

# *Field Test Unit*

P100077

## System Manual

Document #	Revision	Date	Engineer
OMM100077	-R1--	03/25/2014	Ted Drell

Ted Drell & Associates LLC

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## Warranty

This equipment is warranted for a period of 90 days for workmanship and subject to sub-supplier's warranty period for parts. The equipment manufacturer is not responsible for damage due to misuse or physical abuse of the equipment. This equipment is manufactured to quality standards and every effort has been made to ensure the safety of the user. However, the manufacturer is not responsible for misuse or use by unqualified personal resulting in shock or personal injury.

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**Table 1 - Acronyms**

A	Amperes
CTU	Communications Test Unit
ETU	Electronic Test Unit
FTU	Field Test Unit
LED	Light Emitting Diode
Ma	Milliamps (AC or DC)
SPCTU	Subsea Power & Communications Test Unit
VAC	Volts Alternating Current
VDC	Volts Direct Current

**Table 2 - Referenced Documents**

Document Number	Description
NFPA70	National Electrical Code - 2013 Edition
IPC/WHMA-A-620 Rev A	Requirements and Acceptance for Cable and Wire Harness Assemblies

The following notes or warnings are used throughout this document to warn of potential safety issues or operational warnings.

**NOTE:** Use this box to clarify information or specific instructions pertinent to the immediate procedure.



**WARNING:**

This symbol is a warning notice that failure to follow these procedures can result in bodily harm.



**CAUTION:**

This symbol is a warning notice that failure to follow these procedures can result in damage to equipment.

## CONVENTIONS

The following conventions are followed related to this product:

Part Number: P100077

Operations & Maintenance Manual: OMM100077

Schematic Diagram: SD100077

**GENERAL**

The Field Test Unit is designed to be a portable test set with the functionality of an SPCTU, but small and light enough to be carried by one person without a great effort. It is packaged in a small watertight suit case and will float if dropped over the side of a boat or platform. It is a dual channel (two line) unit with two outputs that can be turned on/off individually.

The FTU also has selector switches for each line output so that different connector configurations can be selected without having to have separate cables. The choices per line are:

- Output connected to pins 1 & 3
- Output connected to pins 2 & 4
- Output connected to pins 1 & 2
- Output connected to pins 3 & 4

Each output has a selector switch to turn it on or off with an indicator lamp that is lighted when voltage is present.

A multi-line LCD is integrated with a voltage transducer, current transducers and a microprocessor-based metering system is provided to simultaneously display the output voltage and total current for both output lines. The integrated metering system measures 600VAC full-scale on the voltage channel and 5AAC full-scale on both current channels.

The output voltage is continuously adjustable from 0 to 600VAC @ 1.5AAC max total for both lines combined. (The output voltage is limited to 600VAC  $\pm$  10% based on 120 or 240VAC input to prevent accidental damage to the SCM.) The unit can supply power to SEM A and SEM B continuously or two individual SEM's. The output voltage is generated by a specially wound 5.167:1 ratio toroidal transformer with a configurable 110VAC or 220 VAC primary and 620VAC secondary. The primary is designed to either operate in parallel for a 120VAC input or in series for a 240VAC input. The primary voltage to the toroidal transformer is supplied by a "Variac" or adjustable transformer to provide continuous voltage adjustment over the range of 0-620VAC.

Communications protocol is established by the customer-furnished filter/modem pairs that are installed to furnish communications on power. Without the cards installed and a power jumper card installed, the unit works as a variable AC power source.

The transformer output is connected to the input of both filters via the line on/off switches. This allows each line to be turned on/off independently of the other line. With the line switches in the off position, the unit can be used in the Sub-Sea mode to emulate the SCM with the aid of ETU software.

The selector switches provide a means for one quad cable to be configured for any standard configuration. The FTU comes with cables terminated with connectors on one end only to allow the customer to connect to the device of their choice. Power for the modem and indicator lights is supplied by a Medical Grade power supply from Astec. Input power is fused on both line and neutral to protect the equipment due to a short circuit on the output of the unit.

