Trans-Cal Industries, Inc.

Model SSD120-(XX)A
&
Model SSD120-(XX)AE

All Solid-State
High Altitude Series
(50,000 to 80,000 Feet)
Altitude Encoder/Digitizer

Owner/Installation Manual

T.S.O. C88a Approved

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24 August 2004 Document Number: 881400 Revision: E

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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
--	07/98	Production release.
A	03/00	Added TDR950 & SL70 data Table IV. Changed operating voltage from +14 to +9 Vdc.
B	04/00	Added GTX327 data Table II, GPS connection data.
C	02/00	Added TxD2 data and Rev. A outline drawing.
D	11/02	Added Table VI & ARNAV interconnect data, Rev. B outline drawing.
E	08/04	Updated Manual

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Abbreviations 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
EEPROM	Electronically Erasable Read Only Memory
EIA	Electronic Industries Association
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
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
NIST	National Institute of Standards and Technology
oz	Ounce
psi	Pounds per Square Inch
RAM	Random Access Memory
RS	Recommended Standard
RTCA	RTCA Inc. (formerly 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
Ω	Electrical resistance measured in Ohms.
ºC	Temperature in degrees centigrade.
±	Plus or minus.
§	Section

Section 1.0 Introduction

1.1 Scope

This manual provides detailed installation, calibration and operating instructions for Trans-Cal Industries' Model SSD120-(XX)A and SSD120-(XX)AE[1] series of altitude encoder/digitizer, and applies to units with operating ceilings of 50,000 feet to 80,000 feet.

1.2 Equipment Description

Approved under F.A.A. TSO-C88a, the Model SSD120-(XX)A and SSD120-(XX)AE is an all solid-state electronic device which, when connected to an aircraft static and electrical system, converts pressure altitude information into parallel and serial digital data.

The parallel digital altitude data protocol is set forth in the ICAO International Standard for SSR Pressure Altitude Transmission. 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 and may be used to provide pressure altitude data to GPS or other on board navigation devices. Refer to **Table VIII, Table IX** and **§4.7**

1.3 General Specifications

Operating Voltage: Model SSD120-(XX)A Model SSD120-(XX)AE-RS232 [2]	 +9 to 30 Vdc +12 to 30 Vdc
Operating Current all models:	0.1 Amps at 14Vdc. 0.09 Amps at 28Vdc -30º to +70ºC. 0.54 Amps at 28Vdc -31º to -55ºC.
Operating Temperature: Model SSD120-(XX)A Model SSD120-(XX)AE	 -20° to +70°C -55° to +70°C
Storage Temperature (non-operating) all models:	-65° to +85°C.
Warm-up time:	See Figure 3.
Weight:	17 oz.

[1] SSD120-(XX)AE Extended operating temperature range: -55° to +70°C.

[2] The SSD120-(XX)AE may be operated down to +9Vdc but longer warm-up times will be experienced.

1.3 General Specifications(continued)

1.3.1 Operating Altitude Range

Model	Operating Altitude
SSD120-50A( )	-1000 to +51,000 feet.
SSD120-62A( )	-1000 to +62,700 feet.
SSD120-65A( )	-1000 to +66,000 feet.
SSD120-80A( )	-1000 to +81,000 feet.

1.3.2 Accuracy

Model SSD120-(XX)A:
Accuracy throughout operating temperature range -20º to +70ºC:

-1000 to +42,000 ft.	±30 ft.
42,000 feet to max. altitude	±75 ft.

Model SSD120-(XX)AE:
Accuracy at temperatures/conditions listed:

-1000 to +42,000 ft. (-30º to +70ºC)	±30 ft.
42,100 ft. to max. altitude (-30º to +70ºC)	±50 ft.
-1000 to +42,000 ft. (-55º to -31ºC) No warm-up time.	±50 ft.
42,100 ft. to max. altitude (-55º to -31ºC) No warm-up time.	±75 ft.
-1000 to +42,000 ft. (-55ºC) After 15 minute warm-up.	±30 ft.
42,100 to max. altitude (-55ºC) After 15 minute warm-up.	±50 ft.

1.3.3 Mechanical Characteristics

Model Number	Dimensions	Weight
Model SSD120-50A( )	*See Outline Drawing*	17 oz.
Model SSD120-62A( )	*See Outline Drawing*	17 oz.
Model SSD120-65A( )	*See Outline Drawing*	17 oz.
Model SSD120-80A( )	*See Outline Drawing*	17 oz.

1.3.4 Environmental

All model SSD120-(XX)A digitizers have been designed and tested to meet the requirements of TSO-C88a, in accordance with RTCA Document DO160b, dated July 1984 (specifics provided upon request.) Environmental category: E1BA/JKLMNOPXXXXXXZBBBBBB.

1.3.5 Over Range

The SSD120-(XX)A( ) series of altitude digitizers will not be damaged when operated beyond their specified maximum altitude up to 100,000 feet MSL, (0.1581psi) or over pressured to –5721 feet (18psi) maximum.

1.4 Parallel ICAO Altitude 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: DA-15S 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.
Number of Receivers: The TIA/EIA RS232C standard recommends one receiver per serial port.
Maximum Cable Length: 50 Feet. (15.24 meters)
Code Format: ASCII
Communication System: Simplex
Transmission Method: Asynchronous. (Half Duplex, talk only. Full Duplex in calibration mode only.)
Transmission Rate: Selectable, 1200 bps to 9600 bps.
Update Rate: 1/sec.

1.6 Serial Port Altitude Data Resolution

The default resolution of the altitude digitizer serial data is 100 feet. To enable 10-foot resolution, connect pin 2 of the 9-pin D-Subminiature connector to ground (see **Table VIII**.) The serial port resolution may also be configured via software, see **§4.7**.

1.7 Serial Communication Format

Model SSD120-(XX)A( ) 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.

1.8 Serial Communication Protocol

(Refer to **Table VIII, Table IX** and **§4.7**)

Protocol is user selectable by grounding or leaving open pin 6 or pin 7 of the 9 pin D-Subminiature connector, or by selecting protocols via software see **§4.7.**

Protocol 1: Leaving pin 6 and 7 of the 9 pin connector open results in a protocol compatible with UPS Aviation Technologies' (IIMorrow) Navigation devices.

Examples of serial messages for UPS AT (IIMorrow) devices:

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

UPS AT	
Baud Rate:	1200 bps
Data Bits:	8
Stop Bits:	1
Parity:	None

Protocol 2: Grounding pin 7 of the 9 pin connector results in a protocol compatible with some navigation devices manufactured by Trimble and Garmin.

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.

Trimble/Garmin	
Baud Rate:	9600 bps
Data Bits:	8
Stop Bits:	1
Parity:	None

Protocol 3: Grounding pin 6 of the 9 pin connector results in a protocol compatible with some navigation devices manufactured by Northstar and Garmin.

Examples of serial messages for these devices:

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

Northstar/Garmin	
Baud Rate:	2400 bps
Data Bits:	8
Stop Bits:	1
Parity:	None

Protocol 4: Grounding both pins 6 and 7 of the 9 pin connector results in a protocol compatible with some navigation devices manufactured by Magellan.

Examples of serial messages for Magellan devices:

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

Magellan	
Baud Rate:	1200 bps
Data Bits:	7
Stop Bits:	1
Parity:	Even

Protocol 5: Leaving pins 6 and 7 of the 9 pin connector open, the ARNAV Systems protocol may be software selected see **§4.7** for protocol selection details.

