

4401 Pad Module 4402, 4403, and 4404 Pad/Transformer modules

contents

Section 1	general description	page 1
Section 2	application	page 1
Section 3	installation	page 2
Section 4	circuit description	page 2
Section 5	functional schematics	page 3
Section 6	specifications	page 3
Section 7	testing guide	page 4

1. general description

1.01 The 4401 Pad module provides two adjustable T-pads (0-30dB) for level control in both the transmit and receive channels for a 4wire voice frequency transmission facility.

1.02 The 4402, 4403 and 4404 Pad/Transformer modules each provide two adjustable T-pads (0-30dB) and transformers for level control and dc isolation and balancing in both the transmit and receive channels of a 4wire voice frequency transmission facility. Transformers are tapped to provide optional impedance matching of 150, 600 or 1200 ohms toward the facility. Impedance optioning for each channel is independent and is accomplished via a slide switch on the printed circuit board of the Pad/Transformer module. Terminal-side impedance of these modules is fixed at 600 ohms. Transformers are center-tapped to derive simplex (SX) leads. Simplex leads function at all three (150, 600 or 1200 ohm) facility-side impedance option settings.

1.03 Both Pad and Pad/Transformer modules incorporate four, front-panel test jacks for alignment of transmit and receive input and output levels. Attenuator/(pad) controls are also accessible at the modules' front panels.

1.04 The three Pad/Transformer modules, 4402, 4403 and 4404, incorporate identical circuitry. Differences among the modules lie in the assignment of pinouts. The 4402 is designated as a "facility" unit, the 4403 as an "office" unit, and the 4404 as a "station" unit. **These designations do not define the physical location of the module, but rather indicate the end of the circuit toward which the transformers face.** See the Application section of this Practice for further explanation.

1.05 As Type 10 modules, the 4401, 4402, 4403 and 4404 are provided relay rack or apparatus case mounting via the Tellabs Type 10 Shelf. In relay rack applications, up to 12 modules may be mounted across 6 vertical inches in a 19" rack, while a 23" rack accommodates up to 14 modules across the same vertical space.

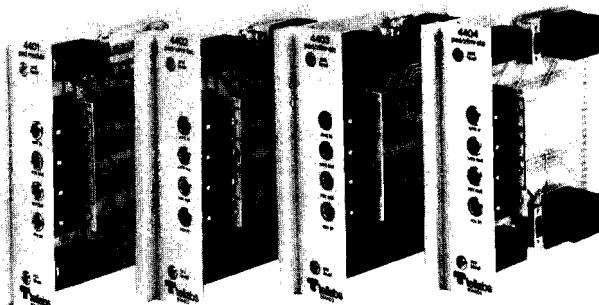


figure 1. 4401, 4402, 4403 and 4404 modules

2. application

2.01 The 4401 Pad module is applied to a 4wire voice frequency transmission facility requiring level adjustment in the form of attenuation. With no transformers, the 4401 is an unbalanced device. It must, therefore, be used in close proximity to other equipment in the circuit that does provide balance. The 4401 is often used to provide level adjustment at a carrier channel interface. Useful range in both transmit and receive channels of the 4401 is 0-30dB loss.

2.02 The 4402, 4403 and 4404 Pad/Transformer modules contribute adjustable insertion loss for level control, dc isolation and balance to a 4wire voice frequency transmission facility. The transmit and receive level adjustment ranges accommodate use on facilities requiring from 0-30dB of loss in either channel.

2.03 The transformer side of the Pad/Transformer provides balanced 150, 600 or 1200 ohm termination, while the terminal side provides 600 ohm termination. The transformer side of the module interfaces a 4wire metallic facility while the terminal side normally interfaces a short loop or a carrier channel. Note that the T-pad may contribute imbalance to the terminal side.

2.04 Optional 150, 600 or 1200 ohm impedance matching on the transformer (balanced) side of the Pad/Transformer module allows application with various types of facilities. The 1200 ohm option is generally used to interface loaded cable. The 600 ohm option interfaces shorter lengths of non-loaded cable, while the 150 ohm option may be used to provide nominal equalization for longer

lengths of non-loaded cable (those requiring more than 3dB of slope equalization). The 600 ohm option may also be used to interface a carrier channel over a short metallic facility.

