# T-36C
# NAV/COMM RAMP and BENCH TEST SET

## Operational & Maintenance Manual
**P/N: 90008077-2**

**REVISION**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K | L | M |
| N | O | P | Q | R | S | T | U | V | W | X | Y | Z |

**17 January 2004**
**For Test Sets Containing Software Revision 1.12 or greater**

Tel-Instrument Electronics Corp
728 Garden Street
Carlstadt, NJ 07072
(201) 933-1600
www.telinstrument.com

Leading the AVIONICS TEST industry into the 21st Century!

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| PART NUMBER | VOLUMES INCLUDED | CHAPTERS INCLUDED |
|---|---|---|
| | | |
| 90008077-1 | VOLUME 1 | CHAPTERS I & II |
| 90008077-2 | VOLUMES 1 & 2 | CHAPTERS I - VI |

Chapter I – Introduction
Chapter II – Preparation for Use and Operation
Chapter III – Theory of Operation
Chapter IV – General Maintenance and Servicing Procedures
Chapter V – Schematics
Chapter VI – Illustrated Parts Catalog

# VOLUME 1

# OPERATIONAL PROCEDURES

# T-36C TABLE OF CHANGES

| Date | REV | ECO | Page | Description |
|---|---|---|---|---|
| 2-10-03 | B | | All pages were affected | Overhaul of entire Manual |
| 1-17-04 | C | | Chap 2 & 4 | Chap 2 – Added additional Tests<br>Chap 4 – Revised entire Calibration |
| | | | | |

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# CHAPTER I

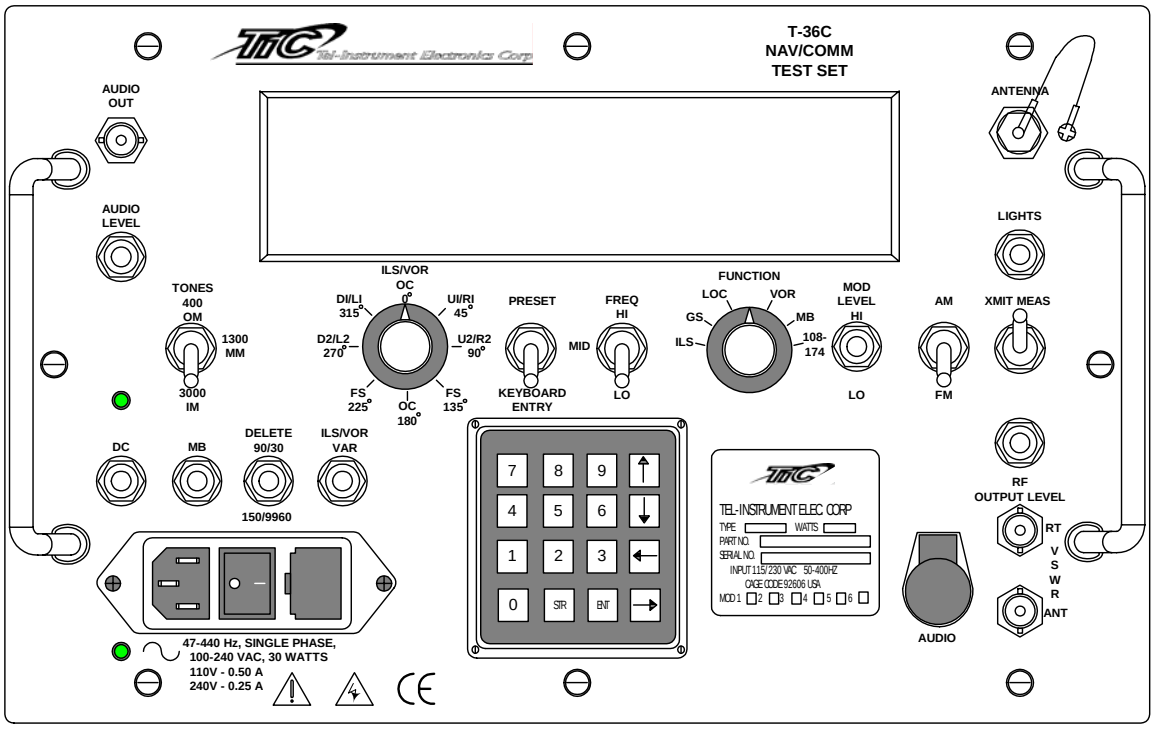
# INTRODUCTION

## SECTION A

## GENERAL INFORMATION

### 1.1 Scope of Manual

This manual provides operator guidance for the T-36C CAT III NAV/COMM Test Set, hereafter referred to as the T-36C, the Test Set, or the T/S. The T-36C is a precision VHF signal simulator, used for ramp, cockpit, or bench testing of VOR, LOC/GS (ILS), and MB NAV receivers, or VHF COMM transceivers.




T-36C Test Set

Figure 1-1

## 1.2 Purpose and Function of Equipment

The T-36C is a portable, rugged, user friendly instrument designed for rapid, ICAO Annex 10 CAT III precision functional testing and calibration of military and general aviation VOR, LOC/GS, MB and VHF COMM transceivers. The Test Set can be operated in either a "preset" mode for rapid simple access to preset test conditions accessible to gloved personnel for ramp/flight-line go, no-go testing, or a "keypad" mode for direct parametric entry for full function bench testing and diagnostics. Operational test flexibility is enhanced by the T-36C's ability to store three carrier frequencies and output power levels for each operating mode, and UUT connection with either a provided antenna or direct connect cable. Stored test frequencies can be pre-programmed to match unique test environments and locations. The Test Set is powered by either an internal NiCad battery or by 100-240 VAC, 47-440 Hz source. An internal battery charger is enabled whenever the Test Set is powered from external AC. All required accessories are stored in the weather resistant MIL-PRF-28800, Style C case.

## 1.3 Warranty[1]

The Tel-Instrument Electronics Corporation warrants that each product it manufactures is free from defective material and workmanship for a period of two (2) years subject to the following terms and conditions. Tel-Instrument Electronics Corporation will remedy any such warranted defect subject to the following:

This warranty requires the unit to be delivered by the owner to Tel-Instrument intact for examination, with all transportation charges prepaid to the factory, within two (2) years from the date of sale to original purchaser. Tel-Instrument will solely determine when such defect exists.

This warranty does not extend to any of Tel products which have been subject to misuse, neglect, accident, improper installation, or used in violation of operating instructions. This warranty does not extend to units which have been repaired, calibrated, or altered in any way by a facility that is not approved, in writing, by Tel-Instrument Electronics Corp. to perform such work. This warranty does not apply to any product where the seals or serial number thereof has been removed, defaced or changed, nor to accessories not of our own manufacture.

Repair parts will be made available for a minimum period of five (5) years after the manufacture of this equipment has been discontinued.

This warranty is in lieu of all other warranties expressed or implied and all such other warranties are hereby expressly excluded. No representative or person is authorized to assume for us any other liability or warranty in connection with the sale of Tel's products.

This warranty does not cover or include batteries (batteries have a separate 90 day warranty).

Additional information with regard to the applications and maintenance of this equipment will be available from time to time.

[1] Tel Instrument Electronics Corp reserves the right to change or modify the warranty without notice.

# SECTION B EQUIPMENT DESCRIPTION

## 1.4 Specifications[2] [3]

### TRANSMITTER

| FUNCTION | PRESET (DEFAULT) FREQUENCY | ACCURACY |
|---|---|---|
| | | |
| MB | 74.5 – 75.5 MHz | ± 150 Hz |
| | | |
| VOR | 108.0500 – 117.9500 MHz | ± 150 Hz |
| | | |
| Localizer (LOC) | 108.1000 – 119.9500 MHz | ± 150 Hz |
| | | |
| Glideslope (GS) | 329.1500 – 335.0000 MHz | ± 300 Hz |
| | | |
| COMM | 108.0000 – 174.0000 MHz | ± 150 Hz |
| | | |
| Channel Spacing in 25 and 8.33 KHz Steps | | |

### RF CHARACTERISTICS

| FUNCTION | DIRECT CONNECT | ANTENNA |
|---|---|---|
| | | |
| MB | -115 dBm to -25 dBm / ±1 dB | -100 to +13 dBm / ± 1 dB |
| | | |
| VOR | -115 dBm to -25 dBm / ±1 dB | -100 to +6 dBm / ± 1 dB |
| | | |
| Localizer (LOC) | -115 dBm to -25 dBm / ±1 dB | -100 to +6 dBm / ± 1 dB |
| | | |
| Glideslope (GS) | -115 dBm to -30 dBm / ±1 dB | -100 to +0 dBm / ± 1 dB |
| | | |
| COMM | -115 dBm to -25 dBm / ±1 dB | -100 to +0 dBm / ± 1 dB |
| | | |
| Selectable in 1 dB Steps | | |

### NAV CHARACTERISTICS

| | | ILS/VOR PRESETS | | | | | | | | | KEYPAD SELECTION | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | OC | U1/R1 | U2/R2 | FS | OC | FS | D2/L2 | D1/L1 | OC | RANGE | ACCURACY |
| | | | | | | | | | | | | |
| VOR | DEGREES | 0º | 45º | 90º | 135º | 180º | 225º | 270º | 315º | 360º | 0-360º | 1º |
| LOC | DDM | 0.000 | 0.046 | 0.093 | 0.200 | 0.000 | 0.200 | 0.093 | 0.046 | 0.000 | 0 to 0.200 DDM L/R | 0.001 DDM |
| GS | DDM | 0.000 | 0.045 | 0.091 | 0.400 | 0.000 | 0.400 | 0.091 | 0.045 | 0.000 | 0 to 0.400 DDM U/D | 0.001 DDM |

[2] Tel Instrument Corp reserves the right to change specifications without notice.
[3] Standard Condition Values

## MODULATION CHARACTERISTICS

| FUNCTION | PRESET (DEFAULT) FREQUENCY | MODULATION RANGE | VARIABLE FREQUENCY |
|---|---|---|---|
| | | | |
| MB | 400 Hz / ± 8 Hz | 95% / ± 5% | ---------- |
| | 1300 Hz / ± 26 Hz | 95% / ± 5% | ---------- |
| | 3000 Hz / ± 60 Hz | 95% / ± 5% | ---------- |
| | | | |
| VOR | 9960 & 30 Hz (0° Course) | 30% / ± 0.5% | 0° - 360° / 1° steps |
| | | | |
| Localizer (LOC) | 90 & 150 Hz (On Course) | 20% / ± 0.5% | 0 to 200 DDM Left & Right<br>0.001 DDM Steps |
| | | | |
| Glideslope (GS) | 90 & 150 Hz (On Course) | 40% / ± 0.5% | 0 to 400 DDM Up & Down<br>0.001 DDM Steps |
| | | | |
| COMM<br>AM | 150 & 1020 Hz | 0 – 95% / ± 5% | 0 to 95%<br>1 % Steps |
| | | | |
| COMM<br>FM | 1020 Hz | 0 – 10 kHz / ± 1 kHz | 0 to 10 kHz<br>1 kHz Steps |
| | | | |
| Ident | 1020 Hz | 10 % / ± 1% | ---------- |

## RECEIVER CHARACTERISTICS

| FUNCTION | TOLERANCE/ACCURACY |
|---|---|
| | |
| COMM Frequency | ± 8 kHz of Selected Frequency |
| COMM Frequency Tolerance | ± 0.2 kHz |
| FM Deviation Range | 0 – 15 kHz |
| FM Deviation Accuracy | ± 1 kHz |
| Sensitivity<br>(Antenna Port) | AM -10 dBm<br>FM -30 dBm |
| Minimum Sensitivity Level (Direct Connect)<br>Frequency, Modulation, & VSWR | +36 dBm |
| VSWR Ratio | 1.0 – 5.0 / ± 0.5 |
| Modulation Accuracy | ± 5% |
| Power Measurement Range<br>Direct Connect | 0 – 14 dBW / ± 1dBW (1 – 25 Watts) |

## MISCELLANEOUS SPECIFICATIONS

| | | | |
|---|---|---|---|
| | | | |
| Size | 15.5 x 9.4 x 6.5 inches | Operating Temperature | -15 to + 55° C |
| Weight | 19 Pounds | Input Current | 0.17 Amps AC |
| Case Style | MIL-PRF-28800, Style A or C | Color | Yellow |
| Input Power | 100 – 240 VRMS ± 10% | Power Consumption | 20 Watts |
| Input Power Frequency | 47 – 440 Hz | | |
| Input Power Specified – Simultaneous Battery Charging and Test Set Operation | | | |

## 1.5 Abbreviations, Acronyms and Glossary Terms[4]

| | |
|---|---|
| A/A | Air to Air |
| A/A B | Air to Air Beacon |
| ac or AC | Alternating Current |
| A/C | Aircraft |
| A/D | Analog to Digital |
| AM | Amplitude Modulation |
| AGC | Automatic Gain Control |
| AM | Amplitude Modulation |
| ATCRBS | Air Traffic Control Radar Beacon System |
| ATC | Air Traffic Control |
| AUT | Aircraft under Test |
| BIT | Built in Test |
| CAT I, II & III | Categories of ILS Approaches |
| CDI | Course Deviation Indicator |
| COMM | Communications, Communication Equipment |
| CW | Continuous Wave |
| D/A | Digital to Analog |
| DH | Decision Height |
| dB | Decibel |
| dBm | Decibels relative to 1 milliwatt |
| dBw | dB-watts or referenced to 1 watt |
| dc or DC | Direct Current |
| DME | Distance Measuring Equipment |
| EMI | Electromagnetic Interference |
| FAA | Federal Aviation Administration |
| FAR | Federal Aviation Regulation |
| FD | Flight Director |
| FIFO | First In First Out |
| FM | Frequency Modulation |
| FREQ | Frequency |
| ft. | Feet |
| G/A | Ground to Air |
| GS | Glideslope |
| Hz | Hertz |
| HDG | Heading |
| HSI | Horizontal Situation Indicator |
| IF | Intermediate Frequency |
| IFF | Identify Friend or Foe |
| ILS | Instrument Landing System |
| IM | Inner Marker (one of three Marker Beacon signals) |
| kHz | Kilohertz |
| kts. | Knots |
| LCD | Liquid Crystal Display |
| LED | Light Emitting Diode |

[4] Further definitions may be found in the following reference books and documents: Helfrick, A.D. Principles of Avionics. Leesburg: Quality Books, 2000. RTCA/DO-181B. Minimum Operational Performance Standards for Air Traffic Control RADAR Beacon System/Mode Select (ATCRBS/Mode S) Airborne Equipment. Washington D.C.: 1999. United States. Federal Aviation Administration. Federal Register Fed 3, 1987 FAA rules Part 91.

| | |
|---|---|
| LOC | Localizer |
| MB | Marker beacon |
| MF | Medium Frequency |
| MHz | Megahertz |
| MM | Middle Marker (one of three Marker beacon signals) |
| NAV | Navigation, Navigational Equipment |
| nmi. | Nautical mile |
| ns | Nanosecond |
| OBS | Omni Bearing Selector |
| OM | Outer Marker (one of three Marker Beacon signals) |
| PAM | Pulse Amplitude Modulation |
| PDME | Precision Distance Measuring Equipment |
| PMCS | Preventative Maintenance Checks and Services |
| PPM | Pulses per Minute |
| PRF | Pulse Repetition Frequency |
| PW | Pulse Width |
| PWR | Power |
| RA | Resolution Advisories |
| RF | Radio Frequency |
| RMI | Radio Magnetic Indicator |
| RMS | Root Mean Square |
| R/T | Receiver Transmitter |
| TA | Traffic Advisories |
| TACAN | Tactical Air Navigation |
| TCAS | Traffic Alert and Collision Avoidance System |
| TX | Transmitter |
| UHF | Ultra High Frequencies, 300 MHz – 3000 MHz |
| VHF | Very High Frequencies, 30 MHz – 300 MHz |
| VOR | VHF Omnidirectional Range |
| VORTAC | VOR and TACAN (co-located) |
| VSWR | Voltage Standing Wave Ratio |
| WOW | Weight On Wheels |
| UUT | Unit Under Test |
| XPDR | Transponder |

# CHAPTER II

# PREPARATION FOR USE AND OPERATION

## SECTION A

## GENERAL INFORMATION

### 2.1 General

This section contains all necessary information on the initial unpacking, inspection, and setup of the T-36C Test Set. Each Test Set has already undergone a comprehensive series of tests, full calibration and Quality Assurance Checks before shipment from Tel-Instrument Corporation.

### 2.2 Unpacking and Inspection

After receiving the Test Set for the first time, ensure there is no damage to the shipping container, before opening the box. Carefully unpack the unit and save the shipping container in a safe location for subsequent shipping or extended storage.

Examine the unit for obvious signs of damage. Carefully check each switch. Connector and display before utilizing the Test Set for the first time.

If damage is found, DO NOT use the Test Set until a determination of the Test Set's condition can be assessed. Contact Tel-Instrument Corporation as soon as possible for further instructions.

Check that all the accessories that you purchased with the Test Set are accounted for. The T-36C Test Set is equipped with the following standard accessories:

| NOMENCLATURE | P/N | QTY |
|---|---|---|
| | | |
| T-36C Test Set | 90 000 077 | 1 |
| AC Line Cord | 75 010 025 | 1 |
| Direct Connect Cable Assembly | 75 010 134 | 1 |
| Omni Antenna | 40 030 003 | 1 |
| Adapter, Right Angle | 48 000 013 | 1 |
| Operators Manual | 90 008 077-1 | 1 |
| Operators And Maintenance Manual | 90 008 077-2 *Optional* | N/A |

T-36C Accessories

Table 2-1

### 2.3 Installation

The T-36C Test Set is ready to use from the factory. There are no installation procedures applicable. The Test Set batteries were installed and fully charged before shipping.

# SECTION B

# OPERATING CONTROLS, INDICATORS, AND CONNECTORS

## 2.4 General

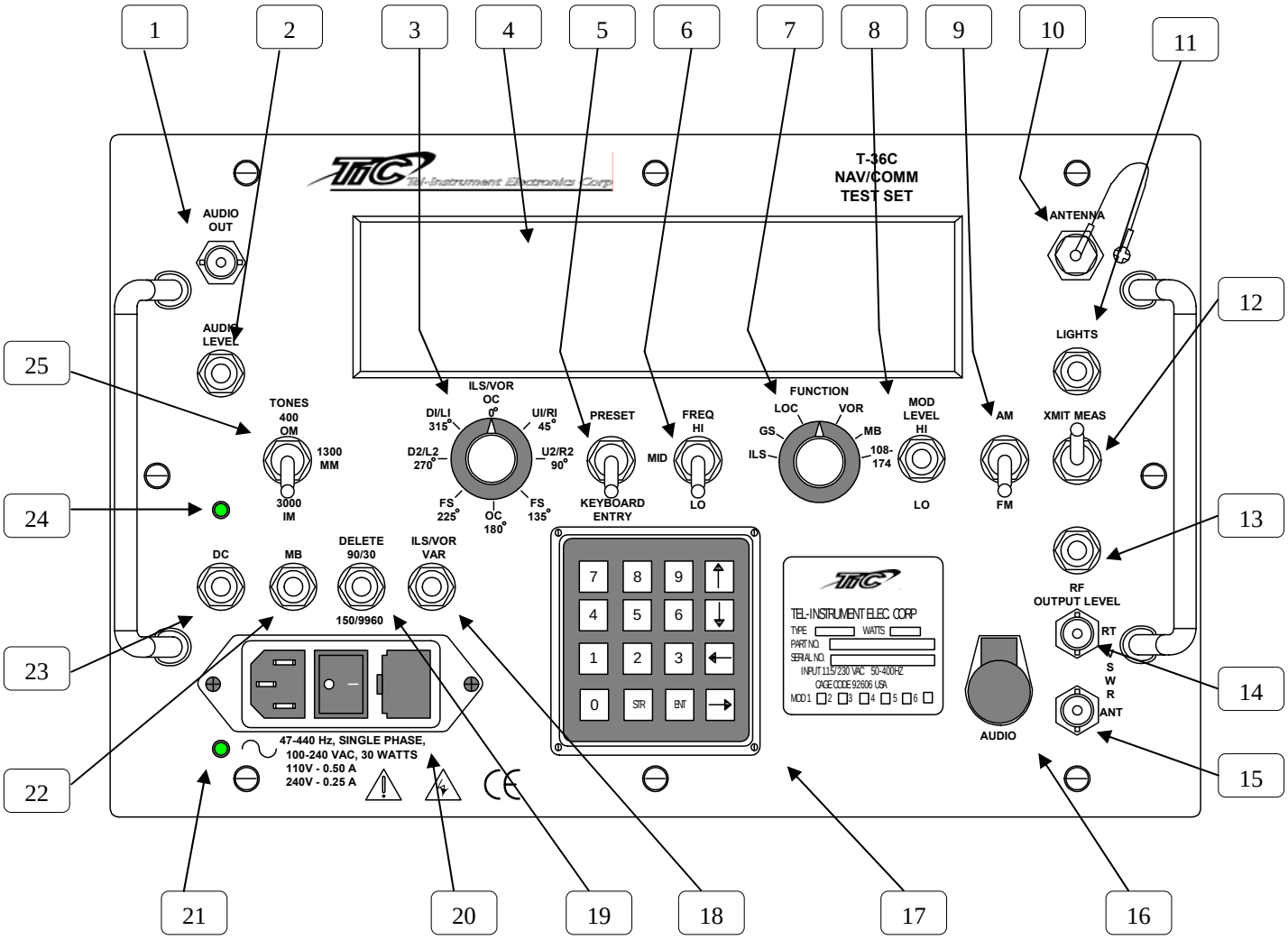
This section explains location and function of the operating controls, indicators and connectors. All controls, indicators, connectors are located on the front panel of the Test Set.

## 2.5 Controls, Indicator, and Connectors

Figure 2-1 and Table 2-2 describes and shows location for each of the T-36C Test Set controls, switches and displays.

**TABLE 2-2 Controls, Indicators, and Connectors**

| Ref | CONTROL, INDICATOR, OR CONNECTOR | FUNCTION |
|---|---|---|
| 1 | **AUDIO OUT** Connector | Calibrated audio tone providing UUT audio modulation at 1020 Hz. |
| 2 | **AUDIO LEVEL** Toggle | Sets Audio Out level. |
| 3 | **ILS/VOR** Rotary Switch | Used in conjunction with the **FUNCTION** Rotary switch. Allows selection of *On Course Bearing* information for VOR and ILS/GS/LOC *Offset deflection*. |
| 4 | **LCD** Display | Provides Operator interface with Test Set functions. |
| 5 | **KEYPAD ENTRY/PRESET** Toggle Switch | Selects NAV and COMM frequencies (MHz). |
| 6 | **FREQ HI/MID/LO** Toggle Switch | Selects low, mid, and high frequencies. Used in conjunction with the **FUNCTION** Rotary Switch. |
| 7 | **FUNCTION** Rotary Switch | Selects Test Set operating Modes. ILS, GS, LOC, VOR MB, and COMM Frequencies of 108.0-174.0 MHz. |
| 8 | **MOD LEVEL** Toggle Switch | Sets modulation level. |
| 9 | **AM/FM** Toggle Switch | Selects *AM* (Amplitude Modulation) or *FM* (Frequency Modulated) transmission signals. |
| 10 | **ANTENNA** Connector | TNC Connector for ramp mode testing utilizing Omni-Antenna. |
| 11 | **LIGHTS** Toggle Switch | Enables momentary or continuous background lighting for **LCD** Display. |
| 12 | **XMIT MEAS** Toggle Switch | Selects transmission measurements display. |
| 13 | **OUTPUT LEVEL** Toggle Switch | Controls RF Output Level. |
| 14 | **VSWR** Connector **RT** | Allows Direct Connection of UUT R/T's. |
| 15 | **VSWR** Connector **ANT** | Direct Connection connector for UUT *Voltage Standing Wave Ratio*. |
| 16 | **AUDIO** Jack | Audio Connector to monitor COMM transmitters. |
| 17 | **KEYPAD** | Utilized for direct data entry. |
| 18 | **ILS/VOR VAR** Toggle Switch | Slews VOR Bearing, GS and LOC DDM. |
| 19 | **DELETE 90/150**, **30/9960** Toggle Switch | Allows the operator to delete the 90/150Hz component of the LOC/GS signals or the 30/9960 Hz component of the VOR output. |
| 20 | **FUSE** and **AC Power** Panel | 1. Provides connection to AC input power via the supplied cable.<br>2. **AC ROCKER** switch to Charge Test Set battery or operation utilizing AC Power.<br>3. **FUSE Cartridge-** provides Test Set power protection. |
| 21 | **AC** Lamp Indicator | Indicates AC power is being utilized. |
| 22 | **MB/NAV ID** Toggle Switch | Momentary switch providing *IDENT*, 400, 1300, or 3000 Hz simultaneous MB RF signals. |
| 23 | **DC** Toggle Switch | Operates Turns Test Set *ON/OFF* when utilizing internal battery. |
| 24 | **DC** Lamp Indicator | Power *ON* Indicator. |
| 25 | **TONES 400/OM, 1300/MM, 3000/IM** Toggle Switch | Selects simulated Marker Beacon audio tones.<br>**400/OM-** 400 Hz/Outer Marker<br>**1300/MM**- 1300 Hz /Middle Marker<br>**3000/IM**- 3000 Hz/Inner Marker |




T-36C Test Set Controls, Indicators, and Connectors

Figure 2-1

# SECTION C

# OPERATING INSTRUCTIONS

## 2.6 General

The T-36C Test Set is capable of testing VOR/LOC/MB/GS and VHF Communications by either direct connection of the UUT or remote testing by use of the supplied Omni-Directional Antenna. Preset frequencies for quick ramp checks of NAV/COMM equipment are built-in the Test Set's memory. The operator also has the capability of manually varying a variety of frequencies, bearing, and heading information.

## 2.7 Battery Operation

The Test Set is factory equipped with a rechargeable Ni-Cad battery capable of operating the Test Set using a 20% Duty Cycle for up to 8 hours at 77 º F (25ºC). This represents a full day of testing on a single charge. When operating the Test Set in lower temperatures, the battery life will decrease.

Due to the Ni-Cad batteries ability to maintain a constant current level, the operator will be able to use the Test Set until the batteries are nearly depleted. By plugging the unit into an AC power source and maintaining a 20% Duty Cycle, the operator may continue to utilize the Test Set and the batteries will begin regaining their charge.

After 16 minutes of inactivity, the Test Set will automatically turn ***OFF*** to conserve battery strength.

It is strongly recommended that the Test set batteries be charged for a short time each week, regardless if the Test Set has been utilized or not. A completely discharged battery will require approximately 8 hours to completely recharge. Occasional charges of 8 hours on partially depleted batteries will have no adverse affects.

### 2.7.1 Battery Charging

Utilize the following procedures to charge the batteries:

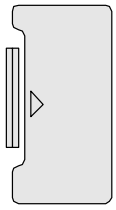
1. Remove the **AC Power Cord** from the Test Set cover.
2. Connect the cord to a suitable 120 VAC outlet (220 VAC if configured).
3. Depress the **AC Rocker** switch to the "**—"** position. Ensure the green **AC** lamp indicator illuminates signifying that battery charging has commenced.

### 2.7.2 220 AC Operation

The T-36C may be operated using 220VAC. The following procedures are necessary before using the Test Set. Failure to properly configure the T-36C may result in severe damage to the Test Set.

1. Remove the **FUSE Cartridge** from the **FUSE** panel located on the front panel (figure 2-2).

**WARNING**
Failure to configure the Test Set for 220VAC operation may result in severe damage to the Test Set and/or injury.



Fuse Cartridge

Figure 2-2

2. Remove and store/dispose the two fuses.

3. Replace the fuses with 250V/0.25A FFT fuses and reinstall the cartridge back in the panel.

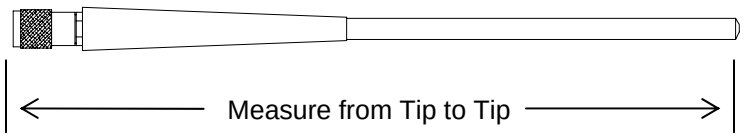
## 2.8 Omni-Directional Antenna

Most navigation receiver checks will be performed on the ramp utilizing the supplied Omni-Antenna. The Omni-Antenna will be most effective if the operator adjusts the length for the selected frequency range. Though not necessary, the operator will notice a marked improvement in performance when adjusting to the correct length.

In order to perform ramp testing, Antenna to Antenna, perform the following steps:

1. Remove the Omni-Antenna from the Test Set Cover. Connect it to the **ANTENNA** connector located on the front panel of the Test Set.

2. Use Table 2-3 and Figure 2-3 to adjust the antenna length to the frequency range that you will be testing in.




Omni Antenna

Figure 2-3

| NAV FREQUENCIES | |
|---|---|
| **FREQUENCY TESTED** | **ANTENNA LENGTH** |
| | |
| MB | Fully Extended |
| VOR | Approx, 30 inches |
| LOC | Approx, 30 inches |
| GS | Approx, 20 inches |
| ILS | Approx, 30 inches |

| COMM FREQUENCIES | |
|---|---|
| **FREQUENCY TESTED** | **ANTENNA LENGTH** |
| | |
| 75 MHz | Fully Extended |
| 108-118 MHz | Approx, 30 inches |
| 118-156 MHz | Approx, 24 inches |
| 156-174 MHz | Approx, 20 inches |

Antenna Lengths

Table 2-3

3. Place the Test Set 10 to 30 ft. from the UUT antenna. Ensure a clear view without obstructions. Nearby ramp equipment or aircraft may interfere with the results. If incorrect results are observed, relocate the Test Set to a different position and re-test. Most tests can be performed from within the aircraft.

## 2.9 Keypad Entry

The T-36C allows the operator to modify and vary numerous parameters allowing unique and more detailed tests to be performed. The flexibility of the variable parameters is sufficient enough to allow *Acceptance Level Testing*. The following parameters can be modified:

1. RF Frequency
2. RF Output Level
3. Audio Output Level
4. Modulation Level (AM or FM Deviation)

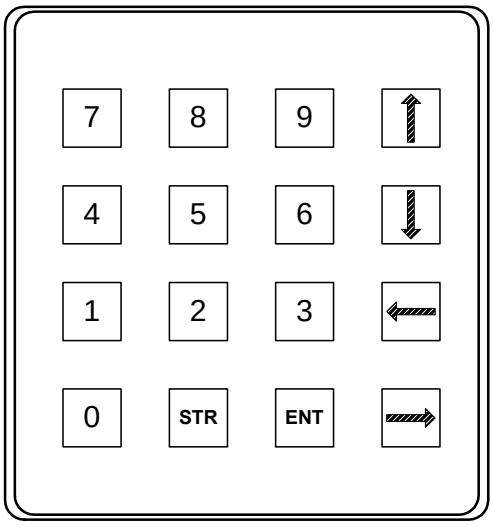
In addition to these parameters, the frequencies assigned to the LO, MID, and HI preset functions can be changed within permitted operating ranges for the function selected.

***NOTE***

Only valid frequencies within normal bandwidths and at 25 KHz or 8.33 KHz increments can be modified.

### 2.9.1 Keypad Entry Instructions

Entering variable parameters utilizing the Keypad requires only that the operator select a parameter within the T-36C normal range and depress the **ENT** pad. Utilize Figure 2-4 for reference.




Keypad

Figure 2-4

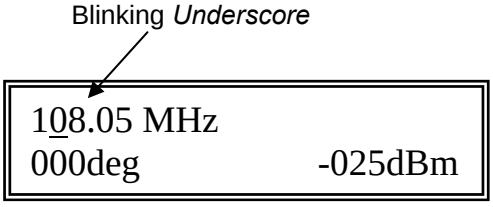
To enter data, the following procedure is used:

1. On the Test Set front panel, toggle the **PRESET/KEYPAD** entry switch to the **KEYPAD** position.

2. Select the desired function utilizing the **FUNCTION** rotary switch.

3. The Test Set display will indicate the current frequency, RF output level, modulation level and audio output level.

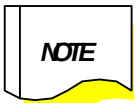
4. A flashing *Underscore-Bar* will be displayed under the first entry position in the frequency position.



5. Enter the desired frequency by depressing the appropriate numbers on the keypad. Each time a number is selected, the *Underscore* will advance one position.

6. Depress the **ARROW** keypads to advance or maneuver the underscore to a different parameter.

7. When all values have been entered, select the **ENT** button.




In order to use the new test value, **ENT** must be pressed or a valid parameter must be entered. When all positions of the value are entered and the Test Set recognizes a valid entry, the Test Set will process the parameter with an Automatic **ENT.**

8. The following are exceptions that apply to the data entry process:

   a. RF frequencies can only be varied with the keypad method.

   b. Manually entered parameters are reset to factory defaults when a new test is selected or the Test Set is turned *OFF*.

   c. In the **NAV** or **LOC** functions, the 10 kHz position can be varied, but the Test Set will not allow entry of invalid parameters.

   d. **GS** frequencies cannot be varied as they are directly coupled to the **LOC** selection.

### 2.9.2 Stored Parameter Changes

The T-36C Test Set condition presets can be changed as desired by the operator. To enter new preset values, the following procedure should be used:

1. Select the FUNCTION desired and the appropriate frequency, LO/MID/HI position, desired to be changed.

2. Vary the displayed parameter fields with utilizing the method described in Para 2.9.1.

3. Press **ENT** or enter all parameter value positions to transfer the new display value into the active test value.

4. Press **STR** to transfer the new test value into the preset frequency LO/MID/HI register position.

5. The new preset value will be retained until it is changed. Test Set power *OFF/ON* cycling will not change the preset value.

6. Only legitimate frequency assignments can be entered for VOR, LOC and GS channel assignments. All other functions selected allow frequency assignments to any 100 Hz increment in the selected frequency ranges.

## 2.10 T-36C Typical Test Displays

Figure 2-5 depicts several typical displays for numerous Test Set functions. These represent only a small percentage of the possible displays that are shown when conducting tests with various types of equipment. Before utilizing the Test Set, thoroughly review this manual and the procedures necessary to properly test the desired equipment. A quick reference guide is located inside the Test Set cover and as an Appendix at the end of the manual.

| | |
|---|---|
| Tel-Instrument T-36C<br>Ver. 1.01 xx/xx/xx | T-36C Start-up Display. Current Software and date installed shown. |
| 118.0000 MHz 1.4 kHz<br>80% AM 15W 2.1 VSWR | COMM Transmitter Testing<br>**XMIT MEAS, AM** |
| 118.0000 MHz 1.4 kHz<br>5.0 KHz FM 15W 2.1VSWR | COMM Transmitter Testing<br>**XMIT MEAS, FM** |
| 118.0000 MHz 100 mV<br>80% AM -063 dBm | COMM Receiver Testing<br>**118-156 AM** |
| 118.0000 MHz 100 mV<br>7.5 KHz FM -063 dBm | COMM Receiver Testing<br>**118-156, FM** |
| 75.0000 MHz<br>-075 dBm | Marker Beacon Testing<br>**MB; OM, MM, or IM** |
| 117.95 MHz<br>225 Deg -075 dBm | VOR Receiver Testing<br>**VOR, 225 º** |
| 108.15 MHz<br>0.045 R -075 dBm | Localizer Receiver Testing<br>**LOC, U1/R1** |
| 110.15 MHz/334.25 MHz<br>0.045 U -075 dBm | Glideslope Receiver Testing<br>**GS, U1/R1** |
| 0.045 U 110.15 MHz<br>0.045 R -075 dBm | **ILS** System Testing |

T-36C Typical Displays

Figure 2-5

## 2.11 General Test Procedures: Navigation, Antenna to Antenna

All of the following tests are described utilizing the T-36C Test Set. It is assumed the operator has a detailed knowledge of Avionics Systems and the UUT test requirements. Refer to Table 2-3 for correct antenna lengths for each test performed. Figure 2-6 illustrates a typical HSI/CDI indicator, utilize for reference when conducting VOR/LOC/ILS and GS Tests.

**NOTE**

The following tests are not meant to replace the testing criteria required for your particular model of equipment. They are general testing procedures to assist the operator in properly utilizing the T-36C T/S.

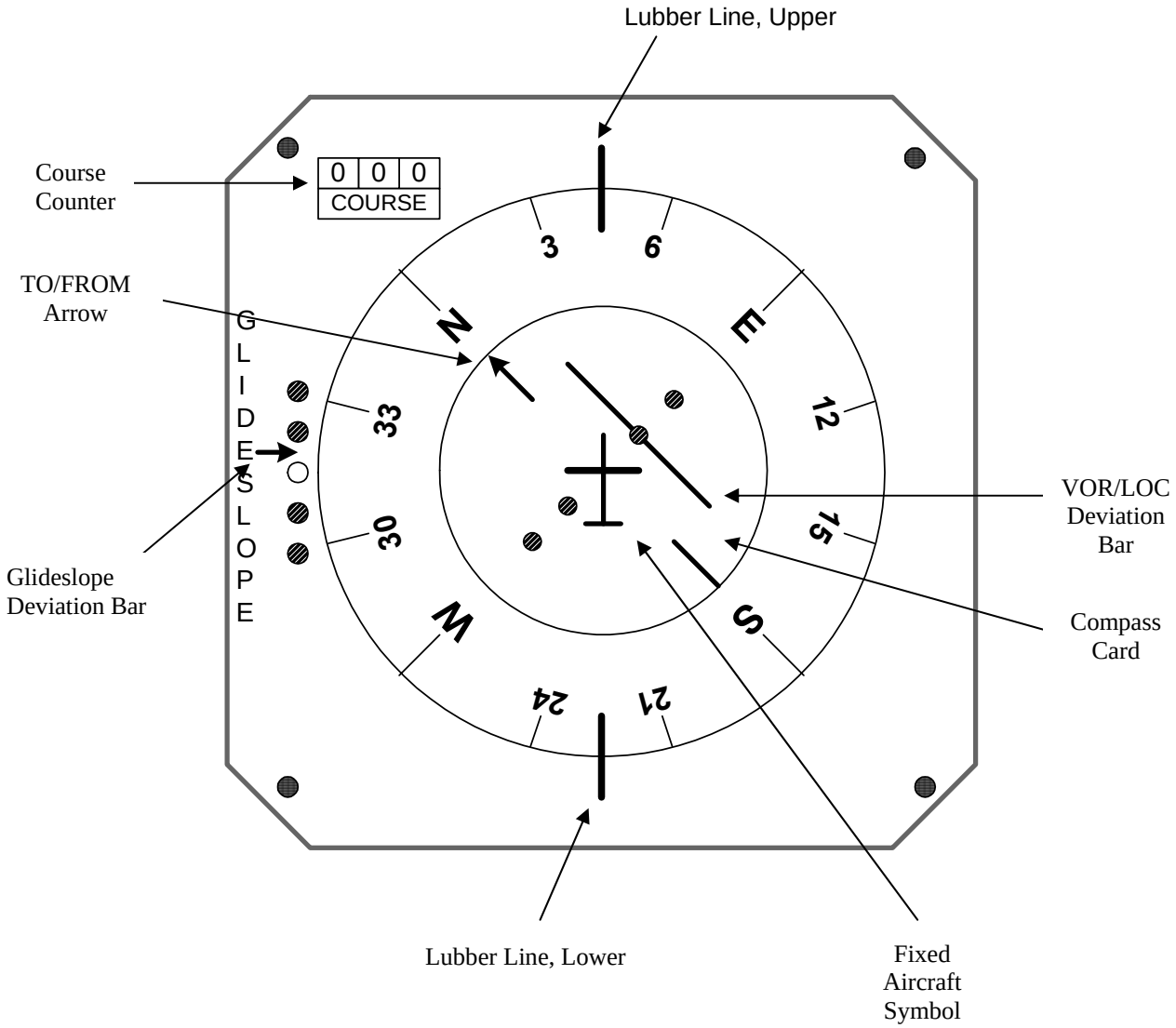



Figure 2-6

Basic HSI/CDI Indicator

### 2.11.1 ILS Test Procedures

**WARNING**

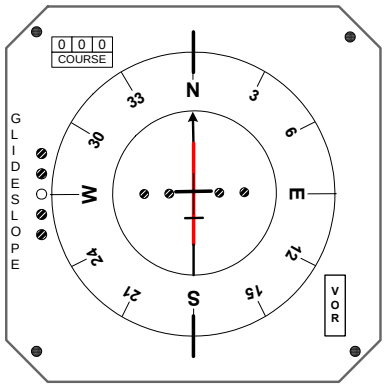
When conducting tests with the aircrafts autopilot engaged, any variation of the aircrafts controls may move the associated control services. Use caution to ensure that all personnel and ground support equipment are clear of the control services.

1. Toggle the **KEYPAD ENTRY/PRESET** switch to **PRESET.**
2. Extend the omni-antenna to 28½" (Top three sections retracted) and connect to the **ANTENNA** connector located on the front panel of the Test Set.
3. Place the **FUNCTION** rotary switch in **ILS**.
4. Toggle the **HI/MID/LO** switch to the **LO** position (108.01 – 334.70 MHz).
5. Turn the GS and LOC receivers *ON* in the Aircraft Under Test (AUT) and select corresponding frequencies on the aircraft panel and Test Set.
6. Select **OC** utilizing the **ILS/VOR** rotary switch. Observe a similar display.

| | |
|---|---|
| 0.000 OC | 108.15MHz |
| 0.000 OC | 000dBm |

7. The Horizontal pointers on your CDI should center and any flags are retracted.

Indicator shown with Deviation Bar centered and course at 000 degrees.



8. Utilizing the **ILS/VOR VAR** toggle switch, depress *Up* and *Down* observing the deviation pointers respond to the movement of the slew switch.

9. Repeat the procedure using different frequencies in the spectrum. Similar results should be observed.

### 2.11.2 GS Test Procedures

**WARNING**

When conducting tests with the aircrafts autopilot engaged, any variation of the aircrafts controls may move the associated control services. Use caution to ensure that all personnel and ground support equipment are clear of the control services.

1. Toggle the **KEYPAD ENTRY/PRESET** switch to **PRESET.**

2. Extend the omni-antenna to 19” (Top five sections retracted) and connect to the **ANTENNA** connector on the front panel of the Test Set.

3. Place the **FUNCTION** rotary switch in **GS**.

4. Toggle the **HI/MID/LO** switch to the **LO** position (334.70 MHz).

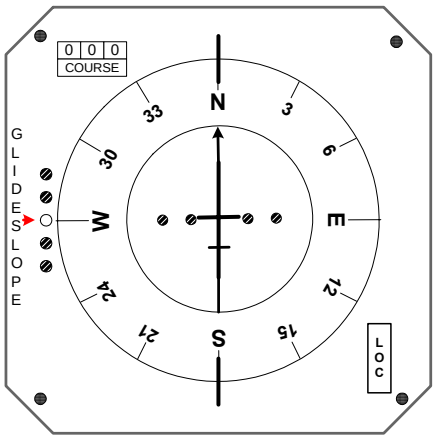
5. Turn the AUT GS receiver *ON* and select corresponding frequencies on the Test Set and aircraft.

6. Select **OC** utilizing the **ILS/VOR** rotary switch.

| |
|---|
| 108.15MHz / 334.55MHz |
| 0.000 OC 000 dBm |

7. Verify the aircraft CDI deviation pointer is centered and no flags present.

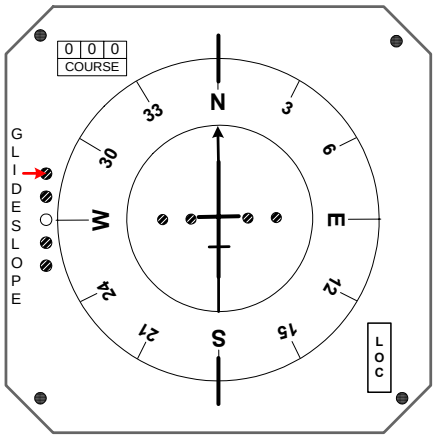
GS Pointer is Centered and On Course (OC).



8. Vary the **ILS/VOR** to **U1/R1**. The GS deviation pointer should indicate a one-dot deflection *UP*.

9. Vary the **ILS/VOR** to **U2/R2**. The GS deviation pointer should indicate a two-dot deflection *UP*.

GS Pointer indicates full Two-Dot *UP* Deflection




10. Vary the **ILS/VOR** to **D1/L1**. The GS deviation pointer should indicate a one-dot deflection *DOWN*.

11. Vary the **ILS/VOR** to **D1/L1**. The GS deviation pointer should indicate a two-dot deflection *DOWN*.

12. Return the **ILS/VOR** rotary knob to **OC**.

13. Momentarily toggle the **DELETE- 90/30 - 150/9960** switch to **90**. Observe a full *UP* deflection on the GS Pointer. Flag should be visible.

14. Momentarily toggle the **DELETE- 90/30 - 150/9960** switch to**150**. Observe a full *DOWN* deflection on the GS Pointer. Flag should be visible.

15. Repeat the procedure using different frequencies in the spectrum. Similar results should be observed.

### 2.11.3 LOC Test Procedures

**WARNING**

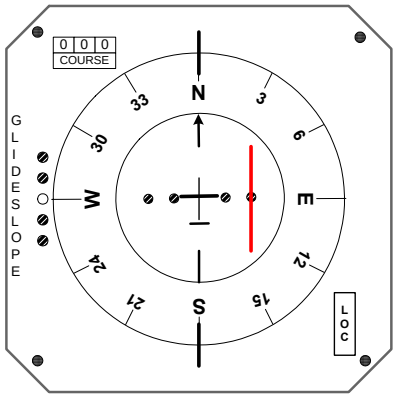
When conducting tests with the aircrafts autopilot engaged, any variation of the aircrafts controls may move the associated control services. Use caution to ensure that all personnel and ground support equipment are clear of the control services.

1. Toggle the **KEYPAD ENTRY/PRESET** switch to **PRESET.**
2. Extend the omni-antenna to 28½" (top three sections retracted) and connect to the **ANTENNA** connector on the front panel of the Test Set.
3. Place the **FUNCTION** rotary switch in **LOC**.
4. Toggle the **HI/MID/LO** switch to the **LO** position (108.01MHz).
5. Turn the LOC receiver *ON* in the AUT and select corresponding frequencies on the aircraft panel and Test Set.
6. Select **OC** utilizing the **ILS/VOR** rotary switch. Observe a similar display as shown below.

| | |
|---|---|
| 108.15MHz | |
| 0.000 OC | +006 dBm |

7. The CDI deviation bar should center with no flags present.
8. Select **U1/R1** utilizing the **ILS/VOR** rotary switch. The LOC deviation bar should indicate a one-dot deflection to the right.
9. Select **U2/R2** utilizing the **ILS/VOR** rotary switch. The LOC deviation bar should indicate a two-dot deflection to the right.

Indicator represents LOC Two Dots right of course



10. Select **D1/L1** utilizing the **ILS/VOR** rotary switch. The LOC deviation bar should indicate a one-dot deflection to the left.

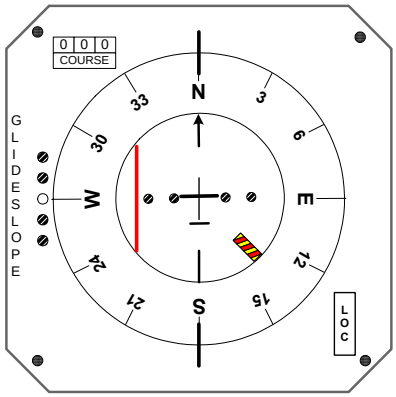
11. Select **D2/L2** utilizing the **ILS/VOR** rotary switch. The LOC deviation bar should indicate a two-dot deflection to the left.

12. Return the **ILS/VOR** rotary knob to **OC**.

13. Momentarily toggle the **DELETE- 90/30 - 150/9960** switch to **90**. Observe a full *LEFT* deflection on the LOC Deviation Bar. Corresponding flag should be visible (see next page).

14. Momentarily toggle the **DELETE- 90/30 - 150/9960** switch to**150**. Observe a full *RIGHT* deflection on the LOC Deviation Bar. Corresponding flag should be visible.

Indicator indicates Full Left Deflection and Flag visible. LOC **DELETE 90 ~** switch pressed.




15. Repeat the procedure using different frequencies in the spectrum. Similar results should be observed.

### 2.11.4 VOR Test Procedures

**WARNING**

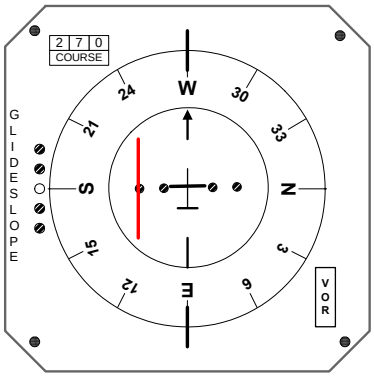
When conducting tests with the aircrafts autopilot engaged, any variation of the aircrafts controls may move the associated control services. Use caution to ensure that all personnel and ground support equipment are clear of the control services.

1. Toggle the **KEYPAD ENTRY/PRESET** switch to **PRESET.**
2. Extend the omni-antenna to 28½" (top three sections collapsed) and connect to the **ANTENNA** connector on the front panel of the Test Set.
3. Place the **FUNCTION** rotary switch in **VOR** and the **ILS/VOR** rotary switch to **OC.**
4. Toggle the **HI/MID/LO** switch to the **LO** position (108.05MHz).
5. Turn the VOR receiver *ON* in the AUT and select corresponding frequencies on the aircraft panel and Test Set.
6. Observe the following display.

| |
|---|
| 108.05MHz<br>000 deg +006 dBm |

7. Utilizing the **RF OUTPUT LEVEL** toggle switch, reduce the preset power to *–47dBm*.
8. Turn the **ILS/VOR** rotary switch through each position and observe that the corresponding bearings (0º, 45º, 90º, 135º, 180º, 225º, 270º, and 315º) are displayed on the VOR indicator.

Indicator represents **VOR** variable fully CCW (2 Dots Left) and course at 270º



9. Utilize the **ILS/VOR VAR** toggle switch and vary the bearing with the VOR deviation bar centered. Ensure the Deviation Bar tracks smoothly left and right of the centered position.

10. Return the **ILS/VOR** rotary knob to **OC**.

11. Delete either the 30 or 9960 Hz component using the **DELETE** toggle switch. The Deviation Bar should deflect full scale from the center and the warning flag should appear.

12. Release the toggle switch and observe a centered bar and no flag.

13. Offset the Test Set frequency by ±50KHz by utilizing the instructions in Paragraph 2.9.1.

14. Verify the appropriate failure flag appears.

### 2.11.5 MB Test Procedures

1. Select **MB** using the **FUNCTION** rotary switch.

2. Extend the antenna to its fullest length and attach it to the **ANTENNA** connector located on the Test Set front panel.

3. Toggle the **PRESET/KEYBOARD ENTRY** switch to the **PRESET** position.

4. Toggle the **LO/MID/HI** switch to the **MID** position (75MHz).

5. Set the RF Output to +13dBm using the **RF OUTPUT LEVEL** toggle switch.

6. Select **400/OM** using the **TONES** toggle switch.

7. Verify the *BLUE* Marker Lamp for the Outer MB illuminates on the aircraft instrument panel. Ensure a 400 Hz tone is audible from the speaker or intercom system (if applicable).

8. Select **1300/MM** using the **TONES** toggle switch.

9. Verify the *AMBER* Marker Lamp for the Middle MB illuminates on the aircraft instrument panel. Ensure a 1300 Hz tone is audible from the speaker or intercom system (if applicable).

