AL64
Alarm Controller
Module

VALIDYNE ENGINEERING CORPORATION

INSTRUCTION MANUAL

Model AL 64 Alarm Controller Plug-In Module
for
Validyne Model MC1 Multi-Channel Modular Transducer System

Issued June 1979

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1-1. INTRODUCTION.

This technical manual contains installation and operation instructions for a Model AL64 Alarm Controller Plug-in Module for a Multi-Channel Transducer Control System. The Module is manufactured by Validyne Engineering Corporation, Northridge, California, 91324.

1-2. GENERAL DESCRIPTION.

The Model AL64 (see Figure 1-1) is an Alarm-Controller Plug-in Module for use in Validyne Engineering Corporation's MC1 family of module cases. It is used to provide two continuously adjustable set points (or alarm points) over a range of 0 to ±10 Vdc, which can be used to monitor and control a 0 to ±10 Vdc input signal, either from another functional plug-in module in the same module case, or an external signal source.

1-3. Generally, when an input voltage exceeds a set alarm voltage on the module, an alarm is energized. The module allows for two distinct set points which can be set to energize two separate alarms, either on an increasing or decreasing voltage input.

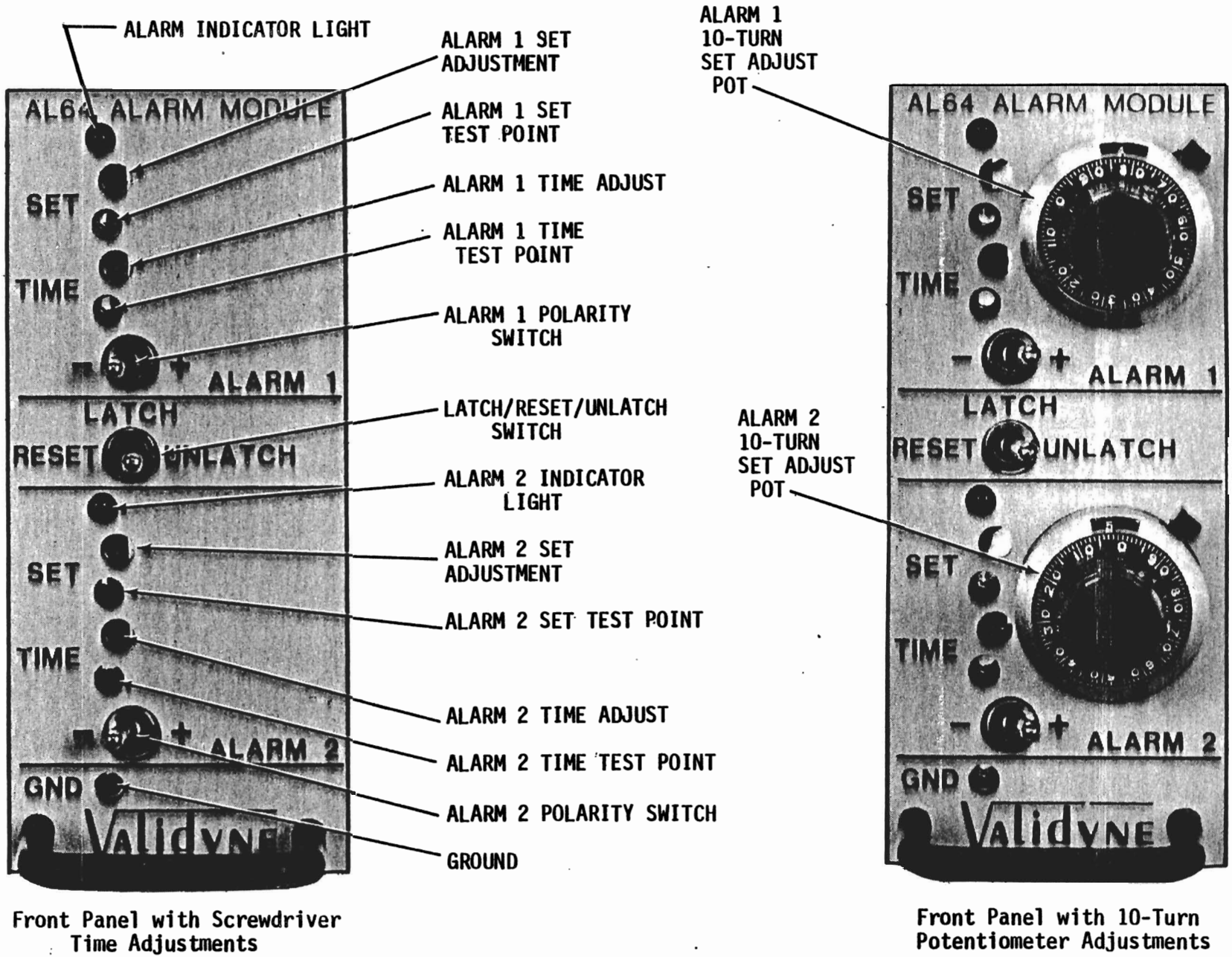
1-4. Each set point is adjustable by either trimpots or 10-turn precision potentiometers with indicator dials which resolve readings to 10 millivolts. Front panel test points enable critical calibration of set points.

1-5. A polarity switch for each set point (+ -), located on the front panel, determines whether the alarm is energized on a negative or positive input voltage. Alarm sense for rising or falling inputs is determined by jumpers on the circuit board.

1-6. The AL64 provides for either LATCH or UNLATCH modes of operation. In the latched mode, the alarm stays on once it has been energized; in the unlatched mode, the alarm comes on when the preset voltage is exceeded, and goes off when the voltage drops below the preset amount. A three-position toggle switch on the front panel places the system in either the LATCH or UNLATCH mode of operation. A RESET position allows the operator to deenergize the alarm once it has been energized in the LATCH or UNLATCH position. This switch function affects both alarms simultaneously. In addition, jumpers on the circuit board allow the system to bypass the LATCH/UNLATCH toggle switch for continuous unlatched operation.

1-7. Alarm status is visually displayed on the front panel by an indicator light (LED) for each alarm. When the alarm goes on, the LED for that particular alarm is lit.

1-8. The Alarm Controller also incorporates a timing circuit which provides for numerous alarm variations. A separate front panel adjustment for each alarm allows continuous variations of time delay (or for pulse widths) from zero to 10 seconds. In the time delay



Front Panel with Screwdriver Time Adjustments

Front Panel with 10-Turn Potentiometer Adjustments

Figure 1-1. AL64 Alarm Controller, Front Panel

mode, it allows a preset delay to elapse before the alarm is energized. In the pulse width mode, it enables adjustment of the pulse width for length of alarm activation (time delay or pulse width mode is selected by jumpers on the circuit board). With the alarm circuit, pulse can also be set for single pulse (one-shot) activation or multiple-pulse, depending on jumper selection on the circuit board.

1-9. In order to eliminate relay contact "chatter", a "dead band" is introduced into the system. This means that when the input voltage exceeds the set point level and the alarm is energized, it must drop the finite amount below the set point voltage to "turn-off" the alarm. The difference between input voltage at "turn-on" and "turn-off" of the alarm is the "dead band". It is set at approximately 0.08 volts, however, it can be altered by changing internal resistors (see Section II). Figure 1-2 illustrates the Dead Band Characteristics.

