Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

1. Purpose

This Technical Bulletin describes the TOTALFLOW Local Protocol Terminal Interface (TLPTI) commands. AAI TOTALFLOW devices now have the capability to be programmed and data items read and written using a simple terminal interface such as Windows Terminal. The TLPTI was developed to keep pace with the many features that are being developed for AAI devices. See Section 4 of this Technical Bulletin for a description of Batch upload and download command capabilities. See Technical Bulletin # 45 for calibration using the Host Console program. See Technical Bulletin # 47 for operation of LPX.exe, our Uploader program for uploading configuration files (*.cfg) to FCUs.

2. Terminal Emulation Set Up and Usage

Local protocol hardware is only supported via an RS-232 interface. Default port settings are *2400 baud, 8 data bits, 2 stop bits, no parity.*

Entering “TERM (ENTER)” or “term (ENTER)” initiates the Terminal Interface Mode. Disconnecting the local port connector terminates Terminal Interface Mode.

To ***read*** data using Local Terminal Interface commands, type the command letters in either upper or lower case. Hit the Enter key (ENTER). The FCU will respond with the current value for the Appropriate data item.

To ***write*** data, type the command letters in either upper or lower case, followed by ‘=‘, then the value to be assigned to the associated data item. Then hit the Enter key (ENTER).

EXAMPLE: To set the specific gravity to 0.5678, the command would be “g=0.5678(ENTER)”.

It is important to remember that this protocol does NO range checking or validation on data entered. Invalid data will generate invalid results.

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

3. Commands

The following commands do not require passing security check:

"OK",	Security status, returns Y or N
"CODE"	Security code input
"XFF"	Extended feature flags
"LB"	Local port baud rate
"DBG"	Debug mode select
"TERM"	Local terminal interface select

The following commands require at least *READ* level security and are READ ONLY:

"DH"	Percent of day DP was above high limit (ACF for pulse input)
"DL"	Percent of day DP was below low limit (ACF for pulse input)
"AP"	Current AP, PSIA
"DP"	Current DP, inches H2O
"P1"	Current Battery, volts
"PC"	Current Charger, volts
"T"	Current Temperature, degrees Fahrenheit
"VA"	Current Accumulated volume, MCF
"Y"	Zero if orifice, (accumulated uncorrected vol. for pulse input)
"VH"	Previous volume calculation, SCF
"VS"	Viscosity, (previous uncorrected volume for pulse input)
"Vi"	Current flow rate, SCF/Hr
"Vm"	Current flow rate, SCF/Hr
"Vy"	Yesterday's volume, MCF
"K"	Yesterday's uncorrected volume for pulse input, ACF
"VCA"	Contact output volume accumulator, MCF
"RA"	AP/AP-reference ratio
"Bah"	AP calibration line segment 1 offset (b in y = mx+b)
"Bal"	AP calibration line segment 0, offset
"Car"	AP calibration line segment 1 slope / line segment 0 slope (m1/m0)
"Rh"	DP/DP-reference ratio (not used on linear meters)
"Bhh"	DP calibration line segment 1 offset (not used on linear meters)
"Bhl"	DP calibration line segment 1 offset (not used on linear meters)
"Chr"	DP calibration line segment 1 slope / line segment 0 slope (m1/m0)
"O"	Outputs 0 (not used on linear meters)
"Kr"	Outputs 0 (not used on linear meters)
"DBR"	Database revision
"PL"	Lithium batter voltage (only on Turbo)
"Tx"	Transducer temperature (Turbo where supported on base board and CB-180)
"P"	Transducer temp correction coefficient crc check status (Turbo where supported and CB-180)
"APTB"	AP thermal table output - 25 float values
"DPTB"	DP thermal table output - 25 float values

The following commands require *WRITE* level security to enter changes:

"BAT"	Outputs batch commands and current values
"TM"	Selects Test mode for AP, DP and RTD; 1 = use test values, 0-use analog inputs (normal mode)
"TAP"	Test mode AP value
"TDP"	Test mode DP value
"TPI"	Test Mode one second pulse count
"TRTD"	Test Mode RTD value
"MDP"	Maximum # Day Period Records
"MLP"	Maximum # Log Period Records
"MEL"	Maximum # Event Log Records

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

COMMUNICATIONS COMMANDS

LOCAL PORT *(PCCU Port)*

"LCB" Local Port comm. buffer size

"LPP" Local Port protocol

0 = Default (TOTALFLOW PCCU)
1 = MODBUS ASCII
2 = TOTALFLOW CCU
3 = LOCAL TERMINAL
5 = MODBUS RTU
6 = Square D (requires custom EPROM firmware)

"LDB" Local Port data bits, 7 or 8

"LPR" Local Port parity

0 = NONE
1 = EVEN
2 = ODD

"LSB" Local Port stop bits

0 or 1=1
2=2

"LDC" Local Port duty cycle, used for running remote protocol over local port, see “W” command

“MBA" MODBUS Slave Address, 0-247

"LXI" Local Port interface type, used for running remote protocol over local port, see RXI command

"LDW" Local Port CCU download, wait time in seconds

“LTO” Local Port Modbus character time-out (in milliseconds, 1 - 65535, 20 ms resolution)

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

REMOTE COMM 1

"RPP" Remote Comm 1 protocol
- 0 = Default (TOTALFLOW CCU)
- 1 = MODBUS ASCII
- 2 = TOTALFLOW CCU
- 5 = MODBUS RTU
- 6 = Square D (requires custom EPROM firmware)

"RCB" Remote Comm 1, communication buffer size

"RXI" Remote Comm 1, hardware interface -

0	0x00 = None
4	0x04 = Modem (RS-232 with DTR always active)
12	0x0c = Radio (RS-232 with DTR active during Listen Interval)
28	0x1c = RS-485
44	0x2c = RS-485 w/one AO channel
56	0x38 = RS-232 w/four AO channels
60	0x3c = RS-485 w/four AO channels
255	0xff = Expanded I/O or VCI

"RDB" Remote Comm 1 data bits, see LDB command

“RDC” or "W" Remote Comm 1, port link establishment index -
- 0 = 4 seconds
- 1 = 2 seconds
- 2 = 1 second
- 3 = 0 seconds

"RPR" Remote Comm 1 parity, see LPR command

"RSB" Remote Comm 1, stop bits, see LSB command

“RBR” or "B" Remote Comm 1, baud rate index -
- 0 = 1200
- 1 = 2400
- 2 = 4800
- 3 = 9600
- 4 = 19200
- 5 = 38400

"RPUD" or “RKD” Remote Comm 1, radio power up delay in milliseconds default = 80

"RXKD" or “RXD” Remote Comm 1, radio transmit key delay in milliseconds default = 420

“RXUD” or "XUK" Remote Comm 1, radio transmit un-key delay in milliseconds default = 40

"RDW" Remote Comm 1 CCU download wait time in seconds
“RTO” Remote Comm 1 time-out (seconds)
“ROPO” Remote Comm 1 operate output
“ROPC” Remote Comm 1 operate control
“RP16” Remote Comm 1 16 bit MODBUS
“RMCT” Remote Comm 1 modem connect time-out
“RMDT” Remote Comm 1 modem disconnect time-out
“RATM” Remote Comm 1 inactive time-out in minutes
“RTO” Remote Comm 1 Modbus (only) character time-out (in milliseconds, 1 - 65535, 20 ms resolution)

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

REMOTE COMM 2 *(AUX Port A)*

"APP" Remote Comm 2 protocol (AUX port A)

0 = Default (none)
1 = MODBUS ACSII
2 = TOTALFLOW CCU
5 = MODBUS RTU
6 = Square D (requires custom EPROM firmware)

"ABR" Remote Comm 2 (AUX Port A) baud rate index, see “RBR” or “B” command

"ADB" Remote Comm 2 (AUX Port A) data bits, see “RDB” command

"APR" Remote Comm 2 (AUX Port A) parity, see “RPR” command

"ASB" Remote Comm 2 (AUX Port A) stop bits, see “RSB” command

"ADC" Remote Comm 2 (AUX Port A) link establishment index, see “W” command

"APUD Remote Comm 2 (AUX Port A) power up delay in milliseconds

"AXKD" Remote Comm 2 (AUX Port A) xmit key delay in milliseconds

"AXUD" Remote Comm 2 (AUX Port A) xmit un-key delay in milliseconds

"AXI" Remote Comm 2 (AUX Port A) hardware interface, see “RXI” command

"ADW" Remote Comm 2 (AUX Port A) CCU download wait time in seconds

“AOPO” Remote Comm 2 (AUX Port A) Operate output

“AOPC” Remote Comm 2 (AUX Port A) Operate control

“ACB” Remote Comm 2 (AUX Port A) comm. buffer size

“AP16” Remote Comm 2 (AUX Port A) 16 bit MODBUS

“AMCT” Remote Comm 2 (AUX Port A) modem connect time-out

“AMDT” Remote Comm 2 (AUX Port A) modem disconnect time-out

“AATM” Remote Comm 2 (AUX Port A) inactive time-out in minutes

“ATO” Remote Comm 2 (AUX Port A) Modbus (only) character time-out
(in milliseconds, 1 - 65535, 20 ms resolution)

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

REMOTE COMM 3 *(AUX port B)*

NOTE: Remote Comm 3 is only available on Model 6713 and 6714 only.

