DATUM SYSTEMS

Appendix C

Datum Systems PSM-500 and PSM-4900 Satellite Modem

Cabling Specifications

PSM-4900/PSM-500 VSAT / SCPC - Cabling Specifications

Revision History

Rev 1.0	6-10-2000	Preliminary Release.
Rev 1.1	8-1-2000	Changed pin 19 to 18 on DB25 connectors and shield connections.
Rev 1.2	12-10-2000	Add information on release of IBS/Reed-Solomon Option.
Rev 1.4	8-27-2002	Add information on release of PSM-4900L Modem.
Rev 1.5	10-23-2006	Add PSM-500 Modem and its USB cable plus BUC wiring.
Rev 1.6	12-17-2006	Add Aux ESC port cable adaptor wiring.

Introduction

This Appendix defines the physical and technical requirements for cabling to Datum Systems M5/M500 class modems including the PSM-4900 and PSM-500 series of Satellite Modem. All of the cabling and connections are identical between the two series except the new USB cable used with the PSM-500 series modems.

1.0 Data Interface Pin Connections

The unit is supplied with an electronically programmable data interface assembly. Table C-1a and b shows the pin assignments for the possible standard interfaces. Table C-2 through C-4 shows the pin assignments used to create an “adaptor” cable from the unit’s 37-pin female “D” sub connector to other types of interface connections such as V.35 “Winchester” type connector standard pin-outs or RS-232 type DB25 connector.

Electrical connections involved in the standard outputs and inputs available in the PSM-4900/PSM-500 fall into four category types

1. V.28 Bipolar signals requiring 1 wire typical of RS-232
2. V.35 Differential signals requiring 2 wires - typical of V.35
3. V.10 Single ended signals requiring 1 wire - typical of V.36
4. V.11 Differential signals requiring 2 wires - typical of RS-422/449

Differential signal lines should use a twisted pair for the two lines of the same signal to help eliminate noise pickup and interference using the common mode rejection abilities of the line receivers.

The input lines of differential pairs are terminated within the modem. These include the Send Data and Terminal Timing lines in V.35, RS-449 and EIA-530/A modes.

> *Caution: A common mistake is to label the single line of a 1 wire signal or the “A” side of a differential signal as the “+” side. This is NOT true. This line is the “-“ side because all standard line drivers and receivers perform an inversion on the signal. Thus the standard “A” line side is inverted from the originating TTL level signal and therefore labeled “-“ or minus. Even some major manufacturers make this mistake so care should be exercised when building cables.*

Table C–1a Data Interface
Chassis Male DB37 Connector J3 Pin Assignment by Signal

Modem Pin	RS–449 Signal Name	V.35, V.36 Signal Name	RS-232 Signal Name *(5)	Eia-530 Signal Name	Direction
1	Shield (Open)	Shield (Open)	Shield (Open)	SHD (Open)	Open(4)
4	Transmit Data (A) –	SD A (SD-)	SD	TD A	Input
22	Transmit Data (B) +	SD B (SD+)		TD B	Input
5	Transmit Clock (A) –	SCT A (ST-)	ST	TTSETC A	Output
23	Transmit Clock (B) +	SCT B (ST+)		TSETC B	Output
6	Receive Data (A) –	RD A (RD-)	RD	RD A	Output
24	Receive Data (B) +	RD B (RD+)		RD B	Output
8	Receive Clock (A) –	SCR A (RT-)	RT	RSETC A	Output
26	Receive Clock (B) +	SCR B (RT+)		RSETC B	Output
7	RTS (A) –	RTS	RTS	RTS A	Input
25	RTS (B) +			RTS B	Input
9	CTS (A) –	CTS	CTS	CTS A	Output
27	CTS (B) +			CTS B	Output
11	Data Mode (A) –	DSR	DCR	DCR A	Output
29	Data Mode (B) +			DCR B	Output
12	TR (A) –	DTR	DTR	DTR A	Input
30	TR (B) +			DTR B	Input
13	Receive Ready (A) –	RLSD	RLSD	RLSD A	Output
31	Receive Ready (B) +			RLSD B	Output
17	Terminal Timing (A) –	SCTE A (TT-)	TSETT	TSETT A	Input
35	Terminal Timing (B) +	SCTE B (TT+)		TSETT B	Input
3	External data Clock (transmit data clock or receive FIFO Buffer output Clock (A) – *(3)	Ext Data/FIFO Clock A (-)*(3)	Ext Data/FIFO Clock A (-)*(3)	Ext Data/FIFO Clock A (-)*(3)	Input
21	External data Clock (transmit data clock or receive FIFO Buffer output Clock (B) + *(3)	Ext Data/FIFO Clock B (+)*(3)	Ext Data/FIFO Clock B (+)*(3)	Ext Data/FIFO Clock B (+)*(3)	Input
19	Signal GND	SIG GND	GND	SGND	GND
20	Common	Chassis			GND
10	Mod Fault Alarm *(2)	Mod Fault Alarm *(2)	Mod Fault Alarm *(2)	Mod Fault Alarm *(2)	OC TTL output
28	Demod Fault Alarm *(2)	Demod Fault Alarm *(2)	Demod Fault Alarm *(2)	Demod Fault Alarm *(2)	OC TTL output
32	Aux RS-232 Receive *(1)	Aux RS-232 Receive *(1)	Aux RS-232 Receive *(1)	Aux RS-232 Receive *(1)	Input
34	Aux RS-232 Transmit *(1)	Aux RS-232 Transmit *(1)	Aux RS-232 Transmit *(1)	Aux RS-232 Transmit *(1)	Output
37	Send Common				GND

