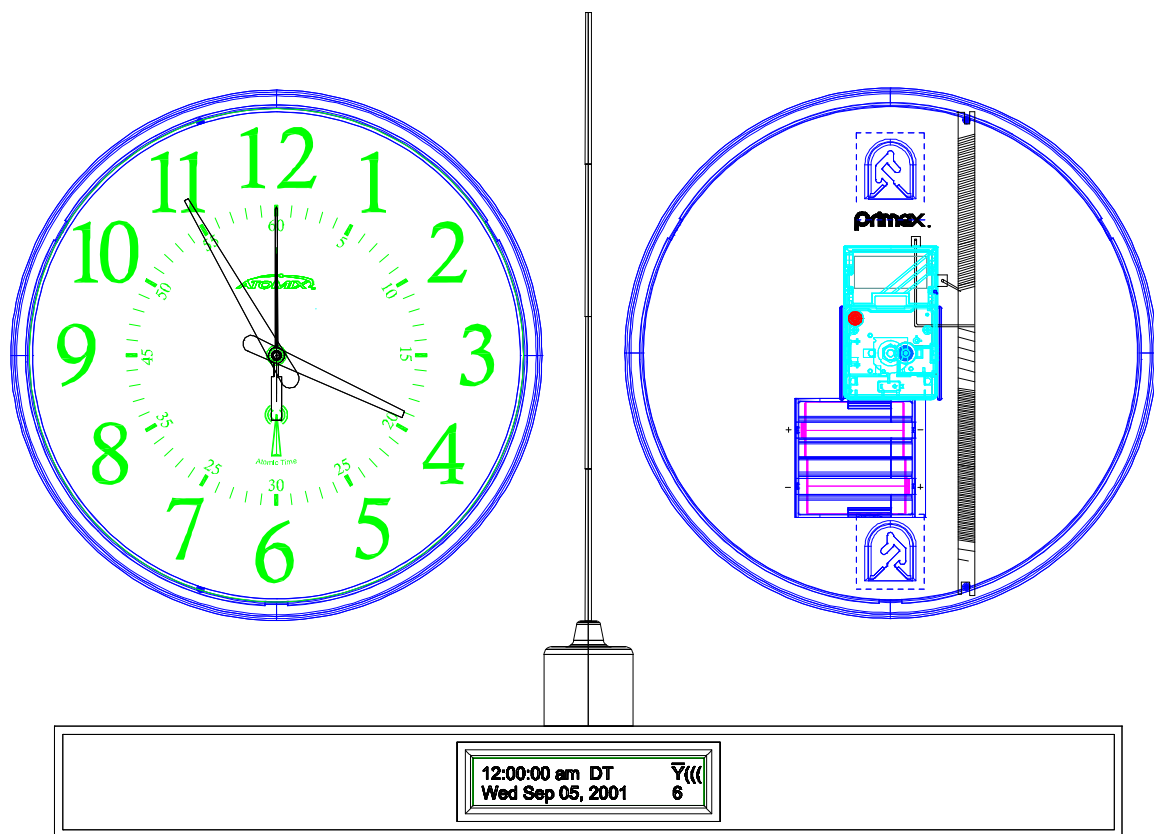


PRIMEX WIRELESS

FM-72 User's Manual



FM-72 Manual
Revised: 12/12/01

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FM-72 Operation Manual

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Section 1: FCC Information and Precautions:

A.) FCC Information and Requirements

This device complies with part 90 of the FCC rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and (2) This device must accept any interference that may cause undesired operation.

Compliance Statement

This device complies with part 15 of the FCC rules and with RSS-210 of Industry Canada.
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.

Warning

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

RF Exposure

To comply with FCC RF exposure requirements for mobile transmitting devices, this transmitter should only be used or installed at locations where there is at least 20cm separation distance between the antenna and all persons.

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Operation of the FM-72 Transmitter requires an operating license. Prior to operating the FM-72 transmitter, an application must be filed with the FCC and approval from FCC is required. Prior to receiving the FM-72 Transmitter, filing and FCC licensing should have been completed, if not, you must fill out and file the required application with the FCC. If you have any questions or need assistance please contact a Primex sale person at 1-800-544-0909.