"BPP"	Remote Comm 3 (AUX port B) protocol 0 = Default (none) 1 = MODBUS ACSII 2 = TOTALFLOW CCU 5 = MODBUS RTU 6 = Square D (requires custom EPROM firmware)
"BPBR"	Remote Comm 3 (AUX port B) baud rate index, see "RBR" or "B" command
"BPDB"	Remote Comm 3 (AUX port B) data bits, see "RDB" command
"BPPR"	Remote Comm 3 (AUX port B) parity, see "RPR" command
"BPSB"	Remote Comm 3 (AUX port B) stop bits, see "RSB" command
"BPDC"	Remote Comm 3 (AUX port B) link establishment index, see "W" command
"BPUD"	Remote Comm 3 (AUX port B) power up delay in milliseconds
"BXKD"	Remote Comm 3 (AUX port B) xmit key delay in milliseconds
"BXUD"	Remote Comm 3 (AUX port B) xmit un-key delay in milliseconds
"BPXI"	Remote Comm 3 (AUX port B) hardware interface, see "RXI" command
"BPDW"	Remote Comm 3 (AUX port B) CCU download wait time in seconds
"BPCB"	Remote Comm 3 (AUX port B) comm. buffer size
"BP16"	Remote Comm 3 (AUX port B) 16 bit MODBUS
"BTO"	Remote Comm 3 (AUX port B) Modbus (only) character time-out (in milliseconds, 1 - 65535, 20 ms resolution)

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

Miscellaneous FCU Configuration

"CD" Contract hour, 0-23
"m" Display units byte

Gas Orifice Meter
Bits: 0 - rate units:
0 = per hour
1 = per day
1 - daily accumulator units:
0 = mcf
1 = mmcf

Pulse Input Meter
Bits: 0 and 1 - rate units:
0 = per hour
1 = per day
2 = per period
2 through 4 - corrected volume units:
0 = scf
1 = dscf
2 = cscf
3 = mscf
4 = dmscf
5 = cmscf
6 = mmscf
5 through 7 - uncorrected volume units:
0 = acf
1 = dacf
2 = cacf
3 = macf
4 = dmacf
5 = cmacf
6 = mmacf

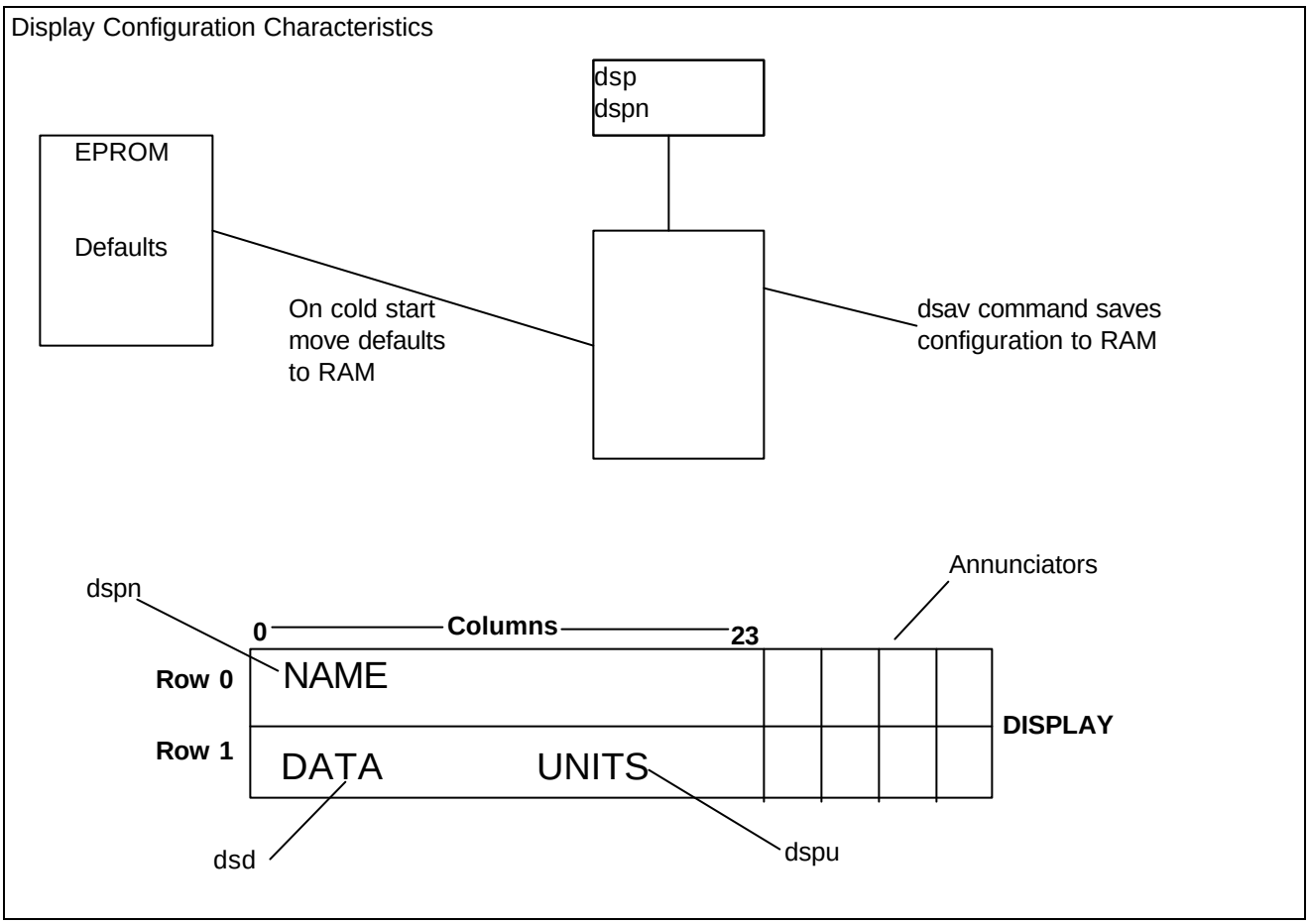
Liquid Orifice Meter
Bits: 0 - rate units:
0 = per hour
1 = per day
1 - daily accumulator units
0 = M (/1000)
1 = MM(/1000000)
2 and 3 - volume units:
0 = cf
1 = gallons
2 = barrels

Note: Setting of the “m” Display Units Bytes is easily achieved using the PCCU laptop or dedicated PCCU by menu selection.

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

/*----------Display Configuration----------*/

Local LCD configuration is possible using the following commands. A brief description is given explaining the methods the remote device uses when dealing with displays.



Example custom display setup: Using a terminal emulator as described above (section 2.0). From the TF> system prompt enter the following (only type text listed between quotes);

1. Select “x” register (x = n) from Appendix B listing for the particular model number of FCU to be programmed (Orifice or Pulse). The display should now show the selected register and default name.

2. Next, select “dspn =” and enter the desired name. X (column) and Y (row) placement offsets can be set using the “dsnx” & “dsny” commands as listed below (see Display example above).

3. Always save the settings by issuing a “dsav” command after the command changes listed.

4. Additionally, settings can be changed for the “Engineering Units” and “Data Format” of selected items (see command structures below).

“x”	Display index; setting this value locks the display to the index number input (see appendix “B”)
"xs"	Display seconds
“nds”	Number of displays - returns the number of programmable displays.
“dsp”	Display description - returns description text for the current display. Setting this value locks the display to the index value input and returns the description text.
“dsi”	Display interval of selected item (0 disables item.)

