FOREWORD

This manual is written for use by highly skilled technicians. Inexperienced personnel should not attempt repair, but should return damaged or malfunctioning amplifiers to the factory for service.

A579, A580, A581

SCR AMPLIFIER MANUAL

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1. DESCRIPTION

1.1 FUNCTIONAL DESCRIPTION

The WESTAMP Models A579, A580, A581 Motor Controls (Servo Amplifiers) are designed for Industrial Applications requiring proportional control of DC motors in position or speed control systems or equipment. The amplifiers are powered from any single phase (50, 60, 400Hz) source and provide full wave, bi-directional DC output proportional to control signal input. The amplifier features include three adjustable gain signal inputs, adjustable current limit. high power fast rise gate pulse, and repetitive drive pulsing for inductive loads. These reliable, low cost amplifiers have high gain, high input impedance and will work directly with most error detection sensors and motors.

The Models A579, A580, A581 are of compact open modular construction for mounting on panels or in cabinets. For special applications, the amplifiers can be provided with coated circuit boards for protection against condensation and some corrosive atmospheres. All three models are essentially the same weight and mounting dimensions with the minor variation shown on the installation data page.

1.2 TYPICAL CHARACTERISTICS

OUTPUT CURRENT	Refer to Table	
OUTPUT VOLTS	± 90 VDC	± 180 VDC
POWER SUPPLY (50, 60, 400Hz, single phase)	115 Vrms	220 Vrms
INPUT SIGNAL	± DC	
INPUT SIGNAL MAXIMUM (No damage)	50 VDC	
INPUT IMPEDANCE	100 K	
INPUTS, NUMBER OF	3 Parallel Summing Inputs	
GAIN, VOLTAGE	1000 V/V	2000 V/V
GAIN STABILITY	± 2 db	
GAIN ADJUSTMENT	3 Inputs ind. adj. 0 to max.	
CURRENT LIMIT ADJUSTMENT	From rated down to 10%	
AMBIENT TEMPERATURE	- 20°C to + 55°C to + 75°C with blower	
ENCLOSURE	Optional	
POWER CONVERSION EFFICIENCY (Saturated output)	97%	

1.3 HORSE POWER RATINGS FOR CONTROLLERS

90VDC			180VDC		
RATING HP	MODEL DASH No.	DC AMPS AT MAX HP	RATING HP	MODEL DASH No.	DC AMPS AT MAX HP
.1-1	A579 -250C-	9 1/2	.5-2	A579 -250M-	9 1/2
1-3	A580 -550C-	28	1-5	A580 -550M-	24
3-5	A581 -1100C-	48	2-10	A581 -1100M-	48

MAXIMUM HP RATINGS IN TABLE ABOVE SHOULD BE REDUCED FOR HEAVY DUTY CYCLE (REPETITIVE STARTING OR REVERSING)

Note: There is no clear cut division between ratings for the various models. For border line selection, the actual model recommended depends upon factors such as duty cycle, reversing requirements, or unusual requirements. Amplifiers intended to drive static loads such as resistors or generator fields can be operated at substantially higher current levels than specified above for the maximum HP rating.

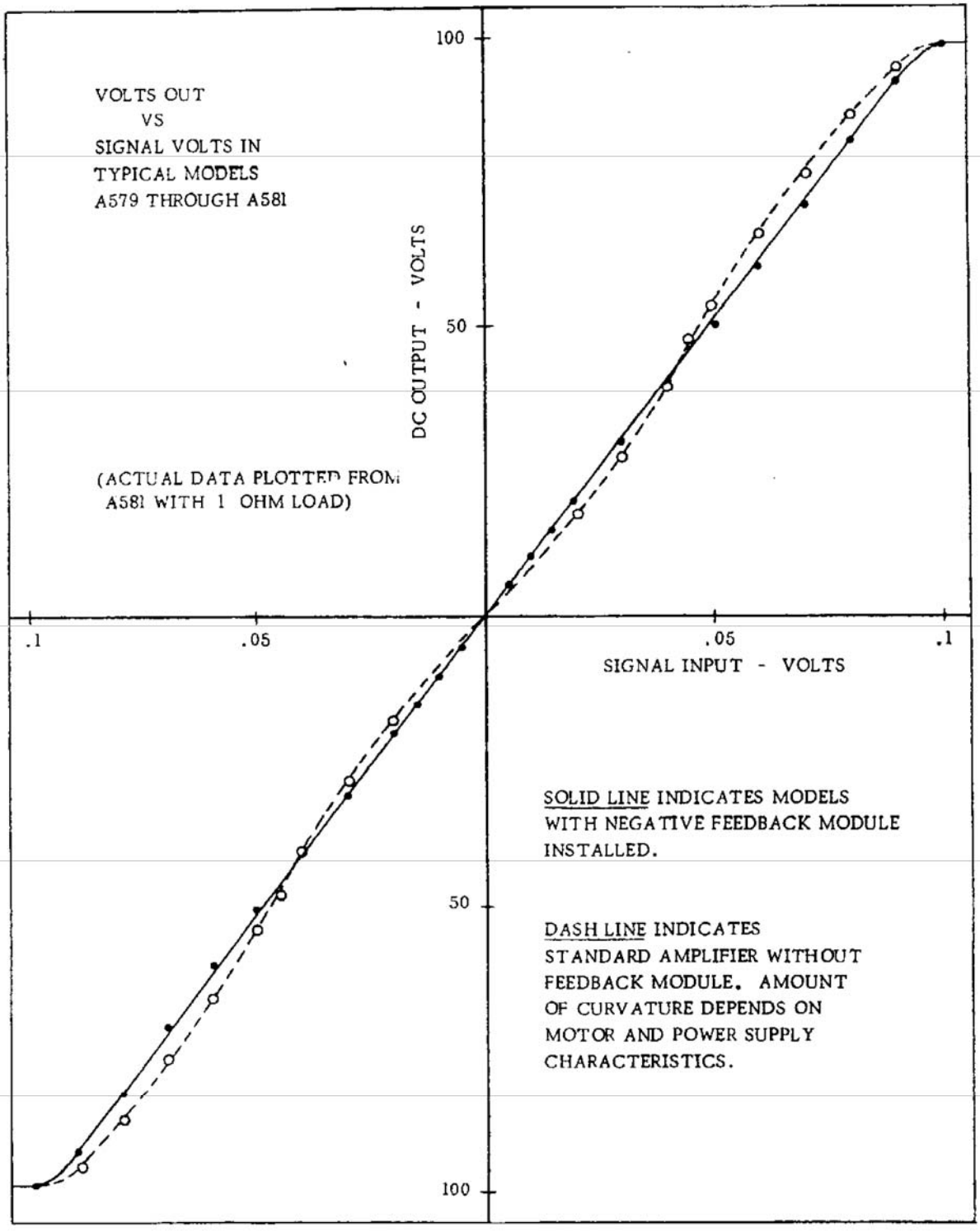
1.4 COMPLETE MODEL NUMBERS 60 Hz

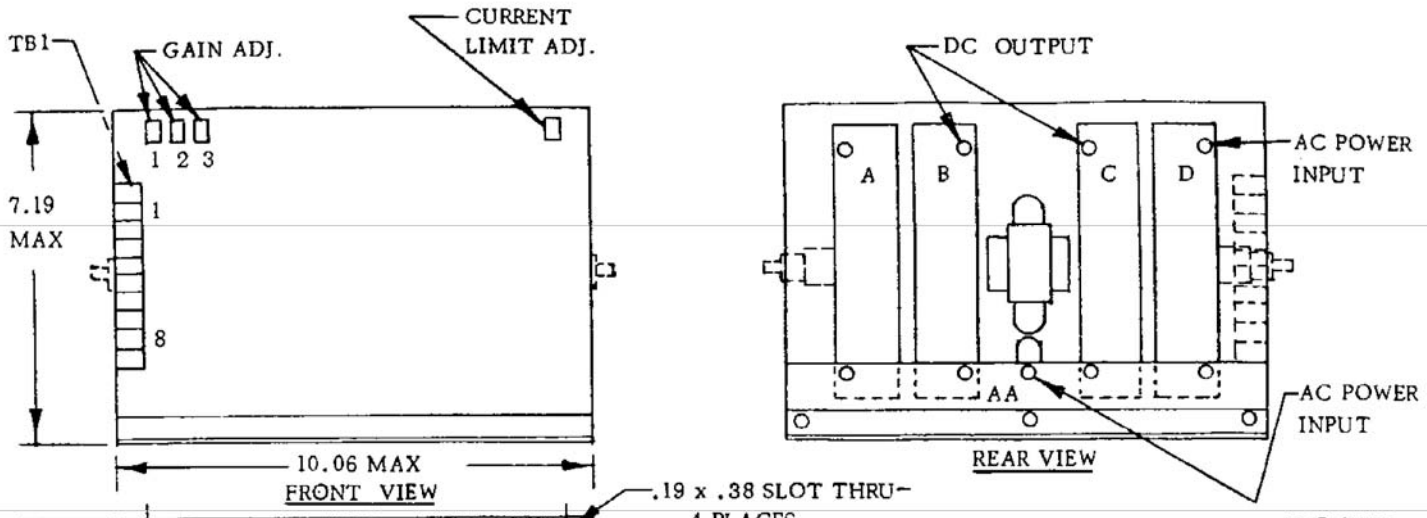
MAX HP	LINE 115 Vrms, MOTOR 90VDC	MAX HP	LINE 220 Vrms, MOTOR 180VDC
1	A579-250C-L3T6P-A	2	A579-250M-L3T6P-A
3	A580-550C-L3T6P-A	5	A580-550M-L3T6P-A
5	A581-1100C-L3T6P-A	10	A581-1100M-L3T6P-A

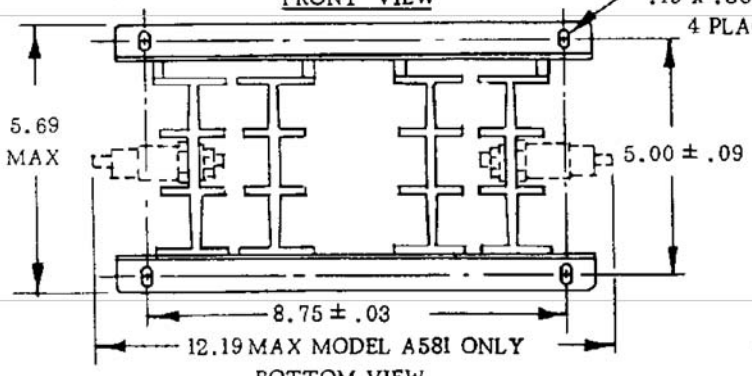
For 50 Hz or 400 Hz, substitute "5" or "4" respectively in place of "6" in model number (i.e. 6P or 5P, or 4P). For back mounted versions, change the "P" to "A" (i.e. A580-550C-L3T6A-A).

High gain amplifiers are subject to pickup and extraneous noise. If the intended application does not require the Standard Gain of 1000/2000, then it is recommended that a gain of 100 or 200 be specified for 115V or 230V amplifiers respectively. This is done by substituting a "-B" in place of an "-A" in the model numbers above.

Other special options included in an amplifier will have different dash letters than shown above. In this case see the back of this manual for additional information.



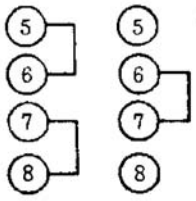


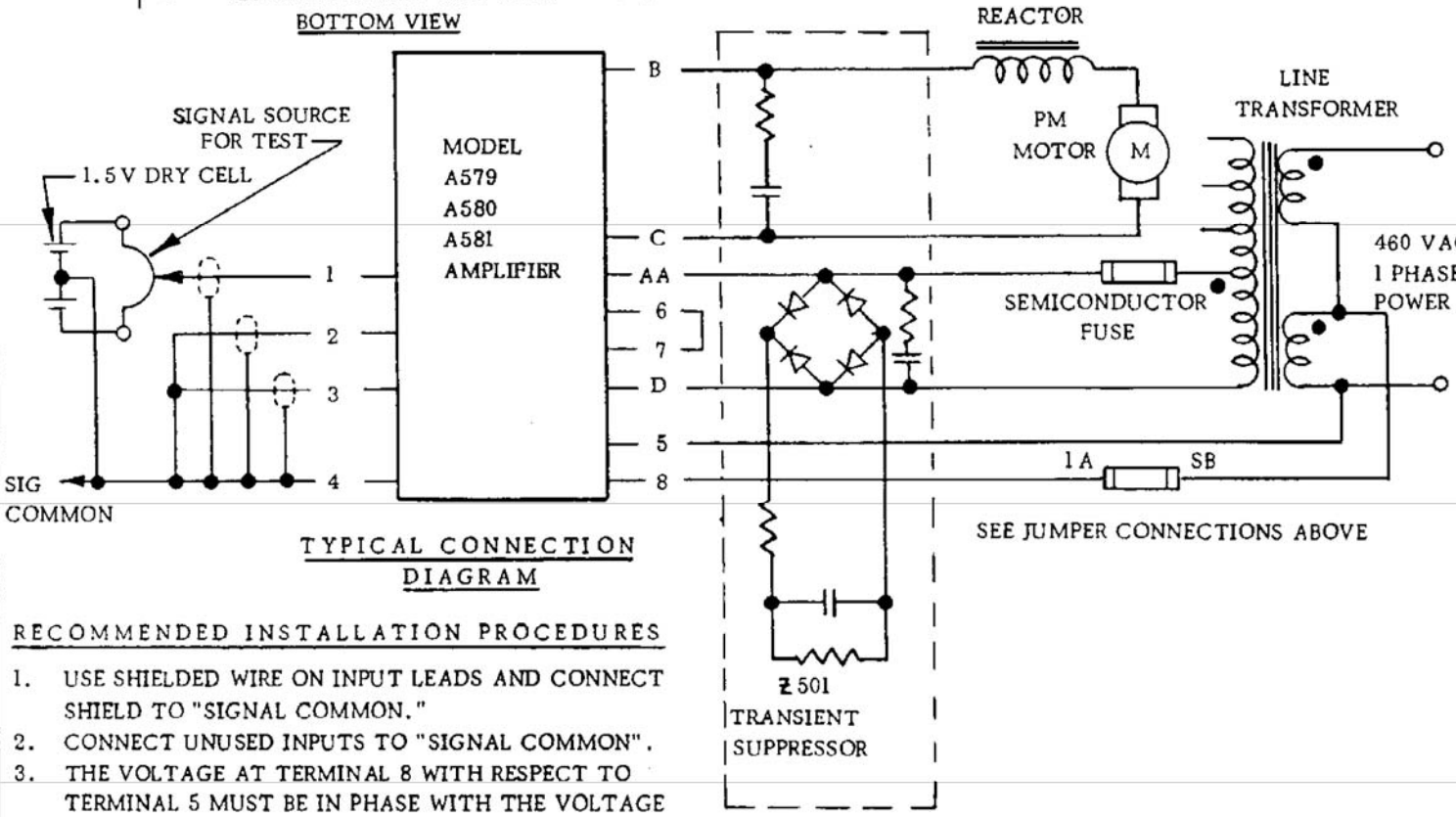


TERMINAL CONNECTIONS

1. DC SIGNAL INPUT
2. DC SIGNAL INPUT
3. DC SIGNAL INPUT
4. SIGNAL COMMON
5. AC REF. POWER
6. JUMPER
7. JUMPER
8. AC REF. POWER

AMPLIFIER JUMPER CONNECTIONS





TYPICAL CONNECTION DIAGRAM

RECOMMENDED INSTALLATION PROCEDURES

1. USE SHIELDED WIRE ON INPUT LEADS AND CONNECT SHIELD TO "SIGNAL COMMON."
2. CONNECT UNUSED INPUTS TO "SIGNAL COMMON".
3. THE VOLTAGE AT TERMINAL 8 WITH RESPECT TO TERMINAL 5 MUST BE IN PHASE WITH THE VOLTAGE AT TERMINAL "AA" W.R.T. HEATSINK "D".
4. CAUTION ! DO NOT USE GROUNDED TEST EQUIPMENT ON OUTPUT CIRCUIT.
5. TURN CURRENT LIMIT CONTROL CW FOR MAX. CURRENT.
6. OUTPUT HEATSINK "B" IS POSITIVE WITH RESPECT TO HEATSINK "C" FOR POSITIVE SIGNAL INPUT ON PINS 1, 2 or 3.