2.05 Each of the Pad/Transformer modules, while incorporating identical components, is configured, via pinout assignment and jack arrangement, for use at a particular point in the circuit. These differing pin assignments allow the 4402, 4403 and 4404 modules to be interchangeable with each other and with Tellabs Line Amplifiers within the framework of a universally wired package such as a Tellabs 261 Assembly. **Note that the name given to each module relates to the end of the circuit toward which its transformers face, not to its physical location in the circuit.** To select the particular Pad/Transformer module best suited to the specific requirements of your application, see the (section 5) Functional Schematics in this Practice. Note, for example, that the 4402 and 4403 modules are identical with respect to everything but the assignment of simplex leads. In the 4402, the simplex leads are brought out on the transformer (RCV IN) side of the module, while in the 4403, simplex leads face the module's RCV OUT port. The 4402 and 4404, on the other hand, reverse the assignment of IN and OUT channels to operate at the opposite end of the circuit from each other.

2.06 Simplex leads in the three Pad/Transformer modules may be used to provide a path for sealing current, or to allow dc or 20Hz signaling to be applied to the 4wire facility.

3. installation inspection

3.01 The 4401, 4402, 4403 and 4404 Pad and Pad/Transformer modules should be visually inspected upon arrival in order to find possible damage incurred during shipment. If damage is noted, a claim should immediately be filed with the shipper. If stored, the module should be visually inspected again prior to installation.

mounting

3.02 Each module mounts in one position of the Tellabs Type 10 Mounting Shelf, which is available in configurations for both relay rack and apparatus case installation. The module plugs physically and electrically into a 56-pin connector at the rear of the Type 10 Shelf.

installer connections

3.03 Before making any connections to the Mounting Shelf, make sure that power is **off** and modules are **removed**. Module(s) should be put in-place only **after** wiring has been completed.

3.04 The following, table 1, lists external connections to the modules. All connections are made via wire wrap at the 56-pin connector at the rear of the modules' mounting shelf position. Pin numbers are found on the body of the 56-pin connector.

connect	to pin			
	4401	4402	4403	4404
receive Tip in (RT1)	7	7	7	7
receive Ring in (RR1)	13	13	13	13
receive Tip out (RT2)	5	5	5	5
receive Ring out (RR2)	15	15	15	15
transmit Tip in (TT2)	55	55	55	55
transmit Ring in (TR2)	49	49	49	49
transmit Tip out (TT1)	41	41	41	41
transmit Ring out (TR1)	47	47	47	47
simplex transmit		43	53	53
simplex receive		9	3	3
ground	17	17	17	17

table 1. external connections

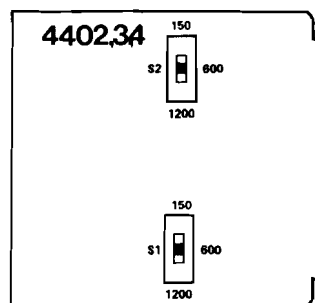


figure 2. Switch Locations

options and alignment

3.05 The 4401 Pad module requires no optioning. Each of the 4402, 4403 and 4404 Pad/Transformer modules incorporates two option switches. Set switch S1 to the desired setting (150, 600 or 1200 ohms) to provide impedance matching in the receive channel. Set switch S2 to the desired setting (150, 600 or 1200 ohms) to provide impedance matching in the transmit channel. Switches and position labels are located on the Pad/Transformer module as shown in figure 2.

