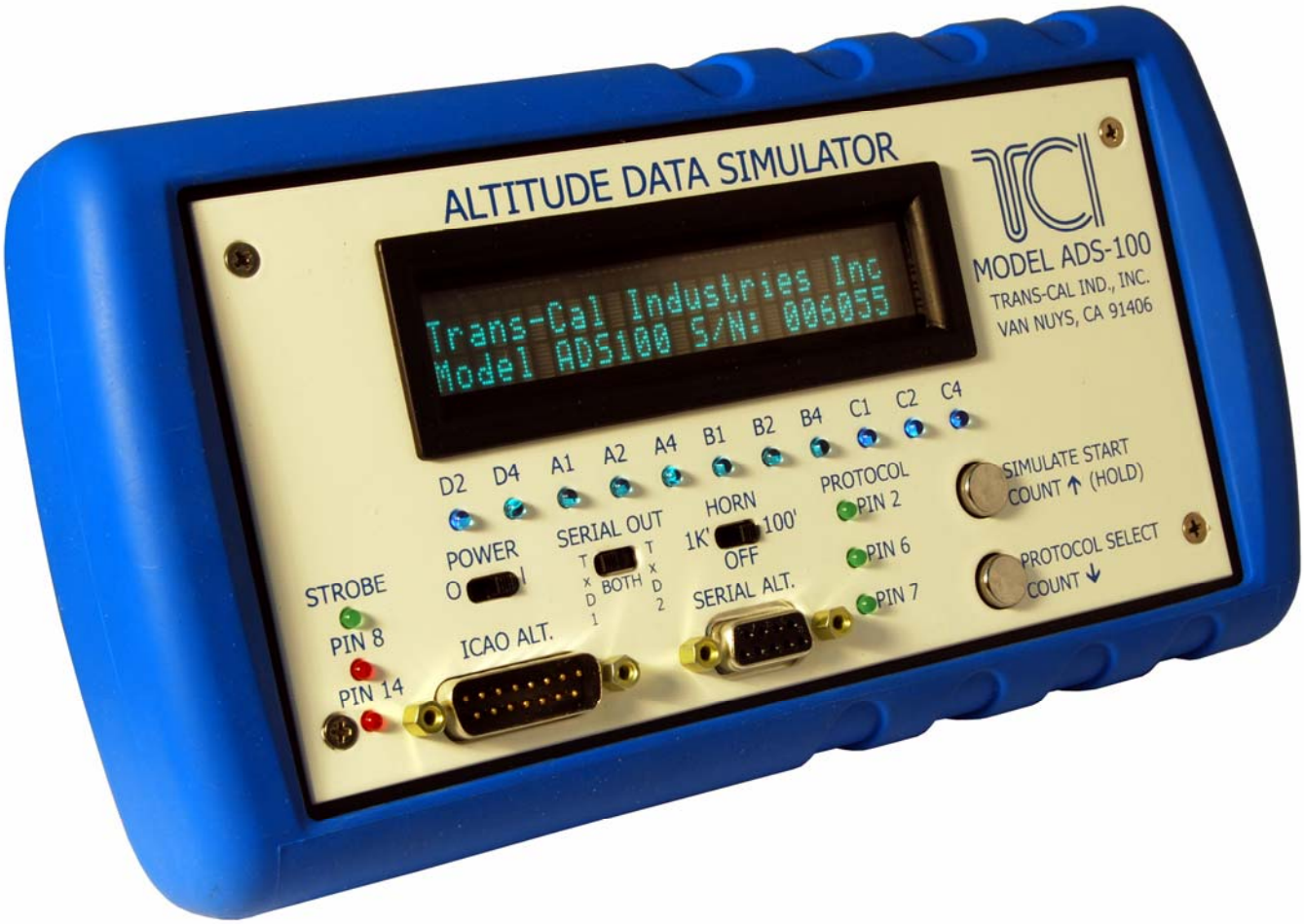
Trans-Cal Industries, Inc.

Model ADS-100
Altitude Data Simulator

Owner/Operation Manual



Trans-Cal Industries, Inc.
Van Nuys Airport
16141 Cohasset Street
Van Nuys, CA 91406-2908
(818) 787-1221 (800) 423-2913 fax (818) 787-8916
www.trans-cal.com

5 January 2009 Document Number: 882202 Rev. A

Please Note:

There is no substitute for common sense and experience. Please exercise caution when connecting the ADS-100 to aircraft altitude reporting systems. The equipment described in this manual, if improperly applied, could damage aircraft instrumentation. The ADS-100 should be operated only by personnel qualified and thoroughly familiar with the test and certification of aircraft systems.

16141 Cohasset Street
Van Nuys, CA 91406
818/787-1221
800/423-2913 x400 Tech Support
FAX 818/787-8916
E-Mail: support@trans-cal.com
www.trans-cal.com

What's in the Box:

Qty.	Part Number	Description
1 ea.	ADS-100	Altitude Data Simulator
1 ea.	882202	Owner/Operation Manual

History of Revision

Revision	Date	Description
N/C	10/2008	Prototype release.
A	01/2009	Production release.

Table of Contents

Abbreviations, Acronyms and Symbols

A	Amperes
AC	Advisory Circular
ARINC	Aeronautical Radio Incorporated
ASCII	American Standard for Coded Information Interchange
ATCRBS	Air Traffic Control Radar Beacon System
bps	Bits per second.
$^{C}_{R}$	Carriage Return
EASA	European Aviation Safety Agency
EEPROM	Electronically Erasable Read Only Memory
EIA	Electronic Industries Association
ETSO	European Technical Standard Order
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
ft.	Distance in feet.
GPS	Global Positioning System
Hz	Hertz
ICAO	International Civil Aviation Organization
I.F.F.	Identification Friend or Foe
In. Hg.	Inches of Mercury
Kbps	Kilobits per Second
KHz	Kilohertz
Lbs.	Weight in pounds
$^{L}_{F}$	Line Feed
LSB	Least Significant Bit
LED	Light Emitting Diode
mA	Milliamperes
max.	Maximum
MB	Millibar
MHz	Megahertz
MFD	Multi-Function Display
MSL	Mean Sea Level
min.	Minimum
ms	Time in milliseconds.
MSB	Most Significant Bit
mW	Milliwatt
NIST	National Institute of Standards and Technology
oz	Ounce
psi	Pounds per Square Inch
RAM	Random Access Memory
RS	Recommended Standard
RTCA	RTCA Inc. (Radio Technical Commission for Aeronautics)
SAE	Society of Automotive Engineers
sec.	Time in seconds.
SSR	Secondary Surveillance Radar
TCI	Trans-Cal Industries, Inc.
TIA	Telecommunication Industries Association
TSO	Technical Standard Order
Vdc	Volts Direct Current
VSI	Vertical Speed Indicator
W	Watt
Ω	Electrical resistance measured in Ohms.
ºC	Temperature in degrees centigrade.
±	Plus or minus.
§	Section

Section 1.0 Introduction to the ADS-100

1.1 Scope

This manual provides detailed operating instructions for Trans-Cal Industries' Model ADS-100 Altitude Data Simulator.

1.2 Equipment Description

The Model ADS-100 is an all solid-state device that simulates the output of altitude encoders/digitizers in both parallel and serial (RS232) data formats. The ADS-100 is designed to substitute for an altitude encoder when testing and troubleshooting an aircraft's altitude reporting system, and to reduce the amount of time consumed in the process of pumping the aircraft static system up and down.

The ADS-100 provides one ICAO parallel altitude output port and two RS232 serial data output ports. The device will simulate an altitude data climb, hold or descent at a selectable rate of 6000 ft./min. or 30,000 ft./min. The test technician can isolate wiring harness faults and simulate any altitude code from -1100 to +126,000 feet in the standard ICAO parallel altitude code. The serial altitude data simulation range extends from -1100 to +99,900 feet on the serial data and -1100 to +126,000 feet on the ICAO data.

The ADS-100 utilizes an internal 9-volt battery which will provide up to 2 hours of uninterrupted operation. The output data and operating instructions are displayed on a bright two-line alpha-numeric vacuum fluorescent display. LED indicators display the status of the encoder strobe, power and serial data connector protocol pins as well as the binary ICAO altitude code. An audible alert signal is generated at the 1000-foot or 100-foot altitude code transition points. Front panel switches control the device power, altitude data ascent/descent, hold, audible signals, and serial data protocol as well as the distribution of the serial data. 15-pin and 9-pin D-Subminiature connectors provide easy connection points to the equipment under test.

1.3 General Specifications

Operating Voltage:	Internal 9V battery. 2 hrs continuous operation.
Operating Current:	0.065 Amps
Operating Temperature:	-20° to +70°C (-4° to +158°F)
Storage Temperature (non-operating):	-55° to +85°C (-67° to +185°F)
Humidity	90% Non-Condensing at 50°C
Weight:	1.26 lbs.
Active Altitude Code Range	-1100 to +99,000 feet (serial data) -1100 to +126,000 feet (ICAO code)

1.4 Parallel ICAO Altitude Output Data Port Specifications

Code Format: In accordance with U.S. National Standard for Common System Component Characteristics for the IFF Mark X (SIF) Air Traffic Control Radar Beacon System, SIF/ATCRBS.
Driver Description: The parallel altitude data output is provided by the “uncommitted” collectors of a transistor array and must be “pulled-up” through a resistive load by the transponder.
Pull-Up Voltage: +3 to 40Vdc.
Maximum Sink Current: 50 mA.
Maximum Cable Length: 4000 ft. (1219 meters)
Input Signal Requirement: Pin 6 (strobe or signal common) must be either grounded or connected to the transponder.

1.5 Serial Altitude Data Port Specifications

Electrical Format: Conforming to the TIA/EIA RS-232C standard.
Logic Levels: “0”, +9 Vdc. Logic “1”, -9 Vdc.
Driver Output Maximum Voltage: ±25 Vdc.
Driver Load Impedance: 3KΩ typ.
The RS232E standard recommends one receiver per serial port.
Maximum Cable Length: 50 Feet. (15.24 meters)
Code Format: ASCII
Communication System: Simplex
Transmission Method: Asynchronous. (Talk only.)
Baud Rate: Selectable, 1200 bps to 9600 bps.
Transmission Rate: 1/sec.

Section 2.0 Serial Altitude Data Communication Format

2.1 Serial Port Altitude Data Resolution

The default resolution of the ADS-100 serial data is 100 feet. (1 meter in ARNAV mode.)

