

6105 Signaling Converter ARD (Ringdown) Module

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1. general description

1.01 The 6105 Signaling Converter ARD (ringdown) module (figure 1) provides conversion between E&M facility-side signaling and any of several modes of terminal-side automatic or manual ringdown signaling. These modes include 30-second-timed, 2-second-burst, and calling-party-controlled (CPC) automatic ringdown operation and 30-second-timed or coded ringing in either ac or dc manual ringdown operation.

1.02 This practice section is reissued to correct information pertaining to M-lead delay in the manual ringdown mode of operation. This practice section also clarifies optioning requirements for the Tellabs 4203 Terminating Set module when it is used with the 6105.

1.03 The 6105 is typically used in combination with a Tellabs 6101 SF Transceiver module to provide a two-module SF ringdown signaling system compatible with established criteria for F-type in-band signaling. A Tellabs 6001 or 6002 DX Signaling module can also be paired with the 6105 to provide a ringdown arrangement with DX signaling over the facility. The 6105 and its associated SF or DX module normally face another 6105 (or equivalent) and an associated SF or DX module at the opposite end of the facility.

1.04 A common application of the 6105 is in Tellabs' 260 and 261 Signaling and Terminating Systems. Both systems are universally wired to accept a variety of Tellabs signaling, terminating, and interface modules. As a result, the facility signaling mode (SF or DX) and the loop signaling mode (office-end foreign exchange [FXO], station-end foreign exchange [FXS], E&M, conventional ringdown, or data ringdown) can be changed simply by interchanging the appropriate modules. (See the 260 and 261 System practices or brochures for a comprehensive description of the 6105's operation in these Systems.)

1.05 When used in combination with a 6101 SF Transceiver, the 6105 converts E-lead signals (derived by the 6101 from incoming SF tone states) to ringing signals toward the local termination. The 6105 also converts local call origination signals from the local termination to M-lead inputs to the trans-

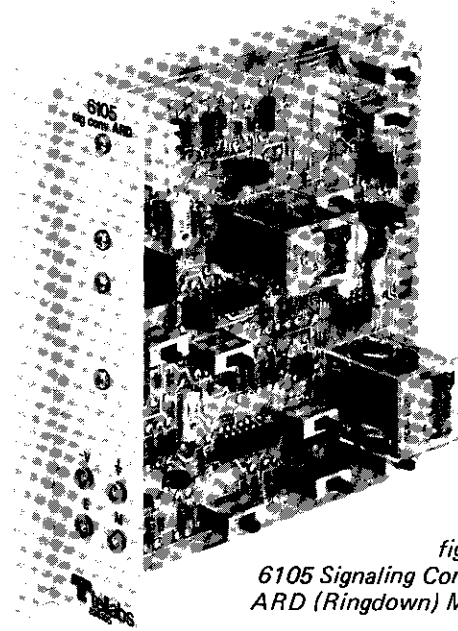


figure 1.
6105 Signaling Converter
ARD (Ringdown) Module

mit section of the 6101 SF Transceiver. When used in E&M-to-DX applications, the 6105 interfaces the 6001 or 6002 DX Signaling module in the same manner.

1.06 Features and options of the 6105 include the following: accommodation of either the manual or the automatic ringdown mode, switch-selectable loop-start or ground-start operation, switch-selectable superimposed or grounded ringing-generator biasing, ringback indication to the originating station during ringing intervals, leads to provide a visual indication of incoming seizure or to start a local ringing generator, either A-and-B-lead or tip-and-ring connection to associated station-side equipment, and a balanced loop-sensing circuit to allow operation in the presence of high longitudinal voltages.

1.07 When used in automatic ringdown applications, the module may be optioned for any of the following modes of operation: a single 2-second ringing burst; 30-second ringing (continuous unless an external or optional plug-on ringing interrupter is used) with automatic timeout if the called party fails to answer; or calling-party-controlled (CPC) ringing. With CPC ringing, the called telephone rings until answered or until the calling party abandons the call.

1.08 When used in the manual mode of operation, either ac (switchboard) or dc (keyed) ringdown may be effected by the 6105. In either case, a switch option determines if ringing is to be coded (i.e., interruption under the control of the user via

key) or under the control of a 30-second ringing timer at the distant location.

1.09 An optional 9903 Ringing Interrupter sub-assembly may be plugged into a receptacle on the 6105 module to provide 2-second-on/4-second-off interrupted ringing, with ring-trip capability during either the silent or the ringing interval. The 9903 can be used in all modes of operation except 2-second burst ringing or coded ringing.

1.10 Internal voltage regulation permits operation on -22 to -56Vdc filtered input. B-lead (talk battery) power is derived prior to regulation to allow operation with conventional B-lead potentials.

1.11 Front-panel test points provide access to battery, ground, and facility-side E lead and M lead to facilitate troubleshooting.

1.12 As a Type 10 module, the 6105 mounts in one position of the Tellabs Type 10 Shelf, versions of which are available for relay-rack or apparatus-case installation. In relay-rack applications, up to 12 modules mount across a 19-inch rack, and up to 14 modules mount across a 23-inch rack. In either case, 6 inches of vertical rack space is used. The 6105 also mounts in one position of a Tellabs 260 or 261 System Mounting Assembly.

2. application types of applications

2.01 The 6105 Signaling Converter ARD (ring-down) module has two primary applications. In the first, the 6105 is used to interface a 6101 SF Transceiver module with any one of several modes of automatic or manual ringdown signaling at a termination. In the second, the 6105 is used in the same capacity with a 6001 or 6002 DX1/DX2 Signaling module.

