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6713 FLOW COMPUTER

Model 6400/6700 Orifice Flow Computer Start-Up Guide

TOTALFLOW

MEASUREMENT & CONTROL SYSTEMS

Introduction:

This startup guide is to assist in the startup of the 6400 or 6700 series flow computer. The 6400 uses the 2015333 electronics board and the 6700 the 2015382 electronics board, commonly called the CB181 board.

Recommended Start-Up Sequence

HINT: Step 1 thru 21 is a recommended start-up sequence and some of the steps do not go into any great detail. Some steps because detail is not needed and some because more information is available later in the Start-Up Guide. For example there are later topics for installing and wiring the RTD, installing the main battery, solar panel installation plus other information. So, scan through the guide to see what information is available before you begin the installation. Also keep in mind that units on a RS485 bus may not have a battery or solar panel since they can be powered from a remote power source such as another flow computer, which does contain a battery and solar panel.

Physical mounting and piping:

1. Unpack
2. Inspect for damage and missing or incorrect components.
3. Determine where to mount FCU.
4. Install bracing for unit; (pipe saddle, direct mount, pipe driven in ground). Attach U-bolts to 2" pipe using silicone spray or Teflon tape to prevent galling. (See Figures 1 & 2)
5. Mount manifold to bottom of unit; Right port of unit is NORMALLY high pressure (upstream side). Check the model number to see if it is designed for flow from left to right (4CYC) or right to left (4AYC). You can also look on the transducer for (H or +) for high side and (L or –) for low side. For direct mount manifolds, the direction is very important. (See Figure 3 for a typical manifold configuration)
6. Connect stainless steel tubing from manifold to orifice tap valves. With the manifold equalized to avoid damaging the AMU, pressure up through the manifold and check for leaks. For best measurement, use large bore, short, equal length gage lines with a downward slope to taps (at least 1" per 3 feet).

A5	**H**	*Hold.* Displayed when HOLD flag is active. When not active, H is shaded. Also displayed when HOLD flag is active for the following: 1. PCCU is being calibrated or 2. A to D Converter cannot be read.
A2, A4, A8 A2=Comm3 A4=Comm2 A8=Comm1	**¥**	*Totalflow Packet Protocol.* The Totalflow Packet Protocol selected on this port. 3 remote communications ports are available for 6700s, 2 for 6400s which can currently be programmed with any of 5 resident remote protocols; Totalflow, Totalflow Packet, Modbus ASCII, Modbus RTU, or Square D.
See above	**S**	*Square D Protocol*: Square D protocol is running on this port. Same options available as above.
See above	**r**	*Alarm Monitoring System.* Ring indicator for the alarm cryout option.
See above	**h**	*Alarm Monitoring System.* Hang up indicator for the alarm cryout option
See above	**i**	*Alarm Monitoring System.* Modem initialization indicator for the alarm cryout option.
See above	**R**	*LevelMaster*: LevelMaster tank gauging option installed. Tank level(s) and temperature are polled (user selectable intervals) by flow computer via RS485.
A6	**C**	*Host Console.* Host Console connected and communicating.
A6	**T**	*Terminal Mode.* Terminal is connected and communicating. See Technical Bulletin #44.
A8	**L_V**	*Low Voltage-Communications.* FCU battery voltage below 12 Vdc--too low to communicate. If FCU is below 11.5 Vdc, sleep mode will occur.
A8	**+9**	*Alarm Monitoring System:* Successful download of alarm page.
A8	**?**	*Alarm Monitoring System:* Received exception broadcast.
A8	**i**	*Alarm Monitoring System:* Initialize modem for cryout.
See above	**+**	Single host send acknowledge with code.
See above	****	Single host send neg-acknowledge with code.
See above	**O**	Attempt to resync on multi-host data requests.

