Trans-Cal Industries, Inc.

Model IA-RS232C-R
Remote Altitude Encoder/Digitizer (Slaved) Interface Adapter
Owner/Installation Manual

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Please Note:

It is the responsibility of the installer of this equipment, within a specific type or class of aircraft, to determine that the aircraft operating conditions are within TSO standards.

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History of Revision

Revision	Date	Description
---	17 Apr. 2001	Production release.
A	4 Jan 2002	Added KGP560 and KMH870 data.
B	20 March 2002	Corrected environmental qualification form, page 27.
C	20 August 2004	Updated document, remove Environmental Qualification Form

Table of Contents

Section 1.0 General

1.1 Scope

This manual provides detailed installation, and operating instructions for the Model IA-RS232C-R series of remote altitude digitizer (slaved) interface adapter.

1.2 Equipment Description

Approved under F.A.A. TSO-C88a the Model IA-RS232C-R is an all solid-state microprocessor-based device, which converts serial (RS232C) altitude data received from pressure altitude reporting equipment, into parallel and serial digital altitude data.

The parallel digital data 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 RS232 output ports. The serial data protocol is individually selectable for each port (refer to **Table VII** & **VIII** and **§4.0**) and may be used to provide pressure altitude data to GPS or other on board navigation devices.

1.3 General Specifications

1.3.1 Operating Voltage:

+8 to +30 VDC.

1.3.2 Operating Current:

0.10 Amperes. (100MA)

1.3.3 Operating Temperature:

-20° to +70° C.

1.3.4 Storage Temperature:

-55° to +70° C.

1.3.5 Warm-up Time:

Initialization requires three complete message cycles from the transmitting altitude reporting instrument. Typically less than 1 second.

1.3.6 Weight:

10 oz.

1.3 General Specifications (continued.)

1.3.7 Operating Altitude:

-1000 feet to the upper limit of the altitude reporting device currently connected.

1.3.8 Accuracy:

This device repeats the data from the transmitting altitude reporting device with 100% accuracy.

1.3.9 Mechanical Characteristics:

See outline drawing.

1.3.10 Environmental:

All model IA-RS232C-R (Slaved) Interface Adapters are designed and tested to meet or exceed the requirements of TSO-C88a, in accordance with RTCA Document DO-160b, dated July 1984 (specifics provided upon request.).

Environmental Category: E1BA/JKLMNOPXXXXXXBBBBBB

1.4 Parallel Altitude Data Port Specification

Code Format: In accordance with U.S. National Standard for Common System Component Characteristics for the I.F.F. 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 50VDC.

Maximum Sink Current: 50 Milliamperes.

Maximum Cable Length: 4000 feet.

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

1.5 Serial Altitude Data Port Specification

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

Logic Levels: Logic "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 to 9600 bps.

Update Rate: 1/second.

1.6 Serial Output Data Communication Format

Model IA-RS232C-R 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.

1.7 Serial Output Data Communication Protocol

The serial data protocol is selectable by grounding or leaving open pins 2 or 9 or pin 10 of the 15-pin D-Subminiature DA-15S connector, or by selecting protocols via software. See **§4.0**. *Note! Hardware jumpers on the D-Subminiature connector will override software settings!*

Grounding pin 2 of the DA-15S will result in 10-foot resolution on the selected protocol, *if 10-foot resolution data is being received from the altitude reporting device.*

Leaving Pin 9 and 10 of the DA-15S 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 10 of the DA-15S 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.

Grounding Pin 9 of the DA-15S connector results in a protocol compatible with some navigation devices manufactured by Northstar and Garmin. At a baud rate of 2400 bps the Interface adapter will send a ten-byte message as follows:

Message	Definition
ALT 10500 $^{C}_{R}$	Altitude 10,500 feet.
ALT -2500 $^{C}_{R}$	Digitizer disabled.

Grounding both Pin 9 and 10 of the DA-15S connector results in a protocol compatible with some navigation devices manufactured by Magellan. At a baud rate of 1200 bps the Interface adapter will send a seventeen-byte message as follows:

Message	Definition
$MGL+02500T+25D6 $^{C}_{R}$	Altitude 2,500 feet.

