Operation guide XSeries G4 plunger operation with PCCU 2104975-001 rev. AA

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1.0 Overview

Operating the ABB Totalflow Plunger application requires the user to understand some basics of our PCCU (Portable Calibration and Collection Unit) software. This guide will give the user basics of interacting with the Plunger application using PCCU.



Figure 1 System components

1.1 How to use this guide

This document will instruct the user that is familiar with Plunger Lift, how to operate the PCCU screens within the ABB Totalflow Plunger Lift application. If you are new to the plunger application see reference section for additional information.

1.2 Assumptions

The guide focuses on operating the PCCU screens with the Totalflow Plunger application. The following is assumed

- PCCU is installed
- PCCU cable is connected to Totalflow device
- Totalflow device has Plunger application running
- All external devices required for the application are connected properly and calibrated.

1.3 Prerequisites

The procedures described in this document apply to the following:

– PCCU software version 7.31 and later

- PCCU interface cable; can be serial ,USB or Ethernet
- XRC^{G4} Part# 2103329-001 software version 2103132-039 and later
- XFC^{G4} Part# 2103328-001 software version 2102861-045 and later

1.4 Background

Numerous PCCU screens exist that require the user understanding in the effort of operating the plunger lift application. It is the goal of this document to give the user a quick instruction of navigating the critical screens within the application.

2.0 Setting up connection with PCCU

This instruction will guide the user in initially connecting to the Totalflow device using a serial connection.

2.1 How to setup connection method (serial)

- 1) From the PCCU initial screen select the "setup" icon in the toolbar.
- 2) Select "Serial port" radio button to begin serial port setup
- 3) Next select "PCCU Com. Port" using the drop down menu, set this on your known serial port for your laptop.
- 4) Finally, in the "Auto Connect' area in the lower section of the screen, select "Entry". This will enable your PCCU setup to open and view the Plunger app each time you launch PCCU.
- 5) Next "Close" out of setup, then click "Entry" in toolbar and go to Plunger lift page.

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Setup Directory Patha Communications Setial pot Connection param PCCU Com. Pot: Initial Baud: Max Baud: Stop Bts: Timeout (ms): Retry Limit:	Macro Setup PCCU Connect Method: TCP/IP ActiveSync (NGC) Buetooth COM5: COM5: Collect Security Code: 0000 Valve Control Pencte Protocol Valve Control Valve Control	
Show Comm St	ats on Status Bar	
Auto Connect	Entry O Collect O Initial Connect	
Cuse default Rol Default Role B Default Role B	e Based Access Control Credentials ased Access Control Usemame ased Access Control Password	
Ready	Not Connected to Device	Login: user



2.2 Setting up view within PCCU

We are now ready to "connect" to the Totalflow device.

- 1) Next, setup your "View" of what plunger details you can see.
- 2) Go to "Totalflow" in the tree view and select "Advanced" for the view. The "Basic" view will not give us enough detailed screens and "Expert" has a lot more screens to view, but is not really required for operations.



Figure 3 View screen

2.3 View status of main "Shutdown" application

The Shutdown application will affect the plunger application, meaning that it can "shut-in" the site and not allow individual Plunger applications to operate. The following steps will instruct the user in working with the Shutdown system.

- 1) "Shutdown DO", displays the status of the Shutdown DO. The two indications are: RUN (system running) and SHUTDOWN (shutdown mode).
- 2) "Last Event", indicates shutdown reason encountered by the system. This could be one of the following; AI, DI, POWER, or Reset.
- "RESET remote", represents the input PCCU uses to cause a reset. The two options are: 0 Inactive or 1 Reset.