A3	=	*Valve Control*: Valve Control option installed. Process Value (PV) is within the user set dead band. No control action required
A3	V	*Valve Control*: Displayed when Valve Control option is on an Expanded I/O board (plug-in RTU). Other Valve Control symbols do not apply.
A3	⌜	*Valve Control*: Valve Control option installed. Valve is in full open position.
A3	⌟	*Valve Control*: Valve Control option installed. Valve is in full closed position.
A3	↑	*Valve Control*: Valve Control option installed. Valve is opening (open signal is being sent to valve actuator).
A3	↓	*Valve Control*: Valve Control option installed. Valve is closing. (close signal is being sent to valve actuator).
A3	ö	*Valve Control*: Valve Control option installed. Valve controller override conditions met (DP/AP override set point or Low Battery).
A3	L_L	*Valve Control*: Valve Control option installed. Local Lock-out is initiated.
A3,A5	A_D	Displayed if A to D Converter Absolute Differential Pressure, Absolute Static Pressure or temperature readings exceed maximum counts or are less than minimum counts. If A to D Converter readings are within range, AD is shaded. A3 Location for 6400, A5 location for 6700.
A4,A7	L_C	*Low Charger.* Displayed if FCU battery charging voltage is (+)0.4 Vdc or is less than or equal to battery voltage. If (+)0.4 Vdc battery charging voltage is greater than battery voltage, LC is shaded.
A4,A6	L	*Local Protocol.* Displayed when PCCU part is active and running TOTALFLOW Local Protocol. When PCCU port is not active, L is shaded. This will occur if PCCU is not connected to PCCU port.

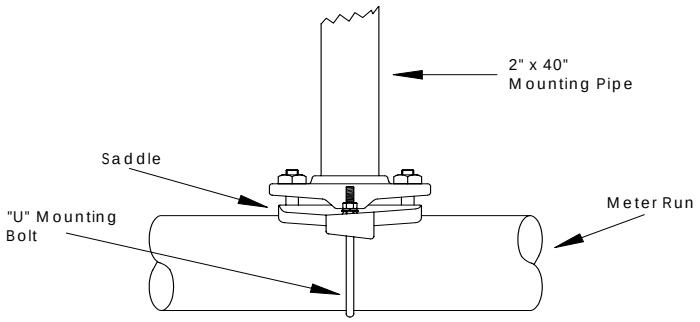


Figure 1 (Saddle Mount)

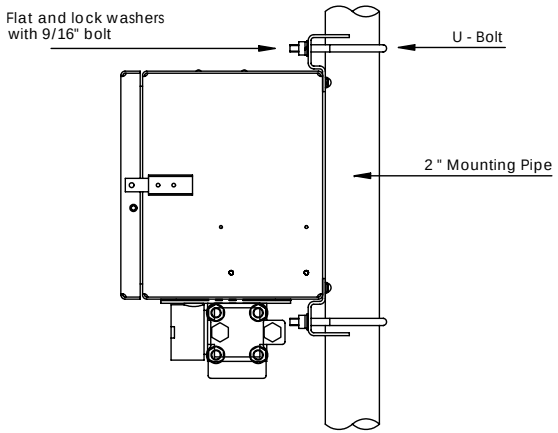


Figure 2 (Pipe Mount)

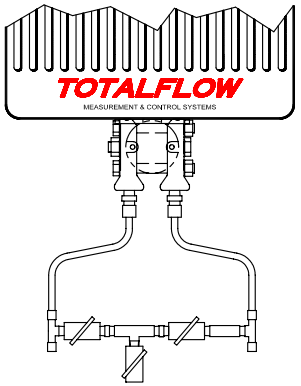


Figure 3 (Typical Manifold Mount)

Install RTD Probe

7. Install RTD and connect wiring to connector block (J-7 for 6400, J-10 for 6700) on main electronics board. (See Figures 5 & 6)

Install Battery(s)

8. Remove the insulating tab from the Lithium battery. Verify that the tab did not tear and is rectangular. If torn, you may have to remove the battery and tab piece; then re-install the battery. Model 6713s can have an Expanded I/O board which also has a Lithium battery.
9. Mount and connect a **fully charged** battery to J1 on the main electronics board.
10. Observe that the display goes through the startup routine then cycles through default display items. This typically insures that the components and wiring are good. Refer to "Standard Displays" on page 15 for sequence, description, measuring units, and format of default displays. Refer to "Visual Alarm & Status Codes" on page 16 for location, characters, and descriptions.

Install Solar Panel

11. Assemble, mount, and connect solar panel or AC charger. NEVER CONNECT CHARGER WITH THE MAIN BATTERY PACK DISCONNECTED. (See pages 7 & 8)

Setup:

12. Connect FS/2 or laptop running PCCU32.
13. Set date/time, ID, location and AGA setup using Entry Mode in PCCU32 or an FS/2.
14. In *Calibration Mode*, select *RTD Installed*, un-check *Use Fixed TF*, and adjust *RTD Bias* if a temperature standard is used.
15. Perform "as found" calibration checks.

