VOICE AND DATA COMMUNICATIONS PRODUCTS

ACCURATE ELECTRONICS INC

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Practice Section 10402000 Rev A

DUAL 11 PORT ACTIVE DATA BRIDGE MODULE
MODEL 10402000

Contents:

1. GENERAL

1.01 This practice provides application, specification, circuit and mechanical description, maintenance, installation, and warranty information relating to Accurate Electronics' Dual 11 Port Active Data Bridge Module, Model 10402000.

1.02 The10402000 Dual 11 Port Active Data Bridge Module provides 4wire transmission interconnection between a dedicated common port and ten multiple ports.

1.03 The 10402000 incorporates a splitter channel and a concentrator channel. Multiple inputs are connected to a common concentrator channel output, and in the splitter channel, a common input is connected to multiple outputs. Splitter and concentrator channels are separate and independent, allowing operation in full duplex data transmission applications.

1.04 The10402000 is an active bridge. Front panel accessible potentiometers provide continuous adjustment of cross bridge gain or loss within two switch selectable loss/gain ranges suitable for most data applications: -30 to –10dB and –10 to +10dB. Either range may be selected independently for each channel. The level to which each channel is adjusted is common to all cross bridge port combinations in that channel – i.e., if the slitter channel potentiometer is set for + 3dB gain, all common to multiple port paths in the splitter channel receive a +3dB level increase.

1.05 All common and multiple ports are characterized by balanced 600-ohm terminating impedance. The active circuitry allows unused multiple ports to be left unterminated without affecting the transmission response of the ports in use.

1.06 Front panel input, output, and line monitor jacks allow cross bridge measurement and monitoring of transmission parameters in both the splitter and concentrator channels.

1.07 The 10402000 may be powered from input voltage of –22 to –56 VDC at a maximum current of 60mA.

1.08 The 10402000 mounts in one position of an Accurate Type-10 Mounting Shelf, versions of which are available for relay rack or apparatus case installations. In relay rack applications, up to 12 modules may be mounted across a 10-inch rack, while up to 14 modules may be mounted across a 23-inch rack. In either case, 6 inches of vertical rack space are used.

2. APPLICATION

2.01 The10402000 interconnects several 4wire data modems to a common data channel or data link. The common data link is terminated at the distant end into a Central Processor Unit (CPU) or computer that may time-sequence-poll various outlying or remote data terminals. A 10402000 provides the central transmission bridge arrangement, or 'hubbing' network, that extends data transmission to the outlying terminals.

2.02 The active circuitry providing cross bridge gain or loss adjustment has two distinct application advantages. Because of the 10402000's gain capability, individual multiple port level control, when required, can usually be provided by a pad or pad/transformer module rather than by a more expensive line amplifier module. The particular active design of the 10402000 also permits unused multiple ports to remain unterminated – i.e., insertion loss and cross bridge loss levels show negligible variation, regardless of the number of terminated multiple ports.

2.03 The most typical of applications, where modems interfacing the multiple ports are all on the same physical premises, within 1,000 feet of the bridge module itself, neither additional level control nor termination modules are required. Level control circuitry and the 600-ohm balanced termination are sufficient to allow the bridge module to function alone. The only exceptions to this are if one or more of the modems is unbalanced or requires transmission levels different from the others.

2.04 External level control, when required, is usually provided by pad or pad/transformer devices. In an application in which individual multiple port level control is necessary, the bridge module's level adjustment is set to satisfy the needs of the multiple port path requiring the most gain (or least loss). The appropriate amount of additional loss from this cross bridge level is then introduced at each of the other multiple ports via an attenuation device.

2.05 If the cable length of the distant end termination of a multiple port is less than 1,000 feet, the exposure to longitudinally induced metallic noise is minimal, and a pad module, which is unbalanced, may be used for level control. If the distance is over 1,000 feet, or the modem at the distant end is unbalanced, a pad/transformer module must be used, because the circuit now needs balance as well as level control. The pad/transformer device may be located at either end of the multiple port circuit, except when an unbalanced modem is involved; in this case, the pad/transformer (or other transformer isolation device) must be located at the modem. Line amplifiers can be used

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in any application within the scope of their level control range, because they also contribute balance.