UNLESS OTHERWISE SPECIFIED: TOLERANCES: FRACTIONS ± 1/64 .XX ± .01 .XXX ± .005 ANGLES ± 2°			WESTAMP INCORPORATE 1542 15TH STRE SANTA MONICA, CA
INSTALLATION DRAWING			
MODEL A579, A580, A581			DWG NO.
DWN	CHK	APP.	
DATE	SCALE		SHEET OF

2. OPERATION

2.1 GENERAL

The amplifier, once properly installed and set up, requires no adjustment maintenance or calibration. After a short turn-on time delay, it requires no warm up period and will operate in the specified manner as soon as power is applied. Refer to Installation Drawing for installation data.

CAUTION ! THE SCR HEATSINKS AND THEIR ASSOCIATED CIRCUIT BOARD MOUNTING HARDWARE ARE AT AC LINE POTENTIAL.

2.2 ADJUSTMENTS

Gain Adjustments

The three gain adjustment potentiometers are located in the upper left hand corner of the circuit board. They are labeled "Gain Adjust 1, 2 and 3" and individually control the input signal amplitude of the barrier strip signal inputs, TB1 - 1, -2 and -3 respectively. Full clockwise potentiometer rotation is maximum gain per each input.

Current Limit Adjustment

The current limit adjustment potentiometer is located in the upper right hand corner of the circuit board. It is adjusted to allow the desired maximum output current (from 100% down to approximately 10%). Maximum output current results with the potentiometer rotated fully clockwise.

Null Adjustments

The two remaining potentiometers labeled R27 and R33 determine the amplifier null adjustment. They are properly adjusted at the factory and should not normally be touched by the user. Should the system require a "hotter" or a "quieter" null, however, they are conveniently located and may be adjusted to the desired performance. Also, they are occasionally "twisted" before they get to the end user. In either case see the Alignment Procedure Section for proper adjustment of the null potentiometers.

2.3 OPERATING NOTES

Operation of motors at low speed high torque or stalled motors with current limited by the current limit adjustment requires careful evaluation to prevent either motor or amplifier damage. When operating under these conditions, the conduction angle of the SCR is very small, causing a low form factor for the motor current. The result is very high peak currents to produce the required DC average and therefore, very high I^2R losses in the motor and in the SCR'S with overheating as a result. Normally, the thermal cutouts in the motor and in the amplifier will provide protection for the components but it

is best to avoid this mode of operation where possible. The Models A579 — A581 are full wave devices which inherently have double the form factor of half wave devices. Some additional ways to avoid low form factor are: Avoid continuous low speed-high torque if not necessary. Select a low speed-high torque motor. Add inductance to the armature circuit (.001 to .003 Hy). Use reduced line voltage.

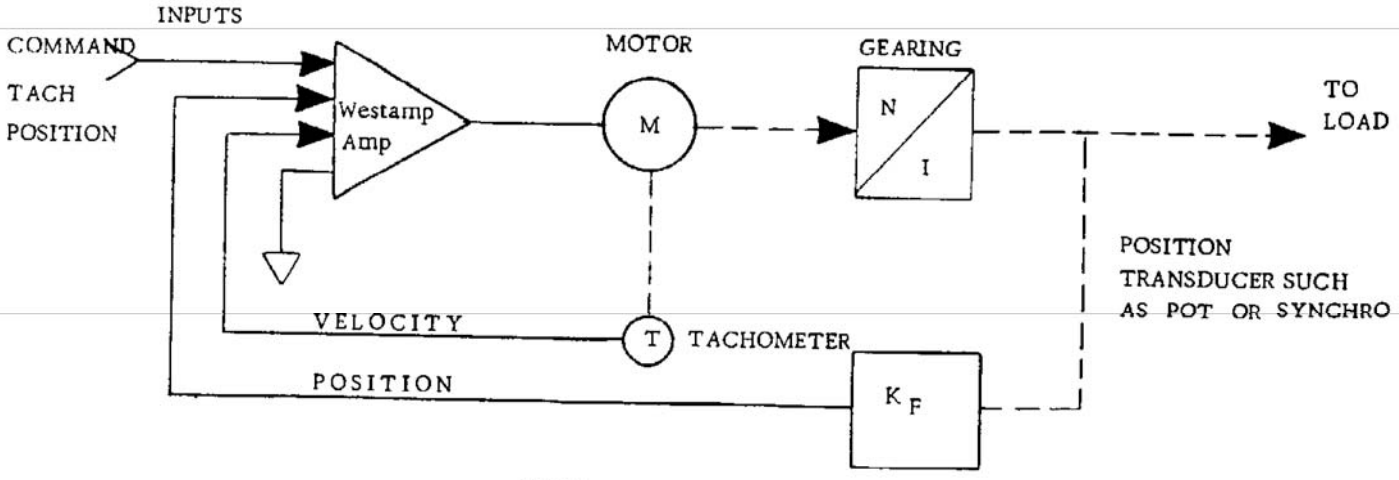
Accidental short circuits and plug reversals of DC motors cause peak currents limited only by the source impedance of the single phase prime supply and the peak line voltage. The value of this peak current must be limited by passive means for a few milliseconds until the current limit takes over (SCR's once "fired" continue conducting until the line voltage reverses polarity). Two suggested methods for limiting this peak current are adding resistance in series with the line and selecting a line transformer with KVA rating no greater than 150% of the maximum amplifier rating.

3. THEORY OF OPERATION

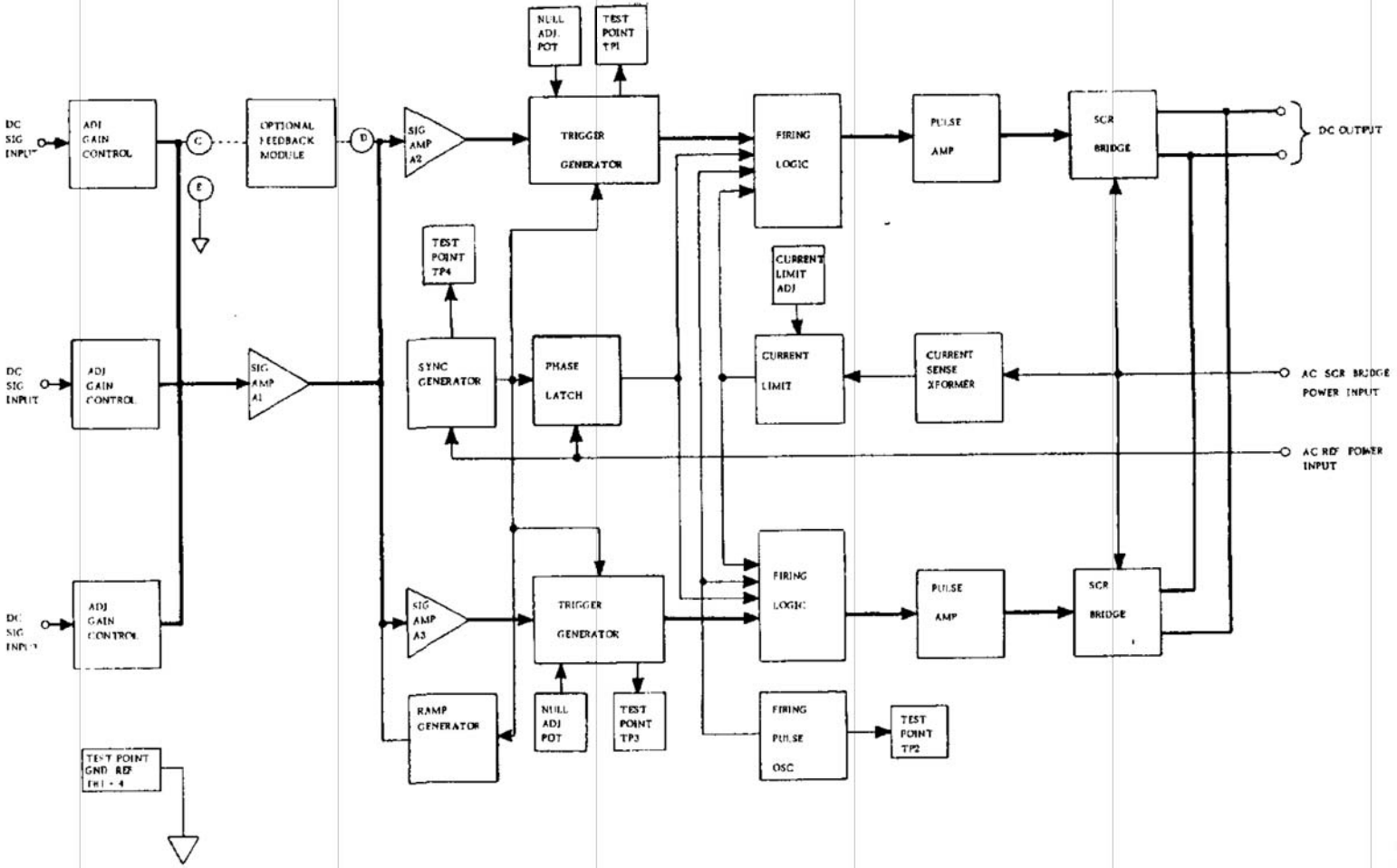
3.1 OVERALL DESCRIPTION

The servo amplifier is used to drive a high power load - usually a DC motor in a servo control system. The motor is driven in either direction depending upon the polarity of the input signal.

The amplifier may control motor speed or shaft position depending upon how the output of the system is connected back to the amplifier input. If the amplifier controls only motor velocity, the inputs are usually (1) a command signal (such as from a Numerical Control) and (2) a rate feedback signal from a tachometer. When the amplifier is used in a position servo loop, an additional feedback signal is connected to the third amplifier input from a "follow-up" transducer. In this case the tachometer provides the required system damping.



TYPICAL SERVO SYSTEM



PART NO	DESCRIPTION	MATERIAL	ITEM
UNLESS OTHERWISE SPECIFIED: TOLERANCES: FRACTIONS ± 1/64 .XX ± .01 .XXX ± .005 ANGLES ± 2° BEND RADII _____ BREAK SHARP EDGES .005 – .010 FINISH	BLOCK DIAGRAM		
	MODEL A579, A580, A581,		
	DRN GJP CHK		
	DATE	SCALE	SHEET OF

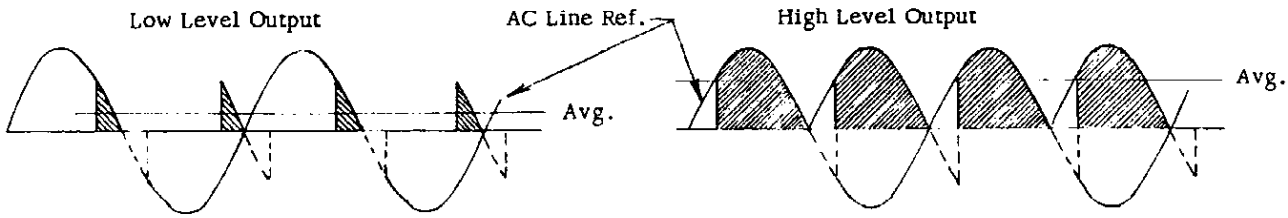
WESTAMP INCORPORATED
1342 18TH STREET
SANTA MONICA, CAL

DWG NO. REV

3.2 CIRCUIT DESCRIPTION

Scr Output

The amplifiers operate on the principle of phase control of the AC power line. Control is effected by synchronizing the phase angle of conduction of the SCR'S to the AC line frequency. The greater the input signal to the amplifier, the greater the conduction angle of the SCR'S which results in more effective power delivered to the load.

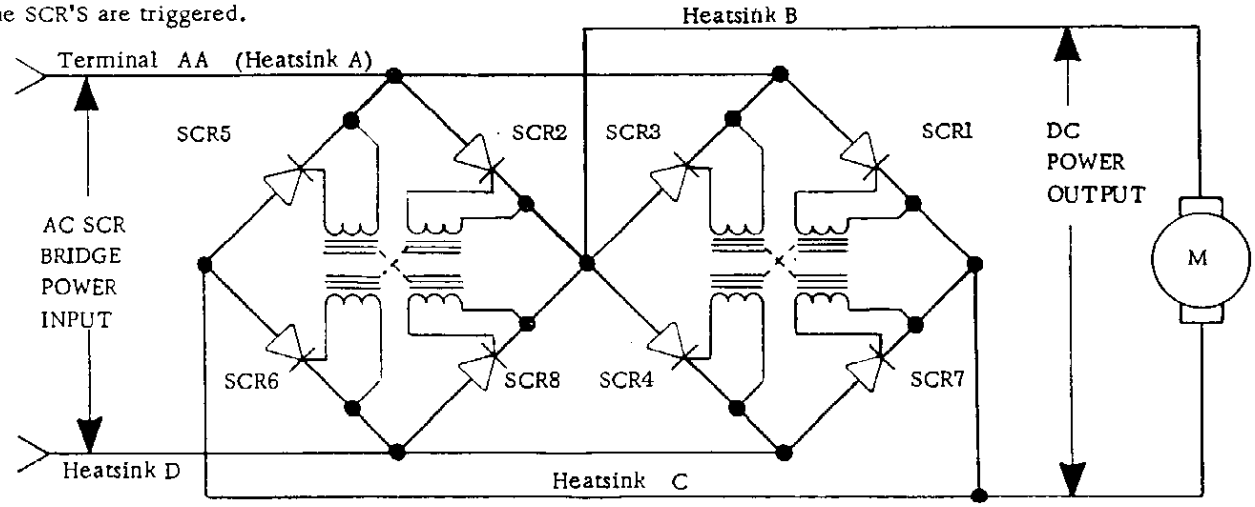


Shaded area shows typical output waveform with resistive load.

Shaded area plus dashed area result with inductive load.

OUTPUT VOLTAGE CHARACTERISTICS

To allow for complete bi-directional full wave control, the SCR'S are connected in two complete bridges,one for each polarity of output voltage. Each bridge has separate control circuits which are isolated from line potential through the use of transformer coupling. The average DC output is determined by the phase angle in each half cycle of the AC power line that the SCR'S are triggered.



SCR BRIDGE CONFIGURATION

The following table shows the firing order to the SCR'S for either polarity of DC input signal and for both half cycles of the AC SCR bridge power.

