TM-2
TAPE TRANSPORT

AMPEX

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TECHNICAL MANUAL FOR

TM-2 TAPE TRANSPORT

AMPEX

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SECTION I
DESCRIPTION/SPECIFICATIONS

1-1. GENERAL DESCRIPTION.

1-2. The Ampex Series TM-2 tape transport is designed for use in the digital data systems. The transport consists basically of two assemblies: a tape transport assembly and a transport electronics assembly.

1-3. SELECTIVE AND OPTIONAL FEATURES. Tape transports are available for use with ½-inch or 1-inch tape, on Ampex or IBM-compatible reels. A choice of tape speeds is also permissible. The inclusion of a transport access door, manual control panel, and photosense unit for detecting beginning or end of tape is determined by customer requirements.

1-4. TAPE TRANSPORT. (Figure 1-1.)

1-5. The function of the tape transport is to move the magnetic tape, in response to command signals, across the write and read heads so that information may be recorded on, or read from, the tape. The tape is driven by two counter-rotating capstans and capstan rollers. Rapid changes in tape speed and directions are facilitated by storing tape in vacuum chambers adjacent to the capstans. The inertia of the storage reels is thus isolated from the tape drive system, and only the mass of the tape in the drive area need be accelerated or decelerated. The vacuum chambers also provide sensing elements for a servo system which seeks to maintain a nominally constant length of tape in each chamber.

1-6. A dual-speed, hysteresis-synchronous motor is used to drive both capstans through a belt and pulley arrangement. The higher tape speed is used in the FAST FORWARD and FAST REVERSE (REWIND) modes.

1-7. Tape is guided across the write and read heads by guides integral to the head assembly. Other tape guiding elements are located at the entrances and exits of the vacuum chambers, and at the supply and take-up reels. Tape packer arms, functioning with the supply and take-up reels, ensure smooth tape packing.

1-8. A vacuum blower, mounted on the rear of the tape transport, is connected through air ducts to the vacuum chambers. This system provides proper tape tensioning, operates in conjunction with transducers to indicate the length of the tape loop within each of the chambers, and maintains a smooth tape loop configuration in the chambers, without danger of folding or kinking.

1-9. The tape transport is intended to operate with a closed access door. Transports with Ampex-supplied doors (optional) are equipped with an interlock switch to disable the transport while the door is open. A positive pressure blower, mounted on the rear of the transport maintains a slight increase over atmospheric pressure between the transport and the door to exclude dust.

1-10. Tape is threaded on the transport by means of a permanent leader, attached to the take-up reel, which is manually connected to each new reel of tape mounted on the supply reel hub. Other features of the transport include sensing devices which stop the tape motion upon contact with the beginning-of-reel or end-of-reel leaders; a write lockout switch, actuated by a ring placed on the supply reel hub and interlock circuitry to prevent tape motion when the tape threading clamp is in the closed position.

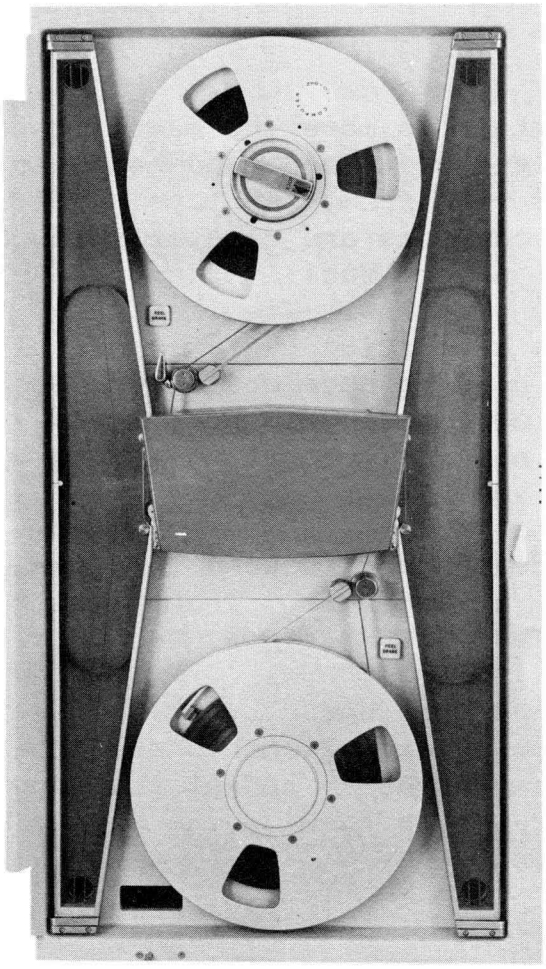


Figure 1-1. Tape Transport

1-11. The tape transport may be supplied hinge-mounted to the left side of the rack or cabinet, permitting the unit to be swung open for ease of inspection, maintenance or service.

1-12. HEAD ASSEMBLY. (Figure 1-2.)

1-13. The head assembly is mounted on the tape transport and performs the actual read and/or write function with respect to the tape. Head assemblies consist of a head mounting plate and head stacks; the exact number and configuration of stacks depends on the tape width, track arrangement, and type of head.

1-14. PHOTOSENSE.

1-15. This optional feature is accomplished by a device which detects reflective markers affixed to the mylar side of the tape. It provides signals to external control circuitry indicating the approach of the beginning or end

of the tape. The device is comprised of two units: the head, mounted on the vacuum chamber associated with the supply reel, and the electronics chassis, mounted on the rear of the tape transport.

1-16. TRANSPORT ELECTRONICS ASSEMBLY. (Figure 1-3)

1-17. The transport electronics assembly is composed of those electronic units required for operation of the tape transport. Mounted in this assembly are an actuator power supply, a servo motor (reel motor) power supply, a connector chassis, an actuator control circuit board, and a dual servo amplifier circuit board. These elements, in conjunction with transducers, switches, and circuitry mounted on the tape transport, exercise complete control over the tape unit in accordance with signals generated by the manual control panel or by external equipment.

1-18. MANUAL CONTROL PANEL. (Figure 1-4.)

1-19. The manual control panel is used when local control of the tape transport is required, or when it is desired to remove the transport from the control of external equipment for maintenance procedures. Although the manual control panel is an optional accessory, equivalent control circuitry must be provided if no manual control panel is supplied.

Figure 1-2. Head Assembly

Figure 1-3.
Transport Electronics Assembly

1-20. VOLTAGE REGULATOR. (Figure 1-5.)

1-21. The voltage regulator is used to provide a stabilized ac voltage to the vacuum blower, the servo oscillator and the servo amplifier power transformer.

1-22. COOLING FAN.

1-23. Units supplied with an Ampex rack cabinet are equipped with a cooling fan mounted in the top of the cabinet. This fan exhausts heated air at the top of the cabinet, drawing cold air through louvers at the bottom to cool the tape transport.

1-24. FUNCTIONAL DESCRIPTION.

1-25. To facilitate a general discussion of machine operation, the following terminology will be used throughout this instruction manual:

Off Mode

Equipment not in operation. No commands have been given and no power applied to the equipment.

Standby Mode

Primary power (117 vac) has been applied to the equipment. All

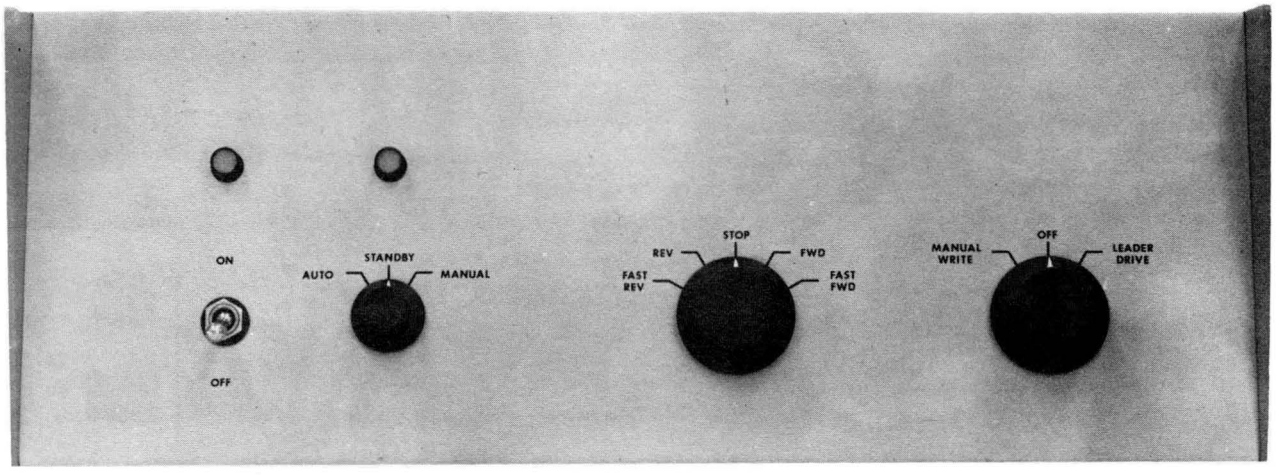


Figure 1-4. Manual Control Panel

internal or external interlocks and time delays are complete and the capstans are turning. The supply and take-up reels are locked in position by the reel brakes, and the servo systems, which seek to maintain nominally constant length loops in the vacuum chambers, are disabled. A power ON indicator on the manual control panel is illuminated.

Manual Ready Mode

Similar to the Standby mode except that the MODE SELECTOR switch on the manual control panel, or similar external switch, has been placed in the MANUAL position. The reel brakes are released and the vacuum chambers activated. Manual commands will control the tape motion.

Automatic Ready Mode

Similar to the Manual Ready mode except that the MODE SELECTOR switch on the manual control panel, or similar external switch, has been placed in the AUTO position. Tape motion may be initiated by automatic commands.

Forward Drive Mode

Equipment which was in one of the Ready modes has been given a Forward Start command. The tape has been engaged between the forward

Figure 1-5. Voltage Regulator

capstan and capstan roller and is moving from the supply reel to the take-up reel at the nominal drive speed.

Reverse Drive Mode

Equipment which was in one of the Ready modes has been given a Reverse Start command. The tape has been engaged between the reverse capstan and capstan roller and is moving from the take-up reel to the file reel at the nominal drive speed.

Fast Drive Mode

Identical to the Forward and Reverse Drive modes except that the equipment has also been given a Fast command. The tape moves at twice the nominal drive speed.

Forward Start Command

This command may be effected by the following means:

1) With the system in the Manual Ready mode, place the MANUAL CONTROL switch in the FWD position.

2) When a manual control panel is not used, ground the FORWARD ON terminal through external equipment or apply a positive-going voltage to the FORWARD AUTO terminal.

3) With the system in the Automatic Ready mode, apply a positive-going voltage to the FORWARD AUTO terminal.

Reverse Start Command

This command may be effected by the following means:

1) With the system in the Manual Ready mode, operate the MANUAL CONTROL switch to the REV position.

2) When a manual control panel is not used, ground the REVERSE ON terminal through external equipment or apply a positive-going voltage to the REVERSE AUTO terminal.

3) With the system in the Automatic Ready mode, apply a positive-going voltage to the REVERSE AUTO terminal.

Fast Command

This command may be effected by the following means:

1) With the system in the Manual Ready mode, place the MANUAL CONTROL switch in the FAST FWD or FAST REV position (depending on the desired tape direction).

2) With the system in the Automatic Ready mode, or when a manual control panel is not used, connect the 24v supply to the terminal. A tape start command must also be given.

Stop Command

This command may be effected by the following means:

1) With the system operating in the Manual mode (forward or reverse, normal or fast tape speeds), place the MANUAL CONTROL switch in the STOP position. The system will now be in the Manual Ready mode.

2) With the system operating in the Automatic mode, remove any commands previously applied to the FORWARD or REVERSE AUTO terminals. Any previously applied FAST command should also be removed.

3) When a manual control panel is not used, remove any commands previously applied to the FORWARD or REVERSE AUTO terminals, remove a ground previously applied to an ON terminal, and apply a ground to a FORWARD OFF or REVERSE OFF terminal through external equipment.

When a Stop command is given during a fast mode any subsequent Start command must be delayed until the capstan speed has returned to normal.

NOTE

Programming limitations for the command signals mentioned above will be found under specifications in this section. (Refer to paragraph 1-33.)

1-26. The following description shows the application of a series of commands to the system.

1-27. Assume that the tape transport is in either the Manual Ready or Automatic Ready mode, power is applied to the system, and all interlocks and time delays are completed. The reel brakes are released and the servos activated to maintain approximately 30 inches of tape in each vacuum chamber.

1-28. The transport receives a Forward Start command. The actuator control circuitry in the electronics assembly applies a pulse to the ON winding of the forward actuator. This actuator moves the forward capstan roller to engage the tape with the forward capstan and the tape is driven past the heads at a rate determined by the capstan speed, while the reel drive servos maintain the correct length of tape in the vacuum chambers. The tape will continue to move forward until a Forward Stop command is received in the control electronics assembly. At this time the actuator control unit will pulse the actuator OFF winding, moving the capstan roller, once more, to its open position.

1-29. As the capstan roller moves away from the capstan, a tape brake mounted on the opposite end of the capstan roller assembly from the capstan roller briefly presses against the tape, which is supported by a metal brake post. This overcomes the inertia presented by the tape and aids in halting tape motion. The equipment is now ready to accept another command signal. (It should be noted that the tape motion across the heads is not stopped by the reel motors. The reel motors are stopped by dynamic braking under the control of the reel servo systems.)

1-30. When the equipment is in the Forward Drive mode, the capstan is removing tape from the supply (left) vacuum chamber and adding it to the take-up (right) vacuum chamber. The result is a tendency for the loop in the left chamber to diminish in size while the loop in the right chamber tends to grow longer. The servo system senses these changes and counteracts them by paying out tape or reeling in tape as required. The actual sensing is accomplished through slots in the base of the chambers, connected to pneumatic transducers. The tape in the vacuum chamber effectively forms a wall between the vacuum on one side of the tape and the slightly higher than atmospheric pressure (because of a positive pressure blower adding air to the space between the transport frame and the closed transport access door) on the other side of the tape. A vacuum sensing device (transducer) connected to this slot senses variations in vacuum resulting from exposure of more or less of the slot to atmosphere as the length of the loop varies within the chamber. The vacuum sensing device takes the form of a diaphragm, expansion or contraction of which moves the core of a differential transformer. The primary of this transformer is excited by a signal from an oscillator. When the core of the transformer is

equidistant from the two secondaries, the output of a demodulator is excited by the transducer is minimal. This null condition is intended to occur when the ends of the tape loops in the column are approximately 12.75 inches apart. Any variation in loop length results in generation of an error signal, changing the demodulator output. The demodulator output in turn controls a d-c servo amplifier, which in turn controls firing of thyratrons in the servo motor power supply. Depending upon the polarity of the demodulator signal (determined by the direction of core shift in the transducer) either the clockwise or counterclockwise thyratrons will fire, causing rotation of the reel motor. This rotation will feed more tape into the vacuum chamber if the loop size has been diminishing, or remove tape from the chamber if the loop has been growing in size. This action continues until the loop reaches its null length, at which time the core of the transformer has returned to its central position, removing the error signal from the demodulator input.

1-31. Assume that the command source signals the transport to enter a high-speed mode. The Fast command signals a relay controlling the capstan drive motor assembly to switch power from the low speed winding of the capstan drive motor to the high-speed winding. The actuator for the appropriate tape direction remains closed, and the capstan roller holds the tape against the capstan. The servo systems continue to maintain appropriate loop length in the vacuum chambers.

1-32. Assume that the tape is moving from the take-up reel to the supply reel at high speed (Fast Reverse mode). As the take-up reel is nearly emptied (determined by the angle of the lower tape packer arm) a microswitch is tripped to shift operation to the normal Reverse Drive mode.

1-33. SPECIFICATIONS.

Table 1-1. Operating Characteristics

	½" Tape 112.5 ips	½" Tape 120 ips	½" Tape 150 ips	1" Tape 120 ips
Start Time[1]	2.0 msec	2.0 msec	2.0 msec	2.0 msec
Start Distance[2] (Band in inches)	.095 - .145	.105 - .155	.138 - .208	.102 - .158
Stop Time[3]	1.5 msec	1.5 msec	1.5 msec	1.5 msec
Stop Distance[4] (Band in inches)	.060 - .120	.070 -.135	.090 - .160	.085 - .135

Table 1-1. Operating Characteristics (Continued)

	½" Tape 112.5 ips	½" Tape 120 ips	½" Tape 150 ips	1" Tape 120 ips
Instantaneous[5] Speed Variation	See Figure 1-6	See Figure 1-6	See Figure 1-6	See Figure 1-6
Short Term Average[6] Speed Variation	±2%	±2%	±2%	±2%
Long Term Average[7] Speed Variation	±1%	±1%	±1%	±1%
Dynamic Skew (max)[8]	3.2 usec	3.0 usec	2.5 usec	6.0

1 Defined as time from application of Start command until tape passing read/write head reaches and remains within 10 percent of nominal speed.

2 Defined as distance moved by tape over read/write heads during start time.

3 Defined as time from application of Stop command until tape motion stops.

4 Defined as distance moved by tape over read/write head during stop time.

5 Defined as speed variation from specified nominal speed at any instant in time; variation is at maximum during start transient and decays to minimum final value.

6 Defined as variation from specified nominal speed averaged over any interval of 10 ms occurring 7 msec or more after application of Start command.

7 Defined as variation from specified nominal speed averaged over any interval of 15 ms occurring 50 msec or more after application of a Start command.

8 Defined as the varying time displacement between the recorded signals of any two heads in the same stack with tape traveling over the heads at the specified nominal speed in either direction. This time displacement is the result of random displacement of the tape as it is moved and guided across the head and will be greatest between the two outermost tracks.

NOTE

Total interchannel time displacement error is expressed as Static Skew + (0.5) (Dynamic Skew). Static skew is determined by the tolerances of the head assembly.

Fast Forward and Fast Reverse (Rewind) speed. . . . Twice nominal drive speed ±5%

Acceleration time from nominal to fast speed. . . . 8 seconds maximum

Deceleration time from fast to nominal speed. . . . 5 seconds maximum

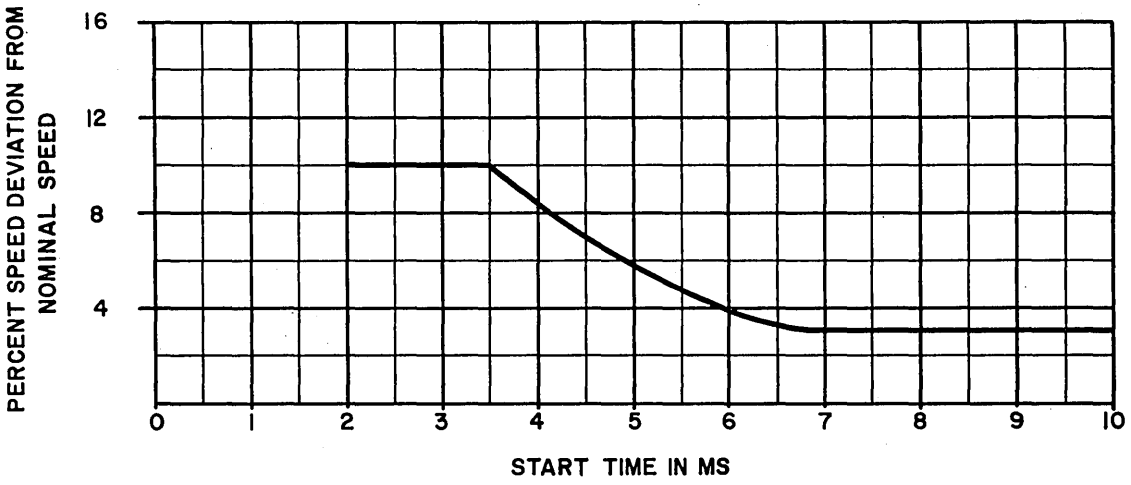


Figure 1-6. Instantaneous Speed Variation

NOTE

The transport is not programmable during deceleration time.

Programming

The actuators shall not be programmed in excess of the rates shown in Table 1-2.

Table 1-2. Program Limits

Duty	Mode	Minimum Time Between Commands
Continuous	Unidirectional	8.5 ms
Continuous	Bidirectional	4.3 ms
Intermittent	Either Mode	2.5 ms

NOTE

Not more than 6 commands shall be given in any 25 ms period.

The storage servo system maintains the tape loop positions in the vacuum storage chambers within the specified limits provided the stop times shown in Table 1-3 are inserted between commands when reversing the direction of tape motion:

NOTE

There shall be no stop delays required in unidirectional operation except as specified under Capstan Drive Actuators above.

Table 1-3. Stop Delays

Tape Speed (ips)	Bidirectional Stop Delay (ms)
112.5	150
120	180
150	350

Access Door Interlock--Places tape unit in Standby mode when transport access door is opened. A mechanical override is provided to facilitage service with the door open.

Long Loop/Short Loop Interlock--Interrupts command input circuits whenever a short loop or long loop is incurred; simultaneously applying Stop commands to both actuators, permitting reel servos to attempt to correct the condition. After 100-150 msec, if condition has not been corrected, tape transport is placed in Standby mode.

Leader Clamp Interlock--Closing the leader clamp places the tape unit in the Standby mode.

Servo Motor Thermal Interlock--A thermal overload switch opens the reel motor circuit if the internal temperature reaches an unsafe level.

Outputs

Interlock Interruption--In the Automatic mode, a -24 vdc signal is removed from the Auto Ready Line when any of the following conditions is incurred: closure of tape leader clamp, long or short loop condition, opening of the transport access door, vacuum failure, or operation of the servo adjustment switch. The Auto Ready signal is also removed when the MODE SELECTOR switch on the manual control panel is placed in the Standby or Manual mode positions.

Long Loop/Short Loop Warning--A signal is provided when tape loops in the vacuum chambers exceed specified limits. Contact rating of the switch is 150 ma maximum at -24 vdc.

Tape Leader Sensing--A conductive leader sensing guide is located near each reel; each guide consists of three rings insulated from

each other. The inner ring is grounded and serves as a ground return for remote circuits. Maximum capacity of each contact is 60 ma at 24 vdc. Arc suppression must be provided if contacts are connected to an inductive load.

Controls

Commands

The tape unit may be operated from the computer programmer or from the manual control panel. Interlocks are provided to protect the operator as well as the tape. Manual control panel commands are discussed below. Other command signals are as follows:

Start/Stop Signals--Start and Stop commands for forward and reverse operation are generated by a level change of 8 vdc (+12 vdc, -0 vdc) into 1000 ohms with a maximum rise time of 10 usec. The maximum level of these commands with respect to ground must not exceed 25 vdc. A positive-going change is a Start command; removal of this command (a negative-going change) is a Stop command.

Separation of Forward and Reverse Commands--Isolated command inputs are used for Forward and Reverse tape directions.

High-Speed Tape Motion--Fast commands are generated by a 24-vdc signal (0.25 amp max.). Removal of this level returns the capstan drive motor to normal speed.

Command Timing--An interlock is provided to prevent acceptance of commands which will turn on one actuator if the other actuator is on.

Manual Control Panel

The manual control panel provides the following controls:

Power Switch--Master switch for all power used in tape transport.

Mode Selector--Places tape transport in Automatic, Standby, or Manual mode.

Manual Control Switch--In the Manual mode, controls tape motion between fast forward, forward, stop, reverse or fast reverse.

Manual Write/Leader Drive--In Manual mode, supplies 24 vdc to external system, to be used to energize write relays. Also in Manual mode, overrides end-of-tape leader stop to permit tape motion.

Interlocks and Indicators

Rewind Time Delay--In the Manual mode, a delay of from 5 to 25 seconds is used to prevent operation of tape during deceleration time of capstan.

Table 1-4. Input Power Requirements

Freq.[1] (cps)	Tape Width	Input Voltage	Current (Standby Mode)	Current (Operating Modes)
50 ± 3 or 60 ± 3	½"	117 vac ±7%	7.0 amp	9 to 20 amp
50 ± 3	1"	117 vac ±7%	7.0 amp	9 to 20 amp

1 Frequency must be held within ±0.3% of nominal to meet Long Term Average Speed Variation specification.

Environmental

Shock and Vibration	None
Temperature	60° to 85°F.
Relative Humidity	45% to 65%
Altutude	0 to 7,000 feet
Atmosphere	Practically dust and particle free
Cooling	A minimum of 400 cfm air flow is required over the servo motors. If additional heat-generating components are located in an enclosed cabinet, additional cooling air may be required.

SECTION II
INSTALLATION

2-1. SELECTION OF LOCATION.

2-2. The selection of a location for the tape transport should be based on the following factors:

1. The rack cabinet or rack selected must be capable of mounting and supporting the components shown in Table 2-1.

Table 2-1. Physical Dimensions

Component	Weight	Height Required	Depth From Rack Face
Tape transport	167 lbs.	35"	14"
Transport electronics assy. Vertical mounting Horizontal mounting	 70 lbs. 70 lbs.	 18" 7"	 7" 18"
Manual control panel	8 lbs.	7"	6"
Voltage regulator	24 lbs.	---	---
Transport access door	24 lbs.	---	---

2. Read and write electronics must be placed so that lengthening of the head cables beyond the 80-inch length supplied is not required. The increased capacitance associated with long head cables will impair high-frequency response.

3. The unit should be located in an area characterized by ambient temperatures between 60° and 85°F, 45% - 65% RH.

4. The unit must not be located in proximity to any strong magnetic fields.

5. A reasonably dust and dirt free environment is required.

2-3. Components of the tape transport are designed for mounting in a standard 19-inch cabinet rack. If the unit is supplied with an Ampex cabinet rack, it is shipped nearly fully assembled and cabled, and the rack need only be fastened in position.

2-4. The manual control panel, if supplied, may be mounted on the same bracket as a horizontally-mounted transport electronics assembly; this configuration requires no additional rack space for the manual control panel. The manual control panel may also be mounted directly above a vertically-mounted transport electronics assembly. In this configuration, seven inches of rack space are required for the manual control panel.

2-5. The voltage regulator is mounted on the side panel of Ampex cabinet racks. In custom installations, it may be mounted similarly or in any other convenient location which affords ample support.

2-6. The dimensions and recommended clearances for the Ampex cabinet rack are shown in Figure 2-1. In general, similar clearances will be required for all mounting schemes.

2-7. UNCRATING.

2-8. Each TM-2 tape transport is packed in a custom-built case for maximum protection in shipment. This case is designed for shipment in a horizontal attitude, and should not be handled in an upright position. In uncrating the tape transport, dismantle the shipping case carefully to avoid damage. Check the contents of the container carefully against the packing slip, and investigate the equipment for damage.

2-9. The voltage regulator transformer (shipped unmounted) must be mounted in the cabinet. Voltage regulator transformers for 60 cycle tape transports are mounted on the right side of the cabinet as viewed from the rear; voltage regulator transformers for 50 cycle tape transports are similarly mounted on the left side of the cabinet. Tapped holes are provided in the cabinet for the voltage regulator transformer and for cable clamps holding the connecting cable to TB709 on the tape transport.

2-10. A shipping lock over the transport latch inside the Ampex cabinet rack must be removed before the latch can be operated.

2-11. The transport electronics assembly is locked during shipping in the Ampex cabinet rack by angle brackets at each side. These locks must be removed before the electronics can be withdrawn from the front for servicing.

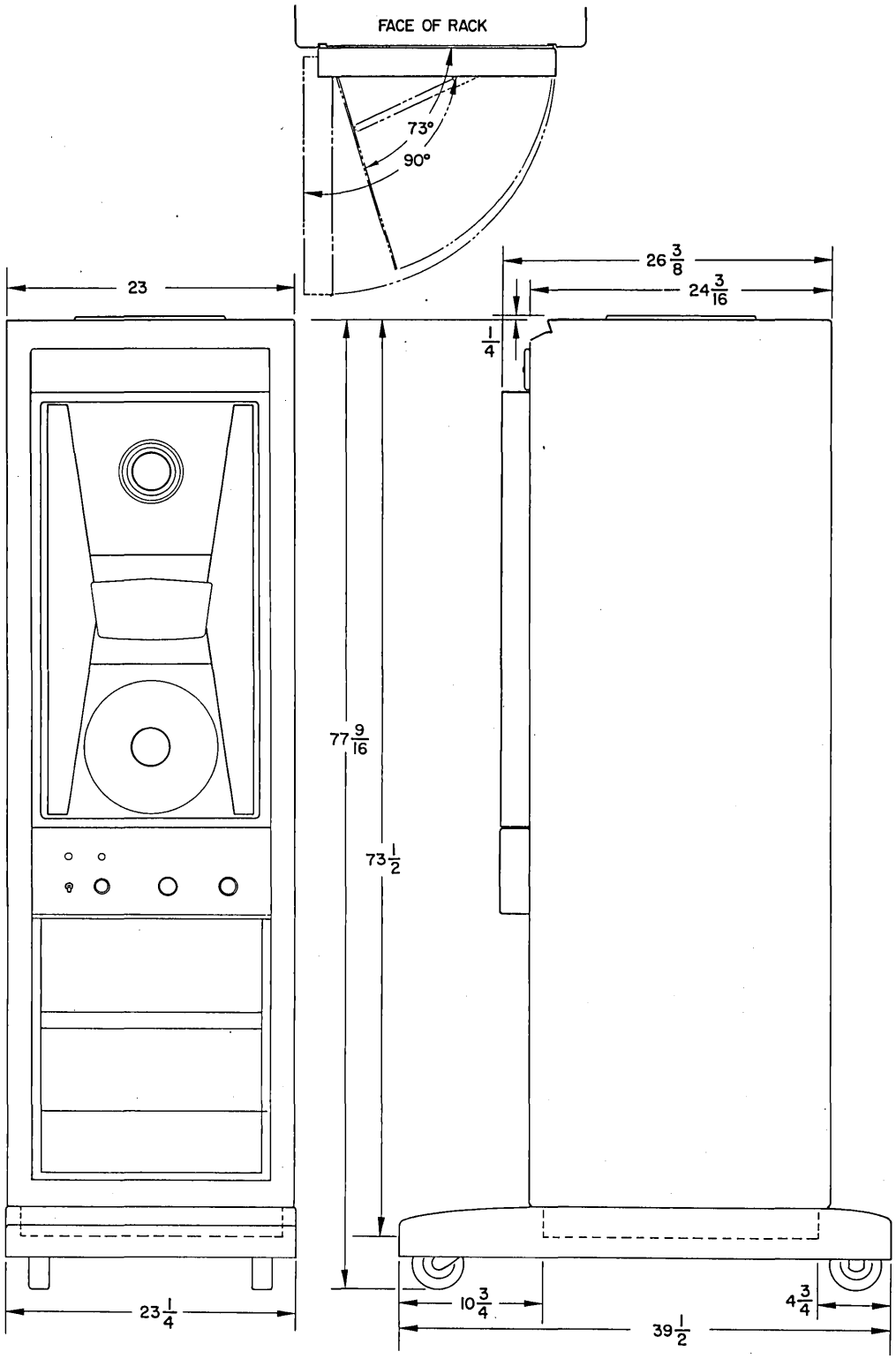


Figure 2-1
Dimensions and Clearances, Ampex Cabinet Rack

2-12. MOUNTING (CUSTOM INSTALLATIONS).

Step 1: Mount the hinge block strip to the left side rail of the rack using the 8½-inch flat head screws provided. A hole pattern for the hinge block is shown in Figure 2-2.

Step 2: Place the rack on its back on the floor.

CAUTION

The tape transport should be lifted only by the main frame casting.

Step 3: Lift the transport into position with the hinge portion of the frame between the blocks of the hinge block strip. (See Figure 2-2.)

Step 4: Insert the hinge pins through the hinge block into the hinge portion of the frame. Tighten the hinge pins securely.

Step 5: Place the transport electronics assembly in position and fasten to the side rails of the rack using the 12-24 by 3/8 inch pan head screws and #12 lock washers provided. Vertically-mounted transport electronics assemblies are fastened to the rack face with eight screws; horizontally-mounted transport electronics assemblies are fastened to the rack face with four screws. The balance of hardware supplied with the horizontally mounted transport electronics assembly may be discarded.

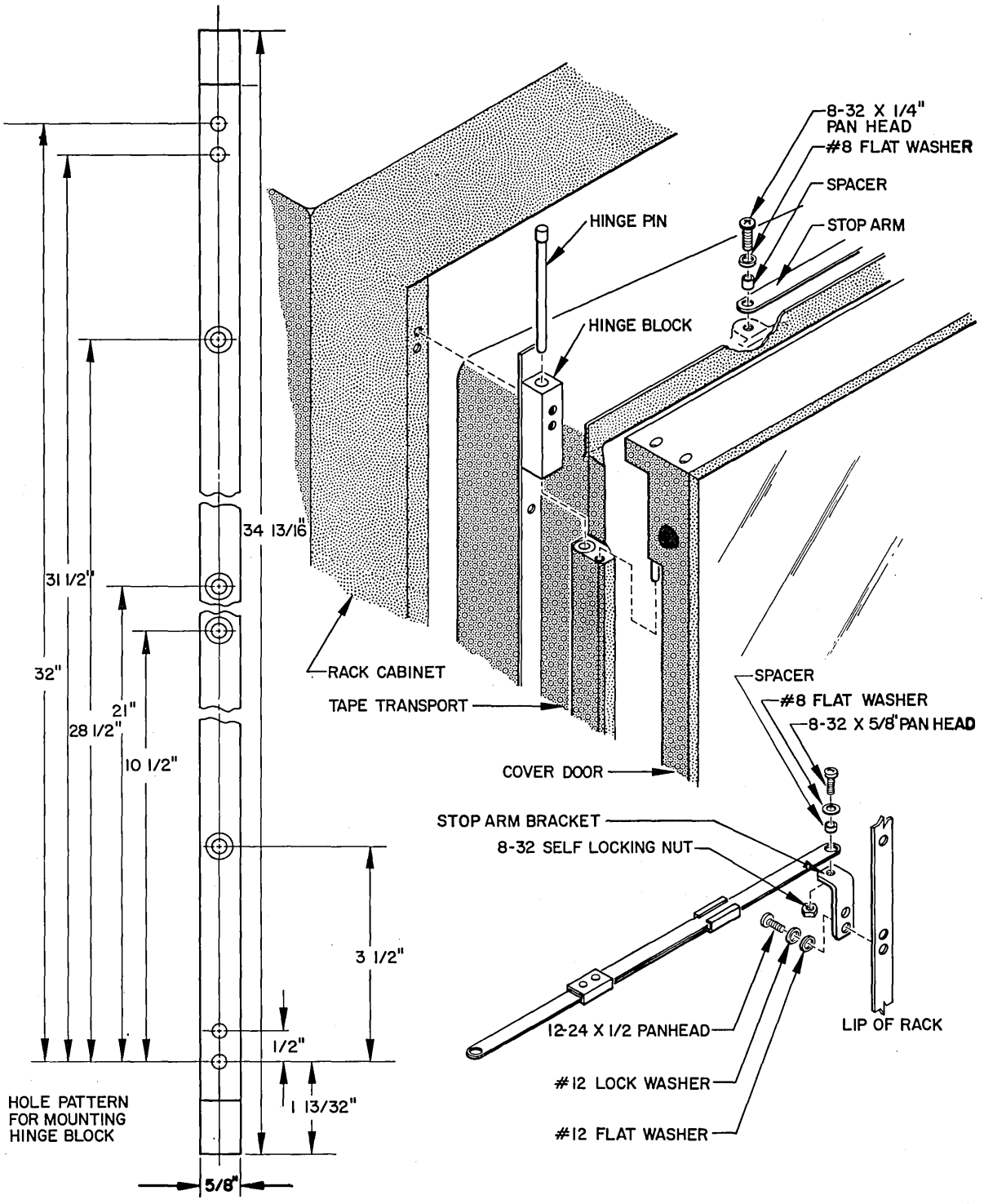


Figure 2-2. Tape Transport Mounting

NOTE

If a horizontally-mounted transport electronics assembly is used and a manual control panel is included in the system, the two brackets (supplied with the manual control panel) should be installed with the transport electronics assembly as shown in Figure 2-3. If a manual control panel is to be used with the vertically-mounted transport electronics assembly, the two brackets should be mounted separately from the transport electronics assembly.

Step 6: Fasten the manual control panel to the bracket (Figure 2-4) using the four 6-32 by 3/8-inch flat head screws supplied with the manual control panel.

CAUTION

Do not attempt to swing the transport out from the rack before the rack is secured to the floor.

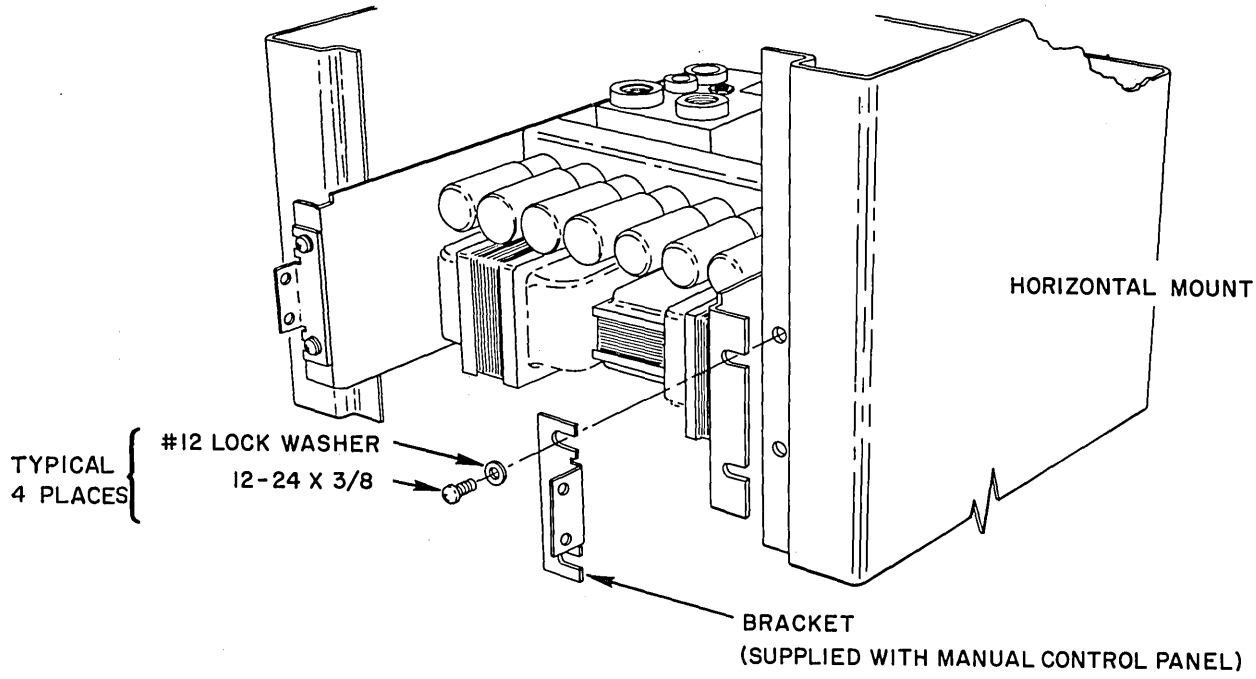
Step 7: Erect the rack and bolt it to the floor.

Step 8: Select a location for the voltage regulator. Using the dimensions and mounting details shown in Figure 2-5, mount this unit using the hardware provided.

Step 9: Fasten a ground strap from the transport to the rack.

Step 10: Mount the bracket on the back of the face of the rack cabinet using the 12-24 by ½-inch screws provided with the tape transport.

Step 11: Assemble the two stop arms provided with the tape transport as shown in Figure 2-2. Fasten the assembly to the bracket attached to Step 10 using the 8-32 by 5/8-inch screw, #8 flat washer, spacer, and #8 self-locking nut as shown in Figure 2-2. Fasten the other end of the assembly to the top of the transport using the 8-32 by ¼-inch screw, #8 flat washer, and spacer as shown in Figure 2-2.



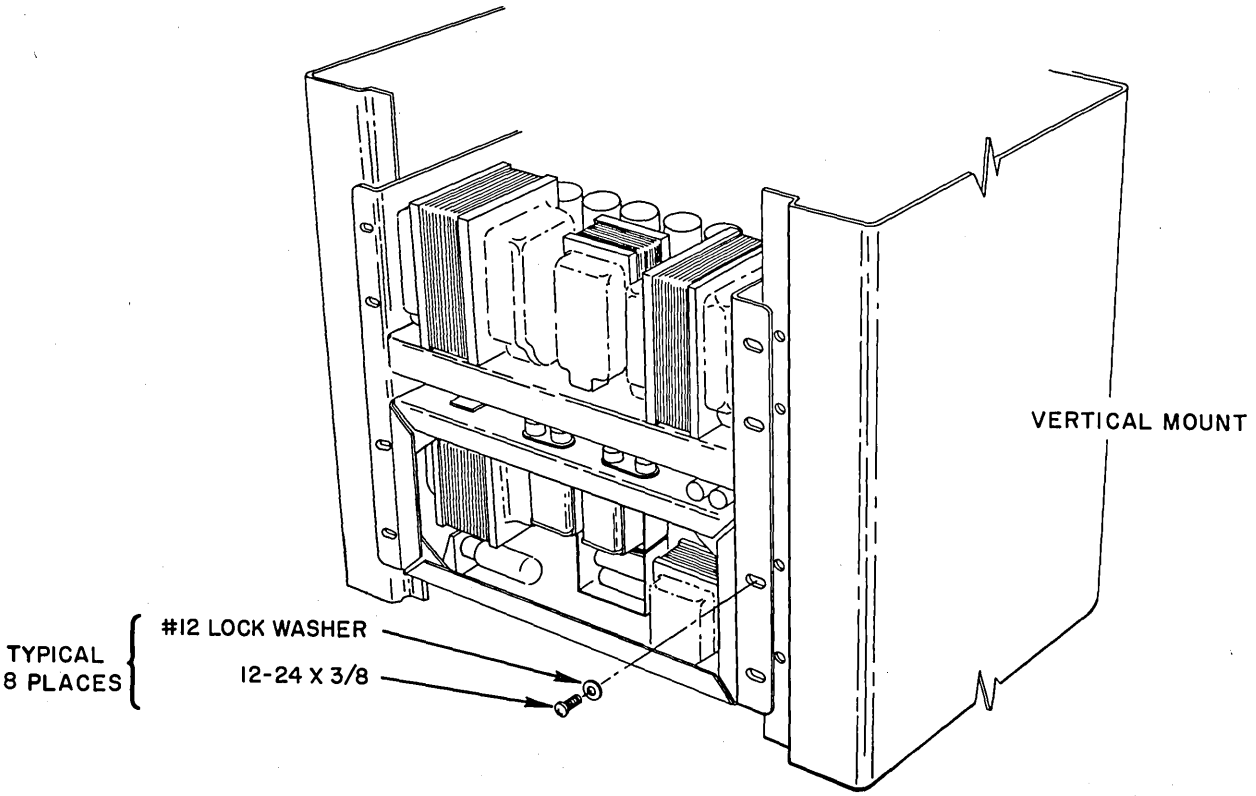


Figure 2-3
Transport Electronics Assembly Mounting

Step 12: Fasten the air filter assembly to the rack at some convenient location. Connect the hose from the air filter to the positive pressure blower inlet, using the hose clamp provided.

NOTE

The air filter is designed to mount at the rear of the rack cabinet. If this scheme is used, the rear door of the cabinet must be louvered or otherwise opened to permit air flow.

Step 13: Provide a source of cooling air through the rack. A minimum flow of 400 cfm over the reel motors is required. Cool air should be drawn in through louvers at the bottom of the rack and expelled at the top.

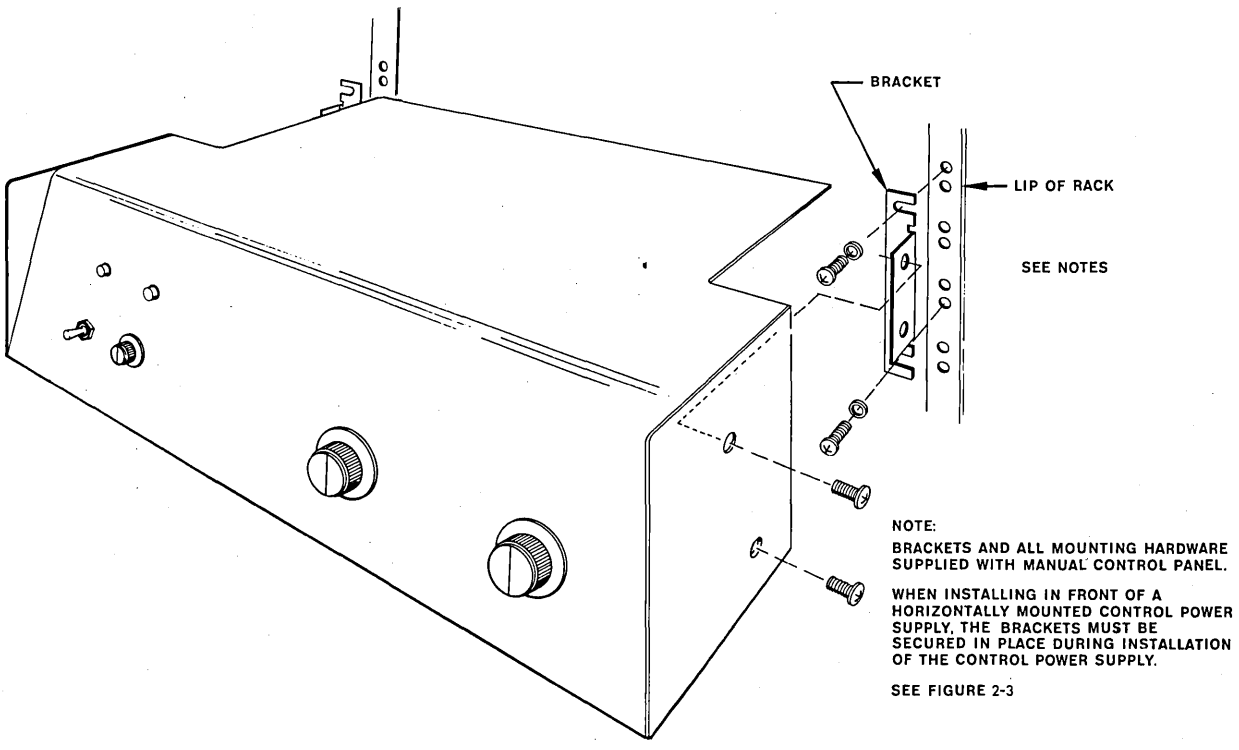


Figure 2-4. Manual Control Panel Mounting

CAUTION

If the transport is not adequately cooled, the servo motors may overheat, and programming of the transport will be restricted.

Step 14: Install cover panels over unused portion of rack.

Step 15: Mount the head assembly on the tape transport by means of the socket head cap screws and flat washers provided. Connect the head connectors to the receptacles on the tape transport, taking care to connect the write head to the write receptacle, the read head to the read receptacle. Fasten the screws which secure each connector to its receptacle.

2-13. CABLING (Figure 2-6).

2-14. All cable connections to the tape transport are made through a connector chassis on the transport electronics assembly. This

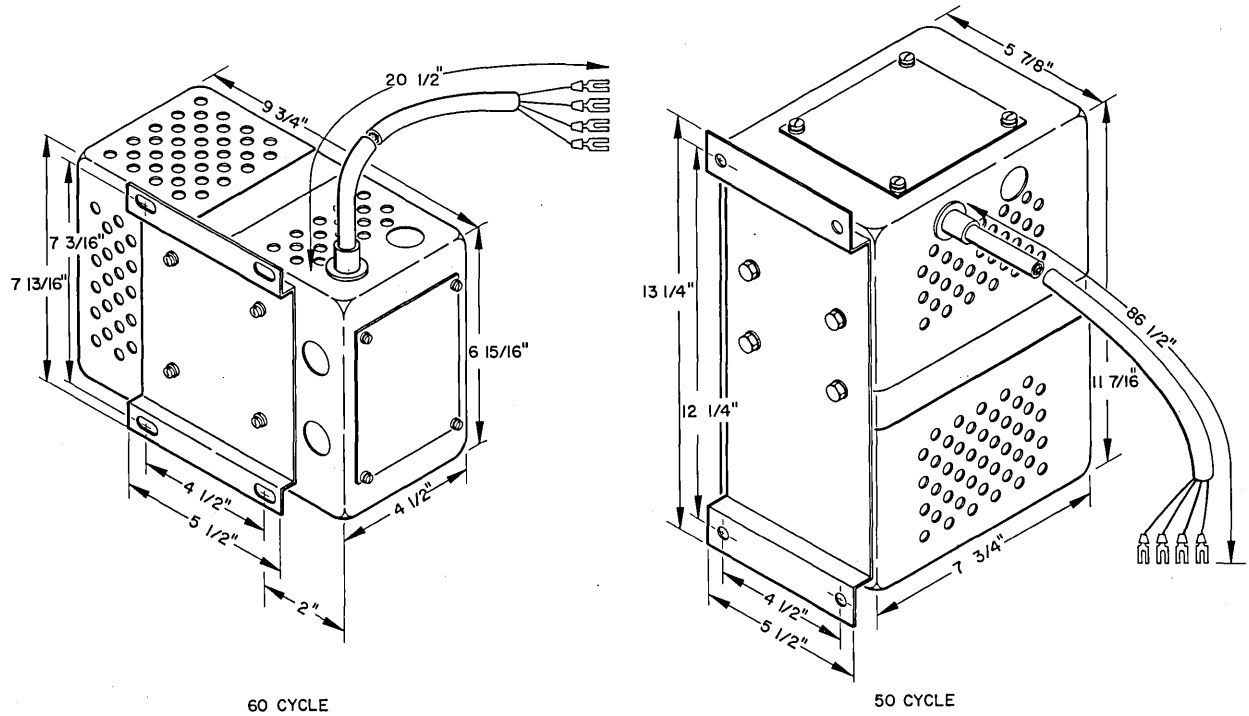


Figure 2-5. Voltage Regulator Mounting

component also serves as a central point for most connections within the tape transport.

Step 1: Connect the cable captive to the tape transport to J301 on the transport electronics assembly.

Step 2: Connect the AC power source to J302. A mating connector for this purpose is furnished with the tape transport.

Step 3: If a manual control panel is supplied, connect the cable captive to the manual control panel to J303 on the transport electronics assembly. If no manual control panel is supplied, suitable similar circuitry must be connected through J303; see Figure 2-7.

Step 4: If the tape transport is to be programmed from the tape control unit of a computer or other external source, connect this source to J304 and J305 on the transport electronics assembly. Mating connectors are supplied with the tape transport. Typical control circuitry is indicated in Figure 2-7.

Step 5: Connect the voltage regulator cable fanning strip to TB709 on the rear of the tape transport.

Step 6: Connect the cooling fan for the rack cabinet to terminals 1 and 2 on TB709, unless the power for this fan is to be supplied elsewhere.

2-15. HEAD CABLE CONNECTIONS.

2-16. The write head cables are terminated in 19-pin male Cannon connectors, one connector being used for each eight-track cable. The read head cables are terminated in similar 19-pin female Cannon connectors. Mating receptacles are provided on Ampex signal electronics assemblies; when no such electronics are provided, mating connectors must be furnished by the user.

2-17. The pin assignments of write and read head connectors are identical, and are shown in Figure 2-8. The numbers shown in parentheses in Figure 2-8 refer to track assignment on the cable for tracks 9 through 16.

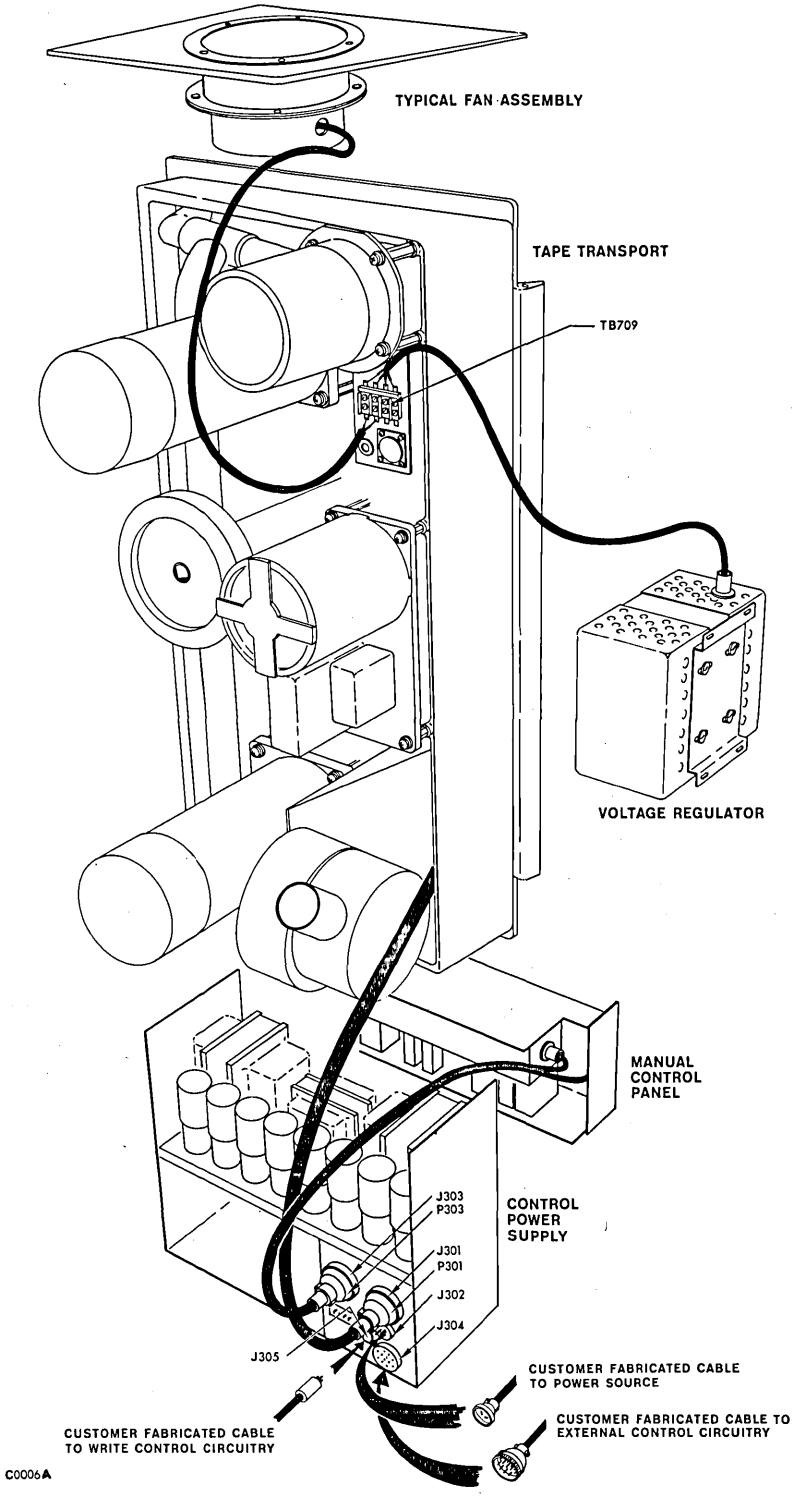


Figure 2-6. Cabling Diagram

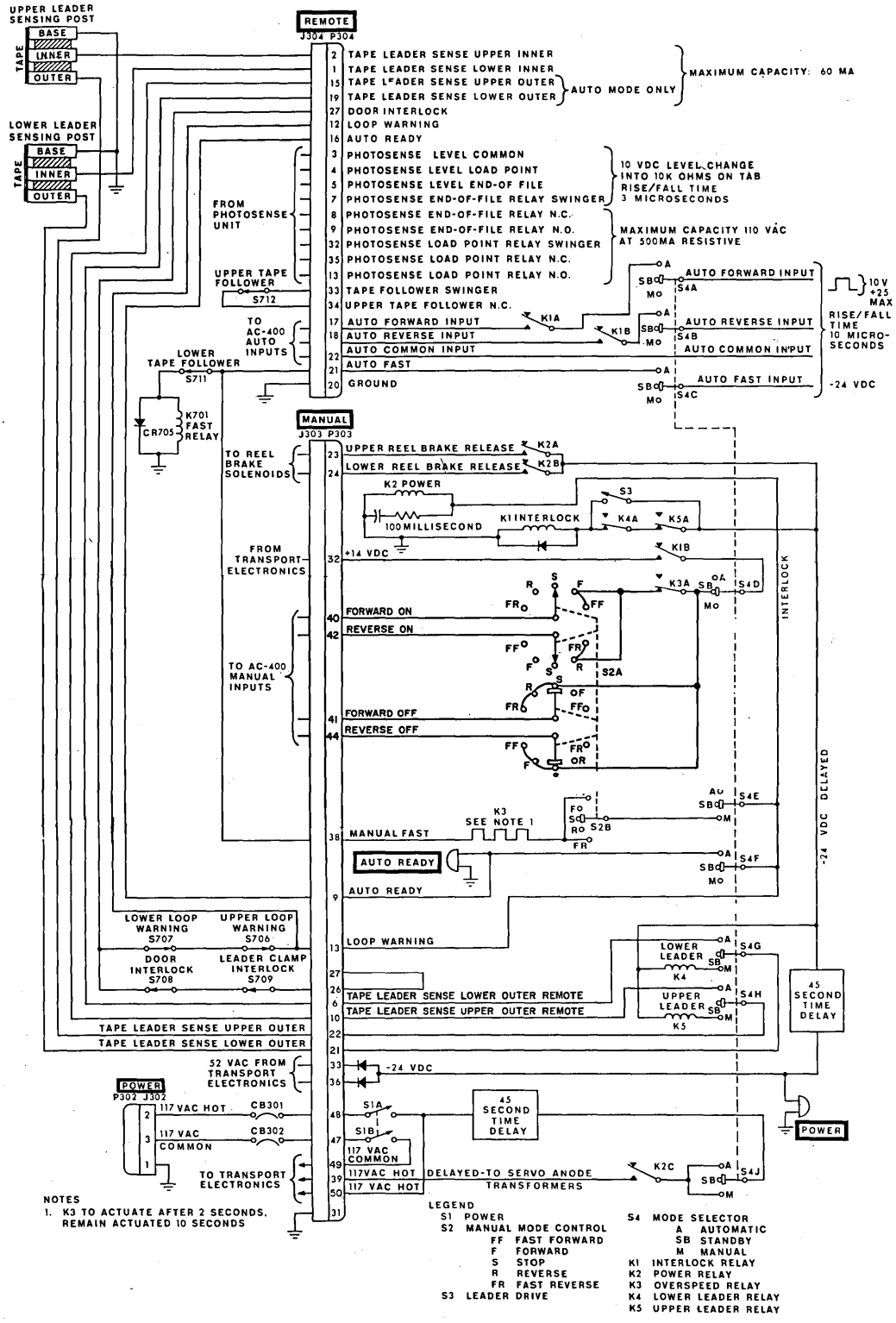


Figure 2-7. Typical Control Circuitry

2-18. PRINTED CIRCUIT CARDS.

2-19. The servo oscillator card, actuator control unit card, and servo amplifier card are not shipped in their sockets. The servo oscillator card should be placed in its housing on the rear of the tape transport, and the actuator control and servo amplifier cards in their respective positions in the transport electronics assembly. Power may now be applied to the system.

2-20. INITIAL CHECKOUT.

2-21. When the installation procedures described above have been completed, initial checkout may be performed. Thread a reel of tape on the transport as detailed in Section III of this manual.

2-22. Apply power to the equipment. Ensure that the vacuum motor is operating properly, the tape loops are formed in the vacuum chambers, and the capstans are rotating, driving the capstan rollers through the quad rings.

2-23. Operate the transport in the forward direction until all of the tape is on the take-up reel. Rewind the tape onto the supply reel.

NOTE

Irregular tape packing from a previous machine may cause faulty tape tracking. Therefore, this check should not be performed without repacking the tape on the supply reel.

CAUTION

With the actuator in the OFF position the tape should never touch the capstan roller. Contact with the roller may cause dropouts because of excessive wear on the oxide side of the tape.

Check to see that the tape is as close as possible to the capstan without touching it. If the tape touches either the capstan roller or the capstan, refer to paragraph 4-12 for adjustment procedure.

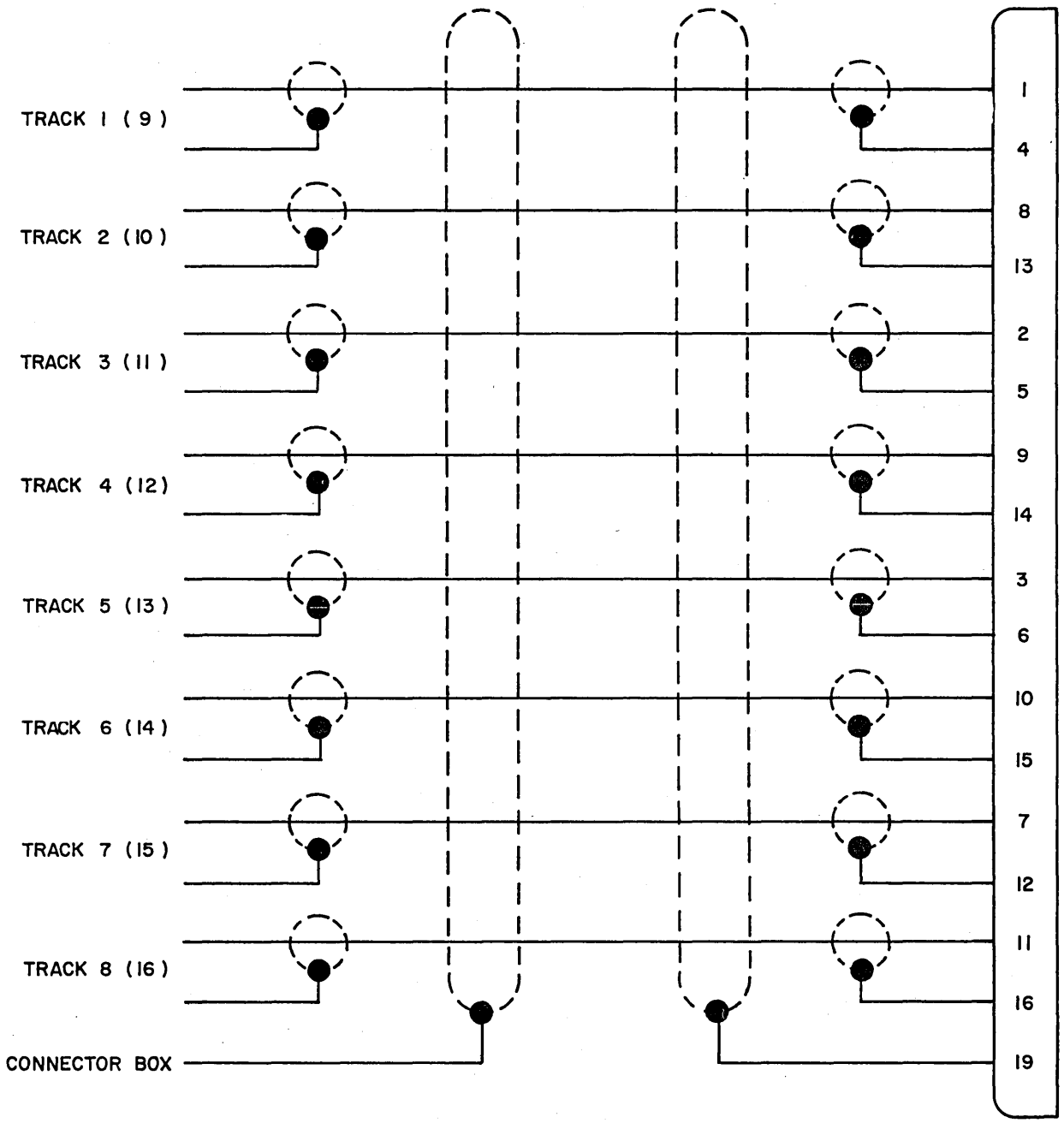


Figure 2-8. Head Cable Connections

2-24. Operate the transport from the control source in the forward and reverse directions. With the eyes at the level of the capstan rollers, observe the tape path between the capstan rollers and the vacuum chambers, between the capstan rollers and the head guides, and across the head. If any rippling, curling, or horizontal shift of the tape is evident, adjust the tape guides as described in paragraph 4-10. If the servo response appears sluggish or jittery, refer to paragraph 4-13 for adjustment procedure.

2-25. While the tape is moving in the forward and reverse directions, observe the action of the tape packer arms. The packer arm shoe must at no time touch the reel flanges. Should the shoe contact the reel, it may be adjusted as detailed in paragraph 4-17.

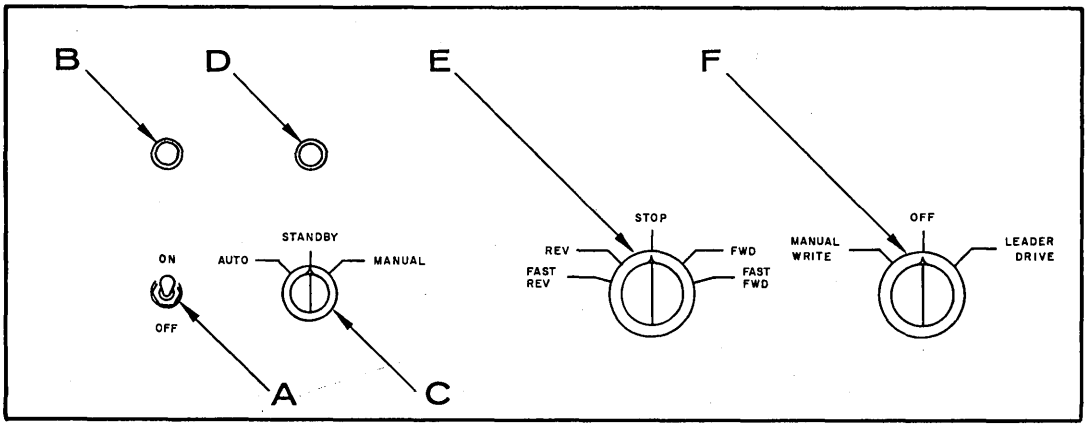
SECTION III
OPERATION

3-1. GENERAL.

3-2. The information contained in this section is based on the assumption that an Ampex manual control panel is incorporated into the tape transport. Since equivalent control circuitry must be provided by the customer if a manual control panel is not included with the tape transport, only minor differences in nomenclature should occur and no basic difference in operating procedure will be encountered.

3-3. OPERATING CONTROLS.

3-4. The operating controls for the tape transport are grouped on the front panel of the manual control panel. These controls and their functions are indicated in Figure 3-1.



CONTROL	DESCRIPTION	FUNCTION
A	POWER SWITCH	POWER ON OR OFF
B	ORANGE INDICATOR	POWER ON
C	MODE SELECTOR SWITCH	AUTO, STANDBY, OR MANUAL
D	GREEN INDICATOR	READY
E	MANUAL CONTROL SWITCH	FAST FORWARD, FORWARD, STOP, REVERSE, OR FAST REVERSE
F	MANUAL WRITE / LEADER DRIVE SWITCH	MANUAL WRITE, OFF, OR LEADER DRIVE

Figure 3-1.
Operating Controls, Manual Control Panel

3-5. THREADING TAPE LEADER.

3-6. Under normal operating conditions, the take-up reel of the transport is never removed. Successive reels of tape, or files, are placed on the supply reel hub.

3-7. The operation of re-threading the tape transport for each supply reel is avoided by attaching a permanent leader to the take-up reel. A connector tab on this leader mates with notches in the leader of each supply reel.

3-8. The machine leader is normally supplied on the take-up reel and will last for many months in normal operation. Should the leader require replacement, the following procedure is recommended.

Step 1: Remove any leader or tape from the take-up reel.

Step 2: Place the tape transport in the Standby mode. Press the lower REEL BRAKE pushbutton and starting with the plain end of the new leader, wind approximately 10 feet of leader on the reel by rotating a reel in a clockwise direction.

Step 3: Open the tape drive mechanism cover and the glass vacuum chamber doors.

Step 4: Referring to Figure 3-2, pass the tape to the left of the lower leader sensing post, over the roller guide of the vacuum chamber, and between the lower vacuum chamber guide and the chamber wall.

Step 5: Route the leader over the upper guide, between the upper guide and the chamber wall, under the buffer spring guide of the vacuum chamber, between the right-hand brake weight and brake post, and between the right-hand capstan and capstan roller.

Step 6: Pass the leader over the right-hand guide of the head assembly, between the hinged head cover and the head stack, and under the left-hand guide on the head assembly.

Step 7: Continue the threading by passing the leader between the left-hand capstan and capstan roller and the left-hand brake weight and brake post. Pass the leader between the photosense head and the buffer spring guide of the left-hand vacuum chamber. If photosense is not used, the leader is routed directly over the buffer spring guide of the left-hand vacuum chamber.

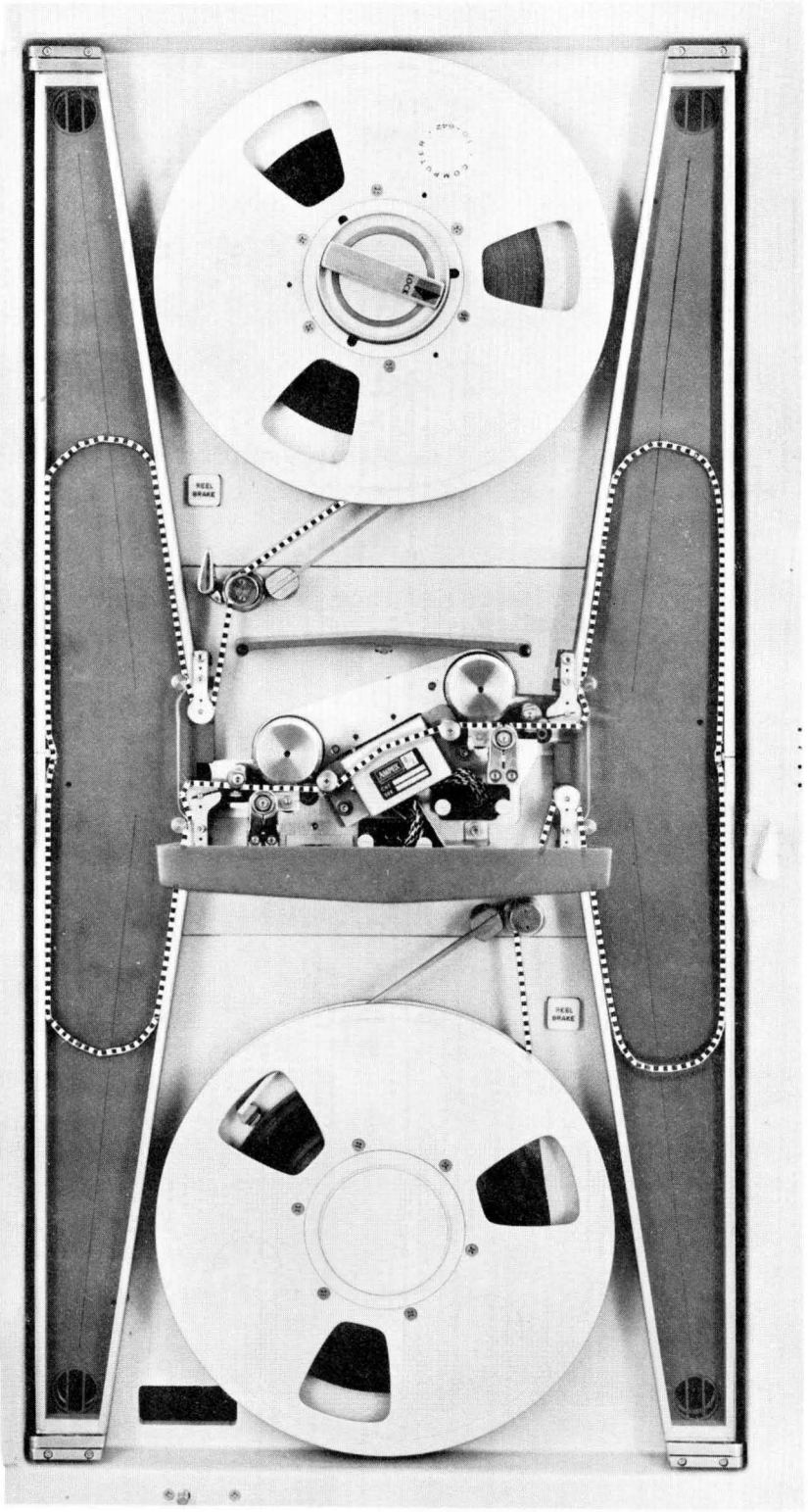


Figure 3-2. Tape Threading Path

Step 8: Thread the leader between the lower chamber guide and the chamber wall, over the upper chamber guide and between this guide and the chamber wall, and under the roller guide on the vacuum chamber. Open the leader clamp at the upper leader sensing post and clamp the leader against the post. Close the vacuum chamber doors and the tape drive mechanism cover.

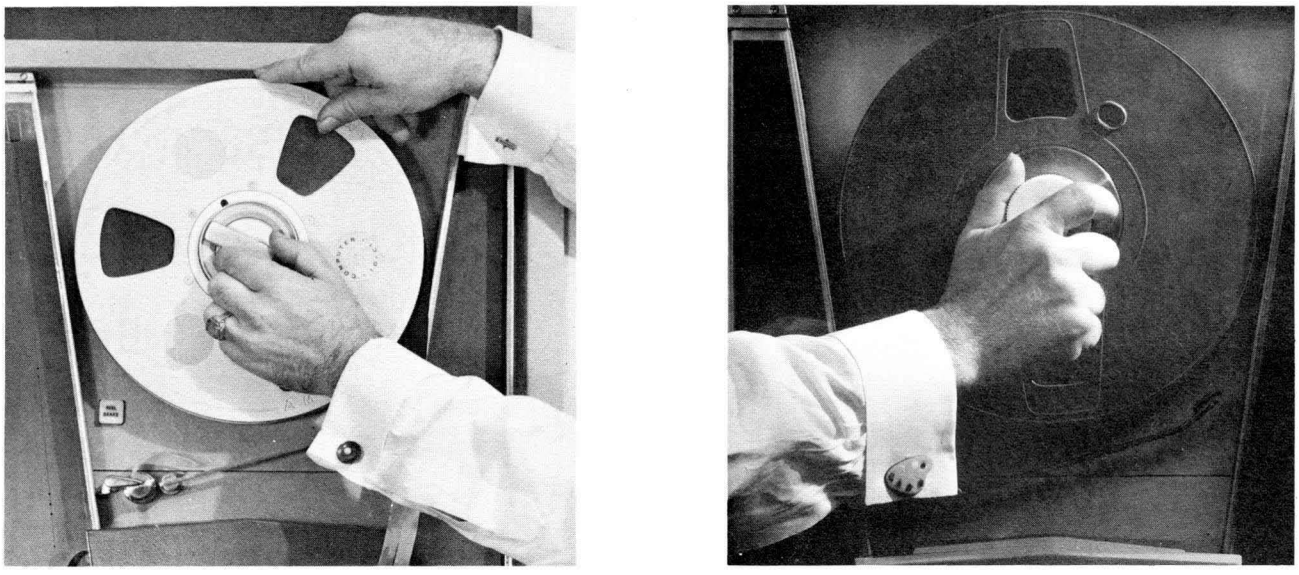
3-9. INSTALLING SUPPLY REEL. (Figure 3-3)

3-10. When the permanent leader has been threaded on the tape transport as above, the supply reel may be installed by following the procedure below.

Step 1: Open the transport access door and engage the leader clamp (if not already engaged).

Step 2: (Ampex reel retainer)--Press the serrated end of the reel retainer handle. If the reel retainer has previously been locked, the lock will release.

(IBM Compatible reel retainer)--Rotate the retainer knob in a counterclockwise direction until the metal plate no longer presses against the tire.



Ampex Supply Reel IBM File Reel

Figure 3-3. Mounting a Supply Reel

Step 3: If a write enable ring is to be used, install the ring on the back of the supply reel.

Step 4: (Ampex reel retainer)--Slip the supply reel over the reel retainer. Hold the reel firmly against the turntable surface and rotate the reel retainer handle approximately 120 degrees clockwise, at which point the reel retainer handle will lock into position. Check to see that the reel is snugly mounted on the retainer.

