

# Installation Guide: 6043 and 6043A

## 4Wire-to-4Wire or 4Wire-to-2Wire

## DX-to-E&M Terminal Repeaters

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### 1. introduction

1.01 This abbreviated practice section provides condensed installation instructions, a block diagram, and testing and troubleshooting information for the Issue 3 versions of the 6043 and 6043A 4Wire-to-4Wire or 4Wire-to-2Wire DX-to-E&M Terminal Repeater modules (Tellabs part numbers **836043** and **836043A**). If you require more information than is provided in this practice, please consult the full-coverage practice on the 6043 and 6043A modules (section 836043/836043A). The full-coverage practice also contains a general description, application information, a circuit description, and complete 6043 and 6043A specifications. Copies of the full-coverage practice should be available, if needed, at your company's local headquarters. Copies can also be obtained by calling Tellabs' Publications/Literature Distribution Group at (312) 969-8800.

1.02 This practice section is revised to provide additional information on alignment in figure 2 and on SX-lead optioning in section 5.

**Note:** In those parts of this practice that apply equally to the 6043 and 6043A, both modules are, for convenience, referred to collectively as the **6043/A**.

### 2. installation inspection

2.01 The 6043/A 4Wire-to-4Wire or 4Wire-to-2Wire DX-to-E&M Terminal Repeater should be visually inspected upon arrival to find any damage incurred during shipment. If damage is noted, a claim should immediately be filed with the carrier. If stored, the module should be visually inspected again prior to installation.

#### mounting

**Caution:** The 6043/A uses a mercury-wetted relay for E&M-lead contact closure. Before installation, the module should be held in an upright position and tapped gently on a hard surface to ensure that the mercury is properly positioned within the relay. After it is tapped, the module should be kept upright until installation and installed in a vertical, upright position.

2.02 The 6043/A mounts in one position of a Tellabs Type 10 Mounting Shelf or in one position of a Tellabs 262-series NCTE/DST Mounting Assembly. Type 10 Shelves are available in versions for relay-rack and apparatus-case installation, while 262 Assemblies are available in versions for relay-rack, wall or desktop, and floor mounting. The 6043/A module plugs physically and electrically into a 56-pin connector at the rear of its shelf or assembly position.

2.03 In applications where a 6043/A module is to be installed in a 262 Assembly, no external connections to the module need be made. This is because all of the assembly's internal connections are factory-prewired and because external wiring is simplified through the use of 25-pair connector-ended cables arranged in accordance with Universal Service Order Code (USOC) RJ2HX. If the customer's terminal equipment is cabled in accordance with USOC RJ2HX, direct connection between the assembly and the customer's equipment is possible. If not, cross-connections between the assembly and the local terminal equipment must be made at an intermediate connectorized terminal block or by means of a special adapter cable available as a list number for selected assemblies.

#### installer connections

2.04 When a 6043/A module is to be installed in a conventional Type 10 Shelf or in an unwired apparatus case or mounting assembly, external connections to the module must be made. Before making any connections to the shelf, case, or assembly, ensure that power is **off** and modules are **removed**. Modules should be put into place only **after** they are properly optioned and **after** wiring is completed.

2.05 Table 1 lists external connections to the 6043/A module. All connections to non-prewired mountings are made via wire-wrapping to the 56-pin connector at the rear of the module's shelf, case, or assembly position. Pin numbers are found on the body of the connector.

#### option selection

2.06 Several option switches must be set before the 6043/A is placed into service. Locations of these switches and of certain alignment switches on the module's printed circuit board are shown in figure 1. Table 2 summarizes all switch options and provides a convenient **checklist** that can be filled out either prior to installation for prescription optioning or during installation to serve as a record for later reference. Refer to figure 1 and table 2, and set each option switch on the 6043/A as required.

connect:	to pin:
4WIRE RCV IN TIP .....	7
4WIRE RCV IN RING .....	13
4WIRE XMT OUT TIP .....	41
4WIRE XMT OUT RING .....	47
4WIRE RCV OUT TIP* .....	5
4WIRE RCV OUT RING* .....	15
4WIRE XMT IN TIP or 2WIRE TIP .....	55
4WIRE XMT IN RING or 2WIRE RING .....	49
4WIRE RCV IN SX (simplex, facility side) .....	9 and 11
4WIRE XMT OUT SX (simplex, facility side) .....	43
E lead .....	23
M lead .....	21
SB (signal battery)** .....	1
SG (signal ground)** .....	19
EXT MNLB (external manual loopback, 6043A only) ...	18
-BATT (-42 to -56Vdc filtered input) .....	35
GND (ground) .....	17