2.02 Less commonly, the 6105 is used to interface an E&M carrier channel with a termination using ringdown signaling. To use the 6105 in this application, the carrier channel unit must be capable of sensing M-lead signals through a battery resistance of 8.2 kilohms. (The M-lead output of the 6105 is not of sufficient amplitude to drive a relay.)

2.03 The 6105 may be switch-optional for either loop-start or ground-start operation. When optioned for ground start, the 6105 should **not** be used in coded or 2-second ringing applications. In ground-start operation, the 6105 opens the A-lead path to ground when the circuit is idle. Upon receipt of incoming seizure (E lead open), the A-lead connection to ground is made and is maintained during ringing and when the local station is off-hook. In coded or 2-second ringing applications, A-lead ground persists only during the ring-timing interval. Unless a call is answered during that interval, the called party will not have a tip-ground condition and will reinitiate rather than answer the call. Outgoing seizure in all other (i.e., CPC and 30-second-timed) ground-start applications is initiated by application of ground to either the station ring lead (2wire sta-

tion termination) or either lead of the station transmit pair (4wire station termination). Local A-lead ground persists as long as the local station remains off-hook in these other applications. In loop-start operation, the 6105 will accommodate any ring-down mode.

2.04 On its terminal side, the 6105 interfaces a station loop or PBX trunk. The facility side of the 6105 faces (through an SF or DX signaling module or carrier channel) another ringdown signaling system at the distant end of a 2wire or 4wire voice-frequency transmission facility. In 2wire terminal-side applications involving a 4wire facility, a Tellabs 4203 Terminating Set with an A-and-B-lead inductor (or equivalent) is required (see caution below). In applications involving a 4wire facility and a 4wire terminal-side loop, a Tellabs 4405 4Wire Station Termination module (or equivalent) is used in conjunction with the 6105 to provide transmitter current, sidetone amplification, and transformer coupling to the 4wire instrument. When a Tellabs 6002 DX Set is used for signaling over a 2wire facility, 2wire terminal-side loops may be directly interfaced by the 6105. A repeat coil built into the 6002 DX Set provides transmission continuity. Figure 2 shows three common applications. Note that, in addition to associated signaling and terminating modules, a line amplifier is often used in conjunction with the 6105 to establish transmission levels when a 4wire facility is involved.

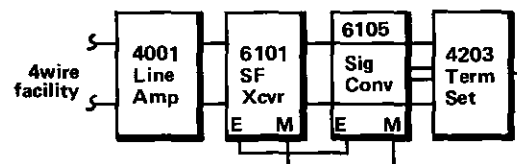


figure 2A. Typical SF application, 4wire-to-2wire

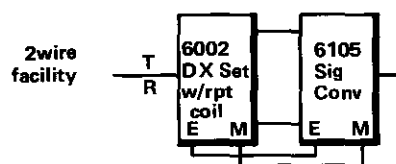


figure 2B. Typical DX application, 2wire-to-2wire

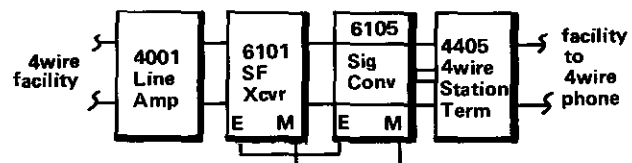


figure 2C. Typical SF application, 4wire-to-4wire

Caution: When the 6105 is used in conjunction with a Tellabs 4203 Terminating Set module and ringing passes through the A and B leads of the 4203, the 4203's A-and-B-lead filter capacitor must be optioned out of the circuit (switch S3-8 set to OFF). Excessive ring generator loading or pretrip may otherwise result.

SF applications

2.05 The 6105 Signaling Converter and 6101 SF Transceiver, in combination, provide an F-type SF signaling system compatible with conventional in-band ringdown signaling equipment at the distant end of the circuit. The 6105, optioned for CPC ringing, is also end-to-end compatible with a Wescom ringdown SF signaling system using the "ARD-WES" mode of operation. See the 6101 practice for detailed information on the SF Transceiver module.

2.06 When the 6105 is used with a companion 6101 SF Transceiver in SF applications, the transmission path is cut and terminated in both directions during idle and ringing intervals, except in ac manual ringdown service. (Because there is no internal loop supervision in ac manual applications, the cut-and-terminate relay in the 6101 operates only during ringing intervals in this mode.) The cut-and-terminate function is controlled by the 6105 but performed by circuitry in the 6101.

2.07 The 6101/6105 combination uses standard SF tone states for ringdown service. In all automatic modes except CPC, tone is transmitted for 2 seconds to initiate distant ringing. Audible ringback is provided to the local station during ringing intervals at the distant end. SF tone is **not** returned when the called party answers. In the CPC mode, tone is transmitted continuously during ringing initiation, and distant ringing occurs continuously until the called party answers or until the calling party goes on-hook. When the called party answers, the 6101-6105 combination at the answering end of the circuit returns a 0.5-second burst of SF tone to the originating end as an indication to stop sending SF tone. In the manual modes of operation, tone persists through the duration of keying. At all other times, no SF tone is present on the circuit.

Note: *The 6101 operates with standard SF tone levels. Input to the receive port of the 6101 is -13dBm during tone-on conditions, except for an augmented level of -1dBm for approximately 400ms each time tone is applied at the distant end of the facility. The 6101's transmit tone level is -36dBm, except for an augmented level of -24dBm during the first 400ms of any tone transmission interval. These levels are consistent with standard facility interface transmission level points (TLP's) of +7 receive and -16 transmit.*

DX applications

2.08 As mentioned earlier, the 6105 Signaling Converter module can also be used to interface DX signaling units with terminal-side ringdown signaling. The 6105 may be paired with a Tellabs 6001 DX Signaling module for use on a 4wire facility or with a 6002 DX Signaling module for use on a 2wire or 4wire facility. In 4wire DX applications, a facility terminating module, such as a 4001 Line Amplifier or a 4411 Pad/Transformer module, is necessary to derive transmit and receive simplex leads used as inputs from the facility to the DX Signaling mod-

ule. In 2wire applications, a repeat coil is integral to the 6002 DX module, and no external facility interface module is required (see figure 2B). Refer to the 6001/6002 Practice for additional information on these DX modules.

operating modes

2.09 The 6105 accommodates any of seven modes of ringdown operation: two manual dc ringdown modes, two manual ac ringdown modes, and three automatic ringdown modes. These seven modes are summarized in table 1. The desired mode is selected via option switches on the 6105's printed circuit board.

