9131 Universal Timer

contents

1. general description

1.01 The Tellabs 9131 Universal Timer module (figure 1) provides a variety of switch-selectable lamp-interruption and timing functions. The 9131 contains two identical and independent timing circuits, each of which is capable of providing lamp flash (indicating incoming ringing) or lamp wink (indicating station hold). Additionally, each timing circuit may be optioned to provide variable operate or release delay rather than repetitive interruption. Other adjustable repetitive interruption rates may also be accommodated.

1.02 Receptacles on the 9131's printed circuit board permit optional use of Tellabs' 9903 Ringing Interrupter plug-on subassembly. When the 9131 is so equipped, the 9903 functions independently of the two integral timing circuits to provide nominal 2-second-on, 4-second-off ringing interruption.

1.03 Each of the timing/interrupter circuits on the 9131 provides two relay contact outputs (form C), and each can provide 60-interruption-per-minute (ipm) lamp flash, 120ipm lamp wink, or adjustable 300-millisecond to 60-second* operate or release delay. Each circuit's operating mode is selected by means of option switches and potentiometers on the module's printed circuit board.

*Although 60 seconds is the *rated* upper limit of each timing circuit's adjustment range, the actual range of these circuits typically extends to about 120 seconds.

1.04 The 9131 may be powered by any input potential between −22 and −56Vdc. Maximum current requirement is 60mA.

1.05 The 9131 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 mount across a 19-inch rack, while up to 14 modules mount across a 23-inch rack. In either case, 6 inches of vertical rack space is used.

2. application

2.01 The 9131 Universal Timer module is typically used in association with key telephone unit (KTU) equipment and in special circuit applications where integral lamp-interruption circuitry is not available. Because of the flexibility of the timing
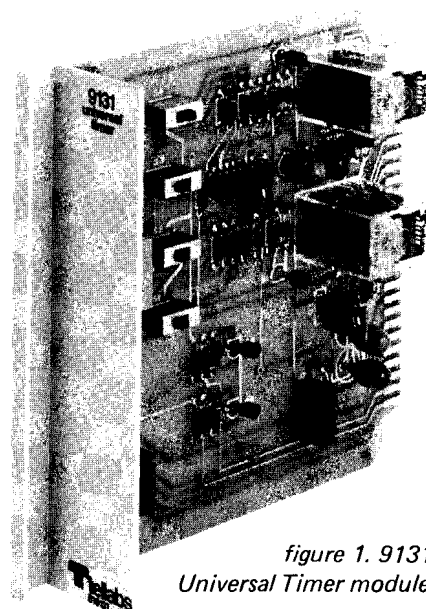

figure 1. 9131 Universal Timer module

circuits, the 9131 may be used in a variety of applications. This section describes the basic operation of the timers and indicates the type of applications in which the 9131 may be used. Note that each timing/interruption circuit controls an associated relay, and that two sets of form-C contacts are derived by each relay. **Circuit 1 is described here; circuit 2 is identical except for pin numbers and component designations.**

external enable/disable control

2.02 External control of the timing relay is provided through the Enable and Disable leads. The Enable lead must be grounded for the output relay to operate. In the slow-to-operate mode (see paragraph 2.05), application of ground to the Disable lead will inhibit operation of the relay. If the relay is operated, application of ground to the Disable lead causes the relay to release immediately. In the slow-to-release mode (see paragraph 2.07), applying ground to the Disable lead immediately resets the timer and de-energizes the relay (if ground has been removed from the TSR lead). Note that the Disable lead acts as both a disable and reset lead in the slow-to-operate mode, but only as a reset lead in the slow-to-release mode.

lamp-flash interruption

2.03 In applications where lamp-flash operation is required to indicate incoming ringing (e.g., key telephone systems or special conferencing arrangements), the 9131 may be arranged to provide 60ipm lamp-flash control. When ground is applied to the Enable lead, the output relay is operated for 0.5 second and released for 0.5 second in each interruption cycle, thus controlling the 60ipm lamp-flash function.

