Apollo®
DB30 DME/RMI/ARINC 429 Interface
Installation Manual

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HISTORY OF REVISIONS

Revision	Date	Description
--	3/28/02	Updated Environmental Qualifications Form
--	3/28/02	Initial release
-00a	5/30/02	Added more detail to paragraph 2.3.2; created section 4.2; added three pins (pin 20, pin 57, and pin 77) to wiring diagram (Figure 16) and removed Note 4 from Figure 16.
-00b	10/8/03	Changed UPSAT logo and references to Garmin.
-00c	11/7/03	Corrected compatibility issues in Figure 17.

ORDERING INFORMATION

To receive additional copies of this publication, order part # **560-2031-XX,** *Apollo®* *DB30 DME/RMI/ARINC 429 Interface Installation Manual.*

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1 INTRODUCTION

1.1 ABOUT THIS MANUAL

This manual describes the installation and checkout procedures for the Apollo DB30 DME Interface. It is intended for use by persons certified by the Federal Aviation Administration (FAA) to install avionics devices.

SECTION 1 Provides an **INTRODUCTION** to the Apollo DB30 unit. TSO certification information is also included in this section.

SECTION 2 Includes **INSTALLATION** and checkout procedures.

SECTION 3 Includes complete **SPECIFICATIONS**.

SECTION 4 Includes **LIMITATIONS** for the equipment and installation.

APPENDIX A Includes **TROUBLESHOOTING** information.

APPENDIX B Includes **PERIODIC MAINTENANCE** requirements.

APPENDIX C Includes the **ENVIRONMENTAL QUALIFICATION FORM**.

APPENDIX D Includes **OPERATING INSTRUCTIONS**.

1.2 APOLLO DB30 DESCRIPTION

The Apollo DB30 DME Interface is an interface unit between the Apollo SL30 VHF NAV/COM and an approved third party DME (Distance Measuring Equipment). The DB30 listens to the SL30 NAV output for the tuning messages that are sent out via the RS-232 serial ports. These serial messages are converted to various industry standards for tuning DME units remotely. The DB30 will also interface NAV or GPS RMI sources to RMI indicators such as the KI 582 or KI 229. The DB30 can output GX50/55/60/65 roll steering data on the ARINC 429 bus. When ARINC Conversion is enabled, the DB30 can interface serial devices to ARINC 429 devices.

1.3 FEATURES

The features of the DB30 DME Interface include:

- 10-32 VDC Power Capability
- Interfaces the Apollo SL30 Nav/COM to most third-party DME units
- RS-232 to ARINC 429 Conversion and ARINC 429 to RS-232 Conversion
- SL30 Nav/Comm and GPS Interface to RMI Bearing Pointer

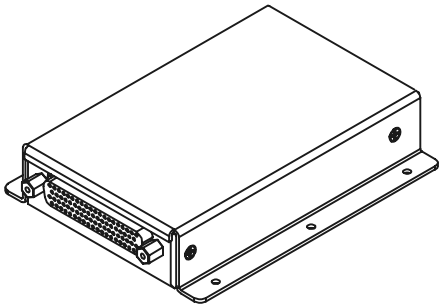


Figure 1. DB30 DME Interface

1.4 REGULATORY COMPLIANCE

1.4.1 TSO REFERENCES

- TSO-C36e, Airborne ILS Localizer Receiving Equipment Operating Within the Radio Frequency Range of 108-112 Megahertz (MHz)
- TSO-C40c, VOR Receiving Equipment Operating Within the Radio Frequency Range of 108-117.95 Megahertz (MHz)
- TSO-C66c, Distance Measuring Equipment (DME) Operating Within the Radio Frequency Range of 960-1215 Megahertz (MHz) {Display aspects only}

Note: *Unauthorized changes or modifications to the DB30 may void the compliance to required regulatory agencies and authorization for continued equipment usage.*

1.5 UNPACKING THE EQUIPMENT

Carefully unpack the equipment. Visually inspect the package contents for any evidence of shipping damage. Retain all shipping containers and packaging material in case reshipment is necessary.

1.6 PACKAGE CONTENTS

As shipped from the Garmin AT factory, the Apollo DB30 package includes most necessary items for installation other than supplies normally available at the installation shop, such as wire and cable ties, and required input and output equipment. The items included in the package are listed in Table 1.

Table 1. Package Contents

Part #	Description	Qty
430-6041-xxx	Apollo DB30 DME/RMI/ARINC 429 Interface	1
Apollo DB30 Shipping Kit, Part # 424-0310-000		
162-0070	Plastic D-sub hood (size 5) with grommets	1
162-0082	22-28 AWG Gold contact crimp pins	50
162-0083	78-pin D-sub plug with ground	1
162-3121	1.9 inch 4-40 Male jackscrew	2
560-2031-xx	Apollo DB30 Installation Manual	1

1.7 OTHER REQUIRED MATERIALS

The Apollo DB30 is intended for use with standard aviation accessories. The following items are required for the installation:

- Wiring
- Mounting screws or rivets

1.8 SPECIAL TOOLS REQUIRED

Crimp Tool

A crimp tool meeting MIL specification M22520/1-01 and a positioner/locator meeting MIL specification M22520/2-09 are required to ensure consistent, reliable crimp contact connections for the D-sub connector. These tools are available from:

Manufacturer	Crimp Tool Mfg. Part Number	Positioner Mfg. Part Number
Amphenol Aerospace	294-268	294-1918
Astro Tool Co.	615717	615725
Daniels Mfg.	22-000 AFM8	22-108 K40
ITT Cannon	995-0001-584	995-0001-739

Crimp Contact Mil-Spec Part Number:..... M3909/58-360
Crimp Tool Mil-Spec Part Number: M22520/2-01
Crimp Tool Positioner Mil-Spec Part Number: M22520/2-09

NOTES

2 INSTALLATION

This section describes the installation of the Apollo DB30 including mounting, wiring, and connections. A post-installation checkout procedure is included at the end of this section.

2.1 PRE-INSTALLATION INFORMATION

Always follow acceptable avionics installation practices per FAA Advisory Circulars (AC) 43.13-1A, 43.13-2A, or later FAA approved revisions of these documents.

Follow the installation procedure in this section as it is presented for a successful installation. Read the entire section before beginning the procedure. Perform the post-installation checkout before closing the work area in case problems occur.

2.2 INSTALLATION OVERVIEW

A successful installation should start with careful planning including determination of mounting location for the DB30, connections to the necessary products, cable routing, and other required modifications. Once the mounting location has been determined, prepare the location for installation. It may be easier to complete the wiring harness and attach the connectors to the DB30 before installing the DB30.

2.3 INSTALLATION CONSIDERATIONS

2.3.1 MOUNTING CONSIDERATIONS

The Apollo DB30 is designed to be mounted in any orientation. Allow appropriate clearance for the DB30, connectors, and cables. See Figure 2 for dimensions.

For typical installations, the Apollo DB30 does not require external cooling. As with all electronic equipment, avoid locating the DB30 near sources that produce high levels of heat.

2.3.2 MINIMUM SYSTEM CONFIGURATION

The Apollo DB30 requires connections to the following equipment as a minimum:

- Power input
- Aircraft ground

If the installation is intended to meet the objectives of TSO-C36e and TSO-C40c the minimum system configuration shall include an Apollo SL30 VHF NAV/COM. In addition to meet the objectives of TSO-C66c the minimum system configuration shall include a third part DME system which is also approved to the appropriate TSO.

2.4 EQUIPMENT MOUNTING

There are four basic steps to installing the Apollo DB30. First, identify the location for mounting the DB30 in the aircraft. Second, drill the holes for the mounting screws or rivets and mount the DB30. Third, route the appropriate wiring and assemble the connector for the DB30. Fourth, test for proper operation.

2.4.1 MOUNTING LOCATION

Locate the Apollo DB30 where the installer can easily reach the connectors. Use the dimensions shown in Figure 2 to prepare the mounting holes for the Apollo DB30. You may also use the DB30 itself as a template for drilling the mounting holes. You will need a #30 drill for using 1/8" rivets.

Note: Use of #6 screws will require enlarging the existing mounting holes.

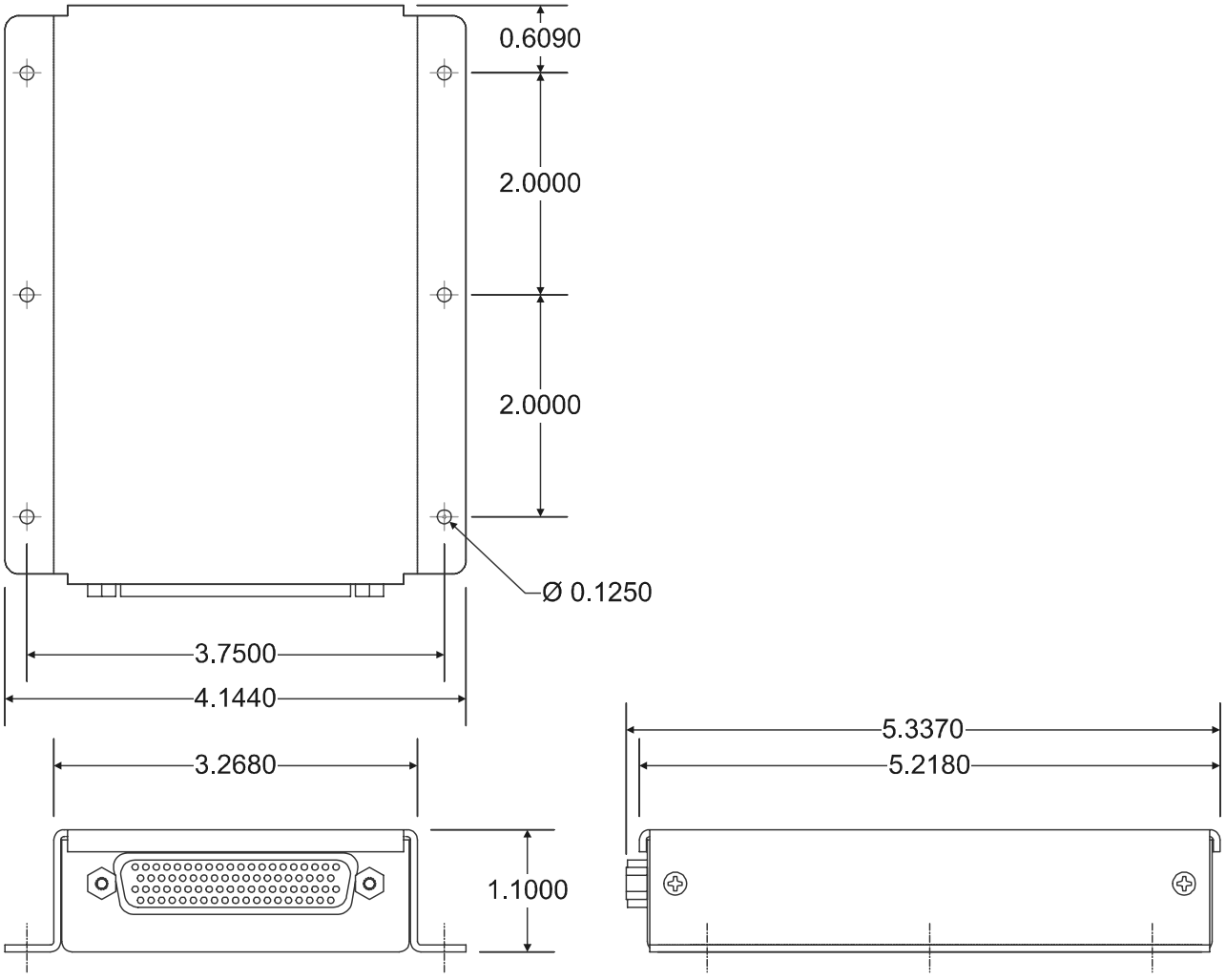


Figure 2. DB30 Dimensions

2.5 WIRING PREPARATION

Refer to the Electrical Connections section starting on page 9 for the appropriate wiring connections to assemble the wiring connector. Once the cable assemblies have been made, attach the cable connectors to the 78-pin D-SUB cable connector. Attach the connector to the back of the DB30 before installing the DB30. Route the wiring bundle as appropriate.

