tellabs
technical manual
76-816101
rev E

practice section 816101

6101 SF Transceiver*

contents

1. general description

1.01 The 6101 SF Transceiver module (figure 1) provides single-frequency (SF) signaling over a 4wire facility and conversion between that SF signaling and the logic-level E&M intermodule signaling required by an associated Signaling Converter module. Conventional 2600Hz SF tone is standard. Other frequencies are optionally available.

1.02 This Practice section is revised to incorporate several corrections and changes of a minor nature.

1.03 The 6101 Transceiver is always used in conjunction with a Signaling Converter module (e.g., a Tellabs 6102, 6103, 6104 , 6105, or 6106) that converts logic-level E&M signaling from the 6101 to the required terminal-side signaling mode (E&M, foreign exchange, or ringdown). Other less common modes of signaling interface can be provided by using modules such as Tellabs' 6251 Switched Service Network (SSN) Trunk module in association with the 6101.

1.04 The 6101 SF Transceiver module and its associated 610X Signaling Converter module together meet all specifications for F-type SF signaling.

1.05 The 6101 operates at conventional 4wire interface levels, i.e., −16dBm (−16TLP) transmit output and +7dBm (+7TLP) receive input. The receive level out of the 6101 may be adjusted ±4dB by means of a front-panel control.

1.06 The 6101 is equipped with an integral SF tone oscillator and a plug-in SF filter subassembly. While 2600Hz is the standard SF tone frequency, other signaling frequencies may be accommodated simply by changing the filter subassembly. (See paragraph 2.09.)

1.07 The intermodule M lead and an intermodule CT (cut-and-terminate) lead convey the necessary information from the Signaling Converter module to control tone-generation circuitry and the cut-and-terminate relay on the 6101. The intermodule E-lead state is under control of the 6101 in response to SF tone detection.

1.08 To prevent talk-off (i.e., an SF component in speech being sensed and treated as a transition

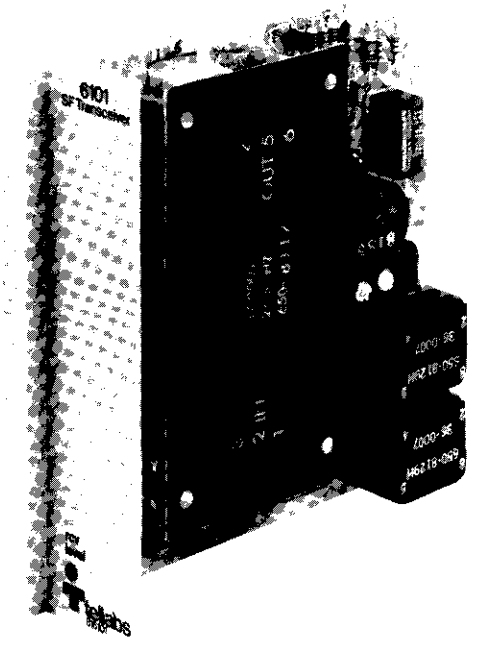


figure 1. 6101 SF Transceiver module

to the idle state), SF detection circuitry in the 6101 uses not only frequency but also duration and level as SF-tone-recognition criteria.

1.09 The 6101's standard SF tone output level is normally −20dBm0. An augmented tone level of −8dBm0 is transmitted for approximately 400ms when tone-on status is initiated. This high-level tone ensures recognition of tone-on status at the distant end of the circuit.

1.10 The 6101 operates on filtered input potentials between −22 and −56Vdc. Current requirement is approximately 20mA.

1.11 The 6101 module mounts in one position of a Tellabs Type 10 Mounting Shelf, versions of which are available for relay rack or apparatus case installation. In relay rack applications, up to 12 modules can be mounted across a 19-inch rack, while up to 14 modules can be mounted across a 23-inch rack. In either case, 6 inches of vertical rack space is used. The 6101 also mounts in one position of a Tellabs 260 or 261 System Mounting Assembly.

2. application

2.01 The 6101 SF Transceiver module, in combination with a Tellabs 610X Signaling Converter module, provides the necessary interface between facility-side F-type SF signaling and any of several terminal-side loop signaling formats as listed on page 2.

