

INSTRUCTION MANUAL

For

SOLID STATE DIGITAL TIMER

MODEL SST-9203

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REVISION HISTORY

<u>Revision</u>	<u>ECN #</u>	<u>Date</u>
2	25637	11/11/93
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APPRECIATION

We are indebted to those who have given their time and advice in the preparation of this instruction manual. It is AVO MULTI-AMP Corporation's goal to continually improve its products and services to its customers. To that end, we welcome any suggestions or contributions our customer would care to offer.

IMPORTANT

The information and data contained within this instruction manual are proprietary with AVO MULTI-AMP Corporation. The equipment described herein may be protected by one or more U.S. letters patent. AVO MULTI-AMP specifically reserves to itself all rights to such proprietary information as well as all rights under any such patent, none of which is waived by the submission of this instruction manual to anyone.

The recipient, if a Government agency, acknowledges that this instruction book and the equipment described were procured with "Limited Rights" to technical data as described in ASPR 9-203 (b).

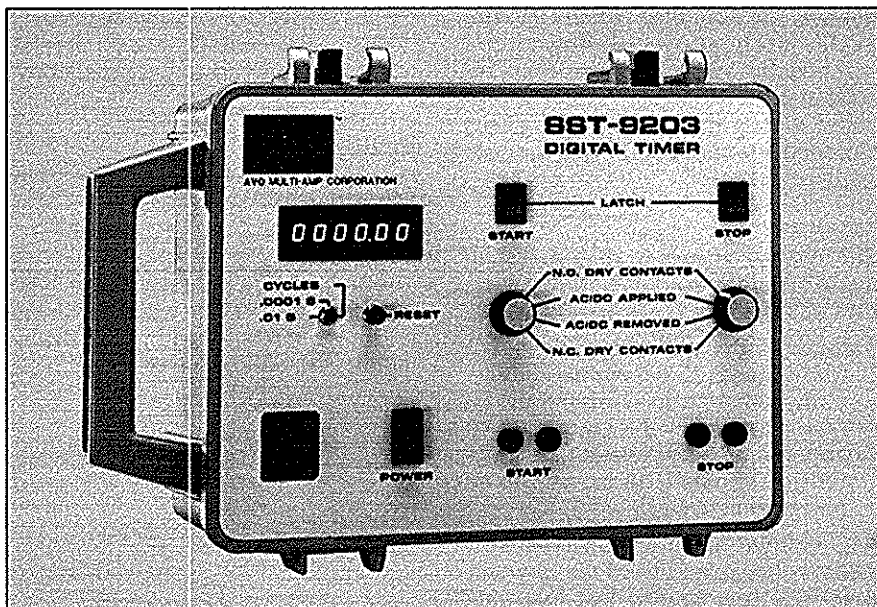
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AVO INTERNATIONAL

THE MEASURE OF EXCELLENCE IN ELECTRICAL TESTING



MULTI-AMP® Model SST-9203

- Versatile timing instrument for many utility applications
- Rugged design for years of daily field use
- ± 0.0001 -second accuracy
- Battery or line operated

Solid-State Digital Timer

DESCRIPTION

The Multi-Amp® Model SST-9203 Solid-State Digital Timer combines ruggedness and reliability with state-of-the-art technology to make it an accurate and versatile timing instrument available for utility applications.

APPLICATIONS:

Designed specifically to measure the operating time of solid-state and electromechanical relays, circuit breakers, contactors or similar switching devices, Model SST-9203 can be easily used in the field, shop or laboratory.

FEATURES AND BENEFITS

- Timing versatility: All necessary start and stop gates are incorporated — applying or removing ac or dc potentials, opening or closing contacts.
- Accuracy: ± 0.0001 second
- Resolution: measures from 0.0001 to 9999.99 seconds OR 0.1 to 99999.9 cycles
- Noise immunity: Shielding and noise-suppression circuitry ensures reliable operation even in typically "noisy" utility environments such as EHV substations and switchyards.
- Rugged design: built tough to provide years of daily field use

Built-in rechargeable battery: Long battery life allows testing in remote locations.

SPECIFICATIONS

Input

115/230 V, 50/60 Hz, 3 VA

Display

0.3-in. (7.6-mm) LED, 6 digits

Battery Capacity

Six hours of continuous usage on a single, full charge. Low battery indication lamp. (Recharge time is twice the time used on battery power. Battery charger is built-in.)

Counter

The specially designed Multi-Amp solid-state digital counter measures the elapsed time of the test in either seconds or cycles. It has extensive shielding and noise-suppression circuitry to ensure accurate and reliable operation under the most demanding field conditions. Incorporating a crystal-controlled oscillator, its accuracy is independent of the power-line frequency.

Ranges (switch-selected)

0.0001 to 99.9999 s
0.01 to 9999.99 s
0.1 to 99999.9 cycles

Start and Stop Gates

Two identical, independent start and stop gate circuits permit simple switch selection of the desired operating modes. The following modes are provided for both the start gate and the stop gate:

Dry Contact Closure (N.O.): Timer starts or stops at the closure of a normally open contact or upon conduction through a semiconductor device, such as an SCR, triac or transistor.

Dry Contact Opens (N.C.): Timer starts or stops at the opening of a normally closed contact or when conduction through a semiconductor device, such as an SCR, triac or transistor is interrupted.

Application of AC or DC Potential (AC/DC APPLIED): In latched mode, timer starts or stops when an ac potential (5 to 300 V rms) or dc potential (6 to 300 V) is applied. In nonlatched mode, timer starts or stops when an ac potential (65 to 300 V rms) or dc potential (6 to 300 V) is applied/removed.

Removal of AC or DC Potential (AC/DC REMOVED): Timer starts or stops when an ac potential (65 to 300 V rms) or dc potential (6 to 300 V) is removed.

START Latch

When ON, the START latch allows timing to be initiated by any start gate and to be stopped **only** by the selected stop gate. When OFF, the START latch allows timing to be initiated by any start gate and to be stopped when that start gate is reversed (such as when timing the closing and opening of a single contact while measuring the trip-free operating time of a circuit breaker).