10. Select **3000/IM** using the **TONES** toggle switch.

11. Verify the *WHITE* Marker Lamp for the Inner MB illuminates on the aircraft instrument panel. Ensure a 3000 Hz tone is audible from the speaker or intercom system (if applicable).

## 2.12 Communications and Transceiver Tests

The following tests for Communication equipment are described with the use of the Test Set antenna and include preset parameters to rapidly determine the state of the equipment being tested. These tests are best performed with two technicians, one located in the aircraft under test, the other operating the Test Set and controls. When conducting antenna-to-antenna checks, ensure that you properly extend the antenna to the correct length IAW Table 2-3.

NOTE

The following tests are not meant to replace the testing criteria required for your particular model of equipment. They are general testing procedures to assist the operator in properly utilizing the T-36C T/S.

### 2.12.1 Modulation, Frequency, and Deviation Measurements

The T-36C is capable of conducting Modulation, Frequency, and Deviation measurements Antenna to Antenna. The following procedures will ensure that the received results are accurate.

1. For best results, follow the procedures as listed in the previous paragraph (2.8). Turn the Test Set *ON* and ensure the Test Set passes the Self Test. Select the frequency on the UUT, and select the corresponding frequency on the Test Set. Key the transmitter to be tested and at the same time, hold *DOWN* the **XMIT – MEAS** switch and observe the following displays:

```
Making Transmitter
Measurements . . .
```

Designate Frequency Selected

Frequency measured ± center

```
120.000 MHz      +0.3 kHz
20% AM           Pwr in Rng
```

% of AM Modulation Measured (FM would indicate deviation)

Signal acquired was in Range of Test Set

2. Release the **XMIT – MEAS** switch once the measurement is completed.

3. If the acquired signal strength too low or high, the following may be displayed:

   **Power Too High**
   **Low Power**
   **No Power**

4. Move the Test Set to a different location to receive the "**Pwr in Rng**" display. This will ensure accurate measurements.

NOTE

The following tests are not meant to replace the testing criteria required for your particular model of equipment. They are general testing procedures to assist the operator in properly utilizing the T-36C T/S.

### 2.12.2 Receiver Squelch Test

1. Select **108-174** using the **FUNCTION** rotary switch.
2. Toggle the **HI/MID/LO** toggle position in the **LO** position.
3. Turn the T/S *ON* and the preset values of 108.000 MHz, 10% modulation at 0 dBm will be displayed.
4. Turn *ON* the AUT VHF COMM equipment, set to the corresponding frequency and adjust the audio to a normal listening level.
5. The Test Set will transmit a 1020 Hz signal, which should be audible in the aircraft headset.
6. Reduce the Test Set RF output level by toggling the **RF OUTPUT** toggle switch until the cockpit audio is not heard (squelched).
7. Slowly increase the RF output by 6 dB. The audio should return and be heard on the headset.
8. Repeat the steps in each position of the **HI/MID/LO** toggle switch.

### 2.12.3 Communication Test

1. Select **108-174** using the **FUNCTION** rotary switch.
2. Toggle the **HI/MID/LO** toggle position in the **MID** position.
3. Turn the T/S *ON* and the preset values of 113.000 MHz, 10% modulation at 0 dBm will be displayed.
4. Turn *ON* the aircraft under test VHF COMM equipment, set to the corresponding frequency and adjust the audio to a normal listening level.
5. Connect a set of headphones to the **AUDIO** jack on the Test Set front panel.
6. Key the transmitter in the AUT and speak in a moderate tone.
7. While transmitting from the aircraft, toggle down the **XMIT MEAS** switch and monitor the transmission from the aircraft.
8. Repeat the procedure for each frequency range or manually select a frequency by placing the **PRESET/KEYBOARD ENTRY** switch in the **KEYBOARD ENTRY** position. The operator may now select any legal frequency within the Test Set capabilities for testing.

NOTE

The following tests are not meant to replace the testing criteria required for your particular model of equipment. They are general testing procedures to assist the operator in properly utilizing the T-36C T/S.

## 2.13 Enhanced Testing Procedures

The T-36C provides all the necessary signals for Bench Top Checks of Navigation and Communication Equipment (within its frequency range). The flexibility and enhanced testing that can be performed with the T-36C by varying the preset test parameters is sufficient to permit acceptance testing and diagnostic capability of the various sensors covered. It is not the purpose here to define all test variations and enhancements that can be achieved, but to establish some concept of the possibilities. As an example, receiver selectivity of COMM receivers can be tested by varying the T-36C output frequency on a desired channel and then varying the Test Set RF output level to establish signal-to-noise ratios, AGC levels, or recovered audio output of the UUT to determine selectivity.

In order to perform these tests, it is necessary to disconnect the omni-directional antenna and utilize the supplied Direct Connect Cable. Connect the UUT Antenna output to the **VSWR RT** or **ANT** connectors located on the front panel of the Test Set. The following guidelines will assist the operator when enhanced testing is required.

**WARNING**
Ensure the Transmitter does not exceed 25 Watts before Direct Connect Transceiver Checks are commenced.

NOTE

All transceiver measurements should be made quickly to minimize heating of the Test Set dummy Load.

## 2.14 DIRECT CONNECT NAV SYSTEMS TESTS

Utilize the following procedures as a guide in making Direct Connect Navigation Checks. Please refer to your Maintenance Manual to provide exact parameter and conditions.

### 2.14.1 MB Sensitivity

Connect the 10K termination adapter to the antenna port. Connect **RT** Port to NAV/COM Receiver antenna input using a 50Ω coaxial cable for all ILS NAV functions.

1. Turn on the aircraft **MB** receiving equipment. Set the HI/LOW switch to **HI** position.
2. Set Test Set **FUNCTION** knob to **MB**.
3. Set the **KEYPAD ENTRY/PRESET** toggle switch to **PRESET**.

4. Set the **FREQ LO/MID/HI** switch to the **MID** position (75.00 MHz).

5. Set the **MB TONES** knob to **400 Hz**.

6. Starting at RF output level of -25 dBm, gradually reduce the **RF OUTPUT LEVEL** with the **RF OUTPUT LEVEL** slew switch until blue lamp goes out. Read RF level.

   This level should be less than the minimum sensitivity specified in the MB receiver documentation.

7. Repeat Step 6 for each additional tone.

8. The UUT marker lamps should all go out at approximately the same RF signal level for all three tones.

9. Increase the RF output level by 30 dB above the highest RF level read in Step 6.

NOTE

If the sensitivity level is > - 55 dBm, set RF output level to the following formula:

$$\left\lceil \frac{-25 + \text{Sen Level}}{2} \right\rceil$$

10. Set the TONES knob to 400 (OM). The blue (outer) marker lamp on the aircraft instrument panel should light and a 400 Hz tone should be audible from the cabin speaker (if applicable).

11. Repeat Step 10 for each tone (1300 MM) amber lamp, (3000 IM) white lamp.

12. Set the MB HI/LOW switch to LOW sensitivity. Repeat steps 1. through 11.

### 2.14.2 MB 3 dB Bandwidth

1. Turn on aircraft MB receiver, and Test Set.

2. Set FREQ using the **KEYPAD** to 75.0 MHz, and the tones switch to 400.

3. Adjust RF output levels to 3 dB above the Receiver Sensitivity Level identified in Step 2.14.1.

4. Decrease the frequency in 10 kHz steps starting at 75.0 MHz until 400 (OM) blue lamp comes on (this is the low end selectivity of the MB receiver).

5. Repeat Steps 1-4 increasing the frequency in 10 KHz steps starting at 75.02 MHz until 400 (OM) blue lamp comes on (this is the high end Sensitivity Level of the MB receiver).

6. The bandwidth is the difference between the two threshold frequencies.

### 2.14.3 LOC Sensitivity

1. Set the Test Set **KEYPAD ENTRY/PRESET** toggle switch to **PRESET**.

2. Set the **FREQ LO/MID/HI** select switch to **LO** (108.10 MHz).

3. Turn on the aircraft Localizer receivers and select this frequency on the aircraft NAV panel.

4. Set the Test Set **FUNCTION** knob to **LOC**.

5. Starting at RF output signal level of -25 dBm, gradually reduce the RF OUTPUT LEVEL with the **RF OUTPUT LEVEL** slew switch. The UUT CDI flag should appear for each LOC receiver at approximately the same RF signal level. Increase the RF output level by 30 dB for subsequent tests.

NOTE

If the sensitivity level is > - 55 dBm, set RF output level to the following formula:

$$\left\lceil \frac{-30 + \text{Sen Level}}{2} \right\rceil$$

6. Set the **ILS/VOR** knob to **OC**. The CDI should center and the indicator flag should be retracted.

7. Set **ILS/VOR** knob to **U1/R1**. The CDI should deflect one-dot to the right.

8. Turn the **ILS/VOR** knob to **U2/R2**. The CDI should deflect two-dots to the right.

9. Repeat this process for ILS/VOR knob positions **D1/L1** and **D2/L2**. The CDI should deflect one and two dot positions to the left. Momentarily disable the 90 Hz modulation component by selecting **DELETE 90**. The CDI should indicate full left and the flag should be visible.

10. Momentarily disable the 150 MHz modulation component by selecting **DELETE 150**. The CDI should indicate full right and the flag should be visible.

11. Repeat steps 5-11 at the other LO/MED/HI positions of the **FREQ** select switch. Similar LOC system test results should be observed.

### 2.14.4 GS Sensitivity

1. Set the Test Set **KEYPAD ENTRY/PRESET** toggle switch to **PRESET**.

2. Set **FREQ LO/MID/HI** select switch to **LO** (334.70 MHz).

3. Turn on the aircraft Glide Slope receivers and select this frequency on the aircraft NAV panel.

4. Set the **FUNCTION** knob to **GS**.

5. Starting at RF output level of -30 dBm, gradually reduce the RF OUTPUT LEVEL with the RF OUTPUT LEVEL slew switch. The UUT CDI flag should appear for each GS receiver frequency at approximately the same RF signal level. Increase the RF output level by 30 dB for subsequent tests.


If the sensitivity level is > - 55 dBm, set RF output level to the following formula:

$$\left\lceil \frac{-30 + \text{Sen Level}}{2} \right\rceil$$

6. Set the **ILS/VOR** knob to **OC**. The horizontal pointer should indicate a center glide path position and the flag should be retracted.

7. Set **ILS/VOR** knob to **U1/R1**. The horizontal pointer should indicate an one-dot up deflection.

8. Set the **ILS/VOR** knob to **U2/R2**. The horizontal pointer should indicate show a two-dot up deflection.

9. Set **ILS/VOR** knob to **D1/L1**. Horizontal pointer should show an one-dot down deflection. Turn the **ILS/VOR** knob to **D2/L2**. Horizontal pointer should show a two-dot down deflection.

10. Momentarily disable the 90 Hz modulation component by selecting **DELETE 90**. The horizontal pointer should indicate a full up glide path and the flag should be visible.

11. Momentarily disable the 150 Hz modulation component by selecting **DELETE 150**. The horizontal pointer should indicate full down glide path and the flag should be visible.

12. Repeat steps 5-11 at the other LO/MID/HI positions of the **FREQ** select switch. Similar GS system test results should be observed.

### 2.14.5 ILS Sensitivity

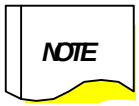
1. Set the Test Set **KEYPAD ENTRY/PRESET** toggle switch to **PRESET**.

2. Set **FREQ** select switch to LO, MID, or HI.

3. Turn on the aircraft Localizer and Glide Slope receivers and select the test frequencies on the aircraft NAV panel.

4. Set the Test Set **FUNCTION** knob to **ILS**.

5. Starting at RF output level of -30 dBm, gradually reduce the RF OUTPUT LEVEL with the **RF OUTPUT LEVEL** slew switch. The UUT CDI flags should appear for each ILS receiver frequency at approximately the same RF signal level. Increase the RF output level by 30 dB for subsequent tests.




If the sensitivity level is > - 55 dBm, set RF output level to the following formula:

$$\left\lceil \frac{-30 + \text{Sen Level}}{2} \right\rceil$$

6. Set the **ILS/VOR** knob to **OC**. The CDI and horizontal pointers should center and both flags should be retracted.

7. Using the **ILS/VOR VAR** slew switch, depress the switch up, then down, following the on screen data. The CDI should move from the left two-dot position to the right two-dot position in response to the movement of the slew switch. Simultaneously, the horizontal pointer should move from the down two-dot position to the up two-dot position.

8. Repeat steps 5-8 at the other **LO/MID/HI** positions of the **FREQ** select switch. Similar ILS system test results should be observed.

## 2.15 DIRECT CONNECT COMM TRANSCEIVER TESTS

Utilize the following procedures as a guide in making Direct Connect Transceiver Checks. Please refer to your Maintenance Manual to provide exact parameter and conditions.

### 2.15.1 Transceiver Test

1. Attach the 10K termination adapter to the **ANTENNA** connector of the Test Set.

2. Connect the T-36C **RT** connector to the **RF** output connector of the UUT using the 10 foot, 50 ohm co-axial cable supplied with the Test Set.

3. Connect the UUT antenna to the **ANT** port of the Test Set if the VSWR check is to be conducted.

4. Connect an audio generator or the Test Set **AUDIO** connector to the microphone input connector of the UUT.

5. Connect an oscilloscope to the UUT headphone connector.

NOTE

All measurements should be made quickly to minimize heating of the Test Set internal dummy load.

### 2.15.2 Receiver AGC Range

1. Select desired UUT frequency. Set Test Set AM modulation to 1000 Hz, 30%.
2. Adjust UUT audio gain control to Maximum.
3. Reduce UUT audio gain control to ½ of P-P value on oscilloscope.
4. Reduce test set RF until oscilloscope signal is at Step 2 level x 0.707 (this is receiver's low AGC level).
5. Increase test set RF until oscilloscope signal is at Step 2 level X 1.414 (this is the receiver's high AGC level).

### 2.15.3 Receiver Sensitivity

1. Adjust test set RF level to low AGC level as indicated in Step 2.15.2.
2. Reduce modulation to 0%.
3. Read P-P value of noise level on oscilloscope at the UUT headphone connector.
4. Turn modulation on 1000 Hz/30%. **AM/FM** Switch to **AM**.
5. Adjust RF level until modulation P-P level is 2X P-P value of noise in Step 3. The RF level at this point is the receiver sensitivity level.

### 2.15.4 Receiver Signal To Noise Ratio

1. Set the UUT channel frequency to the selected Test Set RF output frequency.
2. Select the Test Set modulating frequency of 1000 Hz with the TONES knob @ 30% modulation.
3. Adjust the Test Set RF OUTPUT LEVEL to –67 dBm and connect to the RF output connector of the UUT.
4. Adjust the UUT audio level control to obtain an audio output signal about ½ of the receiver's rated maximum output level.

5. Using an oscilloscope, measure the audio output P-P level (signal level).

6. Remove the 1000 Hz modulation by slewing the MOD LEVEL to 0%.

7. Using an oscilloscope measure the drop in audio output P-P level (noise level).

8. Signal-to-noise level equals 20 log (signal level) / (noise level). This is the signal-to-noise level of the receiver.

### 2.15.5 Transmitter Power Output

**WARNING**
Ensure the Transmitter does not exceed 25 Watts before Direct Connect Transceiver Checks are commenced.

1. Verify that the Test Set is set for the same frequency as the UUT.

2. Key the UUT transmitter.

3. Read the transmitter output power as indicated on the Test Set display.

### 2.15.6 Transmitter Modulation Capability

1. Connect the T-36C RT connector to the RF output connector of the UUT using a 10 foot, 50 ohm coaxial cable supplied with the Test Set.

2. Connect audio generator or the Test Set **AUDIO** connector to microphone input connector of the UUT.

3. Adjust output of audio generator or Test Set AUDIO output to 1000 Hz. 30% modulation, as measured at the output of the UUT.

4. Key the transmitter.

5. Read the measured percentage of modulation as indicated by the T-36C display.

6. Set AM/FM toggle switch of Test Set to **FM** (if function is available on UUT).

7. Set UUT for FM Modulation.

8. Key the transmitter.

9. Read the measured deviation.

### 2.15.7 Transmitter Frequency Accuracy

1. With the test set up connected as per 2.15.6.
2. Key the transmitter.
3. Read the deviation in frequency from nominal as indicated by the T-36C display.

### 2.15.8 Transmitter VSWR

1. Connect the T-36C RT connector to the RF output connector of the UUT using a 10 foot, 50 ohm coaxial cable supplied with the Test Set.
2. Connect UUT antenna to the **ANT** port of the Test Set.
3. Key the transmitter.
4. While depressing the XMIT MEAS switch on the Test Set, note the VSWR reading displayed on the T-36C display.

## 2.16 Basic Principles of VOR, LOC, GS, and MB

### 2.16.1 Basic ILS Principles

ILS (Instrument Landing System) was introduced in the 1930's. The system consists of antennas and transmitters located at the end of the runway at centerline, providing horizontal, vertical, and distance guidance. The system is broken down into: LOC- horizontal control (left & right), GS- vertical control (up & down), and MB- distance control.

The localizer transmitter utilizing the VHF navigation band from 108.10 – 111.95 MHz provides horizontal guidance (LOC), using every odd 100 KHz position.

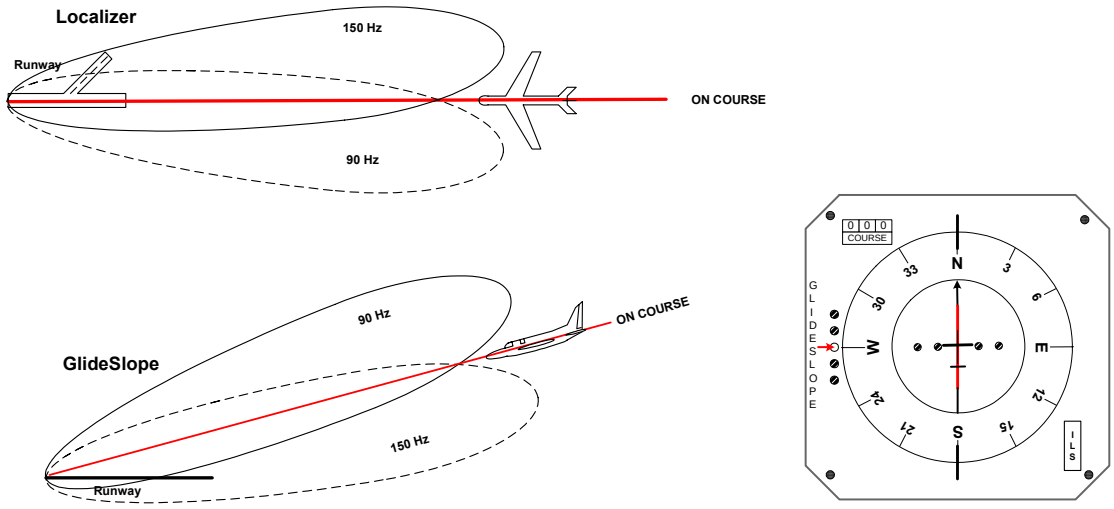
The vertical transmitter utilizing the UHF navigation band from 329.15 – 335.00 MHz provides the vertical guidance (GS).

The LOC and GS Frequencies are typically paired; where as- when you select the appropriate LOC frequency, the ILS receiver will automatically select the paired GS frequency.

MB transmitters, transmit on a frequency of 75 MHz, and are not paired with the ILS receiver.

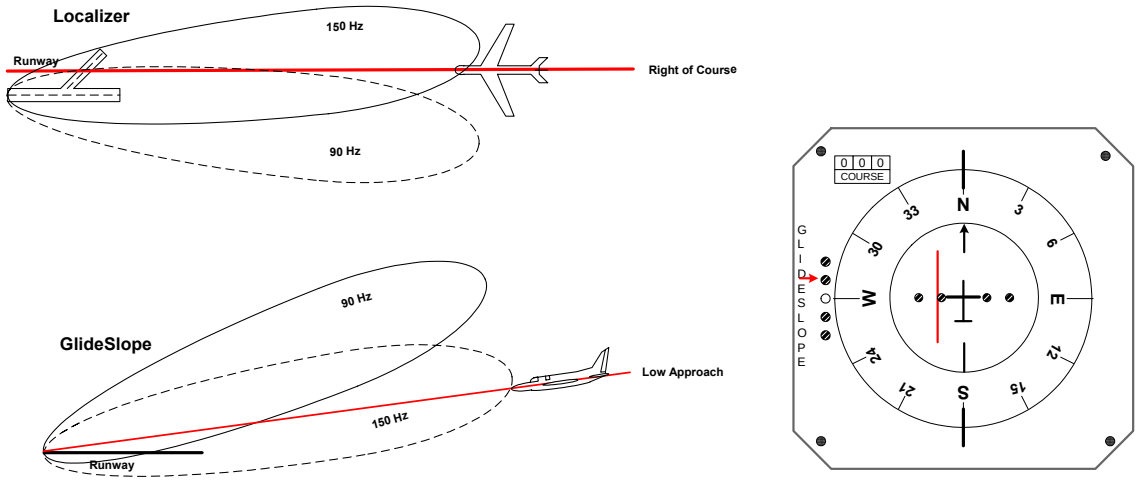
Both the LOC and GS Transmitters transmit a carrier modulated RF with 90 and 150 Hz signals. When an aircraft is receiving the signals and is receiving equal amounts of the 90 and 150 Hz modulation, the aircraft is "On Course", as depicted in Figure 2-7.

If the aircraft is receiving a percentage of modulation greater than the other, the receiver will display an offset either Left/Right or Above/Below "On Course", as shown in Fig. 2-8.




Illustrates an "On Course" aircraft, receiving equal amounts of 90 and 150 Hz modulation.

Figure 2-7

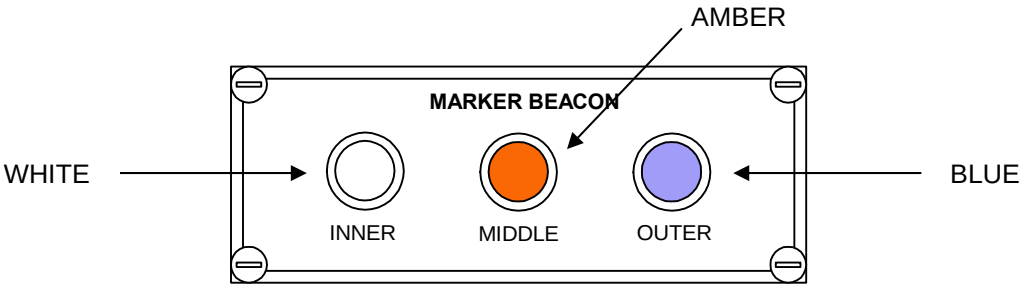



Illustrates an aircraft receiving a higher percentage of LOC 150 Hz modulation, and GS 90 Hz modulation. The Indicator will reflect left and above “On Course” when flying “TO” the VOR station.

Figure 2-8

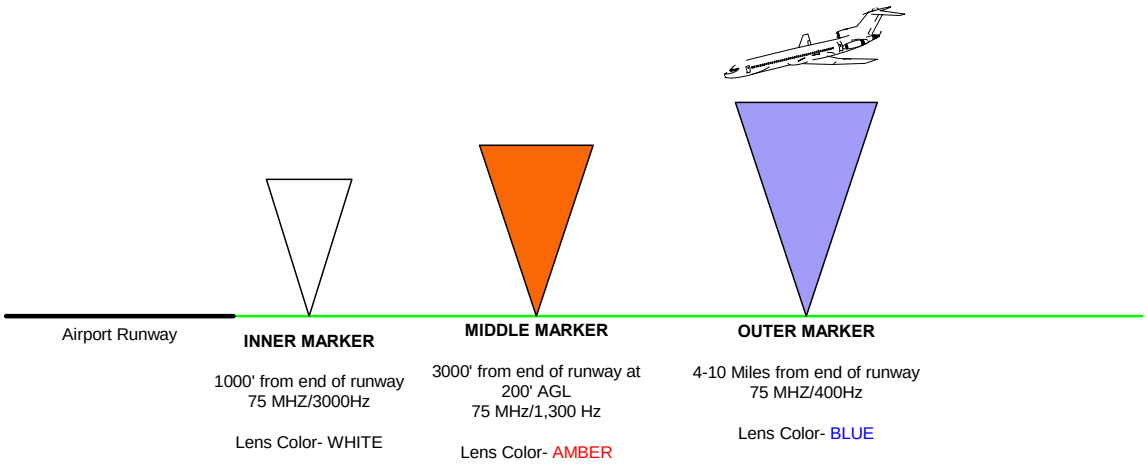
### 2.16.2 Marker Beacon

The MB provides distance to the airport runway. There are normally three transmitters, Outer Marker, Middle Marker and Inner Marker. All three transmit at 75 MHz, modulated at different frequencies for identification. The Inner marker is modulated at 3000 Hz, Middle at 1300 Hz, and the Outer at 400 Hz. As the aircraft flies over the transmitters, located at the approach end of the runway, the MB receiver will receive the signal and dependent on the modulation (Figure 2-10), illuminate the appropriate light on the panel (Figure 2-9).




Typical MB Display

Figure 2-9




Typical MB Approach Parameters

Figure 2-10

### 2.16.3 Basic VOR Principles

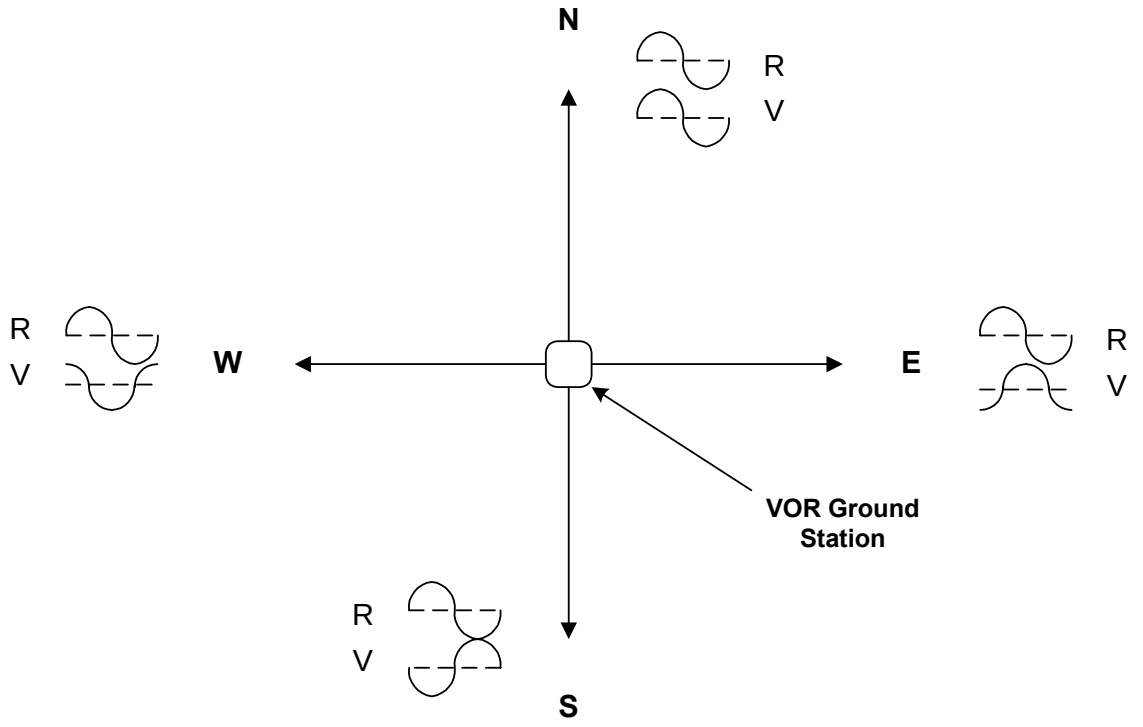
VOR (Variable Omni Range) is a VHF navigational aid utilized to determine the bearing of an aircraft to a designated point. The system comprises of a fixed ground station and the airborne receiver. The ground station transmits two signals, a reference and a variable signal. Within line of sight of a VOR ground station, the aircraft receiver will detect, then compare the phase relationship between the *reference* and *variable signals* and translate it to a bearing from the ground station.

The basic principle of VOR is the measurement of time (phase) difference between the two signals.

The *reference signal* is a 30 Hz signal which frequency modulates (FM) a 9960Hz subcarrier. The frequency modulated signal is then used to amplitude modulate (AM) the RF carrier.

The *variable signal* uses the same carrier frequency but no modulation from the transmitter. The signal is modulated at 30 Hz by the rotation of the antenna.

The *variable* 30 Hz AM signal and the 30 Hz FM *reference* signal are timed (by the rotation of the antenna) to be in phase at a relative position of due north of the VOR station (see figure 2-11).




Phase Relationship between Variable and Reference Signals

Figure 2-11

Using Figure 2-10, Note at due North, the signals are *IN* phase. At due East - the signals are 90° out of phase, due South - 180° out of phase, due West – 270° out of phase. The VOR receiver in the aircraft, measures this phase difference and displays the information as the correct bearing TO or FROM the ground station.

# VOLUME 2

# MAINTENANCE PROCEDURES

# CHAPTER III

# THEORY OF OPERATION

## 3.1 General

The T-36C is a signal generator and COMM transmitter parameter-measuring instrument capable of providing stimulus signals over a broad range of frequencies and diverse modulation types. The unit operates into two basic modes, Communications and navigation. This division holds for most of the circuits in the Test Set because they are used for either navigation or communication. Exceptions occur in the areas where signals are combined to provide a common output connector, power supply, or frequency control.

The discussion of the T-36C circuits will be divided between frequency generation, modulation, transmitter measurements, microprocessor, and power supplies. Because the understanding of the methods of frequency generation are key to the discussions of both the navigation and Communications circuits, this subject will be covered first. Signal combining and power supply, more incidental than key, are discussed last.

## 3.2 Frequency Generation

All the frequencies required by the T-36C, such as carrier and modulation frequencies, are generated using digital techniques. Frequency accuracy is directly related to the single precision reference source which is a highly accurate, temperature compensated, crystal oscillator (TCXO). These reference frequencies include:

| FREQUENCY | USE |
|---|---|
| | |
| 20.97152 MHz | DDS reference |
| 1.31072 MHz | Master clock for navigation modulation |
| 400.000 kHz | For navigation PLL's |
| 454.545 kHz | Reference for frequency discriminator |

The master frequency reference for the entire T-36C is the 10.00000 MHz TCXO, U25, with a frequency accuracy of +/- 1 PPM. The 20.97152 MHz signal has a least common denominator with 10 MHz of 640 Hz. The 640 Hz frequency is derived from 20.97152 MHz by dividing that frequency by 32,768 or 2 to $15^{th}$ power. The same 640 Hz frequency can be generated from the 10 MHz precision source by dividing by 15625 which is 5 to the $6^{th}$ power. The two divided-down outputs, each at 640 Hz, feed a phase detector, U4, the output of which feeds a loop amplifier, U16, and adjusts the frequency of the 20.1572 MHz oscillator via the varactor, CR1.

The 1.31072 MHz reference, which is used for the generation of the NAV modulation waveforms, is derived by dividing the 20.97153 MHz crystal frequency by 16 using U5. The 400 kHz reference for the navigation phase locked loop synthesizers is generated by dividing 10 MHz by

25 with U3. The 454.545 kHz signal is generated from the 10 MHz master oscillator by dividing by 22, using U3 and U40.

### 3.3 COMM Frequency Synthesizer

The frequency range for Communications testing is from 108 MHz to 174 MHz. The method of generating this range of carrier frequencies is to heterodyne two frequencies, both considerably higher than the carrier frequency being generated, and to use the difference frequency as the carrier. The two loops are called the high frequency loop and the low frequency loop.

The actual frequency generated by the high and low frequency loops is chosen to minimize the generation of spurious outputs due to intermodulation. The entire COMM frequency range is divided into bands with the high frequency loop providing a constant frequency while the unit is operated within a band. An exception is when the frequency for the high frequency loop is slightly changed for frequency modulation.

The high and low frequency loops are, essentially, identical. The VCO is divided by a fixed factor of 512, to produce an output in the 1 to 2 MHz range that will permit the use of conventional logic type phase detectors. This division is performed using low power ECL prescalers U6 and U11. Since the output of these prescalers is an ECL signal, a buffer is provided to convert the ECL to HCMOS levels. Additional dividers (U9, U50) are used to get the desired factor 512.

The direct digital synthesizers, DDS (U10, U38), are single chip synthesizers that provide both a sine wave output and a very fast comparator that can be used to detect zero crossings and provide a stable square wave. This square wave output is fed to a phase detector along with the output of the 512 prescaler. The phase detector feeds a loop amplifier U22, for the high frequency loop and U20 for the low frequency loop.

The DDS synthesizers are 32 bit accumulator types such that the frequency least significant bit (LSB) weighting is the input clock frequency divided by 2 to the $32^{nd}$ power or 20.97152E6/4.2949672E9 = 0.0048828126 Hz. The frequency of the DDS is effectively multiplied by 512 and consequently, the LSB is multiplied by the same factor to 2.5 Hz. No T-36M application requires resolution finer than 100 Hz.

The tuning range of the high and low frequency loops has been deliberately limited to prevent the generation of wideband phase noise from the loop amplifier outputs. This, however, limits the capture range of the phase locked loop.

### 3.4 COMM Modulation

The high frequency and low frequency loops are heterodyned using a diode-type doubly balanced mixer, U19. The use of a passive mixer reduces the generation of intermodulation distortion. One VCO feeds the mixer directly while the other is attenuated to set the proper high-level/low-level signal differences.

The output of the mixer feeds a low pass filter with a 400 MHz cutoff frequency. This filter removes all mixing products above 400 MHz, the highest frequency provided by the unit. Other low pass filters are used for each operational band to remove unwanted mixing products for each band. The low pass filters are switched using PIN diodes, CR2 to CR20. Series diodes pass the signal through the desired filter while shunt diodes prevent the unselected filters from leaking energy through to the output.

The outputs of the switched low pass filters are leveled by an AGC amplifier, which provides a stable input to the AM modulator. The AGC is achieved by varying control voltage of mixer. Two monolithic amplifiers, U12 and U18, are used to amplify the signal. The diode, CR21, rectifies the carrier level and provides an output voltage that feeds an error amplifier, U13, which provides a variable control voltage to mixer U51.

The AM modulator operates in a similar fashion as the AGC system. Two mixers, U1 and U2, are drove by amp U36. The DC level is combined with the AC-coupled COMM modulation to provide the carrier level for the COMM output. U3 and U4 compensate for loss of the mixers and U5 provides required output level. The amplitude modulator output, combined with the other outputs, is available on the front panel output connector.

In FM mode the modulation signal is switched to U46 amplifier by switch U1 (AM/FM switch board). U46 injects the modulation signal into the high frequency PLL. Frequency modulation is provided at a frequency of 1 kHz by changing the amplitude of the modulation signal.

## 3.5 COMM Transmitter Modulation and Frequency

Transmitter measurements of modulation and frequency are made by using the COMM synthesizer, slightly offset from the nominal frequency, as a local oscillator. When a COMM transmitter signal is present (>1w) or the XMIT MEAS switch is pressed, the T-36C computer offsets the COMM synthesizer, operating as the local oscillator, for the superheterodyne receiver, at 454.545 kHz.

The mixer for the transmitter modulation measurements is included in U29, which is a FM IF subsystem. Also included in this chip is a limiting IF amplifier for FM signal processing and a frequency discriminator. The frequency discriminator is used both for the normal function of providing FM demodulation, by measuring the amount of frequency deviation of a FM modulated transmitter, and for performing frequency measurements.

When transmitter power is initially applied to the T-36C, or the XMIT MEAS switch is pressed, the 454.545 kHz reference frequency is applied to the limiting IF input. This calibration signal is very precise because it is derived from the 10 MHz TCXO. The DC level of the frequency discriminator is measured using an A/D converter and the value is stored by the microprocessor.

The calibration signal is removed and the frequency synthesizer is offset by 454.545 kHz which places the nominal UUT transmitter carrier frequency in the IF bandwidth. The DC level of the frequency discriminator is again measured and compared to the value obtained with the calibration signal. The frequency synthesizer is stepped up or down to make the UUT derived DC voltage of the frequency discriminator equal to the value obtained with the calibration signal.

The difference between the nominal offset frequency, which is the carrier plus 454.545 kHz, is the frequency error of the transmitter. In addition to providing the frequency error, this technique insures that the transmitter spectrum is centered in the IF pass band which minimizes the errors due to an off-center signal.

The FM discriminator is used for the frequency measurement for both AM and FM UUT transmitters. The limiting action of the FM IF amplifier allows frequency measurement of an AM transmitter, even if there is some modest level of modulation. In addition, since the DC value of the discriminator involves heavy filtering of the FM demdodulator discriminator, the effects of modest frequency modulation are eliminated. Of course, if the applied modulation is high, either AM or FM, the frequency measurement will be compromised. In the case of high AM, the limiting amplifier will go out of limiting on the negative peaks and affect the DC level from the discriminator. In the case of high FM levels, any non-linearity's of the discriminator will appear as

a DC offset and compromise the measurement.

The AM modulation measurement is made using an active peak detector, U31. This circuit is superior to the conventional diode AM detector because there is no diode offset voltage. An AM IF amplifier is provided with about 40 dB of gain control and an AGC system is provided to stabilize the signal level from the IF amplifier output. The output, which is transformer coupled, feeds the active peak detector. The peak detector time constants are selected such that the detector is capable of following the modulation, but does not decay significantly between the 2.2 sec cycles of the 454.545 kHz IF frequency.

The peak detected voltage is fed to U32 where it is filtered, to remove any vestiges of the 454.54 KHz IF carrier and the bias voltage, and subtracted from the signal to produce the envelope of the modulation at the output of U32. This voltage is further filtered in U34 to generate a voltage proportional only to the carrier, which is used for the AGC action. Frequency modulation is demodulated by simply using the output of the frequency discriminator of U29.
U35 is an analog switch that connects either the AM or FM demodulator, depending on the position of the AM/FM switch, to the peak detector. This peak detector is not to be confused with the peak detector circuit of the AM demodulator that was capable of detecting the peak of the AM envelope but would follow the modulation. This peak detector has a time constant of 0.1 second, much longer than the period of the lowest modulation frequency and is capable of holding the peak of the modulation.

Two peak detectors are employed; a positive peak, U33A, and a negative peak detector, U33B. The output of the peak detectors is differenced in an amplifier, U32A. The differencing amplifier provides an output that is proportional to (positive peak - negative peak) the accepted method of measuring modulation. The microprocessor reads the output analog voltage and provides the properly scaled display of modulation.

### 3.6 COMM Transmitter Power and VSWR

The T-36C is capable of measuring both the power output of a communications transceiver and the voltage standing wave ratio (VSWR) of its antenna. The T-36C also provides a high-power dummy load for transmitter measurements when an antenna is not connected. Included in the unit is a VSWR bridge that is used for determining the VSWR of 50-ohm antenna.

When a transmitter is directly connected to the T-36C, the microprocessor connects the antenna port to the VSWR bridge by switching the relay, K3. If a load is applied to the antenna connection that has a VSWR of 5:1 or less, the relay is kept in the energized state and applies the load to the VSWR bridge. If the load provides a VSWR of greater than 5:1, which would include the normal situation of no connection, the relay is de-energized and a 50-ohm dummy load is applied to the VSWR bridge.

The high power resistors R25, R11, R24, R12, R13 and the resistors used in the VSWR bridge R16, R18, R20 and R22 provide 14dB attenuation. This arrangement causes the majority of the power to be dissipated in the VSWR bridge which contains 4 high power resistors and thus distributes the power over a larger radiating surface.

The 14 dB attenuator provides reduced power signals that may be safely handled for the purposes of power and VSWR measurement. The output-side shunt resistor for the attenuator is created by the series combination of R12 and R13. The transmitter measurement is performed at the junction of these resistors so that there is an additional 3 dB attenuation provided by this combination. FM transmitters with carrier powers as high as 25 watts can be measured with the T-36C. In the case of an AM transmitter, the peak power at 100% modulation is 100 watts. The 16 dB of attenuation is required to limit the peak inverse voltage across the detector diode, D1.

Transmitter power is measured by diode rectifying the RF input and measuring the resulting DC value. Considerable filtering is provided so that the value read will represent average power rather than peak power.

VSWR is determined by measuring the output of the VSWR Bridge and using that voltage in the VSWR calculation. Since a wide range of power and VSWR is involved, the diode voltages will include both the linear and square-law regions. Linearization algorithms are employed to correct for these distortions.

## 3.7 NAV Signal Generation

Dedicated generating circuits are used for navigation signals. This is necessary because the T-36C must provide three simultaneous signals in the ILS mode; Localizer, Glide Slope, and Marker Beacon. The navigation signal generation is divided into two areas; VHF and UHF. The VHF section provides the VOR and Localizer signals while the UHF section provides the Glide Slope Signal. The Marker Beacon is provided by the COMM synthesizer.

## 3.8 VHF Signals

The VHF signal generation employs a simple, single-loop synthesizer to generate the necessary carrier frequencies. This synthesizer is a one-chip synthesizer, U71, that contains all the necessary circuits except the loop amplifier for the phase-locked loop. U71 is serially programmed from the microprocessor and receives a precision 400 kHz reference frequency from the 10 MHz TCXO. The loop amplifier consists of U72 and a twin-T network to remove the reference sidebands. The VHF VCO is a Clapp-style oscillator which is varactor tuned by CR17. The oscillator is followed with a fixed attenuator to reduce pulling of the VCO by other circuits.

Two stages of buffer amplifiers, U66 and U67 provide additional isolation from the VCO and provide an AGC system to stabilize the amplitude of the output. A sample of the output is rectified using CR18 and compared to a reference voltage, which is derived from a forward biased diode. This improves the temperature stability of the AGC by compensating for the variable diode voltage. Feedback is achieved by varying the supply current and, consequently, the gain of the buffer amplifier, U67. Amplitude modulation is applied using a balanced mixer, U68. After the modulation is applied, the signal is amplified to the desired output level with the amplifier, U21.

## 3.9 UHF Signals

The UHF NAV synthesizer is similar to the VHF counterpart. The VCO is a bipolar Colpitts type using Q1 with two stages of buffer isolation, and an AGC. The diode CR14 rectifies the output of the second buffer amplifier, U55, and the output is compared to the forward biased voltage of a similar diode, CR15. Adjusting the current to the amplifier using the transistor, Q2, varies the gain of the second buffer amplifier, U55. The output of the second buffer amplifier is fed to the modulator, which is a doubly balanced diode modulator, U56. The phase locked loop is achieved using the same type single chip synthesizer as used in the VHF signal generator, U59. In addition, a loop amplifier, U50, with a twin-T network is used to reduce the reference sidebands.

## 3.10 Navigation Modulation

The waveforms required for modulating the VHF and UHF navigation carriers are generated with digital sampling techniques. The signals generated are 30 Hz, 90 Hz, 150 Hz, 1020 Hz, and 9960 Hz. In addition, the marker beacon modulation tones of 400 Hz, 1300 Hz, and 3000 Hz are generated.

Although most of the modulating waveforms are sinusoidal, other digital operations must be performed on these tones, such as frequency modulation of the 9960 Hz VOR reference and accurate phase shift of the 30 Hz VOR variable tones. Also, the amplitudes of the ILS 90 and 150 Hz tones are set with great accuracy for the LOC and GS modulations. The waveforms are digitized and stored in a ROM. The ROM is sequentially addressed and the value of the digitized waveform is converted to analog to recreate desired waveform.

For all the NAV signals, except the Marker Beacon tones, the frequencies are integer multiples of 30 Hz. Therefore, 1/30th of a second, (33.333msec), of amplitude samples were stored in the ROM which represents an integer number of cycles for the navigation waveforms stored. A table of the disposition of the ROM includes:

| Number of Waveform Cycles | |
|---|---|
| | |
| 30 Hz Variable | 1 |
| 90 Hz Variable | 3 |
| 150 Hz Variable | 5 |
| 1020 Hz Variable | 34 |
| 9960 Hz Variable | 1 |

Notice that the 9960 Hz VOR reference contains only 1 complete cycle. It would appear that 332 complete 9960 Hz cycles would occur in 33.333 ms. However, it must be remembered that the 9960 Hz VOR reference is frequency modulated and the instantaneous frequency of each cycle is different over the 33.333 ms period. Therefore, the process repeats after 33.333 ms, providing the nominal 9960 Hz carrier is phase locked to the $332^{nd}$ harmonic of the 30 Hz frequency.

The stored data must be sampled at a rate greater than twice the highest frequency component of the digitized and stored waveforms. The highest frequency involved in the navigation waveforms is about 10 kHz, derived from the frequency modulated 9960 Hz VOR reference plus the significant sidebands due to the 30 Hz FM. To insure a significantly high sample rate, the waveforms are stored as 2048 samples which are cycled in 33.333 ms, requiring a sample rate of 61.44 kHz which is sufficiently high to satisfy the Nyquist criterion.

The 61.44 MHz clock is derived by first multiplying the 1.31072 MHz signal from the reference frequency generator by three and amplifying and squaring up that signal in U24. This frequency of 3.93216 MHz is then divided by 64 in U25 to provide the required 61.44 kHz clocks for the navigation waveform generation. The frequency multiplication is achieved by filtering the strong third harmonic component of the 1.31072 MHz square wave using the bandpass filter consisting of C45, C46, C49, C50, L2, and L6.

The ROM that contains the digitized NAV waveforms is U35 and the counters U28, U29, and U30 generate the sequential address for accessing the ROM. For the generation of the 90 Hz and 150 Hz waveforms required for the Localizer and Glide Slope, the digitized samples are read in sequence and their digital values latched into the output D/A converter, U40.

The Localizer and Glide Slope waveforms require precise control of the amplitude of each of the 90 and 150 Hz, components which is accomplished by changing the reference voltage of the DAC, U40 with the reference voltage supplied from DAC U8. Thus the 90 and 150 Hz waveforms are stored in the ROM at constant amplitude, with the DAD selected amplitudes of the individual

frequency components controlled by DAC U8. The two components 90 and 150 Hz is summed in U43-A to create the signal for modulating the GS signal generator. In the case of the LOC, in addition to the 90 and 150 Hz modulation, a 1020 Hz Ident tone is added to the 90 and 150 Hz by summing amplifier U43-B.

When creating the VOR modulation it is necessary to add a phase shift between the zero crossing of the 30 Hz modulation of the VOR 9960 Hz reference and the 30 Hz variable tone. This is accomplished by adding an offset between the memory location read from the ROM for the 9960 Hz VOR reference and the variable. The four-bit adders, U31, U32, and U33, add the required offset for generating the VOR bearing. These adders receive one addend from the address counter and the other from the microprocessor. For all modes, other than VOR, the addend from the microprocessor is zero. Thus the addend is other than zero only when the VOR variable is read from the ROM and, therefore, only the VOR variable is shifted in phase.

Since the entire VOR variable sine wave is divided into 2048 segments, an offset of one segment produces a phase change of 360/2048 = 0.17578 degrees, representing the peak to peak quantizing error. To have a more accurate VOR signal, an additional 4 bits of resolution was provided by adding a time delay, U27, from the reading of the VOR sampled amplitude and the latching of this sample to the D/A converter. This results in a quantizing error of 0.01 degrees, which is more than sufficient for generating an accurate VOR bearing signal. In the case of VOR, the three components 30 Hz, 9960 Hz and 1020 Hz are summed in U41.

The Marker Beacon tones involve frequencies that are not integer multiples of 30 Hz and thus involve some minor compromises relative to the digital tone generation using the same ROM as the navigation tones. The navigation 1020 Hz Ident tone is the 34th harmonic of 30 Hz and is generated accurately. The 3000 Hz Marker Beacon tone is the 100th harmonic of 30 Hz and is also created accurately.

Because the 1300 Hz Marker Tone is not an integer multiple of 30 Hz, an approximation is employed. First, only one half of the sine function is stored in the ROM. When the sine wave is generated, the first half of the entire sine function is read from the ROM and the output amplifier is switched to a gain of -1 and the same half cycle is read from the ROM. Therefore, two passes are required of the ROM contents to create an entire cycle. This effectively decreases the cycle time of the ROM from 1/30 second to 1/15 second. However, 1300 Hz is not an integer multiple of 15 Hz either. However, the 87th harmonic of 15 Hz is 1305 Hz, which is sufficiently close to 1300 Hz to satisfy the system requirements. A similar situation exists with the 400 Hz tone. The 27th harmonic of 15 Hz is 405 Hz, which is sufficiently close for the system requirements

### 3.11 Ramp Testing

The T-36C provides a high-level output signal that is used to drive an antenna and provide a radiated signal suitable for antenna-to-antenna testing of the installed UUT. The ramp operation involves taking the normal output from the Test Set and amplifying it by 14 dB and providing that output to the antenna connector. The ramp mode is inhibited by attaching the protective cap to the front-panel antenna connector, J6. The protective cover contains a 10K resistor in the bridge circuit consisting of R1, R2, R3, and R4. The balancing of the bridge causes the output of the comparator U2 to go low and inhibits the ramp mode. Removing the cap and installing an antenna on the antenna connector causes the output to go to a high logic level and permits the ramp mode of operation.

Ramp operation causes relays K1 and K2 to energize. K2 routes the signal from the programmable attenuator output to the K1 and provides the power supply voltage for the ramp amplifier. K2 routes the input signal to the ramp amplifier. When K2 is energized, the internal 14dB attenuator is disconnected from the internal circuits so that the application of a UUT

transmitter to the front panel connector will result in the transmitter being terminated in a dummy load, thus protecting both the T-36C and the transmitter from damage. In the case of the Ramp Receive Mode, the input signal bypasses the ramp amplifier through the K1 relay.

### 3.12 Microprocessor

A 12 MHz 80C31 microprocessor, U3, performs all of the T-36C calculation and control functions. The processor has a battery backed-up RAM to allow the storing of system parameters for later recall. The RAM also stores some calibration parameters installed during factory test. The microprocessor reads the status of the front panel switches by sampling the switches. Eight outputs are provided by U10, which work in conjunction with 8 inputs from U4. The processor controls all relays used for RF switching, including the electro-mechanical attenuator.

As a power saving measure, a special relay driving circuit is used for the attenuator relays. Because the attenuator contains 8 relays, of which all 8 can be energized, considerable battery drain can be attributed to the attenuator. Advantage is taken of the characteristic of a relay that more coil current is required to activate a relay than is required to hold a relay. When the attenuator relays are changed, the relay driver circuit provides a short 12-volt pulse to activate the relay. After the one shot, U15 times out, the voltage for those relays that are energized is reduced to 6 volts.

The microprocessor also drives the display. With the exception of the power indicators, all data from theT-36C is displayed on a 2x40 matrix LCD, driven from the latch, U17 and written by a standard character set. The display contains its own drivers and decoders and provides underscore, cursor, and blinking. The LCD display has an internal electro-luminescent backlight, which requires high voltage alternating current, provided by a modular power supply, U5.

### 3.13 Power Supplies

The T-36C requires several power supply voltages with both positive and negative polarities. To save battery energy, high efficiency switching voltage converters are used to generate the required voltages. Because the unit contains a number of sensitive circuits that can be affected by noise from a switching power supply, on-board regulators provide the necessary voltages for the individual PC boards. The switching voltage converters provide a magnitude slightly greater than required and the voltage is regulated on the PC board where the energy is required.

The 15-volt on-board requirement is met by a voltage converter that increases the nominal 12 VDC battery voltage to 16 VDC. A high efficiency switching voltage converter, using U3 with an external MOSFET, Q1 achieves 85 to 90%voltage conversion efficiency. This 16-volt source is distributed to the PC boards where it is converted to a regulated 15 volts using low-dropout regulators.

