Technical Reference Note

Embedded Power for
Business-Critical Continuity

UFE / UFR Series
Up to 6000 Watts

Total Power:	Up to 6000 W
Input Voltage:	85 - 264 Vac
# of Outputs:	Single + Aux
Output:	24 V & 48 V

Special Features

- Rack mounted chassis (1U, 19")
- 3 hot pluggable rectifiers per 1U chassis, up to 4 kW redundant or 6 kW available power (180 - 264 Vac input)
- Up to 2.6 kW redundant or 3.9 kW available per shelf at 90 - 132 Vac input
- Stackable to 6U high to provide up to 36 kW available power
- Class B conducted EMI EN55022 (See Note 1)
- Automatic fan speed control with fault reporting
- Auxiliary standby output, 11 V at approximately 2.8 W
- High density up to 22 W/in3
- High efficiency up to 91%
- Floating as well as isolated main output voltage allows positive or negative polarity operation
- EU directive 2002/95/EC compliant for RoHS
- 2 year warranty
- PMBus compliant

Safety

- VDE EN/IEC60950-1
- UL/cUL60950-1

Product Description

The UFE series is a digitally controlled high density bulk front end supply. Rated at 1300W for wide range input for 24V and 48V, this supply is well suited for Telecom/Datacom and Industrial applications. At high line input the 48V unit is rated at 2000W. The UFR is a 3 slot 1U rack for use with the UFE series power supplies. Up to 6 UFR's can be parallelled for a total system power of 36KW.

Electrical Specifications

Input	
Input range:	88 - 264 Vac
	176 - 264 Vac
Switching frequency:	450 kHz, fixed
Output	
Output power:	Auxuliary Output: 11 V ± 15%, 2.875 W
Line regulation:	± 0.15% max. (Low line to high line)
Load regulation:	± 0.15% max. (Full load to min. load)

Environmental Specifications

Thermal performance:	-33 °C to +70 °C (Operating)
	-40 °C to +100 °C (Non-operating)
	-40 °C (Cold start)
MTBF:	279, 069 hours (Telcordia SR-332 Issue 1)

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Embedded Power for
Business-Critical Continuity

Installing/Programming UFE/UFR6000 with Universal PMBus GUI

1. Installation

A) Minimum Requirements

- PC with 1 GHz CPU
- Emerson USBI2C iMP Dongle: p/n 73-769-001
- WIN XP
- Admin rights during Software Installation
- Internet connection during Software Installation
- 500 MB HD space
- 512 MB RAM
- USB port

Others:

- PMBus Application notes for PSU (available at www.PowerConversion.com)
- Universal PMBus GUI - User Manual - Feb 2009
- UFE2000-96S48 PMBus xcel Spreadsheet (Optional for Advanced Programming)
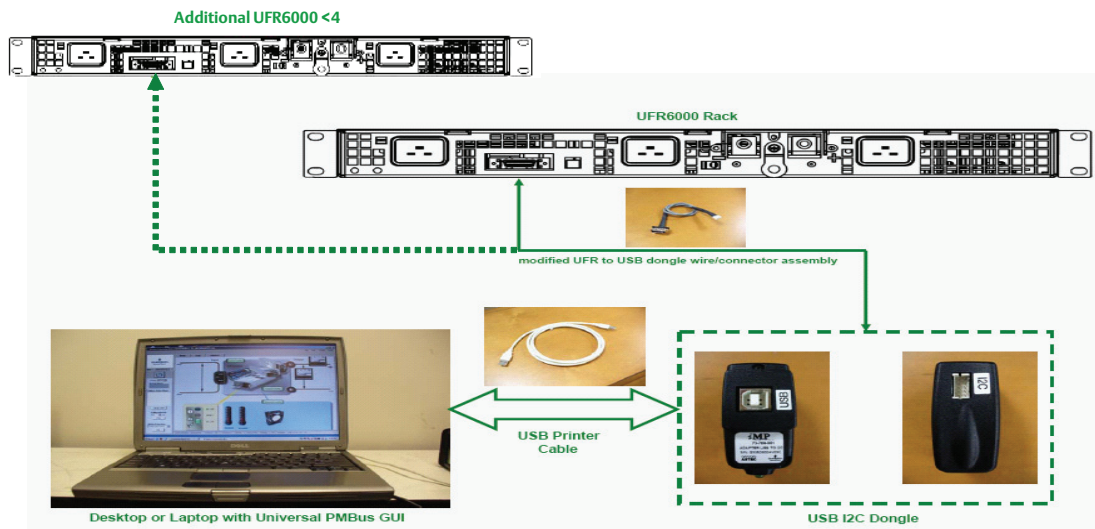
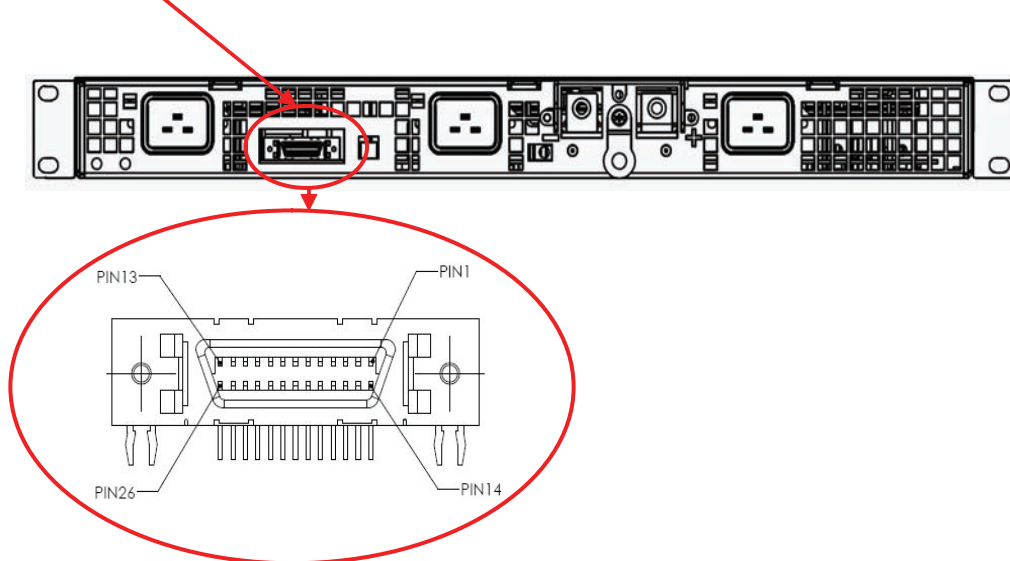### B) Hardware Connections

Figure 1. Hardware Setup

1. Installation continued

B) Hardware Connections continued

Pinout Assignments

a) UFR6000 Rack: Mating Connector from I2C Dongle to URF6000 (J16) is Molex: 52316-2619 or Tyco: 2-5175677-4

UFR Rack signal connector J16

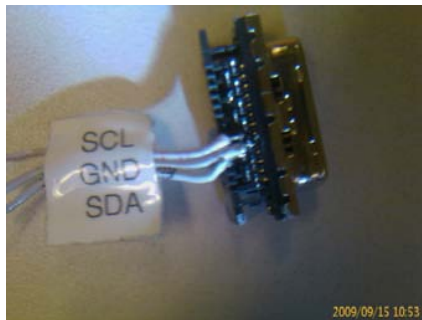**UFR rack signal connector PIN Orientation**

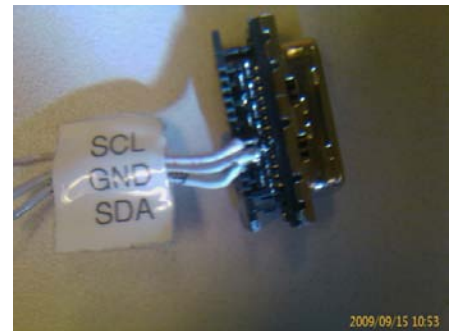Photo 1: UFR6000 mating = 3 connections for I2C lines

