Operating and Maintenance Manual:

ARA-552 Analogue Radio Altimeter Test Set

Atlantis Avionics Test Equipment Corp.

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1 INTRODUCTION

1.1 PURPOSE

The ARA-552 Analogue Radio Altimeter is used for flight line testing of aircraft Autoland systems, Ground Proximity Warning systems, and functional testing of installed Altimeter systems. Together with the ARA-552 hand-held controller, the ARA-552 provides sophisticated capabilities for testing a wide range of analogue altimeters in a variety of aircraft. Using operator-defined parameters such as start altitude, stop altitude, and vertical speed, the ARA-552 defines a radio altitude ramp. This information, along with error and fault control information, is transmitted through a cable adapter to up to three aircraft altimeters. The three-part sequence accurately simulates descent, approach, flare, and touchdown. The ARA-552 may be used whenever active control of the radio altitude bus is a test requirement.

An ARA-552 with the DC altitude output board and relay simulation board options can also simulate the entire altimeter for aircraft installations where the actual altimeter has been removed. For relay simulation, three output channels are provided, each generating Flag, A/P Warn, and six Altitude Trip relays to simulate altimeter functions. Four selectable sets of trip altitude points are available.

1.2 DESCRIPTION OF EQUIPMENT

The ARA-552 Analogue Radio Altimeter has three independently controlled output channels. This facilitates the testing of systems that require up to three operating radio altimeters. Encoded data for each of these three channels is received over a single communications link from the controller unit, either the DRA-707 or the hand-held controller HHC-552. (For more information on the controller unit, see the DRA-707 manual or Appendix B of this manual.) The ARA-552 has the capability of driving three Collins 860F-1/4 radio altimeters simultaneously. The ARA-552 features:

a. Triple frequency synthesizers and output conditioning circuitry for the 860F-1/4 test signal requirements.
b. ARINC 552 characteristic DC altitude voltage conversion circuitry for display of altimeter output voltage in units of feet, with a resolution of one foot.
c. Autopilot Warn and Altitude Trip relay position indicators.
d. System Flag indicators.
e. Self-test (altimeter under test) controls.

Options are available that enable the ARA-552 to:

a. Generate DC altitude voltages according to one of four programmed relationships (e.g., the ARINC 552 curve) for the simulation of a removed altimeter.
b. Generate DC drive voltages for control of certain radio altimeters.
c. Simulate the Autopilot Warn and System Flag relays of a removed altimeter.
d. Simulate the Altitude Trip relays of a removed altimeter according to one of four pre-programmed banks of set points.

When the DC Altitude Output option is fitted, the desired curve characteristic is activated by jumpers in the cable. Similarly, customer options for altitude trip relay closure points are activated by jumpers when the Relay Simulation option is fitted.

The Analogue Radio Altimeter will display the DC altitude, A/P WARN relay position, and the positions of six altitude trip relays for one of the three possible systems. The displayed system is selected with a rotary switch. Flag states for all three systems are simultaneously displayed. The above displays are active whether the signal source is the radio altimeter under test or the simulation produced by the ARA-552. In this manner, positive feedback of the signals on the aircraft wiring is always available to the operator.

When applicable, each altimeter system can be forced independently into a self-test state. The displays discussed above remain active during the altimeter self-test.

The set-up and configuration of the ARA-552 is controlled by the interface cable. Only the Aircraft Installation Delay (AID) setting for each altimeter system must be selected by the operator. The Trip and A/P WARN relay indicating circuits are designed to illuminate the appropriate indicator when the relay contacts close, regardless of the aircraft relay common voltage (28 VDC, ground or unconnected).

Each channel of the ARA-552 is capable of simulating or driving any type of altimeter (within its capability) independent of each other. Operation of the ARA-552 and interpretation of its displays are consistent throughout the range of configurations.

1.2.1 Physical

The ARA-552 is housed in a portable weather-resistant case measuring approximately 50 cm by 24 cm by 34 cm (19.5 in. by 9.5 in. by 13.5 in.) when closed. The electronics are completely housed in the detachable lower portion of the case, which measures 50 cm by 24 cm by 15 cm (19.5 in. by 9.5 in. by 6 in.). The upper half of the case provides about 1500 cubic cm (0.5 cu. ft) of storage space for cables, manuals, and the hand-held controller.

The ARA-552 power supplies and battery are mounted on the inside of the lower portion of the case. The principal electronic circuits are attached to the front panel, which is easily removed for maintenance. The printed circuit assemblies are designed for convenient removal and replacement using standard electronics shop tools.

The front panel is composed of a durable plastic laminate on an aluminium panel. Twelve screws secure the front panel to the case. A metal cover completely encloses the electronics attached to the front panel.

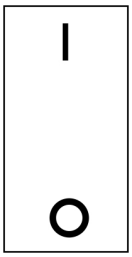
1.2.2 Symbols

The ARA-552 uses the following symbols.

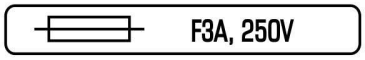
CE Marking Symbol: Shows that the equipment meets all the EU directives applicable to this equipment.

CE

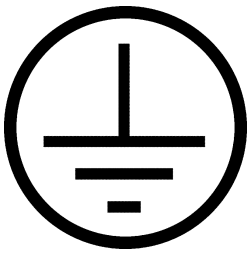
Power Symbol: Indicates which position the main power switch should be in.



Fuse Symbol: Indicates where the fuse is located on the unit and the applicable current.



Earth or Ground Wire Symbol: Indicates the location of the protective earth or ground terminal lug on the equipment.



1.3 ELECTRICAL REQUIREMENTS

The ARA-552 can be powered from any standard AC source (120/230V, 50/60 Hz, 3A). The equipment will continue to operate with a voltage tolerance of 10% (108-132V and 207-254V).

With the installed battery, the ARA-552 will operate under its own power for approximately two hours. The time varies with operating temperature and the number of options installed in the ARA-552 unit. If the battery voltage drops below a preset trip level, the ARA-552 will generate a visible warning to the operator. The battery can be recharged from the above standard AC sources.

The battery may be stored or used in any position by virtue of its sealed construction. Battery charging power is applied whenever AC power is present on the power connector. The battery is composed of eight or ten nickel-cadmium cells* and is charged by a constant voltage method. Charging current is limited to 625 mA by the charging regulation circuitry.

A comparator circuit monitors the battery voltage and activates the LO BAT light when the minimum operational voltage is reached. This minimum voltage is 11.05V for units equipped with ten-cell battery packs and 9V for units equipped with eight-cell battery packs.

*__NOTE__: Units with serial numbers 012, 013, 022, 025, 032 and above contain a ten-cell battery pack.

Units with serial numbers 002 to 011, 014 to 021, 023, 024, and 026 to 031 contain an eight-cell battery pack.

1.4 CALIBRATION

Atlantis Atlantis recommends annual calibration. To register for future calibrations and information updates, please fill out and return to us the owner registration form.

NOTE: All warranties are void if calibration seals are broken.

2 SPECIFICATIONS

2.1 ENVIRONMENTAL

Operating Environment.....indoor use
Operating Altitude .....2000 m. max.
Humidity.....80% RH up to 31˚C, and decreasing linearly to 50% at 40˚C
Overvoltage category II
Pollution degree 2

2.2 PHYSICAL

DIMENSIONS
Closed case ..... 50 x 24 x 34 cm (19.5 x 9.5 x 13.5 in.)
Upper portion (electronics) ..... 50 x 24 x 15 cm (19.5 x 9.5 x 6 in.)
Lower portion (storage) ..... 50 x 24 x 19 cm (19.5 x 9.5 x 7.5 in.)

WEIGHT (not including cables)
Without battery option ..... 9 kg (20 lbs)
With battery option ..... 11 kg (24 lbs)
Average shipping ..... 13 kg (29 lbs)

TEMPERATURE RANGE
Operating .....0 to 40˚C (32 to 104˚F)
Storage ..... -50 to 85˚C (-58 to 185˚F)

DISPLAY.....7 segment LED, 4 1/2 digit

2.3 ELECTRICAL

2.3.1 Input Power

Operating power requirements..... 120/230V, 50/60 Hz
Charger power requirements..... 120/230V, 50/60 Hz
Maximum power consumption.....200 VA
Voltage tolerance 10%
Maximum current draw..... 3A

2.3.2 Frequency Output

Waveform T.H.D. ..... Sine wave, < 15%
Range 680 Hz to 242,460 Hz accuracy (at steady state, over 0.1 second count time)

	Bendix	Collin
Below 300 ft	18 Hz (1/4 ft)	12 Hz (1/4 ft)

300 to 700 ft	50 Hz (1/4 ft)	20 Hz (1/4 ft)
700 to 2000 ft	730 Hz (9 ft)	190 Hz (9 1/2 ft)
Above 2000 ft		230 Hz (10 1/2 ft)

Drive capability ..... 50 Ohms maximum load

2.3.3 Optional Outputs

Collins 860F-1/4

Frequency ..... 40 x (altitude*+ AID/2 [in feet]) + 280 Hz
Voltage ..... 1.5 V(rms) "10% @ 680 Hz + 6dB roll/octave above 2 kHz, " 1dB

Bendix ALA-52, systems 1, 2, 3

Frequency ..... {n x (altitude* + AID**/2 [feet])} + (x)
where n = 70 for system 1, 75 for system, 280 for system 3
and x = 220 for system 1, 240 for system 2, 260 for system 3
Voltage ..... 1.3 - 2.0 RMS

NOTE:

* altitude from -20 to 3000 ft (except Collins 20 ft AID 0 to 3000 ft)
** 20 ft AID is actually 80 ft AID for Bendix ALA-52 system.

2.3.4 DC Altitude Reader

Range (input volts) ..... 0 - 30 VDC
Reading accuracy ..... 20 mV + 1%
Load presented to circuitry ..... 1 K max.
Display ..... 4 1/2 digit LED
Translation curve..... -20 to 480 ft height = (50 x voltage) - 20
Above 480 feet ..... height = Exp [(volts + 52.1461)/10] – 20

2.3.5 Discrete Inputs

Altitude Trip Relay indicators 6
A/P Warn Relay indicators 2
Flag Voltage indicators 3

2.3.6 Ramping Errors

The ramp rate error will be greater than 1% at 1000 fpm or less; not specified above 1000 fpm.

2.3.7 DC Voltage Output (Option 1)

Range (output volts) ..... 0 to 28 VDC
(= -20 ft to +3000 ft for ARINC 552)

Accuracy ..... 10 mV, +0.5% of full scale
Drive capability..... 1000 Ohms maximum load
Translation ..... -20 to 480 ft, volts = 0.02 x (height + 20)
..... above 480 ft, volts = 10 x ln(height + 20) - 52.1461

2.3.8 Relay Simulation (Option 2)

Simulated functions ..... 6 Altitude Trip Relays
(each system) .....(SPST)
2 A/P Warn Relays (SPDT), 1 Flag
Pre-programmed Trip Relay.....4 jumper-activated sets of 6
Activation points ..... altitudes each (customer-specified).

3 THEORY OF OPERATION

3.1 OVERVIEW

The ARA-552, in its basic configuration, comprises the following major circuits, which are explained in functional block detail in the following paragraphs,:

1. Relay position indicators,
2. Analogue-to-digital converter and translator,
3. Triple frequency synthesizers,
4. Power supplies.

Additionally, the DC Altitude Output option card contains three digital to analogue circuits and the Relay Simulation option card contains three sets of nine relays controlled by an on-board microprocessor.

3.2 RELAY POSITION INDICATORS

The Altitude Trip and A/P Warn relay position indicators illuminate upon contact closure. The aircraft installation can have either 28V or ground tied to the common sides of these relays and, therefore, the circuitry must adapt automatically to provide proper indication regardless of the relay common voltage. Refer to Figure 3-1.

The voltage present on the aircraft "relay common" is translated to 28V (if less than 14 VDC) or to 0V (if greater than 14 VDC) by the inverter (A on Figure 3-1).

If there is no aircraft connection to the relay common, the circuit will act as if 0V (GND) was applied. The output of the inverter is applied to the relay momentary contact wiring (relay output) through a 1-megohm resistor (B), thereby forcing the sensing circuitry into the desired condition when the relay contacts are open.