(IBM Compatible reel retainer)--Slip the supply reel over the reel retainer. Hold the reel firmly against the turntable surface and rotate the retainer knob in a clockwise direction until the reel is snugly mounted on the retainer.

Step 5: Press the upper REEL BRAKE pushbutton, releasing the mechanical brake on the upper reel. Pull sufficient tape from the reel to reach the end of the permanent take-up leader held in the tape clamp.

Step 6: Connect the supply leader to the take-up leader as shown in Figure 3-4. One-inch tape leaders have two sections in the quick-connect splice, one-half-inch tape leaders have a single section splice.

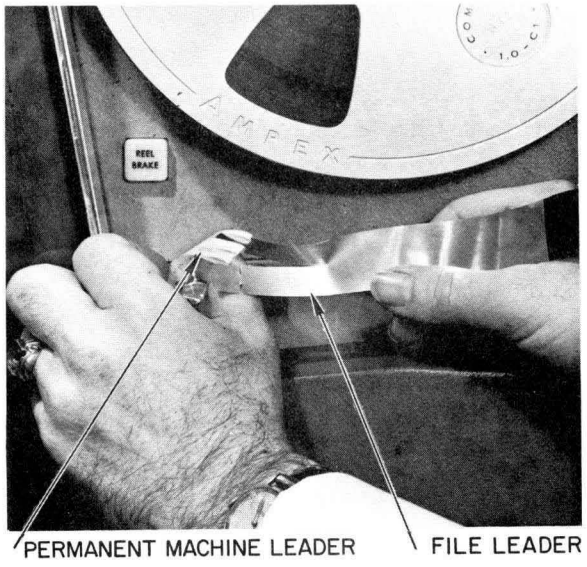


Figure 3-4.
Connecting Leaders

Step 7: Press the upper REEL BRAKE pushbutton and turn the supply reel in a counterclockwise direction to take up all slack between the supply reel and the leader clamp.

Step 8: Release the leader clamp. The upper tape packer arm will move in against the tape pack.

NOTE

The leader clamp must be opened to complete the tape transport interlock.

Step 9: Close the transport access door.

NOTE

The transport access door must be closed to complete the tape transport interlock.

Step 10: Place the MODE SELECTOR switch in the MANUAL position. Place the MANUAL CONTROL switch in the FORWARD position. Hold the MANUAL WRITE/LEADER DRIVE switch in the LEADER DRIVE position until metallized leader no longer contacts the sensing posts. When the MANUAL WRITE/LEADER drive control is released it will automatically return to OFF position. Tape will continue to move in the forward direction.

Step 11: Permit the tape to move forward until the opaque recording tape is completely threaded between the supply and take-up reels. Tape motion may now be stopped by turning the MANUAL CONTROL switch to the STOP position.

3-11. MANUAL OPERATION.

3-12. Manual operation is obtained at all times when the MODE SELECTOR switch is in the MANUAL position. Tape motion control is exclusively a function of the five-position MANUAL CONTROL switch, with writing possible when the MANUAL WRITE/LEADER DRIVE switch is in the MANUAL WRITE position.

3-13. If an entire reel of tape is to be run, the MANUAL CONTROL switch may be left in the FORWARD position. The tape transport will move tape forward until metallized leader at the end of the supply reel contacts the leader sensing post, at which time tape motion will automatically stop. Likewise, the tape may be moved in the reverse direction at normal tape drive speed by utilizing the REVERSE position of the MANUAL CONTROL switch. Tape motion will stop when the metallic leader at the beginning of the supply reel contacts the tape sensing posts.

3-14. If only certain portions of the tape are to be run, the desired section may be more rapidly reached by the use of the FAST FORWARD or FAST REVERSE positions of the MANUAL CONTROL switch. The presence of the metallic leader will stop the tape transport at the end of the reel. (FAST FORWARD and FAST REVERSE operation are locked out when the diameter of the tape pack on the take-up reel falls below a minimum point.)

3-15. If the tape motion is interrupted for any reason, such as breaking the tape transport control interlock circuitry by opening the transport access door, the MANUAL CONTROL switch must be turned to the STOP position after the interruption is cleared before tape motion can be resumed.

3-16. AUTOMATIC OPERATION.

3-17. Placing the MODE SELECTOR switch on the manual control panel in the AUTO position connects all control inputs of the tape unit to external equipment. Control of tape motion is therefore exclusively a function of the computer, and operation of the MANUAL CONTROL or MANUAL WRITE/LEADER DRIVE switches will have no effect on operation.

3-18. If tape motion is interrupted for any reason, such as breaking tape transport control interlock circuitry by opening the transport access door, tape motion is resumed as soon as the interruption is cleared. If this is not desirable, the MODE SELECTOR switch should be turned to the STANDBY position before the interruption is cleared. It will be noted that even though the operation is resumed immediately upon clearance of the interruption, the logical sequence of the programming may be destroyed.

3-19. REMOVING SUPPLY REEL.

3-20. When operating in the MANUAL mode, tape motion is automatically stopped by the presence of metallic leader across the upper leader sensing post. (Leads from this post are available for similar control in the AUTOMATIC mode.) To return the tape to the supply reel, the following procedure should be followed:

Step 1: Turn the MODE SELECTOR switch to the MANUAL position, the MANUAL CONTROL switch to the FAST REVERSE position, and the MANUAL WRITE/LEADER DRIVE switch to the LEADER DRIVE position. The tape will move at high speed from the take-up reel to the supply reel. As the rewind cycle is nearly completed the position of the take-up reel packer arm trips a switch to slow the tape transport to normal reverse speed. As the metallic leader passes over the upper leader sensing post, tape motion is automatically stopped.

Step 2: Turn the MODE SELECTOR switch to STANDBY and the MANUAL CONTROL switch to STOP.

Step 3: Open the transport access door.

Step 4: The tape will be stopped with the leader connection between the supply reel and the leader clamp. Close the leader clamp, gripping the tape.

Step 5: Disconnect the permanent machine leader from the supply leader.

Step 6: Depress the upper REEL BRAKE pushbutton and rotate the reel in a counterclockwise direction until the supply leader is completely wound on the reel.

Step 7: (Ampex reel retainer)--Depress the serrated end of the reel retainer handle to release the lock, permit the handle to rotate in a counterclockwise direction. Remove the reel from the hub.

(IBM Compatible reel retainer)--Turn the retainer knob in a counterclockwise direction until the reel can be removed from the hub.

Step 8: The equipment is now ready to be reloaded. If another supply reel is not to be installed immediately, close the transport access door.

3-21. INTERLOCKS.

WARNING

With the transport access door interlock defeated, the servo systems may be operative. The operator should avoid placing hands near the reels unless the system is in the STANDBY mode.

3-22. Interlocks are provided in the tape transport mechanism to protect the operator and tape. These interlocks should be defeated only when absolutely necessary and with full realization of potential hazards.

3-23. The transport access door interlock switch, located at the lower left front of the tape transport, permits operation of the transport only with the access door closed or when the switch has been defeated. The defeat is possible by gripping the plunger and pulling it toward the operator.

3-24. PREPARING TAPE INDICATORS.

3-25. The tape sensing posts mounted near the supply reel and the take-up reel may be used for indicators in control circuits, logic circuits, etc. Metallized leader placed on the tape backing may be used to ground either or both insulated rings of the sensing post (if the metal leader extends across the lower half of the width of the tape, the inner ring will be grounded; if the leader extends the full width of the tape, both rings will be grounded). The maximum current capacity of each sensing post is 60 milliamperes. The posts are completely available only when the transport is operating in the AUTOMATIC mode; in MANUAL operation, the outer ring of the upper leader sensing post is required to stop tape motion.

3-26. If a photosense unit is incorporated into the tape transport, a level change and/or relay operation are available for control and logic circuits. Photosense signals are not used within the tape unit. Two channels are used, one each for beginning of file and end of file. Placement of the photosense tabs on the tape is indicated in Figure 3-5.

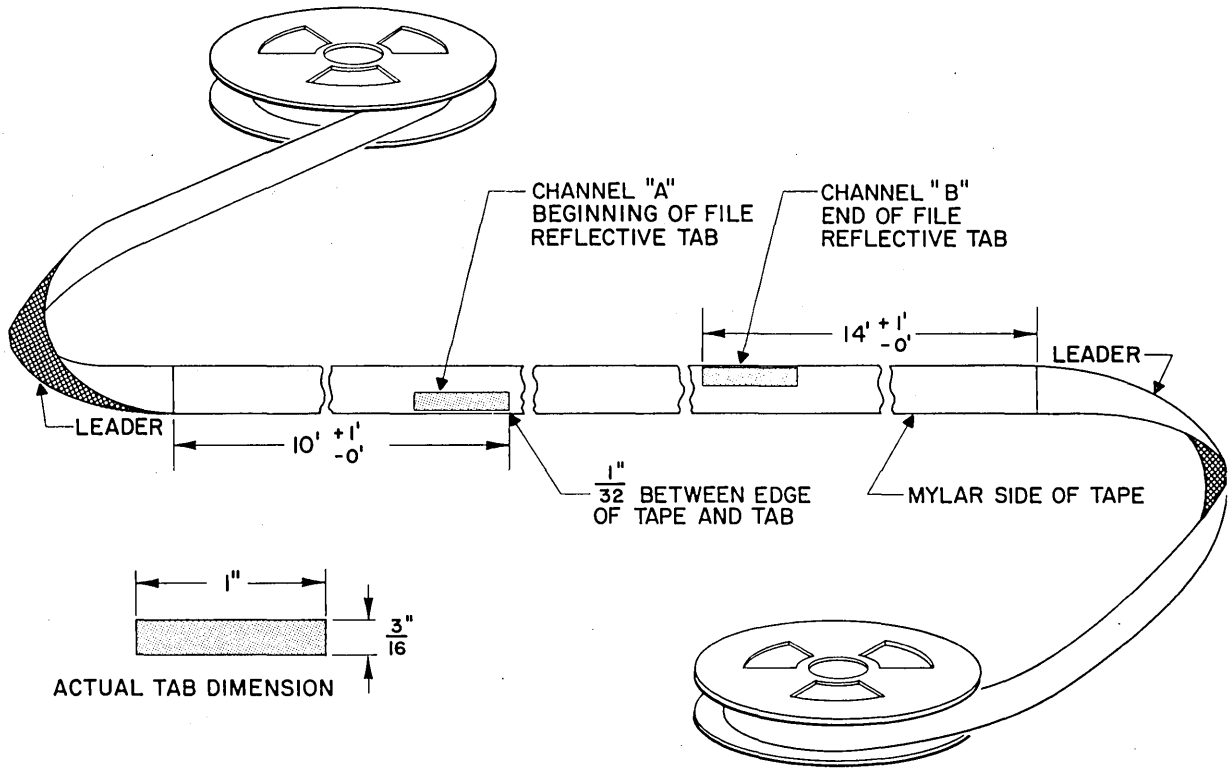


Figure 3-5. Placement of Photosense Tabs on Tape

SECTION IV
CHECKOUT AND ADJUSTMENT

4-1. GENERAL.

4-2. Each Ampex TM-2 Tape Transport is carefully checked out before shipment from the factory and, barring major shipping damage, is ready for operation immediately upon unpacking.

4-3. The information contained in this section may be used for trouble-shooting the transport, checking operating parameters, and adjusting for optimum performance. The tests and adjustments indicated are also advisable after extensive maintenance operations have been performed.

4-4. CHECKING TAPE TRACKING. Tape tracking is most readily checked by cycling the tape transport rapidly between the forward and reverse directions. The operator should observe the tape path between the capstan roller assemblies and the vacuum chambers (the eyes should be at the level of the capstan rollers). There should be no evidence of skew or tape misguiding; that is, the tape should be perfectly flat with no twist or ripple. When the tape is viewed across the head there should be no discernible horizontal shift of the tape. Adjustment of the tape guides is described in paragraph 4-12. Cycling of the transport also permits observation of the servos controlling tape loop length in the vacuum chambers. If the servo response appears sluggish or jittery it should be checked as detailed in paragraph 4-13.

4-5. CHECKING TAPE PACKER ALIGNMENT. During the check of tape tracking observe the action of the tape packer arms. The packer arm shoe must at no time touch the reel flanges. Should the shoe contact the reel, it may be adjusted as detailed in paragraph 4-17.

4-6. CHECKING CAPSTAN ROLLER ADJUSTMENT. Capstan roller gap and tape brake gap are extremely important adjustments in terms of meeting start and stop and distance requirements. The gap between capstan and capstan roller should be checked with a feeler gauge when the actuator is OFF and the tape is removed from the capstan roller. Measured at the tightest point the gap should be actuator throw minus .006 $\pm$.001 inch. The gap between brake pad and brake post should be checked with a feeler gauge when the actuator is off and the tape removed. The gap should be .001 $\pm$.002 inch.

4-7. CAPSTAN ROLLER ADJUSTMENT. The capstan roller assemblies must be carefully adjusted to meet start/stop time and distance requirements. In addition, no "skew" of the tape as it emerges from the capstan and capstan roller may be tolerated. (See Figure 4-1.)

Step 1: Check actuator shaft bearing and support post to ensure that the bearing is running freely, the bearing shell is firmly clamped, and no strain is placed on the bearing by the support post. This is best done by loosening the support post screws (G) while checking the bearing. These screws should then be tightened while the support post is held in a position where no strain is placed on the bearing.

Step 2: Subtract .006 inch from the actuator throw measurement. For actuator throw measurment see paragraph 4-8. The remainder will be the correct gap setting for any capstan roller assembly used with the one actuator. The actuator throw measurement is given on a gummed label attached to each actuator but in the event that the label has been removed or defaced the actuator throw may be measured by the procedure given in paragraph 4-8.

Step 3: Loosen the two socket head cap screws (A) which clamp the capstan roller yoke to the actuator shaft.

Step 4: Using a feeler gauge .002 or .003 inch smaller than the value determined in Step 2, rotate the yoke on the actuator shaft (actuator in the OFF position) so that the feeler gauge is clamped between capstan roller and capstan.

Step 5: Tighten the two screws (A) clamping the yoke to the actuator shaft. While tightening these screws the slight rotation of the yoke on the shaft will consume the .002 or .003 inch allowed in Step 4.

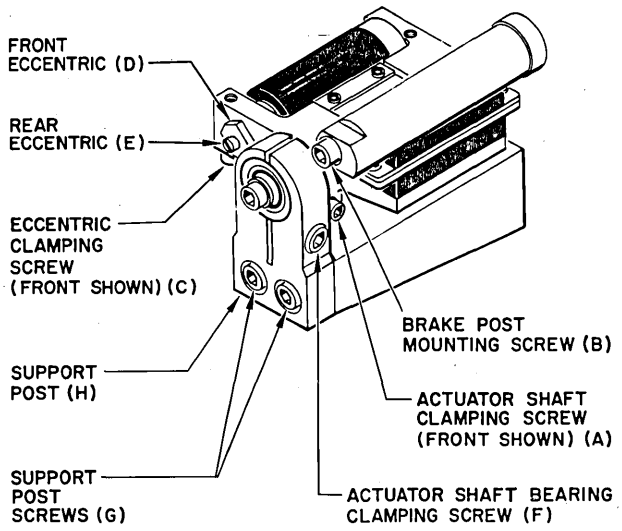


Figure 4-1.
Capstan Roller
Adjustment Points

Step 6: Check the roller gap with a feeler gauge of the thickness determined in Step 2. The gap should be within .001 inch of this value at the tightest point. If the gap is not within this limit, Steps 3 through 6 should be repeated until the gap is correct.

Step 7: Repeat Steps 1 through 6 for the other actuator assembly.

Step 8: Loosen the socket head cap screw (B) for the left-hand tape brake post.

Step 9: Place a .011-inch feeler gauge between the brake pad on the capstan roller assembly and the brake post. Use a wrench to rotate the brake post on its eccentric until the feeler gauge is just held between the post and the pad. Hold the post in this position with the wrench while tightening the brake post screw (B).

Step 10: Check the brake gap with a feeler gauge. If the gap is not .011 ±.002 inch repeat Steps 8 and 9.

Step 11: Repeat Steps 8 through 10 for the right-hand tape brake.

Step 12: Thread the transport with tape.

Step 13: Operate the transport in the Forward Drive mode. Observe the tape as it passes through the right-hand capstan roller. If any distortion (bowing, waving, etc.) of the tape is observed loosen the two socket head screws that clamp the eccentrics within the yoke (C). Manipulate the front and rear eccentrics (D and E) until the tape emerging from the capstan roller is smooth, flat, and straight. Tighten the socket head cap screws (C).

Step 14: Repeat Step 6.

Step 15: Operate the transport in the Reverse Drive mode and repeat Steps 13 and 14 for the left-hand capstan roller.

Step 16: Check the start and stop times as described in Section IV and re-adjust the capstan rollers as needed to meet the desired times. The roller gap and/or brake gap should be increased if the stop and/or start is too short and decreased if it is too long but only within the limits of ±.001 inch of the value determined in Step 2.

4-8. MEASURING ACTUATOR THROW. The throw of the actuator may be determined by the following procedure:

Step 1: With the machine off, remove the tape and manually rotate the right-hand (forward) capstan roller assembly to its ON position (in contact with the capstan).

Step 2: Referring to Figure 4-1, loosen the two socket head cap screws (A) which clamp the capstan roller yoke to the actuator shaft.

Step 3: Rotate the capstan roller yoke on the actuator shaft so that the roller is just in contact with the capstan.

Step 4: Tighten the screws which clamp the yoke to the actuator shaft. Check to see that the roller is still in contact with the capstan.

Step 5: Manually rotate the capstan roller assembly to its OFF position.

Step 6: Using a feeler gauge, determine the gap between the capstan and the capstan roller. This figure represents the actuator throw. Mark this figure on the actuator for future reference.

Step 7: Repeat Steps 1 through 6 for the left-hand (reverse) capstan roller actuator.

4-9. CHECKING START/STOP TIME. The start time is defined as the time after the actuator ON command until the tape motion falls within prescribed tolerances. The stop time is defined as that time required for the output of the read head to drop to zero following the actuator OFF command. A test tape is required to check start/stop time. This tape should be recorded at normal tape drive speed with an NRZ signal used to write logical ONE's on all tracks at a frequency of 50 kc for 150 ips tape transports, 40 kc for 120 ips tape transports, or a comparable ratio for other speeds. In addition to this test tape, the following equipment is required to check start/stop times:

1) Read amplifier capable of developing 2.0 volts peak-to-peak across 600 ohm load.

2) Calibrated oscilloscope, Tektronix 535A or equivalent.

Step 1: Thread the test tape on the tape transport.

Step 2: Connect the test equipment as shown in Figure 4-2. The oscilloscope should be triggered by the FORWARD START command (positive pulse).

Step 3: Program the transport at a convenient rate in the AUTOMATIC mode. The oscilloscope will display the forward start time characteristic of the tape transport, which should resemble Figure 4-3a. Start time, as determined from the oscilloscope display, should be under 2.0 milliseconds. If this specification is not met, adjustment of the forward capstan roller gap will be required, as detailed in paragraph 4-7.

Step 4: Readjust the oscilloscope to trigger on a negative pulse. The oscilloscope will now display the forward stop time characteristic of the tape transport, which should resemble Figure 4-3b. Stop time of the transport should be under 1.5 milliseconds. If this specification is not met, adjustment of the forward tape brake, as detailed in paragraph 4-7, will be required.

Step 5: Reconnect the test equipment so that the oscilloscope is triggered by the Reverse Start command. The oscilloscope should be set to trigger on a positive pulse.

Step 6: Operate the tape transport in the AUTOMATIC mode. The oscilloscope will again display the reverse start characteristic of the tape transport. Start time should be under 2.0 milliseconds; the reverse capstan roller gap should be adjusted as required to achieve this specification.

Step 7: Reset the oscilloscope to trigger on a negative pulse. The oscilloscope will display the reverse stop characteristic of the tape transport, which should be under 1.5 milliseconds. The tape brake should be adjusted as required until this specification is met.

NOTE

In cases where the tape transport does not meet start/stop time specifications after the capstan roller gap and tape brake gap have been checked, rotation of the buffer guides around their axes on the vacuum chamber is indicated.

4-10. CHECKING START/STOP DISTANCE. Start distance is defined as the length of tape passing over the read head during the start time; stop distance is defined as the length of tape passing over the read head during the stop time. Start and stop distances are specified by tape width and tape speed in the the table below.

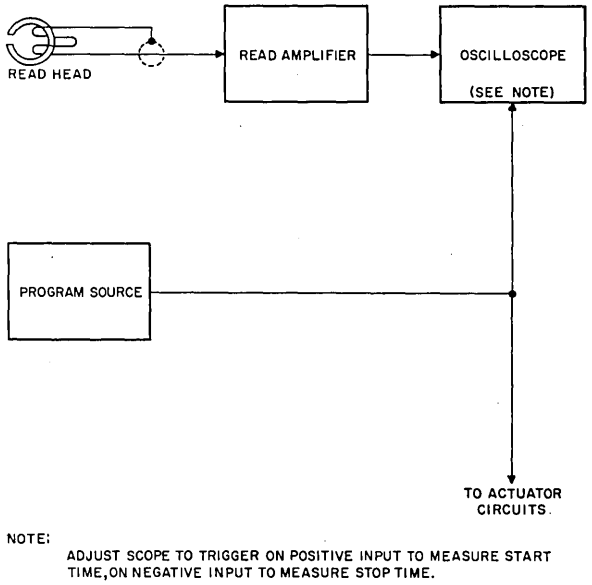


Figure 4-2.
Test Setup; Start/Stop Time Measurement

Table 4-1. Start and Stop Distances

TAPE UNIT	START DISTANCE (INCHES)	STOP DISTANCE (INCHES)
1/2" 150 ips	.138 to .208	.090 to .160
1/2" 120 ips	.105 to .155	.070 to .135
1/2" 112.5 ips	.095 to .145	.060 to .120
1" 120 ips	.102 to .158	.085 to .135

The following equipment is required to measure start and stop distances:

1) Pre-recorded test tape as used in start-stop time measurement.

2) Read amplifier capable of developing 2.0 volts peak-to-peak across a 600-ohm load.

3) Counter, Hewlett-Packard 523B or equivalent.

4) Pulse Generator, Tektronix 161 or equivalent.

Step 1: Connect the test equipment as shown in Figure 4-4. The pulse generator is used to trigger the count gate of the counter for the 2.0 milliseconds immediately following the Forward Start command.

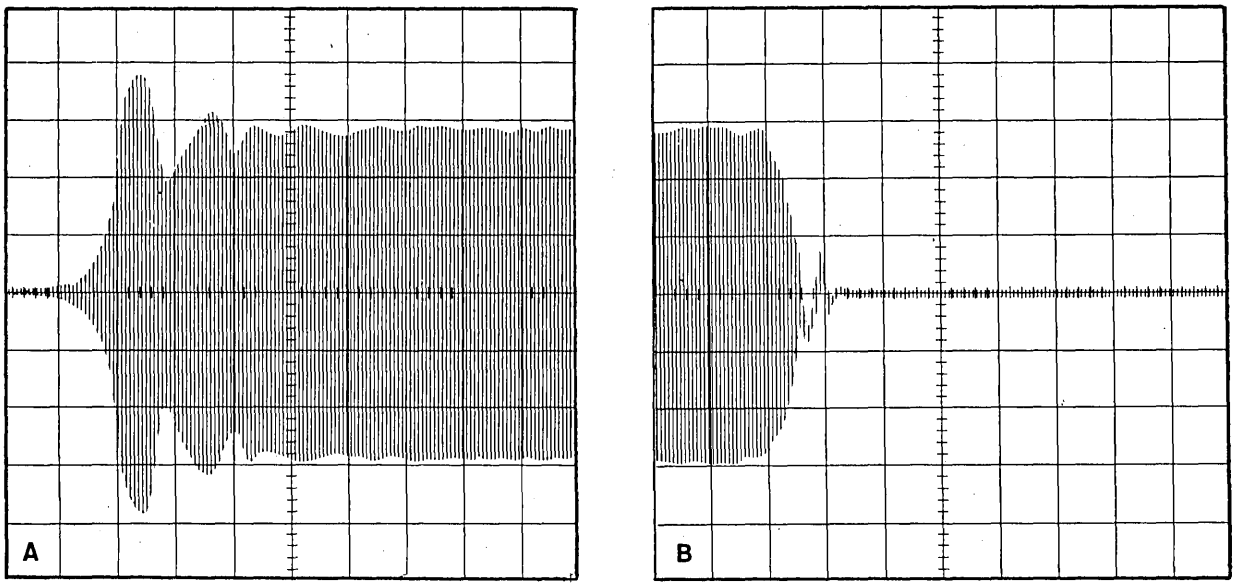


Figure 4-3. Typical Waveforms, Start/Stop Time

Step 2: Program the tape transport at a convenient rate. The counter reads out the number of recorded ONE's passing the read head during the 2.0 milliseconds start time. Because of the ratio of frequency to tape speed of the test tape, each ONE passing the read head represents 0.003 inches. Thus the count, multiplied by three, is the forward start distance expressed in thousandths of an inch. This figure should be equal to or less than the value shown in the table above. If this condition is not met, check capstan roller gap. If the tape transport still fails to meet start distance specifications, adjustment of the buffer spring guide around its axis on the left vacuum chamber may be required.

Step 3: Reconnect the counter and pulse generator to the Reverse Start command input. The counter now reads out the numbers of ONE's passing the read head during the reverse start time. This figure must also be equal to or less than the value shown in the table above.

Step 4: Reconnect the counter and pulse generator to the Forward Stop command input (connection point identical to Step 1, but triggering on negative pulse). The pulse generator is used to trigger the count gate of the counter for the 1.5 milliseconds immediately following the Forward Stop command. The count as shown on the counter, multiplied by three, is the forward stop distance expressed in thousandths of an inch. This figure should be equal to or less than the value shown in the table above.

Step 5: Reconnect the counter and pulse generator to the Reverse Stop command input. The counter now reads out the number of ONE's passing the read head during the reverse stop time. This figure must also be equal to or less than the value shown in the table above.

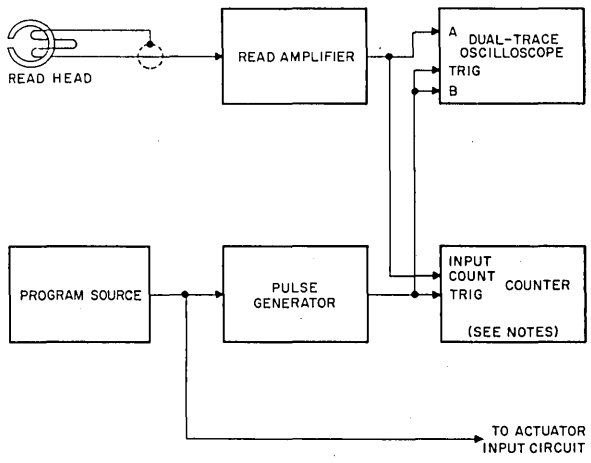


Figure 4-4.
Test Setup, Start/Stop
Distance Measurement

4-11. CHECKING AND ADJUSTING VACUUM. The vacuum level in the vacuum chambers should be checked each time the filters are replaced, and adjusted if necessary. Vacuum

level is checked by attaching a vacuum gauge or manometer to the test points shown in Figure 4-5 in place of the normal tubing. With a normal length loop (13-½ ±½ inch) a reading taken at a test point should indicate a vacuum level equivalent to 13 to 15 inches of water. A flap over a bleeder port (Figure 4-6) provides adjustment of vacuum level.

4-12. ALIGNING CHAMBER GUIDES. The buffer spring guides are aligned by loosening the screws which secure the outboard bearing and manipulating the support with the spanner provided until proper guiding is achieved. (See Figure 4-7.) The rotary tape guides are aligned by loosening the two screws which secure the outboard bearing support and manipulating the support with the spanner until tape guiding is correct.

NOTE

Once the proper axis of the buffer spring guide has been thus determined, rotating of the guide on this axis may be required to meet start/stop time specifications.

4-13. ADJUSTING REEL SERVOS. For optimum performance the following adjustment procedure should be used.

Step 1: Place the transport in the STANDBY mode with the tape stopped and all interlocks and time delays completed.

Figure 4-5.
Vacuum Test Assembly

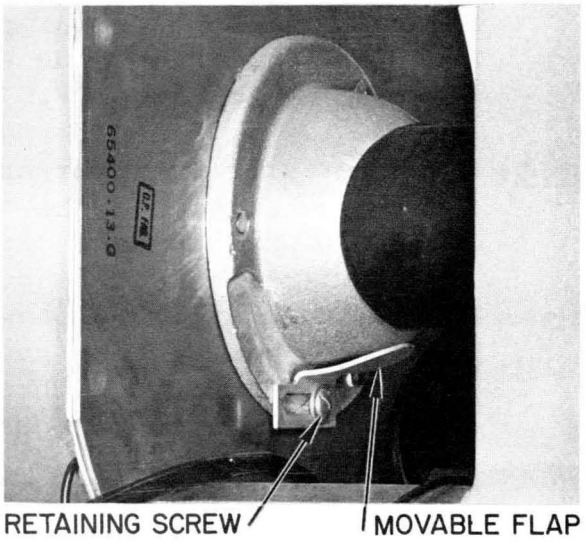


Figure 4-6.
Vacuum Level Adjustment Points

Step 2: Connect an ac voltmeter to TP702 and TP703 on the oscillator assembly at the rear of the transport (Figure 4-8) and adjust the LOWER servo gain control (also located on the oscillator assembly) to give a voltmeter reading of 5.8 volts rms.

Step 3: Connect the voltmeter to TP701 and TP703 on the oscillator assembly and adjust the UPPER servo gain control to give a voltmeter reading of 5.8 volts rms.

Step 4: Depress the reel brake pushbuttons and turn the tape storage reels to give a tape loop in each vacuum chamber 12-3/4 ±1/2 inches long.

Step 5: Connect a d-c voltmeter between pin 16 of the servo amplifier card and ground. (Pin 16 is negative with respect to ground.)

Step 6: Adjust the UPPER servo transducer for a -10 ±1 vdc meter reading. Adjustment is made with either a screw or a knob, depending on the type of transducer, as shown in Figure 4-9.

Step 7: Connect the d-c voltmeter between pin 17 of the servo amplifier card and ground. Note the reading. (Pin 17 is negative with respect to ground.)

Step 8: The voltmeter readings taken in Steps 6 and 7 should be within half a volt of each other. If the difference between

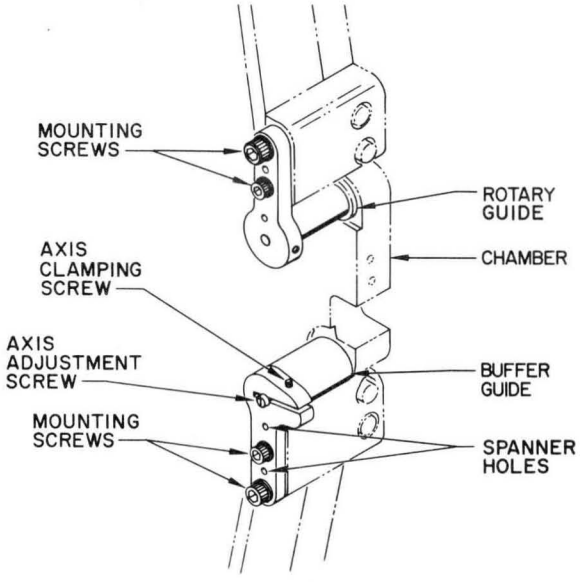


Figure 4-7.
Tape Guide Adjustment Points

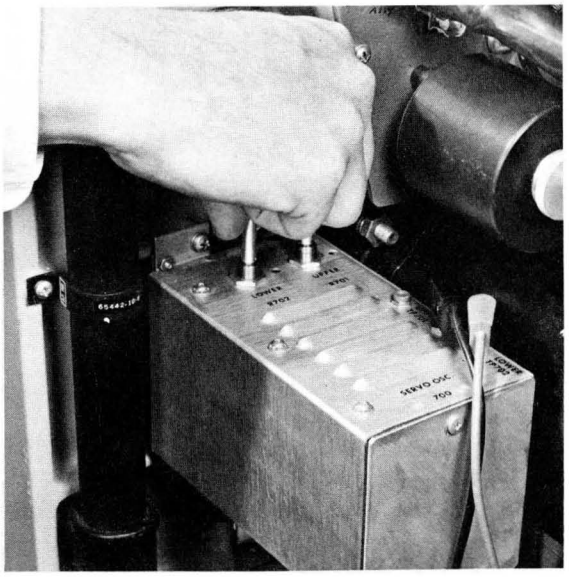


Figure 4-8.
Adjusting Servo Gain

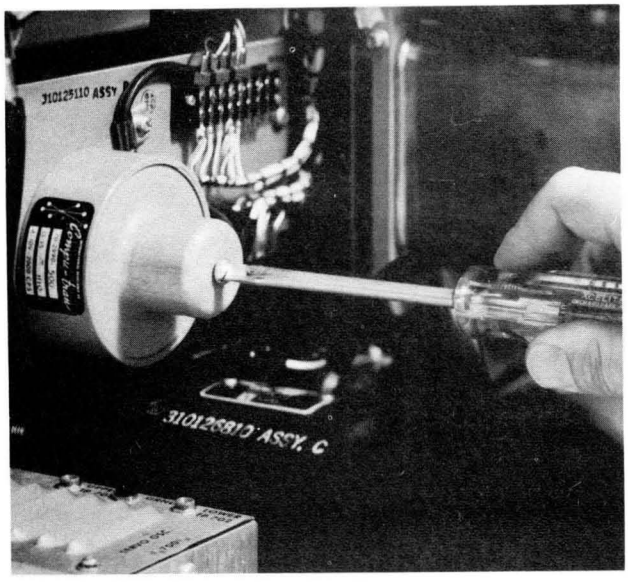
the two readings is greater than half a volt, adjust the upper transducer for a balanced output at pins 16 and 17.

Step 9: Connect the voltmeter to pin 4 of the servo amplifier card and adjust the LOWER servo transducer to give a volt meter reading of -10 ±1 volts. Note the reading.

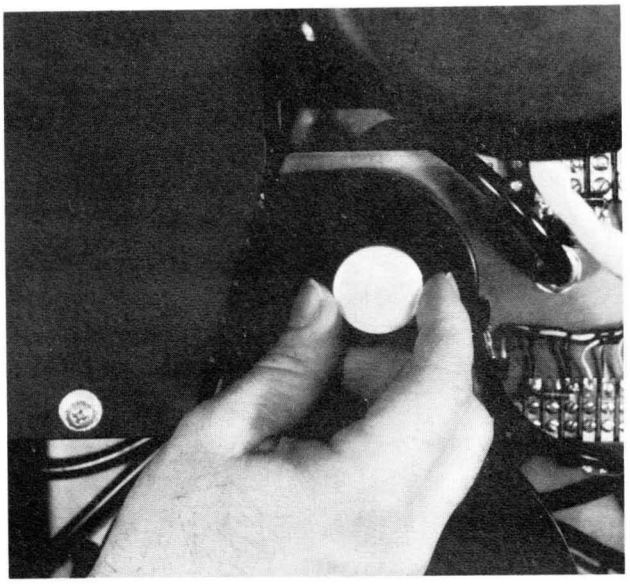
Step 10: Connect the voltmeter to pin 5 of the servo amplifier card and check that it is within half a volt of the reading taken at pin 4. If not, adjust the lower transducer for a balanced output at pins 4 and 5.

Step 11: Recheck balance across pins 16 and 17. Readjust upper transducer if necessary.

Step 12: Visually check the servo operation while the transport is operating with its normal program. Minor adjustments of the gain controls and transducers should be made to give correct loop length and steady operation. This final adjustment will vary with each transport, depending upon the program used and the mass of moving mechanical parts in the system. Tape width, reel weight, tape guide and adjustment, and the type of hold-down assembly, will all effect the servo operation to some extent.



Screw Adjustment



Knob Adjustment

Figure 4-9. Adjusting Servo Transducer (Two Types)

The rotary tape guides are aligned by loosening the two screws which secure the outboard bearing support (Figure 4-7) and manipulating the support with the spanner provided until correct tape guiding is achieved.

4-14. CHECKING REEL HOLD-DOWN OPERATION AND TORQUE (AMPEX REELS). The torque required to lock the hold-down knob may be checked with a torque wrench. Locking torque should be 25 ±2 in./lb. Adjustment, if required, is detailed in paragraph 4-15.

4-15. ADJUSTING HOLD-DOWN KNOB TORQUE (NARTB) REELS ONLY. The torque required to lock the hold-down knob is adjusted as follows:

Step 1: Remove the reel from the hold-down knob.

Step 2: Turn the hold-down knob so that the operating handle points straight up and down, serrated end up (hold-down knob in released condition).

Step 3: Using a prick punch or similar device, press the spring-loaded operating handle retainer at the upper left side of the operating handle so as to free the handle.

Step 4: Remove the operating handle, exercising care not to lose the compression spring.

Step 5: Loosen the screw in the center of the knob.

Step 6: Tighten the nut in the center of the reel slightly. Tighten the lock screw.

Step 7: Reassemble the operating handle.

Step 8: Install a reel.

Step 9: Using a torque wrench, measure the torque required to lock a reel on the hold-down. The torque should be 25 ±2 in./oz. If necessary, repeat Steps 1 through 7 until the proper adjustment is achieved.

4-16. CHECKING ACTUATOR FIRING CIRCUITRY. Operation of the actuator firing circuitry may be checked by programming the transport at the maximum rate permissible within the actuator duty cycles. (See Section I, Description/Specifications.) No actuator functions should be missed within this program. Operation of the interlock circuitry may be checked by inserting a conflicting command 2.5 milliseconds after

issuance of a tape drive command. If the transport is operating in Forward Drive and a Reverse command is issued without an intervening Stop command, the reverse actuator should not close, and vice versa.

4-17. ALIGNING THE TAPE PACKERS. Alignment of a tape packer arm consists of adjusting the position of the packer arm shoe between the flanges of the tape reel.

Step 1: Operate the transport in either the Forward Drive or Reverse Drive mode and check if either packer arm shoe touches the reel. If a packer arm shoe does touch the reel proceed with Step 2.

Step 2: Check that the shoe is correctly fitted and tight on the arm.

Step 3: Use an Allen wrench to loosen the screw clamping the arm to the shaft.

Step 4: Move the arm on the shaft to a position where the arm and shoe do not touch either flange of the reel, taking care not to turn the arm on the shaft.

Step 5: Tighten the set screw.

4-18. ADJUSTING VACUUM SWITCH. The operation of the vacuum switches which signal long-loop or short-loop conditions is checked as follows:

Step 1: Connect a voltmeter across the terminals of the lower loop warning switch (S707).

Step 2: Apply power to the tape unit. Place unit in the Standby mode. Make sure all interlocks are closed. The tape loops in the vacuum chamber should be at the normal 12-3/4 $\pm$1/2-inch length, and the vacuum switch should be closed.

Step 3: Observe the indication of the voltmeter. If a voltage is present, the switch contacts are open as they would be in the case of a long loop, short loop, or vacuum failure, and the switch must be adjusted. (See Step 9 and Figure 4-10.)

Step 4: Press the lower REEL BRAKE pushbutton and elongate the tape loop until it passes over the long loop sensing port. The contacts of the loop warning switch should then be open. If the closed contacts fail to open, adjustment is required. If no adjustment is required, proceed to Step 11.

Step 5: Turn off power to the tape unit and remove the screws which fasten the lower servo control assembly to the tape transport. Allow the assembly to hang by its cable.

CAUTION

Do not permit the servo control assembly leads to short on the tape transport.

Step 6: Disconnect the rubber tubing which connects the long loop sensing hole to the vacuum input port (port on side of switch with electrical connectors).

Step 7: Insert a tee fitting in the vacuum line to permit monitoring of vacuum level with a vacuum gauge or manometer. Replace hose over the vacuum input port.

Step 8: Apply power to the transport. The transport should be in the Standby mode.

Step 9: Press the lower REEL BRAKE pushbutton and elongate the loop in the right vacuum chamber until the loop is partially across the long loop sensing hole and the monitor gauge indicates 7 inches of water vacuum. If the vacuum switch fails to open, remove the hose from the vacuum input port and readjust the setscrew (accessible through the vacuum input port) by turning it 30 to 60 degrees counterclockwise.

NOTE

Counterclockwise rotation of the setscrew will result in an increase of differential pressure required to open the contacts.

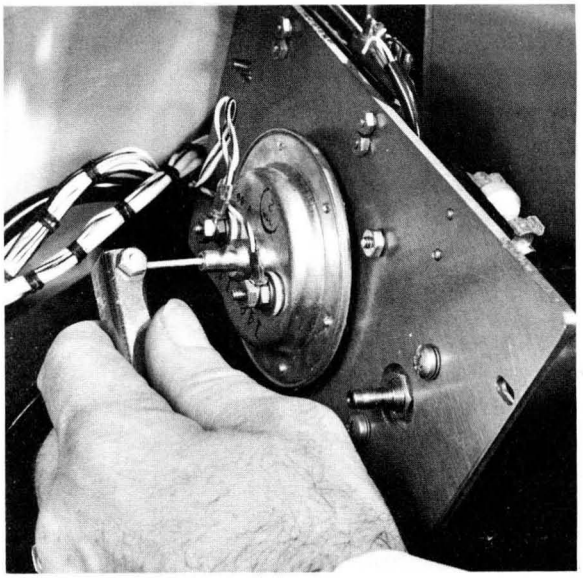


Figure 4-10.
Adjusting Loop Warning Switch

Continue adjusting the switch until the switch actuates as the loop crosses the long loop sensing hole and 7 inches of water vacuum is indicated on the monitor gauge. The switch should remain closed under normal loop conditions.

Step 10: Remount the lower servo control assembly.

Step 11: Repeat Steps 1 through 4 (and 5 through 10 if necessary) for the upper servo (left vacuum chamber).

4-19. CHECKING CAPSTAN DRIVE BELT. The periodic inspection of the capstan drive belt should include check of wear and fraying, as well as any misalignment of the pulleys, idler, etc. Replacement of the belt is outlined in paragraph 7-16.

4-20. ADJUSTING REEL MOTOR BRAKES. Brake adjustment is accomplished by the following procedure:

Step 1: Place a ruler next to the brake solenoid arm. Note the measurement at any particular point along the arm.

Step 2: Depress the REEL BRAKE pushbutton for the brake being adjusted and note the new measurement which should be approximately 1/16 inch.

Step 3: If the difference in positions is incorrect, loosen the two screws which hold the brake solenoid (Figure 4-11) and move the solenoid to a new position. Repeat Steps 1 and 2.

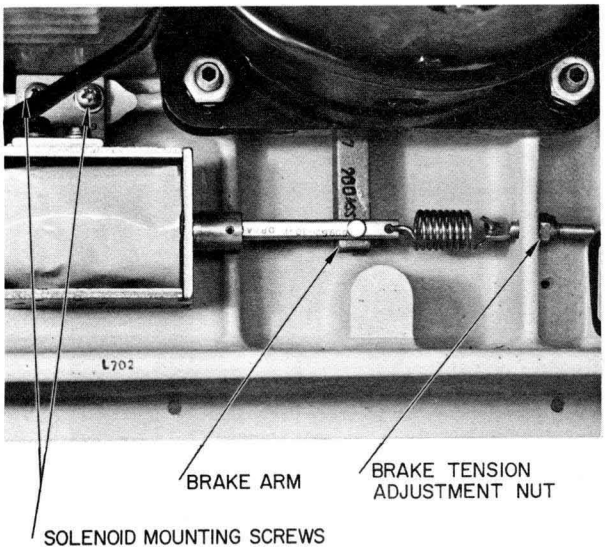


Figure 4-11.
Reel Brake Adjustment Points

Step 4: Connect a spring balance to the brake solenoid arm and check brake tension, which should be 7 $\pm\frac{1}{2}$ lb. If spring tension is not within tolerance, loosen or tighten the tensioning nut on the spade bolt to which the spring is attached. (See Figure 4-11.)

4-21. CHECKING PHOTOSENSE OPERATION. Operation of the circuits may be checked by placing a $\frac{1}{2}$ inch wide strip of reflective tape across the width of the mylar side of the recording tape.

The following equipment is required to check the photosense output.

1) Tape with reflective tab prepared as above.

2) Calibrated oscilloscope, Tektronix 535A or equivalent.

4-22. PHOTOSENSE INSTALLATION KIT 310108210. Connect the oscilloscope leads to points 4 and 8 of photosense fanning strip 4. Issue a Start command that will pass the reflective tab under the photosense head. A level change to -14.5 vdc should occur when the unit is supplied with a 15 vdc source and a 2000 ohm load. Reconnect the oscilloscope leads to point 4 on fanning strip 4 and point 5 on fanning strip 3 and repeat the above procedure.

4-23. PHOTOSENSE INSTALLATION KIT 310108010. Connect the oscilloscope leads to points 4 and 8 of photosense fanning strip 4. Issue a Start command that will pass the reflective tab under the photosense head. A level change of -10 vdc should occur. Reconnect the oscilloscope leads to point 4 on fanning strip 4 and point 5 on fanning strip 3 and repeat the above procedure.

4-24. PHOTOSENSE INSTALLATION KIT 310108110. Connect the oscilloscope leads to 4 and 8 of photosense fanning strip 4. Issue a Start command that will pass the reflective tab under the photosense head. A level change of +10 vdc should occur for 100 ms. Reconnect the oscilloscope leads to point 4 on fanning strip 4 and point 5 on fanning strip 3 and repeat the above procedure.

4-25. PHOTOSENSE AMPLIFIER ADJUSTMENT. Adjust each photosense amplifier potentiometer so that a voltmeter connected between TP1 and TP2 on the amplifier card reads as close as possible to, but not more positive than, 7.5 volts.

SECTION V
MECHANICAL DESCRIPTION

5-1. GENERAL.

5-2. The tape transport consists of the transport assembly, electronics assembly, access door, voltage regulator, head assembly, and head cable and box assembly. A control panel and photosense system may also be included. Schematic arrangements of tape transports showing the relationship of all connectors, terminal boards, and fanning strips used for interconnection are shown in Figure 5-1.

5-3. TAPE TRANSPORT.

5-4. The transport assembly (Figure 5-2, 5-3) consists of a tape supply and take-up system, a tape drive system, a vacuum system, a blower system, and an oscillator for excitation of the transducers. The operation of each of these systems is controlled by circuits in the electronics assembly. In this description the upper reel is referred to as the supply reel and the lower reel as the take-up reel.

5-5. The tape supply system consists of a supply reel drive assembly, a vacuum chamber, a transducer which provides signals for servo control of the reel drive, and a loop warning switch which will interrupt operation if the tape loop in the vacuum chamber becomes too large or too small.

5-6. The supply reel drive assembly is composed of a servo motor, a turntable, a reel retainer assembly, and a brake assembly. The servo motor shaft extends to the front of the tape transport where the reel turntable and retainer assembly are attached to the shaft.

5-7. The Ampex (NARTB) reel retainer assembly is a continuous contact rubber "doughnut" type, cam actuated, which provides a positive indication of a locked or unlocked condition. Turning the reel retainer handle 120° clockwise locks the reel in position; depressing the serrated end of the reel retainer handle unlocks the retainer, collapsing the retainer tire, and permitting the removal of the reel.

5-8. The IBM compatible reel retainer is a compression actuated, continuous contact rubber "doughnut" type. Turning the retainer knob clockwise compresses the retainer tire axially, causing radial expansion to lock the reel in position. Turning the knob counterclockwise allows the tire to restore, permitting removal of the reel.

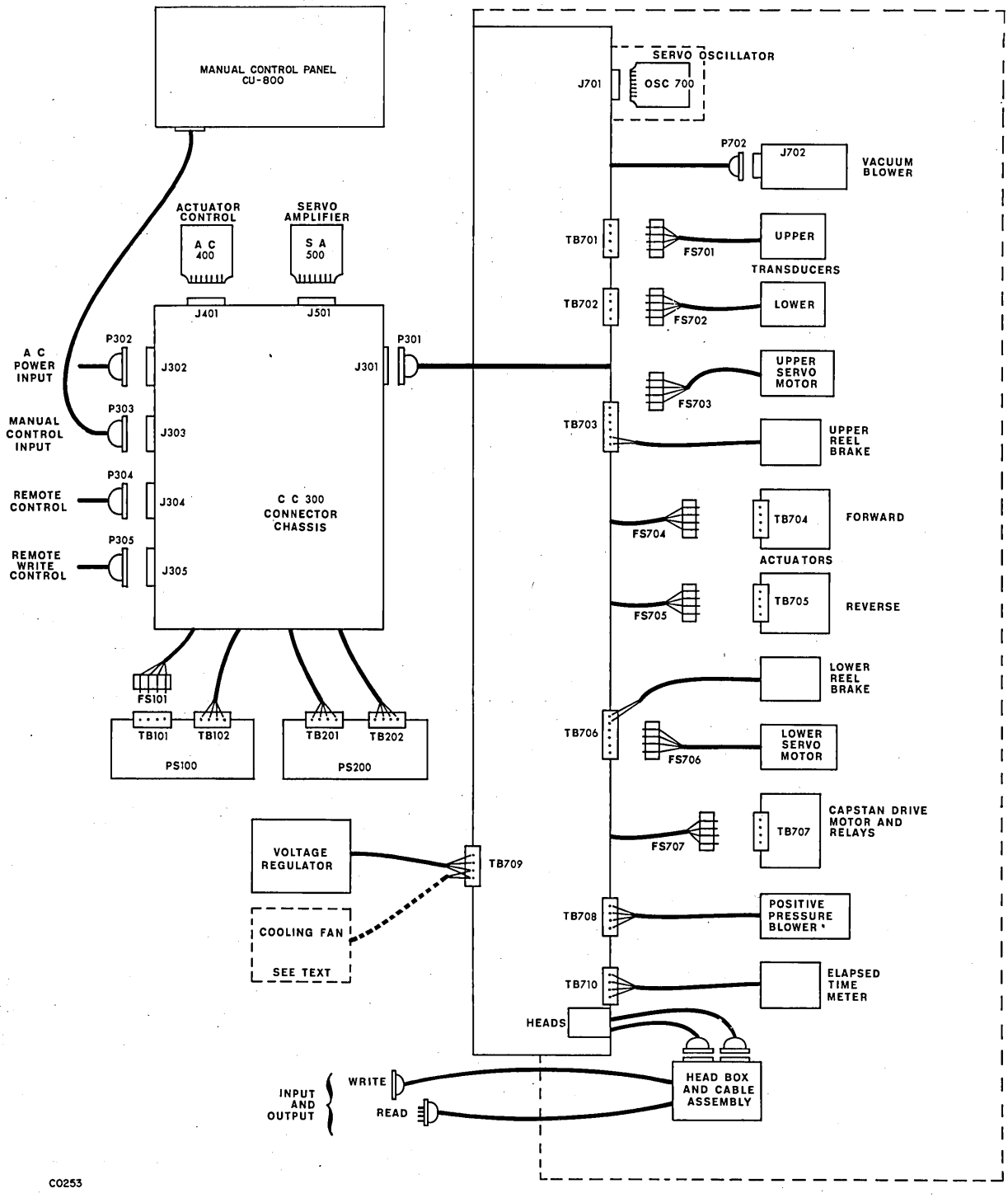


Figure 5-1. Interconnection of Units

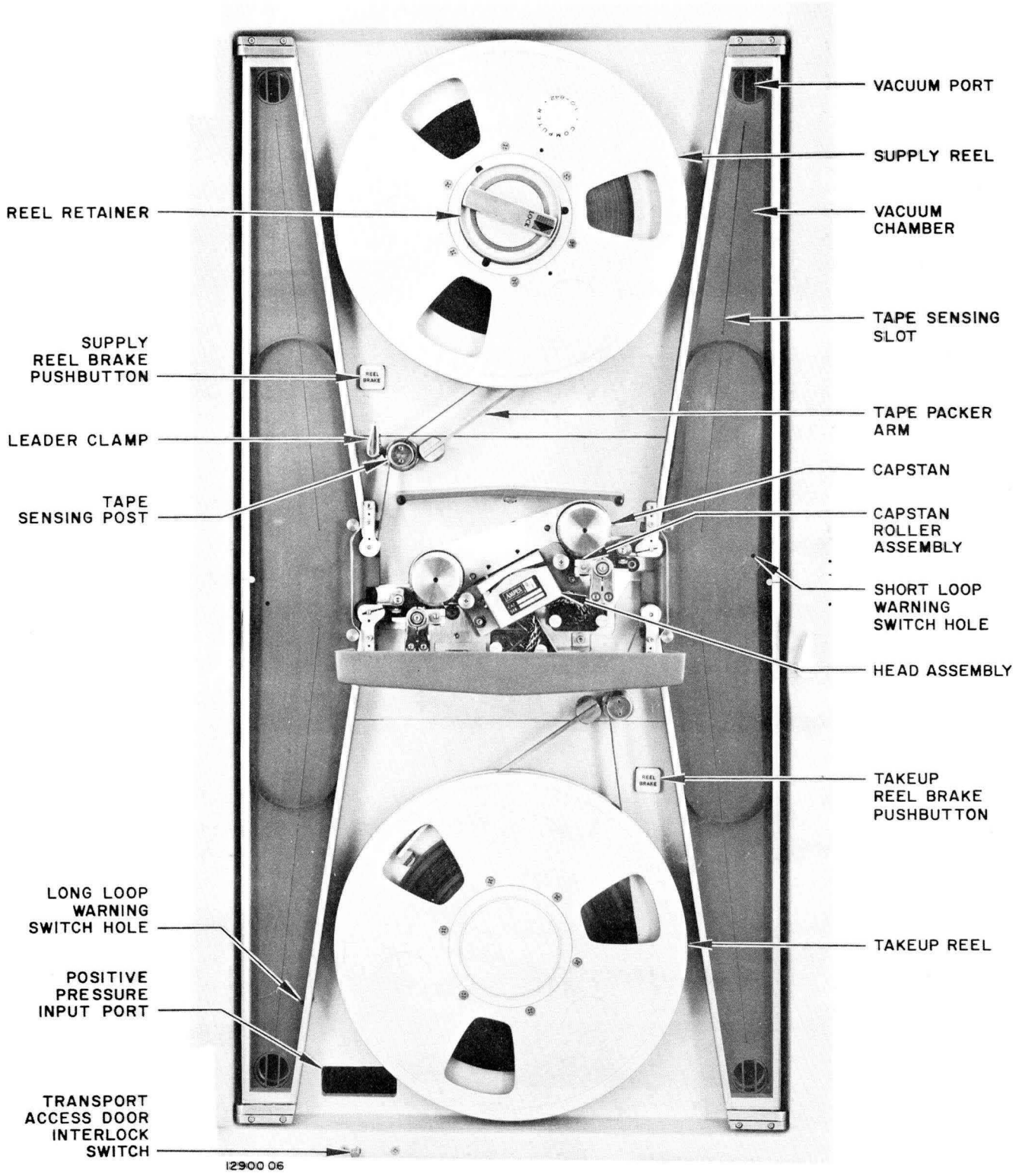


Figure 5-2. Tape Transport, Front View

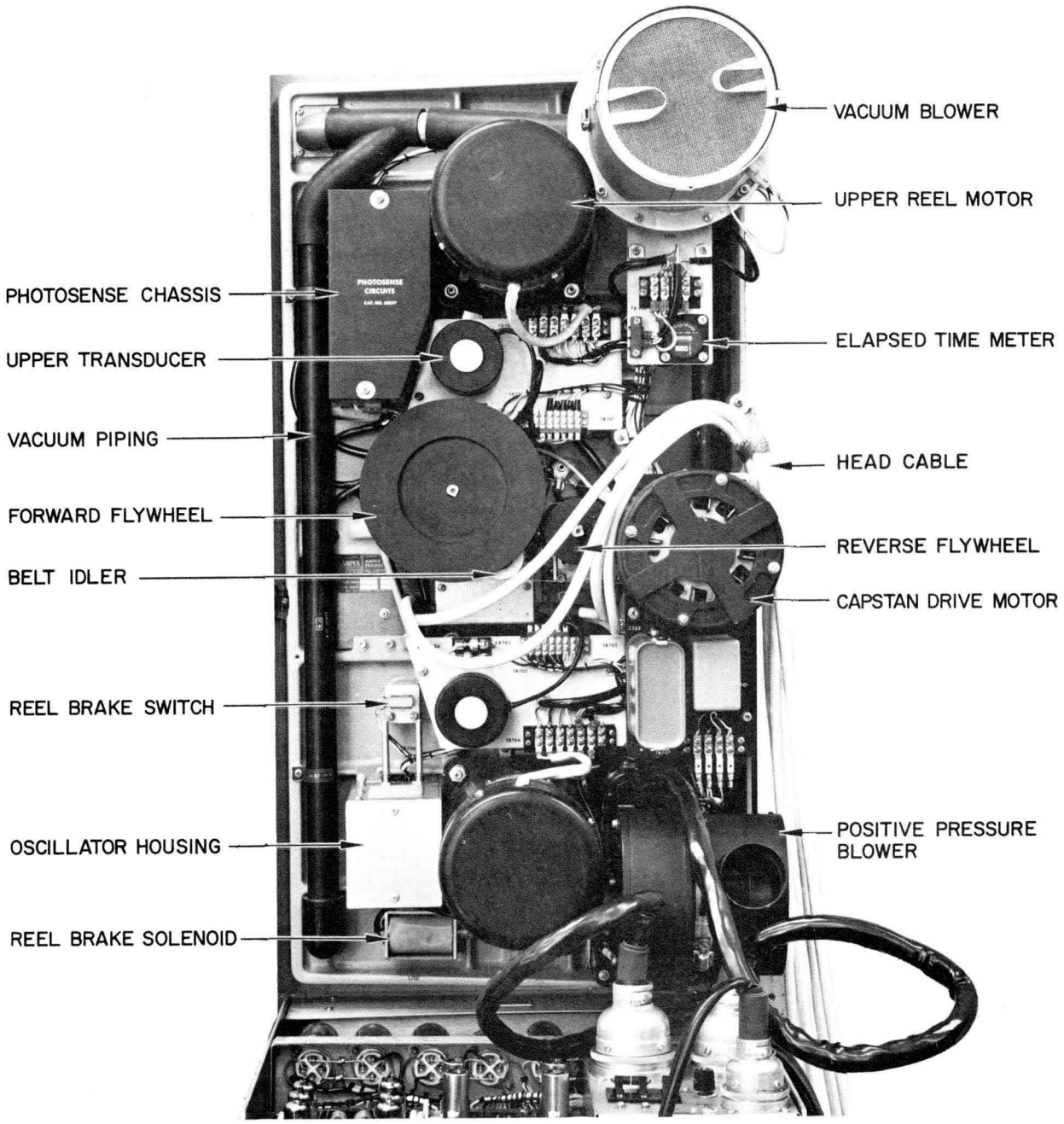


Figure 5-3. Tape Transport, Rear View

5-9. The brake assembly is mounted at the front of the servo motor and consists of a brake drum (mounted on the motor shaft), a brake shoe, a solenoid, and a loading spring. The brake is released when the solenoid is energized, as in normal operating conditions, and applied when the solenoid is de-energized (equipment in STANDBY, door interlock open, leader clamp interlock open, or vacuum lost for any reason). Brake application when the solenoid is de-energized is accomplished by a spring-loaded mechanism. The REEL BRAKE pushbutton allows the mechanical brakes to be released under non-operating conditions.

5-10. All other components of the tape supply system operate in conjunction with the vacuum system. The functioning of the entire servo control system is dictated by the vacuum chamber, a precision subassembly which forms and contains the tape loop, and isolates the reel from the tape drive system. A hinged glass cover encloses the vacuum chamber and forms a vacuum seal. Both ends of the chamber are vented to the vacuum blower assembly; tape acts as a barrier to separate the vacuum (created by the blower) from atmospheric pressure. Tape sensing slots are located in the upper and lower halves of the chamber base plate. These slots have a common junction within the base plate, and are connected through rubber tubing to the transducer.

5-11. The transducer is a diaphragm-operated differential transformer with the diaphragm pneumatically connected to the sensing slots. The core of the transformer is attached to the diaphragm and moves as the diaphragm moves. Any movement of the core from its null position produces an error signal, which is routed to the servo control electronic circuit. This circuit, in turn, causes the reel drive motor to increase or decrease the supply of tape in the chamber to eliminate the error signal.

5-12. The loop warning switch also operates on the diaphragm principle, being closed whenever a difference in air pressure exists (vacuum to atmospheric pressure), but opening when no difference exists (either vacuum-to-vacuum or atmosphere-to-atmosphere). Two holes are provided in the vacuum chamber, one opposite the opening where the tape enters and leaves the chamber, one near the end of the chamber (lower end for supply, upper end for take-up). The inside of the diaphragm is connected to the hole opposite the tape entrance opening; the outside is connected to the hole at the end of the chamber.

5-13. The tape supply system also includes the write lockout switch which may be used to prevent accidental writing over recorded information. This switch is actuated by a write lockout ring, attached to

the hub of the file reel. Normally open contacts are provided and are typically used to permit writing when closed (by completing power circuitry to write amplifiers, etc.).

5-14. The tape drive system consists of a precision plate, on which are mounted the two capstans and their associated actuators, the head assembly, the leader clamp, two tape sensing posts, and two tape packer arms. Also attached to the precision plate, but not considered part of the tape drive system, are the two vacuum chambers. The purpose of the tape drive system is to remove tape from one reservoir (typically the tape supply system), move it at a nominally constant drive speed across the magnetic heads which record or reproduce information, and deposit it in another reservoir (typically the take-up system). The tape drive system also controls the FAST REVERSE and FAST FORWARD modes of tape travel.

5-15. Two counter-rotating capstans provide bi-directional tape drive. The capstans are coupled through a belt and pulleys to the synchronous capstan drive motor. This is a dual-speed motor (1800 rpm or 3600 rpm at 60 cycles, 1500 rpm or 3000 rpm at 50 cycles) for both the normal and the fast drive speeds. The motor and both capstans operate continuously whenever power is applied to the equipment. Relay contacts select the applicable motor winding for the tape drive selected: The low-speed winding for normal operation, or the high-speed winding for the fast drives. Each capstan continuously drives its associated roller through a rubber quad-ring (at the base of the capstan); thus the rollers also are continuously rotating when power is applied.

5-16. While the speed of tape travel is determined by the capstans, the movement of the tape is controlled by the actuators which position the rollers. Two actuators are provided, one for each capstan. These assemblies are mounted on the back of the precision plate, with the actuator shaft extending through the plate to the front of the tape transport. On this shaft is mounted a rocker arm, with the roller mounted at one end, and a tape inertia brake at the other end. There are two stable positions possible for the actuator: ON, when the roller clamps the tape against the capstan to drive the tape, and OFF, when the roller is withdrawn from the capstan. At the moment of withdrawal, the brake overshoots momentarily, locking the tape between a rubber block and a metal post, quickly overcoming the small inertia of the moving tape.

5-17. A special d-c actuator drives the capstan roller assembly. The actuator is controlled by a driver circuit, in the transport electronics assembly, which in turn derives its signals from the command source.

The direction of tape motion is determined by which actuator is ON, since the two capstans rotate in opposite directions.

5-18. A typical head assembly (Figure 5-4) is composed of two tape guides, a write head stack, a read head stack, a hinged shield, base plate, and head cover. Accuracy of tape guiding across the heads is ensured by the precise machining of the base and tape guides, which are mounted at either side of the head stacks. The guide edges are accurately positioned to ensure interchangeability of tapes from machine to machine. The exact head assembly used on individual machines is shown in Section IX.

5-19. The leader clamp provides a convenient means of holding the permanent tape leader while attaching the leader to the magnetic tape. If the clamp inadvertently is left closed against the upper sensing post, the leader clamp interlock will remain open and prevent tape motion.

5-20. The two tape sensing posts, located at the top and bottom of the precision plate, provide tape sensing facilities to signal end of file, beginning of file, etc. These posts, in the tape threading path between each reel and vacuum chamber, consist of three insulated sections. The innermost section is connected to chassis ground; if contact is made between that section and the center section (by the use of metal-backed tape) a remote warning circuit may be actuated. When an end-of-tape relay is used contact across all three sections will energize the relay and stop the tape.

5-21. The tape take-up system is identical to the tape supply system previously described, except that no write lockout switch is provided on the lower reel assembly.

5-22. The vacuum for the vacuum chambers is derived from the vacuum blower assembly. The blower proper is a two-stage centrifugal fan, driven by a universal-wound a-c motor, shock-mounted into the main vacuum blower assembly. The motor is supplied with regulated power from the externally mounted voltage regulator. A bleeder port

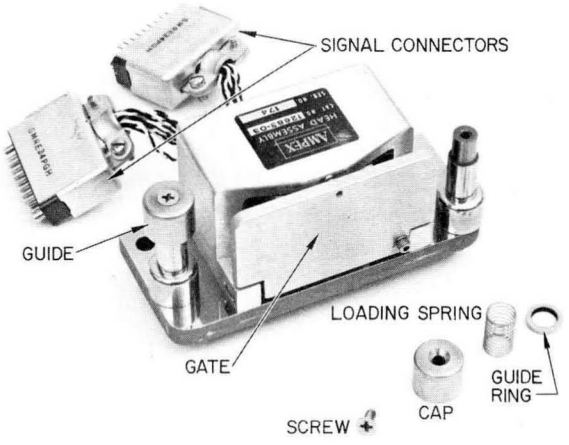


Figure 5-4. Head Assembly

is partially covered by a sliding flap, permitting adjustment of vacuum pressure; this port is on the transport side of the manifold. The vacuum manifold is formed from plastic butyrate tubing and couplings. The manifold is bonded and sealed. The air expelled from the vacuum blower is filtered to prevent dispersal of dust, etc., in the cabinet rack.

5-23. The positive pressure blower assembly is mounted at the lower right-hand side of the main tape transport frame (as viewed from the rear). Air pressure introduced by this assembly ensures that air is always leaking from the tape handling enclosure when the access door is closed. This slight pressurization of the tape handling enclosure keeps out external dust and foreign material. Intake air at the blower is filtered to ensure that it is clean and dust-free.

5-24. The servo oscillator is not part of the transport proper, being more closely associated with the transport electronics assembly. It is, however, physically located on the lower left side of the transport, as viewed from the rear.

5-25. The servo oscillator is constructed on an etched circuit board, with contacts provided at one end to form a connector. The mating connector, J701, is part of the transport wiring, as are the gain adjustment potentiometers R701 and R702. These components are mounted to the transport, shielded by a metal housing. A pair of slides on the inner walls of the housing accept the etched board and align it with J701.

5-26. A removable cover plate is provided, secured with snap-action fasteners, to permit insertion or withdrawal of the etched board. The shafts of potentiometers R701 and R702 protrude through holes provided in the housing to facilitate adjustment.

5-27. TRANSPORT ELECTRONICS ASSEMBLY. (Figure 5-5)

5-28. The transport electronics assembly consists of the electronics and servo motor power supplies (PS-100 and PS-200), the connector chassis (CC-300), the actuator control (AC-400), and the servo amplifier (SA-500).

5-29. Etched board construction and terminal board wiring are used. The two main chassis, the Electronics Power Supply (PS-100) and the Servo Motor Power Supply (PS-200) are attached to mounting brackets. The various sub-assemblies, all readily removable, are mounted on top of the Electronics Power Supply (PS-100) chassis.

5-30. The electronics power supply sub-assembly furnishes the necessary d-c and a-c voltages for operation of the servo amplifier and the actuator control unit. It also serves as the support chassis for these two units, and for the connector chassis.

5-31. The connector chassis is mounted at one end of the main chassis; the balance of the top surface is covered by a panel, hinged to provide ready access to the internal wiring. Mounted on this hinged panel are slides which accept the etched boards of the servo amplifier and actuator control unit, brackets for mating connectors for these units, and lever-operated release mechanisms to facilitate withdrawal of the boards.

5-32. When the tape transport is turned on, 117 vac is supplied to the primaries of power transformers T102, located beneath the connector chassis, and T101, located beneath the hinged panel at the opposite end of the PS-100 electronics power supply. An additional tap on the primary of T102 furnishes 135 vac to the capstan drive motor. The various secondaries of T102 furnish 6.3 vac for the filaments of the thyratrons in the actuator control unit and the tubes in the transducer oscillator. A 52 vac center-tapped winding feeds rectifiers, in the manual control panel, which supply the -24 vdc voltages to the control circuitry. Fuses for this circuit are located beneath the hinged cover. The high-voltage winding furnishes 450 vac to a

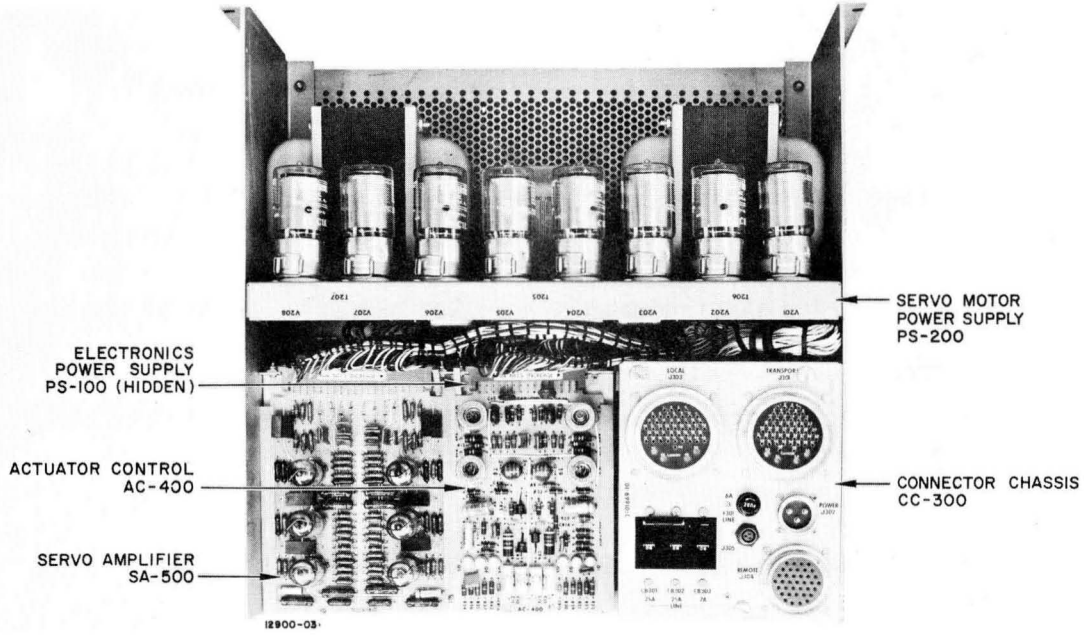


Figure 5-5. Transport Electronics Assembly

bridge rectifier, from which dc is connected to the coil and contacts of an overload relay (K101). This relay is set to operate on an overload of approximately 400 ma, and breaks the overload through its own contacts, causing the relay to drop out and re-cycle rapidly. (The output of the rectifier also furnishes, through a dropping resistor, +14 vdc to the actuator control circuitry.) From the overload relay, the high voltage is supplied to a thyratron (V104) and associated components located beneath the connector chassis which are used a "recharge electronics switch" for charging the actuator capacitors. The filament of the thyratron is supplied 2.5 vac from transformer T102.

5-33. Ground lug 101 is mounted on the PS-100 electronics power supply to provide a common grounding point for all circuits in the tape transport. A cable, part of the CC-300 connector chassis, brings ground leads for all circuits from the connector chassis to ground lug 101. Fanning strip FS101, also part of the CC-300 wiring, connects with terminal board TB101 on the electronics power supply. Separate individual leads are also provided for connection to TB102. Additional portions of the CC-300 Connector chassis wiring are brought out of the CC-300 to provide connectors J401 and J501 (mating connectors for the AC-400 and SA-500 etched boards), which are physically supported on the PS-100 chassis. Another branch of the cabling provides leads for connection to TB201 and TB202 on the servo motor power supply.

5-34. The PS-200 servo motor power supply is a thyratron power supply, used to furnish power to the windings of the servo motors as dictated by the servo amplifier and the transducers. The eight thyratrons, V201 through V208, are mounted in a line along one side of the chassis. In a row paralleling the thyratrons are transformers T205, T206, and T207. Transformer T205, mounted in the center, provides filament voltage for all of the thyratrons. Plate transformers T206 and T207 are supplied with 117 vac, delayed 45 seconds to permit filament warm-up. Below the chassis are terminal boards TB201 and TB202 and an etched circuit board assembly which contains grid biasing transformers T1 through T4 and their associated components.

5-35. The CC-300 connector chassis mounts on the electronics power supply and forms a central point for interconnection of the various units and for inputs and outputs to the power and control circuits.

5-36. On the connector chassis are located circuit breakers CB301, CB302, and CB303. Breakers CB301 and CB302 protect the power input, while CB303 protects the positive pressure and vacuum blowers, the cooling fan, and the PS-100 power transformer T101. Fuse F301 protects the PS-100 power transformer T102 and the drive motor supply

power. The top panel also mounts five connectors. J301 mates with P301, part of the transport wiring. J302 is the power input connector; J303 is the local control connector. When a manual control panel is used, P303, part of its wiring, will mate with J303. When no manual control panel is used, equivalent circuitry must be connected through J303. Receptacle J304, the REMOTE connector, provides a means of connection to external circuitry for automatic or remote controlled operation; receptacle J305 is used for connection of remote circuitry associated with the write control function.

5-37. The AC-400 actuator control is constructed entirely on an etched circuit board. This board is supported within slides mounted on the PS-100 electronics power supply, and mates with connector J401.

5-38. The SA-500 servo amplifier, like the AC-400 actuator control, is constructed entirely on an etched circuit board. It is supported by slides mounted on the PS-100 electronics power supply and mates with connector J501.

5-39. MANUAL CONTROL PANEL, CU-800.

5-40. The CU-800 manual control panel (Figure 5-6) is optional. The unit may be used to provide local primary control over the tape transport. It is intended to be rack mounted below the transport proper; its control surface is tilted for ease of operation. When the transport electronics assembly is mounted horizontally, the manual control panel may be mounted directly in front of it. The following controls and indicators are mounted on the control surface:

SWITCH	FUNCTION
POWER	Controls power to the equipment.
MODE SELECTOR	Selects automatic, standby, or manual modes.
MANUAL CONTROL	Selects tape direction and speed in manual mode.
MANUAL WRITE/ LEADER DRIVE	Selects circuitry to enable writing function or allows the operator to defeat the end-of-tape interlock.
INDICATOR	
POWER	Indicates when power is applied to equipment.
READY	Indicates when interlocks, time delays, etc., are complete and transport is ready for use.

5-41. PHOTOSENSE UNIT.

5-42. The optional photosense unit is composed of an electronic chassis which mounts on the rear of the transport frame and a photosense head which mounts on the supply reel vacuum chamber above the tape guide.

5-43. The electronics chassis, which contains all of the circuitry for photosensing, uses a combination of terminal board construction and etched boards. Terminal board TB2, located at one end of the chassis, provides connections for the signal inputs from the head and the d-c lamp power to the head. At the other end of the chassis are terminal boards TB3 and TB4 which provide connections for the outputs of the unit.

5-44. Five connectors, J1 through J5, accept the various etched boards: J1 and J2 the composite amplifier boards; J3 the 12 volt power supply board; J4 the 10 volt power supply board; and J5 the 6 volt power supply board.

