reachable LAN is found.

During the initialization the status LED will be OFF but will flash when communications has been established. If no other boards are found the LED stay unlit.

The LCD will state 'Computrol' as long the Front Panel board is powered up. At the end of this boot-up, the system.ini will be loaded and the pre-programmed display message will replace

'Computrol'. At the same time, the communications status LEDs will change state and should flash to indicate normal operation. If the board is not acting properly the following should be considered:

- confirm that wiring and terminations are correct
- confirm that communications with Host is functioning
- confirm that the serial port communications is functioning
- resend System.ini file from ProFuel 2
- replace board to confirm that all testing was done properly

If the board is replaced and the system continues to function in an unusual manner then external causes such as a programming issue or the affect of other hardware components must be considered.

C6000 Pump Control Board

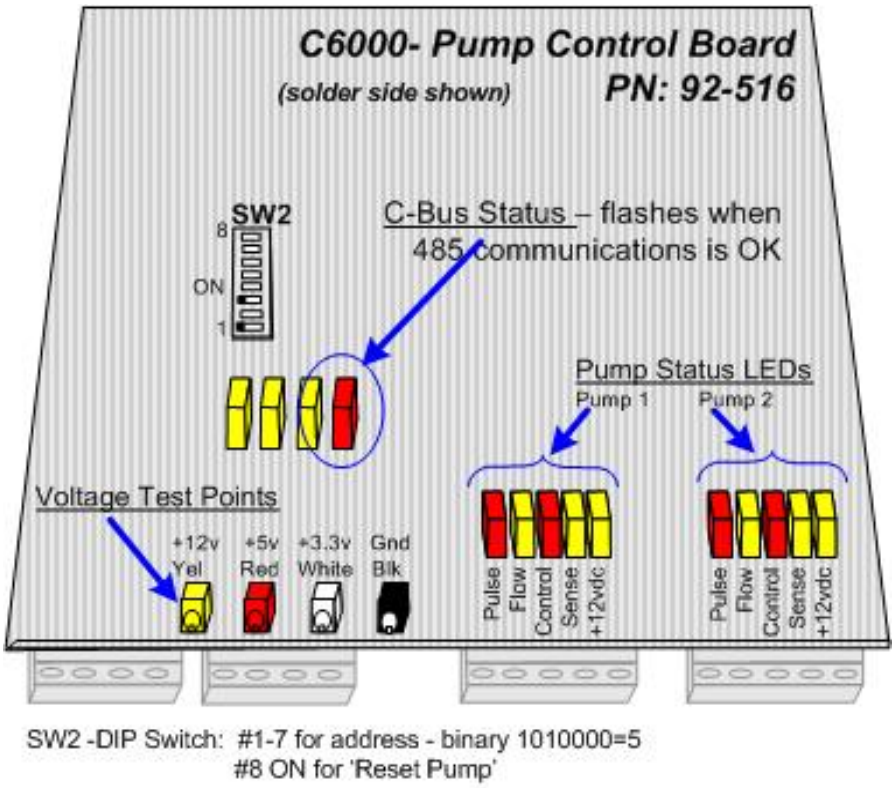


Figure 2: Pump Control Board LEDs

Pump Control Board Communications Status

Pump Control Board (C-Bus) Status LED - flashes to indicate that the board is communicating with the Main Control Board and that the Main Control board has a configuration which includes this board's address (SW2).

If this LED is not flashing the following should be confirmed:

- Wiring and terminations are done correctly
- The address SW2 is set correctly.
- The system.ini file contains information this board needs to operate

In a working PCU:

- Re-send the ProFuel 2 Configuration file to see if normal operation resumes.
- Replace the board to confirm that the board has been damaged.

Pump Control Board Pump Wiring Status

The following status indicator LEDS are active available to assist with the confirmation of normal operation of the pump wiring:

Control LED (red) - when the PCU is in operation the users will identify themselves as valid users and select a pump by number. The PCU will typically display the message 'Begin Fuelling' or ' Begin Loading' as the signal that the pump can be used.

The Control LED is lit from the time the pump is authorized ('Begin Fuelling') to the time the PCU removes the authorization for that pump. The pump can not be turned on when the LED is OFF. When a limit or alarm condition has terminated the transaction the Control LED will turn OFF before the Sense LED.

Sense LED (green) – following the authorization of the pump (Control LED ON) or when the Pump's Bypass switch is in the Manual position the pump can be turned ON and allowed to dispense its product. The pump control wiring is designed so that a sample of current is measured to ensure that any time the pump is running and when the Current Sense signal is measured the green Sense LED is ON.

A Normal transaction is any transaction in which the Sense LED goes OFF before the Control LED. The Authorization for the pump is removed by the C6000 logic immediately after the Sense LED goes OFF. The Debounce timer setting in the ProFuel 2 Pump Configuration screen can be used to create a short delay if transactions are found to be terminated early.

Pulse LED (red) – will flash ON as the pulser signal goes high. If pulses are fast the LED may seem to be ON solid. The LED will be ON/OFF as the pulse goes LOW/HIGH.