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TOTALFLOW	Status DIs AIs DOs Setup Events]		1
···· Totalflow - TCP ···· Totalflow - USB	Description	Value	Units	Comment
MMI Serial - COM0 TF Remote - COM1	STATUS 161.0.2 System Status	Running		
Interface I/O Interface	16 Shutdown DO	RUN		
⊞- Flow Measurement ⊞- Display	161.1.0 Current Alarm Status	Run/Startup START/ENABLE	07/31/13 09:22:25	Aggregate of sub alarms Reason / Date
Holding Registers ⊪ Operations				
n Trend System n Plunger	CONTROLS 161.1.1 Safety System Control	ENABLED		Safety System operation
	16 RESET remote	0 Inactive	- 1->Reset	Reset from PCCU or remotely
	161.3.8 SHUTDOWN remote	0 Inactive	1->Shutdown	Shutdown from PCCU or
	Reread Monitor	Print	Screen Save Send	Close Help X Help 💓
Ready	p	#Polls: 10	#Errors: 0 Connected	d to XFC-howard Login: user

Figure 4 Shutdown screen

2.4 Navigation of Plunger application

2.4.1 Summary screen

Now we are ready to move through the Plunger application screens. Select the correct location of your Plunger application in your tree view and then the "+" sign to expand the view.



When you first "select" the plunger application in the tree, it may take a few moments for you to be able to view due to the amount of data being read by PCCU

- 1) Select your Plunger app icon in the tree, and you should see the "Summary Screen". This is an "Overview" screen in which we can see various updates of activity within the application.
- 2) To "refresh" the values on the screen use the "Reread" or "Monitor" buttons at the bottom left on your screen.

1 🖻 🖪 🖸 💽	ĩn 🋃		9 🗓 🔧	Setup <	۲ 				
	Summary								
···· Totalflow - TCP				1	1	-	1	1	_
Totalflow - USB	424.4.0	Description	Value	Limit	Time Limit	Tune	Min	Max	
	121.1.0	Enable	Enable	_					
- Modbus - COM2	121.1.8	Reset	non-reset						
	121.1.18	Current State	Valve Closed	00:00:01:59	00:00:02:00	1.5			
	121.1.134	Shutdown status	ok						
Flow Measurement		******** VALVES *******							
- Analysis	121.1.25	Main Valve	Closed	Auto Open	Auto Close				
- Digital Outputs		****** CLOSE ****** 6							
No Flow		1: Falling/Closing Valve							-
- Adv Setup	121.4.4	Plunger Fall Delay	00:00:01:01		00:00:01:00				-
Speed of Sound		2: Closed							=
- Holding Registers	121.4.9	Close Timer	00-00-01-59		00.00.02.00				
	404.4.40	2. Usid Class	00.00.01.33		N				
H- Trend System	121.1.10	2: Hold Close	\		None				
e Plunger	121.1.17	******** OPEN ******	/		None	•			
		3: Plunger Arriving							
-1:Falling	121.4.24	Arrival Timer	00:00:00:00		00:00:00:30	00:00:07:00	00:00:09:00	00:00:40:00	
2:Closed		6: Flowing							
OPEN	121.4.32	AfterFlow Timer	00:00:01:01	00:00:01:00					
		******** FAIL *******							1
6:Afterflow	121.1.15	0: Fail Reason	None						٦.
Statistics	•					J			l.`` •

Figure 5 Summary screen

- 3) The value in the "Enable" field sets the operation "Mode" for the plunger. For example, "Enable", puts app in *run mode*, "Manual", puts app in *pause mode*, "Disable", *stops app* and leaves valve in position it is currently in.
- 4) The "Reset" command initializes the logic to the *startup mode*. Once you select "Reset" and Send command, the value will change back to "non-reset".
- 5) "Current State" indicates what state the plunger is currently in. The following table describes the possible states:

State	Description
Fail	Indicates that plunger has failed to arrive
Closing Valve	Indicates that the production valve is closing, and the system is waiting for the plunger fall delay to expire.
Valve Closed	Indicates the plunger fall delay has expired, and the system is waiting for an open valve condition to be initiated.
Plunger Arriving	Indicates that the production valve has opened, and the system is waiting for the plunger to arrive.
Blow Valve	Indicates that the plunger has not yet arrived, blow valve conditions have been met and a secondary valve has been opened.

State	Description
Plunger Arrived	This is an instantaneous state that indicates that the plunger has arrived.
Afterflow	Indicates that the production valve is open, the plunger has arrived and close conditions are waiting to be met.

