

# MC22LV SERIES MASTER CLOCKS



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### PROGRAMMING SUMMARY

The MC22LV is a two-circuit master clock. This manual will use the "MC22LV" and the "Master Clock" interchangeably.

## **1.0 INTRODUCTION**

The MC22LV is a two circuit, calendar programmable solid state master clock. It is used for switching low voltage electric circuits according to a preset time and date program. The MC22LV's AUTO PROMPTING, alphanumeric display makes programming fast and simple. The output relays can be used to ring bells, to control audio/visual equipment or to control lighting, heating, ventilating, air conditioning and security systems with a variety of programming capabilities, ranging from a simple 7 day plan to a more complex plan utilizing its powerful, alternate annual programming features. Each has a compact wall mount enclosure. Selected outputs can be independently programmed for momentary operation such as required for ringing bells in schools, churches or industrial facilities.

Limited options are available for the MC22LV master clocks.

## **2.0 SPECIFICATIONS**

### **PROGRAMMING CAPABILITIES**

*Auto Prompting Display* - Provides display information to guide the operator during programming. From a restart it will take the operator from setting time clear through setting the basic program steps.

*200 Powerful Program Steps* - The MC22LV has a default set up of 1 Basic 7 day plan and 9 Alternate 7 day plans that can be scheduled on an annual basis, or keyboard selected for the current day. The default setup provides for a total of 10 plans, each having 20 program steps. If more than 20-program steps are needed, the program size can be increased using a keyboard-entered function. Up to 100 steps per plan can be programmed for a total of 2 plans. 50 steps per plan would provide a total of 4 plans. Each step can be programmed for both or any combination of the output relays for a specific day of the week, or for all 5 weekdays, or for both weekend days, or for everyday of the week. In addition, steps can be programmed in customized groups such as, Monday, Wednesday, and Friday only.

*20 Annual Plans* - Each annual plan has a starting and ending date, and an associated Alternate Plan. This feature can be used to schedule any 1 of the 1 to 9 alternate, 7 day plans to be used by the MC22LV. Certain annual plans can be programmed to repeat on a yearly basis so that they don't have to be reprogrammed each year.

*Sleep Mode* – Entering Sleep Mode suspends program operation (all program steps are ignored). Leaving Sleep Mode, the program resumes at the next scheduled program step.

*Programmable Daylight Savings Time Adjustment* - The MC22LV can be programmed to automatically adjust its time for Daylight savings time changes according to U. S. law, even if the law changes.

*Automatic Leap Year Compensation.*

*Manual Override* - The output relays can be manually energized or de-energized from the keyboard. The word “Manual” replaces the word “Relays” in the time display until the next program step occurs.

*Pulsed Output* – Relays 1 and 2 can be programmed individually or as a group to operate as momentary contacts, programmable from 1 to 9 seconds.

*I/O Port* – An RS232 I/O port provides an interface for connecting to a computer, or to other ATS devices such as: Digital Clocks, GPS Systems, Ethernet Interface, and other compatible serial data products. The RS232 I/O port is provided on the front panel with a DB9 female connector, and on the terminal blocks inside the enclosure.

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### ELECTRICAL

**Power:** Standard power required is from 20 VAC to 28 VAC, 60 HZ at 8 VA maximum. A Power Module is provided with 120 VAC input to 24 VAC 500mA output. An optional larger 1.66 Amp Power Module is available for powering some add-on accessories. Contact the factory for details.

**Outputs:** MC22LV - Two relays (SPDT) rated at 15A, 48 VAC or 24 VDC resistive.

**RS232 I/O:** For connecting to a computer, or to other ATS devices such as: Digital Clocks, GPS Systems, Ethernet Interface, and other compatible serial data products.

**Wiring:** A clearly labeled terminal block is provided inside the MC22LV.

### POWER FAIL BACKUP

Non-Volatile Memory keeps time and programs for indefinite power outages. All outputs and the display are disabled during backup. The MC22LV resumes normal operation when power returns. If the master clock has been without power for more than 48 hours a "Unit Power Fail" message will appear when power is restored. Times and program will be intact, however pressing the [3] key will begin the AUTO PROMPT sequence. Check time, date, day, etc. to insure accuracy, then press the [EXIT].

### ACCURACY

*Time Keeping* - Synchronous with the AC power line. During a power failure, or when crystal time base is selected, timekeeping is crystal controlled with an accuracy of +/- 4 PPM throughout its full temperature range.

*Programmed Events* - On/Off events are programmable with a one-minute resolution and occur at the zero second of that minute.

Operating Temperature Range - 0 to 50 degrees C

### PHYSICAL

MC22LV: Black, painted aluminum enclosure - 4.8"W X 8"H X 1.8"D.

Mounting holes are provided in the enclosures for easy installation.

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**FRONT PANEL DESCRIPTION**

ALPHANUMERIC DISPLAY - Used for displaying time, day, date, and output status, and for displaying information during programming or reviewing stored programs. In the normal mode of operation, the display will be in the TIME DISPLAY, showing the day, time, and which relays are activated.

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.

AM ON KEY [1] - Used for setting the time to AM when in the TIME SET or PROGRAMMING MODES and for entering the MANUAL CONTROL MODE.

PM KEY [2] - Used for setting the time to PM when in the TIME SET or PROGRAMMING MODES.

TIME KEY [3] - Used for entering the TIME SET MODE.

ANNUAL KEY [A] - Used for entering the ANNUAL PROGRAMMING MODE and for stepping through the stored ANNUAL PLAN for review. The ANNUAL PLAN contains the schedule for the alternate BASIC PLANS in calendar schedule form.

BASIC KEY [B] - Used for entering the BASIC PLAN - PROGRAMMING MODE and for stepping through the stored BASIC PLANS for review. The BASIC PLANS contain the daily timed events instructions.

CLEAR KEY [C] - Used for clearing the ANNUAL PLAN and/or BASIC PLANS.

DATE KEY [D] - Used for entering the SET DATE MODE for entering date or reviewing the date.

EXIT KEY [#] - Used for exiting any of the SET TIME, SET DATE or PROGRAM MODES.

OFF KEY [0] - Used for setting the pulse to OFF when in the PULSE PROGRAMMING MODE.

ENTER KEY [\*] - Used for entering all commands or for stepping through any SET TIME, SET DATE or PROGRAM data entry.

DST KEY [7] - Used for entering the SET DAYLIGHT SAVINGS TIME PROGRAM MODE.

DAY KEY [4] - Used for setting the day in the SET DAY and PROGRAM MODES. Also used for entering the SET DAY MODE.