A2, A4, A8 A2=Comm3 A4=Comm2 A8=Comm1	ǂ	*TOTALFLOW Listen Cycle*: ǂ flashes if this remote port is active and running Totalflow Remote Protocol. Flashes in sync with listening cycle that occurs at 1, 2 or 4 second intervals. 3 remote communications ports are available (2 for 6400) and can be each programmed as described. When FCU remote port is not active, ǂ is shaded. In early versions of 6700s with EXIO, the A8 display will toggle between ǂ and V. Not toggling could indicate a bad board or PROMs mismatched.
See above	→	*Transmitting Data*: If remote port is active and Totalflow Remote Protocol is running, → is displayed.
See above	←	*Receiving Data*: If remote port is active and Totalflow Remote Protocol is running, ← is displayed.
See above	**X**	*Remote Port Not Active*: This is the default state at cold start of the FCU for all remote communications ports. Baud rate must be toggled to activate each remote port. Also displayed when a communications card is missing or bad.
See above	**M**	*MODBUS ASCII*: Modbus ASCII protocol selected on this port. 3 remote communications ports are available for 6700s, 2 for 6400s which can be programmed with any of 5 resident remote protocols; Totalflow, Totalflow Packet, Modbus ASCII, Modbus RTU, or Square D.
See above	**m**	*MODBUS RTU*: Modbus RTU protocol selected on this port. Same options available as above.
See above	**1**	Read X-Frame.
See above	**2**	Process X-Request.
See above	**3**	Wait for Ack/Nak.
See above	**4**	Re-Send Packet.
See above	**5**	Direct Download.
See above	**6**	Positive Acknowledge.
See above	**7**	Nak w/packet list.
See above	**8**	Negative Acknowledge (Typically wrong Security Code).
See above	**9**	Single host write request; send data after ready.

Visual Alarm & Status Codes

Description

After the FCU completes recording Log Period flow and operational records, the LCD will show any alarm conditions that have occurred. Also, the date, hour and type of alarm conditions are stored in the FCU memory. Status codes are also displayed when the conditions exist. An alarm or status code can be a word, character, letter or symbol. The alarm and status codes shown in Table 1 will appear on the right side of the FCU screen; see illustration below. Descriptions of each code are described in Table 1.

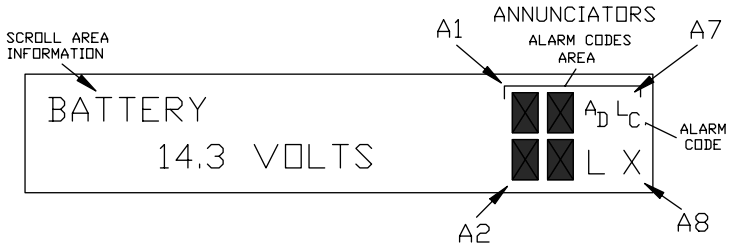


Table 1 Alarm & Status - Codes and Description

Annunciator Location	Alarm/ Status Codes	Description
A1	$^{L}_{L}$	*Low Lithium Battery Alarm*: When $^{L}_{L}$ (low lithium) is displayed, lithium battery voltage is below 2.5 Vdc. If battery voltage is above 2.5VDC, $^{L}_{L}$ appears shaded. A new lithium battery measures approximately 3.6 Vdc.
A1	↑/↓	*DP High & Low Operational Limit Violation*: If differential pressure is above high limit, ↑ is displayed. If below low limit, ↓ is displayed. If pressure is within limits, ↑/↓ keys are shaded. Visible only when DP is on display.
A1	↑/↓	*AP Hi & Lo Operational Limit Violation*: If absolute static pressure is above high limit, ↑ is displayed. If pressure is below low limit, ↓ is displayed. If pressure is within limits, ↑/↓ keys are shaded. Visible only when AP is on display.