***A Tellabs Videotape Training Program is available for this product.**

Signaling Converter module	terminal-side signaling mode
6102	*E&M*
6103	*foreign-exchange (station)*
6104	*foreign-exchange (office)*
6105	*ringdown (automatic or manual)*
6106	*ringdown (data)*

2.02 The 6101 is designed to interface 4wire facilities at standard +7 receive and −16 transmit TLP's. A Line Amplifier (e.g., Tellabs' 4001) is often required to establish proper transmission levels between a metallic facility and the 6101. On both the terminal side and the facility side, the 6101 provides transmit and receive transmission pairs. If the terminal-side termination is 2wire, a 4wire-to-2wire Terminating Set (e.g., Tellabs' 420X) is required to interface the 6101 SF Transceiver and 610X Signaling Converter with the 2wire equipment. The combination of Line Amplifier, SF Transceiver, Signaling Converter, and Term Set provides the basis for Tellabs' 260 and 261 Signaling and Terminating Systems. Please consult the appropriate System Practice for specific information on the 6101 as used in that System. Wiring for the 260 and 261 Systems is shown in figure 2 in section 3 of this Practice.

2.03 Less common applications of the 6101 make use of signaling converter modules other than those in the 610X series. For example, the 6251 Switched Service Network (SSN) Trunk module permits use of the 6101 SF Transceiver to provide signaling interface between the Common Control Switching Arrangement of an SSN and a central office line circuit. For further information on this application, consult the 6251 Practice.

2.04 A continuously adjustable front-panel control on the 6101 module provides from −4 to +4dB of gain in the receive path to compensate for loss in transmission leads, or to accommodate nonstandard levels required by the terminal equipment. This *rcv level* control affects only the terminal-side *output* of the 6101. (The level of incoming SF tone is not affected by this control, thereby maintaining integrity of the module's signal-to-guard ratio.)

2.05 The 6101's cut-and-terminate (CT) relay prevents noise on the terminal side from interfering with SF signaling on the facility side. The CT relay, under the control of the Signaling Converter module, isolates the terminal side from the facility side just prior to and during tone transmission.

2.06 On the terminal side of the 6101, logic-level intermodule E and M leads interface the Signaling Converter module. Intermodule M-lead input states are battery (tone off) and ground (tone on), and intermodule E-lead output states are open (tone on) and ground (tone off). These E and M leads are **not** suitable for standard loop signaling.

2.07 Dial pulse correction is provided by the associated Signaling Converter module. The type of pulse correction is determined by the Signaling Converter module used.

2.08 The 6101 inserts a band-elimination filter (BEF) into the receive speech path when the 6101 is receiving SF signaling tone. This BEF prevents signaling tone transmission through the 6101, thereby preventing interference with subsequent modules in tandem signaling applications or reflection by an associated term set back through the transmit section of the SF unit (possibly indicating a false digit "one" or a false supervisory wink). The filter is inserted 6 to 20ms after receipt of SF tone, and remains in the receive path for at least 225 ±50ms after insertion. The filter is removed 50 ±5ms after cessation of tone.

2.09 A plug-on SF filter subassembly on the 6101's printed circuit board permits easy field conversion if received signaling frequencies other than standard 2600Hz tone are needed. Common frequencies include 1600Hz, 2280Hz, and 2400Hz and filters for these frequencies are readily available from Tellabs. For less common receive frequencies, or for transmit frequencies other than 2600Hz (in which case the module's SF tone oscillator must be changed), contact Tellabs Customer Service at our U.S. or Canadian headquarters or at your Tellabs Regional Office (see page 6 for telephone numbers).

3. installation

inspection

3.01 The 6101 SF Transceiver module 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 carrier. If stored, the module should be visually inspected again prior to installation.

mounting

3.02 The 6101 mounts in one position of a Tellabs Type 10 Mounting Shelf or in position 2 of the 260 or 261 System Assembly. The module plugs physically and electrically into a 56-pin connector at the rear of the Shelf or Assembly.

installer connections

3.03 Before making any connections to the mounting shelf, make sure 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.

3.04 Table 1 lists external connections to the 6101 module. All connections are made via wire wrap at the 56-pin connector at the rear of the module's mounting shelf position. Pin numbers are found on the body of the connector.

3.05 When the 6101 module is used as part of the 260 or 261 System, all intermodule wiring is factory-wired and external connections are simplified by the use of terminal strips or blocks. Refer to the 260 or 261 System Practice for detailed information. A typical wiring scheme within a 260 System is shown in figure 2.