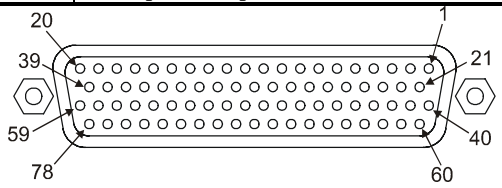
Rear Connector Pinout:

Table 2. Connector Pinout

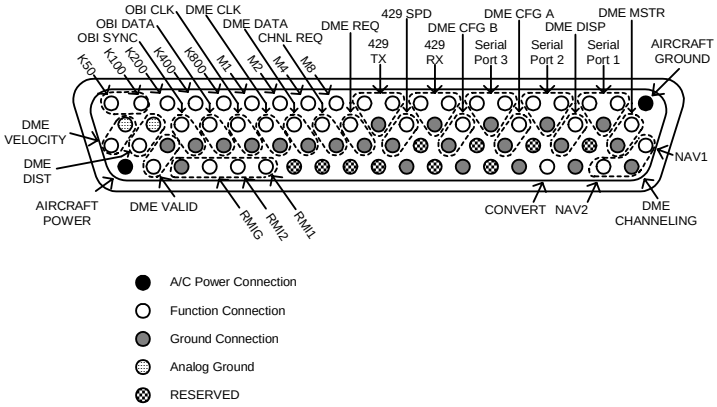
Pin #	I/O	Name	Description	Reference
1	I	Power Ground	Main power ground input	2.6.3.1
2	I	RxD1	RS-232 channel 1 serial data input (NAV 1)	2.6.3.3
3	O	TxD1	RS-232 channel 1 serial data output (NAV 1)	
4	I	RxD2	RS-232 channel 2 serial data input (NAV 2)	
5	O	TxD2	RS-232 channel 2 serial data output (NAV 2)	
6	I	RxD3	RS-232 channel 3 serial data input (GPS)	
7	O	TxD3	RS-232 channel 3 serial data output (GPS)	
8	I	429 RX A	ARINC 429 channel: input A	2.6.3.4
9	I	429 RX B	ARINC 429 channel: input B	
10	O	429 TX A	ARINC 429 channel: output A	
11	O	429 TX B	ARINC 429 channel: output B	
12	O	M8	BCD, 2x5, Slip Code channeling pin	2.6.3.6
13	O	M4	BCD, 2x5, Slip Code channeling pin	
14	O	M2	BCD, 2x5, Slip Code channeling pin	
15	O	M1	BCD, 2x5, Slip Code channeling pin	
16	O	K800	BCD, 2x5, Slip Code channeling pin	
17	O	K400	BCD, 2x5, Slip Code channeling pin	
18	O	K200	BCD, 2x5, Slip Code channeling pin	
19	O	K100	BCD, 2x5, Slip Code channeling pin	
20	O	K50	BCD, 2x5, Slip Code channeling pin	
21	I	DME Master	Configures DB30 to be a Master DME control (GND = active)	2.6.3.5
22	O	Serial Ground 1	RS-232 signal ground	2.6.3.3
23	I	DME Display	Sends DME data back to SL30 (GND = active)	2.6.3.8
24	O	Serial Ground 2	RS-232 signal ground	2.6.3.3
25	I	DME Config A	DME channeling code configuration pin A (GND = active)	2.6.3.6
26	O	Serial Ground 3	RS-232 signal ground	2.6.3.3
27	I	DME Config B	DME channeling code configuration pin B (GND = active)	2.6.3.6
28	O	429 Rx Ground	ARINC 429 RX shield ground	2.6.3.4
29	I	429 Speed	ARINC 429 port speed (GND = low)	
30	O	429 Tx Ground	ARINC 429 TX shield ground	
31	I/O	DME Request	Digital serial DME data request	2.6.3.8
32	I/O	Channel Request	Digital serial DME channel request	
33	I/O	DME Data bus	Digital serial DME data bus	
34	I/O	DME Clock bus	Digital serial DME clock bus	
35	O	OBI Clock	Digital OBI clock signal	2.6.3.10
36	O	OBI Data	Digital OBI data signal	
37	O	OBI Sync	Digital OBI sync pulse	
38	O	Analog Ground (dist)	DME distance analog ground	2.6.3.8
39	O	Analog Ground (vel)	DME velocity analog ground	

Table 2. Connector Pinout				
Pin #	**I/O**	**Name**	**Description**	**Reference**
40	I	Tune NAV 1	Select NAV 1 as DME channel source	2.6.3.9
41	O	DME Config Ground	Common ground pin for DME Master	2.6.3.7
42	--	RESERVED	RESERVED	
43	O	DME Config Ground	Common ground pin for DME Display	2.6.3.7
44	--	RESERVED	RESERVED	
45	O	DME Config Ground	Common ground pin for DME config A	2.6.3.5
46	--	RESERVED	RESERVED	
47	O	DME Config Ground	Common ground pin for DME config B	2.6.3.5
48	--	RESERVED	RESERVED	
49	O	429 Ground	ARINC 429 ground for speed selection	2.6.3.4
50	O	Shield Ground	Shield ground for Serial DME (DME Clock)	2.6.3.8
51	O	Shield Ground	Shield ground for Serial DME (DME Data)	
52	O	Shield Ground	Shield ground for Serial DME (DME Request)	
53	O	Shield Ground	Shield ground for Serial DME (Channel Request)	
54	O	Shield Ground	Shield ground for OBI (OBI Clock)	2.6.3.10
55	O	Shield Ground	Shield ground for OBI (OBI Data)	
56	O	Shield Ground	Shield ground for OBI (OBI Sync)	
57	O	DME Valid Ground	DME data valid ground return	2.6.3.10
58	I	Analog Distance	DME distance = 40 mv/NM, max = 12 VDC	
59	I	Analog Velocity	DME velocity = 20 mv/KT, max = 12 VDC	
60	O	NAV Select Ground	Common ground pin for NAV selection	
61	I	Tune NAV 2	Select NAV 2 as DME channel source	2.6.3.9
62	O	CONVERT Ground	Common ground pin for CONVERT	
63	I	CONVERT	When grounded, RS-232/ARINC 429 conversions are enabled.	2.6.3.4
64	O	Spare Ground	No current assignment	
65	--	RESERVED	RESERVED	
66	O	Spare Ground	No current assignment	
67	--	RESERVED	RESERVED	
68	O	Spare Ground	No current assignment	
69	--	RESERVED	RESERVED	
70	--	RESERVED	RESERVED	
71	--	RESERVED	RESERVED	
72	--	RESERVED	RESERVED	

Table 2. Connector Pinout				
Pin #	**I/O**	**Name**	**Description**	**Reference**
73	I	RMI NAV 1	Select NAV 1 as RMI indicator source	2.6.3.10
74	I	RMI NAV 2	Select NAV 2 as RMI indicator source	2.6.3.10
75	I	RMI GPS	Select GPS as RMI indicator source	2.6.3.10
76	O	RMI Selection Ground	RMI selection signal ground	2.6.3.10
77	I	DME Valid	Analog DME data valid, (> 6 Vdc)	2.6.3.8
78	I	Power Plus	Main power input 10-32V	2.6.3.2



Outside View of Connector – Rear of Unit



Logical Pin Placement Diagram

2.6 ELECTRICAL CONNECTIONS

The Apollo DB30 installation kit includes a 78-pin D-sub shell and crimp contacts. The crimp contacts are specified for 22 to 28 AWG wire. Make the crimp connections with a crimp tool as specified in the 'Special Tools Required section on page 3. All wires should be 22 to 24 AWG unless otherwise specified. Wiring diagrams are included in Figures 13 through 19 for applicable equipment.

2.6.1 POWER

A separate 1-amp (maximum) circuit breaker or fuse should be installed for down-line overload or short circuit protection. The DB30 has an internal fuse. Make the power connections to the Apollo DB30 using 22 AWG wire.

Note: *Circuits should be protected in accordance with guidelines in AC 43.13-1A, chapter 11, section 2, paragraph 429.*

2.6.2 WIRING

Use 22 to 24 AWG wire for all connections. Avoid sharp bends. Do not route cable near high-energy sources. Take care to keep wiring away from aircraft controls and cables.

2.6.3 FUNCTIONAL DESCRIPTIONS

2.6.3.1 Aircraft Ground

Pin 1 - Main power ground input

2.6.3.2 Aircraft Power

Pin 78 - Power Plus, Main power input 10-32V

2.6.3.3 Serial Interface

The DB30 primary device interface is serial based. The DB30 has three serial RS-232 ports. The serial port default values are: 9,600 baud - eight bit data, with 1 stop bit, and no parity. Each port has a three-wire interface: Rx, Tx, and GND. The serial ports are defined to work with Garmin AT Apollo GX and SL GPS or VHF NAV/COM products only.

Serial Port 1 – NAV 1

Pin 2 - RxD1, RS-232 channel 1 serial data input
Pin 3 - TxD1, RS-232 channel 1 serial data output
Pin 22 - Serial ground, RS-232 signal ground

Serial Port 2 – NAV 2

Pin 4 - RxD2, RS-232 channel 2 serial data input
Pin 5 - TxD2, RS-232 channel 2 serial data output
Pin 24 - Serial ground, RS-232 signal ground

Serial Port 3 – GPS

Pin 6 - RxD3, RS-232 channel 3 serial data input
Pin 7 - TxD3, RS-232 channel 3 serial data output
Pin 26 - Serial ground, RS-232 signal ground

2.6.3.4 ARINC 429 Interface

In some installations, a second SL30 NAV unit may not be installed. In this case, port 2 can be configured to provide ARINC 429 to RS-232 conversions. A typical application might include an MX20 Map unit on serial port 2 and a BFG WX500 Stormscope connected to the DB30 ARINC I/O. The configuration is defined in the following table. **Note:** Pin 63 (CONVERT) must be grounded by connection to spare ground pin 62 to enable ARINC conversions.

CONVERT (Pin 63)	Function	Action
OPEN	VHF NAV	VHF NAV function supported on port 2, GPS on port 3 provides Roll Steering data to ARINC 429 output port
GND (Pin 62)	Enable ARINC Conversions	Port 2 (Second NAV) disabled for NAV, enabled for Serial/ARINC 429 conversion ARINC 429 input converted to RS-232 out RS-232 in converted to ARINC 429 output

Table 3. ARINC Conversion

ARINC 429 Rx

Pin 8 - 429 RxA, ARINC 429 channel: input A
Pin 9 - 429 RxB, ARINC 429 channel: input B
Pin 28 - 429 ground, ARINC 429 RX shield ground

ARINC 429 Tx

Pin 10 - 429 TxA, ARINC 429 channel: output A
Pin 11 - 429 TxB, ARINC 429 channel: output B
Pin 30 - 429 ground, ARINC 429 TX shield ground

ARINC 429 Speed

Pin 29 - 429 Speed, ARINC 429 port speed (GND = low)
Pin 49 - 429 Speed Ground, ARINC 429 ground for speed selection

2.6.3.5 DME Channeling Configuration

The Apollo DB30 DME Interface can be configured during installation. The installation configuration includes the following:

- Selection of DME channel output type i.e. King Serial / 2x5 / Slip Code / BCD.
- Selection of DME Master or Slave display (King Serial only).
- Selection of whether DST (Distance, Speed and Time) data is displayed on the SL30 or not.

2.6.3.6 DME Channeling

The DB30 is designed to channel generic DME devices. For this reason, multiple interfaces are defined. These currently include, King DME serial, 2x5 DME channeling, Slip Code, and BCD (binary coded decimal). The King DME serial interface requires a 5-wire interface. The 2x5, Slip Code and BCD are all based off a 10-wire channeling interface. The DB30 can be configured for these channeling formats by making the connections shown in Table 5.

Pin 12 - M8, BCD, 2x5, Slip code channeling pin

Pin 13 - M4, BCD, 2x5, Slip code channeling pin

Pin 14 - M2, BCD, 2x5, Slip code channeling pin

Pin 15 - M1, BCD, 2x5, Slip code channeling pin

Pin 16 - K800, BCD, 2x5, Slip code channeling pin

Pin 17 - K400, BCD, 2x5, Slip code channeling pin

Pin 18 - K200, BCD, 2x5, Slip code channeling pin

Pin 19 - K100, BCD, 2x5, Slip code channeling pin

Pin 20 - K50, BCD, 2x5, Slip code channeling pin

Pin 31 - DME Request, Digital serial DME data request

Pin 32 - DME Channel Request, Digital serial DME channel request

Pin 33 - DME Data Bus, Digital serial DME data bus

Pin 34 - DME Clock Bus, Digital serial DME clock bus

Pin 50 - Shield Ground, Shield ground for Serial DME (DME Clock)

Pin 51 - Shield Ground, Shield ground for Serial DME (DME Data)

Pin 52 - Shield Ground, Shield ground for Serial DME (DME Request)

Pin 53 - Shield Ground, Shield ground for Serial DME (Channel Request)

CONFIG A (Pin 25)	CONFIG B (Pin 27)	Tuning
GND	GND	BCD Discrete
OPEN	GND	Slip Code Discrete
GND	OPEN	2 x 5 Discrete
OPEN	OPEN	Serial DME

Table 4. DB30 DME Channeling Format Configuration

Pin 25 - DME Config A, DME channeling code configuration pin A (GND = active)

Pin 27 - DME Config B, DME channeling code configuration pin B (GND = active)

Pin 45 - DME Config Ground, Common ground pin for DME config A

Pin 47 - DME Config Ground, Common ground pin for DME config B

2.6.3.7 DME Master/Slave Configuration

The DB30 is capable of acting as a Slave DME indicator display or a Master DME Display/Control. This is a program selection pin. If the DME Master pin is grounded, the DME serial port will operate in master mode. The Master/Slave function is only valid with the King Serial DME interface.

DME Master (Pin 21)	DB30 MODE	Comments
GND	Master	DB30 will generate timing and control signals
OPEN	Slave	External device (i.e. KN 572/574) will generate timing and control signals

Table 5. DME Master Configuration

Pin 21 - DME Master, configures DB30 to be a master DME control

Pin 41 - DME Configure Ground, common ground pin for DME Master

2.6.3.8 DB30 Display Mode Configuration

The DB30 is configurable to send DME data back to SL30 NAV/COM units for display. The DME Display option is controlled by an input pin (pin 23). That pin, when grounded, indicates that the DB30 should encode the received DME DST data (Distance, Speed and Time) onto the serial port for display to the appropriate NAV unit. The DME data will come from either the DME serial port or the analog inputs.

The analog inputs are the default when configured for discrete tuning. When running in master mode, DST data is always sent to the SL30 and this pin is ignored.