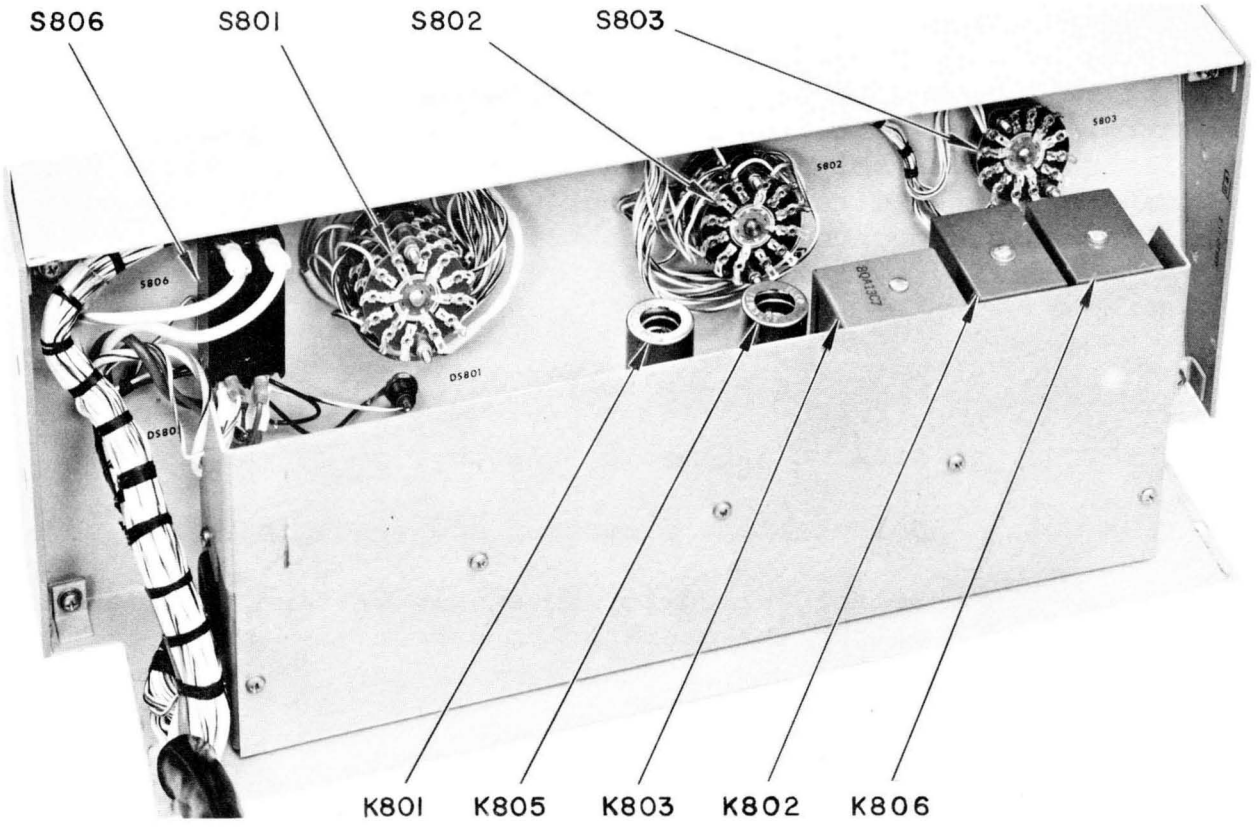


Figure 5-6. Manual Control Panel

5-45. Transformer T1 in the chassis provides 32 vac and 16 vac to the power supplies. Beside the transformer is a bracket mounting diodes CR1, CR2, and CR3, terminal board TB1, and when used, the output relays.

5-46. A cover is provided for the entire electronics unit with cutouts for access to terminal boards TB1, TB2, and TB3.

5-47. The photosense head consists of a light source and the necessary photo-electric elements to sense light from the source when reflected by markers on the tape.

SECTION VI
ELECTRICAL OPERATION

6-1. BASIS OF DISCUSSION.

6-2. The principles of operation of the tape transport are readily divided into two main categories: control of tape motion and control of the servo mechanisms which control the length of loop in the tape storage chambers.

6-3. The explanation of circuit operation will be more clearly understood by referring to the circuit diagrams appearing in Section VIII of this instruction book.

6-4. ACTUATOR CONTROL.

6-5. The first principle to be understood with respect to the actuator is that the speed of tape motion is determined solely by the capstans. The capstan speed, in turn, is controlled by the synchronous drive motor which receives its motive force from the a-c line. The direction of tape motion is controlled by the capstan rollers, each of which engages the tape with one of the two counter-rotating capstans.

6-6. Two identical actuators for control of tape movement in the forward and reverse directions are mounted on the rear of the precision plate of the tape transport. Shafts extend to the front of the precision plate, with yokes clamped to these shafts to support the rollers and inertia brakes.

6-7. Each actuator is similar in design to a polarized relay. Two permanent magnets are used to establish the two stable conditions--ON, when the roller clamps the tape against the rotating capstan, and OFF, when the roller is pulled away from the tape and the capstan.

6-8. The actuator shaft, mounted between the two permanent magnets, has a flat reed brazed to it which serves as an armature. Flux linkage between the two magnets through this reed tends to hold it in its last set position until the opposite coil, form-wound to fit around the reed structure, is pulsed with a short burst of current to form an electromagnet. The two coils create opposing magnetic fields. Thus, one of them is always available to reverse the flux in the reed and cause the reed to flip to the other stable position. The total rotation of the reed as measured at the pole faces is only a few thousandths of an inch. The time required to shift from one position to the other is on the order of 800 microseconds.

6-9. The forward and reverse actuator circuits are identical; only the forward actuator circuit is described.

6-10. A simplified diagram of the forward actuator circuit is shown in Figure 6-1 where the common connection of the actuator ON and OFF coils is connected to a positive voltage source (C106). The other connection of each coil is taken to the anode of a thyratron, the cathode of the thyratron being returned to ground. A negative voltage source (C405) connected via the center tap of the secondary of grid input transformer T408 to the thyratron grids holds the thyratrons off.

6-11. An actuator coil is energized by firing the thyratron connected to it. Both manual and automatic inputs are used to fire the thyratrons. When the manual Forward start terminal (P303, pin 40) is grounded, capacitor C409 charges, dropping the bias voltage to V404 grid across R415, and allows V404 to fire. C106 now discharges through the actuator ON coil and V404 to switch the actuator to the ON condition. Similarly, grounding the manual Stop terminal fires thyratron V403 to switch the actuator to the OFF condition.

6-12. The automatic Forward input terminal (P303, pin 34) is connected via C408 and R413 to the primary of transformer T408. A positive-going change of voltage applied to this terminal charges C408, allows a short burst of current to flow in the transformer primary which in turn induces a voltage in the secondary to overcome the bias voltage on the

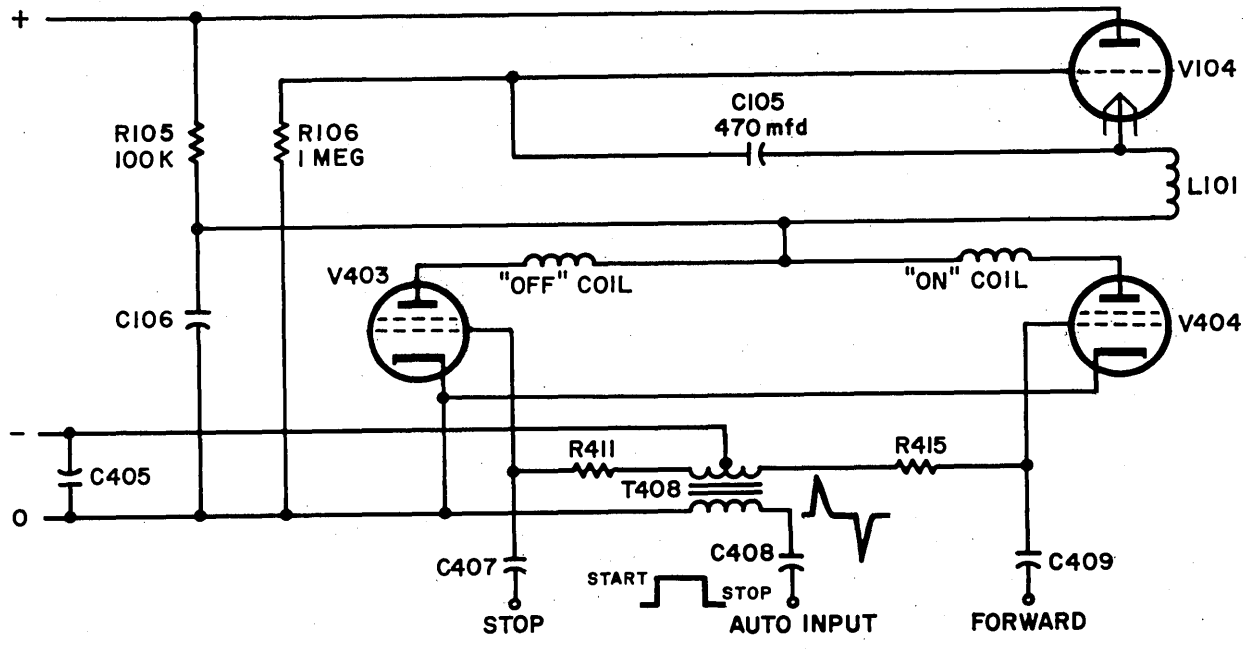


Figure 6-1. Forward Actuator Circuit (Simplified)

grid of V404 and allows it to fire. C106 now discharges through the actuator ON coil and switches the actuator to the ON condition. A negative-going voltage change at the automatic input terminal induces a voltage in the opposite direction in T408, allows V403 to fire and switches the actuator off.

6-13. A thyratron cannot be turned off by a voltage applied to its grid; the anode-cathode voltage must be removed or reversed before the grid can regain control. This is accomplished by the discharge of C106. When an actuator thyratron is fired, current flows from C106 (and continues to flow after the grid bias voltage has been restored) through the actuator coil and thyratron until C106 is discharged. The actuator coil now becomes a voltage source, due to the decaying magnetic field in the coil, and applies a reverse voltage to the anode which cuts off the thyratron and allows the grid to regain control.

6-14. The charging current to C106 is taken from a bridge rectifier power supply. When the system is first switched on, C106 charges slowly via R105. By the time the filament of V104 reaches operating temperature, C106 is fully charged, no voltage difference exists between the anode and cathode of V104 and it remains cut off. When C106 is completely discharged by an actuator operation V104 bypasses R105 to provide a fast charging circuit, ensuring a fully charged C106 when it is needed. When C106 discharges, the cathode voltage of V104 is reduced beyond the point where firing becomes possible. V104, however, does not fire immediately but is delayed to allow C106 to discharge fully and allow the actuator thyratron to be cut off as described in 6-13 above. This delay is performed by a resistor and capacitor in the grid circuit (R106 and C105). As long as C106 is discharging, C105 will also be discharging through R106 and, due to the voltage drop across R106, will bias the grid negative with respect to the cathode and prevent firing. When a steady state is reached, the negative charge on V104 grid leaks away through R106 and V104 fires, charging C106 through a choke (L101). After C106 is charged to the supply voltage, a voltage induced by the decaying field around L101 drives the cathode of V104 positive with respect to its anode and grid and allows it to cut off. The circuit is now ready for the next actuator operation.

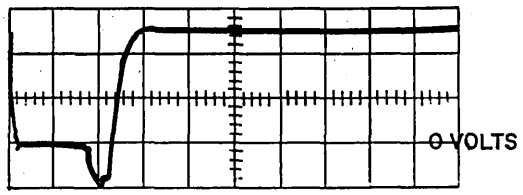
6-15. The identical reverse actuator circuit is driven from the same power supply as the forward actuator circuit (figure 8-3). Because the V104 capacitor charging circuit is common to both forward and reverse actuator circuits, isolation must be provided to prevent C106 discharging when the reverse actuator is operated and C107 discharging when the forward actuator is operated. Diodes CR107-110 provide this isolation. In the event that both C106 and C107 are discharged together (this can occur when a safety interlock switches both actuators

OFF) V104 will continue to supply charging current until both capacitors are charged before cutting off.

6-16. Figure 6-2a shows the voltage waveform seen at the anode of an actuator thyratron (V401, V402, V403, or V404) during operation. At the start of the trace the thyratron is fired by the removal of the negative bias from its grid; the anode voltage drops from 600 to approximately 10 volts, the voltage drop across the thyratron and its cathode resistor during conduction. At approximately 800 microseconds after firing C106 is completely discharged and the anode voltage begins to go negative, cutting off the thyratron. The voltage then rises rapidly as V104 fires and charges C106 (or C107).

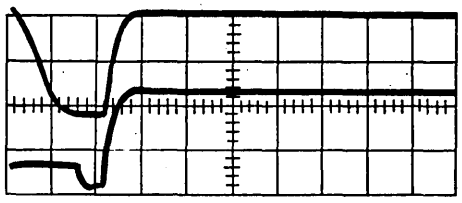
6-17. The thyratron anode voltage waveform is seen again in the lower trace of Figure 6-2b. Shown for comparison in the upper trace is the voltage across C106 or C107. The discharge and charge current in C106 or C107 is shown in Figure 6-3. This current waveform is displayed by connecting the oscilloscope across a 0.1 ohm resistor inserted in series with the capacitor. (The slight discontinuity at 200-250 microseconds is caused by the change in the actuator coil inductance as the armature moves to its new position.)

6-18. When taking measurements during actuator operation shunt loading of the actuator coils should be avoided. Excessive loading will damp the coil and reduce the negative voltage available to cut off the thyratron.



VERTICAL : 200 VOLTS / DIVISION
HORIZONTAL : 500 USEC / DIVISION

Figure 6-2a.
Waveshape, Anode of V404



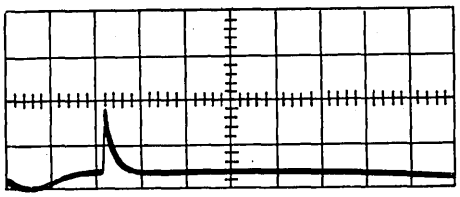
UPPER TRACE : VOLTAGE, C107
VERTICAL : 300 VOLTS / DIVISION
HORIZONTAL : 500 USEC / DIVISION
LOWER TRACE: ANODE, V404
VERTICAL : 300 VOLTS / DIVISION
HORIZONTAL : 500 USEC / DIVISION

Figure 6-2b.
Waveshapes, C107/Anode of V404

6-19. Figure 6-4 shows the waveforms seen at the cathode and grid of V104 during an operating cycle. At the start of the trace an actuator thyratron has fired and C106 or C107 starts to discharge. The cathode voltage (upper trace) follows the capacitor discharge curve while the grid voltage (lower curve) follows the discharge curve only until a steady state is reached. At this point (600 microseconds) the charge on the grid capacitor leaks off through the grid resistor until at about 1200 microseconds the grid voltage is sufficient to allow the thyratron to fire. The cathode and grid voltages now increase to the supply voltage followed by further increase in grid voltage due to the grid capacitor. The grid then restores to the same voltage as the cathode as the grid charge leaks away through the grid resistor.

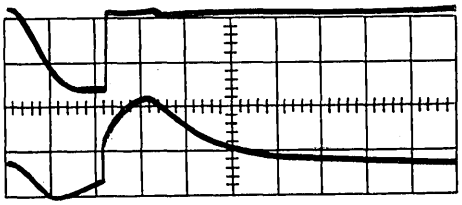
6-20. An overload relay (K101 Figure 8-3) is included in the power supply circuit to prevent damage to the bridge rectifier if severe overload occurs in the 600 vdc circuit. The overload relay coil is by-passed with a variable resistor R110 that is used to set the overload cut-out point. The rectified AC from the bridge rectifier is used to charge two large capacitors (C103 and C104). The charging current to C106 and C107 is taken from these capacitors and there is no excessive power supply load during the charging cycle.

6-21. Because of the time required for an actuator to complete one cycle, it is mandatory that the spacing of commands to the actuator be no closer than 2.5 milliseconds, regardless of the command. If for



VERTICAL : 5 AMPERES/DIVISION
HORIZONTAL : 500 USEC / DIVISION

Figure 6-3.
Waveshape, Discharge Current C107



UPPER TRACE : CATHODE, V104
VERTICAL : 300 VOLTS / DIVISION
HORIZONTAL : 500 USEC / DIVISION
LOWER TRACE : GRID, V104
VERTICAL : 300 VOLTS / DIVISION
HORIZONTAL : 500 USEC / DIVISION

Figure 6-4.
Waveshapes, Cathode/Grid V104

any reason a command signal to the system is programmed closer than 2.5 milliseconds to a previous command, two things may occur:

(1) The control thyratron associated with the previous command will not be permitted to cut off (by virtue of the second command). As a consequence, V104 will connect the power supply to ground via the thyratron and actuator coil.

(2) The grid of V104 will have insufficient time for return to ground potential after the previous command, and V104 will fire prematurely; this, in turn, will shunt the power supply across the actuator coil involved with the result that the associated control thyratron will not cut off.

In either instance, the power supply will be overloaded, and the overload relay K101 will energize. As the contacts of K101 break the power connection, C103-C104 and either C106 or C107 will discharge rapidly through whichever control thyratron is still conducting, and by the time the relay contacts again close the power circuit, the control thyratron will be back to normal status. Thus, accidental programming of commands too close together will not damage the equipment (because of the overload safety feature), but will cause the sequential nature of the programming to be interrupted by one or more missed functions.

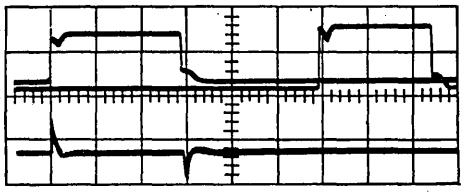
6-22. Two external input connections are provided at the terminals 7 and 9 of the actuator control etched board assembly AC-400; these terminals are connected to terminals 34 and 35 of J303. The input common lead is connected to terminal 8 of the etched board assembly; this common lead may be grounded if desired, but it must serve as the return for the automatic input signals. Start and stop commands must be generated by a dc voltage level change. The actuator will function on an 8 volt (+12, -0) level change, such as -10 to 0 vdc or 0 to +10 vdc for the start command, maintained at the particular voltage for the duration of the run time. Returning the command level to the original level constitutes a stop command. The level of these commands should not exceed 25 vdc. The rise time of this step function dc signal should be no greater than 10 microseconds. The top pattern of Figure 6-5 indicates such an input signal.

6-23. The dc level change is applied to current limiting resistor R413, through the parallel network of C408-R414, and thence to the primary of pulse transformer T408. (The R-C network raises the dc input impedance of the system to prevent undue loading of the external source.) The combination of the input network and the pulse transformer is such that at terminal 1 of T408 only a sharp spike remains

of the original input signal. This is illustrated by the bottom pattern of Figure 6-5. The peaked signal in the primary of T408 is stepped up and applied to the grids of V403 and V404. (See Figure 6-6.) An ON signal causes a positive spike to appear at the primary of T408; a positive spike will then appear at the grid of V404, causing V404 to conduct and shift the actuator ON. At the same time, a negative spike is applied to the grid of V403, adding to the already present fixed dc bias so that V403 does not conduct. If the input command is OFF (signal shifting from zero volts to -10 volts), a positive signal will be applied to the grid of V403 and a negative signal applied to the grid of V404.

6-24. Four external manual control connections are provided at terminals 12, 4, 6 and 10 of the etched board AC-400, corresponding to terminals 44, 41, 40 and 42 of J303. Application of a ground or a positive dc level change to these terminals will cause the indicated actuator operation to occur. For example, suppose it is desired to shift the forward actuator to ON. Applying a ground to terminal 6 of the etched board by means of an external relay or switch will cause a positive spike to appear at the grid of V404. The spike is created by the charging of .002 mfd capacitor C409 through the grid circuit of V404. When the ground is subsequently removed from terminal 6, C409 discharges via shunt resistor R417; the circuit thus is ready for the next similar command. As the ground is applied to terminal 4, a positive spike appears at the grid of V403 and the forward actuator shifts to OFF. Shunt capacitor C406B bypasses any transient impulses picked up via the external wiring. If the manual control is returned to +14 vdc instead of ground, essentially the same results are obtained, but a positive-going spike of greater amplitude is provided to the associated thyratron grid.

6-25. The external manual control system must be interlocked by switches and/or relays to prevent application opposed or contrary commands. For example, it should not be possible to apply a forward ON and a reverse ON command simultaneously, (or in sequence without going through an OFF command). The limitation on



UPPER TRACE:	TYPICAL INPUT SIGNAL
VERTICAL:	10 VOLTS / DIVISION
HORIZONTAL:	5 MSEC / DIVISION
LOWER TRACE:	TERMINAL 1, T408
VERTICAL:	10 VOLTS / DIVISION
HORIZONTAL	5 MSEC/DIVISION

Figure 6-5.
Waveshapes, Typical AC-400
Input/Resulting Pulse

spacing of commands is the same as during automatic operation: 2.5 milliseconds minimum between subsequent commands. It is also recommended that the automatic and manual inputs be interlocked so that it is impossible to apply simultaneous manual and automatic signals. Such interlocks are included in the Ampex Manual Control Panel, and are also indicated in Figure 2-7.

6-26. An actuator interlock circuit prevents one actuator being switched ON if the other actuator is already ON and thus reduces the possibility of damaged tape. Simultaneous ON conditions can arise in three ways:

(1) Start commands applied to the inputs.

(2) Start commands applied when the other actuator is already ON.

(3) Inadvertent firing of one actuator ON due to external noise when the other actuator is on the ON position.

(4) Failure of an actuator to move from the ON position to the OFF position due to a defective actuator or thyratron.

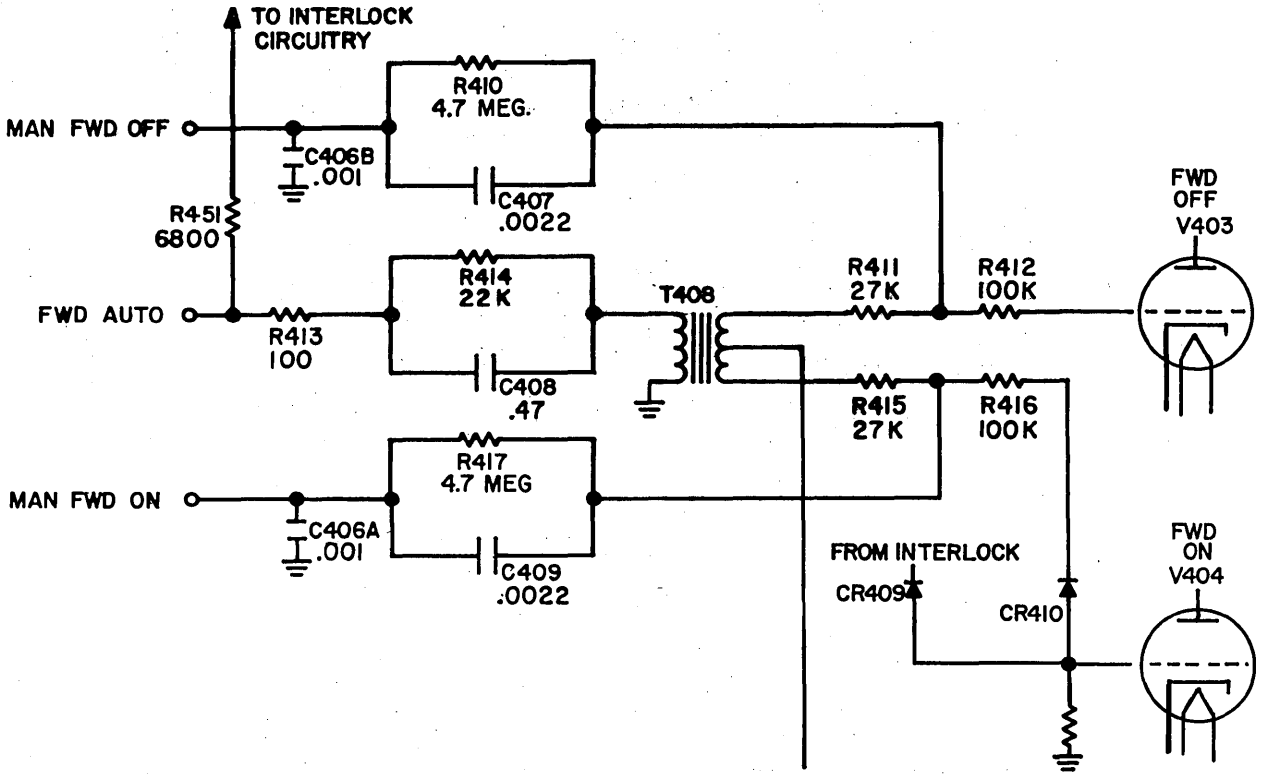


Figure 6-6. Forward Actuator Control (Partial Schematic)

The interlock circuit will prevent simultaneous ON conditions caused by the second and third conditions, but not the first or fourth.

6-27. The forward and reverse interlock circuits are identical; only the forward interlock is described.

6-28. The forward interlock circuit is shown in Figure 6-7. The circuit consists of a flip-flop with emitter-follower input, an AND gate, and an OR gate. The flip-flop is set when the reverse actuator is pulsed on and will then prevent the forward actuator ON thyratron from firing. The flip-flop is reset when the reverse actuator OFF thyratron fires and will then permit the forward ON thyratron to fire when a command is made.

6-29. The flip-flop consists of two transistors, Q404 and Q406, emitter coupled with a common emitter resistor to provide regeneration. The circuit is unbalanced to ensure that when the system is first switched on, Q404 will be conducting and Q406 will be held off; the reset state.

6-30. In the reset state Q404 is conducting due to the base current from the positive 12 volt supply via R440 and R438. The collector

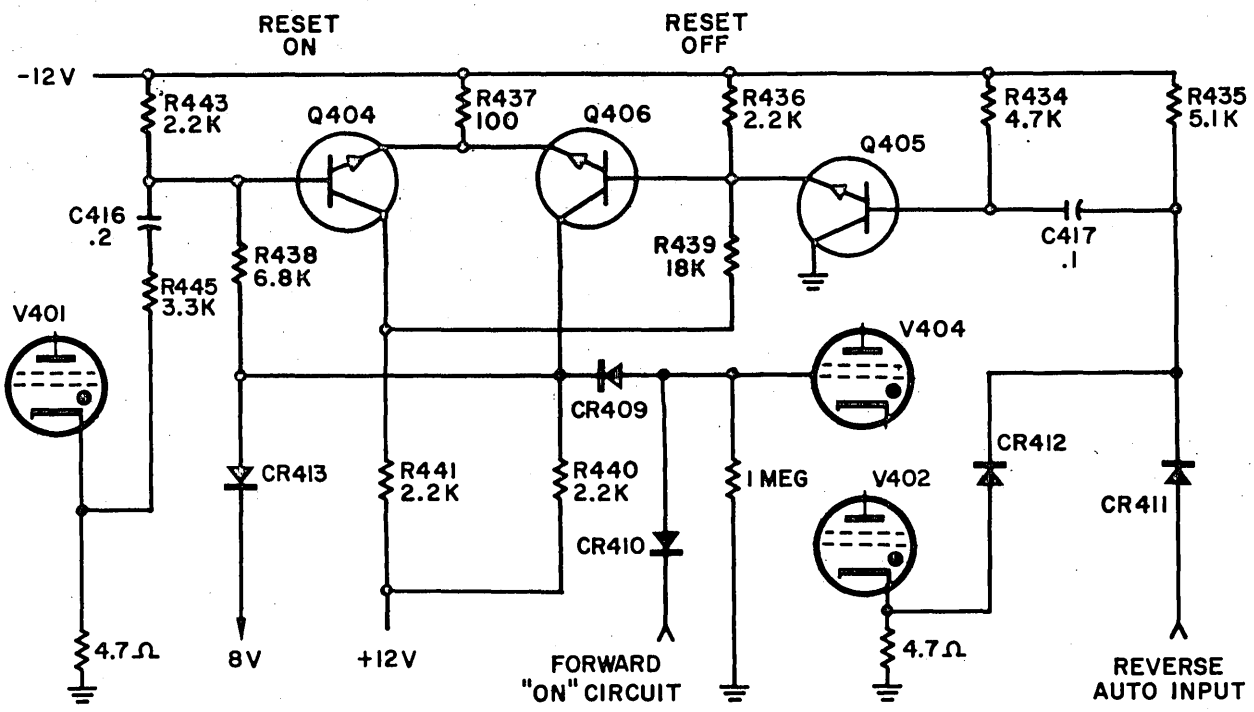


Figure 6-7. Forward Interlock Circuit (Simplified)

current is dropped across R441, preventing any base current flowing in Q406. The emitters of both transistors are tied together and, due to the current in Q404, dropped across the emitter resistor, R437, are held at 1 volt positive with respect to the negative 12 volt supply. The base of Q406 is held close to this supply by R436 and is biased off. The emitter follower input stage (Q405) is biased off, the base is held to the negative 12 volt supply while the emitter is a fraction of a volt positive to this supply, being tied to the base of Q406.

6-31. The flip-flop is set by applying a positive-going pulse to either input of the OR gate (CR411 or CR412). The input pulse applied to CR411 is from the reverse automatic input to the actuator control while the input pulse applied to CR412 is generated across the cathode resistor of V402 when that thyratron fires. Regardless of which input is used the result is that capacitor C417 charges via R434 and the base circuit of transistor Q405 in parallel. With current flowing in the base circuit Q405 switches on and causes base current to flow in Q406 which in turn switches on. As the collector current is dropped across R437 and R440, the Q404 base current is reduced and the emitter voltage increased. Transistor Q404 switches off, its collector voltage increases and base current to Q406 is supplied from the positive 12 volt supply via R441 and R439 to hold Q406 on. As this switching action is regenerative (Q406 switching on in turn switches Q404 off which in turn switches Q406 on), the circuit is quite sensitive to input pulses.

6-32. When the flip-flop is set the AND gate consisting of diodes CR409 and CR410 is inhibited and thyratron V404 cannot fire. In the set condition the junction of R440, CR409, and Q406 collector is held close to the 12 volt negative supply, the grid of V404 remains at this voltage regardless of the condition of the grid input applied via CR410.

6-33. The flip-flop is reset when thyratron V401 fires. The thyratron cathode current causes a positive-going voltage change across the cathode resistor which in turn charges C416 via the base circuit of Q404. Q404 starts to turn on and Q406 off. The circuit is regenerative as described in paragraph 6-31.

6-34. When the flip-flop is reset the AND gate controlling the firing of V404 is enabled (the negative voltage is removed from CR409 cathode) and V404 can be fired.

6-35. The operation in manual and automatic modes is similar except that the flip-flop is set by the firing of the reverse ON thyratron in the manual mode and by the automatic reverse ON pulse in the automatic mode.

6-36. Two power supplies are used for the interlock circuit. The -12 volt supply consists of rectifier CR404; filter network C412, R419, and C413; and shunt regulator Zener diode, CR415. The +12 volt supply consists of rectifier CR403; filter network C410, R418, and C441; and shunt regulator Zener diode CR416.

6-37. SERVO SYSTEM.

6-38. Two identical servo systems are used to drive the tape supply and take-up reels. The tape drive system takes the tape from the supply vacuum chamber, drives it over the head assembly, and feeds it into the take-up vacuum chamber. The servo system supplies tape to and removes tape from the vacuum chambers to maintain a constant length of tape in each vacuum chamber. The vacuum keeps the tape at the correct tension to prevent buckling or folding and allows the tape length in each chamber to be sensed by the servo system.

6-39. The loop of tape in a vacuum chamber divides the chamber into three areas, the center area is open to the atmosphere while the upper and lower areas are open to the vacuum system. Slots in the back plate of the vacuum chambers are connected by tubing to the servo transducers which are able to detect variations in air pressure. The air pressure seen by the transducer is proportional to the length of slot in each of the pressure areas in the vacuum chamber. As the length of tape loop changes the length of the sensing slot in each pressure area changes and the sum of the pressures as seen by the transducer changes. Increases in tape loop size cause the area exposed to the atmosphere to increase and the area exposed to the vacuum to decrease. The result is an increase in the pressure seen by the transducer and an output from the transducer signalling the servo system that tape must be removed from the vacuum chamber. Decreases in tape loop size decrease the area exposed to the atmosphere and increase the area exposed to the vacuum, thus causing a decrease in transducer pressure and a signal to the servo system to supply tape to the chamber. When the correct tape loop size is reached the pressure areas are such that the transducer gives no output to the servo system and the tape reels are stopped.

6-40. Figure 6-8 shows a block diagram of the servo systems. Each system includes a bi-directional series-wound d-c motor, a thyratron speed control circuit for each motor winding (forward and reverse), a three-stage vacuum tube amplifier circuit for each speed control circuit, and a demodulator circuit. Input to the system is provided from an oscillator via two transducers operated by the vacuum system.

6-41. The servo amplifier (SA-500) and the servo power supply (PS-200) form the intermediate link between the tape position error signals and

the rotation of the servo motors. It should be noted that the only moving mechanical parts of the servo system are the transducer diaphragm and core, the servo motors, the reels, and the tape itself.

6-42. The following discussion will be limited to the upper servo system (associated with supply reel and left vacuum chamber). Details of the lower servo system (take-up reel and right vacuum chamber) are identical. Note that the two servos are independent and that servo action in one vacuum chamber has no effect on the other. It is possible therefore, under certain programming sequences, for one reel to be rotating clockwise and the other counterclockwise for very short periods.

6-43. The transducer is an adjustable pnematic, diaphragm-operated linear variable differential transformer. Air pressure from the sensing slots in the vacuum chamber is connected by tubing to one side of a sensing diaphragm, which expands and contracts linearly with changes in vacuum within the plenum behind the sensing slot. The core of the transformer is rigidly attached to the diaphragm, so that movement of the diaphragm displaces the core with respect to the cylindrically wound primary and secondary windings.

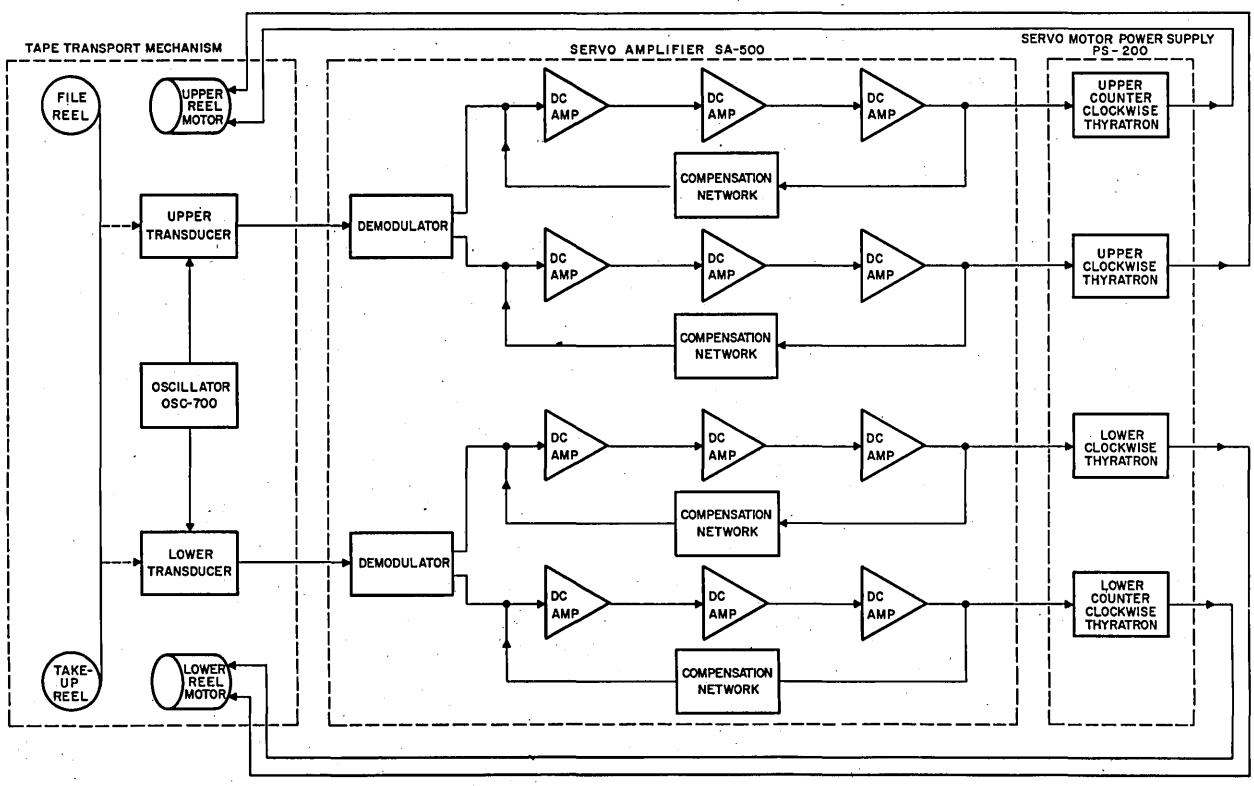


Figure 6-8. Block Diagram, Reel Servo System

6-44. The primary of the transformer is excited at nominally 2000 cps by the oscillator (OSC-700), the output amplitude of the oscillator being varied to adjust servo gain. When the core is positioned equidistant between the primary and the two secondaries, the output from the phase-opposed secondaries are equal. When the diaphragm moves the core away from the center position, unequal voltages are induced in the two secondaries.

6-45. When properly adjusted, the transducer produces a null with the ends of the tape loop approximately 14 inches apart in the vacuum chamber. Changes in length of the tape loops in either the long or short loop directions will cause a corresponding output voltage change as measured across the transformer secondaries.

6-46. These changes in secondary output voltage serve as the speed and direction sense for servo motor control. Overall sensing is such that the servo motors always try to rotate the tape reel in the direction that will return the tape loop length to the transducer null condition.

6-47. The oscillator assembly, mounted on the rear of the tape transport, is a three-stage unit, composed of oscillator, buffer stage, and push-pull power output stage. A block diagram is shown in Figure 6-9.

6-48. The B+ and filament power for operation of the oscillator is obtained from the PS-100 power supply.

6-49. Signals developed across the plate load of the oscillator are attenuated and shifted in phase by the RC networks composed of C2-R4, C3-R5, and C4-R6. (See Figure 8-6.) At the 2000 cps frequency of the oscillator, each of the frequency selective networks shifts the signal in phase by 60°, so that the signal appearing at the grid of oscillator tube V1A is 180° out of phase with the signal at the plate, thus supporting and sustaining oscillation.

6-50. The oscillator signal is applied to V1B, which functions principally as a buffer to prevent any load changes at the output from interacting with the oscillator.

6-51. The push-pull power output stage consists of the two halves of V2 in a conventional circuit, driving output transformer T1, which in turn feeds the primaries of the transducers. Potentiometers, between the secondaries of this transformer and the primaries of the transducers are used to set servo system gain. Typical oscillator output is shown in Figure 6-10.

6-52. The servo amplifier board consists of two demodulators and two d-c amplifiers. Only the demodulator and d-c amplifier relating to the upper servo will be discussed here.

6-53. The input to the servo amplifier board is the signal developed in the secondaries of the transducer differential transformers. The outputs of the servo amplifier board (Figure 8-7) are dc levels varying with the length, and rate of change of length, of tape in the vacuum chamber.

6-54. The ac output from the transducer is rectified and applied to the grids of V1 (Figure 6-11). The common terminal of the transducer secondaries is connected to the amplifier ground while the other terminals of the secondaries are each connected to a diode rectifier circuit where the dc voltages are developed across capacitors C10 and C13. The positive component of one transducer output is summed with the negative component of the other output across a pair of resistors and the resulting voltage applied to one grid of V1. The other positive and negative components are summed and applied to the other grid of V1. When the transducer is in the null condition with both outputs equal, the negative component from one output exactly cancels the positive component from the other output and no error voltage is applied to the grids of V1. When the transducer is not in the null condition one output is greater than the other, one positive component will be greater than its opposing negative component and a positive voltage will be applied to that grid of V1, while the other positive component will be less than its opposing negative component and a negative voltage will

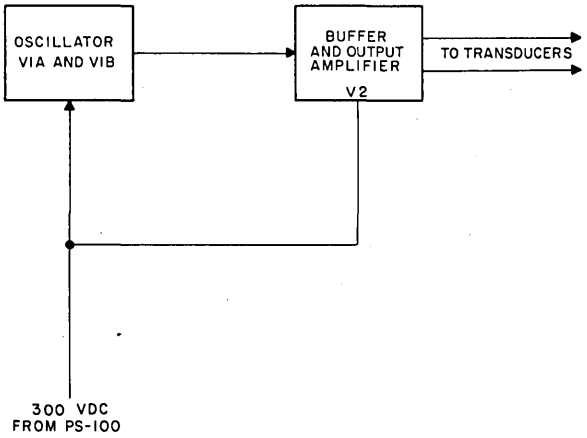
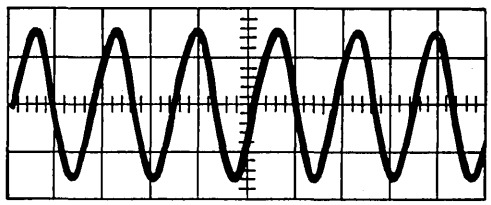


Figure 6-9.
Block Diagram,
Servo Oscillator OSC-700



VERTICAL: 10 VOLTS/DIVISION
HORIZONTAL: 10 MSEC/DIVISION

Figure 6-10.
Waveshape, Typical
Oscillator Output

be applied to that grid of V1. The result is a differential input to V1, the first stage of a d-c amplifier.

6-55. The demodulated signal applied to the grids of V1 is used to control the reel servo motor. The polarity of the voltage excursions applied to V1 is dependent on whether the tape loop is too large or too small and is used to control the direction of reel motor rotation needed to restore the correct loop size. The amplitude of the voltage excursions is dependent upon the amount of variation from the correct loop size and is used to control the reel motor speed.

6-56. The demodulated signal is amplified in a three-stage, differential d-c amplifier, frequency sensitive with negative feedback. Each stage of amplification uses an unbypassed cathode resistor that is common to the two triodes to ensure a balanced signal throughout the amplifier and minimize the effect of tube variations. The feed-back loop uses a filter network (C14-C17 and associated resistors) to bypass the high frequency component of the feedback signal. The result of this lead compensation is much greater amplification at higher frequencies, to provide rapid response to changes in loop size, and increased servo stability.

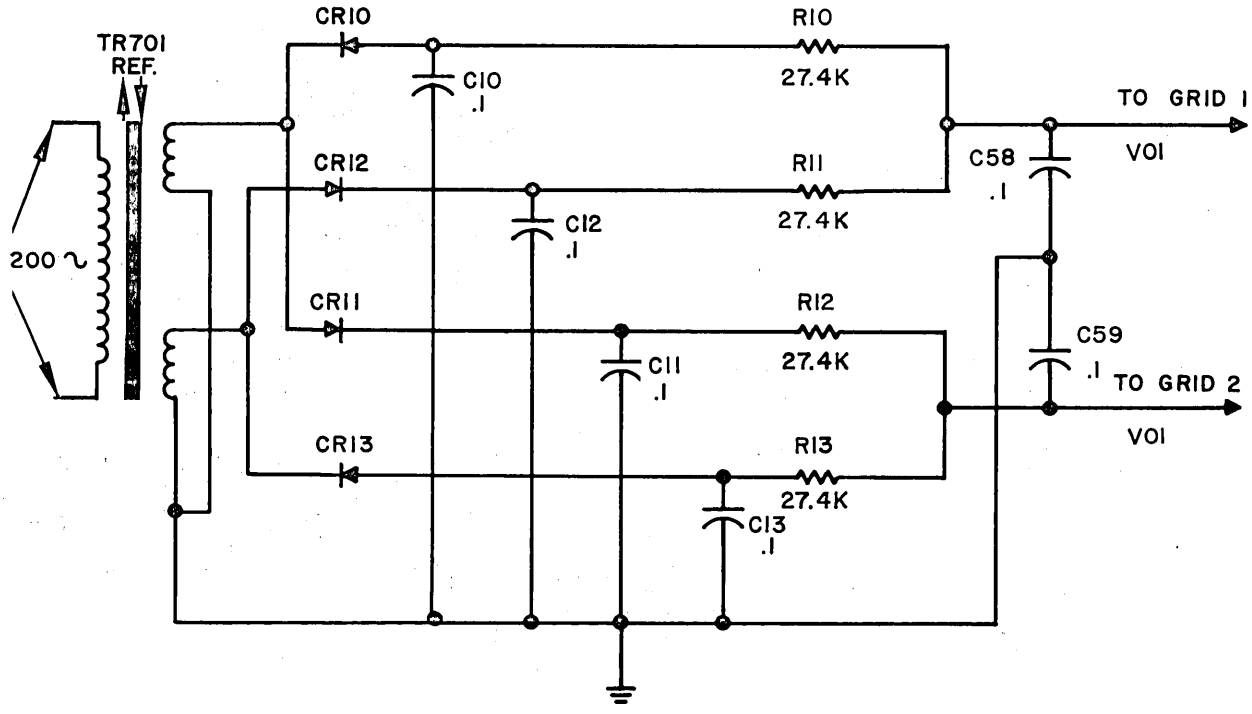


Figure 6-11.
Demodulator SA-500 (Partial Schematic)

6-57. The Servo Motor Power Supply (PS-200) provides power for the reel motors. Each reel motor has two windings, one for clockwise rotation and one for counterclockwise rotation. A simplified power supply circuit for a single motor winding is shown in Figure 6-12 where the motor winding is powered by the secondary of transformer T1 in series with a thyratron. The thyratron grid voltage is supplied from the secondary of transformer T2 in series with the control voltage. The voltage seen by the thyratron grid is the sum of the alternating voltage produced by T2 and the control voltage with a 90° phase shift, and is shown in Figure 6-12. As the thyratron is fired by the grid voltage and turned OFF by the anode voltage, the ON time is seen as the result of the alternating supply superimposed on the control voltage; the ac remains constant so the ON time becomes a function of the control voltage only.

6-58. In the actual power supply circuit (Figure 8-9) two thyratrons are used in a full wave rectifier circuit for each motor winding rather than the half-wave configuration shown in the simplified circuit. Because both negative and positive half cycles of the supply are used the motor ON time is doubled. The phase shifting networks in the grid transformer circuits permit smooth control throughout the entire anode voltage half cycle and provide ON periods in the 0 to 180 degree range

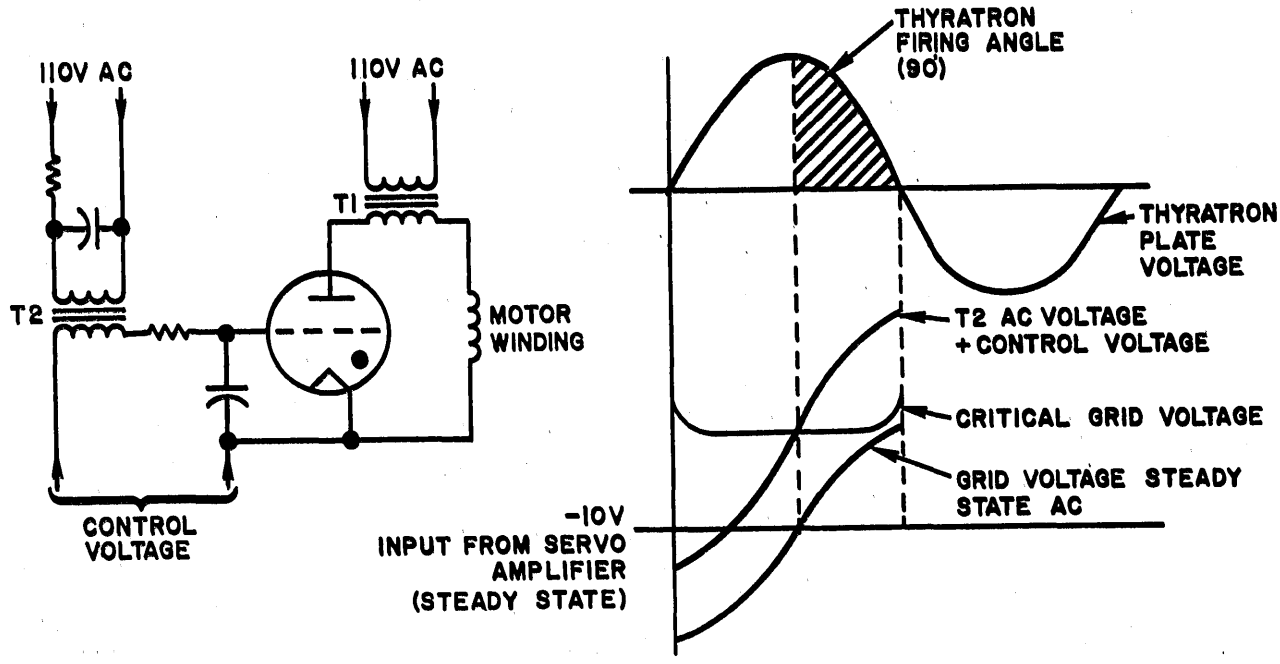


Figure 6-12. Servo Motor Power Supply (Simplified)

so that the motor current becomes a linear function of the control voltage.

6-59. The outputs of the servo amplifier are used as the control voltages for the servo motor power supply. The polarity of the output from each amplifier determines which pair of thyratrons will fire and thus determines the direction of motor rotation. The amplitude of the control voltage determines the firing angle of the thyratrons and thus determines the speed of the motor. Motor direction and speed are therefore a direct function of the size of the tape loop in the vacuum chamber and, when the correct size of the loop is obtained, the thyratrons are held off and the motor is stopped.

6-60. MANUAL CONTROL PANEL.

6-61. The manual control panel offers facilities for power control, selection of command source (manual or automatic), selection of tape motion under manual control, and a manual write/leader drive control. The control functions are so arranged that in the MANUAL mode it is impossible to present simultaneous ON signals to the two actuators.

6-62. The panel consists of four switches for control of the above functions, two time delay relays, four conventional relays, four rectifiers, and two control indicators (POWER ON and READY).

6-63. The power source is connected to pins 47 and 48 of P303 through the circuit breakers CB301 and CB302 on the connecting chassis (CC-300) of the transport electronics assembly. When S806 on the manual control panel is placed in the ON position, power is connected across thermal delay relay K805 through normally-closed contact set K806C of time delay interlock relay K806. Power is also routed through pin 50 of P303 and circuit breaker CB303 to the cooling fan, the positive pressure blower, and the primary of voltage regulator transformer T701. A connection from pin 50 of P303 also routes power through fuse F301 to power transformer T102 in the electronics power supply. If the circuit breakers are all in the ON position, the capstan drive motor will start capstan rotation, the vacuum blower motor and the cabinet cooling fan motors will start as switch S806 is closed. After a 45-second time delay, relay K805 operates. Its contact set couples 24 vdc (rectified by CR805 and CR806 from 52 vac supplied from electronics power supply PS-100) across the coil of time delay interlock relay K806. Contact set K806A provides a holding circuit for the relay, paralleling the contact set of K805. Contact set K806B connects -24 vdc to the external series circuit consisting of the leader clamp switch, interlock switch, door interlock switch, and loop

warning switches. This circuit re-enters the manual control panel at pin 13 of P303. Contact set K806C breaks the power connection to time delay relay K805 which eventually cools and reopens its contacts. The -24 vdc is also used to illuminate POWER indicator DS802.

6-64. The MODE SELECTOR switch, S801, has four decks, each deck a three-pole, three-position switch. When the MODE SELECTOR switch is placed in the AUTOMATIC position, -24 vdc from the interlock circuit is connected through contacts 1 and 2 of deck III and diode CR807 to the coil of relay K804 energizing the relay. Contact sets K804A and K804B are paralleled to connect 117 vac to terminal 39 of P303, from whence the power is routed to anode transformers T206 and T207 in the servo motor power supply (PS-200). An additional -24 vdc output, rectified by diodes CR803 and CR804 from a 52-vac source in the electronics power supply PS-100, supplies power to the brake solenoids through contact sets K804C and K804D to release the brakes on the servo motors.

6-65. If the LOOP WARNING switches are in their normally closed position, -24 vdc is also connected across the coil of interlock relay K802 through contacts 5 and 6 on deck IV of S801 and the relay is energized. Contact sets K802E and K802F are concerned solely with AUTOMATIC mode operation; in their energized position they complete the circuit from the automatic forward and reverse signal inputs to the applicable circuits in the actuator control unit (AC-400).

6-66. Contacts 1 and 2 of deck IV and contacts 9 and 10 on deck III of S801 connect the tape sensing circuits to terminals 6 and 10 on P303, where the voltage may be used for a remote AUTOMATIC READY indicator. Contacts 5 and 6 and 1 and 2 on deck I, when relay contacts K802F and K802E are closed, connect the automatic forward and reverse commands from the remote control source to the actuator control circuits in the transport.

6-67. Should the programming sequence cause a long loop or short loop to be formed in either vacuum chamber while the transport is in the AUTOMATIC mode, the -24 vdc will be removed from pin 13 of P303 (by virtue of the long loop/short loop switch opening). This, in turn, will cause K802 to de-energize until such time as the servo system recovers. There is a time delay of 20 milliseconds (supplied by R805-C801) to permit recovery of loop position. In de-energizing, K802E and K802F open the automatic input circuits; K802C and K802D apply +14 vdc to both actuator OFF circuits, supplying OFF current pulses to both actuators and causing whichever actuator is ON at that moment to switch to the OFF position. K802 will be re-energized as

soon as the long loop or short loop condition is removed by servo action, permitting programming to continue.

6-68. If the basic interlock circuit is broken while the transport is in the AUTOMATIC mode (as by power failure, door opening, vacuum failure, etc.), K802 and K804 will de-energize. These relays cannot be re-energized until the basic interlock is again completed.

6-69. When the MODE SELECTOR switch is placed in the MANUAL position, power relay K804 is energized through isolation diode CR807 and contacts 1 and 4 on deck III. (The interlock circuit must be completed in order that the power relay may be energized.) The contact sets of relay K804 perform the same functions as described above under AUTOMATIC operation.

6-70. Interlock relay K802 is energized if the short loop/long loop switches are in their normally closed positions. The energizing circuit extends from terminal 13 on P303 through contacts 5 and 8 on deck IV, the normally-closed contact set K803A, the MANUAL CONTROL switch (in its STOP position), to the relay coil. In its energized position, relay set K802A forms a holding circuit which bypasses the MANUAL CONTROL switch, permitting this switch to be turned from its STOP position.

6-71. Note that if the MODE SELECTOR switch is placed in the MANUAL position and the MANUAL CONTROL switch in any position other than STOP, relay K802 will not energize. Under these conditions, the MANUAL CONTROL switch must be placed in the STOP position once before any tape motion may be initiated.

6-72. Contact set K802B completes a circuit to +14 through contacts 5 and 8 on deck II of S801 so that manual control signals for tape motion may be selected at the MANUAL CONTROL switch. Contact sets K802C and K802D, in conjunction with contacts 9 and 12 on deck I and contacts 1 and 4 on deck II of S801 ensure that the forward actuator and reverse actuator cannot be shifted ON until the basic interlock is completed. (Contact sets K802E and K802F are applicable only to AUTOMATIC mode operation.)

6-73. Contacts 1 and 4 on deck IV and contacts 5 and 8 on deck III of S801 connect through the interlock circuit to the coil of end-of-tape relay K803. If the outer section of the upper tape sensing contact post is shorted to ground by conductive backing on the tape, the relay is energized. Contact set K803A de-energizes the holding circuit of

interlock relay K802, the contacts of the relay return to their de-energized position, stopping tape motion. Note that end-of-tape relay K803 can be energized only in the MANUAL mode. After the interlock has been completed, contacts 5 and 8 on deck III also supply -24 vdc to the MANUAL WRITE section (contacts 5 and 6 on deck I) of the MANUAL WRITE/LEADER DRIVE switch, so that when that control is placed in the MANUAL WRITE position, associated remote relays for write application may be energized.

6-74. The MANUAL CONTROL switch S802 is a three-deck control, each deck consisting of a two-pole, five-position switch. Deck I is a shorting (make-before-break) type switch; decks II and III are non-shorting. The control may be used to select any of the five tape drive conditions: FWD (Forward), FAST FWD (Fast Forward), STOP, REV (Reverse), and FAST REV (Fast Reverse or Rewind). It should be noted that the switch can select a drive condition only when the MODE SELECTOR switch S801 is at MANUAL, and that all actions previously described for that position are completed. The following discussion, therefore, assumes that the MODE SELECTOR switch is in the MANUAL position, and that relays K802, K804, and K805 have energized.

6-75. When switch S802 is placed in the FWD position, contacts 4 and 6 of deck III complete a +14 vdc circuit to the forward actuator ON circuit and the +14 vdc to the OFF line through contacts 4 and 6 on deck I is removed. The actuator will clamp the roller assembly against the rotating forward capstan, and tape motion will start. When the selector is returned to the STOP position, contacts 3 and 6 on deck I connect the +14 vdc signal to the forward OFF circuit and the +14 vdc to the ON circuit through contacts 4 and 6 on deck III is removed. The roller assembly moves away from the capstan and the tape motion is stopped with the aid of the inertia brake on the roller assembly rocker arm.

6-76. When the MANUAL CONTROL switch is placed in the REV position, contacts 12 and 8 on deck III connect the +14 vdc to the reverse ON circuit and the +14 vdc to the reverse OFF circuit through contacts 9 and 12 on deck I is removed. The reverse actuator clamps the tape against the rotating reverse capstan. When the selector is returned to the STOP position, contacts 9 and 12 on deck I connect the +14 vdc to the reverse OFF circuit. The roller moves away from the capstan, and tape motion is stopped with the aid of the inertia brake on the roller assembly arm.

6-77. When the MANUAL CONTROL switch is placed in the FAST FWD position, contacts 5 and 6 on deck III connect +14 vdc to the forward ON

circuit. Contacts 12 and 11 on deck II connect -24 vdc to thermal time delay relay K801 and, via pin 38 of P303, to rewind relay K701 on the tape transport.

The latter relay selects the fast winding of the capstan drive motor so that the capstans will be driven at higher speed. After approximately two seconds, thermal time delay relay K801 will operate to open its contact set. The contact set will remain open as long as the MANUAL CONTROL switch is in the FAST FWD position; and for approximately five seconds after the control has been switched from this position. This feature prevents the sudden application of the opposite roller assembly when using the fast winding modes as, for example, if the MANUAL CONTROL switch were suddenly moved from FAST FWD to reverse while the tape was moving at high speed. If the roller assembly were permitted to clamp the tape almost immediately, the tape would be subjected to undue stress.

NOTE

It should be remembered that once the actuator clamps the roller assembly against the capstan, it will remain in that position until the OFF signal is received. Thus, breaking the circuit by energizing K801 will not stop tape motion. The contacts of K801 are in series with both actuator ON circuits; hence, neither actuator can be shifted ON until thermal time-delay relay K801 has been allowed to cool.

Returning the selector to the STOP position results in connecting +14 vdc to the forward OFF actuator, through contacts 6 and 3 of deck I. The roller assembly is removed from contact with the forward capstan, rewind relay K701 on the transport is de-energized so that its contacts select the normal winding of the capstan drive motor, and the contacts of thermal time delay relay K801 close after approximately five seconds to close the circuit, allowing subsequent ON commands to operate the actuator circuits.

6-78. When the MANUAL control switch is placed in the FAST REV position, the action is similar to the FAST FWD discussed above. Contacts 12 and 7 on deck III connect the +14 vdc signal to the reverse capstan. Contacts 12 and 7 of deck II connect -24 vdc to K801 and K701, which perform identical functions as under FAST FWD operation.

6-79. The MANUAL WRITE/LEADER DRIVE switch S803 is a two-pole, three-position switch, with one position spring-loaded for return to the center (OFF) position. The switch appears in the circuit only when the MODE SELECTOR switch is in the MANUAL position.

6-80. The purpose of the MANUAL WRITE position is to make -24 vdc available to external controls for use in operating the write function under manual control. Contacts 5 and 6 route this control voltage to pin 25 of P303 when the switch is placed in the MANUAL WRITE position.

6-81. The purpose of the LEADER DRIVE position of the switch is to enable the operator to obtain tape motion when the end-of-tape relay K803 is energized, i.e., when the conductive backed tape is shorting the outer section of either sensing post to ground. To remove the metallized tape leader from the sensing post, contacts 1 and 4 complete the circuit for -24 vdc from terminal 13 of P303 (assuming that short loop/long loop switches are closed) to the coil of interlock relay K802. It is thus possible to energize this relay and achieve tape motion from the MODE SELECTOR switch at times when K803 is energized. The LEADER DRIVE position of the switch is spring-loaded, so that the control returns to the center (OFF) position when released.

6-82. The function of interlock relay K802 in the MANUAL mode is basically the same as for AUTOMATIC operation. However, the long loop/short loop sensing operates while the system is in the MANUAL mode, K802 will not re-energize until the MANUAL CONTROL switch is repositioned to STOP (the holding circuit to K802 will have been interrupted, and must reset via contacts 3 and 6 on deck II of the MANUAL CONTROL switch).

6-83. Interruption of the basic interlock requires re-setting of the basic interlock and return of the MANUAL CONTROL switch to STOP for a moment before subsequent tape motion can be started.

6-84. PHOTOSENSE UNIT.

6-85. The photosense unit gives an output when a reflective tab attached to the tape passes the photosense head. The output may be a relay contact transfer or a voltage level change or both depending upon the type of photosense unit. When a relay contact output is used a hold circuit is included to keep the contacts transferred for 100 milliseconds.

6-86. The photosense head contains a light source and two photosensitive diodes. When normal (brown) tape is under the head very little light from the light source is reflected from the tape to the diodes.

When a reflective tab passes under the head, light is reflected on one of the diodes and increases its reverse conductivity. Each diode is connected to the input of a transistor amplifier and a voltage is applied across it. Changes in diode conductivity due to the reflected light are thus translated into current changes and amplified. The amplifier output is taken to the input of a Schmitt trigger circuit and its output is, in turn, used as input to a two-stage driver circuit. The driver provides current to an output relay or to an external load to give a voltage level change. (See Figure 6-13.)

6-87. The electronics assemblies for a photosense channel, DC Amplifier, Schmitt Trigger, Phantastron (hold circuit), and Driver, are mounted in individual packets. These are in turn mounted on a plug-in composite base card. The complete photosense electronics unit consists of two composite base cards (one for each channel), and three plug-in power supply cards.

6-88. The DC Amplifier circuit uses a common base amplifier and an emitter follower. (See Figure 6-14.) The base of the common base amplifier (Q1) is held slightly below ground by the forward resistance of diode CR1 and resistors R1 and R2 to the -10 volt supply. The emitter voltage is determined by the emitter current and the current through R4 dropped across the photo-diode and R3 in series. Diodes CR2 and CR1 parallel the photo-diode and prevent the voltage across it becoming greater than the combined forward voltage drop of CR2 and CR1. The base of the emitter follower stage (Q2) is tied to the collector of

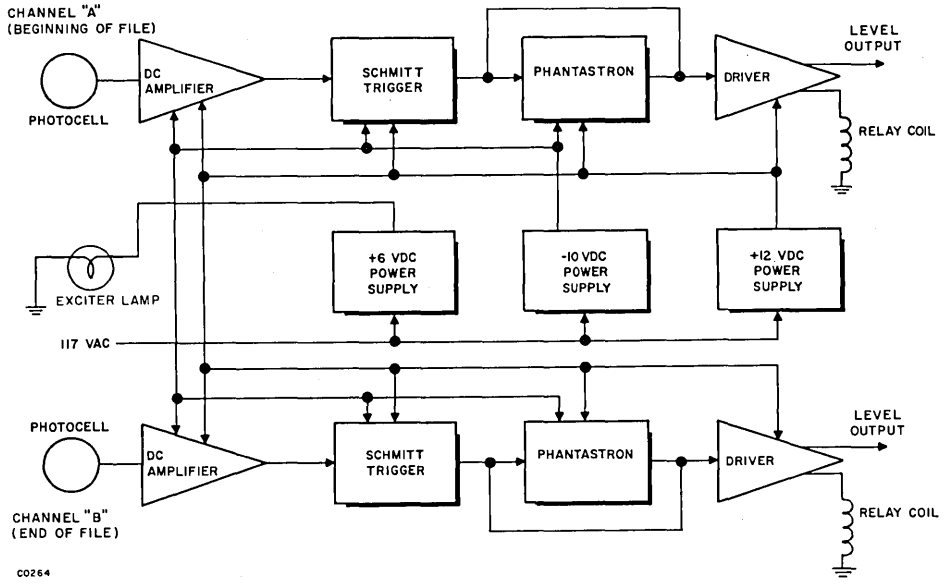


Figure 6-13. Block Diagram, Photosense Electronics

Q1 and its emitter current and output voltage is determined by the voltage drop across R5 due to the collector current in Q1. Adjustment of R4 changes the collector current in Q1 and allows the output voltage of Q2 to be set at -7.5 volts when no reflective tab is under the head.

6-89. When a reflective tab passes under the sensing head, light is reflected on the photo-diode and its resistance decreases, Q1 conducts more collector current, increasing the voltage drop across R5, and decreasing the base current in Q2. Q2 emitter current now decreases and the output voltage dropped across R6 and the load decreases to approximately -2 volts.

6-90. In its normal state Schmitt Trigger transistor Q1, (Figure 6-15) is held off by the negative voltage from the DC amplifier output. Q2 is held on by the base current due to voltage divider R1, R3, and R5. When the base of Q1 becomes less negative, due to a reflective tab being sensed, Q1 turns on, the base voltage on Q2 becomes less positive while its emitter voltage becomes more positive due to the regenerative effect of R2, and Q2 turns off. After a reflective tab has passed under the head and Q1 base becomes more negative and the Schmitt Trigger returns to its original state of Q1 off and Q2 on. The circuit output is clamped to ground by diode CR1 and gives a rectangular positive-going output pulse.

6-91. Transistor Q1 of the driver stage (Figure 6-16) is held off by the negative output from the Schmitt Trigger until a reflective tab is sensed. Q2 is held off by the +12 volt supply and no current flows in

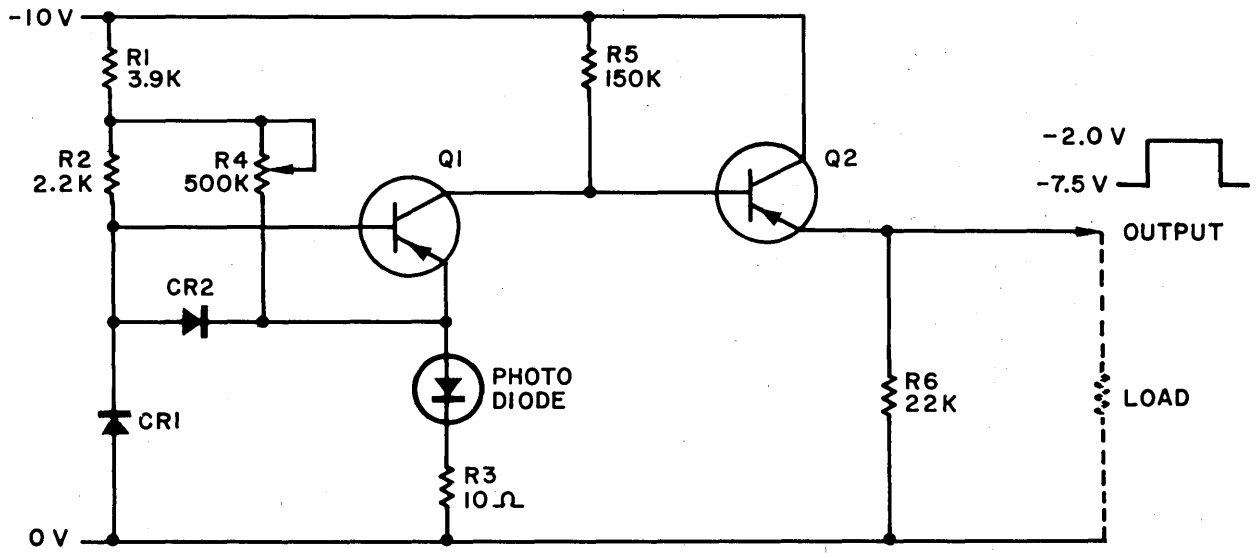


Figure 6-14. Photosense D-C Amplifier

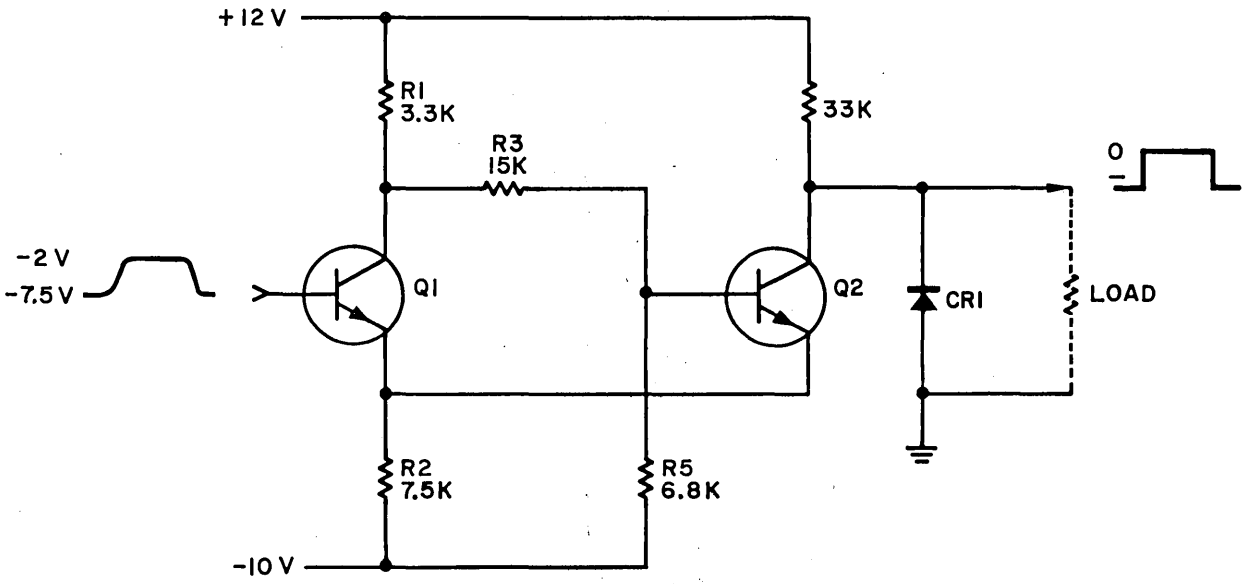


Figure 6-15. Photosense Schmitt Trigger

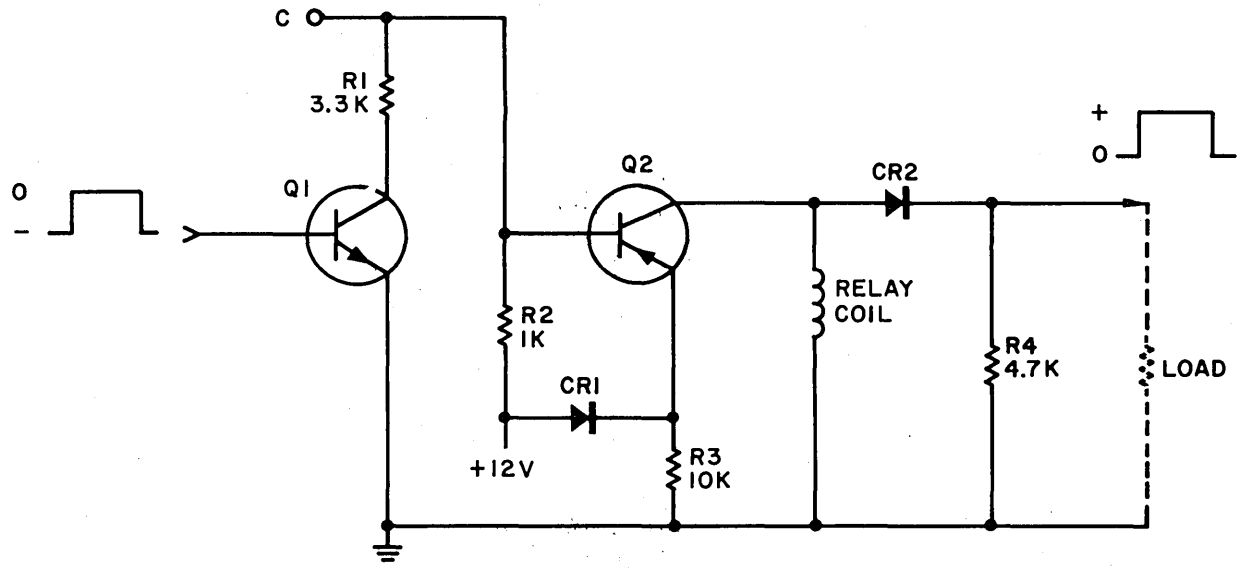


Figure 6-16. Photosense Output Circuit

the relay coil or load resistor. When a reflective tab is sensed and the input to Q1 is grounded Q1 and Q2 turn on and current flows in the relay coil and load resistor, transferring the relay contacts and raising the output level to +10 volts.

6-92. An alternate output circuit is shown in Figure 6-17. In this circuit the negative input during an off tab condition holds Q1 and Q2 on and current flows in the load resistor. When a tab is sensed Q1 and Q2 turn off and the load circuit to ground is open.

6-93. The phantastron circuit, used to hold the output relay operated for 100 milliseconds after a tab is sensed, is shown in Figure 6-18. In the normal (no tab sensed) condition Q3 is held on by the current through R6 into its base and the output voltage is close to the Q3 emitter voltage (+12 volts). Q3 collector current through R5 and R1 makes Q1 base positive and holds Q1 off. Q2 is held on by current through R2 from the -10 volt supply. C1 and C2 are discharged (no difference in potential exists across them) but C3 is charged to -10 volts.

6-94. When a negative-going input pulse is applied to C1 base current flows in Q1 and turns Q1 on. Q1 collector current reduces the negative voltage across C3 and C3 begins to discharge, causing a voltage drop across R6, a positive voltage on Q3 base and Q3 to turn off. With Q3 turned off the circuit output voltage and the voltage on Q1 base go to ground potential to hold Q1 on after the input pulse on C1 ends.

6-95. With Q1 and Q2 both conducting C3 will discharge through R6 and C2 will charge through R2. The discharge rate of C3 is controlled by the charging rate of C2. As C2 charges, a voltage drop occurs across R2 which is a direct function of the rate of charge, this voltage drop is applied to Q2 base, reducing the base current and the collector current. As Q1 and Q2 are in series any change in Q2 collector current will result in a change in the charging rate of C2 and the discharge rate of C3. The result is a linear discharge of C3 over a period of 100 milliseconds. When C3 is discharged no voltage drop exists across R6 and Q3 turns on, the output voltage goes positive, Q1 base goes positive and Q1 starts to turn off. C3 now charges, reducing the collector voltage on Q1 while increasing the base current in Q3 to create a regenerative action giving a short rise time to the output pulse.

6-96. The output of the phantastron circuit is applied to the base of transistor Q2 in the output circuit (point C in Figure 6-16). When the phantastron is used the photosense output relay and level output are held by Q2 for the duration of the phantastron output.

6-97. Three power supplies driven from a 32 volt output transformer, are used in the photosense unit. A -10 volt supply and a +12 volt supply power the electronics while a 5-volt supply is used for the light source. Each supply is shunted by a Zener diode. Plug-in cards carry the power supply components while the transformer and Zener diodes are mounted directly on the photosense chassis.

