

## Environmental Testing of Two 58U91 DC-DC Converters

### **Burn-In Procedure Uses dataTaker DT85 from CAS DataLoggers**

CHESTERLAND OH—June 13, 2013

#### **Applications Note: Environmental Testing of Two 58U91 DC-DC Converters**

##### **Objective:**

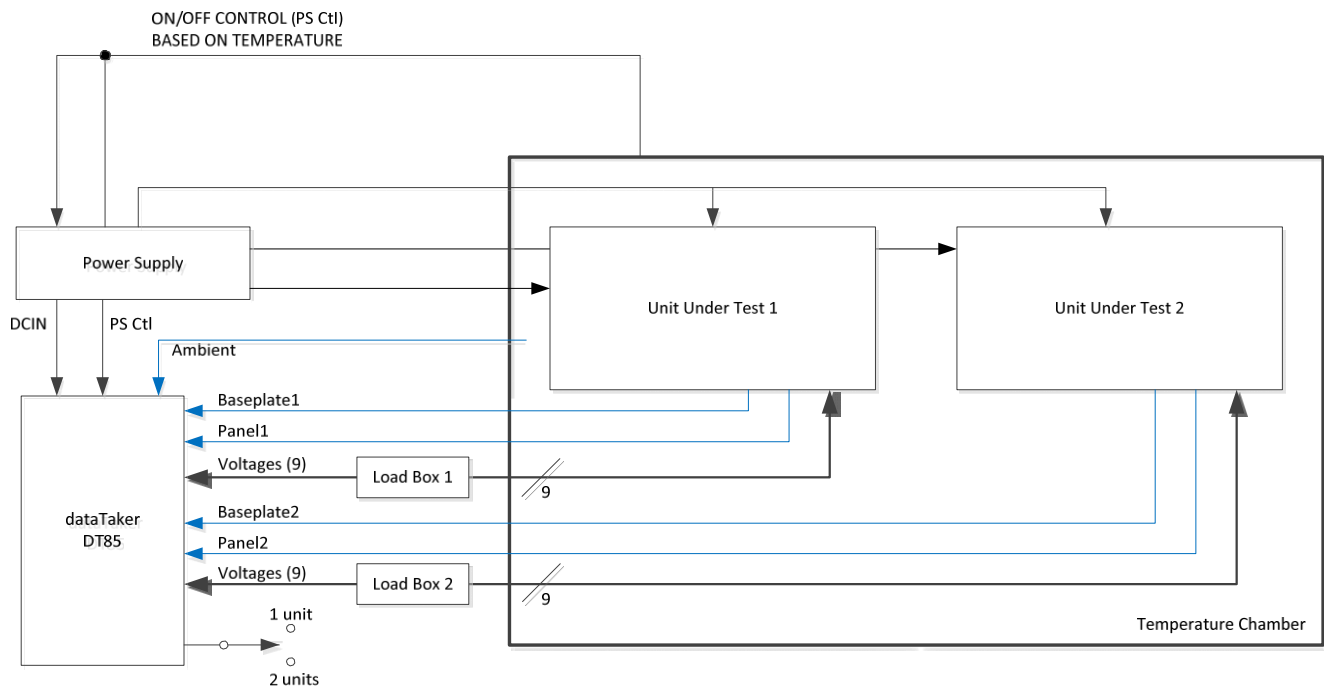
To monitor the performance of one or two of [North Atlantic Industries'](#) DC-DC Converter products over the temperature range of approximately -60C to +80C using a [dataTaker DT85 intelligent data logger](#) provided by [CAS DataLoggers](#).

Each unit under test (UUT) produces nine (9) voltages that need to be monitored and recorded approximately once a minute. In the event that any of these voltages goes outside of a +/-3% window, it must be noted.

Two thermocouples that are mounted within the unit must also be monitored. Additionally, an alert must be generated in the event that these thermocouples differ by a certain (gross) amount from the recorded ambient temperature within the chamber under monitoring.

In addition to the 11 test points described above, we will also need to monitor two “global” signals:

- The Chamber Ambient Temperature** is monitored to ensure that the chamber temperature profile is running correctly and that the UUT temperatures are within normal levels.
- The DCIN Voltage to the UUTS** is monitored to ensure its value is correct, and secondly it will be used to indicate that the UUT *should* be on and it will “enable” the alerts.



