



OPERATION & MAINTENANCE GUIDE -
XMTR1M Single Command Transmitter

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WARNING

Holatron Systems specializes in the design and manufacture of standard and custom electronic control systems where reliability and error free data communication are critical. The transmitter described in this manual is part of a system intended to remotely actuate pyrotechnic or other hazardous devices, and the components of this system have been carefully designed to minimize the possibility of accidental actuation of such devices. Holatron's design goal is to ensure that data communication errors due to radio interference or to insufficient signal strength due to low battery, exceeding specified range, or conductive objects in the signal path will result in failure of intentional actuation rather than unintended actuation. Techniques used to achieve this design goal are described in section 1.9. Though the probability of unintended actuation is extremely small, it cannot be guaranteed to be zero. Therefore, **it is important that the user not enable the receiver until all persons who might be harmed by accidental actuation are in a safe area.**

As a condition of purchase, the user must acknowledge awareness and agreement that utilization of this product and participation in activities utilizing fireworks, rockets, and explosives is an ultra-hazardous activity carrying implied and explicit risks of injuries and damages to the user and to other participants. The user assumes the risk connected with the utilization of this product and all risks of participation in the activities for which this product is sold. User acknowledges that he/she/it has the necessary and required skill, expertise, training and licensing, as may be applicable or necessary by custom, usage, trade or law, to engage and participate in the ultra-hazardous activities connected with the use, purchase, transportation, or employment of the products sold under this agreement. User acknowledges that Holatron Systems, LLC, has not and will not conduct any investigation into the skill, expertise, training and licensing, as may be applicable or necessary by custom, usage, trade or law, of the user or of user's agents, employees and assigns, to engage and participate in the ultra-hazardous activities connected with the use, purchase, transportation, or employment of this product. User specifically agrees that Holatron Systems, LLC, its officers, employees, and agents shall not be liable for any claim, demand, cause of action of any kind whatsoever for, or on account of death, personal injury, property damage or loss of any kind resulting from or related to user's or user's employees', agents' or assigns' use of this product, and user agrees to indemnify, defend in any action at law, and hold harmless Holatron Systems, LLC, from same, whether brought by the user, user's agent, or assigns, or any third party.

NOTE:

This device complies with part 15 of the FCC Rules contained in CFR 47. It has been assigned **FCC ID number: OI4XMTR1M.**

Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications to the hardware not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules contained in CFR 47. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This manual is divided into two sections. The first is a description of the system hardware. The second covers the recommended operating and maintenance procedure.

1.0 HARDWARE DESCRIPTION.

The model XMTR1M Single Command Transmitter is a low power hand-held remote control transmitter which transmits a single fixed encoded command with an attached channel number code and group number code while its external pushbutton is pressed. No transmission occurs while its button is not pressed.

The transmitted channel number code and group number code are determined by the settings of their respective internal digital switches. Only those receivers which match the transmitted codes will be activated by the transmission. Transmission occurs on 418 MHz with amplitude modulation of the carrier (binary "1" = carrier on, binary "0" = carrier off). The transmitter's frequency is synthesized via phase-locked loop referenced to a high precision crystal oscillator for exceptional stability and minimum influence by antenna proximity. No alignment or tuning procedures are ever required to maintain optimum performance.

There are six different selectable digital channel numbers. Transmitters set to separate digital channel numbers can transmit simultaneously without interfering with each other, even though they operate on the same frequency. This permits up to six different receivers or groups of receivers to be controlled by six separate transmitters simultaneously. A transmitter will only actuate receivers whose digital channel and group switches are set to the same channel and group as the transmitter. Transmitters fixed to the same digital channel number will interfere with each other and result in failure-to-fire when actuated simultaneously, even if set to separate group numbers.

The user has access to the following components:

1.1 THE ANTENNA.

The RF signal is radiated by a quarter-wave helical antenna which screws onto a reverse polarity SMA jack on the bottom end of the transmitter box. Use of any antenna other than the one supplied with the transmitter is prohibited under FCC Rules and Regulations as listed in CFR 47, part 15. **The transmitter should never be operated without this antenna in place, as damage to the RF components could result.** Such operation will void the warranty.

1.2 THE “BATTERY LEVEL” INDICATOR.

This red lamp, located internally, verifies that battery voltage is adequate to transmit a signal over the specified range. It is actuated while the external button is pressed and the channel number switch is set to position “0”.

This lamp flashes intermittently in bursts of one, two, or three flashes at a time if the battery has enough capacity to power the transmitter. If no flashing occurs, the battery must be replaced before the transmitter can be used reliably. Three flashes per burst indicate that the battery has full capacity, two flashes indicate that its capacity is beginning to diminish, and one flash indicates that it is near the end of its useful lifetime in which case it should be replaced immediately after the current use. Adequate transmitter output to achieve the specified range will occur as long as the battery voltage is above approximately 2.6 volts, but the battery voltage will drop rapidly at this point.

1.3 THE TRANSMIT INDICATOR.

This red lamp, located internally, lights continuously while the transmitter is generating RF output.

1.4 THE FIRE BUTTON.

This button is located under a protective hinged cover on the top of the transmitter. For safety, the hinged cover must be open in order to press the button. The transmitter's microcomputer and RF circuitry are powered from an internal 3 volt battery which is only connected while this button is pressed. All circuitry is powered off while this button is not pressed.