lamp-wink interruption

2.04   If lamp-wink operation to indicate station hold is required, the 9131 may be arranged to provide 120ipm lamp-wink control. When ground is applied to the Enable lead, the output relay energizes for 0.03 second and de-energizes for 0.47 second in each interruption cycle, thus controlling the 120ipm lamp-wink function.

slow-to-operate timer

2.05   In applications where relay operation after a certain time interval has elapsed is required (to disconnect a call or cause ringing or tone to cease, for example, after a preset time), the 9131 may be arranged to perform a slow-to-operate timing function. When ground is applied to the TSO lead, the timer initiates its timing interval (approximately 300 milliseconds to 60 seconds, as adjusted by the *CKT 1 TIME* potentiometer). At the conclusion of the timing interval, the output relay energizes. Removing the TSO-lead ground causes the timer to begin timing toward the initial state (output relay de-energized) in either of two ways. If the TSO-lead ground is removed before the relay energizes, the timer subtracts the TSO-lead open interval from the TSO-lead ground interval. If the TSO-lead ground is removed after the relay energizes, the output relay releases within 80 percent of the timer-adjusted interval.

special-interrupter timing

2.06   Through use of the slow-to-operate timer function (see paragraph 2.05) and one of its external relay contacts, the 9131 may be arranged for special-interrupter timing. If a contact (pin 40, for example) is grounded and pin 42 is jumpered to pin 37, the slow-to-operate timer will oscillate with a 45/55 percent duty cycle with period determined by the timer-adjusted interval.

slow-to-release timer

2.07   The 9131 may be arranged to provide either of two similar slow-to-release timer functions in applications where relay release after a preset interval is desired (e.g., to provide ringing, tone, or call cutoff after a certain interval). When ground is applied to the TSR lead, the output relay energizes immediately. The release-time interval (as adjusted via the *CKT 1 TIME* potentiometer) begins when the TSR-lead ground is removed. If the TSR-lead ground is reapplied before the output relay releases, the timer is immediately reset to its full timing interval. A momentary operate/slow-to-release function may be obtained if ground is applied to the TSR/OS (slow-to-release/one shot) lead instead. The output relay operates immediately upon application of the TSR/OS-lead ground and releases at the conclusion of the preset interval. If the TSR/OS-lead ground is maintained after the conclusion of the preset interval, the relay will re-operate and oscillate in a manner similar to the wink/flash functions until the TSR/OS-lead ground is removed.

ringing interruption

2.08   A Tellabs 9903 Ringing Interrupter plug-on subassembly may be installed on the 9131 to pro-vide 2-second-on, 4-second-off relay operation suitable for generating interrupted ringing from a continuous ringing supply. The ringing interrupter relay contacts are available at the 9131's 56-pin connector. The 9903 is started (relay operated) by applying ground to the Start lead.

3.   installation

inspection

3.01   The 9131 Universal Timer 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 9131 module mounts in one position of the Tellabs Type 10 Mounting Shelf, which is available in configurations for both relay rack and apparatus case installations. 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   Table 1 lists external connections to the 9131 module. All connections are made via wire wrap at the 56-pin connector at the rear of each module's mounting shelf position. Pin numbers are found on the body of the connector.