The inverted common voltage is shifted towards the opposite extreme by one-quarter of the range, or about 7 V, by the level converter (C). The shifted voltage is applied to two circuits in the window generator (D). One circuit shifts the level up slightly and the other shifts the level down slightly. When these two shifted levels are applied to the dual comparator (E), a "window" of about 10% is created.

The signal from the relay output is shifted in level in exactly the same fashion as the inverted common voltage was shifted and is applied to the comparator. The action of the circuit is such that when the relay contact is open, the voltage is outside the "window", and when the relay is closed, the voltage is inside the windows.

The comparator (E) turns on the indicator when the shifted relay output voltage falls within the window.

Two independent circuits are provided for each altimeter - one for the Altitude Trip relays, and the other for the A/P Warn relay. It will, therefore, operate properly when different voltages are wired to the Trip and A/P Warn relay commons in the aircraft installation.

Signals to the circuitry are routed through the system display selector switch where one of the three available systems is selected for display. The position of this switch affects only the display and not the operation of the associated circuits. The indicating circuitry described above adds no loads to the aircraft or altimeter signals due to the high input resistance.

All TRIP and A/P WARN indicators illuminate for about one second as part of the power-on self-test.

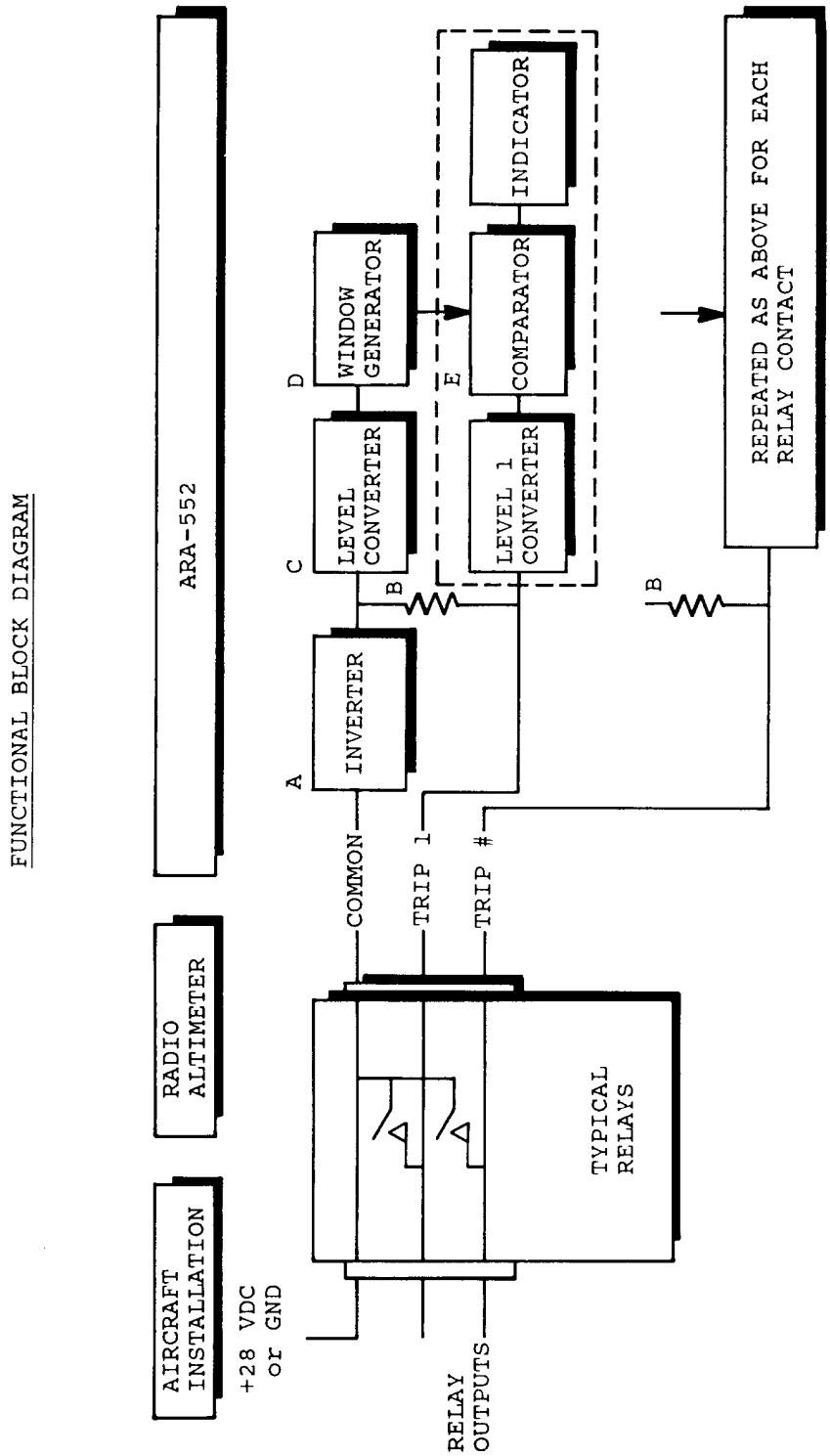


Figure 3-1 - Relay Indicating Circuit

3.3 ANALOGUE-TO-DIGITAL CONVERTER AND TRANSLATOR

The A-to-D converter and translator converts the DC altitude level produced by a radio altimeter into a digital display of the altitude. The circuit has the capability of producing four different relationships of altitude to voltage in order to accommodate more than one standard in a single piece of test equipment. Refer to Figure 3-2.

The DC voltage signal is applied to the input scaling network of the A-to-D converter. This circuit is designed to minimize drift due to temperature variations, which would result in errors otherwise.

The A-to-D converter produces a twelve-bit output proportional to the difference between the applied signal voltage and the voltage reference. The voltage reference is a highly stable voltage source featuring a manual adjustment (maintenance action only) to remove any fixed offsets in the system.

The digital output of the A-to-D converter is applied directly to the address inputs of PROMs (Programmable Read Only Memory). Two additional inputs to these PROMs come from the front panel connectors and serve as a "bank switch" activated to one of the four available conversion tables.

NOTE: Conversion tables are a customer option and therefore a given PROM may not have all four tables filled. All PROMs are shipped with at least the ARINC 552 table installed.

These inputs to the PROMs cause the contents of the PROM address, activated by the particular combination, to appear on the data output. The data is the binary coded decimal (BCD) value of the altitude according to the active conversion table.

The BCD digit values are applied to the display decoders and drivers. To conserve the battery, a blanking signal turns off the four digits of the display when the AUX/OFF/AP selector switch is set in the centre position. All segments of the display illuminate for about one second as part of the power-on self-test.

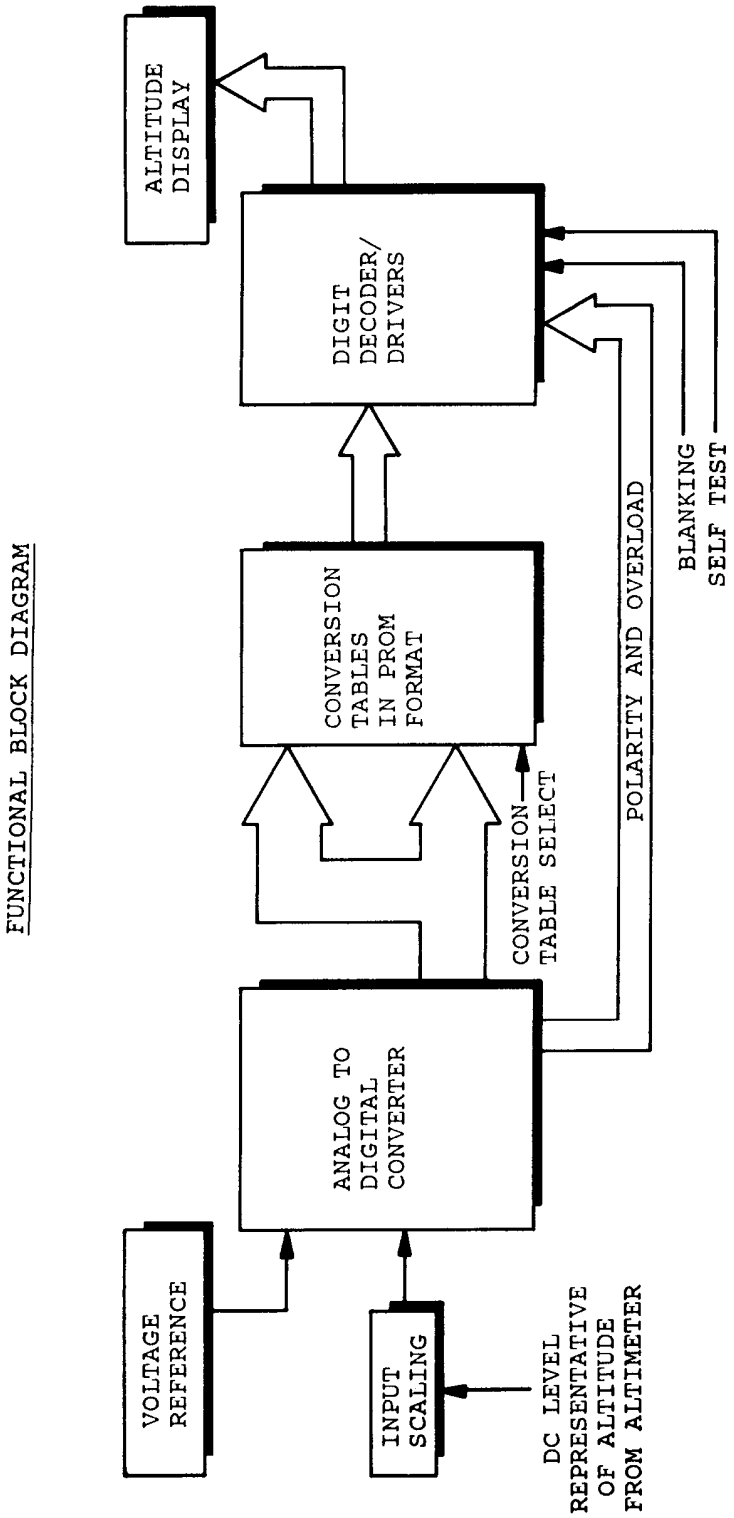


Figure 3-2 - DC Altitude Display

3.4 FREQUENCY SYNTHESIZERS

The ARA-552 incorporates an independent frequency synthesizer for each of its three channels. The frequency synthesizer circuit provides the required signal characteristics for the stimulation of altimeters that use injected audio frequencies up to 200 kHz for the simulation of altitude while the aircraft is on the ground. Refer to Figure 3-3.

Serial data received from the controller unit is converted to the logic format required by the single chip computer. The serial data contains the altitude values for all three channels generated by the controller unit. This data reflects all the fault controls of the HHC-552 as well. Thus the ARA-552 reads an altitude corresponding to the erroneous value (FAIL ALT) if the fault happens to be selected on the DRA-707 or HHC-552. The single chip computer sorts the incoming words by channel and extracts the altitude value from the digital word received.

Each channel is now processed independently. Channel 1 is typical of the other two channels.

The single chip computer monitors the Freq Table Select inputs (which originate as jumpers in the cable attached to the System 1 connector) and selects one of the four factory programmed tables resident in its EPROM memory. If necessary, it also monitors the position of the Channel 1 AID switch on the front panel and calculates a fixed offset that is added to the DRA-707's or the HHC-552's altitude value. The addition of the AID offset is necessary when the altimeter installed in the aircraft radio rack is of a type that is jumper programmed to compensate for the length of antenna cable installed in the aircraft installation.

The above computations and offset adjustments generate a digital output to Channel 1 of the three channel programmable divider, which sets a divider value.

A dual phase-locked loop (PLL) compares the phase of two digital pulse train inputs to maintain a precise frequency output. One of these inputs is generated by the crystal controlled 20 Hz reference clock generator. The other input is generated by the programmable divider as a result of dividing the PLL output frequency by the digital value passed to it from the single chip computer. When the frequency of the programmable divider output is less than 20 Hz, the PLL will cause its frequency to increase until the result is 20 Hz.