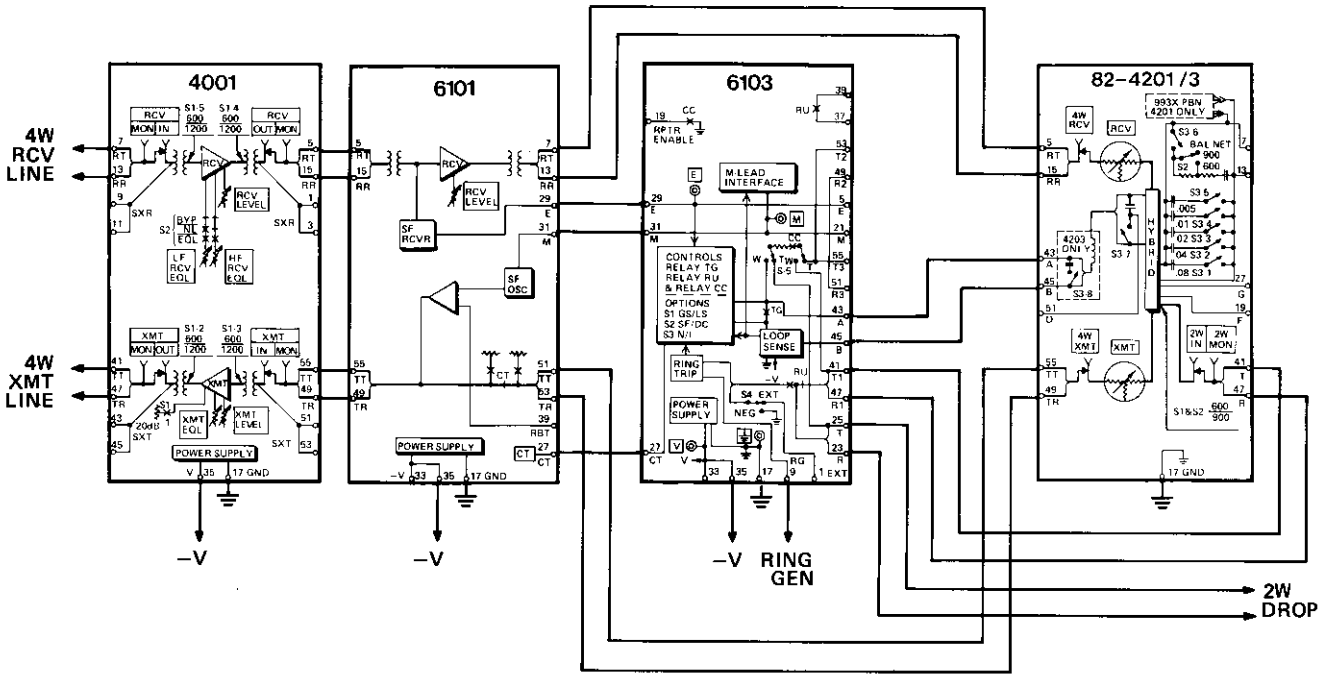


figure 2. Typical wiring for the 6101 in a 260 or 261 System

connect:	to pin:
RCV IN T	5
RCV IN R	15
RCV OUT T	7
RCV OUT R	13
XMT OUT T	55
XMT OUT R	49
XMT IN T	51
XMT IN R	53
E LEAD (signal out)	29
M LEAD (signal in)	31
CT LEAD (cut-and-terminate)	27
RINGBACK TONE (when used with the 6105 only)	39
−BATT (filtered −22 to −56Vdc)	33 or 35
GND (ground)	17

table 1. External connections to 6101

3.06 The 6101 requires no optioning. The *rcv level* control is factory-adjusted for 0dB of gain, but can be adjusted in the field to provide from −4 to +4dB of output gain as required. However, because level adjustment is normally provided by the terminal-interface device (term set), this control is seldom used.

3.07 Alignment of Tellabs' 260 and 261 Signaling and Terminating Systems, which often include the 6101 SF Transceiver module, is explained in each System Practice.

3.08 The receive filter on the 6101's printed circuit board can be changed to adapt the module for receipt of SF signaling frequencies other than the standard 2600Hz. The receive filter is the large subassembly filling most of the 6101's printed circuit board. It can be replaced by removing the four screws that secure it to the circuit board and unplugging the subassembly from its two connectors. The replacement subassembly is then plugged into these connectors to establish the electrical connection and screwed down to secure it to the circuit board. A variety of filter subassemblies for receipt of nonstandard SF tone frequencies are readily available from Tellabs. Please call Tellabs Customer Service at our U.S. or Canadian headquarters or your Tellabs Regional Office for details (see page 6 for telephone numbers).