1.8 Serial Altitude Data Input Requirements

The IA-RS232C-R accepts serial altitude data (RS232C) with 10-foot resolution from an altitude encoder in the following format:

Baud Rate: 9600
Data Bits: 8
Stop Bit: 1
Parity: None
Message Example: ALT 10050 $^{C}_{R}$

Following is a list of Altitude Digitizers manufactured by Trans-Cal Industries, Inc., which are capable of providing this data to the IA-RS232C-R.

SSD120-(XX)A-RS232
SSD120-(XX)A-RS
SSD120-(XX)A-RS1
Any High Altitude Digitizer (50,000' and higher) in the SSD Series will provide the necessary serial data.

Section 2.0 Operation

2.1 General

The IA-RS232C-R 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 Interface Adapter is slaved to the serial data from an Altitude Digitizer and will begin transmitting parallel and serial data upon power up and receipt of three valid serial altitude data messages from the source Altitude Digitizer. 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. All parallel data outputs will be pulled low until the Adapter receives three valid serial data messages from the source altitude encoder, then the parallel data will assume the values for the present pressure altitude being received from the source altitude encoder. If the parallel 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 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 3 valid serial data messages from the source altitude reporting device. Strobing the parallel data will not affect the serial data transmission.

Section 3.0 Installation and Test Equipment

3.1 Mechanical Installation

The IA-RS232C-R 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

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. Connect the A+ power to either pin 8 or 14 of the DA-15P connector, and Circuit Ground to pin 15.

Parallel Data Connection (DA-15P)
The outline drawing provides the electrical connector pin/function information. Use this data when connecting the digitizer to the transponder or other receiving device.

Serial Data Connection (DA-15S)
Table VII lists the pin assignments for the serial data connector.

Connect the Interface Adapter Pin 13 **RxD2** to the **TxD** port of the source altitude digitizer. *Important!* Connect a serial data ground between the source altitude digitizer and the Interface Adapter on either pin 1, 5, or 8. Shielded cable is recommended for all wiring harnesses.

Connect **TxD1** or **TxD2**[1] (transmit data) from the Interface Adapter to the **RxD** (receive data) port on the GPS or other navigation device. All grounds on the DA-15S 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 nav device. Pin 3 **RxD1** is used for protocol selection only. See **§4.0** for software assigned protocols.

[1] The selected serial data protocol may be transmitted simultaneously on both TxD1 and TxD2, unless assigned separately via **Serial Port Software Configuration** see **§4.0**

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:

1. 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.)
2. Use a dedicated serial data test box such as the BLACK BOX™ RS232 Monitor.

3. 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, which allow display of the parallel ICAO altitude code. The IFR Model ATC-600a is one such device. Alternatively, the Trans-Cal Industries' ATS-200 may be used to display the parallel data.

Section 4.0 Serial Port Configuration

4.1 General

The IA-RS232C-R incorporates two separate RS232E compatible outputs that may be configured via software to transmit (2) two *different* altitude data protocols *simultaneously*. Alternatively hardware jumpers installed on the DA-15S serial port connector will select a single protocol to be transmitted on both serial ports. *Note: Hardware jumpers will override software settings.* The following procedure describes a method for changing the serial port protocols using **Hyper Terminal** and an IBM Compatible PC.

4.2 Required Equipment

1.) IBM Compatible PC.
2.) **Hyper Terminal** Version 5.0 or later running Windows® 95, 98, 2000 or ME. Hyper Terminal is available as a free download from www.hilgraeve.com Note: the original version of **Hyper Terminal** which shipped with Windows® 98 will not work correctly. Download Version 5.0 or later!
3.) Interconnecting wiring harness see drawing 881405.
4.) Power supply 8 to 30 VDC @ 0.100 MA

4.3 Hyper Terminal Set-Up on the IBM Compatible PC

Boot up the computer and start the **Hyper Terminal** program. **Hyper Terminal** may be located in the **Programs** section or in the **Accessories** section under **Communications.**

Under the **New Connection** window, (identifies a new connection)
-Choose an icon then select an identifying title such as "Test."
-Select **OK** after you have made your choices.

