tellabs
technical manual
76-816206
rev A

practice section 816206

6206 AIOD Converter (E&M-SX) Module

contents

1. general description

1.01 The 6206 AIOD Converter (E&M-SX) module (figure 1) is an E&M-to-simplex signaling converter used in Automatically Identified Outward Dialing (AIOD) PBX applications. Specifically, the 6206 converts E&M supervision from a conventional E&M signaling link to simplex supervision over a metallic pair to a central office AIOD Interface Circuit or Station-Identification Frame. The 6206 provides supervisory control at the office end of a single PBX-CO AIOD circuit. The 6206 is functionally equivalent to a Western Electric Co. SD-99435-01 Signaling Converter Circuit.

1.02 In the event that this Practice is reissued, the reason for reissue will be stated in this paragraph.

1.03 Features and options of the 6206 include an integral repeat coil (with provision for use of an external coil if desired) and switch-selectable 600 or 900-ohm impedance matching toward the facility. A front-panel *test access* jack facilitates circuit monitoring.

1.04 The 6206's repeat coil terminates the CO AIOD data loop and derives the CO simplex lead. The repeat coil may be optioned out of the circuit if use of an external coil is preferred. When optioned into the circuit, the repeat coil provides either 600 or 900-ohm balanced terminating impedance on the facility side. Terminal-side impedance (toward the CO AIOD data loop) is fixed at 900 ohms, balanced. The 6206 provides idle line termination.

1.05 Front-panel LED's light to indicate E-lead and M-lead busy status. A third front-panel LED lights when the module is in the test mode (see paragraph 2.04).

1.06 The 6206 operates on −44 to −56Vdc filtered central office battery. Maximum current requirement is 70mA (plus M-lead current) when busy.

1.07 The 6206 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.

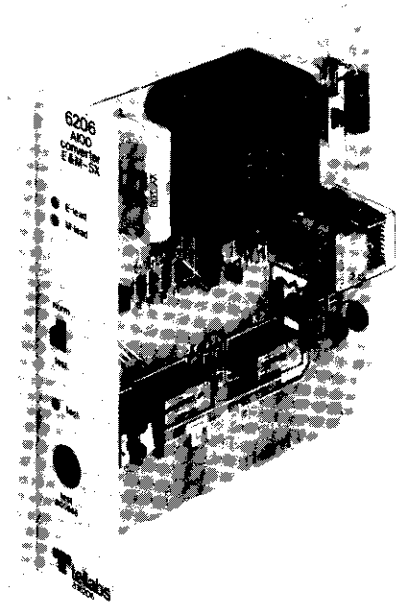


figure 1. 6206 AIOD Converter (E&M-SX) module

2. application and operation

2.01 The 6206 AIOD Converter module is used in a central office providing Automatic Message Accounting (AMA) service to a remote AIOD-equipped PBX. When AMA equipment is located in the central office serving the PBX, signaling conversion equipment is not usually required (see figure 2). When the serving CO cannot accommodate AIOD service, however, access to an AMA register must be extended to a larger office. This extension may be via inband SF signaling, duplex (DX) signaling, or via a PCM (D-type) channel bank. A Tellabs 6205 AIOD Converter module is typically used at the central office serving the PBX to derive E&M signaling from the simplex signaling provided by the PBX AIOD circuit. At the other end of the E&M signaling link, the 6206 converts the E&M signaling into simplex supervision toward the AMA equipment. Figure 3 shows one typical circuit using the 6206.

2.02 The 6206 requests seizure of the associated AMA digit register by changing the state of its internal simplex lead from battery potential to ground in response to an incoming E-lead ground. When a register is connected to the data loop and is ready to receive station-identification data, the AMA interface circuit connects battery to its simplex lead. The 6206 detects this battery potential and changes its M-lead output from ground to battery, indicating to the distant PBX that AIOD data may be