STOP Latch

When ON, the STOP latch allows timing to be stopped at the first operation of any stop gate (thus ignoring contact

bounce, for example). When OFF, the STOP latch allows timing to be stopped by any stop gate, then re-started if the stop gate reverses (provided a start gate is still energized) and then again stopped when the gate again reverses.

Accuracy

The overall accuracy of the instrument, including start and stop gate errors at 25° C is:

Seconds Mode: ± least significant digit (0.0001 or 0.01 depending on seconds range in use) or 0.005% of reading, whichever is greater, when initiated by a dry contact, a dc potential above 5 V or by an ac potential above 115 V*

*AC voltage accuracy decreases at lower voltages and is ±8 ms in worst case (6 V rms applied just following wave-shape peak).

Cycles Mode: ±0.5 cycle when initiated by a dry contact, a dc potential above 5 V or an ac potential above 115 V

Environment

Operating temperature is from 32 to 100° F (0 to 38° C)

Enclosure

The instrument is housed in a high-impact plastic case with lead compartment and equipped with carrying handle and removable cover.

Dimensions

13.5 H x 9.6 W x 9.5 D in.
344 H x 245 W x 242 D mm

Weight

12 lb (5.5 kg)

ORDERING INFORMATION

Item (Qty)	Cat. No.
Solid-State Digital Timer	SST-9203
Included Accessories	
Line cord (1)	6828
Fuses	
0.25A, 250 V (5)	14692
0.5A, 250 V (5)	14693
Test leads (1 pr)	1282
Pouch (1)	14694
Instruction manual (1)	15027



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Safety Precautions

WARNING

The AVO Multi-Amp Model SST-9203 Timer is designed for use on energized circuits. For the safety of the operator and protection of the instrument, do not connect it to circuits that have voltages present beyond the limits of operation stated in the specification. This includes circuits that could become energized during the course of a test procedure utilizing this instrument.

CAUTION

The input voltage of this instrument is selectable. All the units are shipped from the factory set up for operation from a nominal 115 volt, 60 Hz source. If this unit is to be used on a 230 volt source, refer to the Input Voltage Selection section for proper instructions. If the unit is to be used in a 50 Hz environment, refer to Frequency Selection section for instructions.

For safe operation it is absolutely essential that the operator properly and effectively ground (earth) the test set. When using battery operation mode, this is accomplished by connecting an earth ground to the ground terminal on the front panel. When using AC line power, this is accomplished by connecting the input line cord to a properly grounded receptacle. In high noise environments, the front panel ground may be required even if the unit is plugged into a grounded receptacle.

The test leads provided with the Model SST-9203 are sufficiently insulated to withstand any voltage encountered within the specified operating voltages of the instrument as stated in the specification. For the operator, if test leads of another type or manufacture are used, the insulation rating and quality should be at least equal to that of the leads provided.

Input Voltage Selection

All Model SST-9203 timers are manufactured as dual voltage (115/230 V) unit and are shipped from the factory with the input voltage or nominal 115 volt operation. When it is desired to operate the Model SST-9203 from a nominal 230 V power source, it is necessary for the operator to change the input voltage selection switch

Open the timer and remove lid. Make sure the AC line cord is disconnected from the front panel connector. To access the voltage change switch, invert the timer and carefully remove the four (4) rubber bumper feet. Using a long screwdriver, remove the four (4) screws holding the timer and the case together. Remove case from timer assembly. Locate the battery charger PCB assembly in upper right corner of the case. Adjacent to the power transformer is the voltage adjust switch, slide the switch to the desired operating line voltage.

NOTE: Do not change voltage switch with the line cord plugged in. Replace case onto timer assembly. Using a long screwdriver, replace the four (4) screws. Replace the four (4) bumper feet. Use unit as required.

Input Frequency Selection

All Model SST-9203 Timer remanufactured as dual voltage and dual frequency units. They are shipped from the factory set for nominal 115 volt operation and 60 Hz internal timing reference. If it is necessary to change the timing reference from 60 Hz to 50 Hz, a jumper on the timer motherboard must be changed.

Open the timer and remove the lid. Make sure the AC line cord is disconnected from the front panel connector. To access the internal timing jumper, invert the timer and carefully remove the four (4) rubber bumper feet. Using a long screwdriver, remove the four (4) screws holding the timer and case together. Remove case from the timer assembly. Locate the timer motherboard (P/N 14569 - the card has an edge card connector on it). Using long nose pliers or tweezers, move jumper from JP2 pin 1 & 2 to JP2 pins 2 & 3. Replace case onto the timer assembly. Using a long screwdriver, replace the four (4) screws. Replace the four (4) rubber bumper feet. Use unit as required.

BATTERY AND CHARGER

The battery in the SST-9203 is a 6 Volt, 4 ampere hour gel cell. It is completely sealed and will operate in any position.

Anytime the timer is plugged into an AC source, the battery will be charging. The power switch only turns on the electronics. The charging circuit is automatic and needs no adjustment to maintain correct battery voltage.

Battery Replacement

Open the timer and remove lid. Make sure the AC line cord is disconnected from the front panel connector. To access the battery, invert the timer and carefully remove the four (4) rubber bumper feet. Using a long screwdriver, remove the four (4) screws holding the timer and the case together. Remove case from timer assembly. Locate the battery, remove and place with new battery. NOTE: Do not change battery with the line cord plugged in. Replace case onto timer assembly. Using long screwdriver, replace the four (4) screws. Replace the four (4) bumper feet. Snap on lid.

After installing a new battery, allow time for the battery to come to a full charge before attempting extended testing without using AC power input.

THEORY OF OPERATION

SPECIFICATIONS

INPUT

115/230 v, 50/60 Hz, 3 VA

DISPLAY

0.3-in. (7.6-mm) LED, 6 digits

BATTERY CAPACITY

Six hours of continuous usage on a single, full charge. Low battery indication lamp. (Recharge time is twice the time used on battery power. Battery charger is built-in.)

COUNTER

The specially designed Multi-Amp solid state digital counter measures the elapsed time of the test in either seconds or cycles. It has extensive shielding and noise-suppression circuitry to ensure accurate and reliable operation under the most demanding field conditions. Incorporating a crystal-controlled oscillator, its accuracy is independent of the power-line frequency.