Example of an ARNAV serial altitude message:

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

ARNAV	
Baud Rate:	9600 bps
Data Bits:	8
Stop Bits:	1
Parity:	None

Section 2.0 Operation

2.1 General

The SSD120-(XX)A( ) series of altitude digitizer's are designed to be mounted within a pressurized or non-pressurized, but temperature controlled area within aircraft with operating ceilings between 50,000 and 80,000 feet MSL. Usually remotely located, the digitizer is fully automatic in operation. The parallel data output is controlled by the transponder while the serial altitude data is transmitted asynchronously. (Half duplex, talk only. Full duplex in calibration and configuration modes only.)

2.2 Operating Instructions

Parallel Data:
Place the transponder in mode "C", altitude-reporting mode, and apply power to the transponder and to the digitizer. In some installations the digitizer will automatically be supplied power when the transponder is energized; in others, power to the digitizer may be through a separate circuit breaker. If power to the digitizer is provided directly from the aircraft's avionics buss, follow the power-up procedures recommended by the transponder manufacturer. All parallel outputs will be pulled low for a self test at power up, then assume the value for the present input pressure. In some installations, the transponder controls the digitizer by enabling and disabling its outputs. In other installations, the digitizer's output is not controlled by the transponder and is continuously enabled, (Digitizer pin 6 is grounded.)

Serial Data
The serial communication is fully automatic and transmission begins after the self-test is complete. Strobing the parallel data output of the digitizer will not affect the serial data transmission.

Section 3.0 Installation

3.1 Mechanical Installation

The SSD120-(XX)A( ) series of digitizer may be mounted in any attitude within the internal structure of the aircraft. DO NOT mount the digitizer in the direct air stream of either hot or cold air ducts. The mounting position should allow for a short static pressure line from the digitizer to the altimeter, access to the digitizer's adjustments, and ample room for a service loop for the interconnecting cabling to the transponder.

Use #4-40 machine screws, sheet metal screws, or pop rivets to attach the digitizer or the mounting tray to the airframe. Secure mating connectors to the digitizer housing using the #4-40 screws provided. Refer to the outline drawing for mechanical dimensions and the installation block diagram.

3.2 Electrical Installation

The digitizer is designed to operate with either a +14 or +28 Vdc power source. These voltages can be A+ switched power provided by the transponder or can be provided by the avionics buss. If using the avionics buss, protect the circuit with a one amp fuse or circuit breaker.

Parallel ICAO Altitude Data Connection

The outline drawing provides electrical connector pin/function information. Use this data when connecting the digitizer to the transponder. In some installations where older transponders are used, the transponder may not provide an "altitude disable" function. In this case, an instrument panel mounted switch for this function may be required.

Serial Altitude Data Connection

(**Table VIII** lists the pin assignments for the serial port connector.)

Connect the TxD1 or TxD2[3] (transmit data) from the 9-pin D-Subminiature connector to the RxD (receive data) port on the GPS or other navigation device. All grounds on the 9 pin D-subminiature connector are internally connected to ground and may be used to ground protocol pins, as well as provide data ground to the receiving GPS or other device. Pin 3 (RxD) of the 9-pin connector is used for calibration only. See **Table VIII** for connector pin assignments and **§4.6** for software assigned protocols, and **§4.0** for calibration data. Shielded cable is recommended for both serial and parallel data wiring harnesses.

[3]The selected serial data protocol is transmitted simultaneously on both TxD1 and TxD2, unless assigned separately via **Serial Port Output Protocol Configuration** see **§4.7**.

3.3 Serial Altitude Data Port Test Equipment

The output of the serial port may, or may not be directly displayed by the GPS or other device receiving the serial data. 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™, VERSATERM™, SOFTWARE WEDGE™, TERMINAL (Windows® 3.x) or HYPERTERMINAL (Windows® 95 & 98).
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 once a second.

3.4 Parallel ICAO Altitude Data Port Test Equipment

The output of the parallel ICAO altitude data may be monitored by any number of transponder ramp test sets, which allow display of the altitude digitizer/encoder code. The IFR Model ATC-600A Portable Transponder Test Set is one example. Alternatively, the Trans-Cal Industries' ATS-200 may be used to display the parallel data.

Section 4.0 Calibration and Configuration

4.1 Calibration Overview

Reference: FAR 91.217; FAA Advisory Circular 43-6A
FAR 91.423; FAR 43-Appendix E and F
FAA TSO-C88a; SAE AS8003

This procedure will allow adjustment to the calibration curve of the SSD120-(XX)A or SSD120-(XX)AE as an aide in matching the digitizer output to a primary flight altimeter or NIST traceable pressure standard. The maximum allowed error between the primary flight altimeter and the altitude digitizer is ±125 feet as required by TSO-C88a. All Trans-Cal digitizers are calibrated to within ±50 feet of a NIST traceable pressure standard; however, the error allowed on altimeters at higher altitudes could lead to a combined error in excess of ±125 feet.

When the altitude digitizer is installed in an aircraft for use as the transponder's source of mode "C" information, the digitizer must be recalibrated for correspondence to the aircraft's primary flight altimeter, as required by FAR 91.217 and 91.423. Model SSD120-(XX)A and SSD120-(XX)AE are designed to be field calibrated to meet this requirement, as per the procedure described in either **§4.5** or **§4.6**.

The correspondence requirement for altitude digitizers is fully addressed in SAE Aerospace Standard AS8003 §3.11. The SAE standard requires the digitizer to report altitude within ±125 feet of the primary flight altimeter's reading when the pressure datum is set to 29.92 In. Hg., (1013 MB) absolute. This standard also requires a transition accuracy of ±75 feet of the nominal transition point for that altitude. A transition is defined as the point at which the digitizer changes from one altitude to the next, either increasing or decreasing altitude. The nominal transition point of the ICAO code occurs 50 feet prior to the altitude in question. See **Figure 1**.

There are two different methods used to affect the calibration of the altitude digitizer. The technician need only perform the method that is best suited for the application in question. *There is no need to perform both methods.*

Method 1: Span Adjust Mode (§4.5): The internal pressure transducer span and reference may be changed via an IBM compatible PC. This procedure is normally used when access to an NIST traceable pressure standard with accuracy better than 0.05% FS of 15psi is available.

4.1 Calibration Overview(continued)

Method 2: Dynamic Calibration Mode (§4.6): The altitude digitizer may be adjusted utilizing an externally addressable EEPROM, which is configured to accept an alternate altitude error curve entered via an IBM compatible PC at 1000-foot intervals.

4.2 Required Equipment Dynamic Calibration:

(See dynamic calibration block diagram.)

1. Primary flight altimeter or NIST traceable pressure standard.

2. +12 or +28Vdc power supply.

3. IBM compatible computer with an available serial port.

4. Software requirement: **Windows 98®** using **Hyper Terminal** Ver. 5.0 by Hilgraeve. (Available as a free download at http://www.hilgraeve.com) Or equal serial data capture software. See **§3.3a**.

(Software Note: The **Hyper Terminal** program, which is shipped with Windows 98®, will not function correctly. You must download **Version 5.0** or better, to calibrate this device.)

5. A pitot-static test set, capable of exercising the altimeter and digitizer over a range of -1000 feet to the maximum altitude of the digitizer.