5-T type Thermocouples  
(-60 to +80)

19- DC Voltages  
4- 5.00Volts  
4- +12.00 Volts  
4- -12.00 Volts  
3- 3.30 Volts  
1- 32.00 Volts  
1- 28.00 Volts

**Figure 1 – Chamber and UUT Setup**

### **Introduction:**

This application note describes the procedure for performing the burn-in of the **North Atlantic Industries 58U91-03 DC-DC Converter**. It also describes what is monitored and logged, how fault detection is done, and how to use the embedded webpage to monitor real-time data.

Figure 1 shows the setup for testing. The basic equipment uses a **Thermotron S-16 chamber** running the 58U91 profile, a power supply to provide the DC In to the UUT, and the **dataTaker DT85 intelligent data logger** for monitoring and recording the data of the Load Boxes during the six cycles of the temperature profile.

The Setup allows for testing of 1 or 2 units, although when only 1 unit is being tested, it must be in the position designated as UUT 1 and Load Box 1, using the switch connected to the DT85 to select one or two UUTs.

### **Procedure:**

- Ensure that the chamber temperature is at or near room temperature. If one or more UUTs are in the chamber from the prior test, remove them.
- Disconnect Power Cable.
- Disconnect Load Box/Control cable.
- Using a 3/32" Allen-key, loosen rail locks that hold UUT to baseplate.
- Install 1<sup>st</sup> unit onto Baseplate No. 1, insuring that the thermal conductor sheet is not disturbed and lays flat.
- Use the 3/32" Allen-key to tighten UUT onto baseplate.
- Connect Power Supply cable to UUT. Connect Load Box/Control cable to UUT.
- Repeat steps 2, 2a and 2b for 2<sup>nd</sup> unit if required.
- Ensure that the heat sink fans for both baseplates are on.

### Verify the Test Set Up

- Using the Manual controls on the touchscreen of the chamber, perform the following steps:
- Select “Manual”
- Choose a temperature set point (arbitrary but within +/-10deg of the current chamber temperature).
- Select “Run”
- Select “Aux 2” (this manually turns on the input Power Supply to the UUT)
- Select “Run”
- Check that the unit(s) are on and that the Power Supply is drawing the prescribed current for one or two UUTs.
- Using a Web Browser, open the DT85 webpage and go to the “Measurement....List All Channels” page and ensure that the UUT(s) are putting out the nominal voltages and that the temperatures are reasonable.
- If all is OK, select Stop on the Chamber Touch screen.

### Initiate the Burn-in.

- Near the data logger use the toggle switch to select 1 or 2 UUTs
- On the Chamber, Select “Prog Stat” Select “Run”
- Select “Run” again.
- On the data logger Front Panel, Select “Func” Using the down arrow, select “Start Logging” Select “Edit”
- Select “Func” to start collecting data.

Burn-in Completion – TBD (data collection, UUT removal, etc....)

### Burn-in Setup Description:

Please reference **Figure 1** for the discussion that follows. The need to burn-in this product is a customer requirement with a specific temperature profile. The profile starts at room and goes cold to -40C (-57C for cold stabilization). Once stabilized at cold, the unit is turned on and off over a period of approx. 3hrs while temperature and voltage data is recorded. While the unit is on, the chamber is then increased to +71C (+85C for hot stabilization), and again the unit is cycled on and off while data is recorded. This one profile “cycle” takes approx. 6.5hrs and is repeated as per customer requirement, four times. Based on a previously conducted thermal survey of the UUT’s heat load within the chamber, the chamber controls the on/off of the DC In Power Supply at the appropriate times. The power supply then provides the +28VDC to the UUTs. A sample of this control line, PS Ctl is monitored by the dataLogger to “test” if the +28V comes on as requested: if not, an Alarm is declared (more on that later). Once the +28V is present, the data logger then expects to see the various output voltages from the UUT. If any of the voltages are outside of their window, an Alarm is then declared. The state of these alarms, on a UUT Summary basis, can be seen on the Status page of the data logger. In addition, an email is sent to a distribution list notifying personnel that a failure has occurred. However the indication is delivered, it will be necessary to “drill down” using other pages within the logger to get details. The following paragraphs will describe the usage of the data logger’s web pages for viewing real-time data and interpreting alarms.



