AEROFLEX

Ramp Test Set

ATC-601-2

Operation Manual

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Issue-3

OPERATION MANUAL

RAMP TEST SET

ATC-601-2

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Cable Statement:

A double shielded and properly terminated external interface cable must be used with this equipment when interfacing with the COMM Connector.

For continued EMC compliance, all external cables must be 3 meters or less in length.

Nomenclature Statement:

In this manual the ATC-601, ATC-601 Test Set, ATC-601 Ramp Test Set or Test Set refers to the ATC-601-2 Ramp Test Set.

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SAFETY FIRST: TO ALL OPERATIONS PERSONNEL

REFER ALL SERVICING OF UNIT TO QUALIFIED TECHNICAL PERSONNEL

WARNING: USING THIS EQUIPMENT IN A MANNER NOT SPECIFIED BY THE ACCOMPANYING DOCUMENTATION MAY IMPAIR THE SAFETY PROTECTION PROVIDED BY THE EQUIPMENT.

CASE, COVER OR PANEL REMOVAL

Removing the Chassis Assembly from the Case Assembly exposes the operator to electrical hazards that can result in electrical shock or equipment damage. Do not operate this Test Set with the Chassis Assembly removed from the Case Assembly.

SAFETY IDENTIFICATION IN TECHNICAL MANUAL

This manual uses the following terms to draw attention to possible safety hazards, that may exist when operating this equipment.

CAUTION: THIS TERM IDENTIFIES CONDITIONS OR ACTIVITIES THAT, IF IGNORED, CAN RESULT IN EQUIPMENT OR PROPERTY DAMAGE (E.G., FIRE).

WARNING: THIS TERM IDENTIFIES CONDITIONS OR ACTIVITIES THAT, IF IGNORED, CAN RESULT IN PERSONAL INJURY OR DEATH.

SAFETY SYMBOLS IN MANUALS AND ON UNITS

CAUTION: THIS SYMBOL REFERS TO SPECIFIC CAUTIONS REPRESENTED ON THE UNIT AND CLARIFIED IN THE TEXT.

AC OR DC TERMINAL: TERMINAL THAT MAY SUPPLY OR BE SUPPLIED WITH AC OR DC VOLTAGE.

DC TERMINAL: TERMINAL THAT MAY SUPPLY OR BE SUPPLIED WITH DC VOLTAGE.

AC TERMINAL: TERMINAL THAT MAY SUPPLY OR BE SUPPLIED WITH AC OR ALTERNATING VOLTAGE.

SWITCH ON/OFF (PUSH-PUSH): POWER TO THE DEVICE IS CONNECTED ON OR DISCONNECTED OFF.

EQUIPMENT GROUNDING PRECAUTION

Improper grounding of equipment can result in electrical shock.

USE OF PROBES

Check specifications for the maximum voltage, current and power ratings of any connector on the Test Set before connecting it with a probe from a terminal device. Be sure the terminal device performs within these specifications before using it for measurement, to prevent electrical shock or damage to the equipment.

POWER CORDS

Power cords must not be frayed, broken nor expose bare wiring when operating this equipment.

USE RECOMMENDED FUSES ONLY

Use only fuses specifically recommended for the equipment at the specified current and voltage ratings.

INTERNAL BATTERY

This unit contains a Sealed-Lead Battery, serviceable only by a qualified technician.

CAUTION: SIGNAL GENERATORS CAN BE A SOURCE OF ELECTROMAGNETIC INTERFERENCE (EMI) TO COMMUNICATION RECEIVERS. SOME TRANSMITTED SIGNALS CAN CAUSE DISRUPTION AND INTERFERENCE TO COMMUNICATION SERVICES OUT TO A DISTANCE OF SEVERAL MILES. USERS OF THIS EQUIPMENT SHOULD SCRUTINIZE ANY OPERATION THAT RESULTS IN RADIATION OF A SIGNAL (DIRECTLY OR INDIRECTLY) AND SHOULD TAKE NECESSARY PRECAUTIONS TO AVOID POTENTIAL COMMUNICATION INTERFERENCE PROBLEMS.

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INTRODUCTION - ATC-601-2 RAMP TEST SET

This manual contains ATC-601-2 operating instructions for ramp testing ATCRBS and Mode S Transponders. It is strongly recommended that personnel be thoroughly familiar with the contents of this manual before attempting to operate this equipment.

Refer all servicing of unit to qualified technical personnel.

ORGANIZATION

This manual is divided into the following Chapters and Sections:

CHAPTER 1 - OPERATION

Section 1 - DESCRIPTION (physical description of the ATC-601-2)

Section 2 - OPERATION (installation; description of controls, connectors and indicators; performance evaluation; general operating procedures and remote operation)

Section 3 - SPECIFICATIONS

Section 4 - SHIPPING

Section 5 - STORAGE

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CHAPTER ONE

ATC-601-2 TEST SYSTEM

OPERATION MANUAL

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LIST OF ILLUSTRATIONS

LIST OF TABLES

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SECTION 1 - DESCRIPTION

1. GENERAL DESCRIPTION AND CAPABILITIES

1.1 DESCRIPTION

The ATC-601-2 Ramp Test Set is a ruggedized ramp tester designed for ease of use, portability, reliability and long service life. Power is derived from an internal battery. An ac input connection is provided for battery charging, bench operation or servicing use. Most accessories (Flat Antenna, Antenna Cable, Operator's Guide, ac Power Cable, Flexible Antenna, Antenna Shield and Fuse) are kept in the Storage Compartment (Case Assembly Lid). The Tripod is stored separately. Refer to Appendix C for description of accessories.

The ATC-601-2 Ramp Test Set provides PASSED/FAILED verification of ATCRBS and/or Mode S Transponder operation in a ramp environment. The ATC-601-2 is a ground or air interrogating simulator that transmits Modes A, C and S interrogations. The Test Set accurately analyzes reply pulses, provides reply pulse information and indicates failures to comply with accepted guidelines.

1.2 FUNCTIONAL CAPABILITIES

The ATC-601-2 has the following features and capabilities:

- Accurate measurements of transponder transmitting frequency, output power and sensitivity.
- Ruggedized construction designed for the conditions encountered in the ramp environment.
- Automatic Test Sequence mode for fast and easy testing.
- Soft-press key controls for easy operation.
- Reply pulse verification of delay, width, spacing, format and content.
- Memory Storage for up to two sets of test results plus latest test results are stored, indefinitely, until replaced with new test results.
- Built-In-Test (BIT) for confidence testing and fault isolation.
- Ability to test a transponder in the aircraft from a distance of up to 300 feet (91.4 meters).
- LCD Display with automatic light sensing illumination control.
- RF I/O, Monitor, Reply Video and Sync Pulse outputs for use in bench testing.
- Internal Battery allowing up to two hours of operation before recharge.
- Automatic power shutdown after approximately 15 minutes of non-use when ac power is not connected.
- Size and usability to allow one person operation on the ramp.
- Serial remote operation (RS-232) through COMM Connector when Option 1 is installed.

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SECTION 2 - OPERATION

1. INSTALLATION

1.1 GENERAL

The ATC-601-2 is powered by an internal battery. The Test Set contains a battery charging circuit which enables the operator to recharge the battery when connected to ac power.

NOTE: The ATC-601-2 can operate continuously on ac power for servicing and/or bench tests.

Refer to 1-2-2, Figure 2 for location of controls, connectors or indicators.

1.2 BATTERY OPERATION

The internal battery is equipped to power the ATC-601-2 for two hours of continuous use, after which time, the ATC-601-2 battery needs recharging. When executing the Self Test function, the DISPLAY indicates whether the battery is usable or in need of recharging.

NOTE: When battery is low during operation, the ATC-601-2 shows ***BAT*** on the left side of the top line and two small block characters on the left side, below the bottom line of the DISPLAY.

The ATC-601-2 contains an automatic time-out to conserve power. If a key is not pressed within a 15-minute time period, the Test Set shuts Off (only when using battery power).

1.3 BATTERY CHARGING

The battery charger operates whenever ac power is applied to the Test Set and the POWER Key is pressed Off. When charging, the battery reaches an 80% charge in approximately two hours. The battery should be charged every three months (minimum) or disconnected for long term inactive storage periods of more than six months.

1.4 SAFETY PRECAUTIONS

The following safety precautions must be observed during installation and operation. Aeroflex assumes no liability for failure to comply with any safety precaution outlined in this manual.

1.4.1 Complying with Instructions

Installation/operating personnel should not attempt to install or operate the ATC-601-2 without reading and complying with instructions contained in this manual. All procedures contained in this manual must be performed in exact sequence and manner described.

1.4.2 Grounding Power Cord

WARNING: USING A THREE-PRONG TO TWO-PRONG ADAPTER PLUG CREATES A SHOCK HAZARD BETWEEN THE CHASSIS AND ELECTRICAL GROUND.

For ac operation, the power cord, equipped with standard three-prong plug, must be connected to a properly grounded three-prong receptacle. It is the customer's responsibility to:

- Have a qualified electrician check receptacle(s) for proper grounding.
- Replace any standard two-prong receptacle(s) with properly grounded three-prong receptacle(s).

1.4.3 Operating Safety

Due to potential for electrical shock within test equipment, the Chassis Assembly must not be removed from the Case Assembly. Battery/ Voltage Instructions, component replacement and internal adjustments must only be performed by qualified service technicians.

1.4.4 CAUTION and WARNING Labels

Exercise extreme care when performing operations preceded by a CAUTION or WARNING label. CAUTION labels appear where possibility of damage to equipment exists. WARNING labels denote conditions where bodily injury or death may result.

1.5 AC POWER REQUIREMENTS

The ATC-601-2 operates over a voltage range of 100 to 120 VAC at 60 Hz or 220 to 240 VAC at 50 Hz according to the internal Line Supply Switch setting (only serviceable by a qualified technician). Refer to Battery/Voltage Instructions.

Specified fuse ratings are listed in Table 1.

CAUTION: FOR CONTINUOUS PROTECTION AGAINST FIRE, REPLACE ONLY WITH FUSES OF THE SPECIFIED VOLTAGE AND CURRENT RATINGS.

INPUT VOLTAGE	F1 AND F2 FUSES
100 to 120 VAC	1.0 A, 250 V Fast Blo (Type F) (Aeroflex 5106-4501-000) (Bussman AGC1)
220 to 240 VAC	0.5 A, 250 V Fast Blo (Type F) (Aeroflex 5106-0000-016) (Bussman AGC1/2)

Specified Fuse Ratings
Table 1

1.6 FAA REQUIREMENTS

The Federal Aviation Administration (FAA) requires procedures for eliminating the potential for interfering with TCAS-equipped aircraft during transponder testing. Problems arise when the transponder is operating with the aircraft on the ground and the automatic altitude reporting system "pumped up." Three methods of FAA compliance are: shielding transponder antenna(s), connecting the ATC-601-2 directly to the transponder under test and testing in an anechoic enclosure. The Antenna Shield provides a practical way of complying with the FAA requirement when a direct connection or anechoic enclosure is not available. Refer to Appendix C for Antenna Shield installation. Refer to 1-2-4.3 and 1-2-4.4 for testing transponder operation when using the Antenna Shield.

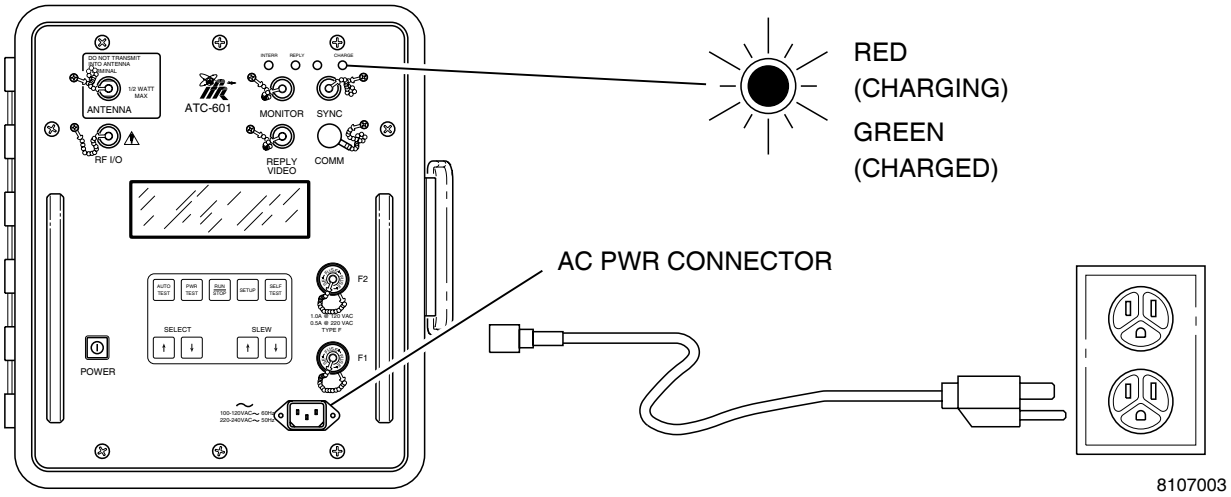
1.7 BATTERY RECHARGING

Refer to 1-2-1, Figure 1.

STEP PROCEDURE

1. Verify FUSES are correct for normal operating voltage. Refer to 1-2-1.5.
2. Connect ac power cable between AC PWR Connector and normal operating voltage power source according to Test Set configuration. Refer to 1-2-1.5.
3. Verify DISPLAY is Off. If DISPLAY is On, press POWER Key.
4. Verify CHARGE Indicator illuminates red.
5. Allow two hours for battery charge or until CHARGE Indicator illuminates green.

   NOTE: If the battery fails to accept a charge and the ATC-601-2 Test Set does not operate on battery power, the battery, serviceable only by a qualified technician, requires replacement. Refer to Battery/Voltage Instructions.



Battery Recharging
Figure 1

1.8 BENCH OPERATION

STEP	PROCEDURE

1. Place transponder (unit under test [UUT]) into Standby.
2. Verify FUSES are correct for normal operating voltage. Refer to 1-2-1.5.
3. Connect ac power cable between AC PWR Connector and normal operating voltage power source according to Test Set configuration. Refer to 1-2-1.5.
4. Press POWER Key On and verify DISPLAY illuminates.
5. Press SETUP Key to enter Setup #1 Menu.
6. Set zero range using SELECT Keys to mover cursor and SLEW Keys to change TOP= and BOTTOM= to **Ø** under RANGE column.
7. Verify ANTENNA Connector has 50 Ω load (Connector Cover) connected.
8. Connect UUT with TNC Cable to RF I/O Connector.
9. Switch UUT out of Standby.

1.9 EXTERNAL CLEANING

The following procedure contains routine instructions for cleaning the outside of the Test Set.

CAUTION: DISCONNECT POWER FROM TEST SET TO AVOID POSSIBLE DAMAGE TO ELECTRONIC CIRCUITS.

STEP	PROCEDURE

1. Clean front panel buttons and display face with soft lint-free cloth. If dirt is difficult to remove, dampen cloth with water and a mild liquid detergent.
2. Remove grease, fungus and ground-in dirt from surfaces with soft lint-free cloth dampened (not soaked) with isopropyl alcohol.
3. Remove dust and dirt from connectors with soft-bristled brush.
4. Cover connectors, not in use, with suitable dust cover to prevent tarnishing of connector contacts.
5. Clean cables with soft lint-free cloth.
6. Paint exposed metal surface to avoid corrosion.

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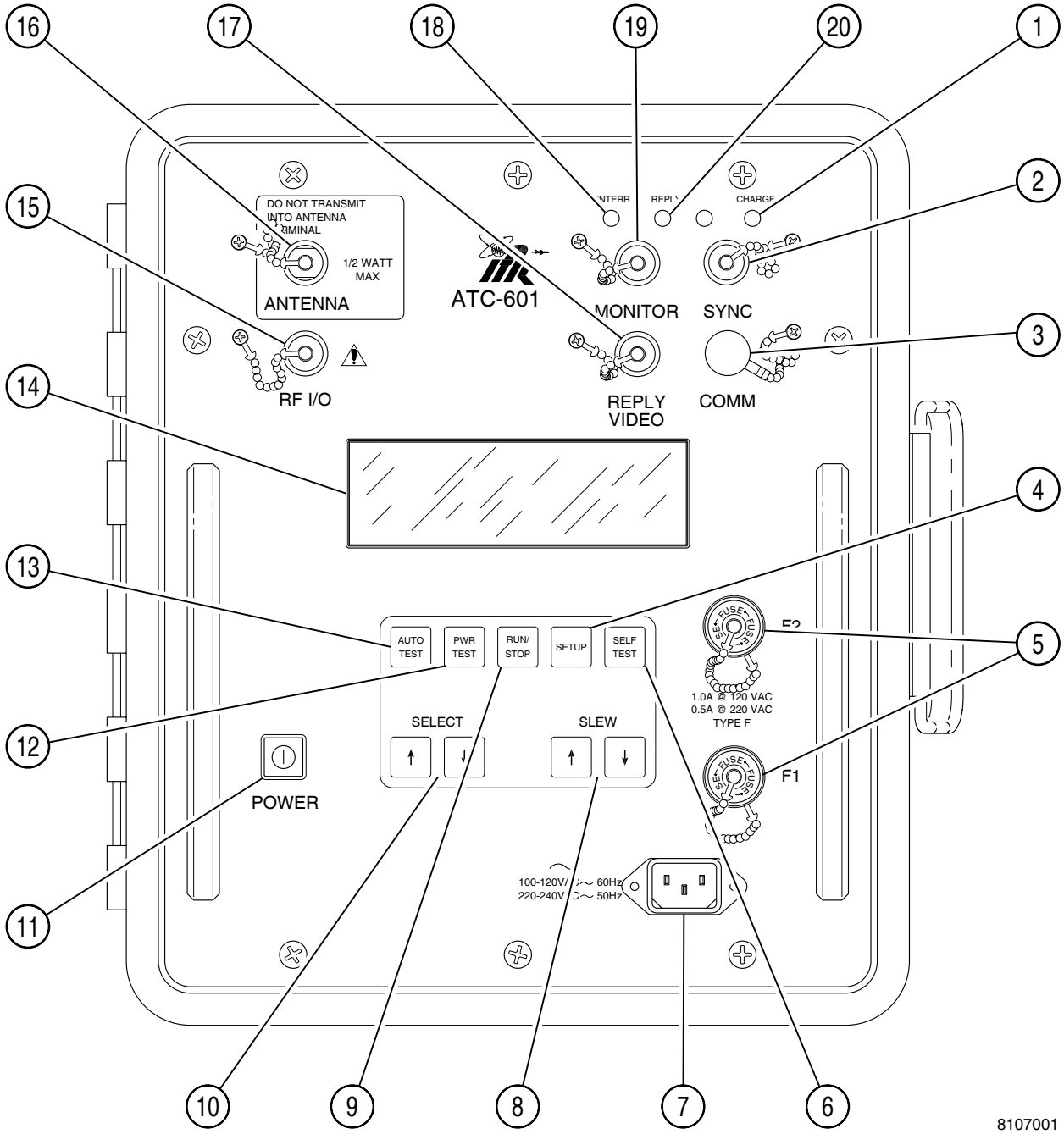
2. CONTROLS, CONNECTORS AND INDICATORS



ATC-601-2 Front Panel
Figure 2

CONTROLS, CONNECTORS AND INDICATORS (NUMERIC ORDER)		CONTROLS, CONNECTORS AND INDICATORS (ALPHABETICAL ORDER)	
AC PWR Connector (J10050)	7	CHARGE Indicator	1
ANTENNA Connector (J10057)	16	SYNC Connector (J10055)	2
AUTO TEST Key	13	COMM Connector (J10053)	3
CHARGE Indicator	1	SETUP Key	4
COMM Connector (J10053)	3	FUSES	5
DISPLAY	14	SELF TEST Key	6
FUSES	5	AC PWR Connector (J10050)	7
INTERR Indicator	18	SLEW Keys	8
MONITOR Connector (J10056)	19	RUN/STOP Key	9
POWER Key	11	SELECT Keys	10
PWR TEST Key	12	POWER Key	11
REPLY Indicator	20	PWR TEST Key	12
REPLY VIDEO Connector (J10054)	17	AUTO TEST Key	13
RF I/O Connector (J10058)	15	DISPLAY	14
RUN/STOP Key	9	RF I/O Connector (J10058)	15
SELECT Keys	10	ANTENNA Connector (J10057)	16
SELF TEST Key	6	REPLY VIDEO Connector (J10054)	17
SETUP Key	4	INTERR Indicator	18
SLEW Keys	8	MONITOR Connector (J10056)	19
SYNC Connector (J10055)	2	REPLY Indicator	20

2.1 FRONT PANEL

Refer to 1-2-2, Figure 2.

ITEM DESCRIPTION

1. CHARGE Indicator

   LED indicates the charger is active (ac applied with Test Set Off). Red indicates when battery is charging and green indicates battery is more than 80% charged.

2. SYNC Connector (J10055)

   BNC type connector provides Oscilloscope Sync. Long pulse goes from low to high before an interrogation and from high to low before an expected reply.

3. COMM Connector (J10053)

   LEMO type connector provides for remote 4-line serial communication (with Option 1 installed) and includes the signals TRANSMIT, RECEIVE, DTR and CTS. The COMM Connector provides data dump output capability with or without Option 1 installed. (Refer to Appendix A.)

4. SETUP Key

   Enters Setup Menus onto the DISPLAY.

5. FUSES

   Provide safe operation with ac input power applied to the ATC-601-2. Refer to 1-2-1.5 for correct fuse size and type.

6. SELF TEST Key

   Enters Self Test screen onto the DISPLAY.

7. AC PWR Connector (J10050) ∿

   Provides the input for an external ac power source (100 to 120 VAC at 60 Hz or 220 to 240 VAC at 50 Hz) for recharging the battery or operating the Test Set. The operating voltage range depends on the Line Supply Switch Setting, only serviceable by a qualified technician. Refer to Battery/Voltage Instructions.

ITEM DESCRIPTION

8. SLEW Keys

   Used to:

   - Adjust values and parameters in Setup Menus.
   - Select Signal Type in Diagnostics screen.
   - Adjust values in Diagnostics screen.
   - Select antenna to be tested in Power Test.

   Variable slew rates are available, depending on item being edited. Keeping SLEW Key pressed provides greater rate of change, in most instances, than pressing and releasing.

9. RUN/STOP Key

   Starts or stops testing.

10. SELECT Keys

    Used to select:

    - Test to perform in Single Test.
    - Items to edit in Setup Menus.
    - Antenna to be tested in Power Test.
    - Diagnostics screen menu from Self Test screen.

11. POWER Key ⏻

    Applies power to the Test Set; push On (***I***) or push Off (***O***).

    NOTE: When operating on battery power, an internal automatic time-out removes power from the Test Set following 15 minutes of no key activity.

12. PWR TEST Key

    Enters Power Test screen onto the DISPLAY.

13. AUTO TEST Key

    Enters Auto Test screen onto the DISPLAY.

ITEM DESCRIPTION

14. DISPLAY

    LCD readout displays various test screens.

15. RF I/O Connector (J10058) ⚠

    CAUTION: MAXIMUM INPUT POWER MUST NOT EXCEED +59 dBm (800 W).

    TNC type connector provides for RF input and output when directly connected with the UUT (Direct Connect).

16. ANTENNA Connector (J10057)

    CAUTION: DO NOT TRANSMIT DIRECTLY INTO ANTENNA TERMINAL. MAXIMUM OVER-THE-AIR INPUT POWER MUST NOT EXCEED 0.5 W.

    BNC type connector is used with the Test Set Antenna (Flat Antenna or Flexible Antenna). Over-the-air testing of the UUT is accomplished through this connector. The connector cover, when attached, provides the 50 Ω load required when connecting the RF I/O Connector to the UUT (Direct Connect) or running the Self Test.

17. REPLY VIDEO Connector (J10054)

    BNC type connector provides demodulated (detected) reply (only when direct connection with UUT is used) for use with an Oscilloscope.

18. INTERR Indicator

    Illuminates when Test Set is generating an interrogation signal.

19. MONITOR Connector (J10056)

    BNC type connector provides interrogation and reply pulses clipped at 50% amplitude point to preserve pulse shape.

20. REPLY Indicator

    Illuminates when the Test Set receives a valid reply signal.

2.2 FLAT ANTENNA

Refer to 1-2-2, Figure 3.

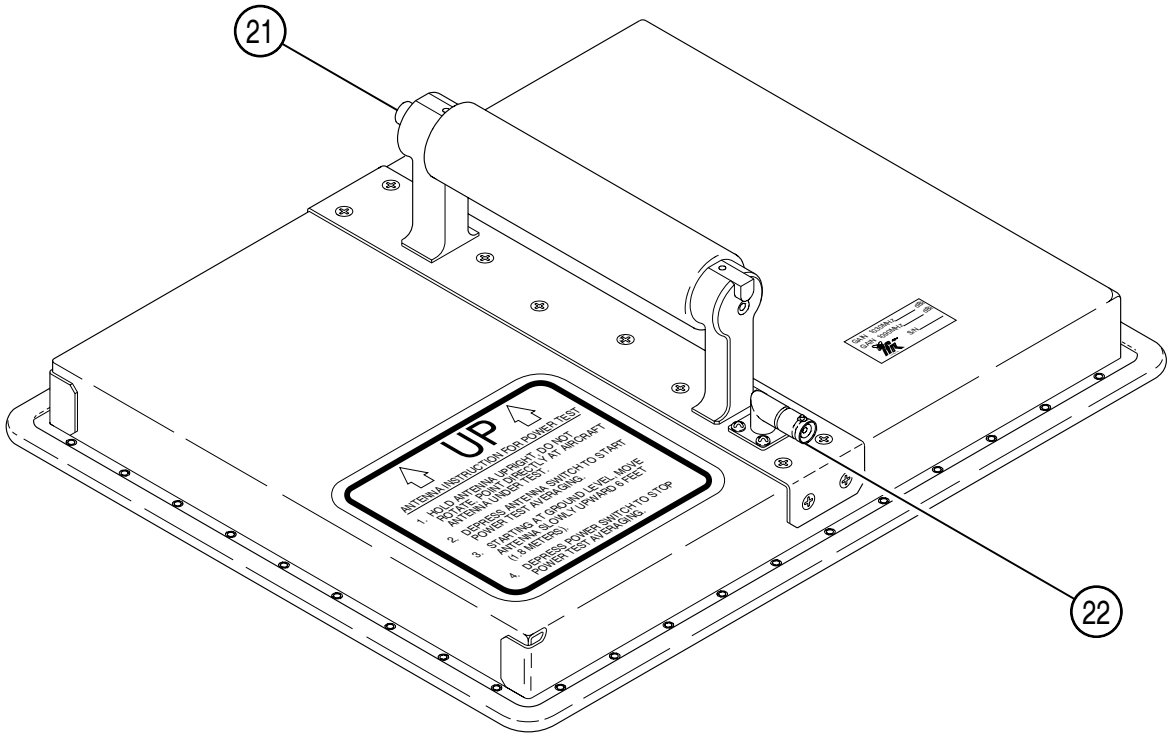
ITEM	DESCRIPTION

21. ANTENNA PUSH BUTTON Switch

    Starts or stops testing, same as the RUN/STOP Key.

22. FLAT ANTENNA Connector (J29001)

    BNC type connector is used to connect Flat Antenna to ATC-601-2 Test Set.



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Flat Antenna
Figure 3

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3. PERFORMANCE EVALUATION

3.1 GENERAL

The ATC-601-2 is equipped with a Self Test for quick performance evaluation and Diagnostics for signal verification. Self Test checks the Digital Module (Digital IF PC Board Assembly and Front Panel Pulse PC Board Assembly functions), Power Supply/Battery and RF Module (RF Assembly functions) for operational capability. Diagnostics are used to verify the ATC-601-2 is transmitting correct interrogations and accurately decoding replies.

Refer to 1-2-2, Figure 2 for location of controls, connectors and indicators.

3.2 SELF TEST

Refer to 1-2-3, Figure 4.

STEP	PROCEDURE

1. Press POWER Key.
2. Press SELF TEST Key to enter Self Test screen. (The ATC-601-2 displays results of the last Self Test.)
3. Terminate ANTENNA Connector (J10057) with 50 Ω load connector cover.
4. Press RUN/STOP Key to initiate Self Test. (The top line displays test names while testing and indicates ***PASSED*** or ***FAILURE*** at completion. The ATC-601-2 displays an eight-digit hexadecimal error code with any failure indications. Also, the ATC-601-2 displays a ***PASSED*** or ***FAILED*** indication for each module/assembly.)
5. Verify all modules/assemblies passed test.

   NOTE: If Self Test indicates a failure, refer to 1-2-3, Table 2 for error code definitions. If battery fails, refer to 1-2-1.7 for Battery Recharging. If any other failure occurs, refer to qualified service technicians for maintenance).

```
** SELF TEST - PASSED **
          RF MODULE: PASSED
      DIGITAL MODULE: PASSED
POWER SUPPLY/BATTERY: PASSED

      Press run to start
```

```
** SELF TEST - FAILURE Ø4ØØØØØØ **
          RF MODULE: PASSED
      DIGITAL MODULE: FAILED
POWER SUPPLY/BATTERY: PASSED

      Press run to start
```

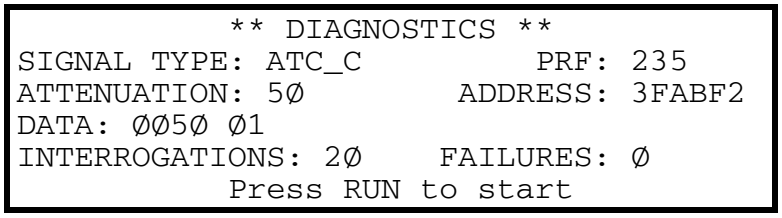
Sample Self Test Screens
Figure 4

TEST	GROUP	VERIFIES	FAILURE CODE (H)	RUNNING ORDER
LO Control	RF	Valid ON/OFF status	00000001	2
LO Detect	RF	LO is locked.	00000002	16
RF Detect	RF	TX level out/attenuation	00000004	17
Battery	Power Supply/ Battery	Voltage is within correct voltage range.	00000010	1
Non-Volatile RAM Battery	Power Supply/ Battery	Battery has sufficient power for RAM to retain memory.	00000020	Only on power-up
DSP Initialization	Digital	Handshake routine	00000040	18
Reply Decoder	Digital	Solicited ATCRBS reply	00000100	10
		Solicited Mode S reply	00000200	9
		Unsolicited Mode S reply (squitter)	00000400	8
IF Loop	RF	Background level (0 dB)	00020000	19
		SLS/foreground ratio (9 dB)	00100000	20
		DSP does not measure a non-existent signal.	00200000	21
UART	Digital	RS-232 loop back	00400000	12
Pulse Wrap	Digital	PULSE to DPSK timing	00800000	11
RAM	Digital	Dual Port RAM (DPR)	01000000	3
		Video RAM	02000000	4
		Non-Volatile RAM	04000000	6
		Display RAM	08000000	5
Attenuator #1	Digital	Level at endline diodes	10000000	13
Attenuator #2	Digital	Level at midline diodes	20000000	13
LO Compensation	Digital	DCXO control voltage	40000000	15
LED	Digital	Interrogation and reply drivers	80000000	7
NOTE: Multiple failures are indicated by the sum of the error codes.				
NOTE: If the DPR Test fails, the Self Test does not run the subsequent RAM tests.				

Self Test Error Code Definitions
Table 2

3.3 DIAGNOSTICS

Refer to 1-2-3, Figure 5.



Sample Diagnostics Screen
Figure 5

CAUTION: DO NOT OPERATE DIAGNOSTICS WITH ANTENNA CONNECTED TO ATC-601-2 TEST SET. TRANSMISSION SIGNALS USED IN DIAGNOSTICS MAY INTERFERE WITH OTHER AREA TRANSPONDER OPERATION AND/OR VIOLATE FCC RULES AND REGULATIONS, PART 87, GOVERNING SIGNAL TRANSMISSIONS FOR LAND TEST STATIONS.

STEP	PROCEDURE

1. Press SELF TEST Key to enter Self Test screen.
2. Press either of the SELECT Keys to enter Diagnostics screen.

CAUTION: MAXIMUM INPUT TO THE RF I/O CONNECTOR CANNOT EXCEED +59 dBm (800 W).

3. Connect a transponder or reply generator to RF I/O Connector, for testing the ATC-601-2 reply decoder.

   NOTE: Interrogation generation may be tested by running Diagnostics Test with or without connecting anything to the ATC-601-2 Test Set.

4. Use SLEW Keys to change values or signal type. Use SELECT Keys to change items. (Cursor line indicates item selected.)

STEP	PROCEDURE

- SIGNAL TYPE:

  Set interrogation signal transmitted by ATC-601-2. (The interrogation signal is the same as the interrogation sent in Auto Test and applicable Single Tests.) Refer to 1-2-3, Table 3 for choice of signals.

- PRF:

  Set interrogation rate from 1 to 235 interrogations per second. (Mode S signals are limited to a PRF of 78. Selectable PRFs [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 20, 21, 24, 26, 29, 34, 39, 47, 59, 78, 118 or 235] are rounded quotients of 235 divided by whole numbers.)

- ATTENUATION:

  Set attenuation of incoming signal/ATC-601-2 output from 0 to 100 steps with each step representing 0.5 dB (0 = no attenuation).

- ADDRESS:

  Set address sent in Mode S interrogations. (Address is changeable in three separate sections, each ranging from 00 to FF [hexadecimal].)

STEP	PROCEDURE

5. Press RUN/STOP Key to initiate test and display following information:

   - DATA:

     Shows most recent reply information in hexadecimal form. Refer to Appendix C for reply definition. A two-digit, hexadecimal status byte follows the data field. ATC-601-2 currently uses only the least significant digit (LSD) with status definition as follows:

     For ATCRBS:
     LSD=0, 2, 4, 6, 8, A, C or E indicates unsolicited reply.

     LSD=1, 3, 5, 7, 9, B, D or F indicates solicited reply.

     For Mode S:
     LSD=0, 4, 8 or C indicates invalid, unsolicited reply.

     LSD=1, 5, 9 or D indicates valid, unsolicited reply.

     LSD=2, 6, A or E indicates invalid, solicited reply.

     LSD=3, 7, B or F indicates valid, solicited reply.

   - INTERROGATIONS:

     Indicates number of interrogations transmitted.

   - FAILURES:

     Indicates number of interrogations transmitted that received no reply.

