WANGCO
INCORPORATED

MOD 11 NRZI
MAGNETIC TAPE TRANSPORT

OPERATION AND MAINTENANCE MANUAL

201086 E

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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 11

REVISION LEVEL

REV. LETTER	DESCRIPTION	DATE	APPROVAL
A	Preliminary Copy	3/72	
B	Update all Sections	6/72	
C	Pages: I-3,II-3,IV-15,IV-16, IV-17, V-8A, V-10, V-11, V-13, V-37, VI-6, VI-7, VI-9, VI-12, VI-16, VI-17, VI-27, VI-28, VI-32, VI-32A (new page), VI-36, VI-48, VI-49, VI-51, VI-52, VI-53, VI-54, VI-55; A-4, A-5, B10, B11, B13, B14, B28, B29, B30, B31, B33, B35, B37, B39, B41, B43, B45.	1/73	
D	Revised pages: Title page; v through xi; I-2, I-3; II-4, II-6,II-9; IV-1 through IV-21; V-1, V-3, V-5, V-9, V-10, V-13, V-17, V-27; VI-32, VI-36, VI-38, VI-51 through VI-60. Appendix A: A-5, A-6, A-7. Appendix B: Update to latest revision level	6/73	
E	Revised pages: I-3, 4 IV-3, IV-15, V-9 through 41, VI-1, 2, 6, 33 through 61, Appendix A & Appendix B updated.	10/74	

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SECTION I

GENERAL DESCRIPTION

This manual describes the operation and maintenance of the WANGCO Mod 11 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

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 11 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 11 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 recorded on IBM equipment will be read by the Mod 11. The unit is capable of processing seven track data at densities of 800, 556, and 200 characters per inch. When processing in the seven track format, NRZI dual density operation is provided at either 800/556, 800/200, or 556/200 cpi. The density selection is made via a controller interface command line. The Mod 11 is capable of processing nine-track data at densities of 800 or 1600 cpi. Data at 1600 cpi is phase encoded. The dual density 800/1600 cpi configuration is also available.

Tape speeds on the Mod 11 are 25 through 75 inches per second. With the combination of tape speed and data density considered, data may be transferred into or out of the tape system at rates from 5,000 to 120,000 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 inertia of the tape on the reels prevents the reels from starting as rapidly as the capstan, so a length of tape is stored by the vacuum chambers between the supply and takeup reels. Changes in the position of tape in the chambers are compensated for by the 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. Interface status lines for the

beginning and end of the tape are provided to the computer or data system to indicate 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 blades which clean the dirt or oxide deposits from the tape.

3. SPECIFICATIONS

Transport specifications are listed in Table 1.

Table 1. Mod 11 Specifications

Data Density:	9-track--800 cpi,1600 cpi,800/1600 cpi 7-track--800/556 cpi,556/200 cpi
Tape Velocity:	25 through 75 ips
Rewind Speed:	200 ips nominal
Total Speed Variation:	±4% maximum
Start/Stop Distance:	start distance = .17 ± .02 inch stop distance = .19 ± .02 inch
Start/Stop Time:	16.0 millisec max. at 25 ips 10.7 millisec max. at 37.5 ips 8.9 millisec max. at 45 ips 5.3 millisec max. at 75 ips
Head:	dual gap
Number of Tracks:	7 IBM-compatible 9 ANSI - Compatible
Recording Mode:	NRZI - IBM and ANSI compatible
Static Skew, WRITE:	electronic skew compensation supplied for NRZI
Static Skew, READ FORWARD:	100 micro-inches (0.00254 mm), maximum

Table 1. Mod 11 Specifications, Continued

Dynamic Skew:	75 micro-inches (0.00190 mm), maximum
Tape Specifications:	Computer grade, 0.5 inch (12.7 mm), 1.5 mil (0.038 mm) thick Mylar base
Reel Size:	Up to 10.5 inch (26.7 cm) diameter, IBM hub compatible
Tape Tension:	8.0 ±0.5 oz. (226.8 ±14.2 grams)
Electronics:	Silicon solid state and 930 series DTL logic
Tape Unit Interface:	DTL logic (low true)
Weight:	160 lbs. (72.57 kilograms)
Height:	24 inches (60.96 cm)
Width:	19 inches (48.26 cm)
Depth:	19 inches (48.26 cm) (from mounting surface)
Power:	115 VAC ±10% 58-62Hz @ 8.5 amps 208 VAC ±10% 58-62Hz @ 4.7 amps 220-240 VAC ±10% 48-52Hz @ 4.2 amps 115 VAC ±10% 48-52 Hz
Operating Environment	
Temperature:	60° to 90°F (15° to 32°C)
Relative Humidity:	20 - 80%, Non-condensing
Non-Operating Environment	
Temperature:	-30° to 140°F (-34° to +60°C)
Relative Humidity:	15 - 95%, Non-condensing
Altitude:	0 - 5,000 feet (1.524 km) (standard) 5,000 feet (1.524 km) and up (optional)

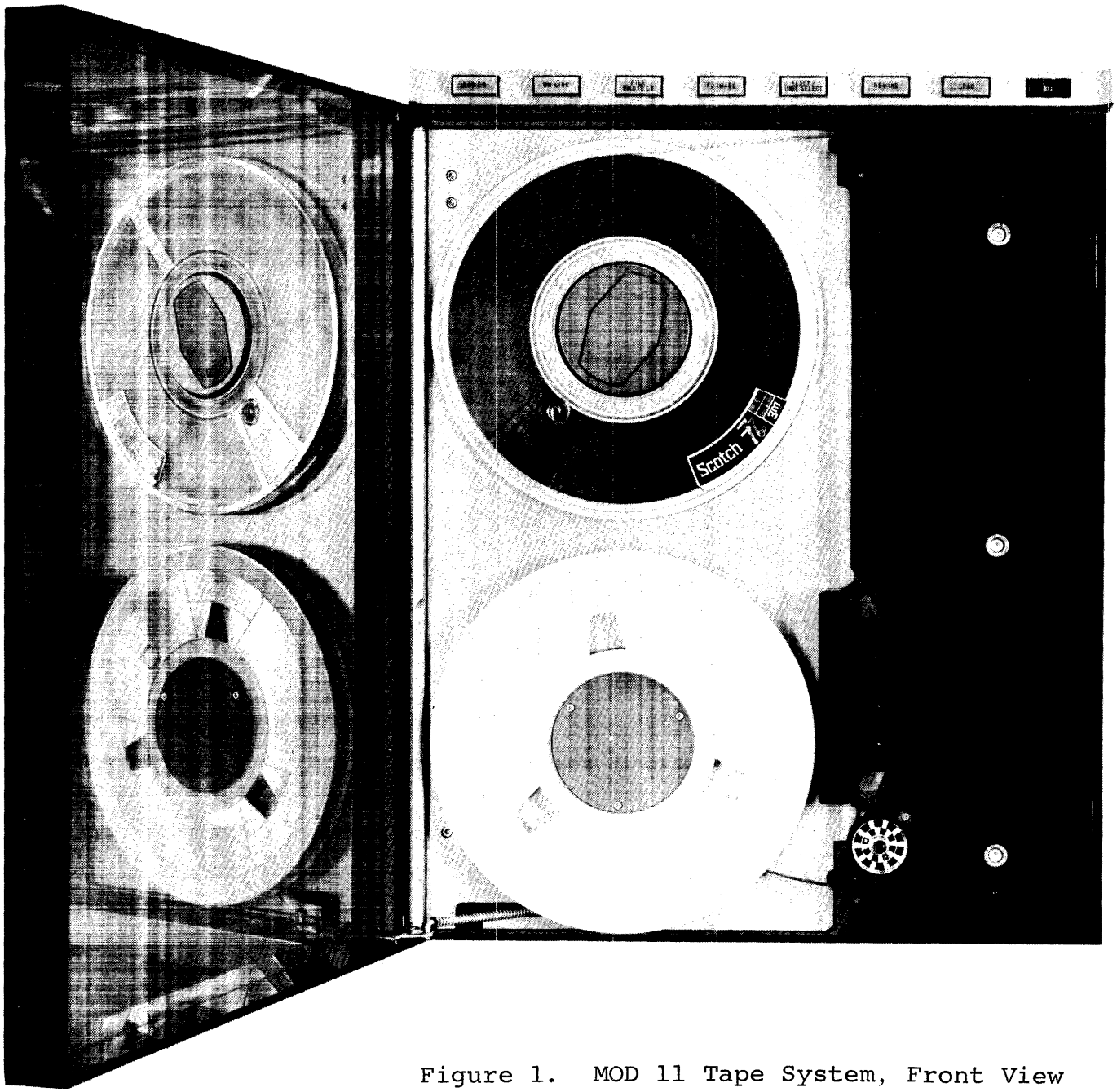


Figure 1. MOD 11 Tape System, Front View

SECTION II

SYSTEM OPERATION

Operation of the Mod 11 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.

TAPE LOADING is made particularly easy by the toggle-action hold-down knob (Figure 2). 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 reel is then firmly 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. This also increases the possibility of errors.

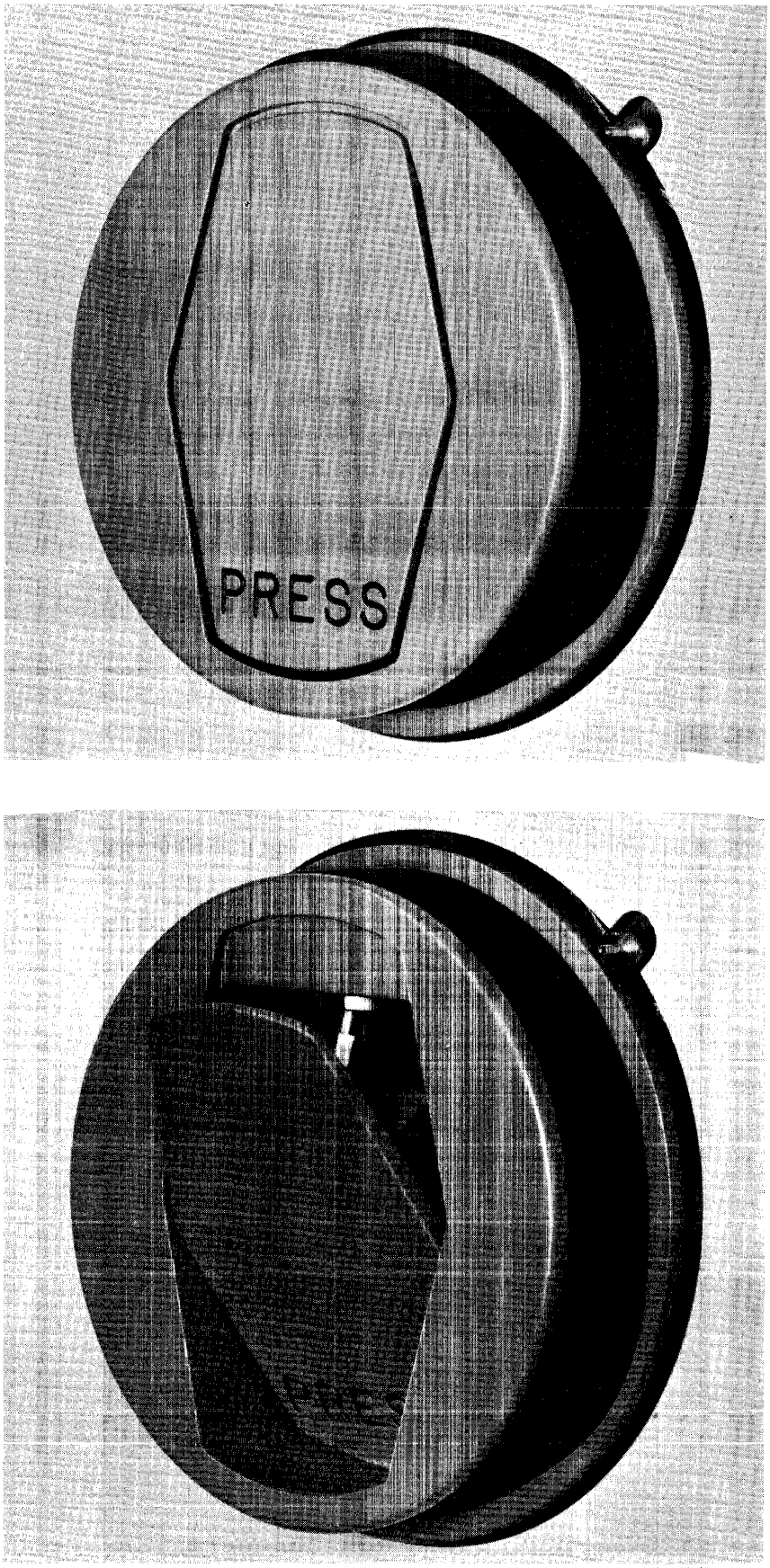


Figure 2. File Reel Mounting Hold-Down Knob in Locked (Top) and Unlocked (Bottom) Positions

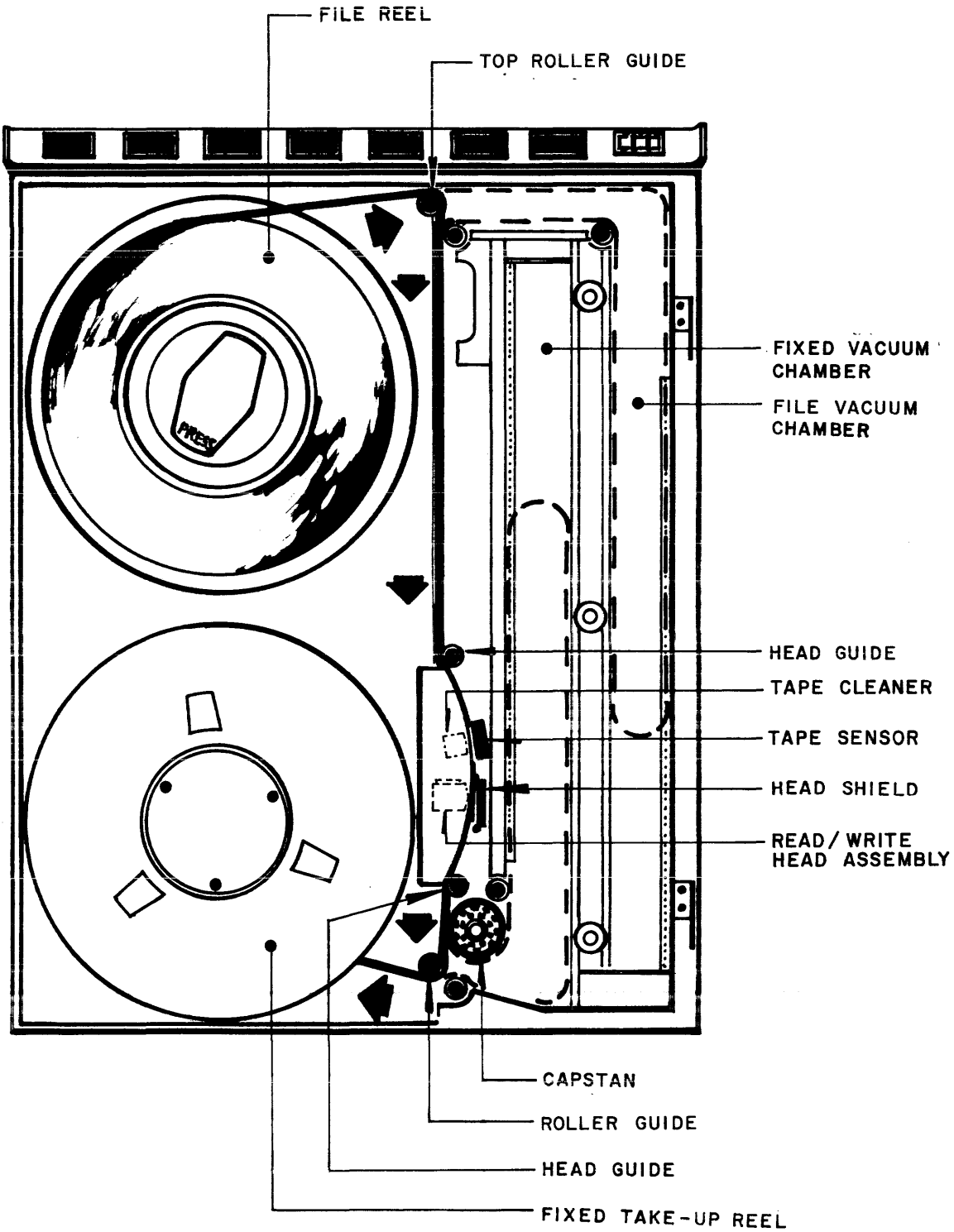


Figure 3. Tape Threading Path

To thread tape follow the procedure given below; also refer to Figure 3. Machine power need not be on at this time.

1. Lead the end of the tape over the top roller guides and down through the slot between the head and head shield. The passage of the tape through the slot causes the 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 assembly, lead the tape past the left side of the capstan and between the two roller guides.

3. Pass the tape under 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. Wind three full turns of tape by hand onto the takeup reel.

7. If machine power has not been turned on, press the power switch, the indicator will illuminate. Complete the loading operation by firmly pressing the LOAD pushbutton on the operator's control panel. The tape will be forced into the vacuum chambers and the capstan will pull the tape forward until the beginning-of-tape (BOT) marker reaches the photo-sense assembly. Control of the tape system will automatically be turned over to the data system tape controller and the ON-LINE and LOAD indicators will light. No operator is needed to put the tape system on line.

WARNING

DO NOT ATTEMPT A LOAD OPERATION WHILE TAPE IS IN THE CHAMBER SINCE THIS MAY CAUSE A MISLOAD. REMOVE TAPE FROM THE CHAMBERS BY MAINTAINING THE REWIND SWITCH DEPRESSED. THIS ACTION WILL CAUSE THE FILE REEL TO TAKE UP THE SLACK.

8. If the On-Line mode is not desired, the tape unit may be taken off-line, for manual operation from the control panel, by pressing the RESET pushbutton.

Tape unloading is initiated while the tape is at load point. The tape is brought to load point at the end of a rewind. To unload the tape, press the REWIND pushbutton on the OCP while the tape is at load point and the transport is in the off-line condition. The tape will be taken up by the supply reel until all tape is removed from the take-up reel. At this time the blower will turn off.

After the blower has stopped, the tape may be completely removed from the tape path and put on the supply reel by depressing and holding in the REWIND pushbutton. When the reel is full, this operation may be stopped by releasing the REWIND pushbutton. The tape reel may then be removed from the machine by pressing the knob toggle to the unlocked position. Again, care should be taken not to press the reel flanges against the sides of the tape.

In the event of power failure while the system is on line, the tension on the tape will be relaxed, preventing any possible tape damage. When power has been restored, tape slack must be taken up as described in step 7. Load the tape. Depress the RESET switch if it is desired to stop forward tape motion. Next, press the REWIND or ON-LINE pushbutton, depending on the requirements of the system with which the MOD 11 is operating.

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

Figure 4. Operator's Control Panel

POWER — This is a combination pushbutton switch and indicator. The indicator is on when regulated power has been supplied to the Mod 11. For the convenience of the maintenance or customer engineer, a power switch is provided on the power supply chassis (Fig. 57) at the inside rear of the machine. It is accessible only when the tape unit is swung open for service.

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

FORWARD — This button will function only when the machine is off line. If the ON LINE indicator is on, pressing the FORWARD button will have no affect. If the ON LINE indicator is off and the FORWARD button 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, the RESET button should be pressed.

RESET/ UNIT SELECT — All tape motion, except UNLOAD, regardless of the command that established it, will stop when RESET is pressed. Pressing RESET clears all read, write, and control functions and will also remove the tape unit from on-line operation with the computer or data system. The ON-LINE indicator will be turned off. This switch also houses the Unit Select indicator. This indicator is illuminated if the unit has been selected.

ON LINE — This is a combination 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, ON-LINE is pressed. 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 indicator is lit when a write enable ring is not installed on the file reel. When a file or 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. Without the ring, protective circuits in the tape system prevent data from being recorded or erased.

REWIND — Pressing this button will result in rewind of the tape, with high speed reverse operation. The operator can stop this reverse motion by pressing the RESET switch. If 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 button is then again pressed, the tape will be drawn out of the tape path and the unload sequence will be completed. If the REWIND button is pressed when the blower is off, the file reel will move slowly in the rewind direction to take up tape, as long as the button is held in. This switch also is disabled if the system is ON-LINE.

UNIT SELECT SWITCH — This switch is standard on all NRZI or Phase Encoding units, but is not used on PE/NRZI switchable units. This is a four-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 set TRUE.

PE SELECT — This switch is used only on PE/NRZI units. It is a combination alternate action switch and indicator. This switch conditions the system to operate in PE mode when the indicator is lit. To operate in NRZI mode, the switch must be in the alternate state corresponding to the indicator being extinguished. The switch is not installed if the PE SELECT input line is used.

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 marker (BOT). Should it be necessary because of power failure or some other malfunctions 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 data 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 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 commonest 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, damage to the tape will result.

In removing 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. Canisters 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 canister to load it on the tape drive, the tape canister should immediately be closed and locked so that dust will not be introduced into the canister while the tape is on the drive. Broken, chipped, or cracked canisters should be discarded immediately. The cost of a canister 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 indefinitely, 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 downtime.

When tape is not in use, it should be stored in canisters 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 11 tape transport 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 11, extremely small particles of dust or loose 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.

Unless otherwise specified, all cleaning functions shall be performed at eight-hour intervals of system use. Perform the following preliminary steps:

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

2. Turn off system power if desired.

3. Remove the head cover by pulling directly away from the front of the machine. The cover will come off with a gentle steady pull.

4. Open the vacuum chamber door, by depressing with a screwdriver the three spring-loaded latches located on the chamber door. The latches will be in the unfastened position when they extend beyond the door level. The door is now able to swing open to the right side.

HEAD ASSEMBLY cleaning will be performed in the following manner. Refer to Figure 5.

1. Moisten a soft, lint-free cloth or Q-tip applicator with IBM Tape Transport Cleaner P/N 453511. After the head surfaces, including that of the erase head, have been carefully swabbed, dry them with a separate clean and lint-free cloth.

2. Clean the tape cleaner blades using the same procedure as described in step 1. Also remove the accumulated oxide residue from the cavities between the blades.

3. Clean the guides including the walls of the ceramic washers. Refer to Figure 6 for all guides.

TAPE GUIDE CLEANING. The remaining guides in the tape path must also be cleaned with the specified cleaning agent.

1. The four roller guides shall be cleaned while rotating them to ensure that all the surfaces have been treated.

2. The remaining guide, which is stationary, is located in the lower section of the fixed reel chamber adjacent to the capstan.

CAPSTAN CLEANING should be performed as follows:

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.

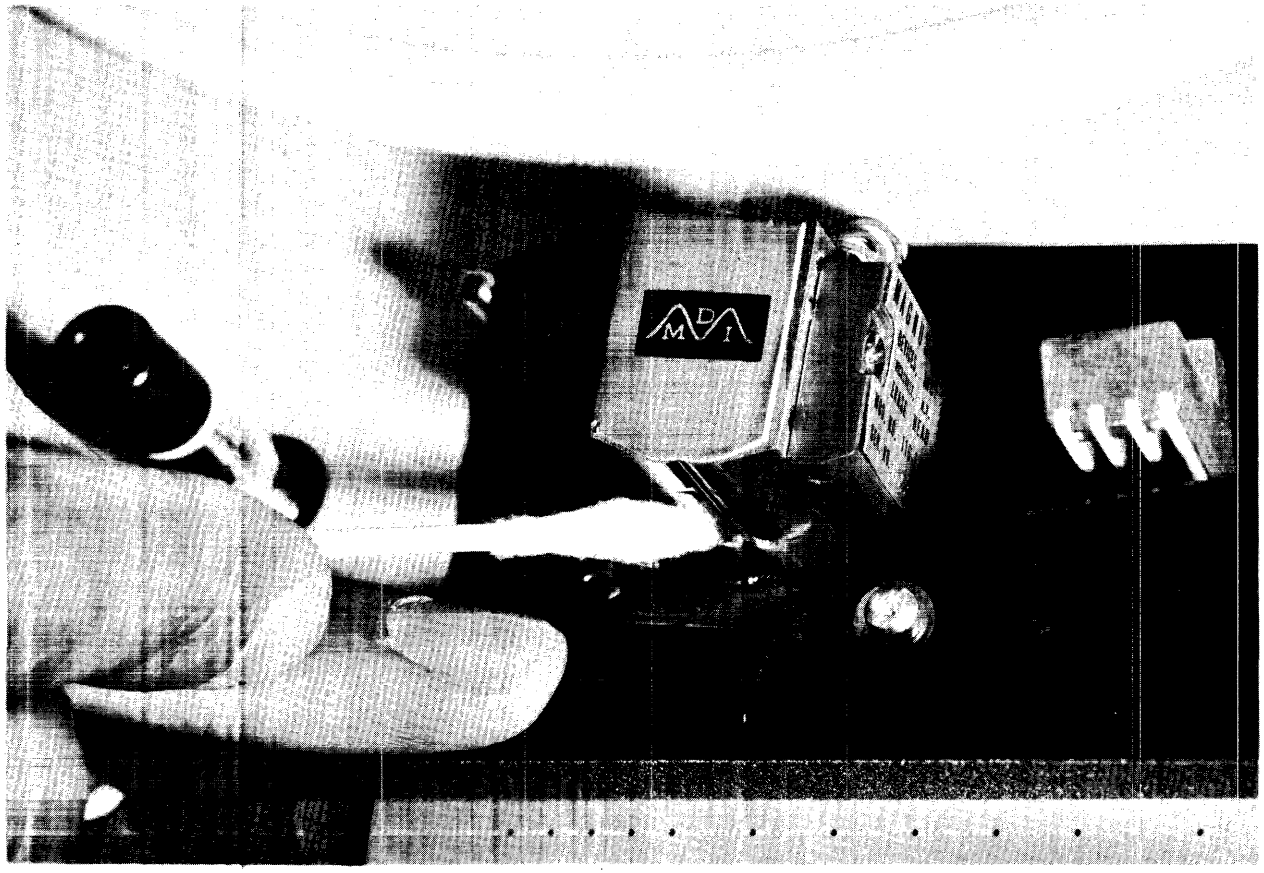


Figure 5. Cleaning the Read/Write Head Assembly

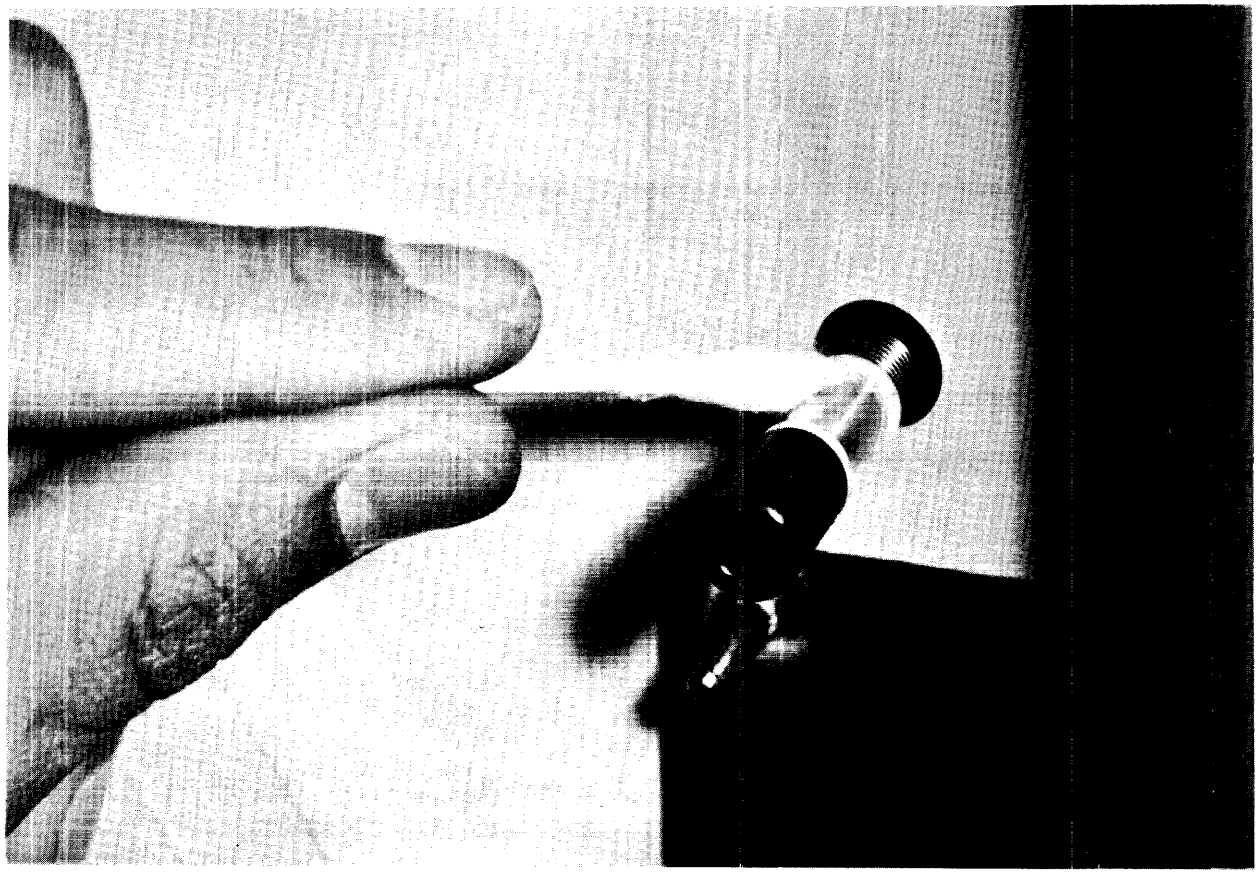


Figure 6. Cleaning the Tape Guides

CHAMBER CLEANING should be performed as follows:

Moisten a lint-free cloth with water. Clean the entire vacuum chamber area, the chamber door, and the vacuum pocket. Dry with a clean lint-free cloth.

TRANSDUCER SERVO BAR SENSE HOLE CLEANING

> IMPORTANT
>
> IT IS IMPERATIVE THAT ALL THE SENSING HOLES ON BOTH TRANSDUCER STRIPS BE CLEANED AT MAXIMUM INTERVALS OF ONE WEEK. THE CLEANING MUST BE EXECUTED EXACTLY AS PRESCRIBED BELOW. REFER TO FIGURE 7.

Cleaning of the sensing holes must be done using the special brush, WANGCO Part No. 100367.

1. Dip the end of the brush in 91% isopropyl alcohol.

2. Position the brush at 45^{o} to the chamber base so that all the bristle tips are against the surface of the servo bar.

3. Using a fairly light pressure, use the brush in a reciprocating fashion over the line of holes, gradually moving from the bottom to the top, over the entire length of the servo bar.

   NOTE: Proper cleaning action is obtained only if you feel the brush bristles "snag" over the holes, indicating penetration.

4. Repeat in the opposite direction, from top to bottom of each servo bar.

5. After both servo bars are cleaned as described in the previous steps wipe them with a clean, lint-free cloth.

At the conclusion of operation re-assemble the unit by performing the following steps:

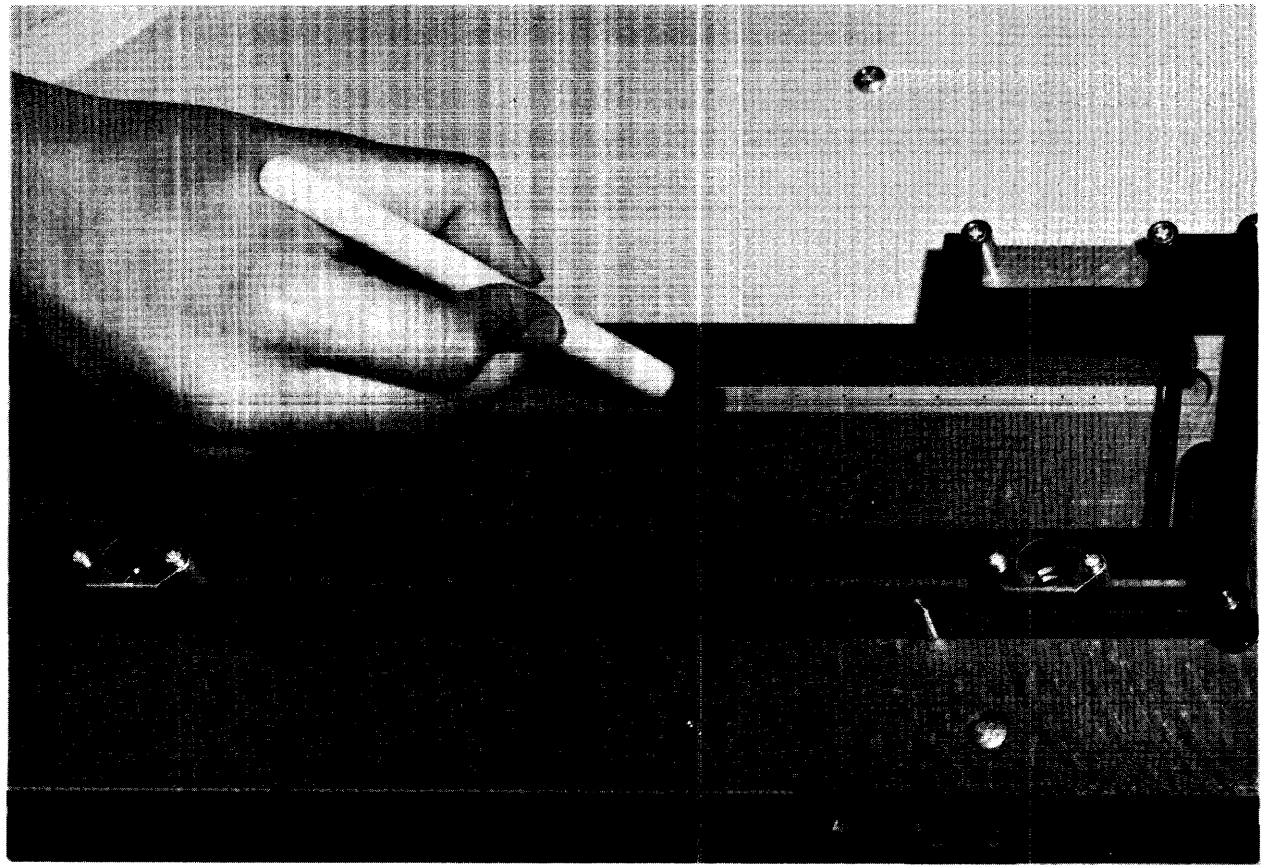


Figure 7. Cleaning the Vacuum Chamber Sensing Holes

1. Replace the head cover by aligning the holes in the cover with the mounting pins on the transport and pressing firmly into place.

   CAUTION: Care must be taken to ensure that the head assembly wires are not pinched upon installation of the cover.

2. Close the chamber cover door and lock the door in place by fully depressing the three spring latches, using a screwdriver or any other rod-like object. The latches are locked in place when they remain at the same level as the door.

Additional cleaning requirements are carried out at longer intervals. Every four months 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. The head cover 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.

SECTION IV

INSTALLATION AND INITIAL CHECKOUT

This section provides installation instructions for the Mod 11 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

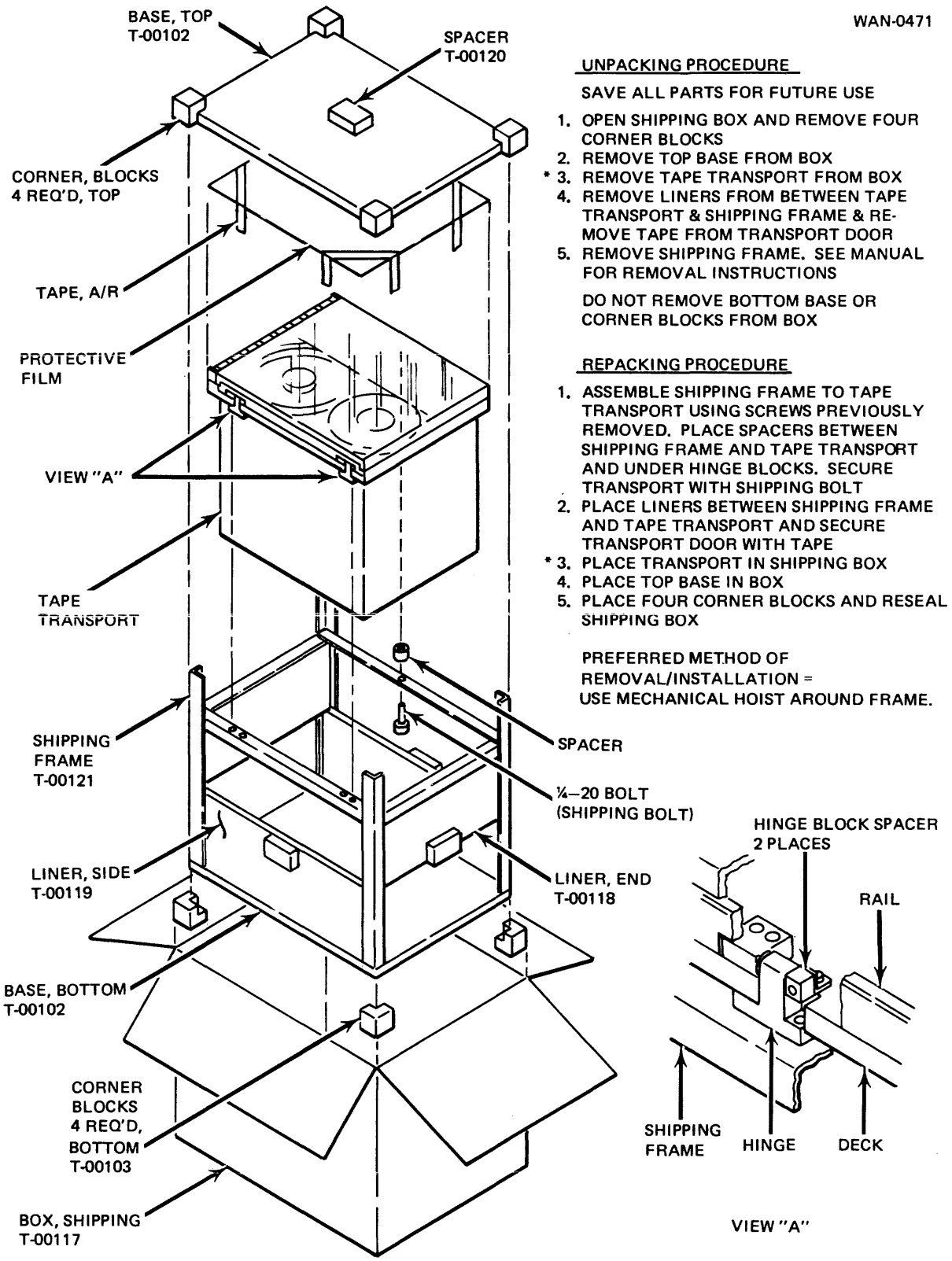
Inspect the shipping container for evidence of in-transit damage. Contact the carrier and manufacturer if damage is evident. Specify nature and extent of damage.

Open shipping container and remove contents. (See illustrated instructions on page IV-2.) Check items removed against the 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.



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UNPACKING PROCEDURE

SAVE ALL PARTS FOR FUTURE USE

1. OPEN SHIPPING BOX AND REMOVE FOUR CORNER BLOCKS
2. REMOVE TOP BASE FROM BOX
* 3. REMOVE TAPE TRANSPORT FROM BOX
4. REMOVE LINERS FROM BETWEEN TAPE TRANSPORT & SHIPPING FRAME & REMOVE TAPE FROM TRANSPORT DOOR
5. REMOVE SHIPPING FRAME. SEE MANUAL FOR REMOVAL INSTRUCTIONS

DO NOT REMOVE BOTTOM BASE OR CORNER BLOCKS FROM BOX

REPACKING PROCEDURE

1. ASSEMBLE SHIPPING FRAME TO TAPE TRANSPORT USING SCREWS PREVIOUSLY REMOVED. PLACE SPACERS BETWEEN SHIPPING FRAME AND TAPE TRANSPORT AND UNDER HINGE BLOCKS. SECURE TRANSPORT WITH SHIPPING BOLT
2. PLACE LINERS BETWEEN SHIPPING FRAME AND TAPE TRANSPORT AND SECURE TRANSPORT DOOR WITH TAPE
* 3. PLACE TRANSPORT IN SHIPPING BOX
4. PLACE TOP BASE IN BOX
5. PLACE FOUR CORNER BLOCKS AND RESEAL SHIPPING BOX

PREFERRED METHOD OF REMOVAL/INSTALLATION = USE MECHANICAL HOIST AROUND FRAME.

MOD 11 Tape Transport Unpacking/Repacking Procedure.

CAUTION

Do not move the three hex drive flat head screws located on the black metal strip of the vacuum chamber door. These screws are factory pre-adjusted to minimize chamber leakage.

2. RACK MOUNTING THE TRANSPORT

To rack mount the tape unit system, it is required to separate the transport deck from the electronics enclosure. First the enclosure will be mounted to the cabinet, and then the deck will be hung on the hinge blocks. The procedure for doing this is described below.

1. Remove the Allen head shipping bolt securing the right side of the transport to the shipping frame. The bolt is removed from the rear of the shipping frame.

2. Open the vacuum chamber door by depressing with a screwdriver or other-rod type object, the three spring-actuated latches located on the metal strip of the cover.

3. Turn the Phillips head bolt located near the top of the file reel chamber until the casting latch releases from the electronic enclosure. Swing the transport open.

4. The following plugs and wires must be disconnected from sub-assemblies in the electronic enclosure. Be sure to remove all the tie straps securing the wiring bundles, to allow each cable assembly to be removed separately.

   a. Head assembly cables P2 and P5 on the Data Electronics Module. This module is located on the left side of the enclosure.

   b. P9, P10, P14, and P17 on the Servo Electronics Module. This module is located in the rear right area of the enclosure.

   c. P19 and P23 on the Transport Control Logic Module located on the right front side of the enclosure. Detach the two cable clamps holding P19 cable from the top panel of the enclosure.

d. Disconnect some of the wiring fastened to the terminal strip TB-2 mounted on the bottom front of the enclosure. The wires are located on pins 1,2,4,5,6,7,8,9. Also the ground wire attached to the terminal strip mounting screw located to the right of pin 12 must be removed.

e. Disconnect the vacuum hose from the input of the vacuum impeller. The impeller is located at the right rear of the enclosure. (When reconnecting the vacuum hose to the vacuum impeller the hose must be twisted in a clockwise direction at the impeller intake nipple to provide a spring-like action to the hose. This will insure that the transport deck will not be prevented from closing by the vacuum hose).

5. Remove the hinge retaining blocks at the left edge of the transport unit.

6. Separate the transport deck from the transport electronics enclosure by lifting the transport off the hinge hangers.

7. The electronics enclosure may now be mounted in a standard 19-inch RETMA or Universal rack with a minimum panel space of 24 inches (see Figure 8 and 8A). In the event that the enclosure is not accessible from the rear or sides after it is bolted in place, it is recommended to connect the system cables at this time. The WRITE and READ cables must be fed through one of the holes located on the left side of the rear panel and connected to J1 and J6, respectively on the Data Electronics Module. The CONTROL cable may enter from a hole on the right side panel or from a hole on the right side of the rear panel. This cable must be connected to J16 on the Transport Control Logic Module.

8. Mount the transport hinge hangers on the rack and hang the transport on the hinge hangers.

9. Reconnect all items of step 4 to the appropriate sub-assemblies in the enclosure.

10. The position of the transport with respect to the cabinet opening may be adjusted by means of the hinge block screws accessible through the holes in the overlay. The hinge blocks should be slackened separately so as not to loosen the vertical adjustment.

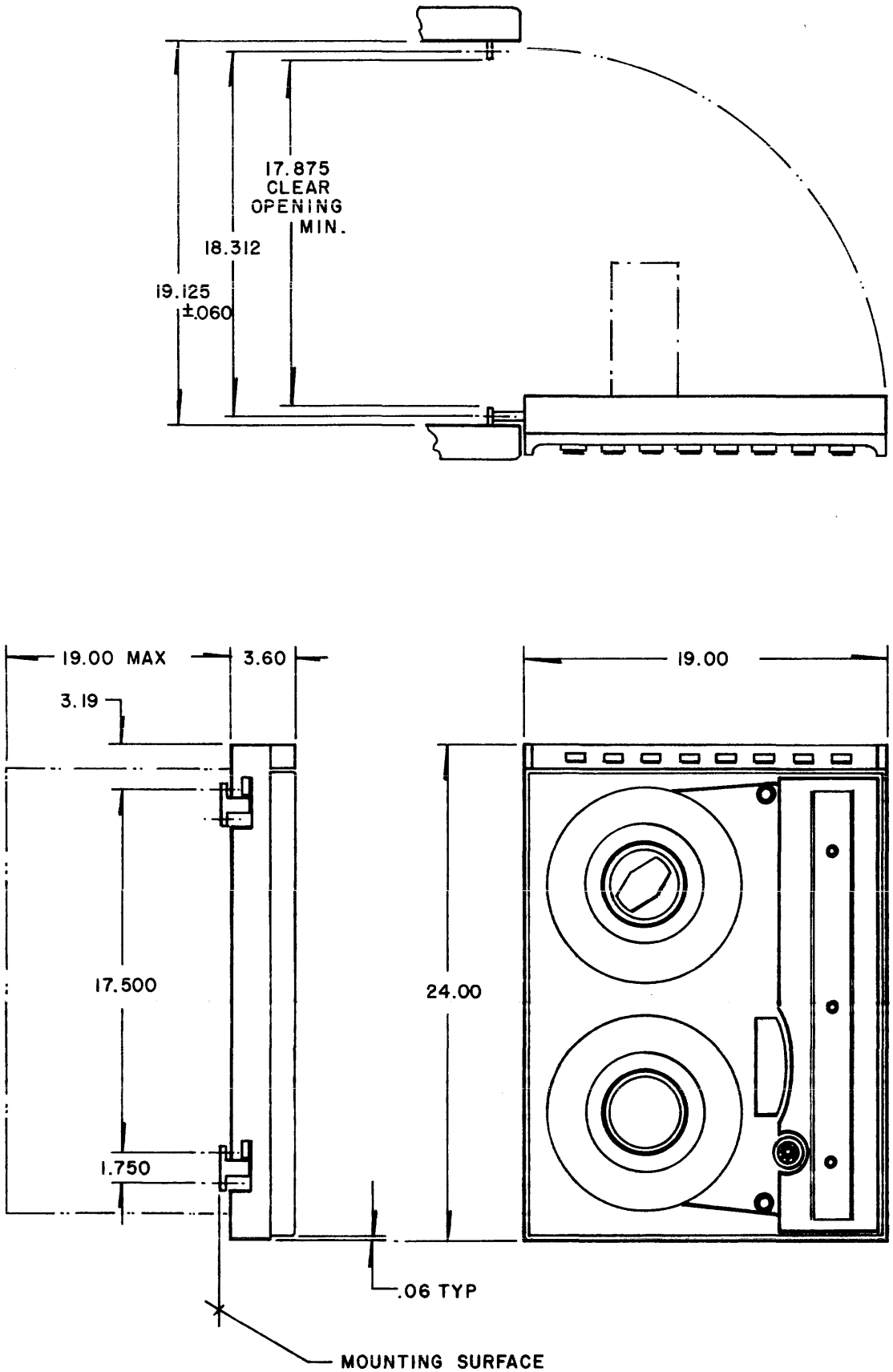


Figure 8. Tape System Rack Mounting

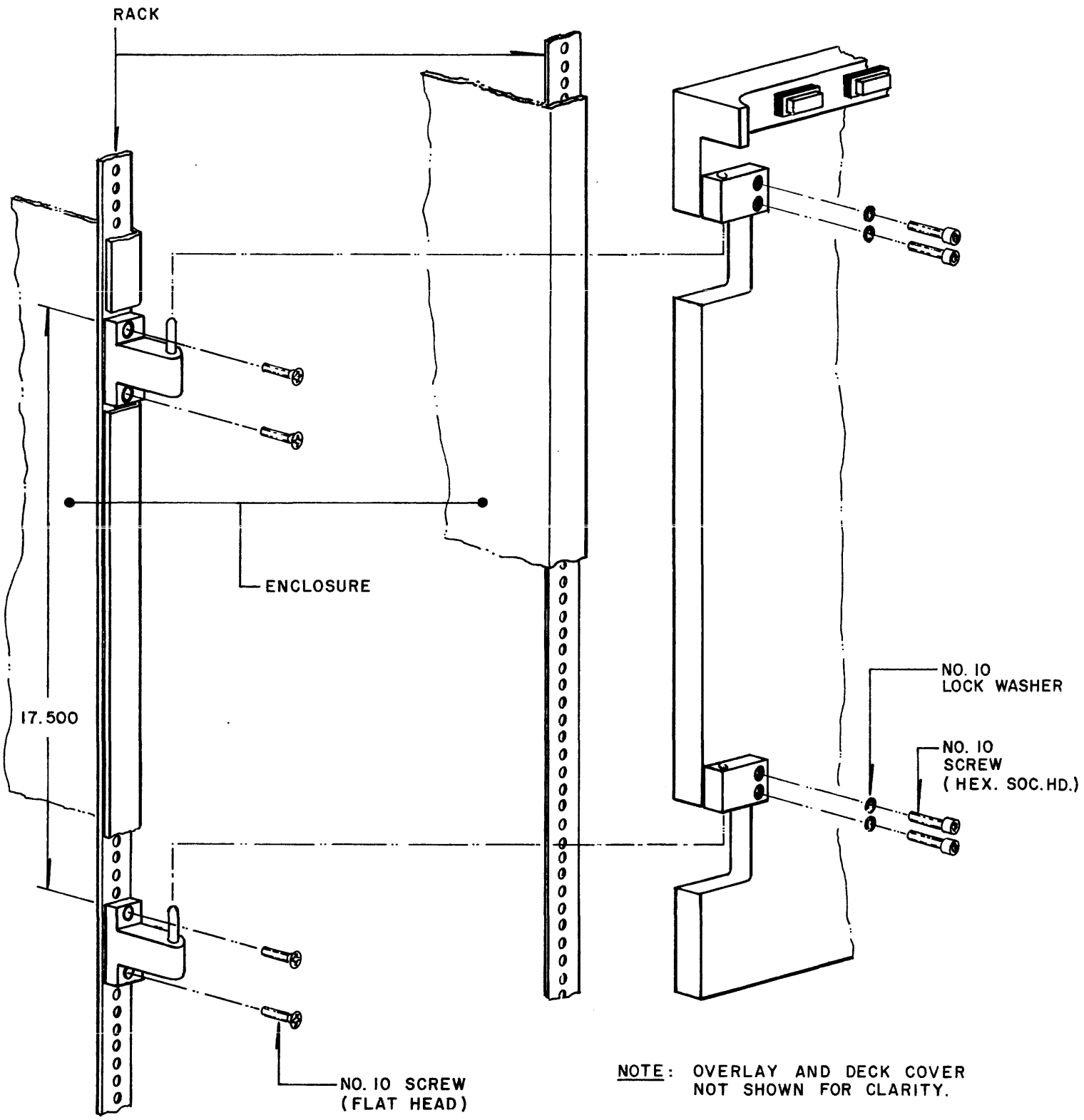


Figure 8A. Tape System Installation

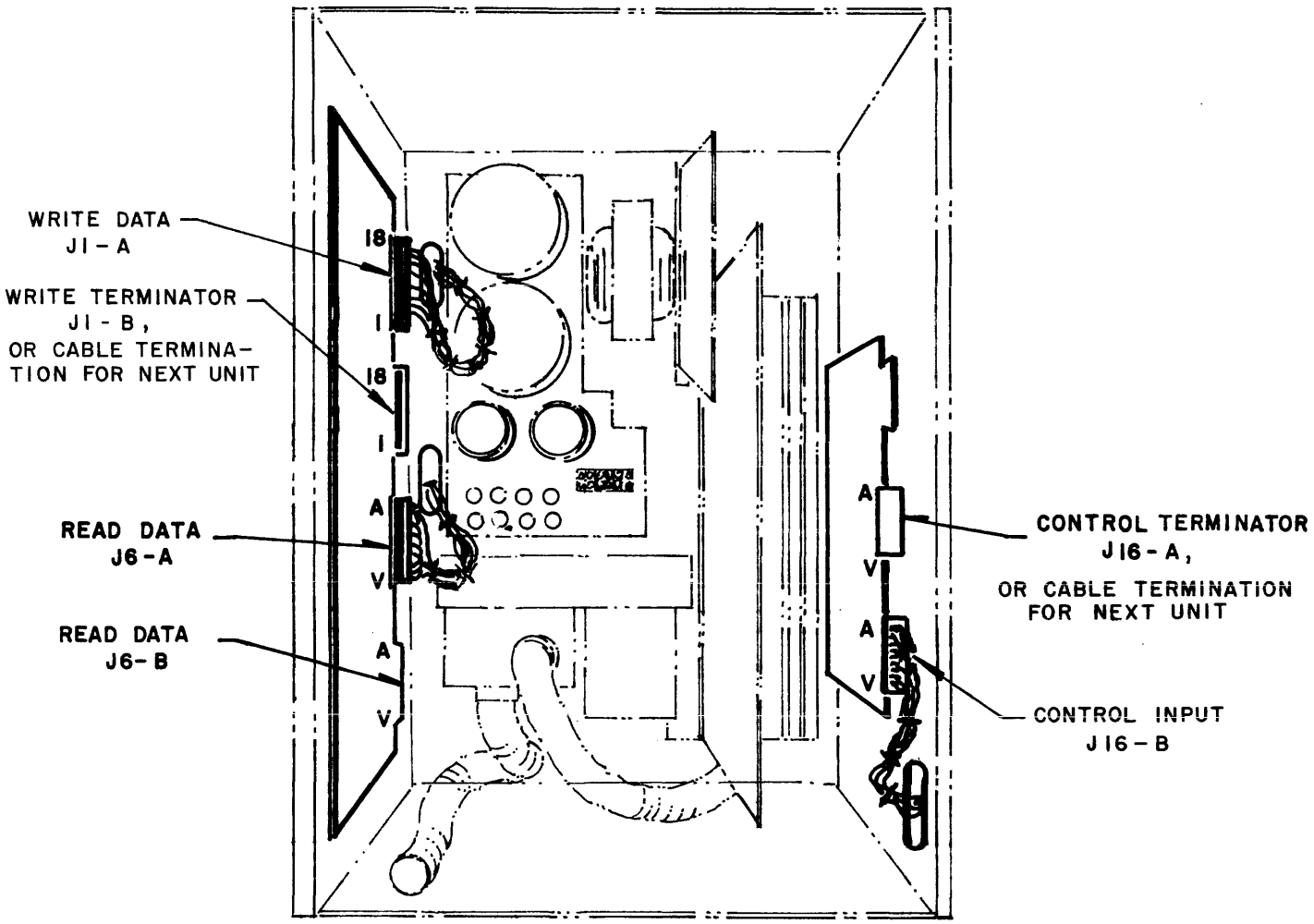


Figure 8B. Tape System Interface Cable Installation

3. 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, wire the required power plug to the cord and verify that the appropriate primary power transformer wiring is correct. This can be accomplished by checking the wiring against the voltage decal. The decal is located on TB-1 which is mounted on the power transformer in the rear of the enclosure. Connect the power cord.

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 a scratch pad reel of tape without a write enable ring onto the transport and thread the tape, following the procedure in Section II.

4. Press the LOAD pushbutton to initiate the load sequence. The tape will enter the vacuum chambers and then 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. Since the write ring is not in place, the FILE PROTECT indicator will be illuminated.

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 actions of the FORWARD and REWIND pushbuttons are inoperative.

6. 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. To unload the tape, again depress the REWIND pushbutton. Tape will now rewind until the system interlocks are broken, causing the reels to stop and the vacuum system to shut down. The remaining tape in the chambers can now be taken up by the file reel by keeping the REWIND switch depressed. The reel can now be removed from the unit as outlined in Section II.

7. If the system cables have not been connected at this time, do so now as described in step 7 of the previous section.

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 approximately 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.

4.2 DAISY CHAINING

Up to four units can be daisy chained on the same bus without any modification to any of the tape units tied in the daisy chain configuration. By changing the position on the Unit Select switch, it is easy to re-assign new tape unit addresses when adding or deleting tape units from the buss.

The following features incorporated into the Mod 11 Transport allow daisy chaining to become a simple operation.

1. Parallel Connectors

   Parallel Connectors are provided for all interface cables (Control, Wire, 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

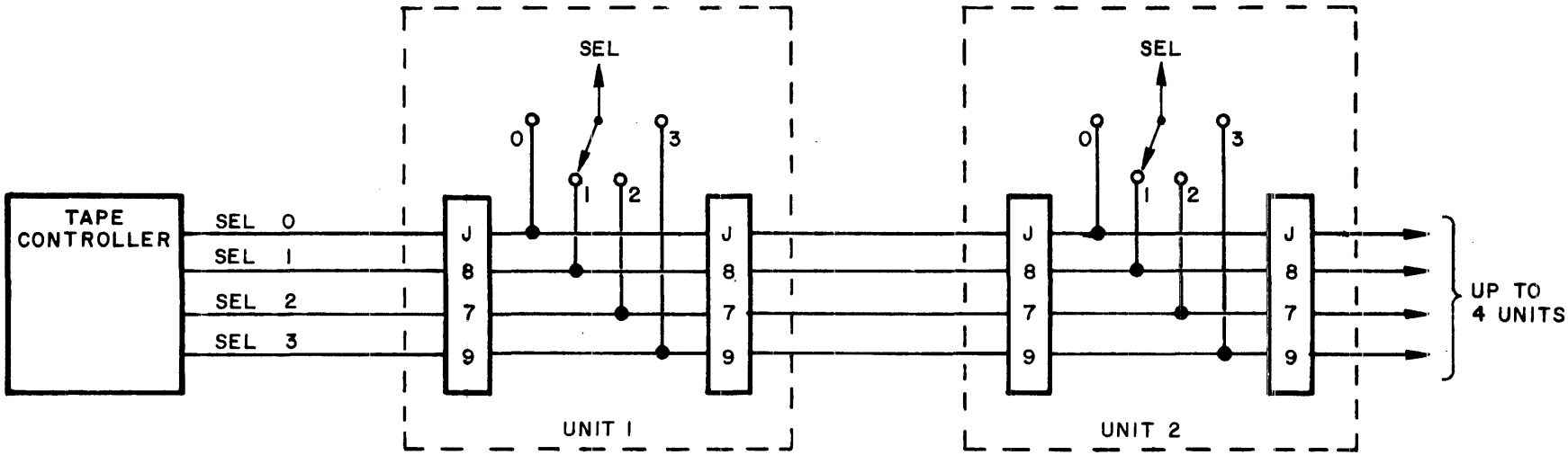
The line terminating resistors, rather than being mounted on the individual tape units, are packaged on a special terminator board assembly. This assembly is pluggable on any unit, thereby facilitating a change to a different drive when a unit is added or removed from the chain. Regardless of what unit 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 with Unit Select Switch

This configuration is not applicable to PE/NRZI switchable units since they do not incorporate a unit select switch. When daisy chaining in the unit select configuration, all the cables (Control, Read, Write) are 1-to-1 cables. (See Figure 9.) 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 Daisy Chaining Cable Configuration without a Unit Select Switch

This method is used only with PE/NRZI switchable units. (See Figure 9A.) With this method, the select lines are rotated in the "tape unit to tape unit" control cable. Pin J of the tape unit will always be the active select line of the tape unit. If a tape unit and cable are removed from the daisy chain, the address of the tape units following the removed tape unit will all be reduced by one. (See Figure 9B.) 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.