\* Not used when module is optioned for 2wire terminal interface.  
 \*\* Mandatory for Type II and III E&M interfaces only.

table 1. External connections to 6043/A

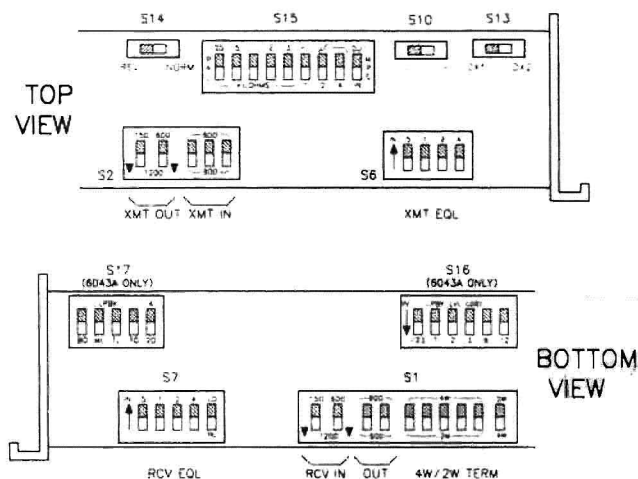


figure 1. 6043/A option switch locations

### alignment overview

2.07 Alignment of the 6043/A comprises the following procedures (all option switches should already be properly set as described above):

- Setting the receive-channel level.
- Introducing receive-channel equalization, if necessary.
- Setting the transmit-channel level.
- Introducing transmit-channel equalization, if necessary.
- Adjusting the integral resistive and capacitive DX balance network.
- For the 6043A only, adjusting the loopback-path level.

### prescription alignment

2.08 Prescription alignment of the 6043A module involves setting all level-control, equalization, loopback-level (6043A only), and DX balance network switches in accordance with specifications on the circuit layout record (CLR) before plugging the mod-

ule into its shelf or assembly position. Table 3 in this practice summarizes all alignment switches on the 6043/A and provides a convenient **checklist** for prescription alignment. To use this table, simply indicate all required alignment-switch settings in the **checklist** column. Then, at installation time, align the 6043/A by setting each switch as indicated in the table (or on the CLR, if preferred).

### equipment required for non-prescription alignment

2.09 In applications where prescription alignment settings are unavailable, non-prescription alignment of the 6043/A is necessary. Access to the appropriate ports of the module is conveniently provided via six front-panel bantam jacks. Equipment required for non-prescription alignment consists of a transmission measuring set (TMS), preferably one with independent transmit and receive impedance settings. If the module's equalizers, loopback-level circuitry (6043A only), and/or DX balance network are to be used, a Tellabs 9801 or 9802 Card Extender (or equivalent) will facilitate alignment by allowing access to the switches on the module's printed circuit board while the module is in place and operating.

### mandatory pre-alignment procedure for non-prescription alignment

2.10 Before beginning non-prescription alignment, do the following:

- Ensure that all option switches are properly set. For the 6043A, also ensure that the module is not in loopback.
- Set all front-panel receive and transmit level-control switches for no gain or loss.
- Set all receive and transmit equalization switches (S7 and S6) for no equalization.

**Note:** On the receive equalizer DIP switch (S7), the **LD/NL** position must be set to **NL**. Otherwise, bump equalization will be introduced even though no dB-value positions are set to **IN**.

- Set all **KILOHMS** and  $\mu$ F positions of the **BAL** DIP switch (S15) for no DX balancing resistance or capacitance.
- For the 6043A, set the loopback-level DIP switch (S16) for no loopback-path loss or gain.

### non-prescription alignment

2.11 Align the 6043/A as directed in the **non-prescription alignment procedure**, figure 2 of this practice.

**Note 1:** The procedure in figure 2 is based on the assumption that certain required local input and output levels are available from circuit records. If this is not the case, some steps may have to be modified to include end-to-end measurements.