connect:	to pin:
CKT 1 ENABLE	45
CKT 1 DISABLE/ RELEASE	4
CKT 1 TSO (slow-to-operate)	37
CKT 1 TSR (slow-to-release)	48
CKT 1 TSR/OS (slow-to-release/one shot)	50
CKT 1 N.C. (1) RELAY CONTACT K1	42
CKT 1 N.O. (1) RELAY CONTACT K1	38
CKT 1 COM. (1) RELAY CONTACT K1	40
CKT 1 N.C. (2) RELAY CONTACT K1	43
CKT 1 N.O. (2) RELAY CONTACT K1	39
CKT 1 COM. (2) RELAY CONTACT K1	41
CKT 2 ENABLE	47
CKT 2 DISABLE/RELEASE	2
CKT 2 TSO (slow-to-operate)	55
CKT 2 TSR (slow-to-release)	46
CKT 2 TSR/OS (slow-to-release/one shot)	44
CKT 2 N.C. (1) RELAY CONTACT K2	52
CKT 2 N.O. (1) RELAY CONTACT K2	56
CKT 2 COM. (1) RELAY CONTACT K2	54
CKT 2 N.C. (2) RELAY CONTACT K2	49
CKT 2 N.O. (2) RELAY CONTACT K2	53
CKT 2 COM. (2) RELAY CONTACT K2	51
9903 RING INTR. START	11
9903 RING INTR. N.C. (1) RELAY CONTACT	5
9903 RING INTR. N.O. (1) RELAY CONTACT	13
9903 RING INTR. COM. (1) RELAY CONTACT	7
9903 RING INTR. N.C. (2) RELAY CONTACT	3
9903 RING INTR. N.O. (2) RELAY CONTACT	9
9903 RING INTR. COM (2) RELAY CONTACT	1
−BATT (−22 to −56Vdc)	35
GND	17

table 1. External connections to 9131

9903 Ringing Interrupter

3.05 If the 9903 Ringing Interrupter is used, attach it to the 9131's printed circuit board by mating the 4-pin plug and the 4-pin receptacle on the 9903 with the 4-pin receptacle and the 4-pin plug on the 9131. Ensure that the pins are firmly and completely seated in their receptacles so that the 9903 does not interfere with any adjacent modules. The 9903 has no options or adjustments.

option selection

3.06 The 9131 contains four option switches and two user-adjustable potentiometers. The locations of these controls on the module's printed circuit board are shown in figure 2, and switch functions are summarized in table 2. After these controls are set, no further optioning or alignment of the module is required.
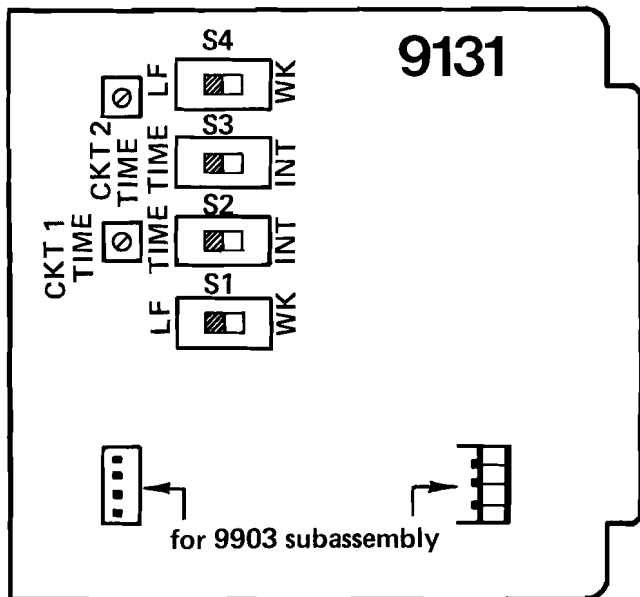

figure 2. Switch locations

function	circuit 1		circuit 2	
	switch	position	switch	position
60ipm lamp flash	S1	LF	S3	INT
	S2	INT	S4	LF
120ipm lamp wink	S1	WK	S3	INT
	S2	INT	S4	WK
slow-to-operate (or release) timer	S2	TIME	S3	TIME
	S1	LF	S4	LF

table 2. Option switch settings

lamp-flash interrupter

3.07 To condition circuit 1 for 60ipm lamp-flash operation, set switch *S1* to *LF* and switch *S2* to *INT*. To condition circuit 2 for this mode of operation, set switch *S3* to *INT* and *S4* to *LF*. Application of ground to the Enable lead (pin 45 for circuit 1; pin 47 for circuit 2) energizes the output circuit.