2.06 Tandem bridge arrangements to expand the number of multiple ports of a 4wire data hubbing network may be achieved by direct connection of one multiple port in each channel of the first 10402000 to the common port of the same channel of a second 10402000, etc. Thus, the tandem arrangement of two 10402000 Modules would provide a bridge with one common and 19 multiple ports. Tandem arrangement may be carried one step further by interconnecting three bridge modules, but to prevent excessive noise from being introduced into the circuit, it is recommended that no more than three 10402000 be used in such an arrangement.

2.07 The multitude of mounting shelves and apparatus cases available for the 10402000 and associated level control modules permit central office relay rack or customer premises apparatus case installation with equal ease.

3. INSTALLATION

Inspection

3.01 Visually inspect the equipment upon its arrival to locate possible shipping damage. If damaged is found, immediately file a claim with the carrier. If the equipment is stored, re-inspect it prior to installation.

Mounting

3.02 The 10402000 mounts in one position of the Accurate Type-10 Mounting Shelf, which is available in configurations for both relay rack and apparatus case installation. The 10402000 plugs physically and electrically into a 56-pin connector at the rear of the shelf. All connections are made at the rear of the shelf to wire wrap pins that are part of the 56-pin connector.

Connections

3.03 Before making any connections to the shelf, ensure that power is off and modules are removed. Modules should be placed only after they are properly optioned and after wiring is completed.

3.04 Table 1 lists external connections to the 10402000. Pin numbers are found on the card connector at the rear of the shelf.

Note: Because of the jack access arrangement of the 10402000, it is suggested that in applications requiring individual multiple port level control, the multiple path requiring the most gain (or least loss) be wired to Port 1 on the bridge. This may facilitate alignment and testing.

Options

3.05 Option switches S1 and S2 determine the loss/gain ranges of the splitter and concentrator channels, respectively. Set each switch to the *Low* splitter position if an adjustable gain range of –30 to –10dB is desired, or to the *High* position if an adjustable gain range of –10 to +10dB is desired. Switch

Table 1. External Connections to the 10402000

CONNECT	TO PIN		CONNECT	TO PIN
Port 1 concentrator input tip	31		Port 7 concentrator input tip	52
Port 1 concentrator input ring	29		Port 7 concentrator input ring	46
Port 1 splitter output tip	21		Port 7 splitter output tip	6
Port 1 splitter output ring	25		Port 7 splitter output ring	12
Port 2 concentrator input tip	37		Port 8 concentrator input tip	50
Port 2 concentrator input ring	55		Port 8 concentrator input ring	48
Port 2 splitter output tip	19		Port 8 splitter output tip	8
Port 2 splitter output ring	23		Port 8 splitter output ring	10
Port 3 concentrator input tip	39		Port 9 concentrator input tip	40
Port 3 concentrator input ring	53		Port 9 concentrator input ring	32
Port 3 splitter output tip	15		Port 9 splitter output tip	22
Port 3 splitter output ring	1		Port 9 splitter output ring	26
Port 4 concentrator input tip	49		Port 10 concentrator input tip	38
Port 4 concentrator input ring	51		Port 10 concentrator input ring	30
Port 4 splitter output tip	5		Port 10 splitter output tip	20
Port 4 splitter output ring	3		Port 10 splitter output ring	24
Port 5 concentrator input tip	56		-V (battery)	35
Port 5 concentrator input ring	42		GND (ground)	17
Port 5 splitter output tip	2		Common input T (tip)	7
Port 5 splitter output ring	16		Common input R (ring)	13
Port 6 concentrator input tip	54		Common input SX (simplex)	9 or 11
Port 6 concentrator input ring	44		Common output T (tip)	41
Port 6 splitter output tip	4		Common output R (ring)	47
Port 6 splitter output ring	14		Common output SX (simplex)	43 or 45