B.) Safety precautions

It is recommended that standard acceptance procedures be followed prior to operating this equipment in the proximity of life support systems.

The FM-72 Transmitter is designed for indoor use. It is not weather protected. Operating the FM-72 out doors during adverse weather conditions is an electrical hazard and may damage the FM-72 transmitter and nullify warranty.

C.) Equipment Precautions

To avoid static shock and possible damage to the FM-72 transmitter make sure that you are electrically grounded before touching either the antenna or case.

Never operate the FM-72 transmitter without the antenna being properly connected. Operating the FM-72 Transmitter

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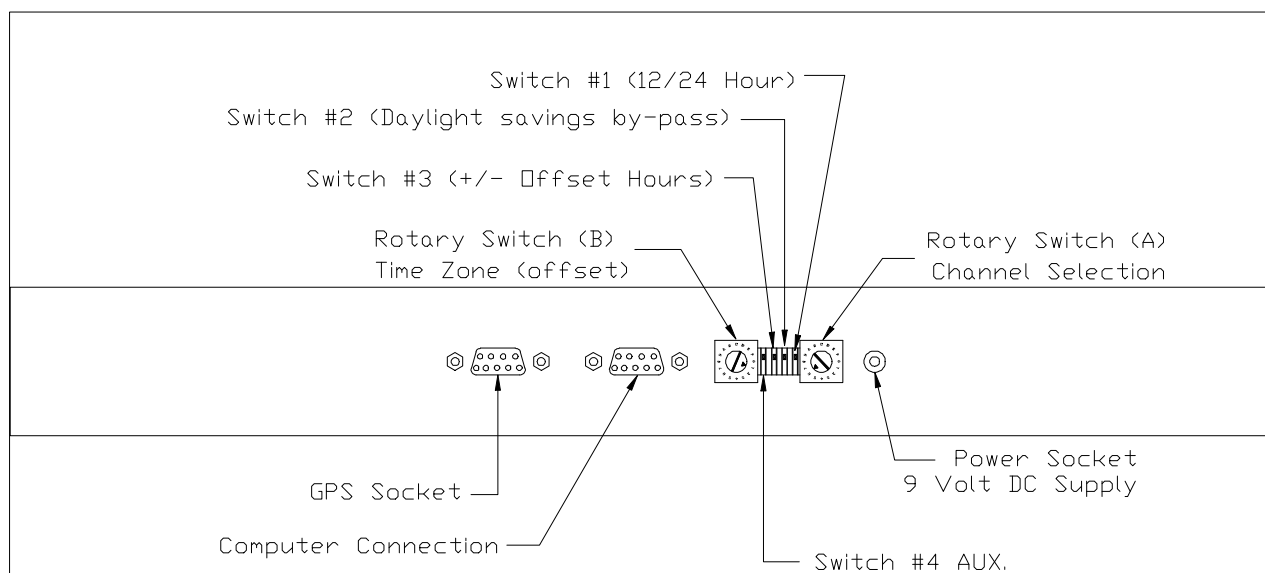
without an antenna will destroy the transmitter circuit! Altering the antenna or case which serves as the ground plane for the antenna is prohibited by FCC regulations. FCC also requires that the antenna be attached to the case and that the antenna is vertical with respect to the earth.

Static electricity can damage the FM-72 transmitter. Be sure that you are grounded before touching the antenna or the case.

Disconnect power from the FM-72 transmitter before making any switch adjustments. If adjustments are made to the switches (except for channel No.), while the transmitter is on, then the changes will not go into effect until power is interrupted and then restored.

Section 2: Setting Switch Preferences:

The switches are located on the back of the FM-72 transmitter (see diagram and detail on page #5). The FM-72 transmitter looks at the position of the switches on power up and stores the information in its memory. With the exception of the channel switch, changing the position of a switch when the transmitter is on will not effect the transmitter until the power is interrupted and restored. The selectable options are for time zone, channel number, 12 or 24 hour display and for automatic or by-pass of daylight savings time adjustments.



