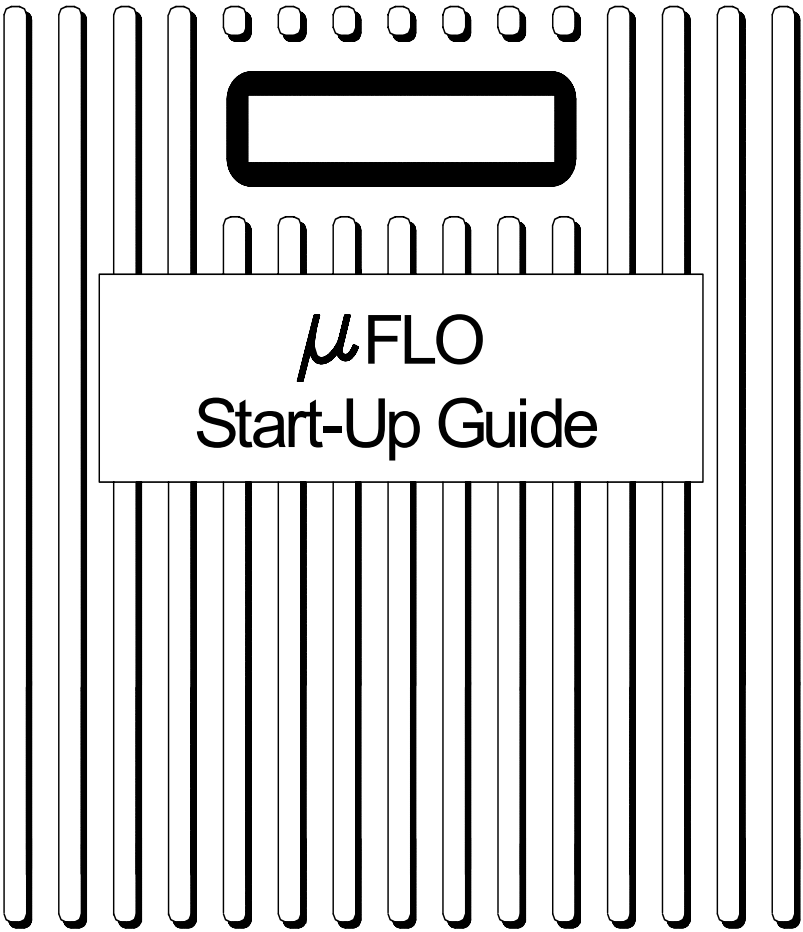
ABB

μFLO SERIES



μFLO
Start-Up Guide

TOTALFLOW

MEASUREMENT & CONTROL SYSTEMS

Introduction:

This startup guide is to assist in the startup of the μFLO series flow computer. Through this guide will be references to status codes that are displayed in different annunciator positions on the unit's display. Since assignments can now be made to any of the eight annunciators, there is no specific annunciator for a specific code. However, for those of you familiar with previous assignments, units are typically shipped with the assignments defaulted as you are accustomed to seeing. This pertains more to communication's ports since users may have custom applications assigned to the other annunciators.

Recommended Start-Up Sequence

HINT: Step 1 thru 22 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 μFLO, 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 the μFLO.
4. Install bracing for μFLO (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 the μFLO. Since the μFLO can be ordered with the flow going left to right or right to left, verify direction of flow by looking at the transducer tag that shows a (+) and (-). Plus(+) indicates the high side (upstream side), therefore flow is from (+) to (-). 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 μFLO's transducer, apply pressure to 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).

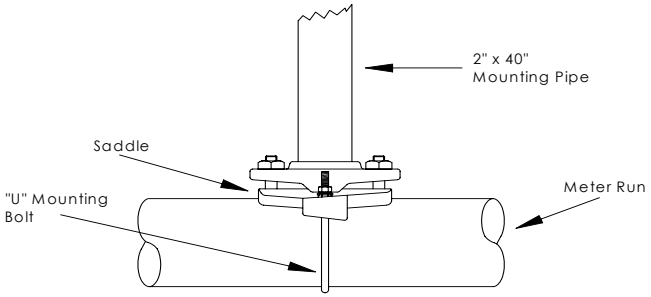


Figure 1 (Saddle Mount)