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

"dspn" Name (description) of selected display item.
"dsnx" X location of name. (Column: 0 - 23)
"dsny" Y location of name. (Row: 0 - 1)

"dspu" Engineering units of selected display item.
"dsux" X location of units. (Column: 0 - 23)
"dsuy" Y location of units. (Row: 0 - 1)

"dsdf" Data format (www.ddd) of selected display item.
"dsdx" X location of data (Column: 0 - 23)
"dsdy" Y location of data. (Row: 0 - 1)

"dsds" Data Scaling factor.

"dvcb" Display VCB VAR (Register) item.

Example: To display a model 6410/6413 DI or DO status to the local LCD;
x=28 (select unused display register location)
dvcb = 2 0 3 (numbers must be separated by spaces)
Where dvcb = Application Array Register

I/O	Application	Array (VCB)	Register (VAR)
DI - 1	2	0	3
DI - 2	2	0	4
DO - 1	2	1	34
DO - 2	2	1	38

The following 9 commands allow the placement of a trend "strip chart" on the local LCD display.

"dspt" Plot type of selected display item (0 = Annunciators, 1 = 16x24, 2 = 8x48, 4 = None)
"dspx" X location of plot. (0 - 20)
"dspy" Y location of plot. (0 - 1)
"dspw" Plot line width (0 = fill graph.)
"dspb" Plot Border (Bit mask, 1-left, 2-right, 4-top, 8-bottom.)
"dspd" Plot Scroll Direction (0 = Left -> Right, 1 = Right -> Left)
"dsph" Plot High Limit
"dspl" Plot Low Limit
"dspa" Plot archive data type (0 = current, 1 = hourly, 2 = daily)

Using the following commands, any display item may be reassigned to display a MODBUS register

"dsmr" Modbus Register of selected display item.
"dss0" Boolean Register State 0 descriptor (10 characters).
"dss1" Boolean Register State 1 descriptor (10 characters).
"dsmp" Enable pre-defined monitor mode plot for selected display item.
"dsfd" Recall factory defaults of selected display item.
"dsav" Save current settings of selected display item.
"rpa" Reset Pulse Input Accumulators
"pik" Pulse input multiplier (meter factor)
"Td" Current date and time
"Id" FCU ID
"L" Location

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

AUXILIARY CONTACT COMMANDS

The following commands have been added to facilitate programming of the Digital Outputs associated with the model 6400 and 6713 Flow Computer Units.

EXAMPLE: To program DOs for high and low flow rate, use the following syntax;

Using a terminal emulator as described above (section 2.0). From the TF> system prompt enter the following (only type text listed between quotes);

"DO1 = 1088"	*1024 (set on Flow rate low alarm) + 64 (auto reset) = 1088
"DO2 = 2112"	*2048 (set on Flow rate high alarm) + 64 (auto reset) = 2112
"Olf = 6000"	*(set Flow rate low alarm to 6000 scf set point)
"Ohf = 8000"	*(set Flow rate high alarm to 8000 set point)
"dsav"	*(save current settings)

"DO1" Auxiliary contact (DO1) setup bits (see below)

"DO2" DO 2 setup bits (see below)
- 1 - set on low charger alarm
- 2 - set on DP low alarm
- 4 - set on DP high alarm
- 8 - set on AP low alarm
- 16 - set on AP high alarm
- 32 - set on remote sense
- 64 - auto reset
- 128 - set on volume set point
- 256 - set on Flowing Temperature low alarm
- 512 - set on Flowing Temperature high alarm
- 1024 - set on Flow rate low alarm
- 2048 - set on Flow rate high alarm

"VC" Auxiliary contact DO1 volume set point

"VS2" Auxiliary contact DO2 volume set point

"OC" To view/set current state of Aux contact (DO1)
- 0 = On (tripped)
- 1 = Off (not tripped)

"OC2" To view/set current state of Aux contact (DO2)
- 0 = On (tripped)
- 1 = Off (not tripped)

NOTE: Flow rate High and Low alarms (DO) stay in the "tripped" state during the alarm condition and are only cleared when the process variable is within the set points selected. Users should be cautious when selecting the "Flow Rate" alarm points when using a solar charged system with interposing relays, and should insure that the battery system is sized accordingly. Please consult with a projects engineer for proper autonomy calculations.

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

ANALOG LIMIT COMMANDS

"Oha"	AP high limit
"Ola"	AP low limit
"Ohh"	DP high limit for orifice (acf high limit for linear meters)
"Olh"	DP low limit for orifice (acf low limit for linear meters)
"Oht"	RTD high limit
"Olt"	RTD low limit
"Ohf"	Flow rate high limit (SCF/HR)
"Olf"	Flow rate low limit (SCF/HR)
"Tf"	Fixed temperature
"Zi"	DP zero cutoff (differential meters only)
"Z"	Pulse window (linear meters only)
"Hl"	Linear meter k factor (linear meters only)
"Hm"	Fixed AP value (linear meters only)
"d"	Accumulated uncorrected volume (linear meters only)

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

AP CALIBRATION COMMANDS

"Al"	AP low calibration point units value, FCU reads associated analog input value
"Am"	AP mid calibration point units value, FCU reads associated analog input value
"Ah"	AP high calibration point units value, FCU reads associated analog input value
"rla"	Recall low calibration point units value, FCU does NOT read analog input
"rma"	Recall mid calibration point units value, FCU does NOT read analog input
"rha"	Recall high calibration point units value, FCU does NOT read analog input
"har"	AP high calibration point analog value
"lar"	AP low calibration point analog value
"mar"	AP mid calibration point analog value
"Aml"	AP mid-low calibration point units value, FCU reads associated analog input
"Amh"	AP mid-high calibration point units value, FCU reads associated analog input
"rmla"	Recall mid-low calibration point units value, FCU does NOT read analog input
"rmha"	Recall mid-high calibration point units value, FCU does NOT read analog input
"mlar"	AP mid-low calibration point analog value
"mhar"	AP mid-high calibration point analog value
"Ca"	Read returns slope of AP line segment 1, write causes AP calibration
"acal"	Batch mode AP calibration selection
“aflg”	AP calibration flags

0x01 = channel has been re-calibrated
0x02 = channel has been calibrated since FCU was cold started

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

DP CALIBRATION COMMANDS

"Hl" DP low calibration point units value, analog value read

"Hm" DP mid calibration point units value, analog value read

"Hh" DP high calibration point units value, analog value read

"rlh" Recall DP low calibration point units value, analog value is NOT read

"rmh" Recall DP mid calibration point units value, analog value is NOT read

"rhh" Recall DP high calibration point units value, analog value is NOT read

"hhr" DP high calibration point analog

"lhr" DP low calibration point analog

"mhr" DP mid calibration point analog

"pch" Recall static pressure correction rhsave

"pcp" Recall static pressure correction AP high point analog value

"pchb" Recall static pressure correction DP analog value when AP is at low calibration point

"pchl" Recall static pressure correction AP analog value when DP is at low calibration point

"pcc" Recall static pressure correction factor

"Hml" DP mid-low calibration units value, analog value read

"Hmh" DP mid-high calibration units value, analog value read

"rmlh" Recall DP mid-low units value, analog value NOT read

"rmhh" Recall DP mid-high units value, analog value NOT read

"mlhr" DP mid-lo analog value (sometimes called “ratio” value)

"mhhr" DP mid-high analog value

“Ch" Read returns slope of line segment 1; write causes DP calibration

"hcal" Batch command to calibrate DP

"hflg" DP calibration flags
0x01 = channel has been re-calibrated
0x02 = channel has been calibrated since FCU was cold started

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

RTD CALIBRATION COMMANDS

"To" RTD bias value added to scaled RTD value

ANALOG OUTPUT CALIBRATION COMMANDS
NOT AVAILABLE ON 6400 Series FCUs

"AOHA" Analog output AP calibration high unit value

"AOLA" Analog output AP calibration low unit value

"AOHD Analog output DP calibration high unit value

"AOLD" Analog output DP calibration low unit value

"AOHT" Analog output Tf calibration high unit value

"AOLT" Analog output Tf calibration high unit value

"AOHF" Analog output flow rate calibration high unit value

"AOLF" Analog output flow rate calibration low unit value

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

AGA DATA

"BTU" Heating value in BTU per SCF

"F", F_{aux}(Auxiliary factor), (F=1.000 is default and turns factor off)

"G" Relative specific gravity

"BSB" Miscellaneous selection bits:
- 0 - RTD installed
- 1 - Use RTD in volume calculation
- 2 - reserved
- 3 - check security code
- 4 - orifice plate material
  - 0 = stainless
  - 1 = monel
- 5 - live analysis
- 6 - use fixed analysis on error
- 7 - display gauge pressure or AP present flag for liquid meters