In the case of a descending altitude ramp, the constantly changing altitude value causes the programmable divider to divide by an ever decreasing number. This causes the PLL to react by decreasing its frequency in order to maintain the 20 Hz output of the divider. The PLL can properly track the highest descent rate, which is 16,000 feet per minute.

The PLL drives a voltage-controlled oscillator (VCO) whose output is a low distortion sine wave at the PLL frequency. Two amplifiers buffer the VCO and increase the drive capability of the output signal. Resistor/capacitor networks are jumper programmable from the System 1 connector to select attenuation and roll-off characteristics of the output signal.

A Self-test Kill signal causes the frequency output to go to 0V while the system SELF TEST button on the ARA-552 front panel is activated. This prevents improper functioning of the altimeter self-test process due to a conflicting frequency signal being injected during the test.

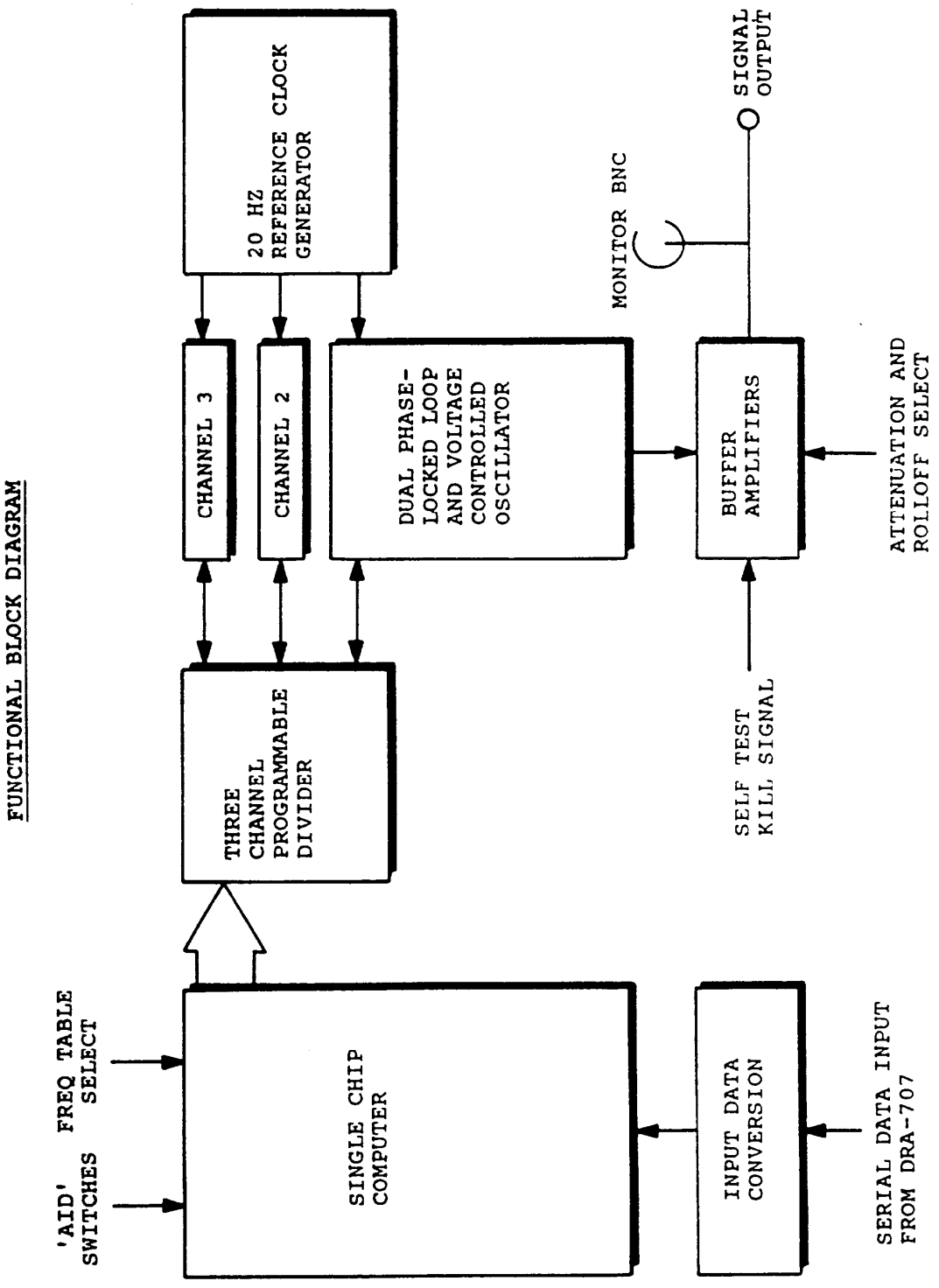


Figure 3-3 - Frequency Synthesizer

3.5 POWER SUPPLIES

The ARA-552 power supply utilizes two power sources:

1. The highly efficient DC-to-DC converters to generate +5 VDC, +15 VDC, and -15 VDC from either a 12 VDC ten-cell battery pack or a 9.6 VDC eight-cell battery pack.
2. The charging power that is produced from line AC power.

A +30 VDC to DC converter is fitted as part of the DC Altitude Output option. Refer to Figure 3-4. Line power of 120/230V, 50/60 Hz is applied to the front panel connector via the power cord. The battery is charged through a constant current regulator, which is mounted on the bracket holding the battery pack, whenever line power is applied to the ARA-552.

Primary DC or battery voltage, whichever is greater, is applied through the front panel power switch to the low battery monitor and DC-to-DC converters.

The low battery monitor illuminates the front panel warning indicator (LO BAT) when battery voltage falls below a level that corresponds to approximately 15 minutes of useful battery life remaining. There are no further warnings. If line power is not applied to the unit, the ARA-552 will shut off in about 15 minutes from the time that the LO BAT warning light comes on, and will remain off until line power is applied.

CAUTION

Do not operate the ARA-552 when
the LO BAT LED is illuminated.

Two DC-to-DC converters are provided in the basic ARA-552 configuration. One converter produces +5 VDC; the other, a dual output unit, provides +15 VDC and -15 VDC. DC-to-DC converters are used because of their efficiency. This attribute serves to reduce battery drain and keeps the generation of heat to a minimum.

When the DC Altitude Output option is installed, a DC-to-DC converter (a 30 VDC converter with a floating output) is added to the power supply.

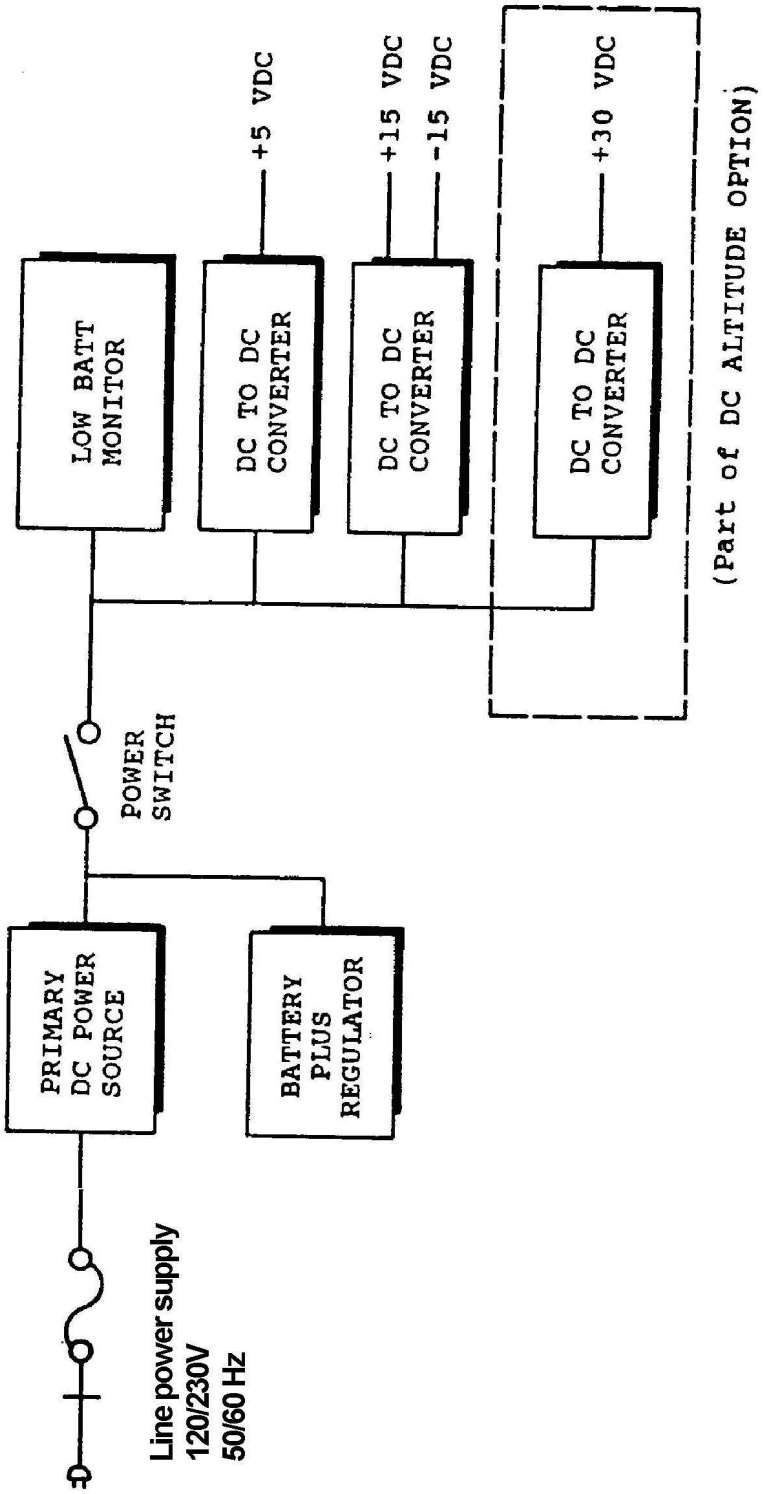


Figure 3-4 - Power Supply Functional Block Diagram

3.6 DC ALTITUDE OUTPUT OPTION CARD

The DC Altitude Output option card generates a DC voltage versus altitude output for each of the three channels. This enables the ARA-552 to simulate the altitude output of a radio altimeter in order to drive the aircraft wiring directly. The ARA-552 also incorporates an electronic servo drive circuit for controlling altimeters that operate in a ground test mode by the injection of a DC voltage. Refer to Figure 3-5.

Serial data containing altitude values for all three channels is brought to the single chip computer on the option board. The computer extracts the altitude data from the received words and allocates these values to their proper channels. Based upon the DC Altitude Table Select jumpers in the cable attached to the ARA-552 front panel connectors, one of the four pre-programmed "DC volts versus altitude" tables is applied to the proper digital-to-analogue converter.

The D-to-A converter generates a precise DC voltage. Accuracy is maintained by a precision voltage reference that is applied to the D-to-A converter. A buffer amplifier increases the drive capability for use as the DC altitude voltage output.

The DC Altitude Output option card also provides an amplifier circuit that can be externally configured (in the patch cable) as a DC servo drive circuit. The Bendix ALA-51 is a typical application for this circuit. The ALA-51 requires a negative-going DC signal input to drive its DC altitude voltage up from its present setting.

When the Bendix ALA-51 cable is attached to the ARA-552 front panel connector, the ARINC 552 DC Altitude table for the D-to-A converter is selected, and the output of the D-to-A buffer is jumpered back to the inverting input of the servo circuit. In addition, plus and minus power is taken from the altimeter DC Altitude Output and applied to the servo circuit, the altimeter DC Altitude is applied to the NON-INVERTING INPUT, and the servo circuit output is applied to the altimeter.

In this configuration, the ARA-552 essentially commands the ALA-51 to move to the altitude set by its DC Altitude Output option card. When the altimeter output is below the option card's DC altitude output, the servo circuit drives to its negative limit. This action causes the altimeter to increase its altitude. In operation, the two altitudes (command and altimeter) will match almost exactly. The theoretical difference between them will be what is required to produce the DC drive voltage for the altimeter. The servo circuit amplifier has an open loop gain of 100,000 and therefore, a 10V drive signal will result in a differential between the command and altimeter altitudes of 0.0001 volts.