DME Display (Pin 23)	Function
GND	Send DST data from DME to selected SL30 NAV unit
OPEN	DME Display Data DISABLED

Table 6. DME Display Data Configuration

Pin 23 - DME Display, Sends DME data back to SL30 (GND = active)

Pin 38 - Analog Ground (dist), DME distance analog ground

Pin 39 - Analog Ground (vel), DME velocity analog ground

Pin 43 - DME Configure Ground, Common ground pin for DME Display

Pin 57 - DME Valid Ground, DME data valid ground return

Pin 58 - Analog Distance, DME distance = 40 mv/NM, max = 12 VDC

Pin 59 - Analog Velocity, DME velocity = 20 mv/KT, max = 12 VDC

Pin 77 - DME Valid, Analog DME data valid, (> 6 Vdc)

2.6.3.9 NAV Selection (DME)

If the installation includes dual SL30s, it is common to have a NAV selection switch to select which NAV unit is currently being used to channel the DME receiver. The DB30 provides this capability with two input pins, which function as follows:

Tune NAV 1 (Pin 40)	Tune NAV 2 (Pin 61)	Function	Action
GND	GND	STOP	DB30 stops sending DME data. DB30 releases the DME clock and data lines to allow DME tuning by external device
OPEN	GND	Tune NAV 2	DME Channel set from NAV 2 DME data is sent to NAV 2 (if DISPLAY PIN is grounded)
GND	OPEN	Tune NAV 1	DME Channel set from NAV 1 DME data is sent to NAV 1 (if DISPLAY PIN is grounded)
OPEN	OPEN	HOLD	DME channel set from last NAV DME data is not sent to any SL30s

Table 7. NAV Selection (DME)

Pin 40 - Tune NAV 1, Select NAV 1 as DME channel source

Pin 60 - NAV Select Ground, Common ground pin for NAV selection

Pin 61 - Tune NAV 2, Select NAV 2 as DME channel source

2.6.3.10 NAV Selection (RMI)

The DB30 is able to drive an RMI bearing pointer. In a traditional installation, the pilot is able to select the Nav data, which is fed to his RMI. In some cases, the RMI has a selection switch. The DB30 allows for the OBI (omni bearing indicator) data to come from the GPS unit, NAV 1 or NAV 2. Selection of more than one source is not valid. The DB30 is designed with the following output technique:

GPS (Pin 75)	NAV 1 (Pin 73)	NAV 2 (Pin 74)	Function	Action
X GND GND	GND X GND	GND GND X	NOT VALID	RMI data sent as invalid
OPEN	OPEN	GND	NAV 2	RMI data sent from NAV 2
OPEN	GND	OPEN	NAV 1	RMI data sent from NAV 1
GND	OPEN	OPEN	GPS	RMI data sent from GPS

Table 8. NAV Selection (RMI)

OBI Clock/Data/Sync – this is a digital word interface defined by the King family of receivers. The VOR or GPS bearing information is sent serially via the interface.

Pin 35 - OBI Clock, Digital OBI clock signal

Pin 36 - OBI Data, Digital OBI data signal

Pin 37 - OBI Sync, Digital OBI sync pulse

Pin 54 - Shield Ground, Shield ground for OBI (OBI Clock)

Pin 55 - Shield Ground, Shield ground for OBI (OBI Data)

Pin 56 - Shield Ground, Shield ground for OBI (OBI Sync)

Pin 73 - RMI NAV 1, Select NAV 1 as RMI indicator source

Pin 74 - RMI NAV 2, Select NAV 2 as RMI indicator source

Pin 75 - RMI GPS, Select GPS as RMI indicator source

Pin 76 - RMI Selection Ground, Common ground for RMI Select

2.7 CONFIGURATION ILLUSTRATIONS

2.7.1 429 CONVERSIONS ENABLED WITH DME DISPLAY DATA ENABLED-TUNE NAV 1

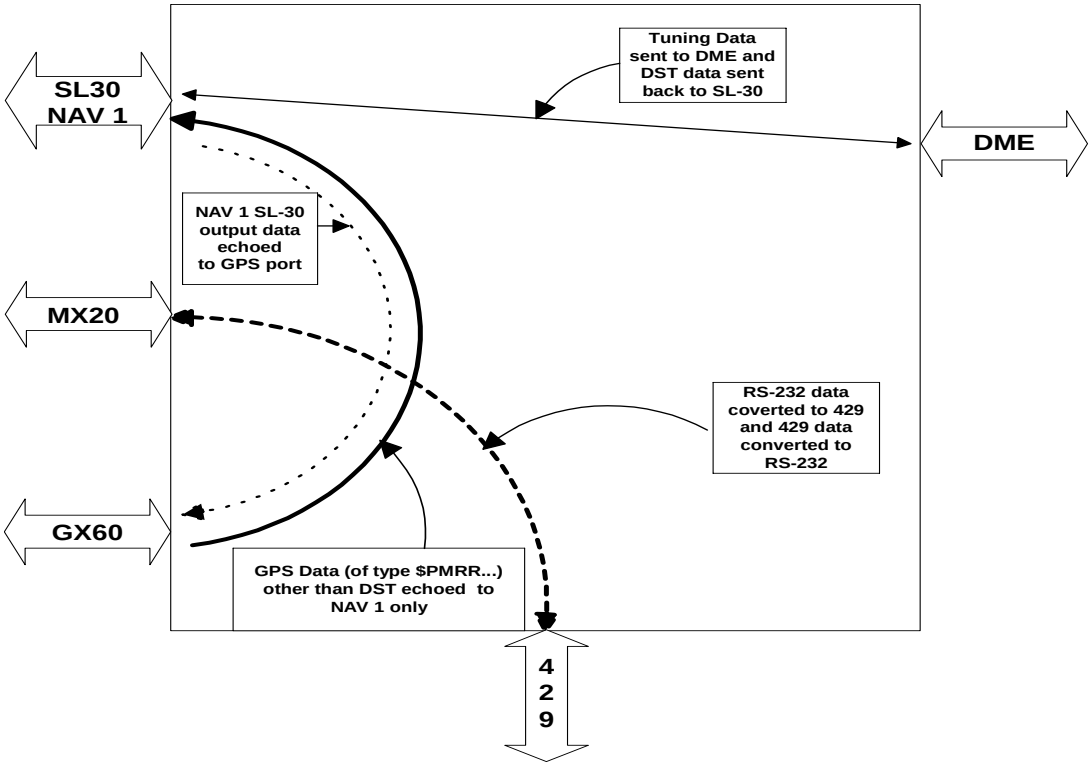


Figure 3. 429 Conversions Enabled and DME Display Data Enabled-NAV 1

In this configuration, NAV 1 is the selected tuning source for the DME. The NAV 1 data is echoed to the GPS port (port 3) and the GPS data (excluding DST) is echoed to the NAV 1 port (port 1). The CONVERT pin is grounded, causing port 2 to become a dedicated link to the ARINC 429 ports for ARINC 429 / RS-232 Conversions (MX20 Map on port 2). The DISPLAY pin is grounded, sending DST data (Distance, Speed and Time) back to the SL30 NAV 1 unit for display.

Tune NAV 1 (Pin 40)	Tune NAV 2 (Pin 61)	DME Display (Pin 23)	Convert (Pin 63)
GND	OPEN	GND	GND

Table 9. 429 Conversions Enabled and DME Display Data Enabled-NAV 1

2.7.2 429 CONVERSIONS ENABLED WITH DME DISPLAY DATA DISABLED-TUNE NAV 1

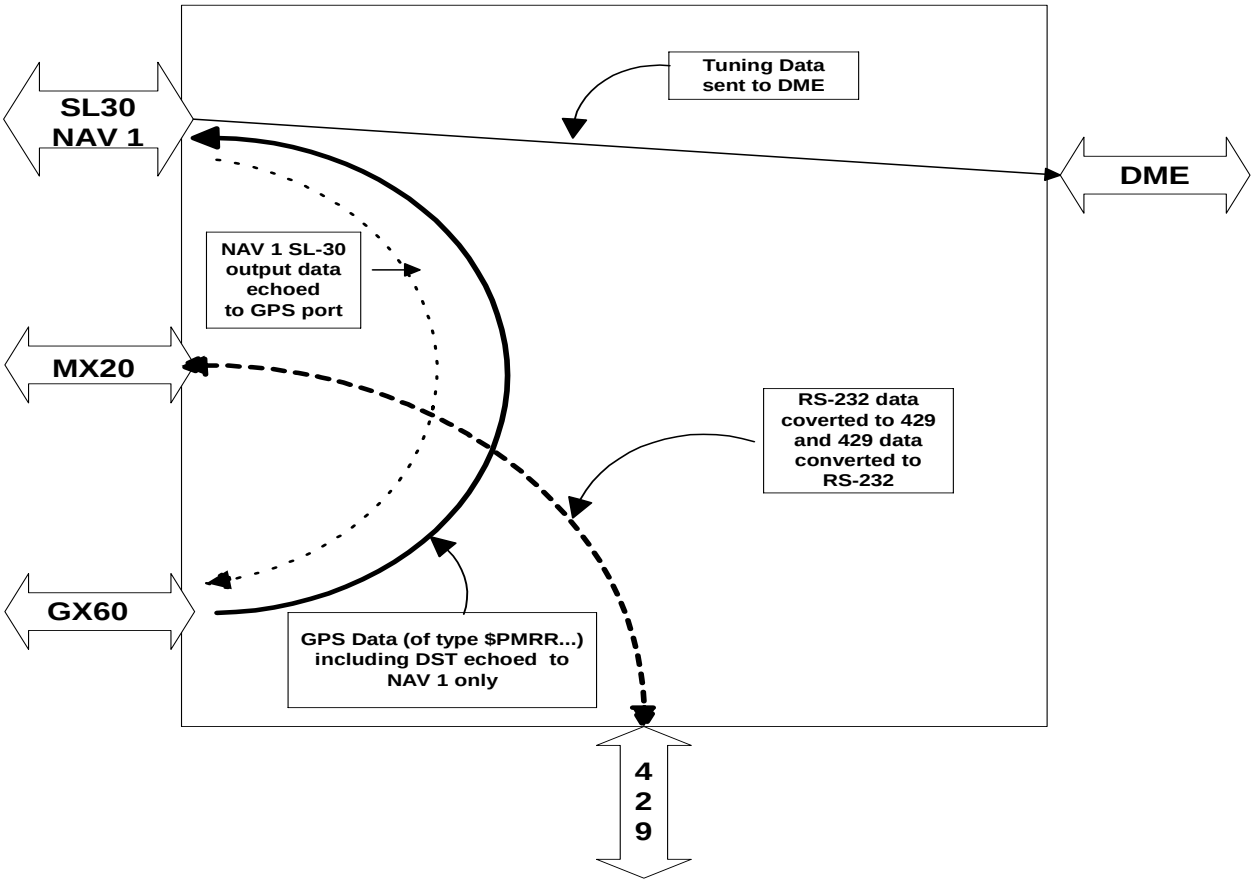


Figure 4. 429 Conversions Enabled and DME Display Data Disabled-NAV 1

In this configuration, SL30 NAV 1 is the selected tuning source for the DME. The NAV 1 data is echoed to the GPS port (port 3) and the GPS data (including DST) is echoed to the NAV 1 port (port 1). The CONVERT pin is grounded, causing port 2 to become a dedicated link to the ARINC 429 ports for ARINC 429 / RS-232 Conversions (MX20 Map on port 2). The DISPLAY pin is open, prohibiting DST data (Distance, Speed and Time) from being sent back to the SL30 NAV 1 unit for display.

