

MC4181-388 SERIES

TIME ZONE

MASTER CLOCK



TABLE OF CONTENTS

INTRODUCTION	2
SPECIFICATIONS	3
INSTALLATION	4
FRONT PANEL DESCRIPTION	5
OPERATION	5
Filling out the Time Zone Record Sheet	5
Auto-Prompt Display and The Cursor	5
Entering Data / Applying Power	6
Selecting Time Base	6
Entering, Reviewing or Editing GMT Time	7
Entering, Reviewing or Editing GMT Date	8
Entering, Reviewing or Editing GMT Day	9
Entering, Reviewing or Editing World Time Zone Plans	9
SPECIAL FUNCTIONS	11
Setting the Time Base	11
Forcing a Restart	11
Zone/Address Test	11
Software Version	11
PROGRAMMING SUMMARY	12
OPTIONAL GPS ANTENNA / RECEIVER	13
Installation and Operation	13
GPS Locked On Indication	13
WORLD TIME ZONE RECORD SHEET	14
WARRANTY	15

MC4181-388 SERIES– TIME ZONE MASTER CLOCKS
REV 12/21/06

INTRODUCTION

The MC4181-388 Series World Time Zone Master Clocks are calendar programmable solid state master clocks used for synchronizing AE Series Digital World Time Clocks according to their specified world time zones. Offsets from Greenwich Mean Time (GMT) and seasonal changes are easily programmed for each world time zone. An optional GPS Antenna/Receiver provides accurate time by locking the MC4181-388 Master Clock to the NIST traceable time (atomic clock) sent by the GPS system.

The AUTO PROMPTING, alphanumeric display makes programming fast and simple.

The MC4181-388 Rack Mount Master Clock has an RS232 I/O Interface that sends Time and Zone information each minute via simple 2-conductor cable to the ATS AE Series World Time Zone Clocks,

MC4181-388 SERIES– TIME ZONE MASTER CLOCKS
REV 12/21/06

SPECIFICATIONS

PROGRAMMING CAPABILITIES

Auto Prompting Display –

Provides display information to guide the operator during programming. From a cold start it will take the operator from setting time clear through setting up the world time zones.

Programmable World Time Zones –

Simple keyboard entry allows for programming up to 15 world time zones including their offset from GMT and any seasonal adjustments.

Automatic Leap Year Compensation.

RS232 Interface –

Provides an RS232 interface for driving AE Series Digital World Time Zone Clocks and CC Series System Clocks, or for connection to a computer or another master clock.

Power required - Standard power is 12 VAC, 50/60 Hz. A 120/12VAC Power Module is provided that uses a standard 120 VAC power outlet (95 VAC to 135 VAC, 60 HZ at 5 VA maximum). For optional powered units (220 VAC and 50 Hz), refer to the option addenda provided.

RS232 I/O - A DB9 connector mounted on the back panel provides the RS232 I/O connection. The RS232 I/O is also available on the terminal blocks on the back panel.

Enclosure - Anodized aluminum enclosure that measures 19"W X 3.5"H X 8"D. Rack mounts in a standard 19" equipment rack. Mounting ears are included.

POWER FAIL BACKUP

The MC4181-388 has a Non-Volatile Memory which keeps time and programs for indefinite power outages. Outputs and the display are disabled during backup. The MC4181-388 resumes normal operation when power returns.

ACCURACY

Time Keeping – Programmable 50Hz Line Sync, 60 Hz Line Sync, or Crystal Time Base

Synchronized to the 60 HZ AC power line, 50 HZ AC power line or crystal time base. Can be changed via keyboard command. During a power failure it is quartz crystal controlled with an accuracy of +/- .005% throughout its full temperature range.

Models with the Optional GPS Interface (Option 427A) track the Atomic Clock for optimum accuracy.

Operating Temperature Range is from 0 to 50 degrees C

MC4181-388 SERIES– TIME ZONE MASTER CLOCKS
REV 12/21/06

INSTALLATION

The MC4181-388 sends Time and Zone information to AE Series World Time Zone Clocks using simple 2-conductor cable. Terminal blocks and/or connectors are provided for all wiring. Additional installation instructions for the AE Series World Time Zone Clocks are included in the specific manuals provided with those products. Also, refer to the system wiring diagram at the back of this manual.