"ORD" Orifice diameter or accumulated uncorrected volume for linear meters

"PID" Pipe diameter or last volume periods uncorrected flow rate for linear meters

"VS" Viscosity or last volume periods uncorrected volume for linear meters

LIQUID ONLY

"k0" Liquid k0 factor

"k1" Liquid k1 factor

"k2" Liquid k2 factor

"Lq" Liquid type

Volume Calculation Parameters

"C" CO2 mole percent

"N" N2 mole percent

"C1" Methane mole percent

"Fp" Fp for NX19 Fpv

"Ft" Ft for NX19 Fpv

"Pb" Pressure base

"Tb" Temperature base

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

"SB" AGA 1985 static factor selection bits:

NOTE: To select items from the following two tables you must enter the "SB =" command followed by the sum of the bit weights. ***Example 1;*** To select all factors in the first table, add 1+2+4+8+16+32+64+128 (sum = 255). ***Example 2;*** To select Fpb and Fg only, add 1+ 4 (sum = 5). ("SB" default is = 64, "DB" default is = 128)

Bit Weight	Bit Position	Description
1	0	Use Fpb
2	1	Use Ftb
4	2	Use Fg
8	3	Use Fb
16	4	Use Faux
32	5	Static pressure tAP is upstream of orifice flag
64	6	New/Old Equation selections supported (read only)
128	7	spare

"DB" AGA 1985 dynamic factor selection bits:

Bit Weight	Bit Position	Description
1	0	Use Ftf
2	1	Use Y
4	2	Use Fr
8	3	Use Fa
16	4	Use Fpv
32	5	Use Fw
64	6	Use pipe tap equations
128	7	Tap type (pipe/flange) supported (read only)

"Fb" Fb basic orifice factor

"K" Ratio of specific heats for orifice, or current days accumulated uncorrected volume for linear meters

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

API 14.3 Data

"Fcd" Fixed input Coefficient of discharge

"APSB" Static selection bits for API 14.3 calculations

Bit Weight	Bit Position	Description
1	0	spare
2	1	spare
4	2	spare
8	3	Use calculated Cd when set
16	4	Use Faux
32	5	Static pressure tAP is upstream of orifice flag
64	6	spare
128	7	spare

"APDB" Dynamic selection bits for API 14.3 calculations

Bit Weight	Bit Position	Description
1	0	spare
2	1	Use Y
4	2	spare
8	3	spare
16	4	Use Fpv
32	5	Use Fw
64	6	spare
128	7	spare

"NUMB" Miscellaneous selection bits for API 14.3 calculations (see “BSB”)

"ZBA" Z of air at base conditions

"OPM" orifice plate coefficient of linear expansion

"PM" pipe coefficient of linear expansion

"CHT" Characteristics type
0 = TOTALFLOW backward compatible
1 = TOTALFLOW NEW EQUATION selectable

"CT" calculation method
0 = none
1 = AGA-3, 1985
2 = AGA-3, 1992

"MCT" calculation method mask (read only); each bit set represents a value which the software supports for volume calculation

"ZM" Z calculation method

"MZM" Z method mask, see MCT

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

"BP" Barometric pressure, fixed input

"VCP" Volume calculation period in seconds

"LGP" Flow file log period in seconds. **NOTE:** This command changes the Log Period (default is 3600, 1 hour). Once this is changed data can be collected ONLY with WinCCU32 at this time. A COLD BOOT is required to reset the FCU to allow collection with PCCU or laptop.

"BATT" Battery Type
0 = Gates
1 = Douglas; this command is only used on Turbo units

"LSA" * Linear or square root averages switch for AP and DP values
0 = linear
1 = square root averages

* The following describes how the Linear / Square Root Averages Switch affects the database values in the FCU.

Sample Accumulation
Each second the FCU reads the current value of AP, DP and TF (temperature in degrees F). The FCU accumulates these values in for later use in flow calculations. The following values are calculated:

```
if (DP >0):
  ap_linear_accumulated = ap_linear_accumulated + current_ap
  ap_square_root_accumulated = ap_square_root_accumulated+square_root(current_ap)
  dp_linear_accumulated=dp_linear_accumulated+current_dp
  dp_square_root_accumulated=dp_square_root_accumulated+square_root(current_dp)
  tf_linear_accumulated=tf_linear_accumulated+current_tf
  tf_square_root_accumulated=tf_square_root_accumulated+square_root(current_tf)
  extension_accumulated=extension_accumulated+current_extension
  flow_samples_accumulated = flow_samples_accumulated + 1.
```

The values above are calculated whenever DP is greater than zero. Another set of accumulators is maintained regardless of DP. The above “flow dependent” values are used in the volume calculation. If the entire log period has no flow, the alternate non-flow dependent accumulated values are logged in the database.

Samples used in Volume Calculation

At each volume calculation period, accumulated values listed in the previous section are averaged for use in the volume calculation procedures. If the linear_square_root_switch is set to linear, the following values are calculated:

```
  average_ap = ap_linear_accumulated / flow_samples_accumulated
  average_dp = dp_linear_accumulated / flow_samples_accumulated
  average_tf = tf_linear_accumulated / flow_samples_accumulated
```

If the linear_square_root_switch is set to square_root, the following values are calculated:

```
  average_ap = (ap_square_root_accumulated / flow_samples_accumulated)**2
  average_dp = (dp_square_root_accumulated / flow_samples_accumulated)**2
  average_tf = (tf_square_root_accumulated / flow_samples_accumulated)**2
```

where **2 means raised to the 2nd power or “squared”.

The average_ap, average_dp and average_tf values are then used to calculate volume using either the AGA-3, 1985 or AGA-3, 1992 method and the selected supercompressibility method.

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

Samples logged in FCU Database

At each log period, accumulated values listed in section 2 are averaged for logging in the FCU database. If the linear_square_root_switch is set to linear, the following values are calculated:

average_ap = ap_linear_accumulated / flow_samples_accumulated
average_dp = dp_linear_accumulated / flow_samples_accumulated
average_tf = tf_linear_accumulated / flow_samples_accumulated

If the linear_square_root_switch is set to square_root, the following values are calculated:

average_ap = (ap_square_root_accumulated / flow_samples_accumulated)**2
average_dp = (dp_square_root_accumulated / flow_samples_accumulated)**2
average_tf = (tf_square_root_accumulated / flow_samples_accumulated)**2

The above values are then logged into the log period database records. Daily averages are calculated in a similar manner at the end of the contract day.

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

GAS ANALYSIS FOR FPV DETAIL METHOD

"H2O"	Water mole percent
"H2S"	hydrogen sulfide mole percent
"He"	helium mole percent
"C2"	ethane mole percent
"C3"	propane mole percent
"NC4"	normal butane mole percent
"IC4"	iso-butane mole percent
"NC5"	normal pentane mole percent
"IC5"	iso-pentane mole percent
"NC6"	normal hexane mole percent
"NC7"	normal heptane mole percent
"NC8"	normal octane mole percent
"NC9"	normal nonane mole percent
"NC10"	normal decane mole percent
"O2"	oxygen mole percent
"CO"	carbon monoxide mole percent
"H2"	hydrogen mole percent
"AR"	argon mole percent
"WC"	water content in lbs/mmscf
"WB"	water content bias

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

TRANSDUCER TEMP CORR CONSTANTS

Note: These commands are only valid for software which supports transducer temperature correction.
(NOT AVAILABLE ON 6400 or 6700 Series FCUs)

"AS",	AP temp correction span numbers
"ASE"	AP temp correction span crc
"AZ"	AP temp correction zero offset numbers
"AZE"	AP temp correction zero offset crc
"DS"	DP temp correction span numbers
"DSE"	DP temp correction span crc
"DZ"	DP temp correction zero offset numbers
"DZE"	DP temp correction zero offset crc

Miscellaneous address display

"disp"	Displays contents of given address using C style format. “disp = e174%f” for example.

Pulse Input Selection

"pic", BATCH, &pic_dat.pb, // Pulse Input Channel Select

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

VALVE CONTROL DATA

Note: These commands are only valid for software which supports valve control.
NOT AVAILABLE ON 6400 Series FCUs.

