OPERATION AND MAINTENANCE
INSTRUCTIONS WITH PARTS LIST

# TEST SET, FIELD CABLE
# AN/GTM-3B
# 7Z 6625-01-599-3857

Trimble Sustainment Engineering Inc
2910 N. Powers Blvd #335
Colorado Springs, CO 80922

**REPRODUCTION AND DISTRIBUTION OF THIS TECHNICAL MANUAL IS AUTHORIZED FOR U.S. GOVERNMENT PURPOSES**

**MANUAL REVISION: A** **26 March 2013**
**P/N: TSE-P01-03-015**

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# WARNING!

**DANGEROUS VOLTAGES EXIST**
**WITHIN THIS EQUIPMENT**

**FAILURE TO PROPERLY FOLLOW**
**INSTRUCTIONS CAN LEAD TO**
**SERIOUS INJURY, DEATH**
**OR DAMAGE TO EQUIPMENT**

**Ensure all external power connections**
**are disconnected prior to servicing**

**Power Connection Checklist:**

- ☐ **AC Power (110/220)**
- ☐ **9 to 36VDC Terminals**
- ☐ **Battery Pack (inside Battery Enclosure)**

**THE AN/GTM-3B CONTAINS NO**
**OPERATOR SERVICEABLE COMPONENTS**


**IF OPENING THE TEST UNIT IS REQUIRED,**
**ENSURE ALL ESD PRECAUTIONS ARE**
**OBSERVED**

# Table of Contents

# Figures

# Tables

# CHAPTER 1
# INTRODUCTION

## 1.1. SCOPE

This manual contains operating instructions and organizational level maintenance procedures for the Test Set, Field Cable, AN/GTM-3B, hereinafter referred to as the Cable Test Set.

**NOTE**

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## 1.2. PURPOSE AND USE

The Cable Test Set is a portable testing unit for checking the continuity and insulation resistance of field-installed 26-pair cable assemblies, (type CX-4566/G or equiv.) and patching panels.

A number of improvements have been made to the original AN/GTM-3 design concept. It is important that a new user familiarize themselves with the updated controls and indications as listed in Chapter 3.

## 1.3. EQUIPMENT DESCRIPTION

Refer to Figure 1. The Cable Test Set comprises the equipment listed in Table 1.

**TABLE 1. EQUIPMENT SUPPLIED**

| Part Number: TSE-P01-01-001-PL | | Rev- | | | | |
|---|---|---|---|---|---|---|
| Assembly: Cable Tester Kit | | | | | | |
| ID | Description | Part Number | Manufacturer | CAGE | Board Qty | Reference Designator |
| 1 | Transit Case | 1560-008-110 | Pelican | 6JUB6 | 1 | |
| 2 | Test Unit | TSE-P01-01-002 | TSE | 6AUC2 | 1 | TSE-P01-01-002 |
| 3 | Branch Cable | TSE-P01-01-003 | TSE | 6AUC2 | 1 | TSE-P01-01-003 |
| 4 | Test Plug | MX-10898/GTM-3 | TSE | 6AUC2 | 1 | TSE-P01-01-004 |
| 5 | AC Power Cord, 6' | ANY STANDARD 3-PRONG | | | 1 | |
| 6 | Operation & Maintenance Manual | | TSE | 6AUC2 | 1 | |
| 7 | Use & Installation Manual | | TSE | 6AUC2 | 1 | |
| 8 | CD ROM | | TSE | 6AUC2 | 1 | |
| 9 | Close Cell Foam | | TSE | 6AUC2 | 1 | TSE-P01-03-009 |

A brief description of the major components that make up the Cable Test Set is given in the following paragraphs.

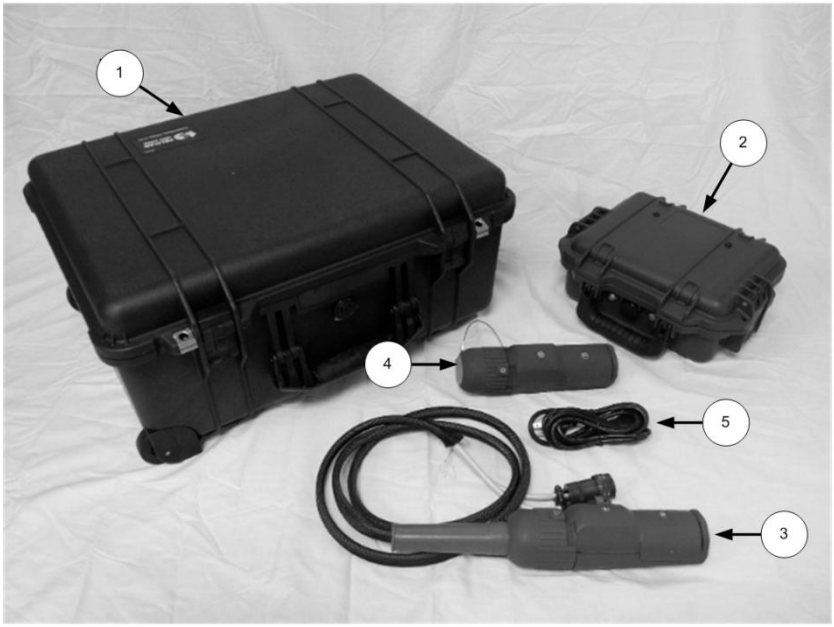



Figure 1. TEST SET COMPONENTS

### 1.3.1. Transit Case

The transit case (Figure 1 - 1) comprises a water-tight, ruggedized enclosure with a hinged cover; it houses all components of the Cable Test Set.

### 1.3.2. Test Unit

The Test Unit (Figure 1 - 2) is designed to check the continuity and insulation resistance of up to six, 26-pair cable assemblies (each 250-ft long) connected in series. The Test Unit can be operated from an AC or DC power source, or internal battery assembly.

### 1.3.3. Branched Cable

The branched cable (Figure 1 - 3) provides the interface between one end of the cable under test and the Test Unit. The branched cable is approximately five feet long and is equipped with two, 26-pin circular connectors and one end and a 26-pair hermaphroditic connector at the other end.

### 1.3.4. Test Plug

The test plug (Figure 1 - 4) is a modified hermaphroditic connector which, when placed at the end of the cable under test, loops the paired wires to the Test Unit via the branched cable. The test plug is used during continuity testing.

### 1.3.5. Power Cord

The power cord (Figure 1 - 5) supplied with the Test Set is a North American standard 3-prong.

NOTE

The AC power cord furnished with the Test Unit can only be plugged into standard North American 110VAC outlets. When using the Test Unit with a 220VAC power source, it is necessary to either replace the power cord or use an appropriate adapter so that the plug may be used with the 220VAC outlet.

For DC operation, the Test Unit can either be powered with the internally-mounted Ni-MH battery pack, or from an external 9-36VDC power source. While the 9-36VDC input jacks are color coded, the input is diode protected to eliminate potential damage caused by an accidental reversal of the polarity. While good to observe the polarity in practice, it is therefore not necessary to connect positive to red and negative to black.

For AC operation, the Test Unit may be operated with a 110/60Hz or 220 VAC/50Hz power source. No configuration changes are required to alter the AC input.

## 1.4. Battery Installation Instructions

NOTE

The Test Unit is designed to detect the presence of the Battery Pack and charge if necessary. The Test unit **does not** require that the Battery Pack be installed to operate.

**1.4.1.** Remove the Test Unit from the Transit Case and place onto a flat surface. Open the Test Unit lid and locate the Battery Box (Figure 2).


**FIGURE 2. BATTERY BOX**

**1.4.2.** Using a hex wrench, remove the two Battery Box Lid screws and slide the cover forward (Figures 3 and 4). Note how the lid is removed to make replacement easier.

**FIGURE 3. BATTERY COVER PARTIALLY REMOVED**


**FIGURE 4. BATTERY BOX COVER REMOVED**

**1.4.3.** When placing the Battery Pack into the Battery Box, note the notch on the right-hand side (Figure 4) for the wiring harness assembly to rest in. Place the Battery Pack as shown in Figure 5, with the harness on the right and the pull tabs straight up. The Battery Box is designed to hold the Battery Pack snugly.

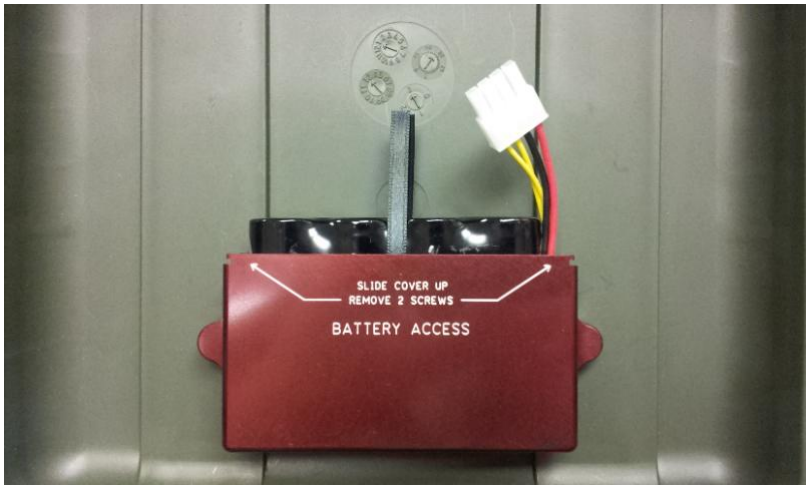



**FIGURE 5. BATTERY PARTIALLY INSTALLED**

**1.4.4.** Attach the Test Unit's battery cable to the Battery Pack wiring harness. Note that the connectors are keyed and cannot be connected incorrectly. Place the connectors on the top of the battery and route the Test Unit cable through the notch at the left of the Battery Box (Figure 6).


**FIGURE 6. BATTERY PROPERLY INSTALLED**

**1.4.5.** Slide the Battery Box cover back onto the Battery Box while 'tucking in' the connector and related hardware. Replace the two hex head screws removed in Step 1.3. The completed installation is shown in Figure 7.


**FIGURE 7. FINISHED BATTERY INSTALLATION**

**1.4.6.** Removal is the reverse of installation with one change: the Battery Pack must be removed by pulling up on both sides of the black strips (Shown standing vertically in Figure 5). The battery may not be removed by pulling the wiring harness.

**1.4.7.** Once the battery is installed, apply external power to the Test Unit and allow 8 hours of continuous charging prior to use.

## 1.5. REFERENCE DATA

**TABLE 2. PHYSICAL AND ELECTRICAL CHARACTERISTICS**

| Item | Characteristics |
|---|---|
| Cable Test Set | |
| Dimensions | 22.06"L x 17.93"W x 10.43"H |
| Weight | 30Lbs (Total weight, including cables, adapters, transit case and manuals) |
| Volume | 1.64 Cubic Feet |
| Test Unit | |
| Dimensions | 11.8”L x 9.8”W x 4.7”H |
| Weight (w/ battery) | 7.2Lbs / 3.3kg |
| Volume | 0.18 Cubic Feet |
| Operating Voltage | DC Input: 9-36VDC from an external power supply. Diode-protected input eliminates the need for proper polarity when connecting.<br><br>AC Input: 110 or 220 VAC, 50 or 60Hz. Input voltage selection is not required. |
| Battery Charging | Built-in constant current charger for the internal 4-cell, 4.8VDC 4500mAh Ni-MH battery pack. |
| Current, Battery | Charge: ~ 2A @ 24VDC MAX<br>Draw: ~ 200mA @ 5VDC MAX when testing |
| Type of Tests | Continuity and insulation resistance. |
| Continuity Test | Seven selectable ranges:<br>250-ft: Up to 20Ω<br>500-ft: Up to 40Ω<br>750-ft: Up to 60Ω<br>1000-ft: Up to 80Ω<br>1250-ft: Up to 100Ω<br>1500-ft: Up to 120Ω<br>Self-Test: Up to 10Ω |
| Insulation Resistance | Indicates a fault condition if the insulation resistance between one selected conductor and ground is 10MΩ (nominal) or less. |

## 1.6. ENVIRONMENTAL CHARACTERISTICS

The AN/GTM-3B was designed to meet or exceed MIL-PRF-28800 Class III specifications. Table 3 provides the environmental characteristics of the Cable Test Set.

**TABLE 3. ENVIRONMENTAL CHARACTERISTICS**

| Item | Characteristics |
|---|---|
| Test Unit | |
| Operating Temp | 0°C to +50°C |
| Storage Temp | -40°C to +71°C |
| Operating Altitude | 0 to 4600 meters |
| Humidity | 5% to 75% ±5% from +30°C to +40°C<br>5% to 45% ±5% above +40°C |
| Vibration, Random | Per MIL-PRF-28800 Table 3 (3.8.4.1) |
| Vibration, Sinusoidal | Per MIL-PRF-28800 Table 4 (3.8.4.2) |
| Shock, Functional | 30g |
| Bench Handling | Per MIL-PRF-28800 Table 4 (3.8.5.3) |
| Watertight Case, Transit | IPC67: 1 meter submersion for 30 minutes |
| Min Operating Time (Battery) | 8 hours |
| Max Recharge Time (Battery) | 10 hours |
| Calibration Interval | No Calibration Required |

## 1.7. WARRANTY INFORMATION

The AN/GTM-3B comes with a one-year warranty covering defects in both parts and workmanship until the end-date noted on the label inside the lid of the Test Unit. It does not cover damage caused by abuse, neglect or acts of God.

# CHAPTER 2
# SERVICE UPON RECEIPT

## 2.1. UNPACKING

The Cable Test Set is shipped in a standard single-wall cardboard box. Unpacking of the Cable Test Set is straightforward and does not require any special tools or unpacking instructions.

## 2.2. CHECKING UNPACKED EQUIPMENT

Open the Transit case and check the Cable Test Set as follows:

1. Inspect the equipment for possible in-shipment damage. If equipment is received in damaged condition, do not attempt to power-on or operate it until the damage has been corrected.
2. Check the equipment against the packing slip and Table 1 to ensure the shipment received is complete. All documentation and accessories will be located within the Transit Case.

## 2.3. SHIPPING PRECAUTIONS

NOTE

Prior to shipping the Cable Test Set, remove the Battery Pack from the Test Unit and place it into the proper cut-out in the Transit Case.

The Cable Test Set can be shipped in the Transit Case without an external shipping container, but this is not recommended to ensure the longevity of the Transit Case. It is recommended that the Cable Test Set be shipped in a standard cardboard box. The shipping box supplied with the Cable Test Set is not considered reusable dunnage and is intended to be discarded.

## 2.4. PREPARATION FOR SHIPMENT

From the Test Unit, referring to Section 1.4, remove the Battery Pack and place into the Battery Pack cut-out in the Transit Case. Place all items into the Transit Case, referring to Table 1 to ensure completeness. Once the case lid is secured, the Cable Test Set is properly prepared for shipment and ready to be placed into a standard cardboard shipping container.

## 2.5. INSTALLATION OF INTERNAL RECHARGEABLE BATTERY

CAUTION

Only a battery pack, model #TSE-P01-03-004 (or equivalent) should be used in the Test Unit. The charging circuit in the Test Unit provides optimum charging current for the specified battery type (Ni-MH) and capacity (4500mAh) only. Refer to Section 4.5.1 for battery pack information.

The Test Unit is shipped with the rechargeable battery pack external to the Test Unit. Refer to Section 1.4 for installation or replacement.

## 2.6. OPERATION FROM 9-36VDC POWER SOURCE

NOTE

While the DC input terminals are RED and BLACK to indicate polarity, the Test Unit is diode-bridge protected and the positive (+) lead may be connected to either input (positive or negative) with no possibility of damage, provided the voltage is kept between 9 and 36VDC.

The external 9-36VDC input to the Test Unit is connected via two binding posts located on the right-hand side of the Front Panel Assembly. To power via the 9-36VDC input, perform the following:

1. Set the POWER switch on the Test Unit to OFF.
2. Ensure the 110V/220VAC power input is not connected.
3. Connect the positive lead from the 9-36VDC power source to the red (+) binding post; negative lead to the black (-) binding post. To connect a lead, press and hold the face of the binding post to expose the connection hole, insert the wire into the hole and release the binding post.
4. Configuration complete.

## 2.7. OPERATION FROM AC POWER SOURCE

The external AC input to the Test Set is connected via the AC power cord to the AC Inlet connector located on the right-hand side of the Front Panel Assembly. To power via the AC input, perform the following:

1. Set the POWER switch on the Test Unit to OFF.
2. Ensure the 9-36VDC input is not connected.

3. From the front panel of the Test Unit, connect the 110VAC Power Cord from the AC Inlet to the wall outlet.
4. Configuration complete.

Note that there is no voltage selector switch required when alternating between the 110VAC and 220VAC inputs.

NOTE

The AC power cord furnished with the Test Unit can only be plugged into standard North American-type 110VAC outlets. When using the Test Set with a 220VAC power source, it is necessary to either replace the power cord plug, or use an adapter.

# CHAPTER 3
# CONTROLS AND INDICATORS

## 3.1. GENERAL

This section provides a description of the Test Unit's controls and indicators. There are no operating controls or indicators on any other items included with the Cable Test Set.

## 3.2. CONTROL AND INDICATORS

Figure 8 shows the controls and indicators for the Test Unit. Table 4 details the function and use of each control and indicator.

**TABLE 4. CONTROLS AND INDICATORS**

| Fig / Index No. | Control / Indicator | Function |
|---|---|---|
| 1 | 9-36VDC binding posts | Provides for connection of external 9-36VDC input. It is diode protected, allowing for connection without regard to polarity (e.g., Positive to RED binding post and Negative to BLACK binding post) and eliminating potential damage. |
| 2 | AC Inlet | Provides for connection of external AC Power to the Test Unit, either 110VAC/60Hz or 220VAC/50Hz. |
| 3 | POWER switch | ON Position: Test Unit is switched on.<br>OFF Position: Test Unit is switched off.<br><br>There is no special shut-down procedure required.<br><br>NOTE<br>When external power (AC or DC) is connected and the Test Unit is powered off, the Test Unit will charge the internal Battery Pack but there will be no indicator. |
| 4 | CABLE PAIRS indicators | Serves to identify the Cable Pair(s) or conductor(s) as either passing or failing, as well as indicating the pair or conductor under test.<br><br>If the Test Unit is operated with the internal battery, the indicators associated with the pair under test illuminate green to show test progress, extinguishing as it moves to the next pair. When the test discovers a faulty Cable Pair |

| | | |
|---|---|---|
| | | or conductor, the indicator associated with the faulty pair will illuminate "RED" and remain illuminated until the Test Unit switches off or the test is exited.<br><br>If the Test Unit is operated with external power (9-36VDC or AC), the indicators corresponding to the Cable Pair under test will light continuously, "GREEN" for pass and "RED" for fail. |
| 5 | GO indicator | Illuminates "GREEN" when test results are normal (GO) and "RED" when a defective Cable Pair is discovered (NO-GO). This indicator is used for both the CCHK and IR tests. |
| 6 | END indicator | Illuminates "GREEN" after the completion of the current test. |
| 7 | LCD display | The LCD display provides operator information based upon the position of the TEST switch (10) as follows:<br><br>NOTE<br>Whether running from the internal Battery Pack or on External Power, the LCD backlight will remain illuminated. Backlight illumination is not user selectable.<br><br><u>CCHK</u><br>250-ft – Used for testing one 26-pair, 250-ft cable with a nominal resistance not exceeding 20Ω.<br><br>500-ft – Used for testing two 26-pair, 250-ft cables (500-ft total) with a nominal resistance not exceeding 40Ω.<br><br>750-ft – Used for testing three 26-pair, 250-ft cables (750-ft total) with a nominal resistance not exceeding 60Ω.<br><br>1000-ft – Used for testing four 26-pair, 250-ft cables (1000-ft total) with a nominal resistance not exceeding 80Ω.<br><br>1250-ft – Used for testing five 26-pair, 250-ft cables (1250-ft total) with a nominal resistance not exceeding 100Ω.<br><br>1500-ft – Used for testing six 26-pair, 250-ft cables |

| | | |
|---|---|---|
| | | (1500-ft total) with a nominal resistance not exceeding 120Ω.<br><br>Self-Test – Runs the Continuity Self-Test with a nominal resistance not exceeding 10 Ω.<br><br><u>IR</u><br>IR – Runs the Insulation Resistance Test.<br><br>Self-Test – Runs the Insulation Resistance Self-Test.<br><br>Test Speed Slow / Fast – Changes the speed of the IR test execution. Default is Slow. Use the "START" button to change the selection.<br><br>Stop on Fail: YES / NO – Changes the nature of the IR test execution to either continue running when a fault is found (NO) or to stop (YES). Default is NO. Use the "START" button to change the selection.<br><br><u>MENU</u><br>Lamp Test – Runs the Display Self-Test, turning on all green LEDs, red LEDs and the Graphical LCD's pixels.<br><br>Button Test – Runs the Button Self-Test, verifying that all Front Panel buttons are operational.<br><br>Test Tone – Applies a constant tone to the Cable Pair under test.<br><br>Tester Info – Provides Firmware Build Date and Time.<br><br>Auto-Off Enabled / Disabled – Affect CCHK and IR tests when running off of the battery pack only. When ENABLED, the Test Unit will turn off once a successful test is completed. When DISABLED, the Test Unit will continue running after a successful test completion. Default is ENABLED. Use the "START" button to change the selection.<br><br>NOTE<br>When running off of the internal Battery Pack with Auto-Off ENABLED, the Test Unit will turn off only upon a successful test completion ("GO"). If the test fails, the |

| | | |
|---|---|---|
| | | Test Unit will remain on.<br><br>System Zero Cal – Allows the operator to connect any cable / plug combination to the Test Unit and 'calibrate out' the system resistance to ensure that measured continuity values are as accurate as possible. |
| 8 | ONE STEP pushbutton | When the AUTO/MAN switch is in the MAN position, pressing the ONE STEP pushbutton once advances the test to the next Cable Pair.<br><br>When the AUTO/MAN switch is in the AUTO position and the test has halted due to a locating a faulty Cable Pair, pressing the ONE STEP pushbutton advances the test to the next Cable Pair. |
| 9 | START pushbutton | The START pushbutton performs a multifunction role, starting tests, changing selections (e.g., Test Speed Slow to Fast), and exiting tests.<br><br>During AUTO mode, pressing the START pushbutton initiates the testing at Cable Pair 1. Holding the START pushbutton down during a test execution resets the test to Cable Pair 1.<br><br>During MAN mode, pressing the START pushbutton resets the test to Cable Pair 1.<br><br>NOTE<br>When running MAN mode it may be necessary to press the ONE STEP button while pressing the START button. |
| 10 | TEST switch | A three-position switch for selecting the required test mode:<br><br>CCHK – Selects the "continuity" test mode.<br>IR – Selects the "insulation resistance" test mode.<br>MENU – Selects the Test Unit Self-Test Functions.<br><br>NOTE<br>When running a test in either AUTO or MANUAL mode, changing the TEST switch position (e.g., IR from CCHK) will cause the test that is running to halt and the display |

| | | |
|---|---|---|
| | | to change to the new setting. |
| 11 | AUTO/MANUAL switch | Permits AUTO (automatic) or MAN (manual) operating mode of the Test Unit.<br><br>AUTO – Testing of the Cable Pairs is performed automatically, beginning with Cable Pair 1 and ending with Pair 26.<br><br>MAN – Testing of the cables pairs is performed manually by depressing the ONE STEP pushbutton for each Cable Pair. The manual test begins with Cable Pair 1 and steps through to Cable Pair 26. The MAN position is normally used when troubleshooting or repairing a cable assembly. |
| 12 | PAIRS 14-26 connector | Provides for connection of the 26-pin female connector on the branched cable. |
| 13 | PAIRS 1-13 connector | Provides for connection of the 26-pin male connector on the branched cable. |
| 14 | UP/DN switch | A momentary rocker switch that allows the operator to interact with the LCD display (7) selections prior to test execution, and also allows for stepping through test results once completed. |
| 15 | LCD Contrast Adjust | This panel-mounted potentiometer is used to adjust the contract of the LCD Display.<br><br>NOTE<br>The contrast may need to be adjusted during use in temperature extremes, when charging or when the Battery Pack charge is low, which is normal for all LCD Displays. |
| 16 | Battery Pack Cable Inlet | This inlet allows for the Battery Pack to be connected to the Test Unit Internal Assembly. |

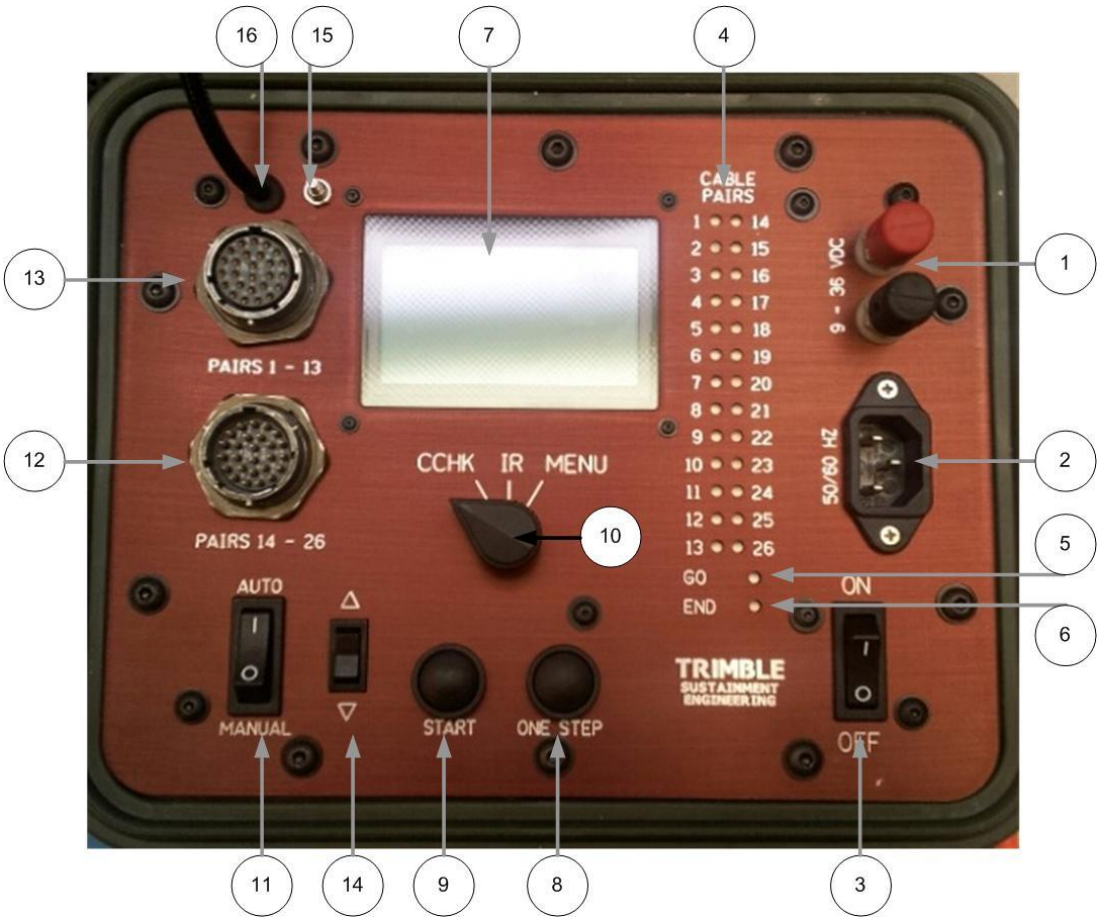



**FIGURE 8. CONTROLS AND INDICATORS**

## 3.3. OPERATING INSTRUCTIONS

When the Test Unit is being powered via internal battery, only the pairs under test will illuminate while all others will remain extinguished to conserve battery power. Once the test is completed and the START button is depressed, the Test Unit will automatically power down to conserve power.