**SPECIFICATIONS**

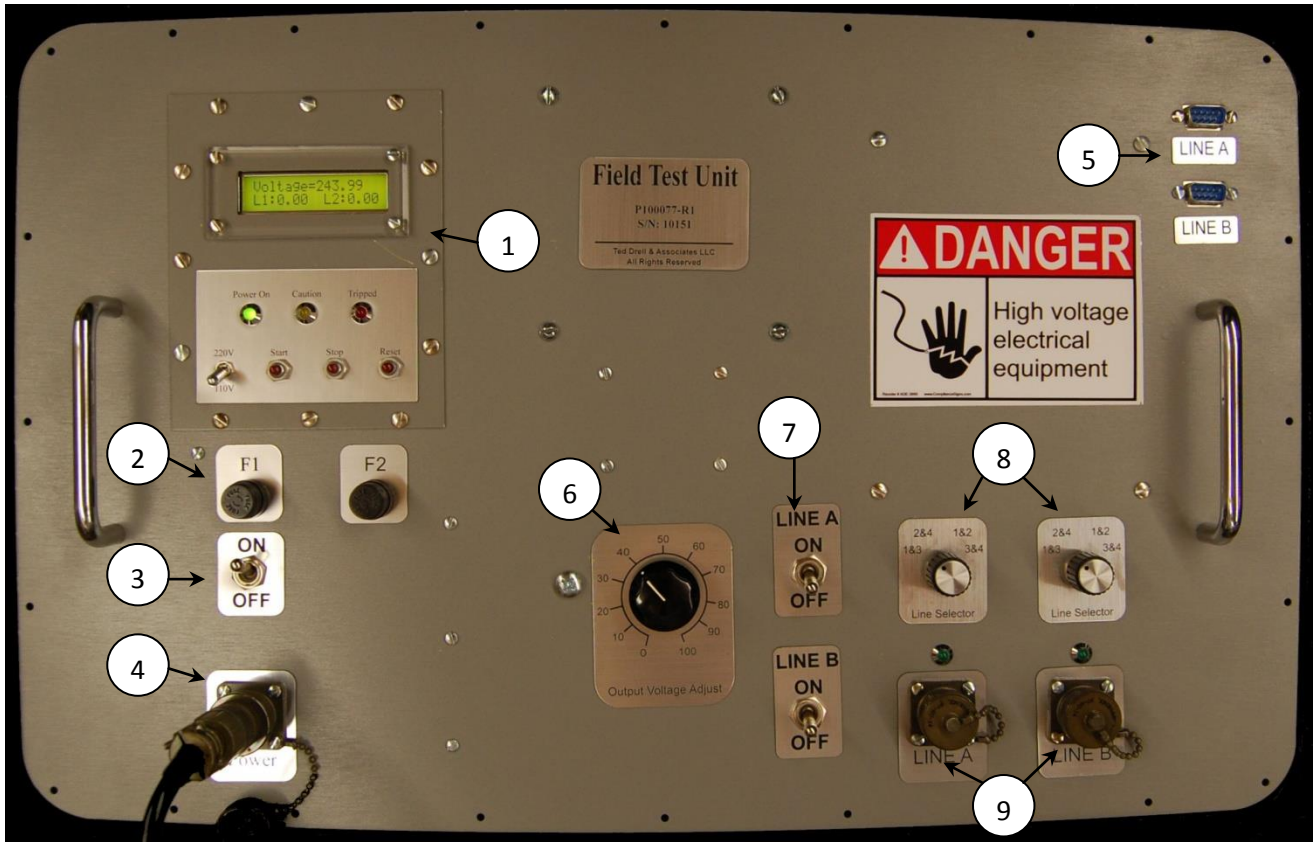
**Table 3 - Specifications**

<b>Item</b>	<b>Description</b>
Size	23 15/16" X 16" X 10 1/8"
Weight	35 lbs
Environmental	Front Panel Case is "O" ring sealed  Case is "O" ring sealed
Input Voltage	120 or 240 VAC ±10% @ 600 Watts, max continuous
Output Voltage	0-600VAC continuously variable @ 600 Watts continuous, aggregate for both channels.
Data Protocol	Customer provided filter and modem; cards in standard 3U Euro-card size.
Data Port	RS-232 with standard handshake lines (Based on the customer furnished KOS150 modem)
Filtering	60Hz low-pass (15.5Khz nulled) on input line
Power Supply	Astec Medical Grade 24VDC for CPU, modem and lamps
Voltage Transducer	600VAC Voltage Transducer
Current Transducer	10 AAC to 5VDC Current transducer
Indicator Lamps	"Output on" indicators for each line

**FUNCTIONAL LAYOUT**

Figure 1 shows the FTU’s front panel describing the controls. The panel is laid out to present a smooth flow from input to output, left to right.

**Figure 1 - Front Panel Controls**



**Table 4 - Panel Controls**

Item	Function
1	Integrated Display Unit
2	Input fuses; 10A @125V Slo Blo
3	Main Power On/Off
4	120/240VAC Power Input
5	RS232 input for KOS 150 data



6	Output Voltage adjust; 0 to 600VAC (@120 or 240VAC nominal input)
7	Individual line on/off
8	Output pin selectors (1 & 3; 2 & 4; 1 & 2; 3 & 4)
9	Output connectors

Figure 2 - Integrated Display Unit



**Table 5 - Functional Description for the Integrated Display Unit**

Item	Function
Power On LED*	AC Power is being supplied to Variac and line transformer
Caution LED	Output voltage has reached a warning threshold of 420VAC .
Tripped LED	Output voltage has exceeded 600 VAC or output current has exceeded 1.5AAC.
220V/110V	Select the input line voltage. (110 or 220VAC)
Start	Instruct the control unit to energize the relay which powers the Variac and transformer.
Stop	Instruct the control unit to de-energize the relay which powers the Variac and transformer.
Reset	Reset the control unit after over voltage or over current trip.

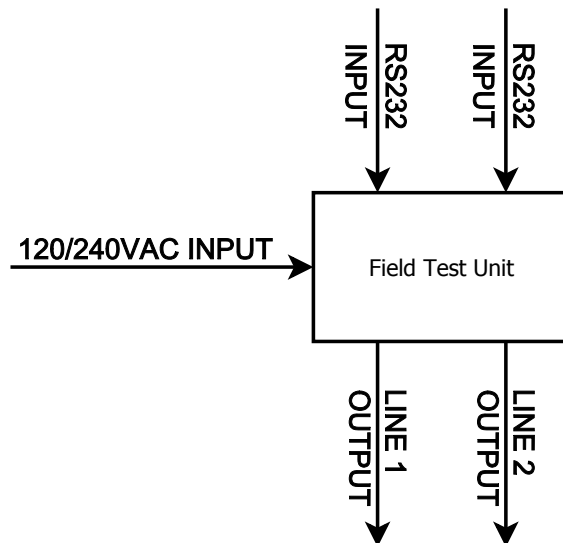
- Main power “ON” is indicated by the back light on the LCD display

**INSTALLATION AND OPERATION**

**Installation**

Connect the FTU as shown in Figure-3.

**Figure 3 - Input/Output Connections**





**CAUTION:** The Line output voltages can be greater than 620VAC and represents a severe shock hazard.



**CAUTION:** Operation of input voltages higher than 120/240VAC +10% may result in damage to the internal parts and to the external equipment.

## Input Power

The system operates from 120/240VAC power 600 watts, maximum. The equipment is furnished with a standard US style 3 prong plug on one end and a 3 pin female “MS” series connector to match the FTU input connection.

## Operation

### Primary Operation Mode

The following steps are the recommended sequence for operation of the FTU. Controls should be operated in the reverse order to shut the unit down.

- Ensure that all toggle switches are in the off position. Adjust the output voltage control to zero (fully counter clockwise position).
- Turn on the main power toggle switch and verify that the LCD display is lighted and the system goes through the start up sequence. When the display indicates the voltage and current, verify that the indications on the integrated display unit read zero.
- Press the “start” button on the integrated display unit. (Press the “stop” button when shutting down the unit.)
- Slowly turn the voltage adjust control clockwise until the voltage indication on the integrated display unit indicates the desired output voltage.
- Set the line selector switch #1 to the desired output connection configuration
- Switch the line switch #1 to on and observe the output current. The output current will depend on the attached SCM.
- Set the line selector switch #2 to the desired output connection configuration
- Switch the line switch #2 to on and observe the output current. The output current will depend on the attached SCM.

