Trans-Cal Industries, Inc.

Model IA-RS232C-D
Dual Port Interface Adapter (Serializer)
Owner/Installation Manual
TSO-C88a Approved

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What's in the Box:

Qty.	Part Number	Description
1 ea.	IA-RS232C-D	Interface Adapter – Dual Port
1 ea.	950001	Owner/Installation Manual
2 ea.	DA-15S	15 Pin D-Subminiature Mating Receptacle
2 ea.	DA-15P	15 Pin D-Subminiature Plug
4 ea.	600016	15 Pin Connector Back Shell
1 ea.	DE-9P	9 Pin D-Subminiature Mating Plug
1 ea.	600017	9 Pin Connector Back Shell

History of Revision

Revision	Date	Description
A	17 Apr. 2001	Revised in entirety.
B	25 Aug. 2004	Updated manual
C	10 Aug. 2006	Updated manual changed warranty from 40 to 42 months
D	19 May 2015	Added Limitations, Deviations & Compliance §1.3.1 DO-178 Cat. Updated reproduction notice. Revise NOTES and CAUTION statements.

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.
CFR	Code of Federal Regulations
^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
H/W	Hardware
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
^L_F	Line Feed
LSB	Least Significant Bit
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
P/N	Part Number
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
S/W	Software
TCI	Trans-Cal Industries, Inc.
TIA	Telecommunication Industries Association
TSO	Technical Standard Order
Vdc	Volts Direct Current
VSI	Vertical Speed Indicator
Ω	Electrical resistance measured in Ohms.
ºC	Temperature in degrees centigrade.
±	Plus or minus.
§	Section

Section 1.0 General

1.1 Scope

This manual provides detailed installation, and operating instructions for the Model IA-RS232C-D series of remote altitude digitizer interface adapter. This manual assumes use by competent, qualified avionics professionals utilizing installation methods in accordance with 14CFR and other industry accepted installation practices.

1.2 Equipment Description

Approved under F.A.A. TSO-C88a the Model IA-RS232C-D is an all solid-state microprocessor-based device that converts parallel altitude data (Gillham Grey Code) received from pressure altitude reporting equipment, into serialized data conforming to the TIA/EIA RS232C standard, as well as repeating the Gillham Altitude Grey Code input on two additional output ports.

The parallel digital altitude data is provided on (2) two output ports. The protocol is set forth in the (ICAO) International Standard for Pressure Altitude Transmission. This data format is in accordance with U.S. National Standards for Common System Component Characteristics for the I.F.F. Mark X (SIF)/Air Traffic Control Radar Beacon System SIF/ATCRBS.

The serial altitude data is provided on (2) two asynchronous RS232C output ports and may be used to provide pressure altitude data to GPS or other on board devices. The serial data protocol is selectable see §1.8.

1.3 General Specifications

1.3.1 Limitations, Deviations & Compliance

NOTE

The conditions and tests for TSO approval of this article are minimum performance standards. Those installing this article, on or in a specific type or class of aircraft, must determine that the aircraft installation conditions are within the TSO standards. TSO articles must have separate approval for installation in an aircraft. The article may be installed only according to 14 CFR part 43 or the applicable airworthiness requirements.

NOTE

DO-160E lightning induced transient susceptibility tests were not conducted on this device and it is the responsibility of the installing agency to substantiate compliance with FAR25.1316. Advisory Circular AC20-136B provides guidance related to the protection of aircraft electrical systems from the effects of lightning.

Deviation:

TSO-C88a specifies RTCA/DO-160A for environmental testing. TCI utilized RTCA/DO-160B in testing this device. DO-160B provides an equivalent level of safety and meets or exceeds the standard environmental test condition requirements of TSO-C88a and DO-160A.

TSO/RTCA Compliance Table

FAA TSO	C88a
RTCA DO-178 Software	Non-Essential Category H/W - S/W P/N: 881053-DrB-700006rC
RTCA DO-160B Environmental*	E1BA/JKLNMOP/XXXXXXZBBBBB

*See Environmental Qualification form for specifics.