2.2 Serial Communication Format

Model ADS-100 carries out serial communication asynchronously with the “Start/Stop” system. The specifics of the format, i.e. the number of data bits, baud rate etc., is determined by the protocol selected. The default protocol is the Trimble/Garmin 9600bps, 8 data bits, 1 stop bit and no parity.

2.3 Serial Communication Protocols

Protocol is user selectable by pushing the protocol select button to scroll through the seven possible protocols described in this section.

2.3.1 Trimble/Garmin Navigation Devices Protocol

The default ADS-100 serial data protocol is compatible with some navigation devices manufactured by Trimble and Garmin. The ADS-100 will send a ten-byte message. The message begins with ALT followed by a space and five altitude bytes; concluding with a carriage return. (9600bps, 8 data bits, 1 stop bit, no parity). The following are examples of serial messages for Trimble or Garmin devices:

Message	Definition
ALT 99900 $^{C}_{R}$	Digitizer disabled.
ALT 10500 $^{C}_{R}$	Altitude 10,500 feet

2.3.2 UPS Aviation Technologies/Garmin AT/IIMorrow Nav. Devices

Pushing the Protocol Select button once will select the serial data protocol compatible with UPS Aviation Technologies’ (IIMorrow) Navigation devices. The ADS-100 will send a seventeen byte message beginning with # AL, then a space followed by five altitude bytes; the letter “T” a standard sensor temperature, two checksum bytes and a carriage return. (1200bps, 8 data bits, 1 stop bit, no parity). The following is an example of the serial message for UPS AT (Garmin AT) (IIMorrow) devices.

Message	Definition
#AL +00800T+25D8 $^{C}_{R}$	Altitude 800 feet

2.3.3 Northstar Navigation Devices Protocol

Pushing the Protocol Select button twice will select the serial data protocol compatible with some navigation devices manufactured by Northstar and Garmin. The ADS-100 will send a 10-byte message. The message begins with ALT followed by a space and five altitude bytes; concluding with a carriage return. (2400bps, 8 data bits, 1 stop bit, no parity.) The following are examples of serial messages for these devices:

Message	Definition
ALT 02500 $^{C}_{R}$	Altitude 2500 feet.
ALT -2500 $^{C}_{R}$	Digitizer disabled.

2.3.4 UPS AT 618 Loran Devices Protocol (IIMorrow)

Pushing the Protocol Select button three times will select the serial data protocol compatible with the UPS AT 618 Loran devices. The ADS-100 will send a seventeen byte message beginning with # AL, then a space followed by five altitude bytes; the letter “T” and the number “25”; two checksum bytes and a carriage return. (1200bps, 7 data bits, 1 stop bit, odd parity). The following is an example of an UPS AT 618 Loran serial altitude message:

Message	Definition
#AL +00800T+25D8$^{C}_{R}$	Altitude 800 feet

2.3.5 Magellan Navigation Devices Protocol

Pushing the Protocol Select button four times will select the serial data protocol compatible with some navigation devices manufactured by Magellan. The ADS-100 sends a seventeen-byte message beginning with $MGL, followed by a +/- sign and five altitude digits, then T+25, a checksum and concludes with a carriage return. (1200bps, 7 data bits, 1 stop bit, even parity.) The following is an example of a serial message for Magellan devices:

Message	Definition
$MGL+02500T+25D6 $^{C}_{R}$	Altitude 2500 feet.

2.3.6 One-Foot Resolution Protocol (Shadin)

Pushing the Protocol Select button five times will select the serial data protocol compatible with some navigation devices manufactured by Shadin. This protocol is utilized by the Shadin AMS2000. Once selected, the Digitizer will send a seventeen byte message beginning with RMS, then a space followed by a sign, five altitude bytes; the letter “T” and the number “25”; two checksum bytes and a carriage return. (9600bps, 8 data bits, 1 stop bit, no parity). The following is an example of the one-foot resolution altitude message:

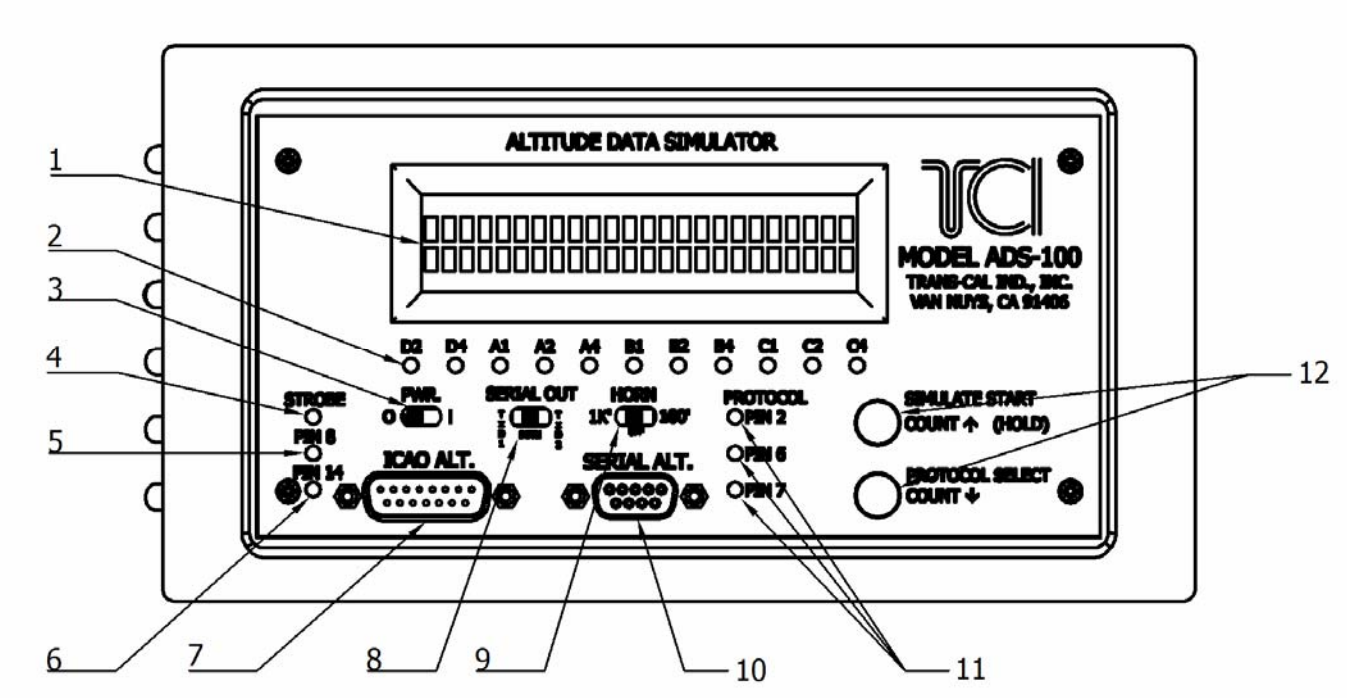
Message	Definition
RMS +02500T+251B$^{C}_{R}$	Altitude 2500 feet

2.3.7 ARNAV Systems Protocol

Pushing the Protocol Select button six times will select the serial data protocol compatible with some navigation devices manufactured by ARNAV Once selected, the Digitizer will send a 24-byte message. Beginning with a $PASHS followed by a comma and ALT, then a +/- sign followed by five altitude digits (in meters,) then an asterisk and a checksum followed by a carriage return and a line feed. (9600bps, 8 data bits, 1 stop bit, no parity.) The following is an example of an ARNAV serial altitude message:

Message	Definition
STX$PASHS,ALT,+00033*1B $^{C}_{R}{}^{L}_{F}$ETX	Altitude 33 meters.

Section 3.0 ADS-100 Front Panel Indicators and Controls



Item #	Function	Item #	Function
1	Alpha-Numeric Display	**7**	ICAO Parallel Altitude Code Output
2	Parallel ICAO Code Indicators	**8**	Serial Data Distribution Switch
3	Power Switch	**9**	Horn Signal Switch
4	Strobe Indicator	**10**	Serial (RS232) Altitude Code Output
5	Power Indicator Pin 8	**11**	Protocol Pin Status Indicators
6	Power Indicator Pin 14	**12**	Simulation/Protocol Function Controls

3.1 Indicators and Control Definitions

[1] Alpha-Numeric Display

Two Line 24 Character Vacuum Fluorescent Display

[2] Parallel ICAO Code Indicators

Eleven LED indicators provide a positive indication of the parllel ICAO code currently transmitted from the ADS-100.

[3] Power Switch

Slide switch controls the application of power to the ADS-100.

[4] Strobe Indicator

A single green LED when lit, confirms the presence of a ground on pin 6 of the ICAO parallel altitude code connector.

[5] Power Indicator Pin 8

A single red LED when lit, confirms the presence of Vdc on pin 8 of the ICAO parallel altitude code connector. *NOTE: This LED confirms the presence of voltage only. It does not indicate that it is the correct voltage!*

[6] Power Indicator Pin 14

A single red LED when lit, confirms the presence of Vdc on pin 14 of the ICAO parallel altitude code connector. *NOTE: This LED confirms the presence of voltage only. It does not indicate that it is the correct voltage!*

[7] ICAO Parallel Altitude Code Output

A 15-pin D-Subminiature connector provides the ICAO parallel altitude code output. See **Table IX** for pin assignments.

[8] Serial Data Distribution Switch

Directs the serial altitude data output on the 9-pin D-Sub to either TxD1 pin 4 (left position), or TxD2 pin 9 (right position), or both TxD1 and 2 (center position.)

[9] Horn Signal Switch

Controls an audible horn signal, the center position is off. Sliding the switch to the left produces a horn signal at every 1000-foot code transition. Sliding the switch to the right produces a horn signal at every 100-foot code transition.

[10] Serial Altitude Code Output

A 9-pin D-Subminiature connector provides the RS232 serial altitude code output. See **Table X** for pin assignments.

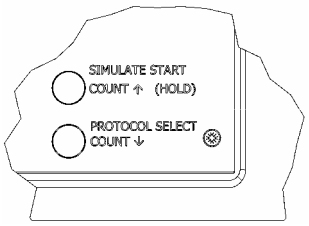
[11] Protocol Pin Status Indicators

Three green LED indicators when lit, indicate a ground on pins 2, 6 or 7 respectively. See **Table XI** For pin functions. This applies to Trans-Cal Encoders with RS232 ports only.

[12] Simulation/Protocol Function Controls

Two push button switches control the start of the simulation, the selection of the serial data protocol and the ascent, descent, hold and rate of climb. See below for a discussion of the function of each button.