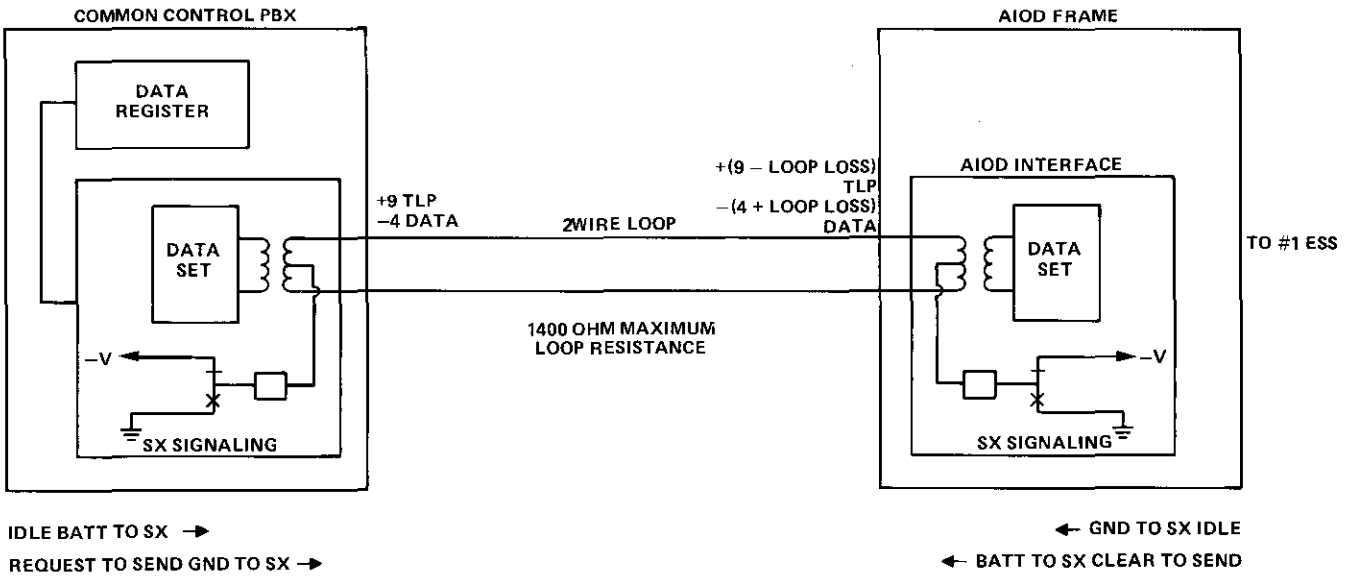


figure 2. Typical local AIOD arrangement

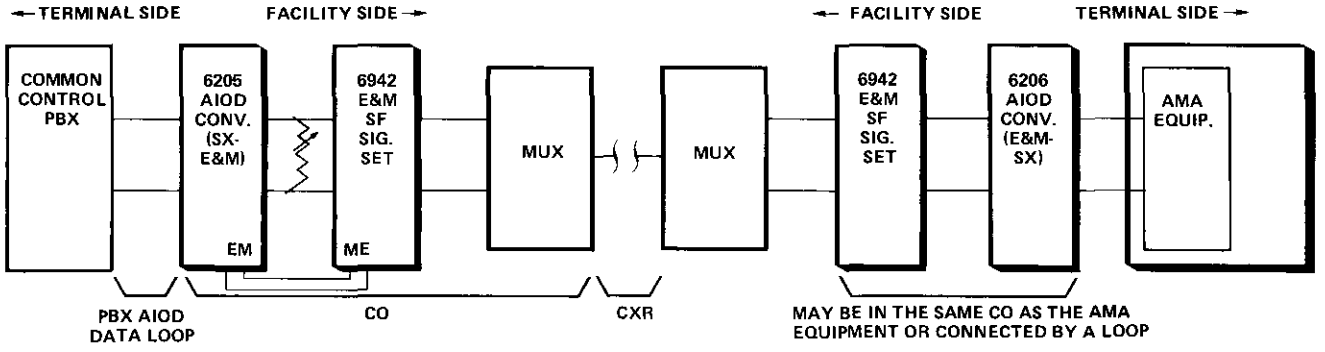


figure 3. Typical 6206 application

transmitted. The PBX then transmits voice-band frequency-shift keying (FSK) or phase-shift keying (PSK) data. At the conclusion of data transmission, the 6206 relays bi-directional disconnect signals to return the data link to its idle state.

repeat coil and level coordination

2.03 The 6206 can be switch-optioned to place its integral repeat coil in the CO AIOD data loop, providing impedance matching and deriving a simplex lead. The module's integral repeat coil does not, however, provide level control. (The insertion loss introduced by the coil is approximately 0.4dB at 1000Hz.) To provide level control between the CO AIOD data loop and the receive input port of the carrier unit, an external attenuator (e.g., a Tellabs 4401, 4402, 4403, or 4404 Pad/Transformer module) must be used.