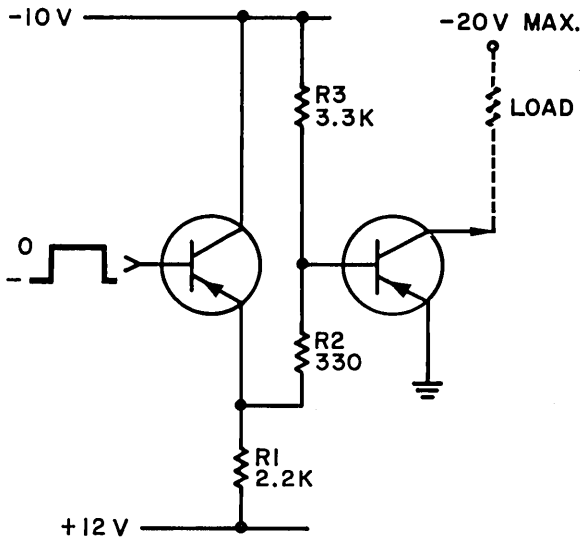


Figure 6-17.
Photosense Alternate
Output Circuit

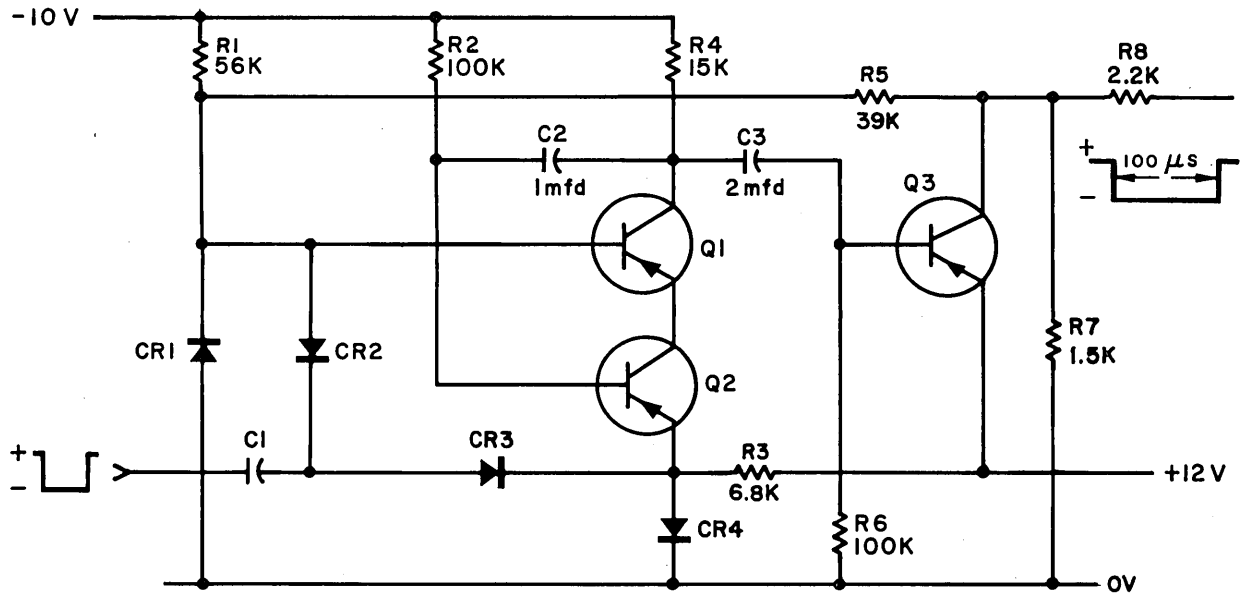


Figure 6-18. Photosense Phantastron Circuit

SECTION VII
MAINTENANCE

7-1. GENERAL.

7-2. The TM-2 Tape Transport is designed to require minimum maintenance and service. Such maintenance as is required will be facilitated by a well-planned program of preventive maintenance, a systematically kept maintenance log, and carefully performed corrective maintenance as required. Adherence to such a program will ensure optimum performance of the equipment over many years.

7-3. A listing of the recommended tools and equipment used in maintenance of the tape transport will be found at the end of this section.

7-4. PREVENTIVE MAINTENANCE SCHEDULE.

7-5. A program of planned periodic maintenance is the most effective way of keeping the tape transport operating at its designed potential. A recommended schedule is shown in Table 7-1. It should be noted that these maintenance procedures are scheduled by number of eight-hour shifts, as well as by hours of running time as indicated on the elapsed time meter at the rear of the tape transport.

Table 7-1. Preventive Maintenance Schedule

Maintenance Operation	Frequency Approx.			Qty.	Total Time (Min.)	Text Paragraph Reference
	Shifts	Hours	Min. Ea.			
Check Tape Transport Tracking	1	8	1	2	2	4-4
Clean Transport	2	16	10	1	10	7-7
Check capstan roller adjustment	2	16	1	2	2	4-6
Check tape packer alignment	12	96	2	2	4	4-17
Adjust capstan rollers	12	96	10	2	20	4-7
Degauss heads and tape guides	24	192	.5	16	8	7-8

Table 7-1. Preventive Maintenance Schedule (Continued)

Maintenance Operation	Frequency Approx.			Qty.	Total Time (Min.)	Text Paragraph Reference
	Shifts	Hours	Min. Ea.			
Clean rack	24	192	5	1	5	7-9
Replace air filters	24	192	.25	4	1	7-10
Check and adjust vacuum	24	192	3	1	3	4-11
Align chamber guides if necessary	24	192	3	4	12	4-12
Check and adjust reel servos	24	192	6	2	12	4-13
Check hold-down operation and torque	24	192	2.5	2	5	4-14
Check Actuator Firing circuitry	24	192	7.5	2	15	4-16
Align pack follower	60	480	10	2	20	4-17
Replace thyratrons	60	480	1	13	13	7-12
Check and adjust reel servos			6	2	12	4-13
Check vacuum switch	124	992	10	2	20	4-18
Replace vacuum tubes Check and adjust reel servos	124	992	.25 6	6 2	3 12	7-13 4-13
Replace vacuum blower motor brushes Check and adjust vacuum	250	2000	1 3	1 1	1 3	7-14 4-11
Check capstan drive belt	250	2000	1	1	1	4-19

Table 7-1. Preventive Maintenance Schedule (Continued)

Maintenance Operation	Frequency Approx.			Qty	Total Time (Min.)	Text Paragraph Reference
	Shifts	Hours	Min. Ea.			
Replace capstan rollers	250	2000				7-15
Reverse(incl. adj.)			30	1	30	
Forward(incl. adj.)			30	1	30	
Replace capstan assemblies	250	2000				7-15
Reverse			30	1	30	
Forward			15	1	15	
Adjust capstan rollers			10	2	20	4-7
Replace actuators	250	2000	10	2	20	7-15
Replace and adjust capstan drive belt	250	2000	10	1	10	7-16
Replace Chamber Guides	250	2000	10	4	40	7-17
Align Guides			3	4	12	4-12
Replace reel motor brushes	250	2000	15	2	30	7-18
Adjust hold down knob torque	250	2000	15	1	15	4-15
Replace positive pressure blower	625	5000	30	1	30	7-19
Replace tape packer assemblies	625	5000	45	2	90	7-20
Replace reel motors	625	5000	30	2	60	7-21
Replace capstan motor	625	5000	20	1	20	7-22
Adjust reel motor brake	625	5000	5	2	10	4-20

7-6. MAINTENANCE OPERATIONS

7-7. CLEANING THE TAPE TRANSPORT.

CAUTION

Use only the indicated cleaning fluids. Use of solvents such as carbon tetrachloride may dissolve the adhesives used in the head and vacuum chamber assemblies. No alcohol should be allowed to reach the capstan roller bearings.

The read/write head assembly should be cleaned with a lint-free cloth or cotton swab moistened with Ampex Head Cleaner as shown in Figure 7-1. The head stacks and guides should be wiped carefully to remove all traces of oxide and dirt. It is not necessary to remove the head assembly from the transport for cleaning.

CAUTION

Objects extending more than 1/8" into the vacuum chamber sensing slots may cause permanent damage. Use only the Ampex cleaning tool.

The vacuum chambers and loop sensing slots should be cleaned and freed of any oxide accumulation. Primary cleaning of the loop sensing slots is accomplished by inserting the slot cleaning tool into the upper end of each sensing slot and drawing it (once only) to the lower end of the slot. (See Figure 7-2.) The vacuum chambers should then be cleaned with a Kimwipe tissue moistened with alcohol, taking care that the Scotch-Lite anti-static strip does not become saturated with alcohol. Be particularly careful to remove all traces of foreign material from the glass cover doors. The capstan roller assemblies, capstans, and fixed tape guides should be thoroughly cleaned with a Kimwipe or cotton swab moistened with isopropyl alcohol. All traces of dirt etc., should be removed. The inside of the transport access door and the face of the transport casting (especially the ledge under the take-up reel) should be wiped free of all traces of foreign material. The tape packer arm shoes should be carefully cleaned and inspected and any accumulation, especially on the lower reel packer arm shoe, should be

removed with a Kim-wipe tissue moistened with alcohol. Packer arm shoes showing signs of damage or roughness should be replaced.

7-8. DEGAUSSING HEAD ASSEMBLY. Head demagnetization is an extremely important operation, especially demagnetization of the read head. When any element in contact with the tape becomes permanently magnetized, recorded data may be partially erased. Any phenomena tending to place large unbalanced pulses through the write or read head may cause magnetization. The following precautions should be observed:

1) Do not connect or disconnect head leads while writing.
2) Do not test head continuity with an ohmmeter.
3) Do not allow any magnetized object to come into contact with any portion of the transport.

The head may be demagnetized by the following procedure:

Step 1: Remove all tape from the transport.

Step 2: Disconnect all power from the equipment.

Step 3: Plug an Ampex Model 704 Demagnetizer into a source of 117 vac power.

Step 4: Bring the tips of the demagnetizer into close proximity to, but not in contact with, the head (Figure 7-3).

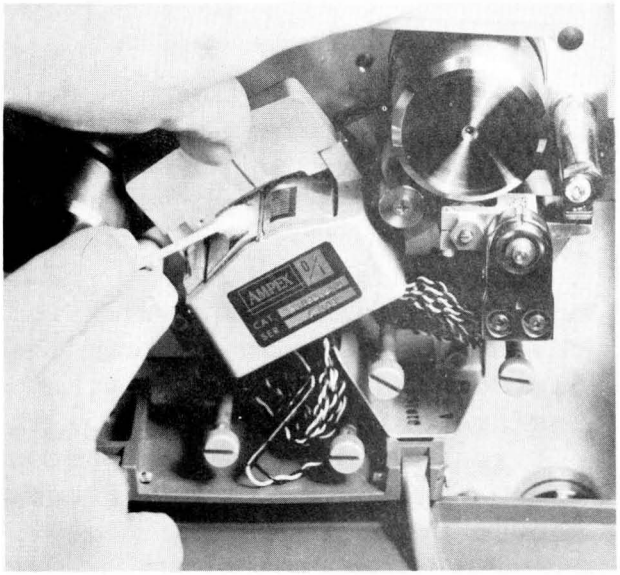


Figure 7-1.
Cleaning Head Assembly

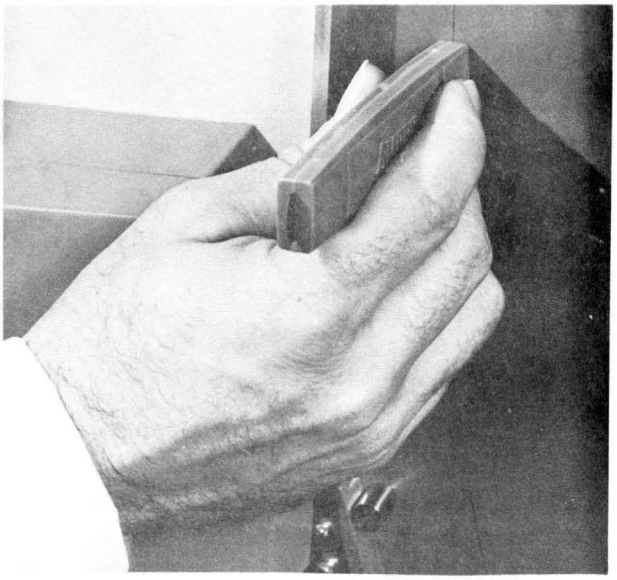


Figure 7-2.
Cleaning Sensing Slots

Step 5: With the tips of the demagnetizer straddling the head gap, run the demagnetizer slowly over the full length of the head.

Step 6: Remove the demagnetizer slowly, allowing the influence of the a-c field to die gradually.

Step 7: Repeat the process for the other head stack.

7-9. CLEANING RACK. The entire rack housing the tape transport and the tape transport itself should be thoroughly cleaned on a regular schedule.

CAUTION

Do not permit any cleaning fluid to come into contact with the capstan bearings or capstan roller bearings. Under no circumstances should the cleaning fluid be allowed to come into contact with the head assembly.

The front of the transport should be carefully wiped with a lint-free cloth moistened with ethyl alcohol.

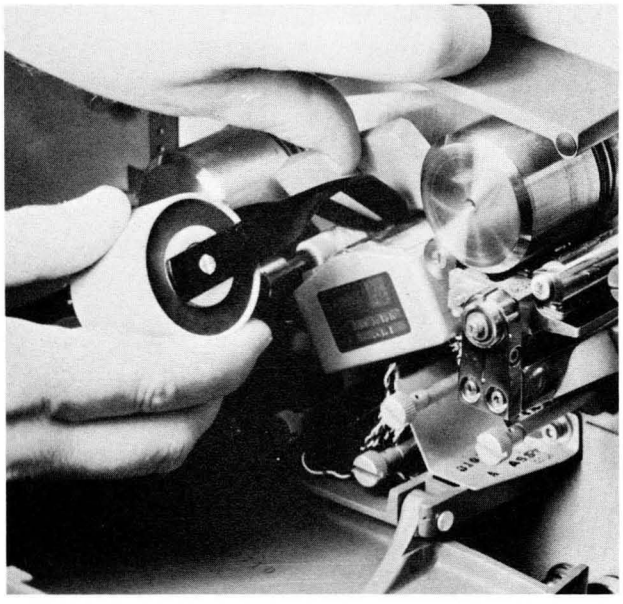


Figure 7-3.
Head Demagnetization

CAUTION

Do not use the vacuum cleaner as a blower or use compressed air to clean the transport.

A vacuum cleaner is useful in reaching otherwise inaccessible dirt on the rear of the transport, inside cabinet racks, etc. The entire rear of the transport and the cabinet housing the transport should be thoroughly cleaned.

7-10. REPLACING AIR FILTERS. The vacuum blower filter, positive

pressure blower filter, and the two filters in the rear door of the rack cabinet should be changed regularly. The vacuum blower filter is replaced by releasing the retainer and pulling the filter straight forward by means of the two loops provided. The new filter is installed by reversing the above process. The positive pressure blower filter is replaced by removing the pan head screw which holds the filter housing in its closed position. The two filters in the rear door of the rack cabinet are replaced by lifting them from their retaining slides. All filters are reusable, and may be cleaned with a vacuum cleaner.

CAUTION

Be certain that any filter cleaned with water is allowed to dry thoroughly before being returned to service. If the filter is not completely dry, moist air may be pumped into the transport and damage the tape and the transport.

Following this cleaning, the filters should be thoroughly washed in clear water and allowed to dry.

7-11. REPLACING TAPE PACKER ARM SHOES. Tape packer arm shoes may be replaced without removing the arm. A single screw holding the shoe to the arm must be removed, the new shoe fitted, and the screw replaced. If the arm must be replaced, follow the steps in paragraph 7-21 which refer to the packer arm.

7-12. REPLACING THYRATRONS. The four thyratrons on the actuator control unit AC-400, the eight thyratrons on the servo motor power supply PS-200, and the thyratron in the electronics power supply PS-100 should be replaced after each 480 hours operating time. Following replacement, the servos should be checked and adjusted as detailed in paragraph 4-13; the actuators should be checked and adjusted as detailed in paragraph 4-16.

7-13. REPLACING VACUUM TUBES. The vacuum tubes on the oscillator (OSC-700) and servo amplifier (SA-500) printed circuit boards should be replaced each 992 hours operating time. Following the replacement, the servos should be completely adjusted as detailed in paragraph 4-13.

7-14. REPLACING VACUUM BLOWER MOTOR BRUSHES. A preassembled spare vacuum blower assembly may be installed and new brushes installed in the original motor without prolonging the down time.

Step 1: Remove the vacuum blower assembly by disconnecting the power plug to the motor and unsnapping the two latches which hold the blower assembly to the base. (Install the spare blower assembly by placing it on the base and snapping the two latches. Connect the power plug.)

Step 2: Remove the filter.

Step 3: Loosen the two screws which secure the blower motor to the blower housing.

Step 4: Remove the power connector from the housing by pressing the two nylon legs toward the center of the body from the outside of the housing, then pressing the connector through the housing.

Step 5: Rotate the motor slightly to clear the screws which secure it to the housing and remove the motor.

Step 6: Unscrew the caps of the brush holders. Remove the old brushes.

Step 7: Insert the new brushes.

Step 8: Reassemble the vacuum blower assembly and reinstall on the tape transport by reversing Steps 1 through 5.

NOTE

Spare blower assemblies (preassembled) are installed by performance of Step 1 only.

7-15. REPLACING CAPSTAN ROLLER ASSEMBLIES, REPLACING CAPSTAN ASSEMBLIES, REPLACING ACTUATORS. The operations in replacing capstan roller assemblies, capstan assemblies, and actuators are so interrelated that they are treated here as a single sequence of operations.

Step 1: Remove the capstan drive motor assembly by removing the belt, separating FS707 from TB707, and removing the three socket head cap screws which hold the assembly to the standoffs.

Step 2: Remove the capstan flywheel by loosening the two Allen head setscrews which mount it to its shaft.

Step 4: Remove the head assembly from the front of the transport by removing the read and write connectors from their receptacles and removing the two socket head cap screws which secure the head assembly base plate to the precision plate.

Step 5: Remove the two socket head cap screws passing through the outboard actuator support bearings to the actuator shafts. Remove the four socket head cap screws which mount the shaft support arms to the shaft support posts.

Step 6: Loosen the socket head cap screws which clamp the capstan roller assemblies to the actuator shafts; slide the capstan roller assemblies from the shafts.

Step 7: From the front of the transport, remove the two socket head cap screws which pass through the precision plate into each of the two actuators.

Step 8: From the rear of the transport, remove the three socket head cap screws which mount each capstan assembly to the precision plate.

Step 9: Disconnect the belt idler spade bolt from its bracket at the side of the forward actuator. Disconnect the fanning strips which connect the two actuators to the transport cabling.

Step 10: Remove each of the capstan assembly/actuator combinations. The actuators fit into sections removed from the capstan housings.

Step 11: Transfer the belt idler spade bolt bracket from the old actuator to a new unit.

Step 12: Reversing the order of Steps 1 through 10, install the new capstan assemblies, actuators, and capstan roller assemblies.

Step 13: Adjust the capstan roller gap and brake gap as detailed in paragraph 4-7.

7-16. REPLACING CAPSTAN DRIVE BELT. The capstan drive belt can be changed without removal of any assemblies from the machine. The belt path is shown in Figure 7-4. Following installation, drive belt tension should be measured as shown in Figure 7-5. A force of approximately 5 $\pm$ ½ lbs should be required to decrease drive belt tension to

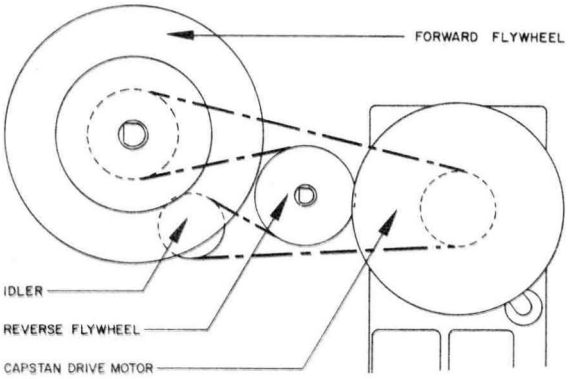
the point where a slowing of the reverse capstan is apparent when monitored with a tachometer. Drive belt tension is adjusted as shown in Figure 7-6.

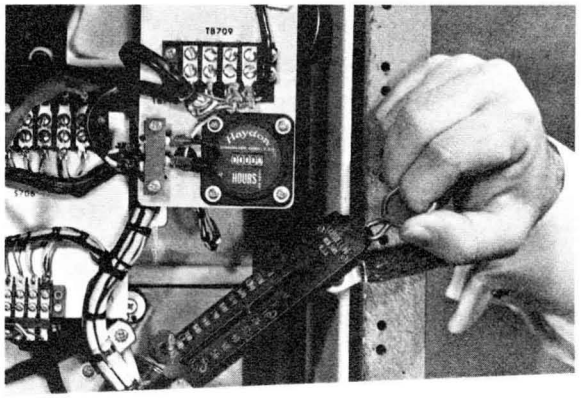
7-17. REPLACING CHAMBER GUIDES. The two buffer spring guides and two roller guides on the vacuum chamber may be changed without removing the chamber from the transport. The buffer spring guide is held in place on the chamber with a single machine screw. The roller guide is replaced by removing the two socket head cap screws which fasten the outboard support element to its base. The roller assembly is then removed, a new roller assembly installed, and the outboard support element reinstalled. The buffer spring guides and the roller guides are aligned as described in paragraph 4-12.

7-18. REPLACING REEL MOTOR BRUSHES. The reel motor brushes may be reached by removing the end dust cap from the motor. Reel motors bearing an Indiana General trade mark utilize two brushes, held in spring-cap brush holders. Reel motors bearing the Lamb trademark utilize four reel brushes, held against the commutator by flat springs.

7-19. REPLACING POSITIVE PRESSURE BLOWER. The positive pressure blower is replaced by the following procedure:

Step 1: Remove the end cap of the positive pressure blower by loosening the bright band which clamps the end cap to the blower housing.





Step 2: Remove the blower wiring at TB708 (located inside the end cap).

Step 3: Remove the four machine screws which attach the blower assembly to the throat projecting from the transport. Remove the blower.

Step 4: Install the new blower assembly by reversing the order of Steps 1 through 3.

7-20. REPLACING THE TAPE PACKER SWITCH ASSEMBLIES. Upper and lower assemblies are not interchangeable. For correct replacement part number refer to section IX of this manual. The following procedure describes the removal and replacement of the upper switch assembly.

Step 1: Use an Allen wrench to loosen the screw clamping the packer arm to its shaft and remove the arm.

Step 2: Remove the screw that couples the switch assembly to the tape clamp linkage.

Step 3: Disconnect the wiring harness from the switch.

Step 4: Remove the hold-down nut and lock washer from the switch assembly. These are located on the front of the transport.

Step 5: Remove the assembly by pushing the shaft through the transport casting from the front.

Step 6: Install the new switch assembly by reversing Steps 2 through 5. Do not tighten the hold-down nut.

Step 7: Rotate the switch assembly to the position where the switch transfers when the leader clamp is closed to a point 1/16-inch to 1/8-inch from complete closure and tighten the hold-down nut.

Step 8: Make sure that the leader clamp is open. Install the packer arm. It must

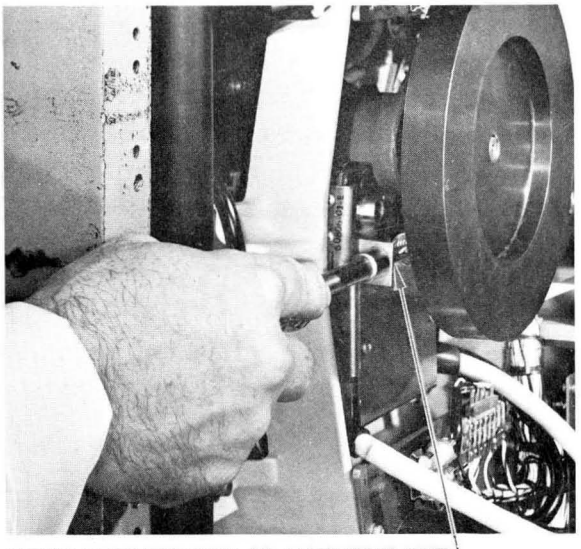


Figure 7-6.
Adjusting Capstan
Drive Belt Tension

clear the reel flanges and the reel hub by 1/8-inch when the leader clamp is open

Step 9: Grasp the packer arm at its base and pull out from the transport to the limit of end travel. The arm must still clear the reel flanges.

Step 10: Simulate a full reel of tape by placing a piece of cardboard across the reel flanges and resting the tape packer shoe on the cardboard. Check to see that the switch is closed.

The lower packer arm switch assembly should be replaced as follows:

Step 1: Remove the capstan drive belt.

Step 2: Remove the forward capstan flywheel by loosening the two set screws which mount it to its shaft.

Step 3: Remove the two servo control assemblies by removing the fanning strips, the two screws securing each assembly to the transport, and the tubing to the vacuum chambers.

Step 4: Use an Allen wrench to loosen the screw clamping the packer arm to its shaft and remove the arm.

Step 5: Disconnect the wiring harness from the switch.

Step 6: Remove the hold-down nut and lock washer from the switch assembly, located on the front of the transport.

Step 7: Remove the assembly by pushing the shaft through the transport casting from the front.

Step 8: Install the new switch assembly by reversing Steps 1 through 7, making sure that the packer arm clears the reel flanges and clears the reel hub by 1/8-inch.

Step 9: Grasp the packer arm at its base and pull out from the transport to the limit of end travel. The arm must still clear the reel flanges.

7-21. REPLACING REEL MOTORS. The replacement procedure for the reel motors is as follows:

Step 1: Snap the hub cap from the lower (fixed) reel assembly. Using an Allen wrench, remove the screws which hold the precision reel assembly to the turntable.

Step 2: Disassemble the upper hold-down knob assembly. Remove the base of the hold-down assembly from the turntable.

Step 3: Disconnect the fanning strips by which the reel motors are connected to the transport cabling.

Step 4: Remove the four nuts which hold each reel motor to its mounting studs on the transport frame.

Step 5: Install the new reel motors.

Step 6: Install the upper hold-down knob. Using a dial indicator, adjust the position of the hold-down for minimum eccentricity.

Step 7: Install the fixed lower reel assembly. Using a dial indicator, adjust the position of the assembly for minimum eccentricity.

Step 8: Connect the fanning strips from the reel motors to the appropriate terminal strips.

NOTE

If misalignment of the reel motors or turntables is evidenced by curling of the edges of the tape, etc., the offending motor or turntable must be shimmed from the transport frame until proper tape tracking is achieved.

7-22. REPLACING CAPSTAN DRIVE MOTOR. The capstan drive motor is replaced by the following procedure:

Step 1: Remove the capstan drive belt.

Step 2: Disconnect the fanning strip with which the capstan drive motor assembly is connected to the transport.

Step 3: Remove the three socket head cap screws which attach the capstan drive motor assembly to the transport standoffs; remove the assembly.

Step 4: Remove the capstan drive pulley from the drive motor by loosening the two screws which fasten it to the motor shaft.

Step 5: Remove the four cap screws which hold the capstan motor to the base plate.

Step 6: Unsolder the motor leads. Remove the capstan drive motor from the base plate.

Step 7: Install the new capstan drive motor by reversing the order of Steps 1 through 5.

7-23. REPLACING REEL BRAKES.

Step 1: Remove the reel motor (see paragraph 7-21).

Step 2: Remove the brake tension adjustment nut (see Figure 4-11).

Step 3: Disconnect the brake solenoid cable from TB703 or TB706.

Step 4: Use a Phillips screwdriver to remove the solenoid mounting screws.

Step 5: Remove the brake assembly complete.

Step 6: If required, disassemble the brake linkage by removing the cotter pin, clevis pin, and roll pin from the linkage.

Step 7: Install the brake assembly by reversing Steps 1 through 6 above.

Step 8: Adjust according to paragraph 4-20.

7-24. REPLACING VACUUM CHAMBERS. To replace the left vacuum chamber the capstan motor assembly must be removed; otherwise the procedure is the same for left and right chambers.

Step 1: Remove the tape from the vacuum chamber.

Step 2: Adjust the vacuum chamber height adjusting screw under the vacuum chamber to just contact the chamber assembly. Tighten the lock nut on the height-adjusting screw.

Step 3: (Left vacuum chamber only.) Remove the capstan drive belt.

Step 4: (Left vacuum chamber only.) Disconnect the harness from the capstan motor assembly fanning strip.

Step 5: (Left vacuum chamber only.) Remove the three socket head cap screws securing the capstan motor assembly to the transport standoffs and remove the assembly.

Step 6: Loosen the tubing clamp screws securing the hard plastic vacuum tubing to the transport. This tubing runs vertically between the upper and lower vacuum chamber ports.

Step 7: Disconnect the flexible plastic tubing from the long loop, short loop, and transducer connections on the vacuum chamber.

Step 8: Use a long Allen wrench to remove the three socket head cap screws securing the vacuum chamber to the precision plate (move the vacuum tubing as required to gain access to the screws); remove the vacuum chamber.

Step 9: Check the sealing tape on the rear of the vacuum chamber for air bubbles and poor adhesion before installing the chamber.

Step 10: Position the vacuum chamber, making sure that it is resting on the height-adjusting screw, clearing the radius of the casting flange, and is parallel to the vertical flange of the transport.

Check the vacuum ports for obstructions and position the foam plastic gaskets to clear the ports.

Step 11: Reverse Steps 2 through 6 taking care that when the three mounting screws are tightened the rear of the chamber is only in contact with the precision plate, as any other contact with the transport may distort the chamber.

7-25. REPLACING READ/WRITE HEAD ASSEMBLY.

Step 1: Use an Allen wrench to loosen the long screws securing the read and write cable connectors.

Step 2: Unplug the read and write cable connectors.

Step 3: Use an Allen wrench to remove the recessed screws securing the head assembly to the precision plate.

Step 4: Pull the head assembly forward to expose the vacuum tubing attached to the rear of the tape cleaner (if used).

Step 5: Remove the plastic vacuum tubing from the head assembly (if used).

Step 6: To install head assembly reverse Steps 1 through 5 above.

7-26. REPLACING PHOTOSENSE HEAD. No attempt should be made to replace components inside the head assembly. In the event of failure a new photosense head kit should be installed as follows:

Step 1: Disconnect the photosense cable connector located at the rear of the transport behind the photosense head.

Step 2: Using an Allen wrench, remove the two screws securing the photosense head to the vacuum chamber. Remove the photosense head.

Step 3: Remove the vacuum chamber (refer to paragraph 7-24).

Step 4: Pull the photosense cable connector through the hole in the precision plate.

Step 5: To install a new photosense head, solder the new photosense cable connector (provided in the kit) to the connecting cable attached to the head. Reverse Steps 1 through 4. The face at the head must be parallel to and approximately 3/16-inch from the tape.

7-27. REPLACING PHOTOSENSE ELECTRONICS UNIT.

Step 1: Remove the two screws on the cover.

Step 2: Remove the cover.

Step 3: Disconnect the harness from the terminal strips.

Step 4: Use a long Phillips screwdriver, remove the two screws securing the chassis assembly to the transport casting and remove the assembly.

Step 5: To install the photosense unit, position the chassis assembly on the casting and reverse Steps 1 through 4.

7-28. PHOTOSENSE KIT INSTALLATION. To install a photosense unit on a tape transport not factory equipped for photosensing follow the installation procedures in paragraphs 7-26 and 7-27.

7-29. REPLACING CAPSTAN QUAD RING. To replace the capstan quad ring complete the following steps:

Step 1: Remove the socket head cap screw from the brake post adjacent to the capstan whose quad ring is to be replaced. Remove the brake post.

Step 2: Loosen the two socket head cap screws (A, Figure 4-1) which clamp the capstan roller yoke to the actuator shaft.

Step 3: Rotate the yoke clockwise until the clearance between the capstan roller and the capstan is enough to allow the quad ring to be removed.

Step 4: Lift the quad ring out of its groove and slide it over the front of the capstan. If the ring may be removed without interference, proceed to Step 6. If the head guide is too close to the capstan to allow the quad ring to pass through, continue with Step 5.

Step 5: Remove the socket head cap screw which secures the left side of the head assembly to the precision plate.

Step 6: Loosen the screw on the right-hand side of the head assembly.

Step 7: Drop the left side of the head assembly enough to let the quad ring pass over the capstan.

Step 8: Place a new quad ring over the end of the capstan, making sure that the inside of the ring is against the capstan. Carefully slide the ring over the capstan to the groove, keeping the inside of the ring constantly in contact with the capstan.

NOTE

If the quad ring is rolled or twisted, it may fall into the groove with the inside of the ring away from the capstan. This may cause excessive wear on the quad ring.

Step 9: Reverse Steps 1 through 7.

Step 10: Adjust the capstan roller gap and brake gap as described in paragraph 4-7.

7-30. REPLACING ELAPSED TIME METER. To remove the elapsed time meter, disconnect the meter leads from TB710 on the mounting plate to which the meter is attached. Remove the four screws which fasten the meter to the plate and remove the meter.

7-31. REPLACING SERVO OSCILLATOR ASSEMBLY. In general, the only part of the servo oscillator assembly which may need replacing is the plug-in servo oscillator card. Remove the two fasteners which secure the servo oscillator cover plate to the chassis and pull out the servo oscillator card. If it should be necessary to remove the servo oscillator chassis, remove the two screws which secure the chassis to the transport and unsolder the leads to the chassis.

7-32. REPLACING HEAD CABLE AND BOX ASSEMBLY. In order to remove the head cable and box assembly, the capstan flywheel and belt idler pulley must first be removed. The following procedure should be used:

Step 1: From the front of the transport, loosen the long screws securing the read and write head connectors.

Step 2: Disconnect the read and write head connectors from the receptacles on the head cable and box assembly.

Step 3: Remove the capstan flywheel by loosening the two Allen head set screws which mount the flywheel to its shaft.

Step 4: Detach the spring on the drive belt idler arm from the eye bolt.

Step 5: Remove the nut which secures the idler arm to the stud. Remove the idler arm.

Step 6: From the front of the transport remove the two socket head cap screws which secure the head cable and box assembly to the precision plate. (One screw is directly below the head assembly. The other is below the read head connector and holds the shield.)

Step 7: Remove the head cable and box assembly.

CAUTION

When positioning the capstan flywheel be sure that the set screws do not touch the capstan housing and that the flywheel clears the belt idler pulley.

Step 8: Install the head cable and box assembly by reversing Steps 1 through 7 above. Position the capstan flywheel for proper drive belt tracking and for clearance of all surfaces.

NOTE

When replacing the drive belt idler arm, tighten the nut enough to prevent end play but be sure that the arm is free to rotate.

7-33. REPLACING TRANSDUCERS AND LOOP WARNING SWITCHES. The servo control mounting plate must be removed in order to replace either a transducer or a loop warning switch. Therefore one procedure is given for replacement of both of these assemblies. To replace the upper transducer or loop warning switch, the capstan flywheel must first be removed. Otherwise the procedure is the same for the upper and lower servo control assemblies.

Step 1: (Upper servo control) Remove the capstan flywheel by loosening the two Allen head setscrews which mount the flywheel to its shaft.

Step 2: Disconnect the transducer fanning strip from TB701 (upper servo) or TB702 (lower servo).

Step 3: Remove the transducer cable clamp.

Step 4: Disconnect the tubing from the loop warning switch.

Step 5: Remove the two screws which secure the servo control mounting plate to the transport frame.

Step 6: Pull the mounting plate away from the transport and turn it so that the side of the plate facing the transport is accessible.

Step 7: From the transport side of the mounting plate, disconnect the leads and tubing from the transducer and the loop warning switch.

Step 8: Remove the two screws which secure the transducer to the mounting plate. Remove the transducer.

Step 9: Return the mounting plate to its original position and remove the nut which secures the loop warning switch to the plate. Remove the loop warning switch.

Step 10: To install the transducer and loop warning switch, reverse Steps 1 through 9.

7-34. REPLACING VACUUM PIPING. To replace the vacuum piping, complete the following steps:

Step 1: Remove the capstan drive motor assembly, as described in paragraph 7-22.

Step 2: On each side of the transport remove the two tube clips which hold the vacuum piping.

Step 3: Disconnect the piping from the vacuum motor.

Step 4: Pull the piping from the vacuum chamber openings and remove the piping.

Step 5: To install the vacuum piping, reverse Steps 2 through 5. Be sure that all the seals are tight.

7-35. TROUBLESHOOTING CHART.

Table 7-2. Troubleshooting Chart

SYMPTOM	POSSIBLE CAUSE	REMEDY
Parity and Bit Errors	Dirty Head	Clean Head Assembly. Paragraph 7-7.
	Edge of tape damaged	Check tape for curled edge, etc. If tape damage is found, check transport guiding with fresh roll of tape.
	Buffer guides misaligned	Align buffer guides. Paragraph 4-12.
	Rotary guides misaligned	Align rotary guides. Paragraph 4-12.
Poor Tape Pack	Insufficient tape packer tension	Replace tape packer assembly. Paragraph 7-20.

Table 7-2. Troubleshooting Chart (Continued)

SYMPTOM	POSSIBLE CAUSE	REMEDY
Poor Tape Pack (Con't.)	Roughness on inside of reel flanges	Replace reel.
	Turntable out of line	Check alignment of hold-down or reel assembly.
	Reel motor worn out	Check reel motor for end play. Not more than .005" end play permissible. Replace motor if necessary. Paragraph 7-21.
	Vacuum level improperly set	Adjust vacuum level. Paragraph 4-11.
	Tape too loose on reel	Replace tape packer assembly. Paragraph 7-20.
Oxide accumulation in vacuum chambers	Foreign material in chambers	Clean chambers. Paragraph 7-7.
	Roughness or warpage in tape path	Check cleanliness and alignment of all elements in tape path.
	Buffer guides misaligned	Align buffer guides. Paragraph 4-12.
	Rotary guides misaligned	Align rotary guides. Paragraph 4-12.
	Defective tape	Replace tape.
Improper loop size in vacuum chamber	Transducer misadjusted	Adjust transducer. Paragraph 4-13.
	Sensing slot dirty	Clean sensing slot. Paragraph 7-7.
	Faulty tape	Check tape width (reels occasionally too wide or too narrow).
	Faulty transducer	Check transducer output at long and short loop and null conditions.

Table 7-2. Troubleshooting Chart (Continued)

SYMPTOM	POSSIBLE CAUSE	REMEDY
Improper loop size in vacuum chamber (Con't.)	Restriction in line between chamber and transducer	Check vacuum at transducer input--should be 12" to 14" of water at short loop, 5" of water at null, 0 at long loop.
Tape loops off center in chamber	Chamber out of adjustment	Adjust position of chamber on transport.
	Foreign material in chamber	Clean chamber. Paragraph 7-7.
	Stretched section of tape	Replace tape.
	Leaky vacuum inlet	Replace or adjust vacuum piping.
Oscillation of tape in chamber	Faulty transducer	Replace transducer Paragraph 7-33.
	Dragging reel brake	Check reel brake adjustment. Paragraph 4-20.
	Obstruction in chamber	Check for oxide buildup next to guide at chamber wall.
	Defective tape	Replace tape.
Steady oscillation of tape in chamber	Servo amplifier board loose in connector	Seat servo amplifier board firmly in connector.
	Servo gain too high	Adjust servo gain. Paragraph 4-13.
Servo inoperation	Severe misadjustment	Adjust servo. Paragraph 4-13.
	Faulty transducer	Replace transducer. Paragraph 7-33.

Table 7-2. Troubleshooting Chart (Continued)

SYMPTOM	POSSIBLE CAUSE	REMEDY
Servo inoperation (Con't.)	Oscillator failure	Check oscillator output.
	Faulty tube in servo amplifier	Check servo amplifier tubes.
	Faulty thyratrons in servo motor supply	Check thyratrons in servo motor supply, interchanging to isolate faulty unit.
Servo operation poor	Dirty sensing slot	Clean sensing slot. Paragraph 7-7.
	Faulty thyratrons in servo motor supply	Interchange thyratrons to isolate faulty unit.
	Transducer out of balance	Check transducer balance at null position.
	Faulty tape	Replace tape.
	Tape path obstructed	Check for oxide buildup in tape path.
	Faulty bias in PS200	Replace bias board.
	Dragging reel brake	Check reel brake adjustment. Paragraph 4-20.
	Defective reel motor	Replace reel motor. Paragraph 7-21.
	Faulty tubes in servo amplifier	Check servo amplifier tubes.
	Low vacuum in chambers	Check vacuum pump and check for leaks in chamber.

Table 7-2. Troubleshooting Chart (Continued)

SYMPTOM	POSSIBLE CAUSE	REMEDY
Reel motor "jitter"	Servo gain too high	Adjust servo gain. Paragraph 4-13.
	Varying thyratron bias in PS-200	Check stability of thyratron bias.
	Faulty tubes in servo amplifier	Check tubes in servo amplifier.
	Varying vacuum in chamber	Replace vacuum blower. Paragraph 7-14.
Inoperative actuator	Faulty thyratron V104 in PS-100	Replace V104.
	R110 on PS-100 open	Replace R110.
	C109 on PS-100 shorted	Replace C109.
	Insufficient actuator command signal	Check input command level.
	Faulty diode in high-voltage bridge, PS-100	Replace any faulty diodes.
	Faulty actuator	Replace actuator. Paragraph 7-15.
Actuator failure at high repetition rates (2.5 ms OFF 4.0 ON)	Faulty V104 in PS-100	Replace V104.
	Weak actuator	Replace actuator. Paragraph 7-15.

7-36. MAINTENANCE TOOLS.

7-37. The following list indicates the general nature of tools required to maintain the TM-2. Manufacturers' names and numbers are indicated only as a guide; any equivalent tool may be used.

Tool	Manufacturer and Number
Allen, wrench set, handled, .035" through 1/8"	Allen #6075
Center punch, 5/16" x 4"	Hargrove #284-5/16
Plastic hammer	Stanley #593
Ball peen hammer	Stanley #306B
Socket, 12 pt, 3/8" drive	Williams #B-1218
1/4" to 3/8" drive adaptor	Proto #5256
1/4" extension drive 14" long	Proto #4763
"T" handle, 1/4" drive	Proto #4785
Scale, 6", steel	Starrett #384
Soldering aid	Walsco #2530
Scribe	Starrett #70A
Screw starter screwdriver	Pearson #3
Scissors, 2-1/2" blade	Wiss #173E
Open end wrench set, 15° and 75°, 3/16" through 5/8"	Williams #1142PR
Spring balance, 8 oz. capacity	
Standard screwdriver set	Snap-On #SD-130-K
Stub screwdriver, small	Xcelite #R-184
Stub screwdriver, medium	Xcelite #R-3164
Stub screwdriver, large	Xcelite #R-5166
Phillips screwdriver set	Proto #9600A
Torque wrench, 0-50 in-lb.	Apco Mossberg #B50
Offset ratchet driver, Allen & Phillips	Yankee #3600-9
Pliers, extractor, external, black	Truarc #2
Pliers, extractor, internal, black	Truarc #3
Pliers, extractor, external, black, large	Truarc #4
Pliers, extractor, external, black	Truarc #015
Wrench, adjustable, 6"	Crescent #AT16
Thickness, gauge	Starrett #66
Drift punch, 1/8"	Hargrove #2868
Drift punch, 3/32"	Hargrove #2866
Drift punch, 1/16"	Hargrove #2864
Pliers, diagonal cutter	Klein #202-5
Pliers, long nose	Klein #303-6
Pliers, needle nose	Utica #777-6
Nutdriver roll	Xcelite #99SM
Nutdriver, #18	Xcelite #HS-18

File, 6" smooth cut	
File, 4" round, second cut	
Tape, steel, 8'	Lufkin #688
Inspection mirror	G.C. #5090
Wire stripper	Miller #100
Pliers, 7½"	Proto #242
Tube puller	G.C. #9130

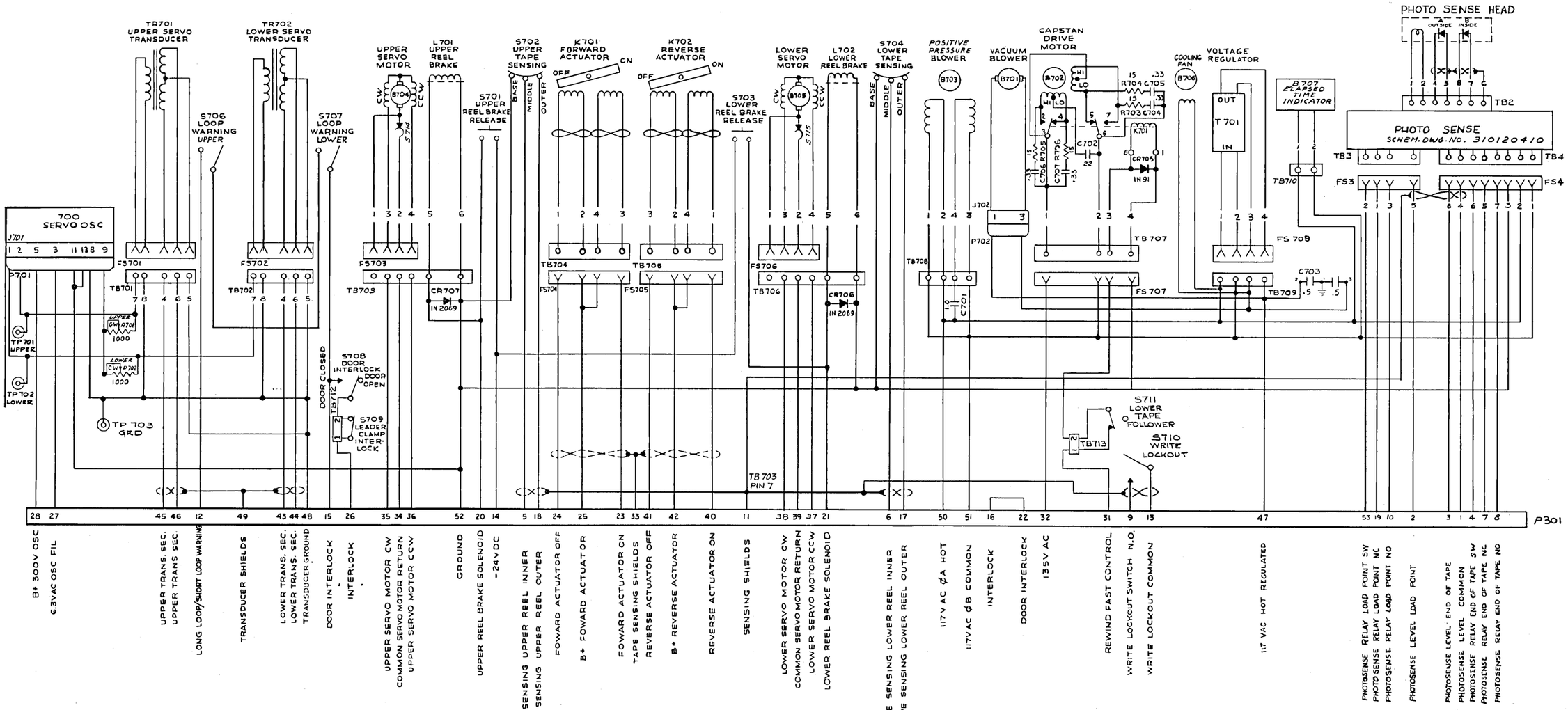


Figure 8-1
Schematic Diagram,
Tape Transport

NOTES:
1-UNLESS OTHERWISE SPECIFIED; ALL RESISTORS IN OHMS, ALL CAPACITORS IN MICROFARADS, ALL RELAYS DEENERGIZED.

Figure 8-2
Schematic Diagram,
Composite Control System

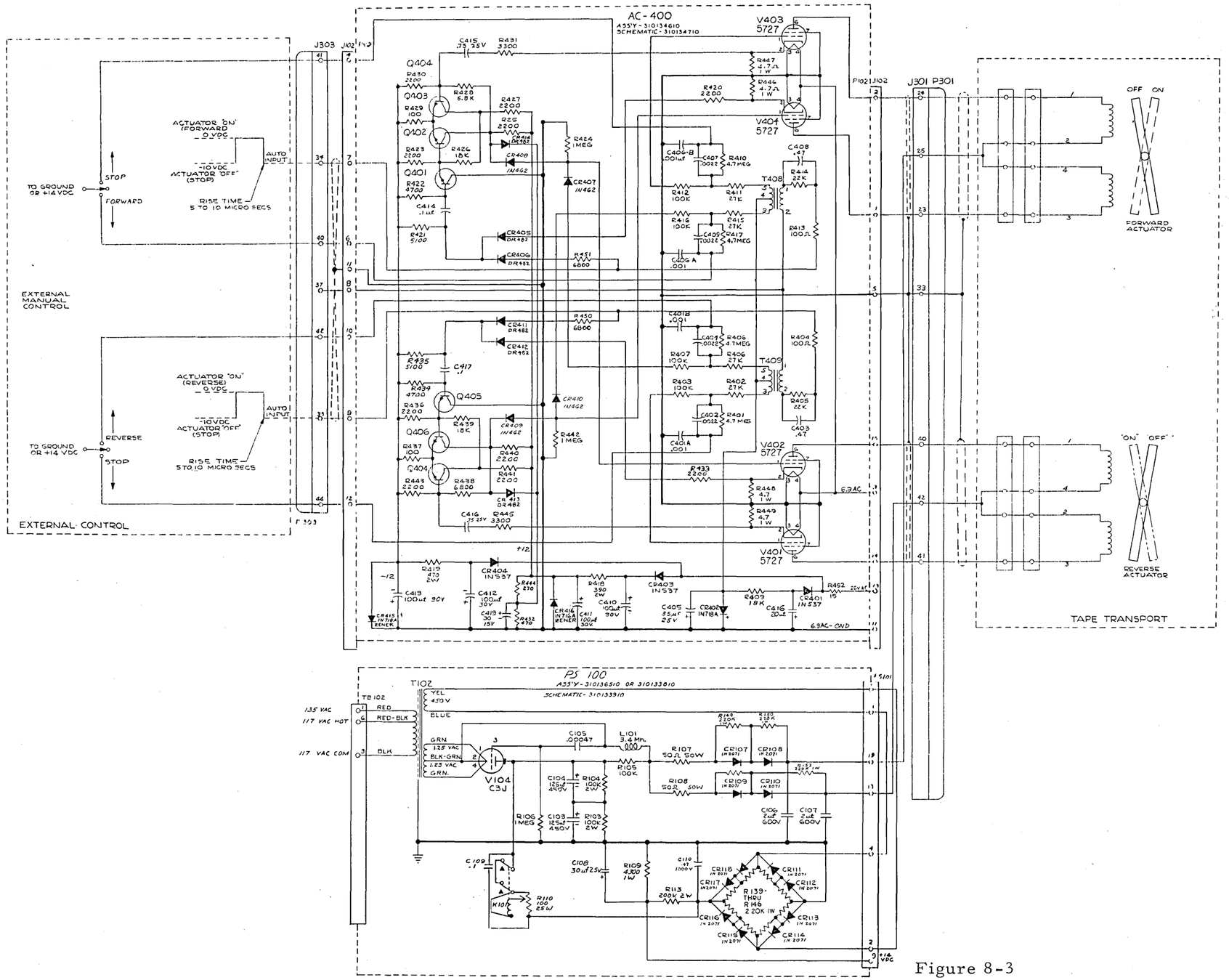


Figure 8-3
Schematic Diagram,
Composite Actuator Control

(UNLESS OTHERWISE INDICATED).

1. ALL RESISTOR VALUES IN OHMS, ½ WATT. ± 10 %.
2. CAPACITOR VALUES IN MICROFARADS.
3. ALL TRANSISTORS ARE 2N438

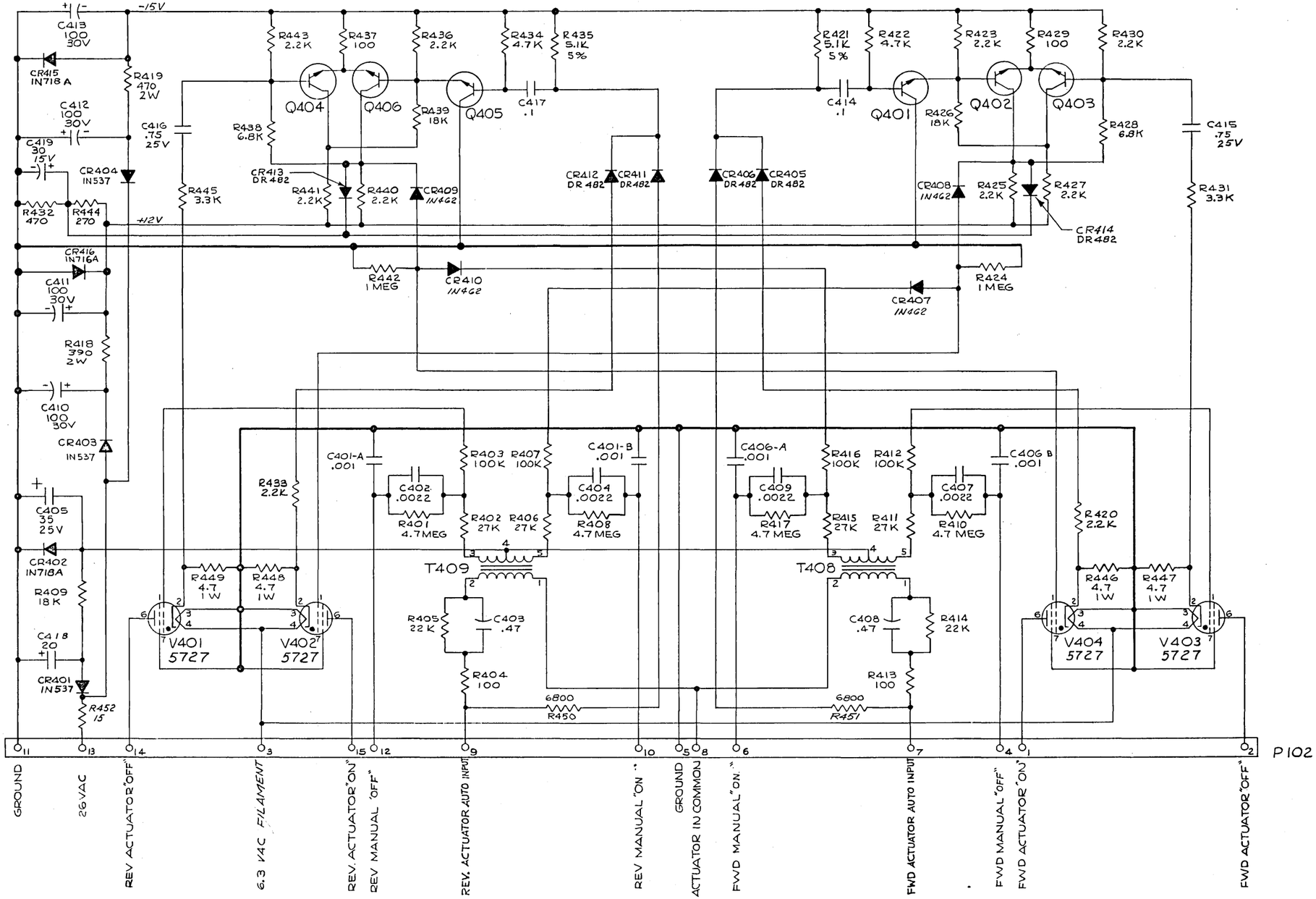


Figure 8-4
Schematic Diagram,
Actuator Control Unit AC-400

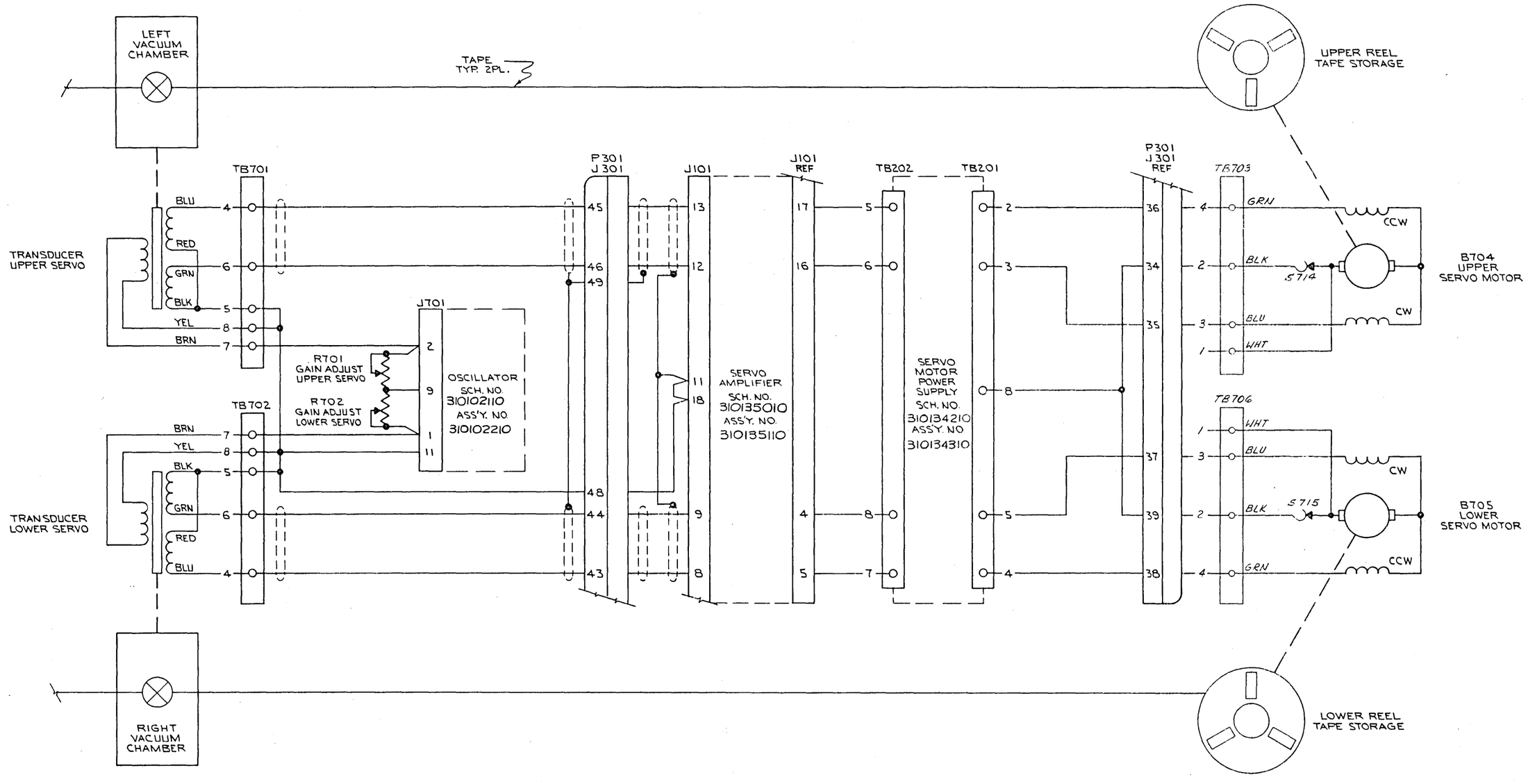
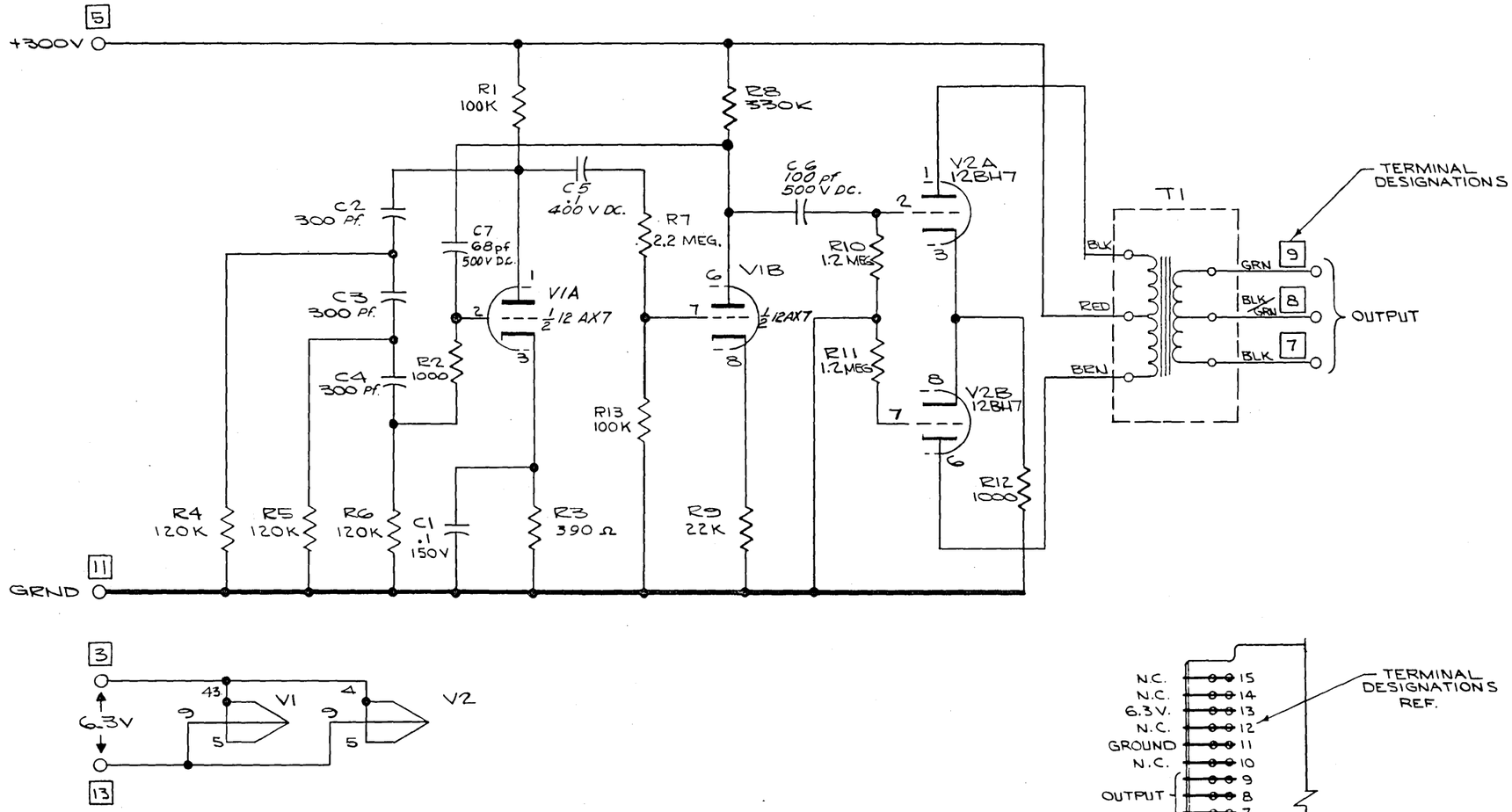


Figure 8-5
Schematic Diagram,
Composite Servo System

1. UNLESS OTHERWISE SPECIFIED;
ALL RESISTORS IN OHMS, 1/2 W., 5%.
ALL CAPACITORS IN MICROFARADS.



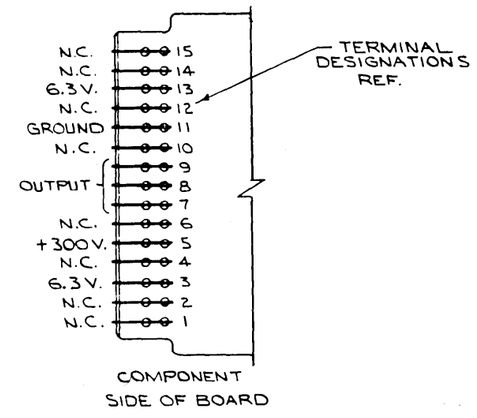
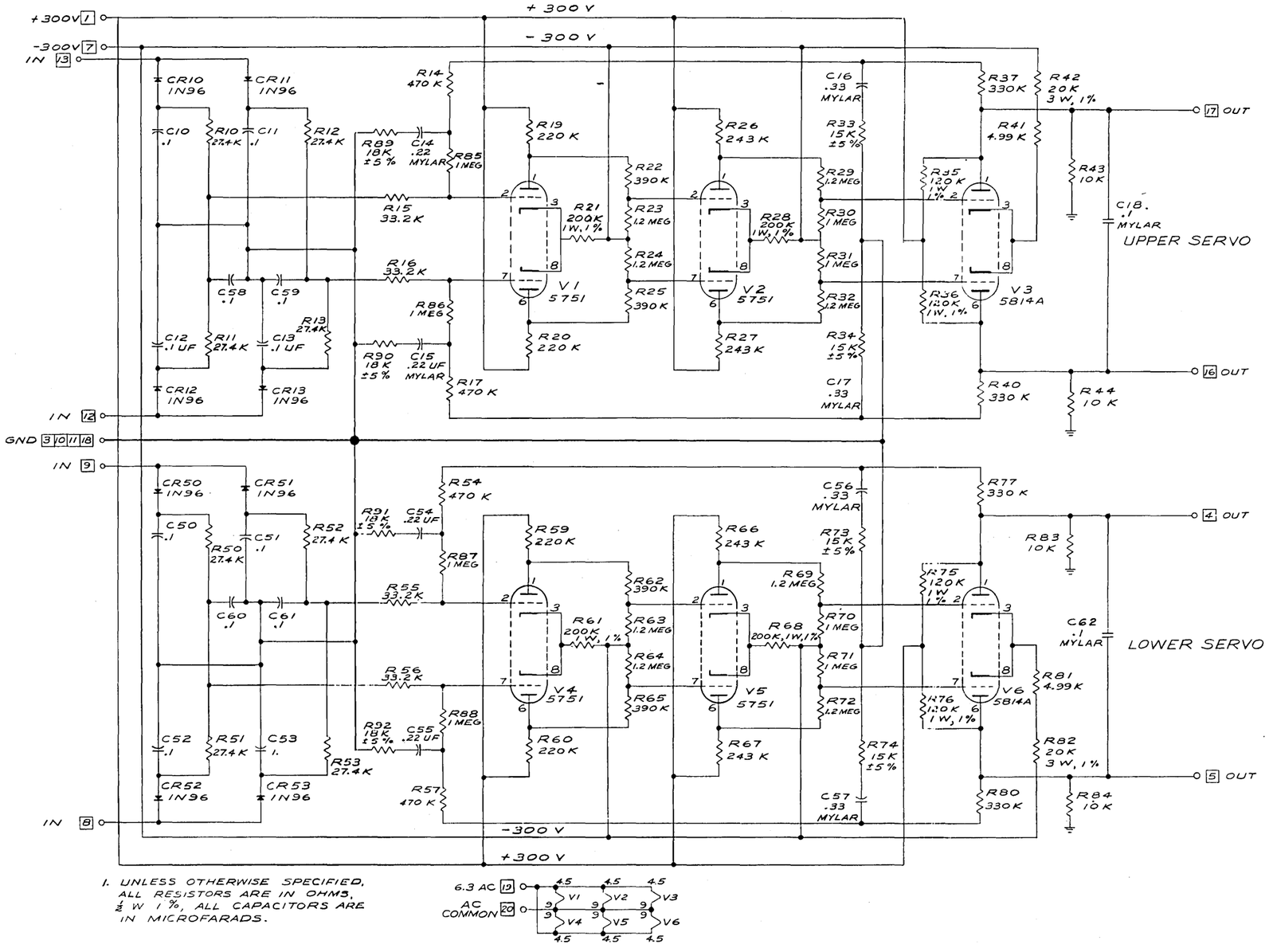


Figure 8-6
Schematic Diagram,
Servo Oscillator OSC-700



1. UNLESS OTHERWISE SPECIFIED, ALL RESISTORS ARE IN OHMS, ¼ W 1 %, ALL CAPACITORS ARE IN MICROFARADS.

Figure 8-7
Schematic Diagram,
Servo Amplifier SA-500

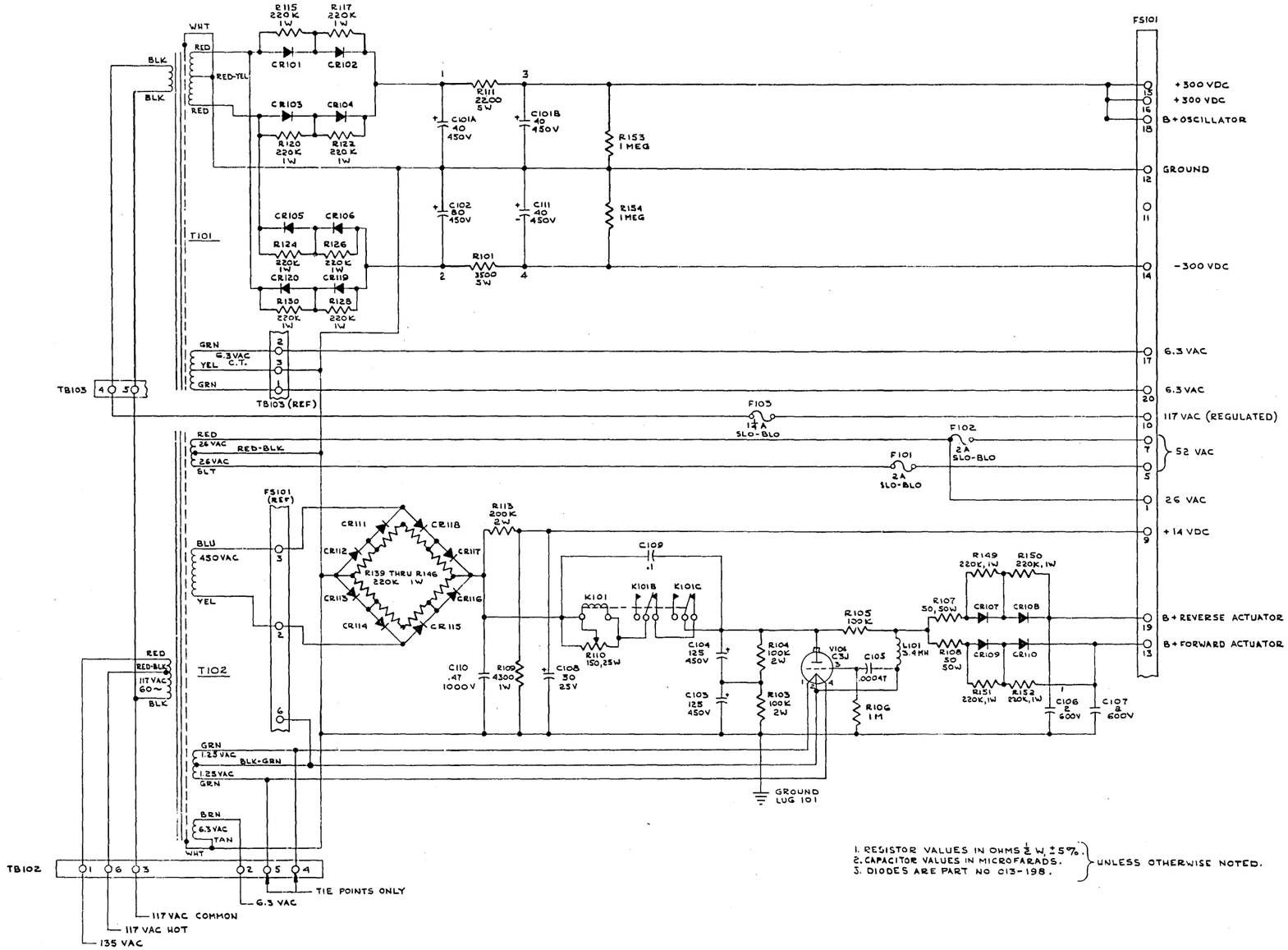


Figure 8-8
Schematic Diagram,
Electronics Power Supply PS-100

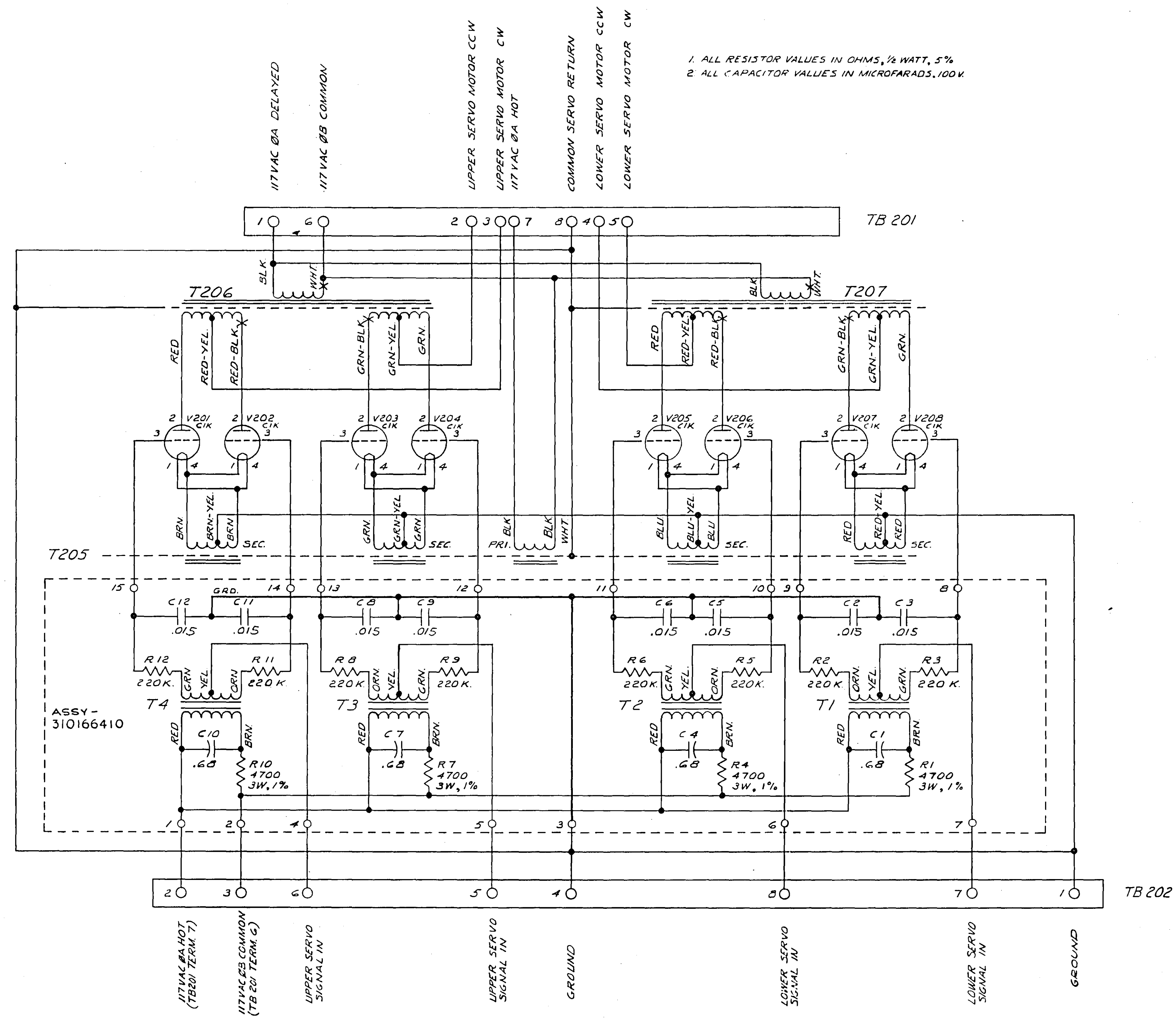


Figure 8-9
Schematic Diagram,
Servo Motor Power Supply PS-200

NOTES

1. USED WITH HARNESS ASSEMBLY 310181510

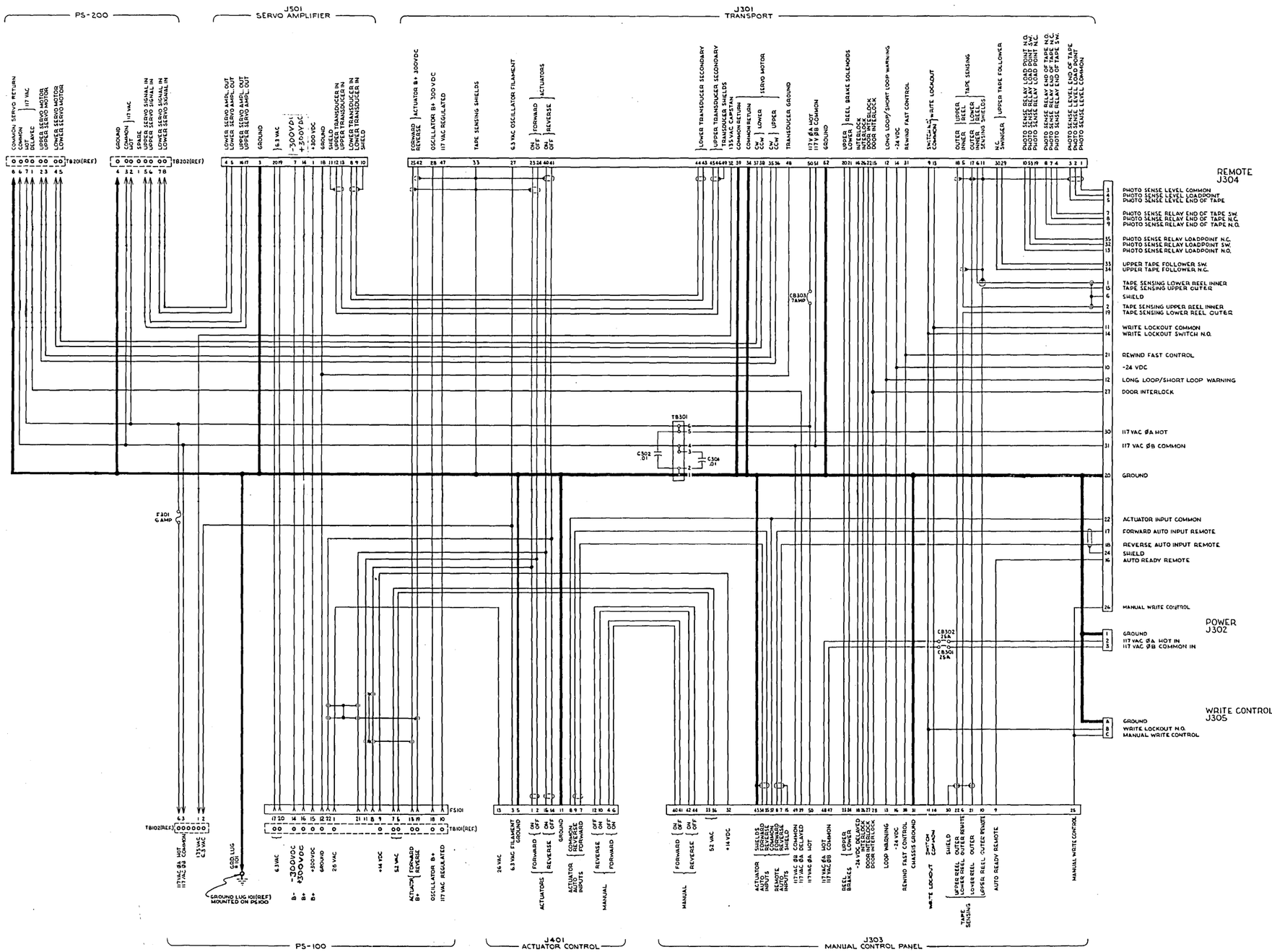


Figure 8-10
Schematic Diagram,
Connector Chassis CC-300

NOTES:

1. UNLESS OTHERWISE SPECIFIED. ALL CAPACITORS IN MICROFARADS ALL RELAYS SHOWN DE-ENERGIZED.
2. RESISTORS TO BE SOLDERED TO RELAY TERMINALS.
3. UNLESS SPECIFIED ALL RESISTORS ½ W ± 10%

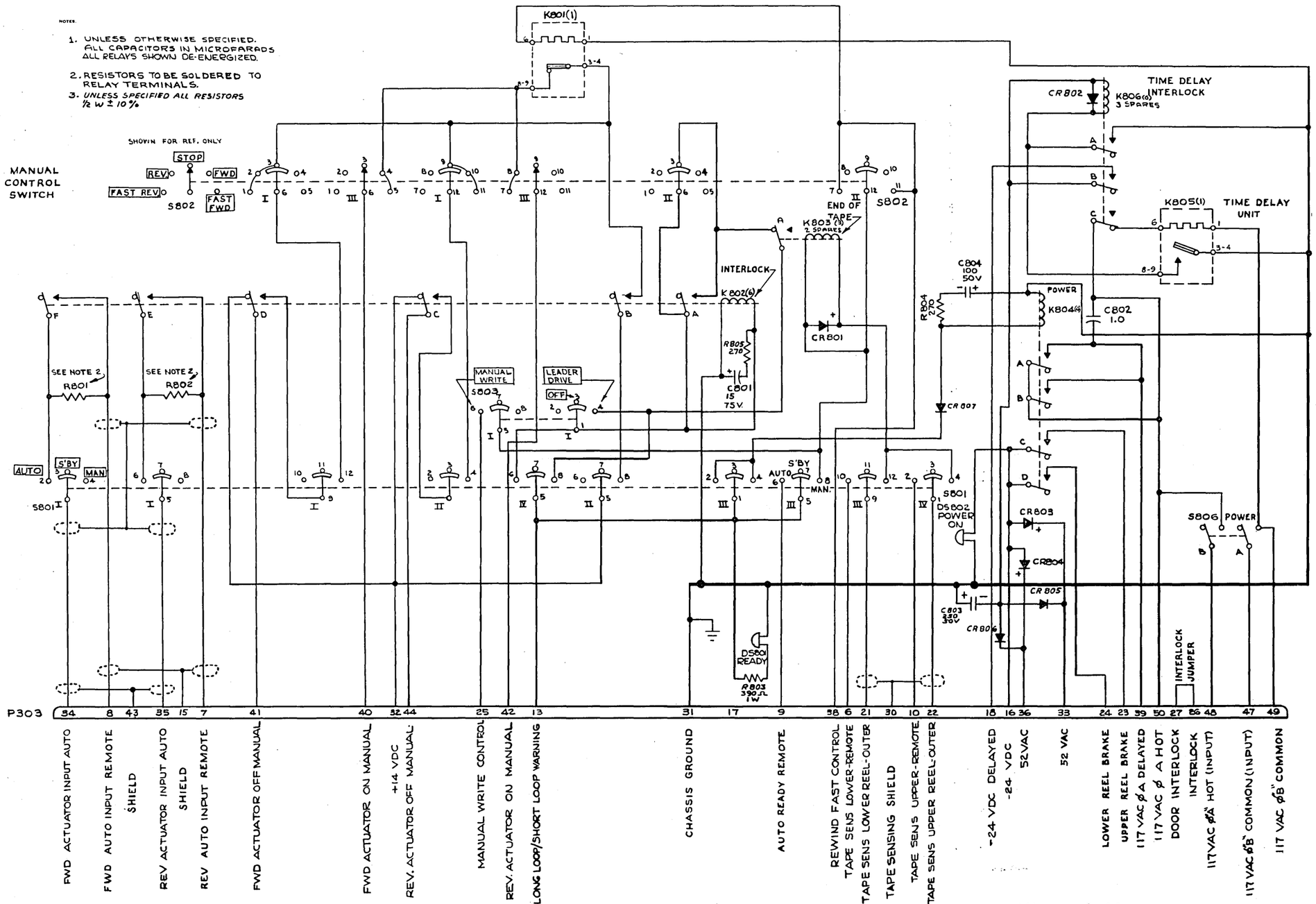


Figure 8-11
Schematic Diagram,
Manual Control Panel CU-800

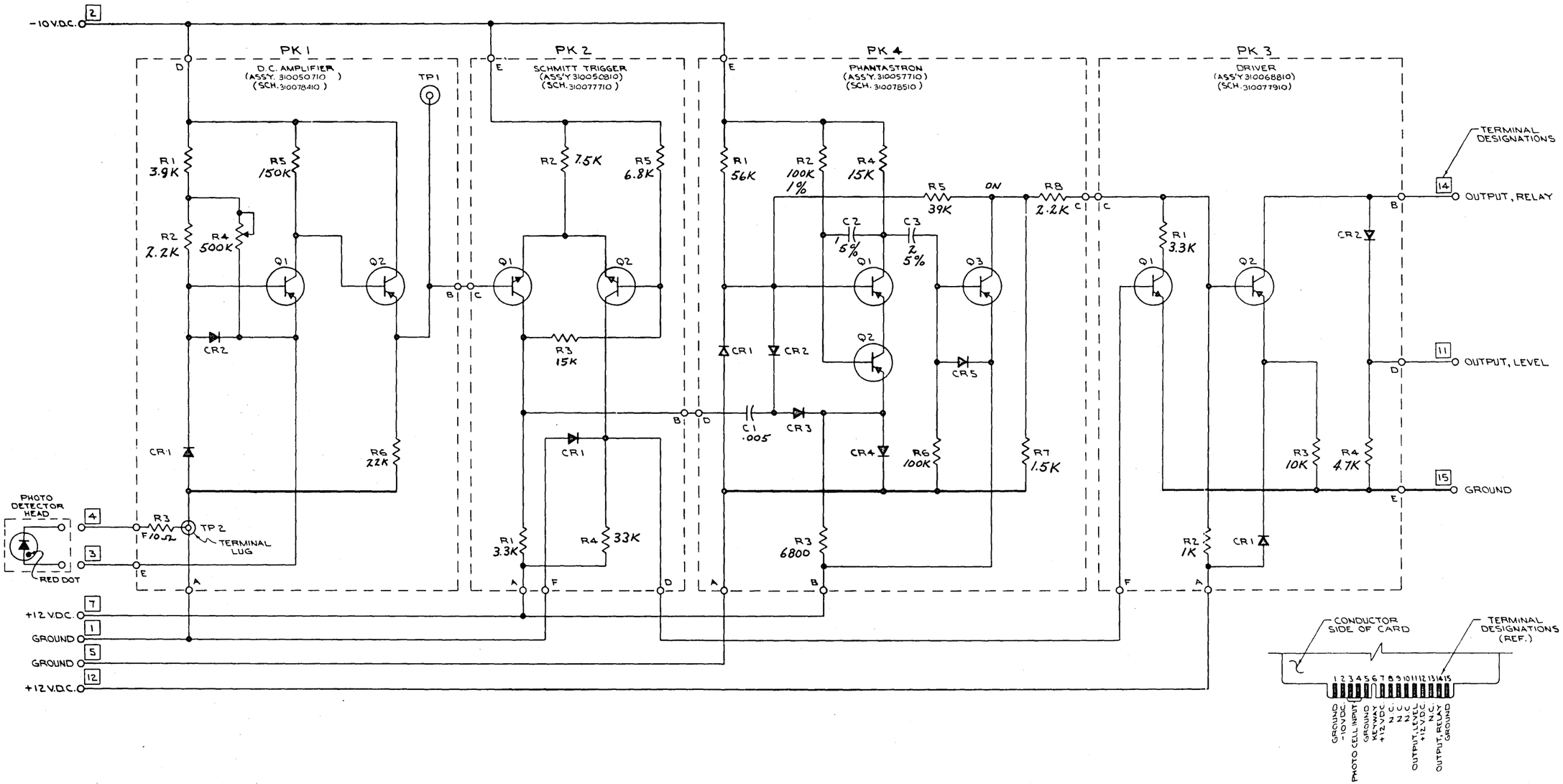


Figure 8-12
Schematic Diagram,
Photosense Base Card
(Used with Photosense Kit
31 01081 10)

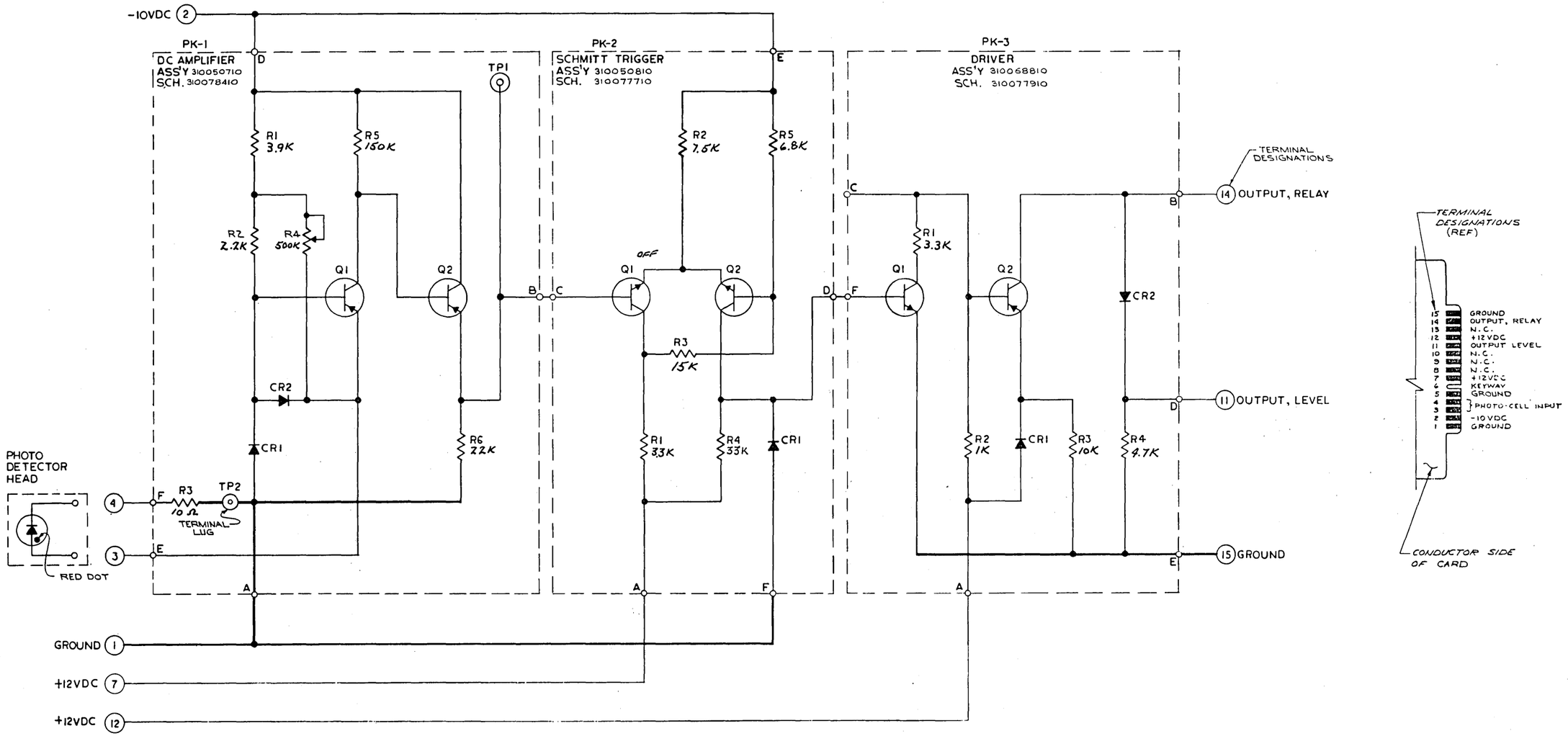


Figure 8-13
Schematic Diagram,
Photosense Base Card
(Used with Photosense Kit
31 01080 10)

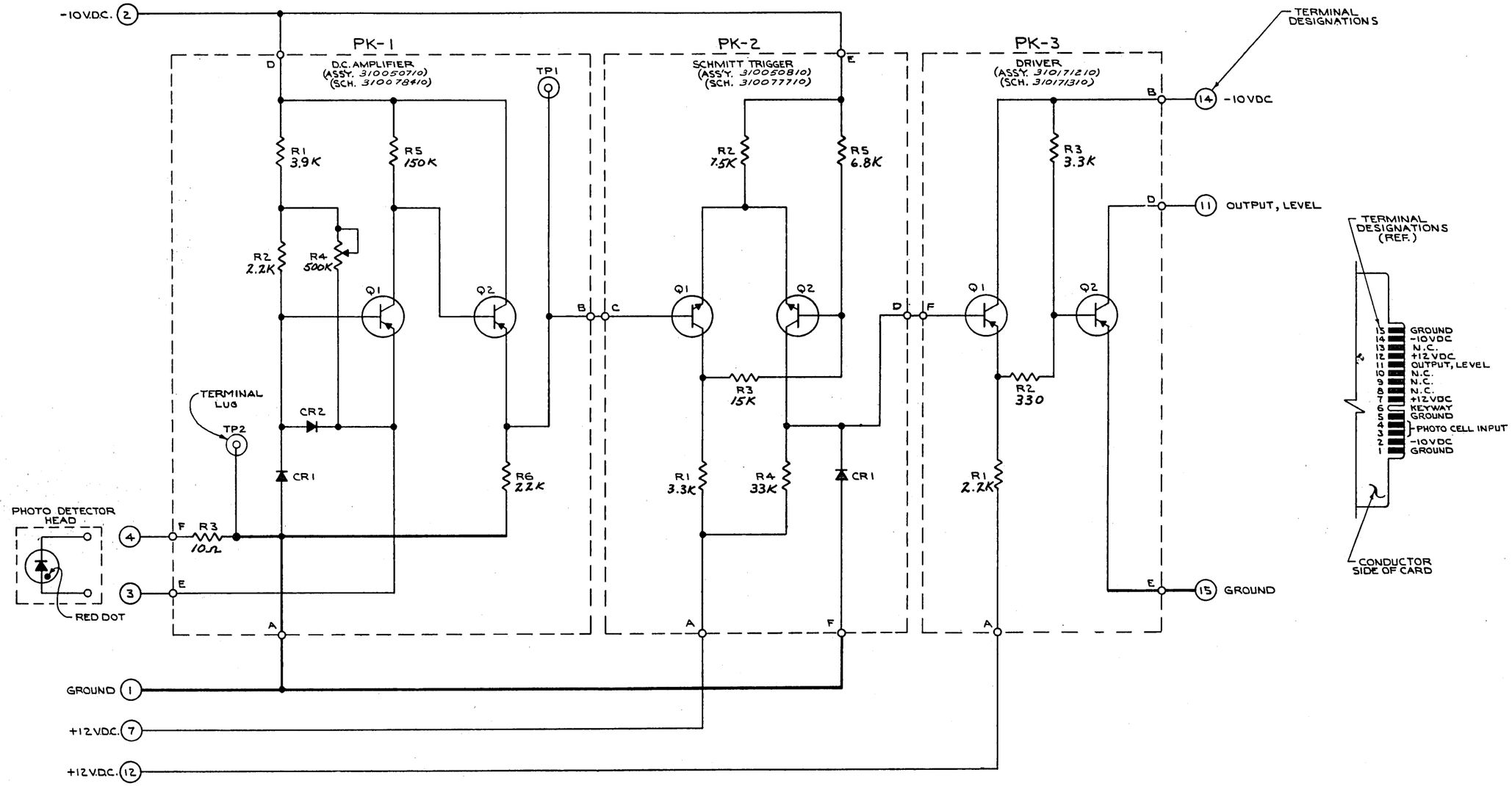


Figure 8-14
Schematic Diagram,
Photosense Base Card
(Used with Photosense Kit
31 01082 10)

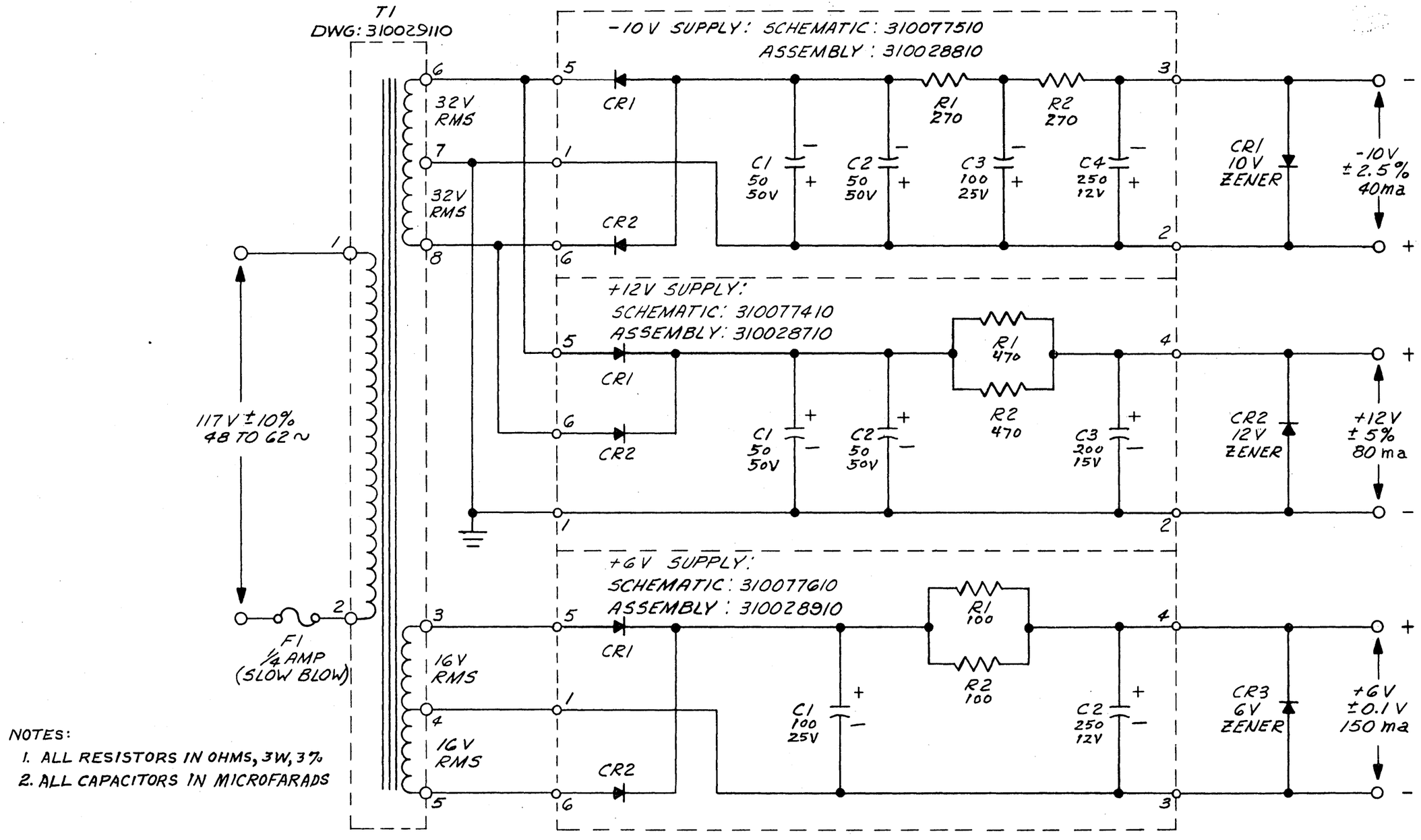


Figure 8-15
Schematic Diagram,
Photosense Power Supply

1. FOR LEVEL OUTPUT USE JUMPER.

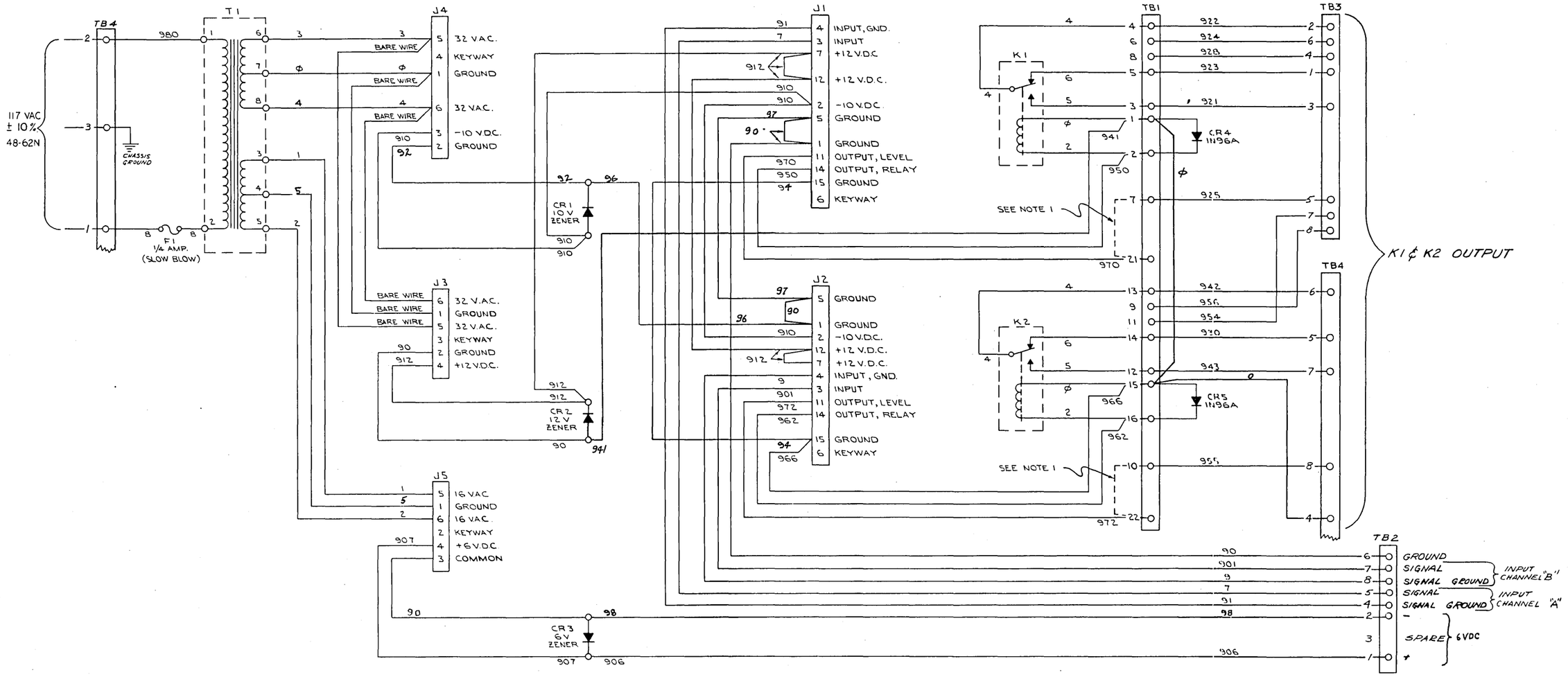


Figure 8-16
Schematic Diagram,
Photosense Chassis Wiring
(Used with Photosense Kits
31 01080 10 and 31 01081 10)

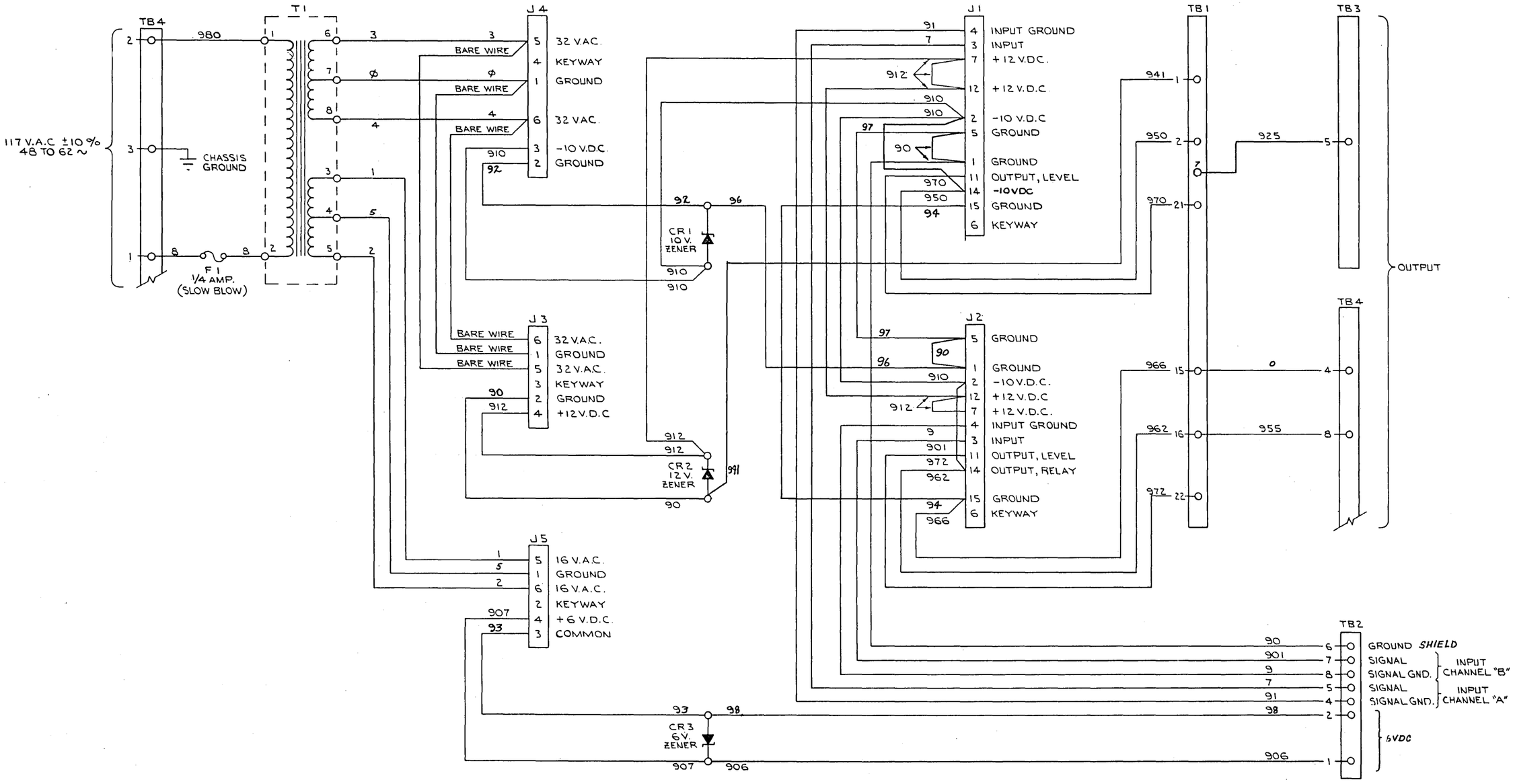


Figure 8-17
Schematic Diagram,
Photosense Chassis Wiring
(Used with Photosense Kit
31 01082 10)

SECTION IX
ILLUSTRATED PARTS BREAKDOWN

9-1. INTRODUCTION.

9-2. The following pages constitute an illustrated parts breakdown for the TM-2 Tape Transport, arranged in disassembly sequence.

9-3. In general, the illustrated parts breakdown indicates the maximum permissible disassembly of parts in the field. Further disassembly may require special tools and fixtures on reassembly, and should not be undertaken.

9-4. Where serial number effectivity is shown, reference is to the catalog numbered item (identified by name plate), not to an assembly or subassembly part number.

9-5. A Usable On code is used in the breakdown to indicate parts, subassemblies, etc., unique to optional features of the tape transport. The significance of each code letter is shown below:

A	Transport assembly, 1/2 inch, 60 cps
B	Transport assembly, 1 inch, 60 cps
C	Transport assembly, 1/2 inch, 50 cps
D	Transport assembly, 1 inch, 50 cps
E	Transport electronics assembly, horizontal mounting
F	Transport electronics assembly, vertical mounting
G	Head assembly, 1/2 inch, 8 channel asymmetrical, read/write
H	Head assembly, 1/2 inch, 8 channel symmetrical, read/write
I	Head assembly, 1/2 inch, 7 channel asymmetrical, read/write
J	Head assembly, 1/2 inch, 7 channel symmetrical, read/write
K	Head assembly, 1 inch, 16 channel asymmetrical, read/write
L	Head assembly, 1 inch, 16 channel symmetrical, read/write combination
M	Photosense installation kit, 1/2 inch, w/open circuit driver

N Photosense installation kit, 1/2 inch, w/relay

O Photosense installation kit, 1/2 inch, w/relay and hold circuit

P Photosense installation kit, 1 inch

Q Photosense installation kit, 1 inch, w/relay and hold circuit

R Transport access door, w/o trademark or model number

S Transport access door, w/o trademark, w/model number

T Transport access door, w/trademark and model number

9-6. In correspondence with Ampex or when ordering parts for the equipment, order by Ampex Part Number. Handling of the order may also be expedited by noting the catalog number and serial number of the assembly for which the part is ordered.

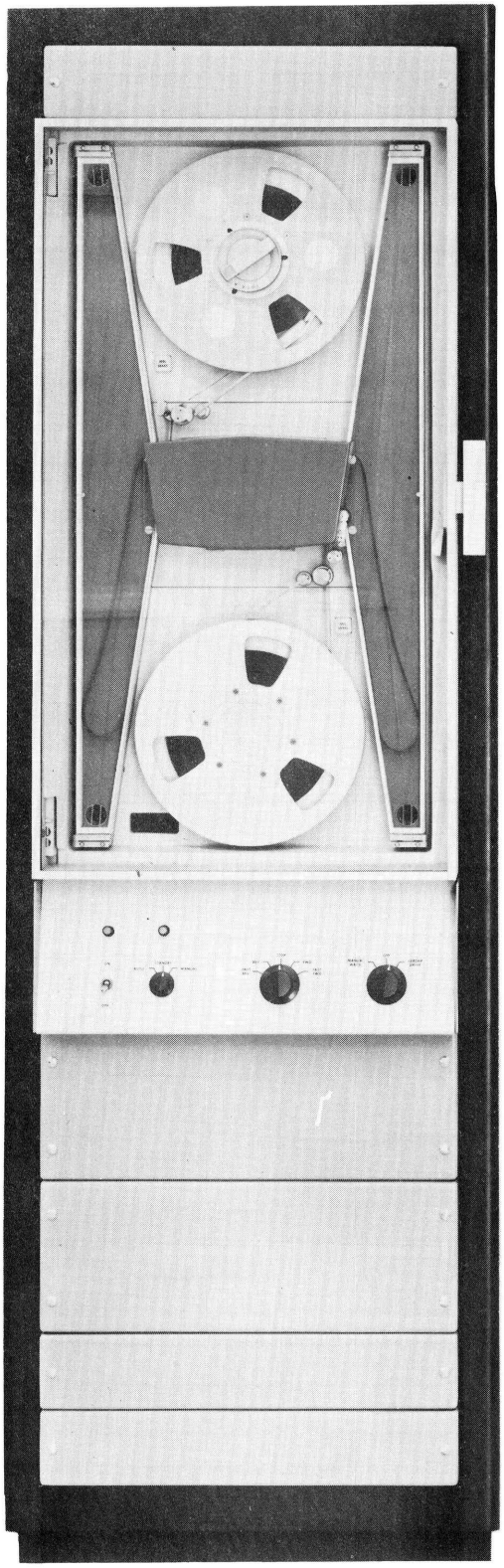


Figure 9-1
TM-2 Tape Transport

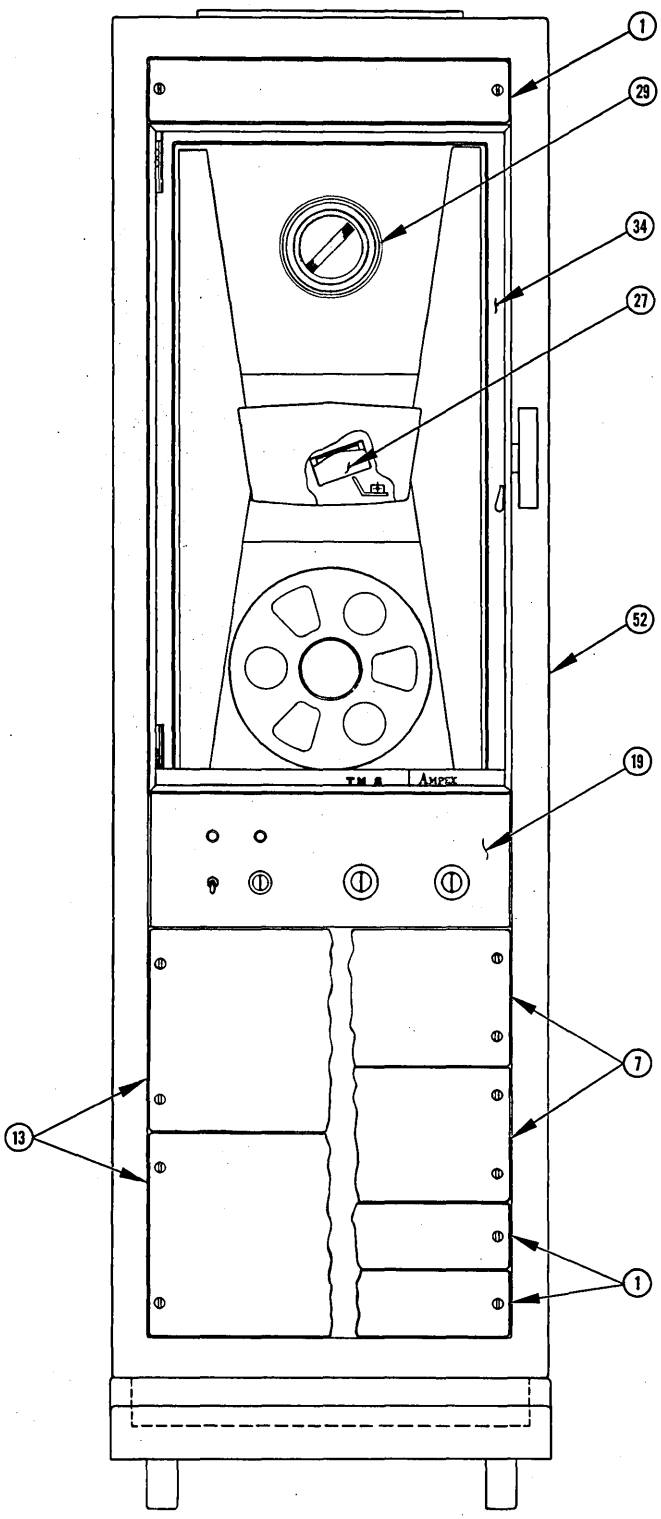


Figure 9-2
TM-2 Tape Transport Final Assembly (sheet 1 of 3)

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-2-		TM-2 TAPE TRANSPORT FINAL ASSEMBLY				
		Tape Transport Final Assembly, TM-2	Ref			
1	31 01090 10	. Cover Assembly, 3-1/2 in. blank panel	A/R			
2	310-015	. . Fastener, slotted hd, stl (Vibrex #F31N)	2			
3	471-451	. . Screw, machine, 12-24 NC-2A by 1/2 in., pan hd Phillips, stl cad plt	4			
	471-089	. . Screw, machine, 10-32 NF-3A by 1/2 in., pan hd Phillips, stl cad plt (MS35209-55) (shipped with Cover Assembly)	4			
4	31 01224 10	. . Bracket, cover mounting	2			
5	31 01223 10	. . Spacer, bracket	2			
6	31 01222 10	. . Cover	1			
7	31 01091 10	. Cover Assembly, 7 in. blank panel	A/R			
8	310-015	. . Fastener, slotted hd, stl (Vibrex #F31N)	4			
9	471-451	. . Screw, machine, 12-24 NC-2A by 1/2 in., pan hd Phillips, stl cad plt	4			
	471-089	. . Screw, machine, 10-32 NF-3A by 1/2 in., pan hd Phillips, stl cad plt (MS35209-55) (shipped with Cover Assembly)	4			
10	31 01226 10	. . Bracket, cover mounting	2			
11	31 01227 10	. . Spacer, bracket	2			
12	31 01225 10	. . Cover	1			
13	31 01092 10	. Cover Assembly, 10-1/2 in. blank panel	A/R			
14	310-015	. . Fastener, slotted hd, stl (Vibrex #F31N)	4			
15	471-451	. . Screw, machine, 12-24 NC-2A by 1/2 in., pan hd Phillips, stl cad plt	8			
	471-089	. . Screw, machine, 10-32 NF-3A by 1/2 in., pan hd Phillips, stl cad plt (MS35209-55) (shipped with Cover assembly)	8			
16	31 01224 10	. . Bracket, cover mounting	4			
17	31 01223 10	. . Spacer, bracket	4			
18	31 01228 10	. . Cover	1			
19	31 01064 10	. Panel Assembly, manual control (See Figure 9-25)	1			
20	145-128	. Connector, plug, male (manual) (Cannon #RLK-A50-22C-1)	1			

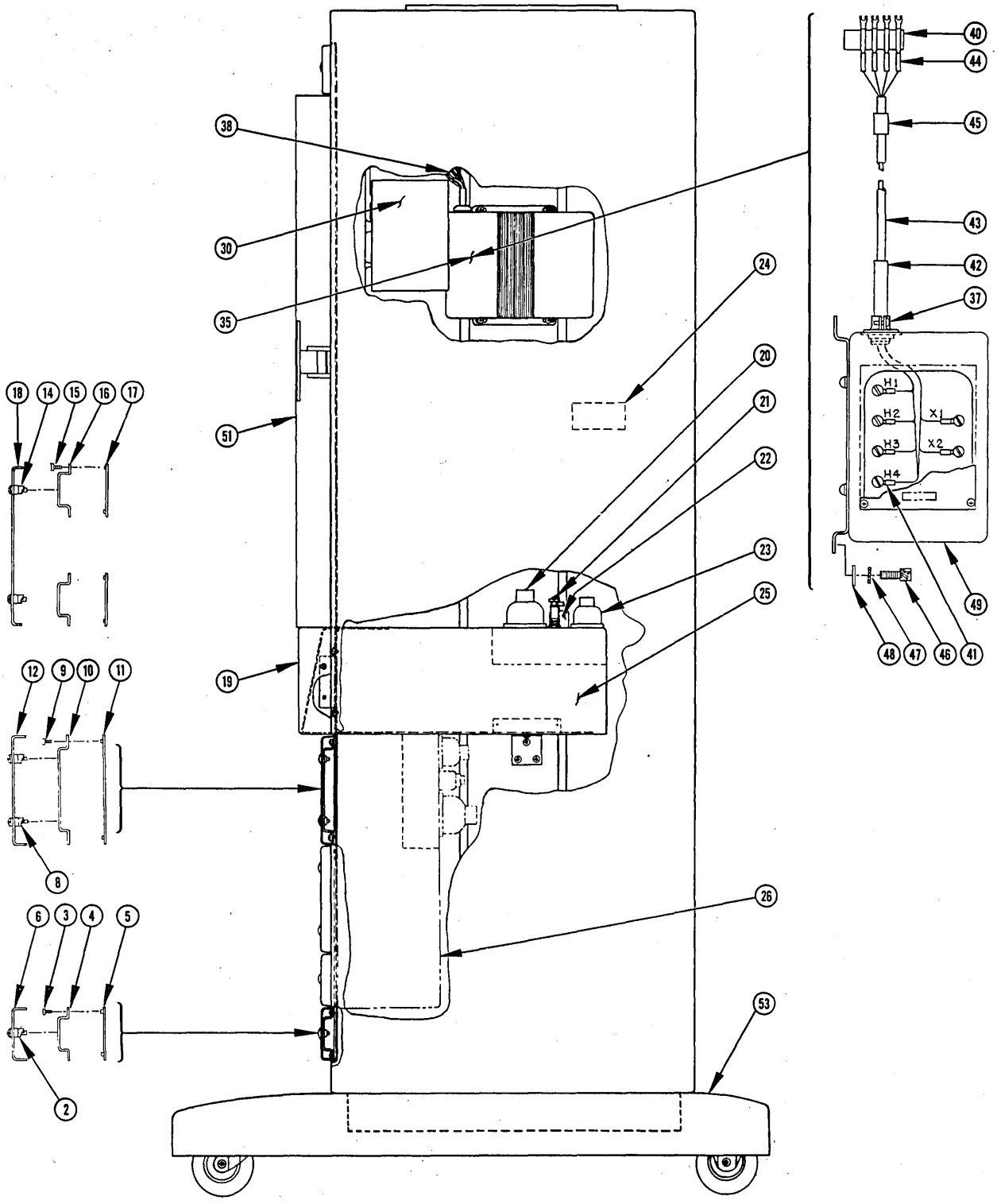


Figure 9-2
TM-2 Tape Transport Final Assembly (sheet 2 of 3)

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-2						
21	145-042	. Connector, plug, male (write) (Cannon #MC-11E-8-3PN)	1			
22	144-106	. Connector, plug, female (power) (Cannon #GK-S3-21C-1/2)	1			
23	145-127	. Connector, plug, male (remote) (Cannon #RFK-37-22C-7/8)	1			
24	650-150	. Label ("Caution High Voltage")	2			
25	31 01110 10	. Control Assembly, power supply (horizontal mounting) (See Figure 9-19)	1	E		
26	31 01112 10	. Control Assembly, power supply (vertical mounting) (See Figure 9-19)	1	F		
27	31 01045 10	. Head Assembly, 1/2 in., 8 channel asymmetrical, read/write (See Figure 9-3)	1	G		
	31 01046 10	. Head Assembly, 1/2 in., 8 channel symmetrical, read/write (See Figure 9-3)	1	H		
	31 01047 10	. Head Assembly, 1/2 in., 7 channel asymmetrical, read/write (See Figure 9-3)	1	I		
	31 01048 10	. Head Assembly, 1/2 in., 7 channel symmetrical, read/write combination (See Figure 9-3)	1	J		
	31 01049 10	. Head Assembly, 1 in., 16 channel asymmetrical, read/write (See Figure 9-3)	1	K		
	31 01050 10	. Head Assembly, 1 in., 16 channel symmetrical, read/write combination (See Figure 9-3)	1	L		
28	31 01057 10	. Head Cable and Box Assembly, 1/2 in. (See Figure 9-4)	1	A, C		
	31 01058 10	. Head Cable and Box Assembly, 1 in. (See Figure 9-4)	1	B, D		
29	31 01043 10	. Ring, writing actuator	1			
30	31 01082 10	. Photosense Installation Kit, 1/2 in., w/open circuit driver (See Figure 9-5)	1	M		
	31 01080 10	. Photosense Installation Kit, 1/2 in., w/relay (See Figure 9-5)	1	N		
	31 01079 10	. Photosense Installation Kit, 1/2 in., w/relay and hold circuit (See Figure 9-5)	1	O		
	31 01083 10	. Photosense Installation Kit, 1 in. (See Figure 9-5)	1	P		
	31 01081 10	. Photosense Installation Kit, 1 in., w/relay and hold circuit (See Figure 9-5)	1	Q		
31	471-876	. Screw, machine, 12-24 NC-2B by 5/16 in., slotted pan hd, brass cad plt (for shipping purposes)	2			
32	502-049	. Washer, #12 spring lock, stl cad plt (for shipping purposes)	2			

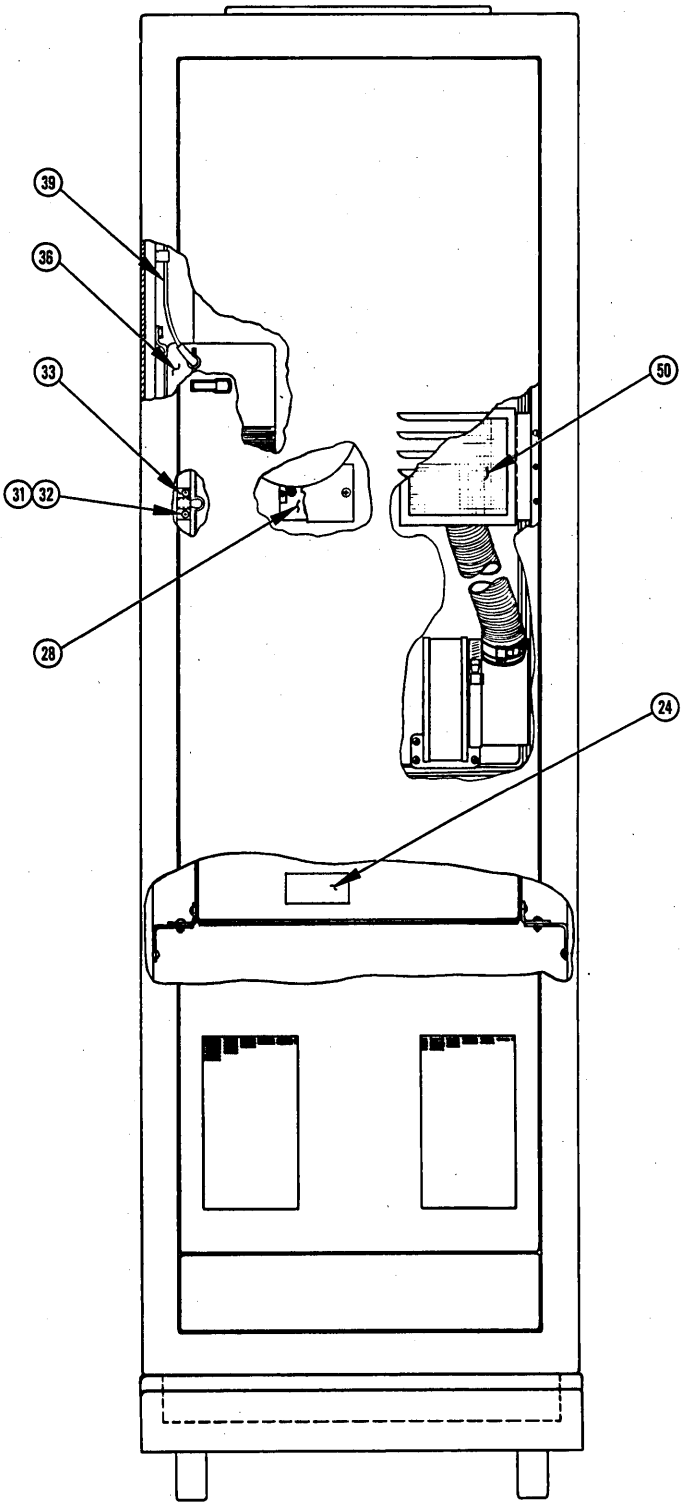


Figure 9-2
TM-2 Tape Transport Final Assembly (sheet 3 of 3)

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-2-						
33	31 01093 10	. Bracket, transport lock (for shipping purposes)	1			
34	31 01105 10	. Transport Assembly, 1/2 in., 60 cycle (See Figures 9-7 thru 9-17)	1	A		
	31 01097 10	. Transport Assembly, 1 in., 60 cycle (See Figures 9-7 thru 9-17)	1	B		
	31 01107 10	. Transport Assembly, 1/2 in., 50 cycle (See Figures 9-7 thru 9-17)	1	C		
	31 01106 10	. Transport Assembly, 1 in., 50 cycle (See Figures 9-7 thru 9-17)	1	D		
35	31 01087 10	. Transformer and Cable Assembly, 60 cycle	1	A,B		
36	31 01089 10	. Transformer and Cable Assembly, 50 cycle	1	C,D		
37	302-103	. . Clamp, cable, 5/8 in. ID adjustable (Appleton #BC7286)	1			
38	31 01218 10	. . Cable Assembly, voltage regulator, 60 cycle	1	A,B		
39	31 01221 10	. . Cable Assembly, voltage regulator, 50 cycle	1	C,D		
40	180-115	. . . Terminal Strip, 4 terminals w/barrier strip (FS709) (Jones #4-160-L)	1			
41	171-001	. . . Connector, solderless, slotted tongue (AMP #34541)	6	A,B		
42	262-003	. . . Bushing, telescoping (AN3420-6)	1			
43	600-028	. . . Tubing, nonmetallic, #3, black (MIL-I-631)	A/R			
44	600-038	. . . Tubing, nonmetallic, #5, black (MIL-I-631)	A/R			
45	600-094	. . . Tubing, nonmetallic, #4, black (Rayclad Tube Inc. #4)	A/R			
46	470-165	. . Screw, cap, 1/4-28 by 1/2 in., hex sch, stl cad plt	4			
47	502-017	. . Washer, 1/4 ext tooth, stl cad plt (MS35335-33)	4			
48	501-106	. . Washer, 1/4 flat, stl cad plt (MS15795-210)	4			
49	31 01217 10	. . Transformer Assembly, 60 cycle	1	A,B		
	31 01220 10	. . Transformer Assembly, 50 cycle	1	C,D		
	471-069	. . Screw, machine, 6-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-25)	8	C,D		
	476-063	. . Screw, self-tapping, #6 by 5/16 in., flat hd Phillips, stl cad plt (Parker-Kalon)	2	C,D		
	501-009	. . Washer, #6 flat, stl cad plt (MS15795-206)	10	C,D		

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-2-						
	492-009	. . Nut, plain hex, 6-32 NC-2B, stl cad plt (MS35649-62)	6	C,D		
	302-031	. . Clamp, cable, plastic (Commercial Plastic #742-3)	10	C,D		
50	31 01085 10	. Filter Assembly (See Figure 9-6)	1			
51	31 01076 10	. Door Assembly, transport cover (See Figure 9-18)	1	R		
	31 01077 10	. Door Assembly, transport cover, w/Model No. (See Figure 9-18)	1	S		
	31 01075 10	. Door Assembly, transport cover, w/Model No. and Ampex identification (See Figure 9-18)	1	T		
52	31 01073 10	. Cabinet Assembly (See Figure 9-26)	1			
53	31 01084 10	. Dolly Assembly (See Figure 9-26)	1			

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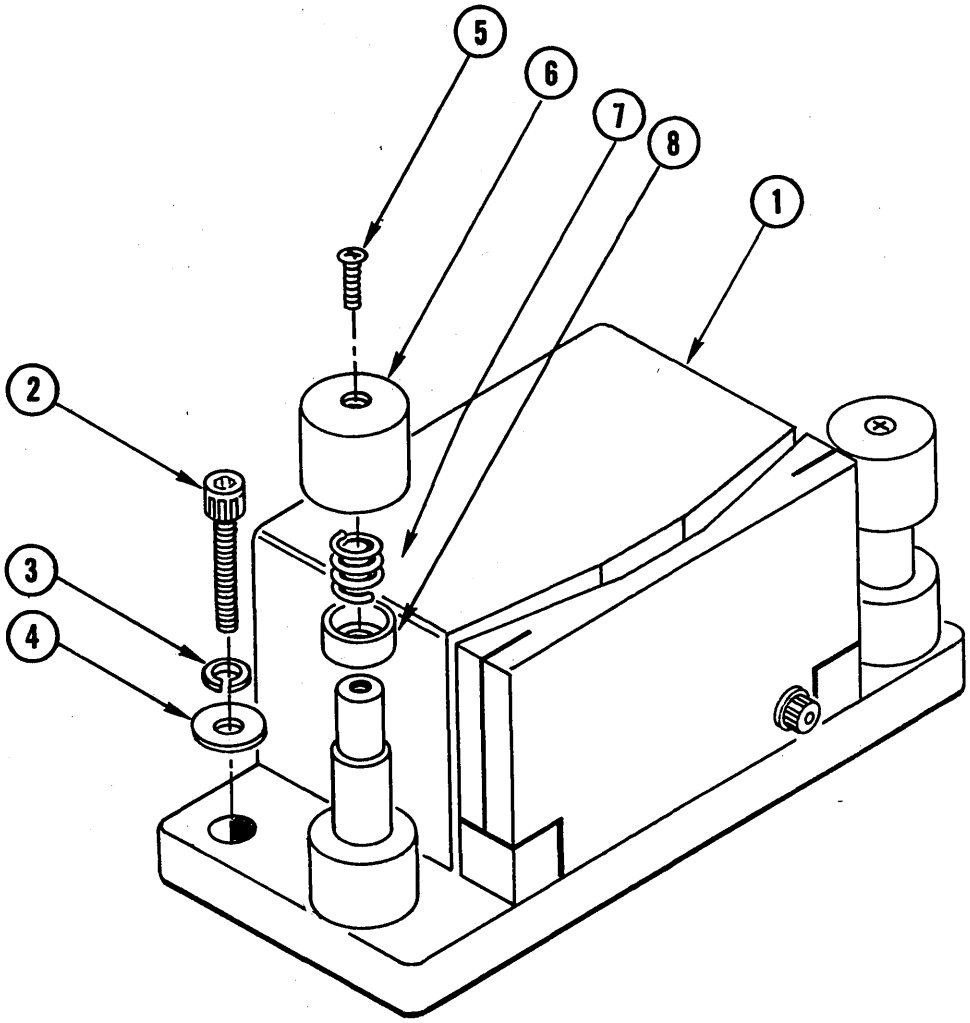

Figure 9-3
Read/Write Head Assemblies

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-3-		READ/WRITE HEAD ASSEMBLIES				
1	31 01045 10	Head Assembly, 1/2 in., 8 channel asymmetrical, read/write (See Figure 9-2)	Ref	G		
	31 01046 10	Head Assembly, 1/2 in., 8 channel symmetrical, read/write (See Figure 9-2)	Ref	H		
	31 01047 10	Head Assembly, 1/2 in., 7 channel asymmetrical, read/write (See Figure 9-2)	Ref	I		
	31 01048 10	Head Assembly, 1/2 in., 7 channel symmetrical, read/write combination (See Figure 9-2)	Ref	J		
	31 01049 10	Head Assembly, 1 in., 16 channel asymmetrical, read/write (See Figure 9-2)	Ref	K		
	31 01050 10	Head Assembly, 1 in., 16 channel symmetrical, read/write combination (See Figure 9-2)	Ref	L		
2	470-021	. Screw, cap, 6-32 NC-3A by 5/8 in., hex sch, stl cad plt (MS35457-9)	2			
3	502-009	. Washer, #6 spring lock, sst (MS35338-79)	2			
4	501-015	. Washer, #6 flat, sst (MS15795-306)	2			
5	471-379	. Screw, machine, 4-40 NC-2A by 1/4 in., 82° flat hd Phillips, sst (MS35200-12)	2			
6	60975	. Guide, cap	2			
7	60701	. Spring	2			
8	69976	. Guide, ring	2			

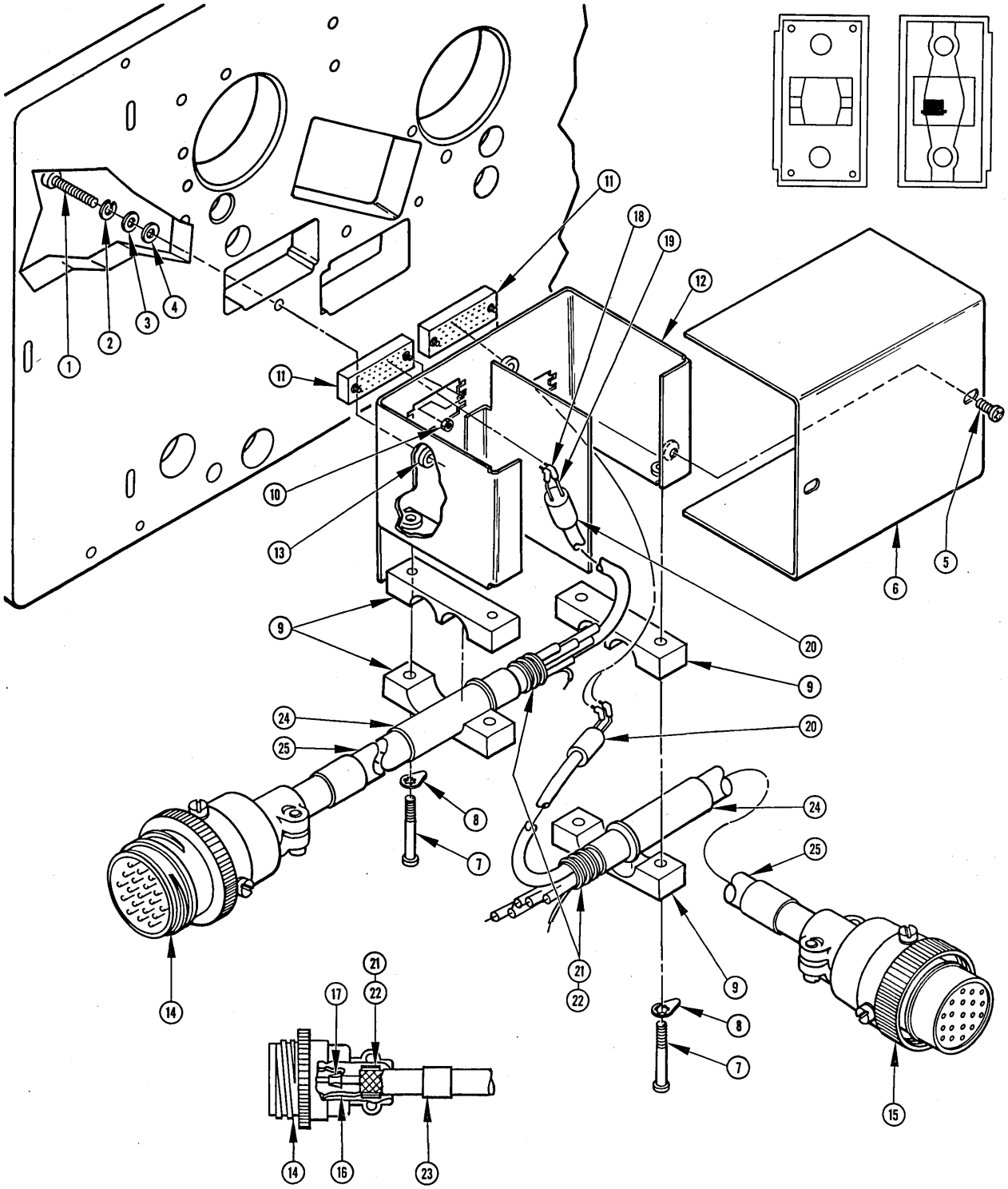

Figure 9-4
Head Cable and Box

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-4-		HEAD CABLE AND BOX				
	31 01057 10	Head Cable and Box Assembly, 1/2 in. (See Figure 9-2)	Ref	A,C		
	31 01058 10	Head Cable and Box Assembly, 1 in. (See Figure 9-2)	Ref	B,D		
1	470-023	. Screw, cap, 6-32 NC-3A by 7/8 in., hex sch, stl cad plt (MS35457-11)	2			
2	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	2			
3	501-009	. Washer, #6 flat, stl cad plt (MS15795-206)	2			
4	503-012	. Washer, #6 shoulder, nonmetallic (Walsco #7856)	2			
	31 01135 10	. Box Assembly, head cable	1	A,C		
	31 01136 10	. Box Assembly, head cable	1	B,D		
5	471-017	. . Screw, machine, 6-32 NC-2A by 1/4 in., pan hd Phillips, brass cad plt (Type MS35212)	2			
6	31 01142 10	. . Cover, chassis	1			
7	471-074	. . Screw, machine, 6-32 NC-2A by 7/8 in., pan hd Phillips, stl cad plt (MS35208-30)	4			
8	172-003	. . Lug, soldering, #6 internal tooth (Shakeproof #2104-6)	4			
9	31 01144 10	. . Retainer, electrical cable	4			
10	493-013	. . Nut, self-locking, hex, 2-56 NC-3B, stl cad plt w/nylon insert (Esna Type NM)	4			
11	146-173	. . Connector, receptacle, female, 26 contacts, supplied w/mounting washer (Winchester #MRE26S-J-30)	2	A,C		
	146-172	. . Connector, receptacle, female, 34 contacts, supplied w/mounting washer (Winchester #SRE34S-J-30)	2	B,D		
12	31 01141 10	. . Chassis Assembly, welded	1	A,C		
	31 01140 10	. . Chassis Assembly, welded	1	B,D		
13	490-011	. . . Nut, anchor, 6-32 NC-2B, stl (Penn Engg. #WN-632)	8			
14	145-082	. Connector, plug, male, 19 contacts (Cannon #RSK-19-22C-1/2)	1	A,C		
	145-082	. Connector, plug, male, 19 contacts (Cannon #RSK-19-22C-1/2)	2	B,D		
15	144-061	. Connector, plug, female, 19 contacts (Cannon #SK-19-21C-1/2)	1	A,C		
	144-061	. Connector, plug, female, 19 contacts (Cannon #SK-19-21C-1/2)	2	B,D		

ILLUSTRATED PARTS BREAKDOWN

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-4-						
16	611-001	. Wire, stranded, insulated #20GA (MIL-W-16878)	A/R			
17	600-017	. Tubing, nonmetallic, insulation, #10 clear (MIL-I-631)	A/R			
18	600-023	. Tubing, nonmetallic, insulation, #17 black (MIL-I-631)	A/R			
19	611-189	. Wire, stranded, insulated, #26GA (MIL-W-16878)	A/R			
20	171-031	. Connector, solderless, cable termination (Burndy #YEC90)	16	A, C		
	171-031	. Connector, solderless, cable termination (Burndy #YEC90)	32	B, D		
21	171-029	. Connector, solderless, cable termination (Burndy #YIC-297)	4	A, C		
	171-029	. Connector, solderless, cable termination (Burndy #YIC-297)	8	B, D		
22	171-030	. Connector, solderless, cable termination (Burndy #YOC-250)	4	A, C		
	171-030	. Connector, solderless cable termination (Burndy #YOC-250)	8	B, D		
23	600-096	. Tubing, nonmetallic, 5/16, insulation sleeving, (Rayclad Tube Inc.)	A/R			
24	262-004	. Bushing, telescoping (AN3420-8)	2	A, C		
	262-004	. Bushing, telescoping (AN3420-8)	4	B, D		
25	31 00238 10	. Cable Assembly, electrical, special purpose, 8 conductor	A/R			

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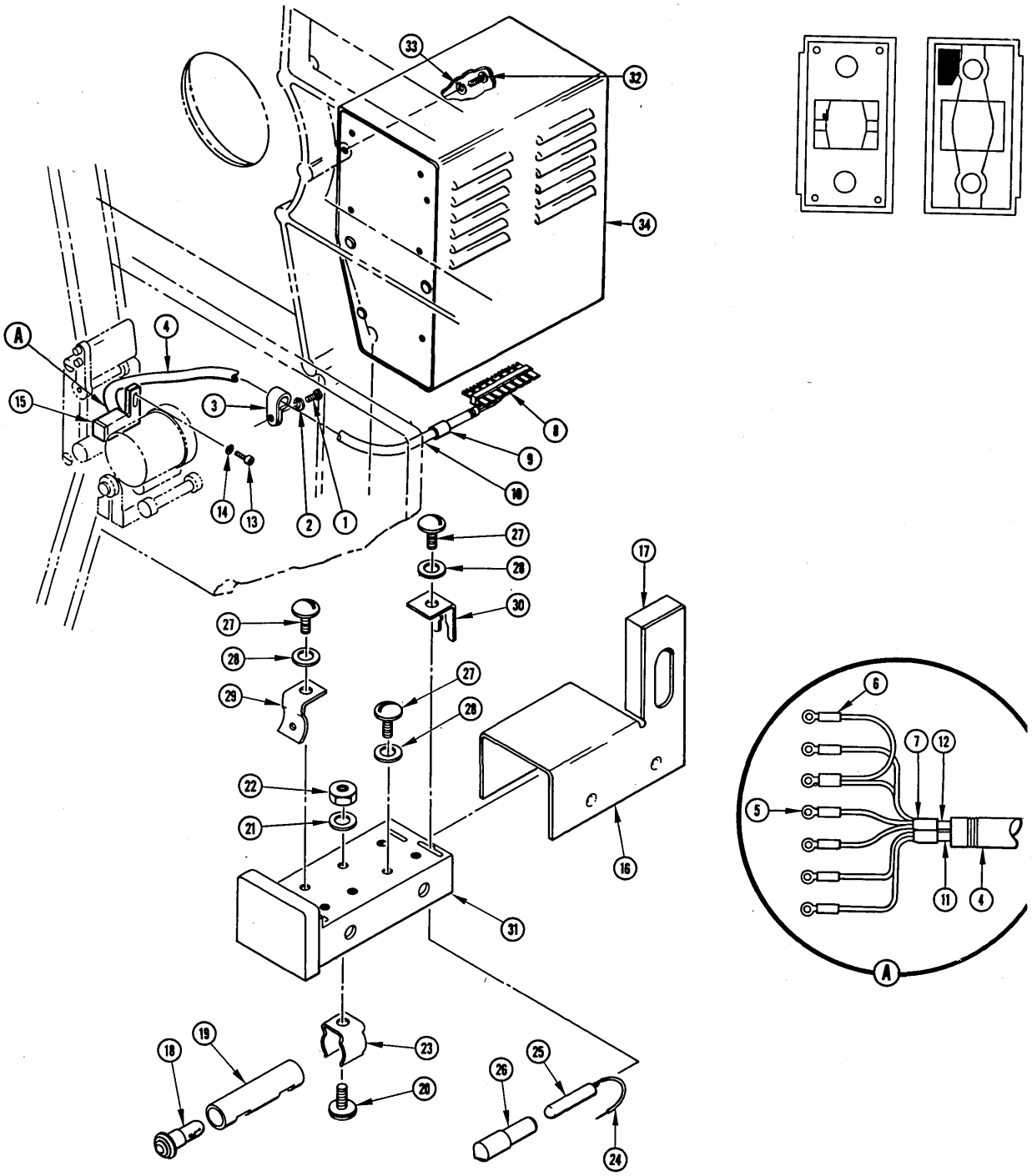

Figure 9-5
Photosense System (sheet 1 of 3)

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-5-		PHOTOSENSE SYSTEM				
	31 01082 10	Photosense Installation Kit, 1/2 in., w/open circuit driver (See Figure 9-2)	Ref	M		
	31 01080 10	Photosense Installation Kit, 1/2 in., w/relay (See Figure 9-2)	Ref	N		
	31 01079 10	Photosense Installation Kit, 1/2 in., w/relay and hold circuit (See Figure 9-2)	Ref	O		
	31 01083 10	Photosense Installation Kit, 1 in. (See Figure 9-2)	Ref	P		
	31 01081 10	Photosense Installation Kit, 1 in., w/relay and hold circuit (See Figure 9-2)	Ref	Q		
1	471-074	. Screw, machine, 6-32 NC-2A by 7/8 in., pan hd Phillips, stl cad plt (MS 35208-30)	1			
2	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	1			
3	302-037	. Clamp, cable, plastic (Commercial Plastic #742-5)	1			
4	31 01209 10	. Cable Assembly, photosense	1			
5	172-027	. . Lug, soldering, copper (Zierick #341)	7			
6	600-132	. . Tubing, nonmetallic, insulation (Rayclad Tubes #12)	A/R			
7	600-093	. . Tubing, nonmetallic, insulation (Rayclad Tubes #6)	A/R			
8	31 01443 10	. . Fanning Strip	1			
9	600-095	. . Tubing, nonmetallic, insulation (Rayclad #2)	A/R			
10	600-007	. . Tubing, nonmetallic, #2 black (MIL-I-631)	A/R			
11	31 00686 10	. . Cable, electrical, special purpose	1			
12	31 00687 10	. . Cable, electrical, special purpose	1			
13	470-061	. Screw, cap, 4-40 NC-3A by 3/8 in., hex sch, sst, passivated	2			
14	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	2			
15	31 01208 10	. Photosense Assembly, 1/2 in.	1	M,N,O		
	31 01207 10	. Photosense Assembly, 1 in.	1	P,Q		
16	31 01434 10	. . Cover, photosense	1	M,N,O		
	31 01433 10	. . Cover, photosense	1	P,Q		
17	31 01442 10	. . Spacer, photosense	1			
18	060-051	. . Lamp, 5 volt, .06 amp (Chicago Miniature #CM8-685)	2			

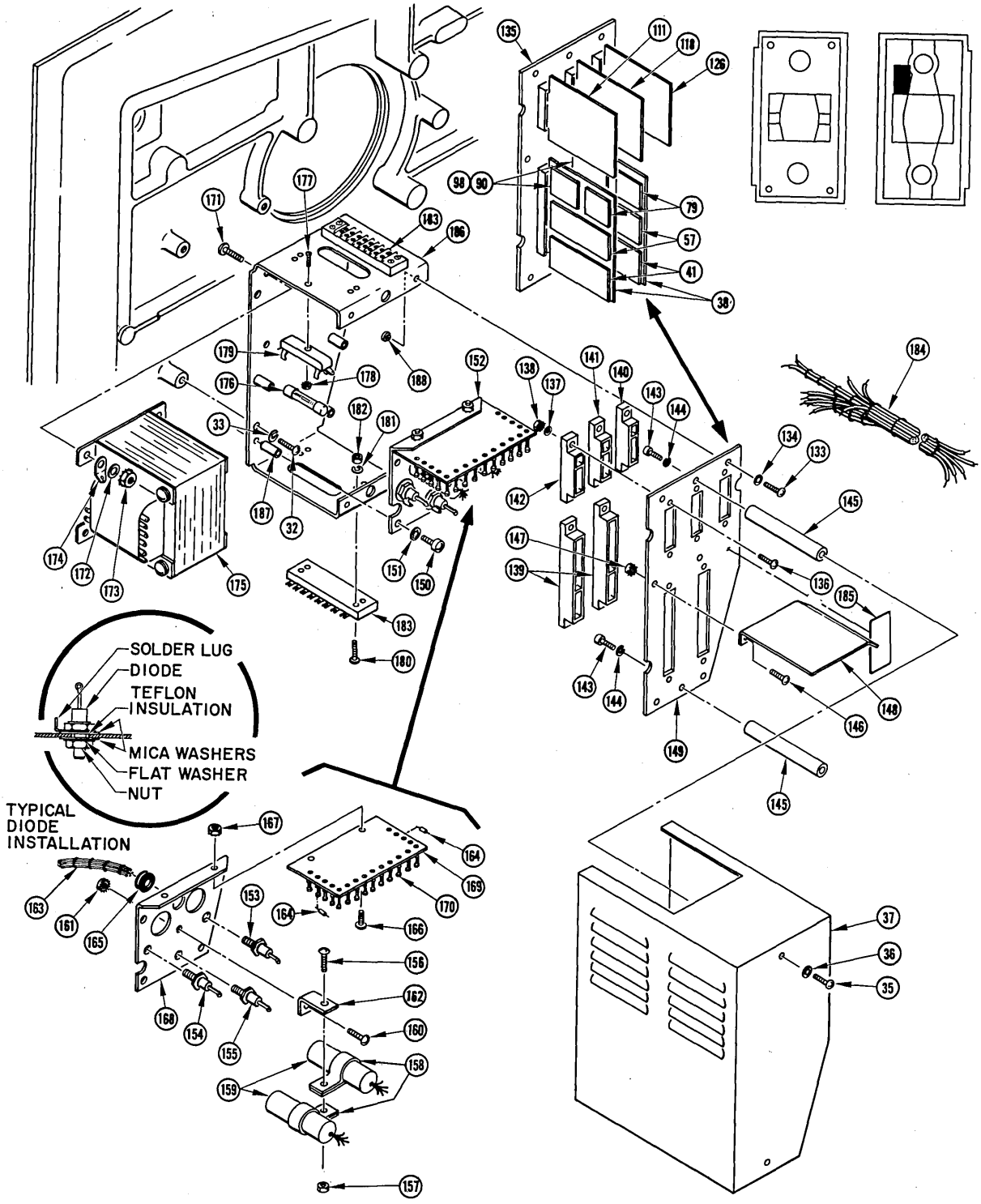

Figure 9-5
Photosense System (sheet 2 of 3)

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-5-						
19	31 01441 10	. . Housing, lamp	1	M,N,O		
	31 01440 10	. . Housing, lamp	1	P,Q		
20	31 01034 10	. . Screw, special, brass	2	P,Q		
21	501-084	. . Washer, flat, 3/32 ID by 3/16 OD by .010 in. thk, brass	2			
22	492-001	. . Nut, plain hex, 2-56 NC-2B, brass cad plt	2			
23	435-044	. . Clip, cradle (Augat #6015-5)	1			
24	600-125	. . Tubing, nonmetallic (Birnbach #8014)	A/R			
25	31 00594 10	. . Cell, photo electric	2			
26	31 01435 10	. . Holder, cell	2			
27	471-875	. . Screw, machine, 2-56 NC-2A by 1/8 in., binder hd slotted, brass cad plt	6			
28	501-084	. . Washer, flat, 3/32 ID by 3/16 OD by .010 in. thk, brass	6			
29	31 01438 10	. . Holder, spring	2			
30	31 01439 10	. . Clip, spring	2			
31	31 01437 10	. . Housing, photosense	1	M,N,O		
	31 01436 10	. . Housing, photosense	1	P,Q		
32	471-078	. Screw, machine, 8-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-40)	3			
33	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	3			
34	31 01202 10	. Chassis Assembly, photosense	1	M		
	31 01201 10	. Chassis Assembly, photosense	1	N		
	31 01200 10	. Chassis Assembly, photosense	1	O,Q		
	31 01203 10	. Chassis Assembly, photosense	1	P		
35	471-078	. . Screw, machine, 8-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-40)	2			
36	502-026	. . Washer, #8 lock, int tooth, stl cad plt (MS35338-38)	2			
37	31 01429 10	. . Cover	1			
38	31 01431 10	. . Base Card Assembly	2	M		
	31 00588 10	. . Base Card Assembly	2	O,Q		