6. *Optional*: ATS-200 or equal device which will allow the display of the 100 foot resolution parallel altitude data.

4.3 Required Equipment Span Adjust:

(See span adjust block diagram.)

1. NIST traceable pressure standard. Accuracy better than 0.05%FS of 15psi.

2. +12 or +28Vdc power supply.

3. IBM compatible computer with an available serial port.

4. Software requirement: **Windows 98®** using **Hyper Terminal** Ver. 5.0 by Hilgraeve. (Available as a free download at http://www.hilgraeve.com) Or equal serial data capture software. See **§3.3a**.

(Software Note: The **Hyper Terminal** program, which is shipped with Windows 98®, will not function correctly. You must download **Version 5.0** or better, to calibrate this device.)

5. Digitizer/PC interface cable see Trans-Cal part number 881404.

6. A pitot-static test set, capable of exercising the altimeter and digitizer over a range of -1000 feet to the maximum altitude of the digitizer.

7. *Optional*: ATS-200 or equal device which will allow the display of the 100 foot resolution parallel altitude data.

4.4 Hyper Terminal Set-Up on the IBM Compatible PC

1. 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**.

2. Under the **New Connection** window. (Identifies the new connection).
   A. Choose an icon then select an identifying title such as "Test".
   B. Select **OK** after you have made your choices.

3. Under the **Connect to** window (Selects the Com port to use.)
   A. Choose **Connect Using Com 1** or whatever **Com** port you have chosen to use.
   B. After your selection click on **OK.**

4. Under the **Com ? Properties**, (Sets communication properties).

5. Under the **Port Settings** tab, set the following:
   A. Bits per second: **9600**
   B. Data bits: **8**
   C. Parity: **None**
   D. Stop Bits: **1**
   E. Flow Control: **None.**

6. Select **OK**.

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

8. Under the **Com ? Properties** window click on the **Settings** tab.

9. Set the following:
   A. Function, arrow, ctrl keys to act as **Terminal Keys.**
   B. Emulation to **Auto Detect.**

10. Under **ASCII Setup.** Set the following.
    A. **Echo off.**
    B. **Wrap lines that exceed terminal width.**

11. Select **OK.**

12. The software is now configured for operation.

4.5 Span Adjust Procedure

Two calibration parameters herein referred to as **X** and **Z,** may be programmed to affect the reference and span of the internal pressure transducer. The following procedure allows the user to change these values bringing the error curve of the digitizer into a "best fit" straight line with a given pressure standard or altimeter.

1. Construct a wiring harness per the wiring harness diagram. TCI P/N: 881404.

2. Connect the digitizer, computer and pressure standard as shown in span adjust test set-up diagram, and energize.

3. Open and configure the **Hyper Terminal** program as described in **§4.4**

4. The digitizer output should now be displayed on the PC screen with 10-foot resolution. (You may use **the Hyper Terminal "Clear Screen** function to remove any extra characters that may clutter the screen. Click **Edit** then click on **Clear Screen**.)

5. Retrieve and write down the **X** parameter from the digitizer's memory by typing **<enter**>, the digitizer will return a **?** Then type **XD<enter>** the digitizer will return a **X=** Then type ***00X=<enter>** Note the number displayed on the PC screen and write this number down, in case a return to the original factory setting is required.

6. Retrieve and write down the **Z** parameter from the digitizer's memory by typing ***00Z=<enter>** Note the number displayed on the PC screen and write this number down, in case a return to the original factory setting is required. Type **QQ** to return to normal operation.

7. Clear the error table as follows, before attempting to calibrate the digitizer.
   A. Type **<enter>**, the digitizer will return a **?**.
   B. Type **ADJ<enter>** the digitizer will return an **A= .**
   C. Type: **CLR<enter>** the digitizer will return **A=.**
   D. Type **QQ** to return to normal operation.

8. Adjust the input pressure until the pressure standard reads the maximum operating altitude of the digitizer.

SSD120-50A	50,000 feet	3.4247 In. Hg.
SSD120-62A	62,000 feet	1.9237 In. Hg.
SSD120-65A	65,000 feet	1.6654 In. Hg.
SSD120-80A	80,000 feet	0.8155 In. Hg.

Note: Backspace does not function in **Hyper Terminal**. If a typing error occurs, hit **<enter>** and begin again.

4.5 Span Adjust Procedure (continued)

CAUTION: Always refer to the Altimeter, VSI or IVSI manufacturer's data for maximum rate of climb or descent and any special test conditions, which may apply.

9. Note the digitizer pressure as displayed on **Hyper Terminal**.

   Calculate the digitizer error:

   > The pressure standard reads 62,000 feet and the digitizer serial output reads: **ALT61910.**
   >
   > **Error=61910-62000= -90 feet**

   An adjustment to the digitizer's **Z** parameter is required to correct this error. Each number added or subtracted from the **Z** parameter results in an approximate 10 ft correction at 62,000 feet.

   > Note: If the digitizer reads low in relation to the manometer, as in the case above, then a negative correction is required. In the above case a command of ***00Z=-9<return>** would yield the approximate 90 foot change.

   > Note: If the digitizer transition is high in relation to the pressure standard then a positive correction is applied.

10. Adjust the **Z** parameter as follows:

    A. Type **<enter>**, the digitizer will return a **?** as well as the current pressure altitude.
    B. Type **XD<enter>** to enter the **Span Adjust** mode.
    C. Type ***00Z=<enter>** The digitizer will return the current **Z** parameter value. *Write this number down!*
    D. Type ***00WE<enter>** to write enable the EEPROM.
    E. Type ***00Z=N<enter>** where **N** represents a number to correct the digitizer **Z** parameter. (No sign required for a positive value.)

    Note: The current factory value must be taken into account when changing any parameter.

4.5 Span Adjust Procedure (continued)

Example:

Factory Setting	Change Required	Change **Z** to	Approximate Change in Feet.
Z=0	-9	***00Z=-9**	+90
Z=5	-4	***00Z=1**	+40
Z=-8	-17	***00Z=-25**	+170
Z=12	3	***00Z=15**	-30

Type **QQ** to quit the adjustment program and return to reading the current input pressure.

Compare the digitizer altitude data to the pressure standard at 62,000 feet (or maximum altitude.) If further adjustments are required repeat the **Z** parameter correction as above.

11. If the digitizer is within ±20 feet of the pressure standard at the digitizer maximum operating altitude proceed to check and adjust the **X** parameter as follows:
12. Adjust the input pressure to 1000 feet or 28.8557 In. Hg.
13. Note the digitizer output displayed on **Hyper Terminal** and calculate the digitizer error:

The pressure standard reads 1,000 feet and the digitizer serial output reads: **ALT00990.**

Error=990-1000= -10 feet

An adjustment the digitizer's **X** parameter is required to correct this error. Each number added or subtracted from the **X** parameter results in an approximate 1 ft correction at 1,000 feet.

Note: If the digitizer reads low in relation to the manometer, as in the case above, then a negative correction is required. In the above case a command of ***00X=-10<enter>** would yield the approximate 10 foot change.

Note: If the digitizer transition is high in relation to the pressure standard then a positive correction is applied.