Photo 2: Back view of UFR6000 with J16 mating

Note:
Sometimes a cable maybe supplied with the Dongle 73-769-001 which is for use with different Power Units (ref ; iMP/iVS). This cable maybe used for connection to the UFR6000 - J16 connection using the following color code references :
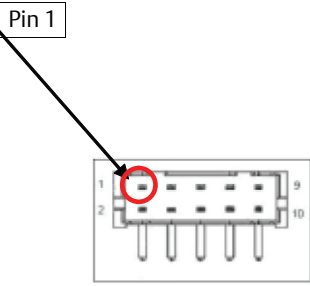
Red –Sclock = pin 21 , Black -SData = pin 23 , White- Gnd = pin 22

1. Installation continued

B) Hardware Connections continued

Pinout Assignments

b) Dongle I2C: 73-769-001: Mating Connector for UFR6000 cable to Dongle is Landwin 2050 Series with 2.0 mm Pitch
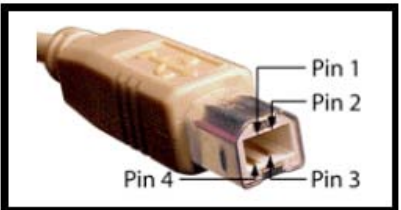
Pin 1

Pin	Signal Name	Description
1	Vbus	USB 5V supply from PC
2	SDA	I2C serial data signal
3	SGND	I2C ground
4	SCL	I2C serial clock signal
5	SGND	I2C ground
6	NC	No connection
7	PGD	Programming data signal
8	PGC	Programming clock signal
9	VDD	Programming positive supply for logic and I/O pins
10	VPP	Programming voltage input

c) Dongle USB: 73-769-001: Mating Connector for Laptop/PC cable to Dongle is Standard USB type-B Plug

USB type-B plug

Pin 1
Pin 2
Pin 3
Pin 4

Standard USB Pin-out and Cable Color Code		
Pin	Wire Color	Function
1	Red	Vbus (5V)
2	White	D-
3	Green	D+
4	Black	GND

1. Installation continued

B) Hardware Connections continued

Notes on Hardware Set-Up:

1. Remote ON-OFF Control: (PS-Enable)
   a) Check Unit Model Number to determine type of PS Enable Signal present

Product Family	Rated Output Power	Input Range	Standard Compliance	Type of Output	Output Voltage	Communications Type	Option Code	Special Modification	RoHS Compliance [9]
UFE	2000	9	6	S	48	P	D	XX	J
UFE = Universal Front-End	1300 = 1300 W 2000 = 2000 W	9 = Universal Input with PFC	6 = UL/CSA/VDE Class A/B	S = Single	48 = 48 V 24 = 24 V	P = PMBus serial communications	None = Active Ishare D = Droop Ishare HD = PS Enable HI/Droop		J = Pb free (RoHS 6/6 compliant)

Active Low Enable means that the UFE unit(s) will not START until its PS-EN (Control) signal on A6 is pulled Low (Gnd).
Active High Enable means that the UFE unit(s) will not STOP until its PS-EN (Control) signal on A6 is pulled Low (Gnd).

Power Supply Connector
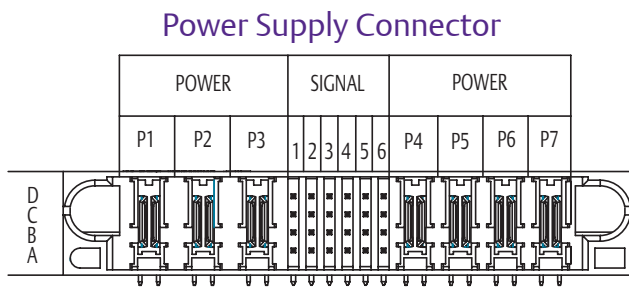
Power Connections Layout
(Looking into Connector Side of UFE Power Supply)

| Power Supply Connector Pinout				
Pin	D	C	B	A
P1	L1			
P2	L2			
P3	PEG			
1	Sense-	Sense+	GND	Shortpin
2	Present-L	GND	PS-ID0	GND
3	PS-ID3	PS-ID2	GND	12V-AUX
4	GND	SCL	PS-ID1	GND
5	SDA	GND	GND	I^2C-En-H (Comm-En-H)
6	SMBALERT#	Ishare	DC-OK-L	PS-EN (Control)
P4	DC_N			
P5	DC_N			
P6	DC_P			
P7	DC_P			