1-10. The Alarm Controller is available with logic output or relay output. Alarm outputs obtained through logic gate outputs are compatible with TTL inputs. Relay outputs can be changed from "normally open" to "normally closed" contacts by proper jumpering on the circuit board.

1-11. AVAILABLE MODELS.

The AL64 can be ordered with logic output or relay output, with separate built-in timing circuit, and with a 10-turn potentiometer for set point adjustments or a trimpot. Table 1-1 describes the various combinations available along with their model number.

1-12. CIRCUIT BOARD JUMPER SELECTION.

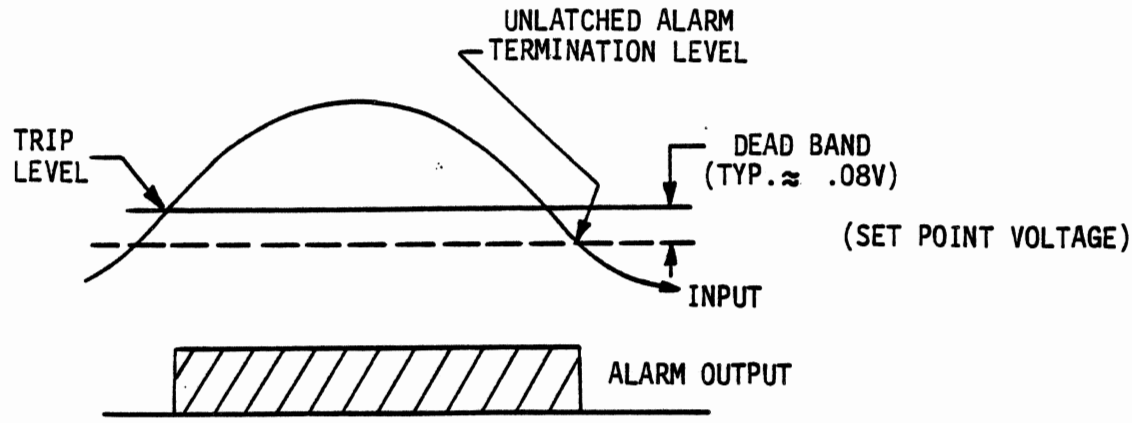
The AL64 is capable of operating in various modes depending on your particular model and the jumper arrangement on the circuit board. Figure 1-3 shows the various jumpers and Table 1-2 summarizes their functions, which are described in detail below:

A. Alarm Sense. Jumper determines whether alarm will be in HI or LO mode. When in the HI position, alarm operates on a rising input voltage. When in the LO position, alarm operates on a falling input voltage. Example: If reference voltage is set for 10 volts and you are in the HI alarm mode, alarm will energize if voltage exceeds 10 volts; if you are in the LO position, alarm will energize whenever voltage falls below 10 volts.

B. Alarm Latch Control. Jumper determines whether alarm will operate in the unlatched mode continuously, bypassing the LATCH/UNLATCH switch on the front panel, or be in the normal mode, controlled by the LATCH/UNLATCH switch.

C. Alarm Relay Contacts. (Applicable to Models TR and DR only.) For models with relay output, jumpers determine whether relay contacts will be normally open or normally closed. In the A position, relay contacts are normally open and closed when there is an alarm; in the B position, relay contacts are normally closed and open when there is an alarm. Units leave the factory with "Normally-Open" contacts jumpered.

HI ALARM THRESHOLDS:



LO ALARM THRESHOLDS:

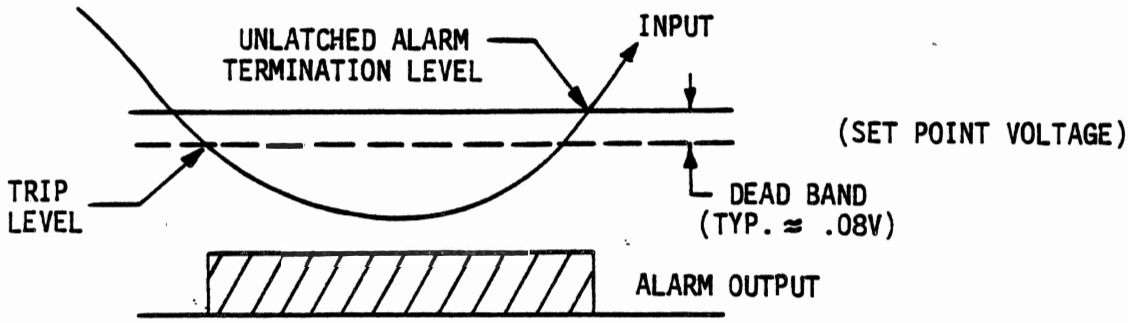


Figure 1-2. Dead Band Characteristics

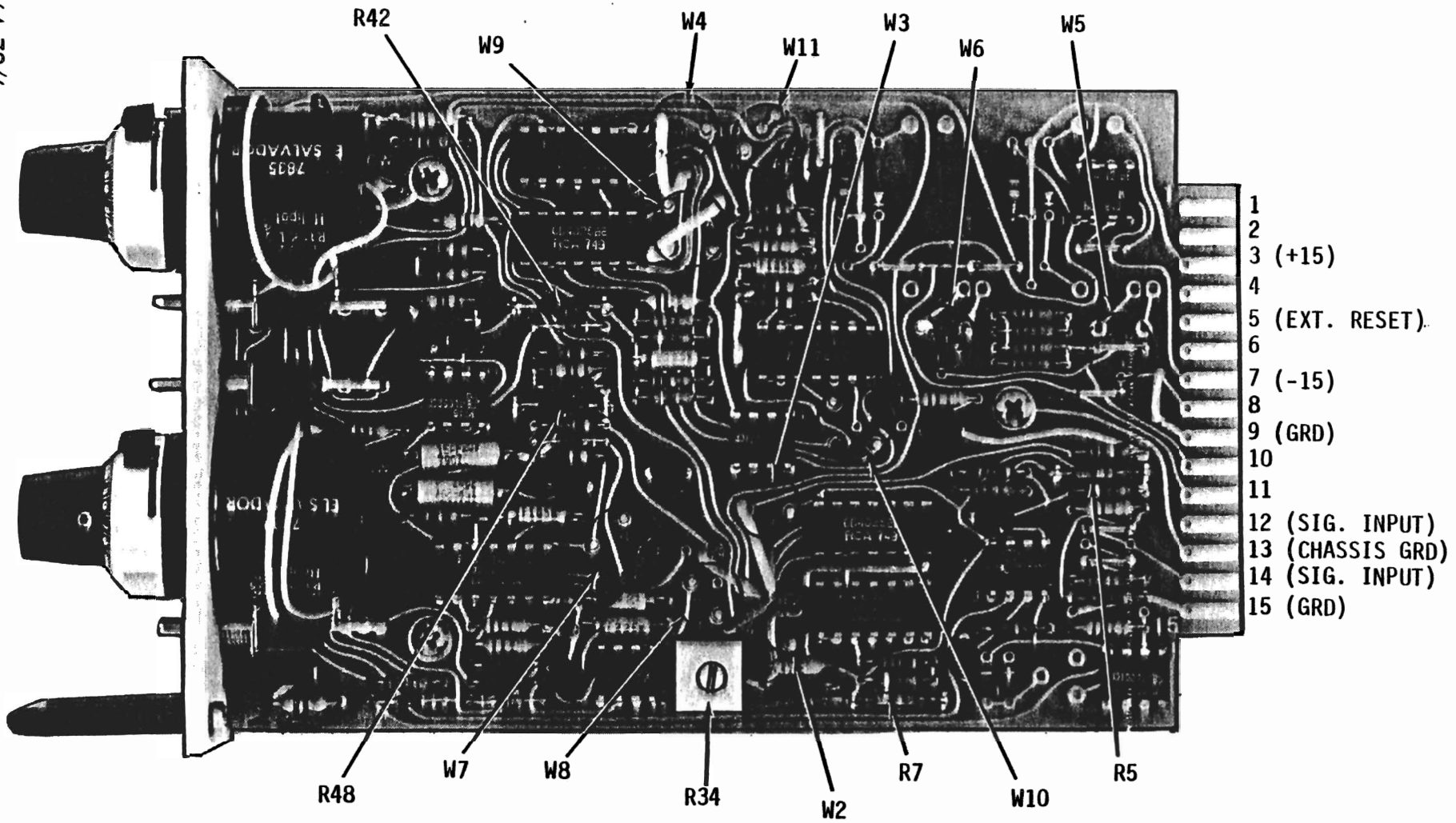


Figure 1-3. AL64 Alarm Controller, Circuit Board

Table 1-1. AL64 Available Models

MODEL NUMBER	DESCRIPTION
AL64TL	Alarm Module, logic with timing circuit and trimpot.
AL64TR	Alarm Module, Relay with timing circuit and trimpot.
AL64DL	Alarm Module, Logic with timing circuit and 10-turn potentiometer and dial.
AL64DR	Alarm Module, Relay with timing circuit and 10-turn potentiometer and dial

D. Alarm Timed Mode Selector. Jumper determines the timer mode. When in the A position (normal delay position), the alarm is in the normal delay time mode. That is, the alarm will not go on until a preset time delay has been exceeded. Delay time is determined by the TIME control adjustment. When in the B position (single pulse per exceedance), the alarm will give off a single pulse when the preset voltage is exceeded. Length of pulse is determined by the TIME control adjustment. When in the C position (multi-pulse during exceedance), the alarm will give off multiple pulses. Length of each pulse is determined by the TIME control adjustment. When in the LATCHED mode, multiple pulsing will begin when the preset voltage is exceeded for the first time, and continue pulsing until reset by the RESET switch. In the UNLATCH mode, multiple pulsing will continue only so long as the voltage exceeds the preset level, and then stop as soon as the level drops below the preset amount.

E. Alarm Timing/Non-Timing Mode. Jumpers determine whether alarm will be in a normal non-timed mode (timer circuit bypassed), a pulsed mode of operation or a time-delay mode of operation.

1-13. CONTROLS AND INDICATORS.

Figure 1-1 shows the controls and indicators for the AL64 Alarm Controller. Their function is described in Table 1-3.

1-14. TECHNICAL CHARACTERISTICS.

Table 1-4 gives the technical characteristics for the AL64 Alarm Controller.

Table 1-2. Jumper Mode Selection (Timing & Logic Modes)

JUMPER (COLOR)	FUNCTION	POSITION	RESULT
W2 (Red)	Alarm No. 1 Sense	A (HI)	Alarm No. 1 input greater than No. 1 reference input.
		B (LO)	Alarm No. 1 input less than No. 1 reference input.
W3 (Orange)	Alarm No. 1 Latch Control	A	Alarm No. 1 Latch Mode Normal (controlled by S3).
		B	Alarm No. 1 Unlatched.
W5 (Green)	Alarm No. 1 Relay Contacts	A	Alarm No. 1 Relay N.O. Contacts (closed at Alarm 1).
		B	Alarm No. 1 Relay N.C. Contacts (open at Alarm 1).
W7 (Violet)	Alarm No. 1 Timed Mode	A	Normal Delay.
		B	Single Pulse per Exceedance.
		C	Multi-Pulse per Exceedance.
W8 (Grey)	Alarm No. 1 Timing/Non-timing Mode	A	Normal (Non-Timed) Mode.
		B	Pulse Mode.
		C	Delay Mode.
W4 (Yellow)	Alarm No. 2 Sense	A (HI)	Alarm No. 2 input greater than No. 2 reference input.
		B (LO)	Alarm No. 2 input less than No. 2 reference input.
W11 (Brown)	Alarm No. 2 Latch Control	A	Alarm No. 2 Latch Mode Normal (controlled by S3).
		B	Alarm No. 2 Unlatched at Alarm No. 1.
W6 (Blue)	Alarm No. 2 Relay Contacts	A	Alarm No. 2 Relay N.O. Contacts (Closed at Alarm No. 2).
		B	Alarm No. 2 Relay N.C. Contacts (Open at Alarm No. 2).
W9 (White)	Alarm No. 2 Timed Mode Selector	A	Normal Delay.
		B	Single Pulse per Exceedance.
		C	Multi-Pulse during Exceedance.
W10 (Black)	Alarm No. 2 Timing/Non Timing Mode	A	Normal (Non-Timed) Mode
		B	Pulse Mode.
		C	Delay Mode.

Table 1-3. Controls and Indicators

CONTROL/INDICATOR	FUNCTION
AL 1 or AL 2 (+ -) Selector	Determines whether alarm will energize on a + or a - voltage for each alarm.
SET Adjustment	Either a trimpot adjustment (Models TL or TR) or 10-turn potentiometer and dial (Models DL or DR) for each alarm. Determines the high and low set points for alarm activation. 10-turn potentiometers have dials calibrated from 0 to 1000 representing a 0 to ±10 volt set point.
SET Test Point	For connection of a voltmeter for critical calibration of set points. One for each alarm.
TIME Adjustment	Control allows continuous variation of delay or pulsewidth (depending upon how jumpers are connected) from zero to 1, 10, or 100 seconds.
TIME Test Point	For connection of a voltmeter for critical calibration of TIME adjustment. One for each alarm.
GRD Connection	For connecting meter to ground during test and adjustment.
Alarm Status Indicators	Two LED indicators (one for each alarm) to indicate alarm activation.
LATCH/RESET/UNLATCH Switch	Three position toggle switch, normally in the LATCH position, alarm stays on when once activated. When in the UNLATCH position, alarm goes on when preset voltage level is exceeded and goes off when voltage returns to normal. RESET switch unlatches the alarm when in the LATCHED position.

NOTE: See Figure 1-1 for control and indicator locations.