CONDUCTING SCR'S

INPUT SIGNAL (TB1 terminals 1, 2 or 3 with respect to TB1 - 4)	AC BRIDGE POWER (Terminal AA with respect to Heatsink D)		Output Polarity Heatsink B with respect to Heatsink C
	Positive Half Cycle	Negative Half Cycle	
Positive DC Input	SCR 2 and SCR 6	SCR 5 and SCR 8	Positive
Negative DC Input	SCR 1 and SCR 4	SCR 3 and SCR 7	Negative

Note: The reference voltage at barrier strip TB1 - 8 with respect to TB1 - 5 must be in phase with the SCR bridge power voltage at terminal AA with respect to Heatsink D.

Pulse Amplifier

The SCR gates are directly triggered through coupling transformers by the pulse amplifier circuits. The trigger signals are actually a "train" of pulses which initiate at the point in each half cycle of the AC line voltage where the SCR'S are first triggered and continue until the zero crossing of the AC line. The frequency of the pulse train is approximately 20KC. The duty cycle is approximately 20%. This method of SCR triggering allows a fast rise, "hard fired" type square wave gate pulse yet keeps SCR gate and firing circuit dissipation to a minimum. It also assures SCR conduction into inductive loads and running motors.

Gain Controls and Operational Amplifiers

The three DC signal inputs are each individually adjustable from 0 to maximum voltage gain. The inputs are summed and applied to the input of the first operational amplifier A1.

The summing point, the output of A1, and signal common are brought up to circuits board points C, D and E respectively. These points are located at the top center of the circuit board and are useful for special options such as high frequency roll-off and overall amplifier negative feedback.

The output of A1 is fed into operational amplifier A2 and A3. Because only positive output information is required of these two amplifiers A2 is operating in the inverting mode and A3 is operating in the non-inverting mode. As may be seen from the block diagram, A2 and its following circuitry control the output when positive signals are applied to the amplifier input. A3 and its following circuitry control the output when negative signal are applied.

Ramp Generator

Also connected at the inverting input to A2 and A3 is a cosine ramp signal derived from the ramp generator. The cosine ramp is used to linearize the amplifier transfer function. This signal is summed with the DC input signal to form a "ramp and pedestal" voltage for the trigger generator circuits.

Trigger Generators

The trigger generators are identical. One is connected to the output of A2 and the other is connected to the output of A3. Without any input signal to the amplifier, the trigger generators are both on the threshold of generating trigger pulses. As an input signal is applied to the amplifier input, the trigger generator receiving the most positive signal begins to generate trigger pulses. Since the trigger generators are synchronized to the AC power line, the very first pulse generated initiates the SCR firing pulse train. The "threshold" point of each trigger generator is adjustable and actually determines the amplifier output null. See the Alignment Section for proper null adjustment. The trigger generator voltage ramps may each be observed TP1 and TP3.

Sync Generator

The sync generator circuit supplies a train of pulses at twice the power line frequency which synchronize the other various circuits to the AC power line. The sync generator is basically a pulse shaper which operates to provide an output pulse at the zero crossing of the AC line voltage. The sync pulse may be observed at TP4.

Firing Logic and Phase Latch

The output of the trigger generator is coupled directly to the logic circuitry. This circuitry is comprised of diode-transistor integrated circuits logic elements. It performs all the required sequencing of signals from the trigger generator, sync generator, oscillator, phase latch, current limit and time delay circuits. It also assures that only one polarity of output SCR'S may be fired per any single half cycle of AC line voltage.

The phase latch function is also accomplished with diode-transistor integrated circuit logic elements. It effects SCR decoupling by allowing only the two instantaneously forward biased SCR'S per output polarity bridge to be given trigger signals. In so doing, it also conserves power by not dissipating gate signal power in reversed biased SCR'S.

Since only the forward biased SCR'S are given trigger signals, the reference voltage of barrier strip TB1-8 with respect to TB1-5 must be in phase with the SCR bridge voltage at Terminal AA with respect to Heatsink D. Should they be out of phase, no SCR will fire and there will be no DC output voltage.

Oscillator

A free running multivibrator supplies the pulse train which is gated on by the logic circuitry, amplified and eventually fires the SCR'S. It is also comprised of integrated circuit diode-transistor logic. The oscillator frequency is approximately 20KC with a duty cycle of approximately 20%. The exact frequency of oscillation and duty cycle are not critical. This pulse train may be observed at test point TP2.

Current Limit

The amplifier load current in the AC supply line is sensed by the current limit transformer. The load current coupling to the current limit circuit is made by a single turn primary of the AC bridge power lead routed through the center of the toroidal current limit transformer. The external amplifier connection to this wire is labeled Terminal AA on the Installation Data. The current transformer is connected to the current limit circuit which acts to limit maximum SCR conduction angle to an average output current determined by current limit control. Because the current limit circuit works into the logic circuitry, the limiting action is very sharp and constant, without a "soft knee" common to other current limited drives.

4. SERVICING

4.1 GENERAL

The Model A579 — A581 Amplifiers are conservatively designed and ruggedly constructed so that in normal operation they will require no maintenance. If a malfunction occurs, it would be advisable to first check the power to the amplifier. If the AC power to the amplifier is present and is phased correctly, then check the signal (or signals) at the amplifier input. Experience has shown that most often a system malfunction can be traced to either lack of AC power or to absence of input signals.

Only after the above checks have been made should a closer examination of the amplifier be considered.

4.2 TEST DATA SHEET

Should it be desired to test the amplifier for proper functioning, the instructions given in the Production Acceptance Test Data Sheet, should be followed. The test should be performed with the amplifier removed from the system in which it was operating. This is both to avoid unwanted inputs during the test and to prevent damage to the system from any possible uncontrolled amplifier output. If the amplifier performs according to the specifications of the Production Acceptance Test Data Sheet, it is good and the malfunction must be elsewhere in the system. If the amplifier fails to meet the specifications of the test, it is faulty. It should be either replaced or repaired.

4.3 TROUBLE SHOOTING

When trouble shooting the amplifier, care must be exercised to avoid compounding the original problem while tracing down its location. The amplifier block diagram, circuit board drawings and alignment procedure included in this manual, give voltage measurements and waveforms which may be expected at various critical points within the amplifier. If an amplifier is determined to be faulty, power to the SCR bridges, Terminal AA, should not be applied until it is established that all other circuits, up to and including the SCR gate pulse circuits, are working properly. The circuit waveforms do not significantly change when the bridge power is not present. A resistor of approximately 3 ohms, inserted in series with the high power AC, is useful to limit any fault currents to a safe value when full power is first applied to a questionable or repaired amplifier.

4.4 AMPLIFIER DISASSEMBLY

See the disassembly figure for details.

The circuit board and heatsinks are removable. If a fault condition is found within the circuit board, the board is easily removable for substitution or factory repair.

DO NOT ATTEMPT TO REWORK THE CIRCUIT BOARD. THIS WILL VOID THE WARRANTY OF THE AMPLIFIER.

To remove the circuit board, simply unplug the pulse transformer primary leads from the circuit board and remove the heatsink mounting screws. The AC power lead through the current limit transformer must also be disconnected. When installing new circuit board, be careful to properly polarize the pulse transformer leads, and observe that the heatsink mounting hardware does not short to any circuitry.

To replace an individual heatsink assembly, observe the following procedure:

A. Disconnect the pulse transformer primary leads at the front of the circuit board.

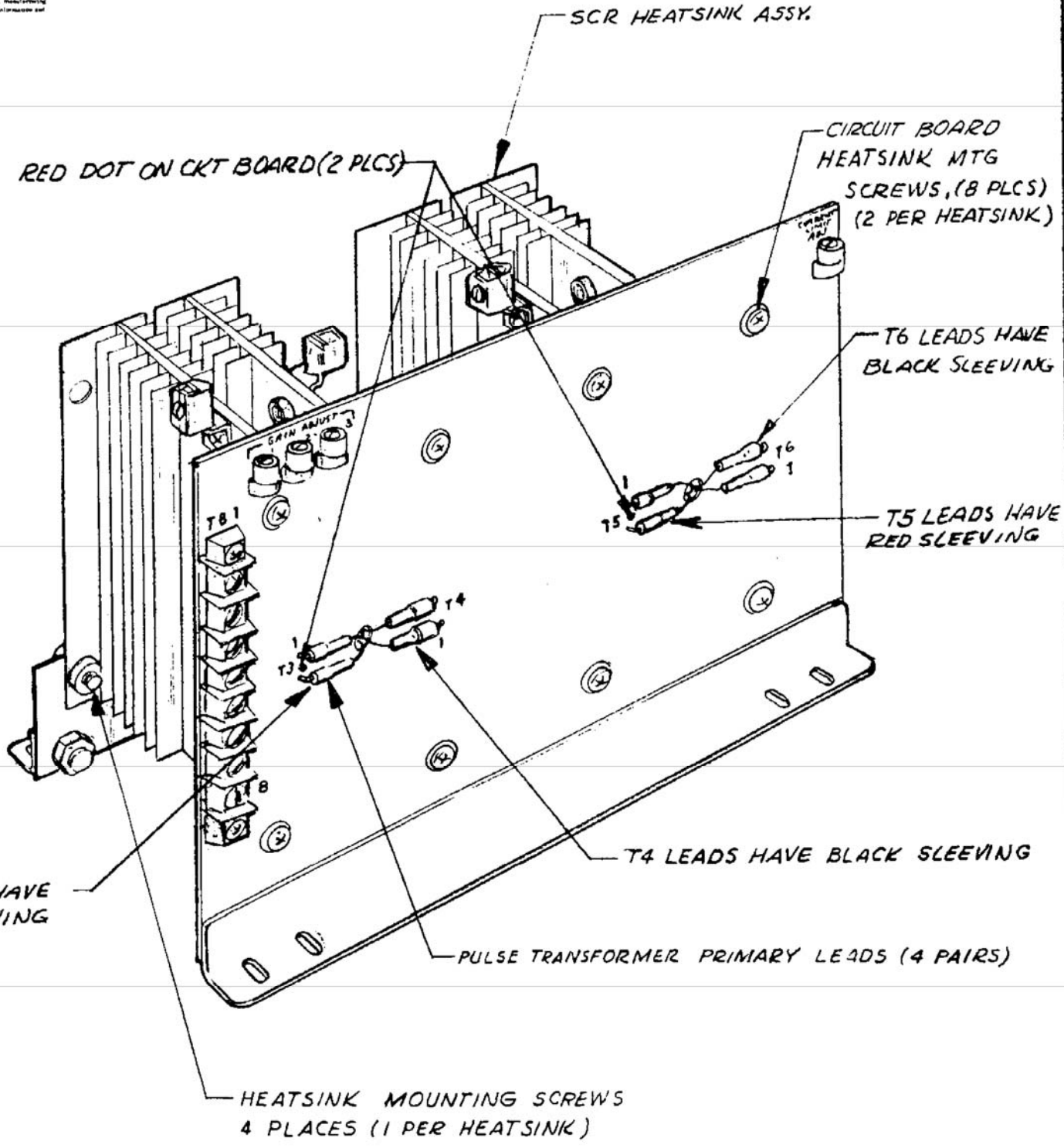
B. Remove the large wires from the SCR cathode and heatsink on the assembly to be replaced. Do not remove the small pulse transformer secondary wires from the SCR.

C. Remove the two circuit board mounting screws and the single rear heatsink mounting screw. The hardware associated with these screws is captive to facilitate reassembly.

D. The heatsink assembly may now be removed. Carefully slip the pulse transformer primary wires through the circuit board hole.

F. To install a replacement heatsink assembly, simply reverse the above procedure.

If replacement of a single SCR is found necessary it should be done with the heatsink assembly removed as described above. The new SCR should be installed, without any insulating washer, directly on the heatsink using a small amount of



AMPLIFIER DISASSEMBLY	WESTAMP INCORPORATED 1542 15TH STREET SANTA MONICA, CALIF.
MODEL A579, A580, A581	DWG NO. / REV.
DWN GJP / CHK / APP.	
DATE 7-28-69 / SCALE NONE	SHEET 1 OF 1

thermally conductive compound. The nut should be tightened to the manufacturer's rated stud torque. These torques are listed below for each amplifier:

AMPLIFIER	SCR STUD TORQUE	
A579	20 in - lb (min)	30 in - lb (max)
A580	40 in - lb (min)	50 in - lb (max)
A581	125 in - lb (min)	150 in - lb (max)

4.5 ALIGNMENT PROCEDURE

Since the control circuitry for the A579 – A581 amplifiers is basically the same, this alignment procedure is written primarily for circuit board check out. To test the complete unit, the Production Acceptance Test Data Sheet must be used in conjunction with this procedure to determine the required AC line voltage and load.

Test Equipment Required

Included in the list of test equipment specified on Production Acceptance Test Data Sheet is an oscilloscope. The scope required need not be an elaborate, high frequency piece of gear, but it must be capable of accurate DC measurements, have calibrated horizontal sweep to at least 1 MHz and have high input impedance.

Note: 1. For connection data and required test equipment, see the specific Production Acceptance Test Data Sheet for the model under test.

2. DO NOT APPLY SCR BRIDGE POWER until the alignment checks have been completed.

3. OBSERVE THIS ALIGNMENT PROCESS ! Do not go ahead to the next step until satisfactory operation described in the prior step is assured.

4. CAUTION ! Heatsinks and Heatsink Mounting Hardware are at AC line potential.

5. DO NOT USE POWER LINE GROUNDED TEST EQUIPMENT.

6. All measurements are made with respect to signal common TB1 - 4.

Pre-Power Checks

Quickly, visually inspect the amplifier for poor solder joints, solder bridges, reversed diodes and capacitors.

Reference Power Checks

Apply rated voltage + 1% to the amplifier barrier strip, TB1.

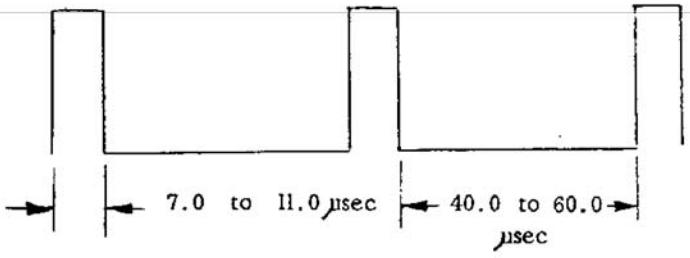
CAUTION ! Be certain jumpers are connected for proper operation. For 115 VAC operation, jumpers must be connected between terminals 5 and 6, 7 and 8. For 230 VAC operation, jumpers must be connected between terminals 6 and 7.

Check the following voltages with a VOM.

Q16	E	+ 4.5	to	+ 5.5VDC
C27	(+)	+ 13.5	to	+ 16.5VDC
C25	(-)	- 13.5	to	- 16.5VDC

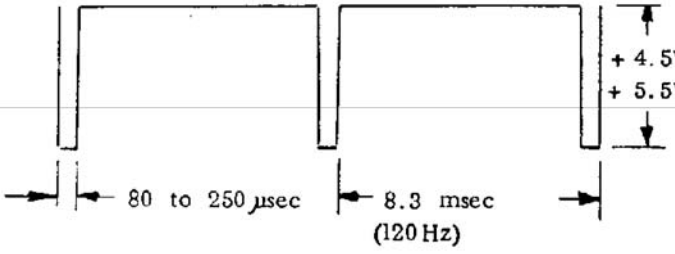
Assure proper oscillator operation by observing the waveform at TP2.

