

TM-8040000718

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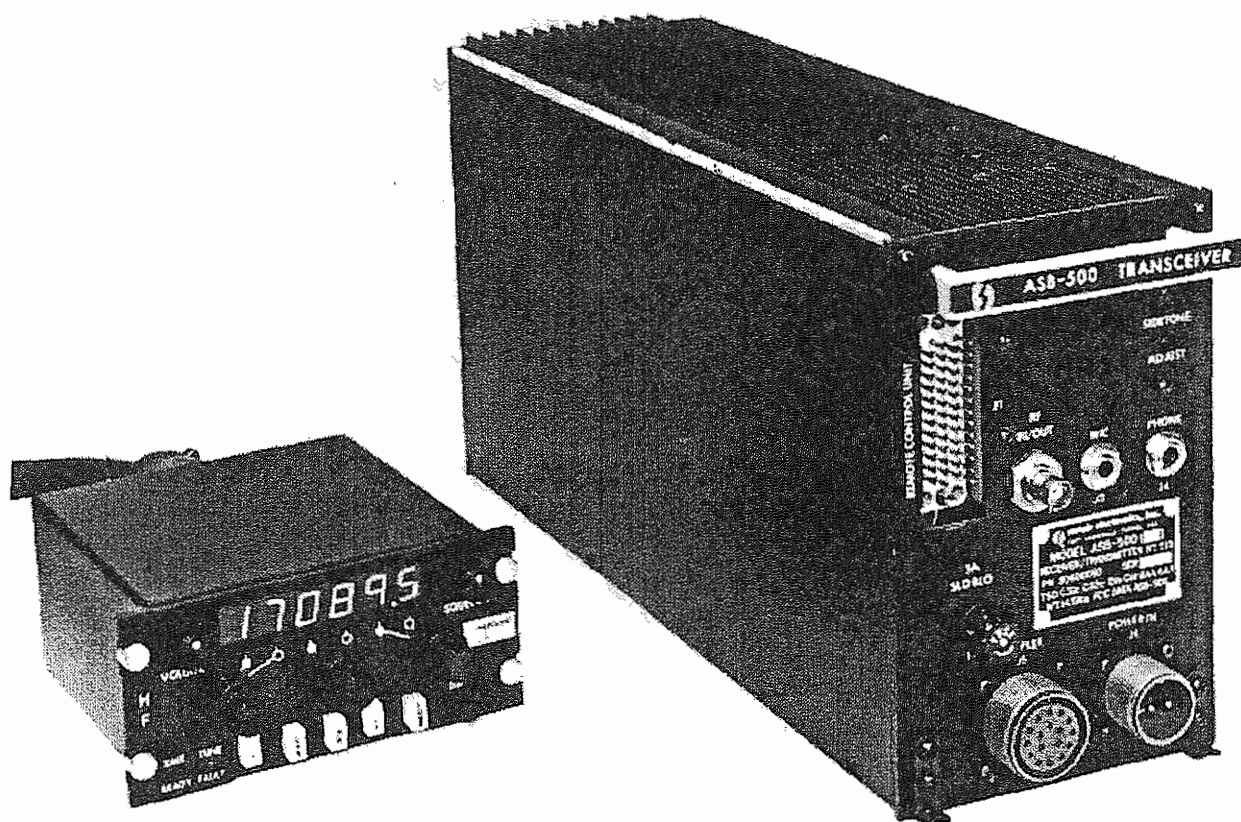
AIRBORNE TRANSCEIVER  
HF/SSB SYNTHESIZED  
SYSTEM

ASB-500

INSTALLATION and OPERATION  
MANUAL



SUNAIR 3101 SW Third Avenue, Ft. Lauderdale, FL 33315-3389



ASB-500

# INSTALLATION AND OPERATION MANUAL

FOURTH EDITION, JULY 1995  
ACU-150D SUPPLEMENT INCLUDED  
MANUAL PART NUMBER 8040000718

## SECTION I

### GENERAL INFORMATION

#### 1.1 SCOPE

The manual contains the necessary information to install and operate the ASB-500 Transceiver, and includes additional information required to test the Transceiver.

#### 1.2 TRANSCEIVER DESCRIPTION

##### 1.2.1 GENERAL

The ASB-500 is a high quality single sideband Transceiver covering the frequency range of 2.0000 to 17.9995 MHz. Modes of operation are Upper Sideband (USB), Lower Sideband (LSB Optional), and amplitude Modulation (AME). The Transceiver is fully solid state and frequency is synthesized in 500 Hz steps. The unit is designed to meet FCC requirements for Part 87, and FAA TSO C31c and C32c.

The ASB-500 is composed of two major assemblies: the Receiver/Transmitter (RT-510) and the Remote Control Head (SCU-55).

##### 1.2.2 RECEIVER/TRANSMITTER - 1A

The Receiver/Transmitter contains the frequency synthesizer as well as all receive and transmit circuitry. The synthesizer provides the local oscillator frequencies (selected from the Remote Control Head) in 500 Hz steps. All frequencies are derived from an ovenized crystal oscillator which provides frequency stability of  $1 \times 10^{-6}$  Hz over the full specified ambient temperature range of the radio after a two minute warm-up.

The Receiver/Exciter circuits employ high quality crystal filters both in the front end of the radio and in the IF section for sideband selection. The first IF is 33.6 MHz, well above the 18 MHz upper limit of the Transceiver, providing an unusually high spurious signal rejection found only in this modern frequency scheme.

Bandpass filtering is included in the Receiver/Exciter circuitry to remove harmonics and spurious from the Exciter, and eliminate out of band interference in the Receiver. Additional low pass filtering is provided at the output of the power amplifier for harmonic rejection.

Multiple voltage regulation is used to provide superior power supply transient suppression. The aircraft supply is first filtered, then regulated to 18 VDC (used by the oven standard), and finally regulated to 12 VDC for use by the Transceiver low level circuitry. The 12 VDC is further regulated on the synthesizer board to 5 VDC for use by the digital circuits.

##### 1.2.3 REMOTE CONTROL - 2A

The remote control head contains the switches which supply digital frequency information to the synthesizer in the Receiver/Transmitter unit, and to the LED display drivers. Also included are the VOLUME and SQUELCH controls, an auxiliary DIMMER control, coupler status lights, and a push-button MODE switch.

Both printed boards used in the control head are plug-in for easy removal and servicing.

### 1.3 TECHNICAL SPECIFICATIONS

TEMPERATURE: Electrical and physical specifications of the Sunair ASB-500 Transceiver are listed below.

#### 1.3.1 GENERAL

APPROVALS: US FCC type accepted to part 87. US FAA authorized to TSO C31c and C32c.

FREQUENCY RANGE: 2.0 to 17.9995 MHz (500 Hz steps).

NUMBER OF CHANNELS: 32,000 synthesized.

FREQUENCY RESOLUTION: 500 Hz steps, Digital LED readout.

FREQUENCY STABILITY:  $\pm 20$  Hz maximum overrated temperature range.

OPERATING MODES: USB, AME, (LSB Optional).

DUTY CYCLE: Voice, continuous.

ENVIRONMENTAL CATEGORY: BAAAAX, TSO C31a and C32c.

ALTITUDE: 30,000 Ft.

TEMPERATURE: Non-operating:  $-50^{\circ}$  to  $+71^{\circ}$ C.  
Short term operating:  $+71^{\circ}$ C.  
Operating:  $-46^{\circ}$ C to  $+55^{\circ}$ C. (TSO Cat. B)

VIBRATION: 10 to 500 Hz, 5g peak - (TSO Cat. A) (control head: 10 to 500 Hz, 1.5g max.; 0.25g from 55 to 500 Hz - TSO Cat. C)

HUMIDITY: 95% at  $+50^{\circ}$ C.

SHOCK: 15g peak, 11 ms duration.

POWER INPUT: 27.5 VDC  $+10\%$ ,  $-20\%$ , at 2.7A Receive 13A peak Transmit.

#### DIMENSIONS:

Transceiver - 1/2 ATR long case. 4.875W x 7.625H x 15.5L (inches). 12.38W x 19.37H x 39.37L (cm).  
Add 1.625"H (4.13H cm) for shockmount.  
Control Head: 5.75W x 2.625H x 5.0D(inches).  
14.61W x 6.67H x 12.70D (cm).

WEIGHT: Transceiver 16.0 lbs (7.2Kg.) 17.5 lb. (7.9Kg.) with shockmount.  
Control head: 1.8 lbs (0.8 kg).

**1.3.2 RECEIVER**

## SENSITIVITY:

SSB - 0.5  $\mu$ V max. into 50 Ohms for 10dB S+N/N.  
AM - 3.0  $\mu$ V max. into 50 Ohms for 10dB S+N/N.

## SELECTIVITY:

SSB - 350 Hz max. to 2500 Hz min. at -6 dB.  
6.0 kHz max. at -60 dB.  
AM - 5.0 kHz min. at -6 dB.  
20 kHz max. at -60 dB.

AUDIO OUTPUT: 50 mW into 600 Ohms and 150 Ohms, unbalanced.

AUDIO DISTORTION: Less than 10% at 50 mW.

GAIN: 10  $\mu$ V nominal for 50 mW audio output.

IF REJECTION: Not less than -70 dB.

IMAGE REJECTION: Not less than -80 dB.

AGC: Fast attack, slow release.  
Threshold: 5  $\mu$ V nominal.  
10 dB max audio change for 94 dB RF input change.

INTERNAL SPURIOUS RESPONSE: 99.5% below equivalent 0.2  $\mu$ V noise input at antenna terminals.

EXTERNAL SPURIOUS RESPONSE: -65 dB below 10 dB S+N/N reference.

**1.3.3 TRANSMITTER**

## POWER OUTPUT:

SSB - 100 Watts PEP  $\pm$ 1dB.  
AM - 35 Watts carrier, nominal.

HARMONIC & SPURIOUS SUPPRESSION: -40 dB.

CARRIER SUPPRESSION: -40 dB.

UNDESIRED SIDEBAND SUPPRESSION: -50 dB at 1.5 kHz.

INTERMODULATION DISTORTION: -29 dB below 2 tone PEP output.

HUM AND NOISE LEVEL: -40 dB.

**SUNAIR ASB-500****1.4 EQUIPMENT SUPPLIED**

The following table is a list of equipment, with their appropriate Sunair part numbers, supplied with the ASB-500 Transceiver.

	<u>Sunair Part No.</u>
1.4.1 Receiver/Transmitter, RT-510	8040000599
1.4.2 Remote Control Head, SCU-55	8040400091
1.4.3 Operation and Maintenance Manual	8040000700
1.4.4 Installation Kit, consisting of:	8040001595
Shockrack with isolators	8040001790
Connector, RF, BNC, UG-88/U	0744030005
Connector, Power, 2 Pin Round.	0754530001
Connector, Coupler, 17 Pin Round.	0754630005
Connector, Control , RT-510 (Power 50 Pin Rect.)	1003390030
Connector, Control, SCU-55 (Power 61 Pin Round.)	0754510000
Connector, Audio, SCU-55 (Power 14 Pin Rect.)	0754940004
Cable Clamp	0754270009
Cable Clamp	1000200001
Reducing Adapter	1001250028
Manual, Installation and Operation	8040000718

**1.5 EQUIPMENT REQUIRED BUT NOT SUPPLIED**

	<u>Sunair Part No.</u>
1.5.1 Antenna Coupler, ACU-150D	8064201098
1.5.2 Antenna, wire or integral airframe.	
1.5.3 Microphone, noise cancelling.	0871510006
1.5.4 600 ohm headphones.	0840180004
1.5.5 Cable Assembly, Power (specify length) 2 conductor.	8033008504
1.5.6 Cable Control, RT-510 to SCU-55 (specify length).	8040007500

**NOTE:**

All cables may be fabricated by the installer in accordance with Figure 2.

**1.6 OPTIONAL EQUIPMENT - NOT SUPPLIED**

	<u>Sunair Part No.</u>
1.6.1 Encapsulated Anti-Precipitation Static Wire Antenna Kit.	0951580001
1.6.2 Microphone, Noise Cancelling	0871510006
1.6.3 Spare Board Kit ASB-500	8040900093
1.6.4 Spare Parts Kit ASB-500	8040900590
1.6.5 Ancillary Kit, consisting of: Extender card Key, Hexspline socket	8040001293 8040002591 0882100009
1.6.6 Headphones	0840180004
1.6.7 Lower Sideband (Factory Installed)	8040050804

**CAUTION**

TO INSURE THAT CABLE HAS NOT BEEN DAMAGED DURING SHIPMENT, ALL CABLE ASSEMBLIES MUST BE CHECKED FOR CONTINUITY OR SHORTS, FROM PIN TO PIN, BETWEEN CONNECTORS BEFORE INITIAL RADIO OR SYSTEM POWER UP.