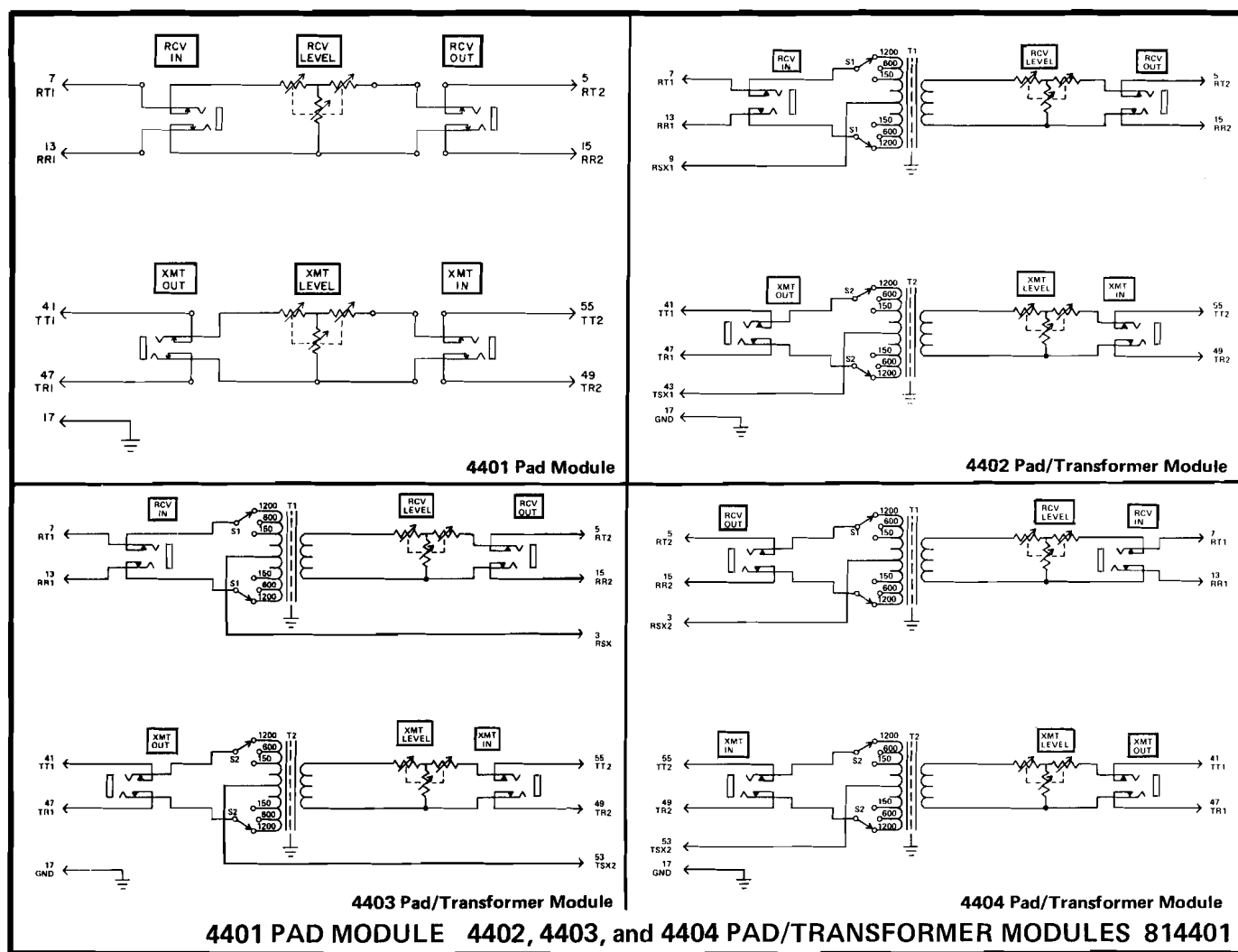
3.06 Alignment of the 4401, 4402, 4403 or 4404 module consists of adjusting the receive and transmit attenuators to provide levels consistent with circuit specifications.

3.07 To adjust the *receive level*, request the distant end send a 1000Hz tone, and, using a terminated (150, 600 or 1200 ohms, as required) ac voltmeter, measure the the input level at the module's RCV IN test jack. Confirm that the input level is correct, then connect the voltmeter (set to 150, 600 or 1200 termination, as required) to the module's RCV OUT jack and adjust the RCV attenuator to attain the specified output level.

3.08 To adjust the *transmit level*, insert a 1000Hz signal at the level and impedance (150, 600 or 1200 ohms) specified for the circuit into the XMT IN jack, and, using an ac voltmeter (terminated in 150, 600 or 1200 ohms, as required) to measure the output level at the XMT OUT jack, adjust the XMT attenuator to achieve the specified output level for the circuit.