1.3.2 Operating Voltage
+12 to +30 VDC

1.3.3 Operating Current
0.090 Amperes (90MA)

1.3.4 Operating Temperature
-20˚ to +85˚C

1.3.5 Storage Temperature
-55˚ to +85˚C

1.3.6 Warm-up Time
0

1.3.7 Weight
12 oz.

1.3.8 Operating Altitude
-1000 to +62,700 feet (Dependant on input device range.)

1.3.9 Accuracy
This device repeats the data from the source altitude reporting device with 100% accuracy

1.3.10 Mechanical Characteristics
See outline drawing.

1.4 Parallel Altitude Data Input Port Specification
(DA-15S Connectors)

The IA-RS232C-D will accept altitude data inputs from (2) two different sources, but only <u>one</u> at a time! Inputting data from two active encoders at the same time <u>will</u> result in miscode. When using two altitude data sources the signal common must be used to switch the encoder data on and off. See **Wiring Example – Dual Input IA-RS232C-D**

If only one altitude data source is used, the signal common must be grounded to continuously enable the altitude data transmission to the interface adapter.

<u>Input Code Format</u>: In accordance with U.S. National Standard for Common System Component Characteristics fir the I.F.F. Mark X (SIF) Air Traffic Control Radar Beacon System, SIF/ATCRBS.

<u>Receiver Description</u>: The parallel altitude data input takes the form of an "uncommitted collector" and is "pulled up" through a resistive load by the interface adapter.

<u>Interface Adapter Pull-Up Voltage</u>: +5 VDC.

<u>Maximum Sink Current</u>: 1 Milliampere.

1.5 Parallel Altitude Data Output Port Specification
(DA-15P Connectors)

<u>Code Format</u>: In accordance with U.S. National Standard for Common System Component Characteristics fir the I.F.F. Mark X (SIF) Air Traffic Control Radar Beacon System, SIF/ATCRBS.

<u>Driver Description</u>: 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, or other receiving device.

<u>Pull-Up Voltage</u>: +3 to 50VDC.

<u>Maximum Sink Current</u>: 50 Milliamperes.

<u>Maximum Cable Length</u>: 50 feet. (15.24 meters)

<u>Input Signal Requirement</u>: pin 6 (strobe or signal common) must be either grounded or connected to the transponder.

1.6 Serial Altitude Data Output Port Specification
(DE-9S Connector)

<u>Electrical Format</u>: Conforming to the TIA/EIA RS232E standard.

<u>Logic Levels</u>: "0" +9 volts. Logic "1" –9 volts.

Driver Output Maximum Voltage: ±25 VDC.

Driver Load Impedance: 3KΩ typ.

Maximum Cable Length: 50 Feet. (15.24 meters)

Code Format: ASCII

Communication Method: Asynchronous

Transmission Rate: Selectable, 1200 bps or 9600 bps.

Update Rate: 1/second.

1.7 Serial Communication Format

Model IA-RS232C-D 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., are determined by the protocol selected.

1.8 Serial Communication Protocol

The serial data protocol is selectable by grounding or leaving open pin or 7 of the 9 pin D-Subminiature DE-9S connector. The selected protocol is transmitted on both serial ports simultaneously.

Leaving Pin 7 of the DE-9S connector open results in the default protocol compatible with UPS Aviation Technologies' (IIMorrow) Navigation devices. At a baud rate of 1200 bps the Interface Adapter sends a seventeen-byte message as follows:

Message:	Definition:
#AL+00800T+25D8^C_R	Altitude 800 feet.

Grounding Pin 7 of the DE-9S connector results in a protocol compatible with some navigation devices manufactured by Trimble and Garmin. At a baud rate of 9600 bps the Interface Adapter will send a ten-byte message as follows:

Message:	Definition:
ALT 10500 ^C_R	Altitude 10,500 feet.
ALT 99900 ^C_R	Digitizer disabled.

Section 2.0 Operation

2.1 General

The IA-RS232C-D Interface Adapter is designed to be mounted within a pressurized or non-pressurized, but temperature controlled area of aircraft operating up to 62,000 feet MSL. Remotely located, the Interface Adapter is fully automatic in operation. The Adapter will begin transmitting parallel and serial data upon power up and the receipt of valid altitude data. The parallel data output is controlled by the transponder, while the serial data is transmitted asynchronously.

2.2 Operating Instructions

Parallel Data:
Apply power to the Interface Adapter and to the device(s) connected to the Adapter. The parallel data will assume the value of the present pressure altitude being received from the altitude data source. If the parallel output data is connected to a transponder it may or may not control the parallel data by an enable/disable signal on the strobe or signal common (pin 6) of the Interface Adapter. To continuously enable the parallel output data pin 6 *MUST* be grounded on the 15 Pin DA-15P connector.