Table C–1b Data Interface
Chassis Male DB37 Connector J3 Pin Assignment by Pin Number

Modem Pin	RS–449 Signal Name	V.35, V.36 Signal Name	RS-232 Signal Name *(5)	Eia-530 Signal Name	Direction
1	Shield (Open)	Shield (Open)	Shield (Open)	SHD (Open)	Open(4)
3	External data Clock (transmit data clock or receive FIFO Buffer output Clock (A) – *(3)	Ext Data/FIFO Clock A (-)*(3)	Ext Data/FIFO Clock A (-)*(3)	Ext Data/FIFO Clock A (-)*(3)	Input
4	Transmit Data (A) –	SD A (SD-)	SD	TD A	Input
5	Transmit Clock (A) –	SCT A (ST-)	ST	TTSETC A	Output
6	Receive Data (A) –	RD A (RD-)	RD	RD A	Output
7	RTS (A) –	RTS	RTS	RTS A	Input
8	Receive Clock (A) –	SCR A (RT-)	RT	RSETC A	Output
9	CTS (A) –	CTS	CTS	CTS A	Output
10	Mod Fault Alarm *(2)	Mod Fault Alarm *(2)	Mod Fault Alarm *(2)	Mod Fault Alarm *(2)	OC TTL output
11	Data Mode (A) –	DSR	DCR	DCR A	Output
12	TR (A) –	DTR	DTR	DTR A	Input
13	Receive Ready (A) –	RLSD	RLSD	RLSD A	Output
17	Terminal Timing (A) –	SCTE A (TT-)	TSETT	TSETT A	Input
19	Signal GND	SIG GND	GND	SGND	GND
20	Common	Chassis			GND
21	External data Clock (transmit data clock or receive FIFO Buffer output Clock (B) + *(3)	Ext Data/FIFO Clock B (+)*(3)	Ext Data/FIFO Clock B (+)*(3)	Ext Data/FIFO Clock B (+)*(3)	Input
22	Transmit Data (B) +	SD B (SD+)		TD B	Input
23	Transmit Clock (B) +	SCT B (ST+)		TSETC B	Output
24	Receive Data (B) +	RD B (RD+)		RD B	Output
25	RTS (B) +			RTS B	Input
26	Receive Clock (B) +	SCR B (RT+)		RSETC B	Output
27	CTS (B) +			CTS B	Output
28	Demod Fault Alarm *(2)	Demod Fault Alarm *(2)	Demod Fault Alarm *(2)	Demod Fault Alarm *(2)	OC TTL output
29	Data Mode (B) +			DCR B	Output
30	TR (B) +			DTR B	Input
31	Receive Ready (B) +			RLSD B	Output
32	Aux RS-232 Receive *(1)	Aux RS-232 Receive *(1)	Aux RS-232 Receive *(1)	Aux RS-232 Receive *(1)	Input
34	Aux RS-232 Transmit *(1)	Aux RS-232 Transmit *(1)	Aux RS-232 Transmit *(1)	Aux RS-232 Transmit *(1)	Output
35	Terminal Timing (B) +	SCTE B (TT+)		TSETT B	Input
37	Send Common				GND

Notes on Data Interface Connections:

1. The Aux RS-232 channel has multiple uses, including communications for redundancy, external AUPC and option interface Monitor and Control.
    a. If Automatic Uplink Power Control is provided by an external multiplexer the control channel uses the Aux RS-232 signal lines.
    b. This RS-232 Aux channel is shared with the optional interface card(s). Specifically the SDMS and SnIP Ethernet interfaces use this channel for modem monitor and control. Therefore, redundancy via the Y-cable is not possible with one of these cards installed, wether enabled or not. It is rare to require redundancy however with Ethernet interfaces as that is handled by alternate routing or STP (Spanning Tree Protocol).
2. The modulator and demodulator fault alarms are Open Collector TTL outputs used to interface to redundancy control equipment. The connected equipment should have a TTL type input with an approximate 3.3 to 10 kOhm pull up resistor to VCC The normal non-alarm condition is no drive to the output transistor. This produces an alarm when the modem is not present.
3. The External Data/FIFO clock pins are an input to the modem. An input at the receive data rate can be used to clock data out of the demodulator FIFO buffer. An input at the transmit data rate can be used to provide a transmit send timing clock which the modem will phase locked to (if within acceptable range). The send timing signal is still an output from the modem, but in this case will be at the input signal rate. Both functions can be used simultaneously if the transmit and receive data rates are the same.
4. The connecting cable should be shielded. The Shield is normally connected to the cable's shield at one end of the connection only. Connecting at the DTE end only prevents ground loop currents being carried on the shield.
5. The synchronous RS-232 connection is limited to 128 kbps.
6. Each differential signal pair (A & B or + & -) is normally assigned to the two physical wires of a twisted pair in the connecting cable.