6. Press RUN/STOP Key to stop test.

SIGNAL TYPE	DEFINITION	USED IN
DSP_MEASURE	(not an output signal) Measures Input (ADC counts in decimal)	ATC-601-2 Calibration
CW_M5	Continuous Wave at -5 dB	ATC-601-2 Calibration
CW	Continuous Wave at 0 dB (power level compensates to attenuation)	ATC-601-2 Calibration
CW_P4	Continuous Wave at +4 dB	ATC-601-2 Calibration
ATC_A_BCKGND	ATCRBS Mode A (background level)	Test operations for automatic attenuation control
ATC_C_BCKGND	ATCRBS Mode C (background level)	MTL Difference Test
ITM_MODES_C	Intermode (Mode C/S)	ATCRBS/Mode S All-Call
ITM_MODES_A	Intermode (Mode A/S)	ATCRBS/Mode S All-Call
ITM_ATC_C	Intermode (Mode C)	ATCRBS Only All-Call
ITM_ATC_A_S	Intermode (Mode A) (triggered to detect Mode S)	ATCRBS Only All-Call
ITM_ATC_A	Intermode (Mode A) (triggered to detect ATCRBS)	ATCRBS Only All-Call
ATC_C_SLS	Mode C with P2 SLS	ATCRBS (SLS at -9 dB)
ATC_A_SLS	Mode A with P2 SLS	ATCRBS (SLS at -9 dB)
ATC_C_SLSØDB	Mode C with P2 SLS	ATCRBS (SLS at 0 dB)
ATC_A_SLSØDB	Mode A with P2 SLS	ATCRBS (SLS at 0 dB)
ATC_C	Mode C	ATCRBS
ATC_A	Mode A	ATCRBS
FMT21	Uplink Format 21	Mode S
FMT2Ø	Uplink Format 20	Mode S
FMT16	Uplink Format 16	Mode S
FMT11	Uplink Format 11	Mode S Only All-Call
FMT5	Uplink Format 5	Mode S
FMT4_SPR_OFF	Uplink Format 4 with Synchronous Phase Reversal (SPR) off	Mode S
FMT4_SPR_ON	Uplink Format 4 with SPR on	Mode S
FMTØ	Uplink Format 0	Mode S

Diagnostics Signal Definitions
Table 3

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4. GENERAL OPERATING PROCEDURES

4.1 GENERAL

This section contains operating instructions for the ATC-601-2 Ramp Test Set. The operating instructions contain general procedures, identifying the controls, connectors, indicators and Display screens used for the individual ATC-601-2 test functions. For specific Unit Under Test (UUT) Procedures, refer to the appropriate UUT Manual.

Refer to 1-2-2, Figure 2 for location of controls, connectors and indicators.

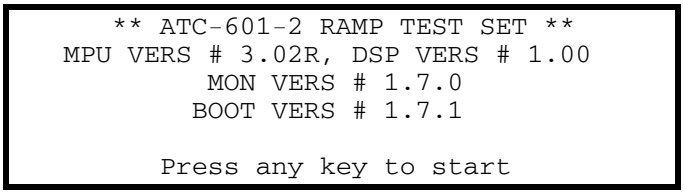
The ATC-601-2 Ramp Test Set tests the operation and installation of an ATCRBS or Mode S transponder in a ramp environment. Four operation modes allow the Test Set to do this:

- Setup allows operator to set various parameters used in testing, remote operation and memory storage.
- Auto Test runs through a group of tests checking function and operation of the transponder.
- Single Test allows the user to run through any one of 39 individual test screens.
- Power Test accurately measures Peak Pulse Power (Effective Radiated Power [ERP]) and Receiver Sensitivity (Minimum Triggering Level [MTL]) of the transponder, even when direct connection with UUT is not possible.

4.2 START-UP

Pressing the ATC-601-2 Test Set POWER Key causes the Start-Up screen to appear on the DISPLAY. Information contained in this screen indicates software versions of the Microprocessing Unit (MPU), Digital Signal Processor (DSP) used in that particular Test Set, Monitor (MON) software downloading tool and Bootstrap (BOOT) software loading tool.

NOTE: An ***R*** in the MPU Version line indicates Option 1 for remote operation is installed.



Sample Start-Up Screen
Figure 6

4.3 SETUP

The ATC-601-2 has four Setup Menus. Setup#1 Menu contains the parameters required for accurate test calculations. Setup#2 contains remote operation parameters. Setup#3 Menu contains memory operation parameters. Setup#4 Menu contains contrast settings.

4.3.1 Setup#1 Menu (Test Operation)

The Setup#1 Menu contains range, height, ATC-601-2 antenna gain and cable loss parameters used in calculating and verifying reply delay and power measurements.

NOTE: Setup#1 Menu information is entered before conducting test operations.

STEP	PROCEDURE
1.	Position ATC-601-2 Test Set according to 1-2-4, Figure 8.
	NOTE: For best Power Test results, aircraft, buildings, vehicles and other large objects should not be between Test Set and aircraft with the UUT. Refer to 1-2-4, Figure 31.
2.	Press SETUP Key once (three times from Setup#2 Menu or twice from Setup#3 Menu) to enter Setup#1 Menu. (ATC-601-2 displays information from last Setup#1 Menu.)

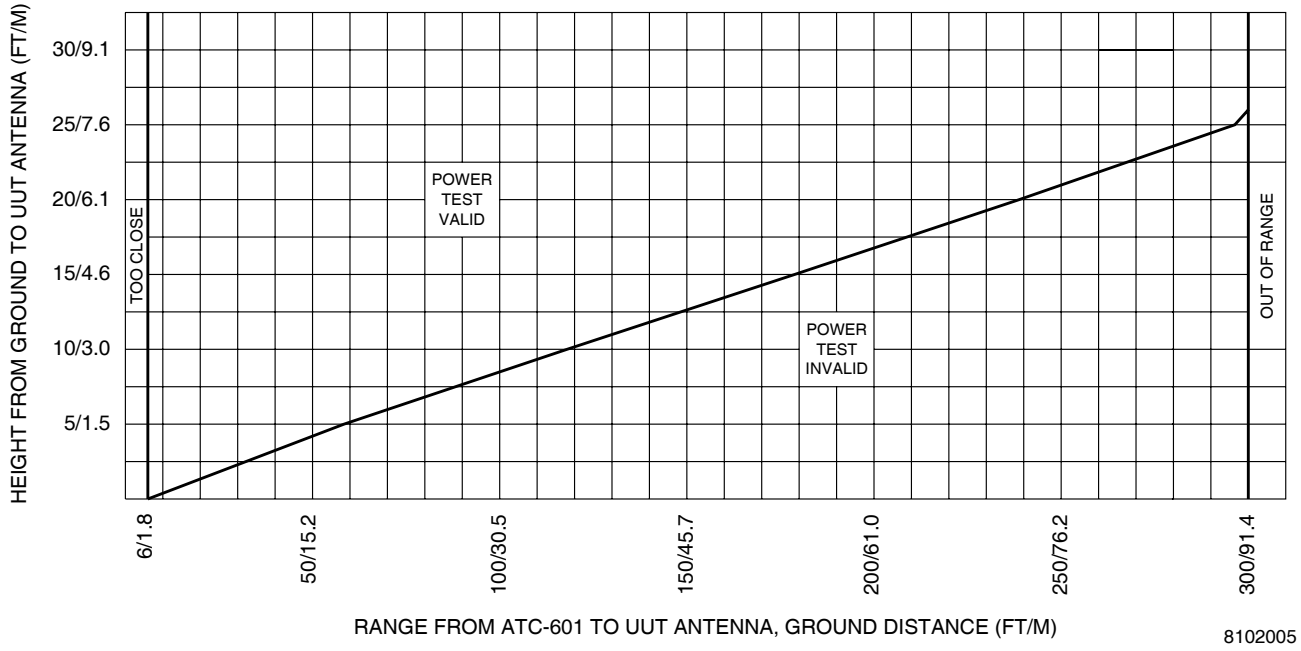
```
          ** SETUP#1 MENU **
   UUT ANTENNA: RANGE HEIGHT
            TOP =  11Ø     18
         BOTTOM =   45      8
       SELECTED =  BOTTOM
GAIN_1Ø3Ø=11.5 GAIN_1Ø9Ø=12.Ø LOSS=1.Ø
```

```
          ** SETUP#1 MENU **
   UUT ANTENNA: RANGE HEIGHT
            TOP =  11Ø     18
         BOTTOM =   45      8
       SELECTED =  TOP
GAIN_1Ø3Ø=11.5 GAIN_1Ø9Ø=12.Ø LOSS=1.Ø
```

```
          ** SETUP#1 MENU **
   UUT ANTENNA: RANGE HEIGHT
            TOP =  25Ø     18  **ERROR**
         BOTTOM =   45      8
       SELECTED =  TOP
GAIN_1Ø3Ø=11.5 GAIN_1Ø9Ø=12.Ø LOSS=1.Ø
```

```
          ** SETUP#1 MENU **
   UUT ANTENNA: RANGE HEIGHT
            TOP =  11Ø     18
         BOTTOM =    Ø      8 * DIRECT *
       SELECTED =  BOTTOM
GAIN_1Ø3Ø=11.5 GAIN_1Ø9Ø=12.Ø LOSS=1.Ø
```

Sample Setup#1 Menu Screens
Figure 7



ATC-601-2 Position Chart
Figure 8

STEP	PROCEDURE

3. Enter information using SLEW Keys to change values and SELECT Keys to change parameters. (Cursor line indicates parameter selected.)

   NOTE: The SLEW Keys have different rates of change according to item and the way keys are pressed. Press and release a key to change a value by one foot. Press and hold a key to change Range values in ten foot increments and Height values in five foot increments.

   Set following parameters:

   - RANGE:

     Set ground distance from ATC-601-2 to UUT Antenna, in feet. (If ATC-601-2 is not within effective range per 1-2-4, Figure 8, DISPLAY indicates an error and shows ***BAD SETUP!*** message in top line.) Set to ***0*** for direct connection (indicated on DISPLAY). Set to ***>0*** when using Test Set antenna.

   - HEIGHT:

     Set vertical distance from Test Set antenna to UUT Antenna, in feet.

STEP	PROCEDURE

   - SELECTED:

     Select UUT Antenna tested in Auto, Single and Power Tests. Selection determines what set of Range and Height values are used for Auto, Single and Power Test calculations.

   NOTE: Actual UUT Antenna tested depends upon shielding or disconnecting the UUT Antenna not being tested.

   - GAIN 1030/GAIN 1090:

     Set Gain in dBi, of Test Set antenna at 1030 MHz and 1090 MHz (noted on Flat Antenna).

   - LOSS:

     Set Coaxial Cable Loss in dB, of ATC-601-2 antenna or direct connect cable (noted on coaxial tag).

4. Press any key to exit Setup#1 Menu.

4.3.2 Setup#2 Menu (Remote Operation)

The Setup#2 Menu contains RS-232 interface parameters used for data dumps and serial remote operation (only with Option 1 installed) through the COMM Connector. Refer to 1-2-5 for remote operation / commands.

4.3.3 Setup#3 Menu (Memory Operation)

The Setup#3 Menu contains Effective Radiated Power (ERP) units, Diversity Test performance control and memory operation parameters.

STEP PROCEDURE

1. Press SETUP Key three times (or twice from Setup#1 Menu or once from Setup#2 Menu) to enter Setup#3 Menu. ATC-601-2 displays information from last Setup#3 Menu.
2. Enter information using SLEW Keys to change values and SELECT Keys to change parameters. (Cursor line indicates parameter selected.)

   Set following parameters:

   - POWER (ERP) UNITS:

     Set ERP measurement units used in Power Test (***dBm***, ***dBw*** or ***WATTS***). Default is ***dBm***.

   - POSITION DECODE (POS):

     Select decode method of Extended Squitter Airborne or Surface Latitude and Longitude. The decode types are ***GLOBAL*** or ***LOCAL***. Default is ***GLOBAL***.

     NOTE: Surface format only uses LOCAL decode.

STEP PROCEDURE

   - DIVERSITY TEST:

     Set control over performing Diversity (isolation) Test during Auto Test (***ON*** to perform Diversity Test or ***OFF*** [Diversity Test displays ***NOT RUN***] to not perform Diversity Test). Default is ***ON***.

   - LLAT:

     User entry for local latitude in degrees minutes and seconds.

     NOTE: Required for decode of Extended Squitter Surface Position.

   - LLONG:

     User entry for local longitude in degrees minutes and seconds.

     NOTE: Required for decode of Extended Squitter Surface Position.

   - RECALL DATA:

     Set test data to recall from memory (***1*** or ***2*** for Memory Location 1 or 2). Default is ***1***.

     Press RUN/STOP Key to recall test data. (A period displayed to the right of the test data selection indicates recall has occurred.)

   - STORE DATA:

     Memory Location for storing current test data (***1*** or ***2*** for Memory Location 1 or 2). Default is ***1***.

     Press RUN/STOP Key to store current test data. (A period displayed to the right of the Memory Location selection indicates the store has occurred, overwriting any previously stored test data.)

```
          ** SETUP#3 MENU **
POWER (ERP) UNITS = WATTS   POS= GLOBAL
DIVERSITY TEST    = ON  SPEC SERV = GICB
RECALL TEST DATA  = 1    STORE DATA = 1
LLAT= 37 39 00 N    LLONG=  97 25 48 W
Change store/recall field then press RUN
```

Sample Setup#3 Menu Screen
Figure 9

STEP	PROCEDURE

- SPEC SERV:

  Set Special Services to either ***GICB*** or ***DF17***. When set to ***GICB***, Test Set uses Ground Initiated Comm B transactions to extract data from transponders BDS registers and display decoded BDS content in 18 screens. When set to ***DF17***, Test Set listens to extended squitters and decodes and displays data.

  NOTE: Transponder must be at least Level 2 and have ADLP connected or incorporated in design of transponder to allow subsytem data from GPS/NAV to be loaded into or extracted from BDS registers.

  NOTE: Only certain BDS registers are available via extended squitter.

  Memory Location for storing current test data (***1*** or ***2*** for Memory Location 1 or 2). Default is ***1***.

  Press RUN/STOP Key to store current test data. (A period displayed to the right of the Memory Location selection indicates the store has occurred, overwriting any previously stored test data.)

3. Press any key to exit Setup#3 Menu.

4.3.4 Setup#4 Menu (Contrast)

The Setup#4 Menu contains Contrast interface parameter used for setting the contrast level of the display.

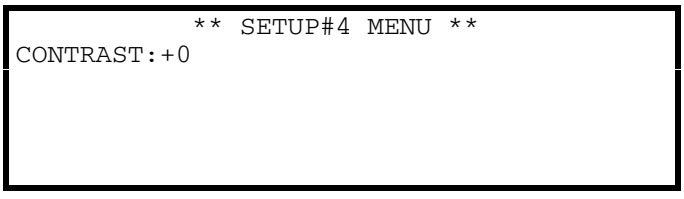
STEP	PROCEDURE

1. Press SETUP Key four times (or three times from Setup#1 Menu, twice from Setup#2 Menu or once from Setup#3 Menu) to enter Setup#4 Menu. ATC-601-2 displays information from last Setup#4 Menu.
2. Enter information using SLEW Keys to change values.

   Set following parameters:

   - CONTRAST:

     Set Contrast level of the display from ***-50*** to ***+50***. Default is ***0***.



Sample Setup#4 Menu Screen
Figure 10

4.4 AUTO TEST

4.4.1 Description

The Auto Test determines operational transponder modes (A, C and/or S). The Test Set interrogates at a level 4 dB above MTL. After performing the Auto Test, the ATC-601-2 stores the information in battery backed up memory. Auto Test comprises Test Screens 1 through 39.

NOTE: The Power Test is displayed on the Auto Test Screen.

SCREEN	DESCRIPTION

Mode Test

Identifies modes of operation. The Mode Test interrogates with Mode A, Mode C and ATCRBS (Mode C)/Mode S All-Call to determine reply modes of the transponder. These are the modes tested during the Auto Test sequence.

NOTE: This is internal to software; no screen is displayed.

1. Reply Delay

Interrogates with valid modes and verifies reply delay minus range delay (average of best 8 of 13 replies) equals:

- 128.00 μs (±0.25 μs) for Mode S
- 128.00 μs (±0.50 μs) for Intermode (All-Call)
- 3.00 μs (±0.50 μs) for ATCRBS

NOTE: Range delay is 2.03 ns/ft (6.67 ns/m), calculated from the values in the Setup Menu.

2. Reply Jitter

Interrogates with valid modes and verifies, using best 24 of 39 replies, reply jitter (changes in reply delay) is:

- ≤0.08 μs for Mode S
- ≤0.10 μs for Intermode (All-Call) and ATCRBS

SCREEN	DESCRIPTION

3. ATCRBS Reply

Interrogates with ATCRBS (Modes A and C) interrogations and verifies:

- F_1 to F_2 spacing is 20.3 μs (±0.10 μs).
- F_7 and F_2 pulse width between the 0.5 amplitude points on the leading and trailing edge is 0.45 μs (±0.10 μs).

4. SLS Level

NOTE: Because interrogation with SLS at -9 dB is sent at MTL plus 12 dB, the SLS Test must be run within 95 feet (28.96 meters) of UUT Antenna being tested.

Interrogates with valid ATCRBS interrogations including P_2 pulse. Interrogations are conducted with P_2 level at -9 dB and then again at 0 dB. Test verifies:

- Transponder does not reply when P_2 level is at 0 dB (UUT is suppressed).
- Transponder replies when P_2 level is at -9 dB (UUT is not suppressed).

5. ATCRBS Only All-Call

Interrogates with an ATCRBS only All-Call and verifies Mode S transponders do not reply.

6. Mode S All-Call

Interrogates with the ATCRBS (Mode A)/Mode S All-Call. Address received in Downlink Format (DF) 11 is then used in an Uplink Format (UF) 4 interrogation to solicit a DF4 reply. The address received is decoded and compared with the address sent. The Mode S All-Call Test Screen also displays the Tail Number of the aircraft.

The ATC-601-2 decodes the Mode S reply address to obtain the Tail Number for various countries (if supported). Refer to Appendix F.

```
      ** AUTO TEST - NOT RUN **
MODES TESTED -        FREQ:
MODES PASSED -         ERP:
MODES FAILED -         MTL:
DIVERSITY ISOLATION:
          Press RUN to start
```

```
      ** AUTO TEST - PASSED **
MODES TESTED - A,C,S FREQ: 1Ø9Ø.ØØ MHz
MODES PASSED - A,C,S  ERP:  53 dBm
MODES FAILED -        MTL: -73 dBm
DIVERSITY ISOLATION: 25 dBm
          Press RUN to start
```

```
          ** AUTO TEST **
MODES TESTED -        FREQ:
MODES PASSED -         ERP:
MODES FAILED -         MTL:
DIVERSITY ISOLATION:
         *** TEST RUNNING ***
```

```
      ** AUTO TEST - FAILED **
MODES TESTED - A,C,S FREQ: 1Ø9Ø.ØØ MHz
MODES PASSED - A,S    ERP:  23 dBw
MODES FAILED - C      MTL: -73 dBm
DIVERSITY ISOLATION: 25 dBm
          Press RUN to start
```

```
      ** AUTO TEST - FAILED **
MODES TESTED - A,C,S FREQ: 1Ø9Ø.ØØ MHz
MODES PASSED - A,C,S  ERP:  53 dBm
MODES FAILED -        MTL: -73 dBm
DIVERSITY ISOLATION:→17 dBm
          Press RUN to start
```

Sample Auto Test Screens
Figure 11

SCREEN DESCRIPTION

7. Invalid Address

Transmits Mode S interrogations using two addresses different from the address determined by the Mode S All-Call, UF11. Test verifies no reply is received. Default addresses used are one greater and 256 greater than the correct address. If Option 1 for remote operation is installed, refer to Miscellaneous Commands in 1-2-5, Table 5 for remotely setting user defined invalid addresses.

8. SPR On/Off

Transmits a Mode S interrogation with the Synchronous Phase Reversal (SPR) On, verifying correct reply is received. Then same interrogation is sent again with the SPR Off, verifying no reply is received.

9. Mode S UF0

Interrogates with Mode S Uplink Format 0 (Short air to air surveillance, ACAS) verifying reply is received that has correct altitude (compared with Mode C altitude), address (compared with Mode Test address) and format.

10. Mode S UF4

Interrogates with Mode S UF4 (Surveillance, altitude request), verifying reply is received that has correct altitude (compared with Mode C altitude), address (compared with Mode Test address) and format.

11. Mode S UF5

Interrogates with Mode S UF5 (Surveillance, identity request) verifying reply is received that has correct identity (compared with Mode A identity), address (compared with Mode Test address) and format.

12. Mode S UF11

Interrogates with Mode S UF11, verifying reply is received that has correct address (compared with Mode Test address) and format. Tests all II and SI codes.

SCREEN DESCRIPTION

13. Mode S UF16

Interrogates with Mode S UF16 (Long air to air surveillance, ACAS), verifying reply, if received, has correct altitude (compared with Mode C altitude), address (compared with Mode Test address) and format. No reply to UF16 does not fail Mode S in Auto Test.

NOTE: Replies to UF16 are only received if an active TCAS II system is installed.

14. Mode S UF20

For level 2-4 transponders (i.e., transponders that support Comm A/B, FAR Part 43), Appendix 'F' requires verification of DF20 reply.

This test first interrogates for BDS 1,0 data link capabilities report. If reply is not received, the test interrogates for BDS 3,0 TCAS sensitivity status message.

NOTE: The BDS 1,0 data link capabilities report interrogates with Mode S UF20 (Comm A, altitude request), RR=17 (long reply), DI=7, RRS=0, verifying DF20 reply received has correct altitude (compared with Mode C altitude), address (compared with Mode Test address) and format. Data displayed in MB message field is not decoded. For decoded capability report, refer to Test 25 Data Link Capability Report BDS 1,0 Part 1 in 1-2-4.4.1.

NOTE: The BDS 3,0 TCAS sensitivity status message interrogates with Mode S UF20 (Comm A, altitude request), RR=19 (long reply), DI=7, RRS=0, MA=05000000000000, verifying DF20 reply received has correct altitude (compared with Mode C altitude), address (compared with Mode Test address) and format. Data displayed in MB message field is not decoded.

SCREEN DESCRIPTION

NOTE: Level 1 transponder does not reply to this test. Failure to reply to this test does not fail Mode S in Auto Test.

NOTE: Transponders without active subsystems capable of accepting Comm A data, do not reply to UF20 interrogations.

15. Mode S UF21

For level 2-4 transponders (i.e., transponders that support Comm A/B, FAR Part 43), Appendix 'F' requires verification of DF21 reply.

This test first interrogates for BDS 1,0 data link capabilities report. If reply is not received, the test interrogates for BDS 3,0 TCAS sensitivity status message.

NOTE: The BDS 1,0 data link capabilities report interrogates with Mode S UF20 (Comm A, altitude request), RR=17 (long reply), DI=7, RRS=0, verifying DF20 reply received has correct altitude (compared with Mode C altitude), address (compared with Mode Test address) and format. Data displayed in MB message field is not decoded. For decoded capability report, refer to Test 25 Data Link Capability Report BDS 1,0 Part 1 in 1-2-4.4.1.

NOTE: The BDS 3,0 TCAS sensitivity status message interrogates with Mode S UF20 (Comm A, altitude request), RR=19 (long reply), DI=7, RRS=0, MA=05000000000000, verifying DF20 reply received has correct altitude (compared with Mode C altitude), address (compared with Mode Test address) and format. Data displayed in MB message field is not decoded.

NOTE: Transponders without active subsystems capable of accepting Comm A data, do not reply to UF21 interrogations.

SCREEN DESCRIPTION

16. Squitter

Verifies DF11 Acquisition squitters are received from the UUT every 0.8 to 2.4 seconds. ATC-601-2 only runs Squitter Test when testing Mode S transponders. Verifies DF17 extended squitters are detected.

17. Frequency

Verifies frequency of transponder is 1090 MHz (±3 MHz). The ATC-601-2 displays frequency in the Auto Test screen.

18. Flight ID BDS 2,0

Interrogates with Mode S UF4 (Comm A Identity request), RR=18 (long reply) and TO request DF20 with AIS reply. Verifies reply received is a DF20 (Comm-B) with an AIS field containing valid characters. No reply to the UF4 does not fail Mode S in Auto Test.

NOTE: Flight ID must be supported either by direct entry of flight ID into transponder or linked subsystem; otherwise AIS is zero.

19. Mode S UELM

Interrogates with Mode S UF4 (Comm A, altitude request), RR=17 (long reply), DI=7, RRS=0, verifying that UELM is supported by the transponder from the data link capabilities report.

Interrogates with Mode S UF4 ELM reservation. Verifies reply received is a DF20 ELM Reservation (Comm-B).

Interrogates with Mode S UF24 (Comm-C) ELM segments (initial, intermediate and final) in three interrogations. Verifies reply received is a Mode S DF24 (Comm-D) acknowledgment.

Interrogates with Mode S UF4 ELM close-out. Verifies reply received is a DF20 ELM close-out (Comm-B). No reply to the UELM test sequence does not fail Mode S in Auto Test.

NOTE: Transponder Level 3 required.

SCREEN DESCRIPTION

20. Mode S DELM

Interrogates with Mode S UF4 (Comm A, altitude request), RR=17 (long reply), DI=7, RRS=0, verifying that DELM is supported by the transponder from the data link capabilities report.

Interrogates with Mode S UF4 ELM reservation. Verifies reply received is a DF20 ELM Reservation (Comm-B).

Interrogates with Mode S UF24 (Comm-C) requesting Comm-D DELMs. Verifies reply received is Mode S DF24 (Comm-D) with correct number of ELM segments.

Interrogates with Mode S UF4 ELM close-out. Verifies reply received is a DF20 ELM close-out (Comm-B). No reply to the DELM test sequence does not fail Mode S in Auto Test.

NOTE: Transponder Level 4 required.

21. Diversity

Verifies diversity isolation (power level difference between UUT "On" antenna squitters and "Off" antenna squitters) is ≥20 dB. Diversity isolation is displayed in Auto Test screen. DF11 squitters are used for this test.

NOTE: To insure ≥20 dB dynamic range for Diversity Test, test must be run within 50 feet (15.24 meters) of UUT Antenna being tested.

22. MTL Difference

Verifies MTL of Mode A interrogations equals MTL of Mode C interrogations (±1.0 dB).

23. Selected Vert Intent Report BDS 4,0 Part 1

NOTE: Not available as DF17.

Interrogates with UF4 RR=20 DI=7 RRS=0, decodes DF20 reply and displays vertical intent report data.

NOTE: ADLP (Air Data Link Processor) must be installed or transponder must have embedded ADLP to receive data from subsystem (in this case the FMS [Flight Management System]).

TEST SCREEN DESCRIPTION

24. Selected Vert Intent Report BDS 4,0 Part 2

Continuation of report.

25. Data Link Capability Report BDS 1,0 Part 1

Interrogates with UF4 RR=17 DI=7 RRS=0, decodes DF20 reply and displays data link capability report.

NOTE: Data is displayed over two screens: Part 1 and Part 2.

NOTE: Not available as DF17.

26. Data Link Capability Report BDS 1,0 Part 2

Continuation of report.

27. Track & Turn Report BDS 5,0

Interrogates with UF4 RR=21 DI=7 RRS=0, decodes DF20 reply and displays track and turn report.

NOTE: ADLP (Air Data Link Processor) must be installed or transponder must have embedded ADLP to receive data from subsystem.

NOTE: Not available as DF17.

28. Heading & Speed Report BDS 6,0

Interrogates with UF4 RR=22 DI=7 RRS=0, decodes DF20 reply and displays heading and speed report.

NOTE: ADLP (Air Data Link Processor) must be installed or transponder must have embedded ADLP to receive data from subsystem

NOTE: Not available as DF17.

29. Airborne Position BDS 0,5

GICB: Interrogates with UF4 RR=16 DI=7 RRS=5, decodes DF20 reply and displays airborne position.

DF17: Receives extended squitter decodes and displays airborne position.

NOTE: DF17's are not run as part of the Auto Test.

TEST SCREEN DESCRIPTION

NOTE: ADLP (Air Data Link Processor) must be installed or transponder must have embedded ADLP to receive data from subsystem.

NOTE: Installation must be in the airborne state to transmit airborne position.

NOTE: Lat/long may be decoded via the Global Unambiguous Position algorithm if no local lat/long is entered in Setup Menu #3 or via the Local Unambiguous Position algorithm if local lat/long is entered in Setup Menu #3.

NOTE: Setup Menu #3 SPEC SERV field may be set to GICB to display this BDS register via GICB transactions or to DF17 to display data received via DF17 extended squitters.

30. Surface Position BDS 0,6

GICB: Interrogates with UF4 RR=16 DI=7 RRS=6, decodes DF20 reply and displays surface position.

DF17: Receives extended squitter decodes and displays surface position.

NOTE: DF17's are not run as part of the Auto Test.

NOTE: ADLP (Air Data Link Processor) must be installed or transponder must have embedded ADLP to receive data from subsystem.

NOTE: Installation must be in the ground state to transmit surface position.

NOTE: Lat/long may be decoded via the Local Unambiguous Position algorithm only if local lat/long is entered in Setup Menu #3; otherwise data is not displayed.

NOTE: Setup Menu #3 SPEC SERV field may be set to GICB to display this BDS register via GICB transactions or to DF17 to display data received via DF17 extended squitters.

TEST SCREEN DESCRIPTION

31. Ident & Category BDS 0,8

GICB: Interrogates with UF4 RR=16 DI=7 RRS=8, decodes DF20 reply and displays ident and category.

DF17: Receives extended squitter decodes and displays ident and category.

NOTE: DF17's are not run as part of the Auto Test.

NOTE: ADLP (Air Data Link Processor) must be installed or transponder must have embedded ADLP to receive data from subsystem.

NOTE: Setup Menu #3 SPEC SERV field may be set to GICB to display this BDS register via GICB transactions or to DF17 to display data received via DF17 extended squitters.

32. Airborne Velocity BDS 0,9 Part 1

GICB: Interrogates with UF4 RR=16 DI=7 RRS=9, decodes DF20 reply and displays airborne velocity.

DF17: Receives extended squitter decodes and displays airborne velocity.

NOTE: DF17's are not run as part of the Auto Test.

NOTE: ADLP (Air Data Link Processor) must be installed or transponder must have embedded ADLP to receive data from subsystem.

NOTE: Installation must be in the airborne state to transmit airborne velocity.

NOTE: Setup Menu #3 SPEC SERV field may be set to GICB to display this BDS register via GICB transactions or to DF17 to display data received via DF17 extended squitters.

TEST SCREEN DESCRIPTION

33. Airborne Velocity BDS 0,9 Part 2

Continuation of report.

34. Airborne Velocity BDS 0,9 Part 3

Continuation of report.

35. Ext Squitter Status BDS 0,7

GICB: Interrogates with UF4 RR=16 DI=7 RRS=7, decodes DF20 reply and displays extended squitter status.

DF17: Receives extended squitter decodes and displays extended squitter status.

NOTE: Not available as DF17.

NOTE: ADLP (Air Data Link Processor) must be installed or transponder must have embedded ADLP to receive data from subsystem.

NOTE: Setup Menu #3 SPEC SERV field may be set to GICB to display this BDS register via GICB transactions or to DF17 to display data received via DF17 extended squitters.

36. Common Usage GICB Cap Report BDS 1,7

Interrogates with UF4 RR=17 DI=7 RRS=7, decodes DF20 reply and displays 27. Common Usage GICB Cap Report BDS 1,7.

NOTE: Not available as DF17.

Interrogates with UF4 RR=17 DI=7 RRS=7, decodes DF20 reply and displays common usage GICB capability report.

37. Specific Services GICB Cap Report BDS 1,8 to 1,C

Interrogates with UF4 RR=17 DI=7 and RRS=8. DF20 reply BDS register content displayed as 14 HEX digits.

Each bit set indicates capability supported for BDS 0,1 to 3,8.

Interrogates with UF4 RR=17 DI=7 and RRS=9. DF20 reply BDS register content displayed as 14 HEX digits.

TEST SCREEN DESCRIPTION

Each bit set indicates capability supported for BDS 3,9 to 7,0.

Interrogates with UF4 RR=17 DI=7 and RRS=10. DF20 reply BDS register content displayed as 14 HEX digits.

Each bit set indicates capability supported for BDS 7,1 to A,8.

Interrogates with UF4 RR=17 DI=7 and RRS=11. DF20 reply BDS register content displayed as 14 HEX digits.

Each bit set indicates capability supported for BDS A,9 to E,0.

Interrogates with UF4 RR=17 DI=7 and RRS=12. DF20 reply BDS register content displayed as 14 HEX digits.

Each bit set indicates capability supported for BDS E,1 to F,F.

NOTE: Not available as DF17.

38. Aircraft Status BDS 6,1

GICB: Interrogates with UF4 RR=16 DI=7 RRS=1, decodes DF20 reply and displays aircraft status.

DF17: Receives extended squitter decodes and displays aircraft status.

NOTE: DF17's are not run as part of the Auto Test.

NOTE: ADLP (Air Data Link Processor) must be installed or transponder must have embedded ADLP to receive data from subsystem.

NOTE: Setup Menu #3 SPEC SERV field may be set to GICB to display this BDS register via GICB transactions or to DF17 to display data received via DF17 extended squitters.

TEST SCREEN	DESCRIPTION

39. ACAS Resolution Advisory BDS 3,0

Interrogates with UF4 RR=19 DI=7 RRS=0, decodes DF20 reply and displays active resolution advisory data.

NOTE: If ACAS Resolution Advisory is not available (BDS=0,0), the test displays "NOT AVAIL."

NOTE: Not available as DF17.

NOTE: TCAS II must be installed and and a resolution advisory must be in progress for data to be displayed on this screen. RA may be stimulated by TCAS-201 test set running a collision scenario.

Power (Displayed on Auto Test Screen)

NOTE: A special procedure (refer to . 1-2-4.6) reduces the effects of multipath when measuring power over the air.

Verifies transponder:

- ERP Direct Connect: >+48.5 dBm and <+57.0 dBm. ERP Radiated is >+48.5 dBm.
- MTL Direct Connect: >-69 dBm and <-77 dBm. MTL Radiated is: >-69 dBm.

4.4.2 Direct Connect Procedure

STEP	PROCEDURE

1. Connect UUT to ATC-601-2 RF I/O Connector.

   CAUTION: TO PREVENT DAMAGE TO ATC-601-2, DO NOT CONNECT UUT TO ANTENNA CONNECTOR WITH ATC-601-2 SET FOR DIRECT CONNECT.

2. Perform Setup#1 Menu procedure (1-2-4.3.1), setting Range, for UUT Antenna to be tested, to ***0***.
3. Press AUTO TEST Key to enter Auto Test screen. (The ATC-601-2 shows the results of the last Auto Test on the DISPLAY.)
4. Press RUN/STOP Key to run Auto Test. (***TEST RUNNING*** and asterisks in bottom line of DISPLAY indicate test is running.)
5. Press RUN/STOP Key at any time to stop test (non-resumable); otherwise, Auto Test runs until all tests are complete.
6. Verify modes (A, C and/or S) tested, passed or failed as indicated on DISPLAY. Verify UUT frequency, power measurements and diversity isolation as indicated on DISPLAY. If any test section fails or more information is needed, refer to .1-2-4.5 for Single Test and/or 1-2-4.6 for Power Test.