4.5 Span Adjust Procedure (continued)

14. Adjust the **X** parameter as follows:

    A. Type **<enter>**, the digitizer will return a **?** as well as the current pressure altitude.

    B. Type **XD<enter>** to enter the **Span Adjust** mode.

    C. Type ***00X=<enter>** The digitizer will return the current **X** parameter value. *Write this number down!*

    D. Type ***00WE<enter>** to write enable the EEPROM.

    E. Type ***00X=N<enter>** where **N** represents a number to correct the digitizer **X** parameter. (No sign required for a positive value.)

    Note: The current factory value must be taken into account when changing any parameter.
    Example:

Factory Setting	Change Required	Change **X** to	Approximate Change in Feet.
X=0	-5	***00X=-5**	+5
X=5	-2	***00X=3**	+2
X=-8	-10	***00X=-18**	+10
X=12	3	***00X=15**	-3

    F. Type **QQ** to quit the adjustment program and return to reading the current input pressure.

15. The **X** and **Z** parameter adjustments do have a slight effect on each other. Adjust the input pressure until the pressure standard is again indicating the maximum digitizer altitude and compare the digitizer output, displayed on the IBM PC, to the pressure standard. If an adjustment is required, return to the Z parameter adjustment and repeat steps 9 through 13.

16. After verifying the digitizer reports within ±2 feet at 1000 feet and ±20 feet at the maximum altitude, store the changes into the digitizer EEPROM.

    A. Type: ***00WE<enter>.**
    B. Type: ***00SP=ALL<enter>**.
    C. Type: **QQ**

See §4.8 for a complete list of commands and definitions available in calibration modes.

4.6 Dynamic Calibration Adjustment Procedure

Reference: FAR 91.217; FAA Advisory Circular 43-6A
FAR 91.423; FAR 43-Appendix E and F
FAA TSO-C88a; SAE AS8003

This procedure will allow adjustment to the calibration curve of the SSD120-(XX)A or SSD120-(XX)AE as an aide in matching the digitizer output to a primary flight altimeter or NIST traceable pressure standard. This procedure differs significantly from the **Span Adjust Procedure** described in **§4.5**. The **Dynamic Calibration Procedure** makes adjustments to the altitude data stored in the digitizer's EEPROM. The technician may make adjustments to the digitizer error curve in 1000 foot increments, over the entire operating range with the single exception of the –1000 foot mark. The technician will make the adjustments at the 0 or whole altitude mark, ***NOT*** at the parallel ICAO data's nominal transition point. See **Figure 1.** The digitizer will automatically adjust the ICAO parallel altitude data to transition 50 feet prior to the 0 mark. (i.e. the digitizer's ICAO parallel altitude code will transition from 900 to 1000 feet while the serial altitude data is transmitting 950 feet.)

1. Construct a wiring harness per the wiring harness diagram 881404.

2. Connect the digitizer, computer and altimeter or NIST standard as shown in the **Dynamic Calibration Block Diagram**, and energize.

3. Open the **Hyper Terminal** program as described in **§4.4.**

4. The digitizer output should now be displayed on the PC screen with 10-foot resolution.

(You may use the **Hyper Terminal "Clear Screen"** function to remove any extra characters that may be cluttering the screen. Click on **Edit** then click on **Clear Screen**.)
Note: Backspace does not function in **Hyper Terminal**. If a typing error occurs, hit **<enter>** and begin again.

5. Set the altimeter barometric input to 29.92 In. Hg. Change the input pressure to -1000 feet and begin to compare the altitude digitizer output, as displayed on the computer, to the altimeter reading at every 1000-foot mark. When the digitizer output begins to differ from the altimeter by more than ±30 feet begin to change the digitizer error curve. (**§4.9** provides a table to for the technician to record the changes required and implemented).

Note: No digitizer correction is possible at the -1000 foot mark.

4.6 Dynamic Calibration Adjustment Procedure (continued)

6. Type **<enter**> the digitizer will respond with **?>(current altitude)**.

7. Type **ADJ <enter>** the digitizer will respond with **A=**

CAUTION: Always refer to the Altimeter, VSI or IVSI manufacturer's data for maximum rate of climb or descent and any special test conditions which must be complied with.

8. Adjust the input pressure until the altimeter or NIST standard is exactly reading a 1000-foot mark. Note the difference between the digitizer and the altimeter and adjust as follows.

The altimeter reads 10,000 and the digitizer reads 10,080. Type "**S10 <enter>**" (**S10** represents **Set 10,000 feet**) The digitizer will now output 10,000 feet based on the current input pressure. The PC will display the altitude at which the digitizer will make this change. In the example referenced above, the PC would display **>10000.**

9. Proceed to the next 1000-foot mark (11,000 ft.) and repeat the procedure, as in step 8 above, until the entire operating range of the digitizer is completed.

Note: If no correction is required at an altitude simply do not enter a correction.

You may quit the adjustment program at any time by typing "**Q**" twice; the digitizer output will then be displayed on the PC screen in normal operation mode.

10. After completing the above procedure you may examine the corrections entered into the EEPROM. Type "**D<enter>**" to dump the EEPROM data and read the current error curve on the PC screen. The following table should appear:

00= 000	01= 000	02= 000	03= 000	04= 000	05= 000
06= 000	07= 000	08= 000	09= 000	10=-080	11= 000
12= 000	13= 000	14= 000	15= 000	16= 000	17= 000
18= 000	19= 000	20= 000	21= 000	22= 000	23= 000
24= 000	25= 000	26= 000	27= 000	28= 000	29= 000
30= 000	31= 000	32= 000	33= 000	34= 000	35= 000
36= 000	37= 000	38= 000	39= 000	40= 000	41= 000
42= 000	43= 000	44= 000	45= 000		
90= 000	91= 000	92= 000	93= 000	94= 000	95= 000
96= 000	97= 000	98= 000	99= 000	>current altitude	

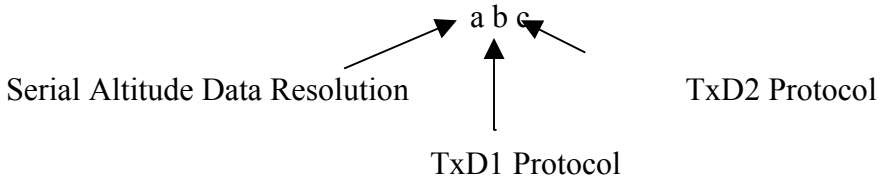
The first two digits represent altitude x1000 feet and the last three digits after the equal sign represent the amount of error introduced at the altitude in feet.

Note: Fields **90=000** through **99=000** contain TCI calibration data and are not user accessible.

4.7 Serial Port Output Protocol Configuration

Connect the digitizer to an IBM compatible computer running **HyperTerminal** as described in **§4.4** and as shown in the **Dynamic Calibration Block Diagram.** Assign the serial port protocols as follows:
Apply power to the digitizer and after the self-test time has elapsed data will appear on the PC screen.

1. Type **<enter>** The digitizer will respond with **?>(current altitude)**.
2. Type **ADJ <enter>** Accesses the digitizer adjustment program. The Digitizer responds **A=.**
3. Type **P <enter>** To identify the current serial port settings.
4. The digitizer will respond with a three-digit number as follows:



1. 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.

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

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

Example:

Type **P215<enter>**	Defined as **10 foot** resolution on TxD1 and TxD2. **UPS Aviation Technologies** protocol transmitted on TxD1. **ARNAV Systems** protocol transmitted on TxD2.