Tune NAV 1 (Pin 40)	Tune NAV 2 (Pin 61)	DME Display (Pin 23)	Convert (Pin 63)
GND	OPEN	OPEN	GND

Table 10. 429 Conversions Enabled and DME Display Data Disabled-NAV 1

2.7.3 429 CONVERSIONS DISABLED WITH DME DISPLAY DATA ENABLED-TUNE NAV 1

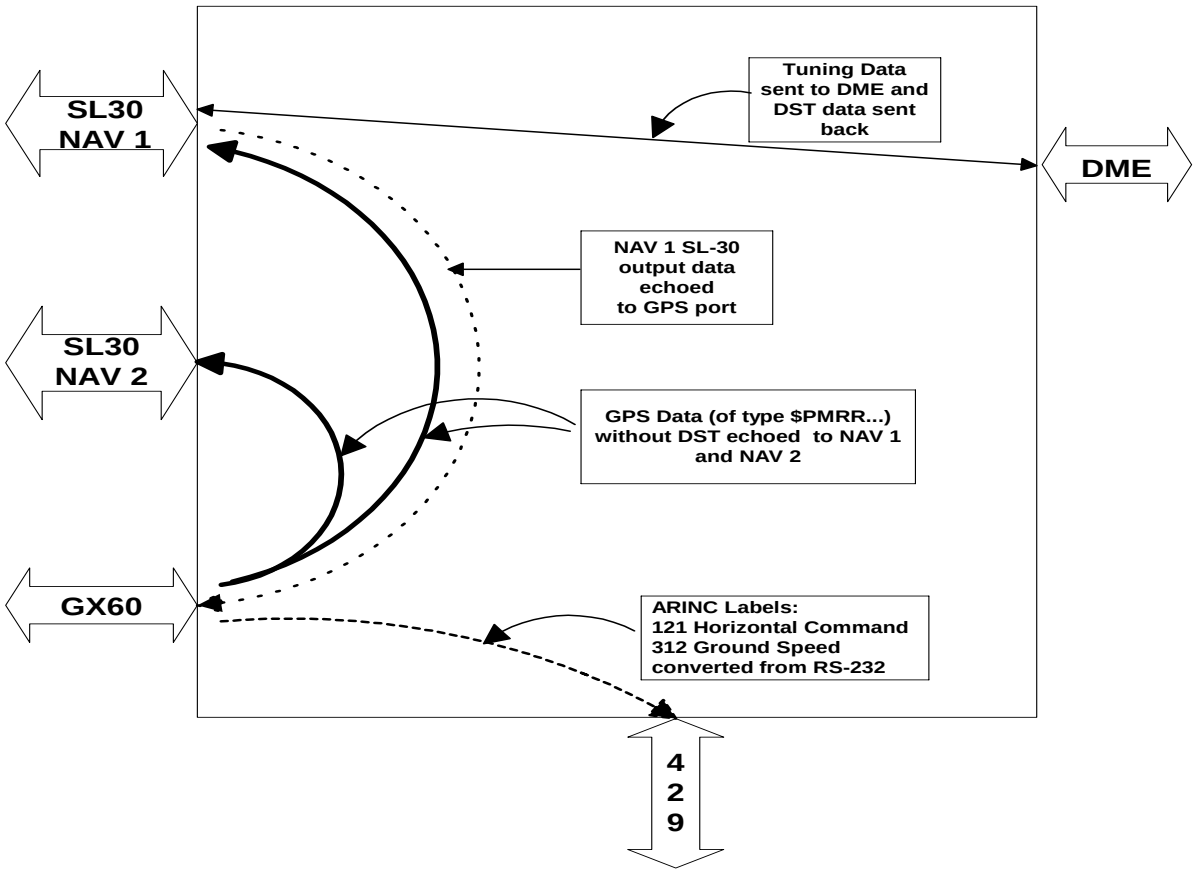


Figure 5. 429 Conversions Disabled with DME Display Data Enabled-NAV 1

In this configuration, NAV 1 is the selected tuning source for the DME. The NAV 1 data is echoed to the GPS port (port 3) and the GPS data (*excluding DST*) is echoed to the NAV 1 port (port 1) and NAV 2 port (port 2). The CONVERT pin is open, enabling a second SL30 NAV unit on port 2. The DISPLAY pin is grounded, sending DST data (Distance, Speed and Time) back to the selected SL30 NAV unit for display.

Tune NAV 1 (Pin 40)	Tune NAV 2 (Pin 61)	DME Display (Pin 23)	Convert (Pin 63)
GND	OPEN	GND	OPEN

Table 11. 429 Conversions Disabled with DME Display Data Enabled-NAV 1

2.7.4 429 CONVERSIONS DISABLED WITH DME DISPLAY DATA ENABLED-TUNE NAV 2

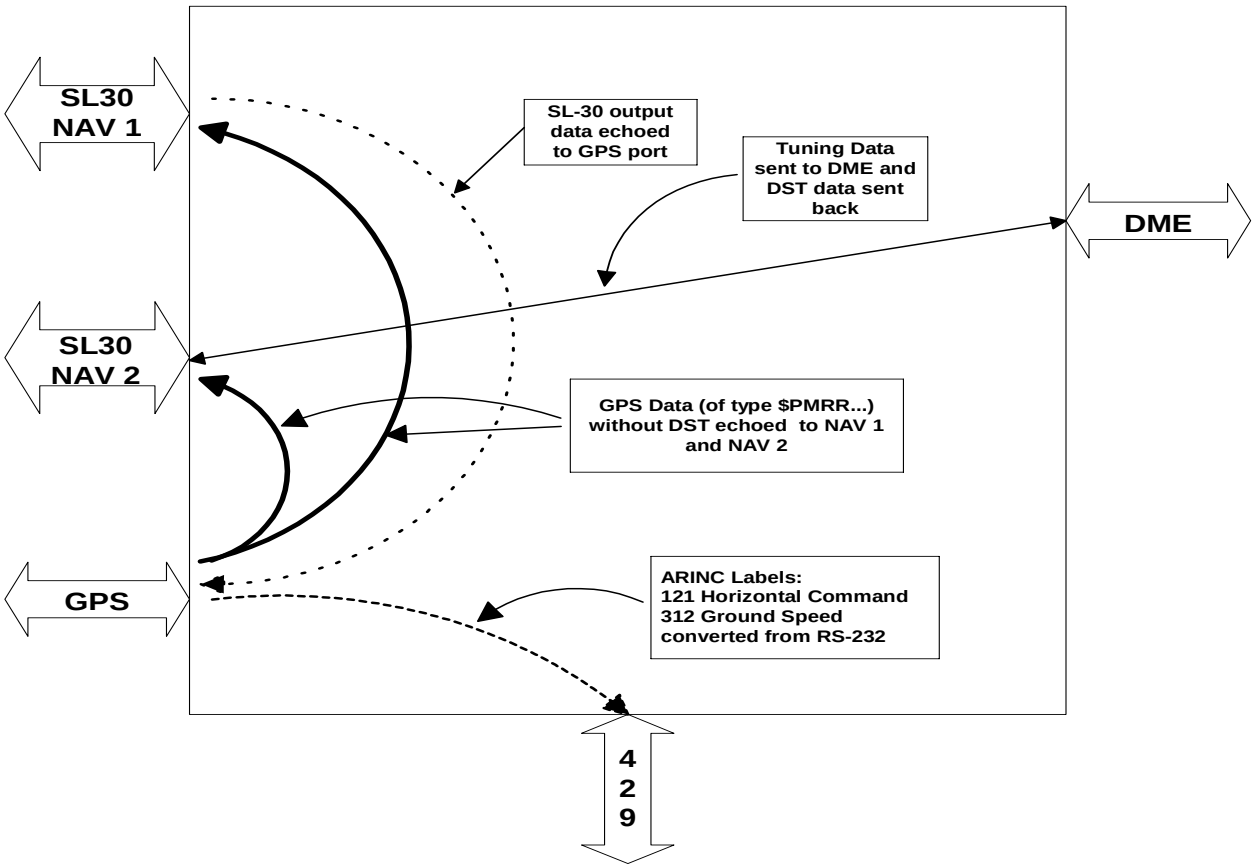


Figure 6. 429 Conversions Disable with DME Display Data Enabled-NAV 2

In this configuration, NAV 2 is the selected tuning source for the DME. The NAV 1 data is echoed to the GPS port (port 3) and the GPS data (excluding DST) is echoed to the NAV 1 port (port 1) and NAV 2 port (port 2). The CONVERT pin is open, enabling a second SL30 NAV/COMM unit on port 2. The DISPLAY pin is grounded, sending DST data (Distance, Speed and Time) back to the selected SL30 NAV/COMM unit for display.

Tune NAV 1 (Pin 40)	Tune NAV 2 (Pin 61)	DME Display (Pin 23)	Convert (Pin 63)
OPEN	GND	GND	OPEN

Table 12. 429 Conversions Disable with DME Display Data Enabled-NAV 2

2.7.5 429 CONVERSIONS DISABLED WITH DME DISPLAY DATA DISABLED-TUNE NAV 1

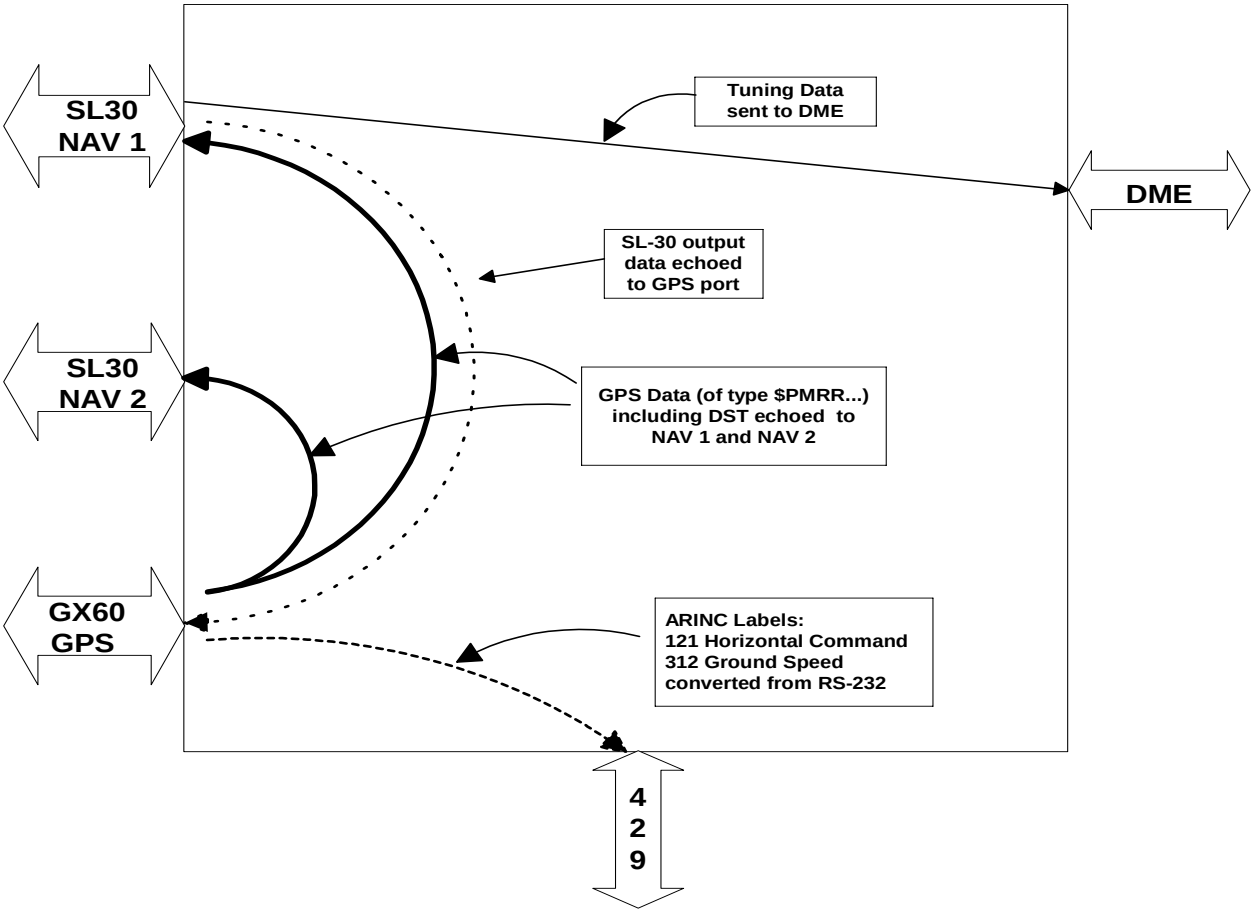


Figure 7. 429 Conversions Disabled and DME Display Data Disabled-NAV 1

In this configuration, NAV 1 is the selected tuning source for the DME. The NAV 1 data is echoed to the GPS port (port 3) and the GPS data (including DST) is echoed to the NAV 1 port (port 1) and NAV 2 port (port 2). The CONVERT pin is open, enabling a second SL30 NAV/COMM unit on port 2. The DISPLAY pin is open, prohibiting DST data (Distance, Speed and Time) from being sent to the selected SL30 NAV/COMM unit for display.

Tune NAV 1 (Pin 40)	Tune NAV 2 (Pin 61)	DME Display (Pin 23)	Convert (Pin 63)
GND	OPEN	OPEN	OPEN

