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# OPERATION MANUAL

## T1201 VOR, ADF, ILS DISCRETE FUNCTION INTERFACE UNIT

**MANUAL NUMBER:** 06-1201-01  
E6-1201-01  
**REVISION:** 0  
**DATE:** 03/26/2007

**WARNING: INFORMATION SUBJECT TO EXPORT CONTROL LAWS**

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## ELECTROSTATIC DISCHARGE GENERAL WARNINGS FOR ALL EQUIPMENT

**CAUTION:** THIS EQUIPMENT MAY CONTAIN ELECTROSTATIC DISCHARGE (ESD) SENSITIVE COMPONENTS. TO PREVENT ESD SENSITIVE EQUIPMENT FROM POSSIBLE DAMAGE, OBSERVE THE FOLLOWING PRECAUTIONS WHEN HANDLING ANY ESD SENSITIVE COMPONENTS, OR UNITS CONTAINING ESD SENSITIVE COMPONENTS:

- a. Maintenance or service personnel must be grounded through a conductive wrist strap, or a similar grounding device, using a 1 M $\Omega$  series resistor for equipment protection against static discharge, and personal protection against electrical shock.
- b. All tools must be grounded (including soldering tools) that may come into contact with the equipment. Hand contact will provide sufficient grounding for tools that are not otherwise grounded, provided the operator is grounded through an acceptable grounding device such as a wrist strap.
- c. Maintenance or service of the unit must be done at a grounded, ESD workstation.
- d. Before maintenance or service of the equipment, disconnect all power sources, signal sources, and loads connected to the unit.
- e. If maintenance or service must be performed with power applied, take precautions against accidental disconnection of equipment components. Specifically, do not remove integrated circuits or printed circuit boards from equipment while the equipment has power applied.
- f. All ESD sensitive components are shipped in protective tubes or electrically conductive foam. The components should be stored using the original container/package when not being used or tested. If the original storage material is not available, use similar or equivalent protective storage material.
- g. When ESD sensitive components are removed from a unit, the components must be placed on a conductive surface, or in an electrically conductive container.
- h. When in storage or not being repaired, all printed circuit boards must be kept in electrically conductive bags, or other electrically conductive containers.
- i. Do not unnecessarily pick up, hold, or directly carry ESD sensitive devices.

Failure to comply with these precautions may cause permanent damage to ESD sensitive devices. This damage can cause devices to fail immediately, or at a later time without apparent cause.

**REVISION HISTORY BY DRAWING NUMBER**

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REVISION: 0 – March 26, 2007

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## SECTION I GENERAL INFORMATION

### 1.1 INTRODUCTION

This manual contains information relative to the physical, mechanical and electrical characteristics of the Aeroflex Model T1201 Discrete Function Interface Unit, (DFIU) PN: 01-1201-00.

### 1.2 UNITS AND ACCESSORIES SUPPLIED

The T1201 DFIU is designed to operate and test ARINC 700 Series ILS (ARINC 710), VOR/MB (ARINC 711) and ADF (ARINC 712) Line Replaceable Units. Power control and protection, as well as all necessary discretes and monitoring points are provided. Magnetic overlays for each applicable LRU are available which connect either the ILS, VOR, or ADF receivers to the T1201. ARINC 429 transmissions and reception to and from the LRU's is provided by the companion T1200 Control Display Unit (CDU) via a rear panel interface connector. The T1201 DFIU also provides an ATE interface port and a special Collins Radio Interface similar to RS-232. A self-contained Antenna Simulator provides the sense and loop signals required for testing ADF receivers.

### 1.3 TECHNICAL CHARACTERISTICS

#### 1.3.1 GENERAL

Weight :	15 lbs. (6.82 Kg)
Height :	12.15 in. (30.86 cm)
Width :	19.00 in. (48-26 cm)
Depth :	9.00 in. (22-86 cm)
Power Requirements :	27.5VDC @ 2 Amps 155VAC/400Hz @ 2 Amps
Operating Temperature :	+10 to +45 deg. C

#### 1.3.2 ANTENNA SIMULATOR

Frequency Range :	190-1750 KHz
Input Impedance :	50 Ohms (unbalanced)
Output Impedance :	78 Ohms +/- 5%
Sense Channel Output Amplitude Attenuation Factor (Effective Height)	.03 times the input
Loop Channel Outputs	
Attenuation Factor :	.023 times input at 190 KHz .038 times input at 577 KHz .023 times input at 1750 KHz
Accuracy :	+/- 2 dB