1.1 Building Connecting and Adaptor Cables

The PSM-4900/PSM-500 uses a single female DB37 connector on the chassis rear at J3 for all terrestrial data interfaces. This is the connector from a standard RS-449 DCE interface. The modem connection is termed a "DCE" connection because by definition the modem is a piece of Data Communications Equipment. The line side DTE, or other DCE, equipment that the modem connects to will likely not use the same connector and pinouts unless it also uses an RS-449 interface. Following are cabling specifications and pinouts for the interconnection cables used to interface between the PSM-4900/PSM-500 and other types of equipment interfaces. These cables can take two forms: Direct connection from the PSM-4900/500 and an adaptor cable which connects to the PSM-4900/500 and presents the specified physical and electrical interface allowing to connect to an existing DCE cable end.

Section 1.1.5 shows the wiring necessary to build a "Y" cable allowing the PSM-4900/500 to perform a low cost version of 1:1 redundancy.

In all of the following tables the cable end required to connect to the modem is a DB37 Male connector, while the other end can be either a male or female connector depending upon the particular equipment to be interfaced.

The modem's DB37 connector contains more than the commonly listed signal lines. Specifically those lines added consist of:

- Clock lines (1 or 2 depending on the particular interface type) allowing an input to the modem to clock data out of the demodulator FIFO buffer.
- Two open collector alarm outputs, one each for the modulator and demodulator used by external redundancy equipment.
- Two RS-232 type signal lines contain the transmit and receive for an auxiliary control port. These lines are also used in redundancy schemes or could possibly by used to implement Automatic Uplink Power Control from an external multiplexer.

These non-standard signal lines are placed on unused pins of the modem's DB37 connector. Normally these lines are not needed in an adaptor cable, but if they are the user must determine where to place them.

Cable Shielding and Grounding Notes.

Per EIA recommendations pin 1 of either a DB37 RS-449 connector and pin 1 of DB25 RS-232/EIA530/V.35 connectors and pin A of an M34 (Winchester) V.35 connector represents the shield connection. Also per those recommendations pin 1 is not connected internally within the modem (DCE) end of the circuit. The shield of cables is connected to the connector shell or body, but is only connected to pin 1 at the DTE end of the circuit. This process is intended to minimize ground loops.

The RS-449 specification calls out three Signal Common circuits within the DB37 connection; Signal Ground on pin 19, Send Common on pin 37 and Receive Common on pin 20. All three are connected to the ground within the modem. The "Signal Ground" line on pin 19 is considered the common line that is connected to the appropriate pins on DB25 or Winchester M34 connectors. No connection is made between this line and the shields.

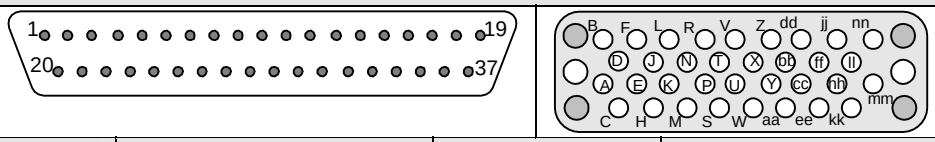
Common Cable Availability.

Four standard cable adaptors are normally stocked by Datum Systems. They may also be available from other companies as noted. These are the "Universal" DB37 male to DB25 female adaptor (DSF00-080), the "Y cable used for 1:1 redundancy (DSF00-081), a DB25 male to V.35 Winchester/M34 female adaptor (DSF00-082), and the DB37 to Winchester/M34 female cable (DSF00-083).
We also stock standard DB9 Male to Female and USB A to B control cables.

1.1.1 V.35 Adaptor Cable Pin Connections

The following table shows pin assignments and connections used to create an adaptor cable to a "Winchester" Type V.35 Connector. Note that in V.35 the signal and clock lines are differential and use two lines per (A and B), while the control lines are a single bipolar (RS-232 like) signal. This is the wiring of the Datum Systems Cable part number DSF00-083.

Table C-2. V.35 Data Interface Cable
37-Pin 'D-Sub" Male to Winchester Pin Assignment



Modem DB-37 Pin No.	Assignment	Direction	Winchester Connector Pin Assignment *
4	SD A (SD-)	Input	P
22	SD B (SD+)	Input	S
5	SCT A (ST-)	Output	Y
23	SCT B (ST+)	Output	aa
6	RD A (RD-)	Output	R
24	RD B (RD+)	Output	T
8	SCR A (RT-)	Output	V
26	SCR B (RT+)	Output	X
7	RTS	Input	C
9	CTS	Output	D
11	DSR	Output	E
12	DTR	Input	H
13	CD	Output	F
17	SCTE A (TT-)	Input	U
35	SCTE B (TT+)	Input	W
19	SIG GND	GND	B
1	Shield	GND	A
3	Ext FIFO Clock A (-)	Input	--Not Assigned--
21	Ext FIFO Clock B (+)	Input	--Not Assigned--
10	Mod Fault Alarm	OC TTL output	--Not Assigned--
28	Demod Fault Alarm	OC TTL output	--Not Assigned--

