AP21LV SERIES TIME SWITCHES

version 2

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AP21LV SERIES TIME SWITCHES

A. INTRODUCTION

The AP21LV SERIES Time Switches are Low Voltage, single circuit, calendar programmable, solid state time switches. They are used for switching electric circuits according to a pre-set time and date program.

They are designed to control lighting, heating, ventilating, air conditioning and security systems where holiday skip operation is desired. Their output relay is rated at 15 amps for 28 VAC or 28 VDC resistive loads. The output can be programmed for momentary operation such as required for ringing bells in schools, churches or industrial facilities. The AP21LV Series Time Switches can be powered by 24 VAC, 60 HZ power, or by 12 VDC. 50 HZ power options are available. The 12 VDC versions require less than 1 watt, making them *Ideal for Solar Powered Applications.*

There are two basic models: the AP21LV and the AP21LVT. Both have an AUTO PROMPTING, alpha-numeric display and a 16 key, positive action keyboard that makes programming fast and simple. They are identical except that the AP21LVT has a Transfer Port. This port allows programs to be transferred from one AP21LVT to another, or to a AP21TR. Programs can even be transferred to or from a computer with the optional AP21COMP Software and Adapter kit. The AP21TR is a plug-in relay module that is programmed from an AP21LVT, or a computer, using the AP21COMP Software. Once programmed, the AP21TR will provide the very same switching functions as the AP21LVT.

The following specifications, descriptions and instructions apply only to the AP21LV and AP21LVT. The term "AP21LV" will be used to cover all versions. The AP21TR is functionally the same, but it does not have a keyboard or a display. Where possible, the AP21TR features will be described. Otherwise, refer to the drawings at the back of this manual for more details.

B. SPECIFICATIONS

PROGRAMMING CAPABILITIES

1. 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 the basic program steps.

2. Up to 30 Powerful Program Steps - Select either a 16 step or 30 step program size from the keyboard. A 16 step program has 10 skip plans, a 30 step program has 3. Each step can be programmed for the specific day of the week, or for all 5 weekdays, or for both weekend days, or for everyday of the week providing up to 105 ON's and 105 OFF's, for a total of 210 events per week.

3. Up to 10 Skip Plans - A 16 step program has 10 skip plans, a 30 step program has 3. Each skip plan has a starting and ending date during which all events are skipped. This feature can be used to skip a single day or groups of days.

4. Programmable Daylight Savings Time Adjustment - The AP21LV Series Time Switches can be programmed to automatically adjust their time for Daylight savings time changes according to U. S. law, even if the law changes.

5. Automatic Leap Year Compensation.

6. Manual Override - The output relay can be manually energized or de-energized from the keyboard. The manual override remains in effect until the next programmed step occurs.

7. Pulsed Output - The output can be programmed to operate as a momentary contact, programmable from 1 to 99 seconds.

ELECTRICAL

Dual Power:	24 VAC, 60 HZ (A 120/24 VAC Power Module is provided). 50HZ Optional. Or 10.5 -15 VDC. Less than 1Watt.
Output:	SPDT relay rated at 15 A resistive at 48 VAC or 24 VDC.
Wiring:	Terminal block - can accommodate wire sizes from 14 to 24 AWG.

POWER FAIL BACKUP

Program and time keeping are maintained for 48 hours on a rechargeable *capacitive backup system* in the event of a power failure. The relay output and the display are disabled during backup. The AP21LV resumes normal operation when power returns.

ACCURACY

TIME KEEPING - Synchronous with the AC power line. During a power failure it is quartz crystal controlled with an accuracy of +/- .003% 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.

PHYSICAL

Size: AP21LV - 3.7" W x 7.6" H x 1.6" D.
AP21LVT - 3.7" W x 8" H x 1.6" D.

Weight - Approximately 2 lbs.
Mounting - Mounting holes provided. See installation.
Operating Temperature Range: -30 to +74 C.

C. INSTALLATION

The AP21LV and AP21LVT can be wall or panel mounted indoors, or in a weather tight enclosure for outdoor installa-

tions.
Refer to the drawings at the back of this manual.

MOUNTING

For the AP21LV or AP21LVT remove the front cover to access the main mounting holes (one at the top and two at the bottom). Fasten the unit to a suitable backplane. Be sure to provide an electrical ground by connecting a ground wire to its case or by mounting it to a grounded backplane. A ground terminal labeled GND is also provided.

WIRING

24 VAC Systems - Connect the 120/24VAC power module provided to the 24 VAC terminals. Connect a GROUND wire to the GND terminal.

12 VDC Systems - Connect the 12 VDC to +12VDC and 12V COM terminals. Be sure to observe polarity. Connect a GROUND wire to the GND terminal.

Load Wiring - Clearly labeled terminals are provided for all relay output connections. NC (normally closed), C (contact wiper) and NO (normally open). Connect as desired.