Verify that the ETU can establish communication to the SCM.

**NOTE:** \*Actual current depends on actual SCM (SEM) configuration and external sensors.

The current transducers are placed downstream of the filter board so that only external current is monitored.

### **Trip condition**

If an over voltage (>600VAC) or over current (>1.5A on either or both lines) condition occurs, the processor will de-energize the AC supply relay and the display will indicate a tripped condition. It will be necessary to first remove the over voltage or over current condition, then press the reset button. The processor will re-boot. When the readout is normal, you will then have to press the start button to resume operations. If the trip condition has not been removed, the unit will automatically go back into the tripped condition.

## **Alternate Operation Mode**

### **Sub Sea Emulation**

While the unit is primarily used to emulate the topside control system (with the use of the ETU), it can also be used to emulate the subsea control module. To do this, the line output switch should be in the "off" position. ETU, in the subsea mode, is connected to the corresponding line. The output connector is then used as the input connector.



**CAUTION: THE LINE SWITCH MUST BE IN THE OFF POSITION OR DAMAGE TO THE FTU OR TOPSIDE EQUIPMENT COULD RESULT.**

### **Communications Verification**

In order to test the operation of the communications portion of the FTU, connect the Loop Back Test Cable (part P100057) to lines 1 & 2. Both line switches must be in the off position. Using one instance of ETU in the topside mode to Line 1 and another instance of ETU in the subsea mode to Line 2, communications should be established.