The MC4181-388 should be securely mounted in a 19" equipment rack according to any local codes using the mounting ears provided. Be sure the equipment is properly grounded to the panel or the facilities ground connection. The MC4181-388 can also be shelf mounted by removing the rack mount ears.



ELECTRICAL CONNECTIONS

A 120/12 VAC Power Module with an six-foot cord is provided for the AC power (connects to a power jack located on the back panel).

All other wiring connections are made at the clearly marked terminal blocks and a DB9 connector located on the back panel of the MC4181-388 enclosure. Remove the terminal block cover plate on the back panel of the MC4181-388 to gain access to the terminal blocks. See the wiring diagram at the back of this manual for more detail. Be sure to replace the terminal block cover plate after making wiring connections. A 10-foot DB9 cable is provided for connection to the remote world time zone clocks. This cable can be extended as required with simple 2-conductor cable such as Belden # 8442.

OPTIONS

For details on the installation and operation of any installed options, refer to the Manuals or Addenda for those options at the back of this manual.

**MC4181-388 SERIES– TIME ZONE MASTER CLOCKS
REV 12/21/06**

FRONT PANEL DESCRIPTION

DISPLAY, KEYBOARD AND LABELING

ALPHANUMERIC DISPLAY - Used for displaying GMT time, day, and date, and for displaying information during programming or reviewing stored programs.

KEYBOARD - Many keys serve multiple functions. Those keys are clearly labeled with their functions to the side and top of the key. They cannot be used incorrectly, as the display will AUTO PROMPT the user as to which key to press.

TIME KEY [3]	Used for entering the GMT Time Set Mode.
DATE KEY [D]	Used for entering the set GMT date mode.
EXIT KEY [#]	Used for exiting any of the GMT set time, set date or program modes.
ENTER KEY [*]	Used for entering all commands or for stepping through program data entry.
DAY KEY [4] -	Used for setting the GMT day of the week.
ZONE KEY [7]	Used for entering the World Time Zone Plans

OPERATION

FILLING OUT THE WORLD TIME ZONE RECORD SHEET

In order to accurately document and enter your program the World Time Zone Program Record Sheet should be used. This sheet provides a list of your selected world time zones along with their respective offsets from GMT and any seasonal changes. Copies are included at the back of this manual.

AUTO PROMPT DISPLAY

A feature called Auto Prompt that guides the operator when programming the unit. For the most part the operator merely has to follow the display as the master clock advances through the program modes. On a cold start (from a discharged backup system) the master clock will advance through a sequence of all the necessary settings including the World Time Zone Plans. You may exit this sequence if desired and enter the program manually from the GMT Time display. Entering a program from the Auto Prompt sequence is identical to entering one manually, except you have to enter each sequence manually.

THE CURSOR

On many of the display messages you will see a flashing square character called the cursor. The cursor indicates that you may now enter or change the data at that position of the display.

**MC4181-388 SERIES– TIME ZONE MASTER CLOCKS
REV 12/21/06**

ENTERING DATA

As data is entered, the master clock constantly checks for a valid entry. For example, you cannot enter 13 for a month when setting the date. After entering valid data to a position on the display, the cursor will advance to the next position. If you have tried to enter invalid data, the cursor will remain at the same position, indicating you must re-enter the data. Simply re-enter the data on top of the existing data and press ENTER. Generally data is entered two digits at a time.

EXITING THE AUTO PROMPT SEQUENCES

Any time during a GMT Set Time, Date, or World Time Zone Programming mode, you may wish to exit the Auto Prompt sequence. Simply press the EXIT key. The master clock will advance to the GMT Time display. From this display you may enter any of the sequences manually. This manual will assume you have exited the Auto Prompt sequence after entering the GMT time. If you had remained in the Auto Prompt sequence, all the sequences covered in the section on ENTERING, REVIEWING OR EDITING TIME AND PROGRAMS would automatically be invoked.

APPLYING POWER

Before power is applied, be sure all installation and wiring is completed to all local codes.