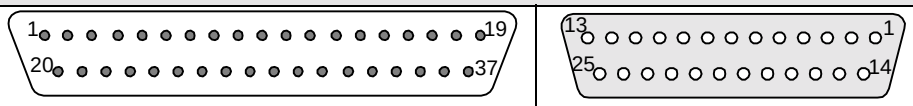
The modem uses a DB37 female connector on the chassis. To create an adaptor cable to connect to a Winchester male cable end (from a DTE device) the pin number from a DB-37 male connector would be wired to the corresponding pin number on a 34 pin Winchester female connector. To create a direct modem to DTE device (such as a router) cable the pin number from a DB-37 male connector would be wired to the corresponding pin number on a 34 pin Winchester male connector (if the DTE uses a female chassis connector).

Note: The 34 pin Winchester connector layout shown is a female.

1.1.2 RS-232 Adaptor Cable Pin Connections

The following table shows pin assignments and connections used to create an adaptor cable to a "DB25" Type RS-232 Connector. All of the signals in RS-232 are single line bi-polar signals. This is a "synchronous" RS-232 connection, unlike the simple asynchronous connection available at a personal computer.

Table C-3. RS-232 Data Interface
37-Pin 'D-Sub" Male Connector Pin Assignment



Modem DB-37 Pin No.	Assignment	Direction	DB25 Female Connector Pin Assignment *
4	SD	Input	2
5	ST	Output	15
6	RD	Output	3
8	RT	Output	17
7	RTS	Input	4
9	CTS	Output	5
11	DSR	Output	6
12	DTR	Input	20
13	DCD	Output	8
17	TT	Input	24
3	Ext FIFO Clock A (-)	Input	18 -- (no standard)--
19	SIG GND	GND	7
1	Shield	GND	1
10	Mod Fault Alarm	OC TTL output	25
28	Demod Fault Alarm	OC TTL output	23

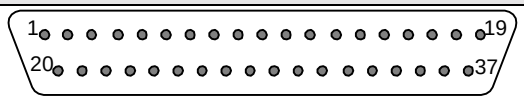
The modem uses a DB37 female connector on the chassis. To create an adaptor cable to connect to an RS-232 DB25 male cable end (from a DTE device) the pin number from a DB-37 male connector would be wired to the corresponding pin number on a DB-25 female connector. To create a direct modem to DTE device (such as a router) cable the pin number from a DB-37 male connector would be wired to the corresponding pin number on a DB-25 male connector (if the DTE uses a female chassis connector).

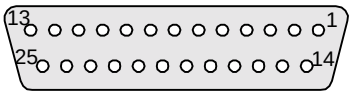
Note: The EIA530 adaptor described in the following section can also be used to replace this adaptor if the extra pin connections are not used for other purposes.

1.1.3 EIA-530/Universal Adaptor Cable Connections (P/N DSF00-080)

The following table shows pin assignments and connections used to create an adaptor cable to a "DB25" Type EIA-530 Connector. This is also a "universal" adaptor, which will work with most other equipment that uses a DB25 connector including RS-232 and V.35 (on DB25).

Table C-4. EIA-530 Data Interface
37-Pin 'D-Sub" Male Connector Pin Assignment





Modem DB-37 Pin No.	Assignment	Direction	DB25 Female Connector Pin Assignment *
4	TD A (SD-)	Input	2
22	TD B (SD+)	Input	14
5	TSETC A (ST-)	Output	15
23	TSETC B (ST+)	Output	12
6	RD A (RD-)	Output	3
24	RD B (RD+)	Output	16
8	RSETC A (RT-)	Output	17
26	RSETC B (RT+)	Output	9
7	RTS A	Input	4
25	RTS B	Input	19
9	CTS A	Output	5
27	CTS B	Output	13
11	DSR (DCR) A	Output	6
29	DSR (DCR) B	Output	22
12	DTR A	Input	20
30	DTR B	Input	23
13	RLSD (DCD) A	Output	8
31	RLSD (DCD) B	Output	10
17	TSETT A (TT-)	Input	24
35	TSETT B (TT+)	Input	11
19	SIG GND	GND	7
1	Shield	GND	1
3	Ext FIFO Clock A (-)	Input	18-- (no standard)--
21	Ext FIFO Clock B (+)	Input	21-- (no standard)--
10	Mod Fault Alarm	OC TTL output	25-- (no standard)--
28	Demod Fault Alarm	OC TTL output	Not installed **23-- (no standard)--

The “A” and “B” lines of each signaling pair should be connected to the two lines of cable twisted pairs.

The modem uses a DB37 female connector on the chassis. To create an adaptor cable to connect to an EIA530 DB25 male cable end (from a DTE device) the pin number from a DB-37 male connector would be wired to the corresponding pin number on a 25 pin DB25 female connector. To create a direct modem to DTE device (such as a router) cable the pin number from a DB-37 male connector would be wired to the corresponding pin number on a DB25 male connector (if the DTE uses a female chassis connector).