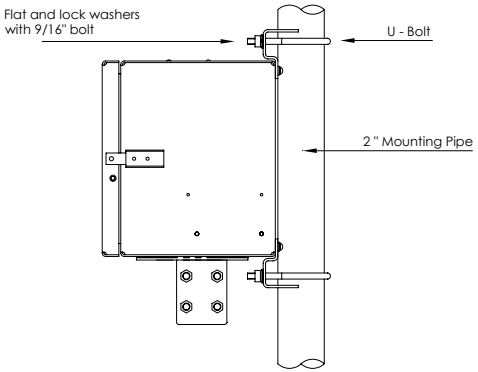


Figure 2 (Pipe Mount)

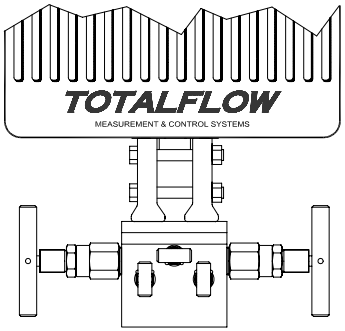


Figure 3 (Typical Manifold Mount)

Install RTD Probe:

7. Install RTD and connect wiring to connector block J9. (See Page 6 and Figure 5)

Install Battery(s):

8. Verify that the Memory Backup is Enabled. This is J1, terminals 1 & 2. (See Page 7 and Figure 5)
9. Mount and connect a fully charged battery to the battery connector J6. (See Page 7 and Figure 5)
10. The display should go quickly through the startup routine then start scrolling through the default display items. (If not, see Tip on Page 19) This typically insures that the components and wiring are good. Refer to “Standard Displays" on page 15 for typical default displays. Refer to “Visual Alarm & Status Codes" on page 16 for location, symbols, and descriptions. You should see a LC code in the A7 annunciator (See Figure 10) since the charging source has not been connected. This is the typical annunciator for the I/O Subsystem application but could vary on different systems.

Install Solar Panel:

11. Assemble, mount, and connect solar panel or AC charger. NEVER CONNECT CHARGER WITH THE MAIN BATTERY PACK DISCONNECTED. (See pages 8 & 9) The LC code should go away after the charging source is connected. Solar powered units will naturally depend on available sunlight.

Setup:

12. Connect FS/2 or laptop running PCCU32 to the unit. To use an FS/2, the μFLO must have been ordered from factory with FS/2 support. PCCU32 must have software Version 4.3 or higher and the FS/2 must be 2018583-007 or higher.
13. Configure μFLO: Set date/time, ID, location, AGA setup, using Entry Mode in PCCU32 or an FS/2.
14. In Calibration Mode, verify registers for Static pressure, Differential pressure and Temperature. (PCCU32 Only)
15. In Calibration Mode, select RTD Installed, un-check Use Fixed TF, and adjust RTD Bias if a temperature standard is used.
16. In Calibration Mode, perform as found calibration checks.

17. 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 and bypass valves are open during AP calibration to avoid a *false DP*. Make sure there are no leaks in the manifold or test equipment.
18. Perform *as left* calibration checks as needed.
19. Place Flow Computer on line: To avoid inducing toggle and/or a calibration shift, close vent valve, open both bypass valves, then open orifice tap valves SLOWLY (high pressure side first). Once both orifice tap valves are fully opened, the bypass valves can be closed.
20. Verify that the unit is calculating volume correctly. Watch the display or look at the *Current Values* in the *Entry Mode* of PCCU32.
21. Collect data and review the event and characteristic files to insure all parameters are set properly.
22. **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 from the PCCU32 *Entry Mode*. 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 the main electronics board.