RANGES (switch-selected)

0.0001 to 99.9999 seconds

0.01 to 9999.99 seconds

0.1 to 99999.9 cycles

ACCURACY

The overall accuracy of the instrument, including start and stop gate errors, is:

Seconds Mode: \pm least significant digit (0.0001 or 0.01 depending on seconds range in use) or .005% of reading, whichever is greater, when initiated by a dry contact, a DC potential above 6 V or by an AC potential above 115 V*

Cycles Mode: \pm 0.5 cycle when initiated by a dry contact, a DC potential above 6 V or an AC potential above 115 V

* AC voltage accuracy decreases at lower voltages and is \pm 8 ms in worst case (6 Vrms applied just following waveshape peak).

Warm-Up Time: Allow approximately 30 minutes for highest accuracy.

ENCLOSURE

The instrument is housed in a high-impact plastic case with lead compartment and equipped with carrying handle and removable cover.

DIMENSIONS

13.5 H x 9.6 W x 9.5 D in.

344 H x 245 W x 242 D mm

WEIGHT

12 lbs. (5.5 kg)

STOP Binding Post	The top signal selected by the STOP Selector Switch is applied to the binding post.
START LATCH	This two position switch is used in conjunction with the START Selector Switch and START Binding Posts to control the starting of the counter. When "ON", the START LATCH allows timing to be initiated by any start gate and to be stopped only by the stop gate selected with the STOP Selector Switch and applied at the STOP Binding Posts. When "OFF", the START LATCH allows timing to be initiated by any start gate and to be stopped when the start gate is reversed (such as timing the closing and opening of a single contact when measuring the trip-free operating time of a circuit breaker).
ON/OFF Switch	Selector Switch and START Binding Post to control the starting of the counter. When "ON", the START LATCH allows timing to be initiated by any start gate and to be stopped only by the stop gate selected with the STOP Selector Switch and applied at the STOP Binding Posts. When "OFF", the START LATCH allows timing to be initiated by any start gate and to be stopped when the start gate is reversed (such as timing the closing and opening of a single contact when measuring the trip-free operating time of a circuit breaker).
STOP LATCH	The two position switch is used in conjunction with the STOP Selector Switch and STOP Binding Post to control the stopping of the counter. When "ON", the STOP LATCH allows timing to be stopped at the first operation of any stop gate (thus ignoring contact bounce, for example). When "OFF", the STOP LATCH allows timing to be stopped by any stop gate and then restarted if the stop gate reverses (provided the start gate is still energized) and then again stopped when the stop gate is again energized.
ON/OFF Switch	Switch and STOP Binding Post to control the stopping of the counter. When "ON", the STOP LATCH allows timing to be stopped at the first operation of any stop gate (thus ignoring contact bounce, for example). When "OFF", the STOP LATCH allows timing to be stopped by any stop gate and then re-started if the stop gate reverses (provided the start gate is still energized) and then again stopped when the stop gate is again energized.
START/STOP Selector Switches	Two identical, independent, four-position switches are provided for selection of start and stop gates. The left switch is used to select the start gate operating mode while the right switch is used to select the stop gate mode. The following modes are provided for both the start gate and the stop gate. <ul style="list-style-type: none"> <li data-bbox="435 1808 1499 1915">a. Dry Contact Closure (N.O. DRY CONTACTS). Timer starts or stops at the closure of a normally open contact or upon conduction through a semiconductor device such as a SCR, triac or transistor.

- b. Dry Contact Opening (N.C. DRY CONTACTS). Timer starts or stops at the opening of a normally closed contact or when conduction through a semiconductor device such as a SCR, triac or transistor is interrupted.
- c. Application or AC or DC Potential (AC/DC APPLIED). Timer starts or stops when an AC potential (5-300 volts rms) or DC potential (6-300 volts) is applied.
- d. Removal of AC or DC Potential (AC/DC REMOVED). Timer starts or stops when an AC potential (65-300 volt rms) or DC potential (6-300 volts) is removed.

PREPARATION FOR OPERATION

Circuit Connections

Test all circuits the SST-9203 START/STOP Binding Posts are to be connected to. If dry contact operation is to be used, be sure the circuit will not become energized when the device to be tested operates. If energized contact operation is to be used, be sure that voltage levels that are or will be present on the test circuits will not exceed the rating of the instrument. The voltage levels present must also be within the operating range of the START/STOP circuit or timing error will result.

The test leads provided are sufficiently insulated for test voltages within the specifications of the instrument.

Control Section

The Model SST-9203 provide wide variety of timing functions. The operator must determine what type of timing condition will be presented and select the appropriate functions that will permit the Model SST-9203 to perform the desired tests. This can be best accomplished if the operator is thoroughly familiar with the various functions of the unit prior to its use by reviewing the Description of Controls and the Timing Functions sections of the manual.

Timing Functions

The timing functions are explained in the Operating Procedures and Description of Controls. However, they can be best understood by the following method:

1. If necessary, connect the input line cord to the correct power source.
2. Connect one pair of test leads to the START Binding Posts and one pair to the STOP Binding Post.
3. Select the N.O. DRY CONTACTS position with the START and STOP Selector Switch.
4. Select any timer mode and range desired.

5. Switch both the START and STOP LATCH Switches to the OFF position.
6. Switch the POWER ON. The timer display will light.
7. Press the timer RESET Button.
NOTE: Always reset the timer prior to beginning a timing test. This is especially important when any control functions are changed.
8. Touch the START test leads together to start the timer. Separate them and the timer will stop. The timer will continue to start and stop every time the START tests leads are touched together and separated.
9. Put the START LATCH Switch in the ON position.
10. Reset the timer.
11. Touch the START leads together and then separate them. The timer will continue to run.
12. Touch the STOP leads together. The timer will stop. Separate the STOP leads. The timer will remain stopped, only as long as the Stop Leads are touching. The timer will restart and continue counting until the STOP leads are again touched together.
13. Stop the timer.
14. Put the STOP LATCH in the ON position.
15. Reset the timer.
16. Start the timer by momentarily touching the START test leads together. The timer will start and continue to run. Momentarily touch the STOP test leads together. The timer will stop. Attempt to restart the timer without pressing the RESET button. The time will remain stopped.
17. Reset the timer and repeat the test. This selection will provide starting and stopping from momentary contact closure.
18. Put the START LATCH in the OFF position.
19. Reset the timer. Repeat the Test as described in Step 8. The Timer will run only as long as the Start Leads are touching. It may be stopped by separating the Start Leads or by touching the Stop Leads

Steps 1-19 demonstrate all the basic starting and stopping functions of the Model SST-9203.