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

Figure 9. Daisy Chaining With Unit Select Switch

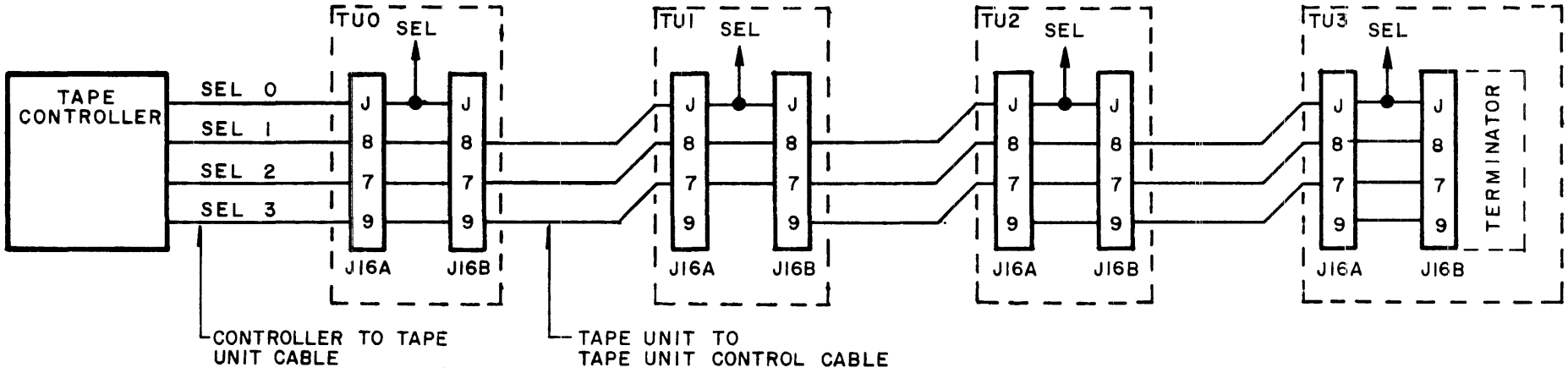


Figure 9A. Daisy Chaining Without Unit Select Switch

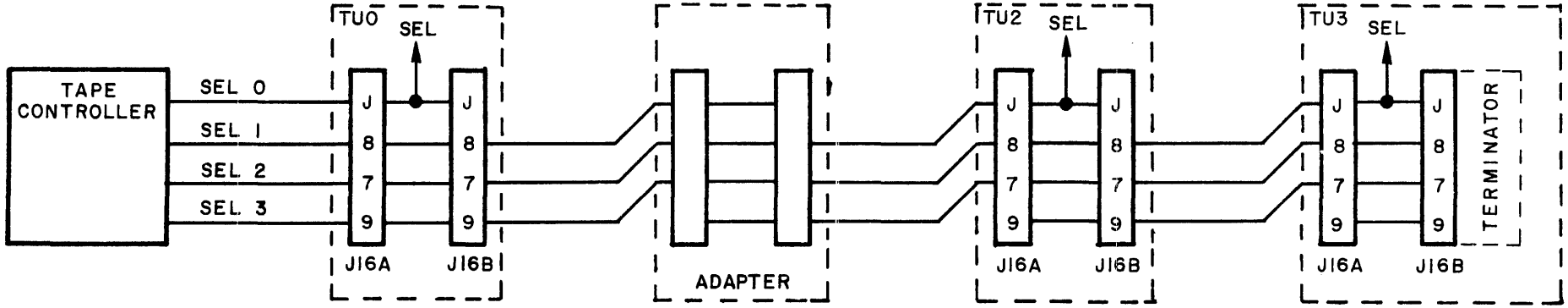


Figure 9B. Daisy Chaining With "T" Cable Adapter

4.3 INPUT REQUIREMENTS

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

Input Level Requirements		
Logic State	Voltage	Current
FALSE (Logic 0) TRUE (Logic 1)	+2.5 to +5.5 volts 0.0 to +0.4 volts	0 (open collector) 26 ma sink

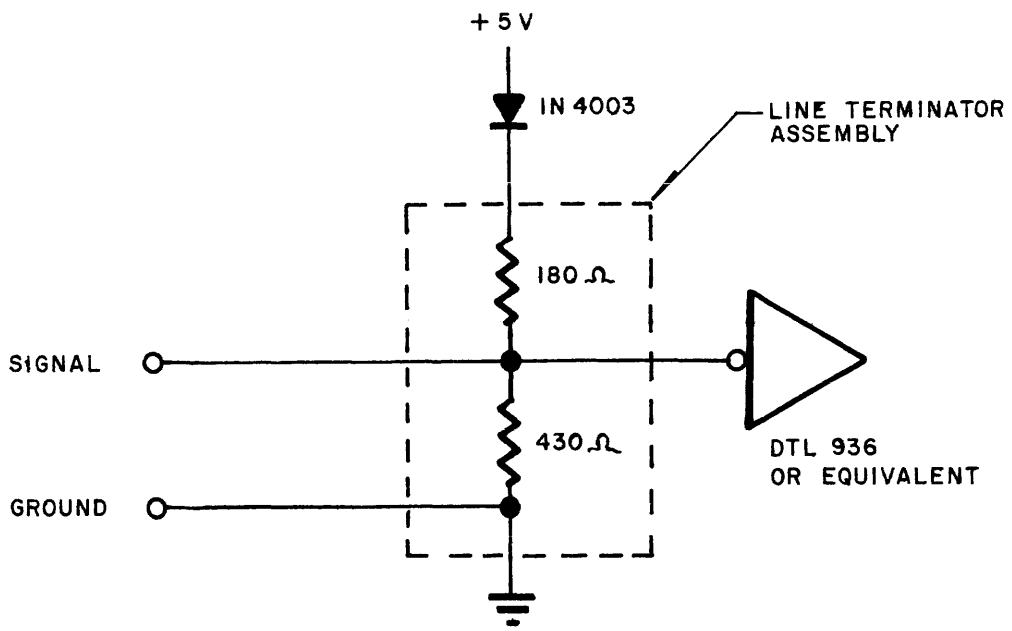


Figure 10. Input Termination Configuration

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NRZI Input Functions

Input Control Lines		Input Data Lines	
Off Line	(1 Line)	Write Data	(7 or 9 Lines)
Select	(4 Line)	Write Strobe	(1 Line)
Forward	(1 Line)	Write Reset	(1 Line)
Reverse	(1 Line)	Low Read Threshold	(1 Line)
Rewind	(1 Line)		
Write Enable	(1 Line)		
Overwrite	(1 Line)		
Density Select	(1 Line)		

The following on-line input signals control the operation of the Mod 11 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 Off-Line

This is a level or a 1 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.

4.4.2 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. Selection of the unit enables all the Write and Read circuitry, the On-Line transport control commands, and the status output lines if the transport ready is TRUE and if the unit is in the On-Line mode.

Table 2. Input/Output Pin Assignments

Connector No. Transitron 600-061-18-SL (or equivalent)		Signal Nomenclature	Signal Pin	Ground Pin
J-16	CONTROL INPUTS FROM CUSTOMER	DENSITY SELECT	D	4
		DENSITY STATUS	F	6
		SELECT 3 COMMAND	9	-
		SELECT 2 COMMAND	7	-
		OVERWRITE	B	2
		SELECT 1 COMMAND	8	-
		SELECT 0 COMMAND	J	-
		FORWARD/STOP	C	3
		REVERSE/STOP	E	5
		REWIND	H	-
		OFF-LINE	L	10
	STATUS OUTPUTS TO CUSTOMER	WRITE ENABLE	K	-
		SPEED	A	1
		READY STATUS	T	16
		ON-LINE STATUS	M	11
		REWIND STATUS	N	12
		EOT STATUS	U	17
		BOT STATUS	R	14
		FILE PROTECT STATUS	P	13
		+5V TERMINATOR POWER	S	-
J-1	WRITE DATA INPUT CONNECTOR	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
J-6	READ DATA OUTPUT CONNECTOR	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
		7 TRACK STATUS	11	M

P

4.4.3 Forward

This is a level which, when TRUE, causes tape to move forward at nominal speed. When the level goes FALSE, the tape motion ceases.

4.4.4 Reverse

This is a level which, when TRUE, causes tape to move in the reverse direction at nominal speed. When the level goes FALSE, tape motion ceases.

4.4.5 Rewind

A 1 μsec minimum pulse on this line shall cause the tape transport to drive tape at the specified rewind speed and stop at the Load Point. The transport will initiate a Load Sequence, illuminating the LOAD indicator, and 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

This line is used only with 7-channel tape transports. A TRUE level on this line conditions the MTT to operate at the higher packing density and causes the high density status line to go TRUE. A FALSE level selects the lower data packing density. This line is internally tied TRUE for 9-track systems.

4.4.7 Overwrite (Qualified Option)

This is a level which, when TRUE, causes special action in the write electronics. It is used in conjunction with the Write Enable signal when isolated records are being updated and replaced with equal length records anywhere on tape. Writing the record in the Overwrite mode causes the erase head and write head currents to be turned off immediately at the end of the record, hence preventing the following record from being erased. Any record may be updated up to a maximum of 5 times only. Attempts to update beyond this number will not be guaranteed because the updated record may creep beyond the maximum IRG limits. The leading edge of this pulse must be prior to or coincident with the leading edge of the Forward or Reverse motion command and the level

must remain TRUE at least 20 μsec after the initiation of the motion command in order to set the MTT in the Overwrite mode.

If this signal is FALSE during a minimum period of 20 μsec after the leading edge of the motion command, the MTT will be taken out of the Overwrite mode.

4.4.8 Write Enable

The leading edge of this pulse must be prior to or coincident with the leading edge of the Forward or Reverse motion command and the level must remain TRUE at least 20 μsec after the initiation of the motion command in order to set the MTT in the Write mode. It is not required to pulse this line if consecutive records are to be written, but merely to hold this line TRUE until the write operation is terminated.

If the Read mode of operation is required, keep this line FALSE for at least 20 μsec starting from the leading edge of the motion command. This will reset the Write/Read flip-flop, hence placing the transport in the Read mode. The Write mode can also be disabled by the following conditions:

(a) A Rewind command
(b) An Off-Line command
(c) Loss of interlocks
(d) Manually switching to the Off-Line mode

4.5 INPUT DATA FUNCTIONS

4.5.1 Write Data

One line is required for each bit in a character. The Write Data lines shall establish the controlling condition for the NRZI write register. When TRUE, the state of the corresponding flip-flop shall 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 shall not be changed. This shall 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 throughout the time interval consisting of 0.2 μsec before to 0.2 μsec after the Write Data Strobe. A minimum of one data line must be TRUE for every strobe.

4.5.2 Write Strobe

A 1 μsec pulse on this line shall cause a change in the state of the NRZI Write register cell at the time the deskew single shot times out, if 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 shall be stable within 0.25 percent.

4.5.3 Write Reset

A 1 μsec pulse on this line resets the NRZI Write register. This pulse shall be used to write the Longitudinal Parity Check (LPC) character at the end of each block of data which, therefore, creates an even number of flux reversals (ONE's) in each track of the block. If the unit is in the overwrite mode, this pulse also causes the shut-off of write current.

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 Low Read Threshold

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 (24 percent). This line is active only in the Read mode 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 Voltage Levels

FALSE (Logic 0)	Open Collector - Terminate as shown in Figure 10A
TRUE (Logic 1)	0.0 to +0.5V

Output Current Level

FALSE level	Open Collector
TRUE level	40 milliamperes maximum sink

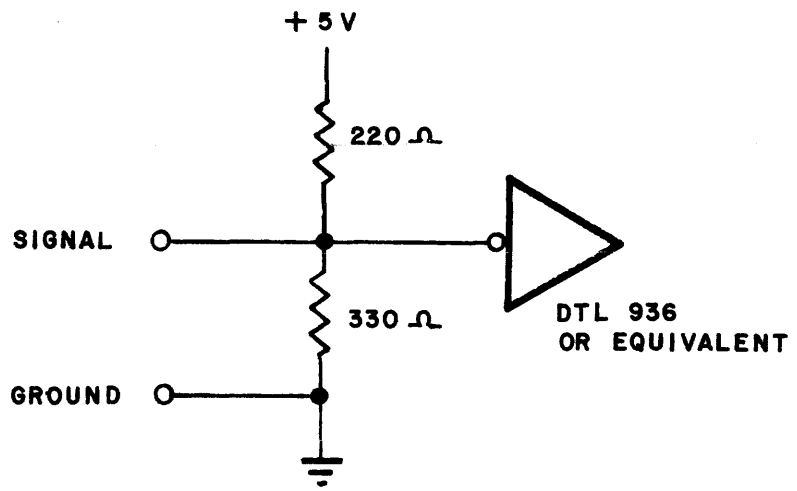


Figure 10A. Output Configuration Termination

Output Functions

Output Control Status Lines		Output Data Lines	
Ready Status	(1 line)	Read Data	(7 or 9 lines)
File Protect Status	(1 line)	Read Strobe	(1 line)
Rewind Status	(1 line)	NRZI/PE Status	(1 line)
On-Line Status	(1 line)	7/9 Trk Status	(1 line)
BOT Status	(1 line)		
EOT Status	(1 line)		
High Density Status	(1 line)		
Speed	(1 line)		

The following On-Line output signals provide the data functions when the unit is ON-LINE and Selected. The control status functions are activated when On-Line and Selected.

4.7 OUTPUT CONTROL FUNCTIONS

4.7.1 Ready Status. This line is TRUE when the transport interlocks are made and unit is On-Line and not rewinding, and the initial Load Sequence is complete.

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 MTT is rewinding. The rewinding function is completed when the tape is placed at Load Point.

4.7.4 EOT. When TRUE, this line shall indicate that the MTT is reading the EOT reflective marker.

4.7.5 BOT. When TRUE, this line indicates that the MTT is reading the reflective marker at the load point.

4.7.6 File Protect. A TRUE level on this line indicates that no Write Enable ring has been installed on the supply reel.

4.7.7 Density Status. When this line is TRUE, the Density select input has been set for high density operation, and the read circuitry has been conditioned accordingly. This line is active only for 7-track systems and is tied permanently TRUE for 9-track systems.

4.8 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.

4.9 OUTPUT DATA FUNCTIONS

4.9.1 Read Data. One for each bit in a character. Each output is in a level which changes to its appropriate state prior to the trailing edge of the Read Strobe pulse and remains in that state until 0.5 μsec after the trailing edge of the Read Strobe pulse.

4.9.2 Read Strobe Pulse. The Read Strobe line shall provide a pulse of 2 μsec for each data character read from tape. The trailing edge of this pulse is used to sample the read data lines.

4.9.3 NRZI/PE Status. When this line is TRUE, it indicates to the system that the selected tape unit is operating in the NRZI mode.

4.9.4 7/9 Track Status. When this line is TRUE, it indicates to the system that the selected tape unit has a 7-track head.

SECTION V

PRINCIPLES OF OPERATION

For best understanding of the principles of operation of the Mod 11 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 system
4. Control electronics
5. Data electronics

1. POWER SUPPLY

The power supply consists of three assemblies: transformer, rectifier filter and regulators, which supply power to the entire system, including the capstan and reel drive systems, the data electronics and the option electronics. As shown in Figure 11, 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 fuse is provided in the hot side of the primary power line.

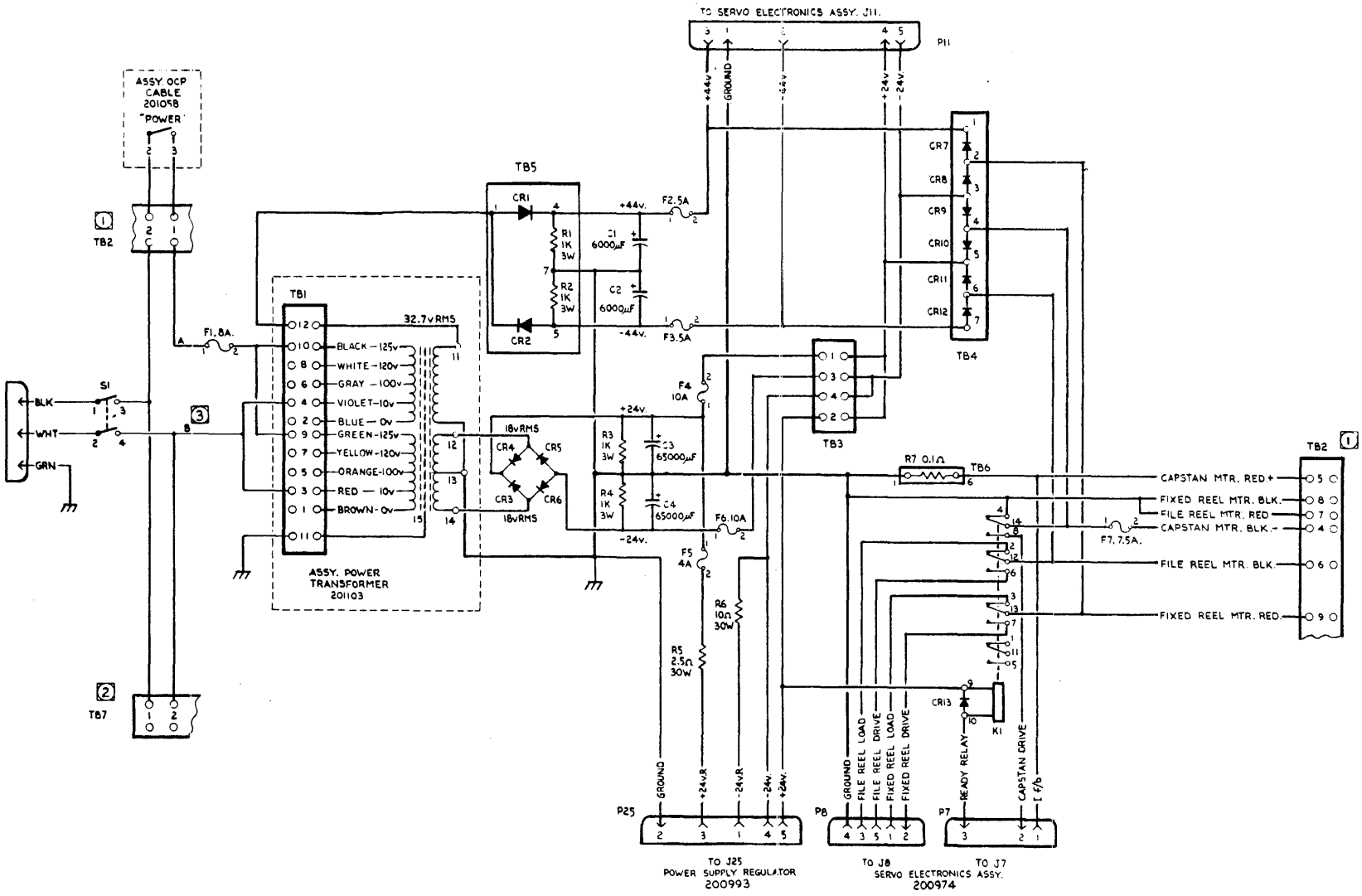


Figure 11. Power Supply

Unregulated DC from the power supply is sent to the regulators and the servo amplifiers. The unregulated voltages supplied to the regulators are +24 volts and -24 volts. The unregulated voltages supplied to the servo amplifiers are +24 volts, -24 volts, +44 volts, and -44 volts.

Each voltage regulator consists of a linear integrated circuit amplifier and power transistors. The output voltage tolerance for the regulators are ±5 percent including line and load variations, aging and initial setting accuracy. Each regulator is potentiometer adjustable except for the -5 volt regulator, which is slaved to the +5 volt regulator.

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 volts line goes above +8 volts, an SCR will conduct, shorting the +24 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 11 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 12).

The strobe disc on the front side of the capstan carries two patterns, one for 50 Hz and one for 60 Hz. The inner pattern is the 60 Hz pattern. When it is viewed under illumination from an 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 supplied on machines operating at 25, 37.5, and 75 inches per second. Thus, proper operation of the capstan 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 of the capstan drive. (See Section VI for calcualting the percentage of such variance and for adjusting the strobe disc.)

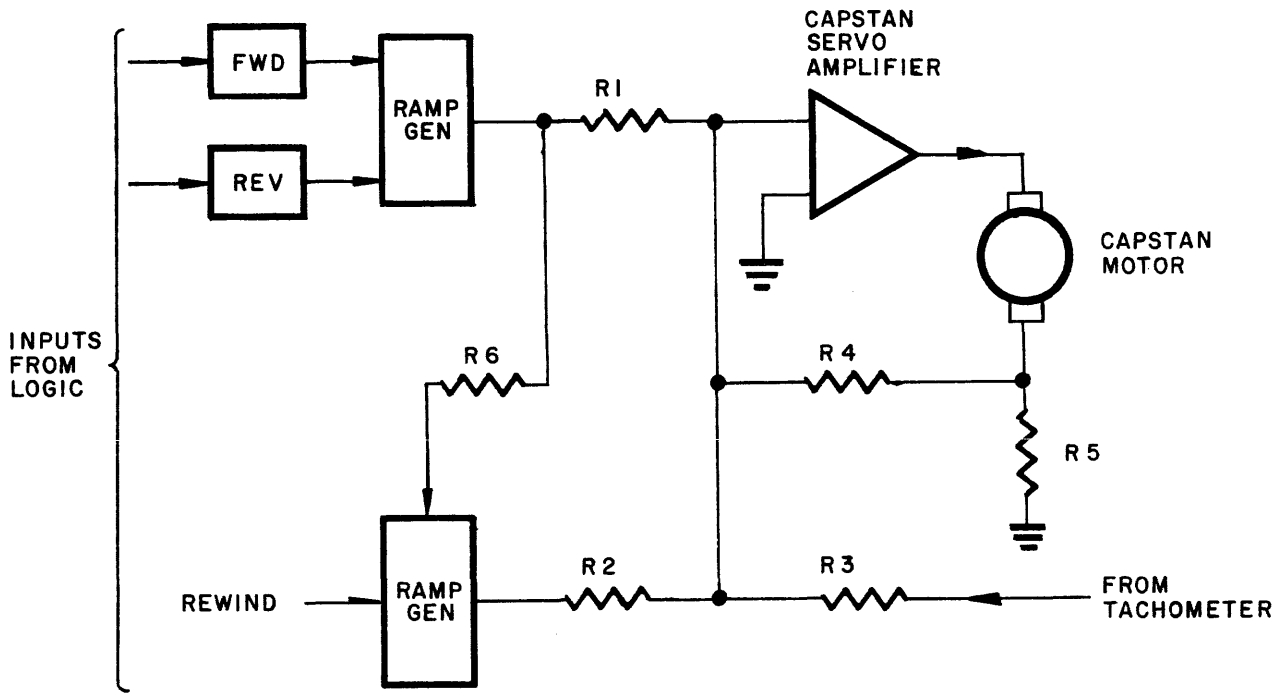


Figure 12. Capstan Drive and Servo System

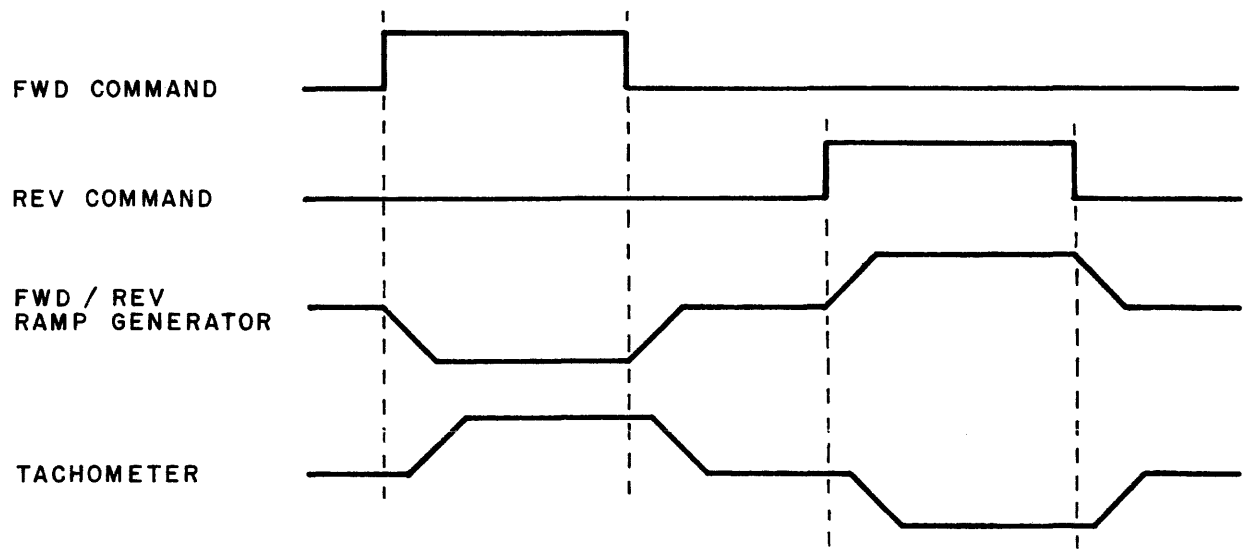


Figure 13. Timing Diagrams of Command to Capstan Servo

Two ramp generators are used in the capstan servo (See Figure 1). One controls the forward and reverse speeds at nominal velocity, and the other controls the rewind speed. The forward/reverse ramp generator uses two Zener diodes as precise voltage references. The rewind ramp generator uses the reverse ramp output through R6 as a voltage reference. Resistors R1 and R2 in Figure 12 in combination with R3 and R4, function as a 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 inter-record 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 13 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 a nominal time constant of 1 second. This provides a time interval that permits the tape to accelerate to 200 ips without exceeding the storage capacity of the vacuum chamber. Fall time is nominally a 0.5 second ramp and it assures that the storage chamber 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 chambers and the friction in the capstan drive motor. The wrap on the capstan 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 DRIVE AND SERVO SYSTEM

Two identical servo systems control the supply and takeup reels in the Mod 11. Storage of appropriate lengths of tape to permit acceleration and deceleration is provided by the vacuum chambers, so that the reels do not have to accelerate as rapidly as the tape does. Storage of tape by the chambers is sufficient to permit the system to operate at the nominal tape speed without program restrictions.

Operation of the reel servo system is diagrammed in Figure 14. A vacuum operated light-sensing circuit provides tape loop information to the servo amplifier, which drives the reel motor. As tape is delivered to the chamber or taken from it, the loop moves up or down, varying the pressure to the piston in the transducer assembly, which varies the position of the mask between the light source and the light-sensing element. This action provides the electrical signal to control the motor speed. Enclosure of the light source prevents ambient light from affecting system performance.

Reel motors are driven by linear amplifiers, stabilized for all operating situations and sequences. During the Rewind mode the amplifier gain is increase 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 the fixed servo amplifier during the unload cycle to bias the tape loop close to the vacuum source end of the chamber. This assures gentle handling of tape as it unloads from the fixed reel. It also prevents loud popping of tape against the chamber grill.

3.1 LIMIT SWITCH

The tape transport is protected from tape spillage by two differential pressure operated switches. (See Figure 15.) One port of the switch is connected to a port in the chamber near the atmosphere end and the other port is connected to a port in the same chamber near the vacuum source end. One switch is used to protect each chamber. If

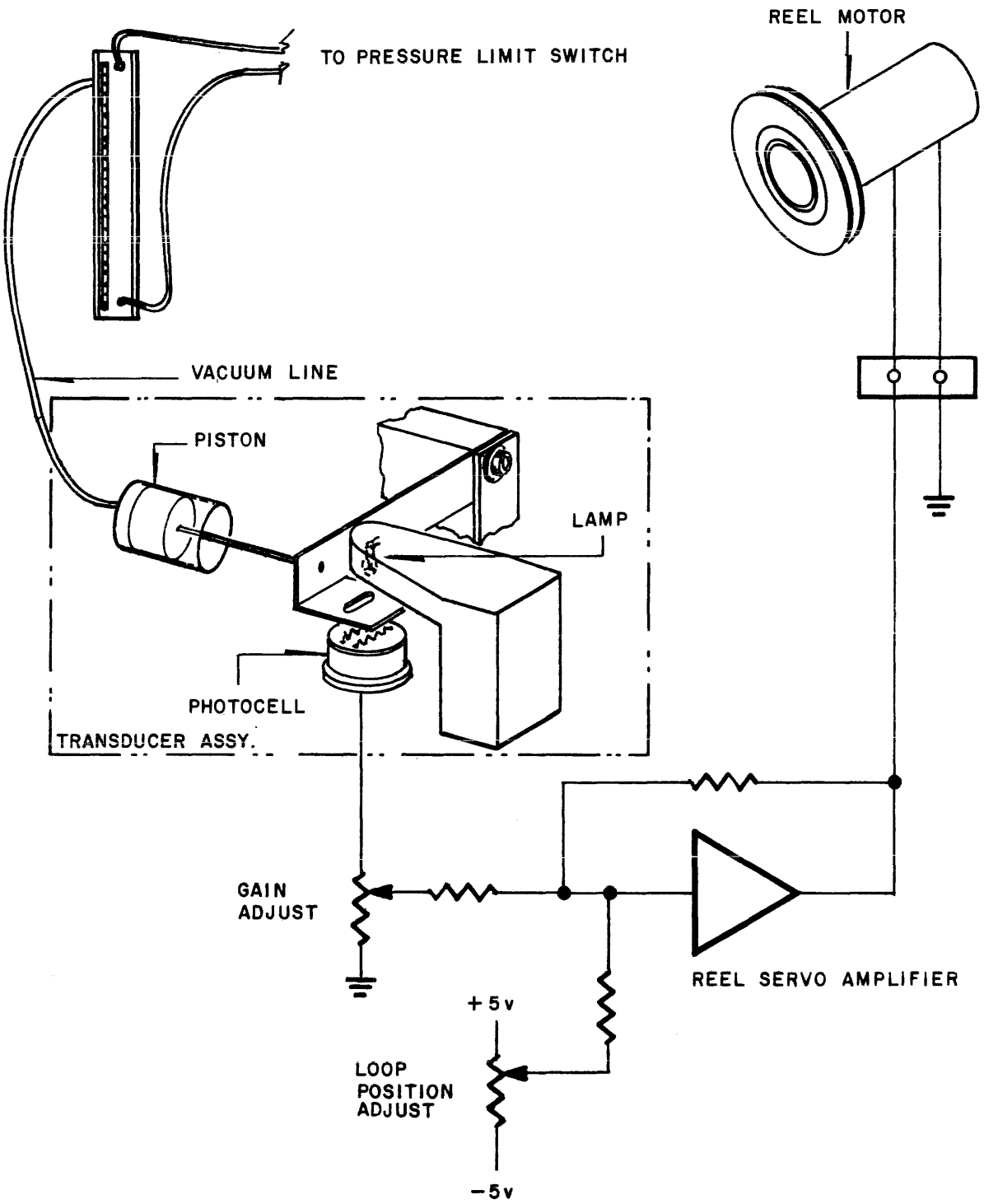


Figure 14. Reel Servo System

the tape is positioned anywhere between the two ports, there is a pressure difference across the switch holding it closed. If the tape is not between the two ports there is no pressure difference across the switch and the switch opens.

The opening of either switch causes a logic 1 to be sent to an inverter, which sets a flip-flop to break the ground path to the limit switches and shuts off the blower. This flip-flop provides a memory, so that if tape is pulled back into the chamber after opening a limit switch the transport remains shut down. This flip-flop is reset during the load sequence described in paragraph 3.2.

The opening of the limit switch also causes the ready relay to drop out, disconnecting all motors from the amplifiers and connecting them to ground through the load relay.

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

3.2 LOAD SEQUENCE

After tape is threaded, the transport will automatically load on depressing the load pushbutton on the OCP (see Fig. 15). Loading is accomplished by turning on the blower, putting tape into the fixed chamber and file chambers, and putting the reel under servo control. The logic to accomplish this is located on the servo electronics board.

The reel amplifiers are divided into two functional blocks: the preamplifier and the power amplifier, with a signal gate between them. The signal path is inhibited by this gate when the transport is not in the ready condition; therefore, the power amplifier may be conveniently used to drive the reel motors for loading and for automatic unload. The load relay, when energized, disconnects the

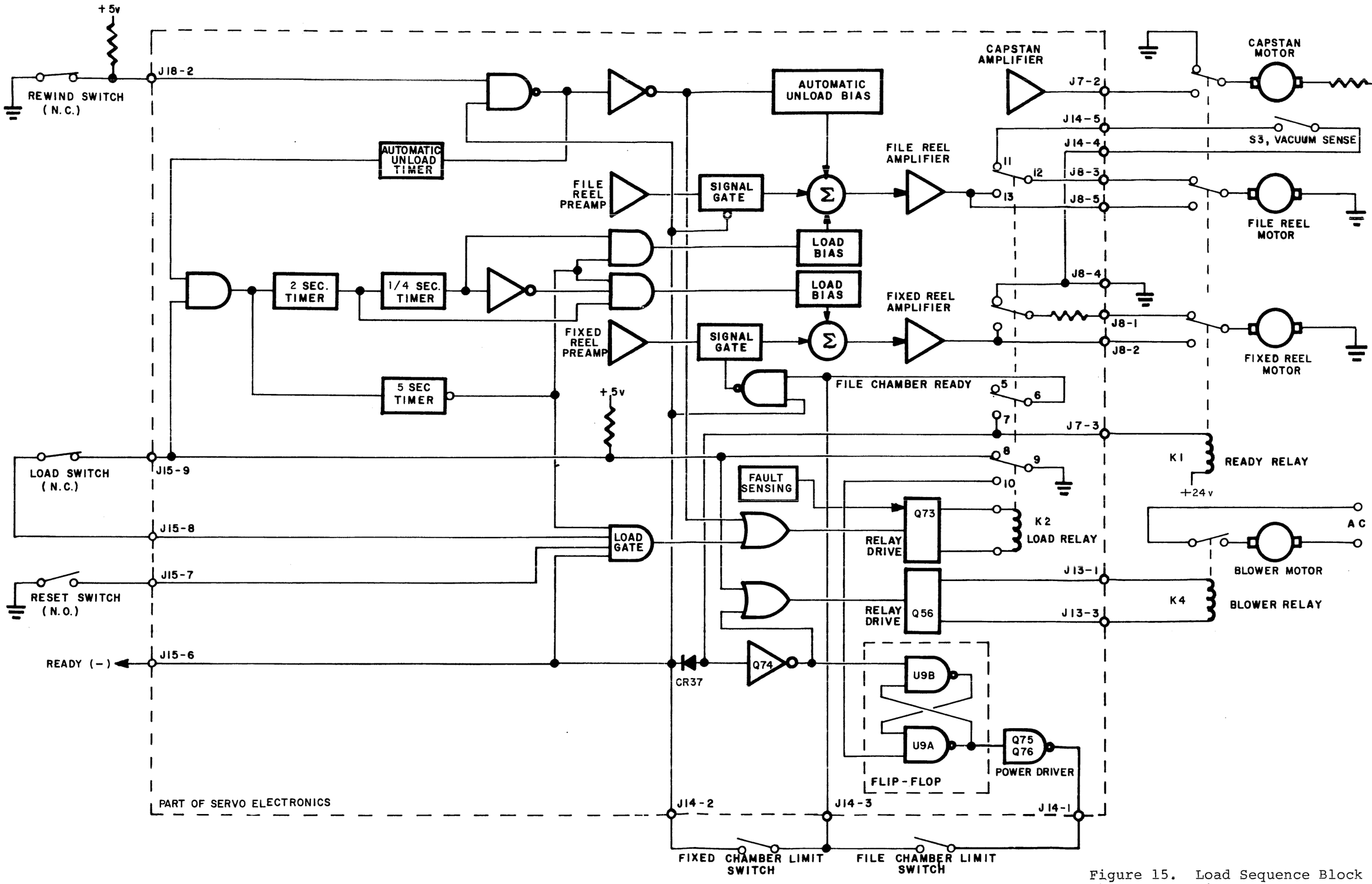


Figure 15. Load Sequence Block Diagram.

motors from ground, and connects them to the amplifiers for the load and automatic unload cycles. The timing circuits provide the proper sequence for loading.

When the transport is on, but not loaded, the following signals appear at the input of the load gate. The reset switch is normally open, corresponding to a logic 1. The load sequence may be aborted at any time by pressing the RESET switch, thereby putting a logic 0 into the load gate. The load switch common is at a logic zero through pins 8 and 9 of the load relay. The transport ready signal is at a logic 1, since no ground is provided through the open limit switches. The limit switches sense that tape is in the chambers and vacuum is up by sensing the pressure difference across the tape. The inverted output of the five-second nominal timer is normally at a logic one. If the LOAD pushbutton is pressed, all inputs to the load gate are at logic 1, and the load relay will be energized. (The "OR" function is used to energize the relay for automatic unload and will be discussed in paragraph 3.3.) Once the relay has been energized it stays energized by shifting the load switch to logic 1 by removing the ground from pin 8. The ground on pin 9 of the load relay is swung from pin 8 to pin 10. The load signal also energizes the blower relay at this time. A ground appearing at pin 10 sets the flip-flop and turns on the power driver providing a ground to the limit switches.

The load signal going to a logic 1 starts the timers. The timer circuit consists of a trigger and a capacitor, which is charged through a resistor to +12 and then discharged through a diode. This type of timer delays a logic 1, but not a logic 0. Since the timing circuit is an integrator, it has excellent noise immunity.

The load signal starts the two-second and five-second timers simultaneously. The two-second delay provides the time for the blower to build up vacuum. The output of the two-second timer going to logic 1 starts the quarter-second timer. The output of the two-second timer is AND-gated with the inverted output of the quarter-second timer and the five-second timer. As the output of the two-second timer reaches a logic 1, the other signals should be at a logic 1, and the bias circuit to

the fixed reel amplifier is turned on by this gate. This bias causes the fixed reel to turn counterclockwise, loading tape into the chamber.

When the quarter-second timer goes to the logic 1 state, its output is AND-gated with the five-second timer. This output applies a pulse to the file reel, making it turn clockwise, putting tape into the file chamber. Simultaneously, the inverted output going to zero turns off the bias to the fixed reel.

The tape going into the file chamber closes the limit switch S1, making the file chamber ready signal go to a logic 0. This signal turns on the signal gate to the fixed reel amplifier, putting the fixed reel under servo control. The ready relay is turned on through the load relay.

Since tape is already in the fixed chamber at this time, the servo action drives it to the center, closing the fixed chamber limit switch, and making the ready signal go to logic 0.

The ready signal going to logic 0 turns on the signal gate, putting the file reel amplifier under servo control. The load relay is de-energized, which returns all timers to the 0 state thereby removing all load biases. A path to hold in the ready relay independent of the load relay is provided through the diode CR37. If the ready signal does not occur within the time determined by the five-second timer, this timer puts a 0 into the load gate, aborting the load.

3.2.1 Voltage Fault Sensing

The Load sequence should not be attempted if a malfunction should occur in the ± 24V supply, or any of the power supply regulators, resulting in the absence of any of the respective supply output voltages. Automatic fault sensing is provided that prevents loading, should such a malfunction occur. The location of this circuitry is illustrated in the block diagram in Figure 15; the circuit details are shown on the schematic in Figure B33.

Referring to Figure B33, the Load relay, K2, is energized by the collector current of Q73, whose base drive is derived from +5V. Should this voltage be absent, then K2 will not pull in. Since the Q73 collector current is derived from the +12V source, K2 cannot pull in if that voltage is absent. Both the +5 and +12 voltages are derived from the

+24V source, and thus K2 cannot pull in if the +24 voltage is absent.

Should the -5V source fail, that condition will be sensed by transistor Q81, which remains cut off so long as -5V is applied to its base, through R230. If the -5V source should fail, Q81 will be driven on by the +12 voltage, via R229, and forces the base of Q73 to ground. Consequently, K2 cannot pull in if the -5V source fails. Since the -5 voltage is derived from -12V, which, in turn, is developed from the -24V source, K2 cannot pull in if the -12V source (and, obviously, the -24V source) should fail.

The ±44 voltages are not involved in the Load operation, and their presence is therefore not monitored by the circuitry described above.

3.3 AUTOMATIC UNLOAD

When the transport is not holding tension, the ready signal is at a logic 1. (See Fig. 15.) This signal is NAND-gated with the positive TRUE signal from the rewind switch. The output of this gate is inverted and used to pull in the load relay through an OR-gate. It is also used to apply a bias to the file reel. The inverted output of the gate is fed into a circuit which delays logic 1, but not logic 0. This circuit is used to inhibit the load sequence. The delay is necessary to prevent a load sequence from starting when the rewind switch is released. Since the rewind switch is a momentary closure type, the transport will remain in the automatic unload mode only as long as the REWIND switch is held in. This mode may be used to take up slack from the chambers in preparing to load or to completely remove tape from the tape path. The bias is designed so that tape is not damaged, even if this mode is used as a slow reel-to-reel rewind.

4. CONTROL ELECTRONICS

The control logic circuitry (see Figure 16) 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.

4.1 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 and Reverse), and On-Line to FALSE. Remote control of the transport can be restored after a

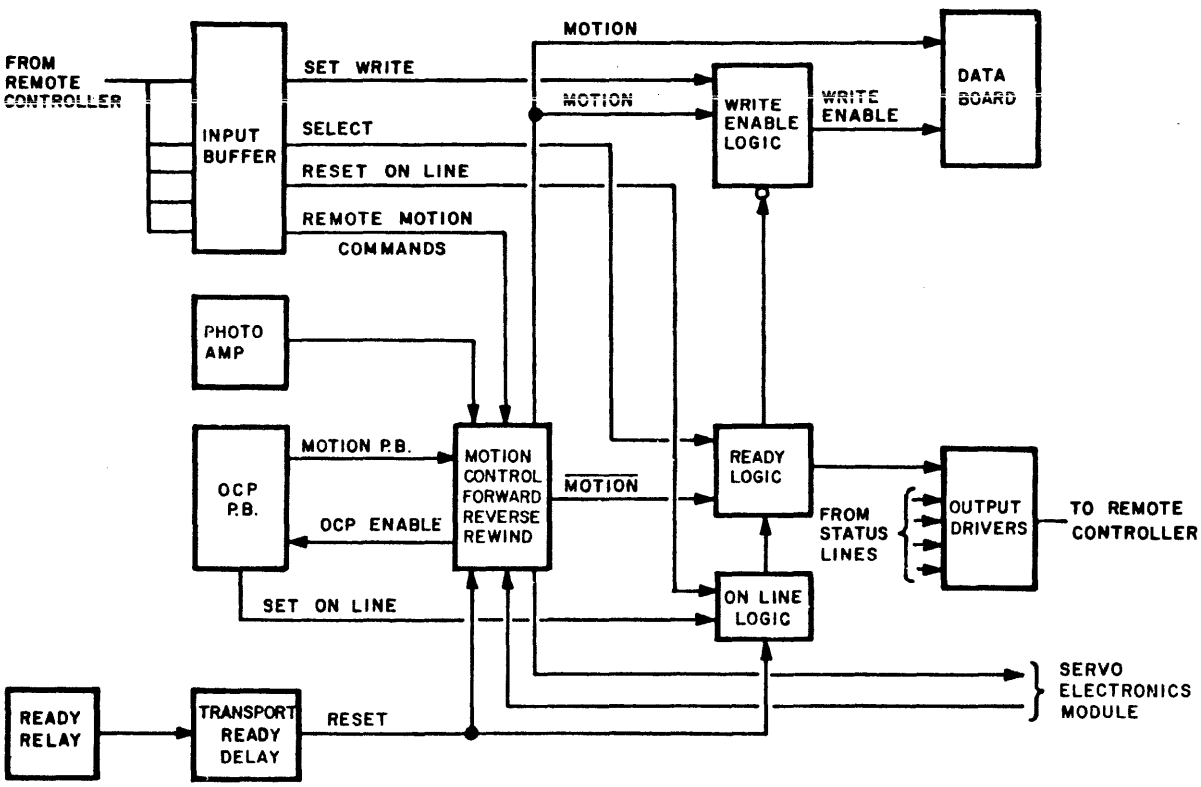


Figure 16. Transport Control Electronics

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.

4.2 MOTION LOGIC (FORWARD AND REVERSE)

A diagram of the logic governing forward and reverse motion is given in Figure 17. 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 comprised of gates A, B, C in Figure 17 is set, and the output of gate A will be TRUE (low). This output is transmitted through NOR-gate D, 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 gate B will be TRUE (low). This output is transmitted through NOR-gate E, which OR's the local and remote reverse commands and presents a reverse (+) signal to the capstan servo.

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 F and G in Figure 17 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 gate D or E.

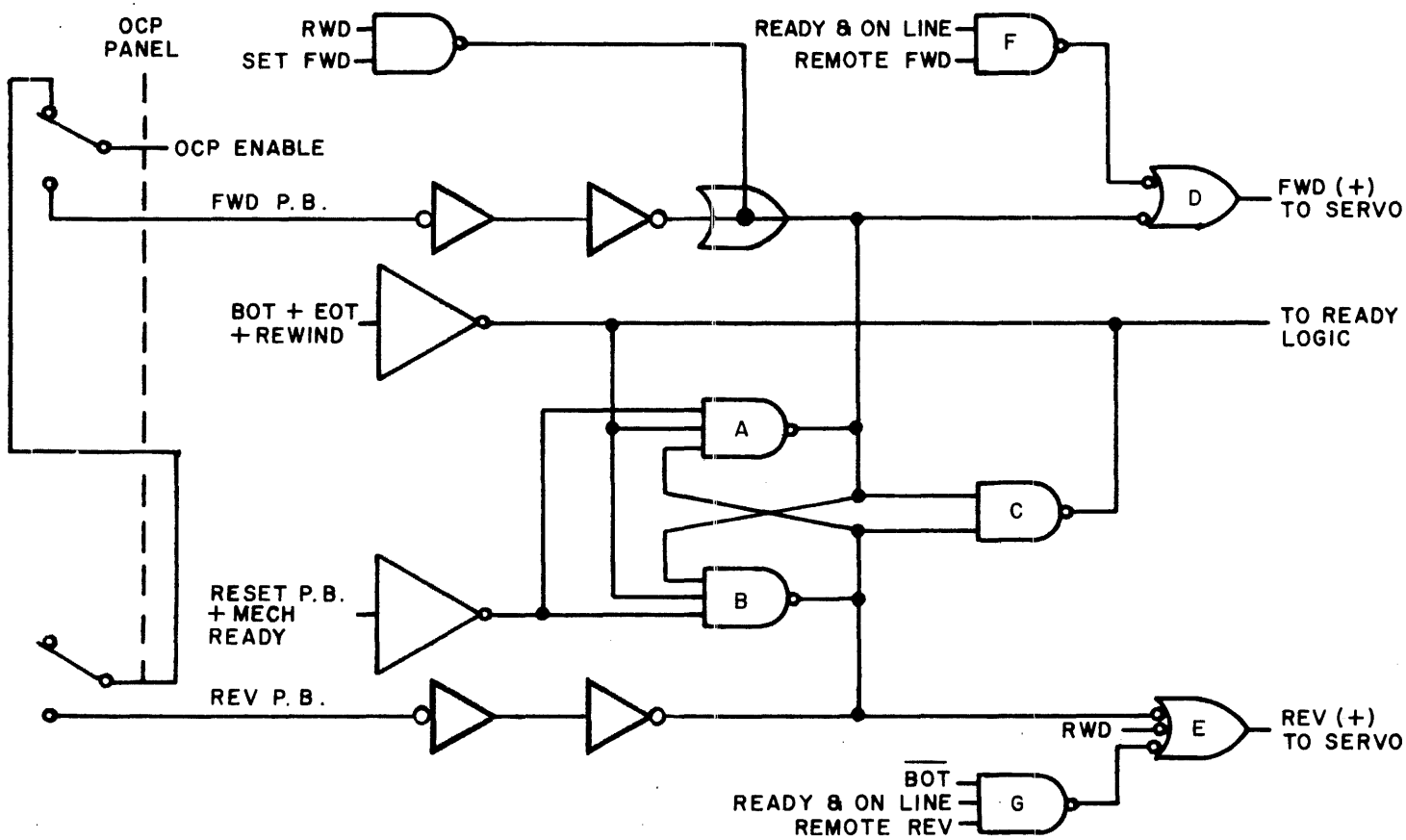


Figure 17. Simplified Logic of Motion Control (Forward and Reverse)

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

4.3 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 18.

The rewind sequence is mechanized with a series of three flip-flops, FF-A, FF-B, and FF-C. The flip-flop FF-A labeled in the diagram is set initially either by the REWIND pushbutton through NAND-gate A, or by the remote rewind command through NAND-gate B. The NAND-gate labeled C decodes the outputs of flip-flops FF-A and FF-C and presents a rewind (-) command to the capstan rewind ramp generator. A reverse-for-rewind is also sent to the capstan servo control through gate D. 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 FF-B and the trailing edge loads FF-C. With FF-B set, the inputs to gate C 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 (A, B and C) 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 is distinguished from a rewind-to-unload command by gating together, at E, the terms Off-Line and Ready, BOT, and

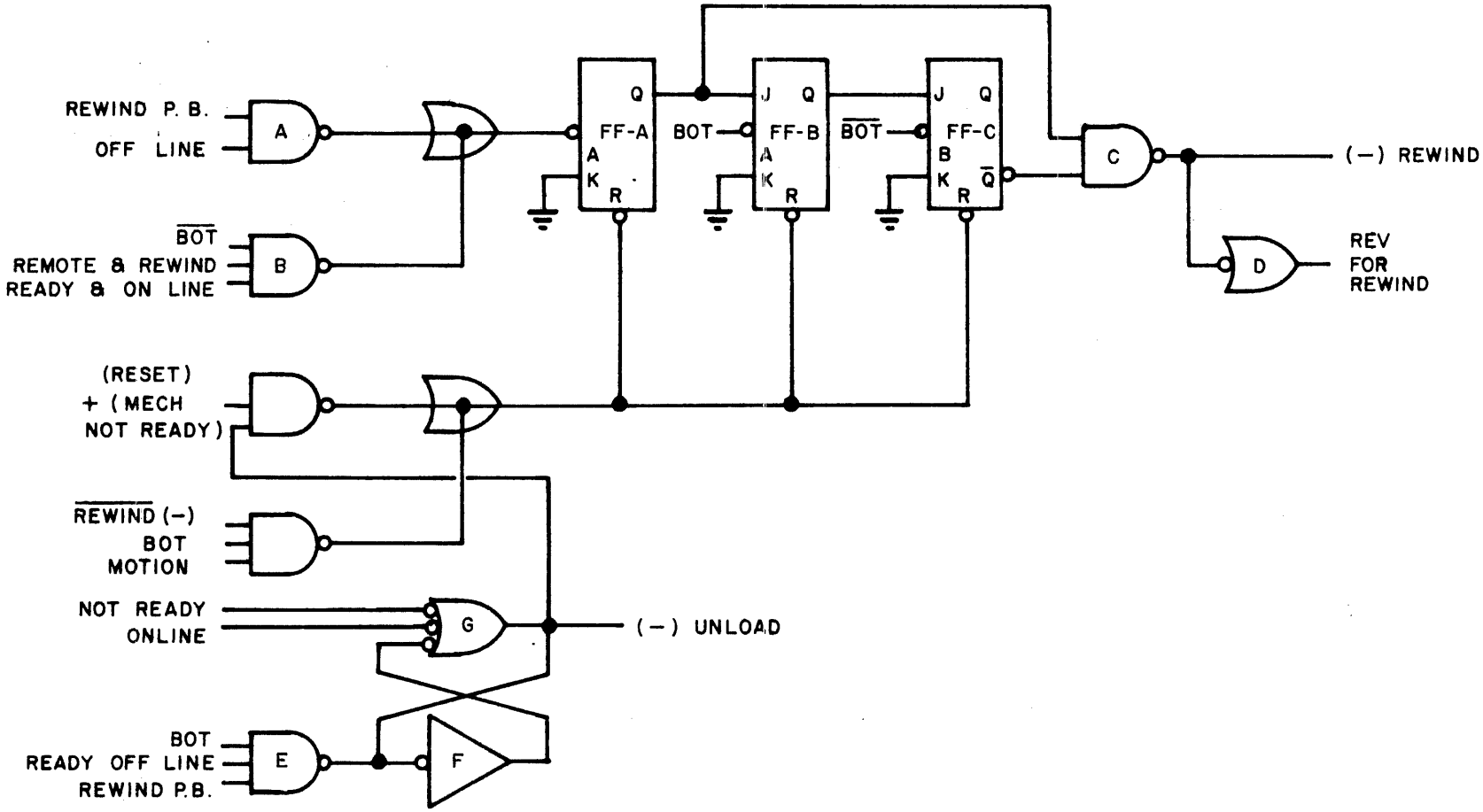


Figure 18. Simplified Logic of Rewind and Unload Control

Rewind. Under these conditions, the easy unload latch, comprised of gates F and G, is set, and an unload (-) signal is sent to the fixed reel servo. 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.)

4.4 WRITE ENABLE LOGIC

Figure 19 diagrams the write enable logic which is comprised of flip-flop FF-A and a positive pulse generator (B and C). The flip-flop is set when the write enable line from the controller is TRUE (high), enabling the J input of FF-A, and when either a forward or reverse motion command is initiated. The T input positive pulse is generated by a pulse generator (B and C). The pulse is generated when MOTION goes TRUE (high). The output of B goes to ground after a time delay. This negative transition initiates a positive pulse at the output of gate C. The trailing edge of this pulse causes FF-A to change states. 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 FF-A goes high after inversion by gate D), and when either a forward or reverse motion command is initiated.

4.5 OVERWRITE AND WRITE RESET LOGIC

The Overwrite logic and Write Reset logic are used in conjunction with the Write Enable logic to perform editing or updating of isolated records. The new record must be the same length as the old record. The mechanization is illustrated in Figure 20.

The overwrite signal is received by a line receiver (I_1), which inverts the signal and drives the "J" input of FF-A. The output of I_1 is inverted by I_2, which drives the "K" input of FF-A. When the overwrite line is TRUE, the "J" input of FF-A is high, and with the next motion command, a trigger pulse is generated, which sets FF-A. The motion pulse also sets FF-B. If write enable is TRUE at this time, and if the file protect switch is on, gate D will be enabled and the write power gate will be turned on.

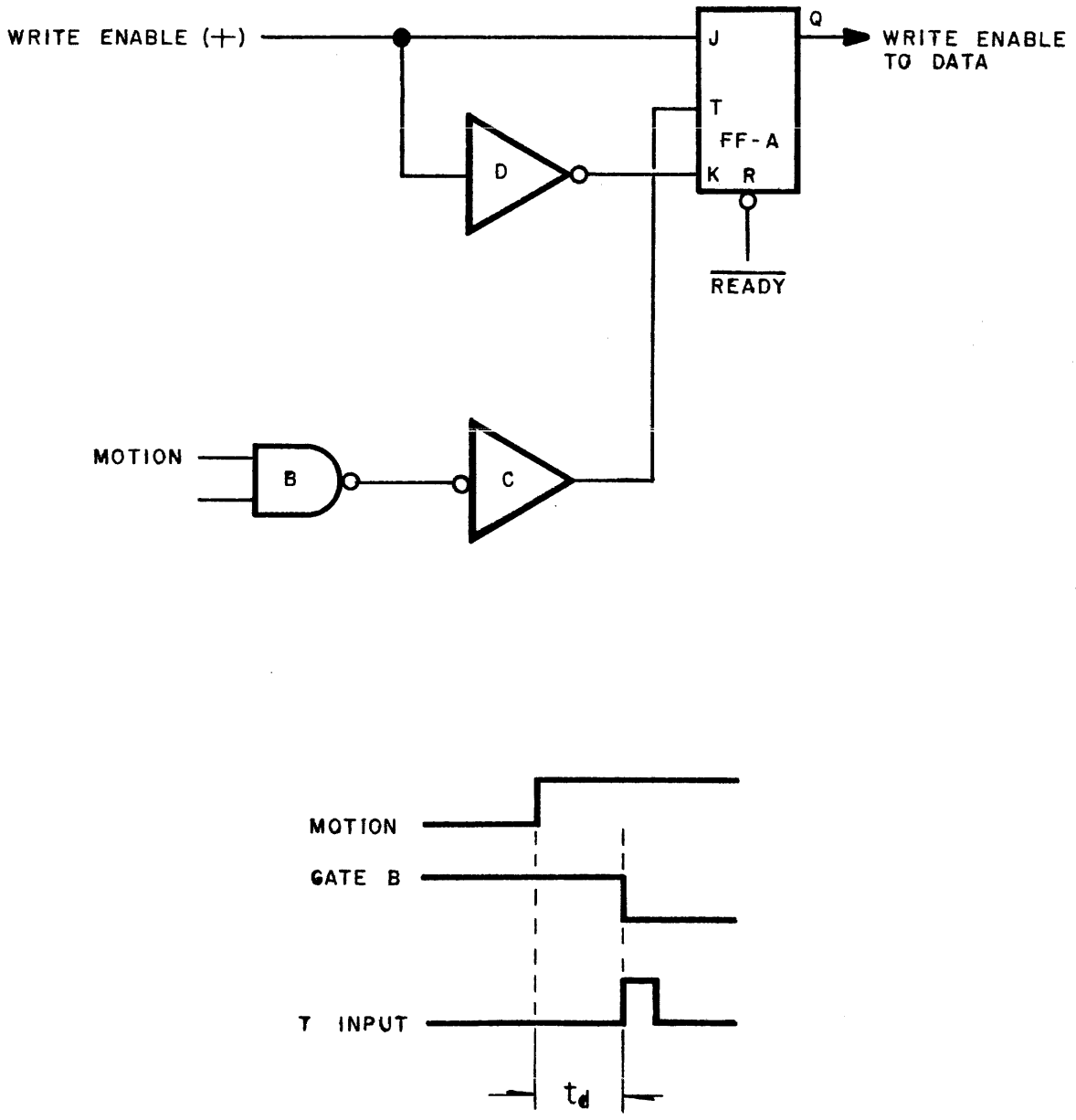


Figure 19. Simplified Logic of Write Enable Control

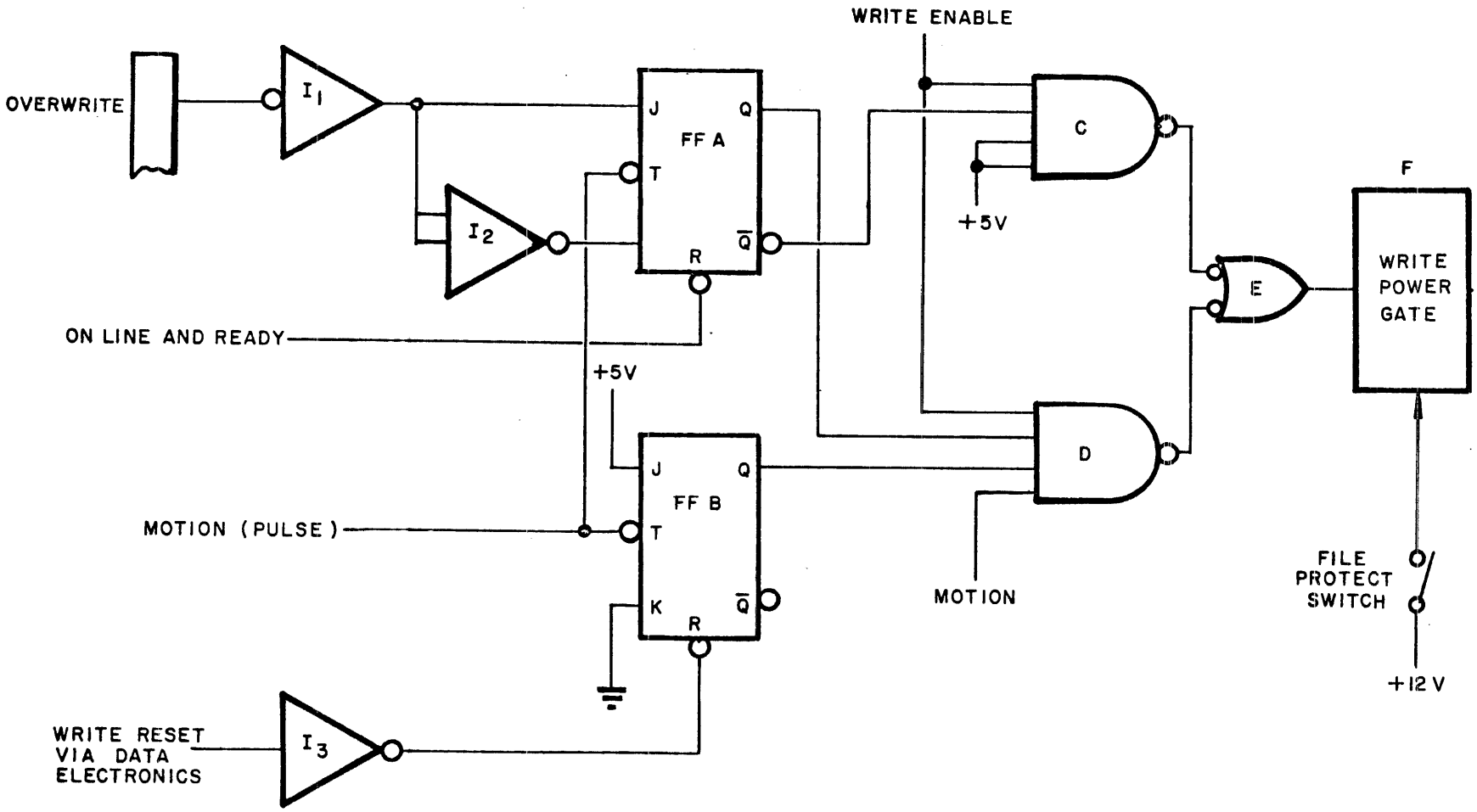


Figure 20. Overwrite and Write Reset Logic

After rewriting the new record, a write reset pulse must be generated immediately following the last check character to reset FF-B. This will inhibit gate D, therefore turning off the write power while tape is still in motion. The write power gate is designed to ramp the write power down, so that spurious write current spikes in the IRG will be held to a minimum.

4.6 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 21. 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.

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.

4.7 READY LOGIC

The ready logic, diagrammed in Figure 22, provides three basic ready signals:

a) Select & Ready (+) from inverter A conditions the data electronics to accept and transmit information to the controller.

b) Ready & On Line from inverter B 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 gate C. 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.