For AP21LV's equipped with the optional connector and wiring harness, the connector pinout is as follows:

Pin 1	Power Yellow	24 VAC
Pin 2	Power Wht/Yel	24 VAC
Pin 3	Green	Ground
Pin 4	Red	Relay Common
Pin 5	Yellow	Relay Normaly Closed
Pin 10	White/Yellow	Relay Normaly Open

D. DESCRIPTION

1. *ALPHA-NUMERIC DISPLAY* - Used for displaying time, day, date, and output status, and for displaying information during programming or reviewing stored programs.

2. *KEYBOARD* - Many of the 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 PROMT* the user as to which key to press.

AM - ON KEY - Used for setting the time to AM when in the time set or programming modes and for setting the output to ON when in the programming mode or for setting the output to ON manually.

PM KEY - Used for setting the time to PM when in the time set or programming modes.

TIME KEY - Used for entering the time set mode.

ANNUAL KEY - Used for entering the annual programming mode and for stepping through the stored annual program for review. The annual program contains the skip plans in calendar schedule form.

BASIC KEY - Used for entering the basic plan programming mode, and for stepping through the stored basic plans for review. The basic plan contains the daily timed events instructions.

CLEAR KEY - Used for clearing all annual skip plans or basic plan steps.

DATE KEY - 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. Returns the AP21 to the main time display screen.

OFF KEY - Used for setting the output to OFF when in the programming mode, or for setting the output to OFF manually.

STEP/ENTER KEY - Used for entering all commands or for stepping through any set time, set date or program

data entry.

DST KEY - Used for entering the set Daylight Savings Time program mode.

DAY KEY - Used for setting the day in the set time and program modes. Also used for entering the set day mode.

E. PROGRAMMING INSTRUCTIONS

AUTO PROMPT DISPLAY - The AP21LV 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 AP21LV advances through the program modes. On a cold start (from a discharged backup system) the AP21LV will advance through a sequence of all the necessary settings, including the basic program. You may exit this sequence if desired, and the unit will advance to the time display. From the time display you can enter any of the set time or program modes manually. See the section on *ENTERING OR CHANGING TIME AND PROGRAMS.*

THE AP21LV CURSOR - On many of the AP21LV 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.

ENTERING DATA - As data is entered into the AP21LV, it 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 postion 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 set time, date or programming mode, you may wish to exit the sequence. Simply press the EXIT key. The AP21LV will advance to the time display. From this display you may enter any of the sequences manually. See section on ENTERING OR CHANGING TIME AND PROGRAMS.

Before starting, you should write out your program on the Program Record Sheets located at the back of this manual.

Upon first applying power to the AP21LV, the display will come up with the first Auto Prompt message.

PWR FAIL Press 3

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

Time? 00:00 AM

You will notice that every numeric field is zero. On a cold start all memory is cleared in the AP21LV, including time, date, and program steps. The cursor will be flashing in the hours digits. 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 hours 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 minutes digits. Now enter the desired two digits for the minutes and press ENTER. The cursor will advance to the AM position. Press the AM or PM key as desired and 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 instant you desire.

After the time is set, the AP21LV display will advance to the set date display.

Date? 00-00-00

The cursor will be flashing in the months position. Enter the desired two digits for the month and press ENTER. The cursor will advance to the days position. Enter the desires two digits for the days and press ENTER. The cursor will advance to the years position. Enter the desired two digits for the year and press ENTER.

After the year is entered the display will advance to the set day display.

Day? Sun

The cursor will be flashing on the S in Sun. Press the DAY key until the desired day appears on the display and then press ENTER.

After setting the day, the AP21LV will advance to the Basic Plan Program mode. This mode allows the operator to program the daily timed events. The display will look as follows:

Step? 00

I*f your program requires more than 16 steps, you must exit the Auto Prompt sequence, and set the program size to 30 steps using Special Function 31. See the SPECIAL FUNCTIONS section.*

The cursor will be flashing on the right hand zero. 00 is the first program step number. Press ENTER to program step 00. The display will then prompt you for the step 00 program information.

WDY 00:00 AM OFF

The cursor will be flashing on the W of WDY. WDY stands for weekday. Program steps may be programmed for individual days, such as Mon or Tue, or for groups of days such as WDY for weekdays (Mon through Fri), EDY for everyday (Sun through Sat.) or WND for weekends (Sat & Sun). Press the DAY key to advance to the desired day or group of days. The display will update as you press the DAY key. Once the desired day or group of days is displayed, press ENTER. The display will advance to the hours position. Enter the desired two digit hour at which this step is to be activated and press ENTER. The display will advance to the the minutes position. Enter the desired two digits for minutes and press ENTER. The display will advance to the AM/PM position. Press the AM or PM key as desired and then ENTER. The display will advance to the OFF position. Press the ON or OFF key as desired then press ENTER. The first step 00 is now programmed. The display will be prompting you for the next step 01.

Step? 01

If your program is finished you may exit here by pressing EXIT and the AP21LV will return to the time display. If not press ENTER, so that data may be entered for step 01. Enter the data for program

step 01 the same as you did for step 00. Continue on until all your program steps are entered up to step 15 (the 16th step) or until you have entered your last step. After entering your last step, press EXIT and the AP21LV will advance to the time display. Program steps do not have to be entered in time order.