16. If calibration is needed, calibrate static pressure first, then differential pressure using a deadweight tester or acceptable standard. Insure that both orifice taps are closed during static pressure calibration to avoid a "false DP". Make sure there are no leaks in the manifold or test equipment.
17. Perform "as left" calibration checks as needed.
18. Place FCU on line: To avoid inducing toggle and/or a calibration shift, open both bypass valves, close vent valve, then open orifice tap valves SLOWLY (high pressure side first). Once both orifice tap valves are fully opened the bypass valves can be closed.
19. Verify the FCU display is calculating volume correctly. Watch the display or poll for current status.
20. Collect data and review the event and characteristic files to insure all parameters are set properly.
21. **Optional:** When you are reasonably sure that all setup and calibration is complete and the unit is on line calculating volume, it is recommended that a *Reset Volume* command be sent using PCCU. This allows the unit to have what might be considered as an official starting point for good live data. The *Reset Volume* will be recorded in the *Events* file to mark the date and time.

Installing and Wiring RTD and Probe

The RTD measures flowing gas temperature. Procedures presented in this section enable the user to install the RTD into the meter run and wire leads to digital board.

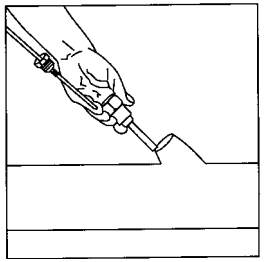
***Totalflow* Materials Supplied**

- ♦ RTD Probe with 10' of cable. Optional lengths 15', 25', 30', 40', and 50'.
- ♦ One (1) thermowell with ¾" NPT threads. Optional threads are ½" and 1".
- ♦ Nylon tie wraps

***Customer* Materials Supplied**

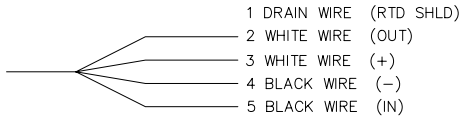
- ❑ Customer must specify or provide Thermowell "U" length.
- ❑ Teflon tape

1. Install thermowell into meter run.
2. Using snap ring pliers, adjust probe length so that it is spring loaded against bottom of thermowell.



3. Remove one of the hole plugs and install cord connector. Remove nut, sealing ring and rubber grommet from cord connector. Slide nut, sealing ring and grommet over RTD cable and insert cable through body of cord connector. Allow enough RTD cable to extend into FCU for connecting wires to RTD termination block J7 on 6400s and J10 on 6700s.
4. Secure RTD Probe cable using supplied sealing ring and nut.

   Note: Power and charging voltage should be removed from FCU before performing any field wiring.
5. Connect RTD probe to FCU RTD connector as follows. Before making connections to terminal block, remove spade lugs if attached and trim wire ends back 1/4" and remove associated terminal block from Digital Board. (See Figures 5 & 6)
6. Loosen terminal block securing screws, insert wire then retighten. Reinstall terminal block with wires attached. Connect wires to connector block (J7-6400, J10-6700) as follows:



Standard Displays

Description	Standard Display
Current Date and Time 24 hour clock	DATE/TIME MM/DD/YY HH:MM:SS
Yesterday's Percent DP Low Limit Percent time below DP Low Set Point	YEST DP LO NN PERCENT
Yesterday's Percent DP High Limit Percent time above DP High Set Point	YEST DP HI NN PERCENT
Current Flow Rate Programmable SCF, MCF or MMCF	FLOWRATE NNNNNN.N SCF/HR
Total Accumulated Volume Programmable SCF, MCF or MMCF	ACCUM VOL NNNNNN.NN MCF
Battery Voltage Volts	BATTERY NN.N VOLTS
Differential Pressure Inches H2O	DIFF PRESS NNN.N IN. H2O
Static Pressure Absolute PSIA	PRESSURE NNN.N PSIA
Flowing Temperature °F	FLOW TEMP NN.N DEG. F
Yesterday's Volume Programmable SCF, MCF or MMCF	YEST VOL NNNN.N MCF
Previous Period Volume Last volume calculation period volume	PERIOD VOL NNNN.N SCF
Charger Voltage	CHARGER NN.N VOLTS
Minute Average Flow Rate	M_FLOWRATE NNNNNN.N SCF/HR

The duration that each parameter is displayed can vary from 5 to 255 seconds (default is 5 seconds); a setting of 0 seconds will turn that display item off.