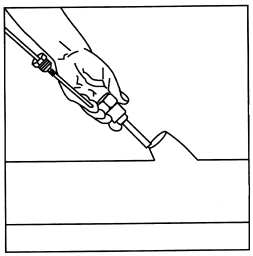
Totalflow Materials Supplied

- 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

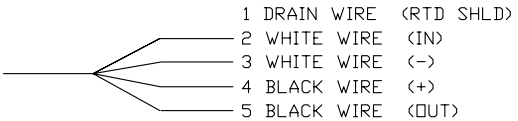
- Customer must specify or provide Thermowell "U" length.
- Teflon tape

1. Install thermowell into meter run.



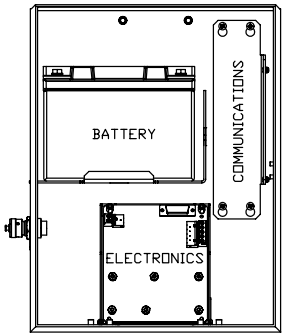
2. Using snap ring pliers, adjust probe length so that it is spring loaded against bottom of thermowell.
3. Remove one of the hole plugs from the μFLO enclosure and install cord connector. Remove nut, sealing ring and rubber grommet from cord connector. Slide nut, sealing ring and grommet over RTD cable and insert cable through body of cord connector. Allow enough cable to extend into unit for connecting wires to RTD termination block J9. (See Figure 5)
4. Secure the cable with the grommet sealing ring and nut.

   Note: Charging source and Power should be removed from unit before performing any field wiring.
5. Connect RTD probe to the μFLO's RTD connector as follows: Before making connections to terminal block, remove spade lugs if attached and trim wire ends back 1/4". Remove J9 terminal block from the μFLO's main electronics board. (See Figure 5)
6. Loosen terminal block securing screws, insert wire, and then retighten. Reinstall terminal block with wires attached.



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. Insert the battery pack into the battery compartment with its long dimension facing outward.



3. Connect battery pack connector to main electronics board Battery connector J6. (See Figure 5)
4. Observe LCD, the display should power up displaying *Warm Start* information and begin scrolling through the default display items.

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

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. Verify that the *Memory Backup* is Enabled with a jumper on the upper two pins (1 & 2) of J1. J1 is located just beneath and a little left of the RTD connector. (See Figure 5)
2. Verify that the $^{L}_{L}$ (low lithium alarm) is not being displayed on the A7 annunciator (default). 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 collar

Procedure:

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

1. Attach 2-inch pipe collar to top end of μFLO mounting pipe. Securely tighten. (See Figure 4)
2. Install a 2-inch pipe extension into collar 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 the other end of cable to μFLO unit until all steps are complete **AND** main battery pack has been connected.
6. Position Solar Panel to face south in the northern hemisphere and north in the southern hemisphere. 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 terminal block J7 Charger Input terminals (See Figure 5). Remove one of the hole plugs from the μFLO enclosure 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 power cable to extend into the unit for connection to Charger Input +/- terminals.
9. Secure Solar Panel cable using grommet, sealing ring and nut.

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

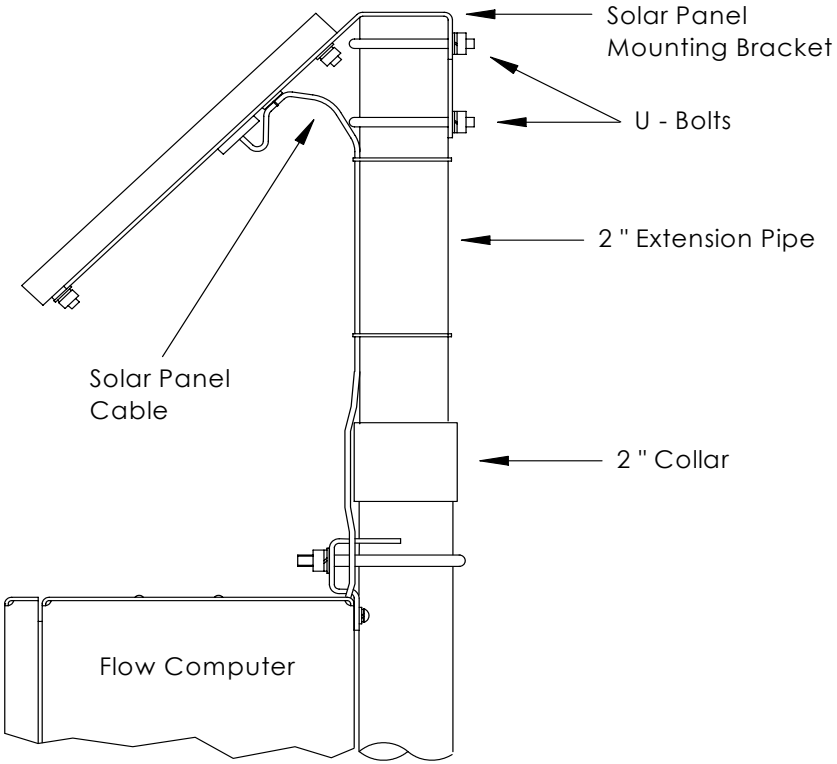


Figure 4 (Solar Panel Mounting)