Table 1-4. Technical Characteristics

ITEM	CHARACTERISTIC
Input Voltage:	±10 volts into 1 megohm. Momentary 115 Vac application without damage. Front panel toggle switches select set point polarities.
Set Point Accuracy:	±0.25% of full scale. Test points at front panel enable set point voltage measurements. Set point voltage is directly proportional to +15 Vdc Supply Input.
Set Point Stability:	±0.1% of full scale plus 0.005%/°F.
Alarm Sense:	HI Alarm: Input rising through set point causes alarm output; LO Alarm: Input falling through set point causes alarm output. Jumpers W2 and W4 can be changed to reverse either or both alarm sense polarities.
Relay Contacts:	Silver Cadmium Oxide contacts, 2A @26 Vdc or 1A @115 Vac, non-inductive. Jumpers determine normally open or closed contacts.
Logic Gate Output:	Up to 10 unit loads, TTL compatible positive output during alarm.
Timing Circuit:	0-10 seconds is the normal range of delay or pulse width adjustment. Full-scale time range of 1 second through 100 seconds available by changing terminal mounted resistor. Front panel test points and timing control potentiometers enable simple and precise set-up of timing for each channel.
Timing & Logic Modes:	Pin and socket terminated jumper wires enable easy patching of timing and logic modes, delay or pulse output modes, single or multiple pulse modes, Alarm 2 unlatched at Alarm 1 mode, Alarm 1 unlatched mode.
Dead Band:	In unlatched mode, difference between input signal at alarm turn-on (set point) and alarm turn-off. Nominally 0.08 volts, adjustable by means of an internal resistor, mounted on terminals. See Figure 1-2 for dead band characteristics.
Dimensions:	1-6 inches wide; 3.7 inches high; 7.0 inches deep.
Weight:	Less than 7 ounces.
Connections:	Plugs into Validyne MC1 Module Case. Input connections through XLR-3-32S receptacles and output connections through WK-4-32S receptacle on back of MC1 Case. Mating connectors: Input- WK-4-21C; Output- XLR-3-11C.

1-15. MODES OF OPERATION.

Described below are the various modes of operation which are further illustrated in Figure 1-4. The figure also gives the proper jumper arrangement to allow operation in the illustrated mode.

A. In the normal unlatched mode of operation, when the input voltage exceeds the set point, the alarm is activated as shown in A and goes off when the voltage falls below the set point.

B. In the unlatched/delay mode of operation as shown in B, when the input voltage exceeds the set point, alarm is energized after a pre-set time delay. Alarm remains on as long as the voltage still exceeds the set point. When the voltage falls below the set point, the alarm is immediately deenergized. If the voltage exceedance is shorter than the time delay, there will be no alarm.

C. In the single pulse/unlatched mode of operation, as shown in C, when the input voltage exceeds the set point, alarm is energized for a maximum preset amount, and then shuts off, even if the voltage still exceeds the set point. If voltage drops and again rises above the set point, the alarm is again energized up to the maximum preset amount, unless voltage falls below preset level before alarm preset time is reached or exceeded.

D. In the multi-pulse unlatched output mode, as shown in D, the alarm will generate a string of pulses whenever the voltage exceeds the set point. Whenever voltage falls below the set point, alarm will immediate go off. This arrangement is useful for generating a signal to close a valve.

E. In the single pulse latched mode, as shown in E, when the input voltage exceeds the set point, the alarm is energized for a maximum preset amount, and then shuts off, even if the voltage still exceeds the set point. Alarm will not come on again until the RESET switch is energized.

F. In the multi-pulse output latched mode, as shown in F, whenever voltage exceeds the set point, the alarm will begin pulsing, with length of alarm pulse preset by the time adjustment. Even when voltage returns to normal, alarm will continue to pulse until reset by the RESET switch.

G. Tank Filling Mode. In the tank filling mode, as shown in G, the Alarm Controller is set so that it can tell the operator when a tank has reached its full condition (shutting off a fill valve), and when the tank has reached an empty condition (energizing an alarm). In this mode of operation, Alarm 2 is set to latch while Alarm 1 is unlatched. Following the example in Figure 1-3G, Alarm 1 is energized when the tank reaches a full condition, turning off the fill valve. As the tank depletes down to the Alarm 2 threshold, the Alarm 2 is energized, automatically starting the filling process again. Alarm 2 goes into a latched mode until the signal reaches the Alarm 1 exceedance point. When this occurs, Alarm 1 energizes, cancelling out (or deenergizing) Alarm 2. When Alarm 1 is energized, Alarm 2 is reset.

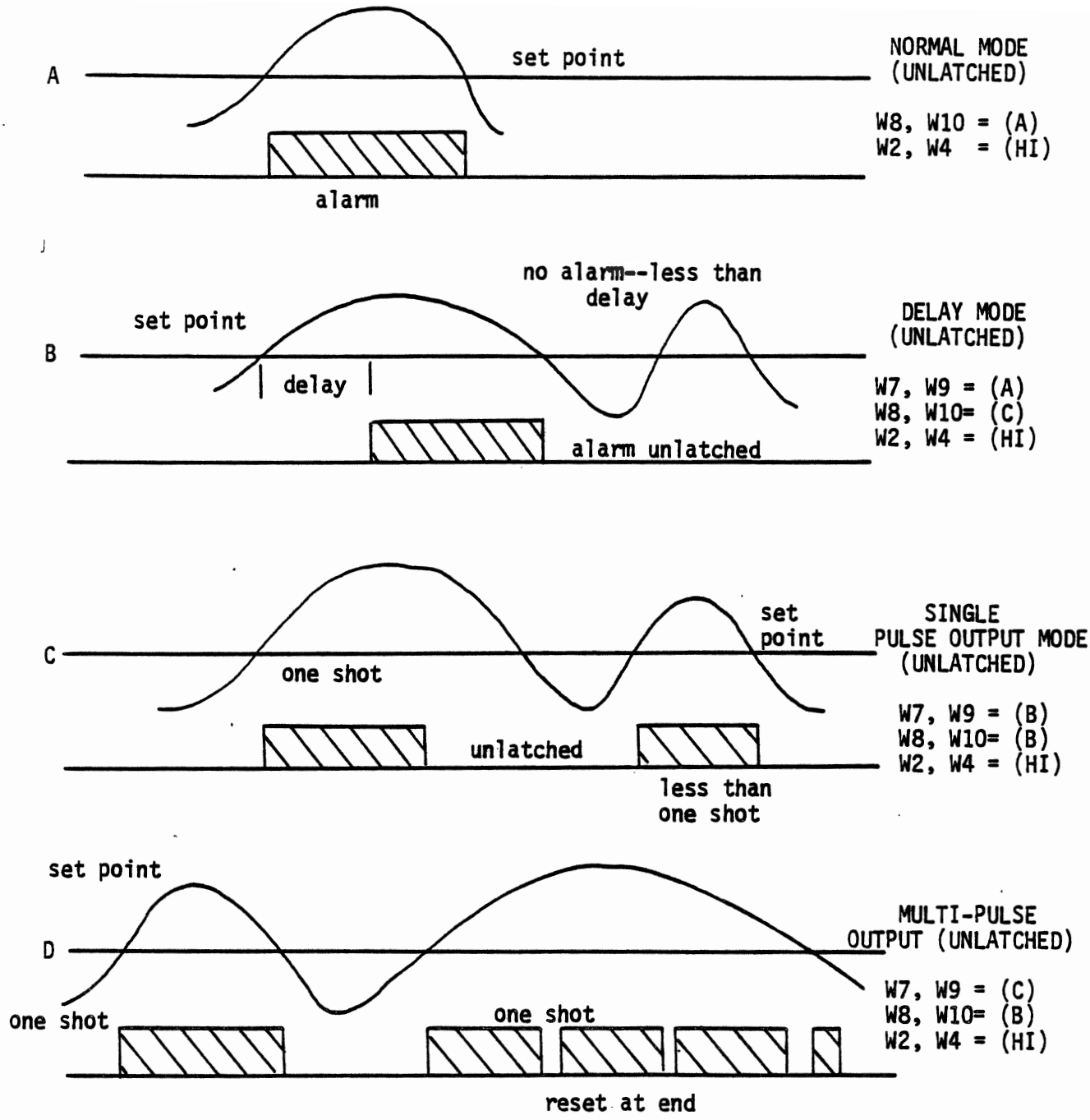


Figure 1-4. Typical Modes of Operation (Sheet 1 of 2)