If the Test Unit is being powered via an external source, the Cable Pairs will illuminate continuously to indicate test results. The END indicator will light and remain ON until a new test is initiated (i.e., there is no auto power shutdown).

## 3.4. INTERNAL BATTERY CHECK

The Test Unit continuously monitors the battery level and will top off the battery charge as necessary. When the battery pack discharges sufficiently below the fully charged value, the Test Unit LCD display will notify the operator by displaying “BAT LO” in the upper right corner.

When externally powered, the LCD upper right corner will indicate either “*CHG*” (blinking), “BAT OK” (fully charged), or nothing (battery is not installed).

When powered by the internal Battery Pack, the LCD upper right corner will indicate either "BAT OK" (battery charge is within tolerance) or "BAT LO" (battery requires charging soon).

## 3.5. SELF-TEST - IR and CCHK

### 3.5.1. Insulation Resistance Test

To self-test the Test Unit, proceed as follows:

1. Connect the two connectors on the branched cable to the two connectors (PAIRS 1-13 and PAIRS 14-26) on the Test Unit Front Panel Assembly. Ensure the test plug is not connected to the branched cable.
2. Set the Test Unit as follows:

| Switch | Setting |
|---|---|
| POWER | ON |
| TEST SWITCH | IR |
| AUTO/MANUAL | AUTO |

3. Using the "UP/DN" switch and from the Test Unit LCD, select SELF-TEST and press the START pushbutton. The CABLE PAIRS indicators will cycle through from 1 to 26, testing each wire for a resistance of greater than 10MΩ. The LCD will indicate the measured value of each conductor within the 26-pairs as well as PASS/FAIL. Failures will be noted on the LED Display.
4. Upon completion, the GO indicator will illuminate either GREEN (GO or PASS, the cable is ready for use) or RED (NO-GO or FAIL, the cable or Test Unit require repair).
5. If a failure is noted, use the "UP/DN" toggle switch to step through the measured values of each Cable Pair until the failed wire is located. Note the wire number and A or B designator along with the measured range prior to continuing to the next step.
6. If the IR (3.5.1) self-test fails, isolate the failed component by first performing the following:
    1. Remove and replace the branched cable with an alternate.
    2. Perform the Insulation Resistance Test (3.5.1). If the test passes, mark the previous cable as potentially bad and remove from service. If the test fails, mark the Test Unit as requiring maintenance and remove from service.

### 3.5.2. Continuity Test

To self-test the Test Unit, proceed as follows:

1. Connect the two connectors on the branched cable to the two connectors (PAIRS 1-13 and PAIRS 14-26) on the Test Unit Front Panel Assembly. Ensure the test plug is connected to the branched cable.
2. Set the Test Unit as follows:

| Switch | Setting |
|---|---|
| POWER | ON |

| | |
|---|---|
| TEST SWITCH | CCHK |
| AUTO/MANUAL | AUTO |

3. Using the "UP/DN" switch and from the Test Unit LCD, select SELF-TEST and press the START pushbutton. The CABLE PAIRS indicators will cycle through from 1 to 26, testing each pair for a resistance of <10, 20, 40, 60, 80, 100 and 120Ω. Measured resistance values will be noted on the LCD Display and failures will be noted with the Red/Green LED Display.
4. Once completed, the GO indicator will illuminate either GREEN (GO) or RED (NO-GO). Once completed successfully, the cable under test is verified ready for use.
5. If the CCHK (3.5.2) self-test fails, isolate the failed component by first performing the following:
    1. Remove and replace the branched cable with an alternate. Perform the Continuity Test (3.5.2). If the test passes, mark the initial branched cable as potentially bad and remove from service. If the test fails, continue to the next step.
    2. Remove and replace the test plug with an alternate. Perform the Continuity Test (3.5.2). If the test passes, mark the initial test plug as potentially bad and remove from service. If the test fails, continue to the next step.
    3. Mark the Test Unit as requiring maintenance and remove from service.

## 3.6. SELF-TEST / MENU SELECTION

### 3.6.1. Lamp Test

To check the serviceability of the front panel indicators, proceed as follows:

1. Set the Test Unit switches as follows:

| Switch | Setting |
|---|---|
| POWER | ON |
| TEST SWITCH | MENU |

2. Using the "UP/DN" switch, and from the LCD Display, highlight the LAMP TEST selection and press START and ensure the following occurs:
    a. All LED's illuminate RED then GREEN.
    b. The LCD display turns on all pixels, appearing like a large black box with a white border.
3. After approximately 4 seconds the display will return to its previous state.

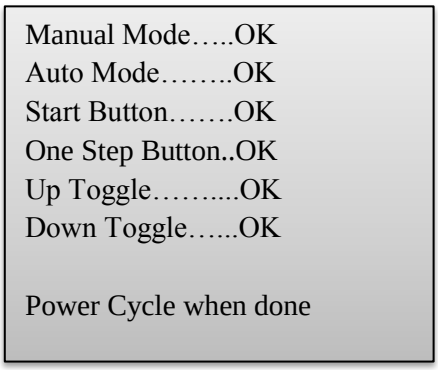
### 3.6.2. Front Panel Button Test

To check the serviceability of the front panel buttons, proceed as follows:

1. Set the Test Unit switches as follows:

| Switch | Setting |
|---|---|
| POWER | ON |
| TEST SWITCH | MENU |

2. From the LCD Display, highlight the BUTTON TEST selection and press START and ensure that each button press is reflected on the front panel LCD display. Note that the LCD will display "Power Cycle when done" across the bottom, instructing the operator to power cycle the Test Unit when completed.
3. Once all the buttons are tested, the display should look like the following:




NOTE

This test will continue to run until the operator cycles the Test Unit power switch.

### 3.6.3. Test Tone

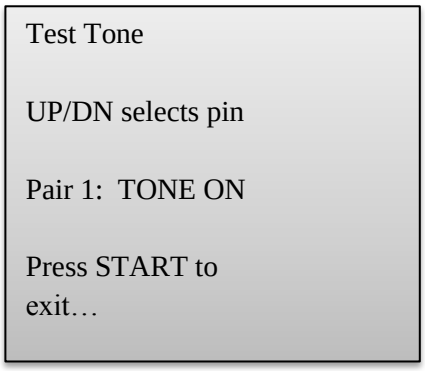
This selection allows the operator to verify that cable under test is capable of passing an audible signal. The Test Unit does not automatically step through the pairs, relying instead on the operator to manually select the pair that requires testing.

To perform the Test Tone test, proceed as follows:

1. Set the Test Unit switches as follows:

| Switch | Setting |
|---|---|
| POWER | ON |
| TEST SWITCH | MENU |

2. Using the "UP/DN" switch, and from the LCD Display, highlight the TEST TONE selection and press START and ensure the following occurs:
    a. Cable Pair '1' LED illuminates GREEN.
    b. The LCD should display the following:




3. Using the "UP/DN" toggle switch, select the cable that requires verification.
4. When the test is complete, press the START button to return to the MENU.

### 3.6.4. Tester Info

This selection allows maintenance personnel to quickly verify that the Test Unit firmware is up to date. If the firmware is found to be out of date the Test unit must be returned for maintenance.

### 3.6.5. Auto-Off Enabled/Disabled

This selection allows operator to over-ride the default automatic shut-off that occurs at the end of testing when running on the internal Battery Pack. "ENABLED" means that the Test Unit shall turn off once a successful IR / CCHK test is completed and the START button is pressed to continue. "DISABLED" means that the Test Unit shall not turn off once an IR / CCHK test is completed and START is pressed to continue.

NOTE

The Auto-Off feature was included to extend the life of the Battery Pack. Disabling the Auto-Off feature will reduce the amount of time the Test Unit will be able to run on battery power.

To change the Auto-Off value, proceed as follows:

1. Set the Test Unit switches as follows:

| Switch | Setting |
|---|---|
| POWER | ON |
| TEST SWITCH | MENU |

2. Using the "UP/DN" switch, and from the LCD Display, highlight the AUTO-OFF ENABLED selection and press START. Ensure that the display changes from AUTO-OFF ENABLED to AUTO-OFF DISABLED.
3. Pressing START again while AUTO-OFF is selected will alternate the value from ENABLED to DISABLED and back again.

NOTE

Powering cycling the Test Unit returns all values to their default values. If power is lost, settings will need to changed again.

### 3.6.6.System Zero Cal

NOTE

Prior to running the System Zero Cal, verify that the Branched Cable and Test Plug to be used will pass the IR and CCHK tests.

The Test Unit was designed to allow for any Branched Cable and Test Plug to be used when testing, even older pre-existing cable assemblies. One issue that may occur with these older cables is a higher line resistance due to age, contact corrosion, etc, and so to counter this the System Zero Cal was included. This function allows the operator to connect any cable / plug combination to the Test Unit and 'calibrate out' the system resistance to ensure that measured continuity values are as accurate as possible.

NOTE

Running the System Zero Cal with no cable attached will result in the Test Unit storing bad calibration data. If this occurs, connect a cable / plug and re-run the test prior to resuming testing.

To perform the System Zero Cal, proceed as follows:

1. Set the Test Unit switches as follows:

| Switch | Setting |
|---|---|
| POWER | ON |
| TEST SWITCH | MENU |

2. Using the "UP/DN" switch, and from the LCD Display, highlight the SYSTEM ZERO CAL selection and press START. The Test Unit will prompt the user to attach the Branched Cable and Shorting Plug. Press START to continue.
3. The LCD will display EEPROM ##: **, where ## is a non-volatile location in memory and ** is a small value, typically 00 to 02, representing the value in ohms. The test will run to completion automatically and, once finished, return the LCD display to the MENU. If the operator notices a very large value (> 60) then a line is faulty and the test will need to be re-run after the cable and plug are verified. It is not necessary to run the SYSTEM ZERO CAL more than once unless the cable and test plug assemblies are changed. All values are stored in non-volatile memory and are loaded when the Test Unit is started.

## 3.7. INSULATION RESISTANCE TEST

This test serves to check the integrity of the insulation between Cable Pairs and ground, executing the test on the "A" side first, followed by the "B" side. If a faulty wire is detected, the test indicates the defective wire within the faulty pair (e.g. 1A or 1B) and notifies the operator via the front panel LED display.

1. Set the Test Unit as follows:

| Switch | Setting |
|---|---|
| POWER | ON |
| TEST | IR |
| AUTO/MAN | AUTO |

CAUTION

The cable assembly to be tested must be completely disconnected (both ends) from the equipment to which it is normally connected.

2. Refer to Figure 9. Connect the cable under test to the Test Unit using the hermaphroditic connector on the branched cable

3. Press and release the START pushbutton and observe that the Cable Pairs indicators illuminate GREEN in sequence, indicating the conductor under test. Note that the test passes through the "A-side" of the connector first, followed by the "B-side", displaying the results in 'real-time' as the test progresses, including the pin under test, the resistance range (e.g. >10M, etc.) and whether the resistance either passes or fails.
4. If step 3 is completed successfully, the insulation resistance of the cable assembly under test is satisfactory and the Test Unit will display either PASS or FAIL at the top of the LCD. The operator can then either use the "UP/DN" rocker switch to cycle through all of the Cable Pairs to review measured values, or press the START button to exit the test. If running on battery power, and if Auto-Off is ENABLED, the Test Unit will then power off to conserve battery power.
5. If any conductor fails the test, the LCD display will indicate a FAIL condition, the GO LED will illuminate RED and the LCD Display will show the failure location (e.g., 1A, 4B, etc).

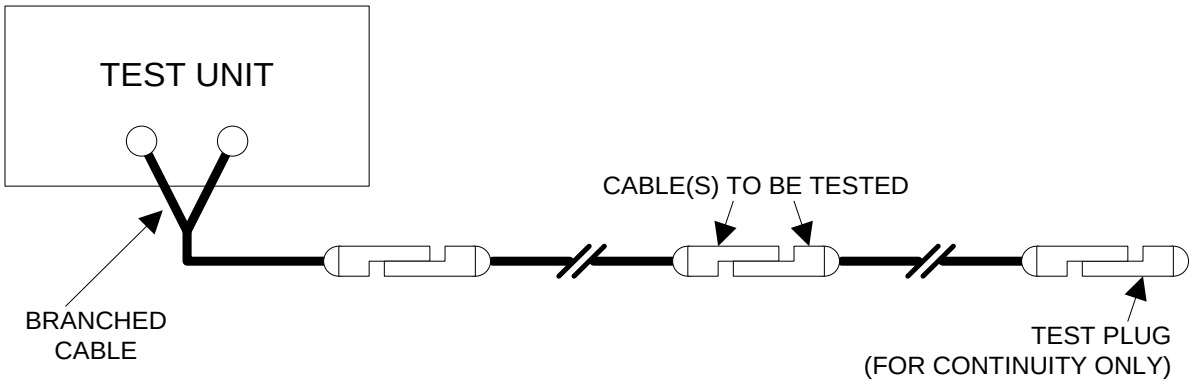



**FIGURE 9. TEST UNIT, OPERATIONAL SET-UP**

## 3.8. CONTINUITY TEST

This test checks for and identifies "open circuit" or high resistance Cable Pairs, if any. Note, however, that although the test identifies the faulty pair, the defective wire within the faulty pair (e.g., 1A or 1B) is not isolated by this test. Proceed as follows:

1. Set the Test Unit as follows:

| Switch | Setting |
|---|---|
| POWER | ON |
| TEST | CCHK |
| LCD UP/DN | FEET OF CABLE HIGHLIGHTED |
| AUTO/MAN | AUTO |

2. Refer to Figure 9. Install the test plug on the other end of the cable under test.

3. Press and release the START pushbutton and observe that the Cable Pairs indicators illuminate GREEN in sequence, indicating the pair under test and a "PASS" condition.
4. If step 3 is completed successfully there will be no RED LED Cable Pair indicators illuminated and the cable under test is acceptable for use. If failures are noted, refer to paragraph 3.9 for corrective action.
5. Once the test is complete, the Test Unit will display either PASS or FAIL at the top of the LCD. The operator can then either use the "UP/DN" rocker switch to cycle through all of the Cable Pairs to review measured values, or press the START button to exit the test. If running on battery power, and if Auto-Off is ENABLED, the Test Unit will then power off to conserve battery power.

## 3.9. FAULT INDICATION

If the continuity test (Para. 3.8) or the insulation resistance test (Para. 3.7) is not completed successfully, the GO indicator will illuminate RED continuously, indicating a fault, or NO-GO, condition. In addition to the GO indicator, one (or more) CABLE PAIR indicators will be illuminated RED. The Cable Pair(s) identified by the RED indication is/are faulty and require maintenance. For example, if CABLE PAIR indicator 22 is RED, then Cable Pair 22 is faulty.

NOTE

It should be noted that a Cable Pair identified as being faulty during continuity test merely means that the Cable Pair does not meet the parameters set by the Test Unit; it does not necessarily mean that the cable is defective. Refer to paragraph 3.10 to determine if the cable is still serviceable.

## 3.10. CABLE USEABILITY TEST

Use the following procedure to determine if a cable found to be faulty as a result of the continuity test (Para. 3.8) is still serviceable.

NOTE

If a continuity fault is detected on a certain cable-length setting, selecting a longer length will assist with determining the usability of the cable assembly under test.

1. Set the Test Unit switches as follows:

| Switch | Setting |
|---|---|
| POWER | ON |
| TEST | MENU |

| | |
|---|---|
| LCD UP/DN | TEST TONE |
| AUTO/MAN | AUTO or MANUAL |

NOTE

The Test Tone test runs in a manual mode only regardless of the AUTO/MAN selection, with the Cable Pair under test selected using the "UP/DN" rocker.

2. Disconnect the test plug from the cable under test, if installed.
3. Connect a field-type telephone to the far end of the cable under test.
4. Upon Test Tone test execution, use the "UP/DN" rocker switch to select the Cable Pair under test. The "UP/DN" rocker allows for moving both forward and backwards through the Cable Pairs.
5. Listen for the test tone on the selected pair as indicated by the Test Unit. For example, if Cable Pair 1 is selected, connect the field telephone to Cable Pair 1 and listen for the test tone. If the test tone quality is acceptable, Cable Pair 1 is still serviceable. Repeat this check on all Cable Pairs selected by the Test Unit as required.

## 3.11. REPAIR VERIFICATION

After completing repairs on a faulty cable, perform the insulation resistance test (Para. 3.7) and continuity test (Para. 3.8) before returning the cable assembly to service.

## 3.12. TEST OF PATCHED PANELS

The Cable Test Set can be used to test the SB-3659/A Panel, Patching Communication (NSN 5859-01-102-2099) and SB-4097/U Panel, Patching Communication (NSN 5895-01-102-2100), or any other patching panels and shelters employing 26-pair connectors, type U-186/U or U-187/U.

Testing of the patching panels is performed in the same manner as described in the preceding paragraphs. Summary follows:

1. For insulation resistance testing, connect the patching panel IN connector to the Test Unit using the branched cable assembly. Make sure that the OUT connector on the patching panel is open circuit, i.e., it must not be connected to any equipment or the shorting plug. Perform the insulation resistance testing per paragraph 3.6.
2. For continuity testing, connect the patching panel IN connector to the Test Unit using the branched cable assembly. Connect the patching panel OUT connector to the shorting plug. Perform continuity testing per paragraph 3.8.

NOTE

The IN and OUT jacks on the patching panel normally provide a straight-thru connection. When

a patch cord is plugged into an IN or OUT jack, the thru connection is broken (becomes open circuit). This feature can be used to check the serviceability of the jacks while performing the continuity testing.

## 3.13. POWER TURN-OFF (AUTO-OFF ENABLED)

When the Test Unit is operated with the internal battery in AUTO or MANUAL mode and Auto-Off is ENABLED, the unit switches off automatically as follows:

1. When a test cycle (CCHK or IR) is successfully completed and all Cable Pairs pass, the GO and END indicators will illuminate GREEN and the LCD will display the measured values for the first pair. The Test Unit will remain on until the START button is pressed, at which time it will automatically shut off.
2. If a fault is located the Test Unit will not automatically shut off regardless of AUTO-OFF setting.

It is recommended that regardless of the mode (AUTO or MANUAL), the POWER switch be set to OFF when the Test Unit is not in use.

When operating from an external power source (9-36VDC or 110/220VAC), use the POWER switch on the Test Unit to turn the unit off.

# CHAPTER 4
# THEORY OF OPERATION

## 4.1. GENERAL

The main tasks performed by the Test Unit are:

1. Insulation resistance testing
2. Continuity testing
3. Tone generation

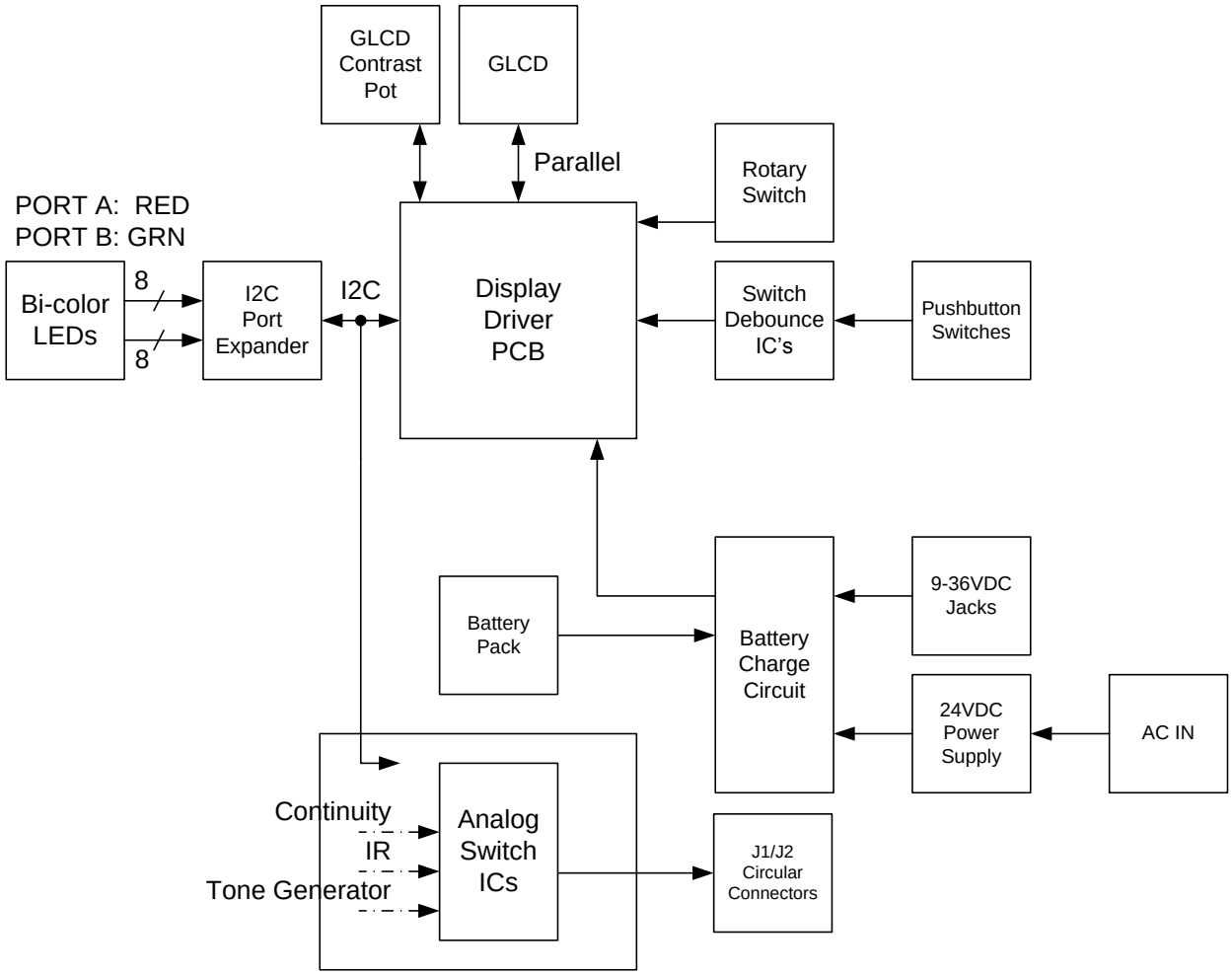



**FIGURE 10. CABLE TEST UNIT BLOCK DIAGRAM**

## 4.2. MAJOR ASSEMBLY DESCRIPTION / PARTS BREAKDOWN

## COMMERCIAL AND GOVERNMENT ENTITY (CAGE) CODE

The following Parts Lists include part numbers and a list of CAGE codes for manufacturers providing replaceable parts for the Test Set, Field Cable AN/GTM-3B. For general listing of codes, names and addresses of manufacturers, refer to Defense Logistics Agency website (http://www.dlis.dla.mil/cage_welcome.asp).

