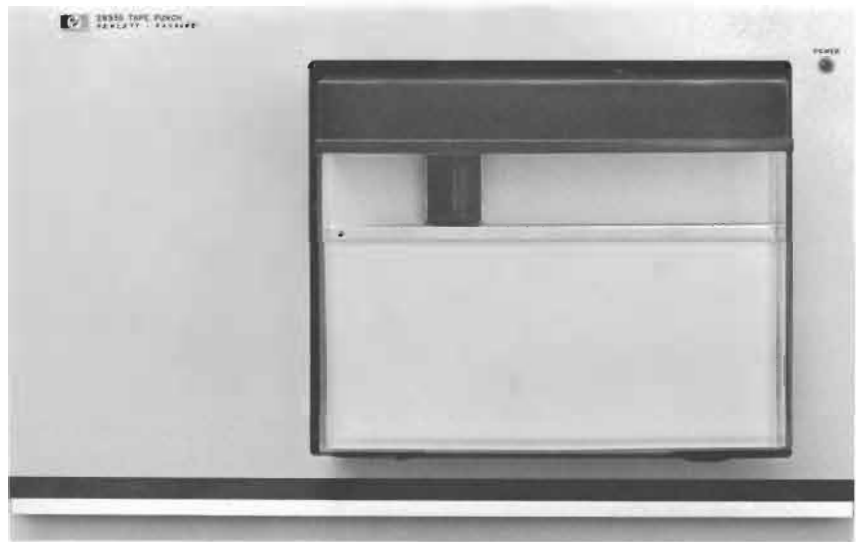


OPERATING AND SERVICE MANUAL

2895B TAPE PUNCH



HEWLETT  PACKARD

OPERATING AND SERVICE MANUAL

2895B

TAPE PUNCH



Serial Numbers Prefixed:

1201, 1231, 1306,
1332, 1340, 1408

HP Computer Museum
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SERIAL NUMBER PREFIX HISTORY

<u>PREFIX</u>	<u>DESCRIPTION</u>
1201	Original configuration.
1231	Rear panel (5, figure 6-1) components relocated and fuse (2) changed.
1306	Power transformer T1 and voltage selector switch changed. See page II.7:2.
1332	Facit Control Circuit Board changed.
1340	Resistors on Logic Inverter PCA changed. See note in table 5-3.
1408	Control panel and lamp – switch assemblies changed. See page II.7:2.

NOTICE

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1-1. INTRODUCTION.

1-2. This operating and service manual covers general information, installation, operation, theory of operation, maintenance, and replaceable parts for the Hewlett-Packard 2895B Tape Punch. (See figure 1-1.) The tape punch is a Hewlett-Packard modification of the Facit 4070 Tape Punch manufactured by Facit AB, Solna, Sweden; therefore, the *Facit 4070 Tape Punch Service Manual* is included as part of the HP 2895B Operating and Service Manual.