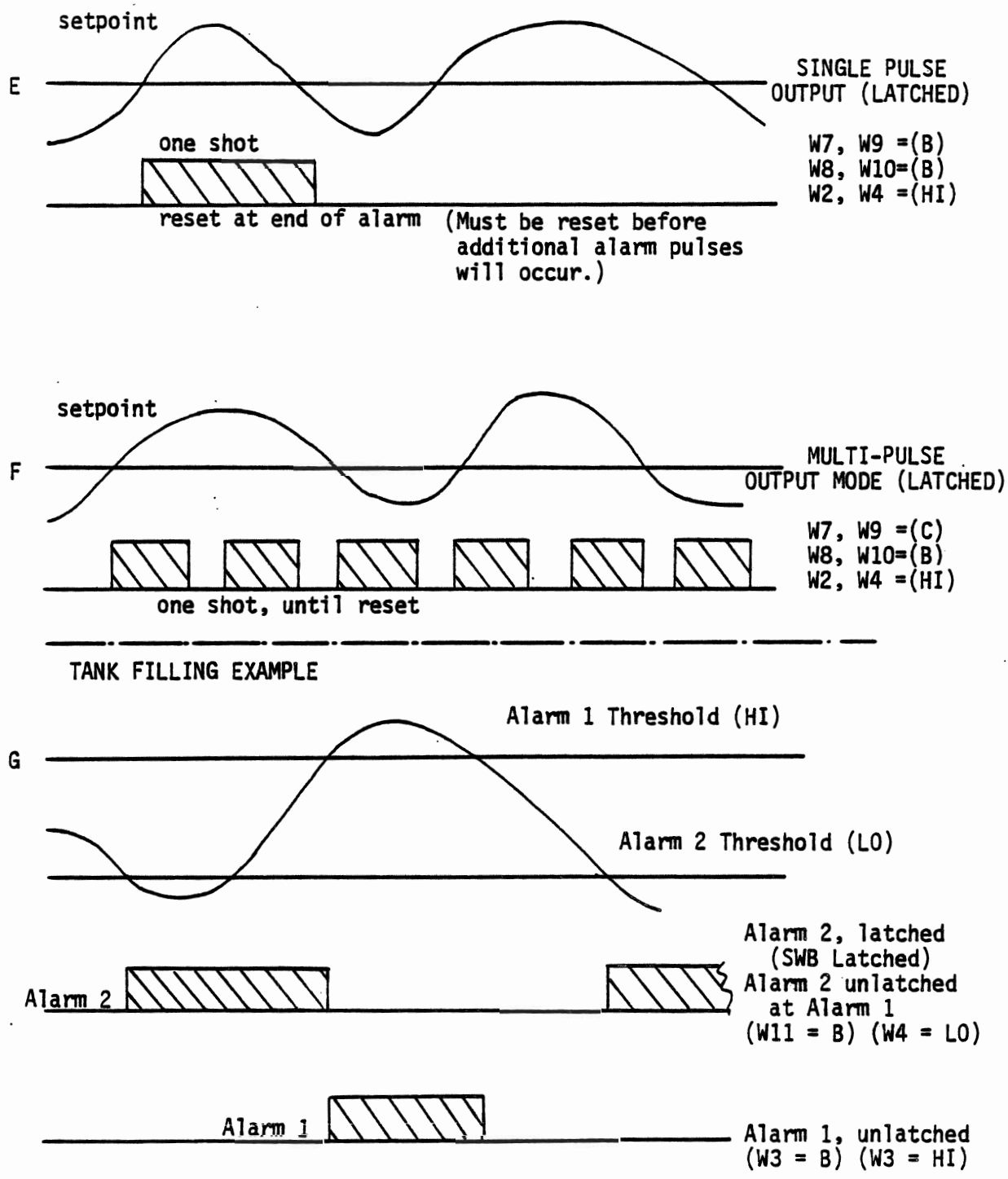


Figure 1-4. Typical Modes of Operation (Sheet 2 of 2)

SECTION II
INSTALLATION AND OPERATION

2-1. INSTALLATION.

The Model AL64 may be plugged into or out of any available channel of the MC1 Module Case while power is on without damage and without affecting adjacent channels.

2-2. INPUT CONNECTIONS.

The ±10-volt output from another module (or other source) which is to be monitored is connected to the AL64 through the XLR-3-32S receptacle on the back of the MC1 Case, marked "Output A". Figure 2-1 shows the input pin functions. The other XLR-3-32S receptacle, marked "Output B", is connected in parallel with "Output A" (inside the MC1 Case), and can be used to drive meters, recorders, or data acquisition (system inputs) for the module being monitored by the AL64. The mating connectors for output A and B are XLR-3-11C.

2-3. OUTPUT CONNECTIONS.

The alarm output connections from the relays or logic of the AL64 are available through the WK-4-32S receptacle on the back of the MC1 Case, marked "Transducer Input". Figure 2-1 illustrates the output pin functions.

2-4. REMOTE RESET CONNECTIONS.

The Alarm Module can be reset either at the Module (front toggle switch, S3) or remotely by modifying the MC1 Case as follows:

A. Install a suitable two-pin connector on the back of the Case and connect to pins 5 (input) and 9 (ground) (or 15) on the AL64 Circuit Board.

B. Whenever pins 5 and 9 (or 15) are shorted together, the alarm will reset. This Remote Reset input can be driven by CMOS or TTL gates. A zero $\leq$ 0.8 V at 1 mA, causes Reset, while a "one" $\geq$ 3 Vdc at open circuit allows normal operation.

C. Connect a cable and connector assembly to mate with the connector on the back of the MC1 Case. The cable may be run to any remote location and hooked up to a remote reset switch.

2-5. JUMPER SELECTION.

Prior to operation, make sure jumpers on circuit board are set to the desired mode of operation. Table 1-2 gives the various modes and the corresponding jumper positions. The table