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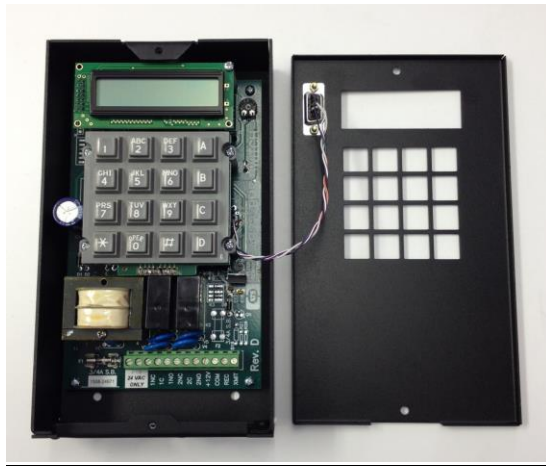
### 3.0 INSTALLATION

#### MC22LV SERIES

The MC22LV should be securely mounted to a suitable mounting panel or surface according to any local codes using the mounting holes provided. Be sure the equipment is properly grounded to the panel or the facilities ground connection.

#### **ELECTRICAL CONNECTIONS**

All wiring connections are made at the clearly marked terminal block located on the inside of the MC22LV enclosure, Remove the top cover of the MC22LV to gain access to the terminal block.



MC22LV shown with the top cover removed.



Standard Power Module

A 120 VAC to 24 VAC Power Module is provided. Connects to the MC22LV Terminals labeled 24 VAC ONLY.

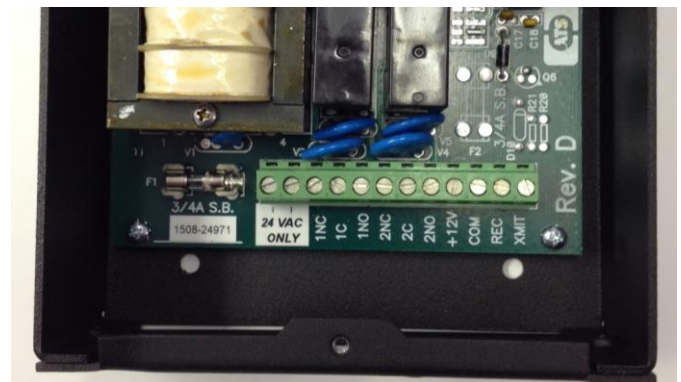


Optional Larger Power Module

An optional, larger Power Module is available for powering accessories.

The 0900-7084 provides 24 VAC at 1.67 Amps.

This Power Module is standard on the MC22-BH and MC22-BP Series products



Terminal Block Detail

Clearly labeled terminal block is provided for all field wiring.

## **OPTIONS**

There are a variety of options available for the MC22LV. For details on the installation and operation of the installed option, refer to the Addenda for those options at the back of this manual.

## **4.0 GETTING STARTED**

### **4.1 THE AUTO PROMPT DISPLAY**

The master clock has 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 restart (from a “power fail” condition) the master clock will advance through a sequence of all the necessary settings including the Basic Plans. You may exit this sequence if desired and enter the program manually from the time display, using the specific commands. Entering a program from the Auto Prompt sequence is identical to entering one manually.

### **4.2 THE CURSOR, ENTERING DATA**

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. 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 and shifts left with each entry.

### **4.3 APPLYING POWER, ENTERING THE TIME**

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:

MC22 Master Clk.  
Version 4.XX

After a few seconds the first Auto Prompt message will appear. If the following message does not appear, read section 7.6 FORCING A RESTART.

UNIT POWER FAIL  
Press “3” key

Simply press key [3]. The display will prompt with the set time display.

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



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It may be showing the correct time, some other time, or all “0’s”.

From this point forward you can exit the Auto Prompt sequence at any time, if desired, by pressing [EXIT]. However, the programming is simplified by staying in the Auto Prompt mode. On a restart all program memory is cleared in the master clock. The cursor will be flashing in the hour’s digits. The bottom line is a prompt to enter 2 digits (HH) for hours. Enter the hours then press the [ENTER] key. Two digits are required for the hours. Example: 01 instead of 1. The cursor will remain flashing in the hour’s digits if an invalid number is entered for the hours. Enter the correct hours. Once a valid number is entered for the hours, the cursor will advance to the minute’s digits. Again, the bottom line is a prompt for entering the minutes. Type two digits for the minutes and press [ENTER]. The cursor will advance to the AM position. Press the AM or PM key then 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 desired instant.

#### **4.4 ENTERING THE DATE**

The next step in the AUTO-PROMPT sequence is entering the date. The display will show:

Date? 12-29-15 Month (MM), ENTER
-------------------------------------

It may be showing the correct date, some other date, or all “0’s”.

The cursor will be flashing in the month's position. The bottom line will give you additional information on how to enter the data. Type the 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. Type the two digits for the day and press [ENTER]. The cursor will move to the year position. Type the two digits for the year and press [ENTER].

#### **4.5 ENTERING THE DAY**

Next, we enter the day of the week. The display will show:

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].

#### **4.6 DAYLIGHT SAVINGS TIME**

The default entries for daylight savings time according to current U.S. law will display as follows:

S DST M=03 SUN=2 F DST M=11 SUN=1
--------------------------------------

**The master clock is pre-loaded with the current daylight savings time settings according to U.S. law. Unless the law changes or you live in an area that does not follow standard U.S. daylight savings time there is no need to change anything on the DST screen.** The top line

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is for the Spring DST and the bottom line is for the Fall DST. The S indicates the Spring DST and the F indicates the Fall DST. The cursor will be flashing in the month position. Enter the two digits for the month in which you wish the Spring DST adjustment to be made (03 for current US law), then press [ENTER]. The valid Spring months are 00, 03, 04, and 05. Enter 00 for the month if you do not wish to use the automatic DST feature and the master clock will advance to the next Auto Prompt display. After a valid month is entered, the cursor will advance to the L in the Sunday position. Enter a 2 for the second Sunday (current US law), 2 for the second, 3 for the third, 4 for the fourth or L for the last Sunday. Use the [5] key to enter the L. The change will be made at 02:00 AM on the Sunday you choose.

After the Spring DST data is entered, the cursor will advance to the Fall DST line. If you have entered a Spring DST, you must enter a Fall DST as well. Failure to do so will erase the Spring DST and then there will be no DST compensation.

Fall DST is entered in the same manner as the Spring DST. Current US law for Fall DST is the first Sunday in November. Enter 11 for the month and 1 for the Sunday. The valid months for the Fall DST are 09, 10, and 11. The valid Sundays for the Fall DST are 1, 2, 3, 4 and L. Use the [5] key to enter the L. The change will be made at 02:00 AM on the Sunday you choose.