The N.C. DRY CONTACTS selection functions opposite of the N.O. DRY CONTACTS selection. Rather than touching the leads together to start or stop the timer they are separated, simulating a closed contact moving to the open position. Similarly, AC/DC

APPLIED acts like an open contact moving to the closed position, and AC/DC REMOVED acts like a closed contact moving to the open position.

Experiment with the different START/STOP functions and various combinations of them, including the LATCH function, to fully understand what the timer will do in a desired test situation.

It is important to note that incorrect timer functioning during a test is generally caused by either an incorrect control selection, not resetting the timer prior to initiating the test or not properly identifying the control points used in the test scheme.

TEST PROCEDURES

There are literally hundreds of testing applications for the Model SST-9203. There are 48 control function combinations and three timer mode selections. Once the operation of the Model SST-9203 is thoroughly understood, the operator can easily construct a test procedure for each application encountered. Various procedures could be suggested by AVO Multi-Amp, but the correct method of timing various devices depends entirely on the recommendations of the manufacturer of the device and the preferences of the operator or the organization that sets the standards for performing such test. Therefore, a General Test Procedure has been provided to guide the operator. It is recommended that the operator add appropriate test procedures to the Test Procedures section as each situation is encountered. If various specific or standard procedures are already available, adding copies of them to the Test Procedures Section for convenient field reference is suggested.

General Test Procedures

Refer to all cautionary statements and other instructions prior to making any test connections.

1. If necessary, connect the instrument to a suitable source of power.
2. Switch the POWER ON/OFF Switch ON. The timer display should light.
3. Switch the START Selector Switch to the desired position for the START function to be used.
4. Switch the START LATCH ON/OFF Switch to the desired position. If it is desired to use a separate STOP function to stop operation of the timer, switch the START LATCH ON. If it is desired to use the reversal of the START signal to stop the timer (such as timing the closing and opening of single contact when measuring the trip-free operating time of a circuit breaker), switch the START LATCH OFF.
5. When it is desired to use a separate stop gate signal to stop the timer, switch the STOP Selector Switch to the desired position.

6. Switch the STOP LATCH ON/OFF Switch to the desired position. If it is desired to have the timer stop upon the first stop signal only, switch STOP LATCH ON. If it is desired to have the timer restarted if the stop signal reverses (as when measuring contact bounce), switch STOP LATCH OFF.
7. Switch the .01 S/.0001 S/CYCLES Switch to the desired mode.
8. Make necessary connections to the START and STOP Binding Post.
9. When the appropriate start and stop signals are applied, the display indicates the elapsed time of the test.

NOTE: Always reset the timer before each timing test to assure all logic circuits are in the correct state, even when the display reads zero. This is especially recommended when any switch positions are changed.

SERVICE DATA

Servicing

The timer utilizes straight forward circuits and components which require little or no service except for routine cleaning, tightening of connections, etc. The timer should be serviced in a clean atmosphere away from energized electrical circuits. The following maintenance is recommended:

1. Open the unit every six months and examine for:
 - a. dirt
 - b. moisture
 - c. corrosion
2. Remove dirt with dry, low pressure, compressed air.
3. Remove moisture as much as possible by putting the test set in a warm, dry environment.
4. As corrosion may take many forms, no specific recommendation can be made for its removal.
5. Inspect battery and lead connections.

Service and Repair Order Instructions

If factory service is required or desired, contact the factory for return instructions.

A Repair Authorization (RA) number will be assigned for proper handling of the unit when it arrives at the factory.

If desired, a letter with the RA number and instructions can be provided.

Provide the factory with model number, serial number, nature of the problem or service desired, return address, your name, and where you can be reached should the factory need to contact you.

If desired, you may also provide a purchase order number, cost limit, billing, and return shipping instructions.

National Institute of Standard and Technology (NIST) traceable calibration and certification of two types is available, if desired, at additional cost.

Class One: A certificate is provided verifying the traceability and calibration of the equipment

Class N: That which is required for nuclear power plant. A certificate of traceability and calibration along with "as found" and "as left" are provided.

If an estimate is required, provide the name and contact information of the person with approval/disapproval authority.

Pack the equipment appropriately to prevent damage during shipment. If a reusable crate or container is used, the unit will be returned in it if it is in suitable condition.

Put the RA number on the address label of the shipping container for proper identification and faster handling.

NOTE: Ship the equipment without instruction manuals or nonessential items such as test leads, spare fuses, etc. These items are not needed to conduct repairs.

Preparation for Reshipment

Save the shipping container for future use. The shipping container your unit came in is designed to withstand the normal bumps and shocks of shipping via common commercial carrier. For example you may wish to reship your unit to AVO Multi-Amp for annual calibration certification.

WARRANTY STATEMENT

AVO Multi-Amp Corporation warrants to the original purchaser that the product is free of defects in material and workmanship for a period of one (1) year from date of shipment. This warranty is limited and shall not apply to equipment which has damage, or cause of defect, due to accident, negligence, improper operation, faulty installation by the purchaser, or improper service or repair by any person, company or corporation not authorized by AVO Multi-Amp Corporation.

AVO Multi-Amp Corporation will, at its' option, either repair or replace those parts and/or materials that it deems to be defective. Any cost incurred by the purchaser for the repair or replacement of such parts and/or material shall be the sole responsibility of the original purchaser.

THE ABOVE WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EITHER EXPRESSED OR IMPLIED ON THE PART OF THE AVO MULTI-AMP CORPORATION, AND IN NO EVENT SHALL THE AVO MULTI-AMP CORPORATION BE LIABLE FOR THE CONSEQUENTIAL DAMAGES DUE TO THE BREACH THEREOF.

REPAIR DATA

It is not always necessary to return the complete instrument to the factory for repair. To save time and reduce costs, basic troubleshooting information has been provided to guide the technician to the possible source of a problem.