**Figure 2 – The dataTaker DT85 Data Logger**

Figure 2 shows the Series 3 dataTaker DT85 data logger. This device has anywhere from 16 to 48 channels based on the type of parameter being monitored; an Ethernet, USB, or RS232 interface; and an internal flash or external USB hard drive for logged data storage. Its universal inputs can monitor temperature (various thermocouple types), voltage, current, resistance and many more values.

## DT85 Embedded Webpages:

The DT85 has a series of webpages for configuring and viewing all values being monitored. Only the viewing pages will be described here. At this time, there are 3 main page categories: “Status,” “Retrieve data,” and “Measurement.” Each of these pages have subpages which will be described in detail.

### Status pages:

This section contains both the “Welcome” and “Schedule” pages. The “Welcome” page displays information about the DT85 itself, its serial number, firmware revision, and other device specific information unrelated to our application.

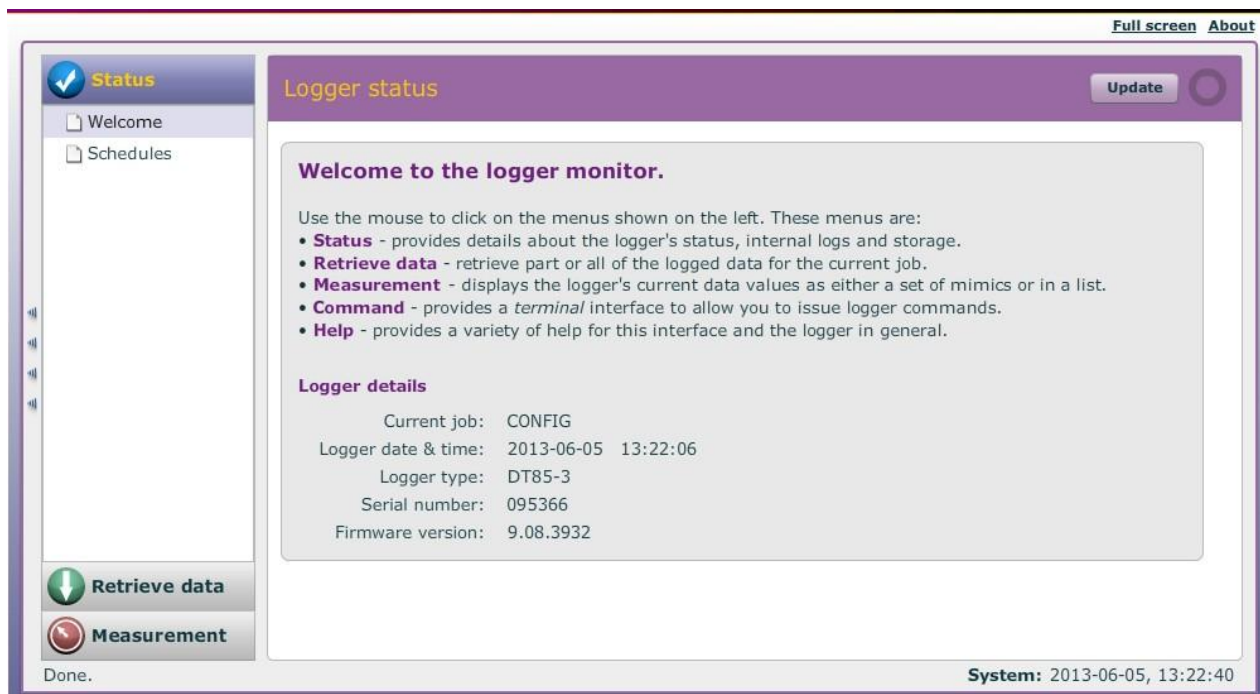
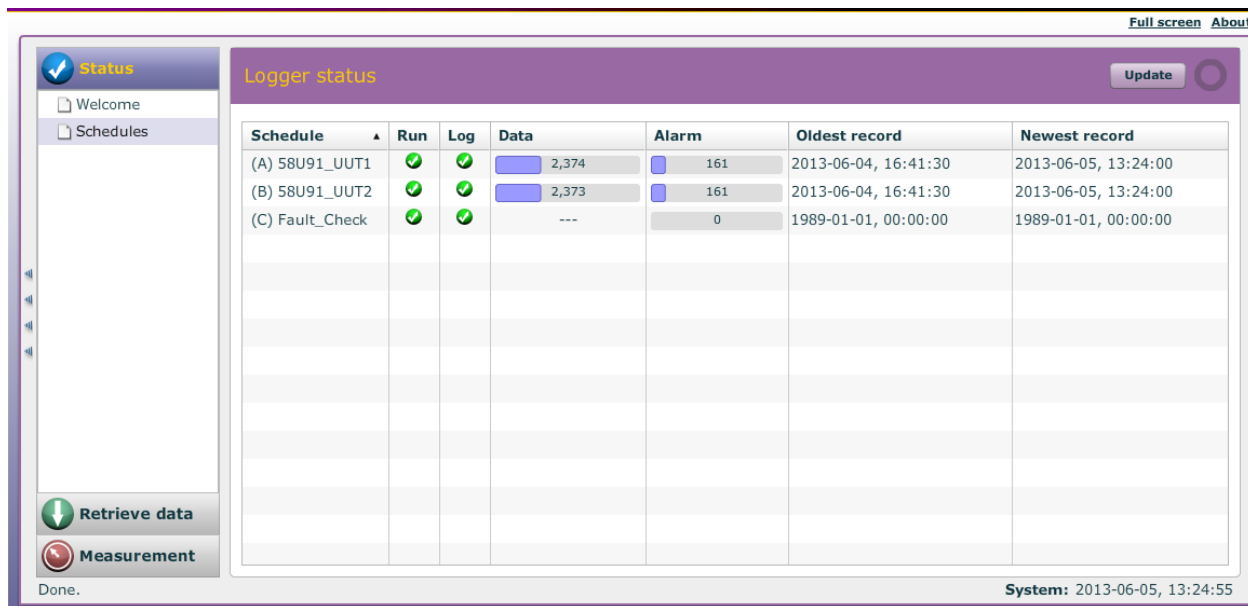