### 4.2.1. Battery – TSE-P01-03-007

The Test Unit has been designed specifically to use a 4-cell Sub-C Ni-MH battery pack, with each cell rated at 1.2V @ 4500mAh. The battery pack includes a thermistor that has been incorporated into the protective shrink wrap to prevent overcharging. Note that the thermistor must meet the specifications outlined in Table 4.

**TABLE 5. REQUIRED THERMISTOR SPECIFICATIONS**

| THM THRESHOLD | RATIO OF $V_{CBIAS}$ | THERMISTOR RESISTANCE (Ω) | TEMPERATURE (°C) | |
|---|---|---|---|---|
| | | | Semitec 103AT-2 | Fenwal 197-103LAG-A01 173-103LAF-301 |
| MIN | 0.73 | 27.04k | 0°C | 4°C |
| MAX | 0.33 | 4.925k | 45°C | 42°C |
| STOP | 0.29 | 4.085k | 50°C | 47°C |

**TABLE 6. BATTERY PACK ASSEMBLY PARTS LIST**

| Part Number: TSE-P01-02-006-PL | | Rev- | | | | |
|---|---|---|---|---|---|---|
| Assembly: Battery Assembly | | | | | | |
| ID | Description | Part Number | Manufacturer | CAGE | Board Qty | Reference Designator |
| 1 | Enclosure | MMBB-BODY-01 REV A | Trimble | 6AUC2 | 1 | |
| 2 | Enclosure Cover | MMBB-COVER-01 REV A | Trimble | 6AUC2 | 1 | |
| 3 | Enclosure Kit, Hardware | TSE-P01-03-BBHK | Trimble | 6AUC2 | 1 | |
| 4 | Battery Pack | TSE-P01-03-007 | Trimble | 6AUC2 | 1 | |
| 5 | Connector, Recept, 4 | 39-01-4040 | Molex | 27264 | 1 | |
| 6 | Contact, Female, Tin, 24-18 AWG | 44476-1112 | Molex | 27264 | 4 | |

### 4.2.2. Battery Charge Circuit – TSE-P01-02-002

The battery charge circuit uses a DC/DC converter to regulate the 24VDC input down to approximately 9VDC through the value of R6. The Maxim IC, part number DS2715, controls the charging of the battery pack, both performing full charges and providing top-off charges as necessary, which eliminates the need to stop testing simply to recharge the batteries. To conserve battery power, a connection exists between the Display Driver Assy U7 and the Battery Charge Assy through TB6. This allows U7 to shut down the Test Unit by sending a clock pulse to IC1 once the tests are completed and when running off of the internal battery. The power switch is connected to TB5 and acts as a power-on and reset once the power-down has occurred.

The battery pack and thermistor are connected to TB4.

The DS2715 provides for an LED output (TB2) to show the status of the charge circuit. The indications are listed in Table 6.

Description from Maxim IC's website:

> It has been optimized for safe and reliable charging of 1 to 10 Ni-MH cells in series. The internal gain block can be selected as either a comparator or transconductance amplifier for charge current regulation. This makes the DS2715 configurable as a switched DC charger, a linear current regulator, or a switch-mode current source. The DS2715 pre-conditions severely depleted cells before entering full charge mode. It terminates full charge using the dT/dt technique, which requires an external sensing thermistor. Over-temperature, under-temperature, and over-voltage detection prevents charging under unsafe conditions. A user selectable charge timer allows charge rates from 0.167°C to 2°C. FAST-CHARGE, TOPOFF and DONE modes are included for highly reliable, safe charging of Ni-MH cells. Discharge mode allows the DS2715 to enter a low power sleep state while the cell pack is being discharged.[1]

[1] http://www.maxim-ic.com/datasheet/index.mvp/id/4788

### 4.2.3.Line Tester – TSE-P01-02-003

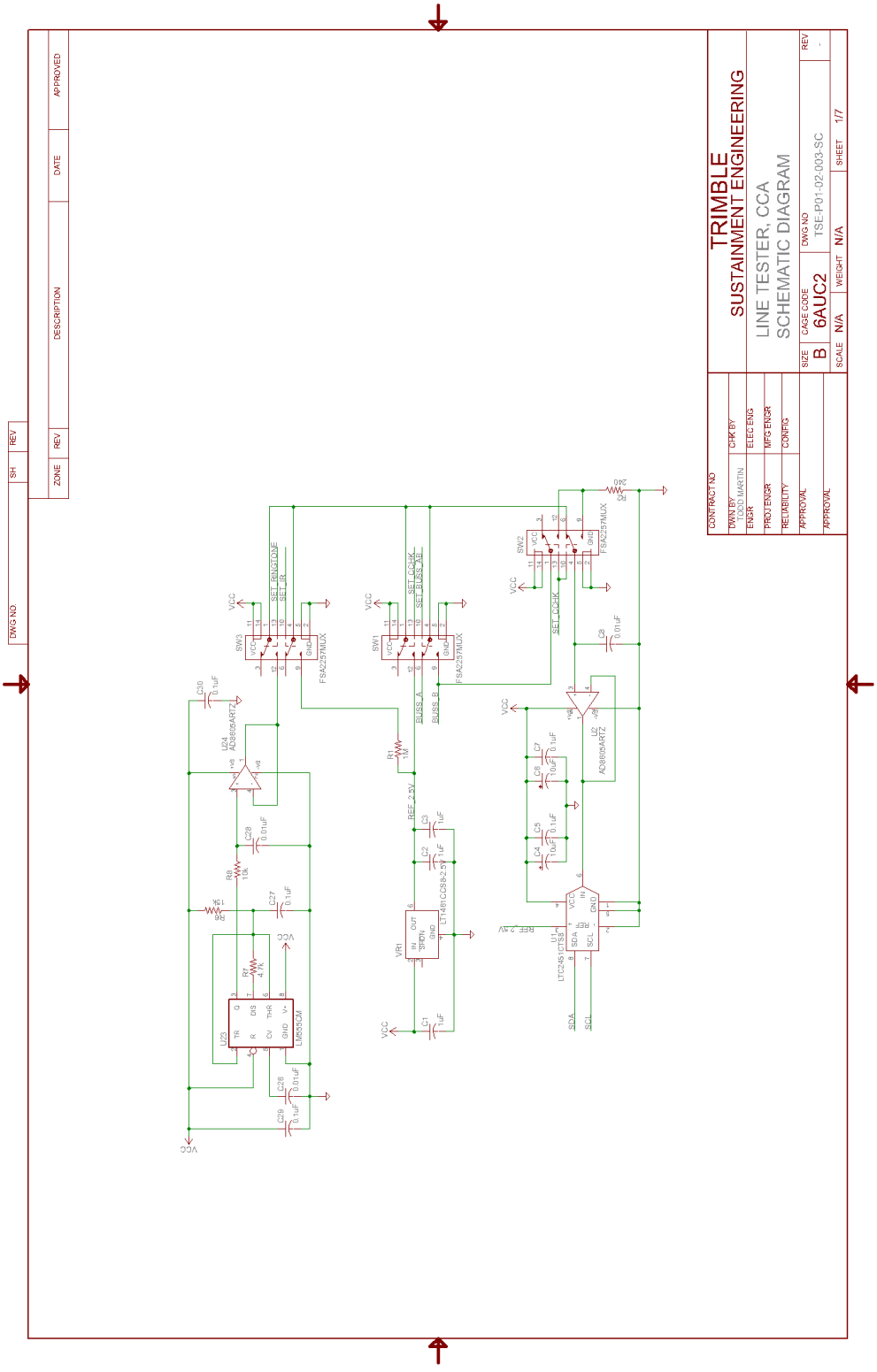
The line tester uses a bank of analog switches to make the electrical connections used for testing all cable features, including continuity, insulation resistance and ring tone. Using this approach will provide longevity and consistency in measurements, eliminating costly, low-reliability and space-consuming mechanical assemblies. As stated, there are three modes of operation, impedance testing, insulation testing, and ring tone testing, all passing through the same set of analog switches.

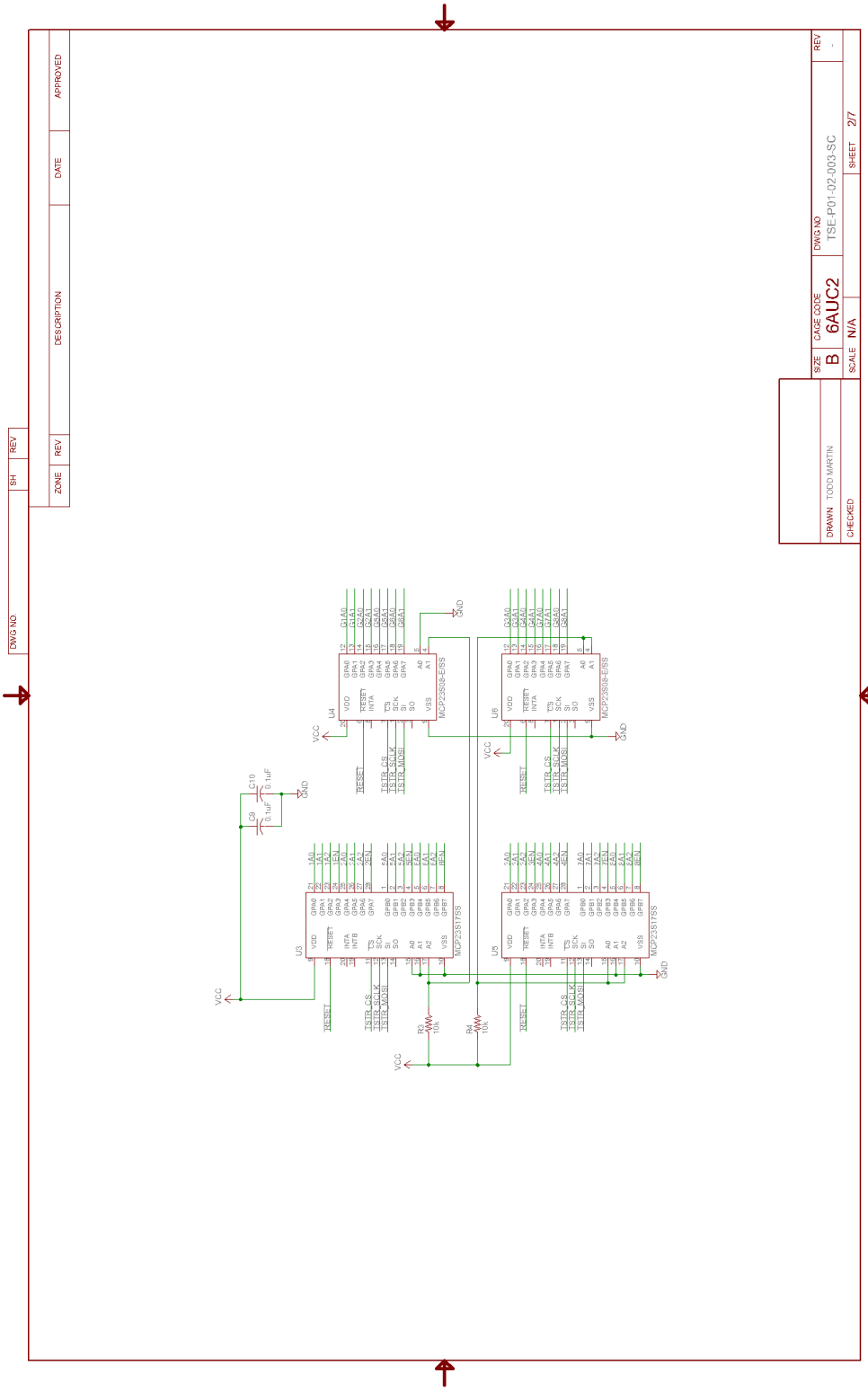
Impedance testing connects a precision voltage reference to the desired wire group A side. The B side measurement is across a resistive load that will draw a maximum of 10mA when there is no resistance. Any resistance between the wire group can be calculated by the voltage measured at the load resistor, and is displayed on the LCD for the operator.

Insulation testing connects all unused pins to ground, while only the pin being tested is pulled up to a precision voltage reference through a 1M resistor. The return voltage is monitored at the pin being tested and will indicate if there is any connection to another line. This low-voltage approach is highly accurate and poses no risk to the operator and less of a risk to any equipment accidentally left connected.

Ring tone testing is similar to isolation testing. The pin being tested is connected to an oscillator that creates an audible tone, which can be heard at the end of the cable with a telephone.