"vp"	Pulse width
"v"	VCI status word
"vpb"	AP bias
"vdh"	DP high limit
"vdl"	DP low limit
"vds"	DP set point
"vdd"	DP deviation
"vdg"	DP gain
"vdr"	Pipe length
"vah"	AP high limit
"val"	AP low limit
"vas"	AP set point
"vad"	AP deviation
"vag"	AP gain
"var"	Pipe inside diameter
"vfh"	Flow rate high limit
"vfl"	Flow rate low limit
"vfs"	Flow rate set point
"vfd"	Flow rate deviation
"vfg"	Flow rate gain
"vf"	VCI interface feature flags
"vfr"	Extended command bits
"vst"	manual pulse width
"vb"	Battery voltage low limit
"vd"	Delay for DP low limit
"vxc"	Time duration to keep valve closed
"vxo"	Time remaining for closed valve
"vc"	VCI command, result byte
"vha"	AP Override Limit
"vla"	AP Restart after Override Limit
"vc2"	VCI additional command word
"vt1"	Intermitter on time
"vt0"	Intermitter off time
"vr1"	Intermitter on time remaining
"vr0"	Intermitter off time remaining
"vf2"	VCI additional feature flags
"v2"	VCI second status word

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

ANALOG INPUT COMMANDS (6400 and 6700 DIGITAL BOARDS)

"APCH" AP analog input channel (see 6400 Digital Board Analog Input Channel Definitions below)
“DPCH” DP analog input channel (see 6400 Digital Board Analog Input Channel Definitions below)

6400/6700 Digital Board Analog Input Channels Definitions
- 0 - Internal DP
- 1 - Internal AP
- 2 - Internal RTD
- 3 - Battery
- 4 - Ground
- 5 - External analog input 1 (defaulted to DP, when selected for calcs., No AP/No DP firmware)
- 6 - External analog input 2 (defaulted to AP, when selected for calcs., No AP/No DP firmware)
- 7 - Charger

"AIX" Analog input index;
- 0 selects external analog input channel 1
- 1 selects external analog input channel 2

The following commands sample the analog input when the engineering units are entered:

"AIP5" Analog input Mid High calibration point in engineering units
"AIP4" Analog input Mid Low calibration point in engineering units
"AIP3" Analog input High calibration point in engineering units
"AIP2" Analog input Mid calibration point in engineering units
"AIP1" Analog input Low calibration point in engineering units

The following command calibrates the selected analog input when written:

"AICL" Analog input calibrate command (AICL = 1 To calibrate)

The following commands may be used for batch calibration:

"AIU5" Analog input mid high calibration point in engineering units
"AIU4" Analog input mid low calibration point in engineering units
"AIU3" Analog input high calibration point in engineering units
"AIU2" Analog input mid calibration point in engineering units
"AIU1" Analog input low calibration point in engineering units
"AIV5" Analog input mid high calibration point analog value
"AIV4" Analog input mid low calibration point analog value
"AIV3" Analog input high calibration point analog value
"AIV2" Analog input mid calibration point analog value
"AIV1" Analog input low calibration point analog value
"AIS4" Analog input LINE 4 span (1/slope)
"AIS3" Analog input LINE 3 span (1/slope)
"AIS2" Analog input LINE 2 span (1/slope)
"AIS1" Analog input LINE 1 span (1/slope)
"AIO4" Analog input LINE 4 offset
"AIO3" Analog input LINE 3 offset
"AIO2" Analog input LINE 2 offset
"AIO1", Analog input LINE 1 offset

The following command calibrates the selected analog input when written:

"AIBC" Analog input batch calibration

ANALOG OUTPUT COMMANDS

NOT AVAILABLE ON 6400 Series FCUs.

"AOX" Analog output index selection

"AOS" Analog output value selection

"AOR" Reset analog output value

"AOHC" Analog output high calibration point units value, analog (counts) value is read.

"AOLC" Analog output low calibration point units value, analog (counts) value is read

"AOV" Analog output analog value

"AO" Analog output percent

"AOUL" Analog output low calibration units value

"AOUH" Analog output high calibration units value

"AOVL" Analog output low calibration analog value

“AOVH" Analog output high calibration analog value

"AOSP" Analog output calibration equation slope

"AOOF" Analog output calibration equation constant

WRITE ONLY COMMANDS

"SC2" 2nd level security code

"SC1" 1st level security code

"WU" Wake up

"RV" Reset accumulated volume and start new log periods

RV = 1 resets volume

"RSP" Start new log periods

“AM” AP marker, units value entered, scaled value read

“DM” DP marker, units value entered, scaled value read

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

ALARM CRYOUT COMMANDS

Three new Local Terminal Interface commands have been added to support FCU Alarm Cry out.

1. COE - Cryout Enable
2. COD - Cryout DCD Delay
3. COF - Cryout Frequency

Cryout Enable (COE) activates alarm cryout mode. Since remote Alarm Monitoring is valid for only one host, cryout is limited to one port only. The following commands list possible settings for cryout.

For all series 6400 and 6700 FCUs

COE = 0	Disable alarm cryout
COE = 1	Remote Comm. 1
COE = 2	Local Port
COE = 3	Remote Comm. 2
COE = 4	Remote Comm. 3 (series 6700 only)

Cryout Enable is set to the port number which is supporting the alarm cryout in order to enable alarms to be sent to the host without being polled. Cryout DCD Delay is the number of remote protocol listen cycles during which data carrier detect must be clear in order to allow alarm to be broadcast. At the beginning of each listen cycle, data carrier detect state is read. If DCD is set, a counter is cleared. If DCD is reset, the counter is incremented. When the counter is greater than Cryout DCD Delay the alarm maybe broadcast. Cryout Frequency is the number of seconds to wait between alarm broadcasts. A one second task increments a timer each second. This timer is reset when alarms are actually broadcast. Cryout Enable, Cryout DCD Delay and Cryout frequency conditions must be met before an alarm will be broadcast by the FCU.

Cryout Theory of Operation

Alarm Cryout allows TOTALFLOW FCUs and RTUs to initiate alarm broadcasts. Alarm configuration is done using Alarm Page editing supported by CCU 5.x software. When an alarm condition exists in the remote unit, the unit will broadcast the alarm page to the host if three conditions are satisfied.

1) Cryout Enable is set to the port number which is running CCU remote protocol and is to report the alarm
2) Cryout DCD clear counter exceeds Cryout DCD Delay
3) Cryout Frequency timer exceeds the Cryout Frequency

Host software must scan for cryout alarms when not servicing poll or collection requests. The host acknowledges alarms received from an remote unit by transmitting a single Remote protocol frame containing the number of alarms received. If this number matches the current number of alarms pending in the remote unit, the remote unit clears all pending alarms. If the number of alarms received by the host and transmitted to the remote in the acknowledgment does not match the current number of pending alarms in the remote unit, none of the pending alarms are cleared in the remote unit. These alarms will be broadcast again when the conditions listed in the previous paragraph are met. To disable cryout, set the COE command to zero (COE = 0)

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

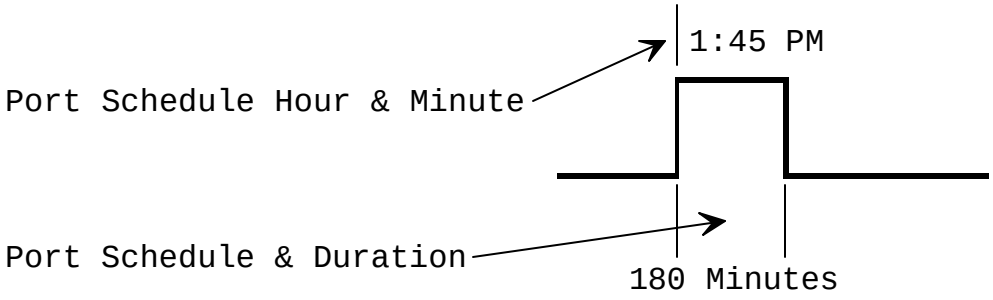
Communications Scheduling COMMANDS

The Standard TOTALFLOW Low Power remote protocol (TLPRP) uses short period duty cycling to reduce power used by remote communications equipment. In the following examples, this device is a radio. When the duty cycle is set to 4 seconds, the FCU powers the radio from 18 to 158 milliseconds (depending on baud rate), plus user selectable power on delay time, every 4 seconds. This type of duty cycling works well for communications devices with relatively short power up times. For devices with slow power on times or in applications where "around the clock" data access is not needed, a new communications schedule option is available. Schedule operation may also be used with Modbus, Square-D, or other protocols.