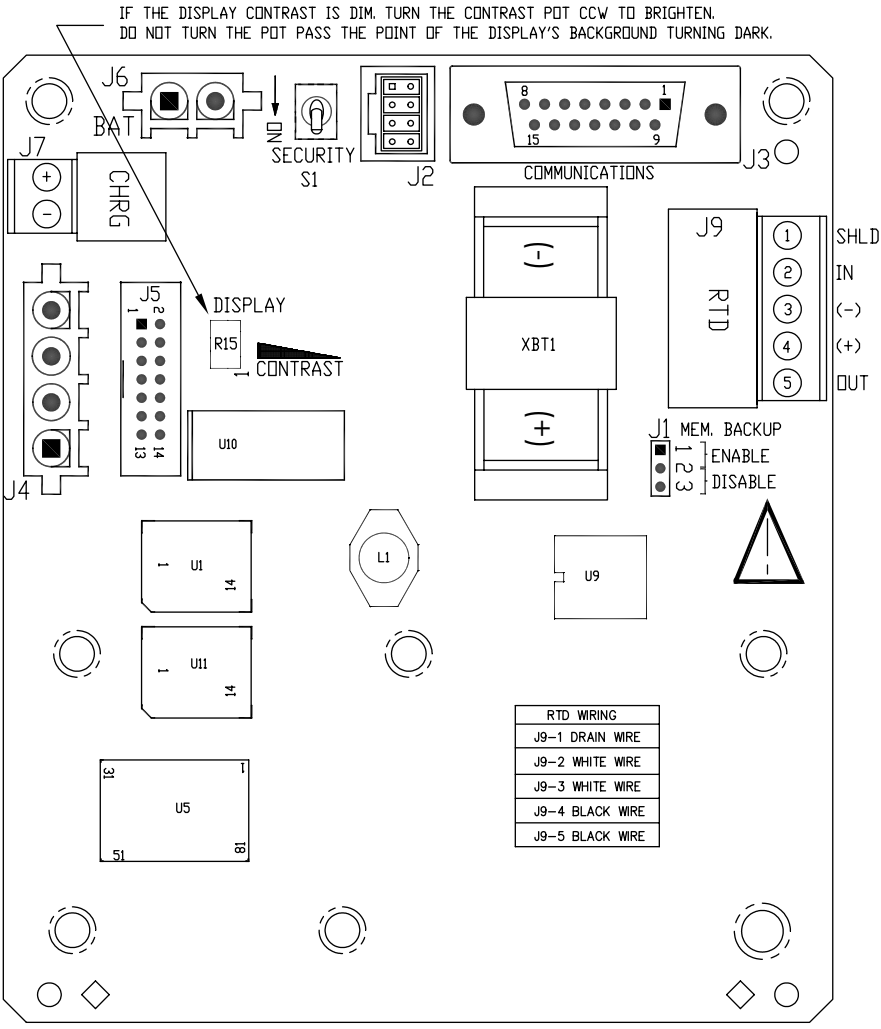
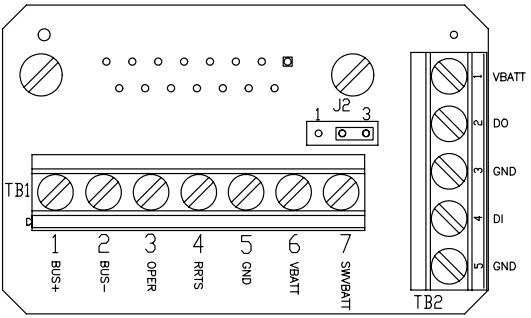


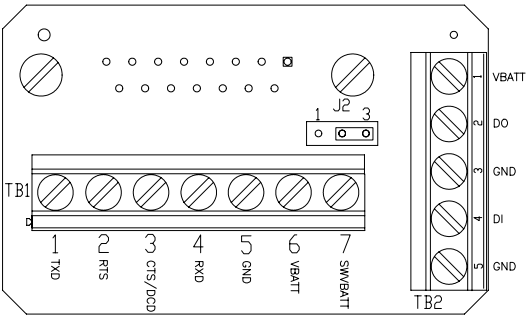
Figure 5 (μFLO Board Layout)

NOTE: For orientation purposes, only connectors and major components are shown.