-The top button is labeled: **SIMULATE START**



- Pushing this button once commands the ADS-100 to begin at -1100 feet and ascend at a rate of 6000 feet/minute.
- Pushing the button again will hold the present output altitude.
- Pushing the button again will resume the ascent.
- Pushing the button twice rapidly will command an ascent at 30,000 feet/min.

-The bottom button is labeled: **PROTOCOL SELECT**

- Pushing this button will scroll though the available serial data output protocols. Stop on the desired protocol. Then press **SIMULATE START** to begin.
- Pushing this button during an ascent or hold will command the ADS-100 to descend at the current rate.

Section 4.0 Operation

The task of isolating altitude reporting faults becomes more difficult as the number of devices connected to the altitude digitizer increases. The ADS-100 is designed to simplify the troubleshooting task by functioning as a reliable and controllable altitude data source. Only three common test scenarios are discussed in this section, obviously many variations exist. Refer to the connection tables, the FAQ section, and the Known Trans-Cal Digitizer Compatibility issues sections for more information.

There is no substitute for common sense and experience. Please exercise caution when connecting the ADS-100 to aircraft pressure altitude reporting systems.

4.1 Standard ICAO Altitude Simulation

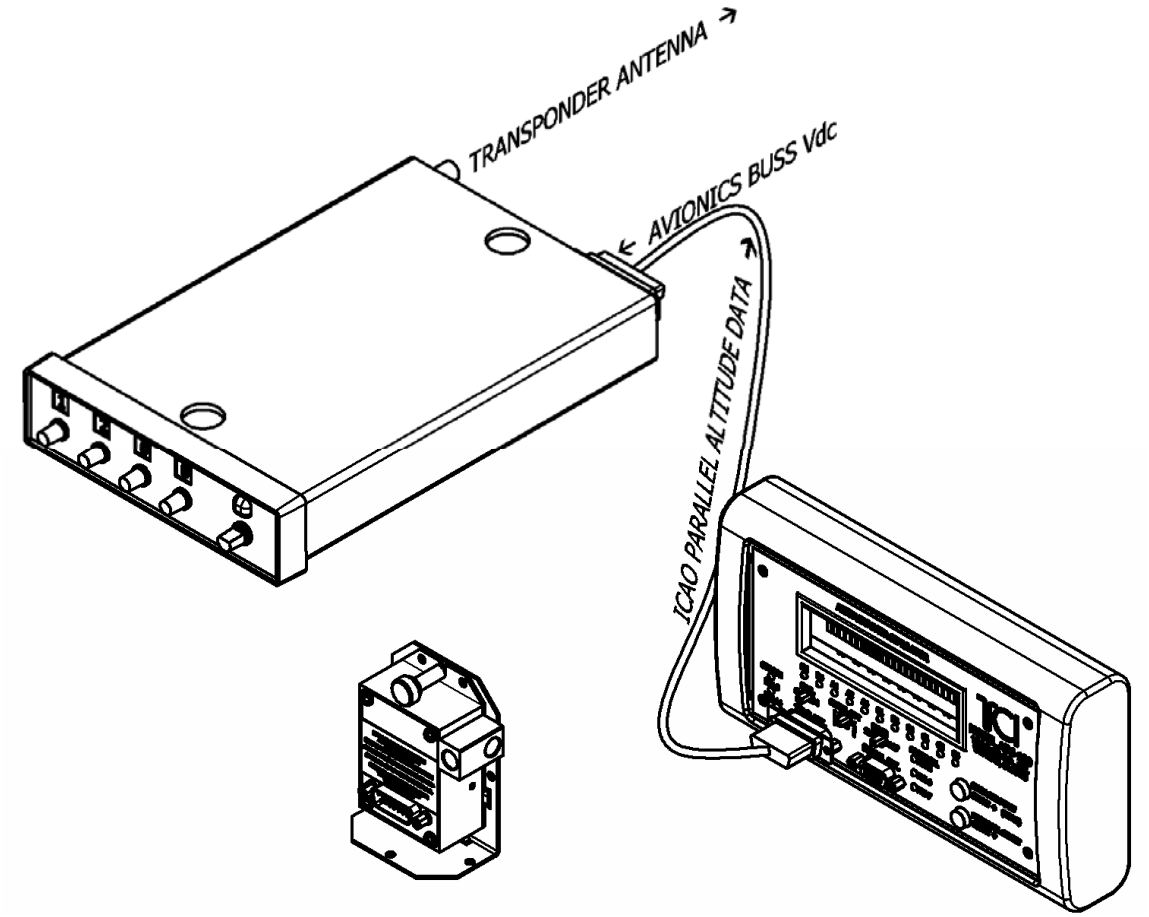
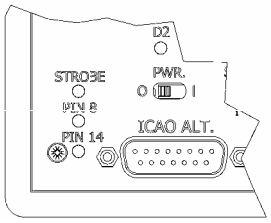


Figure 1

Step 1: With the **ADS-100** and avionics buss power **off**, simply substitute the ADS-100 for the altitude encoder, as shown in **Figure 1**. The altitude data output connector is wired identically to most Trans-Cal altitude reporting devices. The connector pin assignments are found in **Table IX**. Connect an acceptable ramp test set to observe the transponder output as per the manufacturer's instructions.

Step 2: With the **ADS-100** power switch in the **OFF** position, apply power to the avionics buss and the transponder receiving the ICAO altitude data.

- If the red LED labeled **Pin 14** illuminates, then Vdc power is applied to pin 14.
- If the red LED labeled **Pin 8** illuminates, then Vdc power is applied to pin 8.
- If no LEDs illuminate then remove power from the device(s) and check for flaws in the wiring harness as the altitude encoder Vdc power supply is connected to the wrong pin. Correct the error and return to **Step 1.**



Step 3: Slide the ADS-100 power switch to the on position, and again note the LED indicators on the front panel.

- If the green LED labeled **Strobe** illuminates, then a ground is correctly applied to the ICAO connector at pin 6. This will enable the ICAO parallel altitude code output.
- If the **Strobe** LED flickers, this may not indicate a problem. Some older transponders use the strobe function to control the encoder data output, and this flickering is an indication of this function.
- If the strobe LED does not illuminate, then check for a flaw in the harness, as the ICAO parallel data will not be transmitted without a ground on this pin. Remove power from the system and correct the error. Return to **Step 1**.

Step 4: With the ADS-100 power switch in the on position, and after displaying the model and serial number, the ADS-100 should display the following:

Press Simulate To Start **Press Protocol To Select**

Since serial data is not a part of this test, do not press the protocol select button. Press the **Simulate Start** button once. This will command the ADS-100 to begin at -1100 feet and ascend at a rate of 6000 feet/minute. The ADS-100 displays the current ICAO altitude output on the bottom line and the serial data output on the top line of the two line display. The blue LEDs below the 2-line display will indicate the currently active ICAO altitude data bits. After pressing the simulation start button the ADS-100 should begin the ascent sequence and the display will begin as shown below:

ALT -1100← **ICAO ALT: - 01100 Sim**

- To hold an altitude, press the **Simulate Start** button once. To begin a descent, press the **Protocol Select** button once. Compare the data shown on the ADS-100 display with the transponder ramp tester to verify the proper operation of the transponder and wiring harness. The “Sim” in the lower right hand corner of the display signifies that a simulation is underway.

4.2 ICAO Altitude and One RS232 Serial Data Output

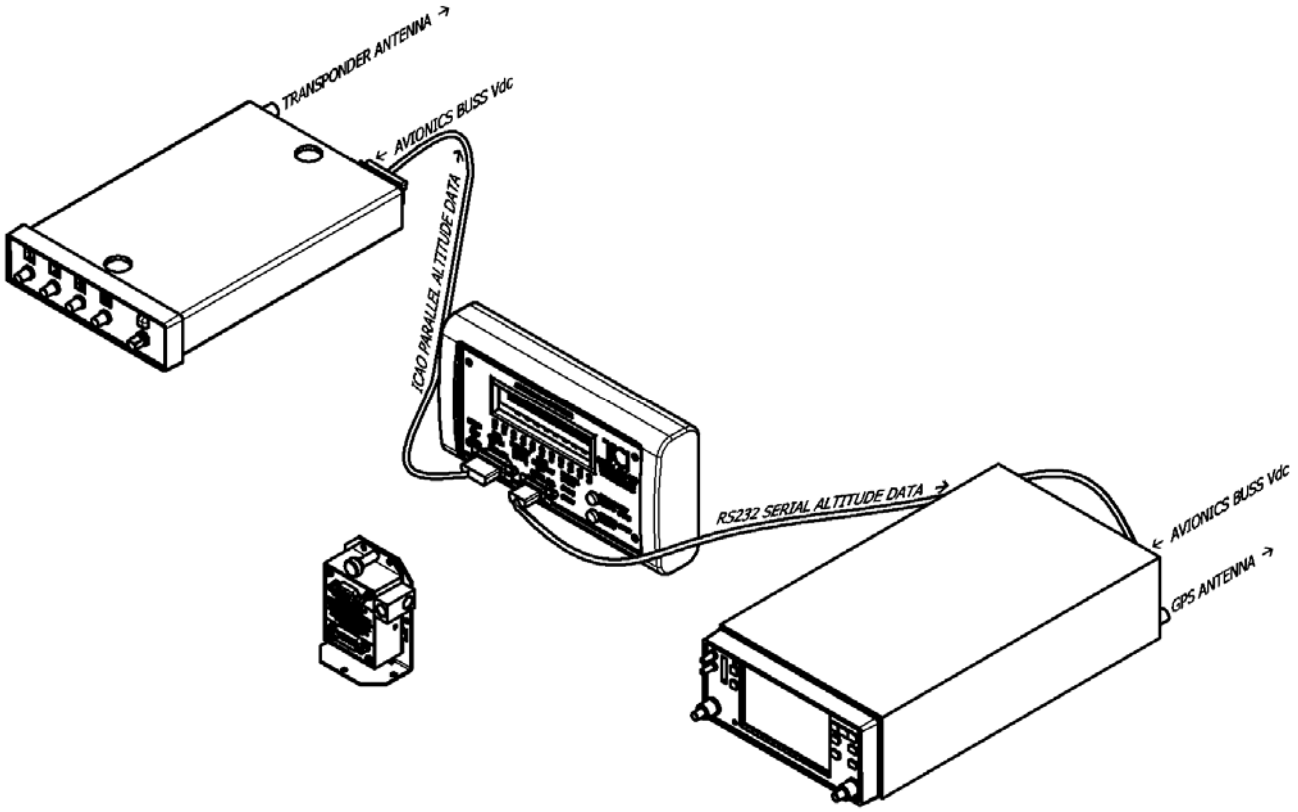
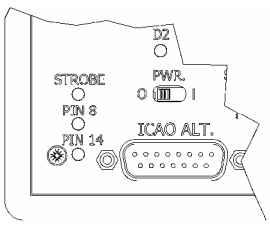


Figure 2

Step 1: With the **ADS-100** and the avionics buss system power **off**, simply substitute the ADS-100 for the altitude encoder, as shown in **Figure 2**. The ICAO altitude data output connector and the serial data output connector are wired identically to most Trans-Cal altitude reporting devices. The connector pin assignments are found in **Table IX.** Connect an acceptable ramp test set to observe the transponder output as per the manufacturer's instructions. The GPS or other device may or may not display the serial altitude data. Consult the manufacture's installation and operation manual to determine the test set-up or other conditions to be complied with.