BACK VIEW "SWITCHES AND SOCKETS"

Set switches:

1.) Important:

Unplug the transmitter, when changing switch settings.
The transmitter only checks switches during power up.

2.) Set Rotary Switch (A) to Channel specified on FCC application.

3.) Set Switch # 1 to set display

A.) Switch up for 24 hour display

B.) Switch down for 12 hour display.

4.) Set Switch # 2 for Daylight Savings

A.) Switch up to By-pass Daylight Savings adjustments

B.) Switch down for automatic daylight savings changes

5.) Set Switch # 3 for direction of UTC offset

A.) Switch up + (Europe)

B.) Switch down - U.S.A.

6.) Set Switch # 4 not connected (for future use)

7.) Set Rotary Switch (B) for time zone offset from UTC.

A.) Position #5 for Eastern Time Zone

B.) Position #6 for Central Time Zone

A.) Position #7 for Mountain Time Zone

B.) Position #8 for Pacific Time Zone

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Section 3: Initial Setup:

A.) Transmitter Setup

1.) Transmitter location

The first step in setting of the FM-72 transmitter is to determine a suitable location for the transmitter. The transmitter requires 120 VAC and therefore it must be located near a 120 VAC outlet. Because the GPS receiver needs a clear view of the sky to receive the GPS signal, the transmitter must be placed near a window (a non-low E window) unless other means for obtaining a precision time signal are used.

For better signal transmission it is recommended that the FM-72 transmitter be located a minimum of 2 to 3 feet above the floor and away from large metal objects, such as lockers, filing cabinets and walls. The antenna radiates in a circular pattern, therefore the coverage for an area will be better when the transmitter is more centrally located than when the transmitter is located in the corner of the building. Also in multistory buildings, locating the antenna in the top story often gives the best coverage.

2.) Assemble Transmitter

- 1.) Set Switch preferences (see page #5)
- 2.) Connect the GPS to the Transmitter
- 3.) Attach GPS receiver to Window
- 4.) Connect the 46" antenna to transmitter (turn antenna clockwise being careful not to cross thread antenna).
- 5.) Connect 9 volt power supply to the transmitter
- 6.) Plug 9 volt DC power supply in to 120 VAC line.
- 7.) Transmitter setup is complete

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B.) Clock setup (see figure page #8)

