MOD 10

MAGNETIC TAPE TRANSPORT

OPERATION & MAINTENANCE MANUAL

200237

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PREFACE

This manual has been prepared to permit separation of the first three sections, which then form an operator's manual. Material for these sections has been scaled to the requirements and training of computer and off-line system operators.

Sections IV and following are addressed to the engineer responsible for setting up and maintaining this equipment on site. Material covered includes:

- Installation of the tape system in system cabinets
- Checkout procedures and requirements
- Interconnection of the tape and data systems
- Principles of design and operation
- Module replacement and adjustment.

MOD 10

REVISION LEVEL

REV. LETTER	DESCRIPTION	DATE	APPROVAL
A	Original publication	5/70	
B	To reflect basic product re-design	9/70	
C	Update all sections with particular emphasis on Section VI and Appendix B	10/71	
D	Update all Sections	2/72	
E	Changed pages - Title Page, iV, IV-3, IV-9, VI-30, VI-31, VI-34, VI-39, VI-44, VI-47, VI-50, VI-58, VI-59, VI-60, VI-61, updated drawings to latest revision	6/72	
F	Changed pages - Title Page, vii, II-7, IV-2, A-3. Add pages - II-10, II-11, II-12, IV-6A. Updated Appendix B drawings to latest revisions.	10/72	
G	Changed Title Page, revised pages: II-3, II-6, II-8, IV-2, IV-9, V-18 and VI-32. Updated drawings to latest revisions.	1/73	

REVISION LEVEL

REV. LETTER	DESCRIPTION	DATE	APPROVAL
H	Changed pages - Title page; v through xi Revised pages - I-1, I-3, II-1 through II-9, III-1 through III-4, IV-1 through IV-18, VI-40, VI-42 Appendix B: revised list of drawings; updated drawings to latest revisions. Deleted pages - I-6, I-7	6/73	
I	Changed pgs: I-4, VI-61, Updated Appendixes A & B	12/73	

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SECTION I

GENERAL DESCRIPTION

This manual describes the operation and maintenance of the WANGCO Mod 10 digital magnetic tape transport system.

1. PURPOSE

The system provides the equipment necessary to:

A. Move half-inch magnetic tape across a read-write head in response to commands from remote equipment or to signals generated from the operator's control panel located on the transport;

B. Read or write data on magnetic tape and transfer this data between the transport and the controller.

2. DESCRIPTION

The Mod 10 is shown in Figure 1 of this section.

In a computer or other data processing system, the magnetic tape units are used to store very large amounts of data. Recovery of the data without errors depends on proper installation and maintenance of the tape units and the tape itself. The Mod 10 has been designed to permit easy operation and simple maintenance; it also has ample safeguards to protect the tape from damage during its use with the tape unit.

In its standard versions, the Mod 10 uses half-inch computer-grade tape, on reels up to 10-1/2 inches in diameter. The file or supply reel mounts on a hold-down knob that is the same size as the knobs on IBM units. Data on the tape is written so that it may be read

by IBM systems; tapes written with IBM equipment may also be read on the Mod 10. Seven or nine tracks of data are written on the tape at densities of 200, 556, 800, or 1600 characters per inch. In the Mod 10, two NRZI densities are provided in the following combinations of the three standard formats: 200 and 556, 556 and 800, 200 and 800 for the seven-track format, and 800 for the nine-track format. When data is written on tape at a density of 1600 characters per inch, it is phase encoded and only the single density is provided in the system.

Tape speeds that are standard to the Mod 10 are 10, 12.5, 18.75, 25, 37.5 and 45 inches per second. With all the combinations of tape speed and data densities considered, data may be transferred into or out of the tape system at rates from 2000 to 72,000 characters per second.

During normal operation of the tape unit with the data system, tape motion and the reading or writing of data are controlled by the system. When the tape system is not under computer control (i.e., when it is off line), tape motion can be controlled by the operator through pushbuttons on the front of the machine. Indicator lights are also provided to show the conditions under which the equipment is operating. Complete details about these functions and indications are provided in Section II.

When the system is operating, the speed and direction of the tape are determined by the capstan. As it turns, the capstan pulls the tape past the head assembly so that it may be either written or read. For the tape system to operate efficiently, the tape must be started and brought up to speed as quickly as possible. The weight of the tape on the reels prevents the reels from starting as rapidly as the capstan, so a small length of tape is held by buffer arms near the supply and takeup reels. When the capstan starts quickly, the buffer arms are either pulled in or released by the tape motion. Changes in the position of these arms result in the supply and takeup reels either feeding tape to the capstan or taking up the slack created by the capstan motion.

Reflective markers at either end of the tape prevent it from being pulled completely from either the supply or takeup reels, except when the operator wants to change the reel. A sensing post near the read/write head assembly illuminates the tape and issues a stop signal when the marker reflects the light into a photocell. Markers for the beginning and end of the tape are on opposite sides, providing to the computer or data system an indication of which end of the tape has been reached.

To provide the greatest assurance that data on the tape will be read correctly, the tape is cleaned just before it gets to the head assembly. The tape cleaner has small holes into which loose dirt or oxide is deposited as the tape is drawn across the cleaner. For best system operation, the dirt must be removed from the cleaner periodically, as described in Section III for the important operator maintenance functions of head assembly and tape guide cleaning.

3. SPECIFICATIONS

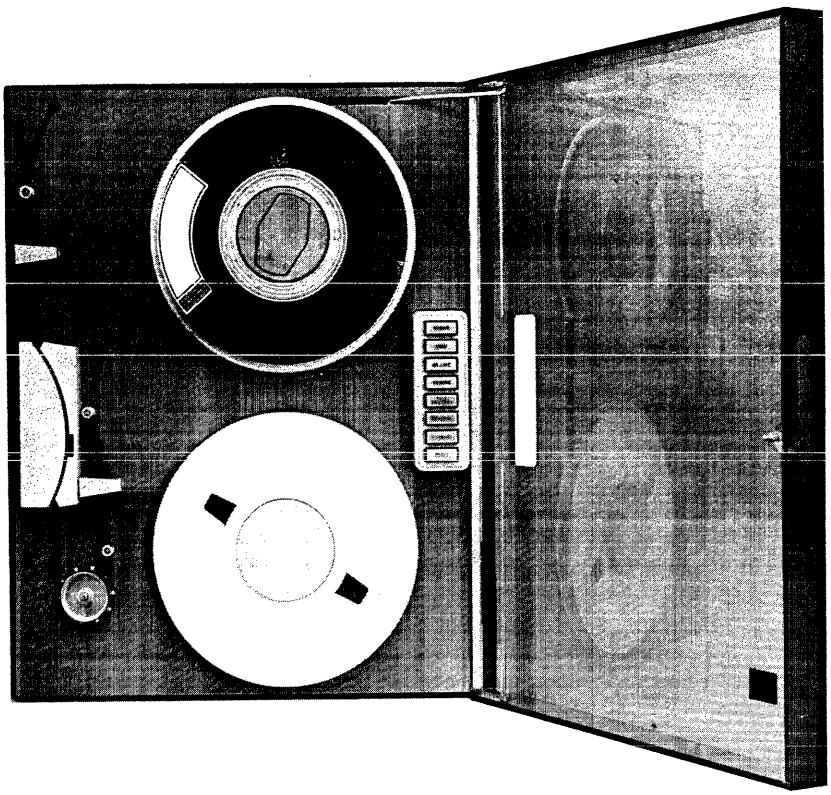
Transport specifications are listed in Table 1.

Table 1. Mod 10 Specifications

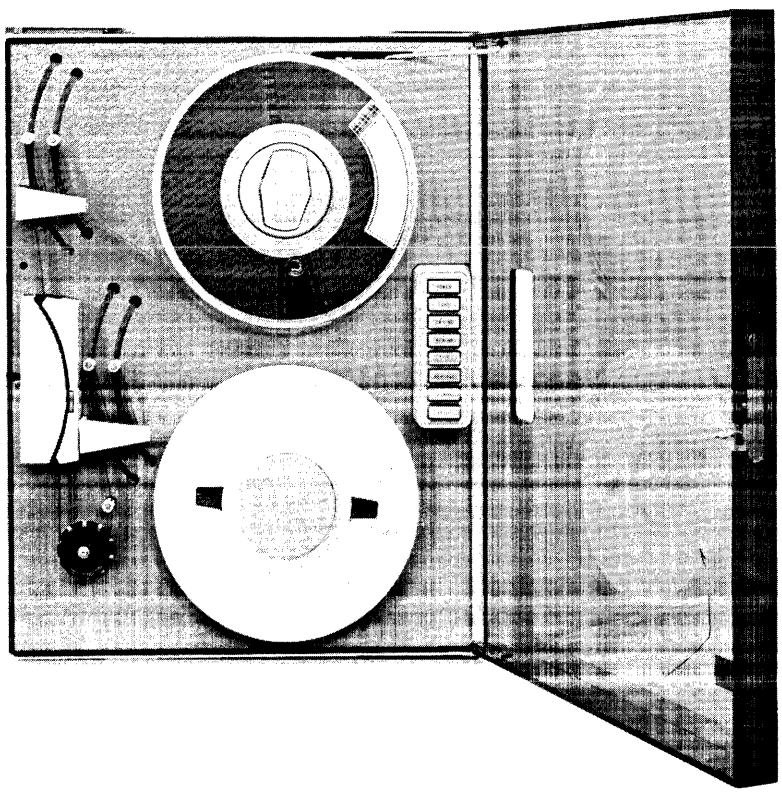
Data Density:	9-track--800 cpi, 1600 cpi 7-track--800/556, 556/200, 800/200 cpi
Tape Velocity:	10, 12.5, 18.75, 25, 37.5, 45 ips
Rewind Speed:	150 ips Nominal
Total Speed Variation:	±4% maximum
Start/Stop Distance:	start distance = .17 ± .02 in. stop distance = .19 ± .02 in.
Start/Stop Time:	37.5 ± 2.5 millisec at 10 ips 30.0 ± 2.0 millisec at 12.5 ips 20.0 ± 1.3 millisec at 18.75 ips 15.0 ± 1.0 millisec at 25 ips 10.0 ± 0.7 millisec at 37.5 ips 8.3 ± 0.6 millisec at 45 ips
Head:	dual gap or single gap
Number of Tracks:	7 IBM-compatible 9 ANSI-compatible
Recording Mode:	NRZI - IBM and ANSI-compatible

Table 1. Mod 10 Specifications, cont'd.

Static Skew, WRITE:	electronic skew compensation supplied on dual gap units
Static Skew, READ FORWARD:	100 micro-inches, maximum
Dynamic Skew:	75 micro-inches, maximum
Tape Specifications:	computer grade, 0.5" wide, 1.5 mil thick Mylar base
Reel Size:	up to 10.5-inch diameter, IBM hub compatible
Tape Tension:	8.0 ± 0.5 oz.
Electronics:	silicon solid state and 930 series DTL logic
Tape Unit Interface:	DTL logic (low true)
Weight:	100 lbs.
Height:	24"
Width:	19"
Depth:	11" (from mounting surface)
Power:	110-125 VAC ± 10%, 2.3 amps/220-250 VAC ± 10%, 1.2 amps, 48-60 Hz
Operating Environment	
Temperature:	60° to 90° F.
Relative Humidity:	20 - 80%, non-condensing
Non-Operating Environment	
Temperature:	-30° to 140° F.
Relative Humidity:	15 - 95%, non-condensing
Altitude:	0 - 20,000 feet



(A) Tape System for Speeds of 25 IPS or Less



(B) Tape System for Speeds of 37.5 and 45 IPS

Figure 1. Mod 10 Tape System - Front View

SECTION II

SYSTEM OPERATION

Operation of the Mod 10 tape system requires only a few simple procedures. These include tape loading and unloading, manual rewind, power failure recovery, and possible other special operations required by the data processing system using the tape equipment.

POWER ON the tape unit by setting the power switch located on the power supply chassis to the ON position. Depress the POWER pushbutton switch located on the operator's control panel. At this point, power will be available to all assemblies and the power indicator will illuminate.

TAPE LOADING is made particularly easy by the toggle-action hold-down knob (Figure 2) designed for the Mod 10. Positive indication is provided by the knob for installation of the reel and for the locked condition. To prepare the knob for installation of the reel, depress the toggle at the end marked PRESS. It will remain in that position. Place the tape reel on the knob, with the write enable ring, or the slot provided for it, toward the tape unit. This will automatically position the end of the tape on the reel for proper threading. After pressing the reel firmly against the knob, using the fingertips against the REEL HUB ONLY, press the extended end of the toggle tab until it is flush with the face of the hold-down knob. The snap action of the knob will be distinctly felt, and the knob is then firmly locked. It is not necessary to hold the reel against the knob when the knob is being locked. Care should also be taken to avoid pressing the reel flanges against the tape pack when loading the tape or locking the knob. Pressure of the flange against the tape edges causes two types of damage: oxide is dislodged from the film, causing potential read errors; deformity of the edge of the tape results in misalignment of the tape as it passes the head, with an increased possibility of errors.

To thread tape on 10, 12.5, 18.75 or 25 ips Mod 10 systems (Figure 3), follow this procedure:

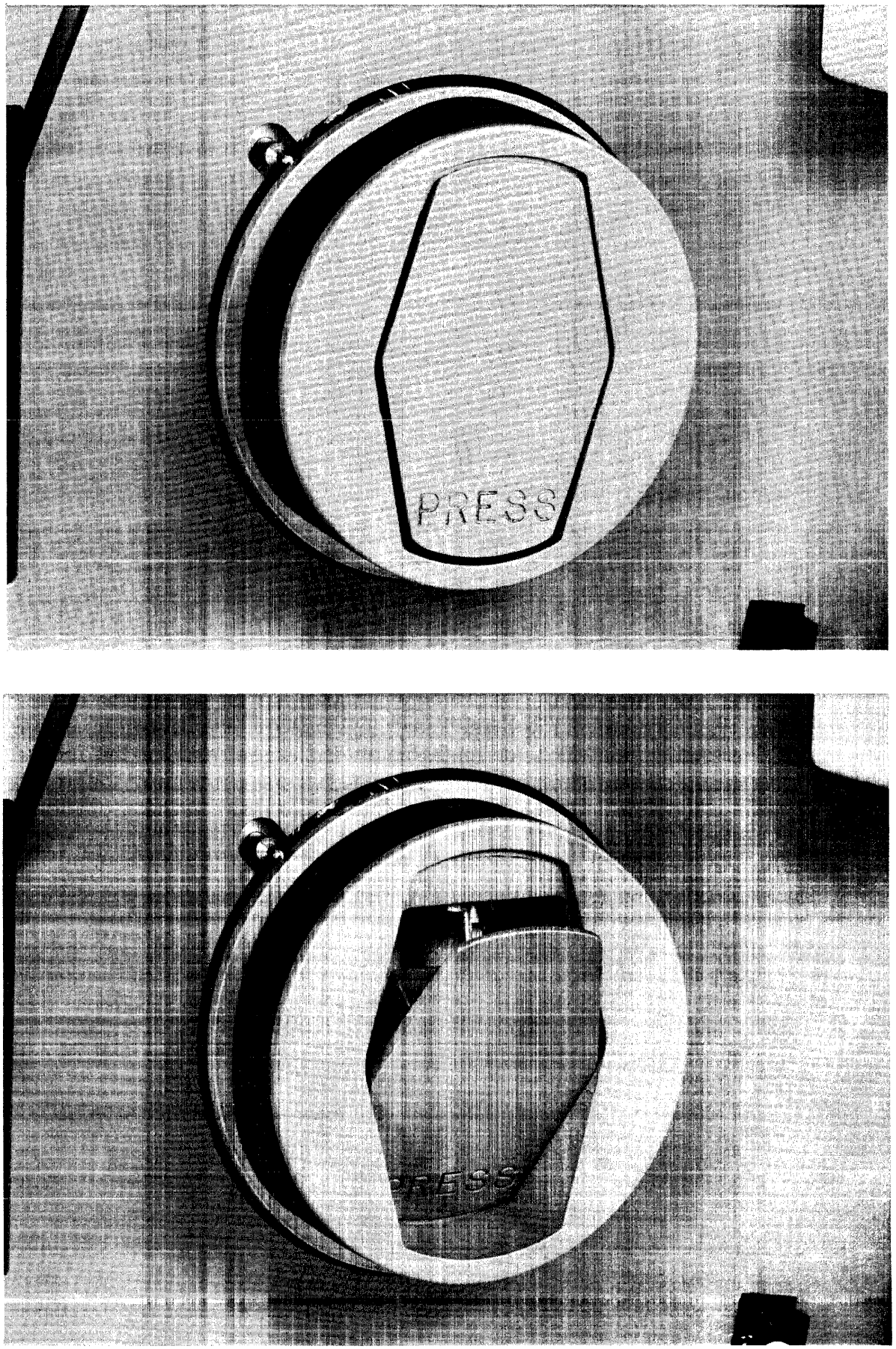
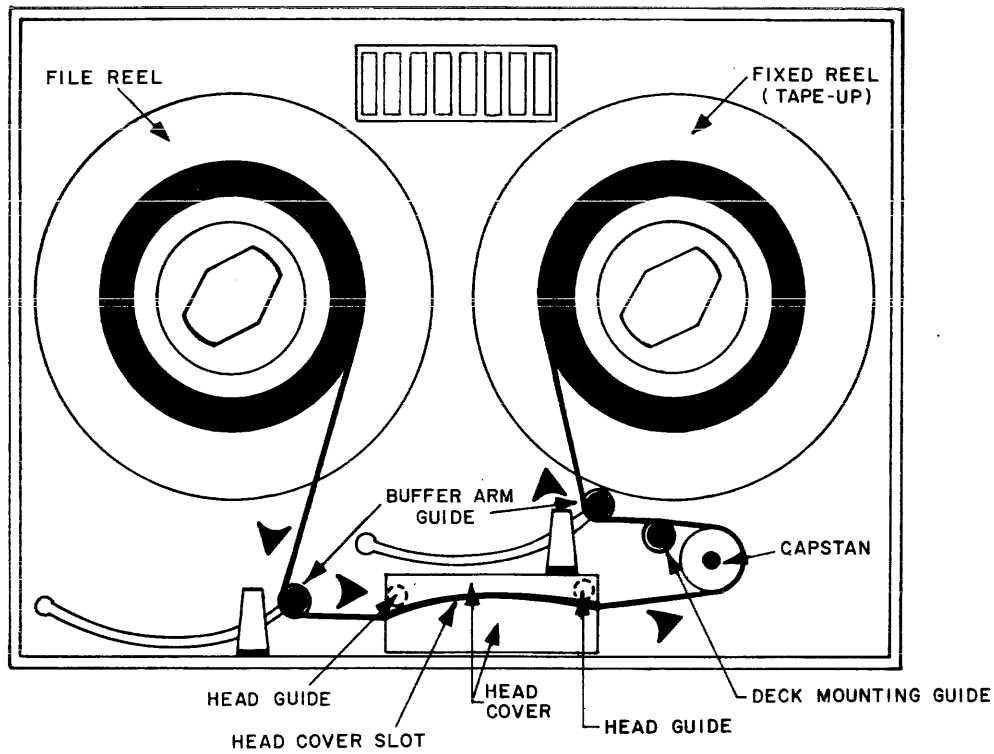


Figure 2. File Reel Mounting Hold-Down Knob in Locked (Top) and Unlocked (Bottom) Positions



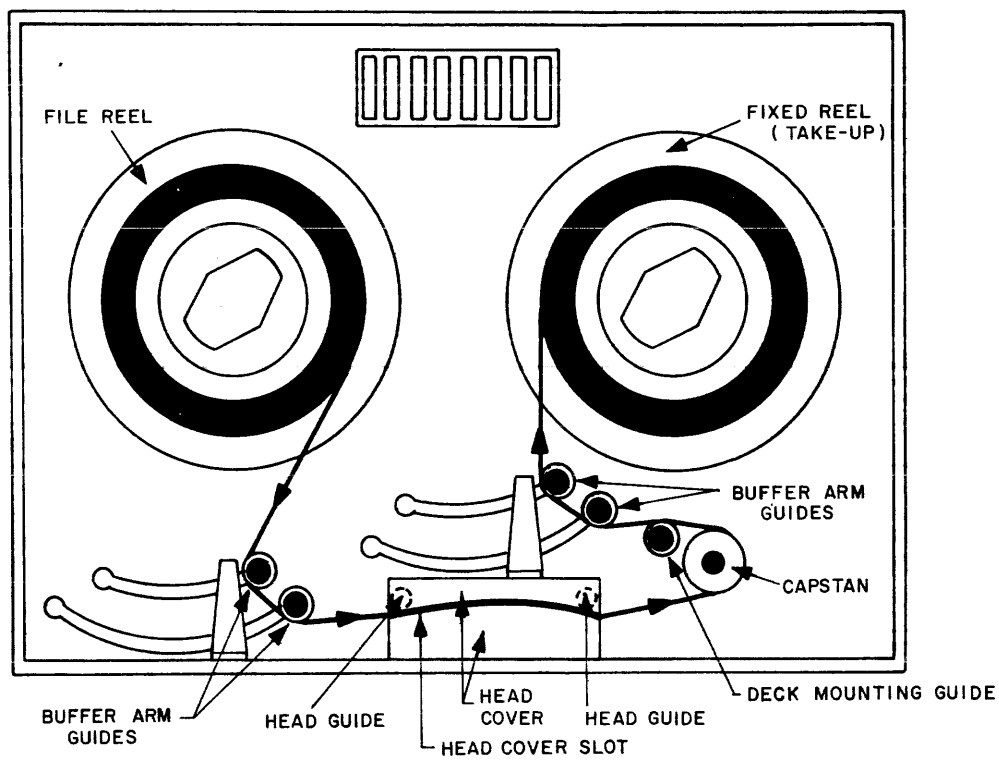


Figure 3. Tape Threading Path for 25 IPS or Less System (Top) and 37.5 and 45 IPS System (Bottom)

1. Lead the end of the tape over the buffer arm guide and down through the slot guide in the head assembly cover. The passage of the tape through the slot causes the small shield over the head assembly to move away from the head. The tape then tracks properly over the read/write heads and other elements in the head assembly.

2. At the capstan end of the head cover slot, lead the tape around the capstan and over the top of the other buffer guide.

3. Pass the tape over the top of the fixed takeup reel.

4. Press the end of the tape against the hub through one of the openings in the reel flange.

5. Holding the tape against the hub, turn the reel until the end of the tape is overlapped and secured by the next tape layer.

6. By hand, wind three full turns of tape onto the takeup reel.

7. To complete the loading operation, firmly press the LOAD pushbutton on the operator's control panel (Figure 4). Both buffer arms will move to their normal operating positions and the capstan will pull the tape forward until the beginning-of-tape (BOT) marker reaches the photosense assembly. Control of the tape system will then be turned over to the data system tape controller automatically, and the ON-LINE indicator and LOAD indicator will light up. No operator action is needed to put the tape system on line.

8. If the on-line mode is not desired, the tape unit may be taken off line, for control from the operator's control panel, by pressing the RESET pushbutton.

To thread tape on 37.5 ips or 45 ips Mod 10 systems (Figure 3), follow the previously described procedure for 25 ips units, except that the tape must be led across both rollers of each buffer arm guide assembly.

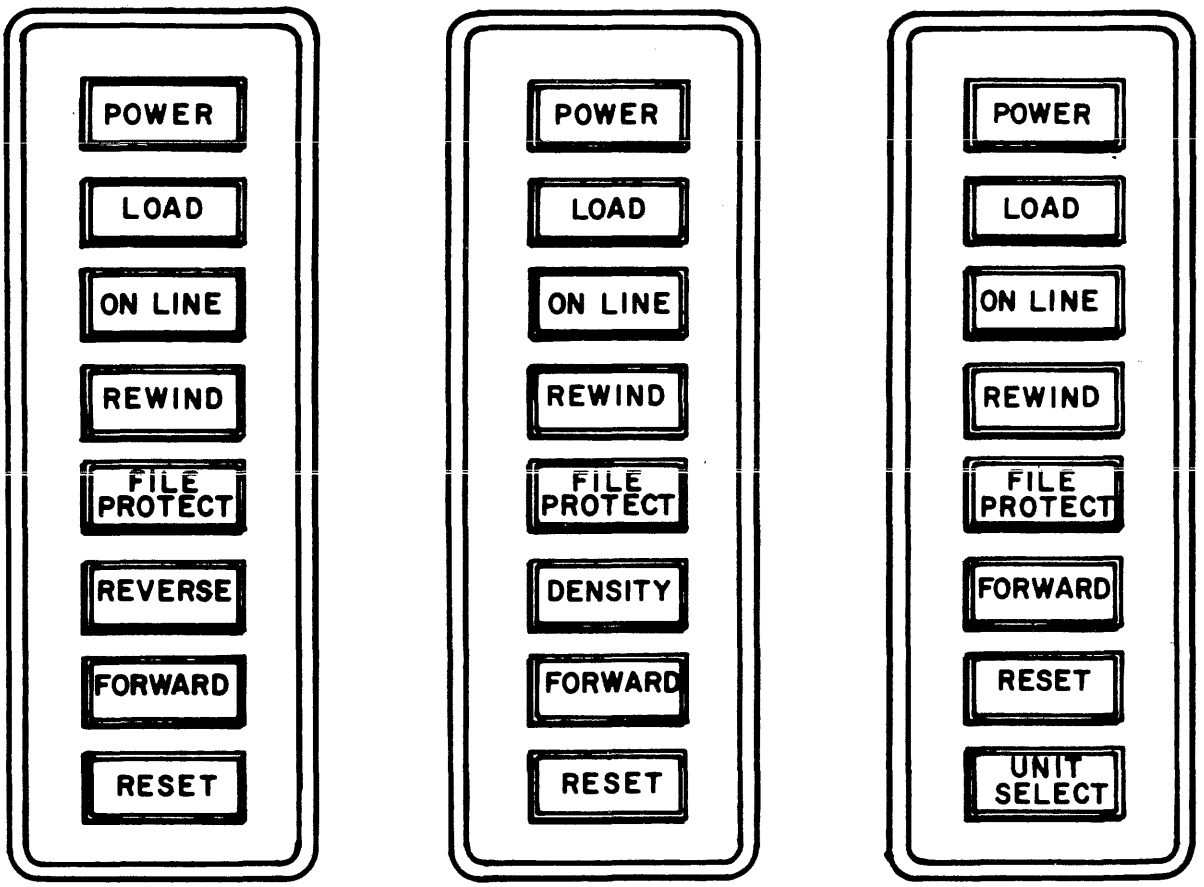
At the conclusion of a tape system operation with the computer, or at other times when it is necessary, the tape will be rewound onto the supply reel. Normally, the computer or data system will issue a rewind command without operator participation. Other conditions will sometimes require the operator to rewind the tape by pressing the REWIND pushbutton on the operator control panel. This will result in high-speed reverse operation. When the beginning-of-tape marker reaches the photosense unit, the rewind will be ended, and the tape unit will advance the tape until the reflective marker is at the photosense head.

TO UNLOAD THE TAPE, push the REWIND pushbutton again. The tape will be pulled through the tape path and returned to the supply reel. The tape reel may then be removed from the machine by pressing the knob toggle to the unlocked position. Again, care should be taken to avoid damage caused by pressing the reel flanges against the sides of the tape.

To POWER OFF the unit, depress the POWER switch on the operator's control panel.

In the event of power failure while the system is on line, the buffer arms will extend and tension on the tape will be relaxed, preventing any possible tape damage. When power has been restored, tape system operations may be resumed by first taking up the tape slack and then pressing the LOAD pushbutton. When the buffer arms have returned to their operating positions, press the RESET pushbutton to stop tape motion. Then press the REWIND or ON-LINE pushbutton, depending on the requirements of the system with which the Mod 10 is operating.

In the following list, the other operator control functions and indicators (Figure 4) are described, with a review of those already mentioned:



(A) Standard (B) Density Option (C) Unit Select Option

Figure 4. Operator's Control Panels

POWER — This is a combination pushbutton switch and indicator. The indicator is on when regulated power has been supplied to the Mod 10. For the convenience of the maintenance or customer engineer, a power switch is provided on the power supply chassis at the rear of the machine. It is accessible only when the tape unit is swung open for service.

LOAD — After threading the tape, press this combination pushbutton switch and indicator to complete the tape loading operation. Tape is automatically advanced to the load point, or beginning-of-tape marker, and then the tape system goes on line. LOAD and ON LINE will be lit when the action is completed. The LOAD light will go out when the tape is advanced from the load point or rewound. The LOAD light will be lit any time that the tape is positioned at the load point. After this sequence of operations is completed the switch becomes functionally disabled and can only be re-enabled by loss of tape tension.

ON LINE — This is a combination pushbutton switch and indicator. As previously mentioned, it is lit when the system is under control of the computer or data system. If the system is off line and if control is to be turned over to the computer, press the ON-LINE pushbutton. The system will be returned to the OFF-LINE mode if the system interlocks are lost, an OFF-LINE controller command is sensed, or the RESET pushbutton is depressed.

FILE PROTECT — This is an indicator that is lit when a write enable ring is not installed on the file reel. When a supply reel is put on the machine with the write enable ring in place in the slot at the back of the reel, the FILE PROTECT light will be off. This indicates that data may be written on the tape. With the ring not in place, protective circuits in the tape system prevent data from being written on the tape.

REWIND — Pressing this pushbutton switch will result in rewind of the tape at high speed. The operator can stop this reverse motion by pressing the RESET pushbutton. If

REWIND (cont'd.)

RESET is not pressed, the tape will go beyond the beginning-of-tape marker, stop, and then automatically return to the load point. If the REWIND pushbutton is then again pressed, the tape will be drawn out of the tape path and the unload sequence will be completed. If the tape system is under computer control, the REWIND pushbutton is disabled. This safety feature prevents accidental tape damage.

FORWARD

This is a combination pushbutton switch and indicator. The pushbutton will function only when the machine is off line. If the ON-LINE indicator is on, pressing the FORWARD pushbutton will have no effect. If the ON-LINE indicator is off and the FORWARD pushbutton is pressed, the indicator will light up and the tape unit will move tape in the forward direction at the normal tape speed. To stop the machine, when it is running in this mode, press the RESET pushbutton.

REVERSE

If the ON-LINE indicator is on, the REVERSE pushbutton is disabled. If the tape unit is off line, pressing this combination pushbutton switch and indicator will light the light and move the tape in reverse at the normal tape speed. To stop the machine when it is running in this mode, press the RESET pushbutton.

RESET

This switch is used only on NRZI units. All tape motion, except UNLOAD, will stop when the RESET pushbutton is pressed. Pressing RESET clears all read, write and control functions. It also removes the tape unit from on-line operation with the computer or data system and turns off the ON-LINE indicator.

UNIT SELECT

This switch is optional on NRZI units. When this switch is used, the REVERSE switch is not installed. This is a 4-position switch used to make the transport assignment in a daisy chain configuration. A particular drive in the

daisy chain is automatically selected if the switch identification number corresponds to the controller select line which has been conditioned TRUE. See Figure 4(C).

DENSITY SELECT

This alternate action switch is optional for NRZI units. When it is used, the REVERSE switch is not installed. When depressed to select High Density, it conditions the data electronics to operate at the high data transfer rate and also causes the indicator to light. When the switch is again depressed, the lower data rate capability is selected and the light is extinguished. See Figure 4(B).

Care and Handling of Digital Magnetic Tape. Satisfactory performance of any digital magnetic tape system depends very heavily on the use of good magnetic tape and upon proper handling of the tape by computer operators. Most data reliability problems begin with improper or careless handling of magnetic tape during the loading of the tape on the tape system or in removing the tape. Reliable performance of magnetic tape systems can be, to a great extent, assured by observing a few simple rules and adopting proper procedures in the handling of tape.

Whenever magnetic tape is handled it should be borne in mind that the Mylar or polyester base on which the magnetic coating is applied is only 1 or 1.5 thousandths of an inch thick. The magnetic coating is only a fraction of that thickness. Several things happen when tape is improperly handled. One of the most serious types of damage is that in which the tape is bent, stretched, or otherwise physically deformed so that part of the magnetic coating is dislodged. This results in two possibilities for data errors. In the first case, the area from which the magnetic coating has been removed will no longer accept data when it is written in the area, and of course data cannot be recovered from that area. The second potential data error results from the redepositing of the loose oxide at some other location where it can cause the tape to be lifted from the head as the tape passes over the head. This again results in improper writing or reading of the data.

Because of the fragility of the tape, it is important that it be handled as little as possible when putting the tape on the tape drive or removing it. At no time should the tape be handled in any area other than that ahead of the beginning-of-tape (BOT) marker. Should it be necessary, because of power failure or some other malfunction, to handle the tape at any other point in its length, extreme care should be exercised to be sure that the edges are not deformed in any way and that no dirt, lint, or other potential contaminants be deposited on the oxide surface or back of the tape. Particles of dust or other material create potential errors in the same way that oxide dislodged

from the surface does, by lifting the tape away from the read and write heads.

When handling the tape in any area, including the length used in threading or loading it on the tape drive, the tape should not be permitted to touch the floor or other surfaces where dust or dirt may be transferred to it. Only that length of tape actually required to thread the tape drive should be removed from the reel in the process of threading. Any extra length of tape that dangles or drops from the machine in the threading process will be likely to pick up dust or other contaminants. Care should be taken to prevent grease from the fingers from being transferred to the tape, and foods should not be brought into the area where computer tapes are used.

When handling the reel upon which the tape is wound, the flanges of the reel should never be pressed against the tape wound on the reel. This is one of the most common sources of damage to tape. When the reel flanges are pressed against the tape, the tape edges protruding from the tape pack will be bent, curled and deformed so that oxide is dislodged and proper guiding of the tape is prevented. To handle the reel properly, it should be grasped with both hands at the outer edges so that any pressure required to hold the reel is directed toward the center opening. When mounting the reel on the hold-down knob of the tape drive, proper seating of the reel can be accomplished by pressing with the fingertips against the area within half an inch of the reel opening. There is a solid ring at this point; no tape is wound in the area and no tape damage to the tape can result. It is extremely important that the reel not be pressed on the tape drive in any way other than that described. If the flexible part of the reel flange is pressed to seat the reel properly, damage to the tape will result.

In removing the tape from the tape handler, these same precautions should be observed. After unlocking the hold-down knob, the tape reel should again be grasped at the outer edges and extreme caution must be used to prevent the reel flange being brought forward to the edge of the tape pack. The tape handler does not

discriminate between damage to the front edge or rear edge of the tape. Damage to either edge of the tape results in the same eventual data unreliability. Cannisters used for storing the tape should always be handled carefully, with no abrupt motions or hard impacts. After the tape reel is removed from the cannister to load it on the tape drive, the tape cannister should immediately be closed and locked so that dust will not be introduced into the cannister while the tape is on the drive. Broken, chipped, or cracked cannisters should be discarded immediately. The cost of a cannister is small compared to the value of the data on a reel of magnetic tape.

When tape has been in use for a long time and data errors begin to occur frequently, it is possible to have the tape cleaned and recertified for additional use. If recertification does not restore the tape to a satisfactory level of reliability, it should be discarded. Most modern digital magnetic tape, if properly handled, will give long and reliable service. It will not last idefinitely, however, and a regular program of tape recertification will help to establish which tapes must be discarded to prevent costly errors and data processing system down-time.

When tape is not in use, it should be stored in cannisters under temperature and humidity conditions prescribed by the tape manufacturer. Tape should never be stored or placed near electric motors, transformers, or any other device that may be expected to generate heavy magnetic fields.

SECTION III

OPERATOR MAINTENANCE FUNCTIONS

Proper and regular maintenance of the Mod 10 tape handler will assure operation at the high levels of data and mechanical reliability that have been designed into the system. Particularly important are the operator maintenance functions that are intended to keep the system free of dirt and contaminants. At the high densities of data on tapes written or read with the Mod 10, extremely small particles of dust or oxide from the tape are capable of causing data errors. Careful attention to the cleaning procedures described in this section will assure the greatest possibility of trouble-free operation.

TRANSPORT AND HEAD CLEANING should be performed after every eight hours of system use. Following are the steps to be carried out:

1. Remove tape from the tape unit, as described in Section II.

2. Remove the head covers by pulling both pieces, one at a time, directly away from the front of the machine. The covers will come off with a gentle, steady pull.

3. Moisten a soft, lint-free cloth or Q-tip applicator with isopropyl alcohol. After the head surfaces, including the surface of the erase head, have been carefully swabbed, they should be dried with a separate clean and lint-free cloth. See Figure 5.

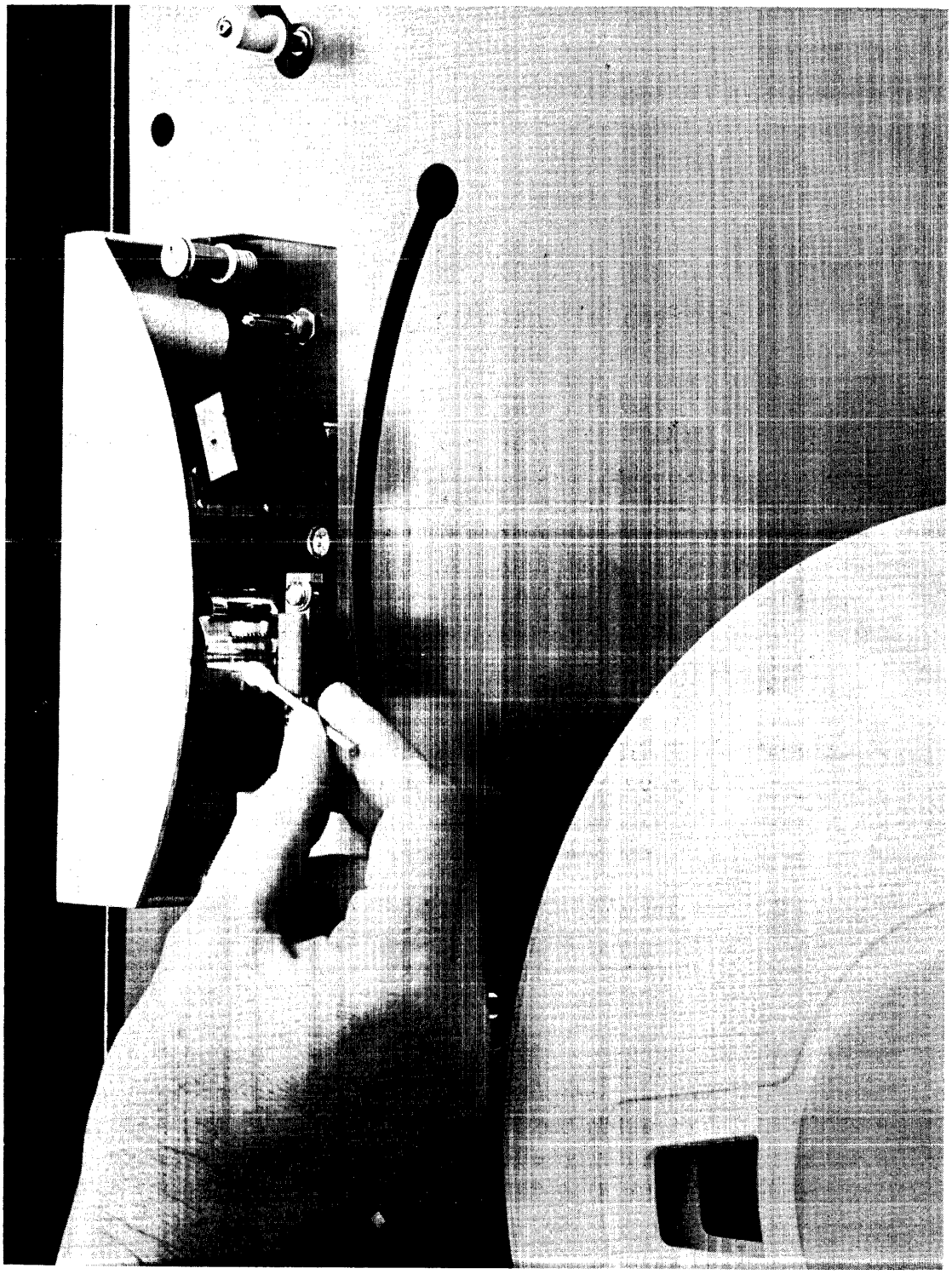


Figure 5. Cleaning the Read/Write Head Assembly

4. Clean the face of the tape cleaner, following the same procedure described in step 3.

5. Clean the head guides and head guide blocks, shown in Figure 5. The guide blocks are immediately in back of the guides. Dry all parts with a clean, lint-free cloth.

6. Clean the roller guides (Figure 6), rotating them to be sure all surfaces are cleaned. Dry with a clean, lint-free cloth.

7. If it has been removed, replace head cover by aligning the holes in the cover with the mounting pins on the transport and pressing firmly into place.

CAPSTAN CLEANING should be performed after <u>every eight hours</u> of use, following this procedure:

1. Moisten a cloth with water.

2. Rotate the capstan slowly with one hand, without touching the rubber surface.

3. At the same time, clean the surface of the capstan with the moistened cloth. Make a visual inspection of the capstan surface for abrasion or polish; if defects are observed, contact the maintenance engineer.

4. Dry the capstan with a separate clean and lint-free cloth.

Additional cleaning requirements are carried out at longer intervals. <u>Every four months</u> the entire surface of the tape unit should be cleaned, making sure that accumulations of dust around the hold-down knobs and in the head area are removed. Head covers should be removed and cleaned on the inside and outside, making sure that all deposits of dust and other possible tape contaminants are removed.

Any periodic maintenance functions beyond those described here are suggested for performance by customer engineers. Details of these additional procedures are described in Section VI.

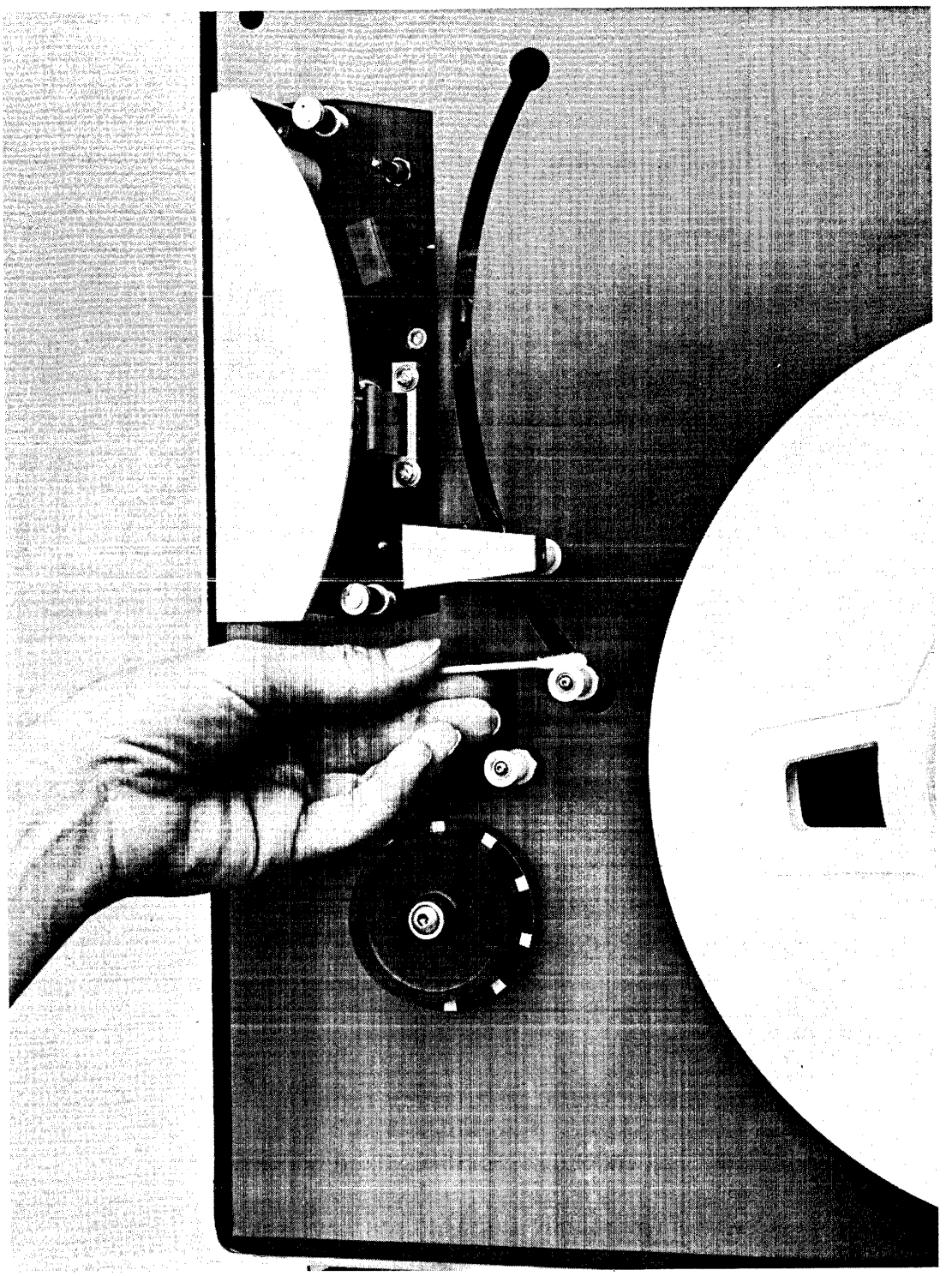


Figure 6. Cleaning the Roller Guides

SECTION IV

INSTALLATION AND INITIAL CHECKOUT

This section provides installation instructions for the Mod 10 magnetic tape system. Information on unpacking the system and on the procedure for electrically connecting and checking out the system is included.

1. UNPACKING AND INSPECTION

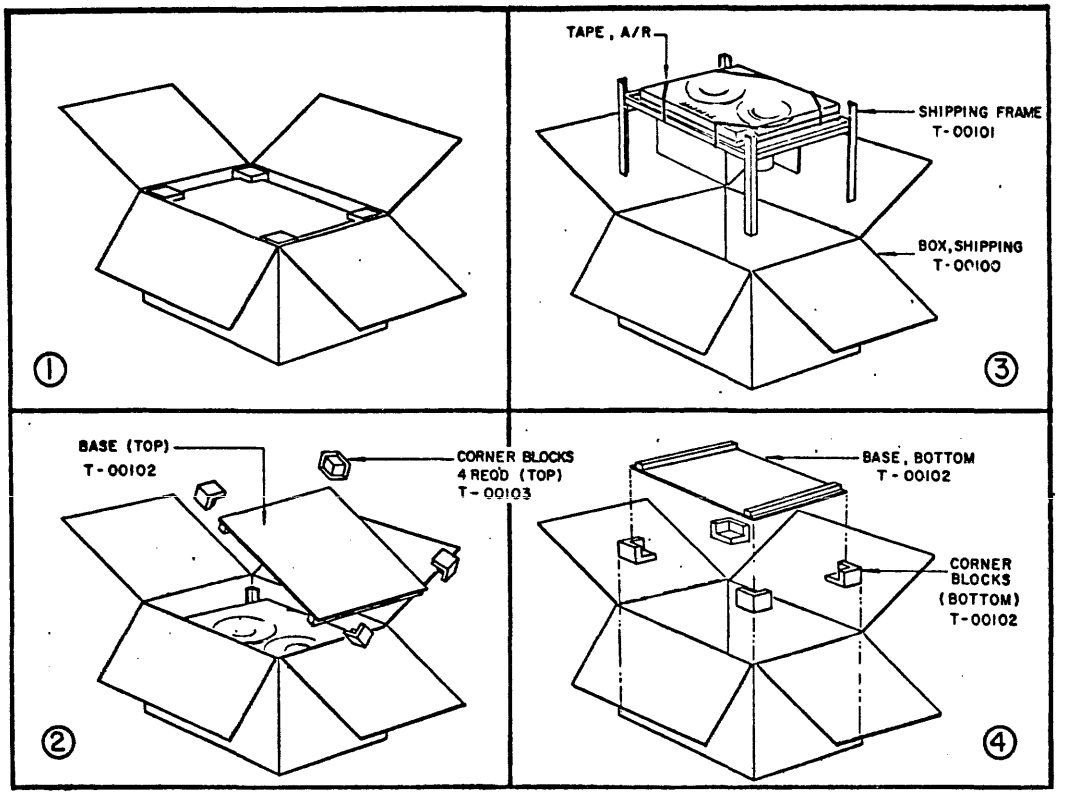
Inspect the shipping container for evidence of in-transit damage. Contact the carrier and manufacturer if damage is evident. Specify nature and extent of damage.

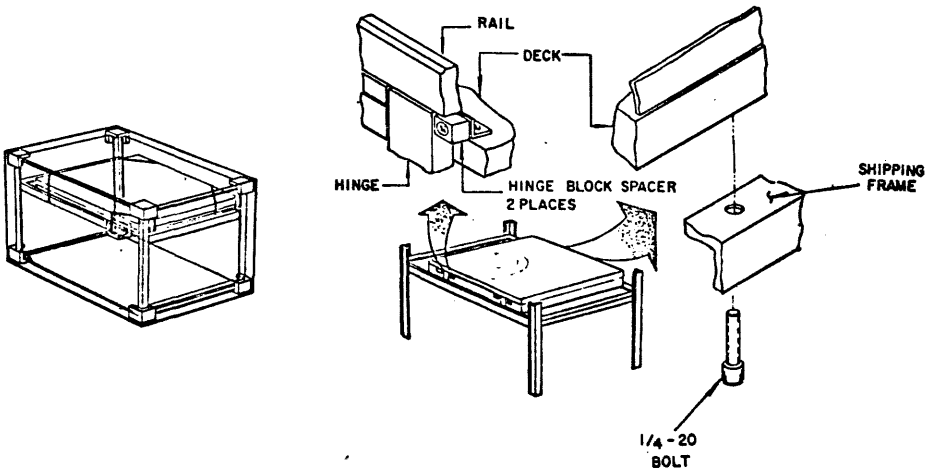
Open shipping container and remove contents. (See Figure 7, page IV-2.) Check items removed from shipping list to verify container contents. Contact a company representative in the event of a packing shortage.

Remove protective padding and covering from the tape system. Verify that the serial number of the unit corresponds to that shown on the shipping invoice.

Visually inspect the exterior of the enclosure for evidence of physical damage that may have occurred in transit.

Check major component assemblies to determine if any assemblies or screws have been loosened. Tighten any loose screws or mounting hardware. Inspect input/output connectors.





UNPACKING PROCEDURE:

SAVE ALL PARTS FOR FUTURE USE.

1. OPEN SHIPPING BOX & REMOVE 4 CORNER BLOCKS.
2. REMOVE TOP BASE FROM BOX.
3. REMOVE TAPE TRANSPORT FROM BOX.
4. REMOVE STRAPPING & PROTECTIVE PADDING FROM TAPE TRANSPORT.
5. REMOVE SHIPPING FRAME.

DO NOT REMOVE BOTTOM BASE OR CORNER BLOCKS FROM BOTTOM OF BOX.

REPACKING PROCEDURE:

1. ASSEMBLY SHIPPING FRAME TO TAPE TRANSPORT USING SCREWS PREVIOUSLY REMOVED.
2. SECURE STRAPPING & PADDING AROUND TAPE TRANSPORT.
3. PLACE TAPE TRANSPORT IN SHIPPING BOX.
4. PLACE TOP BASE IN BOX.
5. PLACE 4 CORNER BLOCKS & RESEAL SHIPPING BOX.

Figure 7. Tape Transport Unpacking/Repacking Procedure

2. INITIAL CHECKOUT PROCEDURES

To check the proper operation of the transport before placing it in the system, follow the specified procedure.

1. For applications not employing 115 VAC line power, verify that the appropriate primary power transformer wiring is correct. This can be accomplished by swinging out the power supply chassis and checking the wiring against the voltage decal mounted on the deck of the transport. See Figure 43.

2. Turn the transport power on by setting the power switch located on the power supply chassis to the ON position and pressing the POWER pushbutton switch located on the operator's control panel. At this point the POWER indicator should light up.

3. Load tape on the transport as described in Section II.

4. Press the LOAD pushbutton to initiate the load sequence. The tape will move forward until it reaches the BOT tab. The ON-LINE indicator should light when the BOT reaches the photosensor. At this point, there will be no action when the LOAD pushbutton is pressed. To remove the system from the on-line mode, press the RESET pushbutton. The system is now in the off-line mode.

5. With the transport off line (ON LINE indicator not illuminated), press the FORWARD pushbutton. Run several feet of tape onto the takeup reel and press the RESET pushbutton to stop the tape. Be sure that when the transport is on line, the action of the FORWARD pushbutton is inoperative.

6. Press the REVERSE pushbutton. Tape will move backward until the BOT tab reaches the photosensor. Be sure that the action of the control is inoperative when the transport is on line.

7. Using the FORWARD pushbutton, run several feet of tape onto the takeup reel. Press the REWIND pushbutton to initiate the rewind mode. The tape will rewind past the BOT tab, return to the BOT tab, and stop with the LOAD indicator lit. If the REWIND pushbutton is now pressed, the tape will rewind until tape tension is lost. This action is used to unload tape. The reel can be removed as outlined in Section II.

3. RACK MOUNTING THE TRANSPORT

The transport may be mounted in a standard 19-inch RETMA or Universal rack with a minimum panel space of 24 inches. A depth of 11 inches minimum is required behind the rack mounting surface. The procedure for mounting (see Figures 8 & 9) is as follows:

1. Remove safety blocks from below hinges then lift transport off shipping frame.

2. Remove hinge-half off shipping frame and install same on rack in desired position.

3. Hang transport on rack and lock in the closed position by tightening catch screw in front of the deck.

4. Replace safety blocks.

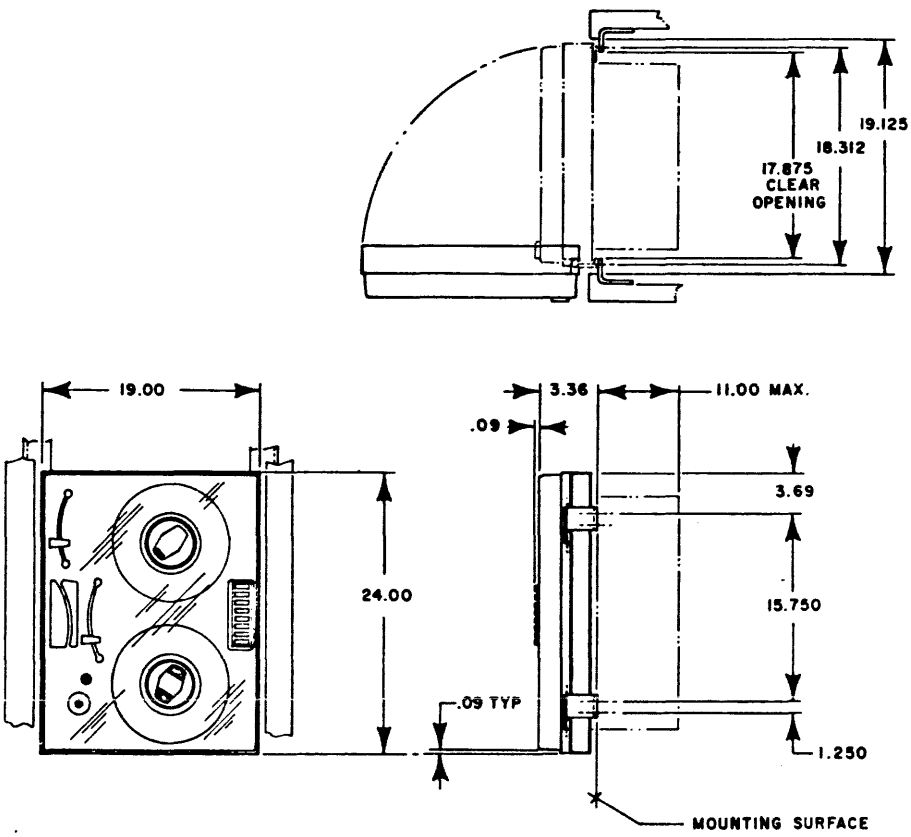


Figure 8. Tape System Rack Mounting

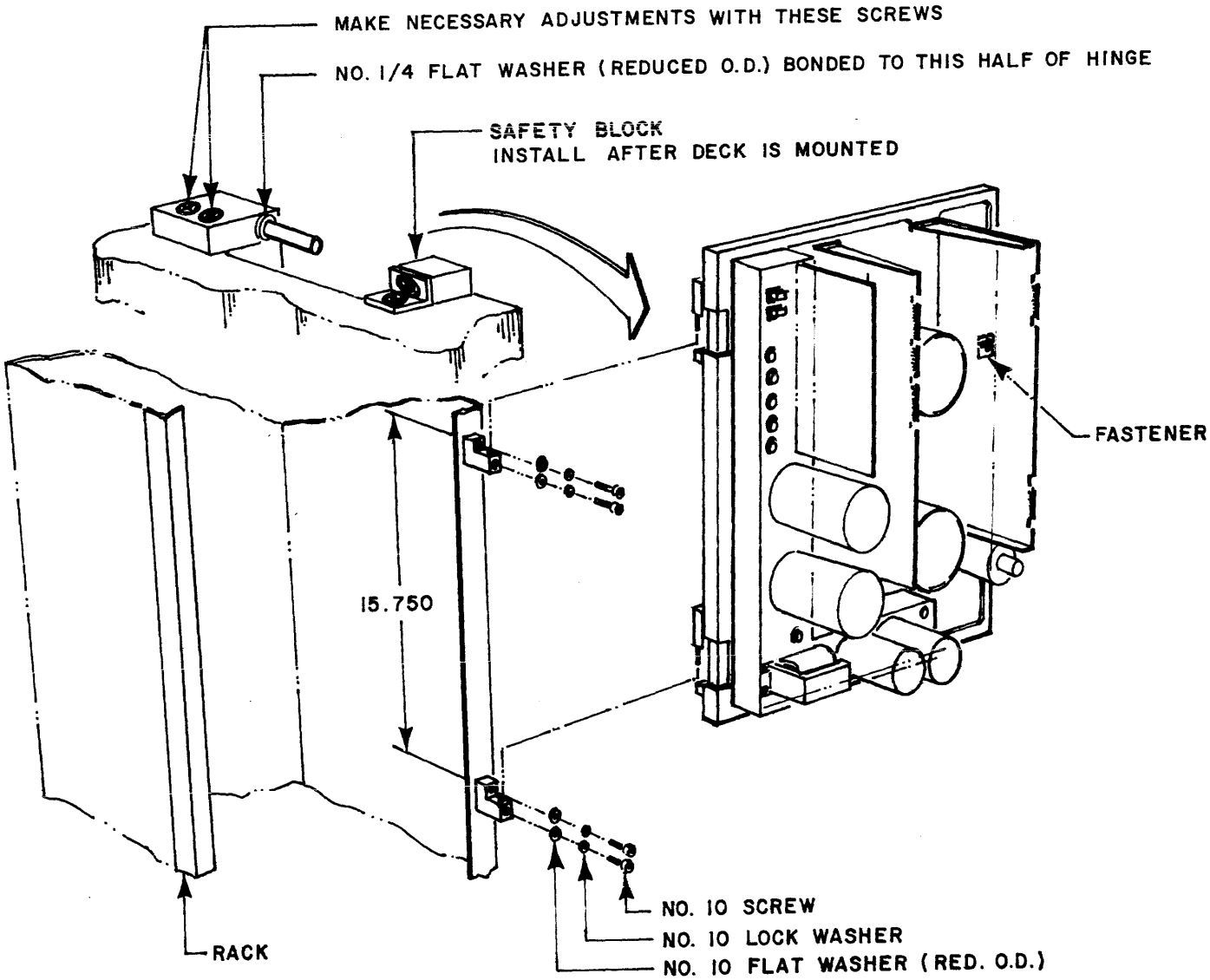


Figure 9. Tape Transport Installation

4. INTERFACE REQUIREMENTS

4.1 CABLING

The interface cables shall be twisted pairs with returns grounded. Wire shall be #24 or #26 AWG conductor with minimum insulation thickness. Cable twist shall be approvimately 30 twists per foot. Maximum cable length shall be 20 feet. The ground side of each pair shall terminate within a few inches of the line receiver or transmitter ground. Connectors shall be Transitron 600-061-18-SL or equivalent. Cables should be wired and strain relieved as shown on Figure 10.

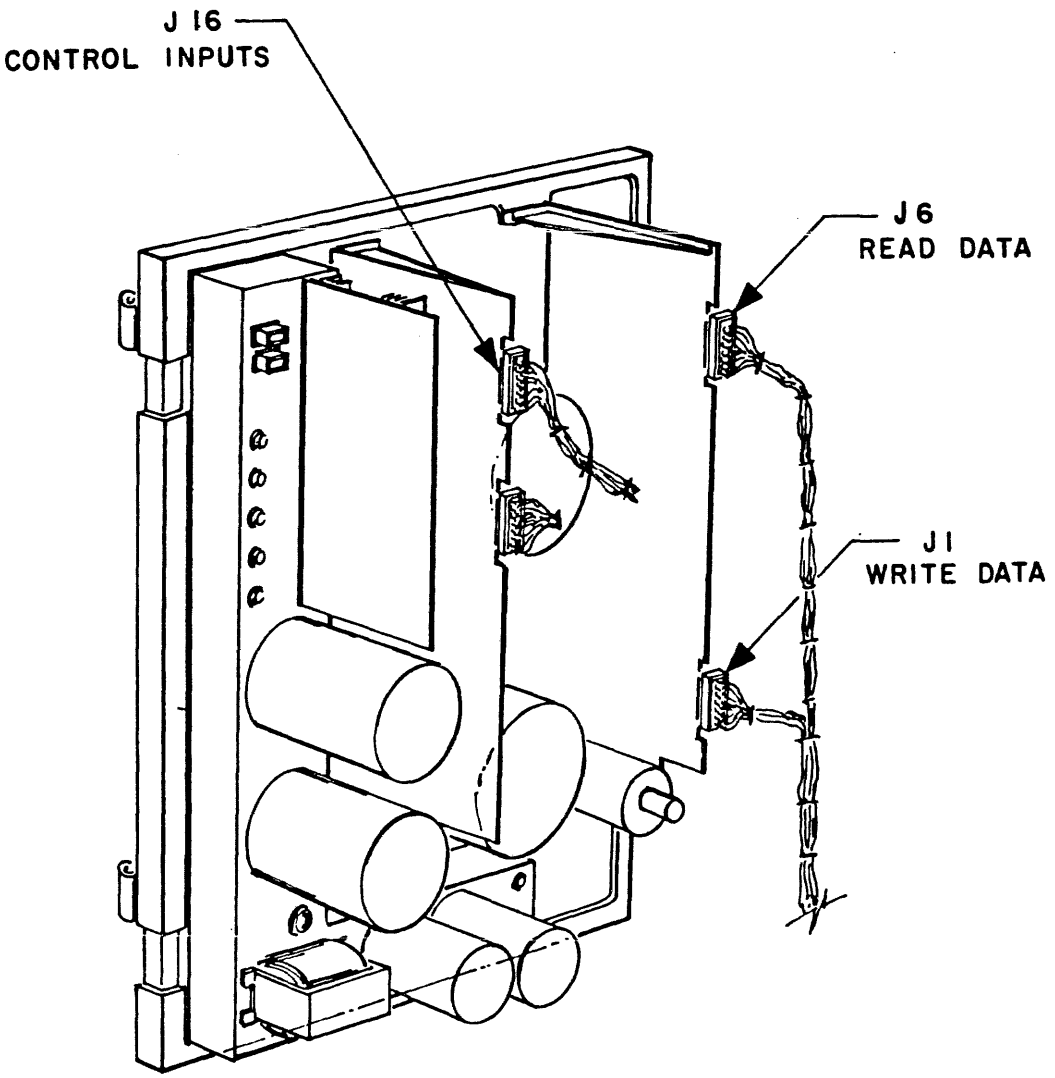


Figure 10. Interface Cable Installation

4.2 DAISY CHAINING (Units using 200632 Control Board and 201142 Data Board)

Up to four units can be daisy chained on the same buss without any modification to any of the tape units tied in the daisy chain configuration. When the Unit Select option is installed, it is feasible to add or delete tape units from the buss and re-assign new tape unit addresses.

The following features incorporated into the Mod 10 Transport allow daisy chaining to become a simple operation.

1. Parallel Connectors

   Parallel Connectors are provided for all interface cables (Control, Write, and Read). The advantages of such a system are as follows:

   a) It allows all interface signals including the four select lines to enter and leave all the tape units in the daisy chain.

   b) It eliminates the requirement of using "T" cables. This facilitates daisy chaining since a drive may be added or removed by simply adding or removing a cable, thus eliminating the requirement of modifying a cable to add another "T." In addition, system reliability is optimized since only the necessary cabling is used.

2. Floating Line Terminators

   The line terminating resistors, rather than being mounted on the individual tape units, are packaged on a special terminator board assembly. This assembly is pluggable on any unit thereby facilitating a change to a different drive when a unit is added or removed from the chain. Regardless of what unit the terminator board is mounted on, as long as any unit on the line is energized, power will be supplied to it.

4.2.1 Daisy Chaining Cable Configuration Without a Unit Select Switch

The following method is recommended when daisy chaining without the unit select option. (See Figure 11 .) With this method, the select lines are rotated in the "tape unit to tape unit" cable. Pin J of the tape unit will always be the active select line of the tape unit. If a tape unit is physically removed from the daisy chain, and a 1 to 1 adapter (Wang P/N 200749) is placed in place of the tape unit, the address of the tape units will remain unchanged. (In all following discussions, 1 to 1 implies a pin for pin connection.) (See Figure 11A.) However, if the tape unit and cable are removed, then the address of the tape units following the removed tape unit will all be reduced by one. (See Figure 11B.) In any case, the address of the tape unit is fixed by its physical position if no adapter is used.

The Read cable and the Write cable do not require any signal rotation, and therefore are 1 to 1 cables.

4.2.2 Daisy Chaining With Unit Select Switch

When daisy chaining with the unit select option, all the cables (Control, Read, Write) are 1 to 1 cables. (See Figure 11C.) With the unit select switch installed, the operator has the freedom to give each of the four units in the daisy chain the logical address desired, regardless of its physical position on the buss. However the address for each drive must be unique. That is, each select line should select a different drive.

4.2.2.1 T Cables

The parallel connectors on the tape drive do not exclude the use of "T" cables. The connections would be identical to Figure 11, 11B when used without the unit select option. If the unit select option is used, the connection would be as shown in Figure 11C.

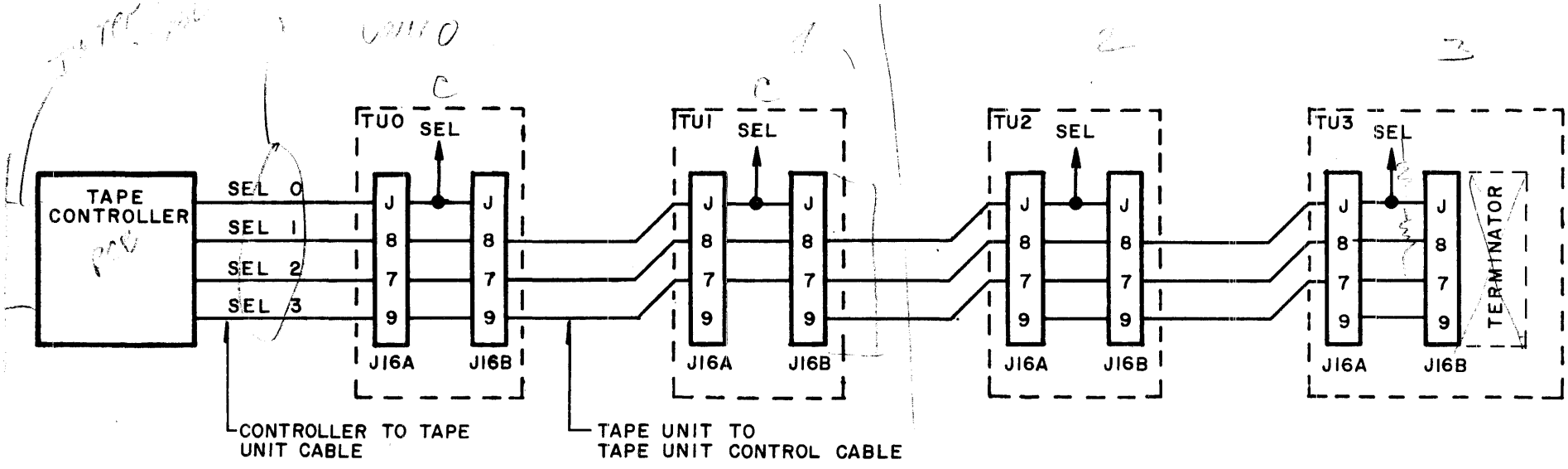


Figure 11. Daisy Chaining Without Unit Select Option

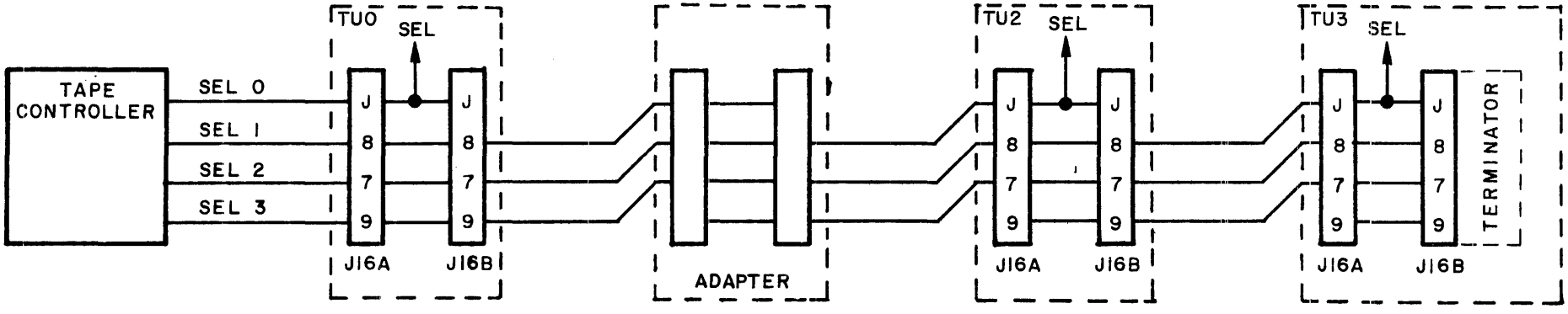


Figure 11A. Daisy Chaining With Adapter

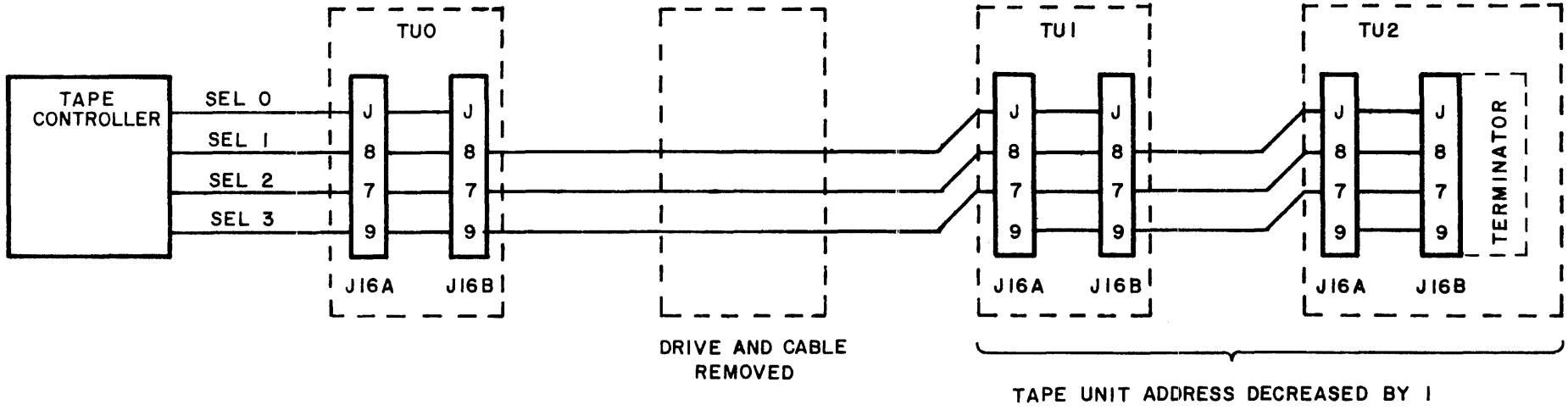
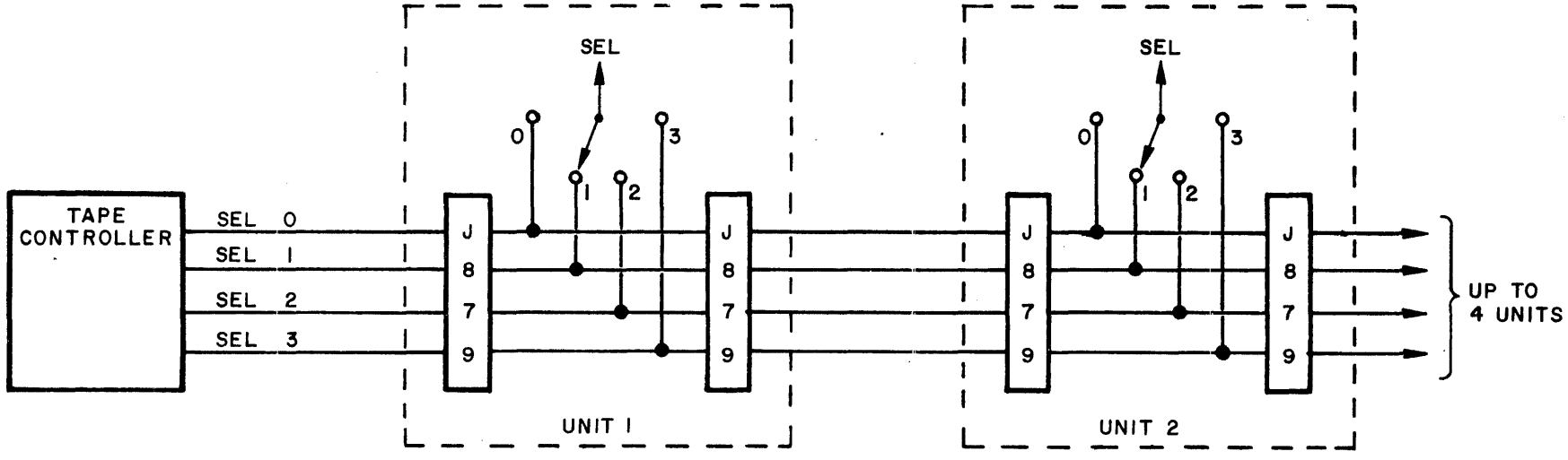


Figure 11B. Daisy Chaining With Drive and Cable Removed



THE LOGICAL ADDRESS OF ANY UNIT IS SELECTED BY SWITCH. EACH SELECT LINE MUST BE USED FOR 1 AND ONLY 1 DRIVE.

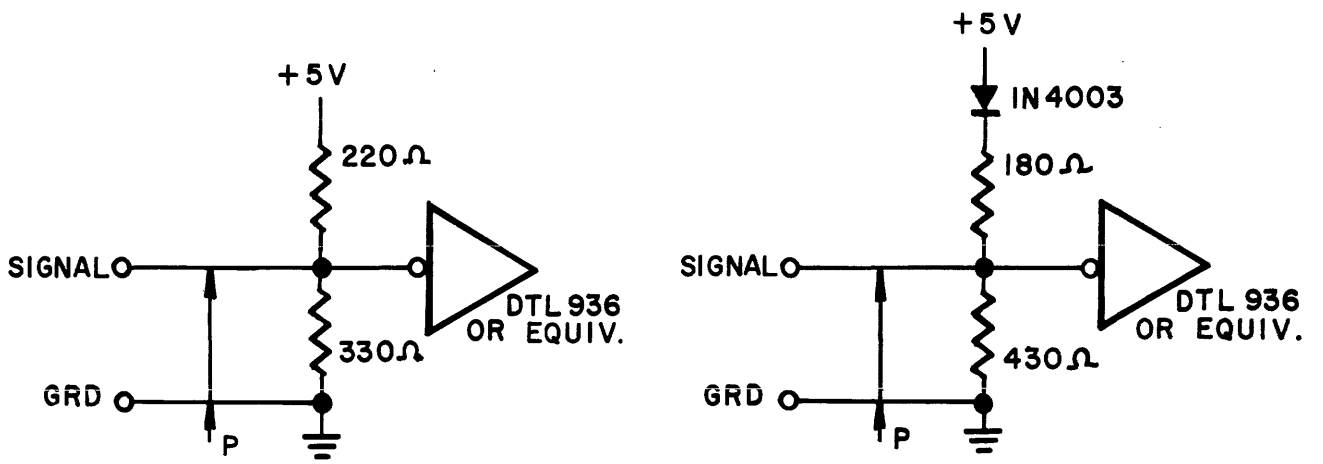
Figure 11C. Daisy Chaining With Unit Select Option

4.3 INPUT REQUIREMENTS

Input voltage requirements, a diagram of input load configuration, and a list of input control and data functions are shown below:

Input Requirements

FALSE (Logic 0)	+2.5 to +5.5V
TRUE (Logic 1)	0.0 to +0.5V



(A) Internal - Single Tape Unit (B) External - Multiple Tape Unit

Figure 12. Input/Output Termination Configuration

Input Functions

Input Control Lines		Input Data Lines	
Select	(1 line)	Write Data	(7 or 9 lines)
Unit Select (Option)	(4 lines)	Write Data Strobe	(1 line)
Forward/Reverse	(1 line)	Write Reset	(1 line)
Run/Stop	(1 line)	Read Permit	(1 line)
Rewind	(1 line)	Write Permit	(1 line)
Density Select	(1 line)	Low Read Threshold Select*	(1 line)
Off-line*	(1 line)		

*These functions are not required for proper operation; therefore, they may be left disconnected.

The following on-line input signals (sections 4.4 and 4.5) control operation of the Mod 10 tape transport only after power is on, the on-line mode has been initiated, ready status has been established, and the unit has been selected. (Table 2 shows the pin connections required to achieve correct interface with the tape controller.)

4.4 INPUT CONTROL FUNCTIONS

4.4.1 Select

When this becomes TRUE, it enables all the write and read circuitry, the on-line transport control commands, and the status output lines if the ready status line is TRUE and if the unit is in the on-line mode. When the level goes FALSE, the above transport functions are disabled.

4.4.2 Unit Select

Four Select lines are provided such that when the one which is TRUE corresponds to the unit select switch position, the unit will be selected.

4.4.3 Forward/Reverse

The state of this line will determine the direction of tape motion upon receipt of a run command. When TRUE, the unit will be conditioned for forward motion. When FALSE, it will be conditioned for reverse motion. A transition shall not occur on this line while the Run/Stop signal is TRUE, but may occur simultaneously to a change on it.

4.4.4 Run/Stop

A TRUE level on this line will cause tape motion in the direction conditioned by the Forward/Reverse line. A FALSE level on this line will stop tape motion.

4.4.5 Rewind

A 2 μsec minimum pulse on this line shall cause the tape transport to drive tape, at 150 ips, in the reverse direction and stop at the Load Point, illuminating the Load indicator. The transport will remain in the On-Line mode. If already at Load Point when the rewind command is given, the command will be ignored. All other motion commands are inhibited until the rewinding sequence is complete.

4.4.6 Density Select

A TRUE level on this line conditions the MTT to operate at the higher packing density. A FALSE level selects the lower data packing density. This line is internally tied TRUE for 9-track systems. This line is inoperative when the Density Switch option is used.

4.4.7 Off-Line

This is a level or a 2 μsec minimum pulse which resets the On-Line flip-flop to the ZERO state, placing the transport under manual control. It is gated only by Select in the transport logic, allowing an Off-Line command to be given while a Rewind is in progress.

Table 2. Input/Output Pin Assignments

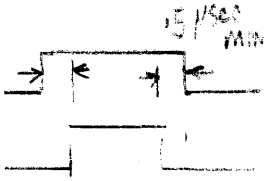
Connector Transitron 600-061-18-SL (or equivalent)	Signal Nomenclature	Signal Pin	Ground Pin
J-16 CONTROL INPUTS FROM CUSTOMER (See Figures B-23 and B-25)	SELECT 0 (Option)	J	-
	SELECT 1 (Option)	8	-
	SELECT 2 (Option)	7	-
	SELECT 3 (Option)	9	-
	SELECT	J	8
	FORWARD/REVERSE	C	3
	RUN/STOP	E	5
	REWIND	H	7
	OFF-LINE	L	10
	DENSITY SELECT	D	4
STATUS OUTPUTS TO CUSTOMER	READY STATUS	T	16
	ON-LINE STATUS	M	11
	REWINDING STATUS	N	12
	EOT STATUS	U	17
	BOT STATUS	R	14
	WRITE ENABLE STATUS	P	13
	HI/LO DENSITY STATUS	F	6
	*SPEED STATUS	A	1
	+5V TERMINATOR POWER (Option)	S	
J-1 WRITE DATA INPUT CONNECTOR (See Figures B-32, B-33, B-35 and B-36)	WRITE PERMIT	B	2
	READ PERMIT	E	5
	LOW READ THRESHOLD	D	4
	WRITE DATA STROBE	A	1
	WRITE RESET	C	3
	WRITE DATA PARITY	L	10
	WRITE DATA 0	M	11
	WRITE DATA 1	N	12
	WRITE DATA 2	P	13
	WRITE DATA 3	R	14
	WRITE DATA 4	S	15
	WRITE DATA 5	T	16
	WRITE DATA 6	U	17
	WRITE DATA 7	V	18
	+5v TERMINATOR POWER (Option)	K	
J-6 READ DATA OUTPUT CONNECTOR (See Figures B-32, B-33, B-35 and B-36)	READ STROBE	2	B
	READ DATA PARITY	1	A
	READ DATA 0	3	C
	READ DATA 1	4	D
	READ DATA 2	8	J
	READ DATA 3	9	K
	READ DATA 4	14	R
	READ DATA 5	15	S
	READ DATA 6	17	U
	READ DATA 7	18	V
	NRZI STATUS	10	L
	7 TRACK STATUS	11	M

*Available only on Daisy Chain Assembly 200632.

4.5 INPUT DATA FUNCTIONS

4.5.1 Write Data

One line is required for each bit in a character. The write data lines establish the controlling condition for the NRZI write register. When TRUE, the state of the corresponding flip-flop will be changed at the time of the write data strobe. This will change the direction of the current through the write head and establish a flux reversal (ONE) on the tape. When FALSE, the state of the flip-flop will not be changed at the time of the write data strobe. This will result in no change in the direction of write head current, hence no flux reversal (ZERO) will be on tape. These data lines must be held steady through the time interval from 0.5 μsec before to 0.5 μsec after the write data strobe. A minimum of one data line must be TRUE for every strobe.



4.5.2 Write Data Strobe

A 2 μsec pulse on this line causes a change in the state of any NRZI write register cell for which the corresponding write data line is TRUE. One pulse is required for each character to be recorded. The recording density is determined by the tape speed and the frequency of the pulses. The frequency will be stable within 0.25 percent.

4.5.3 Write Reset

A 2 μsec pulse on this line resets the NRZI write register. This pulse is used to write the longitudinal parity check (LPC) character at the end of each block of data, creating an even number of flux reversals (One's) in each track of the block.

In a seven-track system, this pulse occurs four character times after the last write data strobe of every block of data.

In a nine-track system, this pulse occurs eight character times after the last write data strobe of every block of data.

4.5.4 Read Permit

The read permit line is used to enable all the read circuitry. When this line goes FALSE, the strobe generator is disabled and the read register is DC reset. This line can be tied permanently TRUE.

4.5.5 Write Permit

When a write enable ring is on the file reel and write permit is TRUE, the tape transport is placed in the write mode.

4.5.6 Low Read Threshold Select

A TRUE level on this line selects a low threshold level (12 percent) for the read signals, allowing for the detection of marginal areas of tape. A FALSE level on this line selects the normal read signal threshold level (25 percent). This line is active only in the read mode on dual gap machines since the threshold level in the write mode is fixed at 45 percent.

4.6 OUTPUT REQUIREMENTS

Output requirements, output current levels, and a list of output control and data functions are displayed below.

Output Requirements

FALSE (Logic 0)	User terminates line as shown in Figure 12(A)
TRUE (Logic 1)	0.0 to +0.5V

Output Current Level

FALSE level	Open collector
TRUE level	40 milliamp max sink

Output Functions

Output Control Status Lines		Output Data Lines	
Ready Status	(1 line)	Read Data	(7 or 9 lines)
Rewinding Status	(1 line)	Read Strobe	(1 line)
EOT Status	(1 line)	*NRZI Status	(1 line)
BOT Status	(1 line)	*7 Track Status	(1 line)
Write Enable Status	(1 line)		
Hi/Lo Density Status	(1 line)		
Speed Status	(1 line)		

*On daisy chain data board assembly 201142 only.

The following on-line output signals (sections 4.7 and 4.8) provide the data functions when the unit is ready and selected. The control status functions are activated when on-line and selected. (Refer to Table 2 for pin connections.)

4.7 OUTPUT CONTROL FUNCTIONS

4.7.1 Ready Status

This line is TRUE when the transport interlocks are made and the unit is on-line.

4.7.2 On-Line Status

When TRUE, this line indicates that the on-line flip-flop is set and the transport is under remote control.

4.7.3 Rewinding Status

When TRUE, this line indicates that the tape transport is rewinding. The rewinding function is completed when the tape stops at the Load Point.

4.7.4 EOT Status

When TRUE, this line indicates that the tape transport is sensing the EOT reflective marker.

4.7.5 BOT Status

When TRUE, this line indicates that the tape transport is sensing the BOT reflective marker.

4.7.6 Write Enable Status

A TRUE level on this line indicates that a write enable ring has been installed on the supply reel.

4.7.7 Hi/Low Density Status

When this line is TRUE, the transport has been set for low-density operation, and the read circuitry has been conditioned accordingly. This line is used only for seven-channel systems.

4.7.8 Speed Status

When this line is TRUE, it indicates to the system that the selected tape unit operates at the lower one of two tape speeds. This line is utilized when two or more drives of different tape speeds are used in a daisy chain system.

4.8 OUTPUT DATA FUNCTIONS

4.8.1 Read Data

One for each bit in a character. The data is in the form of pulses occurring simultaneously and coincident with the Read Strobe pulse. The presence of a pulse indicates a ONE and the absence of a pulse indicates a ZERO. These pulses shall be 2 µsec wide.

4.8.2 Read Strobe Pulse

The Read Strobe line shall provide a pulse of 2 µsec for each data character read from tape. This pulse shall be coincident with the data pulses.

4.8.3 NRZI Status

This line is TRUE whenever the tape unit is Selected and On-Line, and indicates to the controller that the selected tape unit is a NRZI drive as opposed to a PE (Phase Encode) drive. This line is available only on the daisy chain data board assembly 201142.

4.8.4 7 Track Status

When this line is TRUE, it indicates to the controller that the selected tape unit has a 7 track head. This line is available only on the daisy chain data board assembly 201142.

SECTION V

PRINCIPLES OF OPERATION

For best understanding of the principles of operation of the Mod 10 tape system, the major subassemblies are described separately. The functional separation of system operations relates conveniently to the actual physical packaging of the subassemblies. Following are the major subassemblies, in the sequence in which their operation is explained:

1. Power supply
2. Capstan drive and servo system
3. Reel drive and servo systems
4. Control electronics
5. Data electronics

1. POWER SUPPLY

A single assembly supplies power to the entire system, handling the needs of the capstan and reel drive systems, the data electronics and the option electronics. As shown in Figure 13, AC power to the system is controlled by a double-pole, single-throw switch on the power supply chassis and by a single-pole, single-throw pushbutton switch on the operator's control panel. The switch on the power supply chassis must be switched on to use the operator's control panel switch to control power. A three-wire cord is used with the ground line connected directly to the power supply chassis. A circuit breaker is provided in the hot side of the primary power line.

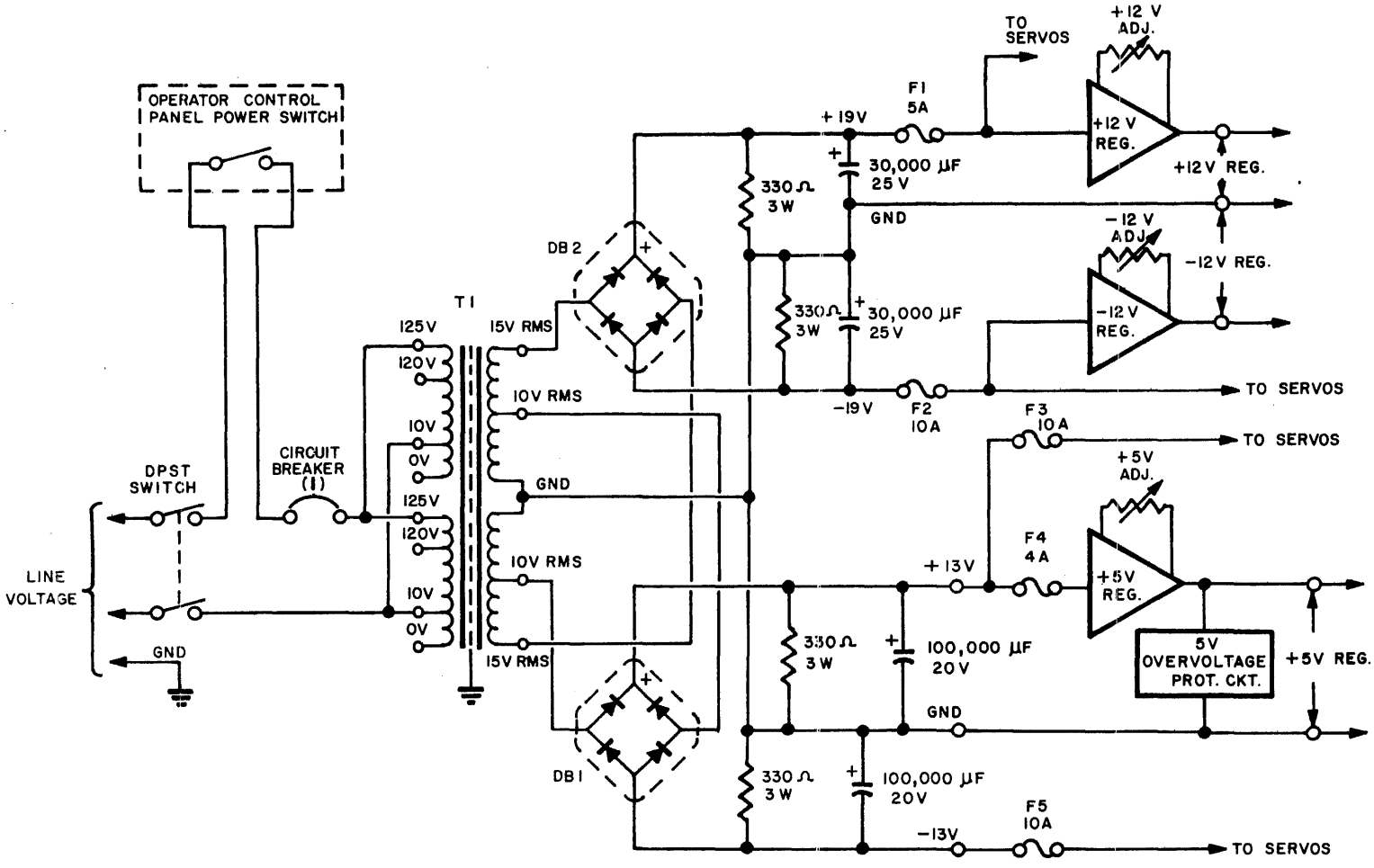


Figure 13. Mod 10 Power Supply

Unregulated DC from the power supply is sent to the regulators, which are on a separate printed circuit board mounted to the power supply chassis; this DC is also used to drive the capstan and reel motors. Voltages supplied unregulated are +19 volts, -19 volts, +13 volts, and -12, and +5 voltages.

Each voltage regulator consists of a linear integrated circuit amplifier plus power output transistors. The output voltage tolerance for the regulators is ±5 per cent and each is potentiometer adjustable. The +12 and -12 volt regulators can supply up to 1.5 amperes and the +5 volt regulator, up to 3.5 amperes.

The output level of the +5 volt regulator is prevented from rising above +8 volts to protect the integrated circuits used in the system from over-voltage stress that could occur under abnormal conditions. If the voltage on the +5 volt line goes above +8 volts, an SCR will conduct, shorting the +13 volt unregulated input line to ground until the fuse opens, thus protecting the circuits.

2. CAPSTAN DRIVE AND SERVO SYSTEM

All tape motion in the Mod 10 is initiated by the capstan, which is driven by a DC motor. When the motor is running, a tachometer generates a DC voltage that is used to control the tape velocity through the capstan servo system (see Figure 14.)

The strobe disc will be on the front of the capstan and will have two patterns, one for 50 Hz and one for 60 Hz. The inner pattern will be for 60 Hz. It is to be viewed with the corresponding AC light (such as fluorescent) the pattern on this disc appears to stand still when the capstan motor of the tape transport is operating at the correct speed. The strobe pattern will be present only on machines operating at 12.5, 25, or 37.5 inches per second. Thus, proper operation of this component of the tape transport can be under continuous visual inspection by the operator. Any departure from a stationary pattern (i.e., precession of the strobe lines in either a clockwise or counterclockwise direction) indicates a speed variance of the capstan drive. (See Section VI for calculating the percentage of such variance.)