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Loop Output Amplitude  
Match at 45° Relative  
Bearing : +/- .25 dB

Antenna Mount Top/Bottom  
Function : Top - Sine & Cosine in phase first quadrant  
Bot - Sine & Cosine 180° out of phase first quadrant

### 1.4 UNIT AND ACCESSORIES SUPPLIED

The Aeroflex Model T1201 DFIU, PN: 01-1201-00, consists of the main test panel and the following accessories:

ITEM	DESCRIPTION	P/N
1	T1201 CD Operation Manual	E6-1201-01
2	115V/400Hz Power Cable	55-2406-00

### 1.5 OPTIONAL EQUIPMENT

The following items are available as optional equipment with the T1201 DFIU. They must be ordered separately.

ITEM	DESCRIPTION	P/N
1	T1201-01 VOR/MB Interface Cable	55-1201-01
2	T1201-02 ILS Interface Cable	55-1201-02
3	T1201-03 ADF Interface Cable	55-1201-03
4	Test Point Overlay – ADF-700	58-1169-00
5	Test Point Overlay – VOR-700	58-1169-01
6	Test Point Overlay – ILS-700	58-1169-02

### 1.6 RELATED INFORMATION

For information regarding the T1201-01 (VOR/MB), T1201-02 ILS and T1201-03 (ADF), T1201-04 (MMR) Interface Cables, refer to their individual operation manuals. When referencing the T1201-04 (MMR) cable also consult the associated test unit the MMR Test Fixture, Manual number 06-0997-00. The part numbers for these Interface Cable manuals are as follows :

INTERFACE CABLE	MANUAL P/N
T1201-01	C6-1201-01
T1201-02	C6-1201-02
T1201-03	C6-1201-03
T1201-04	C6-1201-04

## **SECTION II OPERATION**

### **2.1 GENERAL INFORMATION**

This section contains information relating to the unpacking, inspection and setup of the T1201 DFU accessories.

### **2.2 UNPACKING AND INSPECTION EQUIPMENT**

Carefully remove the T1201 DFU and accessories from the packing box. Make a visual inspection of the unit for evidence of damage incurred during shipment. If a claim for damage is to be made, save the shipping container to substantiate the claim. When all equipment has been unpacked, return the packing material to the container for future use in storing or shipping the equipment.

### **2.3 EQUIPMENT SETUP**

The T1201 DFU may be installed free standing on a workbench table top or mounted in a 19-inch equipment rack using the integral rack mounting ears.

Connect 28VDC power to the banana jack/binding posts (J16) at the rear of the T1201.

Connect 115VAC/400Hz power to the receptacle (J5) at the rear of the T1201 using the power cord JPN: 55-2406-00, provided with the test set.

#### **\* \* \* NOTE \* \* \***

The power cord provided is left unterminated at one end to accommodate wiring to your own particular 115VAC supply. The wires should be connected as follows :

BLK Wire – 115VAC-400Hz Hot  
WHT Wire – 115VAC/400Hz Neutral  
GRN Wire – 115VAC/400Hz Ground

Connect a T1200 CDU to the T1200 Interface connector (J4) at the rear of the T1201 using the T1200 DFU Cable, PN: 55-2401-00, supplied with the T1200.

The LRU is connected to the T1201 via the T1201-01 (VOR/MB), T1201-02 (ILS) or T1201-03 (ADF) Interface Cable, PN: 55-1202-01, -02, or -03, respectively. Install the appropriate magnetic test point overlay (see section 1.5) to the T1201's test point field on the front panel

#### **IMPORTANT**

Refer to the appropriate Component Maintenance Manual (CMM) to test procedure for additional test equipment set up procedures.

## SECTION III OPERATION

### 3.1 INTRODUCTION

This section contains the basic operating procedure for the T1201 DFIU.

### 3.2 CONTROL FUNCTIONS

The T1201 provides all the necessary signals for testing the ARINC 700 Series VOR, ILS and ADF Navigation Systems. The following is a description of each of the controls provided on the DFIU.

#### NOTE

Some additional controls may be installed on the LRU Interface Cables.