For Annual programming, refer to the section on ENTERING OR CHANGING THE ANNUAL PROGRAM.

ENTERING OR CHANGING TIME AND PROGRAMS

Reviewing the time, date, and programs uses the same procedure as entering or changing them, except the data is not changed. Simply press EXIT after reviewing the data.

ENTERING OR CHANGING TIME - You must be in the 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 PM OFF

Press the TIME key. The display will respond with:

Command? 03

Press ENTER. The display will respond with:

Time? 12:34 AM

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.

The cursor will be flashing in the hours position. Enter the desired two digit number for hours and press ENTER. If the hours are correct simply press ENTER. The cursor will move to the minutes 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. The cursor will move to the AM/PM position. Before

pressing ENTER, you may wish to synchronize this AP21LV 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.

The AP21LV will go to the time display and show the time you just entered. If you wish to display the time with seconds so you can check the accuracy of the setting, press the TIME key twice. The display will read:

Command? 33

Press ENTER. The display will then show seconds.

Sun 01:58:33 PM

To go back to the regular time display, simply press EXIT.

ENTERING OR CHANGING THE DATE - You must be in the time display in order to enter the date. Press The DATE key. The display will respond with:

Command? 0D

Press ENTER. The display will respond with:

Date? 11-12-96

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 promt sequence.

The cursor will be flashing in the month's position. 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 AP21LV will go back to the time display. To review your entry press the DATE key 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, 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.

Entering or Changing the Day - You must be in the time display. Press the DAY key. The display will respond with:

Command? 04

Press ENTER. The display will respond with:

Day? Sun

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

ENTERING OR CHANGING THE PULSE - The pulse is normally set to zero for programming steady state ON and OFF events. A pulsed output may be desired for applications requiring a momentary output. You must be in the time display. Press key 5. The display will respond with:

Command? 05

Press ENTER. The display will respond with:

Pulse? 00

If zero is correct (no pulse), press ENTER or EXIT. For pulsed output enter the two digit number of seconds desired from 1 to 99 seconds and press ENTER. The display will return to the time display. To review the pulse do the same as above. Now when the output is turned on, either by manual or program control, it will turn off automatically after the time duration of the pulse.

ENTERING OR CHANGING DAYLIGHT SAVINGS TIME - You must be in the time display. Press the DST key. The display will respond with:

Command 07

Press ENTER. The display will respond with:

S DST M=04 SUN=1

The S indicates that this data is for the Spring DST program. If this is correct press ENTER until it advances to the Fall DST display. If not the cursor will be flashing on the month position. Enter the desired two digits for the month in which you desire the Spring DST adjustment to occur and then press ENTER. Current US law is the 1st Sunday in April. Valid months for Spring DST are 00, 03, 04, 05. Enter 00 for the month to disable DST. After entering a valid month the cursor will move to the Sunday position. Enter the desired Sunday of the month you desire the DST change to take place, and press ENTER. Valid Sundays are 1, 2, 3, 4, L, where L is key 5 (JKL). The adjustment will take place at 02:00 AM on the Sunday you have just chosen. The display will advance to the Fall DST display.

F DST M=10 SUN=L

The F indicates that this is the Fall display. The cursor will be flashing in the month position. Enter the desired two digits for the month you wish the Fall DST adjustment to take place and then press ENTER. Valid months for Fall DST are 09, 10, and 11. Current US law is the last Sunday in October. The cursor will move to the Sunday position. Enter 1, 2, 3, 4 or L, which is key 5 (JKL) for last and press ENTER. The adjustment will take place at 02:00 AM on the Sunday you have just chosen. The display will return to the time display.

ENTERING OR CHANGING THE BASIC PROGRAM - If the basic program was not entered during the Auto Prompt sequence, it can be entered by entering the basic program mode. This mode allows the operator to program the daily timed events. Press BASIC. The display will respond with:

Command? 0B

Press ENTER. The display will respond with:

Step? 00

The cursor will be flashing on the right hand zero. 00 is the first

program step number. Press ENTER to program step 00. The display will then prompt you for the step 00 program information.

Sun 10:00 PM ON

This step may already have data stored from a previous program. At this point you may edit the data in the step or input all new data by simply entering the desired new data in each field. There is no need to erase the data in this step. See the sections on Clearing the Annual and Basic Programs and Clearing Program Steps. The cursor will be flashing on the S of Sun. Program steps may be programmed for individual days, such as Mon or Tue, or for groups of days such as WDY for weekdays (Mon through Fri), EDY for everyday (Sun through Sat.) or WND for weekends (Sat & Sun). Press the DAY key to advance to the desired day or group of days. The display will update as you press the DAY key. Once the desired day or group of days is displayed, press ENTER. The display will advance to the hours position. Enter the desired two digit hour at which this step is to be activated and press ENTER. The display will advance to the the minutes position. Enter the desired two digits for minutes and press ENTER. The display will advance to the AM/PM position. Press the AM or PM key as desired and then ENTER. The display will advance to the OFF position. Press the ON or OFF key as desired then press ENTER. The first step 00 is now programmed. The display will be prompting you for the next step 01.