**WARNING**

CONNECTORS INSTALLED BY THE CUSTOMER MUST BE WIRED IN ACCORDANCE WITH INSTALLATION INSTRUCTIONS PROVIDED IN THE OPERATION AND MAINTENANCE MANUAL. THE CABLE MUST BE CONTINUITY CHECKED AFTER INSTALLATION AND PRIOR TO RADIO OR SYSTEM POWER UP.



## SECTION II

### INSTALLATION

#### 2.1 GENERAL

Section II contains all necessary instructions for the unpacking, inspection, and if necessary, reshipping of damaged equipment or parts. In addition, further information regarding location and mounting considerations, power requirements, antenna and ground system hook-ups and final checkouts after installation is also provided.

#### 2.2 UNPACKING AND INSPECTION

As soon as you have received your unit(s), unpack and inspect all components and accessories. Check the packing list to be sure you have received all items ordered, and that all items necessary for operation have been ordered.

**NOTE:**

Be sure to retain the carton and its associated packing materials should it be necessary to reship damaged equipment.

Do not accept a shipment when there are visible signs of damage to the cartons until a complete inspection is made. If there is a shortage of items or any evidence of damage, insist on a notation to that effect on the shipping papers before signing the receipt from the carrier. If concealed damage is discovered after the shipment has been accepted, notify the carrier immediately in writing and await his inspection before making any disposition of the shipment. A full report of the damage should also be forwarded to Sunair's Product Services Department. Please be sure to include the following information for prompt service:

- a) ORDER NUMBER.
- b) MODEL AND SERIAL NUMBER.
- c) NAME OF TRANSPORTATION AGENCY.
- d) APPLICABLE DATES.

Upon receipt of this information arrangements will be made, by Sunair, for repair or replacement.

#### 2.3 RETURN OF EQUIPMENT TO FACTORY

The shipping carton for the ASB-500 has been designed to protect the equipment during shipment. The container and its associated packing materials should be used to reship the unit. When necessary to return equipment to Sunair for warranty or non-warranty repair, an authorization number is required. This number can be obtained from our Product Services Department:

TELEPHONE: (954) 525-1505,

FACSIMILE: (954) 765-1322.

If the original shipping carton is not available, be sure to carefully pack each unit separately, using suitable cushioning material where necessary. Very special attention should be given to providing enough packing material around connectors and other protrusions from the unit. Rigid cardboard should be placed at the corners of the equipment to protect against denting. DO NOT USE DUNNAGE (STYROFOAM PEANUTS) FOR PACKING PROTECTION, they may allow the unit to shift while being shipped, and, therefore, become damaged.

## SUNAIR ASB-500

When returning subassemblies or components for repair or replacement, be sure to pack each separately, using suitable cushioning material.

Shipment to be made PREPAID consigned to:

Sunair Electronics, Inc.  
Product Services Department  
3101 SW Third Avenue  
Fort Lauderdale, Florida 33315-3389  
U.S.A.

Plainly mark with indelible ink all mailing documents as follows:

US Goods Returned For Repair  
Value For Customs - \$(Amount)

Mark ALL SIDES of the package:

**FRAGILE - ELECTRONIC EQUIPMENT!**

**NOTE:**

Before shipping, carefully inspect the package to be sure it is marked properly and is securely wrapped.

## **2.4 GENERAL INSTALLATION AND MOUNTING INFORMATION**

General instructions for installation and mounting are given for the ASB-500. Satisfactory operation of this equipment will depend upon the care and thoroughness taken during installation.

### **2.4.1 GENERAL INFORMATION**

- a. The location of the Receiver/Transmitter is not critical and may be placed anywhere there is available space within the fuselage. However, to minimize transmit power loss in coaxial cables connecting the transceiver to the antenna coupler, it is desirable to mount the transceiver in the same general area as the antenna coupler.

**NOTE:**

Installation of the Receiver/Transmitter must conform to the Altitude/Temperature restrictions detailed in the equipment specifications.

- b. Install the Remote Control Head in the cockpit in any convenient location.
- c. The installations should be carefully planned beforehand in accordance with the drawings on the following pages.

## **2.5 POWER REQUIREMENTS**

The ASB-500 is designed to operate from a nominal 27.5 VDC +10%, -20%, source. The system should be connected to the source through the aircraft circuit breaker panel, using a 20 ampere breaker. The Antenna Coupler receives its power from the Transceiver through a 5 amp Slo Blo fuse mounted on the Transceiver front panel. All low level voltages used in the Remote Control are current limited to safe levels by voltage regulators and do not require fusing. Power used in the low level stages of the Transceiver is current limited, but is also fused inside the unit by a 5 amp standard fuse to protect against voltage regulator failure.

## 2.6 GROUNDING REQUIREMENTS

### 2.6.1 GENERAL

Connect the ground straps provided on the mounting rack securely to the aircraft frame.

## 2.7 CABLE FABRICATION

### 2.7.1 GENERAL

The cables listed in paragraph 1.5 must be wired to their appropriate connectors as shown in Figure 2.8, Interconnect Wiring Diagram.

All cables are available from Sunair with the exception of the audio wiring from Remote Control Head connector 2A3J2. Since this wiring must be routed to various locations in the aircraft instrument panel, the installer should fabricate this cable using standard aircraft installation practices.

2.7.1.1 If no main cockpit dimmer exists, or control head dimming independent of the main cockpit dimmer is desired, connect a jumper in connector 2A3P2 between pins P and H. If this is done, do not connect pin H to the main cockpit dimmer. Now the full dimming range is available using the control head dimmer only.

### 2.7.2 CHECKS AFTER FABRICATION

#### 2.7.2.1 SYNTHESIZER PROGRAMMING

Each cable must be checked for continuity and short circuits to other pins. Wiring between the Control Head and the Transceiver is pin to pin: "A" to "A", "B" to "B", etc. In order to be certain the synthesizer is being programmed correctly, it is necessary that the output carrier frequency be checked with a counter. Each decade frequency must be checked from 0 to 9 to verify that the wiring of cable 8040007500 is correct. See Figure 2.1 for a recommended test set-up to verify operation on the bench.

Rotate each frequency switch through all ten positions and check for the correct frequency readout on the counter. The 500 Hz dial alternates between "5" and "0" as the switch is rotated. The 10 MHz switch when rotated from the fully CCW position will show a blank, then a "1", and finally a "0". The "0" position is superfluous and shuts down the transceiver. The Remote Control display will flash, denoting an out of limit condition.

**NOTE:**

Any frequency selected below 2.0000 MHz or above 17.9995 MHz is out of limit which will cause the frequency display to flash and will shut down the radio. A "0" in the 10 MHz position is also an out of limit condition.

#### 2.7.2.2 BAND SWITCHING

Bandpass filters are located on the first mixer board and low pass filters are located in the Filter Module. These filters are automatically switched by the 10 MHz and 1 MHz frequency switches in the Control Head.

Operation of these filters may be checked by monitoring the AM carrier output in each band. The bands are divided as follows:

Freq. MHz	Band
2-2.9995	1
3-3.9995	2
4-5.9995	3
6-8.9995	4
9-12.9995	5
13-17.9995	6

Connect the equipment as shown in Figure 2.2.

Depress the ON push button, depress the AM Mode push button and set the frequency for the middle of each band. Key microphone and check for approximately 35 watts power output in each band. If the bands are not being switched properly, the power output will be essentially zero on the wattmeter in the nonoperating band:

**NOTE:** If the band channel drive motor can be heard continuously rotating in the Transceiver, this is generally an indication that two or more band lines are grounded within the cable or connectors.

### 2.7.2.3 MISCELLANEOUS CHECKS

Other functions that must be verified are shown in the following chart:

	<u>Symptom</u>
1. VOLUME control	no audio
2. SQUELCH control	no squelch fully CCW
3. TUNE command	coupler doesn't start to tune
4. FAULT indicator	no fault light when system is first turned on
5. TUNE indicator	no tune light during coupler tune
6. READY indicator	no green ready light after successful coupler tune

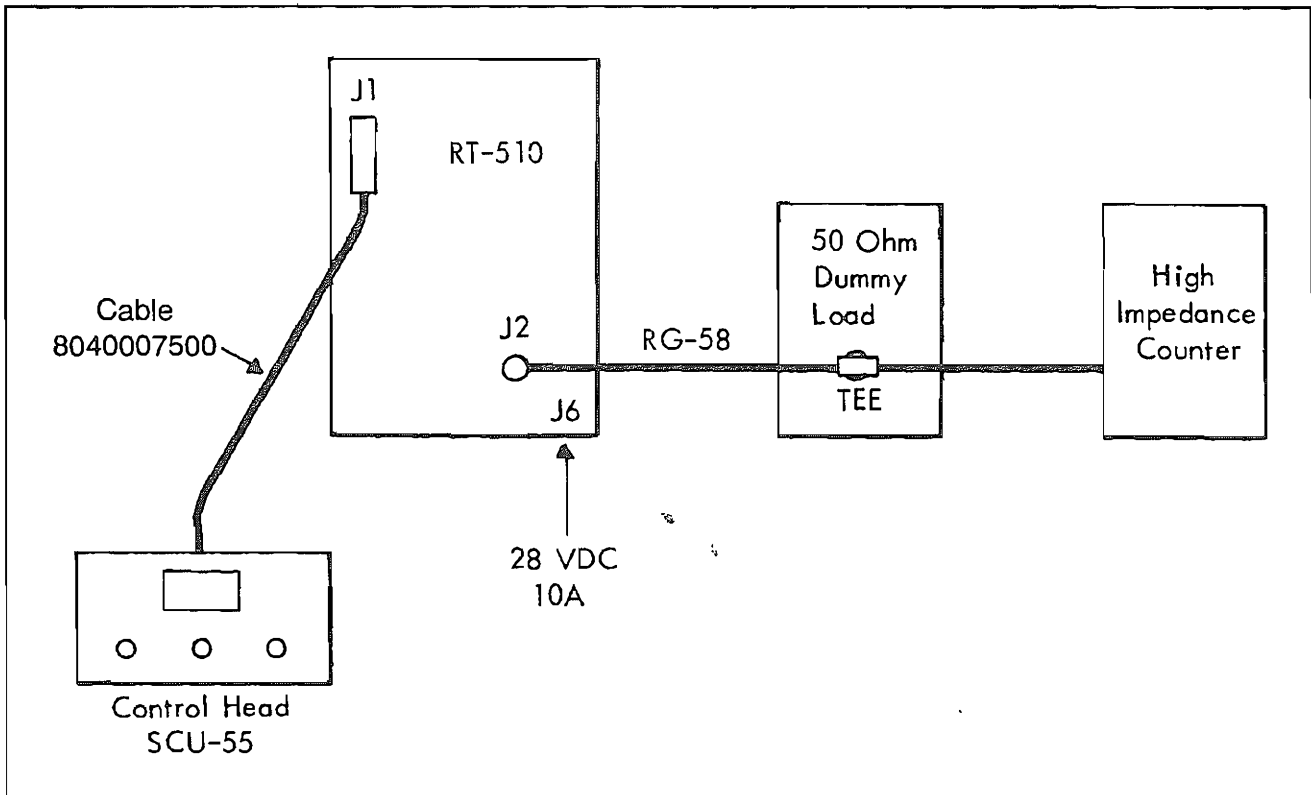


Figure 2.1 Test Set-up for Synthesizer Programming.