- If radio is used, verify directional antenna with correct frequency range is pointed toward base (± 6°). The antenna should be mounted vertically, with the vanes perpendicular to the ground. Verify radio is good, with the same frequencies used.
- If a modem is used, verify dial tone on line at the telephone company's termination box by checking Tip and Ring. Check wiring from pole to UCI or RMA. If cellular line used, also check for proper voltage available. Insure phone number is correct in the FCU and CCU.

NOTE: The telephone company uses a 48 volt power supply so the typical on-hook voltage between the *Tip* and *Ring* wires should be something less than 48 volts. Measuring another way, *Tip* to ground is approx. zero volts and *Ring* to ground is approx. –48 volts.

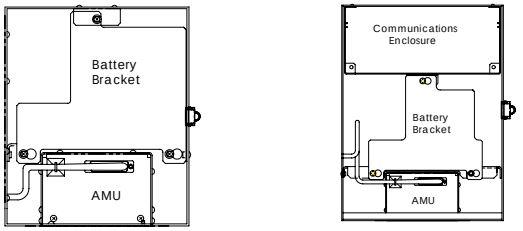
In the off-hook condition; Tip to ground will be approx. –20 volts while Ring to ground will be approx. –28 volts or approx. 8 volts between Tip and Ring.

Wiring

Specific wiring drawings are sent with each unit, based on the options ordered. Most wiring diagrams, including communications are available on the web at http://www.abb.com/totalflow. Select "Continuing Customer Service and Support", and then select "Wiring Instructions". Communications pin-outs of the 6700s and 6400s are shown on Figures 5 & 6 of this guide.

Battery Installation

1. To extend the life of the battery pack, fully charge the battery prior to installation. A system using solar panels may not fully charge the battery. Also a fast charge, which the solar panel can't provide, improves the life of the battery. (See tip below)
2. Remove battery cover plate and insert battery pack into battery compartment with its long dimension facing outward. When cover plate is reinstalled, it will fit snugly against some battery packs. The screws can be loosened to accommodate a larger battery.



3. Connect battery pack connector to electronics board connector J1, located in upper right corner of Board.
4. Observe LCD; the display should be on and scrolling through the startup diagnostics sequence and then default display items.

Caution: Do not connect solar panel power cable to the unit unless main battery pack has been connected to J1.

TIP: To recharge a battery, a quick charge will remove the buildup in the battery much more effectively than a "trickle charge". A battery slowly drained by low light conditions on a solar charged system or setting in storage for instance, will be less likely to recover than a battery pack that was quickly discharged from a short for instance. Store batteries in a cool environment for less drainage.

Lithium Battery

1. Remove the insulating tab from the Lithium battery. Verify that the tab did not tear and is rectangular. If torn, you may have to remove the battery and tab; then re-install the battery. Model 6713s can have an Expanded I/O board which also has a Lithium battery. The Expanded I/O board will have to be removed to get to the battery on the main board. The shield cover will have to be removed from the Expanded I/O to remove it's battery tab.
2. Verify that the $^{L}_{L}$ (low lithium alarm) is not being displayed on the A1 annunciator. This alarm indicates the Lithium battery is below 2.5 volts and should be replaced.

Solar Panel Installation

Totalflow Materials Supplied	• One Solar Panel and Cable • Two U-Bolts and fastening hardware • One Solar Panel Bracket
Customer Materials Supplied	• Cable Ties • One 9-inch or greater extension of 2-inch pipe • One 2-inch union or other suitable length pipe

Procedure:

Note: Step 1 and 2 are not required if pipe is tall enough without the extension.

1. Attach 2-inch pipe union to top end of FCU mounting pipe. Securely tighten.
2. Install a 2-inch pipe extension into union and securely tighten.
3. Install Solar Panel on mounting bracket with provided hardware.
4. Attach Solar Panel mounting plate to top end of 2-inch pipe with U-bolts and associated mounting hardware. Do not tighten U-bolts until Solar Panel has been correctly oriented.
5. If needed, connect Solar Panel power cable to Solar Panel connector on back of unit. **DO NOT** connect other end of cable to FCU unit until all steps are complete **AND** main battery pack has been connected to FCU on J1.
6. Position Solar Panel to face south in northern hemispheres and north for southern hemispheres. Tighten U-bolts securely to avoid movement by wind or vibration.
7. Check solar panel polarity using digital voltmeter to insure (+) and (-) wires are properly identified.
8. The Solar Panel power cable connects to the 6700 terminal block J7 or 6400 terminal block J5 Charger Input terminals. Refer to Figure 5 or 6 for terminal locations. Remove one of the hole plugs and install cord connector. Remove nut, sealing ring and rubber grommet from cord connector. Slide nut, sealing ring and grommet over cable and insert cable through body of cord connector. Allow enough cable to extend into the unit for connection to Charger Input +/- terminals.
9. Secure RTD Probe cable using supplied sealing ring and nut.