This waveform should be the following:



Sync Generator

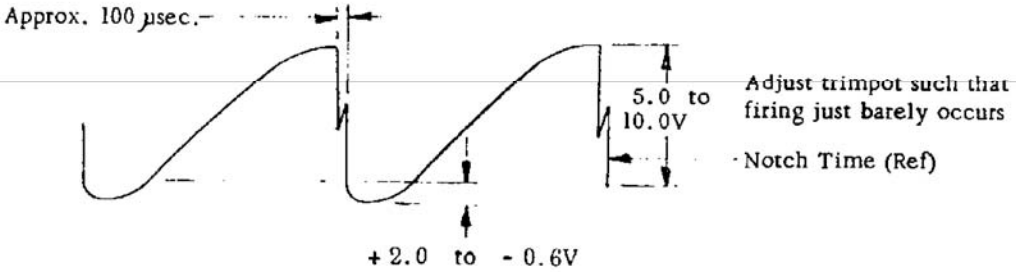
Assure proper sync generator operation by observing the waveform at TP4. This waveform should be the following:



Sync Generator Pulse (Notch)

Trigger Generator

Pre-align the output null by observing the waveform at TP1 and TP3. With all 3 gain pots turned fully CCW adjust R27 (TP1) and R33 (TP3) such that the unijunctions just barely fire at the end of the 1/2 cycle of line frequency (synch generator notch time).

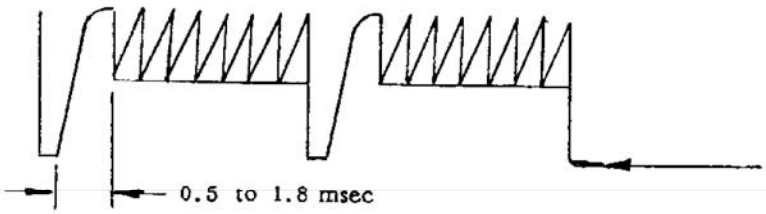


Adjust trimpot such that firing just barely occurs

Notch Time (Ref)

Current Limit

Align Current Limit circuit by inserting a resistance decade box, adjusted to 5.6 Kohm, at R42 and observing the waveform at top of C2. Adjust R42 such that the waveform is as shown:



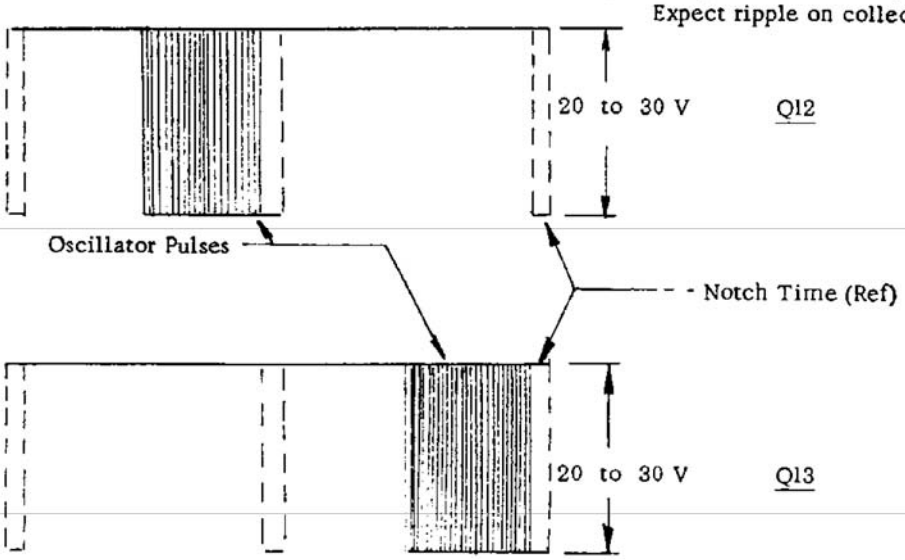
Allowable range of R42 is 5.1K to 15 K.

Waveform may be sawtooth or single pulse only

Assure proper pulse amplifier operation by observing the waveforms at the pulse amplifier transistor collectors in the following manner.

Pulse Amplifiers

A. Apply a signal of approximately + 50 MVDC to TB1-1 w.r.t. TB1-4 and turn R101 fully CW with the oscilloscope synched to the line and observe that the waveforms at Q12 and Q13 are as follows:



B. Check Q14 and Q15 to be certain there is no collector signal at either transistor.

C. Apply a signal of - 50 MVDC to TB1-1 w.r.t. TB1-4. Observe that the waveform at Q14 is similar to that shown for Q12 above.

D. Observe that the waveform at Q15 is similar to that shown for Q13 above.

E. Check Q12 and Q13 to be certain there is collector signal at either transistor.

Check amplifier to its specific model Production Acceptance Test Data Sheet.

WESTAMP HIGH POWER SERVO AMPLIFIER

A580-550C-L3T6A-E A581-1100C-L3T6A-C

ALIGNMENT INSTRUCTIONS WHEN USED IN "Z" AXIS DRIVE SYSTEM ON BURGMASTER MACHINES

1. Purpose and Application of the Servo Amplifier

The purpose of the amplifier and associated system components is to control the machine slide ("Z" axis) velocity. This velocity or feedrate may be varied from stop to 200 in/min maximum either manually or by numerical control.

2. System Components

The following basic electrical components make up the "Z" axis drive system:

2.1 Servo Amplifier with Compensation Board *

2.2 Transient Suppressor *

2.3 Drive Motor

2.4 Power Transformer

2.5 Choke

2.6 Tachometer

* The servo amplifier and the transient suppressor are the only components supplied by Westamp, Inc. It is recommended that a thorough acquaintance be made with the Amplifier Manual and System Connection diagram before any machine alignment is attempted.

3. System Alignment

The basic objective in aligning the drive system is to establish correct feedrates and good speed regulation. This is accomplished by optimum settings of the command and tach gain pots on the servo amplifier.

CAUTION ! Until the system is properly aligned, there is danger of an out of control condition. Always be certain that someone is near the machine stop switch in case such a condition occurs. Proceed through the alignment steps cautiously with complete understanding of the expected results.

When the machine is initially set up, the following alignment steps are recommended:

PRE-POWER CHECKS

3.1 Recheck all system wiring for correct routing and good electrical connection.

3.2 Inspect the servo amplifier heatsink and circuit board for wire strands or debris which may have dropped on it during machine assembly.

3.3 Check the tachometer drive linkage to assure that the belt is tight and that the correct gears are used. The tach must be geared up "4" times to the drive motor shaft. Also make certain that the gears are pinned or have double set screws so that there is no chance of slippage or backlash.

3.4 Adjust the servo amplifier pots as follows:

GAIN POT 1 (Command) - Fully CCW

GAIN POT 2 (Tach) - Fully CCW

CURRENT LIMIT POT - Approximately 2/3 fully CW

At this time do not adjust the null trimpots, R27 and R33.

APPLY POWER TO THE DRIVE SYSTEM

3.5 Measure 220 to 250VAC at the circuit board reference power input terminals TB1 - 8 with respect to TB1 - 5.

3.6 Measure the bridge power voltage accross the two outer amplifier heatsinks. This voltage should be 80 to 150VAC depending on which secondary tap on the main power transformer is used.

3.7 Apply a very small manual command signal (very low feedrate). Turn the command gain pot 1 on the amplifier CW until the slide starts to slowly move. (Make certain there is plenty of room for slide travel in the direction of movement.) Then slowly increase the tach gain pot 2 CW. If the slide velocity abruptly decreases, the tach is phased correctly. If the slide velocity suddenly increases, immediately return the tach pot to its fully CCW position and reverse the tach polarity.

The following steps apply to both initial machine set up and to machine realignment.

3.8 It now should be possible to advance both the gain pots to their mid position. At these gain pot positions, observe the tach output with an oscilloscope while alternately starting and stopping the slide. Adjust the speed to approximately 100 in/min. Slowly increase the tach gain pot (2) until the system starts to have relatively high frequency oscillations when stopped. Then, decrease the pot approximately 1/8 turn.

The object is to get as much tach gain as possible without system oscillation.

At this time the slide should start and stop with fast, controlled response with little or no overshoot.

If overshoot is present increase the Current Limit pot (CW).

3.9 With the slide stopped, adjust the servo amplifier null trim pots (R27 and R33) so that the motor voltage is approximately ± 0.1 to 1 Volts as read on the AC Scale of a VOM. They should be nearly balanced such that the DC value is zero or is alternately switching polarity.

3.10 Adjust slide feedrate by putting a desired feedrate command signal and increase the command gain pot (1) until the slide moves at the correct speed.

NOTE: Since the tach and command signals are summed in the servo amplifier, it will be necessary to readjust the command gain pot (1) if the tach gain pot (2) is for any reason, adjusted. Also, the null adjust pots may required readjustment if the gain pot settings are changed.

4. Typical System Alignment Problems. The following list describes problems which are frequently encountered in system alignment.

4.1 Noisy input signals. Since the servo amplifier has very high gain, the input signal must not have any noise, which would tend to make the amplifier operate in an erratic manner.

4.2 Incorrect Tach Gearing. The correct gearing runs the tachometer at 4 times the motor speed.

4.3 Incorrect tach output voltage. The tachometer output voltage is 20.8 V/1000 RPM.

4.4 Tach gear slippage. The tachometer gears must be pinned or otherwise mechanically set to prevent any slippage.

4.5 Excessive tach ripple. The tachometer ripple must not be excessive or the slide will operate "roughly" with a sound and "feel" transmitted through the machine. This symptom is sometime confused with system oscillation.

4.6 Incorrect null pot adjustment. If the servo amplifier null pots are incorrectly adjusted, the system may have a "dead zone" or the motor may run at the "stop" command input signal.

4.7 Incorrect Amplifier AC Power Phasing. The SCR bridge voltage at wire AA with respect to heatsink D must be in phase with the ref. voltage at TB1 Pin 8 with respect to TB1 Pin 5. If they are out of phase, there will be no output voltage.

4.8 Inadequate Slide Lubrication. The machine slide must have proper lubrication to avoid "rough" operation.

(SUPPLEMENTAL INFORMATION)

P/N 24241

WESTAMP

BURGMASTER A580/581 NOISE REJECTION FILTER (P/N 24241)

FIELD ADJUSTMENT PROCEDURE

NOTE: Read entire procedure before doing anything.

1) This procedure is not to be used unless the unit operates in a uni-directional mode only.

2) Install the amplifier per Installation Drawing No. 24200 Sheet 8.

3) Remove the bridge output fuse.

4) Disconnect the + 5 Volt connection from the Main Board to the Noise Rejection Filter at P201. (Dwg. 24241)

5) Set the Input Signal Pot (R101) and the Tach Signal Pot (R102) on the Main Board to their normal operating values. (Dwg. 24200 Sheet 8)

6) Disconnect the Position Signal Input and the Tach Signal Input at TB1-1 & 2 and put a jumper wire from TB1-1 to TB1-2 to TB1-3. (Signal Common) (Dwg. 24200 Sheet 8)

7) Apply AC power to unit.

8) Use an oscilloscope to monitor the Cathode of CR205 located on the Noise Rejection Filter Board. Adjust R201, located on the upper left hand corner of the Noise Rejection Filter Board for a Signal Level of approximately 2.0 Volts. This is the only adjustment to be made on the Noise Rejection Filter Board. (Dwg. 24241)

9) Remove the jumper wire from TB1-1 to TB1-3 installed in Step #6 above.

10) Use an oscilloscope on the Cathode of CR205, apply + 100 MV and - 100 MV Input Command Signals from the battery box to TB1-1 on the Main Circuit Board of the Amplifier with respect to TB1-3 and observe the output of the op amp A201 located on the Noise Rejection Filter Board. With a positive input signal the output of A201 will be + 4 Volts or greater. With a negative input signal the output of A201 will be 0 Volts ± .6 Volts. (Dwg. 24241)

Input Signal	Output Signal
+ 100 MV	4.0 Volts or greater
- 100 MV	0 Volts ± .6 Volts

11) Re-connect P201 to J201.

12) Use an oscilloscope on the Cathode outputs of both (CR201, CR202) and (CR203, CR204) on the Noise Rejection Filter Board. Apply + 100 MV and - 100 MV input command signals from the battery box to TB1-1 on the Main Circuit Board of the Amplifier with respect to TB1-3. The Cathode output pairs (CR201, CR202) and (CR203, CR204) will switch from 0 Volts to 5 Volts and the Cathode output pairs will not be high (+ 5 Volts) at the same time. (Dwg. 24241)

13) Remove the jumper wire from TB1-2 to TB1-3. (Dwg. 24200 Sheet 8)

14) Install bridge fuse.

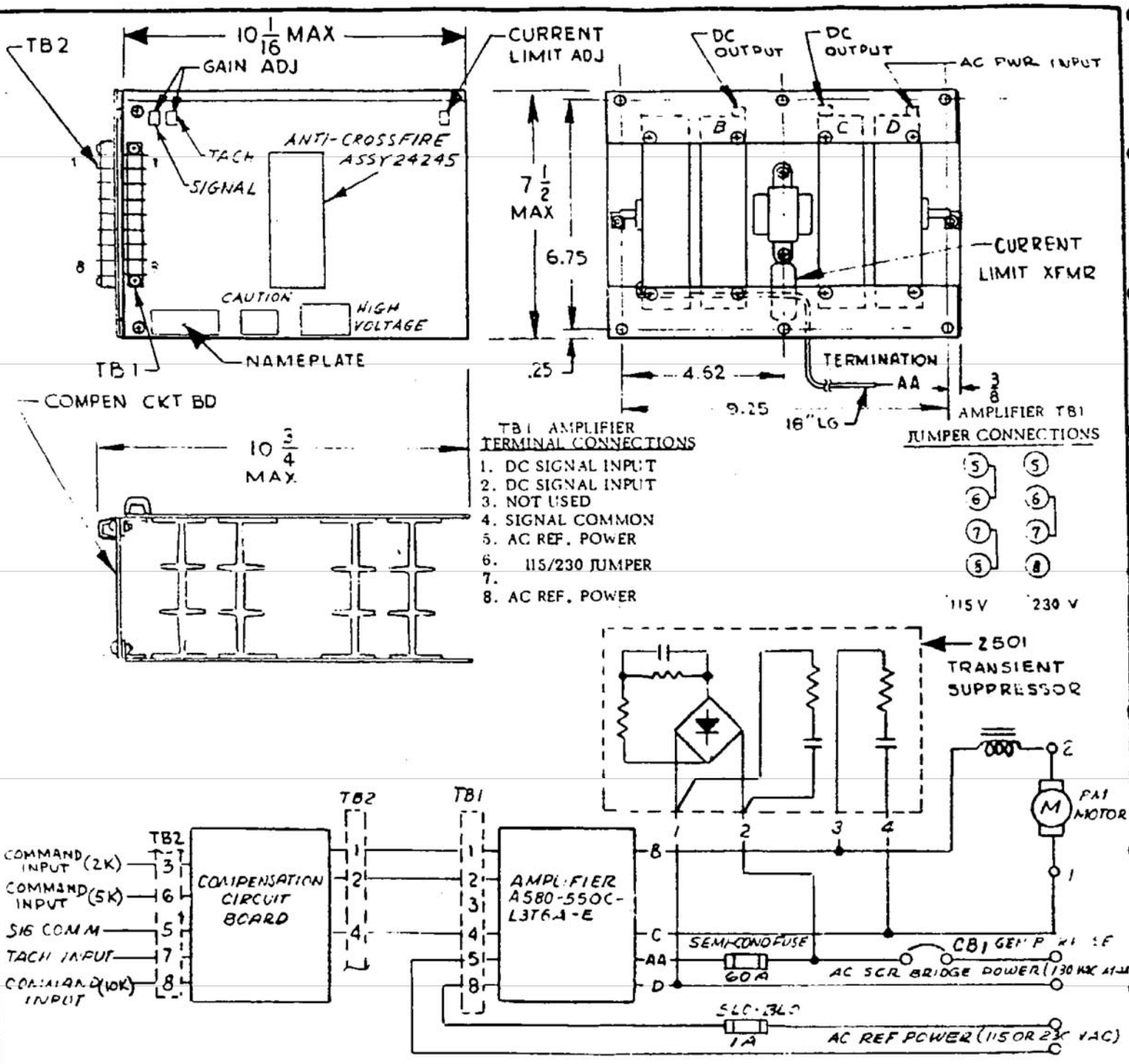
15) Re-connect the unit's position signal and tach signals that were disconnected in Step #6. The unit should now function normally in a bi-directional mode. (Dwg. 24200, Sheet 8)

NOTE: Failure of the Amplifier to meet this procedure indicates a malfunction. Steps to isolate the trouble are outlined in Paragraph 4.3 of the A580/A581 SCR Manual.