#### **4.7 ENTERING PULSE (MOMENTARY OUTPUT) FOR RELAYS 1 and 2**

The pulse for each relay is preset to 5 seconds for momentary ON/OFF events such as ringing school bells, or factory break buzzers. It can be changed as desired for up to 9 seconds duration. A second momentary output of a different duration may be required for late bells or warning bells.

R1 Pulse= 5 Sec R2 Pulse= 5 Sec
------------------------------------

The cursor will be flashing on the "5" for Relay 1. Enter the duration for Relay 1 from 0 to 9 seconds, Press [ENTER]. 0 = Pulse OFF. The cursor will then be flashing on the "5" for Relay 2. Enter the duration for Relay 2 from 0 to 9 seconds, Press [ENTER]. 0 = Pulse OFF.

For applications requiring steady ON and OFF events, the pulse can be set to OFF for either or both relays as shown below. **If a relay is turned ON with a PULSE SETTING = to OFF, the relay will stay ON until programmed to turn OFF again with another program step.**

R1 Pulse= OFF R2 Pulse= OFF
--------------------------------

R1 Pulse= OFF R2 Pulse= 5 Sec
----------------------------------

The master clock will advance to the next Auto Prompt display.

## **4.8 BASIC PLAN**

The next step of the AUTO-PROMPT sequence is basic plan programming. Refer to Chapter 6.0 PROGRAMMING for details on entering your basic plan.

**Note:** Setting Annuals is not included in the auto prompt sequence. See ENTERING, REVIEWING OR EDITING THE ANNUAL PROGRAM(Section 6.3).

## **5.0 OPERATION**

This section will explain how to change or review the existing time, date or programs previously stored, how or how to totally program the unit after exiting the AUTO-PROMPT sequence. It describes how to manually invoke each mode from the command line. You must be in the time display before you can enter a command. Press the [EXIT] key to be sure. The display should look similar to the following:

```
Mon 01:18:00 PM
Relays: - -
```

### **5.1 EDITING TIME [3] [ENTER]**

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

```
Command? 03
Press ENTER
```

Press [ENTER]. The display will respond with:

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

Now you may enter the time as you would during the AUTO-PROMPT sequence. (see Section 4.3 APPLYING POWER, ENTERING THE TIME)

### **5.2 REVIEWING OR EDITING THE 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? 12-29-15
Month (MM), ENTER
```

Enter the date as described in Section 4.4 ENTERING THE DATE.

### **5.3 EDITING THE DAY [4] [ENTER]**

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
```

The day of the week may now be entered in the same manner as in the AUTO-PROMPT sequence. (Section 4.5)

### **5.4 REVIEWING OR EDITING DAYLIGHT SAVINGS TIME [7] [ENTER]**

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

```
Command? 07  
Press ENTER
```

Press [ENTER]. If daylight savings time not previously set, the display will respond with the default entries for the current U.S. law as follows:

```
S DST M=03 SUN=2  
F DST M=11 SUN=1
```

You may now enter the new daylight savings time settings as outlined in Section 4.6.

### **5.5 REVIEWING OR EDITING THE RELAY PULSE (MOMENTARY OUTPUTS)**

#### **FOR RELAYS 1 and 2 [5] [ENTER]**

The pulse is for applications in which only a momentary contact is required (i.e. ringing bells). See Section 4.7 for more information on pulse settings. Start from the time display. Press key [5]. The display will respond with:

```
Command? 05  
Press [ENTER].
```

Press [ENTER]. The display will respond with:

```
R1 Pulse= 5 Sec  
R2 Pulse= 5 Sec
```

The pulse settings for relays 1 and 2 may now be set as outlined in Section 4.7. 0 = Pulse OFF

Once you have entered the relay pulse settings the master clock will return to the time display.

## **5.6 REVIEWING OR EDITING THE BASIC PLAN PROGRAM [B] [ENTER]**

If the basic program was not entered during the restart Auto Prompt sequence, it can be entered by entering the basic program mode. This mode allows the operator to program the daily timed events. Before entering your program be sure to write it out on a program record sheet. Copies of the program record sheet are located at the back of this manual. You may need to change the size of your basic program if it requires more than 20 steps. See SETTING THE MAXIMUM NUMBER OF STEPS PER PLAN (Section 7.3) for more detail.

Press BASIC [B]. The display will respond with:

Command? 0B Press ENTER
----------------------------

The master clock will now advance to the programming sequence.

At this point you can press the [B] key repeatedly to review all stored program steps.

## **6.0 PROGRAMMING**

### **6.1 ENTERING THE BASIC PLAN PROGRAM**

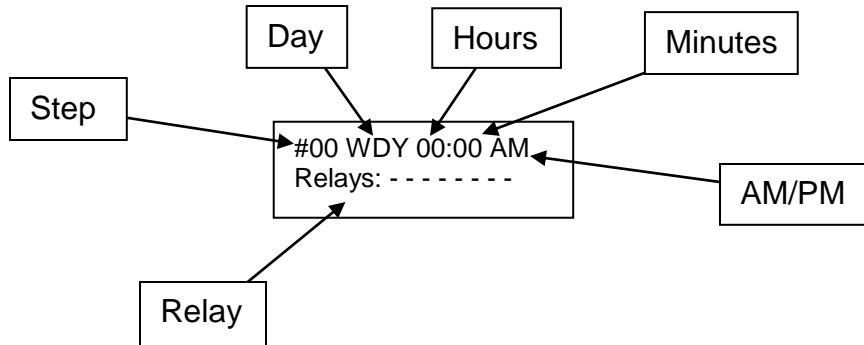
Before you begin programming your MC22LV you should complete the MC SERIES PROGRAM RECORD SHEET included at the back of this manual. Be sure to enter pulse lengths if required for all relays (Sections 5.5, 5.6). You may need to change the size of your basic program. See Section 6.3 for more detail.

See Section 5.8 for information on starting the programming sequence. The display should be showing:

BASIC Plan #0 Step #00
---------------------------

The cursor will be flashing on the zero for Plan #0. Plan #0 is the first of up to 10 Basic Plans, each of which contains a 7-day plan. **Plan #0 is the main 7 day plan and plans 1 through 9 are alternate 7 day plans.** Alternate plans can be scheduled on an annual basis (more on this in ENTERING, REVIEWING OR EDITING THE ANNUAL PROGRAM Section 6.3). Press [ENTER] to select plan #0. The cursor moves to the Step #00 position. Step #00 is the first step of 20 steps in plan #0 by default (Section 7.3). Press [ENTER] to select step #00 and the display will read as follows:

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The cursor will be flashing on the W of WDY (weekday).