4.8 Configuration and Calibration Command List

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

Top-Level Menu Commands	Action
ADJ <enter>	Enter **Configuration/Dynamic/Span Calibration** mode.
XD<enter>	Enter **Span Adjust** Mode.
Q	**Quit** and resume normal operation.

ADJ Sub-Menu Commands	Action
CLR <enter>	**Clear** all EEPROM altitude data.
D <enter>	**Dump** to list all EEPROM altitude error data.
P <enter>	Displays current serial **Port** settings, see **§4.7 Serial Port Software Configuration.**
Pabc<enter>	**Port** protocol assign, see **§4.7 Serial Port Output Protocol Configuration.**
Q	**Quit** and return to top-level commands.
Saa<enter>	**Set** digitizer output to 1K altitude (**aa**) mark at current input pressure. See **§4.6 Dynamic Calibration Adjustment Procedure.**

XD Sub-Menu Commands	Action
Q	**Quit** and return to top-level commands.
***00SP=ALL<enter>**	**Store** the current **X** and **Z** parameters.
***00WE<enter>**	**Write Enable** the EEPROM.
***00X=<enter>**	Returns the current **X** parameter. (Set at 1000 feet.)
***00X=N<enter>**	**"N"** defines a number between 0 and ±100 which will affect a change in the **"X"** parameter. (No sign required for a positive value.) Example: ***00X=5<enter>**
***00Z=<enter>**	Returns the current **Z** parameter. (Set at maximum altitude.)
***00Z=N<enter>**	**"N"** defines a number between 0 and ±100 which will affect a change in the **"Z"** parameter. (No sign required for a positive value.) Example: ***00Z=5<enter>**

NOTES:

1. Backspace does not function. If a typing error occurs hit **<enter>** and begin again.
2. Altitude values 90 to 99 in EEPROM contain factory calibration data and are not customer accessible.
3. A maximum error of ±499 feet may be introduced at any one altitude.
4. **CLR** clears *all* error data in the EEPROM, and returns the digitizer to the original factory calibration.
5. **ERR** indicates syntax error.

4.9 Error Correction Table

Altitude in Feet	Correction	Altitude in Feet	Correction	Altitude in Feet	Correction	Altitude in Feet	Correction
-1000		24000		49000		74000	
0		25000		50000		75000	
1000		26000		51000		76000	
2000		27000		52000		77000	
3000		28000		53000		78000	
4000		29000		54000		79000	
5000		30000		55000		80000	
6000		31000		56000			
7000		32000		57000			
8000		33000		58000			
9000		34000		59000			
10000		35000		60000			
11000		36000		61000			
12000		37000		62000			
13000		38000		63000			
14000		39000		64000			
15000		40000		65000			
16000		41000		66000			
17000		42000		67000			
18000		43000		68000			
19000		44000		69000			
20000		45000		70000			
21000		46000		71000			
22000		47000		72000			
23000		48000		73000			

Digitizer Interconnection Tables

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

SSD120 15 Pin Conn.	Function	Bendix/King KT76/78 Pin Number	Bendix/King KT76A/78A Pin Number	Bendix/King KXP Pin Number
1	D4	*[4]	*[4]	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 *[5]	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.

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

[5] Pins 8 and 14 are connected internally.

Table II

SSD120 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	Garmin GTX 327 Pin Number
1	D4	10	*[6]	*[6]	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 *[7]	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

SSD120-(XX)A 9 Pin Conn.	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 SSD120-(XX)A go to the **Setup Page** and set the **Altitude Source (ALT SRC)** to receive data in the Icarus RS232 format.

[6] Data for this connection is not available at this time.
[7] Pins 8 and 14 are connected internally.

Table III

SSD120 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	Output Enable	2	3	Connect to aircraft ground.	19
8 or 14 *[8]	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.

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

Table IV

SSD120 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	*[9]	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 *[10]	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

SSD120-(XX)A 9 Pin Conn.	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 SSD120-(XX)A 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**.

[9] Data for this connection is not available at this time.
[10] Pins 8 and 14 are connected internally.

Table V

SSD120 15 pin Conn.	Function	Becker Avionic Systems ATC3401 ATC2000	Becker Avionic Systems ATC4401
1	D4	23	20
2	A1	16	1
3	A2	15	2
4	A4	14	3
5	B1	17	14
9	B2	19	15
10	B4	18	16
11	C1	22	17
13	C2	21	18
12	C4	20	19
6	Output Enable	24	25
8 or 14*[11]	+14 to 28Vdc	6	6
15	Ground	24	25

[11] Pins 8 and 14 are connected internally.

TABLE VI

SSD120 15 pin Conn.	Function	Rockwell Collins TPR-710A
7	D2	MP 4K
1	D4	MP 5K
2	A1	MP 4A
3	A2	MP 4B
4	A4	MP 4C
5	B1	MP 4D
9	B2	MP 4E
10	B4	MP 4F
11	C1	MP 4G
13	C2	MP 4H
12	C4	MP 4J
6	Output Enable	MP 6K
8 or 14*[12]	+14 to 28Vdc	Connect to aircraft's avionics buss protected by a fuse or circuit breaker.
15	Ground	Connect to aircraft ground.

MP = Middle Position Connector

[12] Pins 8 and 14 are connected internally.

Table VII

SSD120 15 pin Conn.	Function	Bendix/King 560EGPWS	Bendix/King KMH 870 IHAS Processor
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*[13]	+14 to 28Vdc	Connect to avionics buss via circuit breaker	Connect to avionics buss via circuit breaker
15	Ground	Connect to aircraft ground	Connect to aircraft ground

[13] Pins 8 and 14 are connected internally.

Table VIII

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

Pin	Function
1	Ground [14]
2	Ground for 10' resolution.
3	RxD (Calibration Only)
4	TxD1 [15]
5	Ground [13]
6	Protocol select, see function Table VIII below.
7	Protocol select, see function Table VIII below.
8	Ground[13]
9	TxD2 [14]

Table IX

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

Protocol Selection	Pin 2	Pin 6	Pin 7
UPS AT 100' resolution, 1200bps.	Open	Open	Open
UPS AT 10' resolution, 1200bps.	Gnd.	Open	Open
Trimble/Garmin, 100' resolution, 9600bps.	Open	Open	Gnd.
Trimble/Garmin, 10' resolution, 9600bps.	Gnd.	Open	Gnd.
Northstar/Garmin, 100' resolution, 2400bps.	Open	Gnd.	Open
Northstar/Garmin, 10' resolution, 2400bps.	Gnd.	Gnd.	Open
Magellan, 100' resolution, 1200bps.	Open	Gnd.	Gnd.
Magellan, 10' resolution, 1200bps.	Gnd.	Gnd.	Gnd.
ARNAV Systems (Software selectable ONLY)	Open	Open	Open

[14] Pins 1 and 5 and 8 are internal grounds provided for protocol selection and serial data ground.
[15] 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 **§4.7 Serial Port Output Protocol Configuration.**

GPS/MFD 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	SSD120-(XX)A 9 Pin D-Sub Connector
RxD2	21	4 or 9
Ground	20	1 or 5 or 8
		Optional, jumper pin 2 to ground for 10' resolution.

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	SSD120-(XX)A 9 Pin D-Sub Connector
RxD2	21	4 or 9
Ground	3	1 or 5 or 8
		Optional, jumper pin 2 to ground for 10' resolution.