Upon first applying power the display will come up with a brief sign on message showing the model and version numbers:

TZ41 Master Clk.
Version 2.XX

After a few seconds the first Auto Prompt message will appear.

If this message does not appear, go to the ENTERING, REVIEWING OR EDITING TIME AND PROGRAMS section.

UNIT POWER FAIL
Press '3' key

When the "Unit Power Fail" screen is displayed, the MC4181-388 will send an "Err" message to all the remote world time zone clocks on the system, indicating that the master clock needs to be programmed. Simply press key [3]. The display will respond with the "Time Base " selection screen.

Timebase =
60 Hz Line

Caution: Setting the Time Base incorrectly could produce large time-keeping errors.

The MC4181-388 can be programmed for three different internal time bases. Typically it will be set for 60 Hz Line Synchronization for use where the incoming power is known to have a good 60 Hz power line. It can be programmed for 50 Hz Line Synchronization for use where the incoming power is known to have a good 50 Hz power line. Finally, it can be programmed to use a built-in crystal time base with an accuracy of 0.005%. Crystal time base should only be used for applications where the incoming power does not have a good 50 Hz or 60 Hz power line, or when using the external GPS Timebase.

Press the [4] key to change "60 Hz Line" to "50 Hz Line", or to "Crystal". Once the desired timebase is displayed, press [ENTER] to select.

MC4181-388 SERIES– TIME ZONE MASTER CLOCKS
REV 12/21/06

Next the display will prompt with the Set GMT Time display.

Time? 00:00 GMT
Hrs. (HH), ENTER

From this point forward you can exit the Auto Prompt sequence at any time, if desired, by pressing [EXIT]. However, the programming is simpler if you do not exit.

Be sure to enter GMT time.

The cursor will be flashing in the hour's digits. The bottom line indicates that you need to enter 2 digits (HH) for hours in 24 Hour format. Simply enter the hours then press the [ENTER] key. Two digits are required for the hours. Example: 01 instead of 1. If you try to enter an invalid number for the hours, the cursor will remain flashing in the hour's digits. You must then re-enter the correct hours. If you have entered a valid number for the hours, the cursor will advance to the minute's digits. The bottom line again gives you additional information on how to enter the minutes. Now enter the desired two digits for the minutes and press [ENTER]. Time keeping begins the instant you press [ENTER]. Time can be accurately set to the second by pressing the [ENTER] key at the instant you desire.

After the GMT time is set, the display will advance to the Set GMT Date display. The MC4181-388 will now begin to send default Time and Zone information to the AE Series World Time Zone Clocks. Then the master clock will continue to Auto Prompt all of the programming modes as data is entered.

ENTERING, REVIEWING OR EDITING GMT TIME AND PROGRAMS

This section will explain how to change or review the existing GMT time, GMT date, and World Time Zone Plans previously stored, or to totally program the unit. If you have exited from the Auto Prompt sequence, it describes how to manually invoke each mode. If you did not exit the Auto Prompt sequence, ignore the first few instructions that explain how to invoke each mode.

ENTERING, REVIEWING OR EDITING GMT TIME [3] [ENTER]

You must be in the GMT Time display before you can enter time. Press the EXIT key to be sure. The display should look similar to the following:

Mon 01:18:00 Gmt
Date: 12/31/2001

Press the TIME key [3]. The display will respond with:

Command? 03
Press ENTER

Press [ENTER]. The display will respond with:

Time? 12:34 GMT
Hrs. (HH), ENTER

MC4181-388 SERIES– TIME ZONE MASTER CLOCKS
REV 12/21/06

It may be showing the correct time or some other incorrect time previously stored. It may even be showing all 0's if you exited the auto prompt sequence.

Be sure to enter GMT time.

The cursor will be flashing in the hour's position. The bottom line will give you additional information on how to enter the data. Enter the desired two-digit number for hours in 24 hour format and press [ENTER]. If the hours are correct simply press [ENTER]. The cursor will move to the minute's position. Do not press [EXIT] part way through editing the time, date or any program steps unless you want to abort the editing. If you exit part way through, any changes made prior to the current position will be ignored. Enter the desired two digits for the minutes and press [ENTER]. Before pressing [ENTER], you may wish to synchronize this master clock to some other reference clock. The instant you press [ENTER], the time keeping will begin. Therefore to synchronize with another reference clock, wait until it is ready to change to the desired time and press [ENTER] at that instant.