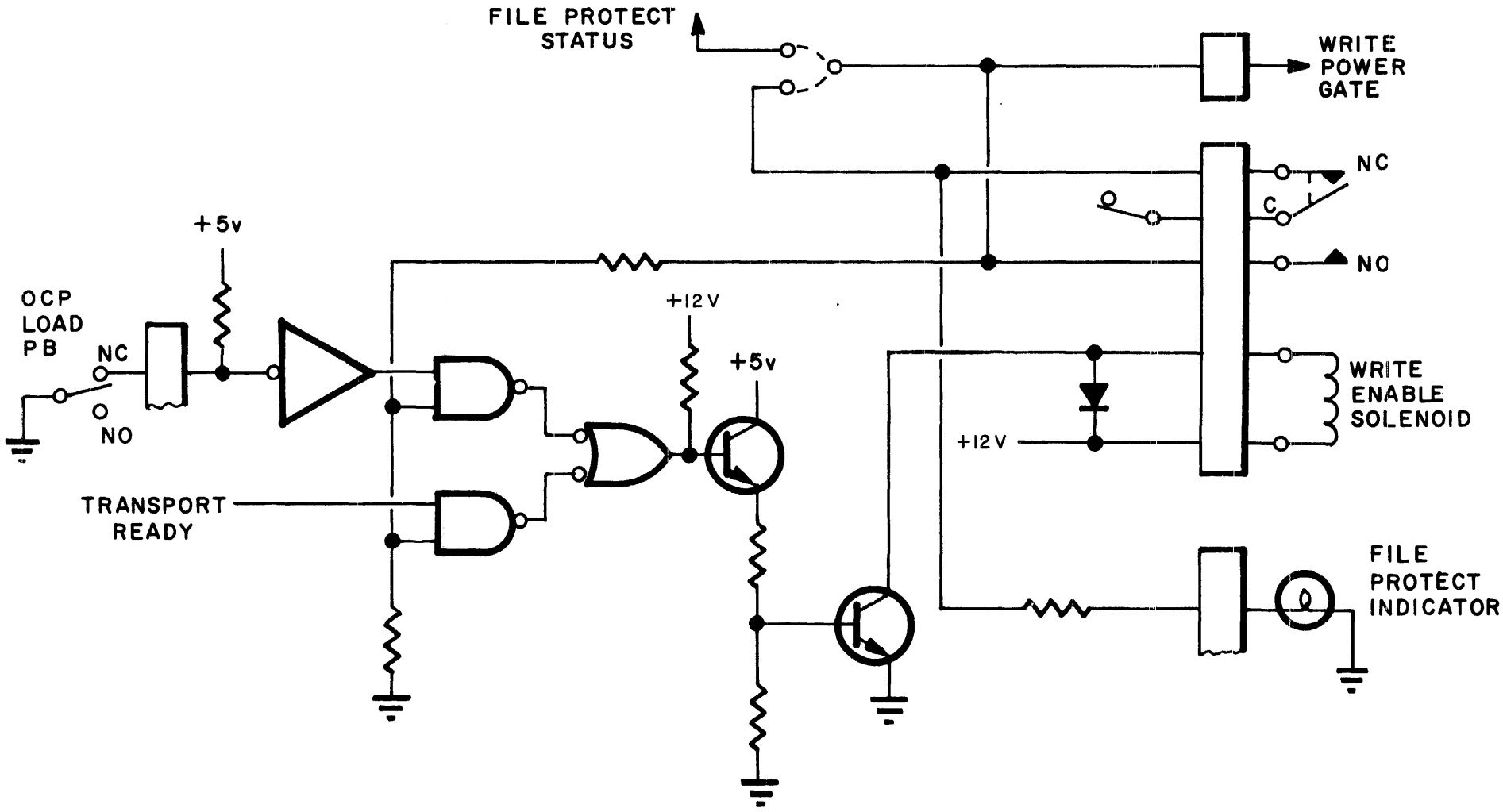


Figure 21. File Protect Logic

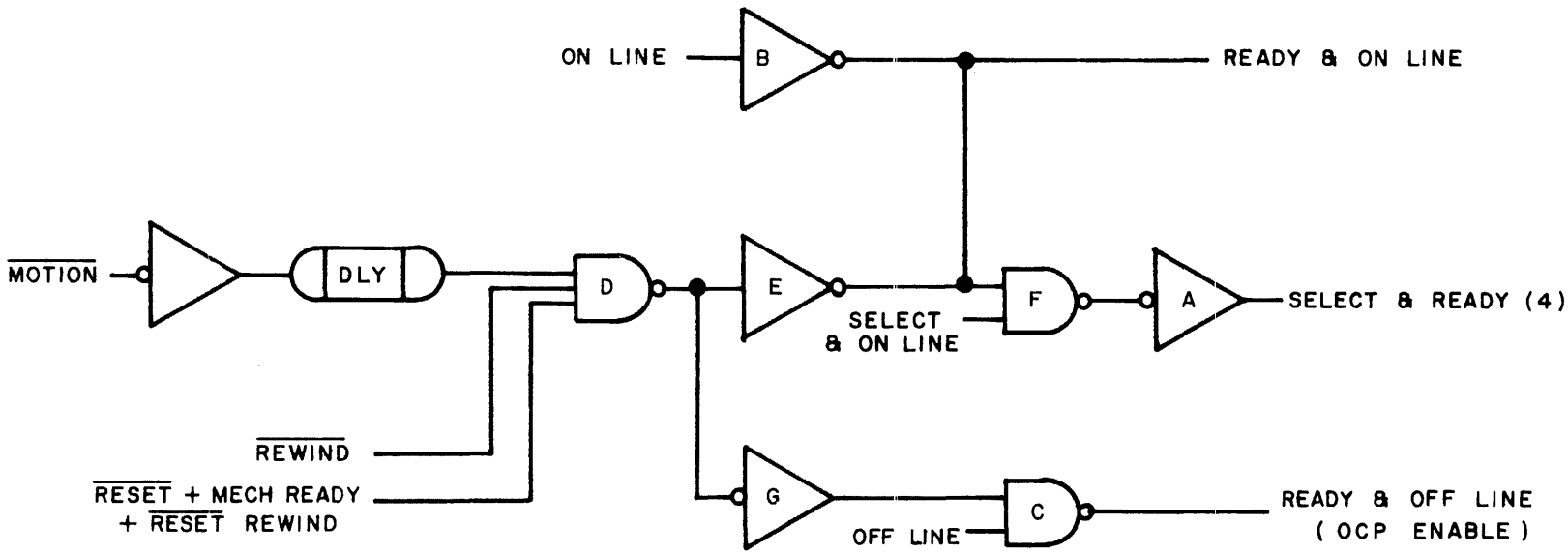


Figure 22. Simplified Logic of Ready Control

The ready signal is generated according to the following logic equation:

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

and is mechanized by gate D. If all the inputs to gate D are TRUE (high) the output will be low. This low signal goes through inverter E and is gated with the terms Select & On-Line by gate F to provide the Select & Ready term. The low output of gate D goes through inverter G and is gated with the term Off-Line by gate C to provide the Ready & Off-Line term. Gate E and B 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 23 and 24 present the 7-track and 9-track location and space specifications.

At the end of each data record, check characters must be recorded and an inter-record gap inserted. Figures 25 and 26 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 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 25 and 26 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 at the proper time by the tape mark character together with its write data strobe. This, 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.

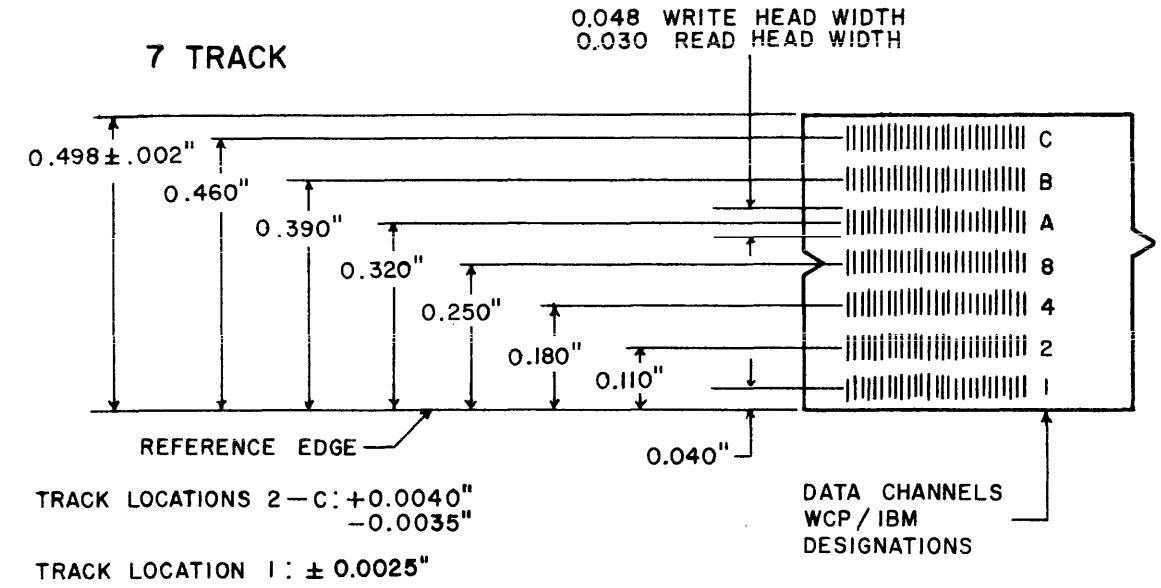


Figure 23. Track Locations and Spacing, 7-Track System

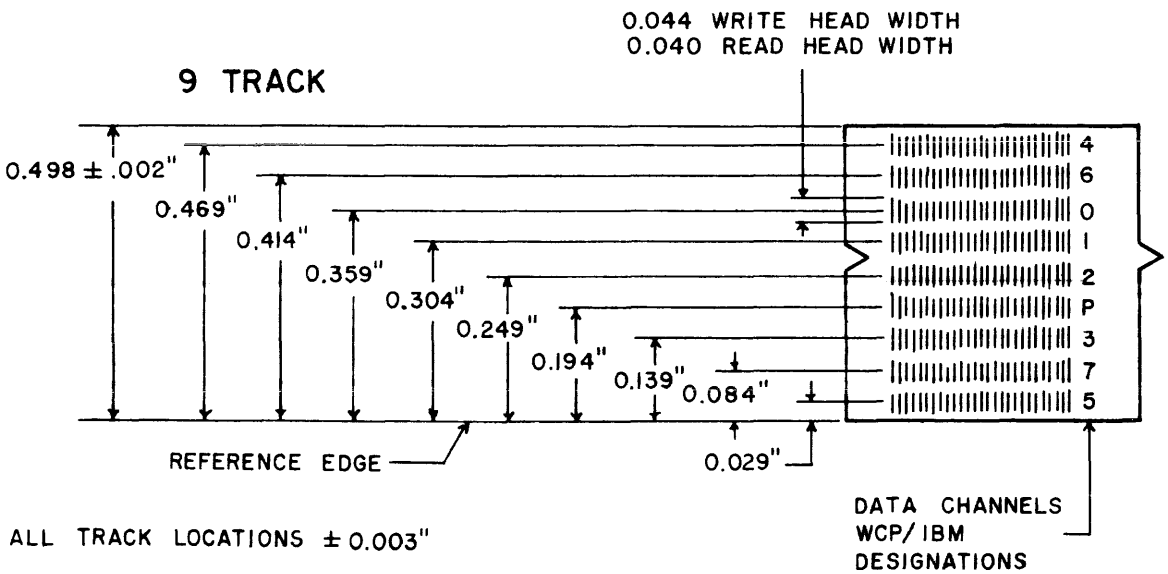


Figure 24. Track Locations and Spacing, 9-Track System

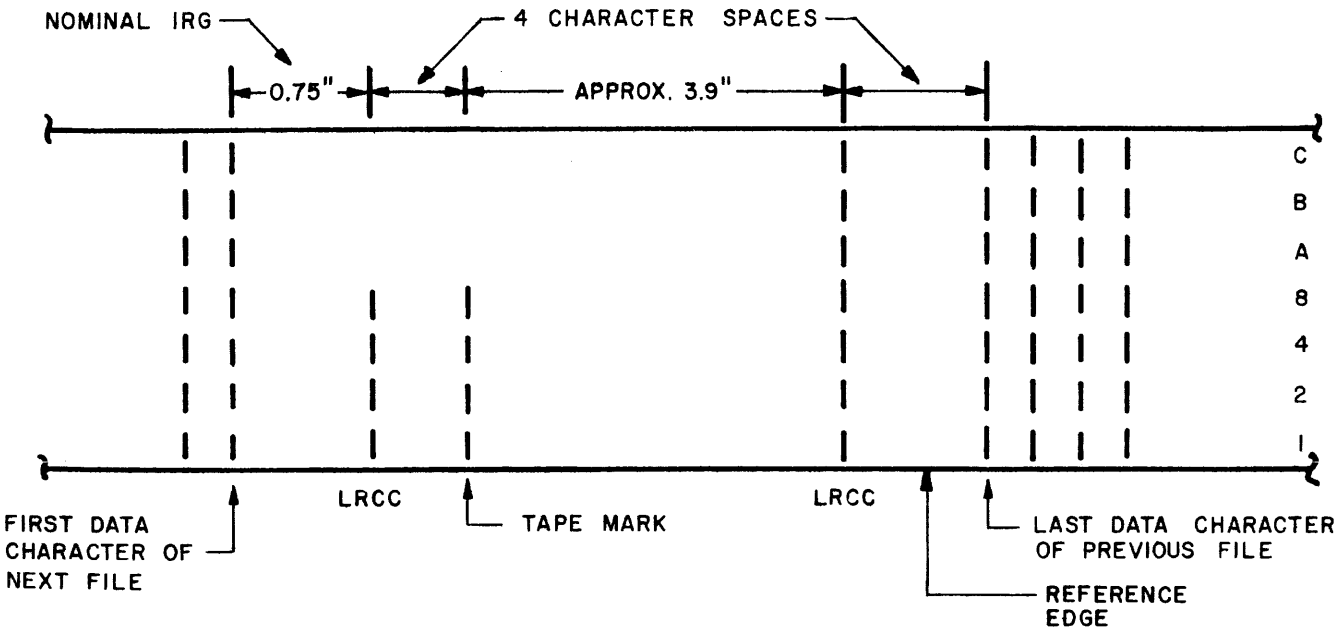
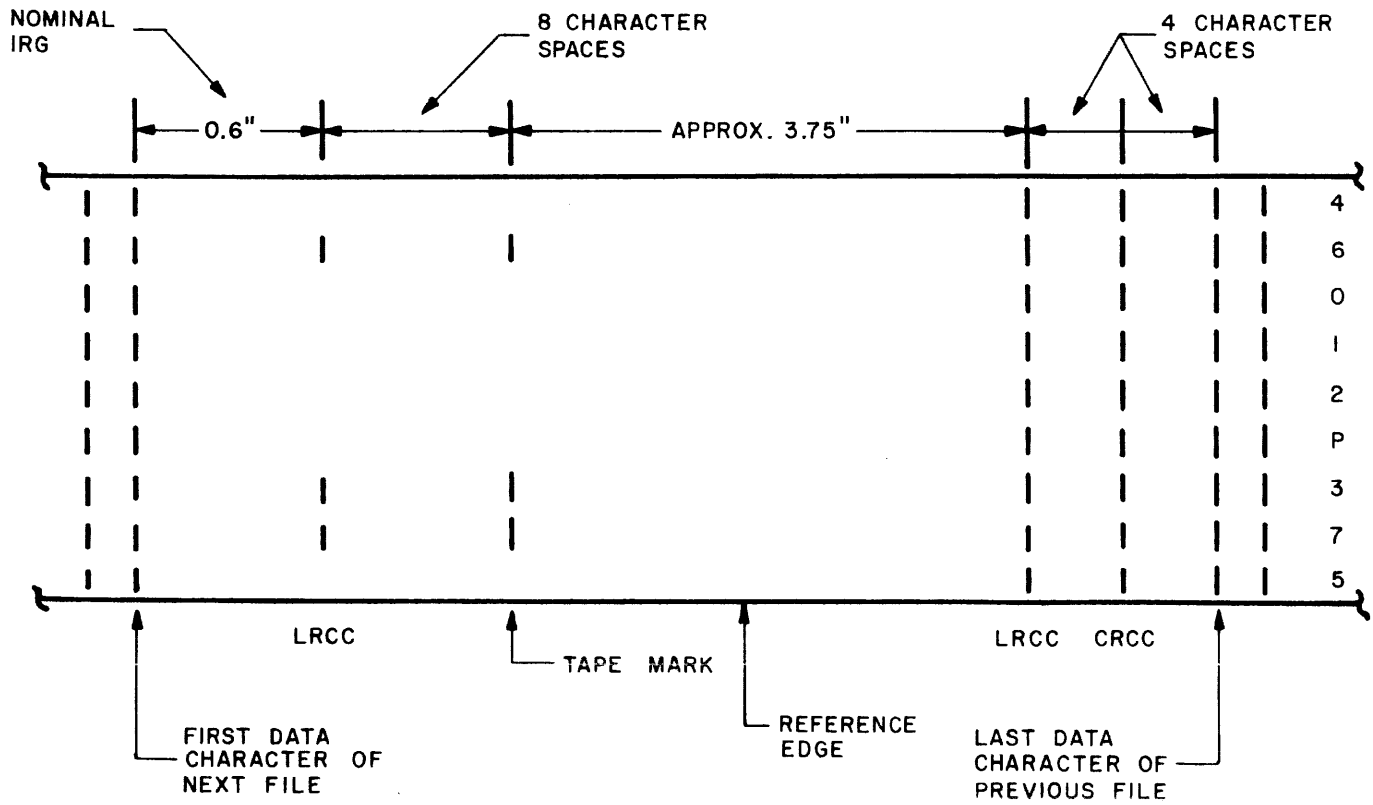


Figure 25. 7-Track File Gap Format



NOTE: TAPE VIEWED FROM MYLAR SIDE.

Figure 26. 9-Track File Gap Format

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 75 ips, it provides 45 to 55 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 plug-in unit that is directly cable-connected to the transport electronics printed circuit board. The tape cleaner, whose operation is entirely mechanical, is optimally 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 27 and 28 present a block diagram and timing diagram of the flow 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. The repetition rate is determined by the product of velocity (V) of the transport and the desired data packing density (D). The frame time therefore becomes the reciprocal of this product $\frac{1}{VD}$. 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 Figure 27). If a given data line is FALSE, the pulse is gated out.

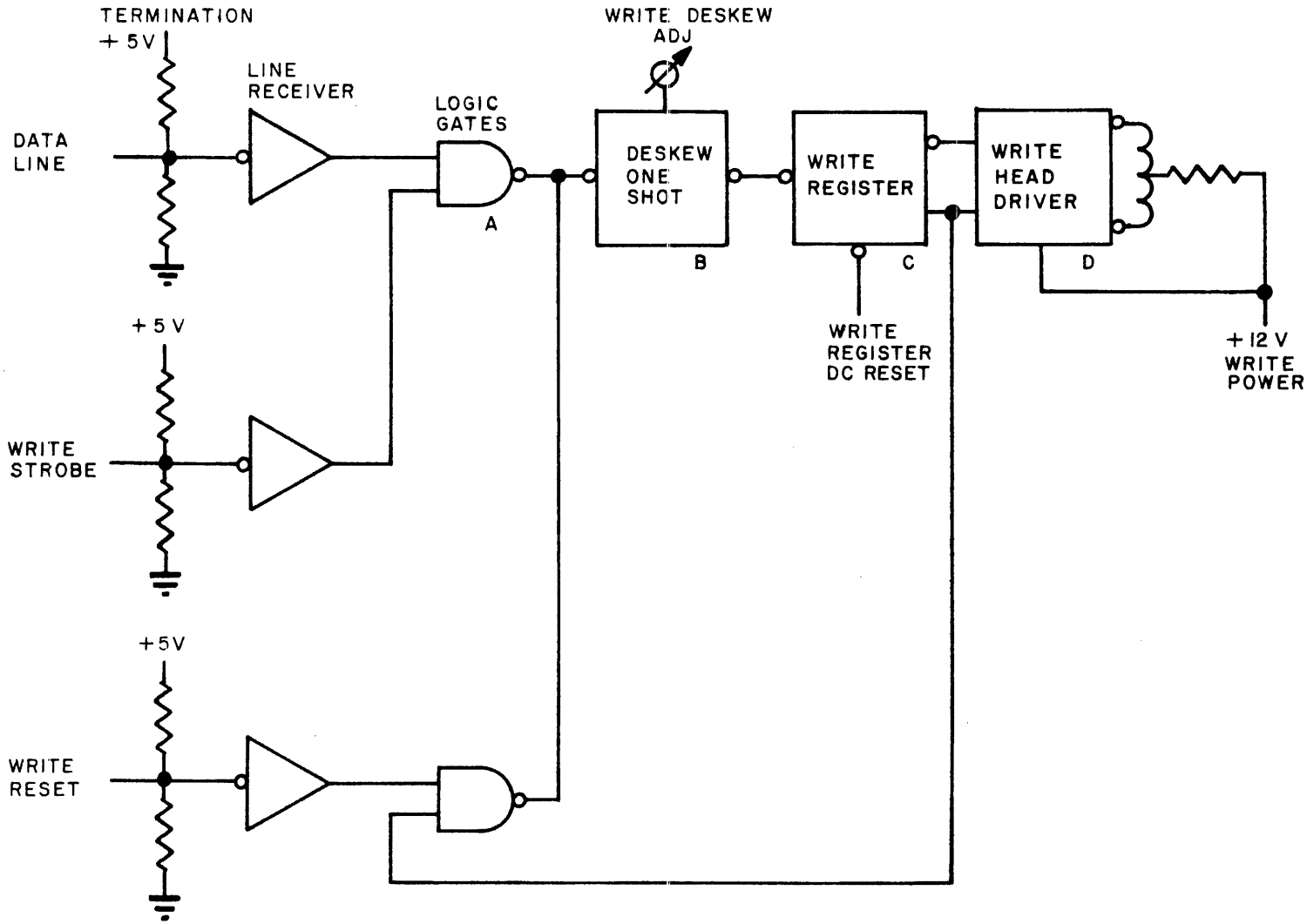


Figure 27. Write Data Flow, Dual Gap Systems

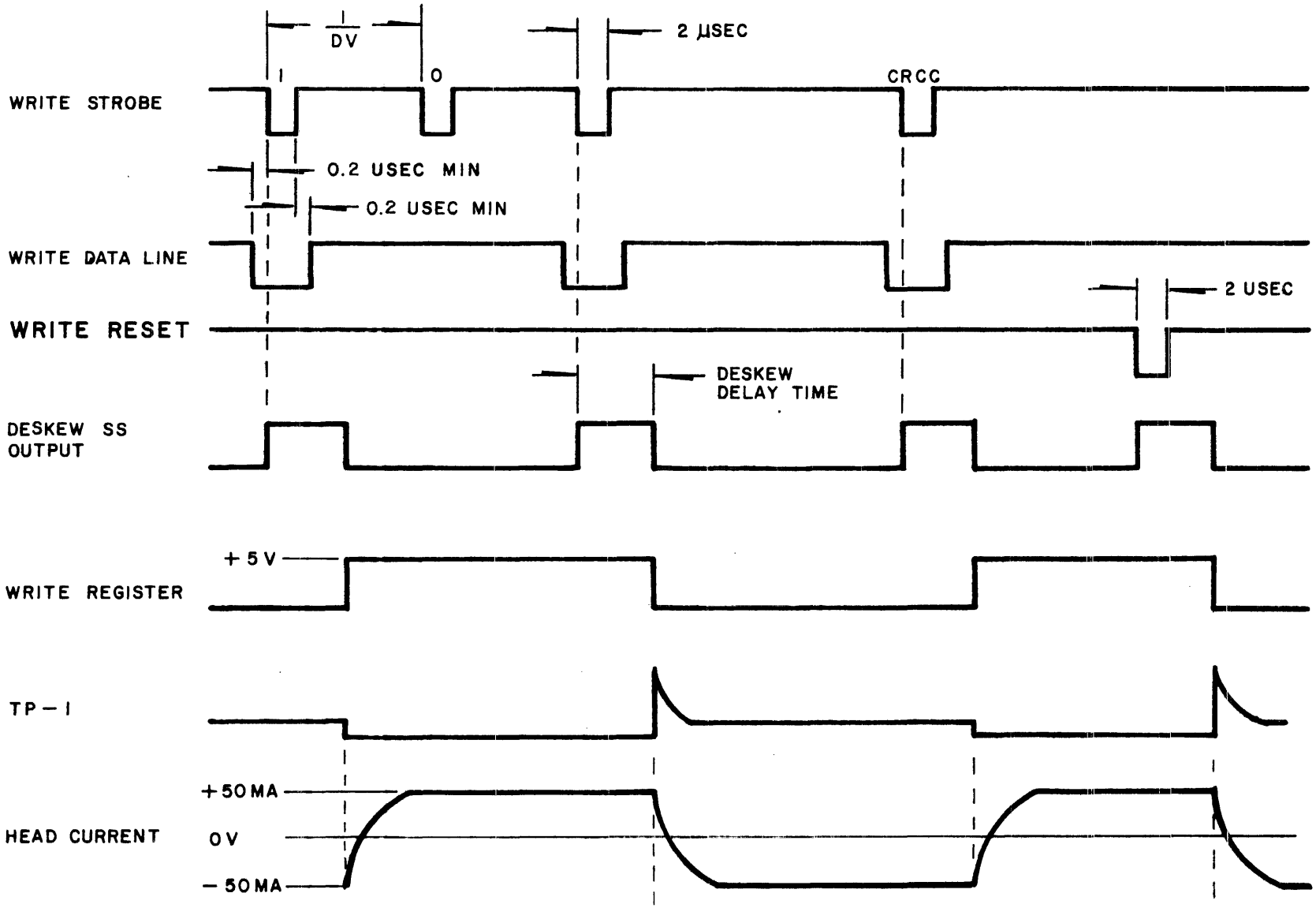


Figure 28. Write Data Flow Timing Diagram, Dual Gap Systems

At the block labeled B (Figure 27) 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 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 29). This is a NAND-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 30 presents a block diagram of the flow of read data through the system. (As in Figure 27, only one channel is indicated.) The read head generates a low-level analog signal of approximately 45 to 55 millivolts peak to peak at 75 ips. 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

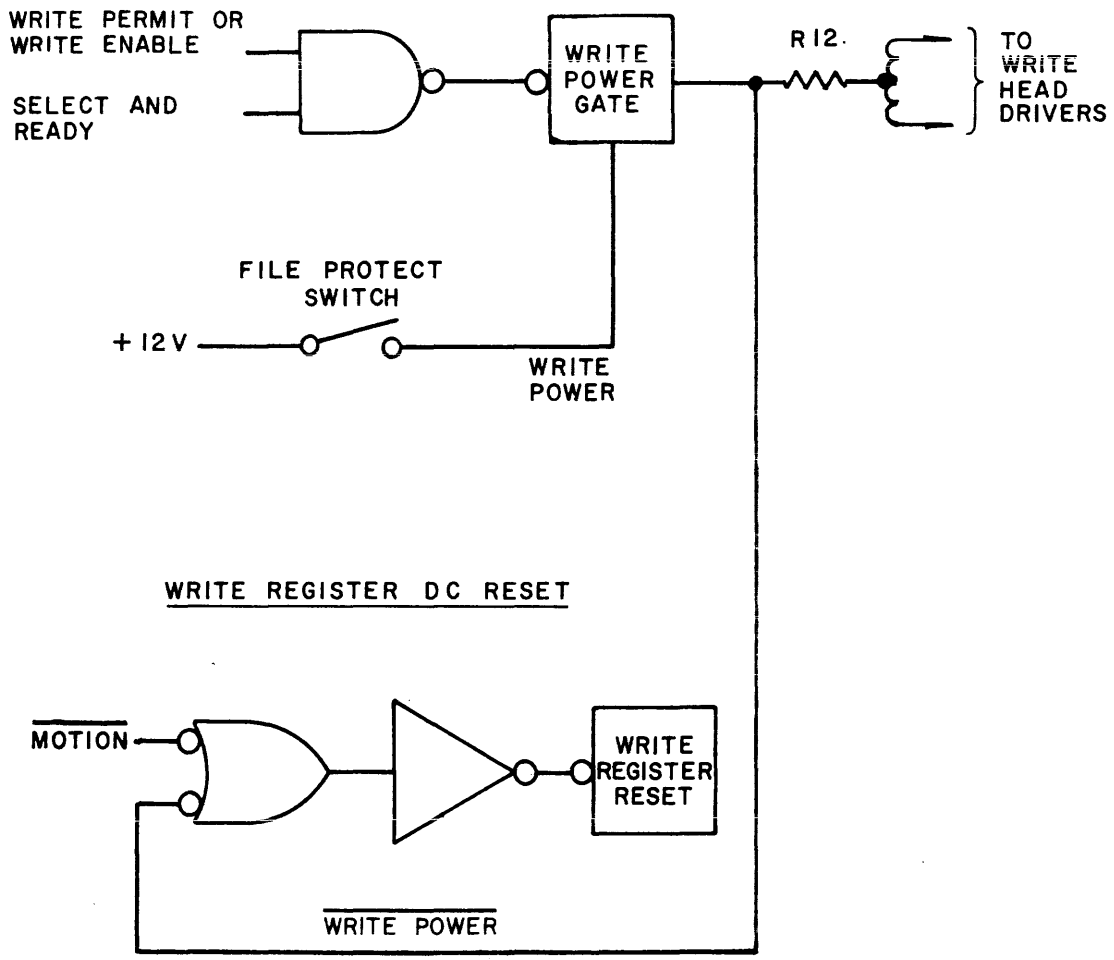


Figure 29. Write Power Gate and Write Register DC Reset, Dual Gap Systems

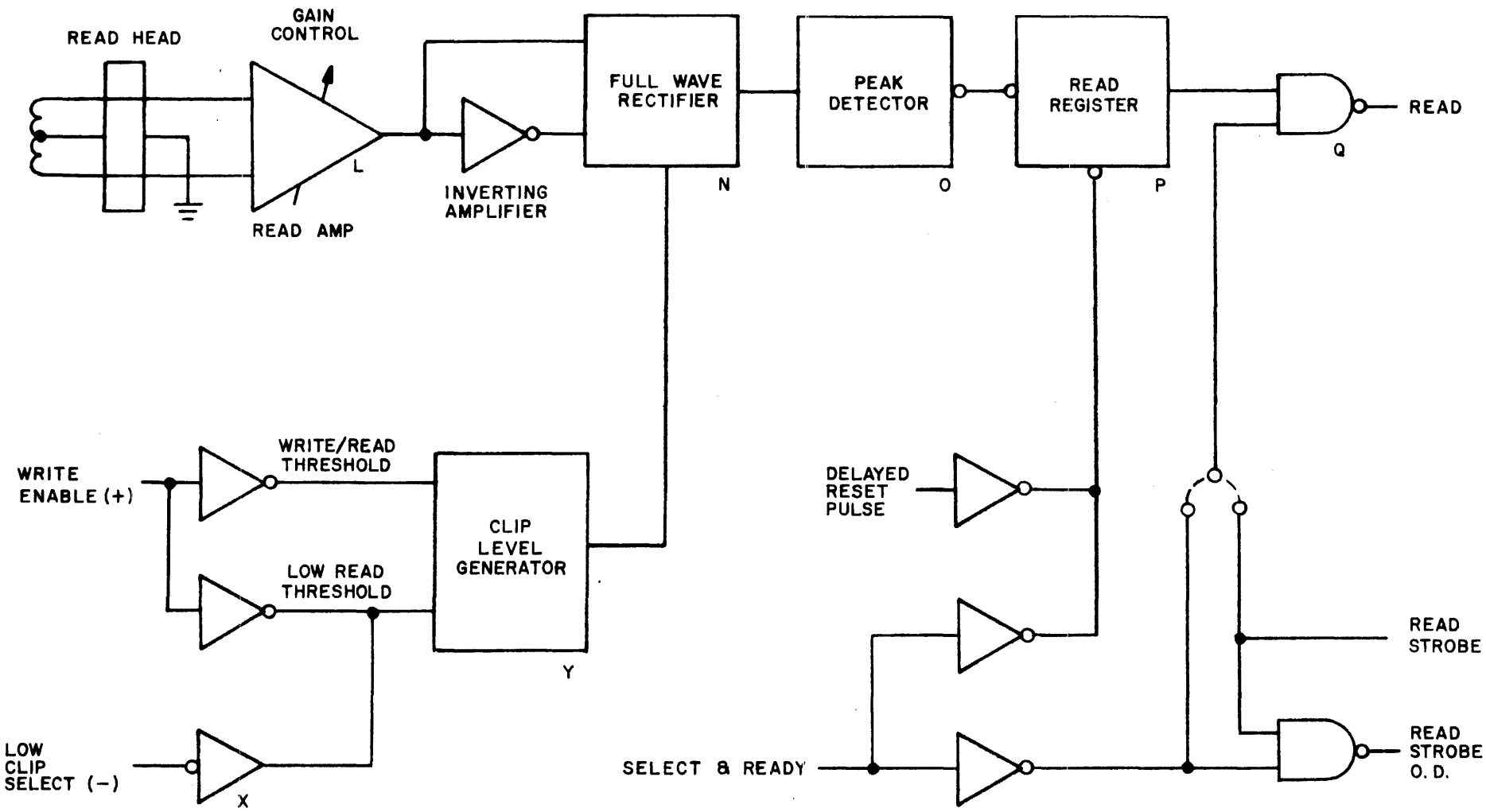


Figure 30. Read Data Flow, Dual Gap Systems

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. 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 11 (see Figure 31). 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. The frame time is defined as $\frac{1}{VD}$, where V is the tape unit velocity and D is the operating data density.

At the end of the variable time delay period, a read strobe pulse is generated (see the block labeled T in Fig. 31) 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.

A timing diagram for both read data flow and strobe generation is given in Figure 32.

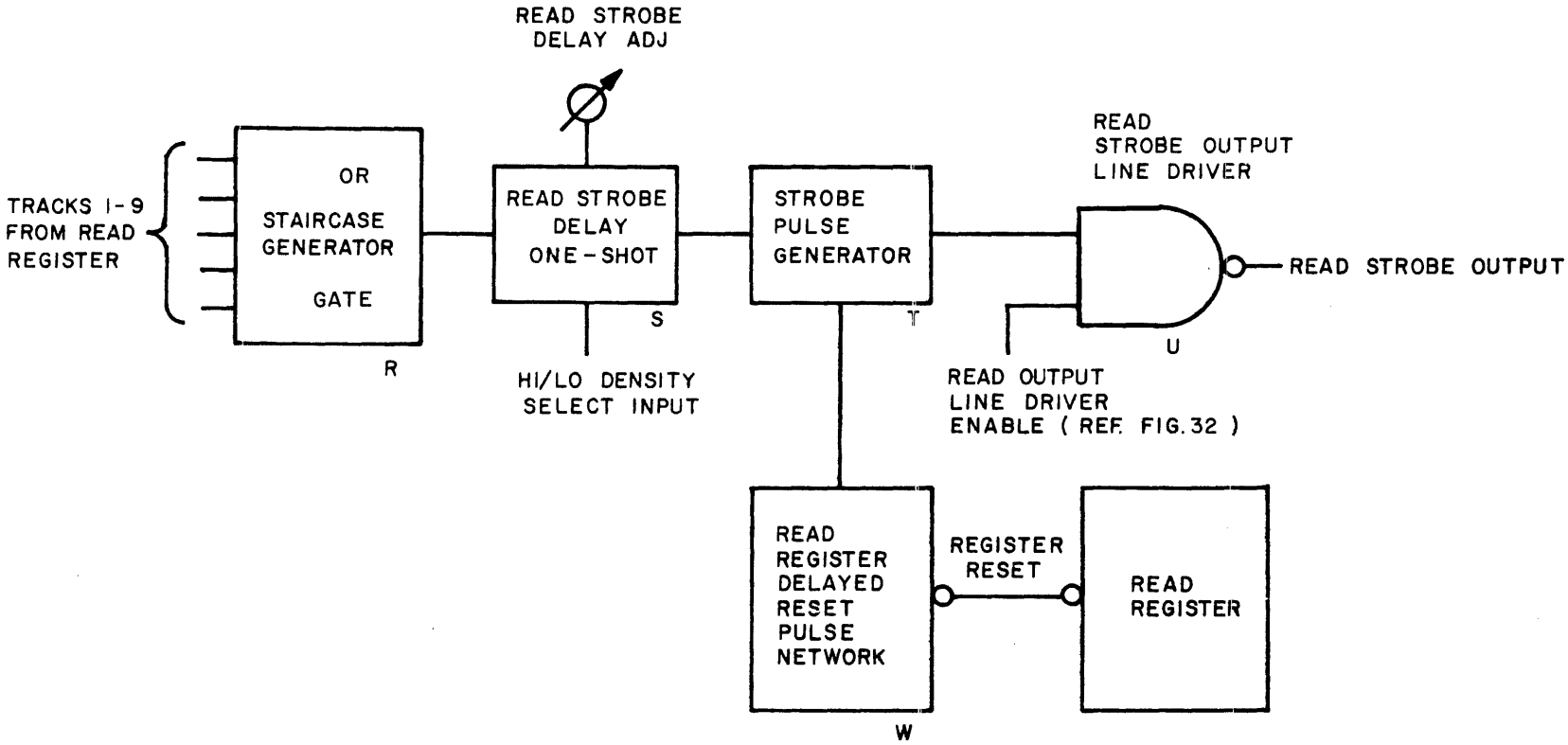


Figure 31. Read Strobe Generation Circuitry, Dual Gap Systems

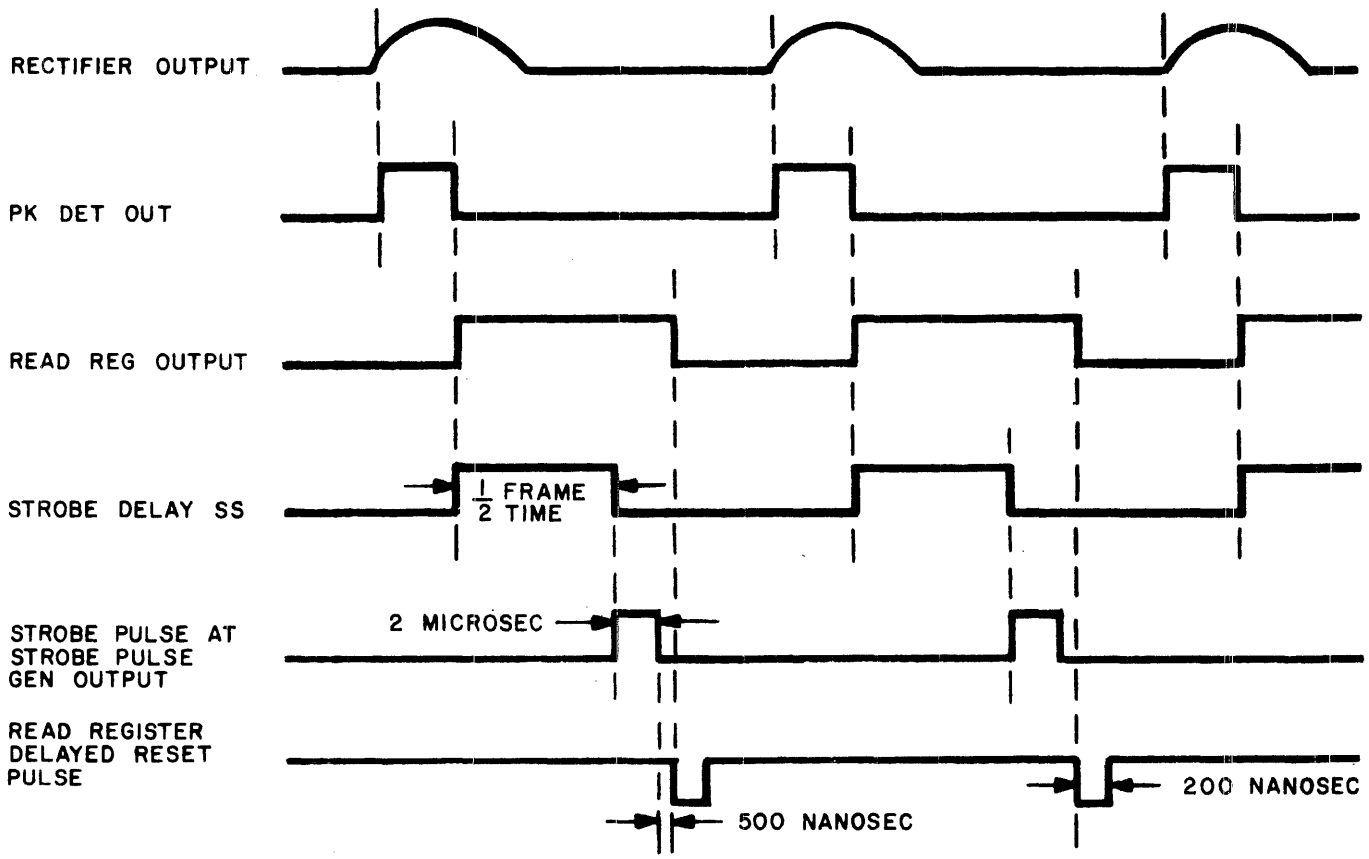


Figure 32. Timing Diagram of Read Data Flow and Strobe Generation, Dual Gap Systems

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. This function is normally tied TRUE on certain interfaces.

Clipping Level Circuitry. This circuitry, shown in Figure 30, generates the clipping levels through which the read signals must pass before reaching the peak detectors. In the write enable mode, approximately 45 percent 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 percent) 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.

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.

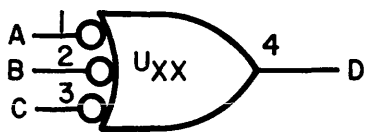
6.0 KEY TO LOGIC SYMBOLS

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:



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

LOGIC SYMBOL LOGIC EQUATION

Figure 33. Logic Symbol Example

Figure 33 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 produces 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:

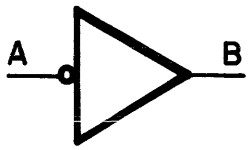
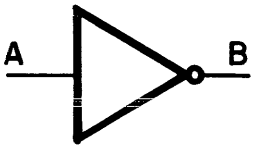
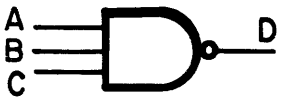
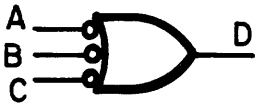
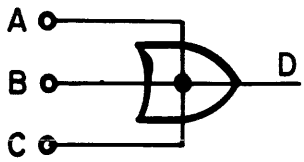
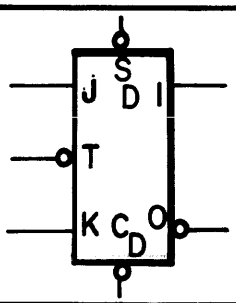
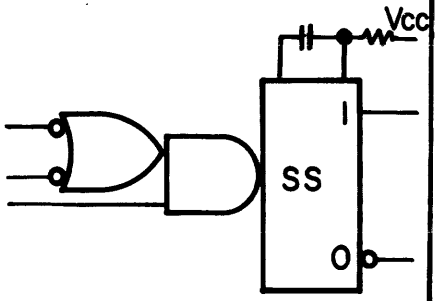
SYNCHRONOUS OPERATION

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	$B = \overline{A \cdot [DLY]}$

NOTE

The information contained in this section of the manual is not to be used as criteria for equipment acceptance verification. This section is to be used for Field Service Adjustments information.

SECTION VI

MAINTENANCE ON SITE

Before any Mod 11 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 11. 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 resonsibility 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 **Q-Tip applicators** IBM Tape Transport Cleaner, #453511 Brush - Transducer Hole, #100367 Screwdriver (medium) or Rod	
FOR THE SERVICE ENGINEER	
Equipment	Model or Type
Allen wrench set	For 4-40,6-32,8-32,and 10-32 cap screws
Allen wrench set	For 4-40,6-32, and 10-32 set screws
Open-end wrench	For 7/16-in. bolts
Long-nose pliers	
Screwdriver set	Phillips
Screwdriver set	Standard blade
Soldering aid	
Soldering iron	
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
Tote (or Tape Controller)	WANGCO P/N 200448
Vacuum Gauge (0-30"H_2O)	Marshaltown
OCP Switch Removal Tool	WANGCO P/N T00015
Scale - 12"	
Trimpot Adjustment Tool	
Gauge - Setting Roller Guide	WANGCO P/N T00032
Belt Tensiometer	Gates 5M Polyflex
Shims - Capstan Motor	WANGCO P/N 201032-001 & 002
Brush - Transducer Hole	WANGCO P/N 100367

Table 5. Suggested Schedule for Preventive Maintenance

	Maintenance Task	Interval (in operating hours)	Procedure Described in:
PERFORMED BY OPERATOR	Clean Head, Tape Cleaner, All guides, Vacuum chambers, Vacuum pocket, Chamber cover, and capstan	8 (Daily)	Section III
	Transducer Servo Bar	40	Section III
	Clean Entire Tape Unit Surface	(Approx. 4 months)	Section III
PERFORMED BY SERVICE ENGINEER	Transducer Servo Bar	(Approx. 6 months)	Section VI, Par. 2
	Clean Tape Cleaner Unit Clean Vacuum Chambers and Vacuum pocket	(as required)	Section VI, Par. 9.2
	Check Tape Tracking	2,000	
	Check Vacuum Motor Belt tension	5,000	Section VI, Par. 11
	Replace Vacuum Motor belt	10,000	Section VI, Par. 11
	Replace Reel Motor brushes	5,000	
	Replace Reel Motors	10,000	
	Replace Capstan Drive Assembly	10,000	Section VI, Par. 10.2

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 Servo Electronics module. The table below shows the voltages and corresponding test points. The voltages should be within ±20 percent of the specified nominal value. (See Figure B39 for test point locations.)

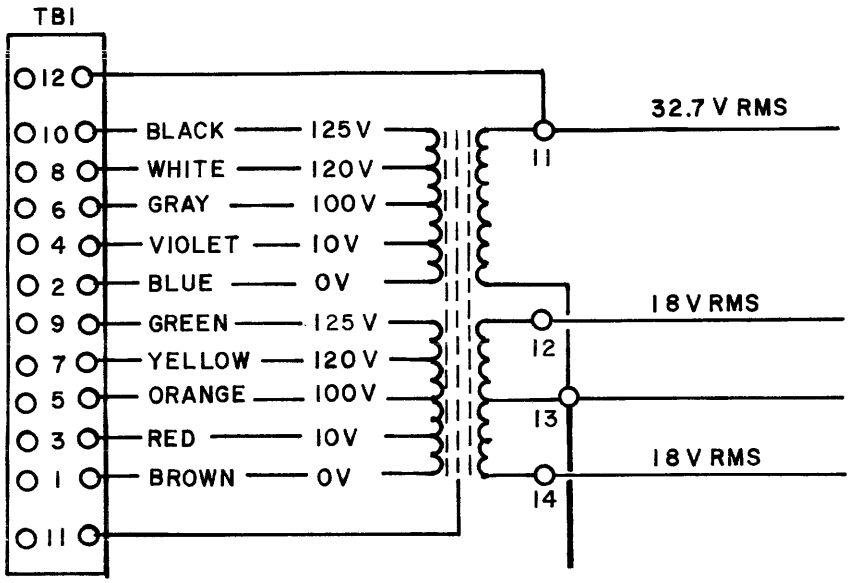
Voltage	Test Point
+44V	TP 17
-44V	TP 20
+24V	TP 18
-24V	TP 19

1.2 FUSES

Seven fuses, in the unregulated power supply, are located on the power supply subassembly. F1 is an 8 amp fuse in the hot side of the primary power line. F2 (5 amp), F3 (5 amp), F4 (10 amp) and F6 (10 amp) supply the arc suppressing diode network (located in the power supply), the servo amplifiers and the power supply regulators. F5 is a 4 amp fuse used to supply current to the +5 volt regulator line only. F7 is a 7.5 amp fuse in the capstan motor line.

1.3 TRANSFORMER TAPS

The Mod 11 tape transport can accept power from various voltage sources, depending on the power transformer primary connection chosen. Figure 34 shows the color coding of the transformer primary wires attached to the terminal strip TB1, which is located inside the transport cabinet and is mounted on top of the transformer.



LINE VOLTAGE	TBI-1 BRN	TBI-2 BLU	TBI-3 RED	TBI-4 V10	TBI-5 ORN	TBI-6 GRY	TBI-7 YEL	TBI-8 WHT	TBI-9 GRN	TBI-10 BLK
90			LINE B	JUMPER TO 3	LINE A	JUMPER TO 5				
100	LINE B	JUMPER TO 1			LINE A	JUMPER TO 5				
110			LINE B	JUMPER TO 3			LINE A	JUMPER TO 7		
115			LINE B	JUMPER TO 3					LINE A	JUMPER TO 9
120	LINE B	JUMPER TO 1					LINE A	JUMPER TO 7		
125	LINE B	JUMPER TO 1							LINE A	JUMPER TO 9
180			LINE B	JUMPER TO 5		LINE A				
200	LINE B	JUMPER TO 5				LINE A				
210		JUMPER TO 7	LINE B			LINE A				
220			LINE B	JUMPER TO 7				LINE A		
230			LINE B	JUMPER TO 9						LINE A
240	LINE B	JUMPER TO 7						LINE A		
250	LINE B	JUMPER TO 9								LINE A

Figure 34. Mod 11 Power Transformer Lead Identification

2. TRANSDUCER SERVO BAR MAINTENANCE

Every six months the following servo bar and cavity cleaning procedure should be followed:

1. Open vacuum chamber door by depressing, with a screw driver or other rod like object, the three spring latches located on the metal strip on the cover.

2. Remove chamber walls that partially cover the servo bars. These walls are fastened to the main casting with eleven #4 screws that are at the rear of the casting.

3. Remove the eight screws that hold each servo bar against the tape deck.

4. Clean the bars thoroughly, using IBM tape transport cleaner, P/N 453511, to be sure all particles of dirt art removed.

5. Clean the servo bar cavity in the tape deck, again using IBM tape transport cleaner, P/N 453511.

6. Reverse the order of instructions 1 and 2 to reassemble the bars and chamber walls.

3. OPENING OF TRANSPORT DECK

1. Turn unit power off at the control panel and disconnect the power cord, or use switch S1 located near the fuse bank.

2. Press in on the three fasteners located on the face of the chamber cover, this will allow the cover to be swung open.

3. Use a Phillip screw driver and turn the screw (located near the top of the file reel vacuum chamber) until it releases the panelock from the deck support bracket.

4. DECK OVERLAY REMOVAL

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

4.1 REMOVAL OF FIXED REEL

Remove the three screws (item 1, Figure 35) from the reel cover. Remove the reel (item 2, Figure 35).

4.2 REMOVAL OF OVERLAY

1. Swing open the vacuum chamber door.

2. Remove the read/write head assembly cover by pulling it in the direction perpendicular to the head plate.

3. Loosen, but do not remove the four overlay screws (item 3, Figure 35).

4. Support the overlay prior to total removal of the screws to eliminate possible damage.

5. Lift the overlay off.

5. TRANSPORT CONTROL LOGIC MODULE REPLACEMENT

The Transport Control Logic module can be removed by the following steps: (Refer to Figure 36.)

1. Turn unit power off at the control panel and disconnect the power cord, or use switch S1 located near the fuse bank.

2. Swing open the transport deck as described in subsection 3.

3. Remove all the connectors from the module, using care to avoid damaging the mating pins.

4. Remove the 5 captive screws (item 1, Figure 36). Be sure to support the assembly to prevent damage when the screws are removed. The module is now free to be removed.

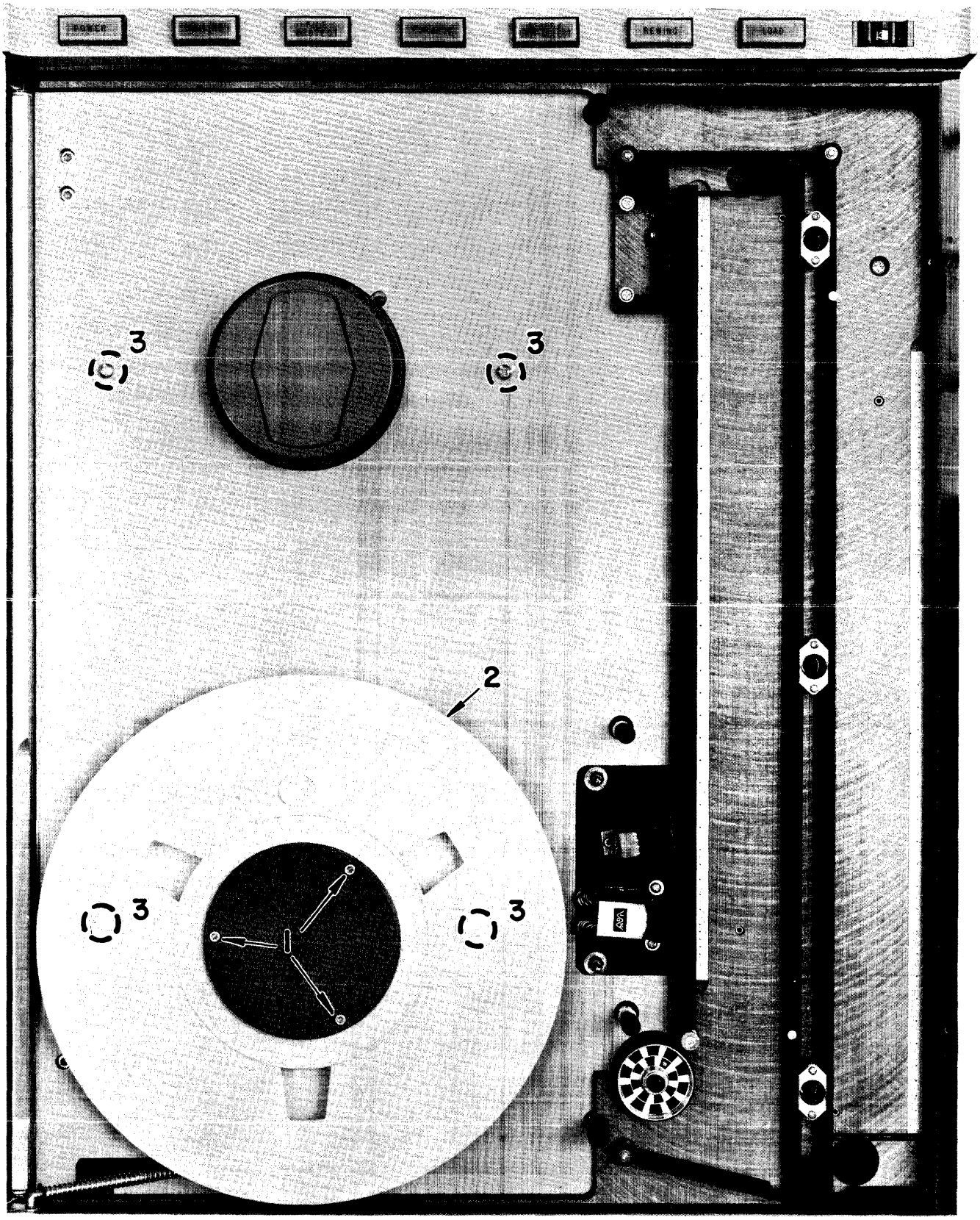


Figure 35. Deck Overlay Removal

6. SERVO ELECTRONICS MODULE REPLACEMENT

The Servo Electronics module can be removed by the following steps: (Refer to Figure 26.)

1. Turn unit power off at the control panel and disconnect the power cord, or use switch S1 located near the fuse bank.
2. Swing open the transport deck as described in subsection 3.
3. Remove all the connectors from the module using care to avoid damaging the mating pins.
4. Remove the 4 Phillip screws (item 2, Figure 26) connecting the module heatsink to the rear of cabinet. Be sure to support the assembly to prevent damage when removing the screws.
5. After installation of the new module, perform the Servo Electronics Adjustments described in subsection 17.

7. DATA ELECTRONICS MODULE REPLACEMENT

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

1. Turn unit power off at the control panel and disconnect the power cord, or use switch S1 located near the fuse bank.
2. Remove connectors P3 and P4. (Refer to Figure 37.)
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 screwdriver risks the possibility of breaking wires on the connectors.
4. While supporting the module to prevent damage, remove the 5 Captive screws (item 1, Figure 37) holding the module to the stand-offs.

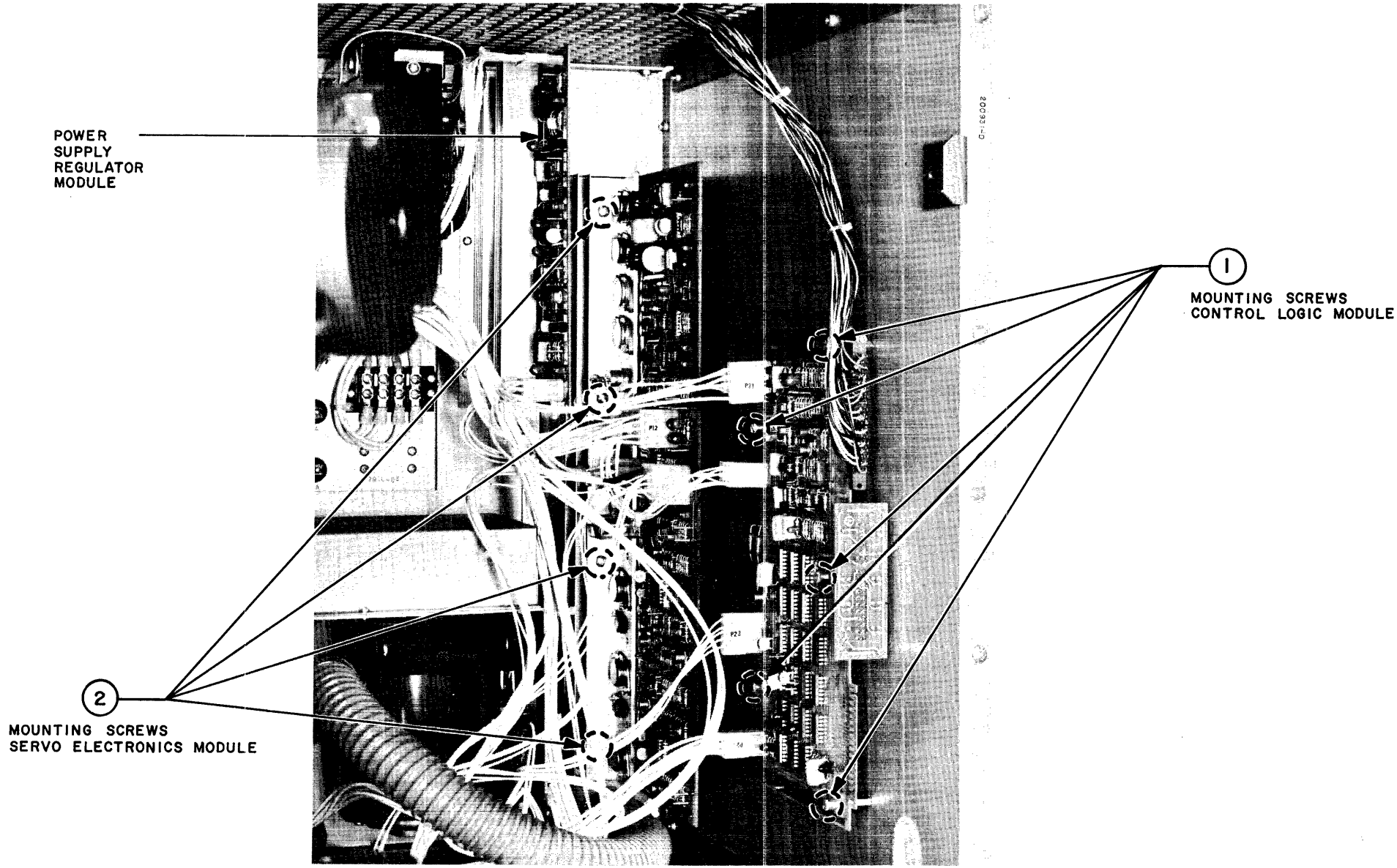


Figure 36. Transport Control Logic and Servo Electronics Module Replacement

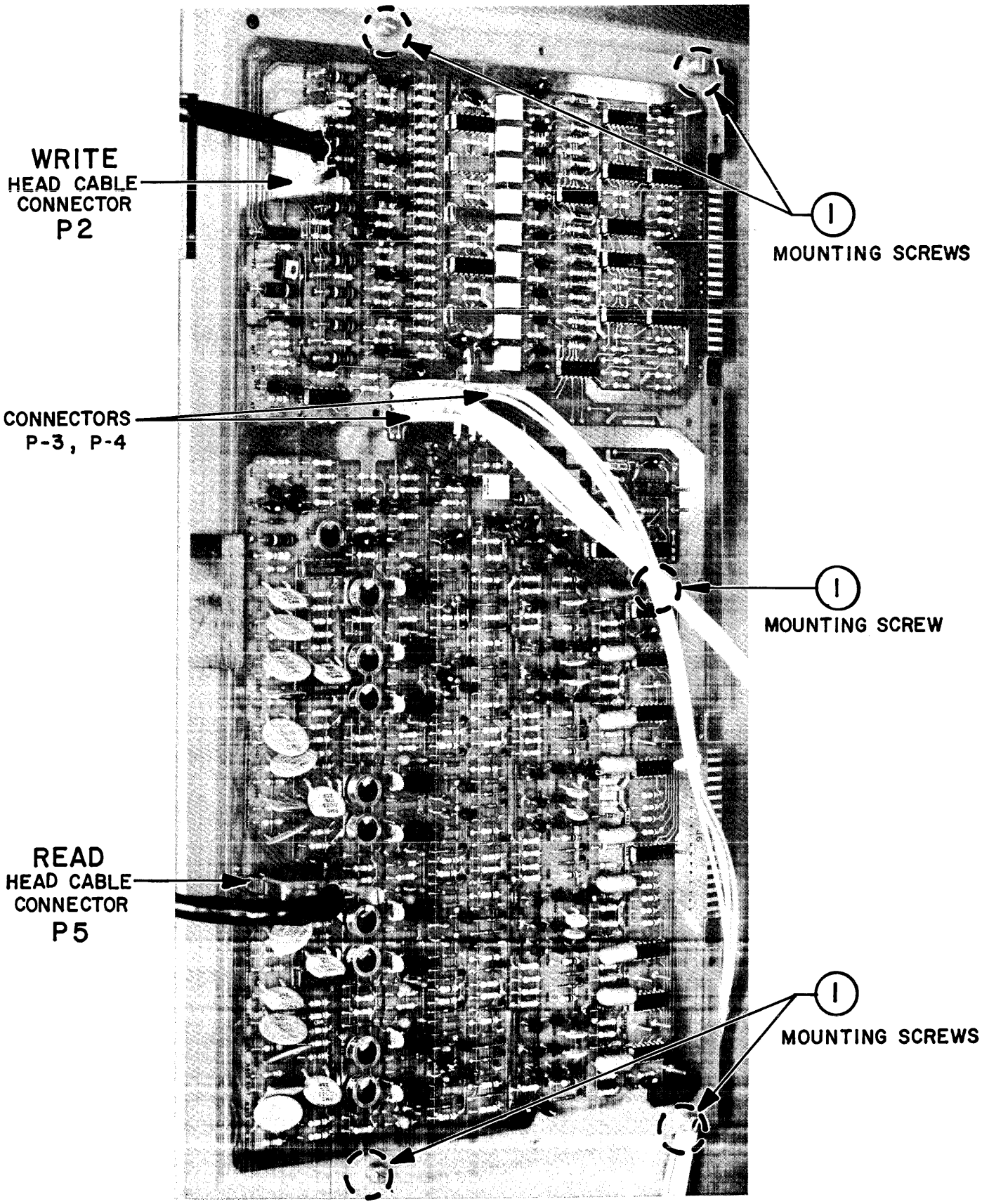


Figure 37. Data Electronics Module Replacement

5. Remove module by sliding it toward the rear of cabinet until it clears the module support.

6. After replacement of the new module, perform the adjustments described in the Data Electronics alignment section 18.

8. 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. (Refer to Figure 38.)