4.4.3 "Over the Air" Ground Test Procedure (UUT Aircraft Altitude Reporting System ≤ Airfield Altitude)

STEP	PROCEDURE

1. Perform Setup#1 Menu procedure, refer to 1-2-4.3.1.
2. Connect Test Set antenna to ATC-601-2 ANTENNA Connector. Position Test Set antenna facing UUT Antenna at Setup#1 Menu Range.
3. Either shield with Antenna Shield (refer to Appendix C) or disconnect and terminate UUT Antenna not being tested. Deactivate other area transponders or position transponders at least three times the Setup#1 Menu Range from the Test Set antenna.
4. Press AUTO TEST Key to enter Auto Test screen. (The ATC-601-2 shows the results of the last Auto Test on the DISPLAY.)
5. Press RUN/STOP Key or ANTENNA PUSH BUTTON Switch (if Flat Antenna is being used) to run Auto Test. (***TEST RUNNING*** and asterisks in bottom line of DISPLAY indicate test is running.)
6. Press RUN/STOP Key or ANTENNA PUSH BUTTON Switch (if Flat Antenna is being used) at any time to stop test (non-resumable); otherwise, Auto Test runs until all tests are complete.
7. Verify modes (A, C and/or S) tested, passed and failed as indicated on DISPLAY. Verify UUT frequency, power measurements and diversity isolation as indicated on DISPLAY. If any test section fails or more information is needed, refer to 1-2-4.5 for Single Test and/or 1-2-4.6 for Power Test.

4.4.4 "Over the Air" Simulated Altitude Test Procedure (UUT Aircraft Altitude Reporting System >Airfield Altitude ["Pumped Up"])

STEP	PROCEDURE

1. Perform Setup#1 Menu procedure, refer to 1-2-4.3.1).
2. Connect Test Set antenna to ATC-601-2 ANTENNA Connector.
3. Shield UUT antenna being tested with Antenna Shield. Refer to Appendix C. Either shield with Antenna Shield or disconnect and terminate UUT Antenna not being tested. Deactivate other area transponders or position transponders >50 feet (15.24 meters) from the Test Set antenna.

   NOTE: The Antenna Shield causes failure indications for Diversity, MTL Difference and Power Tests. The Antenna Shield may cause failure indications for the Frequency test. Such indications may be disregarded. Frequency, Diversity, MTL Difference and Power tests are verified without the Antenna Shield.

4. Position Flat Antenna ≤20 feet (6.1 meters) from transponder antenna being tested. Adjust Setup#1 Menu accordingly.
5. Press AUTO TEST Key to enter Auto Test screen. (The ATC-601-2 shows the results of the last Auto Test on the DISPLAY.)
6. Press RUN/STOP Key or ANTENNA PUSH BUTTON Switch (if Flat Antenna is being used) to run Auto Test. (***TEST RUNNING*** and asterisks in bottom line of DISPLAY indicate test is running.)
7. Press RUN/STOP Key or ANTENNA PUSH BUTTON Switch (if Flat Antenna is being used) at any time to stop test (non-resumable); otherwise, Auto Test runs until all tests are complete.
8. Verify modes (A, C and/or S) tested, passed or failed as indicated on DISPLAY. If any test section fails or more information is needed, refer to 1-2-4.5 for Single Test.

4.5 SINGLE TEST

If more information is needed, the operator is able to view or rerun specific tests. The following graphs contain Single Test procedure, information and sample Display screens associated with each test.

All tests are the same as those run in the Auto Test. Each Single Test runs a Mode Test first to determine valid transponder modes to be tested. Unlike Auto Test, once initiated, each Single Test continues running until RUN/STOP Key is pressed again.

Display screen values are expressed in decimal except for ID codes (expressed in octal). Most Mode S field values are expressed in hexadecimal except for downlink format [DF] and altitude code [AC], expressed in decimal; and identity code [ID], expressed in octal. Top line of DISPLAY indicates PASSED, FAILED, NOT RUN or NO REPLY for that particular test.

Refer to 1-2-4, Table 4 for Screen Symbols Identifications. Refer to Appendix B for signal formats and number system conversions.

4.5.1 GENERAL PROCEDURE

STEP	PROCEDURE

1. Perform the following according to desired test setup:
   - If direct connect is desired, perform Steps 1 through 3 of 1-2-4.4.2.
   - If "Over the Air" Ground Test with UUT Aircraft Altitude Reporting System ≤ Airfield Altitude is desired, perform Steps 1 through 4 of 1-2-4.4.3.
   - If "Over the Air" Simulated Altitude Test with UUT Aircraft Altitude Reporting System >Airfield Altitude is desired (ATCRBS Reply, Mode S UF0, Mode S UF4 and/or Mode S UF16 Tests), perform Steps 1 through 5 of 1-2-4.4.4.
2. Use SELECT Keys to go from Auto Test screen to each Single Test. (Results from last test run, Auto or Single, are shown on DISPLAY).
3. Press RUN/STOP Key or ANTENNA PUSH BUTTON Switch (if Flat Antenna is being used) to initiate test.
4. Press RUN/STOP Key or ANTENNA PUSH BUTTON Switch (if Flat Antenna is being used) to stop test.

4.5.2 Single Test Definitions

SYMBOL	LOCATION	INDICATES
→	Before item line	Error in item
####	Numerical data fields	Data string is too large for data field.
++++	Power line, Frequency line, Diversity Isolation line	Invalid data
****	Power Values Line	Variance due to excessive multipath
** TEST RUNNING **	Bottom line	Test is running.
[ ]	ATCRBS Altitude line Squitter Address line Mode S All-Call Address line	Data in Octal form
■	Before Power Test line	Selected UUT Antenna
■■	Left Side, Below Bottom Line	Battery is Low
BAT	Left Side, Top Line	

Screen Symbols Identification Chart
Table 4

TEST SCREEN DESCRIPTION

1. Reply Delay

Refer to 1-2-4, Figure 12.

The ATC-601-2 interrogates UUT with Modes A, C, S and ATCRBS/Mode S All-Call (Intermode [ITM]).

The Reply Delay test verifies reply delay minus range delay is:

- 128 µs (±0.25 µs) for Mode S
- 128 µs (±0.50 µs) for ITM
- 3.00 µs (±0.50 µs) for ATCRBS (ATC)

Range delay is 2.03 ns/ft (6.67 ns/m) and is calculated using range values established in Setup#1 Menu. Reply delay times are indicated on the DISPLAY. Only Mode S is looked at with ITM interrogation.

```
** REPLY DELAY TEST - NO REPLY **

MODE  S:
ITM   A:            C:
ATC   A:            C:
      *** TEST RUNNING ***
```

```
** REPLY DELAY TEST - PASSED **

MODE  S:------
ITM   A:------      C:------
ATC   A:  3.Ø2 µS   C:  3.1Ø µS
       Press RUN to start
```

```
** REPLY DELAY TEST - FAILED **

MODE →S:129.Ø5 µS
ITM   A:128,Ø2 µS   C:128.Ø4 µS
ATC   A:  3.Ø2 µS   C:  3.1Ø µS
       Press RUN to start
```

Sample Reply Delay Test Screens
Figure 12

TEST SCREEN DESCRIPTION

2. Reply Jitter

Refer to 1-2-4, Figure 13.

The ATC-601-2 interrogates with Modes A, C, S and ATCRBS/Mode S All-Call (ITM).

The Reply Jitter test verifies reply jitter:

- ≤0.08 µs for Mode S
- ≤0.1 µs for ATCRBS and ITM modes

The ATC-601-2 indicates reply jitter values (difference between shortest and longest reply delay) on the DISPLAY.

```
    ** REPLY JITTER TEST - PASSED **

    MODE  S: Ø.Ø3Ø µS
    ITM   A: Ø.Ø5Ø µS    C: Ø.Ø5Ø µS
    ATC   A: Ø.1ØØ µS    C: Ø.Ø75 µS
          Press RUN to start
```

```
    ** REPLY JITTER TEST - FAILED **

    MODE →S: Ø.13Ø µS
    ITM   A: Ø.Ø5Ø µS    C: Ø.Ø5Ø µS
    ATC   A: Ø.1ØØ µS    C: Ø.Ø75 µS
          Press RUN to start
```

Sample Reply Jitter Test Screens
Figure 13

3. ATCRBS Reply

Refer to 1-2-4, Figure 14.

The ATC-601-2 interrogates with Modes A and C.

The ATCRBS Reply test verifies:

- F_1 to F_2 spacing is 20.3 µs (±0.10 µs)
- F_1/F_2 pulse widths are 0.45 µs (±0.10 µs)

The ATC-601-2 indicates F_1 to F_2 spacing, F_1 width and F_2 width values on the DISPLAY. The ATC-601-2 also displays Mode A identity (ID) code and Mode C altitude. If the Special Position Identification Pulse (SPI) is present, the ATC-601-2 displays ***ID*** before the Mode A code. The ALT field blanks out with an invalid input (no C bit or C_1 and C_4 are on at the same time) is received. The four-digit octal code, shown regardless of validity, displays the Mode C information as follows (MSD to LSD):

$A_4,A_2,A_1/B_4,B_2,B_1/C_4,C_2,C_1/D_4,D_2,D_1$

```
  ** ATCRBS REPLY TEST - NO REPLY **
F1 TO F2 SPACING  A:          C:
F1 PULSE WIDTH    A:          C:
F2 PULSE WIDTH    A:          C:
CODE=         ALT=            [    ]
          Press RUN to start
```

```
    ** ATCRBS REPLY TEST - PASSED **
F1 TO F2 SPACING  A:2Ø.3Ø µS C:2Ø.3Ø µS
F1 PULSE WIDTH    A: Ø.45 µS C: Ø.45 µS
F2 PULSE WIDTH    A: Ø.45 µS C: Ø.45 µS
CODE=  7777  ALT= 1Ø,7ØØ FT  [614Ø]
          Press RUN to start
```

```
    ** ATCRBS REPLY TEST - FAILED **
F1 TO F2 SPACING →A:22.ØØ µS C:2Ø.3Ø µS
F1 PULSE WIDTH    A: Ø.45 µS C: Ø.45 µS
F2 PULSE WIDTH    A: Ø.45 µS C: Ø.45 µS
CODE=  7777  ALT= 1Ø,7ØØ FT  [614Ø]
          Press RUN to start
```

Sample ATCRBS Reply Screens
Figure 14

TEST SCREEN DESCRIPTION

4. SLS Level

Refer to 1-2-4, Figure 15.

The ATC-601-2 interrogates with ATCRBS Modes A and C interrogations including the P_2 SLS pulse, verifying valid replies are received when P_2 level is set at -9 dB and no reply is received when P_2 level is set at 0 dB. DISPLAY indicates results.

NOTE: Because interrogation with SLS at -9 dB is sent at MTL + 12 dB, SLS Test must be run within 95 feet (28.96 meters) of UUT Antenna being tested.

```
** SLS LEVEL TEST - PASSED **

        -9 dB: REPLY
         Ø dB: NO REPLY

        Press RUN to start
```

```
** SLS LEVEL TEST - FAILED **

        -9 dB: REPLY
      → Ø dB: REPLY

        Press RUN to start
```

```
** SLS LEVEL TEST - FAILED **

      →-9 dB: NO REPLY
         Ø dB: NO REPLY

        Press RUN to start
```

Sample SLS Level Test Screens
Figure 15

5. ATCRBS Only All-Call

Refer to 1-2-4, Figure 16.

The ATC-601-2 interrogates with an ATCRBS only All-Call and verifies no reply is received from Mode S transponders. DISPLAY indicates results.

```
** ATC ONLY ALL-CALL TEST - PASSED **

            PASSED TEST


        Press RUN to start
```

```
** ATC ONLY ALL-CALL TEST - FAILED **

   MODE S XPDR REPLIED WITH MODE S


        Press RUN to start
```

```
** ATC ONLY ALL-CALL TEST - FAILED **

   MODE S XPDR REPLIED WITH ATCRBS


        Press RUN to start
```

Sample ATCRBS Only All-Call Test Screens
Figure 16

TEST SCREEN DESCRIPTION

6. Mode S All-Call

Refer to 1-2-4, Figure 17.

The ATC-601-2 interrogates with the ATCRBS (Mode A)/Mode S All-Call and displays the DF11 reply address. This address is then sent in a UF4 interrogation. The DF4 reply address is indicated on DISPLAY and compared with the one used. Test fails if Mode S reply is not received or address is inconsistent.

```
** MODE S ALL-CALL TEST - PASSED **
ALL CALL ADDRESS = 3AC421 [16542Ø41]
TAIL NUMBER = N12345  United States


          Press RUN to start
```

```
** MODE S ALL-CALL TEST - FAILED **
ALL CALL ADDRESS = 3BD532 [16752462]
TAIL NUMBER = N12345  United States
DF4 REPLY ADDRESS= 3AC421

          Press RUN to start
```

Sample Mode S All-Call Test Screens
Figure 17

7. Invalid Address

Refer to 1-2-4, Figure 18.

The ATC-601-2 transmits Mode S interrogations using addresses different from the address determined by the Mode S All-Call (UF11) and verifies no reply is received. Results are indicated on DISPLAY.

```
** INVALID ADDRESS TEST - PASSED **

            PASSED TEST


          Press RUN to start
```

```
** INVALID ADDRESS TEST - FAILED **

REPLIED TO INVALID ADDRESS = 3AC422


          Press RUN to start
```

Sample Invalid Address Test Screens
Figure 18

8 SPR On/Off

Refer to 1-2-4, Figure 19.

The ATC-601-2 interrogates with a Mode S interrogation with SPR On and indicates if reply is received. The same interrogation is sent again with SPR Off and test verifies no reply is received. DISPLAY indicates results.

```
   ** SPR ON/OFF TEST - PASSED **

          SPR ON : REPLY
          SPR OFF: NO REPLY

          Press RUN to start
```

```
   ** SPR ON/OFF TEST - FAILED **

            SPR ON : REPLY
          → SPR OFF: REPLY

          Press RUN to start
```

Sample SPR On/Off Test Screens
Figure 19

9. Mode S UF0

Refer to 1-2-4, Figure 20.

The ATC-601-2 interrogates with UF0 verifying a reply is received having correct altitude, same address and correct format. Altitude reported in DF0 is compared with altitude reported during Mode Test in valid ATCRBS Mode C reply. Address is compared with address reported during Mode Test in DF11 reply. The DISPLAY indicates the Downlink Format Fields. If test fails because of incorrect altitude, Mode C altitude is displayed. If test fails because of wrong address, DF11 address is displayed. UF0 AQ bit is "1" for requesting airspeed information in DF0 RI field.

NOTE: AC field blanks out if invalid data is received for that field.

NOTE: Software Version 3.04 supports ICAO amendment 77 transponders. When testing VS discrete start test with installation in airborne state, switch to ground state with test still running. Test Set uses last Mode S address obtained from ATCRBS All Call reply, while in airborne state.

```
    ** MODE S UFØ TEST - PASSED **

 DF Ø  VS=1  SL=Ø  RI=Ø  AC= 1Ø,7ØØ FT
 ADDRESS=3AC421

          Press RUN to start
```

```
    ** MODE S UFØ TEST - FAILED **

 DF Ø  VS=1  SL=Ø  RI=Ø →AC= 1Ø,8ØØ FT
 ADDRESS=3AC421
 MODE C ALT= 1Ø,7ØØ FT
          Press RUN to start
```

```
   ** MODE S UFØ TEST - FAILED **

 DF Ø  VS=1  SL=Ø  RI=Ø  AC= 1Ø,7ØØ FT
→ADDRESS=3BD432
 DF11 ADDR=3AC421
          Press RUN to start
```

```
    ** MODE S UFØ TEST - FAILED **

→DF 4  VS=1  SL=Ø  RI=Ø  AC= 1Ø,7ØØ FT
 ADDRESS=3AC421

          Press RUN to start
```

Sample Mode S UF0 Test Screens
Figure 20

TEST SCREEN DESCRIPTION

10. Mode S UF4

Refer to 1-2-4, Figure 21.

The ATC-601-2 interrogates with UF4 verifying a reply is received having correct altitude, same address and correct format. Altitude reported in DF4 (Surveillance, altitude reply) is compared with altitude reported during Mode Test in valid ATCRBS Mode C reply. Address is compared with address reported during Mode Test in DF11 reply. The DISPLAY indicates the Downlink Format Fields. If test fails because of incorrect altitude, Mode C altitude is displayed. If test fails because of wrong address, DF11 address is displayed.

NOTE: AC field blanks out if invalid data is received for that field.

NOTE: Software Version 3.04 supports ICAO amendment 77 transponders. When testing VS discrete start test with installation in airborne state, switch to ground state with test still running. Test Set uses last Mode S address obtained from ATCRBS All Call reply, while in airborne state.

```
     ** MODE S UF4 TEST - PASSED **

 DF 4 FS=1  DR=ØØ UM=ØØ AC= 1Ø,7ØØ FT
 ADDRESS=3AC421

          Press RUN to start
```

```
     ** MODE S UF4 TEST - FAILED **

DF 4 FS=1  DR=ØØ UM=ØØ →AC= 1Ø,8ØØ FT
 ADDRESS=3AC421
 MODE C ALT = 1Ø,7ØØ FT
          Press RUN to start
```

```
     ** MODE S UF4 TEST - FAILED **

 DF 4 FS=1  DR=ØØ UM=ØØ →AC= 1Ø,7ØØ FT
→ADDRESS=3AB352
 DF11 ADDR=3AC421
          Press RUN to start
```

```
     ** MODE S UF4 TEST - FAILED **

→DF Ø FS=1  DR=ØØ UM=ØØ AC= 1Ø,7ØØ FT
 ADDRESS=3AC421

          Press RUN to start
```

Sample Mode S UF4 Test Screens
Figure 21

TEST SCREEN DESCRIPTION

11. Mode S UF5

Refer to 1-2-4, Figure 22.

The ATC-601-2 interrogates with UF5 verifying a reply is received having correct ID, same address and correct format. ID code reported in DF5 (Surveillance, identity reply) is compared with ID code reported during Mode Test in valid ATCRBS Mode A reply. Address is compared with address reported during Mode Test in DF11 reply. The DISPLAY indicates the Downlink Format Fields. If test fails because of incorrect ID code, Mode A, ID code is displayed. If test fails because of wrong address, DF11 address is displayed.

NOTE: Software Version 3.04 supports ICAO amendment 77 transponders. When testing VS discrete start test with installation in airborne state, switch to ground state with test still running. Test Set uses last Mode S address obtained from ATCRBS All Call reply, while in airborne state.

```
    ** MODE S UF5 TEST - PASSED **

 DF 5  FS=1  DR=ØØ  UM=ØØ  ID=7777
 ADDRESS=3AC421

          Press RUN to start
```

```
    ** MODE S UF5 TEST - FAILED **

 DF 5  FS=1  DR=ØØ  UM=ØØ →ID=7377
 ADDRESS=3AC421
 MODE A CODE=  7777
          Press RUN to start
```

```
    ** MODE S UF5 TEST - FAILED **

 DF 5  FS=1  DR=ØØ  UM=ØØ  ID=7777
→ADDRESS=3BDE31
 DF11 ADDR=3AC421
          Press RUN to start
```

```
    ** MODE S UF5 TEST - FAILED **

→DF Ø  FS=3  DR=12  UM=14  ID=318Ø
 ADDRESS=3AC421

          Press RUN to start
```

Sample Mode S UF5 Test Screens
Figure 22

TEST SCREEN DESCRIPTION

12. Mode S UF11

Refer to 1-2-4, Figure 23.

The ATC-601-2 interrogates with UF11 verifying a reply is received having the same address and correct format and correct II (Interrogator Identity) field. Address is compared with address reported during Mode Test. The test is repeated for each of the 15 II codes from 1 to 15. In the case of an incorrect code reported, a failure arrow identifies the first code that failed.

If the transponder supports SI (Surveillance Identifier) then each of the 63 SI codes from 1 to 63 is tested. In the case of an incorrect code reported, a failure arrow identifies the first code that failed.

The DISPLAY indicates the Downlink Format Fields. If test fails because of incorrect AA, Mode Test address is displayed.

```
   ** MODE S UF11 TEST - PASSED **
 DF11   CA=7   AA=3AC421   PI=ØØØØØ

 II CODE= PASSED
 SI CODE= PASSED
          Press RUN to start
```

```
   ** MODE S UF11 TEST - FAILED **
→DF16   CA=   AA=3AC421   PI=

 II CODE=
 SI CODE=
          Press RUN to start
```

```
   ** MODE S UF11 TEST - FAILED **
 DF11   CA=  →AA=33E35B   PI=
 DF11 ADDR=3AC421
 II CODE=
 SI CODE=
         Press RUN to start
```

```
   ** MODE S UF11 TEST - FAILED **
 DF11   CA=7  AA=3AC421   PI=ØØØØØØ

 II CODE= PASSED
 SI CODE= 48->63
          Press RUN to start
```

Sample Mode S UF11 Test Screens
Figure 23

TEST SCREEN DESCRIPTION

13. Mode S UF16

Refer to 1-2-4, Figure 24.

The ATC-601-2 interrogates with UF16 verifying reply, if received, has correct altitude, same address and correct format. Altitude reported in DF16 is compared with altitude reported during Mode Test in valid ATCRBS Mode C reply. Address is compared with address reported during Mode Test in DF11 reply. The DISPLAY indicates the Downlink Format Fields. If test fails because of incorrect AC, Mode C altitude is displayed. If test fails because of wrong address, DF11 address is displayed. UF16 AQ bit is "0" for requesting TCAS capability information in DF16 RI field.

NOTE: AC field blanks out if invalid data is received for that field.

NOTE: An active TCAS II system must be installed to obtain a response to the UF16 test.

```
    ** MODE S UF16 TEST - PASSED **

 DF16   VS=Ø  SL=Ø  RI=Ø  AC= 1Ø,7ØØ FT
 MV=ØØØØØØØØØØØØØØ       ADDRESS=3AC421

           Press RUN to start
```

```
    ** MODE S UF16 TEST - FAILED **

 DF16   VS=Ø  SL=Ø  RI=Ø  AC= 1Ø,7ØØ FT
 MV=ØØØØØØØØØØØØØØ     →ADDRESS=543212
 DF11 ADDR=3AC421
           Press RUN to start
```

```
    ** MODE S UF16 TEST - FAILED **

→DF21   VS=Ø  SL=Ø  RI=Ø →AC= 1Ø,7ØØ FT
 MV=ØØØØØØØØØØØØØØ       ADDRESS=3AC421

           Press RUN to start
```

```
    ** MODE S UF16 TEST - FAILED **

 DF16   VS=Ø  SL=Ø  RI=Ø →AC= 11,2ØØ FT
 MV=ØØØØØØØØØØØØØØ       ADDRESS=3AC421
 MODE C ALT= 1Ø,7ØØ FT
           Press RUN to start
```

Sample Mode S UF16 Test Screens
Figure 24

TEST SCREEN DESCRIPTION

14. Mode S UF20

Refer to 1-2-4, Figure 25.

The ATC-601-2 first interrogates with UF20 with RR=17, DI=7, RRS=0 verifying data link capability DF20 (long) reply, if received, has correct altitude, same address and correct format. Altitude reported in DF20 (Comm B, altitude reply) is compared with altitude reported during Mode Test in DF11 reply. If there is no reply, the ATC-601-2 interrogates with UF20 with RR=19, DI=7, RRS=0, MA=05000000000000 verifying TCAS sensitivity level DF20 (long) reply, if received, has correct altitude, same address and correct format. Altitude reported in DF20 (Comm B, altitude reply) is compared with altitude reported during Mode Test in DF11 reply.

The DISPLAY indicates the Downlink Format Fields. If test fails because of incorrect AC, Mode C altitude is displayed. If test fails because of wrong address, DF11 address is displayed. MB message field displays Data Link Capability Report or TCAS Sensitive Level Status.

NOTE: For fully decoded data link capability status, refer to Test 25 Data Link Capability Report BDS 1,0 Part 1 in 1-2-4.4.1.

NOTE: AC field blanks out if invalid data is received for that field.

NOTE: Transponders without an embedded ADLP and without active subsystems capable of accepting Comm A data (i.e., TCAS), do not reply to UF20 interrogations.

NOTE: Software Version 3.04 supports ICAO amendment 77 transponders. When testing VS discrete start test with installation in airborne state, switch to ground state with test still running. Test Set uses last Mode S address obtained from ATCRBS All Call reply, while in airborne state.

```
   ** MODE S UF2Ø TEST - PASSED **

 DF2Ø FS=Ø  DR=ØØ UM=ØØ AC= 1Ø,7ØØ FT
 MB=ØØØØØØØØØØØØØØ      ADDRESS=3AC421

          Press RUN to start
```

```
   ** MODE S UF2Ø TEST - FAILED **

 DF2Ø FS=Ø  DR=ØØ UM=ØØ→AC= 1Ø,ØØØ FT
 MB=ØØØØØØØØØØØØØØ      ADDRESS=3AC421
 MODE C ALT= 1Ø,7ØØ FT
          Press RUN to start
```

```
   ** MODE S UF2Ø TEST - FAILED **

→DF21 FS=Ø  DR=ØØ UM=ØØ AC= 1Ø,7ØØ FT
 MB=ØØØØØØØØØØØØØØ      ADDRESS=3AC421

          Press RUN to start
```

```
   ** MODE S UF2Ø TEST - FAILED **

 DF2Ø FS=Ø  DR=ØØ UM=ØØ AC= 1Ø,7ØØ FT
 MB=ØØØØØØØØØØØØØØ     →ADDRESS=3BD422
 DF11 ADDR=3AC421
          Press RUN to start
```

```
  ** MODE S UF2Ø TEST - NO REPLY **

 DF   FS=   DR=   UM=   AC=
 MB=                    ADDRESS=

          Press RUN to start
```

Sample Mode S UF20 Test Screens
Figure 25

TEST SCREEN DESCRIPTION

15. Mode S UF21

Refer to 1-2-4, Figure 26.

The ATC-601-2 first interrogates with UF21 with RR=17, DI=7, RRS=0 verifying data link capability DF21 (long) reply, if received, has correct ID, same address and correct format. ID code reported in DF21 (Comm B, identity reply) is compared with ID code reported during Mode Test in valid ATCRBS Mode A reply. Address is compared with address reported during Mode Test in DF11 reply. If there is no reply, the ATC-601-2 interrogates with UF21 with RR=19, DI=7, RRS=0, MA=05000000000000 verifying TCAS sensitivity level DF21 (long) reply, if received, has correct ID, same address and correct format. ID code reported in DF21 (Comm B, identity reply) is compared with ID code reported during Mode Test in valid ATCRBS Mode A reply. Address is compared with address reported during Mode Test in DF11 reply.

The DISPLAY indicates the Downlink Format Fields. If test fails because of incorrect ID code, Mode A ID code is displayed. If test fails because of wrong address, DF11 address is displayed. MB message field displays Data Link Capability Report or TCAS Sensitivity Level Status.

NOTE: For fully decoded data link capability status, refer to Test 25 Data Link Capability Report BDS 1,0 Part 1 in 1-2-4.4.1.

NOTE: Transponders without an embedded ADLP and without active subsystems capable of accepting Comm A data (i.e., TCAS), do not reply to UF21 interrogations.

TEST SCREEN DESCRIPTION

NOTE: Software Version 3.04 supports ICAO amendment 77 transponders. When testing VS discrete start test with installation in airborne state, switch to ground state with test still running. Test Set uses last Mode S address obtained from ATCRBS All Call reply, while in airborne state.

```
   ** MODE S UF21 TEST - PASSED **

 DF21 FS=Ø  DR=ØØ UM=ØØ ID=7777
 MB=ØØØØØØØØØØØØØØ      ADDRESS=3AC421

          Press RUN to start
```

```
   ** MODE S UF21 TEST - FAILED **

→DF16 FS=Ø  DR=ØØ UM=ØØ ID=3247
 MB=ØØØØØØØØØØØØØØ      ADDRESS=3AC421

       **** TEST RUNNING ****
```

```
   ** MODE S UF21 TEST - FAILED **

 DF21 FS=Ø  DR=ØØ UM=ØØ→ID=7377
 MB=ØØØØØØØØØØØØØØ      ADDRESS=3AC421
 MODE A CODE=  7777
          Press RUN to start
```

```
   ** MODE S UF21 TEST - FAILED **

 DF21 FS=Ø  DR=ØØ UM=ØØ ID=7777
 MB=ØØØØØØØØØØØØØØ     →ADDRESS=3BD422
 DF11 ADDR=3AC421
          Press RUN to start
```

```
  ** MODE S UF21 TEST - NO REPLY **

 DF   FS=   DR=   UM=   ID=
 MB=                    ADDRESS=

          Press RUN to start
```

Sample Mode S UF21 Test Screens
Figure 26

TEST SCREEN DESCRIPTION

16. Squitter

Refer to 1-2-4, Figure 27.

The Squitter test verifies the time period between UUT squitters is 0.8 to 2.4 sec. The ATC-601-2 displays the measured time between UUT squitters along with the squitter address (hexadecimal and octal) and tail number. The test also verifies that DF17 Extended Squitters have been detected.

```
    ** SQUITTER TEST - PASSED **
  DF11 PERIOD = 1.ØØ SECONDS
  TAIL NUMBER = N12345  United States
  SQUITTER ADDRESS= 3AC421 [16542Ø41]
    DF17 DETECTED = YES
          Press RUN to start
```

```
    ** SQUITTER TEST - FAILED **
 →DF11 PERIOD = 2.64 SECONDS
  TAIL NUMBER = N12345  United States
  SQUITTER ADDRESS= 3AC421 [16542Ø41]
    DF17 DETECTED = YES
          Press RUN to start
```

Sample Squitter Test Screens
Figure 27

17. Frequency

Refer to 1-2-4, Figure 28.

The Frequency test verifies UUT frequency is 1090 MHz (±3 MHz). The ATC-601-2 displays the UUT frequency.

```
    ** FREQUENCY TEST - PASSED **

       FREQUENCY = 1Ø92.3Ø MHz


          Press RUN to start
```

```
    ** FREQUENCY TEST - PASSED **

      →FREQUENCY = 1Ø86.8Ø MHz


          Press RUN to start
```

Sample Frequency Test Screens
Figure 28

TEST SCREEN DESCRIPTION

18. Flight ID BDS 2,0 Test

Refer to 1-2-4, Figure 29.

Verifies Flight ID decoded from a DF20 reply contains valid characters.

NOTE: Transponder Level 2=> required.

19. Mode S UELM Test (Uplink Extended Length Message)

Refer to 1-2-4, Figure 30.

Refer to 1-2-4, Table 5 for UELM error codes.

Verifies replies to a minimum multisite three ELM Uplink.

NOTE: Transponder Level 3=> required.

NOTE: The test interrogates for BDS 1,0 Data Link Capabilities Report before testing UELM. If UELM is not available, the test displays "NOT AVAIL."

NUMBER	ERROR
0	No error, Test passed
1	18 seconds Timeout/Closeout reply not received
10	Mode S reply not received
11	Long reply not received
12	DF20 not received
13	Received bad address/all 0s or all 1s
14	IDS≠2
15	IIS not same as in reservation interrogation
20	Mode S ELM reply not received
21	Long ELM reply not received
22	DF24 not received
23	Received bad address/all 0s or all 1s
24	KE≠1
25	TAS=wrong sum number of segments
30	Mode S closeout reply not received
31	Long closeout reply not received
32	Closeout DF20 not received

TEST SCREEN DESCRIPTION

NUMBER	ERROR
33	Received bad address/all 0s or all 1s
34	IDS≠2
35	IIS≠0

UELM Default Test Errors
Table 5

```
     ** FLIGHT ID TEST - PASSED **

DF2Ø  BDS1=Ø2  BDS2=ØØ
AIS=2Ø42ØCCB9C1Ø41  FLIGHT ID=BA349
ADDRESS=3AC421
            Press RUN to start
```

```
       ** FLIGHT ID TEST - FAILED **

DF2Ø   →BDS1=Ø3  BDS2=ØØ
AIS=3Ø42ØCCB9C1Ø41  FLIGHT ID=
ADDRESS=3AC421
            Press RUN to start
```

Sample Flight ID Test Screens
Figure 29

```
    ** MODE S UELM TEST - PASSED **
RES:  DF2Ø  DR=15  IIS=F  IDS=2
ACK:  DF24  KE=1   ND=0   TAS=ØØØF
CLO:  DF2Ø  DR=15  IIS=F  IDS=2
ADDRESS=3AC421  ERROR=0
           Press RUN to start
```

```
    ** MODE S UELM TEST - FAILED **
RES:  DF20  DR=15  IIS=F  IDS=2
ACK: →DF20  KE=    ND=    TAS=
CLO:  DF20  DR=15  IIS=F  IDS=2
ADDRESS=3AC421  →ERROR=22
           Press RUN to start
```

```
    ** MODE S UELM TEST - NOT AVAIL **
RES:  DF    DR=    IIS=   IDS=
ACK:  DF    KE=    ND=    TAS=
CLO:  DF    DR=    IIS=   IDS=
ADDRESS=          ERROR=
           Press RUN to start
```

Sample Mode S UELM Test Screens
Figure 30

TEST SCREEN DESCRIPTION

20. Mode S DELM Test (Downlink Extended Length Message)

Refer to 1-2-4 Figure 31.

Refer to 1-2-4, Table 6 for DELM error codes.

Verifies Downlink ELM operation.

NOTE: Transponder Level 4=> required.

NOTE: The test interrogates for BDS 1,0 Data Link Capabilities Report before testing DELM. If DELM is not available, the test displays "NOT AVAIL."