Under the **Connect to** window, (selects the **Com** port to use)
-Choose **Connect Using Com 1** or whatever **Com** port you have chosen to use.
-After your selection click on **OK.**

Under the **Com? Properties**, (sets the communication properties)
-Choose the **Port Settings** tab, and set the following:

Bits per second:	**9600**
Data bits:	**8**
Parity:	**None**
Stop Bits:	**1**
Flow Control:	**None**

-Select **OK.**

4.3 Hyper Terminal Set-Up on the IBM Compatible PC (continued.)

In the **Hyper Terminal** window select **File** then click on **Properties.**

Under the **Com? Properties** window click on the **Settings** tab.
Set the following:

Function, arrow, ctrl keys to act as **Terminal Keys.**
Emulation to **Auto Detect.**

Under the **ASCII Setup** set the following:
Echo off.
Wrap lines that exceed terminal width.
Select **OK.**
The software is now configured for operation.

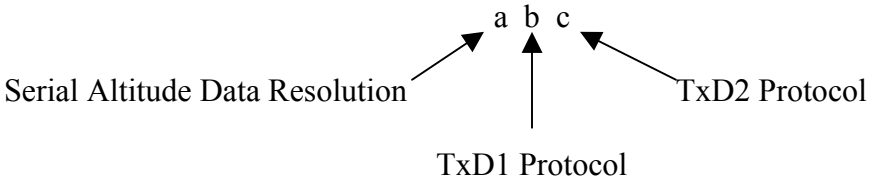
4.4 Serial Port Software Configuration

Connect the digitizer to an IBM Compatible computer running **Hyper Terminal** as described in **§4.3** and as shown in the **Configuration Block Diagram**.

Assign the serial port protocols as follows:

1.) Apply power to the interface adapter.
Type **<P>** The interface adapter will respond with the software revision level and date then the program prompt **?>**
2.) Type **ADJ<enter>** The Adapter will respond with **A=**
3.) Type **P<enter>** Identifies the current serial port settings.

The Interface Adapter responds with a three-digit number as follows:



4.4 Serial Port Software Configuration (continued.)

(a) The first digit represents the serial altitude data resolution.
0 = Use D-Sub connector protocol hardware jumpers.
1 = 100 foot resolution on TxD1 and TxD2.
2 = 10 foot resolution on TxD1 and TxD2.

(b) The second digit represents the protocol selection for TxD1.
0 = Use D-Sub connector protocol hardware jumpers.
1 = UPS Aviation Technologies. 1200 bps.
2 = Trimble/Garmin. 9600bps.
3 = Northstar. 2400bps.
4 = Magellan. 1200bps.
5 = ARNAV. 9600bps.

(c) The third digit represents the protocol selection for TxD2.
0 = Use D-Sub connector protocol hardware jumpers.
1 = UPS Aviation Technologies. 1200 bps.
2 = Trimble/Garmin. 9600bps.
3 = Northstar. 2400bps.
4 = Magellan. 1200bps.

Example:

Type **P212<enter>**	Defined as **10 foot** resolution on TxD1 and TxD2. **UPS Aviation Technologies** protocol transmitted on TxD1. **Trimble/Garmin** protocol transmitted on TxD2.

4.5 Configuration Command List

Following is a list of commands, which will operate in the **ADJ** mode.

Top Level Menu

ADJ<enter>	**Adjust** serial port configuration mode.

Sub-Menu

P<enter>	Displays the current serial **Port** settings, see **§4.4.**
Pabc<enter>	**Port** protocol select, see **§4.4.**

Notes:

1.) Backspace does not function. If a typing error occurs hit **<enter>** and begin again.

2.) **ERR** indicates syntax error.

Interface Adapter Interconnections Tables I thru VI

The following Interface Adapter 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-R DA-15 P	Function	Bendix/King KT76/78 Pin Number	Bendix/King KT76A/78A Pin Number	Bendix/King KXP Pin Number
1	D4	*[2]	*[2]	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 *[3]	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.

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

[3] Pins 8 and 14 are connected internally.

Table II

IA-RS232C-R 15 Pin Conn.	Function	Bendix/King KGP500 EGPWS	Bendix/King KMH 870 IHAS Processor	This column left blank intentionally.	This column left blank intentionally.
1	D4	No Connection	18		
2	A1	12	11		
3	A2	52	10		
4	A4	33	9		
5	B1	14	14		
9	B2	34	13		
10	B4	73	12		
11	C1	32	17		
13	C2	13	16		
12	C4	72	15		
6	Output Enable	Connect to aircraft ground.	Connect to aircraft ground.		
8 or 14 *[4]	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.		
15	Ground	Connect to aircraft ground.	Connect to aircraft ground.		

[4] Pins 8 and 14 are connected together internally.