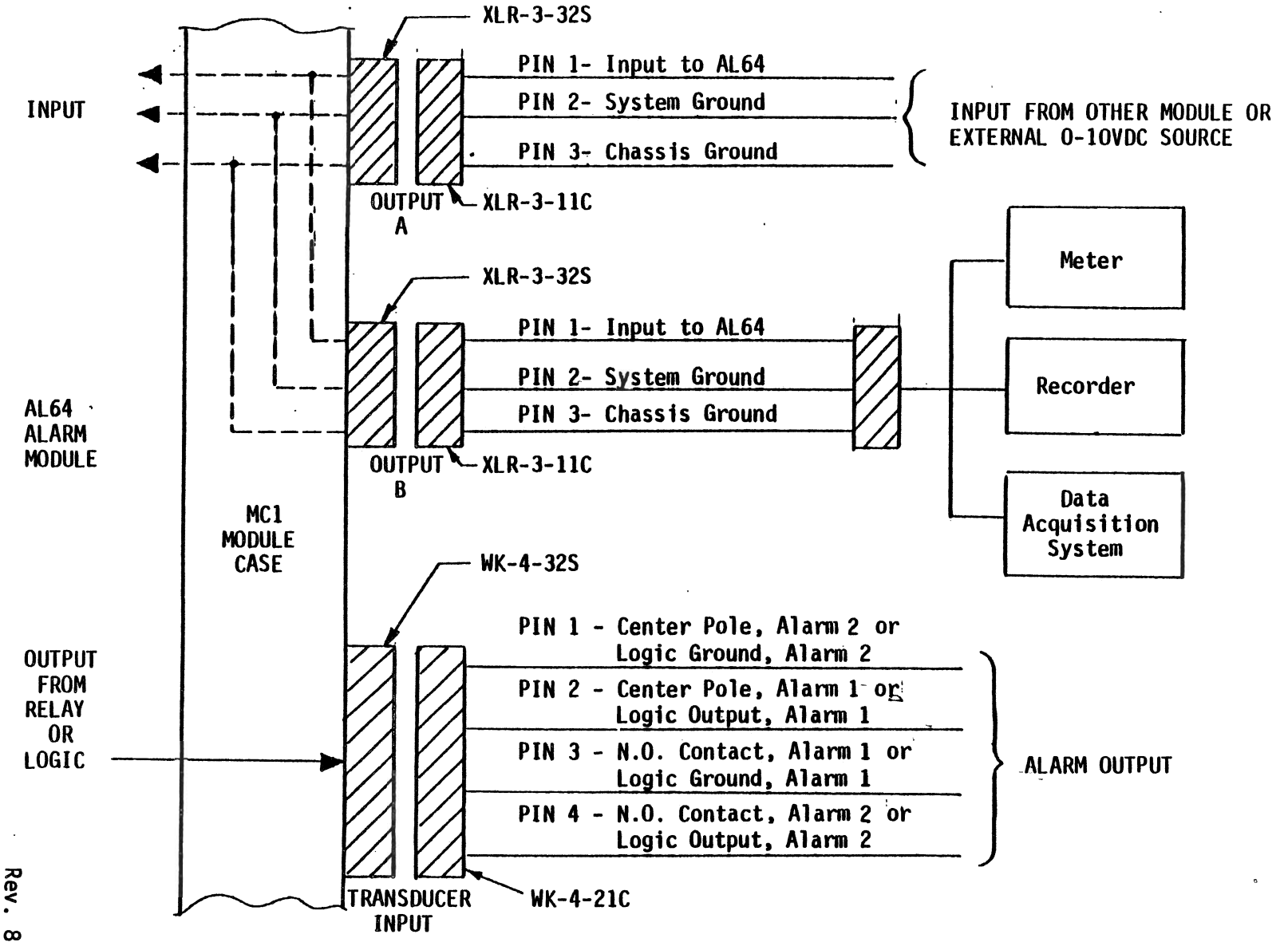


Figure 2-1. Typical Input/Output Connections

also indicates the colors of the jumpers. Jumper positions and the various modes of operation are further described in Paragraph 1-2 and 1-15 and illustrated in Figure 1-2. To change jumper positions, remove jumper from its connecting pin, using a pair of needle nose pliers or equivalent, and reinsert into desired pin position.

2-6. ADJUSTING THE "SET" CONTROL.

The SET control for each channel alarm determines the amount of voltage required to energize the alarm. To adjust this control to the desired voltage, proceed as follows:

A. With AL64 installed in MC1 Case, connect a voltmeter between the SET test point for the desired alarm being set, and the ground (GND) test point. (See Figure 1-1 for location.)

B. There should be a voltage indicated on the voltmeter of from 0 to ±10 volts, depending on the position of the polarity switch (+ or -). Set polarity switch to the desired polarity (+ or -).

C. Adjust SET potentiometer, using either a small screwdriver or by turning the 10-turn potentiometer (depending on your particular model), to the desired alarm level. Example: If you want an alarm indication at 5 volts, adjust the SET potentiometer until voltmeter reads 5 volts.

D. Repeat steps A through C for the second alarm. If using model with 10-turn dial potentiometer, lock potentiometer dials in place. When using a 10-turn dial potentiometer, once it has been properly calibrated, voltage setting can be changed by reading the desired voltage on the potentiometer dial. (See Figure 2-2 for procedure for reading the 10-turn potentiometer dial and paragraph 2-9 for calibration procedure.

2-7. SETTING THE "TIME" CONTROL.

For models incorporating a timing circuit, the time control is used to set the amount of delay before the alarm is energized, or the length of the alarm pulse width. To set this control to the desired time, proceed as follows:

A. With AL64 installed in MC1 Case, connect a voltmeter to the TIME test point for the desired alarm, and ground (GND).

B. Calculate the "time vs voltage" by first determining what the time delay is for the maximum time control voltage output. This is accomplished as follows:

(1) Turn TIME control fully clockwise and introduce a voltage into the AL64 which exceeds the set point of the system.

(2) Depress and hold the RESET switch, and immediately upon release, using a stop watch, determine the exact time required for the alarm to energize after switch is released. This can be determined by