testing

2.04 A front-panel *test access* jack provides access to the local simplex lead via its tip contact (the ring contact is unused). A 310 plug in the *test access* jack allows monitoring of simplex operation when the module's *norm/test* switch is set for normal operation. In the test mode (i.e., when the switch is set to the *test* position), however, this connection is opened for seizure or testing when a plug is inserted into the *test access* jack. Also, a current limiting resistor is inserted between the simplex lead and battery to maintain an idle-circuit indication toward the CO. The front-panel *test* LED lights when the module is in the test mode.

operation

The remainder of section 2 discusses operation of the 6206 in a typical application. Figure 4 shows the simplex and E&M states involved in such applications. Keep in mind that at the distant end of the circuit, similar signaling-state changes will take place, possibly via a Tellabs 6205 AIOD Converter (SX-E&M) module (see figure 3).

idle

2.05 Control of an AIOD channel between a PBX and AMA equipment at a distant central office is

derived via simplex current flow in metallic loops at each end of the link. Signaling between the dc loops is provided via an E&M signaling link, with a 6205 and a 6206 providing conversion between simplex and E&M signaling. At the AMA-office end of the facility, the idle state is characterized by an open E lead into the 6206, which applies battery potential to its simplex lead. The AIOD Interface Circuit or Station-Identification Frame applies ground to its simplex lead in the idle state, to which the 6206 responds by maintaining ground potential on the M lead. The *E-lead* and *M-lead* LED's are not lit, and an idle-line termination is connected across the transmission pair.

seizure

2.06 A request for seizure of the AMA digit register occurs as an input E-lead ground. The 6206 responds by changing its simplex lead potential from battery to ground. Upon detection of this ground, the digit-register connector seizes and connects an idle digit register to the data path. Simultaneously, the AMA equipment changes the state of its simplex lead from ground to battery potential. The 6206 responds by changing its M-lead state from ground to resistance battery, indicating to the distant PBX that AIOD data may be transmitted. The 6206 also removes the idle-line termination from the data transmission path. As data is transmitted, both the *E-lead* and *M-lead* LED's on the 6206 are lit. (Seizure is never initiated in the reverse direction; i.e., the digit register never changes its simplex lead state from idle to busy without a seizure from the 6206.)

disconnect-PBX disconnects first

2.07 When the distant PBX completes transmission of station-identification data, its simplex state changes, and the E-lead input to the 6206 opens. The 6206 responds by extinguishing the *E-lead* LED. No further action is taken until a disconnect indication is received from the digit-register connector or AIOD Interface Circuit. Reseizure attempts from the PBX (i.e., E-lead ground inputs to the 6206) will not alter the simplex and M-lead states of the 6206 until a release indication has been received from the AMA equipment.

2.08 Upon completion of the PBX station-identification sequence, the digit register releases and the register connector or AIOD Interface Circuit removes battery from its simplex lead and applies ground. The 6206 responds by changing its M lead from battery to ground potential, indicating digit-register release to the PBX. Concurrently, the 6206 changes its simplex state from ground to battery potential. All front-panel LED's are extinguished, the module applies idle-line termination, and the circuit is idle.

disconnect-digit register disconnects first

2.09 If the digit-register connector or AIOD Interface Circuit releases before the PBX, the 6206 will recognize a change in local simplex current while its input E lead is at ground potential. The 6206 responds to the simplex ground by changing its M lead from battery to ground potential, indicating digit-register release to the PBX, and by changing its simplex potential from ground to battery. The *E-lead* LED remains lit until the PBX re-