Serial Data:
Serial communication is fully automatic and transmission begins after the Interface Adapter receives valid altitude data messages. Strobing the parallel output data will not affect the serial data transmission.

Section 3.0 Installation and Calibration

3.1 Mechanical Installation

The IA-RS232C-D Interface Adapter may be mounted in any attitude within the internal structure of the aircraft. The mounting position should allow ample room for a service loop on the interconnecting cabling.

3.2 Electrical Installation

NOTE

Proper solder or crimp techniques should be observed when attaching wires to the mating connectors. Failure to do so could result in damage, intermittent operation or non-operation of the adapter. Shielded cable is recommended for all wiring harnesses. Wire and harnesses should be installed in such a way that the weight of the cable does not exert a force on the connector pins. Harnesses must be fully supported to prevent movement and should be protected against chaffing.

The interface adapter is designed to operate with either a 14 or 28 VDC power source. This voltage can be A+ switched power provided by a transponder or provided by the avionics buss. If using the avionics buss, protect the circuit with a ½ amp circuit breaker or fuse. Power should be provided on either 15 pin output connector DA-15P. A+ on pin 8 or 14. DO NOT provide power on more than one connector! The power applied to either DA-15P output connector will be routed internally to both DA-15S data input connectors.

CAUTION
AFTER INSTALLING THE WIRING HARNESS AND BEFORE INSTALLATION OF THE INTERFACE ADAPTER, A CONTINUITY CHECK OF ALL WIRES IN THE HARNESS SHOULD BE MADE TO VERIFY HARNESS CONSTRUCTION. A TEST SHOULD THEN BE MADE WITH THE AIRCRAFT POWER SUPPLIED TO THE INTERFACE ADAPTER'S CONNECTOR TO VERIFY POWER, GROUND AND DATA ARE ROUTED TO THE CORRECT PINS AS DETAILED IN THE **OUTLINE DRAWING**. REMOVE POWER BEFORE INSTALLING THE INTERFACE ADAPTER.

Parallel Data Output Connection (DA-15P)

The outline drawing provides the electrical connector pin/function information. Use this data when connecting the interface adapter to the transponder or other receiving device. See installation example 950002 and outline drawing.

Parallel Data Input Connection (DA-15S)

The outline drawing provides the electrical connector pin/function information. Use this data when connecting the digitizer to the parallel altitude data source. See installation example 950002 and outline drawing.

Serial Data Connection (DE-9S)
Table VI lists the pin assignments for the serial data connector.

Connect **TxD1** or **TxD2** (transmit data) from the Interface Adapter to the **RxD** (receive data) port on the GPS or other navigation device. All grounds on the DA-9S serial data connector are internally connected to ground and may be used to ground protocol pins, as well as provide serial data grounds to the receiving GPS or other navigation device.

3.3 Serial Data Port Test Equipment

The output of the serial port may, or may not be displayed by the GPS or other receiving device. There are several ways to test the output of the serial port:

A. Connect to an open serial port on a personal computer using serial data capture software such as PROCOMM™, SOFTWARE WEDGE™, TERMINAL (Windows® 3.x) or HYPERTERMINAL (Windows® 95, 98, 2000 and ME.)

B. Use a dedicated serial data test box such as the BLACK BOX™ RS232 Monitor.

C. Test for serial output using an oscilloscope to view the 9 VDC square wave group transmitted about 5 times a second.

3.4 Parallel Altitude Data Port Test Equipment

The output of the parallel altitude data may be monitored by any number of transponder ramp test sets that allow display of the altitude digitizer/encoder code. Alternatively, the Trans-Cal Industries, ATS-400 may be used to display the parallel data.

3.5 Calibration

The interface adapter is an all solid-state device that requires no calibration.

NOTE: To ensure correspondence with all on-board pressure altitude systems, altitude digitizers connected to the interface adapter that are not providing information to the ATC transponder should be tested to ensure correspondence to the primary flight altimeter, as per FAA AC43-6C.

Encoder / Digitizer / Transponder Interconnections

The following digitizer/transponder 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 transponder manufacturer.

Table I

IA-RS 232C-D DA-15 P	Function	KT76/78 Pin Number	King KT76A/78A Pin Number	King KXP Pin Number
1	D4	*[1]	*[1]	V
2	A1	6	M	G
3	A2	7	K	H
4	A4	9	J	J
5	B1	4	E	K
9	B2	1	C	L
10	B4	2	B	M
11	C1	3	D	P
13	C2	8	L	R
12	C4	10	H	S
6	Output Enable	Connect to aircraft ground.	Connect to aircraft ground.	Connect to aircraft ground.
8 or 14 *[2]	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.
15	Ground	Connect to aircraft ground.	Connect to aircraft ground.	Connect to aircraft ground.