Figure 3 – The “Welcome” page

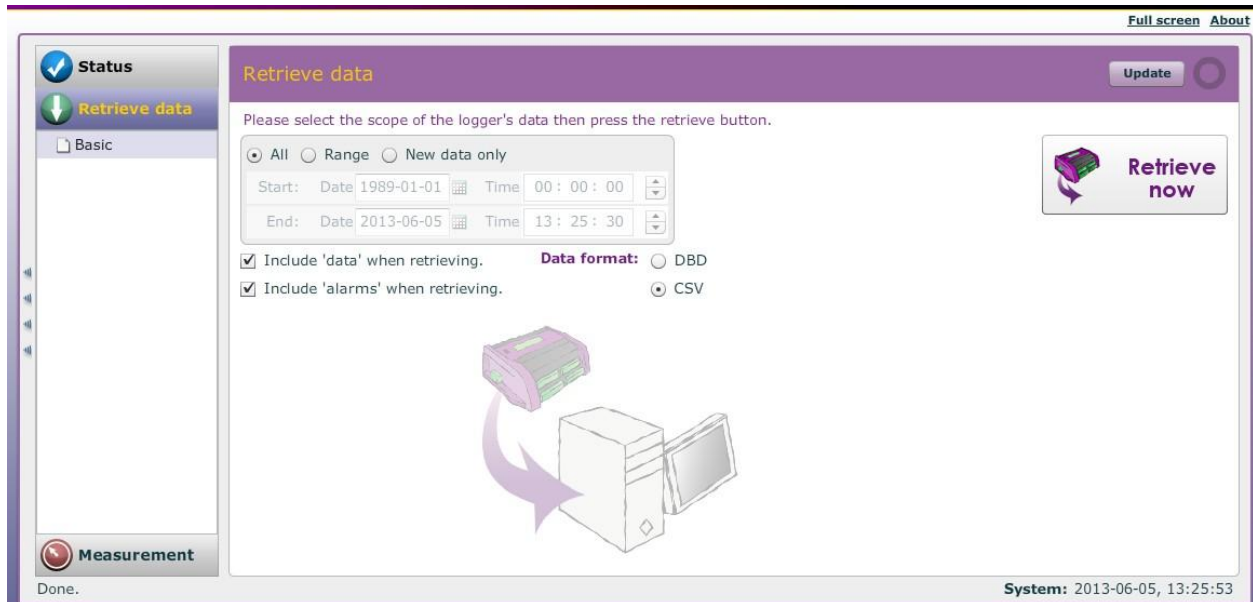
The Schedule page indicates whether data is being acquired and logged; a schedule running is like a program running. The screen below is indicating that Schedules ‘A’, ‘B’, and ‘C’ are running. Schedule A