Table 13. 429 Conversions Disabled and DME Display Data Disabled-NAV 1

2.7.6 429 CONVERSIONS DISABLED WITH DME DISPLAY DATA DISABLED-TUNE NAV 2

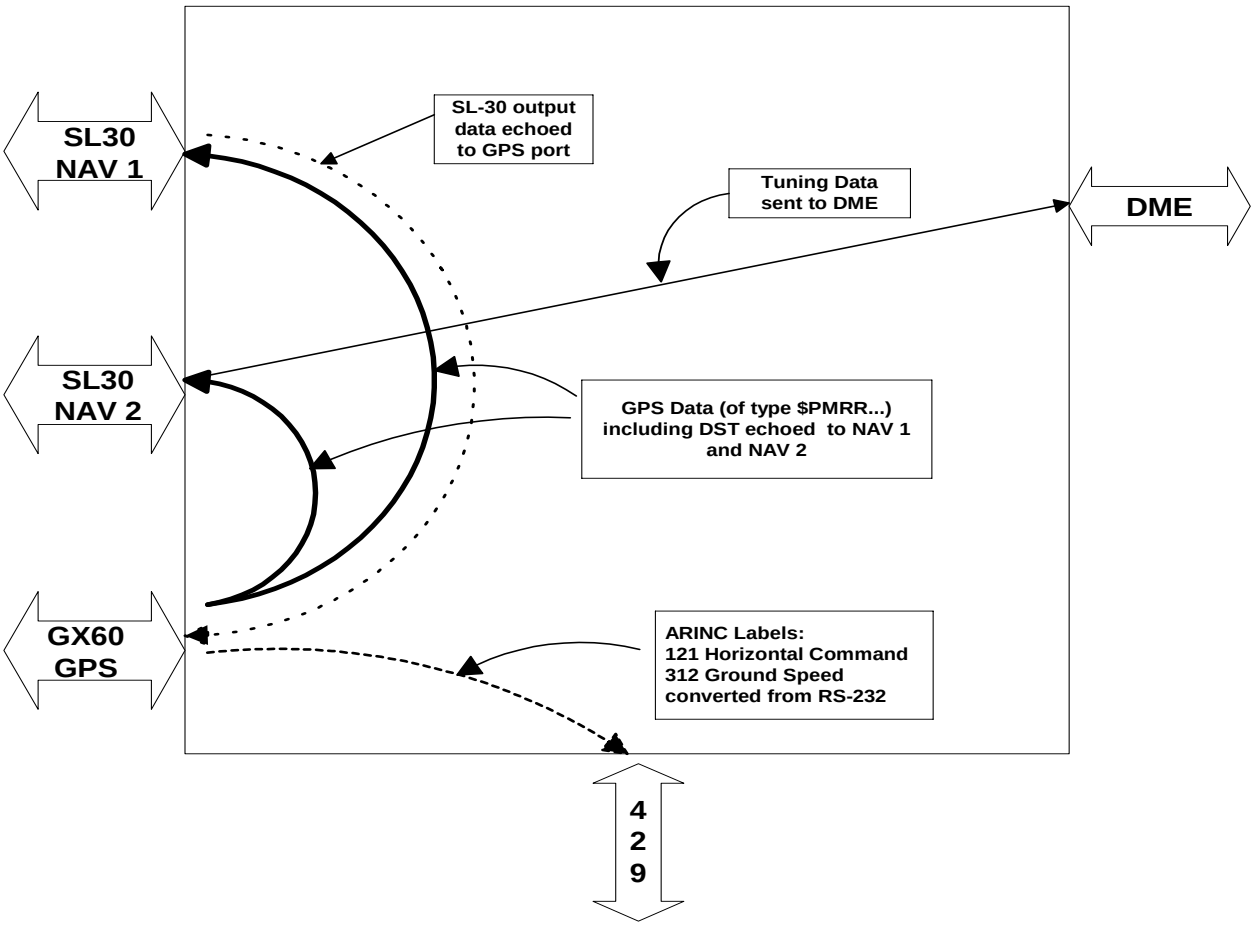


Figure 8. 429 Conversions Disabled and DME Display Data Disabled-NAV 2

In this configuration, NAV 2 is the selected tuning source for the DME. The NAV 1 data is echoed to the GPS port (port 3) and the GPS data (including DST) is echoed to the NAV 1 port (port 1) and NAV 2 port (port 2). The CONVERT pin is open, enabling a second SL30 NAV/COMM unit on port 2. The DISPLAY pin is open, prohibiting DST data (Distance, Speed and Time) from being sent to the selected SL30 NAV/COMM unit for display.

Tune NAV 1 (Pin 40)	Tune NAV 2 (Pin 61)	DME Display (Pin 23)	Convert (Pin 63)
OPEN	GND	OPEN	OPEN

Table 14. 429 Conversions Disabled and DME Display Data Disabled-NAV 2

2.7.7 RMI OBI DATA SOURCE SELECTION – NAV 1

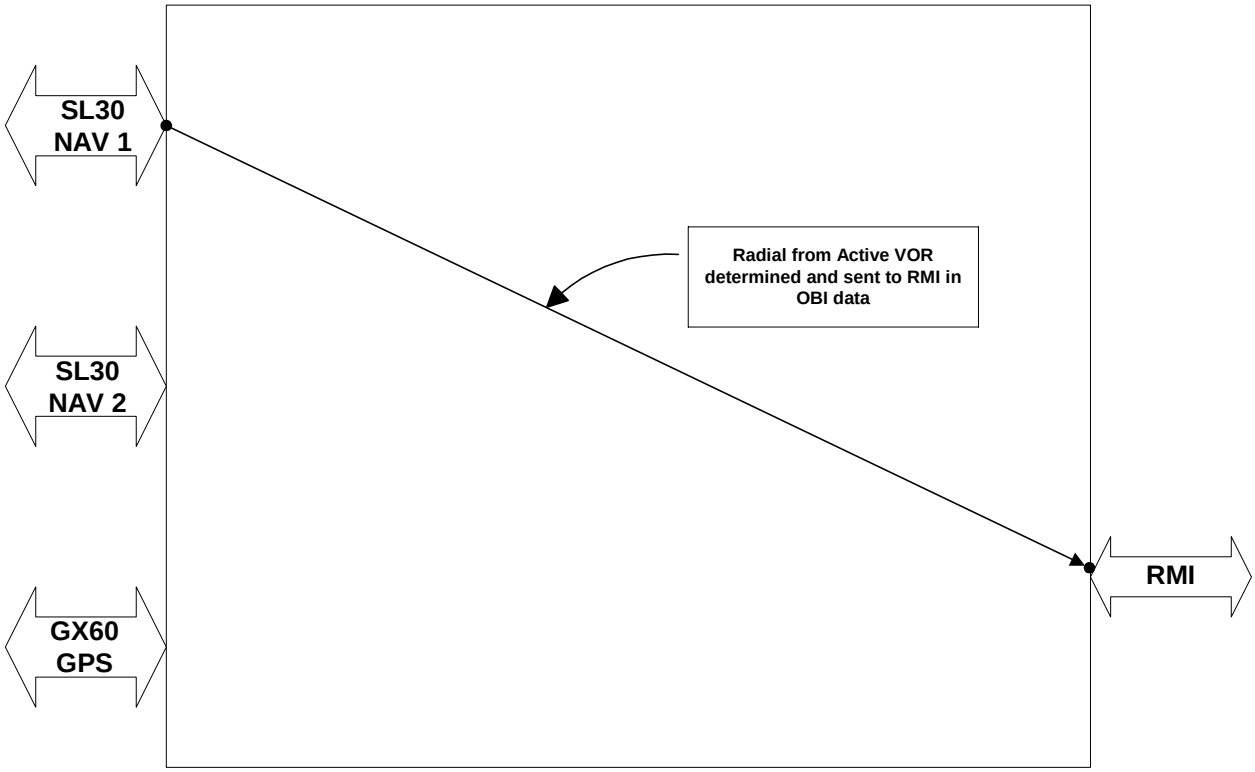


Figure 9. RMI OBI Data Source Selection-NAV 1

When NAV 1 is selected as the RMI OBI data source, the DB30 will determine the Radial from ACTIVE VOR from the SL30 and transmit the OBI data to the RMI at a 100 ms rate.

GPS (Pin 75)	NAV 1 (Pin 73)	NAV 2 (Pin 74)	CONVERT (Pin 63)
OPEN	GND	OPEN	N/A

Table 15. RMI OBI Data Source Selection-NAV 1

2.7.8 RMI OBI DATA SOURCE SELECTION – NAV 2 WITH 429 CONVERSIONS DISABLED

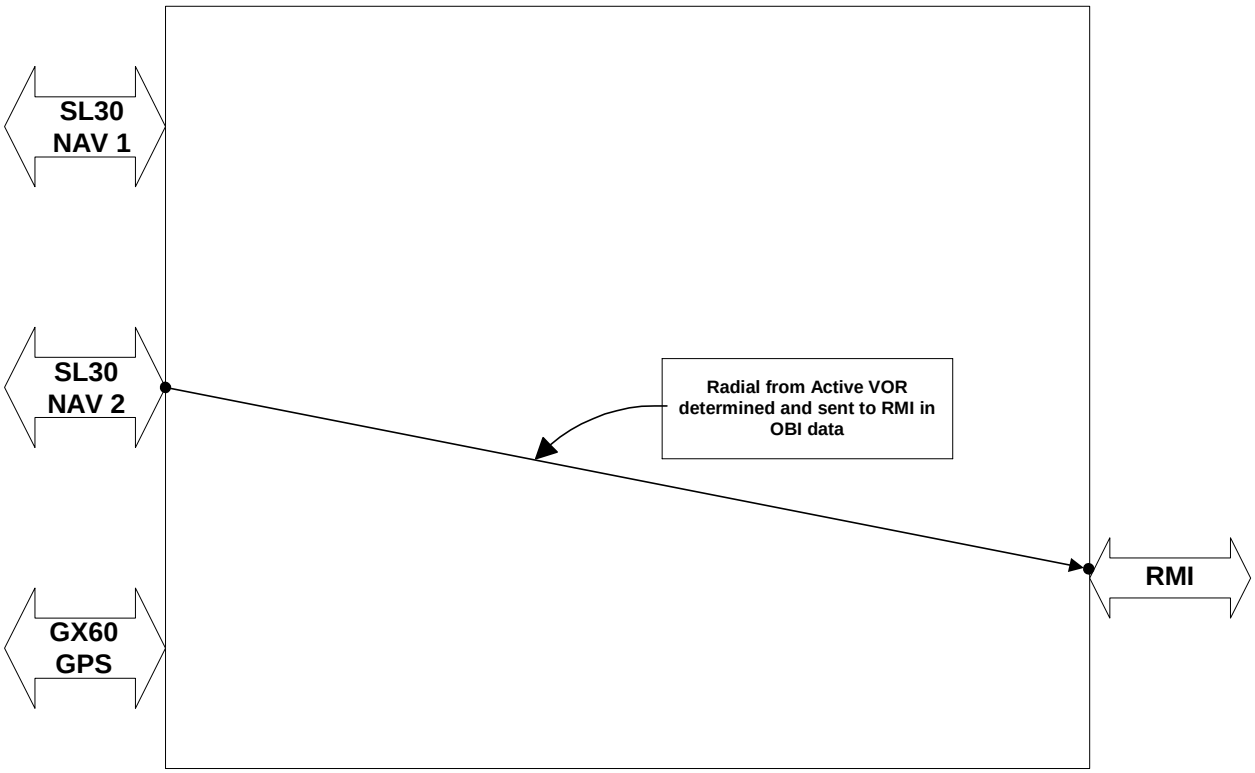


Figure 10. RMI OBI Data Source Selection – NAV 2 with 429 Conversion Disabled

When NAV 2 is selected as the RMI OBI data source, the DB30 will determine the Radial from ACTIVE VOR from the NAV 2 SL30 and transmit the OBI data to the RMI at a 100 ms rate.

GPS (Pin 75)	NAV 1 (Pin 73)	NAV 2 (Pin 74)	CONVERT (Pin 63)
OPEN	OPEN	GND	OPEN

Table 16. RMI OBI Data Source Selection – NAV 2 with 429 Conversion Disabled

2.7.9 RMI OBI DATA SOURCE SELECTION – NAV 2 WITH 429 CONVERSIONS ENABLED

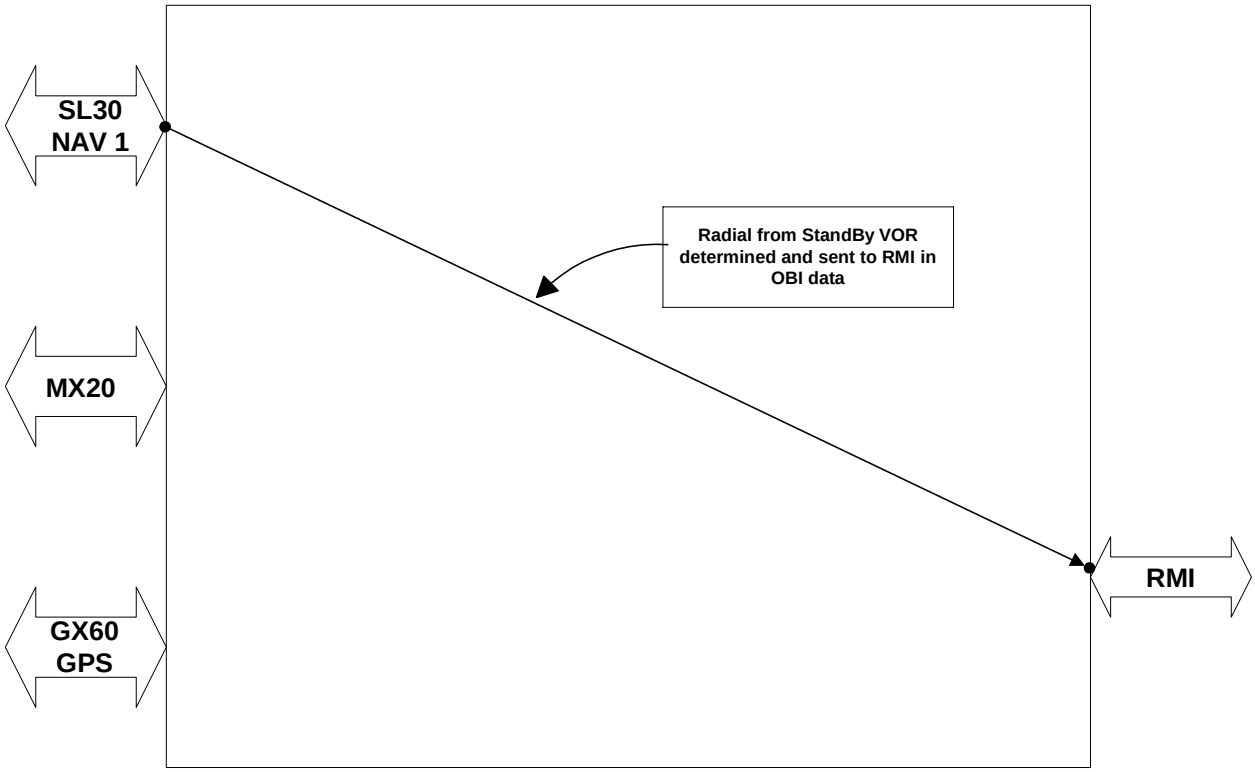


Figure 11. RMI OBI Data Source Selection – NAV 2 with 429 Conversions Enabled

When NAV 2 is selected as the RMI OBI data source and the CONVERT pin is grounded, the DB30 will determine the Radial from the STANDBY VOR of the NAV 1 SL30 (received at a 1 second rate) and transmit the OBI data to the RMI at a 100 ms rate.