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	SSD120-(XX)A 9 Pin D-Sub Connector Pin
RxD+	7	24	1 or 5
RxD-	8	36	4 or 9
Ground	3 or 20	3 or 20	1 or 5
			Protocol assignment, jumper pin 7 to ground on pins 1 or 5 or 8
			Optional, jumper pin 2 to 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	SSD120-(XX)A 9 Pin D-Sub Connector Pin
RxD+	J1-7	J1-24	1 or 5
RxD-	J1-8	J1-36	4 or 9
Ground	J1 - 3 or 20	J1 - 3 or 20	1 or 5
			Protocol assignment, jumper pin 7 to ground on pins 1 or 5 or 8
			Optional, jumper pin 2 to 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**.

Garmin International

Garmin 400 Series GPS Devices

Garmin 78 Pin Conn. (P4001)	SSD120-(XX)A 9 Pin Conn.
57	4 or 9
77 or 78	1 or 5
	Protocol, jumper pin 7 to ground.
	Optional, jumper pin 2 to ground for 10' resolution.

Garmin 400 series GPS software configuration

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

ARNAV Systems, Inc.

ARNAV Systems 5000 Series Multi-Function Display

ARNAV 5000 25 Pin Connector	SSD120-(XX)A 9 Pin Conn.
15	4 or 9
13 or 25	1 or 5 or 8
	Protocol, Software select ARNAV protocol see **§4.7**.

ARNAV Systems GPS-505/506/512 GPS Sensor

ARNAV GPS-505/506/512 DB-25 Connector	SSD120-(XX)A 9 Pin Conn.
8	4 or 9
9	1 or 5 or 8
	Protocol, Software select ARNAV protocol see **§4.7**.

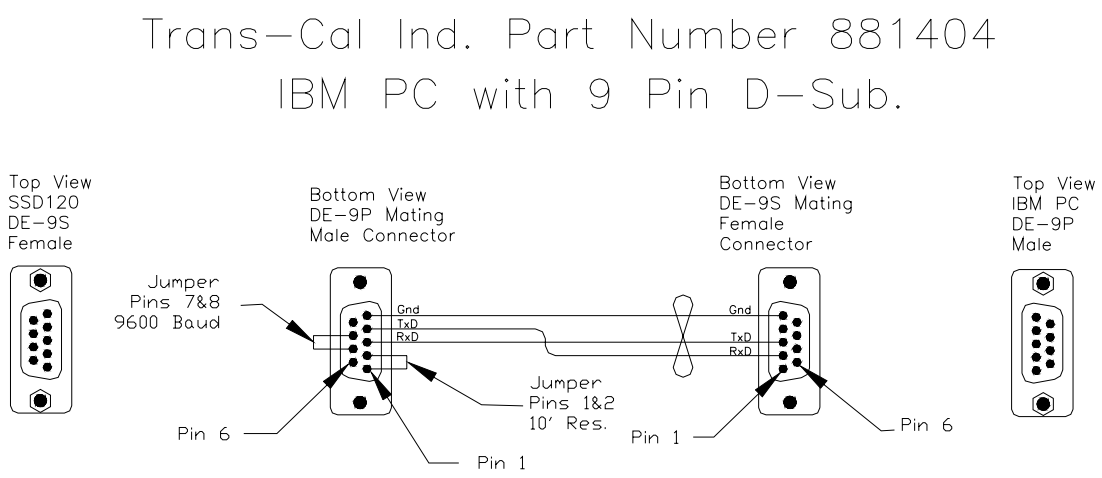
ARNAV Systems DR-100 WxLink Receiver/ Multiplexer

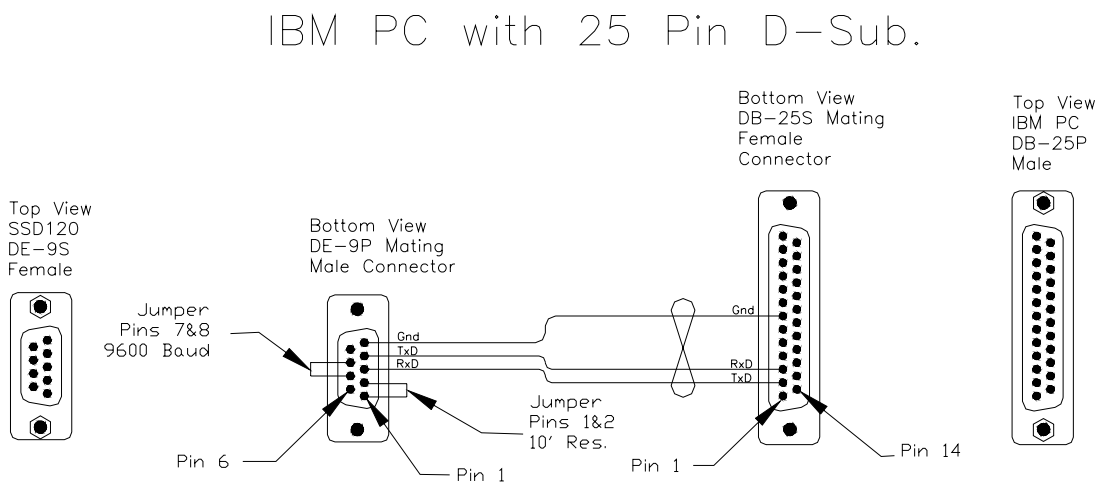
ARNAV DR-100 25 Pin Connector	SSD120-(XX)A 9 Pin Conn.
10	4 or 9
13 or 25	1 or 5 or 8
	Protocol, Software select ARNAV protocol see **§4.7**.

SSD120-(XX)A Software Configuration Note for Use with ARNAV Systems Devices

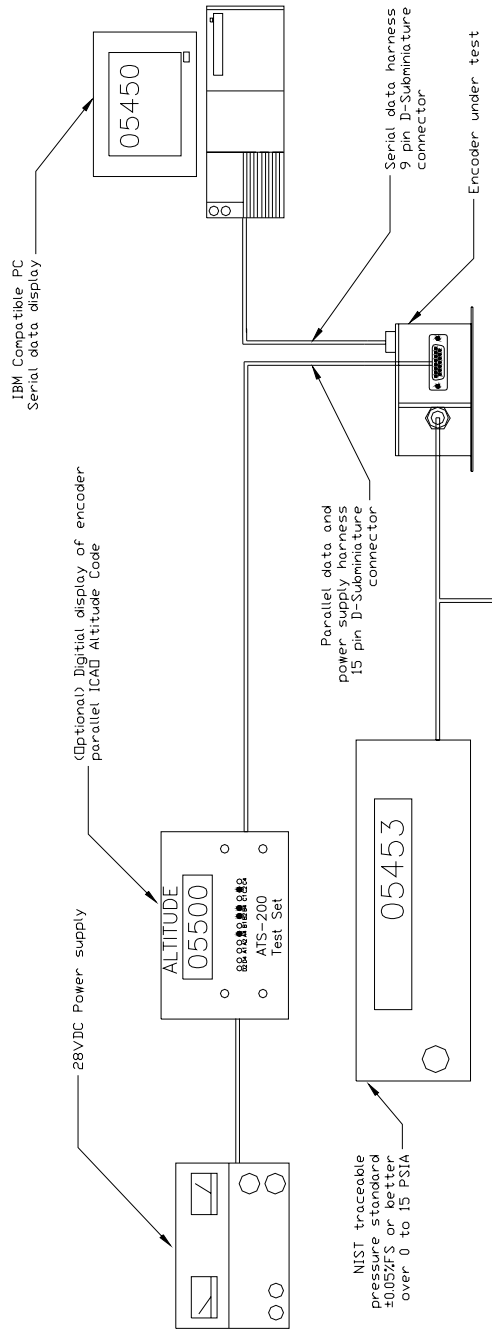
The SSD120-(XX)A *must* be software configured per **§4.7** to operate with ARNAV system devices. Ensure that all hardware jumpers are removed from the 9-pin connector. Hardware jumpers on the 9-pin D-Subminiature Connector (DE-9S) *will override* any software settings.