**Step #** - The #00 indicates that this is step 00 being displayed.

**Day** - Program steps may be programmed for individual days, such as Mon or Tue, or for groups of days such as WDY for weekdays. See below for the step abbreviations, and what they mean. “Special Weeks” (Wk0 thru Wk9) can be created for your specific needs. For example, a Mon, Wed, Fri week. See **ADVANCED PROGRAMMING** (Section 7.1) for more details. Press the DAY [4] key to advance to the chosen day or group of days. The display will update as you press the DAY[4] key. Once the preferred day or group is displayed, press [ENTER]. The display will advance to the hour’s position.

**STEP DAY**

**MEANS...**

EDY	step occurs everyday
WDY	step occurs every weekday
WND	step occurs every weekend day
MON	step occurs every monday
TUE	step occurs every tuesday
WED	step occurs every wednesday
THU	step occurs every thursday
FRI	step occurs every friday
SAT	step occurs every saturday
SUN	step occurs every sunday
WK0-WK9	step occurs on days designated by custom week (see Section 8.1)

**Hours** - Enter the two digit hour at which this step is to be activated and press [ENTER]. The display will advance to the minute’s position.

**Minutes** - Enter two digits for the minutes and press [ENTER]. The display will advance to the AM/PM position.

**AM/PM** - Press the [AM] [1] or [PM] [2] key, then [ENTER]. The display will advance to the first position after the word RELAY.

**Relays** - Enter the number of the relays you wish to be energized by this program step. If a step is entered and a relay that is already energized should stay energized until the next step, it is necessary to enter the relay number again for this step. The relay settings show the state of the relays at the programmed time of the step. The relay numbers will appear on the bottom line as you press the appropriate number. Pressing the same number again will remove the relay number from the bottom line. Once the relays are set, press [ENTER]. The first step (00) is programmed. The following display shows an example of all relays being activated on Weekdays at 10:00 AM.

```
#00 WDY 10:00 AM
Relays: 1 2
```

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The Auto Prompt display will advance to the next step (01).

#01 WDY 00:00 AM  
Relays: - -

Subsequent steps are entered the same way as the first. Continue until the last step of Basic Plan #0 is entered. Step 19 (the 20th step) is the last step if you are using the default setting of 20 steps per plan. After entering the last step, the master clock will advance to Basic Plan #1:

BASIC Plan #1  
Step # 00

The master clock is now prompting you to enter the first of up to 9 alternate plans, plan #1. Plans 1 through 9 are entered the same as plan 0. If you are not using alternate plans 1 through 9, or if you have just entered your last alternate plan, press [EXIT]. The master clock will return to the time display.

## **6.2 CLEARING A PROGRAM STEP**

To clear a program step, press BASIC [B], then [ENTER].

BASIC Plan #0  
Step # 00

The display will prompt you for a plan #(cursor on 0). Choose the basic plan in which the step to be cleared is located, then press [ENTER].

The display will then prompt for a step #(cursor on 00). Choose the # of the step to be cleared, then press [ENTER]. The chosen step and its program contents will be displayed.

The cursor will be on the first letter of the day of the week. Press [ENTER]. The cursor will go to the hour's position. Enter 00 for the hours. This will clear this specific step. Press [ENTER]. The display will advance to the next step. If you are finished, press [EXIT]. The display will read:

BASIC Plan #1  
Step # 00

Choose another plan to edit or press [EXIT] again to return to the time display.

If you wish to erase all the program steps see CLEARING THE ANNUAL AND BASIC PROGRAMS (Section 6.5).

## **6.3 ENTERING, REVIEWING OR EDITING THE ANNUAL PROGRAM** **[A] [ENTER]**

The annual program allows the master clock to be programmed to select any 1 of up to 9 alternate plans. This feature is useful for applications that require a different 7-day plan at

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different times in the future. There are 20 Annual Program Plans, each of which has a starting and ending date, and an associated, alternate plan. The selected alternate plan will begin at 12:00 AM on the start date and will end at 11:59:59 PM on the day of the end date. Basic Plan 0 takes over at the end of any Alternate Plan. To enter the annual program mode, press the ANNUAL [A] key. The display will respond with:

Command? 0A  
Press ENTER

Press [ENTER]. The display will respond with:

ANNUAL #00  
BASIC #1

The cursor will be prompting for an Annual Plan number. #00 is the first Annual Plan. Press [ENTER]. The cursor will then prompt for the Basic Plan to select with this Annual. Enter the Basic Plan number, then press [ENTER]. The display will read:

Start? 00-00-00  
End? 00-00-00

There may be a date already in the start date from a previous program. It is not necessary to erase this old date. Simply enter new data in each field. To erase an annual plan see CLEARING AN ANNUAL PLAN (Section 6.4). The cursor will be flashing in the month's position. Type the two digits for the month at which this Annual Plan will start and press [ENTER]. The display will advance to the day's position. Type the two digits for the day and press [ENTER]. The display will advance to the years position. Type the two digits for the year and press [ENTER] or enter [XX] to repeat the Annual program each year. See the ANNUAL REPEAT PROGRAMS instructions in ADVANCED PROGRAMMING (Section 8.2) for details. The cursor will advance to the end date line. Enter the end date in the same manner as the start date. If your Annual Plan is only for one day, do not enter an end date. Just press [ENTER] to put "00" in the months and the display will advance to the next Annual Plan.

ANNUAL #01  
BASIC #1

Repeat the same procedure for Annual 01 as you did for Annual 00, or press [EXIT] to return to the time display.

## **6.4 CLEARING AN ANNUAL PLAN**

To clear an Annual Plan, press the ANNUAL [A] key, then [ENTER]. The display will respond with:

ANNUAL #00  
BASIC #1

Enter the Annual Plan number to be cleared and press [ENTER] twice. The display will show the contents of that Annual Plan.

Start? 12-19-15  
End? 01-01-16



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Enter 00 for the Start month and press [ENTER]. The plan will be cleared. There is no need to clear the end date once the start date has been cleared. If you are programming the clock from a restart, the annual and basic program steps will be cleared already.

**6.5 CLEARING THE ANNUAL AND BASIC PROGRAMS [C] [ENTER]**

If you are re-programming a previously programmed clock you will need to erase any previous programs as they could conflict with your new program. To clear all program steps, press the CLEAR [C] key. The display will respond with:

Command? 0C  
Press ENTER

Press [ENTER]. The display will respond with:

Clear buffers:  
A=ANNUAL B=BASIC

To clear the Annual program, press [A]. The display will return to the time display. To clear the Basic program instead, press [B].

Press 0-9 or "A"  
for all sets

Choose a Basic Plan number to clear or press [A] to clear all Basic Plans.

If you wish to clear both the annual and basic programs, repeat the process a second time. Only one can be cleared at a time.