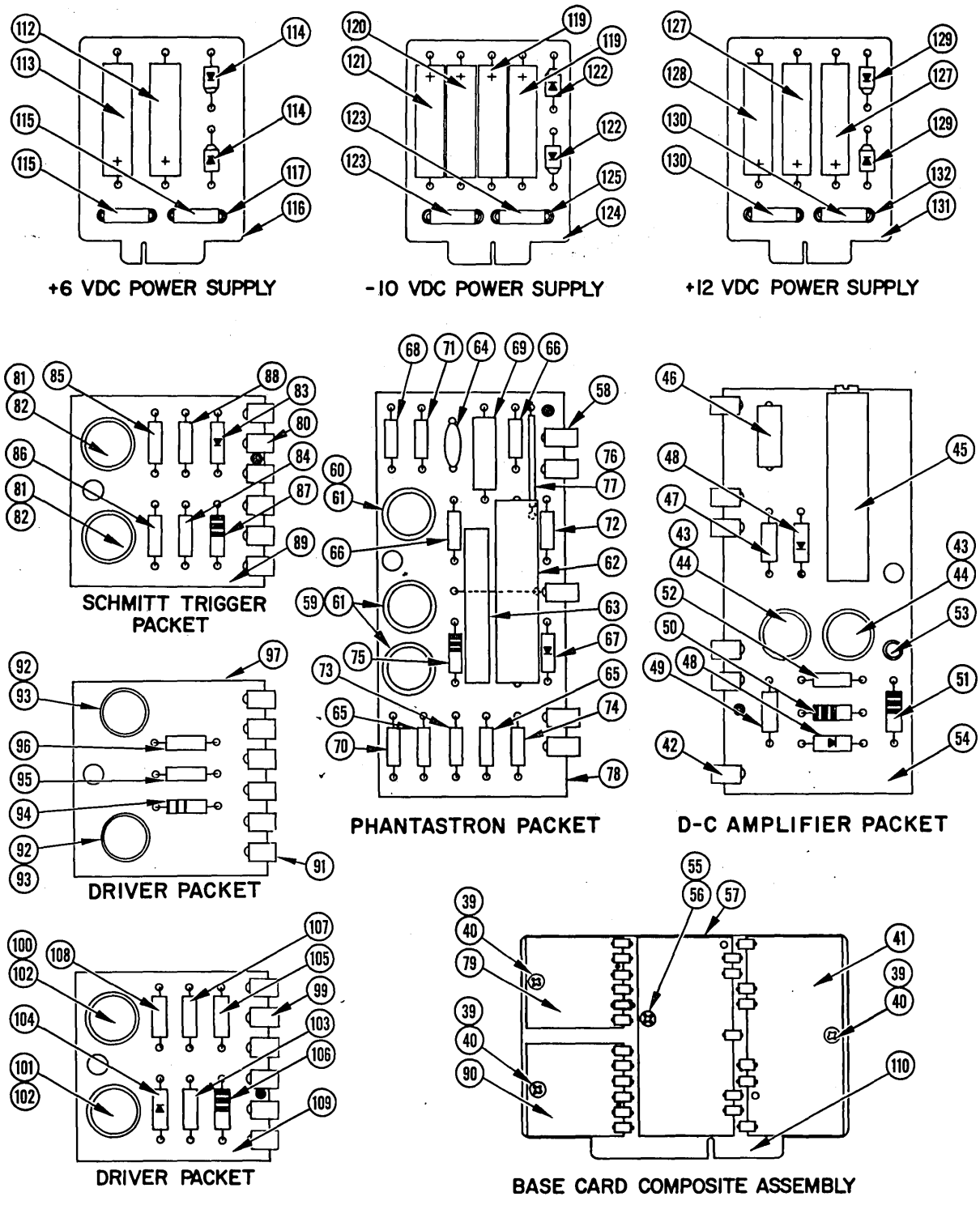

Figure 9-5
Photosense System (sheet 3 of 3)

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-5-						
	31 00589 10	. . Base Card Assembly	2	N,P		
39	471-059	. . . Screw, machine, 4-40 NC-2A by 3/16 in., pan hd Phillips, stl cad plt (MS35208-11)	3			
40	173-069	. . . Standoff, rivet type, 4-40 thd (CTC #1300-9)	3			
41	31 00507 10	. . . Packet Assembly, DC Amplifier	1			
42	31 00670 10	. . . . Strap, packet	6			
43	31 00671 10	. . . . Transistor, PNP, selected (Q1, Q2)	2			
44	280-030	. . . . Spacer, transistor (Milton Ross #10012)	2			
45	044-314	. . . . Resistor, variable, 500 k, 1/4 w, 10% (R4) (Allen-Bradley #RP504U)	1			
46	148-031	. . . . Jack, test point, yellow (TP1) (Ucinite #119437-H)	1			
47	041-406	. . . . Resistor, fixed, composition, 22 k, 1/4 w, 5% (R6) (MIL-R-11: RC07GF223J)	1			
48	013-021	. . . . Diode, silicon, 1N461 (CR1, CR2) (General Instrument, Hughes, Rheem)	2			
49	041-431	. . . . Resistor, fixed, composition, 150 k, 1/4 w, 5% (R5) (MIL-R-11: RC07GF154J)	1			
50	041-414	. . . . Resistor, fixed, composition, 2200 ohm, 1/4 w, 5% (R2) (MIL-R-11: RC07GF222J)	1			
51	041-496	. . . . Resistor, fixed, composition, 10 ohm, 1/4 w, 5% (R3) (Allen-Bradley #CB1005)	1			
52	041-511	. . . . Resistor, fixed, composition, 3900 ohm, 1/4 w, 5% (R1) (MIL-R-11: RC07GF392J)	1			
53	173-012	. . . . Lug, terminal (TP2) (Useco #2010B)	1			
54	31 00669 10	. . . . Card, printed wiring	1			
55	471-059	. . . Screw, machine, 4-40 NC-2A by 3/16 in., pan hd Phillips, stl cad plt (MS35208-11)	1	O,Q		
56	173-069	. . . Standoff, rivet type, 4-40 thd (CTC #1300-9)	1	O,Q		
57	31 00577 10	. . . Packet Assembly, Phantastron	1	O,Q		
58	31 00670 10	. . . . Strap, packet	5	O,Q		
59	31 00671 10	. . . . Transistor, PNP, selected (Q2, Q3)	2	O,Q		
60	014-097	. . . . Transistor, germanium (Q1) (General Instrument #GT1795)	1	O,Q		
61	280-030	. . . . Spacer, transistor (Milton Ross #10012)	3	O,Q		

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-5-						
62	033-038	. . . . Capacitor, metallized, 2 uf, 100 vdc, 5% (C3) (Electron #MI-205D)	1	O,Q		
63	033-039	. . . . Capacitor, metallized, 1 uf, 100 vdc, 5% (C2) (Electron #MI-105D)	1	O,Q		
64	030-051	. . . . Capacitor, ceramic, .005 uf, 50 vdc, (C1) (Sprague #40C172, Electra #8N502RL5)	1	O,Q		
65	013-021	. . . . Diode, silicon, 1N461 (CR1, CR4) (General Instrument, Hughes, Rheem)	2	O,Q		
66	013-151	. . . . Diode, germanium (CR2, CR3) (General Instrument #DR482)	2	O,Q		
67	013-132	. . . . Diode, germanium (CR5) (Hughes #1N96A)	1	O,Q		
68	041-519	. . . . Resistor, fixed, composition, 56 k, 1/4 w, 5% (R1) (MIL-R-11: RC07GF563J)	1	O,Q		
69	042-141	. . . . Resistor, fixed, film, 100 k, 1/2 w, 1% (R2) (MIL-R-10509: RN15X1003F)	1	O,Q		
70	041-413	. . . . Resistor, fixed, composition, 6800 ohm, 1/4 w, 5% (R3) (MIL-R-11: RC07GF682J)	1	O,Q		
71	041-409	. . . . Resistor, fixed, composition, 15 k, 1/4 w, 5% (R4) (MIL-R-11: RC07GF153J)	1	O,Q		
72	041-443	. . . . Resistor, fixed, composition, 39 k, 1/4 w, 5% (R5) (Allen-Bradley Type CB)	1	O,Q		
73	041-394	. . . . Resistor, fixed, composition, 100 k, 1/4 w, 5% (R6) (Allen-Bradley Type CB)	1	O,Q		
74	041-430	. . . . Resistor, fixed, composition, 1500 ohm, 1/4 w, 5% (R7) (MIL-R-11: RC07GF152J)	1	O,Q		
75	041-414	. . . . Resistor, fixed, composition, 2200 ohm, 1/4 w, 5% (R8) (MIL-R-11: RC07GF222J)	1	O,Q		
76	615-002	. . . . Wire, bare, solid, #22 copper, tinned (MIL-3861, Type S)	A/R	O,Q		
77	600-036	. . . . Tubing, nonmetallic, #20 Teflon, clear	A/R	O,Q		
78	31 00683 10	. . . . Card, printed wiring	1	O,Q		
79	31 00508 10	. . . Packet Assembly, Schmitt Trigger	1			
80	31 00670 10	. . . . Strap, packet	6			
81	014-083	. . . . Transistor, germanium, NPN (Q1, Q2) (General Instrument #2N444A)	2			
82	280-030	. . . . Spacer, transistor (Milton Ross #10012)	2			
83	013-132	. . . . Diode, germanium (CR1) (Hughes #1N96A)	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-5-						
84	041-407	. . . . Resistor, fixed, composition, 3300 ohm, 1/4 w, 5% (R1) (MIL-R-11: RC07GF332J)	1			
85	041-520	. . . . Resistor, fixed, composition, 7500 ohm, 1/4 w, 5% (R2) (MIL-R-11: RC07GF752J)	1			
86	041-409	. . . . Resistor, fixed, composition, 15 k, 1/4 w, 5% (R3) (MIL-R-11: RC07GF153J)	1			
87	041-518	. . . . Resistor, fixed, composition, 33 k, 1/4 w, 5% (R4) (MIL-R-11: RC07GF333J)	1			
88	041-413	. . . . Resistor, fixed, composition, 6800 ohm, 1/4 w, 5% (R5) (MIL-R-11: RC07GF682J)	1			
89	31 00672 10	. . . . Card, printed wiring	1			
90	31 01712 10	. . . Packet Assembly, Driver	1	M		
91	31 00670 10	. . . . Strap, packet	6	M		
92	014-097	. . . . Transistor, germanium, (Q1, Q2) (General Instrument #GT1795)	2	M		
93	280-030	. . . . Spacer, transistor (Milton Ross #10012)	2	M		
94	041-414	. . . . Resistor, fixed, composition, 2200 ohm, 1/4 w, 5% (R1) (MIL-R-11: RC07GF222J)	1	M		
95	041-427	. . . . Resistor, fixed, composition, 330 ohm, 1/4 w, 5% (R2) (MIL-R-11: RC07GF331J)	1	M		
96	041-407	. . . . Resistor, fixed, composition, 3300 ohm, 1/4 w, 5% (R3) (MIL-R-11: RC07GF332J)	1	M		
97	31 01819 10	. . . . Card, printed wiring	1	M		
98	31 00688 10	. . . Packet Assembly, Driver	1	N, O, P, Q		
99	31 00670 10	. . . . Strap, packet	6	N, O, P, Q		
100	014-083	. . . . Transistor, germanium, NPN (Q1) (Hughes #2N444A)	1	N, O, P, Q		
101	014-097	. . . . Transistor, germanium (Q2) (General Instrument #GT1795)	1	N, O, P, Q		
102	280-030	. . . . Spacer, transistor (Milton Ross #10012)	2	N, O, P, Q		
103	013-152	. . . . Diode, germanium, stabistor (CR1) (Transitron #S320G)	1	N, O, P, Q		
104	013-153	. . . . Diode, germanium (CR2) (Hughes #1N192)	1	N, O, P, Q		

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-5-						
105	041-407	. . . . Resistor, fixed, composition, 3300 ohm, 1/4 w, 5% (R1) (MIL-R-11: RC07GF332J)	1	N, O, P, Q		
106	041-410	. . . . Resistor, fixed, composition, 1000 ohm, 1/4 w, 5% (R2) (MIL-R-11: RC07GF102J)	1	N, O, P, Q		
107	041-408	. . . . Resistor, fixed, composition, 10 k, 1/4 w, 5% (R3) (MIL-R-11: RC07GF103J)	1	N, O, P, Q		
108	041-412	. . . . Resistor, fixed, composition, 4700 ohm, 1/4 w, 5% (R4) (MIL-R-11: RC07GF472J)	1	N, O, P, Q		
109	31 00711 10	. . . . Card, printed wiring	1	N, O, P, Q		
110	31 00578 10	. . . Base Card	1			
111	31 00289 10	. . Card Assembly, power supply, +6 vdc	1			
112	031-186	. . . Capacitor, electrolytic, 100 uf, 25 volt (C1) (Sprague #30D188A1)	1			
113	031-220	. . . Capacitor, electrolytic, 250 uf, 12 volt (C2) (Sprague #30D157A1)	1			
114	013-197	. . . Diode, silicon (CR1, CR2) (RCA #1N3193)	2			
115	043-469	. . . Resistor, fixed, wirewound, 100 ohm, 3 w, 3% (R1, R2) (Dalohm #RLS-2B)	2			
116	31 00572 10	. . . Card Assembly, terminal	1			
117	173-071	. . . . Lug, terminal, hollow, brass (Useco #1390B-200)	4			
118	31 00288 10	. . Card Assembly, power supply, -10 vdc	1			
119	031-187	. . . Capacitor, electrolytic, 50 uf, 50 volt (C1, C2) (Sprague #30D200A1)	2			
120	031-186	. . . Capacitor, electrolytic, 100 uf, 25 volt (C3) (Sprague #30D188A1)	1			
121	031-220	. . . Capacitor, electrolytic, 250 uf, 12 volt (C4) (Sprague #30D157A1)	1			
122	013-197	. . . Diode, silicon (CR1, CR2) (RCA #1N3193)	2			
123	043-449	. . . Resistor, fixed, wirewound, 270 ohm, 3 w, 3% (R1, R2) (Dalohm #RLS-2B)	2			
124	31 00571 10	. . . Card Assembly, terminal	1			
125	173-071	. . . . Lug, terminal, hollow, brass (Useco #1390B-200)	4			
126	31 00287 10	. . Card Assembly, power supply, +12 vdc	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-5-						
127	031-187	. . . Capacitor, electrolytic, 50 uf, 50 volt (C1, C2) (Sprague #30D200A1)	2			
128	031-247	. . . Capacitor, electrolytic, 200 uf, 15 volt (C3) (Sprague #30D174A1)	1			
129	013-197	. . . Diode, silicon (CR1, CR2) (RCA #1N3193)	2			
130	043-450	. . . Resistor, fixed, wirewound, 470 ohm, 3 w, 3% (R1, R2) (Dalohm #RLS-2B)	2			
131	31 00570 10	. . . Card Assembly, terminal	1			
132	173-071	. . . . Lug, terminal, hollow, brass (Useco #1390B-200)	4			
133	471-060	. . Screw, machine, 4-40 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-12)	4			
134	502-024	. . Washer, #4 lock, int tooth, stl cad plt (MS35333-36)	4			
135	31 01427 10	. . Connector Plate Assembly	1	M		
	31 01428 10	. . Connector Plate Assembly	1	N, O, P, Q		
136	471-063	. . . Screw, machine, 4-40 NC-2A by 7/16 in., pan hd Phillips, stl cad plt (MS35208-15)	10			
137	501-008	. . . Washer, #4 flat, stl cad plt (MS15795-204)	10			
138	496-004	. . . Nut, keps, 4-40 NC-2B, ext washer, stl cad plt (Shakeproof)	10			
139	168-019	. . . Connector, printed circuit board (J1, J2) (Continental Connector Corp #600-110A-546-F6)	2			
140	168-017	. . . Connector, printed circuit board (J3) (Continental Connector Corp #600-110A-900-C3)	1			
141	168-018	. . . Connector, printed circuit board (J4) (Continental Connector Corp #600-110A-900-D4)	1			
142	168-016	. . . Connector, printed circuit board (J5) (Continental Connector Corp #600-110A-900-B2)	1			
143	470-027	. . . Screw, cap, 8-32 NC-2A by 3/8 in., hex sch, stl cad plt (MS35457-14)	2			
144	502-004	. . . Washer, #8 spring lock, stl cad plt (MS35338-42)	2			
145	31 01708 10	. . . Spacer, sleeve	2			
146	471-060	. . . Screw, machine, 4-40 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-12)	2			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-5-						
147	496-004	. . . Nut, keps, 4-40 NC-2B, ext washer, stl cad plt (Shakeproof)	2			
148	31 01707 10	. . . Deflector, air	1			
149	31 01706 10	. . . Connector Plate	1			
150	471-067	. . Screw, machine, 6-32 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-23)	4			
151	502-025	. . Washer, #6 lock, int tooth, stl cad plt (MS35333-37)	4			
152	31 01426 10	. . Diode Bracket Assembly	1	M, P		
	31 01425 10	. . Diode Bracket Assembly	1	N, O, Q		
153	013-145	. . . Diode, zener, 10 volt, 3 w, ±2.5%, w/mounting hardware (CR1) (IRC #3Z10.V25)	1			
154	013-146	. . . Diode, zener, 12 volt, 3 w, ±5%, w/mounting hardware (CR2) (IRC #3Z12.T5)	1			
155	013-156	. . . Diode, zener, 6 volt, 3 w, ±0.1%, w/mounting hardware (CR3) (IRC #3Z6.0V01)	1			
156	471-081	. . . Screw, machine, 8-32 NC-2A by 5/8 in., pan hd Phillips, stl cad plt (MS35208-43)	1	N, O, Q		
157	492-010	. . . Nut, plain hex, 8-32 NC-2B, stl cad plt (MS35649-82)	1	N, O, Q		
158	302-013	. . . Clamp, cable, plastic, 5/8 in. ID (Commercial Plastics)	2	N, O, Q		
159	31 00299 10	. . . Relay, millisecond (K1, K2)	2	N, O, Q		
160	471-078	. . . Screw, machine, 8-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-40)	1	N, O, Q		
161	496-001	. . . Nut, keps, 8-32 NC-2B, ext washer, stl cad plt (Shakeproof)	1	N, O, Q		
162	31 01705 10	. . . Bracket, relay	1	N, O, Q		
163	31 01704 10	. . . Wiring harness	1	N, O, Q		
164	013-132	. . . Diode, germanium (CR4, CR5) (Hughes #1N96A)	2	N, O, Q		
165	260-005	. . . Grommet, neoprene (Rubbercraft #6)	1			
166	471-068	. . . Screw, machine, 6-32 NC-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35208-24)	2			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-5-						
167	496-002	. . . Nut, keps, 6-32 NC-2B, ext washer, stl cad plt (Shakeproof)	2			
168	31 01702 10	. . . Bracket, diode	1			
169	31 01703 10	. . . Terminal Board Assembly (TB1)	1			
170	173-024	. . . . Lug, terminal (Useco #1280B)	18			
171	471-078	. . Screw, machine, 8-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-40)	4			
172	501-010	. . Washer, #8 flat, stl cad plt (MS15795-207)	4			
173	496-006	. . Nut, keps, 8-32 NC-2B, ext tooth, stl cad plt (Shakeproof)	4			
174	172-001	. . Lug, soldering, #8 lock type (Shakeproof #2104-08-00)	1			
175	31 00291 10	. . Transformer, power (T1)	1			
176	070-005	. . Fuse, cartridge, 1/4 amp, slow blow (F1) (Littlefuse #313.250)	1			
177	471-327	. . Screw, machine, 4-40 NC-2A by 5/16 in., 82° flat hd Phillips, stl cad plt (MS35192-13)	1			
178	496-004	. . Nut, keps, 4-40 NC-2B, ext washer, stl cad plt (Shakeproof)	1			
179	130-004	. . Fuse Holder (Littlefuse #357001)	1			
180	471-005	. . Screw, machine, 2-56 NC-2A by 3/8 in., pan hd slotted, brass cad plt (MS35229-5)	12			
181	502-001	. . Washer, #2 spring lock, stl cad plt (MS35338-39)	12			
182	492-001	. . Nut, plain hex, 2-56 NC-2B, brass cad plt	12			
183	180-116	. . Terminal Strip, phenolic, 8 terminal (TB2, TB3, TB4) (Kulka #410-3/4ST-8MFE)	3			
184	31 01430 10	. . Wiring Harness, branched	1			
185	31 00249 10	. . Identification Plate	1			
186	31 01424 10	. . Base Assembly, chassis	1			
187	280-019	. . . Spacer, 6-32 thd, brass cad plt (CTC #1246BX1/2)	4			
188	494-016	. . . Nut, clinch, 4-40 NC-2B, stl cad plt (Penn Engg Co #CL-440-2)	4			

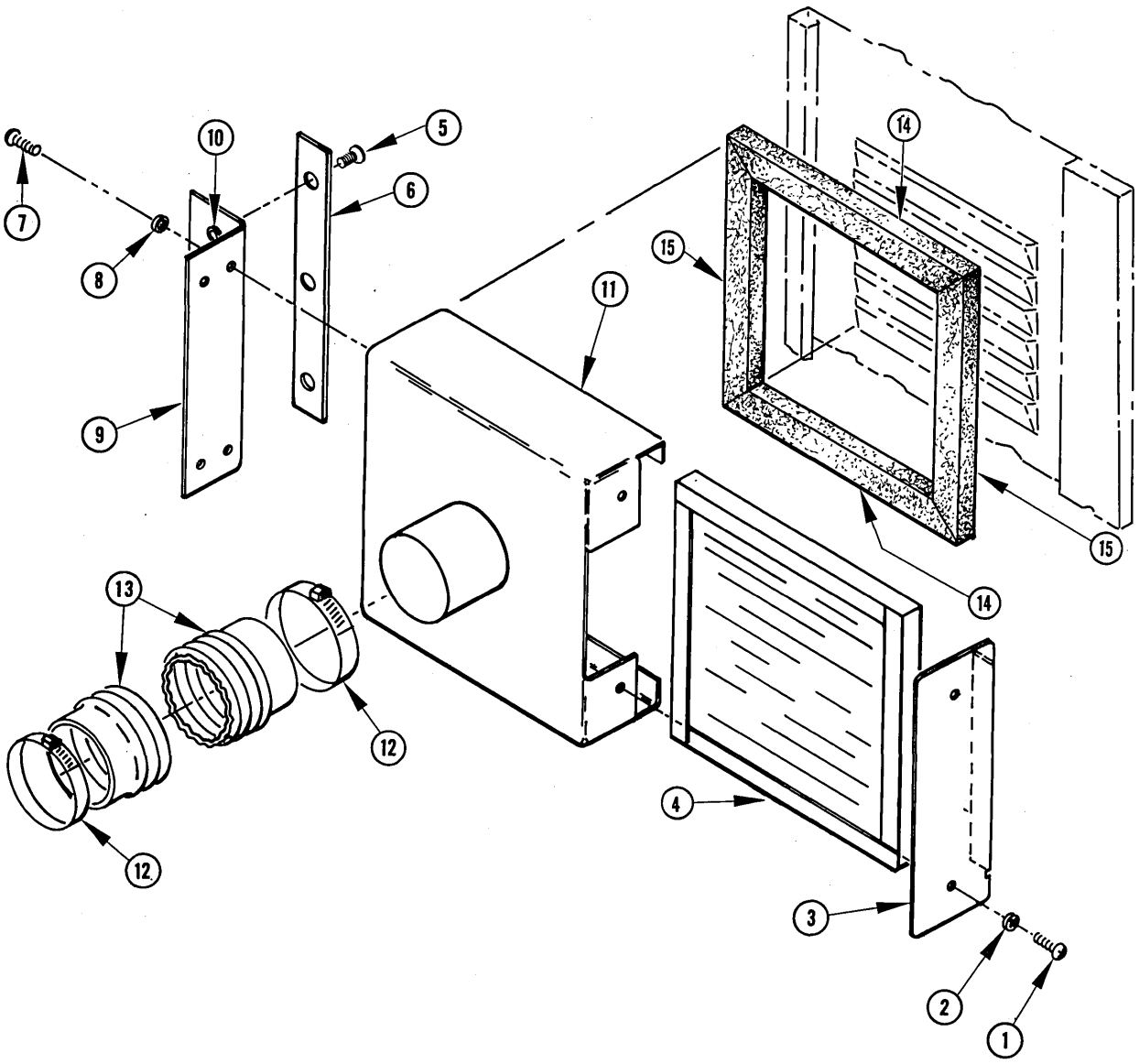

Figure 9-6
Positive Pressure Filter Assembly

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-6-		POSITIVE PRESSURE FILTER ASSEMBLY				
	31 01085 10	Filter Assembly (See Figure 9-2)	Ref			
1	471-068	. Screw, machine, 6-32 NF-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35208-24)	2			
2	502-025	. Washer, #6 lock, int tooth, stl cad plt (MS35333-37)	2			
3	31 01215 10	. Cover	1			
4	370-018	. Filter (Air Maze #P61A)	1			
5	471-345	. Screw, machine, 8-32 NC-2A by 3/8 in., 82° flat hd, stl cad plt (MS35192-40)	3			
6	31 01216 10	. Spacer	1			
7	471-086	. Screw, machine, 10-32 NF-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35209-52)	4			
8	502-005	. Washer, #10 spring lock, stl cad plt (MS35338-43)	4			
9	31 01211 10	. Bracket Assembly	1			
10	490-010	. . Nut, anchor, 8-32 NC-2B (Penn Engg. #WN832)	3			
11	31 01214 10	. Housing, filter, weldment	1			
12	300-050	. Clamp, hose (Cenco #12178 size 4)	2			
13	600-134	. Tubing, nonmetallic, 2-1/2 in. ID by 18 in. with 3/4 in. cuffs (Flexible Tubing Corp #FT-3856)	1			
14	31 01212 10	. Gasket, filter	2			
15	31 01213 10	. Gasket, filter	2			

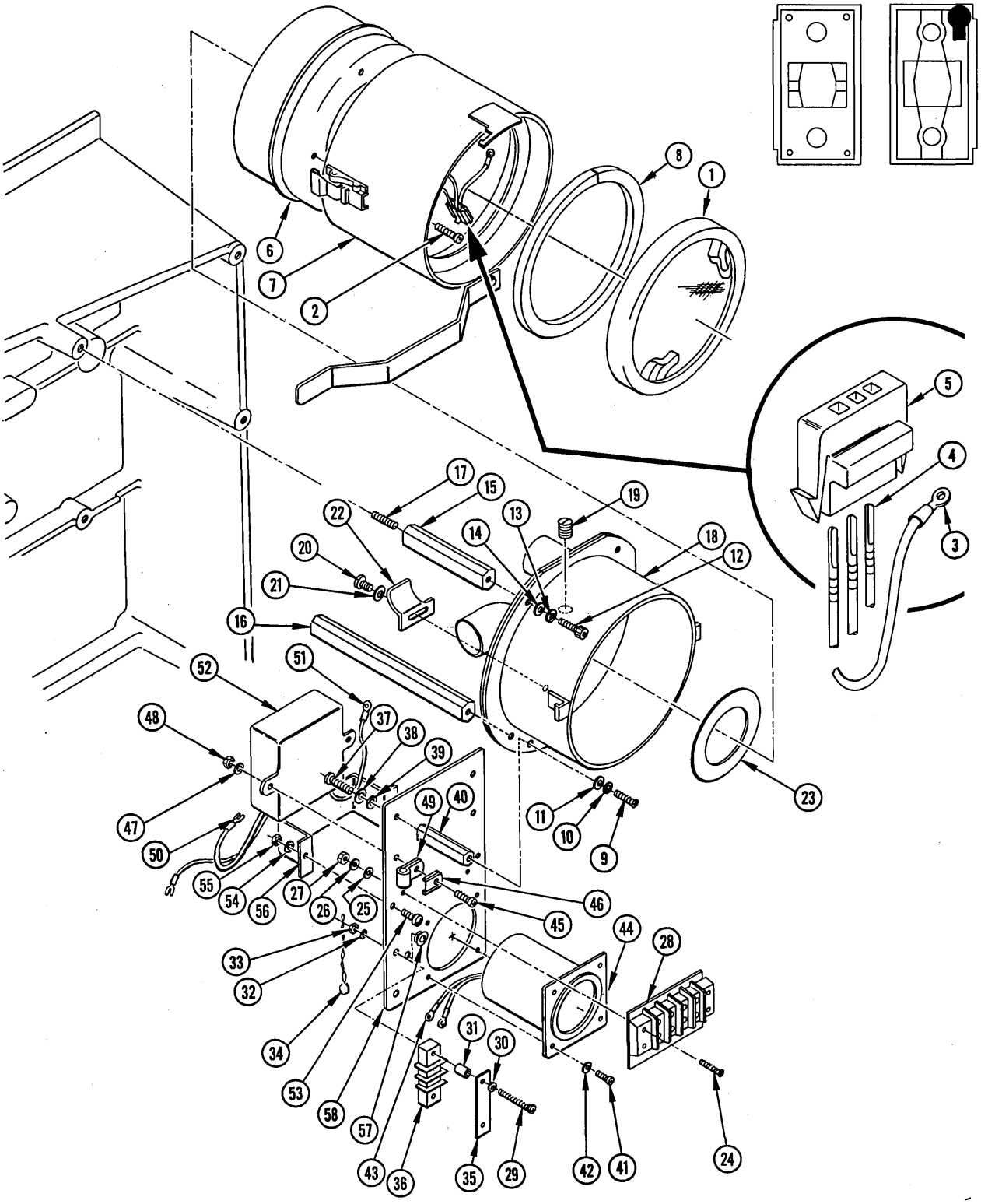

Figure 9-7
Vacuum Blower and Elapsed Time Meter

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-7-		VACUUM BLOWER AND ELAPSED TIME METER				
	31 01105 10	Transport Assembly (See Figure 9-2)	Ref	A		
	31 01097 10	Transport Assembly (See Figure 9-2)	Ref	B		
	31 01107 10	Transport Assembly (See Figure 9-2)	Ref	C		
	31 01106 10	Transport Assembly (See Figure 9-2)	Ref	D		
	31 01248 10	. Vacuum Blower Assembly	1			
1	31 01533 10	. . Filter, vacuum blower	1			
2	471-087	. . Screw, machine, 10-32 NF-2B by 3/8 in., pan hd Phillips, stl cad plt (MS35209-53)	2			
3	171-069	. . Connector, solderless, ring tongue, #10 (AMP #34146)	1			
4	169-019	. . Connector, contact pin (AMP #42641-1)	3			
5	169-049	. . Connector, chassis plug, 3 pin (AMP #480177-1)	1			
6	31 01534 10	. . Motor, vacuum	1			
7	31 00747 10	. . Housing Assembly, vacuum motor	1			
8	296-116	. . . Gasket, foam rubber, 1/2 by 3/4 by 19 in. (Bracamonte)	1			
9	471-071	. Screw, machine, 6-32 NC-2A by 1/2 in., pan hd Phillips, stl cad plt (MS35208-28)	2			
10	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	2			
11	501-009	. Washer, #6 flat, stl cad plt (MS15795-206)	2			
12	470-039	. Screw, cap, 10-32 NF-3A by 5/8 in., hex sch, stl cad plt (MS35458-12)	4			
13	502-005	. Washer, #10 spring lock, stl cad plt (MS35338-43)	4			
14	501-011	. Washer, #10 flat, stl cad plt (MS15795-208)	4			
15	31 01284 10	. Standoff	3			
16	31 01285 10	. Standoff	1			
17	477-177	. Screw, set, headless, 10-32 by 7/8 in., hex soc, cup point, stl cad plt (Allen)	4			
18	31 01247 10	. Base Assembly, vacuum blower	1			
19	440-092	. . Plug, slotted hd, brass, 1/8 in. pipe thd (Imperial Brass #117B)	1			
20	471-558	. . Screw, machine, 4-40 NC-2A by 3/16 in., slotted binder hd, stl cad plt	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-7-						
21	501-008	. . Washer, #4 flat, stl cad plt (MS15795-204)	1			
22	31 01532 10	. . Cover, bleeder	1			
23	31 01500 10	. . Gasket	1			
24	471-072	. Screw, machine, 6-32 NC-2A by 5/8 in., pan hd Phillips, stl cad plt (MS35208-28)	4			
25	501-009	. Washer, #6 flat, stl cad plt (MS15795-206)	4			
26	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	4			
27	492-009	. Nut, plain hex, 6-32 NC-2B, stl cad plt (MS35649-22)	4			
28	180-119	. Terminal strip, barrier, 4 terminal, w/marker strip (TB709) (Kulka #600-3/4ST-4) (See Figure 9-17)	Ref			
29	31 01306 10	. Screw, machine, special	2			
30	501-009	. Washer, #6 flat, stl cad plt (MS15795-206)	2			
31	280-003	. Spacer, #6, brass cad plt (H.H. Smith #2100)	2			
32	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	2			
33	492-009	. Nut, plain hex, 6-32 NC-2B, stl cad plt (MS35649-62)	2			
34	650-147	. Seal, lead w/copper wire (Patrick & Co. #122)	1			
35	31 01307 10	. Cover, terminal	1			
36	180-124	. Terminal Strip, barrier, single screw terminal (TB710) (Kulka #599-2)	1			
	31 01300 10	. Plate Assembly, mounting	1	A, B		
	31 01311 10	. Plate Assembly, mounting	1	C, D		
37	471-071	. . Screw, machine, 6-32 NC-2A by 5/8 in., pan hd Phillips, stl cad plt (MS35208-28)	2			
38	502-003	. . Washer, #6 spring lock, stl cad plt (MS35338-41)	2			
39	501-009	. . Washer, #6 flat, stl cad plt (MS15795-206)	2			
40	31 01619 10	. . Standoff	2			
41	471-062	. . Screw, machine, 4-40 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-14)	4			
42	502-002	. . Washer, #4 spring lock, stl cad plt (MS35338-40)	4			
43	171-010	. . Connector, solderless, #5, ring tongue (AMP)	2			
44	090-024	. . Meter, elapsed time, 60 cps (B707) (Haydon #ED71)	1	A, B		

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-7-						
	090-031	. . Meter, elapsed time, 50 cps (B707) (Haydon #ED71)	1	C,D		
45	471-071	. . Screw, machine, 6-32 NC-2A by 1/2 in., pan hd Phillips, stl cad plt (MS35208-27)	2			
46	506-013	. . Washer, #6, stl cad plt (Weckesser #D-140)	2			
47	502-003	. . Washer, #6 spring lock, stl cad plt (MS35338-41)	2			
48	492-009	. . Nut, plain hex, 6-32 NC-2B, stl cad plt (MS35649-62)	2			
49	302-037	. . Clamp, cable, plastic, 5/16 in. ID (Commercial Plastic #742-5)	2			
50	171-001	. . Connector, solderless, #6, slotted tongue (AMP #34541)	2			
51	172-003	. . Lug, soldering, #6, int tooth (Shakeproof #2104-06)	1			
52	036-055	. . Capacitor, paper, dual bathtub type, .5 uf, 600 vdc (Sprague #BP-2506)	1			
53	471-069	. . Screw, machine, 6-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-25)	2			
54	502-003	. . Washer, #6 spring lock, stl cad plt (MS35338-41)	2			
55	492-009	. . Nut, plain hex, 6-32 NC-2B by 5/8 in., stl cad plt (MS35649-62)	2			
56	31 01620 10	. . Shield	1			
57	260-032	. . Grommet, elastic (Accurate Sales #GS3181)	1			
58	31 01618 10	. . Plate, mounting	1			

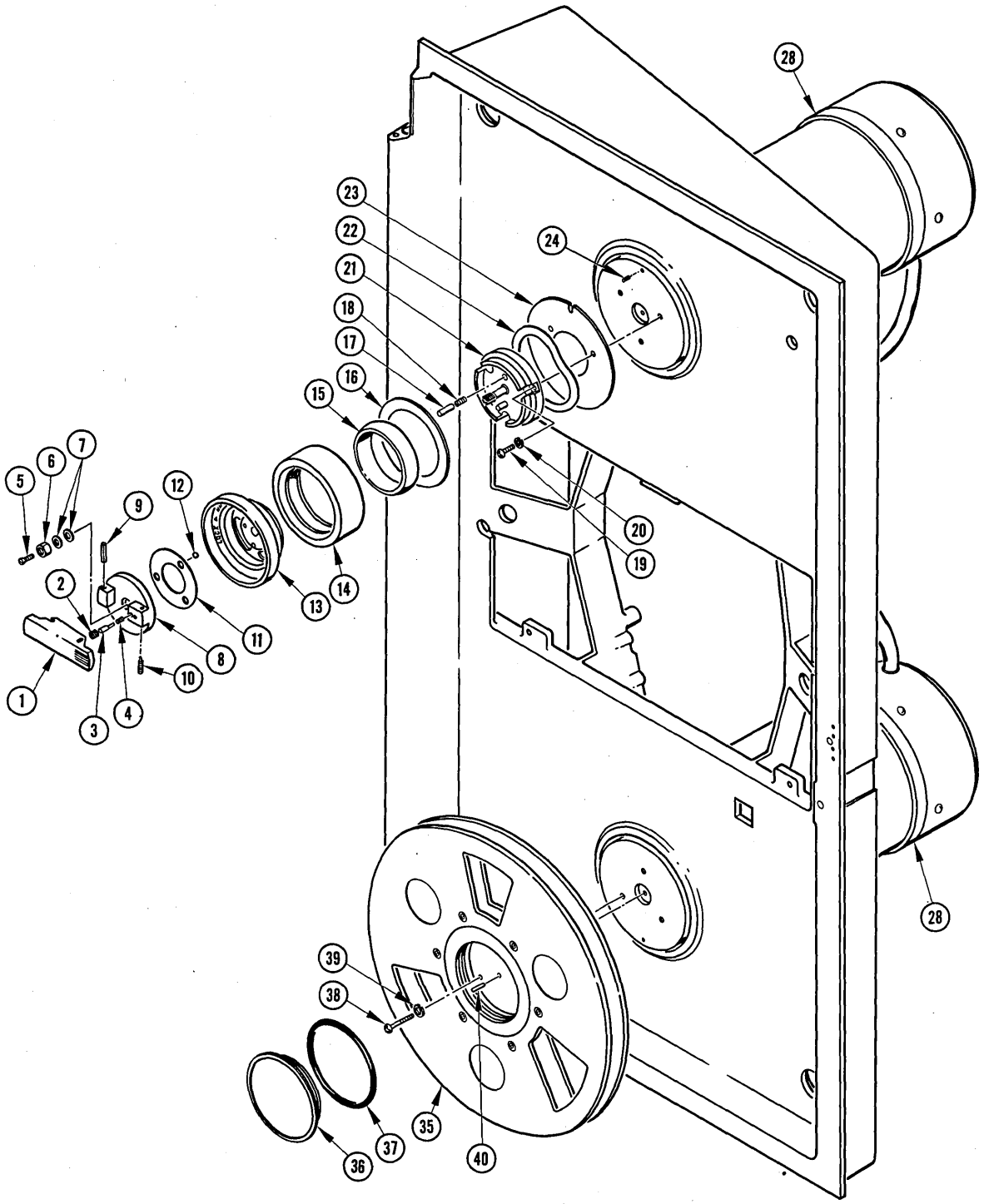

Figure 9-8
Supply Reel, Take-Up Reel, and Reel Motors (sheet 1 of 2)

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-8-		SUPPLY REEL, TAKE-UP REEL AND REEL MOTORS				
	31 01105 10	Transport Assembly (See Figure 9-2)	Ref	A		
	31 01097 10	Transport Assembly (See Figure 9-2)	Ref	B		
	31 01107 10	Transport Assembly (See Figure 9-2)	Ref	C		
	31 01106 10	Transport Assembly (See Figure 9-2)	Ref	D		
	31 01242 10	. Retainer Assembly, reel	1			
1	31 01462 10	. . Handle, reel retainer	1			
2	31 01477 10	. . Spring, helical	1			
3	31 01463 10	. . Pin, straight, headed	1			
4	31 01468 10	. . Spring, helical	1			
5	31 01476 10	. . Screw, cap	1			
6	31 01474 10	. . Nut, plain	1			
7	31 01475 10	. . Washer, thrust	2			
8	31 01471 10	. . Retainer, reel	1			
9	406-024	. . . Pin, roll (Esna #79-012-062-0625)	1			
10	474-044	. . . Pin (Vlier #S48A)	1			
11	31 01464 10	. . Retainer, ball	1			
12	420-020	. . Bearing, ball, .250 dia (Hartford Ball Co. Grade I 440C)	3			
13	31 01461 10	. . Cup, reel retainer cam	1			
14	31 01473 10	. . Tire, reel retainer	1			
15	31 01466 10	. . Ring, reel retainer	1			
16	31 01465 10	. . Washer, flat	1			
17	31 01467 10	. . Pin, straight, headless	1			
18	31 01469 10	. . Spring, helical	1			
19	471-089	. . Screw, machine, 10-32 NF-3A by 1/2 in., pan hd Phillips, stl cad plt (MS35209-55)	3			
20	502-005	. . Washer, #10 spring lock, stl cad plt (MS35338-43)	3			
21	31 01472 10	. . Reel Retainer	1			
22	31 01470 10	. . Washer, spring, compression	1			

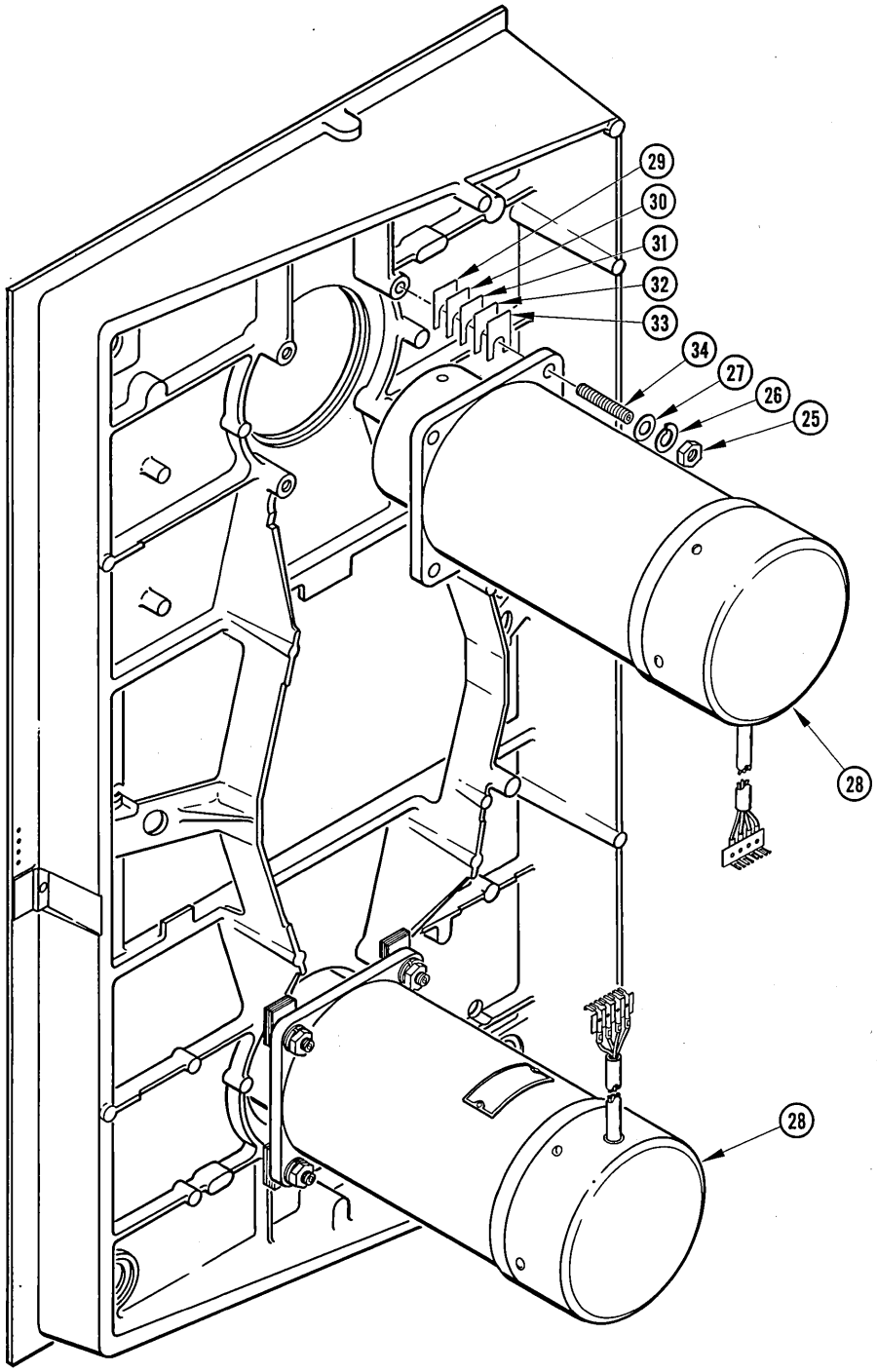

Figure 9-8
Supply Reel, Take-Up Reel, and Reel Motors (sheet 2 of 2)

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-8-						
23	31 01478 10	. . Spacer, disk	1			
24	474-044	. Pin (Vlier #S48A)	1			
25	492-058	. Nut, plain hex, 5/16-18 NC-2B, stl cad plt	8			
26	502-066	. Washer, 5/16 spring lock, stl cad plt (MS35338-83)	8			
27	501-030	. Washer, 5/16 flat, stl cad plt (AN960-516)	8			
28	31 01268 10	. Motor Assembly, reel	2			
29	31 00212 10	. Shim, .0015 in. thk, brass	A/R			
30	31 00213 10	. Shim, .003 in. thk, brass	A/R			
31	31 00214 10	. Shim, .005 in. thk, brass	A/R			
32	31 00215 10	. Shim, .010 in. thk, brass	A/R			
33	31 01312 10	. Shim, .020 in. thk, brass	A/R			
34	477-173	. Screw, set, headless, 5/16-18 NC-3A by 1-3/4 in., hex soc, stl cad plt (Allen)	8			
35	31 01240 10	. Reel Assembly, fixed	1	B,D		
	31 01241 10	. Reel Assembly, fixed	1	A,C		
36	31 00792 10	. . Cap	1			
37	432-043	. . O Ring (MS29513-139)	1			
38	471-093	. . Screw, machine, 10-32 NF-2A by 1 in., pan hd Phillips, stl cad plt (MS35209-59)	3			
39	502-005	. . Washer, #10 spring lock, stl cad plt (MS35338-43)	3			
40	402-011	. . Pin, dowel, .1250 dia, by .50 in., sst	1			

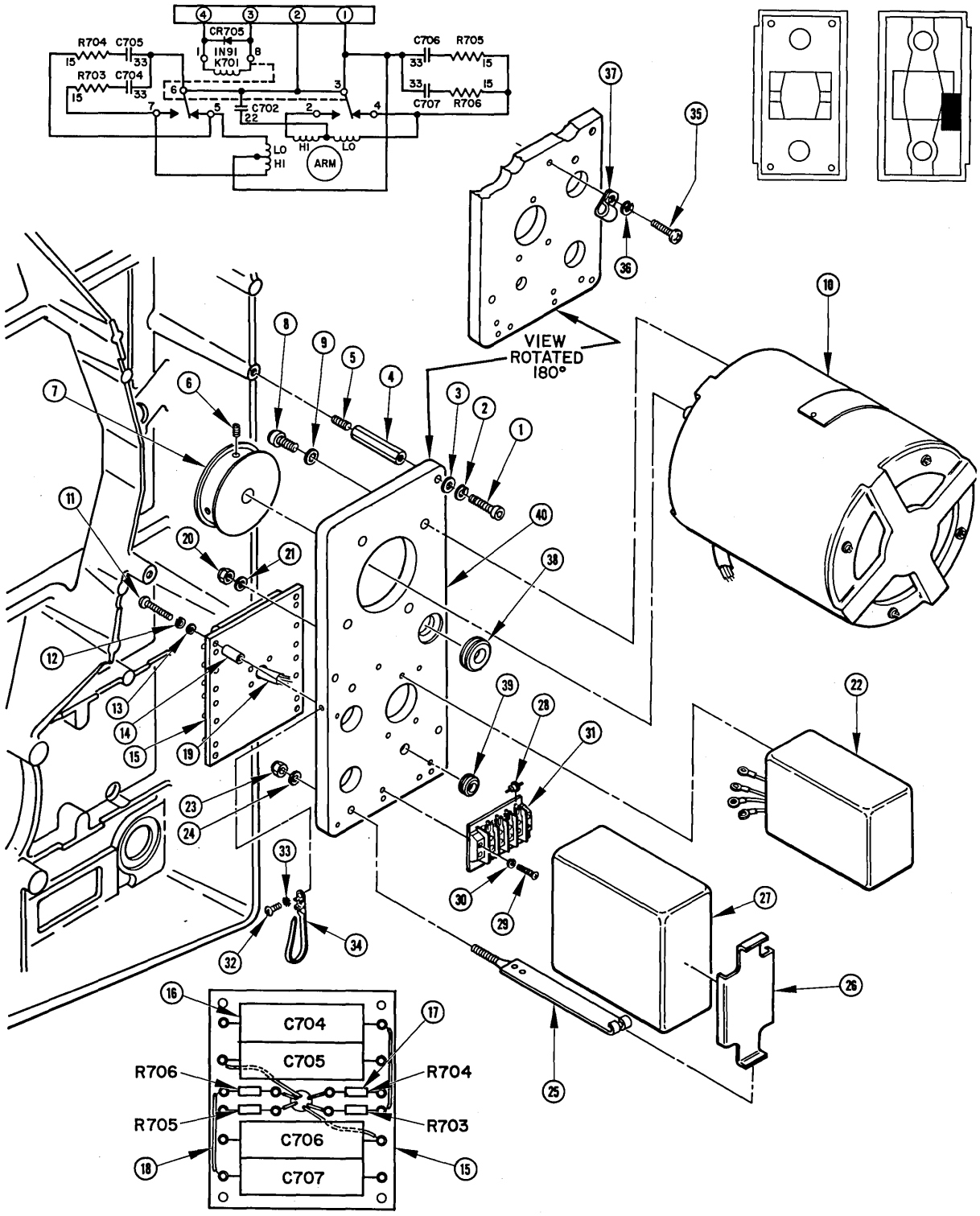

Figure 9-9
Capstan Drive Motor Assembly

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-9-		CAPSTAN DRIVE MOTOR ASSEMBLY				
	31 01105 10	Transport Assembly (See Figure 9-2)	Ref	A		
	31 01097 10	Transport Assembly (See Figure 9-2)	Ref	B		
	31 01107 10	Transport Assembly (See Figure 9-2)	Ref	C		
	31 01106 10	Transport Assembly (See Figure 9-2)	Ref	D		
1	470-041	. Screw, cap, 10-32 NF-3A by 7/8 in., hex sch, stl cad plt (MS35458-14)	3			
2	502-005	. Washer, #10 spring lock, stl cad plt (MS35338-40)	3			
3	501-011	. Washer, #10 flat, stl cad plt (MS15795-207)	3			
4	31 01283 10	. Standoff	3			
5	477-177	. Screw, set, headless, 10-32 by 7/8 in., hex soc, cup point, stl cad plt (Allen)	3			
	31 01253 10	. Drive Motor Assembly, capstan	1	A, B		
	31 01254 10	. Drive Motor Assembly, capstan	1	C, D		
6	477-119	. . Screw, set, headless, 10-32 NF-2A by 1/4 in., hex soc, cup point, sst w/nylon insert (Nylock)	2			
7	31 01540 10	. . Pulley	1	A, B		
	31 01541 10	. . Pulley	1	C, D		
8	470-045	. . Screw, cap, 1/4-20 UNC-3A by 1/2 in., hex sch, stl cad plt (MS35457-33)	4			
9	502-028	. . Washer, lock, 1/4 in., int tooth, stl cad plt (MS35333-35)	4			
10	31 01544 10	. . Motor, capstan drive, ac, 1800/3600 rpm, 60 cps	1	A, B		
	31 01545 10	. . Motor, capstan drive, ac, 1500/3000 rpm, 50 cps	1	C, D		
11	471-074	. . Screw, machine, 6-32 NC-2A by 7/8 in., pan hd Phillips, stl cad plt (MS35208-30)	4			
12	502-003	. . Washer, #6 spring lock, stl cad plt (MS35338-41)	4			
13	501-009	. . Washer, #6 flat, stl cad plt (MS15795-206)	4			
14	280-009	. . Spacer, brass, cad plt (H.H. Smith #2102) (Birnbach #1127)	4			
15	31 01542 10	. . Board Assembly, component	1			
16	035-346	. . . Capacitor, tubular, .33 uf, 400 vdc (C704, C705, C706, C707) (Mallory #GEM4033)	4			
17	041-356	. . . Resistor, 15 ohm, 1/2 watt, 10% (R703, R704, R705, R706)	4			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-9-						
18	600-024	. . . Tubing, insulation, electrical, #20, black (MIL-I-631)	A/R			
19	600-009	. . . Tubing, insulation, electrical, #4, black (MIL-I-631)	A/R			
20	493-002	. . Nut, self-locking, hex, 6-32 NC-2B, brass cad plt w/nylon insert (Esna Type NM)	3			
21	501-009	. . Washer, lock, 1/4 in., int tooth, stl cad plt (MS35333-35)	3			
22	020-113	. . Relay, coil, 24 vdc, 5 amp, 135 vac, 60 cps (K701) (Comar Type A)	1			
23	493-004	. . Nut, self-locking, hex, 10-32 NF-2B, brass cad plt w/nylon insert (Esna Type NM)	2			
24	501-011	. . Washer, #10 flat, stl cad plt (MS15795-208)	2			
25	290-019	. . Bracket, capacitor, spade lug type, 10-32 by 15/16 in. lg stud (MIL-C-25: CPO7SB5)	2	A,B		
	290-014	. . Bracket, capacitor, spade lug type, 10-32 by 15/16 in. lg stud (MIL-C-25: CPO7SB6)	2	C,D		
26	31 01547 10	. . Strap, capacitor mounting	1			
27	036-046	. . Capacitor, paper, 22 uf, 236 vac, 60 cps (C2) (Sprague #201P181)	1	A,B		
	036-052	. . Capacitor, paper, 25 uf, 236 vac, 50 cps (C2) (Sprague #S49755)	1	C,D		
28	013-015	. . Diode (CR705) (General Electric #1N91)	1			
29	471-072	. . Screw, machine, 6-32 NC-2A by 5/8 in., pan hd Phillips, stl cad plt (MS35208-28)	4			
30	502-003	. . Washer, #6 spring lock, stl cad plt (MS35338-41)	4			
31	180-119	. . Terminal Strip, phenolic body, 4 one-sided terminals (Kulka #600-3/4 ST-4 w/marker strip)	1			
32	471-078	. . Screw, machine, 8-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-40)	1			
33	502-015	. . Washer, #8 ext tooth lock, stl cad plt (MS35335-31)	1			
34	302-111	. . Clamp, cable, plastic, adjustable (Panduit Corp #LSC-2D)	1			
35	471-072	. . Screw, machine, 6-32 NC-2A by 5/8 in., pan hd Phillips, stl cad plt (MS35208-28)	1			
36	502-003	. . Washer, #6 spring lock, stl cad plt (MS35338-41)	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-9-						
37	302-036	. . Clamp, cable, plastic (Commercial Plastic #742-6)	1			
38	260-016	. . Grommet, elastic, 3/8 in. ID, 7/8 in. OD, 1/2 in. thk (MS35489-98)	1			
39	260-032	. . Grommet, elastic, 3/16 in. ID, 1/2 in. OD, 7/32 in. thk (Accurate Sales #GS21-81)	1			
40	31 01543 10	. . Plate, motor mounting	1			

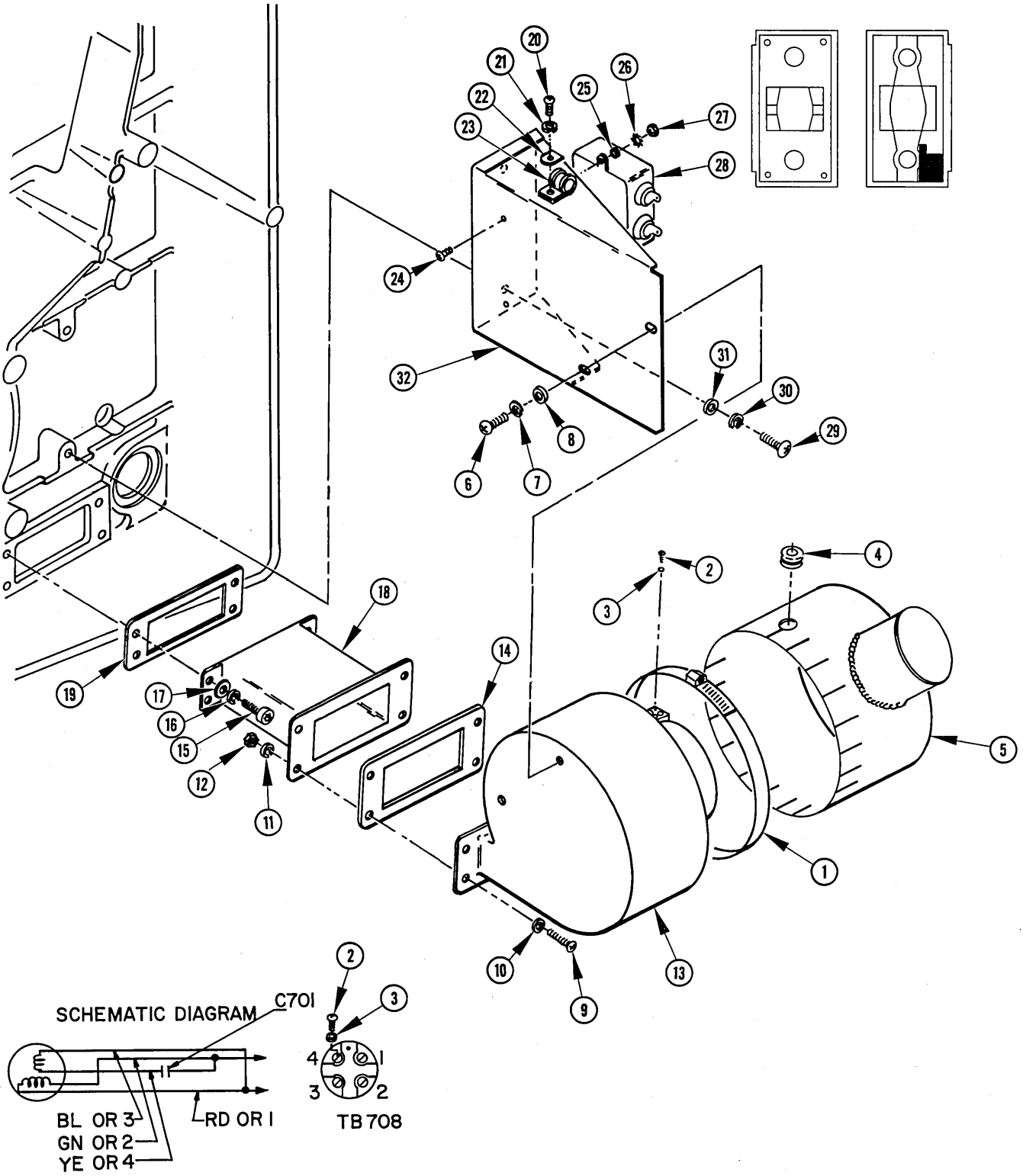

Figure 9-10
Positive Pressure Blower

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-10-		POSITIVE PRESSURE BLOWER				
	31 01105 10	Transport Assembly (See Figure 9-2)	Ref	A		
	31 01097 10	Transport Assembly (See Figure 9-2)	Ref	B		
	31 01107 10	Transport Assembly (See Figure 9-2)	Ref	C		
	31 01106 10	Transport Assembly (See Figure 9-2)	Ref	D		
1	300-053	. Clamp, tube (Aero Seal #200)	1			
2		. Screw, machine, #2-64 NF-2A by 3/16 in., slotted round hd	4			
3		. Washer, #2 lock (Rotron #8649-2)	4			
4	260-004	. Grommet, elastic	1			
5	31 01277 10	. Housing, blower inlet	1			
6	471-078	. Screw, machine, 8-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-40)	2			
7	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	2			
8	501-010	. Washer, #8 flat, stl cad plt (MS15795-207)	2			
9	471-068	. Screw, machine, 6-32 NC-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35208-24)	4			
10	501-009	. Washer, #6 flat, stl cad plt (MS15795-206)	4			
11	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	4			
12	492-009	. Nut, plain hex, 6-32 NC-2B, stl cad plt (MS35649-62)	4			
13	591-028	. Fan, blower (Rotron Type KS409)	1			
14	31 01298 10	. Gasket	1			
15	470-071	. Screw, cap, 6-32 NC-3A by 1/2 in., hex sch, sst	4			
16	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	4			
17	501-009	. Washer, #6 flat, stl cad plt (MS15795-206)	4			
18	31 01296 10	. Adapter, blower	1			
19	31 01298 10	. Gasket	1			
20	471-069	. Screw, machine, 6-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-25)	1			
21	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	1			
22	506-013	. Washer, cable clamp, stl cad plt (Weckesser #D-140)	1			
23	302-029	. Clamp, cable (AN742D14C)	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-10-						
24	471-069	. Screw, machine, 6-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-25)	2			
25	501-009	. Washer, #6 flat, stl cad plt (MS15795-206)	2			
26	502-014	. Washer, #6 lock, ext tooth, stl cad plt (MS35335-30)	2			
27	492-009	. Nut, plain hex, 6-32 NC-2B, stl cad plt (MS35649-62)	2			
28	036-049	. Capacitor, oil, 1 mfd, 600 vdc (Sprague #90P13) (C701)	1			
29	471-078	. Screw, machine, 8-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-40)	2			
30	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	2			
31	501-010	. Washer, #8 flat, stl cad plt (MS15795-207)	2			
32	31 01617 10	. Bracket, blower	1			

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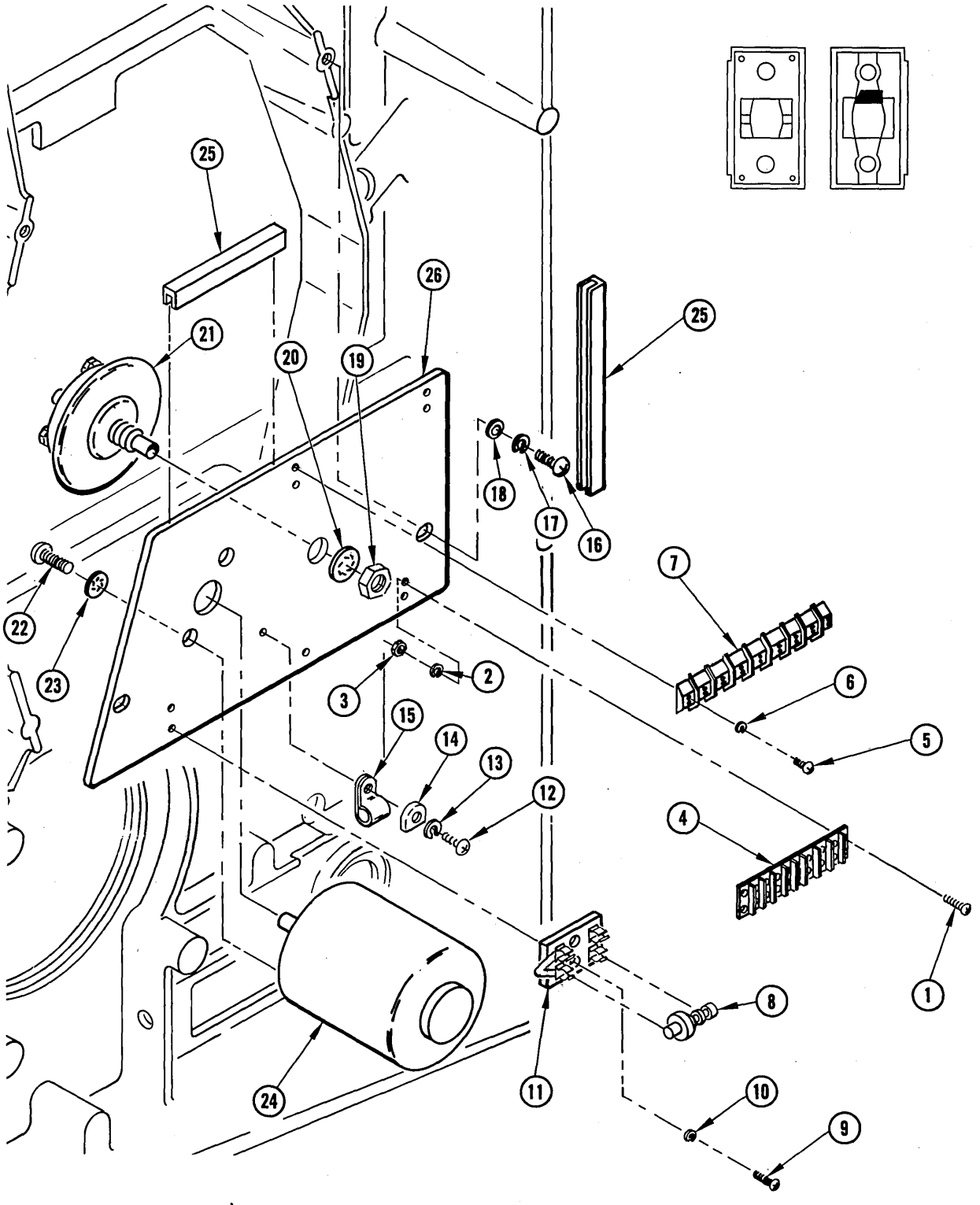

Figure 9-11
Upper Servo Control

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-11-		UPPER SERVO CONTROL				
	31 01105 10	Transport Assembly (See Figure 9-2)	Ref	A		
	31 01097 10	Transport Assembly (See Figure 9-2)	Ref	B		
	31 01107 10	Transport Assembly (See Figure 9-2)	Ref	C		
	31 01106 10	Transport Assembly (See Figure 9-2)	Ref	D		
1	471-064	. Screw, machine, 4-40 NC-2A by 1/2 in., pan hd Phillips, stl cad plt (MS35208-16)	3			
2	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	3			
3	492-008	. Nut, plain hex, 4-40 NC-2B, stl cad plt (MS35649-42)	3			
4	180-116	. Strip, terminal, 2-1/2 in. lg, 8 terminal, phenolic, w/marker strip (TB701) (Kulka #410-3/4 ST-8 MFE) (See Figure 9-17)	Ref			
5	471-064	. Screw, machine, 4-40 NC-2A by 1/2 in., pan hd Phillips, stl cad plt (MS35208-16)	4			
6	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	4			
7	180-117	. Strip, terminal, 3-9/32 in. lg, 7 one sided terminals, phenolic, w/marking strip (TB703) (Kulka #600-3/4 ST-7) (See Figure 9-17)	Ref			
8	582-002	. Rectifier, selenium, single phase half wave (CR701, CR702) (Sarkes Tarzian #40LA)	2			
9	471-061	. Screw, machine, 4-40 NC-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35208-13)	2			
10	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	2			
11	130-008	. Holder, rectifier, 2 pole (Littlefuse #099063)	1			
12	471-070	. Screw, machine, 6-32 NC-2A by 7/16 in., pan hd Phillips, stl cad plt (MS35208-26)	1			
13	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	1			
14	506-013	. Washer, #6 stl cad plt (Weckesser #D-140)	1			
15	302-007	. Clamp, cable, 1/4 in. ID (Commercial Plastic #742-4)	1			
16	471-080	. Screw, machine, 8-32 NC-2A by 1/2 in., pan hd Phillips, stl cad plt (MS35208-42)	2			
17	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	2			
18	501-010	. Washer, #8 flat, stl cad plt (MS15795-207)	2			
	31 01250 10	. Control Assembly, servo	1			
19	492-049	. . Nut, plain hex, 3/8-32 NEF-2B, stl cad plt (MS35082-7)	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-11-						
20	502-083	. . Washer, 3/8 in., int tooth, stl cad plt (MS35333-42)	1			
21	31 01537 10	. . Switch, differential vacuum (S706)	1			
22	471-086	. . Screw, machine, 10-32 NF-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35209-52)	2			
23	502-027	. . Washer, #10 lock, int tooth, stl cad plt (MS35333-39)	2			
24	31 01536 10	. . Transducer, differential vacuum (TR701)	1			
25	269-099	. . Rubber, extrusion, U shaped (Rubbercraft #789)	A/R			
26	31 01535 10	. . Plate, mounting	1			

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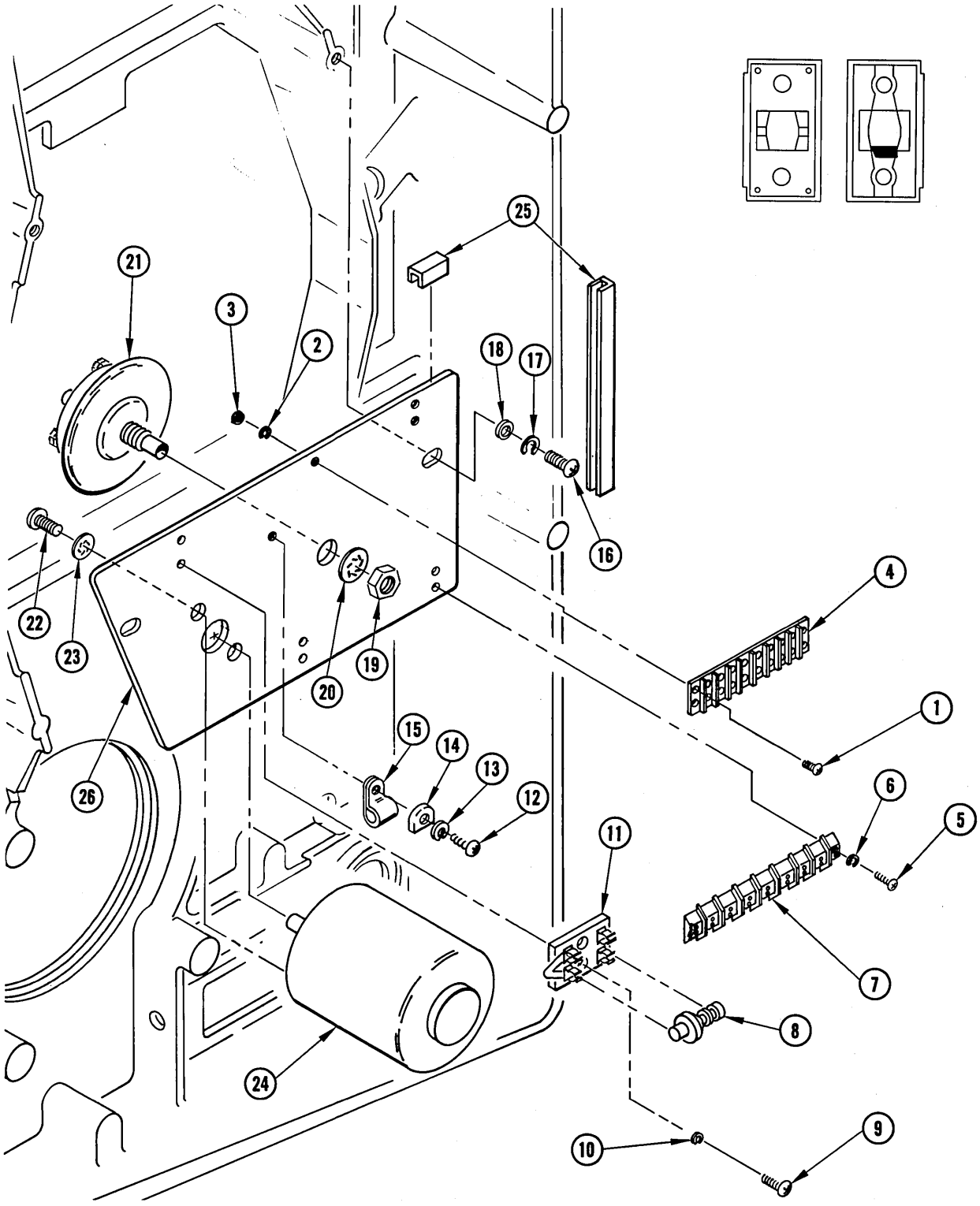

Figure 9-12
Lower Servo Control

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-12-		LOWER SERVO CONTROL				
	31 01105 10	Transport Assembly (See Figure 9-2)	Ref	A		
	31 01097 10	Transport Assembly (See Figure 9-2)	Ref	B		
	31 01107 10	Transport Assembly (See Figure 9-2)	Ref	C		
	31 01106 10	Transport Assembly (See Figure 9-2)	Ref	D		
1	471-064	. Screw, machine, 4-40 NC-2A by 1/2 in., pan hd Phillips, stl cad plt (MS35208-16)	3			
2	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	3			
3	492-008	. Nut, plain hex, 4-40 NC-2B, stl cad plt (MS35649-42)	3			
4	180-116	. Strip, terminal, 2-1/2 in. lg, 8 terminal, phenolic, w/marker strip (TB702) (Kulka #410-3/4ST-8MEF) (See Figure 9-17)	Ref			
5	471-064	. Screw, machine, 4-40 NC-2A by 1/2 in., pan hd Phillips, stl cad plt (MS35208-16)	4			
6	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	4			
7	180-117	. Strip, terminal, 3-9/32 in. lg, 7 one-sided terminals, phenolic, w/marker strip (TB706) (Kulka #600-3/4ST-7) (See Figure 9-17)	Ref			
8	582-002	. Rectifier, selenium, single phase, half wave (CR703, CR704) (Sarkes Tarzian #40LA)	2			
9	471-061	. Screw, machine, 4-40 NC-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35208-13)	2			
10	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	2			
11	130-008	. Holder, rectifier, 2 pole (Littlefuse #099063)	1			
12	471-070	. Screw, machine, 6-32 NC-2A by 7/16 in., pan hd Phillips, stl cad plt (MS35208-26)	1			
13	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	1			
14	506-013	. Washer, #6 stl cad plt (Weckesser #D-140)	1			
15	302-007	. Clamp, cable, 1/4 in. ID (Commercial Plastic #742-4)	1			
16	471-080	. Screw, machine, 8-32 NC-2A by 1/2 in., pan hd Phillips, stl cad plt (MS35208-42)	2			
17	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	2			
18	501-010	. Washer, #8 flat, stl cad plt (MS15795-207)	2			
	31 01251 10	. Control Assembly, servo	1			
19	492-049	. . Nut, plain hex, 3/8-32 NEF-2B, stl cad plt (MS35082-7)	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-12-						
20	502-083	. . Washer, 3/8 in., int tooth, stl cad plt (MS35333-42)	1			
21	31 01537 10	. . Switch, differential vacuum (S707)	1			
22	471-086	. . Screw, machine, 10-32 NF-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35209-52)	2			
23	502-027	. . Washer, #10 lock, int tooth, stl cad plt (MS35333-39)	2			
24	31 01536 10	. . Transducer, differential vacuum (TR702)	1			
25	269-099	. . Rubber, extrusion, U shaped (Rubbercraft #789)	A/R			
26	31 01538 10	. . Plate, mounting	1			

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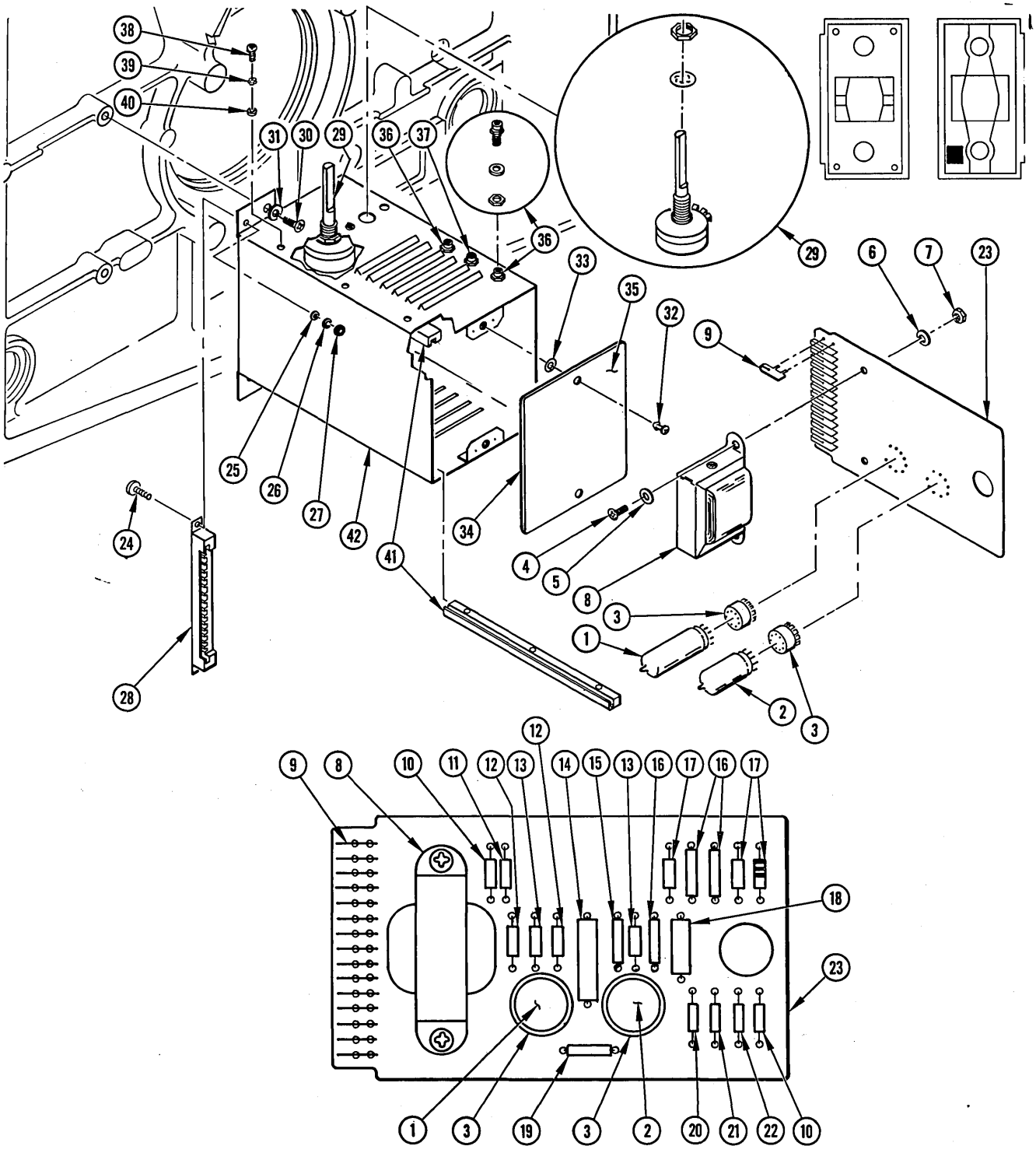