NUMBER	ERROR
0	No error, Test passed
1	18 seconds timeout/Closeout reply not received
10	Mode S reply not received
11	Long reply not received
12	DF20 not received
13	Received bad address/all 0s or all 1s
14	DR<16 (10h)
15	IIS not same as in reservation interrogation
20	Mode S reply not received
21	Long reply not received
22	DF24 not received
23	Received bad address/all 0s or all 1s
24	KE incorrect (≠0 or last segment, ≠1)
25	TAS=wrong sum number of segments
26	ND≠correct segment number
27	Wrong number of segments received
30	Mode S closeout reply not received
31	Long closeout reply not received
32	Closeout DF20 not received
33	Received bad address/all 0s or all 1s
34	DR≠0
35	IIS not same as in reservation or closeout interrogation

DELM Default Test Errors
Table 6

```
   ** MODE S DELM TEST - PASSED **
RES:  DF2Ø  DR=15  IIS=F     IDS=2
SEG:  DF24  KE=1   ND=0 /    TAS=ØØØF
CLO:  DF2Ø  DR=15  IIS=F     IDS=2
ADDRESS=3AC421  ERROR=0   SEGMENTS=15
          Press RUN to start
```

```
   ** MODE S DELM TEST - FAILED **
RES:  DF20  DR=15  IIS=F     IDS=2
SEG:  DF24  KE=1   ND=0 /    TAS=ØØØF
CLO: →DF    DR=    IIS=      IDS=
ADDRESS=3AC421  →ERROR=30  SEGMENTS=15
          Press RUN to start
```

```
   ** MODE S DELM TEST - NOT AVAIL **
RES:  DF    DR=    IIS=      IDS=
SEG:  DF    KE=    ND=  /    TAS=
CLO:  DF    DR=    IIS=      IDS=
ADDRESS=          ERROR=    SEGMENTS=
          Press RUN to start
```

Sample Mode S DELM Test Screens
Figure 31

TEST SCREEN DESCRIPTION

21. Diversity

Refer to 1-2-4, Figure 32.

The Diversity test verifies UUT diversity isolation (difference between "On" antenna squitters and "Off" antenna squitters) is ≥20 dB. ATC-601-2 displays diversity isolation in dB. Test only runs if set in Setup#3 Menu.

NOTE: To insure ≥20 dB dynamic range, test must be run within 50 feet (15.24 meters) of UUT Antenna being tested.

```
** DIVERSITY TEST - PASSED **

  DIVERSITY ISOLATION: 27 dB


      Press RUN to start
```

```
** DIVERSITY TEST - FAILED **

  DIVERSITY ISOLATION: +++++
  SATURATED

      Press RUN to start
```

```
** DIVERSITY TEST - FAILED **

  DIVERSITY ISOLATION: 18 dB


      Press RUN to start
```

```
** DIVERSITY TEST - FAILED **

  DIVERSITY ISOLATION: +++++


      Press RUN to start
```

Sample Diversity Test Screens
Figure 32

22. MTL Difference

Refer to 1-2-4, Figure 33.

Verifies Receiver Sensitivity or MTL to Mode A interrogations does not differ more than 1 dB from MTL to Mode C interrogations. The MTL difference, based on the average of 100 Mode A and 100 Mode C interrogations, is displayed.

```
** MTL DIFFERENCE TEST - PASSED **

MODE A MTL - MODE C MTL = Ø.2 dB


      Press RUN to start
```

```
** MTL DIFFERENCE TEST - FAILED **

MODE A MTL - MODE C MTL = 1.1 dB


      Press RUN to start
```

Sample MTL Difference Test Screens
Figure 33

TEST SCREEN DESCRIPTION

23. Selected Vert Intent Report BDS 4,0 Part 1

Refer to 1-2-4, Figure 34.

Interrogates with UF4 RR=20 DI=7 RRS=0, decodes DF20 reply and displays vertical intent report data.

NOTE: Not available as DF17.

NOTE: ADLP (Air Data Link Processor) must be installed or transponder must have embedded ADLP to receive data from subsystem (in this case the FMS [Flight Management System]).

NOTE: Data is spread over two screens: Part 1 and Part 2.

MCP/FCU SEL ALT
(Mode Control Panel/Flight Control Unit Selected Altitude):
Displayed in feet.

FMS SEL ALT
(Flight Management System):
Displayed in feet.

TARGET ALT
(Target Altitude):
UNKNOWN, ***AIRCRAFT ALT***, ***FCU/MCP SEL ALT*** or ***FMS SEL ALT***

SOURCE INFO
(Target Altitude Source Information):
YES (Source Information Provided) or ***NO*** (Source Information Not Provided)

```
 **SEL VERT INTENT RPT #1 - PASSED **
DF20  BDS=4,0                  AA=3AC421
MCP/FCU SEL ALT= 65,536 ft
FMS SEL ALT= 65,536 ft SOURCE INFO= YES
TARGET ALT= FCU/MCP SEL ALT
            Press RUN TO start
```

Sample Selected Vertical Intent Report Part 1 Screen
Figure 34

TEST SCREEN DESCRIPTION

24. Selected Vert Intent Report BDS 4,0 Part 2

Refer to 1-2-4, Figure 35.

BARO PRES SET
(Barometric Pressure Set):
800 to ***1209.5*** mb

VNAV MODE
(Vertical Navigation Mode):
ACTIVE or ***N/ACTIVE*** (Not Active).

```
 **SEL VERT INTENT RPT #2 - PASSED **
DF20  BDS=4,0                    AA=3AC421
BARO PRES SET= 1100 mb
VNAV MODE= N/ACTIVE  APPR MODE= ACTIVE
ALT HOLD MODE= N/ACTIVE  MODE INFO= YES
           Press RUN TO start
```

Sample Selected Vertical Intent Report
Part 2 Screen
Figure 35

TEST SCREEN DESCRIPTION

25. Data Link Capability Report BDS 1,0 Part 1

Refer to 1-2-4, Figure 36.

Interrogates with UF4 RR=17 DI=7 RRS=0, decodes DF20 reply and displays data link capability report.

NOTE: Not available as DF17.

NOTE: Data is displayed over two screens: Part 1 and Part 2.

SUBNET VER NBR
(Mode S Subnet Version Number):
N_AVL (Not Available) or Three Digit Version Number (currently only Version 001 defined)

XPDR LEVEL
(Transponder Level):
2-4 (Transponder Level 2-4) or
5 (Transponder Level 5 Enhanced Protocol)

SPECIFIC SER CAP REP
(Mode S Specific Services Capability Report):
YES or ***NO***

DTE
(Data Terminal Equipment):
YES or ***NO***

UELM SEG CAP
(Uplink Extended Length Message Segment Capability):
NO UELM, ***16/1 S***, ***16/500 mS***, ***16/250 mS***, ***16/125 mS***, ***16/60 mS*** or ***16/30 mS***
(Example: 16 segments transferred in 500 milliseconds.)

CONT FLAG
(Continuation Flag):
YES (continuation report may be found in registers BDS 11,01 up to 16,01) or ***NO***

```
** DATA LINK CAP REPORT #1 - PASSED **
DF20  BDS=1,0                   AA=3AC421
SUBNET VER NBR=   1     XPDR LEVEL= 2-4
SPECIFIC SER CAP REP= YES      DTE= YES
UELM SEG CAP= 16/250 mS  CONT FLAG= YES
            Press RUN TO start
```

Sample Data Link Capability Report
Part 1 Screen
Figure 36

TEST SCREEN DESCRIPTION

26. Data Link Capability Report BDS 1,0 Part 2

Refer to 1-2-4, Figure 37.

DELM SEG CAP
(Downlink Extended Length Message Segment Capability):
NO DELM, ***4/1 S***, ***8/1 S***, ***16/1 S***, ***16/500 mS***, ***16/250 mS***, ***16/125 mS*** or ***7*** to ***15*** (unassigned)
(Example: 8 segments transferred in 1 Second.)

AIRCRAFT ID CAP
(Aircraft Identification Capability):
YES or ***NO***

SQTR CAP
(Squitter Capability Subfield):
YES (Surveillance code Identifier Capability) or ***NO*** (No Surveillance Code Identifier Capability)

COMM USE GICB REP
(Common Usage [Ground Initiated Comm B] Capability Report):
0 or ***1***
This bit changes when the common usage GICB capability report BDS 1,7 content changes.

SI CAP
(Surveillance Identifier Code Capability):
YES or ***NO***

NOTE: Refer to ICAO Annex 10, Vol III, Part 1, Chapter 5 and RTCA-DO-260 for detailed description of data fields.

```
** DATA LINK CAP REPORT #2 - PASSED **
DF20  BDS=1,0                  AA=3AC421
DELM SEG CAP= 16/500 mS
AIRCRAFT ID CAP= YES         SI CAP= YES
SQUITTER CAP= YES COMM USE GICB REP=1
            Press RUN TO start
```

Sample Data Link Capability Report
Part 2 Screen
Figure 37

TEST SCREEN DESCRIPTION

27. Track & Turn Report BDS 5,0

Refer to 1-2-4, Figure 38.

Interrogates with UF4 RR=21 DI=7 RRS=0, decodes DF20 reply and displays Track & Turn Report data.

NOTE: Not available as DF17.

NOTE: ADLP (Air Data Link Processor) must be installed or transponder must have embedded ADLP to receive data from subsystem (in this case the FMS [Flight Management System]).

ROLL ANGLE:
±***90.0*** deg

T_TRACK ANGLE
(True Track Angle):
0 to ***359*** deg

RATE
(True Track Angle Rate):
±***0.0*** to ***16.0*** deg/sec

GND SPEED
(Ground Speed):
0 to ***2048*** Kts (2 Kt resolution)

T_AIR SPEED
(True Air Speed):
0 to ***2048*** Kts (2 Kt resolution)

NOTE: Refer to ICAO Annex 10, Vol III, Part 1, Chapter 5 and RTCA-DO-260 for detailed description of data fields.

```
 ** TRACK & TURN REPORT - PASSED **
DF20  BDS=5,0                  AA=3AC421
ROLL ANGLE= 40.1 DEG  RATE= 4.0 DEG/S
T_TRACK ANGLE= 90.3DEG
GND SPEED=1000 Kts T_AIR SPEED=1000 Kts
          Press RUN TO start
```

Sample Track & Turn Report Screen
Figure 38

TEST SCREEN DESCRIPTION

28. Heading & Speed Report BDS 6,0

Refer to 1-2-4, Figure 39.

Interrogates with UF4 RR=22 DI=7 RRS=0, decodes DF20 reply and displays Heading & Speed Report data.

NOTE: Not available as DF17.

NOTE: ADLP (Air Data Link Processor) must be installed or transponder must have embedded ADLP to receive data from subsystem (in this case the FMS [Flight Management System]).

IND AIR SPEED
(Indicated Air Speed):
0 to ***1023*** Kts (1 Kt resolution)

MACH
(Mach Number):
0 to ***4.096*** (Mach Number)

BARO ALT RATE
(Barometric Altitude Rate):
-16384 to ***+16352*** ft/ min (32 ft/min resolution)

MAG HDG
(Magnetic Heading):
0 to ***359*** deg

I V VEL
(Inertial Vertical Velocity):
-16384 to ***+16352*** ft/ min (32 ft/min resolution)

NOTE: Refer to ICAO Annex 10, Vol III, Part 1, Chapter 5 and RTCA-DO-260 for detailed description of data fields.

```
 ** HEADING & SPEED REPORT - PASSED **
DF20  BDS=6,0                  AA=3AC421
IND AIR SPEED= 512 Kts   MACH= 4.096
BARO ALT RATE= +14,000 ft/min
MAG HDG=180.3DEG I_V_VEL= +14,000ft/min
            Press RUN TO start
```

Sample Heading & Speed Report Screen
Figure 39

29. Airborne Position BDS 0,5

For GICB, refer to 1-2-4, Figure 40.

For DF17, refer to 1-2-4, Figure 41.

Setup Menu #3 SPEC SERV field is set to GICB to display BDS register via GICB transactions or set to DF17 to display data received via DF17 extended squitters.

GICB: Interrogates with UF4 RR=16 DI=7 RRS=5, decodes DF20 reply and displays airborne position.

DF17: Receives extended squitter decodes and displays airborne position.

NOTE: DF17's are not run as part of the Auto Test.

NOTE: TYPE=0 indicates that no position information is available.

NOTE: ADLP (Air Data Link Processor) must be installed or transponder must have embedded ADLP to receive data from subsystem.

NOTE: Installation must be in the airborne state to transmit airborne position.

LAT (Encoded Latitude) and LONG (Encoded Longitude) decoded CPR format shown in degrees, minutes and seconds.

BARO PR ALT
(Barometric Pressure Altitude):
Set altitude (in ft) (Types 9 to 18) or (GNSS HEIGHT [Global positioning System Derived Height] (Types 20 and 22).

POS
(Position Decode):
LOCAL (if LOCal LAT/LONG entered in Setup Menu #3) or ***GLOBAL*** (if LOCal LAT/LONG not entered in Setup Menu #3).

SURVL STAT
(Surveillance Status):
NO INFO, ***SPI*** (Special Position Identification), ***PERM ALERT*** (Permanent Alert [Emergency]) or ***TEMP ALERT*** (Temporary Alert [change in Mode Identity Code]).

SAF
(Single Antenna Flag):
0 (Single Antenna or ***1*** (Dual Antenna)

T
(Time Sync to UTC):
UTC or ***N/UTC*** (Not UTC)

TYPE:
Specifies class and accuracy of data.

PERIOD:
DF17 squitter average period (in sec)

```
    ** AIRBORNE POS - PASSED **
DF20 BDS=0,5          TYPE=14 AA=3AC421
LAT= 37 39 00 N LONG= 97 25 48 W  SAF=1
BARO PR ALT= 131,068ft   T=N/UTC
SURVL STAT= NO INFO     POS= GLOBAL
           Press RUN TO start
```

```
    ** AIRBORNE POS ** - PASSED
DF20 BDS=             TYPE=0  AA=3AC421
LAT=            LONG=              SAF=
BARO PR ALT=              T=
SURVL STAT=              POS=
           Press RUN TO start
```

Airborne Position Screen
(GICB)
Figure 40

```
 ** EXT SQUIT AIRBORNE POS - PASSED **
DF17 PERIOD= 1S  TYPE=14 AA=3AC421
LAT= 37 39 00 N LONG= 97 25 48 W  SAF=1
BARO PR ALT= 131,068ft   T=N/UTC
SURVL STAT= NO INFO     POS= GLOBAL
           Press RUN TO start
```

Extended Squitter Airborne Position Screen
(DF17)
Figure 41

TEST SCREEN DESCRIPTION

30. Surface Position BDS 0,6

For GICB, refer to 1-2-4, Figure 42.

For DF17, refer to 1-2-4, Figure 43.

Setup Menu #3 SPEC SERV field is set to GICB to display BDS register via GICB transactions or set to DF17 to display data received via DF17 extended squitters.

GICB: Interrogates with UF4 RR=16 DI=7 RRS=6, decodes DF20 reply and displays surface position.

DF17: Receives extended squitter decodes and displays surface position.

NOTE: DF17's are not run as part of the Auto Test.

NOTE: TYPE=0 indicates that no position information is available.

NOTE: ADLP (Air Data Link Processor) must be installed or transponder must have embedded ADLP to receive data from subsystem.

NOTE: To ensure Test Set monitoring levels are set correctly, the test must be started with installation in airborne state and while test is running, the installation is switched to ground state to transmit surface position.

LAT (Encoded Latitude) and LONG (Encoded Longitude) decoded Local unambiguous CPR format shown in degrees, minutes and seconds.

MOVEMENT:
NO INFO (No Information Available), ***A/C STOPPED*** (Aircraft Stopped), ***0.125-1 Kt***, ***1-2 Kt***, ***2-15 Kt***, ***15-70 Kt***, ***70-100 Kt***, ***100-175 Kt*** or ***175 Kt***

HDG
(Heading):
0 to ***359*** deg

HDG STATUS
(Heading Status)
VALID or ***NOT VALID***

T
(Time Sync to UTC):
UTC or ***N/UTC*** (Not UTC)

TYPE:
Specifies class and accuracy of data.

PERIOD:
DF17 squitter average period (in sec)

NOTE: Refer to ICAO Annex 10, Vol III, Part 1, Chapter 5 and RTCA-DO-260 for detailed description of data fields.

```
        ** SURFACE POS - PASSED **
DF20 BDS=0,6          TYPE=11 AA=3AC421
LAT= 37 39 00 N   LONG= 97 25 48 W
MOVEMENT= 2 Kts  T= N/UTC
HDG= 230 DEG  HDG STATUS= VALID
          Press RUN TO start
```

```
        ** SURFACE POS - PASSED **
DF20 BDS=             TYPE=0  AA=3AC421
LAT=               LONG=
MOVEMENT=         T=
HDG=           HDG STATUS=
          Press RUN TO start
```

Surface Position Screen
(GICB)
Figure 42

```
 ** EXT SQUIT SURFACE POS - PASSED **
DF17 PERIOD= 1S  TYPE=11 AA=3AC421
LAT= 37 39 00 N   LONG= 97 25 48 W
MOVEMENT= 2 Kts  T= N/UTC
HDG= 230 DEG  HDG STATUS= VALID
          Press RUN TO start
```

Extended Squitter Surface Position Screen
(DF17)
Figure 43

TEST SCREEN DESCRIPTION

31. Ident and Category BDS 0,8

For GICB, refer to 1-2-4, Figure 44.

For DF17, refer to 1-2-4, Figure 45.

Setup Menu #3 SPEC SERV field is set to GICB to display BDS register via GICB transactions or set to DF17 to display data received via DF17 extended squitters.

GICB: Interrogates with UF4 RR=16 DI=7 RRS=8, decodes DF20 reply and displays identification and category.

DF17: Receives extended squitter decodes and displays identification and category.

NOTE: DF17's are not run as part of the Auto Test.

NOTE: TYPE=0 indicates that no position information is available.

NOTE: ADLP (Air Data Link Processor) must be installed or transponder must have embedded ADLP to receive data from subsystem.

EMIT CAT SET
(ADS-B Emitter Category Set):
A, ***B***, ***C*** or ***D***

EMIT CAT
(ADS-B Emitter Category):
NO ADS-B EMITTER INFO, ***LIGHT, SMALL***, ***LARGE***, ***HIGH VORTEX***, ***HEAVY***, ***HIGH***, ***PERFORMANCE***, ***ROTOCRAFT***, ***GLIDER/SAILPLANE***, ***LIGHTER-THAN-AIR***, ***PARACHUTIST***, ***ULTRALIGHT/ HANG-GLIDER***, ***UNMANNED AERIAL VEHICLE***, ***SPACE VEHICLE***, ***SURFACE EMERGENCY VEHICLE***, ***SURFACE SERVICE VEHICLE*** or ***FIXED GRND/TETHERED OBSTR***

AIS
(Aircraft Identity Subfield):
HEX field containing BDS plus flight ID

FLIGHT ID:
8 ICAO character field

PERIOD:
DF17 squitter average period (in sec)

TEST SCREEN DESCRIPTION

NOTE: Refer to ICAO Annex 10, Vol III, Part 1, Chapter 5 and RTCA-DO-260 for detailed description of data fields.

```
      ** IDENT & CTGRY - PASSED **
DF20 BDS=0,8          TYPE=02 AA=3AC421
EMIT CAT SET= A
EMIT CAT= LARGE
AIS= 20420CCB9C1041  FLIGHT ID=XPN34512
           Press RUN TO start
```

```
      ** IDENT & CTGRY - PASSED **
DF20 BDS=             TYPE=0  AA=3AC421
EMIT CAT SET=
EMIT CAT=
AIS=                  FLIGHT ID=
           Press RUN TO start
```

Identification & Category Screen
(GICB)
Figure 44

```
** EXT SQUIT IDENT & CTGRY - PASSED **
DF17 PERIOD= 1S  TYPE=02 AA=3AC421
EMIT CAT SET= A
EMIT CAT= LARGE
AIS= 20420CCB9C1041  FLIGHT ID=XPN34512
           Press RUN TO start
```

Extended Squitter Identification & Category Screen (DF17)
Figure 45

TEST SCREEN DESCRIPTION

32. Airborne Velocity BDS 0,9 Part 1

For GICB, refer to 1-2-4, Figure 46.

For DF17, refer to 1-2-4, Figure 47.

Setup Menu #3 SPEC SERV field is set to GICB to display BDS register via GICB transactions or set to DF17 to display data received via DF17 extended squitters.

GICB: Interrogates with UF4 RR=16 DI=7 RRS=9, decodes DF20 reply and displays airborne velocity.

DF17: Receives extended squitter decodes and displays airborne velocity.

NOTE: DF17's are not run as part of the Auto Test.

NOTE: TYPE=0 indicates that no position information is available.

NOTE: ADLP (Air Data Link Processor) must be installed or transponder must have embedded ADLP to receive data from subsystem.

NOTE: Installation must be in the airborne state to transmit airborne position.

NOTE: Data is displayed over three screens: Part 1, Part 2 and Part 3.

SUB TYPES
(Subtype Coding):
0 (ICAO DOC 9688 (First Edition of ICAO Mode S Specific Service Manual) not supported
1 - ***VEL OVR GND*** (Velocity Over Ground)
2 - ***VEL OVR GND SUPER*** (Velocity Over Ground Supersonic)
3 - ***AIR SPD HDG NORM*** (Airspeed/Heading Normal)
4 - ***AIR SPD HDG SUPER*** (Airspeed/Heading Supersonic)
5 - ***N/A*** (Not Yet Supported)
6 - ***N/A*** (Not Yet Supported)
7 - ***N/A*** (Not Yet Supported)

EAST-WEST VEL
(East-West Velocity):
NO INFO (No Information)
0 to ***>1021.5*** Kts (Subtype 1)
0 to ***>4084*** Kts (Subtype 2)

NOTE: EAST-WEST VEL is followed by E (East) or W (West) direction identifier.

NORTH-SOUTH VEL
(North-South Velocity):
NO INFO (No Information)
0 to ***>11021.5*** Kts (Subtype 1)
0 to ***>4084*** Kts (Subtype 2)

NOTE: NORTH-SOUTH VEL is followed by N (North) or S (South) direction identifier.

PERIOD:
DF17 squitter average period (in sec)

NOTE: Refer to ICAO Annex 10, Vol III, Part 1, Chapter 5 and RTCA-DO-260 for detailed description of data fields.

```
        ** AIRB VEL #1 - PASSED **
DF20 BDS=0,9          TYPE=19 AA=3AC421
SUBTYPE=  VEL OVR GND
EAST-WEST VEL= 1000 Kts E
NORTH-SOUTH VEL= 1000 Kts N
           Press RUN TO start
```

```
        ** AIRB VEL #1 - PASSED **
DF20 BDS=             TYPE=0  AA=3AC421
SUBTYPE=
EAST-WEST VEL=
NORTH-SOUTH VEL=
           Press RUN TO start
```

Airborne Velocity Part 1 Screen
(GICB)
Figure 46

```
 ** EXT SQUIT AIRB VEL #1 - PASSED **
DF17 PERIOD= 1S  TYPE=19 AA=3AC421
SUBTYPE=  VEL OVR GND
EAST-WEST VEL= 1000 Kts E
NORTH-SOUTH VEL= 1000 Kts N
           Press RUN TO start
```

Extended Squitter Airborne Velocity Part 1 Screen (DF17)
Figure 47

TEST SCREEN DESCRIPTION

33. Airborne Velocity BDS 0,9 Part 2

For GICB, refer to 1-2-4, Figure 48.

For DF17, refer to 1-2-4, Figure 49.

VERT RATE
(Vertical Rate):
NO INFO or ***±0*** to ***16288*** ft/min
(32576 ft/min Subtypes 1 and 2).

VERT SOURCE
(Source of Vertical Rate):
N-AVAIL (Not Available) (Subtype 0),
BARO (Barometric Source) or ***GEO***
(i.e., GPS Source)

GEO ALT DIFF FROM BARO
(Geo Altitude Difference from Barometric Altitude):
±0 to ***3125*** ft

HDG
(Heading):
N-AVAIL (Not Available) or 0 to 359 deg

INTENT
(Intent Change Flag):
CHANGE or ***NO CHANGE***

NOTE: Refer to ICAO Annex 10, Vol III, Part 1, Chapter 5 and RTCA-DO-260 for detailed description of data fields.

```
        ** AIRB VEL #2 - PASSED **
DF20 BDS=0,9          TYPE=19 AA=3AC421
INTENT= NO CHANGE       SOURCE= BARO
VERT RATE= +12ft/min    HDG= 240 DEG
GEO ALT DIFF FROM BARO= -3125 ft
           Press RUN TO start
```

```
        ** AIRB VEL #2 - PASSED **
DF20 BDS=             TYPE=0  AA=3AC421
INTENT=                 SOURCE=
VERT RATE=              HDG=
GEO ALT DIFF FROM BARO=
           Press RUN TO start
```

Airborne Velocity Part 2 Screen
(GICB)
Figure 48

```
 ** EXT SQUIT AIRB VEL #2 - PASSED **
DF17 PERIOD= 1S  TYPE=19 AA=3AC421
INTENT= NO CHANGE       SOURCE= BARO
VERT RATE= +12ft/min    HDG= 240 DEG
GEO ALT DIFF FROM BARO= -3125 ft
           Press RUN TO start
```

Extended Squitter Airborne Velocity Part 2
Screen (DF17)
Figure 49

TEST SCREEN DESCRIPTION

34. Airborne Velocity BDS 0,9 Part 3

For GICB, refer to 1-2-4, Figure 50.

For DF17, refer to 1-2-4, Figure 51.

IFR CAP FLAG
(IFR Capability Flag):
NO ADS-B/CLASS A1> (No ADS-B Capability Class A1 and above) or
ADS-B/CLASS A1> (ADS-B Capability Class A1 and above)

AIR SPEED:
N_AVAIL (Not Available) or ***0*** to ***1021*** Kts

AIR SPEED TYPE:
IAS (Indicated Airspeed) or ***TAS*** (True Airspeed)

NAC
(Navigation Accuracy Category for Velocity):
0 to ***4*** (Reference Tables A5-A7 in RTCA DO-260)

PERIOD:
DF17 squitter average period (in sec)

NOTE: Refer to ICAO Annex 10, Vol III, Part 1, Chapter 5 and RTCA-DO-260 for detailed description of data fields.

```
       ** AIRB VEL #3 - PASSED **
DF20 BDS=0,9          TYPE=19 AA=3AC421
NAC= 4
IFR CAP FLAG= NO ADS-B/CLASS A1>
AIRSPEED= 1021 Kt   AIR SPEED TYPE= TAS
           Press RUN TO start
```

```
       ** AIRB VEL #3 - PASSED **
DF20 BDS=             TYPE=0 AA=3AC421
NAC=
IFR CAP FLAG=
AIRSPEED=           AIR SPEED TYPE=
           Press RUN TO start
```

Extended Squitter Airborne Velocity Part 3 Screen (GCIB)
Figure 50

```
** EXT SQUIT AIRB VEL #3 - PASSED **
DF17 PERIOD= 1S  TYPE=19 AA=3AC421
NAC= 4
IFR CAP FLAG= NO ADS-B/CLASS A1>
AIRSPEED= 1021 Kt   AIR SPEED TYPE= TAS
           Press RUN TO start
```

Extended Squitter Airborne Velocity Part 3 Screen (DF17)
Figure 51

TEST SCREEN DESCRIPTION

35. Ext Squitter Status BDS 0,7

Refer to 1-2-4, Figure 52.

Interrogates with UF4 RR=16 DI=7 RRS=7, decodes DF20 reply and displays extended squitter status.

NOTE: Not available as DF17.

NOTE: ADLP (Air Data Link Processor) must be installed or transponder must have embedded ADLP to receive data from subsystem.

SURFACE SQUITTER TRANS RATE:
N_CAP (No Capability to determine Surface Squitter Rate)
HIGH (High Surface Squitter Rate selected)
LOW (Low Surface Squitter Rate selected)

ALT TYPE
(Altitude Type Subfield (ATS) Coding):
BARO (Barometric Altitude) or ***GNSS*** (GNSS Height)

ESS
(Extended Squitter Status):
14 Digit HEX Field (Bits 1 to 56)

NOTE: Refer to ICAO Annex 10, Vol III, Part 1, Chapter 5 and RTCA-DO-260 for detailed description of data fields.

```
    ** EXT SQUIT STATUS - PASSED **
DF20 BDS=0,7                  AA=3AC421
SURFACE SQUITTER TRANS RATE= HIGH
ALT TYPE= BARO
ESS= 00000000000000
           Press RUN TO start
```

Extended Squitter Status
Figure 52

TEST SCREEN DESCRIPTION

36. Common Usage GICB Cap Report BDS 1,7

Refer to 1-2-4, Figure 53.

Interrogates with UF4 RR=16 DI=7 RRS=7, decodes DF20 reply and displays common usage GICB capability report.

NOTE: Not available as DF17.

This screen displays the BDS Numbers for the common usage GICB services currently supported by the transponder.

NOTE: Shaded BDS in 1-2-4, Table 7 are those not supported by current ATC-601-2 software.

```
  ** COMMON USAGE GICB CAP - PASSED **
DF20 BDS=1,7                    AA=3AC421
:0,5 :0,6 :0,7 :0,8 :0,9 :0,A :2,0 :2,1
:4,0 :4,1 :4,2 :4,3 :4,4 :4,5 :4,8 :5,0
:5,1 :5,2 :5,3 :5,4 :5,5 :5,6 :5,F :6,0
            Press RUN TO start
```

Sample Common Usage GICB Capability Report Screen
Figure 53

BDS	DESCRIPTION
0.5	Ext Squitter Airborne Position
0,6	Ext Squitter Surface Position
0,7	Ext Squitter Status
0,8	Ext Squitter Type & Identification
0,9	Ext Squitter Airborne Velocity Information
0,A	Ext Squitter Event Driven Information
2,0	Aircraft Identification
2,1	Aircraft Registration Number (Flight ID)
4,0	Aircraft Vertical Intention
4,1	Next Way Point Identifier
4,2	Next Way Point Position
4,3	Next Way Point Information
4,4	Meteorological Routine Report
4,5	Meteorological Hazard Report
4,8	VHF Channel Report
5,0	Track & Turn Report
5,1	Position Coarse
5,2	Position Fine
5,3	Air Referenced State Vector
5,4	Way Point 1
5,5	Way Point 2
5,6	Way Point 3
5,F	Quasi-Static Parameter Monitoring
6,0	Heading and Speed Report

Common Usage GICB BDS
Table 7

TEST SCREEN DESCRIPTION

37. Specific Services GICB Cap Report BDS 1,8 to 1,C

Refer to 1-2-4, Figure 54.

NOTE: Not available as DF17.

Interrogates with UF4 RR=17 DI=7 RRS=8; DF20 reply BDS register content displayed as 14 HEX digits.

Each bit set indicates capability supported for BDS 0,1 to 3,8.

Interrogates with UF4 RR=17 DI=7 RRS=9; DF20 reply BDS register content displayed as 14 HEX digits.

Each bit set indicates capability supported for BDS 3,9 to 7,0.

Interrogates with UF4 RR=17 DI=7 RRS=10; DF20 reply BDS register content displayed as 14 HEX digits.

Each bit set indicates capability supported for BDS 7,1 to A,8.

Interrogates with UF4 RR=17 DI=7 RRS=11; DF20 reply BDS register content displayed as 14 HEX digits.

Each bit set indicates capability supported for BDS A,9 to E,0.

Interrogates with UF4 RR=17 DI=7 RRS=12; DF20 reply BDS register content displayed as 14 HEX digits.

Each bit set indicates capability supported for BDS E,1 to F,F.

NOTE: Refer to ICAO Annex 10, Vol III, Part 1, Chapter 5 and RTCA-DO-260 for detailed description of data fields.

```
   ** SPEC SERV GICB CAP - PASSED **
DF20                              AA=3AC421
1,8=00000000000000  1,9=00000000000000
1,A=00000000000000  1,B=00000000000000
1,C=00000000000000
            Press RUN TO start
```

Specific Services GICB Capability Report Screen
Figure 54

TEST SCREEN DESCRIPTION

38. Aircraft Status BDS 6,1

For GICB, refer to 1-2-4, Figure 55.

For DF17, refer to 1-2-4, Figure 56.

Setup Menu #3 SPEC SERV field is set to GICB to display BDS register via GICB transactions or set to DF17 to display data received via DF17 extended squitters.

GICB: Interrogates with UF4 RR=16 DI=7 RRS=9, decodes DF20 reply and displays identification and category.

DF17: Receives extended squitter decodes and displays identification and category.

NOTE: DF17's are not run as part of the Auto Test.

NOTE: TYPE=0 indicates that no position information is available.

NOTE: ADLP (Air Data Link Processor) must be installed or transponder must have embedded ADLP to receive data from subsystem.

SUB TYPE
(Subtype Coding):
NO INFORMATION or ***EMERGENCY/ PRIORITY STATUS***

EMERG/PRIOR S_CODE
(Emergency/Priority Status Coding):
NO EMERGENCY, ***GENERAL EMERGENCY***, ***LIFEGUARD/MEDICAL***, ***MINIMUM FUEL***, ***NO COMMUNICATIONS***, ***UNLAWFUL INTERFERENCE*** or ***DOWNED AIRCRAFT***

RESERVED:
12 digit HEX Field containing contents of Bits 9 to 56.

```
      ** AIRCRFT STATUS ** - PASSED
DF20 BDS=6,1          TYPE=28 AA=3AC421
SUBTYPE= EMERGENCY/PRIORITY STATUS
EMERG/PRIOR S_CODE=UNLAWFUL INTERFNC
RESERVED= 000000000000
           Press RUN TO start
```

```
      ** AIRCRFT STATUS ** - PASSED
DF20 BDS=             TYPE=0  AA=3AC421
SUBTYPE=



           Press RUN TO start
```

Extended Squitter Aircraft Status Screen (GICB)
Figure 55

```
** EXT SQUIT AIRCRFT STATUS - PASSED **
DF17 PERIOD=1s   TYPE=28 AA=3AC421
SUBTYPE= EMERGENCY/PRIORITY STATUS
EMERG/PRIOR S_CODE=UNLAWFUL INTERFNC
RESERVED= 000000000000
           Press RUN TO start
```

Extended Squitter Aircraft Status Screen (DF17)
Figure 56

TEST SCREEN DESCRIPTION

39. ACAS Resolution Advisory BDS 3,0

Refer to 1-2-4, Figure 57.

Interrogates with UF4 RR=16 DI=7 RRS=0, decodes DF20 reply and displays active resolution advisory data.

NOTE: Not available as DF17.

NOTE: If ACAS Resolution Advisory is not available (BDS=0,0) the test displays “NOT AVAIL”.

ARA:
Active RA’s Bits 41 to 54 (displayed in binary).

RAC:
Resolution Advisory Compliment Bit 55 to 58 (displayed in binary).

RAT RA:
Terminated indicator bit 59 displayed in binary.

NOTE: Normally 0 until an RA is terminated, then is 1 for 18 seconds.

TIDA:
Threat Identity Data Altitude displayed in feet.

NOTE: Only displayed when TTI = 2, Intruder Not Mode S Equipped.

TID:
Threat Identity Data Mode S address (HEX) of the threat.

NOTE: Only displayed when TTI = 1.

TIDR:
Threat Identity Data Range in nm.

NOTE: Only displayed when TTI = 2, Intruder Not Mode S Equipped.

TIDB:
Threat Identity Data Bearing in degrees.

NOTE: Only displayed when TTI = 2, Intruder Not Mode S Equipped.