### 4.2.3.1. Line Tester Circuit Schematic, Pages 1 thru 4 – TSE-P01-02-003

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REV
-
SCALE
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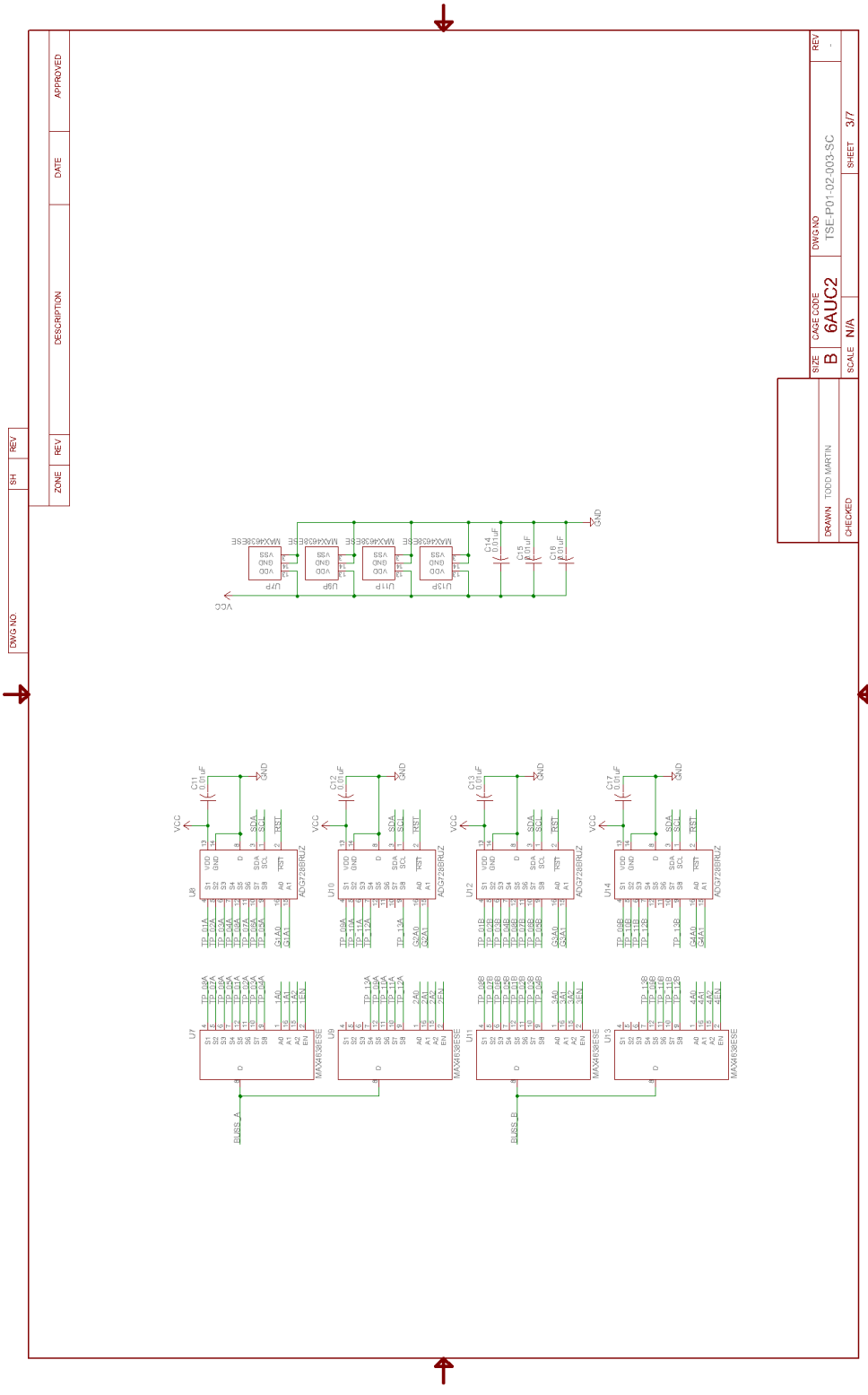
SHEET
2/7
DRAWN
TODD MARTIN
CHECKED
U3
MCP23S17SS
U4
MCP23S08-ESS
U5
MCP23S17SS
U6
MCP23S08-ESS
C9
0.1uF
C10
0.1uF
R3
10k
R4
10k
VCC
GND
RESET
ISTR_CS
ISTR_SCLK
ISTR_MOSI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REV
-
SHEET
3/7
SCALE
N/A
DRAWN
TODD MARTIN
CHECKED
VCC
GND
MAX4638ESE
MAX4638ESE
MAX4638ESE
MAX4638ESE
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U16P
U17P
U18P
C14
0.01uF
C15
0.01uF
C16
0.01uF
C11
0.01uF
C12
0.01uF
C13
0.01uF
C17
0.01uF
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U12
U14
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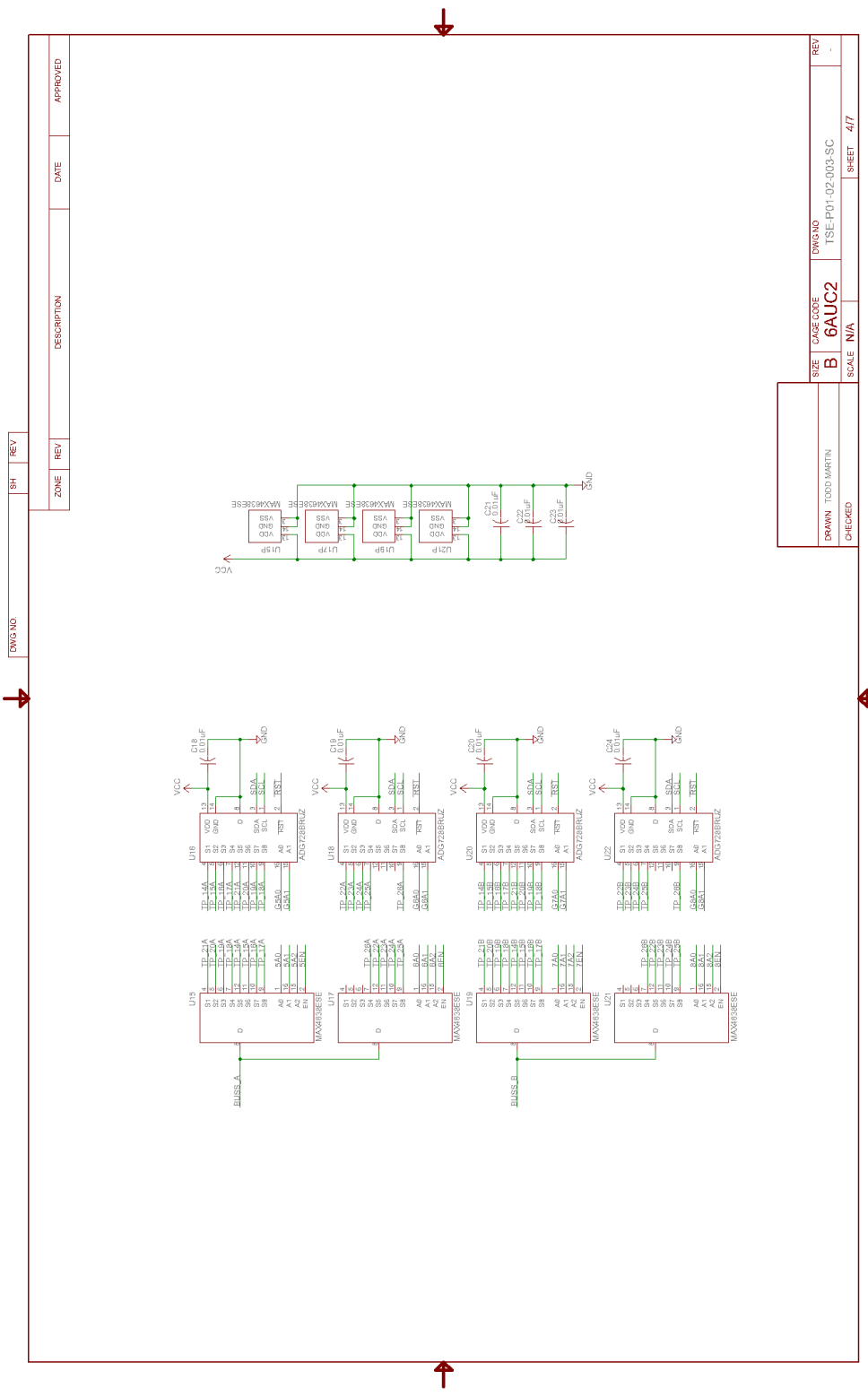
U7
U9
U11
U13
MAX4638ESE
BUSS_A
BUSS_B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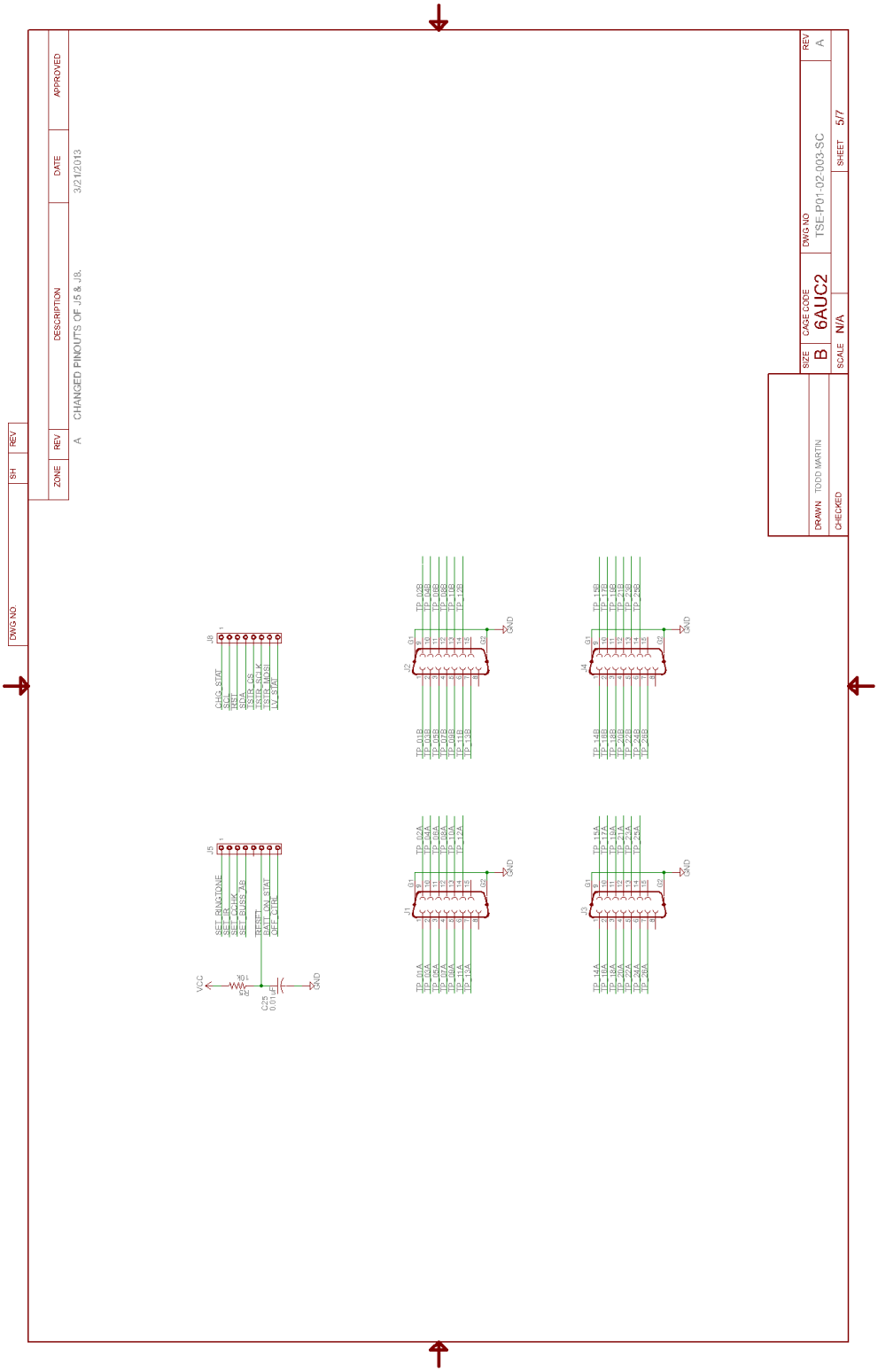
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SIZE
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SCALE
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SHEET
5/7
DRAWN
TODD MARTIN
CHECKED
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INT
SDA
SCL
ISTB_CS
ISTB_SCLK
ISTB_MOSI
LV_SHDN
J5
SET_RINGTONE
SET_CS
SET_CLK
SET_BUSS_AB
RESET
BATT_ON_STAT
SET_LATCH
VCC
R5
47K
C25
0.01uF
GND
J2
J4
J1
J3
TP_1B
TP_2B
TP_3B
TP_4B
TP_5B
TP_6B
TP_7B
TP_8B
TP_9B
TP_10B
TP_11B
TP_12B
TP_13B
TP_14B
TP_15B
TP_16B
TP_17B
TP_18B
TP_19B
TP_20B
TP_21B
TP_22B
TP_23B
TP_24B
TP_25B
TP_26B
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TP_2A
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TP_4A
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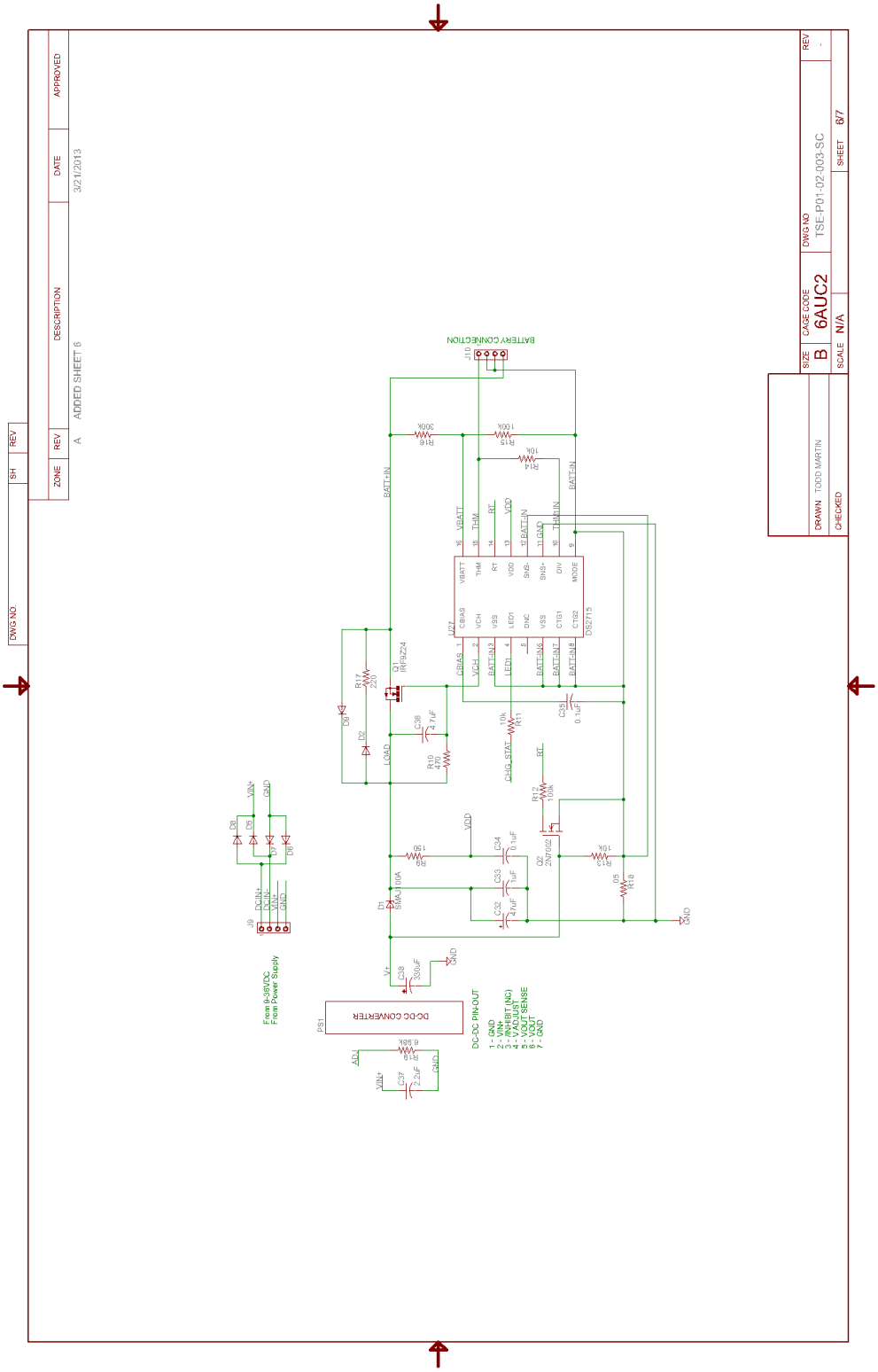
G1
G2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DWG NO
ITSE-P01-02-003-SC
REV
-
SCALE
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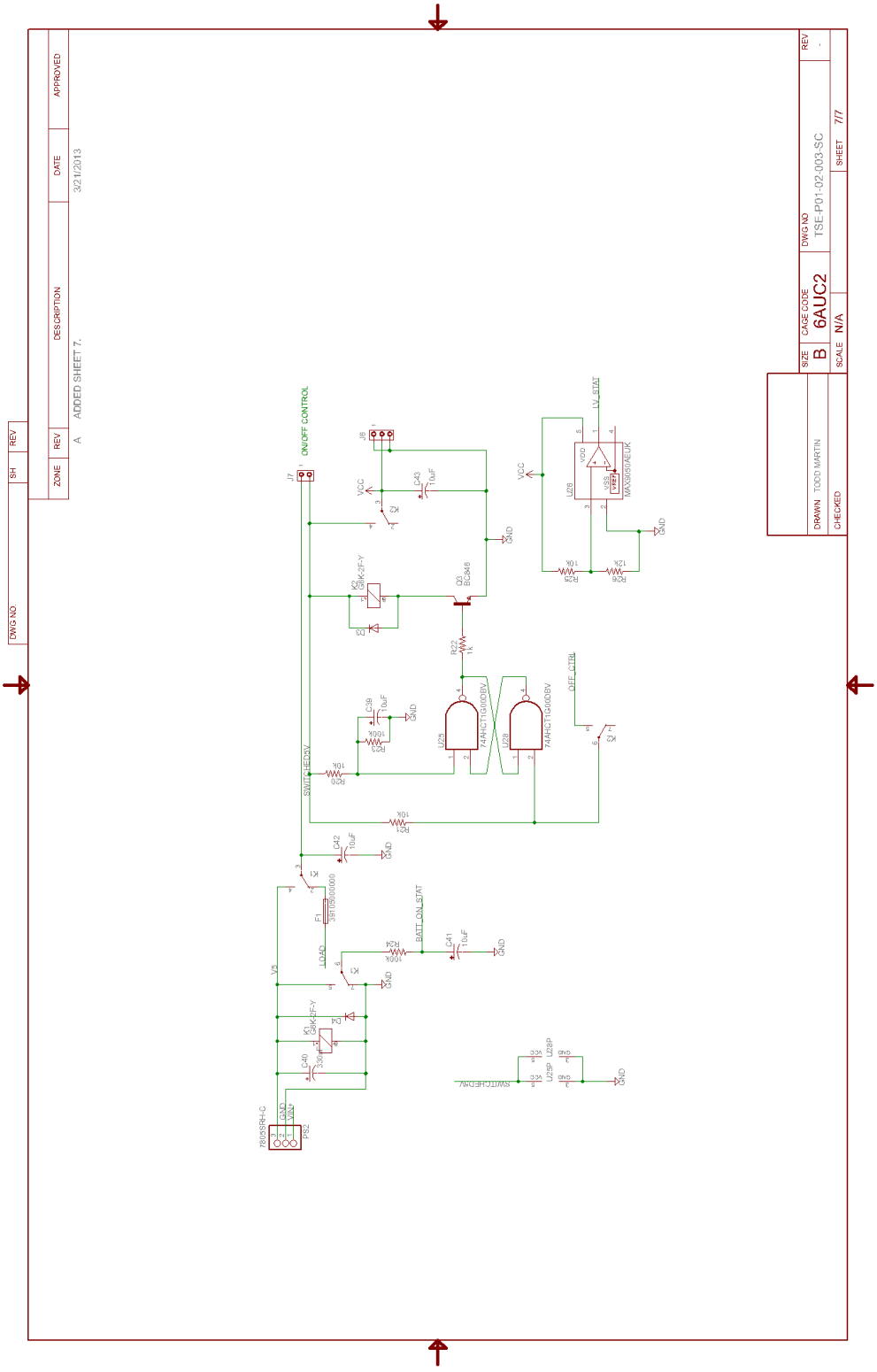
SHEET
6/7
DRAWN
TODD MARTIN
CHECKED
BATTERY CONNECTION
J10
BATT+IN
BATT-IN
U21
DS2715
VBATT
THM
RT
VDD
SNS-
SNS+
DIV
MODE
CBIAS
VCH
VSS
LED1
DNC
CTG1
CTG2
BATTIN2
BATTIN4
BATTIN7
BATTIN8
Q1
IRFB3Z24
R17
220
D4
D2
LOAD
C36
4.7uF
R10
470
10k
VR1
CHG_STAT
C35
0.1uF
R12
100k
Q2
2N7002
R13
10k
R9
5R
C34
0.1uF
C33
1uF
C32
4.7uF
D1
SMAJ10A
R5
VR4
GND
VIN+
GND
D8
D5
D7
D6
DCIN+
DCIN-
VIN-
GND
J9
From 9-36VDC
From Power Supply
V+
C38
330uF
GND
PS1
DC-DC CONVERTER
DC-DC PIN-OUT
1 - GND
2 - VIN+
3 - VIN-/BIT (NC)
4 - V ADJUST
5 - VOUT SENSE
6 - VOUT
7 - GND
ADJ
VIN+
C37
2.2uF
GND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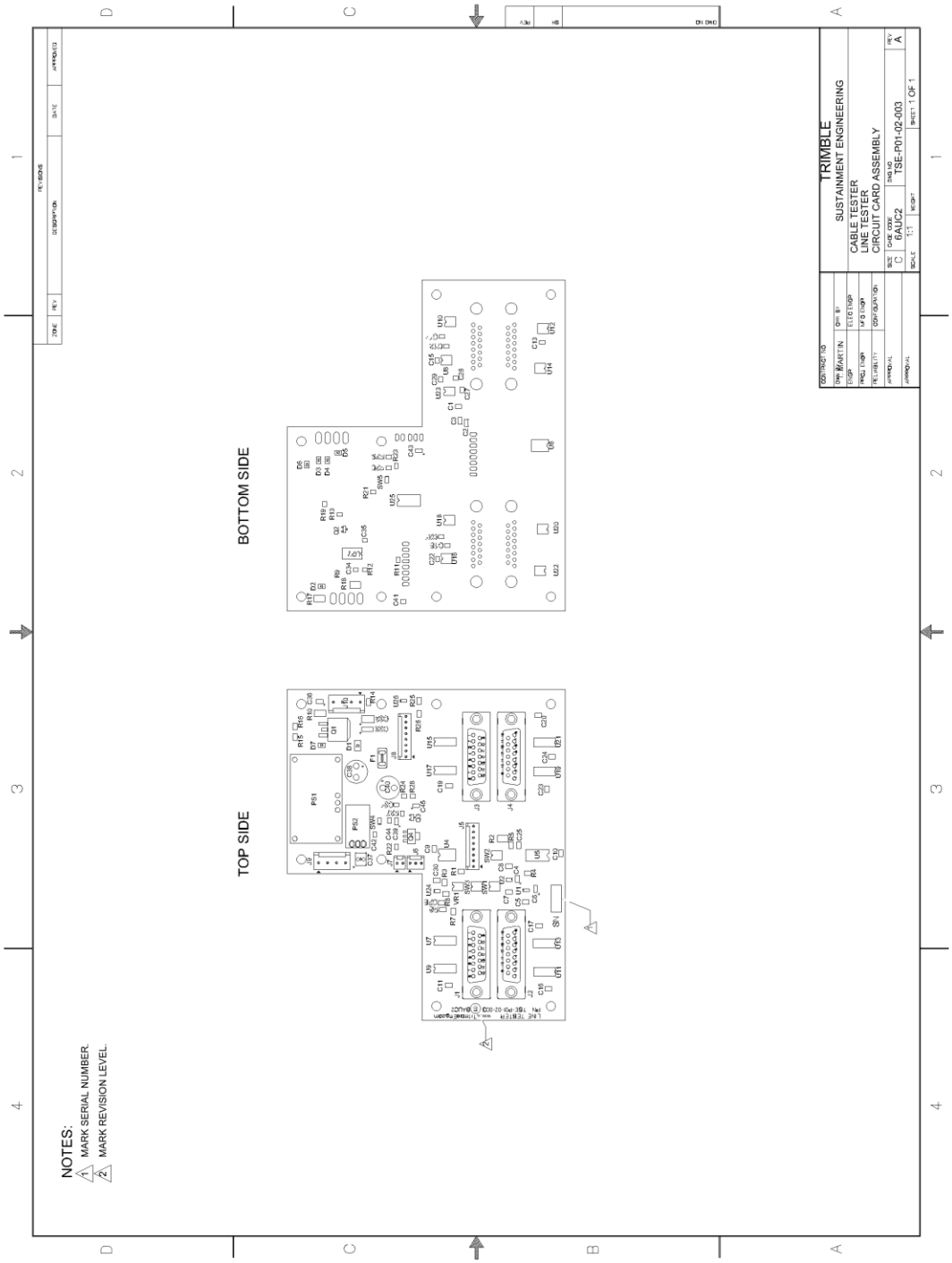
6AUC2
DWG NO
ITSE-P01-02-003-SC
REV
-
SCALE
N/A
SHEET
7/7
DRAWN
TODD MARTIN
CHECKED
ON/OFF CONTROL
LV_STAT
VCC
GND
SWITCHEDSV
OFF_CTRL
LOAD
BATT_ON_STAT
74AHCT1G00DBV
MAX809RAEUK
SWITCHEDSV
PBS2

### 4.2.3.2. Line Tester PCB Parts Locations



### 4.2.3.3. Line Tester Circuit Parts List – TSE-P01-02-003

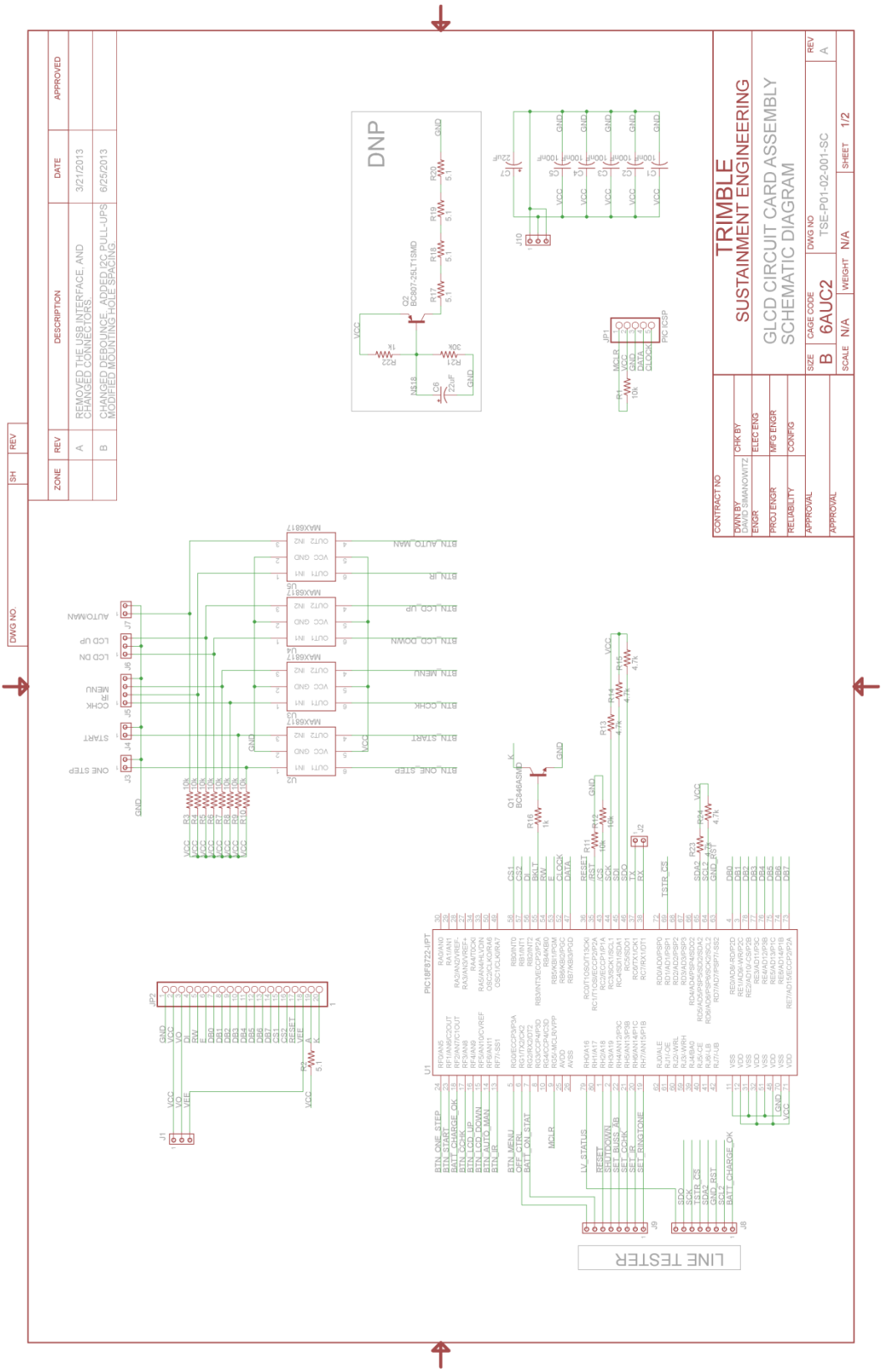
| Part Number: TSE-P01-02-003-PL | | Rev A | | | | | |
|---|---|---|---|---|---|---|---|
| Assembly: Line Tester CCA | | | | | | | |
| ID | Description | Part Number | Manufacturer | CAGE | QTY | Reference Designator |
| 1 | Printed Circuit Card | TSE-P01-03-006 | TSE | 6AUC2 | 1 | |
| 2 | Connector, Dsub, 15F, Veritcle | 1-5747299-4 | TE Connectivity | U0HF6 | 4 | J1, J2, J3, J4 |
| 3 | Header, 1x2, Straight, Lock, 0.1" | 22-11-2022 | Molex | 27264 | 1 | J7 |
| 4 | Header, 1x3, Straight, Lock, 0.1" | 22-11-2032 | Molex | 27264 | 1 | J6 |
| 5 | Header, 1x4, Straight, Lock, 0.156" | 26-61-4040 | Molex | 27264 | 2 | J9, J10 |
| 6 | Header, 1x8, Straight, Lock, 0.1" | 22-11-2082 | Molex | 27264 | 2 | J5, J8 |
| 7 | DC/DC Power Supply, Adjustable | PTN78020WAD | Texas Instruments | 33809 | 1 | PS1 |
| 8 | DC/DC Power Supply, 5V | 7805SRH-C | Murata | SS898 | 1 | PS2 |
| 9 | Capacitor, 0.01uF, 16V, 0603 | MC0603B103K160CT | MultiComp | 0VY29 | 18 | C8, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C28 |
| 10 | Capacitor, 0.1uF, 16V, 0603 | 0603YC104K4T4A | AVX | 04222 | 9 | C5, C7, C9, C10, C27, C29, C30, C34, C35 |
| 11 | Capacitor, 1uF | 0603YD105KAT2A | AVX | 04222 | 4 | C1, C2, C3, C33 |
| 12 | Capacitor, Tant., 2.2uF, 50V, Radial | 199D225X9050C1V1E3 | Vishay Sprague | 05079 | 1 | C37 |
| 13 | Capacitor, Tant., 4.7uF, 16V, 1206 | T491A475K020AT | Kemet | 31433 | 1 | C36 |
| 14 | Capacitor, Tant., 10uF, 16V, 1206 | T491A106K016AT | Kemet | 31433 | 6 | C4, C6, C39, C41, C42, C43 |
| 15 | Capacitor, Tant., 10uF, 16V, 6032 | T491C476K016AT | Kemet | 31433 | 1 | C32 |
| 16 | Capacitor, Elec., 330uF, 25V, Radial | UKA1E331MPD1TD | Nichicon | 55680 | 2 | C38, C40 |
| 17 | Resistor, 0.05, 2512, 1% | WSL2512R0500FEB | Vishay Dale | 02111 | 1 | R18 |
| 18 | Resistor, 150, 1206, 1% | CR1206FX1500ELF | Bourns | 57921 | 1 | R9 |
| 19 | Resistor, 220, 2512, 1% | 3520220RJT | Bourns | 57921 | 1 | R17 |
| 20 | Resistor, 240, 1206, 0.1% | ERA8AEB241V | Panasonic | 0J4G8 | 1 | R2 |
| 21 | Resistor, 470, 1206, 1% | CRCW1206470RFKEA | Vishay Dale | 02111 | 1 | R10 |
| 22 | Resistor, 1k, 1%, 0603 | CRCW06031K00FKEA | Vishay Dale | 02111 | 1 | R22 |
| 23 | Resistor, 4.7k, 1%, 0603 | CRCW06034K70FKEA | Vishay Dale | 02111 | 1 | R7 |
| 24 | Resistor, 6.98k, 1%, 0805 | CRCW08056K98FKEA | Vishay Dale | 02111 | 1 | R19 |
| 25 | Resistor, 10k, 1%, 0603 | CRCW060310K0FKEA | Vishay Dale | 02111 | 10 | R3, R4, R5, R8, R11, R13, R14, R20, R21, R25 |
| 26 | Resistor, 12k, 1%, 0603 | CRCW060312K0FKEA | Vishay Dale | 02111 | 1 | R26 |
| 27 | Resistor, 15k, 1%, 0603 | CRCW060315K0FKEA | Vishay Dale | 02111 | 1 | R6 |
| 28 | Resistor, 100k, 1%, 0603 | CRCW0603100KFKEA | Vishay Dale | 02111 | 4 | R12, R15, R23, R24 |
| 30 | Resistor, 300k, 1%, 0603 | CRCW06033000KFKEA | Vishay Dale | 02111 | 1 | R16 |
| 31 | Resistor, 1M, 1%, 0603 | CRCW06031M00FKEA | Vishay Dale | 02111 | 1 | R1 |
| 32 | Diode, Transient Suppressor, 400W | SMAJ100A | Bourns | 57921 | 1 | D1 |
| 33 | Diode, Ultrafast Recovery, 2A | DB2230600L | Panasonic | 0J4G8 | 2 | D2, D9 |
| 34 | Diode, Rectifier, 200mA, SOD-123 | BAT42W-V-GS18 | Vishay Semiconductor | F4022 | 2 | D3, D4 |