General Information

A) When connecting or disconnecting signal leads, it is recommended that the AC Power be removed from the unit.

B) Always make sure the oscilloscope is floating.



RECOMMENDED INSTALLATION PROCEDURES

1. Use shielded wire on input leads and connect shield to "Signal Common".
2. Connect unused inputs to "Signal Common".
3. The voltage at terminal 8 w.r.t. terminal 5 must be in phase with the voltage at terminal "AA" w.r.t. heatsink "D".
4. CAUTION : DO NOT USE GROUNDED TEST EQUIPMENT ON OUTPUT CIRCUIT.
5. Turn current limit control CW for max current.
6. Output heatsink "B" is + w.r.t. heatsink "C" for + signal input on pins 1, 2 or 3.
7. Dress ref. power and SCR bridge power AC leads away from the signal inputs and associated circuitry.

REV	E.O. NO.	BY	DATE	APPR
B	PER EO 014005	JK	1-18-74	
A	E.O. 099008	J.K	9-20-9	

UNLESS OTHERWISE SPECIFIED: TOLERANCES: FRACTIONS ± 1/64 .XX ± .01 .XXX ± .005 ANGLES ± 2°

INSTALLATION DRAWING

MODEL A580-550C-L3T6A-E

DWN GD | CHK | APP

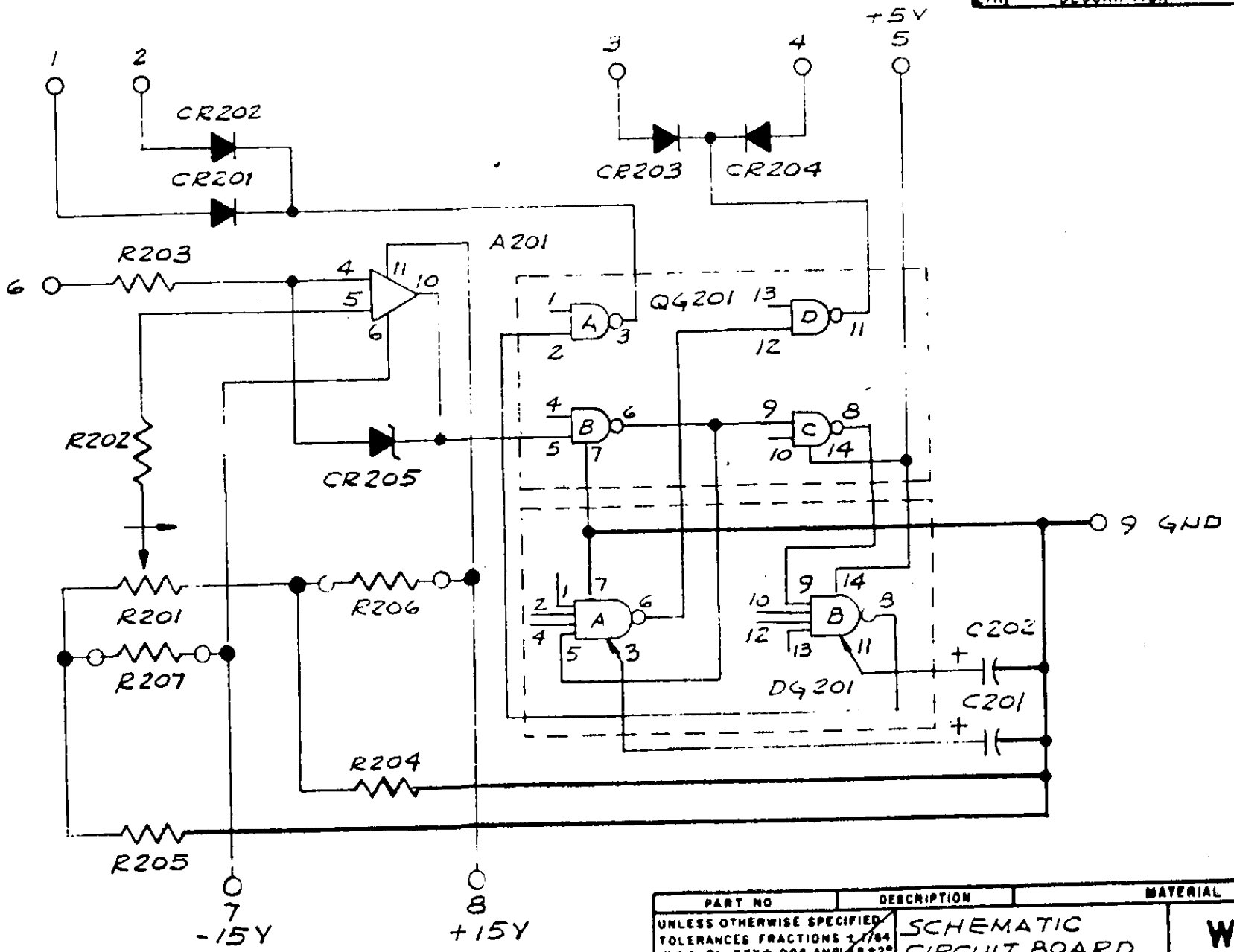
DATE 6-13-68 | SCALE 1/4

WESTAMP INCORPORATED
1542 15TH STREET
SANTA MONICA, CALIF.

DWG NO. 24200 | REV. B

SHEET 8

REVISIONS				
LTR	DESCRIPTION	BY	DATE	APPR



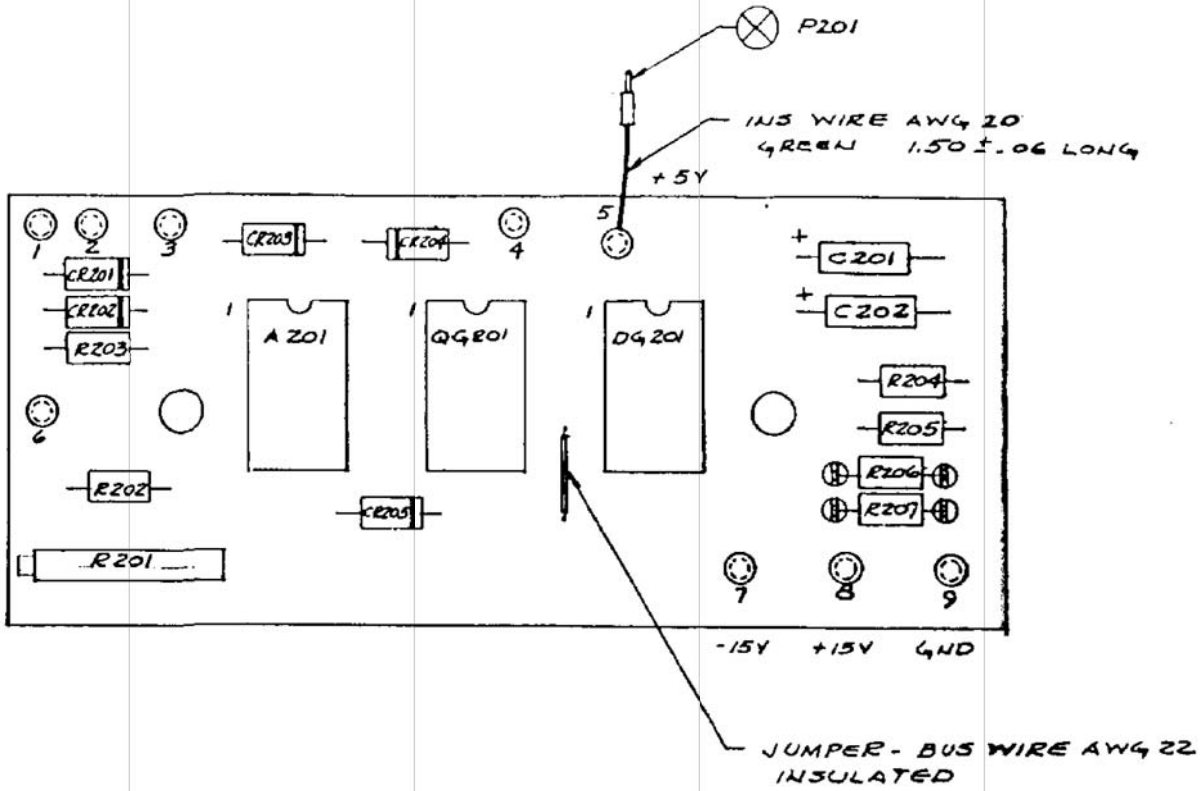
PART NO	DESCRIPTION	MATERIAL	ITEM
UNLESS OTHERWISE SPECIFIED TOLERANCES FRACTIONS ± 1/64 XX ± 01 XXX ± 005 ANGLES ±2° BEND RADII _____ BREAK SHARP EDGES .005 - .010	SCHEMATIC CIRCUIT BOARD ANTI-CROSS FIRE		
FINISH	MODEL A580 SERIES		
	DWN MER CHK APP 11-24		
	DATE 11.7.73 SCALE X		

WESTAMP®
INCORPORATED
1542 15TH STREET
SANTA MONICA, CALIF.

DWG NO 24244 REV.

SHEET 1 OF 1

REVISIONS			
LTR	DESCRIPTION	BY	DATE
A	PER EO 113022	HAC	11/4/72



FOR ELECTRICAL PARTS LIST SEE EPL 24241

PART NO.	DESCRIPTION	MATERIAL	ITEM

UNLESS OTHERWISE DESIGNATED TOLERANCED FRACTIONS ±1/64 .XX ± .01 .XXX ± .005 ANGLES ±2° BEND RADII ____ SHARP EDGES .005 - .010

FINISH

ASSEMBLY, CIRCUIT BOARD - ANTI-CROSS FIRE

MODEL A580 SERIES

DWN MER CHK RJG APP'D

DATE 1.5.73 SCALE 2/1

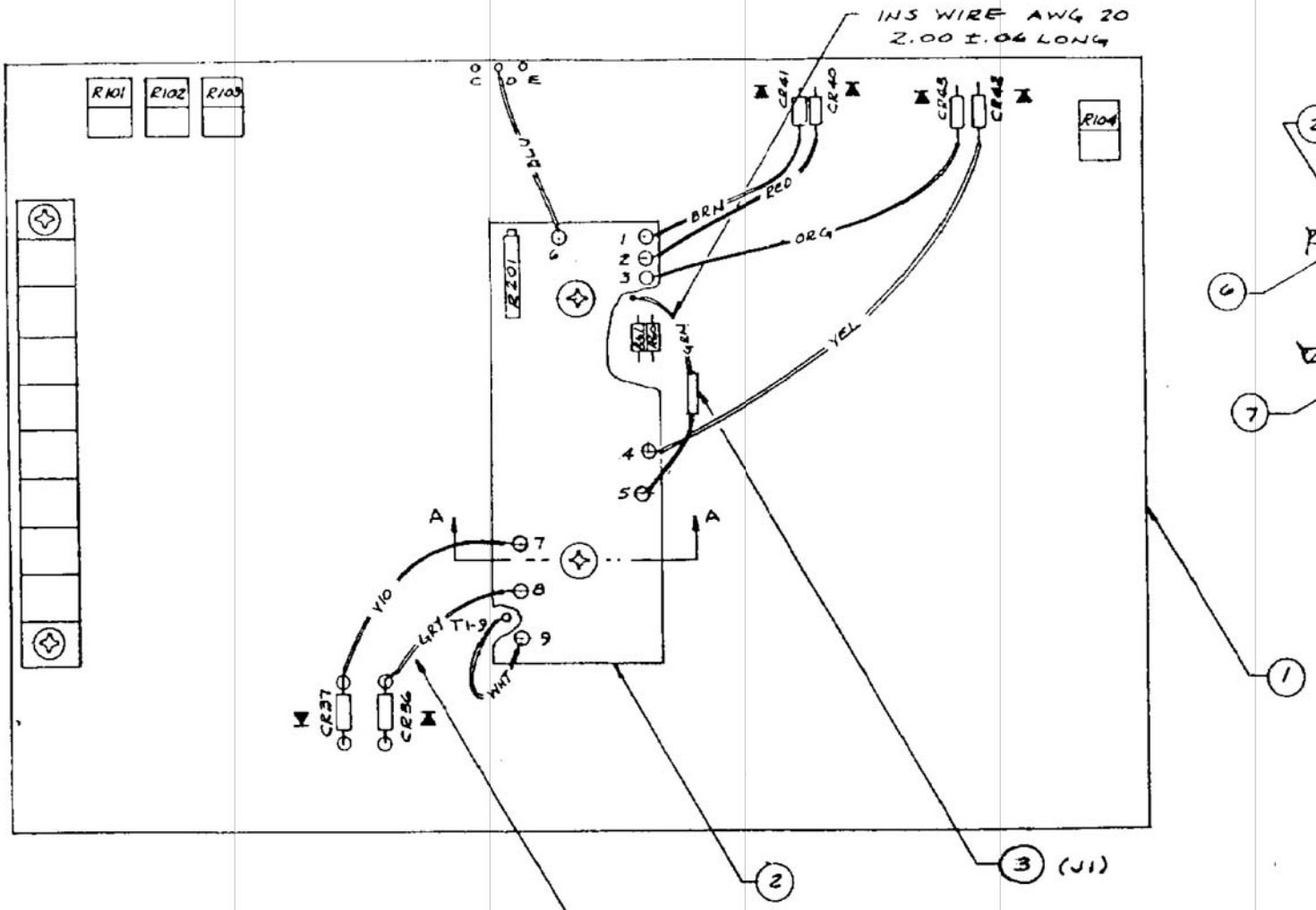
WESTAMP INCORPORATED
1542 15TH STREET
SANTA MONICA, CAL.