has been triggered “executed” 2,374 times, and there were 161 alarms: the 1<sup>st</sup> record was recorded at 4:41pm on 06/04/2013 and the most recent or last record was made at 1:24pm on 06/05/2013. The 161 alarms of Schedule ‘A’ and ‘B’ are alarms but they are not faults--this is the number of times the input Power Supply was shut off by the chamber profile and hence there was no output from the UUT(s). These events will not fire the “Fault Check” (Schedule ‘C’) since that schedule macro knows that the Power Supply should be on to qualify it as a fault. To get the desired results it is imperative that the “Run” and “Log” indicators are checked and green. Details on monitoring and fault checking will be discussed below.



**Figure 4 – The “Schedules” page**

The DT85 has two facilities for retrieving the data from its flash memory. The 1<sup>st</sup> is via an event-triggered email attachment (or FTP transfer), which we will describe as “automatic”, and the manual technique which is described below. The controls on this page allow for a number of variations on what is extracted from the logger. The selections are self-explanatory, i.e. date ranges, with or without alarms, etc. Please note that the DBD file format is the native format of the DT85 and requires readily available 3<sup>rd</sup> party utilities for converting the data. Our application will only use the CSV format.



**Figure 5 – The  
“Retrieve data”  
page**

## **The Measurement pages:**

This section contains the pages that involve real-time viewing of the measured data. Besides “List All Channels,” these pages are highly customizable via the “Mimics” utility. This gives users the capability to display their data using a number of different visual indicators such as Dial Meters, Bar Graphs, Charts, etc. In our case we will have two pages shown below in Figures 6 & 7. Figure 6 is our summary status page where we can see from a distance a “go/no-go” status of the unit under test. A large LED is lit green when all systems are go, and red when a fault has occurred. The logic that drives these LEDs will be discussed in the “List All Channels” section. In addition to the LEDs, the real-time temperature of the chamber is also displayed.



**Figure 6 – The “Summary Status” page**

Figure 7 below is the real-time quantitative data that the logger is measuring and logging. It consists of six graphs, three for each UUT. Since this chart mimic has a limitation of five parameters and 12 parameters are being measured, the technique used was to logically group the parameters with a common parameter “Chamber Ambient Temperature.”

UUT1\_Temp\_DCIN graphs the following:

- 1) Chamber ambient temperature
- 2) DC In
- 3) +32VBAT
- 4) Baseplate Temperature
- 5) Front Panel Temperature