Table III

IA-RS 232C-R 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	*[5]	*[4]	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 *[6]	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-R Serial I/O Connector DA-15S	**Function**	**GTX 327 25 Pin Conn.**
4 or 12	TxD to RxD	19
1 or 5 or 8	Ground	13 or 25
Protocol, Connect pin 10 to ground.		

To allow the **Garmin GTX 327** transponder to communicate with the SSD120-(XX)A-RS232 go to the **Setup Page** and set the **Altitude Source (ALT SRC)** to receive data in the Icarus RS232 format.

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

[6] Pins 8 and 14 are connected internally.

Table IV

IA-RS 232C-R 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 *[7]	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.

[7] Pins 8 and 14 are connected together internally.

Table V

IA-RS 232C-R 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	*[8]	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 *[9]	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-R Serial I/O Connector DA-15S	Function	UPS AT SL70
4 or 12	TxD to RxD	4
1 or 5 or 8	Ground	3

To allow the **UPS AT SL70** transponder to accept serial data from the SSD120-(XX)A-RS232 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**.

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

[9] Pins 8 and 14 are connected internally.

Table VI

IA-RS232C-R 15 Pin Conn.	Function	Becker Avionic Systems ATC3401 ATC2000	This column left blank intentionally.	This column left blank intentionally.	This column left blank intentionally.
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 *[10]	14 to 28VDC Input	6			
15	Ground	24			

[10] Pins 8 and 14 are connected together internally.

Serial Data Connector and Protocol Tables VII & VIII

Table VII

Serial Port I/O Connector, 15 Pin D-Subminiature DA-15S

Pin	Function
1	Ground [11]
2	10' select[12]
3	RxD1
4	TxD1[13]
5	Ground [11]
6	No Connection
7	No Connection
8	Ground[11]
9	Protocol
10	Protocol
11	No Connection
12	TxD2 [13]
13	RxD2 (Altitude Data Input)
14	Spare
15	Spare

Table VIII

Protocol Selection: DA-15S D-Subminiature Connector Function Table

Protocol Selection	Pin 2	Pin 9	Pin 10
UPS AT 100' resolution, 1200bps. **UPS AT 10' resolution, 1200bps.**	Open Gnd.	Open Open	Open Open
Trimble/Garmin, 100' resolution, 9600bps. **Trimble/Garmin, 10' resolution, 9600bps.**	Open Gnd.	Open Open	Gnd. Gnd.
Northstar/Garmin, 100' resolution, 2400bps. **Northstar/Garmin, 10' resolution, 2400bps.**	Open Gnd.	Gnd. Gnd.	Open Open
Magellan, 100' resolution, 1200bps. **Magellan, 10' resolution, 1200bps.**	Open Gnd.	Gnd. Gnd.	Gnd. Gnd.

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

[12] 10 foot resolution altitude data must be provided to the interface adapter from the source altitude reporting device.

[13] TxD1 and TxD2 are two (2) separate RS232 outputs which will transmit the protocol selected by grounding the pins above, or will transmit separate protocols as assigned via software, see **§4.6 Serial Port Software Configuration.**

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-R Serial I/O Connector DA-15S
RxD2	21	4 or 12
Ground	20	1 or 5 or 8
		Optional, jumper pin 2 to ground for 10' resolution.[14]

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-R Serial I/O Connector DA-15S
RxD2	21	4 or 12
Ground	3	1 or 5 or 8
		Optional, jumper pin 2 to ground for 10' resolution.[14]

Apollo MX20 Software Configuration

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

[14] 10 foot resolution altitude data must be provided to the interface adapter from the source altitude reporting device.

Trimble

Trimble 2101 Approach Plus GPS Receiver

Trimble Signal	Trimble 2101 Port 1	Trimble 2101 Port 2	IA-RS232C-R Serial I/O Connector DA-15S
RxD+	7	24	1 or 5
RxD-	8	36	4 or 12
Ground	3 or 20	3 or 20	1 or 5
			Protocol assignment, jumper pin 10 to ground on pins 1 or 5 or 8
			Optional, jumper pin 2 to ground for 10' resolution.[15]

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-R Serial I/O Connector DA-15S
RxD+	J1-7	J1-24	1 or 5
RxD-	J1-8	J1-36	4 or 12
Ground	J1 - 3 or 20	J1 - 3 or 20	1 or 5
			Protocol assignment, jumper pin 10 to ground on pins 1 or 5 or 8
			Optional, jumper pin 2 to ground for 10' resolution.[15]

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**.