Communications Schedule Operation
The *Communications Schedule* option may be operated in one of two modes.

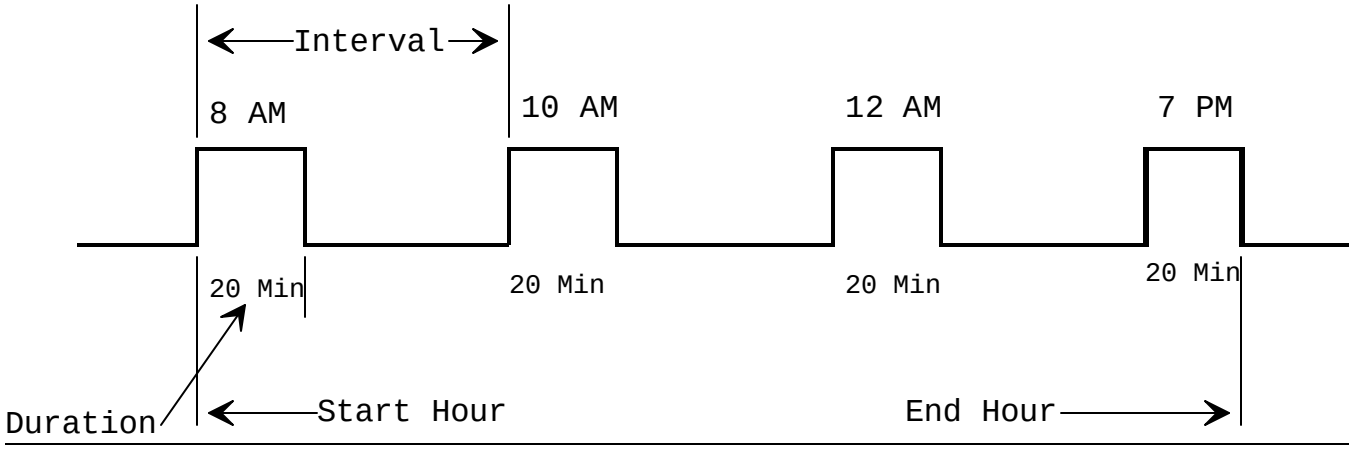
Mode 1: Allows the communications device to be powered on at a selected time of day for some number of minutes. After the duration has expired, the FCU powers off the switched VBATT line and stops the communications protocol task. The FCU still uses the short duty cycle during the prescribed "on time". If the unit cannot be short duty cycled, the duty cycle parameter should be set to zero. The previously explained alarm cryout feature of the TOTALFLOW Remote Protocol will power on the communications device to report alarms if the number of un-acknowledged alarm reports from the FCU does not exceed the exception retry limit. When the FCU is reporting alarms using the host initiated alarm by exception method, the FCU will listen for the report alarms broadcast only during the selected "on" period.

Mode 1, example 1: power on at 1:45 PM for 180 minutes. This example may be selected by setting the port schedule flags to 1 for time of day mode, the port schedule hour for 13 (1:00 PM), the port schedule minute to 45 and the port schedule duration to 180.



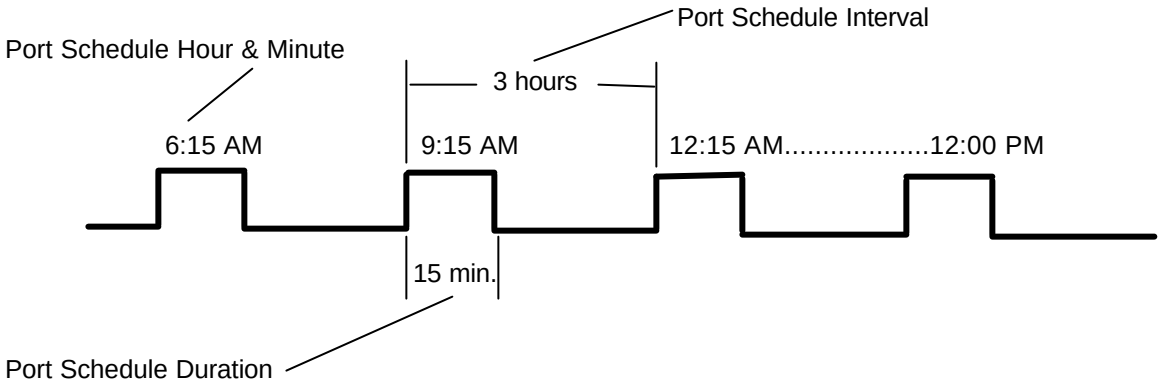
Mode 2: This method allows the communication device to be powered on every "N" hours for "M" minutes duration. A start or "sync" hour may be entered for the cycle, and an off hour may be entered to limit the cycling time.

Mode 2, example 1: starting at 8:00 AM, power on every 2 hours for 20 minutes until 7:00 PM. This example may be selected by setting the port schedule flags to 2 for cycle interval, port schedule hour to 8, port schedule minute to 0, port schedule interval to 2, port schedule duration to 20 and port schedule hour off to 19.



Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

Mode 2, example 2: Power on every 3 hours for 15 minutes, starting at 6:15 AM, continuing all day. This example may be selected by setting port schedule flags to 2 for cycle interval, port schedule hour to 6, port schedule minute to 15, port schedule interval to 3, port schedule duration to 15 and port schedule hour off to 6. Note that setting the port schedule hour off equal to the port schedule hour indicates that the cycle is to continue throughout the day.



Communications Schedule Commands
The following local protocol commands are used to set Communications Schedule parameters.

Remote Port 1 (6400 and 6700 FCUs) ----------

"RPSF" Remote Port 1 Schedule Flags
0 = Normal duty cycle
1 = Time of Day
2 = Cycle Interval

"RPSH" Remote Port 1 Schedule Start Hour
0 = midnight
23 = 11 PM

"RPSM" Remote Port 1 Schedule Starting Minute
0 - 59

"RPSD" Remote Port 1 Schedule duration, in minutes (duration of on time)
0 - 65,534

"RPSI" Remote Port 1 Interval hours, in hours (every n hours)
0 - 254

"RPSS" Remote Port 1 Schedule status (can be used to test operation)
0 = off
1 = on

"RPHO" Remote Port 1 Schedule Hour Off, (off hour to stop cycle)
0 - 23

“RPXR” Remote Port 1 eXception Retry
0 - 255

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

Remote Port 2 (6400 and 6700 FCUs) ----------

"APSF" Remote Port 2 (Aux Port) Schedule flags
0 = Normal duty cycle
1 = Time of Day
2 = Cycle Interval

"APSH" Remote Port 2 (Aux Port) Schedule Start Hour
0 = midnight
23 = 11 PM

"APSM" Remote Port 2 (Aux Port) Schedule Start Minute
0 - 59

"APSD" Remote Port 2 (Aux Port) Schedule duration, in minutes (duration of on time)
0 - 65,534

"APSI" Remote Port 2 (Aux Port) Interval hours, in hours (every n hours)
0 - 254

"APSS" Remote Port 2 (Aux Port) Schedule status (can be used to test operation)
0 = off
1 = on

"APHO" Remote Port 2 (Aux Port) Schedule hour off, (off hour to stop cycle)
0 - 23

“APXR” Remote Port 2 (Aux Port) eXception retry
0 - 255

Remote Port 3 (6700 FCUs ONLY) ----------

"BPSF" Remote Port 3 (Aux Port B) Schedule flags
0 = Normal duty cycle
1 = Time of Day
2 = Cycle Interval

"BPSH" Remote Port 3 (Aux Port B) Schedule Start Hour
0 = midnight
23 = 11 PM

"BPSM” Remote Port 3 (Aux Port B) Schedule Start Minute
0 - 59

"BPSD" Remote Port 3 (Aux Port B) Schedule Duration, in minutes (duration of on time)
0 - 65,534

"BPSI" Remote Port 3 (Aux Port B)Interval hours, in hours (every n hours)
0 - 254

"BPSS" Remote Port 3 (Aux Port B) Schedule Status (can be used to test operation)
0 = off
1 = on

"BPHO" Remote Port 3 (Aux Port B) Schedule Hour Off, (off hour to stop cycle)
0 - 23

“BPXR”- Remote Port 3 (Aux Port B) eXception Retry
0 - 255

Feature flag 0x80000 in the FCU extended feature flags long word indicates communications schedule support.

NOTES

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

The following section describes TOTALFLOW - LPTI - FCU modem support.

Commands
FCU modems are pre-configured using backward compatible defaults. FCU modems may be configured in the field using Local Protocol Terminal Interface command “MODM”.