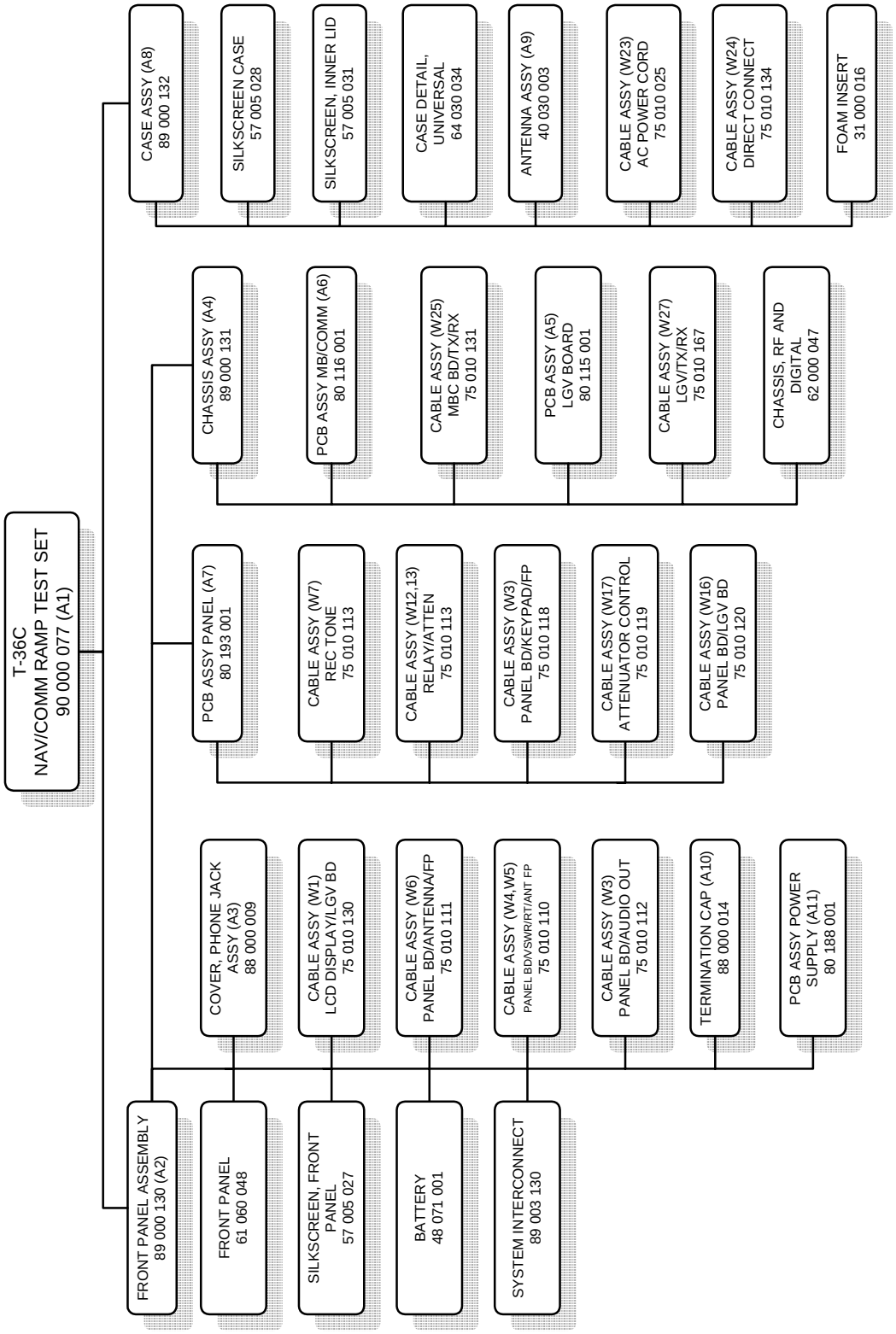
A second switching regulator, U4, Q2, converts the 12 VDC battery voltage to +6VDC with the same 85 to 90% efficiency. This voltage is distributed to the PC boards where it is converted to +5VDC for the logic and other circuits. The +6 VDC source is also used, without further conversion; to hold the attenuator relays. The +6VDC supply is converted to -6 VDC by use of a third switching power supply and is distributed to the PC boards to be converted to -5VDC.

The T-36C contains an internal battery charger to provide charging current for the unit. There is sufficient current to charge the battery while the unit is operating.

By use of different fuse configurations, The T-36C may be configured for either 110 or 220-volt

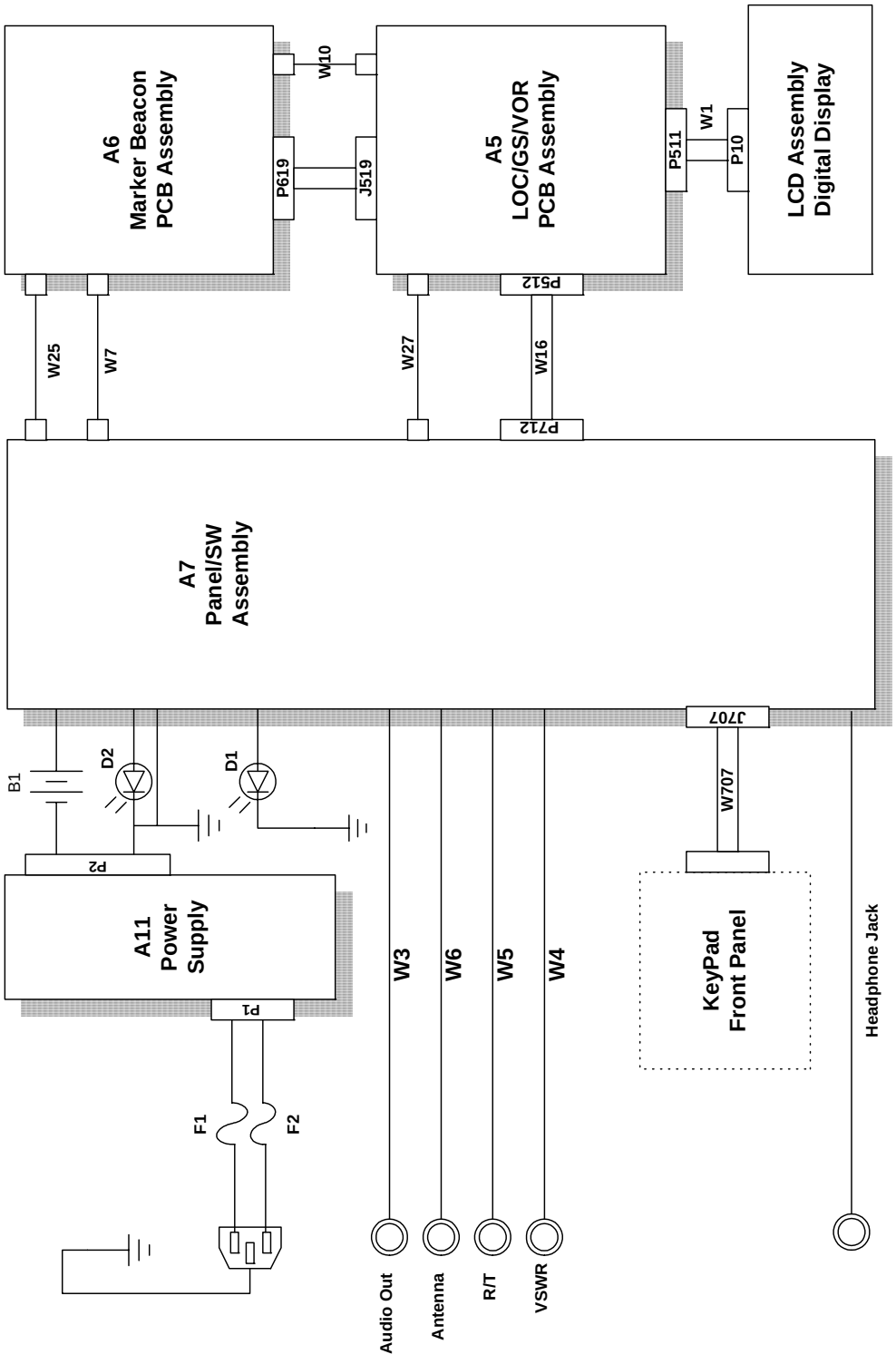
operation. The regulated voltage is applied to the battery through the current limiting resistor, R2, when the DC switch is OFF. During operation, DC switch ON, resistor, R1, is connected in parallel to R2, which provides enough current to charge the battery and utilize the Test Set.

The T-36C has a time-out circuit to prevent the unit from operating until the battery depletes. The binary counter, U10, accomplishes the timing function and power is applied by energizing the relay, K5. The application of power to the Test Set provides power to the timing circuit and resets the binary counter. The output of the gate U8, holds the relay energized so that releasing the front panel switch will not remove power from the unit. If the T-36C is not receiving a charge, the binary counter will count until the last stage changes state and the unit is de-energized.




T-36C Configuration Chart

Figure 3-1




T-36C Simplified Block Diagram

Figure 3-2

# CHAPTER IV

## GENERAL MAINTENANCE AND SERVICING INSTRUCTIONS

### 4.1 General

The use of the current generation of electronic components has dramatically decreased the cost of maintaining and calibrating test equipment. Tel-Instrument Electronics Corp. has recommended an annual calibration and alignment interval and periodic checks to keep the T-36C in operational condition. Performing preventative maintenance checks of the Test Set and Test Set verification checks if a failure is suspected will reduce down time by detecting and correcting potential problems at their onset. This chapter is broken down in three sections.

1. Routine Maintenance (Section A).
2. Test Set Verification and Acceptance Checks (Section B).
3. Annual Calibration and Alignment (Section C).

**Routine Maintenance:** By routinely cleaning and inspecting the T-36C Test Set, the operator will be able to reduce down time due to unexpected failures. Routine Maintenance, as outlined in *Section A*, consists of checks and observations performed to maintain the Test Set in a serviceable and ready condition. They should be accomplished each time the Test Set is utilized and after extended storage.

**Test Set Verification and Acceptance Checks:** If during normal operation a failure is suspected or unusual or erratic results are displayed, perform the procedures as listed in *Section B*. By conducting and verifying the Test Sets condition when abnormal results occur, the operator will be able to determine if the Test Set is malfunctioning or the UUT is at fault. Periodic checks will also alert the operator to possible problems and ensure the Test Set is in full operational condition before it is used.

**Annual Calibration:** A full Calibration and Alignment of the Test Set shall be performed under the following conditions:

1. Tel-Instrument Corporation recommends an Annual Calibration & Alignment to ensure accurate test results and improved performance.
2. If any failure occurs or is suspected during *Routine* or *Test Set Verification Checks*, a full Calibration and Alignment shall be performed.
3. If any major assembly is replaced.
4. If during normal operation, the Test Set fails to meet any specification outlined in Chapter 1, Section B.

### 4.1.1 Safety Precautions

The following are general safety precautions that are not related to a particular test or procedure. These are recommended procedures that all personnel must apply during many phases of operation and maintenance. It is assumed that the operator has general knowledge of electrical theory and the dangers associated with it.

1. When performing any of the preceding tests thoroughly read and understand all procedures before actually performing them.

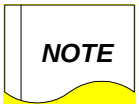
2. The various front panel connectors, switches, and controls specified can be located by referring to Figure 2-1 on page 2-3.

3. Take the time to learn the proper operation and function of the Test Set as outlined in Chapters 1, 2, and 3. Through knowledge of the Test Set and its capabilities greatly improves the time it takes to complete the tests.

4. Pay particular attention to **NOTES** and **WARNINGS** that may accompany some test procedures.

**WARNINGS**

Alerts the operator to potential dangers associated with a particular test. Thoroughly understand the warning before proceeding to prevent a potentially dangerous situation or damage to the Test Set.




**NOTES**

Provides supplemental information that enhances the test procedure.

5. Observe all standard safety procedures when working with live voltages. The potential for electric shock exists any time the Test Set is removed from its case.

6. DO-NOT service the unit or make adjustments alone. Always be in the presence of another person when working with live voltages.

7. Be familiar with general first aid procedures and CPR (Cardiopulmonary Resuscitation). Contact your local Red Cross for more information.

8. Ensure the test equipment and the tools you utilize are in good operational condition and not damaged in any way.

### 4.1.2 Preliminary Considerations

1. Test Equipment- Recommended test equipment is listed before each test. An equivalent type may be substituted in lieu of the listed equipment.

2. Environmental Considerations- Test and align the equipment in conditions similar to the conditions the Test Set will be utilized in.

3. Calibration Test Reports- Test reports are located in Appendix A & Appendix B. Make copies of the test reports before commencing the alignment to properly log results.

4. The Test Set should be allowed to warm up for a period not to exceed 10 minutes before testing begins.

5. Always begin with a fully charged battery.

# SECTION A

# ROUTINE MAINTENANCE

## 4.2 General

By routinely cleaning and inspecting the T-36C Test Set, the operator will be able to reduce down time due to unexpected failures. Routine Maintenance consists of; checks and observations performed to maintain the Test Set in a serviceable and ready condition. They should be accomplished each time the Test Set is utilized and after extended storage.

Routine maintenance consists of the following:

1. Cleaning of the T-36C Test Set exterior case.
2. Inspection of all connectors, cables and the Test Set assembly.
3. Battery check and charging.

### 4.2.1 Cleaning Procedure

Keep the Test Set clean by removing any loose dirt, mildew or mild corrosion with a soft cloth moistened with warm water and a mild detergent. Do not spray any cleaning detergent or water directly on the Test Set. Ensure to dry off the Test Set with a lint free cloth to remove all deposits and remaining cleaning solution. Strong cleaners and chemicals shall be avoided to prevent damage to the display, silk-screening, and switches.

### 4.2.2 Inspection of all Connectors, Cables and Test Set Assembly

By inspecting the cables, connectors, and the Test Set periodically, potential inaccurate test results will be alleviated.

1. Check each cable for kinks, crushed insulation, frayed cables, and rusty connectors.
2. Check each antenna supplied with your Test Set for obvious signs of rust, dents and loose parts.
3. Inspect the Test Set case for signs of abuse. Large dents and cracked displays may render the Test Set inoperable.
4. Toggle and push each switch for proper operation. Sticking switches may result in erroneous test results.
5. Inspect for loose bolts, nuts, and screws; tighten if necessary.
6. Ensure all supplied antennas and cables are properly stowed when not in use.

### 4.2.3 Battery Check and Charging

Check the Ni-Cad battery before each use to ensure a sufficient charge is available to complete the required tests. By charging the battery a few hours each week, you will keep the Ni-Cad battery in a fully charged state ensuring a significant charge is available for extended testing. Follow the procedures in Para 2.7 to fully charge the battery before calibrating the Test Set.

# SECTION B

# TEST SET VERIFICATION AND ACCEPTANCE CHECKS

## 4.3 General

These procedures will be performed on an **Unopened** Test Set by measuring inputs/outputs. If the Test Set results are not within tolerances, the Test Set will require a full Calibration and Alignment as outlined in *Section C*. The tests are broken down into individual sections to allow the operator to verify proper operation of individual functions when a discrepancy may arise or repair was accomplished.

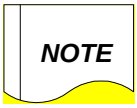
### 4.3.1 Test Equipment Required

The following support equipment (or their equivalent) is necessary to perform the Test Set Verification and Acceptance Checks:

| Name | Designation/Description |
|---|---|
| | |
| Universal Counter | HP 5335A |
| RF Power Meter | HP 432A |
| Spectrum Analyzer | HP 8558B |
| Modulation Meter | Boonton Electronics 82AD |
| Digital Voltmeter | Fluke 8000A |
| Oscilloscope | Tektronix 2235 |
| DC Power Supply | 0-12VDC /1A |
| Zifor 3:VOR Radial Standard | Collins 478A-3 |
| Distortion Analyzer | HP 339A |
| Variable attenuator 0 – 10 dB | Equivalent |
| 50 Ω 25 Watt Load | Equivalent |
| 50 Ω Load W/calibrated 2 KHz Mismatch | Equivalent |
| Communication RX/TX Test Set | Equivalent |
| Copy of Data Sheet (Appendix A)[1] | |

Support Equipment

Table 4-1




A VOR/ILS Mockup Test Set such as a Rhode & Schwartz Navigation Modulation Analyzer/0856.4509.52 may be utilized in lieu of the Universal Counter, RF Power Meter, Spectrum Analyzer, Modulation Meter, Distortion Analyzer, and Zifor.

[1] To ensure accuracy and for simplicity, the Data Sheet is written and organized to reference each step by paragraph and step number. Make a photocopy, review and become familiar with the datasheet before beginning the tests.

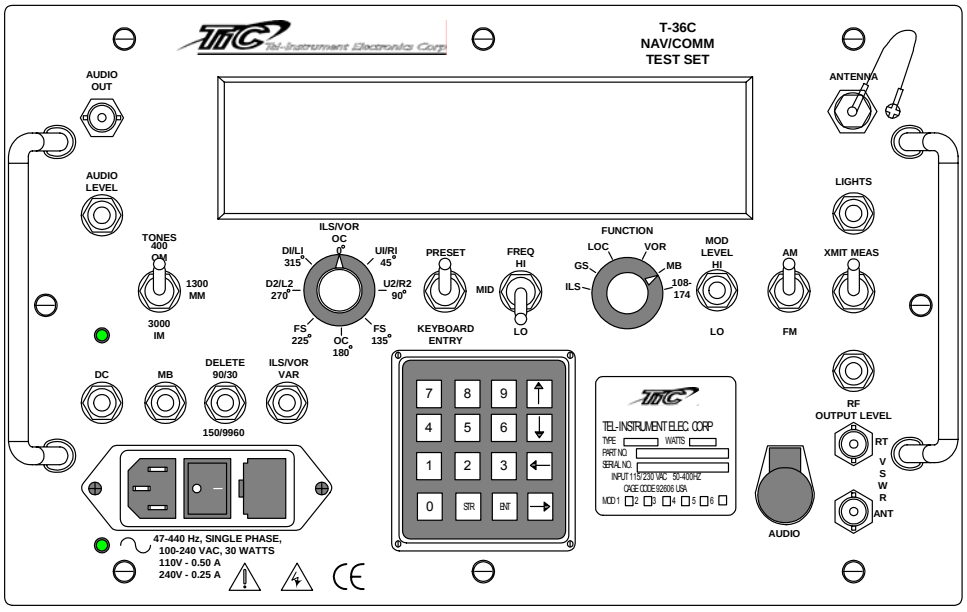
### 4.3.2 Test Set Initial Settings

Set the T-36C front panel switches to the following positions before each test, unless otherwise instructed:

| Function/Rotary Switch | Position |
|---|---|
| | |
| **AUDIO LEVEL** | Centered |
| **DC** | Centered, LED *OFF* |
| **MB/NAV ID** | Centered |
| **DELETE 90/30 – 150/9960** | Centered |
| **ILS/VOR VAR** | Centered |
| **TONES** | **400/OM** |
| **ILS/VOR** Rotary | **OC/0°** |
| **PRESET/KEYBOARD ENTRY** | **PRESET** |
| **FREQ HI/MID/LO** | **LO** |
| **FUNCTION** Rotary | **MB** |
| **MOD LEVEL HI-LO** | Centered |
| **AM – FM** | **AM** |
| **LIGHTS** | Centered |
| **XMIT MEAS** | Up Position |
| **RF OUTPUT LEVEL** | Centered |
| **AC ROCKER** Switch | *OFF*, LED Extinguished |

Initial Settings

Table 4-2




Initial Settings

Figure 4-1

## 4.4 Display Operation and Verification

1. Turn the Test Set "*ON" using 115 VAC* by toggling the **DC** switch up.

2. Verify the *GREEN* LED illuminates and the Test Set turns "*ON"*.

3. The T-36C Initial Start page will be displayed **briefly**, verify the following:

| |
|---|
| Tel-Instrument T-36C<br>Ver X.XX YY/YY/YY |

4. The Test Set will indicate the current software version and the date it was installed. Ensure that you have the correct version as purchased.

5. Toggle the **LIGHTS** switch *down* and verify the backlighting illuminates. Release the switch and the backlighting is extinguished.

6. Toggle the **LIGHTS** switch *Up* and release. Verify the backlighting illuminates and remains illuminated.

7. Toggle the **LIGHTS** switch back to the center position, backlighting extinguishes.

8. Turn the Test Set *"OFF"* by toggling the **DC** switch *down*. The Test Set will turn "*OFF".*

9. Turn the Test Set back *"ON"* and ensure the Test Set turns "*OFF"* after 15 minutes / ± 3 minutes.

### 4.4.1 Radio Frequency Measurements

1. Set all Test Set Initial settings IAW Table 4-2

2. Connect the Frequency Counter to the Test Set **ANTENNA** connector.

3. Turn the Test Set *"ON"* by first holding the **DELETE** toggle switch in the *Down* position and toggle the **DC** switch *UP*. This procedure will remove any modulation from the signals. Verify the following displays:

| |
|---|
| Modulation Off Mode<br>Enter to continue |

4. Press the **ENT** button on the **KEYPAD.**

5. The Test Set display will briefly indicate:

| Modulation turned OFF |
|---|

6. Utilizing the data sheets, provided in Appendix A, measure and record the following parameters utilizing the Power Meter and Frequency Counter:

| Mode | Frequency | Pout, dBm |
|---|---|---|
| | | |
| LOC | 108.10 / ±100Hz | + 6 / ±1dBm |
| LOC | 111.95 / ±100Hz | + 6 / ±1 dBm |
| VOR | 108.00 / ±100Hz | + 6 / ±1 dBm |
| VOR | 117.95 / ±100Hz | + 6 / ±1 dBm |
| GS | 108.95/329.15 / ±100Hz | + 0 / ± 1dBm |
| GS | 110.30/335.00 / ±100Hz | + 0 / ±1 dBm |
| MB | 75MHz / ±100Hz | + 13 / ± 1dBm |
| COMM | 108MHz | + 0 / ± 1dBm |
| COMM | 174MHz | + 0 / ± 1dBm |

7. Turn the Test Set *"OFF"* when all tests are complete.

8. Turn the Test Set back *ON* in a COMM Mode (Termination Cap Removed), 120.000 MHz, 0% Modulation. Slew the **RF OUTPUT LEVEL** switch and verify that the display output level slews from 000 dBm to -100 dBm / ±1dB.

9. Turn the Test Set "OFF" by toggling the **DC** power switch *down*.

### 4.4.2 VOR Modulation Measurements

1. Set the Test Set controls IAW Table 4-2. Utilize a Modulation Meter and Spectrum Analyzer, connect to the **RT** connector on the Test Set front panel.

2. Set the **FUNCTION** to **VOR** and turn "ON" the Test Set by toggling the **DC** power switch *up.*

   2a. Toggle the **DELETE** switch *UP* to the **90/30** position. Verify between **30% / ± 1% (29 – 31%)**; modulation tone of **9960 / ± 99Hz**. Verify FM Deviation of **480 Hz / ± 30 Hz**.

   2b. Toggle the **DELETE** switch *DOWN* to the **150/9960** position and verify between **30% / ± 1% (29 – 31%)** modulation tone of **30 / ± 0.3 Hz.** Record results on the data sheet.

   2c. Release the **DELETE** switch and verify the composite modulation (30 Hz & 9960 Hz) is **60% / ± 3% (57 – 63%)**.

   2d. Toggle the **MB/NAV ID** switch *DOWN* and verify that the **ID** tone is added to the signal to the composite signal.

   2e. Release the **MB/NAV ID** switch.

### 4.4.3 VOR Angle Verification

1. Set the Test Set controls IAW Table 4-2. Connect the **RF** output of the Test Set to a Modulation Meter.

2. Connect the Audio Output of the Modulation meter to the "ZIFOR", or equivalent.

3. Set the attenuation to 10 dB on the "ZIFOR", and turn the Test Set "ON" and the **FUNCTION** knob to **VOR**.

   3a. Observe that the angle corresponds with the **ILS/VOR** selected position (0°) and record the results on the data sheet.

4. Repeat step 3 for each position on the **ILS/VOR** knob and record the results.

   4a. 45°

   4b. 90°

   4c. 135°

   4d. 180°

   4e. 225°

   4f. 270°

   4g. 315°

5. Complete the calculations as shown on the data sheet and verify compliance.

### 4.4.4 LOC Modulation Measurements

1. Turn the **FUNCTION** knob to the **LOC** position.

   1a. Toggle and hold the **DELETE** switch *DOWN* to the **150/9960** position. Verify modulation of **20% / ± 1% (19 – 21%)**, modulation tone of **90 / ± 0.9 Hz**.

   1b. Toggle the **DELETE** switch *UP* to the **90/30** position. Verify the modulation at **20% / ± 1% (19 – 21%)**, modulation tone of **150 / ± 1.5 Hz**.

   1c. Release the **DELETE** switch and verify the composite signal 90 & 150 Hz modulation is **37% / ± 2% ( 35 – 39%)**.

   1d. Toggle the **MB/NAV ID** switch *DOWN* and verify that the **ID** tone is added to the composite signal.

   1e. Verify LOC modulation, as per data sheet, for **L2, L1, OC, R1, & R2**.

### 4.4.5 GS Modulation Measurements

1. Turn the **FUNCTION** knob to the **GS** position.

   1a. Toggle and hold the **DELETE** switch *DOWN* to the **150/9960** position. Verify modulation of **40% / ± 1% (39 – 41%)**, modulation tone of **90 / ± 0.9 Hz**.

   1b. Toggle the **DELETE** switch *UP* to the **90/30** position. Verify the modulation at **40% / ± 1% (39 – 41%)**, modulation tone of **150 / ± 1.5 Hz**.

   1c. Release the **DELETE** switch and verify the composite signal 90 & 150 Hz) modulation is **75% / ± 3% (72 – 78%)**.

   1d. Verify the GS modulation, as per the data sheet, at **D2, D1, OC, U1, & U2** positions.

   1e. Select **ILS** and verify a composite signal **110.15 MHz & 334.55 MHz**. Toggle the **MB/ID** switch *UP* and ensure the **75 MHz** signal is added.

2. With a Modulation Meter connected to the **ANTENNA** port, run the Test Set in COMM mode. Select 120.000 MHz, 70% AM @ 1000 Hz.

   2a. Verify the actual modulation level and that the reading tracks within **± 5** when toggling the **MOD LEVEL** switch.

3. Select 120.000 MHz, **FM** mode, at 8 kHz deviation @ 1000 Hz.

   3a. Verify that the deviation tracks **± 1 kHz** when toggling the **MOD LEVEL** switch.

4. Connect an oscilloscope to the **AUDIO OUT** connector.

   4a. Measure and verify that the audio output level tracks in accordance with the following (utilize the **AUDIO LEVEL** toggle to vary and toggle the XMIT_MEAS switch to measure the value).

| 4.4.5 | AUDIO OUTPUT LEVEL | TOLERANCE |
|---|---|---|
| | | |
| 4a | 100 mv | ± 50 mv |
| | 500 mv | ± 50 mv |
| | 900 mv | ± 50 mv |

### 4.4.6 Receiver

1. Connect a Signal Generator to the **ANTENNA** port, set the Signal Generator to 120.000 MHz, 0.0 dBm, and modulation *OFF*. Turn the Test Set on in a COMM mode. Select 120.0000 MHz. Toggle the **XMIT MEAS** switch down and hold.

   1a. Verify the Test Set displays **120.0000 MHz / ± 200 Hz**.

   1b. Vary the Signal Generator ± 9.5 kHz. Ensure the Test Set tracks **± 0.2 kHz**.

1c. Vary the Signal Generator Output from +16 dBm to -33 dBm. Verify the message on the display is as follows:

| 4.4.6 | Message | Signal level, (dBm) |
|---|---|---|
| | | |
| 1c | POWER TOO HIGH | +16 dBm |
| | POWER IN RANGE | + 9 dBm |
| | POWER IN RANGE | -7 dBm |
| | LOW POWER | -17 dBm |
| | LOW POWER | -26 dBm |
| | NO POWER | - 33 dBm |

1d. Release the **XMIT MEAS** switch.

2. Set the Signal Generator output to -10dBm, 120.0000 MHz, FM Modulation to 8 kHz. Toggle the **XMIT MEAS** switch *DOWN* and hold.

2a. Verify the deviation reading of **8 kHz / ± 1 kHz**.

2b. Vary the Signal Generator Deviation from 1 kHz to 15 kHz. Ensure the Test Set tracks within **± 1 kHz**.

3. Place the Termination Cap on the **ANTENNA** connector.

4. Run the Test Set in COMM Mode, 120.0000 MHz. Connect a Signal Generator to **R/T** output with +30 dBm input (a RF amplifier may be necessary).

5. Verify that the Test Set display switches to a measurement mode and a power reading of **1 W**.

6. Connect the Calibrated Transmitter (+40 dBm) with a 10ft cable to the **R/T** port. Select 120.0000 MHz, modulation *OFF* on the Transmitter. Connect a 50 Ω load to the **ANT** port. Select 120.0000 MHz on the Test Set.

7. Verify the Test Set measures **10 W / ± 2 W**, verify VSWR measurement.

8. Turn the transmitter *OFF*.

9. Replace the 50 Ω load with the variable attenuator. Turn the transmitter *ON* and verify the following:

| 4.4.6 | Attenuator at ANT port | VSWR Measurement |
|---|---|---|
| | | |
| 9a | Open | > 5.0 |
| 9b | 3dB | 3.2 / ± 0.5 |
| 9c | 6dB | 1.6 / ± 0.5 |
| 9d | 10dB | 1.1 / ± 0.5 |

10. Repeat Step 9 at 150.0000 MHz.

11. Plug a headset into the Test Set. Turn the modulation *ON* with either AM or FM modulation. Verify that you are able to hear a tone.

12. Remove the installed fuses from the Front Panel Fuse lock and replace them with 250 V, 0.25 A, FFT Fuses. Connect the Test Set to a 230 VAC Power Supply and verify Test Set operates under that Voltage Level. After confirming Operation, Reinstall the initial fuses.

# SECTION C

# ANNUAL CALIBRATION AND ALIGNMENT

## 4.5 General

A full Calibration and Alignment of the Test Set shall be performed under the following conditions:

1. Tel-Instrument Corporation recommends an Annual Calibration & Alignment to ensure accurate test results and improved performance.

2. If any failure occurs or is suspected during *Routine* or *Test Set Verification Checks*, a full Calibration and Alignment shall be performed.

3. If any major assembly is replaced.

4. If during normal operation, the Test Set fails to meet any specification outlined in Chapter 1, Section B.

### 4.5.1 Procedures

These procedures will be performed on an annual basis. They will be performed on an opened box to allow access to test points and alignment controls to align the Test Set to manufacturer's specifications. If these adjustments fail to return the Test Set to the specified parameters, the unit may require repair and additional maintenance. By utilizing the following procedures and referring to the schematics (Chapter VI), a qualified technician should be able to troubleshoot the problem. Do not make adjustments for results that meet the specification.

**WARNING**
**Any time you are working with exposed wiring, the potential for electrical shock increases. Ensure all standard electrical safety procedures are strictly enforced to prevent injury.**

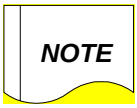
## 4.6 Test Equipment Required

The following support equipment (or their equivalent) is necessary to perform the *Test Set Annual Calibration and Alignment* of the T-36CTest Set.

| Name | Designation/Description |
|---|---|
| | |
| Universal Counter | HP 5335A |
| RF Power Meter | HP 432A |
| Spectrum Analyzer | HP 8558B |
| Modulation Meter | Boonton Electronics 82AD |
| Digital Voltmeter | Fluke 8000A |
| Oscilloscope | Tektronix 2235 |
| DC Power Supply | 0-12VDC /1A |
| Zifor 3:VOR Radial Standard | Collins 478A-3 |
| Distortion Analyzer | HP 339A |
| Variable attenuator 0 – 10 dB | Equivalent |
| 50 Ω 25 Watt Load | Equivalent |
| 10 K Ω Load | Equivalent |
| 50 Ω Load W/calibrated 2 KHz Mismatch | Equivalent |
| Communication RX/TX Test Set | Equivalent |
| Copy of Data Sheet (Appendix B)[2] | |

Test Set Annual Calibration Equipment List

Table 4-3




A VOR/ILS Mockup Test Set such as a Rhode & Schwartz Navigation Modulation Analyzer/0856.4509.52 (or similar) may be utilized in lieu of the Universal Counter, RF Power Meter, Spectrum Analyzer, Modulation Meter, Distortion Analyzer, and Zifor.

[2] To ensure accuracy and for simplicity, the Data Sheet is written and organized to reference each step by paragraph and step number. Make a photocopy, review and become familiar with the datasheet before beginning the tests.

### 4.6.1 Test Set Initial Settings

Set the T-36C front panel switches to the following positions before each test, unless otherwise instructed:

| Function/Rotary Switch | Position |
|---|---|
| | |
| **AUDIO LEVEL** | Centered |
| **DC** | Centered, LED *OFF* |
| **MB/NAV ID** | Centered |
| **DELETE 90/30 – 150/9960** | Centered |
| **ILS/VOR VAR** | Centered |
| **TONES** | **400/OM** |
| **ILS/VOR** Rotary | **OC/0°** |
| **PRESET/KEYBOARD ENTRY** | **PRESET** |
| **FREQ HI/MID/LO** | **LO** |
| **FUNCTION** Rotary | **MB** |
| **MOD LEVEL HI-LO** | Centered |
| **AM – FM** | **AM** |
| **LIGHTS** | Centered |
| **XMIT MEAS** | Up Position |
| **RF OUTPUT LEVEL** | Centered |
| **AC ROCKER** Switch | *OFF*, LED Extinguished |

Table 4-4

Initial Settings

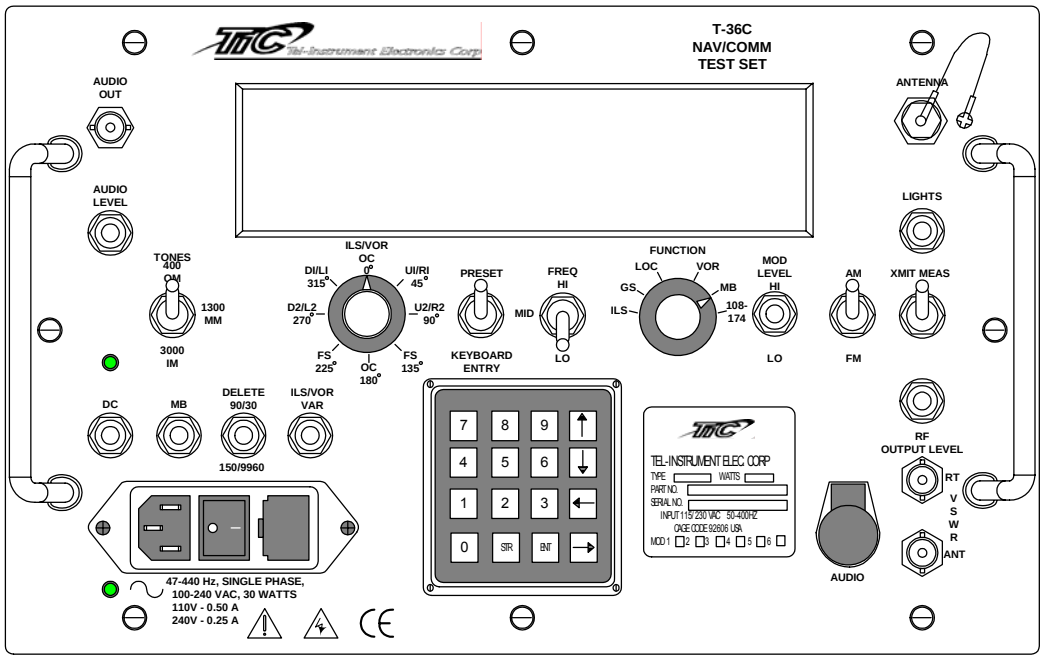



Figure 4-2

Initial Settings

**WARNING**
**Any time you are working with exposed wiring, the potential for electrical shock increases. Ensure all standard electrical safety procedures are strictly enforced to prevent possible injury.**

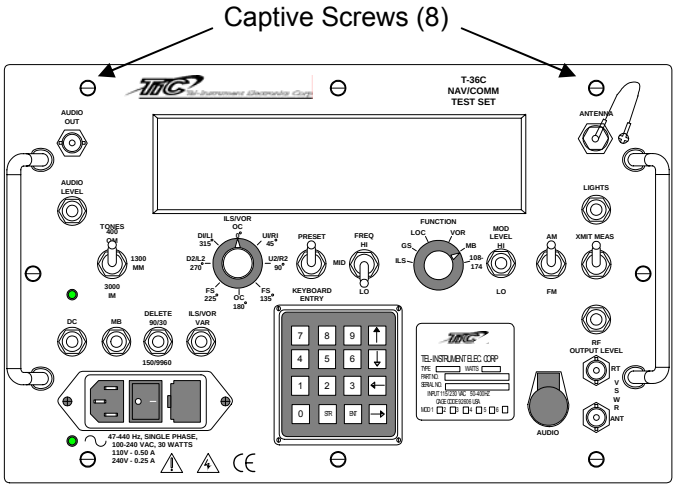
## 4.7 Disassembly of the Test Set

The T-36C Test Set was designed for ease of maintenance and access. Disassembly of the Test requires only the use of simple hand tools. Ensure that the tools that are utilized are in good working condition.

Electrostatic discharge may also pose a concern. When ever opening the Test Set, be sure to follow standard grounding principles. When ever a potential exists for static electricity to build, damage to the Test Set and the internal electronic components may result.

### 4.7.1 Test Set Disassembly Procedures

1. Remove the Test Set from the Case by loosening the eight (8) lock bolts located on the front panel of the Test Set. Do not remove the bolts as they are a captive type. Only loosen them enough to release their grip on the anchor nuts.




2. Grasp the Test Set Handles and slowly remove the Test Set assembly from the case. Ensure that you do not use force to pull the Test Set from the case; you may have to slightly angle the Test Set to allow for free movement of the assembly and attached hardware and cables.

3. Access to the individual circuit boards is accomplished by removing the attaching hardware and covers. Ensure that all attaching cables and connectors remain attached and undue stress is not put on them.

4. Reassembly of the Test Set is accomplished by reversing the order of disassembly. Ensure that all of the connectors, cables and mounting hardware are tight and secure.

## 4.8 Annual Calibration

### 4.8.1 Power Interlocks, and Clocks

***NOTE***

Utilize the Figures 4-4, 4-5, and 4-6 at the end of this chapter for locations of test points and components for adjustment.

1. Connect the Test Set to a 115 VAC power source. Ensure that the DC power is not selected. Verify the *GREEN* LED is illuminated.

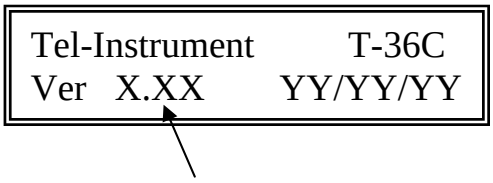
2. Disconnect the Test Battery and measure **14-19 VDC** between **E62 and E66**.

3. Reconnect the battery.

4. Measure and verify the charging voltage is **13.5 VDC / ± 0.5 VDC** between **E-62 and E-66**.

5. Turn the Test Set *ON* by toggling the **DC** switch *UP* and ensure the *DC* LED Illuminates.

6. The initial start page will be shown momentarily. Verify Software Revision Status of your Test Set.

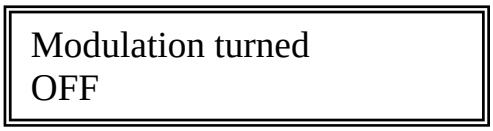



Software Revision Number

7. Turn the Test Set *OFF*.

8. Place the Test Set in the *MODULATION OFF/ON Mode* by turning *"ON"* the Test Set while holding down the **DELETE** switch. Verify the following Display.


9. Press **ENT** on the Keyboard to disable the modulation.



10. Measure and verify the following DC Voltages on the MB/COMM PCB Board.

| 4.8.1 | TEST POINT | EXPECTED VALUE |
|---|---|---|
| | | |
| 10a | TP1 | -6 VDC / ± 0.3 |
| 10b | TP2 | +17 VDC / ± 0.5 |
| 10c | TP3 | +6 VDC / ± 0.3 |
| 10d | TP4 | +5 VDC / ± 0.3 |
| 10e | TP5 | +15 VDC / ± 0.3 |
| 10f | TP6 | -5 VDC / ± 0.3 |
| 10g | TP7 | +5VDC / ± 0.3 |
| 10h | TP8 | +15 VDC / ± 0.3 |

11. Measure and verify the following DC Voltages on the L/G/V Board.

| 4.8.1 | TEST POINT | EXPECTED VALUE |
|---|---|---|
| | | |
| 11a | TP3 | +5 VDC / ± 0.3 |
| 11b | TP15 | +15 VDC / ± 0.3 |
| 11c | TP16 | -5 VDC / ± 0.3 |

12. Remove the 10 K Ω Load from the **Antenna Port** and verify that the Test Set reverts too **ANTENNA MODE; 0.13dBM** shall be displayed.

13. Reconnect the load and verify the Test Set returns to the Direct Connect Mode.

14. Turn power *OFF* to the Test Set.

### 4.8.2 Transmitter Checks

1. Disconnect coax **W27** from **J714** on the Panel/Switch PCB Board and connect it to a Power Meter or equivalent.

2. Turn the Test Set *ON* by Holding down the **DELETE** switch while applying power. Select **ENT** on the keypad to disable the modulation.

3. Measure the P/OUT at each of the steps IAW the Table below. Make adjustments utilizing the appropriate point only if necessary.

| 4.8.2 | MODE | P/OUT ADJUST POINT | FREQUENCY |
|---|---|---|---|
| | | | |
| 3a | LOC | -7 / ± 2dBm - R-181 (L/V/G Bd) | 108.10 MHz / ± 150 Hz |
| 3b | LOC | -7 / ± 2dBm - R-181 (L/V/G Bd) | 111.95 MHz / ± 150 Hz |
| 3c | VOR | -7 / ± 2dBm - R-181 (L/V/G Bd) | 108.00 MHz / ± 150 Hz |
| 3d | VOR | -7 / ± 2dBm - R-181 (L/V/G Bd) | 117.95 MHz / ± 150 Hz |
| 3e | GS | -5 / ± 2dBm - R-139 (L/V/G Bd) | 108.95/329.15 MHz ± 300 Hz |
| 3f | GS | -5 / ± 2dBm - R-139 (L/V/G Bd) | 110.30/335.00 MHz ± 300 Hz |

| | | | |
|---|---|---|---|
| 3g | MB | +3 / ± 2dBm<br>R-125 (MB/COMM Bd) | 75 MHz / ± 150 Hz |
| 3j | COMM | +2/ ± 2dBm<br>R-125 (MB/COMM Bd) | 108 MHz / ± 150 Hz |
| 3k | COMM | +2 / ± 2dBm<br>R-125 (MB/COMM Bd) | 174 MHz / ± 150 Hz |

***NOTE***

Ensure that any Harmonic level is < -15 dBm from the center frequency.

4. Connect a Frequency Meter for the Frequency measurements. If frequency is out of tolerance, adjust the Master **TCXO, U-25/R90**. If you are unable to adjust the frequency to tolerance, the Test Set will require further repair or returned to the factory.

5. Turn power *OFF* to the Test Set.

6. Reconnect **W27** to **J714**.

7. Connect a Power Meter to the ***Antenna Port*** with a 10 foot cable (simulated antenna).

8. Place the Function switch in the **108 – 174 MHz** position.

9. Turn the Test Set *ON* in the *Calibration Mode* by Holding *down* the **MB/ID** switch while turning power *ON*.

```
Enter Cal Code:
```

10. Enter **953** and press **ENT** on the Keypad to access the *Calibration Mode*.

```
Tx & Rx Cal Tables
Enter to continue
```

11. Select "*Tx Ramp"* (Option 2*)* and **ENT**.

```
1. TxDirect     2. TxRamp
3. RxDirect     4. RxRamp
```

**WARNING**
**Once entering the Test Set Calibration Tables, do not depress any buttons unless directed by the following procedures. Possible loss of the Test Set memory may occur. Ensure you follow the written procedures and/or the displayed instructions.**

12. Depress the **ENT** until the Test Set display indicates 108 MHz.

***NOTE***

You can not reverse direction if you pass the designated value. If you inadvertently pass the correct value, select **STR** to reverse back to the first display and select **ENT** to advance to the correct value.

13. Verify **0 / ± 1 dBm** at 108 MHz. If out of tolerance, utilize the *UP/DOWN* arrows to adjust to the correct value. Check and verify every 10 MHz Step to ensure compliance.

| B | Frequency | Power Out, dBm |
|---|---|---|
| | | |
| 13a | 108 MHz | 0 / ±1 dBm |
| 13b | 115 MHz | 0 / ± 1 dBm |
| 13c | 125 MHz | 0 / ± 1 dBm |
| 13d | 135 MHz | 0 / ± 1 dBm |
| 13e | 145 MHz | 0 / ± 1 dBm |
| 13f | 155 MHz | 0 / ± 1 dBm |
| 13g | 165 MHz | 0 / ± 1 dBm |
| 13h | 174 MHz | 0 / ± 1 dBm |

14. Depress the **ENT** button until **MB** is displayed. Subsequent pushes of the **ENT** button will advance you to the VOR, LOC GS, and ILS tables. Verify each step IAW the following chart and adjust the *POWER Out, dBm*. If out of tolerance, utilize the *UP/DOWN* arrows to adjust to the correct value.

| B | MODE | Power Out, dBm |
|---|---|---|
| | | |
| 14a | MB 75 MHz | +13 / ±1 dBm |
| 14b | L/V 108.05 MHz | +6 / ± 1 dBm |
| 14c | L/V 113.00 MHz | +6 / ± 1 dBm |
| 14d | L/V 117.95 MHz | +6 / ± 1 dBm |
| 14e | GS 108.95 | 0 / ± 1 dBm |
| 14f | GS 109.30 | 0 / ± 1 dBm |
| 14g | GS 110.30 | 0 / ± 1 dBm |
| 14h | ILS 110.10 | +6 / ± 1 dBm |

15. Connect a 10K load at the ***Antenna Port*** and a Spectrum Analyzer to the ***R/T Port*** with the 10 Foot cable.

16. Select the *"TxDir"* Calibration Table (Option 1). Utilizing the same procedures as above, adjust the Output levels to the following chart.

| B | MODE | Power Out, dBm |
|---|---|---|
| | | |
| 16a | 108 MHz | -25 / ± 0.5 dBm |
| 16b | 115 MHz | -25 / ± 0.5 dBm |
| 16c | 125 MHz | -25 / ± 0.5 dBm |
| 16d | 135 MHz | -25 / ± 0.5 dBm |
| 16e | 145 MHz | -25 / ± 0.5 dBm |
| 16f | 155 MHz | -25 / ± 0.5 dBm |
| 16g | 165 MHz | -25 / ± 0.5 dBm |
| 16h | 174 MHz | -25 / ± 0.5 dBm |
| 16i | MB 75 MHz | -25 / ± 0.5 dBm |
| 16j | L/V 108.05 MHz | -25 / ± 0.5 dBm |
| 16k | L/V 113.00 MHz | -25 / ± 0.5 dBm |
| 16l | L/V 117.95 MHz | -25 / ± 0.5 dBm |
| 16m | GS 108.95 | -30 / ± 0.5 dBm |
| 16n | GS 109.30 | -30 / ± 0.5 dBm |
| 16o | GS 110.30 | -30 / ± 0.5 dBm |
| 16p | ILS 110.10 | -25 / ± 0.5 dBm |

17. Turn the Test Set *OFF*. Disconnect the Antenna Terminal Cap, and turn the Test Set back *ON.* Toggle the **RF OUTPUT LEVEL** switch; ensure you can vary the signal level in the range of **-25 dBm to -100 dBm** in **1 dB** steps **± 1dB**.

18. Turn the Test Set *OFF* then back *ON* and select the **MB** Mode utilizing the **FUNCTION** switch.

19. Connect a Modulation Meter, or equivalent, to the ***Antenna Port*** and verify AM Modulation Levels are **95% / ± 5% (90 – 100%)** for each of the tones: OM, MM, and IM. Distortion levels should not exceed **15%**. Use **R125 (MB/COMM Bd.)** to correct any variances.

20. Verify the Output Power Levels in the MB and COMM modes (step 14). Correct the *TxRamp and TxDir* tables, if necessary.

21. Turn the T/S *OFF* and back *ON* in the *Calibration Mode.* Select *VOR* calibration option and set/verify the modulation tones in the following sequence:

    21a. Select **2**; Set the modulation to **30% / ± 0.5%** using **R48, L/V/G Bd**. The modulation should be **9960 Hz / ± 99 Hz**. Verify FM deviation of **480 Hz / ± 30 Hz.**

    21b. Select **1**; Set modulation to **30% / ± 0.5%** using **R-16, L/V/G Bd**. The modulation tone should be **30 Hz / ± 3 Hz**.

    21c. Select **3**; Set the modulation to **10% / ± 1%**, using the ***UP/DOWN arrows.*** The modulation tone should be **1020 Hz / ± 50 Hz**.

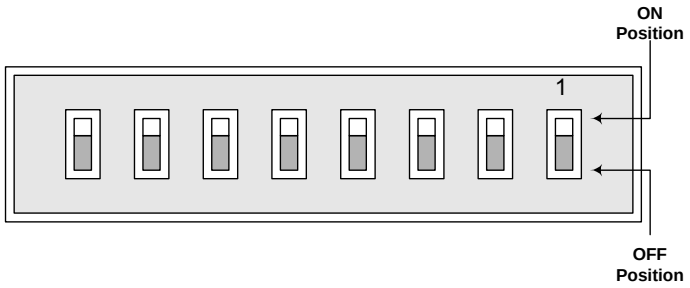
    21d. Select **4**; (ALL) and verify composite **30 Hz + 9960 Hz** modulation is **60% ± 3% (57 – 63%)**.

    21e. Press the ***MB/ID*** *switch down* and verify the ***ID*** tone adds to the signal and increases the modulation level to **70% / ± 3% (67 – 73%)**. Release the switch.

21f. Verify the VOR Angles by connecting the Zifor Test Set, or equivalent, to the Antenna Connector IAW the following Chart:

| **VOR Bearing T/S** | 0 | 45 | 90 | 135 | **180** | 225 | 270 | 315 |
|---|---|---|---|---|---|---|---|---|
| **ZIFOR** | 180 | 225 | 270 | 315 | **0** | 45 | 90 | 135 |

21g. If necessary, adjust A7S1 until the indicator is within specification. Make the adjust at the 180º position. Record the positions on the Data Sheet.




A7S1

Figure 4-3

| **SWITCH S1 SECTIONS** | |
|---|---|
| **Section** | **Degree Offset** |
| | |
| 1 | 0.18 |
| 2 | 0.35 |
| 3 | 0.70 |
| 4 | 1.41 |
| 5 | 2.81 |
| 6 | 5.62 |
| 7 | 11.25 |
| 8 | 22.50 |

Switch S1 Sections and offsets

Table 4-5

22. Select the *LOC* calibration option. Follow the displayed directions and set the modulation levels and verify the modulation tones in the following sequence:

22a. Select **1, 90 Hz/150 Hz**; and adjust for equal amounts of modulation by adjusting **R41, L/V/G Bd**. Set the modulation to **20% / ± 0.5%**, utilize **R182, L/V/G Bd**. The modulation tone shall be **90 Hz / ± 0.9 Hz**.