Step 2: With the **ADS-100** power switch in the **OFF** position, apply power to the transponder receiving the ICAO altitude data.

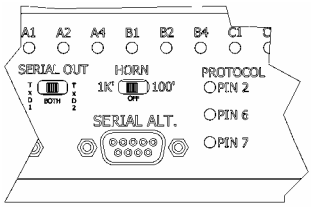
- If the red LED labeled **Pin 14** illuminates then Vdc power is applied to pin 14.
- If the red LED labeled **Pin 8** illuminates then Vdc power is applied to pin 8.
- If no LEDs illuminate then remove power from the device(s) and check for flaws in the wiring harness as the altitude encoder Vdc power supply is connected to the wrong pin. Correct the error and return to **Step 1.**



Step 3: Slide the ADS-100 power switch to the on position, and again note the LED indicators on the front panel.

- If the green LED labeled **Strobe** illuminates then a ground is correctly applied to pin 6. This will enable the ICAO altitude code output.
- If the **Strobe** LED flickers this may not indicate a problem. Some older transponders use the strobe function to control the encoder data output, and this flickering is an indication of this function.

- If the strobe LED does not illuminate, then check for a flaw in the harness, as the ICAO data will not be transmitted without a ground on this pin. Remove power from the system and correct the error. Return to **Step 1**.
- If any of the three LED indicators to the right of the 9-pin serial data connector are illuminated, then there is a ground present on these connector pins. Trans-Cal encoders may or may not require a ground on these pins. This requirement is based on the data protocol selected. Consult **§2.3** and **Table XI** and /or the encoder manual to determine if the proper pin is grounded.



Step 4: Select the serial data output by sliding the serial out switch to the left to select TxD1 (pin4), to the right to select TxD2 (pin9) or the middle position will send the selected protocol to both TxD1 and 2. This choice is based upon the specific configuration of the wiring harness for the application under test. The ADS-100 will only send one protocol out at a time, while Trans-Cal encoders are capable of sending out two different protocols simultaneously.

Step 5: The ADS-100 should now display the following:

Press Simulate To Start **Press Protocol To Select**

Select the serial data protocol by pressing the **Protocol Select** button to scroll through the available formats. Stop on the desired protocol. See **§2.3** for a list of available protocols.

Step 6: Pressing the **Simulate Start** button once will command the ADS-100 to begin at -1100 feet and ascend at a rate of 6000 feet/minute. The ADS-100 displays the current ICAO altitude output on the bottom line and the serial data output on the top line of the two line display. The blue LEDs below the 2-line display show the currently active ICAO altitude data bits. Using the UPS AT protocol as an example, after pressing the simulation start button the display should begin as shown below:

#ALT -1100T+25D5← **ICAO ALT: - 01100 Sim**

This display is the current data output from the ADS-100. The “Sim” in the lower right hand corner of the display signifies that a simulation is underway. Set the GPS to display the current altitude and observe the transponder ramp test device to verify that the output matches the ADS-100 display.

4.3 ICAO Altitude and Two RS232 Serial Data Outputs

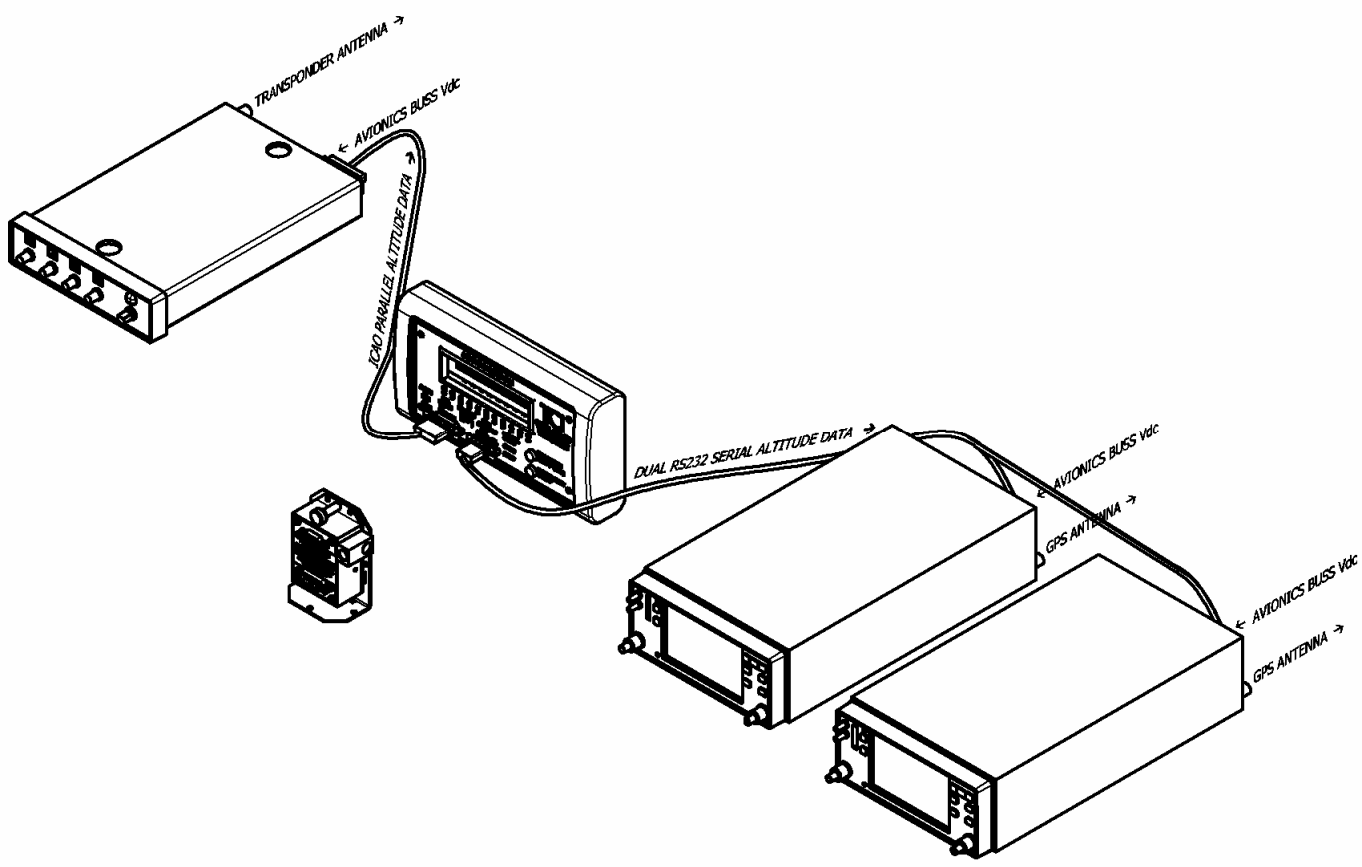
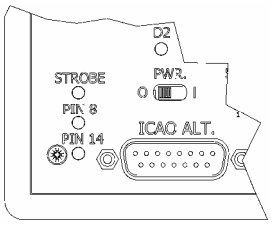


Figure 3

Step 1: With the **ADS-100** and avionics buss system power **off**, simply substitute the ADS-100 for the altitude encoder, as shown in **Figure 3**. The altitude data output connector is wired identically to most Trans-Cal altitude reporting devices. The connector pin assignments are found in **Table IX.** Connect an acceptable ramp test set to observe the transponder output as per the manufacturer's instructions. The GPS or other device may or may not display the serial altitude data.

Step 2: With the **ADS-100** power switch in the **OFF** position, apply power to the transponder receiving the ICAO altitude data.

- If the red LED labeled **Pin 14** illuminates then Vdc power is applied to pin 14.
- If the red LED labeled **Pin 8** illuminates then Vdc power is applied to pin 8.
- If no LEDs illuminate then remove power from the device(s) and check for flaws in the wiring harness as the altitude encoder Vdc power supply is connected to the wrong pin. Correct the error and return to **Step 1.**

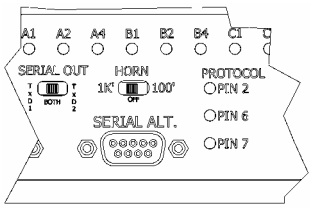


Step 3: Slide the ADS-100 power switch to the on position, and again note the LED indicators on the front panel.

- If the green LED labeled **Strobe** illuminates then a ground is correctly applied to pin 6. This will enable the ICAO altitude code output.
- If the **Strobe** LED flickers this may not indicate a

problem. Some older transponders use the strobe function to control the encoder data output, and this flickering is an indication of this function.

- If the strobe LED does not illuminate, then check for a flaw in the harness, as the ICAO data will not be transmitted without a ground on this pin. Remove power from the system and correct the error. Return to **Step 1**.
- If any of the three LED indicators to the right of the 9-pin serial data connector are illuminated, then there is a ground present on these connector pins. Trans-Cal encoders may or may not require a ground on these pins. This is based on the protocol selected. Consult **Table XI** and /or the encoder manual to determine if the proper pin is grounded.



Step 4: Select the serial data output by sliding the serial out switch to the left to select TxD1 (pin4) or right to select TxD2 (pin9) or the middle position will send the selected protocol to both TxD1 and 2. This choice is based upon the specific configuration of the wiring harness for the application under test. The ADS-100 will only send one protocol out at a time, while Trans-Cal digitizers are capable of sending out two different protocols simultaneously.

Step 5: The ADS-100 should now display the following:

Press Simulate To Start **Press Protocol To Select**

Select the serial data protocol by pressing the **Protocol Select** button to scroll through the available formats. Stop on the desired protocol. See **§2.3** for a list of available protocols.

