

a Mark IV company
Signaling Products Group

Instruction Manual

098-0263

Model AD-756 DTMF Message Decoder

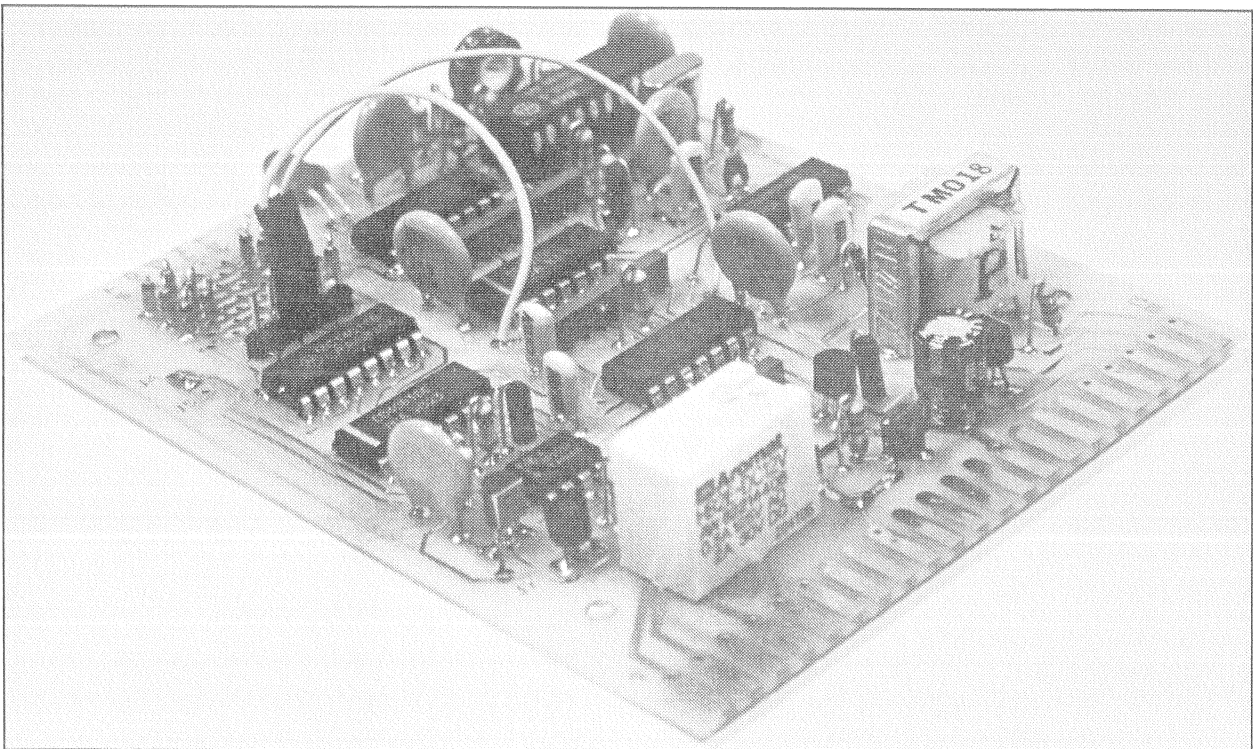


Table of Contents

General	3
Theory of Operation	3
Setup and Miscellaneous	3
Schematic	4-5
Technical Assistance	6
Warranty (Limited)	6
Claims	6
Parts Locator	6
Specifications	6
Parts List	7

General

The Vega Model AD-756 field-programmable one-to-five-digit DTMF message decoder is on a 22-pin card compatible with the 211 Series and Model P-218 rack panel or the Model P-217 cabinet. It provides a DPDT relay-contact output with latch/unlatch capability from any two different last digits. In this latch/unlatch mode of operation, the AD-756 relay contacts may be used for on-off control (any two mutually exclusive control functions) from a remote location. Relay latching upon receipt of a valid message with unlatch from an external command is also available.