- 6) Check "VALVE" position. "Auto Open" indicates that the valve "open" is controlled by the plunger application. If "Force Open" is selected in the drop down list, the valve will be forced "open". It is suggested that the user perform a "Reset" command to re-start the controller after manually controlling the valve. "Auto Close" command behaves the same as "Auto Open" except controls the "close" condition of the valve.
- 7) "CLOSE" section, allows the user to view the close options selected and their status.
- 8) "OPEN" section, allows the user to view the open options selected and their status.
- 9) "FAIL", allows the user to view the reason the plunger failed to arrive.

2.4.2 Setup

In the Plunger "Setup" screen, we will setup various parameters concerning startup, valves, and inputs to the Plunger application.

In the "General Setup" tab, we will setup some general information about the well, optimization on/off, and startup conditions.

- 1) Set the value of "Cycle Start" to "close-close". This indicates valve position is closed at the beginning of the plunger cycle.
- 2) Set the value of "Startup Mode" as "1Closing Valve". This will start the well in its "off time" when it fails and is restarted.
- 3) Set "Optimization" to: Enable or Disable. Enabling this feature allows for tuning to be running.
- 4) "Well Geometry", allows the user to enter data concerning the well parameters.

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TOTALFLOW Communications	Genera	al Setup Valve Setup Tube Se	tup Input Setup					
Totalflow - TCP	Totalflow - USB Description Value Units Comment							
MMI Serial - COM0	12	1.4.2 AfterFlow	00:00:00:18	00:00:01:00	State / Timer / Max Timer			
TF Remote - COM1		COMMON SETUP	-		Other setup variables can be found in their specific State tab			
Modbus - COM2	12	1.1.0 Plunger Control	Enabled		Enable plunger control state machine. Disable resets the con			
E Flow Measurement	12	1.1.2 Cvcle Start	Close-Close	0	Cycle runs from Open-Open or Close-Close			
Setup	12	1.0.10 Trend FileName		U				
Analysis								
Digital Outputs		DESET OPTIONS						
Adv Setup	42	14.00 Charles Made	4 Classing Makes		Chandras adoba an Escabiliz/Danada			
■ Display	12	1.1.20 Startup Mode	1 Closing valve	3	startup state on Enable/Reset			
Holding Registers	12	1.1.3 Safety Reset Mode	Disable					
Operations Trend System								
Plunger		TUNING						
Setup	12	1.1.1 Optimization	Disabled	3	Enables or disables the continuous adjustment of all setpoin			
	12	1.5.28 Plunger Fail Tune	1.5000		If plunger fails, multiply the next tuning by this factor			
OPEN Statistics								
±- statistics		WELL GEOMETRY -	-	4				
	12	1.5.26 Tubing Length	8000.0000	Length	The length of tubing from the stop to the arrival sensor, use			
	12	1.5.27 Tubing ID	1.9230	Inches	The inner diameter of the well tubing, used to calculate the T			
	12	1.5.23 Fluid Gradient	0.4330		Slug Size Constant (0.433)			
	12	1.2.0 Log Size	30		Size of Cycle, Blow and Fail Logs			
	Re-n	ead V Monitor		Print	Screen Save Send Close Help XHelp 🕷			

Figure 6 Setup screen

In "Valve Setup", we can verify or make changes to our valve setup as needed.

- 5) In "Main Valve fail state", it is usually desired to set valve to "Close", if plunger goes into *fail* mode.
- 6) These settings in "Auto", allows for the plunger application to control the valve. "Force Open", or "Force Close" allows for manually forcing the valve into position. It is recommended after manually operating the valve, to "Reset" the controller by using the "Reset" command (Plunger>Summary>Reset) to allow the controller to reset and re-start.