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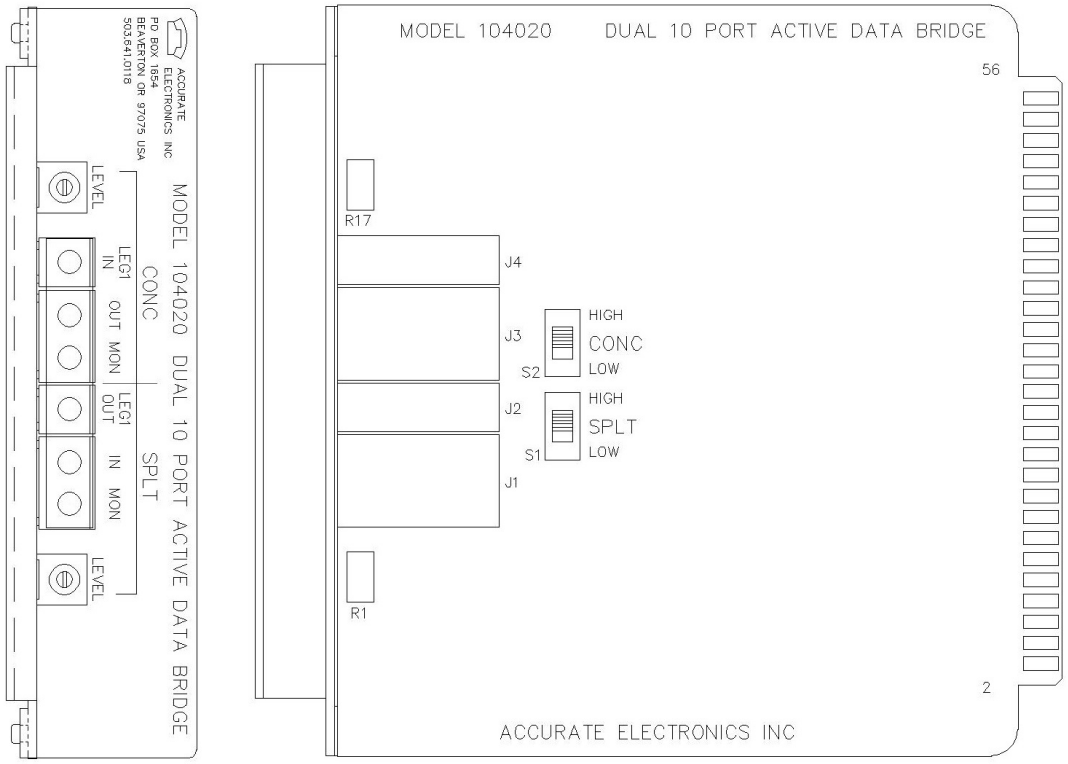
Figure 2. Gain Switch Locations



locations are shown in Figure 2. Fine level adjustments within each range, made via front panel potentiometer, are covered in paragraphs 3.06 and 3.07.

Level Adjustment (All Multiple Ports at Same Level)

Note: It is assumed at this point that the appropriate splitter and concentrator ranges have been selected via switches S1 and S2, respectively. If not, refer back to paragraph 3.5 and set S1 and S2, as required before adjusting levels via the front panel potentiometers.

3.06 To adjust the concentrator channel level, connect a 600-ohm terminated transmission test set to the concentrator out jack and insert 1000Hz test tone at the level specified on the Circuit Level Record (CLR) in the concentrator #1 in jack. Then adjust the concentrator channel level potentiometer to obtain the output level specified on the CLR.

3.07 To adjust the splitter channel level, connect a 600-ohm terminated transmission test set to the splitter #1 out jack and insert 1000Hz test tone at the level specified on the CLR into the splitter in jack. Then adjust the splitter channel level potentiometer to obtain the output level specified on the CLR.

Level Adjustment (Individual Multiple Port Levels)

Note: It is assumed that levels have been calculated and that the multiple port circuit requiring the most gain (or least loss) is connected to Port 1 of the bridge module. It is also assumed that the appropriate splitter and concentrator ranges have been selected via switches S1 and S2, respectively. If not, refer back to paragraph 3.05 and set S1 and S2 as required before adjusting levels via the front panel potentiometers.