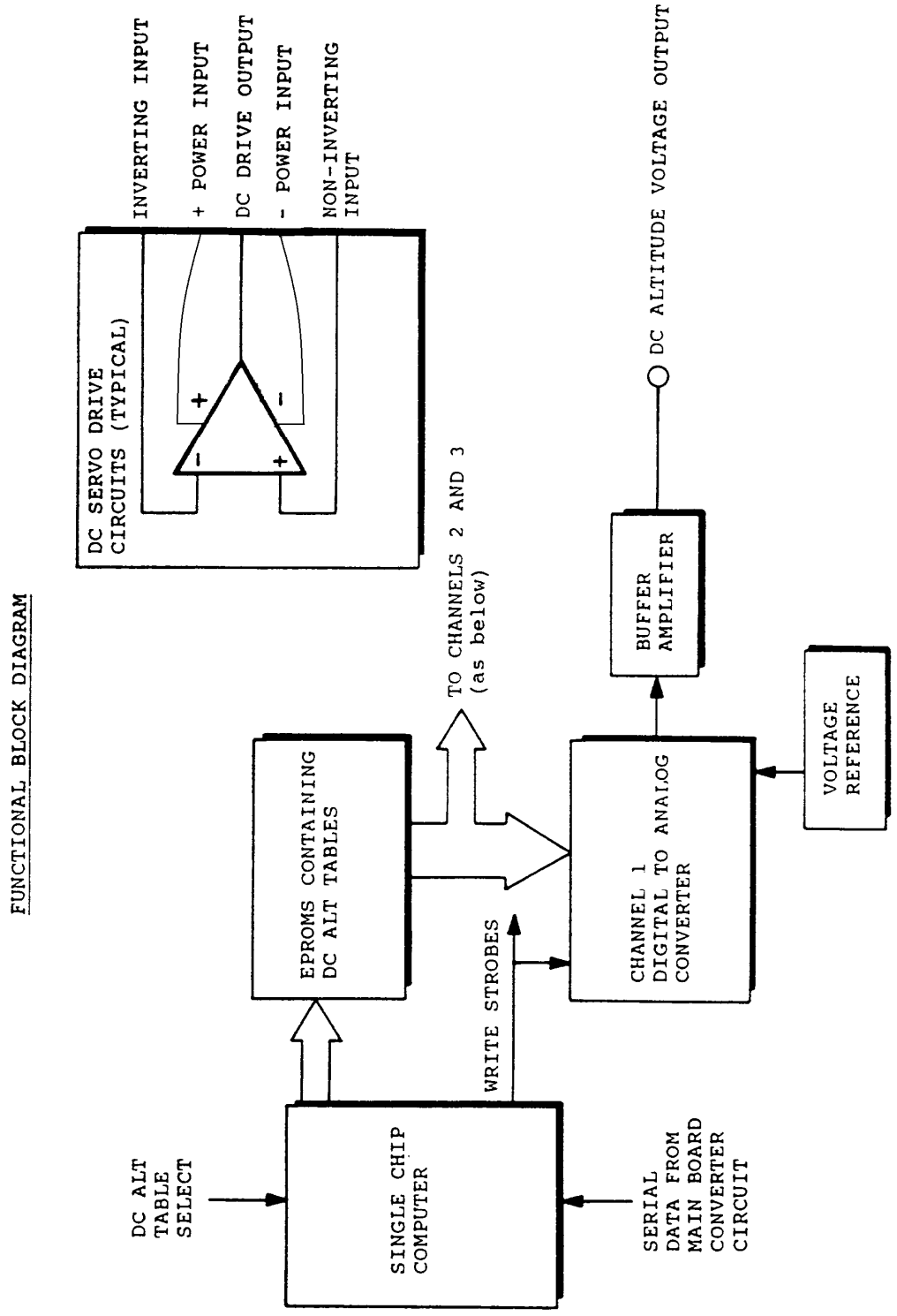


Figure 3-5 - DC Altitude Output Option Card

3.7 RELAY SIMULATION OPTION CARD

The Relay Simulation option card permits the ARA-552 to simulate the action of the Altitude Trip relays, the Autopilot Warn relays, and the Flag output of an altimeter that has been removed from the radio rack. Refer to Figure 3-6.

The option card is connected so that the relay contacts are placed across the wires coming from the above mentioned items while enroute to the front panel indicating circuitry. On the card are 27 relays; nine relays per channel.

Normally the relay coils are unpowered, but when the relay simulation is required, a jumper in the cable applies power to the card so that the relay coils can operate under control of the single chip computer.

The single chip computer receives serial data from the main board receiving circuitry. It extracts the altitude and status data and allocates them to their proper channels. It also reads the "bank select" switch on the cable. This "bank" is the list of altitude values at which individual trip relays will operate. The values are factory pre-programmed according to customer specifications at the time of order.

The relays respond to the contents of the digital word received from the controller unit. If the received status indicates a failed state (as selected on the DRA-707 or HHC-552 front panel) the FLAG relay will be relaxed, simulating the removal of a "valid" signal from an installed altimeter. The Autopilot Warn relay will close (NO WARN) when the "altimeter" is not failed and the altitude is below 3000 feet (simulating sufficient ground signal).

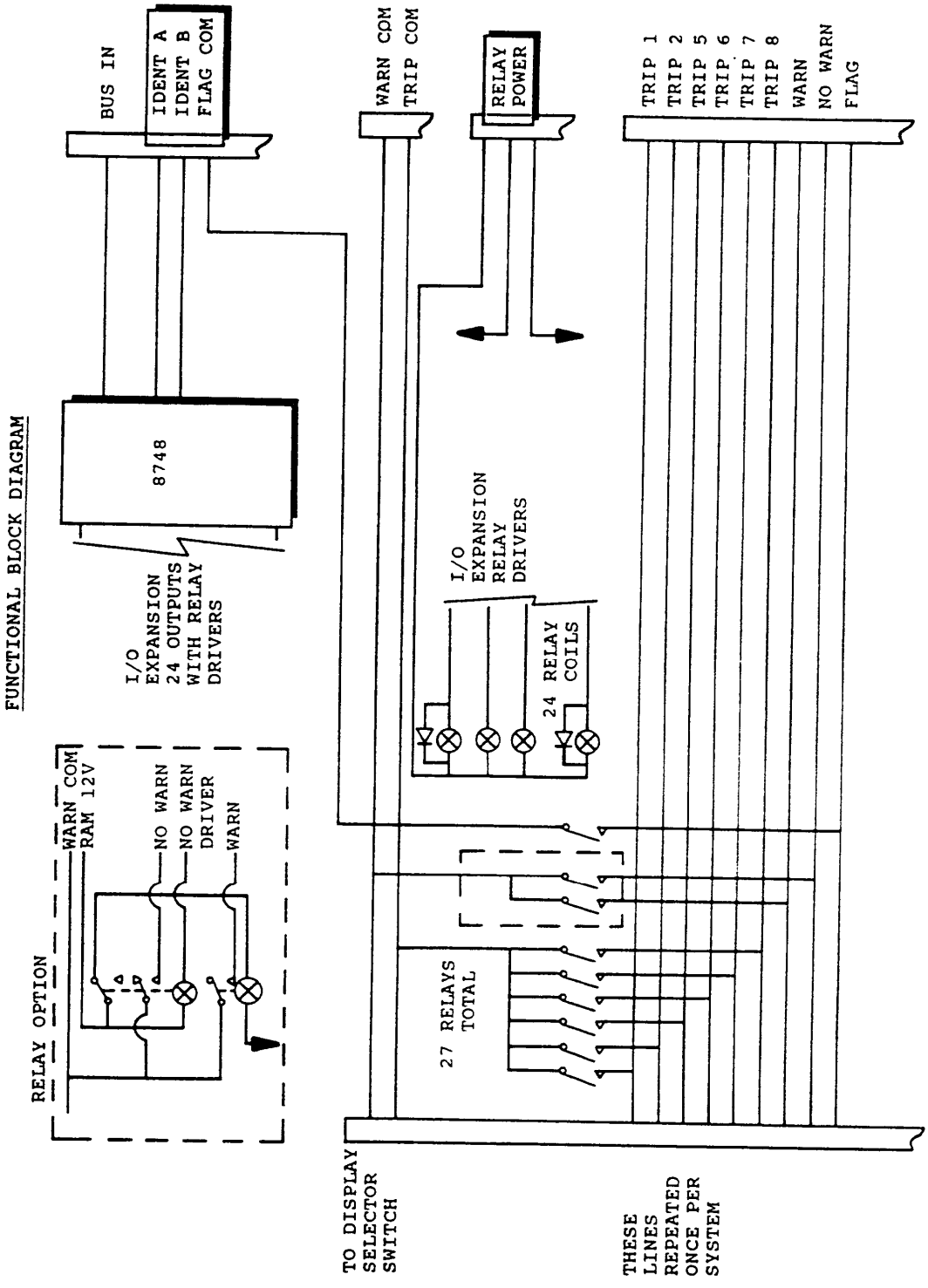


Figure 3-6 - Relay Simulation Option Card

4 INSTALLATION

4.1 LIST OF ACCESSORIES

The accessories for the ARA-552 Analogue Radio Altimeter consist of the data input cable, the AC line power input cord, and the altimeter interface cables.

Due to the available options and wide range of interface capabilities of the ARA-552, the complement of interface cables carried with each unit will vary according to customer selections.

NOTE: Certain interface cables require one or more ARA-552 options. The requirements are identified in the list of available interface cables shown in Table 5-2.

The data input cable can be extended to 500 metres, if necessary.

A power cord for North American standard receptacles (120V, 60 Hz) is provided with the ARA-552. Power cords mating to other types of receptacles must be supplied by the user. Ensure that the power cord is plugged into an earthed outlet.

The ARA-552 can be controlled by the DRA-707 or the HHC-552. The HHC-552 can be stored with the cables in the ARA-552's storage compartment. The two units differ in functional capability only; the ARA-552 responds to both of them in the same fashion. For more details on the DRA-707, refer to the DRA-707 manual. For more information on the HHC-552, refer to Appendix B of this manual.

4.1.1 Basic Set Up

Figure 4-1 shows typical interconnections with the ARA-552 Analogue Radio Altimeter. The ARA-552 must be positioned near the altimeters under test. The interface cables that carry the analogue signals should not be extended, if at all possible. Some cables are more sensitive to external disturbances than others. For example, the 860F-1/4 drive signal drops to approximately 13 mVAC at a simulated altitude of 2500 ft due to the roll-off filter on the ARA-552 output.

The following instructions apply to the HHC-552 and the DRA-707, except as noted.

The controller unit can be positioned according to operator preference for the test being conducted. There are virtually no restrictions on the length of extension of the data input cable. The information is transferred over the data input cable in a digital data transmission format. A maximum length of 500 metres has been stated in the specifications and this should more than suffice for most aircraft applications.

NOTE: On the DRA-707, set the AFCS DATA switch to CONT. Also, ensure that the bit frequency is not more than 12.5 kHz. Press the BIT FREQ key to observe or to set the frequency.

Data transmission is in one direction - from the DRA-707 to the ARA-552. When the DRA-707 is used to control a test from the cockpit, its display reflects only what is being sent to the ARA-552, and not what the ARA-552 is reading back from the altimeter under test.

Line power should be connected to the ARA-552, if extended periods of operation are expected. Line power can be 120/230V, 50/60 Hz.

NOTE: The equipment will continue to operate with a voltage tolerance of 10% (108-132V and 207-254V).

One, two, or three altimeter systems may be connected to the ARA-552. It does not matter which altimeter interface channels are used in a single or dual altimeter interface. All channels are identical insofar as signal characteristics and capabilities are concerned. The operator should know, however, which aircraft altimeter system is connected to which ARA-552 interface connector since all front panel controls are labelled according to the ARA-552 connector designations.