**Note 2:** During alignment, always ensure that the receive portion of the TMS is arranged for properly terminated measurement where appropriate. If the TMS has independent transmit and receive impedance settings, also ensure that the proper TMS transmit impedance is selected when inserting test tone.

option	switch	selection	setting	checklist
terminating impedance, 4wire receive input port (facility side)	RCV IN positions of S1 on main board	1200 ohms (for loaded cable)	150 toward 1200, 600 toward 1200	
		600 ohms (for nonloaded cable or carrier)	150 toward 1200, 600 toward 600	
		150 ohms (extra equalization for nonloaded cable)	150 toward 150, 600 toward 1200	
terminating impedance, 4wire transmit output port (facility side)	XMT OUT positions of S2 on main board	1200 ohms (for loaded cable)	150 toward 1200, 600 toward 1200	
		600 ohms (for nonloaded cable or carrier)	150 toward 1200, 600 toward 600	
		150 ohms (extra equalization for nonloaded cable)	150 toward 150, 600 toward 1200	
2wire or 4wire terminal-side interface*	4W/2W TERM positions of S1 on main board	2wire interface	all six 4W/2W TERM positions toward 2W	
		4wire interface	all six 4W/2W TERM positions toward 4W	
terminating impedance, 2wire port (with 2wire terminal interface)	RCV OUT positions of S1 on main board	900 ohms plus 2.15 $\mu$ F	both positions toward 900	
		600 ohms plus 2.15 $\mu$ F	both positions toward 600	
	AND: XMT IN positions of S2 on main board	900 ohms plus 2.15 $\mu$ F	all three positions toward 900	
		600 ohms plus 2.15 $\mu$	all three positions toward 600	
terminating impedance, 4wire receive output port (with 4wire terminal interface)	RCV OUT positions of S1 on main board	600 ohms only (900-ohm option cannot be used with 4wire terminal interface)	both positions toward 600	
terminating impedance, 4wire transmit input port (with 4wire terminal interface)	XMT IN positions of S2 on main board	600 ohms only (900-ohm option cannot be used with 4wire terminal interface)	all three positions toward 600	
Type I, Type II, or Type III E&M interface	S10 on baby board	Type I interface	I/III	
		Type II interface	II	
		Type III interface (available with DX1 operation only)	I/III	
DX1 or DX2 operation**	S13 on baby board	DX 1 operation	DX1	
		DX2 operation	DX2	
normal or reversed facility-side SX leads***	S14 on baby board	normal	NORM	
		reversed	REV	
midpoint capacitance on facility-side SX leads†	IN/OUT position of MPC switch (S15) on baby board	4 $\mu$ F	IN	
		0 $\mu$ F	OUT	
<b>Note:</b> The following loopback options are available on the 6043A only.				
busying out of module's terminal side (E&M leads) during loopback††	BO position of S17 (LPBK DIP switch) on baby board	busy out	toward BO	
		no busy out	away from BO	

table continued on next page

option	switch	selection	setting	checklist
manual loopback activate/deactivate	ML position of S17 (LPBK DIP switch) on baby board	manual loopback activated	toward ML	
		manual loopback deactivated	away from ML	
tone loopback enable/disable † † †	TL position of S17 (LPBK DIP switch) on baby board	tone loopback enabled	toward TL	
		tone loopback disabled (for manual loopback only)	away from TL	
tone-loopback timeout enable/disable (with tone loopback enabled) † † †	TO position of S17 (LPBK DIP switch) on baby board	tone-loopback timeout enabled (see below for duration selection)	toward TO	
		tone-loopback timeout disabled (for second-tone deactivation only)	away from TO	
tone-loopback timeout duration (with tone-loopback timeout enabled) † † †	4/20 position of S17 (LPBK DIP switch) on baby board	4 minutes	toward 4	
		20 minutes	toward 20	

\* The module's integral CBN is inserted into the circuit whenever 2wire interface is selected. This CBN provides either 900 or 600 ohms (in series with 2.15 $\mu$ F), depending upon 2wire-port impedance optioning.  
 \*\* In DX1 operation, the 6043/A receives M-lead signals and transmits E-lead signals. In DX2 operation, the 6043/A receives E-lead signals and transmits M-lead signals.  
 \*\*\* Continuity of the DX leads must be maintained between the local and distant DX units, i.e., the signaling and reference (balancing) leads of one DX unit must be connected to the respective leads of the other DX unit. Therefore, option one module for NORM and the other for REV.  
 † Normal applications require an IN setting for the MPC switch; short-loop applications, an OUT setting.  
 † † Busing out the module's terminal side (E&M leads) during loopback prevents inadvertent seizure of the associated trunk circuit or line circuit.  
 † † † With tone loopback disabled, both the TO and 4/20 positions of S17 are nonfunctional. With tone loopback enabled but tone-loopback timeout disabled, the 4/20 position of S17 is nonfunctional.