3.08 To adjust levels when individual multiple port level control is required, adjust the concentrator channel level as described back in paragraph 3.06 to obtain the required level for the multiple port circuit connected to Port 1. Then adjust each pad, pad/transformer, or line amplifier module, as specified in the practice for the particular module, to obtain the required levels for the rest of the multiple port circuits in the concentrator channel. Adjust the splitter channel level as described back in paragraph 3.07 to obtain the required level for the multiple port circuit connected to Port 1. Then adjust each pad, pad/transformer, or line amplifier module, as specified in the practice for the particular module, to obtain the required levels for the rest of the multiple port circuits in the splitter channel.

4. CIRCUIT DESCRIPTION

4.01 For help in understanding this section, refer to Figure 1.

4.02 The input of the concentrator channel consists of matched precision resistors at each multiple port and a transformer with the primary shunted by a low value resistor. This provides a low impedance summing point and port isolation for the multiple input ports. Input signals are coupled through the transformer to a variable gain amplifier followed by a switched fixed gain output amplifier and coupling transformer.

4.03 The splitter channel consists of a transformer input variable gain integrated circuit operational amplifier and a power amplifier. The output of the power transformer is of very low impedance and drives twenty 300-ohm resistors to derive proper impedance at the multiple output circuits. The low impedance of the power amplifier provides isolation between output circuits.

4.04 A power supply regulator allows operation on external – 22 to –56 VDC input. A polarity protection diode guards against inadvertent reversal of input power connections. A high voltage surge protector is used to attenuate high voltage transients on the input power leads.

5. MECHANICAL OUTLINE

5.01 See FIGURE 2.

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6. SPECIFICATIONS

6.01 Electrical

Splitter and Concentrator Channel Loss/Gain:
-30 to +10dB usable range

Maximum Output Level (Overload Point):
Splitter: +5dBm Concentrator: +12dBm

Level Change with Loading: 1dB maximum, one port to all ports loaded

Input and Output Port Impedance: 600 ohms balanced

Harmonic Distortion: Splitter: less than 1 % at +3dBm
Concentrator: less than 1 % at +8dBm

Noise: 20dBrrnC, maximum

Frequency Response: ±1dB re 1000Hz level, 300 to 5000Hz

Input Power: -22 to –56VDC, 60mA, maximum

6.02 Environmental

Operating Environment: 20 to 130F (-7 to 54C)

Humidity: up to 95% R.H. (no condensation

6.03 Physical

Dimensions: 5.580" H x 1.420" W x 5.960" D
14.17cm H x 3.61cm W x 15.14cm D

Weight: 16 ounces (454 grams)

Mounting: one position of an Accurate Type-10 Mounting Shelf

7. TESTING AND TROUBLESHOOTING

7.01 The Testing Guide Checklist (see Table 2) may be used to assist in the installation, testing or troubleshooting of the product. The checklist is intended as an aid in the localization of trouble to a specific product. If a product is suspected of being defective, a new one should be substituted and the test conducted again. If the substitute product operates correctly, the original product should be considered defective and returned to Accurate for repair or replacement as directed below. We strongly recommend that no internal (component-level) testing or repairs be attempted on the product. Unauthorized testing or repairs may void the product's warranty. Also, if the product is part of a registered system, unauthorized repairs will result in noncompliance with Part 68 of the FCC Rules and Regulations.

TECHNICAL ASSISTANCE

7.02 Contact Accurate Electronics, Inc. 503.641.0118, FAX: 503.646.3903; Mail: PO Box 1654, Beaverton OR 97075-1654.

RETURN PROCEDURE (FOR REPAIR)

7.03 To return equipment for repair, first contact Accurate Electronics, Inc. Enclose an explanation of the malfunction, your company's name and address, the name of a person to contact for further information, and the purchase order number for the transaction. Accurate Electronics will inspect, repair, and retest the equipment so that it meets its original performance specifications and then ship the equipment back to you. If the equipment is in warranty, no invoice will be issued.