Step 6: Pressing the **Simulate Start** button once will command the ADS-100 to begin at -1100 feet and ascend at a rate of 6000 feet/minute. The ADS-100 displays the current ICAO altitude output on the bottom line and the serial data output on the top line of the two line display. The blue LEDs below the 2-line display show the currently active ICAO altitude data bits. Using the UPS AT protocol as an example, after pressing the simulation start button the display should begin as shown below:

#ALT -1100T+25D5← **ICAO ALT: - 01100 Sim**

This display is the current data output from the ADS-100. The “Sim” in the lower right hand corner of the display signifies that a simulation is underway. Set the GPS to display the current altitude and observe the transponder ramp test device to verify that the output matches the ADS-100 display.

Section 5.0 Tables I through XI Model ADS-100 Interconnection

The following digitizer interconnections are provided as a quick reference only, and though they are correct to the best of our knowledge, always consult the latest installation, operation, and service bulletins from the equipment manufacturer.

Table I Bendix/King

ADS-100 15 Pin Conn.	Function	Bendix/King KT73 Pin Number	Bendix/King KT76/78 Pin Number	Bendix/King KT76A/78A Pin Number	Bendix/King KXP Pin Number
1	D4	8	*[1]	*[4]	V
2	A1	M	6	M	G
3	A2	K	7	K	H
4	A4	J	9	J	J
5	B1	E	4	E	K
9	B2	C	1	C	L
10	B4	B	2	B	M
11	C1	D	3	D	P
13	C2	L	8	L	R
12	C4	H	10	H	S
6	Strobe	Connect to aircraft ground.	Connect to aircraft ground.	Connect to aircraft ground.	Connect to aircraft ground.
8 or 14	+14 to 28Vdc Input.	Connect to aircraft's avionics buss protected by a fuse or circuit breaker.	Connect to aircraft's avionics buss protected by a fuse or circuit breaker.	Connect to aircraft's avionics buss protected by a fuse or circuit breaker.	Connect to aircraft's avionics buss protected by a fuse or circuit breaker.
15	Ground	Connect to aircraft ground.	Connect to aircraft ground.	Connect to aircraft ground.	Connect to aircraft ground.

Serial Data Connection for the Bendix/King KT 73 Transponder

ADS-100 9 Pin Conn.	Function	KT 73 24 Pin Conn.
4 or 9	TxD to RxD	7
1 or 5 or 8	Ground	1 or A
Select the UPS AT 618 Protocol on the ADS-100.		

[1] Data for this connection is not available at this time.

Table II Cessna, Narco, Microair

ADS-100 15 Pin Conn.	Function	Cessna RT359A, RT459A, RT859A Pin Number	Narco AT-150 AT-50, AT-50A Pin Number	Narco AT-6A AT-5, AT-6 Pin Number	Microair T2000
1	D4	10	*[2]	*[6]	21
2	A1	14	7	2	9
3	A2	13	6	4	10
4	A4	15	8	8	11
5	B1	19	12	9	12
9	B2	17	10	10	13
10	B4	16	9	11	17
11	C1	21	14	1	18
13	C2	18	11	3	19
12	C4	20	13	5	20
6	Strobe	11	5	12	Connect to aircraft ground.
8 or 14	+14 to 28Vdc Input	9	18	13	2
15	Ground	Connect to aircraft ground.	Connect to aircraft ground.	14	Connect to aircraft ground.

Narco AT-50 and AT-50A Installations

The Narco AT-5A, AT-6A, AT-50 or AT-50A transponder will not accept data from the SSD120-(XX)N-RS232 Altitude Digitizers. A modification to remove the output decoupling capacitors is required and the unit may be ordered from the factory with this modification. Order Model Number SSD120-(XX)N-RS232 with Mod 1.

Please note! The Narco AT-50 and earlier transponder models require a modification before they will function correctly with any altitude encoder. This modification is outlined in Narco Service Bulletin AT-50A-5.

[2] Data for this connection is not available at this time.

Table III Garmin

ADS-100 15 Pin Conn.	Function	Garmin GTX 327 Pin Number	Garmin GTX 330 & 330D Pin Number	Garmin GNC 300 Pin Number	This column left blank intentionally.
1	D4	18	11	N/C[3]	
2	A1	3	2	15	
3	A2	5	4	16	
4	A4	6	5	17	
5	B1	9	7	18	
9	B2	11	9	19	
10	B4	12	10	20	
11	C1	10	8	21	
13	C2	4	3	22	
12	C4	7	6	23	
6	Strobe	13 or 25 or aircraft ground	50	Connect to aircraft ground	
8 or 14	+14 to 28Vdc Input	+14 to 28VDC Input	Pin 62 through a 3 amp 50V reverse rated diode.	Connect to aircraft's avionics buss protected by a fuse or circuit breaker.	
15	Ground	Connect to aircraft ground.	Connect to aircraft ground.	Connect to aircraft ground.	

[3] Data for this connection not available at this time.

Table IV Garmin

Serial Data Connection for the Garmin GTX327 Transponder

ADS-100 9 Pin Connector	Function	GTX327 25 Pin Connector
4 or 9	TxD to RxD	19
1 or 5 or 8	Data Ground	13 or 25
Digitizer Protocol pin 7 should be connected to ground. Unless software selected in the TCI digitizer set-up.		

Serial Data Connection for the Garmin GTX330 and 330D Transponder

ADS-100 9 Pin Connector	Function	GTX330 62 Pin Connector
4 or 9	TxD to RxD	24 (RS232 In 2)
1 or 5 or 8	Data Ground	DataGround
Digitizer Protocol pin 7 should be connected to ground. Unless software selected in the TCI digitizer set-up.		

Select the Trimble/Garmin format on the ADS-100. To allow the **Garmin GTX 327, 330 and 330D** transponders to communicate with the ADS-100 go to the **Setup Page** and set the **Altitude Source (ALT SRC)** to receive data in the **Icarus RS232 format.**

Table V Edo-Air, Genave, Collins, Radair

ADS-100 15 Pin Conn.	Function	Edo-Air RT-777 Pin Number	Genave Beta 5000 Pin Number	Collins TDR 950 Pin Number	Radair 250 Pin Number
1	D4	15	0	3	15
2	A1	7	4	12	7
3	A2	5	5	10	6
4	A4	3	6	7	13
5	B1	12	7	6	9
9	B2	13	8	5	10
10	B4	14	9	4	11
11	C1	8	10	8	14
13	C2	6	11	11	16
12	C4	4	12	9	12
6	Strobe	2	3	Connect to aircraft ground.	19
8 or 14	+14 to 28Vdc Input	Connect to aircraft's avionics buss protected by a fuse or circuit breaker.	2	Connect to aircraft's avionics buss protected by a fuse or circuit breaker.	22
15	Ground	2	Connect to aircraft ground.	Connect to aircraft ground.	Connect to aircraft ground.

Table VI Bendix, Wilcox, UPS AT

ADS-100 15 Pin Conn.	Function	Bendix TPR-2060 Pin Number	Bendix TR641A/B Pin Number	Wilcox 1014A Pin Number	UPS AT Apollo SL70 Pin Number
1	D4	*[4]	N	C	35
2	A1	4	A	k	13
3	A2	6	B	c	31
4	A4	8	C	W	12
5	B1	9	D	T	33
9	B2	10	E	L	14
10	B4	11	F	D	32
11	C1	3	H	P	16
13	C2	5	J	f	34
12	C4	7	K	Z	15
6	Strobe	Connect to aircraft ground.	Connect to aircraft ground.	Connect to aircraft ground.	Connect to aircraft ground.
8 or 14	+14 to 28Vdc Input	Connect to aircraft's avionics buss protected by a fuse or circuit breaker.	Connect to aircraft's avionics buss protected by a fuse or circuit breaker.	Connect to aircraft's avionics buss protected by a fuse or circuit breaker.	Connect to aircraft's avionics buss protected by a fuse or circuit breaker.
15	Ground	Connect to aircraft ground.	Connect to aircraft ground.	Connect to aircraft ground.	Connect to aircraft ground.

Serial Altitude Data Connection for the Apollo SL70 Transponder

ADS-100 9 Pin Conn.	Function	UPS AT SL70
4 or 9	TxD to RxD	4
1 or 5 or 8	Ground	3

Select UPS AT protocol. To allow the **UPS AT SL70** transponder to accept serial data from the ADS-100 go to the **Test Mode** on the **SL70 Conf** page and set the **Altitude Source (ASrc)** to receive **Serial (Ser)** data. On the **BAUD** page select **1200**.

[4] Data for this connection is not available at this time.

Table VII Becker, Terra, Trig

ADS-100 15 Pin Conn.	Function	Becker Avionic Systems ATC3401 ATC2000	Becker Avionic Systems ATC4401	Terra TRT-250 TRT-250D	Trig TT31 Mode S
1	D4	23	20	9	8
2	A1	16	1	5	M
3	A2	15	2	17	K
4	A4	14	3	16	J
5	B1	17	14	15	E
9	B2	19	15	2	C
10	B4	18	16	14	B
11	C1	22	17	3	D
13	C2	21	18	4	L
12	C4	20	19	18	H
6	Output Enable	24	25	12	Connect to aircraft ground.
8 or 14	+14 to 28Vdc	6	6	20	Connect to aircraft's avionics buss protected by a fuse or circuit breaker.
15	Ground	24	25	Connect to aircraft ground.	Connect to aircraft ground.

Serial Altitude Data Connection for the Trig TT31 Transponder

ADS-100 9 Pin Connector	Function	Trig TT31
4 or 9	TxD to RxD	7
1 or 5 or 8	Ground	A or 1

Digitizer protocol pins 2 and 7 should be connected to ground. Unless software selected in the TCI digitizer set-up.

The TT31 will accept either parallel or serial altitude data inputs in either the Trimble/Garmin or the Shadin "RMS" data formats. The TT31 will select the parallel inputs if both are connected. Serial data inputs are recommended for better Mode S data resolution.