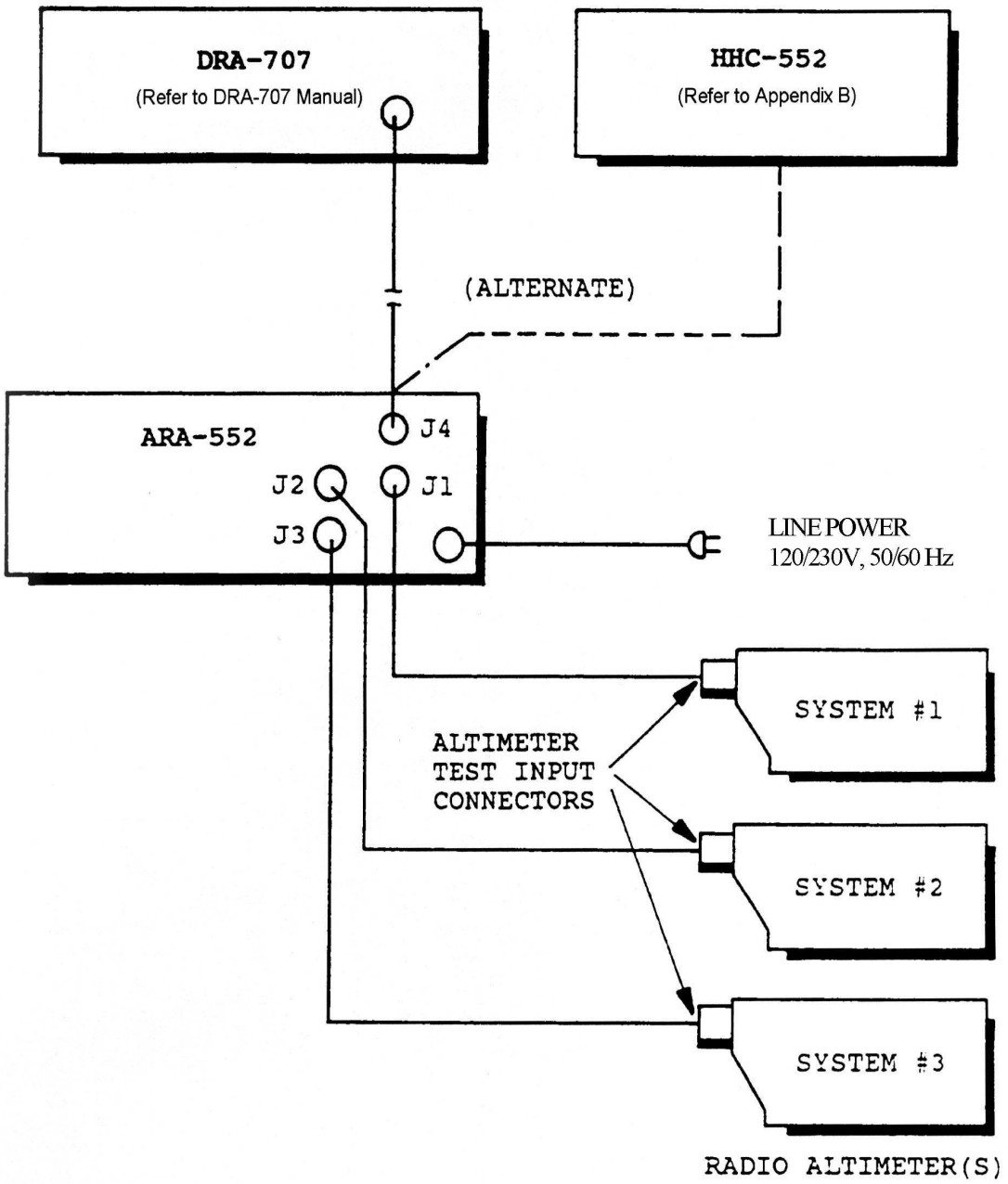


Figure 4-1 - Basic Equipment Set-up

5 OPERATING INSTRUCTIONS

5.1 CONTROLS AND INDICATORS

Figure 5-1 shows the ARA-552 front panel controls and indicators, and provides orientation for Table 5-1, which describes the functions of the controls and indicators.

> ***CAUTION***
>
> The protection provided by this equipment may be impaired if the equipment is used in a manner not specified by the manufacturer.

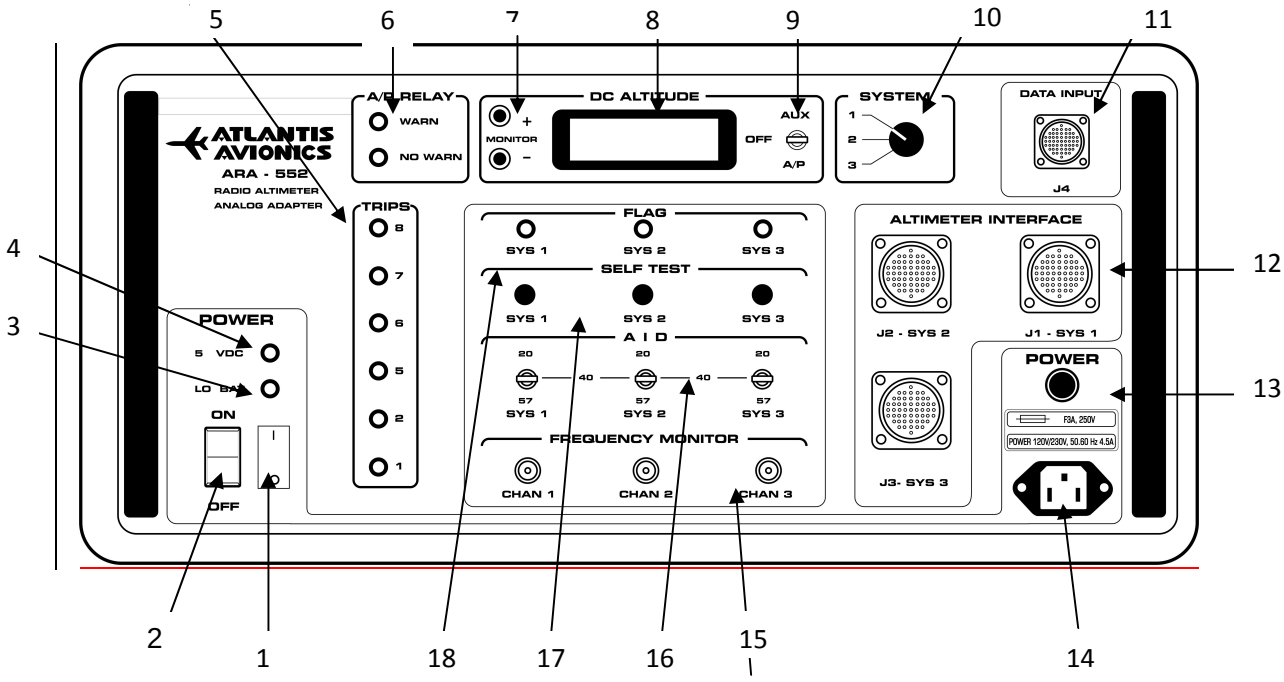


Figure 5-1 - ARA-552 Front Panel Controls and Indicators

Table 5-1 - Front Panel Controls and Indicators

No.	Item	Description
1	Power Symbol	Indicates which position the main power should be in.
2	ON/OFF switch	Applies primary DC power to the DC-to-DC converters to produce operating voltages for the ARA-552. The ARA-552 is fully operational two seconds after the switch is moved to the ON position.
3	LO BAT indicator	Illuminates when the battery voltage is approaching the point where it will cease to provide power for the ARA-552. Plugging the ARA-552 into line power will alleviate this condition.
4	5 VDC indicator	Illuminates when +5 VDC is available from the 5 V power supply.
5	TRIPS indicators	The six numbered indicators correspond to the six numbered

No.	Item	Description
		ALTITUDE TRIP relays specified by ARINC 552. When connected to an altimeter through the SYSTEM selector switch (item 9), the indicators will illuminate when the ALTITUDE TRIP relay contacts are closed (regardless of the relay common voltage). All six TRIP indicators illuminate for about one second when power is turned on. Most indicators remain lit.
6	A/P indicators	The Autopilot Warning relay in the altimeters is a double throw type. The indicators on the ARA-552 illuminate to display the position of the relay. As with the TRIP relays, common voltage is automatically sensed. WARN illuminates in the relay relaxed position, indicating that the A/P system is not functioning properly. NO WARN illuminates when the relay is engaged, indicating that the A/P system is functioning properly. Both A/P relay indicators illuminate for about one second when power is turned on.
7	MONITOR tip jacks	Provide facility for the operator to directly measure, with a DVM, the analogue DC altitude voltage produced by the altimeter as selected by the SYSTEM selector switch (item 9) and the AUX/AP switch (item 8). This will be the same voltage that is read and translated to units of feet in the digital display. This procedure is normally used only to verify the accuracy of the DC ALTITUDE display (item 7).
8	DC ALTITUDE display	Displays the altimeter output altitude in feet. The value is derived from the DC altitude voltage produced by the altimeter as a result of the stimulus from the ARA-552. One of four conversion tables is selected by a jumper in the altimeter interface connector. An altitude over range condition is indicated by the appearance of all decimal points in the display. The display illuminates completely for about one second at power-on to test all operational segments.
9	AUX/OFF/AP switch	Selects for display one of the two DC altitude voltages produced by the altimeter selected on the SYSTEM selector switch (item 9). The centre OFF position causes the display to go blank. This position would be used when it is desired to conserve battery power.
10	SYSTEM 1/2/3 switch	This rotary switch applies signals from the labelled altimeter interface connector to the displays contained in the band associated with it. It switches six ALTITUDE TRIP lines, the A/P WARN and NO WARN relay lines, two DC altitude voltages (labelled A/P and AUX), and two lines to identify the altimeter type to the DC altitude converter. Movement of the switch has no effect on the altimeter - it affects only the displays in the same band on the front panel.
11	DATA INPUT connector	Accepts the command control cable from the controller unit (the DRA-707 or HHC-552). The ARA-552 cannot generate altitude simulations on its own. It receives the information for all of the three channels over a single serial data line from the controller unit. The controller unit generates the altitude descent ramps and relation-ships. The data is transferred using the ARINC 707 data format and RS-422 line drivers. The input signal line may be extended for up to 500 meters without adverse effects on system performance.
12	ALTIMETER INTERFACE J1-	Accepts altimeter interface cables. The System 1 connector description is typical for Systems 2 and 3.

No.	Item	Description
	SYS 1 connector	Jumpers in the cable automatically make the proper signal and conversion table selections. This feature permits consistent operation and interpretation of the ARA-552 over the complete range of subject altimeters and aircraft. Some cables require that one or more of the option cards or conversion tables be incorporated in the ARA-552. Section 5.2 details these requirements and notes any special characteristics of the interface cable or altimeter under test.
NOTE: The equipment will continue to operate with a voltage tolerance of 10% (108-132V and 207-254V).		
13	3 A fuse	Opens the power input line when current exceeds 3 Amps.
14	POWER connector	Accepts a standard AC power cord for line power input.
NOTE: The next four items are provided for each of the three altimeter systems and are identical in function from system to system. Therefore, the System 1 features are described as being typical of Systems 2 and 3.		
15	FREQUENCY MONITOR jack	Provides easy access to monitor the System 1 frequency generator output. This jack would normally be used only during calibration and maintenance, but it can also be used on the flight line for quick visual verification of the signal quality with an oscilloscope.
16	AID 20/40/57 switch	Causes the System 1 frequency generator to shift its frequency output for a given altitude according to the Aircraft Installation Delay (AID), or length of antenna cable installed in the aircraft. This switch must be positioned to match the aircraft system AID. If the proper value is not known, it is usually possible to find the switch setting that makes the ARA-552 DC ALTITUDE display agree with the DRA-707 output at an altitude of 100 feet. The AID switch is only used with altimeters that require a frequency signal for ground simulation (e.g., the Collins 860F-1/4). The setting of this switch does not affect altimeters that use DC drive capability. For the Bendix ALA-52 System, the "20" AID position serves as the 80 ft AID setting. The ALA-52 does not use a 20 ft AID.
17	SELF TEST pushbutton	Activates the self-test function of the altimeter connected to the SYSTEM 1 connector. During the self-test, the System 1 frequency generator of the ARA-552 is inhibited to allow the altimeter to perform properly.
18	FLAG indicator	Illuminates when FLAG (or ALTIMETER VALID) voltage is present. This indicator monitors the System 1 FLAG line at all times - it is not switched by the display selector. The green colour of the indicator signifies that the altimeter output is valid.