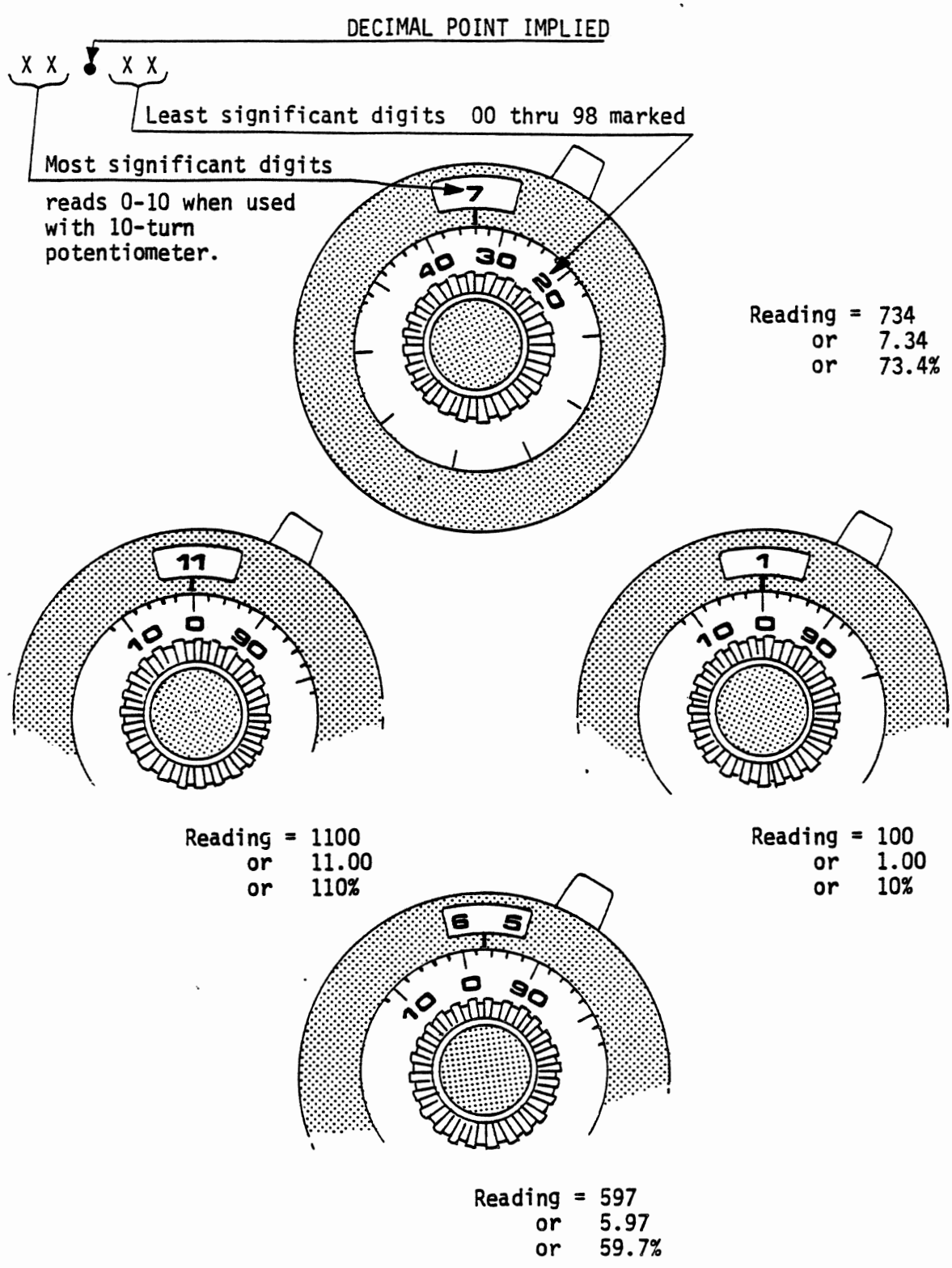


Figure 2-2. Procedure for Setting 10-Turn Potentiometer

observing the alarm indicator light for the alarm being set (located on the front panel). When the light comes on, stop the stop watch and observe the elapsed time.

(3) By noting the elapsed time and the voltage reading, you can readily determine the voltage setting required for any other time. Example: Suppose it takes 12 seconds for the alarm to energize, and the voltage reading on your voltmeter is 10 volts. Since voltage reading is proportional to the elapsed time, we can then determine that by setting the TIME control until the voltage reads 5 volts, we will have a time delay of 6 seconds.

C. Repeat steps A and B to the second alarm, hooking voltmeter up to the appropriate test points.

2-8. DEAD BAND ADJUSTMENT.

The normal "dead band" is set at the factory for approximately 0.08 volts. If it is desired to change the amount of dead band (the difference between input voltages at turn-on and turn-off of the alarm) change resistor value of R7 (AL 1) or R5 (AL 2) by unsoldering and replacing (see Figure 1-2 for location). The amount of "dead band" is inversely proportional to the resistor value. For instance, to double the amount of dead-band, select a resistor value half as large as the one presently installed (normally 300 K ohms).

2-9. REFERENCE LEVEL ADJUST.

The reference level adjust is used to set the alarm SET voltage to correspond exactly with the reading on the 10-turn potentiometer. This adjustment allows you to correct for any errors in the system which would cause the alarm voltage to be different that what is read on the potentiometer dial. Adjust reference level as follows:

A. Remove AL64 from MC1 Case and connect an extender card between the case and the AL64 Circuit Board connector.

B. Connect a voltmeter to the test point for the desired alarm being set and ground (GRD).

C. Turn the 10-turn potentiometer fully clockwise to read 10.00 on the dial.

D. Adjust R34 on the circuit board (see Figure 1-2 for location) using a small screwdriver, until voltage on voltmeter reads exactly 10.00 volts. 10-turn potentiometer now can be set accurately for any voltage by reading the potentiometer dial. For highest accuracy, the SET test point can be measured using a voltmeter.

2-10. CHANGING THE MAXIMUM TIME DELAY.

The AL64 is normally set for a 0-10 second time delay. However, the time delay can be changed to give longer or shorter full scale delays by changing the terminally mounted timing resistors R48 (AL 1) or R42 (AL 2). Since these resistors are normally 100 K ohms to give at least 10 seconds of delay, the maximum time delay is proportional to the resistor values. When changing resistors, make sure new resistors remain in the range of 10 K ohms to 1 meg ohm. Locations of R42 and R48 are shown in Figure 1-2.

2-11. OPERATION.

After all jumpers have been positioned in their proper modes, TIME and SET adjustments have been made, and function switches have been properly positioned, operation of the AL64 is automatic. When an alarm is energized, it may be monitored by observing the alarm lights on the front panel, or remotely by connecting an indicator to the alarm output connector.

SECTION III
THEORY OF OPERATION

3-1. THEORY OF OPERATION. (Reference Figure 3-1, Wiring Diagram; 3-2, Functional Block Diagram; and Figures 3-3 and 3-4, Schematic Diagrams.)

Input signals ranging from 0 to ±10 volts are applied at pin 12 or 14 of the AL64 connector. These pins are connected to the MC1 module case XLR connectors A and B as shown in Figure 3-1.

3-2. AL64 output functions are available at the WK4 Connector. A logic output option can replace the relay contacts (which are shown in Figure 3-1). In this case the logic output Alarm 1 appears at Pin 2 of the connector, and Alarm 2 logic output appears at Pin 4 of the connector, with logic return (ground) terminating at Pins 1 and 3 of the WK4 Connector.

3-3. The input signal is buffered by a unity gain amplifier as shown in Figure 3-2. This amplifier provides over-voltage protection and impedance buffering so that the two comparator circuits can operate without interaction.

3-4. Each comparator has a "set point" adjustment to allow a trip point, ranging from zero to 10 volts, with polarity selected by a toggle switch. The set point potentiometer is either a screwdriver trimmer or a 10-turn dial potentiometer depending on the model ordered. The test point is provided so that the "set point" may be accurately set.

3-5. Both channels of the AL64 have jumpers to determine the HI or LO sense of the alarm output: a HI alarm occurs when the input is more positive than the reference set point, and a LO alarm occurs when the input is more negative than the reference set point.

3-6. Control logic and timing circuitry allows the user to program several modes of operation for each of the two alarms. The primary modes are:

NORMAL -- Non-timed, latch mode, controlled by S3.

DELAY -- Timed delay before alarm mode.

PULSE -- Pulsed output mode, which can be either:

Single Pulse -- 1 per threshold crossing (unless latched)

Multi-Pulse -- pulse train during threshold exceedance.

These modes and others are determined by the jumper connections on the printed circuit board. A tabulation of the jumpers and their functions is given in Table 1-2.

3-7. Two timed modes are possible: either a pulsed alarm function (with single or multiple output pulses), or a delayed output alarm. The time of the pulse width, or delay length, is adjustable from zero to 10 seconds. As an option, time lengths are available from zero to 1 second or from zero to 100 seconds in place of the standard zero to 10 seconds.

3-8. The timing circuit consists of a zero to 10-volt ramp voltage which is gated by exceedance of the set point. When the ramp voltage reaches the level set on the "time test point" the timing period ends. The "time control" adjustment enables the accurate setting of any time period within the full scale range.

3-9. If the time period is observed to be 10 seconds for a "time test point" voltage reading of 9 volts, then half the time (or 5 seconds) will be obtained if the "time control" is adjusted to provide half the voltage, or 4.5 volts at the "time test point".

3-10. In the unlatched mode, the timing function is re-triggerable; that is, if the input set point exceedance terminates prior to the set time duration, the timing ramp is immediately reset and may be restarted at the beginning of the next set point exceedance. If a delay alarm mode is in use, no alarm will occur until an input set point exceedance duration is longer than the set time period. Similarly, in the single pulse output mode, the alarm will consist of a single pulse of the set time period for each exceedance of the input set point, provided the exceedance duration is longer than the set time period. Shorter duration set point exceedances will provide shorter duration output alarm pulses in the unlatched mode.