Two ramp generators are used in the capstan servo. One controls the forward and reverse speeds at nominal velocity, and the other controls the rewind speed. The forward/reverse ramp generator uses a Zener diode as a precise voltage reference. The rewind ramp generator uses the regulated +5 volt level as a voltage reference. Resistors R1 and R2 in Figure 14 in combination with R3 and R4 , function as a

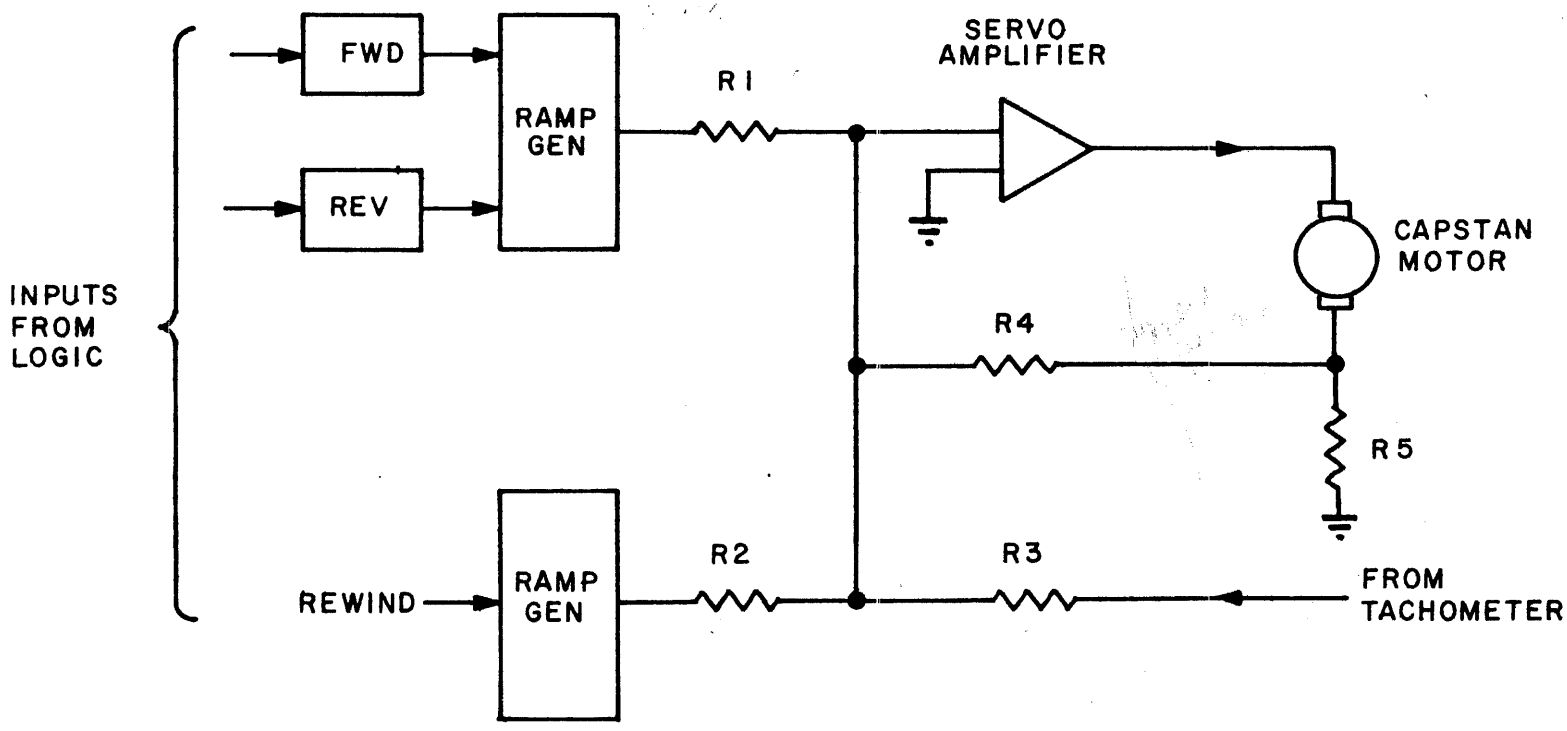


Figure 14. Capstan Drive and Servo System

summing network to control the capstan speed. Current through R3 is generated in the tachometer, and R4 provides feedback from the capstan motor, proportional to the motor current. The current feedback is generated by sensing the voltage across a 0.1 ohm resistor (R5) in series with the motor. When the motor is running, the sum of currents in R3 and R4 is equal to the sum of the currents in R1 and R2.

Either a forward or reverse command to the ramp generator preceding R1 establishes tape motion, in the appropriate direction. The distances traveled during acceleration or deceleration are such that an IBM-compatible interrecord gap is generated. Forward and reverse commands generate currents through R1 having opposite polarities. Symmetry of the start and stop times and distances is readily achieved through the potentiometers in the forward and reverse inputs to the ramp generator. A potentiometer is also used to adjust the capstan drive servo amplifier offset so that no tape motion occurs unless the tape transport has received a motion command.

Figure 15 shows the relative timing of commands to the capstan servo, the ramp function generated, and the resulting tachometer output seen by the servo amplifier.

In the rewind ramp generator, the rise time has nominally a 1 second time constant. This provides a time interval that permits the tape to accelerate to 150 ips without exceeding the storage capacity of the servo arms. Fall time is nominally a 0.5 second ramp and it assures that the storage arm capacity is not exceeded as the tape slows and halts.

When the system is in the ready state, the tape is held motionless by the balanced tension (eight ounces) in the storage arms and the friction in the capstan drive motor. Although the wrap on the capstan varies slightly with the arm position for the takeup reel, it is nominally 180 degrees. The area of tape in contact with the capstan and the tension on the tape prevent any relative motion between capstan and tape.

3. REEL SERVO SYSTEM

Two identical servo systems control the supply and takeup reels in the Mod 10. Storage of appropriate lengths of tape to permit acceleration and deceleration is provided by the buffer arms, which permit the capstan to start and stop the tape without having to start and stop the reels in the same short time. Storage of tape by the arms is sufficient to permit the system to operate at the nominal tape speed without program restrictions.

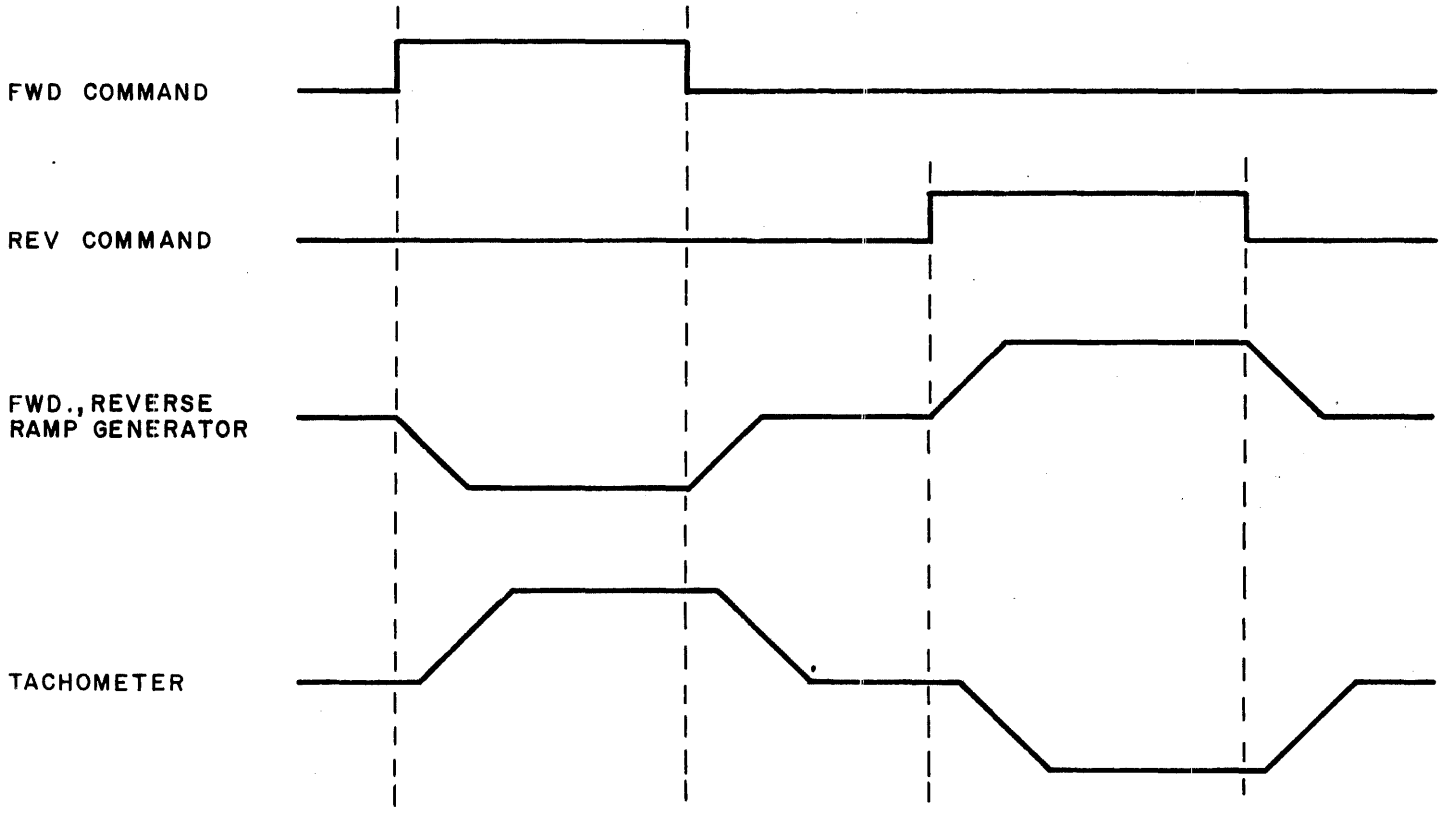


Figure 15. Timing Diagram of Commands to Capstan Servo

Operation of the reel servo system is diagrammed in Figure 16. A light-sensing circuit provides arm-position information to the servo amplifier, which drives the reel motor. As tape is delivered to the arm or taken from it, the arm moves up or down and the position of the mask between the light source and the light-sensing element changes. When the mask is at the appropriate position, the output of the light-sensing circuitry no longer provides an error signal to the amplifier. Enclosure of the light source prevents ambient light from affecting system performance.

Reel motors are driven by linear amplifiers, stabliized for all operating situations and sequences. During the Rewind mode the amplifier gain is increased and the output stage operating voltage is raised to offset the increase in back emf generated by the reel motors at higher rpm. An offset signal is fed to each servo amplifier during the unload cycle to bias each servo swing arm close to its respective stop. This assures gentle handling of tape as it unloads from the fixed reel. It also prevents violent impact of the arms against their stops.

Spring tension on the servo arms is balanced at all times by torque in the reel motors. Should power fail or servo operation be interrupted, the springs pull the arms out and into contact with limit switches that turn off all reel servo and capstan functions. If power fails during high-speed rewind, the reel motors are shorted by contacts on the ready relay. The resulting strong dynamic braking effect stops the reels without damage or spilling of the tape.

Potentiometer adjustments are provided on the transport board to permit proper setting of each swing arm position. A potentiometer adjustment is also provided to set the gain of each reel servo amplifier, compensating for the normal manufacturing tolerances in components.

4. CONTROL ELECTRONICS

The control portion of the transport electronics printed circuit board (see Figure 17) receives its primary inputs from the operator's control panel or the remote controller. In addition, it responds to control signals from the photosense assembly and from the servo amplifiers (during the rewind sequence).

The internal control circuitry outputs signals to the remote tape controller and to the operator's control panel (in the form of indicator lights). Within the transport, it provides signals to the servo amplifiers and to the data electronics printed circuit board.

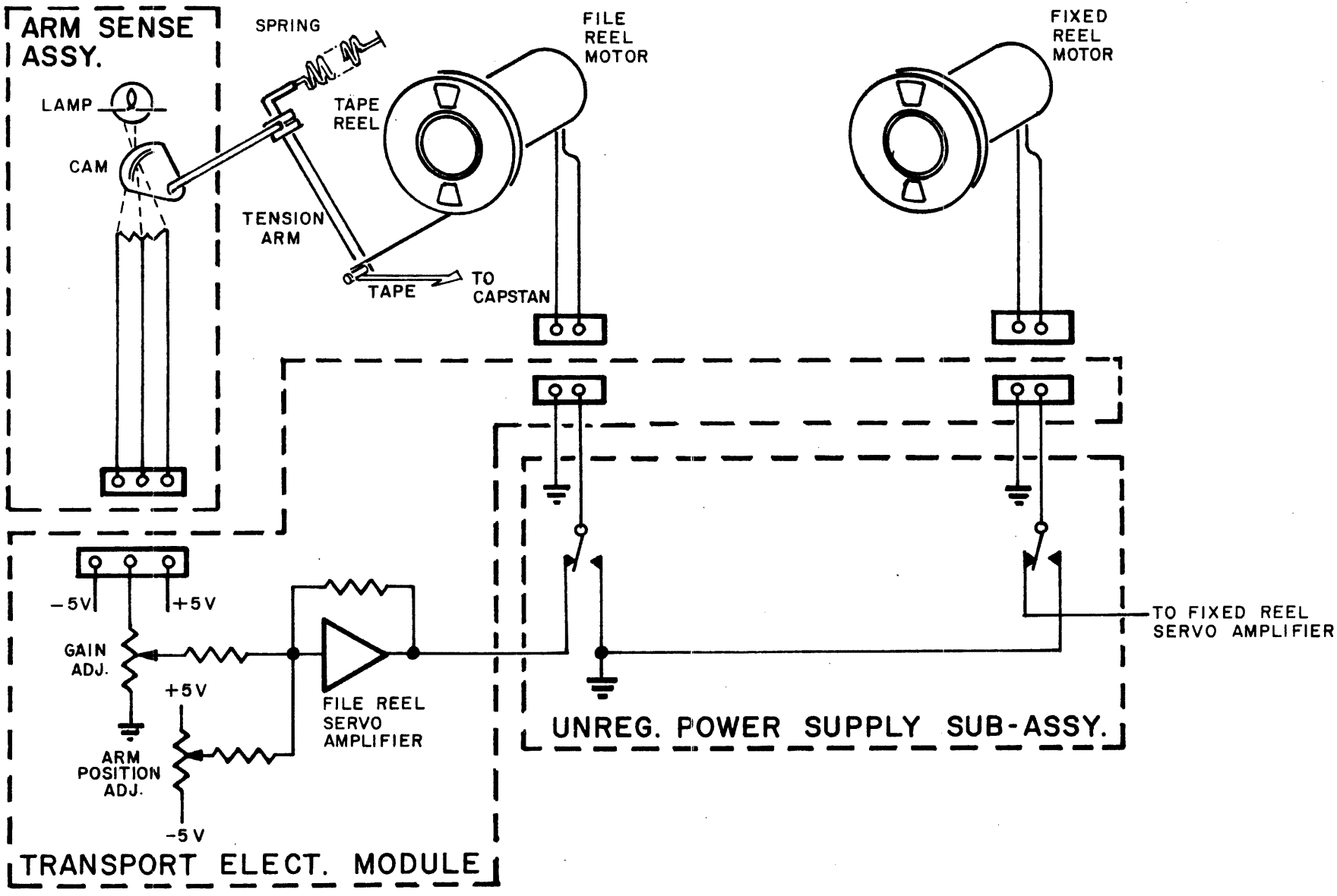


Figure 16. Reel Servo System

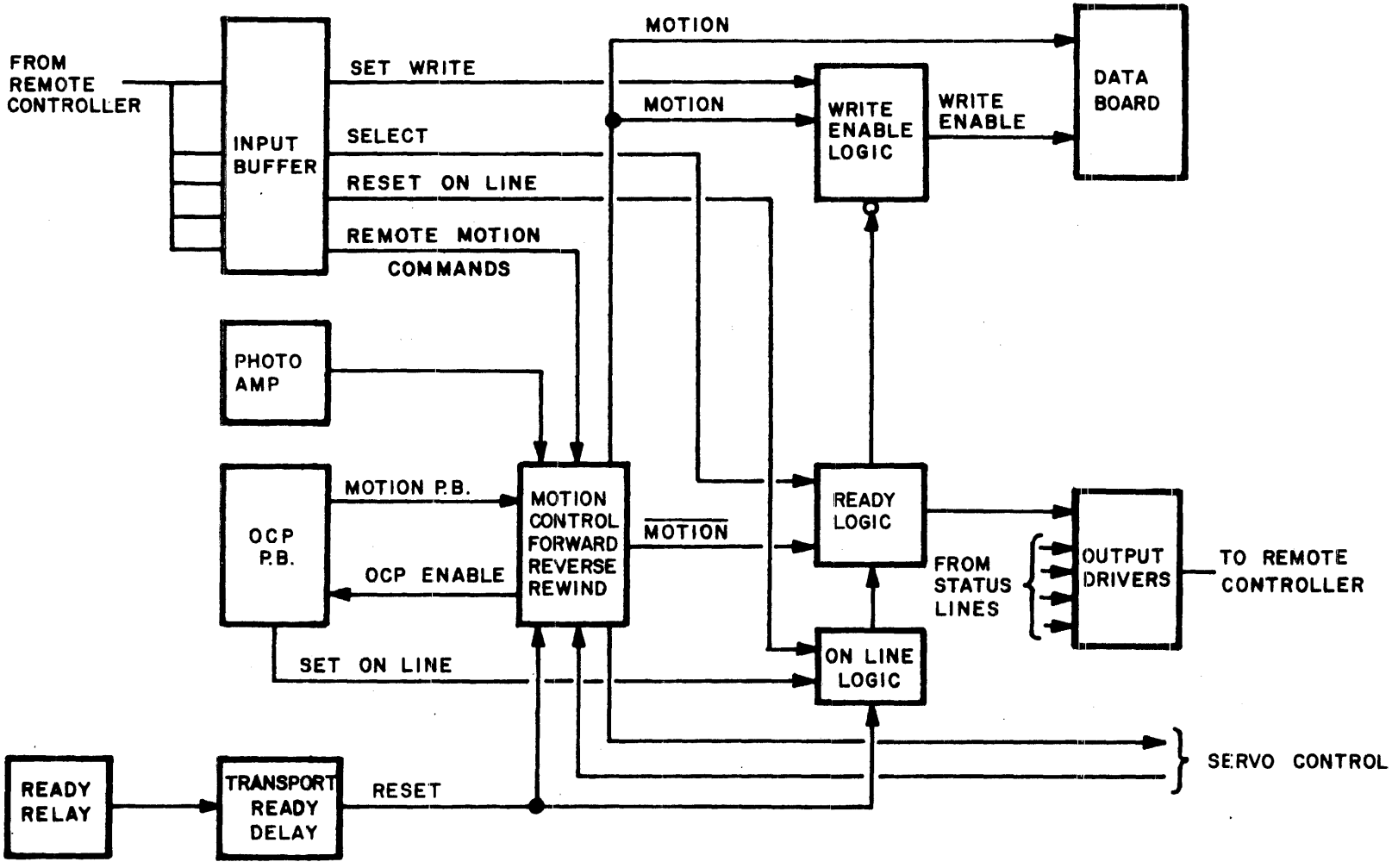


Figure 17. Transport Control Electronics

4.1 BRING-TO-READY SEQUENCE & SYSTEM INTERLOCK

When power is applied to the tape transport, it activates the arm retract motor, returning the servo arms to the load position. With the arms in the load position, the ready relay (K1) is unenergized and all three servo motors are shorted to ground. Interlock switches, S11 and S13, are also open, thus preventing latching of the ready relay (see Figure 18). The operator may then mount tape on the reel as specified in the instructions in Section II. When the operator pushes the LOAD pushbutton at the control panel, he initiates the following automatic load sequence (see Figure 19).

The retract motor is energized; its motion releases the servo arms from their retract position, and the series string of interlock switches (S10, S11, S12, S13) will be in their N.C. position. As the retract motor continues to turn, the load cam detent will be seen by the load cam switch S14, and a momentary ground will be transmitted to the ready relay terminal, K1-10. This energizes the ready relay, thus providing power to the servo motors which then maintain tension on the servo arms. The series string of interlock switches provide an unbroken circuit to ground for the ready relay K1, thus holding the ready relay energized. If any one of the switches S10 through S13 is opened, the ready relay (K1) is de-energized. When the ready relay is energized, it sends a ground signal to the ready delay circuitry, which -- after timing out -- gives an internal ready signal. (This signal does not reach the tape controller unit.) If the tape is not already at BOT, a set forward and on-line command is generated that sets the forward and on-line flip-flops. The tape moves forward, seeking BOT, and the ON-LINE indicator at the operator's control panel is illuminated. (Ready status to the tape controller unit is still inhibited.)

If the tape is already at BOT (or when it reaches BOT, after searching):

Tape motion stops (or is not initiated if at BOT)

A delay network times out and then the ready status line to the tape controller unit goes TRUE.

The LOAD indicator at the operator's control panel is illuminated.

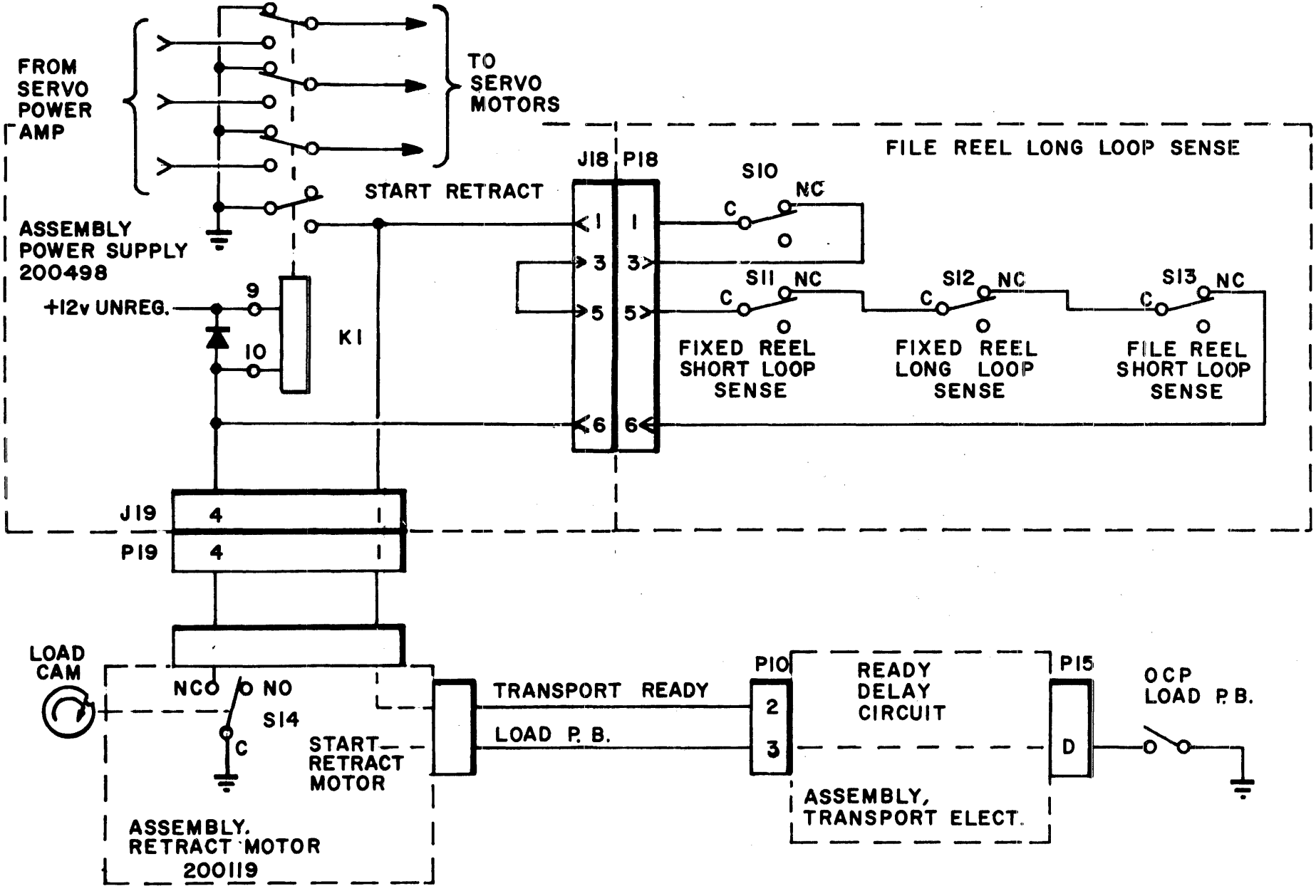


Figure 18. System Interlock Diagram

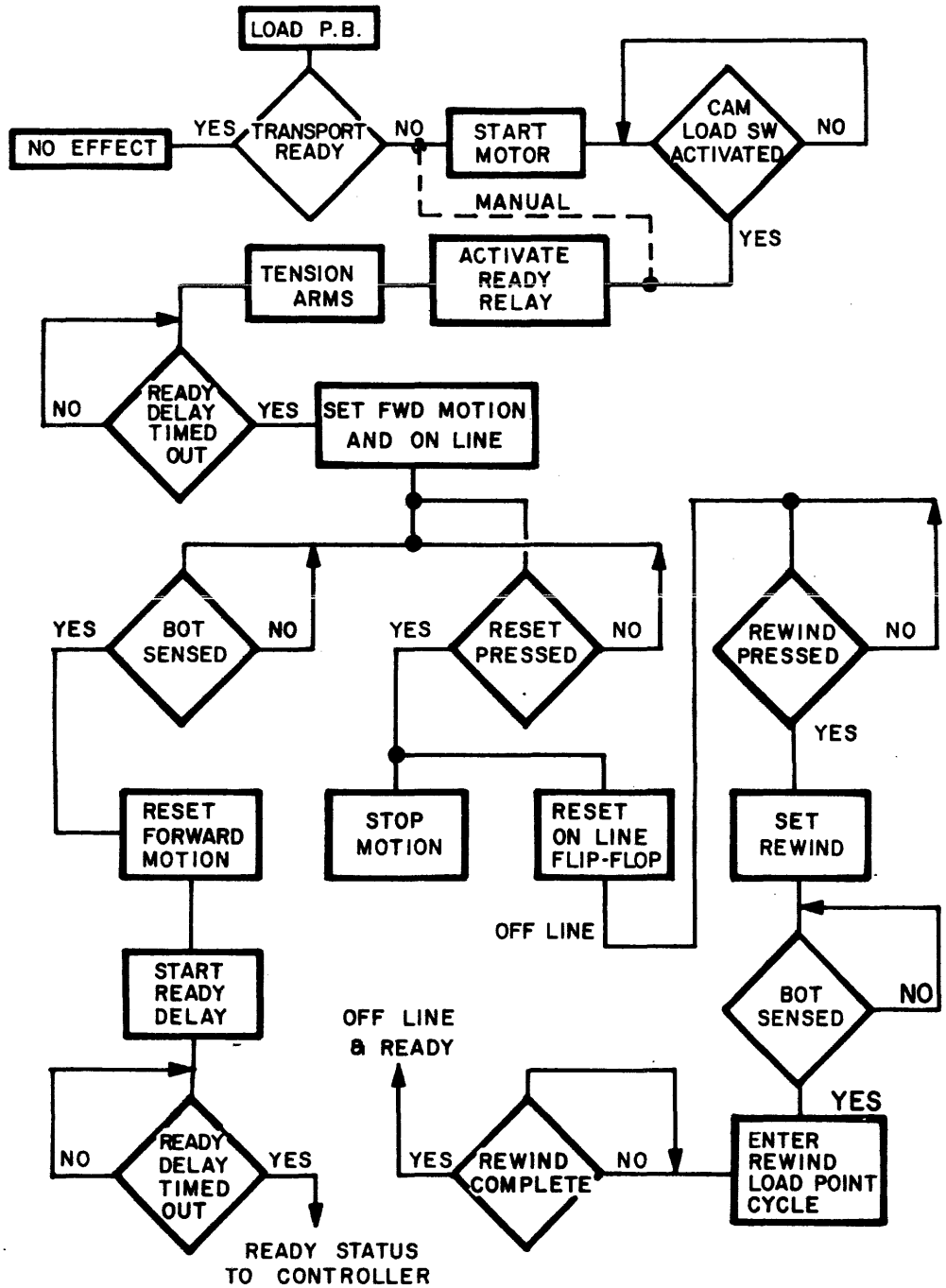
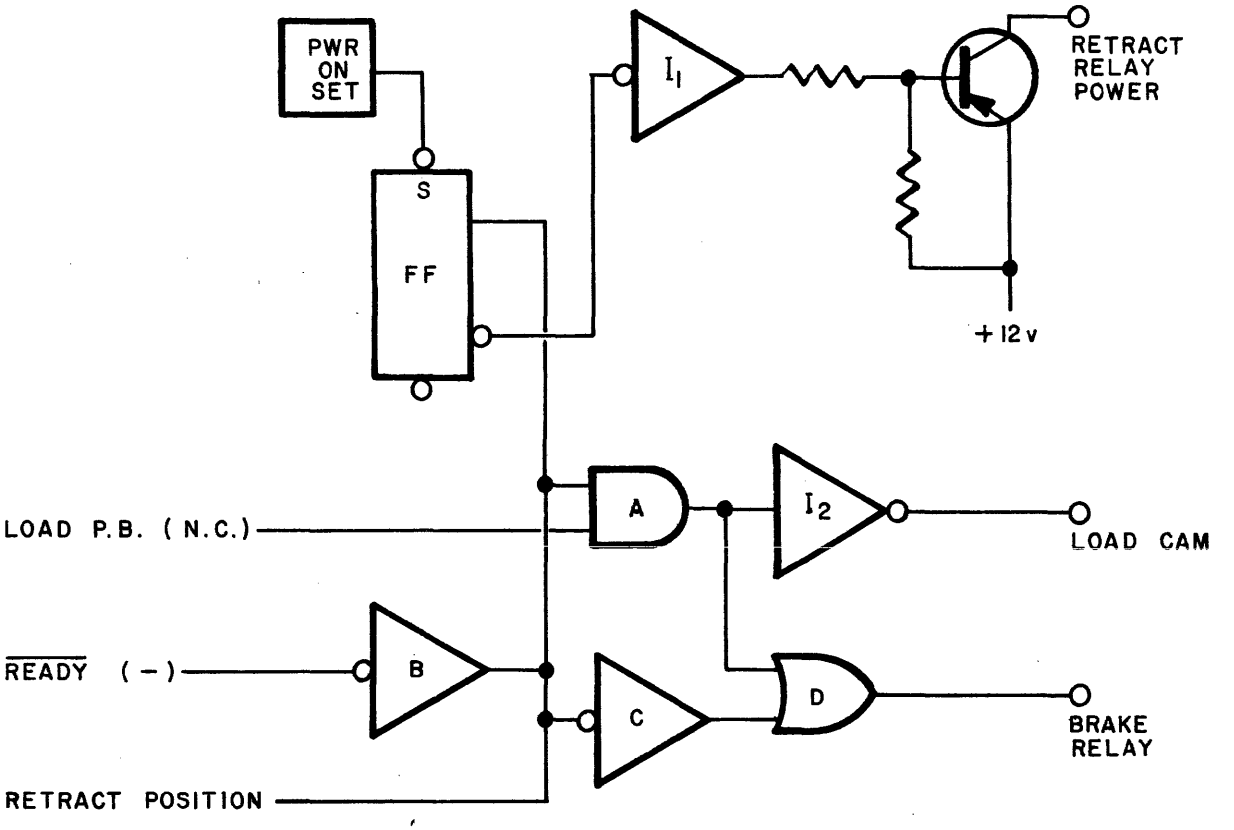


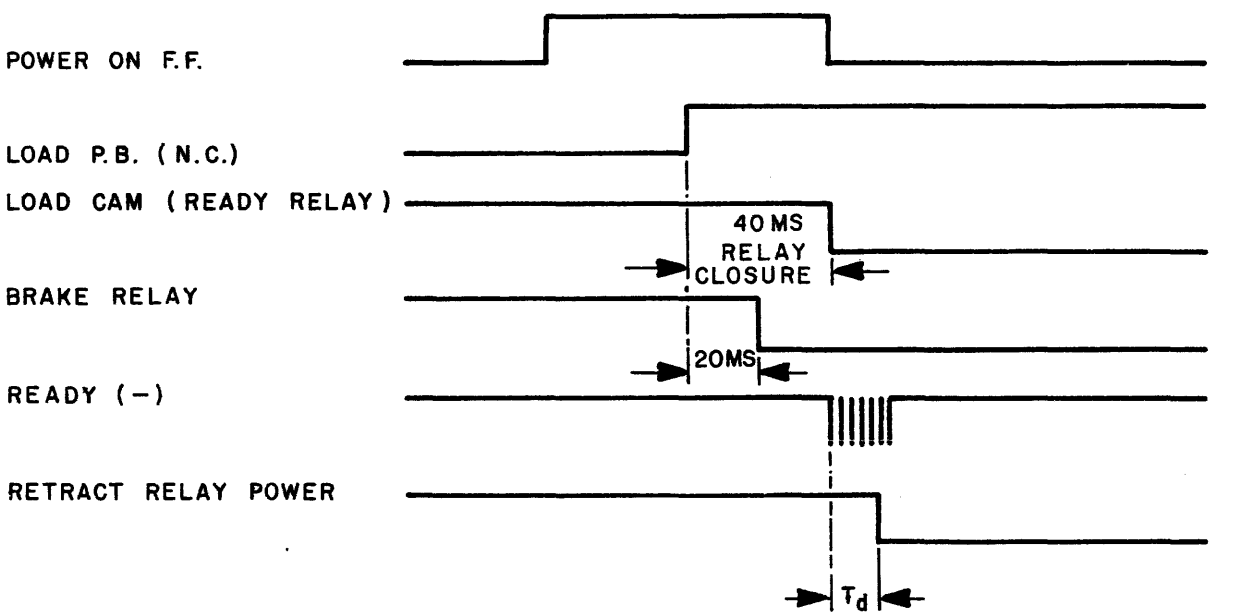
Figure 19. Flow Diagram of Auto Load Sequence

In summary, ready status output to the tape controller will not be TRUE, unless there is no locally initiated forward or reverse motion, there is no rewind in progress, and mechanical ready, on-line status, and selected status are all TRUE.

4.2 BRAKE LOGIC (OPTIONAL)

Figure 19A diagrams the brake logic. When power is initially turned on and if the retract position input is high (open), the flip-flop is set, and the retract relay driver I_1 is held off. The load cam driver I_2 and the brake relay driver D are also held off at this time if the input term Load P.B. is at ground. (Under normal system operation this input is depressed). When the Load P.B. input is High gate A is enabled and turns on I_2, which initiates a load cycle. Gate A also enables gate D which releases the brakes. If the load operation is successful, the Ready (-) input will go High and the power on flip-flop will be reset. If during the power on cycle, the retract position input is Low, the power on flip-flop is held reset. When the power on flip-flop is in the reset state, only the retract relay driver I, is on. This allows normal loading and unloading with the arms retracting automatically.





TIMING SEQUENCE FOR BRAKE RELEASE

Figure 19A. Simplified Diagram of Brake Logic

In summary, ready status output to the tape controller will not be TRUE unless there is no locally initiated forward or reverse motion, there is no rewind in progress, and mechanical ready, on-line status, and selected status are all TRUE.

4.3 RESET AND ON-LINE LOGIC

When on-line status is TRUE, all pushbutton switches at the operator's control panel are disabled except RESET.

Pressing RESET at the control panel DC resets the terms Rewind, Motion (Forward or Reverse), and On-Line to FALSE. Remote control of the transport can be restored after a RESET action by pressing the ON-LINE pushbutton. The on-line command from the operator's control panel is gated through two cross-coupled OR-gates, and the transport is then ready to accept any remote command.

The transport can always be put in the off-line state by the remote off-line command if the tape unit is selected.

4.4 MOTION LOGIC (FORWARD AND REVERSE)

A diagram of the logic governing forward and reverse motion is given in Figure 20. Forward and reverse motion commands to the servos are initiated locally from the operator's control panel when the transport is in the off-line mode or from the remote controller when the transport is on-line.

The OCP-enable line must be TRUE (low) to initiate local motion from the operator's control panel. When the FORWARD pushbutton is pressed, the motion latch is set (U207A, U207B, and U208 in Figure 20), and the output of U207A will be TRUE (low). This output is transmitted through NOR-gate U213B, which OR's the local and remote forward commands and presents a forward (+) signal to the capstan servo.

Local reverse motion is initiated by pressing the REVERSE pushbutton on the operator's control panel. The reverse switch is interlocked in such a way that a reverse command cannot be initiated simultaneously with a forward command. With the motion latch set by the REVERSE pushbutton, the output of U207B will be TRUE (low). This output is transmitted through NOR-gate U214, which OR's the local and remote reverse commands and presents a reverse (+) signal to the capstan servo.

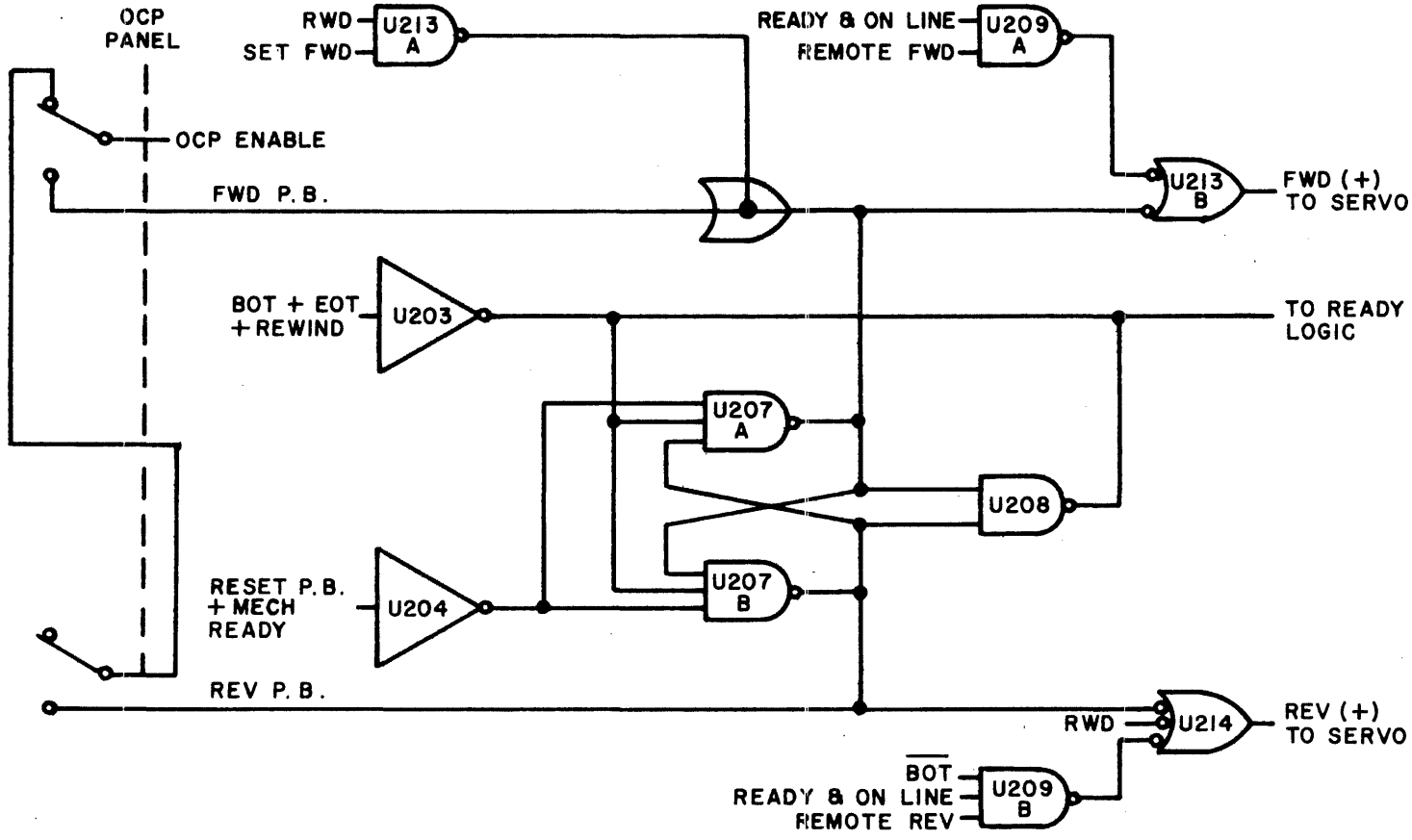


Figure 20. Simplified Logic of Motion Control (Forward and Reverse)

Local reverse or forward motion is terminated if a RESET ACTION is taken, if the transport is mechanically not ready, or if the terms EOT, BOT, or Rewind are TRUE.

When the transport is in the on-line mode, the OCP-enable line will be FALSE (high), thus disabling the FORWARD and REVERSE pushbutton inputs to the motion latch. The NAND-gates labeled U209A and U209B in Figure 20 are enabled by the terms Ready and On-Line, and any subsequent forward or reverse motion commands from the remote controller will be transmitted to the capstan servo control through U213B or U214.

The NAND-gate labeled U209B has an additional term (NOT BOT) on its input. This term prevents reversing off the BOT marker during the on-line mode of operation.

4.5 REWIND AND UNLOAD LOGIC

The rewind sequence is not internally different, whether it stems from an action at the operator's control panel or from a remote command. A logic diagram of this function is given in Figure 21.

The rewind sequence is mechanized with a series of three flip-flops, U210A, U210B, and U211A. The flip-flop labeled U210A in the diagram is set initially either by the REWIND pushbutton through NAND-gate U208, or by the remote rewind command through NAND-gate U209. The NAND-gate labeled U212 decodes the outputs of flip-flops U210A and U210B and presents a rewind (-) command to the capstan rewind ramp generator. A reverse-for-rewind is also sent to the capstan servo control through U214. When the capstan servo receives the rewind(-) and reverse-for-rewind signals, the tape drive ramps to rewind speed and runs until either BOT is reached or a RESET pushbutton action is taken at the operator's control panel. If no RESET action is taken, the leading edge of the BOT tab loads flip-flop U211A and the trailing edge loads flip-flop U210B. With U210B set, the inputs to U212 are no longer TRUE, and the rewind signals to the capstan servo are terminated. The capstan ramps to a stop, a set-forward pulse is generated, and the tape drive begins searching forward for BOT. When BOT is reached, the series of three flip-flops (U210A, U210B, and U211) is reset and tape motion ceases.

At this point, two actions may be used to unload the tape. A RESET action takes the transport off-line, and a subsequent REWIND action causes tape to rewind until tape tension and mechanical interlocks are lost. During the process of unloading, a regular rewind command

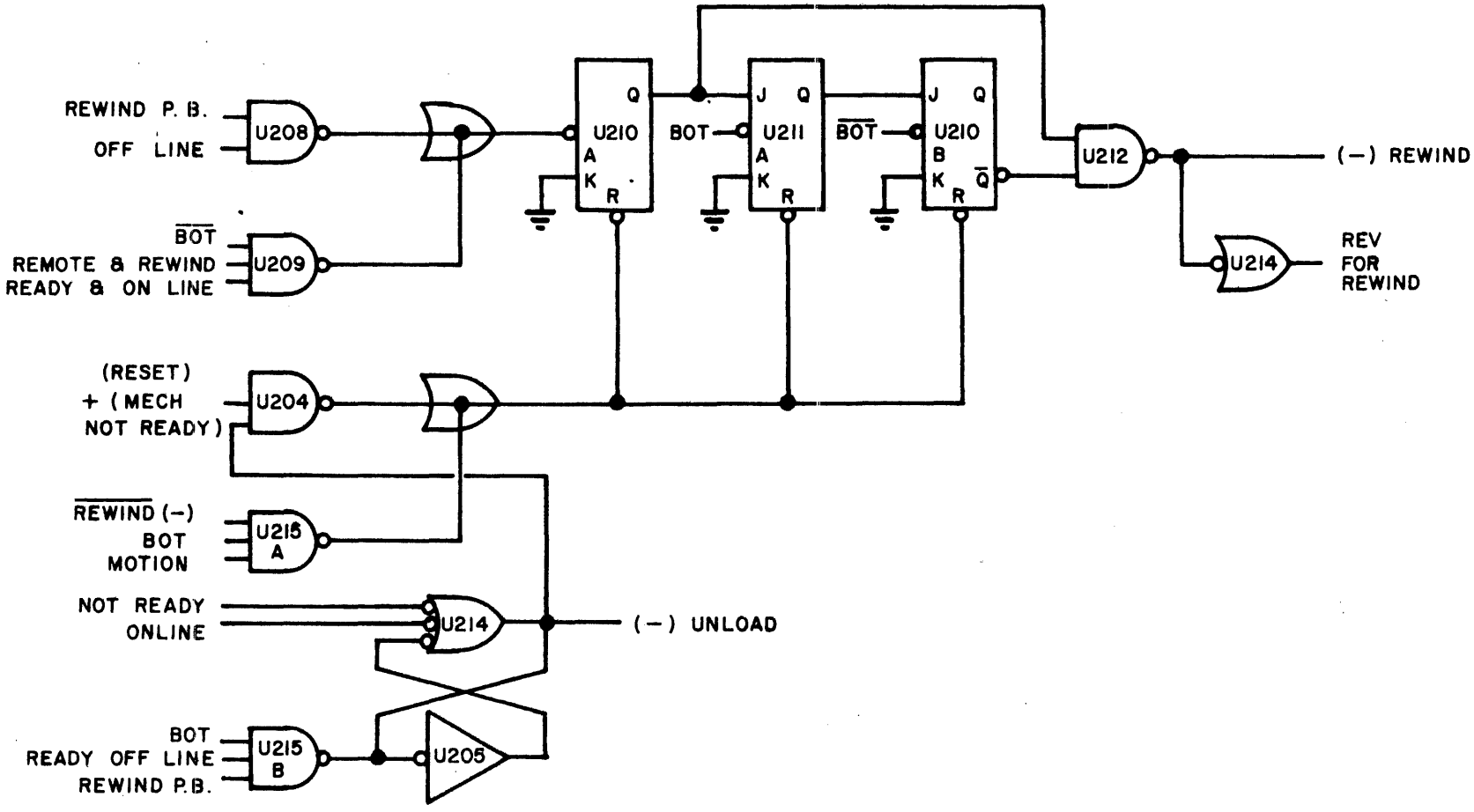


Figure 21. Simplified Logic of Rewind and Unload Control

is distinguished from a rewind-to-unload command by the gating together at U215B of the terms Off-Line and Ready, BOT, and Rewind. Under these conditions, the easy unload latch, comprising U205 and U214, is set, and an unload (-) signal is sent to the fixed reel servo. The fixed reel servo is biased to a position very close to the stop, and the shortened stroke of the servo arms when tape tension is lost prevents accidental damage to the tape as it unloads. The unload latch is reset only by the term Not Mechanically Ready; thus, once an unload is initiated, it must complete its cycle. (Note: If a second BOT tab is sensed during an unload cycle, the tape drive will attempt a search for load point cycle, and will in most cases loop-out, causing the ready relay to drop out.)

4.6 WRITE ENABLE LOGIC

Figure 22 diagrams the write enable logic which comprises a flip-flop (U211) and a positive pulse generator (U219A and U219B). The flip-flop is set when the write enable line from the controller is TRUE (high), enabling the J input of U211, and when either a forward or reverse motion command is initiated. The T input positive pulse is generated by U219A and U219B. The pulse is generated when motion goes TRUE (high). The output of U219A goes to ground after a time delay set by R264 and C217. This negative transition initiates a positive pulse at the output of U219B. The trailing edge of this pulse causes the flip-flop to change states. The pulse width is determined by R265, R266, and C218. When the write enable flip-flop is set, the transport is conditioned to write.

The write enable flip-flop is reset when the write enable line from the controller is FALSE (i.e., when the K input of U211 goes high after inversion by U201), and when either a forward or reverse motion command is initiated.

4.7 FILE PROTECT LOGIC

The file protect logic is mechanized such that there will be a minimum of scraping of the write enable ring during the initial loading cycle of the transport.

The mechanization is shown in Figure 23. When a reel of tape is initially loaded, the file protect switch is closed, and the logic latches the write enable solenoid, thus retracting the solenoid pin to prevent scraping of the write enable ring.

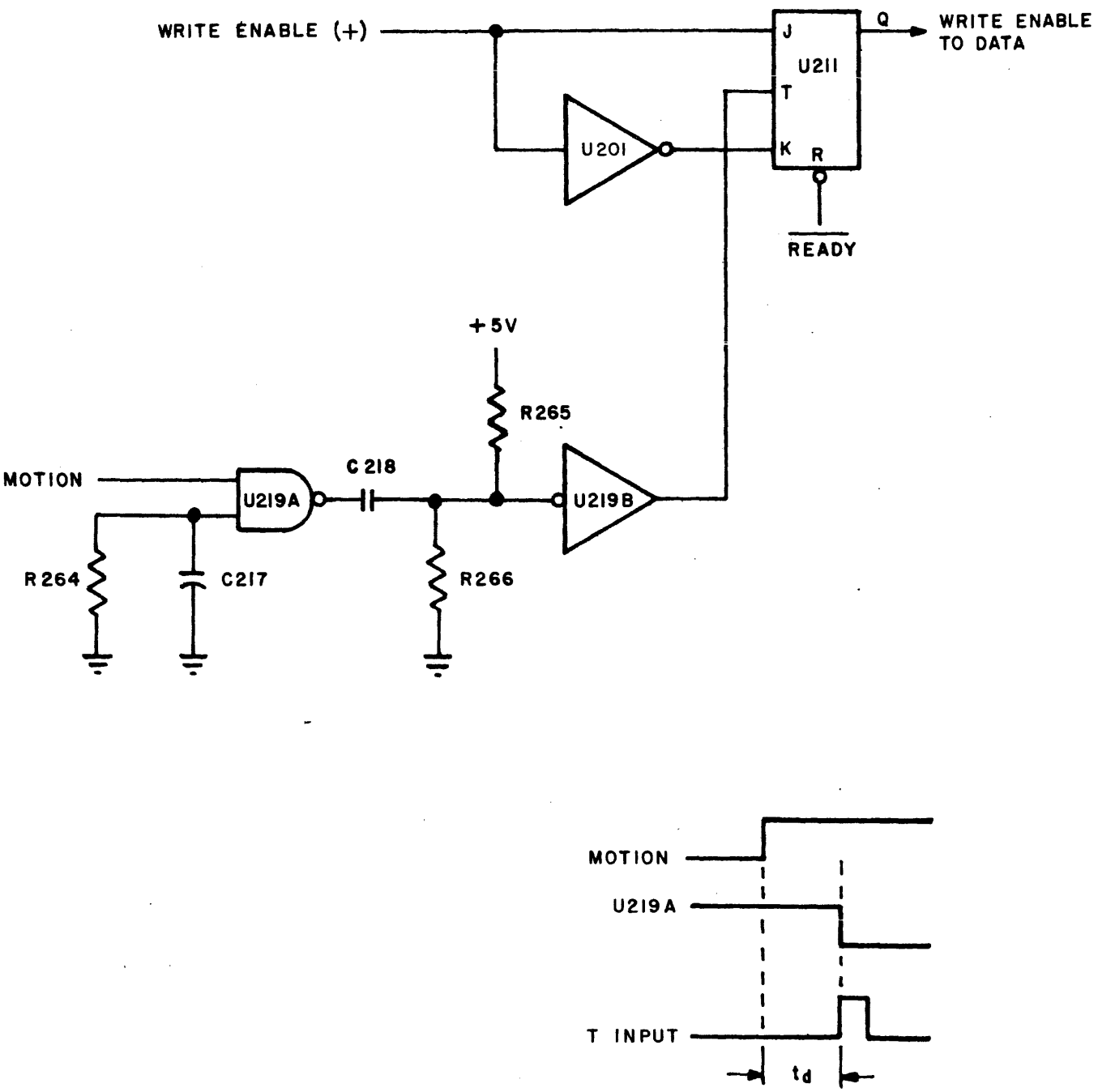


Figure 22. Simplified Logic of Write Enable Control

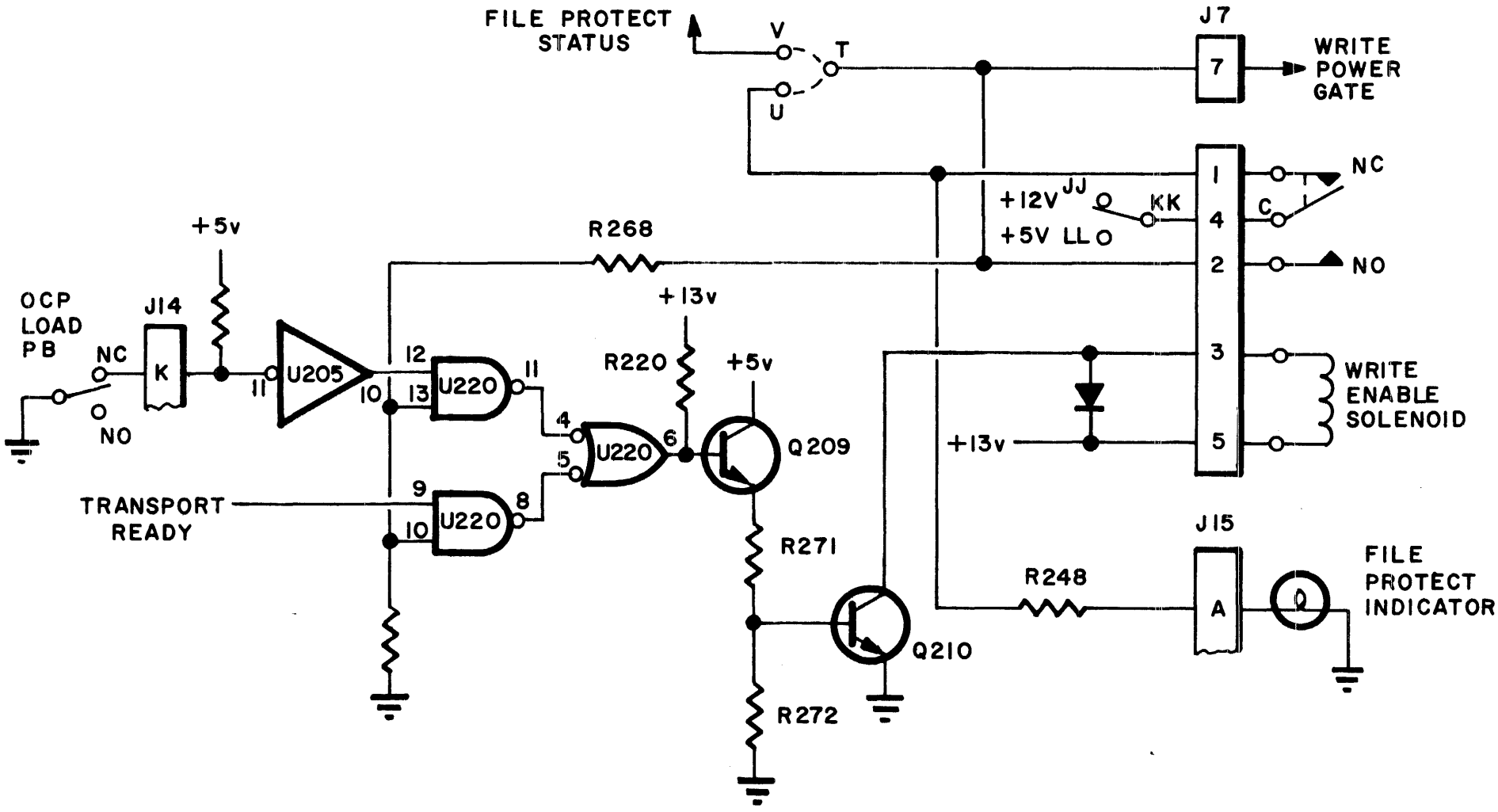


Figure 23. File Protect Logic

When the LOAD pushbutton is pressed, the logic releases the solenoid. This is done to sample if there truly is a write enable ring in place, and that the solenoid was not accidentally energized. When the loading cycle is completed, the transport ready signal is the holding signal.

4.8 READY LOGIC

The ready logic, diagrammed in Figure 24, provides three basic ready signals:

a) Select & Ready (+) from U205, which conditions the data electronics to accept and transmit information to the controller.

b) Ready & On Line from U201, which is transmitted to the controller via an output driver. This line informs the controller that the transport is ready and not rewinding, and therefore able to accept any command from the controller.

c) Ready & Off Line from U208. This is an internal ready signal that enables the operator control panel so that any motion command generated by the operator control panel will be accepted by the transport.

The ready signal is generated by the following logic equation:

$$\text{READY} = \overline{(\overline{\text{DELAYED MOTION}})} \cdot \overline{(\overline{\text{REWIND}}) \cdot (\overline{\text{RESET}} + \text{MECH. READY} + \overline{\text{RESET REWIND}})}$$

and is mechanized by U215. If all the inputs to U215 are TRUE (high) the output will be low. This low signal is inverted by U205A and gated with the terms Select & On-Line by U212 to provide the Select & Ready term. The low output of U215 is also inverted by U205B and gated with the term Off-Line by U208 to provide the Ready & Off-Line term. U205A and U201 are collector-OR'd to provide the Ready & On-Line term.

5. DATA ELECTRONICS

Data electronics described in this manual pertain to NRZI mode recording only. Phase encoding requires additional special data electronics and is described in a separate manual.

In the NRZI mode of recording, a "1" is represented by a change of direction of magnetization between positive and negative saturation levels, and a "0" is represented by no change of magnetization. The data electronics subsystem provides a format that is compatible with the IBM 727-729, 7-track format, at data densities of 200, 556, and 800 cpi. The subsystem also provides compatibility with the IBM 2400 series, USASCII-compatible 9-track format at data densities of 800 cpi. Figures 25 and 26 present the 7- and 9-track location and space specifications.

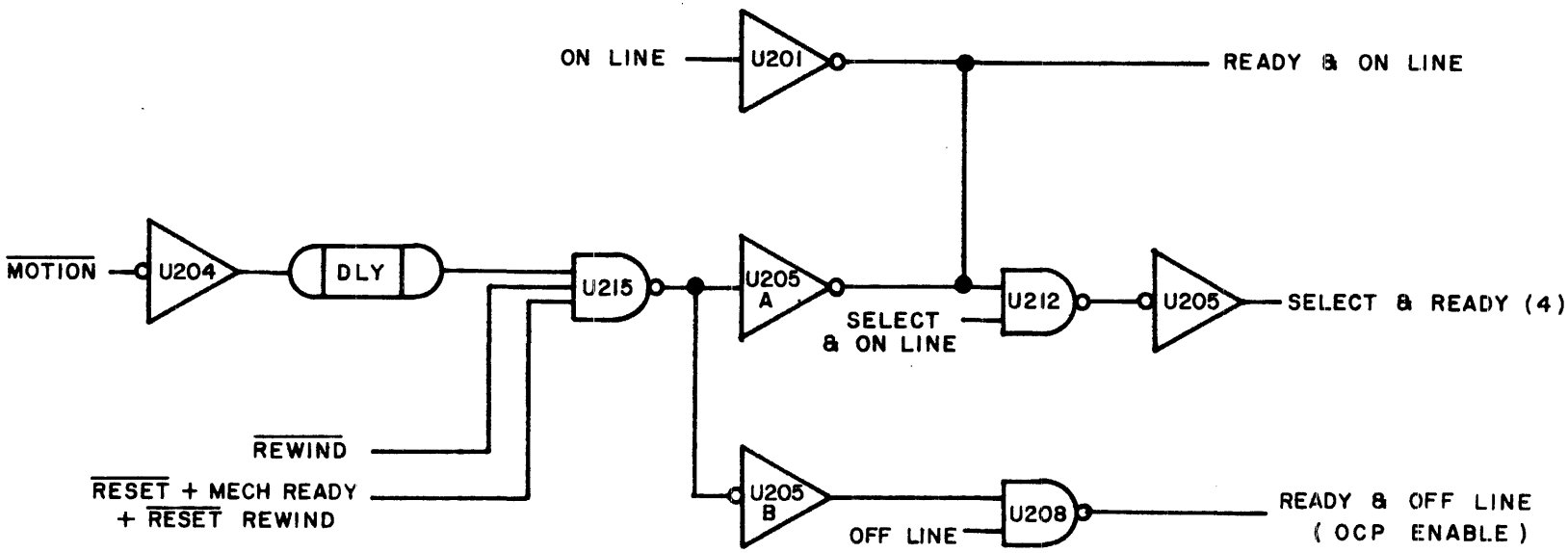


Figure 24. Simplified Logic of Ready Control

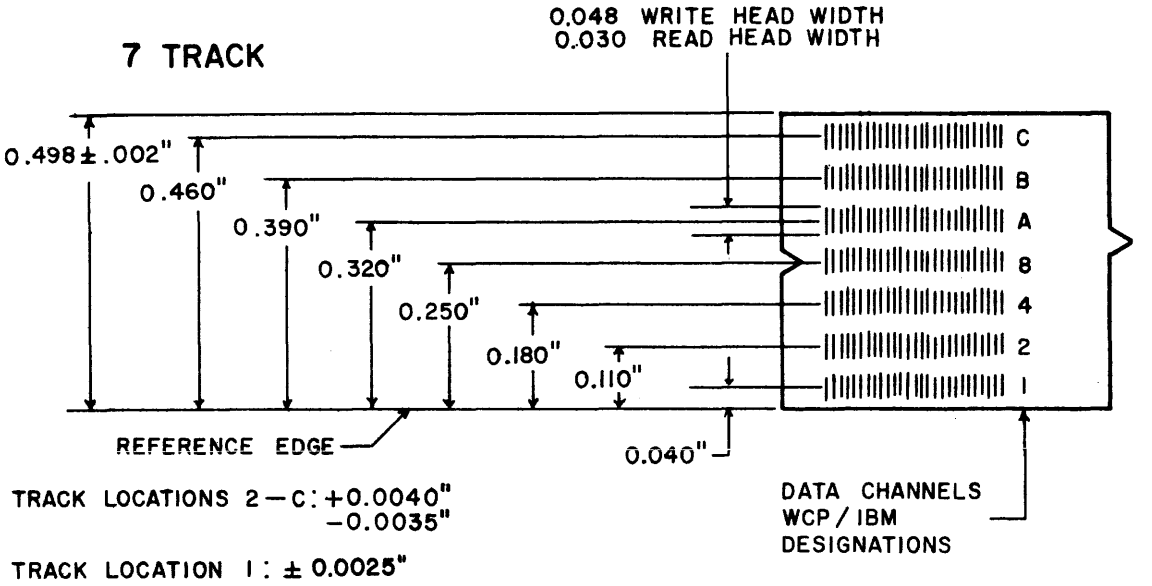


Figure 25. Track Locations and Spacing, 7-Track System

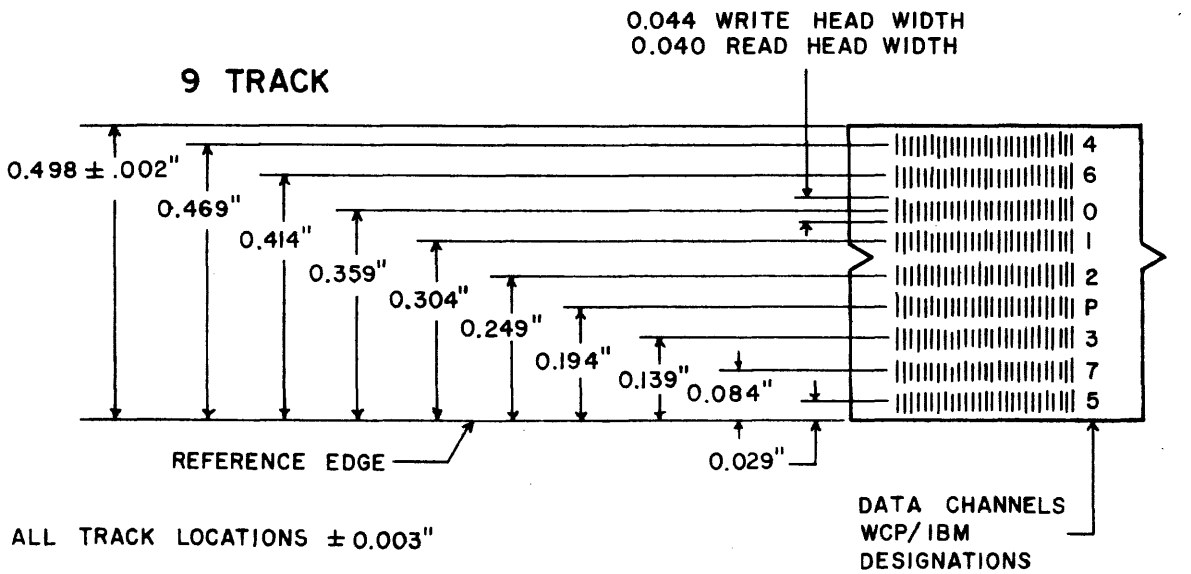


Figure 26. Track Locations and Spacing, 9-Track System

At the end of each data record, check characters must be recorded and an inter-record gap inserted. Figures 27 and 28 present the 7-and 9-track IBM inter-record gap and tape mark formats. As indicated by these figures, in the 7-track format the longitudinal redundancy check character (LRCC) only is written, whereas in the 9-track format, both a cyclic redundancy check character (CRCC) and an LRCC are written.

The CRC character is supplied together with a single write data strobe signal by the customer to the transport interface. It is separated by four character spaces from the last data character of the previous record. In the 9-track system, the LRC character is written four character spaces after the CRCC character, whereas in the 7-track system, the LRC character is written four character spaces after the last data character of the previous record. The LRC character is written by the customer transmitting the WRITE AMPLIFIER RESET signal, (leading edge) at the proper time. This signal resets the write flip-flops causing the total number of magnetization transitions in any track to be an even number.

The Inter-record Gap (IRG) displacement is nominally 0.6 inch for 9-channel systems and 0.75 inch for 7-channel systems. The IRG is established by the sum of the following component distances:

Stop Distance - Stop distance is the distance traveled by a point on the tape from the time a stop command is issued until the tape velocity is zero.

Stop Delay Distance - Stop delay distance is the distance traveled by a point on the tape from the time the LRCC character is placed on tape until a stop command is issued. In dual gap systems, if the read data is used to sense the end of the record, the stop delay distance is the distance traveled from the time the LRCC is sensed at the read bus until the stop command is issued. The stop delay time is generated in the customer's controller.

Start Distance - This is the distance traveled by a point on the tape from the time a forward command is issued until the first data character is placed on tape. The Write Delay time appropriate to the start distance is generated in the customer's controller.

A tape mark is used to separate files of information recorded on tape. The tape mark configuration for 7- and 9-track systems is shown in Figures 27 and 28 respectively. Tape mark timing is established and provided by the customer's controller. The command sequence for inserting a tape mark is as follows: a forward command is issued, followed

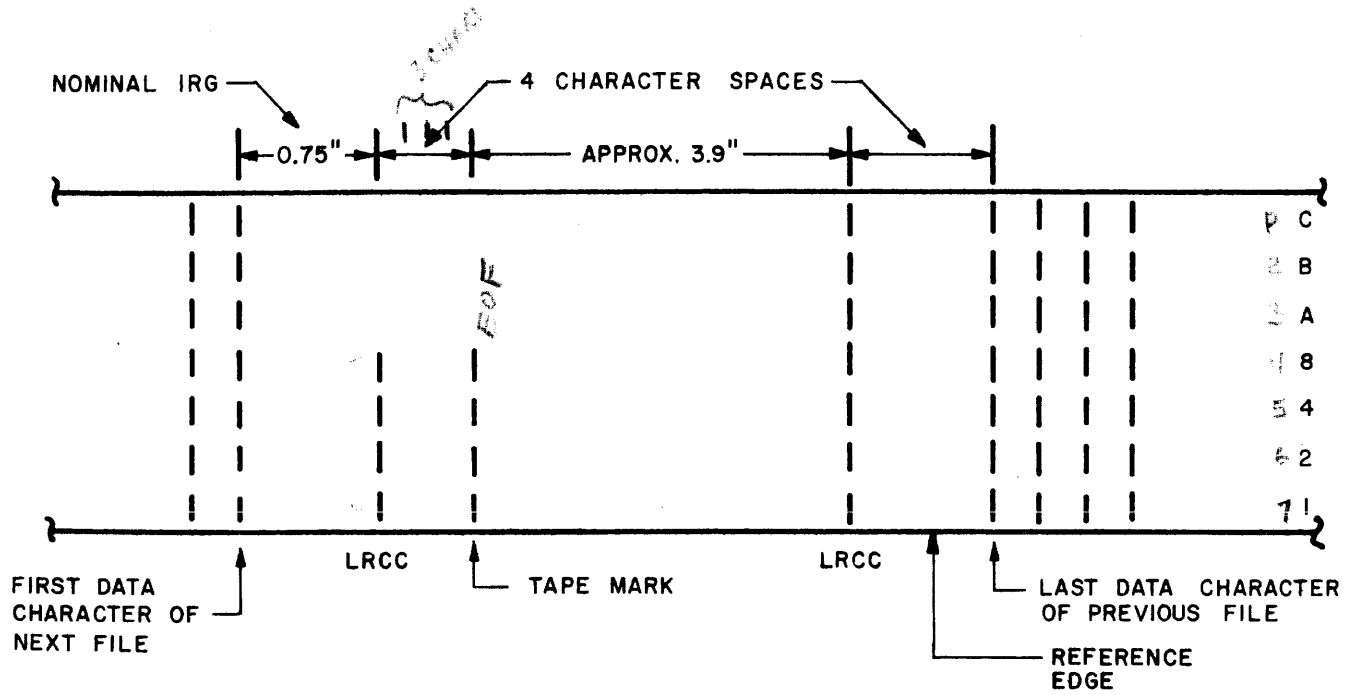
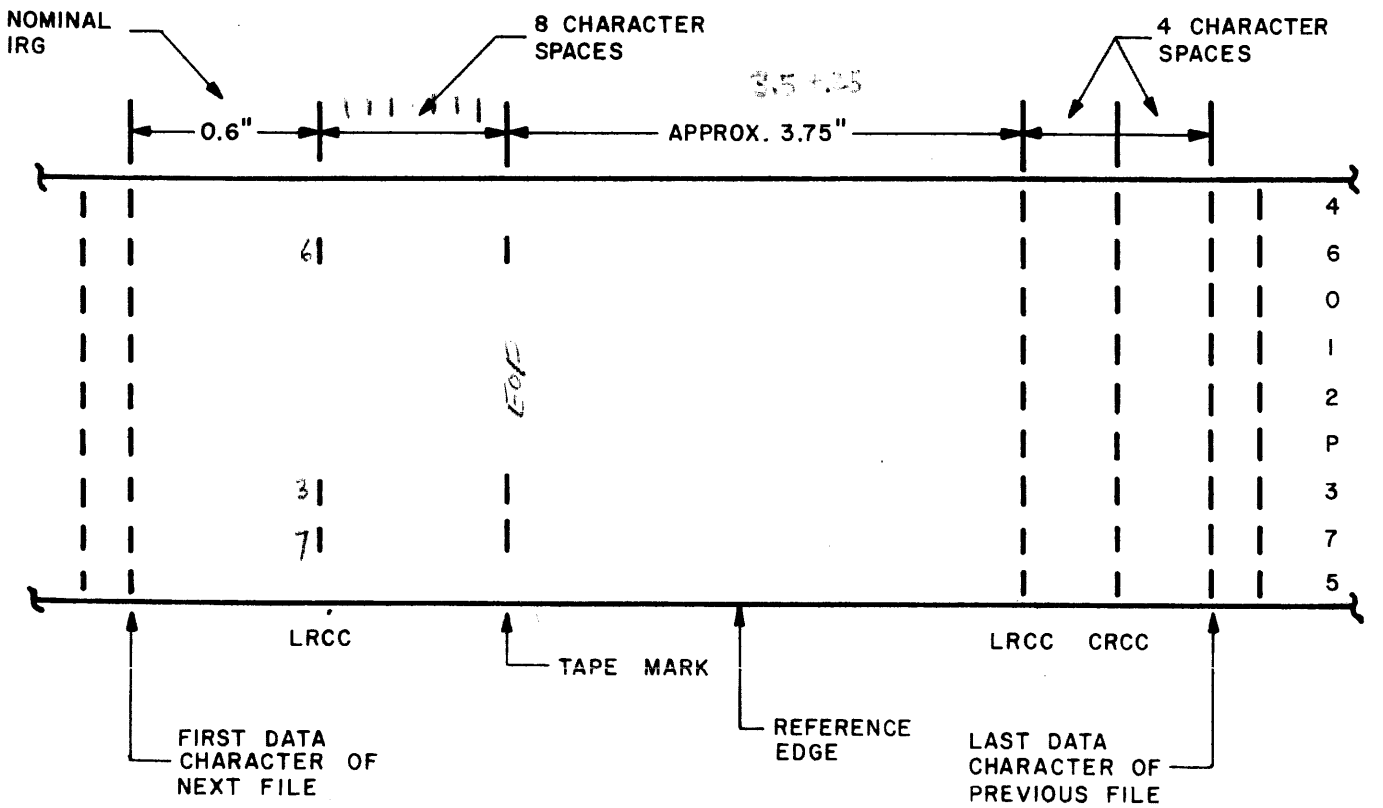


Figure 27. 7-Track File Gap Format



NOTE: TAPE VIEWED FROM MYLAR SIDE.

Figure 28. 9-Track File Gap Format

at the proper time by the tape mark character together with its write data strobe, which in turn is followed by the LRC character written four character spaces later in a 7-track system and 8 character spaces later in a 9-track system.

5.1 DATA ELECTRONICS, DUAL GAP SYSTEMS

5.1.1 Read-After-Write Head Assembly

A dual-gap read-after-write head is optionally available in either a nine-channel or a seven-channel format. A full-width erase head is located on the oxide side of the tape, positioned 0.34 inch from the write stack head gaps. The write stack is center-tapped and it operates at 50 milliamps of current per leg. The voltage output of the read stack is proportional to the speed of the tape; at 25 ips, it provides 18 to 20 millivolts peak to peak. The erase head operates at 50 milliamps.

Two auxiliary components are mounted adjacent to the read/write head on a common base--the photocell and lamp assembly that detects beginning and end of tape, and the tape cleaner. The photosense assembly is a self-contained unit that is directly cable-connected to the transport electronics printed circuit board. The tape cleaner, whose operation is entirely mechanical, is ideally positioned adjacent to the head so that the cleaned tape passes directly to the read/write head, minimizing the chance of contamination that might result in deterioration of data reliability.

5.1.2 Write Data Flow

Figures 29 and 30 present a block diagram and timing diagram of the flow of write data through the system. (Only one data line is shown. The components for the channel represented schematically in these diagrams are, of course, duplicated for each of the other write data channels.) Data enters through line receivers whose function is to invert the low-TRUE levels. Each receiver has a terminating impedance of 130 ohms.

A pulse on the write strobe line clocks information from the data lines into the system. If a given data line is TRUE, the write strobe pulse passes data on that line through the data strobe reset logic gates, which consist of two NAND-gates, OR'd together (see the block labeled A in the figure). If a given data line is FALSE, the pulse is gated out.

At the block labeled B (Figure 29), electronic correction is made for the static skew characteristics of the write head. The leading edge of the gated data pulse triggers the write deskew single-shot, whose pulse width

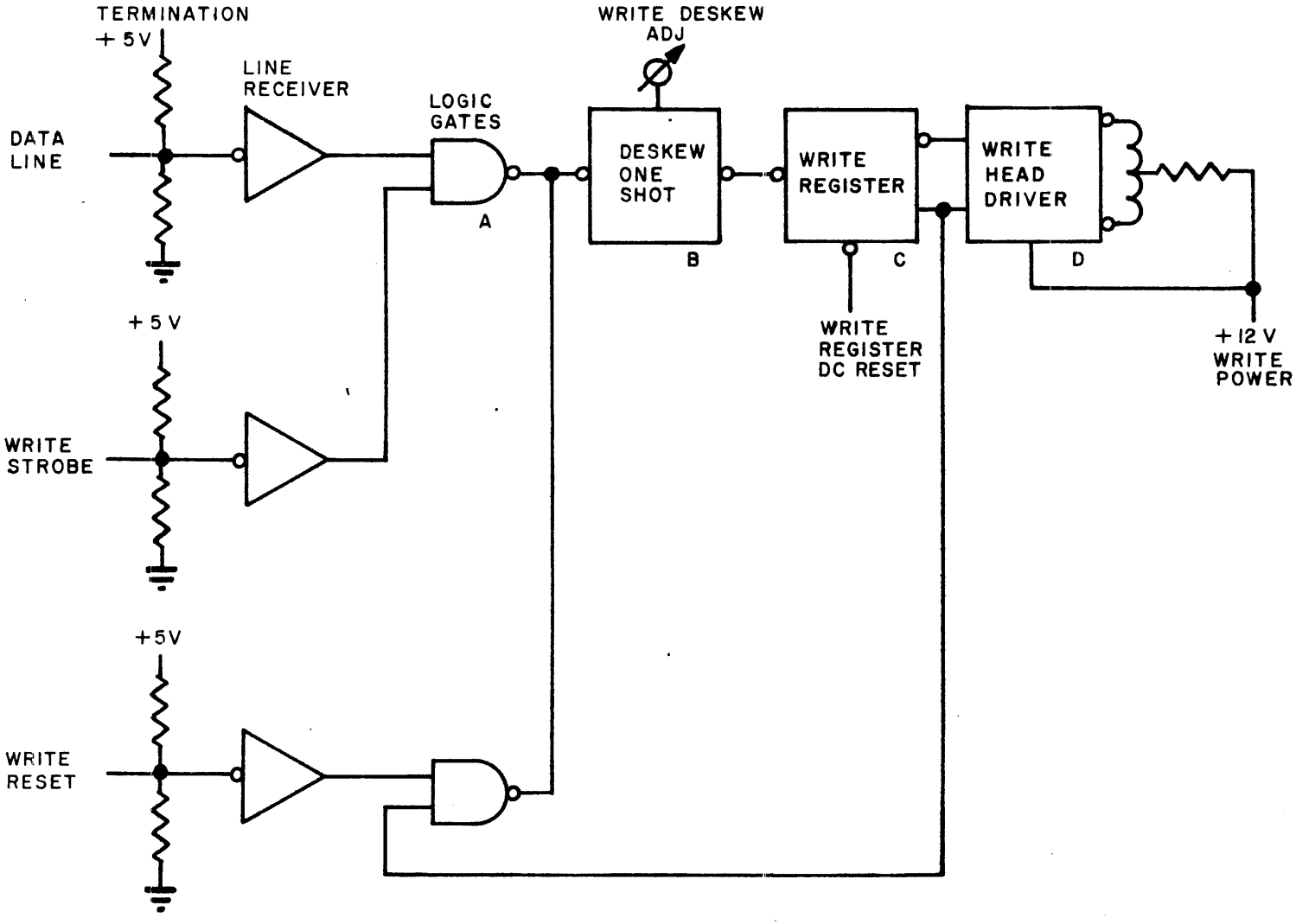


Figure 29. Write Data Flow, Dual Gap Systems

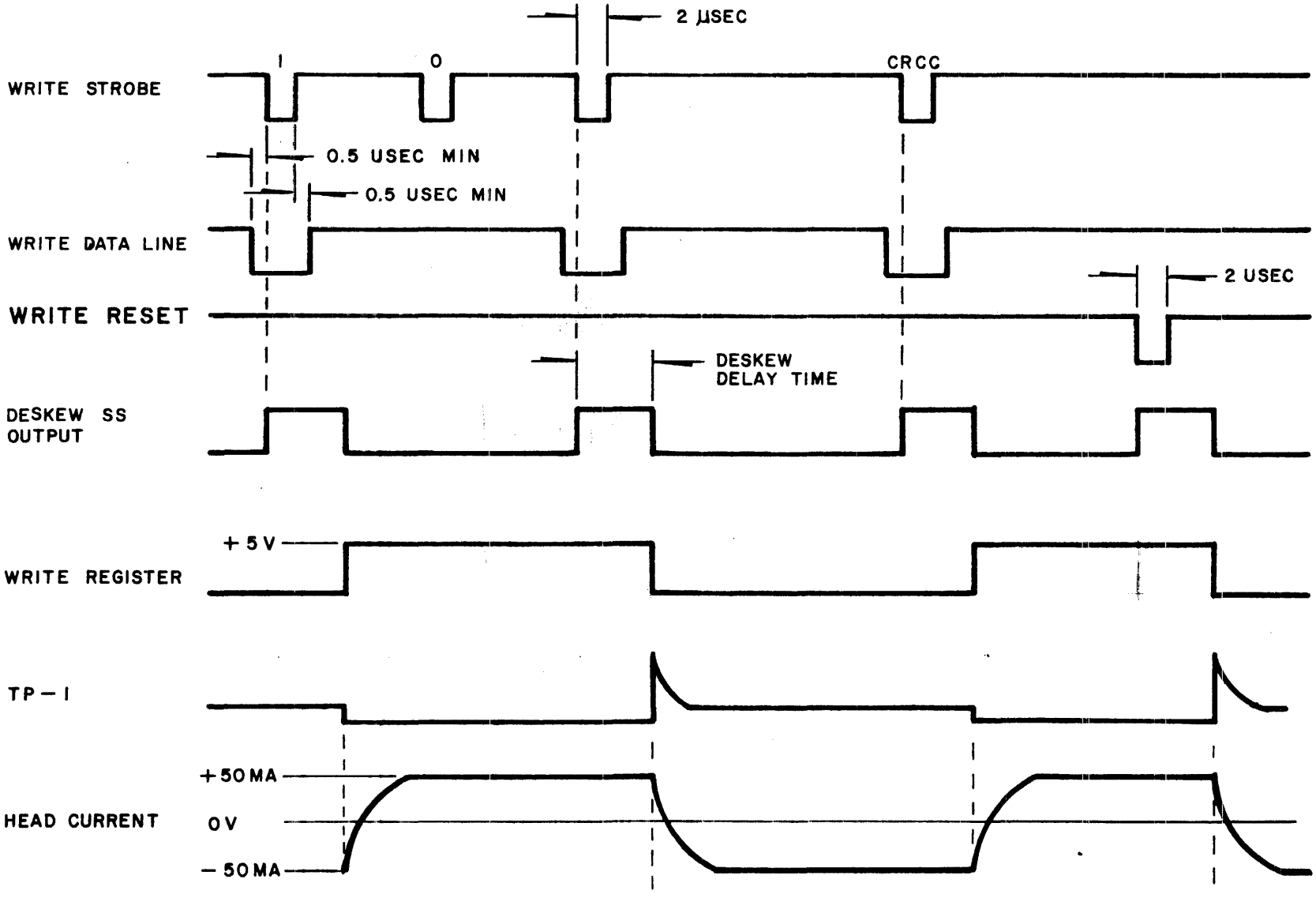


Figure 30. Write Data Flow Timing Diagram, Dual Gap Systems

has been preset and is adjustable by means of a potentiometer. The trailing edge of the pulse loads the write register, whose contents are then converted into currents by the head drivers. The head drivers operate the write heads, which put the data on tape.

At the end of each block of data, a write reset pulse enters the system. In the nine-channel configuration, this pulse enters eight character times after the last strobe of the data block; in the seven-channel configuration, it enters four character times after the last strobe. The function of this pulse is to reset any head drivers remaining in the set state at the end of a data block, thereby generating the longitudinal redundancy check character on tape.

The write register is DC reset at certain times and under certain conditions to ensure that information is not recorded on tape unless recording is deliberately intended. The logic created for this is such that if any one of the terms Motion, Write Enable, Select, and Ready is FALSE, the write register will be DC reset.

The flow of power to the write heads is controlled through the write power gate (see Figure 31). This is an AND-gate function that comprises the terms Write Enable (or Write Permit), Select & Ready, and File Protect. (Write power enters the data electronics printed circuit board from the transport electronics printed circuit board if the file protect switch on the deck has been energized.)

5.1.3 Read Data Flow

Figure 32 presents a block diagram of the flow of read data through the system. (As in Figure 29 , only one channel is indicated.) The read head generates a low-level analog signal of approximately 10 to 20 millivolts peak to peak. The read amplifier, which has a differential input and single-ended output, picks up this signal and amplifies it to a suitable level, then sends it to a phase splitter, which generates the complementary signals required for full-wave rectification. The phase splitter output signal level is adjusted to 12 volts peak to peak by the attenuator control potentiometer at the output of the read amplifier. A clipping level DC bias is fed into the input of the full-wave rectifier with the result that positive peaks above the clip-level threshold are observed at the output of the circuit. This signal is then sent to the peak detector, which in turn generates a digital pulse whose trailing edge is synchronous with the peak of the analog signal and is used to load the read register at that time. The contents of the read register are sent to the output driver and then to the customer's data line.

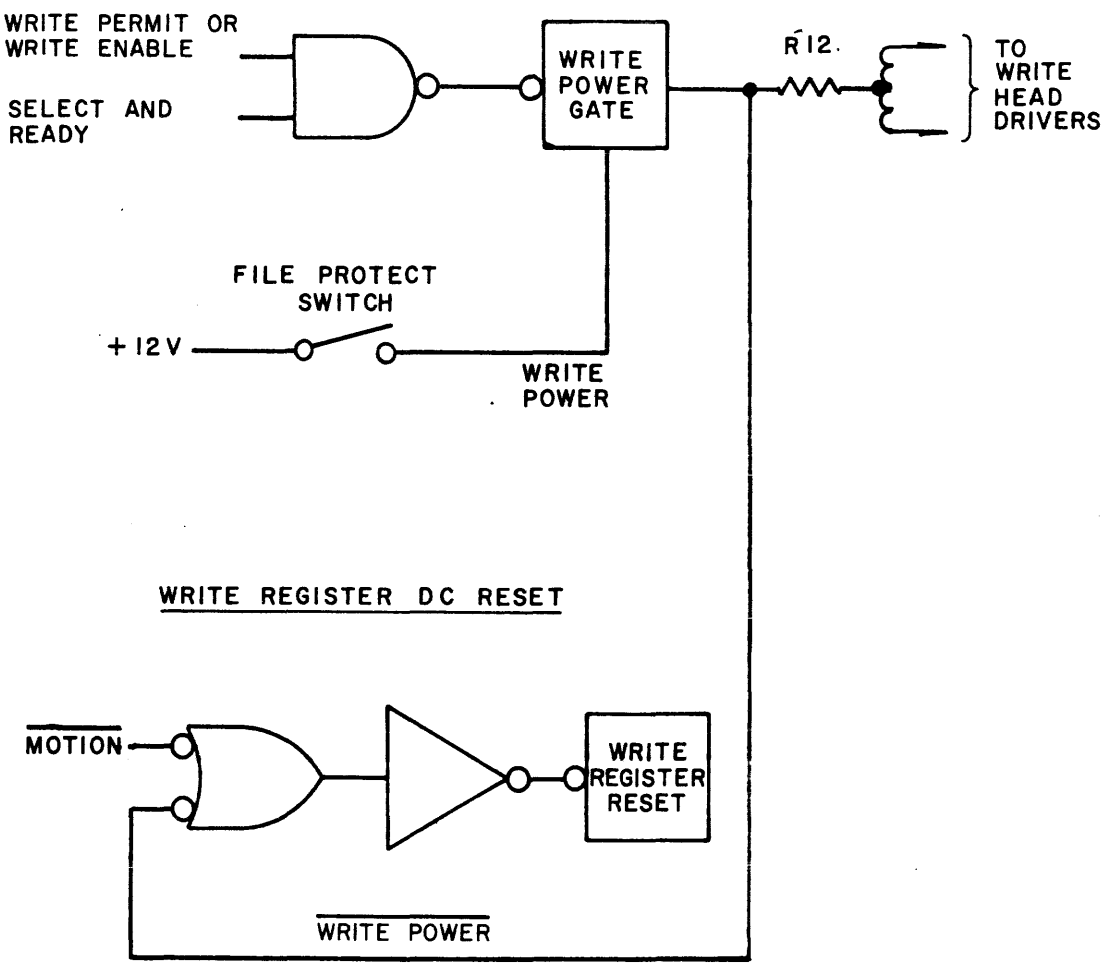


Figure 31. Write Power Gate and Write Register DC Reset, Dual Gap Systems

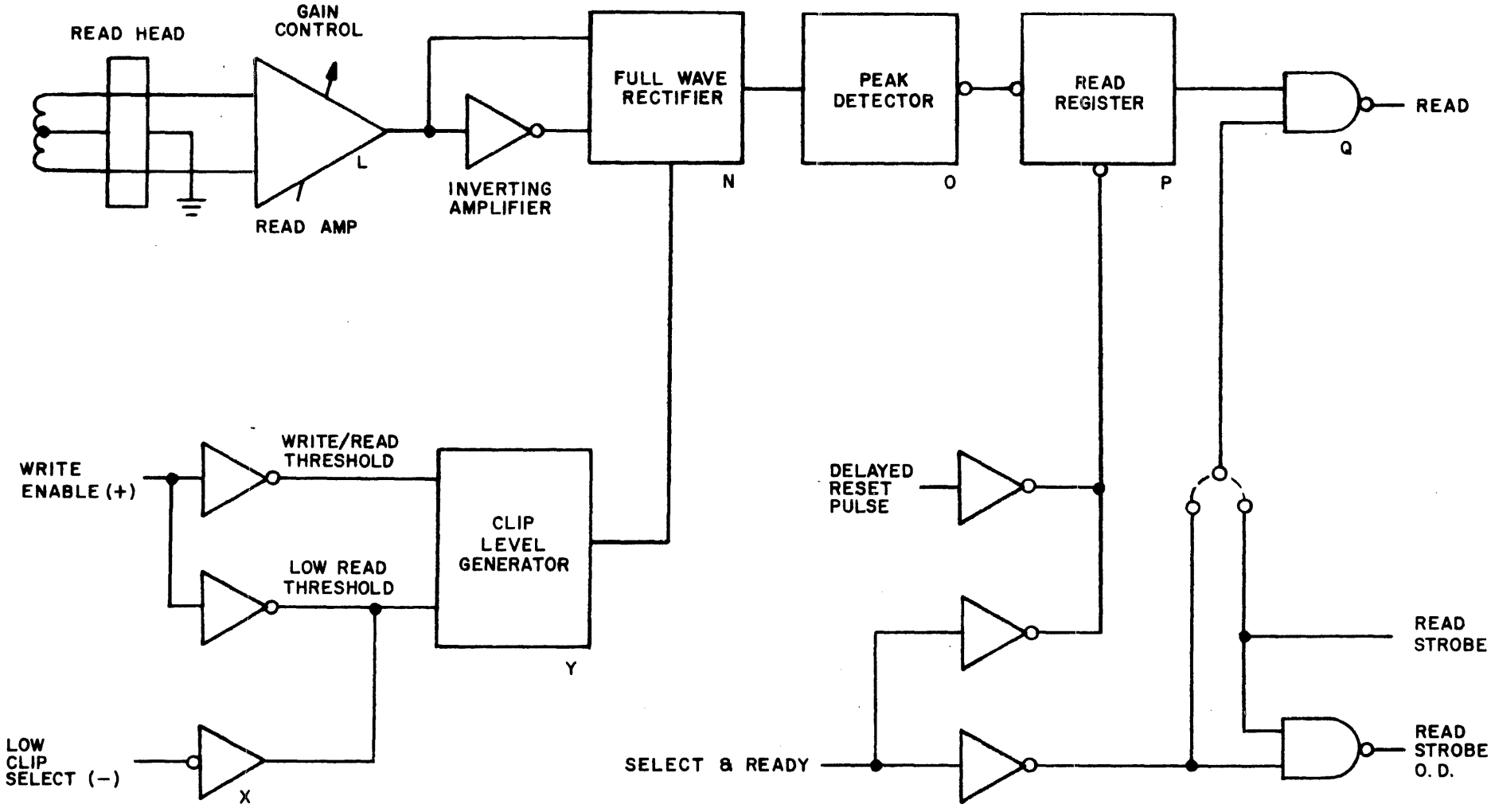


Figure 32. Read Data Flow, Dual Gap Systems

Auxiliary to this general flow of read data, several other functional circuits complete and control the read data generation and transfer process. These auxiliary functions are described in the subsections following.

Strobe Generation Circuitry. As in most other NRZI read systems, the OR'd data method of read strobe pulse generation is used in the Mod 10 (see Figure 33). The first arriving bit sensed at the read register is used to trigger the read strobe delay single-shot. This is implemented by taking the complement outputs of the read register and feeding them into a nine-way OR-gate whose output goes to the single-shot. The pulse width of the single-shot is controlled by adjusting a potentiometer and is set to approximately one-half frame time.

At the end of the variable time delay period, a read strobe pulse is generated (see the block labeled T in the diagram) and sent to the tape controller. The leading edge of this pulse also triggers the read register delayed reset pulse network, allowing 500 nanoseconds for scanning of the data lines by the controller before the read registers are reset. A summing function (data staircase) is provided at the output of the read registers so that interchannel time displacement can be measured.

A timing diagram for both read data flow and strobe generation is given in Figure 34.

High-Low Density Select. Data can be recorded on tape at either a high or low density (more or fewer characters per inch). An input from the high-low density select function changes the pulse width of the read strobe delay single-shot to correspond to the density of character generation.

Read Permit. This system function allows the remote tape controller unit to enable or inhibit read data at any time. Read permit is conditioned by the terms Select and Ready. If either of the two terms is FALSE, the read registers and output drivers are disabled.

Clipping Level Circuitry. This circuitry, shown in Figure 32, generates the clipping levels through which the read signals must pass before reaching the peak detectors. In the write enable mode, approximately 45 per cent of the read signal amplitude is clipped. In the read-only mode, the level is decreased so that only 24 per cent of the read signal amplitude is clipped. A provision has been implemented via the low threshold select remote input line so that an even lower threshold level (12 per cent) can be selected when reading marginal output tapes. The state of this line has no effect on the clipping level while in the write mode of operation.