Step? 01

If your program is finished you may exit here by pressing EXIT and the AP21LV will return to the time display. If not press ENTER, so that data may be entered for step 01. Enter the data for program step 01 the same as you did for step 00. Continue on until all your program steps are entered up to step 15 (the 16th step) or until you have entered your last step. After entering your last step, press EXIT and the AP21 will advance to the time display.

CLEARING PROGRAM STEPS - To clear a program step press BASIC, then ENTER. The display will be:

Step? 00

The cursor will be flashing on the right hand zero. Enter the desired step number to erase, then press enter. The display will then read the contents of the step you chose to erase.

Sun 10:00 AM ON

The cursor will be on the S in Sun. Press ENTER. The cursor will go to the hours position. Enter 00 for the hours to clear this specific step. The display will return to the time display. If you wish to erase all the program steps see the section on Clearing the Annual And Basic Programs.

ENTERING OR CHANGING THE ANNUAL PROGRAM - The annual program allows the AP21LV to be programmed to skip its output operations during holidays or other time periods. There are 10 or 3 skip plans available depending on the program size selected, each of which has a starting and ending date. All output operations will stop at 12:00 AM on the start date and will begin again at 12:00 AM on the day after the end date. To enter the annual program mode press the ANNUAL key. The display will respond with:

Command? 0A

Press ENTER. The display will respond with:

Skip? 00

The cursor will be on the right hand zero. This is the skip plan number. Press ENTER. The display will respond with:

Start? 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. You simply enter new data in each field. To erase an annual skip plan see sections Clearing the Annual and Basic Program and Clearing an Annual Skip Plan. The cursor will be flashing in the months position. Enter the desired two digits for the month at which the skip plan will start and press ENTER. The display will advance to the days position. Enter the desired two digits for the day and press ENTER. The display will advance to the years position. Enter the desired two digits for the

year and press enter. The display will advance to the end date display:

End? 00-00-00

Now you enter the end date in the same manner as the start date. If your skip plan is only for one day, you do not need to enter an end date. Just press EXIT and the AP21LV will return to the time display. Or press ENTER to enter the 00 in the months and the display will advance to the next skip plan.

Skip? 01

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

CLEARING AN ANNUAL SKIP PLAN - If you need to clear an annual skip plan, press the ANNUAL key and then ENTER. The display will respond with:

Skip? 00

The cursor will be flashing on the right hand zero. Enter the desired skip plan number you wish to clear and press ENTER. The display will show the contents of that skip plan.

Start? 10-25-96

The cursor will be flashing on the month. Enter 00 for the month and press ENTER. The skip plan will be cleared. There is no need to clear the end date once the start date has been cleared. If you wish to clear all the annual skip plans see the section on Clearing the Annual and Basic Programs - If you are programming the clock from a cold start, the annual and basic program steps will be cleared already. If you are re-programming a previously programmed clock you will need to erase any previous programs as you may forget to reprogram each step and then they could conflict with your new program.

CLEARING THE ANNUAL AND BASIC PROGRAMS

To clear all program steps, press the CLEAR key. The display will respond with:

Command? 0C

Press ENTER. The display will respond with:

A=ANNUAL B=BASIC

You have the option now to clear either the annual or the basic program. To clear the annual, press A, the same as the ANNUAL key. The display will return to the time display. If it was the basic program you wished to clear, press the B or BASIC key instead of the A. 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.

SPECIAL FUNCTIONS

MANUAL OPERATION OF THE OUTPUT RELAY -The output relay can be manually controlled from the the keyboard. Before doing this be sure it is okay to operate the load connected to the AP21LV. Also be sure the AP21LV is in the time display mode.

To turn the output relay on press the ON key. The display will respond with:

Command? 01

Press ENTER. The output relay will be energized and the display will return to the time display. It will remain on until the next program step instructs it to turn off or until it is manually turned off. If a pulse has been set, the relay will automaticall turn off after the time duration of the pulse. To turn the output relay off, press the OFF key. The display will respond with:

Command? 00

Press ENTER. The output relay will de-energized. It will remain off until the next program step instructs it to turn on or until you manually turn it on.

SETTING THE PROGRAM SIZE - The default program size is 16

Basic Steps and 10 Annual Skips. For larger programs the program size can be changed from the keyboard to 30 Basic Steps and 3 Annual Skips. Previous stored programs should be cleared before changing the program size. To change the program size, press 31 and ENTER. The display will show:

Set=16 Skip=10

Press any key except ENTER or EXIT to toggle the program size. The display will show:

Set=30 Skip=03

Press ENTER when the desired program size is shown.

TRANSFERRING PROGRAMS - Programs can be transferred from one AP21LVT to another or to an AP21TR. A transfer cable is required. To transfer a program, press 78 ENTER. The display will show:

Cable, then ENTER

Connect the tranfer cable from one unit to the other and press ENTER. The display will blank for a few seconds while the data is being transferred. If the transfer was sucessful the AP21LVT will then return to its time display. The receiving unit will display a version message for a few seconds, then it will display time. If unsucessful, an error message will be displayed on both units. Press EXIT to clear the error message.