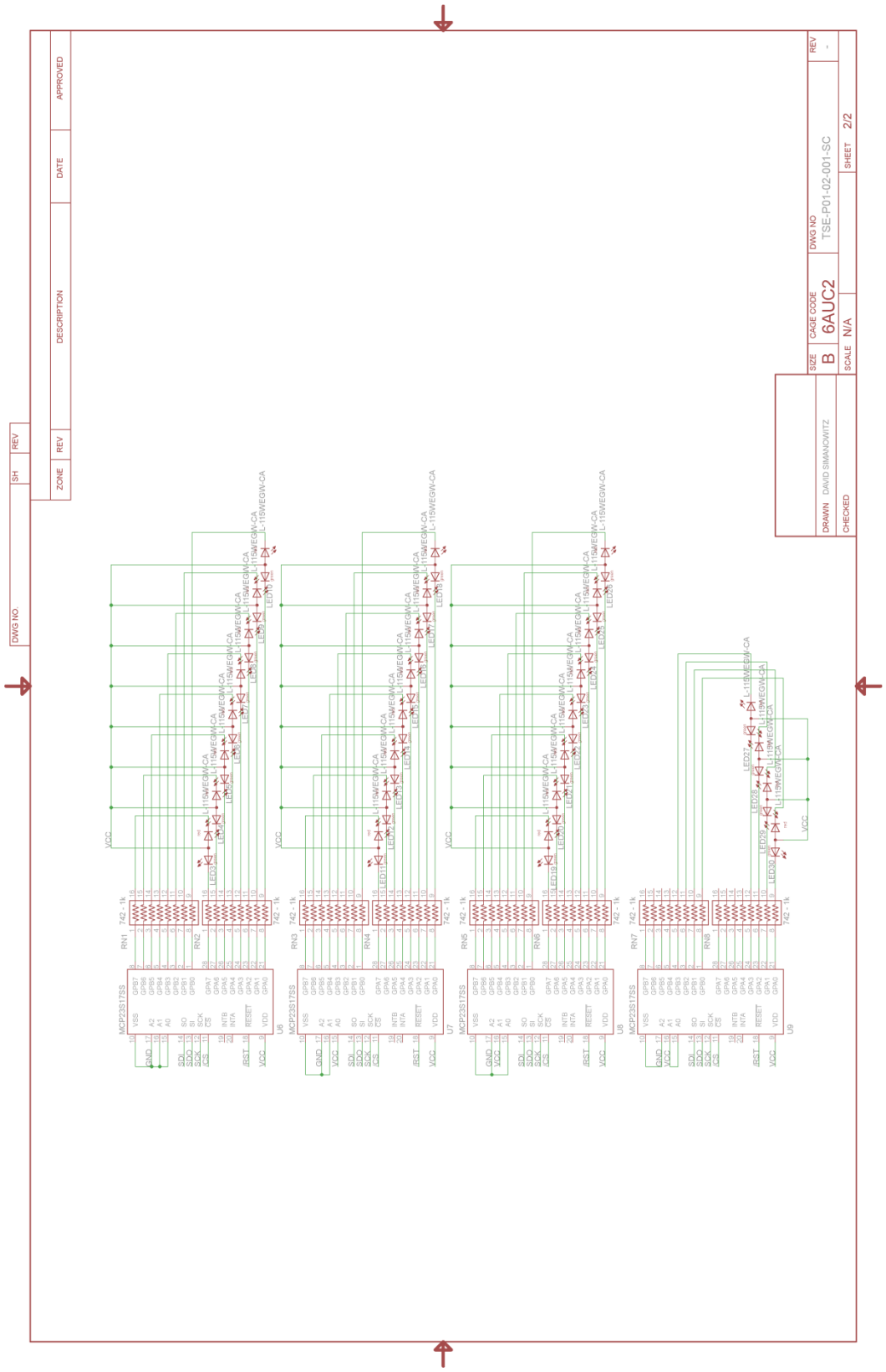
| Part Number: TSE-P01-02-003-PL | | Rev A | | | | |
|---|---|---|---|---|---|---|
| Assembly: Line Tester CCA | | | | | | |
| ID | Description | Part Number | Manufacturer | CAGE | QTY | Reference Designator |
| 35 | Diode, Rectifier, 5A, SMC | MBRS540T3G | ON Semiconductor | 31471 | 4 | D5, D6, D7, D8 |
| 36 | Mosfet, P Chan, 11A | IRF9Z24NSPBF | Vishay Siliconix | 17856 | 1 | Q1 |
| 37 | Mosfet, N Chan, 200mA, SOT-23 | 2N7002 | Fairchild Semiconductor | 7D893 | 1 | Q2 |
| 38 | Transistor, NPN, 100mA | BC846ALT1G | ON Semiconductor | 31471 | 1 | Q3 |
| 39 | Relay, DPDT, 5V, SMD | G6K-2F-Y-DC5 | Omron | F7367 | 2 | K1, K2 |
| 40 | Fuse, 1A, TE5 | 39505000440 | LittelFuse | 75915 | 1 | F1 |
| 41 | IC, ADC 16bit Delta Sig, T-SOT23-8 | LTC2451CTS8#TRMPBFCT | Linear Technologies | 64155 | 1 | U1 |
| 42 | IC, OP Amp | AD8605ARTZ-REEL7 | Analog Devices | 34031 | 2 | U2, U24 |
| 43 | IC, Port Expander, 16 bit | MCP23S17-E/SS | Microchip | 60991 | 2 | U3, U5 |
| 44 | IC, I/O Expander, 8bit, SSOP-20 | MCP23S08-E/SS | Microchip | 60991 | 2 | U4, U6 |
| 45 | IC, Multiplexer 8X1, 16-SOIC | MAX4638ESE+ | Maxim | 1ES66 | 8 | U7, U9, U11, U13, U15, U17, U19, U21 |
| 46 | IC, analog switch, Octal, TSSOP-16 | ADG728BRUZ | Analog Devices | 34031 | 8 | U8, U10, U12, U14, U16, U18, U20, U22 |
| 47 | IC, Timer | LM555CM | Fairchild Semiconductor | 7D893 | 1 | U23 |
| 48 | IC, NAND Gate, Single, SOT-23-5 | SN74AHCT1G00DBVR | Texas Instruments | 33809 | 2 | U25, U28 |
| 49 | IC, Comparator w/2.5V reference | MAX9050AEUK | Maxim | 1ES66 | 1 | U26 |
| 50 | IC, Battery Charger | DS2715Z+ | Maxim | 1ES66 | 1 | U27 |
| 51 | Analog Switch, 2Ch., SPDT | FSA2257MTCX | Fairchild Semiconductor | 7D893 | 3 | SW1, SW2, SW3 |
| 52 | IC, LDO Series VRef, 2.5V, 8-SOIC | LT1461DHS8-2.5#PBF | Linear Technologies | 64155 | 1 | VR1 |

### 4.2.4. Display Driver – TSE-P01-02-001

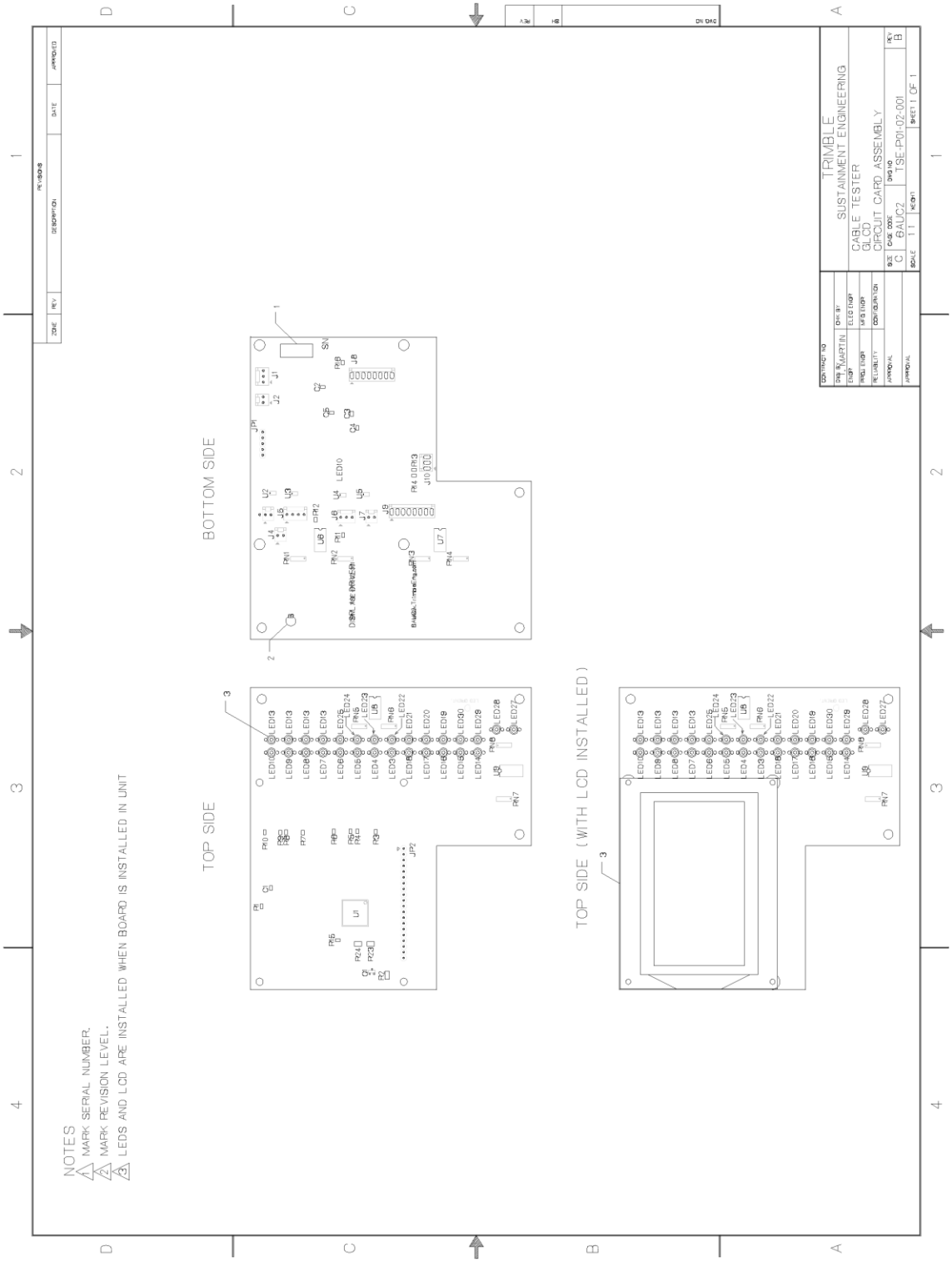
The Display Driver Assembly, IC U7, has been programmed to perform all the command and status functions of the Test Unit. All switches, LEDs, LCD display and Line Tester board are controlled through the PIC18F8722 microcontroller firmware (included on the CD but not a part of this manual).

#### 4.2.4.1. Display Driver Circuit Schematic, Pages 1 & 2 – TSE-P01-02-001




DWG NO
SH
REV
ZONE
REV
DESCRIPTION
DATE
APPROVED
SIZE
B
CAGE CODE
6AUC2
DWG NO
TSE-P01-02-001-SC
REV
-
SCALE
N/A
SHEET
2/2
DRAWN
DAVID SMANOWITZ
CHECKED
VCC
L-115WEGW-CA
742 - 1k
MCP23S17SS

### 4.2.4.2. Display Driver PCB Parts Locations

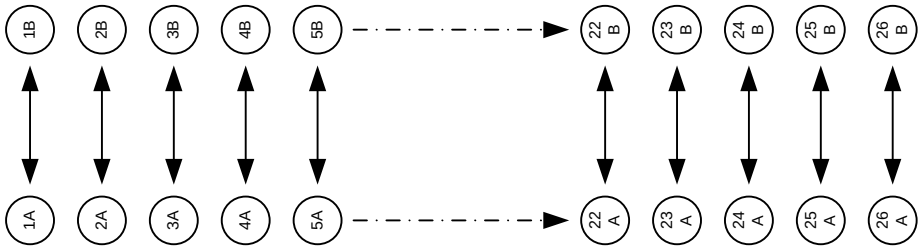


### 4.2.4.3. Display Driver Circuit Parts List – TSE-P01-02-002

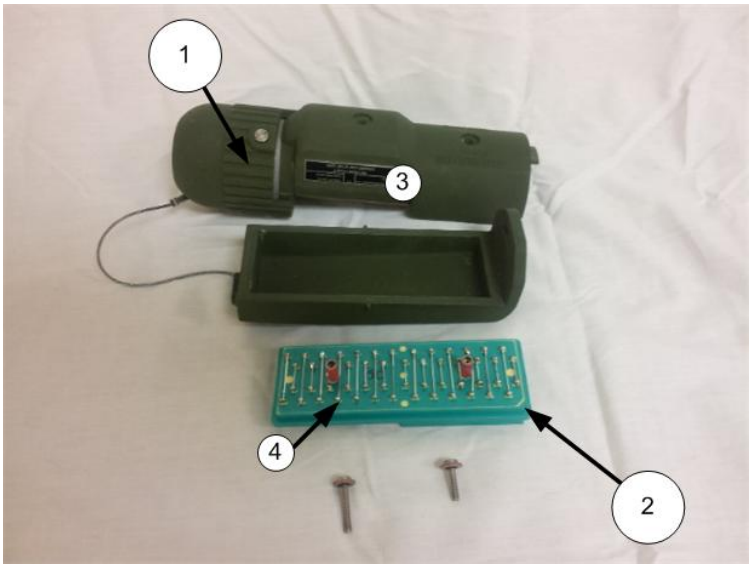
| Part Number: TSE-P01-02-001-PL | | Rev B | | | | | |
|---|---|---|---|---|---|---|---|
| Assembly: GLCD Driver CCA | | | | | | | |
| ID | Description | Part Number | Manufacturer | CAGE | QTY | Reference Designator |
| 1 | PCB, GLCD | TSE-P01-03-004 | TSE | 6AUC2 | 1 | |
| 2 | Header, 1x2, Straight, Locking | 22-11-2022 | Molex | 0VY29 | 4 | J2, J3, J4, J7 |
| 3 | Header, 1x3, Straight, Locking | 22-11-2032 | Molex | 0VY29 | 3 | J1, J6, J10 |
| 4 | Header, 1x4, Straight, Locking | 22-11-2042 | Molex | 0VY29 | 1 | J5 |
| 5 | Header, 1x8, Straight, Locking | 22-11-2082 | Molex | 0VY29 | 2 | J8, J9 |
| 6 | Header, Breakaway, 1x36, Vert. | 22-28-4361 | Molex | 0VY29 | AR | JP1 |
| 7 | Transistor, NPN, 100mA | BC846ALT1G | ON Semiconductor | 31471 | 1 | Q1 |
| 8 | Transistor, PNP | BC807-25LT1G | ON Semiconductor | 31471 | 1 | Q2 |
| 9 | Resistor, 5.1, 1206, 1% | CRCW12065R10JNEA | Vishay Dale | 02111 | 5 | R2, R17, R18, R19, R20 |
| 10 | Resistor, 1k, 0603, 1% | CRCW06031K00FKEA | Vishay Dale | 02111 | 2 | R16, R22 |
| 11 | Resistor, 4.7k, 0603, 1% | CRCW06034K70FKEA | Vishay Dale | 02111 | 3 | R13, R14, R15, R23, R24 |
| 12 | Resistor, 10k, 0603, 1% | CRCW060310K0FKEA | Vishay Dale | 02111 | 11 | R1, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12 |
| 13 | Resistor, 30k, 0603, 1% | CRCW060330K0FKEA | Vishay Dale | 02111 | 1 | R21 |
| 14 | Capacitor, 100nF, 50V, 0603 | 0603YC104K4T4A | AVX | 04222 | 5 | C1, C2, C3, C4, C5 |
| 15 | Capacitor, 22uF, 16V, Electrolytic | 16TZV22M4X6.1 | Rubycon | S7972 | 2 | C6, C7 |
| 16 | Resistor Network, Single, 10k | 742C163102JPCT | CTS | 00079 | 8 | RN1, RN2, RN3, RN4, RN5, RN6, RN7, RN8 |
| 17 | LED, Red/Green, Common Anode | 3BC-3-CA-F | Bivar | 32559 | 28 | LED3, LED4, LED5, LED6, LED7, LED8, LED9, LED10, LED11, LED12, LED13, LED14, LED15, LED16, LED17, LED18, LED19,LED20, LED21, LED22, LED23, LED24, LED25, LED26, LED27, LED28, LED29, LED30 |
| 18 | IC, Switch Debouncer, dual | MAX6817EUT+T | Maxim | 1ES66 | 4 | U2, U3, U4, U5 |
| 19 | IC, Port Expander, 16 Bit | MCP23S17-E/SS | Microchip | 60991 | 4 | U6, U7, U8, U9 |
| 20 | IC, Microcontroller | PIC18F8722-I/PT | Microchip | 60991 | 1 | U1 |
| 21 | GLCD Display | NHD-12864AZ-FSW-GBW-VZ | Newhaven LCD Graphic ... | N/A | 1 | |

### 4.2.5. Test Plug – TSE-P01-01-004

The Test Plug serves as a loop-back in support of the Continuity and self tests. All pairs are connected as shown in Figure 5.




#### 4.2.5.1. Test Plug Illustration



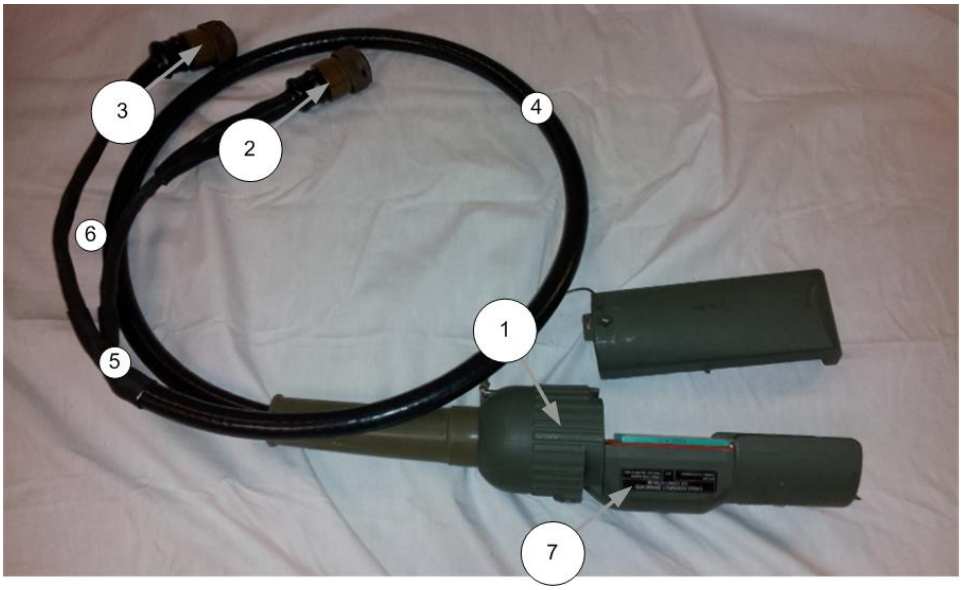

#### 4.2.5.2. Test Plug Parts List

| Part Number: TSE-P01-01-004-PL | | Rev- | Alternate Part Number: MX-10898/GTM-3 | | | |
|---|---|---|---|---|---|---|
| Assembly: Test Plug | | | | | | |
| ID | Description | Part Number | Manufacturer | CAGE | Board Qty | Reference Designator |
| 1 | Connector Assembly, U-185B/G | M55074/1-01 | Tacticom USA | 68908 | 1 | |
| 2 | Connector, Hermaphroditic | MX3227/G | Tacticom USA | 68908 | 1 | |
| 3 | Plate, Identification | TSE-P01-03-010-02 | TSE | 6AUC2 | 1 | |
| 4 | Wire, 24 AWG, White | 83004 009100 | Belden | 3GY56 | AR | |

### 4.2.6. Branched Cable – TSE-P01-01-003

The Branched Cable is used to connect the Test Unit to all cables and patch panels under test that use 26-pair cabling (Refer to Table 7 for wiring).

#### 4.2.6.1. Branched Cable Illustration




#### 4.2.6.2. Branched Cable Parts List

| Part Number: TSE-P01-01-003-PL | | Rev- | | | | |
|---|---|---|---|---|---|---|
| Assembly: Cable Tester; Test Cable | | | | | | |
| ID | Description | Part Number | Manufacturer | CAGE | Board Qty | Reference Designator |
| 1 | Connector, Plug | U-185B/G | Tacticom USA | 68908 | 1 | P101 |
| 2 | Connector, Plug, Male | KPT6UHST3-16-26P | ITT Cannon | 71468 | 1 | P2 |
| 3 | Connector, Plug, Female | KPT6UHST3-16-26S | ITT Cannon | 71468 | 1 | P1 |
| 4 | Cable, 22 AWG, 26 Pair | MIL-C-55036 | Belden | 3GY56 | AR | |
| 5 | Heat Shrink Boot, Y Transition | 381A301-71/42-0 | Raychem | 34964 | 1 | |
| 6 | Heat Shink Tubing | FPHS-032-4005-BLK | SPC Technology | 5T436 | AR | |
| 7 | Label | TSE-P01-03-010-01 | Trimble | 6AUC2 | 4 | |

**TABLE 7. BRANCHED CABLE MAP**

| Part Number: TSE-P01-01-003-WL | | | | Rev - | | | |
|---|---|---|---|---|---|---|---|
| Description: Cable Tester, Test Cable | | | | | | | |
| ID | FROM | TO | WIRE GROUP | WIRE AWG | WIRE COLOR | WIRE LENGTH | SIGNAL |
| 1 | P101-1A | P2-A | | 22 | BLU/Wht(1) | | PAIR #1A |
| 2 | P101-1B | P2-B | | 22 | BLU/Wht(2) | | PAIR #1B |
| 3 | P101-2A | P2-C | | 22 | ORN/WHT(1) | | PAIR #2A |
| 4 | P101-2B | P2-D | | 22 | ORN/WHT(2) | | PAIR #2B |
| 5 | P101-3A | P2-E | | 22 | GRN/WHT(1) | | PAIR #3A |
| 6 | P101-3B | P2-F | | 22 | GRN/WHT(2) | | PAIR #3B |
| 7 | P101-4A | P2-G | | 22 | BRN/WHT(1) | | PAIR #4A |
| 8 | P101-4B | P2-H | | 22 | BRN/WHT(2) | | PAIR #4B |
| 9 | P101-5A | P2-T | | 22 | GREY/WHT(1) | | PAIR #5A |
| 10 | P101-5B | P2-U | | 22 | GREY/WHT(2) | | PAIR #5B |
| 11 | P101-6A | P2-c | | 22 | BLU/RED(1) | | PAIR #6A |
| 12 | P101-6B | P2-Y | | 22 | BLU/RED(2) | | PAIR #6B |
| 13 | P101-7A | P2-S | | 22 | ORN/RED(1) | | PAIR #7A |
| 14 | P101-7B | P2-b | | 22 | ORN/RED(2) | | PAIR #7B |
| 15 | P101-8A | P2-W | | 22 | GRN/RED(1) | | PAIR #8A |
| 16 | P101-8B | P2-V | | 22 | GRN/RED(2) | | PAIR #8B |
| 17 | P101-9A | P2-J | | 22 | BRN/RED(1) | | PAIR #9A |
| 18 | P101-9B | P2-X | | 22 | BRN/RED(2) | | PAIR #9B |
| 19 | P101-10A | P2-R | | 22 | GREY/RED(1) | | PAIR #10A |
| 20 | P101-10B | P2-P | | 22 | GREY/RED(2) | | PAIR #10B |
| 21 | P101-11A | P2-N | | 22 | BLU/BLK(1) | | PAIR #11A |
| 22 | P101-11B | P2-M | | 22 | BLU/BLK(2) | | PAIR #11B |
| 23 | P101-12A | P2-a | | 22 | ORN/BLK(1) | | PAIR #12A |
| 24 | P101-12B | P2-Z | | 22 | ORN/BLK(2) | | PAIR #12B |
| 25 | P101-13A | P2-L | | 22 | GRN/BLK(1) | | PAIR #13A |
| 26 | P101-13B | P2-K | | 22 | GRN/BLK(2) | | PAIR #13B |

| Part Number: TSE-P01-01-003-WL | | | | Rev - | | | |
|---|---|---|---|---|---|---|---|
| Description: Cable Tester, Test Cable | | | | | | | |
| ID | FROM | TO | WIRE GROUP | WIRE AWG | WIRE COLOR | WIRE LENGTH | SIGNAL |
| 27 | P101-14A | P1-F | | 22 | BRN/BLK(1) | | PAIR #14A |
| 28 | P101-14B | P1-E | | 22 | BRN/BLK(2) | | PAIR #14B |
| 29 | P101-15A | P1-D | | 22 | GREY/BLK(1) | | PAIR #15A |
| 30 | P101-15B | P1-C | | 22 | GREY/BLK(2) | | PAIR #15B |
| 31 | P101-16A | P1-B | | 22 | BLU/YLW(1) | | PAIR #16A |
| 32 | P101-16B | P1-A | | 22 | BLU/YLW(2) | | PAIR #16B |
| 33 | P101-17A | P1-G | | 22 | ORN/YLW(1) | | PAIR #17A |
| 34 | P101-17B | P1-H | | 22 | ORN/YLW(2) | | PAIR #17B |
| 35 | P101-18A | P1-T | | 22 | GRN/YLW(1) | | PAIR #18A |
| 36 | P101-18B | P1-U | | 22 | GRN/YLW(2) | | PAIR #18B |
| 37 | P101-19A | P1-V | | 22 | BRN/YLW(1) | | PAIR #19A |
| 38 | P101-19B | P1-W | | 22 | BRN/YLW(2) | | PAIR #19B |
| 39 | P101-20A | P1-b | | 22 | GREY/YLW(1) | | PAIR #20A |
| 40 | P101-20B | P1-S | | 22 | GREY/YLW(2) | | PAIR #20B |
| 41 | P101-21A | P1-Y | | 22 | BLU/PUR(1) | | PAIR #21A |
| 42 | P101-21B | P1-c | | 22 | BLU/PUR(2) | | PAIR #21B |
| 43 | P101-22A | P1-M | | 22 | ORN/PUR(1) | | PAIR #22A |
| 44 | P101-22B | P1-N | | 22 | ORN/PUR(2) | | PAIR #22B |
| 45 | P101-23A | P1-P | | 22 | GRN/PUR(1) | | PAIR #23A |
| 46 | P101-23B | P1-R | | 22 | GRN/PUR(2) | | PAIR #23B |
| 47 | P101-24A | P1-X | | 22 | BRN/PUR(1) | | PAIR #24A |
| 48 | P101-24B | P1-J | | 22 | BRN/PUR(2) | | PAIR #24B |
| 49 | P101-25A | P1-a | | 22 | GREY/PUR(1) | | PAIR #25A |
| 50 | P101-25B | P1-Z | | 22 | GREY/PUR(2) | | PAIR #25B |
| 51 | P101-26A | P1-L | | 22 | RED/WHT(1) | | PAIR #26A |
| 52 | P101-26B | P1-K | | 22 | RED/WHT(2) | | PAIR #26B |

# CHAPTER 5
# MAINTENANCE INSTRUCTIONS

## 5.1. PREVENTATIVE MAINTENANCE

The Cable Test Set should be inspected periodically so that potential defects can be detected and corrective action be taken prior to damage or failure of the equipment occurs per Table 8.