The AD-756 is factory-programmed for a three-digit (777) latch of the relay and a three-digit (77#) unlatch. Referring to the programming chart in Figure 1, note that the programmed digit "7" may be changed to a "1," "2," "3," "4," "5," or "6," by removing diodes. The extra 1N4148 diodes provided may be installed to program messages longer than three digits or to allow other digit combinations.

The AD-756 has wrong-digit reset, and any wrong digit received will immediately reset the decoder to the initial conditions. The relay will remain in its last commanded state until a valid message is received. As shipped, the AD-756 will accept digit rates of 1/3 to 10 digits per second from automatic or keypad-type encoders without adjustment. Solder-bridge pads are provided to shift the digit rate to either a 4 to 22 digits/s range or a 0 (unlimited time between digits) to 10 digits/s range. In this last range, an exclusive (used only once in the message) first digit should be programmed to insure proper decoder operation in the event that the decoder has been inadvertently left in a partially decoded condition. (Otherwise, the first digit of the next message might be the same as the next "expected" digit of the previous partially decoded message.)

Other options include a decoder-latch/external-unlatch mode of operation, a momentary relay operation mode, and a 600-ohm or 10-k-ohm impedance transformer-isolated input. Additional features include VALID and DECODE open-collector outputs and a RESET/INHIBIT input terminal.

Theory of Operation

Referring to the Figure 1 schematic, U4 accepts a DTMF input and decodes a valid digit into a 4-bit binary output code. U5 is a 4-bit comparator which compares the 4 bits from the decoder with the 4 bits from the diode matrix. If the same 4-bit code is present at both "A" and "B" inputs of the comparator, an output will appear at U5-6. If

the U5 "A" and "B" inputs do not have identical codes, an output will appear at U5-5 or U5-7. A U5-6 output and a VALID therefore represents a correct digit received, and a U5-5 or U5-7 output and a VALID represents a wrong digit received. A wrong-digit output from U5 resets counter U6 to zero count (position 1) on the leading edge of a VALID output from U4. A correct digit output from U5 clocks counter U6 to its next position on the trailing edge of a VALID output from U4.

When the counter has been clocked to the last digit position, the "SET" digit diodes in the matrix are enabled by the orange jumper wire through U1D. If the last digit is the correct "SET" digit, no change occurs in the counter until the trailing edge of the last-digit VALID pulse. Counter U6 is then clocked to the yellow jumper wire position, which clocks U7A-1 low. This disables U1D, enables U1C, resets counter U6, and energizes relay K1. Counter U6 remains at the yellow-wire position until inter-digit timer timeout or until the leading edge of any new VALID pulse. At this time, counter U6 is reset to position 1. If the new VALID represents the programmed first digit, it will clock the counter to position 2 on the trailing edge of the VALID pulse.

Relay K1, once energized, will remain energized until a reset message is decoded. At the time when the relay was energized, the "SET" diode code was disabled by U1D and the "RESET" diode code was enabled by U1C. No message except the "RESET" message can therefore change the state of the energized relay. A correct "RESET" message clocks the output of U7A high, which deenergizes relay K1, disables the "RESET" diode code, and enables the "SET" diode code.

A mode whereby the logic is "SET" by the DTMF message, but can only be "RESET" by an external command is also available. In this message-"SET"/external-"RESET" mode or in the momentary mode of operation, U7A cannot be clocked from "on" to "off," and, therefore, the "RESET" diode code is unused.