5.2 OPERATION

This section addresses each altimeter type served by the ARA-552 for the purpose of identifying the capabilities and/or limitations of the ARA-552 when used with these altimeters.

Specific sequences of operation for conducting Radio Altimeter, Autoland or Ground Proximity Warning system tests are not discussed here since they are specified in documents related to the system under test. See paragraph 5.1 for interpretation of the ARA-552 displays.

The ARA-552 can be controlled by the DRA-707 or the HHC-552. If using the DRA-707 as the controller unit, refer to the DRA-707 Operator's Manual for operating instructions. If using the hand-held controller, HHC-552, refer to Appendix B of this manual for operating instructions.

5.2.1 Initial Configuration

Any combination of available cables may be connected to the ARA-552. Each of the three channels operates independently. As a final step in the set-up procedures, check the "Switch Settings of Concern" column in Table 5-2 to ensure that all switch settings related to the cable in use are set properly.

Collins:

The AID switch setting must match the installed altimeter RF cable length in order for the altimeter to output the correct altitude as displayed on the controller unit. If the correct setting is unknown, set the controller unit to a value of 100 feet and then select the ARA-552 AID switch position that results in a value of 100 appearing on the DC ALTITUDE display.

NOTE: To perform flight line tests on Collins Radio Altimeters, Models ALT 50A and ALT 55B, see Appendix A.

Bendix ALA-51:

The ALA-51 is unaffected by AID switch settings. It uses the DC drive feature of the DC AltitudE Output option card.

Bendix ALA-52:

The AID switch setting must match the installed altimeter RF cable length in order for the altimeter to output the correct altitude as displayed on the controller unit. The proper cable must be used with each system (Nos. 1, 2, 3) in order to match the system's scale factor. If the correct setting is unknown, set the controller unit to a value of 100 feet and then select the AID switch position that results in a value of 100 appearing on the DC ALTITUDE display.

ARINC 552 Direct:

This cable is, in effect, simulating an altimeter. It is not affected by AID switch settings. The altitude values at which the Altitude Trip relays will operate are contained in the ARA-552 memory in four sets or banks of six values. These values are customer-specified at the time of order and therefore the proper position of the TRIP BANK switch (located on the cable itself) is determined by the user. Consult company operating procedures for this information.

Table 5-2 - List of Interface Cables

Altimeter or Installation	Cable Part No. (Note 1)	Frequency Curve Ident. (Note 2)	DC Altitude Output Option	Relay Sim. Option	Switch Settings of Concern
Collins 1/4	(110-0440-202) AY969-00313	# 00	No	No	AID to match aircraft installation.
Bendix ALA-51	(110-0440-203) AY969-00319	---	Yes, # 00	No	None
Bendix ALA-52	(110-0440-206 (1)) AY969-00315-001 (110-0440-206 (2)) AY969-00315-002 (110-0440-206 (3)) AY969-00315-003	# 10 (SYS 1) # 01 (SYS 2) # 11 (SYS 3)	No	No	AID to match aircraft installation.
ARINC 552 Direct	(110-0440-204) AY969-00320	___	Yes, # 00	Yes	Select TRIP BANK as per user option.
Honeywell		---	Yes, 3 00	No	None

NOTES:

1. Old cable part number shown in parenthesis.
2. Two-digit code corresponds to a ground applied to pins r and s respectively of the altimeter interface connectors J1, J2, and J3, where 1 = ground applied.

6 MAINTENANCE

6.1 GENERAL

The following procedures include the recommended service intervals. Extended operation or harsh working environments may shorten these service intervals - consult your service representative.

NOTE: Atlantis Avionics recommends that the ARA-552 be returned for service if it malfunctions. This includes battery and fuse replacement. Servicing should be performed by qualified personnel only.

6.1.1 Cleaning

Clean the exterior surfaces of the ARA-552 with a soft, damp cloth and mild detergent. Use a soft bristle brush to remove dirt or dust from the connectors. It is recommended that the unit be cleaned whenever necessary or at least once a year.

CAUTION
DO NOT use any volatile solvent, abrasive,
strong detergent, or bleach to clean the front panel.

6.1.2 Cable Inspection

Inspect all cables for cuts, cracking, wear, loose connectors or other damage. Repair or replace defective cables as required. It is recommended that a cable inspection be done whenever a malfunction is suspected or at least once a year.

6.2 BATTERY CHARGING

The battery option consists of a nickel-cadmium battery pack of sealed construction.

When the battery is being used, care should be taken to avoid running the battery completely flat as this adversely affects battery life. Nickel-cadmium batteries develop a "memory" state if discharged only partially for short periods of time. It is therefore recommended to discharge to LO-BAT condition and recharge the battery at regular intervals.

The battery is charging when the ARA-552 is plugged into line power. The battery charges whether the front panel power switch is set to ON or not i.e., whether the ARA-552 is operating or not operating.

Atlantis Avionics recommends that the ARA-552 be returned if the battery requires replacement.

CAUTION
Do not operate the ARA-552 when
the LO BAT LED is illuminated.

6.3 ALTITUDE CONVERSION CHART

Table 6-1 contains an altitude conversion chart for the Collins 860F-1 and 860F-4 radio altimeters. The frequency values stated are the ideal values for the altimeter. The ARA-552 achieves frequencies close to the ideal. However, the lowest frequency achievable for the Collins 860F-1 is 680 Hz and for the Collins 860F-6 is 610 Hz. The Collins 860F-1 and 860F-4 do not record with altitudes less than 0 ft.

Units will have a frequency resolution of 10 Hz over the entire range from 0 ft to 3000 ft.

Units marked "MOD 1" will have an error as shown below:

Bendix Error	Collins Error	Altitude (ft)
±5 ft	±10 ft	3000
±1 ft	±1 ft	700
±1 ft	±1 ft ±1 ft	300

Frequency of the ARA-552 must be evaluated within the tolerances specified in paragraph 2.2 (Specifications) of this manual.

Table 6-1 - Altitude Conversion Chart (sheet 1 of 7)

ALTITUDE (feet)	INPUT FREQUENCY (Hz)			DC ANALOGUE OUTPUT VOLTAGE (volts)
	20-FT AID	40-FT AID	57-FT AID	
-20				0.000
-10				0.200
0	680	1080	1420	0.400
10	1080	1480	1820	0.600
20	1480	1880	2220	0.800
30	1880	2280	2620	1.000
40	2280	2680	3020	1.200
50	2680	3080	3420	1.400
60	3080	3480	3820	1.600
70	3480	3880	4220	1.800
80	3880	4280	4620	2.000
90	4280	4680	5020	2.200
100	4680	5080	5420	2.400
110	5080	5480	5820	2.600
120	5480	5880	6220	2.800
130	5880	6280	6620	3.000
140	6280	6680	7020	3.200
150	6680	7080	7420	3.400
160	7080	7480	7820	3.600
170	7480	7880	8220	3.800
180	7880	8280	8620	4.000
190	8280	8680	9020	4.200
200	8680	9080	9420	4.400
210	9080	9480	9820	4.600
220	9480	9880	10220	4.800
230	9880	10280	10620	5.000
240	10280	10680	11020	5.200
250	10680	11080	11420	5.400
260	11080	11480	11820	5.600
270	11480	11880	12220	5.800
280	11880	12280	12620	6.000
290	12280	12680	13020	6.200
300	12680	13080	13420	6.400
310	13080	13480	13820	6.600
320	13480	13880	14220	6.800
330	13880	14280	14620	7.000
340	14280	14680	15020	7.200
350	14680	15080	15420	7.400
360	15080	15480	15820	7.600
370	15480	15880	16220	7.800
380	15880	16280	16620	8.000
390	16280	16680	17020	8.200
400	16680	17080	17420	8.400
410	17080	17480	17820	8.600
420	17480	17880	18220	8.800
430	17880	18280	18620	9.000
440	18280	18680	19020	9.200
450	18680	19080	19420	9.400
460	19080	19480	19820	9.600

Table 6-1 - Altitude Conversion Chart (sheet 2 of 7)

ALTITUDE (feet)	INPUT FREQUENCY (Hz)			DC ANALOGUE OUTPUT VOLTAGE (volts)
	20-FT AID	40-FT AID	57-FT AID	
470	19480	19880	20220	9.800
480	19880	20280	20620	10.000
490	20280	20680	21020	10.198
500	20680	21080	21420	10.392
510	21080	21480	21820	10.582
520	21480	21880	22220	10.769
530	21880	22280	22620	10.953
540	22280	22680	23020	11.133
550	22680	23080	23420	11.300
560	23080	23480	23820	11.484
570	23480	23880	24220	11.655
580	23880	24280	24620	11.823
590	24280	24680	25020	11.988
600	24680	25080	25420	12.151
610	25080	25480	25820	12.311
620	25480	25880	26220	12.468
630	25880	26280	26620	12.623
640	26280	26680	27020	12.776
650	26680	27080	27420	12.926
660	27080	27480	27820	13.074
670	27480	27880	28220	13.220
680	27880	28280	28620	13.364
690	28280	28680	29020	13.506
700	28680	29080	29420	13.646
710	29080	29480	29820	13.784
720	29480	29880	30220	13.920
730	29880	30280	30620	14.054
740	30280	30680	31020	14.187
750	30680	31080	31420	14.317
760	31080	31480	31820	14.446
770	31480	31880	32220	14.574
780	31880	32280	32620	14.700
790	32280	32680	33020	14.824
800	32680	33080	33420	14.946
810	33080	33480	33820	15.068
820	33480	33880	34220	15.187
830	33880	34280	34620	15.306
840	34280	34680	35020	15.423
850	34680	35080	35420	15.538
860	35080	35480	35820	15.653
870	35480	35880	36220	15.766
880	35880	36280	36620	15.877
890	36280	36680	37020	15.988
900	36680	37080	37420	16.097
910	37080	37480	37820	16.205
920	37480	37880	38220	16.312
930	37880	38280	38620	16.418
940	38280	38680	39020	16.523
950	38680	39080	39420	16.626

Table 6-1 - Altitude Conversion Chart (sheet 3 of 7)

ALTITUDE (feet)	INPUT FREQUENCY (Hz)			DC ANALOGUE OUTPUT VOLTAGE (volts)
	20-FT AID	40-FT AID	57-FT AID	
960	39080	39480	39820	16.729
970	39480	39880	40220	16.830
980	39880	40280	40620	16.931
990	40280	40680	41020	17.030
1000	40680	41080	41420	17.129
1010	41080	41480	41820	17.227
1020	41480	41880	42220	17.323
1030	41880	42280	42620	17.419
1040	42280	42680	43020	17.514
1050	42680	43080	43420	17.608
1060	43080	43480	43820	17.701
1070	43480	43880	44220	17.793
1080	43880	44280	44620	17.884
1090	44280	44680	45020	17.975
1100	44680	45080	45420	18.064
1110	45080	45480	45820	18.153
1120	45480	45880	46220	18.241
1130	45880	46280	46620	18.329
1140	46280	46680	47020	18.415
1150	46680	47080	47420	18.501
1160	47080	47480	47820	18.586
1170	47480	47880	48220	18.670
1180	47880	48280	48620	18.754
1190	48280	48680	49020	18.837
1200	48680	49080	49420	18.919
1210	49080	49480	49820	19.001
1220	49480	49880	50220	19.082
1230	49880	50280	50620	19.162
1240	50280	50680	51020	19.242
1250	50680	51080	51420	19.321
1260	51080	51480	51820	19.400
1270	51480	51880	52220	19.477
1280	51880	52280	52620	19.555
1290	52280	52680	53020	19.631
1300	52680	53080	53420	19.707
1310	53080	53480	53820	19.783
1320	53480	53880	54220	19.858
1330	53880	54280	54620	19.932
1340	54280	54680	55020	20.006
1350	54680	55080	55420	20.079
1360	55080	55480	55820	20.152
1370	55480	55880	56220	20.224
1380	55880	56280	56620	20.296
1390	56280	56680	57020	20.367
1400	56680	57080	57420	20.438
1410	57080	57480	57820	20.508
1420	57480	57880	58220	20.577
1430	57880	58280	58620	20.647
1440	58280	58680	59020	20.715

Table 6-1 - Altitude Conversion Chart (sheet 4 of 7)