**TABLE 8. PREVENTATIVE MAINTENANCE CHECKS**

| Item | Item to be Inspected | Procedure |
|---|---|---|
| 1 | Transit Case | - Check for cleanliness inside and out. Clean as necessary (Para. 5.1.1)<br>- Check operation of fasteners and hinges. |
| 2 | Test Unit | - Check for cleanliness. Clean as necessary (para 5.1.1)<br>- Check security of the screws that attach the front panel of the Test Unit to the case mount assy.<br>- Check knobs, switches and indicators for security.<br>- Check all rubber boots, grommets and seals for nicks or cuts.<br>- Operate switches to each position to verify normal operation. Ensure there is no jamming or binding. Use the front panel self-test to verify functionality (para 3.5.2) |
| 3 | Branched Cable | - Check branched cable assembly for cleanliness. Clean as necessary (Para. 5.1.1)<br>- Examine circular connectors on the branched cable assembly for broken, missing, bent or otherwise damaged pins.<br>- Check that cables are not frayed or cut.<br>- Check connector retaining clamps for security.<br>- Remove cover from the hermaphroditic connector and check for damaged contacts.<br>- Check gaskets on the hermaphroditic connector for nicks and cuts. |
| 4 | Test Plug | - Remove cover and check for damaged contacts.<br>- Check gasket for nicks and cuts. |

### 5.1.1. Cleaning

WARNING

When using commercial cleaners, ensure that all environmental, safety and health regulations are met.

CAUTION

Do not wipe the Front Panel Assembly, LCD display or enclosure rubber seals with harsh chemicals as damage could result. If the front panel of the Test Unit requires cleaning, use either water, or a gentle cleaner.

1. Remove dust and loose dirt from the equipment using a clean, lint-free cloth.
2. Remove grease and ground-in dirt with a cloth dampened (not wet) with an approved cleaner and a clean cloth.
3. Cleaning should be performed as necessary. No cleaning per a defined schedule is required.

### 5.1.2. Preventative Maintenance of Internal Ni-MH Battery

NOTE

The Test Unit is designed to detect the presence of the Battery Pack and charge if necessary. The Test unit **does not** require that the Battery Pack be installed to operate.

There is no Preventative Battery Maintenance required.

#### 5.1.2.1. Checking Battery Condition

There is no way to check the condition of the Battery Pack condition beyond monitoring the charge status that is displayed in the upper right-hand corner of the LCD. If the Battery Pack will not allow for use over the specified 8-hour period, or if the Battery Pack does not hold a charge and the charge circuit is functional, then the Test Unit requires maintenance.

#### 5.1.2.2. Battery Charging

The Test Unit battery charge circuit allows for charging whenever power is applied to the 9-36VDC or 110/220VAC inputs, even if the Test Unit is being used. There is no

need to remove the Test Unit from service to charge the battery pack. If a new battery pack is installed, or if the battery is allowed to fully discharge, the circuit will automatically pre-condition the battery prior to beginning the full charge cycle. Once the battery pack is fully charged, the charge circuit includes a "top-off" function, ensuring the batteries are maintained at their peak level and will cause the LCD to display "*CHG*".

When first received, plug in the Test Unit to either 9-36VDC or 110/220VAC and allow it to charge for 8 hours.

## 5.2. TROUBLESHOOTING

Table 9 provides the troubleshooting instructions for the Test Unit. The instructions comprise a list of the most likely symptoms, their probably causes, and the recommended corrective action.

NOTE

If the fault cannot be isolated or resolved by the following procedure in Table 9, refer to Table 8 to carry out the preventative maintenance steps prior to beginning repair.

**TABLE 9. TROUBLESHOOTING GUIDE**

| Step | Symptom | Probable Cause | Corrective Action |
|---|---|---|---|
| 1 | Does not advance automatically in either IR or CCHK test modes. | Defective Display Driver Assembly | Replace Display Driver Assembly (Para. 6.7) |
| 2 | Test Unit does not shut-off when END is reached. | a) Auto-Off is disabled<br>b) Defective Display Driver Assembly | a) Enable Auto-Off (Para. 3.9.5)<br>b) Replace Display Driver Assembly (Para. 6.7) |
| 3 | START, ONE STEP Pushbuttons fail the front panel button test (Para. 3.9.2) | a) Disconnected internal cabling<br>b) Defective pushbutton<br>c) Defective Display Driver Assembly | a) Verify cables are properly connected<br>b) Replace the pushbutton (Para. 6.11)<br>c) Replace Display Driver Assembly (Para. 6.7) |
| 4 | AUTO/MANUAL, UP/DN rocker switches fail the front panel button test (Para. 3.5.4) | a) Faulty internal cabling<br>b) Defective rocker switch<br>c) Defective Display Driver Assembly | a) Verify cables are properly connected<br>b) Replace the rocker switch (Para. 6.9)<br>c) Replace Display Driver Assembly (Para. 6.7) |
| 5 | Fails any self-test on any Cable Pairs 1 through 26. | a) Defective Branched Cable<br>b) Faulty internal cabling<br>c) Defective Line Tester Assembly | a) Replace Branched Cable<br>b) Locate and repair the broken wire.<br>c) Replace Line Tester Assembly (Para. 6.8) |
| 6 | Test Unit does not operate from the internal battery. | a) Discharged battery.<br>b) Defective Battery Charge Assembly<br>c) Defective battery. | a) Check connections from the battery to the Test Unit and recharge. (Para. |

| | | | |
|---|---|---|---|
| | | | 5.4.2)<br>b) Replace Battery Charge Assembly (Para. 6.6)<br>c) Replace the battery assembly (Para. 6.15) |
| 7 | Test Unit does not operate with AC input. | a) Faulty internal cabling<br>b) Defective Power Supply<br>c) Defective Battery Charge Assembly | a) Verify internal cabling<br>b) Replace the Power Supply (Para. 6.5)<br>c) Replace Battery Charge Assembly (Para. 6.6) |
| 8 | Internal battery cannot be charged. | a) Faulty internal cabling<br>b) Defective battery<br>c) Defective Battery Charge Assembly | a) Verify internal cabling<br>b) Replace the battery assembly<br>c) Replace Battery Charge Assembly (Para. 6.6) |
| 9 | LCD display appears inoperative. | a) Contrast is improperly adjusted.<br>b) LCD or LCD driver is defective. | a) Adjust contrast for proper display (Figure 2 – 17)<br>b) Replace Display Driver Assembly (Para. 6.7) |
| 10 | For all other faults, verify all cabling and interconnects are correct prior to replacing the internal board assemblies with spares known to be functional. | | |

# CHAPTER 6
# REPAIR

## 6.1. TROUBLESHOOTING

This section provides instructions for the repair of the Cable Test Set. Information provided includes removal and replacement, post-testing instructions and calibration procedures. No special tools are needed for the maintenance and repair procedures. When servicing or replacing assemblies it is important to observe procedures for the proper handling of ESD sensitive components.

WARNING

Prior to starting any maintenance procedure that requires the disassembly of the Test Unit, it is critical that all sources of power be removed. Unplug the Battery Assembly and external power sources prior to beginning any maintenance.

## 6.2. REMOVAL AND REPLACEMENT OF TEST UNIT FROM TRANSIT CASE


**FIGURE 11. TRANSIT CASE**

### 6.2.1. Removal

The Test Unit is provided in a water-tight transit case for transportation to and from test locations. Refer to Figure 11 and proceed as follows:

1. Release the two fasteners (2) on the Transit case (1) and raise the cover.
2. Lift the Test Unit from the case.

### 6.2.2. Replacement

Replacement is the reverse of removal.

## 6.3. REMOVAL AND REPLACEMENT OF TEST UNIT CASE

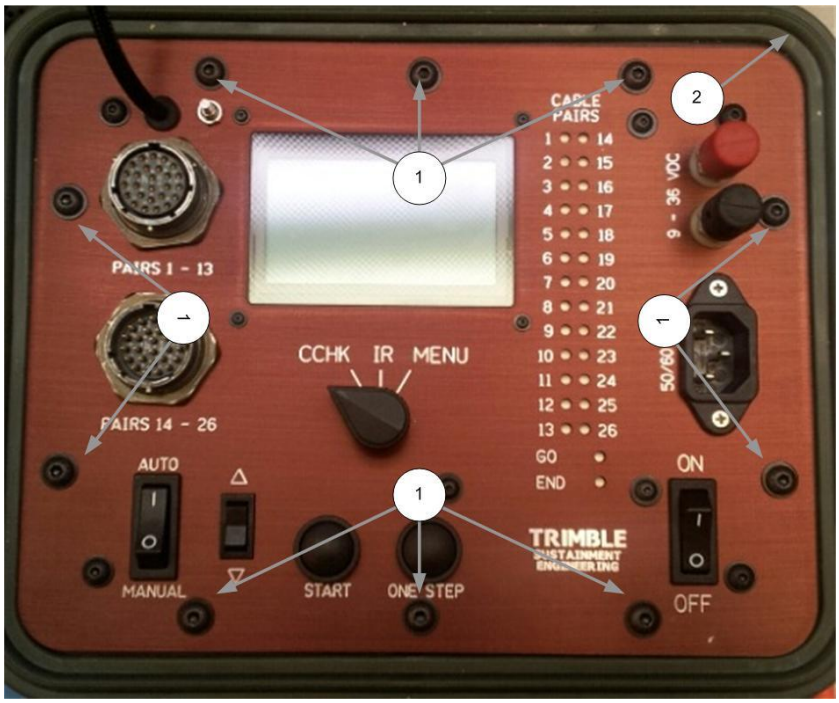



FIGURE 12. FRONT PANEL REMOVAL SCREW LOCATION

WARNING

Ensure AC power is removed from the Test Unit prior to beginning this procedure. When AC power is connected, hazardous voltages are present inside the Test Unit.

### 6.3.1. Removal

1. Remove the Test Unit from the Transit case (Para. 6.2.1).
2. Place the bottom side of the Test Unit on a clean, flat surface.
3. Release the two fasteners on the case and raise the cover.
4. Disconnect the Battery Pack by performing Section 1.4.
5. Remove the screws (Figure 12 - 1) holding the front panel to the Test Unit enclosure (Figure 12 - 2).
6. Carefully remove the Test Unit Assembly from the case.

### 6.3.2. Replacement

1. Position the bottom of the Test Unit case on a clean, flat surface.
2. Carefully slide the Test Unit Assembly into the case.

3. Replace the screws (Figure 12 - 2) holding the front panel to the Test Unit enclosure (Figure 12 - 1).
4. Reconnect the Battery Pack by performing Section 1.4.

## 6.4. PREPARING THE TEST UNIT FOR INTERNAL MAINTENANCE

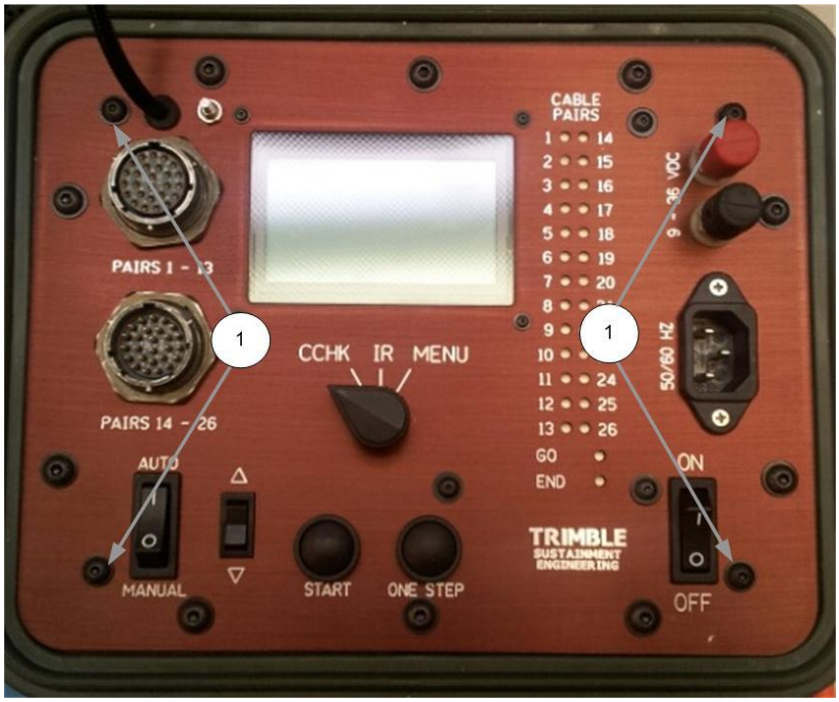



FIGURE 13. FRONT PANEL MOUNTING SCREWS

FIGURE 14. TEST UNIT READY FOR MAINTENANCE

WARNING

Ensure all external power is removed from the Test Unit prior to beginning this procedure. When AC power is connected, hazardous voltages are present inside the Test Unit. When DC power is connected the potential to cause inadvertent damage is present.

### 6.4.1. Removal

1. Remove the Test Unit Assembly by performing Para. 6.3.
2. Remove the screws (Figure 13 – 1) holding the Front Panel to the mounting posts.
3. Place the Front Panel as shown (Figure 14) to expose all components for replacement.

### 6.4.2. Replacement

1. Carefully place the Front Panel onto the mounting posts and replace the mounting screws (Figure 13 – 1).
2. Reinstall the case assembly on the Test Unit (Para. 6.4).

## 6.5. REMOVAL AND REPLACEMENT OF POWER SUPPLY ASSEMBLY

WARNING

Ensure AC power is removed from the Test Unit prior to beginning this procedure. When AC power is connected, hazardous voltages are present inside the Test Unit.

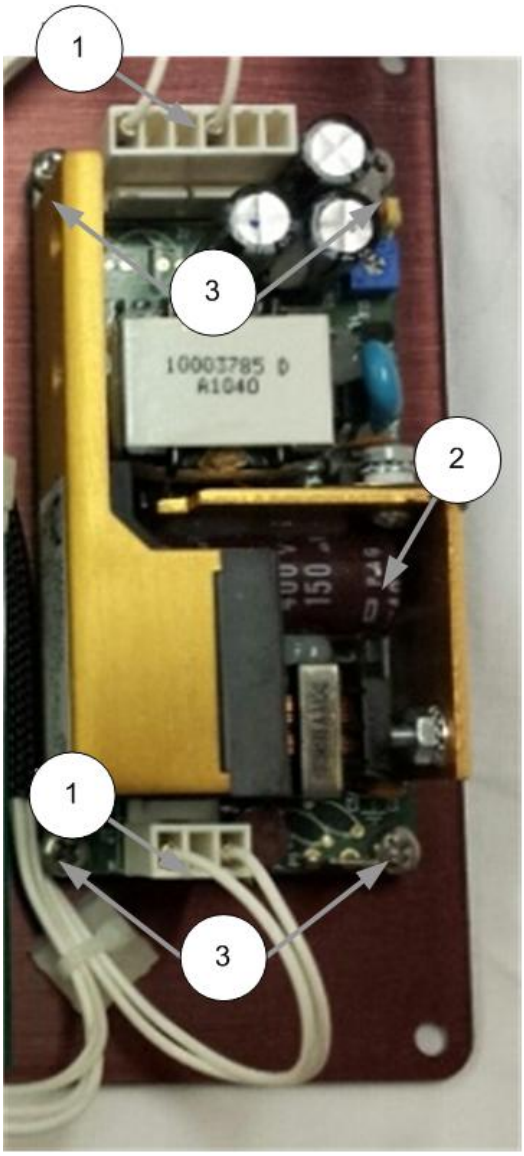



FIGURE 15. POWER SUPPLY AND BATTERY CHARGER ASSEMBLIES

### 6.5.1. Removal

1. Prepare the Test Unit Assembly for maintenance by performing Para. 6.4.
2. Noting their orientation and placement, disconnect cables (Figure 15 – 1) from the Power Supply Assembly (Figure 15 – 2) board.
3. Remove the screws (Figure 15 – 3) holding the Power Supply to the mounting plate (Figure 15 – 4).
4. Carefully remove the Power Supply Assembly from the Test Unit.

### 6.5.2. Replacement

1. Carefully place the Power Supply Assembly board (Figure 15 – 2) into the Test Unit, oriented as shown.
2. Replace the screws (Figure 15 - 3) that hold the power supply in place and, noting orientation and placement, reconnect the cable assemblies (Figure 15 - 1).
3. Reinstall the case assembly on the Test Unit (Para. 6.4).

## 6.6. REMOVAL AND REPLACEMENT OF DISPLAY DRIVER BOARD

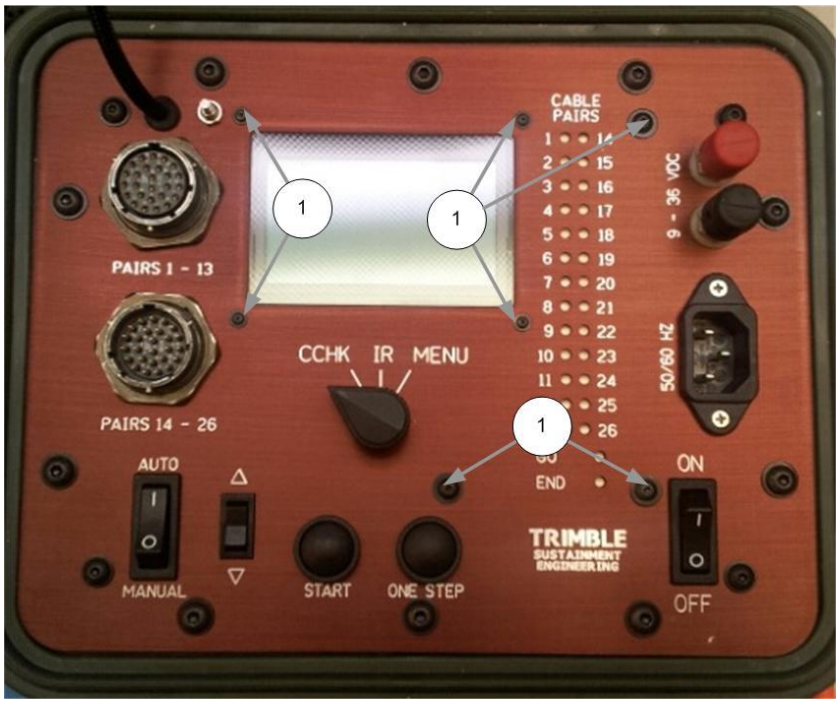



FIGURE 16. DISPLAY DRIVER MOUNTING SCREWS

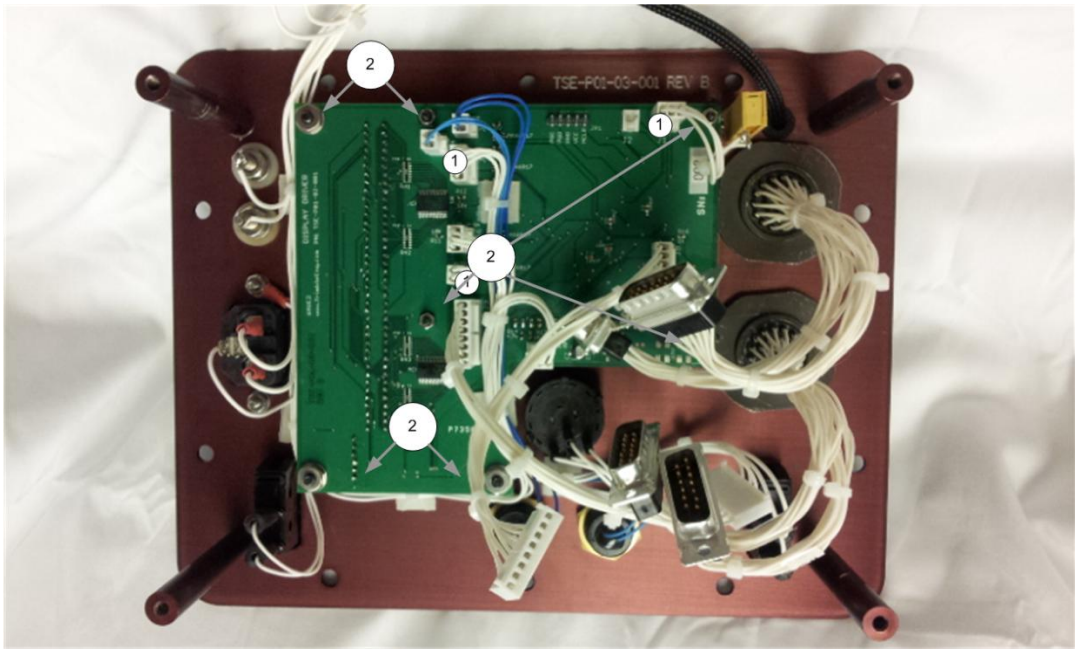



**FIGURE 17. DISPLAY DRIVER ASSEMBLY INTERCONNECTS**

WARNING

Ensure AC power is removed from the Test Unit prior to beginning this procedure. When AC power is connected, hazardous voltages are present inside the Test Unit.

### 6.6.1. Removal

1. Prepare the Test Unit Assembly for maintenance by performing Para. 6.4.
2. From the Display Driver board, noting orientation and placement, remove the cable assemblies (Figure 17 – 1).
3. From the Front Panel of the Test Unit, carefully remove the mounting screws (Figure 16 – 1), ensuring the spacers and washers are not lost.
4. Carefully remove the Display Driver Board from the Test Unit.

### 6.6.2. Replacement

1. Carefully place the Display Driver Board into the Test Unit. Ensure all LEDs are properly aligned to fit into the Front Panel Assembly.
2. Using the washers and spacers removed previously, replace the screws (Figure 16 - 1) that hold the Display Driver Board in place and reconnect the cable assemblies (Figure 17 - 1).
3. Reinstall the case assembly on the Test Unit (Para. 6.4).