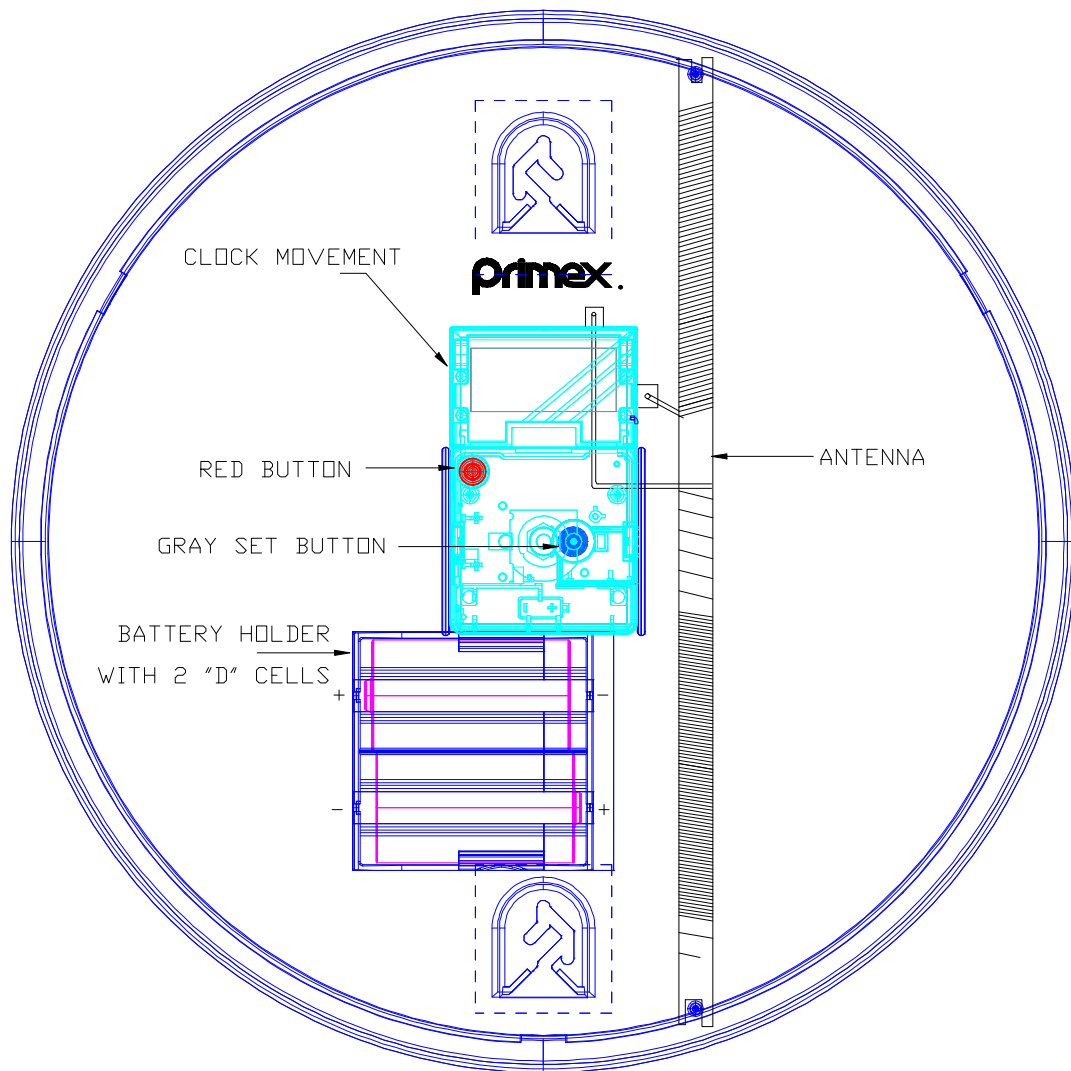
Clocks for the FM-72 transmitters come fully assembled. They do require the installation of 2 "D" cell batteries, setting of the clock hands to the approximate time and the pressing of a red button to identify the position of the second hand and the minute hand.

The procedure is as follows:

- 1.) Insert two "D" cell batteries into battery holder.
- 2.) Using the gray set button, set the clock hands to the approximate time or the nearest hour.
- 3.) When the second hand gets to the 12:00 position press and release the red button.
- 4.) Then when the second hand crosses the minute hand and is at the minute mark that the minute hand is going to, then again press and release the red button.
- 5.) The clock set-up is now complete, and the clock will take two steps on alternate seconds until it decodes a valid time signal. Once a valid time signal has been decoded, the clock will advance at 8 times normal speed or it will slow down to 1/2 normal speed until the clock hands display the correct time.

The clock should receive the signal between 3 seconds and 45 seconds. Once the clock has decoded a valid time signal it will keep and continue to keep with every valid decoded signal for the next minute.

If you press the red button again, the clock will stop and record the hand position. Press the red button again or replacing the batteries and the clock will look for the signal and set to the correct time. If the batteries are removed without pressing the red button, then repeat #2,#3 & #4 above.