table 2. Summary and checklist of 6043/A switch options

alignment function	switch	selection	setting	checklist
selection of receive-channel flat gain or loss	GN and LS positions of front-panel <i>rcv level</i> DIP switch	gain	GN to IN LS to OUT	
		loss	GN to OUT LS to IN	
amount of receive-channel gain or loss, as selected above*	dB-value positions of front- panel <i>rcv level</i> DIP switch*	0.1dB	0.1 to IN	
		0.2dB	0.2 to IN	
		0.4dB	0.4 to IN	
		0.8dB	0.8 to IN	
		1.5dB	1.5 to IN	
		3.0dB	3.0 to IN	
		6.0dB	6.0 to IN	
		12.0dB	12.0 to IN	
receive-channel equalizer selection	LD/NL position of DIP switch S7 (RCV EQL) on main board	compromise bump equalizer (for loaded cable) inserted	LD	
		compromise bump equalizer excluded (for no equalization or use of slope equalizer)	NL	
receive-channel slope equalization for nonloaded cable (gain at 2804Hz re 1004Hz)**	dB-value positions of DIP switch S7 (RCV EQL) on main board**	0.5dB	.5 to IN	
		1dB	1 to IN	
		2dB	2 to IN	
		4dB	4 to IN	
selection of transmit-channel flat gain or loss	GN and LS positions of front-panel <i>xmt level</i> DIP switch	gain	GN to IN LS to OUT	
		loss	GN to IN LS to OUT	

table continued on next page



alignment function	switch	selection	setting	checklist
amount of transmit-channel gain or loss, as selected above*	dB-value positions of front-panel <i>xmt level</i> DIP switch*	0.1dB	0.1 to IN	
		0.2dB	0.2 to IN	
		0.4dB	0.4 to IN	
		0.8dB	0.8 to IN	
		1.5dB	1.5 to IN	
		3.0dB	3.0 to IN	
		6.0dB	6.0 to IN	
		12.0dB	12.0 to IN	
transmit-channel slope-equalization for nonloaded cable (gain at 2804Hz re 1004Hz)**	DIP switch S6 ( <i>XMT EQL</i> ) on main board**	0.5dB	.5 to IN	
		1dB	1 to IN	
		2dB	2 to IN	
		4dB	4 to IN	
DX balance network resistance (0 to 6750 ohms) †	KILOHMS positions of S15 ( <i>BAL</i> DIP switch) on baby board †	250 ohms	toward .25	
		500 ohms	toward .5	
		1000 ohms	toward 1	
		2000 ohms	toward 2	
		3000 ohms	toward 3	
DX balance network capacitance (0 to 7μF) †	μF positions of S15 ( <i>BAL</i> DIP switch) on baby board †	1μF	toward 1	
		2μF	toward 2	
		4μF	toward 4	
loopback-path loss or gain (6043A only) † †	LPBK LVL switch (S16) on baby board † †	23dB loss	–23 to IN	
		1dB gain	1 to IN	
		2dB gain	2 to IN	
		3dB gain	3 to IN	
		6dB gain	6 to IN	
		12dB gain	12 to IN	

\* The eight dB-value positions of the front-panel *rcv level* and *xmt level* DIP switches are cumulative. Total gain or loss introduced into a channel is the sum of that channel's dB-value switch positions set to *IN*.

\*\* The dB-value positions (.5, 1, 2, and 4) of receive-equalizer DIP switch S7 and all four positions of transmit-equalizer DIP switch S6 are cumulative. Total gain introduced at 2804Hz (re 1004Hz) is the sum of those dB-value positions set to *IN*. For no receive equalization, set the *LD/NL* position of S7 to *NL* and the four dB-value positions of S7 to *OUT*. For no transmit equalization, set all four positions of S6 to *OUT*.

† The resistance and capacitance positions of the DX balance network's *BAL* DIP switch (S15) are cumulative. Total resistance (KILOHMS positions) and capacitance (μF positions) introduced is the sum of those switch positions set toward their respective values.