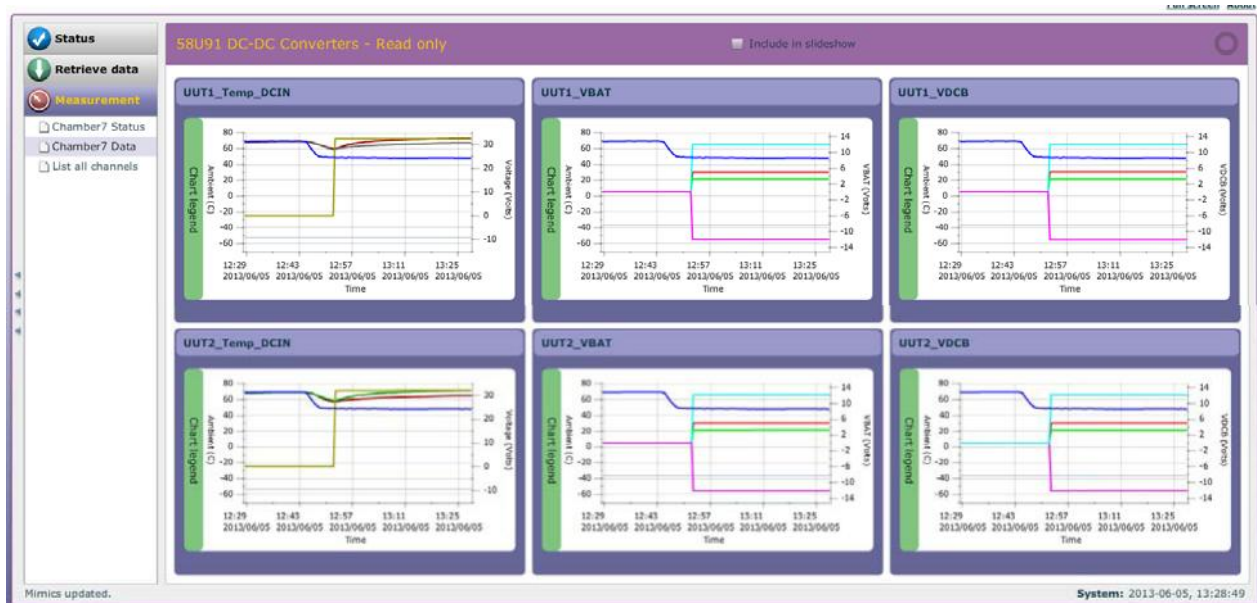
UUT 1\_VBAT graphs:

- 1) Chamber ambient temperature
- 2) +12VBAT
- 3) +5VBAT
- 4) +3.3VBAT
- 5) -12VBAT

UUT1\_VDCB graphs:



- 1) Chamber ambient temperature
- 2) +12VDCB
- 3) +5VDCB
- 4) +3.3VDCB
- 5) -12VDCB



**Figure 7 – The “Real-Time Data” page**

Figure 8 below shows the “List all channels” page. Here you get a snapshot of all the measured parameters for this job. The job is made up of three schedules:

- (A) 58U91\_UUT1 which monitors and logs all of the outputs for UUT1 plus the critical temperatures Baseplate\_1 and Panel\_1. Ambient\_x is common to both UUT(s).
- (B) 58U91\_UUT2 is the equivalent for the second unit under test, and
- (C) Is the Fault checking schedule for the UUTs. The discussion that follows describes the entire monitoring and fault detection scheme for burning in this product.

Status

Retrieve data

Measurement

Chamber7 Status

Chamber7 Data

List all channels

List all channels

Update

☒ Show hidden channels

Manual

Auto

Below is a list of all channels in the current job.