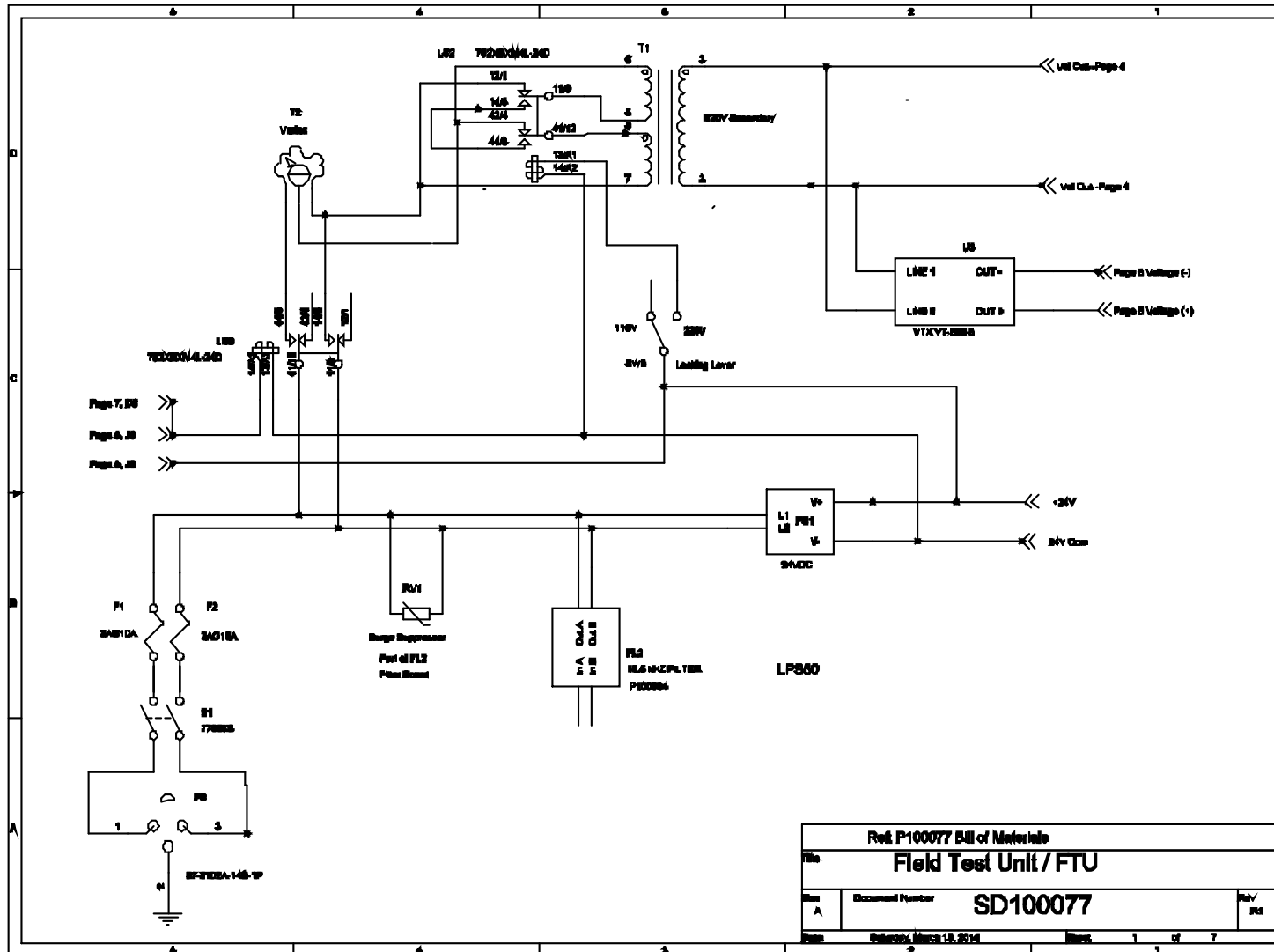
**MAINTENANCE**

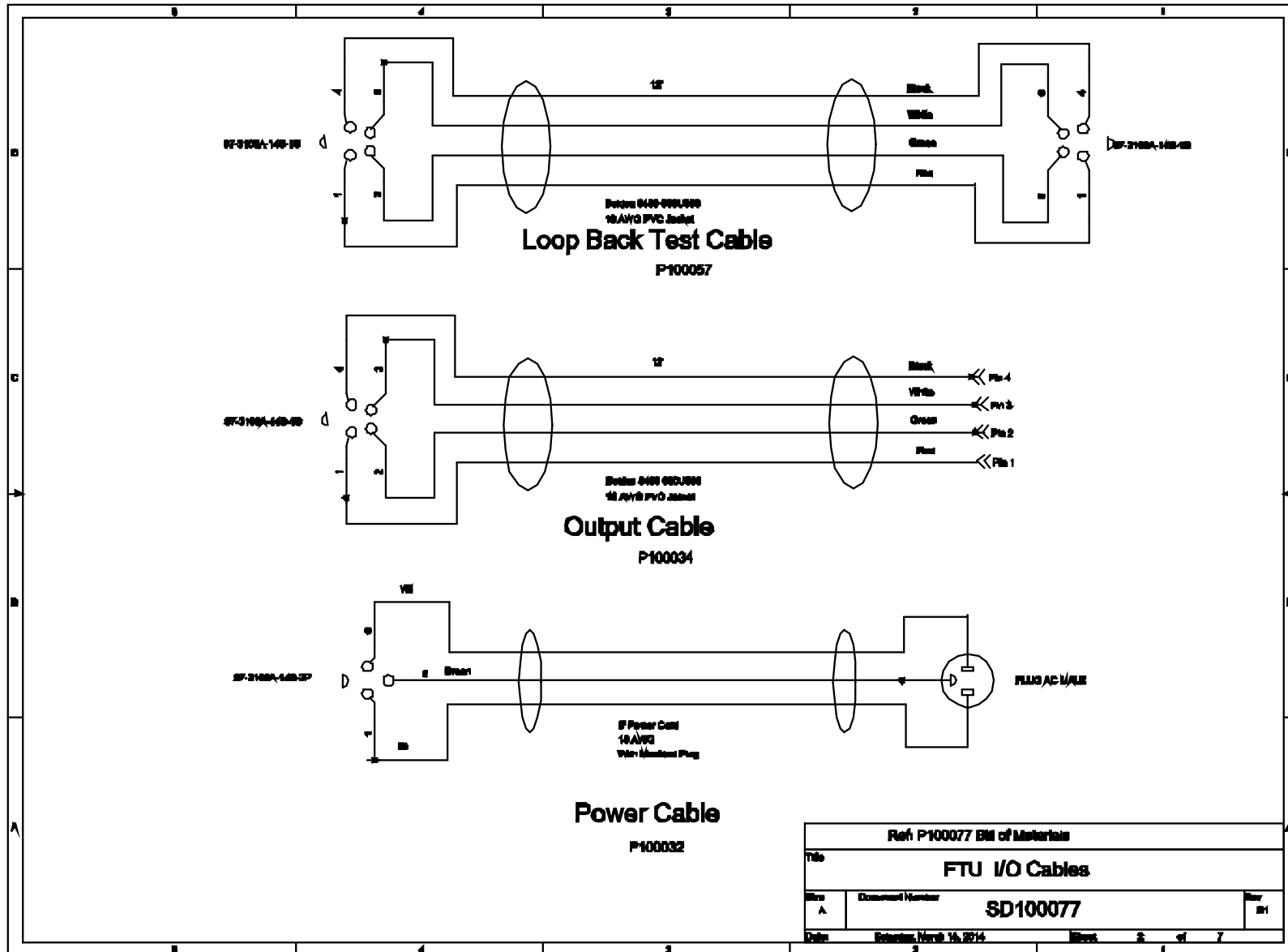
The unit is designed to be relatively maintenance free for the life of the equipment. Dirt and grease are the major contributor to electronic equipment failures. The unit should be kept clean and the protective covers placed on the input and output connectors as well as the cable assemblies to keep dirt out of the connector pin areas. Should dirt or grease get into the pin area, a spray cleaner such as “Freon TF” can be used to clean the area.