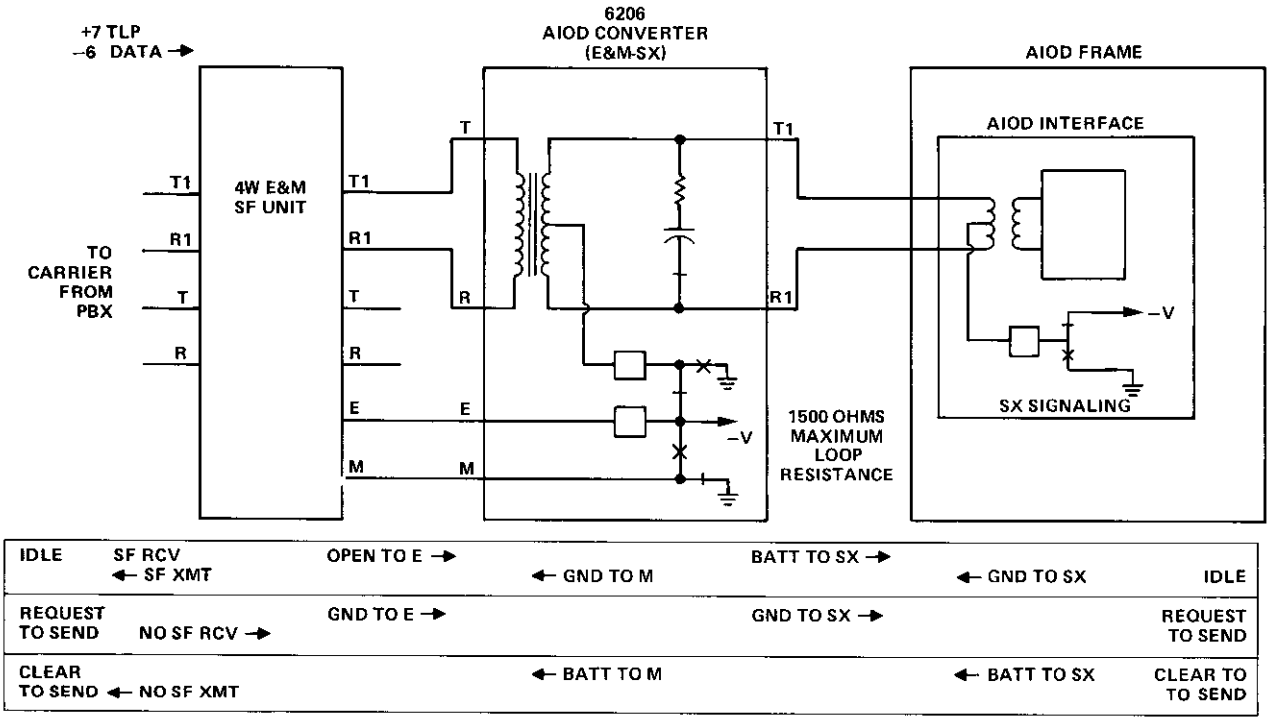


figure 4. Simplex and E&M states in a typical 6206 application

leases. When the PBX releases, the *E-lead* LED extinguishes and the circuit is idle. Circuit supervisory states are summarized in table 1.

supervisory state	6206 E lead	6206 M lead	6206 SX lead	digit-register connector SX lead
idle	open	ground	battery	ground
request for service	ground	ground	ground	ground
request ack.	ground	battery	ground	battery
PBX release	open	battery	ground	battery
AMA release	ground	ground	battery	ground

table 1. Circuit supervisory states

3. installation

inspection

3.01 The 6206 AIOD Converter 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 6206 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. Modules should be put into place only after they are properly optioned and after wiring is completed.

3.04 Tables 2 and 3 list external connections to the 6206 module. All connections are made via wire-wrapping 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. Table 2 lists connections when the module's integral repeat coil is used. Table 3 lists connections when an external repeat coil is used.

option selection

3.05 Three option switches (all of which are two-position slide switches) must be set before the 6206 is placed into service. Two of these switches are located on the printed circuit board as shown in figure 5. The third switch is the *norm/test* switch on the module's front panel (see paragraph 2.04). Paragraphs 3.06 through 3.08 describe each switch in detail.

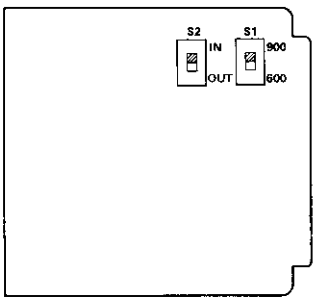


figure 5. 6206 switch options

3.06 Switch *S1* selects either 600 or 900-ohm terminating impedance on the facility side of the 6206. Set *S1* to the *600* or *900* position as required.

3.07 Option switch *S2* conditions the module for use with either an internal or external repeat coil. Set *S2* to the *IN* position if the module's integral repeat coil is used, and wire the module as shown in table 2. Set *S2* to the *OUT* position if an external repeat coil is used, and wire the module as shown in table 3.