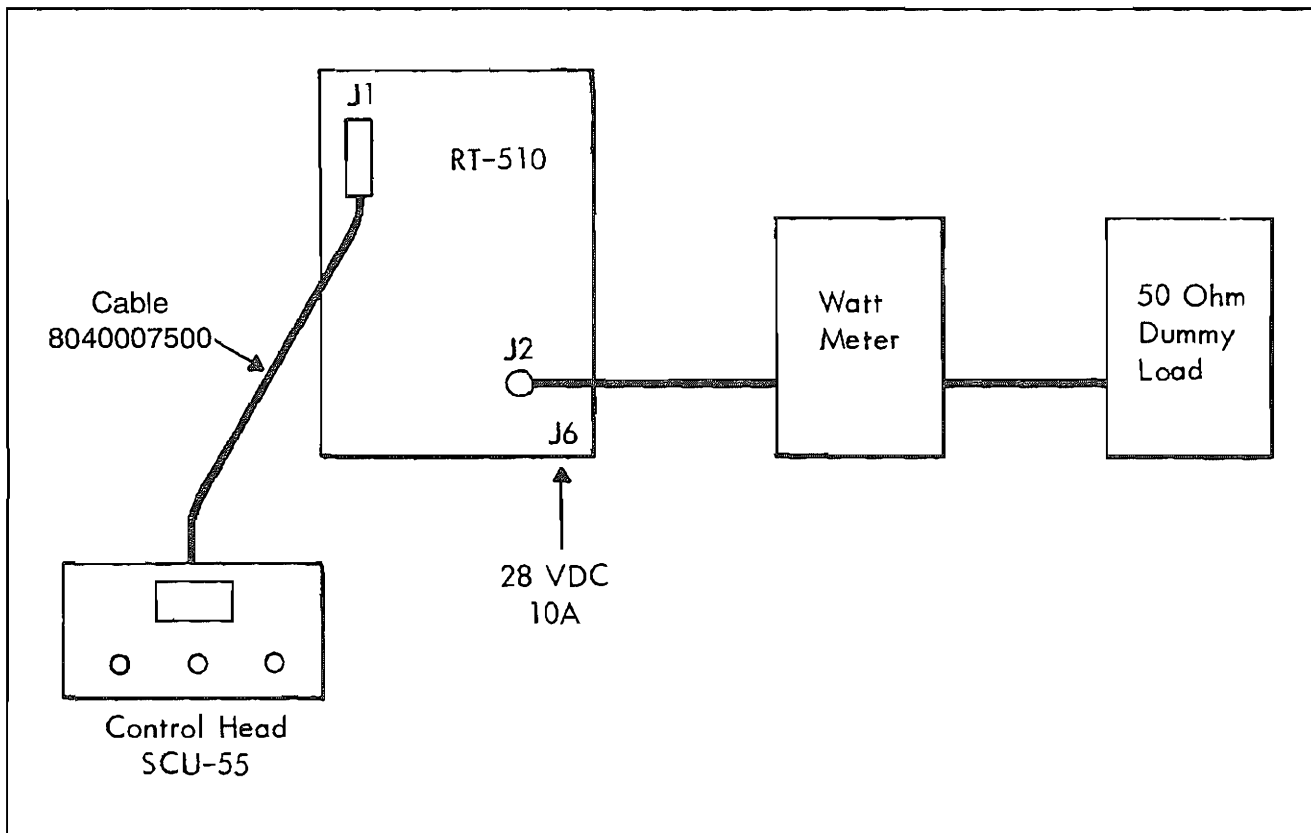


Figure 2.2 Band Switching Test Set-up.

## 2.8 ANTENNA INSTALLATION

### 2.8.1 GENERAL

The installation of a high frequency antenna on an aircraft requires the consideration of two prime factors: the shape or configuration of the antenna must allow the transceiver to transmit and receive efficiently; the appearance of the antenna must be pleasing and the flight characteristics must not drastically alter aircraft performance.

However, in many cases, in an effort to achieve a pleasing appearance, the antenna is located in a position which drastically reduces its efficiency or radiation characteristics. So care must be taken to select an antenna that does not overly favor any one factor to the detriment of the others.

### 2.8.2 FACTORS TO BE CONSIDERED

In order to select the best antenna, consideration must be given to the following factors:

1. Type of aircraft
  - a. Size, shape, airspeed
2. Required communications range
3. Transmitter frequencies
4. Antenna flight requirements
5. Possible antenna coupler locations
6. Antenna radiation characteristics.

Aircraft size and shape is important as it may restrict the types of possible antennas. Aircraft speed must be considered, as 260 MPH and faster aircraft cannot generally use a wing tip attached V antenna. This type of aircraft may also operate in icing conditions which adversely affect V antennas more than the straight type.

The end user's communications distance requirements must be considered, particularly if long-range, such as 800 miles and greater, is required on frequencies as low as 6 to 8 MHz. This requires a V antenna or a long straight antenna 35 feet or longer, if ungrounded.

Transmitter frequencies are generally determined by the area of operation and stations to be worked. These in turn can affect the antenna selection. If most of the frequencies are above 5 MHz it is possible to use a shorter or straight antenna, as coupler efficiency above 5 MHz is good regardless of the antenna type.

The antenna aerodynamic requirements are related to the aircraft type and operating capabilities. Generally, the best aerodynamic design results in the poorest radiating antenna when considering only ungrounded antennas, and care must be taken here in order not to degrade the system operation.

The antenna coupler location dictates the location of one end of the antenna. The output of the coupler is the beginning of the antenna and the antenna wire inside the aircraft must be restricted in length, ideally not more than 6 inches to a maximum of 12 inches, unless coax feed is used for the antenna.

The antenna radiation characteristics (how well does it radiate or receive a signal) is generally the hardest to determine. It is always best to install an antenna that has proven to perform well in past installations. The antennas shown on the following pages have all been installed and used with success on various aircraft. Some will work better on one type of aircraft than another, particularly the grounded type. The grounded antenna to the engine nacelle or vertical stabilizer has worked well on many different aircraft. It may be necessary to try several locations and types of antennas in order to satisfy all of the factors outlined here and not overly compromise any one factor.