Table VIII Honeywell

ADS-100 15 Pin Conn.	Function	Honeywell Bendix/King 560EGPWS & MK-XXI EGPWS	Honeywell Bendix/King KGP 860 GA-EGPWS	Honeywell Bendix/King KMH 870 IHAS Processor
1	D4	No connection	No Connection	18
2	A1	12	J1-12	11
3	A2	52	J1-52	10
4	A4	33	J1-33	9
5	B1	14	J1-14	14
9	B2	34	J1-34	13
10	B4	73	J1-73	12
11	C1	32	J1-32	17
13	C2	13	J1-13	16
12	C4	72	J1-72	15
6	Output Enable	Connect to aircraft ground	Connect to aircraft ground	Connect to aircraft ground
8 or 14	+14 to 28Vdc	Connect to avionics buss via circuit breaker	Connect to avionics buss via circuit breaker	Connect to avionics buss via circuit breaker
15	Ground	Connect to aircraft ground	Connect to aircraft ground	Connect to aircraft ground

The Honeywell Bendix/King 860 EGPWS manual lists an RS232 serial altitude data input on pin J1-45 with a data common on pin J1-46. Several TCI compatible serial data protocols are listed, but at the time of this printing, Trans-Cal has not tested the 860 EGPWS data input for compatibility.

Table IX ICAO Data Connector

ADS-100 15 Pin D-Sub Connector	Function
1	D4
2	A1
3	A2
4	A4
5	B1
6	Strobe
7	D2
8	+Vdc
9	B2
10	B4
11	C1
12	C2
13	C4
14	+Vdc
15	Ground

Tables X and XI Serial Data Connector and Protocol Indicators

Table X

ADS-100 Serial Port Connector, 9-Pin D-Subminiature DE-9S

Pin	Function
1	Ground [5]
2	Ground for 10' resolution.
3	Do Not Connect
4	TxD1 [6]
5	Ground [5]
6	Protocol select, see function Table IX below.
7	Protocol select, see function Table IX below.
8	Ground[5]
9	TxD2 [6]

Table XI

ADS-100 Protocol Selection Indicators: DE-9S D-Subminiature Connector Pin Function Table

Protocol Selection Indicators	Pin 2	Pin 6	Pin 7
UPS AT 100' resolution, 1200bps.	○Off	○Off	○Off
UPS AT 10' resolution, 1200bps.	✹On	○Off	○Off
Trimble/Garmin, 100' resolution, 9600bps.	○Off	○Off	✹On
Trimble/Garmin, 10' resolution, 9600bps.	✹On	○Off	✹On
Northstar/Garmin, 100' resolution, 2400bps.	○Off	✹On	○Off
Northstar/Garmin, 10' resolution, 2400bps.	✹On	✹On	○Off
Magellan, 100' resolution, 1200bps.	○Off	✹On	✹On
Magellan, 10' resolution, 1200bps.	✹On	✹On	✹On

[5] Pins 1 and 5 and 8 of the 9-Pin D-Subminiature connector are internal grounds provided for protocol selection and serial data ground.
[6] TxD1 and TxD2 will transmit the protocol selected via the front panel pushbutton.

Section 6.0 GPS/MFD & Miscellaneous Connection Data

Given the speed with which new GPS and MFD units are entering the market, it is impossible to provide data on every device. The following digitizer/GPS interconnections are provided as a quick reference only, and though they are correct to the best of our knowledge, always consult the latest installation, operation, and service bulletins from the GPS or MFD manufacturer.

6.1 UPS Aviation Technologies (IIMorrow)

Apollo Model GX50, GX60, GX65

Apollo GX50, GX60, GX65 Signal	Apollo 37 Pin D-Sub Connector	ADS-100 9 Pin D-Sub Connector
RxD2	21	4 or 9
Ground	20	1 or 5 or 8
		Select the UPS AT protocol on the ADS-100. Optional, the pin 2 LED may be indicate 10' resolution on the ADS-100.

Apollo GX50, GX60, GX65 Software Configuration

In test mode, rotate the **Large** knob to select serial port configuration **RX.**
Press **SEL,** rotate the large knob to select the **RxD2** port, rotate the small knob to select **AltEnc** input.

Apollo Model MX20 Multi Function Display

Apollo MX20 Signal	Apollo 37 Pin D-Sub Connector	ADS-100 9 Pin D-Sub Connector
RxD2	21	4 or 9
Ground	3	1 or 5 or 8
		Select the UPS AT protocol on the ADS-100. Optional, the pin 2 LED may be indicate 10' resolution on the ADS-100.

Apollo MX20 Software Configuration

Under External Data Source set altitude source to **Port 2**.

6.2 Trimble

Trimble 2101 Approach Plus GPS Receiver

Trimble Signal	Trimble 2101 Port 1	Trimble 2101 Port 2	ADS-100 9 Pin D-Sub Connector Pin
RxD+	7	24	1 or 5 or 8
RxD-	8	36	4 or 9
Ground	3 or 20	3 or 20	1 or 5 or 8
			Select the Trimble/Garmin Protocol on the ADS-100. The Pin 7 LED should indicate the Trimble protocol is selected.
			Optional, the pin 2 LED may indicate a ground for 10' resolution.

Trimble 2101 Approach Plus GPS Receiver Software Configuration - Installation Setup

Access the 2101 installation setup submenu and go to the SERIAL I/O SETUP. Select the GPS serial port which is to receive the pressure altitude data,
SERIAL-1 IN or **SERIAL-2 IN.**
Set data format to **ENCODER**.

2101 I/O Approach Plus GPS Receiver

Trimble Signal	Trimble 2101 I/O Serial Port 1	Trimble 2101 I/O Serial Port 2	ADS-100 9 Pin D-Sub Connector Pin
RxD+	J1-7	J1-24	1 or 5 or 8
RxD-	J1-8	J1-36	4 or 9
Ground	J1 - 3 or 20	J1 - 3 or 20	1 or 5 or 8
			Select the Trimble/Garmin Protocol on the ADS-100. The Pin 7 LED should indicate the Trimble protocol is selected.
			Optional, the pin 2 LED may indicate a ground for 10' resolution.

2101 I/O Approach Plus GPS Receiver Software Configuration - Installation Setup

Access the 2101 installation setup submenu and go to the SERIAL I/O SETUP. Select the GPS serial port, which is to receive the pressure altitude data, **SERIAL-1 IN** or **SERIAL-2 IN.** Set data format to **ENCODER**.

6.3 Garmin International

Garmin 400 and 500 Series GPS Devices (Includes 430W and 530W)

Garmin 78 Pin Conn. (P4001)	ADS-100 9 Pin Conn.
57	4 or 9
77 or 78	1 or 5 or 8
	Select the Trimble/Garmin Protocol on the ADS-100. The Pin 7 LED should indicate the Trimble protocol is selected.
	Optional, the pin 2 LED may indicate a ground for 10' resolution.

Garmin 400 series GPS software configuration

To allow the **Garmin 400 series GPS** to communicate with the SSD120-(XX)N-RS232 go to the **Main RS232 Config** page and set channel 1 input to **Icarus-alt.**

Garmin GNC 300 GPS/Comm

GNC 300 37 Pin Connector J101	Function	ADS-100 9 Pin Connector
17	RxD to TxD	4 or 9
13 or 25	Data Ground	1 or 5 or 8
		Select the Trimble/Garmin Protocol on the ADS-100. The Pin 7 LED should indicate the Trimble protocol is selected. *Optional, the pin 2 LED may indicate a ground for 10' resolution.*

To allow the **Garmin 300 series GPS/Comm** to communicate with the Altitude Digitizer go to the **I/O Test Page** and set channel 1 input to **Icarus-alt.**

6.4 ARNAV Systems, Inc.

ARNAV Systems 5000 Series Multi-Function Display

ARNAV 5000 25 Pin Connector	ADS-100 9 Pin Connector
15	4 or 9
13 or 25	1 or 5 or 8
	ADS-100 Protocol, select ARNAV protocol.

ARNAV Systems GPS-505/506/512 GPS Sensor

ARNAV GPS-505/506/512 DB-25 Connector	ADS-100 9 Pin Connector
8	4 or 9
9	1 or 5 or 8
	ADS-100 Protocol, select ARNAV protocol.

ARNAV Systems DR-100 WxLink Receiver/ Multiplexer

ARNAV DR-100 25 Pin Connector	ADS-100 9 Pin Connector
10	4 or 9
13 or 25	1 or 5 or 8
	ADS-100 Protocol, select ARNAV protocol.

6.5 Century Flight Systems, Inc.

Digital Altitude Preselect/Alerter 1D960 ICAO Parallel Input		
ADS100 Pin	**Function**	**1D960 Pin**
1	D4	9
2	A1	25
3	A2	40
4	A4	10
5	B1	26
6	STROBE	--
7	D2	39
8	PWR	--
9	B2	22
10	B4	7
11	C1	23
12	C4	8
13	C2	38
14	PWR	--
15	GROUND	--

Digital Altitude Preselect/Alerter 1D960 Serial Data Input		
ADS100 Pin	**Function**	**1D960 Pin**
4 or 9	TxD to RxD	37

Please Note: The Century 1D960 manual lists an RS232 serial altitude data input on pin 37 with a data common on pin J1-46. The TCI compatible serial data protocol is listed as the Shadin one-foot protocol see **§1.8.7**, but at the time of this printing, Trans-Cal has not tested the 1D960 input for compatibility.

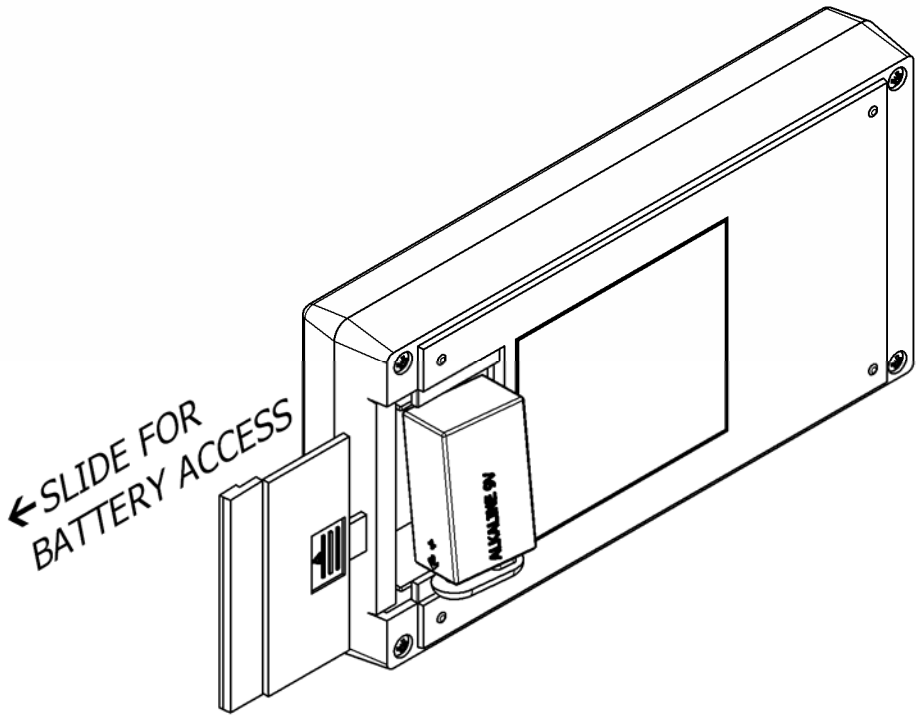
Section 7.0 Calibration, Care and Battery Replacement

Calibration:
The ADS-100 is an all solid-state device that requires no periodic maintenance to maintain its calibration. The simulator may be periodically function tested using TCI Model ATS-400 or equal. The ADS-100 is not field serviceable and if an encoding error is detected, then the unit is to be factory repaired. Contact Trans-Cal Industries for further information.