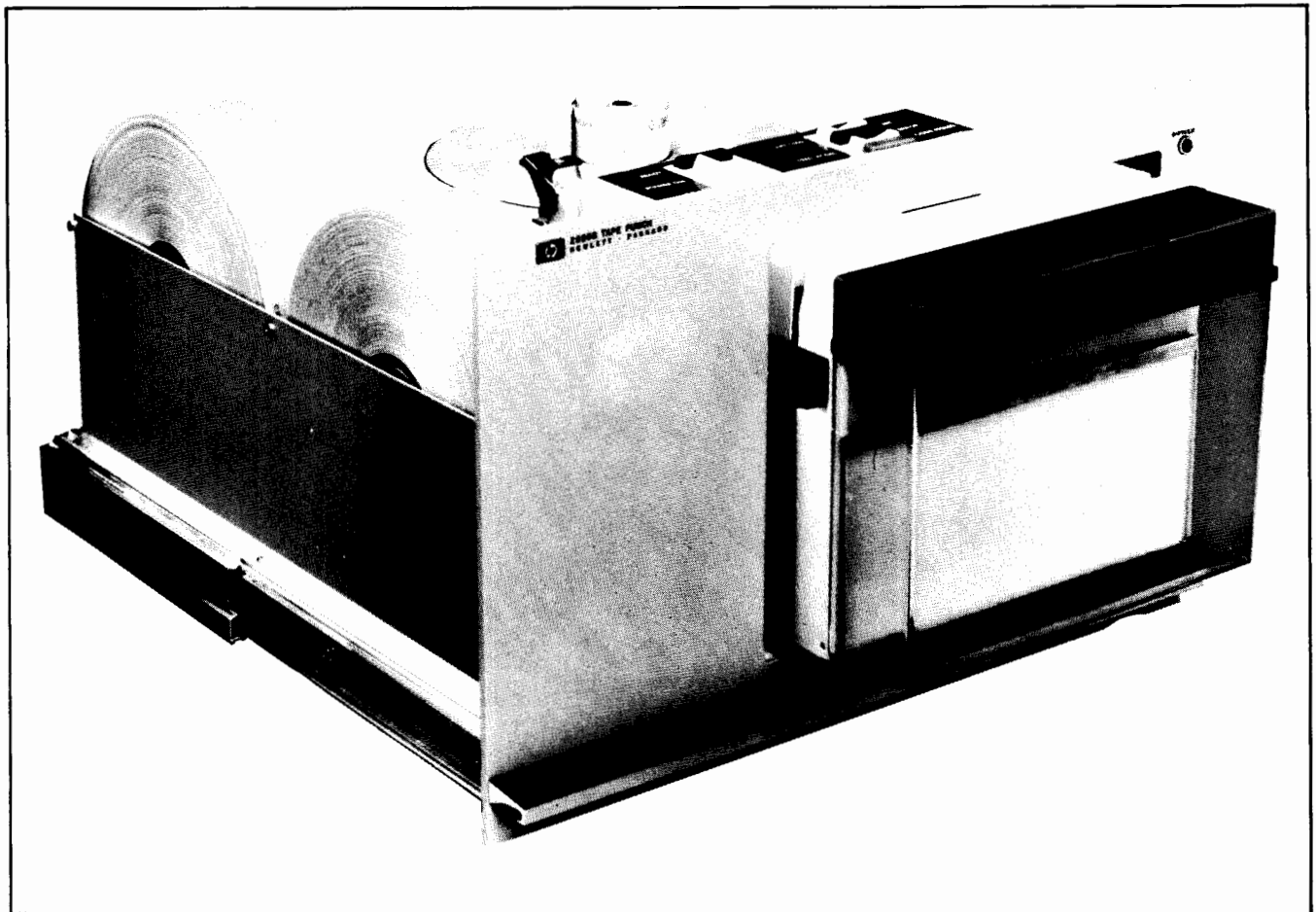
1-3. GENERAL DESCRIPTION.

1-4. The tape punch is an electromechanical device that accepts data bits from a data source (such as a computer) and actuates mechanical mechanisms to punch the data bits into a tape in an eight-level code. The unidirectional tape punch is capable of punching up to a 1-inch (25.4 mm)

wide tape at a rate of 75 characters per second and is equipped with a take-up reel for the punched tape. The tape punch weighs about 35 pounds (15.9 kilograms) and drawer-mounts in a standard 19-inch (482.6 mm) rack. The equipment furnished with each unit is as follows:

- a. Chad box with magnetic catch.
- b. Power cord.
- c. Paper tape, part no. 9280-0063.
- d. Two cardboard take-up bobbins.
- e. Rack mount assembly, 02895-60006, light gray; 02895-60007, moss gray.
- f. Operating and Service Manual 02895-90008.

1-5. The electrical circuits of the tape punch provide operating voltages and timing signals to punch and advance the paper tape. The electrical circuits are located on four printed-circuit assemblies located in the unit. Input signals



2229-1

Figure 1-1. Hewlett-Packard 2895B Tape Punch

are connected to the computer by an interconnecting cable assembly, and ac power is supplied by a separate power cable.

1-6. The Hewlett-Packard modifications to the Facit Tape Punch consist of changing the power connector, adding a drawer mounting feature that includes an ac power indicator, adding a power fuse, adding a logic inverter printed-circuit assembly (PCA), changing the rubber feet, and adding a magnetic catch to the chad box.

1-7. SPECIFICATIONS.

1-8. Specifications for the tape punch are listed in table 1-1.

1-9. IDENTIFICATION.

1-10. Hewlett-Packard uses a serial number located on the rear panel to identify each unit. The first group of digits is a serial number prefix used to identify a particular unit configuration. This prefix does not change unless unit changes are made. The serial number prefix is four digits in length. A code letter between the serial number prefix and serial number indicates the country in which the equipment

was manufactured. The last five digits identify each specific unit. If the serial number prefix on your unit does not agree with that shown on the title page of this manual, there are differences between your unit and the unit described in this manual. These differences are described in manual supplements available at the nearest HP Sales and Service Office. Sales and Service Offices are listed on the back of this manual.

1-11. Facit uses a seven digit serial number located on the bottom of the rear panel to identify each Facit unit manufactured.