DISPLAY BLANKING - The AP21LV and AP21LVT displays will automatically blank if the keyboard is not used for about 5 minutes. Function 88 is used to toggle the display blanking feature on and off. To change to a non blanking display (display stays on indefinitely), press 88 ENTER. The colons will be flashing when display blanking is on. They will be steady when display blanking is off.

DISPLAY LAMP - Some AP21LV's and AP21LVT's have a back-lighted display. Function 93 is used to toggle the display lamp on and off. To turn the lamp on press 93 ENTER. To turn it back off, press 93 ENTER again. If you are using the display blanking feature, the

lamp will automatically go off when the display is blanked.

FORCING A COLD START - For training purposes or for simply starting from scratch, you can reset the AP21LV to a cold start condition. To force a cold start press 77. The display will respond with:

Command? 77

Press ENTER. the display will respond with:

PWR FAIL Press 3

DISPLAYING THE VERSION NUMBER - Press 99 ENTER to show the software version number installed in your unit. The version number will be displayed for about 3 seconds. The version number is also displayed briefly when power is applied.

REVIEWING TIME, DATE AND PROGRAMS

Reviewing the time, date, and programs uses the same procedure as entering or changing them, except the data is not changed. Simply press EXIT after reviewing the data.

REVIEWING THE BASIC PROGRAM - To review the basic program press the BASIC key and then ENTER. The display will show step 00. Press the BASIC key again and it will show the contents of step 00. Press the BASIC key again and it will display step 01. Press the BASIC key again and it will display the contents of step 01. Continue pressing the BASIC key to review all basic program steps or press EXIT to return to the time display.

To review the basic program starting at a step number other than 00, enter the desired step number when the the step 00 display appears and then press the BASIC key. The display will show the contents of the step number you just entered. Press the BASIC key again and the display will move to the next step in the program.

At any time during review of the basic program you may edit any program step information as described previously.

REVIEWING THE ANNUAL SKIP PLANS - To review the annual skip

plans press the ANNUAL key and then ENTER. The display will show skip 00. Press the ANNUAL key again to display the contents of skip 00. Press the ANNUAL key again and the display will move to skip 01. Press the ANNUAL key again and the display will show the contents of skip 01. Continue to press the ANNUAL key to display all the annual skip plans or press EXIT to return to the time display.

To review the annual skips starting at a plan other than skip 00, enter the desired skip plan number when the skip 00 display is shown and press the ANNUAL key. The display will show the contents of the skip plan number you just entered and will advance to the next skip plan number when the ANNUAL key is pressed again.

At any time during the review of the annual skip plans you may edit the skip plan information as described previously.

PROGRAMMING SUMMARY

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

SET TIME - Press TIME 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 after entering the AM or PM.

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

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

SET DST DATES - Press DST 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.

ENTERING THE BASIC PROGRAM - Press the BASIC key then ENTER. Enter the desired step number, press ENTER. Press the DAY key until desired day or group of days is displayed, press ENTER. Enter the hours for this step, press ENTER. Enter the minutes for this step, press ENTER. Press AM or PM, press ENTER.

Press ON or OFF, 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 SKIP PLANS - Press the ANNUAL key then ENTER. Enter the desired skip plan number, press ENTER. Enter the start month, press ENTER. Enter the start day, press ENTER. Enter the start year, press ENTER. Enter the end month, press ENTER. Enter the end day, press ENTER. Enter the end year, press ENTER. The first skip plan is now programmed and ready for the next skip plan. Repeat this process until entire skip plan program is emtered, then press EXIT.

MANUAL OPERATION

RELAY ON - Press ON then ENTER. Relay will energize.
RELAY OFF - Press OFF then ENTER. Relay will de-energize.

CLEARING THE ANNUAL AND BASIC PROGRAMS - Press CLEAR then ENTER. Press ANNUAL (A) to clear annual program or BASIC (B) to clear the basic program.

REVIEWING BASIC PROGRAM - Press BASIC key then ENTER. Press BASIC key again repeatedly to review each step. Press EXIT when done.

REVIEWING THE ANNUAL SKIP PLAN PROGRAM - Press ANNUAL key then ENTER. Press ANNUAL key again repeatedly to review each skip plan.

G. SERVICE POLICY

It is recommended that all service for the AP21LV be done by the factory or by a factory authorized service representative.