At least half of all problems experienced with the Model SST-9203 are minor and can be corrected with a single replacement part. More extensive problems can be corrected by replacing printed circuit board assemblies in the timer assembly. Repairs beyond the scope of the troubleshooting guide should be referred to the Service Department at AVO Multi-Amp or handled through the AVO Multi-Amp Representative

If the unit is still within the original warranty period, or limited warranty period following factory servicing, the factory must be contacted before attempting any repairs or the warranty will be void.

The troubleshooting information relies on the schematic drawings provided with this manual and are normally sufficient for this purpose. Be advised that the drawings are applicable to the unit the manual was supplied with at the time of purchase. If the instruction manual was obtained separately, the drawings will be applicable to the equipment in production at that time and may not duplicate the unit being repaired. It is recommended that if a difference between the unit and the drawings exists, the technician should contact the factory before attempting repairs. Provide the AVO Multi-Amp part number for the part or assembly in question and the serial number of the SST-9203 when making inquiries

Basic Troubleshooting

WARNING

It is necessary to energize the SST-9203 to properly troubleshoot some parts of the circuitry. The technician must take all applicable safety precautions for working on energized circuits.

NOTES

Before suspecting a failure in the instrument, review the Timing Functions, Description of Controls and Timing Variables section to ensure that the problem is not a result of operating error.

Preliminary testing of the SST-9203 within its specified limits can help determine if a malfunction actually exists, identify the type of malfunction and define the general area of the failure.

Failures often occur from components simply wearing out from use. This of course is normal, but occasionally they wear out prematurely or fail as a result of conditions occurring during operation of the instrument. Common causes of malfunctions, other than improper operation, are incorrect power input (voltage above or below specified limits), incorrect test signal voltages (outside of the specified AC/DC Applied/Removed limits), and contact or circuit

resistance too great for the Dry Contact gates to operate properly. These causes can affect either chassis assembly parts, timer assembly parts, or both.

Power Input

Input voltage affects the whole unit and may or may not cause permanent damage if voltage is incorrect. These problems can often be corrected by simply using better source of input power. The rated voltage limits is nominal 115 Vac and 230Vac, 50 or 60HZ.

Some symptoms are as follows:

1. Low voltage:
Weak display, latch relay is sluggish, START/STOP gates function erratically, timing inconsistent, fuses fail.
2. High voltage:
Varistor failure, battery charger assembly power supply failure.

Chassis Assembly

Refer to Schematic Drawing 28008C.

Basic troubleshooting of the main chassis and front panel components are as follows.

1. No power:
Check power source, input fuse, line cord, voltage at battery charger PCB, power switch and wiring
2. Start/Stop Latch malfunction:
Auxiliary relay contacts dirty or relay defective, varistor failure, latch switch failure
(Notes: Latching occurs with switch contacts open.)
3. Start/Stop function problem:
START and/or STOP Selector Switch faulty, dirty contacts, broken jumpers or wiring, bad connection, resistor failure.

Timer Assembly

Refer to Schematic Drawing 28008C.

If all the items external of the timer assembly are in proper order then the problem exist within the timer assembly itself.

The timer assembly is constructed of two basic parts:

1. Display PCB assembly (P/N 14570)
2. Mother PCB assembly (P/N 14569)

The complete timer assembly can be removed from the case of the SST-9203 by removing the four screws located on the bottom of the case and lifting the timer out. It is usually recommended that the complete timer assembly be returned for factory repair if found to be defective. Then any improvements that have been made in the assembly can be incorporated into it during repair and servicing.

Some basic troubleshooting can pinpoint problems to the approximate cause, if it is desired to repair the timer on site.

Basic troubleshooting is as follows:

1. No display when the SST-9203 is energized:
Power supply failure, defective display IC's, defective components on or connections to P/N I4504 PCB. Battery may be defective.
2. Weak or defective display:
Poor supply voltage defective display(s), defective components on P/N 14569 PCB or P/N 14570 PCB.
3. Problems with .01 S/.0001 S/CYCLES selection:
Defective selector switch(es) defective circuit resistors or defective IC's on P/N I4569 PCB or P/N 14570 PCB.
4. Problems with timer reset:
Defective pushbutton switch on P/N I4570 PCB or defects in P/N 14569 PCB.
5. Counting error:
 - a. Defects in P/N 14569 PCB. Defective IC UI.
6. Latch malfunction:

NOTE: The latch relay (X1) is controlled by the timer assembly. Therefore, relay malfunctions can be caused by timer malfunctions.

 - a. Latch relay (X1 on panel) not functioning:
Defective relay (X1) or relay (K1) on P/N 14569 PCB.
 - b. No Start/Stop Latch: Defects on P/N 14569 PCB.
7. Start/Stop malfunction:
 - a. All Start/Stop modes malfunction:
Defective IC U3 on P/N 14569 PCB. Defective DB4, DB5, Q1, Q2, U5, U6, U8 on P/N 14569 PCB on U1 on P/N I4504 PCB.

- b. AC/DC Applied/Removed Start/Stop malfunction:
Defective DB4, DB5, Q1, Q2, U5, U6, U8 on P/N 14569 PCB or U1 on P/N 14504 PCB.
- c. N.O./N.C. Dry Contact Start/Stop malfunction:
Defective DB4, DB5, Q1, Q2, U5, U6, U8 on P/N 14569 PCB or UI on P/N 14504 PCB.

8. Power Supply malfunction

- a. No display:
Loss of T1, battery charging components or defective battery.
- b. Loss of timer Start (includes seconds Count):
Loss of 15V output of P/N 14504 PCB.
- c. Loss of timer Stop:
Loss 15 V output of P/N 14504 PCB.

NOTE: There are two 15V isolated outputs from U1 on P/N 14504 PCB.

Timing Errors

AC applied removed Start/Stop signals can create what appears to be poor repeatability, an inaccuracy or a malfunction in the timer. The lower the voltage level, the more serious the error will be. What appears to be an error, however, is actually a variation in the point on the sine wave at which the voltage is great enough to cause the gate circuit to operate. If the circuit used for the timing test is a low AC voltage and the point at which the contact in the test circuit opens or closes is at or close to zero on the sine wave, the period of time before the voltage level is high enough to trigger the gate circuit can be as much as 4 milliseconds and the total timing variation can be as much as 8 milliseconds. The shorter the duration of the timing test, the more significant the variation becomes. Therefore, if small timing variations would present a problem, it is recommended that an AC voltage of 115 volts or above or a DC voltage be used for voltage applied/removed test selections.