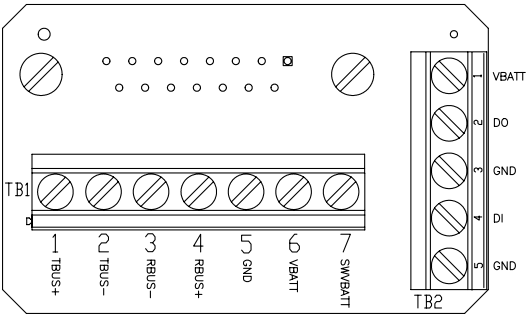
RS–485 SELECTIONS
COMMUNICATIONS TERM BOARD
FIRST OR INTERMEDIATE UNIT
J2
2–3
LAST OR ONLY UNIT
J2
1–2

Figure 6 (RS-485 Termination Board



RS–232 SELECTIONS	
COMMUNICATIONS TERM BOARD	
DCD	CTS
J2	J2
1–2	2–3

Figure 7 (RS-232 Termination Board)



NO J2 SELECTIONS FOR RS-422 COMMUNICATIONS TERMINATION BOARD

Figure 8 (RS-422 Termination Board)

Figures 6, 7 and 8 are termination boards that plug into J3 of the μFLO board providing different communications options.

Remote Communications

The following discussion deals primarily with communications between the μFLO and Host (typically WinCCU).

To communicate with the Host, the μFLO has a remote communications port that can function as RS232, RS485 or RS422. Depending on the customer's order, most units are shipped with an appropriate cable between the 15-pin connector (J3) and the communication's device such as a radio. The other option is a termination board that plugs directly on the 15-pin connector with appropriate terminals labeled. (See pages 10 & 11)

After installation of the μFLO and with the communications path complete, the user needs to enter the appropriate communications parameters. The μFLO was most likely shipped with Com1 set up for *Totalflow Remote* Protocol. If not, select the protocol using the *Entry* mode of PCCU32 as shown below. The protocol must be selected first for the appropriate communications parameters to be displayed. A blinking telephone pole symbol "ǂ" in annunciator position A8 (default) indicates Com1 port is active. See Visual Alarm Codes on page 17 for a full description of alarm characters, locations, and descriptions.

Other Communication Options

After selecting the protocol, verify the other communication parameters. All communication parameters with the exception of modems are found on the *Setup* and *Advanced* tabs. Modem parameters have there own tab. Systems are shipped with default settings for communications but may need fine tuning. The *Schedule* tab parameters are only required if the user wants to power-up the communication's port and communication's devices at designated times to conserve power.

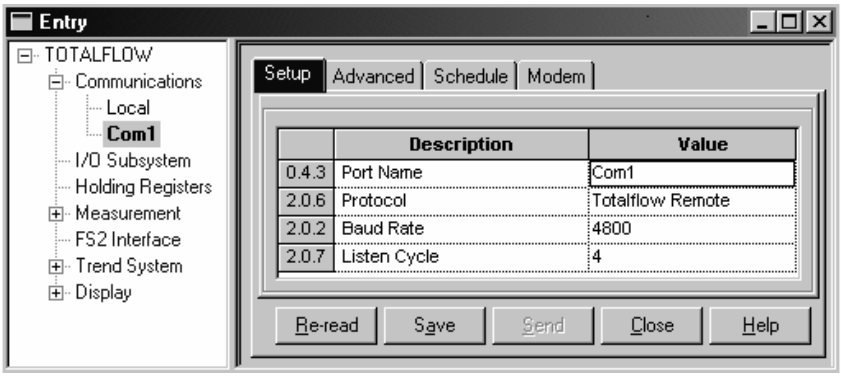


Figure 9 (PCCU32 Entry Mode)

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. A checklist follows as an aid.