GPS (Pin 75)	NAV 1 (Pin 73)	NAV 2 (Pin 74)	CONVERT (Pin 63)
OPEN	OPEN	GND	GND

Table 17. RMI OBI Data Source Selection – NAV 2 with 429 Conversions Enabled

2.7.10 RMI OBI DATA SOURCE SELECTION – GPS

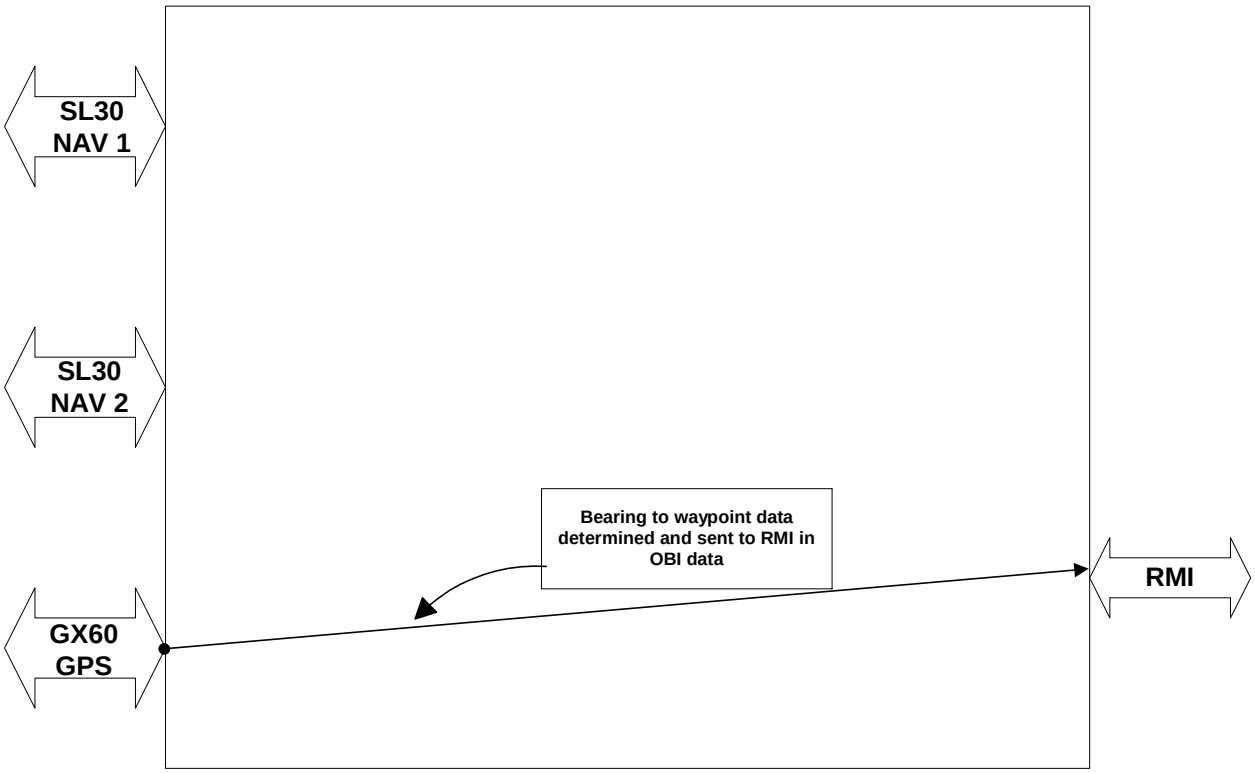


Figure 12. RMI OBI Data Source Selection GPS

When GPS is selected as the RMI OBI data source, the DB30 will determine the Bearing to Active Waypoint from the GPS port SL/GX series GPS (received at a 1 second rate) and transmit the OBI data to the RMI at a 100 ms rate.

GPS (Pin 75)	NAV 1 (Pin 73)	NAV 2 (Pin 74)	CONVERT (Pin 63)
GND	OPEN	OPEN	N/A

Table 18. RMI OBI Data Source Selection GPS

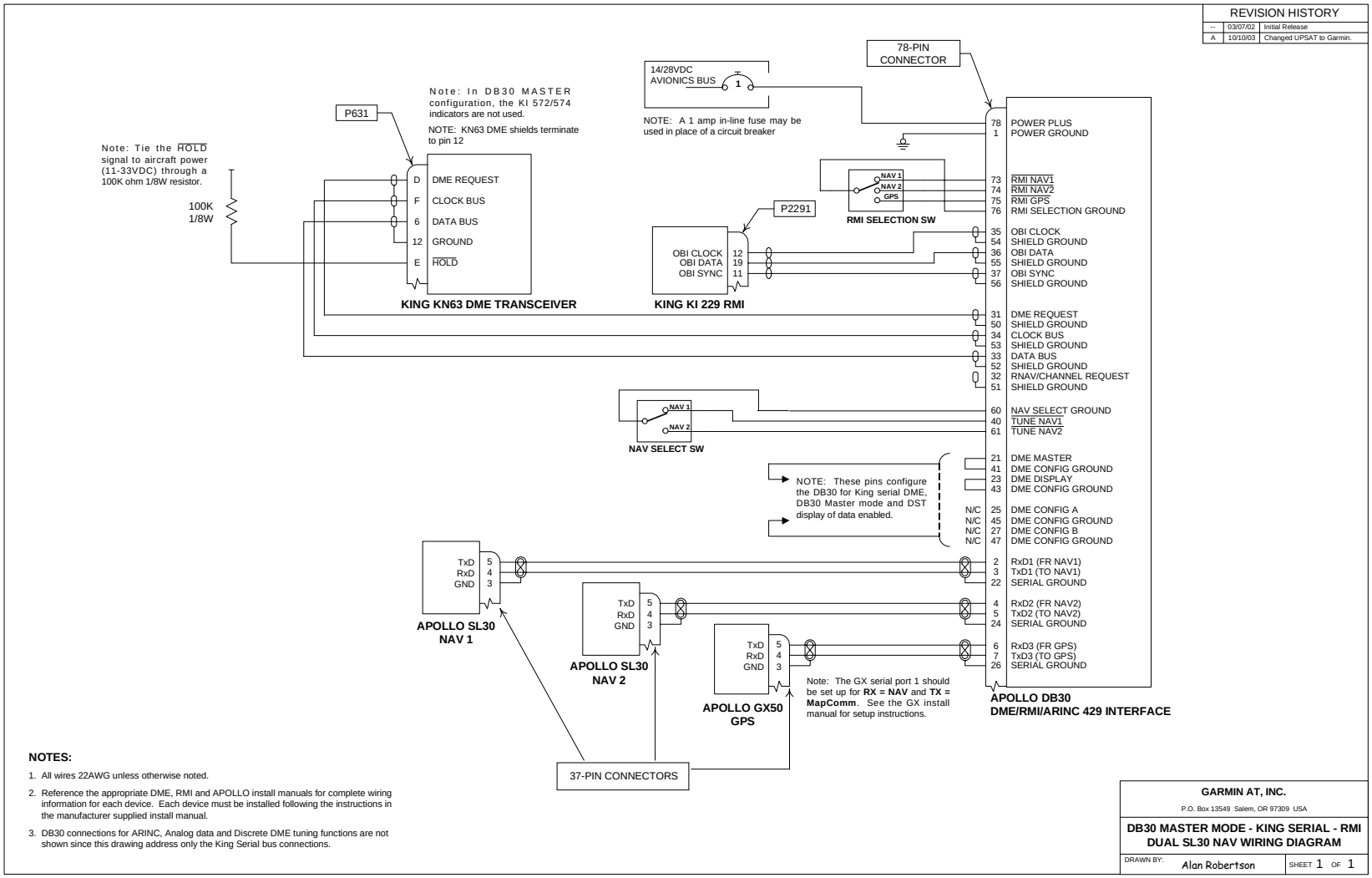


Figure 13. Master Mode – KN63 Serial DME – Dual SL30 NAV

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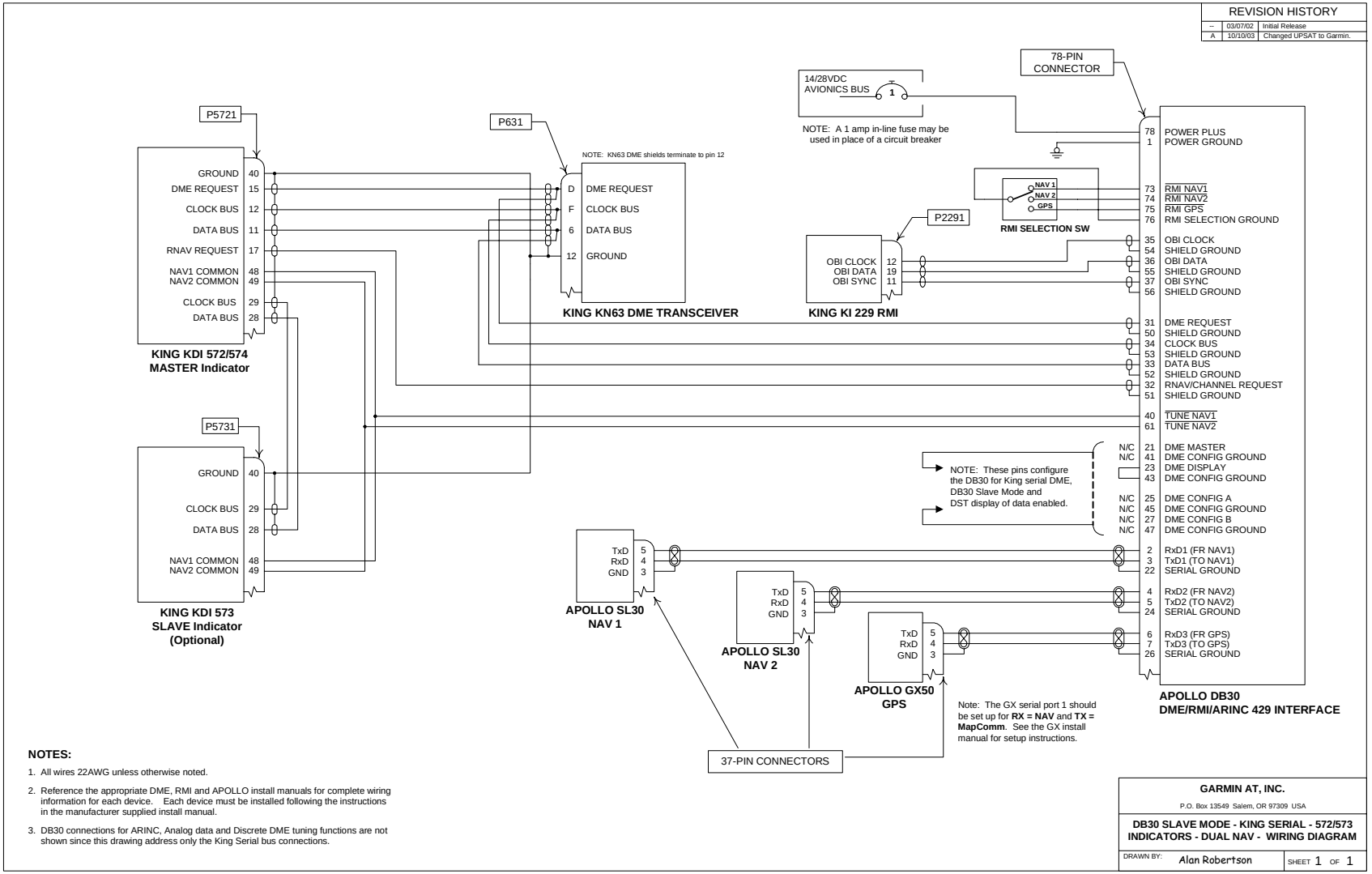