When the SST-9203 is being calibrated, the AC voltage variable is often overlooked. This is particularly true when the timer is compared to a counter and the two are triggered simultaneously with an electronic switch. For best results, a DC voltage should be used to eliminate the variable. If testing the AC voltage Start/Stop characteristics is desired, then the Start/Stop signal must be triggered at the same point on the sine wave to assure that the gate signal will be repeatable. Ideally, the signal should be at a point near peak in the positive direction. In addition, the specified RMS AC voltage values or the various Start/Stop control selections must be adhered to.

If a timing error or variation persists after all the suspected cases of error have been eliminated then it is fairly certain the timer is malfunctioning.

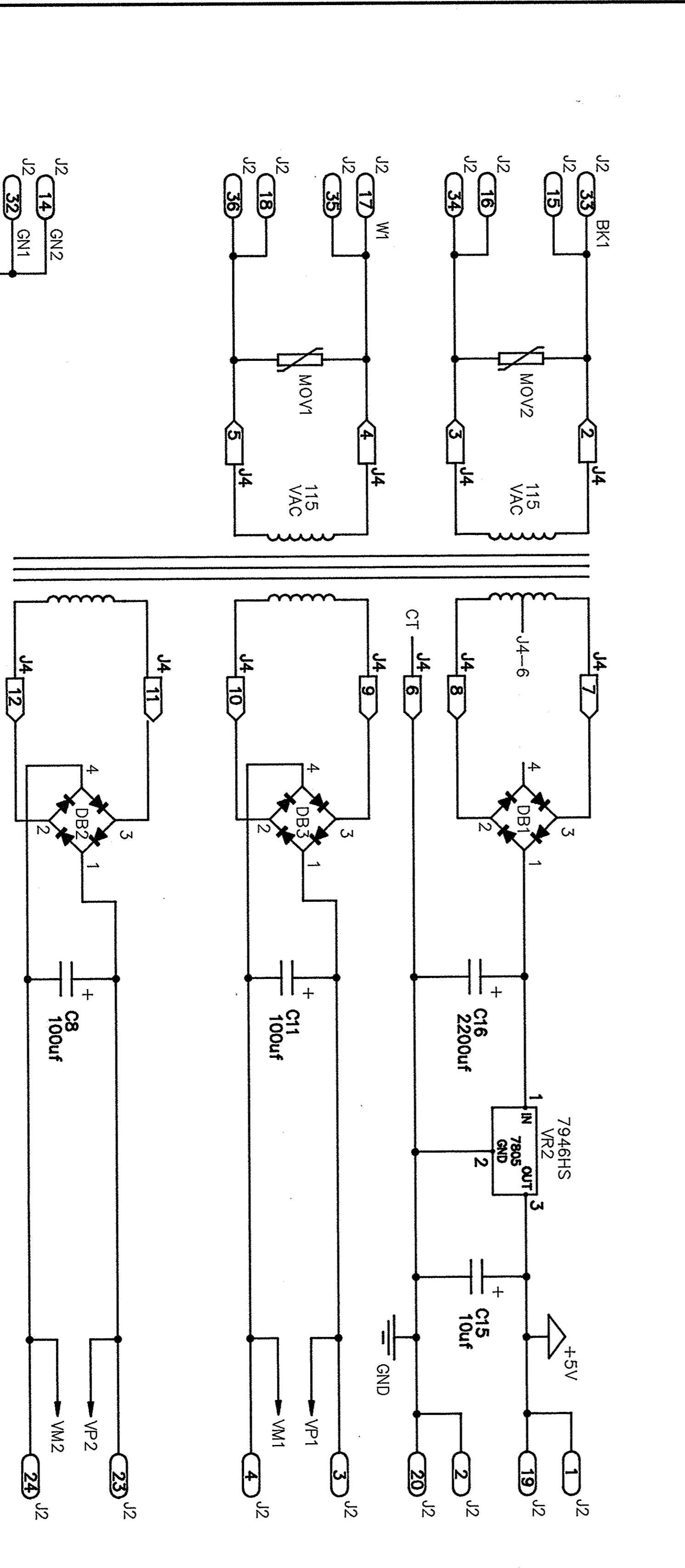
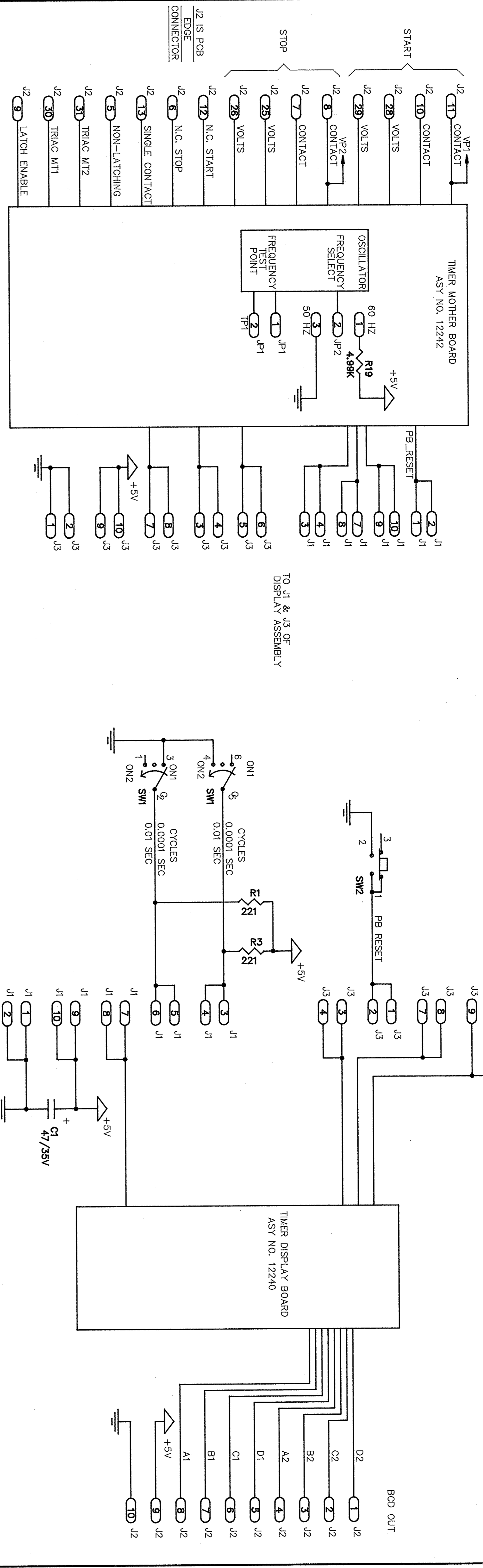
PARTS LIST
SST-9203 Timer Assembly