3.08 Switch *S3* is the front-panel *norm/test* switch. Set *S3* to the *norm* position for normal circuit operation. Set *S3* to the *test* position for direct access to the simplex lead through the front-panel *test access* jack.

3.09 No alignment of the 6206 is required. However, any associated level-control devices should be aligned before the modules are put into service.

connect:	to pin:
T (AIOD interface loop tip)	41
R (AIOD interface loop ring)	49
T1 (local SF unit or CXR channel bank tip)	51
R1 (local SF unit or CXR channel bank ring)	33
M LEAD (to SF or CXR equipment)	45
E LEAD (from SF or CXR equipment)	11
BATT (–48Vdc CO battery)	35
GND (ground)	17

table 2. Installer connections (integral repeat coil)

connect:	to pin:
T (AIOD interface loop tip)	41
R (AIOD interface loop ring)	49
T AUX (repeat coil tip)	53
R AUX (repeat coil ring)	13
SX LEAD	47
M LEAD	45
E LEAD	11
BATT (–48Vdc CO battery)	35
GND (ground)	17

table 3. Installer connections (external repeat coil)

4. circuit description

4.01 This circuit description is intended to familiarize you with the 6206 AIOD converter module for engineering and application purposes only. Attempts to troubleshoot the 6206 internally are not recommended. Such procedures should be limited to those prescribed in section 7 of this Practice. Please refer to the 6206 block diagram, section 5 of this Practice, as an aid in following the circuit description.

Note: *The following circuit description presumes use of the repeat coil integral to the 6206.*

4.02 The analog data path through the 6206 includes an impedance-matching transformer *T1* that derives either 600 or 900-ohm impedance on the E&M signaling-link side and fixed 900-ohm impedance on the AIOD loop side. Signaling-link impedance is controlled by option switch *S1*. The transformer primary (AIOD loop side) is center-tapped to derive a simplex lead through which supervisory currents are introduced and detected.

4.03 The 6206 detects an input E-lead ground and responds by operating its relay *K2* and lighting the *E-lead* LED. Operation of *K2* removes resistance battery from the simplex lead and applies ground. Until the associated digit-register connector or AIOD Interface Circuit responds by changing its simplex feed from ground to battery, no current flows in the simplex path. When the AMA equipment acknowledges seizure by connecting battery to its simplex lead, simplex current flows from the 6206 toward the AIOD/AMA equipment. The 6206 detects this current flow via an opto-coupler that operates relay *K1* through a relay driver that also lights the *M-lead* LED.

4.04 Relay *K1* operated changes the M-lead potential from ground to battery and removes the idle-line termination from the data loop. Operation of relay *K1* also energizes relay *K3,* which transfers control of relay *K1* from the E lead to the *SX current detector*. This transfer prevents inadvertent release and reseizure of the AMA register before the register has properly returned to idle.

4.05 If the distant PBX releases before the digit register disconnects, relay *K3* will release and the *E-lead* LED will extinguish, but relays *K1* and *K2* remain operated. When the digit-register connector indicates disconnection of the digit register by changing its simplex lead from battery potential to ground, current flow in the AIOD loop is momentarily interrupted. This interruption of simplex current is detected by the 6206's *SX current detector* which releases relay *K1* and extinguishes the *M-lead* LED. Relay *K1* released releases relay *K2,* which returns the circuit to its idle state.

4.06 If the digit register releases before PBX disconnect is received, the 6206 responds to the momentary interruption of simplex current by releasing relay *K1,* which extinguishes the *M-lead* LED, releases relay *K2,* and changes the M lead from battery potential to ground. Release of relay *K2* changes the 6206's simplex potential from ground to resistance battery. Subsequent release by the PBX (open E lead) releases relay *K3,* which restores the circuit to idle.

4.07 An idle-circuit termination is provided between the AIOD loop tip and ring conductors. The termination is inserted whenever relay *K1* is de-energized and removed when the relay is energized. The terminating impedance is 900 ohms in series with 2.0 microfarads capacitance.

4.08 Power to the 6206 is provided via normal −48Vdc central office battery. A diode in the power input path provides reverse-battery protection, and a metal-oxide varistor provides voltage transient protection for internal circuitry.