Note: *The circuits in which the 6105 is used are normally two-way circuits, i.e., either end of a circuit may originate or receive calls. Therefore, to best describe both the call-origination and call-termination functions of the 6105, paragraphs 2.11 through 2.14 are based on the assumption that a 6105 is present at both ends of each circuit described therein (rather than at only one end, with different F-type ringdown SF equipment at the other). The ringdown mode at both ends need not be identical unless CPC automatic ringdown is used. When CPC automatic ringdown is used at one end of the circuit, it must also be used at the distant end.*

type of ringdown	available ringing arrangements
manual dc (keyed)	30-second timed ringing coded ringing
manual ac (switchboard)	30-second timed ringing coded ringing
automatic	30-second timed ringing 2-second burst ringing calling-party controlled (CPC) ringing

table 1. 6105 ringdown modes

automatic timed ringdown

2.10 In all modes of automatic ringdown, distant ringing is initiated by a local off-hook. With automatic timed ringdown, this local off-hook causes the local (i.e., originating-end) 6105 module to apply M-lead ground toward the distant (terminating) end for 2 seconds as an indication of circuit seizure. (In SF applications, this 2-second M-lead ground results in transmission of a 2-second SF tone burst toward the distant end.) Receipt of this seizure indication at the distant end causes the E lead of the distant-end 6105 to be opened momentarily, which initiates station ringing at that end. This distant-end ringing persists for either 2 seconds or 30 seconds, depending upon how the 6105 at that end is optioned, unless the distant end answers before the selected interval elapses.

2.11 When the distant-end 6105 is optioned for 2-second ringing, the originating-end 6105 controls the ringing interval. Ringing persists for the duration of the originating end's 2-second M-lead ground. When the distant-end 6105 is optioned for 30-second ringing, it controls the ringing interval. The originating end's 2-second M-lead ground and

the resulting E-lead open at the distant end activate a 30-second timer in the distant-end 6105. When the 30-second option is selected, the module can be further optioned for either continuous or interrupted ringing (through the use of an external ringing interrupters, such as the Tellabs 9903 subassembly). When the 2-second-burst option is selected, only continuous ringing can be used. When the 6105 interfaces ground-start station equipment, only the 30-second ringing option should be used because conventional ground-start operation can be provided only if the called station answers before the ringing interval elapses.

CPC automatic ringdown

2.12 In the calling-party-controlled (CPC) automatic ringdown mode (also known as "ARD-WES"), when the station equipment at the originating end goes off-hook, the 6105 module at that end applies M-lead ground (SF tone on in SF applications) toward the distant (terminating) end as a seizure indication. The terminating-end 6105 receives this information in the form of an E-lead open, which initiates station ringing at that end. In these respects, CPC ringdown is identical to automatic timed ringdown. In CPC ringdown, however, the originating-end M-lead ground and terminating-end E-lead open persist — and, therefore, terminating-end station ringing persists — until the called station answers or until the calling station goes back on-hook. Ringing of the called station in the CPC mode is under control of the receive (E-lead) signaling states in the terminating-end 6105. Answer supervision from the terminating-end 6105 is a brief application of M-lead ground toward the originating end when the call is answered. Receipt of this signaling-state change causes the originating-end 6105 to restore the outgoing M-lead to battery potential, removing the SF tone. Either continuous or interrupted ringing may be used in the CPC mode, and either loop-start or ground-start operation may be accommodated at either end of the circuit. Again, please note that in CPC ringdown applications, the signaling units at **both** ends of the circuit must be optioned for the CPC ringdown mode. This is necessary so that the required answer supervision is provided to the originating end.

manual ringdown

2.13 Manual ringdown may be initiated in either of two ways: by application of ground potential, via a dc ringing switch or key, to a dc input of the originating-end 6105 (dc ringdown mode), or by application of ringing potential across the 2wire tip and ring leads of the originating-end 6105 (ac ringdown mode). In either mode, the originating-end 6105 applies M-lead ground (SF tone on in SF applications) toward the terminating end for as long as ground or ringing potential is applied, to the module. At the terminating end, the resulting E-lead open of the terminating-end 6105 persists concurrently with the originating-end 6105's M-lead ground. This E-lead open activates station ringing either for a 30-second interval or for the

duration of the E-lead open, as selected via switch option on the terminating-end 6105 module. This means that, when the terminating-end 6105 is optioned to provide ringing for the duration of the E-lead open (*S4* set to *CODED RING*), ringing directly follows the manual operation of the dc or switchboard key or switch at the originating end (where *S1* is set to *MAN*). This option therefore allows for coded ringing in applications where multiple stations are present at the terminating end.