ALTITUDE (feet)	INPUT FREQUENCY (Hz)			DC ANALOGUE OUTPUT VOLTAGE (volts)
	20-FT AID	40-FT AID	57-FT AID	
1450	58680	59080	59420	20.784
1460	59080	59480	59820	20.851
1470	59480	59880	60220	20.919
1480	59880	60280	60620	20.986
1490	60280	60680	61020	21.052
1500	60680	61080	61420	21.118
1510	61080	61480	61820	21.184
1520	61480	61880	62220	21.249
1530	61880	62280	62620	21.314
1540	62280	62680	63020	21.378
1550	62680	63080	63420	21.442
1560	63080	63480	63820	21.505
1570	63480	63880	64220	21.568
1580	63880	64280	64620	21.631
1590	64280	64680	65020	21.693
1600	64680	65080	65420	21.755
1610	65080	65480	65820	21.817
1620	65480	65880	66220	21.878
1630	65880	66280	66620	21.939
1640	66280	66680	67020	21.999
1650	66680	67080	67420	22.059
1660	67080	67480	67820	22.119
1670	67480	67880	68220	22.178
1680	67880	68280	68620	22.237
1690	68280	68680	69020	22.296
1700	68680	69080	69420	22.354
1710	69080	69480	69820	22.412
1720	69480	69880	70220	22.470
1730	69880	70280	70620	22.527
1740	70280	70680	71020	22.584
1750	70680	71080	71420	22.641
1760	71080	71480	71820	22.697
1770	71480	71880	72220	22.753
1780	71880	72280	72620	22.809
1790	72280	72680	73020	22.864
1800	72680	73080	73420	22.919
1810	73080	73480	73820	22.974
1820	73480	73880	74220	23.029
1830	73880	74280	74620	23.083
1840	74280	74680	75020	23.137
1850	74680	75080	75420	23.190
1860	75080	75480	75820	23.244
1870	75480	75880	76220	23.297
1880	75880	76280	76620	23.349
1890	76280	76680	77020	23.402
1900	76680	77080	77420	23.454
1910	77080	77480	77820	23.506
1920	77480	77880	78220	23.558
1930	77880	78280	78620	23.609

Table 6-1 - Altitude Conversion Chart (sheet 5 of 7)

ALTITUDE (feet)	INPUT FREQUENCY (Hz)			DC ANALOGUE OUTPUT VOLTAGE (volts)
	20-FT AID	40-FT AID	57-FT AID	
1940	78280	78680	79020	23.660
1950	78680	79080	79420	23.711
1960	79080	79480	79820	23.762
1970	79480	79880	80220	23.812
1980	79880	80280	80620	23.862
1990	80280	80680	81020	23.912
2000	80680	81080	81420	23.962
2010	81080	81480	81820	24.011
2020	81480	81880	82220	24.060
2030	81880	82280	82620	24.109
2040	82280	82680	83020	24.158
2050	82680	83080	83420	24.206
2060	83080	83480	83820	24.255
2070	83480	83880	84220	24.303
2080	83880	84280	84620	24.351
2090	84280	84680	85020	24.398
2100	84680	85080	85420	24.445
2110	85080	85480	85820	24.492
2120	85480	85880	86220	24.539
2130	85880	86280	86620	24.586
2140	86280	86680	87020	24.632
2150	86680	87080	87420	24.678
2160	87080	87480	87820	24.724
2170	87480	87880	88220	24.770
2180	87880	88280	88620	24.816
2190	88280	88680	89020	24.861
2200	88680	89080	89420	24.906
2210	89080	89480	89820	24.951
2220	89480	89880	90220	24.996
2230	89880	90280	90620	25.040
2240	90280	90680	91020	25.085
2250	90680	91080	91420	25.129
2260	91080	91480	91820	25.173
2270	91480	91880	92220	25.216
2280	91880	92280	92620	25.260
2290	92280	92680	93020	25.303
2300	92680	93080	93420	25.347
2310	93080	93480	93820	25.390
2320	93480	93880	94220	25.432
2330	93880	94280	94620	25.475
2340	94280	94680	95020	25.518
2350	94680	95080	95420	25.560
2360	95080	95480	95820	25.602
2370	95480	95880	96220	25.644
2380	95880	96280	96620	25.686
2390	96280	96680	97020	25.727
2400	96680	97080	97420	25.769
2410	97080	97480	97820	25.810
2420	97480	97880	98220	25.851

Table 6-1 - Altitude Conversion Chart (sheet 6 of 7)

ALTITUDE (feet)	INPUT FREQUENCY (Hz)			DC ANALOGUE OUTPUT VOLTAGE (volts)
	20-FT AID	40-FT AID	57-FT AID	
2430	97880	98280	98620	25.892
2440	98280	98680	99020	25.933
2450	98680	99080	99420	25.973
2460	99080	99480	99820	26.014
2470	99480	99880	100220	26.054
2480	99880	100280	100620	26.094
2490	100280	100680	101020	26.134
2500	100680	101080	101420	26.174
2510	101080	101480	101820	26.213
2520	101480	101880	102220	26.253
2530	101880	102280	102620	26.292
2540	102280	102680	103020	26.331
2550	102680	103080	103420	26.370
2560	103080	103480	103820	26.409
2570	103480	103880	104220	26.448
2580	103880	104280	104620	26.486
2590	104280	104680	105020	26.524
2600	104680	105080	105420	26.563
2610	105080	105480	105820	26.601
2620	105480	105880	106220	26.639
2630	105880	106280	106620	26.677
2640	106280	106680	107020	26.714
2650	106680	107080	107420	26.752
2660	107080	107480	107820	26.789
2670	107480	107880	108220	26.826
2680	107880	108280	108620	26.863
2690	108280	108680	109020	26.900
2700	108680	109080	109420	26.937
2710	109080	109480	109820	26.974
2720	109480	109880	110220	27.011
2730	109880	110280	110620	27.047
2740	110280	110680	111020	27.083
2750	110680	111080	111420	27.119
2760	111080	111480	111820	27.155
2770	111480	111880	112220	27.191
2780	111880	112280	112620	27.227
2790	112280	112680	113020	27.263
2800	112680	113080	113420	27.298
2810	113080	113480	113820	27.334
2820	113480	113880	114220	27.369
2830	113880	114280	114620	27.404
2840	114280	114680	115020	27.439
2850	114680	115080	115420	27.474
2860	115080	115480	115820	27.509
2870	115480	115880	116220	27.544
2880	115880	116280	116620	27.578
2890	116280	116680	117020	27.612
2900	116680	117080	117420	27.647
2910	117080	117480	117820	27.681

Table 6-1 - Altitude Conversion Chart (sheet 7 of 7)

ALTITUDE (feet)	INPUT FREQUENCY (Hz)			DC ANALOGUE OUTPUT VOLTAGE (volts)
	20-FT AID	40-FT AID	57-FT AID	
2920	117480	117880	118220	27.715
2930	117880	118280	118620	27.749
2940	118280	118680	119020	27.783
2950	118680	119080	119420	27.817
2960	119080	119480	119820	27.850
2970	119480	119880	120220	27.884
2980	119880	120280	120620	27.917
2990	120280	120680	121020	27.950
3000	120680	121080	121420	27.984
3010	121080	121480	121820	28.017
3020	121480	121880	122220	28.050
3030	121880	122280	122620	28.082
3040	122280	122680	123020	28.115
3050	122680	123080	123420	28.148
3060	123080	123480	123820	28.180
3070	123480	123880	124220	28.213
3080	123880	124280	124620	28.245
3090	124280	124680	125020	28.277
3100	124680	125080	125420	28.309
3110	125080	125480	125820	28.341
3120	125480	125880	126220	28.373
3130	125880	126280	126620	28.405
3140	126280	126680	127020	28.437
3150	126680	127080	127420	28.468
3160	127080	127480	127820	28.500
3170	127480	127880	128220	28.531
3180	127880	128280	128620	28.562
3190	128280	128680	129020	28.594
3200	128680	129080	129420	28.625
3210	129080	129480	129820	28.656
3220	129480	129880	130220	28.687
3230	129880	130280	130620	28.717
3240	130280	130680	131020	28.748
3250	130680	131080	131420	28.779
3260	131080	131480	131820	28.809
3270	131480	131880	132220	28.840
3280	131880	132280	132620	28.870
3290	132280	132680	133020	28.900
3300	132680	133080	133420	28.931

7 WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT

7.1 WEEE STATEMENT

To protect the global environment and as an environmentalist, Atlantis Avionics must remind you that…

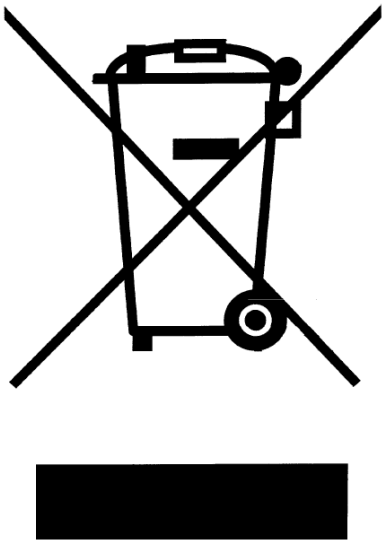
Under the European Union (EU) Directive on Waste Electrical and Electronic Equipment, Directive 2002/96/EC, which took effect on August 13, 2005, products of "electrical and electronic equipment" cannot be discarded as municipal waste anymore and manufacturers of covered electronic equipment will be obligated to take back such products at the end of their useful life.

Atlantis Avionics will comply with the product take back requirement at the end of life of Atlantis Avionics' branded products that are sold into the EU. You can return these products to:

Atlantis Avionics Test Equipment Corp.
8120 Lawson Road, Unit #2
Milton, Ontario
L9T 5C4
Canada

7.2 WEEE SYMBOL

This equipment complies with the WEEE Directive (see paragraph 7.1).



APPENDIX A

Testing Collins Radio Altimeters Models ALT 50A and ALT 55B

INTRODUCTION

This appendix explains how to prepare the ARA-552 Analogue Radio Altimeter for performing flight line tests on Collins Radio Altimeters, Models ALT 50A and ALT 55B.
Atlantis Avionics has modified the internal circuitry of the ARA-552 to enable it to generate the required translation curves for the altimeters.

DESCRIPTION OF EQUIPMENT

Options

Options are available to enable the ARA-552 to:

a. Generate the intermediate frequency signal to stimulate the ALT 50A or ALT 55B altimeters.
b. Illuminate four ALTITUDE TRIP indicators corresponding to the altimeters' ALTITUDE TRIP settings.
c. Display the output altitude in feet.
d. Illuminate the A/P WARN indicator generated by the altimeters' A/P WARN relay.
e. Activate a self-test function of the altimeter.
f. Generate DC altitude voltages according to the ALT 50A or ALT 55B characteristics to simulate a removed altimeter.

Description of Interconnect Cable

Tests are conducted with a special interface cable. At one end, the cable is fitted with a Bendix-type connector for connecting to the ARA-552. The other end is fitted with 0.080 in. diameter phone jacks. This cable will not prevent the altimeter from being reinserted into the electronics bay for testing.

The test cable, AY969-00314 (old part number 110-0440-205), is 6 feet long. All ARA-552 plugs are clearly labelled for ease of connecting to the altimeter.

ELECTRICAL SPECIFICATIONS

Output Characteristics

Frequency ..... 40 x (altitude* + AID/2) + 70 Hz
Voltage ……0.3 RMS, -10% @ 2000 Hz
……..roll-off 6dB/octave above 2 kHz,-1 dB
* Altitude: from -20 to 2000 ft for ALT 50A, -20 to 2500 ft for ALT 55B.

DC Altitude Reader

Translation curve

-20 to 500 ft ..... height = (50 x voltage) - 20 (ft)
above 500 ft ..... height = (voltage - 10.4)/0.003 + 500 (ft)

DC Voltage Output

Translation curve
-20 to 500 ft ..... volts = 0.02 x (height + 20)
above 500 ft ..... volts = 10.4 + (height - 500) x 0.003

OPERATING INSTRUCTIONS

Test Configuration

The Collins Models ALT 50A and ALT 55B altimeters are not equipped with test connectors. The altimeter's cover must be removed to reach the signal points required for testing.

Up to three ALT 50A or ALT 55B altimeters can be tested simultaneously.