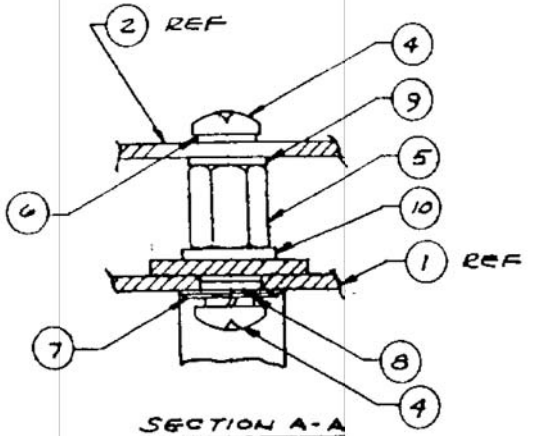
DWG NO. 24241 REV. A

SHEET 1 OF 1

2. FOR SCHEMATIC DWG SEE 24244
1. FOR FABRICATION DWG SEE 24242
NOTES: UNLESS OTHERWISE SPECIFIED

REVISIONS			
LTR	DESCRIPTION	BY	DATE APPD



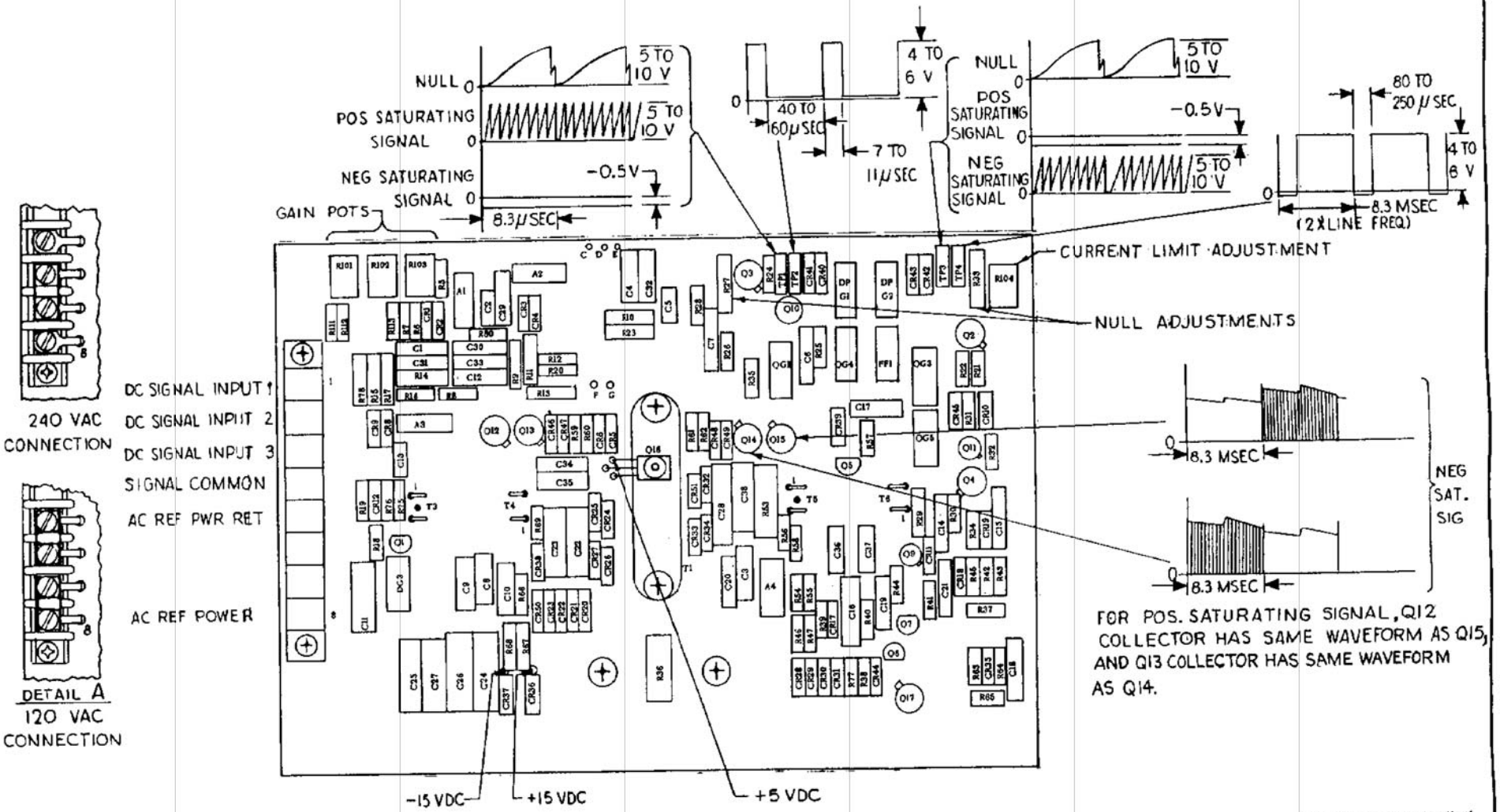


SECTION A-A
TYPICAL 2 PLACES
SCALE: NONE

FOR MECHANICAL PARTS LIST SEE MPL 24245

PART NO.	DESCRIPTION	MATERIAL	ITEM
UNLESS OTHERWISE SPECIFIED TOLERANCES: FRACTIONS ± .XXX IN .XX IN .XXX IN DEMO RADII BREAK SHARP EDGES .005 - .010 FINISH	ASSEMBLY ANTI-CROSS FIRE MODIFICATION		
	MODEL A580 SERIES		
	DRAWN MER CHKD RJS APPD		DWG NO. 24245 REV
	DATE 11.10.78 SCALE NONE		SHEET 1 OF 1

WESTAMP
INCORPORATED
1842 15TH STREET
SANTA MONICA, CAL.



5. WAVEFORMS AND VOLTAGE MEASUREMENTS ARE MADE WITH RESPECT TO SIGNAL COMMON. OSCILLOSCOPE SYNC'D TO AC REF PWR PIN 8 W.R.T. PIN 5 ON TERMINAL STRIP.

4. VOLTAGES ARE TYPICAL AND MAY VARY ± 20%.

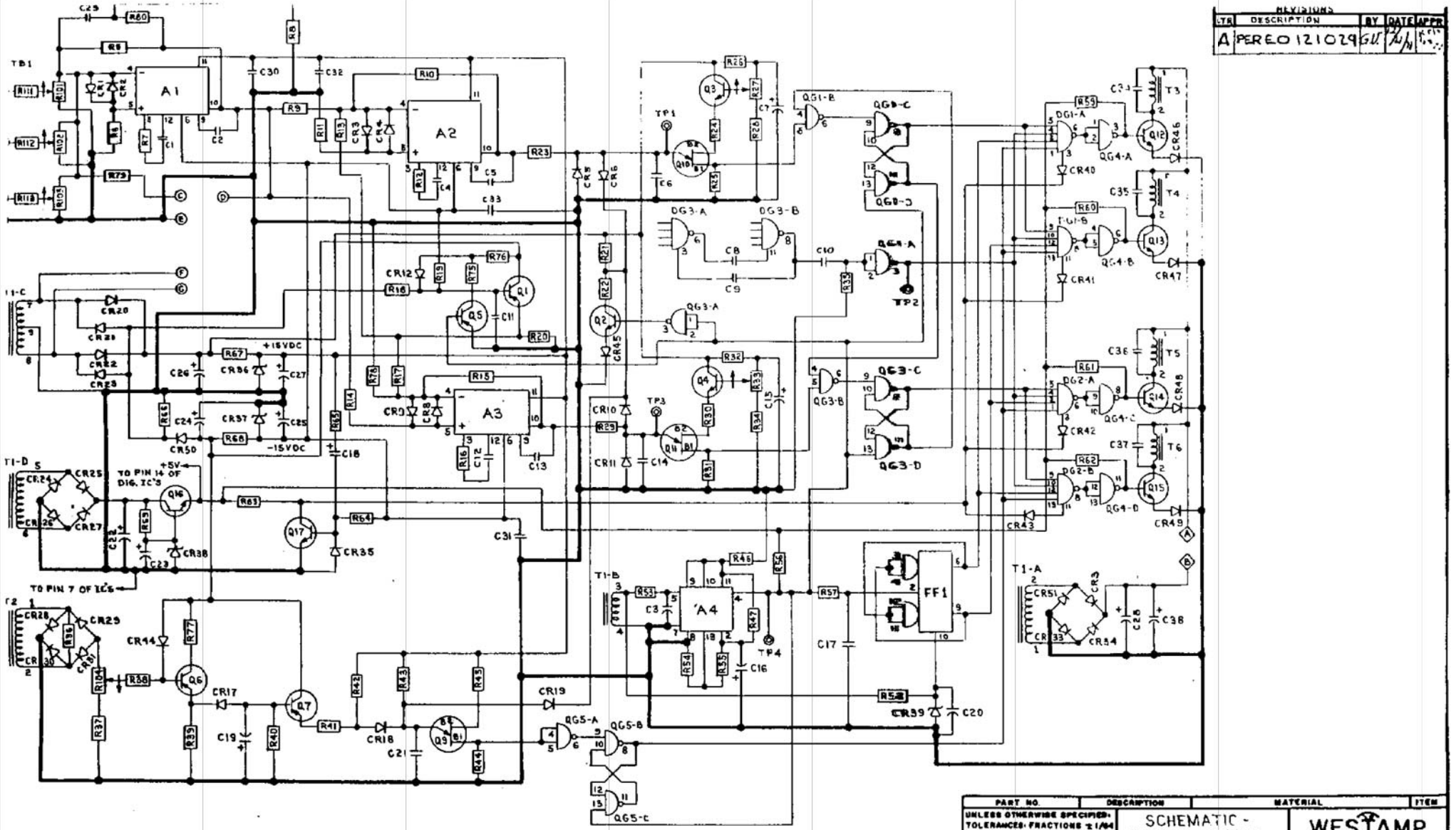
3. VOLTAGES & WAVEFORMS ARE MADE WITH HIGH IMPEDANCE EQUIPMENT (ONE MEGOHM OR GREATER).

2. CAUTION! SCR HEATSINK MTG HARDWARE IS AT LINE POTENTIAL.

1. Q16 COLLECTOR IS ELECTRICALLY HOT TO ITS HEATSINK.

NOTES:

PART NO.	DESCRIPTION	MATERIAL	ITEM
UNLESS OTHERWISE SPECIFIED TOLERANCES: FRACTIONS ± 1/64 .XX ± .01 .XXX ± .005 ANGLES ± 2° DECIMALS DO NOT EXCEED .005 -.000	AMPLIFIER CKT BOARD ASSY		
FINISH	MODEL A579, A580, A581	WESTAMP INCORPORATED 1542 15TH STREET SANTA MONICA, CAL.	
	DWN GJP CHK APP DATE 7-24-69 SCALE 1/1	DWG NO. SHEET OF	REV.



2. DESIGNATIONS LAST USED ARE AS FOLLOWS R113, C38, CR51, Q17, QG5, DG3, A4, FF1, T6 & TP4.
1. DESIGNATIONS NOT USED ARE AS FOLLOWS R1 THRU R4, R48 THRU R52, R70 THRU R74, R81 THRU R100, R105 THRU R110, CR7, CR13 THRU CR16, Q8 & QG2

NOTES:

PART NO.	DESCRIPTION	MATERIAL	ITEM
UNLESS OTHERWISE SPECIFIED: TOLERANCES: FRACTIONS ± 1/64 .XX ± .01 .XXX ± .005 ANGLES ± 2° BEND RADII BREAK SHARP EDGES .005 – .010 FINISH	SCHEMATIC - CIRCUIT BOARD, DC COUPLED SCR AMPL		

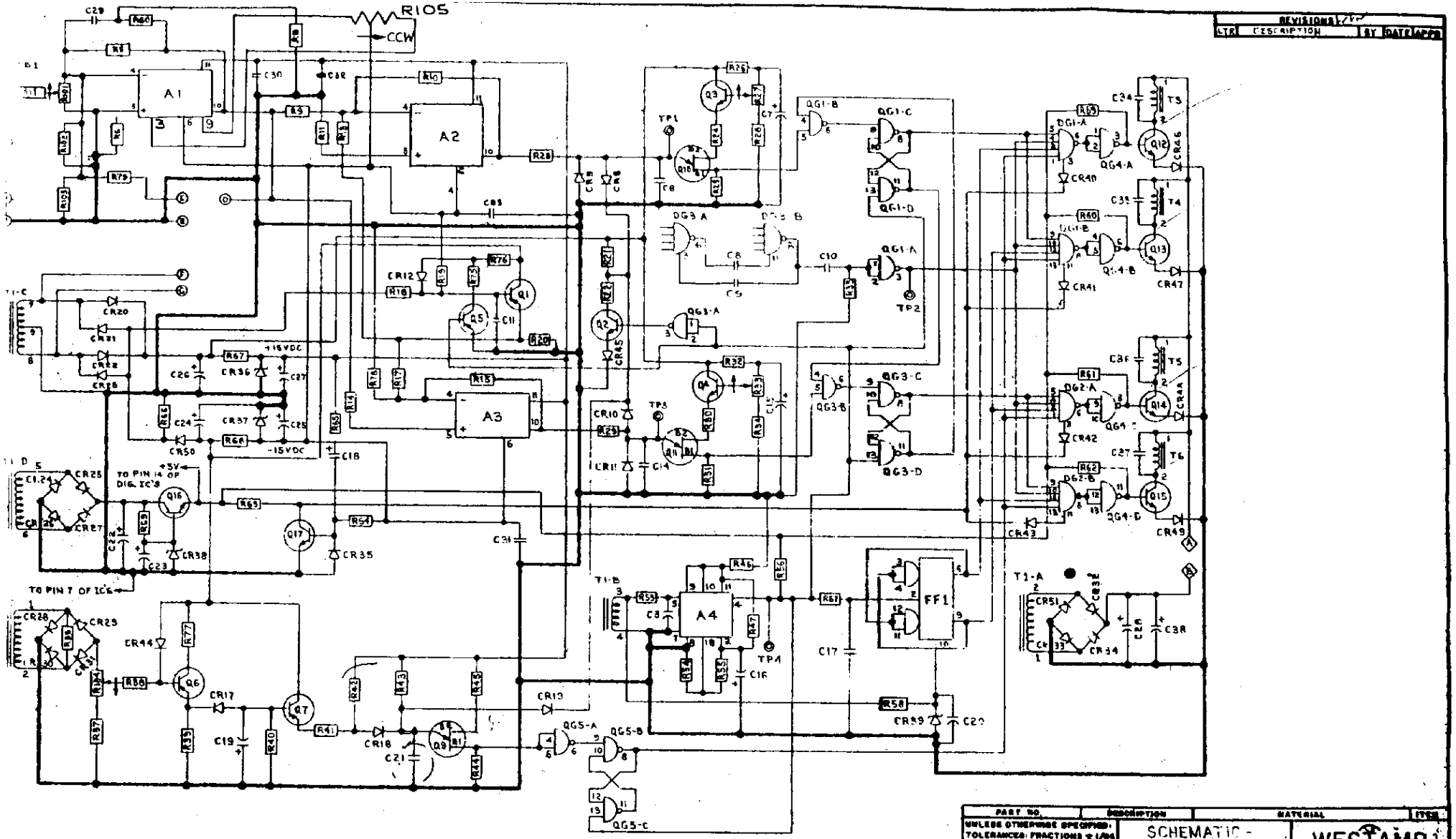
WESTAMP INCORPORATED
1542 15TH STREET
SANTA MONICA, CAL.