1.5 THE BATTERY.

Power is supplied from a CR2032 lithium three volt coin-type battery, accessible by removing one of the transmitter's side plates. This battery should be replaced when required by conditions described in section 1.2 above. CR2032 batteries are readily available and can be purchased at RadioShack stores. Be sure to observe correct polarity when inserting a new battery.

1.6 THE CHANNEL NUMBER SWITCH.

This switch, located on the internal circuit board with silk-screened identification, is accessed by removing a transmitter side-plate. It is a 16 position miniature rotary switch that can be rotated with a small screwdriver. Positions 1 through 6 are used to select transmitter channel 1 through 6, respectively. Position 0 is used to select battery test mode as described in section 1.2. No transmission can occur in this mode. The remaining switch positions are not used.

1.7 THE GROUP NUMBER SWITCH.

This switch, located on the internal circuit board with silk-screened identification, is accessed by removing a transmitter side-plate. It is a 16 position miniature rotary switch that can be rotated with a small screwdriver. Positions A through F are used to select transmitter group A through F, respectively. Position 0 is used to select group G. The remaining switch positions are not used.

1.8 RADIO INTERFERENCE REDUCTION.

For obvious safety reasons, Holatron's design goal is to ensure that data communication errors due to radio interference or to insufficient signal strength due to low battery, exceeding specified range, or conductive objects in the signal path will result in failure of intentional actuation rather than unintended actuation. This goal is achieved by transmitting a 64 bit noise-tolerant code repeatedly while a transmitter button is depressed. 60 of these bits must match the pattern expected by the receiver. Thus, there is one chance in $(2 \text{ to the } 60^{\text{th}} \text{ power})$ of an actuation occurring due to reception of a random signal. Expressed in decimal numbers, this is $(1.1529 \text{ times } 10 \text{ to the } 18^{\text{th}} \text{ power, or } 11529 \text{ followed by } 14 \text{ zeroes})$. This is a probability of $8.6736 \text{ times } 10 \text{ to the } -19^{\text{th}} \text{ power}$ (or a decimal point followed by 18 zeroes followed by 86736). Though this probability of unintended actuation is extremely small, it cannot be guaranteed to be zero. Therefore, **it is important that the user not arm the receiver until all persons who might be harmed by accidental actuation are in a safe area.**

Additional protection is offered by use of 418 MHz as the operating frequency. This frequency is sparsely used only by low power transmitters with a maximum range of approximately 200 yards. It is not commonly used by auto security systems, garage door openers, radio control models, cordless or cellular telephones, wireless microphones, or two way communications equipment. Because this system operates in the UHF region, interference from lamp dimmers, electrical discharges, and other natural sources is also minimal.

No instances of false triggering with this communications technology have been reported to date.

1.9 SPECIFICATIONS.

Parameter	Minimum	Typical	Maximum
Carrier Frequency, MHz.	417.96	418.02	418.08
Range (line-of-sight)			1500 ft
Delay from start of button depression to receiver output (fewer than 4 transmitters transmitting simultaneously)		150 msec	175 msec
Delay from start of button depression to receiver output (more than 3 transmitters transmitting simultaneously)		200 msec	400 msec
Button depression time (fewer than 4 transmitters transmitting simultaneously)	100 msec		
Button depression time (more than 3 transmitters transmitting simultaneously)	400 msec		
Battery current, average, (xmting)		10.0 mA	
Battery current, (not xmting)			0.0 mA
Low Battery Detect Threshold		2.6 V	
Transmitter Supply Voltage	2.5 V		

2.0 OPERATION AND MAINTENANCE.

This section describes the recommended operating procedure and maintenance for the transmitter.

2.1 OPERATION.

- 2.1.1** Before using the transmitter, ensure that its channel number and group number switches are set to the desired numbers as described in the 3rd paragraph of section 1.0. The switches are accessed by removing a transmitter side-plate. They are located on the internal circuit board with silk-screened identification as described in sections 1.6 and 1.7.
- 2.1.2** To activate the transmitter, flip up the protective top cover, and then press the exposed pushbutton. No power is consumed from the battery until the button is pressed. The transmitter should be held in a vertical orientation, away from the body and other conductive objects to achieve maximum range and communication reliability. Generally, the higher the transmitter is held, the greater the range. Conductive objects such as chain-link fences, aluminum bleachers, and automobiles in the transmission path will reduce the range

2.1.3 When the transmitter is being stored or otherwise not used, the protective top cover should be kept closed to prevent actuation from accidental button depression.

2.1.4 It is advisable to check the battery level periodically by removing the side-plate, **setting the channel number switch to position 0**, and holding down the FIRE button. While the button is pressed, the battery level will be displayed on the BATTERY LEVEL INDICATOR as described in section 1.2. No radio transmission occurs if the channel number switch is in position 0.

WARNING - Be sure no receivers are armed or connected to live devices while performing this test to prevent the possibility of accidental actuation in the event of erroneous channel number selection (non- zero selection).

Battery check should typically be performed once per month during moderate usage or once per week during heavy usage. Heavy usage is considered to be several actuations per day, and moderate usage is once per day or fewer.

Be sure to return the channel number switch to its proper position after completion of the battery test.

2.2 MAINTENANCE.

Since there are no calibration or tuning adjustments in the transmitter, the only maintenance required is periodic replacement of the 3 volt battery. This should be done at least once per year, or at the next opportunity if the "Battery Level" light fails to flash when enabled.

If further information or service is required, contact:

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