Leads equipped with phone plugs are labelled for ease in locating the relevant test points. See Figure A-1.

The +28 VDC supply for the ARA-552 trip relays is supplied by the altimeter at A1R103. See Figure A-2.

CAUTION
Be extremely careful when connecting the connecting clip to A1R103.
This junction is not fused. Shorting it can result in damage to the equipment.

The GROUND test clip can be connected to any convenient location on the altimeter's case.

Ensure that all plugs and clip leads are securely seated before powering the altimeter. Options for testing the ALT 50A or the ALT 55B are pre-set on the system connector of the patch cable. No other connections or adjustments are needed.

Other operating instructions are provided in paragraph 5.2 of this manual.

The AID 20/40/57 switch setting on the ARA-552 must match the aircraft AID selection on the altimeter. If this setting is not known, select an altitude of 100 feet using the controller unit. Select the AID switch setting on the front panel of the ARA-552 that results in a value of 100 appearing on the DC ALTITUDE display.

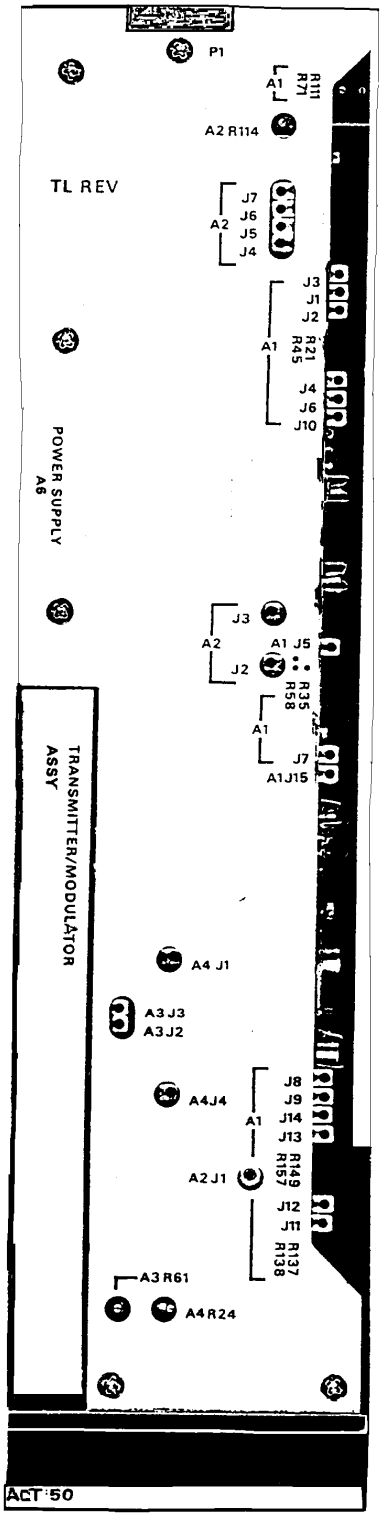


Figure A-1 - Top View of Altimeter With Cover Removed

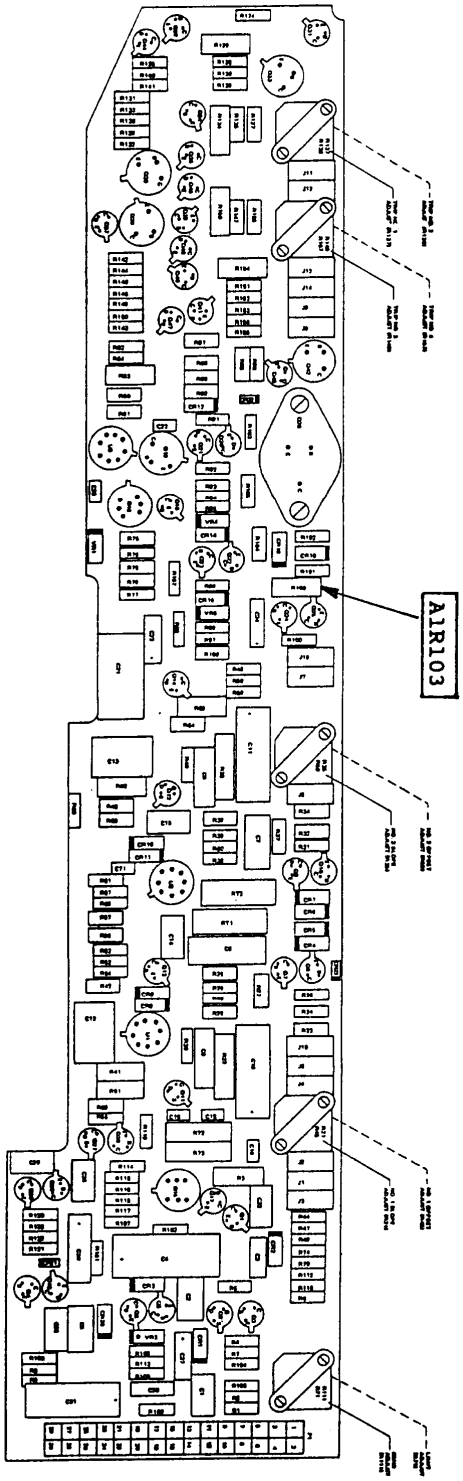


Figure A-2 - Circuit Card

APPENDIX B

ARA-552 Hand-Held Controller

INTRODUCTION

The ARA-552 hand-held controller (HHC-552) has been developed to control the ARA-552 when a more portable test configuration is required. The HHC-552 and ARA-552 provide sophisticated capabilities for testing a wide range of analogue altimeters in a variety of aircraft.

DESCRIPTION OF EQUIPMENT

The HHC-552 is a lightweight unit with pendant cable, keypad, and digital (numeric) display housed a rugged case. The HHC accepts operator-defined parameters, such as start altitude (START ALT), present altitude (PRES ALT), and vertical speed (VERT SPD), to define a radio altimeter "ramp". The operator can hold or resume a ramp, and manually reverse or advance it. However, there is no storage or recall of ramps available on the HHC. The HHC also does not allow the operator to introduce simulated error parameters. Full three-channel operation is maintained, but only one ramp can be simulated at a time. Therefore, the HHC will not allow the concatenation of ramps or the splitting of altimeters.

Physical

The HHC-552 is housed in a portable weather-resistant case with cover, and measures approximately 19 cm by 12.5 cm by 5.3 cm (7 3/4 in. by 5 in. by 2 1/8 in. deep). By removing the single screw below the keypad, the silk-screened face can be removed to reveal the printed circuit board underneath.

Electrical

The HHC-552 receives all its power from the ARA-552. There is no internal battery. Connection to the ARA-552 is facilitated by plugging the HHC's pendant cable into the DATA INPUT (J4) connector on the ARA-552.

Controls

Figure B-1 shows the controller and provides orientation. Table B-1 provides the control labels and their functions.

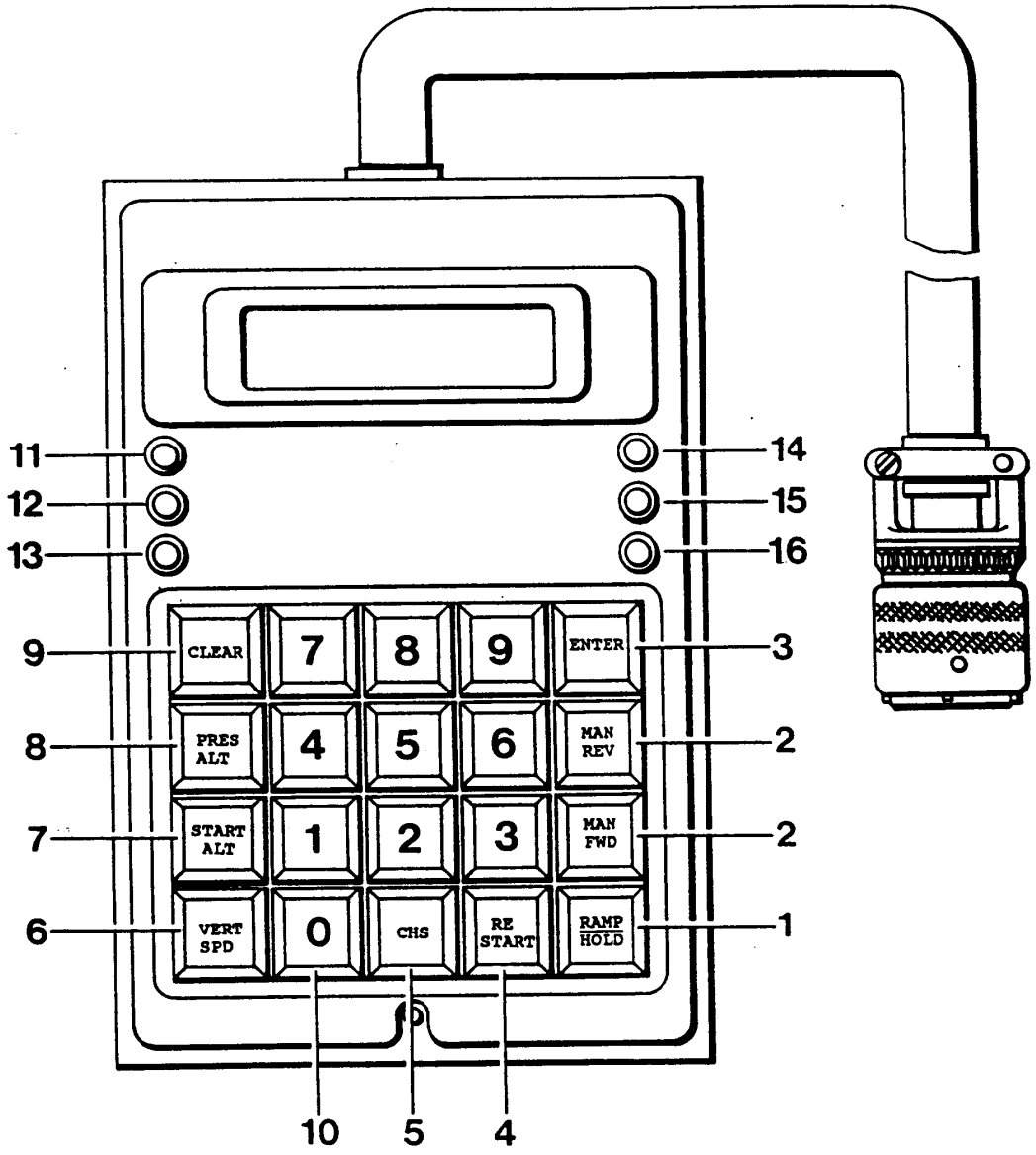


Figure B-1 - ARA-552 Hand-Held Controller

Table B-1 - HHC Control Descriptions

No.	Item	Description
1	RAMP/HOLD button	Causes the programmed altitude ramp to proceed and hold on alternate button selections.
2	MAN FWD /MAN REV buttons	When the ramp is holding, MAN FWD permits the ramp to proceed normally when the button is depressed. Pressing MAN REV manually reverses the ramp.
3	ENTER button	The data shown in the display is accepted as the current value of the selected parameter.
4	RE-START button	The present altitude is set equal to the start altitude.
5	CHS button	The sign (+ or -) of the data shown on the display is changed.
6	VERT SPD button	The display shows the vertical speed of the ramp, i.e., the rate and direction of change of the PRES ALT parameter. Negative values indicate descending ramps.
7	START ALT button	The starting altitude of the ramp is set.
8	PRES ALT button	The present altitude is displayed. New present altitude values can be entered by keying in the values.
9	CLEAR button	Clears the display of any incomplete data entered and allows the operator to begin again.
10	Numeric buttons	The corresponding value is shown on the display.
11	PRES ALT lamp	Illuminates to indicate that the value shown on the display is the present altitude.
12	START ALT lamp	Illuminates to indicate that the value shown on the display is the start altitude.
13	VERT SPD lamp	Illuminates to indicate that the value shown on the display is the vertical speed.
14	RAMP lamp	Illuminates to indicate that the ramp is progressing.
15	HOLD lamp	Illuminates to indicate that the operator has temporarily stopped the ramp.
16	LO BAT lamp	Illuminates to indicate that the charge of the internal battery of the ARA-552 is low.