22b. Select **2**; Verify the modulation is **20% / ± 0.5%**. The modulation tone shall be **150 Hz / ± 1.5 Hz**.

22c. Select **3**; Set the modulation to **10% / ± 1%** (utilizing the **UP/DOWN Arrows** on the keypad. The modulation tone shall be **1020 Hz / ± 50 Hz**.

22d. Select **4** (ALL); and verify the composite (90 Hz and 150 Hz) modulation is **37% / ± 2% (35 – 39%)**.

22e. Toggle the **MB/ID** switch down; verify the **ID** tone is added to the signal and the modulation level increases to **47%/ ± 3% (44 – 50%)**. Release the switch.

22f. Turn the Test Set "OFF" then back "ON" in normal COMM Mode. Verify the LOC modulation for the following:

| 4.8.2 | Difference in 90 Hz & 150 Hz Modulation | |
|---|---|---|
| | | |
| 22f(1) | L2 | 15.5% to 19.5% |
| 22f(2) | L1 | 6% - 10% |
| 22f(3) | OC | -1% - +1% |
| 22f(4) | R1 | -6% - -10% |
| 22f(5) | R2 | -15.5% to -19.5% |

23. Turn the T/S *OFF* and then back *ON* in **GS** mode. Toggle the **DELETE 90/30 – 150/9960** switch *UP* and *DOWN* and adjust the modulation levels even by adjusting **R32 L/V/G Bd**.

23a. Hold the **DELETE** switch *DOWN* and set the and set the modulation to **40% / ± 0.5% (39.5 – 4-.5%)** utilizing **R137, L/V/G Bd**. Ensure the modulation tone is **90 Hz / ± 0.9 Hz**.

23b. Hold the **DELETE** switch *UP* and verify the modulation is **40% / ± 0.5% (39.5 – 4-.5%)**. Ensure the modulation tone is **150 Hz / ± 0.5 Hz**.

23c. Release the switch and verify the composite modulation is **75% / ± 3% (72 – 78%)**.

23d Verify the GS modulation for the following:

| 4.8.2 | Difference in 90 Hz & 150 Hz Modulation | |
|---|---|---|
| | | |
| 23d | U2 | 15% to 20% |
| 23d | U1 | 7% - 11% |
| 23d | OC | -1% - +1% |
| 23d | D1 | -7% to -11% |
| 23d | D2 | -15% to -20% |

24. Select **ILS** mode. Verify a composite signal (LOC & GS) at 110.15 MHz and 334.55 MHz. Toggle the **MB/ID** switch and ensure the 75 MHz signal is added.

25. Connect the ***ANTENNA Port*** to a Modulation Meter. Turn the Test Set *ON* in the COMM Mode. Select **120.00 MHz** at **70% AM Mod @ 1000 Hz**.

26. Measure the Modulation Level and then calculate the correction coefficient as follows:

**AMTx = Actual Reading / 70%**

27. Apply the AMTx coefficient in Calibration Mode. Verify that the reading properly tracks to the displayed number within **± 5%** for the 1000 Hz tone.

***NOTE***

If it is impossible to set both the MB and the COMM modulations utilizing **R125**, retune **R125** for COMM modulation, and trim **R72 L/V/G Bd.** to correct the MB modulation. When completed, repeat steps 21 & 30.

28. Select **120 MHz, FM, 8 kHz deviation at 1000 Hz**. Measure the actual deviation and calculate the correction coefficient as:

**FMTx = Actual Reading in KHz / 8 KHz**

29. Apply the FMTx coefficient in Calibration Mode Verify the reading track with the displayed number to within **1 kHz**. Utilize 108 & 174 MHz as references.

30. Connect **AUDIO OUT PORT** to an oscilloscope. Measure and verify that the audio output voltage tracks to the preset number **±50 mv**.

***NOTE***

Utilize the **AUDIO LEVEL** switch to preset the signal amplitude and press **XMIT MEAS** to make a measurement.

| 4.8.2 | AUDIO OUTPUT LEVEL | TOLERANCE |
|---|---|---|
| | | |
| 30a | 100 mv | ± 50 mv |
| 30b | 500 mv | ± 50 mv |
| 30c | 900 mv | ± 50 mv |

### 4.8.3 Receiver Checks

1. Connect a signal generator to the **R/T Port** utilizing a 10 foot cable. Set the output level to 10 dBm with the modulation *OFF*. In the Calibration Mode, select the *"RxDir" table* and follow instructions on the display. Change the generator frequency and verify at 100 – 170 MHz in 10 MHz steps. Verify correct power measurement of **25 W / ± 4W** at each 10 MHz step. Skip the MB, LOC, VOR and ILS Modes at the end of the table.

2. Connect a signal generator to the **ANTENNA Port** utilizing a 10 foot cable. Set the output level to 0 dBm with the modulation *OFF*. In the Calibration Mode, select the *"RxRamp" table* and follow instructions on the display. Change the generator frequency and the correct power measurement *to* **25 W / ± 4W**. Skip the MB, LOC, VOR and ILS Modes at the end of the table.

3. Set the Signal Generator frequency to 120.000 MHz (0 dBm, modulation OFF) and run the test a second time in the COMM Mode. Select 120.000 MHz on the Test Set and hold down the **XMIT-MEAS** switch. Verify the measured frequency is **120.000 MHz ± 200 Hz**.

4. Vary the Signal Generator ± 9.5 kHz from 120.000 MHz and verify that the Test Set tracks **± 200 Hz**.

5. Toggle the **XMIT-MEAS** switch and vary the signal generator output from +16 dBm to -33 dBm. Verify the Test Set display matches the input level as shown below.

| Message | Signal level, (dBm) |
|---|---|
| | |
| POWER TOO HIGH | +16 dBm |
| POWER IN RANGE | + 9 dBm |
| POWER IN RANGE | -7 dBm |
| LOW POWER | -17 dBm |
| LOW POWER | -26 dBm |
| NO POWER | - 33 dBm |

6. Set the Signal Generator to 0 dBm, modulation level to 70% AM. Toggle the **XMIT-MEAS** switch. Utilize **R96** (MB/COMM Board) adjust the modulation reading to **70%**. Ensure the Test Set is in **AM** mode. Vary the signal level from **-8 to +9 dBm** and verify that the modulation reading does not vary/exceed **± 3%**.

7. Turn the modulation *OFF*. Set the signal generator output to 0dBm, set the voltage at **P19-12** to **0 ± 0.1 V** by adjusting **R-183** (MB/COMM Board) Ensure the actual reading does not exceed **2%**.

8. Set the signal generator modulation level to 50% AM. Take a % AM reading and calculate the correction factor as:

   **AMRx = 50% / actual reading %**

9. Apply the coefficient while in the Calibration Mode. Reset the Test Set in the COMM Mode at 120.00 MHz. Toggle and hold the **XMIT-MEAS** switch. Verify

the AM measurement in the whole range from 0% to 100%. Ensure % AM tracks within **± 5%**.

10. Tune **R-96** if necessary.

11. Set the signal generator output level to -10 dBm, 120.00 MHz and FM to 8 kHz.

12. Press the **XMIT-MEAS** switch and take a deviation reading.

13. Calculate the FM Deviation as follows:

**FMRx = 8 kHz/ Deviation Reading**

14. Apply the coefficient in the Calibration Mode. Vary the deviation of the signal generator from – 1 kHz to 15 kHz. Verify the deviation reading tracks within **± 1 kHz**.

15. Verify the FM Deviation measurement is within **± 1 kHz** while the input signal level is varied from -10 dBm to +16 dBm.

16. Disconnect the signal generator and connect it to the **R/T** port. Run the Test Set in the COMM mode with the 10 k Termination Cap installed.

17. Set the signal generator output for +30 dBm.

***NOTE***

It may be necessary to utilize a RF Amplifier for this Test.

18. Adjust **R70** (L/V/G Board) until the Test Set switches to **XMIT-MEAS** mode. Verify that this occurs at **1W**.

19. Disconnect the signal generator and connect a calibrated transmitter (+40 dBm output with modulation *OFF)* with a 10 ft cable, *to the **RT** port.* Connect a 50 Ω load onto the **ANT** port.

20. Turn the transmitter *ON*. Verify the power reading is **10W ± 2W** at 120 & 150 MHz.

21. Verify the VSWR measurement by replacing the 50 Ω load with the following attenuators and take a VSWR measurement at the following frequencies.

| 4.8.3 | Attenuator | VSWR Measurement | |
|---|---|---|---|
| Frequency | | 120 MHz | 150 MHz |
| | | | |
| 21a | 3 dB | 3.2 ± 0.5 | 3.2 ± 0.5 |
| 21b | 6 dB | 1.6 ± 0.5 | 1.6 ± 0.5 |
| 21c | 10 dB | 1.1 ± 0.5 | 1.1 ± 0.5 |

22. To correct the VSWR measurement, calculate the coefficient based on $VSWR_{3dB}$ reading (for a 3 dB attenuator).

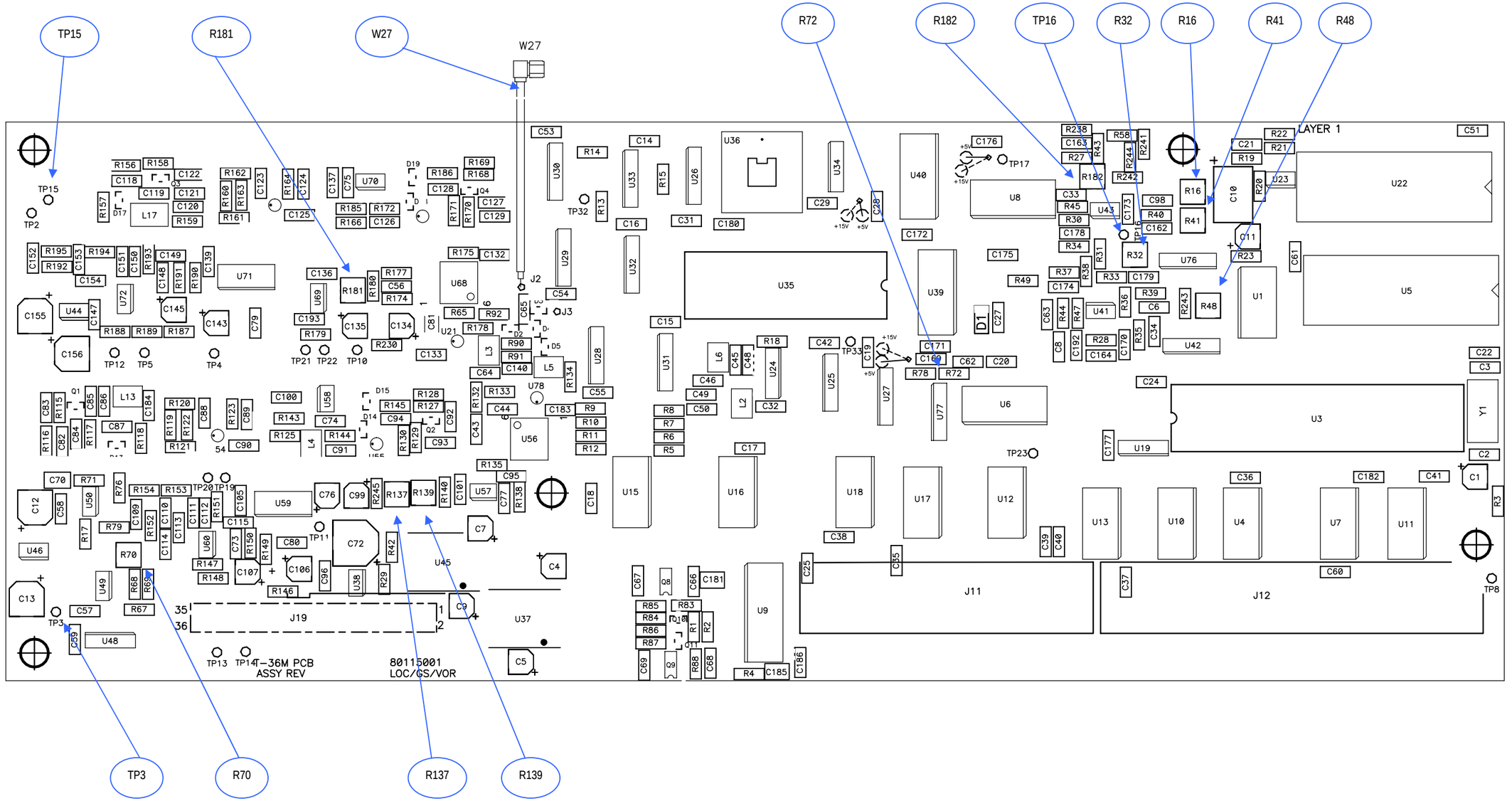
$$VSWR = \frac{VSWR_{3\,dB} + 1}{VSWR_{3\,dB} - 1} \times 0.524$$

23. Apply the correction coefficient in the calibration mode. Repeat Step 21 – 22.

24. Plug a headset into the Test Set. Turn the UUT transmitter on with AM or FM modulation. Verify a tone. Adjust **R7** (panel/Switch PCB) for a convenient output level.

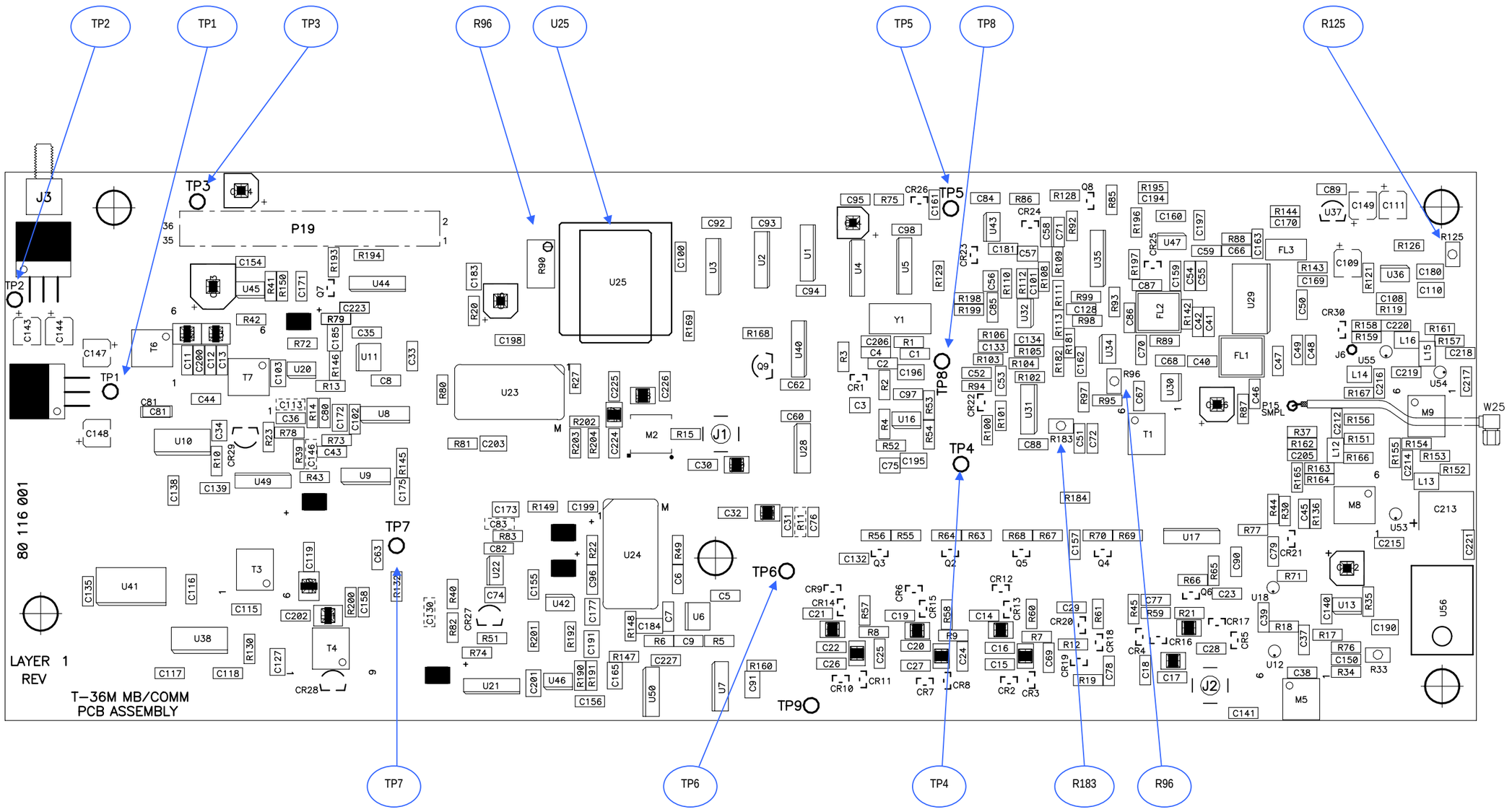
25. Turn the Test Set *OFF* and then back *ON* in normal COMM Mode. Begin timing and ensure that the Test Set turns OFF after 15 min ± 3 min of no operator input.

26. Remove the installed fuses from the Front Panel Fuse lock and replace them with 250 V, 0.25 A, FFT Fuses. Connect the Test Set to a 230 VAC Power Supply and verify Test Set operates under that Voltage Level. After confirming Operation, Reinstall the initial fuses.



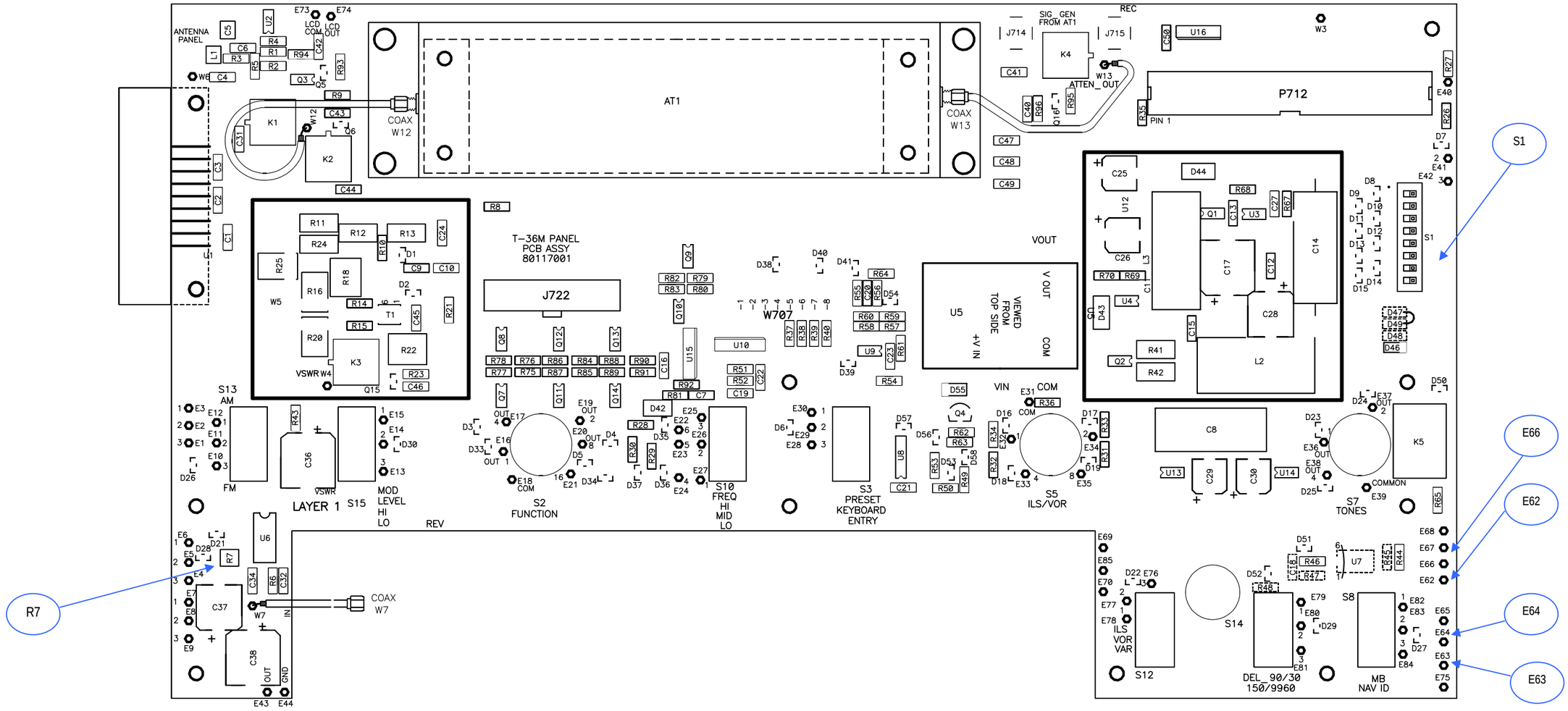

Test and Adjustment Points, L/G/V Board

Figure 4-4




Test and Adjustment Points, MB/COMM Board

Figure 4-5

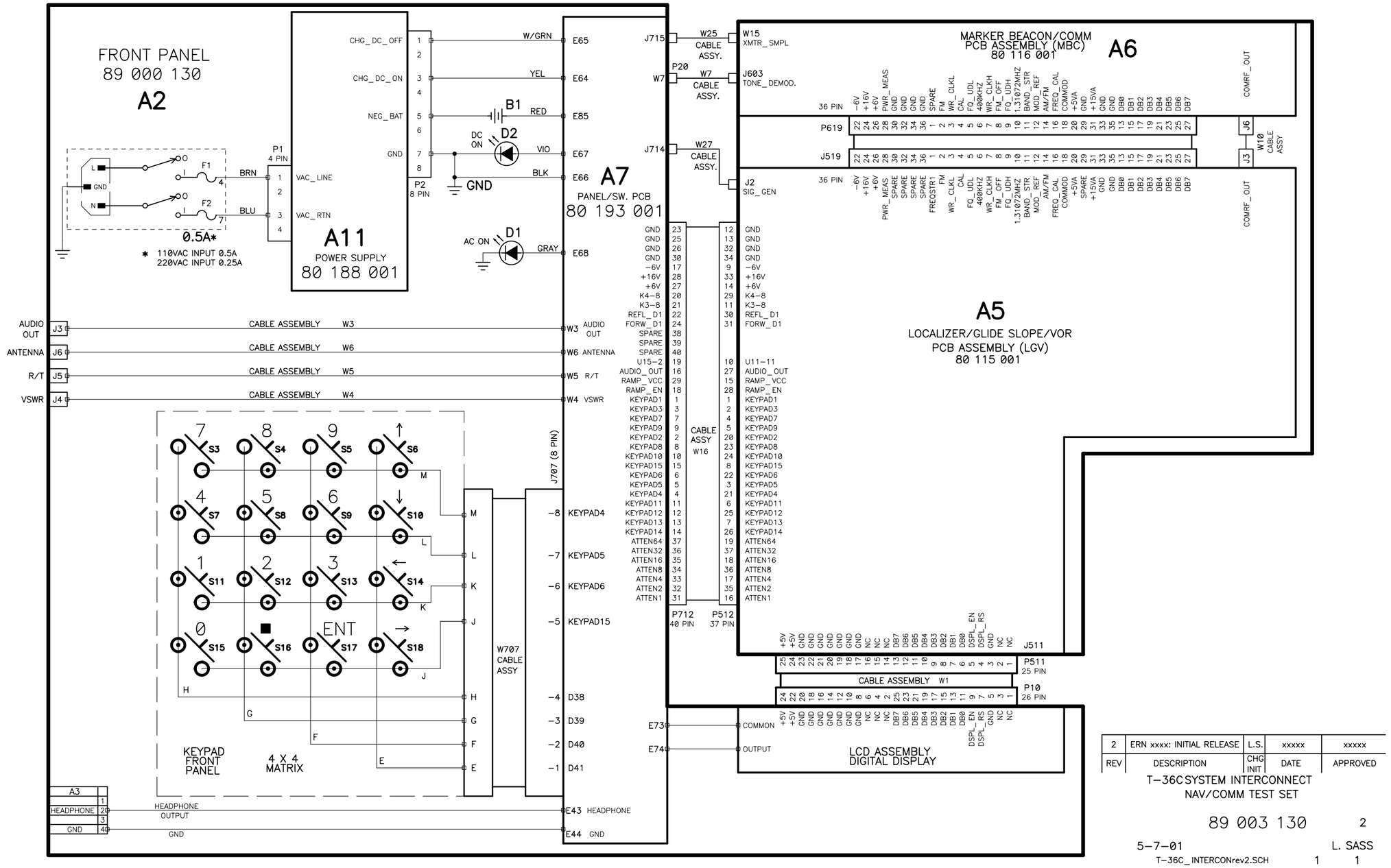



Test and Adjustment Points, PCB Assy. (A7)

Figure 4-6

# CHAPTER V

## SCHEMATICS




| REV | DESCRIPTION | CHG INIT | DATE | APPROVED |
|---|---|---|---|---|
| 2 | ERN xxxx: INITIAL RELEASE | L.S. | xxxxx | xxxxx |

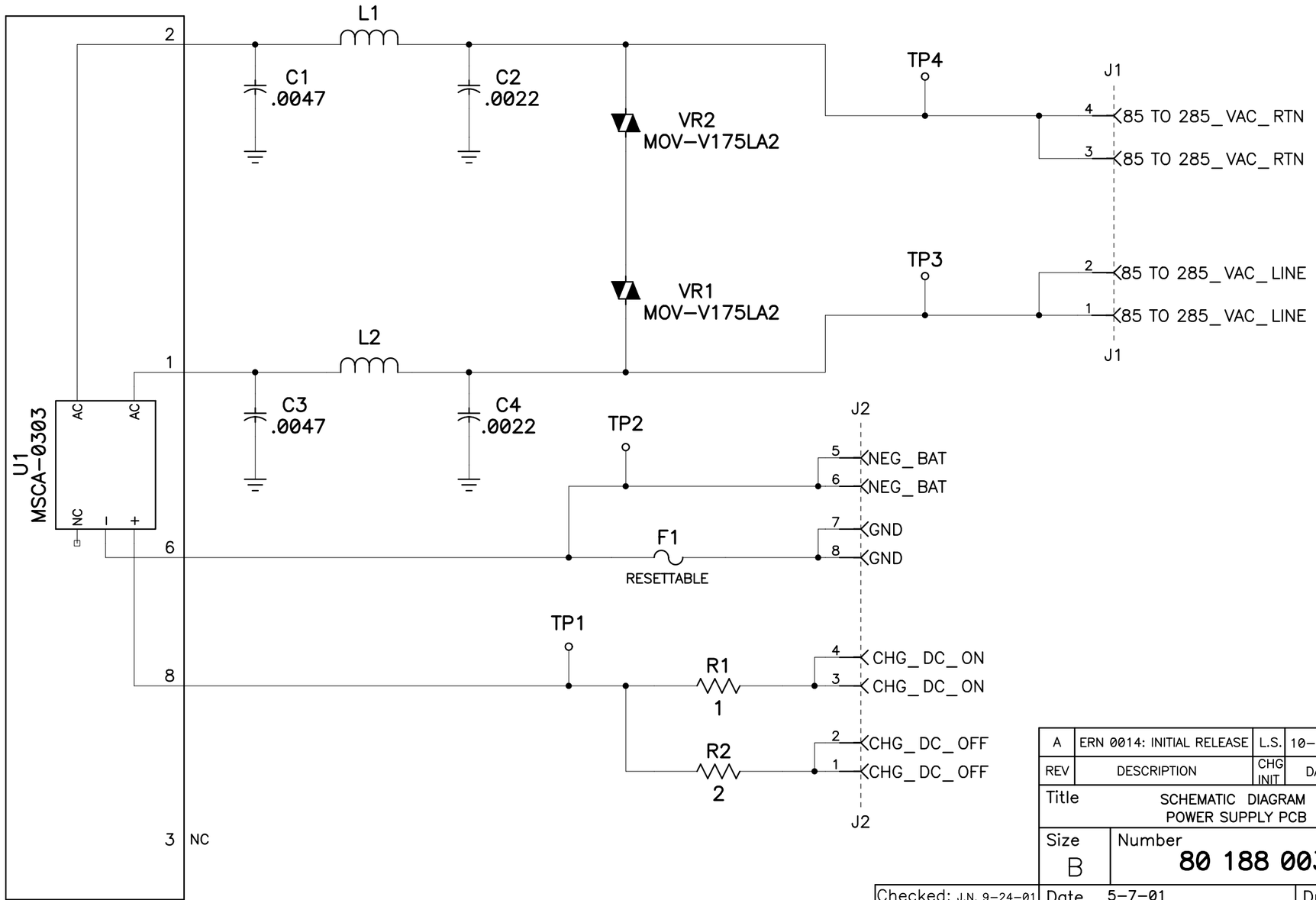
T-36C SYSTEM INTERCONNECT
NAV/COMM TEST SET

89 003 130 2

5-7-01 L. SASS

T-36C_INTERCONrev2.SCH 1 1

09:12:04 Mon Dec 16, 2002

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|---|---|---|---|---|
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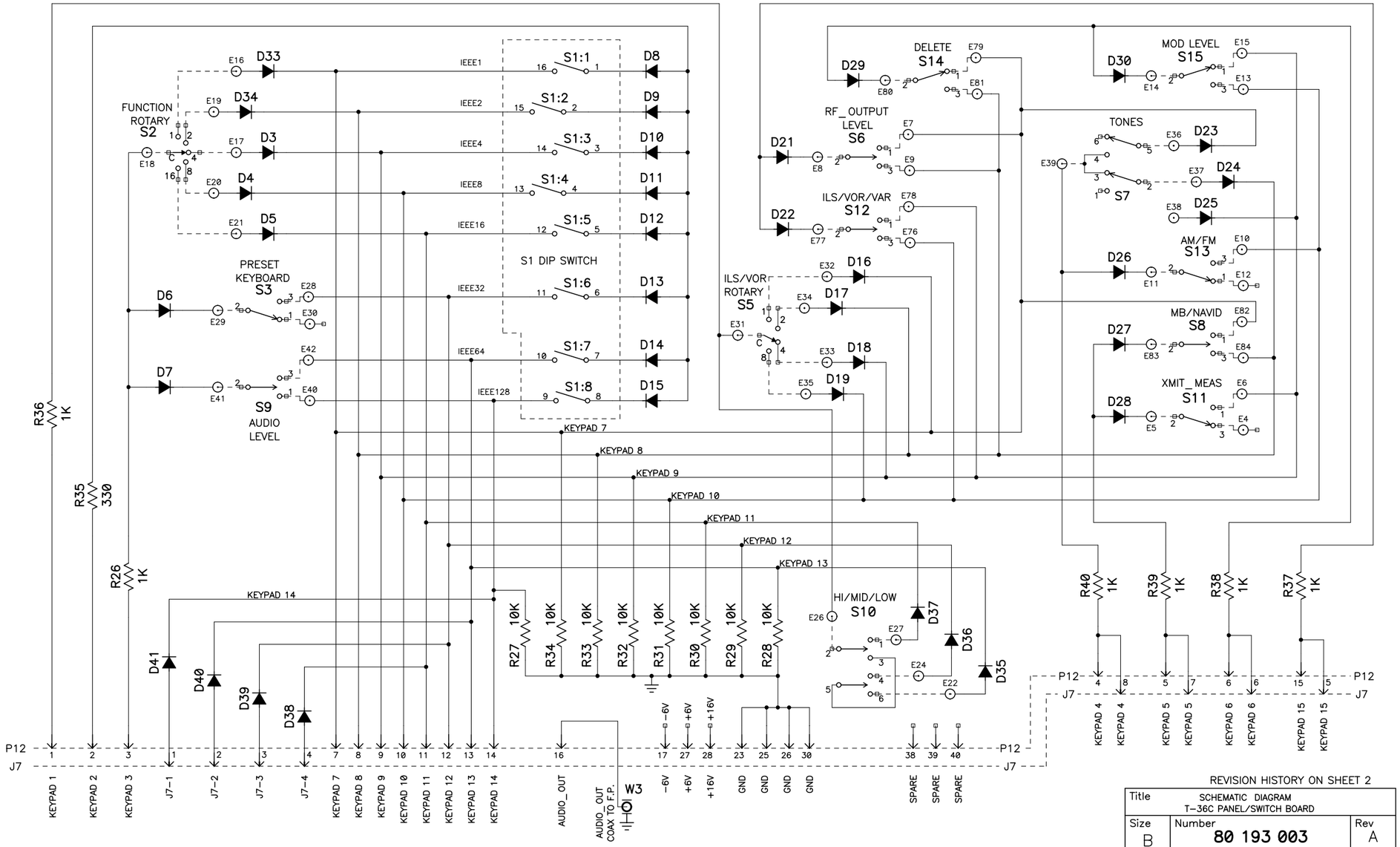
| REV | DESCRIPTION | CHG INIT | DATE | APPROVED |

| | | |
|---|---|---|
| Title | SCHEMATIC DIAGRAM<br>POWER SUPPLY PCB | |
| Size<br>B | Number<br>80 188 003 | Rev<br>A |
| Checked: J.N. 9–24–01 | Date 5–7–01 | Drawn by L.S. |
| Issued: B.R. 9–24–01 | Filename 80188003A.sch | Sheet 1 of 1 |

Mon Dec 16, 2002 09:19:24

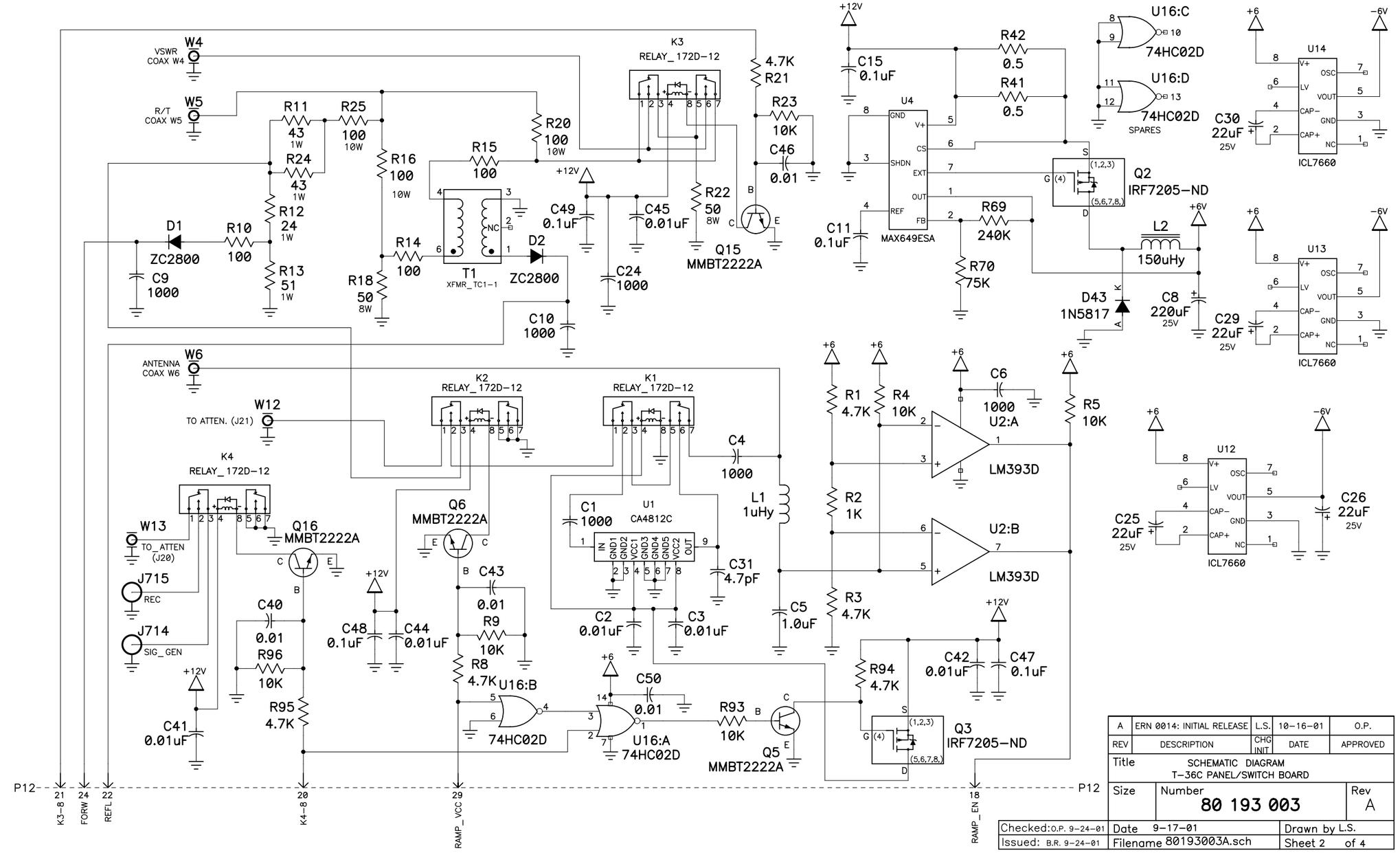



NOTE: ALL DIODE VALUES ARE MMB914

REVISION HISTORY ON SHEET 2

| | | |
|---|---|---|
| Title: SCHEMATIC DIAGRAM T-36C PANEL/SWITCH BOARD | | |
| Size: B | Number: 80 193 003 | Rev: A |
| Checked: O.P. 9-24-01 | Date: 9-17-01 | Drawn by L.S. |
| Issued: B.R. 9-24-01 | Filename 80193003A.sch | Sheet 1 of 4 |

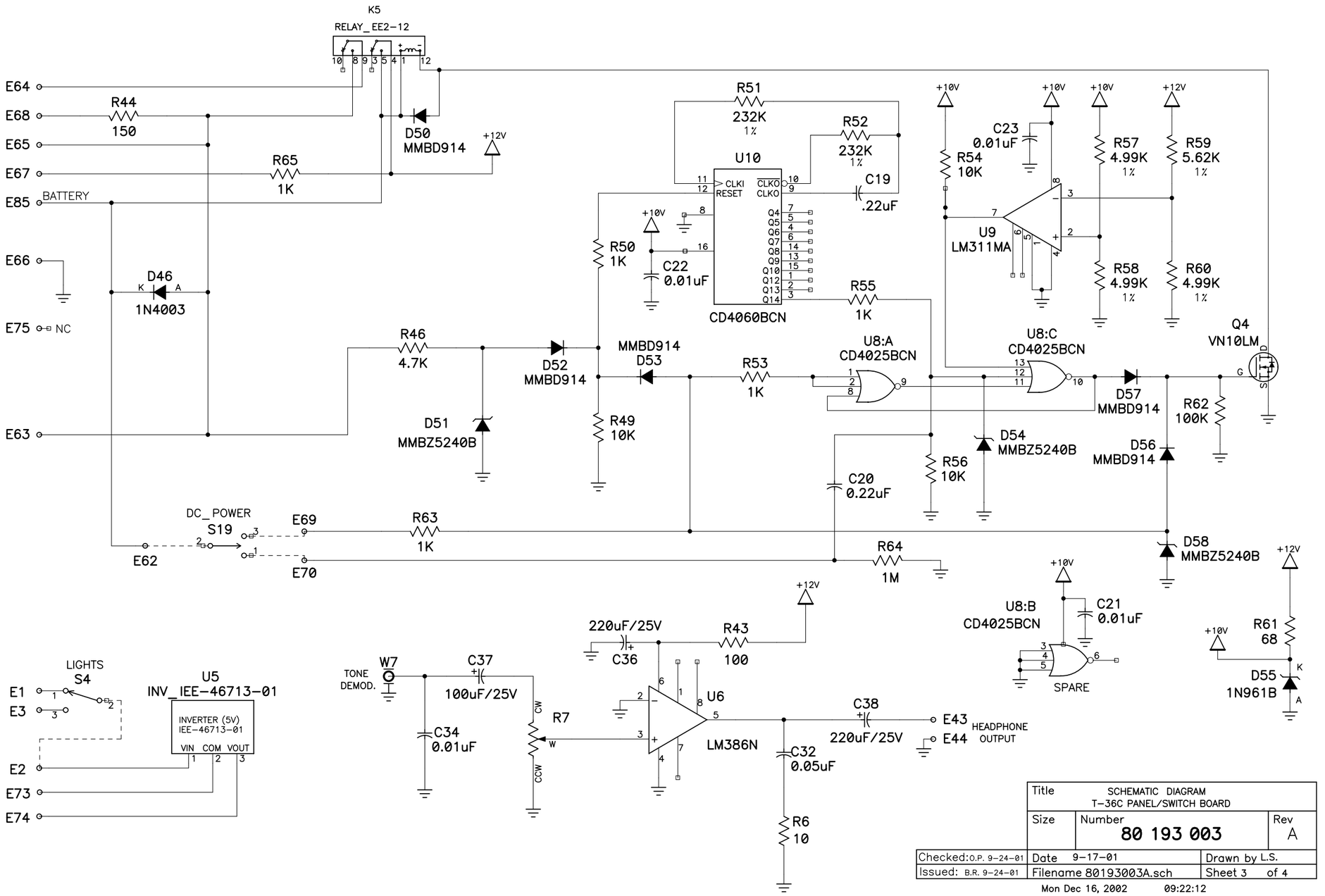
Mon Dec 16, 2002 09:21:31




| | | | | |
|---|---|---|---|---|
| A | ERN 0014: INITIAL RELEASE | L.S. | 10-16-01 | O.P. |
| REV | DESCRIPTION | CHG INIT | DATE | APPROVED |

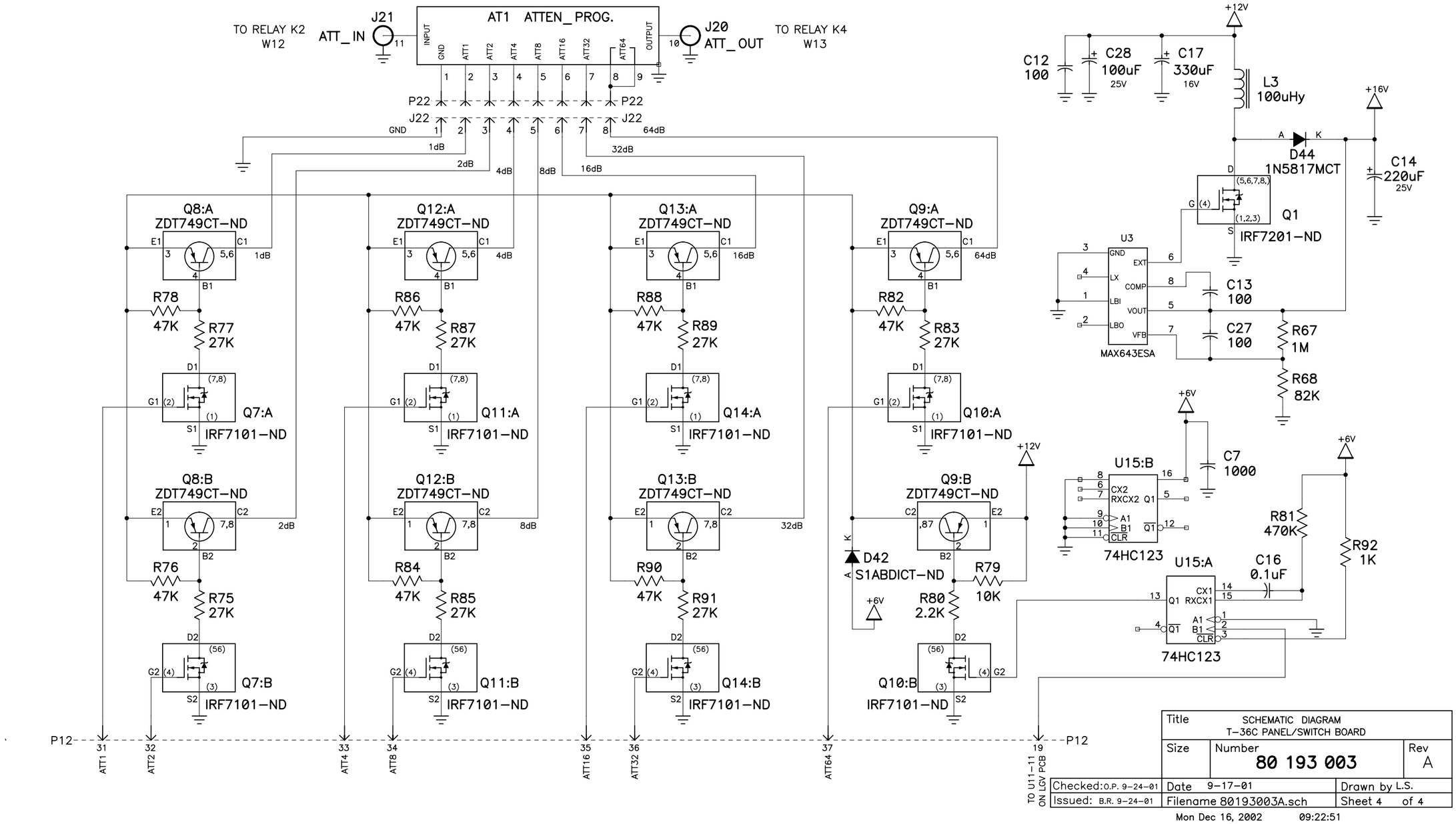
| | | | |
|---|---|---|---|
| Title | SCHEMATIC DIAGRAM T-36C PANEL/SWITCH BOARD | | |
| Size | Number 80 193 003 | | Rev A |
| Checked: O.P. 9-24-01 | Date 9-17-01 | Drawn by L.S. | |
| Issued: B.R. 9-24-01 | Filename 80193003A.sch | Sheet 2 of 4 | |

Mon Dec 16, 2002 09:21:52



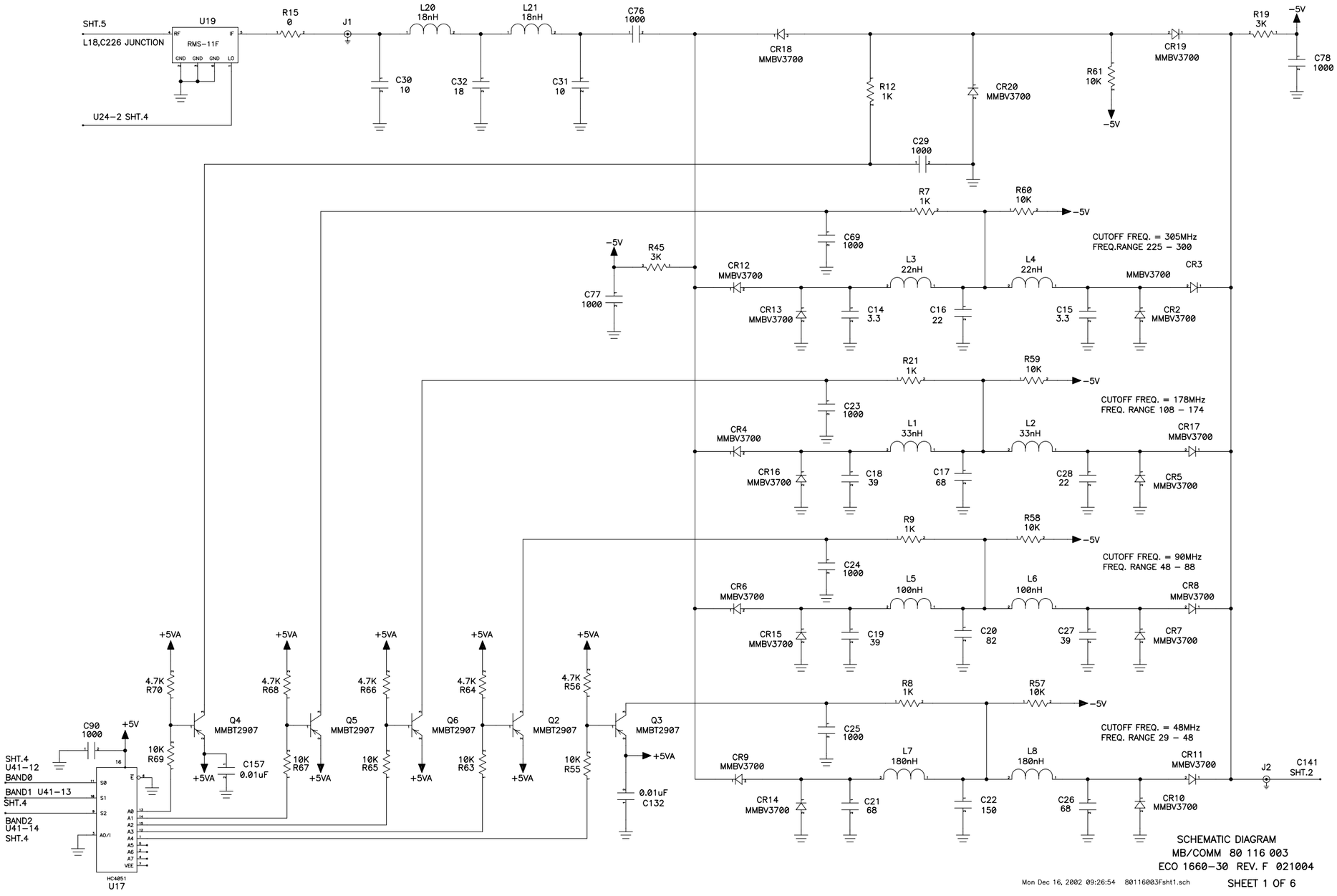

| | | |
|---|---|---|
| Title | SCHEMATIC DIAGRAM<br>T-36C PANEL/SWITCH BOARD | |
| Size | Number<br>80 193 003 | Rev<br>A |
| Checked: O.P. 9-24-01 | Date 9-17-01 | Drawn by L.S. |
| Issued: B.R. 9-24-01 | Filename 80193003A.sch | Sheet 3 of 4 |