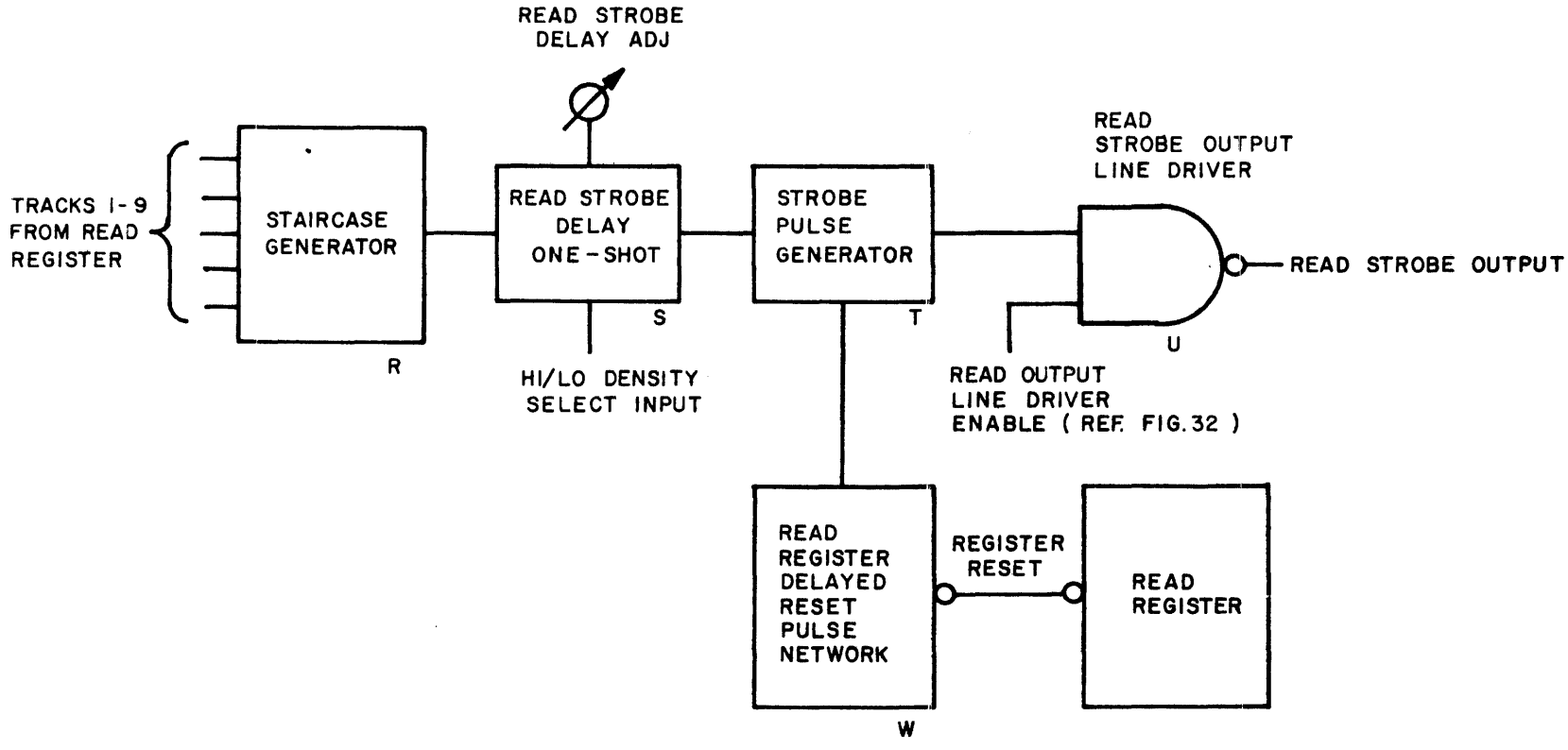


Figure 33. Read Strobe Generation Circuitry, Dual Gap Systems

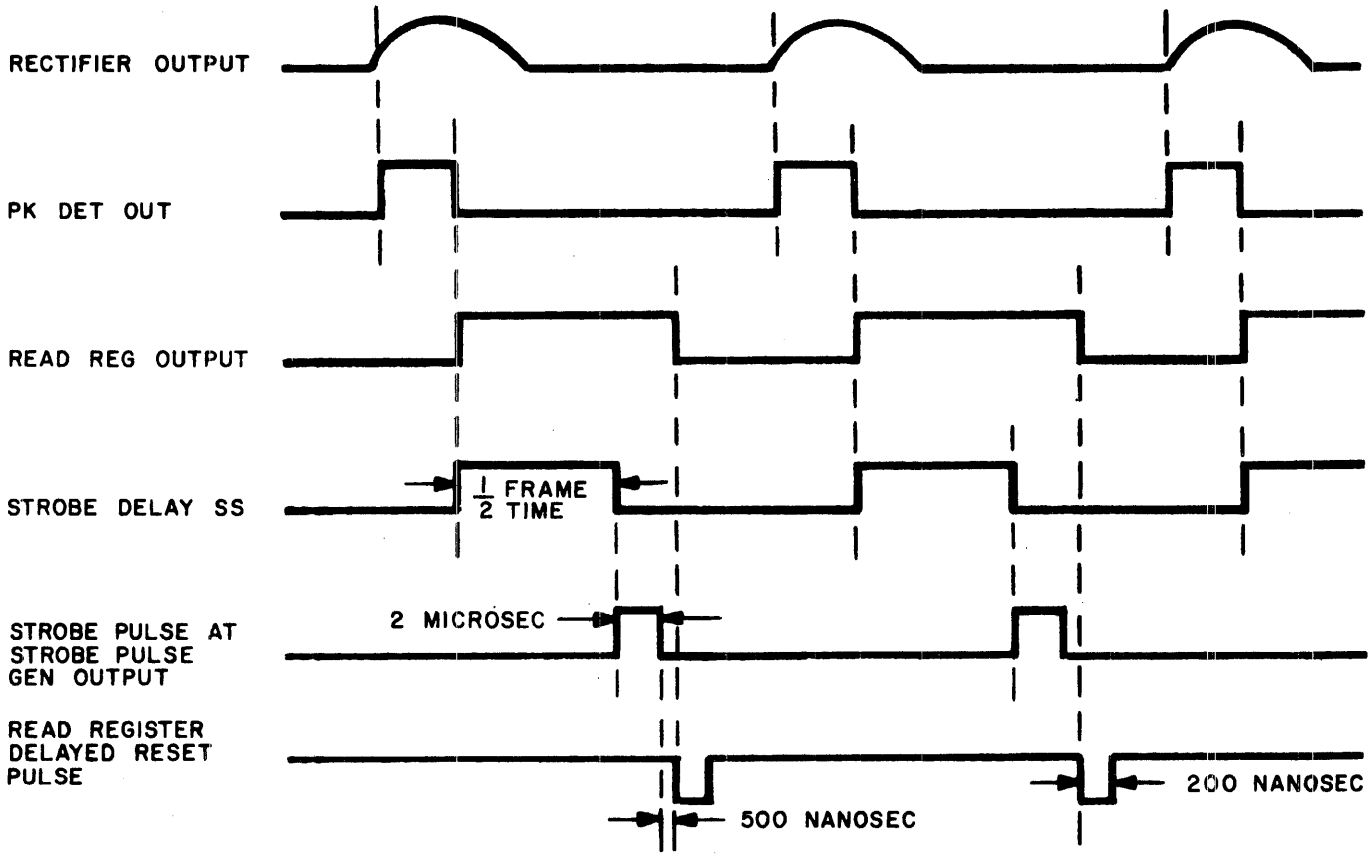


Figure 34. Timing Diagram of Read Data Flow and Strobe Generation, Dual Gap Systems

Rewind Inhibit. This system function prevents the reading of data if the tape is rewinding. The relevant circuitry prevents current flow in the phase splitter, disabling its operation during rewinding.

5.2 DATA ELECTRONICS, SINGLE GAP SYSTEMS

5.2.1 Read/Write Head Assembly

A single-gap read/write head is optionally available in either a nine-channel or a seven-channel format. The head assembly is illustrated in Figure 8. A full-width erase head is located on the oxide side of the tape, positioned 0.34 inch from the head gaps. The stack has a center tap configuration and is operated at 20 milliamps of current per leg. The voltage output of the stack is proportional to the speed of the tape; at 25 ips, it operates at 14 to 18 millivolts peak to peak. The erase head operates at 50 milliamps.

Two auxiliary components are mounted adjacent to the read/write head on a common base--the photocell and lamp assembly that detects beginning and end of tape, and the tape cleaner. The photosense assembly is a self-contained unit that is connected by cable to the transport electronics printed circuit board. The tape cleaner, whose operation is entirely mechanical, is ideally positioned so that the cleaned tape passes directly to the read/write head, minimizing the chance of contamination that might result in deterioration of data reliability.

5.2.2 Write Data Flow

Figure 35 presents a block diagram of the flow of write data through the system. (Only one data line is shown. The channel components represented schematically in this diagram are, of course, duplicated for each write data channel.) Figure 36 presents a write data flow timing diagram.

Data enters through line receivers whose function is to invert the low-TRUE levels. Each receiver has a terminating impedance of approximately 130 ohms. The output of the data line receiver is used to condition the J-K inputs of the write register cells. The write strobe signal is sent to the clock inputs of the write register. If the data line is TRUE at the time the write strobe pulse arrives, the write register will switch states at the trailing edge of the pulse. This in turn changes the state of the head driver which causes the current in the head to reverse its direction.

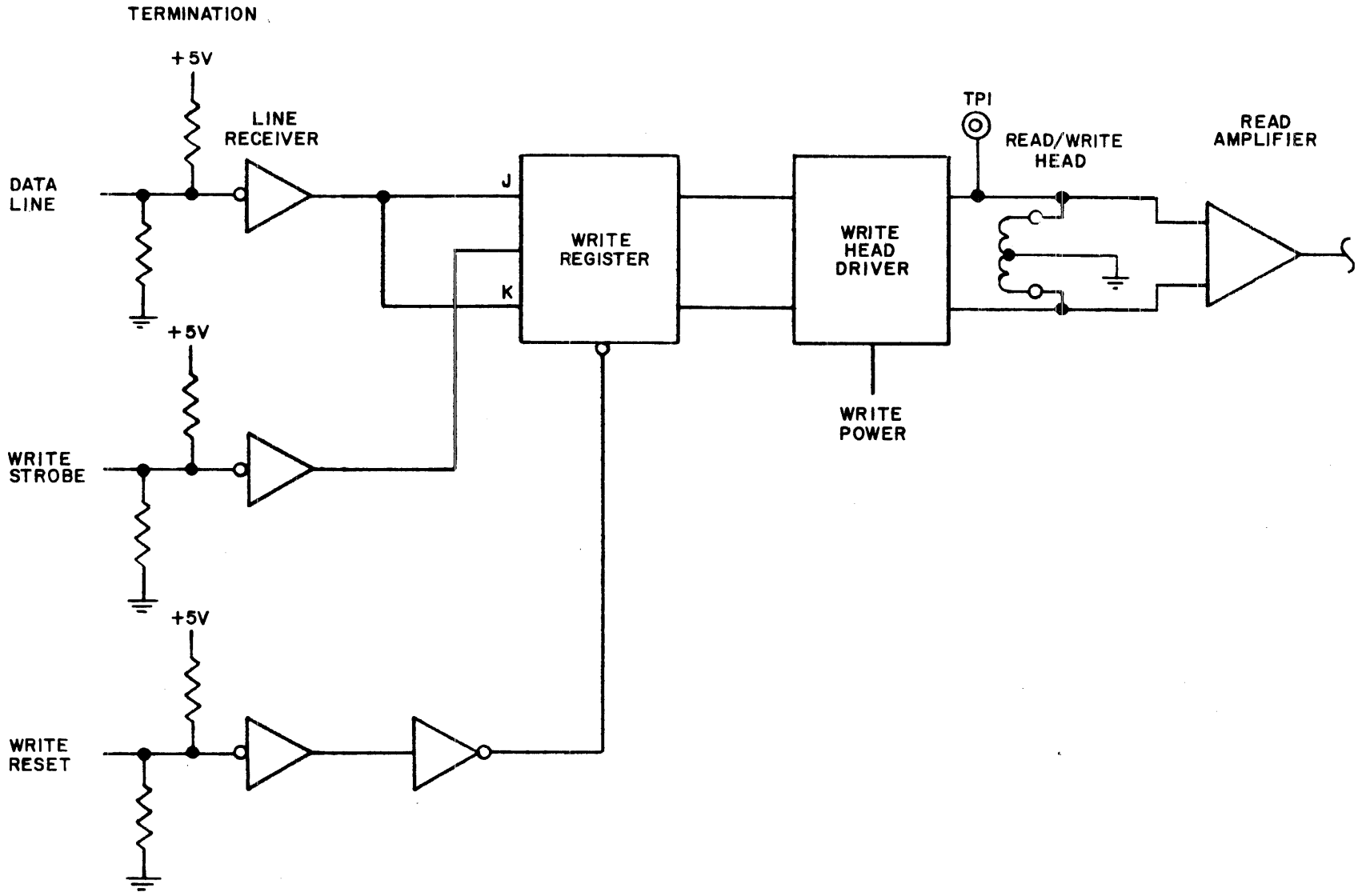


Figure 35. Write Data Flow, Single Gap Systems

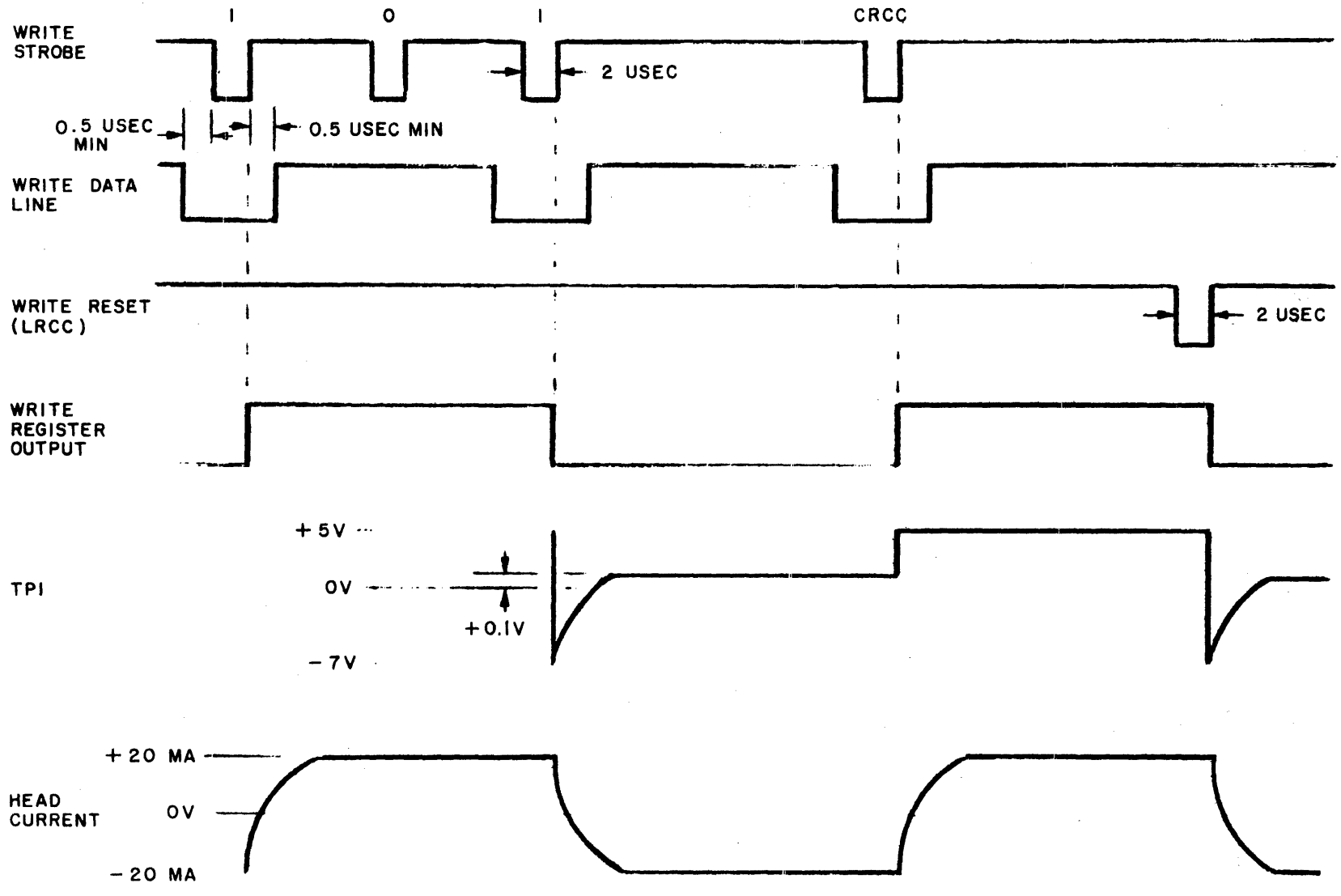


Figure 36. Write Data Flow Timing Diagram, Single Gap Systems

If the data line is FALSE at the time of write strobe, since this causes both the J and the K inputs to be false, the register will not change states; hence, no current reversal will occur at the head. Current reversals at the heads cause data to be recorded on tape.

At the end of each block of data, a write reset pulse enters the system and DC resets the write register. In the nine-channel configuration, this pulse enters eight character times after the last strobe of the data block; in the seven-channel configuration, it enters four character times after the last strobe. The function of this pulse is to reset any head drivers remaining in the set state at the end of a data block, thereby generating the longitudinal redundancy check character on tape.

The write register is DC reset at certain other times to ensure that information is not recorded on tape unless recording is deliberately intended. The logic created for this is such that if any one of the terms Motion, Write Enable, Select, and Ready is FALSE, the write register will be DC reset.

The flow of power to the write heads is controlled via the Write Enable and Select & Ready NAND-gate which sends a signal to the DC set inputs of the write register. When either signal goes FALSE, the write register is both DC set and DC reset, causing both its outputs to go to a high level. This in turn disables both head driver outputs, hence removing both current paths to the head. If both inputs are TRUE, the DC set input to the register goes FALSE, allowing the head driver to drive current into the head. (Write power enters the data electronics printed circuit board from the transport electronics printed circuit board only if the file protect switch on the deck has been energized (see Figure 37.)

5.2.3 Read Data Flow

Figure 38 presents a block diagram of the flow of read data through the system. (As in Figure 35, only one channel is indicated.) A timing diagram for read data flow and strobe generation is given in Figure 39.

Input diodes protect the read amplifier during write operations. The read head generates a low-level analog signal of approximately 14 to 18 millivolts peak to peak. The read amplifier, which has a differential input and single-ended output, picks up this signal and amplifies it to a suitable level, then sends it to an inverting amplifier which generates the converted signal required for the full-wave rectifier. The amplifier output signal level is adjusted to 12 volts peak to peak by the gain control potentiometer. A clipping level DC bias is fed into the input of the

(Continued on page V-41)

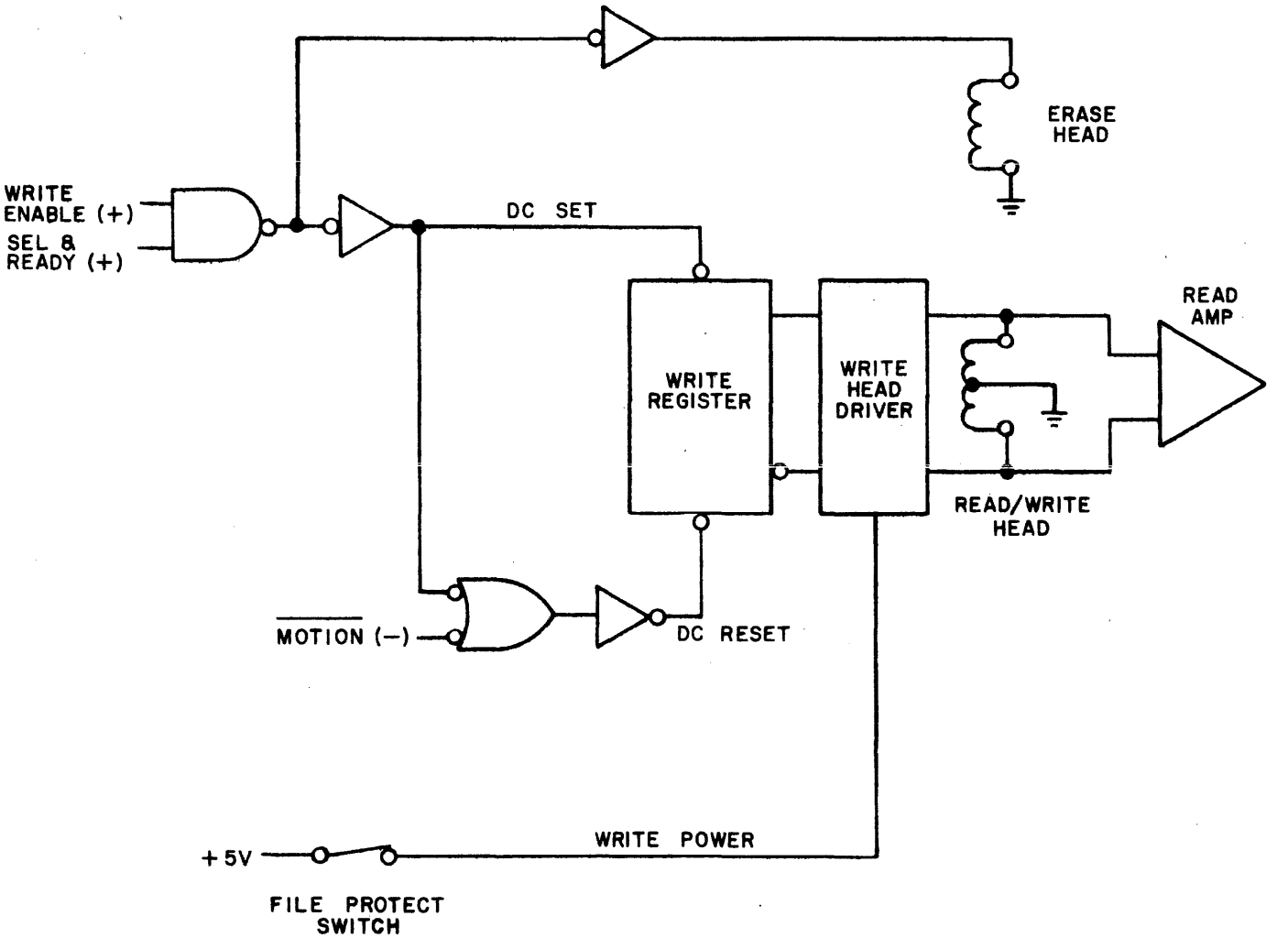


Figure 37. Write Power Gate and Write Register DC Reset, Single Gap Systems

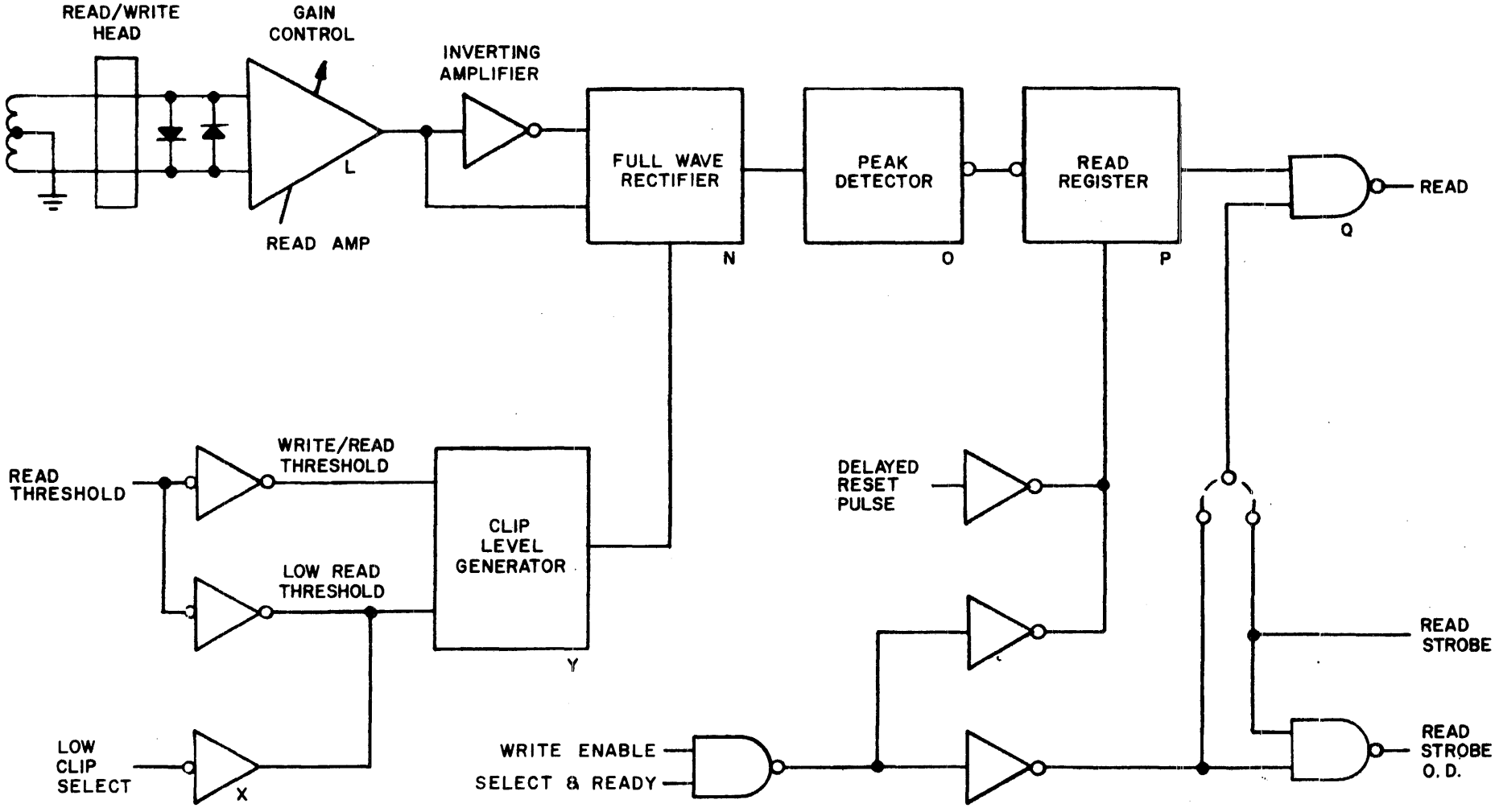


Figure 38. Read Data Flow, Single Gap Systems

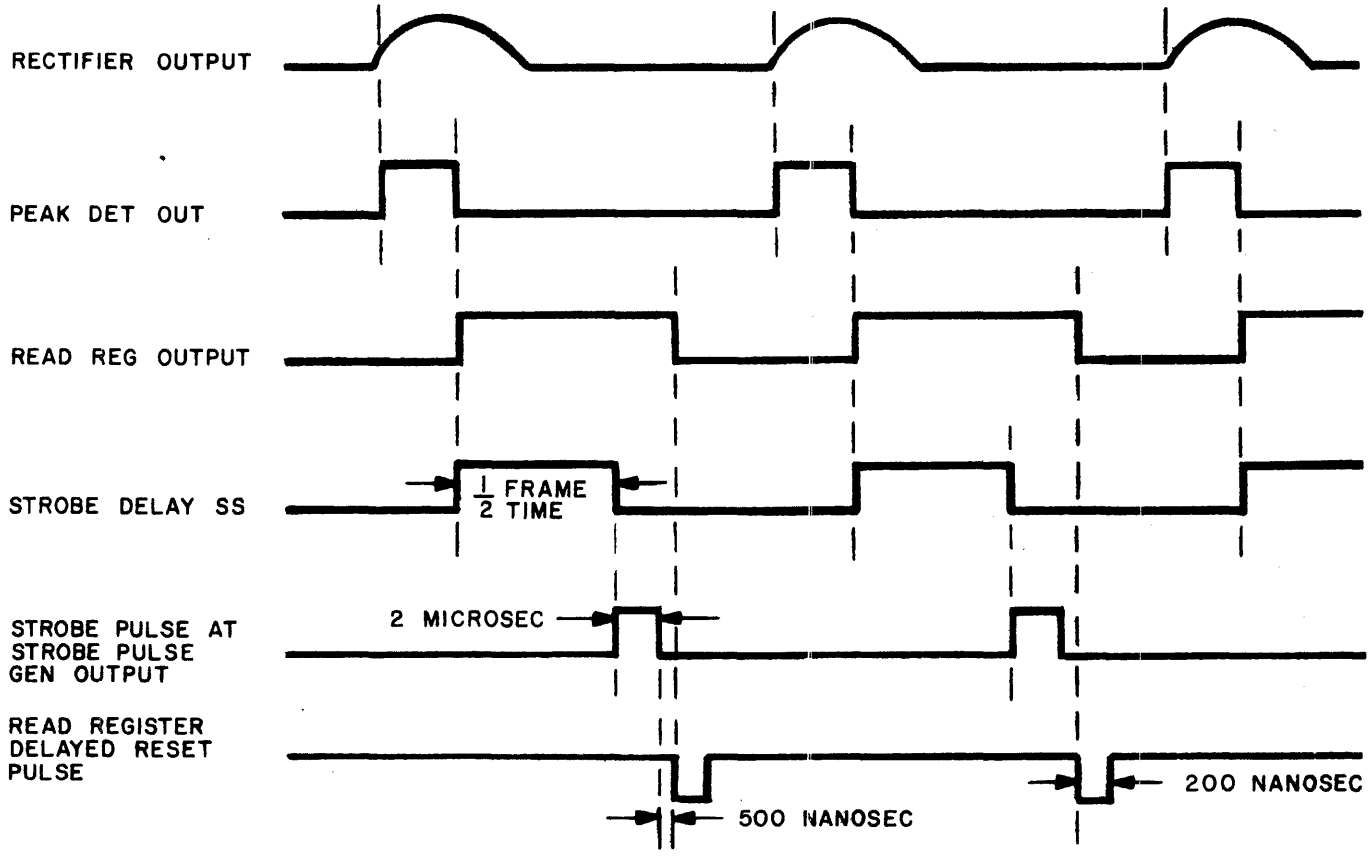


Figure 39. Timing Diagram of Read Data Flow and Strobe Generation, Single Gap Systems

full-wave rectifier with the result that positive peaks above the clip-level threshold are observed at the output of the circuit. This signal is then sent to the peak detector, which in turn generates a digital pulse whose trailing edge corresponds to the peak of the analog signal and is used to load the read register at that time. The contents of the read register are sent to the output driver and thence to the customer's data line.

Auxiliary to this general flow of read data, several other functional circuits are implemented to complete and control the read data generation and transfer process. These auxiliary functions are described in the subsections following.

Strobe Generation Circuitry. As in most other NRZI read systems, the OR'd data method of read strobe pulse generation is used in the Mod 10 (see Figure 40). The first arriving bit sensed at the read register is used to trigger the read strobe delay single-shot. This is implemented by taking the complement outputs of the read register and feeding them into a nine-way OR-gate whose output goes to the single-shot. The pulse width of the single-shot is controlled by adjusting a potentiometer and is set to approximately one-half frame time.

At the end of the variable time delay period, a read strobe pulse is generated (see the block labeled T in the diagram) and sent to the tape controller. The trailing edge of this pulse also triggers the read register delayed reset pulse network, allowing 500 nanoseconds for scanning of the data lines by the controller before the read registers are reset. A summing function (data staircase) is provided at the output of the read registers so that interchannel time displacement can be measured.

High-Low Density Select. Data can be recorded on tape at either a high or low density (more or fewer characters per inch). An input from the high-low density select function changes the pulse width of the read strobe delay single-shot to correspond to the density of character generation.

Clipping Level Circuitry. This circuitry, shown in Figure 38, generates the clipping levels through which the read signals must pass before reaching the peak detectors. If the Read Threshold line is TRUE, approximately 45 per cent of the read signal amplitude is clipped. When this line is FALSE, the level is decreased so that only 25 per cent of the read signal amplitude is clipped. A provision has been implemented via the low-read-threshold remote input line so that an even lower threshold level (12 per cent) can be selected when reading marginal output tapes. The state of this line has no effect on the clipping level while the Read Threshold line is TRUE.

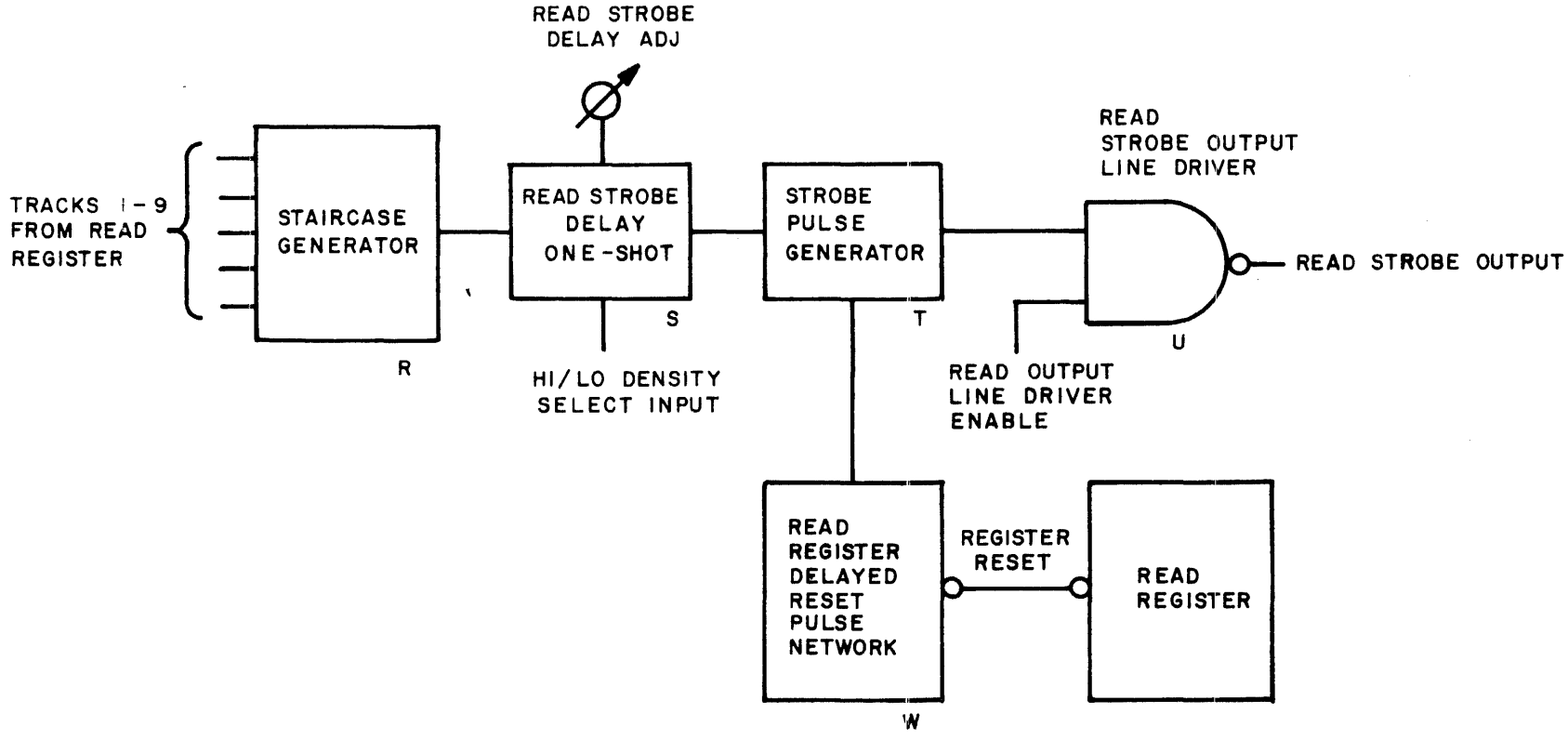


Figure 40. Read Strobe Generation, Single Gap Systems

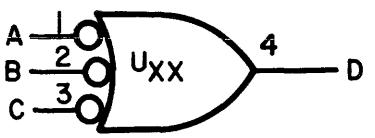
6.0 KEY TO LOGIC SYMBOLS

In several portions of this Manual, primarily in this section and in Appendix B, logic symbols are used to represent certain logical functions or integrated circuit elements. The accepted integrated circuit manufacturer's industry standard symbols are used here.

Since DTL and TTL logic is being employed, it is of the typical inverting type, utilizing NAND-NOR elements rather than AND-OR devices.

Although the same device is used to implement both the NAND and the NOR function, the symbol is shown to correspond to the particular functional operation.

The input/output lines to the device are shown for the TRUE (active) state of the function. A state indicator, shown as a small circle at the input or output of the device, means that if that line is in the TRUE state, it will be at zero volts. Lack of a state indicator means that the TRUE state of the line is at +5 volts. The following symbol and explanation will serve as a clarification and example:



LOGIC SYMBOL

$D = \overline{A + B + C}$

LOGIC EQUATION

Figure 41. Logic Symbol Example

Figure 41 shows a logical NOR element that says that D will be at +5 volts (TRUE state) if any one, or any combination of A,B, or C, is at zero volts. Typically, the designation number of that particular chip in the assembly is shown within the symbol, and the corresponding chip pin numbers are shown on the lines external to the symbol.

Table 3 shows all of the logic symbols used in this Manual with their corresponding names and logical equations. The equations shown are defined by the TRUE level of the input signal.

The single shot produced a positive going pulse at the "1" output and a negative going pulse at the "0" output and these are initiated at the time that the input pulse transitions to its TRUE state.

The flip-flops are of the J-K type and their input/output functions are as follows:

Designation	Function
J	Synchronous set input
K	Synchronous reset input
T	Clock input
S_D	Direct set input
C_D	Direct clear (or Reset) input
1	Set output
0	Reset output

The following truth tables are applicable to these devices:

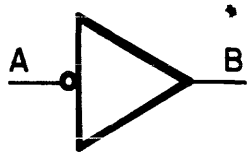
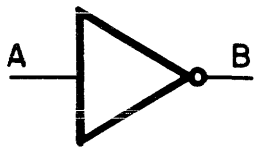
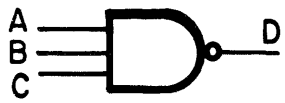
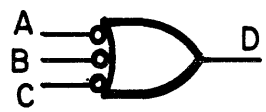
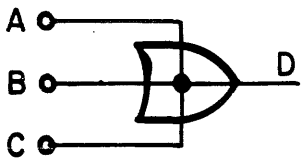
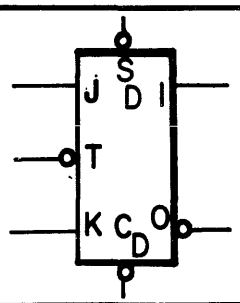
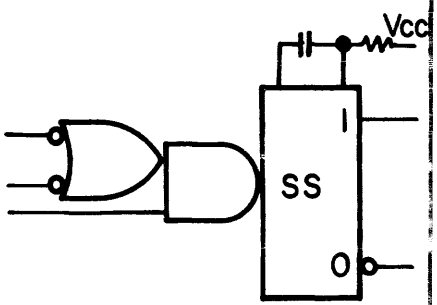
SYNCHRONOUS OPERATION

BEFORE CLOCKS				AFTER CLOCK	
OUTPUTS		INPUTS		OUTPUTS	
1	0	J	K	1	0
L	H	L	X	L	H
L	H	H	X	H	L
H	L	X	L	H	L
H	L	X	H	L	H

ASYNCHRONOUS OPERATION

INPUTS		OUTPUTS	
SD	CD	1	0
L	L	H	H
L	H	H	L
H	L	L	H
H	H	Synchronous Operation	

TABLE 3

SYMBOL	NAME	LOGICAL EQUATION
	NEGATIVE INVERTER	$B = \overline{A}$
	POSITIVE INVERTER	$B = \overline{A}$
	POSITIVE NAND GATE	$D = \overline{ABC}$
	NEGATIVE NOR GATE	$D = \overline{A+B+C}$
	NEGATIVE WIRED OR GATE	D = A+B+C
	FLIP-FLOP (J-K)	SEE TRUTH TABLE
	SINGLE SHOT	SEE EXPLANATION
	TIME DELAY NETWORK	$B = \overline{A \cdot [DLY]}$

SECTION VI

MAINTENANCE ON SITE

Before any Mod 10 tape transport leaves the factory, each of its components has been thoroughly tested and all adjustments have been made to ensure reliable operation. However, injudicious handling in transit or the effect of long use may necessitate the replacement of some parts or the readjustment of some components.

Table 4 lists a basic set of maintenance tools and supplies required for servicing the Mod 10. As the table suggests, some supplies should also be available to the operator for daily or shift-end cleaning.

Table 5 offers a suggested schedule for preventive maintenance. Again, some of these functions are the responsibility of the tape transport operator. Procedures for performing them have been specified in Section III. The remainder--preventive maintenance tasks that must be performed by a service engineer--are described in connection with the repair procedures for the subassembly to which they pertain.

In the pages that follow, instructions are provided for replacements, readjustments, and trouble shooting aids that can effectively be made while the tape transport remains installed in the customer's computer system. Some tasks of repair require test equipment not normally available in the field, or special alignment and adjustment tools that are not available to field engineers. Instructions for repairs of this more complex kind are NOT included in this section.

As in the preceding sections, the maintenance instructions are organized in terms of subassembly units.

Table 4. Maintenance Tools and Supplies

FOR THE OPERATOR	
Lint-free cloth Cotton swabs Isopropyl alcohol	
FOR THE SERVICE ENGINEER	
Equipment	Model or Type
Hex. wrench set	For #4, 6, 8, 10 and 1/4 cap screws and set screws
Spline wrench	For six-fluted #4 set screw
Open-end wrench	For 7/16-inch bolts
Long-nose pliers	
Screwdriver set	Phillips
Screwdriver set	Standard blade
Soldering aid	
Soldering iron	
Tape tracking fixture	WANGCO P/N T-00010
Voltmeter	Triplett Model 800 or equivalent
Reel hub alignment fixtures	WANGCO P/N T-00002
Oscilloscope	Tektronix 547 or equivalent
Dual trace plug-in	Tektronix 1A1 or equivalent
X10 scope probes (3)	Tektronix
Guide shims (as required)	WANGCO P/N 200203
Master alignment tape	IBM #432640 or 432641
Standard-level output tape	IBM #461108 or 432152
Scratch tape	
Pulse generator or TCU	

Table 5. Suggested Schedule for Preventive Maintenance

	Maintenance Task	Interval (in operating hours)	Procedure Described in:
PERFORMED BY OPERATOR	Clean Head, Tape Cleaner Face, Head Guides, & Head Guide Blocks	8 (Daily)	Section III
	Clean and Check Roller Guides	8 (Daily)	Section III
	Clean and Check Capstan	8 (Daily)	Section III
	Clean Entire Tape Unit Surface	(Approx. 4 months)	Section III
PERFORMED BY SERVICE ENGINEER	Clean Tape Cleaner Unit	(as required)	Section VI, par. 7.2
	Check Tape Tracking	2,000	Section VI, par. 12.3
	Replace Reel Motor Brushes	5,000	
	Replace Reel Motors	10,000	Section VI, par. 10
	Replace Capstan Drive Assembly	10,000	Section VI, par. 9.2

1. POWER SUPPLY MAINTENANCE

1.1 CHECKING UNREGULATED POWER SUPPLY

A check may be made of the unregulated power supply by testing with a voltmeter at test points provided on the transport board. The table below shows the voltages and corresponding test points. The voltages should be within ±20 per cent of the nominal specified. (See Figure B17 for test point locations.)

Voltage	Test Point
+19 V	TP 419
-19 V	TP 422
+13 V	TP 420
-13 V	TP 421

1.2 CIRCUIT BREAKER RESET

In the event of malfunction, an automatic circuit breaker prevents damage to the tape transport. The circuit breaker reset button is located adjacent to the power switch on the power supply chassis. The circuit breaker button will be in the OUT position after an automatic circuit break has occurred. Pushing in the button re-makes the circuit.

1.3 FUSES

Five fuses, in the unregulated power supply lines, are located on the power supply subassembly. F1 is a 5 amp fuse in the +19 volt line. F2 is a 10 amp fuse in the -19 volt line. F3 is a 10 amp fuse in the +13 volt line supplying all loads except the +5 volt regulator. F4 is a 4 amp fuse in the +13 volt line supplying current to only the +5 volt regulator. F5 is a 10 amp fuse in the -13 volt line. All fuses are fast-blow types.

1.4 TRANSFORMER TAPS

The Mod 10 tape transport can accept power from sources of varying voltage, depending on the power transformer primary terminal connection chosen. Figure 42 shows the color coding of the transformer primary wires attached to the terminal strip TB1 under the power supply chassis.

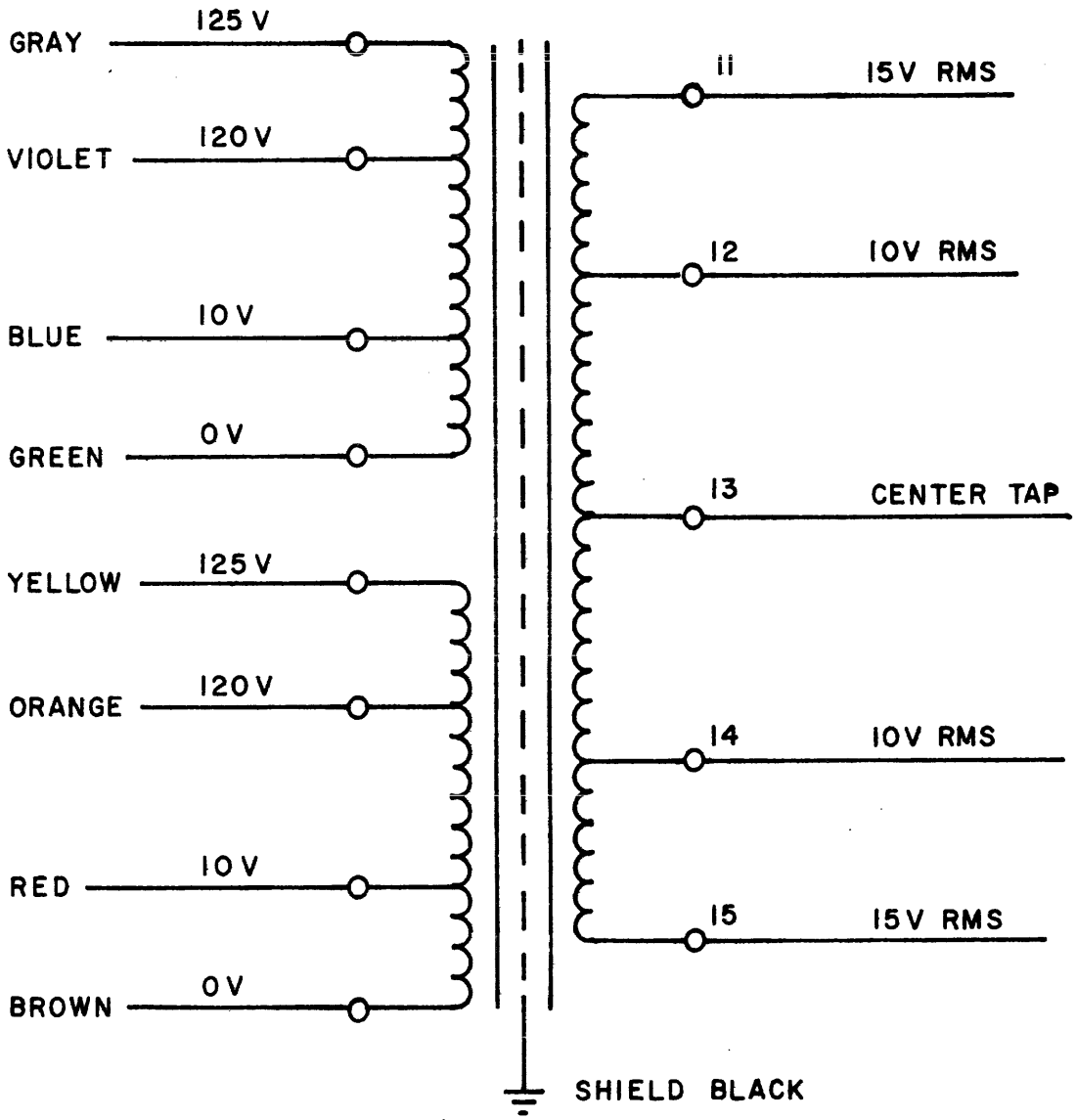


Figure 42. Mod 10 Power Transformer Lead Identification

For example, parallel connection to standard 115V power (plus or minus 10 per cent) is made by connecting the gray and yellow wires to one side of the line voltage and the blue and red wires to the other side. Series connection to a 220V power source is made by connecting the violet wire to one side of the line voltage, connecting the blue to the orange wire on the terminal strip, and connecting the red wire to the other side of the line. Unused wires should be left attached to the terminal strip.

2. OPENING OF POWER SUPPLY ASSEMBLY

The opening of the power supply is necessary when trouble shooting and component replacement is required in this area. It is also required when it is desired to access TB1 to change power transformer taps. The following procedure shall be used:

1. Turn power off of the unit with the toggle switch on the power supply and disconnect the power cord from the wall.

2. Swing out the transport.

3. Remove the 4 Phillips screws fastening the assembly to the deck. These screws are shown flagged in the photograph of Figure 43.

4. Swing assembly open.

3. TRANSPORT MODULE REPLACEMENT

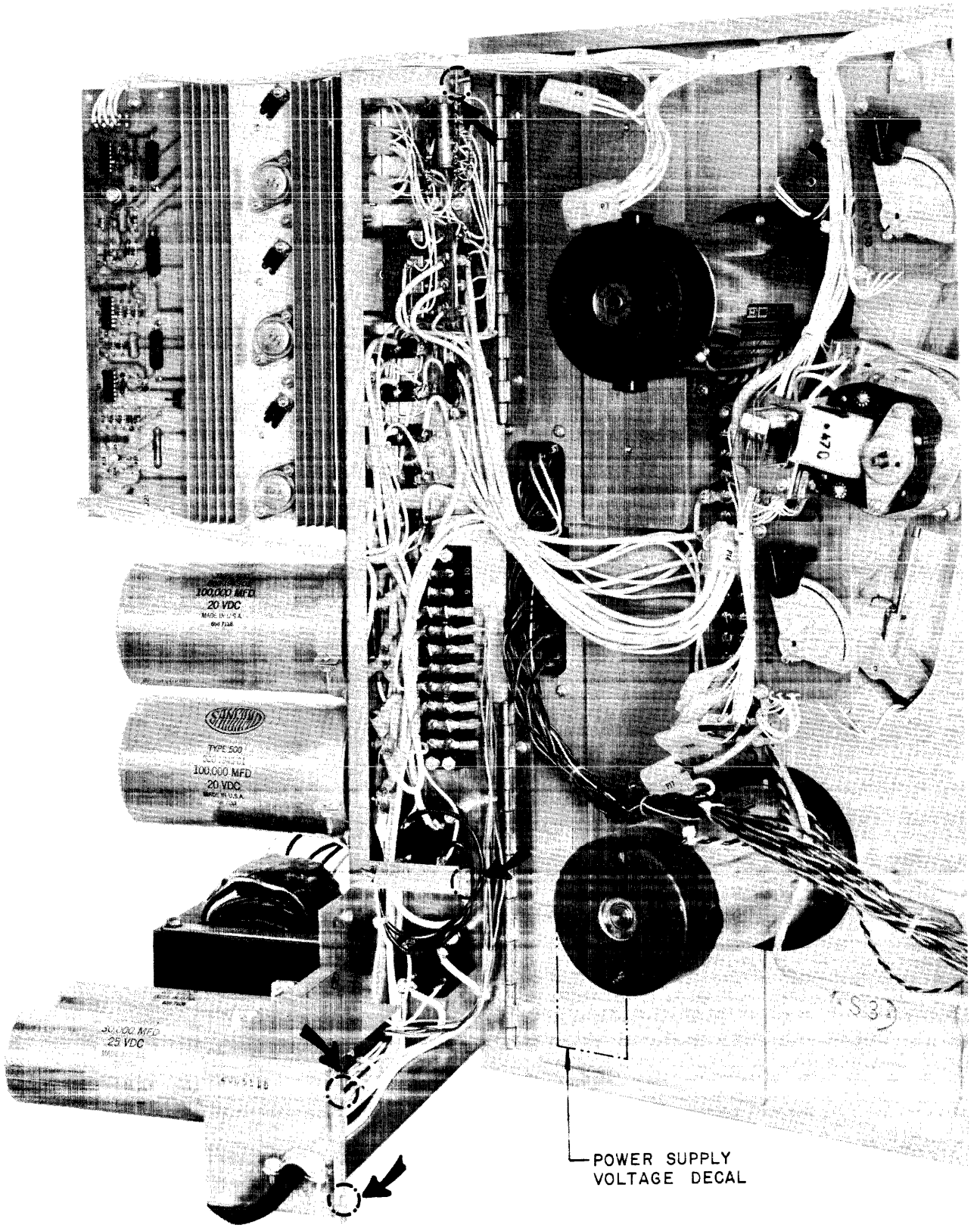
The transport module which houses all the servo and control logic electronics can be removed by following the steps below:

1. Turn power off of the unit with the toggle switch on the power supply and disconnect the power cord from the wall.

2. Remove all the connectors from the module using care to avoid damaging connector pins on the module.

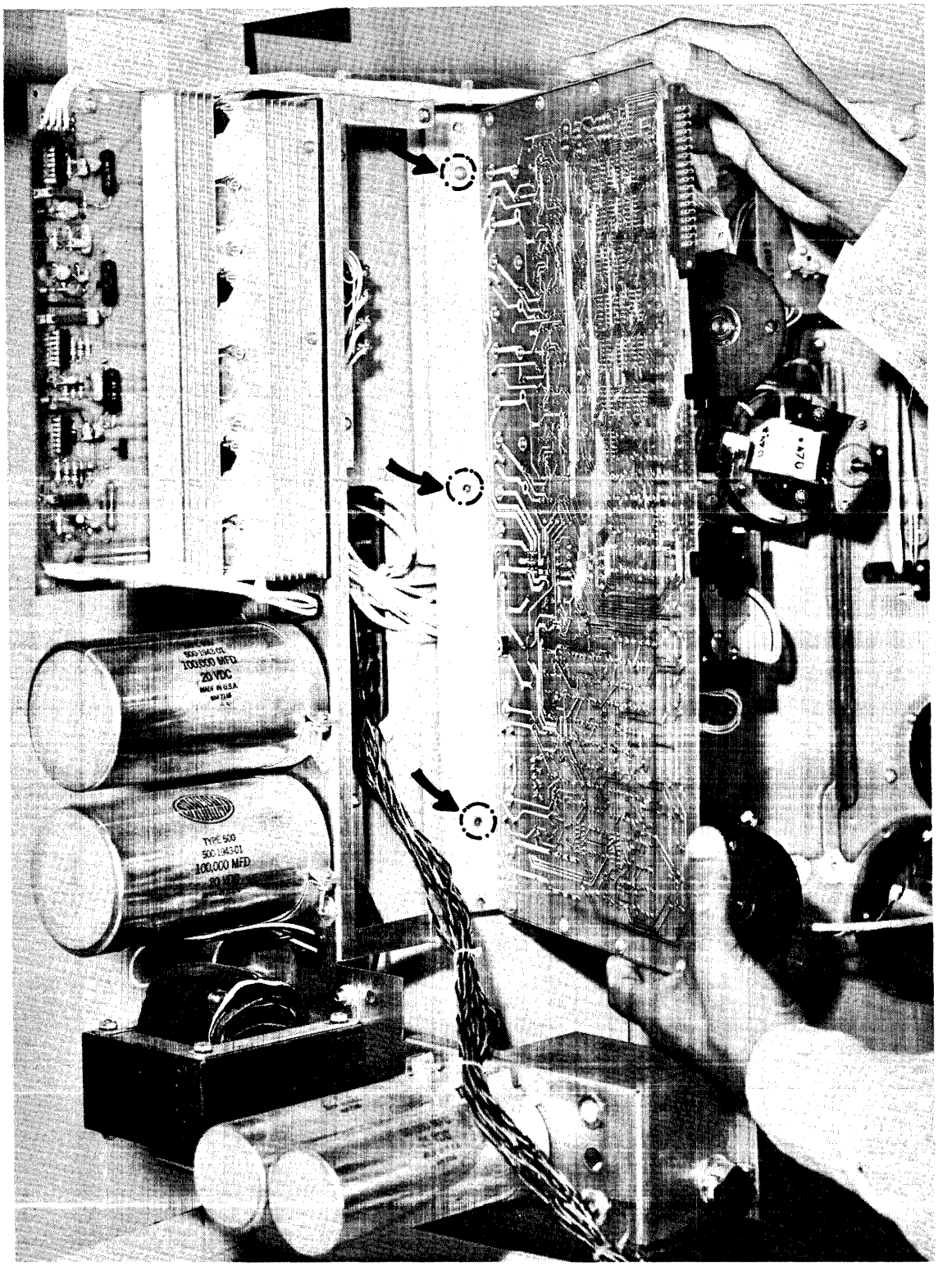
3. Swing open power supply assembly as described in subsection 2.

4. Remove the 3 screws on the heatsink fastening the module to the deck. These screws are shown in the photograph of Figure 44. Be sure to support the assembly



○ POWER SUPPLY ASSY. MOUNTING SCREWS.

Figure 43. How To Open Power Supply



TRANSPORT ELECTRONICS PWB ASSY. MOUNTING HOLES.

Figure 44. Transport Circuit Module Removal

to prevent damage when screws are removed. The module is now free to remove.

5. After installation of the new module, perform the transport module adjustments described in subsection 15.

4. DATA ELECTRONICS MODULE REPLACEMENT

The Data Electronics module which houses all of the record and read electronics can be removed by following the steps below:

1. Turn main power off either at the control panel or the power supply.

2. Remove connectors P3 and P4.

3. Remove the Winchester head cable connectors from the module. IMPORTANT - use an appropriate size screwdriver on the jackscrew fasteners. Loosen the connectors evenly, alternating turns on each screw. Attempting to loosen one side at a time will cause the connectors to bind and possibly bend the pins. Use of fingers instead of a screwdriver risks the possibility of breaking wires on the connectors.

4. While supporting the module to prevent damage, remove the 4 Phillips screws, holding the module mounting brackets to the deck. The location of the bracket screws are shown in the photograph of Figure 45.

5. After replacement of the new module, perform the adjustments described in the appropriate data electronics alignment subsection.

5. OCP SWITCH REPLACEMENT

The operator's control panel pushbutton switches and indicators are sealed assemblies. If either the switch or the indicator fails, the whole sealed assembly must be replaced. (See the photograph in Figure 46.)

1. Put the utility power switch at the back of the transport chassis in the OFF position.

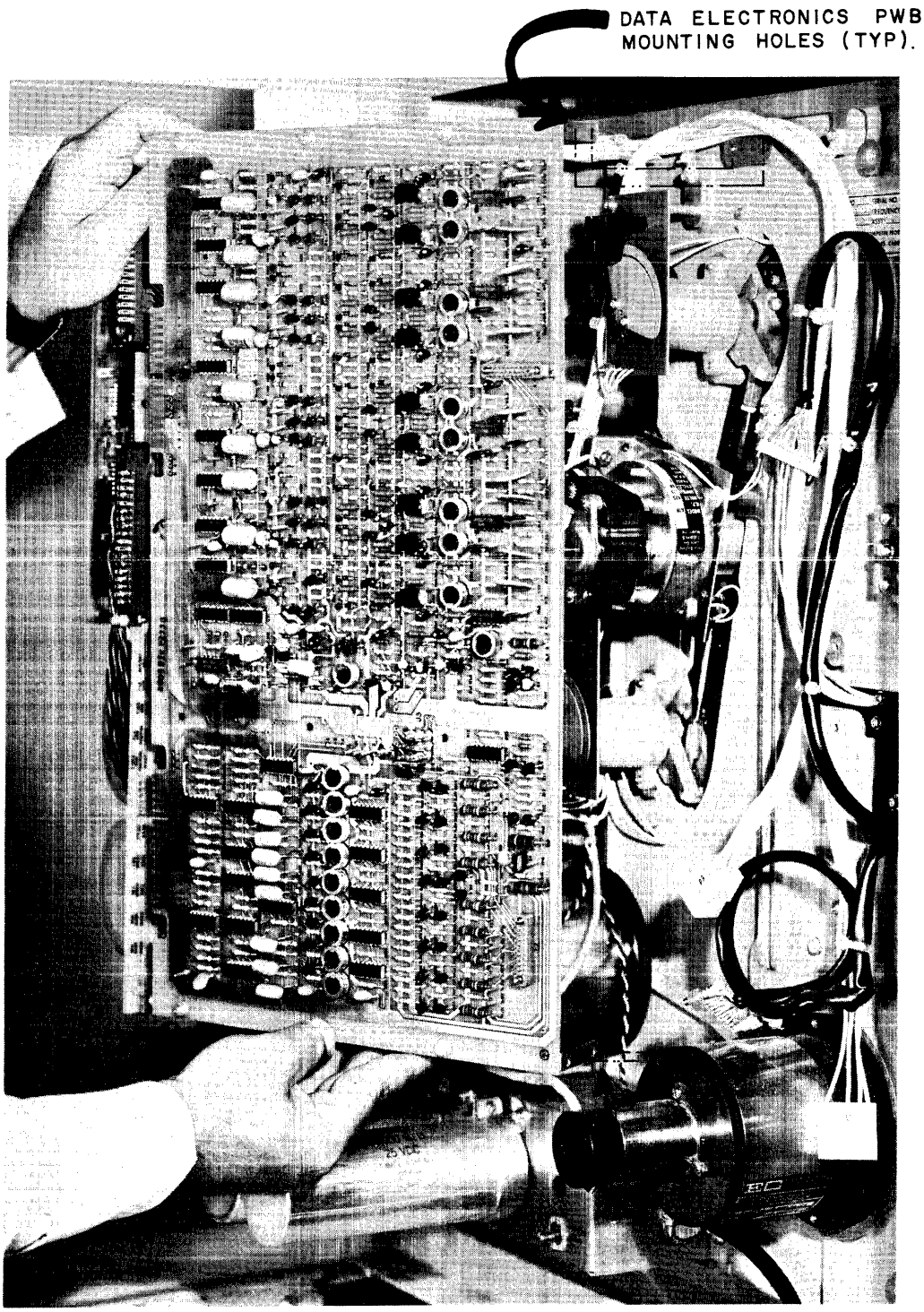


Figure 45. Data Module Removal

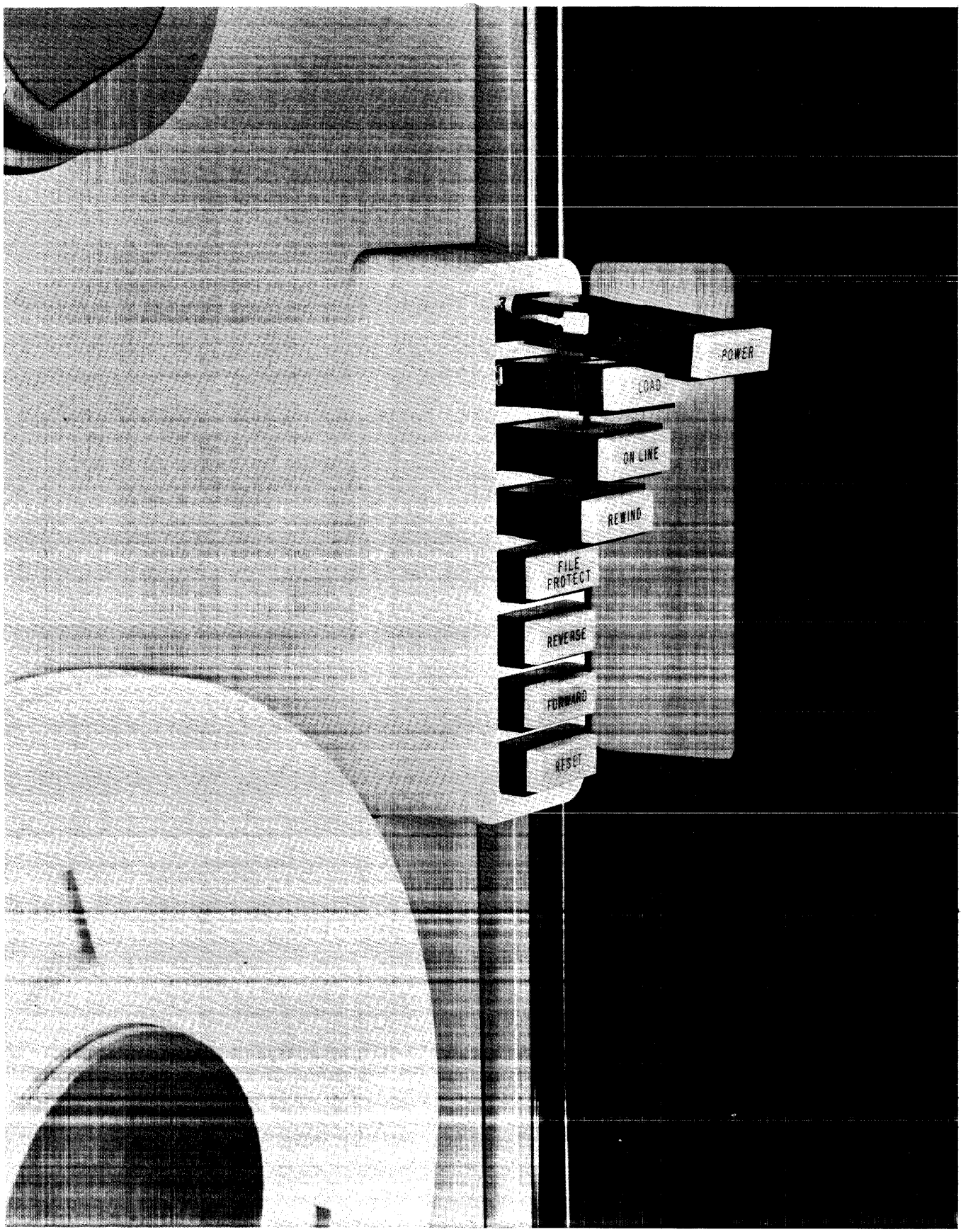


Figure 46. Control Panel Switch Removal

2. Grasp the pushbutton at either side and pull it directly away from the deck, rocking it gently from side to side, using care that the attached wires are not damaged.

3. Note the position of the push-on lugs before removing them from their terminals.

4. Connect the push-on lugs to the replacement switch in the noted positions.

5. Push the switch firmly into position.

6. ARM SENSE LAMP AND CELL REPLACEMENT

6.1 LAMP REPLACEMENT

The lamp and holder assembly is a plug-in unit. To replace the lamp disconnect holder from module. If the assembly is not the plug-in type, unsolder the lamp lead joints at top of shroud and break glyptol to free lamp. Solder and glyptol leads of new lamp. Perform the adjustments of section VI-14.

6.2 CELL REPLACEMENT

It is required to remove the arm sense module in order to replace the photocell. The following steps specify the mechanical procedure for removal:

1. Loosen the Allen screw on the collet clamp and rotate the cam and clamp assembly until it is free of the shaft.

2. Cut the cable harness tie wraps to separate the cable from the rest of the harness.

3. Remove the three Phillips screws securing the module to the main frame.

4. Remove the connector at the end of the module cable located on the transport module. This will be P12 for the file side or P13 for the fixed side.

5. Perform the arm sense module adjustments in sub-section 14 after replacement is completed.

7. HEAD ASSEMBLY REPLACEMENT

Read/Write head assemblies may be removed and replaced in the field by using the following procedure.

CAUTION: SYSTEM POWER MUST BE TURNED OFF PRIOR TO DISCONNECTING OR CONNECTING THE HEAD ASSEMBLY.

1. Remove the head connectors from the data electronics module located at the rear of the machine using an appropriate size slot screwdriver. Do not use fingers for this purpose so that the possibility of damaging connector wires is eliminated.

2. Remove both pieces of head cover and remove the three large Allen screws fastening the head plate assembly to the deck. These screws are shown in the photograph of Figure 47.

3. Since it is not desirable to replace the photosense assembly due to its cable dressing configuration, disconnect this subassembly from the baseplate by removing the two Phillips screws at the rear of the plate.

4. Remove head assembly.

5. Following the procedure in reverse, install the new head assembly.

6. Perform the tape tracking check described in Section 12.3.

7. Perform the data electronics alignments described in Section 16 for dual gap heads or Section 17 for single gap heads.

7.1 REPLACING THE PHOTOSENSE UNIT

The EOT/BOT photosense unit is a sealed component. If either lamp or photocell fails, the unit must be replaced in its entirety, as follows:

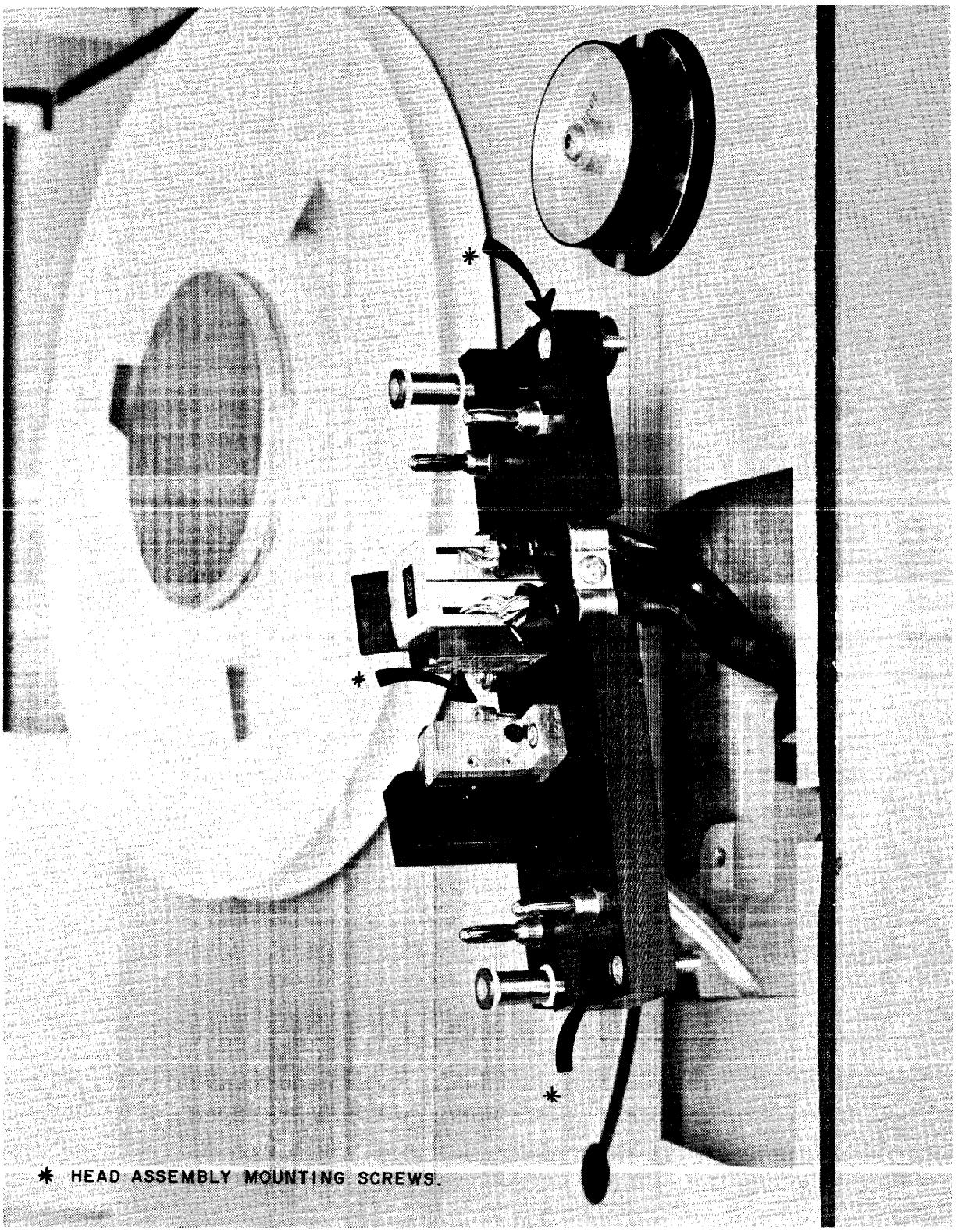


Figure 47. Head Assembly Removal

1. Perform step 2 of paragraph 7.

2. Remove both screws holding photosense unit to read/write head assembly base plate, and move it to rear of deck. Cut the cable harness so that this cable is free. Disconnect P11 connector.

3. Replace photosense unit and reinstall read/write head assembly. Adjust R215 as described in paragraph 15.1 to ensure proper operation of the photosense unit.

7.2 CLEANING THE TAPE CLEANER

A jet of air directed into the perforations of the tape cleaner face will force the accumulation of particles through a vent hole provided on the back of the tape cleaner.

1. Remove read/write head assembly covers (both sides).

2. Shield read/write head by inserting a piece of paper or cloth between the tape cleaner and the head.

3. Blow into the face of the cleaner.

4. Clean the tape cleaner, magnetic head, and base plate according to regular maintenance instructions (Section III).

5. Replace head covers.

If necessary, the tape cleaner can be removed from the head assembly so that a more forceful air jet can be applied. It is suggested, however, that frequent gentle cleaning is preferable to infrequent forceful cleaning.

1. Remove read/write head assembly covers.

2. Remove the screw holding the tape cleaner to the assembly base plate, and remove tape cleaner.

3. Clean by forcing air through the face perforations.

4. Replace tape cleaner and tighten screw. (Action of the roll pin in conjunction with the screw will correctly reposition the tape cleaner.)

5. Replace head covers.

8. DECK OVERLAY REMOVAL

Removal and replacement of many components requires the removal of the deck overlay. The following procedures must be followed:

8.1 REMOVAL OF FIXED REEL

1. For fixed reel hub assemblies whose configuration does not have three screws on the hub cover, insert a flat blade screwdriver behind the chamfered edge of the hub cover and pry it up; this releases the three spring clips holding the cover in place. (See Figure 48.) Remove the three screws holding the reel in place and remove the reel.

2. For assemblies whose configuration have the three screws through the cover, ignore step 1 and remove these screws holding the reel in place. Remove reel.

8.2 REMOVAL OF FIXED GUIDE POST ASSEMBLIES

CAUTION: Identify the top and bottom assemblies prior to removal in order to return them to their correct location upon re-assembly.

1. Remove each guide post by unscrewing two Phillips screws accessible from the rear of the deck. Under no circumstances should the small set screw that holds the roller guide assembly be removed. Removal of this screw destroys an adjusted setting and necessitates laboratory or factory re-tracking.

8.3 REMOVAL OF OVERLAY

1. Remove covers from the read/write head assembly by pulling in the direction perpendicular to the head plate.

2. Loosen, but do not remove, the four overlay screws accessible from the rear of the machine. These screws are shown marked by arrows in the photograph of Figure 49.

3. Support the overlay prior to total removal of the screws to eliminate the falling hence possible damage to it.

4. Lift off overlay.

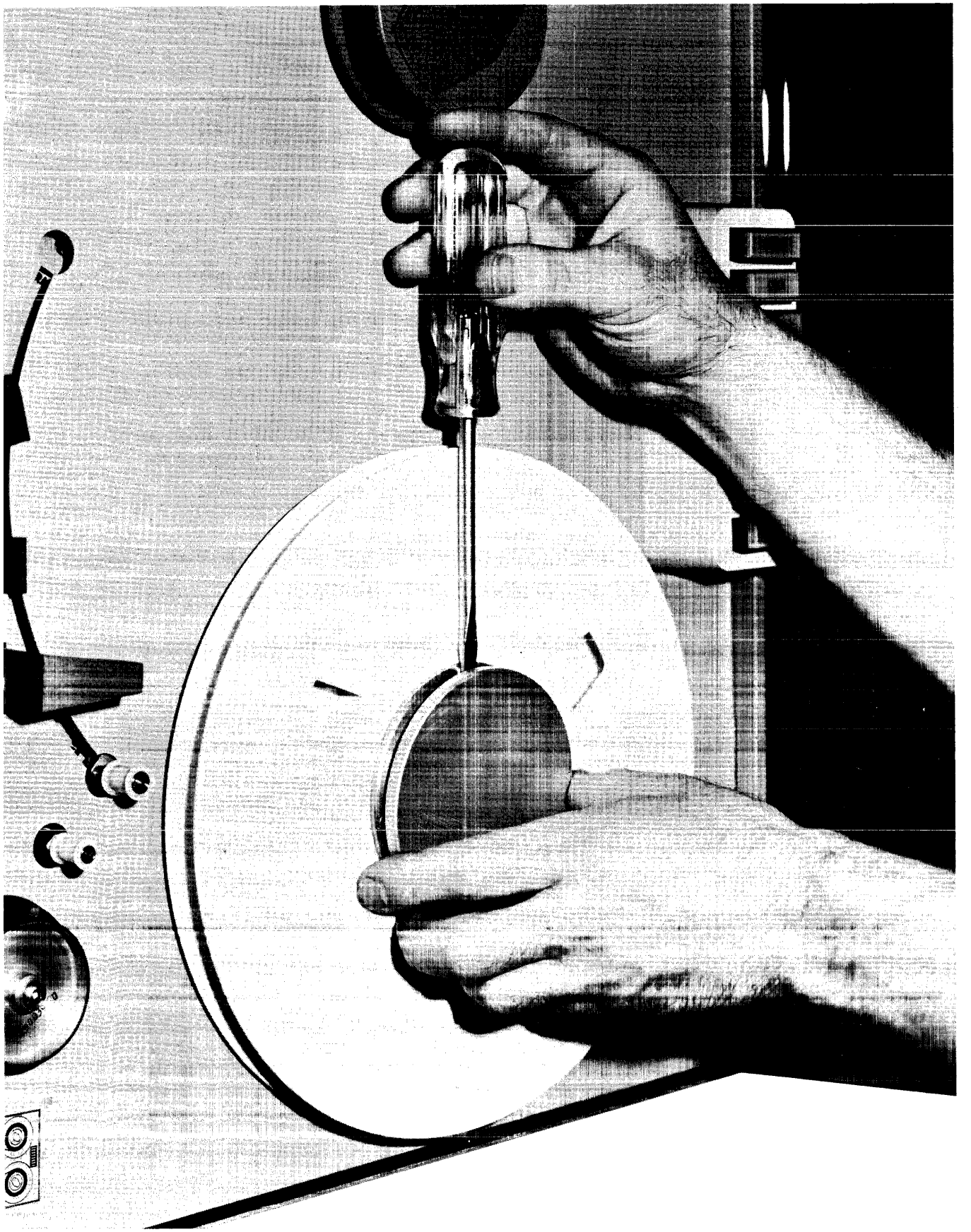


Figure 48. Fixed Reel Removal

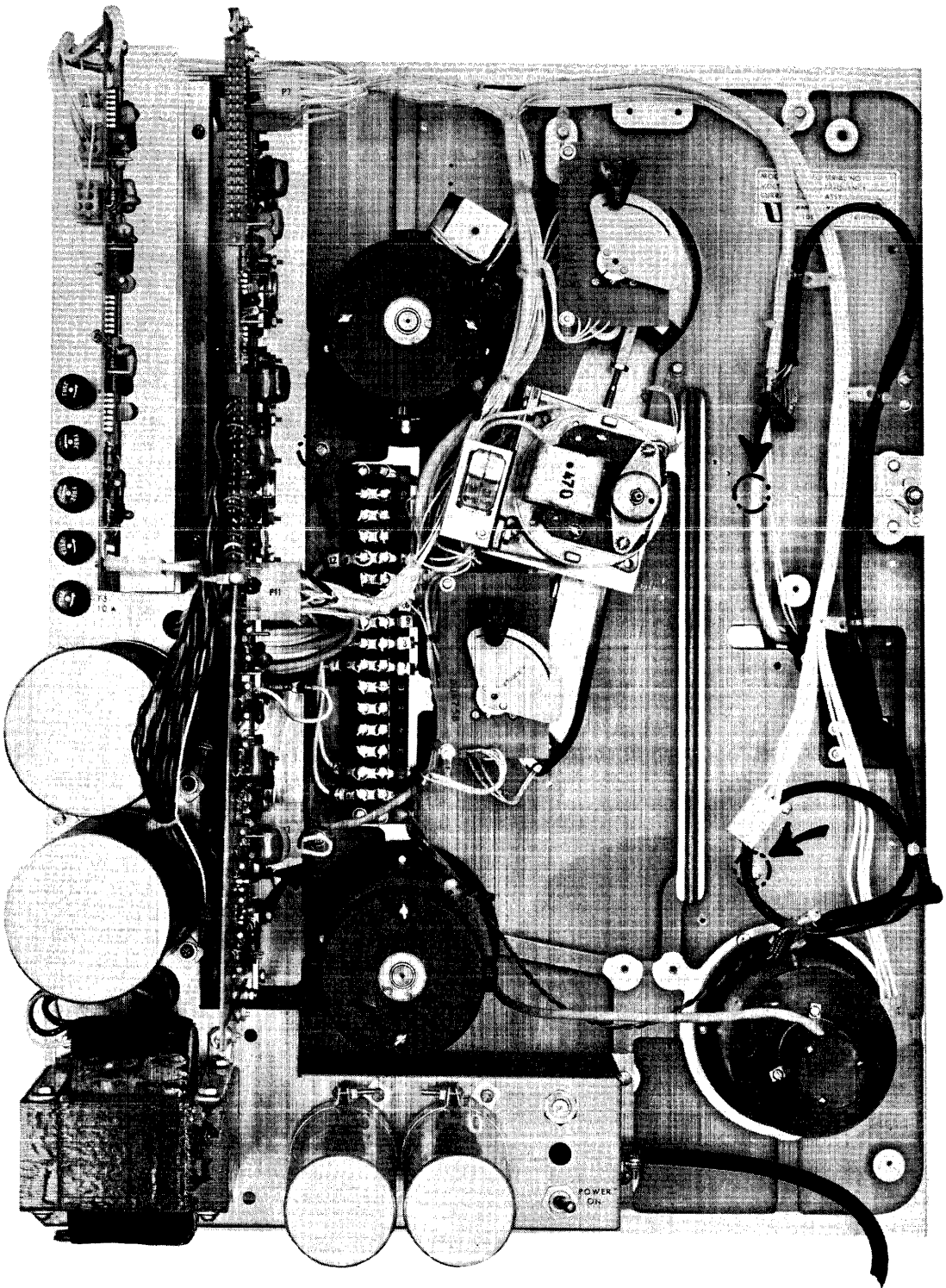


Figure 49. Deck Overlay Removal

9. CAPSTAN AND CAPSTAN MOTOR REPLACEMENT

9.1 CAPSTAN ONLY

The capstan can be removed and replaced by releasing the Allen screw on the top of the capstan motor shaft, holding the shaft by the flats provided. Note the orientation of the capstan before removing it, and ensure that it is replaced in the same position. Capstan speed adjustments are specified in a later section.

9.2 CAPSTAN DRIVE ASSEMBLY

Replacement of the entire capstan drive assembly (capstan and capstan motor) should be done in accordance with the following procedure:

1. Remove capstan (see 9.1).
2. Remove motor and tachometer leads at terminal board at rear.
3. Remove four screws holding motor to transport deck.
4. Replace capstan drive assembly.
5. Replace capstan (see 9.1).
6. Perform the adjustments for speed and start/stop ramps as described in subsections 15.2.2 - 15.2.4.

9.3 CALCULATING CAPSTAN SPEED ERROR

The 50/60 Hz strobe disc is inserted into each capstan. The inner strobe is for 60 Hz and is marked such. It is to be viewed with the corresponding AC light (such as fluorescent). The 50 Hz disc operates with a 100 Hz source whereas the 60 Hz disc requires 120 Hz source. The disc image will appear stationary at 12.5, 25 and 37.5 ips only. The error from nominal for the mentioned speeds is:

$$E = \frac{624}{T \times V} \quad \%;$$

where V is nominal speed in ips, and T is the time in seconds for the image to drift one revolution. If the error exceeds 1% re-adjust speed per section VI-15.2.

10. REEL MOTOR REPLACEMENT

The preventive maintenance schedule (Table 5) suggests that reel motors be replaced after 10,000 hours of operation. Replacement is as follows:

1. Remove overlay.

2. Remove hub of motor to be replaced (two set screws). NOTE: if WCP fixture # P/N T-00002 is not available, measure and record the distance from the reference boss to the hub outer flange prior to removal.

3. Remove motor leads at terminal board at rear.

4. Remove four screws holding motor to transport deck.

5. Screw new motor into place.

6. Replace motor hub using reel hub alignment fixture, which sets the position of the outer flange to a distance 0.727 inch above the adjacent reference boss. If fixture is not available, re-position the hub to the distance measured in step 2. Tighten the two set screws against the flats on the motor shaft.

7. Replace overlay.

11. GUIDE ROLLER BEARING REPLACEMENT

Roller guide bearings, with the exception of those on the file reel swing arm guide, which control tape motion to the head, can be replaced whithout destroying preset tracking adjustment if appropriate care is exercised. (See Figures 50-A & B.)

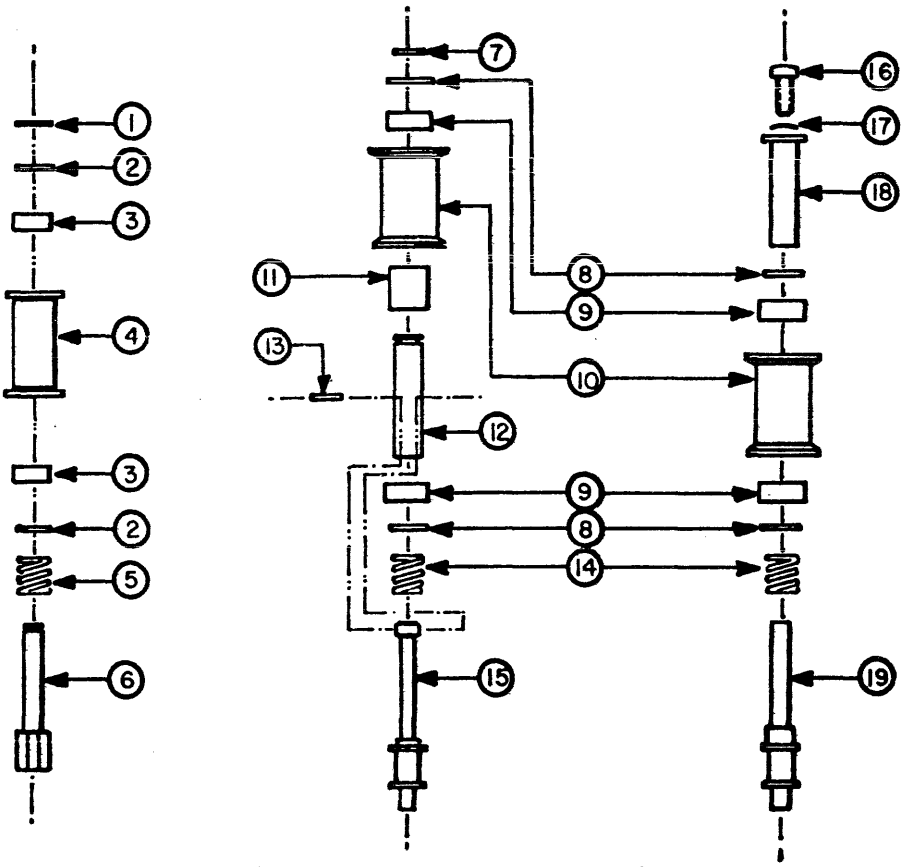
1. Note the position of the guide roller with respect to its shaft. (The roller guide must be replaced with the same flange nearest the overlay panel that it originally occupied.)

2. Remove retaining ring at the shaft end and remove the guide roller.

3. Insert new bearing(s).

4. Replace guide roller.

5. Replace retaining ring.



(A) Fixed Guide
200036 200217

(B) Self Aligning Guide
200425

(C) Fixed Eccentric Guide
200810

Item No.	Description	WCP Part No.
1	Ring, Retaining Ext.	100132-001
2	Washer, Shim	200077-001
3	Bearing, Roller	100006-001
4	Drum	200023
5	Spring	200156
6	Shaft	200037
7	Ring, Retaining Ext.	100132-002
8	Washer, Shim	200077-003
9	Bearing, Roller	100006-002
10	Drum	200419
11	Sleeve, Pin Retaining	200423
12	Sleeve, Bearing	200420
13	Pin	200422
14	Spring	200421
15	Shaft	200418
16	Screw, Button Hd 2-56 x 3/16	100039-903
17	Washer, Belleville	100256
18	Sleeve, Bearing	200752
19	Shaft	200766

Figure 50. Guide Bearing Replacement

Replacement of the file reel swing arm roller guide bearings requires that the guide be re-set as described in paragraph 12.1.1. The bearings are changed by removing the locking screw and withdrawing the eccentric guide assembly from the shaft. (See Figure 50-C.)

12. TAPE TRACKING ALIGNMENT

Tape tracking is the mechanical adjustment of elements in the tape path which contribute to the static and dynamic skew of the tape over the read/write head. Also the proper alignment of the tape edges between the file and fixed reels consistent with proper tape handling (i.e., without damaging the tape.) If re-tracking is found to be required, it is necessary to afterwards re-check the Read Stack Azimuth alignment per the procedure described in sections 16.7 or 17.4.

Forward tape tracking is controlled by guiding elements between the file reel and the capstan. Reverse tape tracking is controlled by guiding elements between the fixed reel and the capstan (see Figure 51).

The following tracking procedure assumes that there is no gross misalignment of guiding elements which would cause tape edge damage. Initially all roller guides are set such that the inner guiding edge is .837 inch from the transport component mounting surface.

12.1 FORWARD TAPE TRACKING

12.1.1 File Reel Swing Arm Roller Guide

Basic mechanical alignment of this guide is simplified through the use of a special tool, WCP # T-00010, the use of which is illustrated in Figure 52. Alignment is as follows:

1. Remove the overlay (see subsection 8 for procedure).

2. Fasten the alignment tool to the head guides making sure the outer surface of the tool is against the fixed guide outer edges, with all shims removed from head guides.

3. Adjust the position of the swing arm at the supporting shaft (#8 screw) such that the roller guide trough mates with the alignment tool.

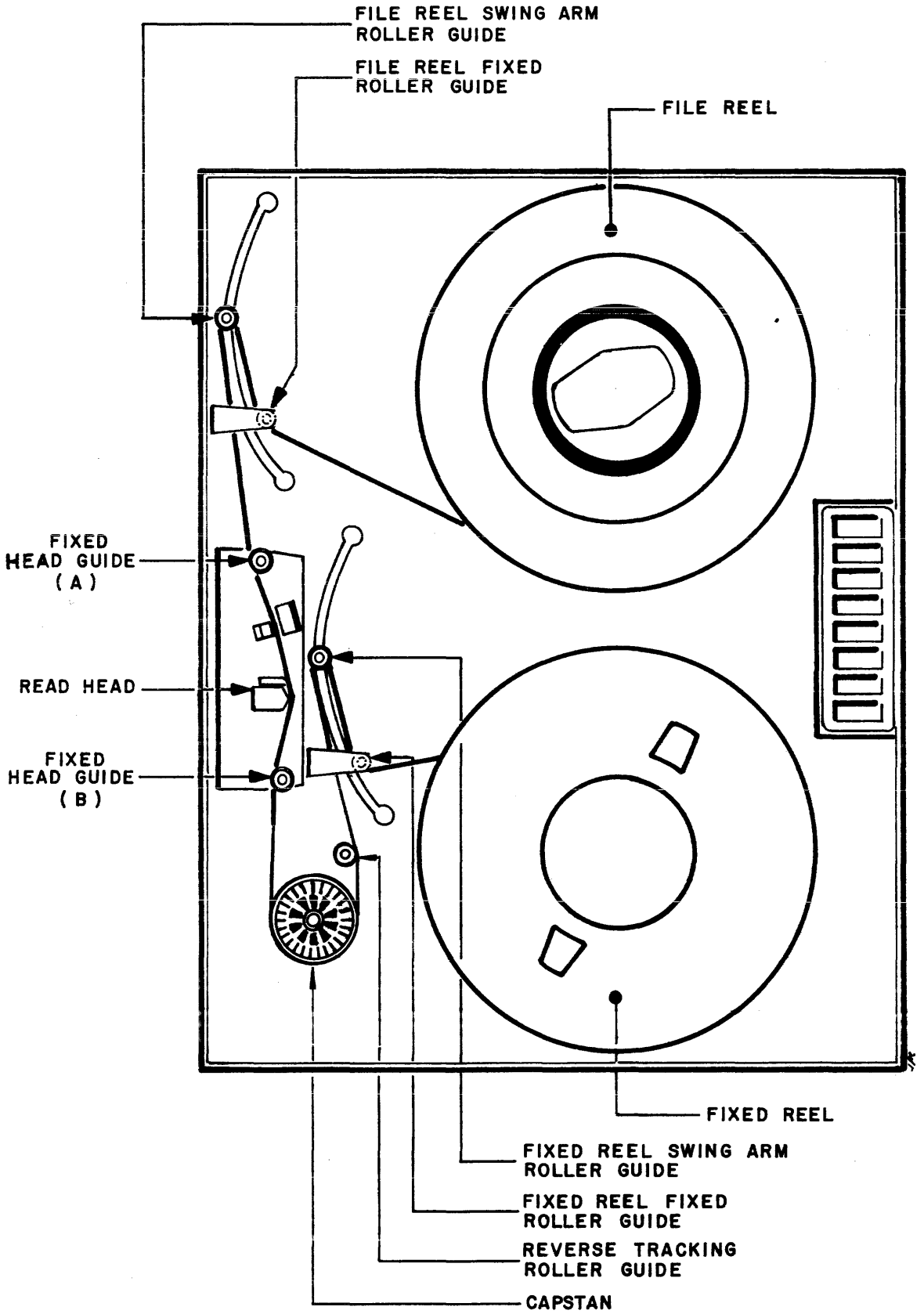


Figure 51. Tape Guide Diagram

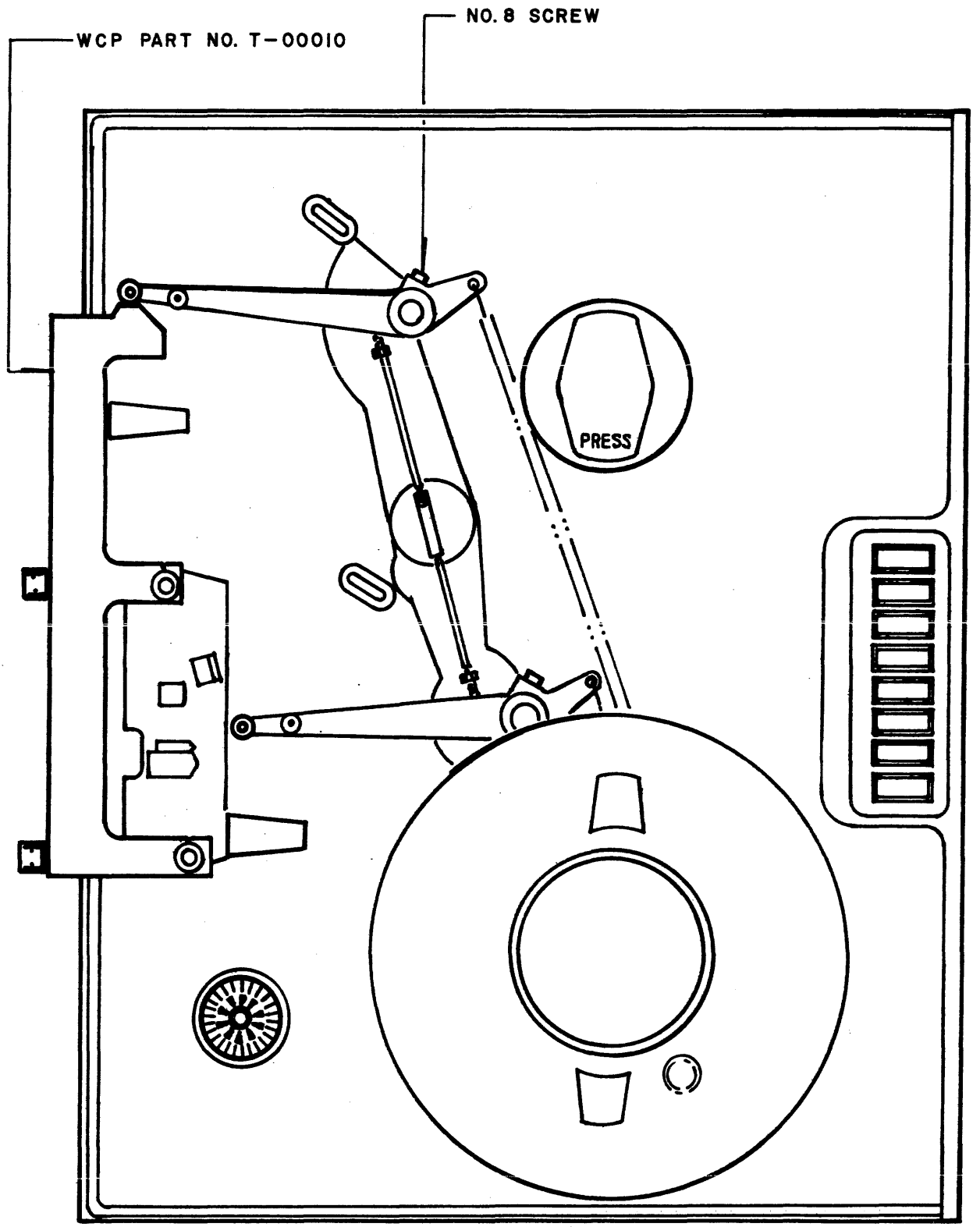


Figure 52. File Reel Arm Guide Alignment

4. Adjust the tilt of the roller guide such that the width of the drum is parallel to the alignment tool. This is accomplished by slackening the roller guide locking screw 1/2 turn and rotating the eccentric guide by means of the hexagon. (See Figure 53.) For the purpose of this adjustment the drum should be presented to the alignment tool by pressing against the roller guide as this simulates the effect of tape tension on the arm.