## 6.7. REMOVAL AND REPLACEMENT OF LINE TESTER / BATTERY CHARGER BOARD

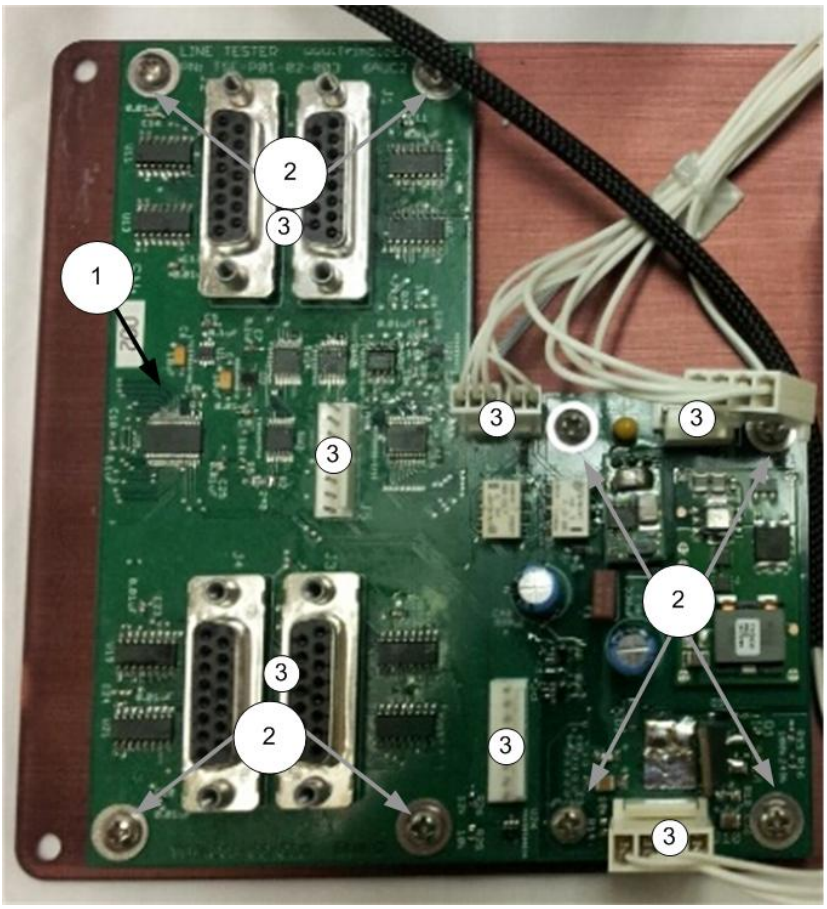



**FIGURE 18. LINE TESTER BOARD**

WARNING

Ensure AC power is removed from the Test Unit prior to beginning this procedure. When AC power is connected, hazardous voltages are present inside the Test Unit.

### 6.7.1. Removal

1. Prepare the Test Unit Assembly for maintenance by performing Para. 6.4.
2. From the Line Tester board (Figure 18- 1), noting orientation and placement, remove the cable assemblies (Figure 18 – 3).
3. From the mounting plate of the Test Unit, carefully remove the mounting screws (Figure 18 – 3), ensuring the spacers and washers are not lost.

4. Reinstall the case assembly on the Test Unit (Para. 6.4).

### 6.7.2. Replacement

1. Carefully place the Line Tester Board into the Test Unit Assembly, oriented as shown.
2. Using the washers and spacers removed previously, replace the screws (Figure 18 - 3) that hold the Line Tester Board in place and reconnect the cable assemblies (Figure 18 - 2).
3. Reinstall the case assembly on the Test Unit (Para. 6.4).

## 6.8. REMOVAL AND REPLACEMENT OF SWITCHES S2, S5 OR S6 (Rockers)

Refer to Figure 19 for component location.


FIGURE 19. SWITCH AND CONNECTOR IDENTIFICATION

### 6.8.1. Removal

1. Prepare the Test Unit Assembly for maintenance by performing Para. 6.4.
2. Noting their placement, disconnect the wires from the rear of the switch.
3. Squeeze the panel-mount clips and remove the switch, passing them through the front of the panel.

### 6.8.2. Replacement

1. Position the switch, ensuring the markings are placed correctly, if applicable.
2. Snap the switch into the front panel and reconnect the wires to the rear mounting lugs.
3. Reinstall the case assembly on the Test Unit (Para. 6.4).

## 6.9. REMOVAL AND REPLACEMENT OF ROTARY SWITCH S1 KNOB

Refer to Figure 19 for component location.

### 6.9.1. Removal

1. Note the switch selection prior to removing.
2. Loosen the hex head screws securing the knob to the rotary switch shaft.
3. Lift the knob from the switch shaft to remove.

### 6.9.2. Replacement

1. Position the knob on the switch shaft, ensuring the markings are placed correctly.
2. Tighten the hex head screws securing the knob to the rotary switch shaft.

## 6.10. REMOVAL AND REPLACEMENT OF SWITCHES S3 and S4

Refer to Figure 19 for component location.

### 6.10.1. Removal

1. Prepare the Test Unit Assembly for maintenance by performing Para. 6.4.
2. Disconnect the pushbutton cable from the display board.
3. Remove the mounting hardware from the rear of the pushbutton and remove from the front panel.
4. Remove the wire terminations from the cable connector, noting orientation and placement.

### 6.10.2. Replacement

1. Insert the switch into the mounting hole on the front panel.
2. Attach the mounting hardware on the rear of the pushbutton.
3. Place the wire terminations into the connector, noting the placement and orientation.
4. Reattach the connector to the Display Driver board.
5. Reinstall the case assembly on the Test Unit (Para. 6.4).

## 6.11. REMOVAL AND REPLACEMENT OF BINDING POSTS TP1 OR TP2

Refer to Figure 19 for component location.

### 6.11.1. Removal

1. Prepare the Test Unit Assembly for maintenance by performing Para. 6.4.
2. Tag and unsolder the wires from the rear of the binding post.
3. Remove the mounting hardware securing the binding post to the front panel and remove.

### 6.11.2. Replacement

1. Insert the binding post into the mounting hole on the front panel and attach using all of the mounting hardware.
2. Solder all tagged wires to the binding post.
3. Replace the screws that hold the Front Panel Assembly to the Test Unit Assembly.
4. Reinstall the case assembly on the Test Unit (Para. 6.4).

## 6.12. REMOVAL AND REPLACEMENT OF CONNECTOR J1 OR J2

Refer to Figure 19 for component location.

### 6.12.1. Removal

1. Prepare the Test Unit Assembly for maintenance by performing Para. 6.4.
2. Disconnect the two D-Sub connectors from the Line Tester board.
3. Remove the mounting nut securing the connector to the front panel. Remove the connector from the Front Panel assembly.

### 6.12.2. Replacement

1. Insert the connector into the mounting hole on the front panel.
2. Install the connector using the mounting hardware.
3. Connect the D-Sub connectors to the Line Tester board, noting orientation and placement.
4. Reinstall the case assembly on the Test Unit (Para. 6.4).

## 6.13. REMOVAL AND REPLACEMENT OF ROTARY SWITCH S1

Refer to Figure 19 for component location.

### 6.13.1. Removal

1. Prepare the Test Unit Assembly for maintenance by performing Para. 6.4.
2. Tag and unsolder the wires from the rear of the rotary switch.
3. Remove the mounting hardware securing the rotary switch to the front panel and remove the switch.

### 6.13.2. Replacement

1. Insert the rotary switch into the mounting hole on the front panel.
2. Install and tighten the mounting hardware to secure to the front panel.
3. Solder all tagged wires to the rotary switch.
4. Reinstall the case assembly on the Test Unit (Para. 6.4).

## 6.14. INSTALLATION, REMOVAL AND REPLACEMENT OF INTERNAL BATTERY

Battery Installation, Removal and Replacement is outlined in Section 1.4.

## 6.15. REMOVAL AND REPLACEMENT OF BATTERY ENCLOSURE


FIGURE 20. BATTERY ENCLOSURE MOUNTING SCREWS

FIGURE 21. BATTERY ENCLOSURE GROMMET LOCATIONS

NOTE

Prior to beginning, refer to Section 1.4.6 for Battery Pack removal.

### 6.15.1. Removal

1. Remove the Test Unit from the Transit case (Para. 6.2.1).
2. Place the bottom side of the Test Unit on a clean, flat surface.
3. Release the two fasteners on the case and raise the cover.
4. While holding the Battery Enclosure with one hand, remove the two hex head screws located on the outside of the top cover.

### 6.15.2. Replacement

1. Install the rubber grommets into the Battery Enclosure rear panel notches.
2. While holding the Battery Enclosure with one hand, install the two hex head screws located on the outside of the top cover.
3. Install the Battery Pack per Section 1.4.

# CHAPTER 7
# MECHANICAL DRAWINGS

## 7.1. Scope

This chapter provides the illustrated parts breakdown (IPB) of the Test Set, Field Cable AN/GTM-3B (Cable Test Set). The purpose of the IPB is to assist maintenance and supply personnel in the identification, requisitioning, storage and issuing of authorized Cable Test Set replaceable parts. The Parts Breakdown Table follows the illustrations and is used for all diagrams preceding it.

## 7.2. Transit Case

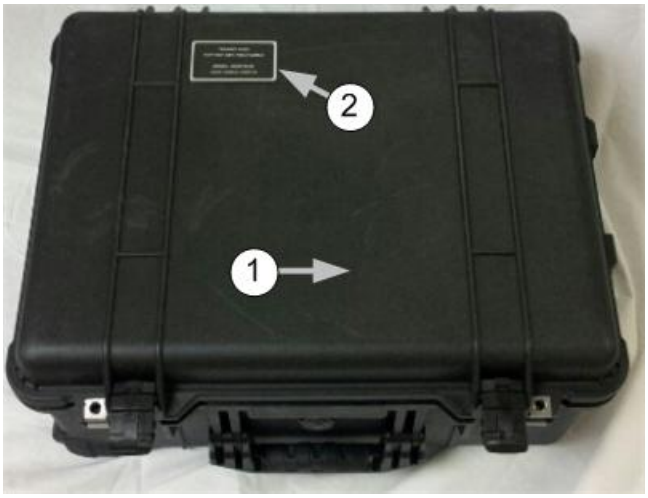



**FIGURE 22. TRANSIT CASE, CLOSED**


**FIGURE 23. TRANSIT CASE, OPEN**

**TABLE 10. TRANSIT CASE PARTS BREAKDOWN**

| Part Number: TSE-P01-01-001 | | Rev- | | | | |
|---|---|---|---|---|---|---|
| Assembly: Transit Case | | | | | | |
| ID | Description | Part Number | Manufacturer | CAGE | Board Qty | Reference Designator |
| 1 | Transit Case | 1560-008-110 | Pelican | 6JUB6 | 1 | |
| 2 | Label | | TSE | 6AUC2 | 1 | |
| 3 | Closed Cell Foam | TSE-P01-03-009 | TSE | 6AUC2 | 1 | |

