

Radio Systems, Inc.

CT-6 Clock/Timer Manual

For Models:

CT-6 Thin Display

CT-6 Desktop Display

CT-6 Large Display

CT-6 Master Driver

CT-6 GPS Driver

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radio
SYSTEMS

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General Description

The CT-6 series of digital clock/timers is a family of timing displays, each of which can be utilized in a stand-alone or master/slave array to provide accurate time-of-day, and uptime read outs.

Models

CT-6 Desktop	4" deep x 3" high Desktop clock/timer which functions as a stand alone or slave display with remote control.
CT-6 Thin	1" deep x 3" high "stick-on" clock/timer display featuring the same functions as the desktop unit, but in a smaller profile cabinet.
CT-6 Large	2" deep x 5" high clock/timer display with large 2" high LED display and the same features set as the "desktop" and "thin" units.
CT-6 Large 4 digit	Same as "Large" unit above but with only 4 LED displays (seconds are omitted) to reduce size and cost.
CT-6 Console	For installation in Radio Systems and other broadcast consoles.
AC-12	12 inch analog impulse clock.

Options

Master Driver	Installs in Desktop and Large units and provides serial master time data to all CT-6 clocks and AC-12 analog clocks. Unit has an on-board ovenized crystal and accepts top-of-hour and 1 and 10 Hz sync inputs.
GPS Master Driver	Installs in Desktop and Large units and includes powered outdoor antenna to receive GPS time data. Automatically updates for daylight savings time and outputs 1 PPS and top-of-hour closure.
AMD-1 Driver	Installs in-circuit to control and drive up to 50 Radio Systems AC-12 analog clocks.
RS-485 Convertor	Installs in-line between the satellite antenna and clock/receiver. Required for cable runs in excess of 150'.

General Operating Instructions

For all units utilized in stand-alone and slave display capacities

Clock/Timer (Mode) Select

All CT-6 units operate as both clocks and timers. Switch between modes by pressing the MODE button on the front of the unit. The front panel LED's will light to indicate the mode selected.

Note that on the CT-6 large, wall display models, the mode switch is available on the remote control only. In its place, the fourth front panel switch is used to put the clock into the set mode.

To Set the Clock:

1. Press the mode button to select the time-of-day display.
2. (Desktop and Thin models) - press and hold the STOP and START buttons. (Large models) - press the SET button.
3. Display resets to 12:00:00 (note - on power up units enter set mode automatically).
4. Press the STOP button to advance the hours. Press the RESET button to advance the minutes (note - seconds are not settable and remain at :00).
5. Start the clock at the top of the minute by pressing the START button.

To Operate the Timer:

1. Press the mode button to select the timer display.
2. Press the START button to start timing.
3. Press the STOP button to stop timing.
4. Press the RESET button to return the display to 00:00.

To Utilize as a Slaved Clock Display:

1. Provide serial data to the unit from a master unit (see the connections diagram).
2. The "data" front panel lamp will light and the time-of-day will immediately conform to the master unit readout.
3. Clock setting is no longer possible on this slave display (all time sets must be made to the master unit).
4. If the data link is lost, the clock will revert to stand-alone local operation and the "data" lamp will extinguish.
5. Local timer functions continue to be available as described on the preceding page.

Remote Control

All front panel controls are available on the rear barrier strip connector.

Contacts are momentary/pull-to-ground

See attached wiring diagram for connections.

Master Driver Additional Operating Instructions

(For units equipped with the optional master driver board)

To Set the Time (on clock power up)

1. Clock will power up in the set mode at 12:00:00. The display will be frozen.
2. Press the STOP button to advance hours. Press the RESET button to advance minutes. (Seconds cannot be adjusted.)
3. At the top of the minute exactly, press START.

To Adjust the Time

1. Desktop models - press and hold the STOP and START buttons.
Large models - press the set button.
2. Display will flash

To adjust the time	press and release the STOP button to add one second press and hold the STOP button to add one hour press and release the RESET button to lose one second press and hold the RESET button to lose one hour
To reset the time	press mode (this must be done prior to adjusting time) display will reset to 12:00:00 and freeze press the STOP button to advance hours press the RESET button to advance minutes
3. Press START to resume normal operation

Battery Lamp

The front panel battery lamp will light when the internal 9V backup battery needs to be replaced.

Note - in the event of a power failure, the battery backs up timer memory only. The display will not illuminate during power failure.

Remote Control

Refer to attached illustration for remote control wiring. Please note the following;

For serial interconnect - use twisted pair cable. Lengths up to 1000' are allowable.

The last unit in the serial chain should be terminated with a 120 Ohm resistor in parallel with the serial line.

BACK and FORWARD switches - adjust time of day seconds (momentary push) and hours (held closed) in the clock mode.

Top of Hour closure - Resets clock seconds to top-of-the-hour (:00).

12/24 Hour Operation

The CT-6 Master driver unit can be user programmed for 12 or 24 hours (military) operation, by changing an internal jumper.

Units are shipped from the factory in the 12 hour mode.

To change to 24 hour operation, consult the corresponding parts layout diagram for CT-6 Master driver and locate jumper JU-1.

For 24-hour operation, remove the jumper from the single jumper pin and insert it so that it connects the two jumper pins together. The clock must be powered off and on for the mode change to take effect.