Figure 9-13
Oscillator and Housing

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-13-		OSCILLATOR AND HOUSING				
	31 01105 10	Transport Assembly (See Figure 9-2)	Ref	A		
	31 01097 10	Transport Assembly (See Figure 9-2)	Ref	B		
	31 01107 10	Transport Assembly (See Figure 9-2)	Ref	C		
	31 01106 10	Transport Assembly (See Figure 9-2)	Ref	D		
	31 01265 10	. Oscillator Assembly (OSC700)	1			
1	012-065	. . Tube, electron, 9 pin miniature (V2) (RCA #12BH7)	1			
2	012-108	. . Tube, electron, 9 pin miniature (V1) (RCA or General Electric #12AX7)	1			
3	150-080	. . Socket, tube, 9 pin (Cinch Type #144P24023)	2			
4	471-077	. . Screw, machine, 8-32 NC-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35208-39)	2			
5	501-010	. . Washer, #8 flat, stl cad plt (MS15795-207)	2			
6	502-004	. . Washer, #8 spring lock, stl cad plt (MS35338-42)	2			
7	492-010	. . Nut, plain hex, 8-32 NC-2B, stl cad plt (MS35649-82)	2			
8	563-020	. . Transformer, cased (T1) (Triad #A53X)	1			
9	168-007	. . Contact, printed circuit board (Elco #5001-1913)	15			
10	041-023	. . Resistor, fixed, composition, 100 k, 1/2 w, ±5% (R1, R13) (MIL-R-11: RC20GF104J)	2			
11	041-028	. . Resistor, fixed, composition, 330 k, 1/2 w, ±5% (R8) (MIL-R-11: RC20GF334J)	1			
12	041-476	. . Resistor, fixed, composition, 1.2 meg, 1/2 w, ±5% (R10, R11) (MIL-R-11: RC20GF125J)	2			
13	041-245	. . Resistor, fixed, composition, 1000 k, 1/2 w, ±5% (R2, R12) (MIL-R-11: RC20GF102J)	2			
14	035-356	. . Capacitor, tubular, .1 uf, 400 vdc, ±5% (C5) (Gudeman #337E104J)	1			
15	034-184	. . Capacitor, mica, 300 pf, 500 vdc, ±5% (C7) (Elmenco #DM15F680J)	1			
16	034-199	. . Capacitor, mica, 300 pf, 500 vdc, ±5% (C2, C3, C4) (Elmenco #DM15F301J)	3			
17	041-318	. . Resistor, fixed, composition, 120 k, 1/2 w, ±5% (R4, R5, R6,) (MIL-R-11: RC20GF124J)	3			
18	035-355	. . Capacitor, tubular, .1 uf, 150 vdc, ±5% (C1) (Gudeman #337Y104J)	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-13-						
19	034-177	. . Capacitor, mica, 100 pf, 500 vdc, ±5% (C6) (Elmenco #DM15F101J)	1			
20	041-344	. . Resistor, fixed, composition, 39 k, 1/2 w, ±5% (R3) (MIL-R-11:RC20GF391J)	1			
21	041-016	. . Resistor, fixed, composition, 22 k, 1/2 w, ±5% (R9) (MIL-R-11:RC20GF223J)	1			
22	041-398	. . Resistor, fixed, composition, 2.2 meg, 1/2 w, ±5%, (R7) (MIL-R-11:RC20GF225J)	1			
23	31 01598 10	. . Card, printed wiring	1			
24	471-061	. Screw, machine, 4-40 NC-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35208-13)	2			
25	501-008	. Washer, #4 flat, stl cad plt (MS15795-204)	2			
26	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	2			
27	492-008	. Nut, plain hex, 4-40 NC-2B, stl cad plt (MS35649-42)	2			
28	168-008	. Connector, printed circuit board (P701) (Elco #5006-15-13-3-5-3/32) (See Figure 9-17)	Ref			
29	044-297	. Resistor, variable, 1 k, 2 w, w/mounting hardware (R701, R702) (Clarostat #43-1000) (See Figure 9-17)	Ref			
30	471-078	. Screw, machine, 8-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-40)	3			
31	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	3			
	31 01266 10	. Chassis Assembly, oscillator	1			
	31 01605 10	. . Plate Assembly, cover	1			
32	310-068	. . . Fastener, receptacle (Southco #81-18-150-16)	2			
33	431-009	. . . Retainer, external, stl cad plt (Southco #81-32-101-15)	2			
34	31 01795 10	. . . Gasket, rubber	1			
35	31 01794 10	. . . Plate, cover	1			
36	148-012	. . Jack, test point, red nylon, w/mounting hardware (TP701, TP702) (Cannon #45E2, Ucinite #118930-B)	2			
37	148-013	. . Jack, test point, black nylon, w/mounting hardware (TP703) (Cannon #45E3, Ucinite #118930-C)	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-13-						
38	471-061	. . Screw, machine, 4-40 NC-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35208-13)	6			
39	502-013	. . Washer, #4 lock, ext tooth, stl cad plt (MS35335-29)	6			
40	501-008	. . Washer, #4 flat, stl cad plt (MS15795-204)	6			
41	31 01606 10	. . Track, circuit board	2			
42	NO NUMBER	. . Chassis Assembly, oscillator, welded	1			

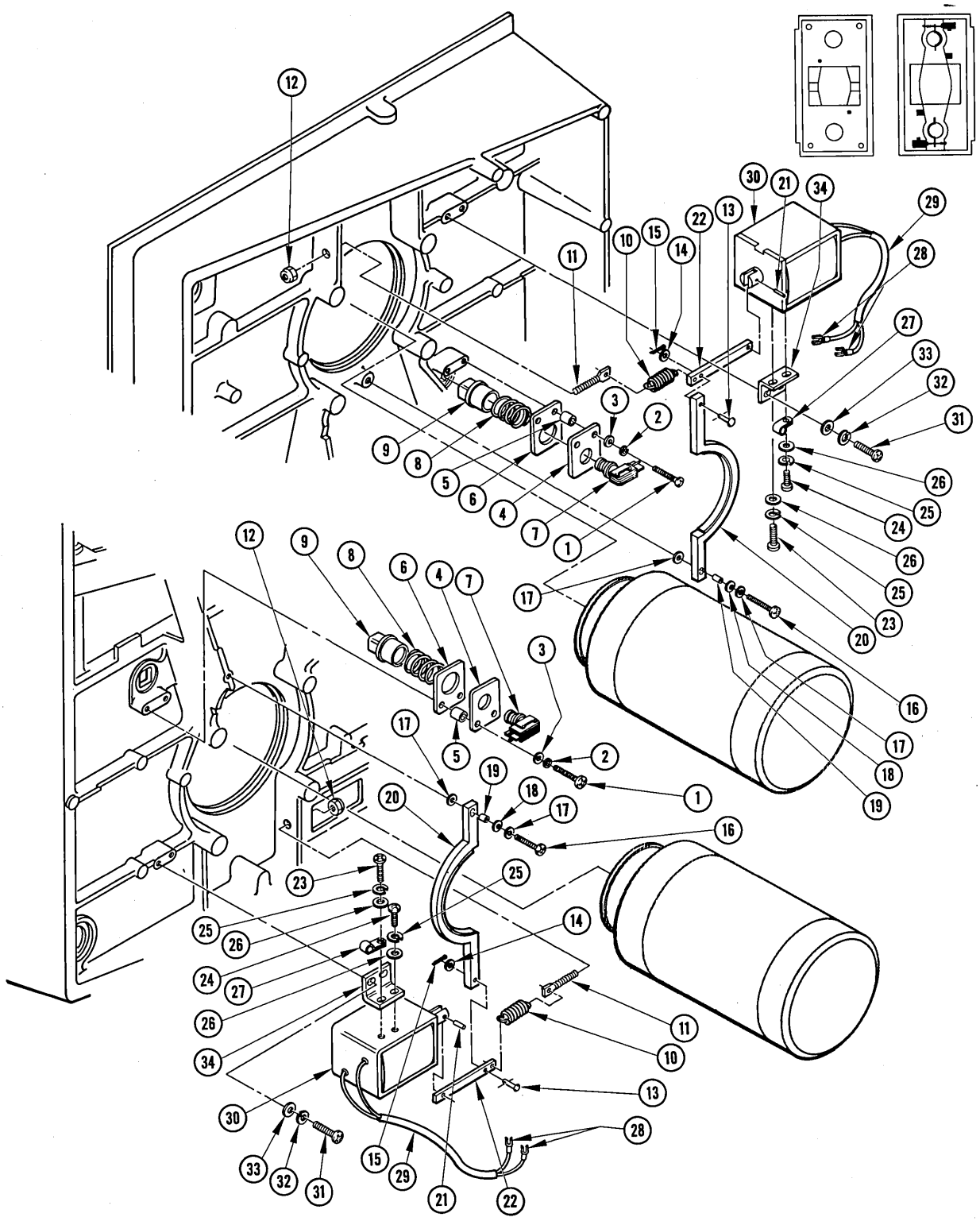

Figure 9-14
Reel Brakes

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-14-		REEL BRAKES				
	31 01105 10	Transport Assembly (See Figure 9-2)	Ref	A		
	31 01097 10	Transport Assembly (See Figure 9-2)	Ref	B		
	31 01107 10	Transport Assembly (See Figure 9-2)	Ref	C		
	31 01106 10	Transport Assembly (See Figure 9-2)	Ref	D		
1	471-047	. Screw, machine, 6-32 NC-2A by 7/8 in., pan hd Phillips, stl cad plt (MS35208-30)	4			
2	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	4			
3	501-009	. Washer, #6 flat, stl cad plt (MS15795-206)	4			
4	31 01272 10	. Plate, switch mounting	2			
5	31 01273 10	. Standoff, switch mounting	4			
6	31 01271 10	. Plate, switch mounting	2			
7	120-013	. Switch, pushbutton, supplied w/mounting hardware (Arrow H&H #3391EPA)	2			
8	31 01270 10	. Spring, button control	2			
9	31 01269 10	. Button Assembly, control	2			
10	31 01295 10	. Spring, helical	2			
11	31 00160 10	. Bolt, spade	2			
12	493-008	. Nut, self-locking, hex, 10-32 NF-3B, stl cad plt, nylon insert	2			
13	400-009	. Pin, clevis, pan hd, stl cad plt (MS20392-17)	2			
14	501-008	. Washer, #4 flat, stl cad plt (MS15795-204)	2			
15	401-005	. Pin, cotter, stl cad plt, 1/16 in. dia. by 1/2 in. lg.	2			
16	471-081	. Screw, machine, 8-32 NC-2A by 5/8 in., pan hd Phillips, stl cad plt (MS35208-43)	2			
17	501-010	. Washer, #8 flat, stl cad plt (MS15795-207)	4			
18	506-011	. Washer, cup (Shakeproof #3502-14-17)	2			
19	31 01276 10	. Spacer, brake shoe	2			
20	31 00106 10	. Shoe, reel brake	2			
21	406-026	. Pin, roll, sst (Esna #79-022-094-500)	4			
22	31 01275 10	. Link, solenoid	2			
23	471-076	. Screw, machine, 8-32 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-38)	2			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-14-						
24	471-027	. Screw, machine, 8-32 NC-2A by 5/16 in., pan hd Phillips, brass cad plt	2			
25	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	4			
26	501-010	. Washer, #8 flat, stl cad plt (MS15795-207)	4			
27	302-031	. Clamp, cable (Commercial Plastic #CPC742-3)	2			
	31 01233 10	. Solenoid and Cable Assembly, DC	2			
28	171-001	. . Connector, solderless (AMP #34541)	4			
29	600-010	. . Tubing, nonmetallic, #5, black (MIL-I-631)	2			
30	022-009	. . Solenoid, 24 vdc, plunger type	2			
31	471-080	. Screw, machine, 8-32 NC-2A by 1/2 in., pan hd Phillips, stl cad plt (MS35208-42)	4			
32	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	4			
33	501-010	. Washer, #8 flat, stl cad plt (MS15795-207)	4			
34	31 01292 10	. Bracket, mounting	2			

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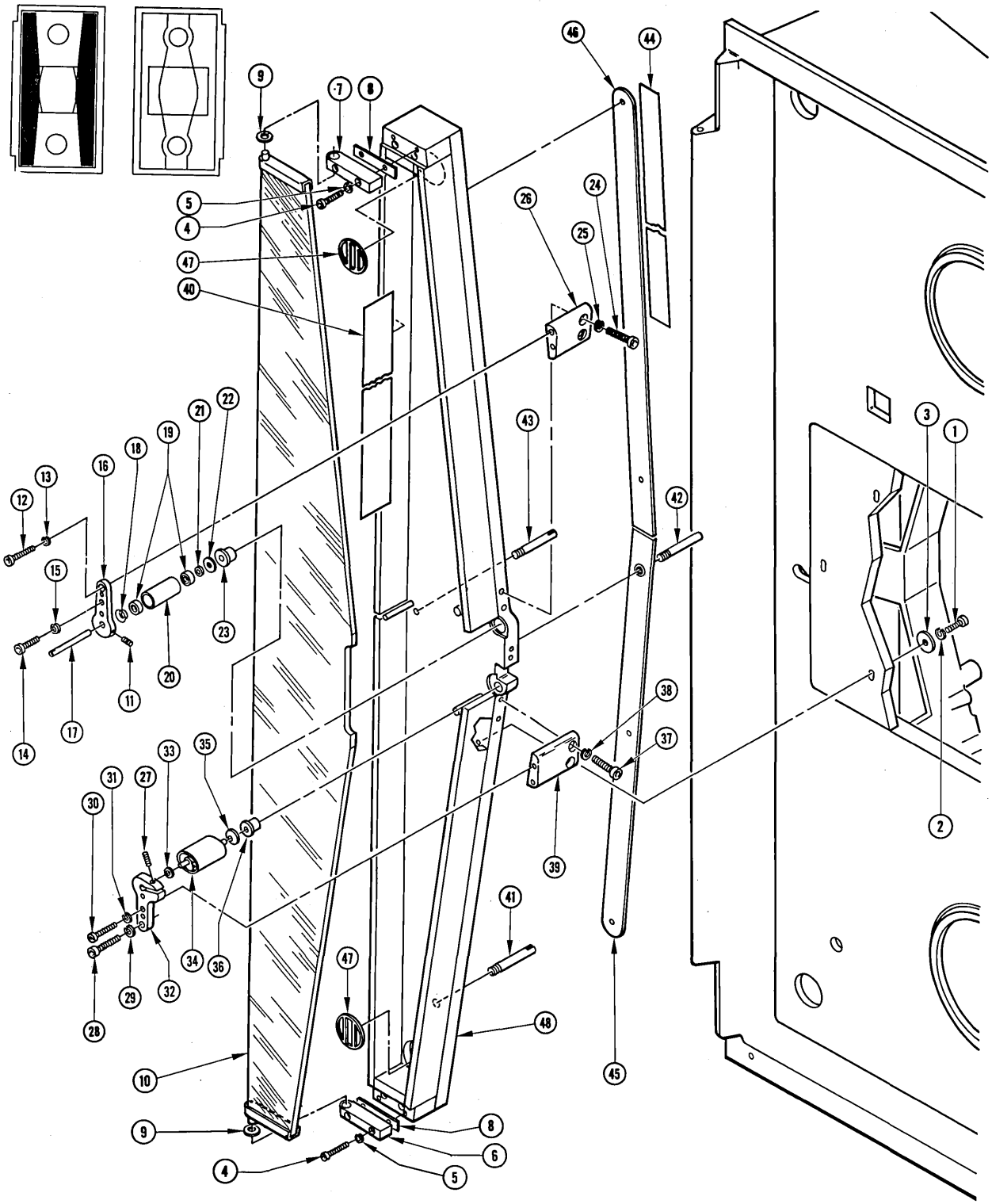

Figure 9-15
Vacuum Chambers

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-15-		VACUUM CHAMBERS				
	31 01105 10	Transport Assembly (See Figure 9-2)	Ref	A		
	31 01097 10	Transport Assembly (See Figure 9-2)	Ref	B		
	31 01107 10	Transport Assembly (See Figure 9-2)	Ref	C		
	31 01106 10	Transport Assembly (See Figure 9-2)	Ref	D		
1	470-175	. Screw, cap, 6-32 by 7/8 in., hex soc, w/nylon insert, stl, black oxide finish (Cleveland Cap)	6			
2	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-40)	6			
3	31 01326 10	. Washer, flat	6			
	31 01302 10	. Chamber Assembly, vacuum	2	A,C		
	31 01255 10	. Chamber Assembly, vacuum	2	B,D		
4	470-064	. . Screw, cap, 4-40 NC-3A by 5/8 in., hex sch, sst, passivated	4			
5	502-002	. . Washer, #4 spring lock, stl cad plt (MS35338-40)	4			
6	31 01483 10	. . Hinge, chamber door	1			
7	31 01484 10	. . Hinge, chamber door	1			
8	31 01521 10	. . Shim, chamber door hinge	A/R			
9	501-058	. . Washer, shim, brass, .025 in. ID by .375 in. OD by .010 in. thk (Tilley)	A/R			
10	31 01485 10	. . Door Assembly, chamber	1			
11	477-027	. . Screw, set, headless, 2-56 NC-3A by 3/16 in., hex soc, cup point, stl cad plt (MS51017-2)	1			
12	470-070	. . Screw, cap, 6-32 NC-3A by 7/16 in., hex sch, sst, passivated	1			
13	502-009	. . Washer, #6 spring lock, sst, passivated (MS35338-79)	1			
14	470-062	. . Screw, cap, 4-40 NC-3A by 7/16 in., hex sch, sst, passivated	1			
15	502-008	. . Washer, #4 spring lock, sst, passivated (MS35338-78)	1			
16	31 01513 10	. . Support, plate	1			
17	31 01519 10	. . Shaft, roller guide	1	A,C		
	31 01518 10	. . Shaft, roller guide	1	B,D		
18	506-017	. . Washer, .126/.130 in. ID by .235/.245 in. OD by .008 in. thk, beryllium copper (Shakeproof #3802-05-16-2114)	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-15-						
19	31 01520 10	. . Bearing, roller guide	2			
20	31 01512 10	. . Sleeve, roller guide	1	A,C		
	31 10511 10	. . Sleeve, roller guide	1	B,D		
21	31 01514 10	. . Spacer, roller guide	1			
22	501-034	. . Washer, flat, brass, .158 in. ID by .234 in. OD by .003 in. thk	A/R			
23	31 01515 10	. . Bushing, roller guide	1			
24	470-088	. . Screw, cap, 10-32 NF-3A by 7/16 in., hex sch, sst, passivated	2			
25	502-011	. . Washer, #10 spring lock, sst, passivated (MS35338-81)	2			
26	31 01517 10	. . Post, support, roller guide	1	A,C		
	31 01516 10	. . Post, support, roller guide	1	B,D		
27	470-054	. . Screw, cap, 2-56 NC-3A by 5/16 in., hex sch, sst, passivated	1			
28	470-070	. . Screw, cap, 6-32 NC-3A by 7/16 in., hex sch, sst, passivated	1			
29	502-009	. . Washer, #6 spring lock, sst, passivated (MS35338-79)	1			
30	470-062	. . Screw, cap, 4-40 NC-3A by 7/16 in., hex sch, sst, passivated	1			
31	502-008	. . Washer, #4 spring lock, sst, passivated (MS35338-78)	1			
32	31 01525 10	. . Plate, support, buffer guide	1			
33	31 01524 10	. . Spacer, buffer guide	1			
34	31 01501 10	. . Buffer Assembly, spring guide	1	A,C		
	31 01491 10	. . Buffer Assembly, spring guide	1	B,D		
35	501-122	. . Washer, .133/.143 in. ID by .297/.305 in. OD by .042/.062 in. thk, spring stl (Shakeproof #3502-05-03)	1			
36	31 01506 10	. . Bushing, buffer spring	1			
37	470-088	. . Screw, cap, 10-32 NF-3A by 7/16 in., hex sch, sst, passivated	2			
38	502-011	. . Washer, #10 spring lock, sst, passivated (MS35338-81)	2			
39	31 01527 10	. . Post, support, buffer guide	1	A,C		

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-15-						
	31 01526 10	. . Post, support, buffer guide	1	B,D		
40	31 01496 10	. . Discharger, electrostatic	2	B,D		
41	31 01492 10	. . Stud, hollow, long loop	1			
42	31 01493 10	. . Stud, hollow, transducer	1			
43	31 01509 10	. . Stud, hollow, short loop	1			
44	225-061	. . Tape, pressure sensitive, aluminized vinyl, 1 in. w (Minnesota Mining and Mfg #474)	A/R			
45	31 01487 10	. . Plate, cover	1			
46	31 01488 10	. . Plate, cover	1			
47	31 01490 10	. . Grille, vacuum chamber	2			
48	NO NUMBER	. . Base Assembly, vacuum chamber	1			

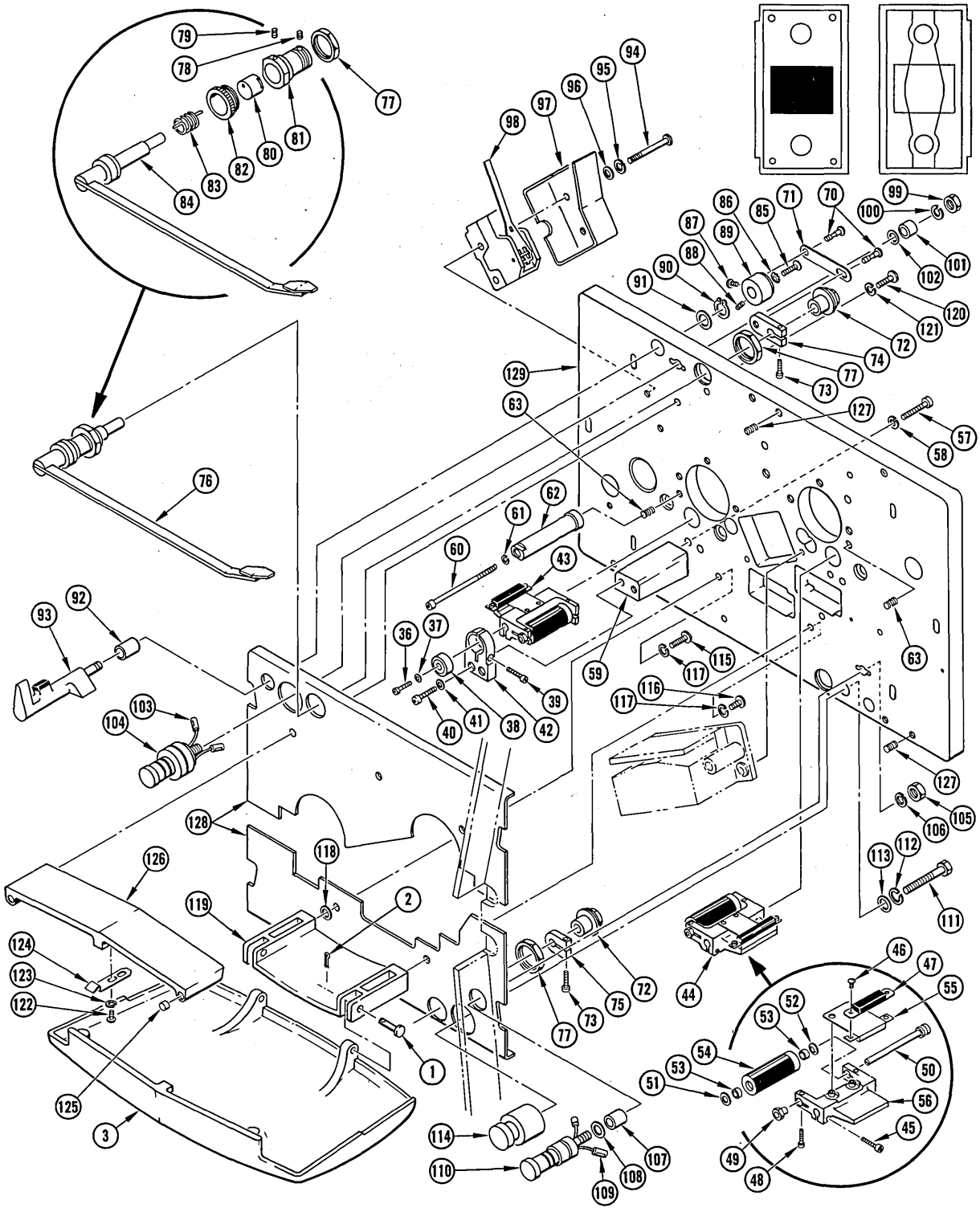

Figure 9-16
Precision Plate (sheet 1 of 2)

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-16-		PRECISION PLATE				
	31 01105 10	Transport Assembly (See Figure 9-2)	Ref	A		
	31 01097 10	Transport Assembly (See Figure 9-2)	Ref	B		
	31 01107 10	Transport Assembly (See Figure 9-2)	Ref	C		
	31 01106 10	Transport Assembly (See Figure 9-2)	Ref	D		
1	400-024	. Pin, clevis, pan hd, stl cad plt (MS20392-1-21)	2			
2	401-004	. Pin, cotter, 1/16 in. dia by 3/8 in. lg, sst	2			
3	31 01237 10	. Cover, tape mechanism	1	A,C		
	31 01238 10	. Cover, tape mechanism	1	B,D		
4	477-174	. Screw, set, headless, 10-32 by 3/8 in., hex soc, cup point, stl cad plt (Allen)	2			
5	31 01274 10	. Flywheel, capstan	1			
	31 01264 10	. Precision Plate Assembly	1	A,C		
	31 01259 10	. Precision Plate Assembly	1	B,D		
	31 01574 10	. . Pulley Assembly, capstan	1			
6	477-119	. . . Screw, set, headless, 10-32 NF-2A by 1/4 in., hex soc, cup point, sst w/nylon insert (Nylock)	2			
7	31 01783 10	. . . Pulley, capstan	2			
8	470-040	. . Screw, cap, 10-32 NF-3A by 3/4 in., hex sch, stl cad plt (MS35458-13)	6			
9	502-005	. . Washer, #10 spring lock, stl cad plt (MS35338-43)	6			
10	31 01125 10	. . Shim, capstan	2	A,C		
11	31 01554 10	. . Capstan Assembly	2			
12	430-124	. . . Ring, retaining, ext, 15/32, stl, unplated (Truarc #5101-46-S)	1			
13	31 01750 10	. . . Capstan	1			
14	432-032	. . . O Ring, synthetic rubber (Minnesota Rubber #MRQI-Q24)	1			
15	430-063	. . . Ring, retaining, int, 1-1/8, stl zinc plt (Truarc #5001-112S-ZD)	1			
16	430-165	. . . Ring, retaining, int, 1-1/8, stl cad plt (Spirolox #RR-112)	1			
17	421-086	. . . Bearing, ball, double shield (New Departure #773LO1X3E, MRC #101KS-FF)	2			

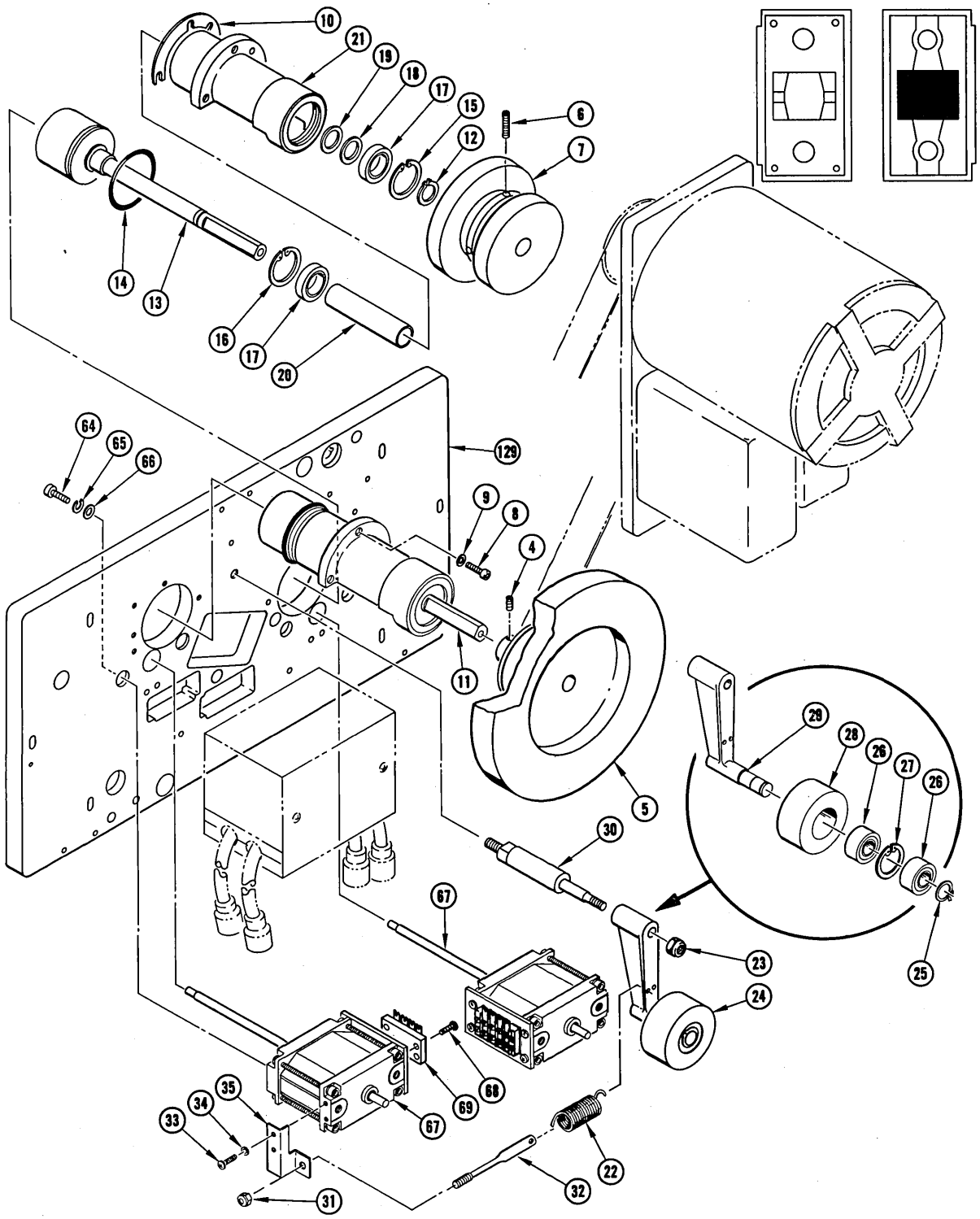

Figure 9-16
Precision Plate (sheet 2 of 2)

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-16-						
18	31 00389 10	. . . Washer, shim, flat, .005 in. thk.	A/R			
19	31 00390 10	. . . Washer, shim, flat, .003 in. thk.	A/R			
20	31 00392 10	. . . Spacer, sleeve	1			
21	31 01749 10	. . . Housing, capstan	1			
22	31 01295 10	. . Spring, helical, extension	1			
23	493-012	. . Nut, self-locking, hex, 1/4-20 NC-3B, stl cad plt w/nylon insert (Esna Type NM)	1			
24	31 01560 10	. . Roller Assembly	1			
25	430-111	. . . Ring, retaining, ext, 3/8, stl cad plt (Truarc #5101-37-S-MD)	1			
26	421-070	. . . Bearing, ball, double shield (MRC #R6ZZ)	2			
27	430-085	. . . Ring, retaining, int, 7/8, stl cad plt (Truarc # N5000-87-S-MD)	1			
28	31 01769 10	. . . Roller, drive belt	1			
29	31 01768 10	. . . Arm, idler	1			
30	31 01559 10	. . Stud, shouldered	1			
31	493-008	. . Nut, self-locking, hex,10-32 NF-3B, stl cad plt w/nylon insert (Esna Type NM)	1			
32	31 01561 10	. . Bolt, eye	1			
33	471-068	. . Screw, machine, 6-32 NC-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35208-24)	2			
34	502-003	. . Washer, #6 spring lock, stl cad plt (MS35338-41)	2			
35	31 01562 10	. . Bracket, anchor	1			
36	470-177	. . Screw, cap, 4-40 by 3/8 in., hex soc, stl cad plt w/nylon insert (Nylock #M60HS440-6C)	2			
37	501-014	. . Washer, #4 flat, sst, passivated (MS15795-304)	2			
38	31 01558 10	. . Bushing Assembly, rubber	2			
39	470-176	. . Screw, cap, 4-40 by 9/16 in., hex soc, stl cad plt w/nylon insert (Nylock #M60HS440-9C)	2			
40	470-167	. . Screw, cap, 4-40 NC-2A by 7/16 in., hex soc, sst, passivated	4			
41	502-008	. . Washer, #4 spring lock, sst, passivated (MS35338-78)	4			
42	31 01570 10	. . Arm, actuator shaft support	2			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-16-						
43	31 01557 10	. . Pinch Roller Assembly, forward	1			
44	31 01556 10	. . Pinch Roller Assembly, reverse	1			
45	470-177	. . . Screw, cap, 4-40 by 3/8 in., hex soc, stl cad plt w/nylon insert (Nylock #M60HS440-6C)	2			
46	471-866	. . . Screw, machine, 2-56 by 1/8 in., pan hd Phillips, stl cad plt w/nylon insert (Nylock #M37AS256-2C)	2			
47	31 01760 10	. . . Pad Assembly, tape brake	1			
48	471-178	. . . Screw, cap, 2-56 by 7/16 in., hex soc, stl cad plt w/nylon insert (Nylock #M60HS256-7C)	2			
49	31 01838 10	. . . Sleeve, flanged, pinch roller	1			
50	31 01764 10	. . . Shaft Assembly, pinch roller	1			
51	31 01833 10	. . . Spacer, bearing	1			
52	501-119	. . . Washer, #5, beryllium copper (Shakeproof)	1			
53	31 01782 10	. . . Bearing, ball	2			
54	31 01765 10	. . . Pinch Roller	1			
55	31 01761 10	. . . Brake Assembly, Tape	1			
56	31 01762 10	. . . Yoke Assembly, forward	1			
	31 01763 10	. . . Yoke Assembly, reverse	1			
57	470-031	. . Screw, cap, 8-32 NC-3A by 3/4 in., hex sch, stl cad plt (MS35457-17)	4			
58	502-004	. . Washer, #8 spring lock, stl cad plt (MS35338-42)	4			
59	31 01571 10	. . Post, actuator shaft support	2			
60	31 01586 10	. . Screw, cap, sch, 8-32 NC-2A by 2-1/4 in., sst	2			
61	502-004	. . Washer, #8 spring lock, stl cad plt (MS35338-42)	2			
62	31 01569 10	. . Post, tape brake	2			
63	495-014	. . Insert, notched, 8-32, sst (Helicoil #1185-2CNX.246)	2			
64	470-029	. . Screw, cap, 8-32 NC-3A by 1/2 in., hex sch, stl cad plt (MS35457-15)	4			
65	502-004	. . Washer, #8 spring lock, stl cad plt (MS35338-42)	4			
66	501-010	. . Washer, #8 flat, stl cad plt (MS15795-207)	4			
67	31 01555 10	. . Actuator Assembly, pinch roller	2			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-16-						
68	471-690	. . . Screw, machine, 4-40 NC-2A by 3/8 in., slotted fillister hd, brass cad plt	4			
69	180-080	. . . Terminal Strip, 4 terminals, phenolic (Kulka #410-3/4 ST-4M)	1			
70	31 01591 10	. . Screw, shoulder	2			
71	31 01592 10	. . Link, tape packer	1			
72	310-067	. . Cam Assembly, adjustable (Pic Design Corp #P1-8)	2			
73	470-010	. . Screw, cap, 4-40 NC-3A by 3/8 in., hex sch, stl cad plt (MS35457-2)	2			
74	65499-1	. . Arm, release, tape packer	1			
75	69308-1	. . Clamp, tape packer	1			
76	65448-2	. . Tape Packer Assembly	2	A, C		
	65448-1	. . Tape Packer Assembly	2	B, D		
77	65480-1	. . . Nut, shaft, tape packer	1			
78	477-122	. . . Screw, set, headless, 4-40 NC-2A by 1/8 in., hex soc, cup point, sst (Bristol)	1			
79	477-130	. . . Screw, set, headless, 4-40 NC-3A by 1/8 in., hex soc, cone point, stl cad plt (MS51034-8)	1			
80	68542-1	. . . Bearing, rear	1			
81	65447-1	. . . Housing, pivot	1			
82	68543-1	. . . Thumbscrew	1			
83	65483-1	. . . Spring	1			
84	65446-2	. . . Arm Assembly, tape packer	1	A, C		
	65446-1	. . . Arm Assembly, tape packer	1	B, D		
85	471-337	. . Screw, machine, 6-32 NC-2A by 7/16 in., 82° flat hd Phillips, stl cad plt (MS35192-26)	1			
86	502-035	. . Washer, #6 lock, ext csk, stl cad plt (MS35336-9)	1			
87	471-634	. . Screw, machine, 4-40 NC-2A by 5/16 in., binder hd slotted, stl cad plt	1			
88	477-031	. . Screw, set, headless, 4-40 NC-3A by 1/4 in., hex soc, cup point, stl cad plt (MS51017-11)	1			
89	65481-1	. . Pulley, clamp, tape packer	1			
90	430-130	. . Ring, retaining, ext, 1/4, sst (Truarc #5101-25W)	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-16-						
91	501-025	. . Washer, 1/4 flat, stl cad plt (AN960-416L)	1			
92	423-012	. . Bushing, plain sleeve, bronze (Bost-Bronze #B-46-4)	1			
93	31 01573 10	. . Clamp, tape	1	A,C		
	31 01572-10	. . Clamp, tape	1	B,D		
94	471-772	. . Screw, machine, 4-40 NC-2A by 1 in., pan hd Phillips, stl cad plt (MS35208-20)	2			
95	502-002	. . Washer, #4 spring lock, stl cad plt (MS35338-40)	2			
96	501-008	. . Washer, #4 flat, stl cad plt (MS15795-204)	2			
97	31 01597 10	. . Shield, switch	1			
98	120-062	. . Switch, sensitive, spdt, 20 amp (Unimax #2HBT215-1	1			
99	492-010	. . Nut, plain hex, 8-32 NC-2B, stl cad plt (MS35649-82)	1			
100	502-004	. . Washer, #8 spring lock, stl cad plt (MS35338-42)	1			
101	31 01589 10	. . Spacer	1			
102	503-013	. . Washer, nonmetallic, #8 (General Cement #6526)	1			
103	171-009	. . Connector, solderless, corrosion resistant (AMP #320555)	2			
104	31 01564 10	. . Guide Assembly, insulated	1	A,C		
	31 01563 10	. . Guide Assembly, insulated	1	B,D		
105	492-010	. . Nut, plain hex, 8-32 NC-2B, stl cad plt (MS35649-82)	1			
106	502-004	. . Washer, #8 spring lock stl cad plt (MS35338-42)	1			
107	31 01589 10	. . Spacer	1			
108	503-013	. . Washer, nonmetallic, #8 (General Cement #6526)	1			
109	171-009	. . Connector, solderless, corrosion resistant (AMP #320555)	1			
110	65568-1	. . Guide Assembly, auxiliary, tape sensor	1	A,C		
	65568-2	. . Guide Assembly, auxiliary,tape sensor	1	B,D		
111	480-004	. . Bolt, machine, 10-32 NF-3A by 29/32 in., stl cad plt (AN3-7A)	1			
112	502-005	. . Washer, #10 spring lock, stl cad plt (MS35338-43)	1			
113	501-005	. . Washer, #10 flat, brass cad plt (AN960B)	1			
114	65490-2	. . Guide, transport	1	A,C		

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-16-						
	65490-1	. . Guide, transport	1	B,D		
115	471-074	. . Screw, machine, 6-32 NC-2A by 7/8 in., pan hd Phillips, stl cad plt (MS35208-30)	1			
116	471-072	. . Screw, machine, 6-32 NC-2A by 5/8 in., pan hd Phillips, stl cad plt (MS35208-28)	1			
117	502-003	. . Washer, #6 spring lock, stl cad plt (MS35338-41)	2			
118	501-009	. . Washer, #6 flat, stl cad plt (MS15795-206)	2			
119	31 01579 10	. . Bracket, hinge	1			
120	471-074	. . Screw, machine, 6-32 NC-2A by 7/8 in., pan hd Phillips, stl cad plt (MS35208-30)	3			
121	502-003	. . Washer, #6 spring lock, stl cad plt (MS35338-41)	3			
122	471-059	. . Screw, machine, 4-40 NC-2A by 3/16 in., pan hd Phillips, stl cad plt (MS35208-11)	2			
123	502-002	. . Washer, #4 spring lock, stl cad plt (MS35338-40)	2			
124	31 01585 10	. . Latch, spring	1			
125	31 01455 10	. . Bumper, head cover	2			
126	31 01584 10	. . Bracket, tape mechanism cover	1			
127	495-010	. . Insert, notched, 10-32, sst (Helicoil #1191-3CNX.285)	4			
128	31 01551 10	. . Plate, overlay	1			
129	31 01549 10	. . Plate, precision	1			

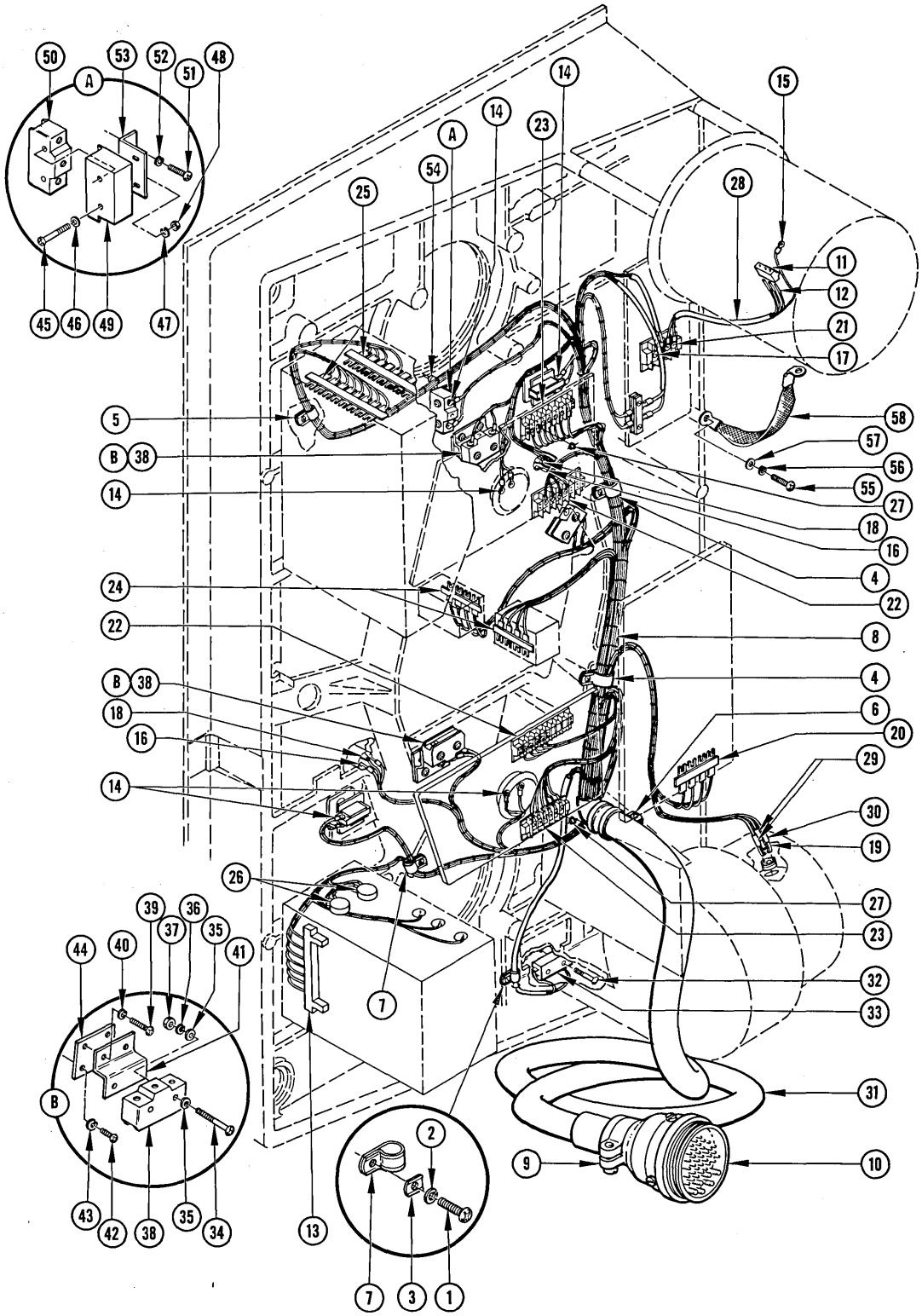

Figure 9-17
Cable, Switches, Vacuum Tubing, and Main Frame (sheet 1 of 2)

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-17-		CABLE, SWITCHES, VACUUM TUBING, AND MAIN FRAME				
	31 01105 10	Transport Assembly (See Figure 9-2)	Ref	A		
	31 01097 10	Transport Assembly (See Figure 9-2)	Ref	B		
	31 01107 10	Transport Assembly (See Figure 9-2)	Ref	C		
	31 01106 10	Transport Assembly (See Figure 9-2)	Ref	D		
1	471-069	. Screw, machine, 6-32 NC-3A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-25)	6			
2	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	6			
3	506-013	. Washer, cable clamp (Weckesser #D-140)	6			
4	302-049	. Clamp, cable, 1/2 in. (Commercial Plastic #742-8)	2			
5	302-007	. Clamp, cable, 1/4 in. (Commercial Plastic #742-4)	1			
6	302-013	. Clamp, cable, 5/8 in. (Commercial Plastic #742-10)	1			
7	302-058	. Clamp, cable, 1/8 in. (Commercial Plastic #742-2)	2			
8	31 01257 10	. Cable Assembly	1			
9	302-002	. . Clamp, cable, w/bushing (AN3057-16A)	1			
10	145-171	. . Connector, plug, male, 53 contact (P301) (Cannon #RLK-53-22-1)	1			
11	169-050	. . Connector, cable cap, 3 contact (P702) (AMP #480178-1)	1			
12	169-012	. . Connector, contact pin (AMP #42641-1)	3			
13	168-008	. . Connector, printed circuit board (P701) (Elco #5006-15-13-3-5-3/32)	1			
14	171-005	. . Connector, solderless, lug, ring tongue, for #6 stud (AMP #31879)	18			
15	171-007	. . Connector, solderless, lug, ring tongue, for #10 stud (AMP #31900)	1			
16	171-008	. . Connector, solderless, knife splice (AMP #31777)	4			
17	171-044	. . Connector, solderless, lug, ring tongue, for #5 or #6 stud (AMP #32442)	2			
18	172-006	. . Connector, solder, lug, plain, 1/4 in. ID (Zierick #29A)	2			
19	172-039	. . Connector, solder, lug, ring tongue, for #2 stud (Zierick #101-HBT)	3			
20	180-115	. . Terminal Strip, fanning strip, 4 lugs (FS707) (Jones #4-160-L)	1			

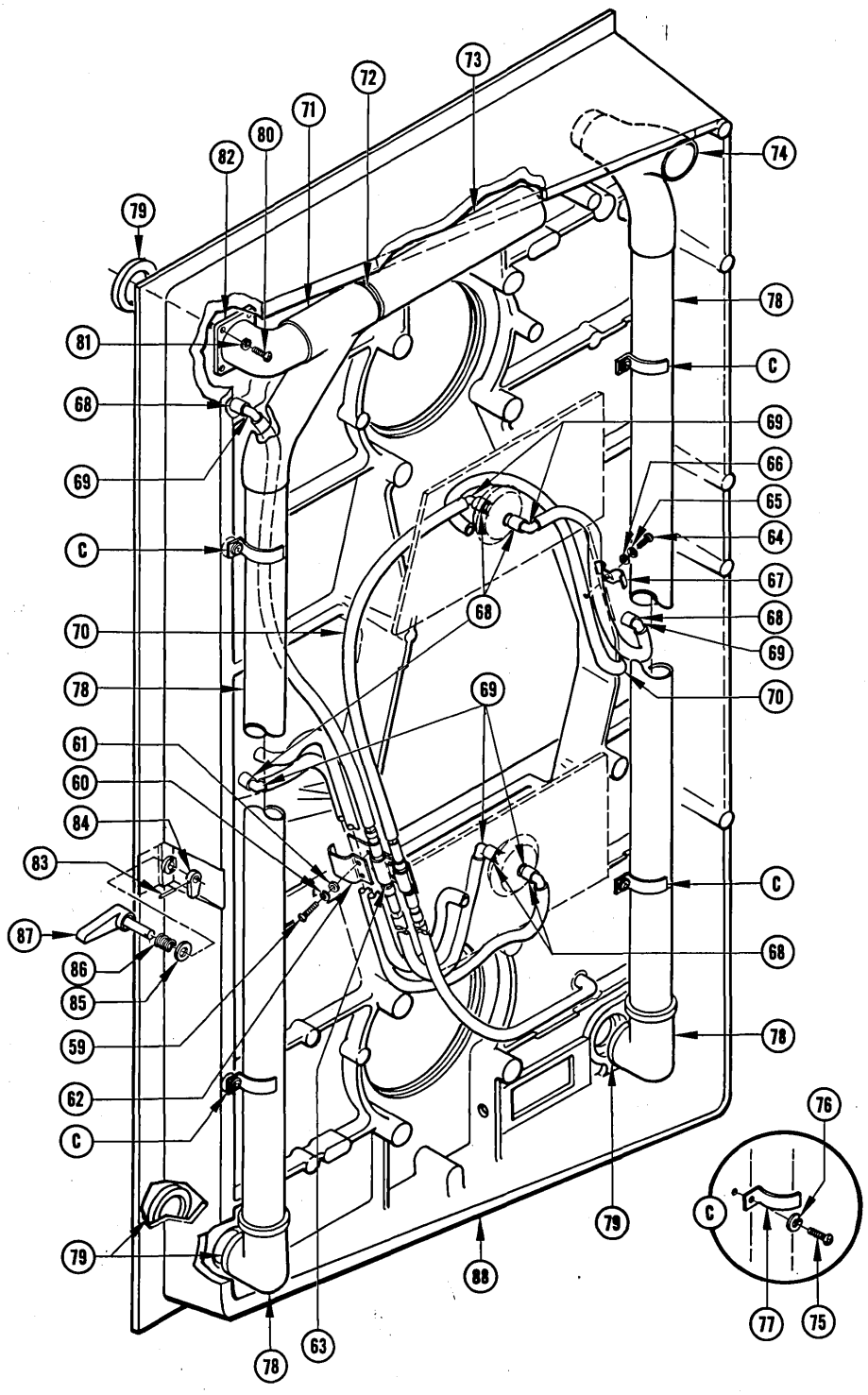

Figure 9-17
Cable, Switches, Vacuum Tubing, and Main Frame (sheet 2 of 2)

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-17-						
21	180-119	. . Terminal Strip, barrier, 4 terminal, w/marker strip (TB709) (Kulka #600-3/4ST-4)	1			
22	180-116	. . Terminal Strip, barrier strip, 8 terminal, w/marker strip (TB701, TB702) (Kulka #410-3/4ST-8MFE)	2			
23	180-117	. . Terminal Strip, barrier strip, 7 terminal, w/marker strip (TB703, TB706) (Kulka #600-3/4ST-7)	2			
24	31 00640 10	. . Terminal Strip, fanning strip, 4 terminal (FS704, FS705)	2			
25	31 01443 10	. . Terminal Strip, fanning strip, 8 lug (FS3, FS4)	2			
26	044-297	. . Resistor, variable, wirewound, 1 k, 2 w, linear taper (R701, R702) (Clarostat #43-1000)	2			
27	013-139	. . Diode, silicon (CR706, CR707) (Texas Instrument #1N2069)	2			
28	600-008	. . Tubing, electrical, insulating, #3 black	A/R			
29	600-025	. . Tubing, electrical, insulating, #10 black	A/R			
30	600-014	. . Tubing, electrical, insulating, #8 black	A/R			
31	600-108	. . Tubing, electrical, insulating, 3/4 in. ID black	A/R			
32	471-333	. Screw, machine, 6-32 NC-3A by 3/16 in., flat hd Phillips, stl cad plt (MS35192-22)	2			
33	120-058	. Switch, cabinet interlock (S708) (Microswitch #3AC5)	1			
34	471-772	. Screw, machine, 4-40 NC-2A by 1 in., pan hd Phillips, stl cad plt (MS35208-20)	4			
35	501-008	. Washer, #4 flat, stl cad plt (MS15795-204)	8			
36	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	4			
37	492-008	. Nut, plain hex, 4-40 NC-2B, stl cad plt (MS35649-42)	4			
38	120-103	. Switch, tape packer, roller lever, spdt (S711, S712) (Microswitch #BZ-RW922-A2)	2			
39	471-068	. Screw, machine, 6-32 NC-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35208-24)	4			
40	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	4			
41	31 01317 10	. Bracket, tape packer switch	2			
42	471-060	. Screw, machine, 4-40 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-12)	4			
43	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	4			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-17-						
44	31 01316 10	. Plate, tape packer switch	2			
45	471-075	. Screw, machine, 6-32 NC-2A by 1 in., pan hd Phillips, stl cad plt (MS35208-31)	2			
46	501-009	. Washer, #6 flat, stl cad plt (MS15795-206)	2			
47	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	2			
48	492-009	. Nut, plain hex, 6-32 NC-2B, stl cad plt (MS35649-62)	2			
49	31 01334 10	. Shield, write enable switch	1			
50	120-118	. Switch, write enable, rigid leaf actuator (S710) (Microswitch #BZ-RW80-A2)	1			
51	471-067	. Screw, machine, 6-32 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-23)	2			
52	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	2			
53	31 01294 10	. Bracket, write enable switch mounting	1			
54	31 01288 10	. Plunger, record lockout	1			
55	471-089	. Screw, machine, 10-32 NF-3A by 1/2 in., pan hd Phillips, stl cad plt (MS35209-55)	1			
56	502-005	. Washer, #10 spring lock, stl cad plt (MS35338-43)	1			
57	501-011	. Washer, #10 flat, stl cad plt (MS15795-208)	1			
58	31 01301 10	. Strap, ground	1			
59	471-061	. Screw, machine, 4-40 NC-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35208-13)	2			
60	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	2			
61	501-008	. Washer, #4 flat, stl cad plt (MS15795-204)	2			
62	31 01331 10	. Clip, retainer, vacuum tubing	1			
63	31 01332 10	. Vacuum Test Assembly	1			
64	471-069	. Screw, machine, 6-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-25)	1			
65	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	1			
66	501-009	. Washer, #6 flat, stl cad plt (MS15795-206)	1			
67	31 01330 10	. Clip, retainer, vacuum tubing	1			
68	31 01328 10	. Tubing, nonmetallic	7			
69	31 01329 10	. Fitting, 90° elbow	7			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-17-						
70	600-107	. Tubing, nonmetallic, 3/16 in. ID by 1/16 in. thk wall, black (Tygon #R3400)	A/R			
71	31 01279 10	. Tee, rubber	1			
72	31 01286 10	. Duct, straight	1			
73	31 01308 10	. Tubing, tapered	1			
74	31 01278 10	. Tee, rubber	1			
75	471-078	. Screw, machine, 8-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-40)	4			
76	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	4			
77	31 01287 10	. Clip, tube	4			
78	31 01256 10	. Piping Assembly, vacuum	2			
79	31 01290 10	. Gasket	6			
80	471-069	. Screw, machine, 6-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-25)	4			
81	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	4			
82	31 01293 10	. Duct, flanged elbow	1			
83	406-026	. Rollpin, sst (Esna #79-022-094-500)	1			
84	31 01281 10	. Latch	1			
85	501-025	. Washer, 1/4 in. flat, stl cad plt (AN960-416L)	1			
86	31 01291 10	. Spring, latch	1			
87	31 01280 10	. Latch Handle Assembly	1			
88	31 01230 10	. Frame Finishing Assembly	1			

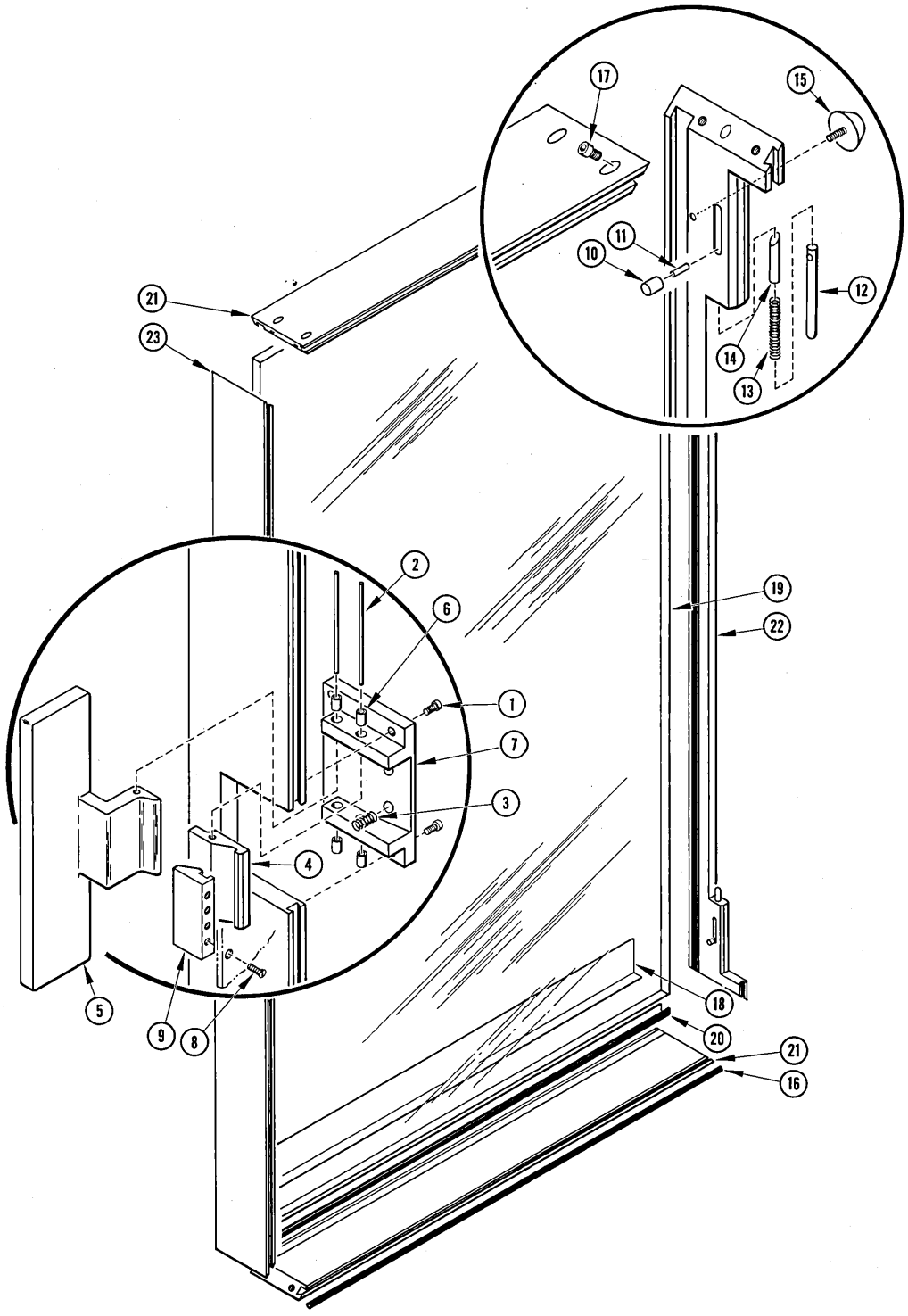

Figure 9-18
Transport Access Door

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-18-		TRANSPORT ACCESS DOOR				
	31 01076 10	Door Assembly, transport cover (See Figure 9-2)	Ref	R		
	31 01077 10	Door Assembly, transport cover, w/Model No. (See Figure 9-2)	Ref	S		
	31 01075 10	Door Assembly, transport cover, w/Model No. and Ampex identification (See Figure 9-2)	Ref	T		
1	470-059	. Screw, cap, 4-40 NC-3A by 1/4 in., hex sch, sst, passivated	4			
2	402-022	. Pin, dowel, stl, .1252 dia by 2 in. lg (Davley #7-0432-1)	2			
3	31 01194 10	. Spring, latch	2			
4	31 01192 10	. Latch	1			
5	31 01193 10	. Handle, hook	1			
6	423-032	. Bushing, sleeve, plain, bronze (Chrysler Amplex #AA-110-2)	4			
7	31 01190 10	. Plate, latch	1			
8	471-372	. Screw, machine, 2-56 NC-2A by 1/4 in., 82° flat slotted hd, sst, passivated (MS35249-3)	4			
9	31 01199 10	. Strike	1			
10	31 01187 10	. Knob	2			
11	406-028	. Rollpin, sst (Esna #79-022-094-0562)	2			
12	31 01186 10	. Pin, hinge	2			
13	31 01185 10	. Spring, hinge	2			
14	31 01184 10	. Stop, spring	2			
15	250-023	. Bumper, neoprene, 3/8-16 thd by 3/8 in. (Rubbercraft #3066)	2			
16	269-090	. Molding, rubber (Rubbercraft #1124)	A/R			
17	470-076	. Screw, cap, 8-32 NC-3A by 1/4 in., hex sch, stl cad plt	8			
18	31 01191 10	. Identification Plate, w/Model No. (used on 31 01077 10)	1	S		
	31 01189 10	. Identification Plate, w/Model No. and Ampex identification (used on 31 01075 10)	1	T		
19	31 01188 10	. Glass, transport door	1			
20	225-064	. Tape, glazing, pressure sensitive one side (Everseal #916)	A/R			
21	31 01181 10	. Strip, top and bottom	2			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-18-						
22	31 01182 10	. Strip, hinge side	1			
23	31 01183 10	. Strip, latch side	1			

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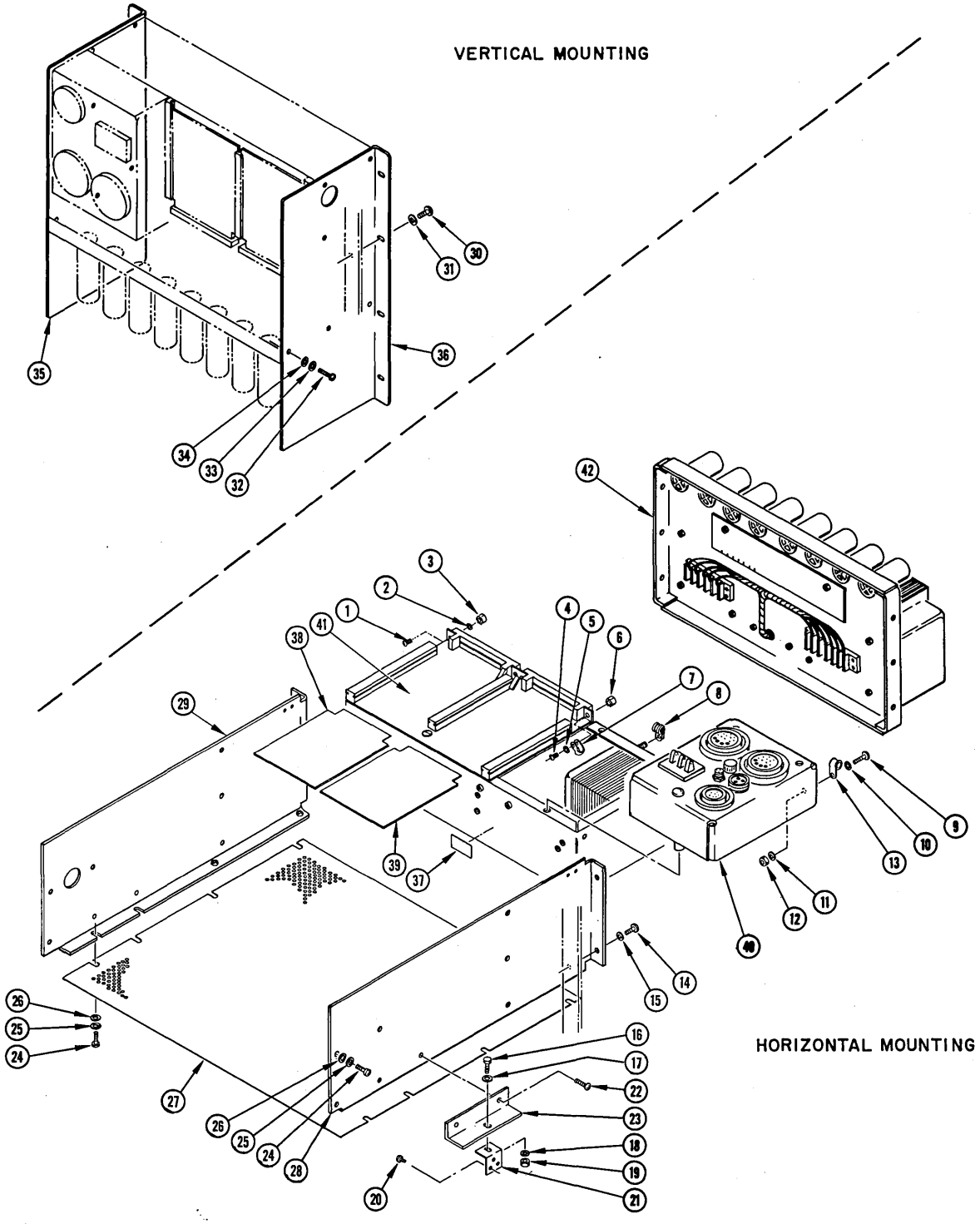

Figure 9-19
Transport Electronics Assembly

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-19-		TRANSPORT ELECTRONICS ASSEMBLY				
	31 01110 10	Control Assembly, Power Supply (horizontal mounting) (See Figure 9-2)	Ref	E		
	31 01112 10	Control Assembly, Power Supply (vertical mounting) (See Figure 9-2)	Ref	F		
1	471-060	. Screw, machine, 4-40 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-12)	3			
2	501-008	. Washer, #4 flat, stl cad plt (MS15795-204)	3			
3	496-004	. Nut, keps, 4-40 NC-2B, ext tooth washer, stl cad plt (Shakeproof)	3			
4	471-064	. Screw, machine, 4-40 NC-2A by 1/2 in., pan hd Phillips, stl cad plt (MS35208-16)	1			
5	501-008	. Washer, #4 flat, stl cad plt (MS15795-204)	1			
6	496-004	. Nut, keps, 4-40 NC-2B, ext tooth washer, stl cad plt (Shakeproof)	1			
7	302-076	. Clamp, cable, black nylon (Weckesser Type 6)	1			
8	302-026	. Clamp, cable, loop type, w/rubber cushion (AN742D-10C)	1			
9	471-079	. Screw, machine, 8-32 NC-2A by 7/16 in., pan hd Phillips, stl cad plt (MS35208-41)	1			
10	501-010	. Washer, #8 flat, stl cad plt (MS15795-207)	1			
11	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	1			
12	492-010	. Nut, plain hex, 8-32 NC-2B, stl cad plt (MS35649-82)	1			
13	302-029	. Clamp, cable, loop type, w/rubber cushion (AN742D-14C)	1			
14	471-463	. Screw, machine, 12-24 NC-2A by 3/8 in., pan hd Phillips, stl cad plt	4	E		
15	502-049	. Washer, #12 spring lock, stl cad plt	4	E		
*16	471-688	. Screw, machine, 1/4-20 UNC-2A by 5/8 in., hex hd, stl cad plt	2	E		
*17	501-012	. Washer, 1/4 flat, stl cad plt (AN960-416)	4	E		
*18	502-006	. Washer, 1/4 spring lock, stl cad plt (MS35338-44)	2	E		
*19	492-012	. Nut, plain hex, 1/4-20 UNC-2B, stl cad plt (MS35690-42)	2	E		
*20	476-064	. Screw, self-tapping, 10-32 by 3/8 in., binder hd Phillips, stl cad plt (Parker Kalon)	6	E		
		*Index numbers 16 thru 23 are for shipping purposes.				

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-19-						
*21	31 01361 10	. Bracket, mounting	2	E		
*22	471-090	. Screw, machine, 10-32 NF-2A by 5/8 in., pan hd Phillips, stl cad plt (MS35209-56)	4	E		
*23	31 01362 10	. Bracket, angle	2	E		
24	471-089	. Screw, machine, 10-32 NF-3A by 1/2 in., pan hd Phillips, stl cad plt (MS35209-55)	18	E		
25	502-005	. Washer, #10 spring lock, stl cad plt (MS35338-43)	18	E		
26	501-011	. Washer, #10 flat, stl cad plt (MS15795-208)	18	E		
27	31 01360 10	. Cover, perforated	1	E		
28	31 01352 10	. Bracket, angle, rack mounting, horizontal	1	E		
29	31 01353 10	. Bracket, angle, rack mounting, horizontal	1	E		
30	471-463	. Screw, machine, 12-24 NC-2A by 3/8 in., pan hd Phillips, stl cad plt	8	F		
31	502-049	. Washer, #12 spring lock, stl cad plt	8	F		
32	471-089	. Screw, machine, 10-32 NF-3A by 1/2 in., pan hd Phillips, stl cad plt (MS35209-55)	10	F		
33	502-005	. Washer, #10 spring lock, stl cad plt (MS35338-43)	10	F		
34	501-011	. Washer, #10 flat, stl cad plt (MS15795-208)	10	F		
35	31 01355 10	. Bracket, angle, vertical mounting	1	F		
36	31 01354 10	. Bracket, angle, vertical mounting	1	F		
37	31 00249 10	. Identification Plate	1			
38	31 01349 10	. Servo Amplifier Assembly (SA-500) (See Figure 9-24)	1			
39	31 01346 10	. Actuator Board Assembly (AC-400) (See Figure 9-23)	1			
40	31 01344 10	. Chassis Assembly (CC-300) (See Figure 9-22)	1			
41	31 01338 10	. Power Supply Assembly (PS-100) (See Figure 9-20)	1			
42	31 01341 10	. Power Supply Assembly, Servo Motor (PS-200) (See Figure 9-21)	1			
		*Index numbers 16 thru 23 are for shipping purposes.				