5. Shims should be replaced as required under Paragraph 16.7 or 17.4.

12.1.2 File Reel Fixed Roller Guide

This guide must be aligned to the swing arm roller guide. This may be done visually by rotating the file reel counterclockwise against the servo, using old tape, under tape tension, until the file reel swing arm reaches a point where the tape disengages the file reel fixed roller guide (see Figure 54). At this point any misalignment between the rollers is seen as a curling or scuffing of the tape edge against one of the file reel fixed guide flanges. This may be corrected by adjusting the file reel fixed guide, using the screw at the side of the guide support for this purpose.

12.2 REVERSE TAPE TRACKING

12.2.1 Reverse Tracking Roller Guide

1. Remove the reverse tracking roller guide by means of the screw at the side of the guide support.

2. Run the tape forward and observe the lateral position of the tape on the capstan. Now run in reverse and see that there is no "tape walk".

3. If this condition is observed, adjust the position of the fixed reel swing arm at its pivot (#8 screw) and align the adjacent fixed roller guide to the swing arm roller guide. The procedure is the same as that for the file reel fixed guide. Capstan "tape walk" between forward and reverse should not be greater than .01 inch with the reverse tracking guide removed.

4. Replace the reverse tracking guide and adjust the forward/reverse "tape walk" as close to zero as possible by means of this guide only.

5. Now that all the alignments are complete, check the results by following the procedure in the next section.

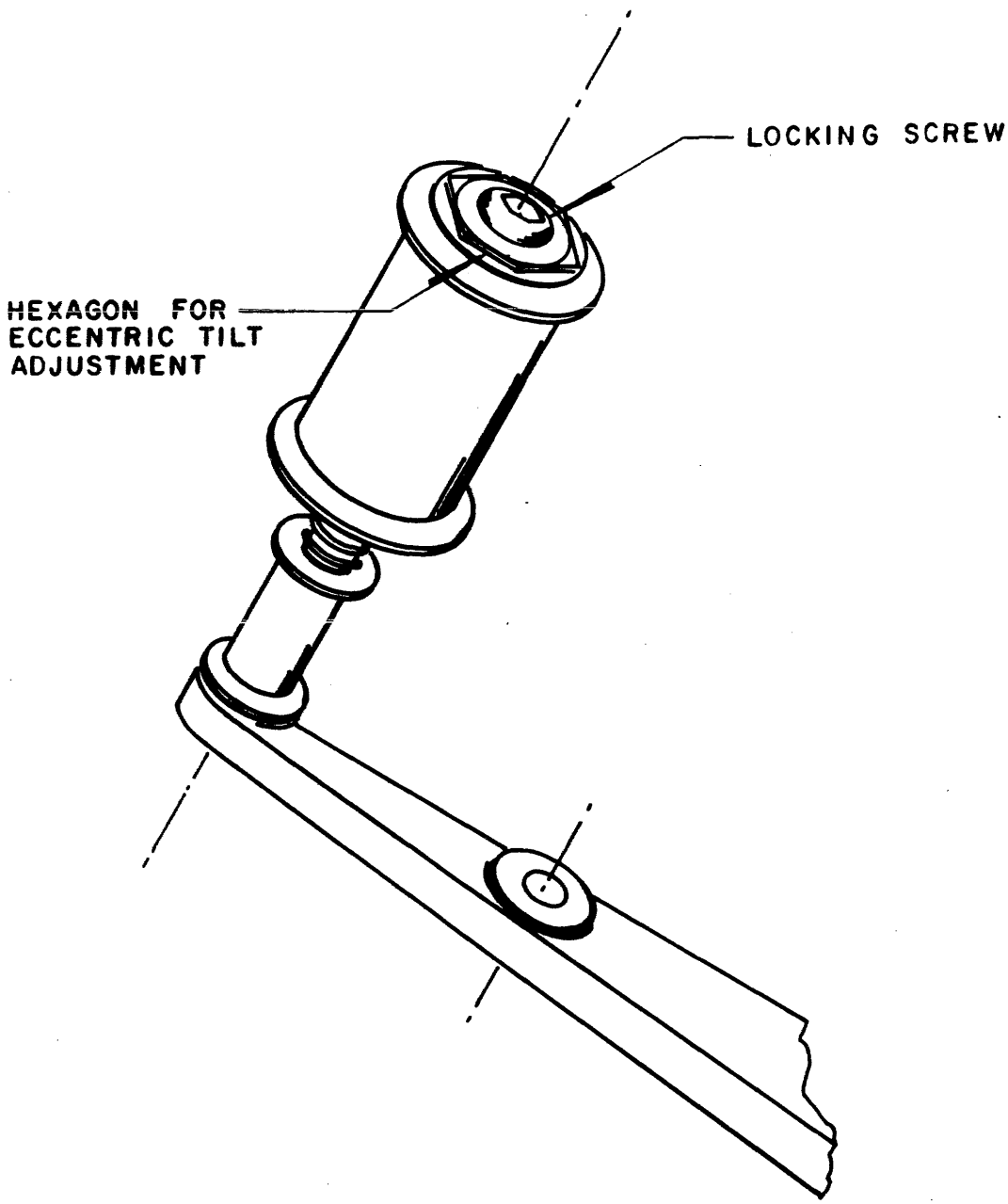


Figure 53. Tilt Adjustment - File Reel Arm Guide

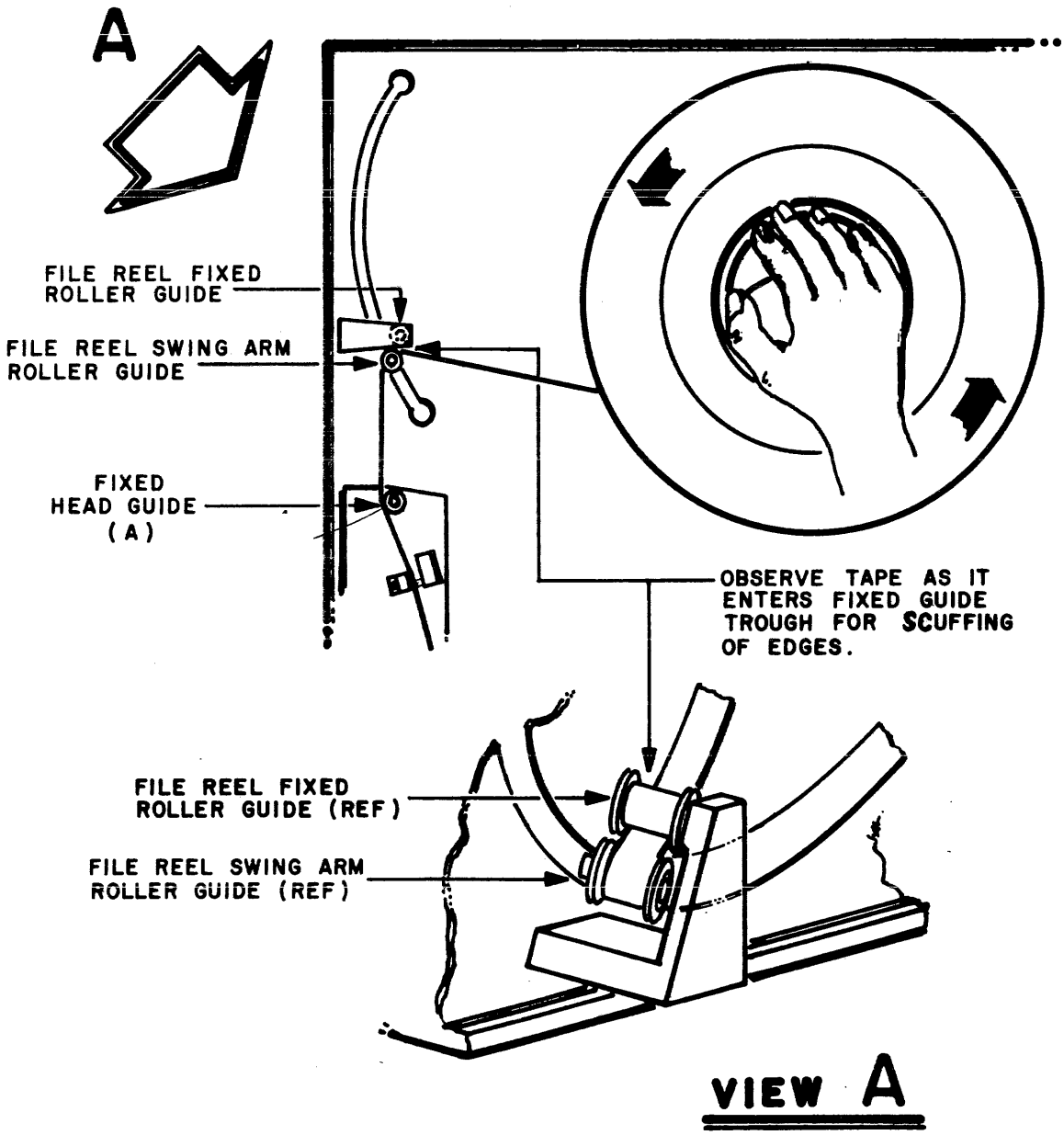


Figure 54. File Reel Fixed Guide Adjustment

12.3 CHECKING TAPE TRACKING

This procedure provides an electrical check to verify that tape is tracking in the reverse direction within acceptable limits with respect to the forward direction. The procedure compares the time displacements of the analog signal peaks of the two outside channels while running tape forward with the time displacement of those peaks while running tape in reverse. If the transport is perfectly tracked, the time displacements in both directions will be the same, but the phase relationship between the two peaks will be opposite. Since the accuracy of tape tracking is directly dependent upon mechanical alignments and mechanical tolerance build-ups, perfect tracking is usually not achieved; however, limits are established that will guarantee reliable operation in both directions.

Equipment required includes an oscilloscope, a dual trace plug-in, and three 10X probes (see Table 4); also required is a scratch-pad tape having all ones recorded on the outside channels. Procedural steps are as follows:

1. Scope controls:

   a) Mode--Chop, AC.

   b) Sensitivity--as required to get good resolution of the peak time displacement.

   c) Trigger--External (+), AC, trigger mode.

   d) Sweeptime--5 μsec/cm.

2. Place Channel 1 scope probe and trigger probe on the test point corresponding to the head edge track located closest to the transport. This test point is 602 for nine-channel systems and 102 for seven-channel systems.

3. Place Channel 2 probe on the test point corresponding to the channel farthest from the transport. This test point is 702 for nine-channel systems and 902 for seven-channel systems.

4. Load the scratch-pad tape and run tape in the forward direction under manual control. Record T_1 (μsec). Run tape in the reverse direction and record T_2. (See Figure 55). Since the read head azimuth angle can be in either direction, the actual phase relation between the reference channel and the other outside channel may be opposite to that depicted in Figure 55.

5. The value of T_2 should be related to T_1 by the following equation:

$$T_2 = -T_1 \pm \frac{75}{V} \text{ sec.}$$

where V represents the transport speed. If this condition is not met, then either there is tape walk on the capstan, or the file reel swing arm guide is improperly set. Retrack the unit per the procedure described in subsection 12.1 and 12.2

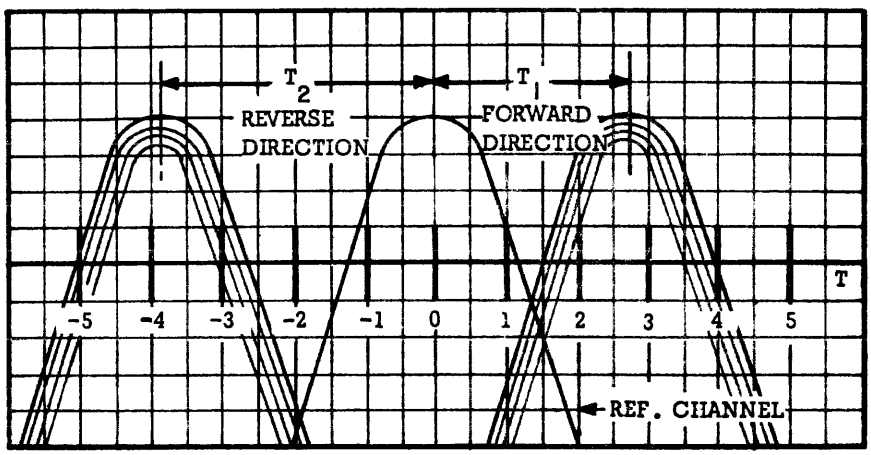


Figure 55. Checking Tape Tracking, Desired Waveform

13. REGULATED POWER SUPPLY ADJUSTMENTS

Three potentiometer adjustments are required to adjust the power supply regulators to the proper operating voltage levels. These potentiometers are located on the regulator subassembly module (See Figure B6). A voltmeter having an accuracy of at least 2 per cent should be used to make the adjustments. Each adjustment should be made according to the following table:

Adjust Voltage To:	By Potentiometer	Connect Meter Between Test Points
+ 5 Volts	R2	TP1(+) & TP4(-)
+12 Volts	R14	TP2(+) & TP4(-)
-12 Volts	R21	TP3(-) & TP4(+)

14. ARM SENSE MODULE ADJUSTMENTS

Correct adjustment of the arm sense module position, cam position, and two potentiometers is necessary to ensure the correct operation of each servo swing arm. The adjustments must be made in the order in which they are specified below. (Either arm may be adjusted first.)

The power must be ON and the transport must be RESET at the control panel before starting the adjustment procedure. No tape should be loaded on the machine.

14.1 FIXED REEL ADJUSTMENTS

1. Mechanically position the swing arm in the center of its normal operating arc and verify that the center of the cam arc lines up with the photocell and lamp housing. If the cam is improperly positioned, reposition cam as specified in subsection 6.

2. Connect a voltmeter between test point 424 and ground on the transport board. (See Figure B24.)

3. Loosen the three screws that secure the arm sense module to the main frame and adjust the position of the module on the slotted holes until the voltmeter reads 0 $\pm$0.2 volts. Tighten the three mounting screws locking the assembly in place.

4. Adjust the fixed reel servo gain potentiometer R462 and the swing arm position potentiometer R465 as outlined in subsection 15.3.

14.2 FILE REEL ADJUSTMENTS

1. Perform Step 1 in 14.1 above.

2. Connect a voltmeter between test point 425 and ground on the transport board. (See Figure B24.)

3. Perform Step 3 in 14.1 above.

4. Adjust the file reel servo gain potentiometer R503 and the swing arm position potentiometer R508 as outlined in subsection 15.3.

15. TRANSPORT MODULE ADJUSTMENTS

15.1 EOT/BOT PHOTOSENSE ADJUSTMENT

1. Connect a voltmeter between test point 201 and ground. (Reference Figure B24.)

2. Adjust potentiometer R215 so that the voltmeter reads 0.0V ± 0.15V while tape is loaded on the transport but neither photosense tab is being sensed.

15.2 CAPSTAN SERVO ADJUSTMENT

Five adjustments are required to ensure correct operation of the capstan drive. The order in which these adjustments are given below must be carefully followed since there is interrelationship between some adjustments. Adjustments should be performed with tape loaded on the transport. Ramp adjustments require that the transport be under program control so that the tape repeatedly starts and stops. (See Figure B24 for potentiometer and test point locations.)

15.2.1 Offset

1. Press RESET pushbutton.

2. Connect a voltmeter between test point 408 and ground.

3. Adjust potentiometer R438 for zero volts, ±100 mv.

15.2.2 Forward Motor Speed

The strobe disc is mounted on the front of the capstan and has two patterns. The inner pattern is used for 60 Hz units and the outer pattern is used for 50 Hz units.

1. For standard speed units (see VI-9.3) containing a strobe disc, while running the unit in the forward direction under manual control, adjust R415 until the strobe pattern appears stationary.

2. For all other speed units, using an IBM skew tape, adjust the potentiometer for a pulse repetition period shown below. This will be observed at TP3 (D/G module) or TP5 (S/G module).

$$P = \frac{1250}{S} \ \mu sec$$

where S is machine speed.

15.2.3 Reverse Motor Speed

1. Repeat the procedure of step 1 (Sec. 15.2.2) while running in reverse using potentiometer R411.

2. Duplicate the procedure of step 2 (Sec. 15.2.2) while running in reverse using potentiometer R411.

15.2.4 Start/Stop Ramp Time

The start/stop ramp times can be properly adjusted only after the forward-reverse speeds have been set up. Only the forward and reverse stop ramps will be adjusted since adjusting the stop ramp for one direction also adjusts the start ramp for the opposite direction. The ramps will be observed at the capstan tachometer output.

Forward Stop Ramp Time:

1. Initiate a start/stop forward motion program.

2. Trigger oscilloscope sweep on external negative at the Motion test point 204 and observe tach signal of TP406. In order to maintain a clean tach signal, pick up scope probe ground on TP403. Use sufficient vertical sensitivity on scope to cleanly measure where the signal reaches the zero axis.

3. Adjust potentiometer R423 so that the time for the tach signal to reach zero output is as follows:

$$T = \frac{340}{S} \text{ milliseconds}$$

where T is the stop ramp in milliseconds and S is the operating speed of the transport in ips (see Figure 56). For example, a 25 ips transport would have a stop ramp time as follows:

$$T = \frac{340}{25} = 13.5 \text{ milliseconds}$$

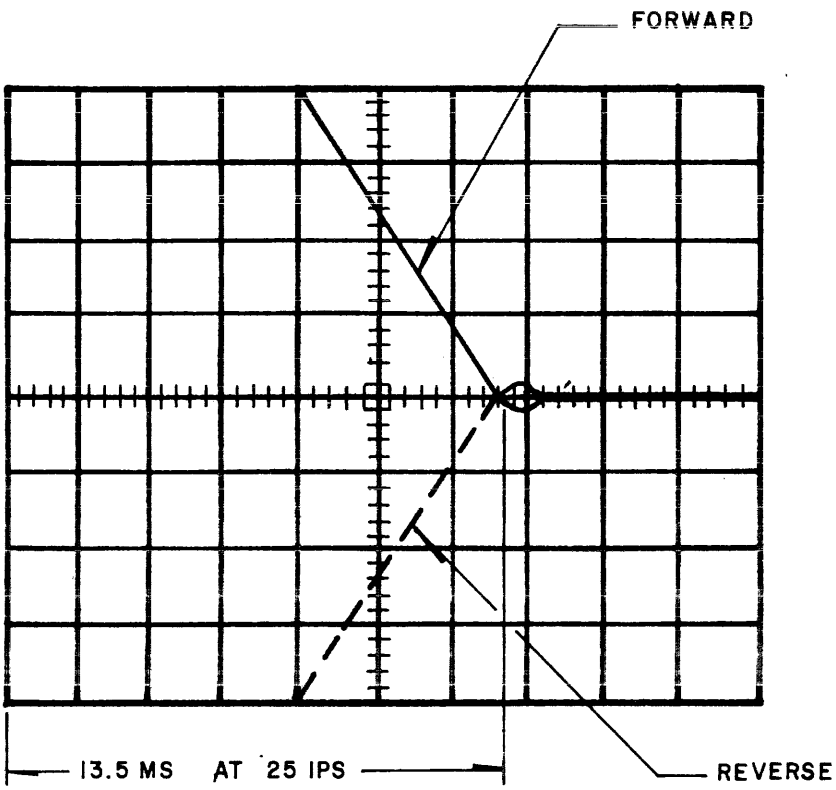


Figure 56. Stop Ramp Time

Reverse Stop Ramp Time:

1. Initiate a start/stop reverse motion program.

2. Using the same procedure as outlined in step 2 of the Forward Stop Ramp Time paragraph above, adjust potentiometer R426 for the same stop ramp time established in step 3 of the procedure.

15.3 REEL SERVO ADJUSTMENTS

Two potentiometer adjustments are required in each reel servo to provide proper servo gain and swing arm operating position. These adjustments vary depending upon the transport operating speed and are specified below.

15.3.1 Gain

1. Mark off four inches of arc along the path traveled by the swing arm tip.

2. Connect an oscilloscope to the servo amplifier output test point 418 for file reel or test point 410 for the fixed reel. (Reference Figure B24.)

3. With tape loaded and holding tension, move the tip of the swing arm back and forth between the end points of the four-inch arc marked off in step 1. (This can be most easily accomplished by moving the reel back and forth by hand rather than the swing arm.)

4. Adjust the gain potentiometer so that the four-inch arm movement in step 3 produces a total voltage change on the oscilloscope as specified below. Potentiometer R503 adjusts the file reel servo gain and R462 the fixed reel servo gain.

   a) For 45 ips machines adjust for a total voltage change of 6.0 volts.

   b) For 37.5 ips machines adjust for a total voltage change of 5.0 volts.

   c) For 25 ips and slower machines adjust for a total voltage change of 3.5 volts.

15.3.2 Swing Arm Position

The swing arm position must be adjusted with tape loaded and the machine operating at the proper speed. Both file and fixed reel arm positions must be adjusted with minimum pack (less than 1/16-inch of tape on reels). The file reel arm position is adjusted by potentiometer R508 while running forward and the fixed reel arm position is adjusted by R465 while running in reverse. The correct operating arm positions for each speed machine is as follows:

1. 45 and 37.5 ips machines should have the swing arm adjusted so that the center of the outermost roller guide on the swing arm is 3/16 of an inch above (measured vertically) the top edge of the fixed roller guide support bracket..

2. 25 ips and slower machines should have the swing arm position adjusted according to the table below. The distances given in the table are measured vertically from the center of the swing arm roller guide to the top edge of the fixed roller guide support bracket.

Machine Speed	Swing Arm Position Above Fixed Guide Bracket
25 ips	1/2 inch
18.75 ips	1.0 inch
12.5 ips	1-1/2 inches
10 ips	1-1/2 inches

16. DATA ELECTRONICS DUAL GAP SYSTEMS ADJUSTMENTS

16.1 ADJUSTMENT SEQUENCE

All alignments are made at the factory prior to shipment of equipment. Verify alignments if either subassembly has been replaced, or if data electronics or heads seem to malfunction. Before performing the adjustments, verify that the scope probes, plug-in unit, and time base are calibrated.

All potentiometer and test point locations are identified by a silk-screened designator adjacent to the component on the module. (See FigureB32for the physical board location of test points and adjustments.)

WARNING: SYSTEM POWER MUST BE TURNED OFF BEFORE DISCONNECTING OR CONNECTING EITHER THE DATA ELECTRONICS MODULE OR THE HEAD ASSEMBLY.

Tape transport and power supply adjustments must be verified before performing the data electronics adjustments. Because of the interrelationship among the circuits, the adjustments must be made in the following sequence:

1. Phase splitter quiescent level adjustment
2. Read amplifier gain adjustment
3. Crossfeed shield
4. Read strobe delay adjustment
5. Read stack azimuth measurement and correction
6. Write stack deskew
   a) Read stack profile measurement
   b) Write deskew single-shot adjustment
7. Verification--staircase measurement.

16.2 PHASE SPLITTER QUIESCENT LEVEL

The following prescribes the adjustment procedure for nine-channel tape transports. The levels at test points 202 and 302 need not be correct for seven-channel systems.

1. Scope controls:

   a) Mode--Channel 1; DC.

   b) Sensitivity--0.05 V/cm.

   c) Trigger--Internal, automatic stability.

2. Connect Channel 1 probe to test point 102.

3. Without running tape, adjust potentiometer R27 until + 1.0 VDC is observed at test point 102.

4. Scan test points 202 to 902 to ensure that the quiescent point of all the phase splitters falls within +1.0 $\pm$ 0.3 VDC.

5. If this condition cannot be attained, readjust R27 until the condition is satisfied.

16.3 READ AMPLIFIER GAIN

The following prescribes the adjustment procedure for nine-channel tape transports. For seven-channel systems, set R218 and R318 fully counterclockwise.

1. Scope controls:

   a) Mode--Channel 1; AC.

   b) Sensitivity--0.2 V/cm.

   c) Trigger--Internal, automatic stability.

2. Load Standard Level Output Tape on the transport and set the tape controller for a continuous write mode at a frequency corresponding to 800 cpi and ones written on all channels.

3. Connect Channel 1 scope probe to test point 102 and run tape forward. Adjust R118 so that the analog signal has a 12-volt peak to peak amplitude. (See Figure 57.)

4. Repeat for all channels. See Table 6 for correct potentiometers and test points.

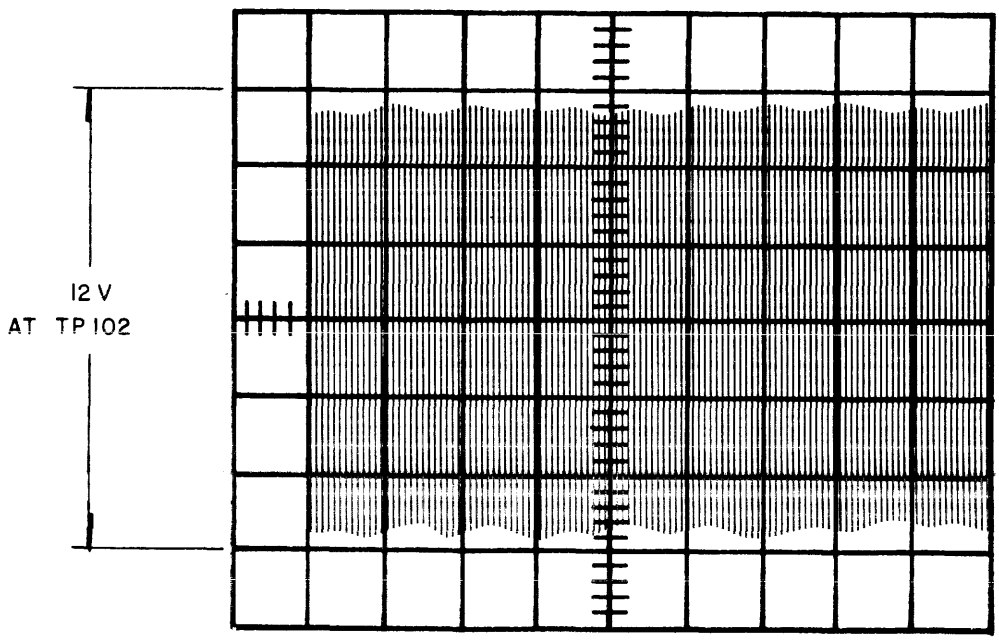


Figure 57. Read Amplifier Gain Adjustment, Dual Gap Systems

Table 6. Data Electronics Adjustment Points - Dual Gap Systems

Channel	Alignment Section				Comments
	Read Amp Gain		Write Deskew		
	Test Point	Pot. No.	Test Point	Pot. No.	
P	TP-102	R-118	TP-103	R-104	
0	TP-202	R-218	TP-203	R-204	Not used in 7-Channel systems.
1	TP-302	R-318	TP-303	R-304	Not used in 7-Channel systems.
2	TP-402	R-418	TP-403	R-404	
3	TP-502	R-518	TP-503	R-504	
4	TP-602	R-618	TP-603	R-604	
5	TP-702	R-718	TP-703	R-704	
6	TP-802	R-818	TP-803	R-804	
7	TP-902	R-918	TP-903	R-904	

16.4 CROSSFEED SHIELD

This is a mechanical alignment on the head gate assembly necessary to minimize the write-to-read crossfeed signal. If the complete head assembly has been replaced, proceed starting with Step 1. If only the crossfeed shield has been replaced, or if only a check is being performed, skip Step 1.

1. Turn all write deskew single-shot potentiometers (R104 to R904) so that all nine head drivers switch simultaneously. This can be observed by scoping test points 101 to 901.

2. Place Channel 1 scope probe on test point 602 and Channel 2 scope probe on test point 702. If this is a seven-channel system, place Channel 1 scope probe on 102 and Channel 2 scope probe on 902. With scope plug-in mode on alternate, set both scope channel vertical gains to 0.01 V/cm.

3. Remove tape from capstan so that the tape will not move when a run command is given. This is to be done by threading the tape, such as to wrap the guide adjacent to the capstan, onto the fixed reel swing arm.

4. Set the tape controller unit for a continuous write mode, all ones on all channels. Run transport and observe crossfeed on the two edge channels. If the peak to peak amplitude of the crossfeed is less than the following, no adjustment is required.

Null Voltage (MV - P-P)	Speed (IPS)
750	10
600	12.5
500	18.75
400	25 and above

See Figure 59 for typical head gate wave forms.

5. If the amplitude is greater than the voltage resulting from the table in item 4, loosen the two head gate screws and reposition the gate by moving it in the plane shown in Figure 58 until a null voltage is reached. The edge of the ferrite should be approximately opposite the Write gap. Be sure that the shield housing is resting on the head block at front and back.

16.5 READ STROBE DELAY

1. Scope controls:

   a) Mode--Channel 1, DC.

   b) Sensitivity--0.1 V/cm.

   c) Trigger--Internal (+) trigger mode.

2. Connect Channel 1 scope probe to test point 3.

3. Verify that the transport is selected for high density operation and write all ones as described in paragraph 16.4, step 2.

4. A positive pulse will be observed at test point 3. See Figure 60 . Adjust R49 for a pulse width of approximately one-half frame time. At 25 ips this should be 25 μsec. A frame time is defined as $\frac{1}{VD}$, where V is the transport velocity and D is the operating data density.

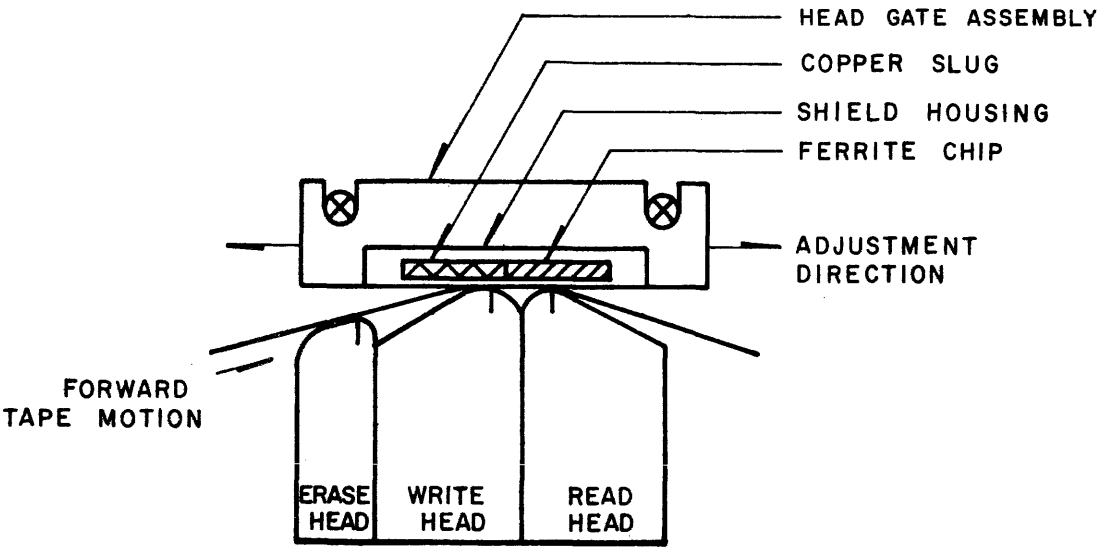


Figure 58. Head Gate Adjustment, Dual Gap Systems

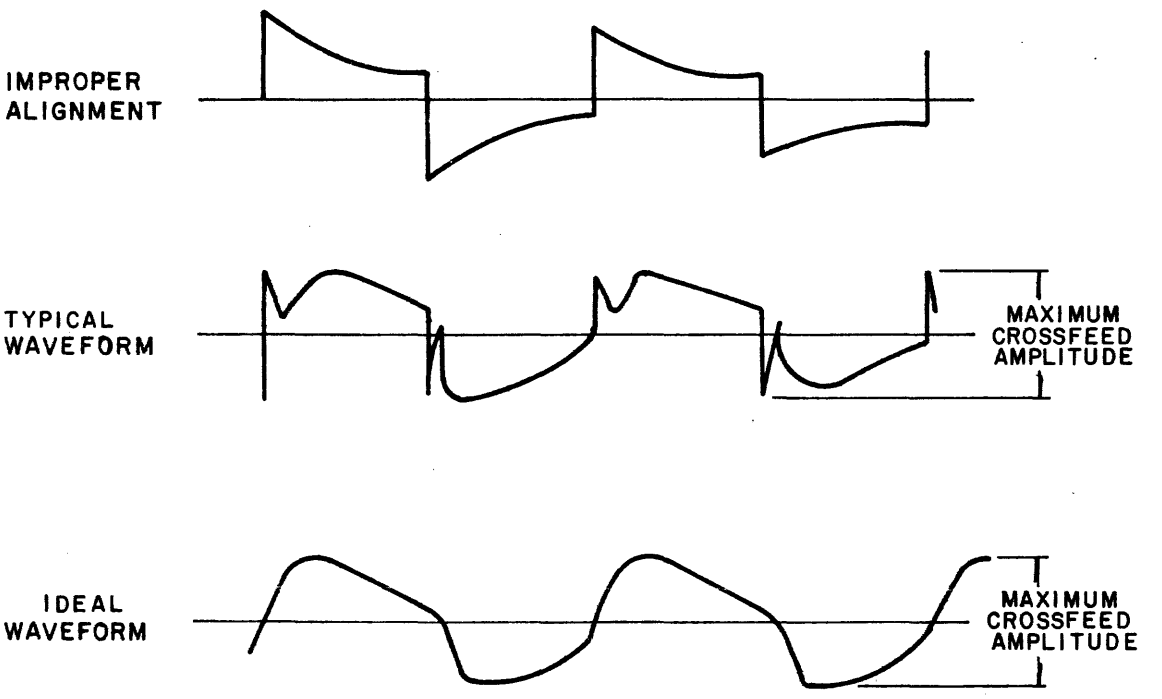


Figure 59. Head Gate Adjustment Waveforms, Dual Gap Systems

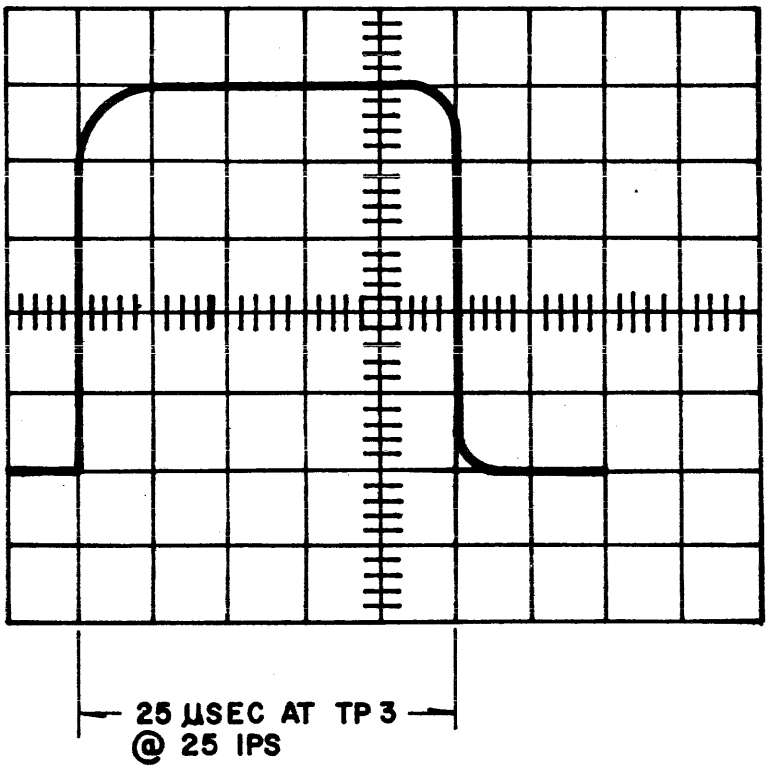


Figure 60. Read Strobe Delay Adjustment, Dual Gap Systems

16.6 READ STACK AZIMUTH MEASUREMENT AND CORRECTION

This adjustment is required only when the read/write head assem has been replaced. Its purpose is to ensure that the read stack i perpendicular to the tape path. This is a mechanical adjustment and is accomplished by shimming either (but only one) of the two guides mounted on the head assembly base plate. The shims are mounted by removing the guide, inserting a shim on the guide sh and re-assembling the guide on the base plate. The shims are 0 inch thick and one shim will correct for 15 micro-inches of skew

1. Scope controls:

   a) Mode--Chop.

   b) Sensitivity--0.2 V/cm, DC, both channels.

   c) Trigger--External (+) AC trigger mode.

   d) Sweeptime--Sufficient resolution so that the positive-going edges of each trace can be accurately measured.

2. Place Channel 1 scope probe and trigger probe on the test point corresponding to the head edge track located closest to the transport. This test point is 603 for nine-channel systems and 103 for seven-channel systems.

3. Place Channel 2 probe on the test point corresponding to the channel farthest from the transport. This test point is 703 for nine-channel systems and 903 for seven-channel systems.

4. Load a master skew alignment tape, making sure that the write enable ring is removed. Place the tape controller unit in a read mode and observe the time displacement between leading edges (see Figure 61). If the time displacement corresponds to a distance less than 25 micro-inches (1 μsec at 25 ips), no shimming is required:

$$\text{Distance } (\mu\text{inch}) = \text{Velocity (ips)} \times \text{Time } (\mu\text{sec}).$$

If the time displacement corresponds to a distance greater than 25 micro-inches, the guide on the file reel side of the head assembly must be shimmed. The number of shims can be calculated as follows, where N represents the number of shims:

$$N = \frac{(\text{Tape Speed})(\text{Time})}{15}$$

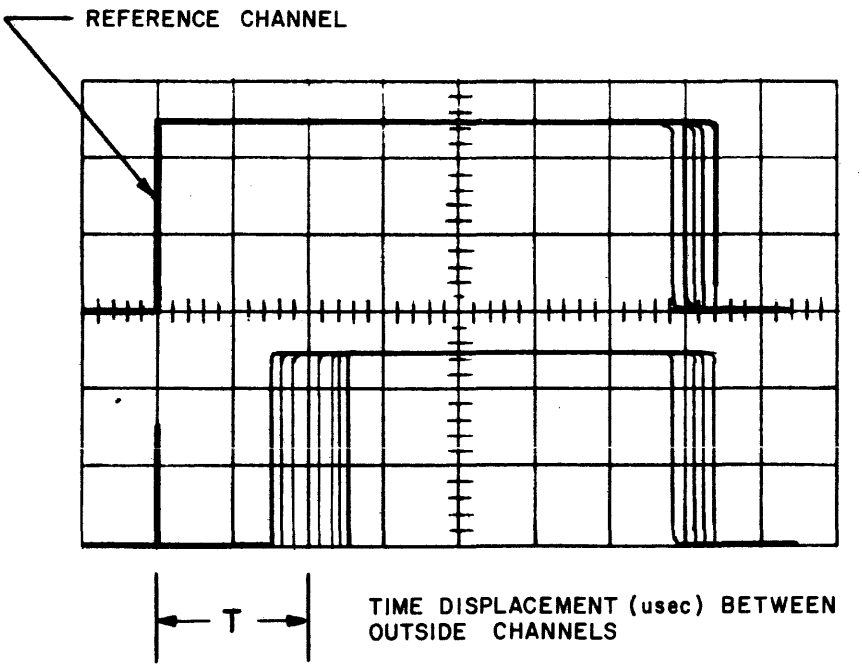


Figure 61. Head Stack Shimming, Dual Gap Systems

Number of Shims	Time Displacement for Speed Indicated (μsec)			
	12.5 ips	25 ips	37.5 ips	45 ips
1	0.7 - 1.8	0.4 - 0.9	0.3 - 0.6	0.2 - 0.5
2	1.9 - 3.0	1.0 - 1.5	0.7 - 1.0	0.6 - 0.9
3	3.1 - 4.2	1.6 - 2.1	1.1 - 1.4	1.0 - 1.2
4	4.3 - 5.4	2.2 - 2.7	1.5 - 1.8	1.3 - 1.5
5	5.5 - 6.6	2.8 - 3.3	1.9 - 2.2	1.6 - 1.8
6	6.7 - 7.8	3.4 - 3.9	2.3 - 2.6	1.9 - 2.2
7	7.9 - 9.0	4.0 - 4.5	2.7 - 3.0	2.3 - 2.5
8	9.1 - 10.2	4.6 - 5.1	3.1 - 3.4	2.6 - 2.8

Shim Table for Standard Tape Speeds

5. If the leading edge of the trace being triggered is seen but not that of the other channel, place the scope trigger probe on the opposite channel and observe the time displacement between pulse leading edges. In this case, the tape guide on the capstan side of the head assembly must be shimmed according to the instructions in step 4.

6. After the guide is shimmed, verify that the time displacement between the outside channels corresponds to a distance less than 25 microinches.

7. Measure and record the static data staircase using the master skew tape utilizing the method described in subsection 16.8. This data will later be used to compare with the results of that section.

16.7 WRITE STACK DESKEW

The method used to ensure proper Write head deskewing is first to plot the read stack gap scatter in the forward direction, referencing each track to the leading track, and using an IBM Master Skew Tape. Then the gap scatter plot is duplicated while writing all ones on a scratch-pad tape by adjusting the potentiometers of the Write Deskew single shots.

16.7.1 Read Head Stack Profile

The method used to measure and record the gap scatter is first to locate the leading track and then to measure the time displacement of each of the other tracks with respect to this track.

16.7.1.1 How to Locate the Leading Track:

The leading track will be located by comparing all the tracks to each other in the method described below. The digital data compared, will be only that which corresponds to the negative peaks of the analog signals observed at TP102 - TP902. By taking this precaution, error due to the effect of the pulse pairing phenomenon is eliminated.

1. Scope Controls

   a) Mode--Chop

   b) Sensitivity--0.2 V/cm, DC, both channels

   c) Trigger--External (+) AC mode connected to CH1 Trigger out jack.

2. Using the IBM Skew Tape, run the transport in the forward direction in the ON-LINE mode.

3. Set Channel 1 scope probe on TP103 and the Channel 2 probe on TP102. Set the scope sweeptime at 1 μ sec/cm. One of the patterns shown in Figure 62 will be observed on the screen:

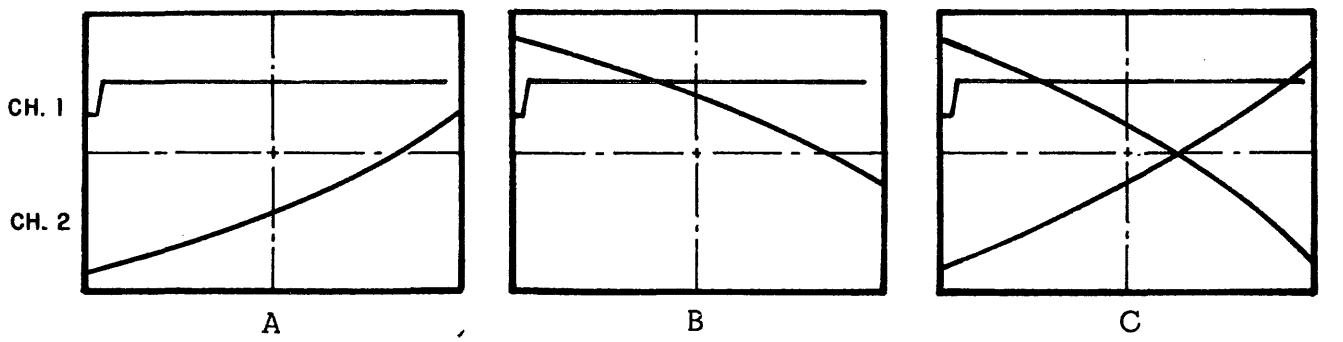


Figure 62. Triggering Method

4. If the display of Figure 62-A is observed, proceed to step 5, since this indicates that correct triggering of alternate bits generated by the negative analog signal peaks has been achieved.

   a) If the display of Figure 62-B is observed, triggering is on alternate bits but created by the wrong polarity analog signal peak. To correct the triggering, lift and re-apply Channel 1 probe to TP103. Normally, after one or two tries, triggering will switch to the correct polarity.

b) If the display of Figure 62-C is observed, triggering again is incorrect because it is occurring on every bit. To correct this condition, change to a faster or slower scope sweep speed.

c) Once the display of Figure 62-A is obtained, do not change the sweep speed for the remainder of the procedure. If greater sweep speed resolution is required, use the Horizontal Magnifier. Correct triggering will be maintained as long as the trigger probe is not moved to another point or if the tape does not change direction.

5. Move Channel 2 probe to TP203.

a) If it is observed that the positive going pulse of TP203 follows the trigger pulse, move Channel 2 probe to TP303 since TP103 is the leading of the two tracks, and it is required to maintain the Channel 1 probe on the leading track. Repeat the process until the signal on Channel 2 is not observed.

b) If the signal on TP203 is not observed on the screen, it is the leading track. Move Channel 1 probe to TP203. Since the trigger probe has now changed location, verify that triggering is still correct, following the method described in step 4 by observing TP102 with Channel 2. Move Channel 2 to TP303.

6. Repeat the process described in step 5 until all the tracks have been scanned, making sure correct triggering is maintained every time the Channel 1 probe is moved to the newly-found leading track.

7. To verify that the leading track has truly been located, keep the Channel 1 probe fixed on that track and scan the remainder of the tracks with Channel 2 probe. The leading edge of the positive pulse will be observed at all of the test points.

16.7.1.2 Profile Plot:

Keeping Channel 1 probe on the Read register test point corresponding to the leading track, use Channel 2 probe on TP103 through TP903. Record the time displacement between the leading edges of both pulses for each track, making sure that the proper triggering method is used.

16.7.2 Write Single-Shot Deskew

This adjustment is performed while the transport is loaded with a scratch tape for writing all ones on all tracks at 800 cpi.

1. While running the transport continuously, display the reference track on Channel 1 and the test track using Channel 2 of the scope. Set the reference track potentiometer to approximately one-third turn from the counterclockwise position. Adjust the corresponding write deskew potentiometer so that the read profile of paragraph 16.7.1.2 is duplicated, making sure that the proper triggering method is used.

2. Repeat for all tracks. See Table 6 for correct test point and potentiometer.

16.8 VERIFICATION--STAIRCASE MEASUREMENT

A quick verification of all the foregoing adjustments can be made by checking the width of the data staircase when the transport is running in the forward direction.

1. Scope controls:

   a) Mode--Channel 1, DC.

   b) Sensitivity--0.1 V/cm.

   c) Trigger--External (+) AC, Trigger mode.

2. Connect scope trigger probe to test point 3 and Channel 1 probe to test point 2.

3. While writing continuous ones, the waveform should resemble that shown in Figure 63. Time T should approximate the results of subsection 16.6, step 7 and should not exceed:

$$\frac{100}{\text{Tape Speed}} \ \mu\text{sec} \quad (T < 4\ \mu\text{sec at 25 ips})$$

Time T shall not include the effects of dynamic skew.

4. If this condition is not met, repeat the procedures specified in paragraphs 16.6 through 16.7.

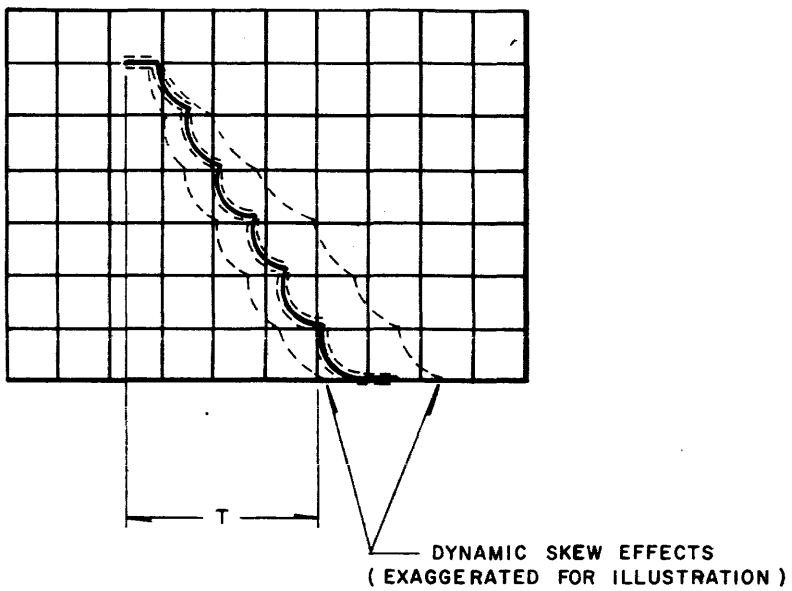


Figure 63. Staircase Waveform, Dual Gap Systems

17. DATA ELECTRONICS SINGLE GAP SYSTEMS ADJUSTMENTS

17.1 ADJUSTMENT SEQUENCE

All alignments are made at the factory prior to shipment of equipment. Verify alignments if either subassembly has been replaced, or if data electronics or heads seem to malfunction. Before performing the adjustments, verify that the scope probes, plug-in unit, and time base are calibrated.

All potentiometer and test point locations are identified on the module by a silk-screened designator adjacent to the component. See Figure B29 for the location of test points and adjustments on the module.

WARNING: SYSTEM POWER MUST BE TURNED OFF BEFORE DISCONNECTING OR CONNECTING EITHER THE DATA ELECTRONICS MODULE OR THE HEAD ASSEMBLY.

Tape transport and power supply adjustments must be verified before performing the data electronics adjustments. Because of the interrelationship among the circuits, the adjustments must be made in the following sequence:

1. Read amplifier gain adjustment
2. Read strobe delay adjustment
3. Read stack azimuth measurement and correction
4. Verification--staircase measurement.

17.2 READ AMPLIFIER GAIN

The following prescribes the adjustment procedure for nine-channel tape transports. For seven-channel systems, Set R211 and R311 fully counterclockwise.

1. Scope controls:

   a) Mode--Channel 1; AC

   b) Sensitivity--0.2 V/cm.

   c) Trigger--internal, automatic stability.

   NOTE: BE CAREFUL TO USE A STANDARD LEVEL OUTPUT TAPE FOR THE READ AMPLIFIER GAIN ADJUSTMENT.

2. Load standard level output tape on the transport and set the tape controller for a continuous write mode at a frequency corresponding to 800 cpi and ones written on all channels.

3. Rewind and then run forward in a Read mode.

4. Connect Channel 1 scope probe to test point 103 and run tape forward. Adjust R111 so that the analog signal has a 12-volt peak to peak amplitude. (See Figure 64.)

5. Repeat for all channels. See Table 7 for correct potentiometers and test points.

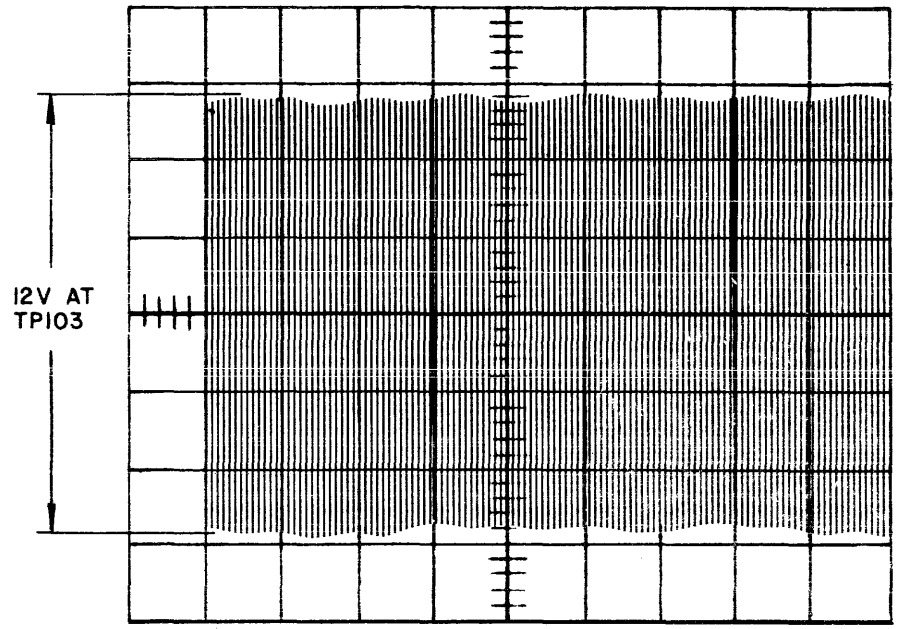


Figure 64. Read Amplifier Gain Adjustment, Single Gap System

Table 7. Data Electronics Adjustment Points - Single Gap System

Alignment Section Read Amp Gain			
Channel	Test Point	Pot. No.	Comments
P	TP-103	R-111	
O	TP-203	R-211	Not used in 7-channel systems
1	TP-303	R-311	Not used in 7-channel systems
2	TP-403	R-411	
3	TP-503	R-511	
4	TP-603	R-611	
5	TP-703	R-711	
6	TP-803	R-811	
7	TP-903	R-911	

17.3 READ STROBE DELAY

1. Scope controls:

   a) Mode--Channel 1, DC.

   b) Sensitivity--0.1 V/cm.

   c) Trigger--Internal (+) trigger mode.

2. Connect Channel 1 scope probe to test point 5.

3. Verify that the transport is selected for high density operation and read all ones.

4. A positive pulse will be observed at test point 5. (See Figure 65.) Adjust R28 for a pulse width of approximately one-half frame time. At 25 ips this should be 25 μsec, at 37.5 ips, 17 μsec, and at 45 ips, 14 μsec. A frame time is defined as $\frac{1}{VD}$, where V is the transport velocity and D is the operating data density.

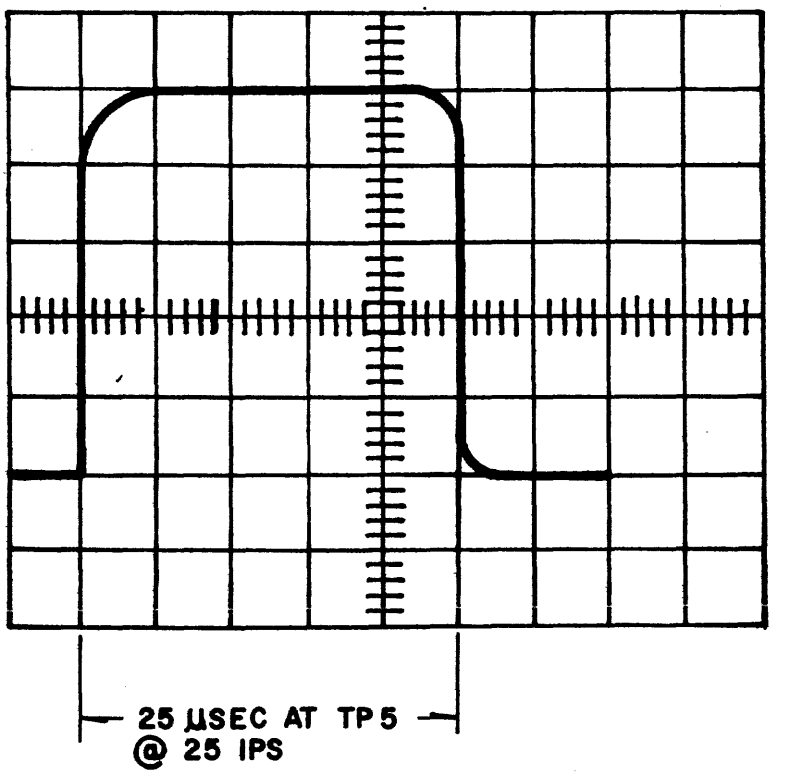


Figure 65. Read Strobe Delay Adjustment, Single Gap Systems

17.4 HEAD STACK AZIMUTH MEASUREMENT AND CORRECTION

This adjustment is required only when the read/write head assembly has been replaced. Its purpose is to ensure that the stack is perpendicular to the tape path. This is a mechanical adjustment and is accomplished by shimming either (but only one) of the two guides mounted on the head assembly base plate. The shims are mounted by removing the guide, inserting a shim on the guide shaft, and reassembling the guide on the base plate. The shims are 0.0002 inch thick and one shim will correct for 15 microinches of skew.

1. Scope controls:

   a) Mode--Chop.

   b) Sensitivity--0.2 V/cm, DC, both channels.

   c) Trigger--External (+) AC trigger mode.

   d) Sweeptime--Sufficient resolution so that the positive-going edges of each trace can be accurately measured.

2. Place Channel 1 scope probe and trigger probe on the test point corresponding to the head edge track located closest to the transport. This test point is 605 for nine-channel systems and 105 for seven-channel systems.

3. Place Channel 2 probe on the test point corresponding to the channel farthest from the transport. This test point is 705 for nine-channel systems and 905 for seven-channel systems.

4. Load a master skew alignment tape, making sure that the write enable ring is removed. Place the tape controller unit in a read mode and observe the time displacement between leading edges. (See Figure 66.) If the time displacement corresponds to a distance less than 25 microinches, no shimming is required.

   Distance (μinch) = Velocity (ips) X Time (μsec.)

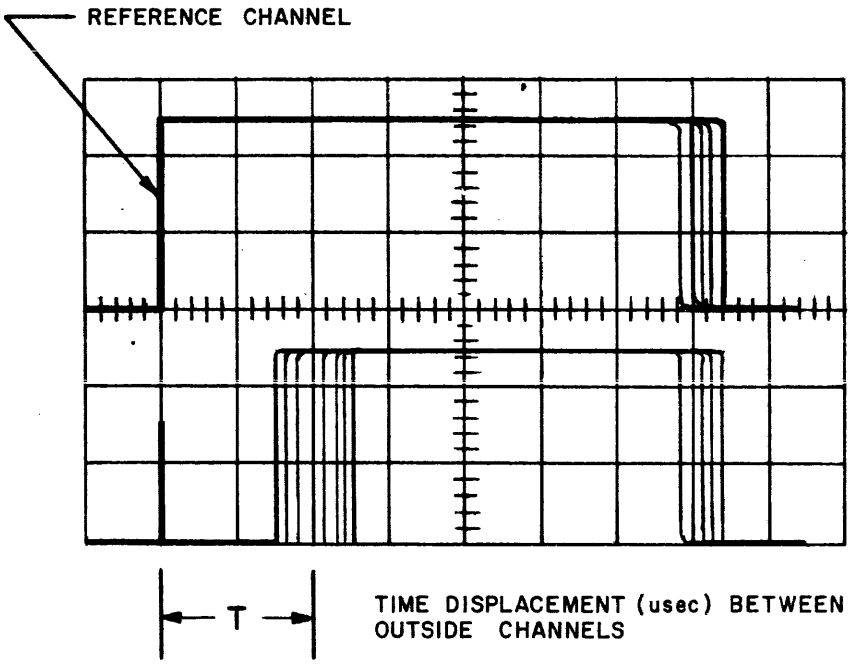


Figure 66. Head Stack Shimming, Single Gap System

If the time displacement corresponds to a distance greater than 25 microinches, the guide on the file reel side of the head assembly must be shimmed. The number of shims can be calculated as follows, where N represents the number of shims:

$$N = \frac{(\text{Tape Speed})(\text{Time})}{15}$$

Number of Shims	Time Displacement for Speed Indicated (μsec)			
	12.5 ips	25 ips	37.5 ips	45 ips
1	0.7 - 1.8	0.4 - 0.9	0.3 - 0.6	0.2 - 0.5
2	1.9 - 3.0	1.0 - 1.5	0.7 - 1.0	0.6 - 0.9
3	3.1 - 4.2	1.6 - 2.1	1.1 - 1.4	1.0 - 1.2
4	4.3 - 5.4	2.2 - 2.7	1.5 - 1.8	1.3 - 1.5
5	5.5 - 6.6	2.8 - 3.3	1.9 - 2.2	1.6 - 1.8
6	6.7 - 7.8	3.4 - 3.9	2.3 - 2.6	1.9 - 2.2
7	7.9 - 9.0	4.0 - 4.5	2.7 - 3.0	2.3 - 2.5
8	9.1 - 10.2	4.6 - 5.1	3.1 - 3.4	2.6 - 2.8

5. If the leading edge of the trace being triggered is seen but not that of the other channel, place the scope trigger probe on the opposite channel and observe the time displacement between pulse leading edges. In this case, the tape guide on the capstan side of the head assembly must be shimmed according to the instructions in step 4.

6. After the guide is shimmed, verify that the time displacement between the outside channels corresponds to a distance less than 25 microinches.

17.5 VERIFICATION--STAIRCASE MEASUREMENT

A quick verification of all the foregoing adjustments can be made by checking the width of the data staircase when the transport is running in the forward direction.

1. Scope controls:

   a) Mode--Channel 1, DC.
   b) Sensitivity--0.1 V/cm.
   c) Trigger--External (+) AC, trigger mode.

2. Connect scope trigger probe to test point 5 and Channel 1 probe to test point 6.

3. While reading continuous ones that have just been recorded, the waveform should resemble that shown in Figure 67. Time T should not exceed:

$$\frac{100}{\text{Tape Speed}} \ \mu\text{sec.} \quad (T < 4\ \mu\text{sec at 25 ips})$$

Time T shall not include the effects of dynamic skew.

4. If this condition is not met, repeat the procedures specified in paragraph 17.4.

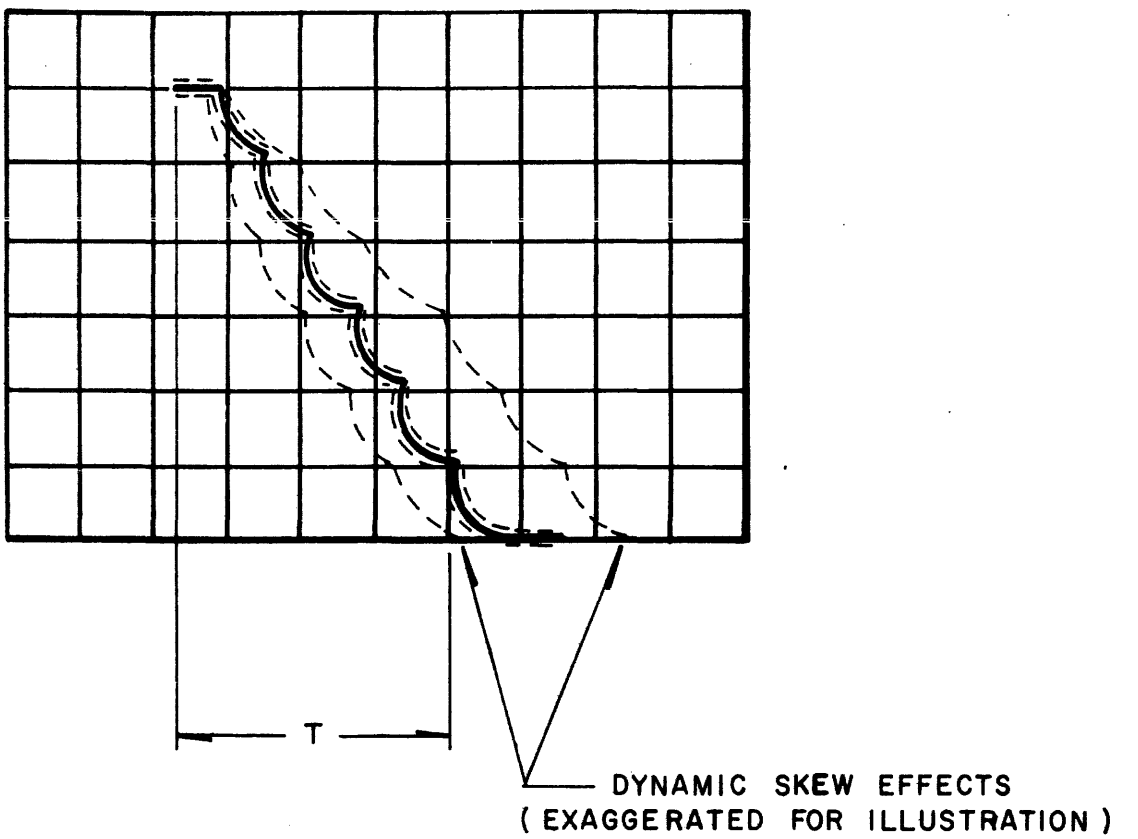


Figure 67. Staircase Waveform, Single Gap Systems

18.0 TROUBLESHOOTING

The following System Troubleshooting Chart provides a means of isolating faults by citing symptoms, providing probable causes and remedies and referencing descriptive sections within the text. This chart in general must be used in conjunction with applicable schematics, assembly drawings and wiring diagrams. Refer to the system photographs in Figure 68 and Figure 69 to help locate the various subassemblies.

TROUBLESHOOTING GUIDE

Symptom	Probable Cause	Remedy	Reference
Power indicator light does not work when switch is pressed on front panel.	S1 power switch in OFF position.	Switch S1 to ON position located by AC cord input.	Section 1, Figure 2
	+5 volts missing.	Check +5 volts at TP1 on regulator circuit board which is mounted on the power supply.	Section 6, Paragraph 13
	CB1 Thermo breaker open.	Push in thermo breaker button located by AC cord input.	Section 1, Figure 2
	Power Indicator Lamp burnt out.	Check the two outside terminals for lamp continuity. You can pull the switch out from the front.	Section VI, Paragraph 5
	No AC voltage to transport.	Check outlet with voltmeter for the proper AC voltage.	
When the LOAD button is pressed swing arms do not move.	Electro-mechanical retract assembly not working.	S16 micro switch open on cam retract assembly.	B13 & B14
	+13V unregulated is missing.	Check J19 Pin 2 for +13V.	B3
	P19 connector not seated.	Check connection.	
	K1 relay coil open.	Pull out relay and measure for continuity between pins 1 and 4.	Sec. VI Figure 49

TROUBLESHOOTING GUIDE

Symptom	Probable Cause	Remedy	Reference
When the LOAD button is pressed the swing arms travel to their upper limits and retract to the load position.	Tape threaded incorrectly.	Check threading diagram.	Sec. II., Fig. 5
	Electro-mechanical retract assembly not working.	S14 micro switch not closing during a load cycle.	B13, B14
	K1 power relay not picking.	Check J19 Pin 2 for +13V.	B3
	+13 volt missing.	Check TP 420.	Sec. VI Para. 1.1
	-13 volt missing.	Check TP 421.	
When the LOAD button is pressed tape tensions and moves forward at a fast speed.	Tape not threaded correctly.	Check threading diagram.	Sec. II., Fig. 5
	Fixed reel amplifier defective.	Remove tape, press load button when swing arms reach their upper limit, turn power OFF & ON. Now the swing arms can be cycled by hand and the voltages can be checked.	Sec. VI. Para. 15.3.
When the LOAD button is pressed tape tensions and travels at a fast reverse speed.	Tape not threaded correctly.	Check threading diagram.	Sec. II., Fig. 5
	File reel amplifier defective.	Remove tape, press load button when swing arms reach their upper limit, turn power OFF & ON. Now the swing arms can be cycled by hand and the plus and minus voltages at TP425 and TP418 can be measured.	Sec. VI. Para. 15.3.

TROUBLESHOOTING GUIDE

Symptom	Probable Cause	Remedy	Reference
When the LOAD pushbutton is pressed, tape tensions, but tape does not move forward.	No forward motion (forward lamp not lit.)	Check TP402 for +5 volts.	B24 & B25
	Ramp generator circuit not working.	Check TP404 for voltage output.	B24 & B25
	Capstan amplifier not working.	Check TP408 for voltage output.	B24 & B25
When the LOAD pushbutton is pressed, tape tensions and the tape moves forward but does not stop at the BOT marker.	BOT tab dirty or tarnished.	Clean with IBM cleaner.	
	Photosense lamp burnt out.	Remove head cover and check.	
	Photosense assembly not adjusted correctly.	With tape loaded and not at BOT TP 201 should be zero volts.	Sec. VI. Para. 15.1.
Swing arms continually cycle up and down after unloading the tape.	Microswitch on cam retract not opening.	Remove overlay and check S15 microswitch by pressing LOAD button and visually watching for make and break action.	B13 & B14
	Defective microswitch.	Test microswitch with power OFF using an ohmmeter.	B13 & B14

TROUBLESHOOTING GUIDE

Symptom	Probable Cause	Remedy	Reference
Tape does not respond to a forward or reverse command in an ON LINE condition.	No ready status from transport.	Check ready status J16 Pin T for zero volts (low TRUE interface.)	B23 & B24
	Interface cable fault.	Check at controller cable and for Ready Status zero volt level input.	B23 & B24
	No forward input command.	Check forward level J16 Pin C for zero volts input.	B23 & B24
	No select command	Check J16 Pin J for zero volts input. Check H and J jumper for +5 volts.	B23 & B24
Write command given but no data being recorded.	File protect logic not working.	Remove tape. Turn Power OFF. Turn power ON and push in solenoid plunger; it should stay in. Press the LOAD button. The plunger should now come out.	B12 Fig. 23.
	No write power.	Check TP6 for +12V. (Dual Gap) Check TP3 for +5V. (Single Gap)	B31 & B32 B28 & B29
	No write enable command.	Check TP207 for +5 volts.	
	Missing write clock.	Check J1 Pin A for negative going clock.	B28 & B29 (S/G) B31 & B32 (D/G)
	Heads not plugged in correctly.	Check J2 connector	B28 & B29 (S/G) B 31 & B32 (S/G)

TROUBLESHOOTING GUIDE

Symptom	Probable Cause	Remedy	Reference
Written data is not correct.	Failure of one Write circuit.	Write all one's and check TP101 through TP901 for Write signals.	B31 & B32 (D/G) B28 & B29 (S/G)
	Intermittent Write power, motion, or write reset.	Monitor Write TP6, (D/G) or TP3 (S/G) motion TP204, Write reset J1 Pin C. Look for level changes.	B31 & B32 (D/G) B28 & B29 (S/G)
Correct written data cannot be read.	One of the read channels is dead.	On dual gap units real all one's and check TP102 through TP902 for proper analog waveforms. Check TP103 through TP903 for proper digital waveforms.	B31 & B32 (D/G)
		On single gap units, read all one's and check TP103 through TP903 for proper analog waveforms. Check TP105 through TP905 for proper digital waveforms.	B28 & B29 (S/G)
	Tape tracking is not adjusted correctly.	Check staircase.	Sec. VI. Par. 16.8 (Dual Gap) Sec. VI. Par. 17.5 (Single Gap)

TROUBLESHOOTING CHART

Symptom	Probable Cause	Remedy	Reference
Correct written data cannot be read, cont'd.	Read amplifier gains are incorrectly adjusted.	Check read amplifier gains.	Sec. VI. Par. 16.3 (Dual Gap) Sec. VI. Par. 17.2 (Single Gap)
	Read Strobe Delay adjustment not correct.	Check read strobe delay adjustment.	Sec. VI. Par. 16.5 (Dual Gap) Sec. VI. Par. 17.3 (Single Gap)

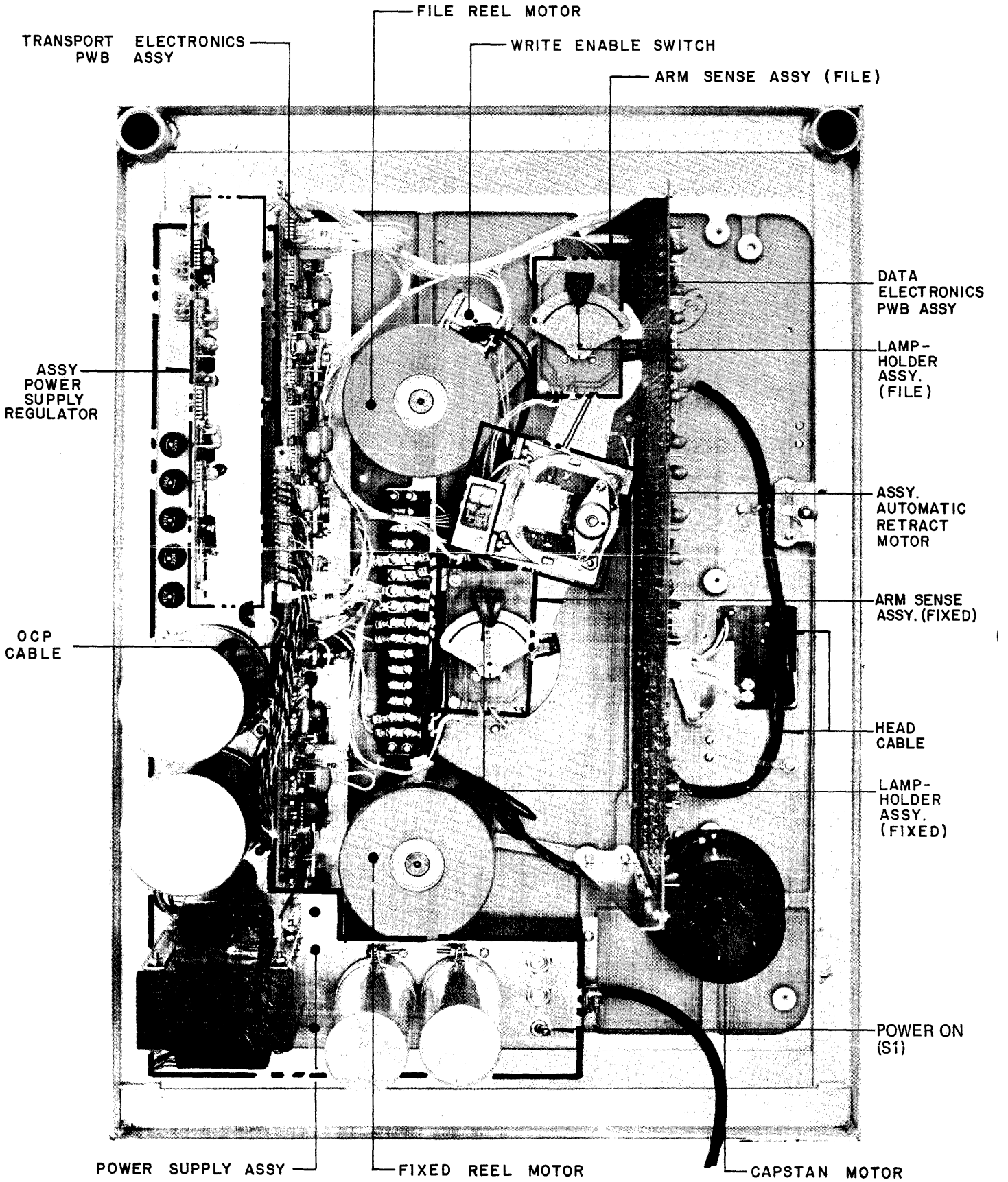


Figure 68. MOD 10 Tape System - Rear View

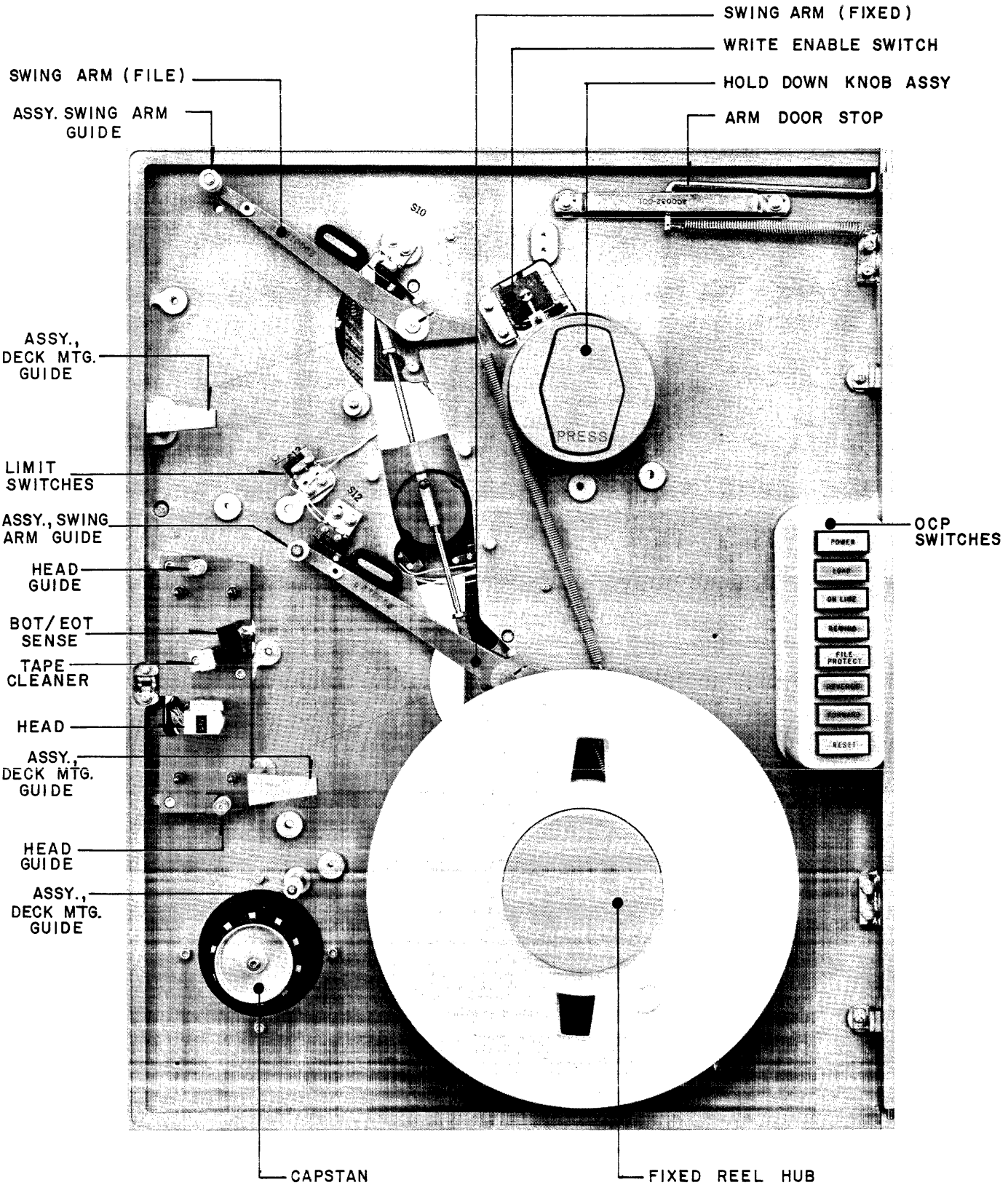


Figure 69. Front View with Overlay Removed

APPENDIX A

RECOMMENDED SPARE PARTS LIST

WANGCO MOD 10 TAPE SYSTEM

For resistors, capacitors, small hardware and other items not included in the following list, any equivalent in type, value, size, tolerance and quality may be substituted.

RECOMMENDED SPARE PARTS LIST

WANGCO MOD 10 TAPE SYSTEM

Description	Wangco Number	Qty	Remarks/ Commercial Equivalent
HEAD ASSEMBLIES AND ASSOCIATED PARTS			
Head Plate Assy, 9 Ch, D/G	200043	1	
Head Plate Assy, 9 Ch, S/G	200227	1	
Head Plate Assy, 0.300", 7 Ch, D/G	200115	1	
Head Plate Assy, 0.150", 7 Ch, D/G	200589	1	
Head Plate Assy, 7 Ch, S/G	200226	1	
Tape Cleaner Assy	200048	1	
Cross Talk Shield Assy, 0.150", 7 & 9 Ch, D/G	200057	1	
Cross Talk Shield Assy, 0.300", 7 Ch. D/G	200461	1	
Photosense Assy	200057	1	
Head Cover	200277	1	
Photosense Cover	200278	1	
Tape Guide Washer	200046	1	
Tape Guide Spring	200047	1	
Tape Guide Drum	200096	1	
Tape Guide Shim	200203	as req.	
Spring Washer	100134-001	1	
Tape Guide Cap	201311	1	
Flat-Head Screw, 4-40 x 1¼"	100040-220	1	
MOTORS AND BRUSHES			
Reel Motor Assy	200063	1	
Reel Motor and Brake Assy	201021	1	Reel Brake Option

RECOMMENDED SPARE PARTS LIST

WANGCO MOD 10 TAPE SYSTEM

Description	Wangco Number	Qty	Remarks/ Commercial Equivalent
MOTORS AND BRUSHES (continued)			
Reel Motor Brake	100249	1	Reel Brake Option
Reel Motor Brush	100190	1	Use with motors 200220, 200374-002
Reel Motor Brush	100379	1	Use with motor 200374-001
Reel Motor Brush	100397	1	Use with motor 201598
Auto Retract Motor Assy	200119	1	
Auto Retract Motor Assy	200500	1	Reel Brake Option
Capstan Motor/Tach Assy	200547	1	Use with motors 200042, 201534
Capstan Motor Brush	100186	1	Use with motor 200042
Capstan Motor Brush	100430	1	Use with motor 201534
PRINTED WIRING BOARD ASSEMBLIES			
Transport Electronics Assy, PWB	200488	1	Single Edge Connectors
Transport Electronics Assy, PWB	200632	1	Dual Edge Connectors
Data Electronics Assy, PWB, S/G	200347	1	
Data Electronics Assy, PWB, D/G	200521	1	
Data Electronics Assy, PWB	201142	1	Dual Edge Connectors
Regulator Assy	200495	1	
Brake Logic Assy, PWB	200518	1	Reel Brake Option
Arm Sense Assy, PWB	200475	1	

RECOMMENDED SPARE PARTS LIST

WANGCO MOD 10 TAPE SYSTEM

Description	Wangco Number	Qty	Remarks/ Commercial Equivalent
TAPE GUIDE ASSEMBLIES			
Deck Mounting Guide Assy	200036	1	25 ips and below
Deck Mounting Guide Assy	200075	1	37½ ips and above
Deck Mounting Guide Assy	200217	1	
Self Aligning Guide Assy	200425	1 - 3	
Eccentric Guide Assy	200810	1	
MISCELLANEOUS ELECTRO-MECHANICAL PARTS			
Arm Sense Lampholder Assy	200794	1	
Write Enable Switch Assy	200378	1	
Power Transformer	200011	1	25 ips, 115/240V
Power Transformer	200487	1	37½ ips & above, 115/240V
Power Transformer	201067	1	25 ips, 100/200V
Power Transformer	200116	1	37½ ips & above, 100/200V
Circuit Breaker	100014	1	
Rectifier Bridge	100018	1	Sangamo 500-1943-01
Capacitor, 100,000uf	100020-008	1	Sangamo 500-1949-01
Capacitor, 30,000uf	100020-014	1	Littlefuse, 311004
Fuse, 4 amp	100028-023	1	Littlefuse, 311005
Fuse, 5 amp	100028-024	1	Littlefuse, 311010
Fuse, 10 amp	100028-027	1	
Power Supply Relay	100030	1	
Arm Retract Relay	100215	1	Two required with Reel Brake Option

RECOMMENDED SPARE PARTS LIST

WANGCO MOD 10 TAPE SYSTEM

Description	Wangco Number	Qty	Remarks/ Commercial Equivalent
MISCELLANEOUS ELECTRO-MECHANICAL PARTS (continued)			
Switch & Indicator, FORWARD	100104-001	1	Control Panel
Switch & Indicator, LOAD	100104-002	1	Control Panel
Switch & Indicator, ON-LINE	100104-003	1	Control Panel
Switch & Indicator, REVERSE	100104-004	1	Control Panel
Switch & Indicator, POWER	100179-001	1	Control Panel
Switch & Indicator, DENSITY	100179-005	1	Contrl Pnl, Density Select Option
Switch & Indicator, REWIND	100130-001	1	Control Panel
Switch, RESET	100130-002	1	Control Panel
Thumb Switch, UNIT SELECT	100245	1	Control Panel, Unit Select
ELECTRONIC COMPONENTS USED ON 200347 PWB			
I.C. Hex. Inverter	100084	1	Motorola MC-836P
I.C. Quad, 2-Input NAND	100085	1	TI SN 15846N
I.C. Quad, 2-Input Power	100086	1	TI SN 15858N
I.C. 10-Input NAND	100087	1	Motorola MC-1804P
I.C. Dual Flip-Flop	100088	1	TI SN158093N
I.C. Monostable	100090	1	Fairchild U6A960159X
I.C. Dual Flip-Flop	100095	1	Motorola MC-852P
I.C. Operational Amplifier	100167	1	Motorola MC-1437L
Transistor, NPN	100080	5	2N4123
Transistor, PNP	100081	3	2N4125
Signal Diode	100091	12	1N914

RECOMMENDED SPARE PARTS LIST

WANGCO MOD 10 TAPE SYSTEM

Description	Wangco Number	Qty	Remarks/ Commercial Equivalent
ELECTRONIC COMPONENTS USED ON 200488 PWB			
I. C. Hex Inverter	100084	1	Motorola MC-836P
I. C. Quad 2-Input NAND	100085	1	TI SN 15846N
I. C. Quad 2-Input Power	100086	1	TI SN 15858N
I. C. Dual Flip-Flop	100088	1	TI SN 158093N
I. C. Triple 3-Input NAND	100107	1	Motorola MC-862P
I. C. Operational Amp	100109	1	Fairchild U6A77241393
Transistor, NPN	100080	3	2N4123
Transistor, PNP	100081	2	2N4125
Transistor, NPN	100112	1	TI-P29
Transistor, PNP	100113	1	TI-P30
Transistor, NPN	100125	1	2N2219
Transistor, PNP	100158	1	2N3053
Transistor, PNP	100160	1	2N4037
Transistor, NPN	100173	1	2N3771
Signal Diode	100091	5	1N914
Zener Diode, 5.6V	100118	1	1N752
Power Diode	100174	1	1N3208
Rectifier Diode	100127	1	1N4003
ELECTRONIC COMPONENTS USED ON 200495 PWB			
I. C. Voltage Regulator	100108	1	Fairchild U6A7723393
Transistor, PNP	100081	1	2N4125
Transistor, PNP	100113	1	TI-P30

RECOMMENDED SPARE PARTS LIST

WANGCO MOD 10 TAPE SYSTEM

Description	Wangco Number	Qty	Remarks/ Commercial Equivalent
ELECTRONIC COMPONENTS USED ON 200495 PWB (continued)			
Transistor, NPN	100159	1	2N3055
Signal Diode	100091	1	1N914
Zener Diode	100118	1	1N752
Rectified Diode	100127	1	1N4003
Zener Diode	100161	1	1N4736A
Silicon C Rectifier	100162	1	40654
ELECTRONIC COMPONENTS USED ON 200518 PWB			
Transistor, NPN	100080	1	2N4123
Transistor, PNP	100083	1	MPS-U51
Transistor, PNP	100125	1	2N2219
Signal Diode	100091	2	1N914
ELECTRONIC COMPONENTS USED ON 200521 PWB			
I. C. Hex Inverter	100084	1	Motorola MC-836P
I. C. Quad 2-Input NAND	100085	1	TI SN 15846N
I. C. Quad 2-Input Power	100086	1	TI SN 15858N
I. C. 10-Input NAND	100087	1	Motorola MC-1804P
I. C. Dual Flip-Flop	100088	1	TI SN 158093N
I. C. Operation Amplifier	100089	1	Fairchild U6A7739393
I. C. Mono Multivibrator	100090	1	Fairchild U6A960159X
Transistor NPN	100080	7	2N4123
Transistor PNP	100081	2	2N4125
Transistor Dual NPN	100082	1	TD 101

RECOMMENDED SPARE PARTS LIST

WANGCO MOD 10 TAPE SYSTEM

Description	Wangco Number	Qty	Remarks / Commercial Equivalent
ELECTRONIC COMPONENTS USED ON 200521 PWB (continued)			
Transistor PNP	100083	1	MPS-U51
Signal Diode	100091	5	1N914
ELECTRONIC COMPONENTS USED ON 200632 PWB			
I. C. Hex Inverter	100084	1	Motorola MC-836P
I. C. Quad 2-Input NAND	100085	1	TI SN 15846N
I. C. Quad 2-Input Power	100086	1	TI SN 15858N
I. C. Dual Flip-Flop	100088	1	TI SN 158093N
I. C. Triple 3-Input NAND	100107	1	Motorola MC-862P
I. C. Operational Amplifier	100109	1	Fairchild U6A7741393
I. C. Dual 4-Input Power Gate	100261	1	
Transistor NPN	100080	4	2N4123
Transistor PNP	100081	2	2N4125
Transistor NPN	100112	1	TI-P29
Transistor PNP	100113	1	TI-P30
Transistor NPN	100125	1	2N2219
Transistor NPN	100158	1	2N3053
Transistor PNP	100160	1	2N4037
Transistor NPN	100173	1	2N3771
Transistor PNP	100083	1	MPS-U51
Zener Diode, 5.6V	100118	1	1N752
Rectifier Diode	100127	1	1N4003
Power Diode	100174	1	1N3208

RECOMMENDED SPARE PARTS LIST

WANGCO MOD 10 TAPE SYSTEM

Description	Wangco Number	Qty	Remarks/ Commercial Equivalent
ELECTRONIC COMPONENTS USED ON 200632 PWB (continued)			
Signal Diode	100091	5	1N914
ELECTRONIC COMPONENTS USED ON 201142 PWB			
I.C. Hex Inverter	100084	1	
I.C. Quad 2-Input NAND	100085	1	
I.C. Quad 2-Input Power	100086	1	
I.C. 10-Input NAND	100087	1	
I.C. Dual Flip-Flop	100088	1	
I.C. Operational Amplifier	100089	1	
I.C. Monostable	100090	1	
Transistor, NPN	100080	7	2N4123
Transistor PNP	100081	1	2N4125
Transistor Dual NPN	100082	1	TD-101
Transistor PNP	100083	1	MPS-U51
Signal Diode	100091	4	1N914
Rectifier Diode	100127	1	1N4003

APPENDIX B

This appendix contains the circuit schematics, assembly drawings, and material lists for all assemblies and subassemblies in the MOD 10 Tape Transport. These documents are identified in the list on the following page.

The circuit schematics are complete representations of the electronics circuitry. The user of this manual will want to consult the schematics in conjunction with his study of the text and the simplified circuit diagrams in the text sections.

The assembly drawings identify every part on any given assembly or subassembly. Parts are identified either by item number (e.g., 1, 2, 3, etc.) or circuit reference number (e.g., R1, C1, U1, etc.). The associated material lists incorporate these identification numbers, together with the part description, WANGCO part number, and part quantity (i.e., the quantity of a particular part required for the given assembly).