lamp-wink interrupter

3.08 To condition circuit 1 for 120ipm lamp-wink operation, set switch *S1* to *WK* and switch *S2* to *INT*. To condition circuit 2 for this mode of operation, set switch *S3* to *INT* and switch *S4* to

WK. Application of ground to the Enable lead energizes the output circuit.

slow-to-operate (or release) timer

3.09 To condition circuit 1 for the slow-to-operate (or release) timing function, set switches *S1* and *S2* to *LF* and *TIME*, respectively, and adjust the *CKT 1 TIME* potentiometer for the desired timing interval (approximately 300ms to 60 seconds). To condition circuit 2 for this mode, set switches *S3* and *S4* to *TIME* and *LF*, respectively, and adjust the *CKT 2 TIME* potentiometer as required. Application of ground to the Enable lead and the TSO lead (slow-to-operate) or the TSR lead (slow-to-release) energizes the output circuit.

4.   circuit description

4.01 This circuit description is intended to familiarize you with the 9131 Universal Timer module for engineering and application purposes only. Attempts to troubleshoot the 9131 internally are not recommended. Procedures for recommended troubleshooting are limited to those prescribed in section 7 of this Practice. Reference to the 9131 block diagram, section 5 of this Practice, will aid in following this circuit description.

4.02 Each *timer* circuit contains an operational amplifier (op amp) that compares the voltage of an integrating capacitor to a reference voltage. For timing functions (slow-to-operate/release), the 9131's timing interval is determined by this capacitor and a variable resistor (*CKT 1 TIME* for circuit 1, *CKT 2 TIME* for circuit 2), while the timing interval for interrupted functions (60ipm lamp flash/ 120ipm lamp wink) is determined by the timing capacitor and fixed resistors. When the capacitor is discharged, the output of the op amp is positive, and vice versa.

4.03 When the op amp's output is negative, the associated output relay (*K1* for circuit 1, *K2* for circuit 2) is operated via a transistor *driver*. External control of the *driver* is provided by the Enable lead (pin 45 for circuit 1, pin 47 for circuit 2). When the Enable lead is open, the output relay is disabled. The presence of ground on the Enable lead energizes the output relay.

4.04 When the 9131 is equipped with a 9903 Ringing Interrupter subassembly, application of ground to the START lead (pin 11) energizes the Interrupter, which is later de-energized by removal of the START-lead ground.

4.05 The 9131 incorporates an internally regulated *power supply* which allows the module to operate on any input voltage from −22 to −56Vdc. Maximum current requirement is 60mA.

6.   specifications

timing range
300ms minimum, 60 seconds rated maximum (typical maximum 120 seconds), continuously adjustable

lamp flash
60ipm; 0.5 sec. on/0.5 sec. off (±15%)

lamp wink
120ipm; 0.47 sec. off/0.03 sec. on (±20%)

ringing interruption via 9903 subassembly
2 seconds on/4 seconds off (nominal)

power
−22 to −56Vdc; 60mA maximum

relay contacts
1 ampere maximum (resistive load at 48Vdc)

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

weight	*dimensions*
8 ounces (227 grams)	**5.58 inches (14.17cm) high**
	1.42 inches (3.61cm) wide
	5.96 inches (15.14cm) deep

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

7.   testing and troubleshooting

7.01   The Testing Guide Checklist may be used to assist in the installation, testing or troubleshooting of the 9131 Universal Timer module. The Testing Guide 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 module 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. It is strongly recommended that no internal (component level) testing or repairs be attempted on the 9131 module. Unauthorized testing or repairs may void the 9131's warranty.

7.02   If a situation arises that is not covered in the Checklist, contact Tellabs Customer Service at (312) 969-8800 or your Tellabs Regional Office for further assistance.