1. Turn unit power off at the control panel and disconnect the power cord, or use switch S1 located near the fuse bank.

2. Swing open the transport deck as described in subsection 3.

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

4. Removal of the switch is simplified through the use of WANGCO tool P/N T00015. Grasp the switch at the front of the panel and then insert the tool over the switch ears at the rear of the panel. The pressure applied by the tool will allow the switch to be easily removed.

5. Push the replacement switch firmly into position.

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

9. HEAD ASSEMBLY REPLACEMENT

The Read/Write head assembly 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.

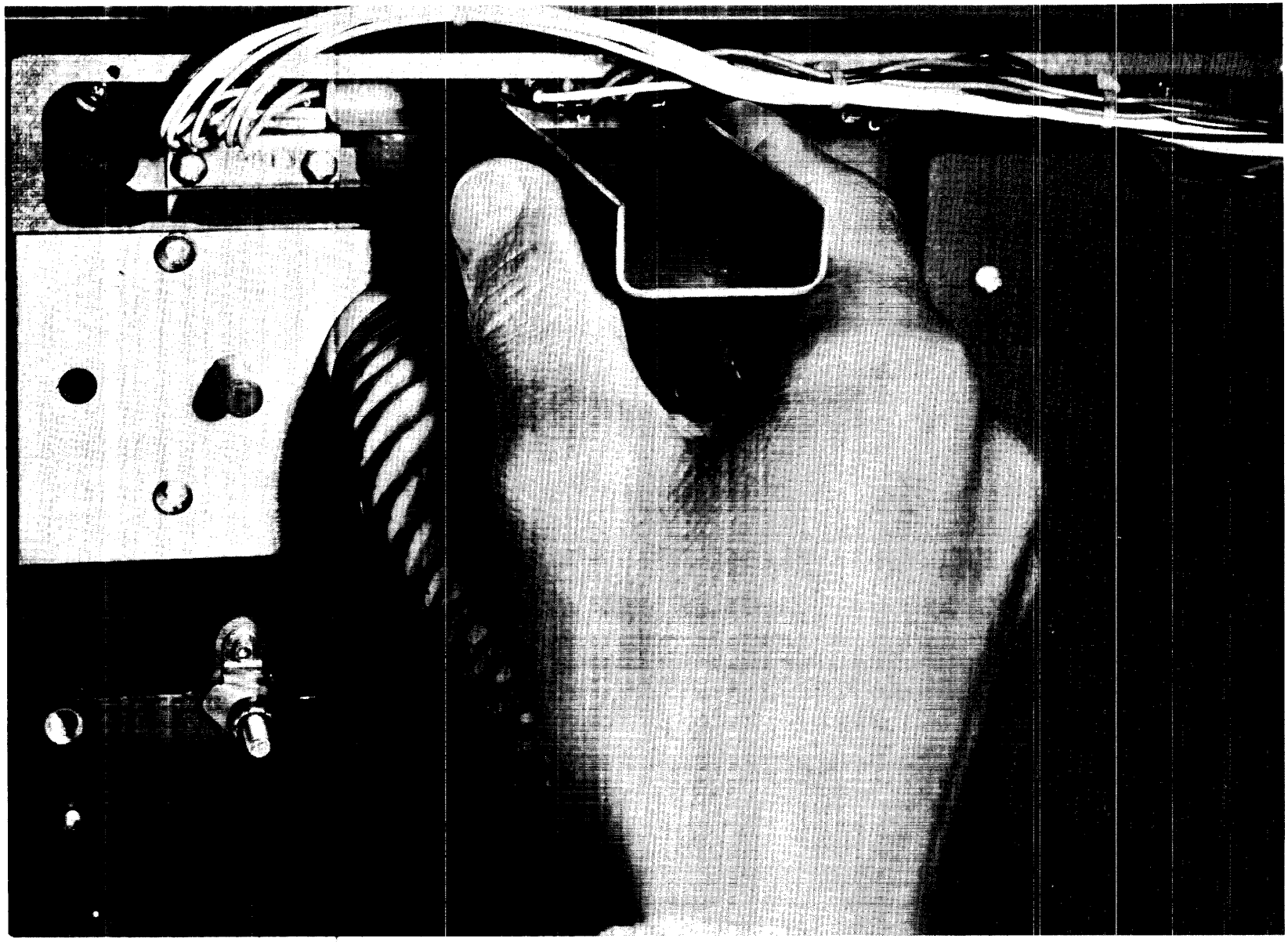


Figure 38. OCP Switch Replacement

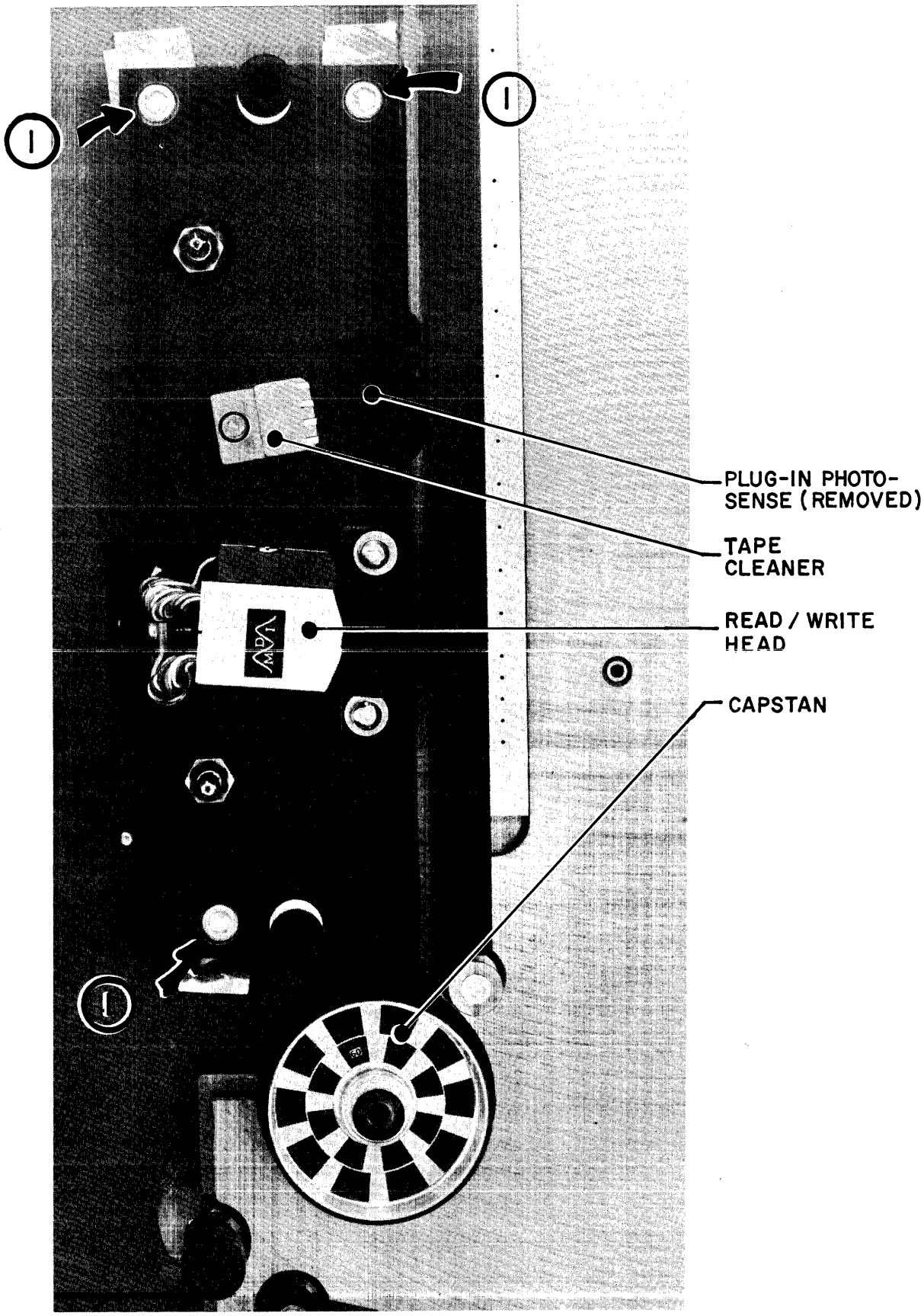


Figure 39. Head Assembly Replacement

1. Swing open the transport deck as described in subsection 3.

2. Remove the head connectors P2 and P5 (refer to Figure 37) from the Data Electronics module mounted on the left side of the transport box, using an appropriate size slot screw driver. Do not use fingers for this purpose so that the possibility of damaging connector wires is eliminated.

3. Remove the four cable clamps holding the cables to the transport casting.

4. Remove the overlay per section 4.

5. Remove the three large Allen screws (item 1, Figure 39) fastening the head plate assembly to the deck. Be sure to support the head assembly to prevent damage when removing the screws. Observe the location of shims under the head plate and replace in the same position when installing the new head plate.

6. Remove head assembly.

7. Following the same procedure in reverse, install new head assembly.

8. Perform the tape tracking check described in subsection 13.1

9. Perform the Data Electronics alignment described in subsection 18.

9.1 REPLACING THE PHOTOSENSE UNIT

The EOT/BOT photosense unit is a plug-in type. To replace unit, slide it off the connectors and install new one. Refer to subsection 17.1 for the adjustment procedure.

9.2 CLEANING THE TAPE CLEANER

1. Brush away the loose particles.

2. Clean the blades thoroughly with IBM cleaner P/N 453511 using Q-Tip applicator.

10. CAPSTAN AND CAPSTAN MOTOR REPLACEMENT

10.1 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 subsection 17.2.

10.2 CAPSTAN DRIVE ASSEMBLY

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

1. Turn unit power off at the control panel and disconnect the power cord, or use switch S1 located near the fuse bank.
2. Remove the capstan (see subsection 10.1).
3. Remove the tachometer plug P9 from the Servo Electronics module. Remove the tie wraps so the plug wires are free to move.
4. Note the position of the (+) and (-) power leads and then remove the leads.
5. Remove the four Phillips screws holding the motor to the transport deck. Remove the shims between the deck and the motor. Remove the motor.
6. Replace the motor and install capstan.
7. Plug the tachometer lead P9 into the Servo Electronics module.
8. Connect up the (+) and (-) leads to the motor terminals.
9. Perform the adjustments for speed and start/stop ramps as described in subsection 17.2.
10. Machine must be retracked according to 13.2.

10.3 CALCULATING CAPSTAN SPEED ERROR

The 50/60 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 25, 37.5 and 75 ips only. The error from nominal for the mentioned speeds is:

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

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%, readjust speed per paragraph 17.2.

11. VACUUM BLOWER BELT REPLACEMENT

1. Turn unit power off at the control panel and disconnect the power cord, or use switch S1 located near the fuse bank.

2. Swing open the transport deck.

3. Remove the 5 Phillips screws (item 1, Figure 40) securing the blower cover. Remove cover.

4. Loosen the 4 Allen screws (item 2, Figure 40) securing the mounting plate. Slide the motor toward the blower assembly enough to allow the belt to be removed. (Access to these screws is gained through the 3 holes in the motor pulley.)

5. Install new belt with the gear teeth facing outward.

6. Using a belt tension tool as shown in Figure 40, adjust the belt tension for 5 pounds of tension when measured with the Gates 5M tensionmeter.

12. GUIDE ROLLER BEARING REPLACEMENT

Roller guide bearings, which control tape motion to and from the head, can be replaced without destroying preset tracking adjustment if appropriate care is exercised. (See Figure 41.)

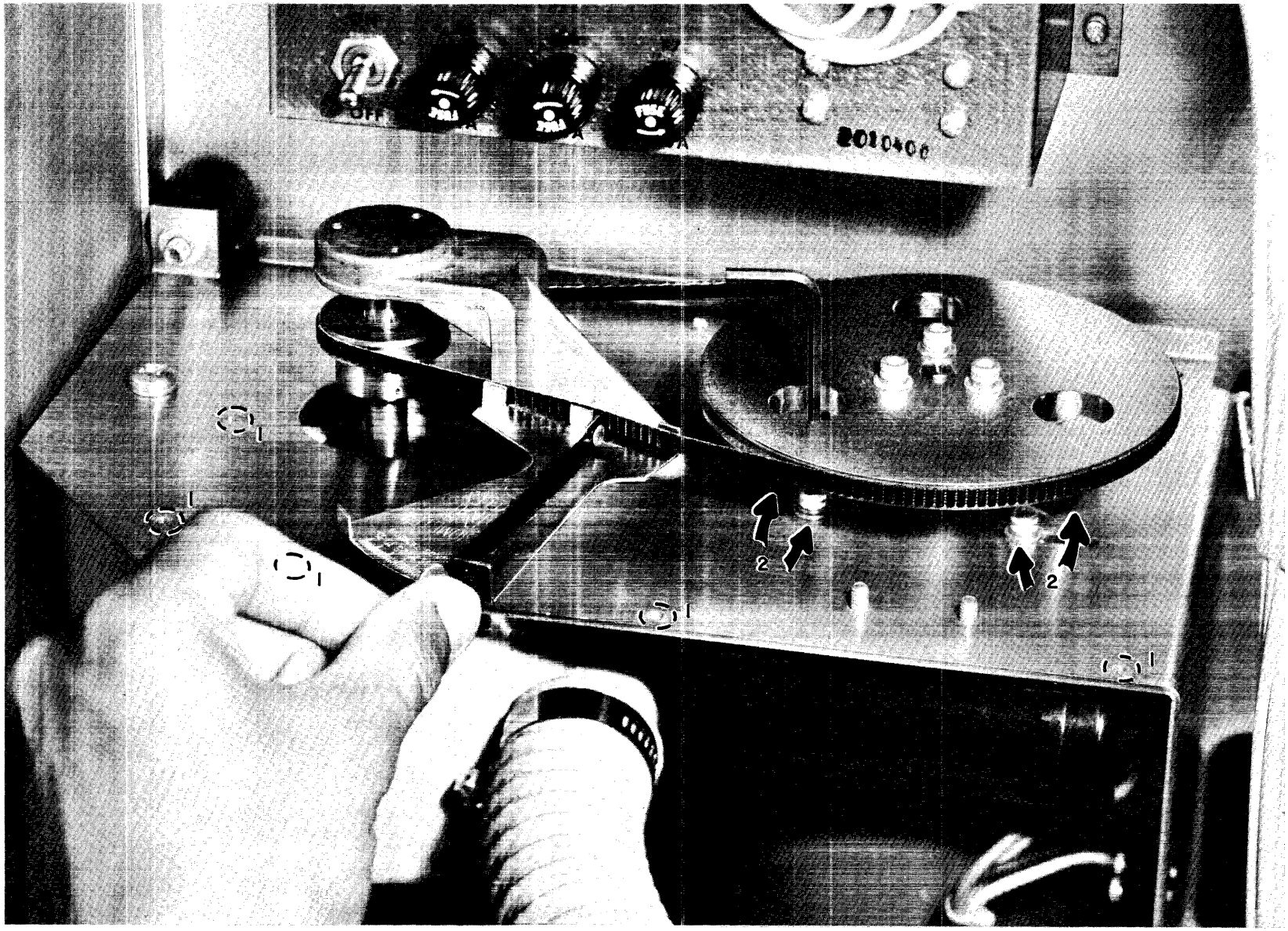


Figure 40. Vacuum Blower Belt Adjustment

1. Note the position of each part when disassembling the roller guide. During reassembly each part must be positioned in the same manner as removed.

2. For the roller guide in Figure 41A remove the retaining ring, item 1, at the shaft end and remove the guide. For the roller guide in Figure 41B the socket head screw, item 11, holding the cap in place must be loosened first to access the retaining ring.

3. Insert new bearing(s).

4. Replace the roller guide.

5. When replacing item 10, maintain .015 inch clearance with item 5, to ensure the drum turns freely.

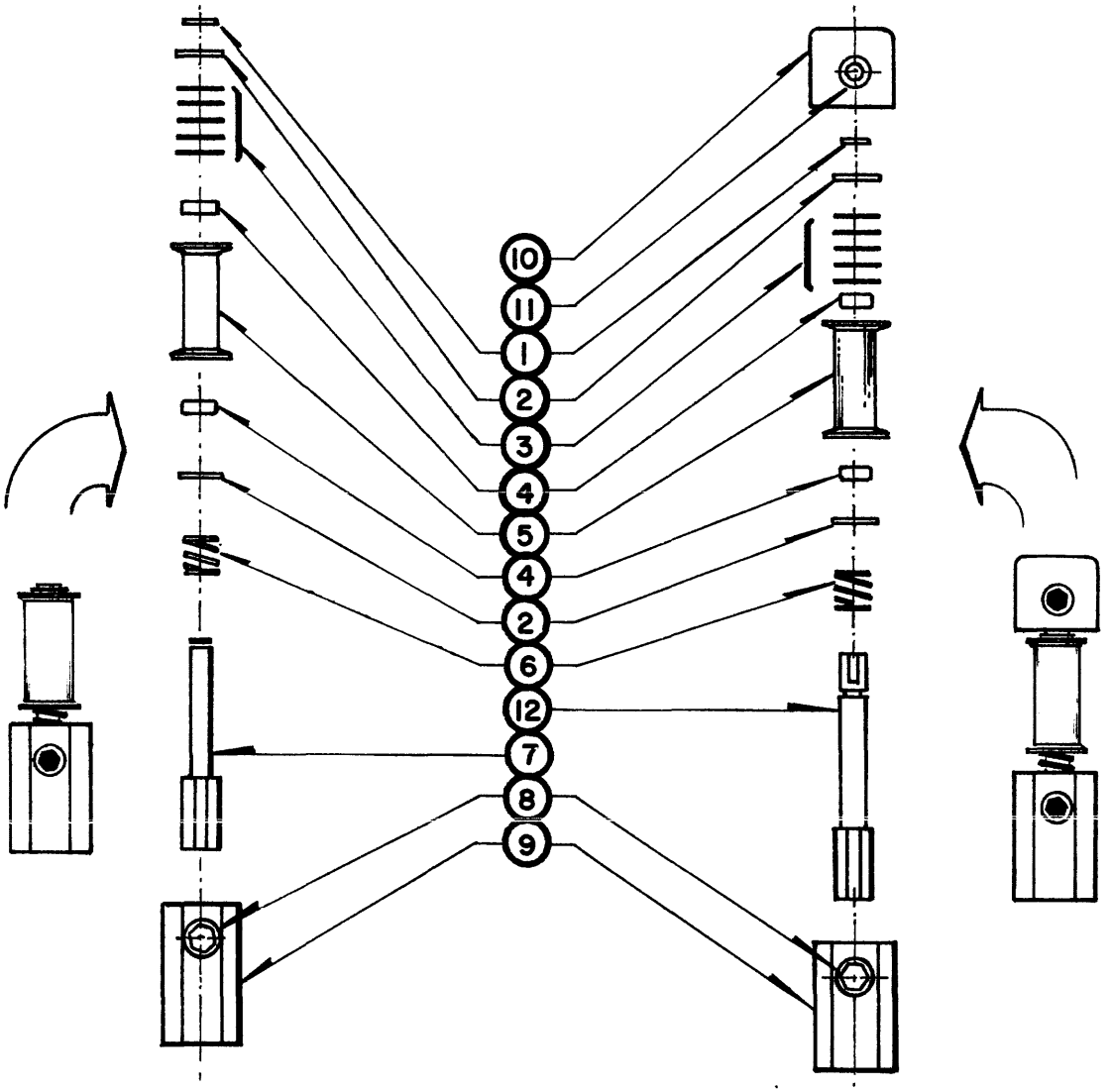
6. The mechanical alignment of these guides is accomplished through the use of a height gauge (WANGCO P/N T00032), the use of which is illustrated in Figure 42.

   The guides are to be set to .504/503 inches from the chamber base to the upper guiding edge of the roller guide.

7. To adjust guides (in Figure 41B) loosen the socket head screw, item 8, and adjust for proper indicator reading. To adjust guides, (in Figure 41A), remove the retaining ring and add or remove shim as required for correct indicator reading.

13. TAPE TRACKING

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, as well as 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 retracking is found to be required, it is necessary to afterwards check the Read Stack Azimuth alignment per the procedure described in paragraph 13.3.



(A) Deck Mounting Guide 201100

(B) Deck Mounting Guide-Loading 201101

Figure 41. Tape Guide Diagram

Item No.	Description	WANGCO P/N	No. Required
1	Ring Retaining External	100132-001	1
2	Washer, Shim	200077-001	2
3	Shim, Deck Mounting Guide	201033-001	5
4	Bearing Roller	100006-001	2
5	Drum, Guide	201041	1
6	Spring	200156	1
7	Shaft, Roller Guide	201045	1
8	Screw, Set Socket Head 6-32 x 1/8	100049-302	1
9	Stand-off	201047	1
10	Cap, Loading Deck Mtg. Guide	201046	1
11	Screw, Set Socket Head 4-40 x 1/8	100049-202	1
12	Shaft, Loading Deck Mtg. Guide	701044	1

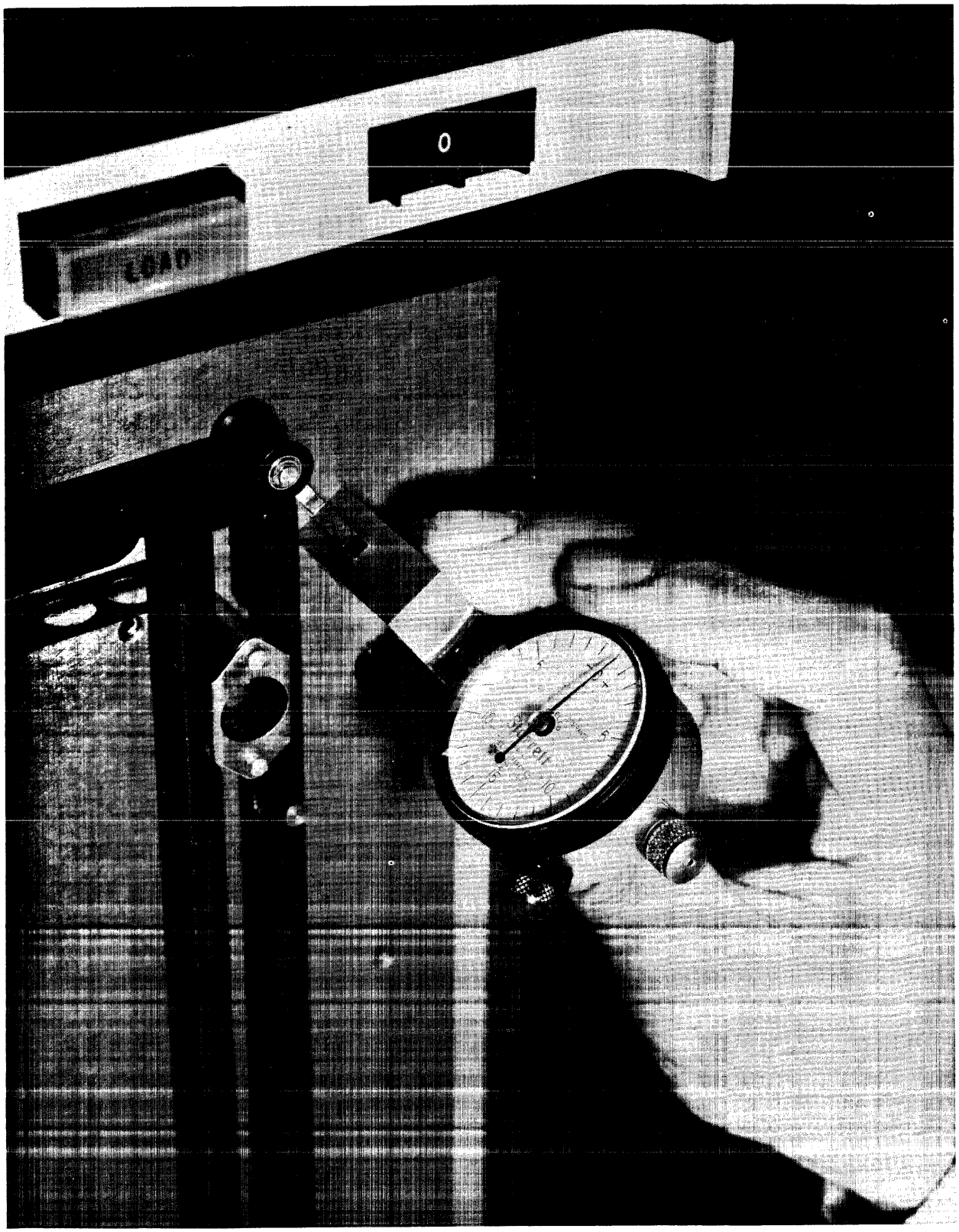


Figure 42. Roller Guide Adjustment

The following tracking procedure assumes that there is no gross misalignment of guiding elements which would cause tape edge damage. All roller guides should be set to .504/503 inches from the chamber base to the upper guiding edge of the roller guide.

13.1 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 these 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 on mechanical alignments and mechanical tolerance buildups, 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 x10 probes; also required is a master skew tape.

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 - 1 μsec/cm

2. Place Channel 1 scope probe and trigger probe on the test point corresponding to the head 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 tape and run tape in the forward direction under remote control (use off-line tester-tote, if available). Record T_1 (μsec). Run tape in the reverse direction and record T_2. (See Figure 43.) 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 43.

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

$$T_2 = -T_1 \pm \frac{50}{V} \text{ μsec}$$

where V represents the transport speed. If this condition is not met, the transport must be realigned. Refer to subsection 13.2 (Tape Tracking Alignment).

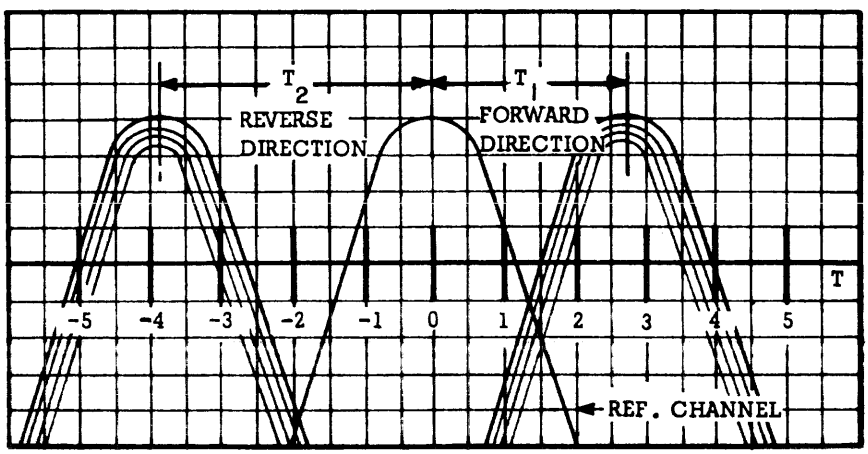


Figure 43. Checking Tape Tracking, Desired Waveform

13.2 TAPE TRACKING ALIGNMENT

Before tracking, all roller guides and fixed guides must be set .504/503 inches, measured from the chamber base to the upper guiding edge of the roller guide. Refer to Figure 44 when performing the following steps.

1. There should be no shims under head guides A and B or under capstan motor bosses "X" and "Y" (see Fig.44).

2. Using a master skew tape observe the displacement between the outside head tracks in the forward direction only. Determine which guide i.e., A or B should be shimmed to correct azimuth. This may be done by pressing against the tape edge near guide A or B. If pressing against the tape edge at Guide A improves the azimuth, then guide B requires shims and visa versa. Refer to Read Stack Azimuth Correction in section 13.3.

3. Different procedures are followed depending on whether:

   (Case a) Guide A is shimmed
   (Case b) Guide B is shimmed
   (Case c) No shims are required

Case (a)

1. Using a master skew tape observe the displacement between the outside head tracks while running tape in the forward direction.

2. Add shims P/N 200203 under guide A until there is zero forward skew.

3. Remove the ceramic guiding washers from guide B, replacing the guide body and cap only.

4. Using master skew tape observe the displacement between outer tracks while running tape in the reverse direction.

5. By pressing against the tape edge near guide B determine whether pushing the tape towards the deck or away from the deck reduces the reverse skew.

6. If the skew improves by pushing the tape towards the deck then the capstan motor needs to be shimmed under bosses "X". If skew improves by pushing away from the deck, motor needs to be shimmed under bosses "Y".

7. The number of shims depend on the magnitude of skew. However there must be an equal number of shims under each of either the "X" or "Y" bosses. Shims to be used are P/N 201032-001 (2 Mil), P/N 201032-002 (1 Mil).

8. After shimming for zero reverse skew replace ceramic guiding washers at guide B. Both forward and reverse skew should now be close to zero.

Case (b)

1. Remove the ceramic guiding washers from guide B, replacing the guide body and cap only.

2. Follow same procedure for capstan shimming as in case (a).

3. Replace ceramic guiding washers at guide B.

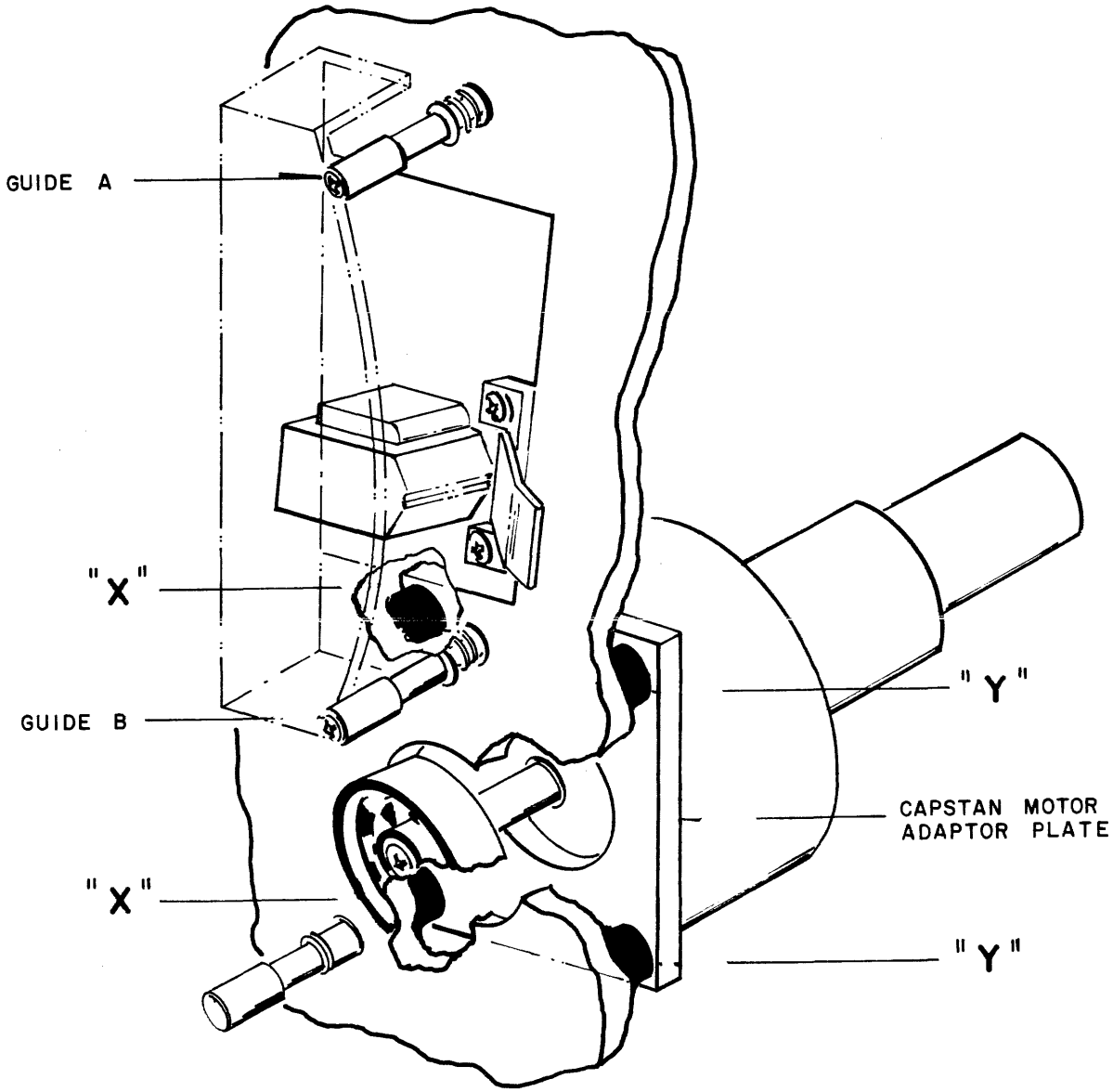
4. Using master skew tape observe the forward skew.

5. Shim guide B for zero forward skew.

6. Both forward and reverse skew should now be close to zero.

Case (c)

Same as Case (a) except neither head guide has to be shimmed.



NOTE: ITEMS "X" AND "Y" ARE CAPSTAN MOTOR BOSSES

Figure 44. Tracking Adjustment

13.3 READ STACK AZIMUTH MEASUREMENT AND CORRECTION

This adjustment is required when the read/write head assembly, capstan or capstan motor have been replaced. It is also used in conjunction with tape tracking alignment in section 13.2. Its purpose is to ensure that the read 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 re-assembling the guide on the base plate. The shims are 0.0002 inch thick and one shim will correct for 15 micro-inches of skew.

1. Scope controls:

   a) Mode--Chop.

   b) Sensitivity--0 maximum, both channels.

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

   d) Sweeptime--Sufficient resolution so that the read signal peaks are well defined.

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 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 the read signal peaks (see Figure 4 5). If the time displacement corresponds to a distance less than 25 micro-inches (1 μsec at 25 ips), no shimming is required:

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

If the signal on Channel 2 lags the reference channel, and 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:

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

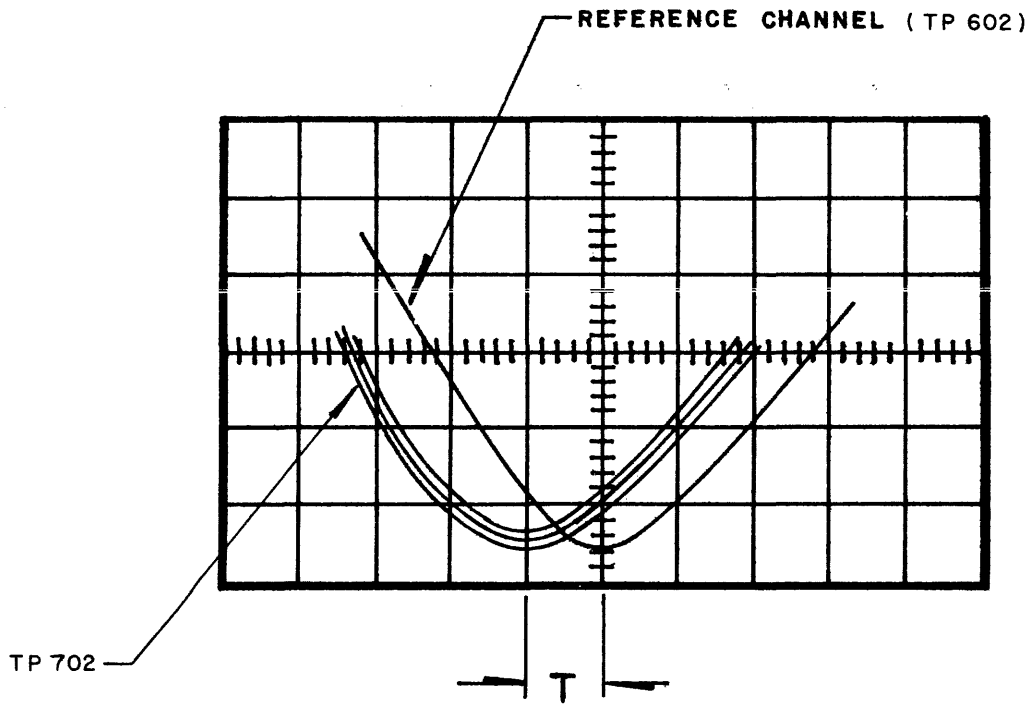


Figure 45. Read Head Signal Peaks, Dual Gap Systems

Number of Shims	Time Displacement for Speed Indicated (μsec)			
	25 ips	37.5 ips	45 ips	75 ips
1	0.4 - 0.9	0.3 - 0.6	0.2 - 0.5	0.1 - 0.3
2	1.0 - 1.5	0.7 - 1.0	0.6 - 0.9	0.31-0.50
3	1.6 - 2.1	1.1 - 1.4	1.0 - 1.2	0.51-0.70
4	2.2 - 2.7	1.5 - 1.8	1.3 - 1.5	0.71-0.90
5	2.8 - 3.3	1.9 - 2.2	1.6 - 1.8	0.91-1.10
6	3.4 - 3.9	2.3 - 2.6	1.9 - 2.2	1.11-1.30
7	4.0 - 4.5	2.7 - 3.0	2.3 - 2.5	1.31-1.50
8	4.6 - 5.1	3.1 - 3.4	2.6 - 2.8	1.51-1.70

Shim Table for Standard Tape Speeds

5. If the signal on Channel 2 leads the reference channel, 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 micro-inches.

7. Measure and record the static data staircase using the master skew tape and utilizing the method described in subsection 18.7. This data will later be used to compare with the results of that section.

14. VACUUM CHAMBER PRESSURE ADJUSTMENT

14.1 TAPE TENSION

The tape tension is proportional to the chamber vacuum. A vacuum of 30 inches of water produces 8 ounces of tape tension.

1. Load a reel of tape on the deck. If the transducers are to be aligned next, use the continuous tape loop described in Section 15, step 1.

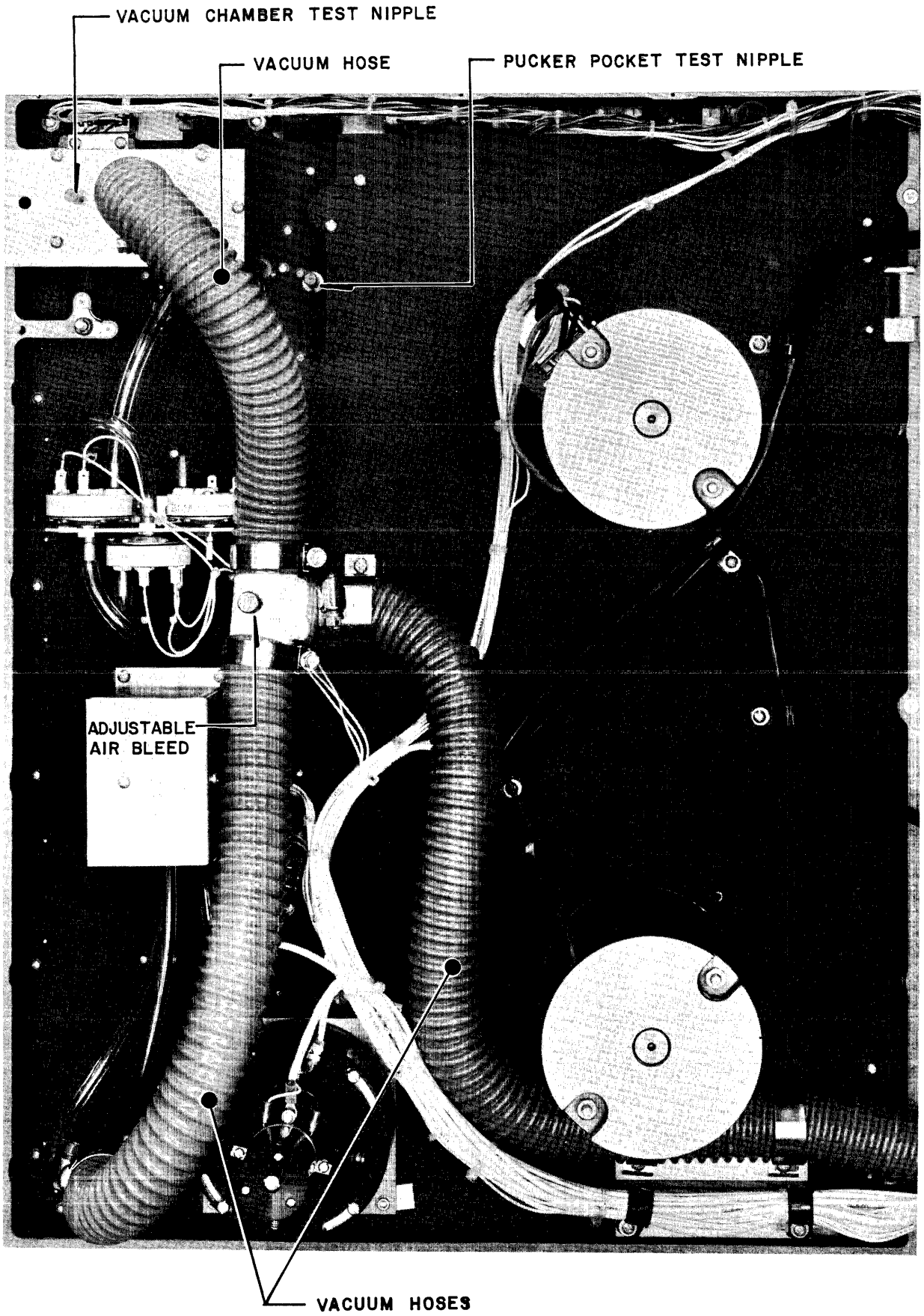


Figure 46. Vacuum Adjustment

2. Connect a vacuum gauge to the test nipple. See Figure 46.

3. Set the vacuum by means of the adjustable air bleed as shown in Figure 46. The vacuum pressure in the chambers shall be set to 30 ± ¼ inches of water. Cap the nipple after removing the gauge.

14.2 VACUUM POCKET

Insure that the chamber pressure (paragraph 14.1) is set correctly before making the following adjustment. The drive must be loaded as in 14.1.

1. Connect a vacuum gauge to the test nipple. See Figure 46.

2. Read the gauge. If vacuum is not between 10 and 12 inches of H_2O, lift the tape from the vacuum pocket, loosen the screw and adjust the metal slide (refer to Figure 47) by moving it up to increase vacuum, or down to decrease vacuum. Put the tape back into the vacuum pocket and check the gauge again. Repeat until proper vacuum is reached. Tighten the screw. Remove the meter and cap the nipple.

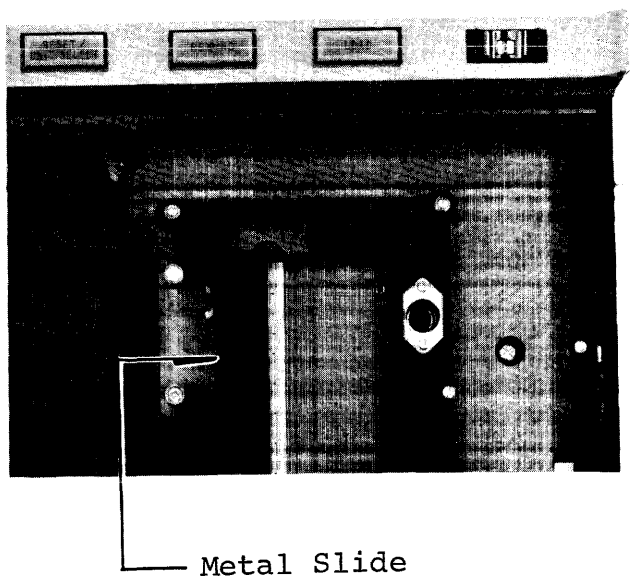


Figure 47. Pucker Pocket Adjustment

15. TRANSDUCER ALIGNMENT

1. Ensure that the source vacuum has been set up as described in section 14.1 before making this adjustment. Thread a continuous loop of standard tape (106.25 inches in circumference) around the tape path as shown in Figure 48. This loop can be made up by cutting a piece of tape 106.25 inches long and splicing the two ends together.

2. Load the drive and then hold the RESET switch depressed for 10 seconds to keep the capstan from turning.

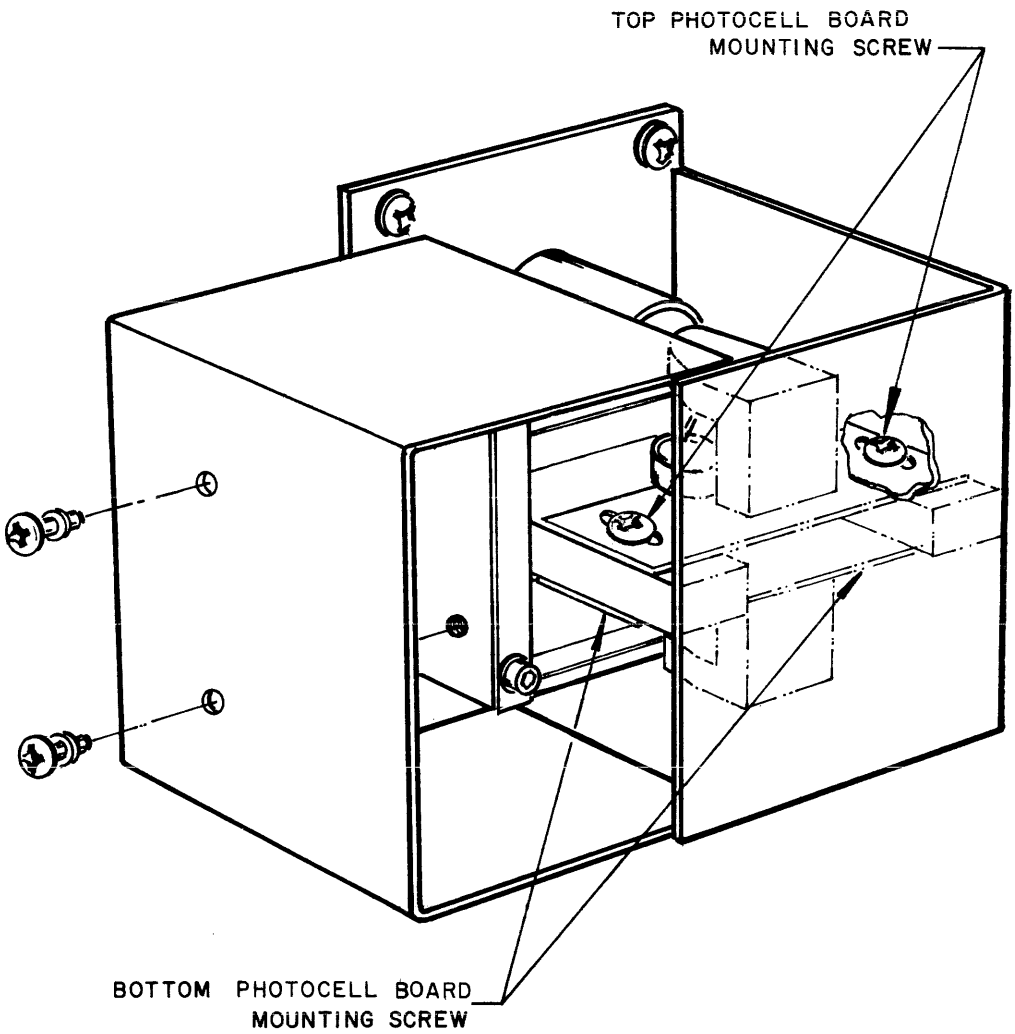
3. Using a scale and measuring on the face of the chamber cover, set the loop in the fixed chamber to 7.30 inches below the top of the chamber grill as shown in Figure 49. Both chambers are now at zero position.

4. The adjustments in this step and the next are made internal to the transducer assembly enclosure (see illustration on page VI-33) which is mounted on the rear of the transport casting, as shown in Figure 57. With the oscilloscope, monitor TP14 (FILE) located on the Servo Electronics module. Loosen the two screws fastening the bottom photocell board and reposition it until a 0 ±0.1V level is obtained. Tighten down the two screws.

5. Monitor TP11 (FIXED) located on the Servo Electronics module, and move the upper photocell board until a 0 ±0.1V level is obtained. Tighten the photocell board down.

NOTE: Tightening of the screws on the photocell boards may shift the setting; therefore, recheck the test points after the screws have been tightened.

6. Remove the continuous tape loop.



Transducer Assembly Enclosure

(For location of Transducer Assembly, see Figure 57)

16. REGULATED POWER SUPPLY ADJUSTMENTS

There are four regulated voltages, +12 volts, +5 volts, -12 volts and -5 volts. The +12 volt, +5 volt, and -12 volt regulators are independently adjustable. The -5 volt supply is slaved to the +5 volt, which it tracks to within ±4 percent. The adjustable supplies will hold an accuracy of ±5 percent for all variations of load, line, life and setting when adjusted with a meter having a ±2 percent accuracy or better. The adjustments are located on the regulator board. (See Figure B-3). Potentiometer adjustments and test points are given in the following table:

Adjust Voltage to:	With Potentiometer	Connect Meter Between Test Points
+12V	R18	TP4(+) & TP3(-)
+ 5V	R8	TP2(+) & TP3(-)
- 5V	—	TP1(-) & TP3(+)
-12V	R24	TP5(-) & TP3(+)

17. SERVO ELECTRONICS MODULE ADJUSTMENT

NOTE: Prior to making the Servo Electronics Adjustments, insure that the 5 volt regulated supplies are correctly adjusted. (See section 16). Also verify that the vacuum is correctly set. (See section 14).

17.1 EOT/BOT PHOTOSENSE ADJUSTMENT

1. Connect a voltmeter between test point 7 and ground. (Refer to Figure B-25).

2. Adjust potentiometer R191 so that the voltmeter reads 0.0V ± 0.15V while tape is loaded on the transport but neither photosense tab is being sensed.

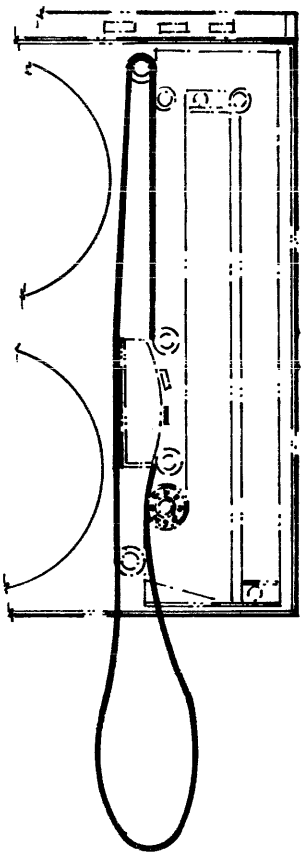


Figure 48. Mounting the Tape Loop

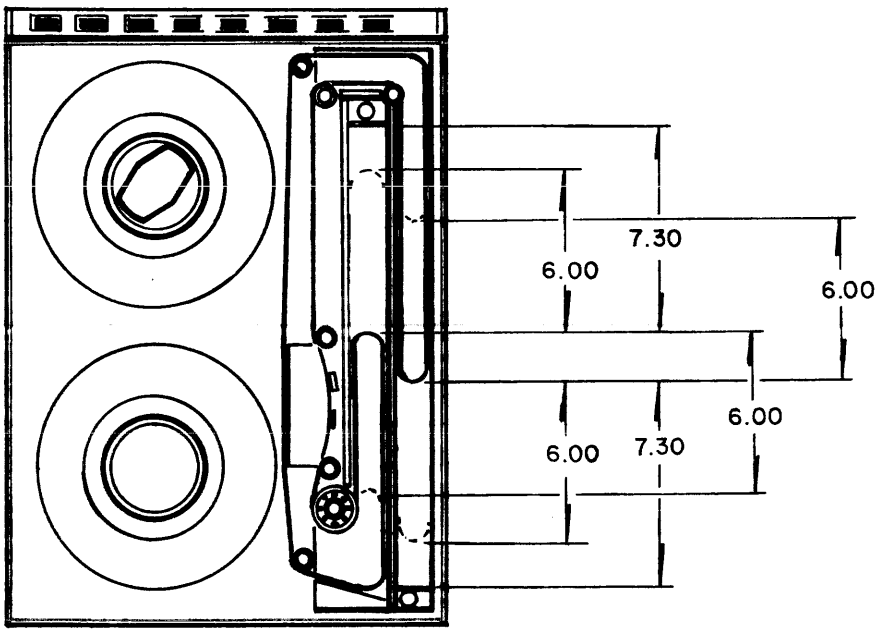


Figure 49. Chamber Adjustment

17.2 CAPSTAN SERVO ADJUSTMENT

17.2.1 Offset

1. Connect a voltmeter between test point 6 and ground (refer to Figure B-25).

2. Adjust the offset control potentiometer R38 so that the voltmeter reads 0 ±0.100V.

17.2.2 Forward Motor Speed

The strobe disc is mounted inside the face 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 tape transports operating at 25, 37.5 and 75 ips, while running the unit in the forward direction under manual control, illuminate the capstan with the corresponding AC light (such as fluorescent) and adjust R11 for a stationary pattern on the strobe disc.

2. For all other speeds, using an IBM skew tape adjust the potentiometer for a pulse repetition period shown below. This will be observed at TP3 on the Data Electronics module. (Refer to Figure B-27).

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

where S is machine speed.

17.2.3 Reverse Motor Speed

Connect an exerciser capable of making the transport run both continuous and start/stop forward and reverse programs to the customer logic input on the control electronic board.

1. Refer to the procedure in step 1 (Forward Motor Speed), while using the exerciser to run the tape in reverse, and adjust potentiometer R12.

2. Duplicate the procedure in step 2 (Forward Motor Speed) while using the exerciser to run tape in reverse and adjusting potentiometer R12.

17.2.4 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 TP5 on the transport control logic board (Figure B-23) and monitor the tach signal at TP5 on the servo amplifier board (Figure B-25).

3. Adjust R20 on the servo amplifier board to make the ramp come to ground in the time given by the following equation, after the start of the sweep.

$$T = \frac{380}{S} - 0.5$$

where T is the stop ramp in milliseconds and S is the operating speed of the transport in ips.

Since the tachometer signal is grounded, consider the ramp to be at ground when the projection of the straight portion of the signal has crossed the ground level. (Refer to Figure 50).

Reverse Stop Ramp Time:

1. Initiate a start/stop reverse motion program.

2. Using the same procedure as outlined in step 2 of Forward Stop Ramp Time paragraph above, adjust potentiometer R19 for the same stop ramp time established in step 3 of the procedure.

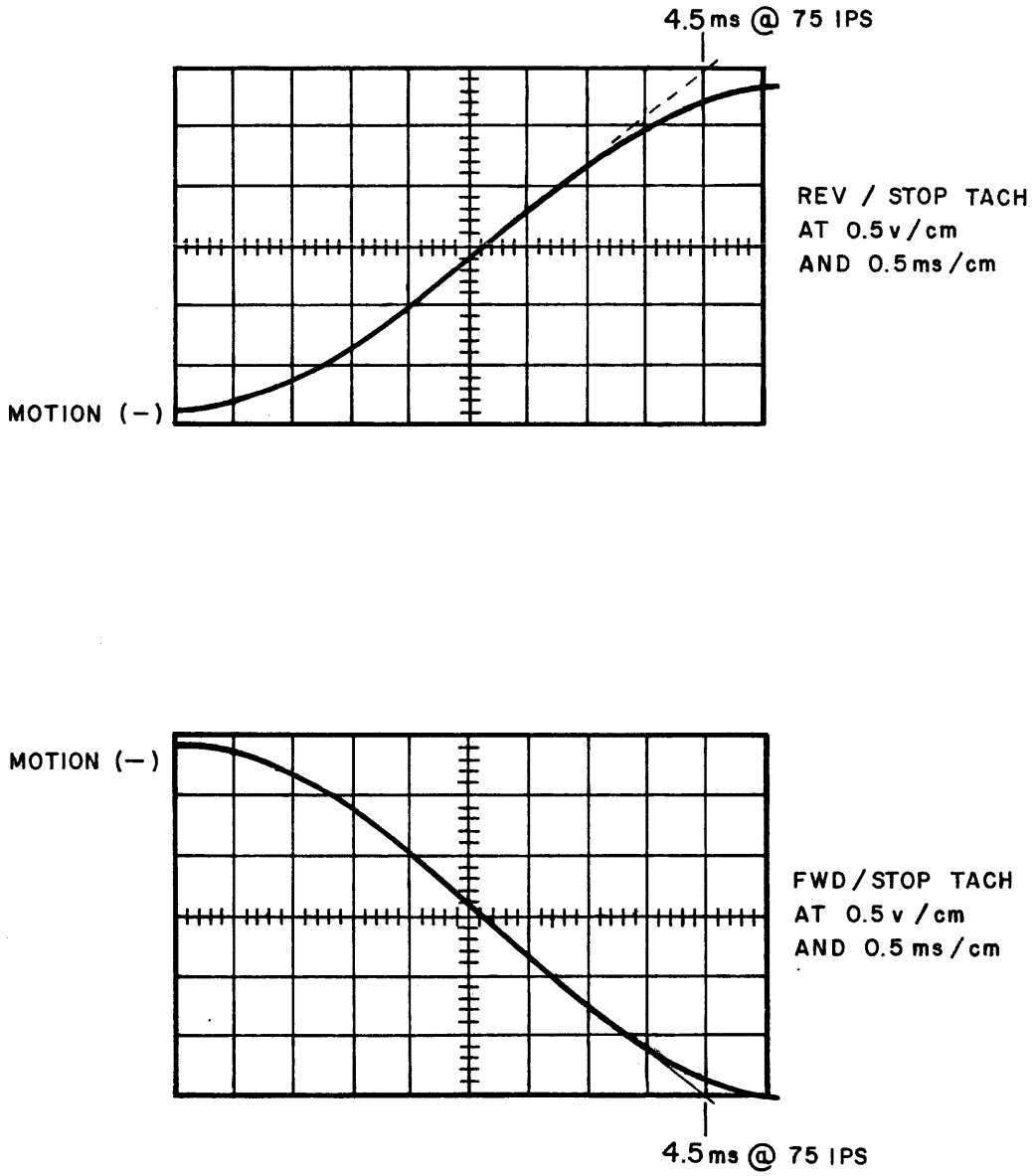


Figure 50. Ramp Stop Time

17.3 REEL SERVO ADJUSTMENT

17.3.1 Chamber Measurement

Determine the location of the center of each of the buffer storage chambers by measuring 7.3 inches from the grill at the extreme of the chambers. Mark this point on the outside of the inner door, which covers the chambers. Mark with removable grease pencil or with masking tape. Measure 6 inches both sides of the marks on both chambers and mark these spots.

17.3.2 Gain Adjustment

1. If not already there, return tape to BOT.

2. To set the gain of the file reel amplifier, grasp the file reel and move it to shift the tape back and forth between the 6 inch marks established above.

3. Monitor the voltage output at TP16 and adjust R160 so that there is a voltage difference of 24 volts between the 6 inch marks on the vacuum chamber.

4. Using the same procedure as in step 3, set the gain of the fixed reel by adjusting R106 and monitoring the voltage output at TP13.

17.3.3 Reel Position Adjustment

1. Adjust R153 to center the loop in the file reel chamber.

2. Press the Forward pushbutton and all tape to advance to EOT.

3. Adjust R100 to center the loop in the fixed reel chamber.

17.4 REWIND TEST

If tape is not already at EOT, press the reset button, and then the Forward button on the OCP. Allow the tape to run until EOT is reached. Press the Rewind button on the OCP. The tape unit should rewind, set forward and advance to EOT.

17.5 UNLOAD TEST

Press the Rewind button while at BOT. The transport should go into reverse and unwind all the tape from the fixed reel. The fixed reel tape loop should ride near the top (source end) of the fixed reel chamber during this operation.