APPENDIX B

List of Drawings

		Drawing No.	Sheet
B-1.	Material List, Power Supply	200511G	1 & 2
B-2.	Schematic, Power Supply	200498E	3 of 3
B-3.	Assembly, Power Supply	200498E	1 & 2
B-4.	Material List, Power Supply Regulators	200495H	1 & 2
B-5.	Schematic, Power Supply Regulators	200495F	4 of 4
B-6.	Assembly, Power Supply Regulators	200495F	3 of 4
B-7.	Deleted		
B-8.	Assembly, Regulator Output Cable	200858B	1 of 1
B-9.	Assembly, Cable OCP	200505E	1 & 2
B-10.	Assembly, Photosense	200164D	1 & 2
B-10a.	Assembly, Photosense	200057A	1 & 2
B-11.	Assembly, Arm Sense	200475E	1 & 2
B-12.	Assembly, Write/Enable Switch	200378J	1 & 2
B-13.	Schematic, Retract Motor	200119M	3 of 3
B-14.	Assembly, Retract Motor	200119M	1 & 2
B-15.	Material List, Retract Motor, Brake Option	200500G	1 & 2
B-16.	Schematic, Retract Motor, Brake Option	200500F	4 of 4
B-17.	Assembly, Retract Motor, Brake Option	200500F	3 of 4
B-18.	Schematic, Brake Logic	200518B	3 of 3
B-19.	Assembly, Brake Logic	200518B	2 of 3
B-20.	Assembly, Data Control Cable	200504C	1 & 2
B-21.	Assembly, Micro Switch Harness	200550C	1 & 2
B-22.	Material List, Transport Electronics	200488T	1 thru 57
B-23.	Schematic, Transport Control Logic	200488T	58 of 59
B-24.	Schematic, Servo Amplifiers	200488T	57 of 59
B-25.	Assembly, Transport Electronics	200488T	59 of 59
B-26.	Deleted		
B-27.	Material List, Transport Electronics	200632U	16 thru 42
B-28.	Schematic, Transport Control Logic	200632U	43 of 45
B-29.	Schematic, Servo Amplifiers	200632U	44 of 45
B-30.	Assembly, Transport Electronics	200632U	45 of 45
B-31.	Material List, Data Electronics, Single Gap,	200347J	1 thru 8
B-32.	Schematic, Data Electronics, Single Gap	200347J	10 of 10
B-33.	Assembly, Data Electronics, Single Gap	200347J	9 of 10
B-34.	Material List, Data Electronics, Dual Gap	200521M	1 thru 19
B-35.	Schematic, Data Electronics, Dual Gap	200521M	20 of 21
B-36.	Assembly, Data Electronics, Dual Gap	200521M	21 of 21
B-37.	Material List, Data Electronics, Dual Gap	201142D	1 thru 35
B-38.	Schematic, Data Electronics, Dual Gap	201142D	19 of 20
B-39.	Assembly, Data Electronics, Dual Gap	201142D	20 of 20
B-40.	Wiring Diagram - Single Gap	200851A	1 of 1
B-41.	Wiring Diagram - Dual Gap	200549C	1 of 1

Wang Computer Products

MATERIAL LIST

ML 200511 G

DRAWING TITLE: ASSY. 115v. 60Hz. POWER SUPPLY, 25 ips. MODEL NO. 1Ø DATE 8/4/70 SHEET 1 OF 3

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Chassis, Power Supply.	200509	1	
2	Spec. Power Transformer.	200011	1	T1.
3				
4	Breaker, Circuit.	100014	1	CB-1
5	Switch, Toggle. DPST.	100015	1	S1.
6	Bridge, Rectifier.	100018	2	DB-1. DB-2.
7	Capacitor, Elect. 100,000uf.	100020-008	2	C3.C4. } Remove Terminal Screws
8	Capacitor, Elect. 30,000uf.	100020-014	2	C1.C2. } and replace with Item 47.
9	Block, Terminal.	100023-010	1	TB.1.
10	Clamp, Capacitor. 2" Dia.	100025-003	2	Use with item 8.
11	Clamp, Capacitor. 3" Dia.	100025-007	2	Use with item 7.
12	Holder, Fuse.	100027	5	
13	Fuse. 4 amp.	100028-023	1	F4.
14	Fuse. 5 amp.	100028-024	1	F1.
15	Fuse. 10 amp.	100028-027	3	F2.F3.F5.
16	Relay.	100030	1	K1.
17	Grommet.	100227-005	2	
18	Grommet.	100227-009	1	
19	Strip, Marker.	100048-010	1	
20	Strip, Terminal.	100149-007	2	TB.3. TB.4.
21	Jumper, 2 Terminal.	100150	2	
22	Clamp, Cable.	100152-001	1	Power Cord.
23	Cord, Power.	100076	1	
24	Terminal, Ins. Stand-off.	100178-001	2	
25	Diode, Rectifier.	100127	9	CR.1. thru CR.9.
26	Capacitor. 200uf.	100183	2	C5.C6.
27	Resistor. 5%. 5w. 0.1Ω	100111-001	1	R5.
28	Resistor. " 3w. 330Ω	100068-331	4	R1. thru R4.
29	Connector, Female.	100010-005	1	P21.
30	Connector, Female.	100010-007	2	J18. J19.
31	Connector, Female.	100010-009	1	P14.
32				
33	Wire, Insulated.	100053-012	A/R	
34	Wire, Insulated.	100053-014	A/R	
35	Wire, Insulated.	100053-016	A/R	
36	Wire, Insulated.	100053-024	A/R	
37	Terminal, Ins. Ring Tongue.	100055-004	16	Yel. No.10.
38	Terminal, " " "	100057-004	21	Red. No.6.
39	Terminal, " " "	100057-008	3	Red.No.10.
40	Terminal, Quick Disconnect.	100139-001	2	
41	Lug, Solder.	100138-004	8	
42	Terminal, Ins. Ring Tongue.	100055-002	1	Yel. No.6.

Wang Computer Products

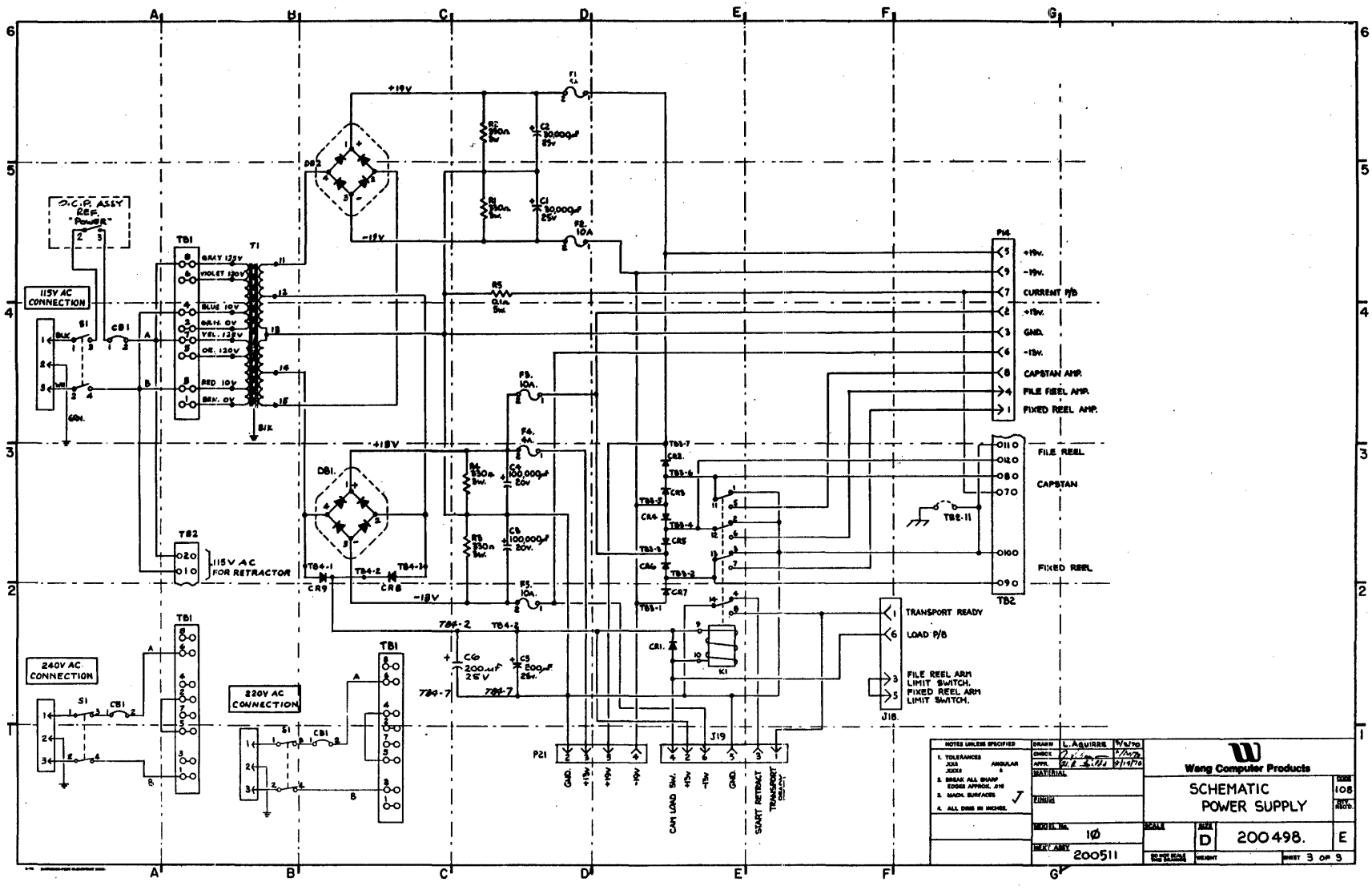
MATERIAL LIST

ML 200511 G

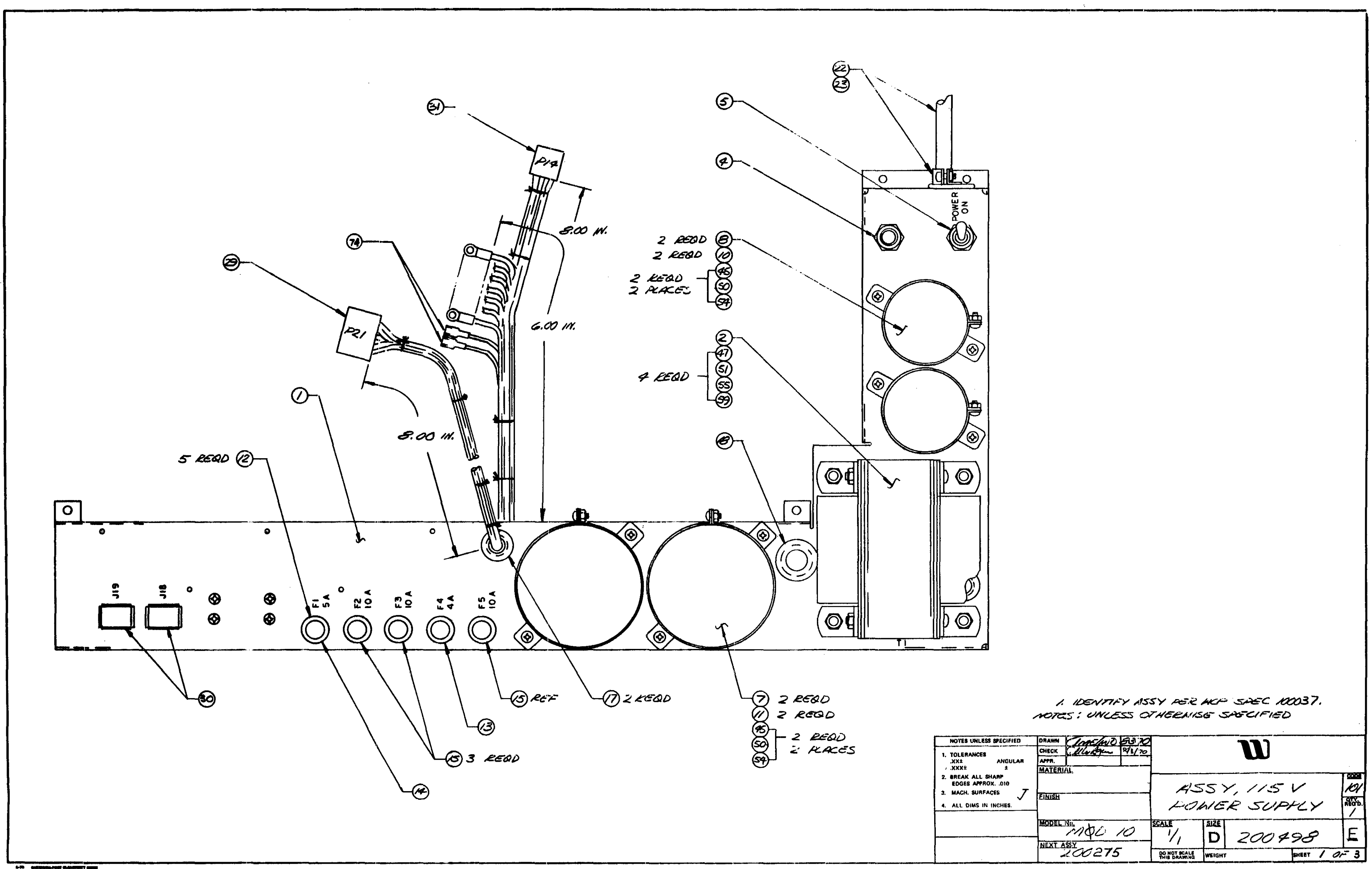
DRAWING TITLE: ASSY. 115v. 60Hz. POWER SUPPLY, 25 ips. MODEL NO. 1Ø DATE 8/4/70 SHEET 2 OF 3

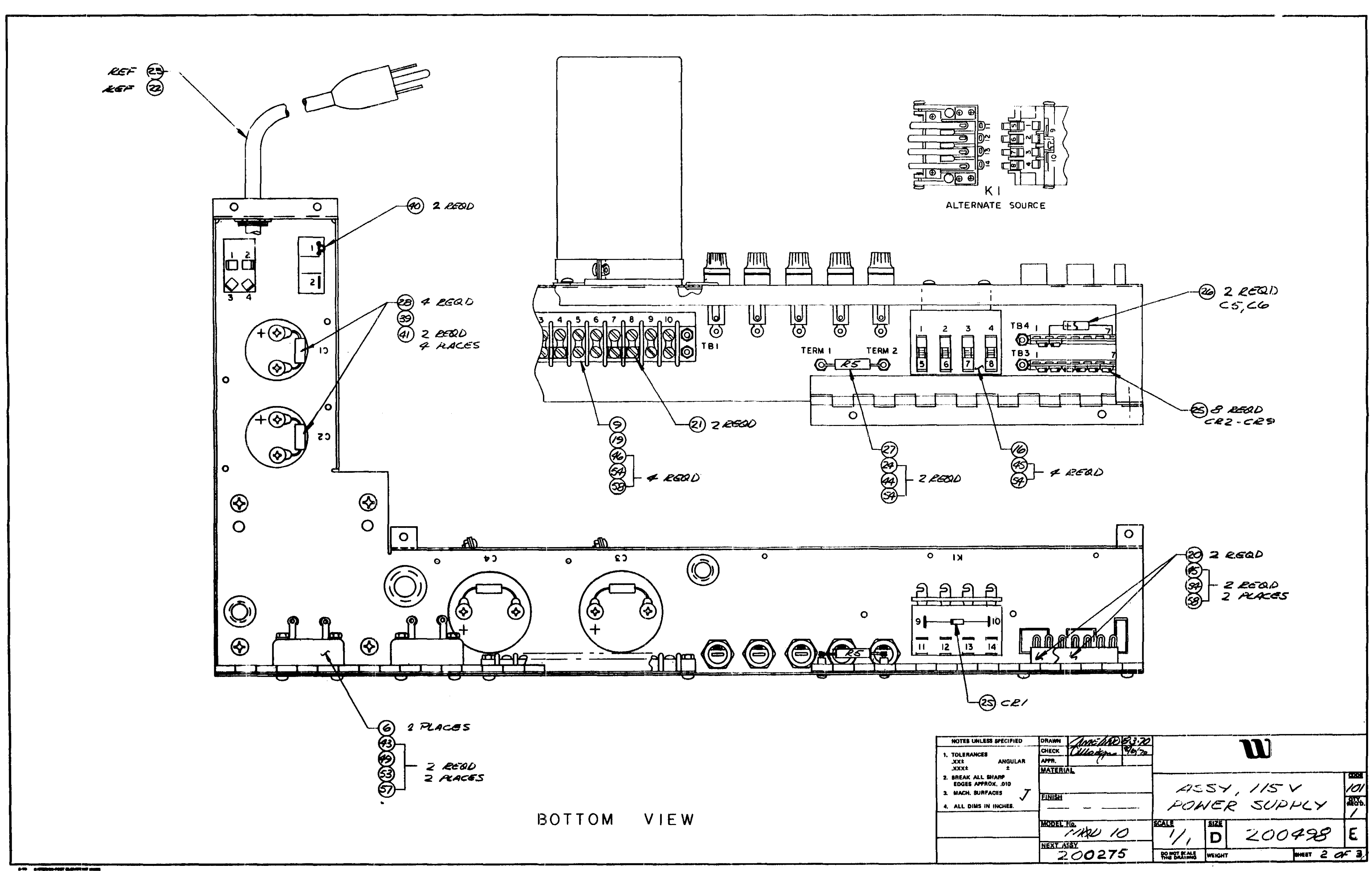
ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
43	Screw, Pan Head.	100036-214	4	4 - 40 x 7/8"
44	Screw, Pan Head.	100036-303	2	6 - 32 x 3/16"
45	Screw, Pan Head.	100036-304	16	6 - 32 x 1/4"
46	Screw, Pan Head.	100036-310	4	6 - 32 x 5/8"
47	Screw, Pan Head.	100036-508	12	10 - 32 x 1/2"
48				
49	Washer, Flat.	100047-200	4	No.4.
50	Washer, Flat.	100047-300	8	No.6.
51	Washer, Flat.	100047-500	4	No.10.
52				
53	Washer, Int. Tooth Lock.	100059-200	4	No.4.
54	Washer, Int. Tooth Lock.	100059-300	22	No.6.
55	Washer, Int. Tooth Lock.	100059-500	4	No.10.
56				
57	Nut, Hex.	100043-200	4	No.4.
58	Nut, Hex.	100043-300	8	No.6.
59	Nut, Hex.	100043-500	4	No.10.
60	TEST Procedure	201709-002	Ref.	
61	Assy. Power Supply.	200498	Ref.	Drawing only.
62				
63	List, Wire.	200514	Ref.	
64	TEST Procedure	200311	Ref.	
65	Pin, Connector. Male.	100021-003	4	
66				
67	Pin, " Female.	100021-005	7	
68	Pin, " Female.	100021-006	11	
69	Pin, " Male.	100021-007	2	
70	Pin, " Male.	100021-010	3	
71	Wire, Insulated.	100053-018	A/R	
72	Strap, Cable	100171-001	2	
73	Strap, Cable	100171-002	6	
74	Terminal, Quick Disconnect	100139-002	2	
75	Insulator	100232-001	2	USE WITH ITEM 74

B-1. Material List, Power Supply



B-2. Schematic, Power Supply





B-3 Assembly, Power Supply

MATERIAL LIST

ML | DRAWING NO. 200495 | REV. H

DRAWING TITLE: ASSY. POWER SUPPLY REGULATORS. MODEL NO. 10 DATE 7/24/70 SHEET 1 OF 4

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Board, Processed.	200497	1	
2	Heatsink.	200510	1	
3	Bracket, Support.	200515	2	
4	I.C. Voltage Regulator.	100108	3	U1.2.3.
5				
6	Transistor. PNP. 2N4125	100081	1	Q5.
7	Transistor. PNP. TI.P30	100113	3	Q1.3.6.
8	Transistor. NPN. 2N3055	100159	3	Q2.4.7.
9				
10				
11	Diode, Zener. 1N752	100118	1	VR2.
12	Diode, Rectifier. 1N4003	100127	2	CR2, CR1
13	Diode, Zener. 1N4736A	100161	1	VR1.
14	Rectifier, Silicon C. 40654	100162	1	SCR1.
15				
16	Capacitor, Ceramic. .001uf	100073-102	1	C12
17	Capacitor, Polyfilm. .01uf	100078-103	1	C8
18	Capacitor, Tantalum 1.5uf	100136-155	3	C5.6.10.
19	Capacitor, " 10uf	100070-106	1	C1.
20	Capacitor, " 47uf	100070-476	3	C4.9.11.
21	Capacitor, Polyfilm .022uf	100078-223	1	C2
22	Resistor, Variable. 500	100163-501	2	R2.21.
23	Resistor, " 1K	100163-102	1	R14.
24	RESISTOR 5%, 5W. .4	100111-004	1	R25
25	Resistor. 5%. 5w. .15	100111-002	1	R7.
26	Resistor. " " .2	100111-003	1	R11.
27	Resistor. " ¼w. 56	100156-560	1	R23
28	Resistor. " " 100	100156-101	4	R4.9.5,10.
29	Resistor. " 5w. 150	100111-151	1	R19.
30	Resistor. " ¼w. 330	100156-331	1	R20.
31	Resistor. " " 750	100156-751	1	R1.
32	Resistor. " " 1K	100156-102	1	R8.

MATERIAL LIST

ML | DRAWING NO. 200495 | REV. H

DRAWING TITLE: ASSY. POWER SUPPLY REGULATORS. MODEL NO. 10 DATE 7/24/70 SHEET 2 OF 4

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
33	Resistor. 5%. ¼w. 1.2K	100156-122	1	R23.
34	Resistor. " " 1.5K	100156-152	1	R12.
35	Resistor. " " 2K	100156-202	1	R13.
36	Resistor. " " 2.2K	100156-222	3	R3.6.16.
37	Resistor. " " 3K	100156-302	3	R15.18.24.
38	Resistor. " " 3.3K	100156-332	1	R17.
39				
40				
41				
42				
43				
44				
45	Pin, Male.	100021-002	9	J21 & J26.
46	Pin, Female.	100021-003	5	J21 & J26.
47	Pin, Test.	100098	4	TP1 thru TP4.
48	Pad, Transistor.	100223	1	Use with Item.14.
49	Insulator, Transistor.	100146	3	Use with Item.7
50	Insulator, Transistor.	100151	3	Use with Item.8.
51				
52	Washer, Flat	100251-100	9	No. 4.
53	Screw, Pan Head.	100036-308	2	6 - 32 x 3/8"
54	Screw, Pan Head.	100036-210	9	4 - 40 x 5/8"
55	Spring Lock Washer	100042-100	9	No.4.
56	Washer, Flat.	100047-200	9	No.4.
57	Washer, Nylon Shoulder.	100063-012	9	
58	Nut, Hex.	100043-200	9	4 - 40.
59	Nut, Hex.	100043-300	2	6 - 32.
60	Washer, Int. Tooth Lock.	100059-300	2	No.6.
61	Artwork, Master.	200496	REF	
62	Test Procedure.	200180	Ref.	

B-4. Material List, Power Supply Regulators

MATERIAL LIST

ML | DRAWING NO. 200495 | REV. H

DRAWING TITLE: ASSY. POWER SUPPLY REGULATORS. MODEL NO. 10 DATE 7/24/70 SHEET 1 OF 4

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Board, Processed.	200497	1	
2	Heatsink.	200510	1	
3	Bracket, Support.	200515	2	
4	I.C. Voltage Regulator.	100108	3	U1.2.3.
5				
6	Transistor. PNP. 2N4125	100081	1	Q5.
7	Transistor. PNP. TI.P30	100113	3	Q1.3.6.
8	Transistor. NPN. 2N3055	100159	3	Q2.4.7.
9				
10				
11	Diode, Zener. 1N752	100118	1	VR2.
12	Diode, Rectifier. 1N4003	100127	2	CR2, CR1
13	Diode, Zener. 1N4736A	100161	1	VR1.
14	Rectifier, Silicon C. 40654	100162	1	SCR1.
15				
16	Capacitor, Ceramic. .001uf	100073-102	1	C12
17	Capacitor, Polyfilm. .01uf	100078-103	1	C8
18	Capacitor, Tantalum 1.5uf	100136-155	3	C5.6.10.
19	Capacitor, " 10uf	100070-106	1	C1.
20	Capacitor, " 47uf	100070-476	3	C4.9.11.
21	Capacitor, Polyfilm .022uf	100078-223	1	C2
22	Resistor, Variable. 500	100163-501	2	R2.21.
23	Resistor, " 1K	100163-102	1	R14.
24	*RESISTOR 5%, 5W. .4*	*100111-004*	*1*	*R25*
25	Resistor. 5%. 5w. .15	100111-002	1	R7.
26	Resistor. " " .2	100111-003	1	R11.
27	Resistor. " ¼w. 56	100156-560	1	R23
28	Resistor. " " 100	100156-101	4	R4.9.5,10.
29	Resistor. " 5w. 150	100111-151	1	R19.
30	Resistor. " ¼w. 330	100156-331	1	R20.
31	Resistor. " " 750	100156-751	1	R1.
32	Resistor. " " 1K	100156-102	1	R8.

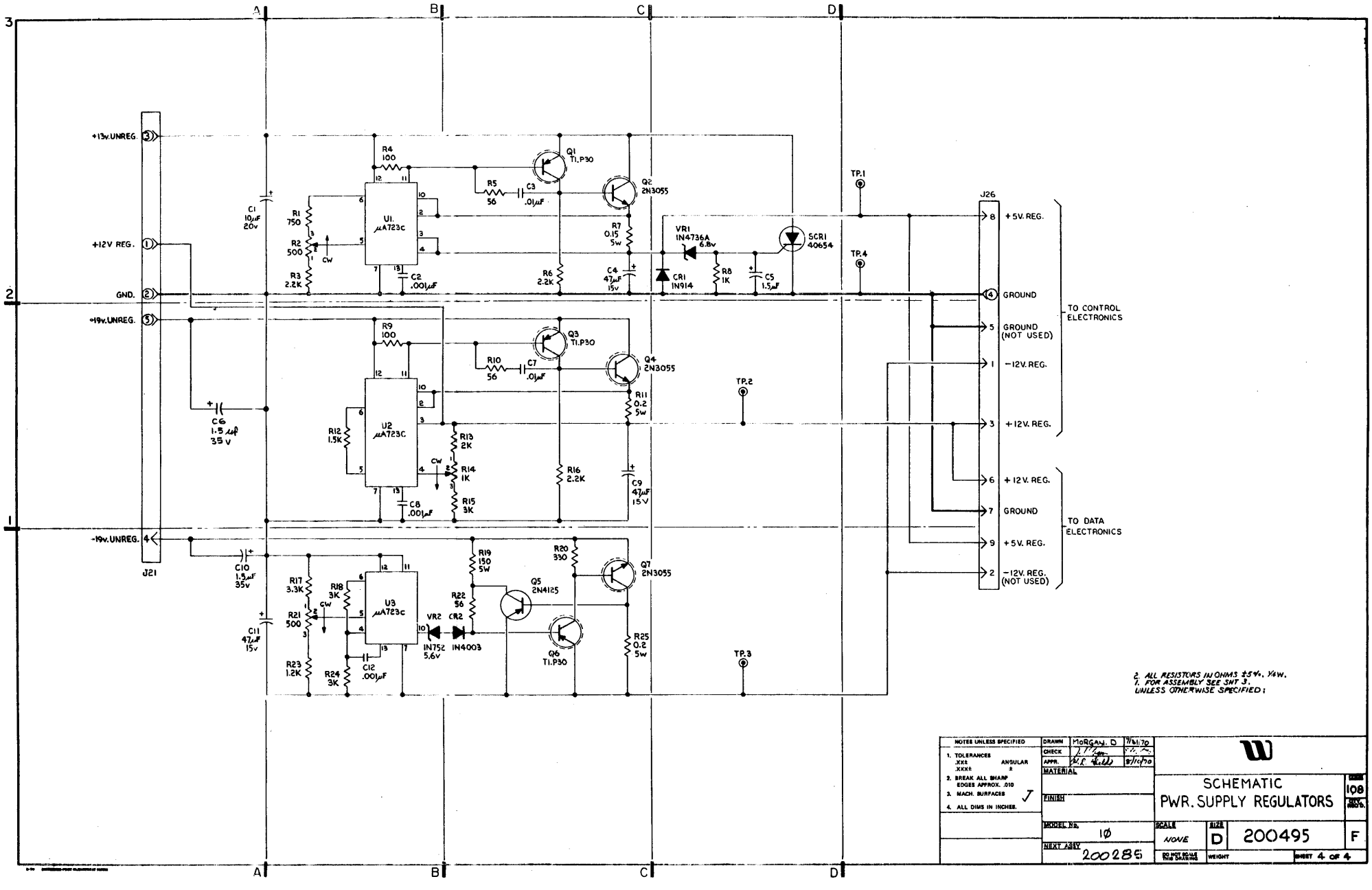
MATERIAL LIST

ML | DRAWING NO. 200495 | REV. H

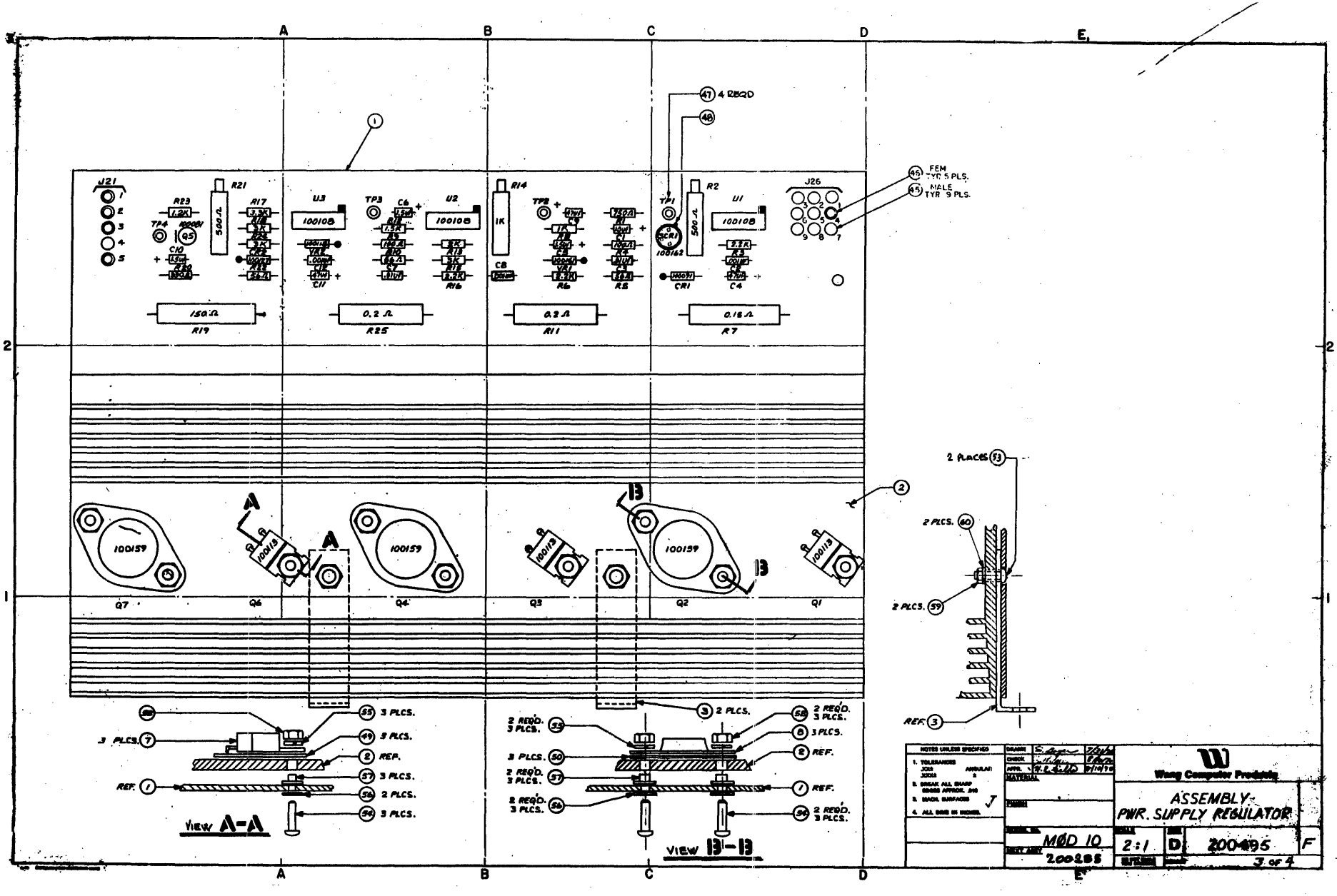
DRAWING TITLE: ASSY. POWER SUPPLY REGULATORS. MODEL NO. 10 DATE 7/24/70 SHEET 2 OF 4

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
33	Resistor. 5%. ¼w. 1.2K	100156-122	1	R23.
34	Resistor. " " 1.5K	100156-152	1	R12.
35	Resistor. " " 2K	100156-202	1	R13.
36	Resistor. " " 2.2K	100156-222	3	R3.6.16.
37	Resistor. " " 3K	100156-302	3	R15.18.24.
38	Resistor. " " 3.3K	100156-332	1	R17.
39				
40				
41				
42				
43				
44				
45	Pin, Male.	100021-001	9	J21 & J26.
46	Pin, Female.	100021-003	5	J21 & J26.
47	Pin, Test.	100098	4	TP1 thru TP4.
48	Pad, Transistor.	100223	1	Use with Item.14.
49	Insulator, Transistor.	100146	3	Use with Item.7
50	Insulator, Transistor.	100151	3	Use with Item.8.
51				
52	Washer, Flat	100251-100	9	No. 4.
53	Screw, Pan Head.	100036-308	2	6 - 32 x 3/8"
54	Screw, Pan Head.	100036-210	9	4 - 40 x 5/8"
55	Spring Lock Washer	100042-100	9	No.4.
56	Washer, Flat.	100047-200	9	No.4.
57	Washer, Nylon Shoulder.	100063-012	9	
58	Nut, Hex.	100043-200	9	4 - 40.
59	Nut, Hex.	100043-300	2	6 - 32.
60	Washer, Int. Tooth Lock.	100059-300	2	No.6.
61	Artwork, Master.	200496	REF	
62	Test Procedure.	200180	Ref.	

B-4. Material List, Power Supply Regulators

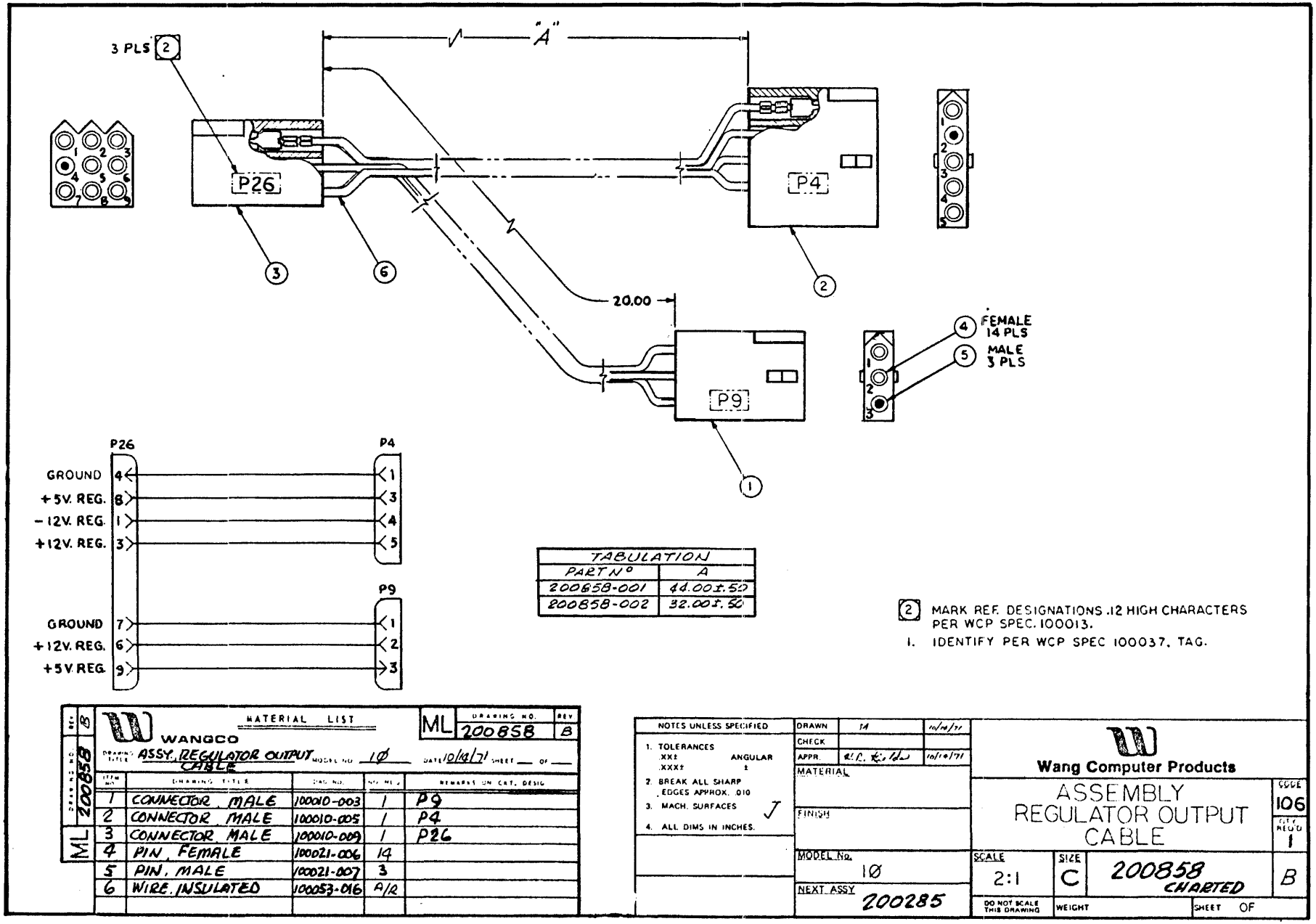


B-5 Schematic, Power Supply Regulators



B-6 Assembly, Power Supply Regulators

B-7. Deleted



TABULATION	
PART Nº	A
200658-001	44.00±.50
200858-002	32.00±.50

2 MARK REF. DESIGNATIONS .12 HIGH CHARACTERS PER WCP SPEC. 100013.

1. IDENTIFY PER WCP SPEC 100037, TAG.

MATERIAL LIST — WANGCO

ML 200858 B

ASSY, REGULATOR OUTPUT CABLE — MODEL NO. 10 — DATE 10/14/71 — SHEET __ OF __

ITEM NO.	DRAWING TITLE	DWG NO.	NO. REQ'D	REMARKS OR CAT. DESIG
1	CONNECTOR, MALE	100010-003	1	P9
2	CONNECTOR, MALE	100010-005	1	P4
3	CONNECTOR, MALE	100010-009	1	P26
4	PIN, FEMALE	100021-006	14	
5	PIN, MALE	100021-007	3	
6	WIRE, INSULATED	100053-016	A/R	

NOTES UNLESS SPECIFIED
1. TOLERANCES .XX± ANGULAR .XXX± ±
2. BREAK ALL SHARP EDGES APPROX. .010
3. MACH. SURFACES ✓
4. ALL DIMS IN INCHES.

DRAWN TA 10/14/71
CHECK
APPR. 10/14/71
MATERIAL
FINISH
MODEL No. 10
NEXT ASSY 200285

Wang Computer Products

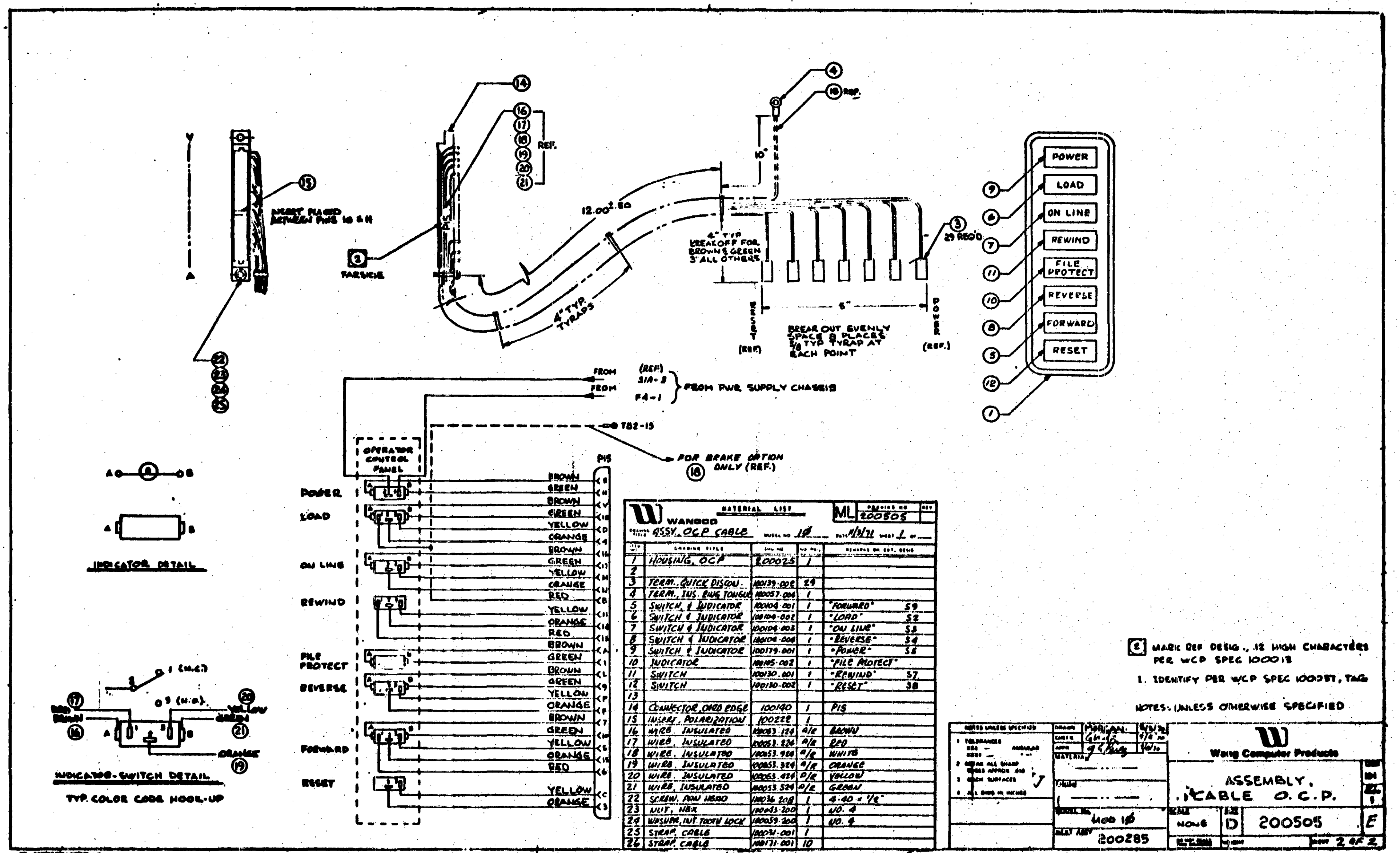
ASSEMBLY REGULATOR OUTPUT CABLE

CODE 106 — QTY REQ'D 1

SCALE 2:1 — SIZE C — 200858 CHARTED — B

DO NOT SCALE THIS DRAWING — WEIGHT — SHEET OF

B-8. Assembly Regulator Output Cable

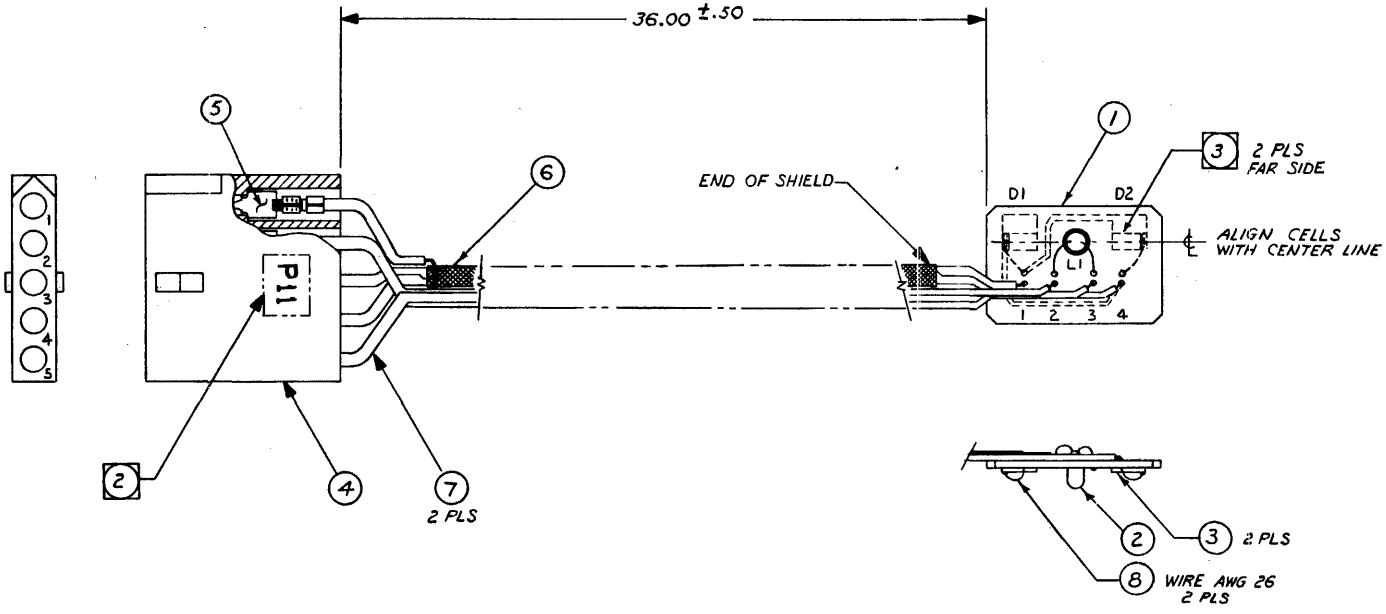


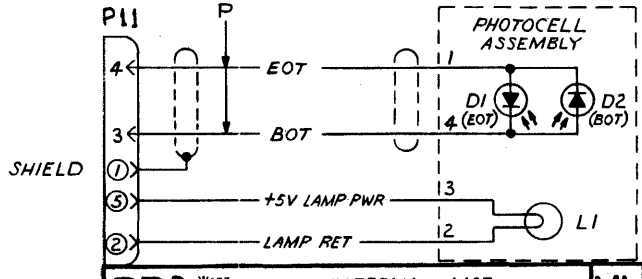
WANGCO MATERIAL LIST — ML 200505

Drawing title: ASSY. OCP CABLE — Model No. 10 — Date 11/3/71 — Sheet 1 of

Item No.	Drawing Title	Dwg No.	No. Req.	Remarks or Ckt. Desig.
1	HOUSING, OCP	200025	1	
2				
3	TERM., QUICK DISCON.	100139-002	29	
4	TERM., INS. RING TONGUE	100057-004	1	
5	SWITCH & INDICATOR	100104-001	1	"FORWARD" S9
6	SWITCH & INDICATOR	100104-002	1	"LOAD" S2
7	SWITCH & INDICATOR	100104-003	1	"ON LINE" S3
8	SWITCH & INDICATOR	100104-004	1	"REVERSE" S4
9	SWITCH & INDICATOR	100179-001	1	"POWER" S6
10	INDICATOR	100105-002	1	"FILE PROTECT"
11	SWITCH	100130-001	1	"REWIND" S7
12	SWITCH	100130-002	1	"RESET" S8
13				
14	CONNECTOR, CARD EDGE	100140	1	P15
15	INSERT, POLARIZATION	100222	1	
16	WIRE, INSULATED	100053-124	A/R	BROWN
17	WIRE, INSULATED	100053-224	A/R	RED
18	WIRE, INSULATED	100053-924	A/R	WHITE
19	WIRE, INSULATED	100053-324	A/R	ORANGE
20	WIRE, INSULATED	100053-424	A/R	YELLOW
21	WIRE, INSULATED	100053-524	A/R	GREEN
22	SCREW, PAN HEAD	100036-208	1	4-40 x 1/8"
23	NUT, HEX	100043-200	1	NO. 4
24	WASHER, INT. TOOTH LOCK	100059-200	1	NO. 4
25	STRAP, CABLE	100031-001	1	
26	STRAP, CABLE	100171-001	10	

B-9. Assembly, Cable OCP





(3) LOCATE & SOLDER CELLS PER ETCHED OUTLINE ON CKT BOARD.
(2) MARK REF DESIG .12 HIGH CHARACTERS PER WCP SPEC 100013.
1. IDENTIFY PER WCP SPEC 100037, TAG.
UNLESS OTHERWISE SPECIFIED;

Wang Computer Products

MATERIAL LIST

ML | DRAWING NO. 200164 | REV.

DRAWING TITLE ASSY, PHOTOSENSE PWB, MODEL NO. 7/10 DATE 2/28/70 SHEET 1 OF 2

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Board, Processed.	200163	1	
2	Lamp.	100809	1	
3	Cell, Solar.	100008	2	
4	Connector, Male.	100010-005	1	P11.
5	Pin, Connector. Female.	100021-005	5	
6	Wire, Twisted Shielded Pair.	100097	A/R	
7	Wire, Insulated.	100053-024	A/R	
8	Wire, Solid Bare.	100051-026	A/R	
9	Artwork, Master.	200162	REF.	

NOTES UNLESS SPECIFIED
1. TOLERANCES .XX± .50 ANGULAR .XXX± ±
2. BREAK ALL SHARP EDGES APPROX. .010
3. MACH. SURFACES
4. ALL DIMS IN INCHES.

DRAWN	JA	12/18/69
CHECK	Callahan	1/26/70
APPR.	P. Bruns	1.28.70
MATERIAL		
FINISH		
MODEL No.	MOD 10	
NEXT ASSY	200057	

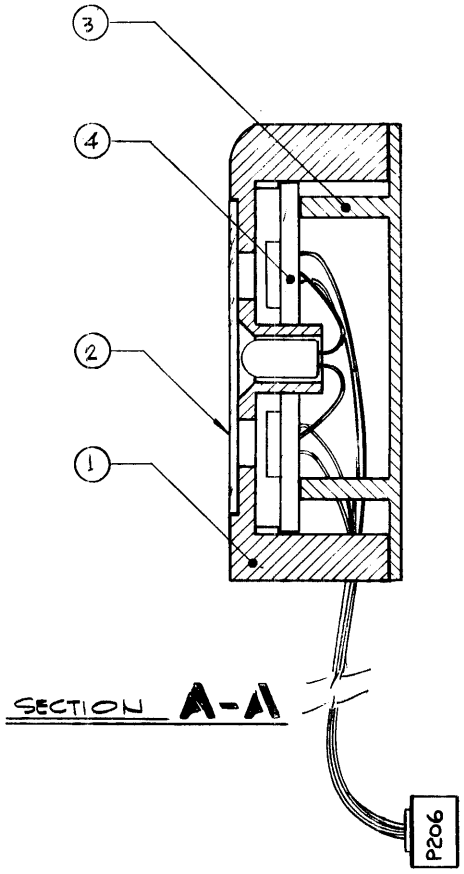
ASSEMBLY PHOTOSENSE

CODE 106 | QTY. REQ'D. 1

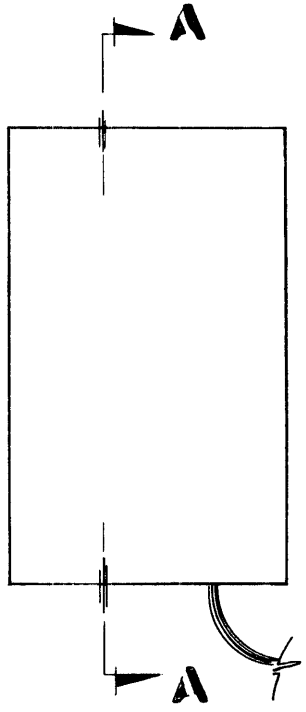
SCALE 2:1 | SIZE C | 200164 | D

DO NOT SCALE THIS DRAWING | WEIGHT —— | SHEET 2 OF 2

B-10 Assembly, Photosense, PWB



SECTION A-A



Wang Computer Products

MATERIAL LIST

ML | DRAWING NO. 200057 | REV.

DRAWING TITLE ASSY. PHOTOSENSE. BOT/EOT. MODEL NO. 10 DATE 12/18/69 SHEET 1 OF 2

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Housing.	200058	1	
2	Window.	200059	1	
3	Cover.	200060	1	
4	Assy. PWB.	200164	1	
5				

2. CEMENT COVER AND WINDOW (ITEMS (2) AND (3)) TO HOUSING (ITEM (1))

1. IDENTIFY PER WCP SPEC 100037, BAG.

NOTES: UNLESS OTHERWISE SPECIFIED.

NOTES UNLESS SPECIFIED			
1. TOLERANCES .XX± ANGULAR .XXX± ±	DRAWN	[signature]	12-23-69
2. BREAK ALL SHARP EDGES APPROX. .010	CHECK	[signature]	3/6/70
3. MACH. SURFACES √	APPR.	P. Bryer	3/6/70
4. ALL DIMS IN INCHES.	MATERIAL	— - —	
	FINISH	— - —	
	MODEL No.	1100 10	
	NEXT ASSY	200043	

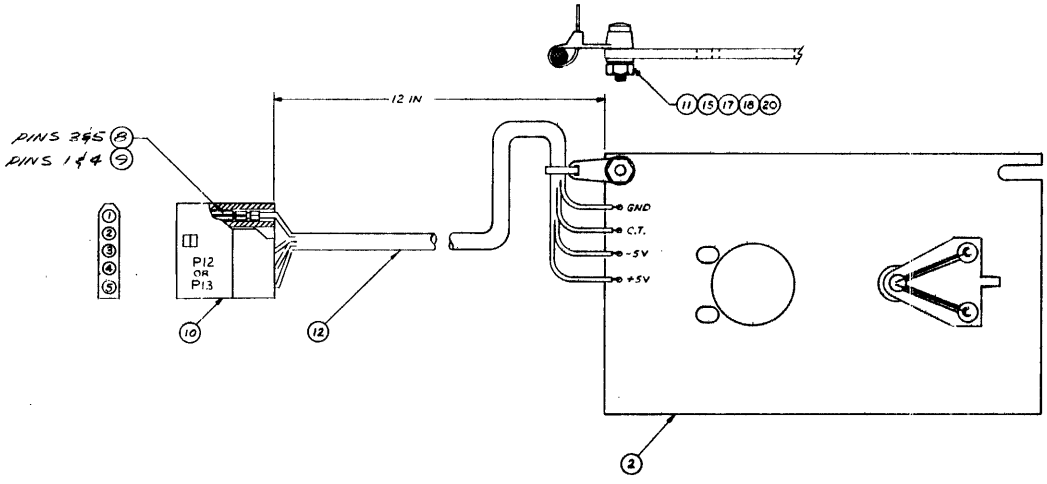
ASSY., PHOTOSENSE

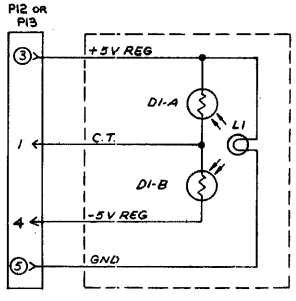
CODE 101 | QTY. REQ'D. 1

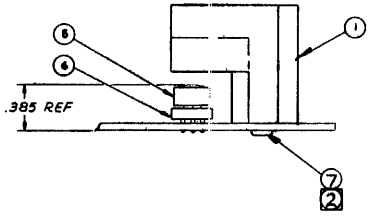
SCALE 4:1 | SIZE C | 2000057 | A

DO NOT SCALE THIS DRAWING | WEIGHT | SHEET 1 OF 2

B-10a Assembly, Photosense







MATERIAL LIST — ML — DRAWING NO. 200475 — REV.

DRAWING TITLE: ASSY, ARM SENSE — MODEL NO. 10 — DATE 10/70 — SHEET 1 OF 2

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS OR CKT. DESIG.
1	Assy, Arm Sense.	200475	1	
2	Board, Processed.	200473	1	
3				
4				
5	Photocell.	100175	1	C1.
6	Diode, Transistor.	100183	1	
7	Pin, Male.	100021-001	2	
8	Pin, Connector. Female.	100021-002	2	
9	Pin, Connector. Male.	100021-003	2	
10	Connector.	100020-001	1	P12 or P13
11	Strap, Cable.	100331-001	1	
12	Wire, Insulated.	100053-024	A/R	
13				
14				
15	Screw, Pan Head.	100036-208	1	4-40 x 1/2"
16				
17	Washer, Flat.	100061-200	1	#4 I.D.
18	Washer, Int. Tooth Lock.	100057-200	1	#4 I.D.
19				
20	Nut, Hex.	100043-200	1	4-40.
21				
22	Artwork, Master.	200473	Ref.	

(2) TO BE SWAGED & SOLDERED IN PLACE

1. IDENTIFY ASSEMBLY PER WCP SPEC 100037 (BAG).

NOTES: UNLESS OTHERWISE SPECIFIED.

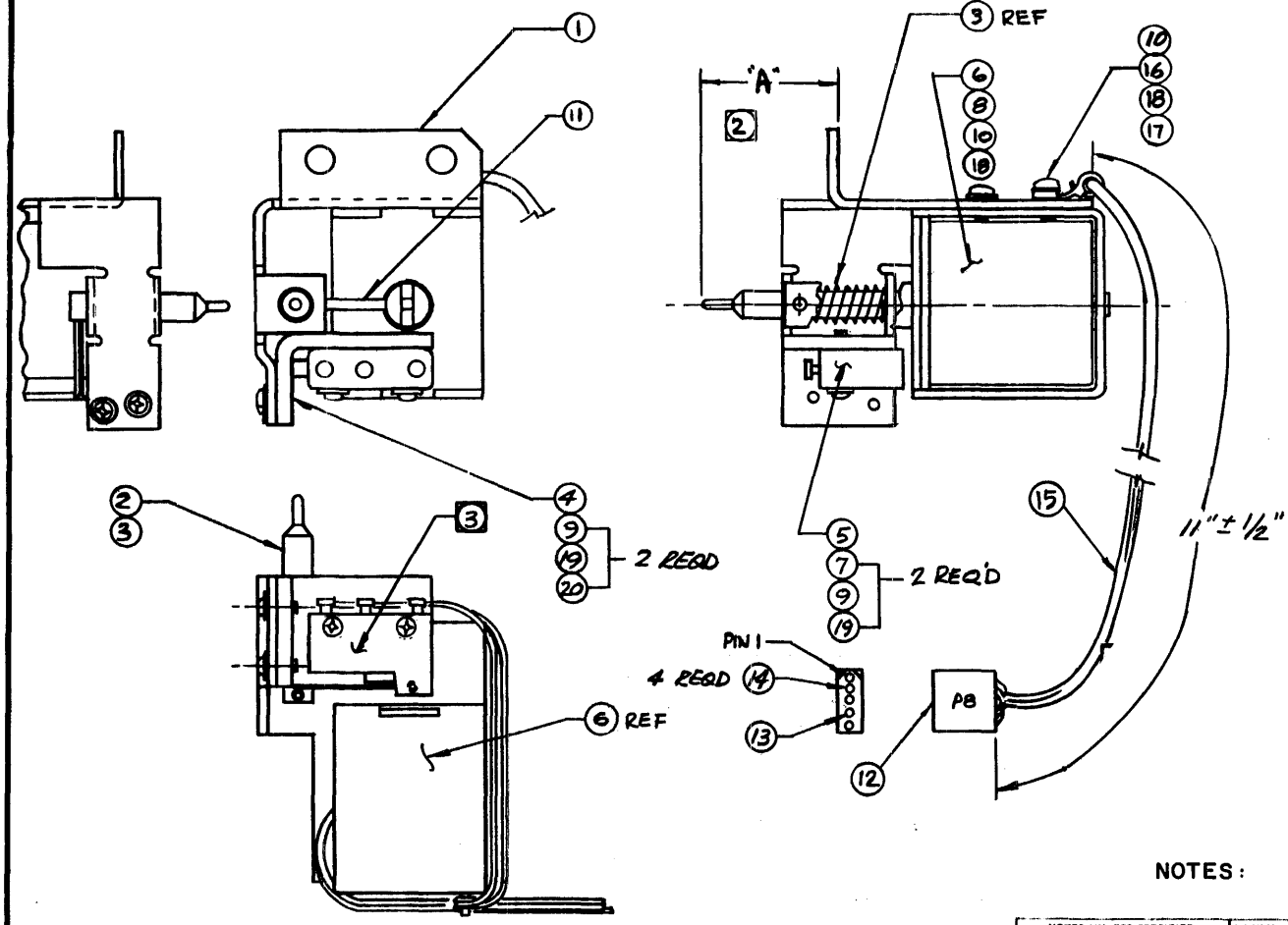
NOTES UNLESS SPECIFIED			
1. TOLERANCES .XX± .XXX± ANGULAR ±	DRAWN	L. Aguirre	6-24-70
2. BREAK ALL SHARP EDGES APPROX. .010	CHECK	[illegible]	8/ /70
3. MACH. SURFACES J	APPR.	[illegible]	8/10/70
4. ALL DIMS IN INCHES.	MATERIAL		
	FINISH		
	MODEL No.	MOD 10	
	NEXT ASSY	200500	

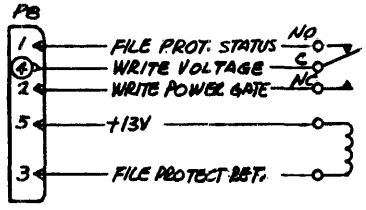
ASSEMBLY, ARM SENSE — CODE 101 — QTY REQD. 2

SCALE 2:1 — SIZE D — 200475 — E

DO NOT SCALE THIS DRAWING — WEIGHT — SHEET 2 OF 2

B-11 Assembly, Arm Sense





Wang Computer Products

MATERIAL LIST

ML | DRAWING NO. 200378 | J

DRAWING TITLE: ASSY. WRITE/ENABLE SWITCH. MODEL NO. 7/10 DATE 4/21/70 SHEET 1 OF 2

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS OR CKT. DESIG.
1	Bracket, Solenoid.	200145	1	
2	Actuator-Pin.	200144	1	
3	Spring.	200146	1	
4	Brkt., Switch Mounting	200124	1	
5	Switch, Micro.	100071	1	
6	Solenoid.	100062-001	1	
7	Screw, Pan Head.	100036-106	2	2 - 56 x 3/8
8	Screw, Pan Head.	100036-304	1	6 - 32 x 1/4
9	Washer, Int. Tooth Lock.	100059-100	2	No.2.
10	Washer, " " "	100059-300	2	No.6.
11	Pin, Groove.	100032-316	1	
12	Connector. Female	100102-003	1	P8.
13	Pin, Connector. Female.	100100-003	1	
14	Pin, " Male.	100100-004	4	
15	Wire, Insulated.	100053-022	A/R	
16	Screw, Pan Head.	100036-307	1	6-32 x 7/16
17	Strap, Cable.	100011-002	1	
18	Washer, Flat.	100047-300	2	No.6.
19	Washer, Flat.	100047-100	4	No.2.
20	Screw, Pan Head	100036-104	2	2 - 56 x 1/4

4 LUBRICATE ALL SLIDING SURFACES WITH SILICONE GREASE, 100409, DOW NO. 111

3 ITEM 5, SWITCH MUST RELEASE WITH PLUNGER ENERGIZED AND ACTUATE WITH PLUNGER DE-ENERGIZED.

2 WITH SOLENOID, ITEM 5, ENERGIZED DIM "A" = .67±.01

NOTES: 1 IDENTIFY WITH WCP SPEC 100037, TAG.

NOTES UNLESS SPECIFIED		
1. TOLERANCES .XX± ANGULAR .XXX± ±	DRAWN	
2. BREAK ALL SHARP EDGES APPROX. .010	CHECK	4/22/70
3. MACH. SURFACES J	APPR.	4/22/70
4. ALL DIMS IN INCHES.	MATERIAL	
	FINISH	
	MODEL No. MOD 7/10	
	NEXT ASSY 200285	

Wangco Incorporated

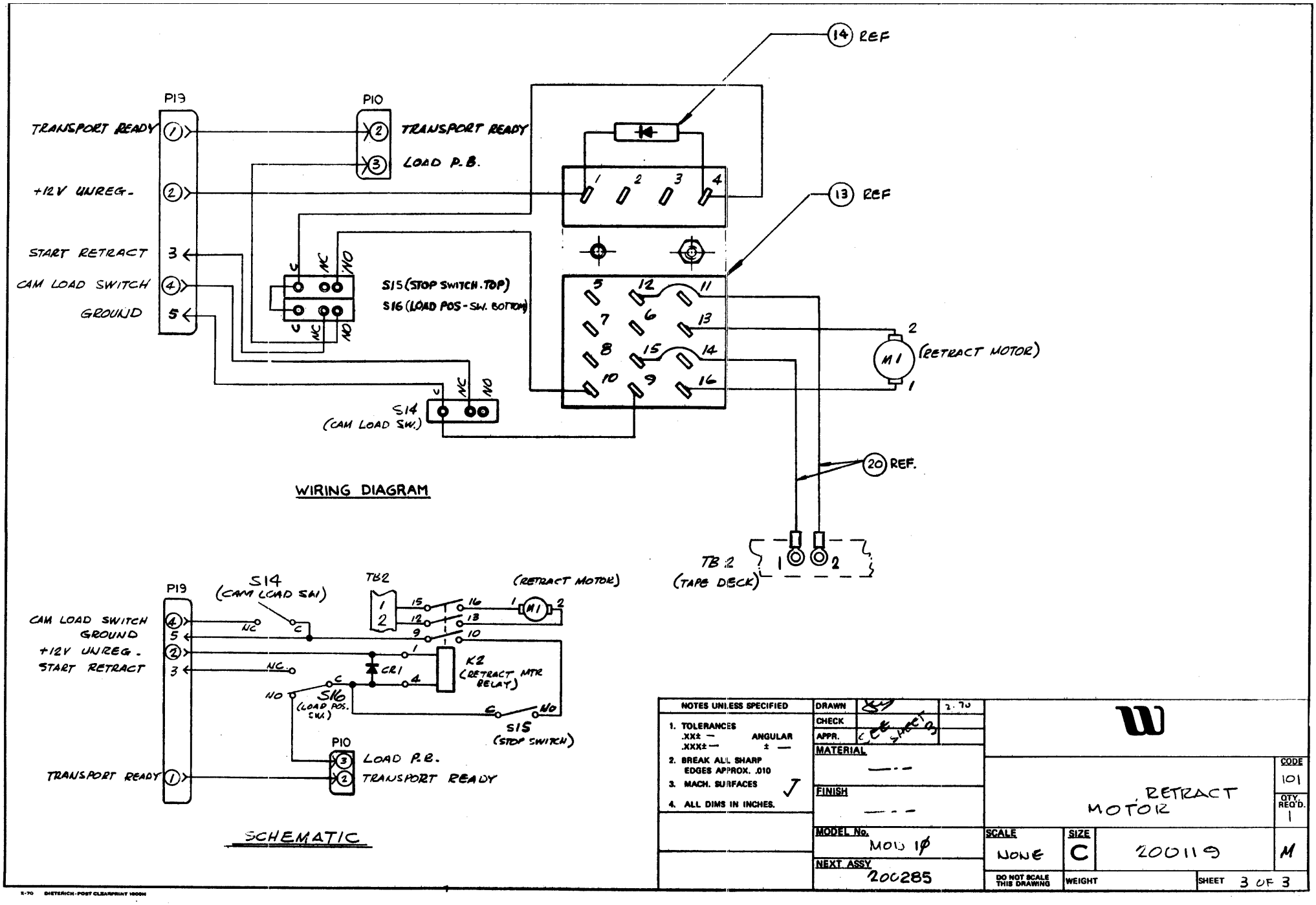
ASSY., WRITE ENABLE SW.

CODE 101 | QTY. REQ'D.

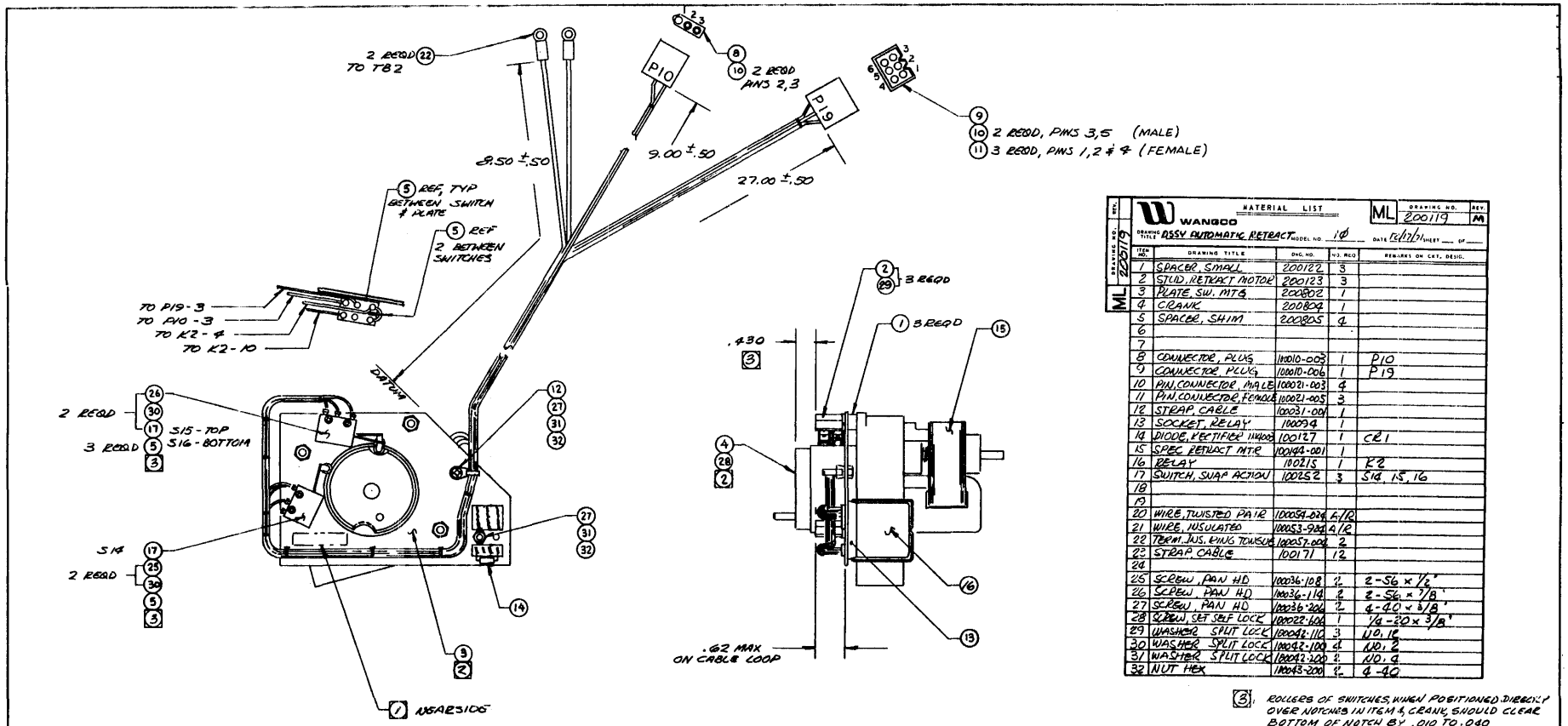
SCALE 2:1 | SIZE | 200378 | J

DO NOT SCALE THIS DRAWING | WEIGHT | SHEET 2 OF 2

B-12. Assembly, Write/Enable Switch



B-13. Schematic, Retract Motor



MATERIAL LIST — WANGCO — ML 200119 — REV. M

DRAWING TITLE: ASSY AUTOMATIC RETRACT — MODEL NO. 10 — DATE 12/12/73 — SHEET ___ OF ___

DRAWING NO. 200119 — REV. M

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
1	SPACER, SMALL	200122	3	
2	STUD, RETRACT MOTOR	200123	3	
3	PLATE, SW. MTG	200802	1	
4	CRANK	200804	1	
5	SPACER, SHIM	200805	4	
6				
7				
8	CONNECTOR, PLUG	100010-003	1	P10
9	CONNECTOR PLUG	100010-006	1	P19
10	PIN, CONNECTOR, MALE	100021-003	4	
11	PIN, CONNECTOR, FEMALE	100021-005	3	
12	STRAP, CABLE	100031-004	1	
13	SOCKET, RELAY	100094	1	
14	DIODE, RECTIFIER 1N4002	100127	1	CR1
15	SPEC RETRACT MTR	100144-001	1	
16	RELAY	100215	1	K2
17	SWITCH, SNAP ACTION	100252	3	S14, 15, 16
18				
19				
20	WIRE, TWISTED PAIR	100059-026	A/R	
21	WIRE, INSULATED	100053-926	A/R	
22	TERM. INS. KING TOMSUE	100057-004	2	
23	STRAP, CABLE	100171	12	
24				
25	SCREW, PAN HD	100036-108	2	2-56 x 1/8"
26	SCREW, PAN HD	100036-114	2	2-56 x 3/8"
27	SCREW, PAN HD	100036-206	2	4-40 x 3/8"
28	SCREW, SET SELF LOCK	100022-106	1	1/4-20 x 3/8"
29	WASHER SPLIT LOCK	100042-110	3	NO. 10
30	WASHER SPLIT LOCK	100042-100	4	NO. 2
31	WASHER SPLIT LOCK	100042-200	4	NO. 4
32	NUT HEX	100043-200	4	4-40

(3) ROLLERS OF SWITCHES, WHEN POSITIONED DIRECTLY OVER NOTCHES IN ITEM 4, CRANK, SHOULD CLEAR BOTTOM OF NOTCH BY .010 TO .040

(2) 2.00 DIA HOLE IN ITEM 3 TO BE INSTALLED CONCENTRIC TO MOTOR SHAFT WITHIN ±.005

(1) IDENTIFY ASSY PER WCP SPEC 1000.37.

NOTES: UNLESS OTHERWISE SPECIFIED

NOTES UNLESS SPECIFIED			
1. TOLERANCES .XX± .XXX± ANGULAR ±	DRAWN	M.D'AMATO	12.6.73
2. BREAK ALL SHARP EDGES APPROX. .010	CHECK	M.KRAWIEC	1.3.74
3. MACH. SURFACES ✓	APPR.	BREYER	1.3.74
4. ALL DIMS IN INCHES.	MATERIAL		
	FINISH		
	MODEL No.	10	
	NEXT ASSY	200285	

Wang Computer Products

ASSY, RETRACT MOTOR

CODE 101 — ASY REQD. 1

SCALE — SIZE D — 200119 — M

DO NOT SCALE THIS DRAWING — WEIGHT — SHEET 2 OF 3

B-14. Assembly, Retract Motor

MATERIAL LIST

ML | DRAWING NO. 200500 | REV. G

DRAWING TITLE: ASSY. RETRACT MOTOR. REEL BRAKE OPTION. MODEL NO. 10 DATE 12/17/71 SHEET 1 OF 4

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Assy. Brake Logic PWB.	200518	1	
2				
3	Spacer, Small.	200122	3	
4	Stud, Retract Motor.	200123	3	
5	Plate, Switch Mounting.	200603	1	
6	Crank.	200804	1	
7	Spacer, Shim.	200805	5	
8				
9				
10				
11	Connector, Jack.	100010-002	2	J24.J25.
12	Connector, Plug.	100010-003	1	P10.
13	Connector, Plug.	100010-006	1	P19.
14	Pin, Connector. Male.	100021-003	8	
15	Pin, Connector. Female.	100021-005	4	
16	Strap, Cable.	100031-001	1	
17				
18	Wire, Insulated.	100053-924	A/R	
19	Wire, Twisted Pair.	100054-024	A/R	
20	Terminal, Ins. Ring Tongue.	100057-004	3	
21	Socket, Relay.	100094	2	
22	Pin, Connector. Female.	100100-003	6	
23	Pin, Connector. Male.	100100-004	3	
24	Connector, Plug.	100102-002	1	P22.
25	Connector, Plug.	100102-003	1	P23.
26	Diode, Rectifier. 1N4003	100127	2	CR1. CR2.
27	Spec. Retract Motor.	100144-001	1	
28	Strap, Cable.	100171-001	17	
29	Relay.	100215	2	K2. K3.
30	Switch, Snap Action.	100252	4	S12.13.14.15.
31	Varistor.	100392	1	VAR.1.
32	Tubing, Shrink.	100185-003	A/R	

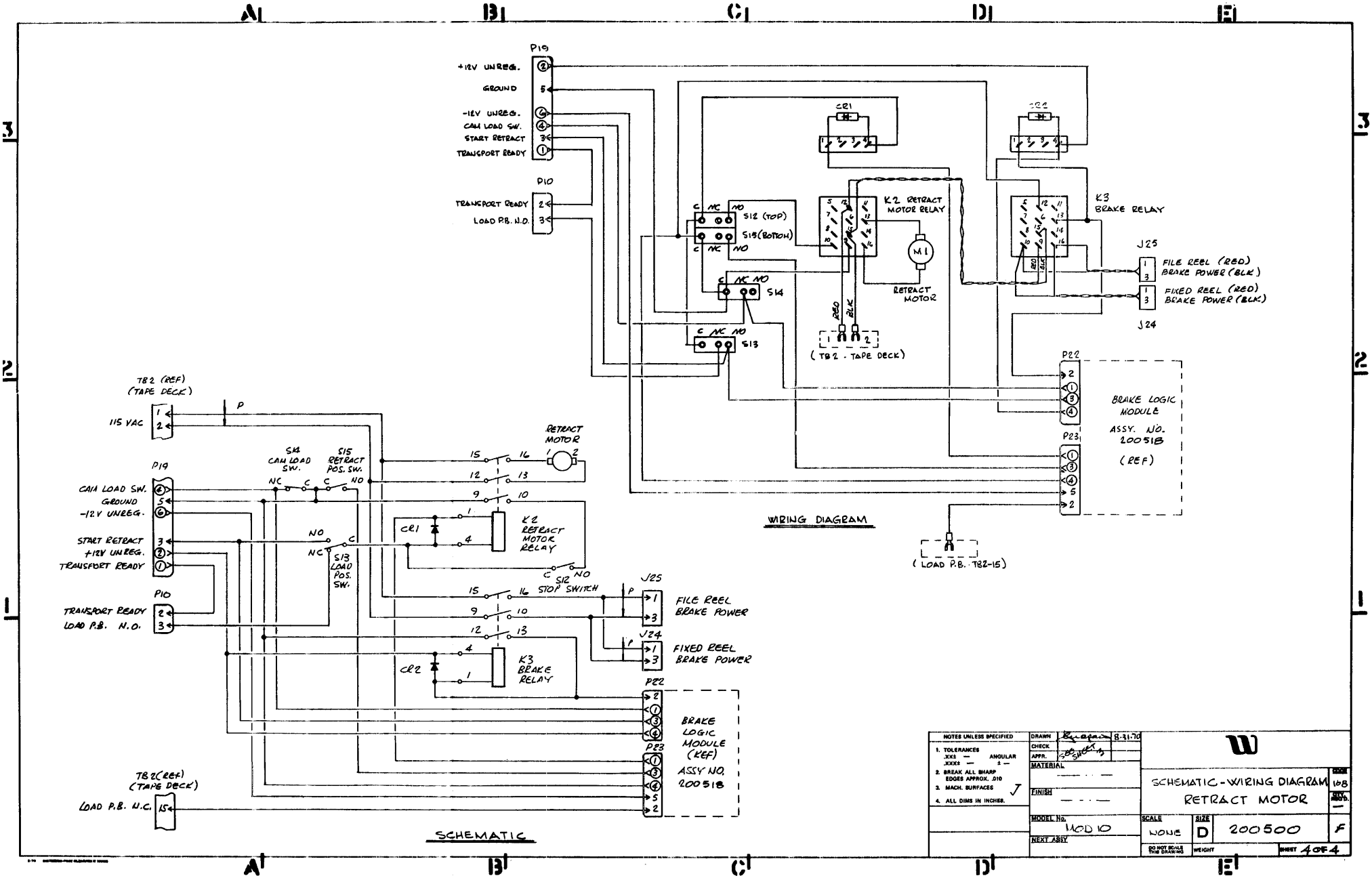
MATERIAL LIST

ML | DRAWING NO. 200500 | REV. G

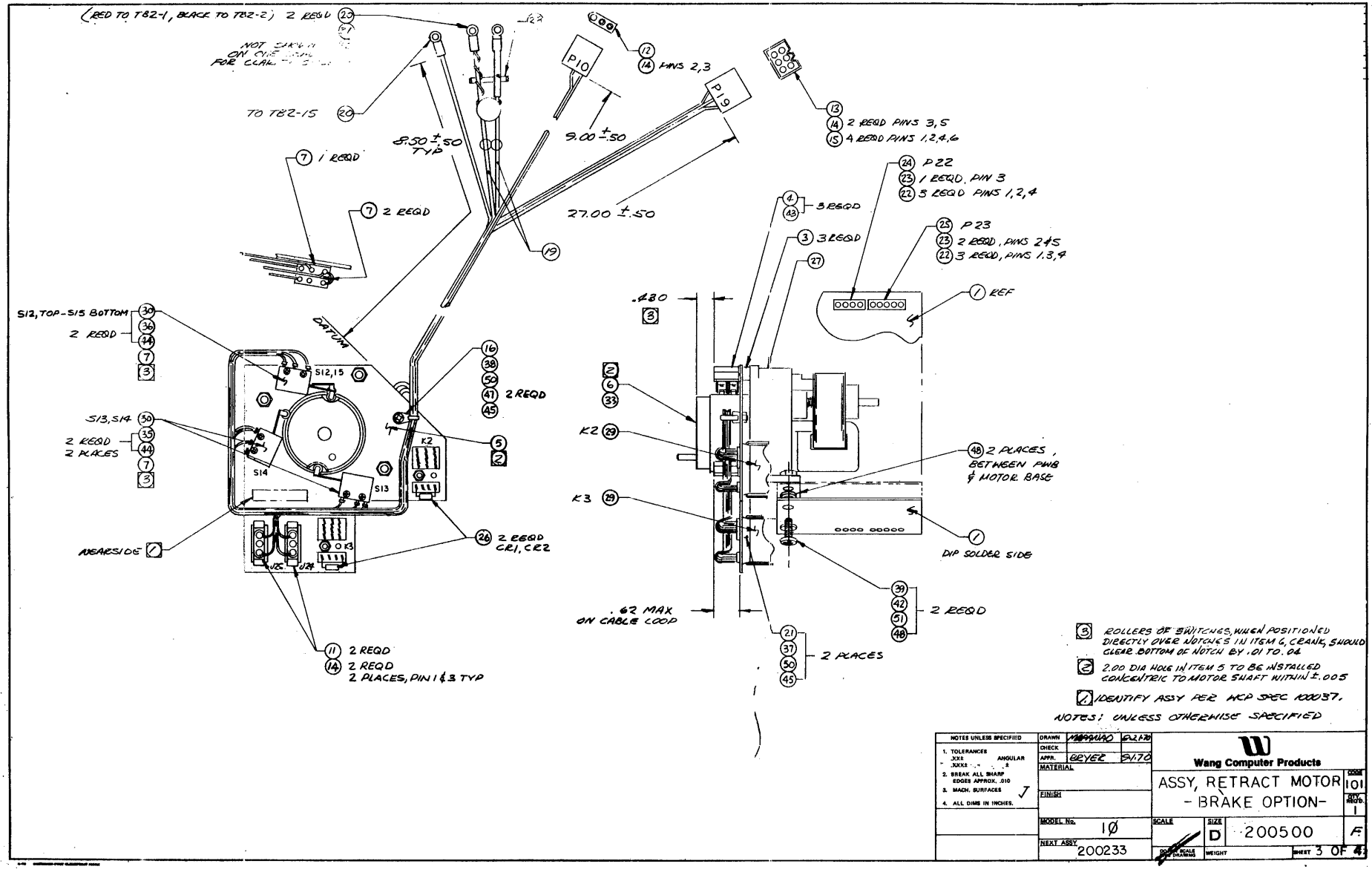
DRAWING TITLE: ASSY. RETRACT MOTOR. REEL BRAKE OPTION. MODEL NO. 10 DATE 12/17/71 SHEET 2 OF 4

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
33	Screw, Set. Self Locking.	100022-606	1	1/4-20 x 3/8"
34				
35	Screw, Pan Head.	100036-108	4	2-56 x 1/2"
36	Screw, " "	100036-114	2	2-56 x 7/8"
37	Screw, " "	100036-206	3	4-40 x 3/8"
38	Screw, " "	100036-207	1	4-40 x 7/16"
39	Screw, Pan Head.	100036-508	2	10-32 x 1/2"
40				
41				
42	Washer, Split Lock.	100042-500	2	No.10.
43	Washer, Split Lock.	100042-110	3	No.12.
44	Washer, Split Lock.	100042-100	6	No.2.
45	Washer, Int. Lock.	100042-200	3	No.4.
46				
47	Washer, Flat.	100047-200	2	No.4.
48	Washer, Flat.	100047-500	4	No.10.
49				
50	Nut, Hex.	100043-200	3	4-40.
51	Nut, Hex.	100043-500	2	No.10.

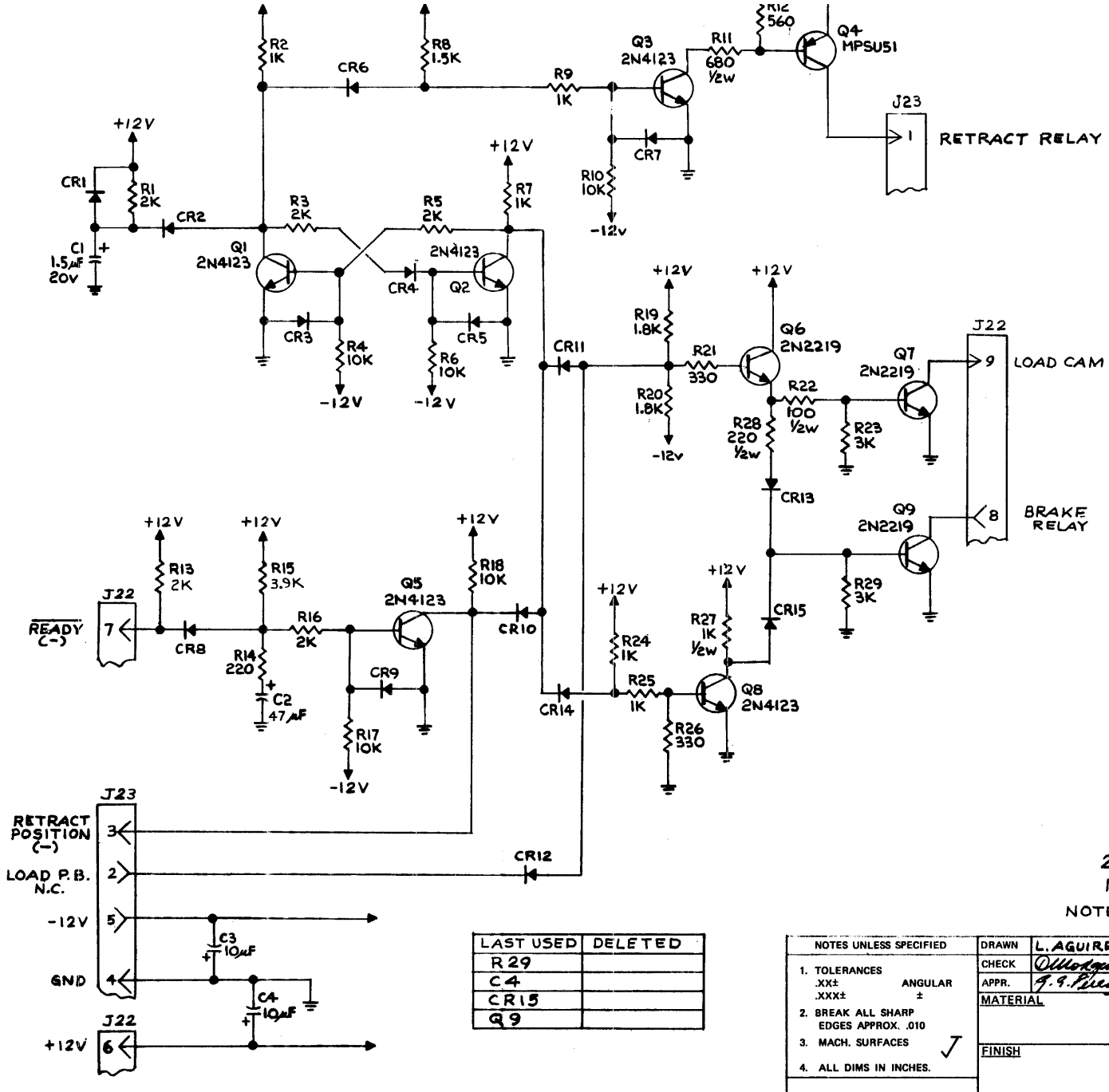
B-15. Material List, Retract Motor, Brake Option



B-16 Schematic, Retract Motor, Brake Option



B-17 Assembly, Retract Motor Brake Option



2. ALL RESISTORS IN OHMS ¼W ± 5%
1. ALL DIODES TO BE IN914.
NOTES: UNLESS OTHERWISE SPECIFIED.

LAST USED	DELETED
R29	
C4	
CR15	
Q9	

B-18 Schematic, Brake Logic

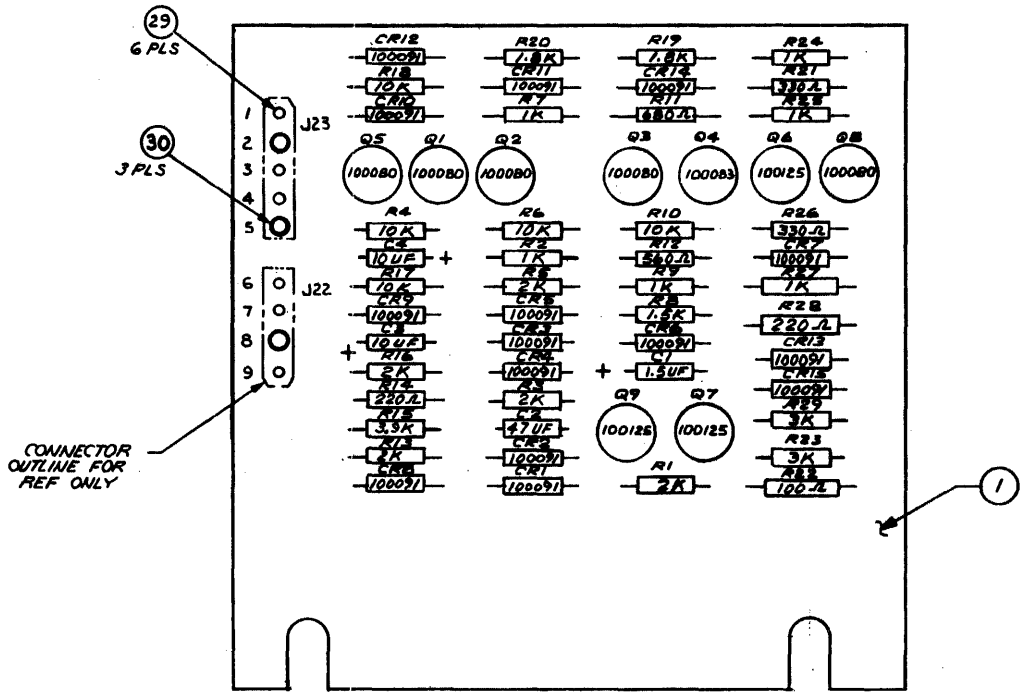
NOTES UNLESS SPECIFIED			
1. TOLERANCES .XX± ANGULAR .XXX± ±	DRAWN	L. AGUIRRE	8-11-70
2. BREAK ALL SHARP EDGES APPROX. .010	CHECK	Ollokgun	9/1/70
3. MACH. SURFACES ✓	APPR.	J. J. Pires	9/10/70
4. ALL DIMS IN INCHES.	MATERIAL		
	FINISH		
	MODEL No.	10	
	NEXT ASSY	200500	

SCHEMATIC
BRAKE LOGIC

CODE 108 | QTY. REQ'D.

SCALE | SIZE C | 200518 | B

DO NOT SCALE THIS DRAWING | WEIGHT | SHEET 3 OF 3



MATERIAL LIST

ML | DRAWING NO. 200518 | REV. B

DRAWING TITLE: ASSY, BRAKE LOGIC PWB. MODEL NO. 10 DATE 8/13/70 SHEET 1 OF 3

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Board, Processed.		200524	1	
2	Artwork, Master.		200523	REF	
3	Transistor. NPN.	2N4123	100080	5	Q1.2.3.5.8.
4	Transistor. PNP.	MPS.U51	100083	1	Q4.
5	Transistor. PNP.	2N2219	100125	3	Q6.7.9.
6					
7	Diode, Signal.	1N914	100091	15	CR1.2.3.4.5.6.7.8.9.10.11.
					CR12.13.14.15.
8					
9	Capacitor, Tantalum.	1.5uf	100136-155	1	C1.
10	Capacitor, "	10uf	100070-106	2	C3.4.
11	Capacitor, "	47uf	100070-476	1	C2.
12					
13	Resistor. 5%. ¼w.	100	100064-101	1	R22.
14	Resistor. " "	220	100064-221	1	R28.
15	Resistor. " ½w.	220	100156-221	1	R14.
16	Resistor. " "	330	100156-331	2	R21.26.
17	Resistor. " "	560	100156-561	1	R12.
18	Resistor. " ¼w.	680	100064-681	1	R11.
19	Resistor. " "	1K	100064-102	1	R27.
20	Resistor. " ½w.	1K	100156-102	5	R2.7.9.24.25.
21	Resistor. " "	1.5K	100156-152	1	R8.
22	Resistor. " "	1.8K	100156-182	2	R19.20.
23	Resistor. " "	2K	100156-202	5	R1.3.5.13.16.
24	Resistor. " "	3K	100156-302	2	R23.29.
25	Resistor. " "	3.9K	100156-392	1	R15.
26	Resistor. " "	10K	100156-103	5	R4.6.10.17.18.
27					
28	Insulator, Transistor.		100223	3	Use with items 5.
29	Pin, Male.		100098	6	
30	Pin, Female.		100099	3	
31	Specification, Test.		200537	REF	

NOTES UNLESS SPECIFIED:
1. TOLERANCES .XX± ANGULAR .XXX± ±
2. BREAK ALL SHARP EDGES APPROX. .010
3. MACH. SURFACES
4. ALL DIMS IN INCHES.