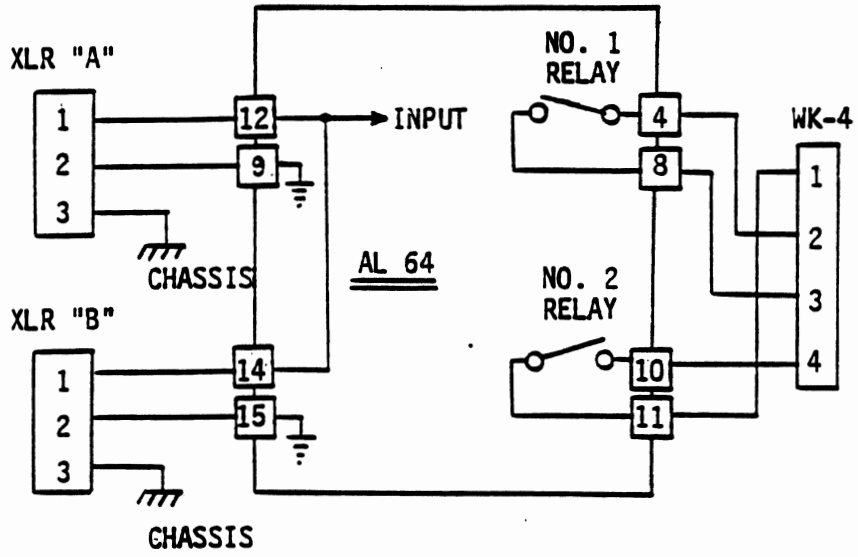


Figure 3-1. AL64 Wiring Diagram

3-11. The latch-unlatch mode is controlled by S3, except when jumpers W3 or W11 are in position B. The output alarms are always cancelled when the "RESET" function is pressed -- either by S3 or by grounding connector pin 5 "external reset". Releasing the "reset" function restores the alarm function. The unlatch mode means that the alarm output will terminate whenever the input set point exceedance ends. Similary, the latch mode means that the alarm output will continue until the AL46 receives a RESET. Note that the single-pulse output mode will issue a single pulse alarm and remain quiescent thereafter if operated in the latch mode.

3-12. A special tank filling mode can be provided by the AL64 as follows: The AL-1 output is assigned a HI alarm set point representing a full condition. The AL-2 output is assigned a LO alarm set point representing a depleted level. W3 is jumpered to B, causing AL-1 to be unlatched. W11 is jumpered to B, causing AL-2 to remain latched and to become unlatched when AL-1 goes to alarm state. With S3 in the latch mode, the system regulates the tank between the AL-1 and AL-2 set points. As the level falls to the AL-2 LO alarm set point, the AL-2 output initiates a "Fill" command, and this command continues until the AL-1 set point is reached. The AL-2 alarm is unlatched at that time, which terminates the "Fill" command. The cycle repeats each time the level falls to the AL-2 set point.

3-13. Dynamic time delays for relay contact operation are 3.5 milliseconds for alarm onset, to 13 milliseconds for alarm dropout. The logic output version has dynamic delays of 11 to 17 microseconds for alarm onset, and 4 to 11 microseconds for alarm turn-off.

3-14. For the relay version of the AL64, either the normally-closed or normally-open contacts can be connected to the output pins, as determined by jumpers W5 and W6.

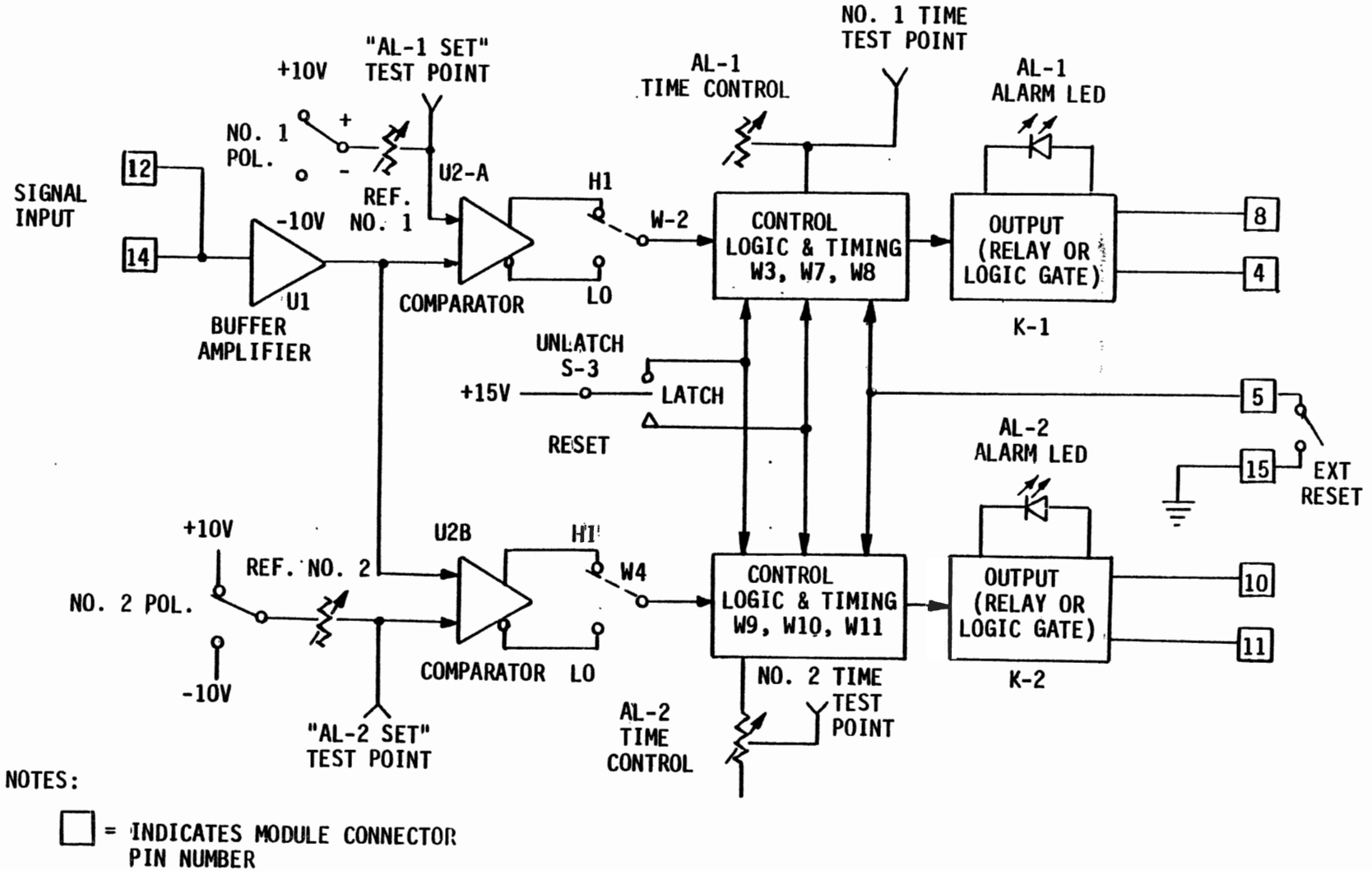


Figure 3-2. AL64 Functional Block Diagram