- Does the "ŧ" flash (Totalflow Remote Protocol only) with the Listen Cycle time in the A8 display (default position)? If no,
    1. The protocol needs to be selected in the *Entry Mode* using PCCU32.
    2. Inadequate 12 VDC battery voltage.
- Insure base radio is working for other locations.
- Verify Station ID and Device ID matches with WinCCU and is the only flow computer with that ID.
- Verify Baud rate, Stop Bits, Security Code, and Listen Cycle time are the same as WinCCU.
- Verify WinCCU is using Packet Protocol. μFLO Series devices only support DB2 Packet Protocol.
- Verify a cable is in place from J3 on the μFLO electronics board to the radio and a cable from the radio to the antenna.
- When using communications termination board, verify wiring to radio or other communication's device. Also verify setting for J2 on the termination board. For RS232 set to DCD for Alarm Cryout feature. (See page 11)

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 device to another. If black and white wires are to be tested, disconnect both wires at both ends, put 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 devices are apart.

- If a 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 that the 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 phone company's box to dial-up modem. If cellular, also check for proper Tip & Ring voltage available. Insure phone number is correct in the μFLO and WinCCU.

NOTE: In the United States, telephone companies use 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.

Users in other countries will have to consult their local telephone companies for voltage specifications.

Wiring

Specific wiring drawings are sent with each μFLO, 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 μFLO are shown on pages 10 and 11 of this guide.

Standard Displays

Items that appear on the device's display are programmable by the user, however based on the measurement application; units will be shipped with some default display items. The following table is a typical set of default displays for an AGA-3 application. Engineering units may vary from those shown if device supports the "Selectable Units" feature.

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 Low NN PERCENT
Yesterday's Percent DP High Limit Percent time above DP High Set Point	Yest DP High NN PERCENT
Current Flow Rate Programmable SCF, MCF or MMCF	Flow Rate NNNNNN.N SCF/HR
Total Accumulated Volume Programmable SCF, MCF or MMCF	Total Accum. Volume NNNNNN.NN MCF
Battery Voltage Displayed in Volts	Battery Voltage NN.N VOLTS
Station ID ID of the box.	Station ID
Differential Pressure Inches H2O	Diff. Pressure NNN.N IN. H2O
Static Pressure Absolute PSIA	Static Pressure NNN.N PSIA
Flowing Temperature °F	Temperature NN.N DEG. F
Yesterday's Volume Programmable SCF, MCF or MMCF	Yesterday's Volume NNNN.N MCF
Previous Calculation Period Volume	Last Calc. Volume NNNN.N SCF
Device ID Individual application ID	Device ID
Charger Voltage	Charger NN.N VOLTS

The duration that each parameter is displayed can vary from 1 to 255 seconds (default is 4 seconds); a setting of 0 seconds will turn that display item off.

Visual Alarm & Status Codes

After the μFLO 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 μFLO's memory. Status codes are also displayed when the conditions exist. An alarm or status code can be a character, letter or symbol. The alarm and status codes shown in Table 1 will appear on the right side of the LCD screen; see illustration below. Descriptions of each code are described in Table 1.

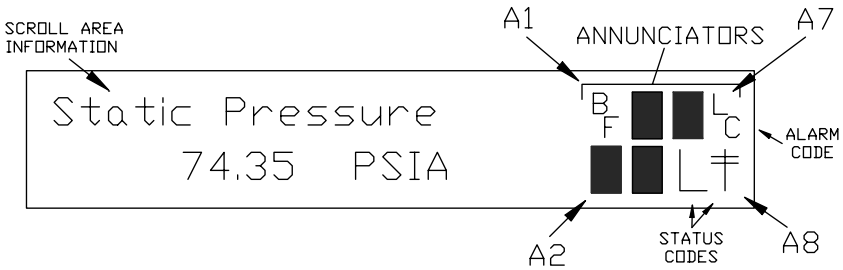


Figure 10 (Annunciator Locations)

Note: Applications in μFLO Series devices can be assigned to any annunciator. To verify the current assignments, see *Annunciators* under *Display* in PCCU32's *Entry Mode*. (See Figure 11)