TIP: To prevent moisture from entering the FCU, allow cable to "dip" below, then rise to access hole. This will provide a path for rainwater away from the access hole.

Communications Troubleshooting

A new radio or modem system that doesn't communicate is difficult to troubleshoot because proper operation has never been proven, and all the initial hardware and software settings are suspect. More than one problem can be present, causing component replacement to be an inadequate trouble shooting technique. Use the following check list as an aid.

- Does the "╪" flash (*Totalflow Remote* Protocol only) with the Listen Cycle time in the A8 display (default position)? If no,
  1. The *Protocol*, *Baud Rate* or *Listen Cycle* needs to be selected using PCCU32 *Entry Mode*.
  2. The communication's module in Comm 1 or Comm 2 is missing or bad or the module is the wrong type (RS232 or RS485).
  3. Inadequate 12 VDC battery voltage.
- Insure base radio is working for other locations.
- Verify Meter ID matches with WinCCU and is the only Totalflow device with that ID.
- Verify Baud rate, Stop Bits, Security Code, and Link Establishment time are same as CCU.
- Verify wiring to antenna, to UCI, UCI to Radio for RS485 installation or to Radio/Modem for RS232 installation.
- If UCI (Universal Communication Interface) is used; verify jumper settings.

TIP: To check for wiring shorts or opens with two or more wire connections, use a multimeter set on continuity (resistance). Check two wires at a time from one unit to another. If black and white wires are to be tested, disconnect both wires at both ends, set one probe on black, the other on white. The meter should read OL or OFL (over range) if no shorts. Jumper the two wires at the other end. The meter should read a low resistance if no opens. This method requires only one end of wiring to be tested, no matter how far the units are apart.

Remote Communications

The following discussion deals primarily with the unit communicating with the Host (typically WinCCU).

To communicate with the Host, the unit has remote communication's ports that can function as RS232 or RS485. Depending on the customer's order, most units are shipped with the appropriate wiring in place for the specified communication's equipment.

After installation of the unit and with the communications path complete, the user needs to enter the appropriate communication's parameters. The FCU does **not** have remote communication active from start-up. To activate it, the Baud Rate or listen cycle must be changed. The FCU defaults at 1200 Baud, 4 second listen cycle. Even if this is the desired setting, the user must toggle through one of these settings. An X in annunciator position A8 (lower right hand corner) means the remote port is not active, while a blinking telephone pole symbol "☤" indicates the port is active. See "Visual Alarm & Status Codes" on page 16 for a full description of alarm characters, locations, and descriptions.

The data bits, stop bits and all required communications parameters can be modified with PCCU32. Communication's settings are displayed on the *Configuration* and *Advanced* tabs of the specific Comm Port in PCCU32 as shown below. Tabs will vary on earlier versions of PCCU32. Many standard radio and modem installations will perform with the default communication's settings.

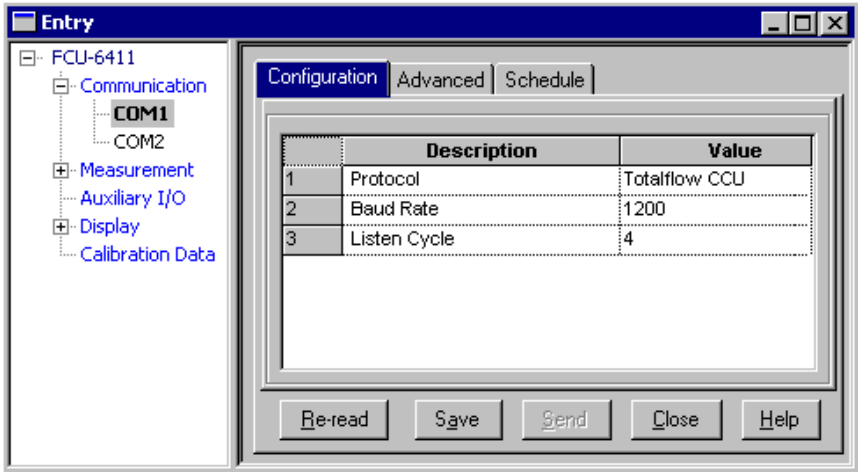


Figure 7 (PCCU32 Entry Mode)