MTE:
Multiple Threat Encounter displayed in 1 bit binary.

TTI:
Threat Type Indicator displayed in decimal range 0-3.

NOTE: Refer to ICAO Annex 10, Vol III, Part 1, Chapter 5 and RTCA-DO-260 for detailed description of data fields.

NOTE: Refer to RTCA D0-185A para 2.2.3.9.3.2.3 MB fields used by TCASII

```
 ** ACAS ACTIVE RES ADVIS - PASSED **
DF20 BDS=3,0                    AA=3AC421
TIDA=10,2300ft TIDR= 1.00nm TIDB= 70deg
ARA= 11101010000000  TID=3A4518
RAC= 1010  RAT= 1  MTE= 1  TTI= 3
          Press RUN TO start
```

Sample ACAS Active Resolution Advisory Test Screen
Figure 57

4.6 POWER TEST

4.6.1 General

The Power Test accurately determines the ERP and MTL of the transponder, whether or not a direct connection with the UUT is used. Two values for each measurement are provided on the DISPLAY. INSTANT values are obtained from the average power readings of the replies received to 100 interrogations. This value is updated every 100 interrogations. The TOP AVG and BOT AVG values are obtained from the average power readings of all replies received during the Power Test sequence.

The Power Test verifies:

- UUT ERP (PEAK POWER) Direct Connection: >+48.5 dBm and <+57.0 dBm. ERP Radiated: >+48.5 dBm.
- UUT MTL Direct Connection: >-69 dBm and <-77 dBm. MTL Radiated: >-69 dBm.

4.6.2 Procedure

Refer to 1-2-4, Figures 58, 59 and 60.

True slant range (Line of Sight Distance) is based on Test Set Antenna to UUT Antenna vertical separation (Setup Height) and horizontal separation (Setup Range). For accurate readings, Power Test must be run at the Range and Height established in Setup#1 Menu procedure. Refer to 1-2-4, Figures 8, 59 and 60.

STEP	PROCEDURE

1. Perform Setup#1 Menu procedure (1-2-4.4.1).
2. Press PWR TEST Key to enter Power Test screen. (ATC-601-2 displays results from last Power Test in units selected in Setup#3 Menu.)
3. Select UUT Antenna to be tested, top or bottom, with SELECT Keys.
4. Connect UUT to RF I/O Connector for direct connection or connect a Test Set Antenna (Flat Antenna is most accurate) to ANTENNA Connector.

STEP	PROCEDURE

5. If direct connection is not used, shield UUT Antenna not being tested with Antenna Shield (refer to Appendix C) or disconnect UUT Antenna and terminate with 50 Ω load.
6. If direct connection is used, terminate ATC-601-2 ANTENNA Connector with 50 Ω load (connector cover).
7. Face Test Set Antenna towards UUT Antenna. Press RUN/STOP Key or ANTENNA PUSH BUTTON Switch to initiate Power Test. If Direct Connection is used, go to Step 9.

   NOTE: Test Set displays accurate power readings when Flat Antenna is facing UUT at Setup#1 Menu Range (distance) according to 1-2-4, Figures 59 and 60. If more accuracy is required, Step 8 is recommended to further reduce errors caused by multipath from the ramp.

8. Starting from ground level, move Flat Antenna upward 6 feet (1.8 meters) at <1 ft/sec (0.3 m/sec).
   - Do not move towards or away from UUT or Range becomes inconsistent.
   - Do not rotate Flat Antenna or power levels are reduced.
   - Move Flat Antenna below and above the median height the same distance for the same amount of time to obtain an accurate power average. (The median height is the height of the Flat Antenna from the ground, required to obtain the Setup Height between the Flat Antenna and UUT Antenna.)
9. Press RUN/STOP Key or ANTENNA PUSH BUTTON Switch to terminate Power Test.

```
            ** POWER TEST **
            ERP(WATTS)  MTL(dBm)  STATUS
■ TOP AVG =     156       -73.4    PASSED
 BOT AVG =      135       -74.3    PASSED
 INSTANT =      146       -73.4
            Press RUN to start
```

```
            ** POWER TEST **
            ERP(dBm  )  MTL(dBm)  STATUS
 TOP AVG =     53.0       -73.4    PASSED
■ BOT AVG =   →47.8        -75.Ø    FAILED
 INSTANT =     47.8       -75.Ø
            Press RUN to start
```

USING TEST SET ANTENNA

```
    ** POWER TEST - TOP ANTENNA **

ANTENNA     ERP(WATTS)  MTL(dBm)  STATUS
    Top         156       -73.4    PASSED

            Press RUN to start
```

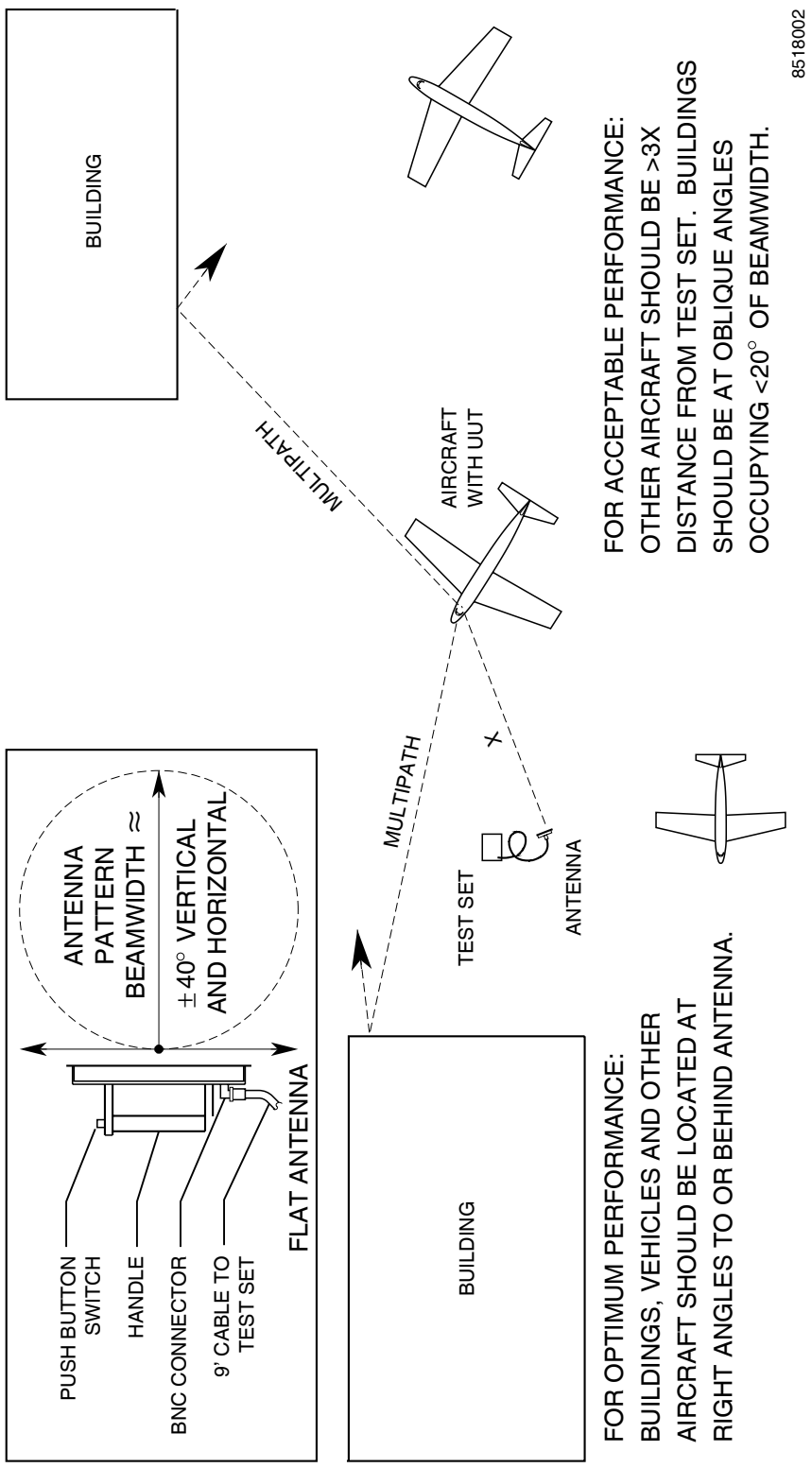
```
   ** POWER TEST - BOTTOM ANTENNA **

ANTENNA     ERP(dBm  )  MTL(dBm)  STATUS
 Bottom        53.0       -73.4    PASSED

            Press RUN to start
```

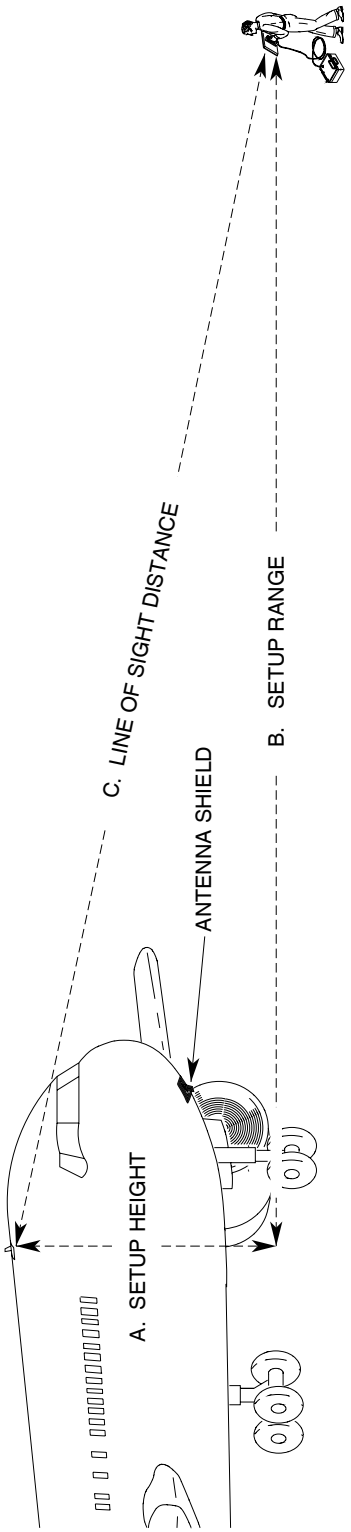
DIRECT CONNECTION

Sample Power Test Screens
Figure 58



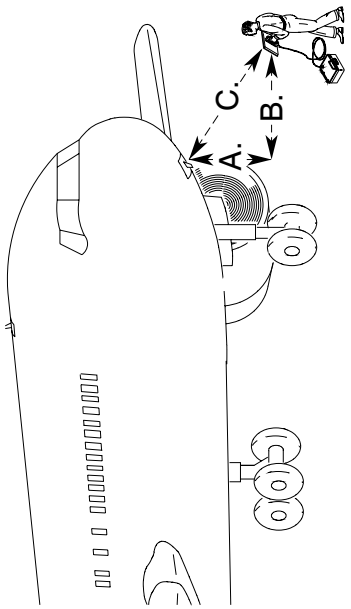
Suggested Layout to Reduce Multipath Errors
Figure 59

8118003



TESTING TOP ANTENNA

WHEN SHIELDING OR TERMINATING TOP ANTENNA IS NOT PRACTICAL, USE SETUP POSITION THAT HAS AIRCRAFT BLOCKING LINE OF SIGHT TO TOP ANTENNA.



TESTING BOTTOM ANTENNA

Ramp Testing
Figure 60

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5. REMOTE OPERATION

5.1 GENERAL

Installation of Option 1 allows remote operation of the ATC-601-2-2 from a PC using Terminal Emulation Software or an RS-232 Terminal. Dumping test data does not require installation of Option 1. Refer to 1-2-5.1.1 and 1-2-5.2.3 for dumping test data.

5.1.1 Operation

The ATC-601-2-2 must be configured according to the following procedure for remote operation. Refer to 1-2-5.3 for Recommended Test Procedures.

STEP PROCEDURE

1. Connect Host System Comm Connector to ATC-601-2 COMM Connector according to 1-2-5, Figure 62 for 9-Pin operation or 1-2-5, Figure 63 for 25-Pin operation.

   NOTE: A PC, using Terminal Emulation Software, or RS-232 Terminal can be used as the Host System.

2. Press SETUP Key twice (once from Setup#1 Menu or three times from Setup#3 Menu) to enter Setup#2 Menu. ATC-601-2 displays information from last Setup#2 Menu.

3. Enter information using SLEW Keys to change values and SELECT Keys to change parameters. (Cursor line indicates parameter selected.)

   Set following parameters:

   - BAUD RATE:

     Set Baud Rate in bps (***110***, ***150***, ***300***, ***600***, ***1200***, ***2400***, ***4800***, ***9600, 19200*** or ***38400***). Default is ***9600***.

   - DATA BITS:

     Set number of data bits per word (***7*** or ***8***). Default is ***8***.

   - STOP BITS:

     Set number of stop bits per word (***1*** or ***2***). Default is ***1***.

STEP PROCEDURE

   - PARITY:

     Set parity check mode (***NONE***, ***ODD***, ***EVEN***, ***MARK*** or ***SPACE***). Default is ***NONE***.

   - HANDSHAKE:

     Set handshake mode (***NONE***, ***CTS*** [one-way hardware], ***CTS/DTR*** [two-way hardware] or ***Xon/Xoff*** [software]). Default is ***Xon/Xoff***.

   - REMOTE ECHO:

     Set remote echo status (***ON*** to enable or ***OFF*** to disable), only shown if Option 1 is installed. Default is ***ON***.

   - PREFIX STRING:

     Set reply prefix status (***ON*** to add prefix strings to remote operation replies for definition or ***OFF***). Default is ***ON***.

   - DUMP TEST DATA:

     Select test data to transmit to Host System (***0*** for active test data [default], ***1*** for test data stored in Memory Location 1; or ***2*** for test data stored in Memory Location 2).

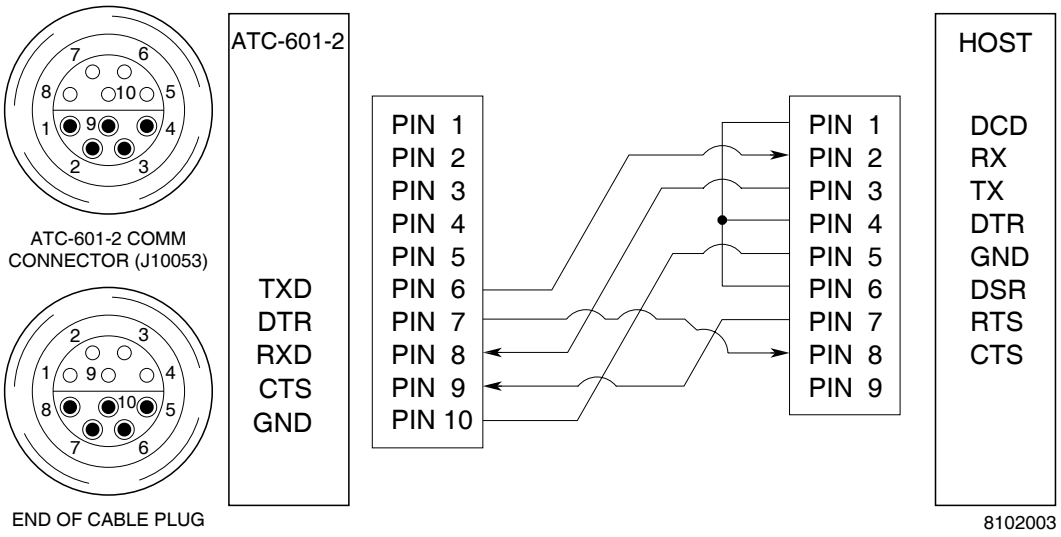
     - Press RUN/STOP Key with cursor located in DUMP TEST DATA: field to download test data. (A period displayed to the right of the test data selection indicates the download has occurred.)

     - Refer to TEST:ALL? query in 1-2-5.2.3 for test data definition. (Test data is sent in same format as in TEST:ALL? query, except all semicolons are replaced with <CrLf> line terminators.)

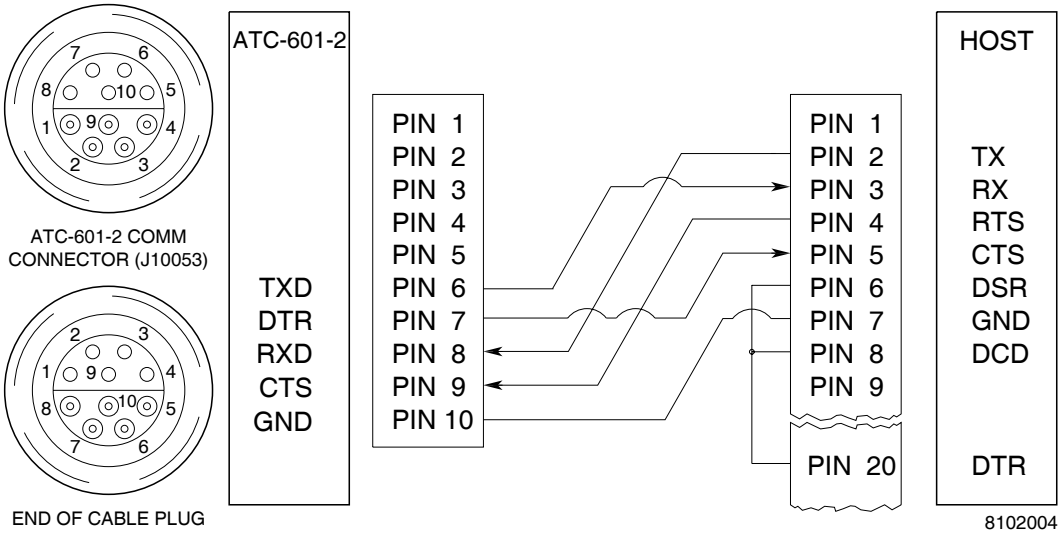
4. Press any key to exit Setup#2 Menu.

```
          ** SETUP#2 MENU **
BAUD RATE = 96ØØ     REMOTE ECHO   = ON
DATA BITS = 8        PREFIX STRING = ON
STOP BITS = 1        DUMP TEST DATA = Ø
PARITY    = NONE      Press RUN to send
HANDSHAKE = NONE      data to COMM port!
```

Sample Setup#2 Menu Screen
Figure 61



ATC-601-2 - Host Cable Connections (9-Pin)
Figure 62



ATC-601-2 - Host Cable Connections (25-Pin)
Figure 63

5.1.2 Syntax

Commands are structured hierarchically through the use of a colon (***:***) delimiter. Commands with multiple parameter fields separate parameters with a comma (***,***). An example of a multiple parameter command is:

TEST:UF0:UDAT 0,1,#H3AC421 (programming Uplink Format 0 using an address of 3AC421h).

At least one space is needed between the command and first parameter. Other spaces or no spaces do not affect the command. Query commands contain a question mark (***?***) at the end of the command and before any parameters. Query commands request data from the ATC-601-2. Refer to 1-2-5, Table 8 for command syntax punctuation.

PUNCTUATION	NAME	DESCRIPTION
:	Compound Command Separator	Allows hierarchy of command structure.
,	Parameter Separator	Separates parameters in multiple parameter command line.
?	Query Command Ending	Requests return data.

Command Syntax Punctuation
Table 8

Numeric data is in decimal form unless specified otherwise. Other numeric formats (base 2, 8 or 16) are specified by preceeding the data with one of the following character strings:

#B	(Binary [base 2])
#Q	(Octal [base 8])
#H	(Hexadecimal [base 16])

Any specified format may be used to send data, but output (received) data is returned only in the format listed in the applicable 1-2-5 table.

Commands are entered using short or long form. The short form is shown in upper case and the long form remainder is shown in lower case. Commands, themselves, are not case sensitive. Italicized items indicate variables. Bold items indicate optional reply prefix strings activated by one of the following:

- Setting Setup#2 PREFIX STRING = ***ON*** or
- Sending the command: ***SYSTem:COMMunicate:PREFix 1***.

Parentheses indicate explanations. A backslash (****), not part of the command, indicates the one line command is continued on next line (to fit in the table). Remote operation has only one command per line and one line per command.

5.2 COMMANDS

5.2.1 Nonspecific Commands

COMMAND	RANGE	DEFINITION
*CLS		Clears status command/error queue.
*IDN?	AEROFLEX, ATC-601-2,S*erial Number*,*CPU Firmware Version-DSP Firmware Version*	Returns Test Set identification parameters (manufacturer, model, serial number, firmware versions for CPU and DSP).
SYSTem:ERRor?	-32769 to 32767 (decimal format) with "*description*" (0 is no error.)	Returns next entry from 16 entry error queue (1-2-5, Table 10).
SYSTem:COMMunicate:\ SERial:ECHO *X*	*X*=1 (On) or 0 (Off)	Sets RS-232 remote echo state.
SYSTem:COMMunicate:\ SERial:ECHO?	1 or 0	Returns RS-232 remote echo state.
SYSTem:COMMunicate:\ PREFix *X*	*X*=1 (Enable) or 0 (Disable)	Enables or disables prefix strings sent with remote test replies.
SYSTem:COMMunicate:\ PREFix?	1 or 0	Returns prefix string control status.
SYSTem:BATTery?	1 (Charged) or 0 (Low)	Returns Battery status.
SYSTem:SCReen *X*	*X*=0 to 27	Displays screen number *X* (1-2-5, Table 11).
SYSTem:SCReen?	0 to 27	Returns currently displayed screen number.

Nonspecific Commands
Table 9

NUMBER	MESSAGE	DEFINITION
0	NO ERROR	No errors
-102	SYNTAX ERROR	Bad command sent
-108	PARAMETER NOT ALLOWED	Too many parameters sent
-109	MISSING PARAMETER	Too few parameters sent
-120	NUMERIC DATA ERROR	Parameter not a number
-221	SETTINGS CONFLICT	Wrong mode or improper setup
-222	DATA OUT OF RANGE	Parameter out of range
-230	DATA CORRUPT OR STALE	Data possibly invalid
-240	HARDWARE ERROR	Hardware problem
-314	SAVE/RECALL MEMORY LOST	Bad setup
-350	QUEUE OVERFLOW;TOO MANY ERRORS	Too many errors to fit in error queue
-351	QUEUE ERROR;UNDEFINED ERROR	Unknown error number

Error Queue Numbers and Messages
Table 10

SCREEN NUMBER	DISPLAYED SCREEN	SCREEN NUMBER	DISPLAYED SCREEN
0	Auto Test	14	Mode S UF20 Test
1	Reply Delay Test	15	Mode S UF21 Test
2	Reply Jetter Test	16	Squitter Test
3	ATCRBS Reply Test	17	Frequency Test
4	SLS Level Test	18	Diversity Test
5	ATCRBS Only All-Call Test	19	MTL Difference Test
6	Mode S All-Call Test	20	Power Test (Setup#1 Range >0)
7	Invalid Address Test	21	Power Test (Setup#1 Range =0)
8	SPR On/Off Test	22	Self Test
9	Mode S UF0 Test	23	Setup#1 Menu
10	Mode S UF4 Test	24	Setup#2 Menu
11	Mode S UF5 Test	25	Setup#3 Menu
12	Mode S UF11 Test	26	Start-up
13	Mode S UF16 Test	27	Diagnostics

Display Screens
Table 11

5.2.2 ATC-601-2 Specific Commands

COMMAND	RANGE	DEFINITION
	SETUP COMMANDS	
ANTenna:TOP *X*,*Y*	*X*=0 (direct connect) to 300, *Y*=0 to 99 (1 foot increments)	Sets top antenna range and height in feet.
ANTenna:TOP?	0 to 300,0 to 99	Returns top antenna range and height in feet.
ANTenna:BOTTom *X*,*Y*	*X*=0 (direct connect) to 300 *Y*=0 to 99 (1 foot increments)	Sets bottom antenna range and height in feet.
ANTenna:BOTTom?	0 to 300,0 to 99	Returns bottom antenna range and height in feet.
ANTenna:INPut *X*	*X*=TOP or BOTTOM	Selects which antenna range and height values to be used in testing.
ANTenna:INPut?	TOP or BOTTOM	Returns selected antenna range and height values used in testing.
ANTenna:GAIN *X*,*Y*	*X*=0.0 to 20.9 (1030 MHz) *Y*=0.0 to 20.9 (1090 MHz) (0.1 dBi increments)	Sets Test Set antenna gain at 1030 MHz and 1090 MHz (in dBi).
ANTenna:GAIN?	0.0 to 20.9,0.0 to 20.9	Returns Test Set antenna gain settings at 1030 MHz and 1090 MHz, in dBi.
ANTenna:LOSS *X*	*X*=0.0 to 9.9 (0.1 dB increments)	Sets coaxial cable loss of Test Set antenna or direct connect cable (in dB).
ANTenna:LOSS?	0.0 to 9.9	Returns coaxial cable loss of Test Set antenna or direct connect cable (in dB).
	DIAGNOSTIC COMMANDS	
DIAGnostic:ADDRess *X*	*X*=#H0 to #HFFFFFF (hexadecimal)	Sets address sent in Mode S diagnostics interrogations.
DIAGnostic:ADDRess?	#H0 to #HFFFFFF (hexadecimal)	Returns Mode S address sent in diagnostics interrogations.
DIAGnostic:ATTENuation *X*	*X*=0 to 100 (0=0 dB, each step=0.5 dB)	Sets attenuation for I/O diagnostics test signals.
DIAGnostic:ATTENuation?	0 to 100 (0=0 dB, each step=0.5 dB)	Returns attenuation for I/O diagnostics test signals.
DIAGnostic:DATA?	#H0 to #HFFFFFFFFFFFFFF (data),#H0 to #HFF (status) (hexadecimal)	Returns most recent reply information and status (1-2-3.3).

ATC-601-2 Specific Commands
Table 12

COMMAND	RANGE	DEFINITION
DIAGNOSTIC COMMANDS (cont)		
DIAGnostic:FAILures?	0 to 2147483647 (-1=not available)	Returns number of diagnostics interrogations sent with no reply received.
DIAGnostic:\ INTERRogations?	0 to 2147483647 (-1=not available)	Returns number of diagnostics interrogations sent.
DIAGnostic:PRF *X*	*X*=1 to 16, 18,, 20, 21, 24, 26, 29, 34, 39, 47, 59, 78, 118 or 235	Sets diagnostics interrogation rate (Mode S ≤78).
DIAGnostic:PRF?	1 to 16, 18, 20, 21, 24, 26, 29, 34, 39, 47, 59, 78, 118 or 235	Returns diagnostics interrogation rate.
DIAGnostic:STARt		Starts diagnostics test.
DIAGnostic:STOP		Stops diagnostics test.
DIAGnostic:STYPe	Refer to 1-2-3, Table 3.	Sets diagnostics test signal type.
TEST COMMANDS		
TEST:AC:ATC?	**ATC ALL CALL -** *Status*,*Reply Status* *Status*=PASSED, FAILED, NOT RUN or NO REPLY *Reply Status*=0 (ok), 1 (Mode S transponder replied w/ Mode S.), 2 (Mode S transponder replied w/ ATCRBS.) or 3 (ATCRBS transponder did not reply.)	Returns ATCRBS Only All-Call Test results.
TEST:AC:ATC:STARt		Runs ATCRBS Only All-Call Test.
TEST:AC:S?	**MODE S ALL CALL -** *Status*, *Reply Status*,*Tail Number*,*All-Call Address*,*DF4 Address* *Status*=PASSED, FAILED, NOT RUN or NO REPLY *Reply Status*=0 (ok), 1 (No DF4 reply), 2 (No DF11 reply), 3 (no reply to test interrogations) or 4 (DF4 reply valid) *Tail Number*=6 ASCII characters *All-Call Address*=24 bit/ hexadecimal *DF4 Address*=24 bit/hexadecimal (only if invalid)	Returns Mode S All-Call Test data.
TEST:AC:S:STARt		Runs Mode S All-Call Test.

ATC-601-2 Specific Commands
Table 12 (cont)

COMMAND	RANGE	DEFINITION
	TEST COMMANDS (cont)	
TEST:ADDRess?	**INVALID ADDRESS -** *Status*, *Reply Status*,*Invalid Address 1*, *Invalid Address 2* *Status*=PASSED, FAILED, NOT RUN or NO REPLY *Reply Status*=0 (ok), 1 (Replied to *Invalid Address 1*), 2 (Replied to *Invalid Address 2*), 3 (Replied to *Invalid Addresses 1 and 2*) *Invalid Address 1*=24 bit/ hexadecimal (only if invalid) *Invalid Address 2*=24 bit/ hexadecimal (only if invalid)	Returns Invalid Address Test data.
TEST:ADDRess:STARt		Runs Invalid Address Test.
TEST:ALL?	Refer to para. 1-2-5.2.3.	Returns all test data.
TEST:ATCReply?	**ATCRBS REPLY -** *Status*,*Status Flags*,*Spacing-A*,*Spacing-C*,*F_1 Width-A*,*F_1 Width-C*,*F_2 Width-A*, *F_2 Width-C*,ID (SPI indicator, not shown otherwise),*Code*,*Altitude* *Status*=PASSED, FAILED, NOT RUN or NO REPLY *Status Flags*=P (Pass) or F (Fail) (6 flags/Spacing-A, Spacing-C, F_1 Width-A, F_1 Width-C, F_2 Width-A, F_2 width-C) *Spacing-A=xx.xx* (Mode A spacing in µs) *Spacing-C=xx.xx* (Mode C spacing in µs) *F_1 Width-A=x.xx* (Mode A F_1 width in µs) *F_1 Width-C=x.xx* (Mode C F_1 width in µs) *F_2 Width-A=x.xx* (Mode A F_2 width in µs) *F_2 Width-C=x.xx* (Mode C F_2 width in µs) *Code*=13 bit/octal (Mode A ID) *Altitude*=24 bit/decimal (Mode C altitude in feet)	Returns ATCRBS Reply Test data.
TEST:ATCReply:STARt		Runs ATCRBS Reply Test.

ATC-601-2 Specific Commands
Table 12 (cont)

COMMAND	RANGE	DEFINITION
	TEST COMMANDS (cont)	
TEST:AUTO?	**AUTO –** *Status*,*Status Flags*,*Test Modes*,*Pass Modes*,*Fail Modes*, *Freq*, *ERP*,*MTL*,*Diversity* *Status*=PASSED, FAILED, NOT RUN or NO REPLY *Status Flags*=P (Pass) or F (Fail) (2 flags/ERP,MTL power tests) *Test Modes* =(1 to 3 Modes-ACS) *Pass Modes*=(1 to 3 Modes-ACS) *Fail Modes*=(1 to 3 Modes-ACS) *Freq=xxxx.xx* (in MHz) *ERP=xxx* dBm, dBw or WATTS *MTL=xxx* dBm *Diversity=xxx* (in dB)	Returns Auto Test data.
TEST:AUTO:DIV *X*	*X*=0 (Disable) or 1 (Enable)	Sets Diversity Test run status.
TEST:AUTO:DIV?	0 or 1	Returns Diversity Test run status.
TEST:AUTO:STARt		Runs Auto Test.
TEST:COUNt?	0 to 2147483647	Returns Data Update Counter Count (resets to 0 at start of test and increments with each new data update).
TEST:DIVersity?	**DIVERSITY –** *Status*,*Diversity*, SATURATED (when saturated) *Status*=PASSED, FAILED, NOT RUN or NO REPLY *Diversity=xxx* (Valid Diversity in dB)	Returns Diversity Test data.
TEST:DIVersity:STARt		Runs Diversity Test.
TEST:FREQuency?	**FREQUENCY –** *Status*,*Freq* *Status*=PASSED, FAILED, NOT RUN or NO REPLY *Freq=xxxx.xx* (UUT Frequency in MHz)	Returns Frequency Test data.
TEST:FREQuency:\ STARt		Runs Frequency Test.
TEST:MTLDiff?	**MTL DIFFERENCE –** *Status*,*Diff* *Status*=PASSED, FAILED, NOT RUN or NO REPLY *Diff=xxx.x* (MTL difference between Modes A and C, in dB)	Returns MTL Difference Test data.
TEST:MTLDiff:STARt		Runs MTL Difference Test.

ATC-601-2 Specific Commands
Table 12 (cont)

COMMAND	RANGE	DEFINITION
	TEST COMMANDS (cont)	
TEST:POWer?	**POWER -** *Status*,*Status Flags*, *Antenna*,*ERP*,*MTL* *Status*=PASSED, FAILED, NOT RUN or NO REPLY *Status Flags*=P (Pass) or F (Fail) (2 flags/ERP,MTL power tests) *Antenna*=TOP or BOTTOM *ERP*=*xxx.x* dBm, dBw or WATTS *MTL*=*xxx.x* dBm (*** - multipath)	Returns Power Test data.
TEST:POWer:STARt		Runs Power Test.
TEST:POWer:UNIT *X*	*X*=DBM, DBW or WATTS	Sets ERP measurement units for Power Test.
TEST:POWer:UNIT?	dBm, dBw or WATTS (default dBm)	Returns ERP measurement units.
TEST:RDELay?	**REPLY DELAY -** *Status*,*Status Flags*,*Mode S*,*ITM A*,*ITM C*, *ATC A,ATC C* *Status*=PASSED, FAILED, NOT RUN or NO REPLY *Status Flags*=P (Pass) or F (Fail) (5 flags/Mode S, ITM A, ITM C, ATC A, ATC C) *Mode S*=*xxx.xx* (in µs) *ITM A*=*xxx.xx* (in µs) *ITM C*=*xxx.xx* (in µs) *ATC A*=*x.xx* (in µs) *ATC C*=*x.xx* (in µs)	Returns Reply Delay Test data.
TEST:RDELay:STARt		Runs Reply Delay Test.
TEST:RECall *X*	*X*=1 or 2 (Memory Location)	Recalls test data.
TEST:RJITter?	**REPLY JITTER -** *Status*,*Status Flags*,*Mode S*,*ITM A*,*ITM C*, *ATC A,ATC C* *Status*=PASSED, FAILED, NOT RUN or NO REPLY *Status Flags*=P (Pass) or F (Fail) (5 flags/Mode S, ITM A, ITM C, ATC A, ATC C) *Mode S*=*x.xx* (in µs) *ITM A*=*x.xx* (in µs) *ITM C*=*x.xx* (in µs) *ATC A*=*x.xx* (in µs) *ATC C*=*x.xx* (in µs)	Returns Reply Jitter Test data.
TEST:RJITter:STARt		Runs Reply Jitter Test.
TEST:RUNning?	0 (Test not running) or 1 (Test running)	Returns test running status

ATC-601-2 Specific Commands
Table 12 (cont)

COMMAND	RANGE	DEFINITION
	TEST COMMANDS (cont)	
TEST:SELF?	**SELF -** *Status*,*Status Flags*, *Failure Code* *Status*=PASSED, FAILED, NOT RUN or NO REPLY *Status Flags*=P (Pass) or F (Fail) (3 flags/RF Module, Digital Module, Power Supply/Battery) *Failure Code*=(Refer to 1-2-3, Table 2.) (only with failure)	Returns Self Test data.
TEST:SELF:STARt		Runs Self Test.
TEST:SLSLevel?	**SLS LEVEL -** *Status*,*Status Flags*,*-9dB*,*0dB* *Status*=PASSED, FAILED, NOT RUN or NO REPLY *Status Flags*=P (Pass) or F (Fail) (2 flags/-9dB, 0dB) *-9dB*=REPLY or NO REPLY *0dB*=REPLY or NO REPLY	Returns SLS Level Test data.
TEST:SLSLevel:STARt		Runs SLS Level Test.
TEST:SPR?	**SPR -** *Status*,*Status Flags*,*On*,*Off* *Status*=PASSED, FAILED, NOT RUN or NO REPLY *Status Flags*=P (Pass) or F (Fail) (2 flags/On, Off) *On*=REPLY or NO REPLY *Off*=REPLY or NO REPLY	Returns SPR On/Off Test data.
TEST:SPR:STARt		Runs SPR On/Off Test.
TEST:SQTR?	**SQUITTER -** *Status*,*Period*,*Tail Number*,*Squitter Address* *Status*=PASSED, FAILED, NOT RUN or NO REPLY *Period=xx.xx* (between squitters in seconds) *Tail Number*=6 ASCII characters *Squitter Address*=24 bit/ hexadecimal	Returns Squitter Test data.
TEST:SQTR:STARt		Runs Squitter Test.
TEST:STOP		Stops current test.
TEST:STORe *X*	*X*=1 or 2 (Memory Location)	Stores test data.