2.14 To accommodate ac (switchboard) ringdown applications, the internal A and B leads in the 6105 can be disconnected via option switch *S6*. (In ac switchboard ringdown applications, local loop A&B-lead current is supplied from the local terminating circuit and not by the 6105.)

ringing interruption

2.15 Ringing interruption may be provided to the local station via an external interrupted ringing source or via a 9903 Ringing Interrupter subassembly that plugs into a receptacle on the 6105's printed circuit board. While ringing interruption cannot be used with 2-second ringing in the automatic mode or with coded ringing in either the ac or dc manual mode, the 9903 can be used to provide standard 2-second-on/4-second-off ringing interruption with 30-second ringing in either the automatic timed mode or the ac or dc manual mode, or with CPC automatic ringdown. With the 9903, ring trip will occur during either silent or ringing intervals.

power, ringing and range

2.16 While all internal 6105 circuitry receives power through a regulator that allows the module to operate on -22 to -56Vdc filtered input, B-lead and M-lead potentials are derived directly from the external power source. Loop-sensing limits are, therefore, dependent upon the external source. Loop-sensing circuitry in the 6105 will operate at a maximum range of 3000 ohms at -48Vdc and a maximum range of 1200 ohms at -24Vdc. Loop limits (cable plus station instrument) for 23mA loop current are 650 ohms at -24Vdc B-lead potential and 1600 ohms at -48Vdc B-lead potential. In applications involving a short loop between the 6105 and the local station, -24Vdc operation is recommended. While the M-lead potential may be -48Vdc, 6105 battery resistance in the M-lead is 8.2 kilohms; therefore, the M-lead output is not capable of driving a relay, and the 6105 must be used in conjunction with a signaling unit capable of sensing M-lead signals from an 8.2-kilohm battery resistance. Facility-side range is determined by the capabilities of the associated signaling unit.

2.17 Talk battery is applied to the local station through the 6105 except in ac (switchboard) manual ringdown applications. To prevent excessive circuit noise, it is important that the power source for the 6105 be free from excessive ripple and transients. (In ac manual ringdown, talk battery is supplied by the switchboard.)

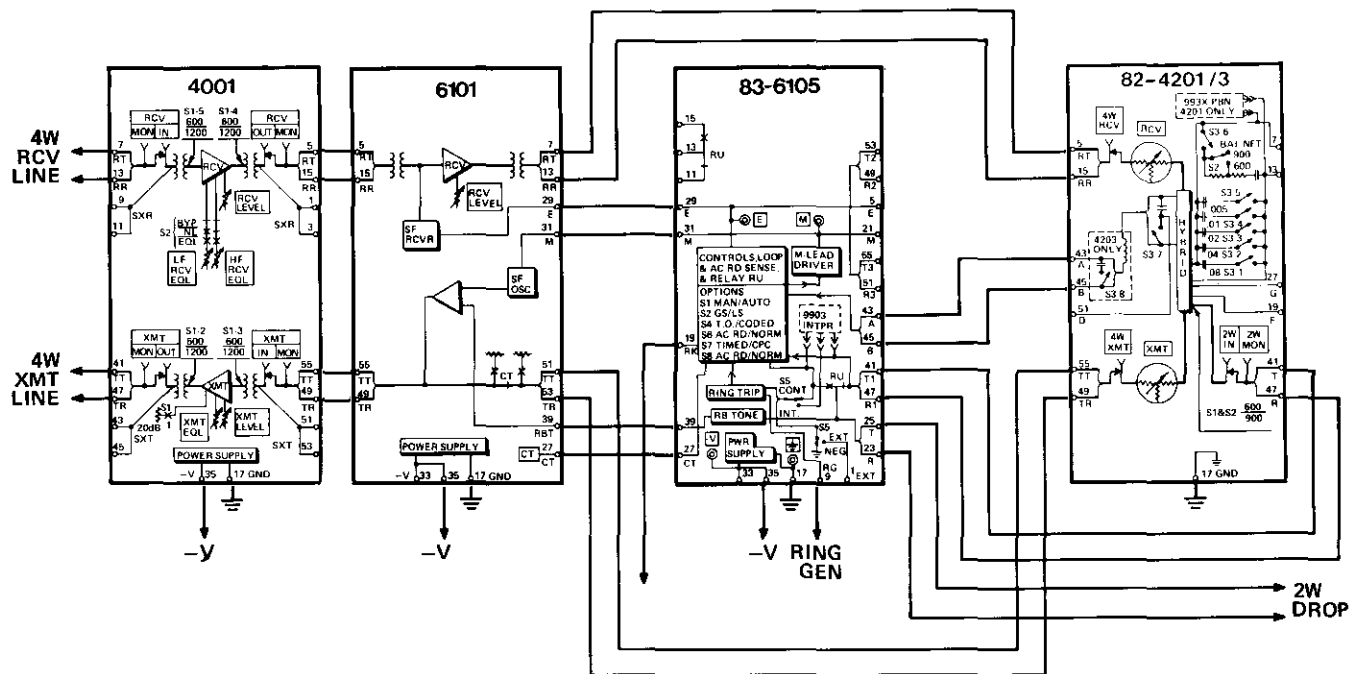


figure 3. Connections required in typical 260 or 261 System application

2.18 To accommodate local ring trip during the ringing interval, some type of dc ringing bias must be provided. The ringing generator connected to the module may be either positively or negatively biased, with a bias potential of either 24 or 48Vdc. Bias voltage is supplied by a dc voltage connected in series with the ac ringing source.

2.19 A spare set of contacts on the ring-up (RU) relay is available via connector pins 11, 13, and 15. These contacts can be used to provide a visual indication of incoming seizure or to start a local ringing generator.

3. installation inspection

3.01 The 6105 Signaling Converter ARD (ring-down) 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 6105 mounts in one position of the Tellabs Type 10 Mounting Shelf, or in position 3 of the Tellabs 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. The 6105 module should be plugged into place only after it is properly optioned and after wiring is completed.