18. DATA ELECTRONICS DUAL GAP SYSTEMS ADJUSTMENTS

18.1 ADJUSTMENT SEQUENCE

All alignments are made at the factory prior to shipment of equipment. Verify alignments if either the 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 Figure B-27 for 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. Write stack deskew.
   a) Read stack profile measurement.
   b) Write deskew single-shot adjustment.
6. Verification--staircase measurement.

18.2 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--0.05V/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 and 902 to ensure that the quiescent point of all the phase splitters falls within +1.0 ± 0.3 VDC.

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

18.3 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 51.)

4. Repeat for all channels. See Table 3 for correct potentiometers and test points.

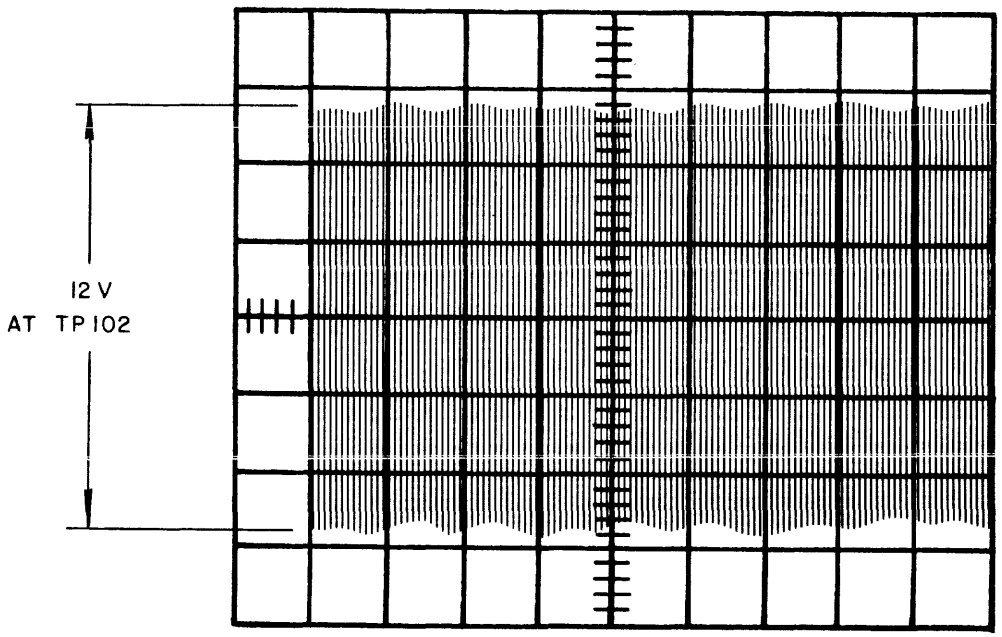


Figure 51. Read Amplifier Gain Adjustment, Dual Gap Systems

18.4 CROSSFEED SHIELD

This is a mechanical alignment, on the head gate assembly, necessary to minimize the write-to-read crossfeed signal.

1. 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 0.2 V/cm.

2. 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. The crossfeed manifests itself as amplitude modulation of the read data. This can be seen by lifting the head shield cover and observing the amplitude modulation increase.

3. Loosen the two head gate screws and reposition the gate by moving it in the plane shown in Figure 52 until a minimum amount of modulation voltage is observed on both channels. 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.

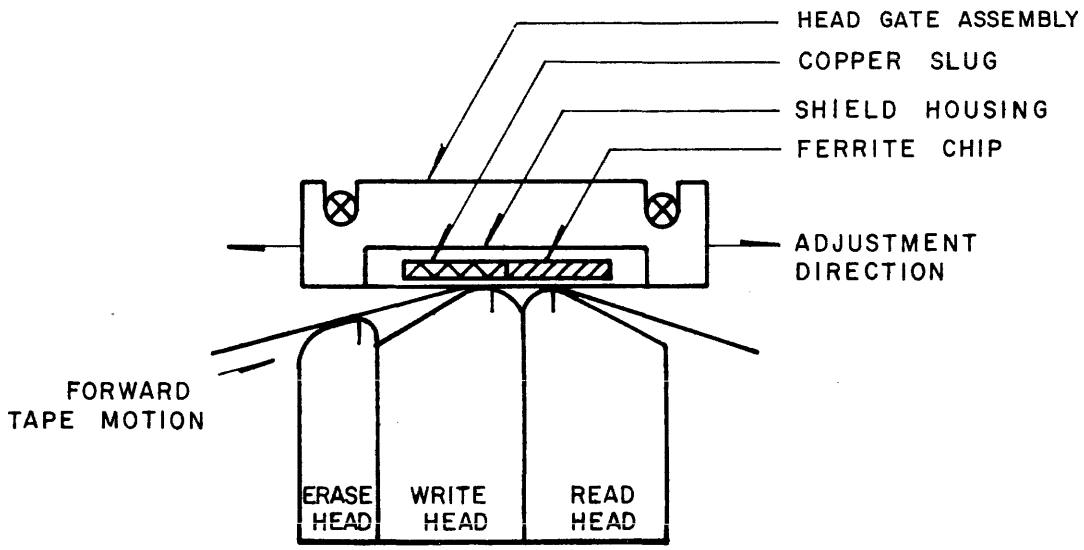


Figure 52. Head Gate Adjustment, Dual Gap Systems

18.5 READ STROBE DELAY

1. Scope controls:

   a) Mode--Channel 1, DC.

   b) Sensitivity--0.1 V/cm.

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

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	

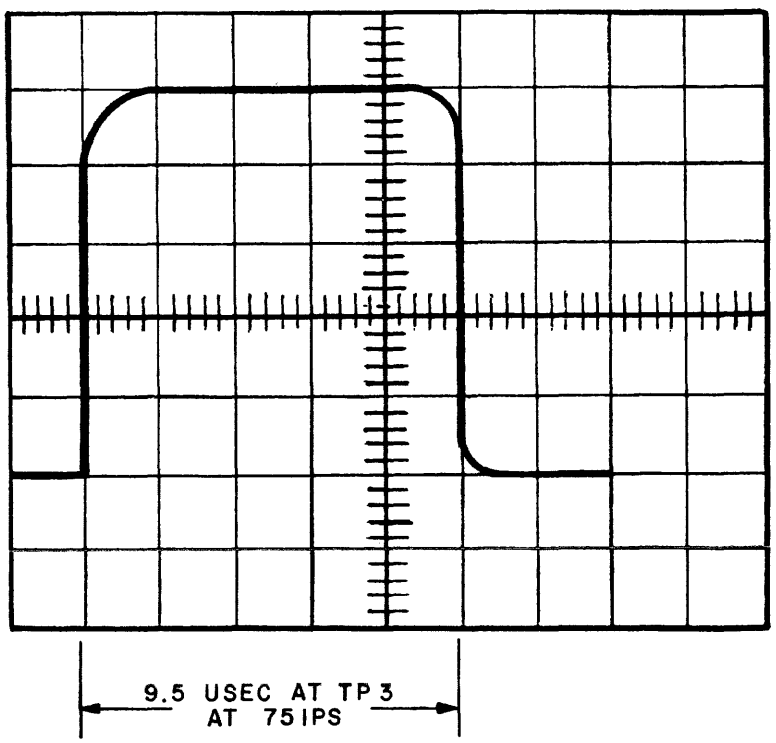


Figure 53. Read Strobe Delay Adjustment, Dual Gap Systems

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 18.4, step 2.

4. A positive pulse will be observed at test point 3. See Figure 53. Adjust R49 for a pulse width of one-half frame time plus 1.1 μsec. At 75 ips this should be 9.5 μsec. Frame time is defined as $\frac{1}{VD}$, where V is the transport velocity and D is the operating data density.

18.6 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.

18.6.1 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.

18.6.1.1 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. Connect the Channel 1 scope probe to TP103 and the Channel 2 probe to TP102. Set the scope sweeptime at 0.5 μsec/cm. One of the patterns shown in Figure 54 will be observed on the screen:

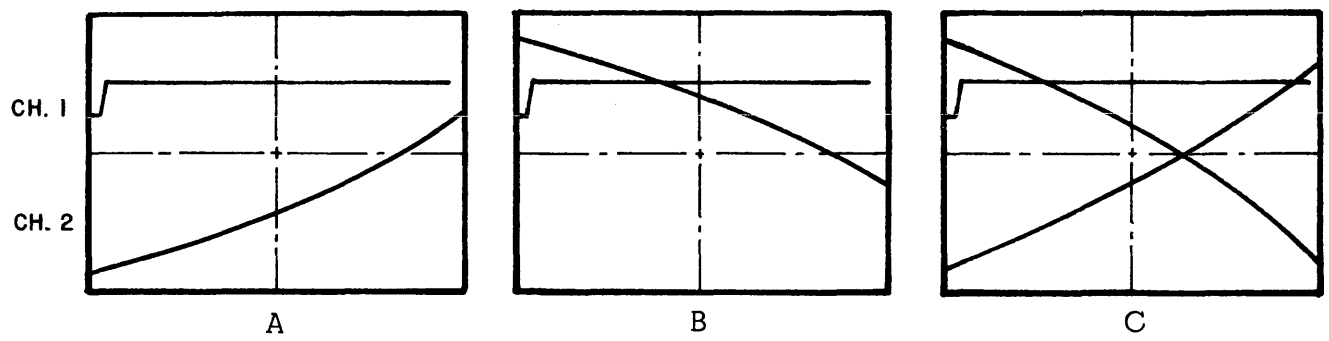


Figure 54. Triggering Method

4. If the display of Figure 54A 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 54B 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 54C 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 54A 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 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.

18.6.1.2 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.

18.6.2 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 on 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 18.6.1.2 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.

18.7 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 55. Time T should approximate the results of subsection 13.3 step 7 and should not exceed:

$$\frac{100}{\text{Tape Speed}} \quad \mu\text{sec} \quad (T<1.33 \ \mu\text{sec at 75 ips}).$$

   Time T shall not include the effects of dynamic skew.

4. If this condition is not met, repeat the procedures specified in paragraph 18.6.

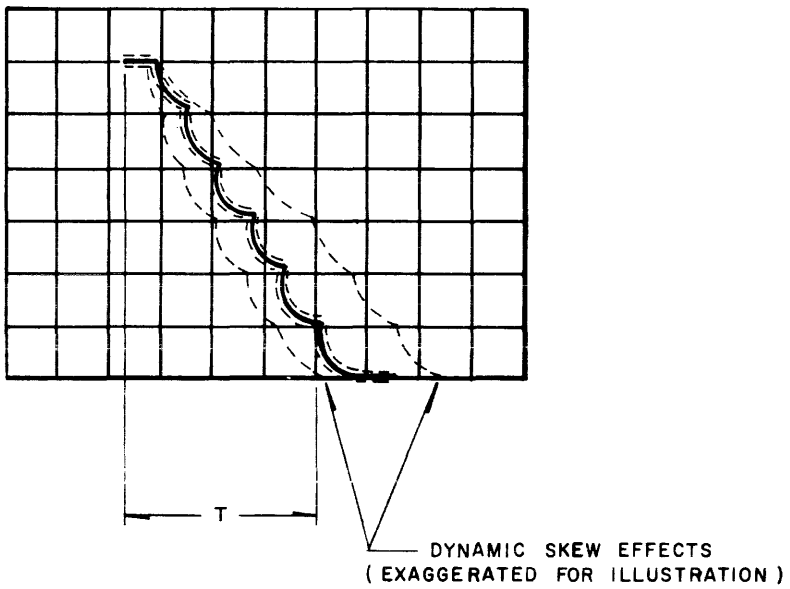


Figure 55. Staircase Waveform, Dual Gap Systems

19. TROUBLESHOOTING

The Troubleshooting Guide on pages VI-52 through VI-60 is a diagnostic aid for the isolation of faults within the transport system. It lists possible symptoms, probable causes for the malfunction, and corrective actions. A reference column cites the text or drawing, relevant to any particular event, which should be consulted for further information and verification. The preceding photographs (Figures 56 and 57) identify assemblies and subassemblies and aid in their location in the transport.

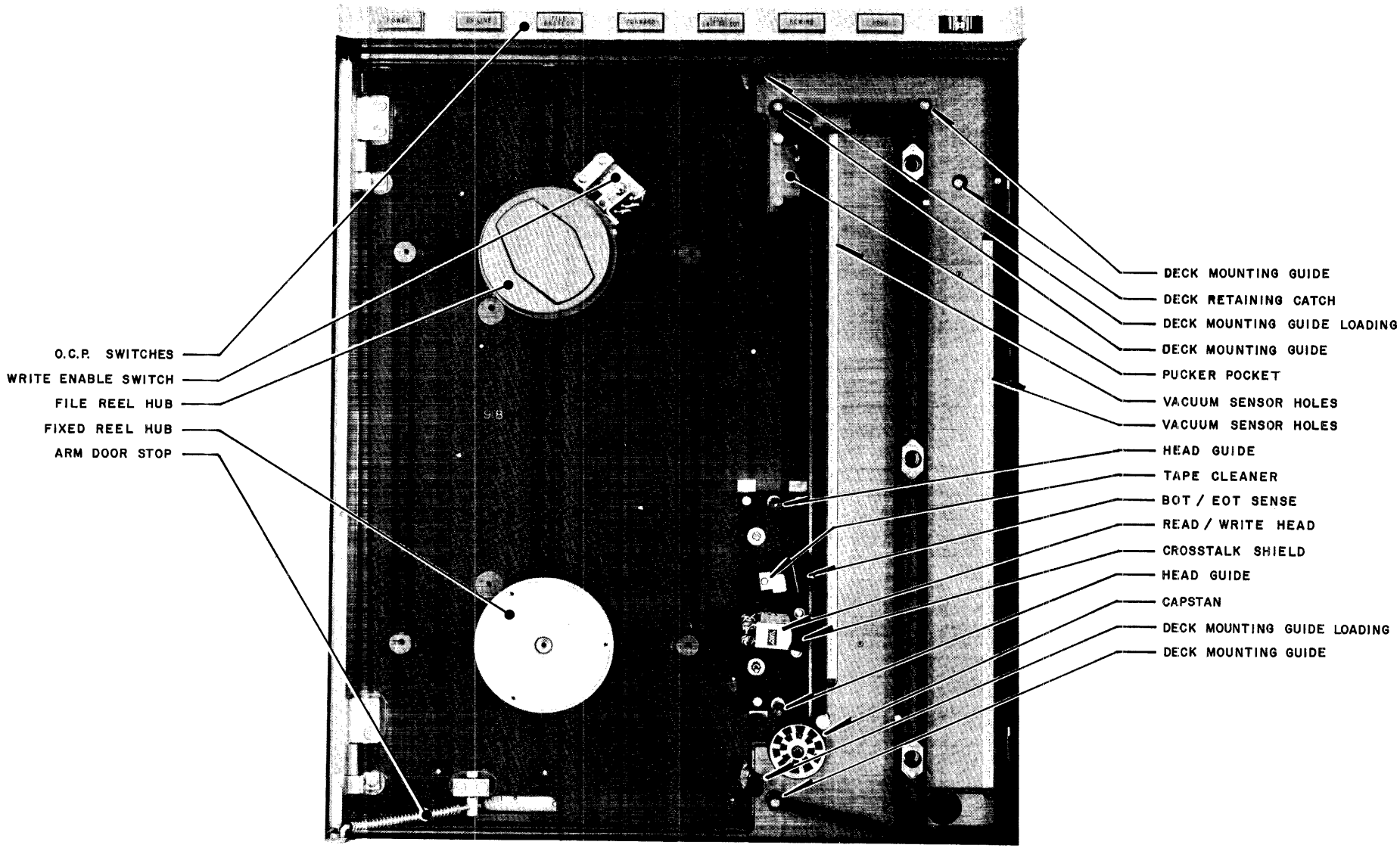


Figure 56. Tape Transport (Front View)

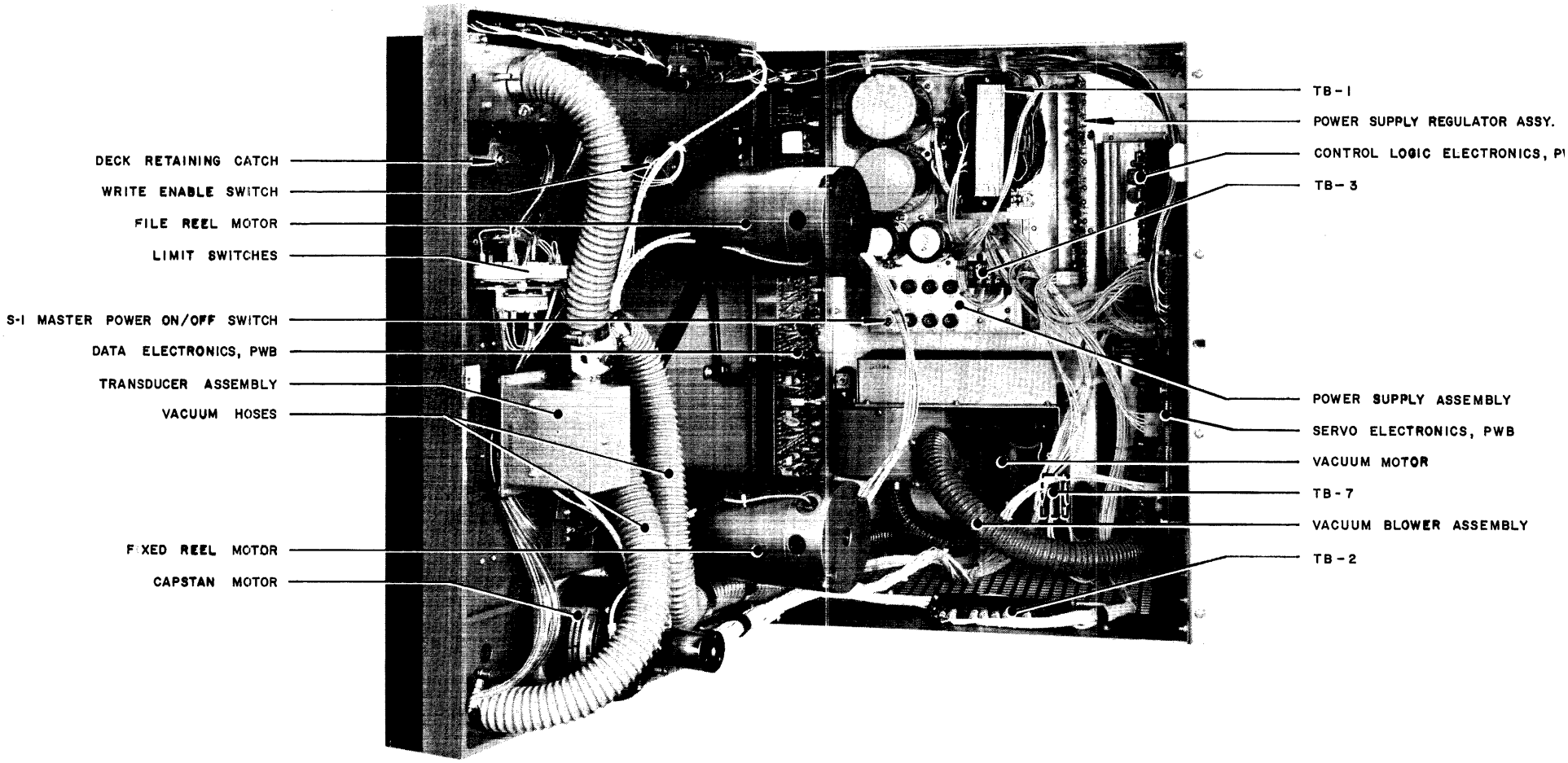


Figure 57. Tape Transport (Rear View and Cabinet)

TROUBLESHOOTING GUIDE

Symptom	Probable Cause	Remedy	Reference
Power indicator light does not work when POWER pushbutton is pressed on front panel.	S1 power switch in OFF position.	Switch S1 to ON position (Located next to fuse bank.)	Section VI, Figure 57
	+5 volts missing.	Check +5 volts at TP2 on regulator circuit board which is mounted on the rear panel.	Section VI Figure 57
	Fuse F1 open.	Replace fuse F1.	Section VI, Figure 57
	Power indicator lamp burned out.	Check the two outside terminals for lamp continuity. Replace the lamp if it is burned out.	Section VI, Paragraph 8
	No AC voltage to transport	Check outlet with voltmeter for the proper AC voltage.	

TROUBLESHOOTING GUIDE

Symptom	Probable Cause	Remedy	Reference
When the LOAD button is pressed the vacuum blower does not turn on.	K4 vacuum blower relay missing return path.	Seat the P13 connector	B25 & B26
		Check relay driver Q56 for an open	B25 & B26
	+24V not present on K4 vacuum blower relay	Seat the P13 connector	B25 & B26
		Check +24V Fuse F4.	Section VI Figure 57
	K4 vacuum blower relay coil open	Check for continuity between terminals 3 and 4 of TB7.	Section VI Figure 57
After the LOAD button is pressed and the vacuum blower comes on, the fixed reel does not put tape into the fixed chamber.	Tape threaded incorrectly.	Check threading diagram	Section II Figure 3
	Excessive tape edge damage	Check for excessive tape edge damage	
	Vacuum set incorrectly	Check and set vacuum level.	Section VI Par. 14
	Fixed reel amplifier defective	Remove tape, check TP13 on Servo Electronics circuit board for proper output during load sequence	Section V Par. 2 B25 & B26

TROUBLESHOOTING GUIDE

Symptom	Probable Cause	Remedy	Reference
	K2, load relay defective	Check if P8 Pin 3 follows TP 16 on Servo Electronics circuit board during load sequence.	B25 & B26
	File reel motor defective	Check if signal of TP 16 on Servo Electronics circuit board is present at TB 2 terminal 6 during load sequence. If not, check for loose connection.	B25, B26 and Section VI Figure 57
After a LOAD sequence is initiated and both the fixed and file chambers have tape in them, the transport does not tension the tape.	Tape was left in chambers prior to pressing the LOAD button.	Take up slack by pressing the REWIND button.	
	Excessive tape damage.	Replace tape. If necessary retrack machine.	Section VI, Para. 13
	Vacuum not set correctly.	Check and set vacuum.	Section VI Par. 14
	Vacuum switches S2 and S3 failed to close.	Check for switch closure as tape goes into each chamber.	Assemby vacuum switches 201097 B-13

TROUBLESHOOTING GUIDE

Symptom	Probable Cause	Remedy	Reference
After the LOAD button is pressed and the vacuum blower comes on, the file reel does not put tape into the File Chamber	K2 load relay defective	Check if J8 Pin 1 follows TP 13 on Servo Electronics circuit board during load sequence.	B25 & B26
	Fixed reel motor defective	Check if signal of TP 13 on Servo Electronics circuit board is present at TB 2 terminal 9 during load sequence. If not, check for a loose connection.	B25 & B26 Section VI Figure 57
	Tape threaded incorrectly	Check threading diagram.	Section II Figure 3
	Excessive tape edge damage	Replace tape. If necessary retrack machine.	Section VI, Para. 13
	Vacuum set incorrectly	Check and set vacuum level.	Section VI Par. 14
	File reel amplifier defective	Remove tape, Check TP 16 on Servo Electronics circuit board for proper output during load sequence.	B25 & B26

TROUBLESHOOTING GUIDE

Symptom	Probable Cause	Remedy	Reference
	Ready relay K1 failed to pull in.	Check that connectors P7 and P14 on Servo Electronics circuit board are seated.	B25 & B26
		Check that Q76 on Servo Electronics circuit board supplies a ground at the initiation of a load sequence.	B25 & B26
		Check for relay continuity between P7 pin 3 and +24V.	B25, B26 B-1 & B-2
	Load relay K2 defective.	Check that pins 9 and 10 of K2 make contact during the load sequence.	B25 & B26
	Chamber servo transducers defective.	Check for burned out lamps in transducer box.	B5
	Either reel amplifier defective.	Check for proper amplifier operation.	Section VI par. 17.3
	Capstan amplifier defective.	Check TP 6 for approximately 0 volts when no Motion commands are present.	B25 & B26

TROUBLESHOOTING GUIDE

Symptom	Probable Cause	Remedy	Reference
When the LOAD push-button is pressed, tape tensions, but tape does not move forward.	No forward motion (forward lamp not lit).	Check TP1 for high level	B25 & B26
	Ramp generator circuit now working.	Check TP3 for voltage output.	B25 & B26
	Capstan amplifier not working.	Check TP6 for voltage output	B25 & B26
When the LOAD push-button 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 tape transport cleaner.	
	Photosense lamp burned out.	Remove head cover and check.	
	Photosense assembly not adjusted correctly.	With tape loaded and not at BOT TP7 should be zero volts.	Sec. VI Para. 17.1 B25 & B26
	Open interconnecting Cable	With tape loaded and not at BOT check cathode of diode CR3 for zero volts on transport control logic board.	B23 & B24

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 low level (low TRUE interface).	B23 & B24
	Interface cable fault.	Check at controller cable and for Ready Status low level input.	B23 & B24
	No Forward input command	Check Forward level J16 Pin C for low level input.	B23 & B24
	No Select command.	Check Jumper UU for low level input. Check S and T jumper for high level.	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.	B14 Fig. 55
	No Write Power	Check TP6 for +12V. (NRZI) J3 Pin 1 for +5V. (PE).	B27 & B28
	No Write Enable command.	Check TP207 for +5 volts.	B23 & B24
	Missing write clock.	Check J1 Pin A for negative clock.	B27 & B28
	Heads not plugged in correctly.	Check J2 connector.	B28

TROUBLESHOOTING GUIDE

Symptom	Probable Cause	Remedy	Reference
Written data is not correct.	Failure of one write circuit	Write all "ones" and check TP101 through TP901 for Write signals.	B27 & B28
	Intermittent Write Power, Motion, or Write Reset commands	Monitor Write TP6 and Write Reset J1 Pin C. Look for level changes.	B27 & B28
Correctly written data cannot be read.	One of the read channels is dead.	NRZI-Read all "ones" and check TP102 through TP902 for proper analog waveforms. Check TP103 through TP903 for proper digital waveforms.	B27 & B28

TROUBLESHOOTING GUIDE

Symptom	Probable Cause	Remedy	Reference
continued	Read amplifier gains are incorrectly adjusted.	Check read amplifier	Section VI, Paragraph 18.3

APPENDIX A

SPARE PARTS

This appendix contains a listing of all spare parts for the WANGCO Mod 11 Tape Unit (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.)

The listing is contained in table A-1 and includes parts for all three configurations of the Mod 11 Tape Units; that is, NRZI, PE, and PE/NRZI. The Remarks column of the table (A-1) provides the applicability of the spare parts, that is, whether the part is for NRZI units only, PE/NRZI units only, or all configurations.

The listing of table A-1 is based on, and contains all, spare parts listed in WANGCO drawing number 201193A.

Table A-1. MOD 11 Spare Parts List

Item No.	Description	Part No.	No. Required	Remarks or Usage
	HEAD ASSEMBLIES, GUIDE ASSEMBLIES & ASSOCIATED PARTS			
1	Assy, Head Plate, 7Ch, Dual Gap	200882-003	1	NRZI, 0.300 inches Gap to Gap
2	Assy, Head Plate, 7Ch, Dual Gap	201001-003	1	NRZI, 0.150 inches Gap to Gap
3	Assy, Head Plate, 9Ch, Dual Gap	201096-003	1	NRZI
4	Assy, Head Plate, 9Ch	200926-003	1	PE & PE/NRZI
5	Assy, Tape Cleaner	200923	1	All Configurations
6	Assy, Cross-Talk Shield	200461	1	7Ch, D/Gap, 0.300 inches Gap to Gap
7	Assy, Cross-Talk Shield	201120	1	All except item 6
8	Assy, Plug-In Photosense	200684	1	All Configurations
9	Cover, Head	200986	1	All Configurations
10	Cap, Tape Guide	201109	2	Used on Head Assy only
11	Shim, Tape Guide	200203	A/R	Used on Head Assy only
12	Washer, Tape Guide	200046	6	4 on Head Assy, 2 on Deck Assy
13	Spring, Tape Guide	200047	3	2 on Head Assy, 1 on Deck Assy
14	Drum, Tape Guide	200096	3	2 on Head Assy, 1 on Deck Assy
15	Assy, Deck Mtg. Guide	201100	3	All Configurations
16	Assy, Deck Mtg. Guide, LOAD	201101	2	All Configurations
17	Washer, Shim	200077-001	10	Used on items 15 & 16
18	Spring	200156	5	Used on items 15 & 16
19	Shim	201033-001	25	Used on items 15 & 16
20	Drum	201041	5	Used on items 15 & 16
21	Shaft, Tape Guide	201044	2	Used on item 15
22	Shaft, Tape Guide	201045	3	Used on item 16
23	Cap, Tape Guide	201046	2	Used on item 16
24	Cap, Tape Guide	201311	1	Used on Deck Assembly
25	Shim, Head Plate Mounting	201032-001	A/R	Used on Deck Assembly
26	Shim, Head Plate Mounting	201032-002	A/R	Used on Deck Assembly
27	Shim, Fixed Guides	201033-002	A/R	Used on Deck Assembly
	MOTORS, BRUSHES, & ASSOCIATED PARTS			
1	Assy, Reel Motor, FILE REEL	201087	1	All Configurations
2	Assy, Reel Motor, FIXED REEL	201088	1	All Configurations
3	Assy, Capstan Motor & Tach.	201089	1	All Configurations
4	Brush, Reel Motor	100320	2	Use with Motor P/N 200389-001
5	Brush, Reel Motor	100321	2	Use with Motor P/N 200389-002
6	Brush, Capstan Motor	100384	2	Use with Motor P/N 200609
7	Vacuum Motor, 60Hz, 115v	100259	1	Use with item 15
8	Vacuum Motor, 50Hz, 230v	100375	1	Use with item 14
9	Vee Belt	100269-001	1	Use with item 7
10	Vee Belt	100269-002	1	Use with item 8
11	Fan	100380	1	Used on 230v machines only
12	Pulley, Motor	201036-001	1	Use with item 7
13	Pulley, Motor	201036-002	1	Use with item 8
14	Assy, Vacuum Blower, 230v	200912	1	50Hz
15	Assy, Vacuum Blower, 115v	201104	1	60Hz
16	Relay, Motor Start, 115v	100258	1	Used in item 15, K3
17	Relay, Motor Start, 230v	100374	1	Used in item 14, K3
18	Capacitor, Motor Start, 115v	100275-001	1	Used in item 15
19	Capacitor, Motor Start, 230v	100275-002	1	Used in item 14
20	Relay, Power	100280	1	Used in items 14 and 15, K4

Table A-1. MOD 11 Spare Parts List (Continued)

Item No.	Description	Part No.	No. Required	Remarks or Usage
	MOTORS & BRUSHES, ETC. (Continued)			
21	Diode, Rectifier, 1N4003	100127	1	Used in items 14 and 15, CR1
22	Capstan	201023	1	Used on item 3
	MISCELLANEOUS ITEMS			
1	Assy, Door Stop	200883	1	All Configurations
2	Door, Cover	200886	1	All Configurations
3	Assy, Chamber Cover	201095	1	All Configurations
4	Assy, Write Enable Switch	201057	1	All Configurations
5	Assy, Power Supply Regulator	200993	1	All Configurations
6	Assy, Power Supply	201040	1	All Configurations
7	Assy, Power Transformer	201103	1	All Configurations
	PRINTED WIRING BOARD ASSEMBLIES			
1	Assy, Transducer Cell PWB	201010	1	All Configurations
2	Assy, Lampholder	200865	2	Used with item 1
3	Assy, Servo Electronics PWB	200974-001	1	Basic 75 ips machine
4	Assy, Servo Electronics PWB	200974-002	1	Basic 45 ips machine
5	Assy, Servo Electronics PWB	200974-003	1	Basic 37½ ips machine
6	Assy, Servo Electronics PWB	200974-004	1	Basic 25 ips machine
7	Assy, Transport Control Logic PWB	201004-001	1	7Ch, Type P, NRZI
8	Assy, Transport Control Logic PWB	201004-002	1	9Ch, Type P, NRZI
9	Assy, Transport Control Logic PWB	201004-003	1	7Ch, Type A, NRZI
10	Assy, Transport Control Logic PWB	201004-004	1	9Ch, Type A, NRZI
11	Assy, Transport Control Logic PWB	201004-005	1	7Ch, Type P, NRZI, No Unit Select
12	Assy, Transport Control Logic PWB	201004-006	1	PE
13	Assy, Transport Control Logic PWB	201004-007	1	9Ch, Type P, NRZI, No Unit Select
14	Assy, Transport Control Logic PWB	201004-008	1	PE/NRZI
15	Assy, Transport Control Logic PWB	201004-009	1	9Ch, Type P, NRZI, Remote Density
16	Assy, Transport Control Logic PWB	201004-010	1	PE. No Unit Select
17	Assy, Transport Control Logic PWB	201004-015	1	Manual Density Select OCP
18	Assy, Data Electronics PWB	201142-001	1	9Ch, 75 ips, Type P, NRZI
19	Assy, Data Electronics PWB	201142-002	1	9Ch, 75 ips, Type A, NRZI
20	Assy, Data Electronics PWB	200692-005	1	75 ips, PE
21	Assy, Data Electronics PWB	200692-008	1	45 ips, PE
22	Assy, Data Electronics PWB	200692-004	1	37½ ips, PE
23	Assy, Write Data PWB	201276-001	1	75 ips, PE/NRZI
24	Assy, Write Data PWB	201276-006	1	45 ips, PE/NRZI
25	Assy, Write Data PWB	201276-007	1	37½ ips, PE/NRZI
26	Assy, Read Data PWB	201279-001	1	75 ips, PE/NRZI
27	Assy, Read Data PWB	201279-006	1	45 ips, PE/NRZI
28	Assy, Read Data PWB	201279-007	1	37½ ips, PE/NRZI
	ELECTRO/MECHANICAL COMPONENTS			
1	Switch, Toggle, DPST	100015	1	S1, Master Power Switch
2	Switch, Snap Action	100071	1	Used on Write Enable Switch
3	Switch, Vacuum	100287	3	S2, S3, S12
4	Switch & Indicator	100104-001	1	FORWARD
5	Switch & Indicator	100104-002	1	LOAD
6	Switch & Indicator	100104-003	1	ON-LINE
7	Switch & Indicator	100104-011	1	RESET/UNIT SELECT, PE
8	Switch & Indicator	100179-001	1	POWER

Table A-1. MOD 11 Spare Parts List (Continued)

Item No.	Description	Part No.	No. Required	Remarks or Usage
	ELECTRO/MECHANICAL COMPONENTS (Continued)			
9	Switch & Indicator	100179-007	1	PE/NRZI
10	Switch	100130-001	1	REWIND
11	Switch	100130-002	1	RESET
12	Switch, Thumbwheel	100245	1	UNIT SELECT
13	Indicator	100105-002	1	FILE PROTECT
14	Fuse, 8 amp	100028-022	1	F1
15	Fuse, 4 amp	100028-023	1	F5
16	Fuse, 5 amp	100028-024	2	F2, F3
17	Fuse, 7.5 amp	100028-026	1	F7
18	Fuse, 10 amp	100028-027	2	F4, F6
19	Relay	100279	1	K1
20	Capacitor, 65,000uf	100278	2	C3, C4
21	Capacitor, 6,000uf	100283	2	C1, C2
22	Cell, Solar	100008	2	Used with item 8 of Head Assys, Guide Assys, & Assoc. Parts
23	Lamp	100009	1	Used with item 8 of Head Assys, Guide Assys, & Assoc. Parts
24	Photocell	100176	2	Used with item 1 of Printed Wiring Board Assys.
25	Lamp	100228	2	Used with item 1 of Printed Wiring Board Assys.
	ELECTRONIC COMPONENTS			
1	I.C. Hex Inverter, 836/936	100084	4	Used on PWB Assy 200692
			7	Used on PWB Assy 201004
			5	Used on PWB Assy 201142
			4	Used on PWB Assy 201276
	I.C. Hex Inverter, 836/936	100084	2	Used on PWB Assy 201279
2	I.C. Quad 2 Input Nand, 846	100085	1	Used on PWB Assy 200974
			6	Used on PWB Assy 201004
			6	Used on PWB Assy 201142
			6	Used on PWB Assy 201276
	I.C. Quad 2 Input Nand, 846	100085	1	Used on PWB Assy 201279
3	I.C. Quad 2 Input Pwr, 858/958	100086	2	Used on PWB Assy 200692
			3	Used on PWB Assy 201004
			4	Used on PWB Assy 201142
			3	Used on PWB Assy 201276
	I.C. Quad 2 Input Pwr, 858/958	100086	3	Used on PWB Assy 201279
4	I.C. 10 Input Nand, 1804	100087	1	Used on PWB Assy 201142
	I.C. 10 Input Nand, 1804	100087	1	Used on PWB Assy 201279
5	I.C. Dual Flip-Flop, 9093	100088	3	Used on PWB Assy 201004
			10	Used on PWB Assy 201142
			9	Used on PWB Assy 201276
	I.C. Dual Flip-Flop, 9093	100088	5	Used on PWB Assy 201279
6	I.C. Dual Op. Amp, 7739	100089	5	Used on PWB Assy 201142
7	I.C. Mono. Multi, 9601	100090	1	Used on PWB Assy 201142
	I.C. Mono. Multi, 9601	100090	9	Used on PWB Assy 201276
	I.C. Mono. Multi, 9601	100090	10	Used on PWB Assy 201279
8	I.C. Dual Flip-Flop, 9099	100095	5	Used on PWB Assy 200692
9	I.C. 3 Input Nand, 862/962	100107	4	Used on PWB Assy 201004

Table A-1. MOD 11 Spare Parts List (Continued)

Item No.	Description	Part No.	No. Required	Remarks or Usage
	ELECTRONIC COMPONENTS (Continued)			
10	I.C. Voltage Reg, 7723	100108	3	Used on Pwr.Supply Reg.Assy 200993
11	I.C. Op. Amp, 7741	100109	8	Used on PWB Assy 200974
12	I.C. Dual Op, 1437	100167	14	Used on PWB Assy 201279
	I.C. Dual Op, 1437	100167	11	Used on PWB Assy 200692
13	I.C. Quad, 2 Input OR Gate, 1812	100175	3	Used on PWB Assy 201276
14	I.C. Dual Monostable, 2602	100234	5	Used on PWB Assy 200692
	I.C. Dual Monostable, 2602	100234	1	Used on PWB Assy 201276
15	I.C. Dual Comparator, 1414	100237	9	Used on PWB Assy 200692
	I.C. Dual Comparator, 1414	100237	9	Used on PWB Assy 201279
16	I.C. Dual 4 Input Pwr, 844/944	100261	5	Used on PWB Assy 200692
	I.C.Dual 4 Input Pwr, 844/944	100261	1	Used on PWB Assy 201004
	I.C. Dual 4 Input Pwr, 844/944	100261	5	Used on PWB Assy 201279
17	I.C. Hex Power Drive, 7407	100327	6	Used on PWB Assy 201276
18	Transistor, NPN, 2N4123	100080	20	Used on PWB Assy 200692
			32	Used on PWB Assy 200974
			12	Used on PWB Assy 201004
			72	Used on PWB Assy 201142
			6	Used on PWB Assy 201276
	Transistor, NPN, 2N4123	100080	74	Used on PWB Assy 201279
19	Transistor, PNP, 2N4125	100081	19	Used on PWB Assy 200692
			12	Used on PWB Assy 200974
			2	Used on Pwr Supply Reg Assy 200993
			5	Used on PWB Assy 201004
			14	Used on PWB Assy 201142
			1	Used on PWB Assy 201276
	Transistor, PNP, 2N4125	100081	10	Used on PWB Assy 201279
20	Transistor, Dual NPN, TD101	100082	9	Used on PWB Assy 201142
21	Transistor, PNP, MPSU51	100083	1	Used on PWB Assy 201004
	Transistor, PNP, MPSU51	100083	1	Used on PWB Assy 201142
22	Transistor, PNP, TIP30	100113	3	Used on Pwr. Supply Reg Assy 200993
23	Transistor, NPN, 2N2219	100125	3	Used on PWB Assy 200974
	Transistor, NPN, 2N2219	100125	3	Used on PWB Assy 201004
24	Transistor, NPN, 2N3053	100158	6	Used on PWB Assy 200974
25	Transistor, NPN, 2N3055	100159	2	Used on PWB Assy 200974
	Transistor, NPN, 2N3055	100159	4	Used on Pwr Supply Reg Assy 200993
26	Transistor, PNP, 2N4037	100160	1	Used on PWB Assy 200692
			5	Used on PWB Assy 200974
			1	Used on Pwr Supply Reg Assy 200993
	Transistor, PNP, 2N4037	100160	1	Used on PWB Assy 201279
27	Transistor, NPN, 2N3772	100219	2	Used on PWB Assy 200974
28	Transistor, NPN, 2N5320	100220	6	Used on PWB Assy 200974
29	Transistor, PNP, 2N5322	100221	5	Used on PWB Assy 200974
30	Transistor, NPN, 2N3773	100281	4	Used on PWB Assy 200974
31	Transistor, NPN, TIP31B	100282	4	Used on PWB Assy 200974
32	Diode, Signal, 1N914	100091	27	Used on PWB Assy 200692
			50	Used on PWB Assy 200974
			11	Used on PWB Assy 201004
			46	Used on PWB Assy 201142
			3	Used on PWB Assy 201276
	Diode, Signal, 1N914	100091	91	Used on PWB Assy 201279

Table A-1. MOD 11 Spare Parts List (Continued)

Item No.	Description	Part No.	No. Required	Remarks or Usage
	ELECTRONIC COMPONENTS (Continued)			
33	Diode, Zener, 1N752	100118	2	Used on PWB Assy 200974
	Diode, Zener, 1N752	100118	1	Used on Pwr Supply Reg Assy 200993
34	Diode, Rectifier, 1N4003	100127	1	Used on PWB Assy 200692
	↑	↑	4	Used on PWB Assy 200974
	↕	↕	2	Used on Pwr Supply Reg Assy 200993
	↕	↕	2	Used on PWB Assy 201004
	↕	↕	1	Used on PWB Assy 201142
	Diode, Rectifier, 1N4003	100127	1	Used on PWB Assy 201276
35	Diode, Zener, 1N4736A	100161	1	Used on Pwr Supply Reg Assy 200993
36	SCR, 40654	100162	1	Used on Pwr Supply Reg Assy 200993
37	Diode, Power, 1N3208	100174	2	Used on PWB Assy 200974
38	Diode, Zener, 1N754A	100373	9	Used on PWB Assy 201279
	VARIABLE RESISTORS			
1	Resistor, Variable, 50	100069-500	1	Used on PWB Assy 201142
2	Resistor, Variable, 5K	100069-502	9	Used on PWB Assy 201142
3	Resistor, Variable, 10K	100069-103	9	Used on PWB Assy 201279
4	Resistor, Variable, 20K	100069-203	1	Used on PWB Assy 200692
	Resistor, Variable, 20K	100069-203	10	Used on PWB Assy 201142
	Resistor, Variable, 20K	100069-203	10	Used on PWB Assy 201279
5	Resistor, Variable, 50K	100069-503	9	Used on PWB Assy 201276
6	Resistor, Variable, 500	100163-501	2	Used on Pwr Supply Reg Assy 200993
7	Resistor, Variable, 1K	100163-102	1	Used on Pwr Supply Reg Assy 200993

APPENDIX B

This appendix contains the circuit schematics, assembly drawings, and material lists for all assemblies and subassemblies in the MOD 11 Tape Transport. These documents are identified in the list on the following page.

The circuit schematics are complete representations of the electronic 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

ENGINEERING DRAWINGS

MOD 11 NRZI

B-1.	Power Supply Assy	201040H
B-2.	Power Supply Schematic	201040H
B-3.	Power Supply Regulator Assy	200993H
B-4.	Power Supply Regulator Schematic	200993H
B-5.	Transducer Enclosure Assy	201085H
B-6.	Transducer Cell Assy	201010D
B-7.	Plug-In Photosense Assy	200684A
B-8.	Photosense Assy	200707A
B-9.	Photosense Connector Assy	201051B
B-10.	Vacuum Blower Assy	201104G
B-11.	Vacuum Blower Schematic	201104G
B-12.	Vacuum Blower Assy	200912E
B-13.	Vacuum Switches Assy	201097C
B-14.	Write Enable Switch Assy	201057B
B-15.	Write Terminator Assy, J1	200714E
B-16.	Control Terminator Assy, J16	200717D
B-17.	OCP Cable Assy	201058E
B-18.	Data Control Cable Assy	201052C
B-19.	Regulator Output Cable Assy	201053A
B-20.	Servo Regulated Power Cable Assy	201054A
B-21.	Servo Control Cable Assy, No. 1	201055A
B-22.	Servo Control Cable Assy, No. 2	201056B
B-23.	Transport Control Logic Assy	201004K
B-24.	Transport Control Logic Schematic	201959A
B-25.	Servo Electronics Assy	200974P
B-26.	Servo Electronics Schematic	200974P
B-27.	Data Electronics Assy, Dual Gap	201142H
B-28.	Data Electronics Schematic, Dual Gap	201142H
B-29.	Wiring Diagram	200947B

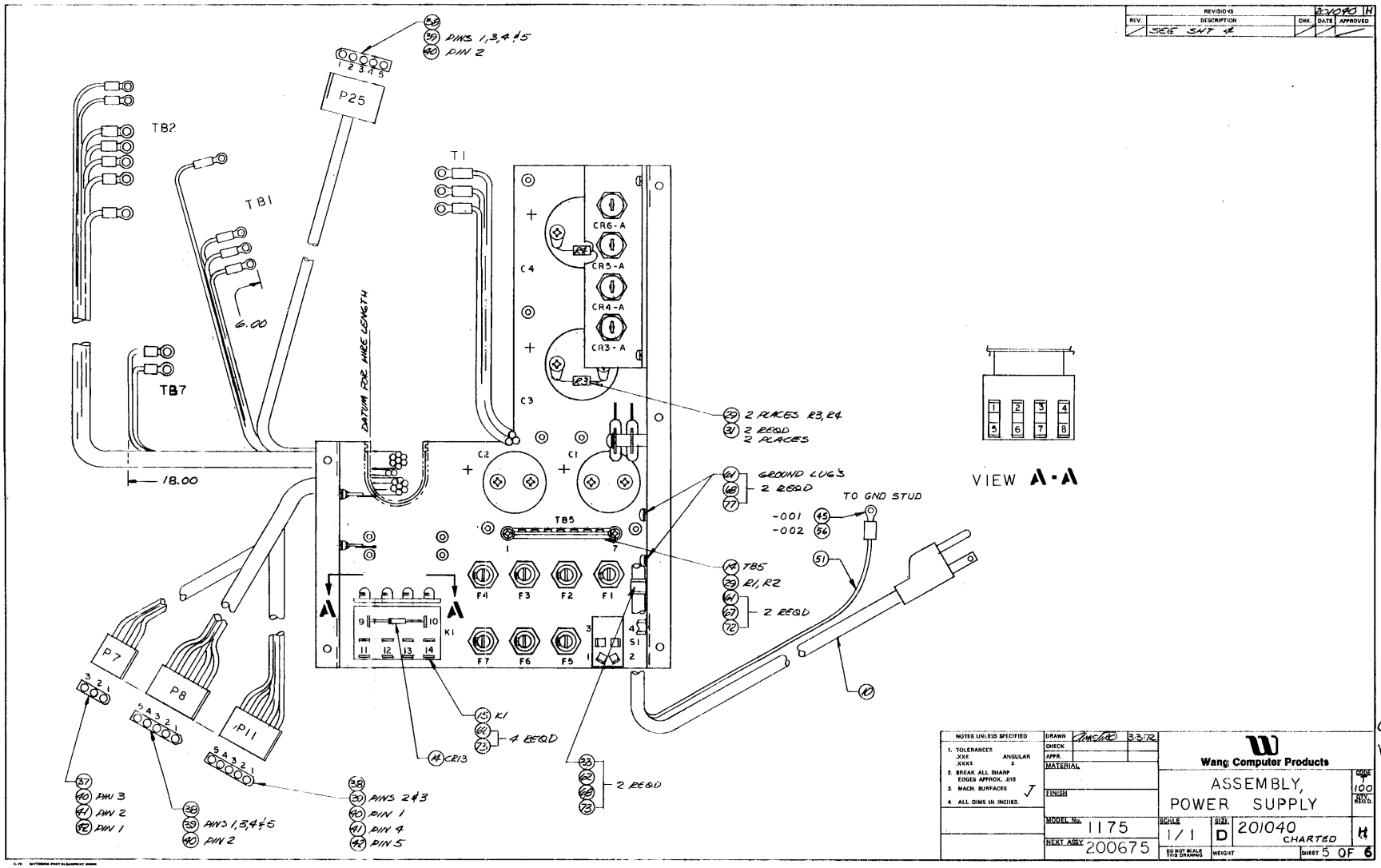


Figure B-1. Power Supply Assembly (pg. 1 of 3)

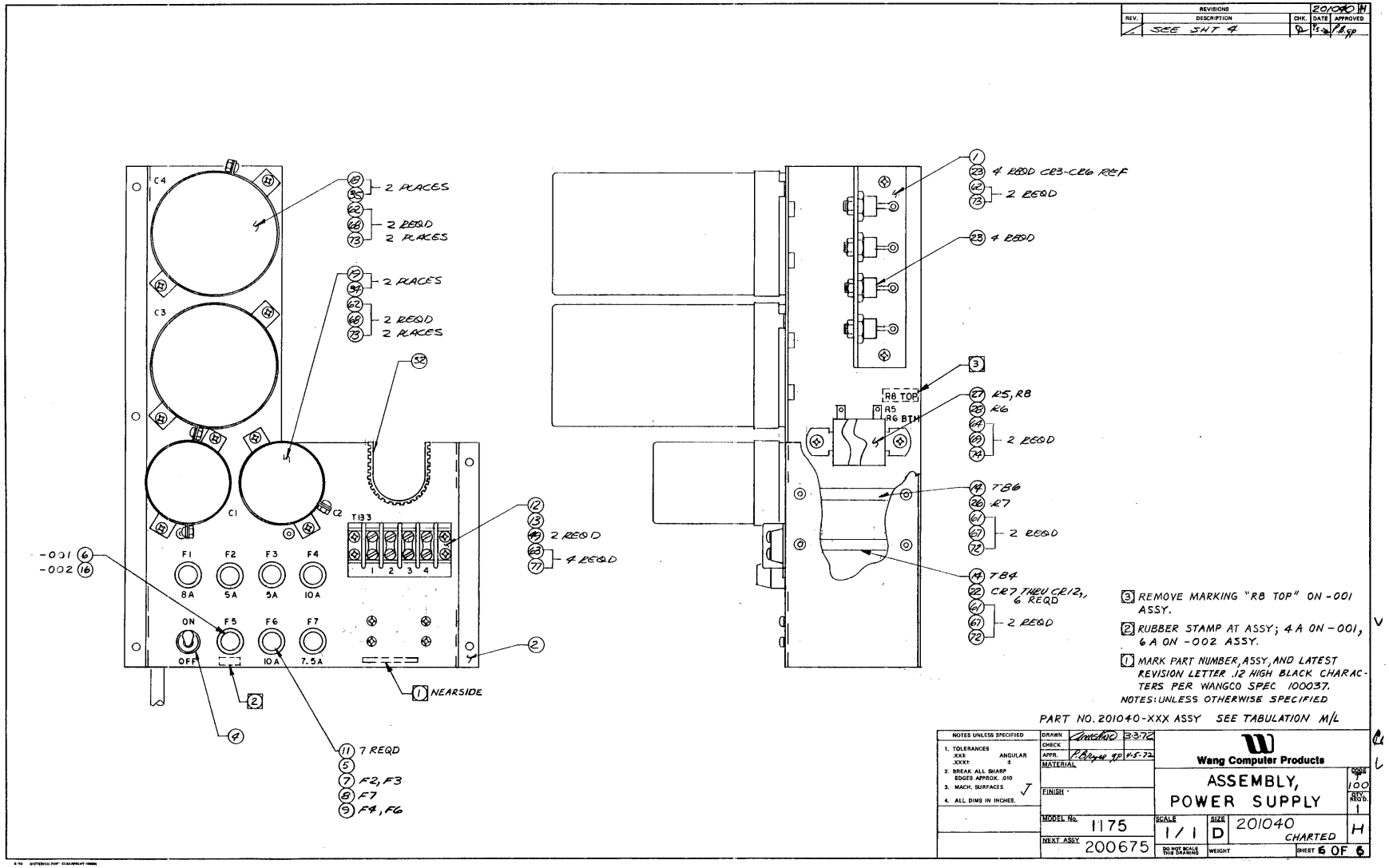


Figure B-1. Power Supply Assembly (pg. 2 of 3)

T-100

Wang Computer Products — MATERIAL LIST

ML DRAWING NO. 201040-001 REV. H

DRAWING TITLE ASSY. POWER SUPPLY. MODEL NO. 11 P.B. 9:P 45-52 DATE 2/24/72 SHEET 1 OF 6

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Heatsink.	200868	1	
2	Chassis.	201039	1	
3				
4	Switch, Toggle.	149001-001	1	S1.
5	Fuse. 8 amp	100028-022	1	F1.
6	Fuse. 4 amp.	100028-019	1	F5.
7	Fuse. 5 amp.	100028-020	2	F2.F3.
8	Fuse. 7.5 amp.	100028-026	1	F7.
9	Fuse. 10 amp.	100028-027	2	F4.F6.
10	Cord, AC Power.	100076-002	1	
11	Fuse Holder.	100027	7	
12	Block, Terminal.	100023-004	1	TB3.
13	Strip, Marker.	100048-004	1	Use with item 12.
14	Strip, Terminal.	100149-007	3	TB4.TB5.TB6.
15	Relay. 24v DC.	100279	1	K1.
16				
17				
18	Capacitor, Elect. 65,000uf	100276	2	C3.C4.
19	Capacitor, Elect. 6,000uf	100283	2	C1.C2.
20				
21	Diode, Rectifier. 1N4721	100052	2	CR1.CR2.
22	Diode, Rectifier. 1N4003	100127	7	CR7.CR8.CR9.CR10.CR11.CR12.CR13
23	Diode, Power. 1N1184	100286	4	CR3.CR4.CR5.CR6.
24				
25				
26	Resistor. 5%. 5W. 0.1	100111-001	1	R7.
27	Resistor. 30w. 2.5	100285-001	1	R5.
28	Resistor. 30w. 10	100285-002	1	R6.
29	Resistor. 5%. 3w. 1K	100068-102	4	R1.R2.R3.R4.
30				
31	Lug, Solder.	100138-004	4	
32	Grommet, Flexible Nylon.	100141-001	A/R	

Wang Computer Products — MATERIAL LIST

ML DRAWING NO. 201040-001 REV. H

DRAWING TITLE ASSY. POWER SUPPLY. MODEL NO. 11 DATE 2/24/72 SHEET 2 OF 6

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
33	Clamp, Cable.	100000-004	2	
34	Clamp, Capacitor. 2" Dia.	100025-003	2	Use with item 19.
35	Clamp, Capacitor. 3" Dia.	100025-007	2	Use with item 18.
36				
37	Connector, Male.	100010-003	1	P7.
38	Connector, Male.	100010-005	3	P8.P11.P25.
39	Pin, Connector. Female.	100021-006	10	
40	Pin, Connector. Male.	100021-007	4	
41	Pin, Connector. Male.	100021-010	2	
42	Pin, Connector. Female.	100021-004	2	
43	Terminal, Ins. Ring Tongue.	100055-005	7	No. 1/4 Yel
44	Terminal, Ins. Ring Tongue.	100055-003	10	No. 8 Yel
45	Terminal, " " "	100055-004	19	No. 10 Yel
46	Terminal, " " "	100057-004	11	
47	Terminal, " " "	100057-008	5	
48	Terminal, Quick Disconnect.	100139-004	2	
49	Jumper, 2 Terminal.	100150	2	Used on item 12.
50	Insulator.	100232-001	2	Used on item 48.
51	Wire, Insulated.	100053-912	A/R	
52	Wire, "	100053-914	A/R	
53	Wire, Insulated.	100053-916	A/R	
54	Wire, "	100053-924	A/R	
55	Wire, "	100053-918	A/R	
56				
57	List, Wire.	201050-001	Ref.	
58	Test Procedure.	201293	Ref.	
59				
60				
61	Screw, Pan Head.	100036-256	7	4-40 x 5/16"
62	Screw, Pan Head.	100036-305	17	6-32 x 5/16"
63	Screw, Pan Head.	100036-308	4	6-32 x 1/2"
64	Screw, Pan Head.	100036-420	2	8-32 x 1 1/4"

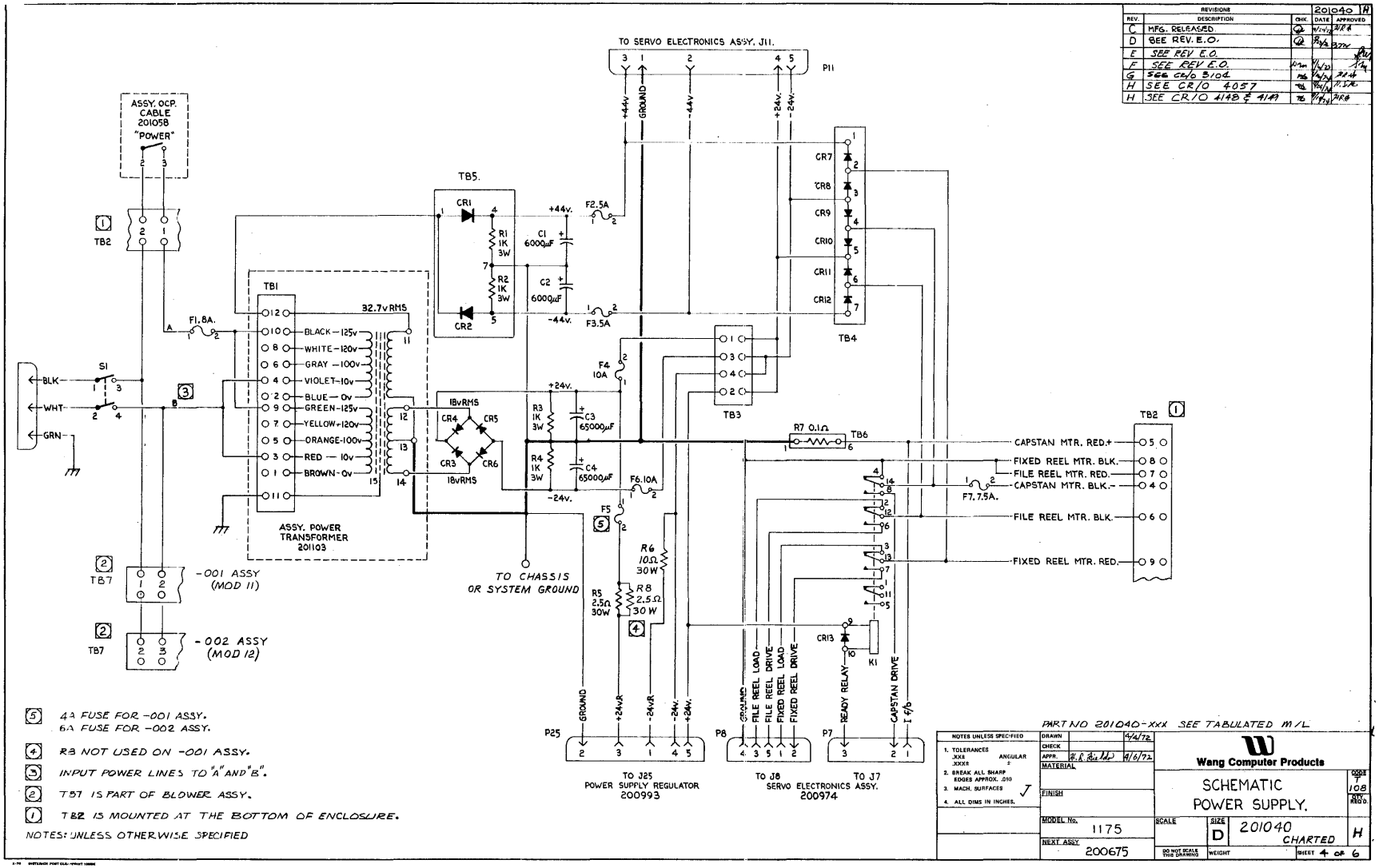
Wang Computer Products — MATERIAL LIST

ML DRAWING NO. 201040-001 REV. H

DRAWING TITLE ASSY. POWER SUPPLY. MODEL NO. 11 DATE 3/3/72 SHEET 3 OF 6

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
65				
66				
67	Washer, Flat.	100047-200	6	No.4.
68	Washer, Flat.	100047-300	11	No.6.
69	Washer, Flat.	100047-400	2	No.8.
70				
71				
72	Washer, Split Lock.	100042-200	6	No.4.
73	Washer, Split Lock.	100042-300	12	No.6.
74	Washer, Split Lock.	100042-400	2	No.8.
75				
76				
77	Washer, Int Tooth Lock.	100059-300	6	No.6.
	Test Procedure	201293		Ref

Figure B-1. Power Supply Assembly (pg. 3 of 3)



REVISIONS				201040 H
REV.	DESCRIPTION	CHK.	DATE	APPROVED
C	MFG. RELEASED			
D	SEE REV. E.O.			
E	SEE REV E.O.			
F	SEE REV E.O.			
G	SEE CR/O 3104			
H	SEE CR/O 4057			
H	SEE CR/O 4148 & 4149			

5. 4A FUSE FOR -001 ASSY.
6A FUSE FOR -002 ASSY.