BACK VIEW OF CLOCK

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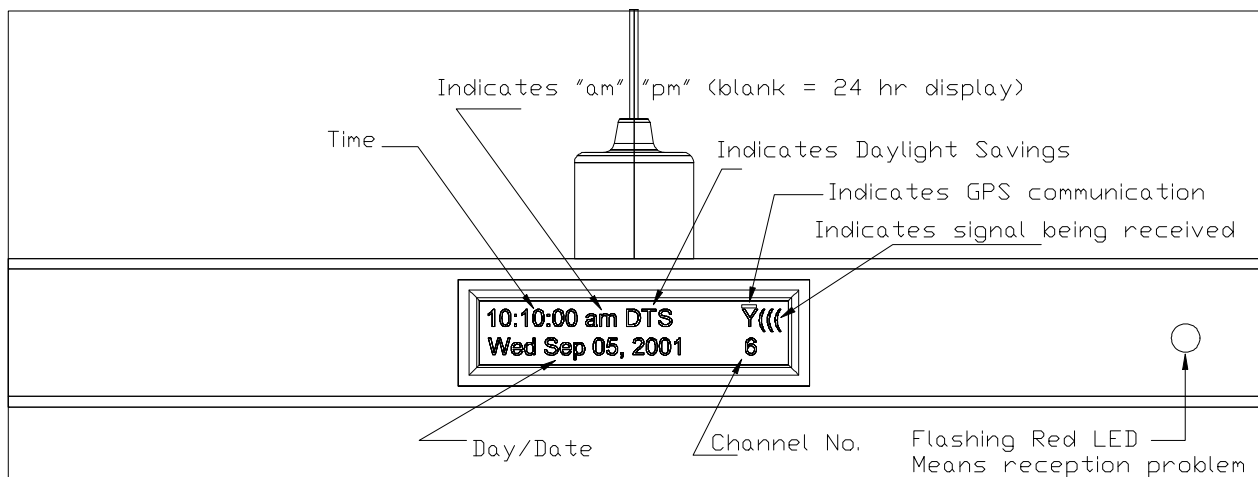
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Section 4: Details of Operation:

A.) Transmitter Operation:

The following assumes that the FM-72 transmitter and clocks have been properly setup as described earlier in this manual. When power is first applied to the FM-72 transmitter, it will display the Software revision number for a few seconds. Then the processor in the FM-72 transmitter will display the Following (see sketch on page 10):

- 1.) The number to the right side of the display is the selected channel number on which the transmitter will be broadcasting the time signal. This channel number must be the same channel specified on your FCC application. If it is not, then you must immediately adjust the channel number to the correct channel number. The channel is adjusted on the back of the unit and the channel can be adjusted without disconnecting power. All other adjustments require the transmitter to be shut down and power restored before they go into effect.
- 2.) The 12:00:00 in the center of the Display will increment every second, until the unit receives a valid time signal. The unit will then display and increment the the correct time and date. Note: The FM-72 transmitter starts to transmit as soon as it receives power; however, it does not transmit time data until it has received a valid time signal.



Front View "Display Panel"

- 3.) The letters "DST" (Daylight Savings Time) or "ST" (Standard Time) will be displayed on the LCD when automatic adjustment for daylight savings time is active. If switch #2 is in the by-pass position then neither of letter sets "DST" and "ST" will be displayed.
 Note: The GPS signal (unlike the WWVB signal) does not encode information about daylight savings time. The time, dates and direction of adjustments are programmed into the transmitter's processor and therefore they are not dependent on reception the day of the time change. In the spring the clocks will rapidly advance at 8 times normal speed to make the adjustment. In the fall the the clocks will run at half speed until they have effectively backed up the one hour. This method was chosen because it simultaneously supports both 12 hour and 24 hour slave clocks with the same electronics.
- 4.) The setting of the time zone switch is not displayed; however, when a valid time has been received you can verify that the correct time zone was set by verifying the hour being displayed is correct.

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- 5.) If the "AM" or "PM" are displayed on the dial, then the 12 hour option was selected and is being displayed. If neither "AM" or "PM" is being displayed then the 24 hour was selected and is being displayed. For practical purposes the 24 hour mode switch only changes the display. Both the 12 & 24 hour modes support the 12 hour and 24 hour clocks.
- 6.) GPS signal reception is indicated by the tower (it looks like a "Y" with a line over it) and by the parentheses. The tower "Y" indicates that the GPS receiver is connected to the FM-72 transmitter and that there is proper communication between the GPS receiver and the FM-72 transmitter. When the FM-72 transmitter is receiving time data from the GPS receiver then the parentheses will sequence.
- 7.) There is an LED light on the front panel. This light only flashes when a severe reception problem has occurred and no time up date has been received from the GPS receiver in seven days.