MODEL A579 THRU A582

DWG NO. 24201 REV. A

DWN E.H.L. CHK [illegible] APPD [illegible]

DATE 9-27-68 SCALE NONE SHEET 1 OF 2

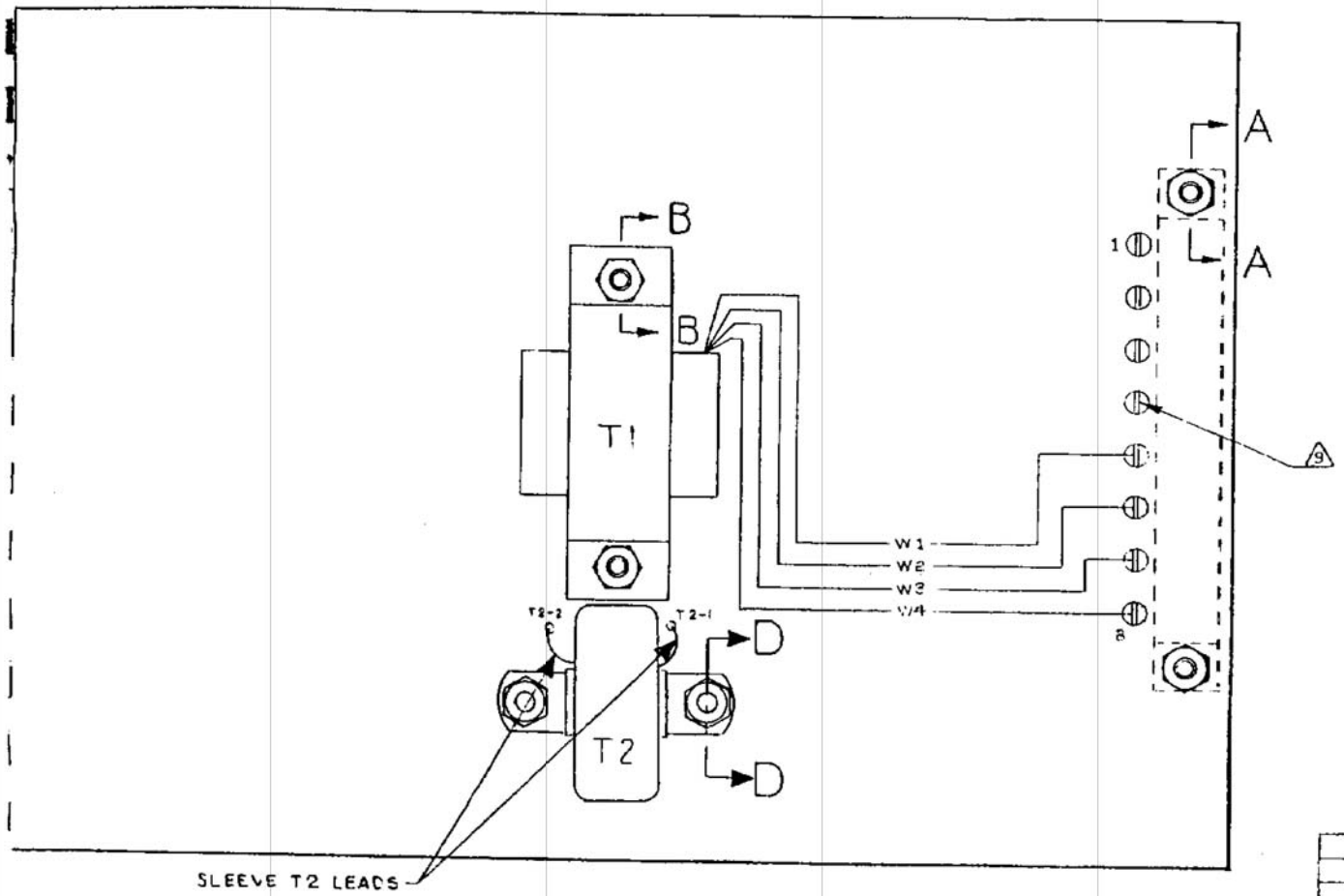


2. DESIGNATIONS LAST USED ARE AS FOLLOWS R113, C38, CR51, Q17, QG5, DG3, A4, FF1, T6 & TP4.
1. DESIGNATIONS NOT USED ARE AS FOLLOWS R1 THRU R4, R48 THRU R52, R70 THRU R74, R81 THRU R100, R105 THRU R110, CR7, CR13 THRU CR16, Q8 & QG2

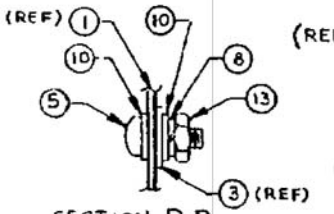
OTES:

PART NO.	DESCRIPTION	MATERIAL	TYPE
UNLESS OTHERWISE SPECIFIED: TOLERANCES: FRACTIONS ± 1/64 .XX ± .01 .XXX ± .005 ANGLES ± 2° DEMO RADII: _____ BREAK SHARP EDGES .005 - .010	SCHEMATIC - CIRCUIT BOARD, DC COUPLED SCR AMPL		
FINISH	MODEL AR-15-CS-A	WESTAMP INCORPORATED 1542 15TH STREET SANTA MONICA, CAL.	
DRWN E.R.L. CHKD	DWG. NO. 2420		
DATE 9-27-6[illegible] SCALE NONE	SHEET 2 OF 2		

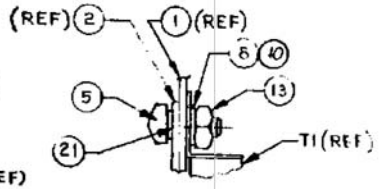
REVISIONS				
LTR	DESCRIPTION	BY	DATE	APPR
A	PER ECO 118019	EHL	11/12/68	
B	PER ECO 128003	EHL	1/14/69	
C	PER ECO 019022	EHL	1/30/69	
D	PER ECO 029011	EHL	5/14/69	
E	ECO 039005	UK	9/11/69	
F	ECO 069001	GJP	4/4/69	
G	ECO 089006	GJP	7/15/69	



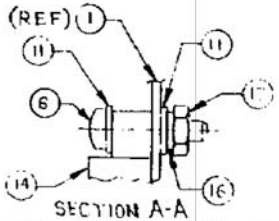
WIRE CHART				
ASSY NO.	W1	W2	W3	W4
-1	BLK	W/BRN	W/RED	W/ORN
-3	BLK	W/BRN	W/RED	W/ORN
-5	BLK	DELETED	DELETED	W/BRN



SECTION D-D



SECTION B-B



SECTION A-A

PART NO.	DESCRIPTION	MATERIAL	ITEM
-5	ASSY	A579, A580 STD(208 VAC)	~
-3	ASSY	A579, A580, A581 STD(220 VAC)	~
-1	ASSY	A579, A580, A581 STD(115 VAC)	~

UNLESS OTHERWISE SPECIFIED: TOLERANCES: FRACTIONS ± 1/64 .XX ± .01 .XXX ± .005 ANGLES ±2° BEND RADII _____ BREAK SHARP EDGES .005-.010

FINISH

COMPONENT ASSY, CKT BD

MODEL: A579 THRU A582

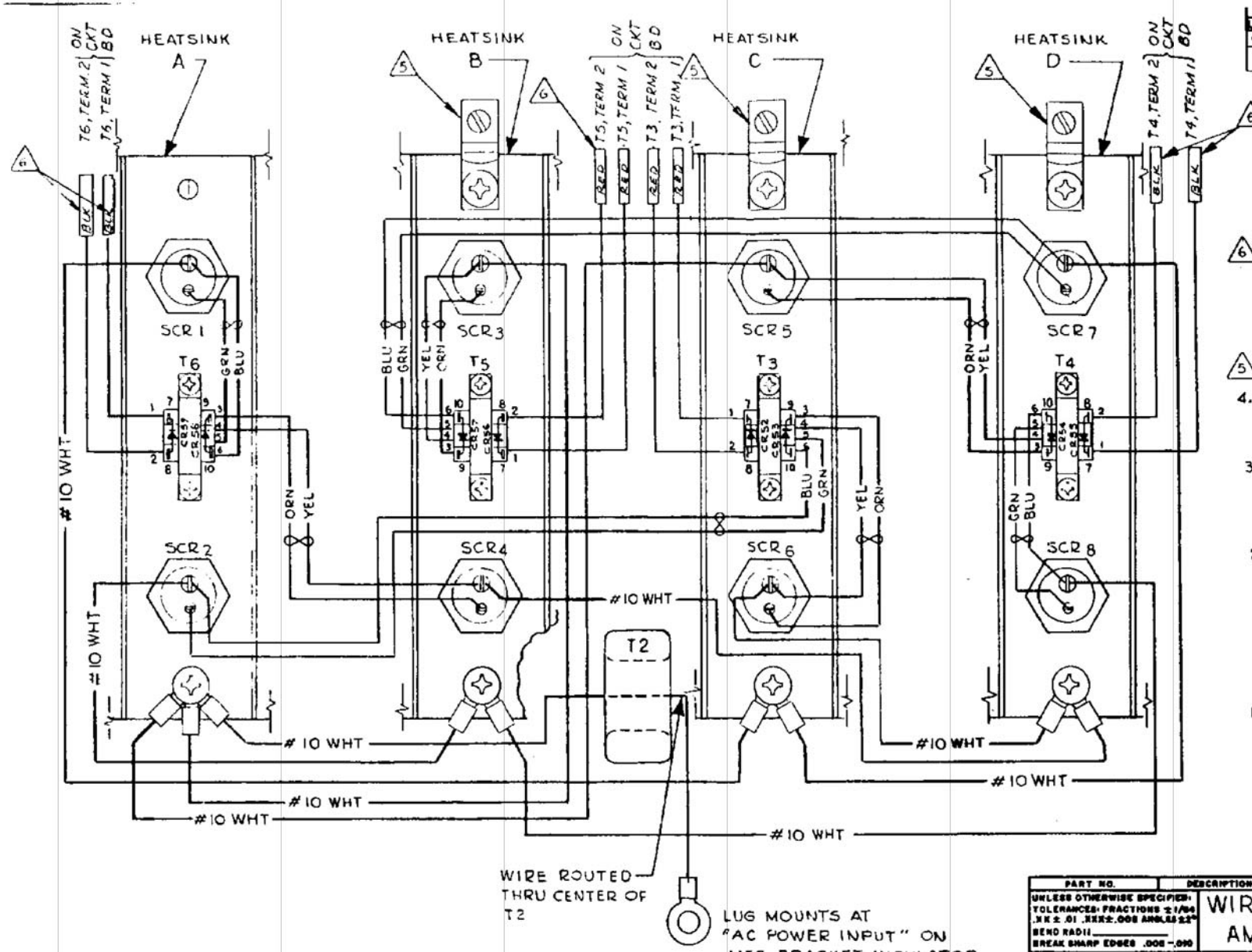
DWN EHL | CHK | APP

DATE 10-1-68 | SCALE 1/1

WESTAMP INCORPORATED
1542 15TH STREET
SANTA MONICA, CAL.

DWG NO. 24204 | REV G

SHEET 1 OF 2



REVISIONS				
LTR	DESCRIPTION	BY	DATE	APPR
C	ECO 089023	GP	5-25-65	
D	PER EO 023009			

6 TERMINATE PRI LEADS (TERMS 1&2) OF PULSE TRANSFORMERS WITH CAMBION #3378-01-0310 JACK & SHRINK SLEEVING. (T4 & T6 LEADS: BLACK SLEEVING) (T5 & T3: RED SLEEVE)

5 LUGS FOR CUSTOMER CONNECTION

4. WIRES TO HAVE SUFFICIENT SLACK TO PREVENT PULLING TAUT AGAINST HEATSINK

3. DRESS & SPOT TIE ALL #10 WHITE WIRES USING TY-RAP (PANDUIT NO. SST2C) AS REQ'D.

2. MECHANICAL OUTLINE & ORIENTATION IS SHOWN FOR REF ONLY. SEE APPLICABLE ASSY DRAWING FOR ASSEMBLY INFORMATION

1. UNLESS OTHERWISE SPECIFIED, ALL WIRE TEFLON INSULATED.

NOTES

PART NO.	DESCRIPTION	MATERIAL	ITEM

UNLESS OTHERWISE SPECIFIED: TOLERANCES: FRACTIONS ±1/64, .XX ± .01, .XXX ± .005, ANGLES ±2°, BEND RADII ____, BREAK SHARP EDGES .005 - .010

FINISH

WIRING DIAG, AMPLIFIER

MODEL A580

DWN GP | CHK | APP

DATE 5-25-65 | SCALE —

WESTAMP INCORPORATED
1542 15TH STREET
SANTA MONICA, CAL.