4. R8 NOT USED ON -001 ASSY.

3. INPUT POWER LINES TO "A" AND "B".

2. TB7 IS PART OF BLOWER ASSY.

1. TB2 IS MOUNTED AT THE BOTTOM OF ENCLOSURE.

NOTES: UNLESS OTHERWISE SPECIFIED

PART NO 201040-xxx SEE TABULATED M/L

NOTES UNLESS SPECIFIED			
1. TOLERANCES .XX± .XXX± ANGULAR ±	DRAWN		4/4/72
2. BREAK ALL SHARP EDGES APPROX. .010	CHECK		
3. MACH. SURFACES	APPR.	W. L. Bell Jr.	4/6/72
4. ALL DIMS IN INCHES.	MATERIAL		
	FINISH		
	MODEL No.	1175	
	NEXT ASSY	200675	

Wang Computer Products

SCHEMATIC POWER SUPPLY.

CODE 1 108 NO REQ'D.

SCALE | SIZE D | 201040 CHARTED | H

DO NOT SCALE THIS DRAWING | WEIGHT | SHEET 4 OF 6

Figure B-2. Power Supply Schematic

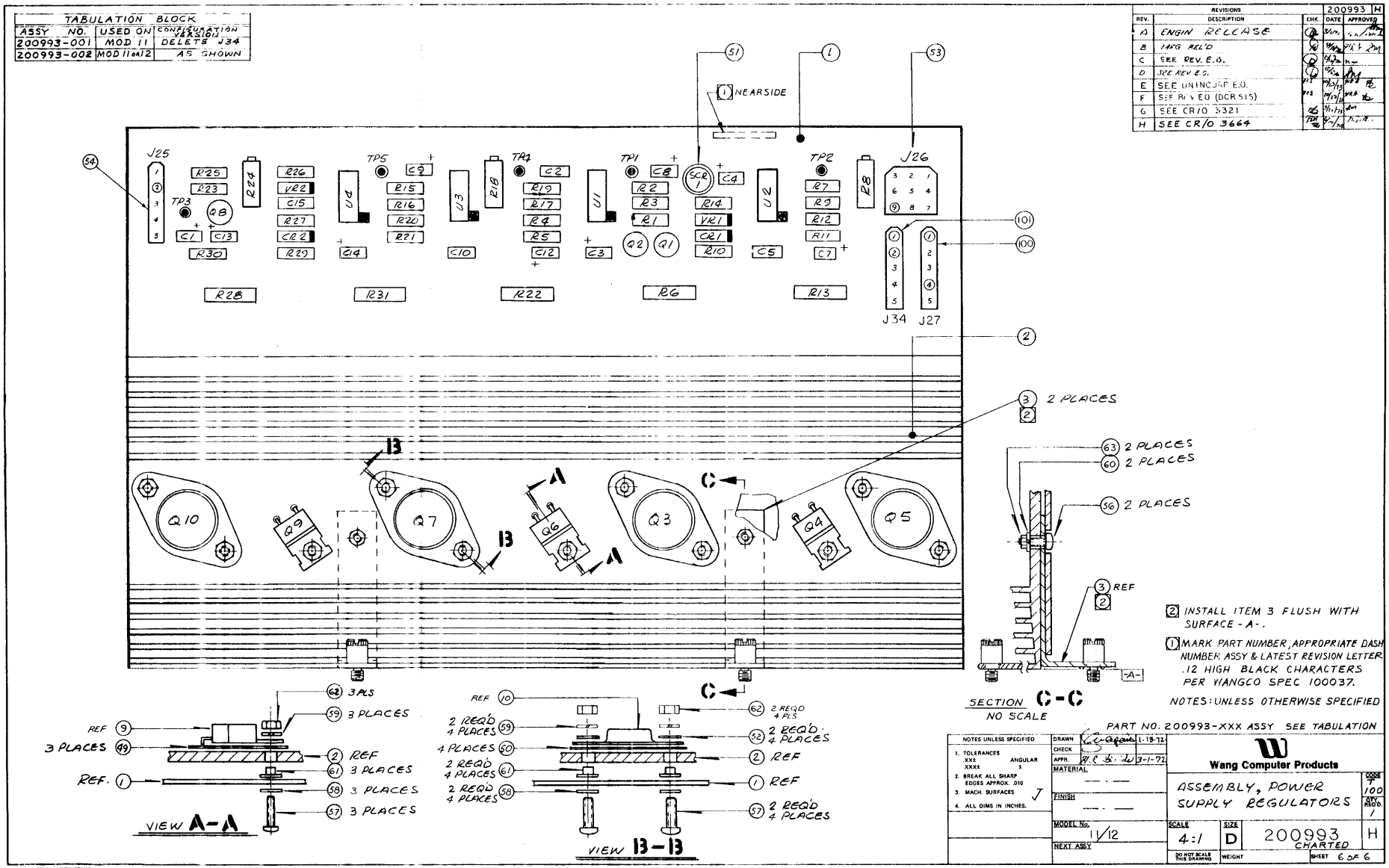


Figure B-3. Power Supply Regulators Assembly (pg. 1 of 2)

Wang Computer Products — MATERIAL LIST

ML | DRAWING NO. 200993-000 | REV. H

DRAWING TITLE: ASSY. POWER SUPPLY REGULATORS BASIC BOARD — MODEL NO. 11/12 — DATE 1/18/72 — SHEET 1 OF 6

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Board, Processed.	200992	1	
2	Heatsink.	201000	1	
3	Bracket, Support.	201973-001	2	
4				
5	IC.Voltage Regulator. uA723C.	100108	3	U2.3.4.
6	IC.Op. Amplifier. uA741.	100109	1	U1.
7				
8	Transistor. PNP. 2N4125	100081	2	Q1.8.
9	Transistor. PNP. TI.P30	100113	3	Q4.6.9.
10	Transistor. NPN. 2N3055	100159	4	Q3.5.7.10.
11	Transistor. PNP. 2N4037	100160	1	Q2.
12				
13	Diode, Zener. 1N752	100118	1	VR2.
14	Diode, Rectifier. 1N4003	100127	2	CR1.2.
15	Diode, Zener. 1N4736A	100161	1	VR1.
16	Rectifier, S.C. 40654	100162	1	SCR1.
17				
18	Capacitor, Ceramic. .001uf.	100073-102	1	C15
19	Capacitor, Ceramic. .0022uf.	100073-222	1	C2.
20	Capacitor, Polyfilm. .01uf.	100078-103	1	C10
21	Capacitor, Tantalum. 1.5uf.	100136-155	5	C1.4.8.9.13.
22	Capacitor, Tantalum. 47uf.	100079-476	4	C3.7.12.14.
23	Capacitor,Polyfilm .022uf	100078-223	1	C5
24	Resistor, Variable. 500	100163-501	2	R8.24.
25	Resistor, Variable. 1K	100163-102	1	R18.
26				
27	Resistor. 5%. 5w. .15	100111-002	1	R13.
28	Resistor. " " .2	100111-003	1	R22.
29	Resistor. " " .4	100111-004	2	R6.31.
30				
31	Resistor. 5%. ½w. 56	100156-560	1	R29
32	Resistor. " " 100	100156-101	4	R10,16.,11,20

Wang Computer Products — MATERIAL LIST

ML | DRAWING NO. 200993-000 | REV. H

DRAWING TITLE: ASSY. POWER SUPPLY REGULATORS BASIC BOARD — MODEL NO. 11/12 — DATE 1/18/72 — SHEET 2 OF 6

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
33	Resistor. 5%. 5w. 330	100111-331	1	R28.
34	Resistor. " ¼w. 330	100156-331	2	R5.30.
35	Resistor. " " 750	100156-751	2	R4.7.
36	Resistor. " " 1K	100156-102	1	R14.
37	Resistor. " " 1.2K	100156-122	1	R25.
38	Resistor. " " 1.5K	100156-152	1	R15.
39	Resistor. " " 2K	100156-202	1	R17.
40	Resistor. " " 2.2K	100156-222	3	R9.12.21.
41	Resistor. " " 3K	100156-302	3	R19.26.27.
42	Resistor. " " 3.3K	100156-332	1	R23.
43	Resistor. " " 5.1K	100156-512	1	R2.
44				
45	Resistor. 1%. ¼w. 10K	100155-385	2	R1.3.
46				
47	Test Procedure.	201185	Ref.	
48	Pin, Test Point.	100098	5	TP1. thru TP5.
49	Insulator, Transistor.	100146	3	Use with item 9.
50	Insulator, Transistor.	100151	4	Use with item 10.
51	Pad, Transistor.	100223	2	Use with item 11. & 16.
52	WASHER,FLAT	100251-200	8	No.4
53	Connector, 9 pin.	100247-001	1	J26.
54	Connector. 5 pin.	100247-005	1	J25.
55				
56	Screw, Pan Head.	100036-308	2	6-32 x 3/8"
57	Screw, Pan Head.	100036-210	11	4-40 x 5/8"
58	Washer, Flat.	100047-200	11	No.4.
59	Washer, SPRING LOCK.	100042-200	11	No.4.
60	Washer, Int. Tooth Lock.	100059-300	2	No.6.
61	Washer, Nylon Shoulder.	100063-012	11	
62	Nut, Hex.	100043-200	11	4-40.
63	Nut, Hex.	100043-300	2	6-32.
64	Artwork, Master.	200991	Ref	

Wang Computer Products — MATERIAL LIST

ML | DRAWING NO. 200993-001 | REV. H

DRAWING TITLE: ASSEMBLY, PWB POWER SUPPLY REGULATORS — MODEL NO. 11 — DATE 10/22/73 — SHEET 3 OF 6

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
100	Connector 5 Pin	100247-008	1	J27

Figure B-3. Power Supply Regulators Assembly (pg. 2 of 2)

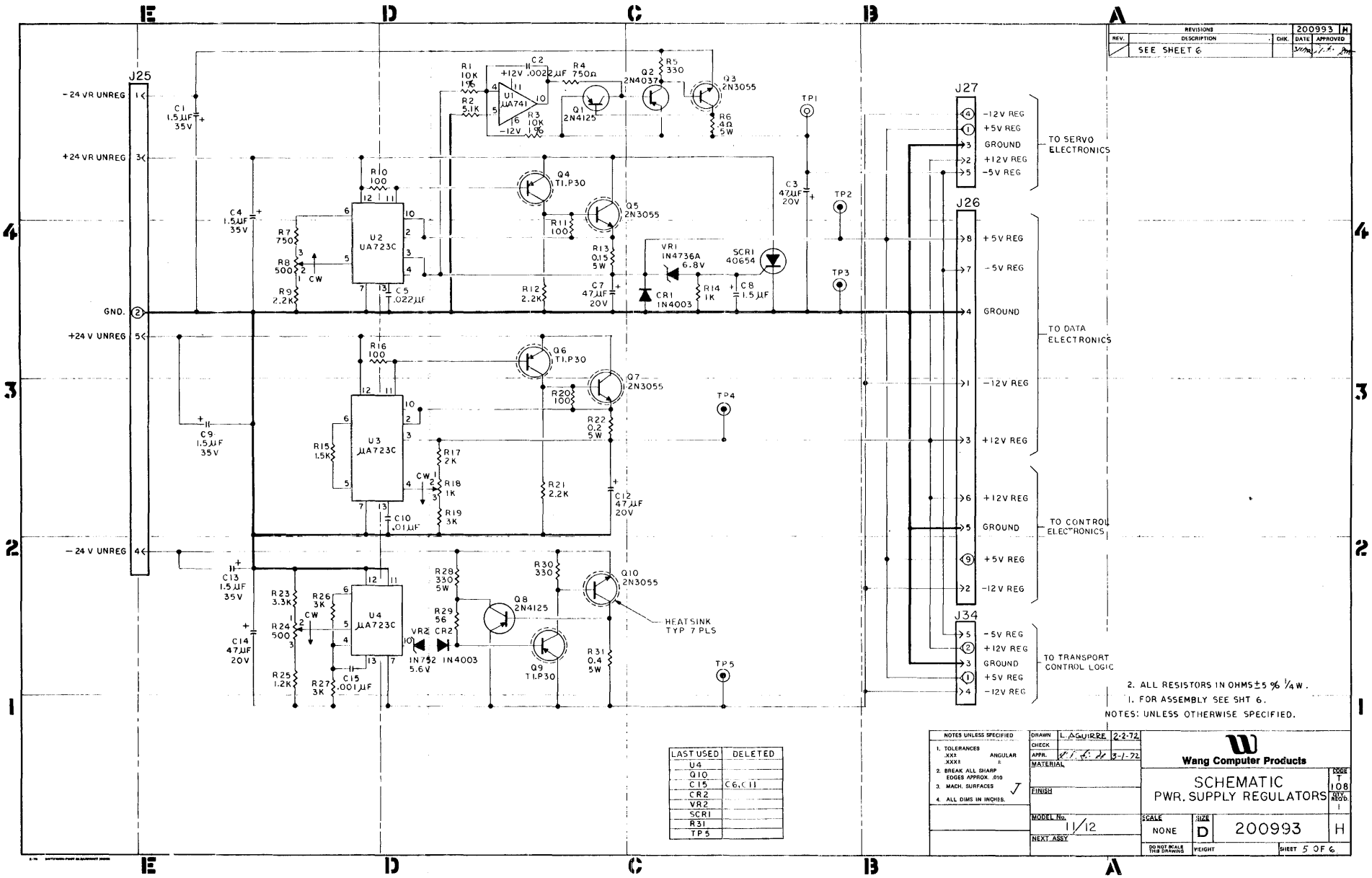
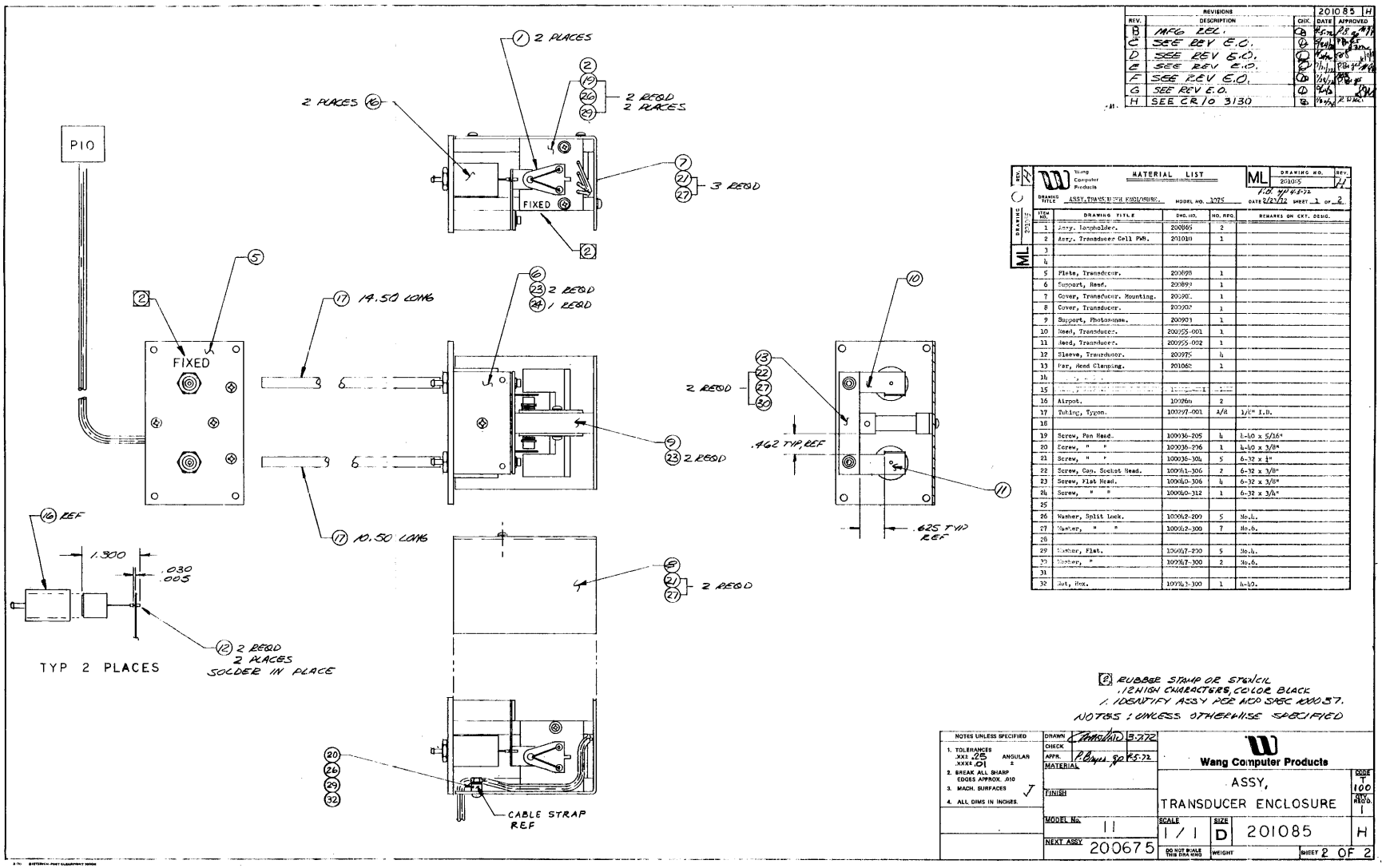


Figure B-4. Power Supply Regulator Schematic



REVISIONS				201085 H
REV.	DESCRIPTION	CHK.	DATE	APPROVED
B	MFG REL.			
C	SEE REV E.O.			
D	SEE REV E.O.			
E	SEE REV E.O.			
F	SEE REV E.O.			
G	SEE REV E.O.			
H	SEE CR/O 3130			

MATERIAL LIST — Wang Computer Products — ML DRAWING NO. 201085 REV. H

DRAWING TITLE: ASSY, TRANSDUCER ENCLOSURE — MODEL NO. 1075 — DATE 2/2/72 — SHEET 1 OF 2

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS OR CKT. DESIG.
1	Assy. Lampholder.	200805	2	
2	Assy. Transducer Cell PWB.	201010	1	
3				
4				
5	Plate, Transducer.	200898	1	
6	Support, Head.	200899	1	
7	Cover, Transducer. Mounting.	200900	1	
8	Cover, Transducer.	200902	1	
9	Support, Photosensor.	200901	1	
10	Head, Transducer.	200955-001	1	
11	Head, Transducer.	200955-002	1	
12	Sleeve, Transducer.	200975	4	
13	Pin, Head Clamping.	201068	1	
14				
15				
16	Airpot.	100260	2	
17	Tubing, Tygon.	100297-001	A/R	1/16" I.D.
18				
19	Screw, Pan Head.	100036-205	4	4-40 x 5/16"
20	Screw, " "	100036-296	1	4-40 x 3/8"
21	Screw, " "	100036-304	5	6-32 x 1"
22	Screw, Cap. Socket Head.	100041-306	2	6-32 x 3/8"
23	Screw, Flat Head.	100040-306	4	6-32 x 3/8"
24	Screw, " "	100040-312	1	6-32 x 3/4"
25				
26	Washer, Split Lock.	100042-200	5	No.4.
27	Washer, " "	100042-300	7	No.6.
28				
29	Washer, Flat.	100047-200	5	No.4.
30	Washer, "	100047-300	2	No.6.
31				
32	Nut, Hex.	101043-300	1	4-40.

[8] RUBBER STAMP OR STENCIL .12 HIGH CHARACTERS, CO/OR BLACK. IDENTIFY ASSY PER MDD SPEC 100.37.

NOTES: UNLESS OTHERWISE SPECIFIED

NOTES UNLESS SPECIFIED			
1. TOLERANCES XX± .25 ANGULAR ± .XXX± .01	DRAWN	Tomsovic	2-2-72
2. BREAK ALL SHARP EDGES APPROX. .010	CHECK		
3. MACH. SURFACES	APPR.	P. Bayes	2-5-72
4. ALL DIMS IN INCHES.	MATERIAL		
	FINISH		
	MODEL No.	11	
	NEXT ASSY	200675	

Wang Computer Products

ASSY, TRANSDUCER ENCLOSURE

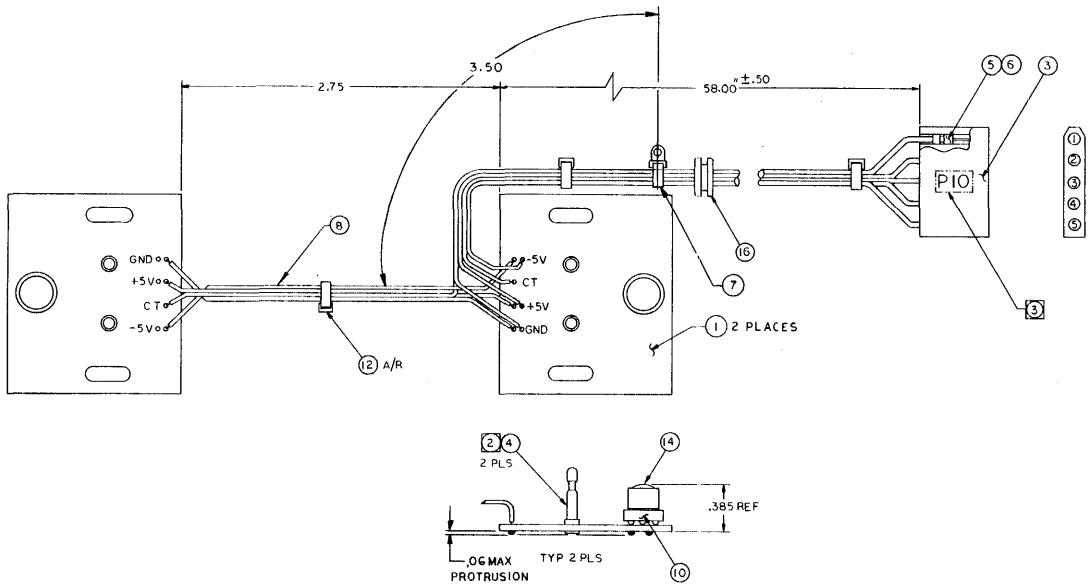
CODE ident. 100 — ASSY REV'D. I

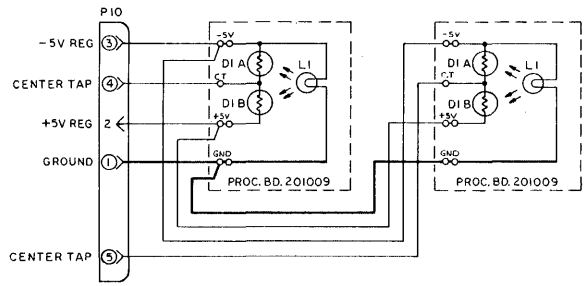
SCALE 1/1 — SIZE D — 201085 — H

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

201085 H

Figure B-5. Transducer Enclosure Assembly





ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS OR CAT. DESIG.
1	Board, Processed.	201009	A	
2				
3	Connector.	100010-005	1	P10.
4	Pin, Male.	100021-001	4	
5	Pin, Connector. Male.	100021-003	1	
6	Pin, Connector. Female.	100021-005	4	
7	Strap, Cable	100031-001	1	
8	Wire, Insulated.	100051-926	A/R	
9				
10	Sensor, Transistor.	100143	2	
11				
12	Strap, Cable.	100171-001	A/R	
13				
14	Photocell.	100176	2	
15				
16	Grommet, Rubber.	100046-003	1	
17				
18	Artwork, Master.	201008	Ref	

(3) MARK REF DESIG. 12 HIGH CHARACTERS, BLK; PER WANG SPEC 100013.
(2) TO BE SWAGED AND SOLDERED IN PLACE.
1. IDENTIFY ASSEMBLY PER WCP SPEC. 100037, TAG.

NOTES:

NOTES UNLESS SPECIFIED
1. TOLERANCES .XX± .25 ANGULAR .XXX± ±
2. BREAK ALL SHARP EDGES APPROX. .010
3. MACH. SURFACES
4. ALL DIMS IN INCHES.

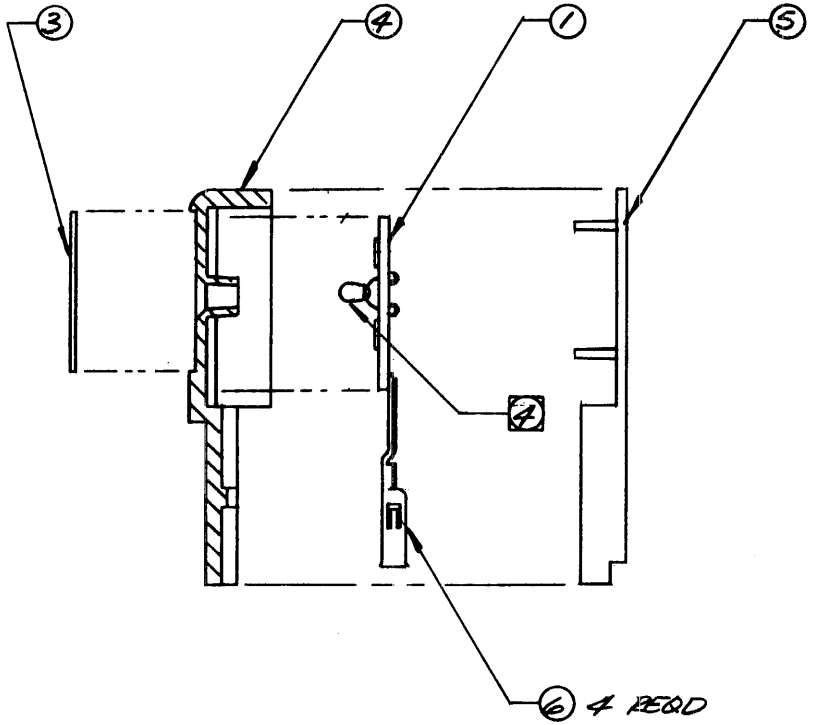
DRAWN 2/10/72
CHECK
APPR.
MATERIAL
FINISH
MODEL No. 1075
NEXT ASSY 201085

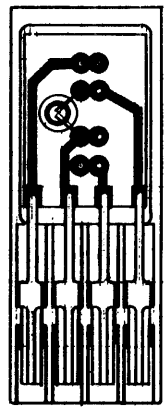
Wang Computer Products

ASSEMBLY
TRANSDUCER CELL PWB

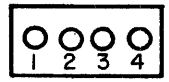
CODE T 100
QTY REQ'D. 1
SCALE 2:1
SIZE D
201010
D
DO NOT SCALE THIS DRAWING
WEIGHT
SHEET 2 OF 2

Figure B-6. Transducer Cell Assembly





ITEM 5, COVER NOT SHOWN FOR CLARITY



(lamp pins 2 & 4)

4 LAMP SHOWN THIS WAY FOR CLARITY. AFTER PINS HAVE BEEN SOLDERED TO BOARD, PLACE IN HOUSING & TURN LAMP FACE INTO HOLE.

3. CEMENT WINDOW (ITEM 3) AND COVER (ITEM 5) TO HOUSING (ITEM 4).

2. SOLDER PINS (ITEM 6) TO ETCH PADS ON BOARD (ITEM 1) AS SHOWN.

1. IDENTIFY ASSY PER WCP SPEC 100037, BAG.

NOTES: UNLESS OTHERWISE SPECIFIED

MATERIAL LIST — ML — DRAWING NO. 200684 — REV.

DRAWING TITLE: ASSY. PLUG-IN PHOTOSENSE. MODEL NO. 825 DATE 9/7/71 SHEET 1 OF 2

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Assy. Photosense PWB.	200707	1	
2				
3	Window.	200059	1	
4	Housing.	200682	1	
5	Cover.	200683	1	
6	Pin. Female.	100021-009	4	

NOTES UNLESS SPECIFIED

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

DRAWN — CHECK — APPR. R. Bigelow 9/23/71

MATERIAL —

FINISH —

MODEL No.

NEXT ASSY 200725

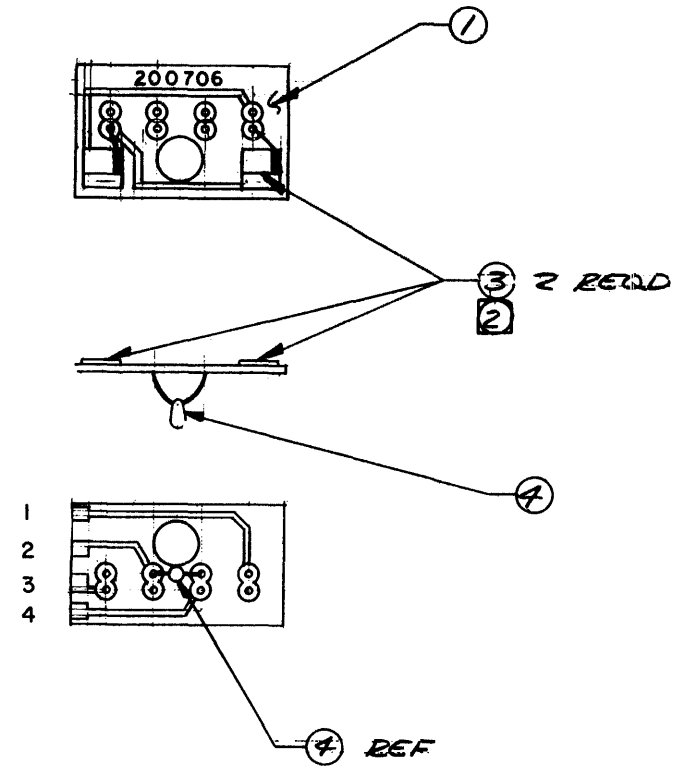
ASSY, PLUG IN PHOTOSENSE

CODE 101 — QTY. REQ'D. 1

SCALE 2/1 — SIZE C — 200684 — A

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

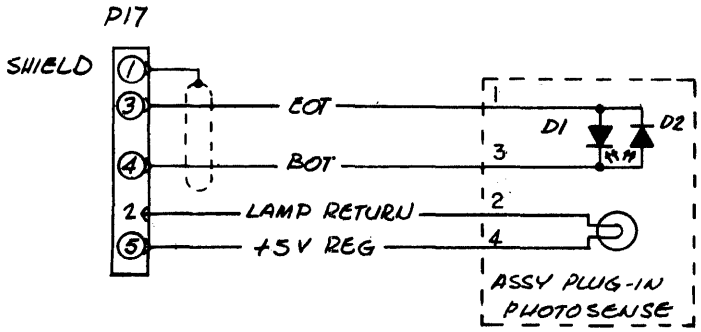
Figure B-7. Plug-In Photosense Assembly



ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Board, Processed.	200706	1	
2				
3	Cell, solar.	100008	2	
4	Lamp.	100009	1	

MATERIAL LIST — ML — DRAWING NO. 200707 — REV. A

DRAWING TITLE ASSY, PHOTOSENSE PWB. MODEL NO. 825 DATE 9/1/71 SHEET 1 OF 2



[2] LOCATE & SOLDER CELLS AS SHOWN AT LEFT, TOWARD INSIDE EDGE OF ETCH.

1. IDENTIFY ASSY PER WCP SPEC 100037, TYP6.

NOTES: UNLESS OTHERWISE SPECIFIED

NOTES UNLESS SPECIFIED			
1. TOLERANCES .XX± ANGULAR .XXX± ±	DRAWN	[illegible]	9.9.71
2. BREAK ALL SHARP EDGES APPROX. .010	CHECK		
3. MACH. SURFACES ✓	APPR.	[illegible]	9 [illegible] 71
4. ALL DIMS IN INCHES.	MATERIAL	— — —	
	FINISH	— — —	
	MODEL No.		
	NEXT ASSY	200684	

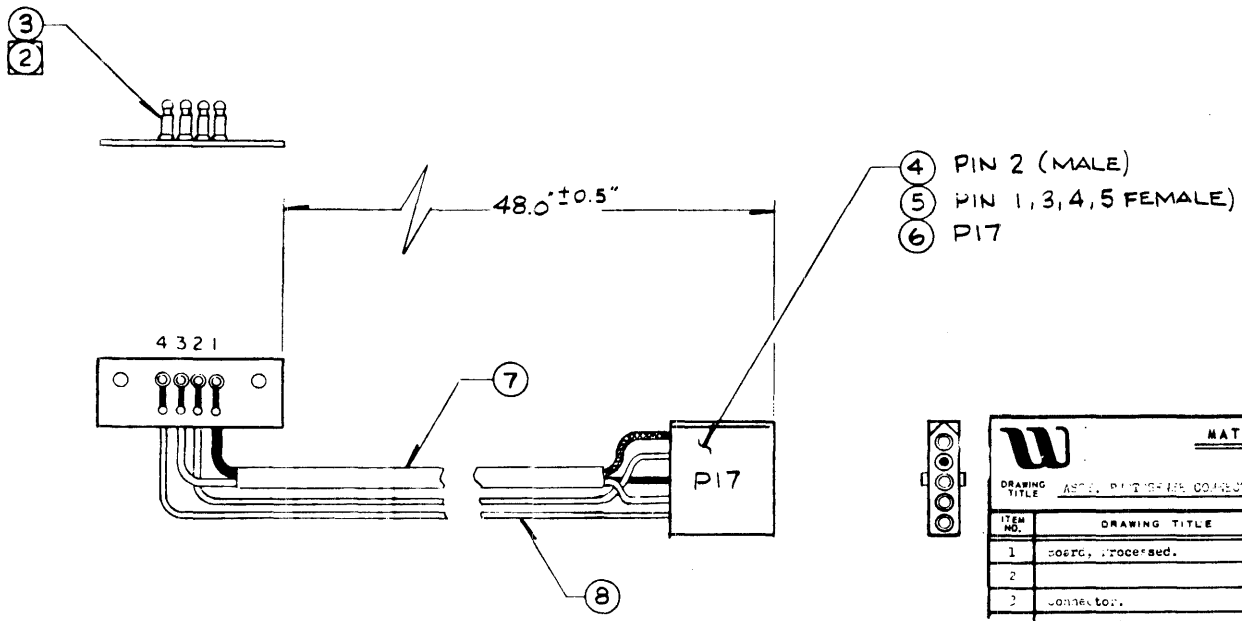
ASSY, PHOTOSENSE PWB

CODE 101 — QTY. REQ'D. 1

SCALE NONE — SIZE C — 200707 — A

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

Figure B-8. Photosense Assembly



MATERIAL LIST				
DRAWING TITLE: ASSY, PHOTOSENSE CONNECTOR. MODEL NO. 1075 DATE 1/24/72 SHEET 1 OF 2			ML	DRAWING NO. 201051 REV. B
ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Board, Processed.	200709	1	
2				
3	Connector.	100110-005	1	P17.
4	Pin, MALE	100021-001	-	
5	Pin, MALE	100021-003	1	Pin 2.
6	Pin, FEMALE	100021-005	4	Pin 1,3,4,5.
7	Wire, Twisted Shielded Pair.	100397	A/R	
	Wire, Insulated.	100353-926	A/R	
9				
10				
11	Artwork, Master.	200708	Ref.	

WIRE LIST				
WIRE NO	TERM	FROM	TO	TERM
1	SOL	TB-1	P17-3	5
2	SOL	TB-2	P17-2	4
3	SOL	TB-3	P17-4	5
4	SOL	TB-4	P17-5	5
5		SHEILD	P17-1	5

2 TO BE SWAGED THEN SOLDERED IN PLACE.

1. IDENTIFY ASSY PER WCP SPEC 100037 TAG.

NOTES: UNLESS OTHERWISE SPECIFIED

NOTES UNLESS SPECIFIED			
1. TOLERANCES XX± ANGULAR XXX± ±	DRAWN	AGUIRRE	1-22-72
2. BREAK ALL SHARP EDGES APPROX. .010	CHECK		
3. MACH. SURFACES √	APPR	1/22/72	1/22/72
4. ALL DIMS IN INCHES.	MATERIAL		
	FINISH		
	MODEL No.	MOD 1075	
	NEXT ASSY	200675	

Wang Computer Products

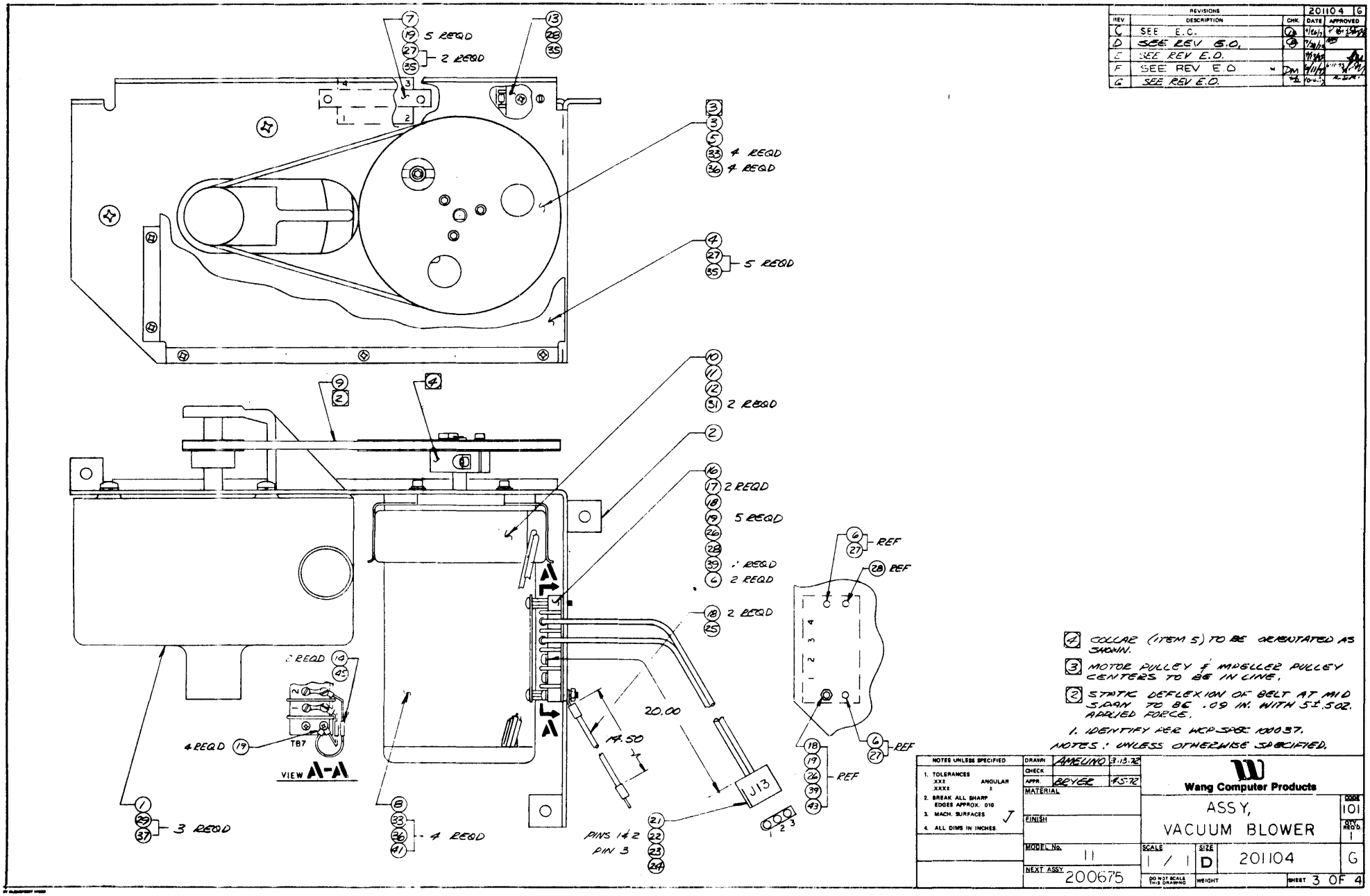
ASSEMBLY, PHOTO SENSE CONN

CODE 101 | QTY. REQ'D. 1

SCALE | SIZE C | 201051 | B

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

Figure B-9. Photosense Connector Assembly



REVISIONS				201104 G
REV	DESCRIPTION	CHK.	DATE	APPROVED
C	SEE E.C.			
D	SEE REV E.O.			
E	SEE REV E.O.			
F	SEE REV E.O.			
G	SEE REV E.O.			

4. COLLAR (ITEM 5) TO BE ORIENTATED AS SHOWN.
3. MOTOR PULLEY & IMPELLER PULLEY CENTERS TO BE IN LINE.
2. STATIC DEFLEXION OF BELT AT MID SPAN TO BE .09 IN. WITH 5 LBS. APPLIED FORCE.
1. IDENTIFY PER MCP-SPEC 100037.

NOTES: UNLESS OTHERWISE SPECIFIED.

NOTES UNLESS SPECIFIED			
1. TOLERANCES XX± ANGULAR XXX± ±	DRAWN	AMELINO	3.13.72
2. BREAK ALL SHARP EDGES APPROX. .010	CHECK		
3. MACH. SURFACES	APPR.	BEYER	4.5.72
4. ALL DIMS IN INCHES.	MATERIAL		
	FINISH		
	MODEL No.	11	
	NEXT ASSY	200675	

Wang Computer Products

ASSY, VACUUM BLOWER

CODE 101 | QTY REQ'D 1

SCALE 1 / 1 | SIZE D | 201104 | G

DO NOT SCALE THIS DRAWING | WEIGHT | SHEET 3 OF 4

Figure R-10. Vacuum Blower Assembly

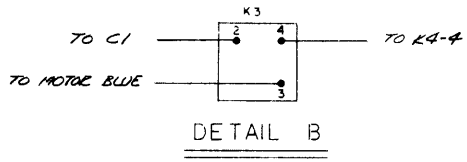
REVISIONS				201104 G
REV	DESCRIPTION	CHK	DATE	APPROVED
/	SEE SHT. 3	/	/	/

MATERIAL LIST — DRAWING NO. 201104 REV G

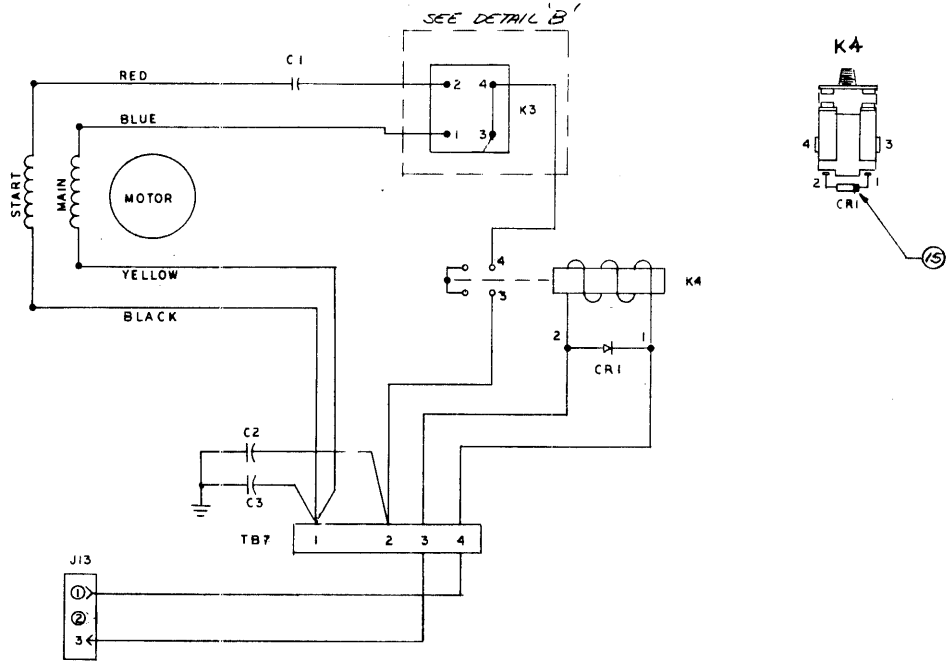
DRAWING TITLE: ASSY, VACUUM BLOWER — MODEL NO. 11 — DATE — SHEET 1 OF 4

DRAWING A 201104-001 REV G

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS OR SPECIFICATION
1	Outline Dwg. Impeller	200907	1	
2	Brkt.Blower Assy	200930	1	
3	Pulley,Motor	201036-001	1	
4	Shroud,Blower Assy	201117	1	
5	Collar,Blower Pulley	201169	1	
6	Stand-off, T Cover.	201256	2	
7	Relay,Motor Starting	100258	1	K3
8	Motor,Vacuum	100259	1	
9	Belt,Vee	100269-001	1	
10	Capacitor,Motor Start	100275-003	1	C1
11	End Cap,Capacitor	100276-001	1	
12	Clamp,Capacitor	100277-003	1	
13	Relay,Power 24 VDC	100280	1	K4
14	Capacitor, AC Line.	100[illegible]-001	1	C2,C3
15	Diode Rectifier	100127	1	CR1 IN4003
16	Strip,Terminal	100023-004	1	TB7
17	Strip,Marker	100048-004	2	
18	Term.Ins.Ring Tongue	100056-002	3	
19	Term.Ins.Ring Tongue	100057-004	14	
20				
21	Connector	100010-003	1	J13
22	Pin,Female	100021-006	2	
23	Pin,Male	100021-007	3	
24	Wire Insulated	100053-918	A/R	
25	WIRE INSULATED	100053-914	A/R	
26	Screw,Pan Hd	100036-304	1	6-32 x 7/16
27	Screw,Pan Hd	100036-304	2	6-32 x 1 1/4
28	Screw,Pan Hd	100036-308	1	6-32 x 1 1/2
29	Screw,Pan Hd	100036-408	1	1/4 - 20 x 1 1/2
30				
31	Screw,Flat Hd 82°	100040-404	2	8-32 x 3/8
32				
33	Screw,Cap Soc.Hd	100041-408	8	8-32 x 1/2
34				
35	Washer,Split-Lock	100042-300	8	No 6
36	Washer,Split Lock	100042-400	8	No 8
37	Washer,Split Lock	100042-600	3	1/4
38				
39	Washer Lock Int.Tooth	100059-300	7	No 6
40				
41	Washer,Flat	100047-400	4	No 8
42				
43	Nut, Maching Hex	100043-300	1	No 6
44				
45	Tubing, Teflon.	100226-002	A/R	
46				
47				
48				
49				
50				



DETAIL B



NOTES UNLESS SPECIFIED			
1. TOLERANCES .XXS ANGULAR .XXXS ±	DRAWN	[illegible]	3/3/72
2. BREAK ALL SHARP EDGES APPROX. .010	CHECK	[illegible]	4/7/73
3. MACH. SURFACES	APPR.		
4. ALL DIMS IN INCHES.	MATERIAL		
	FINISH		
	MODEL No.	11	
	NEXT ASSY	200675	

Wang Computer Products

ASSY VACUUM BLOWER

CODE 101 — QTY REQ'D 1

SCALE 1/1 — SIZE D — 201104 — G

DO NOT SCALE THIS DRAWING — WEIGHT — SHEET 4 OF 4

Figure B-11. Vacuum Blower Schematic

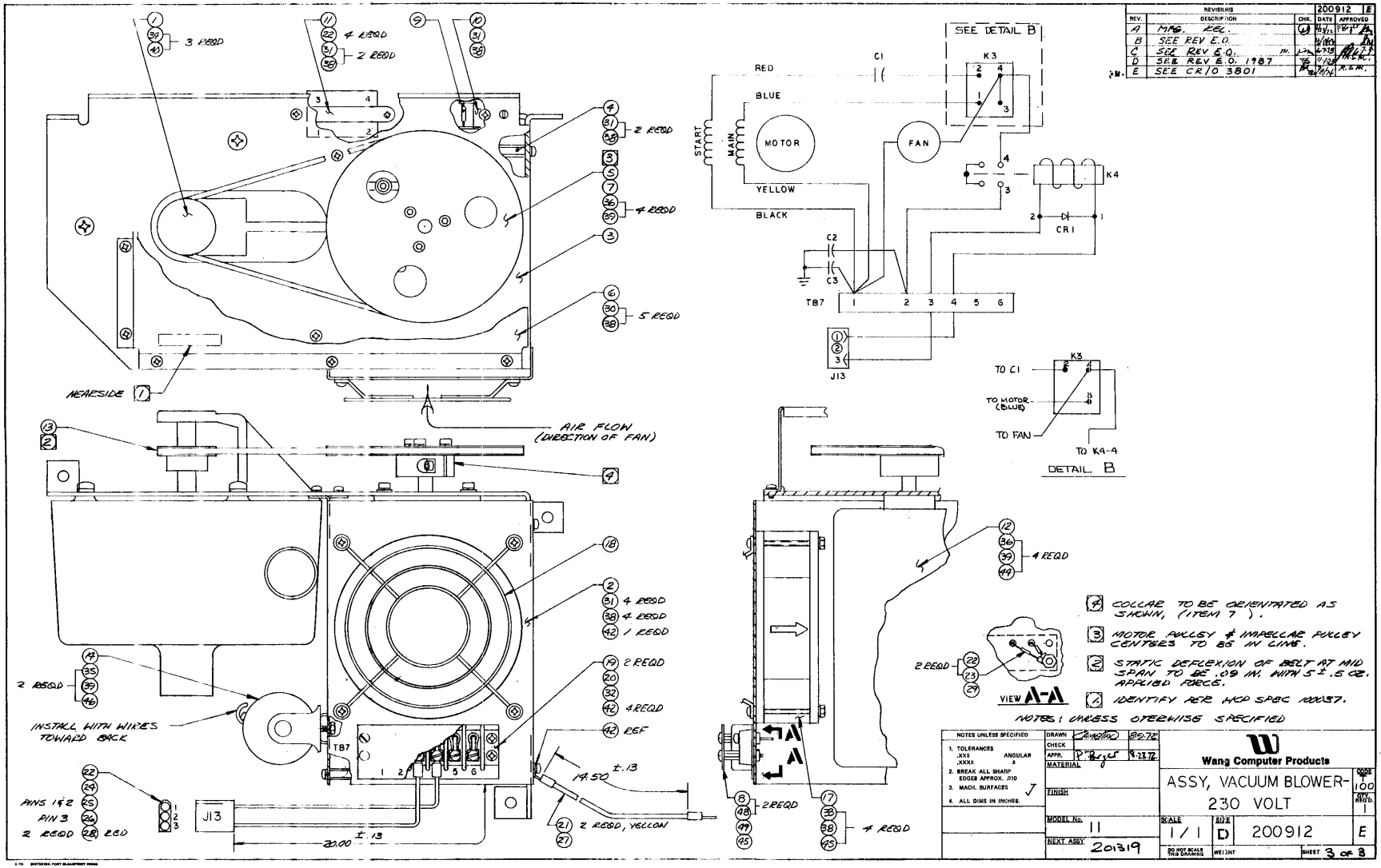


Figure B-12. Vacuum Blower Assembly (pg. 1 of 2)

230v. 50Hz.

REV. E | DRAWING NO. 200912 | ML

WANGCO INCORPORATED — MATERIAL LIST — ML — DRAWING NO. 200912 — REV. E

DRAWING TITLE: ASSY. VACUUM BLOWER. MODEL NO. 11 DATE 8/16/72 SHEET 1 OF 3

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Outline Drawing, Impeller	200907	1	
2	Bracket, Fan Mounting.	200911	1	
3	Bracket, Blower Assy.	200913	1	
4	Spacer, Hex.	200914	1	
5	Pulley, Motor.	201036-002	1	
6	Shroud, Blower Assy.	202090	1	
7	Collar, Blower Motor.	201169	1	
8	Stand-Off. TB Cover.	201256	2	
9	Diode, Rectifier. 1N4003	100127	1	CR1.
10	Relay, Power. 24VDC.	100280	1	K4.
11	Relay, Motor Starting.	100374	1	K3.
12	Motor, Vacuum.	100375	1	
13	Belt, Vee.	100269-002	1	
14	Capacitor, Motor Starting.	100275-002	1	C1.
15	End Cap, Capacitor.	100276-002	1	
16	Clamp, Capacitor.	100277-002	1	
17	Fan.	100380	1	
18	Guard, Finger.	100381	1	
19	Strip, Marker.	100024-006	2	Use with item 20.
20	Strip, Terminal.	100044-006	1	
21	Terminal, Ins. Ring Tongue.	100055-002	2	Yellow.
22	Terminal, Ins. Ring Tongue.	100057-004	8	Red.
23	Capacitor, AC Line.	100428-001	2	C2. C3.
24	Connector.	100010-003	1	J13.
25	Pin, Female.	100021-006	2	
26	Pin, Male.	100021-007	1	
27	Wire, Insulated.	100053-914	A/R	
28	Wire, Insulated.	100053-918	A/R	
29	Tubing, Teflon.	100226-022	A/R	
30	Screw, Pan Head.	100036-303	5	6-32 x 3/16"
31	Screw, Pan Head.	100036-305	9	6-32 x 5/16"
32	Screw, Pan Head.	100036-310	1	6-32 x 5/8"

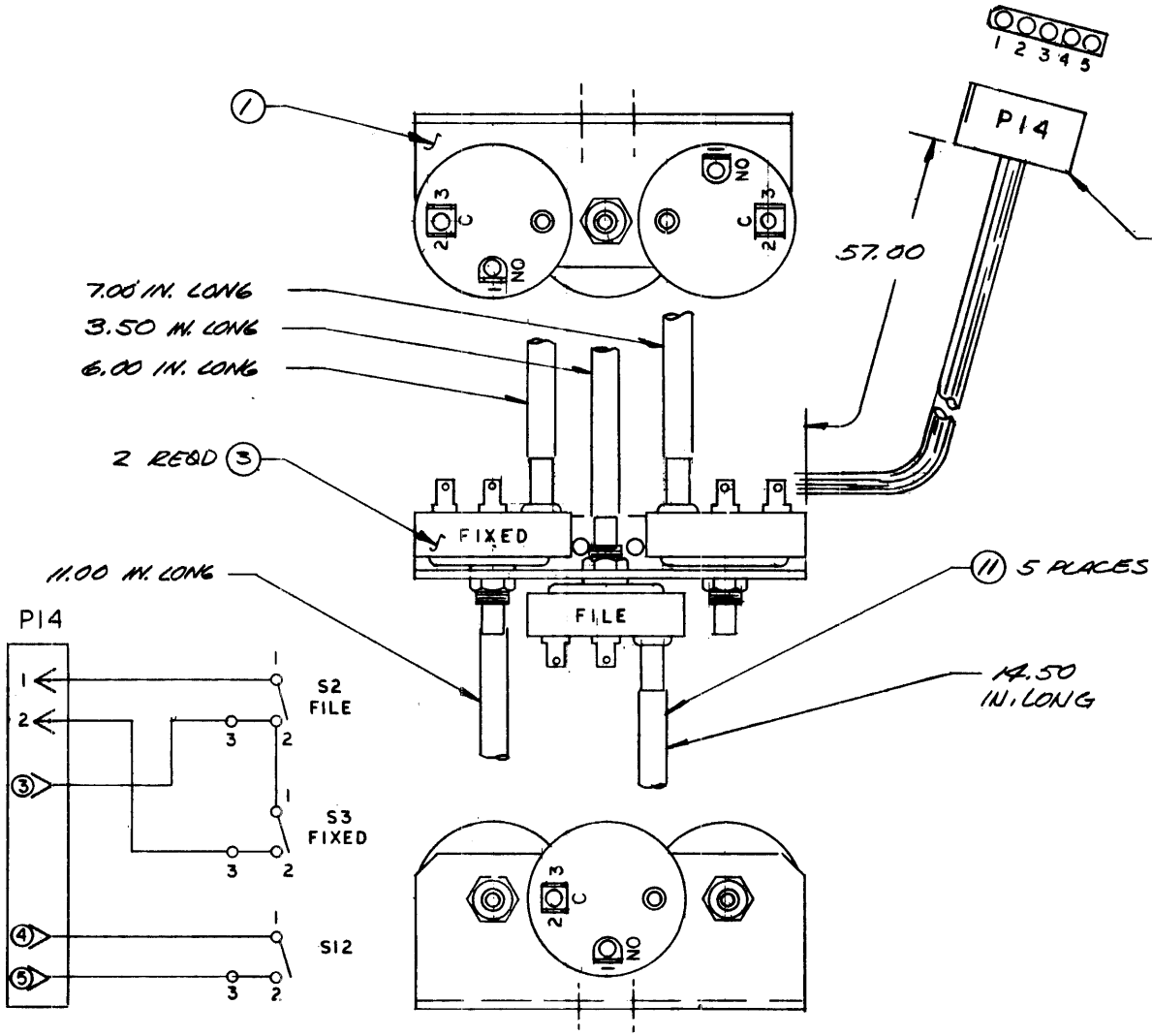
REV. E | DRAWING NO. 200912 | ML

WANGCO INCORPORATED — MATERIAL LIST — ML — DRAWING NO. 200912 — REV. E

DRAWING TITLE: ASSY. VACUUM BLOWER. MODEL NO. 11 DATE 8/16/72 SHEET 2 OF 3

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
33	Screw, Pan Head.	100036-328	4	6-32 x 1.75"
34	Screw, Pan Head.	100036-608	3	1/4-20 x 1/2"
35	Screw, Flat Head. 82°	100040-406	2	8-32 x 3/8"
36	Screw, Cap Socket Head.	100041-408	8	8-32 x 1/2"
37				
38	Washer, Split Lock.	100042-300	18	No.6.
39	Washer, Split Lock.	100042-400	10	No.8.
40	Washer, Split Lock.	100042-600	3	No.1/4.
41				
42	Washer, Int. Tooth Lock.	100059-300	7	No.6.
43				
44	Washer, Flat.	100047-400	4	No.8.
45	Nut, Hex.	100043-300	5	No.6.
46	Nut, Hex.	100043-400	2	No.8.
47				
48	Screw, Pan Head.	100036-304	2	6-32 x 1/4"
49	Screw, " "	100036-312	1	6-32 x 3/4"
50	Screw, " "	100036-316	1	6-32 x 1"

Figure B-12. Vacuum Blower Assembly (pg. 2 of 2)



MATERIAL LIST

ML | DRAWING NO. 201097 | REV. C

DRAWING TITLE ASSY. VACUUM SWITCHES. MODEL NO. 11 DATE 5/23/72 SHEET 1 OF

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Bracket, Switch Mounting.	201074	1	
2				
3	Switch, Vacuum.	100287	3	S2.S3.S12.
4				
5				
6	Connector.	100010-005	1	P14.
7	Pin, male.	100021-003	2	PINS 1, 2
8	Pin, Female.	100021-005	3	PINS 3,4, 5
9	Terminal, Quick Disconnect.	100139-002	7	
10	Wire, Insulated.	100053-924	A/R	
11	Tubing, Tygon.	100297-002	A/R	3/16" I.D.

NOTES UNLESS SPECIFIED
1. TOLERANCES .XX± .25 ANGULAR .XXX± ±
2. BREAK ALL SHARP EDGES APPROX. .010
3. MACH. SURFACES √
4. ALL DIMS IN INCHES.

DRAWN 3.10.72
CHECK
APPR. P.Bajer 4-5-72
MATERIAL
FINISH
MODEL No. 11
NEXT ASSY 200675

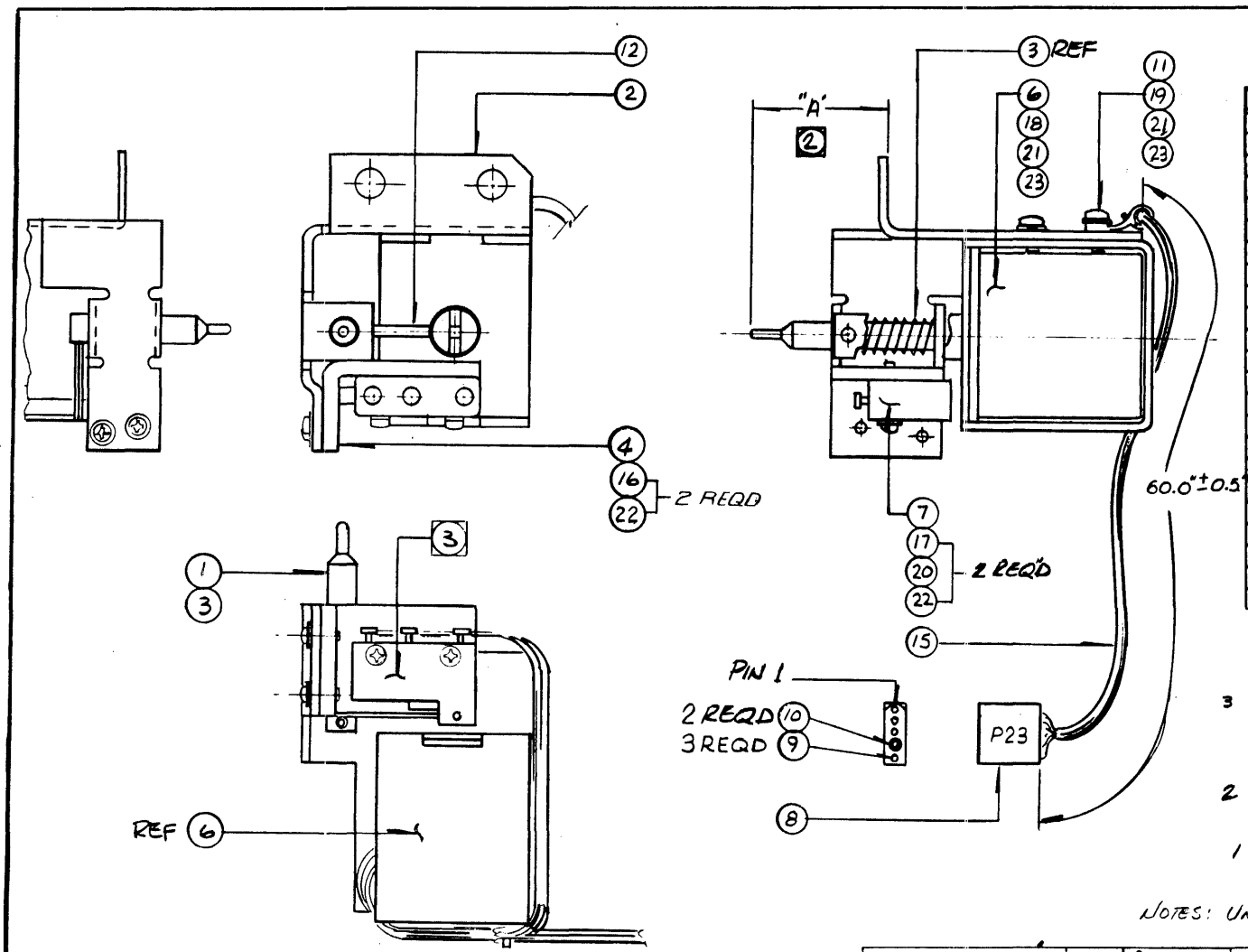
ASSY VACUUM SWITCHES

CODE 101 | QTY. REQ'D. 1

SCALE 1/1 | SIZE C | 201097 | C

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

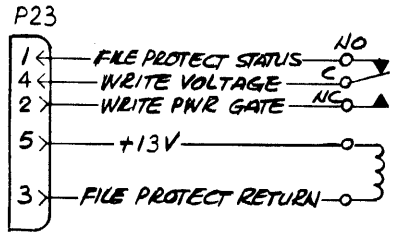
Figure B-13. Vacuum Switches Assembly



ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS
1	Pin, Actuator.	200144	1	
2	Bracket, Solenoid.	200145	1	
3	Spring.	200146	1	
4	Bracket, Switch Mounting.	200724	1	
5				
6	Solenoid.	100062-001	1	
7	Switch, Snap Action.	100071	1	S11
8	Connector.	100010-005	1	P23.
9	Pin, Female.	100021-005	3	
10	Pin, Male.	100021-003	2	
11	Strap, Cable.	100031-003	1	
12	Pin, Groove.	100032-316	1	
13				
14	Wire, Insulated.	100053-922	A/R	
15				
16	Screw, Pan Head.	100036-104	2	2-56 x 1/4"
17	Screw, Pan Head.	100036-106	2	2-56 x 3/8"
18	Screw, Pan Head.	100036-304	1	6-32 x 1/4"
19	Screw, Pan Head.	100036-307	1	6-32 x 7/16"
20				
21	Washer, Flat.	100047-300	2	No.6.
22	Washer, Int. Tooth Lock.	100059-100	2	No.2.
23	Washer, Int. Tooth Lock.	100059-300	2	No.6.