7.03   If a 9131 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 (e.g., service outages, etc.).

replacement

7.04   If a defective 9131 is encountered, notify Tellabs via telephone [(312) 969-8800], letter [see below], or twx [910-695-3530]. Notification should include all relevant information, including the 8X9131 part number (from which we can determine the issue of the module in question). Upon notification, we shall ship a replacement 9131 to you. If the warranty period of the defective module has not elapsed, the replacement module will be shipped at no charge. Package the defective 9131 in the replacement module's carton; sign the packing list included with the replacement 9131 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 equipment prepaid to Tellabs.

repair and return

7.05   Return the defective 9131 module, shipment prepaid, to: Tellabs Incorporated
4951 Indiana Avenue
Lisle, Illinois 60532
Attn: repair and return dept.

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.

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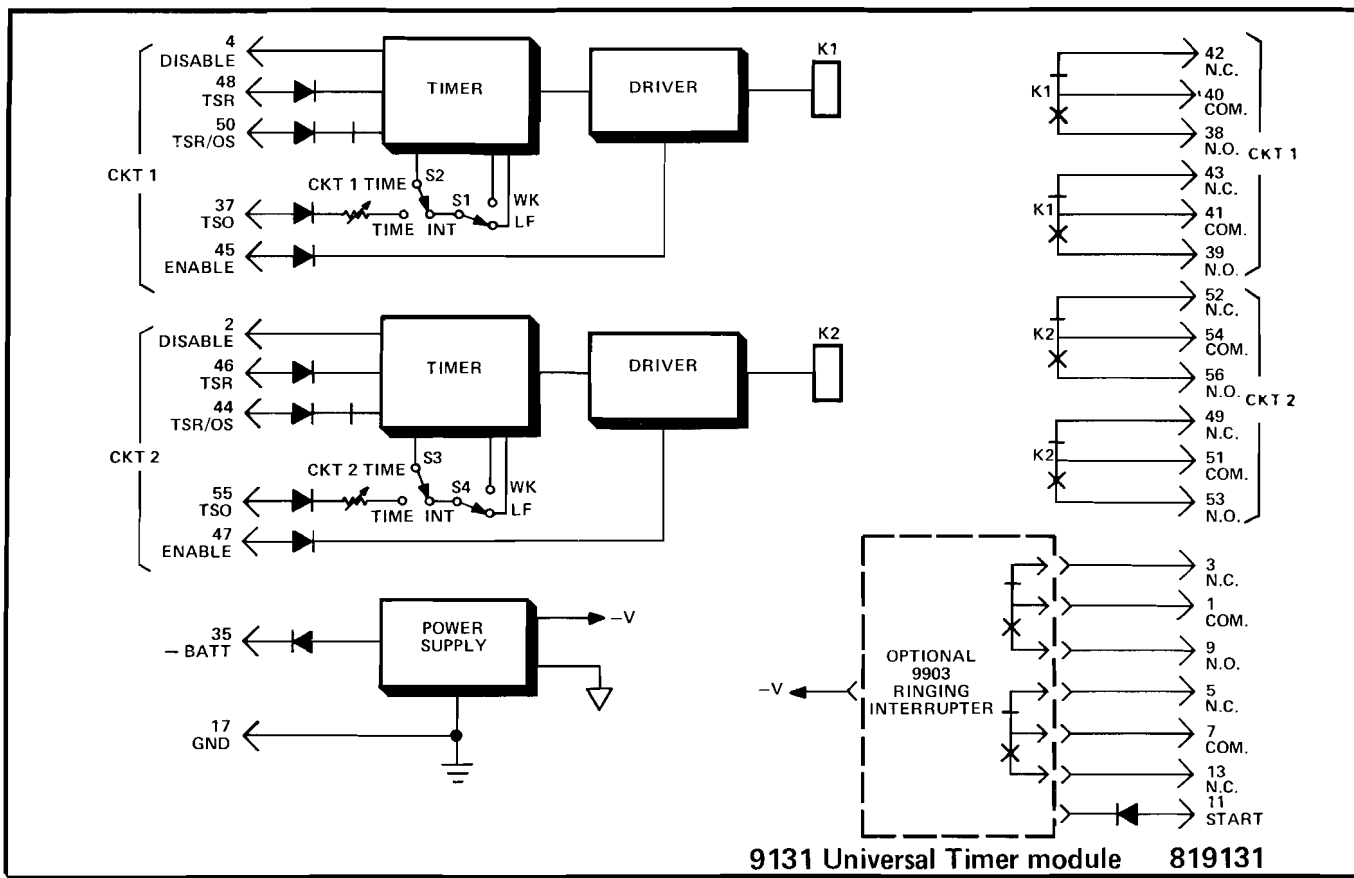
5. block diagram