<u>Description</u>	<u>Part No.</u>
Schematic Drawing	28008C
Printed Circuit Boards	
Mother Board Assembly	14569
Display Assembly	14570
Parts in PCBD 14504	
IC Reference, 1.2V	6673
Transformer	8752
Voltage Comparator	8819
DC/DC Convertor	14533
IC Regulator, 0.5 A	8312
IC Regulator, 1.5 A	8542
Parts in PCBD 14569	
Start/Stop PAL	12085
Oscillator/Divider PAL	12086
Relay, DIP-1	71071
Crystal	6986
CMOS Hex Debounce	8285
Optocoupler	4261
Parts in PCBD 14570	
Driver Decoder	8284
Display, 7 segment	8154
Switch, pushbutton, 2PDT	3681
Switch, Toggle, 2PDT	8125
Parts Mounted Chassis	
Battery	10260
Battery Charger PCB Assembly	14504
Parts Mounted on Front Panel	
Bezel Assembly (red lens)	14518
Switch, rocker	14575
Switch, rotary	14576
Relay	14604
Resistor	2894

NOTES:

1. "Bare" printed circuit boards (without components) are not available.
2. Printed circuit boards contain two part numbers. Use only the assembly part numbers which should correspond to those given above.

REV	ENR	DATE	APPROVED



POWER SUPPLY CIRCUIT IS SHOWN FOR REFERENCE.
IT IS PART OF TIMER MOTHER BOARD.

SIGNATURES		DATE
DWN DJENKE	12/07/92	
CHK		
ENGR		
APVD		
RELEASE		
FILE NO.	26037A00	
PART NO.	12034	
SCALE	NTS	1=1
SHEET	34.22	1 OF 1

UNLESS OTHERWISE SPECIFIED	
ALL DIMENSIONS IN INCHES	
TOLERANCE: 2 PL ± .030	
ANGLES ± 1°	
RAIUS ROUNDED UNLESS OTHERWISE SPECIFIED	
ALL SURFACES UNLESS OTHERWISE SPECIFIED	

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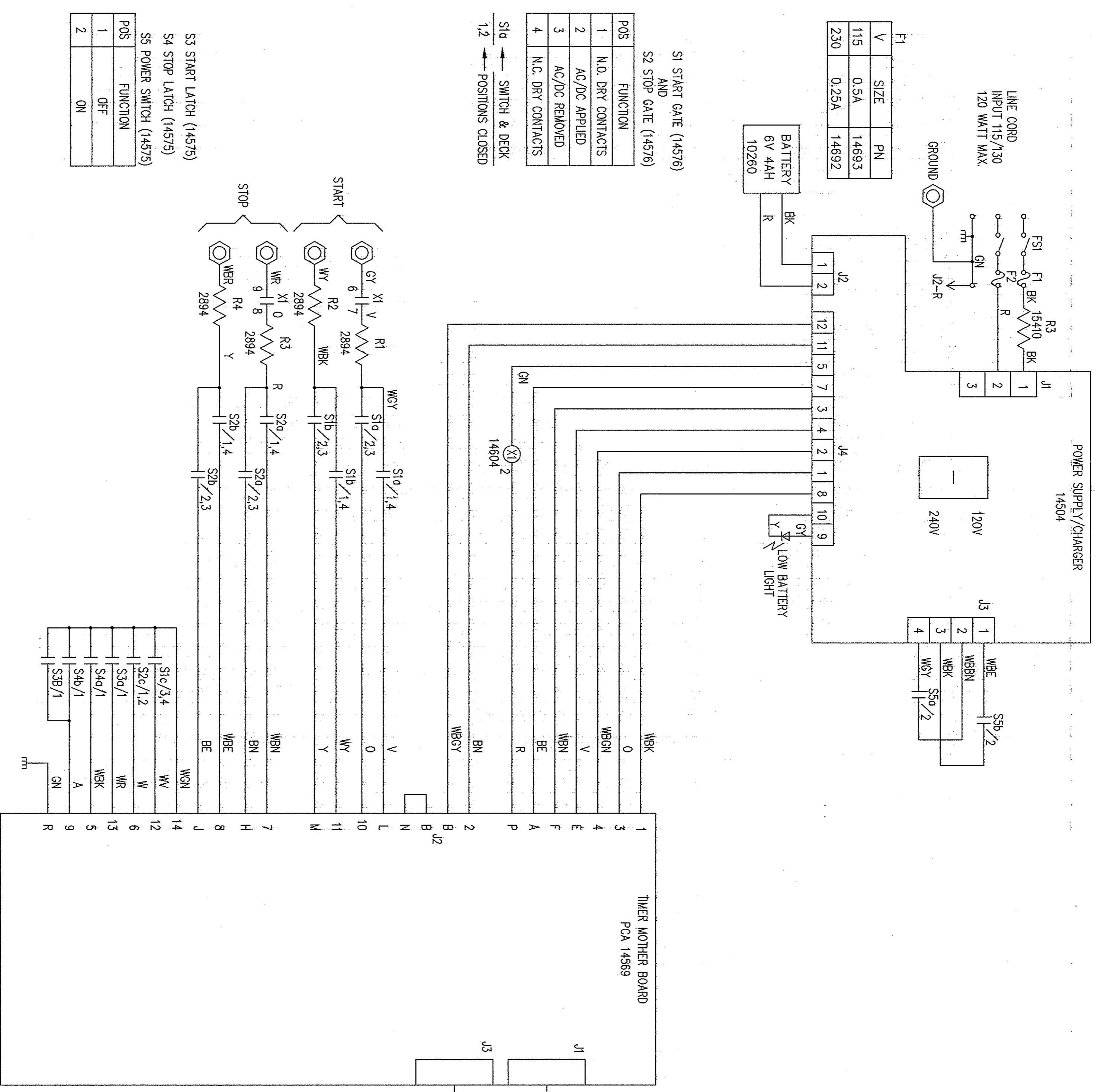
AVO MULTI-AMP®
4371 BRONZE WAY
DALLAS, TEXAS 75237
(214) 350-3201