Basic Operation:

When power is first applied to the FM-72 transmitter it checks for and displays the software version, then it checks the position of the switches and stores their position in memory. The FM-72 transmitter then looks for the GPS (or equivalent) time signal. Once the FM-72 transmitter has received the GPS time, it sets its internal

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clock to that time. The FM-72 then starts to transmit its internal time once every second. The transmission signal is a one watt FM signal at approximately 72.2 MHz. The FM-72 continually monitors the GPS receiver and the FM-72 updates its internal clock every time it receives valid time data from the GPS.

The FM-72 system is a fail-safe design, such that each member of the system continues to function independently during a failure or power interruption to other members of the system. On restoration of power each member resumes normal operation without the need to reset the system or any member of the system.

B.) Receiver (slave clock) Operation:

When the batteries are inserted into the slave clocks, the clock's microprocessor checks to see if the position of the clock hands is stored. If they are stored then the clock will triple beep and by-pass the following hand identification. If the hand positions were not stored in memory, then the microprocessor will wait for the red button to be pressed twice. The first time will indicate that the second hand is at the 12:00 position and the second will indicate the location of the minute hand. After the red button has been pressed twice the microprocessor will start searching the channels. It will start at channel #1 and proceed one by one until it either decodes a valid signal or reaches channel 16. If no signal is detected the receiver will be shut off and try again later. If a signal is received

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then the microprocessor will store the channel number, set the clock to the received time and then for the next minute the clock will keep every time that it receives a valid time signal. If the clock is in a good signal area it will keep once a second. If the clock keeps every few seconds, then you are in a poor signal area. The clocks should work in these poor signal areas, but they will have a shorter battery life (est. 25% less).

After this initial set, the clock will shut off the receiver. On a pre-scheduled time basis the microprocessor will turn the receiver back on and starting with the stored channel it will again look for a valid time signal. However, this time the keeper will not be operated.

If the clock has not decoded a valid time signal for seven days, then it will go back to a double step mode. This non-signal reception can be caused by low battery voltage. Should this occur, then replace both alkaline "D" batteries. NOTE: If you press the red button, before removing the batteries, then the microprocessor will stop the hands and store their location and keep three times. Then after removing and replacing the batteries the clock will keep three times indicating that the hand position is known. The clock will then look for a signal and set to time. Like the initial setup, the clock will keep every time it receives a valid time signal during the next minute.

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Product Specifications

Parameter	Specification
General Specifications	
Frequency Range*	72.100 to 72.400 MHz
Transmission Range	1 mile open field
Radio Technology	Narrowband FM
Modulation Format	N/A
Number of Channels	16
Channel Bandwidth	20 kHz max.
Channel frequencies	72.100 to 72.400 Mhz
	Channel Spacing
Transition Mode	Simplex
Data Rate	2KBps
Data Protocol/Duty Cycle	Manchester
Operating Temperature	0° C to 70° C
Transmitter Specifications	
Transmitter Output Power**	+30 dBm (1 Watt)
Frequency deviation	+/- 4 kHz
Transmitter Power Requirements	120 VAC at 60 Hz
Internal Power Requirements	5 Volts DC
Carrier Frequency Stability	+/-20 ppm
Antenna Type**	Transmitter Mounted Comercial Antenna
Antenna Gain	>-110dBm
Antenna Polarization**	Data Logic 0 to 5 Volts
Receiver Specifications	
Receiver Sensitivity (Decode Sensitivity)	>-110dBm
Receiver Power Requirements	2 Alkaline "D" cells
Antenna Type	Internal
Antenna Gain	.-7dBd

* Governed by Part 90.35. This frequency range was selected for the easieast licensing procedures. Other frequency bands are available for this type of system; however, they require additional frequency coordination at increased cost and would result in different frequency bands for different installations.

** Governed by FCC Part 90.257 (b)