1-12. Printed-circuit assembly revisions of the logic inverter PCA are identified by a letter, a series code, and a division code stamped on the PCA (A-1055-22, etc). The letter code identifies the version of the etched trace pattern on the unloaded board. The series code (middle digits) refers to the electrical characteristics of the loaded PCA and the positions of the components. The division code (last digits) identifies the Hewlett-Packard division that manufactured the PCA. If the series code stamped on the PCA does not agree with the series code shown on the schematic in this manual, there are differences between your PCA and the PCA described in this manual. These differences are described in manual supplements available at the nearest HP Sales and Service Office.

Table 1-1. Specifications

Operating Temperature:	10° to 40°C (50° to 104°F)
Relative Humidity:	*Up to 80% at 40°C (104°F) with no condensation
Punch Speed:	75 characters per second, asynchronous
Tape Type:	Paper, Mylar, or plastic
Tape Width:	Standard 5-level (11/16 inch) or 8-level (1 inch)
Tape Thickness:	
Paper:	0.003 inch to 0.005 inch (0.08 to 0.13 mm) (oiled or dry)
Plastic:	0.003 inch to 0.004 inch (0.08 to 0.11 mm)
Mylar:	0.003 inch to 0.004 inch (0.08 to 0.11 mm)
**Weight:	35 pounds (15.9 kg) (including drawer)
**Overall Dimensions:	21-3/16 inches (538.2 mm) deep, 16-3/4 inches (425.5 mm) wide, 10-1/2 inch (266.7 mm) panel height
Fully extended:	Extends 20-1/8 inches (511.2 mm) from the front of a cabinet
Noise Level:	Punching all channels at full speed, measured 3.3 feet (1 meter) from the tape punch: 74 dB
**Input Signals:	Signal lengths less than 10 microseconds at 0 volts signal level are rejected as noise
“not” Punch Instruction (\overline{PI}):	Minimum pulse duration: 0.1 millisecond Minimum input impedance: 2.2K ohms Logic 1: 0 to +0.5 volts with maximum current of 12 mA Logic 0: +12 volts, 10K ohm source
Data Signals ($\overline{CH1}$ thru $\overline{CH8}$):	Minimum pulse duration: 200 microseconds Minimum input impedance: 22K ohms Logic 0: 0 to +0.5 volts with maximum current of 12 mA Logic 1: +12 volts, 10K ohm source
**Output Signals:	
“not” Punch Ready (\overline{PR}):	Changes to logic 1 during punching cycle. Changes to logic 0 after completion of punching cycle. Informs computer that tape punch is prepared to begin new punching cycle.
“not” Error 2 ($\overline{ERR 2}$):	Changes to logic 0 when tape error is detected
“not” Ready (\overline{RDY}):	Changes to logic 0 when dc power is applied to internal circuitry
“not” Tape Low (\overline{TL}):	Changes to logic 0 when tape on supply reel nears depletion
Logic 1 level for \overline{PR} , $\overline{ERR 2}$, \overline{RDY} , \overline{TL} :	+6 volts, output impedance 1K ohm
Logic 0 level for \overline{PR} , $\overline{ERR 2}$, \overline{RDY} , \overline{TL} :	+0.5 volts with maximum current of 12 mA
Power Requirements:	Voltage: 115, 127, 220, or 240 ±10% volts selected by power selection switch (serial prefixes 1201 and 1231); 100, 115, 220, 240 ±10% volts selected by power switch (serial prefix 1306). Frequency: 47.5 to 100 Hz Power Consumption: 300 VA, maximum
*Denotes limits imposed by paper tape.	
**Denotes specifications that vary from Facit specifications due to the Hewlett-Packard addition of a drawer mounting feature and a logic inverter PCA.	



2-1. INTRODUCTION.

2-2. This section contains information on unpacking, inspection, installation, and reshipment of the tape punch.

2-3. UNPACKING AND INSPECTION.

2-4. If the shipping carton is damaged upon receipt, request that the carrier's agent be present when the tape punch is unpacked. Inspect the tape punch for damage (scratches, dents, broken parts, etc). If the tape punch is damaged and fails to meet specifications, notify the carrier and the nearest Hewlett-Packard Sales and Service Office immediately. (Sales and Service Offices are listed at the back of this manual.) Retain the shipping carton and the packing material for the carrier's inspection. The Sales and Service Office will arrange for the repair or replacement of the damaged tape punch without waiting for any claims against the carrier to be settled.