Cleaning:
The case of the ADS-100 is impact resistant plastic while the front panel is powder coated aluminum. The ADS-100 fluorescent display is covered with a clear plastic lens incorporating an anti-glare coating. Some concentrated glass cleaners containing ammonia may damage the plastic case and/or the lens. A weak solution of soap and water should be sufficient to keep the majority of grease and oils off the case and front panel. Cleaning the display lens with a lint free cloth and eyeglass lens cleaner suitable for use on anti-reflective coatings is recommended.

Battery Replacement:

Remove the protective rubber boot and slide the battery access door as shown below. Replace with a 9V alkaline battery. Replace the battery door and rubber boot.



Section 8.0 Frequently Asked Questions

For your reference, several of these questions are reprinted from the Trans-Cal Altitude Encoder FAQ section.

1. *How often must the ADS-100 to be calibrated; is there periodic maintenance required?*

   There is no periodic maintenance required. The ADS-100 is an all solid-state device. The output of the RS232 and ICAO altitude port may be tested using the Trans-Cal's ATS-400 or using a PC and equivalent encoding altimeter test set.

2. *Can I simulate the serial data all by itself, without connecting the ICAO parallel code?*

   Yes, the any one of the outputs may be utilized independently, or all three at once.

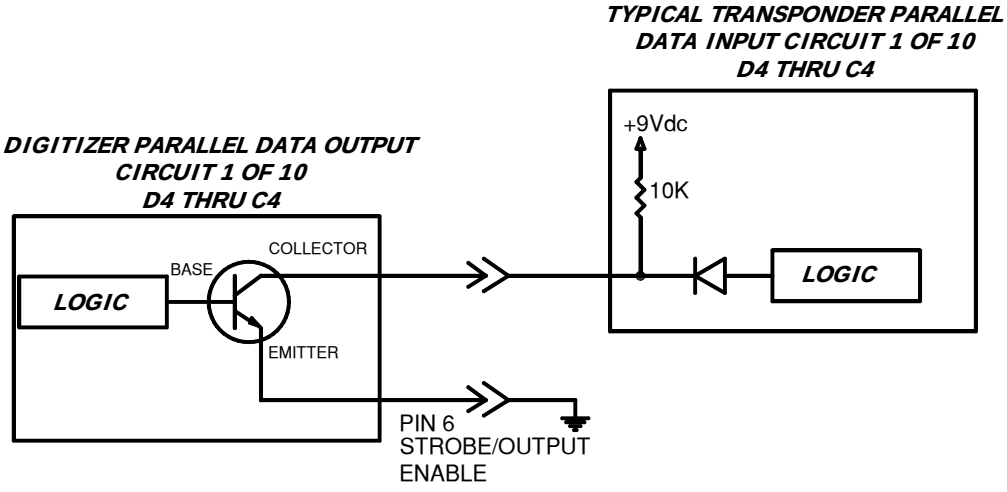
3. *How many devices may be driven off of the parallel ICAO Altitude data port?*

   The number of devices that may be connected to the Digitizer or the ADS-100 ICAO altitude output is a function of the current and power required. The ADS-100 and TCI Digitizer parallel data outputs are "uncommitted" collectors of a transistor array which are "pulled-up" through a resistive load by the transponder (or other device) to some positive voltage. This voltage may range from about +3 to +40Vdc. Each data output line (i.e. D4, A1, A2, A4 etc.) is capable of providing 35 mA (0.035 Amperes) with a "not to exceed" power rating of 100mW (0.1 Watts), when it is "sinking" current in the "on" position. Typical modern applications require about 1 milliampere or less per data line, per device.

   In the circuit illustrated below, the current is calculated as 0.9mA at 8.1mW. At this current and power rating, a total of 12 identical devices could be connected to the digitizer. *Given the wide variety of input circuits capable of interfacing with a Digitizer and the possibility of cross-talk, careful planning of the electrical loads acting upon the Digitizer output is advised.*

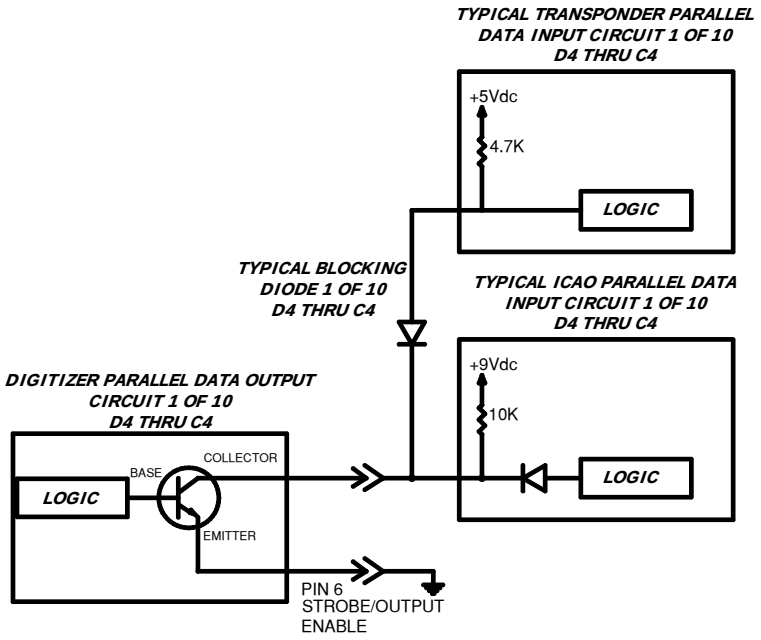
$$V/R = I \qquad 9Vdc/10000Ohms = 0.0009Amps$$

$$V(I) = P \qquad 9Vdc \times 0.0009\,Amps = 0.0081Watts$$



4. *Why do altitude encoding errors occur when connecting a second or third device to the altitude encoder, but not when only one device is connected?*

This is a symptom of "Cross-Talk." This condition typically occurs when the devices connected to the altitude encoder are "pulling-up" to different voltages without diode isolation. When the altitude encoder is in the "off" state the data line electrical current may flow in undesired directions due to this pull-up voltage imbalance. Most modern avionics devices are diode isolated, but in applications where older equipment is mixed with new devices, blocking diodes may be required to isolate the older device. Germanium or Schottky blocking diodes are the preferred devices to install due to the low forward voltage drop across the device. Connect as detailed in the illustration below. Use of general purpose silicon diodes are *NOT* recommended, as the larger voltage drop may interfere with the logic threshold detection in the equipment.



5. *My transponder does not have a D2 or D4 input. What do I do with these signals from the Digitizer?*

Leave unused data bits unconnected.

6. *What is the **Strobe** or **Signal Common** or **Output Enable** function on the ICAO altitude data port?*

This is a control signal for the ICAO parallel altitude data. On devices manufactured by Trans-Cal this function is always on pin 6 of the ICAO altitude port. A "high" or "open" on this pin will disable the ICAO altitude data. A "low" or "ground" on this line will enable the altitude data. Some interconnecting devices may use this signal to control the flow of data from the Digitizer. Be aware that when using this signal and connecting multiple devices to the Digitizer, interruptions of the ICAO data will occur when the controlling device "*strobes*" the Digitizer.

7. *On TCI Altitude Digitizers with serial ports, does the strobe function control the serial data?*

No, the serial data is independent of the parallel ICAO altitude data. Transmission of the serial data is asynchronous. Enabling or disabling the parallel data will not affect the serial data transmission.

8. *Must the parallel ICAO altitude data be connected to use the serial data on Trans-Cal Digitizers?*

No, the serial data output is completely independent of the parallel data output. However, power to Trans-Cal Encoders, must be supplied to the Digitizer through the ICAO altitude data connector.

9. *How many devices may be driven off of the RS232 port?*

One device may be driven off each serial port. Trans-Cal Digitizers provide two RS232 ports on each Digitizer, so two RS232 receiving devices may be driven off of each Digitizer.

10. *Can the Trans-Cal Digitizer transmit two different serial data protocol messages at the same time?*

Yes. The Digitizer may be configured via the serial port and an IBM compatible PC to specify the data protocol to be transmitted on each serial port. **Refer to the Digitizer install manual.** *The ADS-100 can transmit only one protocol over both serial output ports at the same time.*

11. *What is the maximum length of an RS232C wiring harness?*

50 feet, in a transmit only (simplex) application.

12. *I have connected the serial data from the digitizer or ADS-100 to my GPS device, why does the GPS display a "No Pressure Altitude" message?*

There are several possible problem sources.

Electrical Ground Imbalance

RS232 operates in an "unbalanced" (single-ended) transmission method; where the receiving device monitors the difference between the signal voltage and a common ground. If a significant difference in electrical ground potential between the Digitizer and the receiving device exists, then the RS232 signal levels may be adversely affected. Verify the digitizer and receiving device electrical grounds are referenced together by connecting one of the ground pins on the Digitizer RS232 connector to the receiving device's ground.