6. specifications

transmission parameters

insertion loss
0.3 to 0.5dB at 1000Hz between 900-ohm source and 600 or 900-ohm load

frequency response
±0.2dB re 1000Hz level, 500 to 4000Hz
±0.5dB re 1000Hz level, 300 to 4000Hz

port impedances
AIOD data loop side: 900 ohms, balanced
signaling link side: 600 or 900 ohms ±10%, balanced switch-selectable

envelope delay distortion
less than 50 microseconds for any pair of frequencies between 500 and 3000Hz

maximum signal level
greater than +10dBm

supervisory parameters

simplex supervisory range
0 to greater than 5000 ohms dc resistance

SX resistance
500 ohms nominal
(Does not include resistance of current limiting varistor in SX path when K2 relay is operated. The resistance of this device is nominally 65 ohms at low levels of SX current and several kilohms with an external short.)

E-lead sensitivity
maximum 200 ohms dc resistance to ground

supervisory timing
E-lead seizure to SX transition: 3.0 ±1ms
M-lead seizure delay: 10 ±4ms
M-lead release delay: 20 ± 5ms
SX-lead release delay: 5 ±2ms

physical

input voltage
−44 to −56Vdc, filtered

current
idle: 6mA plus SX current
seizure from PBX: 20mA plus SX current
local busy: 70mA plus M-lead current

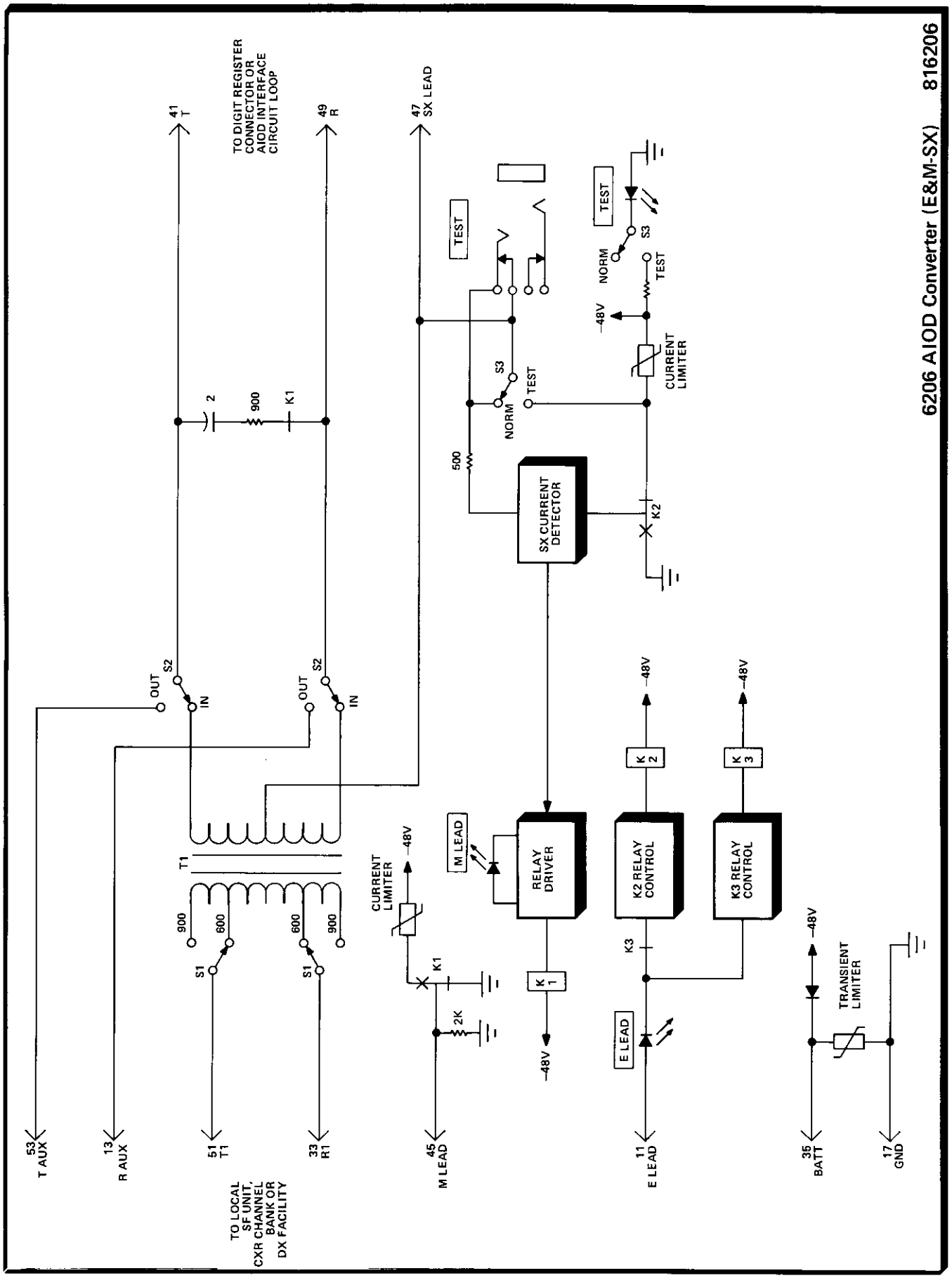
front-panel LED's
M-lead busy
E-lead busy
test mode active