GPS Driver Additional Operating Instructions

Setup Programming

Refer to the dip-switch setting diagram to program the hour offset from GMT for your time zone, to enable the automatic daylight savings time setting, and to enable 12 or 24 hour operation.

Note that the unit is shipped with the factory default setting of Eastern Time Zone (5 hours behind GMT), auto daylight savings time compensation, and 12-hour operation.

The analog clock dip-switch (switch #1) causes the display to flash after recovery from a satellite signal loss as an operator indication that your analog clocks have lost time and must be reset. (Digital clocks connected to the GPS Master driver will automatically update.) After adjusting the time on the analog clock (see analog clock operation), push the start button to cease the flash and resume normal display. Factory default for this feature is "off".

Connections and Installation

1. Mount the antenna on a roof or window ledge with a clear view of the sky. Avoid areas directly under microwave antenna paths, or near dense foliage.
2. The antenna plugs into the clock/receiver via a pre-installed RJ-45 telephone style connector. Up to 150' of four conductor shielded cable may be installed between the antenna and the receiver. This cable may be user provided, or a pre-assembled 150' or 250' extension cable may be purchased from Radio Systems. Please note that for any cable run in excess of 150', in-line balancing RS-485 convertor amplifiers, available from Radio Systems, must be installed. For wiring specifications, see the attached antenna wiring detail.
3. For remote control, serial and analog clock rear panel connections, consult the "Connections to the CT-6 GPS Driver" diagram in this manual.

Operation

1. After all connections are made, apply power. The unit will take from 1 to 15 minutes to acquire the satellite data. During this initial acquisition period, and during any subsequent periods of satellite data loss, the GPS Master unit will display one of 5 error codes. These codes and their meanings are listed below.
2. After acquisition, the true time will display and will be serially relayed to any digital display units "downstream". If data is lost at any time in the future, downstream display "data" lamps will extinguish, but these clocks will continue to run on their internal time base. On satellite reacquisition, the time will be updated, and the "data" lamps re-illuminated.
3. Front panel master GPS controls cannot be used to set or change the digitally displayed time-of-day, but the time mode may be used to adjust the time on any analog clocks connected, and the START, STOP and RESET switches may be used in the timer mode. See the "Analog Clock Connection and Use" section for operating details.

GPS Error Codes

These two digit error codes will display in the GPS master readout in the center two digits on unit turn-on (pre-satellite acquisition) and during any data outage.

Error Code	1-Pulse Per Second	Serial Data	Data
01 (1 PPS line broken)	not present	present	okay
02 (satellite acquisition lost)	present	present	bad
03 (fire-up status - first 1 to 15 minutes)	not present	present	bad
04 (corrupted serial data output)	present	not present	bad
05 (no antenna connection)	not present	not present	bad

Analog Clock Connection and Use

Up to 10 Radio Systems AC-12 analog clocks can be directly connected to any CT-6 Master or GPS driver board. If more than 10 clocks are to be utilized, they may be connected via the AMD-1 analog clock driver. Analog clocks connected to the GPS master driver will automatically be updated for Daylight Savings Time and Standard Time. Clocks wire via a 3-wire cable, and can be connected in a "home-run" or "round-robin" wiring array to the driver.

To connect analog clocks to a CT-6 master unit, consult the "Connections to the CT-6 Clock/Timer" diagram for wiring instructions. To connect analog clocks to a CT-6 GPS unit directly or with an AMD-1 booster driver in-line, consult "Connections to the CT-6 GPS Driver" diagram.

Initial Clock Setting

1. Set your CT-6 Master or GPS unit to the correct time and leave it in normal run mode.
2. Connect the analog clock and start it running (if it has not started on its own) by pushing the STOP/START button on the rear of the analog clock.
3. Stop the second hand exactly as it rests on the "12" by pushing the STOP/START button on the rear of the analog clock again.
4. Set the hour and minute hand for a time several minutes ahead.
5. Repeat this process for any additional clocks in the system, setting all clocks for exactly the same time.
6. When the digital display reads exactly the time set on the analog clock, push the START button on the CT-6 master, GPS master, or AMD-1 master driver unit being utilized in your system. All clocks should start and run together.

To Adjust The Analog Clock Time (using a CT-6 Master or GPS Driver)

1. Put the master in set mode by pressing and holding the START and STOP buttons together for 3 seconds. The digital display will flash.
2. To add a second, push and release the STOP button. To subtract a second, push and release the RESET button.
3. To add an hour (for Daylight Savings Time) push and hold the STOP button for 3 seconds. The analog clocks will run at double speed for exactly $\frac{1}{2}$ hour. To subtract an hour (for Standard Time) push and hold the RESET button for 3 seconds. The analog clocks will stop running for exactly one hour, then start again.
4. Push the START button to resume normal digital clock operation.

Notes:

1. Adjustments made via the CT-6 Master driver will effect the digital readouts. Adjustments made via the CT-6 GPS driver will not effect digital readouts.
2. On systems that utilize the AMD-1 analog clock driver, all time adjustments should be made via this unit. Consult the AMD-1 manual for adjustment instructions.
3. Daylight Savings and Standard Time adjustments are made automatically to all digital and analog clocks connected to the GPS master driver. The user must manually initiate these functions if no GPS receiver is utilized.