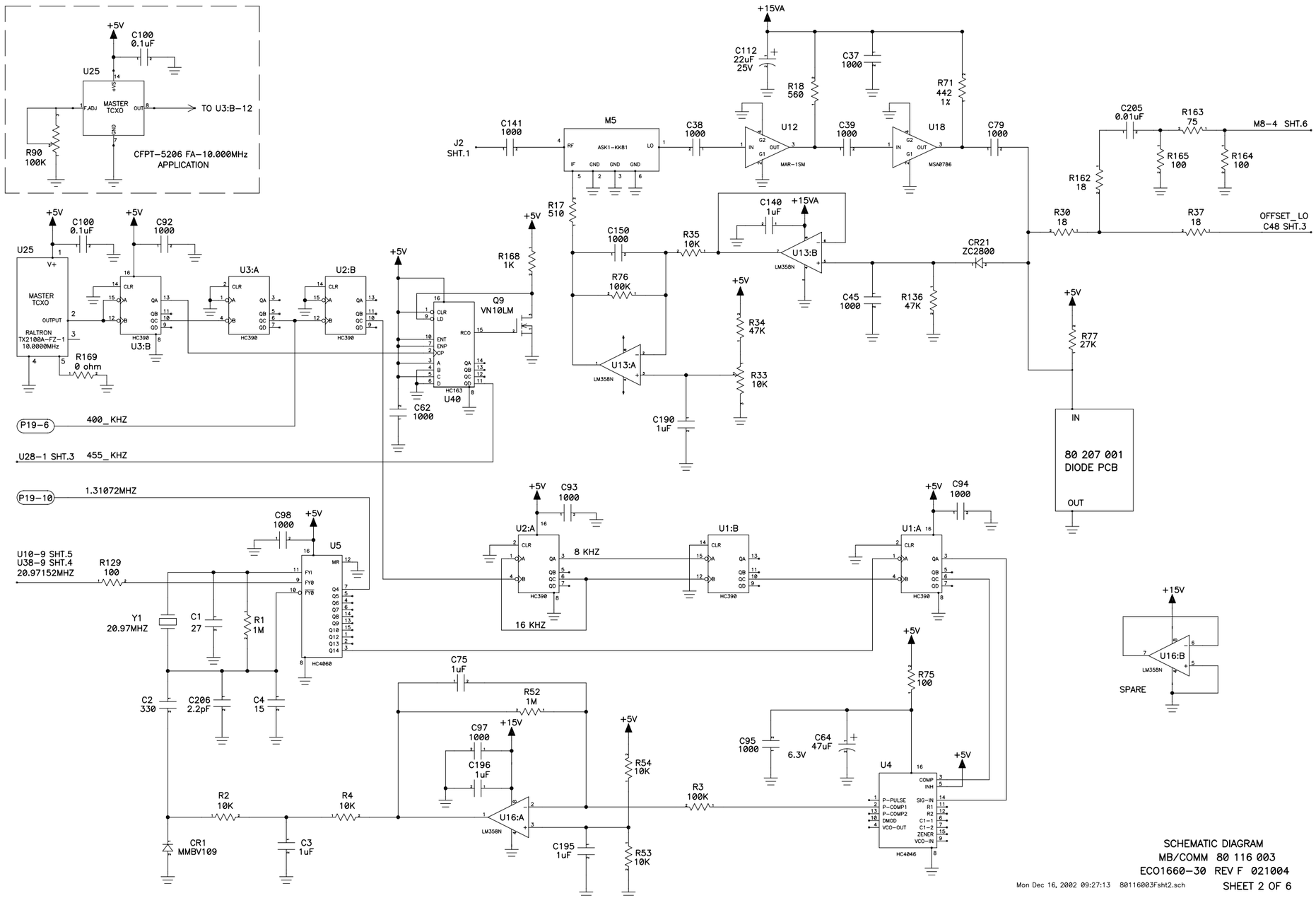
Mon Dec 16, 2002 09:22:12



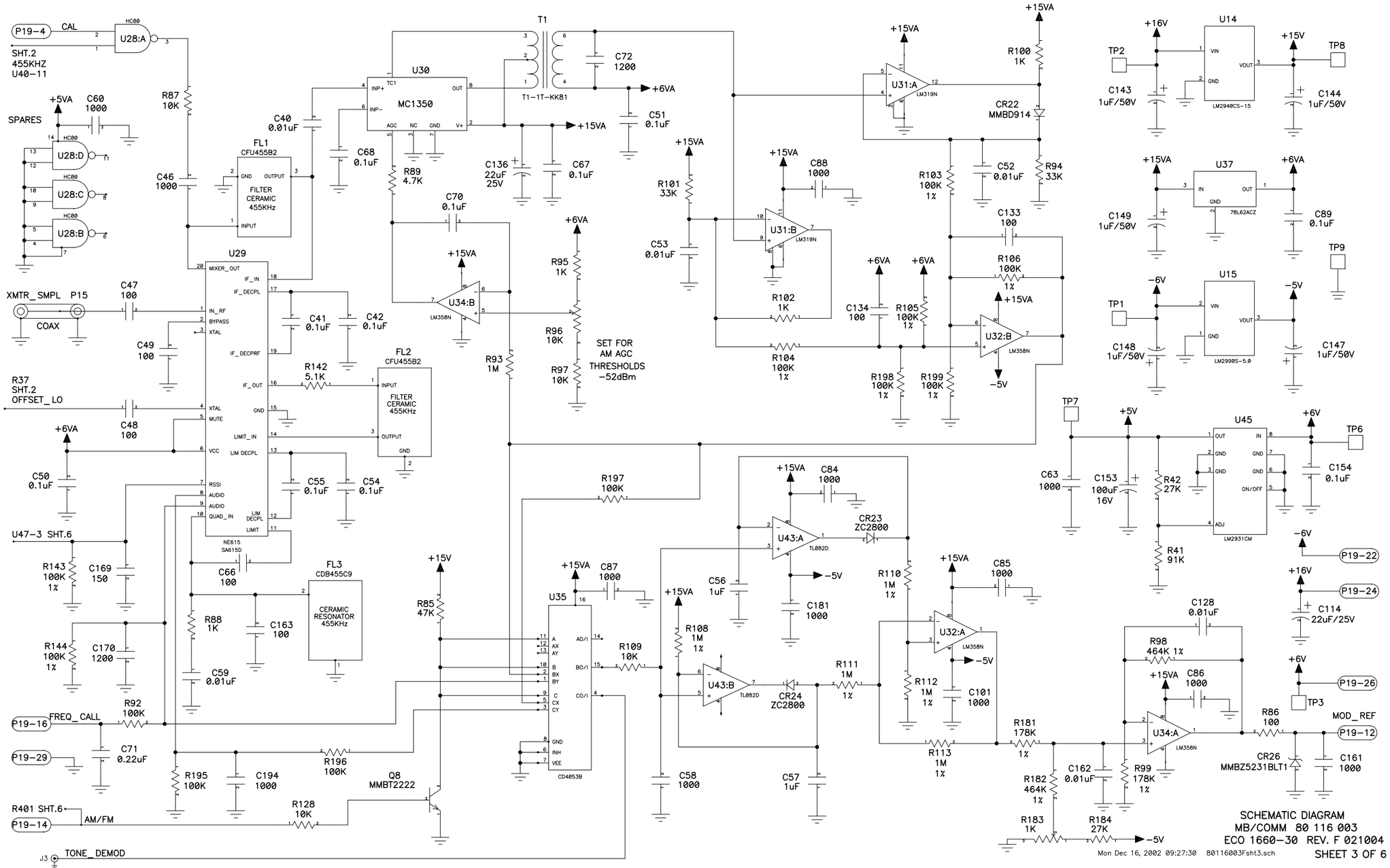

| | | |
|---|---|---|
| Title | SCHEMATIC DIAGRAM<br>T-36C PANEL/SWITCH BOARD | |
| Size | Number<br>80 193 003 | Rev<br>A |
| Checked: O.P. 9-24-01 | Date 9-17-01 | Drawn by L.S. |
| Issued: B.R. 9-24-01 | Filename 80193003A.sch | Sheet 4 of 4 |

Mon Dec 16, 2002 09:22:51

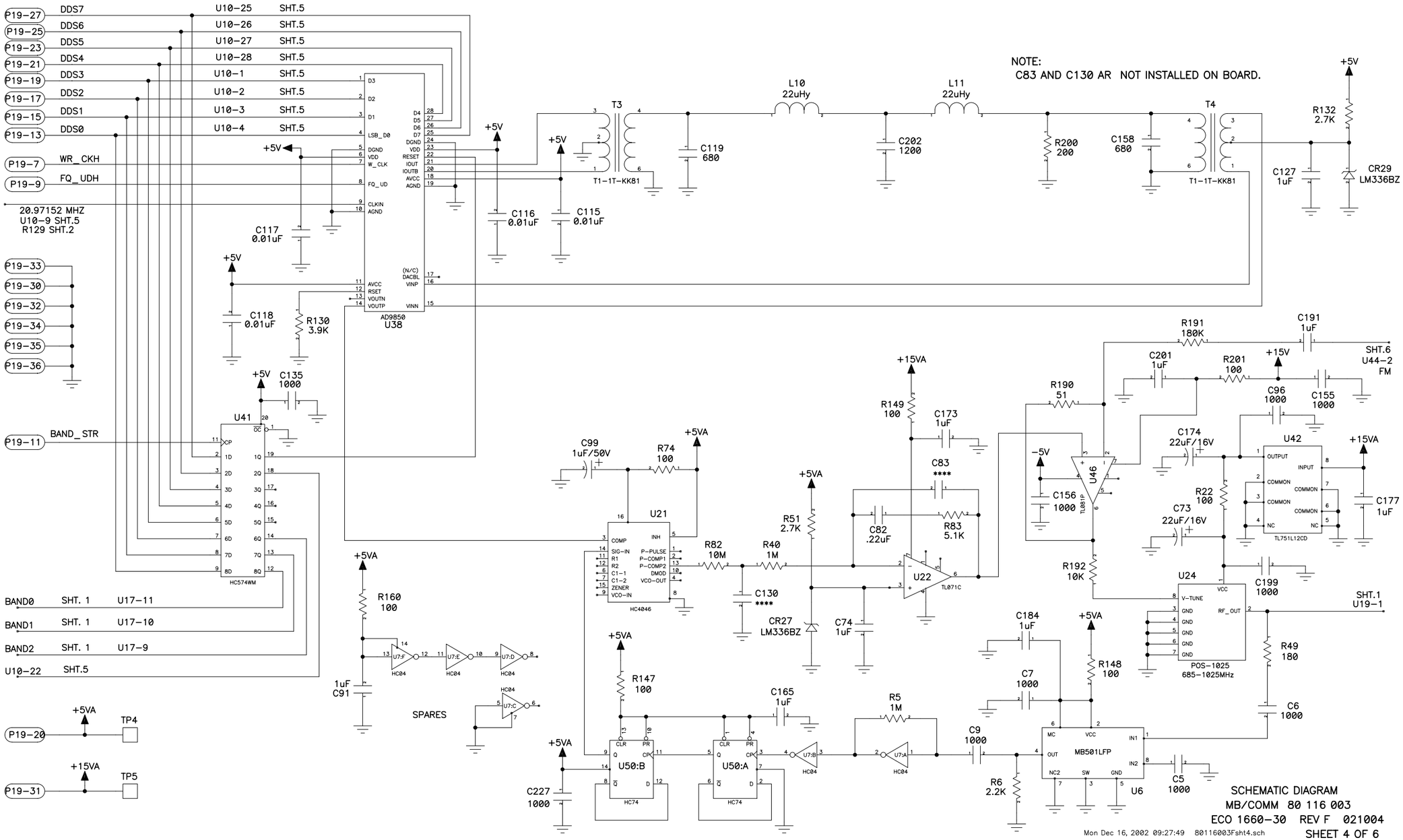

SHT.5
L18,C226 JUNCTION
U19
RF
IF
RMS-11F
GND GND GND LO
U24-2 SHT.4
R15 0
J1
L20 18nH
L21 18nH
C76 1000
C30 10
C32 18
C31 10
CR18 MMBV3700
R12 1K
CR20 MMBV3700
C29 1000
R61 10K
-5V
CR19 MMBV3700
R19 3K
-5V
C78 1000
R7 1K
R60 10K
-5V
C69 1000
CUTOFF FREQ. = 305MHz
FREQ.RANGE 225 - 300
-5V
R45 3K
C77 1000
CR12 MMBV3700
L3 22nH
L4 22nH
CR3 MMBV3700
CR13 MMBV3700
C14 3.3
C16 22
C15 3.3
CR2 MMBV3700
R21 1K
R59 10K
-5V
C23 1000
CUTOFF FREQ. = 178MHz
FREQ. RANGE 108 - 174
CR4 MMBV3700
L1 33nH
L2 33nH
CR17 MMBV3700
CR16 MMBV3700
C18 39
C17 68
C28 22
CR5 MMBV3700
R9 1K
R58 10K
-5V
C24 1000
CUTOFF FREQ. = 90MHz
FREQ. RANGE 48 - 88
CR6 MMBV3700
L5 100nH
L6 100nH
CR8 MMBV3700
CR15 MMBV3700
C19 39
C20 82
C27 39
CR7 MMBV3700
R8 1K
R57 10K
-5V
C25 1000
CUTOFF FREQ. = 48MHz
FREQ. RANGE 29 - 48
CR9 MMBV3700
L7 180nH
L8 180nH
CR11 MMBV3700
J2
C141
SHT.2
CR14 MMBV3700
C21 68
C22 150
C26 68
CR10 MMBV3700
+5VA
4.7K R70
4.7K R68
4.7K R66
4.7K R64
4.7K R56
Q4 MMBT2907
Q5 MMBT2907
Q6 MMBT2907
Q2 MMBT2907
Q3 MMBT2907
10K R69
10K R67
10K R65
10K R63
10K R55
C157 0.01uF
0.01uF C132
C90 1000
+5V
SHT.4
U41-12
BAND0
BAND1 U41-13
SHT.4
BAND2
U41-14
SHT.4
S0
S1
S2
AO/I
E
A0
A1
A2
A3
A4
A5
A6
A7
VEE
HC4051
U17
SCHEMATIC DIAGRAM
MB/COMM 80 116 003
ECO 1660-30 REV. F 021004
Mon Dec 16, 2002 09:26:54 80116003Fsht1.sch
SHEET 1 OF 6

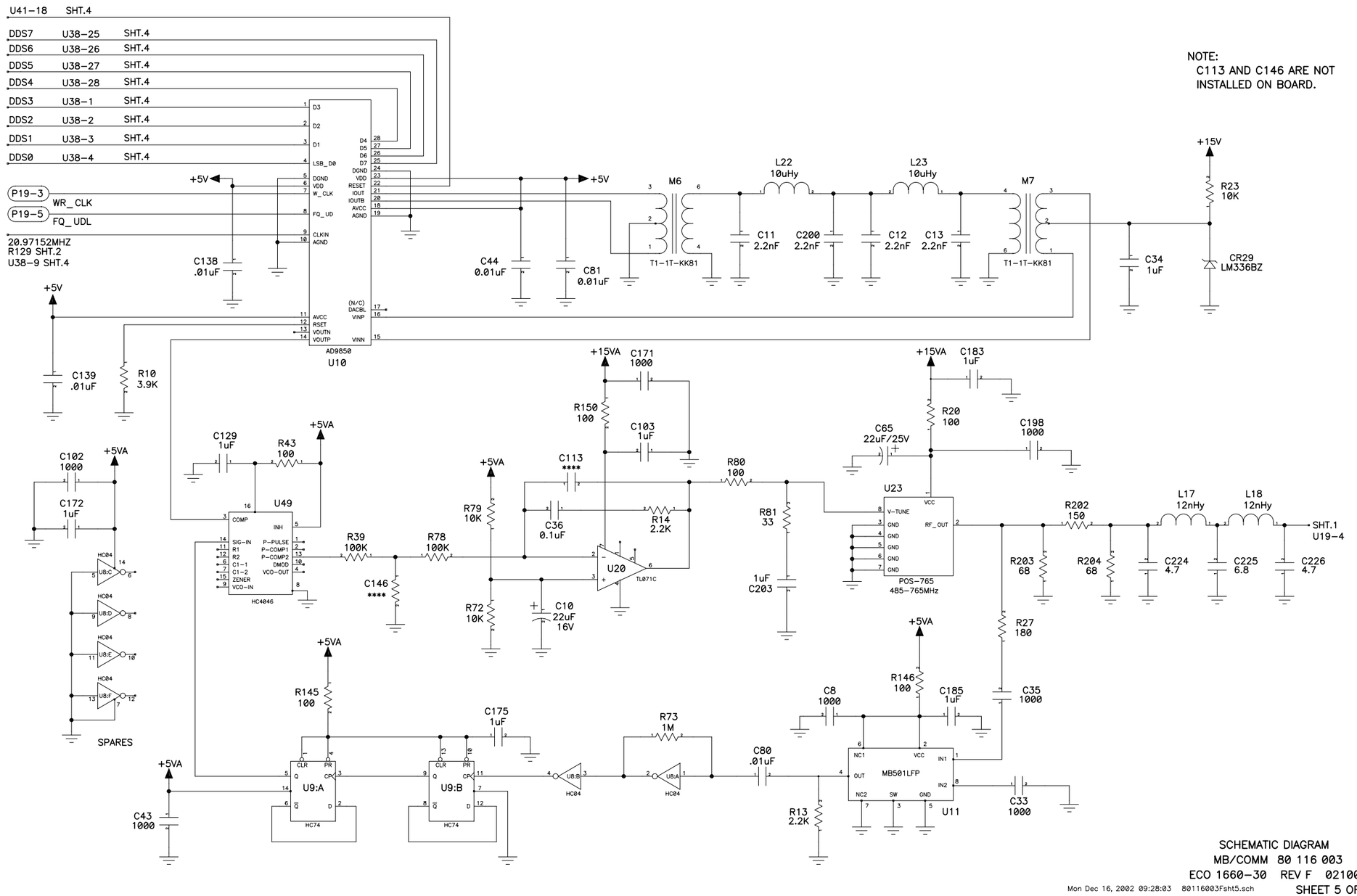



SCHEMATIC DIAGRAM
MB/COMM 80 116 003
ECO1660-30 REV F 021004
Mon Dec 16, 2002 09:27:13 80116003Fsht2.sch
SHEET 2 OF 6

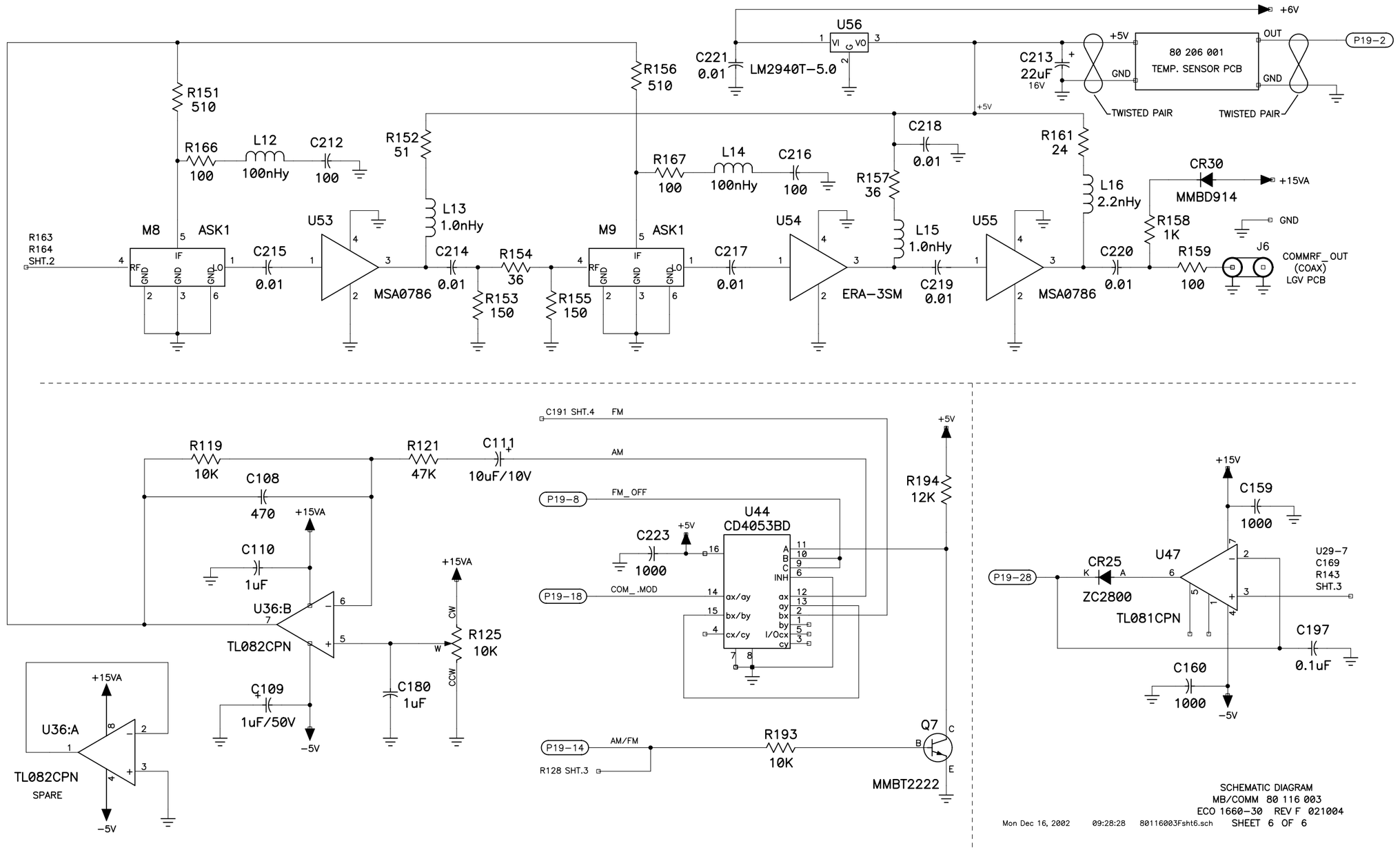


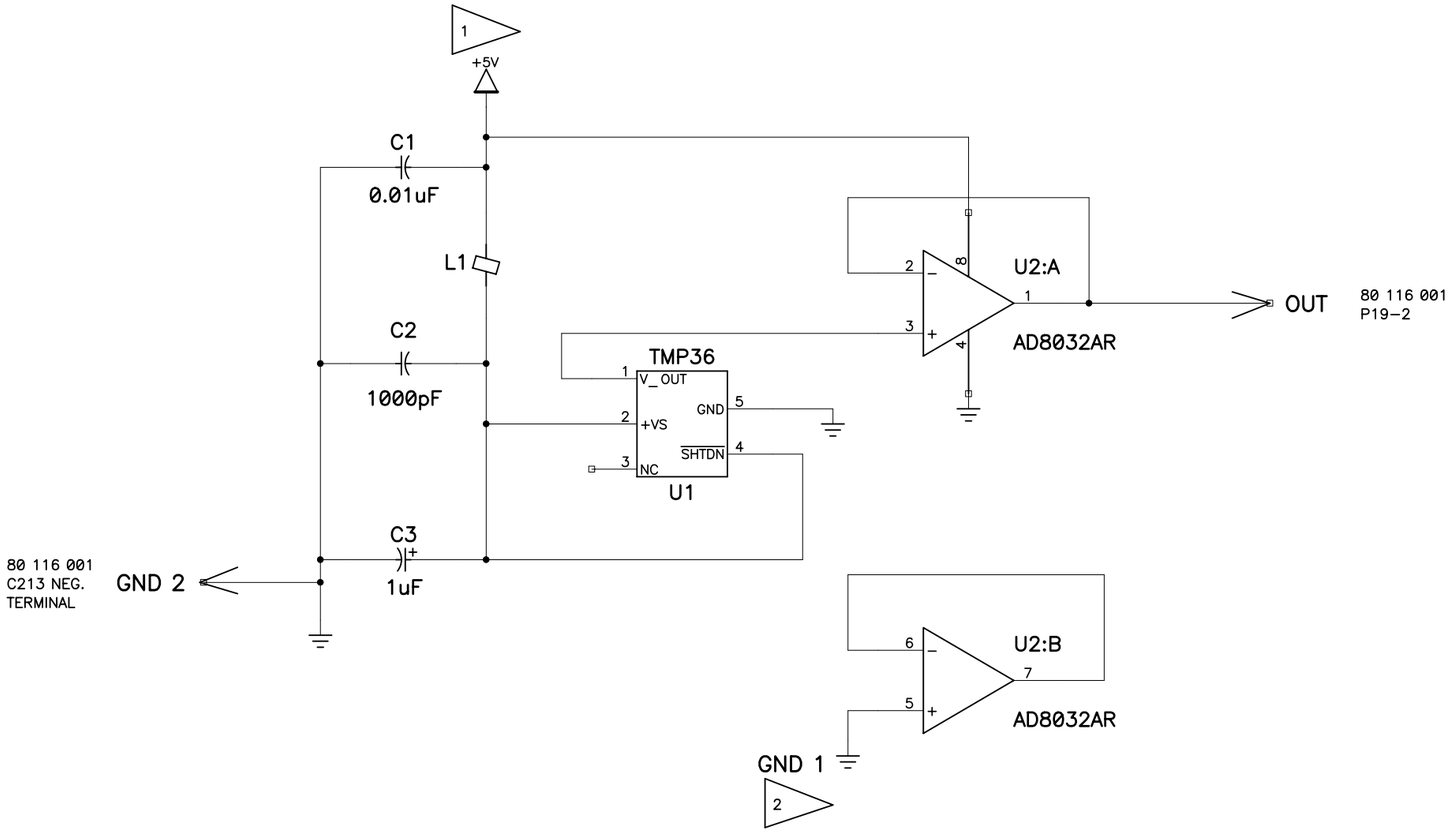

SCHEMATIC DIAGRAM
MB/COMM 80 116 003
ECO 1660-30 REV. F 021004
Mon Dec 16, 2002 09:27:30 8011600 3Fsht3.sch
SHEET 3 OF 6


NOTE:
C83 AND C130 AR NOT INSTALLED ON BOARD.
P19-27 DDS7
P19-25 DDS6
P19-23 DDS5
P19-21 DDS4
P19-19 DDS3
P19-17 DDS2
P19-15 DDS1
P19-13 DDS0
U10-25 SHT.5
U10-26 SHT.5
U10-27 SHT.5
U10-28 SHT.5
U10-1 SHT.5
U10-2 SHT.5
U10-3 SHT.5
U10-4 SHT.5
P19-7 WR_CKH
P19-9 FQ_UDH
20.97152 MHZ
U10-9 SHT.5
R129 SHT.2
AD9850
U38
T3
T4
T1-1T-KK81
L10
22uHy
L11
22uHy
C119
680
C202
1200
R200
200
C158
680
C116
0.01uF
C115
0.01uF
C117
0.01uF
C118
0.01uF
R130
3.9K
R132
2.7K
C127
1uF
CR29
LM336BZ
P19-33
P19-30
P19-32
P19-34
P19-35
P19-36
C135
1000
U41
HC574WM
P19-11 BAND_STR
BAND0 SHT. 1 U17-11
BAND1 SHT. 1 U17-10
BAND2 SHT. 1 U17-9
U10-22 SHT.5
P19-20 TP4
P19-31 TP5
C99
1uF/50V
R74
100
U21
HC4046
R82
10M
R40
1M
C130
****
R51
2.7K
CR27
LM336BZ
C74
1uF
C82
.22uF
C83
****
R83
5.1K
U22
TL071C
R160
100
U7:F
U7:E
U7:D
U7:C
HC04
1uF
C91
SPARES
R147
100
C165
1uF
U50:B
U50:A
HC74
C227
1000
R5
1M
U7:B
U7:A
+15VA
R149
100
C173
1uF
R191
180K
C191
1uF
C201
1uF
R201
100
C155
1000
C96
1000
R190
51
C156
1000
U46
TL081P
-5V
C174
22uF/16V
U42
TL751L12CD
R22
100
C73
22uF/16V
C177
1uF
R192
10K
U24
POS-1025
685-1025MHz
C199
1000
SHT.1
U19-1
C184
1uF
R148
100
C7
1000
R49
180
C6
1000
C9
1000
R6
2.2K
MB501LFP
U6
C5
1000
SCHEMATIC DIAGRAM
MB/COMM 80 116 003
ECO 1660-30 REV F 021004
Mon Dec 16, 2002 09:27:49 80116003Fsht4.sch
SHEET 4 OF 6




SCHEMATIC DIAGRAM
MB/COMM 80 116 003
ECO 1660-30 REV F 021004
Mon Dec 16, 2002 09:28:03 80116003Fsht5.sch SHEET 5 OF 6


+6V
U56
LM2940T-5.0
C221
0.01
C213
22uF
16V
+5V
GND
80 206 001
TEMP. SENSOR PCB
OUT
GND
P19-2
TWISTED PAIR
TWISTED PAIR
R151
510
R156
510
R166
100
L12
100nHy
C212
100
R152
51
R167
100
L14
100nHy
C216
100
C218
0.01
R161
24
R157
36
L16
2.2nHy
CR30
MMBD914
+15VA
R158
1K
GND
J6
COMMRF_ OUT
(COAX)
LGV PCB
R159
100
C220
0.01
L13
1.0nHy
L15
1.0nHy
R163
R164
SHT.2
M8
ASK1
M9
ASK1
U53
U54
U55
C215
0.01
C214
0.01
R154
36
C217
0.01
C219
0.01
R153
150
R155
150
MSA0786
ERA-3SM
MSA0786
C191 SHT.4
FM
AM
R119
10K
C108
470
R121
47K
C111
10uF/10V
P19-8
FM_OFF
U44
CD4053BD
C223
1000
R194
12K
+15VA
C110
1uF
U36:B
TL082CPN
R125
10K
CW
CCW
C109
1uF/50V
C180
1uF
-5V
P19-18
COM_.MOD
P19-14
AM/FM
R128 SHT.3
R193
10K
Q7
MMBT2222
U36:A
TL082CPN
SPARE
C159
1000
U47
TL081CPN
CR25
ZC2800
P19-28
U29-7
C169
R143
SHT.3
C197
0.1uF
C160
1000
SCHEMATIC DIAGRAM
MB/COMM 80 116 003
ECO 1660-30 REV F 021004
Mon Dec 16, 2002 09:28:28 80116003Fsht6.sch SHEET 6 OF 6




NOTES:

1. +5V CONNECTION COMES FROM POSITIVE TERMINAL OF C213 (ON 80 116 001)
2. GND 1 CONNECTION COMES FROM NEGATIVE TERMINAL OF C183–2 (ON 80 116 001)

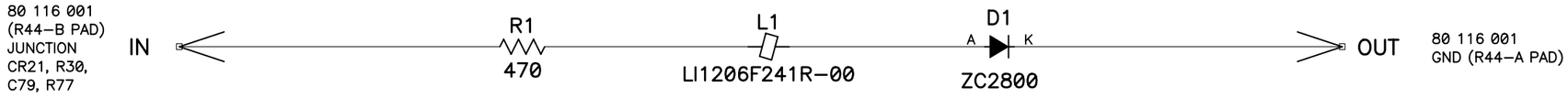
| REV | DESCRIPTION | CHG INIT | DATE | APPROVED |
|---|---|---|---|---|
| A | ECO 1660–42: SEE ECO FOR CHGS | L.S. | 021004 | B.R. |

SCHEMATIC DIAGRAM
TEMP. SENSOR

80 206 003 A

Checked: B.R. 021004
Issued: B.R. 021004

020923
80206003A.sch
1 1
L.S.
Mon Dec 16, 2002 09:24:38

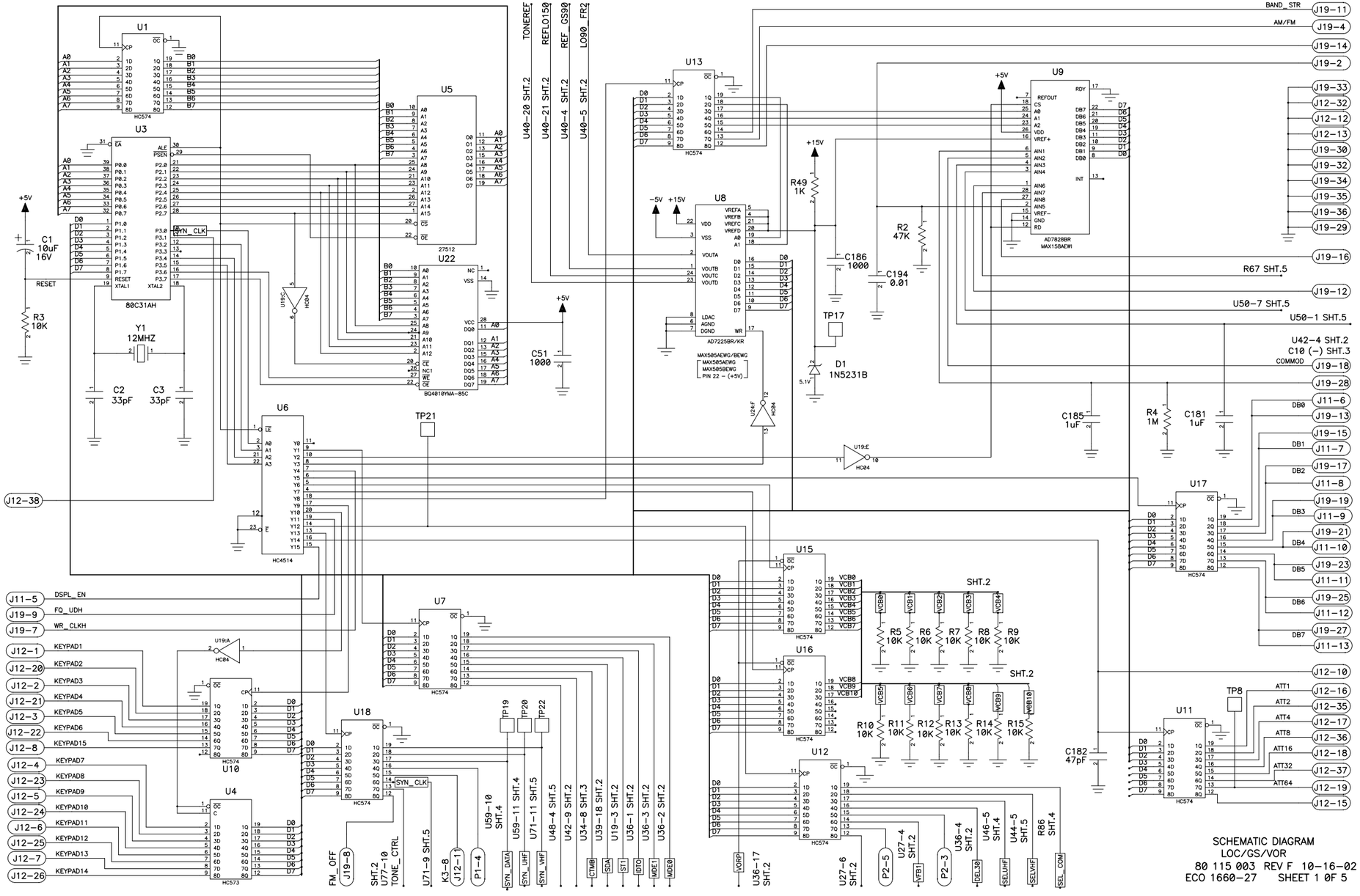


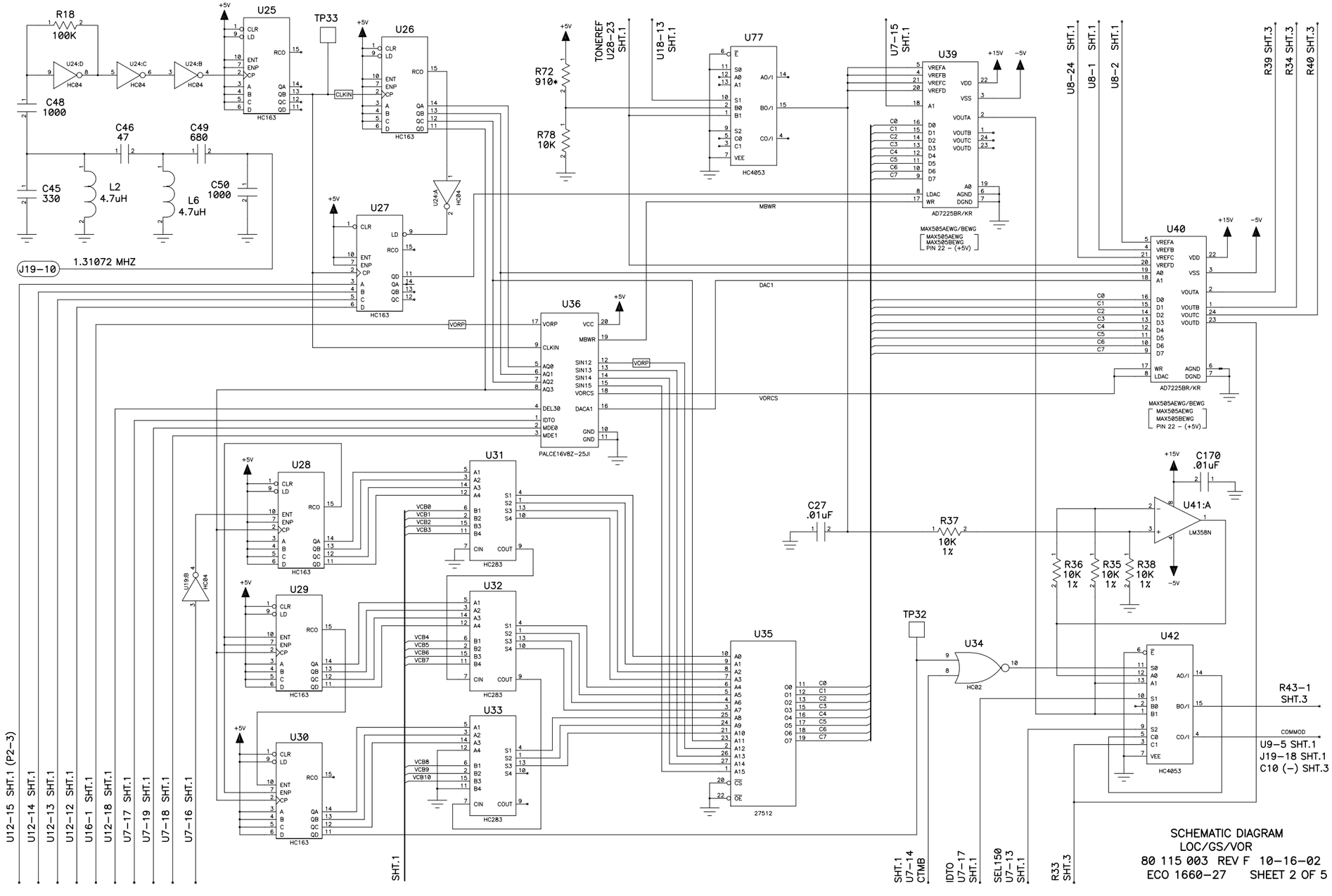

| REV | DESCRIPTION | CHG INIT | DATE | APPROVED |
|---|---|---|---|---|
| A | ECO 1660–38: INITIAL REL. | L.S. | 021004 | B.R. |

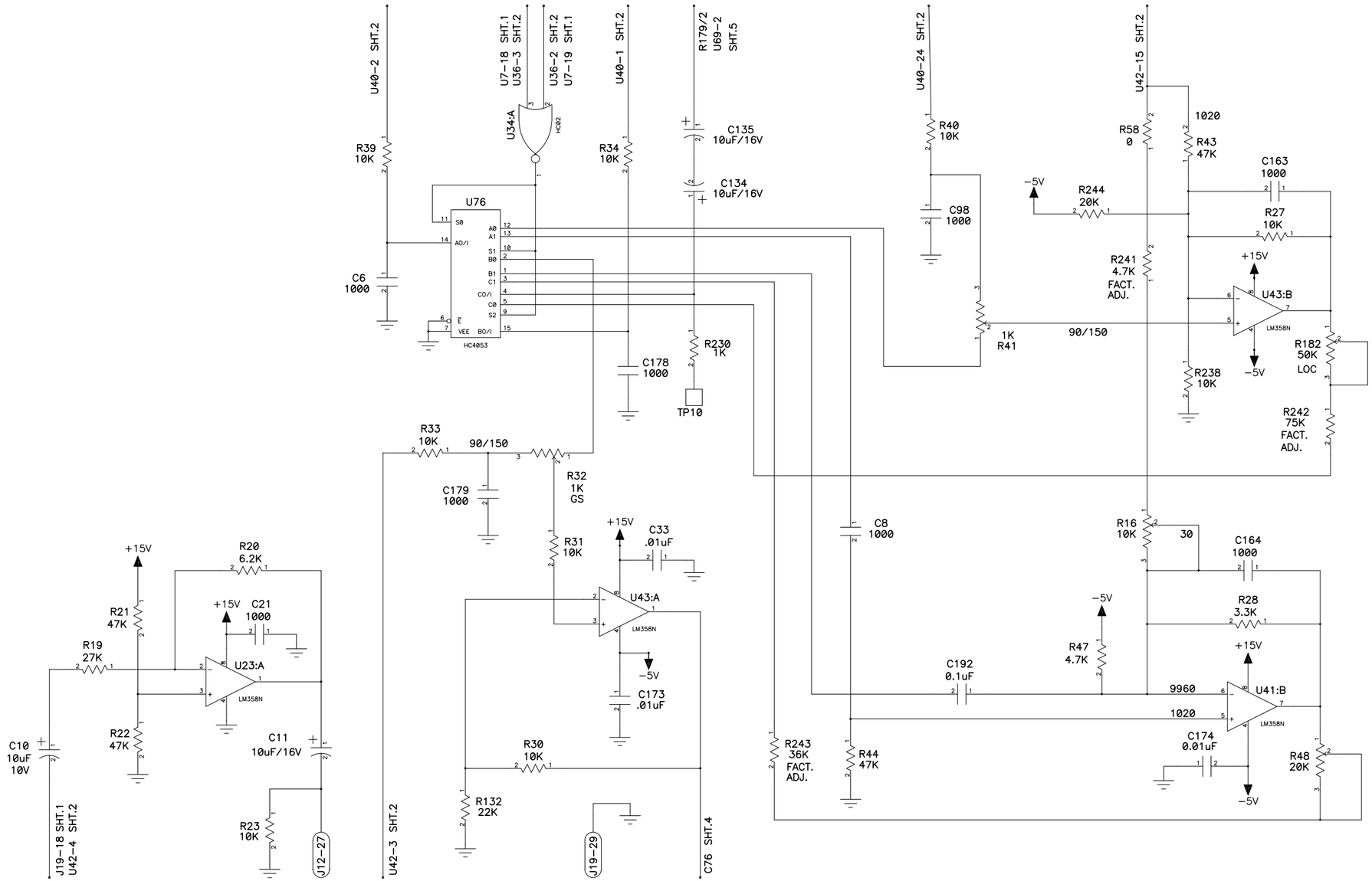
SCHEMATIC DIAGRAM
DIODE BOARD

80 207 003 A

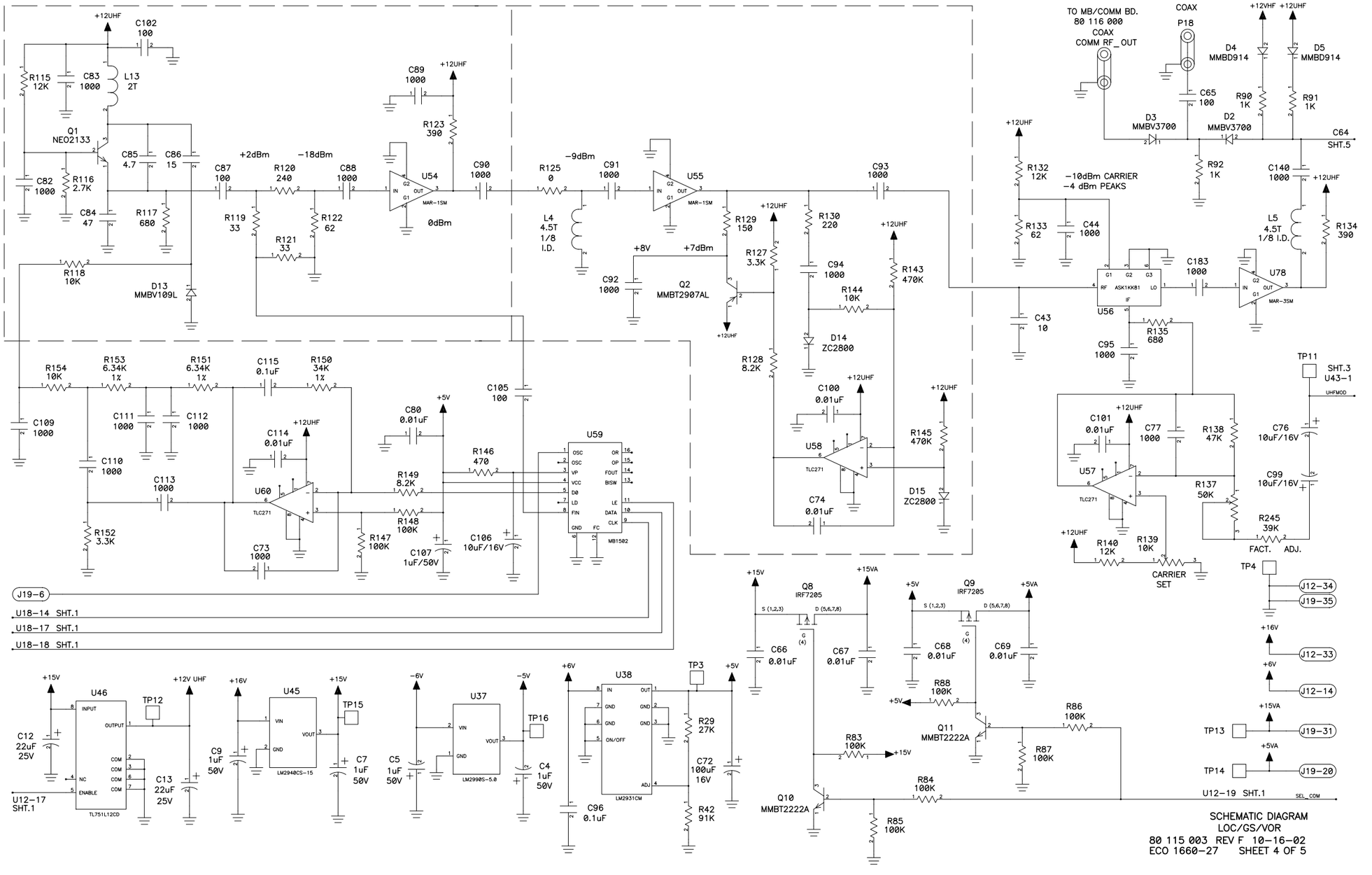
| | | | |
|---|---|---|---|
| Checked: B.R. 021004 | 020923 | | L.S. |
| Issued: B.R. 021004 | 80207003A.sch | 1 | 1 |
| | Mon Dec 16, 2002 09:25:23 | | |

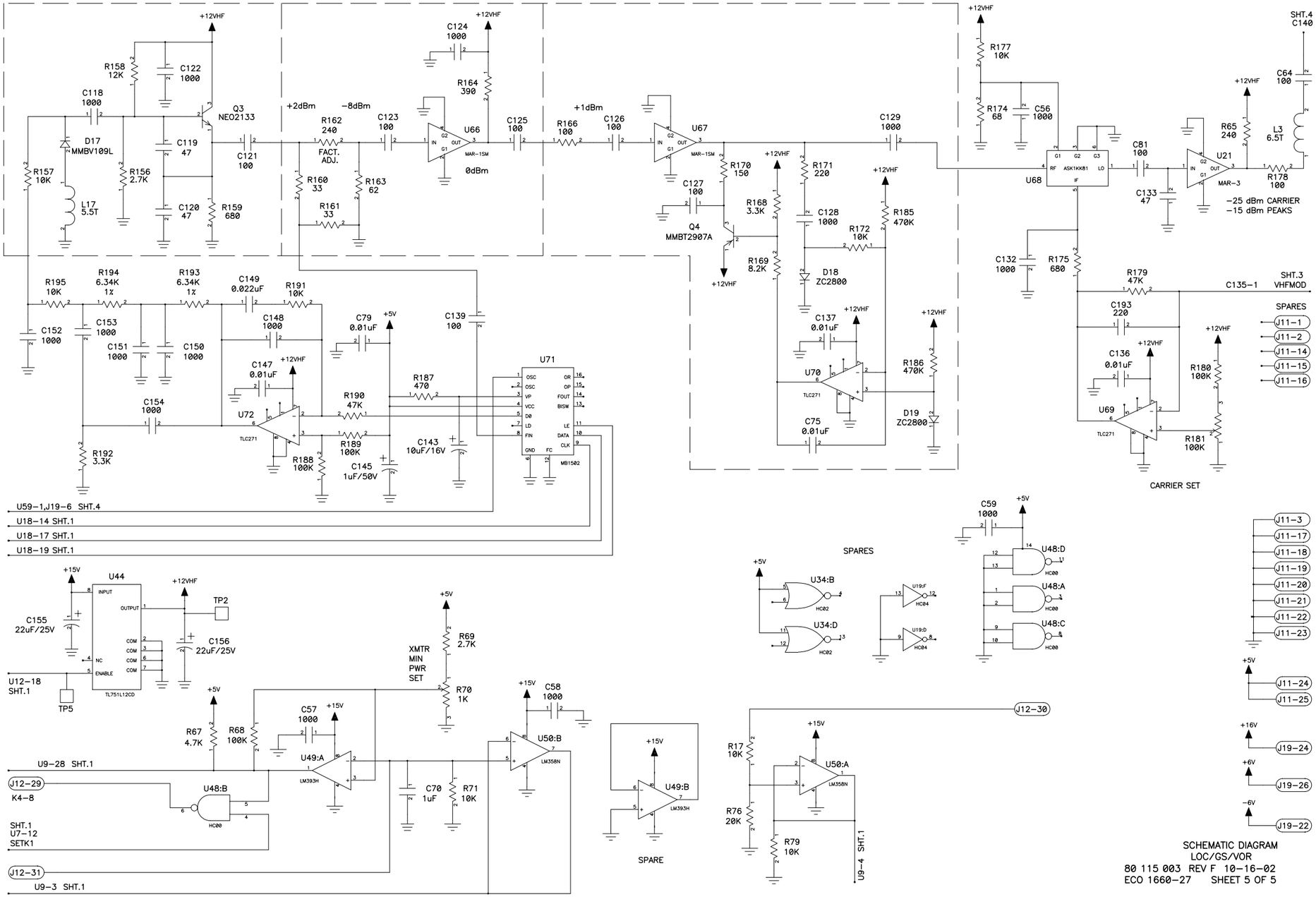

TONEREF
REFLO150
REF_GS90
LO90_FR2
U40-20 SHT.2
U40-21 SHT.2
U40-4 SHT.2
U40-5 SHT.2
U1
U3
U5
U22
U13
U8
U9
U6
U7
U18
U4
U10
U15
U16
U12
U17
U11
80C31AH
27512
BQ4010YMA-85C
AD7225BR/KR
MAX585AEWG/BEWG
MAX585AEWG
MAX585BEWG
PIN 22 - (+5V)
AD7828BR
MAX158AEWI
HC574
HC573
HC4514
HC04
C1 10uF 16V
R3 10K
Y1 12MHZ
C2 33pF
C3 33pF
C51 1000
R49 1K
R2 47K
C186 1000
C194 0.01
TP17
D1 1N5231B
5.1V
C185 1uF
R4 1M
C181 1uF
C182 47pF
TP21
TP19
TP20
TP22
TP8
R5 10K
R6 10K
R7 10K
R8 10K
R9 10K
R10 10K
R11 10K
R12 10K
R13 10K
R14 10K
R15 10K
SHT.2
SYN_CLK
RESET
BAND_STR
AM/FM
R67 SHT.5
U50-7 SHT.5
U50-1 SHT.5
U42-4 SHT.2
C10 (-) SHT.3
COMMOD
DB0
DB1
DB2
DB3
DB4
DB5
DB6
DB7
ATT1
ATT2
ATT4
ATT8
ATT16
ATT32
ATT64
J19-11
J19-4
J19-14
J19-2
J19-33
J12-32
J12-12
J12-13
J19-30
J19-32
J19-34
J19-35
J19-36
J19-29
J19-16
J19-12
J19-18
J19-28
J11-6
J19-13
J19-15
J11-7
J19-17
J11-8
J19-19
J11-9
J19-21
J11-10
J19-23
J11-11
J19-25
J11-12
J19-27
J11-13
J12-10
J12-16
J12-35
J12-17
J12-36
J12-18
J12-37
J12-19
J12-15
J12-38
J11-5 DSPL_EN
J19-9 FQ_UDH
J19-7 WR_CLKH
J12-1 KEYPAD1
J12-20 KEYPAD2
J12-2 KEYPAD3
J12-21 KEYPAD4
J12-3 KEYPAD5
J12-22 KEYPAD6
J12-8 KEYPAD15
J12-4 KEYPAD7
J12-23 KEYPAD8
J12-5 KEYPAD9
J12-24 KEYPAD10
J12-6 KEYPAD11
J12-25 KEYPAD12
J12-7 KEYPAD13
J12-26 KEYPAD14
FM_OFF J19-8
SHT.2 U77-10 TONE_CTRL
U71-9 SHT.5
K3-8 J12-11
P1-4
SYN_DATA
SYN_UHF
SYN_VHF
U59-10 SHT.4
U59-11 SHT.4
U71-11 SHT.5
U48-4 SHT.5
U42-9 SHT.2
U34-8 SHT.3
U39-18 SHT.2
U19-3 SHT.2
U36-1 SHT.2
U36-3 SHT.2
U36-2 SHT.2
CTMB
SDA
ST1
DTO
MDE1
MDE0
VORP
U36-17 SHT.2
U27-6 SHT.2
P2-5
U27-4 SHT.2
VFB1
P2-3
U36-4 SHT.2
DEL30
U46-5 SHT.4
U44-5 SHT.5
SELUHF
SELVHF
R86 SHT.4
SEL_COM
SCHEMATIC DIAGRAM
LOC/GS/VOR
80 115 003 REV F 10-16-02
ECO 1660-27 SHEET 1 0F 5