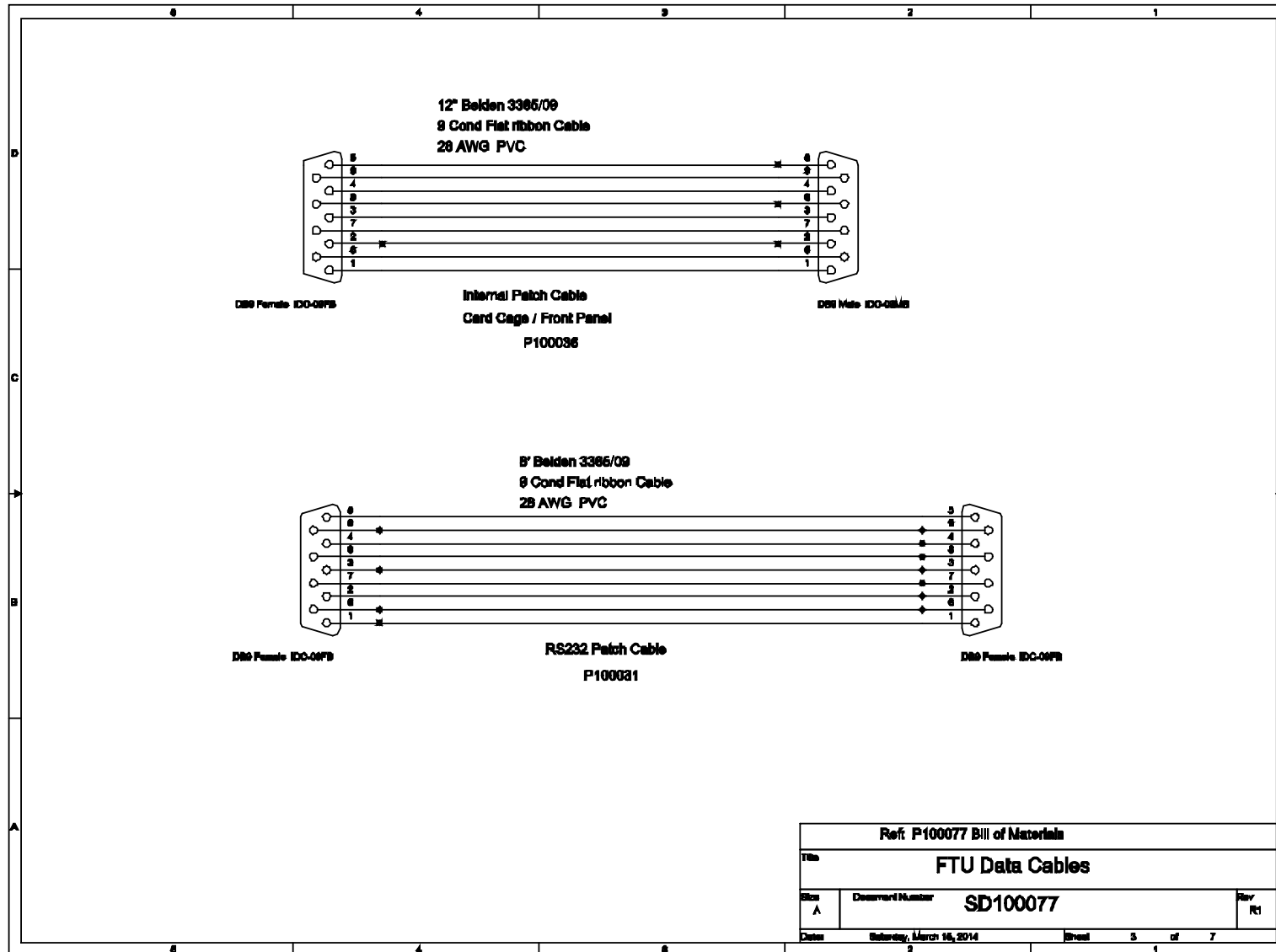
**Table 6 - Recommended Maintenance**

<b>Maintenance Item</b>	<b>Recommended Period</b>
Entire Unit	Clean after each use.
Cable Connectors	Inspect and clean after each use.