[15] 10 foot resolution altitude data must be provided to the interface adapter from the source altitude reporting device.

Garmin International

Garmin 400 Series GPS Devices

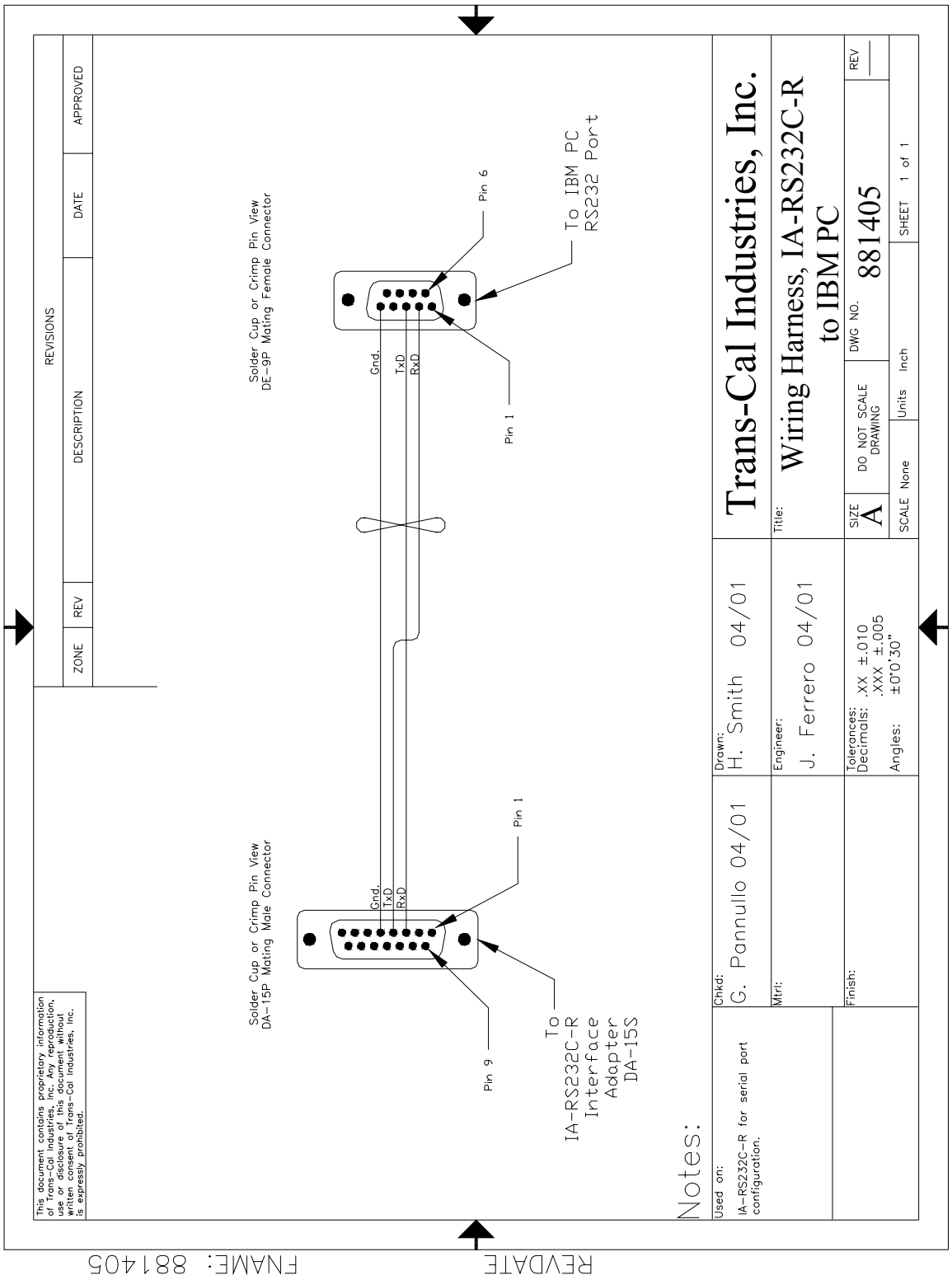
Garmin 78 Pin Conn. (P4001)	Function	IA-RS232C-R Serial I/O Connector DA-15S
57	TxD	4 or 12
77 or 78	Ground	1 or 5
		Protocol, jumper pin 10 to ground.
		Optional, jumper pin 2 to ground for 10' resolution.[16]