ATC-601-2 Specific Commands
Table 12 (cont)

COMMAND	RANGE	DEFINITION
	TEST COMMANDS (cont)	
TEST:UF0:DDATa?	**MODE S UF0 -** *Status*,*Status Flags*,*DF*,*VS*,*RI*,*AC*,*Address* *Status*=PASSED, FAILED, NOT RUN or NO REPLY *Status Flags*=P (Pass) or F (Fail) (3 flags/DF, AC, Address) *DF*=5 bits/decimal *VS*=1 bit/decimal *RI*=4 bits/hexadecimal *AC*=13 bits/decimal *Address*=24 bit/hexadecimal (Refer to Appendix B for Downlink Format field definitions.)	Returns Mode S UF0 Test data.
TEST:UF0:STARt?		Runs Mode S UF0 Test.
TEST:UF4:DDATa?	**MODE S UF4 -** *Status*,*Status Flags*,*DF*,*FS*,*DR*,*UM*,*AC*,*Address* *Status*=PASSED, FAILED, NOT RUN or NO REPLY *Status Flags*=P (Pass) or F (Fail) (3 flags/DF, AC, Address) *DF*=5 bits/decimal *FS*=3 bits/decimal *DR*=5 bits/hexadecimal *UM*=6 bits/hexadecimal *AC*=13 bits/decimal *Address*=24 bit/hexadecimal (Refer to Appendix B for Down-link Format field definitions.)	Returns Mode S UF4 Test data.
TEST:UF4:STARt		Runs Mode S UF4 Test.
TEST:UF5:DDATa?	**MODE S UF5 -** *Status*,*Status Flags*,*DF*,*FS*,*DR*,*UM*,*ID*,*Address* *Status*=PASSED, FAILED, NOT RUN or NO REPLY *Status Flags*=P (Pass) or F (Fail) (3 flags/DF, ID, Address) *DF*=5 bits/decimal *FS*=3 bits/decimal *DR*=5 bits/hexadecimal *UM*=6 bits/hexadecimal *ID*=13 bits/octal *Address*=24 bit/hexadecimal (Refer to Appendix B for Downlink Format field definitions.)	Returns Mode S UF5 Test data.
TEST:UF5:STARt		Runs Mode S UF5 Test.

ATC-601-2 Specific Commands
Table 12 (cont)

COMMAND	RANGE	DEFINITION
	TEST COMMANDS (cont)	
TEST:UF11:DDATa?	**MODE S UF11 -** *Status*,*Status Flags*,*DF*,*CA*,*PI*,*AA* *Status*=PASSED, FAILED, NOT RUN or NO REPLY *Status Flags*=P (Pass) or F (Fail) (2 flags/DF, AA) *DF*=5 bits/decimal *CA*=3 bits/decimal *PI*=24 bits/hexadecimal *AA*=24 bit/hexadecimal (Refer to Appendix B for Downlink Format field definitions.)	Returns Mode S UF11 Test data.
TEST:UF11:STARt		Runs Mode S UF11 Test.
TEST:UF16:DDATa?	**MODE S UF16 -** *Status*,*Status Flags*,*DF*,*VS*,*RI*,*MV*,*AC*,*Address* *Status*=PASSED, FAILED, NOT RUN or NO REPLY *Status Flags*=P (Pass) or F (Fail) (3 flags/DF, AC, Address) *DF*=5 bits/decimal *VS*=1 bit/decimal *RI*=4 bits/hexadecimal *MV*=56 bits/hexadecimal *AC*=13 bits/decimal *Address*=24 bit/hexadecimal (Refer to Appendix B for Downlink Format field definitions.)	Returns Mode S UF16 Test data.
TEST:UF16:STARt		Runs Mode S UF6 Test.
TEST:UF20:DDATa?	**MODE S UF20 -** *Status*,*Status Flags*,*DF*,*FS*,*DR*,*UM*,*MB*,*AC*,*Address* *Status*=PASSED, FAILED, NOT RUN or NO REPLY *Status Flags*=P (Pass) or F (Fail) (3 flags/DF, AC, Address) *DF*=5 bits/decimal *FS*=3 bits/decimal *DR*=5 bits/hexadecimal *UM*=6 bits/hexadecimal *MB*=56 bits/hexadecimal *AC*=13 bits/decimal *Address*=24 bit/hexadecimal (Refer to Appendix B for Downlink Format field definitions.)	Returns Mode S UF20 Test data.
TEST:UF20:STARt		Runs Mode S UF20 Test.

ATC-601-2 Specific Commands
Table 12 (cont)

COMMAND	RANGE	DEFINITION
TEST COMMANDS (cont)		
TEST:UF21:DDATa?	**MODE S UF21 -** *Status*,*Status Flags*,*DF*,*FS*,*DR*,*UM*,*MB*,*ID*, *Address* *Status*=PASSED, FAILED, NOT RUN or NO REPLY *Status Flags*=P (Pass) or F (Fail) (3 flags/DF, AC, Address) *DF*=5 bits/decimal *FS*=3 bits/decimal *DR*=5 bits/hexadecimal *UM*=6 bits/hexadecimal *MB*=56 bits/hexadecimal *ID*=13 bits/octal *Address*=24 bit/hexadecimal (Refer to Appendix B for Downlink Format field definitions.)	
TEST:UF21:STARt		Runs Mode S UF21 Test.
UPLINK DATA COMMANDS		
TEST:UF0:UDATa *X*	*X*=0 or 1 (RL),0 or 1 (AQ) (Refer to Appendix B for Uplink Format field definitions.)	Sets UF0 data fields.
TEST:UF0:UDATa?	0 or 1 (RL),0 or 1 (AQ)	Returns UF0 data.
TEST:UF4:UDATa *X*	*X*=0 to 7 (PC),#H0 to #H1F (RR), 0 to 7 (DI),#H0 to #HFFFF (SD) (Refer to Appendix B for Uplink Format field definitions.)	Sets UF4 data fields.
TEST:UF4:UDATa?	0 to 7 (PC),#H0 to #H1F (RR), 0 to 7 (DI),#H0 to #HFFFF (SD)	Returns UF4 data.
TEST:UF5:UDATa *X*	*X*=0 to 7 (PC),#H0 to #H1F (RR),0 to 7 (DI),#H0 to #HFFFF (SD) (Refer to Appendix B for Uplink Format field definitions.)	Sets UF5 data fields.
TEST:UF5:UDATa?	0 to 7 (PC),#H0 to #H1F (RR),0 to 7 (DI),#H0 to #HFFFF (SD)	Returns UF5 data.
TEST:UF11:UDATa *X*	*X*=#H0 to #HF (PR),#H0 to #HF (II) (Refer to Appendix B for Uplink Format field definitions.)	Sets UF11 data fields.
TEST:UF11:UDATa?	#H0 to #HF (PR),#H0 to #HF (II)	Returns UF11 data.
TEST:UF16:UDATa *X*	*X*=0 or 1 (RL),0 or 1 (AQ),#H0 to #HFFFFFFFFFFFFFF (MU) (Refer to Appendix B for Uplink Format field definitions.)	Sets UF16 data fields.

ATC-601-2 Specific Commands
Table 12 (cont)

COMMAND	RANGE	DEFINITION
UPLINK DATA COMMANDS (cont)		
TEST:UF16:UDATa?	0 or 1 (RL),0 or 1 (AQ),#H0 to #HFFFFFFFFFFFFFF (MU)	Returns UF16 data.
TEST:UF20:UDATa *X*	*X*=0 to 7 (PC),#H0 to #H1F (RR),0 to 7 (DI),#H0 to #HFFFF (SD),#H0 to #HFFFFFFFFFFFFFF (MA) (Refer to Appendix B for Uplink Format field definitions.)	Sets UF20 data fields.
TEST:UF20:UDATa?	0 to 7 (PC),#H0 to #H1F (RR),0 to 7 (DI),#H0 to #HFFFF (SD),#H0 to #HFFFFFFFFFFFFFF (MA)	Returns UF20 data.
TEST:UF21:UDATa *X*	*X*=0 to 7 (PC),#H0 to #H1F (RR),0 to 7 (DI),#H0 to #HFFFF (SD),#H0 to #HFFFFFFFFFFFFFF (MA) (Refer to Appendix B for Uplink Format field definitions.)	Sets UF21 data fields.
TEST:UF21:UDATa?	0 to 7 (PC),#H0 to #H1F (RR),0 to 7 (DI),#H0 to #HFFFF (SD),#H0 to #HFFFFFFFFFFFFFF (MA)	Returns UF21 data.
TEST:UF:UDATa:\DEFault		Sets data for all UF interrogations to initial default settings. Refer to Appendix B, Table 6.

ATC-601-2 Specific Commands
Table 12 (cont)

5.2.3 TEST:ALL? and Data Dump Information

The TEST:ALL? query reply and the test data transmitted to the Host System when activating DUMP TEST DATA = 0 in the Setup#2 Menu Screen contain the same information. The TEST:ALL? query reply separates each set of individual test or data information with a semicolon. The data dump places each set of individual test or data information at the start of a new line.

NOTE: Data dumps do not require installation of Option 1.

Data

Data dumps and TEST:ALL? query replies contain the following:

*IDN? query reply
TEST:SELF? query reply
TEST:AUTO? query reply
TEST:RDELay? query reply
TEST:RJITter? query reply
TEST:ATCReply? query reply
TEST:SLSLevel? query reply
TEST:AC:ATC? query reply
TEST:AC:S? query reply
TEST:ADDRess? query reply
TEST:SPR? query reply
TEST:UF0:DDATa? query reply
TEST:UF4:DDATa? query reply
TEST:UF5:DDATa? query reply
TEST:UF11:DDATa? query reply
TEST:UF16:DDATa? query reply
TEST:UF20:DDATa? query reply
TEST:UF21:DDATa? query reply
TEST:SELF? query reply
TEST:SQTR? query reply
TEST:FREQuency? query reply
TEST:DIVersity? query reply
TEST:MTLDiff? query reply
TEST:POWer? query reply

Examples

The following is an example of a TEST:ALL? query reply:

IFR SYSTEMS INC,ATC-601-2,0,0106-0100; **SELF -** PASSED,PPF,#H10;**AUTO -** FAILED,PP,ACS,AC,S,1090,156 WATTS,-73 dBm,25;**REPLY DELAY -** FAILED, FPPPP,129.05,128.02,128.04,3.02,3.10; **REPLY JITTER -** PASSED,PPPPP,.03,.05, .05,.1,.07;**ATCRBS REPLY -** PASSED, PPPPP,20.3,20.3,.45,.45,.45,.45,ID,#Q777,107 00;**SLS LEVEL -** PASSED,PP,REPLY, NO REPLY;**ATC ALL CALL -** PASSED,0; **MODE S ALL CALL -** PASSED,0,N12345, #H3AC421;**INVALID ADDRESS -** PASSED, 0,,;**SPR -** PASSED,PP,REPLY,NO REPLY; **MODE S UF0 -** PASSED,PPP,0,1,#HC, 10700,#H3AC421;**MODE S UF4 -** PASSED, PPP,4,1,#H0,#H0,10700,#H3AC421; **MODE S UF5 -** PASSED,PPP,5,1,#H0,#H0, #Q7777,#H3AC421;**MODE S UF11 -** PASSED,PP,11,1,#H0,#H3AC421;**MODE S UF16 -** PASSED,PPP,16,0,#H0,#H0,10700, #H3AC421;**MODE S UF20 -** PASSED,PPP, 20,0,#H0,#H0,#H0,10700,#H3AC421;**MODE S UF21 -** PASSED,PPP,21,0,#H0,#H0,#H0, #Q7777,#H3AC421;**SQUITTER -** PASSED, 1,N12345,#H3AC421;**FREQUENCY -** PASSED,1092.3;**DIVERSITY -** PASSED,27, #H3AC421;**MTL DIFFERENCE -** PASSED, .2;**POWER -** PASSED,PP,TOP,156 WATTS, -73.4 dBm

The following is an example of a data dump containing the same information as the TEST:ALL? query reply in the previous example:

AEROFLEX,ATC-601-2,0,0106-0100
SELF - PASSED,PPF,#H10
AUTO - FAILED,PP,ACS,AC,S,1090,
156 WATTS,-73 dBm,25
REPLY DELAY -
FAILED,FPPPP,129.05,128.02,128.04,3.02,
3.10
REPLY JITTER -
PASSED,PPPPP,.03,.05,.05,.1,.07
ATCRBS REPLY -
PASSED,PPPPP,20.3,20.3,.45,.45,.45,.45,
ID,#Q777,10700
SLS LEVEL - PASSED,PP,REPLY,NO REPLY
ATC ALL CALL - PASSED,0
MODE S ALL CALL - PASSED,0,N12345,
#H3AC421
INVALID ADDRESS - PASSED,0,
SPR - PASSED,PP,REPLY,NO REPLY
MODE S UF0 - PASSED,PPP,0,1,#HC,
10700,#H3AC421
MODE S UF4 - PASSED,PPP,4,1,#H0,#H0,
10700,#H3AC421
MODE S UF5 - PASSED,PPP,5,1,#H0,#H0,
#Q7777,#H3AC421
MODE S UF11 - PASSED,PP,11,1,#H0,
#H3AC421
MODE S UF16 - PASSED,PPP,16,0,#H0,
#H0,10700,#H3AC421
MODE S UF20 - PASSED,PPP,20,0,#H0,
#H0,#H0,10700,#H3AC421
MODE S UF21 - PASSED,PPP,21,0,#H0,
#H0,#H0,#Q7777,#H3AC421
SQUITTER - PASSED,1,N12345,#H3AC421
FREQUENCY - PASSED,1092.3
DIVERSITY - PASSED,27,#H3AC421
MTL DIFFERENCE - PASSED,.2
POWER - PASSED,PP,TOP,156 WATTS,
-73.4 dBm

5.3 RECOMMENDED TEST PROCEDURES

5.3.1 General

Do not change data when DIAGnostics:STARt or any TEST:*Test*:STARt (*Test*=specific test) command has been initiated (test is running). Change data only when tests are not currently running. The TEST:STOP command can be issued as many times as needed without causing problems; however, all tests, except Auto Test, do not automatically stop.

NOTE: The TEST:SELF:STARt command shuts off all interrupts including RS-232. Remote commands sent during Self Test are disregarded and lost. Do not send RS-232 commands for duration of the Self Test (≈10 seconds).

5.3.2 Procedures

Auto Test

STEP	PROCEDURE
1.	Send TEST:AUTO:STARt command.
2.	Send TEST:RUNning? query.
3.	Loop previous query until zero.
4.	Send TEST:AUTO? command.

Other than Auto Test

STEP	PROCEDURE
1.	Send TEST:*Test*:STARt command. (*Test*=specific test to run)
2.	Send TEST:COUNt? query.
3.	Loop previous query until data changes.
4.	Send TEST:*Test*? query.
5.	Loop to the TEST:COUNt? query to collect more data.
6.	Send TEST:STOP command.

SECTION 3 - SPECIFICATIONS

1. ATC-601-2 TRANSPONDER RAMP TEST SET SPECIFICATIONS

1.1 SIGNAL GENERATOR

Output Frequency:	1030 MHz (±10 kHz), DCXO controlled
Level:	-57 to -7 dBm typically, into 50 Ω (Automatically controlled to determine receiver sensitivity [MTL] for the selected range and 4 dB typically, higher than MTL for test interrogations)
Test Antenna:	Remote antenna VSWR <1.5:1
Gain:	10 dB typically, specified on the antenna
Range:	6 feet (1.83 meters) to 300 feet (91.44 meters)

1.2 TEST SIGNALS (INTERROGATIONS)

Rate:	235 Hz PRF (±5 Hz)
Interlace Ratio (MTL Interrogations to Test Interrogations):	
ATCRBS:	2:1
Mode S:	8:1
Modes:	A, C, S, Intermode

NOTE: The ATC-601-2 interrogates with the mode(s) necessary to run selected test.

1.3 PULSE CHARACTERISTICS (MEASURED AT 50% AMPLITUDE POINTS)

Spacing:	
Mode A:	
P_1 to P_2:	2.00 µs (±50 ns)
P_1 to P_3:	8.00 µs (±50 ns)
Mode C:	
P_1 to P_2:	2.00 µs (±50 ns)
P_1 to P_3:	21.00 µs (±50 ns)
Mode S:	
P_1 to P_2:	2.00 µs (±50 ns)
P_1 to P_6:	3.50 µs (±50 ns)
P_1 to SPR:	4.75 µs (±50 ns)

1.3 PULSE CHARACTERISTICS (cont)

Spacing (cont):

Intermode:

Mode A:

P_1 to P_3: 8.00 µs (±50 ns)

P_1 to P_4: 10.00 µs (±50 ns)

Mode C:

P_1 to P_3: 21.00 µs (±50 ns)

P_1 to P_4: 23.00 µs (±50 ns)

Widths:

Mode A:

P_1, P_2, P_3: 0.80 µs (±50 ns)

Mode C:

P_1, P_2, P_3: 0.80 µs (±50 ns)

Mode S:

P_1, P_2: 0.80 µs (±50 ns)

P_6 (Short): 16.25 µs (±50 ns)

P_6 (Long): 30.25 µs (±50 ns)

Intermode:

P_1, P_2, P_3: 0.80 µs (±50 ns)

P_4 (Short): 0.80 µs (±50 ns)

P_4 (Long): 1.60 µs (±50 ns)

Rise and Fall Times:

Rise Time (All Modes): 50 to 100 ns

Fall Time (All Modes): 50 to 200 ns

Phase Modulation:

Transition Time: ≤80 ns

Phase Shift: 180° (±10°)

Amplitude Levels:

SLS Level (P_2): -9 dB (±1 dB) and 0 dB relative to P_1 level

NOTE: SLS Level is automatically controlled in the SLS LEVEL Test.

1.4 UUT MEASUREMENTS (REPLIES)

XMTR Frequency:

Range:	1087 to 1093 MHz
Accuracy:	±50 kHz
Resolution:	10 kHz

XMTR Power (at 1090 MHz):

Direct Connection-Peak Pulse Power:

Range:	+46.5 to +59 dBm (45 to 800 W)
Accuracy:	±1 dB
Resolution:	0.1 dB

Effective Radiated Power (ERP):

Range:	+48.5 to +57 dBm (71 to 500 W)

Receiver Sensitivity:

Direct Connection - Minimum Triggering Level (MTL):

Range:	-67 to -79 dBm
Accuracy:	±2 dB

Radiated Field Strength (MTL):

Range:	-69 to -77 dBm into 0 dBi antenna (-77 dB W/m^2 to -85 dB W/m^2)

Reply Delay:

ATCRBS:

Range:	1.80 to 7.00 µs
Accuracy:	±100 ns

Mode S and ATCRBS/Mode S All-Call:

Range:	125.00 to 131.00 µs
Accuracy:	±100 ns

Reply Jitter:

ATCRBS:

Range:	0.00 to 2.30 µs
Accuracy:	±50 ns

Mode S and ATCRBS/Mode S All-Call:

Range:	0.00 to 6.00
Accuracy:	±50 ns

1.4 UUT MEASUREMENTS (cont)

F_1 to F_2 Spacing:

Range:	19.70 to 21.60 µs
Accuracy:	±50 ns

F_1 and F_2 Pulse Width:

Range:	0.25 to 1.00 µs
Accuracy:	±50 ns

Squitter Period:

Range:	0.10 to 4.88 seconds
Accuracy:	±10 ms

Diversity Isolation:

Range:	0 to >20 dB (depending on Antenna Range)
Antenna Range:	6 feet (1.83 meters) to 50 feet (15.24 meters)
Accuracy:	±3 dB

SLS Test (at MTL + 10 dB):

Antenna Range:	6 feet (1.83 meters) to 95 feet (28.96 meters)

1.5 BATTERY OPERATION

Duration:	≥2 hours before recharge at 25° C
Automatic Shutoff:	after 15 minutes of non-use

1.6 POWER REQUIREMENTS

Source Voltage and Frequency:	100 to 120 VAC, 60 Hz 220 to 240 VAC, 50 Hz
Power Consumption:	37 W Maximum 30 W Nominal at 115 VAC 22 W Nominal at 230 VAC
Nominal Input Current:	0.36 A at 115 VAC 0.18 A at 230 VAC

1.7 FUSE REQUIREMENTS

F_1 and F_2:

100 to 120 VAC:	1.0 A, 250 V, Type F
220 to 240 VAC:	0.5 A, 250 V, Type F

1.8 SAFETY

This instrument is designed to comply with the requirements of EN61010-1/IEC1010-1, for Class 1 portable equipment and is for use in a pollution degree 2 environment. The equipment is designed to operate from an installation category II supply, to environmental conditions specified in paragraph 1.4 of EN61010-1.

1.9 OPERATIONAL ENVIRONMENTAL CONSIDERATIONS

This instrument operates over temperature extremes of -20° to +50° C.

SECTION 4 - SHIPPING

1. SHIPPING TEST SETS

1.1 INFORMATION

Test Sets returned to factory for calibration, service or repair must be repackaged and shipped according to the following conditions:

Authorization

Do not return any products to factory without first receiving authorization from Aeroflex Customer Service Department.

CONTACT: Aeroflex
Customer Service

Telephone: (800) 835-2350
FAX: (316) 524-2623
email: service@aeroflex.com

Tagging Test Sets

All Test Sets must be tagged with:

- Identification and address of owner.
- Nature of service or repair required.
- Model Number.
- Serial Number.

Shipping Containers

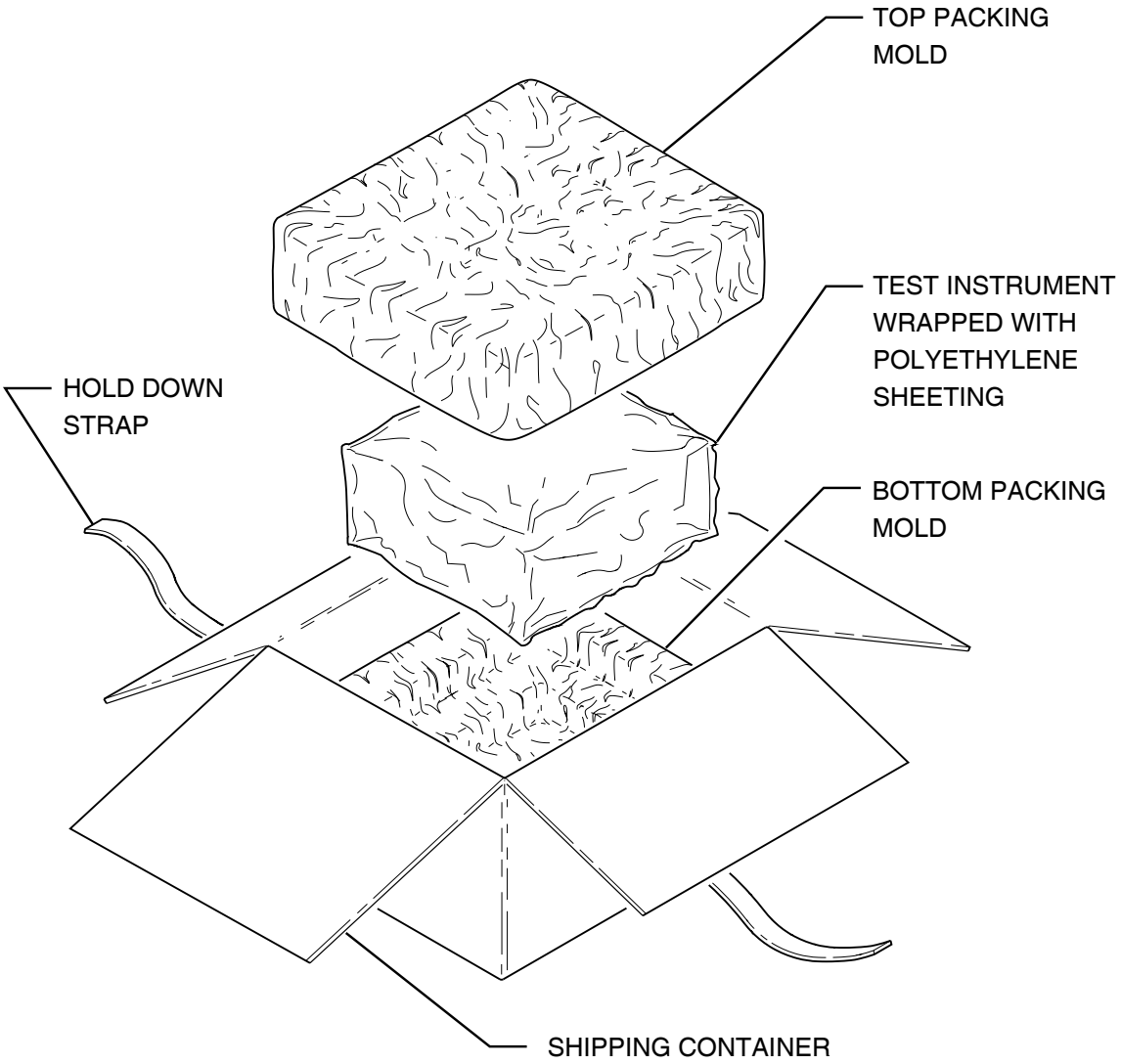
Test Sets must be repackaged in original shipping containers using original packing molds. If original shipping containers and materials are not available, contact Aeroflex Customer Service for shipping instructions.

Freight Costs

All freight costs on non-warranty shipments are assumed by the customer. (See “Warranty Packet” for freight charge policy on warranty claims.)

1.2 REPACKING PROCEDURE

- Make sure bottom packing mold is seated on floor of shipping container.
- Carefully wrap Test Set with polyethylene sheeting to protect finish.
- Place Test Set into shipping container, making sure Test Set is securely seated in bottom packing mold.
- Place top packing mold over top of Test Set and press down until mold rests solidly in bottom packing mold.
- Close shipping container lids and seal with shipping tape or an industrial stapler. Tie all sides of container with break resistant rope, twine or equivalent.



Repacking Procedure
Figure 1

SECTION 5 - STORAGE

1. STORING TEST SETS

Perform the following storage precautions whenever the Test Set is stored for extended periods:

- Disconnect Test Set from any electrical power source.
- Disconnect and store ac power cable and other accessories with Test Set.
- Cover Test Set to prevent dust and debris from covering and entering Test Set.

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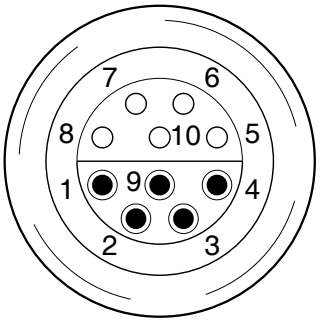
APPENDIX A - CONNECTOR PIN-OUT TABLES

1. TABLE OF I/O CONNECTORS

CONNECTOR	TYPE	SIGNAL NAME	SIGNAL TYPE	INPUT/OUTPUT
J10050	CORCOM	AC PWR	ac Line Power	INPUT
J10053	LEMO	COMM	RS-232C	INPUT/OUTPUT
	Refer to Appendix A, Table 2 for COMM Connector Pin-Out description.			
J10054	BNC	REPLY VIDEO	VIDEO (Direct Connection Only)	OUTPUT
J10055	BNC	SYNC	TTL	OUTPUT
J10056	BNC	MONITOR	TTL VIDEO	OUTPUT
J10057	BNC	ANTENNA	RF	INPUT/OUTPUT
J10058	TNC	RF I/O	RF	INPUT/OUTPUT

I/O Connectors
Table 1

2. COMM CONNECTOR (J10053) PIN-OUT TABLE



PIN NO.	SIGNAL NAME	SIGNAL TYPE	INPUT/OUTPUT	POLARITY
1	EXT SYNC	TTL	OUTPUT	RISING EDGE
2	EXT PULSE	TTL	INPUT	ACTIVE LOW
3	EXT DPSK IN	TTL	INPUT	
4	EXT DPSK OUT	CMOS	OUTPUT	
5	SPARE			
6	TXD	BIPOLAR	OUTPUT	
7	DTR	BIPOLAR	OUTPUT	ACTIVE LOW
8	RXD	BIPOLAR	INPUT	
9	CTS	BIPOLAR	INPUT	ACTIVE LOW
10	GND		OUTPUT	GROUND

Pin-Out for COMM Connector
Table 2

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APPENDIX B - SIGNAL FORMATS

1. OPERATING GOALS

Mode S combines secondary surveillance radar and a ground-air-ground data link system to provide aircraft surveillance and communications necessary for supporting automated ATC in dense traffic environments. Mode S provides common-channel interoperation with the ATC beacon system and may be implemented over an extended ATCRBS-to-Mode S transition period. In supporting ATC automation, Mode S provides the reliable communications necessary for data link services.

2. MODE S MESSAGE CONTENT

2.1 ADDRESS/PARITY (FIELD AP)

All discrete Mode S interrogations (56-bit or 112-bit) and replies (except the All Call reply) contain the 24-bit discrete address of the Mode S transponder upon which 24 error-detecting parity check bits are overlaid. In the All Call reply, the 24 parity check bits are overlaid on the address of the Mode S interrogator. The text of the reply includes the discrete address of the transponder.

2.2 SURVEILLANCE

The primary function of Mode S is surveillance. For the Mode S transponder, this function is accomplished by using short (56-bit) transmissions in both directions. In these transmissions, the aircraft reports altitude (DF04) or ATCRBS 4096 code as well as flight status (airborne, on the ground, alert, Special Position Identification [SPI], etc.).

2.3 DATA LINK COMMUNICATIONS

The discrete addressing and digital encoding allow Mode S transmissions to be used as digital data links. Interrogation and reply formats of the Mode S system contain sufficient coding space to transmit data. Most Mode S data link transmissions are handled as one 56-bit message included as part of long 112-bit interrogations or replies. The transmissions include the message in addition to surveillance data, and is generally used in place of a surveillance interrogation and/or reply.

An efficient transmission of longer messages is accomplished by the extended length message (ELM) capability (UF24 and DF24). Using this capability, a sequence of up to sixteen 80-bit message segments (each with a 112-bit transmission) is transmitted, either ground-to-air or air-to-ground and is acknowledged with a single reply/interrogation. ELMs do not contain surveillance data and thus cannot substitute for a surveillance interrogation-reply cycle.

3. SIGNAL FORMATS

Signal formats for uplink and downlink messages are outlined in Chapter 2, RTCA DO-181 and Chapter 2, Volume I of RTCA DO-185. Tables 1, 2, 3, 4 and 5 in Appendix B contain the signal formats and definitions. Data is expressed in decimal unless otherwise specified. Refer to Appendix B, Table 6 for conversion to hexadecimal, octal or binary. Appendix B, Table 7 shows the ATC-601-2 fixed formats for Mode S using Front Panel operation.

NOTE: TCAS operates in Mode S and many signals pertain only to TCAS.

FORMAT NO.	UF		
0	(0 0000)	— 3 —(RL:1)— 4 —(AQ:1) (BD:8)— 10 —	(AP:24).....Short Air-Air Surveillance
1	(0 0001)	——— 27 or 83 ———	(AP:24)
2	(0 0010)	——— 27 or 83 ———	(AP:24)
3	(0 0011)	——— 27 or 83 ———	(AP:24)
4	(0 0100)	(PC:3) (RR:5) (DI:3) (SD:16)	(AP:24)..Surveillance, Altitude Request
5	(0 0101)	(PC:3) (RR:5) (DI:3) (SD:16)	(AP-24).. Surveillance, Identity Request
6	(0 0110)	——— 27 or 83 ———	(AP:24)
7	(0 0111)	——— 27 or 83 ———	(AP:24)
8	(0 1000)	——— 27 or 83 ———	(AP:24)
9	(0 1001)	——— 27 or 83 ———	(AP:24)
10	(0 1010)	——— 27 or 83 ———	(AP:24)
11	(0 1011)	(PR:4) (II:4)——— 19 ———	(AP:24).....Mode S Only All Call
12	(0 1100)	——— 27 or 83 ———	(AP:24)
13	(0 1101)	——— 27 or 83 ———	(AP:24)
14	(0 1110)	——— 27 or 83 ———	(AP:24)
15	(0 1111)	——— 27 or 83 ———	(AP:24)
16	(1 0000)	— 3 —(RL:1)— 4 —(AQ:1)— 18 —(MU:56)	(AP:24)..... Long Air-Air Surveillance
17	(1 0001)	——— 27 or 83 ———	(AP:24)
18	(1 0010)	——— 27 or 83 ———	(AP:24)
19	(1 0011)	——— 27 or 83 ———	(AP:24)
20	(1 0100)	(PC:3) (RR:5) (DI:3) (SD:16) (MA:56)	(AP:24).....Comm-A, Altitude Request
21	(1 0101)	(PC:3) (RR:5) (DI:3) (SD:16) (MA:56)	(AP:24)..... Comm-A, Identity Request
22	(1 0110)	——— 27 or 83 ———	(AP:24)
23	(1 0111)	——— 27 or 83 ———	(AP:24)
24	(1 1xxx)	(RC:2) (NC:4) (MC:80)	(AP:24).....Comm-C (ELM)

NOTE: (XX:M) represents a field designated XX containing M number of assigned bits.