The “MODM” command runs a program which allows a laptop PC host computer to communicate with the modem over the FCU local port. The following special commands are supported.

- *BAUD* - changes the baud rate between the FCU and the modem; this is a toggle type command which increases the baud rate each type the command is entered up to the maximum baud rate of 38400. When the maximum baud rate is reached, the next baud command sets the modem port baud rate to the minimum rate of 1200 baud.

- *PORT* - changes the modem port. This is also a toggle type command. Each time the command is entered the FCU selects another port The local port cannot be selected.

- *DIALn* - dials the phone number stored using the local command MDL1, MDL2, MDL3 or MDL4 commands. DIAL1 dials the number stored by the MDL1 command. DIAL2 dials the number stored by the MDL2 command and so forth.

- *HANGUP* - issues the modem attention string ‘+++’ followed by the ‘ATH’ command. Next the modem port is initialized. Then the modem initialization string stored by the local command MDMI.

- *BINARY* - allows binary files to be transferred between the laptop PC host computer and another PC using the FCU modem. Once this mode is entered, the MODM program will not recognize the MODM commands. In this mode all entries are sent to the modem and all received data is sent to the local port. To exit this mode, disconnect the local host from the FCU local connection at the round din connector.

“MODM” allows the local host PC to communicate to the FCU modem. AT commands may be sent to the modem and modem responses are sent to the local port. Modem parameters may be entered and saved for recall using the profiles available in the modem.

The following Local Protocol Terminal Interface commands support FCU modem operations.

- AMCT - Remote Comm. 2 (Aux port) modem connect time-out. This is the maximum number of seconds which the FCU will wait for a modem dial out connection over Remote Comm. 2.

- AMDT - Remote Comm. 2 (Aux port) modem disconnect time-out. This the maximum number of seconds which the FCU will wait for a modem disconnect response over Remote Comm. 2.

- BMCT - Remote Comm. 3 (Aux B, 6700 only) port modem connect time-out. This is the maximum number of seconds which the FCU will wait for a modem dial out connection over Remote Comm. 3.

- BMDT - Remote Comm. 3 (Aux B, 6700 only) port modem disconnect time-out. This the maximum number of seconds which the FCU will wait for a modem disconnect response over Remote Comm. 3.

- RMCT - Remote Comm. 1 modem connect time-out. This is the maximum number of seconds which the FCU will wait for a modem dial out connection over remote port.

- RMDT - Remote Comm. 1 modem disconnect time-out. This the maximum number of seconds which the FCU will wait for a modem disconnect response over Remote Comm. 1.

- MPSZ - Modem partition size. This command may be used to adjust the size of the modem partition (file). It is defaulted to hold the modem initialization string and 4 dial strings. If these are not used, the

modem partition may be reduced.

- MDMI - Modem initialization string. This command may be used to store or display up to 254 characters to be sent to the modem at initialization The symbols "^M" are used to represent the carriage return character.

- MDL1 - Modem dial string 1. This command is used to store or display up to 254 characters to be used by the modem to dial.

- APUD - Remote Comm. 2 (Aux port) power up delay. This is number of milliseconds the FCU will delay after powering the interface and before sending the modem "init" string.

- BPUD - Remote Comm. 3 (Aux B port, 6700 only) power up delay. This is number of milliseconds the FCU will delay after powering the interface and before sending the modem "init" string.

- RKD - Remote Comm. 1 power up delay. This is number of milliseconds the FCU will delay after powering the interface and before sending the modem "init" string.

- AATM - Remote Comm. 2 (Aux port) activity time-out. If this number of minutes elapses with no protocol activity, the port task will be killed and restarted.

- BATM - Remote Comm. 3 (Aux B port, 6700 only) activity time-out. If this number of minutes elapses with no protocol activity, the port task will be killed and restarted.

- RATM - Remote Comm. 1 activity time-out. If this number of minutes elapses with no protocol activity, the port task will be killed and restarted.

- LATM - Local port activity time-out. If this number of minutes elapses with no protocol activity, the port task will be killed and restarted.

- AXI - Remote Comm. 2 (Aux port) interface type. Select interface type 4 for modems.
- BPXI - Remote Comm. 3 (Aux B, 6700 only) port interface type. Select interface type 4 for modems.
- RXI - Remote Comm. 1 interface type. Select interface type 4 for modems.

Operation

FCU 14.4 or 2400 baud modems may be configured for dial in operation. In this mode, they are compatible with the line-powered UDS 1200 baud modems. FCU modems also support dial out for Alarm Cryout. Alarm Cryout is configured as described in the document fcucryou.doc. When MODEM interface is selected and the alarm condition is enabled and set, the FCU attempts to connect to a host modem by dialing the dial string stored by the MDL1 command. Modem dials strings 2 through 4 are not used by Alarm Cryout at this time since Remote Alarm by Exception and Cryout support only single host connections. When Alarm Cryout establishes modem connection, the alarm is broadcast and the FCU waits for acknowledgment from the host. If the acknowledgment is received or timed out, the FCU sends the attention and hang-up strings to the modem. The "hang-up" procedure also powers down the communications interface and the operate line associated with the communications port. If the modem is powered from the operate line, it will be powered down.

A port inactivity time-out option has been added. If the activity time-out value for a port is set to a value other than zero (default), the communications monitor task increments a 1 minute counter each 60 seconds. The port protocols reset this counter each time a communications request is received. If no communications requests are received for the duration of the activity time-out, the communications task monitor will restart the port task. The activity time-out value is set using the AATM, BATM, RATM or LATM commands. Values entered are in minutes. This feature may be used to reset and re-initialize the modem periodically.

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

Local Protocol "*Batch*" Commands

Description

The TOTALFLOW Local Protocol Batch Command allows user configurable parameters to be downloaded from the FCU to an ASCII text file. The file can be modified or saved and uploaded to the FCU. This allows the user to be able to "cold start" the FCU and reload previous configuration file data instead of having to manually re-enter the parameters using the PCCU or CCU host software. The "BAT" command may be entered from any terminal emulation program such as "Windows Terminal" or Procomm Plus, etc.

Usage

Connect the Laptop PC to the FCU Local Port connector.

Execute a PC terminal Emulation program and verify port settings. Port settings should be 2400 bps, 8 data bits, 2 stop bits, no parity. Set the terminal emulation program to: Half Duplex, No Local Echo.

Type "TERM"<ENTER>. If term is not echoed, the port settings are incorrect. The FCU should respond with "TF>". If the FCU fails to respond with the "TF>" prompt, check port settings and connections and try again. If the FCU responds with the "TF>" prompt it is ready to respond to Local Protocol Terminal Batch Commands. Section 3 describes the "BAT" command set and usage. See Appendix "A" for a typical TXT file contents.

Download / Receive

To save the FCU configuration to a file, type "BAT" at the "TF>" prompt. DO NOT hit "ENTER" or "carriage return".

Set your Terminal Interface Program (TIP) to receive a file in ASCII or TEXT mode.
If you are using "Windows Terminal" program, select "Transfer" from the menu bar.

From the "Transfer" men, select "Receive TEXT File". A file selection dialog box is displayed. Select or type a new file name to store the file name as. It is recommended that the file name be the same as the meter ID. EXAMPLE: 1234567.890 (maximum ID possible is 10 characters).

After entering the file name in the file dialog box, the dialog disappears and a status bar with "Stop" and "Pause" buttons appears at the bottom of the Terminal window. Hit "ENTER" or "carriage return". The FCU will send a series of Local Protocol Terminal Interface (LPTI) commands and values for current configurable parameters.

When the FCU stops sending commands, hit the "STOP" button. The file name you previously selected, now contains a list of commands and values which can be sent to the FCU after "Cold Start" to restore the configuration.

Upload / Send

To send the file to the FCU, select "Transfer" from the "Terminal" top menu bar.

From the "Transfer" menu, select "Send TEXT File". A file selection box will appear. Select the file with the meter ID to be uploaded that was saved in the step outlined in section 4.2.4 above. When the file is selected, the dialog box disappears and a status bar with "Stop" and "Pause" buttons appears at the bottom of the Terminal window. The file transfer (Upload) process begins automatically. A graph in the status bar shows how much of the file has been transferred and how much is left to be sent.

When the transfer is complete, select the "STOP" button.

Disconnect the PCCU connector. The FCU will return to normal operation. When the PCCU is re-connected to the FCU, the FCU will respond in the normal default PCCU Local Protocol.