R18
100K
U24:D
U24:C
U24:B
HC04
U25
U26
HC163
TP33
CLKIN
C48
1000
C46
47
C49
680
C45
330
L2
4.7uH
L6
4.7uH
C50
1000
J19–10
1.31072 MHZ
U27
U24:A
U19:B
U28
U29
U30
U31
U32
U33
U36
PALCE16V8Z–25JI
VORP
MBWR
DAC1
VORCS
R72
910*
R78
10K
TONEREF
U28–23
SHT.1
U18–13
SHT.1
U77
HC4053
U39
AD7225BR/KR
MAX505AEWG/BEWG
MAX505AEWG
MAX505BEWG
PIN 22 – (+5V)
U7–15
SHT.1
U40
U8–24
SHT.1
U8–1
SHT.1
U8–2
SHT.1
R39 SHT.3
R34 SHT.3
R40 SHT.3
+15V
–5V
C170
.01uF
U41:A
LM358N
C27
.01uF
R37
10K
1%
R36
10K
1%
R35
10K
1%
R38
10K
1%
TP32
U34
HC02
U35
27512
U42
R43–1
SHT.3
COMMOD
U9–5 SHT.1
J19–18 SHT.1
C10 (–) SHT.3
U12–15 SHT.1 (P2–3)
U12–14 SHT.1
U12–13 SHT.1
U12–12 SHT.1
U16–1 SHT.1
U12–18 SHT.1
U7–17 SHT.1
U7–19 SHT.1
U7–18 SHT.1
U7–16 SHT.1
SHT.1
SHT.1
U7–14
CTMB
IDTO
U7–17
SHT.1
SEL150
U7–13
SHT.1
R33
SHT.3
SCHEMATIC DIAGRAM
LOC/GS/VOR
80 115 003 REV F 10–16–02
ECO 1660–27 SHEET 2 OF 5




SCHEMATIC DIAGRAM
LOC/GS/VOR
80 115 003 REV F 10-16-02
ECO 1660-27 SHEET 3 OF 5

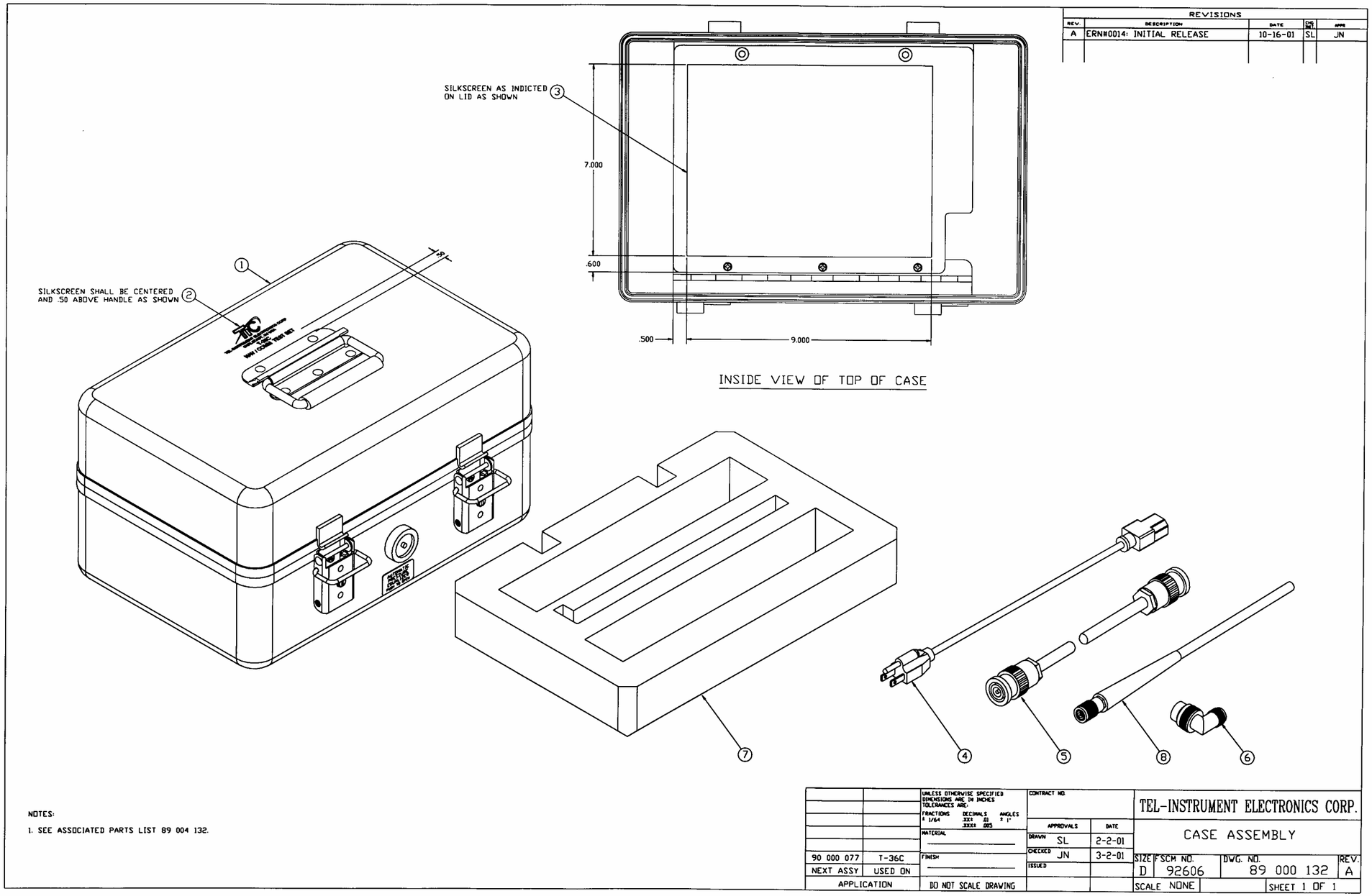

+12UHF
C102 100
R115 12K
C83 1000
L13 2T
Q1 NEO2133
C82 1000
R116 2.7K
C84 47
C85 4.7
C86 15
R117 680
R118 10K
D13 MMBV109L
C87 100
+2dBm
R120 240
−18dBm
C88 1000
R119 33
R121 33
R122 62
C89 1000
+12UHF
R123 390
U54
MAR−1SM
0dBm
C90 1000
R125 0
−9dBm
L4 4.5T 1/8 I.D.
C91 1000
U55
MAR−1SM
C92 1000
+8V
+7dBm
Q2 MMBT2907AL
R129 150
+12UHF
R127 3.3K
R128 8.2K
C93 1000
R130 220
+12UHF
C94 1000
R144 10K
R143 470K
D14 ZC2800
C100 0.01uF
+12UHF
U58
TLC271
C74 0.01uF
R145 470K
+12UHF
D15 ZC2800
TO MB/COMM BD. 80 116 000 COAX COMM RF_OUT
COAX P18
+12VHF +12UHF
D4 MMBD914
D5 MMBD914
C65 100
R90 1K
R91 1K
D3 MMBV3700
D2 MMBV3700
C64 SHT.5
+12UHF
R132 12K
−10dBm CARRIER
−4 dBm PEAKS
R92 1K
C140 1000
+12UHF
R133 62
C44 1000
L5 4.5T 1/8 I.D.
R134 390
G1 G2 G3
RF ASK1KKB1 LO
IF
U56
C183 1000
U78
MAR−3SM
C43 10
R135 680
C95 1000
TP11
SHT.3 U43−1
UHFMOD
+12UHF
C101 0.01uF
C77 1000
R138 47K
C76 10uF/16V
U57
TLC271
C99 10uF/16V
R137 50K
R245 39K
FACT. ADJ.
+12UHF
R140 12K
R139 10K
CARRIER SET
TP4
J12−34
J19−35
+16V
J12−33
+6V
J12−14
+15VA
TP13
J19−31
+5VA
TP14
J19−20
U12−19 SHT.1
SEL_COM
R154 10K
R153 6.34K 1%
R151 6.34K 1%
C115 0.1uF
R150 34K 1%
C109 1000
C111 1000
C112 1000
C110 1000
C113 1000
R152 3.3K
C114 0.01uF
+12UHF
U60
TLC271
C73 1000
C105 100
+5V
C80 0.01uF
R146 470
R149 8.2K
R148 100K
R147 100K
C107 1uF/50V
C106 10uF/16V
U59
OSC OSC VP VCC DØ LD FIN
OR OP FOUT BISW LE DATA CLK FC
GND
MB1502
J19−6
U18−14 SHT.1
U18−17 SHT.1
U18−18 SHT.1
+15V
U46
INPUT
OUTPUT
COM COM COM COM
NC
ENABLE
TL751L12CD
C12 22uF 25V
TP12
+12V UHF
C13 22uF 25V
U12−17 SHT.1
+16V
U45
VIN
VOUT
GND
LM2940CS−15
C9 1uF 50V
TP15
+15V
C7 1uF 50V
−6V
U37
VIN
VOUT
GND
LM2990S−5.0
C5 1uF 50V
−5V
TP16
C4 1uF 50V
+6V
U38
IN
GND GND GND
ON/OFF
OUT
GND GND
ADJ
LM2931CM
C96 0.1uF
TP3
+5V
R29 27K
C72 100uF 16V
R42 91K
+15V
+15VA
Q8 IRF7205
S (1,2,3)
D (5,6,7,8)
G (4)
C66 0.01uF
C67 0.01uF
+5V
+5VA
Q9 IRF7205
C68 0.01uF
C69 0.01uF
R88 100K
+5V
Q11 MMBT2222A
R86 100K
R87 100K
R83 100K
+15V
R84 100K
Q10 MMBT2222A
R85 100K
SCHEMATIC DIAGRAM
LOC/GS/VOR
80 115 003 REV F 10−16−02
ECO 1660−27 SHEET 4 OF 5




SCHEMATIC DIAGRAM
LOC/GS/VOR
80 115 003 REV F 10−16−02
ECO 1660−27 SHEET 5 OF 5

# CHAPTER VI

## ILLUSTRATED PARTS BREAKDOWN
## PARTS LIST




REVISIONS

| REV. | DESCRIPTION | DATE | BY | APP'D |
|---|---|---|---|---|
| A | ERN#0014: INITIAL RELEASE | 10-16-01 | SL | JN |

| | |
|---|---|
| 90 000 077 | T-36C |
| NEXT ASSY | USED ON |
| APPLICATION | |

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ± 1/64 DECIMALS .XX± .01 .XXX± .005 ANGLES ± 1°
MATERIAL
FINISH
DO NOT SCALE DRAWING

CONTRACT NO.

| APPROVALS | DATE |
|---|---|
| DRAWN SL | 2-2-01 |
| CHECKED JN | 3-2-01 |
| ISSUED | |

TEL-INSTRUMENT ELECTRONICS CORP.

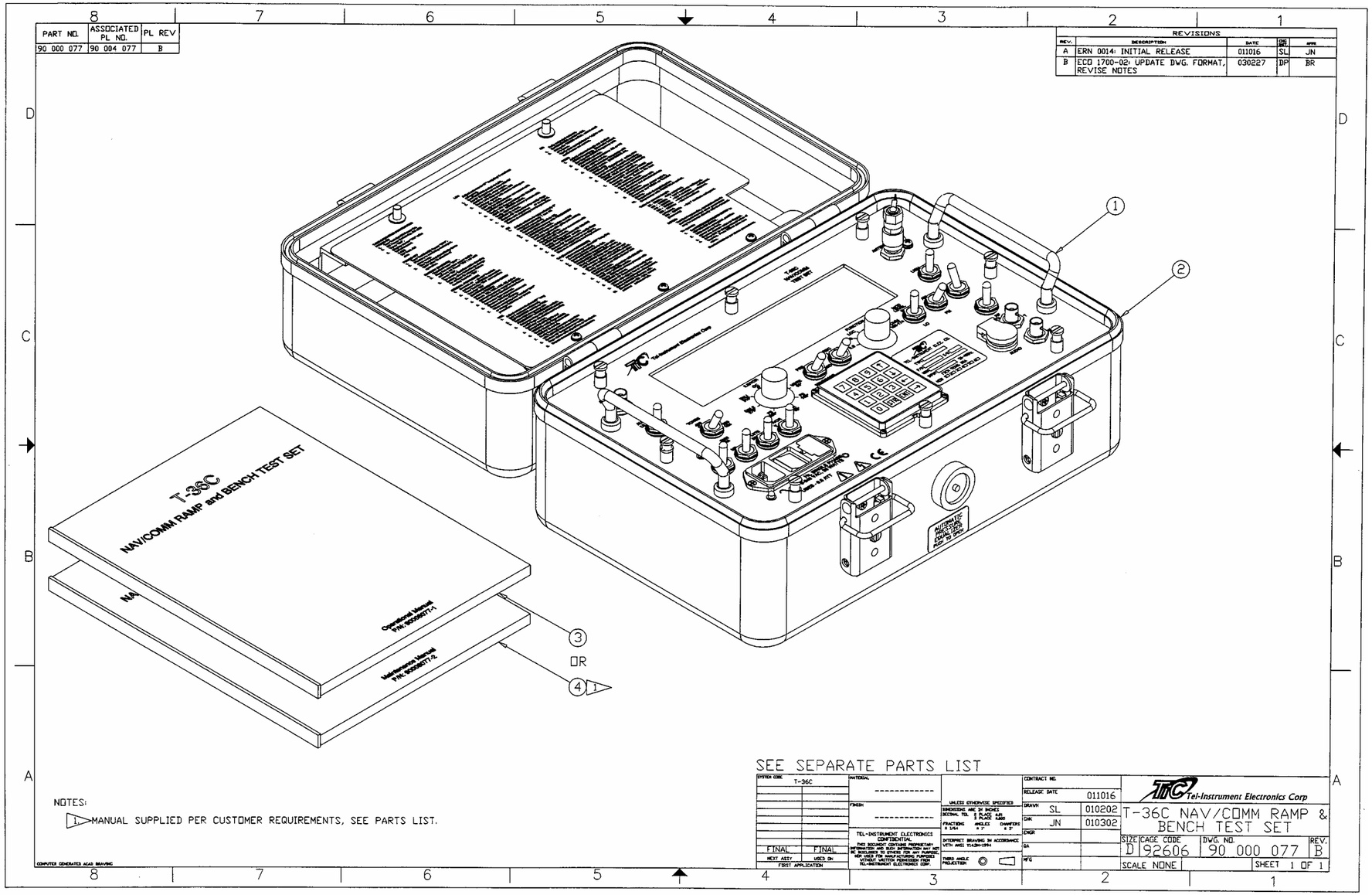
CASE ASSEMBLY

| SIZE | FSCM NO. | DWG. NO. | REV. |
|---|---|---|---|
| D | 92606 | 89 000 132 | A |

SCALE NONE SHEET 1 OF 1

Figure 6-1

| Case Assembly | | | 89 000 132 Rev A | | | |
|---|---|---|---|---|---|---|
| **Item No.** | **Ref. Desig.** | **Nomenclature** | **Tel Desig.** | **Vendor P/N** | **Resource** | **Qty** |
| 1 | | CASE, DETAIL | **64030034** | | | 1 |
| 2 | | SILKSCREEN, CASE | **57005028** | | | 1 |
| 3 | | SILKSCREEN, INNER LID | **57005031** | | | 1 |
| 4 | | CABLE ASSEMBLY, A/C POWER CORD | **75010025** | | | 1 |
| 5 | | CABLE ASSEMBLY, DIRECT CONNECT | **75010134** | | | 1 |
| 6 | | ADAPTER, RIGHT ANGLE | **48000013** | KA-91-15 | KINGS | 1 |
| 7 | | FOAM INSERT | **31000009** | | | 1 |
| 8 | | ANTENNA ASSEMBLY | **40030003** | | | 1 |



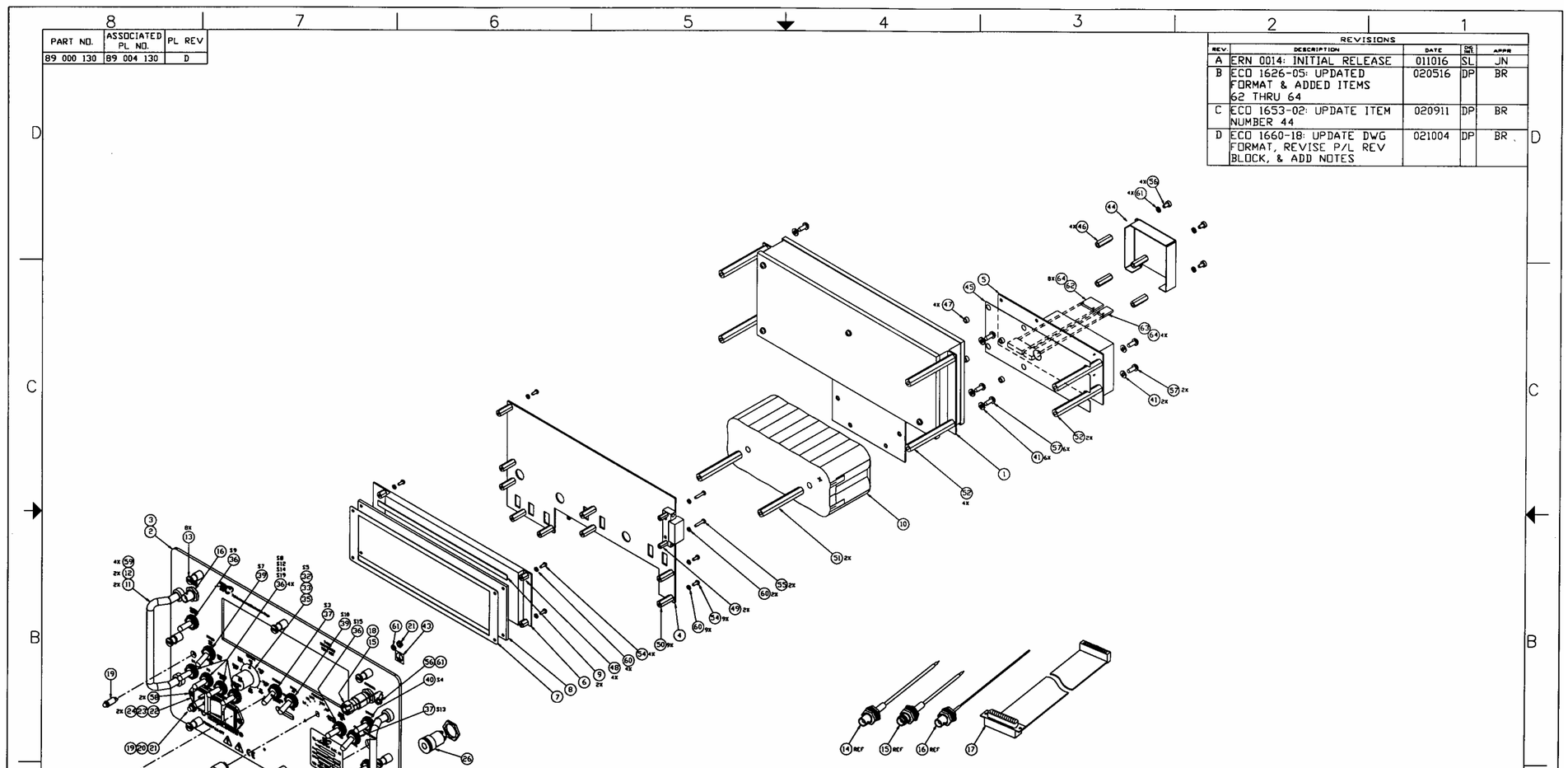

T-36C Test Set

Figure 6-2

| T-36C NAV/COMM Test Set | | | | 90 000 077 Rev A | | |
|---|---|---|---|---|---|---|
| **Item No.** | **Ref. Desig.** | **Nomenclature** | **Tel Desig.** | **Vendor P/N** | **Resource** | **Qty** |
| 1 | | FRONT PANEL ASSEMBLY | **89000130** | | | 1 |
| 2 | | CASE ASSEMBLY | **89000132** | | | 1 |
| 3 | | OPERATIONS MANUAL | **90008077-1** | | | 1 |
| 4 | | Maintenance Manual | **90008077-2** | | | OPT |

| PART NO. | ASSOCIATED PL NO. | PL REV |
|---|---|---|
| 89 000 130 | 89 004 130 | D |

| REVISIONS | | | | |
|---|---|---|---|---|
| REV. | DESCRIPTION | DATE | BY INIT. | APPR |
| A | ERN 0014: INITIAL RELEASE | 011016 | SL | JN |
| B | ECO 1626-05: UPDATED FORMAT & ADDED ITEMS 62 THRU 64 | 020516 | DP | BR |
| C | ECO 1653-02: UPDATE ITEM NUMBER 44 | 020911 | DP | BR |
| D | ECO 1660-18: UPDATE DWG FORMAT, REVISE P/L REV BLOCK, & ADD NOTES | 021004 | DP | BR |



NOTES:
1. FOR FRONT PANEL WIRING DIAGRAM SEE 79000044.
2. FOR SYSTEM INTERCONNECT DIAGRAM SEE 89003130.
3. TEST IN ACCORDANCE WITH 90006077.

SEE SEPARATE PARTS LIST

| | |
|---|---|
| SYSTEM CODE | T-36C |
| NEXT ASSY | 90000077 |
| USED ON FIRST APPLICATION | 90000077 |
| MATERIAL | |
| FINISH | |
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL TOL. 3 PLACE ±.05, 2 PLACE ±.25 FRACTIONS ±1/64 ANGLES ±1° CHAMFERS x 9° | |
| TEL-INSTRUMENT ELECTRONICS CONFIDENTIAL | |
| INTERPRET DRAWING IN ACCORDANCE WITH ANSI Y14.3M-1994 | |
| THIRD ANGLE PROJECTION | |
| CONTRACT NO. | |
| RELEASE DATE | 011016 |
| DRAWN SL | 010130 |
| CHK JN | 010302 |
| ENGR JN | 010302 |
| QA | |
| MFG | |
| Tel-Instrument Electronics Corp | |
| FRONT PANEL ASSEMBLY | |
| SIZE D | CAGE CODE 92606 |
| DWG. NO. | 89 000 130 |
| REV. | D |
| SCALE NONE | SHEET 1 OF 1 |

COMPUTER GENERATED ACAD DRAWING

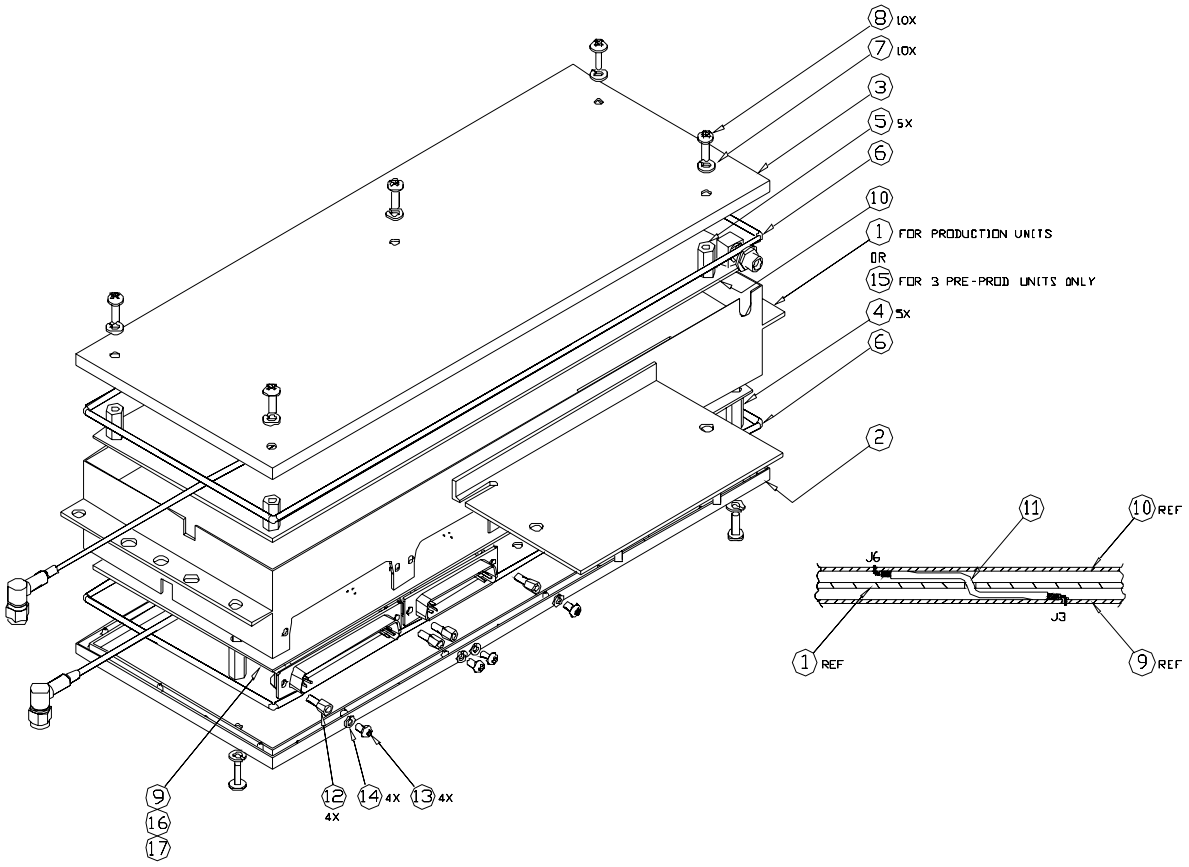
Front Panel Assembly

Figure 6-3

| T-36C Front Panel Assembly (1 of 2) (A2) | | | 89 000 130, Rev D | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| **Item No.** | **Ref. Desig.** | **Nomenclature** | **Tel Desig.** | **Vendor P/N** | **Resource** | **Qty** |
| 1 | | CHASSIS, SUB-ASSEMBLY | **89000131** | | | 1 |
| 2 | | FRONT PANEL | **61060048** | | | 1 |
| 3 | | SILKSCREEN, PANEL | **57005027** | | | 1 |
| 4 | | PCB ASSEMBLY, PANEL/SWITCH | **81117000** | | | 1 |
| 5 | | PCB ASSEMBLY, POWER SUPPLY | **80188001** | | | 1 |
| 6 | | DISPLAY, LCD | **45010001** | 3857-03-040 | IEE | 1 |
| 7 | | GASKET, RUBBER, LCD | **55082012** | | | 1 |
| 8 | | FILTER, LCD DISPLAY | **43015002** | | | 1 |
| 9 | | TAPE, FOAM, 1/4 x 8.00 LG. | **31000011** | 4032 | 3M | 2 |
| 10 | | BATTERY, 12V NI-CAD, 10 FULL-D | **48071001** | 10TNR4D | TNR | 1 |
| 11 | | HANDLE | **56025006** | BZ-130-1 | VEMALINE | 2 |
| 12 | | FERRULE | **31020035** | 288-09-ALC | PEM | 4 |
| 13 | | FASTENER, PANEL | **56020001** | PFC2-832-94 | | 8 |
| 14 | | CABLE ASSEMBLY, PANEL/YSWR/ANT/FP | **75010110** | | | 2 |
| 15 | | CABLE ASSEMBLY, PANEL/ANT/FP | **75010111** | | | 1 |
| 16 | | CABLE ASSEMBLY, PANEL/AUDIO OUT/FP | **75010112** | | | 1 |
| 17 | | CABLE ASSEMBLY, LCD DISPLAY/LGV BD. | **75010130** | | | 1 |
| 18 | | TERMINATION CAP ASSEMBLY | **88001014** | | | 1 |
| 19 | | LED INDICATOR, SNAP-IN (GREEN) | **45001015** | 559-0201-007 | DIALIGHT | 2 |
| 20 | | NUT, HEX, #2-56 | **53010003** | MS35649-224 | MS35649-224 | 4 |
| 21 | | NUT, HEX, SMALL PATTERN, #6-32 | **53010007** | NAS671C-6 | NAS671C-6 | 1 |
| 22 | | A/C RECEPTACLE | **48035010** | KD14.1101.151 | SCHURTER | 1 |
| 23 | | FUSE DRAWER | **48035008** | 4303.2401 | SCHURTER | 1 |
| 24 | | FUSE, 500mA /250V, SUPER TIME LAG | **45100026** | 34.504 | SCHURTER | 2 |
| 25 | | COVER, PHONE JACK ASSEMBLY | **88001009** | | | 1 |
| 26 | | JACK, PHONE | **48050003** | TJT-120 | NEXUS | 1 |
| 27 | | GASKET, KEYBOARD | **55082022** | 88M2015-1 | GRAYHILL | 1 |
| 28 | | KEYBOARD | **49010001** | 88BB2 | GRAYHILL | 1 |
| 29 | | OVERLAY, KEYBOARD | **49010002** | 88001 | GRAYHILL | 1 |
| 30 | | WASHER, SEALING, SWITCH | **52063003** | 60064 | MFS | 13 |

| T-36C Front Panel Assembly (2 of 2) (A2) | 89 000 130, Rev D |
|---|---|

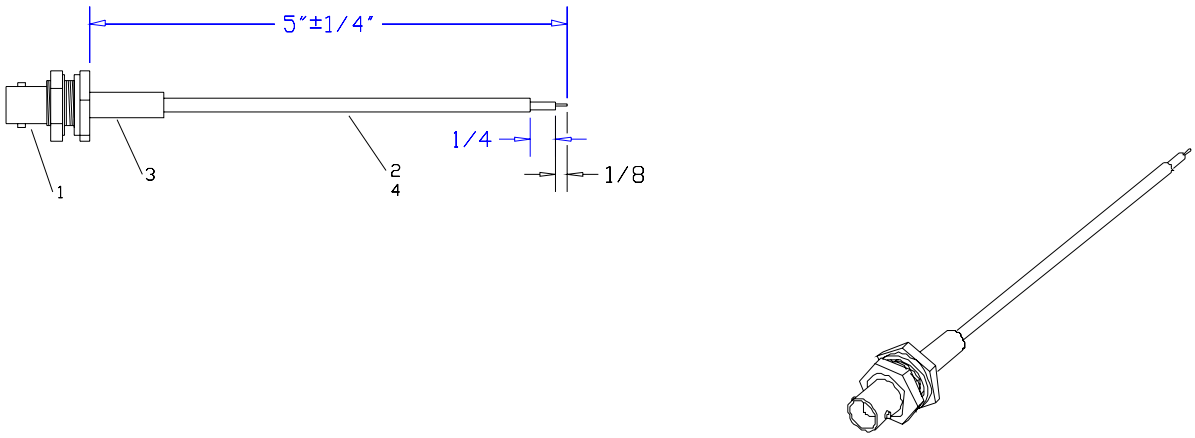
| Item No. | Ref. Desig. | Nomenclature | Tel Desig. | Vendor P/N | Resource | Qty |
|---|---|---|---|---|---|---|
| 31 | | WASHER (.477 DIA) | **52063004** | 396-.020-SS-0 | ASMCO | 13 |
| 32 | | WASHER, SEALING | **52063002** | 93783A029 | McMASTER-CARR | 2 |
| 33 | | KNOB | **57025023** | MS91528-1II1B | ELEC HARDWARE | 2 |
| 34 | S2 | SWITCH, ROTARY | **46020021** | 513385 | GRAYHILL | 1 |
| 35 | S5 | SWITCH, ROTARY | **46020019** | 26ASD45-01-1-AJS | GRAYHILL | 1 |
| 36 | S6,S8,S9,S12,S14,S15,S19 | SWITCH, ROTARY | **46027516** | 7105-TCWZQE | C&K | 7 |
| 37 | S3, S13 | SWITCH, TOGGLE | **46027520** | 7101-TCWZQE | C&K | 2 |
| 38 | S11 | SWITCH, TOGGLE | **46027517** | 7108-TCWZQE | C&K | 1 |
| 39 | S7, S10 | SWITCH, TOGGLE | **46027529** | 7211-TCWZQE | C&K | 1 |
| 40 | S4 | SWITCH, TOGGLE | **46027521** | 7101-TCWZQE | C&K | 1 |
| 41 | S3, S13 | WASHER, SPLIT-LOCK, #8 | **52020003** | MS35338-137 | MS35338-137 | 8 |
| 42 | | NAMEPLATE, GENERIC | **57030010** | | | 1 |
| 43 | | LABEL, SAFETY FUNCTION | **57031011** | PESC-H-EC | PANDUIT | 1 |
| 44 | | COVER, PROTECTIVE | **62040059** | | | 1 |
| 45 | | INSULATOR, PCB (FISH PAPER) | **31000020** | | | 1 |
| 46 | | STANDOFF, 1/4 HEX x .812 LG. | **52400023** | 2109-632-SS-20 | RAF | 4 |
| 47 | | SPACER, 1/4 ROUND x .125 LG. | **52100013** | 1122-6-A-7 | RAF | 4 |
| 48 | | STANDOFF, 1/4 HEX x .312 LG. | **52400008** | 2101-440-SS-20 | RAF | 4 |
| 49 | | STANDOFF, 3/16 HEX x .438 LG. | **52400038** | 2056-440-A-7 | RAF | 2 |
| 50 | | STANDOFF, 1/4 HEX x .750 LG. | **52400035** | 2108-440-SS-20 | RAF | 9 |
| 51 | | STANDOFF, 1/4 HEX x 2.500 LG. | **52400001** | 2132-832-SS-20 | RAF | 2 |
| 52 | | STANDOFF, 5/16 HEX x 2.750 LG. | **52400028** | 2201-832-SS-20 | RAF | 6 |
| 53 | | SCREW, PAN HD, #2-56 x .438 LG. | **50110032** | MS51957-6 | MS51957-6 | 4 |
| 54 | | SCREW, PAN HD, #4-40 x .250 LG. | **50110007** | MS51957-13 | MS51957-13 | 13 |
| 55 | | SCREW, PAN HD, #4-40 x .500 LG. | **50110002** | MS51957-17 | MS51957-17 | 2 |
| 56 | | SCREW, PAN HD, #6-32 x .250 LG. | **50110015** | MS51957-26 | MS51957-26 | 5 |
| 57 | | SCREW, PAN HD, 8-32 x .375 LG. | **50110013** | MS51957-43 | MS51957-43 | 8 |
| 58 | | SCREW, FLAT HD, 82 DEG.,#4-40 x .375 LG. | **50140015** | MS51959-15 | MS51959-15 | 2 |
| 59 | | SCREW, FLAT HD, 82 DEG.,#8-32 x .500 LG. | **50140014** | MS51959-45 | MS51959-45 | 4 |
| 60 | | WASHER, SPLIT-LOCK, #4 | **52020002** | MS35338-135 | MS35338-135 | 15 |
| 61 | | WASHER, SPLIT-LOCK, #6 | **52020001** | MS35338-136 | MS35338-136 | 6 |
| 62 | | CONNECTOR, 8 PIN | **48000090** | 104257-7 | AMP | 1 |
| 63 | | CONNECTOR, 4 PIN | **48000089** | 104257-3 | AMP | 1 |
| 64 | | CONTACTS, CONNECTOR | **46053002** | 104480-8 | AMP | 12 |




Chassis Assembly

Figure 6-4

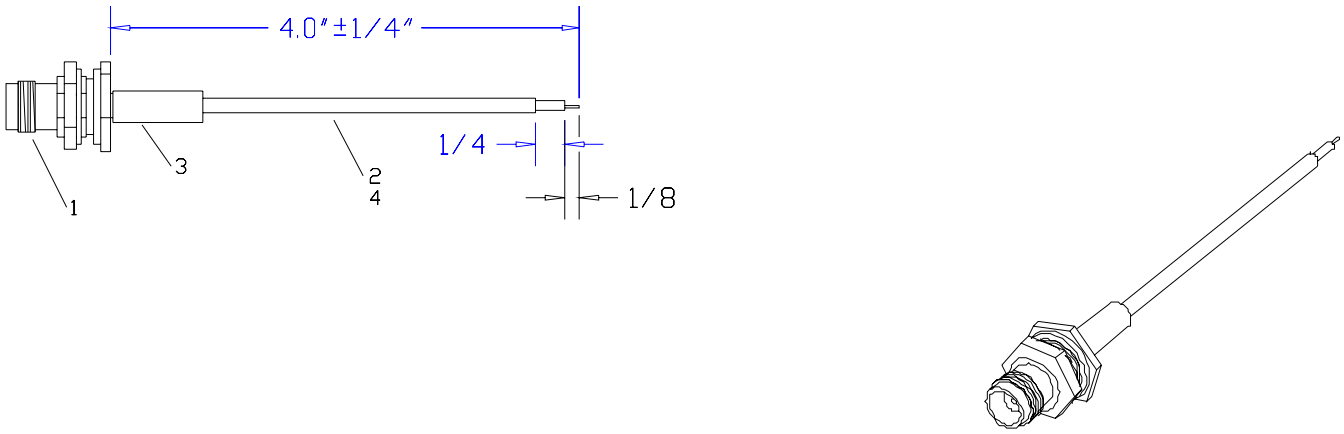
| Chassis Assy. | | | 89 000 131, Rev C | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| **Item No.** | **Ref. Desig.** | **Nomenclature** | **Tel Desig.** | **Vendor P/N** | **Resource** | **Qty** |
| 1 | | CHASSIS, RF AND DIGITAL | **62000047** | | | 1 |
| 2 | | COVER, LGV | **62040036** | | | 1 |
| 3 | | COVER, MBC | **62040035** | | | 1 |
| 4 | | STANDOFF, 1/4 HEX x .750 LG. | **52400063** | 4538-632-SS-20 | RAF | 5 |
| 5 | | STANDOFF, 1/4 HEX x .500 LG. | **52400029** | 4534-632-SS-20 | RAF | 5 |
| 6 | | SHIELD, SPIRAL | **55060001** | SS-06 | SPIRA | AR |
| 7 | | SCREW, PAN HD, #6-32 x .375 LG. | **50110004** | MS51957-28 | MS | 10 |
| 8 | | WASHER, SPLIT-LOCK, #6 | **52020001** | MS35338-136 | MS | 10 |
| 9 | | PCB ASSEMBLY, LOC/GS/VOR | **80115001** | | | 1 |
| 10 | | PCB ASSEMBLY, MB/COMM | **80116001** | | | 1 |
| 11 | | CABLE, COAX, RG-316/U | **71110006** | 53284 | OLYMPIC | AR |
| 12 | | STANDOFF, 3/16 HEX, "D" CONN. | **52400032** | 4750 | RAF | 4 |
| 13 | | SCREW, PAN HD, #4-40 x .188 LG. | **50110008** | MS51957-12 | MS | 4 |
| 14 | | WASHER, SPLIT-LOCK, #4 | **52020002** | MS35338-135 | MS | 4 |
| 15 | | CHASSIS, RF AND DIGITAL (MODIFICATION) | **62000048** | | | 1 |
| 16 | | PROGRAMMED MEMORY | **48077034 -03** | | | 1 |
| 16 | | IC PROM ERASEABLE | **43016001** | | | 1 |
| 17 | | PROGRAMMED MEMORY (SINE) | **48077003 -01** | | | 1 |
| 17 | | IC PROM ERASEABLE | **43016001** | | | 1 |




Cable Assembly, Panel BD/VSWR/R/T/ANT/FP (W4,W5)

Figure 6-5

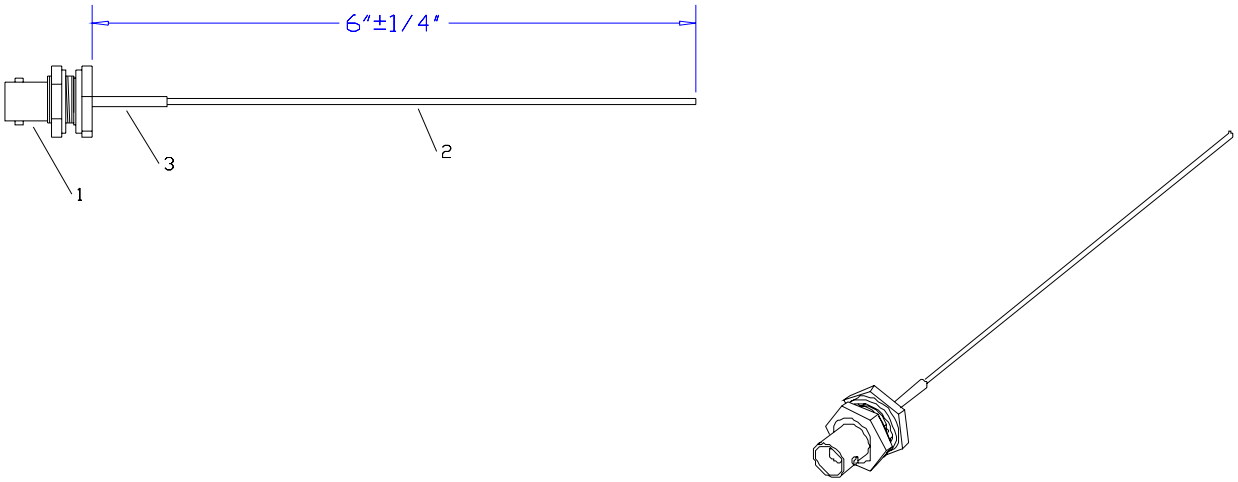
| Cable Assembly, Panel BD/VSWR/R/T/ANT/FP (W4,W5) | | | 75 010 110, Rev B | | | |
|---|---|---|---|---|---|---|
| **Item No.** | **Ref. Desig.** | **Nomenclature** | **Tel Desig.** | **Vendor P/N** | **Resource** | **Qty** |
| 1 | | Connector, BNC | **48040043** | BNC-50-2-20 | SUHNER | 1 |
| 2 | | Wire, Coax | **71111002** | FLEX086 | EZ-FORMCABLE | A/R |
| 3 | | Shrink Tubing, Black | **73000014** | FIT-321-1/4 | ALPHA | 3/4" |
| 4 | | Shrink Tubing, Clear | **73000010** | FIT-221-1/8 | ALPHA | A/R |




Cable Assembly, Panel BD/Antenna/FP (W6)

Figure 6-6

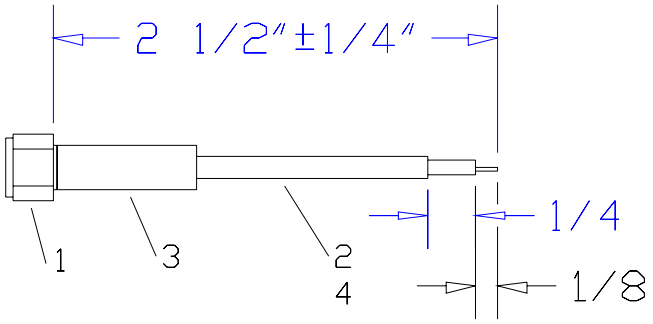
| Cable Assembly, Panel BD/Antenna/FP (W6) | | | 75 010 111, Rev C | | | |
|---|---|---|---|---|---|---|
| **Item No.** | **Ref. Desig.** | **Nomenclature** | **Tel Desig.** | **Vendor P/N** | **Resource** | **Qty** |
| 1 | | CONNECTOR, TNC | **48040044** | 24TNC-50-2-20 | SUHNER | 1 |
| 2 | | WIRE, COAX | **71111002** | EZ-FLEX-086 | EZ-FORM | AR |
| 3 | | SHRINK TUBING, BLACK | **73000014** | FIT-321-1/4 | ALPHA | AR |
| 4 | | SHRINK TUBING, CLEAR | **73000010** | FIT-221-1/8 | ALPHA | AR |
| 5 | | SOFT SOLDER | **SN-60-63** | QQ-S-571 | | AR |

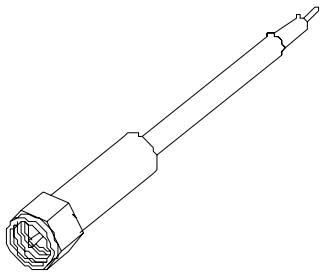



Cable Assembly, Panel BD/Audio Out/FP (W3)

Figure 6-7

| Cable Assembly, Panel BD/Audio Out/FP (W3) | | | 75 010 112, Rev C | | | |
|---|---|---|---|---|---|---|
| **Item No.** | **Ref. Desig.** | **Nomenclature** | **Tel Desig.** | **Vendor P/N** | **Resource** | **Qty** |
| 1 | | Connector, BNC | **48040043** | 24BNC-50-2-20 | SUHNER | 1 |
| 2 | | Wire, Teflon, White | **72722010** | 307-9 | OLYMPIC | A/R |
| 3 | | Shrink Tubing, Clear | **73000008** | FIT-221-3/32 | ALPHA | 3/4" |

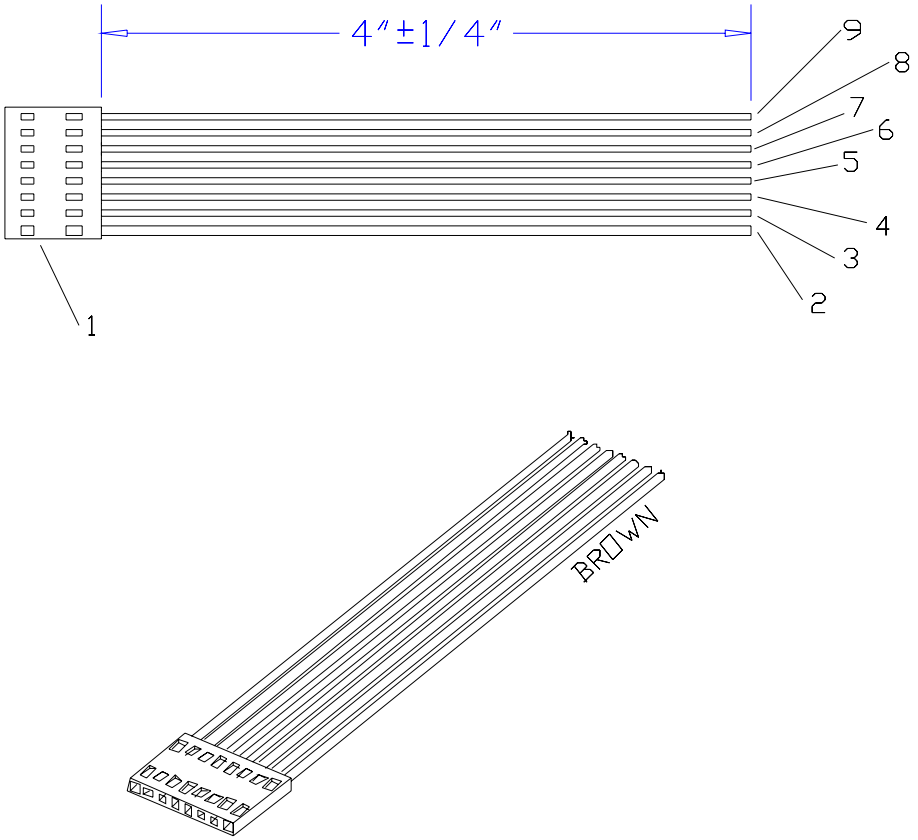


Cable Assembly, Relay to Attenuator (W12,W13)

Figure 6-8

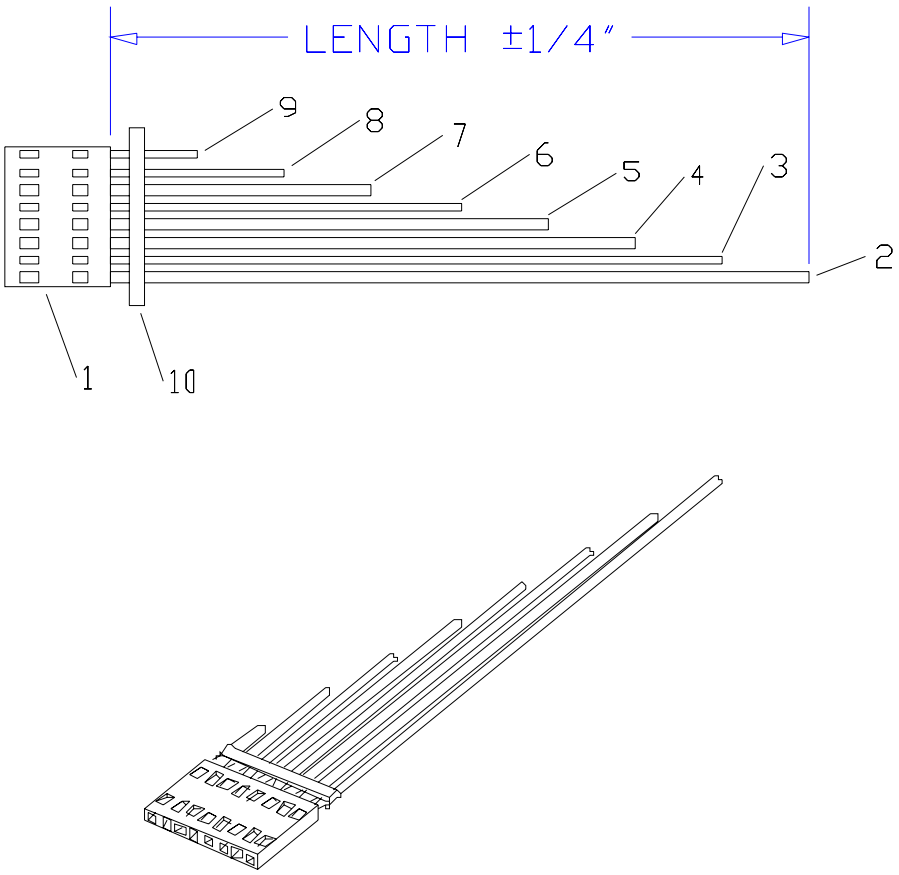
| Cable Assembly, Relay to Attenuator (W12,W13) | | | 75 010 113, Rev C | | | |
|---|---|---|---|---|---|---|
| **Item No.** | **Ref. Desig.** | **Nomenclature** | **Tel Desig.** | **Vendor P/N** | **Resource** | **Qty** |
| 1 | | Connector, Straight, SMA | **48040040** | 142-0693-001 OR EQUIV. | EFJ | 1 |
| 2 | | Wire, Coax | **71111006** | EZ-FLEX-086 | EZ-FORM CABLE | A/R |
| 3 | | Shrink Tubing, Black | **73000014** | FIT-321-1/4 | ALPHA | 3/4" |
| 4 | | Shrink Tubing, Clear | **73000010** | FIT-221-1/8 | ALPHA | A/R |