DWG NO. 24213 | REV D

SHEET 1 OF 1

BOBBIN: MFG AMERLINE P/N E33

LAM/CORE: TYPE EI 75 MAT'L 0.014 M6X

MFR P/N

STACK: 1X1 BRKT: KOBZY 3/4 x 3/4 VERTICAL CHANNEL FRAME

LUG/LEAD DESC: 1→13; COLOR CODED #26 AWG 8" LG

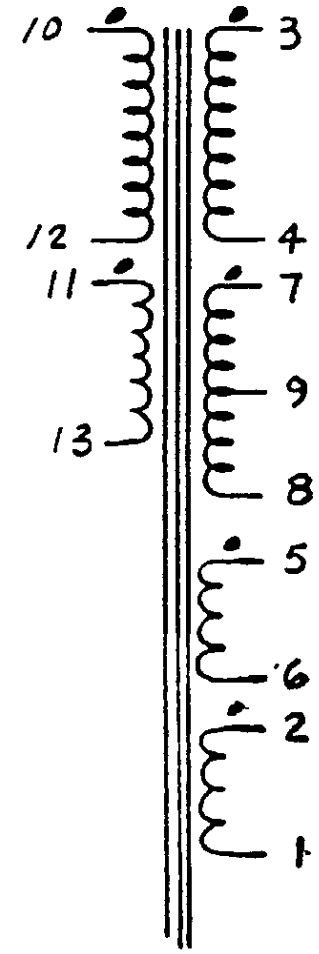
WINDING SEQUENCE	WINDING START	WINDING FINISH	TURNS	WIRE SIZE	VOLTAGE RATIO (± 5 %)	DC RESISTANCE (±20%)
1	10	12	1000	34	—	
2	11	13	1000	34	100 VAC	
3	3	4	1000	40	10.0	
4	7	9	150	28	1.5	
5	9	8	150	28	1.5	
6	5	6	100	28	1.0	
7	2	1	150	28	1.5	
8						

FREQ 60 Hz PRI. EXCIT 115/230 VAC

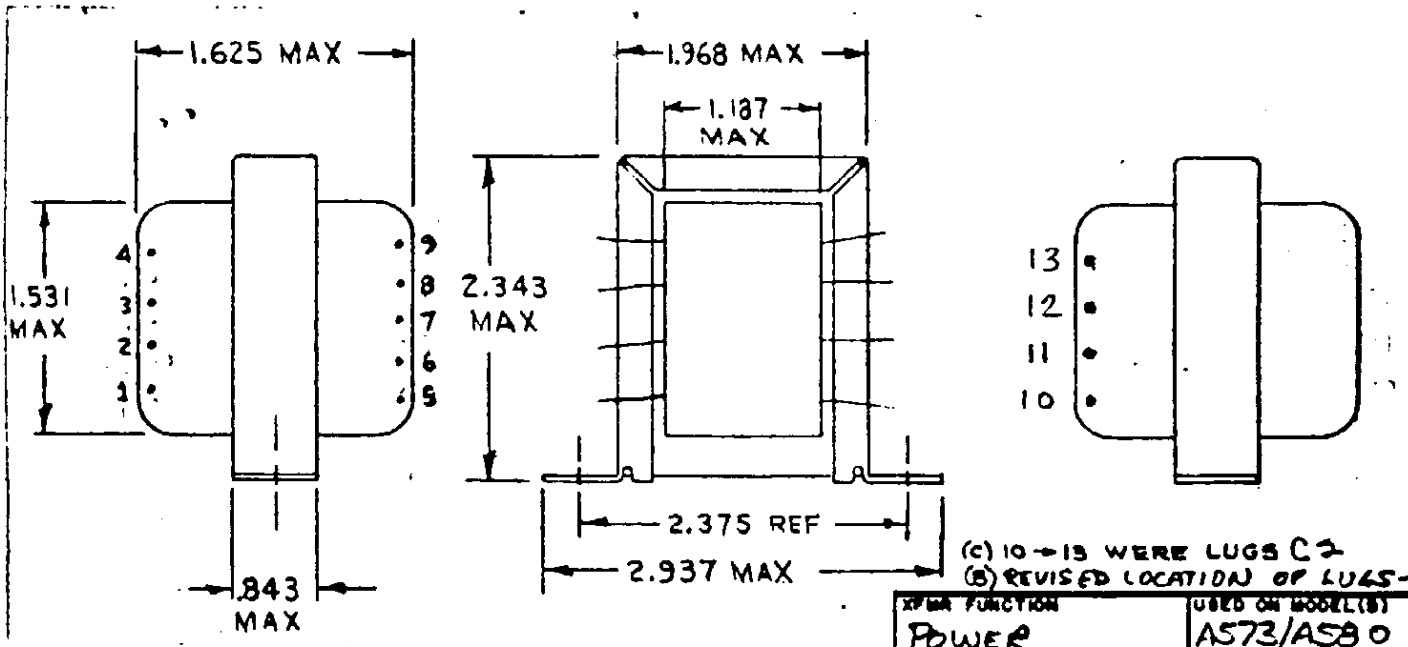
NOTES:

1. XFMR TO BE FABRICATED AND INSPECTED PER E.S.P. 10
2. TEST VOLTAGE RATIO BY APPLY 100 VAC ±1%, 400 Hz ±5% TO TERMINALS 10 AND 12.

WINDING DIAGRAM



OUTLINE



(c) 10 → 13 WERE LUGS C 2

(B) REVISED LOCATION OF LUGS-C 2

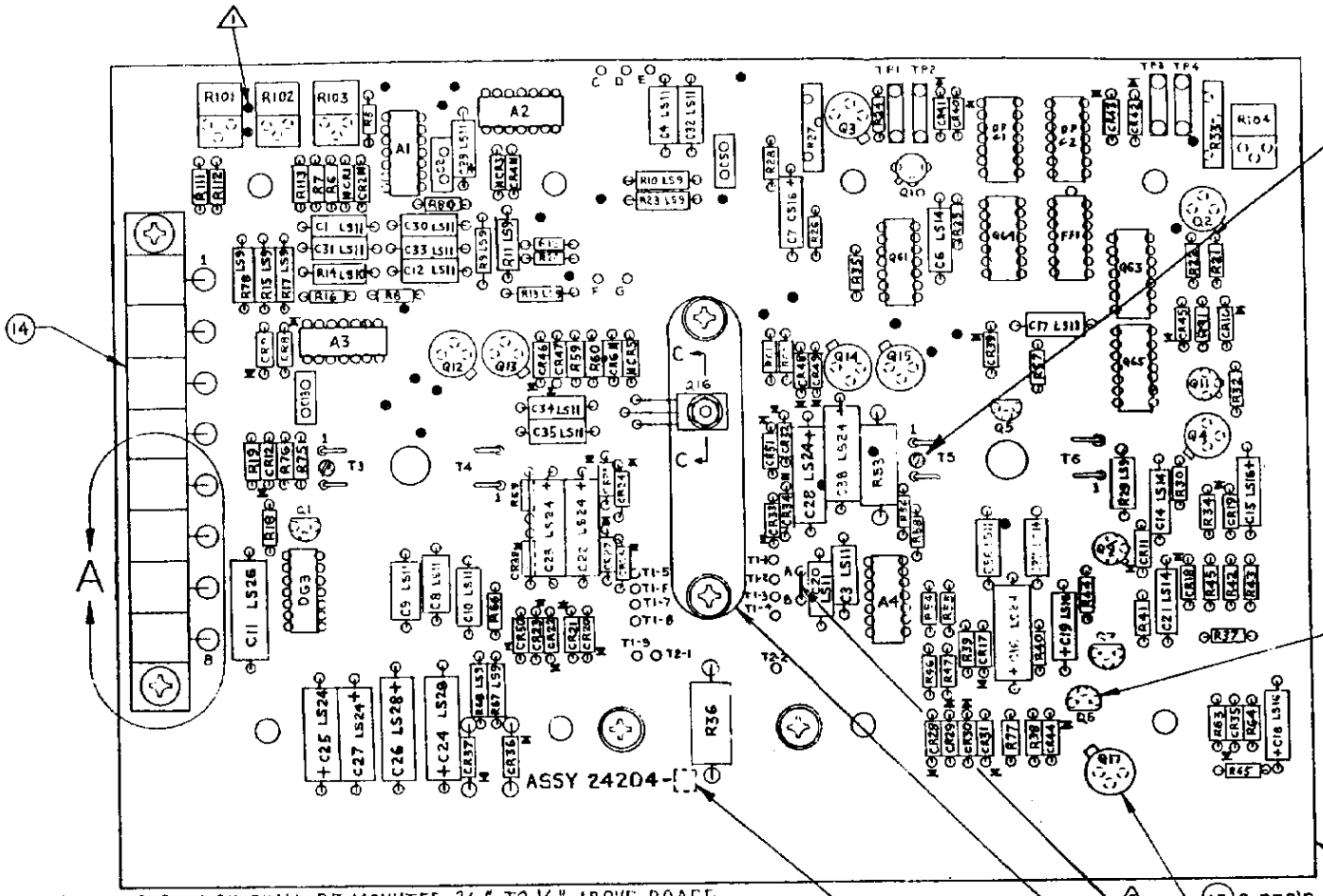
XFMR FUNCTION		USED ON MODEL(S)	
POWER		A573/A580	
DESIGN	DATE	REVISION LETTER	DATE
C Johnson	8/16/68	C	9/10/68

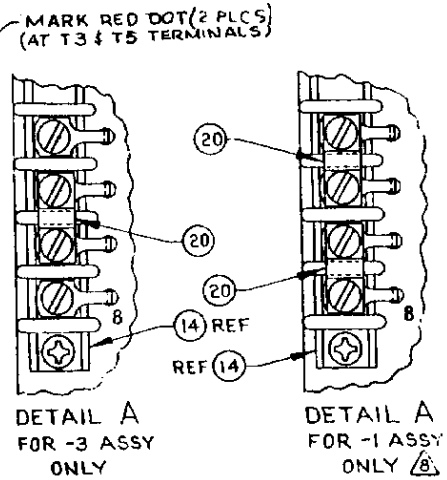
SPECIFICATION FOR T857

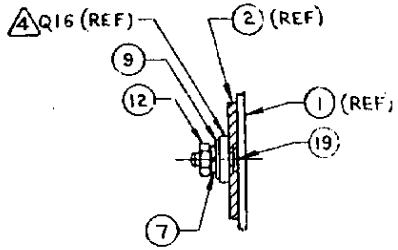
WESTAMP

FORM 218

REVISIONS			
LTR	DESCRIPTION	BY	DATE APPD
SEE SHEET 1 FOR REVISIONS			







6. Q1,Q5,Q6,Q7,Q9,Q10 & Q11 SHALL BE MOUNTED 3/16" TO 1/4" ABOVE BOARD.
5. INSTALL #24 AWG BARE SOLID WIRE BETWEEN "A" & "B" AS SHOWN.
4. APPLY IERC "THERMATE"(OR EQUIV) SILICONE THERMAL COMPOUND TO Q16 MTG SURFACE BEFORE ASSY.
3. COMPLETE ASSY NO. BY RUBBER STAMPING APPROPRIATE DASH NO. 3/32 HIGH, USING PERMANENT WHITE MARKING INK, COAT WITH FUNGUS RESISTANT CLEAR LACQUER.
2. UNLESS OTHERWISE SPECIFIED, RESISTOR AND DIODE LEAD SPACING IS LS2; EXCEPT DIODES IN645 WHICH ARE LS3.
1. FILL INTERFACIAL CONNECTION & UNUSED COMPONENT MTG HOLES WITH SOLDER.

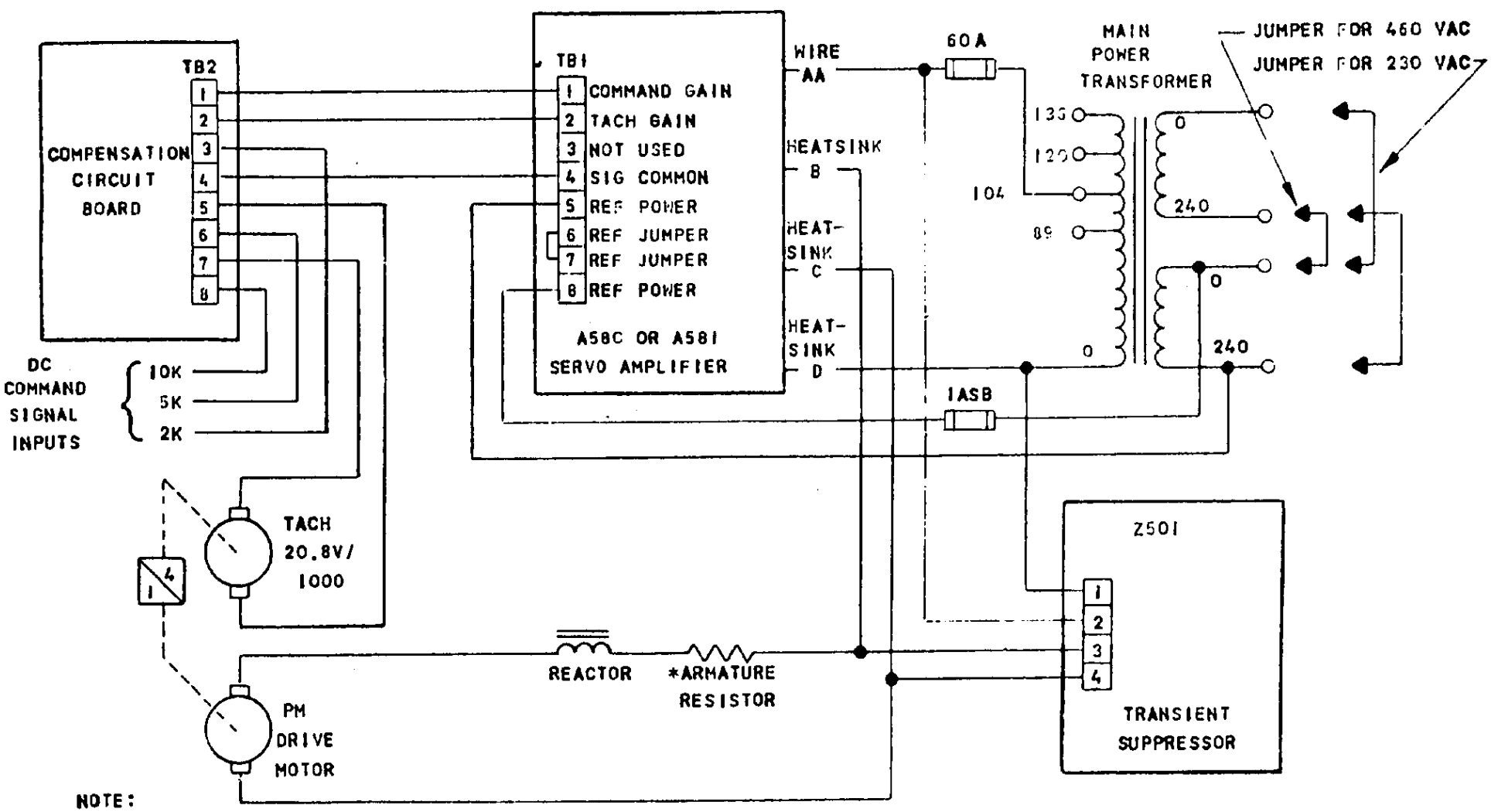
NOTES:

15 8 REQ'D

10. FOR SILK SCREEN A/W SEE DWG NO. 24205.
9. TRIM TERMINALS APPROX. 1/32" FOR MODEL A581, BEFORE MTG HEATSINKS.
8. -5 ASSY SAME AS -1 ASSY EXCEPT OMIT ITEM 20.
7. FOR ITEM IDENTIFICATION SEE SEPARATE P/L CORRESPONDING TO ASSY NO.

PART NO.	DESCRIPTION	MATERIAL	ITEM
UNLESS OTHERWISE SPECIFIED: TOLERANCES: FRACTIONS ± 1/64 .XX ± .01 .XXX ± .005 ANGLES ± 2° BEND RADII _____ BREAK SHARP EDGES .005-.010	COMPONENT ASSY, CKT P.C.	WESTAMP INCORPORATED 1542 15TH STREET SANTA MONICA, CAL.	
FINISH	MODEL A579 THRU A582	DWG NO. 24204	REV. G
	DRWN JHK APR. DATE SCALE	SHEET 2 OF 2	

ITM	DESCRIPTION	BY	DATE	APPD



NOTE:

1. COMMAND AND TACH SIGNAL WIRES SHOULD BE SHIELDED.
2. * ARMATURE RESISTOR USED WITH A581 AMPL ONLY.
3. CAUTION! DO NOT USE GROUNDED TEST EQUIPMENT ON OUTPUT CIRCUIT.

PART NO	DESCRIPTION	MATERIAL	ITEM

UNLESS OTHERWISE SPECIFIED:
TOLERANCES FRACTIONS ± 1/64
XX ± .01 XXX ± .005 ANGLES ±2°
BEND RADII _____
BREAK SHARP EDGES .005 – .010

FINISH

BURCMASTER 2 AXIS DRIVE SYSTEM

MODEL A580, A581

DWN GJP | CHK | APP

DATE 12/15/6 | SCALE

WESTAMP® INCORPORATED
1542 15TH STREET
SANTA MONICA, CALIF.

DWG NO. | REV.

SHEET 1 OF