DRAWN S. Boyer 8/3/70 | CHECK SK 8/4/70 | APPR. G.A. Bixby 8/10/70

MATERIAL

FINISH

MODEL No. MØD 10

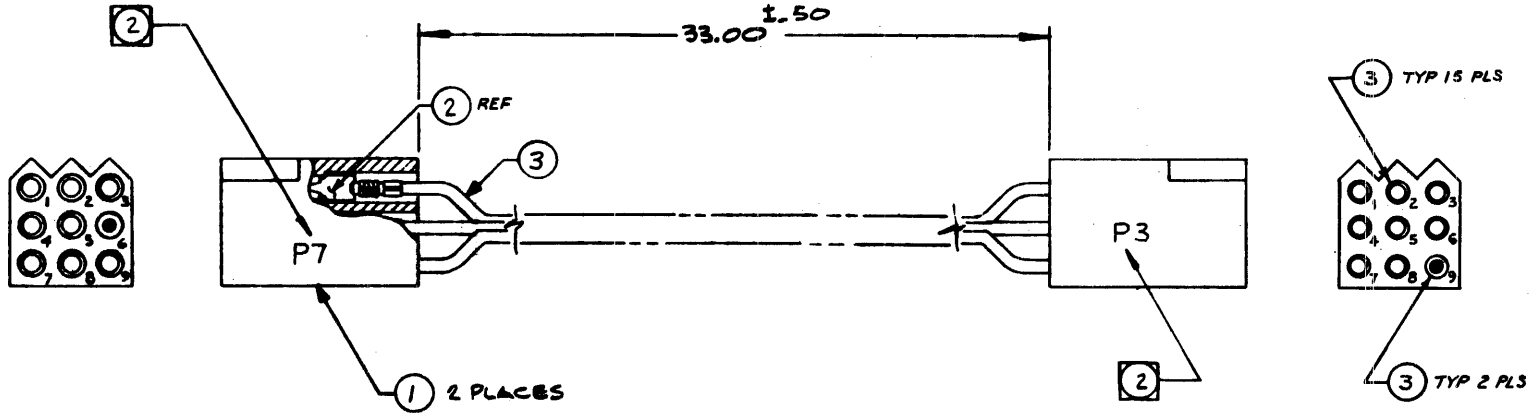
NEXT ASSY 200500

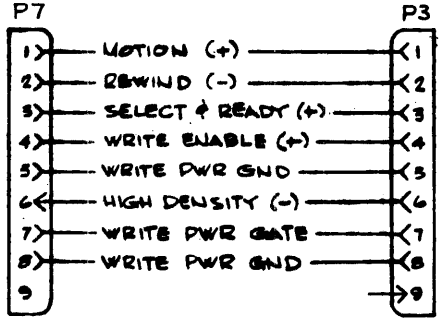
ASSEMBLY, BRAKE LOGIC

CODE 101 | QTY. REQ'D. 1

SCALE 2:1 | SIZE C | 200518 | B

DO NOT SCALE THIS DRAWING | WEIGHT | SHEET 2 OF 3





2. MARK REF DESIG. .12 HIGH CHARACTERS PER WCP SPEC 100013.

1. IDENTIFY PER WCP SPEC 100057 .TAG

UNLESS OTHERWISE SPECIFIED:

MATERIAL LIST — ML — DRAWING NO. 200504 — REV. C

DRAWING TITLE: ASSY. DATA CONTROL CABLE. MODEL NO. 16 DATE 7/16/70 SHEET 1 OF 2

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Connector, Male.	100010-009	2	P7,3
2	Pin, Female.	100021-006	16	
3	Pin, Male.	100021-007	2	
4	Wire, Insulated.	100053-018	A/R	

NOTES UNLESS SPECIFIED
1. TOLERANCES .XX± .50 ANGULAR .XXX± ±
2. BREAK ALL SHARP EDGES APPROX. .010
3. MACH. SURFACES ✓
4. ALL DIMS IN INCHES.

DRAWN 7/15/70 — CHECK 7/16/70 — APPR.

MATERIAL

FINISH

MODEL No. MOD 10

NEXT ASSY 200499

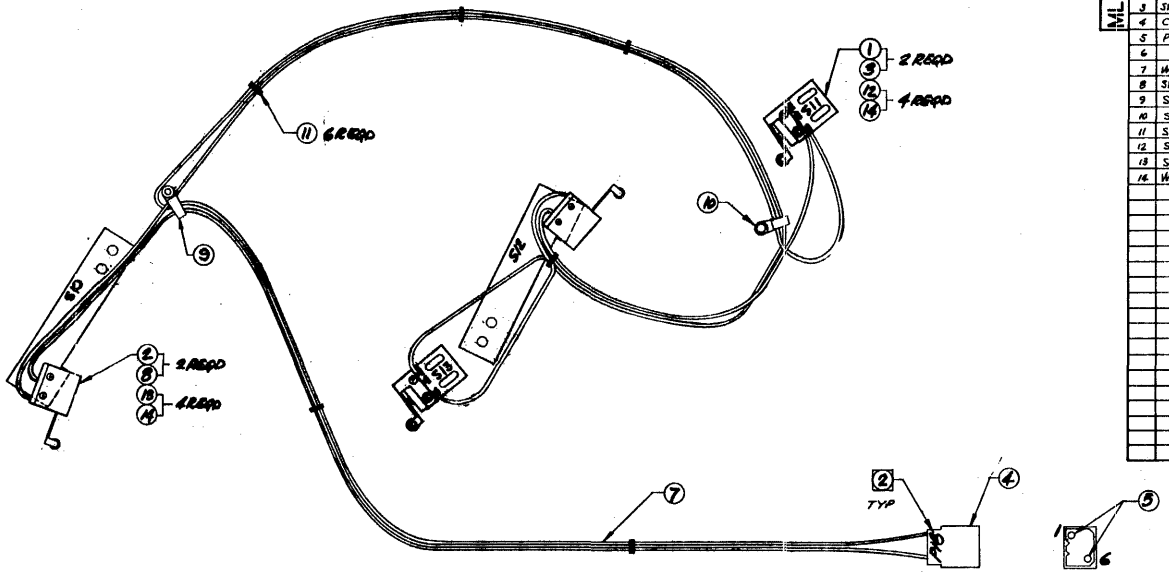
ASSEMBLY, DATA CONTROL CABLE

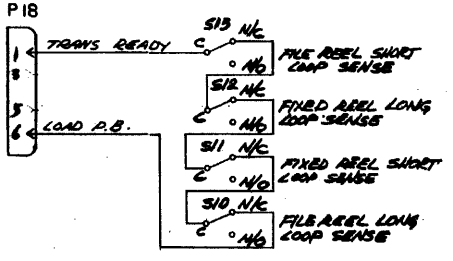
CODE 101 — QTY. REQ'D. 1

SCALE 2:1 — SIZE C — 200504 — C

DO NOT SCALE PRINT — WEIGHT — SHEET 2 OF 2

B-20 Assembly, Data Control Cable





MATERIAL LIST

WANGCO

ML DRAWING NO. 200550 REV.

DRAWING TITLE ASSY. MICRO SWITCH HARNESS MODEL NO. 10 DATE 5/30/72 SHEET 1 OF

ITEM NO.	DRAWING TITLE	DRG. NO.	NO. REQ.	REMARKS OR CKT. DESIG.
1	BRACKET, SWITCH MOUNTING	200017	2	
2	BRACKET, SWITCH MOUNTING	201170	2	
3	SWITCH, SNAP ACTION	100012	2	S11, S13
4	CONNECTOR	10010-006	1	P12
5	PIN, MALE	10021-003	2	
6				
7	WIRE, INSULATED	100053-926	A/R	
8	SWITCH, SNAP ACTION	100252	2	S10, S12
9	STRAP, CABLE	10031-001	1	
10	STRAP, CABLE	10031-003	1	
11	STRAP, CABLE	10171-001	6	
12	SCREW, PAN HEAD	10036-106	4	2-56 x 3/8
13	SCREW, PAN HEAD	10036-107	4	2-56 x 7/16
14	WASHER, SPLIT LOCK	10042-100	8	NO. 2

WIRE LIST

WIRE NO	TERM	FROM	TO	TERM	LENGTH
1	(5)	P18-1	S13-C	SOL	43.50
2	(5)	P18-6	S10-NC	SOL	21.50
3	SOL	S12-C	S13-NC	SOL	6.50
4	SOL	S12-NC	S11-C	SOL	14.00
5	SOL	S10-C	S11-NC	SOL	28.00

[2] MARK REF DESIGNATION AS SHOWN COLOR BLACK, PER W.C.P. SPEC. 100013. SWITCH NUMBERS SHOWN FOR REF ONLY.

[1] IDENTIFY PER WCP SPEC 100037

NOTES: UNLESS OTHERWISE SPECIFIED

NOTES UNLESS SPECIFIED
1. TOLERANCES XX ± 1/64" XXX ± .010 ANGULAR ± 1°
2. BREAK ALL SHARP EDGES APPROX. .010
3. MACH. SURFACES
4. ALL DIMS IN INCHES

DRAWN L. AGUIRRE 4-21-70
CHECK [illegible] 5-26-70
APPR.
MATERIAL
FINISH
MODEL NO. 10
NEXT ASSY 200499

Wang Computer Products

ASSY MICRO SWITCH HARNESS

SCALE NONE SIZE D 200550 REV. C

DO NOT SCALE THIS DRAWING WEIGHT SHEET 2 OF 2

B-21 Assembly, Micro Switch Harness

MATERIAL LIST

ML 200488 - 000

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. BASIC BOARD. MODEL NO. 10 DATE 11/17/71 SHEET 1 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Board, Processed.	200494	1	
2	Heatsink.	200512	1	
3	Bracket, Suppert.	200513	2	
4				
5	I.C.Hex Inverter.	100084	5	U201.202.203.204.205.
6	I.C.Quad.2 Input Nand.	100085	6	U206.208.212.213.219.220.
7	I.C.Quad.2 Input Power.	100086	2	U216.217.
8	I.C.Dual Flip-Flop.	100088	2	U210.211.
9	I.C.Triple.3 Input Nand.	100107	4	U207.209.214.215.
10	I.C.Operational Amplifier.	100109	3	U218.401.402.
11				
12	Transistor, NPN. 2N4123	100080	32	Q200.201.204.209.211.212.401.
				Q406.407.410.411.412.414.415.
				Q421.422.423.424.425.426.428.
				Q429.430.436.437.438.441.445.
				Q446.448.449.450.
13	Transistor, PNP. 2N4125	100081	18	Q202.203.205.206.402.403.404.
				Q405.408.409.413.416.427.431.
				Q439.444.447.451.
14	Transistor, NPN. TI.P29	100112	2	Q434.454.
15	Transistor, PNP. TI.P30	100113	2	Q432.452.
16	Transistor, NPN. 2N2219	100125	3	Q207.208.210.
17	Transistor, PNP. 2N3053	100158	1	Q418.
18	Transistor, PNP. 2N4037	100160	3	Q417.440.443.
19	Transistor, NPN. 2N3771	100173	7	Q419.420.433.435.442.453.455.
20	Diode, Zener. 5.6v. 1N752	100118	1	VR401.
21	Diode, Power. 1N3208	100174	1	CR432.
22	Diode, Rectifier. 1N4003	100127	1	CR210.
23				
24				
25				

MATERIAL LIST

ML 200488 - 000

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. BASIC BOARD. MODEL NO. 10 DATE 11/17/71 SHEET 3 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
50	Resistor. 5%. ¼w. 2.7	100156-2R7	2	R260.261.
51	Resistor. " 3w. 47	100068-470	1	R271.
52	Resistor. " ¼w. 100	100156-101	18	R243.255.256.257.258.427.440.
				R443.444.445.447.455.456.482.
				R483.489.528.529.
53	Resistor. 5%. 3w. 150	100068-151	1	R496.
54	Resistor. " ¼w. 200	100156-201	8	R473.474.479.480.519.520.525.
				R526.
55	Resistor. 5%. ¼w. 220	100156-221	11	R200.202.204.206.208.210.212.
				R235.239.269.273.
56	Resistor. 5%. ¼w. 300	100156-301	1	R410.
57	Resistor. " " 330	100156-331	9	R201.203.205.207.209.211.213.
				R218.219.
58	Resistor. 5%. 3w. 330	100068-331	1	R502.
59	Resistor. " ¼w. 360	100156-361	2	R442.446.
60	Resistor. " " 430	100156-431	2	R251.252.
61	Resistor. " 3w. 470	100068-471	4	R434.435.436.437.
62	Resistor. " ¼w. 510	100156-511	2	R533.534.
63	Resistor. " " 560	100156-561	3	R214.216. .448.
64	Resistor. " " 1K	100156-102	20	R240.278.401.402.449.472.477.
				R478.481.485.491.494.497.501.
				R513.515.518.522.524.527.
65	Resistor. 5%. ¼w. 1.2K	100156-122	1	R217.
66	Resistor. " " 1.5K	100156-152	1	R270.
67	Resistor. " " 2K	100156-202	3	R418.463.504.
68	Resistor. " " 2.2K	100156-222	6	R224.225.231.237.265.493.
69	Resistor. 5%. ¼w. 3K	100156-302	4	R408.458.495.535.
70	Resistor. " " 3.6K	100156-362	5	R222.223.232.238.266.
71	Resistor. " " 3.9K	100156-392	6	R419.439.441.490.498.499.

MATERIAL LIST

ML 200488 - 000

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. BASIC BOARD. MODEL NO. 10 DATE 11/17/71 SHEET 5 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
99	Pin, Connector. Male.	100021-007	30	
100	Pin, Connector. Female.	100021-008	14	
101				
102				
103	Pad, Transistor.	100223	5	Q210.417.418.440.443.
104	Insulater, Transistor.	100151	7	TO-3.
105				
106	Wire, Insulated.	100053-916	A/R	From item 21 to hole B.
107	Wire, Solid Insulated.	100248-924	A/R	Jumper J12. From SS to TT.
108	Screw, Pan Head.	100036-206	10	4-40 x 3/8"
109	Screw, Pan Head.	100036-210	16	4-40 x 5/8"
110				
111	Washer, Flat.	100047-200	26	No.4.
112	Washer, Int. Tooth Lock.	100059-200	26	No.4.
113	Washer, Nylon Shoulder.	100063-012	14	
114	Washer, Nylon Shoulder.	100063-008	1	Use with CR432.
115	Nut, Hex.	100043-200	26	4-40.
116				
117				
118	Specification, Test.	200532	Ref.	
119				
120				
121				
122				
123				
124				
125				
126				
127				
128				
129				
130				

MATERIAL LIST

ML 200488 - 002

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB.Type 'P' 12½ips. D/G. 90h. MODEL NO. 10 DATE 11/18/71 SHEET 7 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 10uf	100070-106	1	C204.
132				
133	Resistor, 5%. ¼w. 750	100156-751	1	R234.
134	Resistor, " 3w. 47	100068-470	1	R248.
135	Resistor, " ¼w. 750	100156-751	1	R268.
136	Resistor, " " 27K	100156-273	1	R421.
137	Resistor, " " 100K	100156-104	1	R431.
138	Resistor, " " 12K	100156-123	1	R432.
139	Resistor, " " 680K	100156-684	1	R466.
140	~~Resistor, " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor, " " 390K	100156-394	1	R468.
142	Resistor, " " 1.5M	100156-155	1	R509.
143	~~Resistor, " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor, " " 390K	100156-394	1	R511.
145	Resistor, 5%. ¼w. 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				~~Jumper J11.~~ " W " X.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML 200488 - 000 REV.

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. BASIC BOARD. MODEL NO. 10 DATE 11/17/71 SHEET 2 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
26	Diode, Signal. 1N914	100091	47	CR200.201.202.203.204.205.206.
				CR207.208.209.211.401.402.403.
				CR404.405.406.407.408.409.410.
				CR411.412.413.414.415.416.417.
				CR418.419.420.421.422.423.424.
				CR425.426.427.428.429.430.431.
				CR433.434.435.436.437.
27				
28	Capacitor, Ceramic. 330pf	100073-331	1	C205.
29	Capacitor, " .001uf	100073-102	2	C216.217.
30	Capacitor, " .0022uf	100073-222	1	C218.
31	Capacitor, " .005uf	100073-502	2	C406.407.
32				
33	Capacitor, Polyfilm. .01uf	100078-103	5	C200.201.202.410.426.
34	Capacitor, " .1uf	100078-104	2	C203.219.
35				
36	Capacitor, Polyfilm. .15uf	100128-154	2	C413.420.
37	Capacitor, " .33uf	100128-334	1	C424.
38	Capacitor, " .47uf	100128-474	2	C412.419.
39				
40	Capacitor, Tantalum. 1.5uf	100136-155	9	C401.404.405.408.409.414.415.
				C421.422.
41	Capacitor, Tantalum. 10uf	100070-106	12	C206.207.208.209.210.211.212.
				C213.214.215.402.403.
42	Capacitor, Tantalum. 47uf	100070-476	4	C411.417.418.425.
43				
44	Resistor, Variable. 1K	100163-102	1	R215.
45	Resistor, " 5K	100163-502	2	R411.415.
46	Resistor, " 10K	100163-103	5	R423.426.438.465.508.
47	Resistor, " 20K	100163-203	2	R462.503.
48				
49				

MATERIAL LIST

ML 200488 - 000 REV.

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. BASIC BOARD. MODEL NO. 10 DATE 11/17/71 SHEET 4 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
72	Resistor. 5%. ¼w. 4.3K	100156-432	1	R429.
73	Resistor. " " 4.7K	100156-472	2	R412.416.
74	Resistor. " " 5.1K	100156-512	21	R230.233.236.253.254.259.262.
				R263.264.267.272.279.407.409.
				R413.414.424.425.428.464.505.
75	Resistor. 5%. ¼w. 6.8K	100156-682	5	R226.228.229.247.450.
76	Resistor. " " 8.2K	100156-822	1	R227.
77	Resistor. " " 10K	100156-103	10	R245.276.403.404.420.422.452.
				R454.461.492.
78	Resistor. " " 11K	100156-113	2	R486.488.
79	Resistor. " " 12K	100156-123	1	R430.
80	Resistor. " " 20K	100156-203	2	R274.487.
81	Resistor. " " 22K	100156-223	2	R506.531.
82	Resistor. " " 27K	100156-273	2	R475.521.
83	Resistor. " " 33K	100156-333	3	R460.514.516.
84	Resistor. " " 39K	100156-393	1	R500.
85	Resistor. " " 43K	100156-433	1	R275.
86	Resistor. " " 47K	100156-473	3	R405.406.453.
87	Resistor. " " 100K	100156-104	5	R242.277.433.451.532.
88	Resistor. " " 220K	100156-224	1	R241.
89	Resistor. " " 270K	100156-274	1	R459.
90	Resistor. " " 300K	100156-304	3	R417.471.517.
91	Resistor. " " 330K	100156-334	2	R220.221.
92	Resistor. " " 390K	100156-394	6	R246. .469.470.476. .512.
				R523.
93	Resistor. " " 1Meg.	100156-105	1	R507.
94	Resistor. " " 150	100156-151	2	R467.510.
95	Resistor. " " 390	100156-391	2	R249.250.
96	Heatsink.	100096	2	TO-5. Use with CR417.418.
97	Pin, Test Point. Male.	100098	35	Ineludes J8-4.
98	Pin, Female.	100099	4	

MATERIAL LIST

ML 200488 - 001 REV.

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB.Type 'P' 10ips. D/G. 90h. MODEL NO. 10 DATE 11/18/71 SHEET 6 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 10uf	100070-106	1	C204.
132				
133	Resistor, 5%. ¼w. 750	100156-751	1	R234.
134	Resistor, " 3w. 47	100068-470	1	R248.
135	Resistor, " ¼w. 750	100156-751	1	R268.
136	Resistor, " " 33K	100156-333	1	R421.
137	Resistor, " " 120K	100156-124	1	R431.
138	Resistor, " " 12K	100156-123	1	R432.
139	Resistor, " " 680K	100156-684	1	R466.
140	~~Resistor, " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor, " " 390K	100156-394	1	R468.
142	Resistor, " " 1.5M	100156-155	1	R509.
143	~~Resistor, " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor, " " 390K	100156-394	1	R511.
145	Resistor, 5%. ¼w. 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML 200488 - 003 REV. 7

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type'P' 18 ips.D/G. 90h. MODEL NO. 10 DATE 11/18/71 SHEET 8 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 10uf	100070-106	1	C204.
132				
133	Resistor, 5%. ¼w. 750	100156-751	1	R234.
134	Resistor, " 3w. 47	100068-470	1	R248.
135	Resistor, " ¼w. 750	100156-751	1	R268.
136	Resistor, " " 18K	100156-183	1	R421.
137	Resistor, " " 68K	100156-683	1	R431.
138	Resistor, " " 13K	100156-133	1	R432.
139	Resistor, " " 680K	100156-684	1	R466.
140	~~Resistor, " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor, " " 390K	100156-394	1	R468.
142	Resistor, " " 1.5M	100156-155	1	R509.
143	~~Resistor, " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor, " " 390K	100156-394	1	R511.
145	Resister, 5%. ¼w. 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML DRAWING NO. 200488 - 000 REV. -

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. BASIC BOARD. MODEL NO. 10 DATE 11/17/71 SHEET 3 OF ___

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
50	Resistor. 5%. ¼w.	2.7	100156-2R7	2	R260.261.
51	Resistor. " 3w.	47	100068-470	1	R271.
52	Resistor. " ¼w.	100	100156-101	18	R243.255.256.257.258.427.440.
					R443.444.445.447.455.456.482.
					R483.489.528.529.
53	Resistor. 5%. 3w.	150	100068-151	1	R496.
54	Resistor. " ¼w.	200	100156-201	8	R473.474.479.480.519.520.525.
					R526.
55	Resistor. 5%. ¼w.	220	100156-221	11	R200.202.204.206.208.210.212.
					R235.239.269.273.
56	Resistor. 5%. ¼w.	300	100156-301	1	R410.
57	Resistor. " "	330	100156-331	9	R201.203.205.207.209.211.213.
					R218.219.
58	Resistor. 5%. 3w.	330	100068-331	1	R502.
59	Resistor. " ¼w.	360	100156-361	2	R442.446.
60	Resistor. " "	430	100156-431	2	R251.252.
61	Resistor. " 3w.	470	100068-471	4	R434.435.436.437.
62	Resistor. " ¼w.	510	100156-511	2	R533.534.
63	Resistor. " "	560	100156-561	3	R214.216. 448.
64	Resistor. " "	1K	100156-102	20	R240.278.401.402.449.472.477.
					R478.481.485.491.494.497.501.
					R513.515.518.522.524.527.
65	Resistor. 5%. ¼w.	1.2K	100156-122	1	R217.
66	Resistor. " "	1.5K	100156-152	1	R270.
67	Resistor. " "	2K	100156-202	3	R418.463.504.
68	Resistor. " "	2.2K	100156-222	6	R224.225.231.237.265.493.
69	Resistor. 5%. ¼w.	3K	100156-302	4	R408.458.495.535.
70	Resistor. " "	3.6K	100156-362	5	R222.223.232.238.266.
71	Resistor. " "	3.9K	100156-392	6	R419.439.441.490.498.499.

MATERIAL LIST

ML DRAWING NO. 200488 - 000 REV. -

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. BASIC BOARD. MODEL NO. 10 DATE 11/17/71 SHEET 5 OF ___

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
99	Pin, Connector. Male.	100021-007	30	
100	Pin, Connector. Female.	100021-008	44	
101				
102				
103	Pad, Transistor.	100223	5	Q210.417.418.440.443.
104	Insulater, Transistor.	100151	7	TO-3.
105				
106	Wire, Insulated.	100053-916	A/R	From item 21 to hole B.
107	Wire, Solid Insulated.	10024B-924	A/R	Jumper J12. From SS to TT.
108	Screw, Pan Head.	100036-206	10	4-40 x 3/8"
109	Screw, Pan Head.	100036-210	16	4-40 x 5/8"
110				
111	Washer, Flat.	100047-200	26	No.4.
112	Washer, Int. Tooth Lock.	100059-200	26	No.4.
113	Washer, Nylon Shoulder.	100063-012	14	
114	Washer, Nylon Shoulder.	100063-008	1	Use with CR432.
115	Nut, Hex.	100043-200	26	4-40.
116				
117				
118	Specification, Test.	200532	Ref.	
119				
120				
121				
122				
123				
124				
125				
126				
127				
128				
129				
130				

MATERIAL LIST

ML DRAWING NO. 200488 - 002 REV. -

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB.Type 'P' 12½ips. D/G. 9Ch. MODEL NO. 10 DATE 11/18/71 SHEET 7 OF ___

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum.	10uf	100070-106	1	C204.
132					
133	Resistor, 5%. ¼w.	750	100156-751	1	R234.
134	Resistor, " 3w.	47	100068-470	1	R248.
135	Resistor, " ¼w.	750	100156-751	1	R268.
136	Resistor, " "	27K	100156-273	1	R421.
137	Resistor, " "	100K	100156-104	1	R431.
138	Resistor, " "	12K	100156-123	1	R432.
139	Resistor, " "	680K	100156-684	1	R466.
140	~~Resistor, " "~~	~~150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor, " "	390K	100156-394	1	R468.
142	Resistor, " "	1.5M	100156-155	1	R509.
143	~~Resistor, " "~~	~~150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor, " "	390K	100156-394	1	R511.
145	Resistor, 5%. ¼w.	3.3M	100156-335	1	R536.
146					
147	Wire, Solid Insulated.		10024B-924	A/R	Jumper J1. From JJ to KK.
					Jumper J2. " U " V.
					Jumper J4. " PP " RR.
					Jumper J5. " F " G.
					Jumper J6. " GG " HH.
					Jumper J7. " H " J.
					Jumper J8. " EE " FF.
					Jumper J9. " D " E.
					Jumper J10. " AA " CC.
					Jumper J11. " W " X.
					Jumper J19. " DD " TP208.

MATERIAL LIST

ML DRAWING NO. 200488 - 004 REV. -

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type 'P' 25ips. D/G. 9Ch. MODEL NO. 10 DATE 11/18/71 SHEET 9 OF ___

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum.	1.5uf	100136-155	1	C204.
132					
133	Resistor, 5%. ¼w.	750	100156-751	1	R234.
134	Resistor, " 3w.	47	100068-470	1	R248.
135	Resistor, " ¼w.	750	100156-751	1	R268.
136	Resistor, " "	15K	100156-153	1	R421.
137	Resistor, " "	51K	100156-513	1	R431.
138	Resistor, " "	13K	100156-133	1	R432.
139	Resistor, " "	680K	100156-684	1	R466.
140	~~Resistor, " "~~	~~150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor, " "	390K	100156-394	1	R468.
142	Resistor, " "	1.5M	100156-155	1	R509.
143	~~Resistor, " "~~	~~150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor, " "	390K	100156-394	1	R511.
145	Resistor, 5%. ¼w.	3.3M	100156-335	1	R536.
146					
147	Wire, Solid Insulated.		10024B-924	A/R	Jumper J1. From JJ to KK.
					Jumper J2. " U " V.
					Jumper J4. " PP " RR.
					Jumper J5. " F " G.
					Jumper J6. " GG " HH.
					Jumper J7. " H " J.
					Jumper J8. " EE " FF.
					Jumper J9. " D " E.
					Jumper J10. " AA " CC.
					Jumper J11. " W " X.
					Jumper J19. " DD " TP208.

MATERIAL LIST

ML DRAWING NO. 200488 - 000 REV. -

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. BASIC BOARD. MODEL NO. 10 DATE 11/17/71 SHEET 4 OF ___

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
72	Resistor. 5%. ¼w.	4.3K	100156-432	1	R429.
73	Resistor. " "	4.7K	100156-472	2	R412.416.
74	Resistor. " "	5.1K	100156-512	21	R230.233.236.253.254.259.262.
					R263.264.267.272.279.407.409.
					R413.414.424.425.428.464.505.
75	Resistor. 5%. ¼w.	6.8K	100156-682	5	R226.228.229.247.450.
76	Resistor. " "	8.2K	100156-822	1	R227.
77	Resistor. " "	10K	100156-103	10	R245.276.403.404.420.422.452.
					R454.461.492.
78	Resistor. " "	11K	100156-113	2	R486.488.
79	Resistor. " "	12K	100156-123	1	R430.
80	Resistor. " "	20K	100156-203	2	R274.487.
81	Resistor. " "	22K	100156-223	2	R506.531.
82	Resistor. " "	27K	100156-273	2	R475.521.
83	Resistor. " "	33K	100156-333	3	R460.514.516.
84	Resistor. " "	39K	100156-393	1	R500.
85	Resistor. " "	43K	100156-433	1	R275.
86	Resistor. " "	47K	100156-473	3	R405.406.453.
87	Resistor. " "	100K	100156-104	5	R242.277.433.451.532.
88	Resistor. " "	220K	100156-224	1	R241.
89	Resistor. " "	270K	100156-274	1	R459.
90	Resistor. " "	300K	100156-304	3	R417.471.517.
91	Resistor. " "	330K	100156-334	2	R220.221.
92	Resistor. " "	390K	100156-394	6	R246. .469.470.476. .512.
					R523.
93	Resistor. " "	1Meg.	100156-105	1	R507.
94	Resistor. " "	150	100156-151	2	R467.510.
95	Resistor. " "	390	100156-391	2	R249.250.
96	Heatsink.		100096	2	TO-5. Use with Q417.418.
97	Pin, Test Point. Male.		100098	35	Ineludes J8-4.
98	Pin, Female.		100099	4	

MATERIAL LIST

ML DRAWING NO. 200488 - 001 REV. -

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB.Type 'P' 10ips. D/G. 9Ch. MODEL NO. 10 DATE 11/18/71 SHEET 6 OF ___

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum.	10uf	100070-106	1	C204.
132					
133	Resistor, 5%. ¼w.	750	100156-751	1	R234.
134	Resistor, " 3w.	47	100068-470	1	R248.
135	Resistor, " ¼w.	750	100156-751	1	R268.
136	Resistor, " "	33K	100156-333	1	R421.
137	Resistor, " "	120K	100156-124	1	R431.
138	~~Resistor, " "~~	~~12K~~	~~100156-123~~	~~1~~	~~R432.~~
139	Resistor, " "	680K	100156-684	1	R466.
140	~~Resistor, " "~~	~~150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor, " "	390K	100156-394	1	R468.
142	Resistor, " "	1.5M	100156-155	1	R509.
143	~~Resistor, " "~~	~~150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor, " "	390K	100156-394	1	R511.
145	Resistor, 5%. ¼w.	3.3M	100156-335	1	R536.
146					
147	Wire, Solid Insulated.		10024B-924	A/R	Jumper J1. From JJ to KK.
					Jumper J2. " U " V.
					Jumper J4. " PP " RR.
					Jumper J5. " F " G.
					Jumper J6. " GG " HH.
					Jumper J7. " H " J.
					Jumper J8. " EE " FF.
					Jumper J9. " D " E.
					Jumper J10. " AA " CC.
					Jumper J11. " W " X.
					Jumper J19. " DD " TP208.

MATERIAL LIST

ML DRAWING NO. 200488 - 003 REV. 7

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type 'P' 18 ips.D/G. 9Ch. MODEL NO. 10 DATE 11/18/71 SHEET 8 OF ___

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum.	10uf	100070-106	1	C204.
132					
133	Resistor, 5%. ¼w.	750	100156-751	1	R234.
134	Resistor, " 3w.	47	100068-470	1	R248.
135	Resistor, " ¼w.	750	100156-751	1	R268.
136	Resistor, " "	18K	100156-183	1	R421.
137	Resistor, " "	68K	100156-683	1	R431.
138	~~Resistor, " "~~	~~13K~~	100156-133	1	R432.
139	Resistor, " "	680K	100156-684	1	R466.
140	~~Resistor, " "~~	~~150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor, " "	390K	100156-394	1	R468.
142	Resistor, " "	1.5M	100156-155	1	R509.
143	~~Resistor, " "~~	~~150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor, " "	390K	100156-394	1	R511.
145	Resistor, 5%. ¼w.	3.3M	100156-335	1	R536.
146					
147	Wire, Solid Insulated.		10024B-924	A/R	Jumper J1. From JJ to KK.
					Jumper J2. " U " V.
					Jumper J4. " PP " RR.
					Jumper J5. " F " G.
					Jumper J6. " GG " HH.
					Jumper J7. " H " J.
					Jumper J8. " EE " FF.
					Jumper J9. " D " E.
					Jumper J10. " AA " CC.
					Jumper J11. " W " X.
					Jumper J19. " DD " TP208.

MATERIAL LIST

ML DRAWING NO. 200488 - 005 REV. -

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type 'P' 37½ips.D/G. 9Ch. MODEL NO. 10 DATE 11/18/71 SHEET 10 OF ___

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum.	1.5uf	100136-155	1	C204.
132					
133	Resistor, 5%. ¼w.	750	100156-751	1	R234.
134	Resistor, " 3w.	47	100068-470	1	R248.
135	Resistor, " ¼w.	750	100156-751	1	R268.
136	Resistor, " "	10K	100156-103	1	R421.
137	Resistor, " "	33K	100156-333	1	R431.
138	Resistor, " "	15K	100156-153	1	R432.
139	Resistor, " "	300K	100156-304	1	R466.
140	~~Resistor, " "~~	~~10K~~	~~100156-103~~	~~1~~	~~R467.~~
141	Resistor, " "	390K	100156-394	1	R468.
142	Resistor, " "	680K	100156-684	1	R509.
143	~~Resistor, " "~~	~~10K~~	~~100156-103~~	~~1~~	~~R510.~~
144	Resistor, " "	390K	100156-394	1	R511.
145					
146					
147	Wire, Solid Insulated.		10024B-924	A/R	Jumper J1. From JJ to KK.
					Jumper J2. " U " V.
					Jumper J4. " PP " RR.
					Jumper J5. " F " G.
					Jumper J6. " GG " HH.
					Jumper J7. " H " J.
					Jumper J8. " EE " FF.
					Jumper J9. " D " E.
					Jumper J10. " AA " CC.
					Jumper J11. " W " X.
					Jumper J19. " DD " TP208.

MATERIAL LIST

ML 200488 - 006 T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'P' 45ips. D/G. 9Ch. MODEL NO. 10 DATE 11/19/71 SHEET 11 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 1.5uf	100136-155	1	C204.
132				
133	Resistor. 5%. ¼w. 750	100156-751	1	R234.
134	Resistor. " 3w. 47	100068-470	1	R248.
135	Resistor. " ¼w. 750	100156-751	1	R268.
136	Resistor. " " 9.1K	100156-912	1	R421.
137	Resistor. " " 27K	100156-273	1	R431.
138	Resistor. " " 15K	100156-153	1	R432.
139	Resistor. " " 300K	100156-304	1	R466.
140	~~Resistor. " " 150 100156-151 1 R467.~~			
141	Resistor. " " 330K	100156-334	1	R468.
142	Resistor. " " 680K	100156-684	1	R509.
143	~~Resistor. " " 150 100156-151 1 R510.~~			
144	Resistor. " " 330K	100156-334	1	R511.
145				
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML 200488 - 008 T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'A' 12½ips. D/G. 9Ch. MODEL NO. 10 DATE 11/18/71 SHEET 13 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133	Resistor. 5%. ¼w. 750	100156-751	1	R234.
134	Resistor. " 3w. 47	100068-470	1	R248.
135	Resistor. " ¼w. 750	100156-751	1	R268.
136	Resistor. " " 27K	100156-273	1	R421.
137	Resistor. " " 100K	100156-104	1	R431.
138	Resistor. " " 12K	100156-123	1	R432.
139	Resistor. " " 680K	100156-684	1	R466.
140	~~Resistor. " " 150 100156-151 1 R467.~~			
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150 100156-151 1 R510.~~			
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML 200488 - 010 T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'A' 25ips. D/G. 9Ch. MODEL NO. 10 DATE 11/18/71 SHEET 15 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133	Resistor. 5%. ¼w. 750	100156-751	1	R234.
134	Resistor. " 3w. 47	100068-470	1	R248.
135	Resistor. " ¼w. 750	100156-751	1	R268.
136	Resistor. " " 15K	100156-153	1	R421.
137	Resistor. " " 51K	100156-513	1	R431.
138	Resistor. " " 13K	100156-133	1	R432.
139	Resistor. " " 680K	100156-684	1	R466.
140	~~Resistor. " " 150 100156-151 1 R467.~~			
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150 100156-151 1 R510.~~			
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML 200488 - 012 T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'A' 45ips. D/G. 9Ch. MODEL NO. 10 DATE 11/18/71 SHEET 17 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133	Resistor. 5%. ¼w. 750	100156-751	1	R234.
134	Resistor. " 3w. 47	100068-470	1	R248.
135	Resistor. " ¼w. 750	100156-751	1	R268.
136	Resistor. " " 9.1K	100156-912	1	R421.
137	Resistor. " " 27K	100156-273	1	R431.
138	Resistor. " " 15K	100156-153	1	R432.
139	Resistor. " " 300K	100156-304	1	R466.
140	~~Resistor. " " 150 100156-151 1 R467.~~			
141	Resistor. " " 330K	100156-334	1	R468.
142	Resistor. " " 680K	100156-684	1	R509.
143	~~Resistor. " " 150 100156-151 1 R510.~~			
144	Resistor. " " 330K	100156-334	1	R511.
145				
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML DRAWING NO. 200488 - 007 REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'A' 10ips. D/G. 9Ch. MODEL NO. 10 DATE 11/19/71 SHEET 12 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133	Resistor. 5%. ¼w. 750	100156-751	1	R234.
134	Resistor. " 3w. 47	100068-470	1	R248.
135	Resistor. " ¼w. 750	100156-751	1	R268.
136	Resistor. " " 33K	100156-333	1	R421.
137	Resistor. " " 120K	100156-124	1	R431.
138	Resistor. " " 12K	100156-123	1	R432.
139	Resistor. " " 680K	100156-684	1	R466.
140	~~Resistor. " " 150 100156-151 1 R467.~~			
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150 100156-151 1 R510.~~			
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML DRAWING NO. 200488 - 009 REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'A' 18 ips. D/G. 9Ch. MODEL NO. 10 DATE 11/18/71 SHEET 14 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133	Resistor. 5%. ¼w. 750	100156-751	1	R234.
134	Resistor. " 3w. 47	100068-470	1	R248.
135	Resistor. " ¼w. 750	100156-751	1	R268.
136	Resistor. " " 18K	100156-183	1	R421.
137	Resistor. " " 68K	100156-683	1	R431.
138	Resistor. " " 13K	100156-133	1	R432.
139	Resistor. " " 680K	100156-684	1	R466.
140	~~Resistor. " " 150 100156-151 1 R467.~~			
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150 100156-151 1 R510.~~			
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML DRAWING NO. 200488 - 011 REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'A' 37½ips. D/G. 9Ch. MODEL NO. 10 DATE 11/18/71 SHEET 16 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133	Resistor. 5%. ¼w. 750	100156-751	1	R234.
134	Resistor. " 3w. 47	100068-470	1	R248.
135	Resistor. " ¼w. 750	100156-751	1	R268.
136	Resistor. " " 10K	100156-103	1	R421.
137	Resistor. " " 33K	100156-333	1	R431.
138	Resistor. " " 15K	100156-153	1	R432.
139	Resistor. " " 300K	100156-304	1	R466.
140	~~Resistor. " " 10K 100156-103 1 R467.~~			
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 680K	100156-684	1	R509.
143	~~Resistor. " " 10K 100156-103 1 R510.~~			
144	Resistor. " " 390K	100156-394	1	R511.
145				
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML DRAWING NO. 200488 - 013 REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'P' 10ips. S/G. 9Ch. MODEL NO. 10 DATE 11/18/71 SHEET 18 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 10uf	100070-106	1	C204.
132				
133				
134				
135				
136	Resistor. 5%. ¼w. 33K	100156-333	1	R421.
137	Resistor. " " 120K	100156-124	1	R431.
138	Resistor. " " 12K	100156-123	1	R432.
139	Resistor. " " 680K	100156-684	1	R466.
140	~~Resistor. " " 150 100156-151 1 R467.~~			
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150 100156-151 1 R510.~~			
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From KK to LL.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J15. " A " C.
				Jumper J16. " UU " VV.
				Jumper J17. " WW " XX.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML DRAWING NO. 200488 - 008 REV.

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'A' 12½ips. D/G. 90h. MODEL NO. 10 DATE 11/18/71 SHEET 13 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133	Resistor. 5%. ½w. 750	100156-751	1	R234.
134	Resistor. " 3w. 47	100068-470	1	R248.
135	Resistor. " ½w. 750	100156-751	1	R268.
136	Resistor. " " 27K	100156-273	1	R421.
137	Resistor. " " 100K	100156-104	1	R431.
138	Resistor. " " 12K	100156-123	1	R432.
139	Resistor. " " 680K	100156-684	1	R466.
140	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML DRAWING NO. 200488 - 010 REV.

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'A' 25ips. D/G. 90h. MODEL NO. 10 DATE 11/18/71 SHEET 15 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133	Resistor. 5%. ½w. 750	100156-751	1	R234.
134	Resistor. " 3w. 47	100068-470	1	R248.
135	Resistor. " ½w. 750	100156-751	1	R268.
136	Resistor. " " 15K	100156-153	1	R421.
137	Resistor. " " 51K	100156-513	1	R431.
138	Resistor. " " 13K	100156-133	1	R432.
139	Resistor. " " 680K	100156-684	1	R466.
140	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.
				Jumper J19. " DD " TP208.

DATA GEN

MATERIAL LIST

ML DRAWING NO. 200488 - 012 REV.

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'A' 45ips. D/G. 90h. MODEL NO. 10 DATE 11/18/71 SHEET 17 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133	Resistor. 5%. ½w. 750	100156-751	1	R234.
134	Resistor. " 3w. 47	100068-470	1	R248.
135	Resistor. " ½w. 750	100156-751	1	R268.
136	Resistor. " " 9.1K	100156-912	1	R421.
137	Resistor. " " 27K	100156-273	1	R431.
138	Resistor. " " 15K	100156-153	1	R432.
139	Resistor. " " 300K	100156-304	1	R466.
140	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " " 330K	100156-334	1	R468.
142	Resistor. " " 680K	100156-684	1	R509.
143	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " " 330K	100156-334	1	R511.
145				
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.
				Jumper J19. " DD " TP208.

X-REMOVE

CHANGE TO L-K FOR DIVE TYPE CONTROLLER

MATERIAL LIST

ML DRAWING NO. 200488 - 03[illegible] REV.

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'P' 12½ips. S/G. 90h. MODEL NO. 10 DATE 11/18/71 SHEET 19 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 10uf	100070-106	1	C204.
132				
133				
134				
135				
136	Resistor. 5%. ½w. 27K	100156-273	1	R421.
137	Resistor. " " 100K	100156-104	1	R431.
138	Resistor. " " 12K	100156-123	1	R432.
139	Resistor. " " 680K	100156-684	1	R466.
140	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From KK to LL.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J15. " A " C.
				Jumper J16. " UU " VV.
				Jumper J17. " WW " XX.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML DRAWING NO. 200488 - 009 REV.

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'A' 18 ips. D/G. 90h. MODEL NO. 10 DATE 11/18/71 SHEET 14 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133	Resistor. 5%. ½w. 750	100156-751	1	R234.
134	Resistor. " 3w. 47	100068-470	1	R248.
135	Resistor. " ½w. 750	100156-751	1	R268.
136	Resistor. " " 18K	100156-183	1	R421.
137	Resistor. " " 68K	100156-683	1	R431.
138	Resistor. " " 13K	100156-133	1	R432.
139	Resistor. " " 680K	100156-684	1	R466.
140	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML DRAWING NO. 200488 - 011 REV.

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'A' 37½ips. D/G. 90h. MODEL NO. 10 DATE 11/18/71 SHEET 16 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133	Resistor. 5%. ½w. 750	100156-751	1	R234.
134	Resistor. " 3w. 47	100068-470	1	R248.
135	Resistor. " ½w. 750	100156-751	1	R268.
136	Resistor. " " 10K	100156-103	1	R421.
137	Resistor. " " 33K	100156-333	1	R431.
138	Resistor. " " 15K	100156-153	1	R432.
139	Resistor. " " 300K	100156-304	1	R466.
140	~~Resistor. " " 10K~~	~~100156-103~~	~~1~~	~~R467.~~
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 680K	100156-684	1	R509.
143	~~Resistor. " " 10K~~	~~100156-103~~	~~1~~	~~R510.~~
144	Resistor. " " 390K	100156-394	1	R511.
145				
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML DRAWING NO. 200488 - 013 REV.

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'P' 10ips. S/G. 90h. MODEL NO. 10 DATE 11/18/71 SHEET 18 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 10uf	100070-106	1	C204.
132				
133				
134				
135				
136	Resistor. 5%. ½w. 33K	100156-333	1	R421.
137	Resistor. " " 120K	100156-124	1	R431.
138	Resistor. " " 12K	100156-123	1	R432.
139	Resistor. " " 680K	100156-684	1	R466.
140	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From KK to LL.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J15. " A " C.
				Jumper J16. " UU " VV.
				Jumper J17. " WW " XX.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML DRAWING NO. 200488 - 015 REV.

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'P' 18 ips. S/G. 90h. MODEL NO. 10 DATE 11/18/71 SHEET 20 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 10uf	100070-106	1	C204.
132				
133				
134				
135				
136	Resistor. 5%. ½w. 18K	100156-183	1	R421.
137	Resistor. " " 68K	100156-683	1	R431.
138	Resistor. " " 13K	100156-133	1	R432.
139	Resistor. " " 680K	100156-684	1	R466.
140	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From KK to LL.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J15. " A " C.
				Jumper J16. " UU " VV.
				Jumper J17. " WW " XX.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML 200488 - 016 T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'P' 25ips. S/G. 9Ch. MODEL NO. 10 DATE 11/22/71 SHEET 21 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 1.5uf	100136-155	1	C204.
132				
133				
134				
135				
136	Resistor. 5%. ½w. 15K	100156-153	1	R421.
137	Resistor. " " 51K	100156-513	1	R431.
138	Resistor. " " 13K	100156-133	1	R432.
139	Resistor. " " 680K	100156-684	1	R466.
140	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From KK to LL.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J15. " A " C.
				Jumper J16. " UU " VV.
				Jumper J17. " WW " XX.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML 200488 - 017 T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'P' 37½ips.S/G. 9Ch. MODEL NO. 10 DATE 11/22/71 SHEET 22 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 1.5uf.	100136-155	1	C204.
132				
133				
134				
135				
136	Resistor. 5%. ½w. 10K	100156-103	1	R421.
137	Resistor. " " 33K	100156-333	1	R431.
138	Resistor. " " 15K	100156-153	1	R432.
139	Resistor. " " 300K	100156-304	1	R466.
140	~~Resistor. " " 10K~~	~~100156-103~~	~~1~~	~~R467.~~
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 680K	100156-684	1	R509.
143	~~Resistor. " " 10K~~	~~100156-103~~	~~1~~	~~R510.~~
144	Resistor. " " 390K	100156-394	1	R511.
145				
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From KK to LL.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J15. " A " C.
				Jumper J16. " UU " VV.
				Jumper J17. " WW " XX.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML 200488 - 018 T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'P' 14ips. S/G. 9Ch. MODEL NO. 10 DATE 11/22/71 SHEET 23 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 1.5uf.	100136-155	1	C204.
132				
133				
134				
135				
136	Resistor. 5%. ½w. 9.1K	100156-912	1	R421.
137	Resistor. " " 27K	100156-273	1	R431.
138	Resistor. " " 15K	100156-153	1	R432.
139	Resistor. " " 300K	100156-304	1	R466.
140	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " " 330K	100156-334	1	R468.
142	Resistor. " " 680K	100156-684	1	R509.
143	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " " 330K	100156-334	1	R511.
145				
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From KK to LL.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J15. " A " C.
				Jumper J16. " UU " VV.
				Jumper J17. " WW " XX.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML 200488 - 019 T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'A' 10ips. S/G. 9Ch. MODEL NO. 10 DATE 11/22/71 SHEET 24 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133				
134				
135				
136	Resistor. 5%. ½w. 33K	100156-333	1	R421.
137	Resistor. " " 120K	100156-124	1	R431.
138	Resistor. " " 12K	100156-123	1	R432.
139	Resistor. " " 680K	100156-684	1	R466.
140	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML 200488 - 020 T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'A' 12½ips. S/G. 9Ch. MODEL NO. 10 DATE 11/22/71 SHEET 25 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133				
134				
135				
136	Resistor. 5%. ½w. 27K	100156-273	1	R421.
137	Resistor. " " 100K	100156-104	1	R431.
138	Resistor. " " 12K	100156-123	1	R432.
139	Resistor. " " 680K	100156-684	1	R466.
140	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML 200488 - 021 T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'A' 18 ips.S/G. 9Ch. MODEL NO. 10 DATE 11/22/71 SHEET 26 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133				
134				
135				
136	Resistor. 5%. ½w. 18K	100156-183	1	R421.
137	Resistor. " " 68K	100156-683	1	R431.
138	Resistor. " " 13K	100156-133	1	R432.
139	Resistor. " " 680K	100156-684	1	R466.
140	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML 200488 - 022 T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'A' 25ips. S/G. 9Ch. MODEL NO. 10 DATE 11/22/71 SHEET 27 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133				
134				
135				
136	Resistor. 5%. ½w. 15K	100156-153	1	R421.
137	Resistor. " " 51K	100156-513	1	R431.
138	Resistor. " " 13K	100156-133	1	R432.
139	Resistor. " " 680K	100156-684	1	R466.
140	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.
				Jumper J19. " DD " TP208.

MATERIAL LIST

ML 200488 - 023 T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'A' 37½ips.S/G. 9Ch. MODEL NO. 10 DATE 11/22/71 SHEET 28 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133				
134				
135				
136	Resistor. 5%. ½w. 10K	100156-103	1	R421.
137	Resistor. " " 33K	100156-333	1	R431.
138	Resistor. " " 15K	100156-153	1	R432.
139	Resistor. " " 300K	100156-304	1	R466.
140	~~Resistor. " " 10K~~	~~100156-103~~	~~1~~	~~R467.~~
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 680K	100156-684	1	R509.
143	~~Resistor. " " 10K~~	~~100156-103~~	~~1~~	~~R510.~~
144	Resistor. " " 390K	100156-394	1	R511.
145				
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.
				Jumper J19. " DD " TP208.

MATERIAL LIST — ML — DRAWING NO. 200488 - 018 — REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type'P' 45ips. S/G. 9Ch. MODEL NO. 10 DATE 11/22/71 SHEET 23 OF

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum.	1.5uf.	100136-155	1	C204.
132					
133					
134					
135					
136	Resistor. 5%. ½w.	9.1K	100156-912	1	R421.
137	Resistor. " "	27K	100156-273	1	R431.
138	Resistor. " "	15K	100156-153	1	R432.
139	Resistor. " "	300K	100156-304	1	R466.
140	~~Resistor. " "~~	~~150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " "	330K	100156-334	1	R468.
142	Resistor. " "	680K	100156-684	1	R509.
143	~~Resistor. " "~~	~~150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " "	330K	100156-334	1	R511.
145					
146					
147	Wire, Solid Insulated.		100248-924	A/R	Jumper J1. From KK to LL.
					Jumper J2. " U " V.
					Jumper J4. " PP " RR.
					Jumper J5. " F " G.
					Jumper J6. " GG " HH.
					Jumper J7. " H " J.
					Jumper J8. " EE " FF.
					Jumper J9. " D " E.
					Jumper J10. " AA " CC.
					Jumper J11. " W " X.
					Jumper J15. " A " C.
					Jumper J16. " UU " VV.
					Jumper J17. " WW " XX.
					Jumper J19. " DD " TP208.

MATERIAL LIST — ML — DRAWING NO. 200488 - 020 — REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type'A' 12½ips. S/G. 9Ch. MODEL NO. 10 DATE 11/22/71 SHEET 25 OF

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131					
132					
133					
134					
135					
136	Resistor. 5%. ½w.	27K	100156-273	1	R421.
137	Resistor. " "	100K	100156-104	1	R431.
138	Resistor. " "	12K	100156-123	1	R432.
139	Resistor. " "	680K	100156-684	1	R466.
140	~~Resistor. " "~~	~~150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " "	390K	100156-394	1	R468.
142	Resistor. " "	1.5M	100156-155	1	R509.
143	~~Resistor. " "~~	~~150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " "	390K	100156-394	1	R511.
145	Resistor. " "	3.3M	100156-335	1	R536.
146					
147	Wire, Solid Insulated.		100248-924	A/R	Jumper J1. From JJ to KK.
					Jumper J2. " T " V.
					Jumper J3. " L " M.
					Jumper J5. " F " G.
					Jumper J7. " H " J.
					Jumper J8. " EE " FF.
					Jumper J9. " D " E.
					Jumper J10. " AA " CC.
					Jumper J11. " W " X.
					Jumper J13. " N " P.
					Jumper J14. " R " S.
					Jumper J19. " DD " TP208.

MATERIAL LIST — ML — DRAWING NO. 200488 - 022 — REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type'A' 25ips. S/G. 9Ch. MODEL NO. 10 DATE 11/22/71 SHEET 27 OF

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131					
132					
133					
134					
135					
136	Resistor. 5%. ½w.	15K	100156-153	1	R421.
137	Resistor. " "	51K	100156-513	1	R431.
138	Resistor. " "	13K	100156-133	1	R432.
139	Resistor. " "	680K	100156-684	1	R466.
140	~~Resistor. " "~~	~~150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " "	390K	100156-394	1	R468.
142	Resistor. " "	1.5M	100156-155	1	R509.
143	~~Resistor. " "~~	~~150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " "	390K	100156-394	1	R511.
145	Resistor. " "	3.3M	100156-335	1	R536.
146					
147	Wire, Solid Insulated.		100248-924	A/R	Jumper J1. From JJ to KK.
					Jumper J2. " T " V.
					Jumper J3. " L " M.
					Jumper J5. " F " G.
					Jumper J7. " H " J.
					Jumper J8. " EE " FF.
					Jumper J9. " D " E.
					Jumper J10. " AA " CC.
					Jumper J11. " W " X.
					Jumper J13. " N " P.
					Jumper J14. " R " S.
					Jumper J19. " DD " TP208.

MATERIAL LIST — ML — DRAWING NO. 200488 - 018 — REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type'P' 45ips. S/G. 9Ch. MODEL NO. 10 DATE 11/22/71 SHEET 29 OF

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131					
132					
133					
134					
135					
136	Resistor. 5%. ½w.	9.1K	100156-912	1	R421.
137	Resistor. " "	27K	100156-273	1	R431.
138	Resistor. " "	15K	100156-153	1	R432.
139	Resistor. " "	300K	100156-304	1	R466.
140	~~Resistor. " "~~	~~150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " "	330K	100156-334	1	R468.
142	Resistor. " "	680K	100156-684	1	R509.
143	~~Resistor. " "~~	~~150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " "	330K	100156-334	1	R511.
145					
146					
147	Wire, Solid Insulated.		100248-924	A/R	Jumper J1. From JJ to KK.
					Jumper J2. " T " V.
					Jumper J3. " L " M.
					Jumper J5. " F " G.
					Jumper J7. " H " J.
					Jumper J8. " EE " FF.
					Jumper J9. " D " E.
					Jumper J10. " AA " CC.
					Jumper J11. " W " X.
					Jumper J13. " N " P.
					Jumper J14. " R " S.
					Jumper J19. " DD " TP208.

MATERIAL LIST — ML — DRAWING NO. 200488 - 019 — REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type'A' 10ips. S/G. 9Ch. MODEL NO. 10 DATE 11/22/71 SHEET 24 OF

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131					
132					
133					
134					
135					
136	Resistor. 5%. ½w.	33K	100156-333	1	R421.
137	Resistor. " "	120K	100156-124	1	R431.
138	Resistor. " "	12K	100156-123	1	R432.
139	Resistor. " "	680K	100156-684	1	R466.
140	~~Resistor. " "~~	~~150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " "	390K	100156-394	1	R468.
142	Resistor. " "	1.5M	100156-155	1	R509.
143	~~Resistor. " "~~	~~150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " "	390K	100156-394	1	R511.
145	Resistor. " "	3.3M	100156-335	1	R536.
146					
147	Wire, Solid Insulated.		100248-924	A/R	Jumper J1. From JJ to KK.
					Jumper J2. " T " V.
					Jumper J3. " L " M.
					Jumper J5. " F " G.
					Jumper J7. " H " J.
					Jumper J8. " EE " FF.
					Jumper J9. " D " E.
					Jumper J10. " AA " CC.
					Jumper J11. " W " X.
					Jumper J13. " N " P.
					Jumper J14. " R " S.
					Jumper J19. " DD " TP208.

MATERIAL LIST — ML — DRAWING NO. 200488 - 021 — REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type'A' 18 ips.S/G. 9Ch. MODEL NO. 10 DATE 11/22/71 SHEET 26 OF

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131					
132					
133					
134					
135					
136	Resistor. 5%. ½w.	18K	100156-183	1	R421.
137	Resistor. " "	68K	100156-683	1	R431.
138	Resistor. " "	13K	100156-133	1	R432.
139	Resistor. " "	680K	100156-684	1	R466.
140	~~Resistor. " "~~	~~150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " "	390K	100156-394	1	R468.
142	Resistor. " "	1.5M	100156-155	1	R509.
143	~~Resistor. " "~~	~~150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " "	390K	100156-394	1	R511.
145	Resistor. " "	3.3M	100156-335	1	R536.
146					
147	Wire, Solid Insulated.		100248-924	A/R	Jumper J1. From JJ to KK.
					Jumper J2. " T " V.
					Jumper J3. " L " M.
					Jumper J5. " F " G.
					Jumper J7. " H " J.
					Jumper J8. " EE " FF.
					Jumper J9. " D " E.
					Jumper J10. " AA " CC.
					Jumper J11. " W " X.
					Jumper J13. " N " P.
					Jumper J14. " R " S.
					Jumper J19. " DD " TP208.

MATERIAL LIST — ML — DRAWING NO. 200488 - 023 — REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type'A' 37½ips.S/G. 9Ch. MODEL NO. 10 DATE 11/22/71 SHEET 28 OF

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131					
132					
133					
134					
135					
136	Resistor. 5%. ½w.	10K	100156-103	1	R421.
137	Resistor. " "	33K	100156-333	1	R431.
138	Resistor. " "	15K	100156-153	1	R432.
139	Resistor. " "	300K	100156-304	1	R466.
140	~~Resistor. " "~~	~~10K~~	~~100156-103~~	~~1~~	~~R467.~~
141	Resistor. " "	390K	100156-394	1	R468.
142	Resistor. " "	680K	100156-684	1	R509.
143	~~Resistor. " "~~	~~10K~~	~~100156-103~~	~~1~~	~~R510.~~
144	Resistor. " "	390K	100156-394	1	R511.
145					
146					
147	Wire, Solid Insulated.		100248-924	A/R	Jumper J1. From JJ to KK.
					Jumper J2. " T " V.
					Jumper J3. " L " M.
					Jumper J5. " F " G.
					Jumper J7. " H " J.
					Jumper J8. " EE " FF.
					Jumper J9. " D " E.
					Jumper J10. " AA " CC.
					Jumper J11. " W " X.
					Jumper J13. " N " P.
					Jumper J14. " R " S.
					Jumper J19. " DD " TP208.

MATERIAL LIST — ML — DRAWING NO. 200488 - 025 — REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type 'P' 10ips. D/G. 7Ch. MODEL NO. 10 DATE 11/18/71 SHEET 30 OF

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum.	10uf	100070-106	1	C204.
132					
133	Resistor, 5%. ½w.	750	100156-751	1	R234.
134	Resistor, " 3w.	47	100068-470	1	R248.
135	Resistor, " ½w.	750	100156-751	1	R268.
136	Resistor, " "	33K	100156-333	1	R421.
137	Resistor, " "	120K	100156-124	1	R431.
138	Resistor, " "	12K	100156-123	1	R432.
139	Resistor, " "	680K	100156-684	1	R466.
140	~~Resistor, " "~~	~~150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor, " "	390K	100156-394	1	R468.
142	Resistor, " "	1.5M	100156-155	1	R509.
143	~~Resistor, " "~~	~~150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor, " "	390K	100156-394	1	R511.
145	Resistor, 5%. ½w.	3.3M	100156-335	1	R536.
146					
147	Wire, Solid Insulated.		100248-924	A/R	Jumper J1. From JJ to KK.
					Jumper J2. " U " V.
					Jumper J4. " PP " RR.
					Jumper J5. " F " G.
					Jumper J6. " GG " HH.
					Jumper J7. " H " J.
					Jumper J8. " EE " FF.
					Jumper J9. " D " E.
					Jumper J10. " AA " CC.
					Jumper J11. " W " X.
					Jumper J3. " L " K.

MATERIAL LIST

ML 200488 - 026 REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB.Type 'P' 12½ips. D/G. 7Ch MODEL NO. 10 DATE 11/18/71 SHEET 31 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 10uf	100070-106	1	C204.
132				
133	Resistor, 5%. ¼w. 750	100156-751	1	R234.
134	Resistor, " 3w. 47	100068-470	1	R248.
135	Resistor, " ¼w. 750	100156-751	1	R268.
136	Resistor, " " 27K	100156-273	1	R421.
137	Resistor, " " 100K	100156-104	1	R431.
138	Resistor, " " 12K	100156-123	1	R432.
139	Resistor, " " 680K	100156-684	1	R466.
140	~~Resistor, " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor, " " 390K	100156-394	1	R468.
142	Resistor, " " 1.5M	100156-155	1	R509.
143	~~Resistor, " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor, " " 390K	100156-394	1	R511.
145	Resistor, 5%. ¼w. 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J3. " L " K.

MATERIAL LIST

ML 200488 - 028 REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type'P' 25ips. D/G. 7Ch. MODEL NO. 10 DATE 11/18/71 SHEET 33 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 1.5uf	100136-155	1	C204.
132				
133	Resistor, 5%. ¼w. 750	100156-751	1	R234.
134	Resistor, " 3w. 47	100068-470	1	R248.
135	Resistor, " ¼w. 750	100156-751	1	R268.
136	Resistor, " " 15K	100156-153	1	R421.
137	Resistor, " " 51K	100156-513	1	R431.
138	Resistor, " " 13K	100156-133	1	R432.
139	Resistor, " " 680K	100156-684	1	R466.
140	~~Resistor, " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor, " " 390K	100156-394	1	R468.
142	Resistor, " " 1.5M	100156-155	1	R509.
143	~~Resistor, " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor, " " 390K	100156-394	1	R511.
145	Resistor, 5%. ¼w. 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2 " U " V.
				Jumper J4 " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J3. " L " K.

MATERIAL LIST

ML 200488 - 030 REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type'P' 45ips. D/G. 7Ch. MODEL NO. 10 DATE 11/19/71 SHEET 35 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 1.5uf	100136-155	1	C204.
132				
133	Resistor. 5%. ¼w. 750	100156-751	1	R234.
134	Resistor. " 3w. 47	100068-470	1	R248.
135	Ressistor. " ¼w. 750	100156-751	1	R268.
136	Resistor. " " 9.1K	100156-912	1	R421.
137	Resistor. " " 27K	100156-273	1	R431.
138	Resistor. " " 15K	100156-153	1	R432.
139	Resistor. " " 300K	100156-304	1	R466.
140	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " " 330K	100156-334	1	R468.
142	Resistor. " " 680K	100156-684	1	R509.
143	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " " 330K	100156-334	1	R511.
145				
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J3. " L " K.

MATERIAL LIST

ML 200488 - 032 REV. -

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type'A' 12½ips. D/G. 7Ch. MODEL NO. 10 DATE 11/18/71 SHEET 37 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133	Resistor. 5%. ¼w. 750	100156-751	1	R234.
134	Resistor. " 3w. 47	100068-470	1	R248.
135	Resistor. " ¼w. 750	100156-751	1	R268.
136	Resistor. " " 27K	100156-273	1	R421.
137	Resistor. " " 100K	100156-104	1	R431.
138	Resistor. " " 12K	100156-123	1	R432.
139	Resistor. " " 680K	100156-684	1	R466.
140	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.

MATERIAL LIST

ML 200488 - 027 REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB.Type'P' 18 ips. D/G. 7Ch. MODEL NO. 10 DATE 11/18/71 SHEET 32 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 10uf	100070-106	1	C204.
132				
133	Resistor, 5%. ¼w. 750	100156-751	1	R234.
134	Resistor, " 3w. 47	100068-470	1	R248.
135	Resistor, " ¼w. 750	100156-751	1	R268.
136	Resistor, " " 18K	100156-183	1	R421.
137	Resistor, " " 68K	100156-683	1	R431.
138	Resistor, " " 13K	100156-133	1	R432.
139	Resistor, " " 680K	100156-684	1	R466.
140	~~Resistor, " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor, " " 390K	100156-394	1	R468.
142	Resistor, " " 1.5M	100156-155	1	R509.
143	~~Resistor, " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor, " " 390K	100156-394	1	R511.
145	Resistor, 5%. ¼w. 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J3. " L " K.

MATERIAL LIST

ML 200488 - 029 REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type'P' 37½ips. D/G. 7Ch. MODEL NO. 10 DATE 11/18/71 SHEET 34 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum 1.5uf	100136-155	1	C204.
132				
133	Resistor, 5%. ¼w. 750	100156-751	1	R234.
134	Resistor, " 3w. 47	100068-470	1	R248.
135	Resistor, " ¼w. 750	100156-751	1	R268.
136	Resistor, " " 10K	100156-103	1	R421.
137	Resistor, " " 33K	100156-333	1	R431.
138	Resistor, " " 15K	100156-153	1	R432.
139	Resistor, " " 300K	100156-304	1	R466.
140	~~Resistor, " " 10K~~	~~100156-103~~	~~1~~	~~R467.~~
141	Resistor, " " 390K	100156-394	1	R468.
142	Resistor, " " 680K	100156-684	1	R509.
143	~~Resistor, " " 10K~~	~~100156-103~~	~~1~~	~~R510.~~
144	Resistor, " " 390K	100156-394	1	R511.
145				
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J3. " L " K.

MATERIAL LIST

ML 200488 - 031 REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB.Type'A' 10ips. D/G. 7Ch. MODEL NO. 10 DATE 11/19/71 SHEET 36 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133	Resistor. 5%. ¼w. 750	100156-751	1	R234.
134	Resistor. " 3w. 47	100068-470	1	R248.
135	Resistor. " ¼w. 750	100156-751	1	R268.
136	Resistor. " " 33K	100156-333	1	R421.
137	Resistor. " " 120K	100156-124	1	R431.
138	Resistor. " " 12K	100156-123	1	R432.
139	Resistor. " " 680K	100156-684	1	R466.
140	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.

MATERIAL LIST

ML 200488 - 033 REV. -

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB.Type'A' 18 ips. D/G. 7Ch. MODEL NO. 10 DATE 11/18/71 SHEET 38 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
131				
132				
133	Resistor. 5%. ¼w. 750	100156-751	1	R234.
134	Resistor. " 3w. 47	100068-470	1	R248.
135	Resistor. " ¼w. 750	100156-751	1	R268.
136	Resistor. " " 18K	100156-183	1	R421.
137	Resistor. " " 68K	100156-683	1	R431.
138	Resistor. " " 13K	100156-133	1	R432.
139	Resistor. " " 680K	100156-684	1	R466.
140	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " " 390K	100156-394	1	R468.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.

MATERIAL LIST — ML — DRAWING NO. 200488 - 028 — REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'P' 25ips. D/G. 7Ch. MODEL NO. 10 DATE 11/18/71 SHEET 33 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 1.5uf	100136-155	1	C204.
132				
133	Resistor, 5%. ¼w. 750	100156-751	1	R234.
134	Resistor, " 3w. 47	100068-470	1	R248.
135	Resistor, " ¼w. 750	100156-751	1	R268.
136	Resistor, " " 15K	100156-153	1	RL21.
137	Resistor, " " 51K	100156-513	1	RL31.
138	Resistor, " " 13K	100156-133	1	RL32.
139	Resistor, " " 680K	100156-684	1	RL66.
140	~~Resistor, " " 150~~	~~100156-151~~	~~1~~	~~RL67.~~
141	Resistor, " " 390K	100156-394	1	RL68.
142	Resistor, " " 1.5M	100156-155	1	R509.
143	~~Resistor, " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor, " " 390K	100156-394	1	R511.
145	Resistor, 5%. ¼w. 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J3. " L " K.

MATERIAL LIST — ML — DRAWING NO. 200488 - 029 — REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'P' 37½ips. D/G. 7Ch. MODEL NO. 10 DATE 11/18/71 SHEET 34 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 1.5uf	100136-155	1	C204.
132				
133	Resistor, 5%. ¼w. 750	100156-751	1	R234.
134	Resistor, " 3w. 47	100068-470	1	R248.
135	Resistor, " ¼w. 750	100156-751	1	R268.
136	Resistor, " " 10K	100156-103	1	RL21.
137	Resistor, " " 33K	100156-333	1	RL31.
138	Resistor, " " 15K	100156-153	1	RL32.
139	Resistor, " " 300K	100156-304	1	RL66.
140	~~Resistor, " " 10K~~	~~100156-103~~	~~1~~	~~RL67.~~
141	Resistor, " " 390K	100156-394	1	RL68.
142	Resistor, " " 680K	100156-684	1	R509.
143	~~Resistor, " " 10K~~	~~100156-103~~	~~1~~	~~R510.~~
144	Resistor, " " 390K	100156-394	1	R511.
145				
146				
147	Wire, Solic Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J3. " L " K.

MATERIAL LIST — ML — DRAWING NO. 200488 - 030 — REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'P' 45ips. D/G. 7Ch. MODEL NO. 10 DATE 11/19/71 SHEET 35 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 1.5uf	100136-155	1	C204.
132				
133	Resistor. 5%. ¼w. 750	100156-751	1	R234.
134	Resistor. " 3w. 47	100068-470	1	R248.
135	Ressistor. " ¼w. 750	100156-751	1	R268.
136	Resistor. " " 9.1K	100156-912	1	RL21.
137	Resistor. " " 27K	100156-273	1	RL31.
138	Resistor. " " 15K	100156-153	1	RL32.
139	Resistor. " " 300K	100156-304	1	RL66.
140	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~RL67.~~
141	Resistor. " " 330K	100156-334	1	RL68.
142	Resistor. " " 680K	100156-684	1	R509.
143	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " " 330K	100156-334	1	R511.
145				
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J3. " L " K.

MATERIAL LIST — ML — DRAWING NO. 200488 - 031 — REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'A' 10ips. D/G. 7Ch. MODEL NO. 10 DATE 11/19/71 SHEET 36 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133	Resistor. 5%. ¼w. 750	100156-751	1	R234.
134	Resistor. " 3w. 47	100068-470	1	R248.
135	Resistor. " ¼w. 750	100156-751	1	R268.
136	Resistor. " " 33K	100156-333	1	RL21.
137	Resistor. " " 120K	100156-124	1	RL31.
138	Resistor. " " 12K	100156-123	1	RL32.
139	Resistor. " " 680K	100156-684	1	RL66.
140	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~RL67.~~
141	Resistor. " " 390K	100156-394	1	RL68.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.

MATERIAL LIST — ML — DRAWING NO. 200488 - 032 — REV. -

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'A' 12½ips. D/G. 7Ch. MODEL NO. 10 DATE 11/18/71 SHEET 37 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133	Resistor. 5%. ¼w. 750	100156-751	1	R234.
134	Resistor. " 3w. 47	100068-470	1	R248.
135	Resistor. " ¼w. 750	100156-751	1	R268.
136	Resistor. " " 27K	100156-273	1	RL21.
137	Resistor. " " 100K	100156-104	1	RL31.
138	Resistor. " " 12K	100156-123	1	RL32.
139	Resistor. " " 680K	100156-684	1	RL66.
140	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~RL67.~~
141	Resistor. " " 390K	100156-394	1	RL68.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.

MATERIAL LIST — ML — DRAWING NO. 200488 - 033 — REV. -

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'A' 18 ips. D/G. 7Ch. MODEL NO. 10 DATE 11/18/71 SHEET 38 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133	Resistor. 5%. ¼w. 750	100156-751	1	R234.
134	Resistor. " 3w. 47	100068-470	1	R248.
135	Resistor. " ¼w. 750	100156-751	1	R268.
136	Resistor. " " 18K	100156-183	1	RL21.
137	Resistor. " " 68K	100156-683	1	RL31.
138	Resistor. " " 13K	100156-133	1	RL32.
139	Resistor. " " 680K	100156-684	1	RL66.
140	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~RL67.~~
141	Resistor. " " 390K	100156-394	1	RL68.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.

MATERIAL LIST — ML — DRAWING NO. 200488 - 034 — REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'A' 25ips. D/G. 7Ch. MODEL NO. 10 DATE 11/18/71 SHEET 39 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133	Resistor. 5%. ¼w. 750	100156-751	1	R234.
134	Resistor. " 3w. 47	100068-470	1	R248.
135	Resistor. " ¼w. 750	100156-751	1	R268.
136	Resistor. " " 15K	100156-153	1	RL21.
137	Resistor. " " 51K	100156-513	1	RL31.
138	Resistor. " " 13K	100156-133	1	RL32.
139	Resistor. " " 680K	100156-684	1	RL66.
140	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~RL67.~~
141	Resistor. " " 390K	100156-394	1	RL68.
142	Resistor. " " 1.5M	100156-155	1	R509.
143	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " " 390K	100156-394	1	R511.
145	Resistor. " " 3.3M	100156-335	1	R536.
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.

MATERIAL LIST — ML — DRAWING NO. 200488 - 035 — REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS
PWB. Type'A' 37½ips. D/G. 7Ch. MODEL NO. 10 DATE 11/18/71 SHEET 40 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133	Resistor. 5%. ¼w. 750	100156-751	1	R234.
134	Resistor. " 3w. 47	100068-470	1	R248.
135	Resistor. " ¼w. 750	100156-751	1	R268.
136	Resistor. " " 10K	100156-103	1	RL21.
137	Resistor. " " 33K	100156-333	1	RL31.
138	Resistor. " " 15K	100156-153	1	RL32.
139	Resister " " 300K	100156-304	1	RL66.
140	~~Resistor. " " 10K~~	~~100156-103~~	~~1~~	~~RL67.~~
141	Resistor. " " 390K	100156-394	1	RL68.
142	Resistor. " " 680K	100156-684	1	R509.
143	~~Resistor. " " 10K~~	~~100156-103~~	~~1~~	~~R510.~~
144	Resistor. " " 390K	100156-394	1	R511.
145				
146				
147	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.

MATERIAL LIST — ML — DRAWING NO. 200488 - 036 — REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type'A' 1Sips. S/G. 7Ch. MODEL NO. 1A DATE 11/18/71 SHEET 41 OF ___

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133	Resistor. 5%. ½w. 750	100156-751	1	R23h.
13h	Resistor. " ½w. h7	100068-h70	1	R2h8.
135	Resistor. " ½w. 750	100156-751	1	R268.
136	Resistor. " " 9.1K	100156-912	1	Rh21.
137	Resistor. " " 27K	100156-273	1	Rh31.
138	Resistor. " " 15K	100156-153	1	Rh32.
139	Resistor. " " 300K	100156-304	1	Rh66.
1h0	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~Rh67.~~
1h1	Resistor. " " 330K	100156-334	1	Rh68.
1h2	Resistor. " " 680K	100156-684	1	R509.
1h3	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
1hh	Resistor. " " 330K	100156-334	1	R511.
1h5				
1h6				
1h7	Wire, Solid Insulated.	1002h8-92h	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.

MATERIAL LIST — ML — DRAWING NO. 200488 - 038 — REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type'P' 12sips. S/G. 7Ch. MODEL NO. 1B DATE 11/18/71 SHEET 43 OF ___

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 10uf	100070-106	1	C20h.
132				
133				
13h				
135				
136	Resistor. 5%. ½w. 27K	100156-273	1	Rh21.
137	Resistor. " " 100K	100156-104	1	Rh31.
138	Resistor. " " 12K	100156-123	1	Rh32.
139	Resistor. " " 680K	100156-684	1	Rh66.
1h0	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~Rh67.~~
1h1	Resistor. " " 390K	100156-394	1	Rh68.
1h2	Resistor. " " 1.5M	100156-155	1	R509.
1h3	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
1hh	Resistor. " " 390K	100156-394	1	R511.
1h5	Resistor. " " 3.3M	100156-335	1	R536.
1h6				
1h7	Wire, Solid Insulated.	1002h8-92h	A/R	Jumper J1. From KK to LL.
				Jumper J2. " U " V.
				Jumper Jh. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J15. " A " C.
				Jumper J16. " UU " VV.
				Jumper J17. " WW " XX.
				Jumper J3. " L " K.

MATERIAL LIST — ML — DRAWING NO. 200488 - 040 — REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type'P' 25ips. S/G. 7Ch. MODEL NO. 1B DATE 11/22/71 SHEET 45 OF ___

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 1.5uf	100136-155	1	C20h.
132				
133				
13h				
135				
136	Resistor. 5%. ½w. 15K	100156-153	1	Rh21.
137	Resistor. " " 51K	100156-513	1	Rh31
138	Resistor. " " 13K	100156-133	1	Rh32.
139	Resistor. " " 68K	100156-683	1	Rh66.
1h0	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~Rh67.~~
1h1	Resistor. " " 390K	100156-394	1	Rh68.
1h2	Resistor. " " 1.5M	100156-155	1	R509.
1h3	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
1hh	Resistor. " " 390K	100156-394	1	R511.
1h5	Resistor. " " 3.3M	100156-335	1	R536.
1h6				
1h7	Wire, Solid Insulated.	1002h8-92h	A/R	Jumper J1. From KK to LL.
				Jumper J2. " U " V.
				Jumper Jh. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J15. " A " C.
				Jumper J16. " UU " VV.
				Jumper J17. " WW " XX.
				Jumper J3. " L " K.

MATERIAL LIST — ML — DRAWING NO. 200488 - 042 — REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type'P' 45ips. S/G. 7Ch. MODEL NO. 1B DATE 11/22/71 SHEET 47 OF ___

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 1.5uf.	100136-155	1	C20h.
132				
133				
13h				
135				
136	Resistor. 5%. ½w. 9.1K	100156-912	1	Rh21.
137	Resistor. " " 27K	100156-273	1	Rh31.
138	Resistor. " " 15K	100156-153	1	Rh32.
139	Resistor. " " 300K	100156-304	1	Rh66.
1h0	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~Rh67.~~
1h1	Resistor. " " 330K	100156-334	1	Rh68.
1h2	Resistor. " " 680K	100156-684	1	R509.
1h3	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
1hh	Resistor. " " 330K	100156-334	1	R511.
1h5				
1h6				
1h7	Wire, Solid Insulated.	1002h8-92h	A/R	Jumper J1. From KK to LL.
				Jumper J2. " U " V.
				Jumper Jh. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J15. " A " C.
				Jumper J16. " UU " VV.
				Jumper J17. " WW " XX.
				Jumper J3. " L " K.

MATERIAL LIST — ML — DRAWING NO. 200488 - 037 — REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type'P' 10ips. S/G. 7Ch. MODEL NO. 1B DATE 11/18/71 SHEET 42 OF ___

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 10uf	100070-106	1	C20h.
132				
133				
13h				
135				
136	Resistor. 5%. ½w. 33K	100156-333	1	Rh21.
137	Resistor. " " 120K	100156-124	1	Rh31.
138	Resistor. " " 12K	100156-123	1	Rh32.
139	Resistor. " " 680K	100156-684	1	Rh66.
1h0	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~Rh67.~~
1h1	Resistor. " " 390K	100156-394	1	Rh68.
1h2	Resistor. " " 1.5M	100156-155	1	R509.
1h3	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
1hh	Resistor. " " 390K	100156-394	1	R511.
1h5	Resistor. " " 3.3M	100156-335	1	R536.
1h6				
1h7	Wire, Solid Insulated.	1002h8-92h	A/R	Jumper J1. From KK to LL.
				Jumper J2. " U " V.
				Jumper Jh. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J15. " A " C.
				Jumper J16. " UU " VV.
				Jumper J17. " WW " XX.
				Jumper J3. " L " K.

MATERIAL LIST — ML — DRAWING NO. 200488 - 039 — REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type'P' 18 ips. S/G. 7Ch. MODEL NO. 1B DATE 11/18/71 SHEET 44 OF ___

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 10uf	100070-106	1	C20h.
132				
133				
13h				
135				
136	Resistor. 5%. ½w. 18K	100156-183	1	Rh21.
137	Resistor. " " 68K	100156-683	1	Rh31.
138	Resistor. " " 13K	100156-133	1	Rh32.
139	Resistor. " " 680K	100156-684	1	Rh66.
1h0	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~Rh67.~~
1h1	Resistor. " " 390K	100156-394	1	Rh68.
1h2	Resistor. " " 1.5M	100156-155	1	R509.
1h3	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
1hh	Resistor. " " 390K	100156-394	1	R511.
1h5	Resistor. " " 3.3M	100156-335	1	R536.
1h6				
1h7	Wire, Solid Insulated.	1002h8-92h	A/R	Jumper J1. From KK to LL.
				Jumper J2. " U " V.
				Jumper Jh. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J15. " A " C.
				Jumper J16. " UU " VV.
				Jumper J17. " WW " XX.
				Jumper J3. " L " K.

MATERIAL LIST — ML — DRAWING NO. 200488 - 041 — REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type'P' 37½ips.S/G. 7Ch. MODEL NO. 1B DATE 11/22/71 SHEET 46 OF ___

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 1.5uf.	100136-155	1	C20h.
132				
133				
13h				
135				
136	Resistor. 5%. ½w. 10K	100156-103	1	Rh21.
137	Resistor. " " 33K	100156-333	1	Rh31.
138	Resistor. " " 15K	100156-153	1	Rh32.
139	Resistor. " " 300K	100156-304	1	Rh66.
1h0	~~Resistor. " " 10K~~	~~100156-103~~	~~1~~	~~Rh67.~~
1h1	Resistor. " " 390K	100156-394	1	Rh68.
1h2	Resistor. " " 680K	100156-684	1	R509.
1h3	~~Resistor. " " 10K~~	~~100156-103~~	~~1~~	~~R510.~~
1hh	Resistor. " " 390K	100156-394	1	R511.
1h5				
1h6				
1h7	Wire, Solid Insulated.	1002h8-92h	A/R	Jumper J1. From KK to LL.
				Jumper J2. " U " V.
				Jumper Jh. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J15. " A " C.
				Jumper J16. " UU " VV.
				Jumper J17. " WW " XX.
				Jumper J3. " L " K.

MATERIAL LIST — ML — DRAWING NO. 200488 - 043 — REV. T

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB. Type'A' 10ips. S/G. 7Ch. MODEL NO. 1B DATE 11/22/71 SHEET 48 OF ___

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133				
13h				
135				
136	Resistor. 5%. ½w. 33K	100156-333	1	Rh21.
137	Resistor. " " 120K	100156-124	1	Rh31.
138	Resistor. " " 12K	100156-123	1	Rh32.
139	Resistor. " " 680K	100156-684	1	Rh66.
1h0	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~Rh67.~~
1h1	Resistor. " " 390K	100156-394	1	Rh68.
1h2	Resistor. " " 1.5M	100156-155	1	R509.
1h3	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
1hh	Resistor. " " 390K	100156-394	1	R511.
1h5	Resistor. " " 3.3M	100156-335	1	R536.
1h6				
1h7	Wire, Solid Insulated.	1002h8-92h	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.

ML DRAWING NO. 200488 - 036 REV. T

DATE 11/18/71 SHEET 41 OF

REQ.	REMARKS ON CKT. DESIG.
1	R234.
1	R248.
1	R268.
1	Rh21.
1	Rh31.
1	Rh32.
1	Rh66.
~~1~~	~~Rh67.~~
1	Rh68.
1	R509.
~~1~~	~~R510.~~
1	R511.
/R	Jumper J1. From JJ to KK.
	Jumper J2. " T " V.
	Jumper J3. " L " M.
	Jumper J5. " F " G.
	Jumper J7. " H " J.
	Jumper J8. " EE " FF.
	Jumper J9. " D " E.
	Jumper J10. " AA " CC.
	Jumper J11. " W " X.
	Jumper J13. " N " P.
	Jumper J14. " R " S.

MATERIAL LIST

ML DRAWING NO. 200488 - 038 REV. T

DRAWING TITLE ASSY.TRANSPORT ELECTRONICS PWB. Type'P' 12ips. S/G. 7Ch. MODEL NO. 18 DATE 11/16/71 SHEET 43 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 10uf	100070-106	1	C204.
132				
133				
134				
135				
136	Resistor. 5%. ½w. 27K	100156-273	1	Rh21.
137	Resistor. " " 100K	100156-104	1	Rh31.
138	Resistor. " " 12K	100156-123	1	Rh32.
139	Resistor. " " 680K	100156-684	1	Rh66.
1h0	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~Rh67.~~
1h1	Resistor. " " 390K	100156-394	1	Rh68.
1h2	Resistor. " " 1.5M	100156-155	1	R509.
1h3	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
1h4	Resistor. " " 390K	100156-394	1	R511.
1h5	Resistor. " " 3.3M	100156-335	1	R536.
1h6				
1h7	Wire, Solid Insulated.	10028-92h	A/R	Jumper J1. From KK to LL.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J15. " A " C.
				Jumper J16. " UU " VV.
				Jumper J17. " WW " XX.
				Jumper J3. " L " K.

MATERIAL LIST

ML DRAWING NO. 200488 - 040 REV. T

DRAWING TITLE ASSY.TRANSPORT ELECTRONICS PWB. Type'P' 25ips. S/G. 7Ch. MODEL NO. 18 DATE 11/22/71 SHEET 45 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 1.5uf	100136-155	1	C204.
132				
133				
134				
135				
136	Resistor. 5%. ½w. 15K	100156-153	1	Rh21.
137	Resistor. " " 51K	100156-513	1	Rh31.
138	Resistor. " " 13K	100156-133	1	Rh32.
139	Resistor. " " 68K	100156-683	1	Rh66.
1h0	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~Rh67.~~
1h1	Resistor. " " 390K	100156-394	1	Rh68.
1h2	Resistor. " " 1.5M	100156-155	1	R509.
1h3	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
1h4	Resistor. " " 390K	100156-394	1	R511.
1h5	Resistor. " " 3.3M	100156-335	1	R536.
1h6				
1h7	Wire, Solid Insulated.	10028-92h	A/R	Jumper J1. From KK to LL.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J15. " A " C.
				Jumper J16. " UU " VV.
				Jumper J17. " WW " XX.
				Jumper J3. " L " K.

MATERIAL LIST

ML DRAWING NO. 200488 - 042 REV. T

DRAWING TITLE ASSY.TRANSPORT ELECTRONICS PWB. Type'P' 45ips. S/G. 7Ch. MODEL NO. 18 DATE 11/22/71 SHEET 47 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 1.5uf.	100136-155	1	C204.
132				
133				
134				
135				
136	Resistor. 5%. ½w. 9.1K	100156-912	1	Rh21.
137	Resistor. " " 27K	100156-273	1	Rh31.
138	Resistor. " " 15K	100156-153	1	Rh32.
139	Resistor. " " 300K	100156-304	1	Rh66.
1h0	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~Rh67.~~
1h1	Resistor. " " 330K	100156-334	1	Rh68.
1h2	Resistor. " " 680K	100156-684	1	R509.
1h3	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
1h4	Resistor. " " 330K	100156-334	1	R511.
1h5				
1h6				
1h7	Wire, Solid Insulated.	10028-92h	A/R	Jumper J1. From KK to LL.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J15. " A " C.
				Jumper J16. " UU " VV.
				Jumper J17. " WW " XX.
				Jumper J3. " L " K.

MATERIAL LIST

ML DRAWING NO. 200488 - 044 REV. T

DRAWING TITLE ASSY.TRANSPORT ELECTRONICS PWB. Type'A' 12ips. S/G. 7Ch. MODEL NO. 18 DATE 11/22/71 SHEET 49 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133				
134				
135				
136	Resistor. 5%. ½w. 27K	100156-273	1	Rh21.
137	Resistor. " " 100K	100156-104	1	Rh31.
138	Resistor. " " 12K	100156-123	1	Rh32.
139	Resistor. " " 680K	100156-684	1	Rh66.
1h0	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~Rh67.~~
1h1	Resistor. " " 390K	100156-394	1	Rh68.
1h2	Resistor. " " 1.5M	100156-155	1	R509.
1h3	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
1h4	Resistor. " " 390K	100156-394	1	R511.
1h5	Resistor. " " 3.3M	100156-335	1	R536.
1h6				
1h7	Wire, Solid Insulated.	10028-92h	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.

ML DRAWING NO. 200488 - 037 REV. T

DATE 11/18/71 SHEET 42 OF

REQ.	REMARKS ON CKT. DESIG.
	C204.
	Rh21.
	Rh31.
	Rh32.
	Rh66.
~~1~~	~~Rh67.~~
	Rh68.
	R509.
~~1~~	~~R510.~~
	R511.
	R536.
	Jumper J1. From KK to LL.
	Jumper J2. " U " V.
	Jumper J4. " PP " RR.
	Jumper J5. " F " G.
	Jumper J6. " GG " HH.
	Jumper J7. " H " J.
	Jumper J8. " EE " FF.
	Jumper J9. " D " E.
	Jumper J10. " AA " CC.
	Jumper J11. " W " X.
	Jumper J15. " A " C.
	Jumper J16. " UU " VV.
	Jumper J17. " WW " XX.
	Jumper J3. " L " K.

MATERIAL LIST

ML DRAWING NO. 200488 - 039 REV. T

DRAWING TITLE ASSY.TRANSPORT ELECTRONICS PWB. Type'P' 18 ips. S/G. 7Ch. MODEL NO. 18 DATE 11/13/71 SHEET 44 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 10uf	100070-106	1	C204.
132				
133				
134				
135				
136	Resistor. 5%. ½w. 18K	100156-183	1	Rh21.
137	Resistor. " " 68K	100156-683	1	Rh31.
138	Resistor. " " 13K	100156-133	1	Rh32.
139	Resistor. " " 660K	100156-664	1	Rh66.
1h0	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~Rh67.~~
1h1	Resistor. " " 390K	100156-394	1	Rh68.
1h2	Resistor. " " 1.5M	100156-155	1	R509.
1h3	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
1h4	Resistor. " " 390K	100156-394	1	R511.
1h5	Resistor. " " 3.3M	100156-335	1	R536.
1h6				
1h7	Wire, Solid Insulated.	10028-92h	A/R	Jumper J1. From KK to LL.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J15. " A " C.
				Jumper J16. " UU " VV.
				Jumper J17. " WW " XX.
				Jumper J3. " L " K.

MATERIAL LIST

ML DRAWING NO. 200488 - 041 REV. T

DRAWING TITLE ASSY.TRANSPORT ELECTRONICS PWB. Type'P' 37½ips.S/G. 7Ch. MODEL NO. 18 DATE 11/22/71 SHEET 46 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum. 1.5uf.	100136-155	1	C204.
132				
133				
134				
135				
136	Resistor. 5%. ½w. 10K	100156-103	1	Rh21.
137	Resistor. " " 33K	100156-333	1	Rh31.
138	Resistor. " " 15K	100156-153	1	Rh32.
139	Resistor. " " 300K	100156-304	1	Rh66.
1h0	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~Rh67.~~
1h1	Resistor. " " 390K	100156-394	1	Rh68.
1h2	Resistor. " " 680K	100156-684	1	R509.
1h3	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
1h4	Resistor. " " 390K	100156-394	1	R511.
1h5				
1h6				
1h7	Wire, Solid Insulated.	10028-92h	A/R	Jumper J1. From KK to LL.
				Jumper J2. " U " V.
				Jumper J4. " PP " RR.
				Jumper J5. " F " G.
				Jumper J6. " GG " HH.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J15. " A " C.
				Jumper J16. " UU " VV.
				Jumper J17. " WW " XX.
				Jumper J3. " L " K.

MATERIAL LIST

ML DRAWING NO. 200488 - 043 REV. T

DRAWING TITLE ASSY.TRANSPORT ELECTRONICS PWB. Type'A' 18ips.S/G. 7Ch. MODEL NO. 18 DATE 11/22/71 SHEET 48 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133				
134				
135				
136	Resistor. 5%. ½w. 33K	100156-333	1	Rh21.
137	Resistor. " " 120K	100156-124	1	Rh31.
138	Resistor. " " 12K	100156-123	1	Rh32.
139	Resistor. " " 620K	100156-681	1	Rh66.
1h0	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~Rh67.~~
1h1	Resistor. " " 390K	100156-394	1	Rh68.
1h2	Resistor. " " 1.5M	100156-155	1	R509.
1h3	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
1h4	Resistor. " " 390K	100156-394	1	R511.
1h5	Resistor. " " 3.3M	100156-335	1	R536.
1h6				
1h7	Wire, Solid Insulated.	10028-92h	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.

MATERIAL LIST

ML DRAWING NO. 200488 - 045 REV. T

DRAWING TITLE ASSY.TRANSPORT ELECTRONICS PWB. Type'A' 18 ips.S/G. 7Ch. MODEL NO. 18 DATE 11/22/71 SHEET 50 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131				
132				
133				
134				
135				
136	Resistor. 5%. ½w. 18K	100156-183	1	Rh21.
137	Resistor. " " 68K	100156-683	1	Rh31.
138	Resistor. " " 13K	100156-133	1	Rh32.
139	Resistor. " " 660K	100156-664	1	Rh66.
1h0	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~Rh67.~~
1h1	Resistor. " " 390K	100156-394	1	Rh68.
1h2	Resistor. " " 1.5M	100156-155	1	R509.
1h3	~~Resistor. " " 150~~	~~100156-151~~	~~1~~	~~R510.~~
1h4	Resistor. " " 390K	100156-394	1	R511.
1h5	Resistor. " " 3.3M	100156-335	1	R536.
1h6				
1h7	Wire, Solid Insulated.	10028-92h	A/R	Jumper J1. From JJ to KK.
				Jumper J2. " T " V.
				Jumper J3. " L " M.
				Jumper J5. " F " G.
				Jumper J7. " H " J.
				Jumper J8. " EE " FF.
				Jumper J9. " D " E.
				Jumper J10. " AA " CC.
				Jumper J11. " W " X.
				Jumper J13. " N " P.
				Jumper J14. " R " S.

MATERIAL LIST

ML | DRAWING NO. 200488 - 046 | REV. S

DRAWING TITLE: ASSY. TRANSPORT ELECTRONICS PWB. Type 'A' 25ips. S/G. 7Ch. MODEL NO. 18 DATE 11/22/71 SHEET 51 OF

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131					
132					
133					
134					
135					
136	Resistor. 5%. ½w.	15K	100156-153	1	R421.
137	Resistor. " "	51K	100156-513	1	R431.
138	Resistor. " "	13K	100156-133	1	R432.
139	Resistor. " "	680K	100156-684	1	R466.
140	~~Resistor. " "~~	~~150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " "	390K	100156-394	1	R468.
142	Resistor. " "	1.5M	100156-155	1	R509.
143	~~Resistor. " "~~	~~150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " "	390K	100156-394	1	R511.
145	Resistor. " "	3.3M	100156-335	1	R536.
146					
147	Wire, Solid Insulated.		100248-924	A/R	Jumper J1. From JJ to KK.
					Jumper J2. " T " V.
					Jumper J3. " L " M.
					Jumper J5. " F " G.
					Jumper J7. " H " J.
					Jumper J8. " EE " FF.
					Jumper J9. " D " E.
					Jumper J10. " AA " CC.
					Jumper J11. " W " X.
					Jumper J13. " N " P.
					Jumper J1h. " R " S.