TITLE SCHEMATIC,
DIGITAL TIMER

SIZE DWG NO 26037D REV 0

26037D
EASI FILE CORP. IRVINE, CA
EFH22

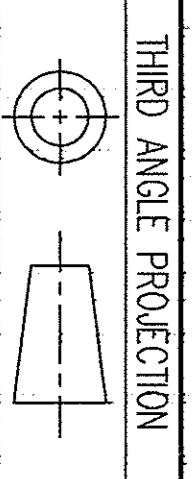
REV	EON	DESCRIPTION	DATE	APP'D
0	24695	REDRAWN PER EON	9/21/92	
1	25050	REDRAWN PER EON	2/22/93	
2	25914	REDRAWN PER EON	13MAR94	
3	29436	SEE EON	11-12-03	(Signature)



F1	V	SIZE	PN
115	0.5A	14693	
230	0.25A	14692	

POS	FUNCTION
1	N.O. DRY CONTACTS
2	AC/DC APPLIED
3	AC/DC REMOVED
4	N.C. DRY CONTACTS

POS	FUNCTION
1	OFF
2	ON



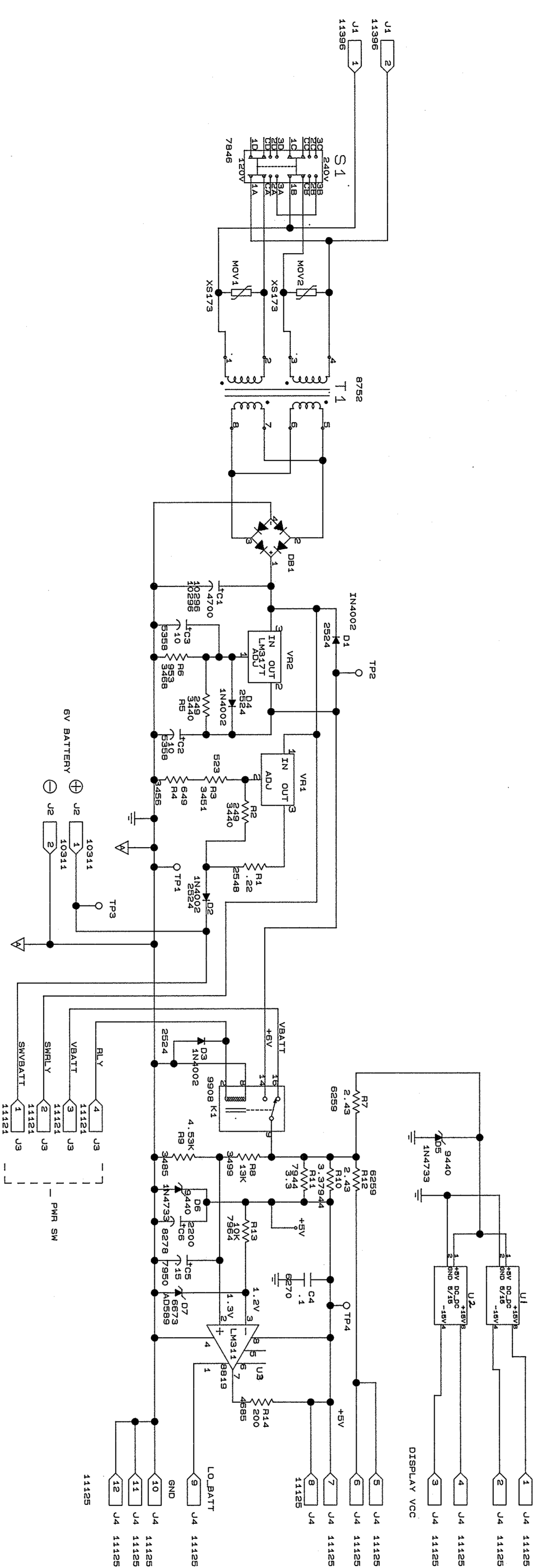
SIGNATURES		DATE	TITLE	
DWN KG		04/10/94	SCHEMATIC, SST-9203	
ENG				
APD				
RELEASE				
FILE NO	28008A03		SIZE DWG NO	28008C
PART NO	SST-9203		SCALE	N.T.S. 1=1
			SHEET	34,22 1 OF 1

REF DWG - 29136

4271 BRONZE WAY
DALLAS, TEXAS 75237
(214) 350-9201

28008C Rev. 3

REV. NO.		28115D	
REV.	ECN	DATE	
0	24695	9/21/92	
1	24993	1/25/93	
2	25360	7/5/93	
3	28792	1-24-00	

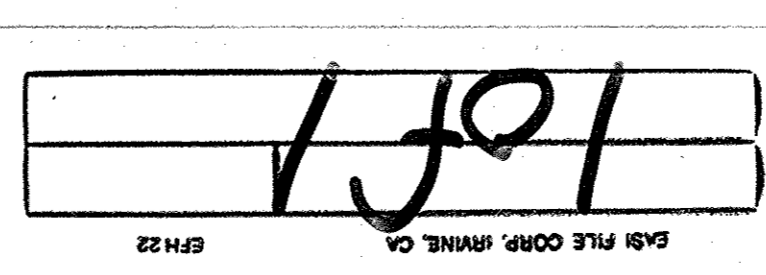


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AVO MULTI-AMP (214) 393-3501
 CORPORATION 4571 BRONZE WAY DALLAS, TEXAS 75237
 ENGR. *MM* DATE 7-8-93
 TITLE SCH TIMER BATT CHG SHEET 1 OF 3
 PART NO. 14504 DWG. NO. 28115D REV. 3

ASY DWG 28115B
 281148M
 PCB (14503) 28113BP

14504RO 7-8-1993 9: 33



28115D