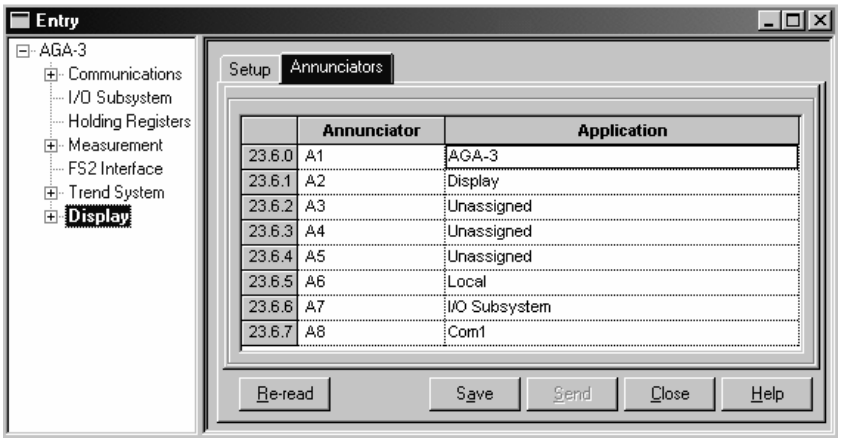


Figure 11 (Annunciator Assignments)

Table 1 Alarm & Status - Codes and Description

Alarm/ Status Codes	Description
I/O Subsystem	
$^{L}_{L}$	Low Lithium Battery Alarm: When $^{L}_{L}$ (low lithium) is displayed, lithium battery voltage is below 2.5 VDC. A new lithium battery measures approximately 3.6 VDC.
$^{L}_{C}$	Low Charger: Displayed if battery charging voltage is less than 0.4 VDC greater than the battery voltage.
Communications	
→	Transmitting Data:
←	Receiving Data:
!	Nak. Negative Acknowledgement w/packet list.
+	Ack. Positive Acknowledge of receipt of request.
⫛	Waiting for Ack. Waiting for response after transmission.
?	Exception Alarm Processing.
⫪	ID Recognized.
⫩	Listen Cycle. 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.
M	MODBUS ASCII: Modbus ASCII protocol is selected for the port assigned to this annunciator.
m	MODBUS RTU: Modbus RTU protocol is selected for the port assigned to this annunciator.

L	Local Protocol. Displayed when PCCU32 port is active and running TOTALFLOW Local Protocol.
¥	*Packet Protocol.* The Totalflow Packet protocol is selected for the port assigned to this annunciator.
R	*LevelMaster Protocol*: The LevelMaster protocol is selected for the port assigned to this annunciator.
Measurement Applications	
B_F	Back Flow Condition: Visible only when the DP variable is being displayed.
Z	Zero Flow Condition: Visible only when the Flow Rate variable is being displayed.
H	*Hold:* Displayed when PCCU32 is in *Calibration Mode* and has a measurement application in *Hold* mode.
A	*Alarm Condition.* Need to view alarm. You may need to compare application limits to current values to determine where the alarm condition is present.
$^{A}_{D}$	A to D Failure. Displayed if A to D Converter's Differential Pressure, Absolute Static Pressure or temperature readings exceed maximum counts or are less than minimum counts.
Display Application	
1	A number represents the Display Group number currently being displayed.
↑	The displayed item's value is above the Data High Limit value specified on the display Item Setup screen.
↓	The displayed item's value is below the Data Low Limit value specified on the display Item Setup screen.

TIP: If the Display Does Not Scroll As Expected

When power is first applied, the unit should quickly go through startup and begin cycling through the pre-programmed display items. If the display does not scroll after startup and/or looks similar to the following: (Part numbers are for example only)

6200 μFLO Boot Prom
2100917-001 (COPYRIGHT)

Disconnect the main power and then re-connect it. You should see something similar to:

Verifying Flash XXXXX	or	COLD BOOT Flash 2100917-001
Checksum = XXXX Verify Passed		6213 μFLO Flash 2100917-001 (COPYRIGHT)

If the display still doesn't scroll, try disconnecting the power and re-connecting it again. If still no success, do the following:

With PCCU32, connect to the unit and establish communications such as Connect To Totalflow, Entry Mode, etc. Go into Terminal Mode and type "0.0.0=COLD" (Do not enter quotes). The unit should go through a Cold Start procedure and then begin scrolling. If this does not succeed, call the number on the back of this guide and talk to a customer service representative.

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