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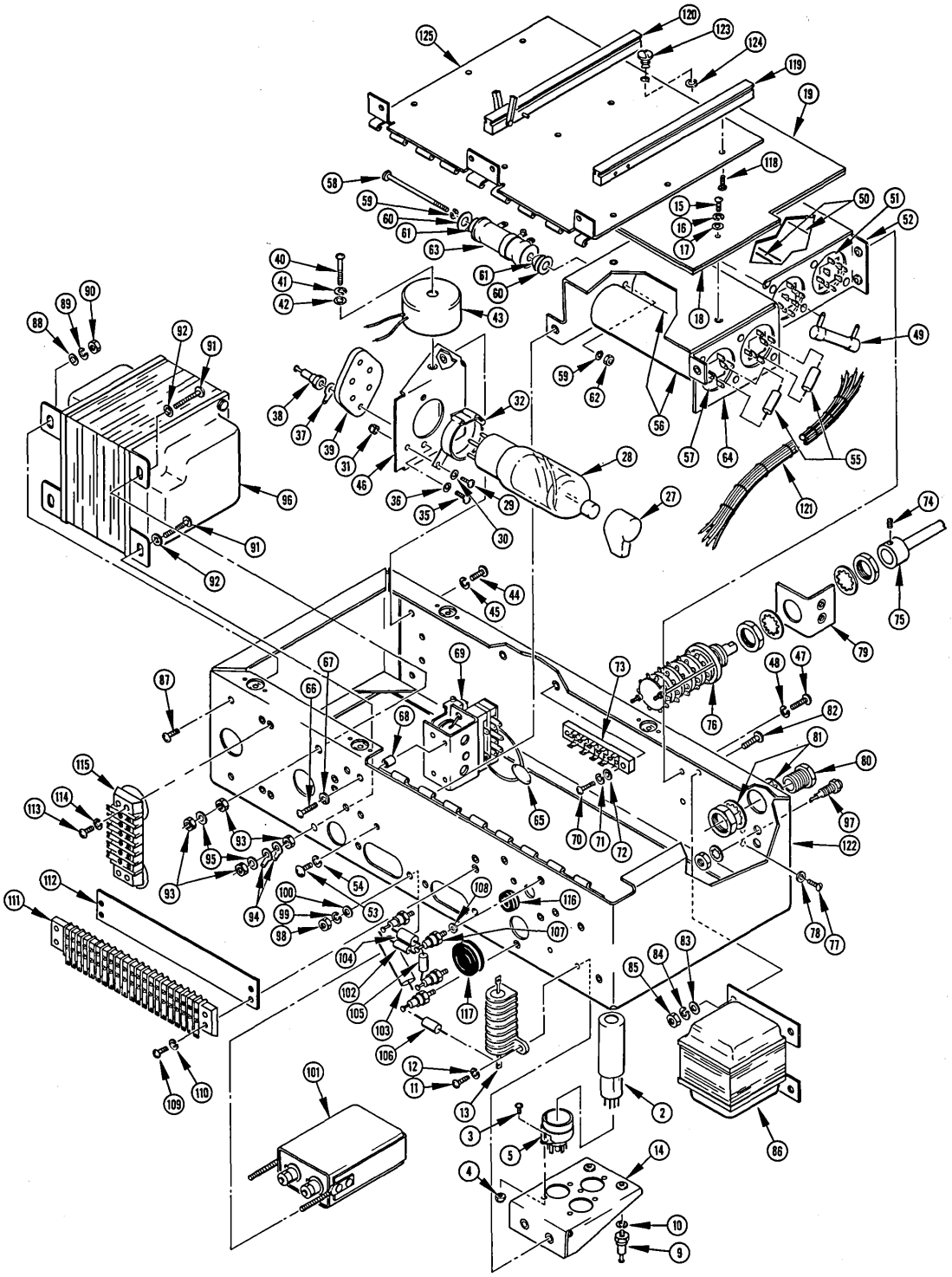
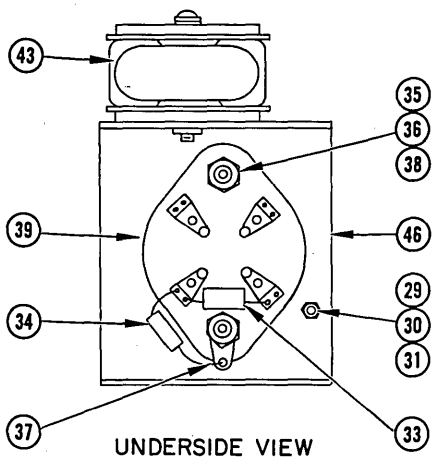
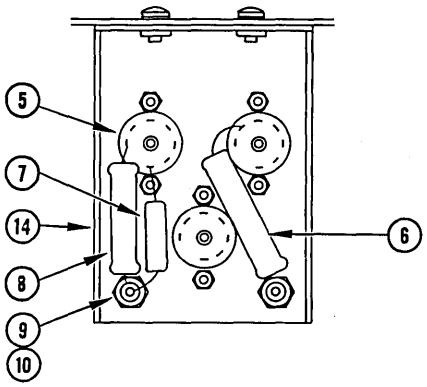


Figure 9-20
Electronics Power Supply PS-100 (sheet 1 of 2)

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-20-		ELECTRONIC POWER SUPPLY (PS-100)				
	31 01338 10	Power Supply Assembly (PS-100) (See Figure 9-19)	Ref			
1	160-009	. Shield, tube (JAN: TS102U03)	3			
2	011-004	. Tube, voltage regulator, 150 vdc (V101, V102, V103) (RCA, Raytheon, Sylvania #OA2)	3			
3	471-060	. Screw, machine, 4-40 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-12)	6			
4	493-026	. Nut, self-locking, hex, 4-40 NC-2B, brass cad plt, nylon insert (Esna #92-1660-40)	6			
5	150-025	. Socket, miniature tube (JAN: TS102P01)	3			
6	043-128	. Resistor, fixed, wirewound, 10 k, 10 w, 5% (R101) (Clarostat Type AC-10-F)	1			
7	043-503	. Resistor, fixed, wirewound, 25 k, 5 w, 10% (R114) (Dalohm Type CS-5)	1			
8	043-178	. Resistor, fixed, wirewound, 5 k, 5 w, 5% (R102) (Dalohm Type RS-5)	1			
9	173-041	. Lug, terminal, standoff (Cambridge Thermionic #X1995-A)	2			
10	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	2			
11	471-061	. Screw, machine, 4-40 NC-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35208-13)	5			
12	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	5			
13	043-280	. Resistor, fixed, wirewound, 50 ohm, 50 w, 10% (R107, R108) (Dalohm Type B-50)	2			
14	31 01656 10	. Chassis, regulator	1			
15	471-068	. Screw, machine, 6-32 NC-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35208-24)	2			
16	502-031	. Washer, #6 lock, int tooth, sst (MS35333-71)	2			
17	501-009	. Washer, #6 flat, stl cad plt (MS15795-206)	2			
18	31 00904 10	. Board, insulation	1			
19	31 00901 10	. Terminal Board Assembly, diode rectifier	1			
20	070-022	. . Fuse, cartridge, slow blow, 1-1/4 amp (F103) (Littlefuse #313125)	1			
21	070-019	. . Fuse, cartridge, slow blow, 2 amp (F101, F102) (Littlefuse #313002)	2			



UNDERSIDE VIEW
THYRATRON BRACKET



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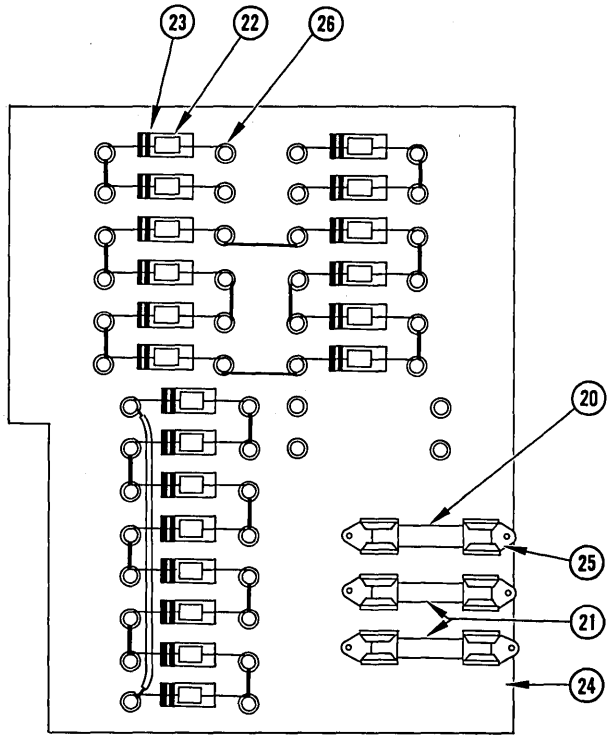
REGULATOR CHASSIS



DETAIL,TERMINAL BOARD ASSEMBLY

Figure 9-20
Electronics Power Supply PS-100 (sheet 2 of 2)

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-20-						
22	013-198	. . Diode, silicon (CR101 thru CR120) (Texas Instrument #1N2071)	20			
23	041-174	. . Resistor, fixed, composition, 220 k, 1 w, 10% (R115, R117, R120, R122, R124, R126, R128, R130, R139 thru R146, R149 thru R152) (MIL-R-11: RC32GF224K)	20			
24	31 00902 10	. . Terminal Board Sub-Assembly	1			
25	130-005	. . . Fuse Clip (Bussman #4548)	6			
26	173-015	. . . Lug, terminal, turret (Useco #1300B)	44			
27	162-017	. Cap, vacuum tube (Millen #36001)	1			
28	015-013	. Tube, thyratron (V104) (Taylor #C3J)	1			
29	471-061	. Screw, machine, 4-40 NC-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35208-13)	1			
30	501-008	. Washer, #4 flat, stl cad plt (MS15795-204)	1			
31	493-026	. Nut, self-locking, hex, 4-40 NC-2B, brass cad plt, nylon insert (Esna #92-1660-40)	1			
32	300-001	. Clamp, tube (Birtcher #926C-2)	1			
33	034-105	. Capacitor, mica, .00047 uf, 1000 volt (C105) (Elmenco #VCM20D471J)	1			
34	041-031	. Resistor, fixed, composition, 1 meg, 1/2 w, 10% (R106) (MIL-R-11: RC20GF105K)	1			
35	471-070	. Screw, machine, 6-32 NC-2A by 7/16 in., pan hd Phillips, stl cad plt (MS35208-26)	2			
36	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	2			
37	172-003	. Lug, soldering, int tooth, (Shakeproof #2104-06)	1			
38	173-003	. Lug, terminal, turret (Useco #1417)	2			
39	150-094	. Socket, tube (E. F. Johnson #122-224-100)	1			
40	471-448	. Screw, machine, 6-32 NC-2A by 1-1/4 in., pan hd Phillips, stl cad plt (MS35208-32)	1			
41	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	1			
42	501-009	. Washer, #6 flat, stl cad plt (MS15795-206)	1			
43	31 00330 10	. Choke Assembly, encapsulated (L101)	1			
44	471-078	. Screw, machine, 8-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-40)	4			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-20-						
45	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	4			
46	31 01654 10	. Bracket, thyratron	1			
47	471-078	. Screw, machine, 8-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-40)	4			
48	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	4			
	31 01650 10	. Capacitor-Rectifier Assembly (SA-500)	1			
49	043-120	. . Resistor, fixed, wirewound, 3500 ohm, 10 w, 5% (R111) (Clarostat Type AC-10-F)	1			
50	031-073	. . Capacitor, electrolytic, 4 x 20 uf, 450 volt (C101, C102) (Astron #EYQ2025)	2			
51	290-004	. . Bracket, capacitor (Mallory #BP-6)	2			
52	31 01850 10	. . Chassis, capacitor-rectifier	1			
53	471-078	. Screw, machine, 8-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-40)	2			
54	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	2			
	31 01651 10	. Capacitor-Rectifier Assembly (AC-400)	1			
55	041-224	. . Resistor, fixed, composition, 100 k, 2 w, 10% (R103, R104) (MIL-R-11: RC42GF104K)	2			
56	031-039	. . Capacitor, electrolytic, 125 uf, 450 volt (C103, C104) (Sprague Type DFP)	2			
57	290-004	. . Bracket, capacitor (Mallory #BP-6)	2			
58	471-514	. . Screw, machine, 8-32 NC-2A by 2-1/2 in., rd hd slotted, stl cad plt	1			
59	502-004	. . Washer, #8 spring lock, stl cad plt (MS35338-42)	2			
60	506-003	. . Washer, centering (Ohmite #6000)	2			
61	503-007	. . Washer, insulating, mica (Ohmite #6011)	2			
62	492-010	. . Nut, plain hex, 8-32 NC-2B, stl cad plt (MS35649-82)	1			
63	040-023	. . Resistor, variable, wirewound, 150 ohm, 25 w (R110) (Ohmite #0369)	1			
64	31 01851 10	. . Chassis, capacitor-rectifier	1			
65	030-032	. Capacitor, ceramic, .1 uf, 500 volt (C109) (Sprague #5HK-P1)	1			
66	471-071	. Screw, machine, 6-32 NC-2A by 1/2 in., pan hd Phillips, stl cad plt (MS35208-27)	4			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-20-						
67	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	4			
68	280-003	. Spacer, brass cad plt (Birnbach #1125)	4			
69	020-006	. Relay, 3 pole, double throw, 115 volt (K101) (Philtrol #33QA)	1			
70	471-063	. Screw, machine, 4-40 NC-2A by 7/16 in., pan hd Phillips, stl cad plt (MS35208-15)	2			
71	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	2			
72	501-008	. Washer, #4 flat, stl cad plt (MS15795-204)	2			
73	180-014	. Terminal Strip, 5 double terminals (TB103) (Jones #5-170)	1			
74		. Setscrew, 6-32 NC-2B	1			
75	31 01659 10	. Shaft, extender	1			
76	122-077	. Switch, rotary, miniature, 5 pole, 7 throw, w/mounting hardware (S501) (Grayhill #12005-7 w/12C1087)	1			
77	471-068	. Screw, machine, 6-32 NC-2A by 5/16 in., pan hd Phillips, stl cad plt (MS35208-24)	2			
78	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	2			
79	31 01660 10	. Bracket, switch mounting	1			
80	281-018	. Bushing, panel, brass nickel plt (H. H. Smith #119)	1			
81	502-077	. Washer, 3/8 lock, int tooth, stl (Shakeproof #1220-02)	2			
82	471-087	. Screw, machine, 10-32 NF-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35209-53)	4			
83	501-011	. Washer, #10 flat, stl cad plt (MS15795-208)	4			
84	502-005	. Washer, #10 spring lock, stl cad plt (MS35338-43)	4			
85	492-011	. Nut, plain hex, 10-32 NF-2B, stl cad plt (MS35650-102)	4			
86	31 01653 10	. Transformer, power (T101)	1			
87	471-087	. Screw, machine, 10-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35209-53)	2			
88	501-011	. Washer, #10 flat, stl cad plt (MS15795-208)	2			
89	502-005	. Washer, #10 spring lock, stl cad plt (MS35338-43)	2			
90	492-011	. Nut, plain hex, 10-32 NF-2B, stl cad plt (MS35650-102)	2			
91	471-093	. Screw, machine, 10-32 NF-2A by 1 in., pan hd Phillips, stl cad plt (MS35209-59)	2			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-20-						
92	502-027	. Washer, #10 lock, int tooth, stl cad plt (MS35333-39)	2			
93	492-011	. Nut, plain hex, 10-32 NF-2B, stl cad plt (MS35650-102)	4			
94	172-028	. Lug, soldering, brass (H. H. Smith #1493)	2			
95	501-011	. Washer, #10 flat, stl cad plt (MS15795-208)	2			
96	31 01649 10	. Transformer, power (T102)	1			
97	148-011	. Jack, test point, w/mounting hardware (TP501, TP502) (Cannon #45E1)	2			
98	492-011	. Nut, plain hex, 10-32 NF-2B, stl cad plt (MS35650-102)	4			
99	502-005	. Washer, #10 spring lock, stl cad plt (MS35338-43)	4			
100	501-011	. Washer, #10 flat, stl cad plt (MS15795-208)	4			
101	036-059	. Capacitor, paper, rectangular, 2 uf, 600 volt (C106, C107) (Sprague #CP70B1EF205K)	2			
102	031-211	. Capacitor, electrolytic, 35 uf, 25 volt (C108) (Sprague #TE1208)	1			
103	035-366	. Capacitor, tubular, .47 uf, 1000 volt (C110) (Gudeman #XFS26159-20)	1			
104	041-106	. Resistor, fixed, composition, 4300 ohm, 1 w, 5% (R109) (MIL-R-11: RC32GF432J)	1			
105	041-536	. Resistor, fixed, composition, 200 k, 2 w, 5% (R113) (MIL-R-11: RC42GF204J)	1			
106	041-224	. Resistor, fixed, composition, 120 k, 2 w, 10% (R105) (MIL-R-11: RC42GF124K)	1			
107	173-041	. Lug, terminal, standoff (Cambridge Thermionic #X1995-A)	4			
108	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	4			
109	471-063	. Screw, machine, 4-40 NC-2A by 7/16 in., pan hd Phillips, stl cad plt (MS35208-15)	4			
110	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	4			
111	180-049	. Terminal Strip, barrier type, 22 terminal (TB101) (Kulka #410-3/4ST-22M)	1			
112	31 01648 10	. Insulator, barrier strip	1			
113	471-063	. Screw, machine, 4-40 NC-2A by 7/16 in., pan hd Phillips, stl cad plt (MS35208-15)	4			
114	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	4			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-20-						
115	180-082	. Terminal Strip, barrier type, 6 terminal (TB102) (Kulka #600-3/4ST-6 w/marker strip)	1			
116	260-005	. Grommet, neoprene (Rubbercraft #6)	1			
117	260-007	. Grommet, neoprene (MS35489-13)	2			
118	471-059	. Screw, machine, 4-40 NC-2A by 3/16 in., pan hd Phillips, stl cad plt (MS35208-11)	9			
119	31 01652 10	. Track, circuit board	2			
120	31 01662 10	. Track, circuit board	1			
121	31 01658 10	. Cable Harness	1			
122	31 01655 10	. Chassis Assembly	1			
123	431-010	. . Retainer, hairpin, external (Southco #82-32-101-17)	1			
124	310-061	. . Fastener, oval hd, 1/4 turn (Southco #2-0-140)	1			
125	31 01800 10	. . Cover Assembly, hinged	1			

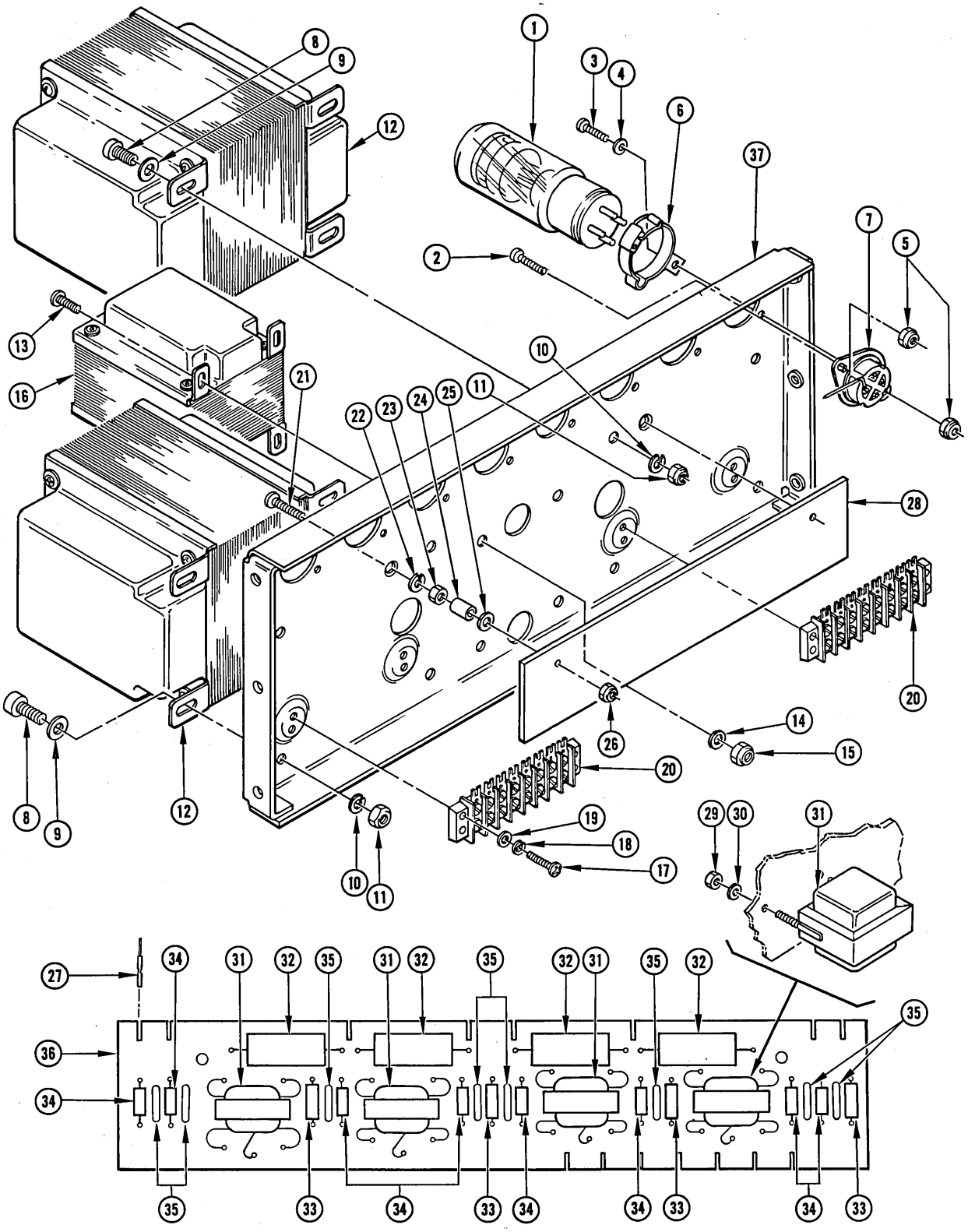


Figure 9-21
Servo Motor Power Supply PS-200

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-21-		SERVO MOTOR POWER SUPPLY (PS-200)				
	31 01341 10	Power Supply Assembly, Servo Motor (PS-200) (See Figure 9-19)	Ref			
1	015-012	. Tube, thyratron (V201 thru V208) (Electrons Inc #ELC1K, National Electronics #N16014/C1K)	8			
2	471-069	. Screw, machine, 6-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-25)	8			
3	471-071	. Screw, machine, 6-32 NC-2A by 1/2 in., pan hd Phillips, stl cad plt (MS35208-27)	8			
4	501-009	. Washer, #6 flat, stl cad plt (MS15795-206)	8			
5	493-015	. Nut, self-locking, hex, 6-32 NC-2B, stl cad plt, nylon insert (Esna Type NM)	16			
6	300-001	. Clamp, tube (Birtcher #926C-2)	8			
7	150-058	. Socket, tube, ceramic (Millen #33004)	8			
8	470-045	. Screw, cap, 1/4-20 UNC-3A by 1/2 in., hex sch, stl cad plt (MS35457-33)	8			
9	501-012	. Washer, 1/4 flat, stl cad plt (AN960-416)	8			
10	502-006	. Washer, 1/4 spring lock, stl cad plt (MS35338-44)	8			
11	492-012	. Nut, plain hex, 1/4-20 UNC-2B, stl cad plt (MS35690-402)	8			
12	31 01666 10	. Transformer, step-up (T206, T207)	2			
13	471-088	. Screw, machine, 10-32 NF-3A by 7/16 in., pan hd Phillips, stl cad plt (MS35209-54)	4			
14	501-011	. Washer, #10 flat, stl cad plt (MS15795-208)	4			
15	493-008	. Nut, self-locking, hex, 10-32 NF-3B, stl cad plt, nylon insert (Esna Type NM)	4			
16	31 01667 10	. Transformer, step-down (T205)	1			
17	471-064	. Screw, machine, 4-40 NC-2A by 1/2 in., pan hd Phillips, stl cad plt (MS35208-16)	8			
18	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	8			
19	501-008	. Washer, #4 flat, stl cad plt (MS15795-204)	8			
20	180-051	. Terminal Strip (TB201, TB202) (Kulka #600-3/4ST-8 w/marker strip)	2			
21	471-872	. Screw, machine, 6-32 by 1 in., 100° flat hd Phillips, stl cad plt	2			
22	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	2			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-21-						
23	492-009	. Nut, plain hex, 6-32 NC-2B, stl cad plt (MS35649-62)	2			
24	280-006	. Spacer, for #6 screw, brass cad plt (H. Smith #2101, Birnbach #1126)	2			
25	503-035	. Washer, flat, nonmetallic (Walsco #7836)	2			
26	493-015	. Nut, self-locking, hex, 6-32 NC-2B, stl cad plt, nylon insert (Esna Type NM)	2			
27	171-024	. Connector, solderless (AMP #42587-2)	15			
28	31 01664 10	. Bias Assembly (PS-200)	1			
29	492-032	. . Nut, plain hex, special, 4-40 NC-2B, stl cad plt	8			
30	502-090	. . Washer, #4 spring lock, stl cad plt	8			
31	31 01814 10	. . Transformer, bias (T1 thru T4)	4			
32	035-285	. . Capacitor, tubular, .68 uf, 200 volt (C1, C4, C7, C10) (Sprague #118P68492S4)	4			
33	043-471	. . Resistor, fixed, wirewound, 4700 ohm, 3 w, 3% (R1, R4, R7, R10) (Dalohm Type RLS-2B)	4			
34	041-076	. . Resistor, fixed, composition, 220 k, 1/2 w, 10% (R2, R3, R5, R6, R8, R9, R11, R12) (MIL-R-11: RC20GF224K)	8			
35	030-002	. . Capacitor, ceramic, .01 uf, 500 volt (C2, C3, C5, C6, C8, C9, C11, C12) (Erie #811-000-GP-103P)	8			
36	31 01813 10	. . Printed Circuit Board, bias	1			
37	31 01663 10	. Chassis, servo power supply	1			

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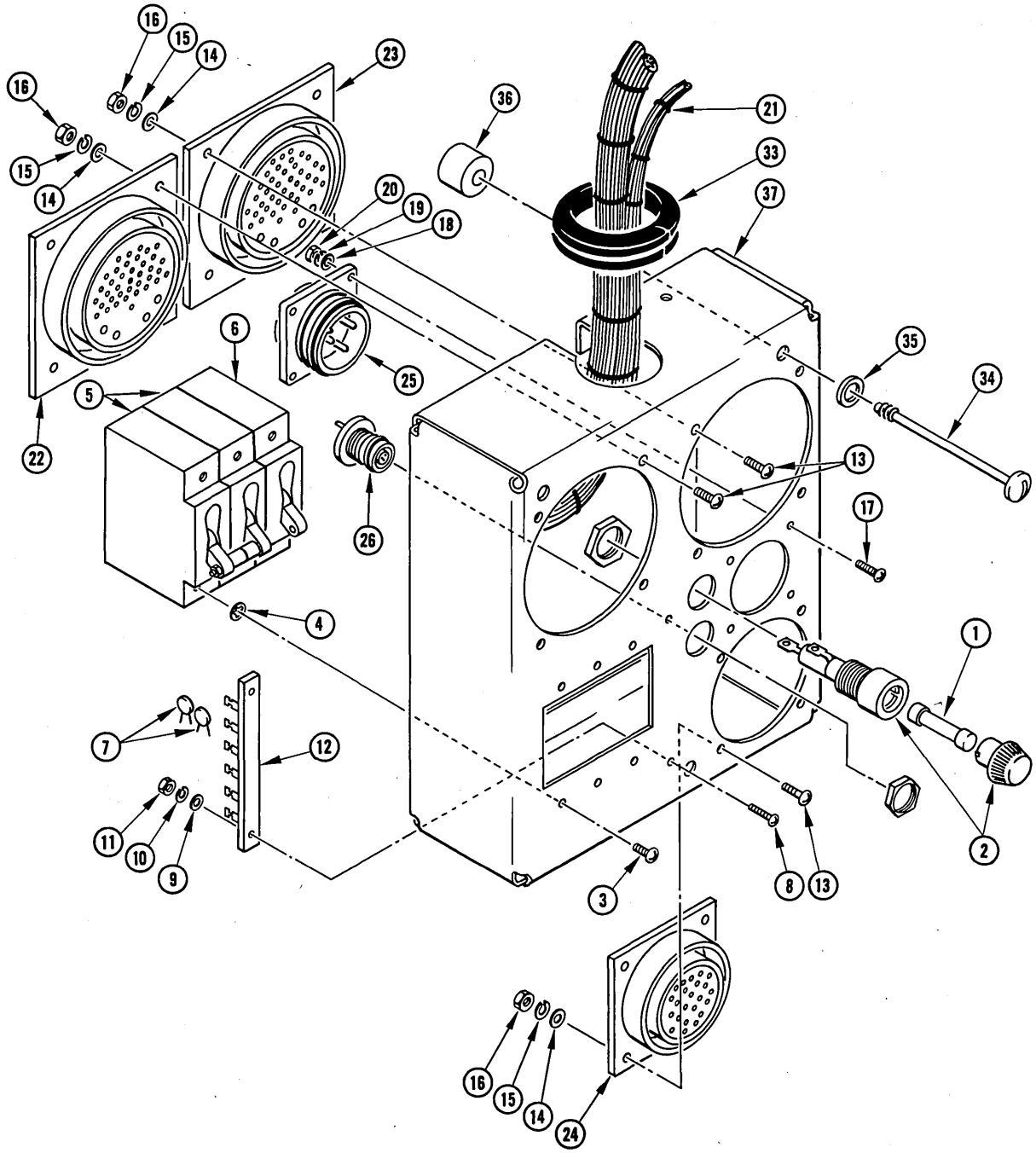

Figure 9-22
Connector Chassis CC-300 (sheet 1 of 2)

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-22-		CONNECTOR CHASSIS (CC-300)				
	31 01344 10	Chassis Assembly (CC-300) (See Figure 9-19)	Ref			
1	070-008	. Fuse, cartridge, 6 amp, fast blow (F301) (Littlefuse #312006)	1			
2	130-013	. Holder, fuse, w/mounting hardware (Bussman #HKP)	1			
3	471-066	. Screw, machine, 6-32 NC-2A by 3/16 in., pan hd Phillips, stl cad plt (MS35208-32)	6			
4	502-025	. Washer, #6 lock, int tooth, stl cad plt (MS35333-37)	6			
5	126-018	. Circuit Breaker, 25 amp, 2 pole, companion series (CB301, CB302) (Heineman #XAM33-25)	1			
6	126-023	. Circuit Breaker, 7 amp, 115 volt ac, 60 cps (CB303) (Heineman #AM-12)	1			
7	030-129	. Capacitor, ceramic, .01 uf, 1000 volt (CD #BYA10S1M)	2			
8	471-063	. Screw, machine, 4-40 NC-2A by 7/16 in., pan hd Phillips, stl cad plt (MS35208-15)	2			
9	501-008	. Washer, #4 flat, stl cad plt (MS15795-204)	2			
10	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	2			
11	492-008	. Nut, plain hex, 4-40 NC-2B, stl cad plt (MS35649-42)	2			
12	180-082	. Terminal Strip, barrier type (Kulka #600-3/4ST-6 w/marker strip)	1			
13	471-069	. Screw, machine, 6-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-25)	12			
14	501-009	. Washer, #6 flat, stl cad plt (MS15795-206)	12			
15	502-003	. Washer, #6 spring lock, stl cad plt (MS35338-41)	15			
16	492-009	. Nut, plain hex, 6-32 NC-2B, stl cad plt (MS35649-62)	12			
17	471-062	. Screw, machine, 4-40 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-14)	4			
18	501-008	. Washer, #4 flat, stl cad plt (MS15795-204)	4			
19	502-002	. Washer, #4 spring lock, stl cad plt (MS35338-40)	4			
20	492-008	. Nut, plain hex, 4-40 NC-2B, stl cad plt (MS35649-42)	4			
21	31 01670 10	. Cable Assembly	1			
22	146-142	. . Connector, receptacle, female, 50 contacts (J303) (Cannon #RLK-A50-31SL)	1			
23	146-141	. . Connector, receptacle, female, 53 contacts (J301) (Cannon #RLK-A53-31SL)	1			

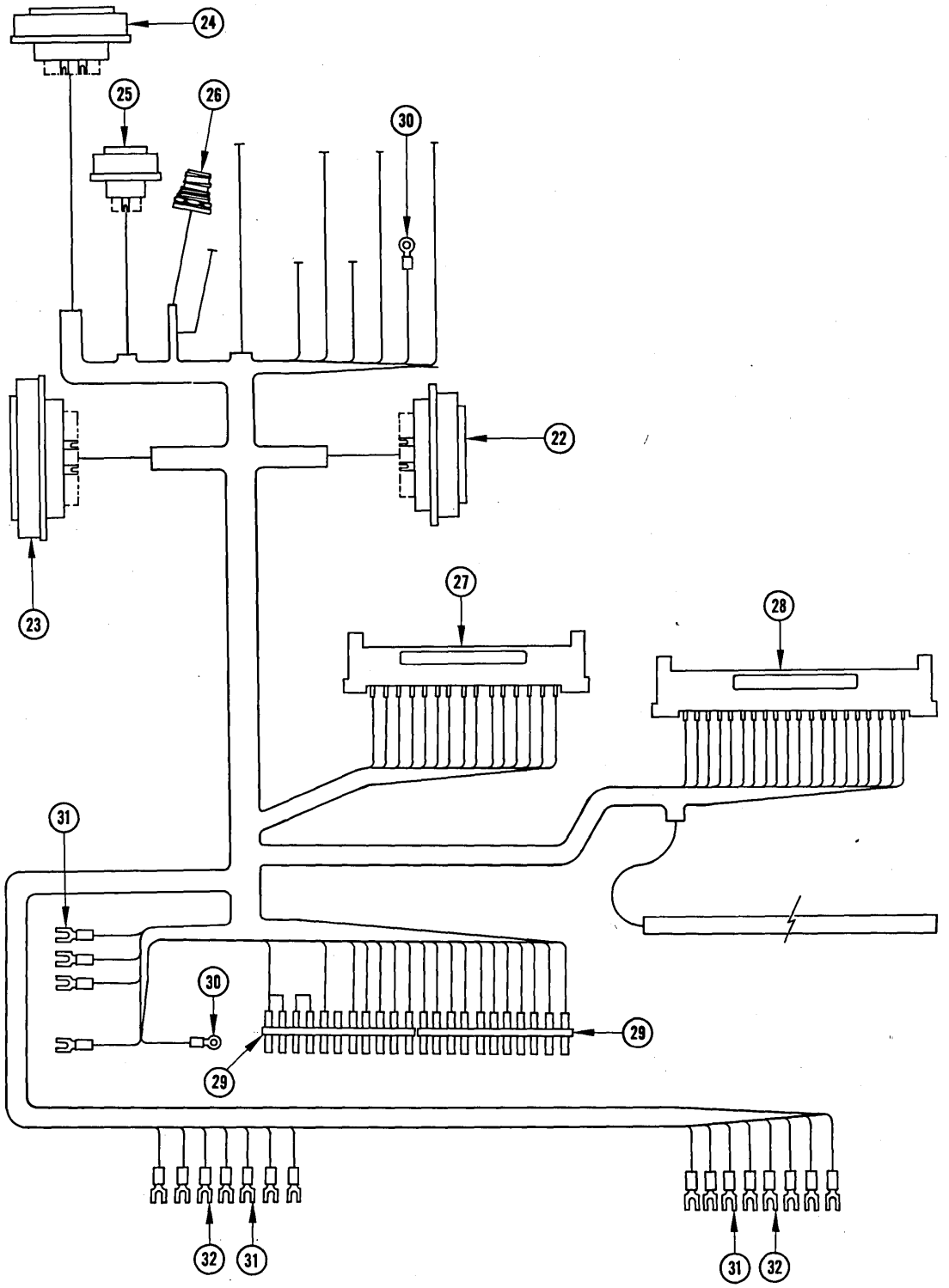

Figure 9-22
Connector Chassis CC-300 (sheet 2 of 2)

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-22-						
24	146-143	. . Connector, receptacle, female, 37 contacts (J304) (Cannon #RFK-37-31SL)	1			
25	147-105	. . Connector, receptacle, male, 3 contacts (J302) (Cannon #GK-S3-32S)	1			
26	146-042	. . Connector, receptacle, female, 3 contacts, w/mounting hardware (J305) (Cannon #MC-14E-8-3SN)	1			
27	168-008	. . Connector, printed circuit board (J401) (Elco #5006-15-13-3-5-3/32)	1			
28	168-009	. . Connector, printed circuit board (J501) (Elco #5006-20-13-3-5-1/16)	1			
29	31 01816 10	. . Fanning Strip	2			
30	171-007	. . Connector, solderless, ring tongue (AMP #31900)	11			
31	171-066	. . Connector, solderless, red, spade lug (Burndy #SE18-Z2)	15			
32	171-065	. . Connector, solderless, blue, spade lug (Burndy #SE14-Z2)	4			
	171-016	. . Connector, solderless, ring tongue (AMP #34170)	13			
	171-072	. . Connector, solderless, crimp type (Burndy #YEC-150)	8			
	171-096	. . Connector, solderless, crimp type (Burndy #YEC-180)	4			
33	260-018	. . Grommet, neoprene, 1-1/4 in. ID (Rubbercraft #71)	1			
34	310-086	. Screw, fastener, sst (Southco #58-33-1-56)	3			
35	503-042	. Washer, retaining, nonmetallic (Southco #17-10014-11)	3			
36	31 01020 10	. Spacer, chassis	3			
37	31 01669 10	. Chassis, connector	1			

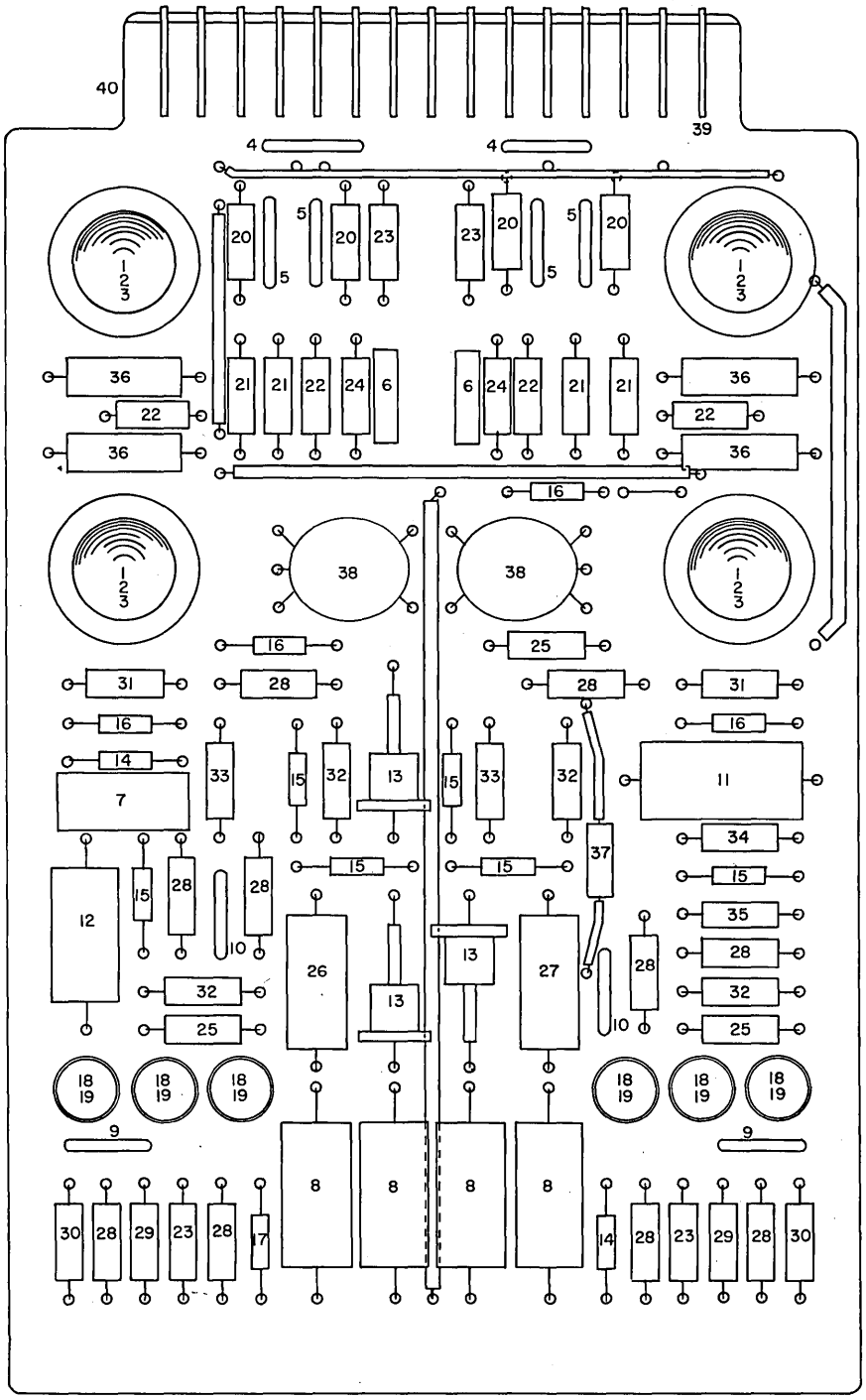

Figure 9-23
Actuator Control Unit AC-400

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-23-		ACTUATOR CONTROL UNIT (AC-400)				
	31 01346 10	Actuator Board Assembly (AC-400) (See Figure 9-19)	Ref			
1	160-007	. Shield, tube (Elco #120)	4			
2	012-136	. Tube, electron (V1, V2, V3, V4,) (CBS, GE, RCA #5727)	4			
3	150-097	. Socket, tube (Cinch #53P24234)	4			
4	030-004	. Capacitor, ceramic, 2 x .001 uf, 500 volt (C1A, C1B, C6A, C6B) (Centralab #DD2-102)	2			
5	020-043	. Capacitor, ceramic, .0022 uf, 500 volt (C2, C4, C7, C9) (Erie #811-000-GP-222P)	4			
6	030-101	. Capacitor, ceramic, .47 uf, 25 volt (C3, C8) (Sprague #5C11)	2			
7	031-211	. Capacitor, electrolytic, 35 uf, 25 volt (C5) (Sprague #TE1208)	1			
8	037-110	. Capacitor, tantalum, 100 uf, 30 volt (C10 thru C13) (Sprague #109D107C2030T2)	4			
9	030-095	. Capacitor, ceramic, .1 uf, 25 volt (C14, C17) (Sprague #5C7)	2			
10	030-094	. Capacitor, ceramic, 1 uf, 25 volt (C15, C16) (Sprague #5C13)	2			
11	031-129	. Capacitor, electrolytic, 20 uf, 50 volt (C18) (Sprague #TE1305)	1			
12	031-135	. Capacitor, electrolytic, 30 uf, 15 volt (C19) (Sprague #TE1158)	1			
13	013-050	. Diode, crystal (CR1, CR3, CR4) (General Electric #1N537)	3			
14	013-162	. Diode, zener (CR2, CR15) (Hoffman #1N718A)	2			
15	013-151	. Diode, germanium (CR5, CR6, CR11 thru CR14) (General Instrument #DR482)	6			
16	013-028	. Diode, silicon (CR7 thru CR10) (Hughes #1N462)	4			
17	013-102	. Diode, zener (CR16) (Hoffman #1N716A)	1			
18	014-007	. Transistor (Q1 thru Q6) (CBS #2N438)	6			
19	280-030	. Spacer, transistor (Milton Ross #10012)	6			
20	041-089	. Resistor, fixed, composition, 4.7 meg, 1/2 w, 10% (R1, R8, R10, R17) (MIL-R-11: RC20GF475K)	4			
21	041-065	. Resistor, fixed, composition, 27 k, 1/2 w, 10% (R2, R6, R11, R15) (MIL-R-11: RC20GF273K)	4			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-23-						
22	041-072	. Resistor, fixed, composition, 100 k, 1/2 w, 10% (R3, R7, R12, R16) (MIL-R-11: RC20GF104K)	4			
23	041-038	. Resistor, fixed, composition, 100 ohm, 1/2 w, 10% (R4, R13, R29, R37) (MIL-R-11: RC20GF101K)	4			
24	041-064	. Resistor, fixed, composition, 22 k, 1/2 w, 10% (R5, R14) (MIL-R-11: RC20GF223K)	2			
25	041-063	. Resistor, fixed, composition, 18 k, 1/2 w, 10% (R9, R26, R39) (MIL-R-11: RC20GF183K)	3			
26	041-527	. Resistor, fixed, composition, 390 ohm, 2 w, 10% (R18) (MIL-R-11: RC42GF391K)	1			
27	041-199	. Resistor, fixed, composition, 470 ohm, 2 w, 10% (R19) (MIL-R-11: RC42GF471K)	1			
28	041-052	. Resistor, fixed, composition, 2200 ohm, 1/2 w, 10% (R20, R23, R25, R27, R30, R33, R36, R40, R41, R43) (MIL-R-11: RC20GF222K)	10			
29	041-001	. Resistor, fixed, composition, 5100 ohm, 1/2 w, 5% (R21, R35) (MIL-R-11: RC20GF512J)	2			
30	041-056	. Resistor, fixed, composition, 4700 ohm, 1/2 w, 10% (R22, R34) (MIL-R-11: RC20GF472K)	2			
31	041-031	. Resistor, fixed, composition, 1 meg, 1/2 w, 10% (R24, R42) (MIL-R-11: RC20GF105K)	2			
32	041-058	. Resistor, fixed, composition, 6800 ohm, 1/2 w, 10% (R28, R38, R50, R51) (MIL-R-11: RC20GF682K)	4			
33	041-054	. Resistor, fixed, composition, 3300 ohm, 1/2 w, 10% (R31, R45) (MIL-R-11: RC20GF332K)	2			
34	041-044	. Resistor, fixed, composition, 470 ohm, 1/2 w, 10% (R32) (MIL-R-11: RC20GF471K)	1			
35	041-041	. Resistor, fixed, composition, 270 ohm, 1/2 w, 10% (R44) (MIL-R-11: RC20GF271K)	1			
36	041-091	. Resistor, fixed, composition, 4.7 ohm, 1 w, 10% (R46 thru R49) (Ohmite)	4			
37	041-351	. Resistor, fixed, composition, 15 ohm, 1/2 w, 10% (R52) (MIL-R-11: RC20GF150K)	1			
38	31 01675 10	. Transformer, pulse (T8, T9)	2			
39	168-007	. Connector, printed circuit board (Elco #5001-1913)	15			
40	31 01674 10	. Card, printed wiring	1			

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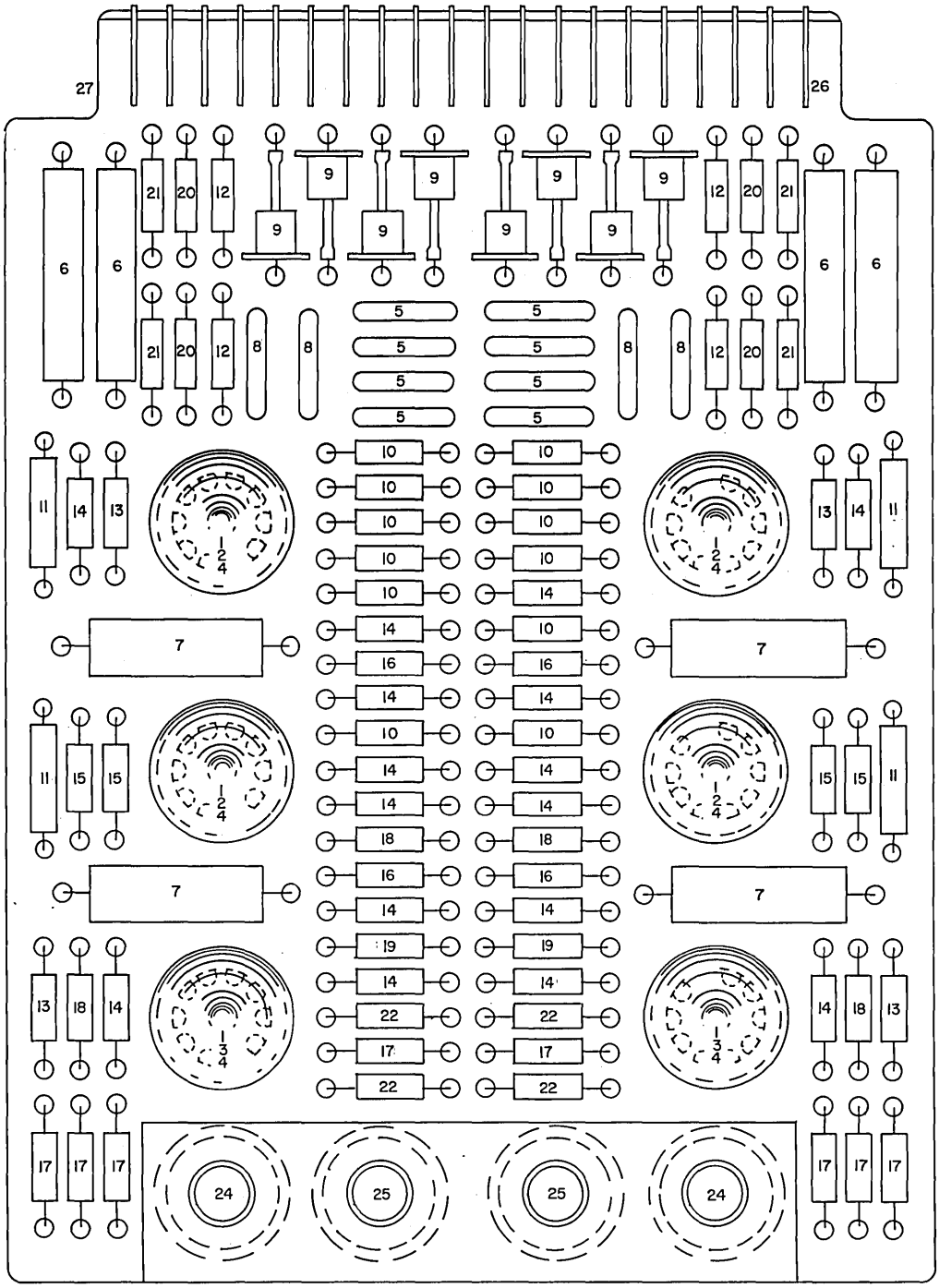

Figure 9-24
Servo Amplifier SA-500

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-24-		SERVO AMPLIFIER (SA-500)				
	31 01349 10	Servo Amplifier Assembly (SA-500) (See Figure 9-19)	Ref			
1	431-012	. Retainer, hairpin, tube (Tub-lok #102-W-PC)	6			
2	012-068	. Tube, electron (V1, V2, V4, V5) (RCA, GE, Sylvania #5751)	4			
3	012-106	. Tube, electron (V3, V6) (RCA #5814A)	2			
4	150-104	. Socket, tube (Elco #3906-2-2)	6			
5	030-044	. Capacitor, ceramic, .1 uf, 75 volt (C10 thru C13, C50 thru C53) (Centralab #DDA-104)	8			
6	035-337	. Capacitor, tubular, .22 uf, 150 volt (C14, C15, C54, C55) (Gudeman #338Y224J)	4			
7	035-315	. Capacitor, tubular, .15 uf, 150 volt (C16, C17, C56, C57) (Gudeman #337Y154J)	4			
8	030-059	. Capacitor, ceramic, .02 uf, 500 volt (C58 thru C61) (Sprague #36C205)	4			
9	013-015	. Diode, crystal (CR10 thru CR13, CR50 thru CR53) (GE #1N91)	8			
10	041-025	. Resistor, fixed, composition, 150 k, 1/2 w, 5% (R10 thru R13, R21, R28, R50 thru R53, R61, R68) (MIL-R-11: RC20GF154J)	12			
11	042-148	. Resistor, fixed, film, 3300 k, 1 w, 1% (R14, R17, R54, R57) (MIL-R-10509: RN25X3304F)	4			
12	042-141	. Resistor, fixed, film, 100 k, 1/2 w, 1% (R15, R16, R55, R56) (MIL-R-10509: RN15X1003F)	4			
13	041-321	. Resistor, fixed, composition, 200 k, 1/2 w, 5% (R19, R20, R59, R60) (MIL-R-11: RC20GF204J)	4			
14	042-268	. Resistor, fixed, film, 1200 k, 1/2 w, 1% (R22 thru R25, R29 thru R32, R62 thru R65, R69 thru R72) (MIL-R-10509: RN15X1204F)	16			
15	041-374	. Resistor, fixed, composition, 240 k, 1/2 w, 5% (R26, R27, R66, R67) (MIL-R-11: RC20GF244J)	4			
16	041-254	. Resistor, fixed, composition, 15 k, 1/2 w, 5% (R33, R34, R73, R74) (MIL-R-11: RC20GF153J)	4			
17	042-156	. Resistor, fixed, film, 47 k, 1/2 w, 1% (R35, R36, R38, R39, R75, R76, R78, R79) (MIL-R-10509: RN15X4702F)	8			
18	042-269	. Resistor, fixed, film, 330 k, 1/2 w, 1% (R37, R40, R77, R80) (MIL-R-10509: RN15X3303F)	4			
19	041-017	. Resistor, fixed, film, 33 k, 1/2 w, 5% (R41, R81) (MIL-R-11: RC20GF334J)	2			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-24-						
20	042-119	. Resistor, fixed, film, 1 meg, 1/2 w, 1% (R85 thru R88) (MIL-R-10509: RN15R1004F)	4			
21	041-460	. Resistor, fixed, composition, 56 k, 1/2 w, 5% (R89 thru R92) (MIL-R-11: RC20GF563J)	4			
22	042-137	. Resistor, fixed, film, 150 k, 1/2 w, 1% (R43, R44, R83, R84) (MIL-R-10509: RN15X1503F)	4			
23	31 01677 10	. Shield, potentiometer	1			
24	044-284	. Resistor, variable, 100 k, 1/2 w (R18, R58) (Allen-Bradley #TSRU1041)	2			
25	044-315	. Resistor, variable, 25 k, 1/2 w (R42, R82) (Allen-Bradley #TSRU2531)	2			
26	168-007	. Connector, printed circuit board (Elco #5001-1913)	20			
27	31 01676 10	. Card, printed wiring	1			

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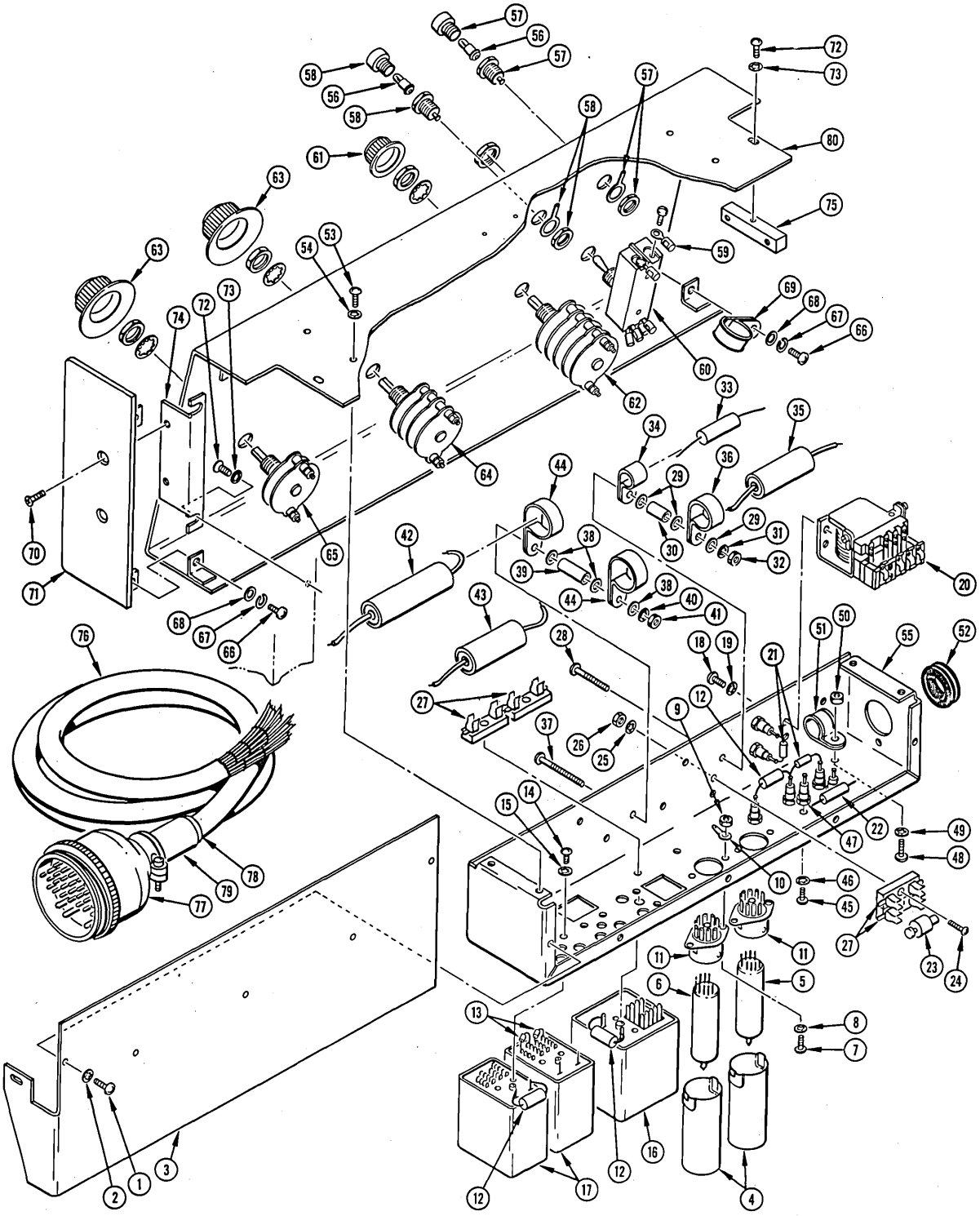

Figure 9-25
Manual Control Panel

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-25-		MANUAL CONTROL PANEL				
	31 01064 10	Panel Assembly, manual control (See Figure 9-2)	Ref			
1	471-069	. Screw, machine, 6-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-25)	7			
2	502-025	. Washer, #6 lock, int tooth, stl cad plt (MS35333-37)	7			
3	31 01153 10	. Cover, chassis	1			
4	160-020	. Shield, tube (JAN-S-28A: TS103U03)	2			
5	020-059	. Relay, time delay, 2 second (K801) (Amperite #26C2T)	1			
6	020-092	. Relay, time delay, 45 second (K805) (Amperite #115N045T)	1			
7	471-060	. Screw, machine, 4-40 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-12)	4			
8	502-024	. Washer, #4 lock, int tooth, stl cad plt (MS35333-36)	4			
9	492-004	. Nut, plain hex, 4-40 NC-2B, stl cad plt (MS35649-42)	4			
10	172-032	. Lug, soldering (Cinch #Y141)	1			
11	150-026	. Socket, noval (JAN: TS103P01)	2			
12	013-139	. Diode, silicon (CR801, CR802, CR807) (Texas Inst #1N2097)	3			
13	041-057	. Resistor, fixed, composition, 5600 ohm, 1/2 w, 10% (MIL-R-11: RC20GF562K)	2			
14	471-066	. Screw, machine, 6-32 NC-2A by 3/16 in., pan hd Phillips, stl cad plt (MS35208-32)	6			
15	502-025	. Washer, #6 lock, int tooth, stl cad plt (MS35333-37)	6			
16	020-122	. Relay, 24 volt coil (K803) (Philtrol #8QA-24-3C-24)	1			
17	020-103	. Relay, sealed (K802, K806) (Philtrol #8QA2Z16)	2			
18	471-067	. Screw, machine, 6-32 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-23)	4			
19	502-025	. Washer, #6 lock, int tooth, stl cad plt (MS35333-37)	4			
20	020-035	. Relay, 24 volt DC coil (K804) (Philtrol #33BDC-24-4C-13)	1			
21	041-041	. Resistor, fixed, composition, 270 ohm, 1/2 w, 10% (R804, R805) (MIL-R-11: RC20GF271K)	2			
22	041-140	. Resistor, fixed, composition, 390 ohm, 1 w, 10% (R803) (MIL-R-11: RC32GF391K)	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-25-						
23	582-026	. Rectifier, selenium, single phase, half wave (CR802 thru CR806) (Sarkes Tarzian #20LA)	4			
24	471-559	. Screw, machine, 4-40 NC-2A by 3/8 in., binder hd slotted, stl cad plt	4			
25	502-024	. Washer, #4 lock, int tooth, stl cad plt (MS35333-36)	4			
26	492-008	. Nut, plain hex, 4-40 NC-2B, stl cad plt (MS35649-42)	4			
27	130-007	. Holder, rectifier (Littlefuse #099062)	4			
28	471-449	. Screw, machine, 6-32 NC-2A by 1-3/8 in., pan hd Phillips, stl cad plt	1			
29	501-009	. Washer, #6 flat, stl cad plt (MS15795-206)	3			
30	280-010	. Spacer, 3/4 in. lg, brass cad plt (H. Smith #2108, Birnbach #1133)	1			
31	502-025	. Washer, #6 lock, int tooth, stl cad plt (MS35333-37)	1			
32	492-009	. Nut, plain hex, 6-32 NC-2B stl cad plt (MS35649-62)	1			
33	031-119	. Capacitor, electrolytic, 15 uf, 75 vdc (C801) (CD #NL15-75P)	1			
34	302-036	. Clamp, cable, 3/8 in. (Commercial Plastic #742-6)	1			
35	031-118	. Capacitor, electrolytic, 100 uf, 50 vdc (C804) (Sprague #TVA1310)	1			
36	302-086	. Clamp, cable, 11/16 in. (Commercial Plastic #742-11)	1			
37	471-436	. Screw, machine, 6-32 NC-2A by 1-5/8 in., pan hd Phillips, stl cad plt	1			
38	501-009	. Washer, #6 flat, stl cad plt (MS15795-206)	3			
39	31 01165 10	. Spacer, connector	1			
40	502-025	. Washer, #6 lock, int tooth, stl cad plt (MS35333-37)	1			
41	492-009	. Nut, plain hex, 6-32 NC-2B, stl cad plt (MS35649-62)	1			
42	035-302	. Capacitor, tubular, 1 uf, 600 vdc (C802) (Gudeman #XHF2508J-10)	1			
43	031-126	. Capacitor, electrolytic, 250 uf, 50 vdc, (C803) (Sprague #TVA1312)	1			
44	302-091	. Clamp, cable, 1 in. (Commercial Plastic #742-16)	2			
45	471-066	. Screw, machine, 6-32 NC-2A by 3/16 in., pan hd Phillips, stl cad plt (MS35208-32)	11			
46	502-005	. Washer, #6 lock, int tooth, stl cad plt (MS35333-37)	11			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-25-						
47	173-003	. Lug, terminal, turret, gold plt (Useco #1417)	11			
48	471-069	. Screw, machine, 6-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-25)	1			
49	502-025	. Washer, #6 lock, int tooth, stl cad plt (MS35333-37)	1			
50	492-009	. Nut, plain hex, 6-32 NC-2B, stl cad plt (MS35649-62)	1			
51	302-049	. Clamp, cable, 1/2 in. (Commercial Plastic #742-8)	1			
52	260-011	. Grommet, elastic, 11/16 in. ID (MS35489-19)	1			
53	471-069	. Screw, machine, 6-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-25)	4			
54	502-025	. Washer, #6 lock, int tooth stl cad plt (MS35333-37)	4			
55	31 01155 10	. Chassis, control panel	1			
56	060-019	. Lamp, incandescent, 28 volt, 0.04 amp (MS25237-327)	2			
57	060-056	. Light, indicator, green, w/mounting hardware (DS802) (Sloan #855S1-G-5-855-820)	1			
58	060-057	. Light, indicator, amber, w/mounting hardware (DS801) (Sloan #855S1-A-3-855-820)	1			
59	171-016	. Connector, solderless, ring tongue, #10 stud (AMP #34170)	6			
60	120-100	. Switch, toggle, 250 volt, 20 amp, w/mounting hardware (S806) (Arrow H & H #80421U)	1			
61	230-036	. Knob, dial, skirted (Raytheon #2420-1051G1)	1			
62	31 01158 10	. Switch, rotary, w/mounting hardware (S801)	1			
63	230-039	. Knob, dial, skirted (Raytheon #2420-1081G1)	2			
64	31 01157 10	. Switch, rotary, w/mounting hardware (S802)	1			
65	31 01159 10	. Switch, rotary, w/mounting hardware (S803)	1			
66	471-078	. Screw, machine, 8-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-40)	4			
67	502-004	. Washer, #8 spring lock, stl cad plt (MS35338-42)	4			
68	501-010	. Washer, #8 flat, stl cad plt (MS15795-207)	4			
69	302-049	. Clamp, cable, 1/2 in. (Commercial Plastic #742-8)	1			
70	471-336	. Screw, machine, 6-32 NC-2A by 3/8 in., 82° flat hd Phillips, stl cad plt (MS35192-25)	4			
71	31 01148 10	. Side Assembly, control panel, welded	1			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-25-						
72	471-069	. Screw, machine, 6-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-25)	10			
73	502-025	. Washer, #6 lock, int tooth, stl cad plt (MS35333-37)	10			
74	31 01151 10	. Bracket, control	1			
75	31 01161 10	. Bracket	1			
76	31 01378 10	. Cable Assembly (CU800)	1			
77	145-128	. . Connector, plug, male, 50 contact (P303) (Cannon #RLK-A50-22C-1)	1			
78	262-006	. . Bushing, telescoping (AN3420-12)	1			
79	262-007	. . Bushing, telescoping (AN3420-16)	1			
80	31 01145 10	. Panel Assembly, control, welded	1			

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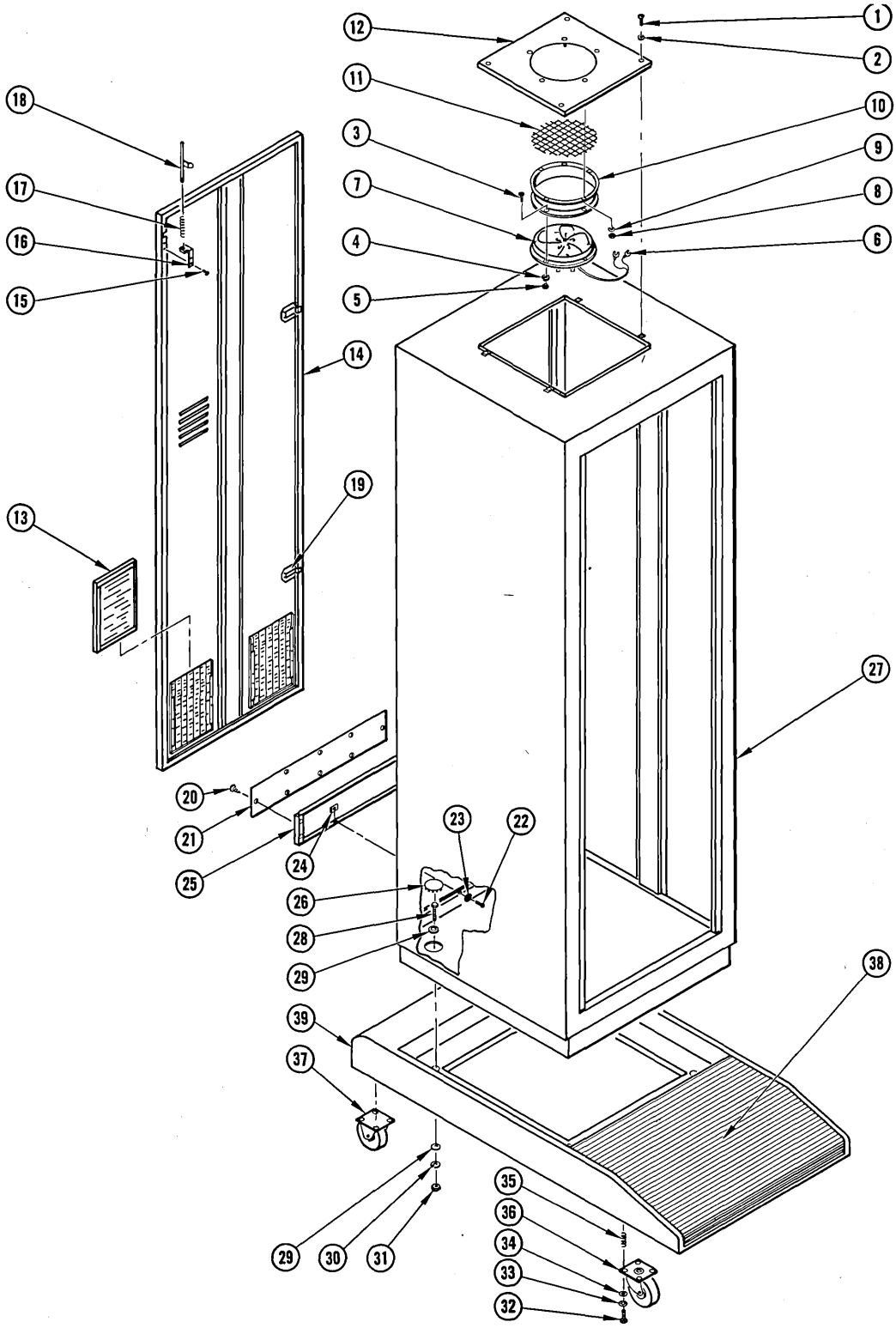

Figure 9-26
Cabinet and Dolly Assemblies

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-26-		CABINET AND DOLLY ASSEMBLIES				
	31 01073 10	Cabinet Assembly (See Figure 9-2)	Ref			
1	471-076	. Screw, machine, 8-32 NC-2A by 1/4 in., pan hd Phillips, stl cad plt (MS35208-38)	4			
2	502-026	. Washer, #8 lock, int tooth, stl cad plt (MS35338-38)	4			
	31 01175 10	. Fan Assembly	1			
3	471-078	. . Screw, machine, 8-32 NC-2A by 3/8 in., pan hd Phillips, stl cad plt (MS35208-40)	5			
4	502-004	. . Washer, #8 spring lock, stl cad plt (MS35338-42)	5			
5	492-010	. . Nut, plain hex, 8-32 NC-2B, stl cad plt (MS35649-82)	5			
6	171-001	. . Connector, solderless, slotted tongue, #6 (AMP #34541)	2			
7	591-031	. . Fan, blower (Kooltronic #KB800B)	1			
8	492-010	. . Nut, plain hex, 8-32 NC-2B, stl cad plt (MS35649-82)	5			
9	502-004	. . Washer, #8 spring lock, stl cad plt (MS35338-42)	5			
10	591-033	. . Sleeve, fan (Kooltronic #800M)	1			
11	591-034	. . Grille, fan (Kooltronic #800X)	1			
12	31 01405 10	. . Cover, vent	1			
13	370-022	. Filter, air (Air-Maze #P61A)	1			
14	31 01172 10	. Door Assembly	1			
15	471-334	. . Screw, machine, 6-32 by 1/4 in., 82° flat hd Phillips, stl cad plt (MS35192-23)	2			
16	31 01400 10	. . Retainer, spring	1			
17	31 00566 10	. . Spring, door	1			
18	31 00564 10	. . Pin Assembly, door	1			
19	311-043	. . Latch, flush (Hartwell #H4700-C064-125)	2			
20	476-002	. Screw, self-tapping, 6-32 by 1/4 in., pan hd Phillips, stl cad plt (Parker-Kalon)	8			
21	31 01174 10	. Cover	1			
22	471-865	. Screw, machine, 10-24 by 5/8 in., pan hd Phillips, stl cad plt	6			
23	501-011	. Washer, #10 flat, stl cad plt (MS15795-208)	6			

FIG. & INDEX NO.	AMPEX PART NO.	DESCRIPTION 1 2 3 4 5 6 7	QTY. PER ASSY.	USE ON CODE	EFFECTIVE ON	EFFECTIVE THRU
9-26-						
24	497-028	. Speednut, U type, 10-24 screw size, zinc chromate stl (Tinnerman #C710-632-67)	6			
25	31 01173 10	. Panel, outlet	1			
26	251-028	. Button, plug (United Carr #48175)	4			
27	31 01171 10	. Cabinet Assembly, weldment	1			
	31 01084 10	Dolly Assembly (See Figure 9-2)	Ref			
28	480-032	. Bolt, 7/16-14 NC-2A by 1-1/2 in., hex hd, stl cad plt (Sloss and Brittan)	4			
29	501-098	. Washer, flat, 15/32 in. ID, 15/16 in. OD, 1/16 in. thk, stl cad plt	8			
30	502-084	. Washer, 7/16 spring lock, stl cad plt (MS35337-47)	4			
31	492-051	. Nut, plain hex, 7/16-14 NC-2B, stl cad plt	4			
32	480-033	. Bolt, 3/8-16 NC-2A by 5/8 in., hex hd, stl cad plt (Sloss and Brittan)	16			
33	502-047	. Washer, 3/8 lock, int tooth, sst, passivated (MS35333-76)	16			
34	501-102	. Washer, 3/8 flat, stl cad plt	16			
35	495-034	. Insert, 3/8-16 by 3/8 in., sst (Heli-Coil #1185-6CNX .375)	16			
36	082-004	. Caster, swivel (Bassick #H-4999-2)	2			
37	082-005	. Caster, rigid (Bassick #H-4989-2)	2			
38	269-104	. Mat, fine line, gray, 36 in. w (Golden State #103)	A/R			
39	31 01210 10	. Casting, dolly	1			

TM-2
SPARE PARTS LIST

NOTE: All fractional quantities should be rounded off to the nearest whole number.

* Refer to last page

QTY	PART NUMBER	DESCRIPTION 1 2 3 4 5 6	REFERENCE
ONE/ SITE		Head Assembly	
		. Guide Assembly, metal	
1	60701-1	. . Spring	
1	60976-1	. . Ring, guide	
		. Guide Assembly, ceramic	
1	310202810	. . Spring	
1	310349710	. . Ring, guide	
ONE/ SITE		Head Cable & Box Assembly	
		Photosense Assembly	
ONE/ SITE	310193010	. Head Assembly	
ONE/ SITE	310120910	. Cable Assembly	
1	013-145	. Diode, zener, 10V, 3W	
1	013-146	. Diode, zener, 12V, 3W	
1	013-156	. Diode, zener, 6V, 3W	
.5	310050810	. Packet Assy, Schmidt Trigger	*

QTY	PART NUMBER	DESCRIPTION 1 2 3 4 5 6	REFERENCE
.5	310171210	. Packet Assy, Output driver	*
.5	310068810	. Packet Assy, Relay driver	*
.5	310028910	. Card Assy, PS to 6V	
.5	310028810	. Card Assy, PS to -10V	
.5	310028710	. Card Assy, PS, +12V	
.5	310057710	. Packet Assy, Phantastron	*
.5	310050710	. Packet, Assy, DC Amp	*
		Vacuum Blower Assembly	
1	3100153410	. Motor, vacuum	
.25	310074710	. Housing Assy, Vacuum Motor	
		NOTE: Above items needed for quick replacement of vacuum motor assembly.	
1	310015310	. Gasket	
4	650-154	. Brushes, Vacuum Motor	
1	169-049	. Connector, Plug, Chassis	
4	169-019	. Connector, Contact, Pin	
	310103510	Retainer Assy, Reel NARTB	
.5	310104010	. Handle, Reel retainer	
.5	310147710	. Spring, Helical	Under Handle
.5	310146810	. Spring, Helical	
.5	310147610	. Screw, Cap	

QTY	PART NUMBER	DESCRIPTION 1 2 3 4 5 6	REFERENCE
.5	310147410	. Nut, Plain	
.5	310147510	. Washer, Thrust	
.5	406-024	. Pin, roll, centering	
1	474-044	. Pin, Vlier	
3	420-020	. Bearing, Ball	
.25	310147310	. Tire, Reel Retainer	
.5	310146710	. Pin, Straight Headless	
.5	310146910	. Spring, Helical	Nearest Motor
.5	310147010	. Washer, Spring, Compression	
		Servo Control Assy	
TWO/ SITE	310153710	. Switch, Differential, Vacuum	
2	310153610	. Transducer, Differential Vacuum	
		Oscillator & Housing	
.25	310126510	. Oscillator Assy	OSC 700
2	012-065	. Tube, 12BH7	
2	012-108	. Tube, 12AX7	
		Reel Brakes	
.25	310010610	. Shoe, reel brake	Upper or Lower
.25	310123310	. Solenoid & Cable Assy	Upper or Lower

QTY	PART NUMBER	DESCRIPTION 1 2 3 4 5 6	REFERENCE
		Vacuum Chambers	
ONE/ SITE	310130210	. Chamber Assy, 1/2"	
1	310150110	. Buffer Spring Guide	w/outboard support
1	65395-2	. Buffer Spring Guide	w/o outboard support
ONE/ SITE	310125510	Chamber Assy, 1"	
1	310149110	. Buffer Spring Guide	w/outboard support
1	65395-1	. Buffer Spring Guide	w/o outboard support
4	310152010	Bearing, roller guide	
2	506-017	Washer, Shakeproof	
.5	310151210	Sleeve, roller guide, 1/2"	
.5	310151110	Sleeve, roller guide, 1"	
1	310151910	. Shaft, roller guide, 1/2"	
1	310151810	. Shaft, roller guide, 1"	
1 roll	225-061	. Tape, pressure sensitive, 1"	Back of chamber
		Precision Plate Assy	
2	310155510	. Actuator Assy, pinch roller	
2	310158610	. Screw cap 8-32 X 2¼"	Brake Post Mtg.
2	310155810	. Bushing Assy, rubber	Actuator Support

QTY	PART NUMBER	DESCRIPTION 1 2 3 4 5 6	REFERENCE
.5	164839-03	. Bearing, ball	Belt tension arm assy
.5	310155410	. Capstan Assy	
1	310155710	. Capstan Roller Assy Fwd	Late Model
1	310155610	. Capstan Roller Assy, Rev.	Late Model
6	310176514	. . Molded Rubber Assy	Includes shaft & Bearings
1	310252410	. Capstan Roller Assy Fwd.	Used on earlier models
1	310252510	. Capstan Roller Assy Rev.	Used on earlier models
6	310011914	. . Molded Rubber Assy	Includes shaft & bearings
.25	310124310	Hold Down Knob Assy, IBM	
3	310034210	. Knob	Ampex Gray
1	310090010	. Latch Ring	
3	470-093	. Screw Hex Nut	Hdk Mtg.
3	501-017	. Washer, flat	Hdk Mtg.
		Positive Pressure Blower Assy	
.25	591-028	. Blower Motor	
2	370-018	. Filter, cabinet mtg.	
.25	310153310	. Filter, transport mtg.	
		Power Supply Assy, PS 100	
2	015-013	. Tube C3J	

QTY	PART NUMBER	DESCRIPTION 1 2 3 4 5 6	REFERENCE
.25	020-006	. Relay	Actuator Over-load
1	040-023	. Resistor, 150 ohm, 25w	Actuator Over-load
4	013-198	. Diode IN2071	
		Servo Power Supply, PS 200	
4	015-012	. Tube, ClK	
ONE/ SITE	310166410	. Bias Board Assy	
		Chassis Assy, CC300	
ONE/ SITE	126-019	. Circuit Breaker, 15 AMP	
TWO/ SITE	126-016	. Circuit Breaker, 25 AMP	117VAC Line
1	126-012	. . Handle Kit	
4	070-008	. Fuse, 6 amp, fast blow	F301
ONE/ SITE	310406110	Actuator Board Assy, AC400	
	310134610	Older models	
8	012-036	. Tube, 5727	
.5	310167510	. Transformer, pulse	
ONE/ SITE	310134910	Servo Amp Board Assy, SA-500	Adjustable
4	012-068	1 Tube, 5751	
2	012-106	. Tube, 5814A	
ONE/ SITE	310192810	Servo Amp Board Assy	Non Adjustable

QTY	PART NUMBER	DESCRIPTION 1 2 3 4 5 6	REFERENCE
4	012-068	. Tube, 5751	
2	012-106	. Tube, 5814A	
		Manual Control Panel	
.5	020-059	. Relay, 2 sec	K801
.5	020-092	. Relay, 45 sec	K805
ONE/ SITE	310126810	Motor Assy, reel	
1	081-019	. Belt, 34" capstan drive	Drive motor 1 to 1.5 ratio
1	081-014	. Belt, 35" capstan drive	Drive motor 1 to 2 Ratio
		. Minor Hardware Kit	1 transport/ 4 years.

The quantities indicated are designed to support one transport operating one shift for one year.

* All of these cards are not needed for any one assy. Choose only those which match your system.