Garmin 400 series GPS software configuration

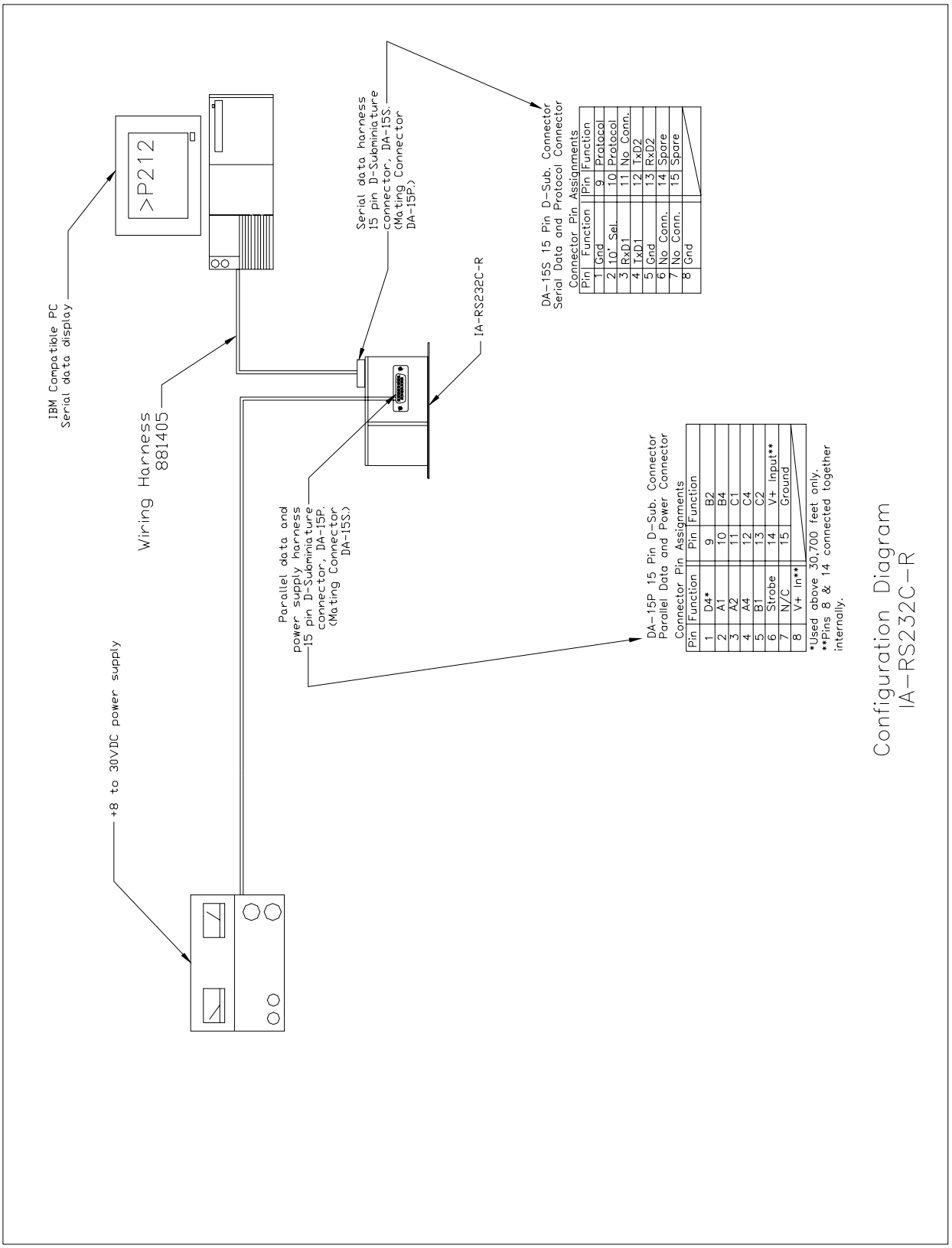
To allow the **Garmin 400 series GPS** to communicate with the SSD120-(XX)A-RS232 go to the **Main RS232 Config** page and set channel 1 input to **Icarus-alt.**

[16] 10 foot resolution altitude data must be provided to the interface adapter from the source altitude reporting device.