Cable Assembly, Panel BD/Keypad/FP (W3)

Figure 6-9

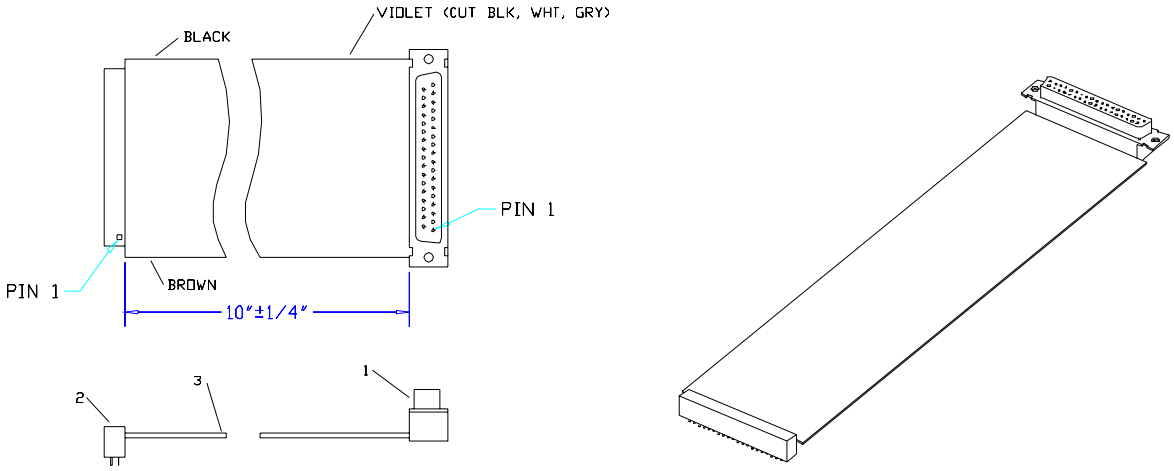
| Cable Assembly, Panel BD/Keypad/FP (W3) | | | 75 010 118, Rev C | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| **Item No.** | **Ref. Desig.** | **Nomenclature** | **Tel Desig.** | **Vendor P/N** | **Resource** | **Qty** |
| 1 | | Connector, Receptacle, 8 Pin | **48000081** | 104439-7 | AMP | 1 |
| 2 | | Wire, Teflon, Brown | **72722002** | 307-1 | OLYMPIC | A/R |
| 3 | | Wire, Teflon, Red | **72722003** | 307-2 | OLYMPIC | A/R |
| 4 | | Wire, Teflon, Orange | **72722004** | 307-3 | OLYMPIC | A/R |
| 5 | | Wire, Teflon, Yellow | **72722005** | 307-4 | OLYMPIC | A/R |
| 6 | | Wire, Teflon, Green | **72722006** | 307-5 | OLYMPIC | A/R |
| 7 | | Wire, Teflon, Blue | **72722007** | 307-6 | OLYMPIC | A/R |
| 8 | | Wire, Teflon, Violet | **72722008** | 307-7 | OLYMPIC | A/R |
| 9 | | Wire, Teflon, Gray | **72722009** | 307-8 | OLYMPIC | A/R |




Cable Assembly, Attenuator Control (W17)

Figure 6-10

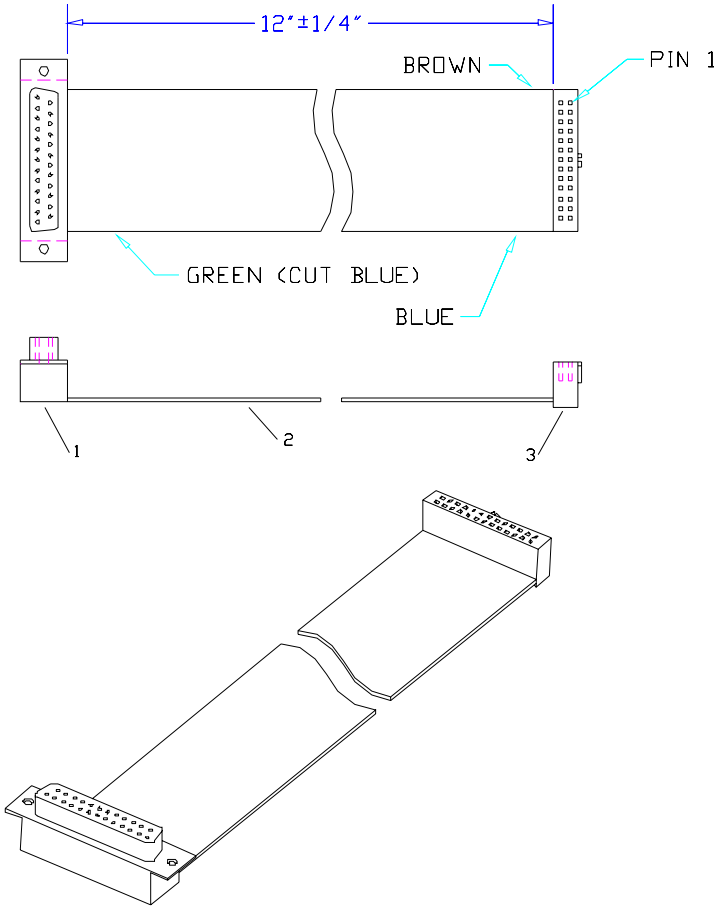
| Cable Assembly, Attenuator Control (W17) | | | 75 010 119, Rev C | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| **Item No.** | **Ref. Desig.** | **Nomenclature** | **Tel Desig.** | **Vendor P/N** | **Resource** | **Qty** |
| 1 | | Connector, Receptacle, 8 Pin | **48000081** | 104439-7 | AMP | 1 |
| 2 | | Wire, Teflon, Brown | **72722002** | 307-1 | OLYMPIC | A/R |
| 3 | | Wire, Teflon, Red | **72722003** | 307-2 | OLYMPIC | A/R |
| 4 | | Wire, Teflon, Orange | **72722004** | 307-3 | OLYMPIC | A/R |
| 5 | | Wire, Teflon, Yellow | **72722005** | 307-4 | OLYMPIC | A/R |
| 6 | | Wire, Teflon, Green | **72722006** | 307-5 | OLYMPIC | A/R |
| 7 | | Wire, Teflon, Blue | **72722007** | 307-6 | OLYMPIC | A/R |
| 8 | | Wire, Teflon, Violet | **72722008** | 307-7 | OLYMPIC | A/R |
| 9 | | Wire, Teflon, Gray | **72722009** | 307-8 | OLYMPIC | A/R |
| 10 | | Cable Tie, Miniature | **56001003** | L-4-18-9-C | T & B | A/R |




Cable Assembly, Panel BD/LGV BD (W16)

Figure 6-11

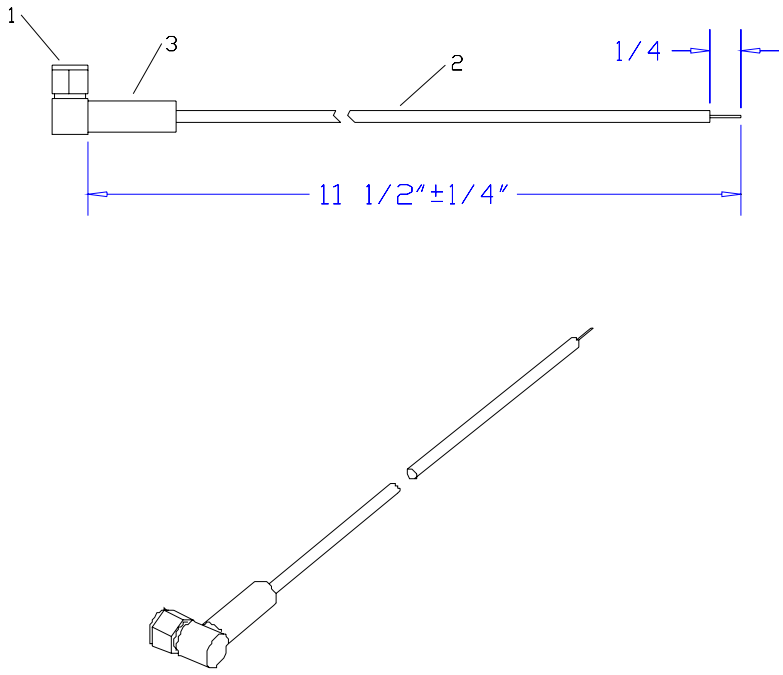
| Cable Assembly, Panel BD/LGV BD (W16) | | | 75 010 120, Rev D | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| **Item No.** | **Ref. Desig.** | **Nomenclature** | **Tel Desig.** | **Vendor P/N** | **Resource** | **Qty** |
| 1 | | CONNECTOR, 37 PIN | **48000039** | | AMP | 1 |
| 2 | | CONNECTOR, 40 PIN | **55050006** | | 3M | 1 |
| 3 | | CABLE, FLAT 50 CONDUCTOR | **75000019** | | 3M | AR |
| 4 | | LABEL, LASER, RIBBON CABLE | **73100002** | | PANDUIT | 1 |




Cable Assembly, LCD Display/LGV BD (W1)

Figure 6-12

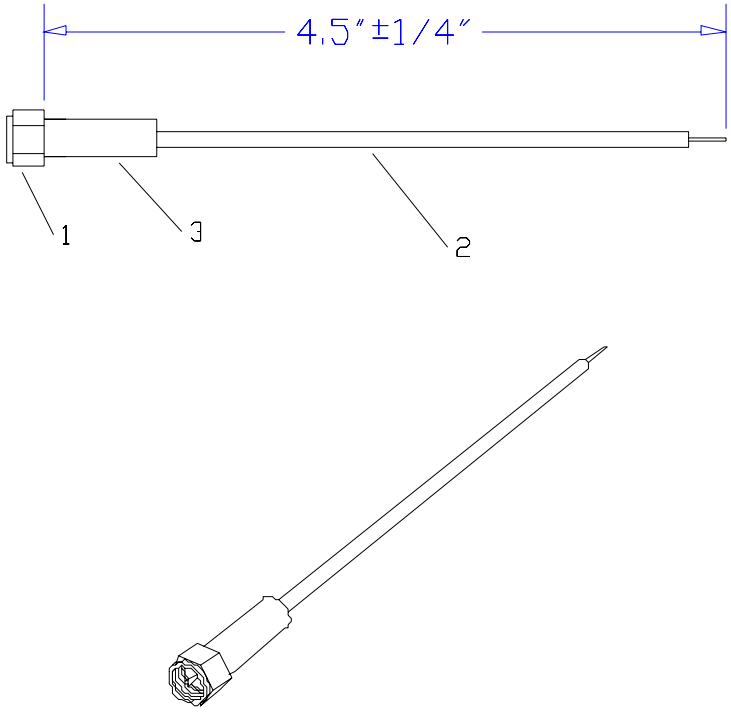
| Cable Assembly, LCD Display/LGV BD (W1) | | | | 75 010 130, Rev B | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| **Item No.** | **Ref. Desig.** | **Nomenclature** | **Tel Desig.** | **Vendor P/N** | **Resource** | **Qty** |
| 1 | | Connector, 25 Pin | **48000015** | 747303-2 OR EQUIV. | AMP | 1 |
| 2 | | Cable, 50 Conductor | **75000019** | 3302/50 | 3M | A/R |
| 3 | | Connector, 26 Pin | **48000016** | 622-2630 | T & B | 1 |




Cable Assembly, MBC BD/TX/RX (W25)

Figure 6-13

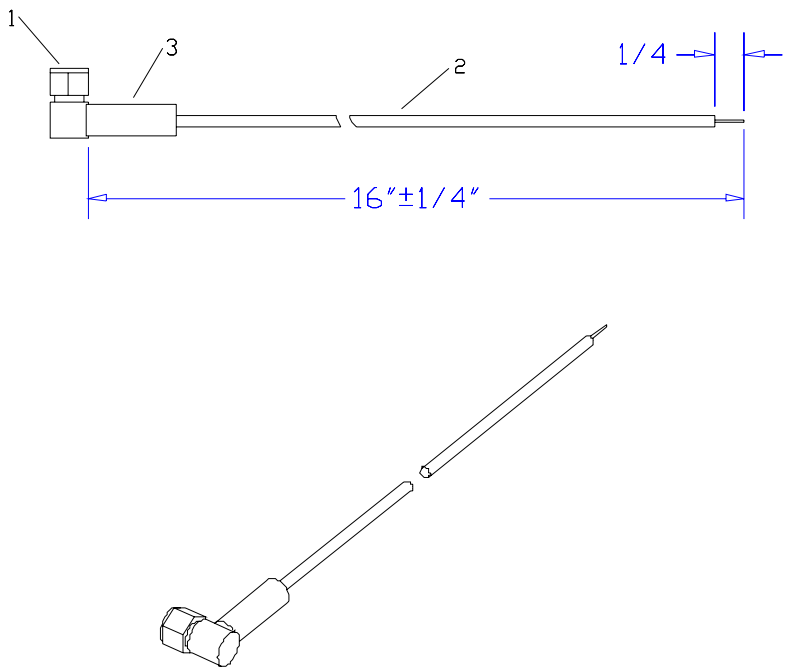
| Cable Assembly, MBC BD/TX/RX (W25) | | | | 75 010 131, Rev C | | |
|---|---|---|---|---|---|---|
| **Item No.** | **Ref. Desig.** | **Nomenclature** | **Tel Desig.** | **Vendor P/N** | **Resource** | **Qty** |
| 1 | | Connector, SMA Right | **48040036** | 142-0403-101 | EFJ | 1 |
| 2 | | Cable, Coax | **71110006** | RG-316/U | RG-316/U | A/R |
| 3 | | Shrink Tubing, Black | **73000014** | FIT-321-1/4 | ALPHA | 3/4" |




Cable Assembly, Rec/Tone (W7)

Figure 6-14

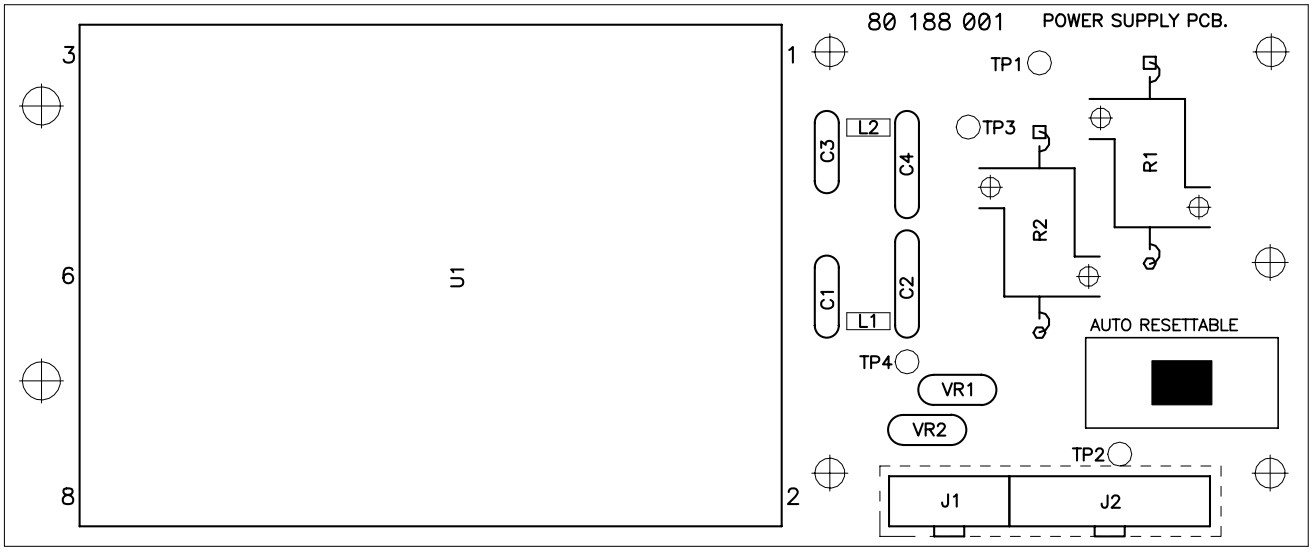
| Cable Assembly, Rec/Tone (W7) | | | 75 010 132, Rev C | | | |
|---|---|---|---|---|---|---|
| **Item No.** | **Ref. Desig.** | **Nomenclature** | **Tel Desig.** | **Vendor P/N** | **Resource** | **Qty** |
| 1 | | Connector, SMA | **48040026** | 142-0321-101 | EFJ | 1 |
| 2 | | Cable, Coax | **71110006** | RG-316/U | RG-316/U | A/R |
| 3 | | Shrink Tubing, Black | **73000014** | FIT-321-1/4 | ALPHA | 3/4" |




Cable Assembly, LGV/TX/RX (W27)

Figure 6-15

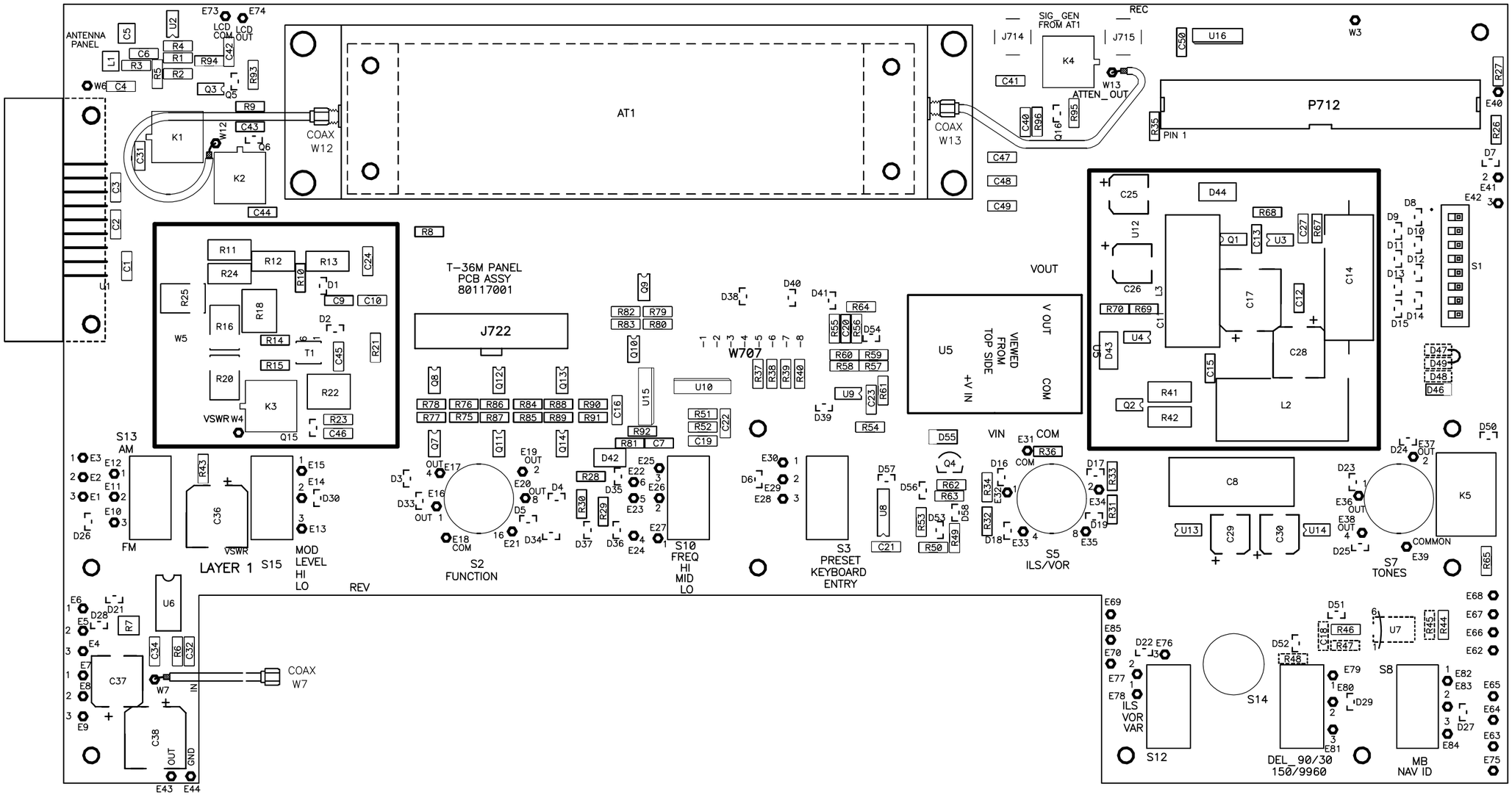
| Cable Assembly, LGV/TX/RX (W27) | | | 75 010 167, Rev B | | | |
|---|---|---|---|---|---|---|
| **Item No.** | **Ref. Desig.** | **Nomenclature** | **Tel Desig.** | **Vendor P/N** | **Resource** | **Qty** |
| 1 | | Connector, SMA Right | **48040036** | 142-0403-101 | EFJ | 1 |
| 2 | | Cable, Coax | **71110006** | RG-316/U | RG-316/U | A/R |
| 3 | | Shrink Tubing, Black | **73000014** | FIT-321-1/4 | ALPHA | 3/4" |




PCB Assembly, Power Supply (A11)

Figure 6-16

| PCB Assembly, Power Supply (A11) | | | 80 188 001, Rev A | | | |
|---|---|---|---|---|---|---|
| **Item No.** | **Ref. Desig.** | **Nomenclature** | **Tel Desig.** | **Vendor P/N** | **Resource** | **Qty** |
| 1 | | PCB DRILLING AND FABRICATION | **80188002** | | | 1 |
| 2 | VR1, VR2 | VARISTOR (MOV) | **42230002** | V175LA2 | HARRIS | 2 |
| 3 | C1, C3 | CAPACITOR, CERAMIC, DISK .0047uF/1500V | **42100003** | 125LSD47 | SPRAGUE | 2 |
| 4 | C2, C4 | CAPACITOR, CERAMIC, DISK .0022uF/2500V | **42100004** | 440LD22 | SPRAGUE | 2 |
| 5 | U1 | CONVERTER, AC/DC | **48092003** | MSCA-0303 | ASTRODYNE | 1 |
| 6 | J2 | CONNECTOR, HEADER, 8POS, SINGLE ROW | **55050011** | 103670-7 | AMP | 1 |
| 7 | J1 | CONNECTOR, HEADER, 4POS, SINGLE ROW | **55050010** | 103670-3 | AMP | 1 |
| 8 | TP1-TP4 | TERMINAL | **55025008** | TP-105-01-09 | COMP. CORP | 4 |
| 9 | L1, L2 | CHIP, FERRITE | **48065003** | H11206N500R | STEWARD | 2 |
| 10 | R1 | RESISTOR, POWER, 5W 1 Ohm | **41400003** | RH-5-1 | DALE | 1 |
| 11 | R2 | RESISTOR, POWER, 5W 2 Ohm | **41400004** | RH-5-2 | DALE | 1 |
| 12 | F1 | FUSE, STRAP, AUTO RESET | **45100024** | PFST-200 | SCHURTER | 1 |
| 13 | | TAPE, INSULATING | **31006001** | KPT-3/8 | DUPONT | AR |
| 14 | | EYELETS, BRASS FLANGE | **51010002** | GS3-6 | STIMPSON | 4 |
| 15 | | TINNED COPPER BUS WIRE | **72001000** | 755 | OLYMPIC | AR |




PCB Assembly, Panel (A7)

Figure 6-17

| PCB Assembly, Panel (A7) (1 of 3) | 80 193 001, Rev A |
|---|---|

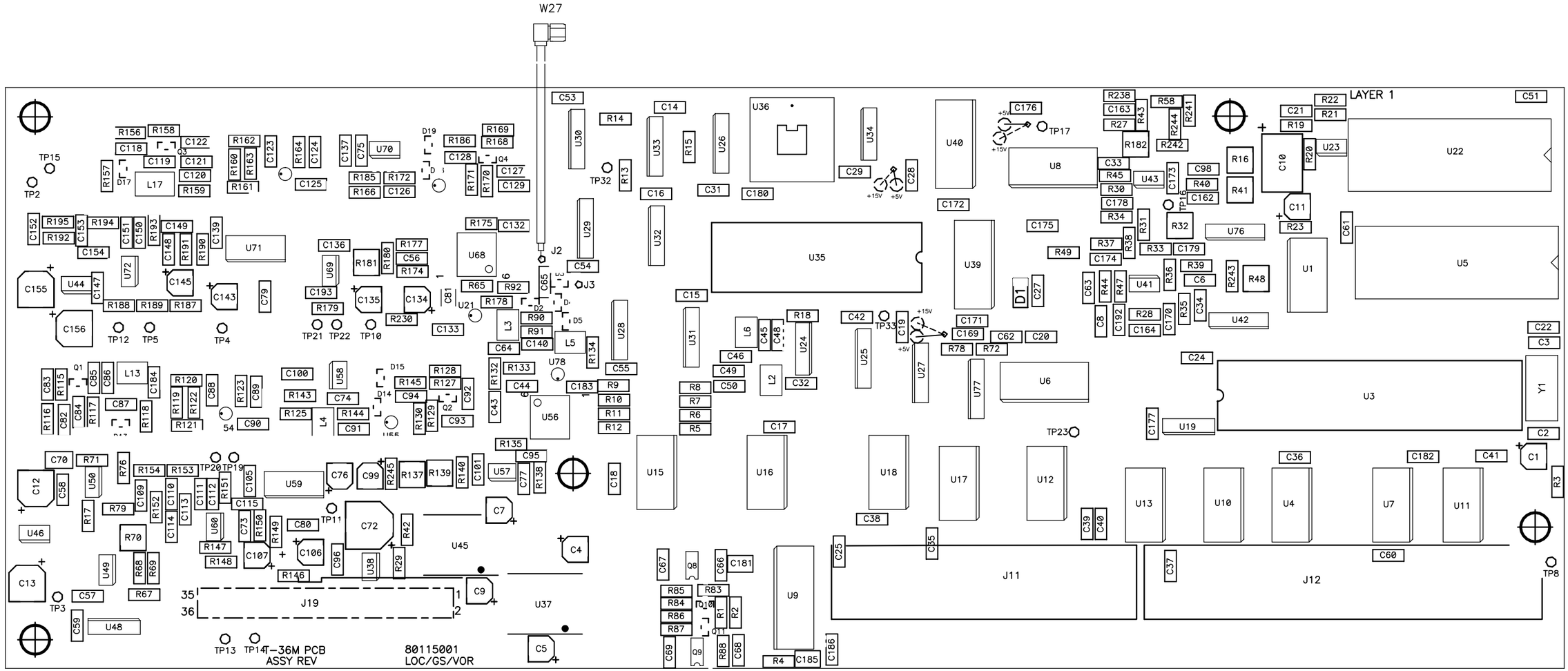
| Item No. | Ref. Desig. | Nomenclature | Tel Desig. | Vendor P/N | Resource | Qty |
|---|---|---|---|---|---|---|
| 1 | | Panel PCB, Drilling and Fabrication (Rev F) | **80117002** | | | 1 |
| 2 | U1 | Amplifier, RF, Wideband Linear | **48084007** | CA4812C | MOTOROLA | 1 |
| 3 | U2 | Low Power Low Offset Voltage Dual Comp., SM, SO-8 | **40201045** | LM393D | NAT'L SEMICON. | 1 |
| 4 | U3 | Step-Up Switching Regulator, SM, SO-8 | **40201125** | MAX643AESA | MAXIM | 1 |
| 5 | U4 | Step-Down DC-DC Controller, SM, SO-8 | **40201124** | MAX649ESA | MAXIM | 1 |
| 6 | U5 | Inverter (5V) | **48072001** | 46013-01 | IEE | 1 |
| 7 | U6 | Audio Amplifier, DIP-8 | **40200067** | LM386N-4 | NAT'L SEMICON. | 1 |
| 8 | U8 | Tripple 3-Input Buffered NOR Gate, SM, SO-14 | **40201015** | CD4025BCM | NAT'L SEMICON. | 1 |
| 9 | U9 | Voltage Comparator, SM, SO-8 | **40201099** | LM311D | NAT'L SEMICON. | 1 |
| 10 | U10 | 14-Stage Ripple-Carry Binary Counter/Divider, SM, SO-8 | **40201020** | CD4060BCM | NAT'L SEMICON. | 1 |
| 11 | U12, U13, U14 | Switched-Capacitor Voltage Converter, SM, SO-8 | **40201012** | ICL7660ESA | MAXIM | 3 |
| 12 | U15 | Dual Retriggerable Monostable Multivibrator, SM, SO-16 | **40201074** | 74HC123AM | N.S. | 1 |
| 13 | U16 | Quad 2-Input NOR Gate, SM, SO-14 | **40201034** | 74HC02D | NAT'L SEMICON. | 1 |
| 14 | K1-K4 | Relay, DPDT | **46002004** | 172D-12 | TELEDYNE | 4 |
| 15 | K5 | Relay, SM | **46005002** | EE2-12 | NEC | 1 |
| 16 | AT1 | Relay Programmable Attenuator, 0-127dB | **44002002** | 50P-076 | JFW INDUSTRIES | 1 |
| 17 | T1 | Transformer, RF, SM | **43002003** | TC1-1 | MINI-CIRCUITS | 1 |
| 18 | D55 | Diode, Zener, 10V | **40010006** | 1N961B | MOTOROLA | 1 |
| 19 | D46 | Diode, Rectifier | **40010012** | 1N4003 | 1N4003 | 1 |
| 20 | D3-D19, D21-D30, D33-D1 D50,D52,D53, D56, D57 | Diode, General Purpose Signal, SM, SOT-23 | **40010014** | MMBD914 | MOTOROLA | 41 |
| 21 | D1, D2 | Diode, Schottky, SM, SOT-23 | **40010016** | ZC2800 | ZETEX | 2 |
| 22 | D51,D54, D58 | Diode, Zener, SM | **40010025** | PMBZ5240B | PHILLIPS | 3 |
| 23 | D43, D44 | Diode, Schottky, Rectifier, SM | **40010034** | 1N5817MCT-ND | DIGI-KEY | 2 |
| 24 | D42 | Diode,SM | **40010038** | S1ABDICT-ND | DIGI-KEY | 1 |
| 25 | Q4 | Transistor, N-Cannel, MOSFET | **40001012** | VN10LM | MOTOROLA | 1 |
| 26 | Q2, Q3 | Transistor, Single, Logic Level, P-Chan., MOSFET, SM , SO-8 | **40001025** | IRF7205-ND | DIGI-KEY | 2 |
| 27 | Q1 | Transistor, Single, Logic Level, N-Chan., MOSFET, SM , SO-8 | **40001026** | IRF7201-ND | DIGI-KEY | 1 |
| 28 | Q7, Q10, Q11, Q14 | Transistor, Dual, Logic Level, N-Chan., MOSFET, SM , SO-8 | **40001027** | IRF7101-ND | DIGI-KEY | 4 |
| 29 | Q8, Q9, Q12, Q13 | Transistor, Dual, SM, SM-8 | **40001028** | ZDT749CT-ND | DIGI-KEY | 4 |
| 30 | Q5, Q6, Q15, Q16 | Transistor N-P-N, SM, SOT-23 | **40001011** | MMBT2222A | MOTOROLA | 4 |
| 31 | L1 | Inductor, SM, 32CS, 1uHy | **43011041** | 380LB-1R0K | TOKO | 1 |
| 32 | L3 | Inductor, Choke, 100uHy | **43011045** | 5900-101 | MILLER | 1 |
| 33 | L2 | Inductor, Choke, 150uHy | **43011046** | 5900-151 | MILLER | 1 |
| 34 | C31 | Cap, Chip, CC1206, NPO, 4.7pF | **42025042** | | | 1 |

| PCB Assembly, Panel (A7) (2 of 3) | 80 193 001 |
|---|---|

| Item No. | Ref. Desig. | Nomenclature | Tel Desig. | Vendor P/N | Resource | Qty |
|---|---|---|---|---|---|---|
| 35 | C13, C27, C12 | Cap, Chip, CC1206, NPO, 100pF | **42025025** | | | 3 |
| 36 | C1, C4, C7, C9, C10, C6 | Cap, Chip, CC1206, NPO, 1000pF | **42025037** | | | 6 |
| 37 | C2,C3,C21, C22-C24,C34,C40-46 | Cap, Chip, CC1206, X7R, 0.01uF | **42020001** | | | 14 |
| 38 | C32 | Cap, Chip, CC1206, X7R, 0.056uF | **42020016** | | | 1 |
| 39 | C11,C15,C16,C47-C50 | Cap, Chip, CC1206, X7R, 0.1uF | **42020013** | | | 7 |
| 40 | C19, C20 | Cap, Chip, CC1206, NPO, 0.22uF | **42025044** | | | 2 |
| 41 | C5 | Cap, Chip, CC1210, 1uF | **42026001** | | | 1 |
| 42 | C8, C14 | Cap. Alum. Axial, 220uF/25V | **42180004** | 2222-118-36221 | PHILLIPS | 2 |
| 43 | C25, C26, C29, C30 | Cap, SM, Elect., 22uF/25V | **42185036** | ECE-V1EA220P | PANASONIC | 4 |
| 44 | C28, C37 | Cap, SM, Elect., 100uF/25V | **42186001** | ECE-V1EA101P | PANASONIC | 2 |
| 45 | C36, C38 | Cap, SM, Elect., 220uF/25V | **42186002** | ECE-V1EA221P | PANASONIC | 2 |
| 46 | C17 | Cap, SM, Elect., 330uF/25V | **42186005** | ECE-V1EA331UP | PANASONIC | 1 |
| 47 | R57, R58, R60 | Res, Chip RC1206 MF 1% 4.99K | **41101260** | | | 3 |
| 48 | R59 | Res, Chip RC1206 MF 1% 5.62K | **41101265** | | | 1 |
| 49 | R51, R52 | Res, Chip RC1206 MF 1% 232K | **41101420** | | | 2 |
| 50 | R6 | Res, Chip RC1206 5% 10 OHM | **41160052** | | | 1 |
| 51 | R61 | Res, Chip RC1206 5% 68 OHM | **41160016** | | | 1 |
| 52 | R10, R14, R15, R43 | Res, Chip RC1206 5% 100 OHM | **41160006** | | | 4 |
| 53 | R44 | Res, Chip RC1206 5% 150 OHM | **41160009** | | | 1 |
| 54 | R35 | Res, Chip RC1206 5% 330 OHM | **41160023** | | | 1 |
| 55 | R2,R26,R36-R40,R50, R53,R55,R63,R65,R92 | Res, Chip RC1206 5% 1K | **41160003** | | | 13 |
| 56 | R80 | Res, Chip RC1206 5% 2.2K | **41160008** | | | 1 |
| 57 | R1,R3,R8,R21,R46,R94, R95 | Res, Chip RC1206 5% 4.7K | **41160013** | | | 7 |
| 58 | R4,R5,R9,R23,R27-R34,R49,R54,R56,R79, R93,R96 | Res, Chip RC1206 5% 10K | **41160015** | | | 18 |
| 59 | R75,R77,R83,R85,R87, R89, R91 | Res, Chip RC1206 5% 27K | **41160024** | | | 7 |
| 60 | R76,R78,R82,R84,R86, R88,R90 | Res, Chip RC1206 5% 47K | **41160031** | | | 7 |
| 61 | R70 | Res, Chip RC1206 5% 75K | **41160101** | | | 1 |
| 62 | R68 | Res, Chip RC1206 5% 82K | **41160102** | | | 1 |
| 63 | R62 | Res, Chip RC1206 5% 100K | **41160025** | | | 1 |
| 64 | R69 | Res, Chip RC1206 5% 240K | **41160035** | | | 1 |

| PCB Assembly, Panel (A7) (3 of 3) | 80 193 001 |
|---|---|

| Item No. | Ref. Desig. | Nomenclature | Tel Desig. | Vendor P/N | Resource | Qty |
|---|---|---|---|---|---|---|
| 65 | R81 | Res, Chip RC1206 5%, 470K | **41160036** | 3314G-1-103E | BOURNS | 1 |
| 66 | R64, R67 | Res, Chip RC1206 5% 1M | **41160049** | RW1S0BAR500J | OHMITE | 2 |
| 67 | R7 | Trimpot, SM, 10K | **41050010** | P24XCT-ND | DIGI-KEY | 1 |
| 68 | R41, R42 | Res, Chip, 1W, 5% 0.5 OHM | **41802002** | P43XCT-ND | DIGI-KEY | 2 |
| 69 | R12 | Res, Chip, SM, RC2512 5% 24 OHM | **41130011** | P51XCT-ND | DIGI-KEY | 1 |
| 70 | R11, R24 | Res, Chip, SM, RC2512 5% 43 OHM | **41130010** | RFP-250250-4Y50-2 | H. P. / RFP | 2 |
| 71 | R13 | Res, Chip, SM, RC2512 5% 51 OHM | **41130012** | 3314G-1-103E | BOURNS | 1 |
| 72 | R18, R22 | Res, Chip, SM, 8W, 2% 50 OHM | **41130013** | RW1S0BAR500J | OHMITE | 2 |
| 73 | R16, R20, R25 | Res, High Power,10W, 5% 100 OHM | **41130014** | RFP-10-100RV | H. P. / RFP | 3 |
| 74 | J714, J715 | Connector, SMA, Straight, Female | **48040035** | 142-0701-201 | E.F. JOHNSON | 2 |
| 75 | J722 | Connector, 8-Pin Header, Single Row | **48000082** | 103638-7 | AMP | 1 |
| 76 | | Cover, Shield Isolation, RF | **62040053** | | | 1 |
| 77 | | Cover, Shield Isolation, RF | **62040054** | | | 1 |
| 78 | | Shield Isolation, RF | **31020100** | | | 1 |
| 79 | | Shield Isolation, RF | **31020101** | | | 1 |
| 80 | S1 | Switch, 8 Position, SM | **46024002** | 90HBW08S | GRAYHILL | 1 |
| 81 | W7 | Cable Assy, Rec/Tone | **75010132** | | | 1 |
| 82 | W12,W13 | Cable Assy, Relay to Attenuator | **75010113** | | | 2 |
| 83 | W707 | Cable Assy, Panel Bd/Keypad/FP | **75010118** | | | 1 |
| 84 | W17 | Cable Assy, Attenuator Control | **75010119** | | | 1 |
| 85 | W16 | Cable Assy, Panel Bd/Loc/Gs/Vor | **75010120** | | | 1 |




PCB Assembly, LGV Board (A5)

Figure 6-18

| PCB Assembly, LGV Board (A5) (1 of 5) | 80 115 001, Rev G |
|---|---|

| Item No. | Ref. Desig. | Nomenclature | Tel Desig. | Vendor P/N | Resource | Qty |
|---|---|---|---|---|---|---|
| 1 | A1M | PCB Drilling and Fabrication (Rev A) | **80115002** | | | 1 |
| 2 | U3 | MiDo-Processor, DIP-40 | **40200027** | 80C31BH | Intel | 1 |
| 3 | | | | | | |
| 4 | U22 | Memory I.C. | **40200103** | BQ4010YMA-85C | Benchmarq | 1 |
| 5 | U36 | Programmable Logic, SM, | **40201100** | 16V8Z-25JI | Palce | 1 |
| 6 | | | | | | |
| 7 | U57, U58, U60, U69, U70, U72 | Low Power Operational Amp., SM, SO-8 | **40201075** | TLC271IP | T. I. | 6 |
| 8 | U49 | Low Power Low Offset Voltage Dual Comp., SM, SO-8 | **40201045** | LM393D | Nat'l Semi. | 1 |
| 9 | U23, U41, U43, U50 | Low Power Dual Operational Amp., SM, SO-8 | **40201051** | LM358M | Nat'l Semi. | 4 |
| 10 | U9 | 8-channel 8-bit A/D Converter, SM, SO-28 | **40201092** | MAX158AEW1 | Maxim | 1 |
| 11 | U8, U39, U40 | Quad 8-bit D/A Converter, SM, SO-24 | **40201091** | MAX505AEWG /BEWG | Maxim | 3 |
| 12 | U25-U30 | Synchronous Binary Counter, SM, SO-16 | **40201002** | 74HC163D | Nat'l Semi. | 6 |
| 13 | U34 | Quad 2-Input NOR Gate, SM, SO-14 | **40201034** | 74HC02D | Nat'l Semi. | 1 |
| 14 | U31-U33 | 4-Bit Binary Adder With Fast Carry, SM, SO-16 | **40201095** | 74HC283D | Nat'l Semi. | 3 |
| 15 | U48 | Quad 2-Input NAND Gate, SM, SO-14 | **40201038** | 74HC00M | Nat'l Semi. | 1 |
| 16 | U1, U4, U17, U18 | Octal D-Type Latch, SM, SO-20 | **40201014** | 74HC573WM | Nat'l Semi. | 4 |
| 17 | U7, U10-U13, U15, U16 | Octal D-Type Edge-Triggered Flip Flop, SM, SO-20 | **40201013** | 74HC574WM | Nat'l Semi. | 7 |
| 18 | U19, U24 | Hex Inverter, SM, SO-14 | **40201019** | 74HC04D | Nat'l Semi. | 2 |
| 19 | U42, U76, U77 | Triple 2-Channel Analog Multiplexer, SM, SO-16 | **40201080** | 74HC4053BCM | Nat'l Semi. | 3 |
| 20 | U6 | 4-to-16 Line Decoder with Latch, SM, SO-24 | **40201018** | 74HC4514WM | Nat'l Semi. | 1 |
| 21 | U56, U68 | Frequency Mixer, 600MHz, SM | **40201001** | ASK1KK81 | Mini-Circuits | 2 |
| 22 | U54, U55, U66, U67 | RF Amp. 20dB@500MHz, SM, 86 Plastic | **40201098** | MAR-1SM | Mini-Circuits | 4 |
| 23 | U21, U78 | RF Amp. 12dB@500MHz, SM, 86 Plastic | **40201087** | MAR-3SM | Mini-Circuits | 2 |
| 24 | U59, U71 | Prescaler/Serial Input PLL Freq. Synthesizer, SM, SO-16 | **40201057** | MB1502PF | Fujitsu | 2 |
| 25 | U38 | Voltage Regulator, +5V, SM | **56060012** | LM2931CM | Nat'l Semi. | 1 |
| 26 | U45 | Voltage Regulator, +15V, SM | **56060010** | LM2940CS-15 | Nat'l Semi. | 1 |
| 27 | U37 | Voltage Regulator, -5V, SM | **56060013** | LM2990S-5.0 | Nat'l Semi. | 1 |
| 28 | U44, U46 | Voltage Regulator, SM , SO-8 | **56060009** | TL751L12CD | T. I. | 2 |
| 29 | | | | | | |
| 30 | XU5, XU35 | Connector, Socket, 28 Pin | **48064001** | ICN-286-S5-T | Rob Nugent | 2 |
| 31 | J19 | Connector, Socket 36 Pin | **48000055** | SSW-118-01-G-D | Samtec | 1 |
| 32 | J11 | Connector, Rt. Angle, 25 Pin | **48000023** | 56-722-010 | Spectrum | 1 |

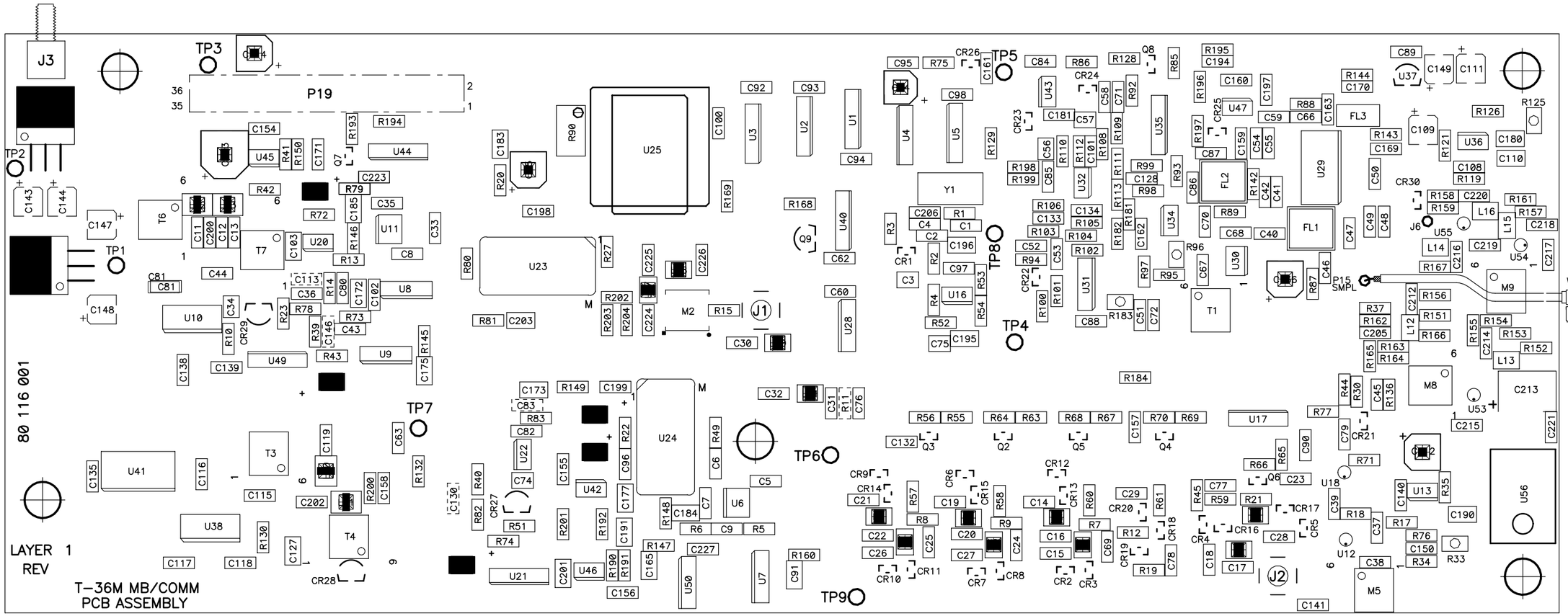
| PCB Assembly, LGV Board (A5) (2 of 5) | | | 80 115 001, Rev G | | | |
|---|---|---|---|---|---|---|
| **Item No.** | **Ref. Desig.** | **Nomenclature** | **Tel Desig.** | **Vendor P/N** | **Resource** | **Qty** |
| 33 | J12 | Connector, Rt. Angle, 37 Pin | **48000033** | FCC17-C37PC-44B | Amphenol | 1 |
| 34 | Y1 | Crystal, 12 MHz, HC-18/U | **40040016** | | Bomar | 1 |
| 35 | XY1 | Crystal, Mount | **55080002** | 470. 025 | Bivar | 1 |
| 36 | | | | | | |
| 37 | D2, D3 | Diode, Silicon PIN Switching, SM, SOT-23 | **40010010** | MMBV3700LT1 | Motorola | 2 |
| 38 | D4, D5 | Diode, General Purpose Signal, SM, SOT-23 | **40010014** | MMBD914 | Motorola | 2 |
| 39 | D14, D15, D18, D19 | Diode, Schottky, SM, SOT-23 | **40010016** | ZC2800 | Z-Tech | 4 |
| 40 | D13, D17 | Diode, Tuning, SM, SOT-23 | **40010017** | MMBV109L | Motorola | 2 |
| 41 | D1 | Diode, Zener, 5.1V | **40010030** | 1N5231B | Motorola | 1 |
| 42 | | | | | | |
| 43 | Q8, Q9 | Transistor N-Cannel, MOSFET, SM , SO-8 | **40001025** | IRF7205 | Int'l Rectifier | 2 |
| 44 | Q10, Q11 | Transistor N-P-N, SM, SOT-23 | **40001011** | MMBT2222A | Motorola | 2 |
| 45 | Q1, Q3 | Transistor N-P-N Silicon High Frequency, SM, SOT-23 | **40001013** | NE02133 | NEC | 2 |
| 46 | Q2, Q4 | Transistor P-N-P, SM, SOT-23 | **40001014** | MMBT2907A | Motorola | 2 |
| 47 | TP2-TP5, TP8, TP10, TP11, TP12-TP17, TP19-TP23, TP32, TP33 | Terminal | **55025008** | TP-105-01-09 | VCC | 20 |
| 48 | L17 | Coil, Wound, 24 AWG 5.5T, .188 I.D. CW | **43025018** | | | 1 |
| 49 | L3 | Coil, Wound, 24 AWG 6.5T, .188 I.D. CW | **43025031** | | | 1 |
| 50 | L13 | Coil, Wound, 22 AWG 2T, .125 I.D. CCW | **43025038** | | | 1 |
| 51 | L2, L6 | Inductor-SM 4.7uhy | **43011031** | 300LS-4R7K | Toko | 2 |
| 52 | L4, L5 | Coil, Wound, 24 AWG 4.5T, .125 I.D. CW | **43025034** | | | 2 |
| 53 | | | | | | |
| 54 | C4, C5 ,C7, C9, C107, C145 | Cap-SM, Elect, 1uF/50V | **42185045** | ECE-V1HA010R | Panasonic | 6 |
| 55 | C10 | Cap, Tant, 10uF/10V | **42470023** | ECS-F1AE106K | Panasonic | 1 |
| 56 | C1, C11, C76, C99, C106, C134, C135, C143 | Cap, SM, Elect, 10uF/6V | **42185030** | ECE-V1CA100R | Panasonic | 8 |
| 57 | C12, C13, C155, C156 | Cap, SM, Elect, 22uF/25V | **42185036** | ECE-V1EA220P | Panasonic | 4 |
| 58 | C72 | Cap, SM, Elect, 100uF/16V | **42186003** | ECE-V1CA101P | Panasonic | 1 |
| 59 | C81 | Cap, Cerm, 100pF | **42000019** | | | 1 |
| 60 | C86 | Cap, Chip, CC1206, NPO, 15pF | **42025015** | | | 1 |
| 61 | C85 | Cap, Chip, CC1206, NPO, 4.7pF | **42025042** | | | 1 |
| 62 | C43 | Cap, Chip, CC1206, NPO, 10pF | **42025013** | | | 1 |

| PCB Assembly, LGV Board (A5) (3 of 5) | 80 115 001, Rev G |
|---|---|

| Item No. | Ref. Desig. | Nomenclature | Tel Desig. | Vendor P/N | Resource | Qty |
|---|---|---|---|---|---|---|
| 63 | C2, C3 | Cap, Chip, CC1206, NPO, 33pF | **42025019** | | | 2 |
| 64 | C46, C84, C119, C120, C133, C182 | Cap, Chip, CC1206, NPO, 47pF | **42025021** | | | 6 |
| 65 | C64, C65, C87, C105, C121, C123, C125, C126, C127, C139, C184 | Cap, Chip, CC1206, NPO, 100pF | **42025025** | | | 11 |
| 66 | C193 | Cap, Chip, CC1206, NPO, 220pF | **42025029** | | | 1 |
| 67 | C45 | Cap, Chip, CC1206, NPO, 330pF | **42025031** | | | 1 |
| 68 | C49 | Cap, Chip, CC1206, NPO, 680pF | **42025035** | | | 1 |
| 69 | C6, C8, C21, C39, C44, C48, C50, C51, C56-C61, C73, C77, C82, C83, C88-C95, C98, C109-C113, C118, C122, C124, C128, C129, C132, C140, C148, C150-C154, C163, C164, C178, C179, C183, C186 | Cap, Chip, CC1206, NPO, 1000pF | **42025037** | | | 51 |
| 70 | C14-C20, C22-C29, C31-C38, C40-C42, C53-C55, C62, C63, C66-C69, C74, C75, C79, C80, C100, C101, C114, C136, C137, C147, C162, C169-C177, C180 | Cap, Chip, CC1206, X7R, 0.01uF | **42020001** | | | 56 |
| 71 | C149 | Cap, Chip, CC1206, X7R, 0.022uF | **42020021** | | | 1 |
| 72 | C96, C115, C192, C194 | Cap, Chip, CC1206, X7R, 0.1uF | **42020013** | | | 4 |
| 73 | C70, C181, C185 | Cap, Chip, CC1210, 1uF | **42026001** | | | 3 |
| 74 | | | | | | |

| PCB Assembly, LGV Board (A5) (4 of 5) | | | 80 115 001, Rev G | | | |
|---|---|---|---|---|---|---|
| **Item No.** | **Ref. Desig.** | **Nomenclature** | **Tel Desig.** | **Vendor P/N** | **Resource** | **Qty** |
| 75 | R32, R41, R70 | Trimpot, SM, 1K | **41050007** | 3314G-1-102E | Bourns | 3 |
| 76 | R16, R139 | Trimpot, SM, 10K | **41050010** | 3314G-1-103E | Bourns | 2 |
| 77 | R48 | Trimpot, SM, 20K | **41050011** | 3314G-1-203E | Bourns | 1 |
| 78 | R137, R182 | Trimpot, SM, 50K | **41050012** | 3314G-1-503E | Bourns | 2 |
| 79 | R181 | Trimpot, SM, 100K | **41050013** | 3314G-1-104E | Bourns | 1 |
| 80 | | | | | | |
| 81 | | | | | | |
| 82 | R151, R153, R193, R194 | Res, Chip, RC1206, MF, 1% 6.34K | **41101270** | | | 4 |
| 83 | R35-R38 | Res, Chip, RC1206, MF, 1% 10.0K | **41101289** | | | 4 |
| 84 | | | | | | |
| 85 | R150 | Res, Chip, RC1206, MF, 1%, 34K | **41101340** | | | 1 |
| 86 | | | | | | |
| 87 | R58, R125 | Res, Chip, RC1206, 5% 0 OHM | **41160145** | | | 2 |
| 88 | R119, R121, R160, R161 | Res, Chip, RC1206, 5% 33 OHM | **41160007** | | | 4 |
| 89 | R122, R133, R163 | Res, Chip, RC1206, 5% 62 OHM | **41160063** | | | 3 |
| 90 | R174 | Res, Chip, RC1206, 5% 68 OHM | **41160016** | | | 1 |
| 91 | R166, R178 | Res, Chip, RC1206, 5% 100 OHM | **41160011** | | | 2 |
| 92 | R129, R170 | Res, Chip, RC1206, 5% 150 OHM | **41160009** | | | 2 |
| 93 | R130, R171 | Res, Chip, RC1206, 5% 220 OHM | **41160020** | | | 2 |
| 94 | R65, R120, R162 | Res, Chip, RC1206, 5% 240 OHM | **41160045** | | | 3 |
| 95 | R123, R134, R164 | Res, Chip, RC1206, 5% 390 OHM | **41160070** | | | 3 |
| 96 | R146, R187 | Res, Chip, RC1206, 5% 470 OHM | **41160021** | | | 2 |
| 97 | R117, R135, R159, R175 | Res, Chip, RC1206, 5% 680 OHM | **41160027** | | | 4 |
| 98 | R72 | Res, Chip, RC1206, 5% 910 OHM | **41160039** | | | 1 |
| 99 | R20 | Res, Chip, RC1206, 5% 6.2K | **41160084** | | | 1 |
| 100 | R49, R90-R92, R230 | Res, Chip, RC1206, 5% 1K | **41160003** | | | 5 |
| 101 | R69, R116, R156 | Res, Chip, RC1206, 5% 2.7K | **41160004** | | | 3 |
| 102 | R28, R127, R152, R168, R192 | Res, Chip, RC1206, 5% 3.3K | **41160029** | | | 5 |
| 103 | R241, R47, R67 | Res, Chip, RC1206, 5% 4.7K | **41160013** | | | 3 |
| 104 | R128, R149, R169 | Res, Chip, RC1206, 5% 8.2K | **41160087** | | | 3 |

| PCB Assembly, LGV Board (A5) (5 of 5) | | | 80 115 001, Rev G | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| **Item No.** | **Ref. Desig.** | **Nomenclature** | **Tel Desig.** | **Vendor P/N** | **Resource** | **Qty** |
| 105 | R3, R5-R15, R17, R23, R27, R30, R31, R33, R34, R39, R40, R71, R78, R79, R118, R144, R154, R157, R172, R177, R191, R195, R238 | Res, Chip, RC1206, 5% 10K | **41160015** | | | 33 |
| 106 | R115, R132, R140, R158 | Res, Chip, RC1206, 5% 12K | **41160089** | | | 4 |
| 107 | R76, R244 | Res, Chip, RC1206, 5% 20K | **41160092** | | | 2 |
| 108 | R45 | Res, Chip, RC1206, 5% 22K | **41160047** | | | 1 |
| 109 | R19, R29 | Res, Chip, RC1206, 5% 27K | **41160024** | | | 2 |
| 110 | R243 | Res, Chip, RC1206, 5% 36K | **41160095** | | | 1 |
| 111 | R245 | Res, Chip, RC1206, 5% 39K | **41160096** | | | 1 |
| 112 | R2, R21, R22, R43, R44, R138, R179, R190 | Res, Chip, RC1206, 5% 47K | **41160031** | | | 8 |
| 113 | R242 | Res, Chip, RC1206, 5% 75K | **41160101** | | | 1 |
| 114 | R42 | Res, Chip, RC1206, 5% 91K | **41160103** | | | 1 |
| 115 | R18, R68, R83-R88, R147, R148, R180, R188, R189 | Res, Chip, RC1206, 5% 100K | **41160025** | | | 13 |
| 116 | R143, R145, R185, R186 | Res, Chip, RC1206, 5% 470K | **41160036** | | | 4 |
| 117 | R4 | Res, Chip, RC1206, 5% 1M | **41160049** | | | 1 |
| 118 | W27 | Cable Assy, LGV / Tx/Rx | **75010167** | | | 1 |
| 119 | | Shield, Isolation | **31020074** | | | 2 |
| 120 | | Cover, RF Shielding | **62040030** | | | 2 |
| 121 | | Wire, Kynar, Insulated, 28 AWG | **72628001** | 461-0 | Olympic | AR |
| 122 | | Adhesive, Wire Tacking (Spot Cement) | **31010005** | TACPAC444 | Loctite | AR |