Figure 14. Slave Mode – KN63 Serial DME – 572/573/574 Indicator - Dual SL30 NAV

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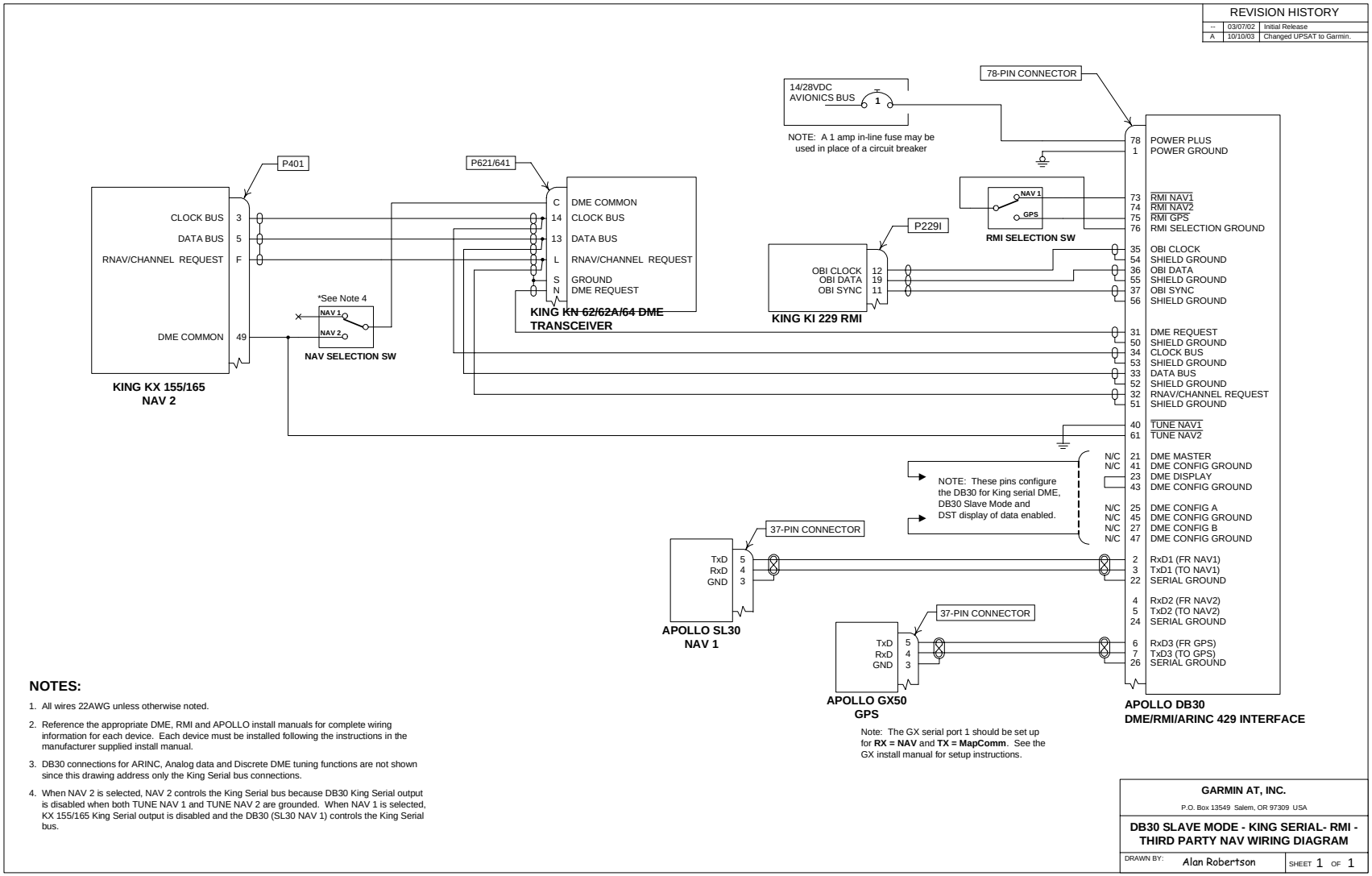

Figure 15. Slave Mode – KN62/62A/64 DME – KX155/165 NAV

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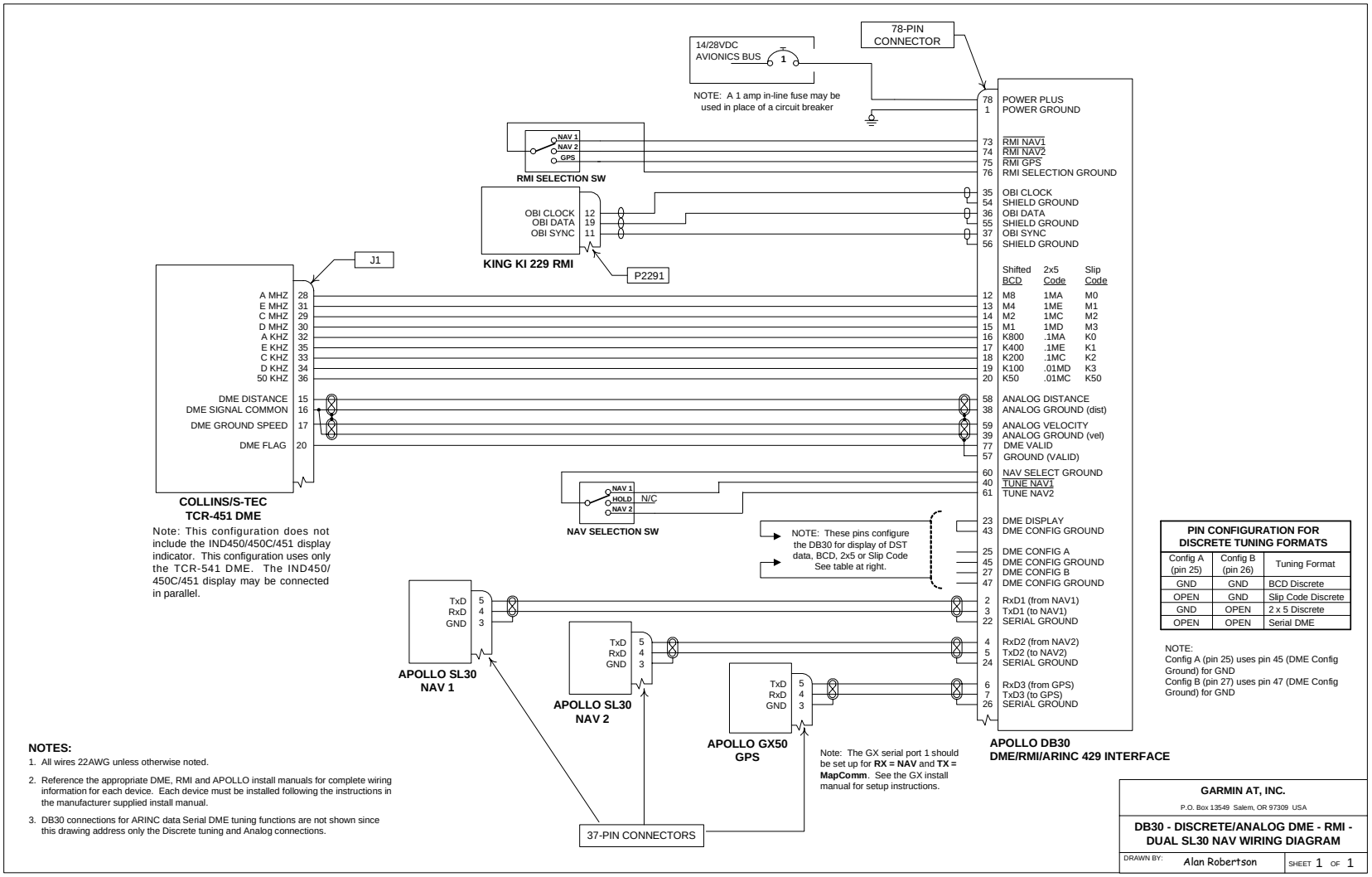

Figure 16. Discrete Tuning – S-TEC TCR-451 DME - Dual SL30 NAV

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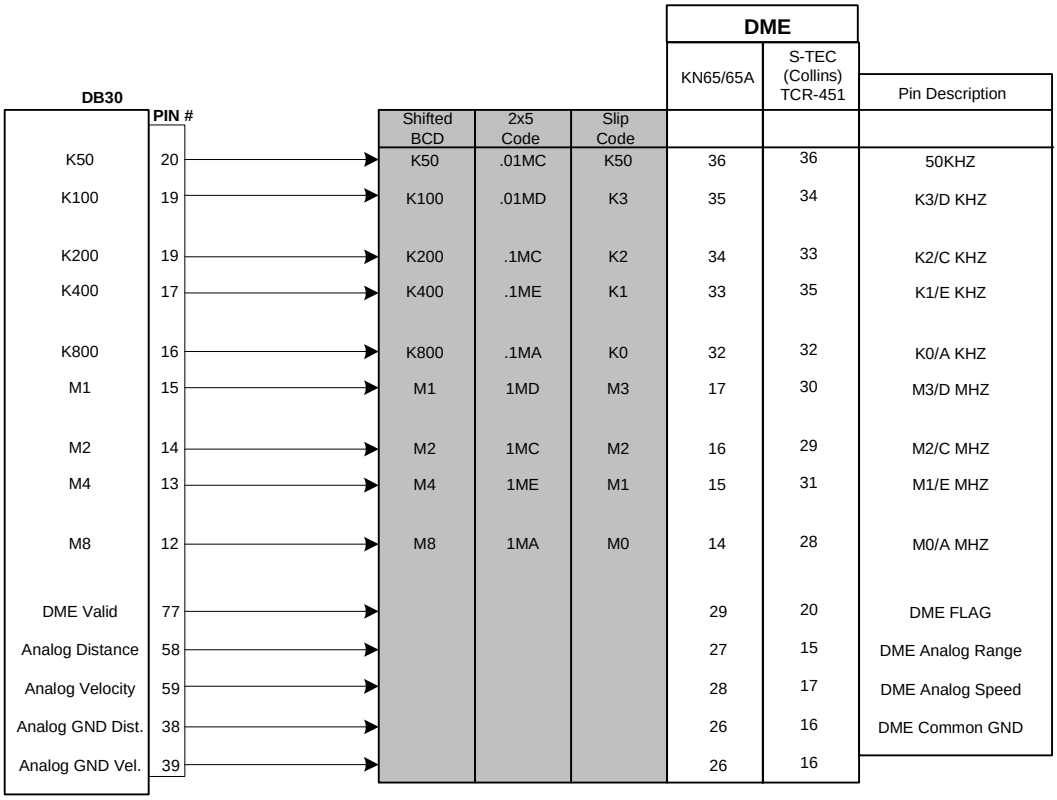
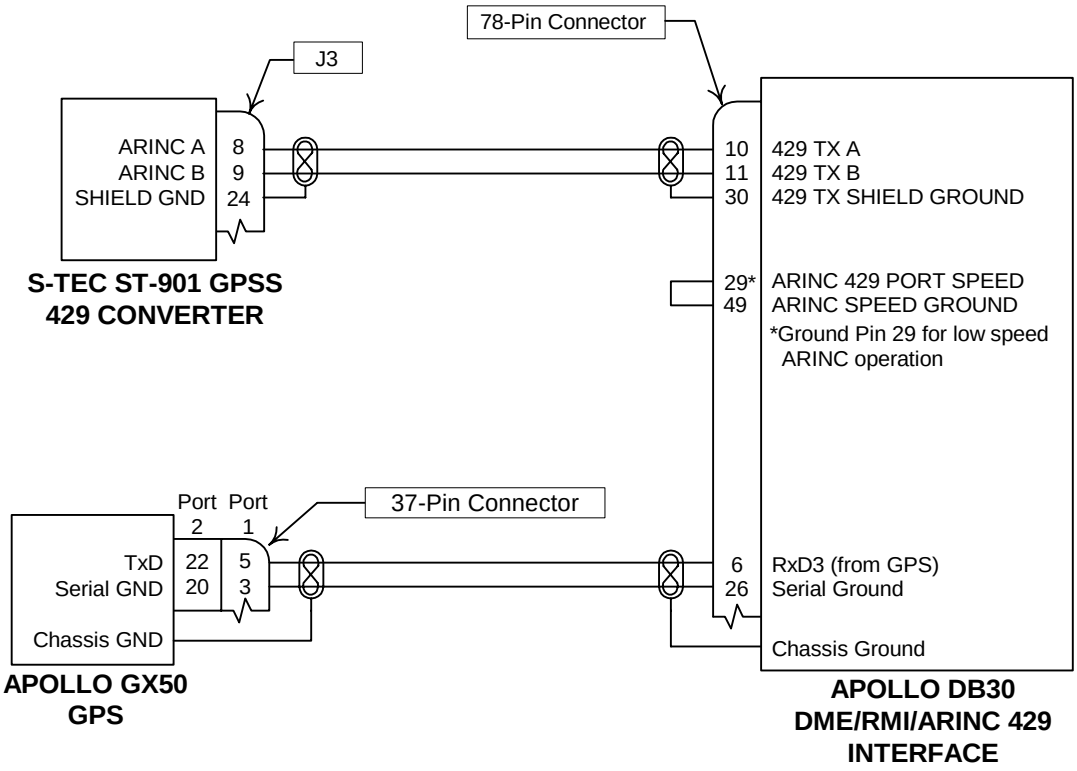


Note: The DB30 2x5 tuning interface is not compatible with the ARC RTA-476A or Narco DME transceivers.

Figure 17. Discrete Tuning BCD, 2x5 and Slip Code Connections



Notes:

1. The GX50 serial port that is used will have to be configured so that TX = MAP/COM

2. Only those connections required for GPSS (Roll Steering) are shown. Refer to the appropriate install manual for each device for complete installation instructions.

Figure 18. DB30 Roll Steering Interface - GX50 to S-TEC GPSS 429 Converter

2.8 POST INSTALLATION CHECKOUT

Once the DB30 unit has been installed, complete the following checkout procedure to verify proper operation. The steps that are not applicable to a particular installation may be skipped. A checkout log sheet is included on page 37, to be filled out during the checkout procedure. Make a photocopy of the log sheet for ease of use if desired.

2.8.1 MOUNTING / WIRING CHECK

Verify that all cables are properly secured and shields are connected as the install drawings indicate. Installation may require that you check the movement of the aircraft controls to verify that there is no interference.

2.8.2 SETUP AND CHECKOUT

The DB30 does not require software configuration or programming. The DB30 should have been set up via the configuration pins for each desired function (see installation wiring diagrams).