1. Installation continued

B) Hardware Connections continued

b) If Emerson UFR6000 Rack is supplied then the Global PS-En signal at J16 Pin #5 can ENABLE all Active LOW UFE Units contained within the rack when it is connected to Pin #4 (Gnd).

If Emerson UFR6000 Rack is supplied then the Global PS-En signal at J16 Pin #5 can DISABLE all Active HIGH UFE Units contained within the rack when it is connected to Pin #4 (Gnd).

Rack Signal Connector Pinout			
Pin No.	Function	Pin No.	Function
1	48V Sense+	14	48V Ishare
2	Ground	15	Unit 1 Present
3	48V Sense-	16	Ground
4	Ground	17	Unit 2 Present
5	PS-EN (Control)	18	Ground
6	DC1-OK0-L	19	Unit 3 Present
7	DC2-OK-L	20	Ground
8	DC3-OK-L	21	SCL
9	I^2C-En-H-1 (Comm-En-H)	22	Ground
10	I^2C-En-H-2 (Comm-En-H)	23	SDA
11	I^2C-En-H-3 (Comm-En-H)	24	Ground
12	Ground	25	SMBALERT#
13	12V-Aux	26	N/C

Link to ENABLE Active LOW UFE Units
Link to DISABLE Active HIGH UFE Units

PIN13

PIN1

PIN26

PIN14
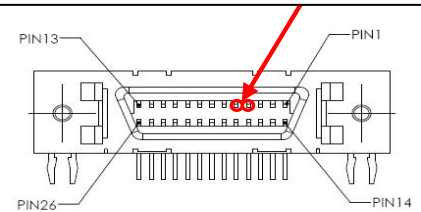
1. Installation continued

B) Hardware Connections continued

2. UFE Unit Addressing in Multi-Rack systems

a) If the system contains more than 1 x URF6000 Rack then paralleling of Pin 21 / Pin 22 / Pin 23 at appropriate J16 connectors of each additional UFR6000 Rack to a single USB Dongle will be required.

b) If there are more than 1 x UFR6000 Shelf then select dip switch according to table below for appropriate UFE Unit address recognition.

0 = ON = Down
1 = OFF = UP

UFR6000 — Rack Dip Switch SW1

UFR6000	UFE NUMBER	PS-ID3	PS-ID2	PS-ID1	PS-ID0	MICRO I²C/SMBus ADDRESS	*EEROM I²C ADDRESS
Rack 4	1	0	0	0	0	E0	A0
	2	0	0	0	1	E2	A2
	3	0	0	1	0	E4	A4
	4	0	0	1	1	E6	A6
Rack 3	5	0	1	0	0	E8	A8
	6	0	1	0	1	EA	AA
	7	0	1	1	0	EC	AC
	8	0	1	1	1	EE	AE
Rack 2	9	1	0	0	0	F0	A0
	10	1	0	0	1	F2	A2
	11	1	0	1	0	F4	A4
	12	1	0	1	1	F6	A6
Rack 1	13	1	1	0	0	F8	A8
	14	1	1	0	1	FA	AA
	15	1	1	1	0	FC	AC
	16	1	1	1	1	FE	AE

Table 3 - UFE Numbering Reference, *EEPROM is optional

Shelf DIP Switch Table		
Shelf Number	DIP Switch	DIP Switch
1	Up	Up
2	Up	Down
3	Down	Up
4	Down	Down

The UFE PSU addresses from Left to Right are: F8(Left), FA(Middle) or FC(Right) for the 1st UFR6000 Rack in single or multi rack system