Setup and Miscellaneous

Program for desired message length by moving the orange jumper wire to the corresponding position. Move the yellow jumper wire to the adjacent higher position from the orange jumper wire. (Example of five-digit message: orange wire to position 5, yellow wire to position 6.) If the position occupied by the orange jumper wire has been programmed with diodes, the diodes must be removed. Program for desired digits by deleting or



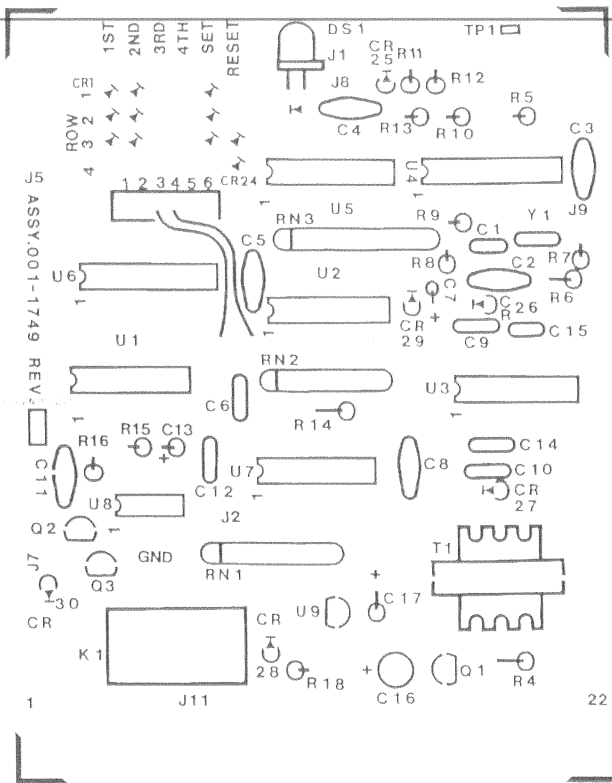


Figure 2. Parts locator for Model AD-756 DTMF message decoder.

adding 1N4148 diodes as shown on the chart in Figure 1.

Input transformer T1 is not designed to carry direct current. If DC is on the line, isolate the input with an external capacitor.

The setting of the input level control R5 is not critical, providing that the decoder is never driven into clipping. To optimize performance, particularly dynamic range, adjust R5 for 120 mV_{p-p} at TP1 with a "normal" incoming DTMF signal level. This adjustment provides approximately 10 dB of upward dynamic range and 23 dB of downward dynamic range.

Technical Assistance

Vega products are engineered to meet your requirements of performance, reliability, and compatibility. Technical assistance is offered by correspondence or telephone, should it be required, to assure your satisfaction.

Warranty (Limited)

All Vega signaling products are guaranteed against malfunction due to defects in materials and workmanship for three years, beginning at the date of original purchase. If such a malfunction occurs, the product will be repaired or replaced (at our option) without charge during the three-year period, if delivered to the Vega factory. Warranty

does not extend to damage due to improper repairs, finish or appearance items, or malfunction due to abuse or operation under other than the specified conditions, nor does it extend to incidental or consequential damages. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation may not apply to you. This warranty gives the customer specific legal rights, and there may be other rights which vary from state to state.

Claims

No liability will be accepted for damages directly or indirectly arising from the use of our materials or from any other causes. Our liability shall be expressly limited to replacement or repair of defective materials.

Specifications

Input: Standard 2 of 7 or 2 of 8 DTMF tones

Input Impedance: 600 Ω or 10 k Ω , transformer isolated

Tone Input Level: 10 mV_{rms} to 3 V_{rms}, adjustable

Signal Twist: 12 dB (minimum) level difference accepted

S/N Tolerance: 6 dB at normal dialing rates

Frequency Acceptance: $\pm 1.5\%$ minimum

Input Dynamic Range: Greater than 30 dB

Talk Off: Less than 30 hits on the first programmed digit at normal dialing rates, using Mitel CM7291 test tape

Dialing Rate: 1/3 to 10 digits/s or 4 to 22 digits/s or 0 to 10 digits/s

Intermessage Time: 15 ms minimum

Supply Voltage: +10 to +15 V_{dc}

Supply Current: 10 mA maximum, relay and LED deenergized; 60 mA maximum, relay and LED energized