## 7.3. Test Unit

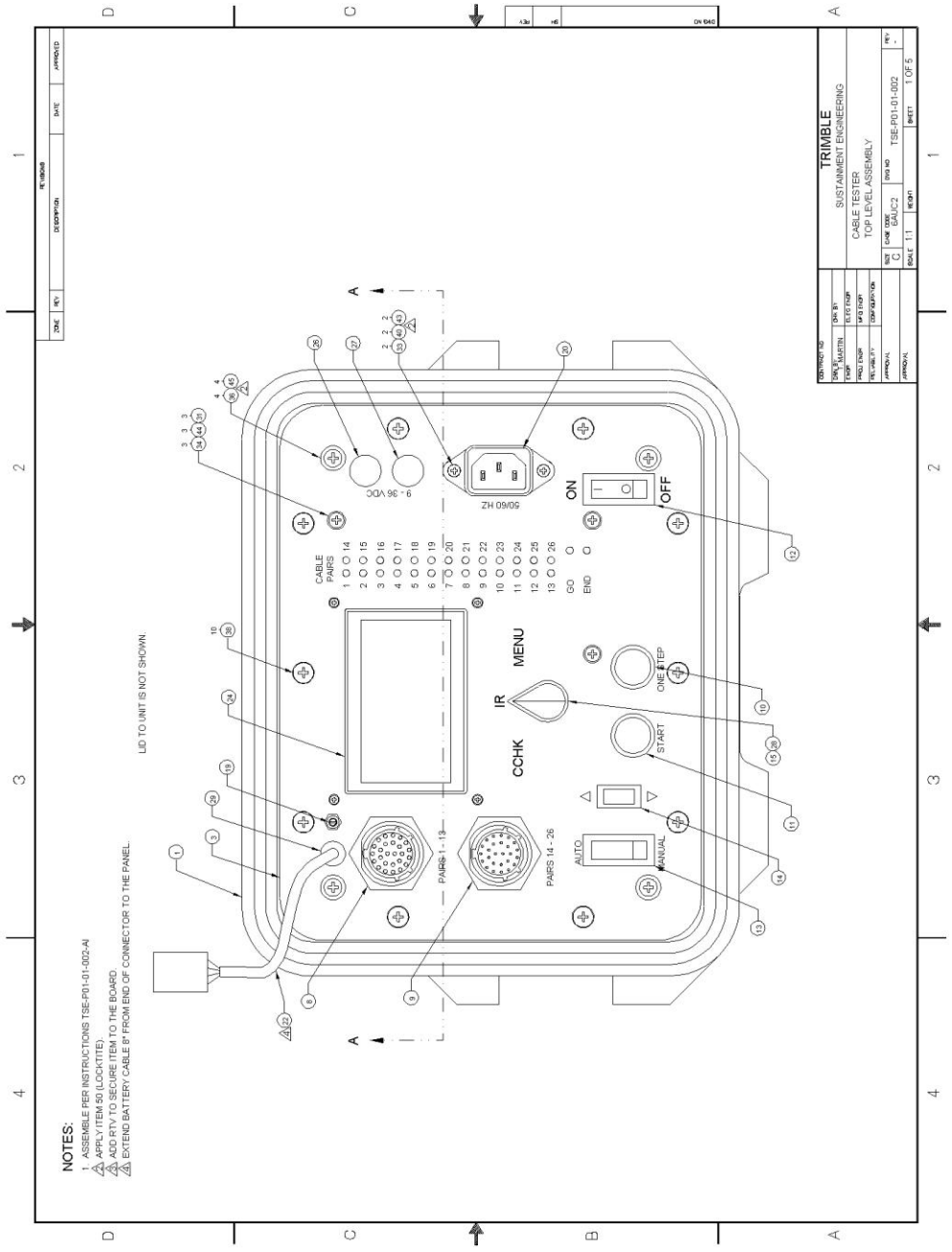



**FIGURE 24. TEST UNIT MECHANICAL, 1 OF 5**

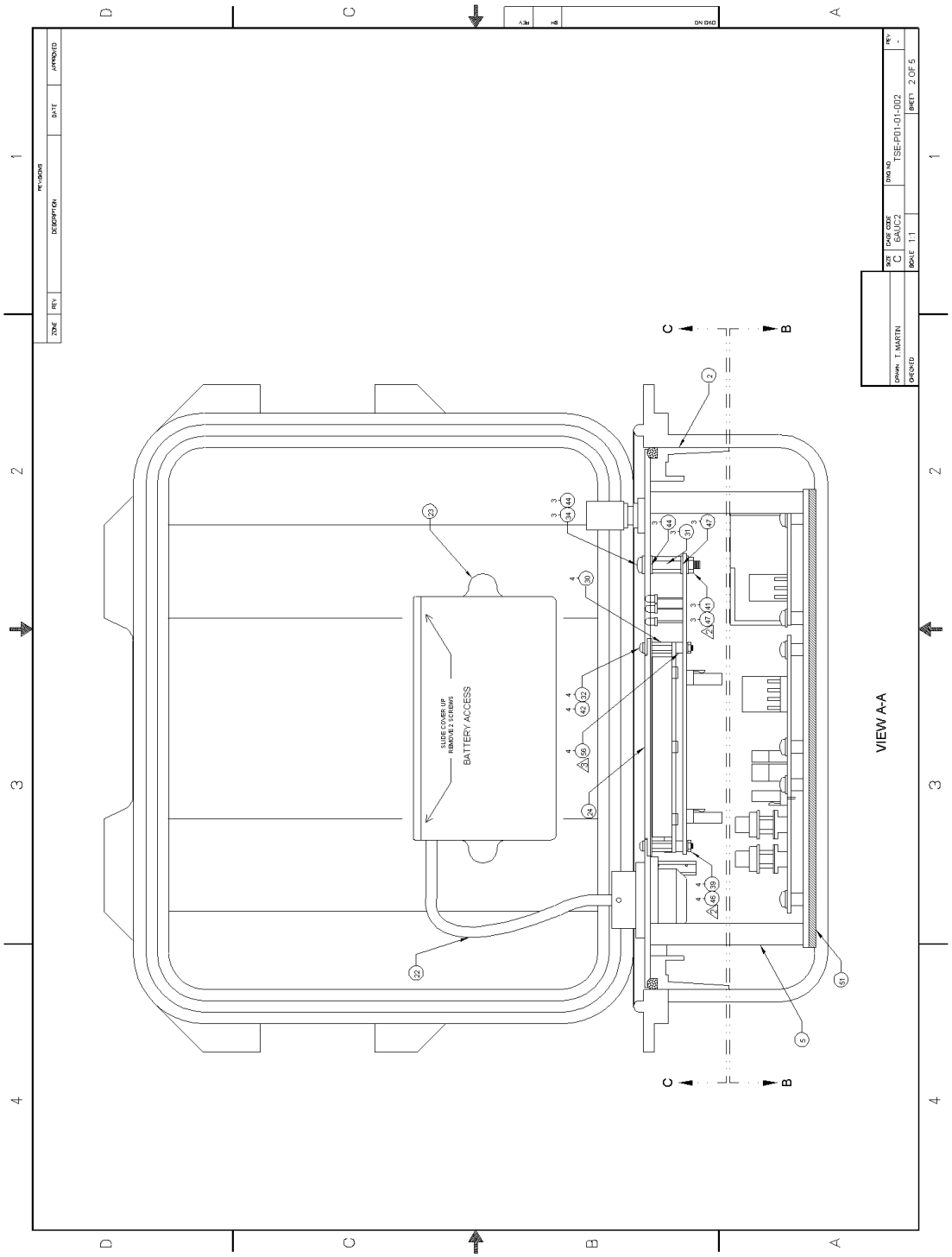



**FIGURE 25. TEST UNIT MECHANICAL, 2 OF 5**

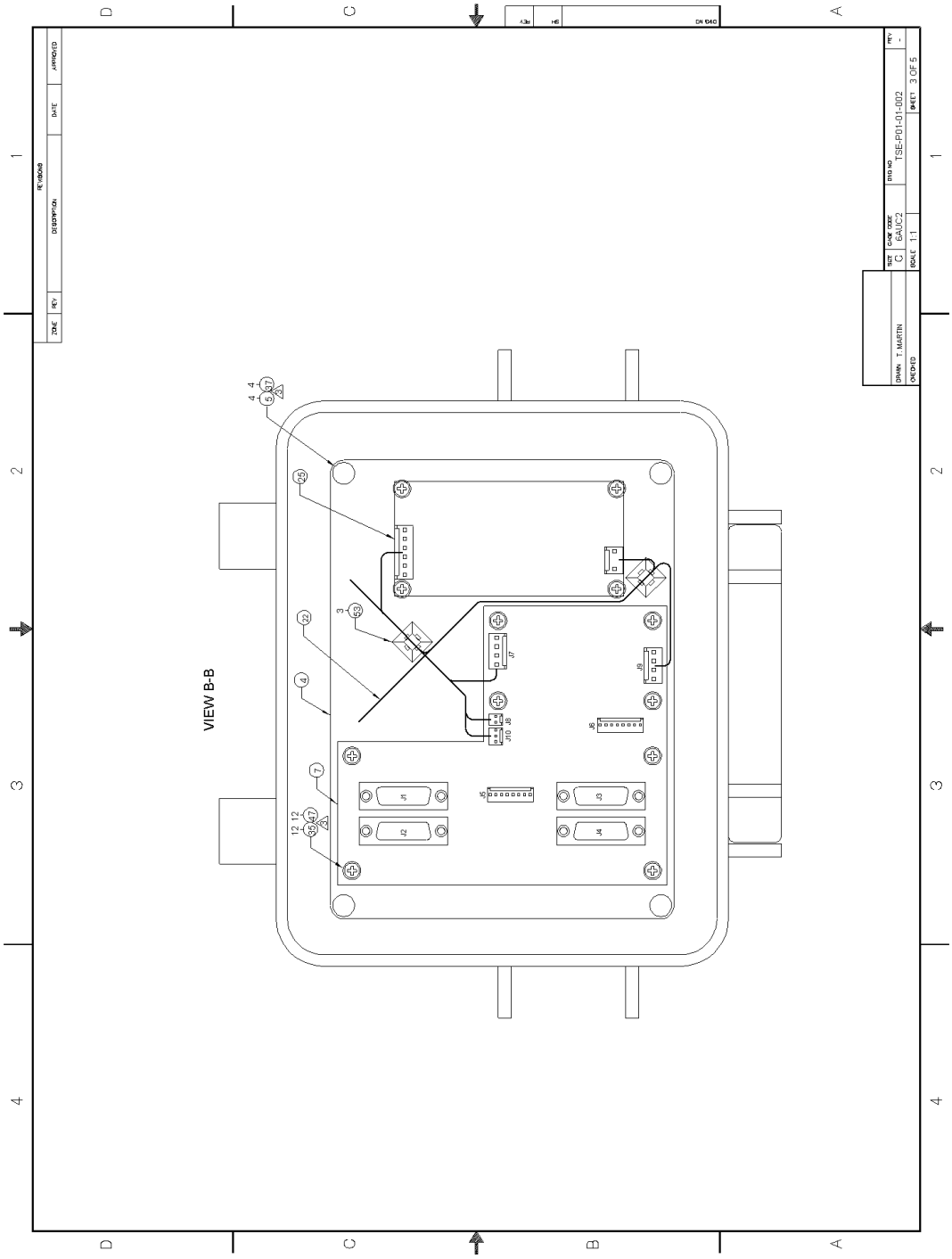



**FIGURE 26. TEST UNIT MECHANICAL, 3 OF 5**

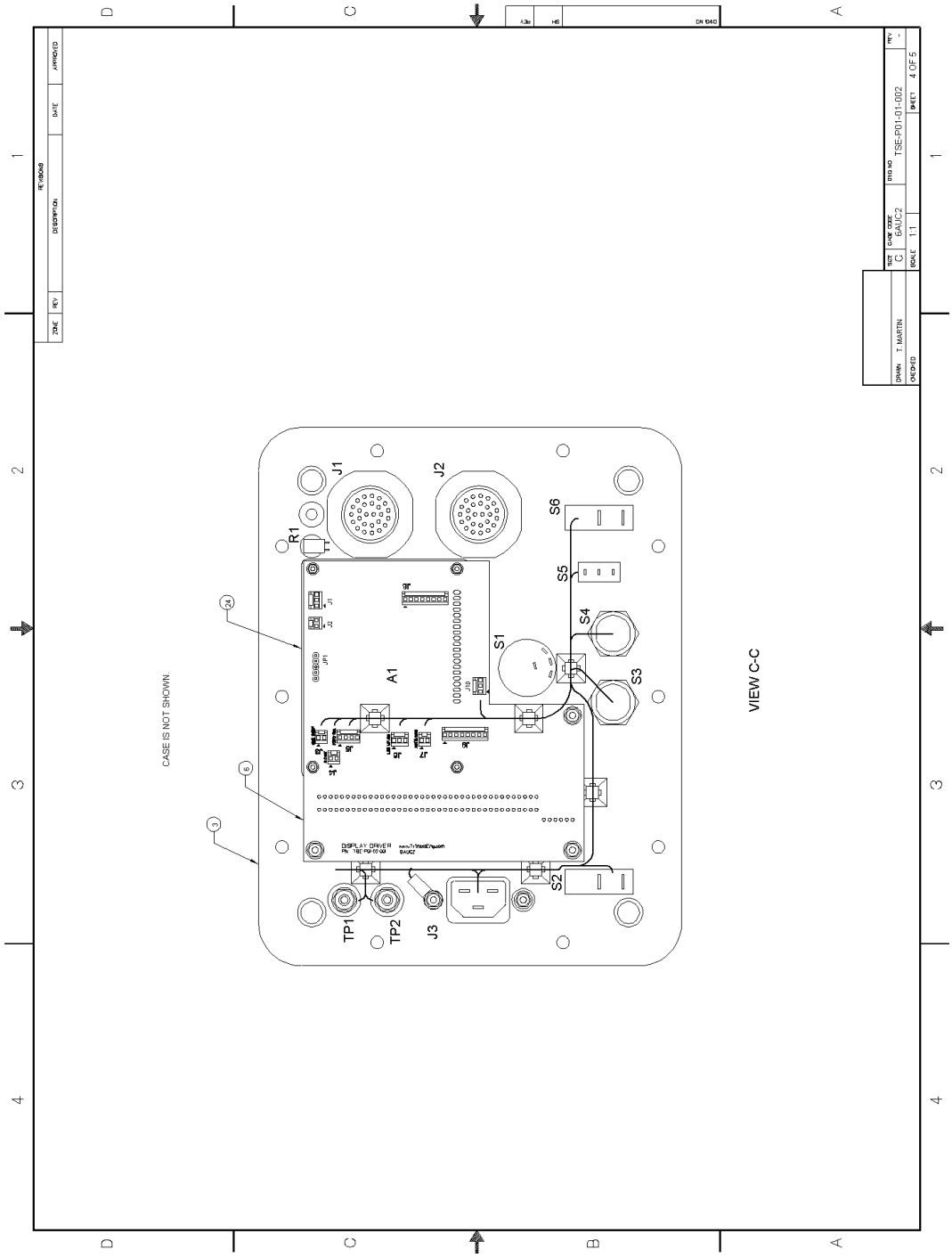



**FIGURE 27. TEST UNIT MECHANICAL, 4 OF 5**

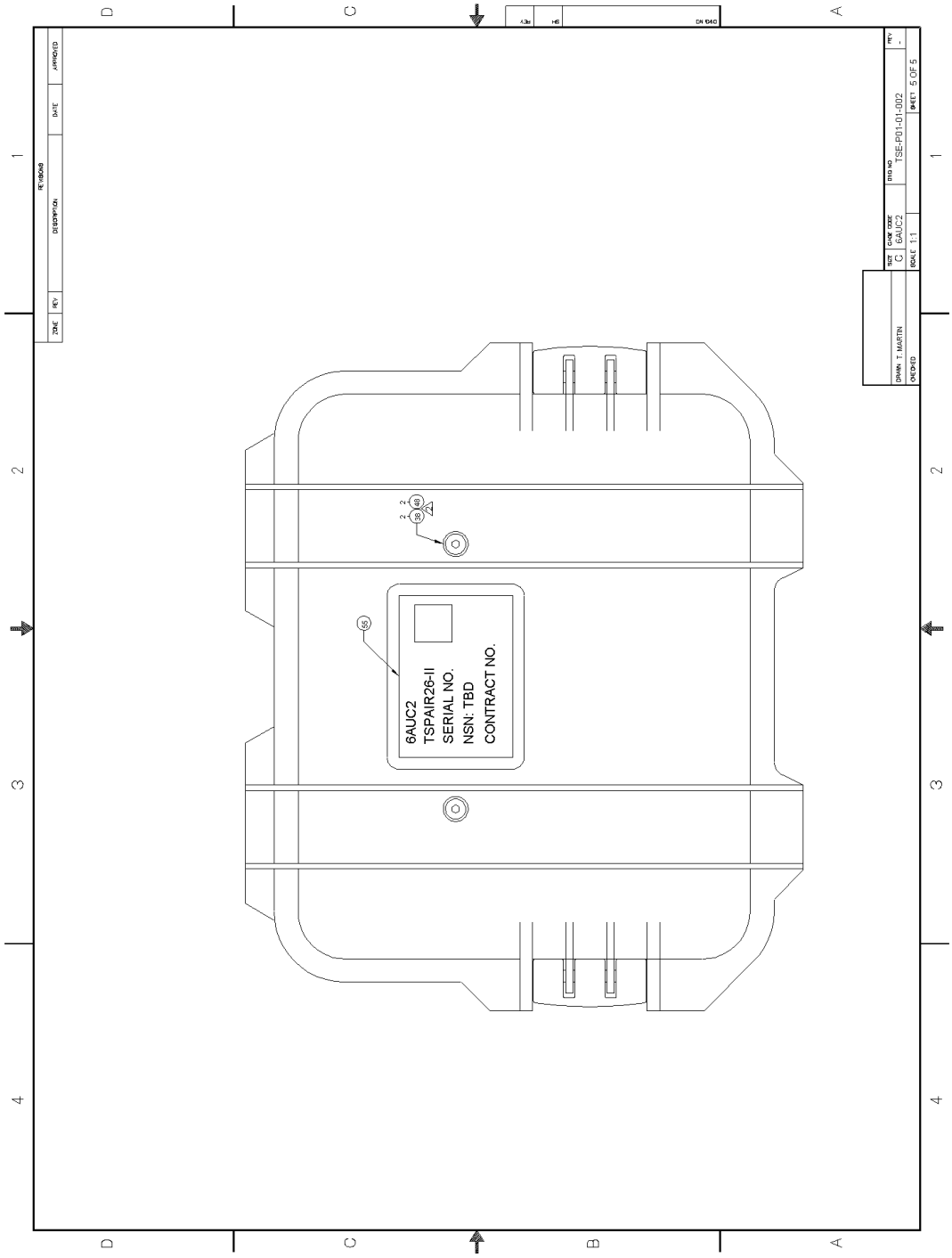



**FIGURE 28. TEST UNIT MECHANICAL, 5 OF 5**

**TABLE 11. TEST UNIT PARTS BREAKDOWN**

| Part Number: TSE-P01-01-002-PL | | Rev- | | Alternate Part Number: TS26PAIR-II | | | |
|---|---|---|---|---|---|---|---|
| Assembly: Cable Tester | | | | | | | |
| ID | Description | Part Number | Manufacturer | CAGE | Board Qty | Reference Designator | |
| 1 | Case | IM2050 | Pelican | 6JUB6 | 1 | | |
| 2 | Rail Assembly | IM20XX-BEZEL | Pelican | 6JUB6 | 1 | | |
| 3 | Top Panel | TSE-P01-03-001 | TSE | 6AUC2 | 1 | | |
| 4 | Bottom panel | TSE-P01-03-002 | TSE | 6AUC2 | 1 | | |
| 5 | Support Rod | TSE-P01-03-003 | TSE | 6AUC2 | 4 | | |
| 6 | CCA, GLCD Driver | TSE-P01-03-004 | TSE | 6AUC2 | 1 | A1 | |
| 7 | CCA, Line Tester | TSE-P01-03-006 | TSE | 6AUC2 | 1 | A2 | |
| 8 | Cable Assembly, W001 | TSE-P01-02-004-01 | TSE | 6AUC2 | 1 | W001 | |
| 9 | Cable Assembly, W002 | TSE-P01-02-004-02 | TSE | 6AUC2 | 1 | W002 | |
| 10 | Cable Assembly, W003 | TSE-P01-02-005-01 | TSE | 6AUC2 | 1 | W003 | |
| 11 | Cable Assembly, W004 | TSE-P01-02-005-02 | TSE | 6AUC2 | 1 | W004 | |
| 12 | Cable Assembly, W005 | TSE-P01-02-005-03 | TSE | 6AUC2 | 1 | W005 | |
| 13 | Cable Assembly, W006 | TSE-P01-02-005-04 | TSE | 6AUC2 | 1 | W006 | |
| 14 | Cable Assembly, W007 | TSE-P01-02-005-05 | TSE | 6AUC2 | 1 | W007 | |
| 15 | Cable Assembly, W008 | TSE-P01-02-005-06 | TSE | 6AUC2 | 1 | W008 | |
| 16 | Cable Assembly, W009 | TSE-P01-02-005-07 | TSE | 6AUC2 | 1 | W009 | |
| 17 | Cable Assembly, W010 | TSE-P01-02-005-08 | TSE | 6AUC2 | 1 | W010 | |
| 18 | Cable Assembly, W011 | TSE-P01-02-005-09 | TSE | 6AUC2 | 1 | W011 | |
| 19 | Cable Assembly, W012 | TSE-P01-02-005-10 | TSE | 6AUC2 | 1 | W012 | |
| 20 | Cable Assembly, W013 | TSE-P01-02-005-11 | TSE | 6AUC2 | 1 | W013 | |
| 21 | Cable Assembly, W014 | TSE-P01-02-005-12 | TSE | 6AUC2 | 1 | W014 | |
| 22 | Cable Assembly, W015 | TSE-P01-02-005-13 | TSE | 6AUC2 | 1 | W015 | |
| 23 | Battery Assembly Kit | TSE-P01-03-TPHK | TSE | 6AUC2 | 1 | | |
| 24 | LCD Cover | TSE-P01-03-007 | TSE | 6AUC2 | 1 | | |
| 25 | Power Supply | ECM60US24 | XP Power | H1WH8 | 1 | PS1 | |
| 26 | Binding Post, Red | 4995-2 | Pomona | 24253 | 1 | TP1 | |
| 27 | Binding Post, Black | 4995-0 | Pomona | 24253 | 1 | TP2 | |
| 28 | Knob | MS91528-1K2B | EHC | N/A | 1 | | |
| 29 | Grommet | 737 | Keystone | 91883 | 1 | | |
| 30 | Standoff, 0.375", #2-56, Hex, Alum. | 1797D | Keystone | 91883 | 4 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 31 | Standoff, 0.5", #6-32, Hex, Alum. | 2210 | Keystone | 91883 | 3 | |
| 32 | Screw, #2x56, 1.0", Panhd, Black Oxide | 24667 | Fastenal | 0Y3H3 | 4 | |
| 33 | Screw, #4x40, 0.5", Flathd, pkg 100 | 2AA62 | Grainger | 02WA1 | 2 | |
| 34 | Screw, #6x32, 1.0", Panhd, Black Oxide | 24885 | Fastenal | 0Y3H3 | 3 | |
| 35 | Screw, #6x32, 0.375", Panhd, pkg 100 | 2BB21 | Grainger | 02WA1 | 12 | |
| 36 | Screw, #8x32, 0.5", Panhd, Black Oxide | 1124024 | Fastenal | 0Y3H3 | 4 | |
| 37 | Screw, #8x32, 0.38", Flathd, pkg 100 | 2AB27 | Grainger | 02WA1 | 4 | |
| 38 | Screw, #10x32, 0.5", Panhd, Black Oxide | TSE-P01-03-TPHK | TSE | 6AUC2 | 2 | |
| 39 | Nut, #2x56, pkg 100 | 1WA81 | Grainger | 02WA1 | 4 | |
| 40 | Nut, #4x40, pkg 100 | 1WA85 | Grainger | 02WA1 | 2 | |
| 41 | Nut, #6x32, pkg 100 | 1WA89 | Grainger | 02WA1 | 3 | |
| 42 | Washer, Flat, #2, Black Oxide | 0149165 | Fastenal | 0Y3H3 | 4 | |
| 43 | Washer, Flat, #4, pkg 100 | 2WA22 | Grainger | 02WA1 | 2 | |
| 44 | Washer, Flat, #6, Black Oxide | 0149167 | Fastenal | 0Y3H3 | 6 | |
| 45 | Washer, Flat, #8, Black Oxide | 0149168 | Fastenal | 0Y3H3 | 4 | |
| 46 | Washer, Flat, #2, Nylon | 4DAN7 | Grainger | 02WA1 | 4 | |
| 47 | Washer, Flat, #6, Nylon | 4DAR9 | Grainger | 02WA1 | 18 | |
| 48 | Washer, Flat, #10, Black Oxide | TSE-P01-03-TPHK | TSE | 6AUC2 | 2 | |
| ~~49~~ | (----REMOVED----) | (----REMOVED----) | (----REMOVED----) | N/A | | |
| 50 | Heatshrink Tubing, 0.3" | FPHS-016-6020 | SPC Technology | 5T436 | AR | |
| 51 | Neoprene sheet | 1MTP6 | Grainger | 02WA1 | AR | |
| 52 | Ty-rap, 3.1", Pkg 1000 | PLT.7M-M | Panduit | 0XJ45 | AR | |
| 53 | Cable Tie Mount, 4-Way, 0.5" Sq. | ABM1M-A-C | Panduit | 0XJ45 | 8 | |
| 54 | ThreadLocker, Medium Strength | 8702-10ML | MG Chemicals | L3160 | AR | |
| 55 | Label | | TSE | 6AUC2 | 1 | |
| 56 | Spacer, 0.09" ID, 0.125" length | 1107-2-SS | RAF Electronics | 55566 | 4 | |

## 7.4. Test Plug

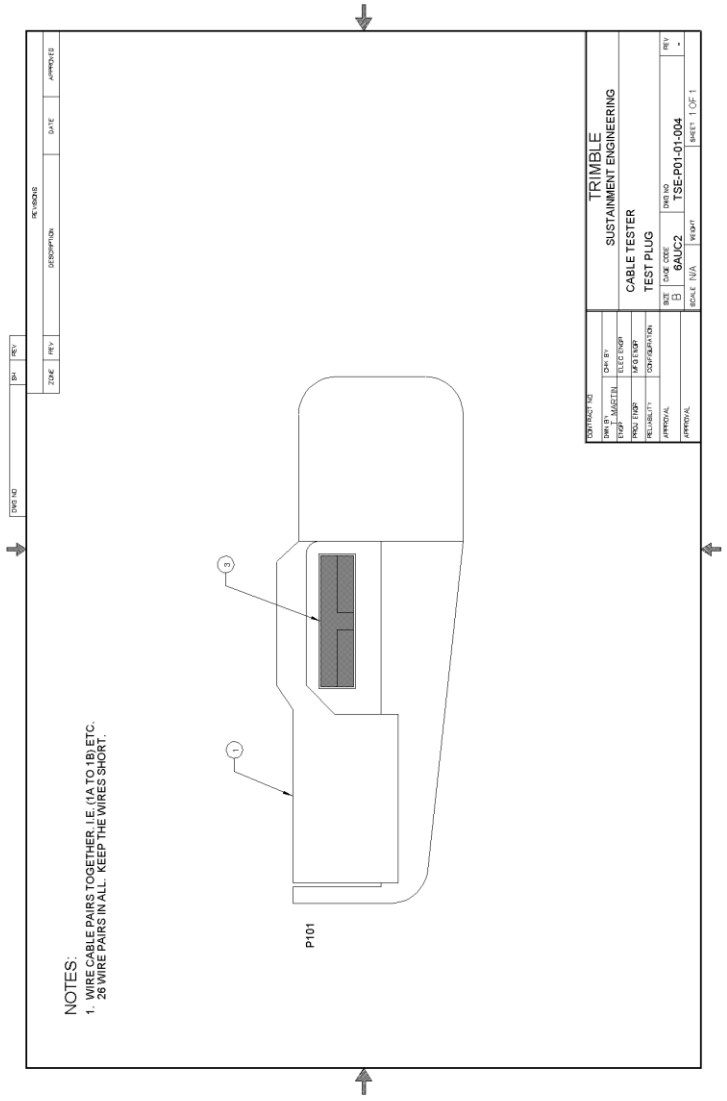



**FIGURE 29. TEST PLUG, MECHANICAL**

| Part Number: TSE-P01-01-004-PL | | Rev- | Alternate Part Number: MX-10898/GTM-3 | | | |
|---|---|---|---|---|---|---|
| Assembly: Test Plug | | | | | | |
| ID | Description | Part Number | Manufacturer | CAGE | Board Qty | Reference Designator |
| 1 | Connector Assembly, U-185B/G | M55074/1-01 | Tacticom USA | 68908 | 1 | |
| 2 | Connector, Hermaphroditic | MX3227/G | Tacticom USA | 68908 | 1 | |
| 3 | Plate, Identification | TSE-P01-03-010-02 | TSE | 6AUC2 | 1 | |
| 4 | Wire, 24 AWG, White | 83004 009100 | Belden | 3GY56 | AR | |

## 7.5. Branched Cable

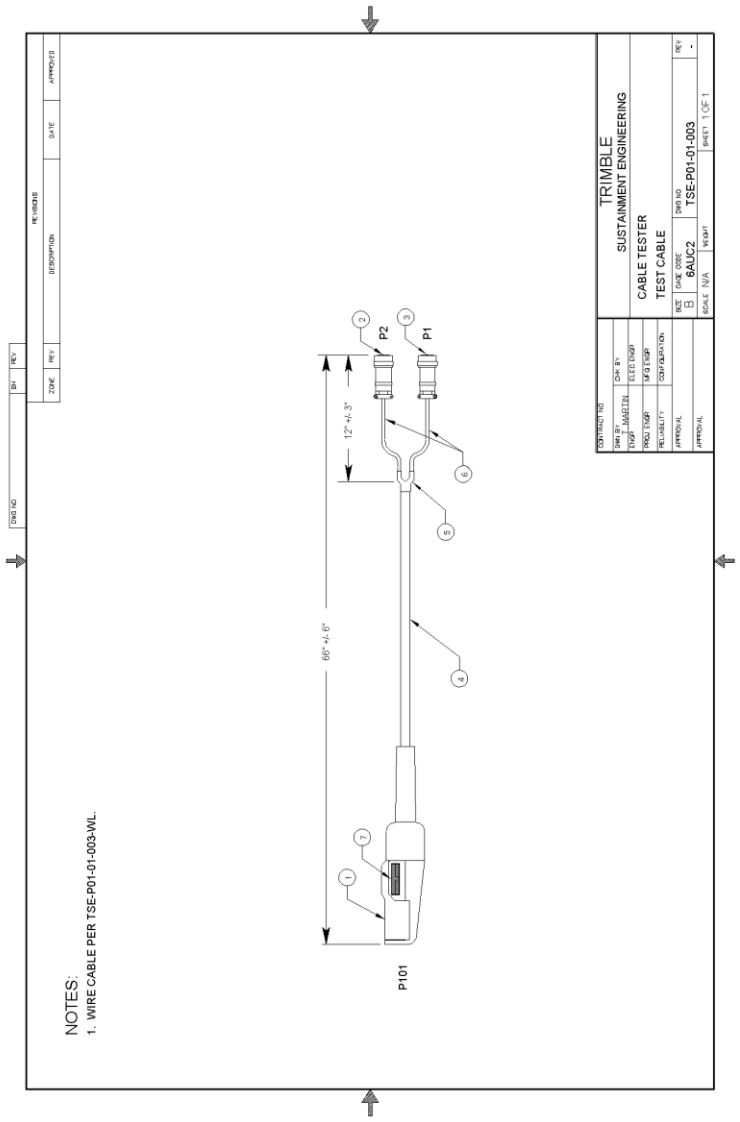



**FIGURE 30. BRANCHED CABLE, MECHANICAL**

| Part Number: TSE-P01-01-003-PL | | Rev- | | | | |
|---|---|---|---|---|---|---|
| Assembly: Cable Tester; Test Cable | | | | | | |
| ID | Description | Part Number | Manufacturer | CAGE | Board Qty | Reference Designator |
| 1 | Connector, Plug | U-185B/G | Tacticom USA | 68908 | 1 | P101 |
| 2 | Connector, Plug, Male | KPT6UHST3-16-26P | ITT Cannon | 71468 | 1 | P2 |
| 3 | Connector, Plug, Female | KPT6UHST3-16-26S | ITT Cannon | 71468 | 1 | P1 |
| 4 | Cable, 22 AWG, 26 Pair | MIL-C-55036 | Belden | 3GY56 | AR | |
| 5 | Heat Shrink Boot, Y Transition | 381A301-71/42-0 | Raychem | 34964 | 1 | |
| 6 | Heat Shink Tubing | FPHS-032-4005-BLK | SPC Technology | 5T436 | AR | |
| 7 | Label | TSE-P01-03-010-01 | Trimble | 6AUC2 | 4 | |

# CHAPTER 8
# TEST UNIT VERIFICATION

While the Test Unit does not require periodic calibration it may become necessary to execute a performance test to ensure proper functionality. The following test is performed by Trimble Sustainment Engineering Inc. prior to shipment of any Cable Test Set and may be used as a reference if the test adapters called out are not available.

## 8.1. Verification Procedure

# Cable Tester Test Procedure

Serial Number: _____

Date: _____

Operator: _____

**Setup:**

Gather the following test equipment and components. _____

- Cable Tester Kit
  - Cable Tester
  - Branch cable
  - Shorting Plug
  - Batter Pack
- DC Power Supply
- Meter
- Cable Tester Load Simulator
  - Load simulator cable
  - Shorting cable
  - CCHK loads
  - IR load plug

**Startup:**

NOTE: If the power supply current is greater than 1 Amp. Turn off the power supply immediately. The internal cabling may have an issue. Return for rework. Do not continue with the test procedure.

Make sure the battery pack is connected to the cable tester and powered off. _____

Set up the DC Power Supply to 24 +/- 0.3 VDC, and connect to the 9-36VDC Input test points . _____

Power on the DC Power Supply and verify the current draws 0.65 +/- 0.2 Amps. Record _____

Power on the cable tester and verify the LCD display is visible, and the backlight is on. NOTE: It may be necessary to adjust the LCD contrast trim pot. CW will brighten up the display, and CCW will darken the display. _____

Verify "*CHG*" is displayed in the upper right hand corner of the screen, and blinks on and off approximately once per second. NOTE: Upon completion of a test the "*CHG*" indicator may cease blinking once per second and is expected. _____

Turn the knob to "MENU". Select the "Lamp Test" and press the START button to run the lamp test. Verify that the all of the pixels on the LCD are working, and the LEDs all go green and red. _____

Select the “Button Test” and press the START button to start and actuate the 6 button positions and verify that they display the correct label on the LCD. Power cycle the cable tester to get back to the main menu. _____

Select the “Tester Info” and press the START button and verify the information states the most current firmware revision.

EXAMPLE:

Firmware Build:
23-Jul-13
11:39:56 _____

**System Zero Calibration:**

Connect the branch cable that is a part of the cable tester kit. _____

Connect the shorting plug that is a part of the cable tester kit. _____

Select the “System Zero Cal” and press START to run the test. Verify at the end of the test that all channels were calibrated. NOTE: Do not remove the cable yet. NOTE: A failed pair will indicate “63” representing an OPEN condition. _____

**CCHK Test:**

Turn the knob to “CCHK”. _____

Put the cable tester into “Manual” mode. _____

Press the START button twice to run the 250-ft test. Record the value of resistance for each channel in the table below. Verify that all values are less than 1.1 ohm, and there are no failures. _____

| Channel | Record (ohms) |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
| 12 | |
| 13 | |

| Channel | Record (ohms) |
|---|---|
| 14 | |
| 15 | |
| 16 | |
| 17 | |
| 18 | |
| 19 | |
| 20 | |
| 21 | |
| 22 | |
| 23 | |
| 24 | |
| 25 | |
| 26 | |

Put the cable tester into “Auto” mode. _____

Remove the shorting plug, and connect the load simulator cable with shorting cables to the branch cable. _____

From the table below connect the appropriate load listed and run the CCHK test and verify the expected results from each test. NOTE: All channels will either pass or fail. _____

| CCHK Test | Load | Expected Results<br><br>For all channels | Results |
|---|---|---|---|
| 250-ft | 18 | Pass | |
| 250-ft | 22 | Fail | |
| 500-ft | 36 | Pass | |
| 500-ft | 44 | Fail | |
| 750-ft | 55 | Pass | |
| 750-ft | 65 | Fail | |
| 1000-ft | 75 | Pass | |
| 1000-ft | 85 | Fail | |
| 1250-ft | 95 | Pass | |
| 1250-ft | 105 | Fail | |
| 1500-ft | 115 | Pass | |
| 1500-ft | 125 | Fail | |

**Tone Test:** NOTE: This test will test the setting of each channel and verify that the pair A & B are wired correctly, as no tone will be present on lines that have reversed pairs.

Disconnect the shorting cables, and connect the load simulator. Turn on the load simulator and set the load to Test Tone, and channel 1. _____

Switch the cable tester to "MENU" and select the Test Tone. _____

Verify the tone is audible on each channel. Switch the load simulator channel to match the output channel of the cable tester. _____

Power down the load simulator and disconnect the simulator and cable. _____

**IR Test:**

Turn the knob to "IR". _____

Remove the load simulator and connect the IR load plug to the branch cable. _____

Put the cable tester into “Auto” mode. _____

Run the IR Test. Verify channels (1, 2, 3, 5, 6, 9, 10, 11, 13, 14, 16, 25, and 26) pass, and all other channels fail. _____

**Stop on Failure Test:**

From the IR menu, toggle the setting for “Stop on Fail: NO” to “YES”. _____

Run the IR Test. Verify that the test stops on all failures. NOTE: Press “ONE STEP” to continue on the failure. _____

**Battery Test:**

Turn off the cable tester. Turn off the power supply and disconnect from the cable tester. _____

Turn on the cable tester, and verify that “BATT OK” is displayed in the upper right hand corner. NOTE: It may be necessary to adjust the contrast. _____

**Auto-Off Test:**

Disconnect the IR load plug. _____

Rerun the IR Test and verify the test passes. At the end of the test press “START”, and verify that the cable tester turns off. _____

Turn the cable tester back on. _____

From the MENU, toggle the setting for “Auto-Off Enabled” to “… Disabled”. _____

Rerun the IR Test and verify the test passes. At the end of the test press “START”, and verify that the cable tester does not turn off. _____

Reconnect the IR load plug. _____

From the MENU, toggle the setting for “Auto-Off Disabled” to “… Enabled”. _____

Rerun the IR Test and verify the LEDs for the failures stay illuminated. At the end of the test press “START”, and verify that the cable tester does not turn off. _____

Remove the IR load plug. _____

**Test Speed:**

From the IR menu, toggle the setting for “Test Speed Slow” to “Test Speed Fast”. _____

Rerun the IR test and verify that each pair is tested at about one per second. Test will pass. _____

**AC Power Test:**

Turn off the cable tester, and disconnect the battery. _____

Connect an AC power cord to the cable tester and power the unit on. _____

Test Complete. Restore all equipment to its original configuration.