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[1] Data for this connection is not available at this time.
[2] Pin 8 of the DA-15P is connected to Pin 8 of the DA-15S. Pin 14 of the DA-15P is connected to pin 14 of the DA-15S.

Table II

IA-RS 232C-D DA-15 P	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	Garmin GTX 327 Pin Number
1	D4	10	*3	*3	18
2	A1	14	7	2	3
3	A2	13	6	4	5
4	A4	15	8	8	6
5	B1	19	12	9	9
9	B2	17	10	10	11
10	B4	16	9	11	12
11	C1	21	14	1	10
13	C2	18	11	3	4
12	C4	20	13	5	7
6	Output Enable	11	5	12	13 or 25 or aircraft ground
8 or 14 *4	14 to 28VDC Input	9	18	13	14 to 28VDC Input
15	Ground	Connect to aircraft ground.	Connect to aircraft ground.	14	Connect to aircraft ground.

Serial Data Connection for the Garmin GTX327 Transponder

IA-RS232C-D Serial I/O Connector DE-9S	Function	GTX 327 25 Pin Conn.
4 or 9	TxD to RxD	19
1 or 5 or 8	Ground	13 or 25
Protocol, Connect pin 7 to ground.		

To allow the **Garmin GTX 327** transponder to communicate with the IA-RS232C-D go to the **Setup Page** and set the **Altitude Source (ALT SRC)** to receive data in the Icarus RS232 format.

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3 Data for this connection not available at this time.

4 Pin 8 of the DA-15P is connected to Pin 8 of the DA-15S. Pin 14 of the DA-15P is connected to pin 14 of the DA-15S.

Table III

IA-RS 232C-D DA-15 P	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	Output Enable	2	3	Connect to aircraft ground.	19
8 or 14 *5	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.

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[5] Pin 8 of the DA-15P is connected to Pin 8 of the DA-15S. Pin 14 of the DA-15P is connected to pin 14 of the DA-15S.

Table IV

IA-RS 232C-D DA-15 P	Function	Bendix TPR-2060 Pin Number	Bendix TR641A/B Pin Number	Wilcox 1014A Pin Number	UPS AT Apollo SL70 Pin Number
1	D4	*[6]	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	Output Enable	Connect to aircraft ground.	Connect to aircraft ground.	Connect to aircraft ground.	Connect to aircraft ground.
8 or 14 *[7]	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

IA-RS232C-D Serial I/O Connector DE-9S	Function	UPS AT SL70
4 or 9	TxD to RxD	4
1 or 5 or 8	Ground	3

To allow the **UPS AT SL70** transponder to accept serial data from the IA-RS232C-D go to the **Test Mode** on the **SL79 Conf** page and set the **Altitude Source (ASrc)** to receive **Serial (Ser)** data. On the **BAUD** page select **1200**.

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

[7] Pin 8 of the DA-15P is connected to Pin 8 of the DA-15S. Pin 14 of the DA-15P is connected to pin 14 of the DA-15S.

Table V

IA-RS 232C-D DA-15 P	Function	Becker Avionic Systems ATC3401 ATC2000	This column left intentionally blank	This column left intentionally blank	This column left intentionally blank
1	D4	23			
2	A1	16			
3	A2	15			
4	A4	14			
5	B1	17			
9	B2	19			
10	B4	18			
11	C1	22			
13	C2	21			
12	C4	20			
6	Output Enable	24			
8 or 14 *8	14 to 28VDC Input	6			
15	Ground	24			

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[8] Pin 8 of the DA-15P is connected to Pin 8 of the DA-15S. Pin 14 of the DA-15P is connected to pin 14 of the DA-15S.

Table VI

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

Pin	Function
1	Ground [9]
2	Spare
3	Spare
4	TxD1[10]
5	Ground [8]
6	Protocol
7	Protocol
8	Ground[8]
9	TxD2[10]

Table VII

Protocol Selection: DE-9S D-Subminiature Connector Function Table

Protocol Selection	Pin 6	Pin 7
UPS AT 100' resolution, 1200bps.	Open	Open
Trimble/Garmin, 100' resolution, 9600bps.	Open	Gnd.
Northstar/Garmin, 100' resolution, 2400bps.	Gnd.	Open
Magellan, 100' resolution, 1200bps.	Gnd.	Gnd.