† † The six positions of the LPBK LVL switch (S16) on the 6043A are cumulative. Total loss or gain, in dB, introduced into the module's loopback path is the sum of those LPBK LVL switch positions set to *IN*.

table 3. Summary and checklist of 6043/A alignment switches

#### 4. testing and troubleshooting

4.01 The *troubleshooting guide* in this section may be used to assist in the installation, testing, or troubleshooting of the 6043/A 4Wire-to-4Wire or 4Wire-to-2Wire DX-to-E&M Terminal Repeater module. The guide is intended as an aid in the localization of trouble to a specific module. If a module is suspected of being defective, a new one should be substituted and the test conducted again. If the substitute module operates correctly, the original module should be considered defective and returned to Tellabs for repair or replacement. We strongly recommend that no internal (component-level) testing or repairs be attempted on the 6043/A module. Unauthorized testing or repairs may void the module's warranty. Also, if the module is part of a registered system, unauthorized repairs will result in noncompliance with Part 68 of the FCC Rules and Regulations.

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

4.02 If a situation arises that is not covered in the *troubleshooting guide*, contact Tellabs Customer Service as follows (telephone numbers are given below):

USA customers: Contact Tellabs Customer Service at your Tellabs Regional Office.

Canadian customers: Contact Tellabs Customer Service at our Canadian headquarters in Mississauga, Ontario.

International customers: Contact your Tellabs distributor.