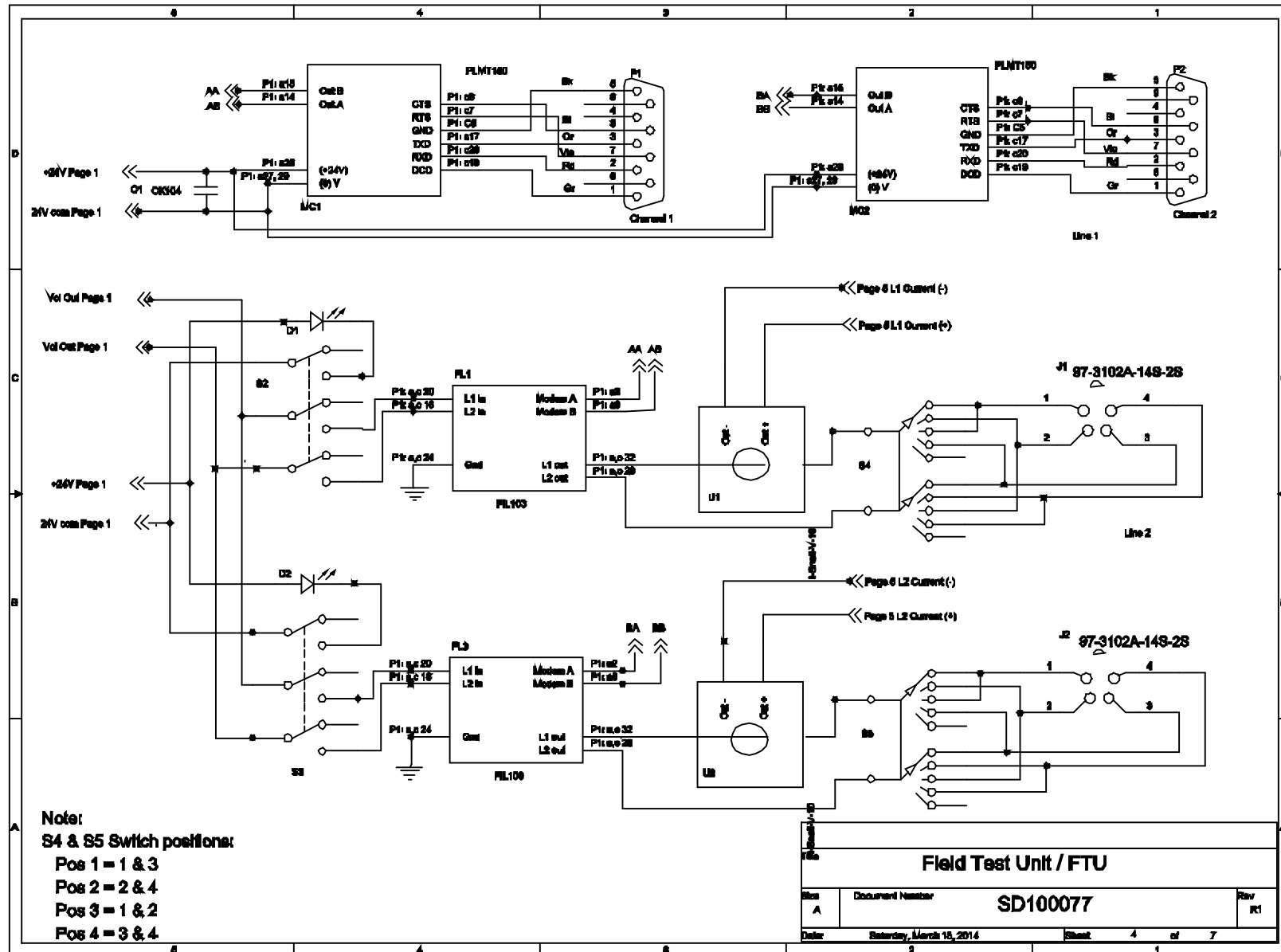
**SCHEMATICS**

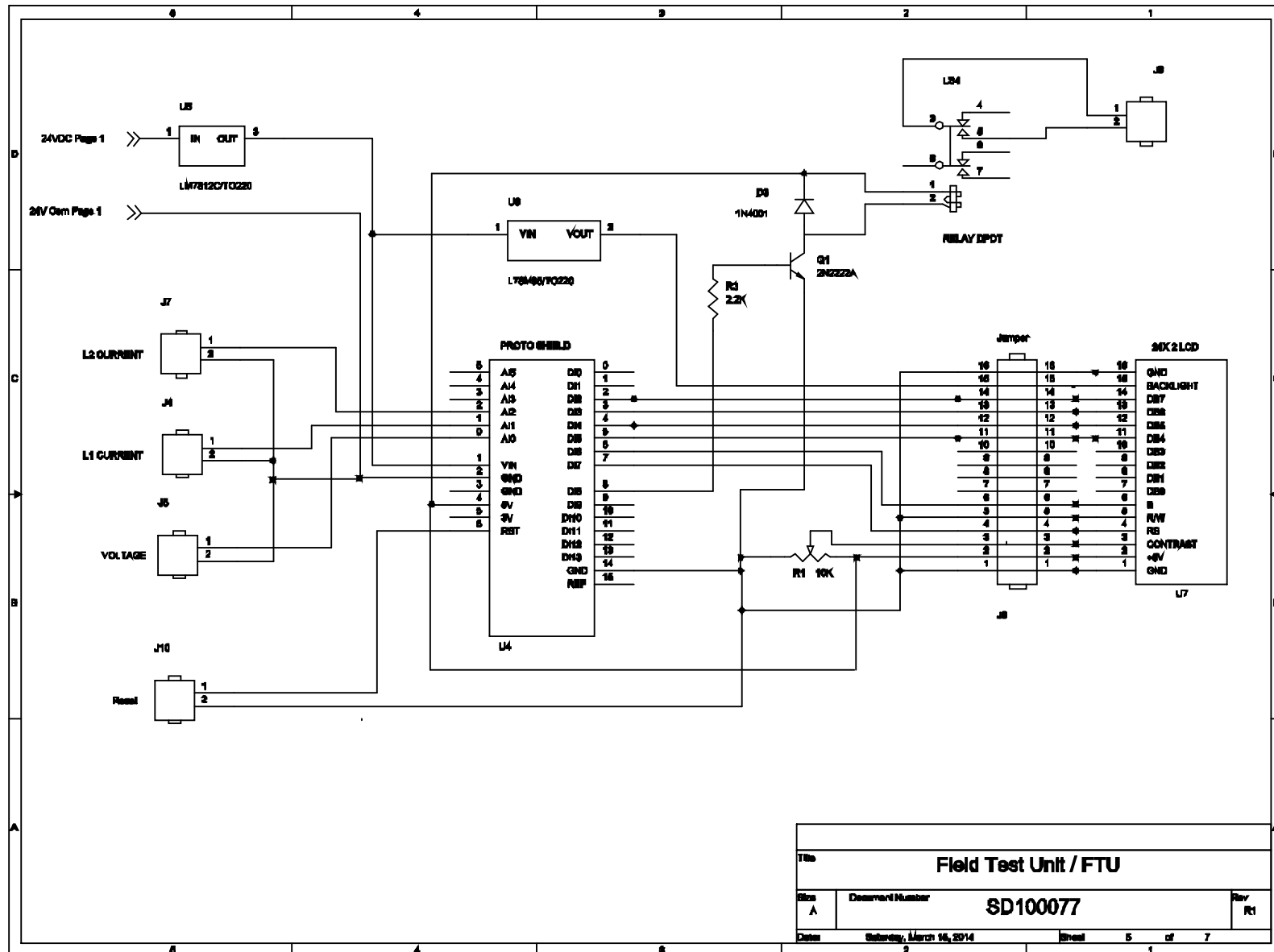




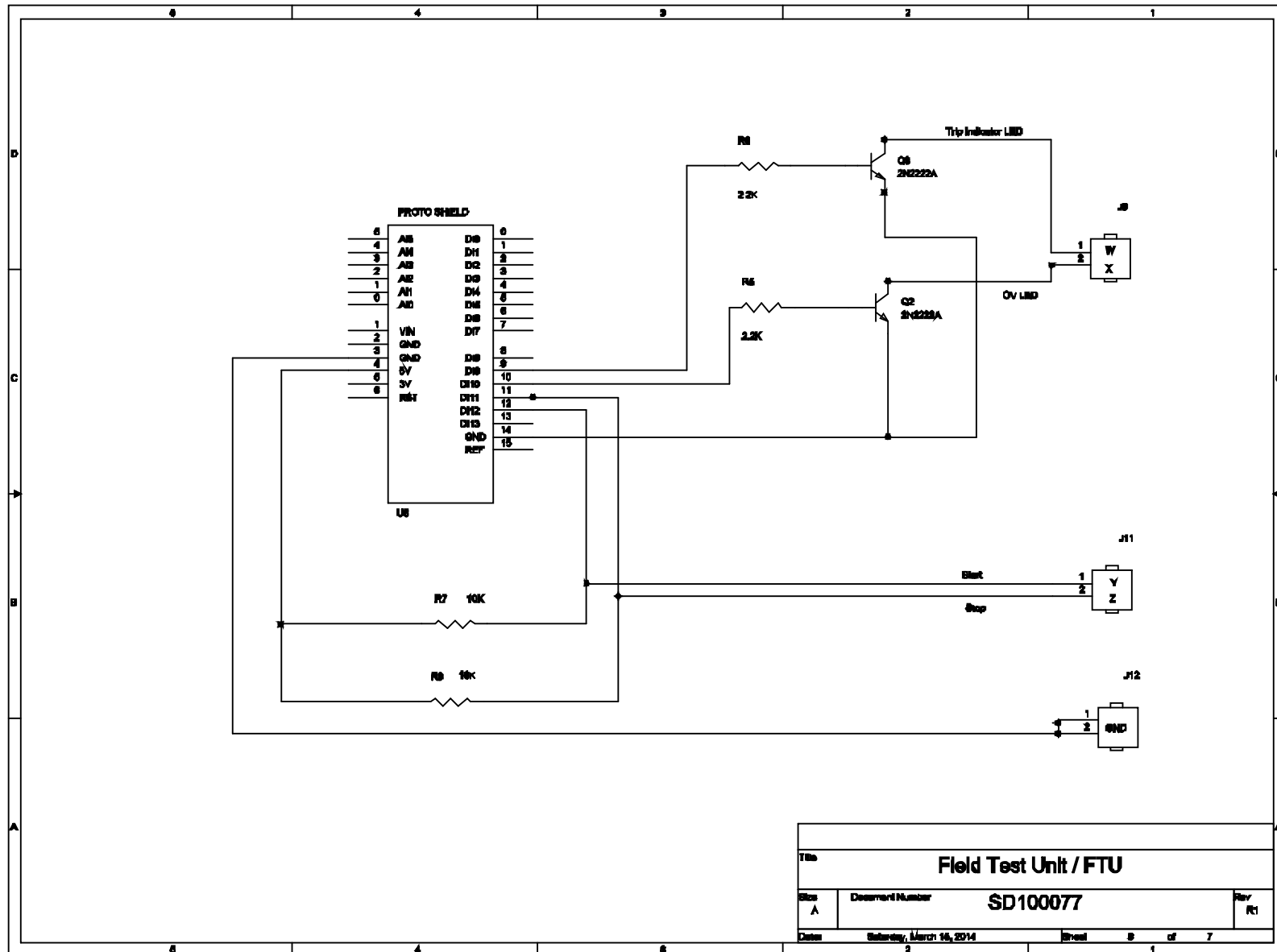