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 IN.
1 IDENTIFY WITH WCP SPEC 100037, TRG.

NOTES: UNLESS OTHERWISE SPECIFIED



NOTES UNLESS SPECIFIED			
1. TOLERANCES .XX± ANGULAR .XXX± ±	DRAWN	AGUIRRE	1-19-72
2. BREAK ALL SHARP EDGES APPROX. .010	CHECK		
3. MACH. SURFACES	APPR.		2/22/72
4. ALL DIMS IN INCHES.	MATERIAL	— - —	
	FINISH	— - —	
	MODEL No.	MOD 1075	
	NEXT ASSY	200675	

Wang Computer Products

ASSY., WRITE ENABLE SW.

CODE 101 | QTY. REQ'D.

SCALE 1=1 | SIZE | 201057 | B

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

Figure B-14. Write Enable Switch Assembly

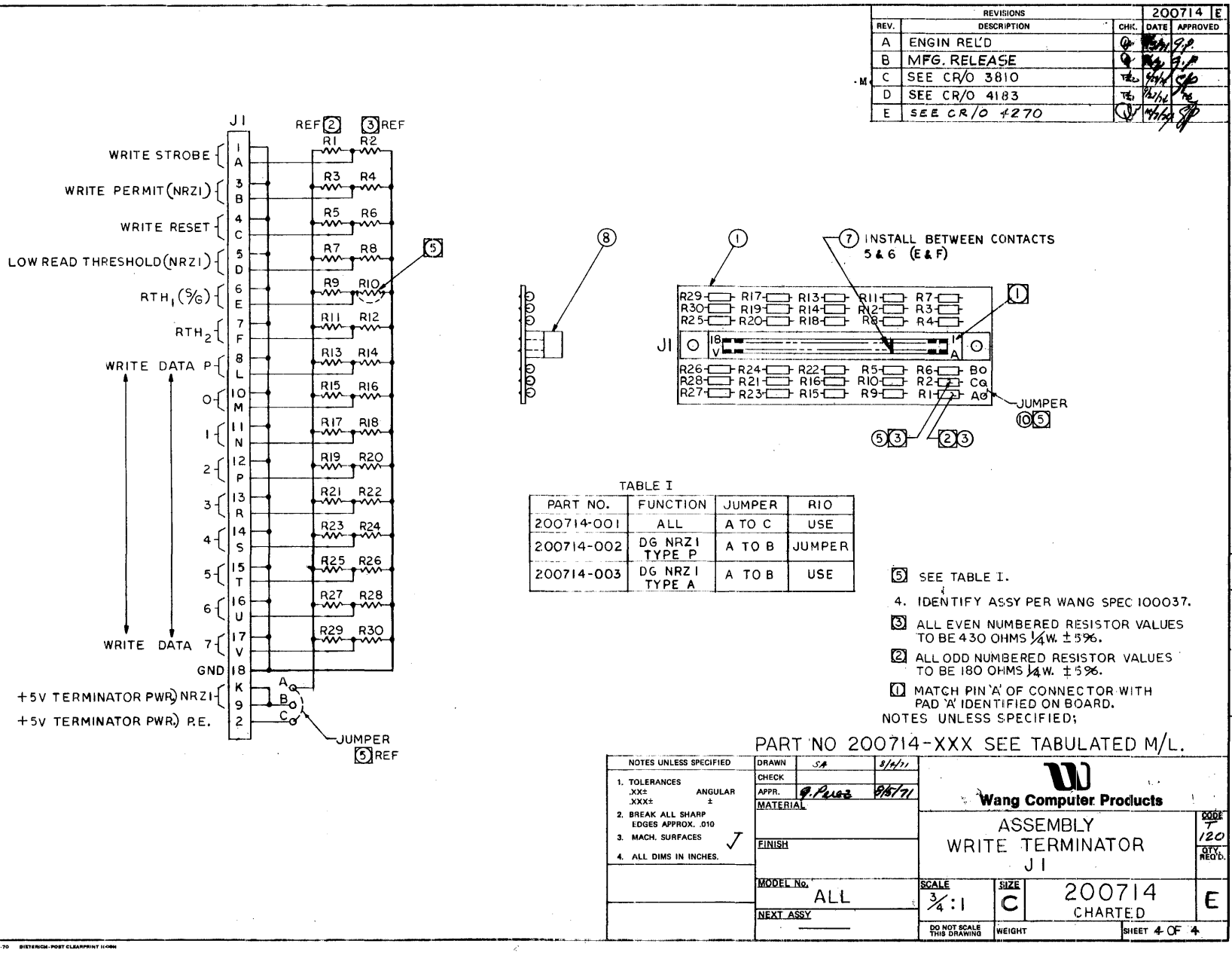


TABLE I

PART NO.	FUNCTION	JUMPER	R10
200714-001	ALL	A TO C	USE
200714-002	DG NRZI TYPE P	A TO B	JUMPER
200714-003	DG NRZI TYPE A	A TO B	USE

5 SEE TABLE I.

4. IDENTIFY ASSY PER WANG SPEC 100037.

3 ALL EVEN NUMBERED RESISTOR VALUES TO BE 430 OHMS 1/4W. ±5%.

2 ALL ODD NUMBERED RESISTOR VALUES TO BE 180 OHMS 1/4W. ±5%.

1 MATCH PIN 'A' OF CONNECTOR WITH PAD 'A' IDENTIFIED ON BOARD.

NOTES UNLESS SPECIFIED;

PART NO 200714-XXX SEE TABULATED M/L.

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

DRAWN SA 8/4/71
CHECK
APPR. G. Perez 9/15/71
MATERIAL
FINISH
MODEL No. ALL
NEXT ASSY

Wang Computer Products

ASSEMBLY
WRITE TERMINATOR
J1

CODE 7 120 QTY. REQ'D.

SCALE 3/4:1 SIZE C 200714 CHARTED E

DO NOT SCALE THIS DRAWING WEIGHT SHEET 4 OF 4

200714 E

Figure B-15. Write Terminator Assembly, J1 (pg. 1 of 2)

T120

REV. D

Wang Computer Products

MATERIAL LIST

ML

DRAWING NO. 200714 - 001 REV. D

DRAWING TITLE ASSY.WRITE TERMINATOR. MODEL NO. ALL. DATE 8/5/71. SHEET 1 OF 4

DRAWING 200714 - 00-

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Board, Processed.	200713	1	
2				
3	Resistor. 5%. ¼w. 180	100156-181	15	R1.3.5.7.9.11.13.15.17.19.21.
4				R23.25.27.29.
5	Resistor. 5%. ¼w. 430	100156-431	15	R2.4.6.8.10.12.14.16.18.20.
6				R22.24.26.28.30.
7	Insert. Polarization.	100222	1	
8	Connector, 18 Pin.	100246	1	
9				
10	Wire, Insulated.	100051-024	A/R	Jumper A to C.
11				
12				
13				
14	Artwork, Master.	200712	Ref.	
15	Test Procedure.	200966	Ref.	

DUAL GAP NRZI TYPE-P

T 120

REV. D

Wang Computer Products

MATERIAL LIST

ML

DRAWING NO. 200714 - 002 REV. D

DRAWING TITLE ASSY.WRITE TERMINATOR. MODEL NO. ALL. DATE 8/5/71. SHEET 2 OF 4

DRAWING 200714 - 00-

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Board, Processed.	200713	1	
2				
3	Resistor, 5%. ¼w. 180	100156-181	15	R1.3.5.7.9.11.13.15.17.19.21.
				R23.25.27.29.
4				
5	Resistor. 5%. ¼w. 430	100156-431	14	R2.4.6.8.[illegible].12.14.16.18.20.22.
				R24.26.28.30.
6				
7	Insert. Polarization.	100222	1	
8	Connector, 18 Pin.	100246	1	
9				
10	Wire, Insulated.	100051-024	A/R	Jumper A to B. and where R10
11				position is.
12				
13				
14	Artwork, Master.	200712	Ref.	
15	Test Procedure.	200966	Ref.	

DUAL GAP NRZI TYPE 'P'

REV. A

WANGCO INCORPORATED

MATERIAL LIST

ML

DRAWING NO. 200714-003 REV. A

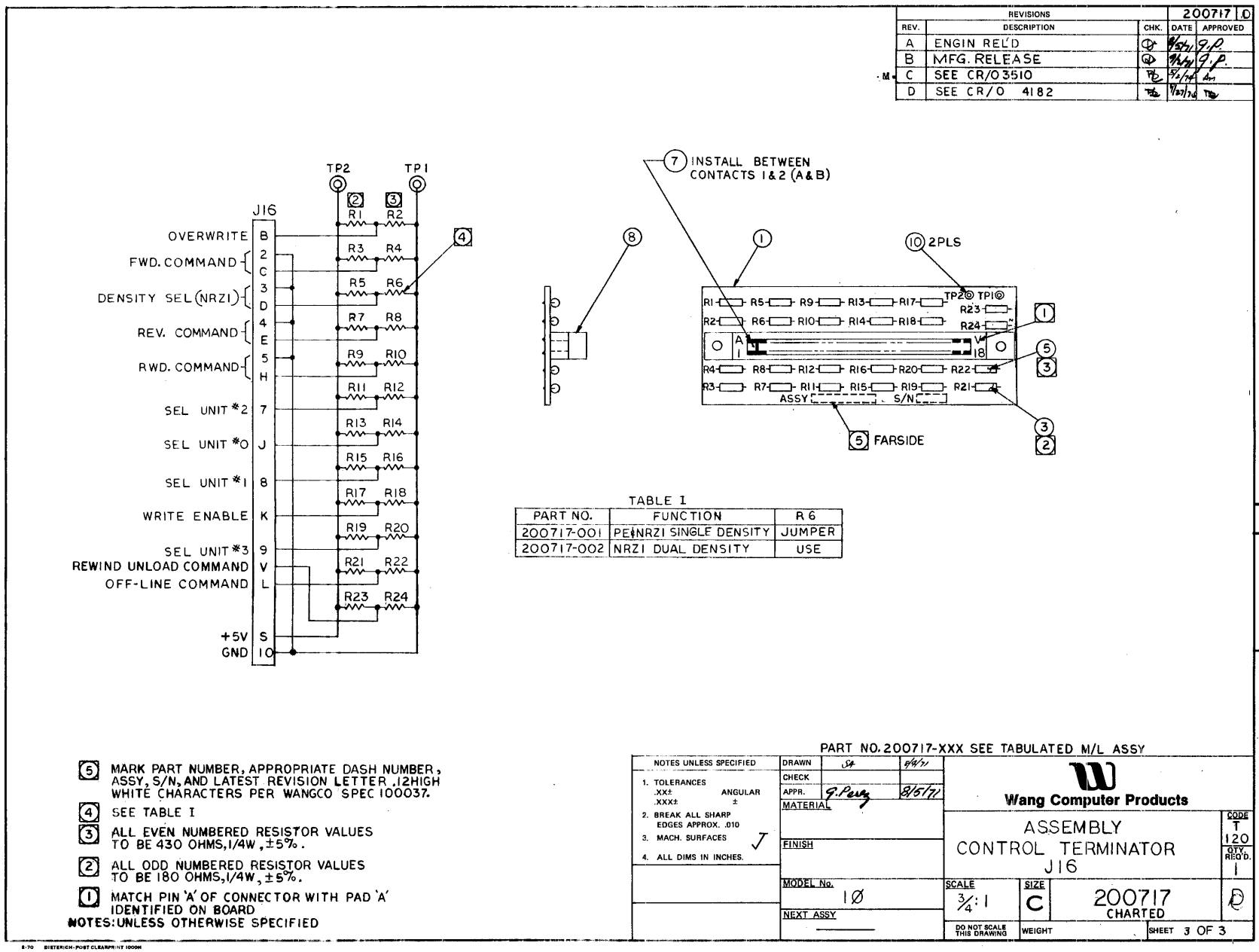
DRAWING TITLE ASSY. WRITE TERMINATOR. MODEL NO. ALL. DATE 10/7/74 SHEET 3 OF 4

DRAWING NO. 200714-003

Item No.	Drawing Title	Dwg. No.	Rev.	Qty.	Remarks on Ckt. Desig.
1	Board, Processed.	200713		1	
2					
3	Resistor, 5%. ¼W. 180	100156-181		15	R1.3.5.7.9.11.13.15.17.19.
					R21.23.25.27.29.
4					
5	Resistor, 5%. ¼W. 430	100156-431		14	R2.4.6.8.10.12.14.16.18.20.
					R22.24.28.30.
6					
7	Insert,Polarization.	100222		1	
8	Connector, 18 Pin.	100246		1	
9					
10	Wire, Insulated.	100051-024		A/R	Jumper A to B.
11					
12					
13					
14	Artwork, Master.	200712		Ref	
15	Test Procedure.	200966		Ref.	

FORM 209 (5/74)

Figure B-15. Write Terminator Assembly, J1 (pg. 2 of 2)



200717 C

Figure B-16. Control Terminator Assembly, J16 (pg. 1 of 2)

T 12.0

REV. D

Wang Computer Products

MATERIAL LIST

ML

DRAWING NO. 200717 - 001 REV. D

DRAWING TITLE ASSY.CONTROL TERMINATOR. MODEL NO. 10A DATE 8/4/71. SHEET 1 OF 3

DRAWING 200717 - 001

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Board, Processed.	200716	1	
2				
3	Resistor. 5%. ¼w. 180	100156-181	12	R1.3.5.7.9.11.13.15.17.19.21.23
4				
5	Resistor. 5%. ¼w. 430	100156-431	11	R2.4.8.10.12.14.16.18.20.22.24
6				
7	Insert, Polarization.	100222	1	
8	Connector. 18 Pin.	100246	1	
9				
10	Pin, Connector. Male.	100098	2	TP1. TP2.
11				
12	Wire, Insulated.	100051-024	A/R	Jumper in R6 position.
13				
14	Artwork, Master.	200715	Ref.	
15	Test Procedure.	200966	Ref.	

NRZI DUAL DENSITY.

T 12.0

REV. D

Wang Computer Products

MATERIAL LIST

ML

DRAWING NO. 200717 - 002 REV. D

DRAWING TITLE ASSY.CONTROL TERMINATOR. NRZI. DUAL DENSITY. MODEL NO. 10 DATE 8/5/71. SHEET 2 OF 3

DRAWING 200717 - 002

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Board, Processed.	200716	1	
2				
3	Resistor. 5%. ¼w. 180	100156-181	12	R1.3.5.7.9.11.13.15.17.19.21.23
4				
5	Resistor, 5%. ¼w. 430	100156-431	12	R2.4.6.8.10.12.14.16.18.20.22.
6				24.
7	Insert, Polarization.	100222	1	
8	Connector, 18 Pin.	100246	1	
9				
10	Pin, Connector. Male.	100098	2	TP1. TP2.
11				
12				
13				
14	Artwork, Master.	200715	Ref.	
15	Test Procedure.	200966	Ref.	

Figure B-16. Control Terminator Assembly, J16 (pg. 2 of 2)

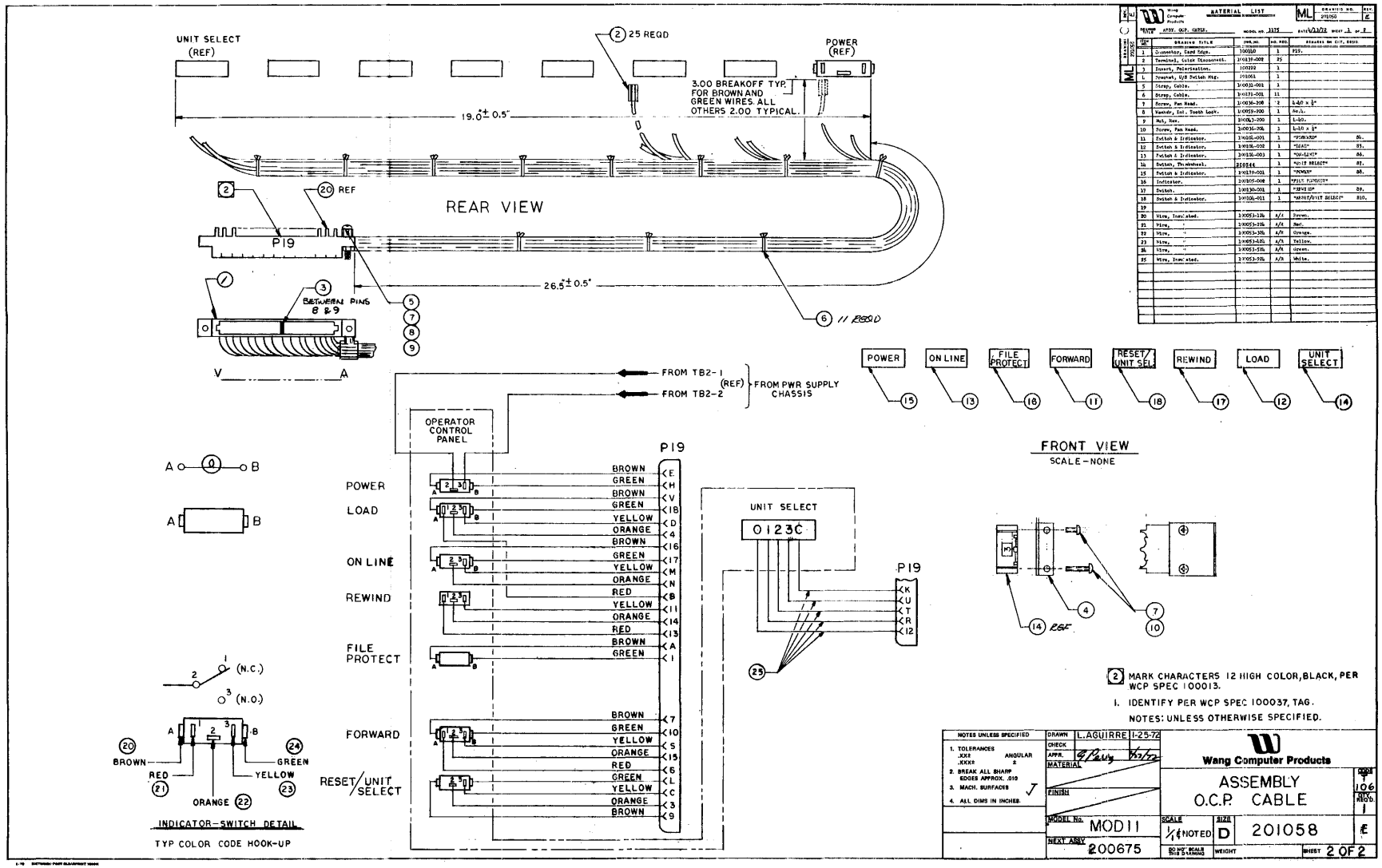
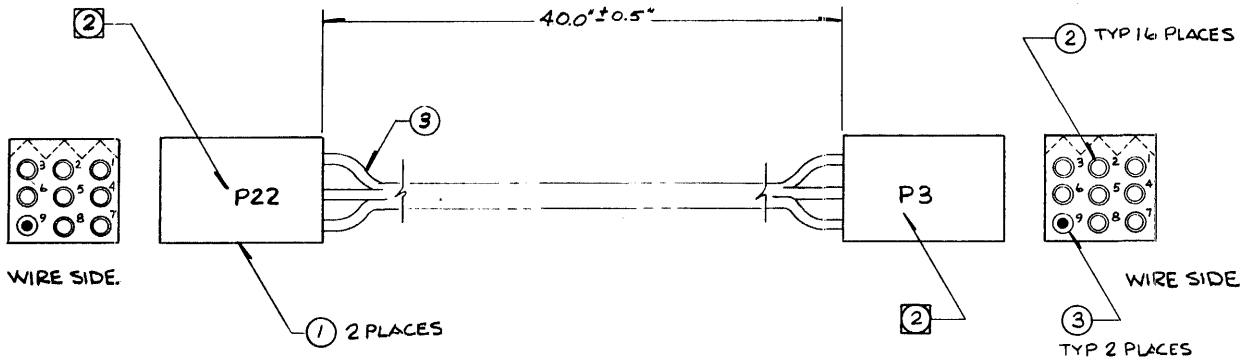
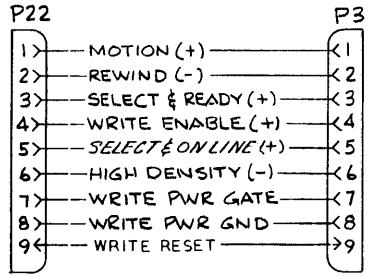


Figure B-17. OCP Cable Assembly

REVISIONS			201052	C
REV.	DESCRIPTION	CHK.	DATE	APPROVED
A	MFG. RELEASE			
B	SEE REV E.O. (DCR 692)		11/4/72	
C	SEE REV E.O.			





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

1. IDENTIFY PER WCP SPEC 100037 TAG.

NOTES' UNLESS OTHEWISE SPECIFIED.

MATERIAL LIST

WANGCO

DRAWING TITLE ASSY., DATA CONTROL CABLE MODEL NO. 1075 DATE 1-24-72 SHEET ___ OF ___

ML DRAWING NO. 201052 REV. C

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	CONNECTOR	100010-009	2	P3, P22
2	PIN, FEMALE	100021-006	16	
3	PIN, MALE	100021-007	2	
4	WIRE, INSULATED	100053-918	A/R	

ORIGINAL ON MYLAR — REV — ML

NOTES UNLESS SPECIFIED

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

DRAWN	AGUIRRE	1-22-72
CHECK		
APPR.		
MATERIAL		
FINISH		
MODEL No.	MOD 11	
NEXT ASSY	200675	

Wang Computer Products

ASSEMBLY, DATA CONTROL CABLE

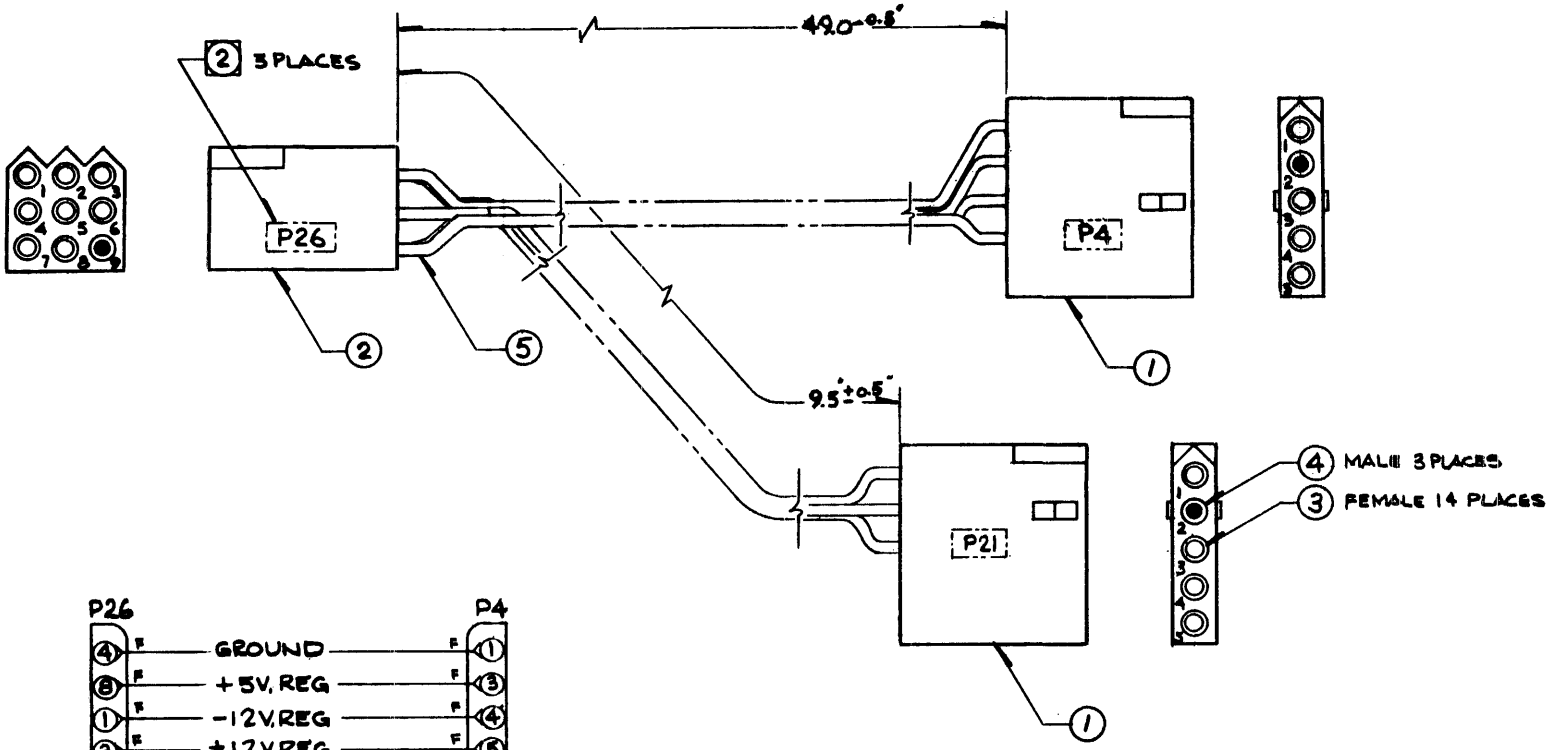
CODE 101 — QTY. REQ'D. 1

SCALE 2:1 — SIZE C — 201052 — C

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

8-71 DIETZGEN-POST CLEARPRINT 1000H

Figure B-18. Data Control Cable Assembly



2 MARK REF DESIGNATIONS .12 HIGH CHARACTERS PER WCP SPEC. 100018.

1. IDENTIFY PER WCP SPEC. 100037 TAG.

NOTES: UNLESS OTHERWISE SPECIFIED.

MATERIAL LIST — ML — DRAWING NO. 201053 — REV. A

DRAWING TITLE: ASSY. REGULATOR OUTPUT CABLE. MODEL NO. 1075 DATE 1/24/72 SHEET 1 OF 2

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Connector.	100010-005	2	P4. P21.
2	Connector.	100010-009	1	P26.
3	Pin, Female.	100021-006	14	
4	Pin, Male.	100021-007	3	
5	Wire, Insulated.	100053-916	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 AGUIRRE 1-22-72
CHECK
APPR. 1/22/72
MATERIAL
FINISH
MODEL No. MOD 1075
NEXT ASSY 200675

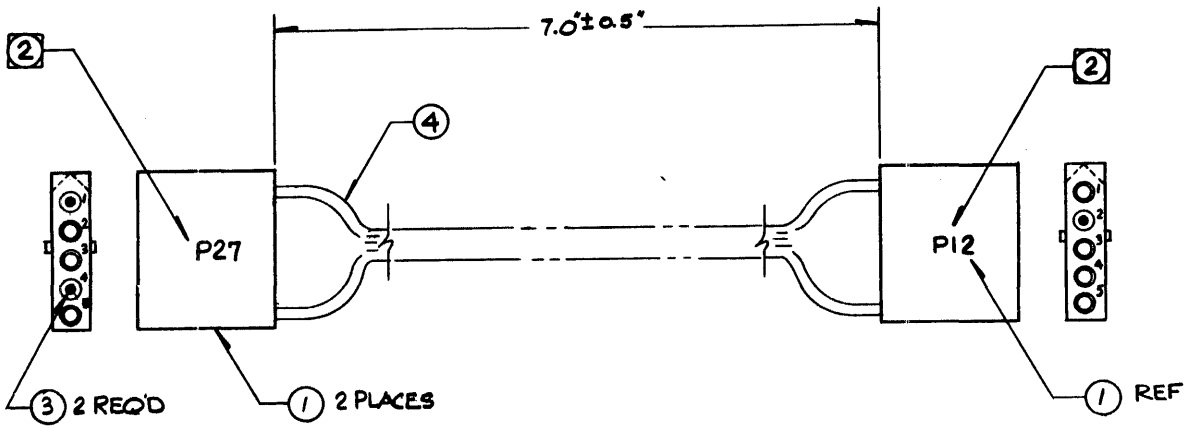
ASSEMBLY REGULATOR OUTPUT CABLE

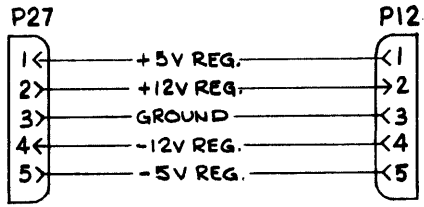
CODE 106 — REV. LTR. 1

SCALE 2:1 — SIZE C — 201053 — A

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

Figure B-19. Regulator Output Cable Assembly





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

1. IDENTIFY PER WCP SPEC 100037 TAG.

NOTES: UNLESS OTHERWISE SPECIFIED.

MATERIAL LIST — DRAWING NO. 201054 REV. A

DRAWING TITLE: ASSY. SERVO REGULATED POWER CABLE, MODEL NO. 1075, DATE 1/24/72, SHEET 1 OF 2

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Connector.	100010-005	2	P12, P27.
2	Pin, Female.	100021-006	7	
3	Pin, Male.	100021-007	3	
4	Wire, Insulated.	100053-918	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 AGUIRRE 1-22-72
CHECK
APPR. 2/2/72
MATERIAL
FINISH
MODEL No. MOD 1075
NEXT ASSY 200675

ASSEMBLY, SERVO REGULATED POWER CABLE

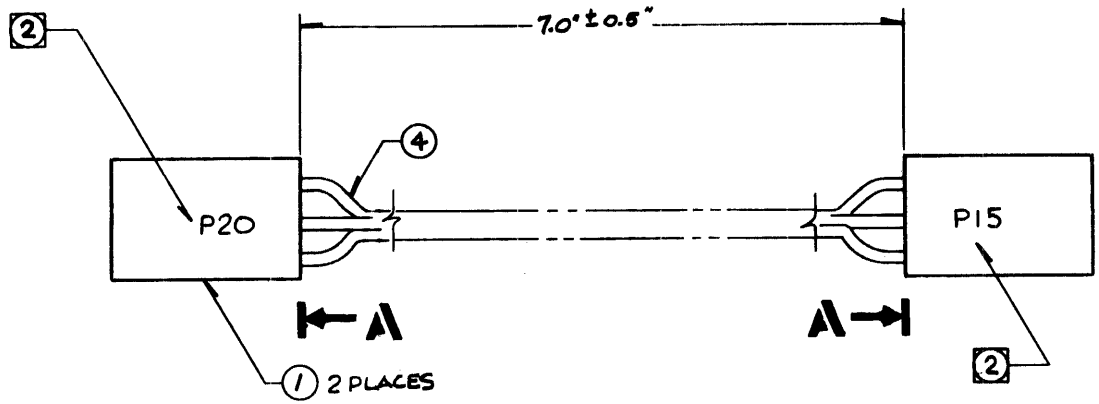
CODE 101 | QTY. REQ'D. 1

SCALE 2:1 | SIZE C | 201054 | A

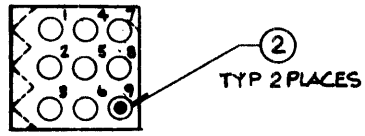
DO NOT SCALE THIS DRAWING | WEIGHT | SHEET 2 OF 2

ITEK/CH-POST CLEARPRINT 1000H

Figure B-20. Servo Regulated Power Cable Assembly



P20		P15
1	LOAD PB. COM	9
2	LOAD PB. N/C	8
3	RESET PB N/C	7
4	TRANSPORT READY (-)	6
5		5
6	FORWARD (+)	4
7	SET FORWARD	3
8	REWIND (-)	2
9	REVERSE (+)	1



VIEW IN DIRECTION OF 'A'

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

1. IDENTIFY PER WCP SPEC 100087 TAG

NOTES: UNLESS OTHERWISE SPECIFIED.

MATERIAL LIST — ML — DRAWING NO. 201055, REV. A

DRAWING TITLE: ASSY. NO.1. SERVO CONTROL CABLE. MODEL NO. 1075 SP 2/22/72 DATE 2/24/72 SHEET 1 OF 2

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Connector.	100017-009	2	P15. P20.
2	Pin, Male.	100021-003	2	
3	Pin, Female.	100021-005	14	
4	Wire, Insulated.	100053-924	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 AGUIRRE 1-19-72
CHECK
APPR. 2/22/72
MATERIAL
FINISH
MODEL No. MOD 1075
NEXT ASSY 200675

ASSEMBLY, NUMBER 1
SERVO CONTROL CABLE

CODE 101
QTY. REQ'D. 1
SCALE 2:1
SIZE C
201055
A
DO NOT SCALE THIS DRAWING
WEIGHT
SHEET 2 OF 2

IVERICH-POST CLEARPRINT 1000H

Figure B-21. Servo Control Cable, No. 1 Assembly

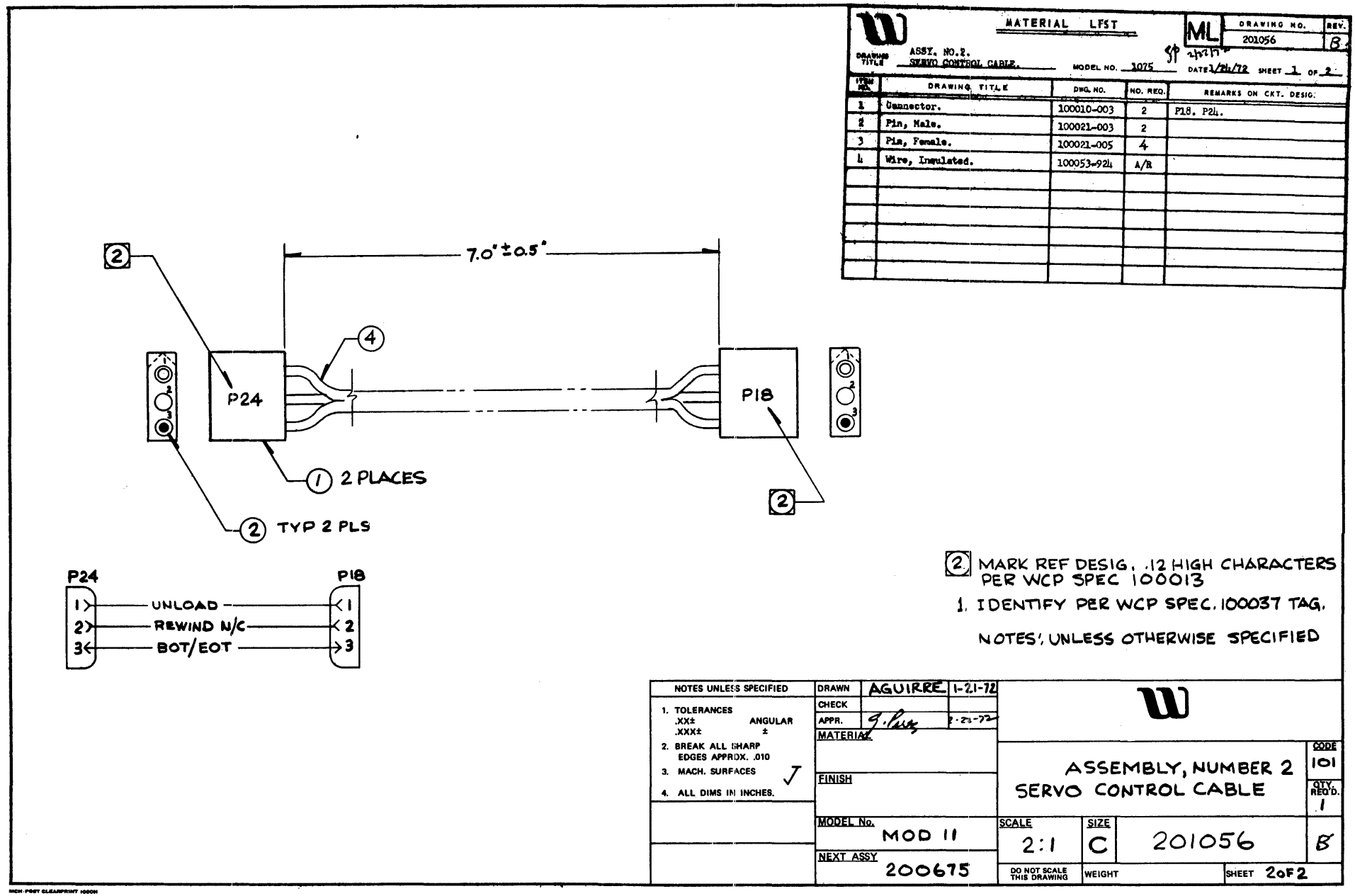


Figure B-22. Servo Control Cable, No. 2 Assembly

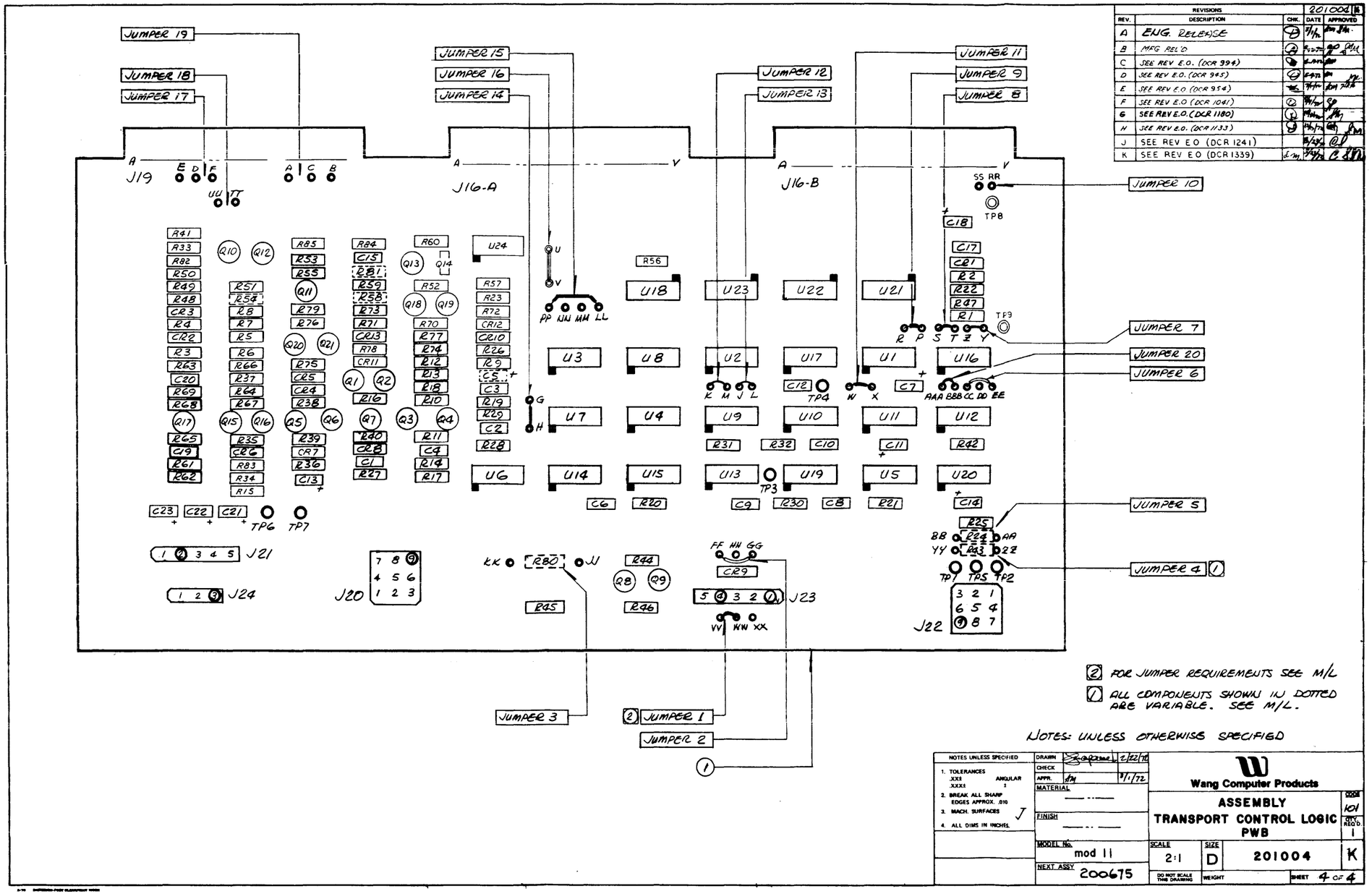


Figure B-23. Transport Control Logic Assembly (pg. 1 of 3)

WANGCO INCORPORATED — MATERIAL LIST — ML — DRAWING NO. 201004-000 — REV. K

DRAWING TITLE: ASSY. TRANSPORT CONTROL LOGIC PWB — MODEL NO. 1075 — DATE 2/4/72 — SHEET 1 OF 4

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Board, Processed	201003	1	
2				
3				
4	IC. Hex. Inverter	100084	7	U1,2,3,4,5,21,24
5	IC. Quad. 2 Input Nand.	100085	6	U6,8,12,13,19,20
6	IC. Quad. 2 Input Power	100086	3	U16,17,18
7	IC. Dual Flip-Flop	100088	3	U10,11,22
8	IC. Triple 3 Input Nand.	100107	4	U7,9,14,15
9	IC. Dual 4 Input Power Gate	100261	1	U23
10				
11	Transistor. NPN. 2N4123	100080	12	Q1,2,3,4,7,8,10,11,12,15,16,17
12	Transistor. PNP 2N4125	100081	5	Q5,6,13,18,19
13	Transistor. NPN 2N2219	100125	3	Q9,20,21
14	Transistor. PNP MPS-U51	100083	1	Q14
15				
16	Diode, Rectifier 1N4003	100127	2	CR1,9
17	Diode, Signal 1N914	100091	11	CR2,3,4,5,6,7,8,10,11,12,13
18				
19	Capacitor, Ceramic 330pf	100073-331	1	C12
20	Capacitor, " .0022uf	100073-222	1	C10
21	Capacitor, " .001uf	100073-102	2	C8,9
22	Capacitor, Polyfilm .01uf	100078-103	4	C1,3,4,19
23	Capacitor, " .022uf	100078-223	1	C15
24	Capacitor, " .1uf	100078-104	3	C2,6,17
25				
26	Capacitor, Tantalum 10uf	100070-106	7	C7,11,14,18,21,22,23
27	Capacitor, " 47uf	100070-476	1	C20
28	Capacitor, " 10uf	100136-106	1	C13
29				
30				
31	Resistor, 5%,3W 47	100068-470	1	R45
32	Resistor, " ½W 100	100156-101	7	R38,68,69,71,73,76,79

WANGCO INCORPORATED — MATERIAL LIST — ML — DRAWING NO. 201004-000 — REV. K

DRAWING TITLE: ASSY. TRANSPORT CONTROL LOGIC PWB — MODEL NO. 1075 — DATE 2/4/72 — SHEET 2 OF 4

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
33	Resistor, 5%,¼W 220	100156-221	4	R19,20,25,42
34	Resistor, 1%," 267	100155-234	1	R49
35	Resistor, 5%," 430	100156-431	2	R74,77
36	Resistor, 1%," 511	100155-261	1	R48
37	Resistor, 5%," 560	100156-561	2	R50,61
38	Resistor, " " 390	100156-391	2	R70,72
39	Resistor, " " 1K	100156-102	2	R18,62
40	Resistor, " " 1.5K	100156-152	1	R44
41	Resistor, " " 2.2K	100156-222	8	R6,7,12,28,31,55,59,60
42	Resistor, " " 3.3K	100156-332	1	R51
43	Resistor, " " 3.6K	100156-362	5	R3,4,13,29,32
44	Resistor, " " 5.1K	100156-512	20	R1,2,11,21,22,23,26,27,30,84, R85,33,41,46,47,56,57,75,78&2
45	Resistor, " " 6.8K	100156-682	5	R5,9,10,40,63
46	Resistor, " " 8.2K	100156-822	1	R8
47	Resistor, " " 10K	100156-103	5	R16,36,65,67,83
48	Resistor, " " 5.6K	100156-562	1	R52
49	Resistor, " " 20K	100156-203	1	R14
50	Resistor, " " 22K	100156-223	1	R53
51	Resistor, " " 47K	100156-473	1	R34
52	Resistor, " " 100K	100156-104	4	R15,17,37,64
53	Resistor, " " 110K	100156-114	1	R66
54	Resistor, " " 220K	100156-224	1	R35
55	Resistor, " " 390K	100156-394	1	R39
56				
57				
58				
59	Pin, Male. Test Point	100098	9	
60	Screw, Captive	100262	5	
61	Pad, Transistor	100223	4	
62	Connector, 9 Pin	100247-001	2	J22,20
63	Connector, 5 Pin	100247-005	1	J21

WANGCO INCORPORATED — MATERIAL LIST — ML — DRAWING NO. 201004-000 — REV. K

DRAWING TITLE: ASSY. TRANSPORT CONTROL LOGIC PWB — MODEL NO. 1075 — DATE 2/4/72 — SHEET 3 OF 4

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
64	Connector, 5 Pin	100247-008	1	J23.
65	Connector, 3 Pin	100247-010	1	J24.
66				
67				
68	Schematic	201959	Ref	
69	Artwork, Master	201002	Ref	
70	Test Procedure	201146	Ref.	

WANGCO INCORPORATED — MATERIAL LIST — ML — DRAWING NO. 201004-001 — REV. K

DRAWING TITLE: ASSY. TRANSPORT CONTROL LOGIC PWB. 7CH. TYPE 'P' — MODEL NO. 1075 — DATE 2/11/72 — SHEET 1 OF 1

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
91	Capacitor, Tantalum. 1.5uf	100136-155	1	C5.
92				
93	Resistor. 5%. ½w. 390	100064-391	1	R58.
94	Resistor. " ½w. 750	100156-751	1	R24.
95	Resistor. " " 750	-751	1	R43.
96	Resistor. " 3w. 47	100068-470	1	R80.
97	Resistor. " ½w. 390	100064-391	1	R81.
98	Resistor. " ½w. 1.5K	100156-152	1	R54.
99				
100				
101				
102	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. " GG to HH.
				Jumper J3. Not used.
				Jumper J4. " "
				Jumper J5. " "
				Jumper J6. From CC to DD.
				Jumper J7. " Y to Z.
				Jumper J8. " S to T.
				Jumper J9. " P to R.
				Jumper J10. Not used.
				Jumper J11. From W to X.
				Jumper J12. Not used.
				Jumper J13. " "
				Jumper J14. From G to H.
				Jumper J15. " LL to PP.
				Jumper J16. " U to V.
				Jumper J17. Not used.
				Jumper J18. " "
				Jumper J19. " "
				Jumper J20. FROM AAA to BBB.

WANGCO INCORPORATED — MATERIAL LIST — ML — DRAWING NO. 201004-002 — REV. K

DRAWING TITLE: ASSY. TRANSPORT CONTROL LOGIC PWB 9CH. TYPE 'P' — MODEL NO. 1075 — DATE 2/11/72 — SHEET 1 OF 9

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
91	Capacitor, Tantalum 1.5uf	100136-155	1	C5.
92				
93	Resistor, 5%,¼W 390	100064-391	1	R58
94	Resistor, " ½W 750	100156-751	1	R24
95	Resistor, " " 750	100156-751	1	R43
96	Resistor, " 3W 47	100068-470	1	R80
97	Resistor, " ½W 390	100064-391	1	R81
98	Resistor, " ½W 1.5K	100156-152	1	R54
99				
100				
101				
102	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to HH.
				Jumper J3. Not Used.
				Jumper J4. Not Used.
				Jumper J5. Not Used.
				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 J10. Not used.
				Jumper J11. From W to X.
				Jumper J12. Not Used.
				Jumper J13. " "
				Jumper J14. From G to H.
				Jumper J15. From LL to PP.
				Jumper J16. From U to V.
				Jumper J17. Not used.
				Jumper J18. " "
				Jumper J19. " "
				Jumper J20. " "

WANGCO INCORPORATED — MATERIAL LIST — ML — DRAWING NO. 201004-003 — REV. K

DRAWING TITLE: ASSY. TRANSPORT CONTROL LOGIC PWB 7CH. TYPE 'A' — MODEL NO. 1075 — DATE 2/11/72 — SHEET 1 OF 1

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
91				
92				
93	Resistor, 5%,¼W 390	100064-391	1	R58
94	Resistor, " ½W 750	100156-751	1	R24
95	Resistor, " " 750	100156-751	1	R43
96	Resistor, " 3W 47	100068-470	1	R80
97	Resistor, " ½W 390	100064-391	1	R81
98	Resistor, " ½W 1.5K	100156-152	1	R54
99				
100				
101				
102	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to FF.
				Jumper J3. Not used.
				Jumper J4. " "
				Jumper J5. " "
				Jumper J6. From CC to EE.
				Jumper J7. Not used.
				Jumper J8. From S to T.
				Jumper J9. From P to R.
				Jumper J10. From RR to SS.
				Jumper J11. Not used.
				Jumper J12. From K to M.
				Jumper J13. From J to L.
				Jumper J14. From G to H.
				Jumper J15. From LL to PP.
				Jumper J16. From U to V.
				Jumper J17. Not used.
				Jumper J18. " "
				Jumper J19. " "
				Jumper J20. From AAA to BBB.

WANGCO INCORPORATED — MATERIAL LIST — ML — DRAWING NO. 201004-004 — REV. K

DRAWING TITLE: ASSY. TRANSPORT CONTROL LOGIC PWB 9CH TYPE 'A' — MODEL NO. 1075 — DATE 2/11/72 — SHEET 1 OF 1

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
91				
92				
93	Resistor, 5%, ¼W 390	100064-391	1	R58
94	Resistor, " ½W 750	100156-751	1	R24
95	Resistor, " " 750	100156-751	1	R43
96	Resistor, " 3W 47	100068-470	1	R80
97	Resistor, " ½W 390	100064-391	1	R81
98	Resistor, " ½W 1.5K	100156-152	1	R54
99				
100				
101				
102	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to FF.
				Jumper J3. Not used.
				Jumper J4. " "
				Jumper J5. " "
				Jumper J6. From CC to EE.
				Jumper J7. Not used.
				Jumper J8. From S to T.
				Jumper J9. From Pto R.
				Jumper J10. From RR to SS.
				Jumper J11. Not used.
				Jumper J12. From K to M.
				Jumper J13. From J to L.
				Jumper J14. From G to H.
				Jumper J15. From LL to PP.
				Jumper J16. From U to V.
				Jumper J17. Not used.
				Jumper J18. " "
				Jumper J19. " "
				Jumper J20. " "

NO UNIT SELECT

WANGCO INCORPORATED — MATERIAL LIST — ML — DRAWING NO. 201004-005 — REV. K

DRAWING TITLE: ASSY. TRANSPORT CONTROL LOGIC PWB 7CH TYPE 'P' — MODEL NO. 1075 — DATE 2/11/72 — SHEET 1 OF 1

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
91	Capacitor, Tantalum 1.5uf	100136-155	1	C5.
92				
93	Resistor, 5%,¼W 390	100064-391	1	R58.
94	Resistor, " ½W 750	100156-751	1	R24.
95	Resistor, " " 750	100156-751	1	R43.
96	Resistor, " 3W 47	100068-470	1	R80.
97	Resistor, " ½W 390	100064-391	1	R81.
98	Resistor, " ½W 1.5K	100156-152	1	R54.
99				
100				
101				
102	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to HH.
				Jumper J3. Not used.
				Jumper J4. " "
				Jumper J5. " "
				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 J10. Not used.
				Jumper J11. From W to X.
				Jumper J12. Not used.
				Jumper J13. " "
				Jumper J14. From G to H.
				Jumper J15. From LL to PP.
				Jumper J16. From U to V.
				Jumper J17. Not used.
				Jumper J18. From TT to UU.
				Jumper J19. not used.
				Jumper J20. From AAA to BBB.

Figure B-23. Transport Control Logic Assembly (pg. 2 of 3)

Computer

MATERIAL LIST

ML | DRAWING NO. 201004-006 | REV. K

ASSY. TRANSPORT CONTROL
DRAWING TITLE: LOGIC PWB. 9CH. TYPE 'P' | MODEL NO. 11PE | DATE 7-12-72 | SHEET 1 OF 1

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
91	Capacitor, Tantalum. 1.5uf	100136-155	1	C5.
92				
93				
94				
95				
96				
97	Resistor 5% ½w. 82	100064-820	1	R81.
98	RESISTOR 5% ½W 10K	100156-103	1	R54
99				
100				
101				
102	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From XX to WW.
				Jumper J2. From GG to HH.
				Jumper J3. From KK to JJ.
				Jumper J4. " YY to ZZ.
				Jumper J5. " AA to BB.
				Jumper J6. " CC to DD.
				Jumper J7. " Y to Z.
				Jumper J8. " S to T.
				Jumper J9. " P to R.
				Jumper J10. Not Used.
				Jumper J11. From W to X.
				Jumper J12. Not Used.
				Jumper J13. " "
				Jumper J14. From G to H.
				Jumper J15. " LL to PP.
				Jumper J16. " U to V.
				Jumper J17. Not Used.
				Jumper J18. Not Used.
				Jumper J19. Not Used.
				Jumper J20. Not Used.

NO UNIT SELECT

WANGCO INCORPORATED **MATERIAL LIST**

ML | DRAWING NO. 201004-007 | REV. K

ASSY. TRANSPORT CONTROL
DRAWING TITLE: LOGIC PWB 9CH. TYPE 'P' | MODEL NO. 1075 | DATE 2/11/72 | SHEET 1 OF 1

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
91	Capacitor, Tantalum 1.5uf	100136-155	1	C5.
92				
93	Resistor, 5%,½W 390	100064-391	1	R58.
94	Resistor, " ½W 750	100156-751	1	R24.
95	Resistor, " " 750	100156-751	1	R43.
96	Resistor, " 3W 47	100068-470	1	R80.
97	Resistor, " ½W 390	100064-391	1	R81.
98	Resistor, " ½W 1.5K	100156-152	1	R54.
99				
100				
101				
102	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to HH.
				Jumper J3. Not used.
				Jumper J4. " "
				Jumper J5. " "
				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 J10.Not used.
				Jumper J11.From W to X.
				Jumper J12.Not used.
				Jumper J13. " "
				Jumper J14.From G to H.
				Jumper J15.From LL to PP.
				Jumper J16.From U to V.
				Jumper J17.Not used.
				Jumper J18.From TT to UU.
				Jumper J19.Not used.
				Jumper J20. " "

BASIC PE/NRZI

WANGCO INCORPORATED **MATERIAL LIST**

ML | DRAWING NO. 201004-008 | REV. K

ASSY. TRANSPORT CONTROL
DRAWING TITLE: LOGIC PWB 9CH. TYPE 'P' | MODEL NO. 11 | DATE 8/4/72 | SHEET 1 OF 1

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
91	Capacitor, Tantalum 1.5uf	100136-155	1	C5.
92				
93	Resistor, 5%,½W 390	100064-391	1	R58.
94	Resistor, " ½W 750	100156-751	1	R24.
95	Resistor, " " 750	100156-751	1	R43.
96	Resistor, " 3W 47	100068-470	1	R80.
97	Resistor, " ½W 390	100064-391	1	R81.
98	Resistor, " ½W 1.5K	100156-152	1	R54.
99				
100				
101				
102	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to HH.
				Jumper J3. Not used.
				Jumper J4. " "
				Jumper J5. " "
				Jumper J6. " "
				Jumper J7. From Y to Z.
				Jumper J8. From S to T.
				Jumper J9. From P to R.
				Jumper J10.Not used.
				Jumper J11.From W to X.
				Jumper J12.Not used.
				Jumper J13. " "
				Jumper J14.From G to H.
				Jumper J15.From MM to PP.
				Jumper J16.From U to V.
				Jumper J17.From D to E.
				Jumper J18.From TT to UU.
				Jumper J19.From A to B.
				Jumper J20.Not used.

REMOTE DENSITY SELECT

WANGCO **MATERIAL LIST**

ML | DRAWING NO. 201004 - 009 | REV. K

ASSY. TRANSPORT CONTROL
DRAWING TITLE: LOGIC PWB. 9CH. PE/NRZI. | MODEL NO. 11DE. | DATE 2/16/73 | SHEET 1 OF 1

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
91	Capacitor, Tantalum. 1.5uf	100136-155	1	C5.
92				
93	Resistor. 5%. ½w. 390	100064-391	1	R58.
94	Resistor. " ½w. 750	100156-751	1	R24.
95	Resistor. " " 750	100156-751	1	R43.
96	Resistor. " 3w. 47	100068-470	1	R80.
97	Resistor. " ½w. 390	100064-391	1	R81.
98	Resistor. " ½w. 1.5K	100156-152	1	R54.
99				
100				
101				
102	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. " GG " HH.
				Jumper J3. Not Used.
				Jumper J4. " "
				Jumper J5. " "
				Jumper J6. " "
				Jumper J7. From Y to Z.
				Jumper J8. From S " T.
				Jumper J9. " P " R.
				Jumper J10. Not Used.
				Jumper J11. From W to X.
				Jumper J12. Not Used.
				Jumper J13. " "
				Jumper J14. From G to H.
				Jumper J15. " MM " PP.
				Jumper J16. " U " V.
				Jumper J17. " D " F.
				Jumper J18. " TT " UU.
				Jumper J19. " A " C.
				Jumper J20. " AAA " BBB.

NO UNIT SELECT

WANGCO INCORPORATED **MATERIAL LIST**

ML | DRAWING NO. 201004-010 | REV. K

ASSY. TRANSPORT CONTROL
DRAWING TITLE: LOGIC PWB 9CH. TYPE 'P' | MODEL NO. 11PE | DATE 3/5/73 | SHEET 1 OF 1

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
91	Capacitor, Tantalum 1.5uf	100136-155	1	C5.
92				
93				
94				
95				
96				
97	Resistor, 5%, ½W 82	100064-820	1	R81.
98	Resistor, " ½W 10K	100156-103	1	R54
99				
100				
101				
102	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From XX to WW.
				Jumper J2. From GG to HH.
				Jumper J3. From KK to JJ.
				Jumper J4. From YY to ZZ.
				Jumper J5. From AA to BB.
				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 J10.Not used.
				Jumper J11.From W to X.
				Jumper J12.Not used.
				Jumper J13. " "
				Jumper J14.From G to H.
				Jumper J15.From LL to PP.
				Jumper J16.From U to V.
				Jumper J17.Not used.
				Jumper J18.From TT to UU.
				Jumper J19.Not used.
				Jumper J20. " "

MANUAL DENSITY SELECT OCP. NO UNIT SELECT.