**7.0 SPECIAL FUNCTIONS**

**7.1 MANUAL OPERATION OF THE OUTPUT RELAYS [1] [ENTER]**

**WARNING!! Manually controlling the relays will affect the loads connected to the Master Clock. Operating these loads at the wrong time may cause damage, injury or disruption of activities. Be aware of what is being operated by the relays and let others know that this is about to take place.**

To manually control the output relays from the keyboard, press the MANUAL [1] key. The display will respond with:

Command? 01  
Press ENTER

Press [ENTER]. The display will respond with:

Manual Control  
Relays: - -

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Key in the number(s) of the relay(s) that you would like to manually control. The numbers of the relays chosen will be seen on the bottom line of the display. To remove a relay from the bottom line, press its number again.

Manual Control  
Relays: 12

After selecting the relays, press [ENTER]. The output relays chosen will be energized and the Master Clock will return to the time display. The relays will remain on for the duration of their respective pulse length, or until the next program step instructs them to turn off, or until they are manually operated again.

**7.2 MANUAL SELECTION OF ALTERNATE PLANS [2] [1] [ENTER]**

Alternate Plans can be selected from the keyboard in addition to being selected by the ANNUAL PROGRAM.

To select an Alternate Plan type [2] [1] [ENTER]. The display will respond with:

Select  
New Basic: 0

Enter the desired Basic Plan number, then press [ENTER]. The master clock will now run the Basic Plan you have selected. The master clock will automatically go back to Basic Plan 0 after 12:00 AM. Also, if any of the following changes are made, the master clock will return to Basic Plan 0:

- Entering a new time.
- A power failure of any duration.
- Entering a new date.
- Modifying the Annual programs.
- Clearing the Annual programs.

Use special function 90 (See STATUS Section 7.5) to verify which plan is running.

**7.3 SETTING THE MAXIMUM NUMBER OF STEPS PER PLAN [3] [1] [ENTER]**

The master clock has a default setup of 10 Basic Plans with 20 Program Steps each for a total of 200 steps. These plans are numbered Plan 0 through Plan 9. Plan 0 is the main Plan that will repeat itself every 7 days. Plans 1 through 9 are Alternate Plans that can be scheduled by the Annual Program, or they can be called up manually using the MANUAL SELECTION function as described above.

The master clock can be reconfigured to allow more than 20 Steps per Plan. Special function Command 31 is used to adjust the number of Steps per Plan from 20 to 100. The number of Alternate Plans will automatically be adjusted to fit the maximum number of 200 Steps available. **Changing the maximum number of Steps per Plan should be done prior to entering your program.**

To set the number of Steps type [3] [1] [ENTER]. The display will read:

Max. Step No: 19  
(0-99), ENTER

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The cursor will be flashing on the maximum Step number. Since all Step numbers begin with 0, a maximum number of 19 represents 20 Steps. Refer to the chart below to determine your Max. Step No

# Steps	# Alternate Plans	Max. Step No.
1-20	9	19 (default)
21-25	7	24
26-28	6	27
29-33	5	24
34-40	4	39
41-50	3	49
51-66	2	65
67-100	1	99

If your application requires 26 steps, enter 27 as the Max. Step No.

Press [ENTER]. The display will respond as follows:

Max. Buffer No.  
= 6 (Press EXIT)

Since the Basic Plans begin with Plan 0, this means there are a total of 7 Plans available. Each will have 28 Steps. To go back to the time display, press [EXIT].

**7.4 ENTER SLEEP MODE [4] [5] [ENTER]**

Sleep Mode is useful for suspending “Break Signals” during student testing, Summer school, meetings, and other special events.

Sleep Mode can be selected from the keyboard. Press [4] [5] [ENTER] . The display will show:

Sleep Mode  
(Command 45)

To exit the Sleep Mode, press [4] [5] [ENTER] again. The MC22LV will resume normal operation.

During “Sleep Mode” the MC22LV ignores all Basic Plan programs (relay outputs are stopped). This does not affect any stored Basic Plans or Annual Plans.

**7.5 STATUS [9] [0] [ENTER]**

The master clock has a status check capability. Press [9] [0] [ENTER]. The display will show:

Unit Status: T=N  
B=0 A=XX MD=12H

“T” status is for factory use only. It should always be "N". “B” status indicates which Basic Plan is in effect. “A” status indicates which Annual Plan is in effect. “XX” indicates no Annual Plan in use at this time. “MD” status indicates whether the MC22LV is transmitting 12 or 24 Hour time.

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**7.6 FORCING A RESTART [7] [7] [ENTER]**

For training purposes or clearing all programming information from the master clock, a restart is recommended. Press [7] [7] [ENTER]. The display will show the UNIT POWER FAIL message.

UNIT POWER FAIL  
Press "3" key

**7.7 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:

MC22 Master Clk.  
Version 4.XX

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

**7.8 SELECTING THE TIME BASE [3] [0] [ENTER]**

The default Time Base setting for the MC4181LV is for 60 HZ AC line synchronization. This is the preferred setting for installations in North America and other countries where 60 HZ power is available.

For countries where 50 HZ AC power is available, the MC22LV can be set to synchronize with the 50 HZ AC power line.

For areas where the AC line frequency is not accurate, or in applications where an AC generator is used for power, the MC22LV can be set for an internal crystal time base.

To check or change the timebase setting for the MC22LV master clock press [3] [0] [ENTER]. The display will read:

Timebase=  
60Hz Line

The cursor will be on the 6. If this is correct for your application press [EXIT].

To select a different time base, do not press [EXIT]. Instead, press any key while the cursor is on the 6 and the display will advance to the next time base selection. Other selections are:

Timebase=  
50Hz Line

Timebase=  
Crystal

Once the desired time base is shown on the display, press [ENTER].

## 8.0 ADVANCED PROGRAMMING

### 8.1 CUSTOM WEEKS (Wk0 – Wk9) [2] [2] [ENTER]

Up to ten custom weeks can be user defined for the master clock. This is useful for applications that require the same events on various groups of days of the week. For example: custom week Wk0 could be defined for Mondays, Wednesdays, and Fridays.

To define Wk0 through Wk9 press [2] [2] [ENTER]

Set Days for Wk0  
Days: -M-W-F-

The numbers 1 through 7 correspond to the days of the week. Press [1] for Sunday, [2] for Monday, etc. Press [A] to enter and advance to the next custom week. Press [EXIT] to return to the time display.

To review the custom weeks, press [2] [2] [ENTER], then [A] to cycle through Wk0 to Wk9. Press [EXIT] to return to the time display.