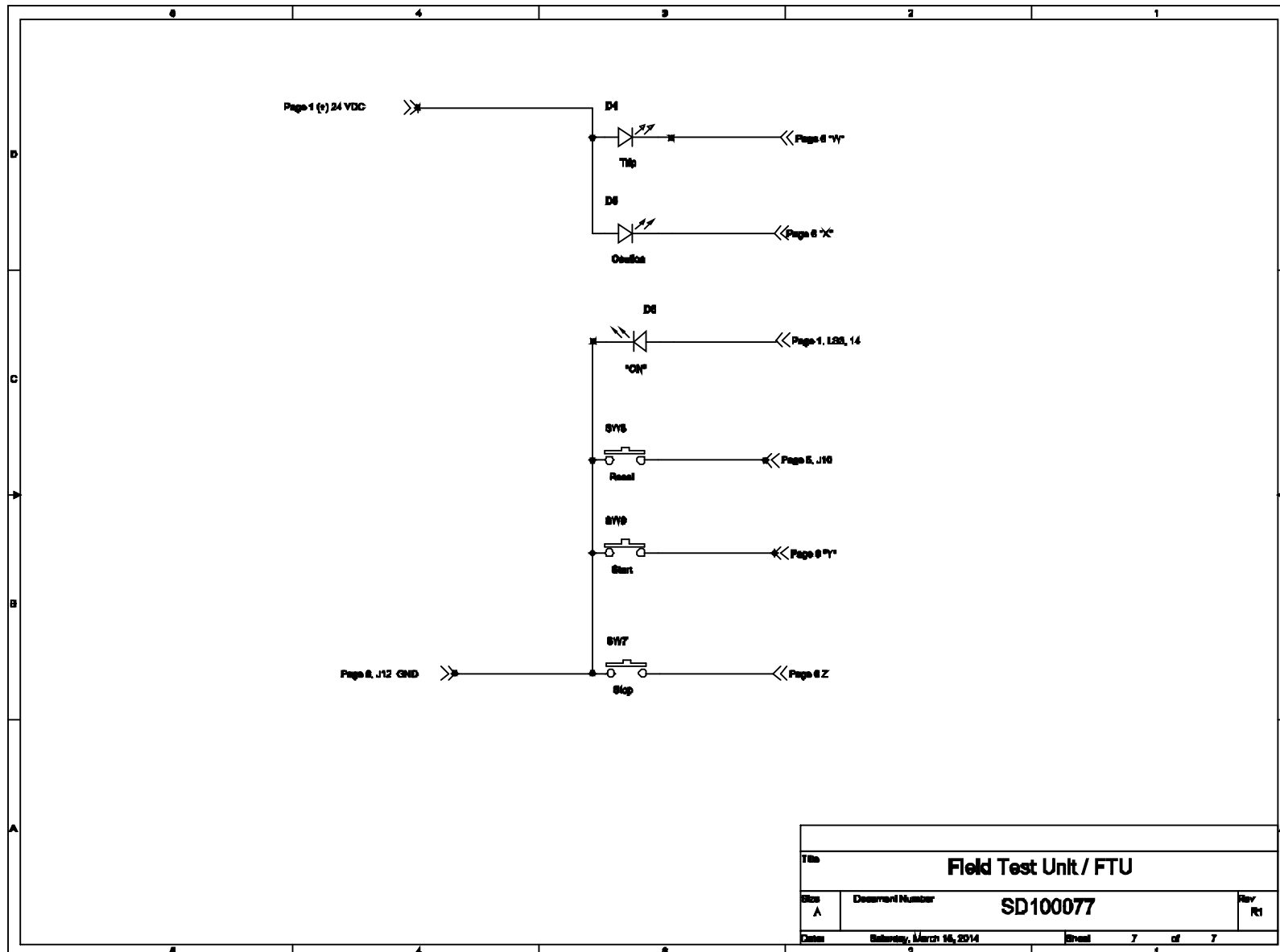







Title			Field Test Unit / FTU		
Size	Order Number	SD100077			Rev
A					R1
Date	Released	March 16, 2014	Sheet	5	of 7