Note: *For* **transmission** *of nonstandard SF tone frequencies, the 6101's oscillator must be changed. Again, contact Tellabs Customer Service for details.*

4. circuit description

4.01 This circuit description is intended to familiarize you with the 6101 SF Transceiver module for engineering and application purposes only. Attempts to test or troubleshoot the 6101 internally are not recommended. Procedures for recommended testing and troubleshooting in the field are limited to those prescribed in section 7 of this Practice. Please refer to the 6101 block diagram, section 5 of this Practice, as an aid in following this circuit description.

transmit portion

4.02 A ground potential on the M lead causes the *oscillator timing and level control* circuit to transmit SF tone from the 2600Hz oscillator to the transmit pair through an *amplifier*. The *oscillator timing and level control* circuit increases the gain of the *amplifier* for approximately 400ms following the transition of the M lead to the ground state. After a sustained M-lead ground, the *amplifier* gain is decreased to the low signal level. A ground potential on the CT (cut-and-terminate) lead operates the *CT relay*, which breaks the connection between the *xmt in* and *xmt out* pairs and terminates each pair into 600 ohms.

receive portion

4.03 The E lead is open when SF tone is detected by the receive circuitry (i.e., *band pass filter,*

BEF, and dual detector comparator) and is at ground when SF tone is removed. The receive input is transformer-coupled to the *band-elimination filter, filter switch,* and the *bandpass filter.* The *bandpass filter* is connected to a signal level *detector* and one side of the signal level *comparator.*

4.04 When the receive circuitry is in the low-guard state (continuous received SF tone), the *band-elimination filter* is connected to the receive *amplifier* by the *filter switch.* Insertion of the *BEF* into the transmission path attenuates the signaling frequency below the normal audible level. Additionally, the guard *detector* is disabled by the *timing and logic circuit.* This circuitry also prevents the E lead from changing to a ground state when incoming SF tone ceases for less than 50ms when the receiver is in the low-guard state.

4.05 SF tone removed from the input of the receive circuitry causes the *timing and logic circuitry* to activate the *filter switch* and bypass the *BEF.* Additionally, the receive circuitry is placed into the high-guard detection state by the enabling of the guard *detector.*

4.06 The *rcv level* control varies the gain of the receive *amplifier.* The receive *amplifier* is transformer-coupled to the receive output.

6. specifications

transmit

alignment level, facility side
−16dBm (−16TLP)

insertion loss
0.2dB at 1kHz

frequency response
300Hz to 4000Hz ±0.2dB, re 1kHz

precut time delay
1 to 15ms (precut under control of associated signaling converter module)

internal SF oscillator frequency and stability
2600Hz ±2Hz for 6 months, 2600Hz ±5Hz for life of unit (other frequencues are available upon special order)

transmit tone level
low level: −36 ±1dBm
high level: −24 ±2dBm

high-level tone duration
400 ±100ms upon initiation of tone-on status

pulse distortion
within ±0.5ms of input (appropriate delays provided in associated module)

M-lead input
−22 to −56Vdc resistance battery during off-hook (SF off); ground during on-hook (SF on)

receive

alignment level, facility side
+7dBm (+7TLP)

frequency response
with band elimination filter removed:
300 to 3400Hz ±0.2dB, re 1kHz
with band elimination filter inserted:
250 to 2000Hz ±0.1dB; 3000 to 4000Hz ±0.5dB, re 1kHz

tone rejection
2590 to 2610Hz, 55dB minimum (with BEF inserted)

gain range
±4dB relative to nominal +7TLP

facility terminating impedance
600 ohms ±5%, 300 to 4000Hz

signaling tone threshold
−26.5 ±2.5dB

receive signaling frequency
2600 ±2Hz standard (others optional by special order)

signal-to-guard ratio
10dB nominal

bandwidth
75Hz nominal (high guard); 300Hz nominal (low guard)

guard circuit transition timing
high-to-low, 225 ±60ms
low-to-high, 50 ±10ms

band-elimination filter timing
insertion: 13 ±7ms minimum
removal: 225 ±50ms minimum, or 50ms after end of tone bursts longer than 225 ±50ms

total harmonic distortion
less than 1%

maximum line noise
56dBrnC

E-lead timing
SF recognition delay (high guard), 17 ±2ms;
loss of SF recognition time (low guard), 40ms nominal

E-lead output
50mA maximum, 60Vdc maximum

common specifications

input power
−22 to −56Vdc, filtered, ground referenced; 20mA nominal

operating environment
20° to 130°F (−6° to 54°C), humidity to 95% (no condensation)