testing guide checklist

Note: *Because the two timing/interrupter circuits of the 9131 are identical, this checklist will apply equally to either circuit. The only difference will be option switch assignments and pin assignments. See table 1 for pin assignments. See figure 2, table 2, and accompanying text (paragraphs 3.06 through 3.09) for option switch assignments.*

test	test procedure	normal result	if normal conditions are not met, verify:
lamp-flash interrupter	Option circuit for lamp-flash-interrupter mode and ground Enable lead.	Relay operates at 60ipm rate (0.5 second operate/0.5 second release) □.	Power □. Wiring □. Option switches properly set □. Disable lead open □. Replace 9131 and retest □.
lamp-wink interrupter	Option circuit for lamp-wink-interrupter mode and ground Enable lead.	Relay operates at 120ipm rate (0.03 second operate/0.47 second release) □.	Same as above □.
slow-to-operate timer	Option circuit for timing mode, adjust associated potentiometer fully counterclockwise (CCW), and ground Enable and TSO leads.	Relay operates approximately 300 milliseconds after TSO-lead ground is applied □.	Same as above □.
	Open TSO lead.	Relay releases □.	Same as above □.
	Adjust associated potentiometer fully clockwise (CW) and ground TSO lead.	Relay operates 60 seconds (minimum) after TSO-lead ground is applied □.	Same as above □.
slow-to-release timer	Option circuit for timing mode, adjust associated potentiometer fully CCW, and ground Enable and TSR leads.	Relay operates immediately □.	Same as above □.
	Open TSR lead.	Relay releases approximately 300 milliseconds after TSR-lead open □.	Same as above □.
	Adjust associated potentiometer fully CW, and ground TSR lead.	Relay operates immediately □.	Same as above □.
	Open TSR lead.	Relay releases 60 seconds (minimum) after TSR-lead open □.	Same as above □.
momentary operate/slow-to-release function (slow-to release, one shot timer)	Option circuit for timing mode, adjust associated potentiometer fully CCW, and ground Enable and TSR/OS leads.	Relay operates immediately and releases after approximately 300 milliseconds □. (Above sequence continues until TSR/OS-lead ground is removed.) □.	Same as above □.
	Open TSR/OS lead.	Operate/release function ceases □.	Same as above □.
	Adjust associated potentiometer fully CW, and ground TSR/OS lead.	Relay operates immediately and releases after 60 seconds (minimum) □. Above sequence continues until TSR/OS-lead ground is removed □.	Same as above □.
	Open TSR/OS lead.	Operate/release function ceases □.	Same as above □.
ringing interrupter (if equipped)	With 9903 subassembly mounted in place, ground START lead.	Relay K1 on 9903 operates for 2 seconds and releases for 4 seconds □. Above sequence continues until START-lead ground is removed □.	Power □. Wiring □. Option switches set correctly □. 9903 seated firmly in connectors □. Replace 9903 and retest □. Replace 9131 and retest □.
	Open START lead.	Operate/release function ceases □.	Same as above □.