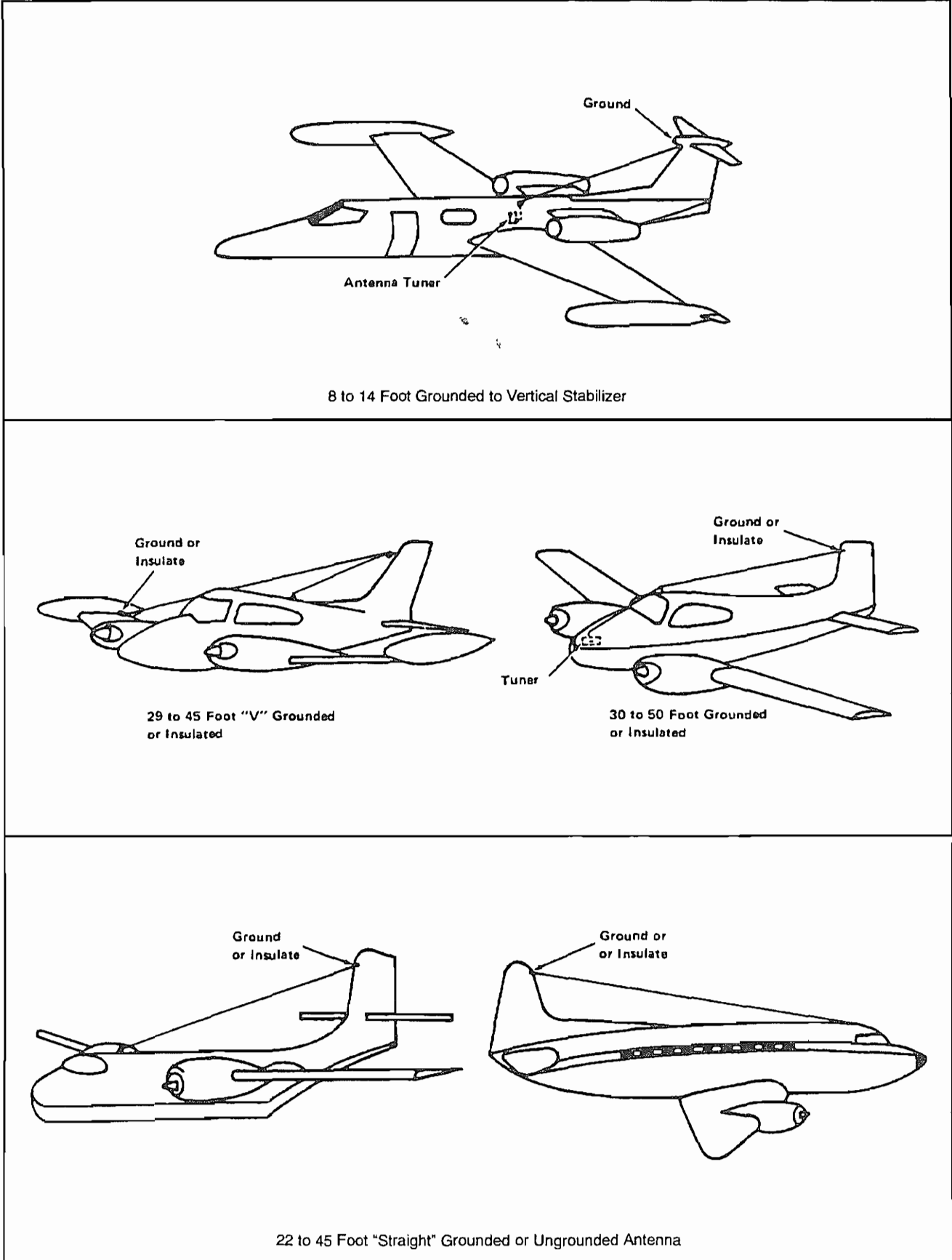


Figure 2.3 Typical Antenna Configurations

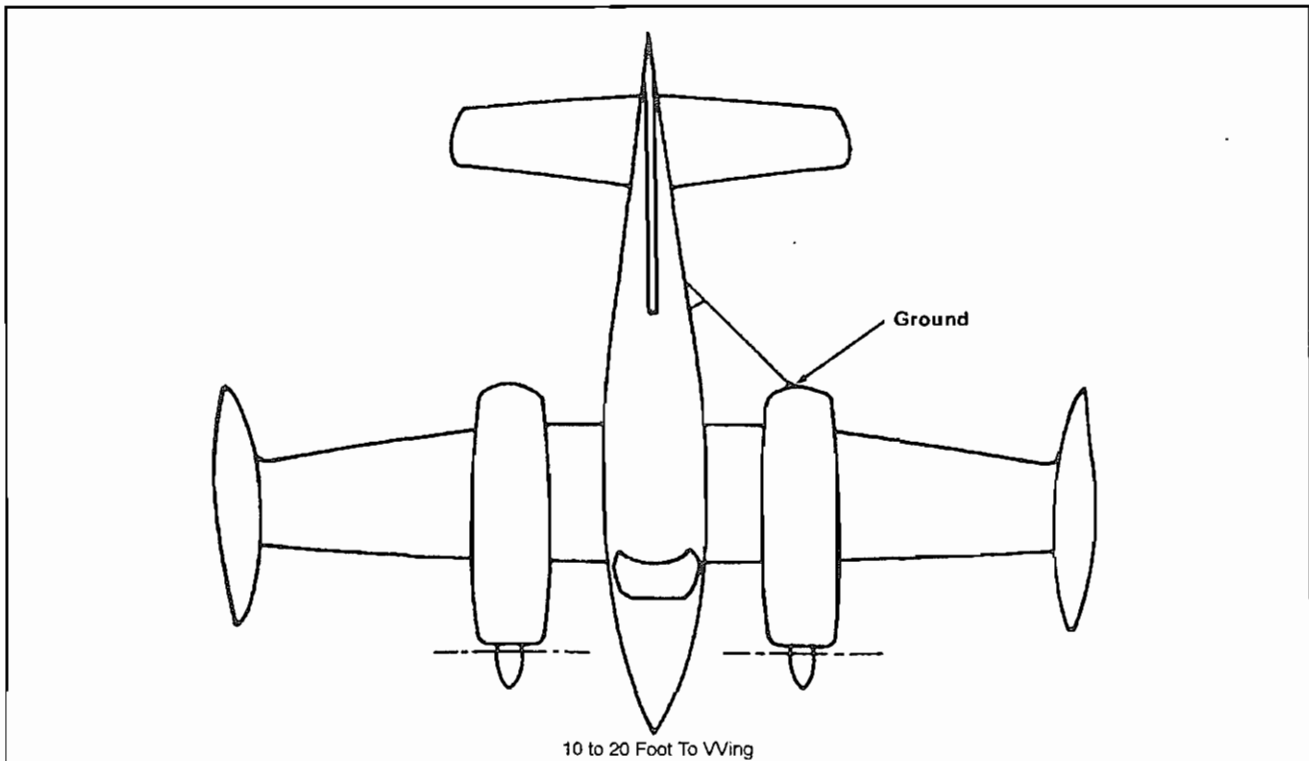
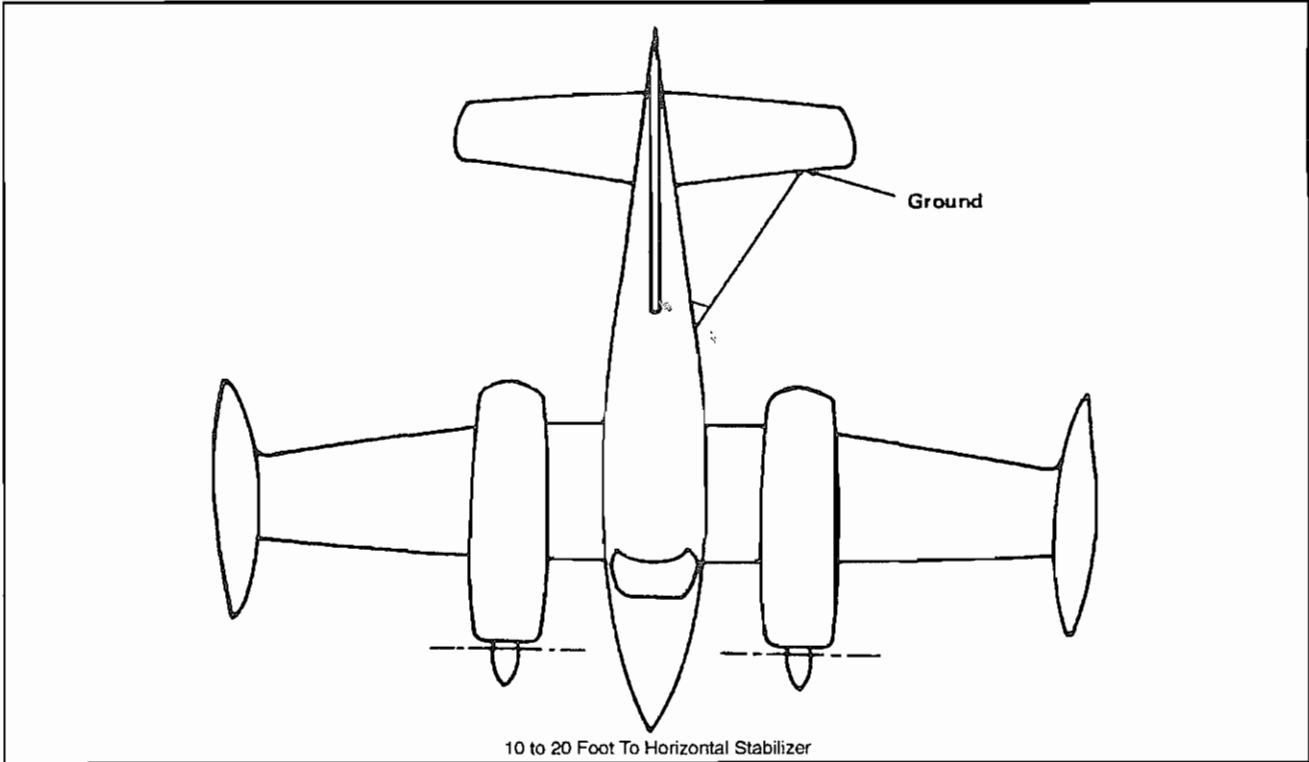


Figure 2.3 Typical Antenna Configurations (Cont.).



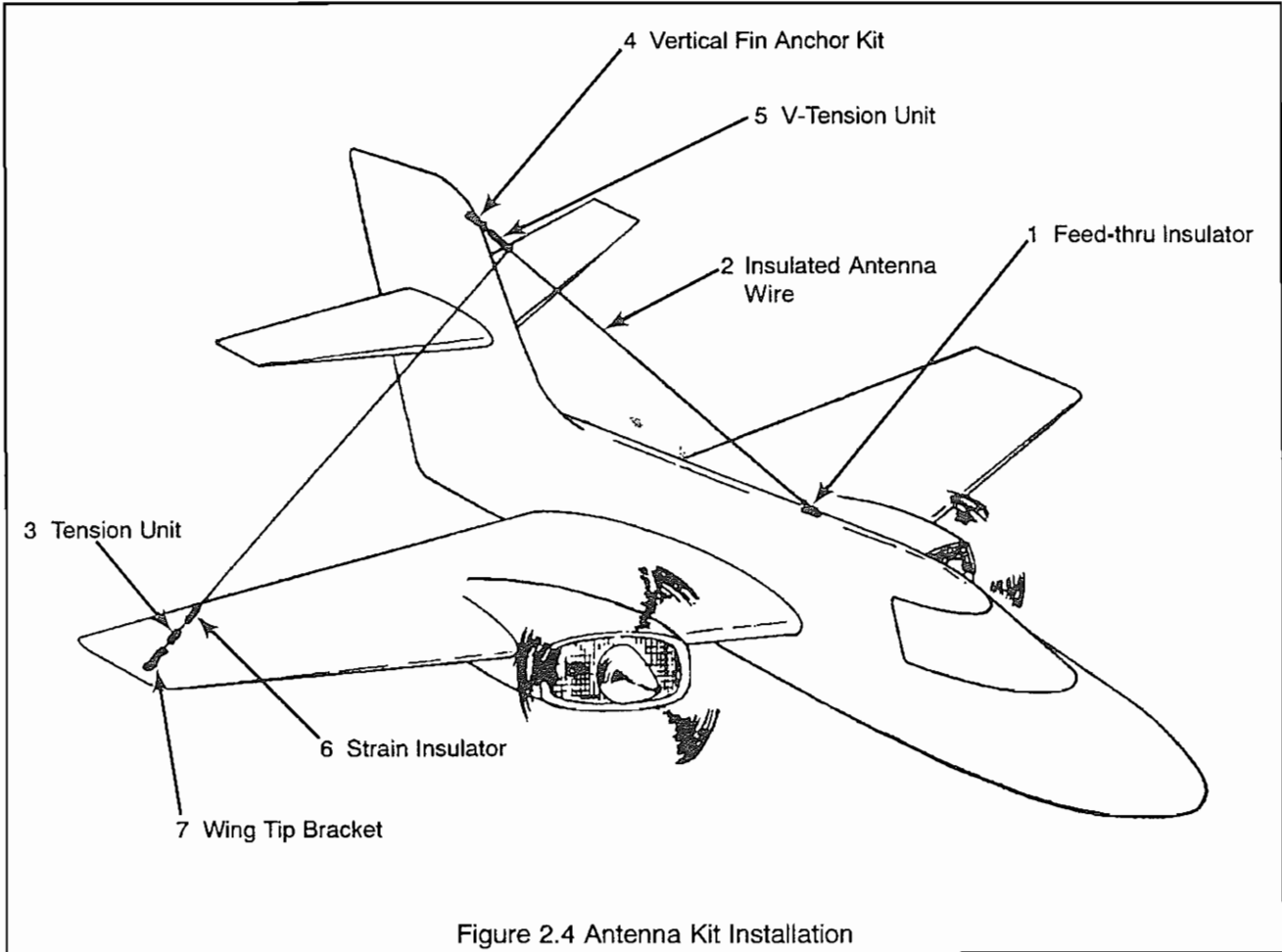


Figure 2.4 Antenna Kit Installation

ANTENNA KIT (ANTI-PRECIP) PN 0951580001	
ITEM	DESCRIPTION
1	Feed-thru Insulator
2	60 Feet Insulated Antenna Wire
3	Tension Unit
4	Vertical Fin Anchor Kit
5	V-Tension Unit
6	Strain Insulator
7	Wing Tip Bracket
8	Wire Retraction Tool, Short
9	Installation Instructions

Table 2.1 Antenna Kit Components

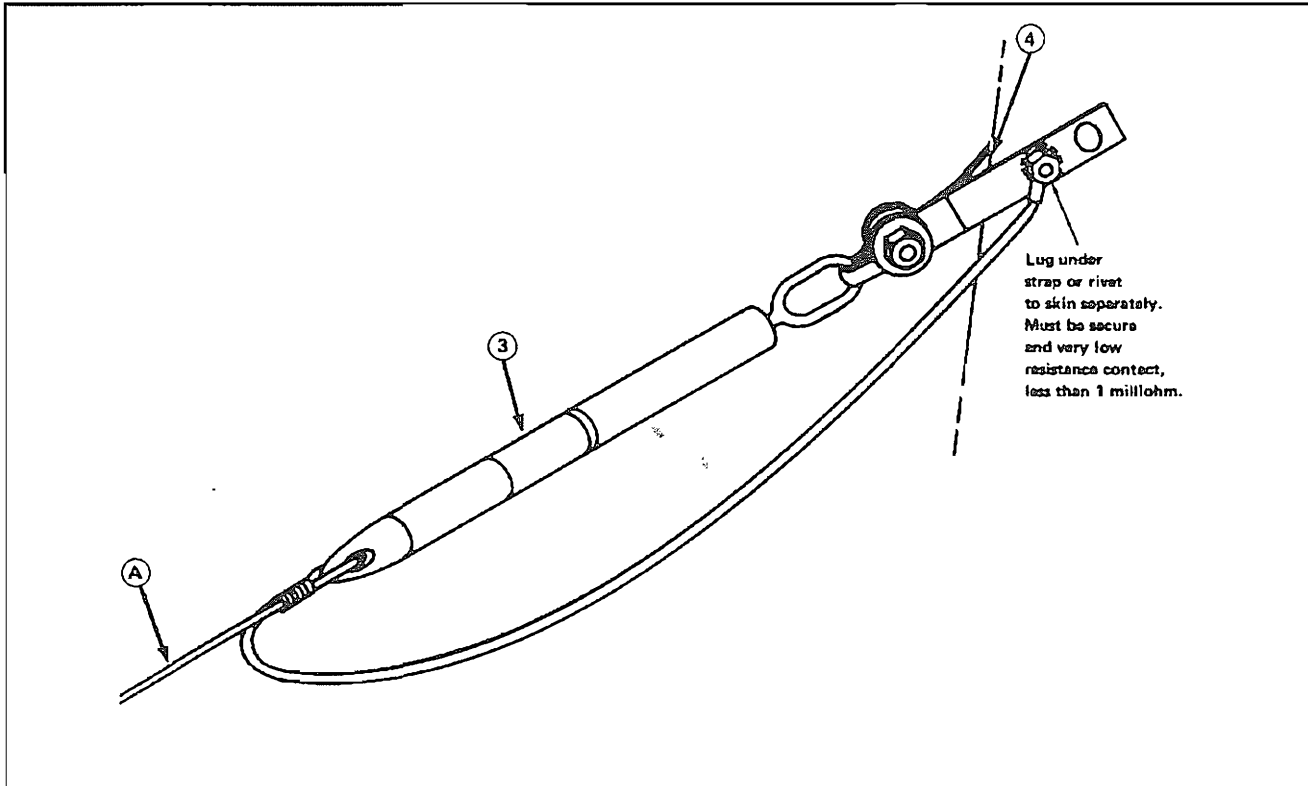


Figure 2.5 Antenna Grounding.

### 2.8.3 ANTENNA KIT INSTALLATION

For information to install the Antenna Kit (PN0951580001) refer to Figure 2.4. Table 2.1 lists the items in the Antenna Kit.

### 2.8.4 ANTENNA GROUNDING METHOD

For straight grounded antennas (see Figure 2.5), the antenna (A) from feed through insulator (Item 1, Table 2.1) is fed through the V-tension unit (Item 5) and clamped or tied with nylon cord (as shown) to proper length. Ground antenna with ground lug to Item 4 of Table 2.1 or aircraft skin. Ground connection **MUST** be secure, low resistance and capable of high current.