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[9] Pins 1 and 5 and 8 are internal grounds provided for protocol selection and serial data ground.

[10] TxD1 and TxD2 are two (2) separate RS232 outputs that will transmit the protocol selected by grounding the pins above, See §1.8.

GPS Connection Data

Given the speed with which new GPS 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 manufacturer.

UPS Aviation Technologies (IIMorrow)

Apollo Model GX50, GX60, GX65

Apollo GX50, GX60, GX65 Signal	Apollo 37 Pin D-Sub Connector	IA-RS232C-D Serial Port Connector DE-9S
RxD2	21	4 or 9
Ground	20	1 or 5 or 8

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	IA-RS232C-D Serial Port Connector DE-9S
RxD2	21	4 or 9
Ground	3	1 or 5 or 8

Apollo MX20 Software Configuration

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

Trimble

Trimble 2101 Approach Plus GPS Receiver

Trimble Signal	Trimble 2101 Port 1	Trimble 2101 Port 2	IA-RS232C-D Serial Port Connector DE-9S
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
			Protocol assignment, jumper pin 7 to ground on pins 1 or 5 or 8

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	IA-RS232C-D Serial Port Connector DE-9S
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
			Protocol assignment, jumper pin 7 to ground on pins 1 or 5 or 8

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**.

Garmin International
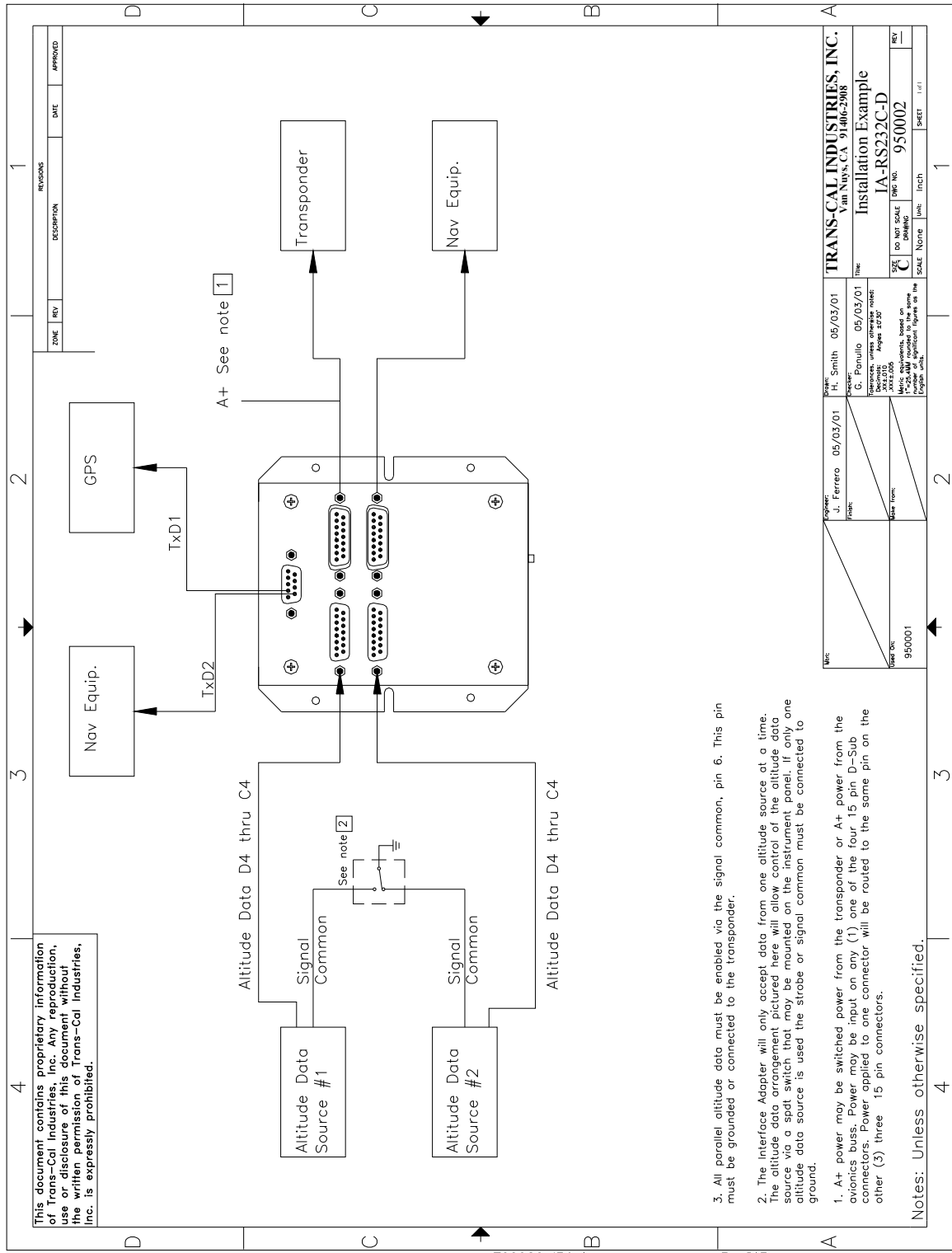
Garmin 400 Series GPS Devices