Wiring Harness Diagram Part Number 881404





Span Adjust Block Diagram



SSD120-(XX)A
Parallel Data and Power Connector
15 Pin D-Sub Connector

Pin	Function	Pin	Function
1	D4	9	B2
2	A1	10	B4
3	A2	11	C1
4	A4	12	C4
5	B1	13	C2
6	Strobe	14	14/28V Input
7	D2*	15	Ground
8	N/C		

*Used above 62,700 feet only.

SSD120-(XX)A
Serial Data Connector
9 Pin D-Sub Connector

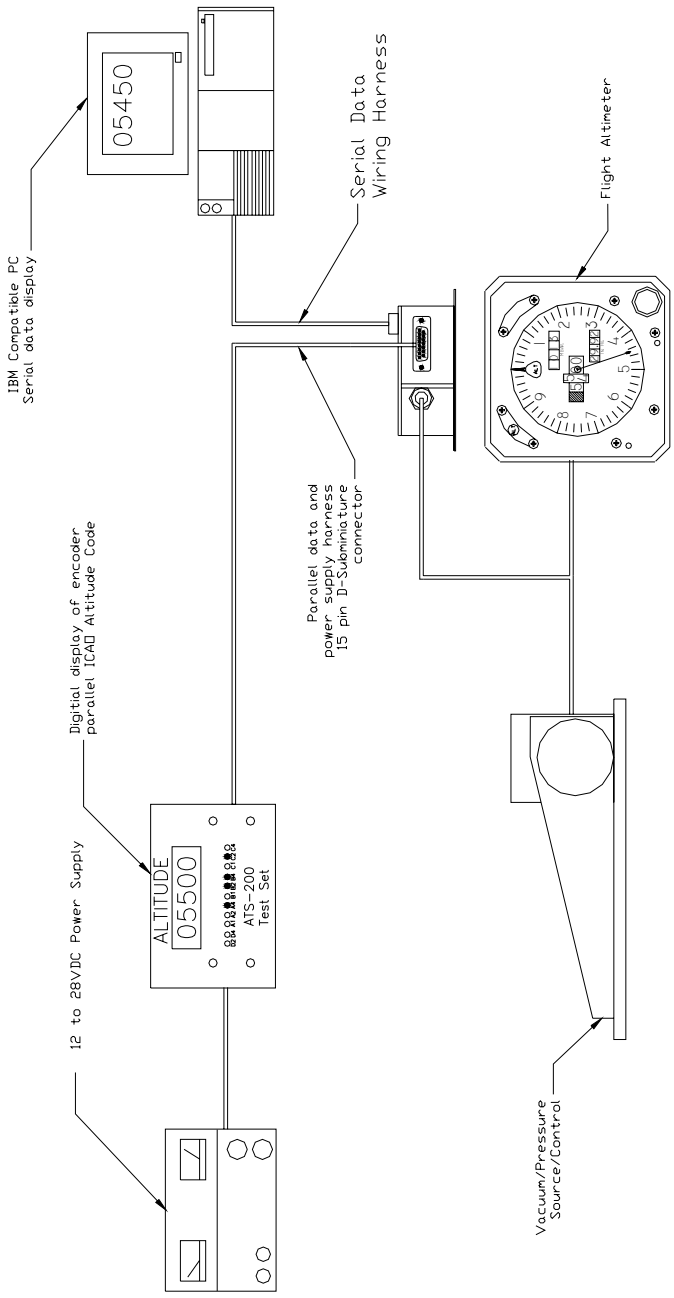
Pin	Function
1	Ground
2	10° Resolution Select
3	RxD
4	TxD
5	Ground
6	Protocol Select
7	Protocol Select
8	Ground
9	Spare

IBM PC Serial Data Connector
9 Pin Male D-Sub Connector

Pin	Function
1	Signal Detect
2	RxD
3	TxD
4	DTE Ready
5	Ground
6	DCE Ready
7	Req. to Send
8	Clr. to Send
9	DCE Ready

Block Diagram Typical Test Set-up.
Span Adjust
Models SSD120-50A(E) thru 80A(E)

Dynamic Calibration Block Diagram



SSD120-(XX)A(E)-RS232
Parallel Data and Power Connector
15 Pin D-Sub Connector

Pin	Function	Pin	Function
1	D4*	9	B2
2	A1	10	B4
3	A2	11	C1
4	A4	12	C4
5	B1	13	C2
6	Strobe	14	14/28V Input
7	Spare	15	Ground
8	14/28V Input		

*Used above 30,700 feet only.