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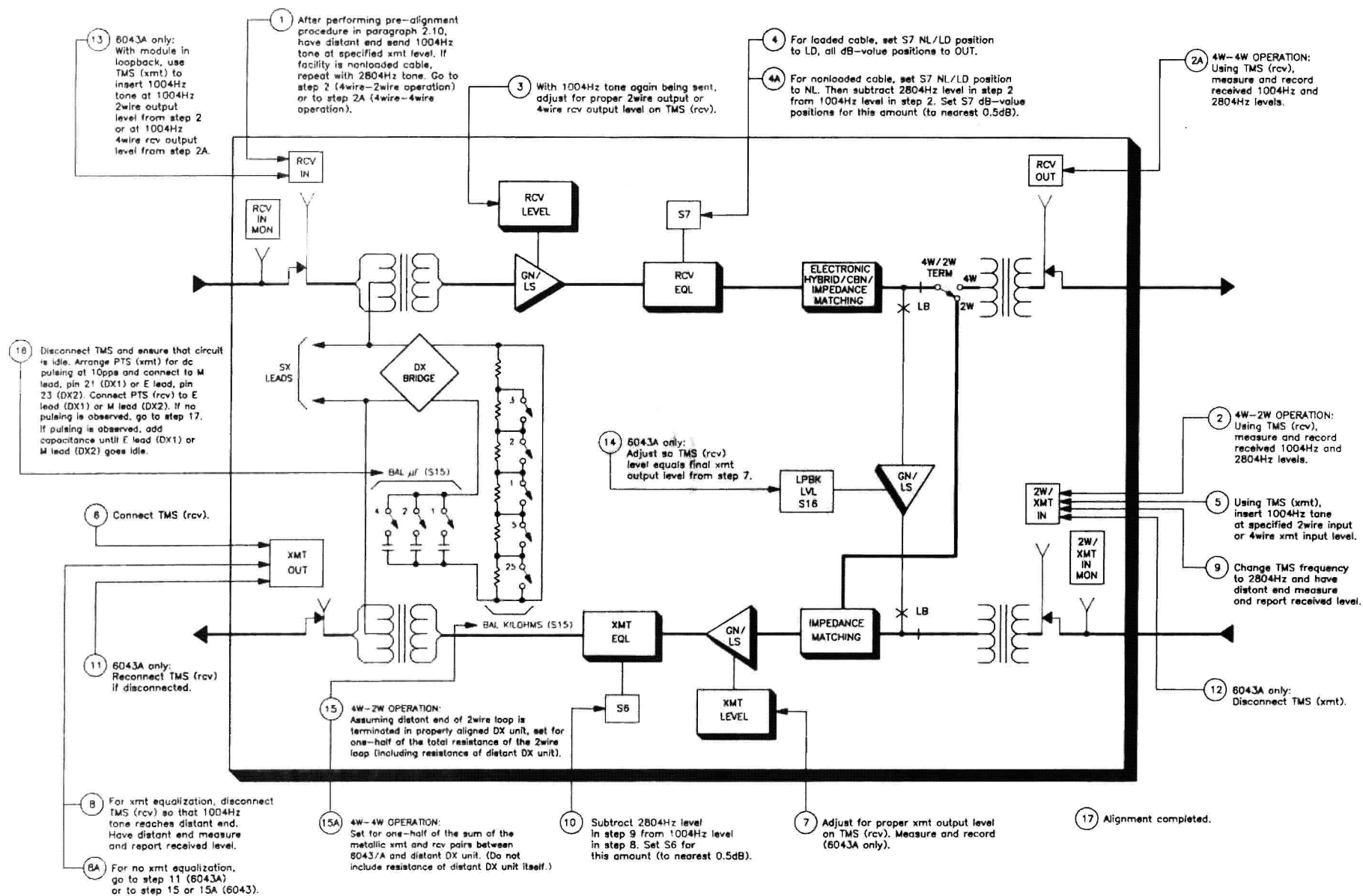
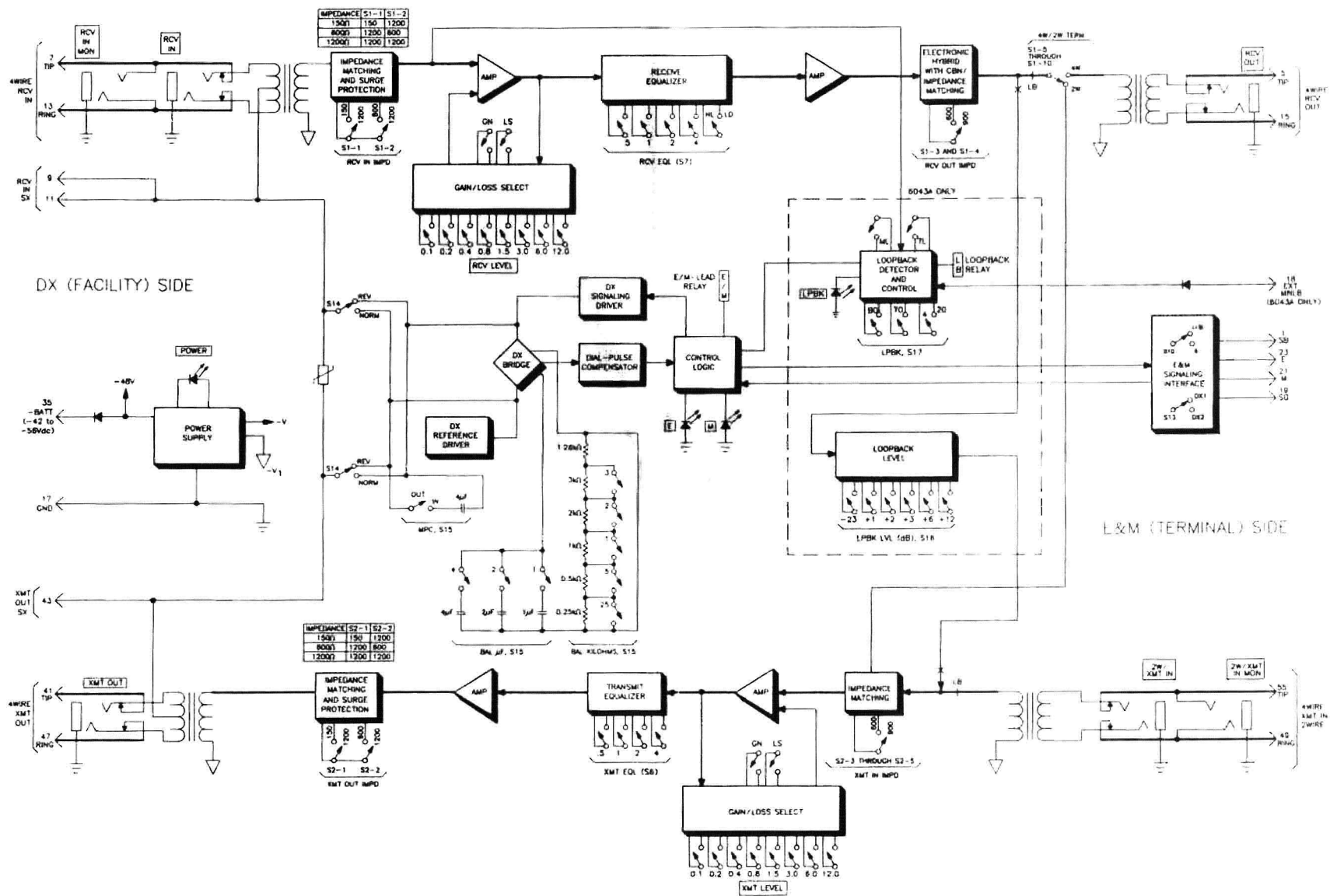