ENTERING, REVIEWING OR EDITING THE GMT DATE [D] [ENTER]

You must be in the time display in order to enter the date. Press the DATE key [D]. The display will respond with:

Command? 0D
Press ENTER

Press [ENTER]. The display will respond with:

Date? 12-29-98
Month (MM), ENTER

It may be showing the correct date or some other date stored previously. It may even be showing all 0's if you exited from the auto prompt sequence.

Be sure to enter the GMT date.

The cursor will be flashing in the month's position. The bottom line will give you additional information on how to enter the data. Enter the desired two digit number for the month and press [ENTER]. If the correct two digits are already there, simply press [ENTER]. The cursor will move to the day position. Enter the desired two digits for the day and press [ENTER]. The cursor will move to the year position. Enter the desired two digits for the year and press [ENTER]. The master clock will go back to the time display. To review your entry press the DATE key [D] and [ENTER]. The date display will appear. You can edit the date again if you wish or press [EXIT] to return to the time display. Remember that if you edit any part of the time, date or any program steps, you must not exit. Press [ENTER] until all positions of the display have been edited or you have accepted the default information in each display.

**MC4181-388 SERIES– TIME ZONE MASTER CLOCKS
REV 12/21/06**

ENTERING, REVIEWING OR EDITING THE GMT DAY [4] [ENTER]

Be sure to enter the GMT day.

You must be in the time display. Press the DAY key [4]. The display will respond with:

Command? 04
Press ENTER

Press [ENTER]. The display will respond with:

Day? Sun
DAY key, ENTER

It may be showing the correct day or some other day stored previously. Press the DAY key [4] until the desired day is shown on the display and then press [ENTER]. The display will return to the time display.

ENTERING, REVIEWING OR EDITING THE WORLD TIME ZONES PLANS [7] [ENTER]

For each World Time Zone connected to your system, you will need to program the specific offset from GMT and any seasonal changes required (DST).

For your specific World Time Zones, see the table at the back of this manual.

You must be in the time display. Press the ZONE key [7]. The display will respond with:

Command? 07
Press ENTER

Press [ENTER]. The display will respond with:

Time Zone #01

The Zone numbers correspond to the specific zones of the World Time Zone Clock displays connected to the system. For example: Time Zone #01 corresponds to Zone 1 (address 1) of the World Time Zone Clock display. Up to 15 unique World Time Zones are possible.

The Cursor will be flashing on the 1, indicating that you can select a World Time Zone number. Valid entries are 1 to 15. If Zone #01 is desired, simply press ENTER. The display will respond with:

Zn01 Offset From
GMT = +00.0 Hrs

MC4181-388 SERIES– TIME ZONE MASTER CLOCKS
REV 12/21/06

The cursor will be on the “+” sign, prompting for an Offset from GMT. Refer to the World Time Zone Table at the back of this manual for your specific time zones.

If the desired offset is a “-“ (minus) from GMT, press any key (except ENTER or EXIT) to change the sign from “+” to “-“ and visa versa, then press ENTER. The cursor will move to the 00.0. Enter the desired Hours (two digits) of Offset, the press ENTER. Valid entries are from –12 to +12 Hours, including 00. The cursor will move to the tenths of Hours for the Offset. Valid entries are 0 or .5. Press any key (except ENTER or EXIT) to change the fractional offset from 0 to .5 and visa versa. Then press ENTER.

The display will respond with:

Format = 12 Hour

Press any key (except ENTER or EXIT) to change the Format from 12 Hour to 24 Hour and visa versa. Press ENTER. The display will respond with:

S DST M=00 SUN=L
E DST M=00 SUN=L

The top line is for the Start (S) of DST and the bottom line is for the End (E) of DST. The cursor will be flashing in the month position. Enter the desired two digits for the month you wish the Start of the DST adjustment to be made (03 for current US law) and then press [ENTER]. Enter 00 for the month if there is no DST requirement for this zone. After a valid month is entered, the cursor will advance to the L in the Sunday position. Enter the desired Sunday for this change to occur. Valid entries are 1 to 5 (2 for the second Sunday (current US law), 1 for the first, 3 for the third, 4 for the fourth or 5 (L) for the last Sunday). L is the same as key 5. The change will be made at 02:00 AM on the Sunday you choose.