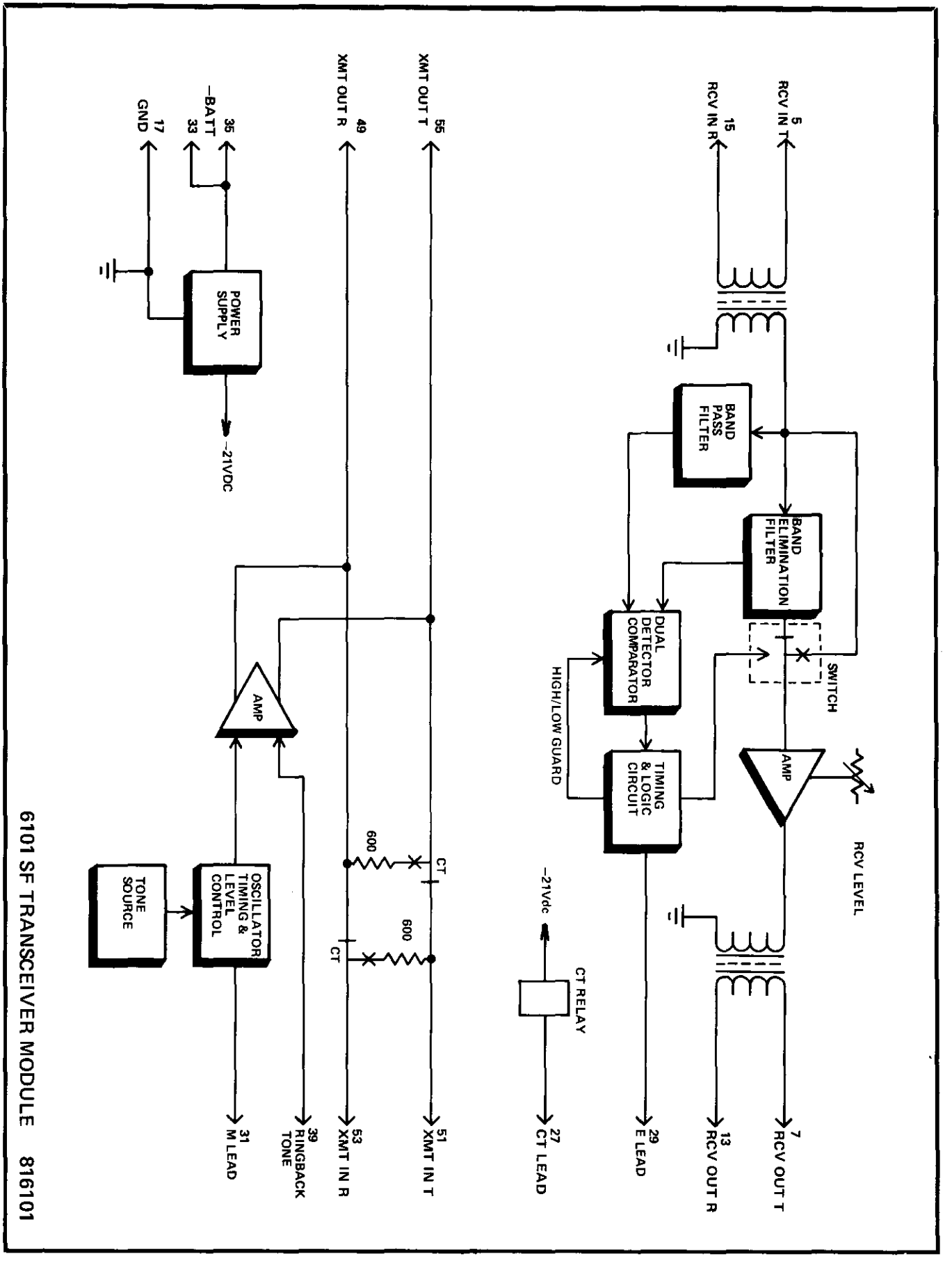
dimensions
5.58 inches (14.17cm) high
1.42 inches (3.61cm) wide
5.96 inches (15.14cm) deep

weight
21 ounces (595 grams)

mounting
relay rack or apparatus case via one position of Tellabs Type 10 Mounting Shelf; also mounts in one position of a Tellabs 260 or 261 System Mounting Assembly

7. testing and troubleshooting

7.01 The Testing Guide Checklist in this section may be used to assist in the installation, testing, or troubleshooting of the 6101 SF Transceiver module. The Checklist 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 6101 module. Unauthorized testing or repairs may void the module's warranty.