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	ปัจ	1	😇 🗇 🎾 🖃	🗓 🛠 🛃	<i></i>	[=]D [/
Communications	Ge	eneral Setup	Valve Setup Tube Setup Input	Setup		1
- Totalflow - TCP	l r		Description	Value	State	Comment
MMI Serial - COM0		121.4.2	Closing Valve	00:00:00:11	00:00:01:00	State / Timer / Max Timer
TF Remote - COM1			ON/OFF CONTROL			
Modbus - COM2		121.1.23	Valve Position	Upstream		Valve position relative to meter. This is set from valve
Flow Measurement		121.2.1	Valve Time Limit	5	Seconds	enabled
- Setup		121.2.1		5	beconds	
Analysis			MAIN VALVE SETUD			
Digital Outputs			MAIN VALVE SETUP			Specifies the number and type of outputs used for the
No Flow		121.1.27	Main Valve Type	Latch-I wo output		used
Adv Setup Display		121.3.17	Main Open DO	7.2.4	Low	Address of Main Valve Open Digital Output when Valve
- Holding Registers		121.3.18	Main Close DO	7.2.5	High	Address of Main Valve Close Digital Output when Valve
Operations		121.1.28	Main Valve Fail State	Close 🚺		Fail Main Valve Position
Trend System						
- Plunger Setup		121.1.30	Manual Main Valve Open NOW	Auto 🥏		
CLOSED		121.1.33	Manual Main Valve Close NOW	Auto	9	
OPEN						
Statistics			VALVE CONTROL			
		121 1 24	Valve Controller (Ontion)	Disabled		Ontional - Use Valve Control during flow cycle/Plunger
				I	1	
	۱Ľ					
		Re-read	Monitor		Print Screer	a Save Send Close Help X Help 🧶
Ready				#Pol	ls: 961 #Errors	: 0 Connected to XFC-howard Login: user

Figure 7 Valve setup

In "Input Setup", we can verify or make changes to the inputs for our plunger app as needed.

7) In "Detection Type", make sure that "Plunger" is selected if running a plunger in your application. There is also a setting for "Intermitter" if no plunger is used in your scenario.

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E- TOTALFLOW General Setup Valve Setup Tube Setup Input Setup								
Totalflow - TCP								
Totalflow - USB			Description	Register	Value	Comment		
MMI Serial - COM0		121.4.2	Plunger Arriving	00:00:00:04	00:00:40:00	State / Timer / Max Timer		
TF Remote - COM1								
Modbus - COM2			INPUT VALUE REGISTERS					
Elow Measurement		121.3.6	Casing Pressure Al	0.0.0	0	Address of Casing Pressure AL normal = IOS 3.4 (AI5)		
Setup		121.3.5	External Pressure Al	0.0.0		Address of External Pressure AI. Used for either tubing or line pro		
Analysis		121.3.9	Hold Pressure Register	0.0.0	0	Address of Hold Pressure Al		
No Flow		121.3.10	Open 1 Register	0.0.0	0	Address of Open 1		
Adv Setup		121.3.11	Open 2 Register	0.0.0	0	Address of Open 2		
Display Holding Registers		121.3.12	Close 1 Register	0.0.0	0	Address of Close 1 (in1)		
Operations		121.3.13	Close 2 Register	0.0.0	0	Address of Close 2 (in2)		
Trend System		121.3.26	Hold External Register	0.0.0	Low	Address of Hold External		
Setup								
			MISC REGISTERS					
OPEN		121.1.4	Detection Type	Plunger 🗸		Selects whether a plunger is being used or if the logic will act as		
. Statistics		121.3.0	Plunger Arrival Pl	Plunger	J	Address of plunger arrival Pulse Input - Current		
				Intermitter				
		121.3.27	Restart Button Register	0.0.0		Address of Restart Plunger DI		
		121.3.28	Open button	0.0.0	Low	Address for valve open push button DI		
		121.3.29	Close button	0.0.0	Low	Address for valve close push button DI		
		•				Þ		
		Re-read	Monitor		Print	Screen Save Send Close Help XHelp 🕷		
Ready	, 				#Polls: 96	3 #Errors: 0 Connected to XFC-howard Login: user		

Figure 8 Input setup

2.4.3 "Closed" setup

We now can set the conditions for the valve to "Open".

1) Several conditions can be enabled to "Open" the valve. To use a "Timer" to open the valve, *Enable* "Closed Timer" and set the "Limit" in time.