3.04 Table 2 lists external connections to the 6105 Signaling Converter. 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 56-pin connector.

connect:	to pin:
T (to station tip lead)	25
R (to station ring lead)	23
T1 (to 420X or 6002)	41
R1 (to 420X or 6002)	47
T2 (if required)	49
T3 (if required)	51
R2 (if required)	53
R3 (if required)	55
E (intermodule E lead from 6101 or 600X)	29 or 5
M (intermodule M lead from 6101 or 600X)	31 or 21
CT (cut-and-terminate to 6101)	27
A (A lead to 420X or 6002)	43
B (B lead to 420X or 6002)	45
RING GEN (ringing generator)	9
RINGBACK TONE	39
EXT RING GEN BIAS (external ringing generator bias)	1
RINGDOWN KEY (DC) (if required)	19
-BATT (-22 to -56Vdc)	35 or 33
GND (internal ground)	17
NC (K1: normally closed relay contact)	11
NO (K1: normally open relay contact)	15
COMM (K1: common contact)	13

table 2. External connections to 6105

3.05 Figure 3 shows the connections required when the 6105 is used in an Issue 2 Tellabs 260 or 261 signaling and Terminating System. Internal connections in Tellabs 260 and 261 Systems are universally prewired. Only external connections need be made.

options and alignment

3.06 Before placing the 6105 module into service, eight option

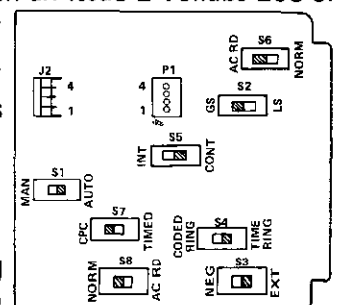


figure 4. 6105 option switch locations

receive ringing mode	S1**	S2	S3	S4**	S5	S6*	S7*	S8*
auto 30-sec. timed	AUTO	LS or GS	NEG or EXT	TIMED RING	CONT or INT	NORM	TIMED RD	NORM
auto 2-sec. burst	AUTO	LS	NEG or EXT	CODED RING	CONT	NORM	TIMED RD	NORM
auto CPC	AUTO	LS	NEG or EXT	CODED RING	CONT or INT	NORM	CPC RD	NORM
manual coded dc rd	MAN	LS	NEG or EXT	CODED RING	CONT	NORM	TIMED RD	NORM
30-sec manual dc rd	MAN	LS or GS	NEG or EXT	TIMED RING	CONT or INT	NORM	TIMED RD	NORM
manual coded ac rd	MAN	LS	NEG or EXT	CODED RING	CONT	ACRD	TIMED RD	ACRD
30-sec. manual ac rd	MAN	LS or GS	NEG or EXT	TIMED RING	CONT or INT	ACRD	TIMED RD	ACRD
*Controls ringing at distant end								
**Controls ringing at local station								

table 4. Option switch settings for various ringing modes

switches must be set. Locations of these switches on the module's printed circuit board are shown in figure 4. After these options are selected, no alignment of the 6105 is required (see paragraph 3.15.)

3.07 Option settings for each specific application of the 6105 module are listed in table 4. More detailed explanations of the options follow in paragraphs 3.08 through 3.14.

3.08 Switch *S1* is used to select the transmit (outgoing) ringdown mode. Set *S1* to the *AUTO* position for automatic (timed or CPC) ringdown or to the *MAN* position for ac (switchboard) or dc (keyed) manual ringdown.

3.09 Switch *S2* is used to select the loop supervisory mode for the local loop. Set *S2* to the *LS* position for loop-start supervision or to the *GS* position for ground-start supervision. Do not use the ground-start option in the coded-ringing mode (i.e., when switch *S4* is set to the *CODED RING* position). For one-way ringdown service on a loop-start circuit, the module at the station which is to receive calls only can be optioned for ground-start operation.

3.10 Switch *S3* conditions the module for battery-biased or ground-biased ringing generator. Set *S3* to the *NEG* position to provide an internal ground return for use when a battery-biased (–24 or –48Vdc) ringing generator is connected to pin 9. Set *S3* to the *EXT* position and connect a source of battery to pin 1 for use when a ground-biased ringing generator is connected to pin 9.

3.11 Switch *S4* is used to select either the timed or coded mode of ringing at the local station. Set *S4* to the *CODED RING* position when ringing following E-lead input (open=ringing) is desired. In manual coded-ringing applications, a 9903 Ringing Interrupter subassembly cannot be used. A ringing interrupter can, however, be used in the automatic CPC mode. Set *S4* to the *TIMED RING* position for applications with ringing in response to a 30-second timer.

3.12 Switch *S5* is used to condition the module for use with or without a 9903 Ringing Interrupter subassembly. Set *S5* to the *INT* (interrupted ringing) position if a 9903 subassembly is to be attached to the 6105 to provide 2-second-on/4-second-off local ringing. Set *S5* to the *CONT* (continuous ringing) position only if the 9903 subassembly is not used.

Note: Do not set *S5* to the *CONT* position when a 9903 subassembly is plugged into the module.

3.13 Switches *S6* and *S8* are used to option the 6105 for ac ringdown applications. Set both *S6* and *S8* to the *AC RD* position for local ac (switchboard) control of distant-end ringing. Set *S6* and *S8* to *NORM* for all other applications.

3.14 Switch *S7* is used to select calling-party-controlled (CPC) or timed ringing in automatic ringdown modes. Set *S7* to the *CPC RD* position for CPC ringing only. Set *S7* to the *NORM* position for all other automatic ringdown modes and for all manual ringdown applications.