#### 3.2.1 CONTROLS – FRONT PANEL (Figure 3-1)

- |     |                                   |  |
|-----|-----------------------------------|--|
| (1) | DFIU POWER ON/OFF Switch (S18)    | The T1201 power requirements are provided by an external 28VDC source connected to the T1201 through a set of banana jack/binding posts (J16) on the rear panel. The power to the DFIU is turned ON or OFF with a DPST toggle switch.            |
| (2) | DFIU POWER Fuse (F2)              | Provides over-current protection for the T1201 internal circuitry.   |
| (3) | DFIU POWER Lamp (DS5)             | Illuminates when the DFIU 28VDC power is switched on by S18.   |
| (4) | UUT POWER ON/OFF Switch (S17)     | The Unit Under Test power requirements are provided by an external 115VAC/400Hz source connected to the T1201 through a 3-conductor power receptacle (J5) on the rear panel. The power to the UUT is turned ON or OFF with a DPST toggle switch. |
| (5) | UUT POWER Fuse (F1)               | Provides over-current protection for the unit under test.  |
| (6) | UUT POWER Lamp (DS4)              | Illuminates when the UUT 115Vac/400Hz power is switched on with S17.   |
| (7) | CURRENT MONITOR Jacks (J12 & J13) | These test jacks allow the user to calculate the current drawn by the UUT by measuring the AC voltage dropped across a precision 1 ohm resistor (R1) in series with the connection to the UUT power input (1 volt + 1 amp).                      |
| (8) | LRU AC OUT Jacks (J14 & J15)      | These test jacks allow the user to monitor the 115VAC output from the UUT (VOR & ILS LRU'S only).  |
| (9) | LRU Connector (J1)                | 156-pin DL connector used to connect with the VOR, ISL, and ADF LRU Interface Cables, i.e. T1201-01, T1201-02 and T1201-03.  |



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- |      |                                    |  |
|------|------------------------------------|--|
| (10) | 429 INPUT BUS Jacks (J203 & J204)  | Two ¼" stereo phone jacks allow monitoring of the two ARINC 429 output buses from the UUT.   |
| (11) | 429 OUTPUT BUS Jacks (J205 & J206) | Two ¼" stereo phone jacks allow monitoring of the two ARINC 429 output buses from the UUT.   |
| (12) | DATA SOURCE Switch (S11)           | Controls the discrete input pin of the UUT for selecting either ARINC 429 input port A or B.   |
| (13) | RCVR AUDIO OUT Jacks (J10 & J11)   | Allows monitoring of the VOR, ILS and ADF Receiver audio outputs.  |
| (14) | SDI CODE Switch (S16)              | Allows changing the SDI input straps to each possible SDI code (0-3).  |
| (15) | AUDIO LOAD Switch (S15)            | Allows selecting various loads for the VOR, ILS or ADF audio outputs. The AMP position connects the audio output to the internal amplifier and speaker.                                      |
| (16) | VOLUME Control                     | Controls the volume of the speaker.  |
| (17) | A/G LOGIC Switch (S10)             | Controls the AIR/GROUND discrete input to the UUT. The input is connected to ground on the ON position and is open in the OFF position.  |
| (18) | FUNC TEST DISC Switch (S9)         | Controls the FUNCTION TEST discrete input to the UUT. The input is connected to ground in the ON position and is open in the OFF position.   |
| (19) | TEST POINT Field                   | Provides monitoring capability for the sixty pin corresponding to the top plug of the LRU ARINC 600 connector. Magnetic overlays are available which define each point for user convenience. |
| (20) | TUNE FUNCTION TEST Switch (S1)     | Controls the TUNE/FUNCTION TEST INHIBIT discrete input (MP1C) on the ILS Receiver. The input is connected to ground in the ON position and is open in the OFF position.                      |
| (21) | LOC/GS DATA Switch (S12)           | Allows connecting or disconnecting the "LOC/GS Interrupt Data Program pin" (MP3A) to the "LOC/GS Data Control Common" (MP3B) on the ILS Receiver.  |
| (22) | SPEAKER (LS101)                    | A 45 ohm speaker for reproducing the receiver audio from the UUT.  |
| (23) | INNER MARKER Lamp (DS1)            | White lamp which illuminates when the Inner (Fan) Marker output from the Marker Beacon Receiver goes low.  |
| (24) | MKR AUDIO LOAD Switch (S14)        | Allows selecting various loads for the Marker Beacon Receiver audio output. The AMP position connects the audio output to the internal amplifier and speaker.                                |