To create Basic Plan Steps with this feature, use the same procedure as entering standard Basic Plan Steps. (See ENTERING BASIC PLAN PROGRAM Section 6.1) When prompted for the Day or days of the week for a given Step the custom weeks will appear as choices along with the standard Days.

00 Wk0 08:30 AM  
Relays: 1 2

### 8.2 ANNUAL REPEAT PROGRAMS

Some Annual Plan programs may have the same Start and End dates every year, such as Christmas, July 4<sup>th</sup>, and New Years Day. Instead of creating multiple Annual Programs for each year, special Annual Programs can be created to cover every year into the future.

To create these special Annual Plan programs, use the same procedure as entering standard Annual Plans. (See ENTERING, REVIEWING OR EDITING THE ANNUAL PROGRAM Section 6.3) When prompted for the year (YY) for the Start and End dates, press the “A” key instead of entering two digits for the year. Pressing the “A” key will insert XX for the year. For example, the following Annual Plan Program will begin December 19<sup>th</sup> and end January 1<sup>st</sup> every year:

Start 12-19-XX  
End 01-01-XX

### 8.3 RS232 I/O INTERFACE

An RS232 interface is provided for communicating with the MC22LV. With this interface, complete master clock programs can be uploaded or downloaded using the MC Programming Software (free download available at [http://www.ats-usa.com/software/mcp\\_106.zip](http://www.ats-usa.com/software/mcp_106.zip) or from the ATS Software CD).

The MC22LV can synchronize with other MC22LVs and MC4181 Series Master Clocks. The MC22LV can be used to update ATS AE, AN, ANC, and CC Series Displays. The Time, Date,

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and Day of the Week of the MC22LV can synchronize to the GPS system's atomic clock via an AE Series GPS Master Clock, or GPS-TR3 Master Clock Interface. Time, Date, and Day of the Week of a Master Clock can also be synchronized with computers using PCMCSet Software (free download available at <http://www.ats-usa.com/software/pcmcset103.zip>)

The MC22LV can receive 10-Byte messages via RS232 from a computer or another master clock. These 10-Byte messages can include Time in 12 or 24-Hour format, Date, and Day of the Week.

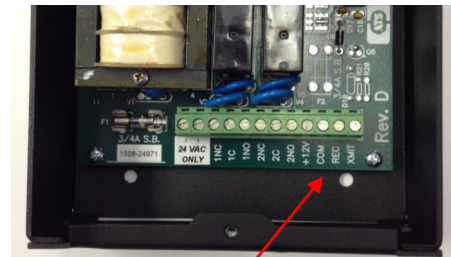
In addition the MC22LV will automatically transmit 10-Byte messages for time, in 12 or 24 Hour format, for use by other Master Clocks and ATS AE and CC Series Displays. This information will be sent once each minute at the top of the minute (00<sup>th</sup> second). ATS Displays must be set for address 15 (standard for CC Series Displays) to display received Time.

The RS232 output can drive up to 50 ATS 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. Application Notes are available.

The RS232 I/O Interface is provided by a DB9 female connector on the front panel, and also on the clearly labeled terminal blocks inside. Depending on your application a DB9 cable may be required. Contact us at 800-444-7161 for details.



DB9 female  
connector for  
RS232 I/O



Terminal Block  
connections for  
RS232 I/O

### 8.4 SELECT 12 OR 24 HOUR CLOCK OUTPUT [2] [4] [ENTER]

The MC22LV can be set up to transmit 12 or 24 Hour format to all compatible ATS Clocks and Clock Calendars connected to the MC22LV's serial output. Press [2] [4] [ENTER]. The display will show:

12 Hour Mode

Press any numerical key to alternate between 12 or 24 Hour mode. Once the desired mode is showing, press [ENTER].

To check the mode use the Status Check [9] [0]. See Section 7.5 for details.

## **9.00 PROGRAMMING SUMMARY**

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

**SET TIME** - Press TIME [3] key then [ENTER]. Enter the hours, press [ENTER]. Enter the minutes, press [ENTER]. Press [AM] or [PM], press [ENTER]. Timing begins the instant you press [ENTER] on entering the [AM] or [PM].

**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].

**SET DST DATES** - Press DST [7] key then [ENTER]. Enter month for Spring DST, press [ENTER]. Enter the desired Sunday for Spring DST, press [ENTER]. Enter month for Fall DST, press [ENTER]. Enter the desired Sunday for Fall DST, press [ENTER].

**SETTING THE MAXIMUM NUMBER OF STEPS PER PLAN** - Press [3] [1] then [ENTER]. Enter the desired number of steps per plan, up to 99 then press [ENTER]. Press [EXIT] after reviewing the display.

**ENTERING A CUSTOM WEEK PROGRAM** - Press the [2] [2] [ENTER]. Enter the desired days (1 = Sunday to 7 = Friday) for Custom Week WK0. Press [A] to advance to the next Custom Week WK1. Do the same for each Custom Week required.

**ENTERING THE BASIC PLAN PROGRAM** - Press the BASIC [B] key then [ENTER]. Enter the desired plan number, press [ENTER]. Enter the desired step number, press [ENTER]. Press the DAY [4] key until desired day or group of days is displayed, press [ENTER]. Enter the desired hour, press [ENTER]. Enter the desired minute, press [ENTER]. Press [AM] or [PM], press [ENTER]. Enter the desired relays to turn ON, press [ENTER]. The step is now programmed and ready for the next step. Repeat this process until entire program is entered then press [EXIT].

**ENTERING THE ANNUAL PLAN PROGRAM** - Press the ANNUAL [A] key then [ENTER]. Enter the desired Annual Plan number, press [ENTER]. Enter the desired Alternate Plan number, press [ENTER]. Enter the start month, press [ENTER]. Enter the start day, press [ENTER]. Enter the start year, press [ENTER]. Or press [A] to enter "XX" for the year and make the plan an Annual Repeat Plan. Enter the end month, press [ENTER]. Enter the end day, press [ENTER]. Enter the end year, press [ENTER]. Or press [A] to enter "XX" for the year and make the plan an Annual Repeat Plan. The first Annual Plan is programmed. The menu will now advance to the next Annual Plan. Press [ENTER] to continue programming Annual Plans or press [EXIT] to return to the time display.

**MANUAL SELECTION OF ALTERNATE PLANS** - Press [2] [1] then [ENTER]. Select alternate plan (Basic Plan 1 to 9) then press [ENTER].

**MANUAL OPERATION** - Press MANUAL [1] then [ENTER]. Enter relays to manually control then press [ENTER]. The chosen relays will energize.

**CLEARING THE ANNUAL AND BASIC PROGRAMS** - Press CLEAR [C] then [ENTER]. Press ANNUAL [A] to clear annual program or BASIC [B] to clear the basic program. Choose the sets buffer to clear.