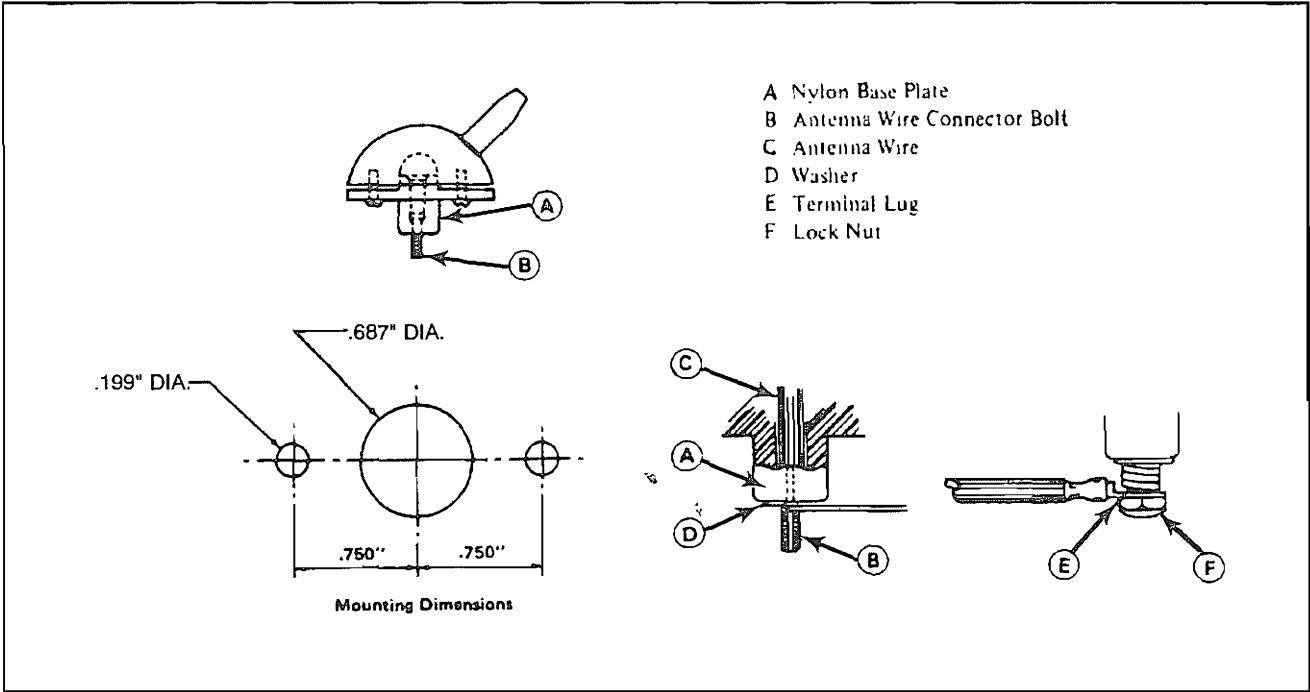


Figure 2.6 Feed-Thru Insulator

**2.8.5 FEED-THRU INSULATOR**

For proper installation of the Feed-Thru Insulator (Item 1 of Table 2.1) refer to Figure 2. 6 and the following text. Strip back polyethylene shield (C) to expose approximately 4" of antenna wire core. Insert core into connector bolt (B) and extract from slot. Insert washer (D) as shown. Wind wire around connector bolt (B) 3 1/2 to 4 turns. Install terminal lug (E) of antenna lead and secure with lock nut (F), as shown in Figure 2. 6.

**2.8.6 V-TENSION UNIT**

Application of an V-Tension Unit (Item 5 of Table 2.1) for a "V" type antenna, refers to Figures 2.4 and 2.7.

The Antenna (A) is connected to the feed-thru insulator (Item 1), Table 2.1) and routed via the vertical stabilizer by the use of the V-tension unit (B), as shown. The end is connected at the wing tip.

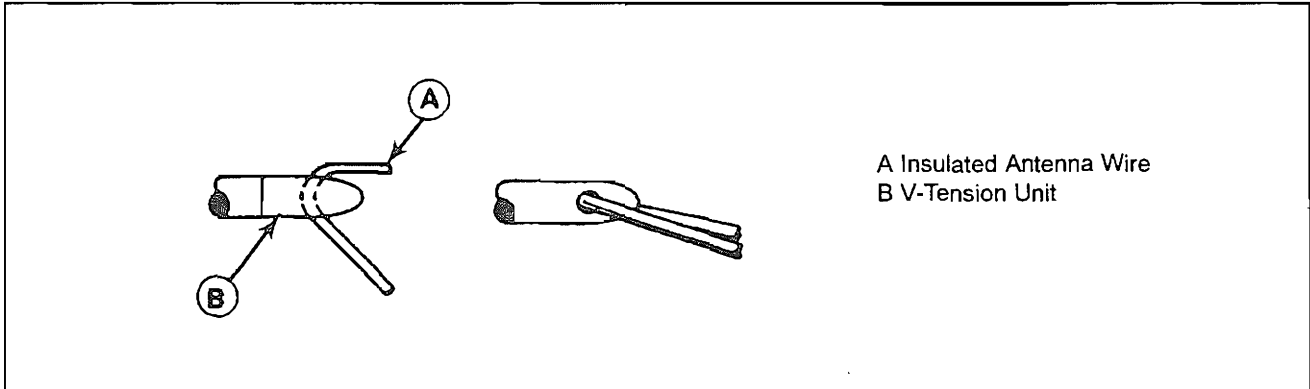


Figure 2.7 V-Tension Unit

## 2.9 SELCAL OPERATION

Audio for operation of Selcal equipment is available through the transceiver front panel phone jack. This audio level is not controlled by the remote control unit volume control but remains essentially constant.

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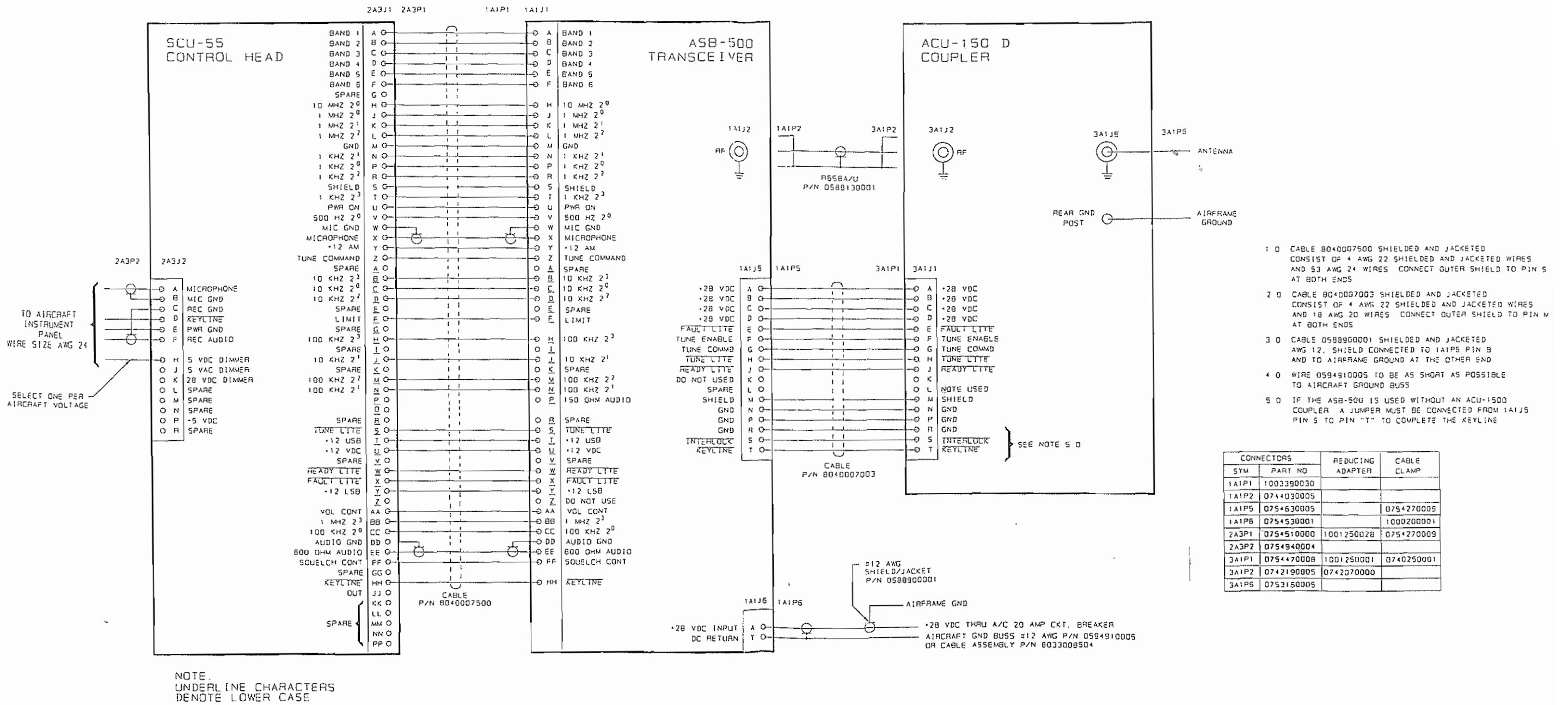


Figure 2.8 Interconnect Diagram, ASB-500/ACU-150D ( ) System.