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- |      |                                |  |
|------|--------------------------------|--|
| (25) | MIDDLE MARKER Lamp (DS2)       | Amber lamp which illuminates when the Middle Marker output from the Marker Beacon goes Low.  |
| (26) | MKR AUDIO OUT Jacks (J8 & J9)  | Allows monitoring of the Marker Beacon Receiver audio output.  |
| (27) | OUTER MARKER Lamp (DS2)        | Blue lamp which illuminates when the Outer Marker output from the Marker Beacon Receiver goes low.   |
| (28) | SENSE Switch (S7)              | Controls the Hi/Lo Sensitivity discrete input (MP9D) on the Marker Beacon Receiver. The input is connected to ground in the HI position and is open in the LO position.  |
| (29) | INHIBIT Switch (S8)            | Controls the Marker Function Inhibit discrete input (MP2D) on the Marker Beacon Receiver. The input is grounded in the ON position and is open in the OFF position.  |
| (30) | QEC STRAP Switch (S2-S6)       | Five toggle switches control the Quadrantal Error Correction inputs to the ADF Receiver. Each input is connected to the "QEC COMMON" pin (MP9C) in the CLOSED (DOWN) position and is open in the UP position.  |
| (31) | SIMULATED BEARING Control (B1) | Planetary drive which controls the angular setting of the internally mounted goniometer. The goniometer controls the sine and cosine ADF antenna inputs to the ADF Receiver.   |
| (32) | ADF Antenna Connector (J17)    | 16 pin connector used to mate with the ADF Antenna connector on the T1201-03 ADF Interface Cable.  |
| (33) | RF INPUT Connector (J301)      | BNC connector used to input the RF signal to the ADF Antenna Simulator for producing the sense and loop signals.   |
| (34) | ANTENNA MOUNT Switch (S13)     | Controls the Antenna Mount Top/Bottom discrete input (MP13C) on the ADF Receiver. The input is connected to ground in the TOP position and is open in the BOTTOM position. Also used to cause a 108° phase reversal of the sine output from the ADF Antenna Simulator. |