If you are set up to service equipment like the AP21LV and desire to service it yourself, there is one caution:

> Before removing or replacing any parts, especially IC1, be sure the 1FD super capacitor has been totally discharged to avoid damage. On the right side of the printed circuit assembly there are two test points. One is ground (GND), and the other is the super capacitor + connection (TP1). Use a clip lead to short these together to discharge the super capacitor. It is recommended that the clip lead be left in place until the repair is finished.
>
> ATS will provide ongoing service support in and out of warranty. Send your repairs to:
>
> APPLIED TECHNICAL SYSTEMS
> 849 KING PLACE
> SHREVEPORT, LA 71115

H. WARRANTY

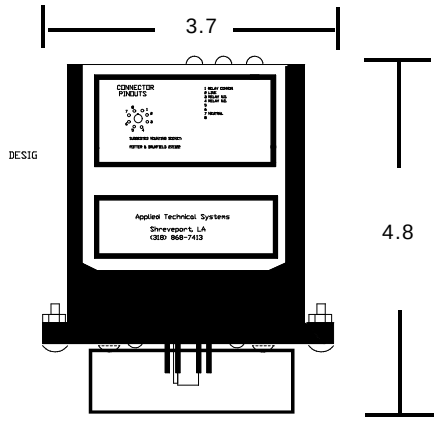
APPLIED TECHNICAL SYSTEMS
WARRANTY POLICY

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.

AP21TR FEATURES - The AP21TR is programmed from an AP21LVT, or a computer using the AP21COMP Software. Once programmed, it performs the same functions as the AP21LVT

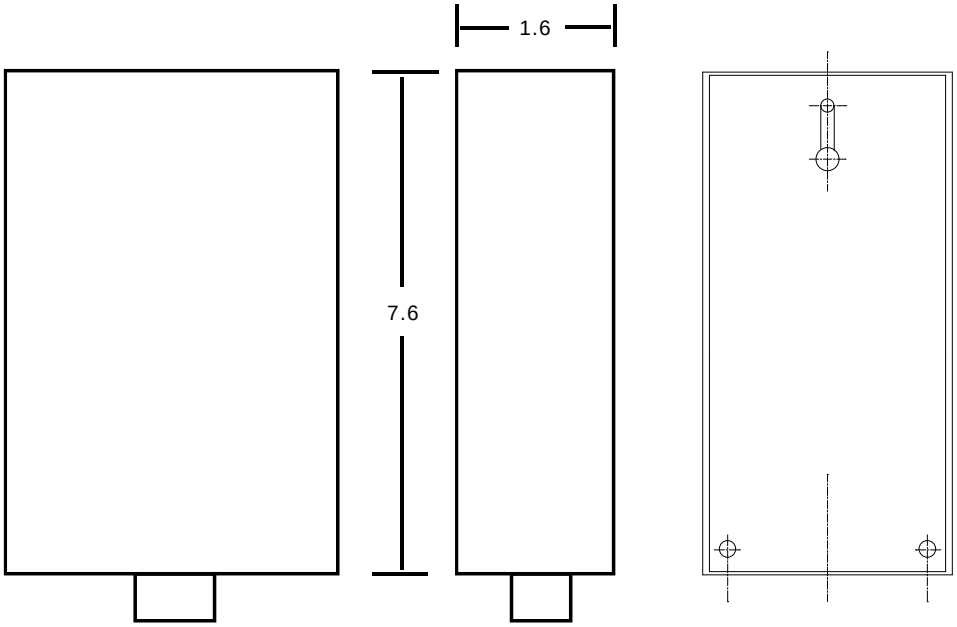


Red LED PFAIL
Green LED OK
Yellow LED RELAY
Transfer Port located on top.

Requires an Octal Socket base. Potter & Brumfield 27E122 or equivalent.