**REVIEWING BASIC PLAN PROGRAM** - Press BASIC [B] key then [ENTER]. Press BASIC [B] key again repeatedly to review each step. Press [EXIT] when done.

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REVIEWING THE ANNUAL PLAN PROGRAM - Press ANNUAL [A] key then [ENTER]. Press ANNUAL [A] key again repeatedly to review each Annual plan.

SETTING THE OUTPUT PULSE – Press [5] then [ENTER]. Enter a pulse length from 0 to 9 for Relay 1 Press [ENTER]. Enter the pulse length from 0 to 9 for Relay 2. Press [ENTER].  
0 = Pulse OFF.

SELECTING SLEEP MODE – Press [4][5] then [ENTER] to enter the sleep mode. Press [4][5] then [ENTER] again to exit the sleep mode.



**MC22 SERIES PROGRAM RECORD SHEET**

LOCATION \_\_\_\_\_ DATE \_\_\_\_\_

PULSE LENGTH FOR RELAY 1 (0-9 SECS) \_\_\_\_ 0 = Pulse OFF

PULSE LENGTH FOR RELAY 2 (0-9 SECS) \_\_\_\_ 0 = Pulse OFF

BASIC PLAN # \_\_\_\_\_ NUMBER OF STEPS PER PLAN \_\_\_\_\_

CUSTOM WEEK SETTINGS (Wk0-9) \_\_\_\_\_

STEP	DAYS	HH:MM	AM/PM	R E L A Y S									
				1	2								

**ANNUAL PLAN PROGRAM RECORD SHEET**

LOCATION \_\_\_\_\_

DATE \_\_\_\_\_

ANNUAL #	BASIC #	START DATE	END DATE
		MM-DD-YY*	MM-DD-YY*
00			
01			
02			
03			
04			
05			
06			
07			
08			
09			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			

**\* NOTE: TO HAVE ANNUAL PROGRAMS REPEAT EACH YEAR AUTOMATICALLY, PRESS “A” WHEN PROMPTED FOR THE YEAR. THIS WILL INSERT “XX” FOR THE YEAR PORTION OF THE DATE.**

**\*\*\*\* SPECIAL FUNCTIONS \*\*\*\***

- 01     MANUAL
- 05     PULSE FOR RELAYS 1 AND 2
- 21     SELECT ALTERNATE PLAN
- 22     DEFINE CUSTOM WEEKS
- 24     SELECT 12 OR 24 HOUR CLOCK OUTPUT
  
- 31     SET PROGRAM SIZE
- 30     SELECT TIMEBASE
- 45     SLEEP MODE
- 90     STATUS CHECK
- 77     RE-BOOT CLEAR ALL MEMOREY

## **TECHNICAL SUPPORT**

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

**PHONE (800) 444-7161**

**FAX (318) 797-4864**

See our website at [www.ats-usa.com](http://www.ats-usa.com)

## **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**

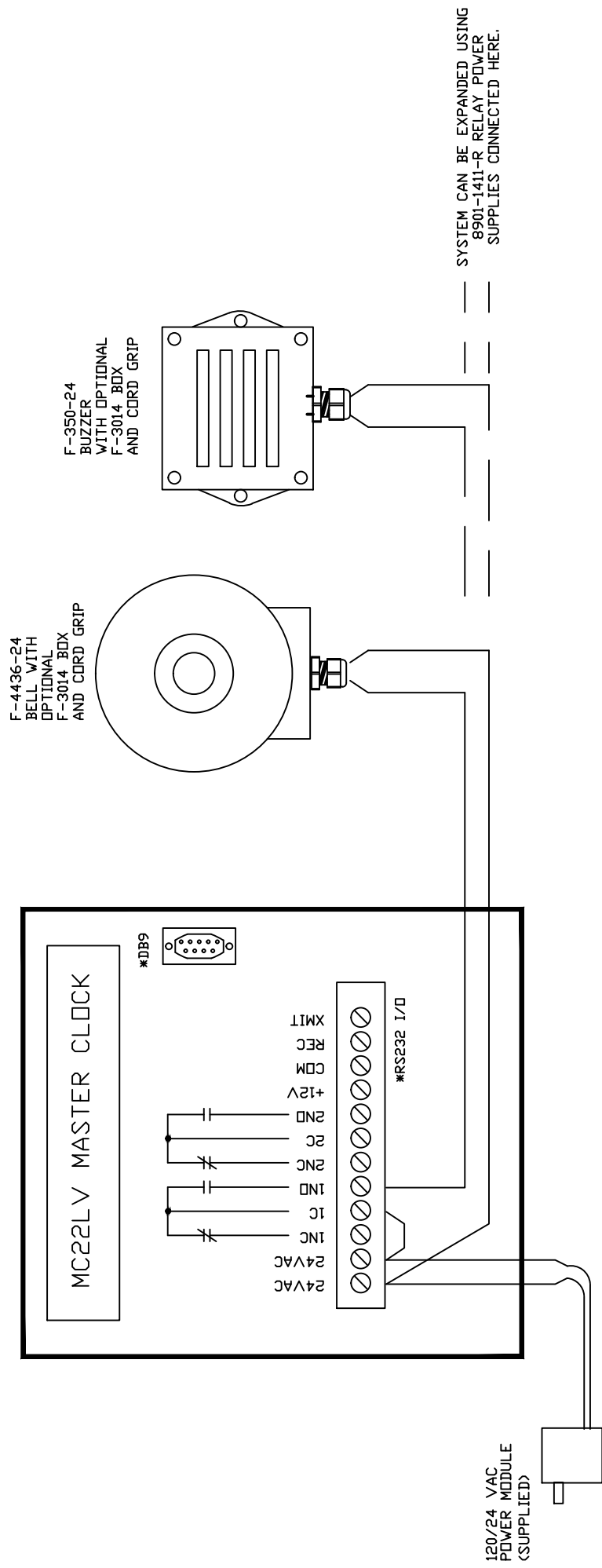
ATS warrants its products to be free of defects in material and workmanship for a period of 24 months from the date of purchase. ATS will repair or replace any product returned to its authorized factory service center within the warranty period so long as there is no evidence that the product has been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

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PN



SYSTEM CAN BE EXPANDED USING 8901-1411-R RELAY POWER SUPPLIES CONNECTED HERE.