CODE A - MANUAL DENSITY SELECT.

MATERIAL LIST

ML | DRAWING NO. 200488 - 047 | REV. S

DRAWING TITLE: ASSY. TRANSPORT ELECTRONICS PWB. Type 'A' 37½ips. S/G. 7Ch. MODEL NO. 18 DATE 11/22/71 SHEET 52 OF

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131					
132					
133					
134					
135					
136	Resistor. 5%. ½w.	10K	100156-103	1	R422.
137	Resistor. " "	33K	100156-333	1	R431.
138	Resistor. " "	15K	100156-153	1	R432.
139	Resistor. " "	300K	100156-304	1	R466.
140	~~Resistor. " "~~	~~10K~~	~~100156-103~~	~~1~~	~~R467.~~
141	Resistor. " "	390K	100156-394	1	R468.
142	Resistor. " "	680K	100156-684	1	R509.
143	~~Resistor. " "~~	~~10K~~	~~100156-103~~	~~1~~	~~R510.~~
144	Resistor. " "	390K	100156-394	1	R511.
145					
146					
147	Wire, Solid Insulated.		100248-924	A/R	Jumper J1. From JJ to KK.
					Jumper J2. " T " V.
					Jumper J3. " L " M.
					Jumper J5. " F " G.
					Jumper J7. " H " J.
					Jumper J8. " EE " FF.
					Jumper J9. " D " E.
					Jumper J10. " AA " CC.
					Jumper J11. " W " X.
					Jumper J13. " N " P.
					Jumper J1h. " R " S.

CODE B - MANUAL ON-LINE

MATERIAL LIST

ML | DRAWING NO. 200488 - 048 | REV.

DRAWING TITLE: ASSY. TRANSPORT ELECTRONICS PWB. Type 'A' 45ips. S/G. 7Ch. MODEL NO. 18 DATE 11/22/71 SHEET 53 OF

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131					
132					
133					
134					
135					
136	Resistor. 5%. ½w.	9.1K	100156-912	1	R421.
137	Resistor. " "	27K	100156-273	1	R431.
138	Resistor. " "	15K	100156-153	1	R432.
139	Resistor. " "	300K	100156-304	1	R466.
140	~~Resistor. " "~~	~~150~~	~~100156-151~~	~~1~~	~~R467.~~
141	Resistor. " "	330K	100156-334	1	R468.
142	Resistor. " "	680K	100156-684	1	R509.
143	~~Resistor. " "~~	~~150~~	~~100156-151~~	~~1~~	~~R510.~~
144	Resistor. " "	330K	100156-334	1	R511.
145					
146					
147	Wire, Solid Insulated.		100248-924	A/R	Jumper J1. From JJ to KK.
					Jumper J2. " T " V.
					Jumper J3. " L " M.
					Jumper J5. " F " G.
					Jumper J7. " H " J.
					Jumper J8. " EE " FF.
					Jumper J9. " D " E.
					Jumper J10. " AA " CC.
					Jumper J11. " W " X.
					Jumper J13. " N " P.
					Jumper J1h. " R " S.

CODE C - 5v. TO CONTROLLER.

MATERIAL LIST

ML | DRAWING NO. 200488 - XXX | REV.

DRAWING TITLE: ASSY. TRANSPORT ELECTRONICS PWB. MANUAL ON-LINE. MODEL NO. 18 DATE 11/22/71 SHEET 55 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
	Use the appropiate sheet			
	showing the combination of			
	speed; type 'A' or 'P', and			
	7 or 9 Ch. Then change the			
	first digit of the dash No.			
	to letter B.			
	EXAMPLE:- 200488 - B06			
	defines a Type 'P' 45ips D/G.			
	9Ch. Transport PWB with the			
	Manual On-Line Option.			
	Also:-			
	Jumper J9. From D to E.			Delete.

For Dual Guide Swing Arms

MATERIAL LIST

ML | DRAWING NO. 200488 - 049 | REV.

DRAWING TITLE: ASSY. TRANSPORT ELECTRONICS PWBType"P"25ips D/G 9 Ch. MODEL NO. 25 DATE 7-6-72 SHEET 57 OF

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
131	Capacitor, Tantalum 1.5uf		100136-155	1	C204
132					
133	Resistor, 5%. ½w.	750	100156-751	1	R234.
134	Resistor, " 3w.	47	100068-470	1	R248.
135	Resistor, " ½w.	750	100156-751	1	R268.
136	Resistor, " "	15K	100156-153	1	R421.
137	Resistor, " "	51K	100156-513	1	R431.
138	Resistor, " "	13K	100156-133	1	R432.
139	Resistor, " "	300K	100156-304	1	R466.
140					
141	Resistor, 5% "	390K	100156-394	1	R468.
142	Resistor, " "	680K	100156-684	1	R509.
143					
144	Resistor, " "	390K	100156-394	1	R511.
145					
146					
147	Wire, Solid Insulated.		100248-924	A/R	Jumper J1. From JJ to KK.
					Jumper J2. " U " V.
					Jumper J4. " PP " RR.
					Jumper J5. " F " G.
					Jumper J6. " GG " HH.
					Jumper J7. " H " J.
					Jumper J8. " EE " FF.
					Jumper J9. " D " E.
					Jumper J10. " AA " CC.
					Jumper J11. " W " X.
					Jumper J19. " DD " TP208

MATERIAL LIST

ML | DRAWING NO. 200488 - XXX | REV.

DRAWING TITLE: ASSY. TRANSPORT ELECTRONICS PWB. MANUAL DENSITY SELECT. MODEL NO. 18 DATE 11/23/71 SHEET 54 OF

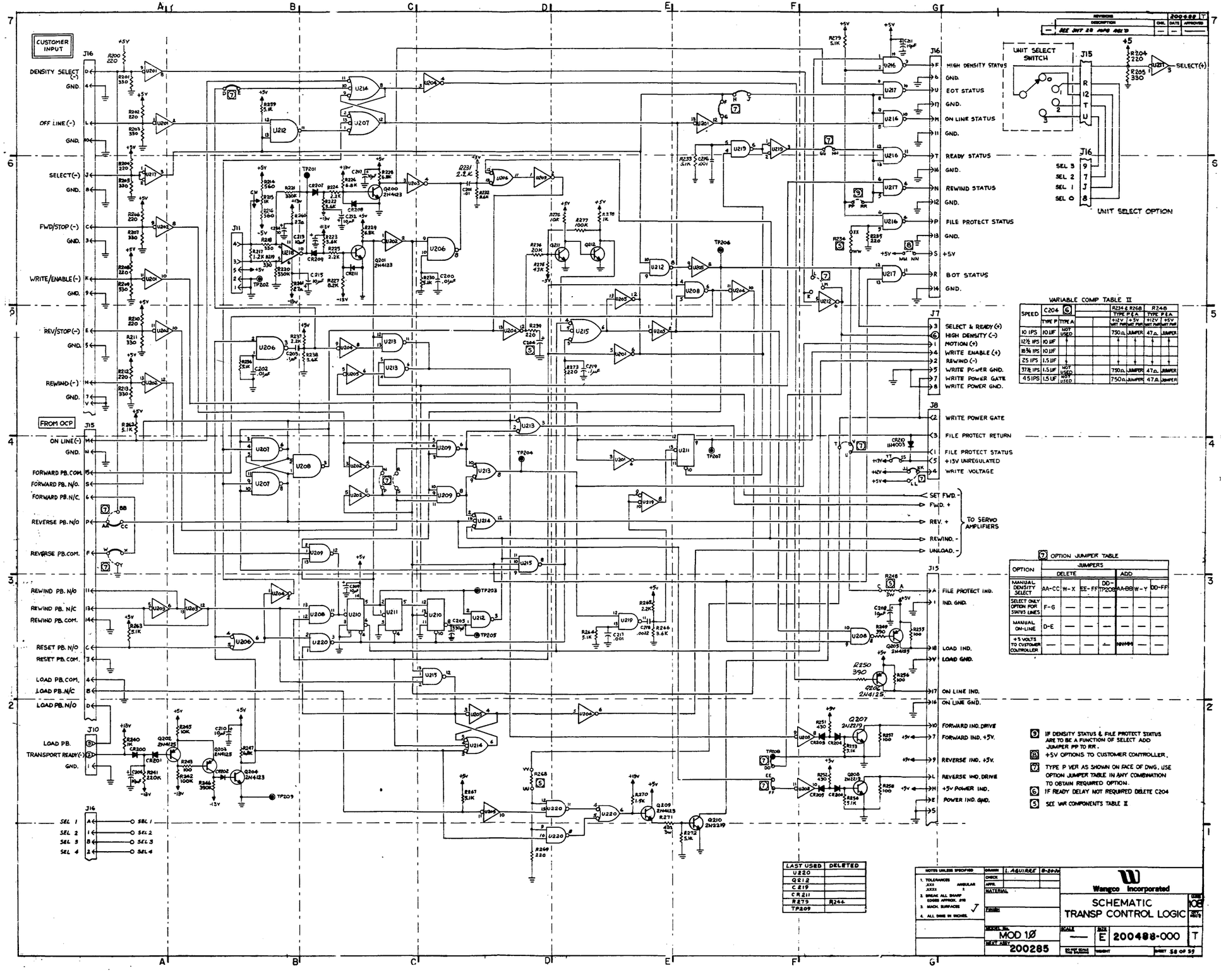
ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
	Use the appropiate sheet			
	showing the combination of			
	speed; type 'A' or 'P'; and			
	7 or 9 Ch. Then change the			
	first digit of the dash No.			
	to letter A.			
	EXAMPLE:- 200488 - A06			
	defines a Type 'P' 45ips. D/G.			
	9Ch. Transport PWB with the			
	Manual Density Select Option.			
	Also:-			
	Jumper J8. From EE to FF.			Delete.
	Jumper J8. " DD " FF.			Add.
	Jumper J10. From AA to CC.			Delete.
	Jumper J10. " AA " BB.			Add.
	Jumper J11. From W to X.			Delete.
	Jumper J11. " W " Y.			Add.
	Jumper J19. From DD to TP208.			Delete.

MATERIAL LIST

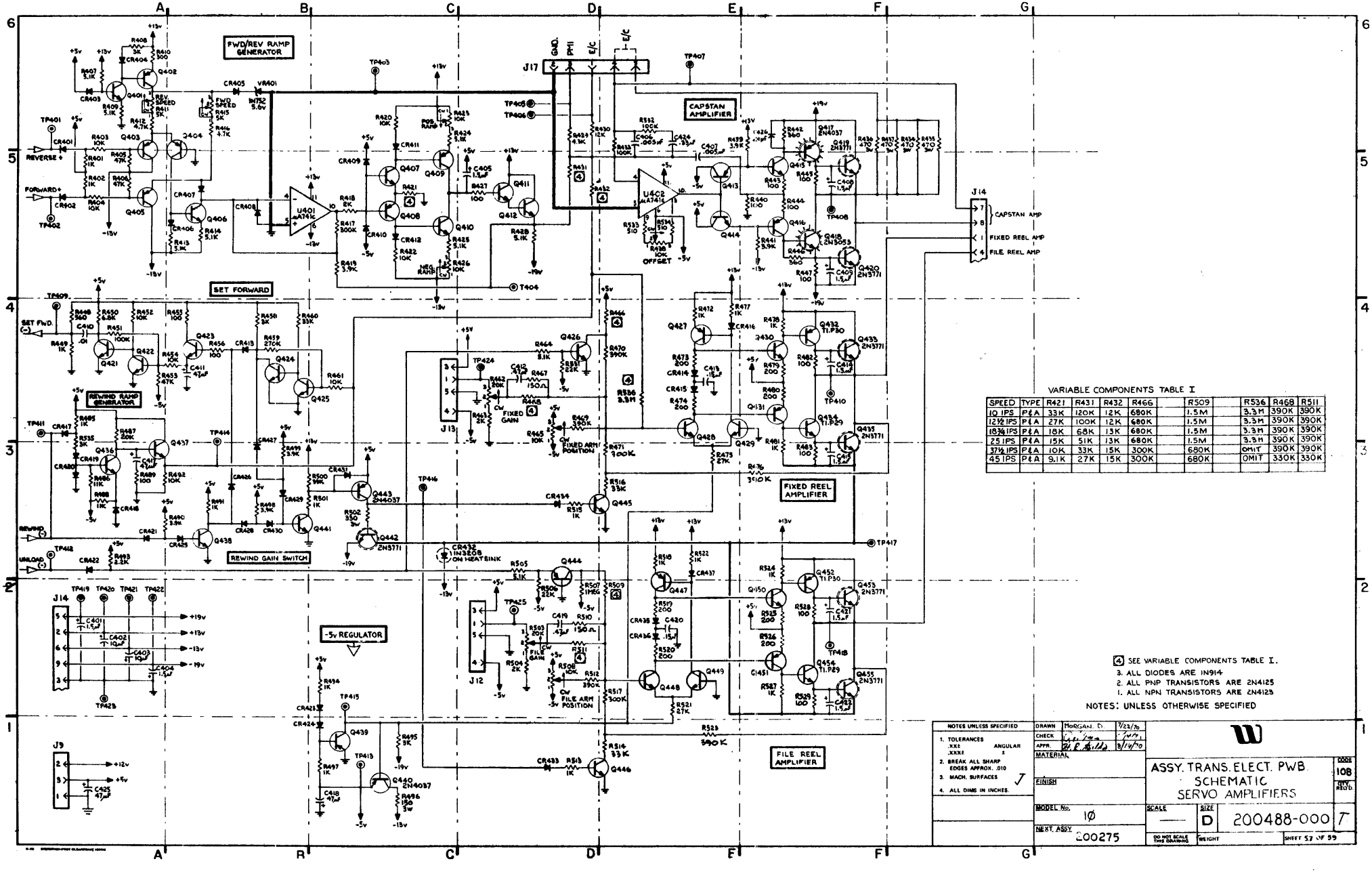
ML | DRAWING NO. 200488 - XXX | REV.

DRAWING TITLE: ASSY. TRANSPORT ELECTRONICS PWB. 5v. to Controller. MODEL NO. 18 DATE 11/23/71 SHEET 56 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
	Use the appropiate sheet			
	showing the combination of			
	speed; type 'A' or 'P', and			
	7 or 9 Ch. Then change the			
	first digit of the dash No.			
	to letter C.			
	EXAMPLE:- 200488 - C06			
	defines a Type 'P' 45ips. D/G.			
	9Ch. Transport PWB with the			
	5v. to the Controller Option.			
	Also:-			
	Jumper J28. From MM to NN.			Add.



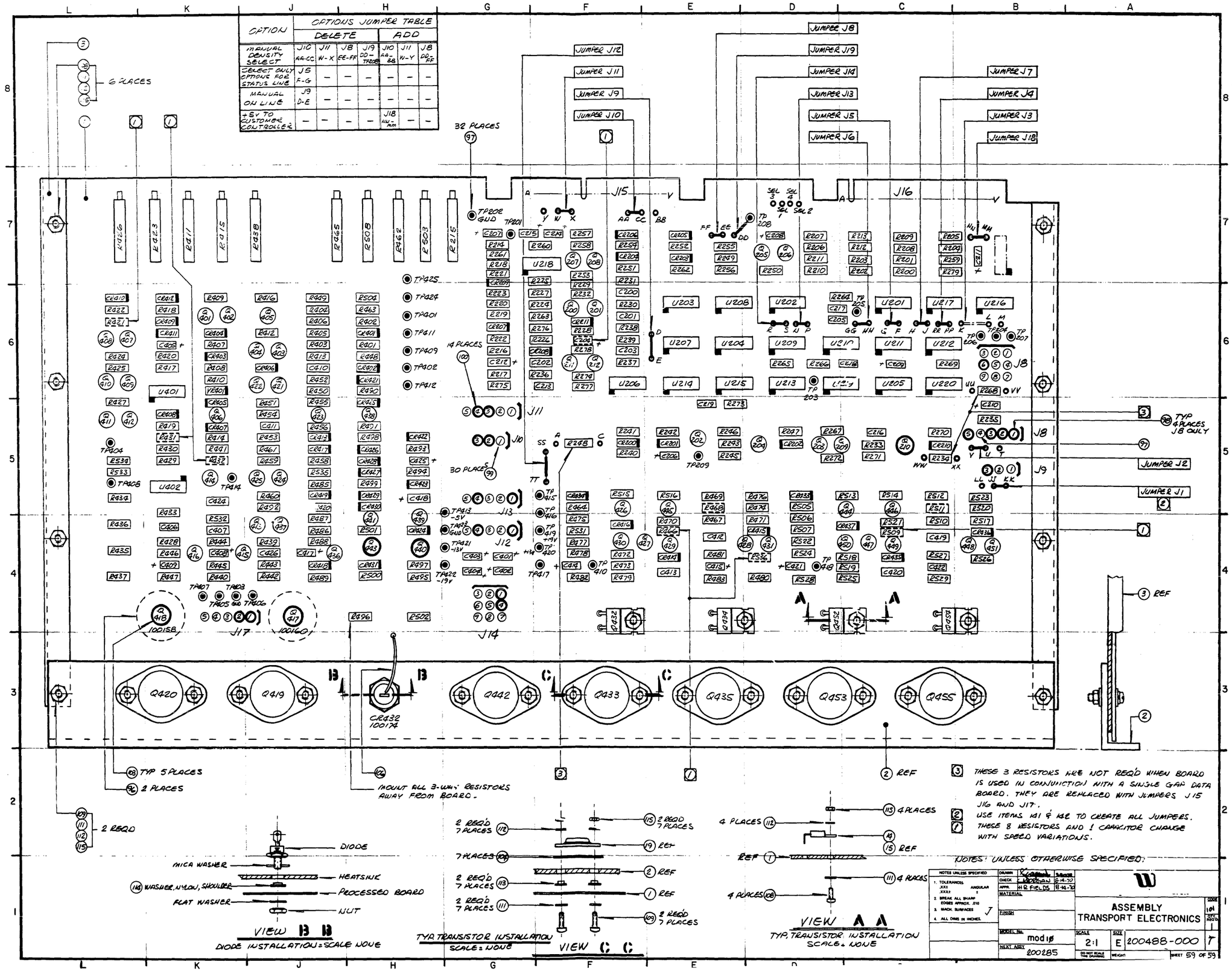
B-23 Schematic, Transport Control Logic, PWB



SPEED	TYPE	R421	R431	R432	R466		R509		R536	R468	R511
10 IPS	P&A	33K	120K	12K	680K		1.5M		3.3M	390K	390K
12½ IPS	P&A	27K	100K	12K	680K		1.5M		3.3M	390K	390K
18¾ IPS	P&A	18K	68K	13K	680K		1.5M		3.3M	390K	390K
25 IPS	P&A	15K	51K	13K	680K		1.5M		3.3M	390K	390K
37½ IPS	P&A	10K	33K	15K	300K		680K		OMIT	390K	390K
45 IPS	P&A	9.1K	27K	15K	300K		680K		OMIT	330K	330K

B-24. Schematic, Servo Amplifiers

OPTION	OPTIONS JUMPER TABLE						
	DELETE				ADD		
MANUAL DENSITY SELECT	J10 AA-CC	J11 W-X	J8 EE-FF	J19 DD-TP208	J10 AA-BB	J11 W-Y	J8 DD-FF
SELECT ONLY OPTIONS FOR STATUS LINE	J5 E-G	—	—	—	—	—	—
MANUAL ON LINE	J9 D-E	—	—	—	—	—	—
+5V TO CUSTOMER CONTROLLER	—	—	—	—	J18 UU-MM	—	—



B-26, Deleted

BASIC DAISY CHAIN WITH UNIT SELECT

WANGCO INCORPORATED — MATERIAL LIST — ML

DRAWING NO. 200632-011 REV. U

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB 251PS 9CH TYPE 'P' — MODEL NO. 10 — DATE 8/31/72 — SHEET 16 OF 45

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136	Capacitor, Tantalum 1.5uf	100136-155	1	C209
137	Capacitor, Polyfilm .33uf	100128-334	1	C424
138	Resistor, 5%, ½W 390	100064-391	1	R266
139	Resistor, " ¼W 15K	100156-153	1	R421
140	Resistor, " " 51K	100156-513	1	R431
141	Resistor, " " 13K	100156-133	1	R432
142	Resistor, " " 100K	100156-104	1	R433
143	Resistor, " " 680K	100156-684	1	R466
144	Resistor, " " 390K	100156-394	1	R468
145	Resistor, " " 1.5M	100156-155	1	R509
146	Resistor, " " 390K	100156-394	1	R511
147	Resistor, " " 100K	100156-104	1	R532
148	Resistor, " " 3.3M	100156-335	1	R536
149	Resistor, " " 2.2K	100156-222	1	R262
150	Resistor, " " 750	100156-751	1	R235
151	Resistor, " " 750	100156-751	1	R251
152	Resistor, " ½W 390	100064-391	1	R280
153	Resistor, " 3W 47	100068-470	1	R269
154	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to HH.
				Jumper J6. From CC to DD.
				Jumper J7. From Y to Z.
				Jumper J8. From S to T.
				Jumper J9. From P to R.
				Jumper J11.From W to X.
				Jumper J14.From G to H.
				Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J10,J12,			Jumper J16.From U to V.
	J13,J18,J20 not used			Jumper J17.From D to F.
				Jumper J19.From A to C.
155	Rework Instructions	201324	Ref.	

BASIC DAISY CHAIN WITH UNIT SELECT.

WANGCO INCORPORATED — MATERIAL LIST — ML

DRAWING NO. 200632-012 REV. U

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB 251PS 7CH TYPE 'P' — MODEL NO. 10 — DATE 8/31/72 — SHEET 17 OF 45

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136	Capacitor, Tantalum 1.5uf	100136-155	1	C209
137	Capacitor, Polyfilm .33uf	100128-334	1	C424
138	Resistor, 5%, ½W 390	100064-391	1	R266
139	Resistor, " ¼W 15K	100156-153	1	R421
140	Resistor, " " 51K	100156-513	1	R431
141	Resistor, " " 13K	100156-133	1	R432
142	Resistor, " " 100K	100156-104	1	R433
143	Resistor, " " 680K	100156-684	1	R466
144	Resistor, " " 390K	100156-394	1	R468
145	Resistor, " " 1.5M	100156-155	1	R509
146	Resistor, " " 390K	100156-394	1	R511
147	Resistor, " " 100K	100156-104	1	R532
148	Resistor, " " 3.3M	100156-335	1	R536
149	Resistor, " " 2.2K	100156-222	1	R262
150	Resistor, " " 750	100156-751	1	R235
151	Resistor, " " 750	100156-751	1	R251
152	Resistor, " ½W 390	100064-391	1	R280
153	Resistor, " 3W 47	100068-470	1	R269
154	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to HH.
				Jumper J6. From CC to DD.
				Jumper J7. From Y to Z.
				Jumper J8. From S to T.
				Jumper J9. From P to R.
				Jumper J11.From W to X.
				Jumper J14.From G to H.
				Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J10,J12,			Jumper J16.From U to V.
	J13,J18 not used			Jumper J17.From D to F.
				Jumper J19.From A to C.
				Jumper J20.From AAA to BBB.
155	Rework Instructions	201324	Ref.	

BASIC DAISY CHAIN WITH UNIT SELECT

WANGCO INCORPORATED — MATERIAL LIST — ML

DRAWING NO. 200632-013 REV. U

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB 37½IPS 9CH TYPE 'P' — MODEL NO. 10 — DATE 8/31/72 — SHEET 18 OF 45

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136	Capacitor, Tantalum 1.5uf	100136-155	1	C209
137	Capacitor, Polyfilm .68uf	100128-684	1	C424
138	Resistor, 5%, ½W 390	100064-391	1	R266
139	Resistor, " ¼W 10K	100156-103	1	R421
140	Resistor, " " 33K	100156-333	1	R431
141	Resistor, " " 15K	100156-153	1	R432
142	Resistor, " " 43K	100156-433	1	R433
143	Resistor, " " 300K	100156-304	1	R466
144	Resistor, " " 390K	100156-394	1	R468
145	Resistor, " " 680K	100156-684	1	R509
146	Resistor, " " 390K	100156-394	1	R511
147	Resistor, " " 43K	100156-433	1	R532
148				
149	Resistor, 5%, ½W 2.2K	100156-222	1	R262
150	Resistor, " " 750	100156-751	1	R235
151	Resistor, " " 750	100156-751	1	R251
152	Resistor, " ½W 390	100064-391	1	R280
153	Resistor, " 3W 47	100068-470	1	R269
154	Wire, Solid Insulated	100248-924	A/r	Jumper J1. From VV to WW.
				Jumper J2. From GG to HH.
				Jumper J6. From CC to DD.
				Jumper J7. From Y to Z.
				Jumper J8. From S to T.
				Jumper J9. From P to R.
				Jumper J11.From W to X.
				Jumper J14.From G to H.
				Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J10,J12,J13,			Jumper J16.From U to V.
	J18,J20 not used.			Jumper J17.From D to F.
				Jumper J19.From A to C.
155	Rework Instructions	201324	Ref.	

BASIC DAISY CHAIN WITH UNIT SELECT.

WANGCO INCORPORATED — MATERIAL LIST — ML

DRAWING NO. 200632-014 REV. U

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB 37½IPS 7CH TYPE 'P' — MODEL NO. 10 — DATE 8/31/72 — SHEET 19 OF 45

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136	Capacitor, Tantalum 1.5uf	100136-155	1	C209
137	Capacitor, Polyfilm .68uf	100128-684	1	C424
138	Resistor, 5%, ½W 390	100064-391	1	R266
139	Resistor, " ¼W 10K	100156-103	1	R421
140	Resistor, " " 33K	100156-333	1	R431
141	Resistor, " " 15K	100156-153	1	R432
142	Resistor, " " 43K	100156-433	1	R433
143	Resistor, " " 300K	100156-304	1	R466
144	Resistor, " " 390K	100156-394	1	R468
145	Resistor, " " 680K	100156-684	1	R509
146	Resistor, " " 390K	100156-394	1	R511
147	Resistor, " " 43K	100156-433	1	R532
148				
149	Resistor, 5%, ½W 2.2K	100156-222	1	R262
150	Resistor, " " 750	100156-751	1	R235
151	Resistor, " " 750	100156-751	1	R251
152	Resistor, " ½W 390	100064-391	1	R280
153	Resistor, " 3W 47	100068-470	1	R269
154	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to HH.
				Jumper J6. From CC to DD.
				Jumper J7. From Y to Z.
				Jumper J8. From S to T.
				Jumper J9. From P to R.
				Jumper J11.From W to X.
				Jumper J14.From G to H.
				Jumper J15.From NN to PP.
	Jumpers J3,J4,J10,J12,J13,			Jumper J16.From U to V.
	J18 not used.			Jumper J17.From D to F.
				Jumper J19.From A to C.
				Jumper J20.From AAA to BBB.
155	Rework Instructions	201324	Ref.	

BASIC DAISY CHAIN WITH UNIT SELECT

WANGCO INCORPORATED — MATERIAL LIST — ML

DRAWING NO. 200632-015 REV. U

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB 451PS 9CH TYPE 'P' — MODEL NO. 10 — DATE 8/31/72 — SHEET 20 OF 45

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136	Capacitor, Tantalum 1.5uf	100136-155	1	C209
137	Capacitor, Polyfilm .68uf	100128-684	1	C424
138	Resistor, 5%, ½W 390	100064-391	1	R266
139	Resistor, " ¼W 9.1K	100156-912	1	R421
140	Resistor, " " 27K	100156-273	1	R431
141	Resistor, " " 15K	100156-153	1	R432
142	Resistor, " " 43K	100156-433	1	R433
143	Resistor, " " 300K	100156-304	1	R466
144	Resistor, " " 330K	100156-334	1	R468
145	Resistor, " " 680K	100156-684	1	R509
146	Resistor, " " 330K	100156-334	1	R511
147	Resistor, " " 43K	100156-433	1	R532
148				
149	Resistor, " " 2.2K	100156-222	1	R262
150	Resistor, " " 750	100156-751	1	R235
151	Resistor, " " 750	100156-751	1	R251
152	Resistor, " ½W 390	100064-391	1	R280
153	Resistor, " 3W 47	100068-470	1	R269
154	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to HH.
				Jumper J6. From CC to DD.
				Jumper J7. From Y to Z.
				Jumper J8. From S to T.
				Jumper J9. From P to R.
				Jumper J11.From W to X.
				Jumper J14.From G to H.
				Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J10,J12,J13,			Jumper J16.From U to V.
	J18,J20 not used			Jumper J17.From D to F.
				Jumper J19.From A to C.
155	Rework Instructions	201324	Ref.	

BASIC DAISY CHAIN WITH UNIT SELECT.

WANGCO INCORPORATED — MATERIAL LIST — ML

DRAWING NO. 200632-016 REV. U

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB.451PS 7CH TYPE 'P' — MODEL NO. 10 — DATE 8/31/72 — SHEET 21 OF 45

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136	Capacitor, Tantalum 1.5uf	100136-155	1	C209
137	Capacitor, Polyfilm .68uf	100128-684	1	C424
138	Resistor, 5%, ½W 390	100064-391	1	R266
139	Resistor, " ¼W 9.1K	100156-912	1	R421
140	Resistor, " " 27K	100156-273	1	R431
141	Resistor, " " 15K	100156-153	1	R432
142	Resistor, " " 43K	100156-433	1	R433
143	Resistor, " " 300K	100156-304	1	R466
144	Resistor, " " 330K	100156-334	1	R468
145	Resistor, " " 680K	100156-684	1	R509
146	Resistor, " " 330K	100156-334	1	R511
147	Resistor, " " 43K	100156-433	1	R532
148				
149	Resistor, " " 2.2K	100156-222	1	R262
150	Resistor, " " 750	100156-751	1	R235
151	Resistor, " " 750	100156-751	1	R251
152	Resistor, " ½W 390	100064-391	1	R280
153	Resistor, " 3W 47	100068-470	1	R269
154	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to HH.
				Jumper J6. From CC to DD.
				Jumper J7. From Y to Z.
				Jumper J8. From S to T.
				Jumper J9. From P to R.
				Jumper J11.From W to X.
				Jumper J14.From G to H.
				Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J10,J12,			Jumper J16.From U to V.
	J13,J18 not used			Jumper J17.From D to F.
				Jumper J19.From A to C.
				Jumper J20.From AAA to BBB.
155	Rework Instructions	201324	Ref.	

BASIC DAISY CHAIN WITH UNIT SELECT

WANGCO INCORPORATED — MATERIAL LIST — ML

DRAWING NO. 200632-017 REV. U

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB 251PS 9CH. TYPE 'A' — MODEL NO. 10 — DATE 8/31/72 — SHEET 22 OF 45

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136				
137	Capacitor, Polyfilm .33uf	100128-334	1	C424
138	Resistor, 5%, ½W 390	100064-391	1	R266
139	Resistor, " ¼W 15K	100156-153	1	R421
140	Resistor, " " 51K	100156-513	1	R431
141	Resistor, " " 13K	100156-133	1	R432
142	Resistor, " " 100K	100156-104	1	R433
143	Resistor, " " 680K	100156-684	1	R466
144	Resistor, " " 390K	100156-394	1	R468
145	Resistor, " " 1.5M	100156-155	1	R509
146	Resistor, " " 390K	100156-394	1	R511
147	Resistor, " " 100K	100156-104	1	R532
148	Resistor, " " 3.3M	100156-335	1	R536
149	Resistor, " " 2.2K	100156-222	1	R262
150	Resistor, " " 750	100156-751	1	R235
151	Resistor, " " 750	100156-751	1	R251
152	Resistor, " ½W 390	100064-391	1	R280
153	Resistor, " 3W 47	100068-470	1	R269
154	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to FF.
				Jumper J6. From CC to EE.
				Jumper J10.From RR to SS.
				Jumper J8. From S to T.
				Jumper J9. From P to R.
				Jumper J12.From K to M.
				Jumper J14.From G to H.
				Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J7,J11			Jumper J16.From U to V.
	J18,J20 not used.			Jumper J17.From D to F.
				Jumper J19.From A to C.
				Jumper J13.From J to L.
155	Rework Instructions	201324	Ref.	

BASIC DAISY CHAIN WITH UNIT SELECT

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 200632-018 | REV. U

DRAWING TITLE: ASSY. TRANSPORT ELECTRONICS PWB 25IPS 7CH. TYPE 'A' | MODEL NO. 10 | DATE 8/31/72 | SHEET 23 OF 45

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136				
137	Capacitor, Polyfilm .33uf	100128-334	1	C424
138	Resistor, 5%, ½W 390	100064-391	1	R266
139	Resistor, " ½W 15K	100156-153	1	R421
140	Resistor, " " 51K	100156-513	1	R431
141	Resistor, " " 13K	100156-133	1	R432
142	Resistor, " " 100K	100156-104	1	R433
143	Resistor, " " 680K	100156-684	1	R466
144	Resistor, " " 390K	100156-394	1	R468
145	Resistor, " " 1.5M	100156-155	1	R509
146	Resistor, " " 390K	100156-394	1	R511
147	Resistor, " " 100K	100156-104	1	R532
148	Resistor, " " 3.3M	100156-335	1	R536
149	Resistor, " " 2.2K	100156-222	1	R262
150	Resistor, " " 750	100156-751	1	R235
151	Resistor, " " 750	100156-751	1	R251
152	Resistor, " ½W 390	100064-391	1	R280
153	Resistor, " 3W 47	100068-470	1	R269
154	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to FF.
				Jumper J6. From CC to EE.
				Jumper J10.From RR to SS.
				Jumper J8. From S to T.
				Jumper J9. From P to R.
				Jumper J12. From K to M.
				Jumper J14. From G to H.
				Jumper J15. From NN to PP.
	Jumpers J3,J4,J5,J7,J11,			Jumper J16. From U to V.
	J18, not used.			Jumper J17. From D. to F.
				Jumper J19. From A to C.
				Jumper J13. From J to L.
155	Rework Instructions	201324	Ref.	

BASIC DAISY CHAIN WITH UNIT SELECT

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 200632-019 | REV. U

DRAWING TITLE: ASSY. TRANSPORT ELECTRONICS PWB 37½IPS 9CH. TYPE 'A' | MODEL NO. 10 | DATE 8/31/72 | SHEET 24 OF 45

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136				
137	Capacitor, Polyfilm .68uf	100128-684	1	C424
138	Resistor, 5%, ½W 390	100064-391	1	R266
139	Resistor, " ½W 10K	100156-103	1	R421
140	Resistor, " " 33K	100156-333	1	R431
141	Resistor, " " 15K	100156-153	1	R432
142	Resistor, " " 43K	100156-433	1	R433
143	Resistor, " " 300K	100156-304	1	R466
144	Resistor, " " 390K	100156-394	1	R468
145	Resistor, " " 680K	100156-684	1	R509
146	Resistor, " " 390K	100156-394	1	R511
147	Resistor, " " 43K	100156-433	1	R532
148				
149	Resistor, " " 2.2K	100156-222	1	R262
150	Resistor, " " 750	100156-751	1	R235
151	Resistor, " " 750	100156-751	1	R251
152	Resistor, " ½W 390	100064-391	1	R280
153	Resistor, " 3W 47	100068-470	1	R269
154	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to FF.
				Jumper J6. From CC to EE.
				Jumper J10.From RR to SS.
				Jumper J8. From S to T.
				Jumper J9. From P to R.
				Jumper J12.From K to M.
				Jumper J14. From G to H.
				Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J7,J11,			Jumper J16.From U to V.
	J18,J20 not used.			Jumper J17.From D to F.
				Jumper J19.From A to C.
				Jumper J13.From J to L.
155	Rework Instructions	201324	Ref.	

BASIC DAISY CHAIN WITH UNIT SELECT.

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 200632-020 | REV. U

DRAWING TITLE: ASSY. TRANSPORT ELECTRONICS PWB 37½IPS 7CH. TYPE 'A' | MODEL NO. 10 | DATE 8/31/72 | SHEET 25 OF 45

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136				
137	Capacitor, Polyfilm .68uf	100128-684	1	C424
138	Resistor, 5%, ½W 390	100064-391	1	R266
139	Resistor, " ½W 10K	100156-103	1	R421
140	Resistor, " " 33K	100156-333	1	R431
141	Resistor, " " 15K	100156-153	1	R432
142	Resistor, " " 43K	100156-433	1	R433
143	Resistor, " " 300K	100156-304	1	R466
144	Resistor, " " 390K	100156-394	1	R468
145	Resistor, " " 680K	100156-684	1	R509
146	Resistor, " " 390K	100156-394	1	R511
147	Resistor, " " 43K	100156-433	1	R532
148				
149	Resistor, " " 2.2K	100156-222	1	R262
150	Resistor, " " 750	100156-751	1	R235
151	Resistor, " " 750	100156-751	1	R251
152	Resistor, " ½W 390	100064-391	1	R280
153	Resistor, " 3W 47	100068-470	1	R269
154	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to FF.
				Jumper J6. From CC to EE.
				Jumper J10.From RR to SS.
				Jumper J8. From S to T.
				Jumper J9. From P to R.
				Jumper J12. From K to M.
				Jumper J14. From G to H.
				Jumper J15. From NN to PP.
	Jumpers J3,J4,J5,J7,J11,			Jumper J16. From U to V.
	J18. not used.			Jumper J17. From D to F.
				Jumper J19. From A to C.
				Jumper J13. From J to L.
155	Rework Instructions	201324	Ref.	

Jumper J20. From AAA to BBB.

BASIC DAISY CHAIN WITH UNIT SELECT.

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 200632-021 | REV. U

DRAWING TITLE: ASSY. TRANSPORT ELECTRONICS PWB 45IPS 9CH. TYPE 'A' | MODEL NO. 10 | DATE 8/31/72 | SHEET 26 OF 45

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136				
137	Capacitor, Polyfilm .68uf	100128-684	1	C424
138	Resistor, 5%, ½W 390	100064-391	1	R266
139	Resistor, " ½W 9.1K	100156-912	1	R421
140	Resistor, " " 27K	100156-273	1	R431
141	Resistor, " " 15K	100156-153	1	R432
142	Resistor, " " 43K	100156-433	1	R433
143	Resistor, " " 300K	100156-304	1	R466
144	Resistor, " " 330K	100156-334	1	R468
145	Resistor, " " 680K	100156-684	1	R509
146	Resistor, " " 330K	100156-334	1	R511
147	Resistor, " " 43K	100156-433	1	R532
148				
149	Resistor, " " 2.2K	100156-222	1	R262
150	Resistor, " " 750	100156-751	1	R235
151	Resistor, " " 750	100156-751	1	R251
152	Resistor, " ½W 390	100064-391	1	R280
153	Resistor, " 3W 47	100068-470	1	R269
154	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to FF.
				Jumper J6. From CC to EE.
				Jumper J10.From RR to SS.
				Jumper J8. From S to T.
				Jumper J9. From P to R.
				Jumper J12.From K to M.
				Jumper J14.From G to H.
				Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J7,J11,			Jumper J16.From U to V.
	J18,J20 not used.			Jumper J17.From D to F.
				Jumper J19.From A to C.
				Jumper J13.From J to L.
155	Rework Instructions	201324	Ref.	

BASIC DAISY CHAIN WITH UNIT SELECT.

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 200632-022 | REV. U

DRAWING TITLE: ASSY. TRANSPORT ELECTRONICS PWB 45IPS 7CH. TYPE 'A' | MODEL NO. 10 | DATE 8/31/72 | SHEET 27 OF 45

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136				
137	Capacitor, Polyfilm .68uf	100128-684	1	C424
138	Resistor, 5%, ½W 390	100064-391	1	R266
139	Resistor, " ½W 9.1K	100156-912	1	R421
140	Resistor, " " 27K	100156-273	1	R431
141	Resistor, " " 15K	100156-153	1	R432
142	Resistor, " " 43K	100156-433	1	R433
143	Resistor, " " 300K	100156-304	1	R466
144	Resistor, " " 330K	100156-334	1	R468
145	Resistor, " " 680K	100156-684	1	R509
146	Resistor, " " 330K	100156-334	1	R511
147	Resistor, " " 43K	100156-433	1	R532
148				
149	Resistor, " " 2.2K	100156-222	1	R262
150	Resistor, " " 750	100156-751	1	R235
151	Resistor, " " 750	100156-751	1	R251
152	Resistor, " ½W 390	100064-391	1	R280
153	Resistor, " 3W 47	100068-470	1	R269
154	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to FF.
				Jumper J6. From CC to EE.
				Jumper J10.From RR to SS.
				Jumper J8. From S to T.
				Jumper J9. From P to R.
				Jumper J12.From K to M.
				Jumper J14.From G to H.
				Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J7,J11,			Jumper J16.From U to V.
	J18, not used.			Jumper J17.From D to F.
				Jumper J19.From A to C.
				Jumper J13.From J to L.
155	Rework Instructions	201324	Ref.	

BASIC DAISY CHAIN WITHOUT UNIT SELECT.

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 200632-023 | REV. C

DRAWING TITLE: ASSY. TRANSPORT ELECTRONICS PWB 25IPS 9CH. TYPE'B' | MODEL NO. 10 | DATE 8/31/72 | SHEET 28 OF 45

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136	Capacitor, Tantalum 1.5uf	100136-155	1	C209
137	Capacitor, Polyfilm .33uf	100128-334	1	C424
138	Resistor, 5%,½W 390	100064-391	1	R266
139	Resistor, " ½W 15K	100156-153	1	R421
140	Resistor, " " 51K	100156-513	1	R431
141	Resistor, " " 13K	100156-133	1	R432
142	Resistor, " " 100K	100156-104	1	R433
143	Resistor, " " 680K	100156-684	1	R466
144	Resistor, " " 390K	100156-394	1	R468
145	Resistor, " " 1.5M	100156-155	1	R509
146	Resistor, " " 390K	100156-394	1	R511
147	Resistor, " " 100K	100156-104	1	R532
148	Resistor, " " 3.3M	100156-335	1	R536
149	Resistor, " " 2.2K	100156-222	1	R262
150	Resistor, " " 750	100156-751	1	R235
151	Resistor, " " 750	100156-751	1	R251
152	Resistor, " ½W 390	100064-391	1	R280
153	Resistor, " 3W 47	100068-470	1	R269
154	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to HH.
				Jumper J6. From CC to DD.
				Jumper J7. From Y to Z.
				Jumper J8. From S to T.
				Jumper J9. From P to R.
				Jumper J11.From W to X.
				Jumper J14.From G to H.
				Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J10,J12,			Jumper J16.From U to V.
	J13,J20 not used			Jumper J17.From D to F.
				Jumper J19.From A to C.
				Jumper J18.From TT to UU.
155	Rework Instructions	201324	Ref.	

B-27. Material List, Transport Electronics (Page 2 of 4)

BASIC DAISY CHAIN WITHOUT UNIT SELECT.

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 200632-024 | REV. U

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB 251PS 7CH.TYPE 'P' | MODEL NO. 10 | DATE 8/31/72 | SHEET 29 OF 45

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136	Capacitor, Tantalum 1.5uf	100136-155	1	C209
137	Capacitor, Polyfilm .33uf	100128-334	1	C424
138	Resistor, 5%,½W 390	100064-391	1	R266
139	Resistor, " ¼W 15K	100156-153	1	R421
140	Resistor, " " 51K	100156-513	1	R431
141	Resistor, " " 13K	100156-133	1	R432
142	Resistor, " " 100K	100156-104	1	R433
143	Resistor, " " 680K	100156-684	1	R466
144	Resistor, " " 390K	100156-394	1	R468
145	Resistor, " " 1.5M	100156-155	1	R509
146	Resistor, " " 390K	100156-394	1	R511
147	Resistor, " " 100K	100156-104	1	R532
148	Resistor, " " 3.3M	100156-335	1	R536
149	Resistor, " " 2.2K	100156-222	1	R262
150	Resistor, " " 750	100156-751	1	R235
151	Resistor, " " 750	100156-751	1	R251
152	Resistor, " ¼W 390	100064-391	1	R280
153	Resistor, " 3W 47	100068-470	1	R269
154	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to HH.
				Jumper J6. From CC to DD.
				Jumper J7. From Y to Z.
				Jumper J8. From S to T.
				Jumper J9. From P to R.
				Jumper J11.From W to X.
				Jumper J14.From G to H.
				Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J10,J12,			Jumper J16.From U to V.
	J13, not used.			Jumper J17.From D to F.
				Jumper J19.From A to C.
				Jumper J18.From TT to UU.
155	Rework Instructions	201324	Ref.	

Jumper J20.From AAA to BBB.

BASIC DAISY CHAIN WITHOUT UNIT SELECT.

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 200632-025 | REV. U

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB 37½IPS 9CH.TYPE 'P' | MODEL NO. 10 | DATE 8/31/72 | SHEET 30 OF 45

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136	Capacitor, Tantalum 1.5uf	100136-155	1	C209
137	Capacitor, Polyfilm .68uf	100128-684	1	C424
138	Resistor, 5%,½W 390	100064-391	1	R266
139	Resistor, " ¼W 10K	100156-103	1	R421
140	Resistor, " " 33K	100156-333	1	R431
141	Resistor, " " 15K	100156-153	1	R432
142	Resistor, " " 43K	100156-433	1	R433
143	Resistor, " " 300K	100156-304	1	R466
144	Resistor, " " 390K	100156-394	1	R468
145	Resistor, " " 680K	100156-684	1	R509
146	Resistor, " " 390K	100156-394	1	R511
147	Resistor, " " 43K	100156-433	1	R532
148				
149	Resistor, " " 2.2K	100156-222	1	R262
150	Resistor, " " 750	100156-751	1	R235
151	Resistor, " " 750	100156-751	1	R251
152	Resistor, " ¼W 390	100064-391	1	R280
153	Resistor, " 3W 47	100068-470	1	R269
154	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to HH.
				Jumper J6. From CC to DD.
				Jumper J7. From Y to Z.
				Jumper J8. From S to T.
				Jumper J9. From P to R.
				Jumper J11.From W to X.
				Jumper J14.From G to H.
				Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J10,J12,			Jumper J16.From U to V.
	J13,J20 not used.			Jumper J17.From D to F.
				Jumper J19.From A to C.
				Jumper J18.From TT to UU.
155	Rework Instructions	201324	Ref.	

Jumper J20.From AAA to BBB.

BASIC DAISY CHAIN WITHOUT UNIT SELECT.

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 200632-026 | REV. U

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB 37½IPS 7CH.TYPE 'P' | MODEL NO. 10 | DATE 8/31/72 | SHEET 31 OF 45

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136	Capacitor, Tantalum 1.5uf	100136-155	1	C209
137	Capacitor, Polyfilm .68uf	100128-684	1	C424
138	Resistor, 5%,½W 390	100064-391	1	R266
139	Resistor, " ¼W 10K	100156-103	1	R421
140	Resistor, " " 33K	100156-333	1	R431
141	Resistor, " " 15K	100156-153	1	R432
142	Resistor, " " 43K	100156-433	1	R433
143	Resistor, " " 300K	100156-304	1	R466
144	Resistor, " " 390K	100156-394	1	R468
145	Resistor, " " 680K	100156-684	1	R509
146	Resistor, " " 390K	100156-394	1	R511
147	Resistor, " " 43K	100156-433	1	R532
148				
149	Resistor, " " 2.2K	100156-222	1	R262
150	Resistor, " " 750	100156-751	1	R235
151	Resistor, " " 750	100156-751	1	R251
152	Resistor, " ¼W 390	100064-391	1	R280
153	Resistor, " 3W 47	100068-470	1	R269
154	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to HH.
				Jumper J6. From CC to DD.
				Jumper J7. From Y to Z.
				Jumper J8. From S to T.
				Jumper J9. From P to R.
				Jumper J11.From W to X.
				Jumper J14.From G to H.
				Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J10,J12,			Jumper J16.From U to V.
	J13 not used			Jumper J17.From D to F.
				Jumper J19.From A to C.
				Jumper J18.From TT to UU.
155	Rework Instructions	201324	Ref.	

Jumper J20.From AAA to BBB.

BASIC DAISY CHAIN WITHOUT UNIT SELECT.

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 200632-027 | REV. U

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB 451PS 9CH.TYPE 'P' | MODEL NO. 10 | DATE 8/31/72 | SHEET 32 OF 45

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136	Capacitor, Tantalum 1.5uf	100136-155	1	C209
137	Capacitor, Polyfilm .68uf	100128-684	1	C424
138	Resistor, 5%,½W 390	100064-391	1	R266
139	Resistor, " ¼W 9.1K	100156-912	1	R421
140	Resistor, " " 27K	100156-273	1	R431
141	Resistor, " " 15K	100156-153	1	R432
142	Resistor, " " 43K	100156-433	1	R433
143	Resistor, " " 300K	100156-304	1	R466
144	Resistor, " " 330K	100156-334	1	R468
145	Resistor, " " 680K	100156-684	1	R509
146	Resistor, " " 330K	100156-334	1	R511
147	Resistor, " " 43K	100156-433	1	R532
148				
149	Resistor, " " 2.2K	100156-222	1	R262
150	Resistor, " " 750	100156-751	1	R235
151	Resistor, " " 750	100156-751	1	R251
152	Resistor, " ¼W 390	100064-391	1	R280
153	Resistor, " 3W 47	100068-470	1	R269
154	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to HH.
				Jumper J6. From CC to DD.
				Jumper J7. From Y to Z.
				Jumper J8. From S to T.
				Jumper J9. From P to R.
				Jumper J11.From W to X.
				Jumper J14.From G to H.
				Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J10,J12,			Jumper J16.From U to V.
	J13,J20 not used.			Jumper J17.From D to F.
				Jumper J19.From A to C.
				Jumper J18.From TT to UU.
155	Rework Instructions	201324	Ref.	

BASIC DAISY CHAIN WITHOUT UNIT SELECT.

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 200632-028 | REV. U

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB 451PS 7CH.TYPE 'P' | MODEL NO. 10 | DATE 8/31/72 | SHEET 33 OF 45

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136	Capacitor, Tantalum 1.5uf	100136-155	1	C209
137	Capacitor, Polyfilm .68uf	100128-684	1	C424
138	Resistor, 5%,½W 390	100064-391	1	R266
139	Resistor, " ¼W 9.1K	100156-912	1	R421
140	Resistor, " " 27K	100156-273	1	R431
141	Resistor, " " 15K	100156-153	1	R432
142	Resistor, " " 43K	100156-433	1	R433
143	Resistor, " " 300K	100156-304	1	R466
144	Resistor, " " 330K	100156-334	1	R468
145	Resistor, " " 680K	100156-684	1	R509
146	Resistor, " " 330K	100156-334	1	R511
147	Resistor, " " 43K	100156-433	1	R532
148				
149	Resistor, " " 2.2K	100156-222	1	R262
150	Resistor, " " 750	100156-751	1	R235
151	Resistor, " " 750	100156-751	1	R251
152	Resistor, " ¼W 390	100064-391	1	R280
153	Resistor, " 3W 47	100068-470	1	R269
154	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to HH.
				Jumper J6. From CC to DD.
				Jumper J7. From Y to Z.
				Jumper J8. From S to T.
				Jumper J9. From P to R.
				Jumper J11.From W to X.
				Jumper J14.From G to H.
				Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J10,J12,			Jumper J16.From U to V.
	J13 not used.			Jumper J17.From D to F.
				Jumper J19.From A to C.
				Jumper J18.From TT to UU.
155	Rework Instructions	201324	Ref.	

Jumper J20.From AAA to BBB.

BASIC DAISY CHAIN WITHOUT UNIT SELECT.

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 200632-029 | REV. U

DRAWING TITLE: ASSY.TRANSPORT ELECTRONICS PWB 25IPS 9CH.TYPE 'A' | MODEL NO. 10 | DATE 8/31/72 | SHEET 34 OF 45

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136				
137	Capacitor, Polyfilm .33uf	100128-334	1	C424
138	Resistor, 5%,½W 390	100064-391	1	R266
139	Resistor, " ¼W 15K	100156-153	1	R421
140	Resistor, " " 51K	100156-513	1	R431
141	Resistor, " " 13K	100156-133	1	R432
142	Resistor, " " 100K	100156-104	1	R433
143	Resistor, " " 680K	100156-684	1	R466
144	Resistor, " " 390K	100156-394	1	R468
145	Resistor, " " 1.5M	100156-155	1	R509
146	Resistor, " " 390K	100156-394	1	R511
147	Resistor, " " 100K	100156-104	1	R532
148	Resistor, " " 3.3M	100156-335	1	R536
149	Resistor, " " 2.2K	100156-222	1	R262
150	Resistor, " " 750	100156-751	1	R235
151	Resistor, " " 750	100156-751	1	R251
152	Resistor, " ¼W 390	100064-391	1	R280
153	Resistor, " 3W 47	100068-470	1	R269
154	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to FF.
				Jumper J6. From CC to KK.
				Jumper J10.From RR to SS.
				Jumper J8. From S to T.
				Jumper J9. From P to R.
				Jumper J12.From K to M.
				Jumper J14.From G to H.
				Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J7,J11,			Jumper J16.From U to V.
	J20 not used.			Jumper J17.From D to F.
				Jumper J19.From A to C.
				Jumper J18.From TT to UU.
155	Rework Instructions	201324	Ref.	

Jumper J13.From J to L.

BASIC DAISY CHAIN WITHOUT UNIT SELECT.

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 200632-030 | REV. U

DRAWING TITLE: ASSY. TRANSPORT ELECTRONICS PWB 25IPS 7CH. TYPE 'A' | MODEL NO. 10 | DATE 8/31/72 | SHEET 35 OF 45

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136					
137	Capacitor, Polyfilm	.33uf	100128-334	1	C424
138	Resistor, 5%, ½W	390	100064-391	1	R266
139	Resistor, " ½W	15K	100156-153	1	R421
140	Resister, " "	51K	100156-513	1	R431
141	Resistor, " "	13K	100156-133	1	R432
142	Resistor, " "	100K	100156-104	1	R433
143	Resistor, " "	680K	100156-684	1	R466
144	Resistor, " "	390K	100156-394	1	R468
145	Resistor, " "	1.5M	100156-155	1	R509
146	Resistor, " "	390K	100156-394	1	R511
147	Resistor, " "	100K	100156-104	1	R532
148	Resistor, " "	3.3M	100156-335	1	R536
149	Resistor, " "	2.2K	100156-222	1	R262
150	Resistor, " "	750	100156-751	1	R235
151	Resistor, " "	750	100156-751	1	R251
152	Resistor, " ½W	390	100064-391	1	R280
153	Resistor, " 3W	47	100068-470	1	R269
154	Wire, Solid Insulated		100248-924	A/R	Jumper J1. From VV to WW.
					Jumper J2. From GG to FF.
					Jumper J6. From CC to EE.
					Jumper J10.From RR to SS.
					Jumper J8. From S to T.
					Jumper J9. From P to R.
					Jumper J12.From K to M.
					Jumper J14.From G to H.
					Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J7,J11,				Jumper J16.From U to V.
	not used.				Jumper J17.From D to F.
					Jumper J19.From A to C.
					Jumper J18.From TT to UU. Jumper J13.From J to L.
155	Rework Instructions		201324	Ref.	

Jumper J20.From AAA to BBB.

BASIC DAISY CHAIN WITHOUT UNIT SELECT.

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 200632-031 | REV. U

DRAWING TITLE: ASSY. TRANSPORT ELECTRONICS PWB 37½IPS 9CH. TYPE 'A' | MODEL NO. 10 | DATE 8/31/72 | SHEET 36 OF 45

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136					
137	Capacitor, Polyfilm	.68uf	100128-684	1	C424
138	Resistor, 5%, ½W	390	100064-391	1	R266
139	Resistor, " ½W	10K	100156-103	1	R421
140	Resistor, " "	33K	100156-333	1	R431
141	Resistor, " "	15K	100156-153	1	R432
142	Resistor, " "	43K	100156-433	1	R433
143	Resistor, " "	300K	100156-304	1	R466
144	Resistor, " "	390K	100156-394	1	R468
145	Resistor, " "	680K	100156-684	1	R509
146	Resistor, " "	390K	100156-394	1	R511
147	Resistor, " "	43K	100156-433	1	R532
148					
149	Resistor, " "	2.2K	100156-222	1	R262
150	Resistor, " "	750	100156-751	1	R235
151	Resistor, " "	750	100156-751	1	R251
152	Resistor, " ½W	390	100064-391	1	R280
153	Resistor, " 3W	47	100068-470	1	R269
154	Wire, Solid Insulated		100248-924	A/R	Jumper J1. From VV to WW.
					Jumper J2. From GG to FF.
					Jumper J6. From CC to EE.
					Jumper J10.From RR to SS.
					Jumper J8. From S to T.
					Jumper J9. From P to R.
					Jumper J12.From K to M.
					Jumper J14.From G to H.
					Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J7,J11,				Jumper J16.From U to V.
	J20 not used.				Jumper J17.From D to F.
					Jumper J19.From A to C.
					JUMPER J18 FROM TT TO UU JUMPER J13 FROM J TO L
155	Rework Instructions		201324	Ref.	

Jumper J20.From AAA to BBB.

BASIC DAISY CHAIN WITHOUT UNIT SELECT.

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 200632-032 | REV. U

DRAWING TITLE: ASSY. TRANSPORT ELECTRONICS PWB 37½IPS 7CH. TYPE 'A' | MODEL NO. 10 | DATE 8/31/72 | SHEET 37 OF 45

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136					
137	Capacitor, Polyfilm	.68uf	100128-684	1	C424
138	Resistor, 5%, ½W	390	100064-391	1	R266
139	Resistor, " ½W	10K	100156-103	1	R421
140	Resistor, " "	33K	100156-333	1	R431
141	Resistor, " "	15K	100156-153	1	R432
142	Resistor, " "	43K	100156-433	1	R433
143	Resistor, " "	300K	100156-304	1	R466
144	Resistor, " "	390K	100156-394	1	R468
145	Resistor, " "	680K	100156-684	1	R509
146	Resistor, " "	390K	100156-394	1	R511
147	Resistor, " "	43K	100156-433	1	R532
148					
149	Resistor, " "	2.2K	100156-222	1	R262
150	Resistor, " "	750	100156-751	1	R235
151	Resistor, " "	750	100156-751	1	R251
152	Resistor, " ½W	390	100064-391	1	R280
153	Resistor, " 3W	47	100068-470	1	R269
154	Wire, Solid Insulated		100248-924	A/R	Jumper J1. From VV to WW.
					Jumper J2. From GG to FF.
					Jumper J6. From CC to EE.
					Jumper J10.From RR to SS.
					Jumper J8. From S to T.
					Jumper J9. From P to R.
					Jumper J12.From K to M.
					Jumper J14.From G to H.
					Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J7,J11,				Jumper J16.From U to V.
	not used.				Jumper J17.From D to F.
					Jumper J19.From A to C.
					Jumper J18.From TT to UU. Jumper J13.From J to L.
155	Rework Instructions		201324	Ref.	

Jumper J20.From AAA to BBB.

BASIC DAISY CHAIN WITHOUT UNIT SELECT.

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 200632-033 | REV. U

DRAWING TITLE: ASSY. TRANSPORT ELECTRONICS PWB 45IPS 9CH. TYPE 'A' | MODEL NO. 10 | DATE 8/31/72 | SHEET 38 OF 45

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136					
137	Capacitor, Polyfilm	.68uf	100128-684	1	C424
138	Resistor, 5%, ½W	390	100064-391	1	R266
139	Resistor, " ½W	9.1K	100156-912	1	R421
140	Resistor, " "	27K	100156-273	1	R431
141	Resistor, " "	15K	100156-153	1	R432
142	Resistor, " "	43K	100156-433	1	R433
143	Resistor, " "	300K	100156-304	1	R466
144	Resistor, " "	330K	100156-334	1	R468
145	Resistor, " "	680K	100156-684	1	R509
146	Resistor, " "	330K	100156-334	1	R511
147	Resistor, " "	43K	100156-433	1	R532
148					
149	Resistor, " "	2.2K	100156-222	1	R262
150	Resistor, " "	750	100156-751	1	R235
151	Resistor, " "	750	100156-751	1	R251
152	Resistor, " ½W	390	100064-391	1	R280
153	Resistor, " 3W	47	100068-470	1	R269
154	Wire, Solid Insulated		100248-924	A/R	Jumper J1. From VV to WW.
					Jumper J2. From GG to FF.
	* FOR DIVA DO NOT CHANGE				Jumper J6. From CC to EE.
	USE V7-Y-Z				Jumper J10.From RR to SS.
					Jumper J8. From S to T.
					Jumper J9. From P to R.
					Jumper J12.From K to M.
					Jumper J14.From G to H.
					Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J7,J11,				Jumper J16.From U to V.
	J20 not used.				Jumper J17.From D to F.
					Jumper J19.From A to C.
					Jumper J18.From TT to UU.
155	Rework Instructions		201324	Ref.	

Jumper J13.From J to L.

* This JUMPER does NOT change because of 7 TRK DUAL DENSITY option is added —

MANUAL DENSITY — 7 TRK — BASIC DAISY CHAIN WITHOUT UNIT SELECT. — FOR "A" DIVA DC

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 200632-034 | REV. U

DRAWING TITLE: ASSY. TRANSPORT ELECTRONICS PWB 45IPS 7CH. TYPE 'A' | MODEL NO. 10 | DATE 8/31/72 | SHEET 39 OF 45

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136					
137	Capacitor, Polyfilm	.68uf	100128-684	1	C424
138	Resistor, 5%, ½W	390	100064-391	1	R266
139	Resistor, " ½W	9.1K	100156-912	1	R421
140	Resistor, " "	27K	100156-273	1	R431
141	Resistor, " "	15K	100156-153	1	R432
142	Resistor, " "	43K	100156-433	1	R433
143	Resistor, " "	300K	100156-304	1	R466
144	Resistor, " "	330K	100156-334	1	R468
145	Resistor, " "	680K	100156-684	1	R509
146	Resistor, " "	330K	100156-334	1	R511
147	Resistor, " "	43K	100156-433	1	R532
148					
149	Resistor, " "	2.2K	100156-222	1	R262
150	Resistor, " "	750	100156-751	1	R235
151	Resistor, " "	750	100156-751	1	R251
152	Resistor, " ½W	390	100064-391	1	R280
153	Resistor, " 3W	47	100068-470	1	R269
154	Wire, Solid Insulated		100248-924	A/R	Jumper J1. From VV to WW.
					Jumper J2. From GG to FF.
					Jumper J6. From CC to EE.
					Jumper J10.From RR to SS.
					Jumper J8. From S to T.
					Jumper J9. From P to R.
					Jumper J12.From K to M.
					Jumper J14.From G to H.
				X	Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J7,J11,				Jumper J16.From U to V.
	J20 not used			X	Jumper J17.From D to E.
				X	Jumper J19.From A to B.
					Jumper J18.From TT to UU. Jumper J13.From J to L.
155	Rework Instructions		201350	Ref.	

NN→FF; D→F; V SW; A→C

MANUAL DENSITY — BASIC DAISY CHAIN WITHOUT UNIT SELECT.

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 200632-035 | REV. U

DRAWING TITLE: ASSY. TRANSPORT ELECTRONICS PWB 45IPS 7CH. TYPE 'A' | MODEL NO. 10 | DATE 8/31/72 | SHEET 40 OF 45

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136					
137	Capacitor, Polyfilm	.68uf	100128-684	1	C424
138	Resistor, 5%, ½W	390	100064-391	1	R266
139	Resistor, " ½W	9.1K	100156-912	1	R421
140	Resistor, " "	27K	100156-273	1	R431
141	Resistor, " "	15K	100156-153	1	R432
142	Resistor, " "	43K	100156-433	1	R433
143	Resistor, " "	300K	100156-304	1	R466
144	Resistor, " "	330K	100156-334	1	R468
145	Resistor, " "	680K	100156-684	1	R509
146	Resistor, " "	330K	100156-334	1	R511
147	Resistor, " "	43K	100156-433	1	R532
148					
149	Resistor, " "	2.2K	100156-222	1	R262
150	Resistor, " "	750	100156-751	1	R235
151	Resistor, " "	750	100156-751	1	R251
152	Resistor, " ½W	390	100064-391	1	R280
153	Resistor, " 3W	47	100068-470	1	R269
154	Wire, Solid Insulated		100248-924	A/R	Jumper J1. From VV to WW.
					Jumper J2. From GG to FF.
					Jumper J6. From CC to EE.
					Jumper J10.From RR to SS.
					Jumper J8. From S to T.
					Jumper J9. From P to R.
					Jumper J12.From K to M.
					Jumper J14.From G to H.
				X	Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J7,J11,				Jumper J16.From U to V.
	J20 not used			X	Jumper J17.From D to E.
				X	Jumper J19.From A to B.
					Jumper J18.From TT to UU. Jumper J13.From J to L.
155	Rework Instructions		201350	Ref.	

MANUAL DENSITY — BASIC DAISY CHAIN WITHOUT UNIT SELECT.

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 200632-037 | REV. U

DRAWING TITLE: ASSY. TRANSPORT ELECTRONICS PWB 45IPS 7CH. TYPE 'A' | MODEL NO. 10 | DATE 8/30/73 | SHEET 42 OF 45

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
136					
137	Capacitor, Polyfilm	.68uf	100128-684	1	C424
138	Resistor, 5%, ½W	390	100064-391	1	R266
139	Resistor, " ½W	9.1K	100156-912	1	R421
140	Resistor, " "	27K	100156-273	1	R431
141	Resistor, " "	15K	100156-153	1	R432
142	Resistor, " "	43K	100156-433	1	R433
143	Resistor, " "	300K	100156-304	1	R466
144	Resistor, " "	330K	100156-334	1	R468
145	Resistor, " "	680K	100156-684	1	R509
146	Resistor, " "	330K	100156-334	1	R511
147	Resistor, " "	43K	100156-433	1	R532
148					
149	Resistor, " "	2.2K	100156-222	1	R262
150	Resistor, " "	750	100156-751	1	R235
151	Resistor, " "	750	100156-751	1	R251
152	Resistor, " ½W	390	100064-391	1	R280
153	Resistor, " 3W	47	100068-470	1	R269
154	Wire, Solid Insulated		100248-924	A/R	Jumper J1. From VV to WW.
					Jumper J2. From GG to FF.
					Jumper J6. From CC to EE.
					Jumper J10.From RR to SS.
					Jumper J8. From S to T.
					Jumper J9. From P to R.
					Jumper J12.From K to M.
					Jumper J14.From G to H.
					Jumper J15.From NN to PP.
	Jumpers J3,J4,J5,J11				Jumper J16.From U to V.
	J20 not used				Jumper J17.From D to E.
					Jumper J19.From A to B.
					Jumper J18.From TT to UU.
					Jumper J13.From J to L.
155	Rework Instructions		201424	Ref.	JUMPER J7 FROM Y TO Z

NOT USED WITH "A" DC INTERFACE

B-27. Material List, Transport Electronics (Page 4 of 4)

B-28. Schematic, Transport Control Logic

REVISIONS				200632 T
REV.	DESCRIPTION	CHK.	DATE	APPROVED
—	[illegible] 44			

FWD/REV RAMP GENERATOR

SET FORWARD

REWIND RAMP GENERATOR

REWIND GAIN SWITCH

-5v REGULATOR

CAPSTAN AMPLIFIER

FIXED REEL AMPLIFIER

FILE REEL AMPLIFIER

J17 GND. PM1 E/C E/C

J14 CAPSTAN AMP, FIXED REEL AMP, FILE REEL AMP

J13 FIXED GAIN, FIXED ARM POSITION

J12 FILE GAIN, FILE ARM POSITION

J9 +12v, +5v

J14 +19v, +13v, -13v, -19v

4 FOR VARIABLE COMPONENTS SEE M/L.

3. ALL DIODES ARE IN914
2. ALL PNP TRANSISTORS ARE 2N4125
1. ALL NPN TRANSISTORS ARE 2N4123

NOTES: UNLESS OTHERWISE SPECIFIED

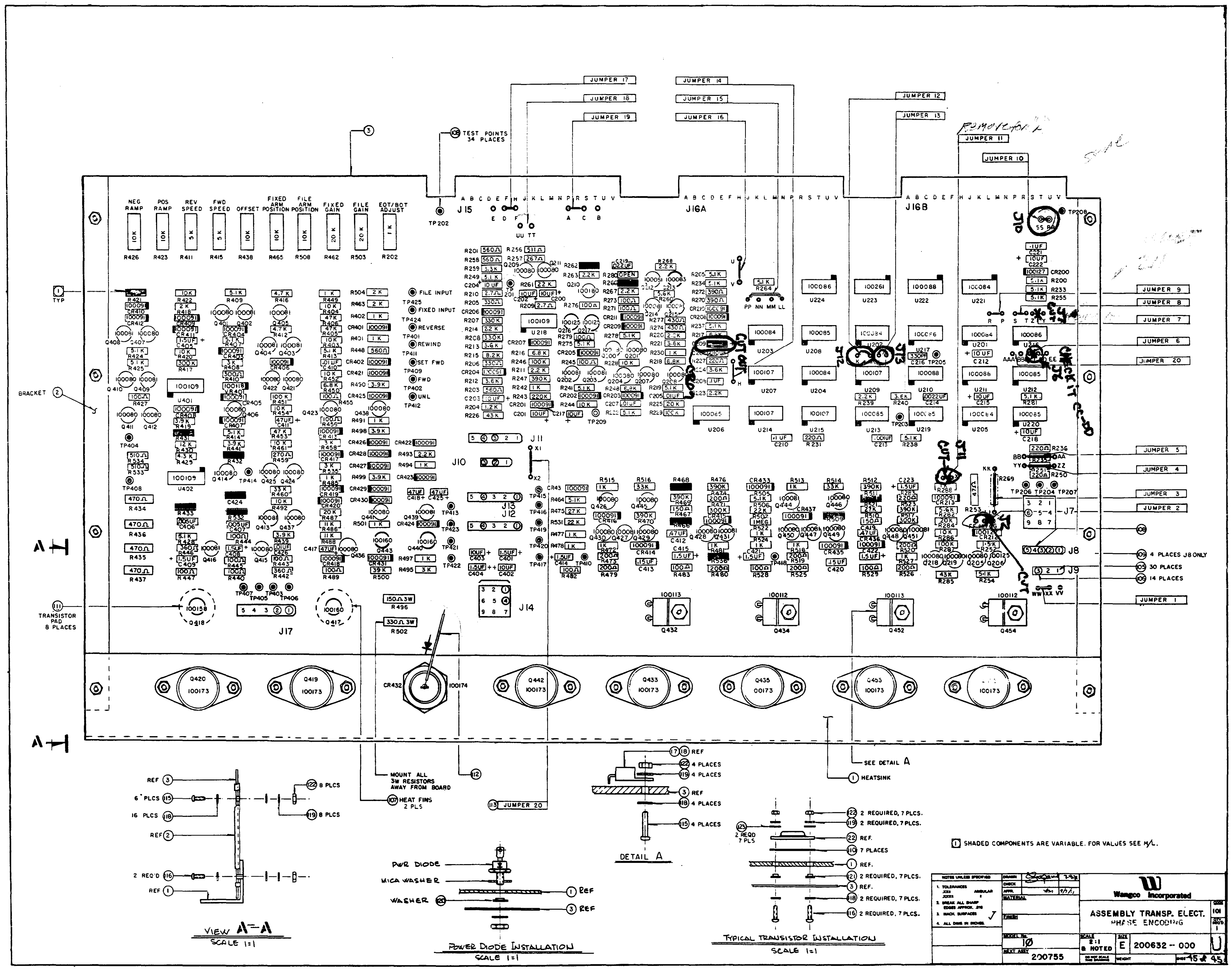
NOTES UNLESS SPECIFIED	DRAWN	SA	8/2/71
1. TOLERANCES XX± ANGULAR XXX± ±	CHECK		
2. BREAK ALL SHARP EDGES APPROX. .010	APPR.	H. E. Hebb	9/7/71
3. MACH. SURFACES √	MATERIAL		
4. ALL DIMS IN INCHES.	FINISH		
	MODEL No.	10	
	NEXT ASSY	200755	

Wang Computer Products

ASSY TRANSP FLECT. PWB. SCHEMATIC SERVO AMPLIFIERS

CODE 108 | SIZE D | 200632 | REV U

SCALE — | DO NOT SCALE THIS DRAWING | WEIGHT | SHEET 44 OF 45



B-30. Assembly, Transport Electronics

MATERIAL LIST

ML DRAWING NO. 200347 - 0000 REV. J

DRAWING TITLE ASSY. DATA ELECTRONICS PWB, BASIC BOARD. MODEL NO. 10 DATE 4/8/71 SHEET 1 OF 10

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Board, Processed.	200254	1	
2	Bracket, Support.	200462-001	1	
3	Bracket, Support.	200462-002	1	
4				
5	I.C.Hex. Inverter.	100084	3	U1.2.29.
6	I.C.Quad.2 Input Nand.	100085	1	U31.
7	I.C.Quad.2 Input Power.	100086	5	U23.24.25.26.30.
8	I.C.10 Input Nand.	100087	1	U27.
9	I.C.Dual Flip-Flop.	100088	5	U18.19.20.21.22.
10	I.C.Monostable.	100090	1	U28.
11	I.C.Dual Flip-Flop.	100095	5	U3.4.5.6.7.
12	I.C.Operational Amplifier.	100167	10	U8.9.10.11.12.13.14.
				U15.16.17.
13				
14	Transistor. NPN. 2N4123	100080	50	Q2.3.4.6.7. Q103-903.
				Q104-904. Q106-906.
				Q107-907. Q108-908.
15	Transistor. PNP. 2N4125	100081	29	Q1.5. Q101-901.
				Q102-902. Q105-905.
16				
17	Diode, Signal. 1N914	100091	117	CR101-901. CR103-903.
				CR105-905. CR106-906.
				CR107-907. CR108-908.
				CR109-909. CR110-910.
				CR111-911. CR112-912.
				CR113-913.CR114-914. CR115-915.
18	Capacitor, Ceramic. 10pf.	100073-100	9	C107-907.
19	Capacitor, Mica. 68pf.	100243-68	1	C8.
20	Capacitor, Mylar. .0015uf	100165-152	1	C6.
21	Capacitor, Polyfilm. .0015uf	100225-152	11	C7.
22	Capacitor, Polyfilm. .47uf	100128-474	1	C1.
23				

MATERIAL LIST

ML DRAWING NO. 200347 - 0000 REV. J

DRAWING TITLE ASSY. DATA ELECTRONICS PWB, BASIC BOARD. MODEL NO. 10 DATE 4/8/71 SHEET 3 OF 10

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
51	Resistor. 1%. ¼w. 1.62K	100155-309	18	R107-907. R108-908.
52	Resistor. " " 1.96K	100155-317	1	R31.
53	Resistor. 5%. " 2.7K	100156-272	29	R3.6.7.19.20.21.26.30.
				R32.33.46.
				R128-928. R126-926.
54	Resistor. 5%. ¼w. 1.8K	100156-182	9	R118-918.
55	Resistor. " " 2.2K	100156-222	9	R116-916.
56	Resistor. " " 4.7K	100156-472	20	R35.44. R120-920. R125-925.
57	Resistor. " " 6.8K	100156-682	4	R25.27.29.36.
58	Resistor. " " 8.2K	100156-822	9	R113-913.
59	Resistor. 1%. ¼w. 10K	100155-385	18	R114-914. R115-915.
60	Resistor. 5%. " 12K	100156-123	18	R117-917. R119-919.
61	Resistor. " " 27K	100156-273	9	R109-909.
62	Resistor. 1%. " 34.8K	100155-437	9	R112-912.
63				
64	Resistor. 5%. ¼w. 100K	100156-104	18	R124-924. R127-927.
65	Resistor. " " 1Meg.	100156-105	9	R122-922.
66				
67	Wire, Insulated.	100053-022	A/R	
68				
69	Artwork, Master.	200253	Ref.	
70	Specification, Test.	200436	Ref.	
71	Procedure, Test. Test Station	200438	Ref.	
72				
73	Connector, Head.	100137	1	J2.
74	Pin, Connector. Male.	100098	53	
75	Connector.	100010-004	1	J4.
76	Connector.	100010-009	1	P7.
77	Pin, Connector.	100021-005	5	
78	Pin, Connector.	100021-003	4	
79				
80	Strap, Cable.	100031-003	1	

MATERIAL LIST

ML DRAWING NO. 200347 - 001 REV. J

DRAWING TITLE ASSY. DATA ELECTRONICS PWB.Type P. 12½ips. S/G. MODEL NO. 10 DATE 4/8/71 SHEET 5 OF 10

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
113	Capacitor, Mylar. .01uf	100165-103	1	C5.
114	Capacitor, Tantalum. 22uf	100168-226	9	C101-901.
115	Capacitor, Ceramic. 68pf	100073-680	9	C102-902.
116	Capacitor, Polyfilm. .01uf	100188-103	9	C104-904.
117	Capacitor, Mylar. .0068uf	100165-682	9	C105-905.
118				
119				
120	Resistor. 5%. ¼w. 12K	100156-123	1	R45.
121	Resistor. 1%. " 178K	100155-505	9	R110-910.
122				
123				
124	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From A to B.
				Jumper J2. Not used.
				Jumper J3. From F to H.

MATERIAL LIST

ML DRAWING NO. 200347 - 003 REV. J

DRAWING TITLE ASSY. DATA ELECTRONICS PWB.Type P. 37½ips. S/G. MODEL NO. 10 DATE 4/8/71 SHEET 7 OF 10

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
113	Capacitor, Mylar. .0047uf	100165-472	1	C5.
114	Capacitor, Tantalum. 4.7uf	100070-475	9	C101-901.
115	Capacitor, Ceramic. 100pf	100073-101	9	C102-902.
116	Capacitor, Polyfilm. .0033uf	100188-332	9	C104-904.
117	Capacitor, Mylar. .0022uf	100165-222	9	C105-905.
118				
119				
120	Resistor. 5%. ¼w. 6.8K	100156-682	1	R45.
121	Resistor. 1%. " 68.1K	100155-465	9	R110-910.
122				
123				
124	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From A to B.
				Jumper J2. Not used.
				Jumper J3. From F to H.

MATERIAL LIST

ML DRAWING NO. 200347 - 0000 REV. J

DRAWING TITLE ASSY. DATA ELECTRONICS PWB, BASIC BOARD. MODEL NO. 10 DATE 4/8/71 SHEET 2 OF 10

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
24	Capacitor, Ceramic .0033uf	100157-332	1	C4.
25	Capacitor, Polyfilm. .0047uf	100188-472	9	C106-906.
26	Capacitor, Ceramic. 820pf	100073-821	9	C108-908.
27	Capacitor, Polyfilm. .01uf	100188-103	9	C103-903.
28				
29	Capacitor, Tantalum. 1.5uf	100136-155	1	C41.
30	Capacitor, " 10uf	100070-106	33	.2.3.9.10.11.12.13.14.15.
				C16.17.18.19. 21.22.23.24.
				C25.26.27.28.29.30.31.32.33.
				C34.35.36.37.38.39.40.
31				
32	Resistor. 5%. ¼w. 75	100156-750	9	R131-931.
33	Resistor, Variable. 5K	100069-502	9	R111-911.
34	Resistor, " 20K	100069-203	1	R28.
35	Resistor. 5%. ¼w. 91	100156-910	1	R39.
36	Resistor. 5%. ¼w. 2.7	100156-2R7	2	R41.43.
37	Resistor. " " 220	100156-221	13	R1.4.15.27. R101-901.
38	Resistor. " " 240	100156-241	19	R23. R105-905. R106-906.
39	Resistor. 1%. " 309	100155-240	1	R11.
40	Resistor. 5%. " 330	100156-331	15	R2.5.9.16.18. .40.
				R102-902.
41	Resistor. 5%. ¼w. 470	100156-471	11	R22.37.R121-921.
42	Resistor. 1%. " 511	100155-261	1	R10.
43	Resistor. " " 634	100155-270	1	R12.
44	Resistor. " " 1K	100155-289	1	R13.
45	Resistor. 5%. ¼w. 180	100156-181	1	R38.
46	Resistor. 5%. ¼w. 1K	100156-102	3	R8.24.34.
47	Resistor. 5%. ¼w. 1K	100046-102	1	R14.
48	Resistor. " ¼w. 1.5K	100156-152	45	R123-923. R103-903. R104-904.
49				R129-929. R130-930.
50				

MATERIAL LIST

ML DRAWING NO. 200347 - 0000 REV. J

DRAWING TITLE ASSY. DATA ELECTRONICS PWB, BASIC BOARD. MODEL NO. 10 DATE 4/8/71 SHEET 4 OF 10

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81				
82				
83				
84	Screw, Pan Head.	100036-206	3	4-40 x 3/8"
85	Screw, Pan Head.	100036-210	1	4-40 x 5/8"
86	Washer, Int. Tooth Lock.	100059-200	4	No.4.
87				
88	Washer, Flat.	100047-200	4	No.4.
89	Washer, Flat Nylon.	100050-000	4	
90	Nut, Hex.	100043-200	1	4-40.

MATERIAL LIST

ML DRAWING NO. 200347 - 002 REV. J

DRAWING TITLE ASSY. DATA ELECTRONICS PWB.Type P. 25ips. S/G. MODEL NO. 10 DATE 4/8/71 SHEET 6 OF 10

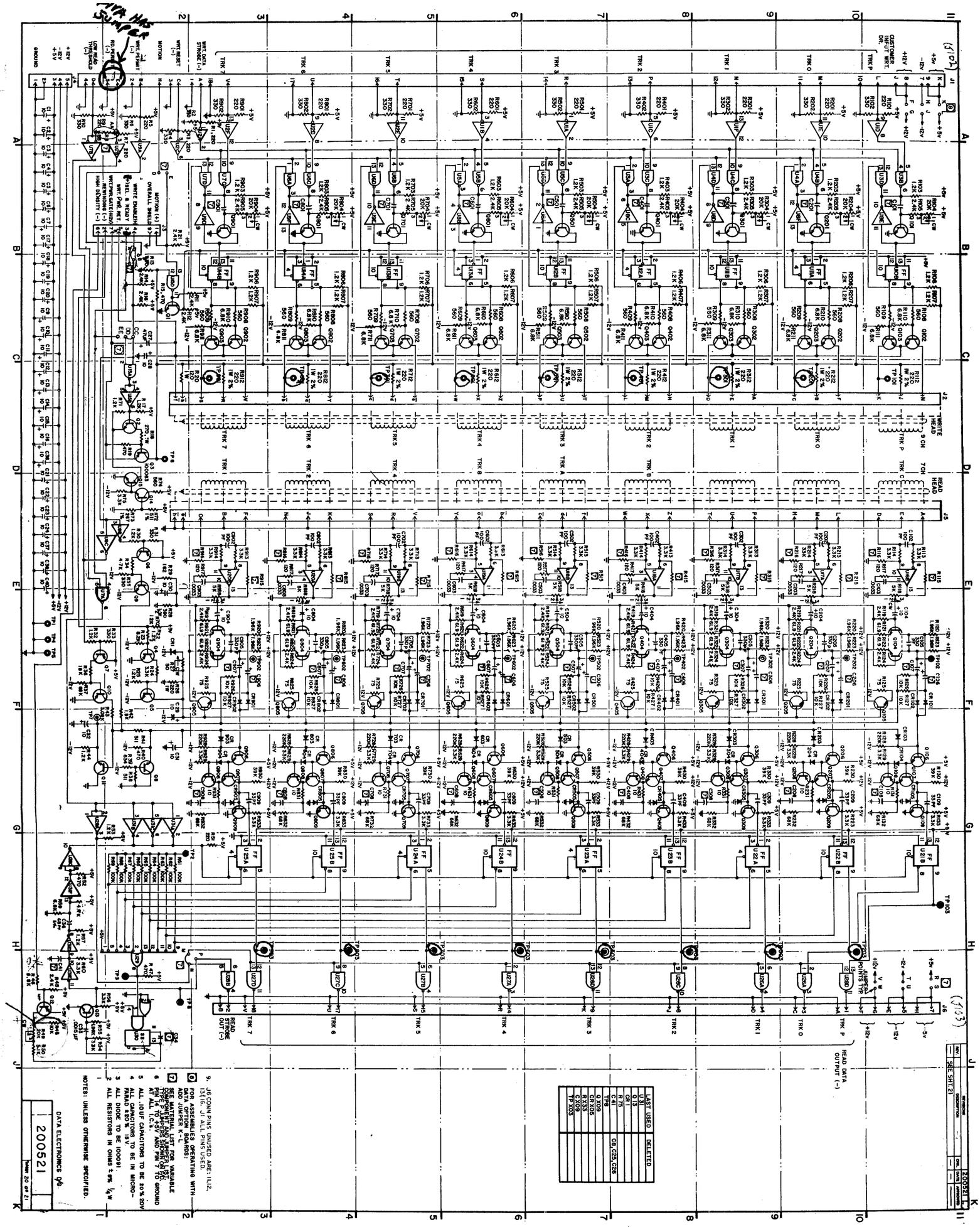
ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
113	Capacitor, Mylar. .0082uf	100165-822	1	C5.
114	Capacitor, Tantalum. 4.7uf	100070-475	9	C101-901.
115	Capacitor, Ceramic. 68pf	100073-680	9	C102-902.
116	Capacitor, Polyfilm. .0047uf	100188-472	9	C104-904.
117	Capacitor, Mylar. .0033uf	100165-332	9	C105-905.
118				
119				
120	Resistor. 5%. ¼w. 6.8K	100156-682	1	R45.
121	Resistor. 1%. " 90.9K	100155-477	9	R110-910.
122				
123				
124	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From A to B.
				Jumper J2. Not used.
				Jumper J3. From F to H.

MATERIAL LIST

ML DRAWING NO. 200347 - 004 REV. J

DRAWING TITLE ASSY. DATA ELECTRONICS PWB. Type 'P' 15ips. S/G. MODEL NO. 10 DATE 6/30/71 SHEET 8 OF 10

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
113	Capacitor, Mylar. .0047uf	100165-472	1	C5.
114	Capacitor, Tantalum. 4.7uf	100070-475	9	C101-901.
115	Capacitor, Ceramic. 100pf	100073-101	9	C102-902.
116	Capacitor, Polyfilm. .0022uf	100188-222	9	C104-904.
117	Capacitor, Mylar. .0018uf	100165-182	9	C105-905.
118				
119				
120	Resistor. 5%. ¼w. 6.8K	100156-682	1	R45.
121	Resistor. 1%. " 51.1K	100155-453	9	R110-910.
122				
123				
124	Wire, Solid Insulated.	100246-924	A/R	Jumper J1. From A to B.
				Jumper J2. Not used.
				Jumper J3. From F to H.



B-31 Schematic, Data Electronics, Dual Gap, PWB

SPEED	C101-C901	R102-C902	C104-C904	C105-C905	C5	R110-R910	R45
10.5 IPS	22 UF	68 PF	.01 UF	.0068 UF	.01 UF	178 K	12K
25 IPS	4.7 UF	68 PF	.0047 UF	.0033 UF	.0082 UF	90.9K	6.8K
37.5 IPS	4.7 UF	100 PF	.0033 UF	.0022 UF	.0047 UF	68.1K	6.8K

VARIABLE COMPONENTS TABLE

LAST USED	DELETED
U31	
Q908, Q7	
CR913	CR2, CR4
R928, R46	R42
C908, C41	

(10) SEE VARIABLE COMPONENTS TABLE.

9. IC's U1, U2 AND U29 TO BE 100084
   U3 THRU U7 TO BE 100095
   U8 THRU U17 TO BE 100167
   U18 THRU U22 TO BE 100088
   U23 THRU U26 & U30 TO BE 100086
   U27 TO BE 100087
   U28 TO BE 100090
   U31 TO BE 100085
8. ALL NPN TRANSISTORS TO BE 100090
7. ALL PNP TRANSISTORS TO BE 100081
6. PARTIAL REF. DESIGNATIONS ARE SHOWN. PREFIX THE DESIGNATION WITH THE UNIT NUMBER OR SUBASSY DESIGNATION (S) OR BOTH FOR COMPLETE DESIGNATION. AREA ENCLOSED IN BROKEN LINE IS A REPETITIVE CIRCUIT, REF DESIG'S ARE ABBREVIATED. COMPLETE REF DESIG'S SHALL CONSIST OF CLASS LETTER, CIRCUIT NO., AND REF DESIG. NO. (EXAMPLE; REF DESIG. FOR RESISTOR SHOWN AS R1 SHALL BE R201 IN CIRCUIT 200).
4. ALL CAPACITORS IN MICROFARADS ±20% 20V
3. ALL DIODES TO BE 100091
2. ALL RESISTORS IN OHMS ±5% 1/4 W
1. PWB ASSY SEE SHEET #8

NOTES: UNLESS OTHERWISE SPECIFIED

NOTES UNLESS SPECIFIED			
1. TOLERANCES XXX ANGULAR XXX.X ±	DRAWN	[illegible]	3-20-74
2. BREAK ALL SHARP EDGES APPROX .010	CHECK	[illegible]	
3. MACH. SURFACES	APPR.	[illegible]	
4. ALL DIMS IN INCHES	MATERIAL		
	FINISH		
	MODEL No.	9100-J	
	NEXT ASSY	200456	

SCHEMATIC
DATA ELECTRONICS-SINGLE GAP

CODE 108 | REV. #8/9

SCALE NONE. | SIZE E | 200347 J

DO NOT SCALE THIS DRAWING | WEIGHT | SHEET 10 OF 10

B-33. Assembly, Data Electronics, Single Gap, PWB

TP2, GROUND
JUMPER J3
TP5 FIRST CHARACTER
READ CHARACTER GATE
TP8, GROUND
JUMPER J2
JUMPER J1
WRITE INPUT
P7
WIRE SIDE
5 REQ
19 IN
J4
3 REQ
2 IN
READ OUTPUT
WRITE PWR GATE
HIGH DENSITY
MOTION (+)
GROUND
SEL & READY
WRITE ENABLE
+12V REG
-12V REG
+5V REG
TP7, GROUND
TP6, STAIRCASE
VARIABLE COMPONENTS TYPICAL SEE M/L
READ REGISTER OUTPUTS
OUTSIDE TRACK
READ TRACKS, READ GAIN ADJ 12V P-P
USE A STANDARD LEVEL OUTPUT TAPE.
WRITE ALL ONES THEN READ. (DO NOT
USE 16M MASTER ALL ONES TAPE
TP1, GROUND
INSIDE TRACK
REF
3 PLACES
MARK REF DESIG. .12 HIGH, CHARCTERS PER WCP SPEC 100013

NOTES:

NOTES UNLESS SPECIFIED
1. TOLERANCES
.XXX = ±.010 ANGULAR ±2°
.XXXX = ±.005
2. BREAK ALL SHARP EDGES APPROX. .010
3. MACH. SURFACES
4. ALL DIMS IN INCHES

DRAWN L. AGUIRRE 4-28-72
CHECK
APPR.
MATERIAL
FINISH

ASSEMBLY
DATA ELECTRONICS
SINGLE GAP

CODE 101
DRW. NO. 1

MODEL No. MOD 10
NEXT ASSY. 200456

SCALE 2:1
SIZE E
200347
J

DO NOT SCALE THIS DRAWING
WEIGHT
SHEET 9 OF 10

MATERIAL LIST — ML — DRAWING NO. 200521 - 00000 — REV. M

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. BASIC BOARD, DUAL GAP. MODEL NO. 16 DATE 3/2/71 SHEET 1 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
27	Capacitor, Tantalum. 10uf.	100070-106	11	C1.2.3.4.5.6.7.9.10.11.12.13.
				C14.15.16.17.18.19.20.21.22.23.
				C24.28.29.30.31.32.37.38.39.40.
				C101-904.
28	Capacitor, Tantalum. 47uf.	100070-476	1	C27.
29				
30	Resistor, Variable. 50	100069-500	1	R27.
31	Resistor, " 5K	100069-502	9	R118-918.
32	Resistor, " 20K	100069-203	10	R19. R104-904.
33				
34	Resistor, 5%. ½w. 10	100156-100	9	R131-931.
35	Resistor. 1%. " 61.9	100155-173	18	R121-921. R122-922.
36	Resistor. " " 75	100155-181	9	R125-925.
37	Resistor. 5%. " 120	100156-121	9	R117-917.
38	Resistor. " 1w. 120	100067-121	1	R20.
39	Resistor. 1%. ½w. 162	100155-213	1	R29.
40	Resistor. 5%. " 220	100156-221	15	R1.3.5.7.9.51. R101-901.
41	Resistor. 2%. 1w. 220	100142-221	10	R26. R112-912.
42	Resistor. 1%. ½w. 267	100155-234	1	R73.
43	Resistor. 5%. 1w. 270	100067-271	1	R18.
44	Resistor. " ½w. 330	100156-331	17	R2.4.6.13.31.33.35.10.
				R102-902.
45	Resistor. 5%. ½w. 390	100064-391	1	R28.
46	Resistor. " ½w. 470	100156-471	5	R15.19.40.47.52.
47	Resistor. 1% " 511	100155-261	3	R38.41.72.
48	Resistor. 5% " 560	100156-561	19	R74. R108-908. R109-909.
49	Resistor. 1% " 634	100155-270	1	R39.
50				
51	Resistor. 5%. ½w. 1.2K	100156-122	37	R17.22.25.30.32.44.53.57.70.
				R71. R103-903. R106-906.
52				R107-907.
53				

MATERIAL LIST — ML — DRAWING NO. 200521-00000 — REV. M

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. BASIC BOARD, DUAL GAP. MODEL NO. 16 DATE 3/2/71 SHEET 3 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
54	Resistor. 1%. ½w. 1.96K Ω	100155-317	20	R42.55.R120-920. R123-923.
55	Resistor. 5%. " 2.4K Ω	100156-242	33	R11.12.14.16.21.45.
				R105-905.R119-919.R124-924.
56	Resistor. 1%. ½w. 3.09K Ω	100155-336	1	R43.
57	Resistor. 5%. " 3.3K Ω	100156-332	41	R24.51.56.60.75.R113-913.
				R114-914.R129-929.R133-933.
58				
59	Resistor. 5%. ½w. 4.7K Ω	100156-472	2	R34.58.
60	Resistor. " " 5.1K Ω	100156-512	1	R50.
61	Resistor. " " 6.8K Ω	100156-682	20	R46.59. R110-910. R111-911.
62	Resistor. " " 8.2K Ω	100156-822	1	R23.
63	Resistor. " " 10K Ω	100156-103	19	R48.R126-926.R127-927.
64				
65	Resistor. " " 18K Ω	100156-183	1	R36.
66	Resistor. " " 39K Ω	100156-393	9	R130-930.
67	Resistor. " " 68K Ω	100156-683	10	R37.R132-932.
68	Resistor. " " 100K Ω	100156-104	9	R61.62.63.64.65.66.67.68.69.
69	Resistor. " " 220K Ω	100156-224	9	R128-928.
70				
71				
72				
73	Connector, Head. Male.	100137	2	J2. J5.
74	Connector. 9 pin.	100247-001	1	J3.
75	Connector. 5 pin.	100247-005	1	J4.
76	Pin, Male.	100098	33	Test Points.
77				
78				
79				
80	Screw, Pan Head.	100036-206	6	4 - 40 x 3/8"
81	Washer, Flat.	100047-200	6	No.4.
82	Washer, Int. Tooth Lock.	100059-200	6	No.4.
83				

MATERIAL LIST — ML — DRAWING NO. 200521-00000 — REV. M

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. 10-12.9 IPS. TYPE F. D/GAP. MODEL NO. 16 DATE 3/2/71 SHEET 5 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Mylar. .015uf	100165-153	1	C34.
117	Capacitor, POLYFILM .001uf	100225-152	1	C41.
118	Capacitor, Poly. .0033uf	100077-332	9	C101-901.
119	Capacitor, Tantalum. 1uf	100136-105	18	C106-906. C107-907.
120	Capacitor, Polyfilm. .47uf	100128-474	9	C108-908.
121				
122				
123	Resistor. 5%. ½w. 750K Ω	100156-754	18	R115-915. R116-916.
124				
125				
126				
127	Wire, Solid Bare. Insulated.	100218-924	A/R	Jumper J1. From A to C
128				Jumper J2. From M to N
				Jumper J3. From AA to BB
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11. From CC to DD.