2-5. INSTALLATION.**2-6. MOUNTING REQUIREMENTS.**

2-7. The drawer-mounted tape punch fits in a 19-inch (483 mm) rack and requires 10-1/2 inches (267 mm) of panel height. Figure 2-1 shows the overall dimensions of the tape punch including the slide mounting parts.

Note: When determining a mounting location for the tape punch, the tape reader location should be considered. If the tape punch is mounted above the tape reader, loose chad from the tape punch may fall into the tape reader and cause reading errors.

2-8. LUBRICATION REQUIREMENTS.

2-9. Portions of the tape punch require periodic lubrication; however, the tape punch was lubricated during the manufacturing process and does not require attention until the normal maintenance procedures are executed. Section V of this manual contains maintenance information.

2-10. POWER REQUIREMENTS.

2-11. The tape punch operates from a 100- to 240-volt (serial prefix 1306 and on) or 115- to 240-volt (serial prefixes 1201, 1231) 50- to 100-hertz power source with a maximum power consumption of 300 volt-amperes. A power

selection switch located near the take-up reel provides power selection capability by the user. Depending on the input ac voltage, a 2-ampere slow-blow type fuse (see figure 2-2) provides protection from overloads. Power is connected to the tape punch by a detachable three-wire power cable.

2-12. SIGNAL REQUIREMENTS.

2-13. An interconnecting cable which connects to the back of the tape punch (see figure 2-2) transfers signals from/to the computer. The signals from the computer to the tape punch are ground-true, and signal lengths less than 10 microseconds at 0 volts are rejected as noise. Signals originated by the tape punch and sent to the computer are positive-true. (Refer to table 1-1.) The data signals must have a minimum pulse duration of 200 microseconds. The punch instruction signal must have a minimum pulse duration of 0.1 millisecond. (Refer to table 5-3 for connector signal index.)

2-14. INSTALLATION PROCEDURE.

2-15. To install the tape punch, proceed as follows:

- a. Remove the tape punch and drawer-mounting parts from the shipping containers.
- b. Assemble the slide mounting drawer as shown in figure 2-3. (Refer to table 6-1 for attaching parts.)
- c. Mount the drawer in the cabinet (figure 2-3, inserts A and B) and install the tape punch in the proper location.
- d. Set the power selection switch located near the take-up reel to a setting that is compatible with the power source.
- e. Verify that the POWER ON switch (2, figure 3-1) located on the operator panel is in the off position and connect the power cable to the power connector located at the rear of the tape punch. Connect the free end of the power cable to a suitable power source.
- f. Connect the signal interconnecting cable to the signal connector located at the rear of the tape punch. Secure the connector in place by sliding the lock to the lock position, then connect the opposite end of the interconnecting cable to the computer (or other suitable signal source).
- g. Connect the POWER lamp wiring to the POWER lamp located on the drawer front panel. Using the parts listed in table 6-1, secure the POWER lamp wiring to the drawer as shown in figure 6-1.