The UFE PSU addresses from Left to Right are : F0(Left), F2(Middle) or F4(Right) for the 2nd Rack is a 2 or multi rack system

The UFE PSU addresses from Left to Right are : EB(Left), EA(Middle) or EC(Right) for the 3rd Rack is a 3 or multi rack system

The UFE PSU addresses from Left to Right are : E0(Left), E2(Middle) orE4(Right) for the 4th Rack is a 4 rack system

1. Installation continued

C) Software Notes

1) Installation

a) The Emerson Universal PMBus GUI requires a Software Framework/Platform in order to operate. The preferred Framework is Microsoft .NET Framework 3.5.   If not yet installed on your PC, download and install .Net 3.5 at http://www.microsoft.com/downloads/details.aspx?FamilyID=333325fd-ae52-4e35-b531-508d977d32a6&DisplayLang=en

b) Create a Universal PMBus folder & extract contents of UniversalPMBusGUI_v00.09.00Beta_w-o_.NET3.5installer.zip to it. Universal PMBus GUI can be downloaded at this link http://www.powerconversion.com/pmbusgui

c) Inside Universal PMBus folder, run setup.exe

d) Extract ail_HID_std.zip file in windows\system32 folder. This is the driver file for 73-769-001 USB I2C dongle. (Note : if your computer has a previous iMPGui installed then such can be found already).

2) Programming

a) To run Universal PMBus GUI, click on Start-> Programs->Emerson Network Power->Universal PMBus GUI Screen will display.

Note: The PSU system will be auto-detected by the Universal PMBus GUI and it will display the below for the presently addressed UFE Unit (Example : Unit address FA = Center UFE in Rack #1)

You can now perform various functions and operations through PMBus commands.
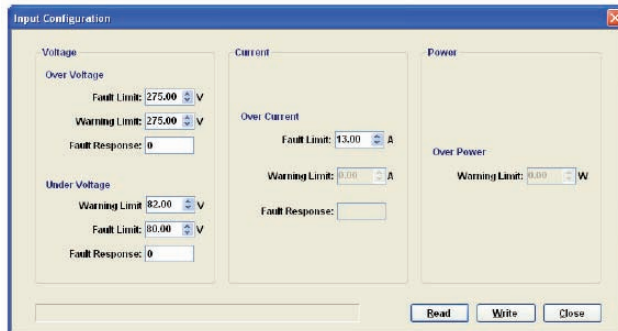
1. Installation continued
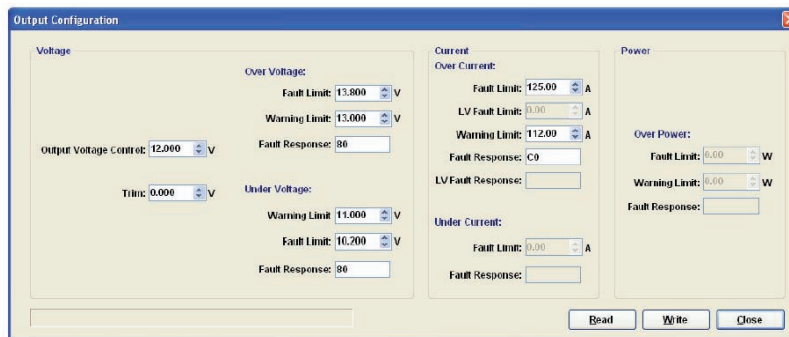
C) Software Notes

2) Programming

b) Basic Programming : The easiest way to vary Basic UFE variables is by clicking the appropriate Config tab on the BASIC Panel

1) Input Configuration : Setting the Input Limits of the Power Supply

After making appropriate adjustments then press write command tab to send new values to presently addressed UFE Unit.

2) Output Configuration: Setting the output Limits & Voltage of the Power Supply

After making appropriate adjustments then press write command tab to send new values to presently addressed UFE Unit.

Refer to Universal PMBus GUI – User manual for further details.