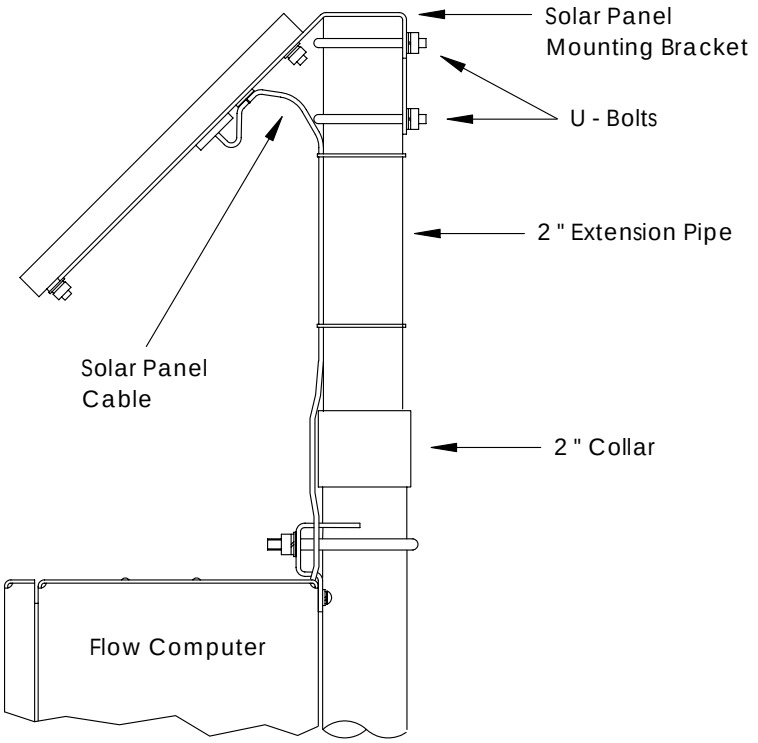
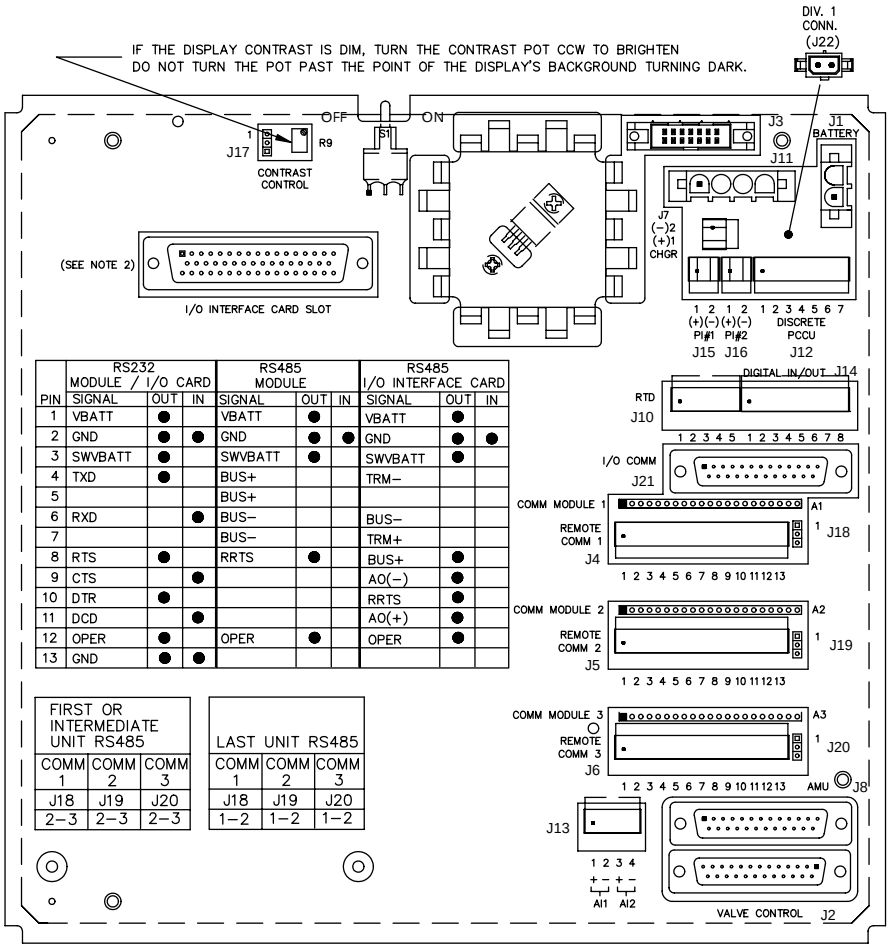