After the Start (S) DST data is entered, the cursor will advance to the End (E) DST line. If you have entered a Start (S) DST, you must enter an End (E) DST as well. Failure to do so will erase the Start DST and then there will be no DST compensation for this zone.

In the same manner as the Start DST, enter the desired month and Sunday you wish the adjustment to be made. Current US law for Fall DST is the first Sunday in November. Example: enter 11 for the month and 1 for the Sunday. The change will also be made at 02:00 AM on the Sunday you choose.

After pressing [ENTER] the master clock will prompt for the next Zone. Repeat the above procedure to enter the specific data for each World Time Zone. You must completely enter all data for each zone including Offset, Format, and DST to store the zone information. The zone data will not be stored otherwise. After entering the last zone, press EXIT to return to the standard time display.

MC4181-388 SERIES– TIME ZONE MASTER CLOCKS
REV 12/21/06

SPECIAL FUNCTIONS

SETTING THE TIME BASE [3] [0] [ENTER]

Caution: Setting the Time Base incorrectly could produce large time-keeping errors.

The MC4181-388 can be programmed for three different internal time bases. Typically it will be set for 60 Hz Line Synchronization for use where the incoming power is known to have a good 60 Hz power line. It can be programmed for 50 Hz Line Synchronization for use where the incoming power is known to have a good 50 Hz power line. Finally, it can be programmed to use a built-in crystal time base with an accuracy of 0.005%. Crystal time base should only be used for applications where the incoming power does not have a good 50 Hz or 60 Hz power line, or when using the external GPS Timebase.

Press [3] [0] [ENTER]. The display will respond with:

Timebase = 60 Hz Line

Press the [4] key to change “60 Hz Line” to “50 Hz Line”, or to “Crystal”. Once the desired timebase is displayed, press [ENTER] to select.

FORCING A RESTART [7] [7] [ENTER]

For training purposes you can do a cold start. Press [7] [7] [ENTER]. The display will show the UNIT POWER FAIL message.

When the “Unit Power Fail” screen is displayed, the MC4181-388 will send an “Err” message to all the remote world time zone clocks on the system, indicating that the master clock needs to be programmed. This message will be cleared when time is reset. Then time will be sent at the next minute update.

ZONE / ADDRESS TEST [9] [7] [ENTER]

This feature is useful to determine the specific zone number of each remote World Time Zone Clock display.

To test the zones (addresses) of the World Time Zone Clocks connected to your master clock press [9] [7] [ENTER]. The World Time Zone Clocks will display their respective zones (addresses). Press [9] [7] [ENTER] again to terminate the Zone/Address Test. World Time Zone times will reappear after approximately one minute (at the next time update from the MC4181-388). There will be no indication on the MC4181-388 display, only on the remote World Time Zone Clock displays.

SOFTWARE VERSION [9] [9] [ENTER]

To check the version of the software installed in your master clock press [9] [9] [ENTER]. The display will read:

TZ41 Master Clk. Version 2.XX

After 5 seconds the display will return to the time display.

MC4181-388 SERIES– TIME ZONE MASTER CLOCKS
REV 12/21/06

PROGRAMMING SUMMARY

Read the sections on Programming Instructions before using the PROGRAMMING SUMMARY.

SETTING THE TIME BASE - Press [3] [0] [ENTER]. Press any key, key [4] is best, until the desired time base appears on the display. Press [ENTER].

SET TIME - Press TIME [3] key then [ENTER]. Enter GMT Time in 24-Hour Format. Enter the hours, press [ENTER]. Enter the minutes, press [ENTER]. Timing begins the instant you press [ENTER] after entering the minutes.

SET DATE - Press DATE [D] key then [ENTER]. Enter month, press [ENTER]. Enter day, press [ENTER]. Enter year, press [ENTER].

SET DAY - Press the DAY [4] key then [ENTER]. Press the DAY [4] key until desired day is displayed, then press [ENTER].