Note: When the CPC ringing mode is used, the 6105 modules at both ends of the circuit must be optioned for CPC operation. Both 6105's must also be optioned for automatic ringdown by setting *S1* to the *AUTO* position and *S4* to the *CODED RING* position.

alignment

3.15 No alignment of the 6105 itself is required. In SF applications, however, the receive amplifier of the associated 6101 SF Transceiver must be adjusted for zero gain through the unit. Also, if an associated line amplifier is used at the facility interface, it should be adjusted to provide +7dBm receive and –16dBm transmit transmission levels (at 1004Hz) to the 6101 module. Refer to either the Tellabs 260 or 261 System Practice or the individual Practices on the associated line amps, and signaling and terminating modules for detailed information on alignment and optioning of these modules.

4. circuit description

4.01 This circuit description is intended to familiarize you with the 6105 Signaling Converter ARD module for engineering and application purposes only. Attempts to troubleshoot the 6105 internally are not recommended and may void your warranty. Troubleshooting procedures should be limited to those prescribed in section 7 of this Practice. Please refer to the associated functional block diagram, section 5 of this Practice, as an aid in understanding this circuit description.

4.02 The receive portion of the 6105 consists of a ring delay timer and sensing circuit, a ring latch, and a ring timer. The ring delay circuit and E-lead sensor set the ring latch approximately 100 milliseconds after the incoming E-lead changes from

ground to open, except in coded-ringing and CPC applications (described in paragraphs 4.03 and 4.04). The *ring latch* is reset by the *ring timer* 30 seconds after initiation of ringing is set, relay *K1* operates, and ringing is supplied to the local station.

4.03 When option-switch *S4* is in the *coded ring* position, the *ring latch* is disabled, and the *ring-up (RU) relay* will operate whenever the incoming E lead is open.

4.04 In the CPC ringdown mode, the ring latch is disabled and local ringing persists until the local station answers or until the local E lead returns to ground. When the local station answers an incoming call in the CPC mode, a monopulser is triggered and grounds the local 6105's M lead for approximately 0.5 second to indicate local-station answer.

4.05 When the 6105 is equipped with a 9903 Ringing Interrupter subassembly, operation of the *RU relay* energizes the 9903 Interrupter, which is subsequently de-energized either by expiration of the ring-up timing interval, by local ring trip, or by an incoming E-lead state change from open to ground (CPC mode).

4.06 Local ring trip is provided by a bidirectional light-coupled sensor that operates on the dc component of the composite ac-dc ringing signal.

4.07 In ground-start applications, the GS relay (*K2*) is operated when the incoming E lead is opened, and is de-energized when the *ring latch* is reset or when the E lead is grounded, unless the local station has gone off-hook during the timing interval or while the E lead is open.

4.08 Outgoing seizure (toward a distant location) is effected through control of the M lead. The M lead is maintained at battery potential (through an 8.2-kilohm resistance) during both busy and idle states, and changes to ground potential to indicate outgoing seizure.

4.09 In the timed automatic ringdown mode, outgoing seizure occurs when the local station goes off-hook. A precision balanced *loop detect and loop sense* circuit senses the flow of loop current and, after a 120 millisecond delay, enables the *0.5-sec timer/M-lead latch*. While enabled, this *latch* causes the M lead to be at ground potential.

4.10 In the CPC ringdown mode, the *M-lead latch* is set when the local station initiates a call. This *latch* maintains the 6105 M lead at ground potential until the local station goes on-hook or until a reset pulse is received from the E-lead sensing circuitry (*ring delay and ring latch*) and the *answer supervision reset*, indicating that the distant station has answered the call. This *M-lead latch* is prevented from operating on incoming calls.

4.11 The *CT* (cut-and-terminate) *relay control* circuit in the 6105 is controlled by either the *loop detect* circuit or the *M-lead latch* circuit so that, in all modes except ac ringdown, the CT lead is at ground (*CT relay* operated) when the circuit is idle (no loop current) and when the M lead is at ground.

In the ac ringdown mode, the CT lead is at ground only during outgoing signaling.

6. specifications

E-lead signaling states

idle: ground

busy: ground

ringing initiation: open

maximum external E-lead resistance to ground

500 ohms

ringing frequency range

16 to 67Hz

ring-up delay

120 to 180ms

ringing time parameters

30 second ring: ± 3 seconds

coded ringing: follows E-lead open ± 0.5 seconds

local ring trip range

0 to 3000-ohm station loop: 48Vdc ringing generator bias

0 to 1200-ohm station loop: 24Vdc ringing generator bias

pre-trip margin

will not pretrip with up to 3 μ F capacitance and 30

kilohm loop leakage resistance

loop sensing range

—48Vdc operation: 3000 ohms

—24Vdc operation: 1200 ohms

ground-start seizure delay

within 200ms of incoming seizure

M-lead signaling states

idle: resistance battery

busy: resistance battery

seizure: ground

M-lead seizure delay

200 $\pm$ 50ms in auto or CPC mode; no delay in manual

call-initiation mode

transmit signaling time parameters (*M-lead duration*)

automatic mode: 2 $\pm$ 0.5 seconds

CPC mode: 0.5 $\pm$ 0.1 second when answering an incoming

call; constant when initiating an outgoing call

manual mode: responds within 1ms of seizure or release

dc manual seizure

ground through 2000 ohms

ac manual seizure

minimum 50Vac ringing on loop (A and B) leads

M-lead resistance

busy and idle: 8200 ohms to negative supply

seizure: 100 ohms to ground

power requirements

—22 to —56Vdc, filtered, ground-referenced

20mA idle

20mA + loop current: busy (loop start)

40mA + loop current: busy (ground start)

40mA: ringing (loop start)

50mA: ringing (ground start)