Flow LED (green) – Flow Switches are seldom used. These LEDs should remain OFF.

C6000 Front Panel Board

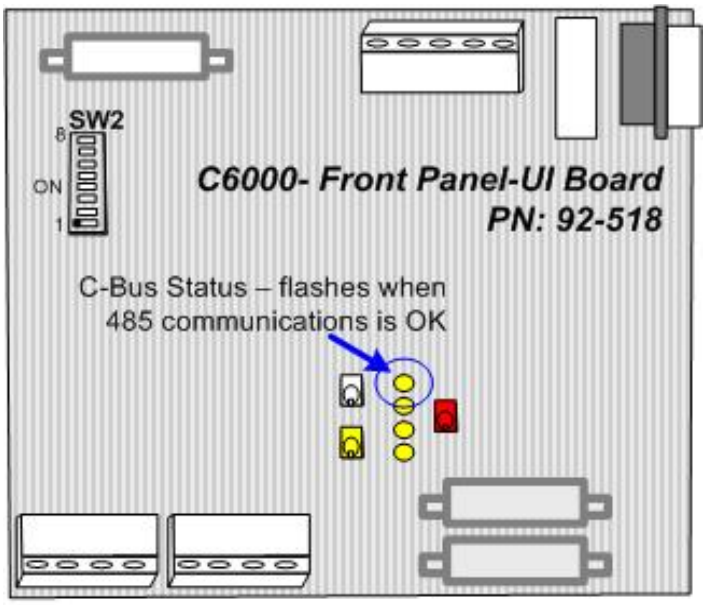


Figure 3: C6000 Front Panel UI Board

Front Panel C-Bus Status

Front Panel C-Bus Status LED - flashes to indicate that the board is communicating with the Main Control Board.

If a Main Control board has a system.ini that does not include information required to fully configure the other boards then the LEDs on those boards will not start to flash.

The Front Panel board is designed to display 'Computrol' any time it is powered up and not configured by the Main Control board to display a different message. During the PCU boot up 'Computrol' will be displayed. On completion of the power up the message will be changed to a user programmed message unless:

- there is no system.ini information to change the display or to configure the FP-UI board
- the board is not communicating with the Main Control board

If this LED is not flashing the following should be confirmed:
- Wiring and terminations are done correctly
- The address SW2 is set correctly.
- The system.ini file contains information this board needs to operate

In a working PCU:
- resend the system.ini file using the ProFuel 2 program to see if normal operation resumes.
- Replace the board to confirm that the board has been damaged.

Troubleshooting Tips

The following 5 sections describe troubleshooting techniques to help evaluate the situations and to restore proper operation of the fuel network. The areas discussed include:

Loss of Communications
Computrol on the Display
Disabled Pump or Invalid Transaction
Invalid Cards
Reset Pump

Loss of Communications

Whether by Ethernet or Serial, Wireless or Wired, communications is critical to the operation of the fuel network. Most connections are made using ProFuel's automated processes to Poll or Send Cards and if the connection can not be made the processes will not be completed successfully.

The problem may be the originating computer hardware or configuration, the Computrol C6000 or it could be any of the copper connections, and devices in between.

A problem can only be classified a communications problem when there are no other issues. When the PCU is allowing users or customers to get fuel and connecting to the PCU is the only problem then the following techniques can be used to evaluate or resolve the situation.

Troubleshooting Serial Communications

The serial communications implemented is full duplex which means that a loop-back test can be used to determine where a problem may be found. The full description of the communications specification is as follows:

3-Wire RS232
9600 Baud from factory - up to 115.2K Baud possible
8 bit word length
Parity None
1 stop bit
Xon/Xoff - Flow Control

The 3-wire communication link uses the Rx (receive), Tx (Transmit), and ground conductors. When Full Duplex communications is used the characters echo on the computer screen only after the signal is echoed back from the termination at the other end.

If the communications is garbled then it is possible that the ground is not connected properly or one of the parameters specified above is not set correctly.

Typically, incorrect baud rate settings will make the PCU appear unresponsive on the communications link. Testing can be performed using the ProFuel program's Manual Communications or using the Microsoft Windows program called Hyper-Tterminal.

With one of these programs open on the computer connected properly to the PCU any characters typed on the keyboard should be echoed back to the screen after which the PCU will respond.

If there is no response the following steps should be followed:

- attempt to communicate
- if there is no response a loop-back test should be performed.
- If the loop-back test is successful then the problem is on the board and the board should be replaced.

Consideration must be given to determining if this is a new installation or one that was functioning properly at one time. If the installation is new or some component has been changed then that is most likely the problem area and the manufacturer or supplier should be consulted.

If the installation is a new one then all wiring and communications devices need to be checked. Depending on the device it may be possible to use the loop-back test are various points between the PCU and the computer serial port.

Loop-Back Tests

These tests can be done at any serial port from the back of the computer to the end of the cable which connects to the Main Control board. Using either the ProFuel Manual Communications screens or using HyperTerminal.