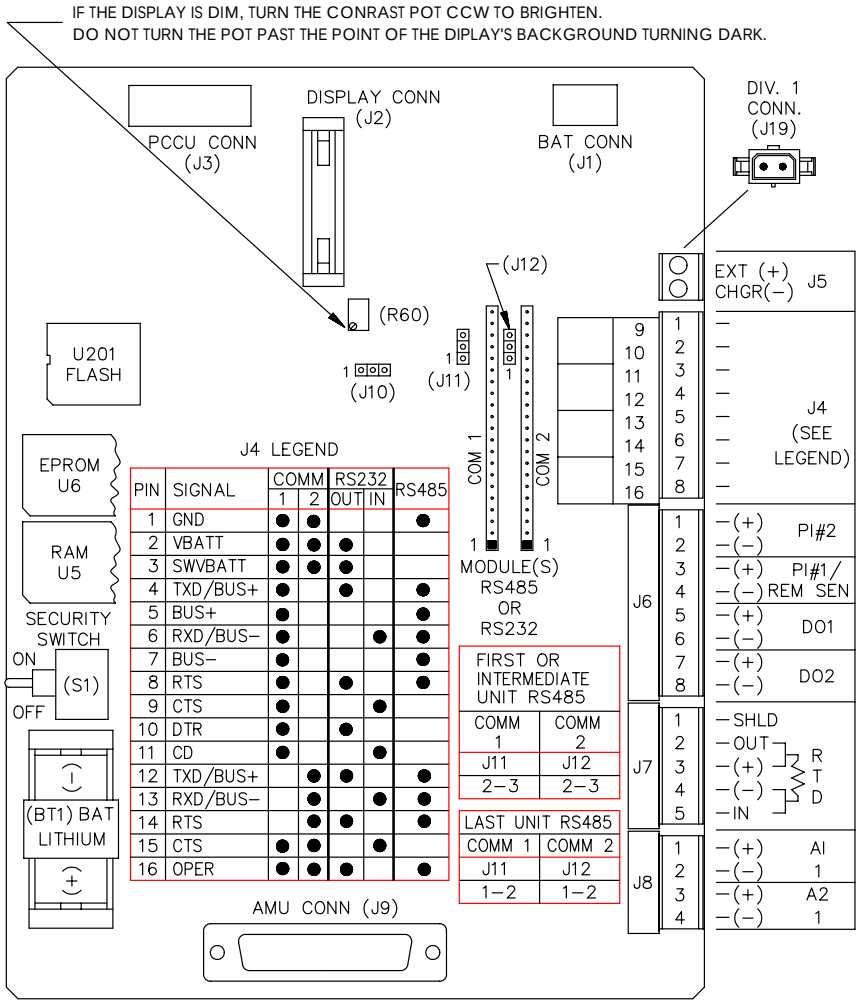
Figure 4 (Solar Panel Mounting)



NOTES:

1. Refer to Wiring Interconnect drawing 2015225-WI for more information on communications wiring.
2. An I/O Interface Card uses the communications path of Remote Comm 1. Therefore, you cannot have an I/O Interface Card and Comm Module 1 plugged in at the same time.

Figure 5 (Model 6700 Layout)



NOTE: See Wiring Interconnect drawing 2015225-WI for more information on communications wiring.

Figure 6 (Model 6400 Layout)