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TOTALFLOW Ommunications	Close	ed-Setup	Closed-HOLD 2:Close Timer			
Totalflow - TCP			Description.		1.114	0
Totalflow - USB			Description	Value	Limit	Comment
TE Persete COMU		121.4.2	ATTERFIOW	00:00:00:31	00:00:01:00	state / limer / Max limer
Modbus - COM2	1	121.1.16	Hold / Open Reason	None	None	
+ I/O Interface			2:Open Valve Enables			Reasons To End Valve Closed
Flow Measurement	1	121.1.51	Closed Timer	ENABLED	00:00:01:00	Optional - Use timer to open main valve
Setup	1	121.1.62	Tube-Line Open	Disabled	0.0000	Optional - Use tubing-line pressure to open main valve
Analysis Digital Outputs	1	121.1.63	Case-Line Open	Disabled	0.0000	Optional - Use case-line pressure to open main valve
No Flow	1	121.1.67	C-L & T-L Open	Disabled		Optional - Use Case-Line and Tube-Line to open main va
Adv Setup	1	121.1.64	Case-Tube Open	Disabled	0.0000	Optional - Use casing-tubing to open main valve
⊞- Display Holding Registers	1	121.1.66	"C-T & T-L" Open	Disabled		Optional - Use casing-tubing AND Tube-Line to open ma
⊕- Operations	1	121.1.68	Load Ratio Open	Disabled	0.0000	Optional - Use Load Ratio to open main valve
Trend System	1	121.1.124	Foss Gaul Open	Disabled	-3.3511	Optional - Use Foss Gaul to open main valve, LR=C-T/C-L
B- Plunger Setup	1	121.1.54	Tube Pressure Open	Disabled	0.0000	Optional - Use Tubing Pressure to open main valve
- CLOSED	1	121.1.52	Case Pressure Open	Disabled	0.0000	Optional - Use Casing Pressure to open main valve
1:Falling	1	121.1.56	SP Open	Disabled	0.0000	Optional - Use Static Pressure to open main valve
H- OPEN	1	121.1.58	Open 1	Disabled	0.0000	Optional - Use Open 1 to open main valve
Statistics	1	121.1.60	Open 2	Disabled	0.0000	Optional - Use Open 2 to open main valve
	•	1		111		,
	Re	e-read 🔽	Monitor		Print Screen	n Save Send Close Help XHelp 🌉
Ready				#Polls:	1044 #Errors	:: 0 Connected to XFC-howard Login: user

Figure 9 Closed setup

3.0 Reference

Additional information about the ABB Plunger application can be found on our website <u>http://www.abb.com/totalflow</u>. The following chart has direct links to many documents on-line that the user may find helpful concerning plunger lift.

Base Board	I/O Description	Drawing #	ABB Web Site Link	
TFIO DIDO Module	Plunger Lift: Direct I/O option	2102981	Plunger DI-DO Wiring	
XFC	XFCG4 6410/6411/6413/6414 (2103328 BD) TO DRUCK1040/1240GP/APTRANSDUCER	2104128	XFC to Druck wiring	
XFC	XFCG4 (2103328) BOARD PINOUTS	2104122	XFCG4 Board Pinouts	
XFC	Plunger Lift Tubing/Casing & ON/OFF for XFC W Versa-Valves(DI-DO Module)	2103174	XFC to Casing-Tubing & Di/Do versa	
XFC	XFCG4 (2103328 BOARD) COMM2 TO EXT MULTIVARIABLES W/RTD PROBE	2104126	XFC to XMV on com 2	

Base Board	I/O Description	Drawing #	ABB Web Site Link	
XRC	Plunger Lift on/off for XRC,Tubing/Casing,DI-DO Module(Arrival Sensor)	2102983	XRC to Tubing/Casing	
XRC	Plunger Lift Valve Control(wTubing, Casing, Arrival Sensor) using Valve Control Module	2102985	XRC to VIv Ctl Module	
XRC	XRCG4 (2103022 BD) COMM1 TO Ext MULTIVARIABLE W/RTD PROBE	2104127	XRC to XMV on com 1	
XRC	XRCG4 (2103329 BD) AI TO 2-WIRE TRANSMITTER(ANALOG INPUT) W/EXTERNAL 12/24VDC POWER	2104337	XRC to Ext Xmitter with Ext Pwr	
All G4 products	Plunger Analysis Software	Web folder with several docs	<u>Plunger Analysis</u> <u>Software</u>	
All G4 Products	Automating Wellpad Operations	9AKK105713A5059	Automating Wellpad Operations	
All G4 Products	ABB Plunger Lift application sheet	9AKK105713A3836	ABB Plunger application Sheet	

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Document Title								
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