NOTE: —N— represents free coding space with N available bits, coded as Zeros for transmission.

NOTE: For Uplink Formats (UF) 0 through 23, the format number corresponds to the binary code in the first 5 bits of the interrogation. Format number 24 is arbitrarily defined as the format beginning with Ones in the first two bit positions. The following three bits (xxx) vary with the interrogation content.

NOTE: All formats are shown for completeness, although a number of them are unused.

Overview of Mode S Interrogation Formats
Table 1

FORMAT NO.	DF		
0	(0 0000)	(VS:1) (CC:1)-1-(SL:3)-2-(RI:4)-2-(AC:13) (AP:24)	Short Air-Air Surveillance
1	(0 0001)	—— 27 or 83 —— (P:24)	
2	(0 0010)	—— 27 or 83 —— (P:24)	
3	(0 0011)	—— 27 or 83 —— (P:24)	
4	(0 0100)	(FS:3) (DR:5) (UM:6) (AC:13) (AP:24)	Surveillance, Altitude Reply
5	(0 0101)	(FS:3) (DR:5) (UM:6) (ID:13) (AP-24)	Surveillance, Identity Reply
6	(0 0110)	—— 27 or 83 —— (P:24)	
7	(0 0111)	—— 27 or 83 —— (P:24)	
8	(0 1000)	—— 27 or 83 —— (P:24)	
9	(0 1001)	—— 27 or 83 —— (P:24)	
10	(0 1010)	—— 27 or 83 —— (P:24)	
11	(0 1011)	(CA:3) (AA:24) (PI:24)	All Call Reply/Squitter
12	(0 1100)	—— 27 or 83 —— (P:24)	
13	(0 1101)	—— 27 or 83 —— (P:24)	
14	(0 1110)	—— 27 or 83 —— (P:24)	
15	(0 1111)	—— 27 or 83 —— (P:24)	
16	(1 0000)	(VS:1)-2-(SL:3)-2-(RI:4)-2-(AC:13)(MV:56)(AP:24)	Long Air-Air Surveillance
17	(1 0001)	(CA:3) (AA:24) (ME:56) (PI:24)	Extended Squitter
18	(1 0010)	—— 27 or 83 —— (P:24)	
19	(1 0011)	—— 27 or 83 —— (P:24)	
20	(1 0100)	(FS:3) (DR:5) (UM:6) (AC:13) (MB:56) (AP:24)	Comm-B, Altitude Reply
21	(1 0101)	(FS:3) (DR:5) (UM:6) (ID:13) (MB:56) (AP:24)	Comm-B, Identity Reply
22	(1 0110)	—— 27 or 83 —— (P:24)	
23	(1 0111)	—— 27 or 83 —— (P:24)	
24	(1 1xxx)	(KE:1) (ND:4) (MD:80) (AP:24)	Comm-D (ELM)

NOTE: (XX:M) represents a field designated XX containing M number of assigned bits.

NOTE: (P:24) represents a 24-bit field reserved for parity information.

NOTE: —N— represents free coding space with N available bits, coded as Zeros for transmission.

NOTE: For Downlink Formats (DF) 0 through 23, the format number corresponds to the binary code in the first 5 bits of the reply. Format number 24 is arbitrarily defined as the format beginning with Ones in the first two bit positions. The following three bits (xxx) vary with the reply content.

NOTE: All formats are shown for completeness, although a number of them are unused.

Overview Of Mode S Reply Formats
Table 2

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
AA		24	9-32	X	The aircraft address announced in the clear, used in DF=11, 17.
AC		13	20-32	X	The altitude code used in formats DF=0, 4, 16 and 20. All bits are Zeros if altitude information is not available. Contains metric altitude if M-bit (26) is One.
AP		24 24	33-56 89-112	X X	Parity overlaid on the Address appears at the end of all transmissions, uplink and downlink, with the exception of format DF=11.
AQ		1	14	X	Designates formats UF=0, 16 as acquisition transmissions. Bit 14 (RI, DF=0, 16), repeats AQ as received by transponder.
BD		8	15-22	X	Contains the identity of the ground-initiated Comm-B register contents to appear in the MV field of the corresponding reply, used in UF=0.
CA		3	6-8	X	Used in DF=11, Squitter or All Call reply, to report transponder capability. Codes are: 0 = Level 1, no communications capability (surveillance only,) Transponder accepts UF=0, 4, 5, 11; Transponder transmits DF=0, 4, 5, 11. 1 = Level 2, Comm-A and Comm-B capability, Transponder accepts UF=0, 4, 5, 11, 20, 21; Transponder transmits DF=0, 4, 5, 11, 20, 21. 2 = Level 3, Comm-A, Comm-B and uplink ELM capability, Transponder accepts UF=0, 4, 5, 11, 20, 21, 24; Transponder transmits DF=0, 4, 5, 11, 20, 21. 3 = Level 4, Comm-A, Comm-B, uplink and downlink ELM capability, Transponder accepts UF=0, 4, 5, 11, 20, 21, 24; Transponder transmits DF=0, 4, 5, 11, 20, 21, 24. 4 = Level 2, 3 or 4; ability to set code 7, and is on the ground. 5 = Level 2, 3 or 4; ability to set code 7, and is airborne. 6 = Level 2,3 or 4; ability to set code 7. 7 = DR≠0 or FS=3,4 or 5. **NOTE:** Codes 4-7 are for squitters only.

Overview of Format Definitions
Table 3

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
CC		1	7	X	Indicates transponder has ability to support crosslink capability (decode the contents of the UF=0 BD field and respond with the contents of the specified ground-initiated Comm-B register in the MV field of the corresponding DF=16 reply. Used in DF=0.
CL		3	14-16	X	Coding in Binary 000=IC Field contains the II code 001=IC Field contains SI codes 1 to 15 010=IC Field contains SI codes 16 to 31 011=IC Field contains SI codes 32 to 47 100=IC Field contains SI codes 48 to 63
DF		5	1-5	X	The first field in all downlink formats is the transmission descriptor.
DI		3	14-16	X	Identifies coding contained in the SD codes are: 0 = SD has Interrogator Identifier (IIS). 1 = SD contains (IIS, MBS, MES, LOS, RSS, TMS). 2 = SD used for extended squitter surface control 3 = SD contains SIS, LSS, RRS 4-6 = Not assigned. 7 = SD contains IIS, RRS, LOS, TMS
DR		5	9-13	X	Requests extraction of downlink messages from the transponder by the interrogator and appears in formats DF=4, 5, 20, 21. The codes are: 0 = No downlink request. 1 = Request to send Comm-B message (B bit set), 2 = TCAS information available. 3 = TCAS information available and request to send Comm-B message. 4 = Comm-B Broadcast #1 available. 5 = Comm-B Broadcast #2 available. 6 = TCAS information and Comm-B Broadcast #1 available. 7 = TCAS information and Comm-B Broadcast #2 available. 8-15 = Not assigned. 16-31 = Request to send n-segments, signified by 15 + n. Codes 1-15 take priority over codes 16-31.

Overview of Format Definitions
Table 3 (Cont)

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
FS		3	6-8	X	Reports flight status of aircraft and is used in formats DF=4, 5, 20, 21. Codes are:

CODE	ALERT	SPI	AIRBORNE	ON THE GROUND
0	no	no	yes	no
1	no	no	no	yes
2	yes	no	yes	no
3	yes	no	no	yes
4	yes	yes	either	
5	no	yes	either	

6, 7 are not assigned.

ID		13	2-32	X	The 4096 identification code, numbers , as, set by the pilot, in DF=5, 21.
IC		4	10-13	X	Contains II or SI depending on value of CL field. II: Identifies the interrogator and appears in UF=11, the Mode S Only All Call. **NOTE:** The same information may also appear in the IIS subfields. SI: Surveillance Identifer (lower 4 bits of 6 bit SI code) **NOTE:** Surveillance Identifier is derived from CL and IC fields of UF11, or directly in the SIS subfield of SD field value of CL field in formats UF4,5,20 and 21
KE		1	4	X	Defines the content of the ND and MD fields in Comm-D replies, DF=24.
MA		56	33-88	X	Messages directed to the aircraft, part of Comm-A interrogations, UF=20, 21.
	ADS	8	33-40	X	Defines the content of the MA message field in Comm-A requests and is expressed in two groups of 4 bits each, ADS1 (33-36) and ADS2 (37-40).
	ADS1	4	33-36	X	Part of the A-Definition Subfield and is set to 0 for TCAS Sensitivity Level Commands.
	ADS2	4	37-40	X	Part of the A-Definition Subfield and is set to 5 for TCAS Sensitivity Level Commands.

Overview of Format Definitions
Table 3 (Cont)

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
MA	SLC	4	41-44	X	Sensitivity Level Command for the TCAS aircraft. The codes are: 0 = No command. 1 = Not Assigned. 2 = Select TA_ONLY mode of operation. 3 = Set TCAS Sensitivity Level to 3. 4 = Set TCAS Sensitivity Level to 4. 5 = Set TCAS Sensitivity Level to 5. 6 = Set TCAS Sensitivity Level to 6. 7 = Set TCAS Sensitivity Level to 7. 8-14 = Not Assigned. 15 = Cancel previous Sensitivity Level.
MB		56	33-88	X	Messages to be transmitted to interrogator, part of the Comm-B replies, DF=20, 21. The field contains Data Link, Capability Reports or Aircraft Identification Reports or TCAS Resolution Advisory Reports.
	ACS	20	45-64	X	Comm-A capability subfield reports data link service(s) supported by the installation. If all bits are Zeros, no Comm-A data link services are supported.
	AIS	48	41-88	X	Aircraft Identification, reported when a surveillance or Comm-A interrogation (UF=4, 5, 20, 21) contains RR=18 and DI=anything but 7. AIS contains up to eight 6-bit characters as defined in Table 4.
MB	ARA	14	41-54	X	TCAS Resolution Advisory Report indicating current Active Resolution Advisories (if any) generated by own TCAS unit against one or more threat aircraft. Each bit indicates a specific resolution advisory with One being active and Zero being inactive. Bit indications are: 41-Climb. 42-Don’t descend. 43-Don’t descend faster than 500 FPM. 44-Don’t descend faster than 1000 FPM. 45-Don’t descend faster than 2000 FPM. 46-Descend. 47-Don't climb. 48-Don't climb faster than 500 FPM. 49-Don't climb faster than 1000 FPM. 50-Don't climb faster than 2000 FPM. 51-Turn left. 52-Turn right. 53-Don't turn left. 54-Don't turn right.

Overview of Format Definitions
Table 3 (Cont)

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
MB	BCS	16	65-80	X	Comm-B capability subfield reports installed data sources that can be accessed by the ground for transmission via a ground-initiated Comm-B. If all bits are Zeros, no data is accessible by a ground-initiated Comm-B.
	BDS	8	33-40	X	Defines the content of the MB message field in reply to ground-initiated Comm-B and is expressed in two groups of 4 bits each, BDS1 (33-36) and BDS2 (37-40).
	BDS1	4	33-36	X	Corresponds with RR in UF=4, 5, 20, 21. The codes are: 0 = MB contains Air-initiated Comm-B. 1 = MB contains Data Link Capability Report. 2 = MB contains Aircraft Identification. 3 = MB contains TCAS Resolution Advisory. 4-15 = Not assigned.
	BDS2	4	37-40	X	Basic report uses BDS2=0. More complex Mode S installations report additional capabilities in various formats assigned to BDS2 codes other than 0 as requested by interrogator, specified in the RRS subfield of SD.
	CFS	4	41-44	X	Continuation subfield contains the BDS2 value of the next additional capability report available from the installation.
MB	ECS	8	81-88	X	Data Link Capability subfield reports ELM capability of installation. No ELM data link services are supported if all bits are Zeros.
	MTE	1	60	X	Multiple Threat Encounter bit indicates ≥2 simultaneous TCAS threats.
	RAC	4	55-58	X	Resolution Advisory Complements subfield indicates currently active resolution, advisory complements (if any) received from all other TCAS aircraft with on-board resolution capability. Bits are set to One when active and Zero when inactive. Bit indications are: 55-Don't descend. 56-Don't climb. 57-Don't turn left. 58-Don't turn right.
	RAT	1	59	X	Resolution Advisory Terminated indicator is set to One for 18 seconds (±1 second) following termination of a previously reported resolution advisory.

Overview of Format Definitions
Table 3 (Cont)

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
MB	TID	26	33-88	X	Threat Identity Data subfield contains data according to TTI field. If TTI=1, TID contains Mode S address of threat in bits 63-85 (bits 87-88 are Zero). If TTI=2, TID contains altitude, range and bearing data.
	TIDA	13	63-75	X	Threat Identity Data, Altitude subfield reports Mode C altitude code of the threat.
	TIDB	6	83-88	X	Threat Identity, Bearing subfield reports most recent bearing of the threat.
	TIDR	7	76-82	X	Threat Identity, Range subfield reports most recent range of the threat.
	TTI	2	61-62	X	Threat Type Indicator subfield defines type of data in TID field.
MC		80	9-88	X	Comm-C field contains one segment of a sequence of segments transmitted to the transponder in the ELM mode. MC is part of UF=24.
	IIS	4	9-12 (if RC=0 to 2) or 25-28 (if RC=3)	X	Interrogator Identifier subfield reports the identity of the interrogator (See SD and UM fields).
	SRS	16	9-24	X	If a Comm-C interrogation (UF=24) contains RC=3, the SRS subfield contains a list of segment request-authorizations for DELMs in the 16-bit (9-24) SRS subfield. Starting with bit 9, denoting the first segment, each of the following bits is set to One if the transmission of the corresponding segment is requested. Refer to Table 5.
MD		80	9-88	X	Comm-D field, part of DF=24, contains one segment of a sequence of segments transmitted by the transponder in the ELM mode. It may contain a summary of received MC segments of an uplink ELM.
	TAS	16	17-32	X	Reports segments received in a Comm-C sequence. Starting with bit 17 denoting the first segment, each successive bit is One if the corresponding segment was received. TAS appears if KE=1 in the same reply. Refer to Table 5 for values.
ME		56	33-88	X	Extended squitter message, part of DF=17, contains broadcast messages.
MU		56	33-88	X	Field, part of the long air-air surveillance interrogation UF=16, contains information used in air-to-air exchanges (TCAS, Resolution Messages and TCAS Broadcast Messages).

Overview of Format Definitions
Table 3 (Cont)

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
MU	CHC	3	47-49	X	Cancel Horizontal Resolution Advisory Complement. In TCAS Resolution Messages transmitted by TCAS without horizontal resolution capability, CHC is set to 0. The codes are: 0 = No cancellation. 1 = Cancel, don't turn left. 2 = Cancel, don't turn right. 3-7 = Not assigned.
	CVC	2	43-44	X	Cancel Vertical Resolution Advisory Complement. The codes are: 0 = No cancellation. 1 = Cancel, don't descend. 2 = Cancel, don't climb. 3 = Not assigned.
	HRC	3	50-52	X	Horizontal Resolution Advisory Complement. In TCAS Resolution Messages transmitted by TCAS without horizontal resolution capability, HRC is set to 0. The codes are: 0 = No horizontal resolution advisory complement sent. 1 = Intruder TCAS sense is turn left/do not turn left. 2 = Intruder TCAS sense is turn left/do not turn right. 3-4 = Not assigned. 5 = Intruder TCAS sense is turn right/do not turn left. 6 = Intruder TCAS sense is turn right/do not turn right. 7 = Not assigned.
	HSB	5	56-60	X	Encoded Sense Bits for Horizontal Resolution Complements provide a parity coding field protecting the six horizontal sense bits (CHC and HRC) and are used in TCAS III Resolution Messages.
	MID	24	65-88	X	Contains discrete address of interrogating aircraft and is in TCAS Resolution Advisories Lock Requests, TCAS Resolution Messages and TCAS Broadcast Messages. **NOTE:** TCAS Broadcast Message is sent at 10-second intervals.

Overview of Format Definitions
Table 3 (Cont)

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
MU	MTB	1	42	X	Multiple Threat Bit indicates more than one TCAS threat when set to One and no more than one threat when set to Zero.
	UDS	8	33-40	X	Defines the content of the MU message field and is expressed in two 4-bit groups, UDS1 (33-36) and UDS2 (37-40).
	UDS1	4	33-36	X	Is set to 3 for TCAS Resolution Messages and TCAS Broadcast Messages.
	UDS2	4	37-40	X	Is set to 0 for TCAS Resolution Messages or set to 2 for TCAS Broadcast Messages.
	VRC	2	45-46	X	Vertical Resolution Advisory, Complement. The codes are: 0 = No vertical resolution advisory complement sent. 1 = Don't descend. 2 = Don't climb. 3 = Not assigned.
	VSB	4	61-64	X	Encoded Sense Bits for Vertical Resolution Complements provide a parity coding field to protect four vertical sense bits (CVC and VRC) in all TCAS Resolution Messages. If bits 43-46 do not agree with bits 61-64, the TCAS receiver assumes an error and disregards message. Bits are as follows:

43	44	45	46	61	62	63	64
0	0	0	0	0	0	0	0
0	0	0	1	1	1	1	0
0	0	1	0	0	1	1	1
0	0	1	1	1	0	0	1
0	1	0	0	1	0	1	1
0	1	0	1	0	1	0	1
0	1	1	0	1	1	0	0
0	1	1	1	0	0	1	0
1	0	0	0	1	1	0	1
1	0	0	1	0	0	1	1
1	0	1	0	1	0	1	0
1	0	1	1	0	1	0	0
1	1	0	0	0	1	1	0
1	1	0	1	1	0	0	0
1	1	1	0	0	0	0	1
1	1	1	1	1	1	1	1

Overview of Format Definitions
Table 3 (Cont)

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
MV		56	33-88	X	Field, part of the long air-air surveillance reply DF=16, contains information used in air-to-air exchanges (Coordination Reply Message).
	ARA	14	41-54	X	Same as in MB field.
	MTE	1	60	X	Same as in MB field.
	RAC	4	55-58	X	Same as in MB field.
	RAT	1	59	X	Same as in MB field.
MV	VDS	8	33-40	X	Defines the content of the MV message field and is expressed in two 4-bit groups, VDS1 (33-36) and VDS2 (37-40).
	VDS1	4	33-36	X	Is set to 3 for Coordination Reply Message.
	VDS2	4	37-40	X	Is set to 0 for Coordination Reply Message.
NC		4	5-8	X	Provides the segment number transmitted in an uplink ELM and is part of a Comm-C interrogation, UF=24.
ND		4	5-8	X	Provides the segment number transmitted in a downlink ELM and is part of a Comm-D reply, DF=24.
PC		3	6-8	X	Contains operating commands to the transponder and is part of surveillance and Comm-A interrogations UF=4, 5, 20, 21. The codes are: 0 = No changes in transponder state. 1 = Non-selective All Call lockout. 2 = Not assigned. 3 = Not assigned. 4 = Cancel B. 5 = Cancel C. 6 = Cancel D. 7 = Not assigned.
PI		24	33-56	X	Contains the parity overlaid on the interrogator identity code. PI is part of the reply, DF=11, to the Mode S Only All Call.

Overview of Format Definitions
Table 3 (Cont)

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
PR		4	6-9	X	Field contains commands to the transponder specifying the reply probability to the Mode S Only All Call interrogation, UF=11 containing the PR. A command to disregard any lockout state can also be given. The assigned codes are: 0 = Reply with probability = 1. 1 = Reply with probability = 1/2. 2 = Reply with probability = 1/4. 3 = Reply with probability = 1/8. 4 = Reply with probability = 1/16. 5,6,7 = Do not Reply. 8 = Disregard lockout, reply with probability = 1. 9 = Disregard lockout, reply with probability = 1/2. 10 = Disregard lockout, reply with, probability = 1/4. 11 = Disregard lockout, reply with probability = 1/8. 12 = Disregard lockout, reply with probability = 1/16. 13, 14, 15 = Do not reply. **NOTE:** On receipt of a Mode S Only All Call containing a PR code other than 0 or 8, transponder executes a random process and makes a reply decision for the interrogation in accordance with the commanded probability. Random occurrence of replies enables interrogator to acquire closely spaced aircraft when replies would otherwise synchronously garble each other.
RC		2	3-4	X	Designates transmitted segment as initial, intermediate or final if coded 0, 1 or 2 respectively. RC=3 is used to request Comm-D DELMs by the transponder. RC is part of Comm-C interrogation, UF=24.

Overview of Format Definitions
Table 3 (Cont)

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
RI		4	14-17	X	Information in DF=0, 16. The codes are: 0 = No on-board TCAS. 1 = Not assigned. 2 = On-board TCAS with resolution capability inhibited. 3 = On-board TCAS with vertical-only resolution capability. 4 = On-board TCAS with vertical and horizontal resolution capability. 5-7 = Not assigned. 8 = No maximum airspeed data available. 9 = Airspeed is ≤75 kts. 10 = Airspeed is >75 kts and ≤150 kts. 11 = Airspeed is >150 kts and ≤300 kts. 12 = Airspeed is >300 kts and ≤600 kts. 13 = Airspeed is >600 kts and ≤1200 kts. 14 = Airspeed is >1200 kts. 15 = Not assigned.
RL		1	9	X	Command, sent in UF=0, 16; solicits DF=0 reply if Zero and DF=16 reply if One (only if transponder is associated with Airborne Collision Avoidance System [ACAS] equipment). Otherwise, in UF=0, Zero solicits DF=0 reply and One solicits no reply. In UF=16, Zero solicits DF=16 reply and One solicits no reply.
RR		5	9-13	X	Contains length and content of interrogator requested reply. RR is part of surveillance and Comm-A interrogations UF=4, 5, 20, 21.

RR CODE	REPLY LENGTH	MB CONTENT
0-15	Short	N/A
16	Long	Air initiated Comm-B
17	Long	Data link capability
18	Long	Aircraft Identification
19	Long	Resolution Advisories
20-31	Long	Not Assigned

NOTE: If first bit of RR code is One, decimal equivalent of last four bits of RR code designates code for BDS1 in reply (ground initiated). BDS2 is assumed to be Zero if not specified by DI=7 and RRS.

Overview of Format Definitions
Table 3 (Cont)

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
SD		16	17-32	X	Contains control codes, as specified by the DI field affecting transponder protocol and is part of surveillance and Comm-A interrogations UF=4, 5, 20, 21.
	IIS	4	17-20	X	Interrogator Identifier subfield contains the self-identification code of the interrogator and is numerically identical to the II code transmitted by the interrogator in Mode S Only All Calls. IIS codes are 0 through 15; IIS=0 is not a valid interrogator identifier for multisite purposes. IIS is sent only when DI=0, 1 or 7.
	LOS	1	26	X	Lockout subfield, if set to One, initiates a multisite All Call lockout to Mode S Only All Calls (UF=11) from the Interrogator indicated in IIS of the interrogation. If LOS is set to Zero, no change in lockout state is commanded. LOS is sent only if DI=1 or 7.
	LSS	1	23	X	Lockout surveillance subfield, if set to One, shall signify a multisite lockout command from the interrogator indicated in SIS. LSS set to zero shall be used to signify that no change in lockout state is commanded.
	MBS	2	21-22	X	Multisite Comm-B subfield, sent when DI=1, is assigned the following codes: 0 = No Comm-B action. 1 = Comm-B reservation. 2 = Comm-B closeout.
	MES	3	23-25	X	Multisite ELM subfield, sent when DI=1, contains reservation and closeout commands for ELM as follows: 0 = No ELM action. 1 = Comm-C reservation. 2 = Comm-C closeout. 3 = Comm-D reservation. 4 = Comm-D closeout. 5 = Comm-C reservation and Comm-D closeout. 6 = Comm-C closeout and Comm-D reservation. 7 = Comm-C and Comm-D closeouts.

Overview of Format Definitions
Table 3 (Cont)

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
SD	RCS	3	24-26	X	Rate control subfield shall control the squitter rate of the transponder when it is reporting the surface format. The codes are: 0 = No squitter rate command 1 = Report high surface squitter rate for 60 seconds 2 = Report low surface squitter rate for 60 seconds 3 = Suppress all surface squitters for 60 seconds 4 = Suppress all surface squitters for 120 seconds 5-7 Not assigned
	RRS	4	21-24	X	Reply Request subfield, sent when DI=7, contains coding corresponding to the requested BDS2 code.
	RRS	4	24-27	X	Reply Request subfield, sent when DI=3, contains coding corresponding to the requested BDS2 code.
	RSS	2	27-28	X	Reservation Status subfield, sent when DI=1, requests transponder to report reservation status in the UM field. The codes are: 0 = No request. 1 = Report Comm-B reservation status. 2 = Report Comm-C reservation status. 3 = Report Comm-D reservation status.
	SAS	2	27-28	X	Surface Antenna Subfield, shall control the diversity antenna that is used for the acquisition and extended squitters when the aircraft is reporting the surface format. The codes are: 0 = No antenna command, use the top antenna 1 = Alternate top and bottom antennas for 120 seconds 2 = Use bottom antenna for 120 seconds 3 = Return to the default
	SIS	6	17-22	X	Surveillance Identifier Subfield, shall contain an assigned SI code of the interrogator.

Overview of Format Definitions
Table 3 (Cont)

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
SD	TCS	3	21-23	X	Type Control Subfield, shall control the position type reported by the transponder. The codes are: 0 = No position type command 1 = Use surface position type for the next 15 seconds 2 = Use surface position type for the next 60 seconds 3 = Cancel surface type command 4-7 = Not assigned.
	TMS	4	29-32	X	Tactical Message subfield, sent when DI=1 or 7, contains coding for linking the Comm-A message segments. The codes are: 0 = No Action. 1 = Unlinked, Priority. 2 = Unlinked, Acknowledge. 3 = Unlinked, Priority, Acknowledge. 4 = Linked 1st Segment, Single ADS. 5 = Linked 1st Segment, Single ADS Priority. 6 = Linked 1st Segment, Single ADS Acknowledge. 7 = Linked 1st Segment, Single ADS, Priority, Acknowledge. 8 = Linked 1st Segment, Multiple ADS. 9 = Linked 1st Segment, Multiple ADS, Priority. 10 = Linked 1st Segment, Multiple ADS, Acknowledge. 11 = Linked 1st Segment, Multiple ADS, Priority, Acknowledge. 12 = Second Segment. 13 = Third Segment. 14 = Final Segment. 15 = Not Assigned.

Overview of Format Definitions
Table 3 (Cont)

FIELD	SUB FIELD	NO. OF BITS	BITS POSITION	FORMATS UP DOWN	CONTENT
SL		3	9-11	X	Reports the current operating sensitivity level of the TCAS unit and is a part of air-air surveillance replies, DF=0, 16. The codes are: 0 = No TCAS sensitivity level reported. 1 = TCAS operates at sensitivity level 1. 2 = TCAS operates at sensitivity level 2. 3 = TCAS operates at sensitivity level 3. 4 = TCAS operates at sensitivity level 4. 5 = TCAS operates at sensitivity level 5. 6 = TCAS operates at sensitivity level 6. 7 = TCAS operates at sensitivity level 7. **NOTE:** The SL field has no meaning for aircraft with RI=0 (no on-board capability to generate resolution, advisories).
UF		5	1-5	X	The first field in all uplink formats is the transmission descriptor in all interrogations.
UM		6	14-19	X	Contains transponder status readouts in replies DF=4, 5, 20, 21.
	IDS	2	18-19	X	Identifier Designator subfield reports the type of reservation made by the interrogator identified in IIS and corresponds with the RSS subfield of SD. Assigned coding is: 0 = No information available. 1 = Comm-B reservation active. 2 = Comm-C reservation active. 3 = Comm-D reservation active.
	IIS	4	14-17	X	Interrogator Identifier subfield reports the identity of the interrogator that has made a multisite reservation.
VS		1	6	X	Indicates aircraft is airborne when Zero or aircraft is on the ground when One. VS is a part of DF=0, 16.

Overview of Format Definitions
Table 3 (Cont)

				B5	0	0	1	1
				B6	0	1	0	1
B4	B3	B2	B1					
0	0	0	0			P	SP	0
0	0	0	1		A	Q		1
0	0	1	0		B	R		2
0	0	1	1		C	S		3
0	1	0	0		D	T		4
0	1	0	1		E	U		5
0	1	1	0		F	V		6
0	1	1	1		G	W		7
1	0	0	0		H	X		8
1	0	0	1		I	Y		9
1	0	1	0		J	Z		
1	0	1	1		K			
1	1	0	0		L			
1	1	0	1		M			
1	1	1	0		N			
1	1	1	1		O			
SP=SPACE code								

6-Bit Character Set for AIS Subfield
Table 4

SRS OR TAS SUBFIELD VALUE		NUMBER OF SEGMENTS
OCTAL	HEXADECIMAL	
100000	8000	1
140000	C000	2
160000	E000	3
170000	F000	4
174000	F800	5
176000	FC00	6
177000	FE00	7
177400	FF00	8
177600	FF80	9
177700	FFC0	10
177740	FFE0	11
177760	FFF0	12
177770	FFF8	13
177774	FFFC	14
177776	FFFE	15
177777	FFFF	16

Valid Values for SRS and TAS Subfields
Table 5

BINARY	OCTAL	DECIMAL	HEXADECIMAL
000	0	0	0
001	1	1	1
010	2	2	2
011	3	3	3
100	4	4	4
101	5	5	5
110	6	6	6
111	7	7	7
1000	10	8	8
1001	11	9	9
1010	12	10	A
1011	13	11	B
1100	14	12	C
1101	15	13	D
1110	16	14	E
1111	17	15	F
10000	20	16	10

Number Systems Conversion
Table 6

UF#	FIELDS				
0	RL=0	AQ=1			
4	PC=0	RR=0	DI=0	SD=0	
5	PC=0	RR=0	DI=0	SD=0	
11	PR=0	IC= II: 0-15 IC= SI: 1-63	CL= 000 CL= 001-100		
16	RL=1	AQ=0	MU=0		
20	PC=0 PC=0	RR=17 RR=19	DI=7 DI=7	RRS=0 RRS=0	MA=00000000000000 MA=05000000000000
21	PC=0 PC=0	RR=17 RR=19	DI=7 DI=7	RRS=0 RRS=0	MA=00000000000000 MA=05000000000000

ATC-601-2 Mode S Interrogation Formats (in Decimal)
Table 7

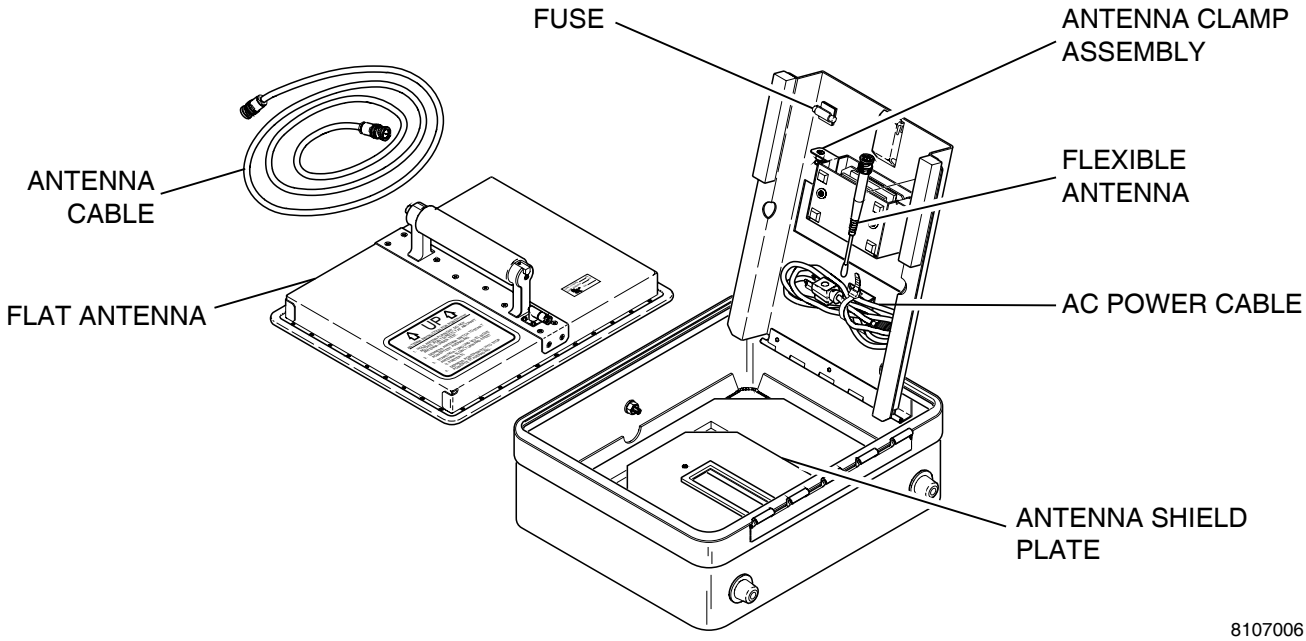
APPENDIX C - AUXILIARY EQUIPMENT

Refer to 1-2-2, Figure 2 for connectors and indicators.

1. STORAGE COMPARTMENT

Refer to Appendix C, Figure 1.

ITEM	DESCRIPTION
●	Antenna Clamp Assembly: Used with Antenna Shield Plate to cover UUT Antenna not being tested.
●	Flexible Antenna: RF monopole antenna used with Test Set when power accuracy is not critical and a direct connection is not convenient.
●	ac Power Cable: Used to connect ac power from an external source to AC PWR Connector.
●	Antenna Shield Plate: Used with Antenna Clamp Assembly to cover UUT Antenna not being tested.
●	Flat Antenna: RF antenna used with Test Set when power accuracy is most critical.
●	Antenna Cable: BNC to BNC coaxial cable used to connect FLAT ANTENNA Connector to ANTENNA Connector.
●	Fuse: Spare FUSE



Auxiliary Equipment
Figure 1

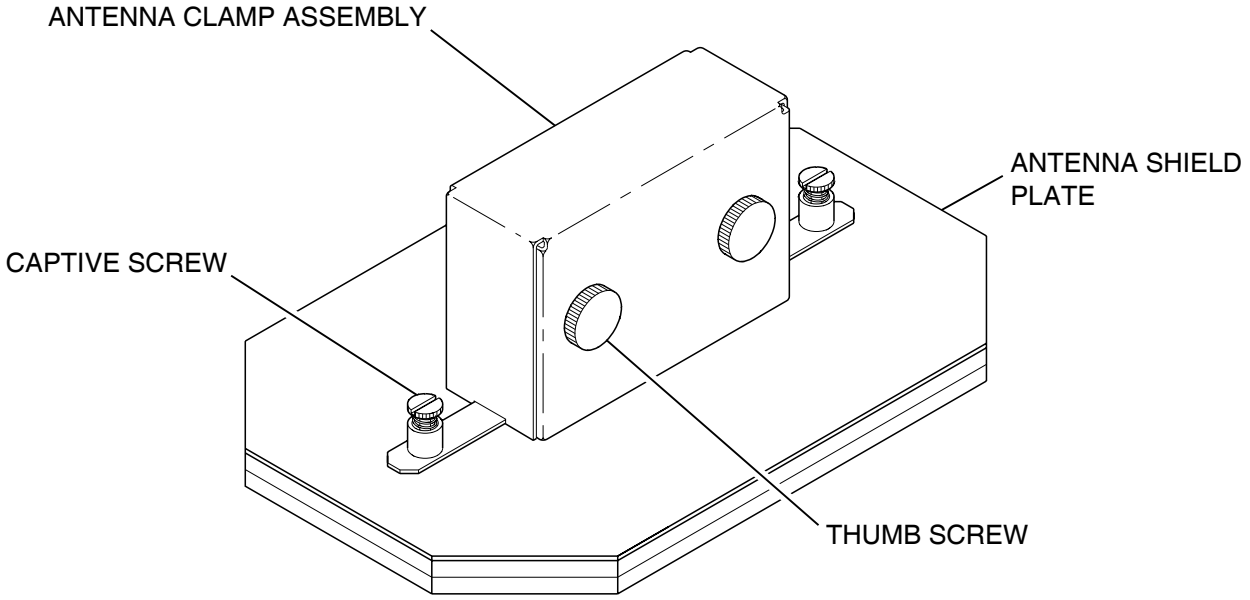
2. TRIPOD

The tripod holds the Test Set Antenna during stationary ramp testing.