WANGCO INCORPORATED **MATERIAL LIST**

ML | DRAWING NO. 201004 - 015 | REV. L

ASSY. TRANSPORT CONTROL
DRAWING TITLE: LOGIC PWB. 9CH. TYPE 'P' | MODEL NO. 1175 | DATE 4/10/73 | SHEET 1 OF 1

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
91	Capacitor, Tantalum. 1.5uf	100136-155	1	C5.
92				
93	Resistor. 5%. ½w. 390	100064-391	1	R58.
94	Resistor. " ½w. 750	100156-751	1	R24.
95	Resistor. " " 750	100156-751	1	R43.
96	Resistor. " 3w. 47	100068-470	1	R80.
97	Resistor. " ½w. 390	100064-391	1	R81.
98	Resistor. " ½w. 1.5K	100156-152	1	R54.
99				
100				
101				
102	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. " GG " HH.
				Jumper J3. Not used.
				Jumper J4. " "
				Jumper J5. " "
				Jumper J6 From CC to DD.
				Jumper J7. " Y " Z
				Jumper J8. " S " T
				Jumper J9. " P " R
				Jumper J10. Not Used.
				Jumper J11. From W to X
				Jumper J12. Not Used.
				Jumper J13. " "
				Jumper J14. From G to H.
				Jumper J15. " MM " PP.
				Jumper J16 " U " V.
				Jumper J17. " D to E
				Jumper J18. From TT to UU.
				Jumper J19. " A to B.
				Jumper J20. " "

LOW DENSITY STATUS.

WANGCO **MATERIAL LIST**

ML | DRAWING NO. 201004-016 | REV. K

ASSY. TRANSPORT CONTROL
DRAWING TITLE: LOGIC PWB 9CH. TYPE 'P' | MODEL NO. 1075 | DATE 3/29/74 | SHEET 1 OF 1

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
91	Capacitor, Tant. 1.5uf	100136-155	1	C5.
92				
93	Resistor, 5%, ½W 390	100064-391	1	R58.
94	Resistor, " ½W 750	100156-751	1	R24.
95	Resistor, " " 750	100156-751	1	R43.
96	Resistor, " 3W 47	100068-470	1	R80.
97	Resistor, " ½W 390	100064-391	1	R81.
98	Resistor, " ½W 1.5K	100156-152	1	R54.
99				
100				
101				
102	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. From GG to HH.
				Jumper J3. Not used.
				Jumper J4. Not used.
				Jumper J5. Not used.
				Jumper J6. From CC to EE.
				Jumper J7. From Y to Z.
				Jumper J8. From S to T.
				Jumper J9. From P to R.
				Jumper J10.Not used.
				Jumper J11.From W to X.
				Jumper J12.Not used.
				Jumper J13.Not used.
				Jumper J14.From G to H.
				Jumper J15.From LL to PP.
				Jumper J16.From U to V.
				Jumper J17.Not used.
				Jumper J18.Not used.
				Jumper J19.Not used.
				Jumper J20.Not used.

NRZI NO UNIT SELECT. MANUAL DENSITY SELECT.

T= 120

See Shipping Configuration

WANGCO INCORPORATED **MATERIAL LIST**

ML | DRAWING NO. 201004-017 | REV. A

ASSY. TRANSPORT CONTROL
DRAWING TITLE: LOGIC PWB. 7Ch. Type 'A' | MODEL NO. 1075 | DATE 6/10/74 | SHEET 1 OF 1

Item No.	Drawing Title	Dwg. No.	Qty.	Remarks on Ckt. Desig.
91				
92				
93	Resistor, 5%,½W. 390	100064-391	1	R58.
94	Resistor, " ½w. 750	100156-751	1	R24.
95	Resistor, " " 750	-751	1	R43.
96	Resistor, " 3W. 47	100068-470	1	R80.
97	Resistor, " ½w. 390	100064-391	1	R81.
98	Resistor, " ½w. 1.5K	100156-152	1	R54.
99				
100				
101				
102	Wire, Solid Insulated.	100248-924	A/R	Jumper J1. From VV to WW.
				Jumper J2. " GG to FF.
				Jumper J3. Not used.
				Jumper J4. " "
				Jumper J5. " "
				Jumper J6. From CC to EE.
				Jumper J7. Not used.
				Jumper J8. From S to T.
				Jumper J9. " P to R.
				Jumper J10. " RR to SS.
				Jumper J11. Not used.
				Jumper J12. From K to M.
				Jumper J13. " J to L.
				Jumper J14. " G to H.
				Jumper J15. " MM to PP.
				Jumper J16. " U to V.
				Jumper J17. " D to E.
				Jumper J18. " TT to UU.
				Jumper J19. " A to B.
				Jumper J20. Not used.

Figure B-23. Transport Control Logic Assembly (pg. 3 of 3)

REVISIONS				201959
REV.	DESCRIPTION	ORIG.	DATE	APPROVED
A	MFG REL			

LAST USED	DELETED
U24	
Q21	
C23	C16
CR13	
R85	
TP9	

6. J16 PINS UNUSED ARE: 15, 18 (V.
J19 PINS UNUSED ARE: 8, D, H (U.

5. IF DENSITY STATUS & FILE PROTECT STATUS ARE TO BE A FUNCTION OF SELECT ADD JUMPER Y TO Z.

4. +5V OPTIONS TO CUSTOMER CONTROLLER.

3. TYPE 'P' VERSION JUMPER CONFIGURATION SHOWN.

2. IF READY DELAY NOT REQUIRED DELETE C5.

1. FOR VAR COMPONENTS SEE M/L.

NOTES. UNLESS OTHERWISE SPECIFICED.

DRAWN		Wangco Incorporated
CHECK		
APPR.	4/23/79	
MATERIAL		SCHEMATIC TRANSPORT CONTROL LOGIC
FINISH		CODE ID 108
MODEL NO.	MOD 11	SCALE NONE
NEXT ASSY	201004	SIZE E 201959 A
DO NOT SCALE THIS DRAWING		WEIGHT SHEET 1 OF 1

201959 A

Figure B-24. Transport Control Logic Schematic

REV.	REVISIONS DESCRIPTION	CHK.	DATE	APPROVED
D	SEE REV E.O. (DCR 944)			
E	SEE REV E.O. (DCR 959)			
F	SEE REV. E.O.			
G	SEE REV. E.O. (DCR 955)			
H	SEE REV. E.O. (DCR 951)			
J	SEE REV. E.O. (DCR 1180)			
K	SEE REV E.O. (DCR 501)			
L	SEE REV E.O. (DCR 1354)			
M	SEE REV E.O. (DCR 1117)			
N	SEE CR/O 3020			
P	SEE CR/O 3634			

200974 P

OFFSET · NEG RAMP · POS RAMP · REV SPEED · FWD SPEED · BOT/EOT ADJUST · FIXED GAIN · FIXED POSITION · FILE POSITION · FILE GAIN

NOT USED

(77) TEST POINT (TYP) 25 PLACES

(1) PROCESSED 8D.

(2) HEATSINK

(39) TO 5 PADS (TYP) 22 PLACES · (105) HEAT FINS 2 PLACES · (94) 2 PLACES · (11) RELAY SOCKET · (10) RELAY · NOT USED

VIEW A-A
TYPICAL TRANSISTOR INSTALLATION
SCALE 1:1

4 PLACES (125) · 4 PLACES (122) · REF (16) · 4 PLACES (112) · REF (2) · 4 PLACES (123) · REF (1) · 4 PLACES (121) · 4 PLACES (120)

TYP. POWER DIODE INSTALLATION
SCALE 1:1

2 PLACES (22) · MICA WASHER 2 PLACES · 2 PLACES (124) · 2 REF · 1 REF

VIEW B-B
TYPICAL TRANSISTOR INSTALLATION
SCALE 1:1

2 REQD 8PLS (126) · (125) 2 REQ'D-8 PLACES · (122) 2 REQ'D-8 PLACES · (15) REF · (106) 8 PLACES. · (2) REF · (123) 2 REQ'D-8 PLACES · (1) REF · (121) 2 REQ'D-8 PLACES · (120) 2 REQ'D-8 PLACES

(1) COMPONENTS OUTLINED IN DASHED LINES ARE VARIABLE. SEE M/L FOR PRESCRIBED VALUES.

NOTES UNLESS SPECIFIED	DRAWN AGUIRRE 5-72	Wang Computer Products	
TOLERANCES XX± ANGULAR, XXX±	CHECK	ASSEMBLY SERVO ELECTRONICS	CODE 120
2. BREAK ALL SHARP EDGES APPROX. .010	APPR.		QTY. REQ'D. 1
3. MACH. SURFACES	MATERIAL		
4. ALL DIMS IN INCHES.	FINISH		
	MODEL NO. MOD 1075	SCALE 2=1 · SIZE E · 200974 · P	
	NEXT ASSY 200675	DO NOT SCALE THIS DRAWING · WEIGHT · SHEET 10 OF 10	

Figure B-25. Servo Electronics Assembly (pg. 1 of 2)

T120

Wang Computer Products — MATERIAL LIST — ML — DRAWING NO. 200974 - 000 — REV. P

DRAWING TITLE ASSY. SERVO ELECTRONICS. MODEL NO. 11 DATE 5/8/72 SHEET 1 OF 10

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Board, Processed.		200973	1	
2	Heatsink.		20101.2	1	
3					
4	IC.Quad. 2 Input Wand.		100085	1	U9.
5	IC.Operational Amplifier.		100109	8	U1.2.3.4.5.6.7.8.
6					
7	Transistor. NPN.	2N4123	100080	32	Q1.6.c.14.16.18.19.20.21.22.23.
					Q25.26.33.34.35.36.37.38.39.40.
					Q45.55.58.59.64.74.75.78.79.80.
					Q81.
8	Transistor. PNP.	2N4125	100081	12	Q2.3.5.7.15.17.24.42.44.54.61.
					Q63.
9	Transistor. NPN.	2N2219	100125	3	Q73.76.77.
10	Transistor. NPN.	2N3053	100158	6	Q8.31.41.56.60.65.
11	Transistor. NPN.	2N3055	100159	2	Q29.32.
12	Transistor. PNP.	2N4037	100160	5	Q9.24.43.47.62.
13	Transistor. NPN.	2N3772	100219	2	Q12.13.
14	Transistor. NPN.	2N5320	100220	6	Q11.27.46.49.68.82
15	Transistor. PNP.	2N5322	100221	5	Q10.30.48.66.67.
16	Transistor. NPN.	2N3773	100281	4	Q52.53.71.72.
17	Transistor. NPN.	TI.P31B	100282	4	Q50.51.69.70.
18					
19	Diode, Signal.	1N914	100091	50	CR1.2.3.4.5.6.7.8.9.10.11.12.
					CR13.14.15.20.21.22.23.24.25.
					CR26.27.28.29.30.31.32.33.34.
					CR35.36.38.39.40.41.42.44.45.
					CR46.47.48.49.50.51.52.53.54.
					CR55.56.
20	Diode, Zener.	1N752	100118	2	VR1.2.
21	Diode, Rectifier.	1N4003	100127	4	CR16.17.37.43.
22	Diode, Power.	1N3208	100174	2	CR18.19.

Wang Computer Products — MATERIAL LIST — ML — DRAWING NO. 200974 - 000 — REV. P

DRAWING TITLE ASSY. SERVO ELECTRONICS. MODEL NO. 11 DATE 5/8/72 SHEET 2 OF 10

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
23	~~Capacitor, Ceramic.~~	~~33pf~~	~~100073-330~~	~~2~~	~~C17.24.~~
24	Capacitor, CERAMIC	47pf	100073-470	1	C8.
25	~~Capacitor, " "~~	~~200pf~~	~~100073-201~~	~~2~~	~~C16.23.~~
26	Capacitor, "	.0015uf	100073-152	3	C6.16,23.
27	Capacitor, "	.005uf	100073-502	1	C7.
28	CAPACITOR "	.0033uF	100073-352	4	C17.24.37.38.
29	Capacitor, Polyester.	.039uf	100078-393	2	C3.4.
30	Capacitor, "	.1uf	100239-104	2	C15.22.
31	Capacitor, "	.15uf	100128-154	1	C1.
32	Capacitor, "	.47uf	100128-474	1	C5.
33					
34	Capacitor, Tantalum.	1.5uf	100136-155	5	C9.10. .27.28.36.
35	Capacitor, "	3.3uf	100284-335	2	C12.20.
36	Capacitor, "	10uf	100070-106	3	C14.33.34.
37	Capacitor, "	47uf	100070-476	9	C11.21.29.30.31.32.35.13.39
38					
39	Resistor, Variable.	1K	100163-102	1	R191.
40	Resistor, "	5K	100163-502	3	R11.12.38.
41	Resistor, "	10K	100163-103	6	R19.20.100.106.153.160.
42					
43	Resistor, 5%. 3w.	3	100068-001	1	R228.
44	Resistor. " 2w.	22	100156-220	6	R134.135.184.185.283.284
45	Resistor. " "	100	100156-101	16	R35.46.47.74.77.81.90.132.133.
					R140.181.183.109.161.218.205.
46	Resistor. 5%. 2w.	120	100064-121	2	R126.176.
47	Resistor. " 2w.	240	100156-241	1	R44.
48	Resistor. " "	270	100156-271	2	R6.7.
49	Resistor. " "	330	100156-331	4	R193.194.209.210.
50	Resistor. " 3w.	330	100068-331	2	R41.42.
51	Resistor. " 2w.	390	100156-391	1	R211.
52	Resistor. " "	430	100156-431	4	R148.149.187.225.
53	Resistor. " "	510	100156-511	2	R37.39.

Wang Computer Products — MATERIAL LIST — ML — DRAWING NO. 200974 - 000 — REV. P

DRAWING TITLE ASSY. SERVO ELECTRONICS. MODEL NO. 11 DATE 5/8/72 SHEET 3 OF 10

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
54	Resistor. 5%. 2w.	560	100156-561	2	R190.192.
55	Resistor. " "	750	100156-751	2	R9.10.
56	Resistor. " "	910	100156-911	3	R52.53.58.
57	Resistor. " "	1K	100156-102	35	R1.2.4.5.16.28.33.34.40.43.63.
					R65.67.69.87.96.113.114.118.
					R119.129.131.146.163.164.169.
					R170.180.182.186.207.215.216.
					R226.206. .17 .2 .27.
58	Resistor. 5%. 3w.	1K	100068-102	6	R127.128.130.177.178.179.
59	Resistor. 5%. 2w.	1.2K	100156-122	1	R196.
60	Resistor. " "	2K	100156-202	3	R18.60.61.
61	Resistor. " 2w.	2K	100064-202	1	R45.
62	Resistor. " 2w.	2.2K	100156-222	1	R15.
63	Resistor. " "	2.7K	100156-272	2	R13.14.
64	Resistor. " "	3K	100156-302	3	R58.62.230.
65	Resistor. " "	3.6K	100156-362	3	R3.8.235
66	Resistor. " "	3.9K	100156-392	4	R54.66.70.212.
67	Resistor. " "	5.1K	100156-512	4	R21.24.36.188.
68	Resistor. " "	5.6K	100156-562	1	R208.
69	Resistor. 1%. "	5.11K	100155-357	2	R29.30.
70	Resistor. 5%. "	6.2K	100156-622	2	R72.79.
71	Resistor. " 2w.	6.2K	100064-622	2	R73.76.
72	RESISTOR 5% ¼W	3.3K	100156-332	1	R222
73	Resistor. 5%. 2w.	10K	100156-103	38	R51.55.56.78.82.83.86.88.91.92.
					R95.97.98.99.116.120.121.122.
					.142.145.147.166.168.171.
					R173.197.198.199.200.201.202.
					R203.204.213.214.219.220.229
74	Resistor. 5%. 2w.	11K	100156-113	1	R68.
75	Resistor. " "	12K	100156-123	2	R34.227.
76	Resistor. " "	16K	100156-163	2	R31.32.
77	Resistor. " "	20K	100156-203	7	R84.94.105.111.143.156.221.

Wang Computer Products — MATERIAL LIST — ML — DRAWING NO. 200974 - 000 — REV. P

DRAWING TITLE ASSY. SERVO ELECTRONICS. MODEL NO. 11 DATE 5/8/72 SHEET 4 OF 10

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
78	Resistor. 5%. 2w.	22K	100156-223	2	R71.75.
79					
80					
81	Resistor. 5%. 2w.	33K	100156-333	1	R50.
82	Resistor. " "	39K	100156-393	4	R101.139.152.231
83					
84	Resistor. 5%. 2w.	51K	100156-513	2	R89.217.
85					
86	Resistor. " "	82K	100156-823	2	R117.167.
87					
88	Resistor. 1%. 2w.	90.9K	100155-477	4	R107.110.157.158.
89	RESISTOR. 5% ¼W	110K	100156-114	1	R80
90	Resistor. 5%. 2w.	100K	100156-104	6	R17.64. .85.93.144.223.
91	Resistor. " "	120K	100156-124	2	R115.165.
92	Resistor. " "	150K	100156-154	2	R125.175.
93	Resistor. " "	390K	100156-394	1	R108.
94	Resistor. 5%. 2w.	270K	100156-274	2	R49.138
95	Resistor. " "	330K	100156-334	4	R123.172.189.195.
96	Resistor. 1%. "	499K	100155-548	2	R103.159.
97	Resistor. 5%. "	510K	100156-514	2	R112.162.
98	Resistor. 5%. 2w.	1Meg	100156-105	5	R59..124.174.204.155
99					
100	Resistor. 5%. 2w.	2Meg	100156-205	2	R154. .227.
101					
102				1	
103					
104					
105	Heatsink.		100096	2	Q10.11.
106	Wire, Stranded Insulated.		100053-916	A/R	Use with items 22.
107	Pin, Test Point.		100098	25	TP1 thru TP25.
108	Insulator, Transistor.		100151	8	TO-3
109	Pad, Transistor.		100223	22	TO-5.

Wang Computer Products — MATERIAL LIST — ML — DRAWING NO. 200974 - 000 — REV. P

DRAWING TITLE ASSY. SERVO ELECTRONICS. MODEL NO. 11 DATE 5/8/72 SHEET 5 OF 10

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
110	Relay.		100240	1	K2.
111	Socket, Relay.		100241	1	
112	Insulator, Transistor.		100116	4	Use with items 17.
113	Connector. 9 pin.		100247-001	1	J15.
114	Connector. 5 pin.		100247-005	4	J8.10.12.17.
115	Connector. 5 pin.		100247-008	1	J11.
116	Connector. 3 pin.		100247-010	3	J9.13.18.
117	Connector. 3 pin.		100247-011	1	J7.
118	Connector. 5 pin.		100247-006	1	J14.
119					
120	Screw, Pan Head.		100036-208	20	4-40 x 1/2"
121	Washer, Flat.		100047-200	20	No.4.
122	Washer. SPRING LOCK		100042-200	20	No.4.
123	Washer, Nylon Shoulder.		100063-012	20	TO-3.
124	Washer, Nylon Shoulder.		100063-008	2	Use with items 22.
125	Nut, Hex.		100043-200	20	4-40.
126	WASHER, FLAT		100251-200	20	No 4
127					
128					
129	Artwork, Master.		200972	Ref.	
130	Test Procedure.		200876	Ref.	

T120

Wang Computer Products — MATERIAL LIST — ML — DRAWING NO. 200974 - 002 — REV. P

DRAWING TITLE ASSY. SERVO ELECTRONICS. 44PCS. MODEL NO. 11 DATE 4/3/72 SHEET 7 OF 10

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
145					
146					
147	Resistor. 1%. 2w.	10.5K	100155-367	1	R25.
148	Resistor. " "	10.5K	100155-367	1	R26.
149	Resistor. " "	6.19K	100155-365	1	R27.
150	Resistor. 5%. 2w.	47K	100156-473	1	R22.
151	Resistor. " "	47K	100156-473	1	R23.
152	Resistor. " "	680K	100156-684	1	R102.

Wang Computer Products — MATERIAL LIST — ML — DRAWING NO. 200974 - 000 — REV. P

DRAWING TITLE ASSY. SERVO ELECTRONICS. 75PCS. MODEL NO. 11 DATE 3/20/72 SHEET 6 OF 10

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
145	~~Resistor. Variable.~~	~~.1Meg~~	~~100163-104~~	~~1~~	~~R30.~~
146					
147	Resistor. 1%. 2w.	6.34K	100155-366	1	R25.
148	Resistor. " "	6.34K	100155-366	1	R26.
149	Resistor. " "	7.68K	100155-374	1	R27.
150	Resistor. 5%. "	2MK	100156-203	1	R22.
151	Resistor. " "	20K	100156-203	1	R23.
152	Resistor. " "	1.510K	100156-516	1	R102.

1.80

Wang Computer Products — MATERIAL LIST — ML — DRAWING NO. 200974 - 001 — REV. P

DRAWING TITLE ASSY. SERVO ELECTRONICS 75PCS. MODEL NO. 11 DATE 3/20/72 SHEET 56 OF 10

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
145	~~Resistor. Variable.~~	~~.1Meg~~	~~100163-104~~	~~1~~	~~R30.~~
146					
147	Resistor. 1%. 2w.	6.34K	100155-366	1	R25.
148	Resistor. " "	6.34K	100155-366	1	R26.
149	Resistor. " "	7.68K	100155-374	1	R27.
150	Resistor. 5%. "	2MK	100156-203	1	R22.
151	Resistor. " "	20K	100156-203	1	R23.
152	Resistor. " "	1.510K	100156-516	1	R102.

T120

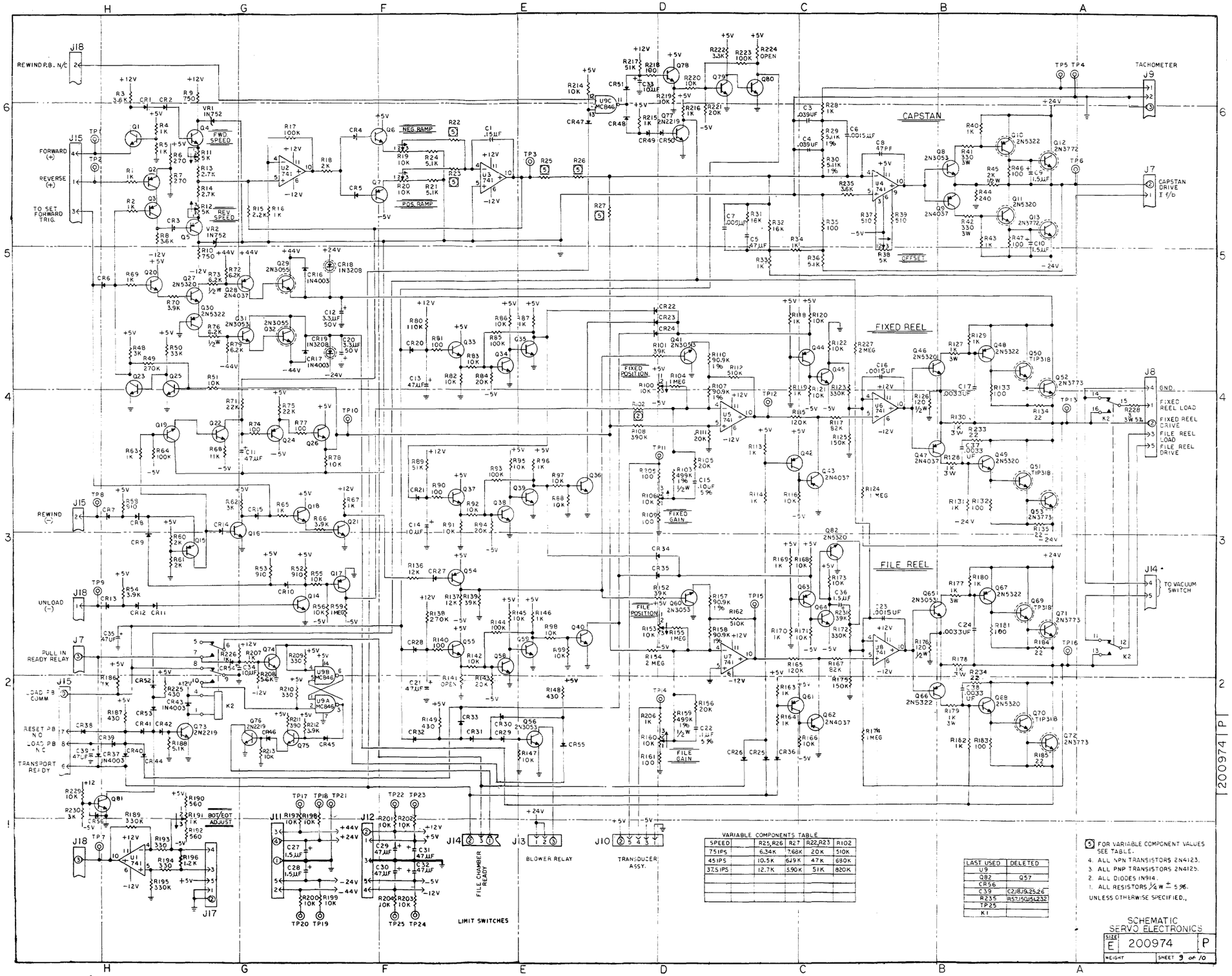
Wang Computer Products — MATERIAL LIST — ML — DRAWING NO. 200974 - 003 — REV. P

WANGCO

DRAWING TITLE ASSY. SERV. ELECTRONICS. 37PCS. MODEL NO. 11 DATE 8/17/72 SHEET 8 OF 10

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
145					
146					
147	Resistor. 1%. 2w.	12.7K	100155-395	1	R25.
148	Resistor. " "	12.7K	100155-395	1	R26.
149	Resistor. " "	590K	100155-363	1	R27.
150	Resistor. 5%. 2w.	51K	100156-513	1	R22.
151	Resistor. " "	51K	100156-513	1	R23.
152	Resistor. " "	820K	100156-824	1	R102.

Figure B-25. Servo Electronics Assembly (pg. 2 of 2)



VARIABLE COMPONENTS TABLE				
SPEED	R25,R26	R27	R22,R23	R102
7.5 IPS	6.34K	7.68K	20K	51OK
45 IPS	10.5K	6.19K	47K	68OK
37.5 IPS	12.7K	5.90K	51K	82OK

LAST USED	DELETED
U9	
Q82	Q57
CR56	
C39	C21,19,25,26
R235	R57,150,151,232
TP25	
K1	

5 FOR VARIABLE COMPONENT VALUES SEE TABLE.

4. ALL NPN TRANSISTORS 2N4123.
3. ALL PNP TRANSISTORS 2N4125.
2. ALL DIODES IN914.
1. ALL RESISTORS 1/4 W ± 5%.

UNLESS OTHERWISE SPECIFIED.,

SCHEMATIC SERVO ELECTRONICS

SIZE E | 200974 | P

WEIGHT | SHEET 9 OF 10

Figure B-26. Servo Electronics Schematic

REV.	REVISIONS DESCRIPTION	CHK.	DATE	APPROVED
A	PRODUCTION REL'D			
B	SEE REV E.O (DCR 474)			
C	SEE REV. E.O.			
D	SEE REV E.O (DCR 1799)			
E	SEE REV E.O (DCR 1172)			
F	SEE REV E.C. (DCR 1423)			
G	SEE CR/O 3232			
H	SEE CR/O 3227			

201142 H

JUMPER 12
JUMPER 9
JUMPER 5
JUMPER 6
JUMPER 3
JUMPER 1
JUMPER 2
JUMPER 10
JUMPER 7
JUMPER 11
JUMPER 8
JUMPER 4

J1A J1B J6A J6B

CAPTIVE SCREWS 5 PLS

JUMPERS AS SHOWN FOR T&PS TYPE A
FOR OTHER COMBINATIONS SEE MCL

NOTES UNLESS SPECIFIED	DRAWN	L. RENNERE	3-852
1. TOLERANCES .XXX ANGULAR .XX±	CHECK		
2. BREAK ALL SHARP EDGES APPROX .015	APPR.	G. Healy	4-4-72
3. MACH. SURFACES	MATERIAL		
4. ALL DIMS IN INCHES.	FINISH		
	MODEL No.	mod 11	
	NEXT ASSY	200675	

Wang Computer Products

ASSEMBLY - DATA ELECTRONICS D/C

CODE IDENT 71120 REV. H

SCALE 2:11 | SIZE E | 201142 | H

DO NOT SCALE THIS DRAWING | WEIGHT | SHEET 6 OF 6

Figure B-27. Data Electronics, Dual Gap (pg. 1 of 7)

MATERIAL LIST

Wang Computer Products

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB, BASIC BOARD, 9TRK — MODEL NO. 11 — DATE 3/30/72 — SHEET 1 OF 6

DRAWING NO. 201142 - 000 — REV. H

9-12-72

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Board, Processed.	201141	1	REV 'H'
2	Artwork, Master.	201140	Ref.	
3	Test Procedure.	200287	Ref.	
4	IC.Hex Inverter.	100081	5	U1.2.4.9.31.
5	IC.Quad. 2 Input Nand.	100065	6	U3.4.5.6.7.15.
6	IC.Quad. 2 Input Power.	100086	4	U26.27.28.32
7	IC.10 Input Nand.	100087	1	U29.
8	IC.Dual Flip-Flop.	100088	10	U10.11.12.13.16.21.22.23.24.
				U25.
9	IC.Operational Amplifier.	100089	5	U16.17.18.19.20.
10	IC.Monostable.	100090	1	U30.
11				
12	Transistor. NPN. 2N4123	100080	63	Q1.2.5.8.9.11.13.14.15.
				Q101-901. Q102-902. Q103-903.
				Q106-906. Q107-907.
				Q109-909.
13	Transistor. PNP. 2N4125	100081	14	Q3.6.7.10.12. Q104-904.
				Q105-905. Q108-908.
14	Transistor. Dual NPN. TD-101	100082	9	Q104-904.
15	Transistor. PNP. MPS-A51.	100083	1	Q3.
16				
17	Transistor NPN 2N708	151000-001	9	Q105-905.
18	Diode, Signal. 1N914	100091	46	CR1. CR101-901. CR102-902.
				CR103-903. CR104-904.
				CR105-905.
19	Diode, Rectifier. 1N4003	100127	1	CR2.
20				
21	Capacitor, Ceramic. 33pf	100073-330	9	C109-909.
22	Capacitor, Mica. 68pf	100243-680	1	C36.
23	Capacitor, Ceramic. 100pf	100073-101	9	C102-902.
24	Capacitor, " 220pf	100073-221	9	C105-905.
25	Capacitor, Polyfilm. .0015uf	100077-152	1	C35.

MATERIAL LIST

Wang Computer Products

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB, BASIC BOARD, — MODEL NO. 11 — DATE 3/30/72 — SHEET 2 OF 6

DRAWING NO. 201142 - 000 — REV. H

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
26	Capacitor, Ceramic. .0033uf	100073-332	9	C103-903.
27				
28				
29	Capacitor, Tantalum. 1.5uf	100136-155	9	C104-904.
30	Capacitor, " 10uf	100072-106	32	C1.2.3.4.5.6.7.8.10.11.12.13.
				C14..15.16.17.18.19.20.21.22.23.
				C24..26.29.30.31.32.37.38.39.40.
31				
32				
33				
34	Resistor, Variable. 5Q	100069-500	1	R27.
35	Resistor, " 5K	100069-502	9	R118-918.
36	Resistor, " 20K	100069-203	10	R2.9. R104-904.
37				
38	Resistor. 5%. ¼w. 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%. ¼w. 162	100155-213	1	R29.
44				
45	Resistor. 5%. ¼w. 220	100156-221	1	R51.
46	Resistor. 2%. 1w. 220	100142-221	10	R26. R112-912.
47	Resistor. 1%. ¼w. 267	100155-234	1	R73.
48	Resistor. 5%. 1w. 270	100067-271	1	R18.
49	Resistor. " ¼w. 330	100156-331	4	R33.34.53.35.
50	Resistor. " ¼w. 390	100064-391	1	R28.
51				
52	Resistor. 5%. ¼w. 470	100156-471	5	R15.19.40.47.52.
53	Resistor. 1%. " 511	100155-261	1	R38.41.72.
54	Resistor. 5%. " 560	100156-561	19	R74. R106-906. R109-909.

MATERIAL LIST

Wang Computer Products

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB, BASIC BOARD, — MODEL NO. 11 — DATE 3/30/72 — SHEET 3 OF 6

DRAWING NO. 201142 - 000 — REV. H

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
55	Resistor. 1%. ¼w. 63Ω	100155-270	1	R39.
56				
57	Resistor. 5%. ¼w. 1.2K	100156-122	37	R17.22.25.30.32.44.53.57.70.71.
				R103-903. R106-906. R107-907.
58	Resistor. 1%. ¼w. 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%. ¼w. 3.09K	100155-336	1	R43.
61	Resistor. 5%. " 3.3K	100156-332.	41	R24.51.56.60.75. R113-913.
				R114-914. R129-929. R133-933.
62	Resistor. 5%. ¼w. 4.7K	100156-472	2	R34.58.
63	Resistor. " " 5.1K	100156-512	2	R46.50.
64	Resistor. " " 6.8K	100156-682	20	R16.59. 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%. ¼w. 18K	100156-183	1	R36.
69	Resistor. " " 39K	100156-393	9	R130-930.
70				
71	Resistor. 5%. ¼w. 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%. ¼w. 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.
79	~~Screw, Captive.~~	~~100262~~	~~5~~	
80				

MATERIAL LIST

Wang Computer Products

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB, — MODEL NO. 11 — DATE 6/20/72 — SHEET 4 OF 6

DRAWING NO. 201142 - 000 — REV. H

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
c1				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				
92				
93				
94				
95				
96	Wire, Solid Insulated.	100246-924	A/R	Jumper J1. From V to W.
				Jumper J5. " T " U.
				Jumper J6. " H " J.
	These are permanent jumpers			Jumper J7. " F " G.
	that must be installed on all			Jumper J8. " X " Y.
	boards.			

WANGCO INCORPORATED MATERIAL LIST

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB, 75IPS. TYPE 'P' D/G. 9TRK — MODEL NO. 11 — DATE 3/30/72 — SHEET 1 OF 1

DRAWING NO. 201142-001 — REV. H

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	Capacitor, Polystyrene. .002uf	100077-202	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%. ¼w. 150K	100156-154	9	R115-915.
90	Resistor. " " 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.

WANGCO INCORPORATED MATERIAL LIST

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB 75IPS. TYPE 'A' D/G. 9 TRK — MODEL NO. 11 — DATE 3/30/72 — SHEET 1 OF 1

DRAWING NO. 201142-002 — REV. H

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	Capacitor, Polystyrene .002uf	100077-202	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%,¼w 150K	100156-154	9	R115-915.
90	Resistor, " " 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. From M to P.
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11.From DD to EE.
				Jumper J12.From GG to HH

WANGCO INCORPORATED MATERIAL LIST

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. 40-45IPS TYPE 'A' D/G. 9 TRK — MODEL NO. 11 — DATE 3/30/72 — SHEET 1 OF 1

DRAWING NO. 201142 - 003 — REV. H

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%. ¼w. 330K	100156-334	9	R115-915.
90	Resistor. " " 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 INCORPORATED MATERIAL LIST

DRAWING TITLE: ASSY.DATA ELECTRONICS — MODEL NO. 11 — DATE 3/30/72 — SHEET 1 OF 1

DRAWING NO. 201142-004 — REV. H

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%, ¼W 330K	100156-334	9	R115-915.
90	Resistor, " " 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. From M to P.
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11.From DD to EE.
				Jumper J12.From GG to HH

Figure B-27. Data Electronics, Dual Gap (pg. 2 of 7)

WANGCO MATERIAL LIST

DRAWING NO. 201142 - 005 REV. H

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. 30-39.91PS. TYPE'P' DUAL GAP 9 TRK. MODEL NO. 11. DATE 8/21/72. SHEET 1 OF 1

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. .33uf	100136-334	9	C106-906.
85	Capacitor, " .33uf	100136-334	5	C107-907.
86	Capacitor, Polyfilm. .18uf	100128-184	9	C108-908.
87				
88				
89	Resistor. 5%. ½w. 330K	100156-334	9	R115-915.
90	Resistor. " " 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 " P.
				Jumper J3. " AA " BB.
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11. From CC to DD.
				JUMPER J12 " GG " HH

WANGCO INCORPORATED MATERIAL LIST

DRAWING NO. 201142-006 REV. H

DRAWING TITLE: ASSY.DATA ELECTRONICS PWB 30-39.91PS.TYPE 'A' DUAL GAP. MODEL NO. 11. DATE 8/21/72 SHEET 1 OF 1

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, " .33uf	100136-334	9	C107-907.
86	Capacitor, Polyfilm .18uf	100128-184	9	C108-908.
87				
88				
89	Resistor, 5%,½W 330K	100156-334	9	R115-915
90	Resistor, " " 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. From M to P.
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11.From DD to EE.
				Jumper J12.From GG to HH.

WANGCO INCORPORATED MATERIAL LIST

DRAWING NO. 201142-007 REV. H

DRAWING TITLE: ASSY.DATA ELECTRONICS PWB 23-29.91PS.TYPE'P' DUAL GAP. MODEL NO. 11. DATE 8/21/72 SHEET 1 OF 1

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, " .47uf	100136-474	9	C107-907.
86	Capacitor, Polyfilm .27uf	100128-274	9	C108-908
87				
88				
89	Resistor, 5%,½W 330K	100156-334	9	R115-915.
90	Resistor, " " 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. From M to N.
				Jumper J3. From AA to BB.
				Jumper J9. Not used.
				Jumper J10,Not used.
				Jumper J11.From CC to DD.
				Jumper J12.From GG to HH.

WANGCO INCORPORATED MATERIAL LIST

DRAWING NO. 201142-008 REV. H

DRAWING TITLE: ASSY.DATA ELECTRONICS PWB 23-29.91PS.TYPE'A' DUAL GAP. MODEL NO. 11. DATE 8/21/72 SHEET 1 OF 1

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, " .47uf	100136-474	9	C107-907.
86	Capacitor, Polyfilm .27uf	100128-274	9	C108-908.
87				
88				
89	Resistor, 5%,½W 330K	100156-334	9	R115-915.
90	Resistor, " " 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. From M to P.
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11.From DD to EE.
				Jumper J12.From GG to HH.

WANGCO MATERIAL LIST

DRAWING NO. 201142 - 009 REV. H

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB. 40-45PS. TYPE'P' DUAL GAP. 9 TRK. MODEL NO. 10. DATE 8/21/72. SHEET 1 OF 1

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, " .22uf	100136-224	9	C107-907.
86	Capacitor, Polyfilm. .15uf	100128-154	9	C108-908.
87				
88				
89	Resistor. 5%. ½w. 330K	100156-334	9	R115-915.
90	Resistor. " " 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 " X.
				Jumper J3. " AA " ZZ.
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11. From CC to DD.
95				JUMPER J12 " GG " HH
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

DRAWING NO. 201142-010 REV. H

DRAWING TITLE: ASSY.DATA ELECTRONICS PWB 40-45PS.TYPE'A' DUAL GAP 9 TRK. MODEL NO. 10. DATE 8/21/72 SHEET 1 OF 1

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, " .22uf	100136-224	9	C107-907.
86	Capacitor,Polyfilm .15uf	100128-154	9	C108-908.
87				
88				
89	Resistor, 5%,½W 330K	100156-334	9	R115-915.
90	Resistor, " " 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. From M to P.
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11.From DD to EE.
				Jumper J12.From GG to 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 INCORPORATED MATERIAL LIST

DRAWING NO. 201142-011 REV. H

DRAWING TITLE: ASSY.DATA ELECTRONICS PWB 30-39.91PS.TYPE'P' DUAL GAP 9 TRK. MODEL NO. 10. DATE 8/21/72 SHEET 1 OF 1

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, " .33uf	100136-334	9	C107-907.
86	Capacitor, Polyfilm .18uf	100128-184	9	C108-908.
87				
88				
89	Resistor, 5%,½W 330K	100156-334	9	R115-915.
90	Resistor, " " 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. From M to N.
				Jumper J3. From AA to BB.
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11.From CC to DD.
				Jumper J12.From GG to 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 INCORPORATED MATERIAL LIST

DRAWING NO. 201142-012 REV. H

DRAWING TITLE: ASSY.DATA ELECTRONICS PWB 30-39.91PS.TYPE'A' DUAL GAP 9 TRK. MODEL NO. 10. DATE 8/21/72 SHEET 1 OF 1

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, " .33uf	100136-334	9	C107-907.
86	Capacitor, Polyfilm .18uf	100128-184	9	C108-908.
87				
88				
89	Resistor, 5%, ½W 330K	100156-334	9	R115-915.
90	Resistor, " " 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. From M to P.
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11.From DD to EE.
				Jumper J12.From GG to 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.

Figure B-27. Data Electronics, Dual Gap (pg. 3 of 7)

WANGCO MATERIAL LIST — INCORPORATED

ML | DRAWING NO. 201142-013 | REV. H

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB 23-29,91IPS.TYPE'P'DUAL GAP 9 TRK | MODEL NO. 10 | DATE 8/21/72 | SHEET 1 OF 1

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, " .47uf	100136-474	9	C107-907.
86	Capacitor,Polyfilm .27uf	100128-274	9	C108-908.
87				
88				
89	Resistor, 5%,½W 330K	100156-334	9	R115-915.
90	Resistor, " " 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. From M to N.
				Jumper J3. From AA to BB.
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11.From CC to DD.
				Jumper J12.From GG to 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 — INCORPORATED

ML | DRAWING NO. 201142-014 | REV. H

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB 23-29,91IPS.TYPE'A' DUAL GAP 9 TRK | MODEL NO. 10 | DATE 8/21/72 | SHEET 1 OF 1

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, " .47uf	100136-474	9	C107-907.
86	Capacitor,Polyfilm .27uf	100128-274	9	C108-908.
87				
88				
89	Resistor, 5%,½W 330K	100156-334	9	R115-915.
90	Resistor, " " 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. From M to P.
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11.From DD to EE.
				Jumper J12.From GG to 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 — INCORPORATED

ML | DRAWING NO. 201142-016 | REV. H

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB 75IPS.TYPE 'A' D/G 9 TRK | MODEL NO. 11 | DATE 2/13/73 | SHEET 1 OF 1

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	Capacitor,Polystyrene .002uf	100077-202	1	C34.
82	Capacitor,Mica 820pf	100243-821	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%,½W 150K	100156-154	9	R115-915.
90	Resistor, " " 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. From M to N.
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11.From DD to EE.
				Jumper J12.From GG to HH.

WANGCO MATERIAL LIST — INCORPORATED

ML | DRAWING NO. 201142-017 | REV. H

DRAWING TITLE: ASSY.DATA ELECTRONICS PWB 75IPS.TYPE 'P' D/G 7 TRK | MODEL NO. 11 | DATE 3/2/73 | SHEET 1 OF 1

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	Capacitor,Polystyrene .002uf	100077-202	1	C34.
82	Capacitor,Mica 820pf	100243-821	1	C41.
83	Capacitor,Polystyrene 510pf	100077-511	9	C101-901.
84	Capacitor,Tantalum .15uf	100136-154	9	C106-906.
85	Capacitor, " .15uf	100136-154	9	C107-907.
86	Capacitor,Polyfilm .082uf	100 078-823	9	C108-908.
87				
88				
89	Resistor,5%,½W 150K	100156-154	9	R115-915.
90	Resistor," " 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. From M to N.
				Jumper J3. From AA to BB.
				Jumper J9. Not used.
				Jumper J10. Not used.
				Jumper J11.From CC to DD.
				Jumper J12.From FF to GG.

WANGCO MATERIAL LIST — INCORPORATED

ML | DRAWING NO. 201142-018 | REV. H

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB 75IPS.TYPE 'A' D/G 7 TRK | MODEL NO. 11 | DATE 3/2/73 | SHEET 1 OF 1

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
81	Capacitor,Polystyrene .002uf	100077-202	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%,½W 150K	100156-154	9	R115-915.
90	Resistor, " " 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. From N to P.
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11.From DD to EE.
				Jumper J12.From FF to GG.

WANGCO MATERIAL LIST — INCORPORATED

ML | DRAWING NO. 201142-019 | REV. H

DRAWING TITLE: ASSY. DATA ELECTRONICS PWB 40-45IPS.TYPE 'P' DUAL GAP 7 TRK | MODEL NO. 11 | DATE 3/2/73 | SHEET 1 OF 1

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%,½W 330K	100156-334	9	R115-915.
90	Resistor, " " 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. From M to N.
				Jumper J3. From AA to BB.
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11.From CC to DD.
				&umper J12.From FF to GG.

WANGCO MATERIAL LIST — INCORPORATED

ML | DRAWING NO. 201142-020 | REV. H

DRAWING TITLE: ASSY.DATA ELECTRONICS 40-45IPS. TYPE 'A' D/G 7 TRK | MODEL NO. 11 | DATE 3/2/73 | SHEET 1 OF 1

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%,½W 330K	100156-334	9	R115-915.
90	Resistor, " " 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. From M to P.
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11.From DD to EE.
				Jumper J12.From FF to GG.

WANGCO MATERIAL LIST — INCORPORATED

ML | DRAWING NO. 201142-021 | REV. H

DRAWING TITLE: ASSY.DATA ELECTRONICS PWB 30-39,91PS.TYPE'P' DUAL GAP 7 TRK | MODEL NO. 11 | DATE 3/2/73 | SHEET 1 OF 1

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 .33uf	100136-334	9	C106-906.
85	Capacitor, " .33uf	100136-334	9	C107-907.
86	Capacitor, Polyfilm .18uf	100128-184	9	C108-908.
87				
88				
89	Resistor, 5%,½W 330K	100156-334	9	R115-915.
90	Resistor, " " 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. From M to N.
				Jumper J3. From AA to BB.
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11.From CC to DD.
				Jumper J12.From FF to GG.

Figure B-27. Data Electronics, Dual Gap (pg. 4 of 7)

WANGCO INCORPORATED — MATERIAL LIST

ML DRAWING NO. 201142-022 REV. H

DRAWING TITLE: ASSY.DATA ELECTRONICS PWB 30-39.91PS.TYPE'A' DUAL GAP 7 TRK — MODEL NO. 11 — DATE 3/2/73 — SHEET 1 OF 1

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, " .22uf	100136-224	9	C107-907.
86	Capacitor, Polyfilm .18uf	100128-184	9	C108-908.
87				
88				
89	Resistor, 5%,½W 330K	100156-334	9	R115-915.
90	Resistor, " " 380K	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. From M to P.
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11.From DD to EE.
				Jumper J12.From FF to GG.

WANGCO INCORPORATED — MATERIAL LIST

ML DRAWING NO. 201142-023 REV. H

DRAWING TITLE: ASSY.DATA ELECTRONICS PWB 23-29.91PS.TYPE'B' DUAL GAP 7 TRK — MODEL NO. 11 — DATE 3/3/73 — SHEET 1 OF 1

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, " .47uf	100136-474	9	C107-907.
86	Capacitor, Polyfilm .27uf	100128-274	9	C108-908.
87				
88				
89	Resistor, 5%,½W 330K	100156-334	9	R115-915.
90	Resistor, " " 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. From M to N.
				Jumper J3. From AA to BB.
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11.From CC to DD.
				Jumper J12.From FF to GG.

WANGCO INCORPORATED — MATERIAL LIST

ML DRAWING NO. 201142-024 REV. H

DRAWING TITLE: ASSY.DATA ELECTRONICS PWB 23-29.91PS.TYPE'A' DUAL GAP 7 TRK — MODEL NO. 11 — DATE 3/2/73 — SHEET 1 OF 1

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, " .47uf	100136-474	9	C107-907.
86	Capacitor, Polyfilm .27uf	100128-274	9	C108-908.
87				
88				
89	Resistor, 5%,½W 330K	100156-334	9	R115-915.
90	Resistor, " " 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. From M to P.
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11.From DD to EE.
				Jumper J32.From FF to GG.

WANGCO INCORPORATED — MATERIAL LIST

ML DRAWING NO. 201142-025 REV. H

DRAWING TITLE: ASSY.DATA ELECTRONICS PWB 40-45IPS.TYPE 'P' DUAL GAP 7 TRK — MODEL NO. 10 — DATE 3/2/73 — SHEET 1 OF 1

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, " .22uf	100136-224	9	C107-907.
86	Capacitor, Polyfilm .15uf	100128-154	9	C108-908.
87				
88				
89	Resistor, 5%,½W 330K	100156-334	9	R115-915.
90	Resistor, " " 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. From M to N.
				Jumper J3. From AA to BB.
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11.From CC to DD.
				Jumper J12.From FF to 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 INCORPORATED — MATERIAL LIST

ML DRAWING NO. 201142-026 REV. H

DRAWING TITLE: ASSY.DATA ELECTRONICS PWB 40-45IPS.TYPE'A' DUAL GAP 7 TRK — MODEL NO. 10 — DATE 3/2/72 — SHEET 1 OF 1

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, " .22uf	100136-224	9	C107-907.
86	Capacitor, Polyfilm .15uf	100128-154	9	C108-908.
87				
88				
89	Resistor, 5%,½W 330K	100156-334	9	R115-915.
90	Resistor, " " 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. From M to P.
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11.From DD to EE.
				Jumper J12.From FF to 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 INCORPORATED — MATERIAL LIST

ML DRAWING NO. 201142-027 REV. H

DRAWING TITLE: ASSY.DATA ELECTRONICS PWB 30-39.91PS.TYPE'B' DUAL GAP 7 TRK — MODEL NO. 10 — DATE 3/2/72 — SHEET 1 OF 1

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, " .33uf	100136-334	9	C107-907.
86	Capacitor, Polyfilm .18uf	100128-184	9	C108-908.
87				
88				
89	Resistor, 5%,½W 330K	100156-334	9	R115-915.
90	Resistor, " " 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. From M to N.
				Jumper J3. From AA to BB.
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11.From CC to DD.
				Jumper J12.From FF to 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 INCORPORATED — MATERIAL LIST

ML DRAWING NO. 201142-028 REV. H

DRAWING TITLE: ASSY.DATA ELECTRONICS PWB 30-39.91PS.TYPE'A' DUAL GAP 7 TRK — MODEL NO. 10 — DATE 3/2/73 — SHEET 1 OF 1

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, " .33uf	100136-334	9	C107-907.
86	Capacitor, Polyfilm .18uf	100128-184	9	C108-908.
87				
88				
89	Resistor, 5%,½W 330K	100156-334	9	R115-915.
90	Resistor, " " 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. From M to P.
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11.From DD to EE.
				Jumper J12.From FF to 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 INCORPORATED — MATERIAL LIST

ML DRAWING NO. 201142-029 REV. H

DRAWING TITLE: ASSY.DATA ELECTRONICS PWB 23-29.91PS.TYPE'P' DUAL GAP 7 TRK — MODEL NO. 10 — DATE 3/2/73 — SHEET 1 OF 1

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, " .47uf	100136-474	9	C107-907.
86	Capacitor, Polyfilm .27uf	100128-274	9	C108-908.
87				
88				
89	Resistor, 5%,½W 330K	100156-334	9	R115-915.
90	Resistor, " " 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. From M to N.
				Jumper J3. From AA to BB.
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11.From CC to DD.
				Jumper J12.From FF to 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.

Figure B-27. Data Electronics, Dual Gap (pg. 5 of 7)

WANGCO INCORPORATED — MATERIAL LIST

ML DRAWING NO. 201142-030 REV. H

DRAWING TITLE ASSY.DATA ELECTRONICS PWB 23-29.91PS.TYPE'A' DUAL GAP 7TRK MODEL NO. 10 DATE 3/2/73 SHEET 1 OF 1

REV. H | DRAWING NO. 201142-030 | ML

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, " .47uf	100136-474	9	C107-907.
86	Capacitor,Polyfilm .27uf	100128-274	9	C108-908.
87				
88				
89	Resistor, 5%,½W 330K	100156-334	9	R115-915.
90	Resistor, " " 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. From M to P.
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11.From DD to EE.
				Jumper J12.From FF to 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 INCORPORATED — MATERIAL LIST

ML DRAWING NO. 201142- 032 REV. H

DRAWING TITLE ASSY.DATA ELECTRONICS PWB 7SIPS TYPE 'A' D/G 7 TRK MODEL NO. 11 DATE 3/2/73 SHEET 1 OF 1

REV. H | DRAWING NO. 201142-032 | ML

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
81	Capacitor,Polystyrene .002uf	100077-202	1	C34.
82	Capacitor,Mica 820pf	100243-821	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%,½W 150K	100156-154	9	R115-915.
90	Resistor," " 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. From M to N.
				Jumper J3. Not used.
				Jumper J9. Not used.
				Jumper J10." "
				Jumper J11.From DD to EE.
				Jumper J12.From FF to GG.

UNSTROBED DATA.

WANGCO INCORPORATED — MATERIAL LIST

ML DRAWING NO. 201142 - 033 REV. H

DRAWING TITLE AS Y. DATA ELECTRONICS PWB. 40-45IPS. 9GH. D/3. TYPE 'A' MODEL NO. 1145 DATE 3/6/73 SHEET 1 OF 1

REV. H | DRAWING NO. 201142-033 | ML

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, " .22uf	100136-224	9	C107-907.
86	Capacitor, Polyfilm. .15uf	100128-154	9	C108-908.
87				
88				
89	Resistor. 5%. ½w. 330K	100156-334	9	R115-915.
90	Resistor. " " 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 " J.
				Jumper J3. Not Used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11. From DD to EE.
				Jumper J12. " JJ " HH.

UNSTROBED DATA

WANGCO INCORPORATED — MATERIAL LIST

ML DRAWING NO. 201142-034 REV. B

DRAWING TITLE ASSY.DATA ELECTRONICS PWB 40-45IPS.TYPE'A' DUAL GAP 7TRK MODEL NO. 10 DATE 4/9/74 SHEET 1 OF 1

REV. B | DRAWING NO. 201142-034 | ML

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
81	Capacitor, Polystyrene.0047uf	100077-472	1	C34.
82	Capacitor, Polystyrene.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, " .22uf	-224	9	C107-907.
86	Capacitor, Polyfilm .15uf	100128-154	9	C108-908.
87				
88				
89	Resistor, 5%,½w. 330K	100156-334	9	R115-915.
90	Resistor, " " 330K	-334	9	R116-916.
91				
92				
93				
94	Wire, Solid Insulated	100248-924	A/R	Jumper J1 from B to C.
				Jumper J2 " M to N
				Jumper J3 " Not used.
				Jumper J9 " Not used.
				Jumper J10 " " "
				Jumper J11 " DD to EE
				Jumper J12 " FF to 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 INCORPORATED — MATERIAL LIST

ML DRAWING NO. 201142-035 REV. B

DRAWING TITLE ASSY.DATA ELECTRONICS PWB 40-45IPS.TYPE'A' DUAL GAP 9 TRK MODEL NO. 10 DATE 4/9/74 SHEET 1 OF 1

REV. B | DRAWING NO. 201142-035 | ML

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
81	Capacitor, Polystyrene.0047uf	100077-472	1	C34.
82	Capacitor, Polystyrene.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, " .22uf	-224	9	C107-907.
86	Capacitor, Polyfilm .15uf	100128-154	9	C108-908.
87				
88				
89	Resistor, 5%,½w. 330K	100156-334	9	R115-915.
90	Resistor, " " 330K	-334	9	R116-916.
91				
92				
93				
94	Wire, Solid Insulated	100248-924	A/R	Jumper J1 from B to C
				Junoer J2 " M to N
				Jumper J3 Not used.
				Jumper J9 " "
				Jumper J10 " "
				Jumper J11 from DD to EE
				Jumper J12 " GG to 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 INCORPORATED — MATERIAL LIST

ML DRAWING NO. 201142-036 REV. A

DRAWING TITLE ASSY.DATA ELECTRONICS PWB 10-12.91PS.TYPE'P'DUAL GAP 9 TRK MODEL NO. 10 DATE 4/25/74 SHEET 1 OF 1

REV. A | DRAWING NO. 201142-036 | ML

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
81	Capacitor .015uf	100165-153	1	C34.
82	Capacitor .0015uf	100225-152	1	C41.
83	Capacitor .0033uf	100077-332	9	C101-901.
84	Capacitor,Tantalum 1uf	100136-105	9	C106-906.
85	Capacitor, " 1uf	-105	9	C107-907.
86	Capacitor,Polyfilm .47uf	100128-474	9	C108-908.
87				
88				
89	Resistor, 5%,½w 750K	100156-754	9	R115-915.
90	Resistor, " " 750K	-754	9	R116-916.
91				
92				
93				
94	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From A to C.
				Jumper J2. From M to N.
				Jumper J3. From AA to BB.
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11. From CC to DD.
				Jumper J12. From GG to 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 INCORPORATED — MATERIAL LIST

ML DRAWING NO. 201142-037 REV. A

DRAWING TITLE ASSY.DATA ELECTRONICS PWB 10-12.91PS.TYPE'A' DUAL GAP 9TRK MODEL NO. 10 DATE 4/25/74 SHEET 1 OF 1

REV. A | DRAWING NO. 201142-037 | ML

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
81	Capacitor .015uf	100165-153	1	C34.
82				
83	Capacitor,Polystyrene .0033uf	100077-332	9	C101-901.
84	Capacitor,Tantalum 1uf	100136-105	9	C106-906.
85	Capacitor, " 1uf	-105	9	C107-907.
86	Capacitor,Polyfilm .47uf	100128-474	9	C108-908.
87				
88				
89	Resistor, 5%,½w. 750K	100156-754	9	R115-915.
90	Resistor, " " 750K	-754	9	R116-916.
91				
92				
93				
94	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From B to C.
				Jumper J2. From M to P.
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11. From DD to EE.
				Jumper J12. " GG to 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 INCORPORATED — MATERIAL LIST

ML DRAWING NO. 201142-038 REV. A

DRAWING TITLE ASSY. DATA ELECTRONICS PWB 10-12.91PS.TYPE'P' DUAL GAP 7TRK MODEL NO. 10 DATE 4/25/74 SHEET 1 OF 1

REV. A | DRAWING NO. 201142-038 | ML

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ	REMARKS ON CKT. DESIG.
81	Capacitor .015uf	100165-153	1	C34.
82	Capacitor .0015uf	100225-152	1	C41.
83	Capacitor .0033uf	100077-332	9	C101-901.
84	Capacitor,Tantalum 1uf	100136-105	9	C106-906.
85	Capacitor, " 1uf	-105	9	C107-907.
86	Capacitor,Polyfilm .47uf	100128-474	9	C108-908.
87				
88				
89	Resistor, 5%,½w. 750K	100156-754	9	R115-915.
90	Resistor, " " 750K	-754	9	R116-916.
91				
92				
93				
94	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From A to C.
				Jumper J2. From M to N.
				Jumper J3. From AA to BB.
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11. From CC to DD.
				Jumper J12. " FF to 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.

Figure B-27. Data Electronics, Dual Gap (pg. 6 of 7)

REV. A

DRAWING NO. 201142-039

ML

WANGCO INCORPORATED — **MATERIAL LIST**

ML DRAWING NO. 201142-039 REV. A

DRAWING TITLE ASSY.DATA ELECTRONICS PWB. 10-12.9IPS.TYPE'A' DUAL GAP 7TRK MODEL NO. 10 DATE 4/25/74 SHEET 1 OF 1

ITEM NO.	DRAWING TITLE	DWG.NO.	NO. REQ	REMARKS OR CKT. DESIG.
81	Capacitor .015uf	100165-153	1	C34.
82				
83	Capacitor,Polystyrene .0033uf	100077-332	9	C101-901.
84	Capacitor, Tantalum 1uf	100136-105	9	C106-906.
85	Capacitor, " 1uf	-105	9	C107-907.
86	Capacitor,Polyfilm .47uf	100128-474	9	C108-908.
87				
88				
89	Resistor, 5%,½w. 750K	100156-754	9	R115-915.
90	Resistor, " " 750K	-754	9	R116-916.
91				
92				
93				
94	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From B to C.
				Jumper J2. From M to P.
				Jumper J3. Not used.
				Jumper J9. " "
				Jumper J10. " "
				Jumper J11. From DD to EE.
				Jumper J12. " FF to 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.

REV. A

DRAWING NO. 201142-040

ML

WANGCO INCORPORATED — **MATERIAL LIST**

ML DRAWING NO. 201142-040 REV. A

DRAWING TITLE ASSY. DATA ELECTRONICS PWB. 17-22.9IPS. TYPE'B' DUAL GAP 9TRK MODEL NO 17 DATE 5/20/74 SHEET 1 OF 1

ITEM NO.	DRAWING TITLE	DWG.NO.	NO. REQ	REMARKS OR CKT. DESIG.
91	Capacitor, Polystyrene .0082uf	100077-822	1	C34.
92	Capacitor, Polyester .0033uf	100225-152	1	C41.
83	Capacitor, Polystyrene .0022uf	100077-222	9	C101-901.
84	Capacitor, Tantalum .68uf	100136-684	9	C106-906.
85	Capacitor, " .68uf	-684	9	C107-907.
86	Capacitor, Polyfilm .33uf	100128-334	9	C108-908.
87				
88				
89	Resistor, 5%,½w. 560K	100156-564	9	R115-915.
90	Resistor, " " 560K	-564	9	R116-916.
91				
92				
93				
94	Wire, Solid Insulated	100248-924	A/R	Jumper J1. From A to C.
				Jumper J2. " M to N.
				Jumper J3. " AA to BB.
				Jumper J9. Not used.
				Jumper J10. " "
				Jumper J11. From CC to DD.
				Jumper J12. " GG to 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.

Figure B-27. Data Electronics, Dual Gap (pg. 7 of 7)

LAST USED	DELETED
U32	
Q13	
CR2	
R75	
C41	C9,C25,C26
TP9	
QX09	
CRX05	
RX33	
CX09	
TPX03	

Figure B-28. Data Electronics, Dual Gap Schematic

Figure B-29. Magtape Transport Wiring Diagram