Garmin 78 Pin Conn. (P4001)	Function	IA-RS232C-D Serial Port Connector DE-9S
57	TxD	4 or 9
77 or 78	Ground	1 or 5 or 8
		Protocol, jumper pin 7 to ground.

Garmin 400 series GPS software configuration

To allow the **Garmin 400 series GPS** to communicate with the IA-RS232C-D go to the **Main RS232 Config** page and set channel 1 input to **Icarus-alt.**

Wiring Example - Dual Input IA-RS232C-D

NOTE:

1. PINS 8 AND 14 ARE CONNECTED TO 8 AND 14 ON ALL 15 PIN CONNECTORS. CONNECT +Vdc TO ONLY ONE INPUT CONNECTOR.

2. STROBE IS OFTEN OFTEN IDENTIFIED AS SIGNAL COMMON OR DATA ENABLE.

Installation Example IA-RS232C-D

Environmental Qualification Form

Nomenclature: Interface Adapter
Model No.: IA-RS232C-D   FAA TSO-C88a
Manufacturer: Trans-Cal Industries, Inc., 16141 Cohasset St. Van Nuys, CA   91406
DO-160B Testing Completed: Oct. 1994

Conditions	Section	Description of Tests Conducted
Temp. and Altitude	**§4.0**	Tested to Category E1.
Low Temperature	**§4.5.1**	-20°C
High Temperature	**§4.5.2 & 4.5.3**	+55°C
In-Flight Loss of Cooling	**§4.5.4**	No cooling required.
Altitude	**§4.6.1**	30,700 Feet
Decompression	**§4.6.2**	
Overpressure	**§4.6.3**	
Temp. Variation	**§5.0**	Tested to Category B.
Humidity	**§6.0**	Tested to Category A.
Operational Shock and Crash Safety	**§7.0**	Tested to Category B.
Vibration	**§8.0**	Tested to Categories JKLMNOP
Explosive Atmosphere	**§9.0**	Identified as Category X, no test performed.
Waterproofness	**§10.0**	Identified as Category X, no test performed.
Fluids Susceptibility	**§11.0**	Identified as Category X, no test performed.
Sand and Dust	**§12.0**	Identified as Category X, no test performed.
Fungus Resistance	**§13.0**	Identified as Category X, no test performed.
Salt Spray	**§14.0**	Identified as Category X, no test performed.
Magnetic Effect	**§15.0**	Tested to Category Z.
Power Input	**§16.0**	Tested to Category B.
Voltage Spike	**§17.0**	Tested to Category B.
Audio Frequency Conducted Susceptibility – Power Inputs	**§18.0**	Tested to Category B.
Induced Signal Susceptibility	**§19.0**	Tested to Category BC.
RF Susceptibility (Radiated and Conducted)	**§20.0**	Tested to Category T for Radiated Susceptibility and Category T for Radiated Susceptibility.
Emission of RF	**§21.0**	Tested to Category B.
Lightning Induced Transient Susceptibility	**§22.0**	Identified as Category X, no test performed.

Outline Drawing

WARRANTY REGISTRATION

Trans-Cal Industries warrants each Model IA-RS232C-D Solid State digitizer / serializer to be free of defects in workmanship and materials for a period of 42 months after purchase. This warranty applies to the original purchaser of the instrument.

Trans-Cal's obligation under this warranty is limited to repairing or replacing any unit returned to Trans-Cal during the life of this warranty provided:

(1) The defective unit is returned to us, **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 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: IA-RS232C-D   SERIAL NO: IAD-_____

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:_____