- With an open circuit between RX and TX conductors, pins 2 and 3 in the communications wiring there will be no response to any keystrokes.
- With a short circuit (jumper) between RX and TX each keystroke will be echoed on the screen. No other characters should appear.
- If characters appear in response to the keystrokes but they are not what was typed, the problem may be incorrect speed (baud), bad ground, or some other problem.

If the test is unsuccessful (no echo of keystrokes) and there are additional communications devices in the line then the loop-back test should be done at locations closer to the PC. The short should be applied on Com Ports closer and closer to the PC until the location of the failure is found.

When the C6000-PCU is initializing there will be initialization messages sent from the PCU processor out on the Serial port. This communications will always be on 3 wire, t 9600 Baud, 8,N,1. If communications from the PCU is in question check to see if these message strings show on the 3 wire, direct wire connection to the PCU like a laptop. If the messages do not appear the board can not communicate with the Laptop.

Display Says 'Computrol'

The Vacu-Flourescent Display (VFD) of the C6000 PCU is controlled by the board mounted on the door. The board is the Front Panel User Interface board (FP-UI) and it controls the display, the keypad, the card reader and a receipt printer if one is installed.

The FP-UI board is programmed to display the word 'Computrol' by default. If power is applied to the board it will initialize and put the word 'Computrol' on the display. If this occurs in a unit which has been working normally one of several things may be the cause:

- Improper settings in the ProFuel 2 database can make the <system.ini> configuration file incomplete or incorrect.
- Improper start up of the PCU so that the processor did not complete the loading of the <system.ini> file.
- Improper wiring or a disconnected wire between the Main Control board and the Front Panel Board so that communications is interrupted or intermittent
- Damaged or failed Main Control board
- Damaged or failed Front Panel board

To resolving the issue confirm the following:

- Confirm that a power reset removes the problem
- Confirm that unit is communicating with the Host or to a Laptop connected directly to the serial port.
- Confirm that the system.ini file stored on the PCU Main Control Board is a valid copy of the file generated by the ProFuel 2 program.
- Use the Communications – File Transfer – feature in ProFuel 2 to send a copy refreshing the system.ini file
- Confirm if the communication LEDs on the FP-UI board are flashing to indicate a good connection between the board and the Main Control board. On start-up, the Main Control board must send the operational instructions to the FP-UI or it will only function in its default mode.
- If all voltages and wiring has been checked and the unit continues to display 'Computrol' then replacement boards should be used to confirm normal operation of the hardware.

Anytime the Front Panel loses the messages it is configured to display, it will revert to 'Computrol'. This could result from a processor spike and will at times be resolved by resetting the board but may need a board to be replaced.

The ProFuel 2 program will create a functional <system.ini> file with the defaults set on installation of the program or with program changes made by the user/system manager. Export the ini for create it and use the File transfers tab in the communication screen to send it to the PCU.

The C6000 PCU is delivered with a <system.ini> file which specifies only that the communications parameters will be 3 Wire serial communications set to 9600 Baud N,8,1 the standard chosen by Computrol.

Disabled Pump Message

The 'Disabled Pump' message may be displayed by the C6000 PCU under the following normal conditions:

- The pump has been Disabled by the System Manager using the disable pump command
- The PCU has automatically disabled the pump when 3 consecutive transactions on a single pump are terminated by 'No Start'
- The PCU has automatically disabled the pump when 3 consecutive transactions on a single pump are terminated by 'No Pulse'

When communications between the Main Control Board and the Pump Control Board is lost then the Main Board will report the Pumps as disabled since it can not control the pumps. The Disabled state is used to prevent any activity on the pump until communications can be restored.

If all programming, wiring and voltages have been checked then replacing the Pump Control board will provide confirmation if the problem is the hardware related.

Invalid Pump

When a User's ID is confirmed to be valid for a specific pump and the C6000 PCU displays Invalid Pump in response to the pump selection it may be due a communications problem which should be treated as the 'Disabled Pump' above.

Invalid Cards

When cards or other User IDs are reported a Invalid on the displayed message it is most commonly due to error in entering data in the ProFuel User screen and or transferring the data to the PCU.

If the same Card or keypad entered number is found to be invalid on three consecutive attempts then an Invalid transaction containing that ID will be created. The system manager can examine the transaction data to confirm if the number is configured properly or if it is being entered incorrectly.

While the problem can arise with keypad entered ID numbers, it is more common with cards and readers. Present the card and the PCU will display the error message such as 'Invalid Card'. Wait for the message to return to the standard prompt such as 'Present Card' and repeat 2 more times for a total of 3 times in the cycle.

The transaction can be viewed in manual communication mode to see how the card entered differs from what is in the authorization table.

Diagrams and Screen Shots

Foldout (11x17) diagrams are included with Factory Printed Manuals
Site Wiring Typical
Site Wiring for Gasboy 9800 Series
Site wiring for Fillrite