figure 2. Non-prescription alignment procedure for 6043/A



6043 and 6043A 4Wire-to-4Wire or 4Wire-to-2Wire DX-to-E&M Terminal Repeaters

836043/836043A

### 3. block diagram

US Atlantic Region: (203) 798-0506  
 US Capital Region: (703) 478-0468  
 US Central Region: (312) 357-7400  
 US Southeast Region: (305) 834-8311  
 US Southwest Region: (214) 869-4114  
 US Western Region: (714) 850-1300  
 Canada: (416) 624-0052

4.03 If a module is diagnosed as defective, follow the *replacement* procedure in paragraph 4.04 when a critical service outage exists (e.g., when a system or a critical circuit is down and no spares are available). If the situation is not critical, follow the *repair and return* procedure in paragraph 4.05.

## replacement

4.04 To obtain a replacement module, notify Tellabs via letter or telephone (see addresses and numbers below) or via TWX (910-695-3530 in the USA, 610-492-4387 in Canada). Be sure to provide all relevant information, including the 8X6043(A) part number that indicates the issue of the module in question. Upon notification, we shall ship a replacement to you. If the module in question is in warranty, the replacement will be shipped at no charge. Pack the defective module in the replacement module's carton, sign the packing slip included with the replacement, and enclose it with

## troubleshooting guide

**Note:** Because the 6043/A contains a mercury-wetted relay, this module should always be held in an upright position and tapped gently on a hard surface before installation. The module should then be kept in an upright position until installed. If trouble is encountered with an installed module, remove it from the mounting shelf and repeat this procedure before taking any further corrective action.

trouble condition	possible causes (check before assuming is defective)
module completely inoperative	1) No input power. 2) Improper wiring.
cannot derive proper receive-channel (4wire-to-4wire or 4wire-to-2wire) transmission level	1) Main-board 4wire or 2wire terminal-side interface switches (4W/2W TERM positions of DIP switch S1) improperly set. 2) Front-panel rcv level DIP switch improperly set. 3) Main-board receive impedance switches (RCV IN/OUT positions of DIP switch S1) improperly set. 4) Main-board receive equalization DIP switch (S7) improperly set. 5) Circuit not seized. 6) Test-equipment impedance improperly set or test equipment not terminated.
cannot derive proper transmit-channel (4wire-to-4wire or 2wire-to-4wire) transmission level	1) Main-board 4wire or 2wire terminal-side interface switches (4W/2W TERM positions of DIP switch S1) improperly set. 2) Front-panel xmt level DIP switch improperly set. 3) Main-board transmit impedance switches (XMT OUT/XMT IN positions of DIP switch S2) improperly set. 4) Main-board transmit equalization DIP switch (S6) improperly set. 5) Circuit not seized. 6) Test-equipment impedance improperly set or test equipment not terminated.
improper signaling	1) Incorrect transmission level settings (see preceding trouble condition and possible causes). 2) SX-lead NORM/REV switch (S14) improperly set. 3) E&M signaling interface switch (S10) improperly set. 4) DX1/DX2 signaling switch (S13) improperly set. 5) DX balance network improperly aligned. 6) Excessive cable leakage. 7) Excessive longitudinal voltage on facility.
cannot activate or deactivate manual loopback via option switch (6043A only)	1) Ground on EXT MNLB (external manual loopback) lead (pin 18).
cannot activate or deactivate manual loopback via EXT MNLB-lead ground (6043A only)	1) EXT MNLB (external manual loopback) lead (pin 18) improperly wired. 2) Source of ground defective.
cannot activate or deactivate 2713Hz tone loopback (6043A only)	1) Loopback options improperly set; check baby-board LPBK DIP switch (S17). 2) Tone not applied for proper duration and, for activation only, then removed. 3) Tone at improper frequency or below -30dBm detection threshold. 4) Ground on EXT MNLB (external manual loopback) lead (pin 18).
cannot derive transmission loopback (6043A only)	1) Module not in loopback (lpbk LED unlit).
cannot derive proper loopback transmission level (6043A only)	1) Loopback-level (LPBK LVL) DIP switch (S16) improperly set. 2) Module not in loopback (lpbk LED unlit).