2.8.2.1 Equipment Setup

SL30 DST Setup

If an attached SL30 NAV/COM is going to be used to display Distance, Speed and Time data from an attached DME device, the DST data display must be enabled from the SL30 installation setup (see SL30 install manual). The SL30 user guide shows how to bring up the DST display when the unit is operating normally. *Note: The DB30 automatically determines which SL30 to send DST data based on which SL30 is providing the DME tuning information.*

GPS (GX/SL) Serial Port Setup

You must configure the GPS serial data output correctly so that the DB30 relays the proper data to the NAV units. The GPS serial port 1 should be set up for Tx = MapComm. If configuring a GX series GPS, also set up serial port 1 for Rx = NAV. Follow the instructions for GPS serial setup found in the GPS installation manual under ***Post Installation Checkout*** in the sections ***Test Mode Checkout And Setup*** and ***Serial Interface Configuration***. When the GPS is configured, turn the GPS power off, then back on to return to normal operation.

2.8.2.2 DB30 And System Checkout Procedure

Verifying Serial Communications

1. Power up the aircraft and turn on the Avionics.
2. Boot the GX into simulator mode: Press & hold the **NAV** button while turning the power switch on. (cycling the power will return you to normal operating mode). *Note: SL GPS installations must be tested using an actual GPS position since you can not activate the simulator mode with out special wiring within the installation.*
3. Enter a single leg flight plan into the GPS, or use **Direct-To**... **ENTER**.
4. Verify that the CDI centers and indicates a valid **TO** flag (unit has a position fix).
5. Press **NAV**, then press **SEL** on each SL30 and verify that the remote data from the GPS receiver is being echoed through the DB30 to each SL30 NAV/COM unit.
6. On the SL30 NAV1, **Flip/Flop** the nearest VOR into the active frequency.

7. Press **NAV** on the GX, turn the outer knob counter-clockwise and verify that the tuned VOR frequency is displayed on the GX. *Note: Only the GX series with version 3.3 or later support VHF NAV display of data.*

Verifying DME Operations

Note: The VOR and DME signals may be simulated by test equipment or live off-air signals may be used this procedure. A flight test is not required to verify this system.

1. The remotely connected DME should tune to the corresponding SL30 NAV/COM active VOR/LOC frequency based on the position of the **Tune NAV** switch.
2. By flip-flopping various frequencies into each SL30 and alternating the selection of the **Tune NAV1** / **Tune NAV2** switch, verify that the DME properly tunes to the corresponding DME channel.
3. If the installation supports the remote display of DME data on the SL30, Press **NAV**, then press **SEL**, then turn the outer knob counter-clockwise to *"SHOW DST DATA?"*, and press **ENT**. (do this on each SL30)
4. Verify that the displayed DST information corresponds to the SL30 that is selected to provide tuning information to the DME. Cross display of information is NOT acceptable.
5. Change the **Tune NAV** switch and verify that the displayed DME data switches from SL30 #1 to SL30 #2, corresponding to the **Tune NAV** switch selection.

Verifying RMI Operations

1. If an RMI is installed in the system verify that RMI indication corresponds to the setting of the **RMI Select** switch.
2. Set the **RMI Select** switch to the **GPS** position. Verify that the RMI bearing pointer is pointing **TO** the current waypoint *(You must have a valid flight plan entered into the GPS).*
3. Set the **RMI Select** switch to the **NAV1** position. Verify that the RMI bearing pointer rotates to point to the tuned VOR station. *(The SL30 #1 must be tuned to a valid VOR).*
4. Set the **RMI Select** switch to the **NAV2** position. Verify that the RMI bearing pointer rotates to point to the tuned VOR station. *(The SL30 #2 must be tuned to a valid VOR).*

Verifying GPSS Operations

1. If the DB30 is interfaced to an S-Tec autopilot with the GPS Roll Steering option, verify GPSS operation by following this procedure. The GPSS functions may be tested with the GX operating in the simulator mode. *Note: The SL series GPS do not support GPS Roll Steering.*
2. The GX must have a valid **TO** waypoint and must have a simulated ground speed greater than 5 knots.
3. Activate the autopilot and press **GPSS**. The GPSS light may initially blink, but should be on steady after a few seconds. This indicates the system is receiving the proper ARINC 429 labels to fly the airplane.
4. Turn off the GX GPS receiver and verify that the GPSS light starts blinking after a few seconds.

Note: This procedure is designed to specifically check an S-TEC autopilot with the S-TEC ST-901 Roll Steering option. Steps to check other compatible equipment may differ.

Apollo DB30 Post-Installation Checkout Log

Date: ___/___/___
By: _____

CONFIGURATION INFORMATION:
DB30 DME/RMI/ARINC 429 Interface 430-6041-0_____ Mod ____ Serial # _____

DB30 SYSTEM CHECKOUT PROCEDURES:

Equipment Setup-
[ ] SL30 **#1** DST data display enabled/disabled
[ ] SL30 **#2** DST data display enabled/disabled
[ ] Setup GPS serial port 1 for **Tx = MapCom**
[ ] Setup GX GPS serial port 1 for **Rx = Nav**

Verifying Serial Communications
[ ] GPS data echoed to each SL30 NAV
[ ] On GX, verify tuned VOR frequency from SL30 #1 is displayable

Verifying DME Operations
[ ] Set **Tune NAV** switch to **Tune NAV1**, tune nearest navaid via SL30 #1, verify DME tunes
[ ] Tune alternate navaid via SL30 #2, switch to **Tune NAV2**, verify DME tunes
[ ] DST data displayed on each SL30, as **Tune NAV** switch is changed, is from selected SL30

Verifying RMI Operations
[ ] Set **RMI Select** switch to **GPS**, verify RMI points TO current waypoint
[ ] Set **RMI Select** switch to **NAV1**, verify RMI points to the tuned VOR station
[ ] Set **RMI Select** switch to **NAV2**, verify RMI points to the tuned VOR station

Verifying GPSS Operations
[ ] With a valid position & flight plan, the GPSS light should turn ON (not blinking)
[ ] Turn OFF the GPS, verify that GPSS light blinks after a few seconds.

THIS COMPLETES THE POST-INSTALLATION CHECKOUT PROCEDURE

COMMENTS:

2.9 INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

Modification of an aircraft for the installation of this unit obligates the aircraft operator to include the maintenance information provide by this section in the operator's Aircraft Maintenance Manual and the operator's Aircraft Scheduled Maintenance Program

1. Maintenance Manual information (system description, operation, location, removal, installation, testing, etc.) is contained within this document and any appropriate information should be copied to, and/or included with, the operator's airplane Maintenance Manual.
2. Line Replaceable Unit (LRU) part numbers and other necessary part numbers contained in the installation data package should be placed into the aircraft operator's airplane Illustrated Parts Catalog (IPC).
3. The specific wiring diagram information, along with the supplemental information described in the Installation Manual, pertaining to the installation of this unit, should be placed into the aircraft operator's airplane Wiring Diagram Manuals.
4. Scheduled Maintenance Program task to be added to the operator's maintenance program are found in Appendix B – Periodic Maintenance, of this installation manual.

NOTES

3 SPECIFICATIONS

This section includes detailed electrical, physical, environmental and performance specifications for the Apollo DB30.

3.1 ELECTRICAL

Input voltage: 10 VDC to 32 VDC

Input current: 14 V ..... 130 mA typical

28 V ..... 70 mA typical

3.2 PHYSICAL

Height ..... 1.1 inches (27.94 mm)

Width ..... 4.14 inches (105.16 mm)

Depth (behind faceplate) ..... 5.23 inches (132.84 mm)

Weight ..... 0.56 lb. (0.254 kg)

3.3 ENVIRONMENTAL

The Apollo DB30 unit is designed and tested to meet appropriate categories of RTCA/DO-160D. The Environmental Qualification Form is included in Appendix C.

Operating temperature ..... -20°C to +55°C

Storage temperature ..... -55°C to +85°C

Temperature variation ..... 2°C per minute

Humidity ..... 95% at 50°C

Maximum altitude ..... 25,000 feet

Cooling ..... Not required

NOTES

4 LIMITATIONS

4.1 INSTALLATION

Installations are to be made in accordance with all appropriate FAA approved guidelines for each given installation. It is the responsibility of the installer to ensure that aircraft installation conditions meet the appropriate TSO standards for the specific type and class of aircraft involved.

4.2 INCOMPLETE SYSTEM

The DB30 DME/RMI/Arinc 429 Interface box is TSO approved as an incomplete system. The DB30 meets the objectives of TSO-C36e and TSO-C40c only when interfaced to the Apollo SL30 VHF NAV/COM. In addition the system meets the objectives of TSO-C66c when interfaced to third party DME equipment and installed as out lined in this installation manual.

NOTES

5 APPENDIX A - TROUBLESHOOTING

This appendix provides information to assist troubleshooting if problems occur after completing the installation. Use Table 19 to assist in troubleshooting. Note that the DB30 has no display or indicators that can be used for troubleshooting. Devices connected to the DB30 such as an SL30, GX50 or MX20 can be useful for determining whether the DB30 is functioning properly or if there are problems with the installation.

Table 19. Troubleshooting Guide

Problem	Cause	Solution
DST data (Distance, Speed, Time) is not displayed on the SL30.	• The DB30 is not getting power.	Check power connections, breakers or fuse, and main avionics switch.
	• The DB30 not set up for DST display.	Make sure DB30 DISPLAY pin has been jumpered to GND.
	• The SL30 has not been set up for display of DST data.	Consult SL30 users guide for setup of DST display.
Tuning data not updating DME	• Desired NAV source has not been selected.	Select desired NAV source using NAV select switch to chose desired NAV receiver for the DME.
ARINC 429 device is not receiving data from the DB30.	• The DB30 is not configured for ARINC 429 conversion.	Make sure CONVERT pin on DB30 has been jumpered to GND.
	• Serial device not connected to DB30 serial port 2.	Connect Serial device to DB30 serial port 2.
	• ARINC 429 device not connected to DB30 ARINC TxA and TxB output channels.	Connect ARINC 429 Device to DB30 ARINC TxA and TxB output channels.
Autopilot is not getting GPSS/Roll Steering data from the DB30	• GX50 not connected to DB30 serial port 3.	Make sure the GX50 is connected to the DB30 serial port 3.
	• GX50 not set up for MAP/COM output on TX for serial port that is connected to the DB30.	Consult the GX50 install manual for serial port configuration for correct serial port output.
RMI pointer does not indicate correctly	• Desired RMI source has not been selected	Select desired RMI source from NAV 1, NAV 2 or GPS.

5.1 CONTACTING THE FACTORY FOR ASSISTANCE

If the Apollo DB30 unit fails to operate despite troubleshooting efforts, contact the Garmin AT factory for assistance.

Garmin AT
2345 Turner Rd. SE
Salem, Oregon 97302
USA
Phone: 503.581.8101 or 800.525.6726
http://www.garminat.com

Be prepared to offer the following information about the installation:

- Installation configuration (list of any accessories)
- Model number, part number with mod levels, and serial number
- Description of problem
- Efforts made to isolate the problem

NOTES

NOTES

6 APPENDIX B - PERIODIC MAINTENANCE

6.1 EQUIPMENT TEST

No scheduled servicing tasks are required on the Apollo DB30.

6.2 EQUIPMENT CALIBRATION

The Apollo DB30 design requires **no** internal manual adjustments.

NOTES

7 APPENDIX C - ENVIRONMENTAL QUALIFICATIONS

The Apollo DB30 has been tested to the following environmental categories per procedures defined in RTCA/DO-160D.

Environmental Qualification Form		
Nomenclature: DB30 Part No.: 430-6041-000 TSO No.: C36e, C40c, C66c		Manufacturer: Garmin AT 2345 Turner Road SE Salem, Oregon 97302
Conditions	Section	Description of Conducted Tests
Temperature and Altitude In-flight Loss of Cooling Altitude Decompression	4.0 4.5.4 4.6.1 4.6.2	Equipment tested to Category B1 & A1 No cooling required. Operating temp: -20ºC to +55ºC Short time high temp: to +70ºC Ground survival temp: -55ºC to +85ºC Equipment tested to 25,000 feet Equipment tested to 25,000 feet
Overpressure	4.6.3	Equipment tested for overpressure
Temperature Variation	5.0	Equipment tested to Category C, 2°C/min
Humidity	6.0	Equipment tested to Category A, standard humidity environment
Operational Shocks and Crash Safety	7	Equipment tested for both operational and crash safety shocks to Category B Type 5R. (Equipment operated normally after the crash safety shocks.)
Vibration	8.0	Equipment tested without shock mounts to Category S, Curves B, M
Explosion Proofness	9.0	Equipment identified as Category X, no test required
Waterproofness	10.0	Equipment identified as Category X, no test required
Fluids Susceptibility	11.0	Equipment identified as Category X, no test required
Sand and Dust	12.0	Equipment identified as Category X, no test required
Fungus Resistance	13.0	Equipment identified as Category X, no test required
Salt Spray	14.0	Equipment identified as Category X, no test required
Magnetic Effect	15.0	Equipment is Class Z, < 0.3 meter
Power Input	16.0	Equipment tested to Categories A & B
Voltage Spike	17.0	Equipment tested to Category A
Audio Frequency Conducted Susceptibility - Power Inputs	18.0	Equipment tested to Category Z
Induced Signal Susceptibility	19.0	Equipment tested to Category Z
Radio Frequency Susceptibility (Radiated and Conducted)	20	Equipment tested to Category TT-
Emission of Radio Frequency Energy	21	Equipment tested to Category B
Lightning Induced Transient Susceptibility	22.0	Equipment identified as Category A3 B2
Lightning Direct Effects	23.0	Equipment identified as Category X, no test required
Icing	24.0	Equipment identified as Category X, no test required
Electrostatic Discharge (ESD)	25.0	Equipment tested to Category X
Remarks:		

NOTES


GARMIN