8. MAINTENANCE

8.01 No preventive maintenance is required. General care is recommended.

9. WARRANTY

9.01 All Accurate Electronics Inc. products carry a full FIVE (5) YEAR warranty on materials and workmanship. See WARRANTY in front of catalog.

Note: Warranty service does not include removal of permanent customer markings on the front panels of Accurate Electronics' products, although an attempt will be made to do so. If a product must be marked defective, we recommend that it be done on a piece of tape or on a removable stick-on label.

9.02 If a situation arises that is not covered in the checklist, contact Accurate Customer Service as follows (telephone number are given below):

Contact Accurate Electronic Customer Service

9.03 If a product is diagnosed a defective, follow the replacement procedure in paragraph 9.04 when a critical service outage exists (e.g., when a system of a critical circuit is down and no spares are available). If the situation is not critical, follow the repair and return procedure in paragraph 9.05.

Replacement

9.04 To obtain a replacement product, notify Accurate Electronics. Be sure to provide all relevant information, including the 10402000 part number that indicates the issue of the product in question. Upon notification, we shall ship a replacement product to you. If the product in question is in warranty, the replacement will be shipped at no charge. Pack the defective product in the replacement product's carton, sign the packing slip included with the replacement, and enclose it with the defective product (this is your return authorization). Affix the preaddressed label provided with the replacement product to the carton being returned, and ship the product prepaid to Accurate Electronics.

Repair and Return

9.05 Return the defective product, shipment prepaid, to Accurate Electronics Inc. :

ACCURATE ELECTRONICS INC.
ATTN: REPAIR AND RETURN
8687 SW HALL BLVD. #100
BEAVERTON, OREGON 97008 USA

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FIGURE 1. Circuit Description