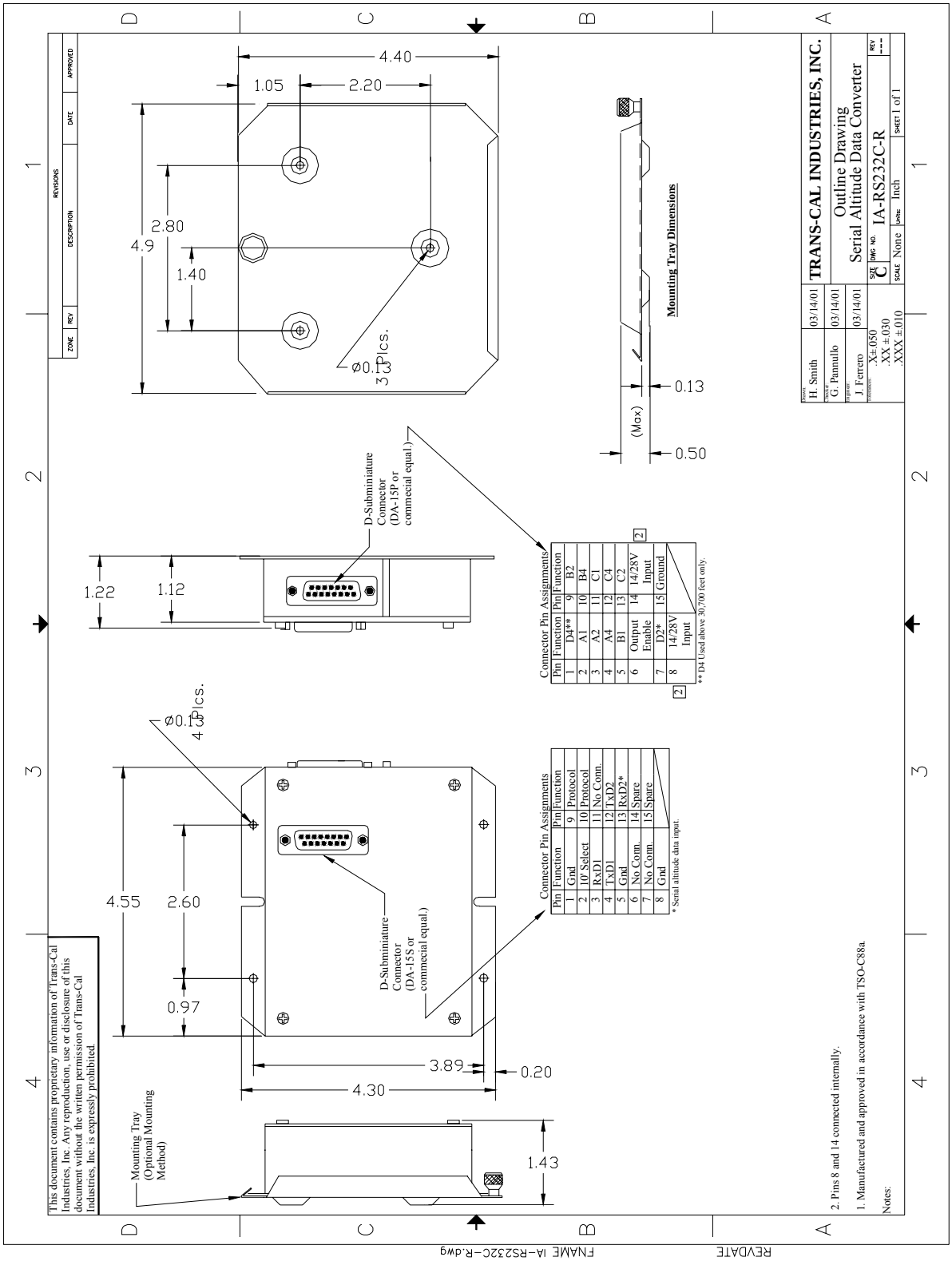
Wiring Harness Drawing 881405



Configuration Set-Up Diagram



Outline Drawing



WARRANTY REGISTRATION

Trans-Cal Industries warrants each Model SSD120-(XX)A(E)-RS1 Solid State digitizer / serializer to be free of defects in workmanship and materials for a period of eighteen (18) 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: SSD120-( )A(E)-RS1 SERIAL NO: RS-_____

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:_____