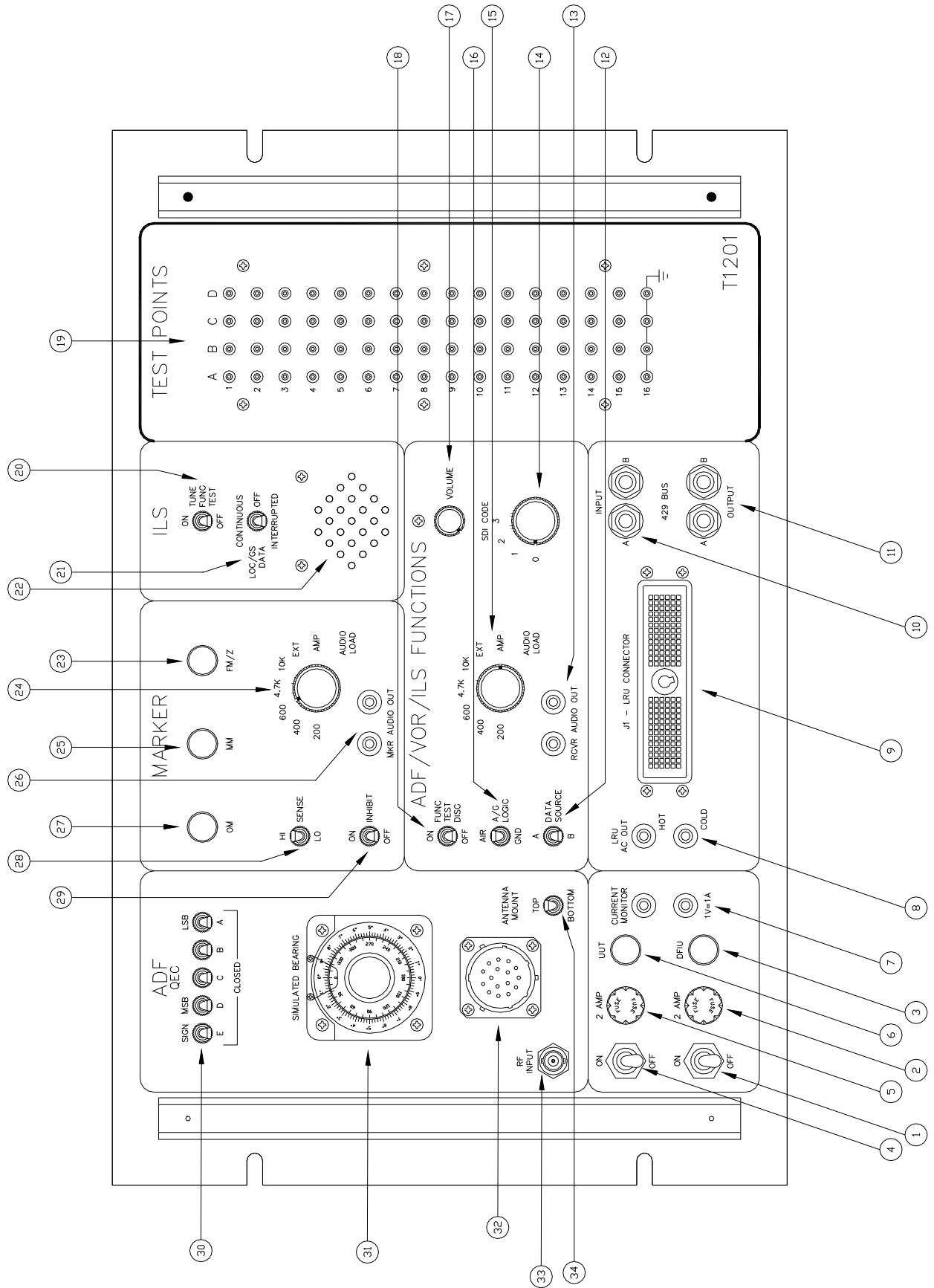
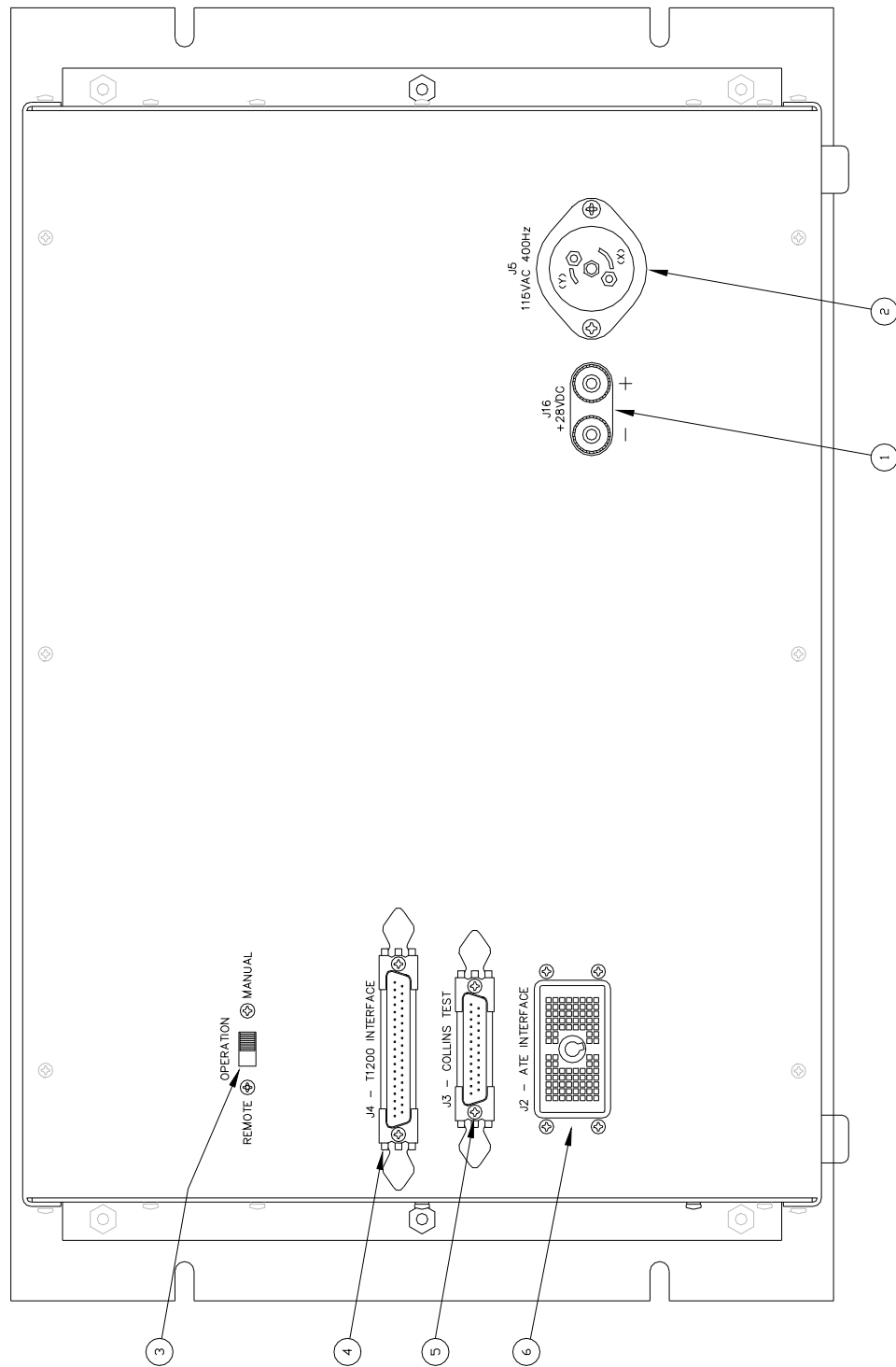