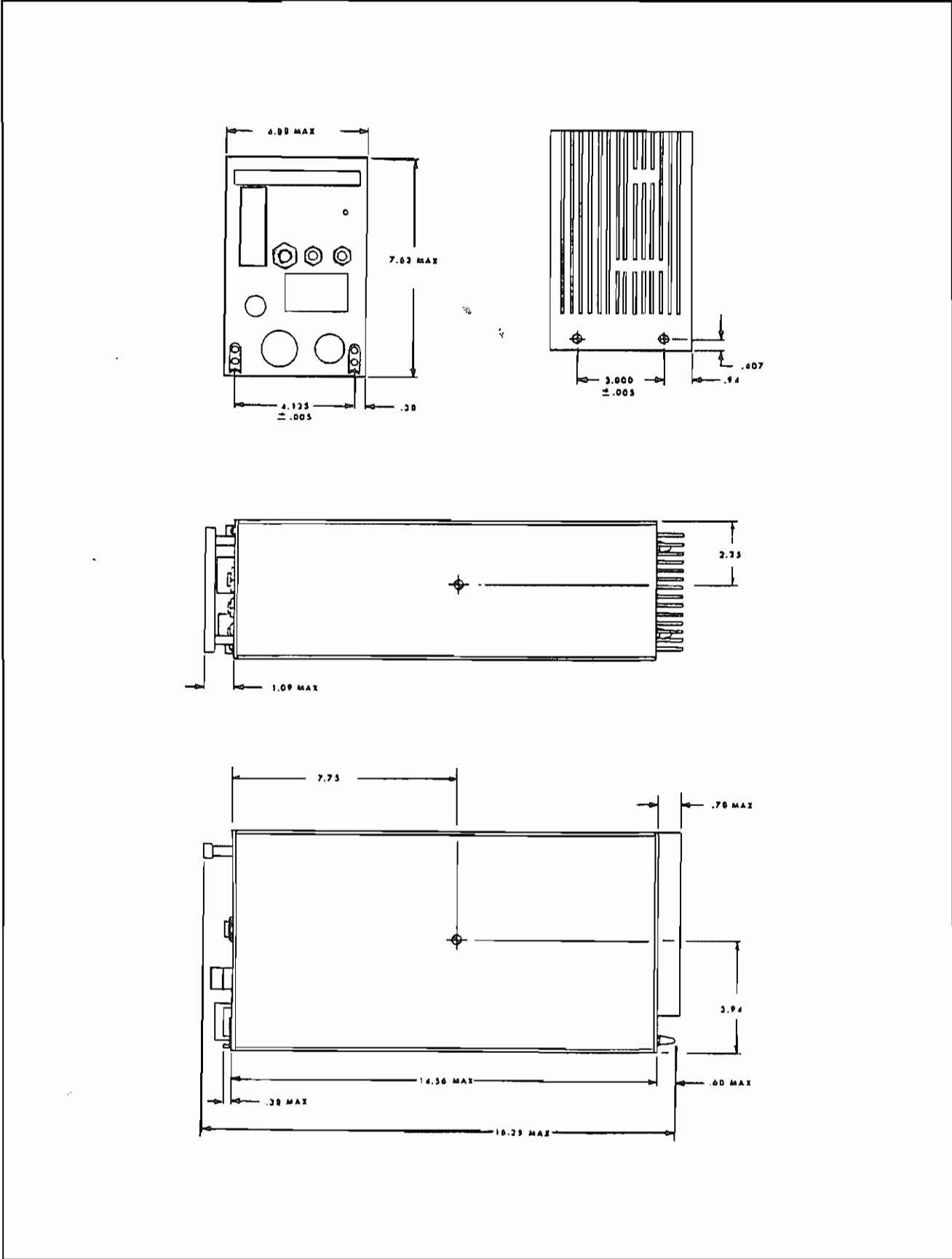


Figure 2.9 Transceiver Outline Dimensions RT-510

SUNAIR ASB-500

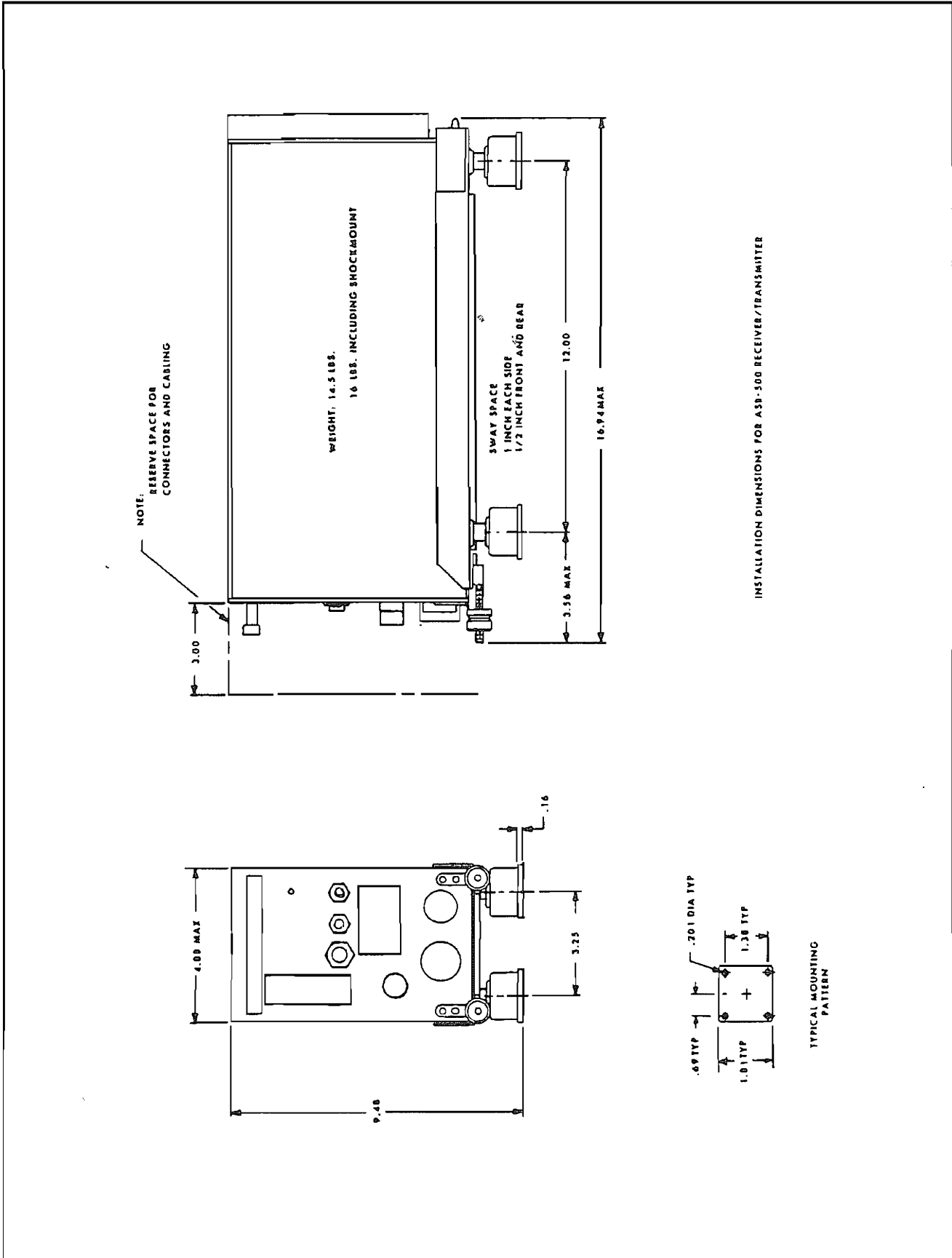


Figure 2.10 Transceiver Installation Dimensions RT-510.

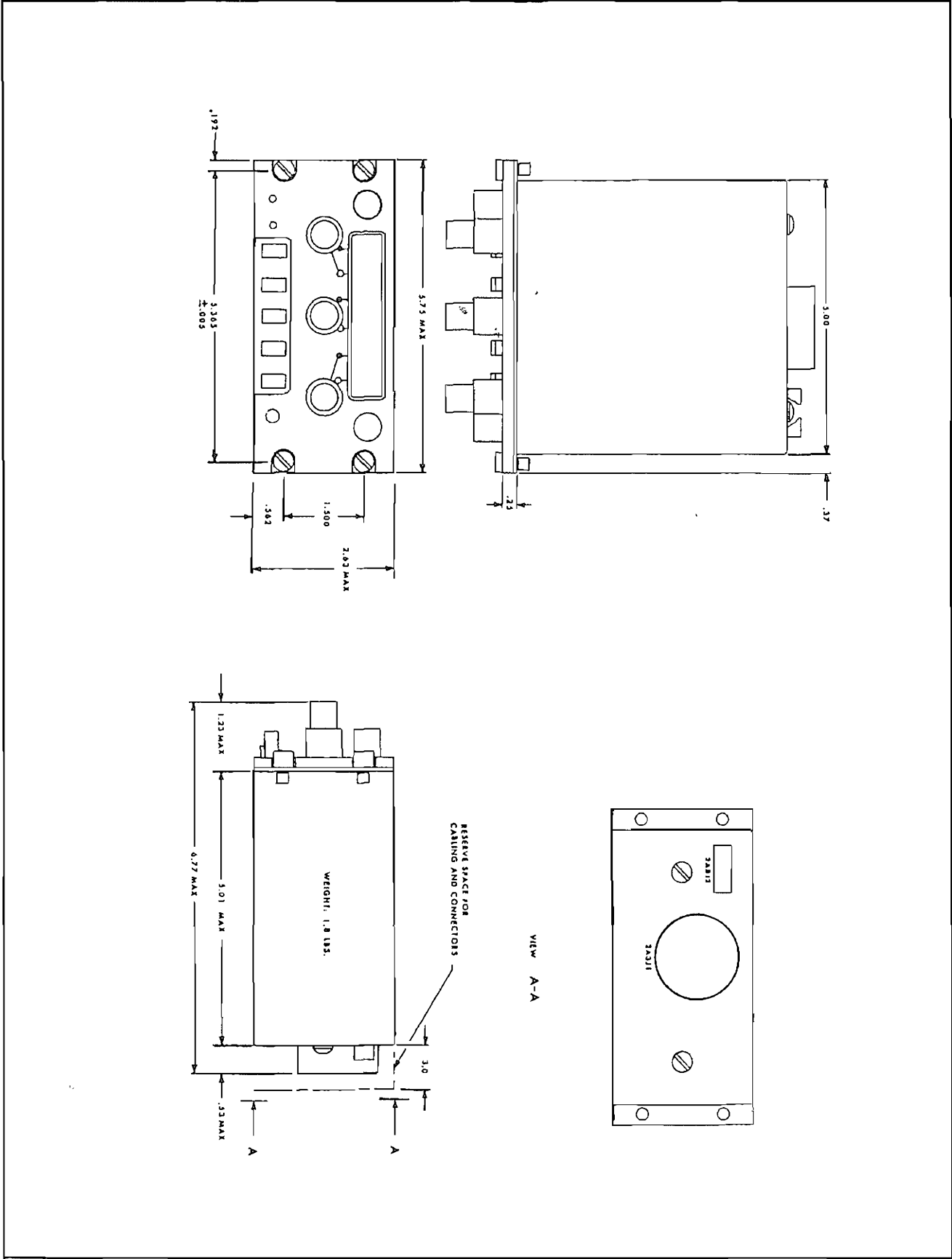


Figure 2.11 Control Head Outline Dimensions SCU-55.



## SECTION III OPERATION

### 3.1 SYSTEM CONTROLS AND CONNECTORS

This section provides information and instructions required for proper operation of the ASB-500 Transceiver.

#### 3.1.1 REMOTE CONTROL HEAD

- FREQUENCY SWITCHES (6) ..... Selects the operating frequency:  
10 MHz switch, 1 MHz switch, 100 kHz switch, 10 kHz switch, 1 kHz switch, 500 Hz switch.
- ON ..... Applies primary Power when pushed in. Disconnects primary power when pushed a second time.
- LSB ..... Selects Lower Sideband mode when pushed in. (When option is installed).
- AM ..... Selects AM mode when pushed in.
- USB ..... Selects Upper Sideband mode when pushed in.
- TUNE ..... Starts antenna coupler tuning cycle at frequency selected.
- VOLUME CONTROL ..... Controls the level of the receive audio to rear panel audio connector 2A3J2 and headphone jack on Transceiver front panel.
- SQUELCH CONTROL ..... Adjusts squelch threshold. Fully CCW is maximum squelch.
- DIMMER CONTROL ..... Adjusts brightness of frequency display and panel lights. (Operates in conjunction with cockpit dimmer control).
- FREQUENCY DISPLAY ..... Displays frequency selected by Frequency Switches. NOTE: If a frequency below 2.0 MHz or above 17.9995 MHz is selected, transceiver is disabled and display flashes on and off.



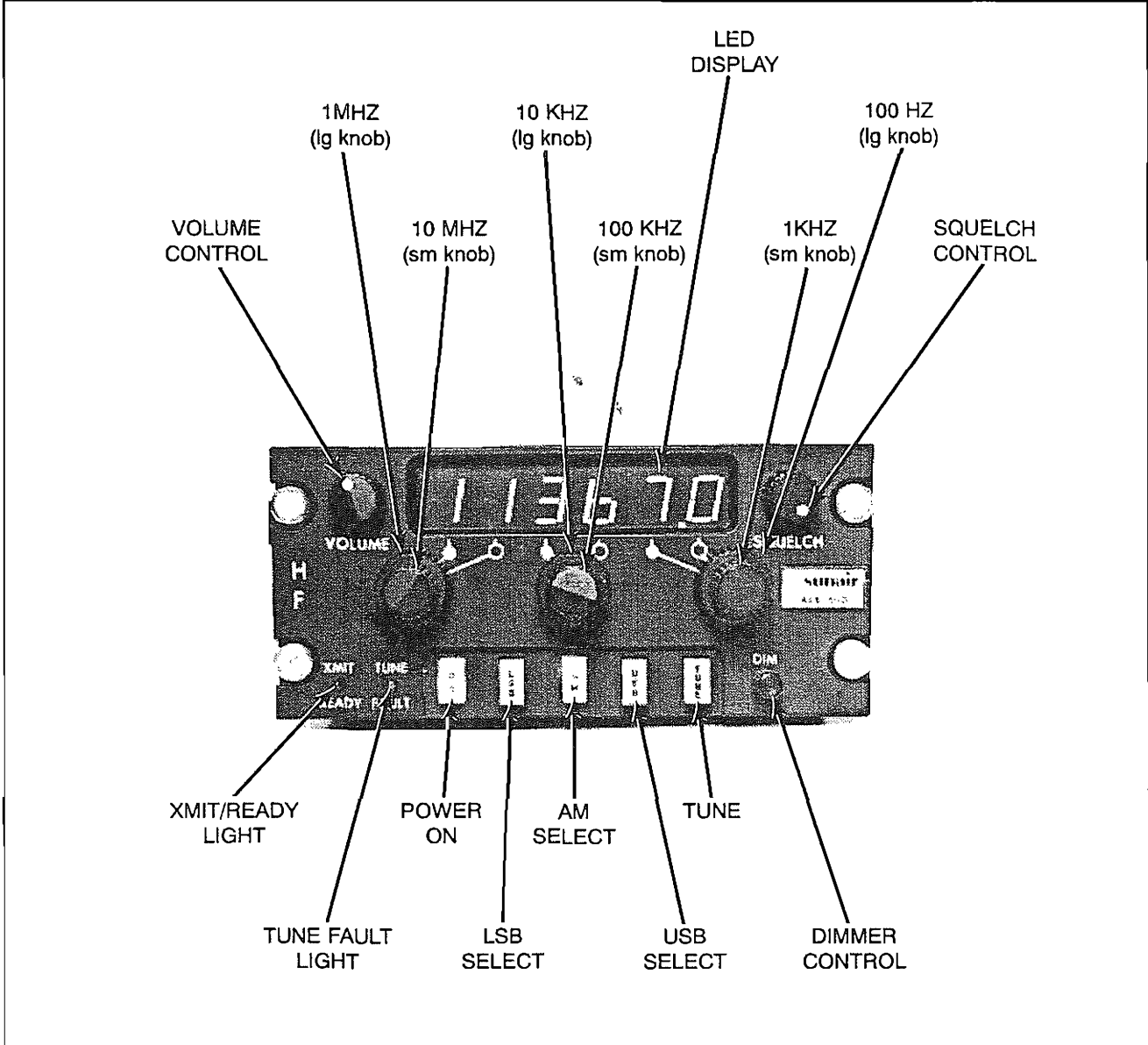


Figure 3.1 Remote Control Head Front Panel.