Many routers use a common 60 or 68 pin cable for all types of connections, and adaptors are available from several sources between that connector and either DB25 or Winchester/M34 connectors.

**Note that in this cable the DTR B signal input to the modem coincides with the demodulator fault alarm output from the modem. It is recommended that the Demod fault line not be installed since these are special purpose non-standard signals rarely used.

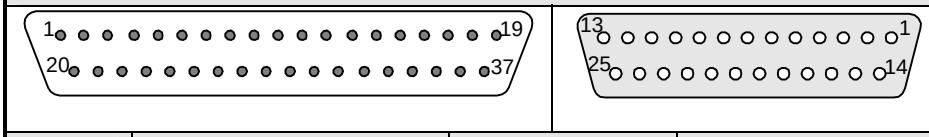
This EIA530 cable adaptor can also serve as a “Universal” adaptor both to an RS-232 type DB25 connection and to a PSM-2100 type DB25 V.35 connection as outlined in Section 1.1.4 below.

This “Universal” adaptor is normally stocked by Datum Systems under Part Number DSF00-080.

1.1.4 V.35 Using DB25 Adaptor Cable Pin Connections or Adaptor to PSM-2100 Type DB25 Connection

The following table shows pin assignments and connections used to create an adaptor cable to a "DB25" Connector as used in many V.35 applications and on the PSM-2100 modems. This cable would allow a PSM-4900/500 Modem to replace a PSM-2100 Modem in an existing system.

Table C-5. V.35 25 pin (DB25) Data Interface 37-Pin 'D-Sub" Male Connector Pin Assignment



Modem DB-37 Pin No.	Assignment	Direction	DB25 Female Connector Pin Assignment *
4	SD A (SD-)	Input	2
22	SD B (SD+)	Input	14
5	SCT A (ST-)	Output	15
23	SCT B (ST+)	Output	12
6	RD A (RD-)	Output	3
24	RD B (RD+)	Output	16
8	SCR A (RT-)	Output	17
26	SCR B (RT+)	Output	9
7	RTS	Input	4
9	CTS	Output	5
11	DSR	Output	6
12	DTR	Input	20
13	DCD	Output	8
17	SCTE A (TT-)	Input	24
35	SCTE B (TT+)	Input	11
19	SIG GND	GND	7
1	Shield	GND	1
3	Ext FIFO Clock A (-)	Input	**18 --Not Assigned--
21	Ext FIFO Clock B (+)	Input	21 --Not Assigned--
10	Mod Fault Alarm	OC TTL output	25
28	Demod Fault Alarm	OC TTL output	23

Note: The EIA530 adaptor described in the previous section can also be used to replace this adaptor if the extra pin connections are not used for other purposes.
** If this adaptor is used to allow a PSM-4900/500 modem to replace a PSM-2100 modem and the external FIFO clock lines are used the "A" line should be connected to pin 19 of the DB25.

1.1.5 Data Interface "Y" Cable Pin Connections

The following table shows pin assignments and connections used to create a special "Y" cable for implementing 1:1 redundancy between two PSM-4900 or PSM-500 units. The cable is the same for any interface standard programmed, but the two unit types and settings must be the same.

Table C-6. Data Interface 37-Pin 'D-Sub Y Cable Connections

Signal Name	Modem A DB-37 Male Pin No.	Modem B DB-37 Male Pin No.	Common I/O DB-37 Female Pin No.
Shield (Open)	1	1	1
External Clock (A) –	3	3	3
Transmit Data (A) –	4	4	4
Transmit Clock (A) –	5	5	5
Receive Data (A) –	6	6	6
RTS (A) –	7	7	7
Receive Clock (A) –	8	8	8
CTS (A) –	9	9	9
Data Mode (A) –	11	11	11
TR (A) –	12	12	12
Receive Ready (A) –	13	13	13
Mod Fault Alarm	14	14	14
Terminal Timing (A) –	17	17	17
Signal GND	19	19	19
Common	20	20	20
External Clock (B) +	21	21	21
Transmit Data (B) +	22	22	22
Transmit Clock (B) +	23	23	23
Receive Data (B) +	24	24	24
RTS (B) +	25	25	25
Receive Clock (B) +	26	26	26
CTS (B) +	27	27	27
Data Mode (B) +	29	29	29
TR (B) +	30	30	30
Receive Ready (B) +	31	31	31
Aux RS-232 Receive **	32	34	N/C
Demod Fault Alarm	33	33	33
Aux RS-232 Transmit **	34	32	N/C
Terminal Timing (B) +	35	35	35

** Note the reversal on these two lines; all other lines are 1:1.

2.0 Remote Control Pin Connections

The unit is supplied with a combination RS-232/RS-485 control interface. Table C-7 shows the pin assignments used to create an "adaptor" cable from the unit's 9-pin female "D" sub connector to other common types of interfaces connections such as the common DB9 male connector available on a personal computer for asynchronous RS-232 interface or standard RS-232 type DB25 connectors.