4. circuit description

4.01 The 4401 Pad module consists of two, 600 ohm adjustable T-pad attenuators mounted to a Type 10 printed circuit card. The 4402, 4403 and 4404 Pad/Transformer modules incorporate the same T-pad attenuators as the 4401. In addition, an isolation transformer is provided on one side of



5. FUNCTIONAL SCHEMATICS

each attenuator pad. Each transformer is tapped to provide switch-selectable 150, 600 or 1200 ohm impedance options, and each transformer derives a simplex lead toward the facility associated with that transformer.

6. specifications

impedance (4401)

facility side: 600 ohms $\pm 10\%$
terminal side: 600 ohms $\pm 10\%$

impedance (4402, 4403, and 4404)

facility side: 150 ohms $\pm 15\%$, or 600 or 1200 ohms $\pm 10\%$,
switch-selectable
terminal side: 600 ohms $\pm 10\%$

attenuation range

0.5 to 30.5dB, adjustable

simplex-lead current (4402, 3 and 4 only)

120mA maximum
5mA maximum unbalanced

insertion loss (excluding 4401)

0.5dB at 1000Hz (minimum)

echo return loss (facility side) (excluding 4401)
20dB minimum

maximum isolation between windings
500 volts RMS at 60Hz (N/A 4401)

envelope delay (N/A 4401)
less than 100 μ s

longitudinal balance (excluding 4401)
60dB minimum, 200 to 4000Hz, facility side only

operating environment

20° to 130° F (−7° to 54° C), humidity to 95% (no condensation)

dimensions

5.58" (14.17cm) high
1.42" (3.61cm) wide
5.96" (15.14cm) deep

weight

4401: 11½ ounces (326 grams)
4402, 03, and 04: 15½ ounces (439 grams)

mounting

relay rack or apparatus case via one position of Tellabs
Type 10 Shelf or one position of Wescom Type 400 Shelf

7. testing and troubleshooting

7.01 Proper operation of the 4401 Pad module, or 4402, 4403 or 4404 Pad/Transformer modules, may be verified at the time of installation. If the module exhibits the specified attenuation range, and if you are able to achieve the desired level adjustment at 1000Hz, no further testing need be initiated. If proper operation is not encountered, verify that the transmit and receive impedance option switches are set correctly, that wiring is correct, and that the module is firmly seated in its connector.

7.02 If a malfunction persists after checking the three items above, remove the module and insert a substitute module. If the circuit now functions properly, the original module should be considered defective and should be returned to Tellabs for replacement or repair. It is strongly recommended that no "internal" testing or repair be attempted on these modules. Unauthorized testing or repair may void the modules' warranty.

7.03 If a 4401, 4402, 4403 or 4404 module is diagnosed as defective, the situation may be remedied by either "replacement" or "repair and return". Because it is the more expedient method, the "replacement" procedure should be followed whenever time is a critical factor. (i.e.; service outages, etc.).

replacement

7.04 If a defective module is encountered, notify Tellabs directly, via telephone, letter or twx. Notification should include all relevant information, including the 8X440X part number (from which we can determine the Model and Issue of the module in question). Upon notification, we shall ship a replacement module to you. If the Warranty date of the module has not elapsed, the replacement module will be shipped at no charge. Package the defective unit in the replacement module's carton; sign the packing list included with the replacement and enclose it with the defective module (this is your return authorization); affix the preaddressed label(s) provided with the replacement module to the carton(s) being returned; and ship the equipment prepaid to Tellabs.

repair and return

7.05 Return the defective module, shipment prepaid, to Tellabs. Enclose an explanation of the module's malfunction. Follow your company's standard procedure with respect to administrative paperwork. Tellabs will repair the module and ship it back to you. If the module is in Warranty, no invoice will be issued.

7.06 If a situation arises that is not covered in this practice, contact Tellabs Customer Service at 312-969-8800 for further assistance.

testing guide checklist

test	procedure	normal result	if normal conditions are not met, verify:
transmission continuity	With balanced oscillator and TMS, measure transmission continuity at 1000Hz from RCV IN port to RCV OUT port and from XMT IN port to XMT OUT port.	Signal appears at output port at specified level <input type="checkbox"/> .	Wiring <input type="checkbox"/> . Attenuator settings <input type="checkbox"/> . Impedance switches properly set <input type="checkbox"/> . Facility on either side of module <input type="checkbox"/> . Replace 440X module and retest <input type="checkbox"/> .