5. BLOCK DIAGRAM

6101 SF TRANSCEIVER MODULE 816101

testing guide checklist

Note: *This Testing Guide Checklist is based on the assumption that the 6101 is being tested in a 260 or 261 Signaling and Terminating System with all modules inserted.*

test	test procedure	normal result	if normal conditions are not met, verify:
receive signal level	Arrange receive portion of transmission measuring set (TMS) for 600-ohm bridging measurement and connect it to *RCV OUT MON* jack of Line Amplifier (or pins 5 and 15 of 6101). Request distant end to send 2600Hz SF tone at −20dBm0 using local SF transmitter. Measure received SF tone level.	Tone level between −10 and −16dBm ☐.	Tone is being sent. To do this, have distant end use test oscillator to send 2600Hz tone at −36dBm (−20dBm0). If tone is then received, have distant location check its SF transmitter ☐. If no tone is received, check transmission path and Line Amp ☐. If received tone is not between −10 and −16dBm, check Line Amp gain and equalization settings ☐.
circuit noise level	Same as above, but arrange TMS for C-message noise measurement. Have distant end stop sending SF tone.	Noise level less than 56dBrnC ☐.	Transmission facility properly aligned and levels set correctly ☐.
E-lead signaling state	Using VOM (50Vdc scale) connected between pin 29 (E lead) and pin 17 (ground) of 6101, measure potential with incoming tone (from distant end) alternately applied and removed.	With tone applied to facility, VOM indicates open circuit voltage (approximately −20Vdc) ☐. With tone removed, VOM indicates approximately 0Vdc ☐.	Replace 6101 module and retest ☐. If 6102 is used and trouble persists, verify 6102's switch *S2* in *E GND* position and *S3* in *NORM* position ☐. Replace 6102 and retest ☐.
transmit path cut and transmit SF tone level	Arrange transmit portion of TMS for 1004Hz output at 0dBm0. Insert this signal at *2W IN* jack of Term Set or *XMT IN* jack of 4W Sation Termination. Connect receive portion of TMS, arranged for 600-ohm bridging measurement, to *XMT IN MON* jack of Line Amp (or pins 55 and 49 of 6101).	Measure 2600Hz tone at −36 ±1dBm ☐. 1004Hz test tone not present ☐.	Circuit idle in both directions ☐. 4wire transmit output port terminated in 600 ohms ☐. Replace 6101 and retest ☐. Replace Signaling Converter and retest ☐. Check wiring between pin 27 of 6101 and pin 27 of Signaling Converter module ☐.

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.*

7.02 If a situation arises that is not covered in the Checklist, contact Tellabs Customer Service at your Tellabs Regional Office or at our Lisle, Illinois, or Mississauga, Ontario, Headquarters. Telephone numbers are as follows:

US central region: (312) 969-8800
US northeast region: (412) 787-7860
US southeast region: (305) 645-5888
US western region: (702) 827-3400
Lisle Headquarters: (312) 969-8800
Mississauga Headquarters: (416) 624-0052

7.03 If a 6101 is diagnosed as defective, the situation may be remedied by either *replacement* or *repair and return*. Because it is more expedient, the *replacement* procedure should be followed whenever time is a critical factor (e.g., service outages, etc.).

replacement

7.04 To obtain a replacement 6101 module, notify Tellabs via letter (see addresses below), telephone (see numbers above), or twx (910-695-3530 in the USA, 610-492-4387 in Canada). Be sure to provide all relevant information, including the 8X6101 part number that indicates the issue of the module in question. Upon notification, we shall ship a replacement module to you. If the module in question is in warranty, the replacement will be shipped at no charge. Pack the defective 6101 in the replacement module's carton, sign the packing slip included with the replacement, and enclose it with the defective module (this is your return authorization). Affix the preaddressed label provided with the replacement module to the carton being returned, and ship the module prepaid to Tellabs.

repair and return

7.05 Return the defective 6101 module, shipment prepaid, to Tellabs (attn: repair and return).

in the USA: Tellabs Incorporated
4951 Indiana Avenue
Lisle, Illinois 60532

in Canada: Tellabs Communications Canada, Ltd.
1200 Aerowood Drive, Unit 39
Mississauga, Ontario, Canada L4W 2S7

Enclose an explanation of the module's malfunction. Follow your company's standard procedure with regard 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.