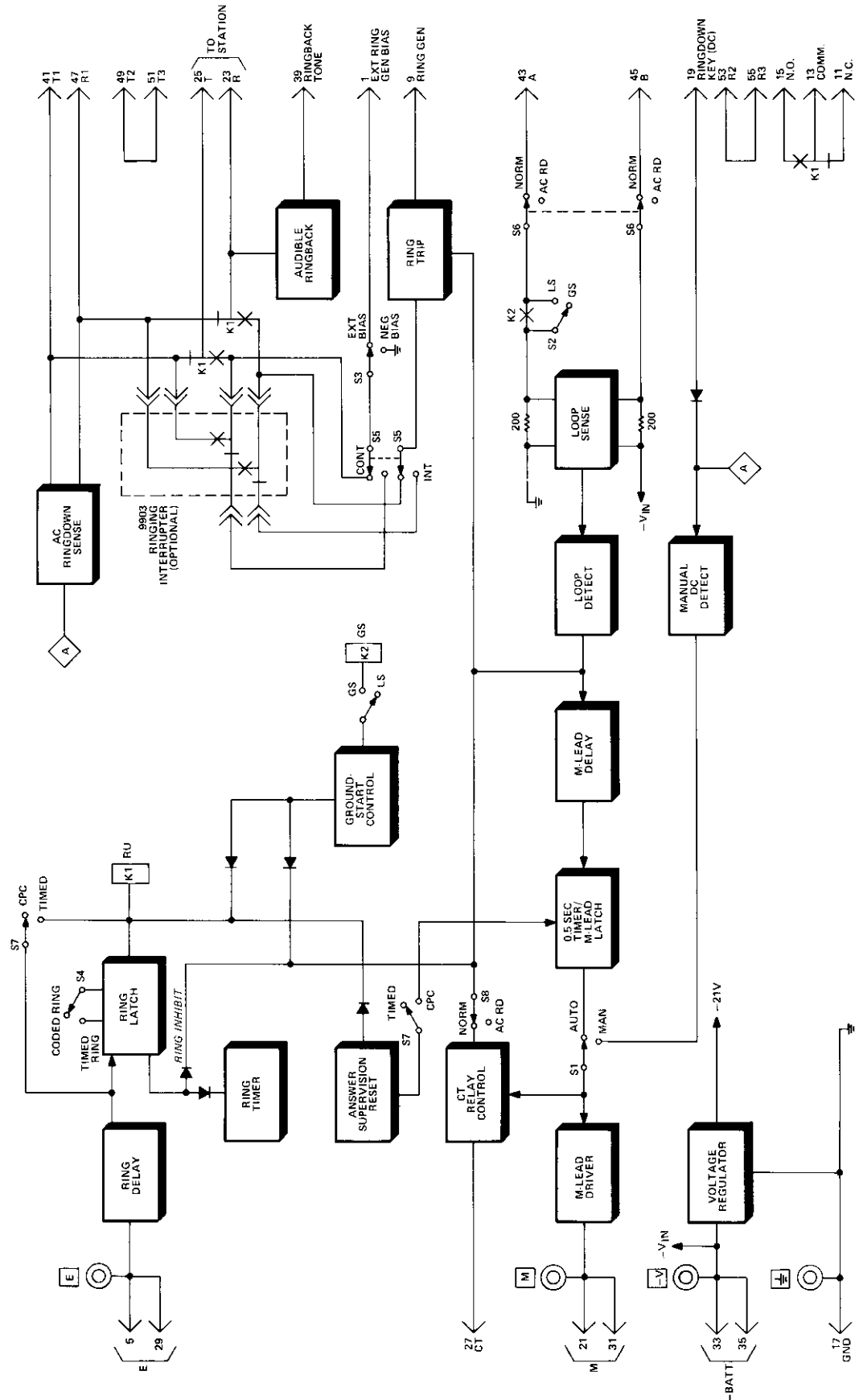
longitudinal balance

60dB minimum

longitudinal environment

module operates in presence of up to 60Vac rms line induction (measured with unit removed, and tip and ring connected together to ground through a 500-ohm resistor)

specifications continued on page 9



6105 Signaling Converter ARD 836105

5. block diagram

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

9 ounces (255 grams)

10 ounces (284 grams) with 9903 Ringing Interrupter

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 Signaling and Terminating 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 6105 Signaling 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 6105 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, 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: (213) 595-7071

Lisle Headquarters: (312) 969-8800

Mississauga Headquarters: (416) 624-0052

7.03 If a 6105 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 6105 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 8X6105 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 6105 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 6105 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 guide checklist