**3.2 CHECKS AFTER INSTALLATION**

**NOTE:** If extended test time is anticipated an auxilliary power unit should be connected to the aircraft in order to maintain battery voltage.

## SUNAIR ASB-500

1. Apply power to the radio by pushing in Control Head "ON" switch.

"ON" light should be illuminated.  
"TUNE FAULT" light should be illuminated.  
LED frequency display should indicate frequency of operation.  
NOTE: If selected frequency is below 2.0 MHz or above 17.9995 MHz the display will flash on and off indicating unusable frequency. Display will also flash if a "0" is registered in the 10 MHz display.
2. Select HF Comm system and set SQUELCH control maximum CW and set VOLUME control CW.

Audio noise or signal should be present in aircraft speaker. Reduce VOLUME to normal level after test.
3. Set SQUELCH control maximum CCW.

Aircraft speaker should be silenced except when strong signal present. After test, return SQUELCH control to CW position.
4. Adjust COCKPIT Dimmer Control.

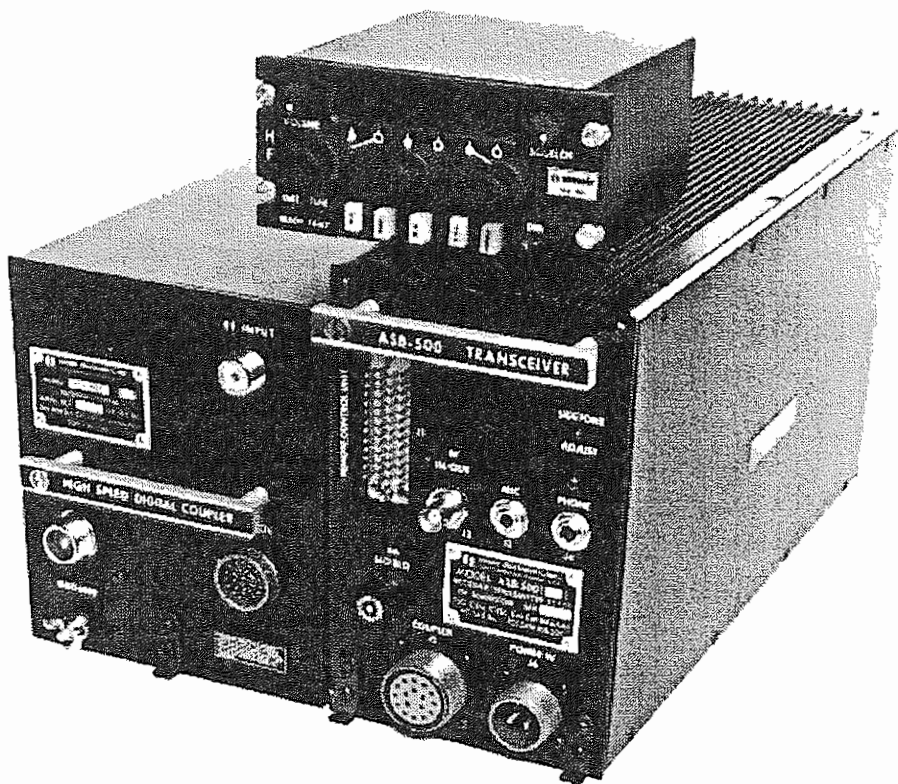
All control head lamps and LED display should vary in intensity. Further variation may be made with control head dimmer.
5. Rotate each frequency select knob from 0 to 9.

LED display should indicate correct readout.  
NOTE: LED display is driven directly from control head frequency switches and this check does not verify that cable 8040007500 which controls the synthesizer is wired correctly. See paragraph 2.7.2.1.
6. Select frequency of a nearby ground station. Set mode switch to required operating mode and push TUNE switch.

TUNE FAULT or READY LIGHT should not be lit and TUNE push button light should remain on during coupler tune cycle. When tune cycle complete, TUNE light should go out and READY light should be lit, audio or noise should be heard from speaker.
7. Establish contact with ground station and request radio check. Check sidetone level in headphones.

Adjust for desired level via transceiver front panel screwdriver hole.
8. Select various frequencies from 2 to 17.9995 MHz and perform coupler tuning checks.

Coupler should tune all frequencies. Check for not more than 4 percent of forward power is the reflected power between Transceiver RF OUT (1A1J2) and Coupler IN (3A8P2).



ACU-150D SUPPLEMENT  
TO ASB-500  
OPERATION AND MAINTENANCE MANUAL  
P/N 8040000700  
AND  
INSTALLATION AND OPERATION MANUAL  
P/N 8040000718

ACU-150D  
DIGITAL AUTOMATIC ANTENNA COUPLER

## SECTION I

### GENERAL INFORMATION

#### 1.1 SCOPE

This manual contains information necessary to install, operate, maintain and repair the ACU-150D High Speed Digital Antenna Coupler.

#### 1.2 DESCRIPTION

See Figure 1.1

##### 1.2.1 GENERAL

The ACU-150D is a high quality remotely controlled antenna coupler, capable of matching a wide variety of antennas over the frequency range of 2.0000 to 17.9999 MHz. The unit is designed for use with the ASB-500 system.

Operation of the ACU-150D requires only the initiation of a "TUNE" command. When tuning has been completed (minimum VSWR of the antenna at the selected frequency), the green XMIT/READY Lamp on the control panel indicates the transceiver is ready for use. The ACU-150D continuously monitors the antenna VSWR when transmitting. If the antenna becomes detuned during operation (VSWR exceeds 2.0:1), the TUNE/FAULT Lamp will light on the control panel and the operator is required to initiate a "TUNE" command to repeat the tune cycle.

##### 1.2.2 ASSEMBLIES

###### 1.2.2.1 Chassis Assembly 3A1

Provides the required mounting surfaces for the various electrical and mechanical components. The Motherboard 3A1A1 serves as the interconnect for all assemblies.

###### 1.2.2.2 Computer Board 3A2

This assembly contains the microprocessor responsible for 9 operations and functions of the ACU-150D.

###### 1.2.2.3 Comparator Board 3A3

This assembly contains the analog interface circuitry used to process the detector inputs to the microprocessor.

###### 1.2.2.4 Detector/Pad Assembly 3A4

The Detector Assembly 3A4A1 contains the magnitude, phase and VSWR detectors. The Pad Assembly 3A4A2 plugs into the Detector Assembly and protects the transmitter from impedance variations during the tuning cycle.

###### 1.2.2.5 RF Assembly 3A5

The two boards comprising the RF Assembly are the RF Input Board 3A5A1 and the RF Output Board 3A5A2. The boards contain all of the binary variable elements in the antenna matching network.

## SUNAIR ACU-150D

### 1.3 TECHNICAL SPECIFICATIONS

#### 1.3.1 GENERAL

FREQUENCY RANGE: 2.0000 to 17.9999 MHz

RF INPUT POWER: 100 Watts PEP

INPUT IMPEDANCE: 50 ohms, non-reactive

DUTY CYCLE: Continuous

TUNING TIME: Typically 2.5 seconds first tune, 1.0 seconds or less from memory

TUNE POWER REQUIRED: 25 Watts RF delivered

TUNE ACCURACY: 1.2:1 VSWR Typical

REMOTE CAPABILITY: Up to 250 ft. from transmitter

POWER INPUT: 27.5VDC + 10%-20%, 1 amp maximum

WEIGHT: 8.5 lbs (3.825 kgs)

SIZE: (INCHES) 6.88H X 5.80W X 12.11D  
(CM) 17.48H X 14.73W X 30.75D

#### 1.3.2 ENVIRONMENTAL

TEMPERATURE: Operating: -55°C to +70°C (RTCA/DO-160A Category B)

HUMIDITY: +95% at +50°C (RTCA/DO-160A Category A)

SHOCK: 6G in all planes, 15G crash safety

VIBRATION: 0.20" DA, 5 Hz to 14 Hz 0.02" DA, or 2G peak, 14 Hz to 44 Hz 3G peak, 44 Hz to 2 KHz  
(RTCA/DO-160A Category J & Y)

ALTITUDE: 35,000 ft. (RTCA/DO-160A Category C)

**1.4 EQUIPMENT SUPPLIED****SUNAIR PART NUMBER**

High Speed Digital Antenna Coupler, ACU-150D	8064201098
Installation Kit, consisting of:	8064200598
Cable Clamp	0740250001
Adapter RF, for PL-259/UG-175/U	0742070000
Connector, RF, UHF, PL-259	0742190005
Connector, RF, HN, UG-59A	0753160005
Connector, Power, 26 Pin Round	0754470008
Reducing Adapter	1001250001
Strap, Ground	8033390603
Connector, HN Adapter	8042390700
Mounting Plate Assembly ACU-150/D	8064202591
Installation and Operation Manual	8040000718



## SECTION II

### INSTALLATION

#### 2.1 POWER REQUIREMENTS

The ACU-150D is designed to operate from a nominal 27.5 VDC +10%-20% source. The input 27.5 VDC should be supplied by the companion transceiver so the antenna coupler power will be turned off when the transceiver is turned off.

#### 2.2 INSTALLATION CONSIDERATIONS AND MOUNTING INFORMATION

The satisfactory operation of the equipment will depend upon the care and thoroughness taken during the installation.

##### IMPORTANT INSTRUCTIONS

- a) Carefully plan the antenna installation to minimize the length of wire between the coupler output and the antenna itself. This lead should be kept as short as physically possible. Six inches or less is optimum, the wire inside the aircraft is a part of the antenna, but will radiate inside the fuselage, not outside. This energy may cause interference with other electronic equipment in the vicinity. This interference can often be reduced by using high voltage coaxial cable such as RG-8/U, between the coupler and the antenna feedthrough. The coax must be kept short because coax lengths longer than three feet can cause large losses, particularly at the antenna resonant and antiresonant frequencies, when VSWR exceeds 10.

**NOTE:** Installation of the Antenna Coupler must conform to the Altitude/Temperature restrictions detailed in the equipment specifications.

- b) The installations should be carefully planned beforehand.

#### 2.3 GROUNDING REQUIREMENTS

##### 2.3.1 GENERAL

It is very important that the mounting plate be securely connected to the aircraft frame. The radiation resistance of some aircraft antennas is quite low, sometimes less than one ohm at the lower frequencies. In order not to decrease the efficiency, the coupler must be securely bonded to the aircraft such that the resistance readings should be in the order of one milliohm or less from the aircraft frame to the ground portion of the antenna RF output connector, 3A1J3.

#### 2.4 CABLE FABRICATION

##### 2.4.1 USE OF COAX BETWEEN 3A1J3 (ANTENNA COUPLER OUTPUT) AND THE ANTENNA

As stated previously in paragraph 2.2, the use of a coax should be avoided if possible, for maximum system efficiency. If coax must be used, it should be as short as possible. The loss introduced by the coax is directly related to the antenna impedance, particularly the real part. Maximum coax loss will generally occur when the antenna impedance is high and crossing from inductive to capacitive or from capacitive to inductive.

## 2.4.2 GENERAL

The cables must be wired to their appropriate connections as shown in the Interconnect Wiring Diagrams.