operating environment
20° to 130°F (−7° 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
16 ounces (454 grams)

mounting
relay rack or apparatus case via one position of Tellabs Type 10 Mounting Shelf



5. block diagram

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 6206 AIOD Converter 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 6206 module. Unauthorized testing or repairs may void the module's warranty.

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 or Mississauga Headquarters. Telephone numbers of the regional offices are as follows:

central: (314) 625-8800
northeast: (412) 787-7860
southeast: (305) 645-5888
western: (213) 595-7071

7.03 If a 6206 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 6206 module, notify Tellabs via letter (see below), telephone ((312) 969-8800 in the USA, (416) 624-0052 in Canada), or twx (910-695-3530). Be sure to provide all relevant information, including the 8X6206 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 6206 in the replacement module's carton, sign the packing slip included with the replacement module, 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 6206 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 11
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.

testing and troubleshooting guide

Note: *Proper operation of the 6206 can be determined by performing tests via the front-panel* test access *jack and the local E lead. To avoid seizure of the digit register during testing, the 6206 applies battery potential to the SX lead toward the local AMA equipment when a plug is inserted into the* test access *jack.*

test	test procedure	normal result	if normal conditions are not met, verify:
circuit idle	Set front-panel *norm/test* switch to *test* position and insert test cord with 310-type plug into *test access* jack. Connect CO ground through 500 to 1000 ohms resistance to the test-cord tip lead.	Front-panel *test* LED lighted ☐. *E-lead* and *M-lead* LED's extinguished ☐.	Power properly connected ☐. E-lead open ☐.
incoming seizure	Apply ground to 6206 E lead (pin 11). Use a VOM (50Vdc scale) to measure dc potential between test-cord tip lead and ground.	Before E-lead ground, VOM reads −40 ±10Vdc ☐. With E-lead ground, VOM reads 0 to −10Vdc ☐. *E-lead* LED is lighted ☐.	External dc resistance between E lead and ground less than 200 ohms ☐. Replace module and retest ☐.
seizure acknowledgment	Remove the resistance ground connected to the test-cord tip lead and connect resistance battery (−48Vdc, 500 to 1000 ohms dc resistance).	*M-lead* LED lights ☐. M lead (pin 45) at −48 ±4Vdc ☐.	E-lead ground ☐. External M-lead circuitry disconnected ☐. Replace 6206 and retest ☐.
E-lead release	Remove E-lead ground (pin 11).	*E-lead* LED extinguishes ☐. *M-lead* LED lighted ☐. Voltage on test-cord tip lead 0 to −10Vdc ☐.	Replace module, re-establish seizure, and perform release test ☐.

troubleshooting guide continued on page 8

test	test procedure	normal result	if normal conditions are not met, verify:
AIOD release	Remove resistance battery from test-cord tip conductor and connect resistance ground (500 to 1000 ohms).	Voltage on tip conductor at 310 plug −40 ±10Vdc ☐. *M-lead* LED extinguished ☐.	Same as above ☐.
transmission	Apply ground to E lead (pin 11). Reapply resistance battery to test-cord tip conductor. Arrange transmit position of transmission measuring set to output 1000Hz test tone at 0dBm and at 900 ohms. Insert this signal at connection pins 41 and 49. Condition TMS for appropriate terminating impedance and measure the signal level at pins 51 and 33.	Both *E-lead* and *M-lead* LED's lighted ☐. TMS measures −0.3 ±0.2dBm ☐.	Option switch *S2* set to *in* ☐. Option switch *S1* set to *600* or *900,* as appropriate ☐.
	Return *S3* to *norm.* Remove test cord and E-lead ground.	All LED's extinguished ☐.	

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