test	test procedure	normal result	if normal conditions are not met, verify:
power and ringing	Using VOM (–250Vdc scale) to measure voltage between 6105 –V and GND test points. Remove connection from –V test point. Adjust VOM to measure Vac and connect it to pin 9. Measure ringing potential.	From –22 to –56Vdc (referenced to ground) present at –V test point ☐ . Ringing voltage of 50 to 120Vac measured from pin 9 to ground ☐ .	External power ☐ . External ringing source ☐ .
circuit idle, E lead	During idle circuit conditions, use VOM (–50Vdc scale) to measure voltage between E-lead and ground test points.	Voltage less than ± 24 Vdc, indicating E-lead ground ☐ . Ringing voltage does not appear across station tip and ring leads (pins 41 and 47) ☐ .	Associated 6101 or 6001/2 fully inserted into its connector and powered ☐ . No SF tone being received, or distant-end DX set busy ☐ . Replace associated 6101 or 6001/2 and retest ☐ .
incoming seizure (loop start)	Open E lead to 6105 either by transmitting 2-second SF tone or M-lead ground from distant location, or by unplugging (momentarily) 6101 or 6001/2 module. Observe station ringing (or observe station tip and ring leads with VOM set for Vac).	Local ringing commences within 150ms of occurrence of E-lead open. If <i>S4</i> in <i>CODED RING</i> position, or if <i>S7</i> in <i>CPC RD</i> position, ringing coincides with E-lead open intervals ☐ . If <i>S4</i> and <i>S7</i> set for timed ringdown, ringing persists for 30 seconds ☐ .	6105 options set correctly ☐ . Station wiring correct and station on-hook ☐ . <i>S5</i> in <i>CONT</i> position unless 9903 Interrupter used ☐ . Replace 6105 and retest ☐ . Replace 6101 or 6001/2 and retest ☐ . Replace 9903 and retest ☐ .
incoming seizure (ground start)	Same as loop-start incoming seizure above.	Tip ground extended to station, and ringing commences within 150ms of occurrence of E-lead open. Ringing and E-lead ground persist for 30 seconds (timed ringdown mode) or for duration of E-lead open (CPC ringdown mode) ☐ .	<i>S2</i> in <i>GS</i> position ☐ . All above conditions in loop-start incoming-seizure test ☐ .
local ring trip	While local station is ringing, place station in off-hook condition.	Ringing ceases as soon as station goes off-hook, with no audible ringing in station receiver ☐ .	Ringing source referenced to dc potential and <i>S3</i> in <i>NEG BIAS</i> position ☐ ; or ringing source grounded and dc bias potential connected to pin 1 with <i>S3</i> in <i>EXT BIAS</i> position ☐ . Station wiring correct ☐ . Local loop limits not exceeded ☐ . Replace 6105 and retest ☐ .
circuit idle, M lead	Use VOM (–250Vdc scale) to measure voltage between 6105 M-lead and ground test points.	With circuit idle, M-lead test point at supply voltage (–24 or –48Vdc) ☐ .	Local station on-hook ☐ . Replace 6105 and retest ☐ .
outgoing seizure, loop start, automatic ringdown mode	Same as above. Place local station off-hook.	When station goes off-hook, M-lead voltage changes from battery to ground potential for approximately 2 seconds and then returns to battery potential ☐ .	Local station wiring correct ☐ . Loop limits are not exceeded ☐ . <i>S2</i> in <i>LS</i> position ☐ . <i>S1</i> in <i>AUTO</i> position ☐ . <i>S6</i> in <i>NORM</i> position ☐ . Replace 6105 and retest ☐ .

test	test procedure	normal result	if normal conditions are not met, verify:
outgoing seizure, ground start, automatic ringdown mode	Same as above. Momentarily ground associated ring lead.	As station goes off-hook, no change in M-lead potential occurs ☐ . When ring lead is grounded, M lead changes from battery potential to ground for approximately 2 seconds and then returns to battery potential (timed ringdown mode) ☐ , or remains at ground potential until local station goes on-hook or until a momentary E-lead open occurs (CPC mode) ☐ .	Local station wiring ☐ . Loop limits not exceeded ☐ . S2 in GS position ☐ . S1 in AUTO position ☐ . S6 in NORM position ☐ . Ring ground removed ☐ . Replace 6105 and retest ☐ .
outgoing seizure, dc manual ringdown mode	Use VOM (-250Vdc scale) to measure voltage between 6105 M-lead and ground test points. Place local station off-hook and depress local ringdown key.	When station goes off-hook, no change in M-lead potential occurs ☐ . While ringdown key depressed, M-lead voltage at ground ☐ , and when released, M-lead voltage at supply potential ☐ .	S1 in MAN position ☐ . Ground (through maximum 2000-ohm resistance) supplied to pin 19 when ringdown key is depressed ☐ . S2 in LS position ☐ . S6 in NORM position ☐ . Replace 6105 and retest ☐ .
outgoing seizure, ac (switchboard) manual ringdown mode	Use VOM (-250Vdc scale) to measure voltage between 6105 M-lead and ground test points. Depress switchboard ringdown key.	M-lead potential same as supply potential except while ringdown key depressed ☐ . M lead at ground when ringdown key depressed ☐ .	Ringing voltage (50Vac rms minimum) appears between connector pins 41 and 47 when ringdown key is depressed ☐ . S1 in MAN position ☐ . S6 and S8 in AC RD position ☐ . Replace 6105 and retest ☐ .
cut-and-terminate relay control (SF only)	Seize circuit. Remove 6101 and observe CT lead on 6105.	CT at ground during ringing and idle ☐ . In automatic and dc manual ringdown modes (and during ringing only in ac manual ringdown mode), CT open during seizure ☐ .	Switches S1, S2, S6, and S8 set correctly ☐ . Wiring between pin 27 of 6105 and pin 27 of 6101 ☐ . Replace 6105 and retest ☐ . Replace 6101 and retest ☐ .
answer supervision (CPC ringdown mode only)	Establish incoming seizure and place station off-hook during ring interval. Use VOM (-250 Vdc scale) to measure voltage between 6105 M-lead and ground test points.	M-lead potential changes from supply potential to ground for approximately 0.5 second following ring trip, and then returns to supply potential ☐ .	S6 in NORM position ☐ . S1 in AUTO position ☐ . Other switches set correctly ☐ . Replace 6105 and retest ☐ .
interrupted ringing	(Test in 30-second timed ringing mode.) If 6105 equipped with 9903 Ringing Interrupter sub-assembly, momentarily open E lead to initiate incoming seizure and observe local ringing at station or use VOM to measure dc voltage through station tip and ring leads (pins 41 and 47).	Within 150ms of E-lead open, ringing commences and follows 2-second on/4-second-off sequence until 30-second timing interval expires ☐ .	S5 in INT position ☐ . Other switches set correctly ☐ . 9903 properly oriented and firmly in place ☐ . Station wiring ☐ . Station on hook ☐ . Replace 9903 and retest ☐ . Replace 6105 and retest ☐ .



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