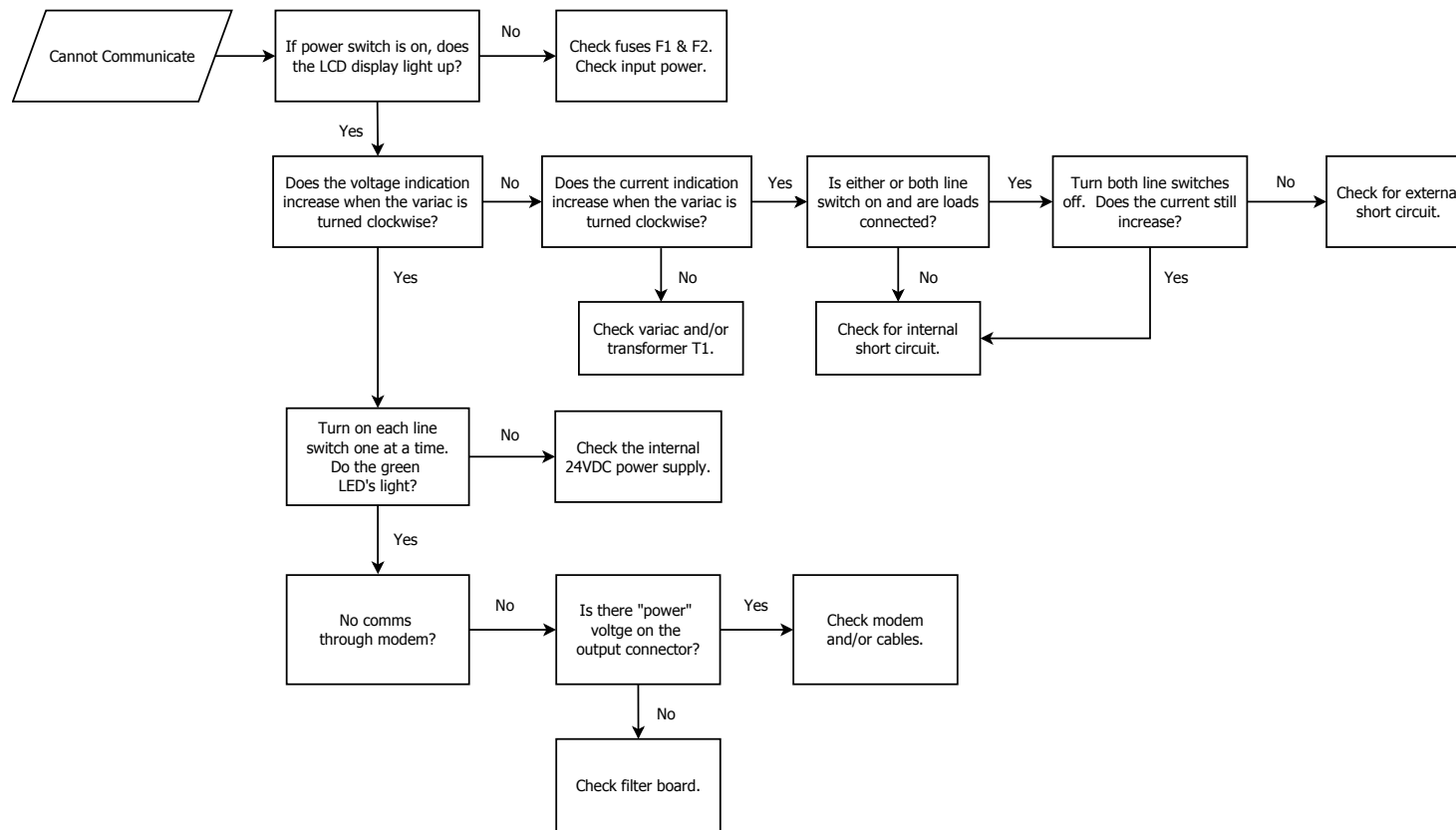
**FAULT-FINDING**

The following flow chart will guide the process for finding faults in the FTU.



**WARNING:** This equipment should only be opened by qualified personnel. This equipment should only be opened when the AC Power is OFF and the power cord disconnected.

**Figure 4 - Fault-finding Flow Chart**



PARTS LIST

Table 7 - Parts List

P100077 R1 BOM Ref: SD100077 R1			Field Test Unit / Dual Filters & Modems				3/17/2014
FTU Parts List							
Item	Quantity	Reference	Part #	Newark Part #	FMC Part #	Description	Mfg
1	3	D1, D2, D6	WL-19040351			Green LED panel indicators	
2	1	D3	1N4007			1A Diode 1000PIV	
3	1	D4	WL-19040353			Red LED	
4	1	D5	WL-19040352			Yellow LED	
5	2	F1, F2	HKP			Fuse Holders	Littlefuse
6	2	F1, F2	3AG 10A			10A Fuses	Littlefuse
7	2	FL1, FL3	FIL161		100029636	Filter; KOS150	FMC
8	1	FL2	P1000004			15.5Khz null filter	TD&A
9	2	J1, J2	97-3102A-14S-2S	93F1170		Output Connectors	Amphenol
10	2	LS2, LS3	782XBXM4L-24D			DPDT relay and socket	Magnecraft
11	1	LS4	G5V-2			Relay	Omiron
12	2	MC1, MC2	PLMT160		100027506	Modem; KOS150	FMC
13	1	Misc	7750B	54M9946		Front Panel (Blank)	Serpac
14	1	Misc	R-920	24K7061		Case	Serpac
15	2	Misc	DC2D2B	34C8796		Knobs	EHC
16	2	Misc	P100034			12' output cable	TD&A
17	1	Misc	P100032			Power Cable	TD&A
18	2	Misc	P100031			8' RS232 ribbon cable	TD&A
19	3	Misc	9760-14	96F5895		Cap	Amphenol
20	3	Misc	9760-14P	96F5890		Cap	Amphenol
21	1	Misc	P100027			Custom Card Cage & Back Plane	TD&A
22	1	Misc	P200009			Transformer Mounting Plates	TD&A
23	50'	Misc	83009 010100	02F4825		Belden 18AWG Teflon Hook up wire	Newark
24	2	P1, P2	P100036			12" Internal Patch Cable	TD&A
25	1	P3	97-3102A-14S-1P	93F1194		Input Connector	Amphenol

Table 7 - Parts List Continued

P100077 R1 BOM Ref: SD100077 R1				Field Test Unit / Dual Filters & Modems			3/17/2014
FTU Parts List							
Item	Quantity	Reference	Part #	Newark Part #	FMC Part #	Description	Mfg
26	1	PS1	LPS55			24 VDC Power Supply	Astec
27	3	Q1, Q2, Q3	2N2222			NPN Transistor	
28	1	R1	10K ohm			single turn potentiometer	
29	3	R3, R5, R6	2.2K ohm			1/4W resistor	
30	2	R7, R8	10K ohm			1/4 resistor	
31	3	S1, S2, S3	7700K3	11M1803		Toggel Switches	Eaton
32	2	S4, S5	451-1098-ND			Output selector switches	Electroswitch
33	1	S6	7201K2ZQE			Locking Lever Toggle Switch	
34	3	S7, S8, S9	30-2			NO Pushbutton Switch	Grayhill
35	1	T1	P5113			120/240-620 Stepup Transformer @372VA	Houston Transformer
36	1	T2	291	76M8673		0-100% variac; 300W	Staco
37	2	U1, U2	1-V-10			i-Snail Current Transducer	Elkor
38	1	U3	AAC 108-600			600VAC Transducer	AAC
39	1	U4	UNO			Arduino CPU Module	
40	1	U5	LM7812C/TO220			12V DC/DC Converter	
41	1	U6	L78M05/TO220			5V DC/DC Converter	
42	1	U7	LCM-S01602DSF			16X2 LCD Display	Lumex