PROGRAMMING THE WORLD TIME ZONE PLANS - Press ZONE [7] key then [ENTER].

Enter the desired Zone (1 to 15) to program, press ENTER.

Select "+" or "-" (using any key except ENTER or EXIT) for the sign of the Offset, then press ENTER.

Enter the desired Hours of Offset from GMT (-12 to +12, or 00), then press ENTER. Enter the desired tenths of Hours of Offset from GMT (0 or .5), then press ENTER.

Select 12 or 24 Hour Format (using any key except ENTER or EXIT), then press ENTER.

Enter 00 for the month if no DST adjustments are required for this Zone. Otherwise, enter the month for Start (S) DST, press [ENTER]. Enter the desired Sunday for the Start (S) DST, press [ENTER]. Enter month for End (E) DST, press [ENTER]. Enter the desired Sunday for End (E) DST, press [ENTER].

Repeat this procedure for each Zone required. See the World Time Zones table at the back of this manual for more information.

RS232 I/O INTERFACE

The RS232 Interface provides the time output signals for all the World Time Zone Clock displays connected to the system.

All remote World Time Zone Clock displays must be set with an address from 1 to 15 (usually done at the factory).

The RS232 output can drive up to 50 AE Series Large Displays at a distance up to 2000 feet away (each display requires local power). For additional displays and additional distance, AE-455DR6 RS232 Drivers can be added to the system.

MC4181-388 SERIES– TIME ZONE MASTER CLOCKS
REV 12/21/06

OPTIONAL GPS ANTENNA/RECEIVER

The Optional GPS Antenna/Receiver (GPS-427A) provides accurate tracking of GMT time and date from the GPS satellites (tracks the Atomic Clock).

INSTALLATION

The GPS-427A Antenna/Receiver must be mounted with a clear, 120 degree view of the sky. See the GPS-427A manual for more details.

The GPS-427A Antenna/Receiver connects to three clearly marked terminals located on the back panel of the MC4181-388 (located on the inside panel of the MC4181N-388). See the system wiring diagram at the back of this manual for more detail.

OPERATION

When the GPS-427A Antenna/Receiver is used with the MC4181-388 Master Clock, accurate time signals are automatically monitored, and adjustments are made to the Master Clock. No operator adjustments or inputs are required.

GPS LOCKED ON INDICATION

After accurate GPS time has been acquired and set, the MC4181-388 will indicate a “GPS Locked On” condition by changing the “Gmt” to a “GMT” (all capital letters) on the main time display.

WORLD TIME ZONE RECORD SHEET

LOCATION _____

DATE _____

ZONE #	ZONE NAME	GMT OFFSET	DST	
			START DATE M = SUN =	END DATE M = SUN =
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				

****** SPECIAL FUNCTIONS ******

- 07 ZONE - ENTER WORLD TIME ZONE PLAN
- 30 SELECT TIME BASE
- 77 COLD BOOT (RESTART)
- 97 ZONE/ADDRESS TEST
- 99 DISPLAY VERSION

TECHNICAL SUPPORT

For any questions concerning installation and operation of this product, contact our factory at:

**PHONE (800) 444-7161
OR
FAX (318) 797-4864**

SERVICE POLICY

It is recommended that all service for this product be done by the factory or by a factory authorized service representative. Applied Technical Systems will provide ongoing service support in and out of warranty. Send your repairs to:

**APPLIED TECHNICAL SYSTEMS
849 KING PLACE
SHREVEPORT, LA 71115**

**APPLIED TECHNICAL SYSTEMS
WARRANTY POLICY**

ATS warrants its products to be free of defects in material and workmanship for a period of 24 months from the date of purchase. ATS will repair or replace any product returned to its authorized factory service center within the warranty period so long as there is no evidence that the product has been abused, misused, damaged by lightning, overloads of any kind or water, or altered in any way.

Products returned for warranty must be returned with freight prepaid. ATS will pay normal freight charges to return the product to the customer. Special premium freight requested by the customer will be charged to the customer.

ATS disclaims any warranties expressed or implied, including merchantability and/or fitness for a particular purpose. In no event shall ATS be held liable for incidental or consequential damages.