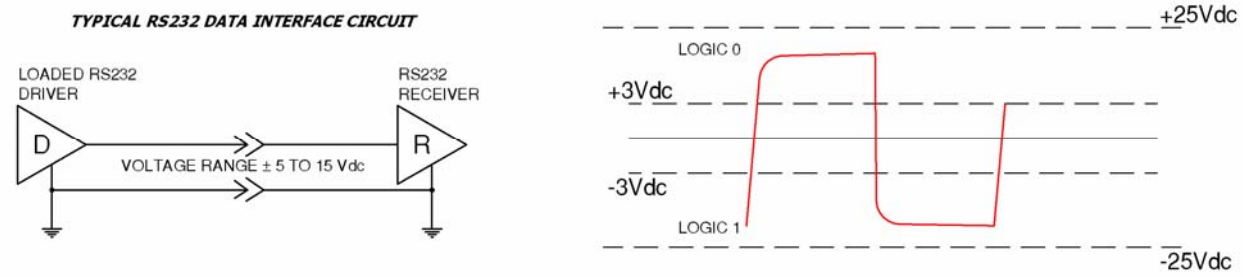
Receiving Device Configuration

The receiving device is looking for a specific message at a specific baud rate and parity. These messages, baud rates and parity vary from manufacturer to manufacturer. A mismatch on any one of these items will cause a communication failure. In addition, many devices are capable of software configuration to accept RS232 data on different connector pins. Verify the following:

a. Digitizer data is routed to the correct connector pin on the receiving device.
b. The receiving device is software configured to accept data on that connector pin.
c. The receiving device is software configured to accept the correct message protocol at the correct baud rate and parity.
d. The Digitizer is transmitting the same message, baud rate and parity as configured in item c above.

13. *The system recognizes the serial pressure altitude data when I use the ADS-100 but not when I use the altitude digitizer. How can I verify the RS232 data message, baud rate and parity transmitted from the Digitizer?*

a. Use the Trans-Cal ATS-400 Test Set to display the altitude digitizer RS232 data.
b. Use a PC with an open RS232 port and serial data capture software. Some possible software solutions include: HYPER TERMINAL (Windows® 95 & 98 & XP), SOFTWARE WEDGE™, PROCOMM™, VERSATERM™.
c. Use a dedicated serial data test box such as the BLACK BOX™ RS232 MONITOR.
d. An oscilloscope may be used to view the 9Vdc square wave transmitted about 1/second.



Section 9.0 Known Trans-Cal Digitizer Compatibility Issues

9.1 Honeywell KT 73 Transponder with Serial Altitude Data Input

The **KT 73** must be configured to accept serial altitude data on pin 7 of the main connector, and software configured for *High Resolution M* (IIMorrow). 1200bps, 7 data bits, 1 stop bit and odd parity.The Trans-Cal **SSD120-(XX)N-RS232** must be software configured to transmit the correct serial data protocol to the Bendix/King KT 73 transponder as described in the installation manual. Configure the ADS-100 to transmit the UPS AT 618 Loran protocol.

9.2 Narco AT5A, AT6A, AT-50 and AT-50A Installations and SSD120-(XX)N Mod.1

The Narco AT-5A, AT-6A, AT-50 or AT-50A transponder will not accept data from standard Trans-Cal Altitude Digitizers. A modification to remove the output decoupling capacitors is required and the unit may be ordered from the factory with this modification. Order Model Number SSD120-(XX)N with Mod. 1. ***Please note!*** **This modification may NOT be performed in the field.** ***Please also note!*** The Narco AT-50 and earlier transponder models require a modification before they will function correctly with any altitude encoder. This modification is outlined in Narco Service Bulletin AT-50A-5.

9.3 "Mod. 1" Installations

SSD120-(XX)N-XXXX Mod.1 Altitude digitizers lack decoupling capacitors on the ICAO altitude data line outputs to enable operation with older Narco transponders. When installing a Mod. 1 unit in an aircraft, and **particularly when installing in composite structured aircraft,** great care should be taken to insure that the digitizer is located away from RF emitting devices and fields. The interconnecting data harness must be shielded and properly grounded. Additional shielding around the digitizer may be required to prevent stray RFI from disrupting the digitizer's analog signal sensing electronics.

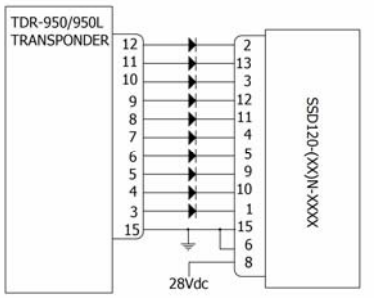
9.4 King KT-75

The King KT-75/75R uses the old RTL (resistor transistor logic) pulling up to about 3 volts; consequently the open collectors of the SSD120-(XX)N-XXXX will not pull the signal past the KT-75 logic threshold.

9.5 S-Tec (Collins) TDR950

The TDR950 must be powered-up first, or the SSD120-(XX)N-XXXX must be diode isolated to prevent the TDR 950 from invalidating the encoder data.

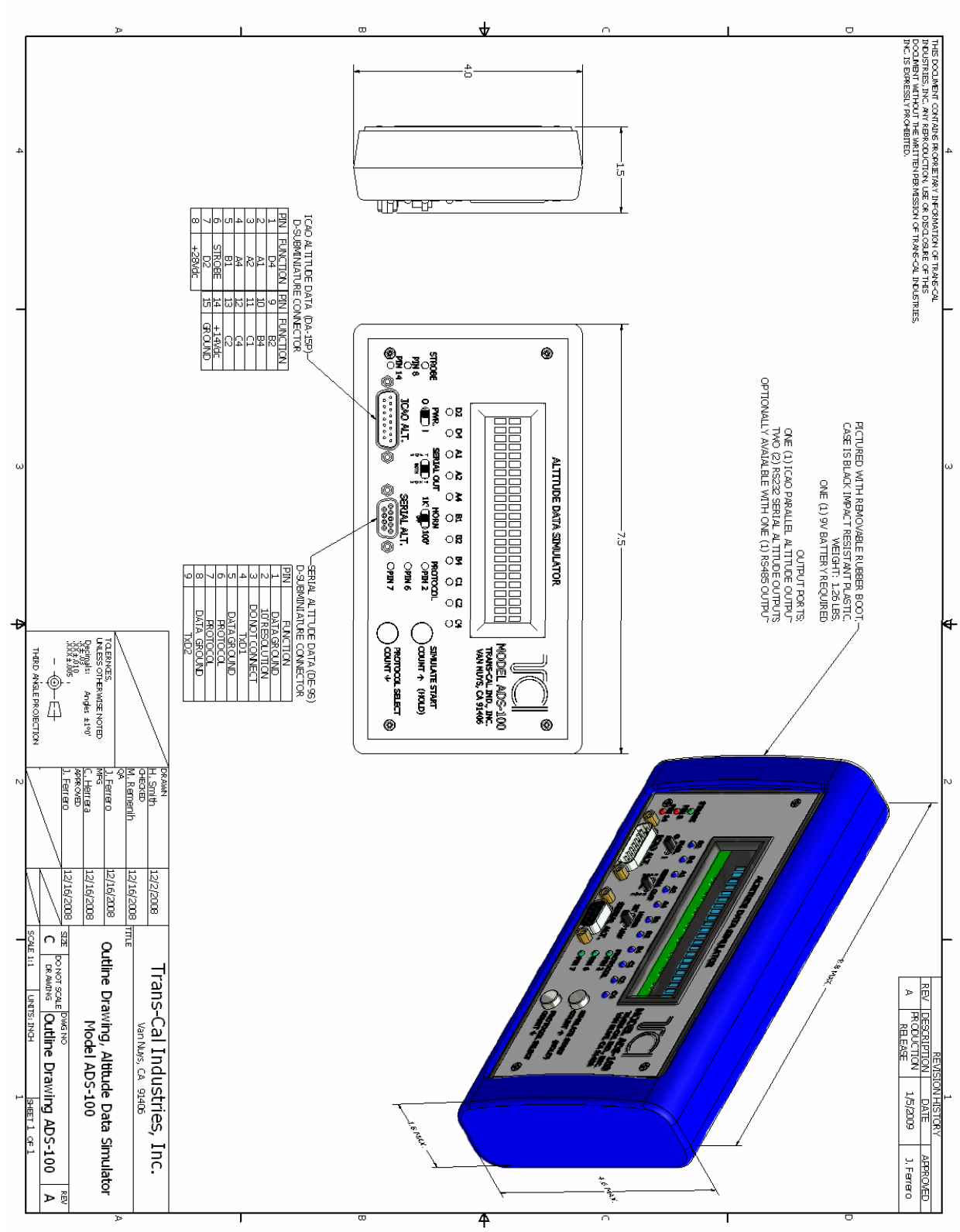
All diodes are type 1N4454 (CPN 353-3741-010).



9.6 Trans-Cal SSD120-(XX)N Backwards Compatibility

All Model SSD120-(XX)N-XXXX are pin-for-pin replacements for all Model SSD120-(XX) and D120-P2 T, with ONE exception. The older SSD120-(XX) utilized a 28V heater ground on pin 1 of the D-Subminiature connector. Pin 1 is the D4 data bit on the SSD120-(XX)N models. Rewire the harness appropriately, if D4 is an active bit. No action is required if D4 is unused. All Model SSD120-(XX)N-XXXX are pin-for-pin replacements for all Model SSD120-(XX)A-XXXX.

Outline Drawing



Manufacturer Direct Warranty
Do Not Return to Place of Purchase

Trans-Cal Industries warrants each Model ADS-100 Altitude Data Simulator to be free of defects in workmanship and materials for a period of 18 months after purchase. **Do NOT send this unit to a distributor or retailer for repair.** Contact the factory directly if you experience problems (818) 787-1221.

This warranty applies to the original purchaser of the instrument. Trans-Cal's obligation under this warranty is limited to repairing or replacing any ADS-100 returned to Trans-Cal during the life of this warranty provided:

(1) The defective unit is returned to Trans-Cal, **transportation pre-paid.**
(2) Prior approval is obtained from Trans-Cal.
(3) The unit has not been damaged by misuse, neglect, improper operation, accident, alteration, weather related damage or improper installation.

Trans-Cal **DOES NOT** reimburse labor costs on warranty repairs. Trans-Cal Industries will be the sole judge as to the cause of the malfunction and wherein the responsibility lies. No other obligation or liability is expressed or implied.

For the above warranty to become effective, the attached registration card **must** be completed and returned to Trans-Cal Industries, properly filled out and signed by the dealer selling or installing this equipment.

Mail to: Trans-Cal Ind., Inc., 16141 Cohasset St., Van Nuys, CA 91406

✂- cut here -

MODEL: ADS-100 **SERIAL NO: ADS-_____**

AIRCRAFT:_____ NUMBER:_____

OWNER:_____

ADDRESS:_____

CITY:_____ STATE:_____ZIP:_____

DEALER:_____

INSTALLED BY:_____

LICENSE NO:_____

INSTALLATION DATE:_____

I hereby certify the above instrument was installed in accordance with the instructions of Trans-Cal Industries, and the installation was done to industry standards. I further certify the instrument was properly working on the above date.

SIGNED:_____

PRINT NAME:_____