MATERIAL LIST — ML — DRAWING NO. 200521-0003 — REV. M

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. 17-22.9 IPS. TYPE F. D/GAP. MODEL NO. 16 DATE 3/2/71 SHEET 7 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Poly. .0082uf	100077-822	1	C34.
117	Capacitor, POLYFILM .001uf	100225-152	1	C41.
118	Capacitor, Poly. .0022uf	100077-222	9	C101-901.
119	Capacitor, Tantalum. .68uf	100136-684	18	C106-906. C107-907.
120	Capacitor, Polyfilm. .33uf	100128-334	9	C108-908.
121				
122				
123	Resistor. 5%. ½w. 560K Ω	100156-564	18	R115-915. R116-916.
124				
125				
126				
127	Wire, Solid Insulated.	100218-924	A/R	Jumper J1. From A to C
128				Jumper J2. From M to N
				Jumper J3. From AA to BB.
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11. From CC to DD.

MATERIAL LIST — ML — DRAWING NO. 200521-00000 — REV. M

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. BASIC BOARD, DUAL GAP. MODEL NO. 16 DATE 3/2/71 SHEET 1 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Board, Processed.	200167	1	
2	Bracket, Mounting.	200016	2	
3				
4	I.C.Hex. Inverter.	100084	5	U1.2.8.9.31.
5	I.C.Quad. 2 Input Nand.	100085	6	U3.4.5.6.7.15.
6	I.C.Quad. 2 Input Power.	100086	3	U26.27.28.
7	I.C.10 Input Nand.	100087	1	U29.
8	I.C. Dual Flip-Flop.	100088	10	U10.11.12.13.14.21.
				U22.23.24.25.
9	I.C.Operational Amplifier.	100089	5	U16.17.18.19.20.
10	I.C.Monostable.	100090	1	U30.
11				
12	Transistor. NPN. 2N3123	100080	72	Q1.2.5.8.9.11.13.14.15.
				Q101-901. Q102-902.
				Q103-903. Q105-905.
				Q106-906. Q107-907. Q109-909.
13	Transistor. PNP. 2N3125	100081	14	Q4.6.7.10.12. Q108-908.
14				
15	Transistor. Dual NPN. TIM101.	100082	9	Q104-904.
16	Transistor. PNP. MPS-U51.	100083	1	Q3.
17				
18	Diode, Signal. 1N914.	100091	46	CR1.CR101-901. 102-902.
				CR103-903. 104-904.
				CR105-905.
19				
20	Capacitor, Ceramic. 33pf	100073-330	9	C109-909.
21	Capacitor, MICA 68pf	100243-680	1	C36.
22	Capacitor, CERAMIC 100pf	100073-101	9	C102-902.
23	Capacitor, " 330pf	100073-331	9	C105-905.
24	Capacitor, Poly. .0015uf	100077-152	1	C35.
25	Capacitor, Ceramic. .0033uf	100073-332	9	C103-903.
26				

MATERIAL LIST — ML — DRAWING NO. 200521-00000 — REV. M

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. BASIC BOARD, DUAL GAP. MODEL NO. 16 DATE 3/2/71 SHEET 4 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
84	Nut, Hex.	100043-890	6	4 - 40.
85				
86				
87	Artwork, Master.	200166	Ref.	
88	Wire, Solid Insulated.	100218-924	A/R	Jumper J1. From WW to VV.
				Jumper J5. " TT " UU.
				Jumper J6. " HH " JJ.
	THESE JUMPERS ARE TO BE			Jumper J7. " FF " GG.
	USED ON ALL VERSIONS			Jumper J8. " KK " YY.

MATERIAL LIST — ML — DRAWING NO. 200521-00000 — REV. M

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. 13-16.9 IPS. TYPE F. D/GAP. MODEL NO. 16 DATE 3/2/71 SHEET 6 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Poly. .0082uf	100077-822	1	C34.
117	Capacitor, POLYFILM .001uf	100225-152	1	C41.
118	Capacitor, Poly. .0033uf	100077-332	9	C101-901.
119	Capacitor, Tantalum. .68uf	100136-684	18	C106-906. C107-907.
120	Capacitor, Polyfilm. .47uf	100128-474	9	C108-908.
121				
122				
123	Resistor. 5%. ½w. 560K Ω	100156-564	18	R115-915. R116-916.
124				
125				
126				
127	Wire, Solid Insulated.	100218-924	A/R	Jumper J1. From A to C
128				Jumper J2. From M to N
				Jumper J3. From AA to BB.
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11. From CC to DD.

MATERIAL LIST — ML — DRAWING NO. 200521-0004 — REV. M

DRAWING TITLE: ASSY DATA ELECTRONICS PWB. 23-29.9 IPS. TYPE F. D/GAP. MODEL NO. 16 DATE 3/2/71 SHEET 8 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Poly. .0082uf	100077-822	1	C34.
117	Capacitor, POLYFILM .0068uf	100225-152	1	C41.
118	Capacitor, Poly. .0015uf	100077-152	9	C101-901.
119	Capacitor, Tantalum. .47uf	100136-474	18	C106-906. C107-907.
120	Capacitor, Polyfilm. .27uf	100128-274	9	C108-908.
121				
122				
123	Resistor, 5%. ½w. 330K Ω	100156-334	18	R115-915. R116-916.
124				
125				
126				
127	Wire, Solid Insulated.	100218-924	A/R	Jumper J1. From A to C
128				Jumper J2. From M to N
				Jumper J3. From AA to BB
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11. From CC to DD.

OLIVETTI.

MATERIAL LIST

ML DRAWING NO. 200521-0013 REV. M

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. 10-12.9 IPS. TYPE A. D/GAP. MODEL NO. 16 DATE 3/2/71 SHEET 11 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Mylar. .015uf	100165-153	1	C34.
117				
118	Capacitor, Poly. .0033uf	100077-332	9	C101-901.
119	Capacitor, Tantalum. 1nf	100136-105	18	C106-906. C107-907.
120	Capacitor, Polyfilm. .47uf	100128-474	9	C108-908.
121				
122	Resistor. 5%. ½w. 330Ω	100156-331	1	R8.
123	Resistor. " " 750KΩ	100156-754	18	R115-915. R116-916.
124				
125				
126				
127	Wire, Solid Insulated.	10028-924	A/R	Jumper J1. From B to C
128	[illegible]	[illegible]		Jumper J2. From M to P
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11. From DD to EE.

MATERIAL LIST

ML DRAWING NO. 200521-0013 REV. M

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. 17-22.9 IPS. TYPE A. D/GAP. MODEL NO. 16 DATE 3/2/71 SHEET 13 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Poly. .0082uf	100077-822	1	C34.
117				
118	Capacitor, Poly. .0022uf	100077-222	9	C101-901.
119	Capacitor, Tantalum. .68uf	100136-684	18	C106-906. C107-907.
120	Capacitor, Polyfilm. .33uf	100128-334	9	C108-908.
121				
122	Resistor. 5%. ½w. 330Ω	100156-331	1	R8.
123	Resistor. " " 560KΩ	100156-564	18	R115-915. R116-916.
124				
125				
126				
127	Wire, Solid Insulated.	10028-924	A/R	Jumper J1. From B to C
128	[illegible]	[illegible]		Jumper J2. From M to P
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11. From DD to EE.

MATERIAL LIST

ML DRAWING NO. 200521-0013 REV. M

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. 30-39.9 IPS. TYPE A. D/GAP. MODEL NO. 16 DATE 3/2/71 SHEET 15 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Poly. .0047uf	100077-472	1	C34.
117				
118	Capacitor, Poly. .001uf	100077-102	9	C101-901.
119	Capacitor, Tantalum. .33uf	100136-334	18	C106-906. C107-907.
120	Capacitor, Polyfilm. .18uf	100128-184	9	C108-908.
121				
122	Resistor. 5%. ½w. 330Ω	100156-331	1	R8.
123	Resistor. " " 330KΩ	100156-334	18	R115-915. R116-916.
124				
125				
126				
127	Wire, Solid Insulated.	10028-924	A/R	Jumper J1. From B to C
128	[illegible]	[illegible]		Jumper J2. From M to P
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11. From DD to EE.

MATERIAL LIST

ML DRAWING NO. 200521-013 REV. M

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. 23-29.9 IPS. TYPE 'A' D/G. MODEL NO. 16 DATE 12/14/71 SHEET 17 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Poly. .0082uf	100077-822	1	C34.
117				
118	Capacitor, Poly. .0015uf	100077-152	9	C101-901.
119	Capacitor, Tantalum. .47uf	100136-474	9	C106-906.
120	Capacitor, Tantalum. .47uf	100136-474	9	C107-907.
121	Capacitor, Polyfilm. .27uf	100128-274	9	C108-908.
122				
123	Resistor, 5%. ½w. 330	100156-331	1	R8.
124	Resistor, " " 330K	100156-334	9	R115-915.
125	Resistor, " " 330K	100156-334	9	R116-916.
126				
127				
128				
129	Wire, Solid Insulated.	10028-924	A/R	Jumper J1. From B to C.
				Jumper J2. " M to P.
				Jumper J10. " R to S.
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J11. From DD to EE.

MAT

WANGCO

DRAWING TITLE: ASSY. DATA ELECTRONIC 30-39.9IPS. TYPE 'A'

ITEM NO.	DRAWING TITLE
116	Capacitor, Poly. .00
117	
118	Capacitor, Poly. .0
119	Capacitor, Tantalum.
120	Capacitor, "
121	Capacitor, Polyfilm.
122	
123	Resistor, 5%. ½w.
124	Resistor. " "
125	Resistor. " "
126	
127	
128	
129	Wire, Solid Insulated.

MATERIAL LIST

ML DRAWING NO. 200521-0013 REV. M

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. 13-16.9 IPS. TYPE A. D/GAP. MODEL NO. 16 DATE 3/2/71 SHEET 12 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Poly. .0082uf	100077-822	1	C34.
117				
118	Capacitor, Poly. .0033uf	100077-332	9	C101-901.
119	Capacitor, Tantalum. .68uf	100136-684	18	C106-906. C107-907.
120	Capacitor, Polyfilm. .47uf	100128-474	9	C108-908.
121				
122	Resistor, 5%. ½w. 330Ω	100156-331	1	R8.
123	Resistor. " " 560KΩ	100156-564	18	R115-915. R116-916.
124				
125				
126				
127	Wire, Solid Insulated.	10028-924	A/R	Jumper J1. From B to C
128	[illegible]	[illegible]		Jumper J2. From M to P
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11. From DD to EE.

MATERIAL LIST

ML DRAWING NO. 200521-0013 REV. M

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. 23-29.9 IPS. TYPE A. D/GAP. MODEL NO. 16 DATE 3/2/71 SHEET 14 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Poly. .0082uf	100077-822	1	C34.
117				
118	Capacitor, Poly. .0015uf	100077-152	9	C101-901.
119	Capacitor, Tantalum. .47uf	100136-474	18	C106-906. C107-907.
120	Capacitor, Polyfilm. .27uf	100128-274	9	C108-908.
121				
122	Resistor. 5%. ½w. 330Ω	100156-331	1	R8.
123	Resistor. " " 330KΩ	100156-334	18	R115-915. R116-916.
124				
125				
126				
127	Wire, Solid Insulated.	10028-924	A/R	Jumper [illegible] J1. From B to C
128	[illegible]	[illegible]		Jumper J2. From M to P.
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11. From DD to EE.

MATERIAL LIST

ML DRAWING NO. 200521-0014 REV. M

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. 30-45 IPS. TYPE A. D/GAP. MODEL NO. 16 DATE 3/2/71 SHEET 16 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Poly. .0047uf	100077-472	1	C34.
117				
118	Capacitor, Poly. .001uf	100077-102	9	C101-901.
119	Capacitor. Tantalum. .22uf	100136-224	18	C106-906. C107-907.
120	Capacitor, Polyfilm. .15uf	100128-154	9	C108-908.
121				
122	Resistor, 5%. ½w. 330Ω	100156-331	1	R8.
123	Resistor. " " 330KΩ	100156-334	18	R115-915. R116-916.
124				
125				
126				
127	Wire, Solid Insulated.	10028-924	A/R	Jumper J1. From B to C
128	[illegible]	[illegible]		Jumper J2. From M to P
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11. From DD to EE.

MATERIAL LIST

ML DRAWING NO. 200521-014 REV. M

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. 30-45 IPS. TYPE A. D/GAP. MODEL NO. 16 DATE 3/2/71 SHEET 18 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Poly. .0047uf	100077-472	1	C34.
117	CAPACITOR, Poly. .0015uf	100225-152	1	C44.
118	Capacitor, Poly. .001uf	100077-102	9	C101-901.
119	Capacitor. Tantalum. .22uf	100136-224	18	C106-906. C107-907.
120	Capacitor, Polyfilm. .15uf	100128-154	9	C108-908.
121				
122	Resistor, 5%. ½w. 330Ω	100156-331	1	R8.
123	Resistor. " " 330KΩ	100156-334	18	R115-915. R116-916.
124				
125				
126				
127	Wire, Solid Insulated.	10028-924	A/R	Jumper J1. From B to C
128			A/R	Jumper J2. From M to N
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11. From DD to EE.

Atc
cut out AA & BB
click

OLIVETTI.

MATERIAL LIST — ML — DRAWING NO. 200521-013 — REV. M

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. 23-29.9 IPS. TYPE 'A' D/GAP. MODEL NO. 10 DATE 12/14/71 SHEET 17 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Poly. .0082uf	100077-822	1	C34.
117				
118	Capacitor, Poly. .0015uf	100077-152	9	C101-901.
119	Capacitor, Tantalum. .47uf	100136-474	9	C106-906.
120	Capacitor, Tantalum. .47uf	100136-474	9	C107-907.
121	Capacitor, Polyfilm. .27uf	100128-274	9	C108-908.
122				
123	Resistor, 5%. ½w. 330	100156-331	1	R8.
124	Resistor. " " 330K	100156-334	9	R115-915.
125	Resistor, " " 330K	100156-334	9	R116-916.
126				
127				
128				
129	Wire, Solid Insulated.	10021.8-924	A/R	Jumper J1. From B to C.
				Jumper J2. " M to P.
				Jumper J10. " R t S.
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J11. From DD to EE.

OLIVETTI.

MATERIAL LIST — ML — DRAWING NO. 200521 - 015 — REV. M

DRAWING TITLE: WANGCO ASSY. DATA ELECTRONICS PWB 30-39.9IPS. TYPE 'A' D/GAP. MODEL NO. 10 DATE 10/4/72 SHEET 19 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Poly. .0047uf	100077-472	1	C34.
117				
118	Capacitor, Poly. .001uf	100077-102	9	C101-901.
119	Capacitor, Tantalum. .33uf	100136-334	9	C106-906.
120	Capacitor, " .33uf	100136-334	9	C107-907.
121	Capacitor, Polyfilm. .18uf	100128-184	9	C108-908.
122				
123	Resistor, 5%. ½w. 330	100156-331	1	R8.
124	Resistor. " " 330K	100156-334	9	R115-915.
125	Resistor. " " 330K	100156-334	9	R116-916.
126				
127				
128				
129	Wire, Solid Insulated.	10021.8-924	A/R	Jumper J1. From B to C.
				Jumper J2. " M " P.
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. From R to S.
				Jumper J11. " DD " EE.

MATERIAL LIST — ML — DRAWING NO. 200521-[illegible] — REV. M

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. 23-29.9 IPS. TYPE A. D/GAP. MODEL NO. 10 DATE 3/2/71 SHEET 13 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Poly. .0082uf	100077-822	1	C34.
117				
118	Capacitor, Poly. .0022uf	100077-222	9	C101-901.
119	Capacitor, Tantalum. .68uf	100136-684	18	C106-906. C107-907.
120	Capacitor, Polyfilm. .33uf	100128-334	9	C108-908.
121				
122	Resistor. 5%. ½w. 330Ω	100156-331	1	R8.
123	Resistor. " " 560KΩ	100156-564	18	R115-915. R116-916.
124				
125				
126				
127	Wire, Solid Insulated.	10021.8-924	A/R	Jumper J1. From B to C
128	[illegible]	[illegible]		Jumper J2. From M to P
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11. From DD to EE.

MATERIAL LIST — ML — DRAWING NO. 200521-[illegible] — REV. M

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. 30-39.9 IPS. TYPE A. D/GAP. MODEL NO. 10 DATE 3/2/71 SHEET 15 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Poly. .0047uf	100077-472	1	C34.
117				
118	Capacitor, Poly. .001uf	100077-102	9	C101-901.
119	Capacitor, Tantalum. .33uf	100136-334	18	C106-906. C107-907.
120	Capacitor, Polyfilm. .18uf	100128-184	9	C108-908.
121				
122	Resistor, 5%. ½w. 330Ω	100156-331	1	R8.
123	Resistor. " " 330KΩ	100156-334	18	R115-915. R116-916.
124				
125				
126				
127	Wire, Solid Insulated.	10021.8-924	A/R	Jumper J1. From B to C
128	[illegible]	[illegible]		Jumper J2. From M to P
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11. From DD to EE.

MATERIAL LIST — ML — DRAWING NO. 200521-[illegible] — REV. M

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. 23-29.9 IPS. TYPE A. D/GAP. MODEL NO. 10 DATE 3/2/71 SHEET 14 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Poly. .0082uf	100077-822	1	C34.
117				
118	Capacitor, Poly. .0015uf	100077-152	9	C101-901.
119	Capacitor, Tantalum. .47uf	100136-474	18	C106-906. C107-907.
120	Capacitor, Polyfilm. .27uf	100128-274	9	C108-908.
121				
122	Resistor. 5%. ½w. 330Ω	100156-331	1	R8.
123	Resistor. " " 330KΩ	100156-334	18	R115-915. R116-916.
124				
125				
126				
127	Wire, Solid Insulated.	10021.8-924	A/R	Jumper [illegible] J1. From B to C
128	[illegible]	[illegible]		Jumper J2. From M to P.
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11. From DD to EE.

MATERIAL LIST — ML — DRAWING NO. 200521-[illegible] — REV. M

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. 30-45 IPS. TYPE A. D/GAP. MODEL NO. 10 DATE 3/2/71 SHEET 16 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Poly. .0047uf	100077-472	1	C34.
117				
118	Capacitor, Poly. .001uf	100077-102	9	C101-901.
119	Capacitor, Tantalum. .22uf	100136-224	18	C106-906. C107-907.
120	Capacitor, Polyfilm. .15uf	100128-154	9	C108-908.
121				
122	Resistor, 5%. ½w. 330Ω	100156-331	1	R8.
123	Resistor. " " 330KΩ	100156-334	18	R115-915. R116-916.
124				
125				
126				
127	Wire, Solid Insulated.	10021.8-924	A/R	Jumper J1. From B to C
128	[illegible]	[illegible]		Jumper J2. From M to P
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11. From DD to EE.

MATERIAL LIST — ML — DRAWING NO. 200521-014 — REV. M

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. 30-45 IPS. TYPE A. D/GAP. MODEL NO. 10 DATE 3/2/71 SHEET 18 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Poly. .0047uf	100077-472	1	C34.
117	CAPACITOR, POLY. .0015uF	100225-152	1	C41.
118	Capacitor, Poly. .001uf	100077-102	9	C101-901.
119	Capacitor. Tantalum. .22uf	100136-224	18	C106-906. C107-907.
120	Capacitor, Polyfilm. .15uf	100128-154	9	C108-908.
121				
122	Resistor, 5%. ½w. 330Ω	100156-331	1	R8.
123	Resistor. " " 330KΩ	100156-334	18	R115-915. R116-916.
124				
125				
126				
127	Wire, Solid Insulated.	10021.8-924	A/R	Jumper J1. From B to C
128			A/R	Jumper J2. From M to N
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11. From DD to EE.

Add AA & BB and RS

connect

B-34. Material List, Data Electronics, Dual Gap, PWB (page 2 of 2)

ML DRAWING NO. 200521 - 00000 REV. M

DATE 3/2/71 SHEET 2 OF 21

REMARKS ON CKT. DESIG.
C1.2.3.4.5.6.7.9.10.11.12.13.
C14.15.16.17.18.19.20.21.22.23.
C24.28.29.30.31.32.37.38.39.40.
C10[illegible]-904.
C27.
R27.
R128-928.
R49. R104-904.
R131-931.
R121-921. R122-922.
R125-925.
R117-917.
R20.
R29.
R1.3.5.7.9.51. R101-901.
R26. R112-912.
R73.
R18.
R2.4.6.13.31.33.35.10.
R102-902.
R28.
R15.19.40.47.52.
R38.41.72.
R74. R108-908. R109-909.
R39.
R17.22.25.30.32.44.53.57.70.
R71. R103-903. R106-906.
R107-907.

MATERIAL LIST

ML DRAWING NO. 200521-00000 REV. M

DRAWING TITLE ASSY. DATA ELECTRONICS PWB. BASIC BOARD. DUAL GAP. MODEL NO. 1[illegible] DATE 3/2/71 SHEET 3 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
54	Resistor. 1%. ½w. 1.96Kῼ	100155-317	20	R12.55.R120-920. R123-923.
55	Resistor. 5%. " 2.4Kῼ	100156-242	33	R11.12.14.16.21.45.
				R105-905.R119-919.R124-924.
56	Resistor. 1%. ½w. 3.09Kῼ	100155-336	1	R43.
57	Resistor. 5%. " 3.3Kῼ	100156-332	41	R24.54.56.60.75.R113-913.
				R114-914.R129-929.R133-933.
58				
59	Resistor. 5%. ½w. 4.7Kῼ	100156-472	2	R34.58.
60	Resistor. " " 5.1Kῼ	100156-512	1	R50.
61	Resistor. " " 6.8Kῼ	100156-682	20	R46.59. R110-910. R111-911.
62	Resistor. " " 8.2Kῼ	100156-822	1	R23.
63	Resistor. " " 10Kῼ	100156-103	19	R48.R126-926.R127-927.
64				
65	Resistor. " " 18Kῼ	100156-183	1	R36.
66	Resistor. " " 39Kῼ	100156-393	9	R130-930.
67	Resistor. " " 68Kῼ	100156-683	10	R37.R132-932.
68	Resistor. " " 100Kῼ	100156-104	9	R61.62.63.64.65.66.67.68.69.
69	Resistor. " " 220Kῼ	100156-224	9	R128-928.
70				
71				
72				
73	Connector, Head. Male.	100137	2	J2. J5.
74	Connector. 9 pin.	100247-001	1	J3
75	Connector. 5 pin.	100247-005	1	J4
76	Pin, Male.	100098	33	Test Points.
77				
78				
79				
80	Screw, Pan Head.	100036-206	6	4 - 40 x 3/8"
81	Washer, Flat.	100047-200	6	No.4.
82	Washer, Int. Tooth Lock.	100059-200	6	No.4.
83				

MATERIAL LIST

ML DRAWING NO. 200521-00000 REV. M

DRAWING TITLE ASSY. DATA ELECTRONICS PWB. 10-12.9 IPS. TYPE P. D/GAP. MODEL NO. 1[illegible] DATE 3/2/71 SHEET 5 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Mylar. .015uf	100165-153	1	C34.
117	Capacitor, POLYFILM .0015uF	100225-152	1	C11.
118	Capacitor, Poly. .0033uf	100077-332	9	C101-901.
119	Capacitor, Tantalum. 1uf	100136-105	18	C106-906. C107-907.
120	Capacitor, Polyfilm. .47uf	100128-474	9	C108-908.
121				
122				
123	Resistor. 5%. ½w. 750Kῼ	100156-754	18	R115-915. R116-916.
124				
125				
126				
127	Wire, Solid Insulated.	1002[illegible]8-924	A/R	Jumper J1. From A to C
128	[illegible]	[illegible]	/	Jumper J2. From M to N
				Jumper J3. From AA to BB
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11. From CC to DD.

MATERIAL LIST

ML DRAWING NO. 200521-0[illegible] REV. M

DRAWING TITLE ASSY. DATA ELECTRONICS PWB. 17-22.9 IPS. TYPE P. D/GAP. MODEL NO. 1[illegible] DATE 3/2/71 SHEET 7 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Poly. .0082uf	100077-822	1	C34.
117	Capacitor, POLY. .0015uF	100225-152	1	C11.
118	Capacitor, Poly. .0022uf	100077-222	9	C101-901.
119	Capacitor, Tantalum. .68uf	100136-684	18	C106-906. C107-907.
120	Capacitor, Polyfilm. .33uf	100128-334	9	C108-908.
121				
122				
123	Resistor. 5%. ½w. 560Kῼ	100156-564	18	R115-915. R116-916.
124				
125				
126				
127	Wire, Solid Insulated.	1002[illegible]8-924	A/R	Jumper J1. From A to C
128	[illegible]	[illegible]	/	Jumper J2. From M to N
				Jumper J3. From AA to BB.
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11. From CC to DD.

MATERIAL LIST

ML DRAWING NO. 200521-00[illegible] REV. M

DRAWING TITLE ASSY. DATA ELECTRONICS PWB. 30-39.9 IPS. TYPE P. D/GAP. MODEL NO. 1[illegible] DATE 3/2/71 SHEET 9 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Poly. .0047uf	100077-472	1	C34.
117	Capacitor, POLY. .0015uF	100225-152	1	C11.
118	Capacitor, Poly. .001uf	100077-102	9	C101-901.
119	Capacitor, Tantalum. .33uf	100136-334	18	C106-906. C107-907.
120	Capacitor, Polyfilm. .18uf	100128-184	9	C108-908.
121				
122				
123	Resistor. 5%. ½w. 390Kῼ	100156-334	18	R115-915. R116-916.
124				
125				
126				
127	Wire, Solid Insulated.	1002[illegible]8-924	A/R	Jumper J1. From A to C
128	[illegible]	[illegible]	/	Jumper J2. From M to N
				Jumper J3. From AA to BB.
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11. From CC to DD.

ML DRAWING NO. 200521-00000 REV. M

DATE 3/2/71 SHEET 1 OF 21

REMARKS ON CKT. DESIG.
U1.2.8.9.31.
U3.4.5.6.7.15.
U26.27.28.
U29.
U10.11.12.13.14.21.
U22.23.24.25.
U16.17.18.19.20.
U30.
Q1.2.5.8.9.11.13.14.15.
Q101-901. Q102-902.
Q103-903. Q105-905.
Q106-906. Q107-907. Q109-909.
Q4.6.7.10.12. Q108-908.
Q104-904.
Q3.
CR1.CR101-901. R02-902.
CR103-903. 104-904.
CR105-905.
C109-909.
C36.
C102-902.
C105-905.
C35.
C103-903.

MATERIAL LIST

ML DRAWING NO. 200521-00000 REV. M

DRAWING TITLE ASSY. DATA ELECTRONICS PWB. BASIC BOARD. DUAL GAP. MODEL NO. 1[illegible] DATE 3/2/71 SHEET 4 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
84	Nut, Hex.	100043-200	6	4 - 40.
85				
86				
87	Artwork, Master.	200266	Ref.	
88	Wire, Solid Insulated.	1002[illegible]8-924	A/R	Jumper J4. From VV to WW.
				Jumper J5. " TT " UU.
				Jumper J6. " HH " JJ.
	THESE JUMPERS ARE TO BE			Jumper J7. " FF " GG.
	USED ON ALL VERSIONS			Jumper J8. " II " YY.

MATERIAL LIST

ML DRAWING NO. 200521-00000 REV. M

DRAWING TITLE ASSY. DATA ELECTRONICS PWB. 13-16.9 IPS. TYPE P. D/GAP. MODEL NO. 1[illegible] DATE 3/2/71 SHEET 6 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Poly. .0082uf	100077-822	1	C34.
117	Capacitor, POLY. .0015uF	100225-152	1	C11.
118	Capacitor, Poly. .0033uf	100077-332	9	C101-901.
119	Capacitor, Tantalum. .68uf	100136-684	18	C106-906. C107-907.
120	Capacitor, Polyfilm. .47uf	100128-474	9	C108-908.
121				
122				
123	Resistor. 5%. ½w. 560Kῼ	100156-564	18	R115-915. R116-916.
124				
125				
126				
127	Wire, Solid Insulated.	1002[illegible]8-924	A/R	Jumper J1. From A to C
128	[illegible]	[illegible]	/	Jumper J2. From M to N
				Jumper J3. From AA to BB.
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11. From CC to DD.

MATERIAL LIST

ML DRAWING NO. 200521-00[illegible] REV. M

DRAWING TITLE ASSY. DATA ELECTRONICS PWB. 23-29.9 IPS. TYPE P. D/GAP. MODEL NO. 1[illegible] DATE 3/2/71 SHEET 8 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Poly. .0082uf	100077-822	1	C34.
117	Capacitor, POLY. .0015uF	100225-152	1	C11.
118	Capacitor, Poly. .0015uf	100077-152	9	C101-901.
119	Capacitor, Tantalum. .47uf	100136-474	18	C106-906. C107-907.
120	Capacitor, Polyfilm. .27uf	100128-274	9	C108-908.
121				
122				
123	Resistor, 5%. ½w. 330Kῼ	100156-334	18	R115-915. R116-916.
124				
125				
126				
127	Wire, Solid Insulated.	1002[illegible]8-924	A/R	Jumper J1. From A to C
128	[illegible]	[illegible]	/	Jumper J2. From M to N
				Jumper J3. From AA to BB
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11. From CC to DD.

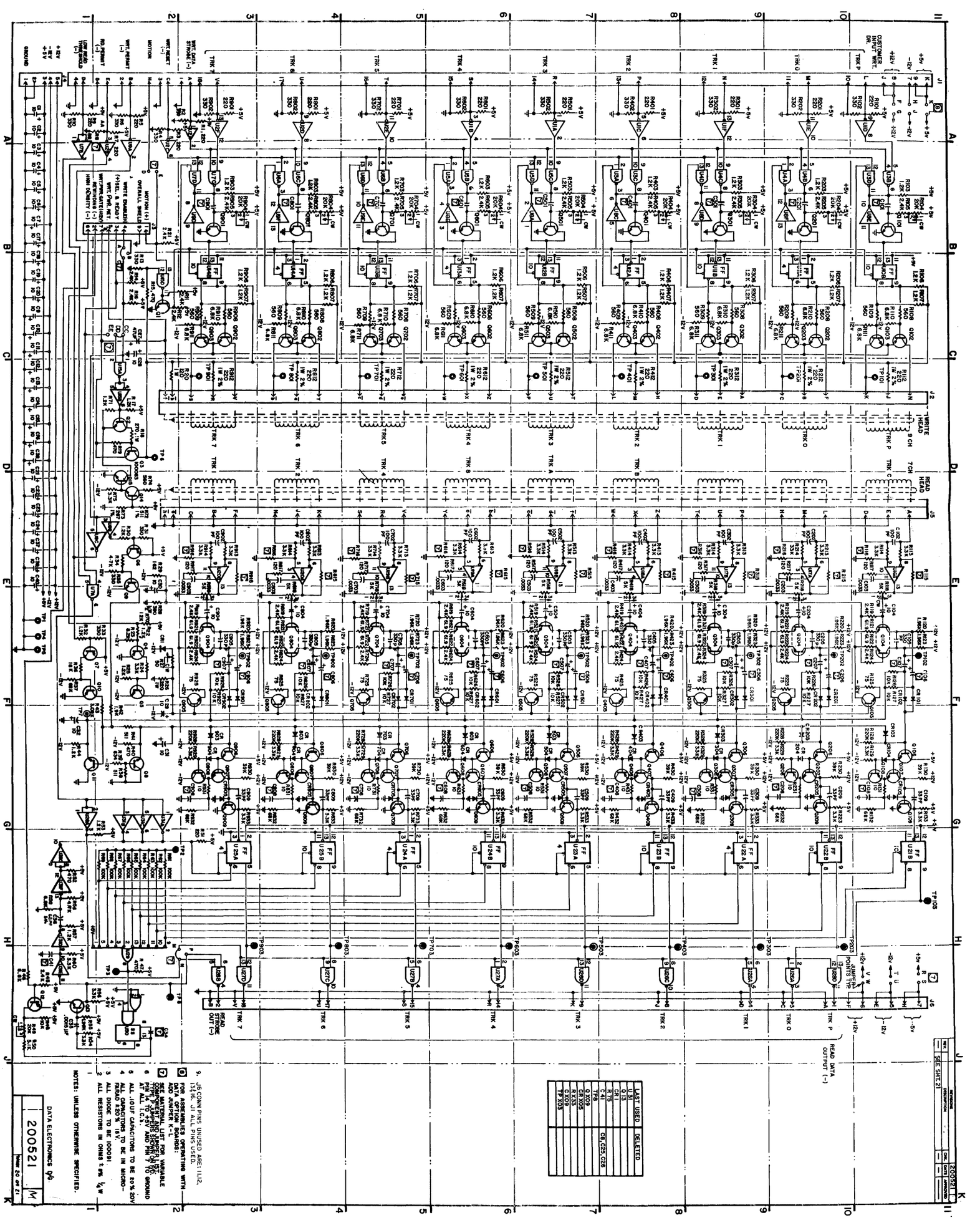
MATERIAL LIST

ML DRAWING NO. 200521-00[illegible] REV. M

DRAWING TITLE ASSY. DATA ELECTRONICS PWB. 40-45 IPS. TYPE P. D/GAP. MODEL NO. 1[illegible] DATE 3/2/71 SHEET 10 OF 21

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
116	Capacitor, Poly. .0047uf	100077-472	1	C34.
117	Capacitor, POLY. .0015uF	100225-152	1	C11.
118	Capacitor, Poly. .001uf	100077-102	9	C101-901.
119	Capacitor, Tantalum. .22uf	100136-224	18	C106-906. C107-907.
120	Capacitor, Polyfilm. .15uf	100128-154	9	C108-908.
121				
122				
123	Resistor. 5%. ½w. 330Kῼ	100156-334	18	R115-915. R116-916.
124	[illegible]	[illegible]	/	
125				
126				
127	Wire, Solid Insulated.	1002[illegible]8-924	A/R	Jumper J1. From A to C
128	[illegible]	[illegible]	/	Jumper J2. From M to N
				Jumper J3. From AA to BB
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11. From CC to DD.

B-34. Material List, Data Electronics, Dual Gap, PWB (page 1 of 2)



B-35. Schematic, Data Electronics, Dual Gap, PWB

B-36. Assembly, Data Electronics, Dual Gap, PWB

MATERIAL LIST — WANGCO — ML — DRAWING NO. 201142-000 — REV. D

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB — MODEL NO. 11 — DATE 3-30-72 — SHEET 1 OF 36

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
1	BOARD, PROCESSED	201141	1	
2	ARTWORK, MASTER	201140	REF	
3	TEST PROCEDURE	200287	REF	
4	I.C. HEX INVERTER	100084	5	U1, 2, 8, 9, 31
5	I.C. QUAD 2 INPUT NAND	100085	6	U3, 4, 5, 6, 7, 15
6	I.C. QUAD 2 INPUT POWER	100086	4	U26, 27, 28, 32
7	I.C. 10 INPUT NAND	100087	1	U29
8	I.C. DUAL FLIP FLOP	100088	10	U10, 11, 12, 13, 14, 21, 22, 23, 24
				U25
9	I.C. OPERATIONAL AMPLIFIER	100089	5	U16, 17, 18, 19, 20
10	I.C. MONOSTABLE	100090	1	U30
11				
12	TRANSISTOR, NPN 2N4123	100080	72	Q1, 2, 8, 5, 9, 11, 13, 14, 15.
				Q101-901 Q102-902 Q103-903
				Q105-905 Q106-906 Q107-907
				Q109-909
13	TRANSISTOR, PNP 2N4125	100081	14	Q4, 6, 7, 10, 12, Q108-908
14	TRANSISTOR, DUAL NPN TD101	100082	9	Q104-904
15	TRANSISTOR, PNP MPS-U51	100083	1	Q3
16				
17				
18	DIODE, SIGNAL IN914	100091	46	CR1 CR101-901 CR102-902
				CR103-903 CR104-904
				CR105-905
19	DIODE, RECTIFIER IN4003	100127	1	CR2
20				
21	CAPACITOR, CERAMIC 33PF	100073-330	9	C109-909
22	CAPACITOR, MICA 68PF	100243-680	1	C36
23	CAPACITOR, CERAMIC 100 PF	100073-101	9	C102-902
24	CAPACITOR, " 220 PF	100073-221	9	C105-905
25	CAPACITOR, POLYFILM .0015UF	100077-152	1	C35

MATERIAL LIST — WANGCO — ML — DRAWING NO. 201142-000 — REV. D

DRAWING TITLE: ASSY., DATA ELECTRONICS, PWB — MODEL NO. 11 — DATE 3-30-73 — SHEET 3 OF 36

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
55	RESISTOR 1% 1/4W 634	100155-270	1	R39
56				
57	RESISTOR 5% 1/4W 1.2K	100156-122	37	R17, 22, 25, 30, 32, 44, 53, 57, 70, 71
				R103-903 R106-906 R107-907
58	RESISTOR 1% 1/4W 1.96K	100155-317	20	R42, 55 R120-920 R123-923
59	RESISTOR 5% " 2.4K	100156-242	33	R11, 12, 14, 16, 21, 45
				R105-905 R119-919 R124-924
60	RESISTOR 1% 1/4W 3.09K	100155-336	1	R43
61	RESISTOR 5% " 3.3K	100156-332	41	R24, 54, 56, 60, 75 R113-913
				R114-914 R129-929 R133-933
62	RESISTOR 5% 1/4W 4.7K	100156-472	2	R34, 58
63	RESISTOR " " 5.1K	100156-512	2	R48, 50
64	RESISTOR " " 6.8K	100156-682	20	R46, 59 R110-910 R111-911
65	RESISTOR " " 8.2K	100156-822	1	R23
66	RESISTOR " " 10K	100156-103	18	R126-926 R127-927
67				
68	RESISTOR 5% 1/4W 18K	100156-183	1	R36,
69	RESISTOR " " 39K	100156-393	9	R130-930
70				
71	RESISTOR 5% 1/4W 68K	100156-683	10	R37, R132-932
72	RESISTOR " " 100K	100156-104	9	R61, 62, 63, 64, 65, 66, 67, 68, 69
73	RESISTOR 5% 1/4W 220K	100156-224	9	R128-928
74				
75	CONNECTOR, 9 PIN	100247-001	1	J3
76	CONNECTOR, 5 PIN	100247-005	1	J4
77	PIN, MALE	100098	33	TEST POINTS
78	CONNECTOR, HEAD	100137	2	J2, J5

MATERIAL LIST — WANGCO — ML — DRAWING NO. 201142-001 — REV. D

DRAWING TITLE: ASSY., DATA ELECTRONICS, PWB 7.5IPS TYPE "P" DG 9TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 5 OF 36

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
81	CAPACITOR, MYLAR .0022UF	100165-222	1	C34
82	CAPACITOR, POLYESTER .0015UF	100225-152	1	C41
83	CAPACITOR, POLYSTYRENE 510PF	100077-511	9	C101-901
84	CAPACITOR, TANTALUM .15UF	100136-154	9	C106-906
85	CAPACITOR, TANTALUM .15UF	100136-154	9	C107-907
86	CAPACITOR, POLYFILM .082UF	100078-823	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W. 150K	100156-154	9	R115-915
90	RESISTOR 5% 1/4W 150K	100156-154	9	R116-916
91				
92				
93	SCREW, CAPTIVE	100262	5	
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM A TO C
				JUMPER J2 " M " N
				JUMPER J3 " AA " BB
				JUMPER J9 NOT USED
				JUMPER J10 " "
				JUMPER J11 FROM CC TO DD
				JUMPER J12 " GG " HH

MATERIAL LIST — WANGCO — ML — DRAWING NO. 201142-003 — REV. D

DRAWING TITLE: ASSY., DATA ELECTRONICS, PWB 40-45IPS TYPE "P" DG 9TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 7 OF 36

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR, POLYSTYRENE .0047UF	100077-472	1	C34
82	CAPACITOR, POLYESTER .0015UF	100225-152	1	C41
83	CAPACITOR, POLYSTYRENE .001UF	100077-102	9	C101-901
84	CAPACITOR, TANTALUM .22 UF	100136-224	9	C106-906
85	CAPACITOR, TANTALUM .22 UF	100136-224	9	C107-907
86	CAPACITOR, POLYFILM .15 UF	100128-154	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116-916
91				
92				
93	SCREW, CAPTIVE	100262	5	
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM A TO C
				JUMPER J2 " M " N
				JUMPER J3 " AA " BB
				JUMPER J9 NOT USED
				JUMPER J10 " "
				JUMPER J11 FROM CC TO DD
				JUMPER J12 " GG " HH

MATERIAL LIST — WANGCO — ML — DRAWING NO. 201142-000 — REV. D

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB — MODEL NO. 11 — DATE 3-30-73 — SHEET 2 OF 36

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
26	CAPACITOR, CERAMIC .0033UF	100073-322	9	C103-903
27				
28				
29	CAPACITOR, TANTALUM 1.5UF	100136-155	9	C104-904
30	CAPACITOR, " 10 UF	100070-106	32	C1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13
				C14, 15, 16, 17, 18, 19, 20, 21, 22, 23
				C24, 28, 29, 30, 31, 32, 37, 38, 39, 40
31				
32				
33				
34	RESISTOR, VARIABLE 50	100069-500	1	R27
35	RESISTOR, " 5K	100069-502	9	R118-918
36	RESISTOR, " 20K	100069-203	10	R49, R104-904
37				
38	RESISTOR 5% 1/4 W 10	100156-100	9	R131-931
39	RESISTOR 1% " 61.9	100155-173	18	R121-921 R122-922
40	RESISTOR " " 75	100155-181	9	R125-925
41	RESISTOR 5% " 120	100156-121	9	R117-917
42	RESISTOR " 1W 120	100067-121	1	R20
43	RESISTOR 1% 1/4W 162	100155-213	1	R29
44				
45	RESISTOR 5% 1/4W 220	100156-221	1	R51
46	RESISTOR 2% 1W 220	100142-221	10	R26 R112-912
47	RESISTOR 1% 1/4W 267	100155-234	1	R73
48	RESISTOR, 5% 1W 270	100067-271	1	R18
49	RESISTOR 5% 1/4W 330	100156-331	4	R13, 31, 33, 35
50	RESISTOR 5% 1/2W 390	100064-391	1	R28
51				
52	RESISTOR 5% 1/4W 470	100156-471	5	R15, 19, 40, 47, 52
53	RESISTOR 1% " 511	100155-261	3	R38, 41, 72
54	RESISTOR 5% " 560	100156-561	19	R76, R108-908 R109-909

MATERIAL LIST — WANGCO — ML — DRAWING NO. 201142-000 — REV. D

DRAWING TITLE: ASSY., DATA ELECTRONICS, PWB — MODEL NO. 11 — DATE 6-20-72 — SHEET 4 OF 36

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				
92				
93				
94				
95				
96	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J4 FROM V TO W
				JUMPER J5 " T " U
				JUMPER J6 " H " J
				JUMPER J7 " F " G
	THESE ARE PERMANENT			JUMPER J8 " X " Y
	JUMPERS THAT MUST BE			
	INSTALLED ON ALL BOARDS.			

MATERIAL LIST — WANGCO — ML — DRAWING NO. 201142-002 — REV. D

DRAWING TITLE: ASSY., DATA ELECTRONICS, PWB 7.5 IPS TYPE "A" DG 9TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 6 OF 36

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
81	CAPACITOR, MYLAR .0022UF	100165-222	1	C34
82				
83	CAPACITOR, POLYSTYRENE 510PF	100077-511	9	C101-901
84	CAPACITOR, TANTALUM .15UF	100136-154	9	C106-906
85	CAPACITOR, TANTALUM .15UF	100136-154	9	C107-907
86	CAPACITOR, POLYFILM .082UF	100078-823	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 150K	100156-154	9	R115-915
90	RESISTOR 5% 1/4W 150K	100156-154	9	R116-916
91				
92				
93	SCREW, CAPTIVE	100262	5	
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " P
				JUMPER J3 NOT USED
				JUMPER J9 " "
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " GG " HH

MATERIAL LIST — WANGCO — ML — DRAWING NO. 201142-004 — REV. D

DRAWING TITLE: ASSY., DATA ELECTRONICS, PWB 40-45 IPS TYPE "A" DG 9TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 8 OF 36

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR, POLYSTYRENE .0047UF	100077-472	1	C34
82				
83	CAPACITOR, POLYSTYRENE .001UF	100077-102	9	C101-901
84	CAPACITOR, TANTALUM .22 UF	100136-224	9	C106-906
85	CAPACITOR, TANTALUM .22 UF	100136-224	9	C107-907
86	CAPACITOR, POLYFILM .15 UF	100128-154	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116-916
91				
92				
93	SCREW, CAPTIVE	100262	5	
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " P
				JUMPER J3 NOT USED
				JUMPER J9 " "
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " GG " HH

B-37. Material List, Data Electronics, Dual Gap, PWB (page 1 of 5)

New "P" TYPE MOD 11 PCB IN "MOD 10 DRIVE"

WANGCO — MATERIAL LIST

ASSY., DATA ELECTRONICS, PWB — DRAWING TITLE: 30-39.9 IPS TYPE "P" DG 9TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 9 OF 36 — ML DRAWING NO. 201142-005 REV. D

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
81	CAPACITOR, POLYSTYRENE .0047UF	100077-472	1	C34
82	CAPACITOR, POLYESTER .0015UF	100225-152	1	C41
83	CAPACITOR, POLYSTYRENE .001 UF	100077-102	9	C101-901
84	CAPACITOR, TANTALUM .33UF	100136-334	9	C106-906
85	CAPACITOR, TANTALUM .33UF	100136-334	9	C107-907
86	CAPACITOR, POLYFILM .18UF	100128-184	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116-916
91				
92				
93	SCREW, CAPTIVE	100262	5	
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM A TO C
				JUMPER J2 " M " N
				JUMPER J3 " AA " BB
				JUMPER J9 NOT USED
				JUMPER J10 " "
				JUMPER J11 FROM CC TO DD
				JUMPER J12 " GG " HH

WANGCO — MATERIAL LIST

ASSY., DATA ELECTRONICS, PWB — DRAWING TITLE: 23-29.9 IPS TYPE "P" DUAL GAP 9 TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 11 OF 36 — ML DRAWING NO. 201142-007 REV. D

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
81	CAPACITOR POLYSTYRENE.0082UF	100077-822	1	C34
82	CAPACITOR, POLYESTER .0015UF	100225-152	1	C41
83	CAPACITOR, POLYSTYRENE .0015UF	100077-152	9	C101-901
84	CAPACITOR, TANTALUM .47UF	100136-474	9	C106-906
85	CAPACITOR, TANTALUM .47UF	100136-474	9	C107-907
86	CAPACITOR, POLYFILM .27UF	100078-274	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116-916
91				
92				
93	SCREW, CAPTIVE	100262	5	
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM A TO C
				JUMPER J2 " M " N
				JUMPER J3 " AA " BB
				JUMPER J9 NOT USED
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " GG " HH

WANGCO — MATERIAL LIST

ASSY., DATA ELECTRONICS, PWB — DRAWING TITLE: 40-45 IPS TYPE "P" DG 9TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 13 OF 36 — ML DRAWING NO. 201142-009 REV. D

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
81	CAPACITOR, POLYSTYRENE .0047UF	100077-472	1	C34
82	CAPACITOR, POLYESTER .0015UF	100225-152	1	C41
83	CAPACITOR, POLYSTYRENE .001UF	100077-102	9	C101-901
84	CAPACITOR, TANTALUM .22UF	100136-224	9	C106-906
85	CAPACITOR, TANTALUM .22UF	100136-224	9	C107-907
86	CAPACITOR, POLYFILM .15UF	100078-154	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116-916
91				
92				
93				
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM A TO C
				JUMPER J2 " M " N
				JUMPER J3 " AA " BB
				JUMPER J9 NOT USED
				JUMPER J10 " "
				JUMPER J11 FROM CC TO DD
				JUMPER J12 " GG " HH
95				
96				
97				
98				
99				
100	BRACKET, MOUNTING	200016	2	
101	SCREW, PAN HEAD	100036-206	6	2-56 X 3/8"
102	WASHER, FLAT	100047-200	6	NO. 2
103	WASHER, INT. TOOTH LOCK	100059-200	6	NO. 2
104	NUT, HEX	100043-200	6	2-56

WANGCO — MATERIAL LIST

ASSY., DATA ELECTRONICS, PWB — DRAWING TITLE: 30-39.9 IPS TYPE "P" DG 9TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 15 OF 36 — ML DRAWING NO. 201142-011 REV. D

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
81	CAPACITOR, POLYSTYRENE .0047UF	100077-472	1	C34
82	CAPACITOR, POLYFILM .0015UF	100225-152	1	C41
83	CAPACITOR, POLYSTYRENE .001 UF	100077-102	9	C101-901
84	CAPACITOR, TANTALUM .33 UF	100136-334	9	C106-906
85	CAPACITOR, TANTALUM .33UF	100136-334	9	C107-907
86	CAPACITOR, POLYFILM .18UF	100128-184	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116-916
91				
92				
93				
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM A TO C
				JUMPER J2 " M " N
				JUMPER J3 " AA " BB
				JUMPER J9 NOT USED
				JUMPER J10 " "
				JUMPER J11 FROM CC TO DD
				JUMPER J12 " GG " HH
95				
96				
97				
98				
99				
100	BRACKET, MOUNTING	200016	2	
101	SCREW, PAN HEAD	100036-206	6	2-56 X 3/8"
102	WASHER, FLAT	100047-200	6	NO. 2
103	WASHER, INT. TOOTH LOCK	100059-200	6	NO. 2
104	NUT, HEX	100043-200	6	2-56

WANGCO — MATERIAL LIST

ASSY., DATA ELECTRONICS, PWB — DRAWING TITLE: 30-39.9 IPS TYPE "A" DUAL GAP 9TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 10 OF 36 — ML DRAWING NO. 201142-006 REV. D

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
81	CAPACITOR, POLYSTYRENE .0047UF	100077-472	1	C34
82				
83	CAPACITOR, POLYSTYRENE .001UF	100077-102	9	C101-901
84	CAPACITOR, TANTALUM .33UF	100136-334	9	C106-906
85	CAPACITOR, TANTALUM .33UF	100136-334	9	C107-907
86	CAPACITOR, POLYFILM .18UF	100128-184	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116-916
91				
92				
93	SCREW, CAPTIVE	100262	5	
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " P
				JUMPER J3 NOT USED
				JUMPER J9 " "
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " GG " HH

WANGCO — MATERIAL LIST

ASSY., DATA ELECTRONICS, PWB — DRAWING TITLE: 23-29.9 IPS TYPE "A" DG 9TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 12 OF 36 — ML DRAWING NO. 201142-008 REV. D

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
81	CAPACITOR, POLYSTYRENE.0082UF	100077-822	1	C34
82				
83	CAPACITOR, POLYSTYRENE .0015UF	100077-152	9	C101-901
84	CAPACITOR, TANTALUM .47UF	100136-474	9	C106-906
85	CAPACITOR, TANTALUM .47UF	100136-474	9	C107-907
86	CAPACITOR, POLYFILM .27UF	100078-274	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116-916
91				
92				
93	SCREW, CAPTIVE	100262	5	
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " P
				JUMPER J3 NOT USED
				JUMPER J9 " "
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " GG " HH

WANGCO — MATERIAL LIST

ASSY., DATA ELECTRONICS, PWB — DRAWING TITLE: 40-45 IPS TYPE "A" DG 9TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 14 OF 36 — ML DRAWING NO. 201142-010 REV. D

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
81	CAPACITOR, POLYSTYRENE.0047UF	100077-472	1	C34
82				
83	CAPACITOR, POLYSTYRENE .001UF	100077-102	9	C101-901
84	CAPACITOR, TANTALUM .22UF	100136-224	9	C106-906
85	CAPACITOR, TANTALUM .22UF	100136-224	9	C107-907
86	CAPACITOR, POLYFILM .15UF	100126-154	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116-916
91				
92				
93				
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " P
				JUMPER J3 NOT USED
				JUMPER J9 " "
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " GG " HH
95				
96				
97				
98				
99				
100	BRACKET, MOUNTING	200016	2	
101	SCREW, PAN HEAD	100036-206	6	2-56 X 3/8"
102	WASHER, FLAT	100047-200	6	NO. 2
103	WASHER, INT. TOOTH LOCK	100059-200	6	NO. 2
104	NUT, HEX	100043-200	6	2-56

WANGCO — MATERIAL LIST

ASSY., DATA ELECTRONICS, PWB — DRAWING TITLE: 30-39.9 IPS TYPE "A" DG 9TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 16 OF 36 — ML DRAWING NO. 201142-012 REV. D

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
81	CAPACITOR, POLYSTYRENE .0047UF	100077-472	1	C34
82				
83	CAPACITOR, POLYSTYRENE .001UF	100077-102	9	C101-901
84	CAPACITOR, TANTALUM .33UF	100136-334	9	C106-906
85	CAPACITOR, TANTALUM .33UF	100136-334	9	C107-907
86	CAPACITOR, POLYFILM .18 UF	100128-184	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116-916
91				
92				
93				
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " P
				JUMPER J3 NOT USED
				JUMPER J9 " "
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " GG " HH
95				
96				
97				
98				
99				
100	BRACKET, MOUNTING	200016	2	
101	SCREW, PAN HEAD	100036-206	6	2-56 X 3/8"
102	WASHER, FLAT	100047-200	6	NO. 2
103	WASHER, INT. TOOTH LOCK	100059-200	6	NO. 2
104	NUT, HEX	100043-200	6	2-56

NEW "P" TYPE MOD 11 PCB IN "MOD 10 DAYTIME"

MATERIAL LIST — ML DRAWING NO. 201142-005 REV. D

WANGCO — DRAWING TITLE 23-29.9 IPS TYPE "P" DUAL GAP 9 TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 9 OF 36

ITEM NO.	DRAWING TITLE	* DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
	UF	100077-472	1	C34
	F	100225-152	1	C41
	F	100077-102	9	C101-901
	F	100136-334	9	C106-906
	F	100136-334	9	C107-907
	F	100128-184	9	C108-908
	K	100156-334	9	R115-915
	K	100156-334	9	R116-916
		100262	5	
		100248-924	A/R	JUMPER J1 FROM A TO C
				JUMPER J2 " M " N
				JUMPER J3 " AA " BB
				JUMPER J9 NOT USED
				JUMPER J10 " "
				JUMPER J11 FROM CC TO DD
				JUMPER J12 " GG " HH

MATERIAL LIST — ML DRAWING NO. 201142-007 REV. D

WANGCO — DRAWING TITLE ASST., DATA ELECTRONICS, PWB 23-29.9 IPS TYPE "P" DUAL GAP 9 TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 11 OF 36

ITEM NO.	DRAWING TITLE	* DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR POLYSTYRENE .0082UF	100077-822	1	C34
82	CAPACITOR, POLYESTER .0015UF	100225-152	1	C41
83	CAPACITOR, POLYSTYRENE .0015UF	100077-152	9	C101-901
84	CAPACITOR, TANTALUM .47UF	100136-474	9	C106-906
85	CAPACITOR, TANTALUM .47UF	100136-474	9	C107-907
86	CAPACITOR, POLYFILM .27UF	100078-274	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116-916
91				
92				
93	SCREW, CAPTIVE	100262	5	
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM A TO C
				JUMPER J2 " M " N
				JUMPER J3 " AA " BB
				JUMPER J9 NOT USED
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " GG " HH

MATERIAL LIST — ML DRAWING NO. 201142-009 REV. D

WANGCO — DRAWING TITLE ASSY., DATA ELECTRONICS, PWB 40-45 IPS TYPE "P" D6 9TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 13 OF 36

ITEM NO.	DRAWING TITLE	* DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR, POLYSTYRENE .0047UF	100077-472	1	C34
82	CAPACITOR, POLYESTER .0015UF	100225-152	1	C41
83	CAPACITOR, POLYSTYRENE .001UF	100077-102	9	C101-901
84	CAPACITOR, TANTALUM .22UF	100136-224	9	C106-906
85	CAPACITOR, TANTALUM .22UF	100136-224	9	C107-907
86	CAPACITOR, POLYFILM .15UF	100078-154	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116-916
91				
92				
93				
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM A TO C
				JUMPER J2 " M " N
				JUMPER J3 " AA " BB
				JUMPER J9 NOT USED
				JUMPER J10 " "
				JUMPER J11 FROM CC TO DD
				JUMPER J12 " GG " HH
95				
96				
97				
98				
99				
100	BRACKET, MOUNTING	200016	2	
101	SCREW, PAN HEAD	100036-206	6	2-56 X 3/8"
102	WASHER, FLAT	100047-200	6	NO. 2
103	WASHER, INT. TOOTH LOCK	100059-200	6	NO. 2
104	NUT, HEX	100043-200	6	2-56

MATERIAL LIST — ML DRAWING NO. 201142-011 REV. D

WANGCO — DRAWING TITLE ASSY., DATA ELECTRONICS, PWB 30-39.9 IPS TYPE "P" D6 9TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 15 OF 36

ITEM NO.	DRAWING TITLE	* DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR, POLYSTYRENE .0047UF	100077-472	1	C34
82	CAPACITOR, POLYFILM .0015UF	100225-152	1	C41
83	CAPACITOR, POLYSTYRENE .001UF	100077-102	9	C101-901
84	CAPACITOR, TANTALUM .33UF	100136-334	9	C106-906
85	CAPACITOR, TANTALUM .33UF	100136-334	9	C107-907
86	CAPACITOR, POLYFILM .18UF	100128-184	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100155-334	9	R115-915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116-916
91				
92				
93				
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM A TO C
				JUMPER J2 " M " N
				JUMPER J3 " AA " BB
				JUMPER J9 NOT USED
				JUMPER J10 " "
				JUMPER J11 FROM CC TO DD
				JUMPER J12 " GG " HH
95				
96				
97				
98				
99				
100	BRACKET, MOUNTING	200016	2	
101	SCREW, PAN HEAD	100036-206	6	2-56 X 3/8"
102	WASHER, FLAT	100047-200	6	NO. 2
103	WASHER, INT. TOOTH LOCK	100059-200	6	NO. 2
104	NUT, HEX	100043-200	6	2-56

MATERIAL LIST — ML DRAWING NO. 201142-013 REV. D

WANGCO — DRAWING TITLE ASSY., DATA ELECTRONICS, PWB 23-29.9 IPS TYPE "P" D6 9TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 17 OF 36

ITEM NO.	DRAWING TITLE	* DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR, POLYSTYRENE .0082UF	100077-822	1	C34
82	CAPACITOR, POLYESTER .0015UF	100225-152	1	C41
83	CAPACITOR, POLYSTYRENE .0015UF	100077-152	9	C101-901
84	CAPACITOR, TANTALUM .47UF	100136-474	9	C106-906
85	CAPACITOR, TANTALUM .47UF	100136-474	9	C107-907
86	CAPACITOR, POLYFILM .27UF	100078-274	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116-916
91				
92				
93				
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM A TO C
				JUMPER J2 " M " N
				JUMPER J3 " AA " BB
				JUMPER J9 NOT USED
				JUMPER J10 " "
				JUMPER J11 FROM CC TO DD
				JUMPER J12 " GG " HH
95				
96				
97				
98				
99				
100	BRACKET, MOUNTING	200016	2	
101	SCREW, PAN HEAD	100036-206	6	2-56 X 3/8"
102	WASHER, FLAT	100047-200	6	NO. 2
103	WASHER, INT. TOOTH LOCK	100059-200	6	NO. 2
104	NUT, HEX	100043-200	6	2-56

MATERIAL LIST — ML DRAWING NO. 201142-006 REV. D

WANGCO — DRAWING TITLE ASSY., DATA ELECTRONICS, PWB 23-29.9 IPS TYPE "A" D6 9TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 10 OF 36

ITEM NO.	DRAWING TITLE	* DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
	N	100077-472	1	C34
		100077-102	9	C101-901
		100136-334	9	C106-906
		100136-334	9	C107-907
		100128-184	9	C108-908
		100156-334	9	R115-915
		100156-334	9	R116-916
		100262	5	
		100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " P
				JUMPER J3 NOT USED
				JUMPER J9 " "
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " GG " HH

MATERIAL LIST — ML DRAWING NO. 201142-008 REV. D

WANGCO — DRAWING TITLE ASSY., DATA ELECTRONICS, PWB 23-29.9 IPS TYPE "A" D6 9TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 12 OF 36

ITEM NO.	DRAWING TITLE	* DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR, POLYSTYRENE .0082UF	100077-822	1	C34
82				
83	CAPACITOR, POLYSTYRENE .0015UF	100077-152	9	C101-901
84	CAPACITOR, TANTALUM .47UF	100136-474	9	C106-906
85	CAPACITOR, TANTALUM .47UF	100136-474	9	C107-907
86	CAPACITOR, POLYFILM .27UF	100078-274	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116-916
91				
92				
93	SCREW, CAPTIVE	100262	5	
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " P
				JUMPER J3 NOT USED
				JUMPER J9 " "
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " GG " HH

MATERIAL LIST — ML DRAWING NO. 201142-010 REV. D

WANGCO — DRAWING TITLE ASSY., DATA ELECTRONICS, PWB 40-45 IPS TYPE "A" D6 9TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 14 OF 36

ITEM NO.	DRAWING TITLE	* DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR, POLYSTYRENE .0047UF	100077-472	1	C34
82				
83	CAPACITOR, POLYSTYRENE .001UF	100077-102	9	C101-901
84	CAPACITOR, TANTALUM .22UF	100136-224	9	C106-906
85	CAPACITOR, TANTALUM .22UF	100136-224	9	C107-907
86	CAPACITOR, POLYFILM .15UF	100128-154	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116-916
91				
92				
93				
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " P
				JUMPER J3 NOT USED
				JUMPER J9 " "
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " GG " HH
95				
96				
97				
98				
99				
100	BRACKET, MOUNTING	200016	2	
101	SCREW, PAN HEAD	100036-206	6	2-56 X 3/8"
102	WASHER, FLAT	100047-200	6	NO. 2
103	WASHER, INT. TOOTH LOCK	100059-200	6	NO. 2
104	NUT, HEX	100043-200	6	2-56

FOR D6 SHOULD BE ON

MATERIAL LIST — ML DRAWING NO. 201142-012 REV. D

WANGCO — DRAWING TITLE ASSY., DATA ELECTRONICS, PWB 30-39.9 IPS TYPE "A" D6 9TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 16 OF 36

ITEM NO.	DRAWING TITLE	* DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR, POLYSTYRENE .0047UF	100077-472	1	C34
82				
83	CAPACITOR, POLYSTYRENE .001UF	100077-102	9	C101-901
84	CAPACITOR, TANTALUM .33UF	100136-334	9	C106-906
85	CAPACITOR, TANTALUM .33UF	100136-334	9	C107-907
86	CAPACITOR, POLYFILM .18UF	100128-184	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116-916
91				
92				
93				
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " P
				JUMPER J3 NOT USED
				JUMPER J9 " "
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " GG " HH
95				
96				
97				
98				
99				
100	BRACKET, MOUNTING	200016	2	
101	SCREW, PAN HEAD	100036-206	6	2-56 X 3/8"
102	WASHER, FLAT	100047-200	6	NO. 2
103	WASHER, INT. TOOTH LOCK	100059-200	6	NO. 2
104	NUT, HEX	100043-200	6	2-56

MATERIAL LIST — ML DRAWING NO. 201142-014 REV. D

WANGCO — DRAWING TITLE ASSY., DATA ELECTRONICS, PWB 23-29.9 IPS TYPE "A" D6 9TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 18 OF 36

ITEM NO.	DRAWING TITLE	* DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR, POLYSTYRENE .0082UF	100077-822	1	C34
82				
83	CAPACITOR, POLYSTYRENE .0015UF	100077-152	9	C101-901
84	CAPACITOR, TANTALUM .47UF	100136-474	9	C106-906
85	CAPACITOR, TANTALUM .47UF	100136-474	9	C107-907
86	CAPACITOR, POLYFILM .27UF	100128-274	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116-916
91				
92				
93				
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " P
				JUMPER J3 NOT USED
				JUMPER J9 " "
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " GG " HH
95				
96				
97				
98				
99				
100	BRACKET, MOUNTING	200016	2	
101	SCREW, PAN HEAD	100036-206	6	2-56 X 3/8"
102	WASHER, FLAT	100047-200	6	NO. 2
103	WASHER, INT. TOOTH LOCK	100059-200	6	NO. 2
104	NUT, HEX	100043-200	6	2-56

B-37. Material List, Data Electronics, Dual Gap, PWB (page 2 of 5)

UNSTROBED DATA

MATERIAL LIST

WANGCO

DRAWING TITLE ASSY., DATA ELECTRONICS, PWB 7.5 IPS TYPE "A" DG 9TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 19 OF 36

ML DRAWING NO. 201142-016 REV. D

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR, MYLAR .0022UF	100165-222	1	C34
82	CAPACITOR, POLYESTER .0015UF	100225-152	1	C41
83	CAPACITOR, POLYSTYRENE 510PF	100077-511	9	C101-901
84	CAPACITOR, TANTALUM .15UF	100136-154	9	C106-906
85	CAPACITOR, TANTALUM .15UF	100136-154	9	C107-907
86	CAPACITOR, POLYFILM .082UF	100078-823	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 150K	100156-154	9	R115-915
90	RESISTOR 5% 1/4W 150K	100156-154	9	R116-916
91				
92				
93	SCREW, CAPTIVE	100262	5	
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " N
				JUMPER J3 NOT USED
				JUMPER J9 " "
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " GG " HH

MATERIAL LIST

WANGCO

DRAWING TITLE ASSY., DATA ELECTRONICS, PWB 7.5 IPS TYPE "A" DG 7TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 21 OF 36

ML DRAWING NO. 201142-018 REV. D

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR, MYLAR .0022UF	100165-222	1	C34
82				
83	CAPACITOR, POLYSTYRENE 510PF	100077-511	9	C101-901
84	CAPACITOR, TANTALUM .15UF	100136-154	9	C106-906
85	CAPACITOR, TANTALUM .15UF	100136-154	9	C107-907
86	CAPACITOR, POLYFILM .082UF	100078-823	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 150K	100156-154	9	R115-915
90	RESISTOR 5% 1/4W 150K	100156-154	9	R116-916
91				
92				
93	SCREW, CAPTIVE	100262	5	
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " P
				JUMPER J3 NOT USED
				JUMPER J9 " "
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " FF " GG

MATERIAL LIST

WANGCO

DRAWING TITLE ASSY., DATA ELECTRONICS. PWB 40-45 IPS TYPE "A" DG 7TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 23 OF 36

ML DRAWING NO. 201142-020 REV. D

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR POLYSTYRENE .0047UF	100077-472	1	C34
82				
83	CAPACITOR, POLYSTYRENE .001UF	100077-102	9	C101-901
84	CAPACITOR, TANTALUM .22 UF	100136-224	9	C106-906
85	CAPACITOR, TANTALUM .22 UF	100136-224	9	C107-907
86	CAPACITOR, POLYFILM .15 UF	100128-154	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116-916
91				
92				
93	SCREW, CAPTIVE	100262	5	
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " P
				JUMPER J3 NOT USED
				JUMPER J9 " "
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " FF " GG

NOT THE SAME AS 9 TRK NOT USED BY DLM

MATERIAL LIST

WANGCO

DRAWING TITLE ASSY., DATA ELECTRONICS, PWB 7.5 IPS TYPE "P" DG 7 TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 20 OF 36

ML DRAWING NO. 201142-017 REV. D

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR, MYLAR .0022UF	100165-222	1	C34
82	CAPACITOR, POLYESTER .0015UF	100225-152	1	C41
83	CAPACITOR, POLYSTYRENE 510PF	100077-511	9	C101-901
84	CAPACITOR, TANTALUM .15UF	100136-154	9	C106-906
85	CAPACITOR, TANTALUM .15UF	100136-154	9	C107-907
86	CAPACITOR, POLYFILM .082UF	100078-823	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 150K	100156-154	9	R115-915
90	RESISTOR 5% 1/4W 150K	100156-154	9	R116-916
91				
92				
93	SCREW, CAPTIVE	100262	5	
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM A TO C
				JUMPER J2 " M " N
				JUMPER J3 " AA " BB
				JUMPER J9 NOT USED
				JUMPER J10 " "
				JUMPER J11 FROM CC TO DD
				JUMPER J12 " FF " GG

MATERIAL LIST

WANGCO

DRAWING TITLE ASSY., DATA ELECTRONICS, PWB 40-45 IPS TYPE "P" DG 7TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET 22 OF 36

ML DRAWING NO. 201142-019 REV. D

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR, POLYSTYRENE .0047UF	100077-472	1	C34
82	CAPACITOR, POLYESTER .0015UF	100225-152	1	C41
83	CAPACITOR, POLYSTYRENE .001UF	100077-102	9	C101-901
84	CAPACITOR, TANTALUM .22UF	100136-224	9	C106-906
85	CAPACITOR, TANTALUM .22UF	100136-224	9	C107-907
86	CAPACITOR, POLYFILM .15UF	100128-154	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330 K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330 K	100156-334	9	R116-916
91				
92				
93	SCREW, CAPTIVE	100262	5	
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " N
				JUMPER J3 " AA " BB
				JUMPER J9 NOT USED
				JUMPER J10 " "
				JUMPER J11 FROM CC TO DD
				JUMPER J12 " FF " GG

MATERIAL LIST

WANGCO

DRAWING TITLE ASSY., DATA ELECTRONICS, PWB 30-39.9 IPS TYPE "P" DG 7TRK — MODEL NO. 11 — DATE 2-13-73 — SHEET ___ OF 36

ML DRAWING NO. 201142 REV. D

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR, POLYSTYRENE .0047UF	100077-472	1	C34
82	CAPACITOR, POLYESTER .0015UF	100225-152	1	C41
83	CAPACITOR, POLYSTYRENE .001UF	100077-102	9	C101-901
84	CAPACITOR, TANTALUM .33 UF	100136-334	9	C106-906
85	CAPACITOR, TANTALUM .33 UF	100136-334	9	C107-907
86	CAPACITOR, POLYFILM .18 UF	100078-184	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330 K	100156-334	9	R116-916
91				
92				
93	SCREW, CAPTIVE	100262	5	
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM A TO C
				JUMPER J2 " M " N
				JUMPER J3 " AA " BB
				JUMPER J9 NOT USED
				JUMPER J10 " "
				JUMPER J11 FROM CC TO DD
				JUMPER J12 " FF " GG

B-37. Material List, Data Electronics, Dual Gap, PWB (Page 3 of 5)

MATERIAL LIST

WANGCO

ML | DRAWING NO. 201142-022 | REV. D

DRAWING TITLE ASSY., DATA ELECTRONICS, PWB 30-39.9 IPS TYPE "A" DG 7TRK | MODEL NO. 11 | DATE 2-13-73 | SHEET 25 OF 36

ITEM NO.	DRAWING TITLE	- DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR Polystyrene .0047uF	100077-472	1	C34
82				
83	CAPACITOR, POLYSTYRENE .0014F	100077-102	9	C101 - 901
84	CAPACITOR, TANTALUM .33uF	100136-334	9	C106 - 906
85	CAPACITOR, TANTALUM .33uF	100136-334	9	C107 - 907
86	CAPACITOR, POLYFILM .18 uF	100128-184	9	C108 - 908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115 - 915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116 - 916
91				
92				
93	SCREW, CAPTIVE	100262	5	
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " P
				JUMPER J3 NOT USED
				JUMPER J9 " "
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " FF " GG

MATERIAL LIST

WANGCO

ML | DRAWING NO. 201142-023 | REV. D

DRAWING TITLE ASSY., DATA ELECTRONICS, PWB 23-29.9 IPS TYPE "D" DG 7TRK | MODEL NO. 11 | DATE 2-13-73 | SHEET 26 OF 36

ITEM NO.	DRAWING TITLE	- DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR Polystyrene .0082uF	100077-822	1	C34
82	CAPACITOR, POLYESTER .0015UF	100225-152	1	C41
83	CAPACITOR, POLYSTYRENE .0015uF	100077-152	9	C101 - 901
84	CAPACITOR, TANTALUM .47 UF	100136-474	9	C106 - 906
85	CAPACITOR, TANTALUM .47 UF	100136-474	9	C107 - 907
86	CAPACITOR, POLYFILM .27 UF	100128-274	9	C108 - 908
87				
88				
89	RESISTOR 5% 1/4W 330 K	100156-334	9	R115 - 915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116 - 916
91				
92				
93	SCREW, CAPTIVE	100262	5	
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM A TO C
				JUMPER J2 " M " N
				JUMPER J3 " AA " BB
				JUMPER J9 NOT USED
				JUMPER J10 " "
				JUMPER J11 FROM CC TO DD
				JUMPER J12 " FF " GG

MATERIAL LIST

WANGCO

ML | DRAWING NO. 201142-024 | REV. D

DRAWING TITLE ASSY., DATA ELECTRONICS, PWB 23-29.9 IPS TYPE "A" DG 7TRK | MODEL NO. 11 | DATE 2-13-73 | SHEET 27 OF 36

ITEM NO.	DRAWING TITLE	- DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR, Polystyrene .0082uF	100077-822	1	C34
82				
83	CAPACITOR, POLYSTYRENE .0015 uF	100077-152	9	C101 - 901
84	CAPACITOR, TANTALUM .47 UF	100136-154	9	C106 - 906
85	CAPACITOR, TANTALUM .47 UF	100136-154	9	C107 - 907
86	CAPACITOR, POLYFILM .27 UF	100128-274	9	C108 - 908
87				
88				
89	RESISTOR 5% 1/4W 330 K	100156-334	9	R115 - 915
90	RESISTOR 5% 1/4W 330 K	100156-334	9	R116 - 916
91				
92				
93	SCREW, CAPTIVE	100262	5	
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " P
				JUMPER J3 NOT USED
				JUMPER J9 " "
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " FF " GG

MATERIAL LIST

WANGCO

ML | DRAWING NO. 201142-025 | REV. b

DRAWING TITLE ASSY., DATA ELECTRONICS, PWB 40-45 IPS TYPE "D" DG 7TRK | MODEL NO. 11 | DATE 2-13-73 | SHEET 28 OF 36

ITEM NO.	DRAWING TITLE	- DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR, POLYSTYRENE .0047uF	100077-472	1	C34
82	CAPACITOR, POLYESTER .0015UF	100225-152	1	C41
83	CAPACITOR, POLYSTYRENE .001uF	100077-102	9	C101 - 901
84	CAPACITOR, TANTALUM .22 uF	100136-224	9	C106 - 906
85	CAPACITOR, TANTALUM .22 uF	100136-224	9	C107 - 907
86	CAPACITOR, POLYFILM .15 uF	100128-154	9	C108 - 908
87				
88				
89	RESISTOR 5% 1/4W 330 K	100156-334	9	R115 - 915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116 - 916
91				
92				
93				
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " P
				JUMPER J3 NOT USED
				JUMPER J9 " "
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " FF " GG
95				
96				
97				
98				
99				
100	BRACKET, MOUNTING	200016	2	
101	SCREW, PAN HEAD	100036-206	6	2-56 X 3/8"
102	WASHER, FLAT	100047-200	6	NO. 2
103	WASHER, INT. TOOTH LOCK	100059-200	6	NO. 2
104	NUT, HEX	100043-200	6	2-56

MATERIAL LIST

WANGCO

ML | DRAWING NO. 201142-026 | REV. D

DRAWING TITLE ASSY., DATA ELECTRONICS, PWB 20-45 IPS TYPE "A" DG 7TRK | MODEL NO. 11 | DATE 2-13-73 | SHEET 29 OF 36

ITEM NO.	DRAWING TITLE	- DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR, Polystyrene .0047uF	100077-472	1	C34
82				
83	CAPACITOR, POLYSTYRENE .0014F	100077-102	9	C101 - 901
84	CAPACITOR, TANTALUM .22 UF	100136-224	9	C106 - 906
85	CAPACITOR, TANTALUM .22 UF	100136-224	9	C107 - 907
86	CAPACITOR, POLYFILM .15 UF	100128-154	9	C108 - 908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115 - 915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116 - 916
91				
92				
93				
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " P
				JUMPER J3 NOT USED
				JUMPER J9 " "
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " FF " GG
95				
96				
97				
98				
99				
100	BRACKET, MOUNTING	200016	2	
101	SCREW, PAN HEAD	100036-206	6	2-56 X 3/8"
102	WASHER, FLAT	100047-200	6	NO. 2
103	WASHER, INT. TOOTH LOCK	100059-200	6	NO. 2
104	NUT, HEX	100043-200	6	2-56

MATERIAL LIST

WANGCO

ML | DRAWING NO. 201142-027 | REV. D

DRAWING TITLE ASSY., DATA ELECTRONICS, PWB 30-39.9 IPS TYPE "D" DG 7TRK | MODEL NO. 11 | DATE 2-13-73 | SHEET 30 OF 36

ITEM NO.	DRAWING TITLE	- DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR, Polystyrene .0047uF	100077-472	1	C34
82	CAPACITOR, POLYFILM .0015UF	100225-152	1	C41
83	CAPACITOR, POLYSTYRENE .001uF	100077-102	9	C101 - 901
84	CAPACITOR, TANTALUM .33 uF	100136-334	9	C106 - 906
85	CAPACITOR, TANTALUM .33 UF	100136-334	9	C107 - 907
86	CAPACITOR, POLYFILM .18 UF	100078-184	9	C108 - 908
87				
88				
89	RESISTOR 5% 1/4W 330 K	100156-334	9	R115 - 915
90	RESISTOR 5% 1/4W 330 K	100156-334	9	R116 - 916
91				
92				
93				
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM A TO C
				JUMPER J2 " M " N
				JUMPER J3 " AA " BB
				JUMPER J9 NOT USED
				JUMPER J10 " "
				JUMPER J11 FROM CC TO DD
				JUMPER J12 " FF " GG
95				
96				
97				
98				
99				
100	BRACKET, MOUNTING	200016	2	
101	SCREW, PAN HEAD	100036-206	6	2-56 X 3/8"
102	WASHER, FLAT	100047-200	6	NO. 2
103	WASHER, INT. TOOTH LOCK	100059-200	6	NO. 2
104	NUT, HEX	100043-200	6	2-56

B-37. Material List, Data Electronics, Dual Gap, PWB (page 4 of 5)

WANGCO

MATERIAL LIST

ML DRAWING NO. 201142-028 REV. D

DRAWING TITLE 30-34.9 TYPE "A" DG 7TRK MODEL NO. 11 DATE 2-13-73 SHEET 31 OF 36

ITEM NO.	DRAWING TITLE	* DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR, POLYSTYRENE .0047 MF	100077-472	1	C34
82				
83	CAPACITOR, POLYSTYRENE .00105	100077-102	9	C101-901
84	CAPACITOR, TANTALUM .33 UF	100136-334	9	C106-906
85	CAPACITOR, TANTALUM .33 UF	100136-334	9	C107-907
86	CAPACITOR, POLYFILM .18 UF	100128-184	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116-916
91				
92				
93				
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " P
				JUMPER J3 NOT USED
				JUMPER J9 " "
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " FF " GG
95				
96				
97				
98				
99				
100	BRACKET, MOUNTING	200016	2	
101	SCREW, PAN HEAD	100036-206	6	2-56 X 3/8"
102	WASHER, FLAT	100047-200	6	NO. 2
103	WASHER, INT. TOOTH LOCK	100059-200	6	NO. 2
104	NUT, HEX	100043-200	6	2-56

WANGCO

MATERIAL LIST

ML DRAWING NO. 201142-030 REV. D

DRAWING TITLE 23-29.9 IPS TYPE "A" DG 7TRK MODEL NO. 11 DATE 2-13-73 SHEET 33 OF 36

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR POLYSTYRENE .0082 MF	100077-822	1	C34
82				
83	CAPACITOR, POLYSTYRENE .00154	100077-152	9	C101-901
84	CAPACITOR, TANTALUM .47 UF	100136-474	9	C106-906
85	CAPACITOR, TANTALUM .47UF	100136-474	9	C107-907
86	CAPACITOR, POLYFILM .27 UF	100128-274	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330 K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330 K	100156-334	9	R116-916
91				
92				
93				
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " P
				JUMPER J3 NOT USED
				JUMPER J9 " "
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " FF " GG
95				
96				
97				
98				
99				
100	BRACKET, MOUNTING	200016	2	
101	SCREW, PAN HEAD	100036-206	6	2-56 X 3/8"
102	WASHER, FLAT	100047-200	6	NO. 2
103	WASHER, INT. TOOTH LOCK	100059-200	6	NO. 2
104	NUT, HEX	100043-200	6	2-56

UNSTROBED DATA

WANGCO

MATERIAL LIST

ML DRAWING NO. 201142-033 REV. D

DRAWING TITLE 90-45 IPS TYPE 7A" 9CH DG MODEL NO. 11 DATE 2-13-73 SHEET 35 OF 36

ITEM NO.	DRAWING TITLE	* DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR, POLYSTYRENE .0047MF	100077-472	1	C34
82	CAPACITOR, POLYESTER .0015 UF	100225-152	1	C41
83	CAPACITOR, POLYSTYRENE .001UF	100077-102	9	C101-901
84	CAPACITOR, TANTALUM .22 UF	100136-224	9	C106-906
85	CAPACITOR, TANTALUM .22 UF	100136-224	9	C107-907
86	CAPACITOR, POLYFILM .15 UF	100128-154	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116-916
91				
92				
93	SCREW, CAPTIVE	100262	5	
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " N
				JUMPER J3 NOT USED
				JUMPER J9 " "
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " GG " HH

WANGCO

MATERIAL LIST

ML DRAWING NO. 201142-029 REV. D

DRAWING TITLE 23-29.9IPS TYPE "P" DG 7TRK MODEL NO. 11 DATE 2-13-73 SHEET 32 OF 36

ITEM NO.	DRAWING TITLE	* DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR, POLYSTYRENE .0082UF	100165-822	1	C34
82	CAPACITOR, POLYESTER .0015UF	100225-152	1	C41
83	CAPACITOR, POLYSTYRENE .00154	100077-152	9	C101-901
84	CAPACITOR, TANTALUM .47UF	100136-474	9	C106-906
85	CAPACITOR, TANTALUM .47UF	100136-474	9	C107-907
86	CAPACITOR, POLYFILM .27 UF	100128-274	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 330K	100156-334	9	R115-915
90	RESISTOR 5% 1/4W 330K	100156-334	9	R116-916
91				
92				
93	SCREW, CAPTIVE	100262	5	
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM A TO C
				JUMPER J2 " M " N
				JUMPER J3 " AA " BB
				JUMPER J9 NOT USED
				JUMPER J10 " "
				JUMPER J11 FROM CC TO DD
				JUMPER J12 " FF " GG
95				
96				
97				
98				
99				
100	BRACKET, MOUNTING	200016	2	
101	SCREW, PAN HEAD	100036-206	6	2-56 X 3/8"
102	WASHER, FLAT	100047-200	6	NO. 2
103	WASHER, INT. TOOTH LOCK	100059-200	6	NO. 2
104	NUT, HEX	100043-200	6	2-56

UNSTROBED DATA

WANGCO

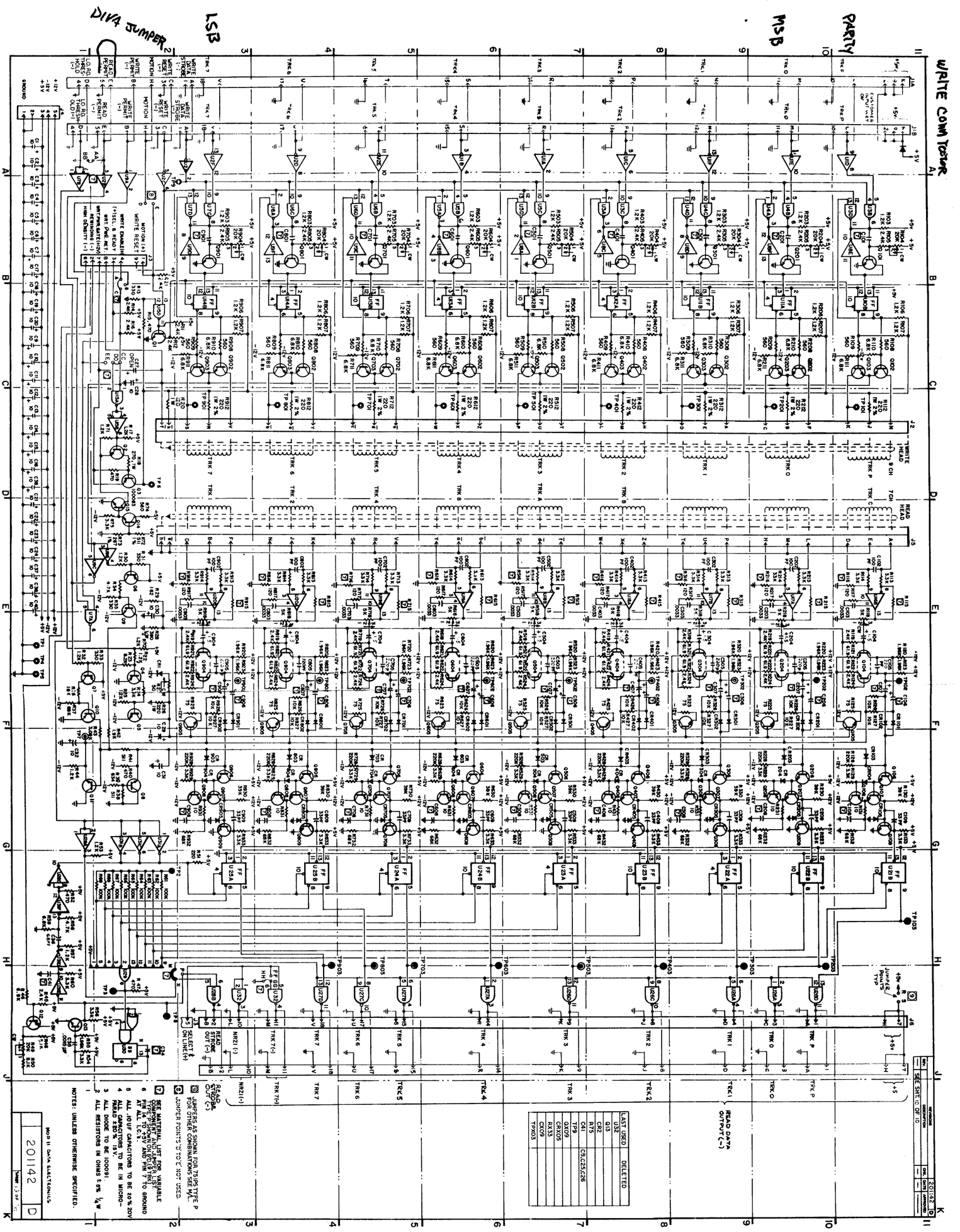
MATERIAL LIST

ML DRAWING NO. 201142-032 REV. D

DRAWING TITLE 7.5IPS TYPE "A" DG 7TRK MODEL NO. 11 DATE 2-13-73 SHEET 34 OF 36

ITEM NO.	DRAWING TITLE	* DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	CAPACITOR, MYLAR .0022UF	100165-222	1	C34
82	CAPACITOR, POLYESTER .0015UF	100225-152	1	C41
83	CAPACITOR, POLYSTYRENE 510PF	100077-511	9	C101-901
84	CAPACITOR, TANTALUM 15UF	100136-154	9	C106-906
85	CAPACITOR, TANTALUM 15UF	100136-154	9	C107-907
86	CAPACITOR, POLYFILM 082UF	100078-823	9	C108-908
87				
88				
89	RESISTOR 5% 1/4W 150K	100156-154	9	R115-915
90	RESISTOR 5% 1/4W 150K	100156-154	9	R116-916
91				
92				
93	SCREW, CAPTIVE	100262	5	
94	WIRE, SOLID INSULATED	100248-924	A/R	JUMPER J1 FROM B TO C
				JUMPER J2 " M " N
				JUMPER J3 NOT USED
				JUMPER J9 " "
				JUMPER J10 " "
				JUMPER J11 FROM DD TO EE
				JUMPER J12 " FF " GG

B-37. Material List, Data Electronics, Dual Gap, PWB (page 5 of 5)



B-38. Schematic, Data Electronics, Dual Gap, PWB

Green Line are Jumpers added - 1

B-39. Assembly, Data Electronics, Dual Gap, PWB

REVISIONS				200851 A
REV.	DESCRIPTION	CHK.	DATE	APPROVED
A	MFG RELEASE		4/71	

P17
P10
P19
P18
P21
P26
P4
P9
P7
P3
P8
P12
P11
P2
P1
P6
P5
TB2

ASSY. TRANS.P. ELECT. 200488

ASSEMBLY POWER SUPPLY P/N 200498

REGULATOR 200495

ASSY. RETRACT MOTOR 200119

ASSY., MICROSW. HARNESS 200550

ASSEMBLY FWD REEL ARM SENSE P/N 200475

ASSEMBLY FILE REEL ARM SENSE P/N 200475

ASSEMBLY PHOTOSENSE P/N 200057

ASSEMBLY WRITE ENABLE SWITCH P/N 200378

ASSEMBLY 9 TRACK HEAD 200227

ASSEMBLY DATA ELECTRONICS 200347

OPERATOR CONTROL PANEL

ASSY CABLE OCP P/N 100505

TACHOMETER

ELECTROCRAFT TACH

PM1 TACH

ELECTROCRAFT MOTORS ONLY

LOAD P.B.

TRANSPORT READY

GROUND

TO OCP LOAD SW. PIN 1 (NC)

115V AC POWER SUPPLY

+13 V UNREG.

START RETRACT

CAM LOAD SWITCH

-13V UNREG.

CAPSTAN RETURN

FILE REEL DRIVE

FIXED REEL DRIVE

CAPSTAN MOTOR DRIVE

TR. READY

FILE REEL ARM LIMIT (SID) N/C

LOAD P.B.

ARM LIMIT SW(S11)(C)

FIXED REEL DRIVE

+13V UNREGULATED

GROUND

FILE REEL DRIVE

+19 V UNREGULATED

-13 V UNREGULATED

CAPSTAN FEEDBACK

CAPSTAN MTR. DRIVE

-19V UNREGULATED

+5V REG.

+12V REG.

GRD

FROM TAPE CONTROLLER

FORWARD/STOP
DENSITY SELECT
REVERSE/STOP
REWIND
SELECT
WRITE ENABLE
OFF LINE

TO TAPE CONTROLLER

HIGH DENSITY STATUS
ON LINE STATUS
REWIND STATUS
FILE PROTECT STATUS
BOT STATUS
READY STATUS
EOT STATUS

MOTION (+)
REWIND (-)
SELECT & READY (+)
WRITE ENABLE (+)
WRITE POWER GRD
HIGH DENSITY (-)
WRITE POWER GATE
WRITE POWER GRD

OUTPUT
+5V
-5V
GROUND

+5V LAMP PWR
BOT
EOT
LAMP RETURN
SHIELD GROUND

+13V UNREGULATED
WRITE VOLTAGE
FILE PROTECT RET.
WRITE POWER GATE
FILE PROTECT STATUS

TRK P
TRK 0
TRK 1
TRK 2
TRK 3
TRK 4
TRK 5
TRK 6
TRK 7

ERASE HEAD

READ DATA OUTPUT (-)

READ STROBE OUTPUT (-)

CUSTOMER OR CRCC INPUT WRITE DRIVERS

WRITE DATA STROBE (-)
WRITE RESET (-)
WRITE PERMIT (-)
READ PERMIT (-)
LOW READ THRESHOLD (-)

POWER
LOAD
ON LINE
REWIND
FILE PROTECT
REVERSE
FORWARD
RESET

BROWN
GREEN
YELLOW
ORANGE
RED

RED
BLK

NOTES UNLESS SPECIFIED	DRAWN		15-1-71
1. TOLERANCES .XX ANGULAR .XXX ±	CHECK		
2. BREAK ALL SHARP EDGES APPROX. .010	APPR.		
3. SMOOTH SURFACES	MATERIAL		
4. ALL DIMS IN INCHES	FINISH		
	MODEL No.	10	
	NEXT ASSY	200456	

Wangco Incorporated

WIRING DIAGRAM
MAGTAPE TRANSPORT
9CHANNEL S/G

CODE 10649 | DWG. NO. 200851 | REV. A

SCALE — | SIZE E | 200851 | A

WEIGHT | SHEET 1 OF 1

B-41. Wiring Diagram Magtape Transport, Dual Gap