1. Installation continued

C) Software Notes

2) Programming

b) Basic Programming : The easiest way to vary Basic UFE variables is by clicking the appropriate Config tab on the BASIC Panel

2) Output Configuration continued

Notes :

a) To communicate to a different UFE via the GUI, one needs to select a different appropriate UFE address by clicking on the address drop down button on the Basic Panel (see attached screen)

b) Changing the Output Voltage of UFE Units from Standard Factory settings may cause Current Unbalance between Paralleled Modules unless all modules are set to the same output Volage setting at time of paralleling.

Changing the output voltage of a UFE Unit via the Output Config Screen (Vout command) sets 1 x UFE Unit at a time.   So, before adjusting the output of a active unit, there is a need to either pull-out the other modules first or turn them off via PMBus command. There is no "blocking" via the GUI software when all are enabled and one changes the voltage of one of the running units.

c) Advanced Programming : Using the Test Panel (tab) (Ref to PMBus Gui User Guide V3.0)
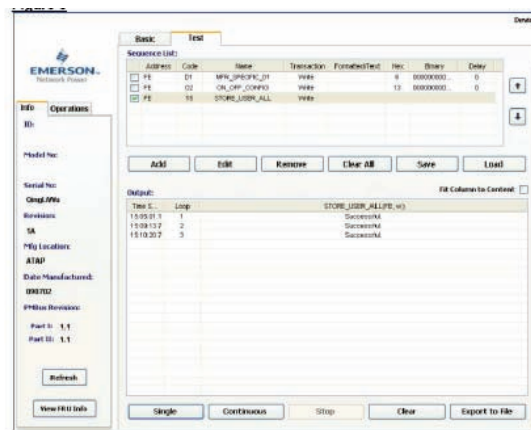Pressing the Test Tab will bring up at Command Sequence Listing (Fig #1)

1. Installation continued

C) Software Notes

2) Programming

c) Advanced Programming : Using the Test Panel (tab) (Ref to PMBus Gui User Guide V3.0)
Pressing the Test Tab will bring up at Command Sequence Listing (Fig #1)
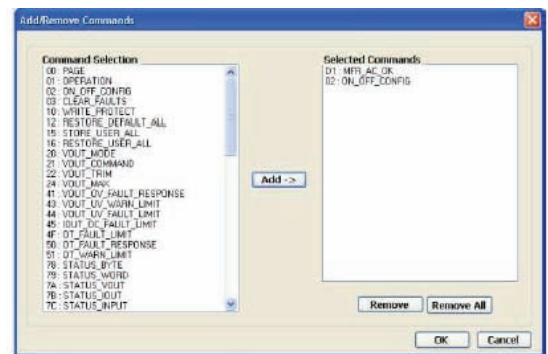

Figure 1

Figure 2

The Command Sequence Listing can be added / subtracted to by pressing the "Add" button. A list of PSU supported Commands will appear (Fig #2) . A new sequence list can be created by selecting appropriately & pressing "Add->" button. When all required commands are selected then press OK to return to the Test Panel.

You can change a Command within the Test Panel by selecting the required command & press "Edit" button. A new dialog box will appear outlining present unit address / command name / transaction status (Read or Write)
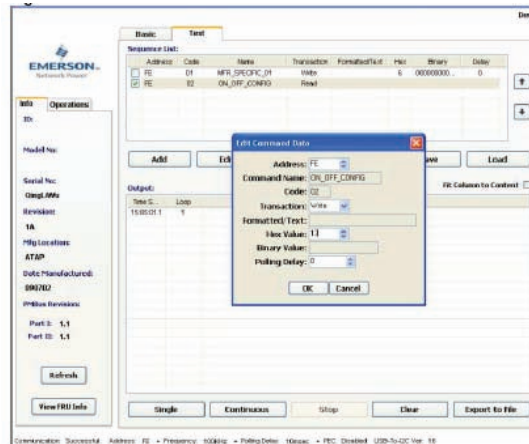
1. Installation continued

C) Software Notes
2) Programming
c) Advanced Programming :
Notes :
a) The commands in the sequence list view are Read Transactions by default but can be selected to Write via the "down" arrow.
b) The appropriate Hex Code needs to be entered followed by "OK" button.