3. ANTENNA SHIELD PROCEDURE

Refer to Appendix C, Figure 2.

STEP	PROCEDURE
1.	Position Antenna Clamp Assembly inside the slot in the Antenna Shield Plate, aligning captive screws into the respective screw holes.
2.	Tighten captive screws.
3.	Cover UUT Antenna with Antenna Shield. Loosen Thumbscrews if necessary. **NOTE:** It may be necessary to remove UUT Antenna Guard if access to UUT Antenna is restricted.
4.	Secure Antenna Shield by tightening thumbscrews.



Antenna Shield
Figure 2

APPENDIX D - METRIC/BRITISH IMPERIAL CONVERSION TABLE WITH NAUTICAL DISTANCE CONVERSIONS

TO CONVERT:	INTO:	MULTIPLY BY:	TO CONVERT:	INTO:	MULTIPLY BY:
cm	feet	0.03281	meters	feet	3.281
cm	inches	0.3937	meters	inches	39.37
feet	cm	30.48	m/sec	ft/sec	3.281
feet	meters	0.3048	m/sec	km/hr	3.6
ft/sec	km/hr	1.097	m/sec	miles/hr	2.237
ft/sec	knots	0.5921	miles	feet	5280
ft/sec	miles/hr	0.6818	miles	km	1.609
ft/sec^2	cm/sec^2	30.48	miles	meters	1609
ft/sec^2	m/sec^2	0.3048	miles	nmi	0.8684
grams	ounces	0.03527	miles/hr	ft/sec	1.467
inches	cm	2.54	miles/hr	km/hr	1.609
kg	pounds	2.205	miles/hr	knots	0.8684
kg/cm^2	psi	0.0703	nmi	feet	6080.27
km	feet	3281	nmi	km	1.8532
km	miles	0.6214	nmi	meters	1853.2
km	nmi	0.5396	nmi	miles	1.1516
km/hr	ft/sec	0.9113	ounces	grams	28.34953
km/hr	knots	0.5396	pounds	kg	0.4536
km/hr	miles/hr	0.6214	psi	kg/cm^2	0.0703
knots	ft/sec	1.689	100 ft	km	3.048
knots	km/hr	1.8532	100 ft	miles	1.894
knots	miles/hr	1.1516	100 ft	nmi	1.645

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APPENDIX E - ABBREVIATIONS

A

A	Amperes
AA	Address Announced
AC	Altitude Code
AC	Alternating Current
ac	Alternating Current
ACAS	Airborne Collision Avoidance System
ACS	Comm-A Capabilitiy Subfield
A/D	Analog to Digital
ADC	Analog to Digital Converter
ADDR	Address
ADLP	Airborne Data Link Processor
ADS	A-Definition Subfield
AIS	Comm-A Capability Subfield
ALT	Altitude
AP	Address Parity
AQ	Acquisition Special
ASCII	American National Standard Code for Information Interchange
ATC	Air Traffic Control
ATC	ATCRBS (screen abbreviation)
ATCRBS	Air Traffic Control Radar Beacon System
ATE	Automatic Test Equipment
ATTEN	Attenuation
AUTO	Automatic
AVG	Average

B

BAT	Battery
BCS	Comm-B Capability Subfield
BD	Comm-B Data
BDS	B-Definition Subfield
BIT	Built In Test
BOT	Bottom
bps	Bits per Second
BR	Bridge Rectifier
BT	Battery

C

C	Celsius or Centigrade
CA	Transponder Capability
CC	Crosslink Capability
ccw	Counterclockwise
CFS	Continuation Subfield
CHAN	Channel
CHC	Cancel Horizontal Resolution Advisory
CLOS	Closeout
cm	Centimeter (10^{-2} Meters)
Cont	Continued
CPU	Central Processing Unit
CrLf	Carriage Return and Line Feed
CTRL	Control
CTS	Clear to Send/(One-way hardware)
CTS/DTR	Two-way hardware
CVC	Cancel Vertical Resolution Advisory Complement
CW	Continuous Wave
cw	Clockwise

D

D/A	Digital to Analog
DABS	Discrete Address Beacon System
DAC	Digital to Analog Converter
dB	Decibel
dBi	Decibels above isotropic
dBm	Decibels above one milliwatt
dB W/m^2	Decibels above one watt per square meter
DCD	Data Carrier Detect
DCXO	Digitally Compensated Crystal Oscillator
DELM	Downlink Extended Length Message
DF	Downlink Format
DI	Designator Identification
DMM	Digital Multimeter
DPSK	Differential Phase Shift Keying
DR	Downlink Request
DSP	Digital Signal Processor
DSR	Data Set Ready
DTR	Data Terminal Ready

E

ECS	Extended Capability Subfield
ELM	Extended Length Message
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EOL	End of Line
ERP	Effective Radiated Power
ESB	Encoded Sense Bits
ESD	Electrostatic Discharge
EXT	External

F

FCC	Federal Communications Commission
FPM	Feet Per Minute
FREQ	Frequency
FS	Flight Status
FT	Foot/Feet
Ft	Foot/Feet

G

GEN	Generator
GND	Ground

H

h	Hexadecimal
Hz	Hertz
HRC	Horizontal Resolution Advisory Complement

I

ID	Identification
IDS	Identifier Designators Subfield
IFF	Identification Friend or Foe
II	Interrogator Identification
IIS	Interrogator Identification Subfield
IN	Input
INTERR	Interrogation
I/O	Input/Output
ITM	Intermode

K

KE	Control, ELM
kg	Kilogram (10^3 Grams)
kHz	Kilohertz (10^3 Hertz)
km	Kilometer (10^3 meters)
Kts	Knots (Velocity)

L

LCA	Logic Cell Array
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LF	Line Feed
LO	Local Oscillator
LOS	Lockout Subfield
LSB	Least Significant Bit
LSD	Least Significant Digit

M

m	Meters
MA	Message, COMM-A
MAX	Maximum
MB	Message, COMM-B
MBS	Multisite COMM-B Subfield
MC	Message, COMM-C
MD	Message, COMM-D
ME	Message, COMM-E
MEAS	Measuring
MES	Multisite ELM Subfield
MHz	Megahertz (10^6 Hertz)
µs	Microsecond (10^{-6} Seconds)
MID	Mode S Address
MIN	Minimum
MPU	Microprocessing Unit
ms	Millisecond (10^{-3} Seconds)
MTB	Multiple Threat Bit
MTE	Multiple Threat Encounter
MTL	Minimum Threshold Level
MU	Message, COMM-U
MV	Message, COMM-V

N

N/A	Not Applicable
NC	C-Segment Number
ND	D-Segment Number
nmi	Nautical Miles
No	Number
ns	Nanosecond (10^{-9} Seconds)

O

o	Octal
OUT	Output
Ω	Ohm

P

PC	Personal Computer
PC	Printed Circuit
PC	Protocol
PI	Parity/Interrogator Identity
PLCS	Places
PN	Part Number
PPM	Pulse Position Modulation
ppm	Parts per Million
PR	Probability of Reply
PRF	Pulse Repetition Frequency
PROM	Programmable Read Only Memory
psi	Pounds per Square Inch
PWM	Pulse Width Modulation
PWR	Power

R

RAM	Random Access Memory
RAC	Resolution Advisory Complement
RAT	Resolution Advisory Termination
RC	Reply Control
RCI	Remote Control Interface
RCVD	Received
RCVR	Receiver
Ref	Reference
RF	Radio Frequency
RI	Reply Information Air-to-Air
RL	Reply Length
RMS	Root Mean Square
ROM	Read Only Memory
RR	Reply Request
RRS	Reply Request Subfield
RSS	Reservation Status Subfield
RTCA	Requirements and Technical Concepts for Aviation organization
RTS	Request to Sent
RX	Receive
RXD	Receive Data

S

SCOPE	Oscilloscope
SCPI	Standard Commands for Programmable Instruments organization
SD	Special Designator
Sec	Second
SL	Sensitivity Level
SLM	Standard Length Message
SLS	Side-Lobe Suppression
SPI	Special Identifier Pulse
SQTR	Squitter
SRQ	Service Request
SRS	Segment Request Subfield
SSR	Secondary Surveillance Radar
SYNC	Synchronous

T

TAS	Transmission Acknowledgment Subfield
TCAS	Traffic Alert and Collision Avoidance System
TID	Threat Identity Data
TMS	Tactical Message Subfield
Trig	Trigger
TTI	Threat Type Indicator
TTL	Transistor-Transistor Logic
TX	Transmit
TXD	Transmit Data

U

UDS	U-Definition Subfield
UELM	Uplink Extended Length Message
UF	Uplink Format
UM	Utility Message
UUT	Unit Under Test

V

V	Volt
VAC	Volts, Alternating Current
VCO	Voltage Controlled Oscillator
Vdc	Volts, Direct Current
VDS	V-Definition Subfield
VERS	Version
VRAM	Video Random Access Memory
VRC	Vertical Resolution Advisory Complement
Vrms	Volts Root Mean Square
VS	Vertical Status
VSB	Vertical Sense Bits
VSWR	Voltage Standing Wave Ratio

W

W	Watt

X

XMTR	Transmitter
Xon/Xoff	Software Handshake
XPDR	Transponder

APPENDIX F - MODE S ADDRESS BLOCKS

This table contains Mode S address blocks for countries whose tail numbers are decoded by the ATC-601-2. For an expanded list of Mode S codes, refer to Appendix G.

COUNTRY	ADDRESS BLOCK
Belgium	448000 – 448FFF
Canada	C00000 – C3FFFF
Denmark	458000 – 45FFFF
France	380000 – 3AFFFF
Germany	3C0000 – 3FFFFF
Poland	488000 – 48FFFF
Switzerland	4B0000 – 4B7FFF
USA	A00000 - AFFFFF

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APPENDIX G - MODE S ADDRESS BLOCKS

This table contains a complete list of Mode S address blocks. For countries whose tail numbers are decoded by the ATC-601-2, refer to Appendix F.

COUNTRY	ADDRESS BLOCK
Afghanistan	70000 – 700FFF
Albania	501000 – 5013FF
Algeria	0A0000 - 0A7FFF
Angola	090000 – 090FFF
Antigua and Barbuda	0CA000 – 0CA3FF
Argentina	E00000 – E3FFFF
Armenia	600000 – 6003FF
Australia	7C0000 – 7FFFFF
Austria	440000 – 447FFF
Azerbaijan	600800 – 600BFF
Bahamas	0A8000 – 0A8FFF
Bahrain	894000 – 894FFF
Bangladesh	702000 – 702FFF
Barbados	0AA000 – 0AA3FF
Belarus	510000 – 5103FF
Belgium	448000 – 448FFF
Belize	0AB000 0AB3FF
Benin	094000 – 0943FF
Bhutan	680000 – 6803FF
Bolivia	E94000 – E94FFF
Bosnia and Herzegovina	513000 – 5133FF
Botswana	030000 – 0303FF

COUNTRY	ADDRESS BLOCK
Brazil	E40000 – E4FFFF
Brunei Darassalam	895000 – 8953FF
Bulgaria	450000 – 457FFF
Burkin Faso	09C000- 09CFFF
Burundi	032000 – 032FFF
Cambodia	70E000 – 70EFFF
Cameroon	034000 – 034FFF
Canada	C00000 – C3FFFF
Cape Verde	096000 – 096FF
Central African Republic	06C000 – 06CFFF
Chad	084000 – 084FFF
Chile	E80000 – E80FFF
China	780000 – 78BFFF
Colombia	0AC000 – 0ACFFF
Comoros	035000 – 0353FF
Congo	036000 – 036FFF
Cook Islands	901000 – 9013FF
Costa Rica	0AE000 – 0AEFFF
Côte d/Ivoire	038000 – 038FFF
Croatia	501C00 – 501FFF
Cuba	0B0000 – 0B0FFF
Cyprus	4C8000 – 4C83FF

COUNTRY	ADDRESS BLOCK
Czech Rep	498000 – 49FFFF
Dem Republic Korea	72000 – 727FFF
Dem Republic Congo	08C000 – 08CFFF
Denmark	458000 – 45FFFF
Djibouti	098000 – 0983FF
Dominican Rep	0C4000 – 0C4FFF
Ecuador	E84000 – E84FFF
Egypt	010000 – 017FFF
El Salvador	0B2000 – 0B2FFF
Equatorial Guinea	042000 – 042FFF
Eritrea	202000 – 2023FF
Estonia	511000 – 5113FF
Ethiopia	040000 – 040FFF
Fiji	C88000 – C88FFF
Finland	460000 - 467FFF
France	380000 – 3AFFFF
Gabon	03E000 – 03EFFF
Gambia	09A000 – 09AFFF
Georgia	514000 – 5143FF
Germany	3C0000 – 3FFFFF
Ghana	044000 – 044FFF
Greece	468000 – 46FFFF
Grenada	0C000 – 0CC3FF
Guatemala	0B4000 – 0B4FFF
Guinea	046000 – 046FFF

COUNTRY	ADDRESS BLOCK
Guinea-Bissau	048000 – 0483FF
Guyana	0B6000 – 0B6FFF
Haiti	0B800 – 0B8FFF
Honduras	0BA000 – 0BAFFF
Hungary	470000 – 477FFF
Iceland	4CC000 – 4CCFFF
India	800000 – 83FFFF
Indonesia	8A0000 - 8A7FFF
Iran, Islamic Rep	730000 – 737FFF
Iraq	728000 – 72FFFF
Ireland	4CA000 – 4CAFFF
Israel	738000 – 73FFFF
Italy	300000 – 33FFFF
Jamaica	0BE000 – 0BEFFF
Japan	840000 – 87FFFF
Jordan	740000 – 747FFF
Kazakhstan	683000 – 6733FF
Kenya	04C000 – 04CFFF
Kiribati	C8E000 – C8E3FF
Kuwait	706000 – 706FFF
Kyrgyzstan	601000 – 6013FF
Lao Dem Rep	708000 – 708FFF
Latvia	502C0 – 502FFF
Lebanon	748000 – 74FFFF
Lesotho	04A000 – 04A3FF

COUNTRY	ADDRESS BLOCK
Liberia	050000 – 050FFF
Libyan Arab Jam	018000 – 01FFFF
Lithuania	503C00 – 503FFF
Luxembourg	4D0000 – 4D03FF
Madagascar	054000 – 054FFF
Malawi	057000 – 058FFF
Malaysia	75000 – 757FFF
Maldives	05A000 – 05A3FF
Mali	05C000 – 05CFFF
Malta	4D2000 – 4D23FF
Marshall Islands	900000 – 9003FF
Mauritania	05E000 – 05D3FF
Mauritius	060000 – 0603FF
Mexico	0D0000 – 0D7FFF
Micronesia, Federal States	681000 – 6813FF
Monaco	4D4000 – 4D43FF
Mongolia	682000 – 6823FF
Morocco	020000 – 027FFF
Mozambique	006000 – 006FFF
Myanmar	704000 – 704FFF
Namibia	201000 – 2013FF
Nauru	C8A000 – C8A3FF
Nepal	70A000 – 70AFFF
Netherlands, Kingdom	480000 – 487FFF

COUNTRY	ADDRESS BLOCK
New Zealand	C80000 – C87FFF
Nicaragua	0C0000 – 0C0FFF
Niger	062000 – 062FFF
Nigeria	064000 – 064FFF
Norway	478000 – 47FFFF
Oman	70C000 – 70C3FF
Pakistan	760000 – 767FFF
Palau	684000 – 6843FF
Panama	0C2000 – 0C2FFF
Papua New Guinea	898000 – 898FFF
Paraguay	E88000 – E88FFF
Peru	E8C000 – E8CFFF
Philippines	758000 – 75FFFF
Poland	488000 – 48FFFF
Portugal	490000 – 497FFF
Qatar	06A000 – 06A3FF
Rep of Korea	718000 – 71FFFF
Rep of Moldova	504C00 – 504FFF
Romania	4A0000 – 4A7FFF
Russian Fed	100000 – 1FFFFF
Rwanda	06E000 – 06EFFF
Saint Lucia	C8C000 – C8C3FF
St Vincent and Grenadines	0BC000 – 0BC3FF
Samoa	902000 – 9023FF

COUNTRY	ADDRESS BLOCK
San Marino	500000 – 5003FF
Sao Tome and Principe	09E000 – 09E3FF
Saudi Arabia	710000 – 717FFF
Senegal	070000 – 070FFF
Seychelles	074000 – 0743FF
Sierra Leone	076000 – 0763FF
Singapore	768000 – 76FFFF
Slovakia	505C00 – 505FFF
Slovenia	506C00 – 506FFF
Solomon Islands	897000 – 8973FF
Somalia	078000 – 078FFF
South Africa	008000 – 00FFFF
Spain	340000 – 37FFFF
Sri Lanka	770000 – 777FFF
Sudan	07C000 – 07CFFF
Suriname	0C80000 – 0C8FFF
Swaziland	07A000 – 07A3FF
Sweden	4A8000 – 4AFFFF
Switzerland	4B0000 – 4B7FFF
Syrian Arab Rep	778000 – 77FFFF
Tajikistan	515000 – 5153FF
Thailand	880000 – 887FFF

COUNTRY	ADDRESS BLOCK
The former Yugoslav Rep of Macedonia	512000 – 5123FF
Togo	08800 – 088FFF
Tonga	C8D000 – C8D3FF
Trinidad and Tobago	0C6000 – 0C6FFF
Tunisia	028000 – 02FFFF
Turkey	4B8000 – 4BFFFF
Turkmenistan	601800 – 601BFF
Uganda	068000 – 068FFF
Ukraine	508000 – 50FFFF
United Arab Emirates	896000 – 896FFF
United Kingdom	400000 – 423FFFF
United Rep of Tanzania	080000 – 080FFF
United States	A00000 - AFFFFF
Uruguay	E90000 – E00FFF
Uzbekistan	507C00 – 507FFF
Vanuatu	C90000 – C903FF
Venezuela	0D8000 – 0DFFFF
Viet Nam	888000 – 88FFFF
Yemen	890000 – 890FFF
Zambia	08A000 – 08AFFF
Zimbabwe	004000 – 0043FF

COUNTRY	ADDRESS BLOCK
Non-contracting states	
Yugoslavia	4C0000 – 4C7FFF
Other allocations	
ICAO (1)	F00000 – F07FFF
ICAO (2)	899000 – 8993FF
ICAO (2)	F09000 – F093FF

NOTE: (1) ICAO or the designate administers this block for assigning temporary aircraft addresses if and when an immediate action is to be taken to avoid the assignment of an unauthorized 24-bit aircraft address.

The temporary address is intended to be relinquished as soon as practicable when the 24-bit aircraft address is assigned by a Stat of Registry or common mark registering authority in conformance with the provisions in 4, 5 and 6 of the ICAO Annex 10 Vol. III.

The State concerned is then expected to inform ICAO or the designate regarding the release of the temporary address.

NOTE: (2) Block allocated for special use in the interest of flight safety.

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INDEX

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FOR QUALIFIED SERVICE PERSONNEL ONLY

BATTERY/VOLTAGE INSTRUCTIONS

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WARNING:

HIGH VOLTAGE EQUIPMENT

THIS EQUIPMENT CONTAINS CERTAIN CIRCUITS AND/OR COMPONENTS OF EXTREMELY HIGH VOLTAGE POTENTIALS, CAPABLE OF CAUSING SERIOUS BODILY INJURY OR DEATH. WHEN PERFORMING ANY OF THE PROCEDURES CONTAINED IN THIS MANUAL, HEED ALL APPLICABLE SAFETY PRECAUTIONS.

SAFETY FIRST: TO ALL SERVICE PERSONNEL

REFER ALL SERVICING OF UNIT TO QUALIFIED TECHNICAL PERSONNEL.

WARNING: USING THIS EQUIPMENT IN A MANNER NOT SPECIFIED BY THE ACCOMPANYING DOCUMENTATION MAY IMPAIR THE SAFETY PROTECTION PROVIDED BY THE EQUIPMENT.

CASE, COVER OR PANEL REMOVAL

Removing the Chassis Assembly from the Case Assembly exposes the technician to electrical hazards that can result in electrical shock or equipment damage.

SAFETY IDENTIFICATION IN TECHNICAL MANUAL

This manual uses the following terms to draw attention to possible safety hazards, that may exist when operating or servicing this equipment.

CAUTION: THIS TERM IDENTIFIES CONDITIONS OR ACTIVITIES THAT, IF IGNORED, CAN RESULT IN EQUIPMENT OR PROPERTY DAMAGE (E.G., FIRE).

WARNING: THIS TERM IDENTIFIES CONDITIONS OR ACTIVITIES THAT, IF IGNORED, CAN RESULT IN PERSONAL INJURY OR DEATH.

SAFETY SYMBOLS IN MANUALS AND ON UNITS

CAUTION: This symbol refers to specific CAUTIONS represented on the unit and clarified in the text.

AC OR DC TERMINAL: Terminal that may supply or be supplied with ac or dc voltage.

DC TERMINAL: Terminal that may supply or be supplied with dc voltage.

AC TERMINAL: Terminal that may supply or be supplied with ac or alternating voltage.

SWITCH ON/OFF (Push-Push): Power to the device is connected ON or disconnected OFF.

EQUIPMENT GROUNDING PRECAUTION

Improper grounding of equipment can result in electrical shock.

USE OF PROBES

Check specifications for the maximum voltage, current and power ratings of any connector on the Test Set before connecting it with a probe from a terminal device. Be sure the terminal device performs within these specifications before using it for measurement, to prevent electrical shock or damage to the equipment.

POWER CORDS

Power cords must not be frayed, broken nor expose bare wiring when operating this equipment.

USE RECOMMENDED FUSES ONLY

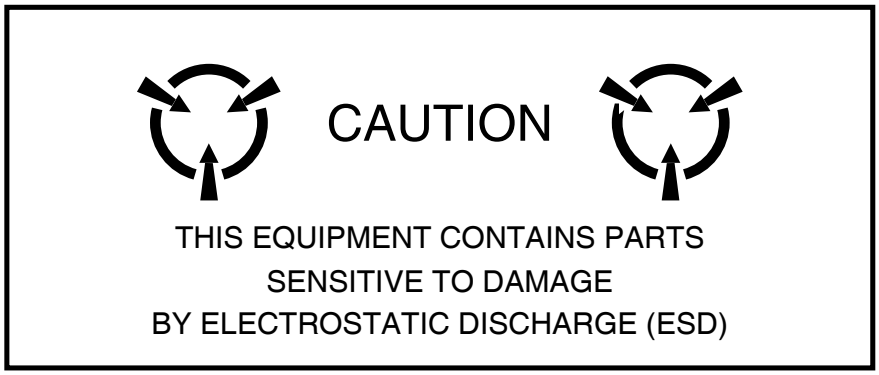
Use only fuses specifically recommended for the equipment at the specified current and voltage ratings.

WARNING: THE ATC-601-2 USES A SEALED-LEAD-BATTERY PACK. THE FOLLOWING WARNINGS CONCERNING LEAD-ACID BATTERIES MUST BE HEEDED:

- **DO NOT RECHARGE OUTSIDE THE ATC-601-2.**
- **DO NOT CRUSH, INCINERATE OR DISPOSE OF IN NORMAL WASTE.**
- **DO NOT SHORT CIRCUIT OR FORCE DISCHARGE AS THIS MIGHT CAUSE THE BATTERY TO VENT, OVERHEAT OR EXPLODE.**

CAUTION: INTEGRATED CIRCUITS AND SOLID STATE DEVICES SUCH AS MOS FETS, ESPECIALLY CMOS TYPES, ARE SUSCEPTIBLE TO DAMAGE BY ELECTROSTATIC DISCHARGES RECEIVED FROM IMPROPER HANDLING, THE USE OF UNGROUNDED TOOLS AND IMPROPER STORAGE AND PACKAGING. ANY MAINTENANCE TO THIS UNIT MUST BE PERFORMED WITH THE FOLLOWING PRECAUTIONS:

- BEFORE USE IN A CIRCUIT, KEEP ALL LEADS SHORTED TOGETHER EITHER BY THE USE OF VENDOR-SUPPLIED SHORTING SPRINGS OR BY INSERTING LEADS INTO A CONDUCTIVE MATERIAL.
- WHEN REMOVING DEVICES FROM THEIR CONTAINERS, GROUND THE HAND BEING USED WITH A CONDUCTIVE WRISTBAND.
- TIPS OF SOLDERING IRONS AND/OR ANY TOOLS USED MUST BE GROUNDED.
- DEVICES MUST NEVER BE INSERTED INTO NOR REMOVED FROM CIRCUITS WITH POWER ON.
- PC BOARDS, WHEN TAKEN OUT OF THE SET, MUST BE LAID ON A GROUNDED CONDUCTIVE MAT OR STORED IN A CONDUCTIVE STORAGE BAG. REMOVE ANY BUILT-IN POWER SOURCE, SUCH AS A BATTERY, BEFORE LAYING PC BOARDS ON A CONDUCTIVE MAT OR STORING IN A CONDUCTIVE BAG.
- PC BOARDS, IF BEING SHIPPED TO THE FACTORY FOR REPAIR, MUST BE PACKAGED IN A CONDUCTIVE BAG AND PLACED IN A WELL-CUSHIONED SHIPPING CONTAINER.



CAUTION: SIGNAL GENERATORS CAN BE A SOURCE OF ELECTROMAGNETIC INTERFERENCE (EMI) TO COMMUNICATION RECEIVERS. SOME TRANSMITTED SIGNALS CAN CAUSE DISRUPTION AND INTERFERENCE TO COMMUNICATION SERVICES OUT TO A DISTANCE OF SEVERAL MILES. USERS OF THIS EQUIPMENT SHOULD SCRUTINIZE ANY OPERATION THAT RESULTS IN RADIATION OF A SIGNAL (DIRECTLY OR INDIRECTLY) AND ENSURE COMPLIANCE WITH INSTRUCTIONS IN FAA CIRCULAR AC 170-6C, DATED FEBRUARY 19, 1981.

FOR QUALIFIED SERVICE PERSONNEL ONLY

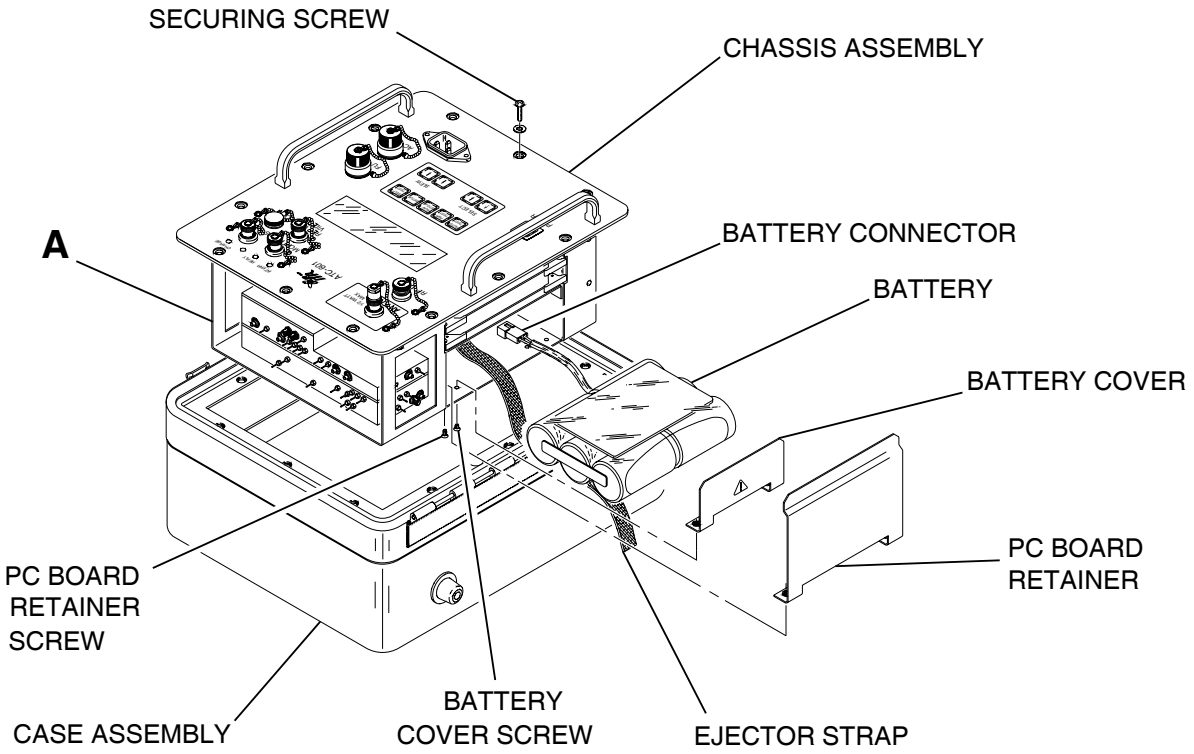
Refer to Figure 1.

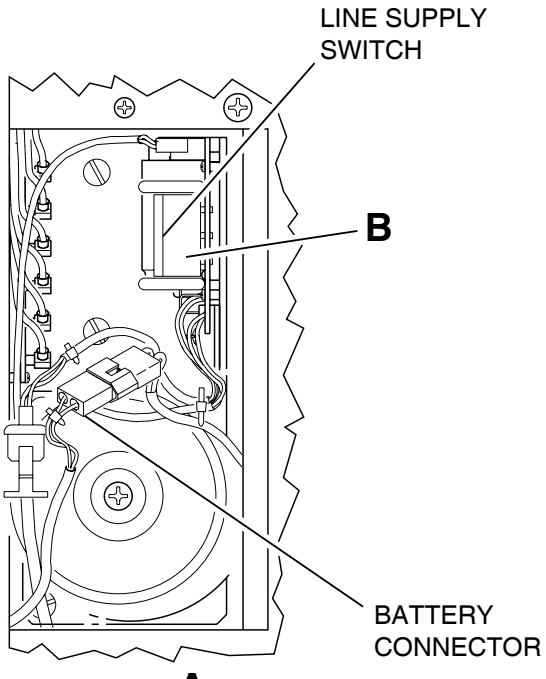
BATTERY REPLACEMENT

STEP	PROCEDURE
1.	Verify ATC-601-2 is Off and not connected to ac power.
2.	Remove 12 securing screws and lift Chassis Assembly from Case Assembly.
3.	Pull out battery connector from underneath middle of Chassis Assembly and disconnect.
4.	Remove two PC board retainer screws from bottom of Chassis Assembly and remove PC board retainer.
5.	Remove two battery cover screws from bottom of Chassis Assembly and remove battery cover.
6.	Pull ejector strap to remove battery from Chassis Assembly.
	WARNING: DISPOSE OF OLD BATTERY ACCORDING TO STANDARD SAFETY PROCEDURES.
	⚠ **CAUTION:** REPLACE ONLY WITH THE BATTERY SPECIFIED BY AEROFLEX. DO NOT ATTEMPT TO INSTALL A NON-RECHARGEABLE BATTERY.
7.	Install new battery in front of ejector strap.
8.	Reinstall battery cover and two battery cover screws in Chassis Assembly.
9.	Reinstall PC board retainer and two PC board retainer screws in Chassis Assembly.
10.	Connect battery connector and tuck back underneath middle of Chassis Assembly.
11.	Reinsert Chassis Assembly into Case Assembly.
12.	Reinstall 12 securing screws.
	CAUTION: REPLACING NYLON WASHERS IS RECOMMENDED TO MAINTAIN WATER RESISTANCE CAPABILITY WHEN REINSTALLING CHASSIS ASSEMBLY INTO CASE ASSEMBLY.

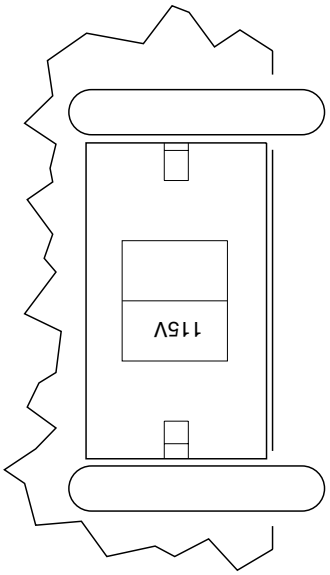
LINE SUPPLY SWITCH

STEP	PROCEDURE
1.	Verify ATC-601-2 is Off and not connected to ac power.
2.	Remove 12 securing screws and lift Chassis Assembly from Case Assembly.
3.	Position Chassis Assembly for access to Line Supply Switch.
4.	If power source is 100 to 120 VAC at 60 Hz, set Line Supply Switch to ***115***.
	If power source is 220 to 240 VAC at 50 Hz, set Line Supply Switch to ***230***.
5.	Reinsert Chassis Assembly into Case Assembly.
6.	Reinstall 12 securing screws.
	CAUTION: REPLACING NYLON WASHERS IS RECOMMENDED TO MAINTAIN WATER RESISTANCE CAPABILITY WHEN REINSTALLING CHASSIS ASSEMBLY INTO CASE ASSEMBLY.





DETAIL **A**



DETAIL **B**

8107028

Battery Removal and Line Supply Switch Location
Figure 1

As we are always seeking to improve our products, the information in this document gives only a general indication of the product capacity, performance and suitability, none of which shall form part of any contract. We reserve the right to make design changes without notice.

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AEROFLEX

Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven, customer-focused.