PCB Assembly, MB/COMM (A6)

Figure 6-19

| PCB Assembly, MB/COMM (A6) (1 of 6) | | | 80 116 001, Rev J | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| **Item No.** | **Ref. Desig.** | **Nomenclature** | **Tel Desig.** | **Vendor P/N** | **Resource** | **Qty** |
| 1 | | Panel PCB Drilling and Fabrication | **80116002** | | | 1 |
| 2 | | | | | | |
| 3 | U1, U2, U3 | Dual 4-Bit Decade Counter, SM, SO-16 | **40201030** | 74HC390M | N.S. | 3 |
| 4 | U4, U21, U49 | CMOS Phase Lock Loop, SM, SO-16 | **40201042** | 74HC4046D | Motorola | 3 |
| 5 | U5 | 14-Stage Ripple-Carry Binary Counter/Divider, SM, SO-8 | **40201020** | CD4060BCM | N.S. | 1 |
| 6 | U7, U8 | Hex Inverter, SM, SO-14 | **40201019** | 74HC04M | N.S. | 2 |
| 7 | U9, U50 | Dual D Flip-Flop, SM, SO-14 | **40201021** | 74HC74AM | N.S. | 2 |
| 8 | U17 | 8-Channel Analog Multiplexer, SM, SO-16 | **40201101** | 74HC4051D | N.S. | 1 |
| 9 | U28 | Quad 2-Input NAND Gate, SM, SO-14 | **40201038** | 74HC00M | N.S. | 1 |
| 10 | U40 | Binary Counter with Synchronous Clear, SM, SO-16 | **40201002** | 74HC163D | N.S. | 1 |
| 11 | | | | | | |
| 12 | U41 | Octal D Flip-Flop, Edge-Triggered, SM, SO-20 | **40201013** | 74HC574WM | N.S. | 1 |
| 13 | U35, U44 | Triple 2-Channel Analog Multiplexer, SM, SO-16 | **40201049** | CD4053BCM | N.S. | 2 |
| 14 | U13, U16, U32, U34 | Low Power Dual Operational Amp., SM, SO-8 | **40201051** | LM358D | N.S. | 4 |
| 15 | U31 | High Speed Dual Comparator, SM, SO-14 | **40201044** | LM319M | N.S. | 1 |
| 16 | U20, U22 | Low-Noise JFET-Input Operational Amp., SM, SO-8 | **40201158** | TL071C | T.I. | 2 |
| 17 | U46, U47 | JFET-Input Operational Amp., SM, SO-8 | **40201007** | TL081CD | T.I. | 2 |
| 18 | U43, U36 | JFET-Input Dual Operational Amp., SM, SO-8 | **40201008** | TL082CD | T.I. | 2 |
| 19 | U10, U38 | Direct Digital Synthesizer, 125MHz, SM, SSOL-28 | **40201121** | AD9850BRS | Analog Devices | 2 |
| 20 | U29 | Low Power Mixer FM IF System, SM, SOL-20 | **40201118** | SA615D | Philips | 1 |
| 21 | U6, U11 | Two Modulus Prescaler, 1.1GHz, SM, SO-8 | **40201003** | MB501FLP | Fujitsu | 2 |
| 22 | U30 | IF Amplifier, SM, SO-8 | **40201052** | MC1350D | Motorola | 1 |
| 23 | U12 | RF Amp. 16dB@500MHz, SM, 86 Plastic | **40201098** | MAR-1SM | Mini-Circuits | 1 |
| 24 | U54 | RF Amp. 22dB@500MHz, SM, 86 Plastic | **40201156** | ERA-3SM | Mini-Circuits | 1 |
| 25 | U18, U53, U55 | RF Amp. 12dB@500MHz, SM, 86 Plastic | **40201128** | MSA 0786 | HP | 3 |
| 26 | M2 | Frequency Mixer, (0.35-2)GHz, SM | **40201086** | RMS-11F | Mini-Circuits | 1 |
| 27 | M5, M8, M9 | Frequency Mixer, (1-600)MHz, SM | **40201001** | ASK-1-KK81 | Mini-Circuits | 3 |
| 28 | U23 | Voltage Controlled Oscillator, (485-765)MHz | **40201119** | POS-765 | Mini-Circuits | 1 |
| 29 | U24 | Voltage Controlled Oscillator, (685-1025)MHz | **40201120** | POS-1025 | Mini-Circuits | 1 |

| PCB Assembly, MB/COMM (A6) (2 of 6) | | | 80 116 001, Rev J | | | |
|---|---|---|---|---|---|---|
| **Item No.** | **Ref. Desig.** | **Nomenclature** | **Tel Desig.** | **Vendor P/N** | **Resource** | **Qty** |
| 30 | U56 | Voltage Regulator, +5V, TO-220 | **56060006** | LM2940T-5.0 | N.S. | 1 |
| 31 | U45 | Voltage Regulator, +5V, SM, TO-220 | **56060012** | LM2931CM | N.S. | 1 |
| 32 | U37 | Voltage Regulator, +6V, SM, SO-8 | **56060014** | LM78L62ACZ | N.S. | 1 |
| 33 | U14 | Voltage Regulator, +15V, SM, TO-220 | **56060010** | LM2940CS-15 | N.S. | 1 |
| 34 | U15 | Voltage Regulator, -5V, SM, TO-220 | **56060013** | LM2990S-5.0 | N.S. | 1 |
| 35 | U42 | Voltage Regulator, +12V, SM, SO-8 | **56060009** | TL751L12CD | T.I. | 1 |
| 36 | | | | | | |
| 37 | Q2-Q6 | Transistor P-N-P, SM, SOT-23 | **40001014** | MMBT2907A | Motorola | 5 |
| 38 | Q7, Q8 | Transistor N-P-N, SM, SOT-23 | **40001011** | MMBT2222A | Motorola | 2 |
| 39 | Q9 | Transistor, N-Channel, MOSFET | **40001012** | VN10LM | Motorola | 1 |
| 40 | | | | | | |
| 41 | CR2-CR20 | Diode, Silicon PIN Switching, SM, SOT-23 | **40010010** | MMBV3700L | Motorola | 19 |
| 42 | CR22, CR30 | Diode, General Purpose Signal, SM, SOT-23 | **40010014** | MMBD914 | Motorola | 2 |
| 43 | CR27-CR29 | Diode, Reference 2.5V | **40200040** | LM336BZ2.5 | N.S. | 3 |
| 44 | CR21, CR23-CR25 | Diode, Schottky, SM, SOT-23 | **40010016** | ZC2800 | Z-TECH | 4 |
| 45 | CR1 | Diode, Voltage-Variable Capacitance, SM, SOT-23 | **40010017** | MMBV109L | Motorola | 1 |
| 46 | CR26 | Diode, Zener, 5.1V, SM, SOT-23 | **40010039** | MMBZ5231BLT1 | Motorola | 1 |
| 47 | | | | | | |
| 48 | FL1, FL2 | Filter, Ceramic 455KHz | **43020007** | CFU455B2 | MURATA | 2 |
| 49 | FL3 | Resonator, Ceramic 455KHz | **40040032** | CDB455C9 | MURATA | 1 |
| 50 | Y1 | Crystal, 20.97215MHz | **40040030** | BOMAR | BOMAR | 1 |
| 51 | XY1 | Crystal, Mount | **55080002** | 470-025 | BIVAR | 1 |
| 52 | U25 | Oscillator, 10Mhz | **48075007** | 7X2100A-FZ-1-10,000Mhz | RALTRON | 1 |
| 53 | P19 | Header, Shrouded, Top 36 Pin | **48000064** | TSS-118-01-G-D | SAMTEC | 1 |
| 54 | T1, T3, T4, T6, T7 | Transformer, RF | **43002002** | T1-1T-KK81 | Mimi-Circuit | 5 |
| 55 | TP1-TP10 | Terminal | **55025008** | TP-105-01-09 | Vendor Comp. | 10 |
| 56 | U25 (Alternate to item 52) | Temperature Compensated Oscillator, 10MHz | **48075009** | CFPT-5206FA-10.000MHz | CFPT | 1 |
| 57 | L17, L18 | Inductor, SM, 32CS 12nH | **43011070** | 380NB-12NM | TOKO | 2 |
| 58 | L20, L21 | Inductor, SM, 32CS 18nH | **43011032** | 380NB-18NM | TOKO | 2 |
| 59 | L3, L4 | Inductor, SM, 1210 22nH | **43011040** | CTM1210-R022K | CTL. TECH. | 2 |
| 60 | L1, L2 | Inductor, SM, 32CS 33nH | **43011033** | 380NB-33NM | TOKO | 2 |
| 61 | L5, L6, L12, L14 | Inductor, SM, 32CS 100nH | **43011071** | 380NB-R10M | TOKO | 4 |
| 62 | L7, L8 | Inductor, SM, 32CS 180nH | **43011036** | 380NB-R18M | TOKO | 2 |
| 63 | L13, L15, L16 | Inductor, SM, 32CS 1.0uH | **43011041** | 380LB-1R0K | TOKO | 3 |
| 64 | L22, L23 | Inductor, SM, 43FS 10uH | **43011020** | 300LS-100K | TOKO | 2 |
| 65 | L10, L11 | Inductor, SM, 43FS 22uH | **43011030** | 300LS-220K | TOKO | 2 |

| PCB Assembly, MB/COMM (A6) (3 of 6) | 80 116 001, Rev J |
|---|---|

| Item No. | Ref. Desig. | Nomenclature | Tel Desig. | Vendor P/N | Resource | Qty |
|---|---|---|---|---|---|---|
| 66 | | | | | | |
| 67 | | | | | | |
| 68 | C206 | Cap, Chip, CC1206, NPO 2.2pF | **42025005** | | | 1 |
| 69 | C14, C15 | Cap, Chip, CC1206, NPO 3.3pF | **42025007** | | | 2 |
| 70 | C224, C226 | Cap, Chip, CC1206, NPO 4.7pF | **42025042** | | | 2 |
| 71 | C225 | Cap, Chip, CC1206, NPO 6.8pF | **42025011** | | | 1 |
| 72 | C30, C31 | Cap, Chip, CC1206, NPO 10pF | **42025013** | | | 2 |
| 73 | C4 | Cap, Chip, CC1206, NPO 15pF | **42025015** | | | 1 |
| 74 | C32 | Cap, Chip, CC1206, NPO 18pF | **42025016** | | | 1 |
| 75 | C16, C28 | Cap, Chip, CC1206, NPO 22pF | **42025017** | | | 2 |
| 76 | C1 | Cap, Chip, CC1206, NPO 27pF | **42025018** | | | 1 |
| 77 | C18, C19, C27 | Cap, Chip, CC1206, X7R 39pF | **42020009** | | | 3 |
| 78 | C17, C21, C26 | Cap, Chip, CC1206, NPO 68pF | **42025023** | | | 3 |
| 79 | C20 | Cap, Chip, CC1206, NPO 82pF | **42025024** | | | 1 |
| 80 | C47-C49,C66,C133,C134,C163, C212,C216 | Cap, Chip, CC1206, NPO 100pF | **42025025** | | | 9 |
| 81 | C22, C169 | Cap, Chip, CC1206, X7R 150pF | **42020010** | | | 2 |
| 82 | | | | | | |
| 83 | C2 | Cap, Chip, CC1206, NPO 330pF | **42025031** | | | 1 |
| 84 | C108 | Cap, Chip, CC1206, NPO 470pF | **42025033** | | | 1 |
| 85 | C119, C158 | Cap, Chip, CC1206, NPO 680pF | **42025035** | | | 2 |
| 86 | C5-C9, C23-C25, C29, C33, C35, C37-C39, C43, C45, C46, C58, C60, C62, C63, C69, C76-C79, C84-C88, C90, C92-C98, C101, C102, C135, C140, C141, C150, C155, C156, C159, C160, C161, C171, C181, C194, C198, C199, C223, C227 | Cap, Chip, CC1206, NPO 1000pF | **42025037** | | | 67 |

| PCB Assembly, MB/COMM (A6) (4 of 6) | 80 116 001, Rev J |
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| Item No. | Ref. Desig. | Nomenclature | Tel Desig. | Vendor P/N | Resource | Qty |
|---|---|---|---|---|---|---|
| 87 | C72, C170, C202 | Cap, Chip, CC1206, NPO 1200pF | **42025038** | | | 3 |
| 88 | C11, C12, C13, C200 | Cap, Chip, CC1206, NPO 2200pF | **42020015** | | | 4 |
| 89 | C40, C44, C52, C53, C59, C80, C81, C115-C118, C128, C132, C138, C139, C157, C162, C205, C214, C215, C217-C221 | Cap, Chip, CC1206, X7R 0.01uF | **42020001** | | | 25 |
| 90 | C36,C41,C42,C50,C51, C54-C57,C67,C68,C70,C89, C100,C154, C197 | Cap, Chip, CC1206, X7R 0.1uF | **42020013** | | | 16 |
| 91 | C71, C82 | Cap, Chip, CC1206, X7R, 0.22uF | **42020065** | | | 2 |
| 92 | C3,C34,C56,C57,C74,C75,C91,C103,C110,C127,C165,C172,C173, C175,C177, C180,C183-C185,C190, C191,C195, C196, C201,C203 | Cap, Chip, CC1210, 1uF | **42026001** | | | 25 |
| 93 | | | | | | |
| 94 | C109, C143, C144, C147-C149 | Cap, SM, Elect. 1uF/50V | **42185045** | ECE-V1HA010R | PAN | 6 |
| 95 | C111 | Cap, SM, Elect. 10uF/16V | **42185030** | ECE-V1CA100R | PAN | 1 |
| 96 | C112, C136, C65, C114 | Cap, SM, Elect. 22uF/25V | **42185036** | ECE-V1EA220P | PAN | 4 |
| 97 | C10, C73, C99, C129, C174 | Cap, SM, Tant. 22uF/25V | **42480009** | ECS-T1ED226R | PAN | 5 |
| 98 | C64 | Cap, SM, Elect. 47uF/16V | **42185033** | ECE-V0JA470SP | PAN | 1 |
| 99 | C153 | Cap, SM, Elect. 100uF/16V | **42186003** | ECE-V1CA101P | PAN | 1 |
| 100 | C213 | Cap, SM, Tant. 22uF/16V | **42480001** | ECS-H1CD226R | PAN | 1 |

| PCB Assembly, MB/COMM (A6) (5 of 6) | 80 116 001, Rev J |
|---|---|

| Item No. | Ref. Desig. | Nomenclature | Tel Desig. | Vendor P/N | Resource | Qty |
|---|---|---|---|---|---|---|
| 101 | R71 | Res, Chip, RC1206, 1%, MF, 442 OHM | **41101159** | | | 1 |
| 102 | R103-R106,R143, R144,R198, R199 | Res, Chip, RC1206, 1%, MF, 100K | **41101385** | | | 8 |
| 103 | R99, R181, R191 | Res, Chip, RC1206, 1%, MF, 178K | **41101409** | | | 3 |
| 104 | R98, R182 | Res, Chip, RC1206, 1%, MF, 464K | **41101449** | | | 2 |
| 105 | R110-R113 | Res, Chip, RC1206, 1%, MF, 1M | **41101481** | | | 4 |
| 106 | R15, R169 (R169 assoc with item 52) | Res, Chip, RC1206, 5%, 0 OHM | **41160145** | | | 2 |
| 107 | R30, R37, R162 | Res, Chip, RC1206, 5%, 18 OHM | **41160038** | | | 3 |
| 108 | R161 | Res, Chip, RC1206, 5%, 24 OHM | **41160059** | | | 1 |
| 109 | R81, R154, R157 | Res, Chip, RC1206, 5%, 36 OHM | **41160060** | | | 3 |
| 110 | R190, R152 | Res, Chip, RC1206, 5%, 51 OHM | **41160043** | | | 2 |
| 111 | R203, R204 | Res, Chip, RC1206, 5%, 68 OHM | **41160016** | | | 2 |
| 112 | R163 | Res, Chip, RC1206, 5%, 75 OHM | **41160040** | | | 1 |
| 113 | R20,R22,R43,R74,R75, R80,R86, R129, R145-R150, R160,R164, R165,R201, R159,R166, R167 | Res, Chip, RC1206, 5%, 100 OHM | **41160011** | | | 21 |
| 114 | R153, R155, R202 | Res, Chip, RC1206, 5%, 150 OHM | **41160009** | | | 3 |
| 115 | R27, R49, R200 | Res, Chip, RC1206, 5%, 200 OHM | **41160067** | | | 3 |
| 116 | R17, R18, R151, R156 | Res, Chip, RC1206, 5%, 510 OHM | **41160046** | | | 4 |
| 117 | R7-R9, R12, R21, R88, R95, R100, R102, R158, R168 | Res, Chip, RC1206, 5%, 1K | **41160003** | | | 11 |
| 118 | R6, R13, R14 | Res, Chip, RC1206, 5%, 2.2K | **41160008** | | | 3 |
| 119 | R19, R45, R51, R132 | Res, Chip, RC1206, 5%, 2.7K | **41160004** | | | 4 |
| 120 | R10, R130 | Res, Chip, RC1206, 5%, 3.9K | **41160022** | | | 2 |
| 121 | R56,R64,R66,R68,R70, R83,R89,R142 | Res, Chip, RC1206, 5%, 5.1K | **41160082** | | | 8 |

| PCB Assembly, MB/COMM (A6) (6 of 6) | | | 80 116 001, Rev J | | | |
|---|---|---|---|---|---|---|
| **Item No.** | **Ref. Desig.** | **Nomenclature** | **Tel Desig.** | **Vendor P/N** | **Resource** | **Qty** |
| 122 | R2,R4,R23, R35,R53-R55,R57-R61,R63,R65,R67,R69, R72,R79,R87,R97,R109, R119,R128, R192,R193 | Res, Chip, RC1206, 5%, 10K | **41160015** | | | 25 |
| 123 | R42, R77, R184 | Res, Chip, RC1206, 5%, 27K | **41160024** | | | 3 |
| 124 | R94, R101 | Res, Chip, RC1206, 5%, 33K | **41160042** | | | 2 |
| 125 | R85, R34, R121, R136, R194 | Res, Chip, RC1206, 5%, 47K | **41160031** | | | 5 |
| 126 | R41 | Res, Chip, RC1206, 5%, 91K | **41160103** | | | 1 |
| 127 | R3,R39,R76,R78,R92,R195-R197 | Res, Chip, RC1206, 5%, 100K | **41160025** | | | 8 |
| 128 | R126 | Res, Chip, RC1206, 5%, 240K | **41160035** | | | 1 |
| 129 | R1,R5,R40, R52,R73,R93,R108 | Res, Chip, RC1206, 5%, 1M | **41160049** | | | 7 |
| 130 | R82 | Res, Chip, RC1206, 5%, 10M | **41160033** | | | 1 |
| 131 | R183 | Trimpot, SM 1K | **41050007** | 3314G-1-102E | Bourns | 1 |
| 132 | R33, R96, R125 | Trimpot, SM 10K | **41050010** | 3314G-1-103E | Bourns | 3 |
| 133 | J1, J2 | Connector, SMA, Straight, Female | **48040052** | 142-0701-231 | EFJ | 2 |
| 134 | J3 | Connector, Right Angle, SMA, Female | **48000056** | 142-0701-501 | EFJ | 1 |
| 135 | W25 | Cable Assy, MBC Bd./Panel Switch Bd. | **75010131** | | | 1 |
| 136 | R90 (Associated with item 56) | Trimpot, Multiturn 100K | **41700016** | RC24CW104 | Bourns | 1 |
| 137 | | Wire, Kynar, Insulated, 28 AWG (BLK) | **72628001** | 461-0 | Olympic | AR |
| 138 | | Wire, Kynar, Insulated, 28 AWG (RED) | **72628003** | 461-2 | Olympic | AR |
| 139 | | PCB Assembly, Temp Sensor | **80206001** | | | 1 |
| 140 | | PCB Assembly, Diode | **80207001** | | | 1 |
| 141 | | Adhesive, Silicone RTV | **31010001** | 732 | Dow Corning | AR |
| 142 | | Adhesive, Wire Tacking (Spot Cement) | **31010005** | TACPAK444 | Loctite | AR |
| | | Schematic Diagram | **80116003** | | | |

# APPENDIX A

## T-36C Data Sheet/Test Set Verification and Acceptance Checks

| | |
|---|---|
| **DATE** | |
| **Serial #** | |
| **Technician** | |

| 4.4 Display Operation and Verification | | | | |
|---|---|---|---|---|
| Step # | Test Description | Expected Value | Actual Result | Pass / Fail |
| | | | | |
| 2 | Verify Green LED | LIT | | |
| 4 | Verify Current Software | | | |
| 5 | Momentary Backlighting | Illuminated | | |
| 6 | Backlighting, Constant | Remains Illuminated | | |
| 9 | Auto Shut Off | 15 Minutes | | |

| 4.4.1 Radio Frequency Measurements | | | | | | |
|---|---|---|---|---|---|---|
| Step # | Test Description | Expected Value | | Actual Result | | Pass / Fail |
| | | | | | | |
| 6 | Frequency and P out Verification | Freq | P out | Freq | P out | |
| 6a | LOC | 108.10/± 100 Hz | +6 / ± 1 dBm | MHz | dBm | |
| 6b | LOC | 111.95/± 100 Hz | +6 / ± 1 dBm | MHz | dBm | |
| 6c | VOR | 108.00/± 100 Hz | +6 / ± 1 dBm | MHz | dBm | |
| 6d | VOR | 117.95/± 100 Hz | +6 / ± 1 dBm | MHz | dBm | |
| 6e | GS | 108.95/329.15 ± 100 Hz | +0 / ± 1 dBm | MHz | dBm | |
| 6f | GS | 110.30/335.00 ± 100 Hz | +0 / ± 1 dBm | MHz | dBm | |
| 6g | MB | 75MHz/± 100 Hz | +13 / ± 1 dBm | MHz | dBm | |
| 6h | COMM | 108MHz± 100Hz | +0/ ± 1 dBm | MHz | dBm | |
| 6i | COMM | 174MHz± 100Hz | +0/ ± 1 dBm | MHz | dBm | |
| | | | | | | |
| 8 | RF Output Slew | 000 dBm to -100dBm ± 1 dB | | PASS FAIL | | |

| 4.4.2 VOR Modulation Measurements | | | | |
|---|---|---|---|---|
| Step # | Test Description | Expected Value | Actual Result | Pass / Fail |
| | | | | |
| 2a | 9960Hz DELETE *UP* | 29 – 31% | % | |
| | 9960 Modulation | 9960 / ± 99 Hz | Hz | |
| | FM Deviation | 480 Hz / ± 30 Hz | Hz | |
| 2b | 9960Hz DELETE *DOWN* | 29 – 31% | % | |
| | 30 Hz Modulation | 30 / ± 0.3 Hz | Hz | |
| 2c | Composite Signal (30 & 9960 Hz) | 57 – 63% | % | |
| 2d | Composite Signal (30, 9960, & 1020 Hz) | Present | Checked | |

| 4.4.3 VOR Angle Verification | | | | |
|---|---|---|---|---|
| Step # | Test Description | Expected Value | Actual Result | Pass / Fail |
| | | | | |
| 3a | Angle Verification- 0º | 180 ±1º | º | |
| 4a | Angle Verification- 45º | 225 ±1º | º | |
| 4b | Angle Verification- 90º | 270 ±1º | º | |
| 4c | Angle Verification- 135º | 315 ±1º | º | |
| 4d | Angle Verification- 180º | 0 ±1º | º | |
| 4e | Angle Verification- 225º | 45 ±1º | º | |
| 4f | Angle Verification- 270º | 90 ±1º | º | |
| 4g | Angle Verification- 315º | 135 ±1º | º | |

| 4.4.4 LOC Modulation Measurements | | | | |
|---|---|---|---|---|
| Step # | Test Description | Expected Value | Actual Result | Pass / Fail |
| | | | | |
| 1a | DELETE switch *DOWN* to 150/9960 | 19 – 21% | % | |
| | Modulation Tone | 90 / ± 0.9 Hz | Hz | |
| | | | | |
| 1b | DELETE switch *UP* to 90/30 | 19 – 21% | % | |
| | Modulation Tone | 150 / ± 1.5 Hz | Hz | |
| | | | | |
| 1c | Verify Composite Signal 90 & 150 Hz | 35 – 39% | % | |
| 1d | Verify Composite Signal 90, 150, 1020 Hz | Present | PASS FAIL | |

| 4.4.4 LOC Modulation Measurements | | | | |
|---|---|---|---|---|
| Step # | Test Description | Measured Value | Actual Result | Pass / Fail |
| | | | | |
| 1e L2 | Del 90 | Measurement - % | Checked | |
| | Del 150 | Measurement - % | Checked | |
| | Diff in % | 15.5% – 19.5% | % | |
| L1 | Del 90 | Measurement - % | Checked | |
| | Del 150 | Measurement - % | Checked | |
| | Diff in % | 6% - 10% | % | |
| OC | Del 90 | Measurement - % | Checked | |
| | Del 150 | Measurement - % | Checked | |
| | Diff in % | -1% to +1% | % | |
| R1 | Del 90 | Measurement - % | Checked | |
| | Del 150 | Measurement - % | Checked | |
| | Diff in % | -6% to -10% | % | |
| R2 | Del 90 | Measurement - % | Checked | |
| | Del 150 | Measurement - % | Checked | |
| | Diff in % | -15.5% to -19.5% | % | |

| 4.4.5 GS Modulation Measurements | | | | |
|---|---|---|---|---|
| Step # | Test Description | Expected Value | Actual Result | Pass / Fail |
| | | | | |
| 1a | DELETE switch *DOWN* to 150/9960 | 39 – 41% | % | |
| | Modulation Tone | 90Hz / ± 0.9Hz | Hz | |
| | | | | |
| 1b | DELETE switch *UP* to 90/30 | 39 – 41% | % | |
| | Modulation Tone | 150Hz / ± 1.5Hz | Hz | |
| | | | | |
| 1c | Verify Composite Signal 90 & 150 Hz | 72 – 78% | % | |

| 4.4.5 GS Modulation Measurements | | | | |
|---|---|---|---|---|
| Step # | Test Description | Expected Value | Actual Result | Pass / Fail |
| | | | | |
| 1d U2 | Del 90 | Measurement - % | Checked | |
| | Del 150 | Measurement - % | Checked | |
| | Diff in % | 15% – 20% | % | |
| U1 | Del 90 | Measurement - % | Checked | |
| | Del 150 | Measurement - % | Checked | |
| | Diff in % | 7% - 11% | % | |

| 4.4.5 GS Modulation Measurements | | | | |
|---|---|---|---|---|
| Step # | Test Description | Expected Value | Actual Result | Pass / Fail |
| | | | | |
| 1d OC | Del 90 | Measurement - % | Checked | |
| | Del 150 | Measurement - % | Checked | |
| | Diff in % | -1% to +1% | % | |
| D1 | Del 90 | Measurement - % | Checked | |
| | Del 150 | Measurement - % | Checked | |
| | Diff in % | -7% to -11% | % | |
| D2 | Del 90 | Measurement - % | Checked | |
| | Del 150 | Measurement - % | Checked | |
| | Diff in % | -15% to -20% | % | |
| 1e | Verify Composite Signal 110.15 & 334.55 | Present | PASS FAIL | |
| | 110.15, 334.55, and 75 MHz | Present | PASS FAIL | |

| 4.4.5 GS Modulation Measurements | | | | |
|---|---|---|---|---|
| Step # | Test Description | Expected Value | Actual Result | Pass / Fail |
| | | | | |
| 2a | Modulation Tracking / 1000 Hz | Within ± 5 | | |
| 3a | Deviation Tracking | Within ± 1 kHz | | |
| 4a | Audio Output Level 100 mv | ± 50 mv | mv | |
| | Audio Output Level 500 mv | ± 50 mv | mv | |
| | Audio Output Level 900 mv | ± 50 mv | mv | |

| 4.4.6 Receiver | | | | |
|---|---|---|---|---|
| Step # | Test Description | Expected Value | Actual Result | Pass / Fail |
| | | | | |
| | Verify Display | 120.000 MHz / ± 200 Hz | MHz | |
| | Tracking | Tracks ± 0.2 kHz | | |

| 4.4.6 Receiver | | | | |
|---|---|---|---|---|
| Step # | Test Description | Expected Value | Actual Result | Pass / Fail |
| | | | | |
| 1a | Verify Display | 120.000 MHz / ± 200 Hz | MHz | |
| 1b | Tracking | 9.5 kHz / ± 0.2 kHz | | |
| 1c | POWER TOO HIGH, Display Verification | + 16 dBm | dBm | |
| | POWER IN RANGE, Display Verification | +9 dBm | dBm | |
| | POWER IN RANGE, Display Verification | -7 dBm | dBm | |
| | LOW POWER, Display Verification | -17 dBm | dBm | |
| | LOW POWER, Display Verification | -26 dBm | dBm | |
| | NO POWER, Display Verification | -33 dBm | dBm | |

| 4.4.6 Receiver | | | | | |
|---|---|---|---|---|---|
| Step # | Test Description | Expected Value | | Actual Result | Pass / Fail |
| | | | | | |
| 2a | Verify Deviation | 8 kHz / ± 1 kHz | | kHz | |
| 2b | Tracking | 1 – 15 kHz / ± 1 kHz | | PASS FAIL | |
| | | | | | |
| 5 | Verify Test Set switches to Measurement Mode | Display indicates 1 W | | W | |
| 7 | Power Measurement, 120 MHz | 10 W / ± 2 W | | W | |
| | | | | | |
| | | Attenuator | Value | | |
| 9 | VSWR Measurement, 120 MHz | Open | > 5.0 | | |
| | | 3 dB | 3.2 ± 0.5 | | |
| | | 6 dB | 1.6 ± 0.5 | | |
| | | 10 dB | 1.1 ± 0.5 | | |
| 10 | VSWR Measurement, 150 MHz | Open | > 5.0 | | |
| | | 3 dB | 3.2 ± 0.5 | | |
| | | 6 dB | 1.6 ± 0.5 | | |
| | | 10 dB | 1.1 ± 0.5 | | |
| 11 | Audio Verification | Tone | | | |
| 12 | Verify 230 VAC Operation | Operates | | | |

| | |
|---|---|
| **DATE** | |
| **PASS/FAIL** | |
| **Technician** | |

# APPENDIX B

## T-36C Data Sheet/Test Set Annual Calibration and Alignment

| 4.8.1 Power Interlocks and Clocks | | | | |
|---|---|---|---|---|
| | | | | |
| Step # | Test Description | Specification | Initial Result | Final Adjusted (If applicable) |
| | | | | |
| 1 | AC Green LED | Illuminated | Checked | Checked |
| 2 | Power E62 & E66 | 14 – 19 VDC | VDC | VDC |
| 4 | Charging Voltage | 13.5 VDC ± 0.5 VDC | VDC | VDC |
| 5 | DC LED | Illuminated | Checked | Checked |
| 6 | Verify Software | | | |
| | | | | |
| 10 | DC Voltage MB/COMM Board | | | |
| 10a | TP1 | - 6 / ± 0.3 VDC | VDC | VDC |
| 10b | TP2 | + 17 / ± 0.5 VDC | VDC | VDC |
| 10c | TP3 | + 6 / ± 0.3 VDC | VDC | VDC |
| 10d | TP4 | +5 / ± 0.3 VDC | VDC | VDC |
| 10e | TP5 | +15 / ± 0.3 VDC | VDC | VDC |
| 10f | TP6 | - 5 / ± 0.3 VDC | VDC | VDC |
| 10g | TP7 | +5 / ± 0.3 VDC | VDC | VDC |
| 10h | TP8 | +15 / ± 0.3 VDC | VDC | VDC |
| | | | | |
| 11 | DC Voltage L/G/V Board | | | |
| 11a | TP3 | +5 / ± 0.3 VDC | VDC | VDC |
| 11b | TP15 | +15 / ± 0.3 VDC | VDC | VDC |
| 11c | TP16 | - 5 / ± 0.3 VDC | VDC | VDC |

| 4.8.2 Transmitter Checks | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Step # | Test Descript. | Specification | | Initial Result | | Final Adjusted (If applicable) | |
| | | | | | | | |
| 3 & 4 | Output Signals | Power dBm | Frequency MHz | Power dBm | Frequency MHz | Power dBm | Frequency MHz |
| a | LOC | - 7 ± 2dBm | 108.10 MHz ± 150 Hz | dBm | MHz | dBm | MHz |
| b | LOC | - 7 ± 2dBm | 111.95 MHz ± 150 Hz | dBm | MHz | dBm | MHz |
| c | VOR | - 7 ± 2dBm | 108.00 MHz ± 150 Hz | dBm | MHz | dBm | MHz |
| d | VOR | - 7 ± 2dBm | 117.95 MHz ± 150 Hz | dBm | MHz | dBm | MHz |
| e | GS | - 5 ± 2dBm | 108.95/329.15 ± 300 Hz | dBm | MHz | dBm | MHz |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| f | GS | - 5 ± 2dBm | 110.30/335.00 ± 300 Hz | dBm | MHz | dBm | MHz |
| g | MB | +3 ± 2dBm | 75 MHz ± 150 Hz | dBm | MHz | dBm | MHz |
| h | COMM | +3 ± 2dBm | 108 MHz ± 150 Hz | dBm | MHz | dBm | MHz |
| i | COMM | +3 ± 2dBm | 174 MHz ± 150 Hz | dBm | MHz | dBm | MHz |

| Step # | Test Description | Specification | | Initial Result | | Final Adjusted (If applicable) | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| 13 | Antenna Output | Mode | P Out, dBm | Mode | P Out, dBm | Mode | P Out, dBm |
| 13a | COMM | 108 MHz | 0 ± 1 dBm | COMM | dBm | COMM | dBm |
| 13b | COMM | 115 MHz | 0 ± 1 dBm | COMM | dBm | COMM | dBm |
| 13c | COMM | 125 MHz | 0 ± 1 dBm | COMM | dBm | COMM | dBm |
| 13d | COMM | 135 MHz | 0 ± 1 dBm | COMM | dBm | COMM | dBm |
| 13e | COMM | 145 MHz | 0 ± 1 dBm | COMM | dBm | COMM | dBm |
| 13f | COMM | 155 MHz | 0 ± 1 dBm | COMM | dBm | COMM | dBm |
| 13g | COMM | 165 MHz | 0 ± 1 dBm | COMM | dBm | COMM | dBm |
| 13h | COMM | 174 MHz | 0 ± 1 dBm | COMM | dBm | COMM | dBm |
| | | | | | | | |
| 14a | MB, 75 MHz | +13 ± 1 dBm | | P Out, dBm | | P Out, dBm | |
| 14b | L/V 108.05 MHz | +6 ± 1 dBm | | P Out, dBm | | P Out, dBm | |
| 14c | L/V, 113.00 MHz | +6 ± 1 dBm | | P Out, dBm | | P Out, dBm | |
| 14d | L/V, 117.95 MHz | +6 ± 1 dBm | | P Out, dBm | | P Out, dBm | |
| 14e | GS, 108.95 | +0 ± 1 dBm | | P Out, dBm | | P Out, dBm | |
| 14f | GS, 109.30 | +0 ± 1 dBm | | P Out, dBm | | P Out, dBm | |
| 14g | GS, 110.30 | +0 ± 1 dBm | | P Out, dBm | | P Out, dBm | |
| 14h | ILS, 110.10 | +6 ± 1 dBm | | P Out, dBm | | P Out, dBm | |
| | | | | | | | |
| 16a | COMM 108 MHz | - 25 ± 0.5 dBm | | P Out, dBm | | P Out, dBm | |
| 16b | COMM 115 MHz | - 25 ± 0.5 dBm | | P Out, dBm | | P Out, dBm | |
| 16c | COMM 125 MHz | - 25 ± 0.5 dBm | | P Out, dBm | | P Out, dBm | |
| 16d | COMM 135 MHz | - 25 ± 0.5 dBm | | P Out, dBm | | P Out, dBm | |
| 16e | COMM 145 MHz | - 25 ± 0.5 dBm | | P Out, dBm | | P Out, dBm | |
| 16f | COMM 155 MHz | - 25 ± 0.5 dBm | | P Out, dBm | | P Out, dBm | |
| 16g | COMM 165 MHz | - 25 ± 0.5 dBm | | P Out, dBm | | P Out, dBm | |
| 16h | COMM 174 MHz | - 25 ± 0.5 dBm | | P Out, dBm | | P Out, dBm | |
| 16i | MB, 75 MHz | - 25 ± 0.5 dBm | | P Out, dBm | | P Out, dBm | |
| 16j | L/V 108.05 MHz | - 25 ± 0.5 dBm | | P Out, dBm | | P Out, dBm | |
| 16k | L/V, 113.00 MHz | - 25 ± 0.5 dBm | | P Out, dBm | | P Out, dBm | |
| 16l | L/V, 117.95 MHz | - 25 ± 0.5 dBm | | P Out, dBm | | P Out, dBm | |
| 16m | GS, 108.95 | - 30 ± 0.5 dBm | | P Out, dBm | | P Out, dBm | |
| 16n | GS, 109.30 | - 30 ± 0.5 dBm | | P Out, dBm | | P Out, dBm | |
| 16o | GS, 110.30 | - 30 ± 0.5 dBm | | P Out, dBm | | P Out, dBm | |
| 16p | ILS, 110.10 | - 25 ± 0.5 dBm | | P Out, dBm | | P Out, dBm | |
| | | | | | | | |
| 17 | RF Level Output Slew Function | -25 to -100 dBm 1 dB Steps | | Checked | | Checked | |

| Step # | Test Description | Specification | | Initial Result | | Final Adjusted (If applicable) | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| 19 | MB Modulation | Freq Hz | Mod level % | % of Distort. | Freq Hz | Mod level % | % of Distort. |
| | OM | 400 ± 8 | 95 ±5 (95-100) | | | | |
| | MM | 1300±26 | 95 ±5 (95-100) | | | | |
| | IM | 3000± 60 | 95 ±5 (95-100) | | | | |

| Step # | Test Description | Specification | Initial Result | Final Adjusted (If applicable) |
|---|---|---|---|---|
| | | | | |
| 21 | VOR Modulation | | | |
| 21a | 9960 Hz AM | 30% ± 0.5% | % | % |
| | FM Deviation | 480 HZ ±30 Hz | Checked | Checked |
| 21b | 30 Hz AM | 30 ± 0.5% | % | % |
| 21c | 1020 Hz AM | 9 – 10% | % | % |
| 21d | Composite | 57 – 63% | % | % |
| 21e | Composite with MB/ID | 67 – 73% | % | % |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 21f | VOR Bearing | Test Set | 0 | 45 | 90 | 135 | 180 | 225 | 270 | 315 |
| | | Zifor | 180 | 225 | 270 | 315 | 0 | 45 | 90 | 135 |
| | | Checked | | | | | | | | |
| 21g | S1 Switch Positions | On/Off | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| | | | | | | | | | | |

| Step # | Test Description | Specification | Initial Result | Final Adjusted (If applicable) |
|---|---|---|---|---|
| | | | | |
| 22 | LOC Modulation | | | |
| 22a | 90 Hz AM | 90 Hz ± / 0.9 Hz% | % | % |
| 22b | 150 Hz AM | 150 Hz / ± 1.5 Hz | % | % |
| 22c | 1020 Hz AM | 1020 Hz / ± 50 Hz | % | % |
| 22d | 90 + 150 Hz AM | 35 – 39% | % | % |
| 22e | 90+150+1020 Hz | 44 – 50% | % | % |
| 22f | | | | |
| L2 | DEL 90 | | % | % |
| | DEL 150 | | % | % |
| | Diff in % | 15.5% - 19.5% | % | % |
| L1 | DEL 90 | | % | % |
| | DEL 150 | | % | % |
| | Diff in % | 6% – 10% | % | % |
| OC | DEL 90 | | % | % |
| | DEL 150 | | % | % |
| | Diff in % | -1% to + 1% | % | % |
| R1 | DEL 90 | | % | % |
| | DEL 150 | | % | % |
| | Diff in % | -6% to -10% | % | % |

| | | | | |
|---|---|---|---|---|
| R2 | DEL 90 | | % | % |
| | DEL 150 | | % | % |
| | Diff in % | -15.5% to -19.5% | % | % |

| Step # | Test Description | Specification | Initial Result | Final Adjusted (If applicable) |
|---|---|---|---|---|
| | | | | |
| 23 | GS Modulation | | | |
| 23a | 90 Hz AM | 90 Hz / ± 0.9 Hz | % | % |
| 23b | 150 Hz AM | 150 Hz / ± 1.5 Hz | % | % |
| 23c | Composite Mod | 72 – 78% | % | % |
| 23d | | | | |
| U2 | DEL 90 | | % | % |
| | DEL 150 | | % | % |
| | Diff in % | 15% - 20% | % | % |
| U1 | DEL 90 | | % | % |
| | DEL 150 | | % | % |
| | Diff in % | 7% – 11% | % | % |
| OC | DEL 90 | | % | % |
| | DEL 150 | | % | % |
| | Diff in % | -1% to + 1% | % | % |
| D1 | DEL 90 | | % | % |
| | DEL 150 | | % | % |
| | Diff in % | -7% to -11% | % | % |
| D2 | DEL 90 | | % | % |
| | DEL 150 | | % | % |
| | Diff in % | -15% to -20% | % | % |

| Step # | Test Description | Specification | Initial Result | Final Adjusted (If applicable) |
|---|---|---|---|---|
| | | | | |
| 24 | ILS Modulation | Verify Composite Signal 110.15 & 334.55 MHz | Checked | Checked |
| | | 110.15, 334.55, & 75 MHz | Checked | Checked |

| Step # | Test Description | Specification | Initial Result | Final Adjusted (If applicable) |
|---|---|---|---|---|
| | | | | |
| 26 | Correction Factor | AMTx = 1.0 | AMTx = | AMTx = |
| 27 | AM in Tx Mode | Tracks within ± 5% | Checked | Checked |
| 28 | Correction Factor | FMTx = 1 | FMTx= | FMTx= |
| 29 | FM in Tx Mode | Tracks within ± 1 kHz | Checked | Checked |
| 30a | Audio Out | 100 mV ± 50 mV | Checked | Checked |
| 30b | | 500 mV ± 50 mV | Checked | Checked |
| 30c | | 900 mV ± 50 mV | Checked | Checked |

| 4.8.3 Receiver Checks | | | | | | | |
|---|---|---|---|---|---|---|---|
| Step # | Test Description | Specification | | Initial Result | | Final Adjusted (If applicable) | |
| 1 | Receiver R/T Port | RxDirect Table | | Checked | | Checked | |
| 2 | Receiver, ANT Port | RxRamp Table | | | | Checked | |
| 3 | Frequency Measurements | 120.00 MHz ± 200 Hz | | MHz | | MHz | |
| 4 | Frequency Tracking | ± 9.5KHz from 120 MHz ±200 Hz | | Checked | | Checked | |
| 5 | Power at Antenna Port | Verify Display matches | | | | | |
| | POWER TOO HIGH | + 16 dBm | | dBm | | | |
| | POWER IN RANGE | +9 dBm | | dBm | | | |
| | POWER IN RANGE | -7 dBm | | dBm | | | |
| | LOW POWER | -17 dBm | | dBm | | | |
| | LOW POWER | -26 dBm | | dBm | | | |
| | NO POWER | -33 dBm | | dBm | | | |
| 6 | AM Modulation | Does not exceed ±3% | | Checked | | Checked | |
| 7 | P19-12 | 0 ± 0.1V | | Checked | | Checked | |
| 8 | AMRx Correction Factor | AMRx = 1.0 | | AMRx = | | AMRx= | |
| 9 | AMRx Tracks | 0 % to 100% ±5% | | Checked | | Checked | |
| 13 | FMRx Correction Factor | FMRx = 1.0 | | Checked | | Checked | |
| 14 | FM Deviation | ± 1 kHz | | Checked | | Checked | |
| 15 | FMRx Tracks | -10dBm to +16 dBm ±5% | | Checked | | Checked | |
| 18 | Test Set /XMIT_MEAS Mode | 1 W | | Checked | | Checked | |
| 20 | 120 MHz | 10 W ± 2 W | | W | | W | |
| 20 | 150 MHz | 10 W ± 2 W | | W | | W | |
| 21 | VSWR Measurement, load at ANT Port | 120 MHz | 150 MHz | 120 MHz | 150 MHz | 120 MHz | 150 MHz |
| a | 3 db Load | 3.2 ± 0.5 | 3.2 ± 0.5 | | | | |
| b | 6 dB Load | 1.6 ± 0.5 | 1.6 ± 0.5 | | | | |
| c | 10 dB Load | 1.1 ± 0.5 | 1.1 ± 0.5 | | | | |
| 22 | VSWR Measurement | VSWR = 1.0 | | VSWR= | | VSWR= | |
| 24 | Headset Output | Verify Tones | | Checked | | Checked | |
| 25 | Verify Auto Shut Off | 15 Min ± 1 Min | | Checked | | Checked | |
| 26 | 230 VAC Operation | Operates | | Checked | | Checked | |

| | |
|---|---|
| Date of Calibration | |
| Technician | |
| Signature or Stamp | |