The Hex Code is developed from the UFE2000-96S48 PMBus excel Spread sheet
The excel spreadsheet has macros which will not run unless you enable such.
When opening the spreadsheet, one needs to enable macros when asked and also verify that the Analysis Tool Pak in excel is active. This is achieved by checking excel under Tools->Add-in options.
If such are not enabled then when you change the values in the command spreadsheet, the resultant value/s will not change
c) Pressing the "Single" or "Continuous" button executes the new command
d) The Test Panel allows you to connect to multiple UFE Units because the Address Column is changeable per command. You can also arrange the command sequence, save & load it for future use.

Example : For adjusting the Output Voltage from 48 to 50 Vdc using Hex Code
(developed from the UFE2000-96S48 PMBus xcel Spread sheet)

1) Insert the UFE Module on the left most side,
2) Run the PMBus Universal GUI & on the BASIC Screen press the Test Tab.
3) Add VOUT_Command (21) to the Sequence Listings.

Screenshot of "Test" tab, with the command sequences for adjusting to 50V output

1. Installation continued

C) Software Notes

2) Programming

3a) At address F8, write on register 21 data = 021E (Hex Code) for 50.00V
Example for VOUT_COMMAND

Command Number	21		Number of Data Bytes		2	Read Support?	Y	Write Support?
Command Name	VOUT_COMMAND							

| Input Coefficients				$Y = (mX + b)10^R$	
m	b	R	Desired Voltage	Calculated Y to send	
643	-26733	-1	50.000	542	VOUT COMMAND from the UFE2000-96S48 PMBus Spreadsheet
			42 V min, 57 V max	021E	

3b) After filling in the sequence list, press "SINGLE" button once for new Voltage to take affect. Voltmeter on
GUI should now read 50V. Check Unit out Voltage using DVM.
4) Send STORE_USER_ALL (command 15) for the new instruction to be registered in "default" memory.
Otherwise the new instruction (50 Vdc) will only be applied as long as the mains is not recycled.
5. Power off the UFE module and wait for the Front Panel LED to go off.
6. Power on again and check that 50V is set.

Example : Modifying UFE Unit PS Enable from Active LOW to Active HIGH
1) Insert the UFE Module on the left most side of UFR6000,
2) Run the PMBus Universal GUI & on the BASIC Screen press the Test Tab.
3) Add ON_OFF_CONFIG (command 02) & STORE_USER_ALL (Command 15) to the Sequence Lists.
4) Select & press "Edit".
5) On Dialog box Check Address/ Command & change Transaction to Write & enter 13 in Hex window. Press OK
"button".
6) Press "Single " button for the new command to take affect.
7) Send STORE_USER_ALL (command 15) for the new instruction to be registered in "default" memory

Note :
a) The UFE unit may turn off since its factory setting was Active Low = On. The global PS Enable on UFR6000 rack
J16 pin 5 to 4 will need to be opened to allow the new Active High version to start.
b) The Active HIGH instruction is only stored it the units "present" memory. Thus if the mains is recycled the unit
will revert to Active LOW. One needs to activate the STORE_USER_ALL (Command 15) to ensure that the
Active HIGH instruction is stored in the Units "default" Memory.
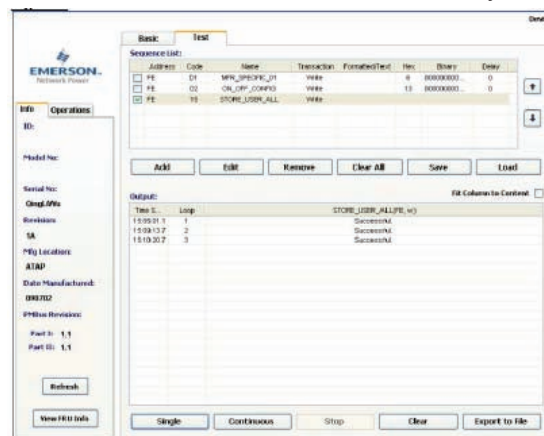
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