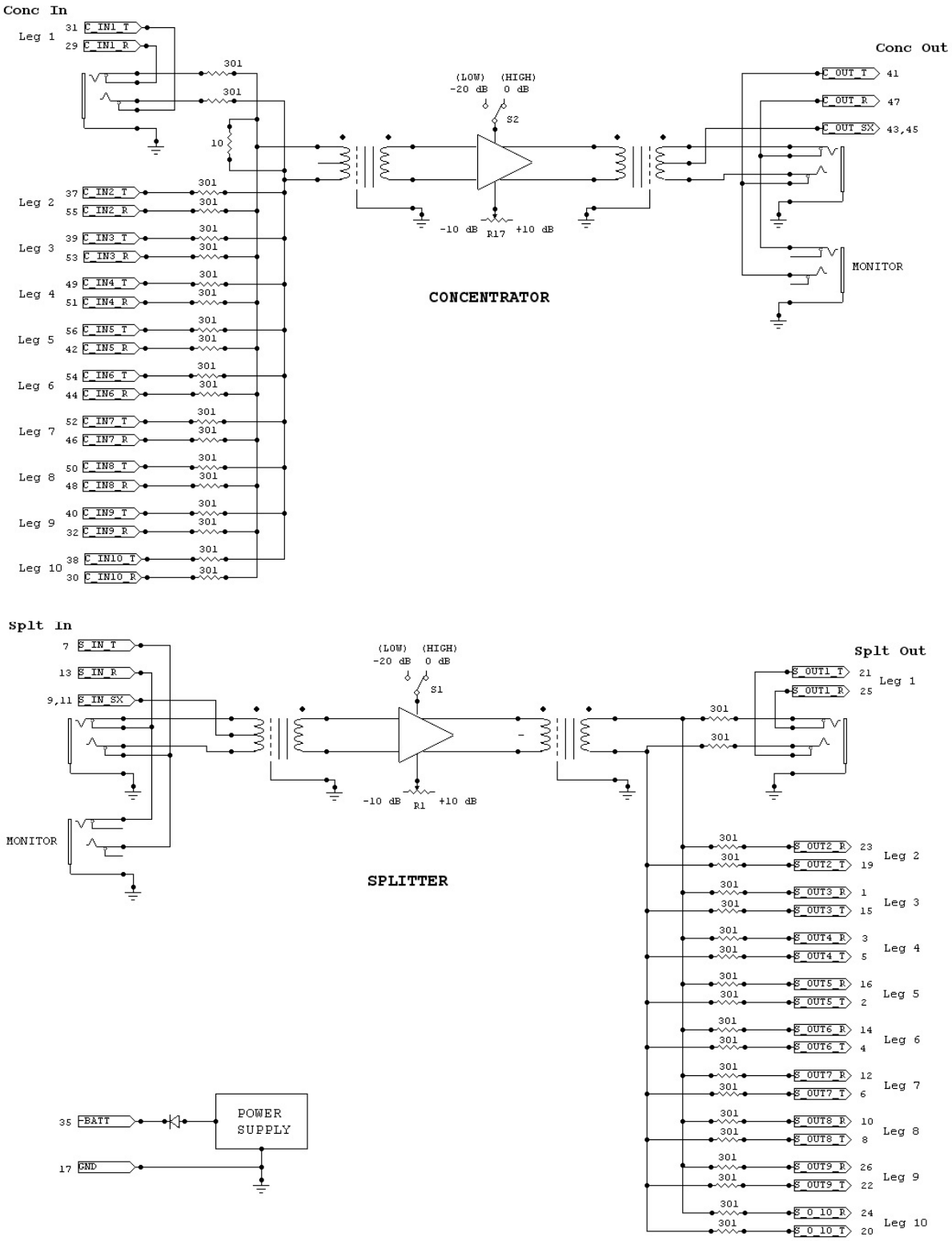

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Table 2. Test Guide Checklist.

Test	Procedure	Normal results	If Normal Conditions Are Not Met, Verify:
Splitter Channel Gain (-30 to –10dB range)	Connect test signal (at maximum level of –10 dBm) to splitter amplifier input via connector pins 7 and 13 or via splitter in jack. Measure amplifier output at pins 21 and 25 or at splitter #1 out jack.	- With splitter level control adjusted fully counterclockwise (CCK), output level approximately 30dB lower than input level. - With splitter level control fully clockwise (CW), output level approximately 10dB lower than input.	- Power applied to module - Wiring - Proper impedance terminations (check for double terminations) - Switch S2 properly set - Output level not exceeding +5dBm overload point
Splitter Channel Gain (-10 to +10dB range)	Same as above	- With splitter level control adjusted fully CCW, output level approximately 10dB lower than input level. - With splitter level control fully CW, output level approximately 10dB higher than input.	Same as above
Splitter Channel Noise	Insert shorting plug into splitter in jack or short pins 7 and 13, and measure output noise level with a noise test set at pins 21 and 25 or splitter #1 out jack.	Noise level less than 20dBrnC for all gain settings.	- Input to splitter amp not shorted - Noise test set at proper terminating impedance - High RF environment affecting test set
Concentrator Channel Gain (-30 to –10dB range)	Connect test signal (at maximum level of –10dBm) to concentrator input via concentrator #1 in jack or pins 31 and 29. Measure amplifier output at pins 41 and 47 or concentrator jack.	- With Concentrator level control fully CCW, output level approximately 30dB lower than input. - At full CW, output level about 10dB lower than input.	- Power applied to module - Wiring - Terminating impedance correct - Switch S1 properly set - Output level not exceeding +12dBm overload point
Concentrator Channel Gain (-10 to +10dB range)	Same as above	- With concentrator control fully CCW, output level approximately 10dB lower than input. - At full CW, output level about 10dB lower than input.	Same as above
Concentrator Channel Noise	Connect shorting straps between the concentrator input tip and ring pairs (pins 31 and 29, 37 and 55, 39 and 53, etc.). Measure noise level at the concentrator out jack (terminated measurement).	Noise level less than 20dBrnC for all gain settings.	- Input to concentrator amp not shored - Noise test set at proper terminating impedance - High RF environment affecting test set

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