2.1 RS-232 Control Cable Pin Connections

The following table showing pin assignments and connections can be used to create an interconnecting cable from the modem's DB9 female control port to a "DB9" PC RS-232 or a "DB25" Type RS-232 connector. All of the signals in RS-232 are single line bi-polar signals. This is an "asynchronous" RS-232 connection. No hardware flow control signals are available on the connector. A standard personal computer DB9 Male to Female cable is usable in this application.

Table C-7. RS-232 Data Interface
9-Pin 'D-Sub' Cable Male Connector to J6 Pin Assignment

Modem DB-9 Pin No.	Assignment	Direction	DB9 Female Connector Pin Assignment *	DB25 Female Connector Pin Assignment *
2	RS–232 Transmit Signal	Output	2	3
3	RS–232 Receive Signal	Input	3	2
5	RS-232 Signal Common	I/O	5	7

2.2 RS-485 Control Cable Pin Connections

The following table shows pin assignments for connecting to the modem's RS-485 remote control port. A full interconnecting cable is not shown, as no standard exists for the RS-485 connections at the controller end of the cable. This is an "asynchronous" RS-485 connection. No hardware flow control signals are available on the connector.

Table C-8. RS-485 Data Interface
9-Pin 'D-Sub' Cable Male Connector to J6 Pin Assignment

Modem DB-9 Pin No.	Assignment	Direction
1	RS–485 Transmit Data (B) +	Output
6	RS-485 Transmit Data (A) -	Output
8	RS-485 Receive Data (B) +	Input
9	RS-485 Receive Data (A) -	Input

2.3 USB Update/Control Cable

The USB software update or remote control cable is a standard A to B cable no longer than 10 ft. These are normally purchased and not separately fabricated.

3.0 Auxiliary Pin Connections with R-S/IBS Multiplexer Option Installed

When the optional Reed-Solomon and IBS Multiplexer card is installed in the modem the Engineering Service Channel and Remote Facility Channel input/output is brought out to the Auxiliary I/O connector, J4.
Table C-9 below defines the J4 connector pin assignments with this option installed. The modem's connector is a DB37 Male connector and requires a DB37 female connector to mate with it.
Note that when the IBS Multiplexer is placed in the IBS "Standard" mode the Engineering Service Channel, or ESC, RS-232 connection is synchronous and uses clock lines. When in the "Enhanced" or "Custom" modes the ESC RS-232 mode is asynchronous and presents common asynchronous control signal lines.

Table C-9. Auxiliary ESC/RFC Interface
37-Pin 'D-Sub" Male Connector J4 Pin Assignment

Modem DB37 Pin No.	Assignment	Direction
	ESC in IBS All Modes RS-485 Connection	
4	RS-485 Transmit Data (B) +	Input
12	RS-485 Transmit Data (A) -	Input
6	RS–485 Receive Data (B) +	Output
11	RS-485 Receive Data (A) -	Output
	ESC in IBS Standard Mode RS-232 Synchronous Connection	
4	RS–232 Transmit Data	Input
13	RS–232 Transmit Clock	Output
6	RS–232 Receive Data	Output
7	RS–232 Receive Clock	Output
	ESC in IBS Enhanced/Custom Mode RS-232 Asynchronous Connection	
4	RS–232 Transmit Data	Input
6	RS–232 Receive Data	Output
7	RS–232 CTS	Output
9	RS–232 RTS	Input
11	RS–232 DSR	Output
12	RS–232 DTR	Input
13	RS–232 DCD	Output

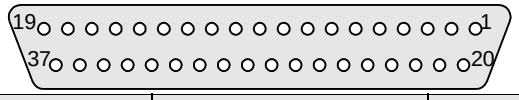
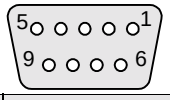
Table C-9. Auxiliary ESC/RFC Interface 37-Pin 'D-Sub" Male Connector J4 Pin Assignment		
Modem DB37 Pin No.	**Assignment**	**Direction**
	IBS Custom Mode RFC-I/O Connections	
33	RFC channel A Input (TTL, Internal 1mA Pull-Up)	Input
34	RFC channel A Form-C Common	Output
35	RFC channel A Form-C N.C.	Output
16	RFC channel A Form-C N.O.	Output
15	RFC channel B Input (TTL, Internal 1mA Pull-Up)	Input
17	RFC channel B Form-C Common	Output
18	RFC channel B Form-C N.C.	Output
36	RFC channel B Form-C N.O.	Output
14, 19, 20, 32, 37	Ground	Common

3.1 Aux ESC Port Adaptor Cables

The modem's rear panel Auxiliary port is a DB37 male connector carrying multiple potential signals. To use this port you will often need to build special cable adaptors for use with common or specialized connections. Several are shown below for ESC connections.

3.1.1 RS-232 Computer DB9 to Aux ESC Port Adaptor Cable

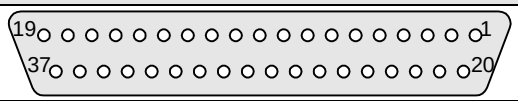
To connect from a PC type computer with a DB9 type connector on the rear panel to the Aux ESC Port J4 on the modem rear the following adaptor cable will allow the use of a standard DB9 male to female connector between them. The adaptor described below could also be made approximately 6 feet long if the computer is that close.