Fig. 3-1: T1201-Controls – Front Panel

3.2.2 CONTROLS – REAR PANEL (Fig. 3-2)

- |     |                                    |  |
|-----|------------------------------------|--|
| (1) | 24VDC Power Input Jacks            | A set of banana jack/binding post used to connect the DFIU to a 24VDC power source.  |
| (2) | 115VAC/400Hz Power Receptacle (J5) | Used to connect the DFIU to a 115VAC/400Hz power source via the detachable 3-conductor power cord.   |
| (3) | REMOTE SELECTOR Switch             | This switch has no current function and is not operational.  |
| (4) | T1200 INTERFACE Connector (J4)     | A 37-pin female D connector used to interface the DFIU to a T1200 CDU.   |
| (5) | COLLINS TEST Connector (J3)        | A 25-pin female D connector used to gain access to various test points from the UUT top plug. See PN: 02-1201-00 for wiring information.   |
| (6) | ATE INTERFACE Connector            | A 96-pin DL connector wired to the DFIU's test point board and to the LRU interface connector. It is also wired to several monitor points on the DFIU which provide additional ATE connections not covered by the test point board. See PN: 02-1201-00 for wiring information. |



**Fig. 3-2 ; T1201 Controls – Rear Panel**

## **SECTION IV THEORY OF OPERATION**

### **4.1 GENERAL CIRCUIT THEORY**

Some active circuit is contained on printed circuit boards within the T1201. The following is a brief description.

#### **4.1.1 AUDIO AMP BOARD**

The Audio Amp Board, PN: 20-5573-00, is mounted to the inside of the front panel beside the Test Point Board. It is used to provide the selectable load for the receiver's audio output and to provide a variable amplified output to drive the panel mounted speaker.

#### **4.1.2 ANTENNA SIMULATOR BOARD**

The Antenna Simulator Board, PN: 20-5616-00, is mounted to the inside of the front panel just above the power switches. It is used to drive the sense and loop antenna of the ADF Receiver.

The sense and loop outputs are derived from an RF source (190-1750 KHz) applied at the RF INPUT BNC Connector (J303). The input impedance is approximately 50 ohms.

The signal level at the sense output is determined by voltage divider R309 and R310, transformer T305 and series resistor R311.

The sine and cosine loop output signals are the result of coupling the RF signal through a goniometer, whose angular position is determined by the rotational placement of a graduated planetary driver mechanism attached to its shaft. Amplitude calibration is accomplished with gain adjustment potentiometers R313 (COS channel) and R314 (SIN channel).

## **SECTION V MAINTENANCE**

### **5.1 MAINTENANCE INFORMATION**

To assist in the maintenance of the Aeroflex Model T1201 Discrete Function Interface Unit, bills of material, assembly drawings, schematics and a test procedure are included in the T1201 Maintenance Manual (P/N 06-1201-00 for hard copy, E6-1201-00 for CD) available separately from Aeroflex.