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

Appendix “A”

The following listing represents a typical “BAT” file, downloaded from an FCU to an ASCII text file.
NOTE: The values located in this example will be different than what you will see on your particular unit.

LPP = 3
LC = 1
SC1 = 0000
SC2 = 0000
TAP = 0.000000
TDP = 0.000000
TPI = 0.000000
TRTD = 0.000000
MDP = 50
MLP = 970
MEL = 200
RCB = 4096
LCB = 4096
ACB = 4096
LDC = 3
MBA = 1
LDW = 7
RPP = 0
RBR = 3
RDB = 8
RPR = 0
RSB = 2
RDC = 0
RPUD = 80.000000
RXKD = 419.999981
RXUD = 40.000000
RXI = 12
B=3
W=0
RKD = 80.000000
RXD = 419.999981
XUK = 40.000000
RDW = 7
APP = 0
ABR = 3
ADB = 8
APR = 0
ASB = 2
ADC = 3
APUD = 80.000000
AXKD = 419.999981
AXUD = 40.000000
AXI = 0
ADW = 7
CD = 0
m=0
CB = 0
Td = 07/20/95 10:48:37

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

Id = FCU-64NN
L= totalflow tm
VC = 0.000000
OC = 1
Oha = 2046.999931
Ola = 0.000000
Ohh = 2046.999931
Olh = 0.000000
Oht = 419.999981
Olt = 0.000000
Ohf = 1000000.000000
Olf = 0.000000
PIK = 1.000000
RPA = 0
Zi = 0.000000
Tf = 60.000000
rla = 29.400001
rma = 89.699993
rha = 164.700007
har = 163.741970
lar = 15.404953
mar = 88.392191
rmla = 59.549999
rmha = 127.200007
mlar = 51.898570
mhar = 126.067078
acal = 1
rlh = 0.000000
rmh = 75.000000
rhh = 150.000000
hhr = 149.851332
lhr = 0.326683
mhr = 74.903846
pch = 0.275993
pcp = 163.741970
pchb = 0.318136
pchl = 15.303071
pcc =-0.000314
rmlh = 37.500000
rmhh = 112.500000
mlhr = 37.615266
mhhr = 112.377596
hcal = 1
To = 0.000000
AOHA = 0.000000
AOLA = 0.000000
AOHD = 0.000000
AOLD = 0.000000
AOHT = 0.000000
AOLT = 0.000000
AOHF = 0.000000
AOLF = 0.000000
BTU = 1000.000000
F=1.000000
G=0.600000
BSB = 129

ORD = 1.000000
PID = 2.067000
VS = 0.010268
C=0.000000
N=0.000000
C1=100.000000
Fp = 1.000000
Ft = 1.000000
Pb = 14.730000
Tb = 60.000000
SB = 64
DB = 128
Fb = 210.225630
K=1.300000
FCd = 0.600000
APSB = 40
APDB = 18
ZBA = 0.999590
OPM = 9.250000
PM = 6.200000
CHT = 1
CT = 2
ZM = 11
BP = 14.700000
VCP = 60
LGP = 3600
LSA = 0
BATT = 0
H2O = 0.000000
H2S = 0.000000
He = 0.000000
C2 = 0.000000
C3 = 0.000000
NC4 = 0.000000
IC4 = 0.000000
NC5 = 0.000000
IC5 = 0.000000
NC6 = 0.000000
NC7 = 0.000000
NC8 = 0.000000
NC9 = 0.000000
NC10 = 0.000000
O2 = 0.000000
CO = 0.000000
H2 = 0.000000
AR = 0.000000
WC = 0.000000
WB = 7.000000
pic = 1
x = 0
xs = 0
x = 1
xs=5
x=2
xs=5
x=3

xs=5
x=4
xs=5
x=5
xs=0
x=6
xs=0
x=7
xs=5
x=8
xs=5
x=9
xs=5
x=10
xs=5
x=11
xs=0
x=12
xs=0
x=13
xs=0
x=14
xs=5
x=15
xs=5
x=16
xs=0
x=17
xs=0
x=18
xs=0
x=19
xs=0
x=20
xs=5
x=21
xs=0
x=22
xs=0
x=23
xs=0
x=24
xs=0
x=25
xs=0
x=26
xs=0
x=27
xs=0
x=28
xs=0
x=29
xs=0
x=0
LC=0
LPP=3

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

Appendix “B”

The “x” registers listed above are associated with the FCU display items in the default list as referenced in Section 3 - “x” and “dsp” commands. The following display “x” tables are presented to assist the user in locating a particular “x” display parameter location.

All display items listed below as “PROM ID” are spare slots which may be assigned using the “DSMR” command.

Model 6410, 6413 Orifice

0 = SLEEP
1 = FLOW TEMP
2 = PRESSURE
3 = DIFF PRESS
4 = BATTERY
5 = M_FLOWRATE
6 = CHARGER
7 = ACCUM VOL
8 = FLOWRATE
9 = YEST DP HI
10 = YEST DP LO
11 = PERIOD VOL
12 = LOC/ID
13 = M_FLOWRATE
14 = YEST VOL
15 = DATE/TIME
16 = BTU RATE
17 = PERIOD BTU
18 = YEST
19 = ACCUM BTU
20 = ACC CDVOL
21 = ACC CDBTU
22 = PREV CDVOL
23 = PREV CDBTU
24 = AI 1
25 = AI 2
26 = *PROM ID (Spare)*
27 = *PROM ID (Spare)*
28 = *PROM ID (Spare)*
29 = Test Plot
30 = VARIABLE
31 = POWER UP

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

Model 6411, 6414 Pulse

0 = SLEEP
1 = FLOW TEMP
2 = PRESSURE
3 = PERIOD VOL
4 = BATTERY
5 = ACCUM VOL
6 = ACCUM VOL
7 = FLOWRATE
8 = FLOWRATE
9 = YEST HI
10 = YEST LO
11 = HOUR VOL
12 = HOUR VOL
13 = YEST VOL
14 = YEST VOL
15 = DATE/TIME
16 = LOC/ID
17 = VARIABLE
18 = CHARGER
19 = PULSE CNTS
20 = BTU RATE
21 = HOUR BTU
22 = YEST BTU
23 = ACCUM BTU
24 = ACC CDVOL
25 = ACC CDBTU
26 = PREV CDVOL
27 = PREV CDBTU
28 = AI 1
29 = AI 2
30 = Test Plot
31 = POWER UP

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

Model 6610, 6613 (CB-180) Orifice

0 = SLEEP
1 = FLOW TEMP
2 = PRESSURE
3 = DIFF PRESS
4 = BATTERY
5 = M_FLOWRATE
6 = CHARGER
7 = ACCUM VOL
8 = FLOWRATE
9 = YEST DP HI
10 = YEST DP LO
11 = PERIOD VOL
12 = LOC/ID
13 = XDUCR TEMP
14 = YEST VOL
15 = DATE/TIME
16 = BTU RATE
17 = PERIOD BTU
18 = YEST BTU
19 = ACCUM BTU
20 = ACC CDVOL
21 = ACC CDBTU
22 = PREV CDVOL
23 = PREV CDBTU
24 = *PROM ID (Spare)*
25 = *PROM ID (Spare)*
26 = *PROM ID (Spare)*
27 = *PROM ID (Spare)*
28 = *PROM ID (Spare)*
29 = *PROM ID (Spare)*
30 = Test Plot
31 = POWER UP

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

Model 6610, 6613 (CB-180) Orifice

0 = SLEEP
1 = FLOW TEMP
2 = PRESSURE
3 = PERIOD VOL
4 = BATTERY
5 = ACCUM VOL
6 = ACCUM VOL
7 = FLOWRATE
8 = FLOWRATE
9 = YEST HI
10 = YEST LO
11 = HOUR VOL
12 = HOUR VOL
13 = YEST VOL
14 = YEST VOL
15 = DATE/TIME
16 = LOC/ID
17 = XDUCR TEMP
18 = CHARGER
19 = PULSE CNTS
20 = BTU RATE
21 = HOUR BTU
22 = YEST BTU
23 = ACCUM BTU
24 = ACC CDVOL
25 = ACC CDBTU
26 = PREV CDVOL
27 = PREV CDBTU
28 = *PROM ID (Spare)*
29 = *PROM ID (Spare*
30 = Test Plot
31 = POWER UP

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface

Technical Bulletin # 44 (rev. 2.8)
FCU Local Protocol Terminal Interface