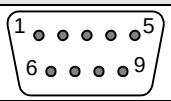
Table C-10. RS-232 Aux ESC to Computer Adaptor Cable 37-Pin D-Sub Female to 9 pin D-Sub Female Connector Pin Assignment			
			
Modem Aux Port DB-37 Pin No.	**Assignment**	**Direction Relative to Aux Port**	**DB9 Female Connector Pin Assignment ***
4	SD	Input	3
6	RD	Output	2
20	SIG GND - Shield	GND	5

3.1.2 RS-232 Modem Control DB9 to Aux ESC Port Adaptor Cable

For remote control applications it is often desireable to connect from the modem's rear panel Aux port to its own or another modem's J6 Control Port. The following adaptor cable will allow that connection, and can also be used with a standard DB9 male to female connector to extend the connection length. The adaptor described below would normally be approximately 5 inches long.

Table C-11. RS-232 Aux ESC to Modem J6 Adaptor Cable
37-Pin D-Sub Female to 9 pin D-Sub Male Connector Pin Assignment



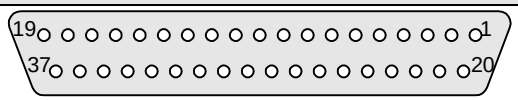


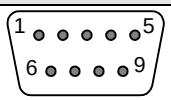
Modem Aux Port DB-37 Pin No.	Assignment	Direction Relative to Aux Port	DB9 Male Connector Pin Assignment *
4	SD	Input	2
6	RD	Output	3
20	SIG GND - Shield	GND	5

3.1.3 RS-485 Modem Control DB9 to Aux ESC Port Adaptor Cable

As an alternate to the cable above changing the connections for RS-485 will allow control of multiple modems at a location.

Table C-12. RS-485 Aux ESC to Modem J6 Adaptor Cable
37-Pin D-Sub Female to 9 pin D-Sub Male Connector Pin Assignment





Modem Aux Port DB-37 Pin No.	Assignment	Direction Relative to Aux Port	DB9 Male Connector Pin Assignment *
4	SD-B (+)	Input	1
12	SD-A (-)	Input	6
6	RD-B (+)	Output	8
11	RD-A (-)	Output	9
20	SIG GND - Shield	GND	5

The shield is not absolutely required for 485. The differential SD should be one twisted pair and the RD should be a second twisted pair.

4.0 RF/IF Connections

The unit transmit and receive IF signals are intended to be carried on coaxial cable connected via BNC connectors. The connectors on the unit are BNC Female and the connecting cables should use BNC Male.

The M5 70 MHz modem can be programmed to provide either 50Ω or 75Ω IF interfaces. If the unit is programmed to provide a 50Ω impedance connection the cable type should be consistent, such as RG58 type cable. If the unit is programmed to provide a 75Ω impedance connection the cable type should be consistent, such as RG59 type cable.

The modem maintains its characteristic transmit impedance even when the output is turned off or disabled either in standard or redundant modes. This provides a constant impedance termination when connected to RF upconverter or IF combiner equipment.

Both Transmit and Receive IF connections are capacitively coupled. It is however good practice to use an external “DC block” if DC power is to be placed on the transmit or receive IF cables.

4.1 L-Band RF/IF Connections

The L-Band (950 to approximately 2000 MHz range) used for the receive of the PSM-4900/500H modem and the transmit and receive of the PSM-4900/500L modem have special connection and cabling requirements. These are separated into the receive and transmit sides as they are significantly different. Of common note however is the at the cables must have very high shielding efficiency to prevent cross-talk from the transmit to receive lines.

4.1.1 L-Band Receive Cables

The L-Band Receive is usually 75 Ohms and uses type “F” connectors on both ends. The cable must be capable of carrying 3 different signals effectively: the L-Band receive signal, medium current DC power up to 500 mA and a 10 MHz reference signal. The cable must therefore have low loss through the entire L-Band. Note that the common RG-59 cable is not suitable for this application.

Example receive cable types:
RG6 (approx. 0.25 inch diameter).
RG11 (approx 0.405 inch diameter, may be difficult to find type “f” connectors for).

4.1.2 L-Band Transmit Cables

The L-Band Transmit is usually 50 Ohms and uses type “N” connectors on both ends. The cable must be capable of carrying 3 different signals effectively: the L-Band transmit signal, high current DC power up to approximately 5 A and a 10 MHz reference signal. The cabling and connections must be carefully designed to have low loss for each of these signals.

Example transmit cable types:
RG214 for shorter cable runs (<100 ft).
LMR-400 for cable runs up to approximately 300 ft.
..Belden 9913 – similar to LMR-400.