SSD120-(XX)A(E)-RS232
Serial Data Connector
9 Pin D-Sub Connector

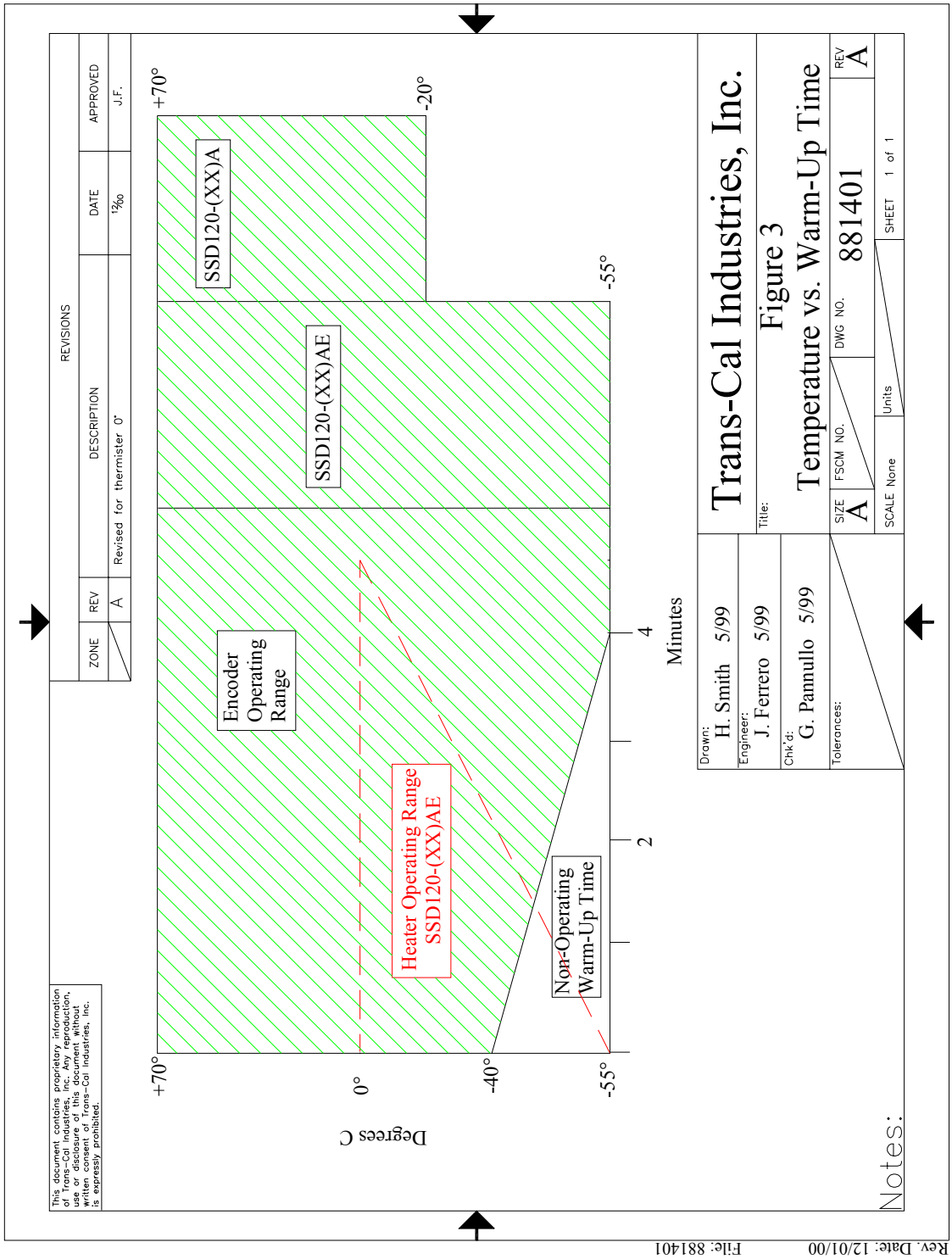
Pin	Function
1	Ground
2	10' Resolution Select
3	RxD
4	TxD1
5	Ground
6	Protocol Select
7	Protocol Select
8	Ground
9	TxD2

IBM PC Serial Data Connector
9 Pin Male D-Sub Connector

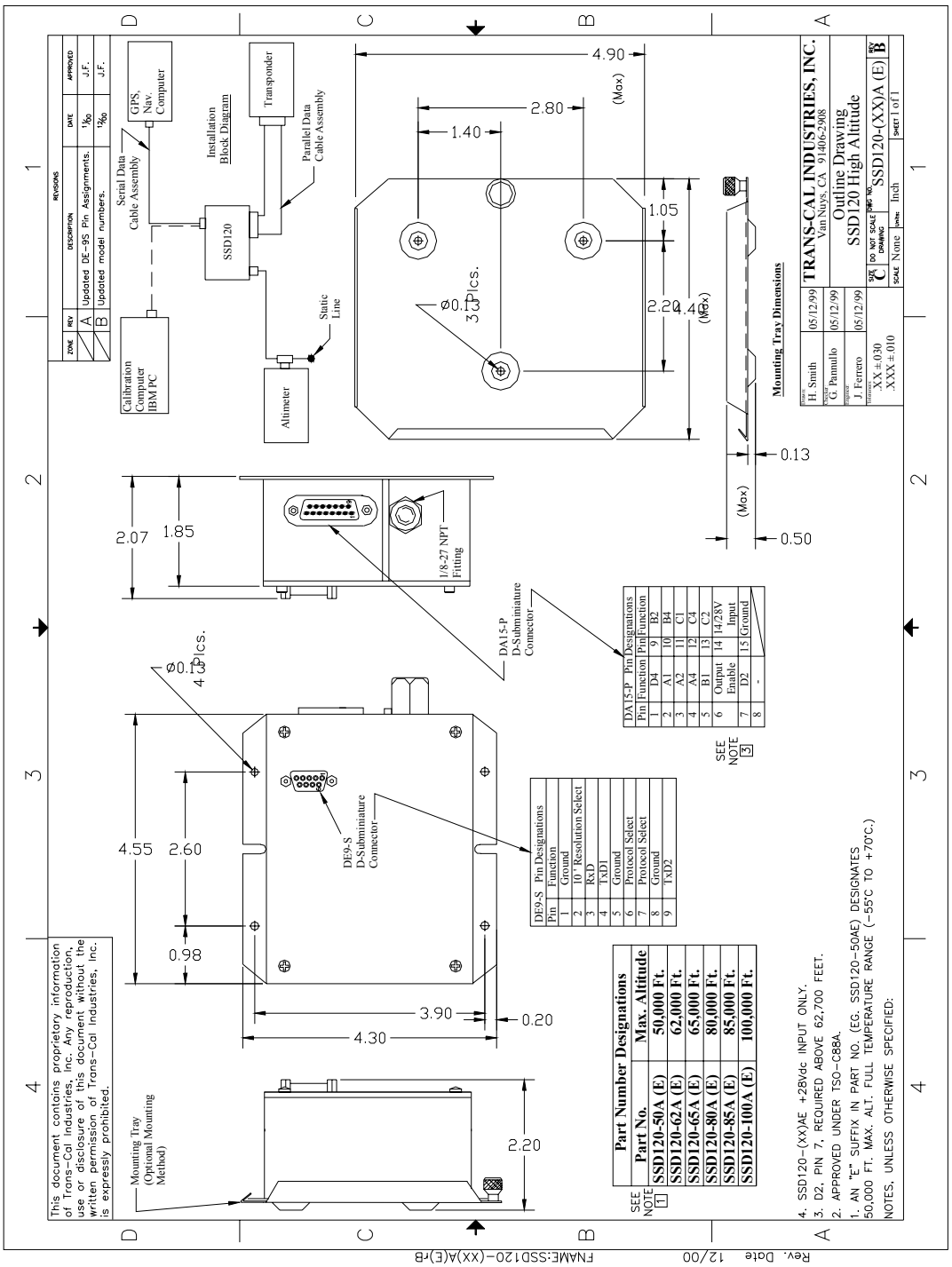
Pin	Function
1	Signal Detect
2	RxD
3	TxD
4	DTE Ready
5	Ground
6	DCE Ready
7	Req. to Send
8	Clr. to Send
9	DCE Ready

Block Diagram Typical Test Set-up, Dynamic Calibration
Models SSD120-30A(E)-RS232 thru 42A(E)-RS232

Temperature vs. Warm-up Time



Outline Drawing



Part Number Ordering Form

Trans-Cal Industries, Inc.
Solid State Altitude Digitizer
Part Number Ordering Information

SSD120-XX X X-XXXX

Max. Operating Altitude (Feet)	
30,000	-30
35,000	-35
42,000	-42
50,000	-50
62,000	-62
65,000	-65
80,000	-80
85,000	-85
100,000	-100

Model Nomenclature	Identifier
Encoder / Digitizer	A
Modular Encoder	M
Servo Module	SM

Operating Temperature Range	
Blank	-20˚ to +70˚C
E	-55˚ to +70˚C

Additional Ports and Features	
-RS232	Dual RS232 Ports
-RS	RS485 and Dual RS232 Ports
-RS1	RS485 and 1' Resolution on TxD2

Part Number Example: SSD120-42AE-RS232
Note: On models operating at 50,000 to 100,000 feet, dual RS232 ports are included as a standard feature.

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:_____