Run	Name	Value	Units	Alarm	Time stamp	Log	Input	Schedule
✓	-12VDCB_2	-12.15991	V		2013-06-05, 17:57:31	✓	13-V	(B) 58U91_UUT2
✓	3P3BAT_1	3.282089	V		2013-06-05, 17:57:30	✓	5+V	(A) 58U91_UUT1
✓	3P3BAT_2	3.2882488	V		2013-06-05, 17:57:31	✓	15-V	(B) 58U91_UUT2
✓	3P3VDCB_1	3.2902129	V		2013-06-05, 17:57:30	✓	3+V	(A) 58U91_UUT1
✓	3P3VDCB_2	3.2790875	V		2013-06-05, 17:57:30	✓	11+V	(B) 58U91_UUT2
✓	5VBAT_1	4.9970994	V		2013-06-05, 17:57:30	✓	5*V	(A) 58U91_UUT1
✓	5VBAT_2	5.001852	V		2013-06-05, 17:57:31	✓	13*V	(B) 58U91_UUT2
✓	5VDCB_1	5.0603938	V		2013-06-05, 17:57:30	✓	3-V	(A) 58U91_UUT1
✓	5VDCB_2	4.9942136	V		2013-06-05, 17:57:30	✓	11-V	(B) 58U91_UUT2
✓	12VBAT_1	12.035673	V		2013-06-05, 17:57:30	✓	7-V	(A) 58U91_UUT1
✓	12VBAT_2	12.149249	V		2013-06-05, 17:57:31	✓	15+V	(B) 58U91_UUT2
✓	12VDCB_1	12.010461	V		2013-06-05, 17:57:30	✓	3*V	(A) 58U91_UUT1
✓	12VDCB_2	12.154554	V		2013-06-05, 17:57:30	✓	11*V	(B) 58U91_UUT2
✓	32VBAT_1	32.441444	V		2013-06-05, 17:57:30	✓	7*V	(A) 58U91_UUT1
✓	32VBAT_2	31.972076	V		2013-06-05, 17:57:31	✓	13+V	(B) 58U91_UUT2
✓	Ambient_1	-41.660151	degC		2013-06-05, 17:57:30	✓	4TT	(A) 58U91_UUT1
✓	Ambient_2	-41.63828	degC		2013-06-05, 17:57:30	✓	4TT	(B) 58U91_UUT2
✓	Baseplate_1	-27.85342	degC		2013-06-05, 17:57:30	✓	1TT	(A) 58U91_UUT1
✓	Baseplate_2	-29.82006	degC		2013-06-05, 17:57:30	✓	2TT	(B) 58U91_UUT2
✓	DCIN_1	28.604298	V		2013-06-05, 17:57:30	✓	9-V	(A) 58U91_UUT1
✓	DCIN_2	28.604912	V		2013-06-05, 17:57:30	✓	9-V	(B) 58U91_UUT2
✓	Panel_1	-17.89446	degC		2013-06-05, 17:57:30	✓	1*TT	(A) 58U91_UUT1
✓	Panel_2	-20.56147	degC		2013-06-05, 17:57:30	✓	2*TT	(B) 58U91_UUT2
✓	UUT1_Alarm	0			2013-06-05, 17:57:31	✗	CALC	(C) Fault_Check
✓	UUT2_Alarm	0			2013-06-05, 17:57:31	✗	CALC	(C) Fault_Check

Figure 8 – The “List all Channels” page

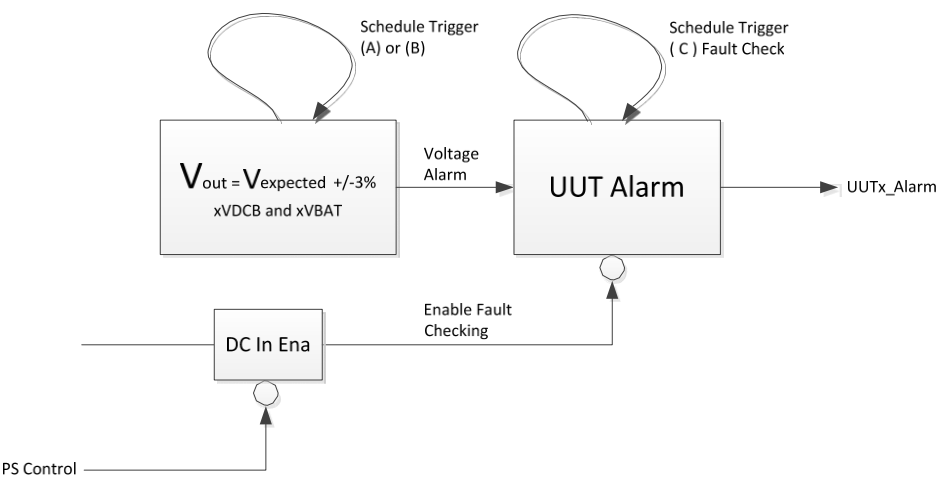


Figure 9 – Schedule Diagram

The “list all channels” page provides a series of columns that gives most of the information about the parameters within the configuration. The “Run” column is an indication as to whether the schedule

("Schedule" column) that is associated with that parameter ("Value" column) is running. The "Name", "Value," and "Units" columns are self- explanatory. The "Timestamp" is the timestamp of the logged data, and the "Log" column is an indication as to whether the parameter is being logged. "Input" is the DT85 input terminal being used. The "Alarm" column is explained below.

As required by the customer, the xVDCB and the xVBAT signals along with the Ambient, Baseplate, and Panel temperatures are being monitored and logged. As the xVDCB and xVBAT signals are being monitored they are also being tested to see if they fall within +/-3% of nominal. There are times when this test will fail, primarily when the DC In signal is not present. Although an "alarm" will be generated (internal to the logic only), it is not considered a fault. Figure 9 shows this logic.

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