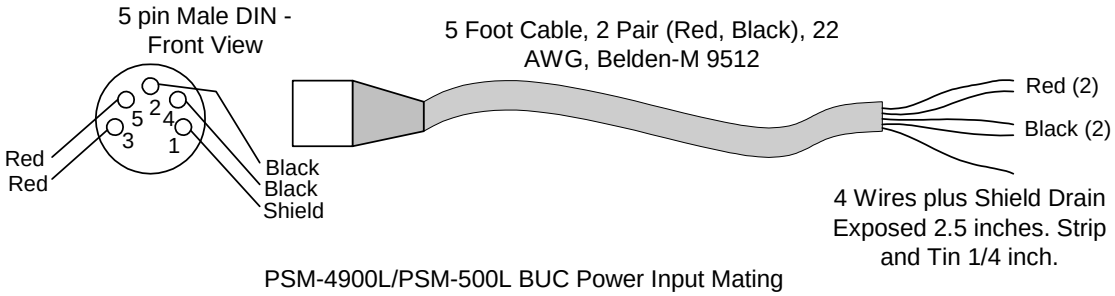
5.0 L-Band BUC Power Cable & Connections

The M5 series PSM-4900L and M500 series PSM-500L modems include a built in Bias-T Multiplexer that allows sending DC power and a 10 MHz reference up the transmit coaxial cable for use by the connected Block Up Converter or BUC. Normally the modem is supplied with an external 24 Volt power supply to power the BUC. Some higher powered BUCs require a 48 Volt power supply. One of Datum Systems' standard supply to meet this need is the Astrodyne SP-150-48 which has a 3.2 Amp output sufficient for most BUCs in the approximate 10 Watt range. The power supply connections require care to insure proper BUC operation. The connections shown here should be applicable to a wide variety of power supplies, and if required you can use this information to fabricate your own cable.

There are two cables attached to the power supply, the DC cable from supply to modem and the AC cable from AC power outlet to the supply. The DC cable is normally a Datum Systems' P/N DSF03-085, which is a 2 pair, 22 AWG, shielded cable with one end terminated in a 5 pin DIN connector mating with the modem connector.

Caution: The modem internal circuitry, the DIN connector and the cable are designed for an absolute maximum of 6 Amps. The DIN connector pin connections internally are designed for higher heat dispersal to handle this much current, but it must not be exceeded.

The DC cable required to connect the power supply to the PSM-4900L or PSM-500L modem is assembled as follows:



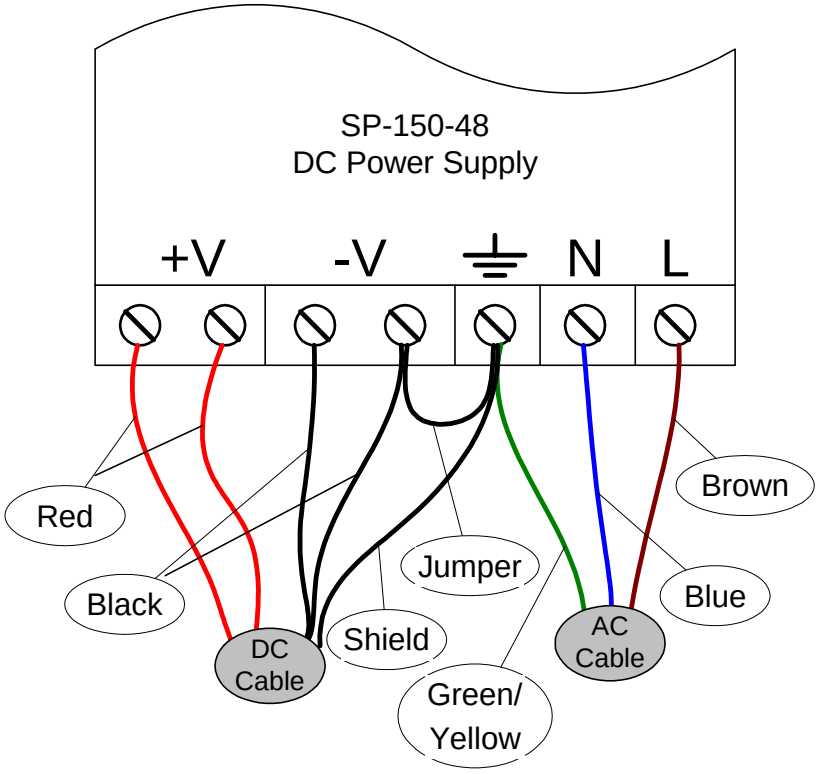
PSM-4900L/PSM-500L BUC Power Input Mating
Cable DSF03-085 - Assembly Diagram

The modem's matching female DIN connector is described in the main manual body.

Two wires each are used for the V+ and V-, which adds redundancy and helps to carry the current. It is difficult to get larger wires soldered to the DIN connector. The cable may be made shorter if desired.

The figure below shows the power supply wiring to this cable. Most packaged DIN rail type supplies have similar connections.

Note especially the jumper added between the ground and one of the negative supply leads. This jumper is important when used with BUCs that can use FSK control signals, otherwise the 4th harmonic of the supplies switching frequency may interfere with the FSK operation.



The AC cable is a 3 wire standard power cable with an AC plug appropriate for the country of use.