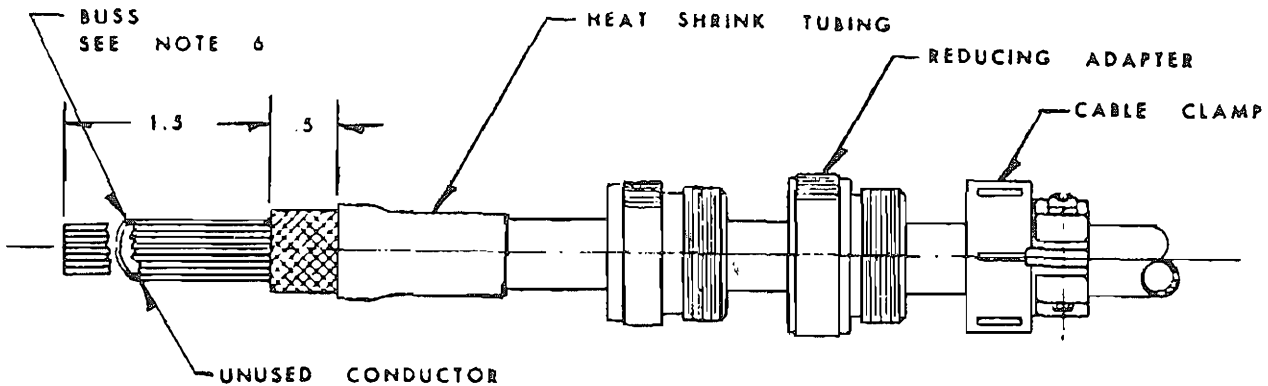
All cables are available from Sunair. Since the wiring must be routed to various locations in the aircraft instrument panel, the installer should fabricate this cable using standard aircraft installation practices. Figure 2.1 illustrates the method of fabricating the control cable connector. If the transceiver is located adjacent to the ACU-150D it may not be practical to use cable 8040007003. In this case, any cable used should be shielded, with the shield grounded on both ends.

## 2.4.3 CHECKS AFTER FABRICATION

Each cable should be checked after fabrication. The control cable should be checked for pin to pin continuity and for shorts to other pins. The RF cables should be checked for continuity and shorts.

## 2.5 CHECKS AFTER INSTALLATION

1. Select a frequency in the 2 to 3 MHz range. Set MODE switch to AM position.
2. Upon initial power on, the FAULT Lamp will come on.
3. Depress the TUNE Pushbutton.
4. The TUNE/FAULT Lamp will be on.
5. After a short delay (7 sec. max) the TUNE Lamp will extinguish and the READY Lamp will come on.
6. Select a frequency in the 12 to 18 MHz range. Depress the TUNE Pushbutton. When the READY Lamp illuminates, key the MIC in AM mode and check for a fault.
7. Return to the first frequency tuned in step (1). Key the MIC in AM mode. The coupler status lights will show FAULT. Depress the TUNE Pushbutton, when the READY Lamp illuminates, key the MIC in AM mode and check for a fault.
8. Remove the RF coaxial cable from the transceiver RF connector. Depress the TUNE Pushbutton. After approximately 7 seconds, the FAULT Lamp will illuminate. Key the MIC. The transceiver will not transmit.
9. Replace the RF coaxial cable on the transceiver and depress the TUNE Pushbutton. When the READY Lamp comes on, the system is checked out and ready for use.



**INSTRUCTIONS**

1. Strip outer rubber covering back from end of cable as shown.
2. Pull braid back over outer rubber covering. Pull braid tight to make smallest diameter of cable.
3. Slide cable clamp and reducing adapters over cable as shown.
4. Put heat shrink tubing over end of braid as shown.
5. Check to be sure cable clamp will slide over heat shrink tubing braid. The two clamps on the cable clamp should clamp over the exposed braid to provide a ground for the shield.
6. Any unused conductors should be tied together with a small buss wire and soldered to outer braid at one point. Make sure clamp will pass over braid.
7. CAUTION: If 8040007003 is used, care should be exercised to avoid use of excess heat on the braid to prevent melting the inner conductor (Conductor insulation is PVC.)
8. Strip 1/8" of insulation off conductors to be soldered in connector.
9. Solder wires into connector.
10. Screw adapter into connector. Slide cable clamps up cable and tighten clamps on exposed braid.
11. If Sunair part number 8040007003 is not used, be sure to check O.D. of cable to be used to be sure it will fit through I.D. of cable clamp.

Figure 2.1 Cable Fabrication.

SUNAIR ACU-150D

8064001609A

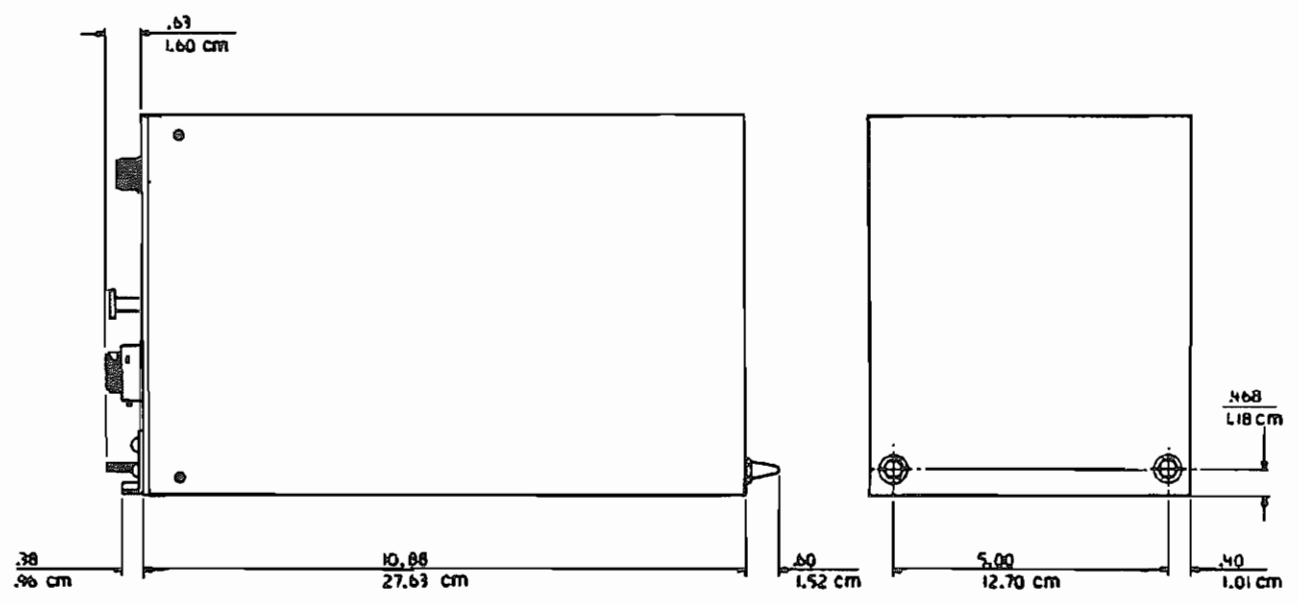
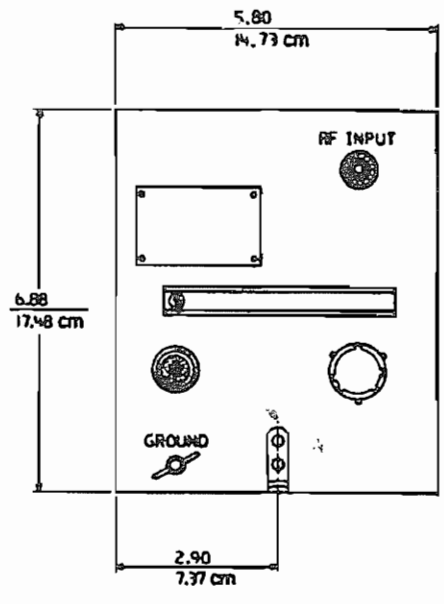


Figure 2.2 Outline Dimensions, ACU-150D.

SUNAIR ACU-150D

8064001609A

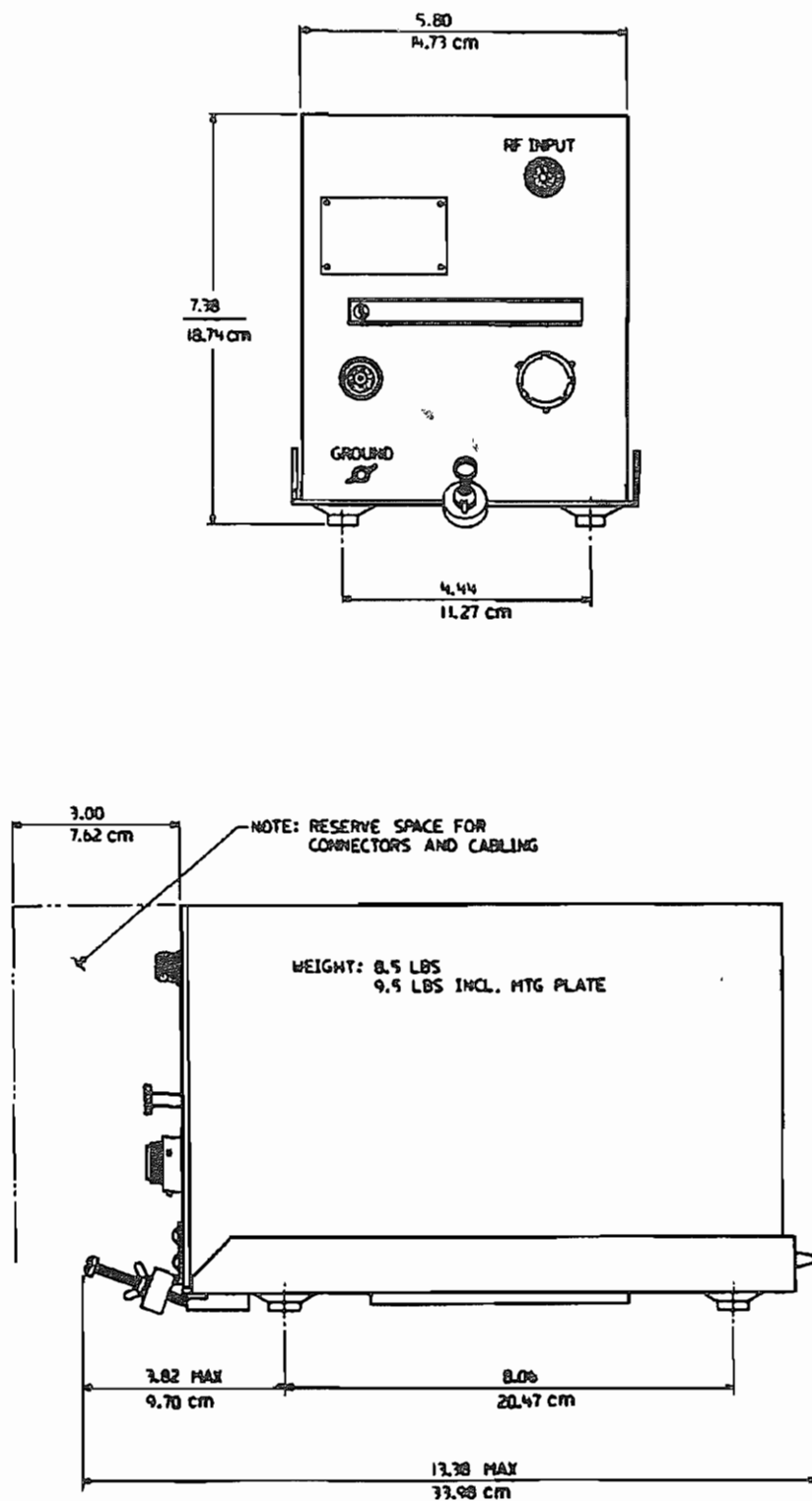


Figure 2.3 Outline Dimensions, ACU-150D and Mounting Plate Assembly.

## SECTION III

### OPERATION

#### 3.1 GENERAL

This section contains information concerning the proper operation of the ACU-150D High Speed Digital Antenna Coupler.

#### 3.2 COUPLER CONTROLS/INDICATORS

The controls and indicators for the ACU-150D are contained on the ASB-500 system's control head, the SCU-55.

##### TUNE PUSHBUTTON

- a) Initiates a tune cycle.
- b) Illuminates during a tune cycle.

##### TUNE/FAULT LAMP

This lamp is illuminated for the following conditions:

- a) STEADY: When the transceiver is initially turned on.
- b) When a tune cannot be properly achieved. (Approximately 7 seconds after initiation of TUNE).

##### XMIT/READY LAMP

This lamp is illuminated after a tuning cycle has been completed.

#### 3.3 CHECK OUT PROCEDURES

See Checks After Installation Section 2.5.