Temperature Range: -30°C to +70°C

Outputs: DPDT relay contacts, 2 A_{dc} maximum; DECODE open collector, 100 mA_{dc} maximum; VALID open collector, 20 mA_{dc} maximum

Size: 3.6 in (9.1 cm) W x 4.5 in (11.4 cm) D x 0.75 in (1.9 cm) H

AD-756 Parts List

Part No.	Description	Ckt Sym	Part No.	Description	Ckt Sym
001-1749	PCB ASSY AD756 DTMF DCDR				RN2
001-1764	CONN KIT JK-22		138-0015	RNET CMN 9X22K SIP	RN3
001-1766	DIODE KIT MATRIX PRG 16EA		140-0001	XSTR NPN MPS4124 TO92 GP	Q1
098-0263	MAN INST AD756 DTMF DCDR				Q2
			144-0001	XSTR NDMOS2N7000 TO92 SW	Q3
001-1749	PCB ASSY AD756 DTMF DCDR				CR1
065-0330	PC BD AD756 DTMF DCDR		161-0426	DIODE 1N4148	CR17
104-0408	CAP TANT 1MF 35V	C7			CR18
104-0748	CAP TANT 10MF 10V	C13			CR19
		C17			CR2
105-1007	CAP MYLAR .01MF 20% 100V	C10			CR23
		C12			CR24
		C14			CR25
		C6			CR26
		C9			CR27
105-1013	CAP MYLAR .1MF 10% 100V	C11			CR28
		C5			CR29
		C8			CR3
110-1314	CAP CER .1MF 20% 25V	C2			CR30
		C3			CR5
		C4			CR6
110-1320	CAP CER .001MF 20% 50V	C15			CR7
110-1390	CAP CER .0068MF 10% X7R	C1	161-0537	DIODE LED	DS1
112-1609	CAP ELEC 100MF 20% 25V	C16	165-1212	XTAL HC-18 3.579545 MHZ	Y1
136-0028	RES COMP 470 5% 1/4W	R16	180-0321	RELAY DPDT PCB 12V	K1
136-0030	RES COMP 680 5% 1/4W	R4	286-1707	JUMPER PIGTAIL ORANGE	
136-0032	RES COMP 1K 5% 1/4W	R18	286-1708	JUMPER PIGTAIL YELLOW	
136-0044	RES COMP 10K 5% 1/4W	R5	286-1768	PIN TEST POINT	TP1
		R6	286-1772	CONNECTOR 36PIN STRIP TIN	
136-0048	RES COMP 22K 5% 1/4W	R14	318-0246	XFORMER 10K CT-10K CT	T1
136-0052	RES COMP 47K 5% 1/4W	R7	425-0130	INT CKT NE555 TIMER	U8
136-0059	RES COMP 180K 5% 1/4W	R11	425-0132	IC CMOS 4017 CNTR-DCDR	U6
		R12	425-0158	IC CMOS 4013 DUAL D FF	U7
136-0060	RES COMP 220K 5% 1/4W	R9	425-0166	IC REG-P 78L05 5V .1A	U9
136-0061	RES COMP 270K 5% 1/4W	R15	425-0171	IC CMOS 4081 QUAD 2AND	U1
136-0063	RES COMP 390K 5% 1/4W	R10	425-0172	IC CMOS 4075 TRIP 3OR	U2
136-0294	RES COMP 510K 5% 1/4W	R8	425-0191	IC CMOS 4069 HEX INV	U3
136-1955	RES COMP 5.1K 5% 1/4W	R13	425-0295	INT CKT MT8870 DTMF DCR	U4
138-0013	RNET ISO 4X22K SIP	RN1	425-0296	IC CMOS 4063B MAG COMP	U5



a Mark IV company

Signaling Products Group

9900 Baldwin Place • El Monte, California 91731-2204
Telephone: (818) 442-0782 • Toll-Free: 800-877-1771
Fax: (818) 444-1342

Printed in USA
January 1992