**INSTRUCTIONS:**

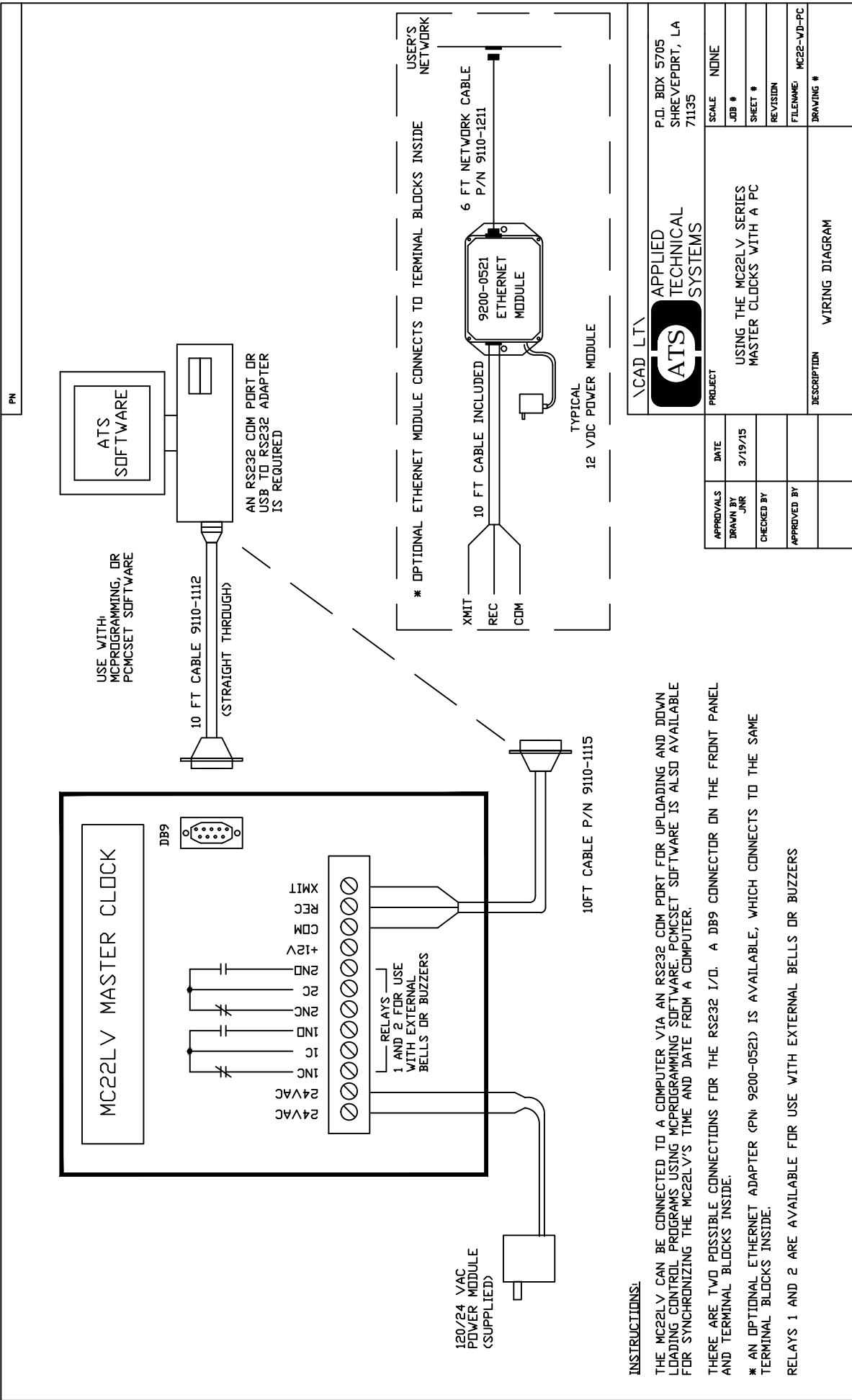
- ONE F-4436-24 BELL CAN BE ADDED USING THE STANDARD POWER MODULE PROVIDED. UP TO (7) BELLS CAN BE ADDED USING THE OPTIONAL 0900-7084 POWER MODULE
- ONE BUZZER CAN BE ADDED USING THE OPTIONAL 0900-7084 POWER MODULE FOR LARGER SYSTEMS A 8901-1411-R RELAY POWER SUPPLY WILL BE REQUIRED.
- RELAY 1 OR 2 CAN BE CONNECTED AS SHOWN TO EXTERNAL BELLS OR BUZZERS
- \* THE RS232 I/O IS AVAILABLE ON THE FRONT PANEL DB9 CONNECTOR AND ON THE TERMINAL BLOCKS INSIDE. SEE DWG# MC22-VD-PC FOR DETAILS.

APPROVALS		DATE	SCALE		NO. OF SHEETS
DRAWN BY JNR		3/18/15	JOB #		NO. OF SHEETS
CHECKED BY			SHEET #		NO. OF SHEETS
APPROVED BY			REVISION		NO. OF SHEETS
			FILENAME: MC22-VD1		NO. OF SHEETS
			DRAWING #		NO. OF SHEETS

\CAD.LTV  
**APPLIED TECHNICAL SYSTEMS**  
 P.O. BOX 5705  
 SHREVEPORT, LA  
 71135

**PROJECT**  
 CONTROL BELLS OR BUZZERS  
 WITH MC22LV SERIES  
 MASTER CLOCKS

**DESCRIPTION**  
 WIRING DIAGRAM



**INSTRUCTIONS:**

THE MC22LV CAN BE CONNECTED TO A COMPUTER VIA AN RS232 COM PORT FOR UPLOADING AND DOWN LOADING CONTROL PROGRAMS USING MCPROGRAMMING SOFTWARE. PCMCSET SOFTWARE IS ALSO AVAILABLE FOR SYNCHRONIZING THE MC22LV'S TIME AND DATE FROM A COMPUTER.

THERE ARE TWO POSSIBLE CONNECTIONS FOR THE RS232 I/O. A DB9 CONNECTOR ON THE FRONT PANEL AND TERMINAL BLOCKS INSIDE.

\* AN OPTIONAL ETHERNET ADAPTER (P/N: 9200-0521) IS AVAILABLE, WHICH CONNECTS TO THE SAME TERMINAL BLOCKS INSIDE.

RELAYS 1 AND 2 ARE AVAILABLE FOR USE WITH EXTERNAL BELLS OR BUZZERS

\CAD LTV <b>APPLIED TECHNICAL SYSTEMS</b> P.O. BOX 5705 SHREVEPORT, LA 71135		SCALE: NONE JOB #: _____ SHEET #: _____ REVISION: _____ FILENAME: MC22-VJ-PC DRAWING #: _____
APPROVALS: _____ DRAWN BY: JNR CHECKED BY: _____ APPROVED BY: _____	DATE: 3/19/15	PROJECT: USING THE MC22LV SERIES MASTER CLOCKS WITH A PC DESCRIPTION: WIRING DIAGRAM