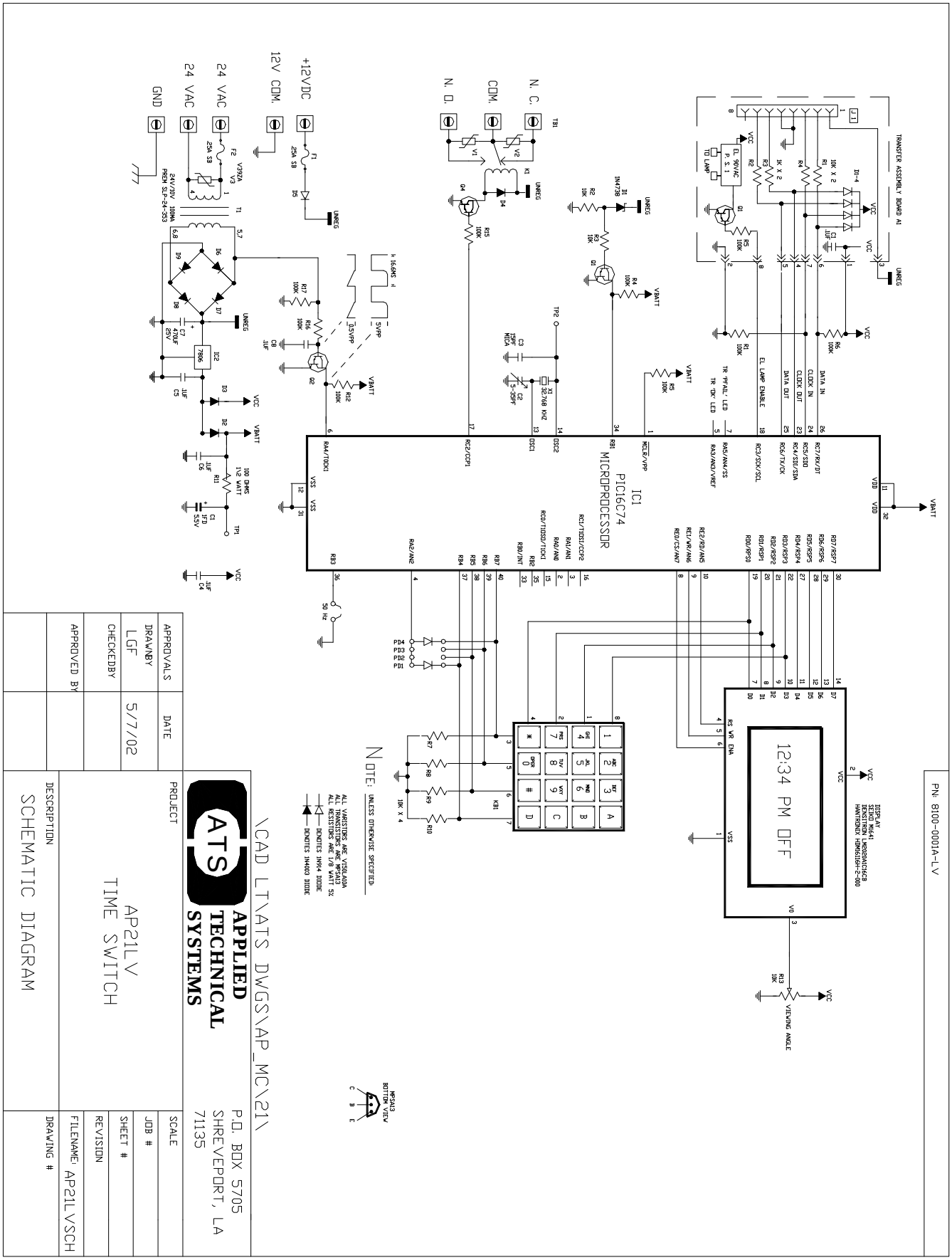
WIRING:

120 VAC Line	PIN 2	Relay NC	PIN 4
120 VAC Neut	PIN 7	Relay COM	PIN 1
12 VDC (+)	PIN 8	Relay NO	PIN 3
12 VDC (-)	PIN 6		

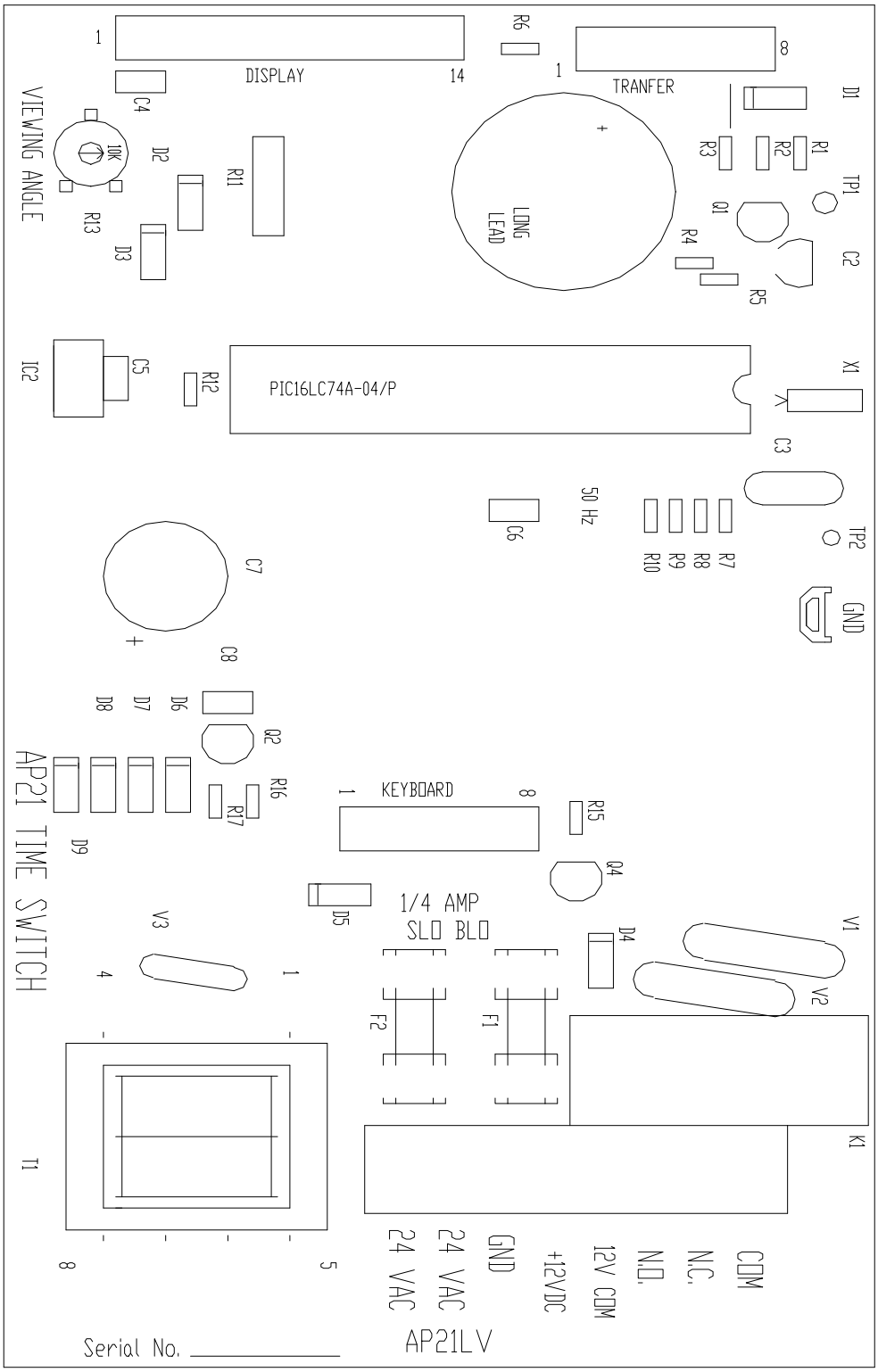


AP21LVT HEIGHT IS 8 INCHES

DIMENSIONS



AP21 SCHEMATIC DIAGRAM



AP21 COMPONENT OVERLAY

AP21LV PARTS LIST

DESIGNATOR	DESCRIPTION
IC1	INTEGRATED CIRCUIT, PIC16LC74
IC2	INTEGRATED CIRCUIT, REGULATOR, 7806
R1	RESISTOR, 270K, 1/8W, 5%
R2	RESISTOR, 10MEG, 1/8W, 5%
R3,4,5,19,20,11, 16,17,18	RESISTOR, 100K, 1/8W, 5%
R15	RESISTOR, POTENTIOMETER, 10K
R6,7,8,9,12,13,14	RESISTOR, 10K, 1/8W, 5%
R10	RESISTOR, 100 OHM, 1/2W, 5%
C1	CAPACITOR, IFD, 5.5V
C2	CAPACITOR, TRIMMER, 5-35PF
C3	CAPACITOR, 15PF, SILVER MICA
C4,5,6,8	CAPACITOR, .1UF, MONOLYTHIC
C7	CAPACITOR, 470UF, 25V, ELECTROLYTIC
D1	DIODE, ZENER, 1N4738A
D2,3,4,5,6,7,8,9	DIODE, IN4003
D	DIODE, 1N914 (1N4148)
Q1,2,3,4	TRANSISTOR, DARLINGTON, MPSA13
V1,2,3	VARISTOR, V39ZA
T1	TRANSFORMER, SLP-24-353
X1	CRYSTAL, 32.768 Khz
F1,2	FUSE, 1/4 AMP, 2AG, SLO-BLOW
K1	RELAY, PR1C16DC12K OR
TB1	TERMINAL BLOCK,
(1)	HEADER, DISPLAY, TSW-114-20-T-S
(2)	TEST POINT, SMALL, K30C
(3)	TEST POINT, LARGE
(4)	RIBBON, KEYBOARD
(5)	PRINTED CIRCUIT BOARD, 99-001
(6)	STANDOFF, SUPPORT, TCBS-4
(7)	CLIP, FUSE

AP21LV Time Switch Program Record

DATE

LOCATION

DST SPRING MONTH SUNDAY

DST FALL MONTH SUNDAY

(1 = FIRST)
(2 = SECOND)
(3 = THIRD)
(4 = FORTH)
(L = LAST)

PULSED OUTPUT _____ SEC.

(1 TO 99 SECONDS = PULSED)
(0 = STEADY)

SPECIAL FUNCTIONS

00 RELAY OFF
01 RELAY ON
05 SET PULSE
31 SET PROGRAM SIZE
33 DISPLAY SECONDS
77 COLD START
78 PROGRAM TRANSFER
93 DISPLAY LAMP
99 SOFTWARE VERSION

APPLIED TECHNICAL SYSTEMS
P.O. Box 5705
Shreveport, La. 71135
800-444-7161
318-797-7508
318-797-4864 FAX

BASIC PROGRAM

STEP	DAYS	HH	MM	A/PM	ON/OFF
00					
01					
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					

AP21LV Time Switch
Program Record

ANNUAL PROGRAM

SKIP		MM	DD	YY
00	START			
	END			
01	START			
	END			
02	START			
	END			
03	START			
	END			
04	START			
	END			
05	START			
	END			
06	START			
	END			
07	START			
	END			
08	START			
	END			
09	START			
	END			

OTHER AP21LV OPTIONS AND ACCESSORIES

9100-1021	Connector and mating 48" harness.
9110-0041	Transfer Cable, six feet.
AP21COMP	Computer Software for programming AP21LVT's and AP21TR's.

NOTES

AP21LV SERIES
TIME SWITCHES

OPERATORS MANUAL

AP21LV and AP21LVT

24 V AC OR 12 V DC POWERED

ATS APPLIED TECHNICAL SYSTEMS