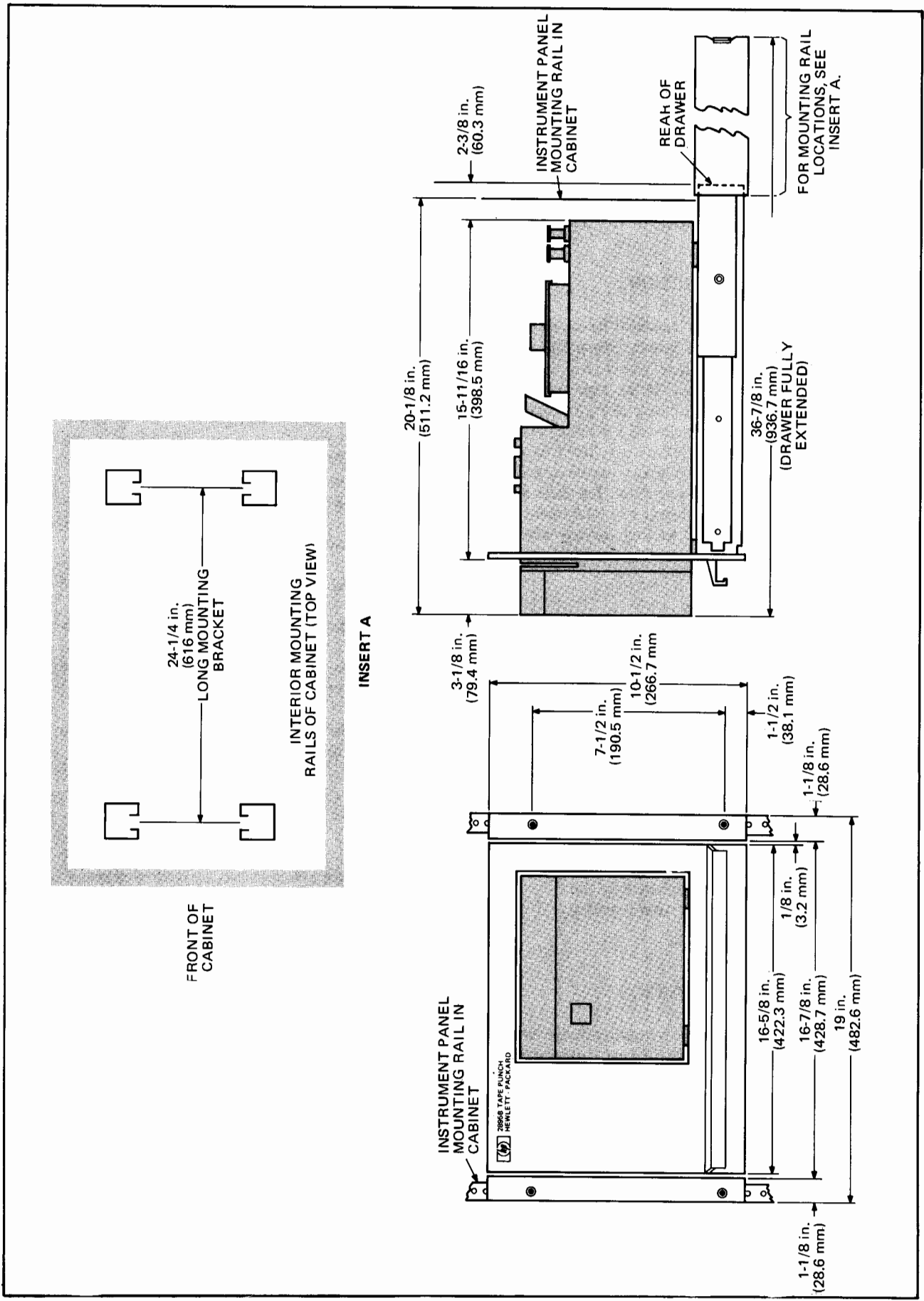
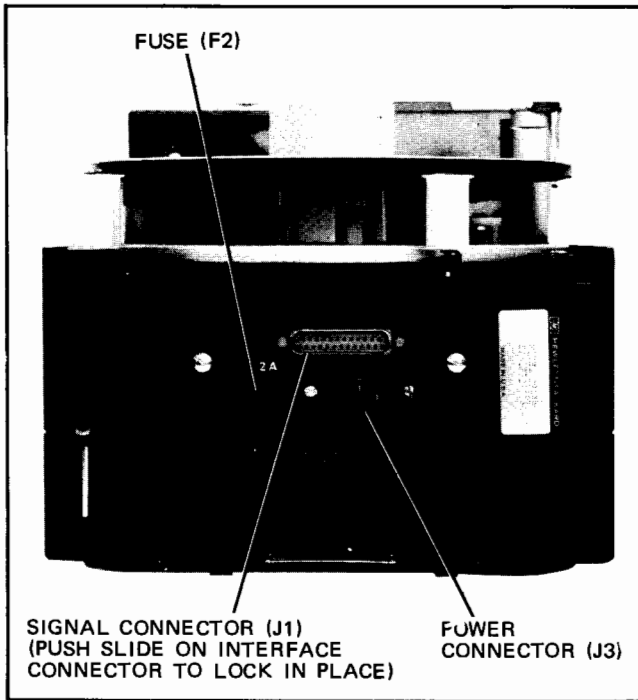


Figure 2-1. Tape Punch Overall Dimensions

2229-2A



2157-3A

Figure 2-2. Typical Tape Punch, Rear View
(Serial Prefix 1231 and on)

- h. Roll the drawer-mounted tape punch in and out of the cabinet to ensure that the power and signal cables do not catch on the surrounding hardware.
- i. Install a roll of tape, part no. 9280-0063, according to the instructions provided in section III of this manual.
- j. Check that the tape punch is operating properly by operating the controls and observing the indications

described in paragraph 3-3. Then perform the Initial Turn On procedures described in paragraph 3-9.

- k. Check that the tape punch punches all channels properly by pressing the CODE HOLES switch (8, figure 3-1). Use the tape registration template, part no. 1535-0268, to check the punched holes resulting from the CODE HOLES switch operation.
- l. If a malfunction is detected, refer to the Maintenance section of this manual.

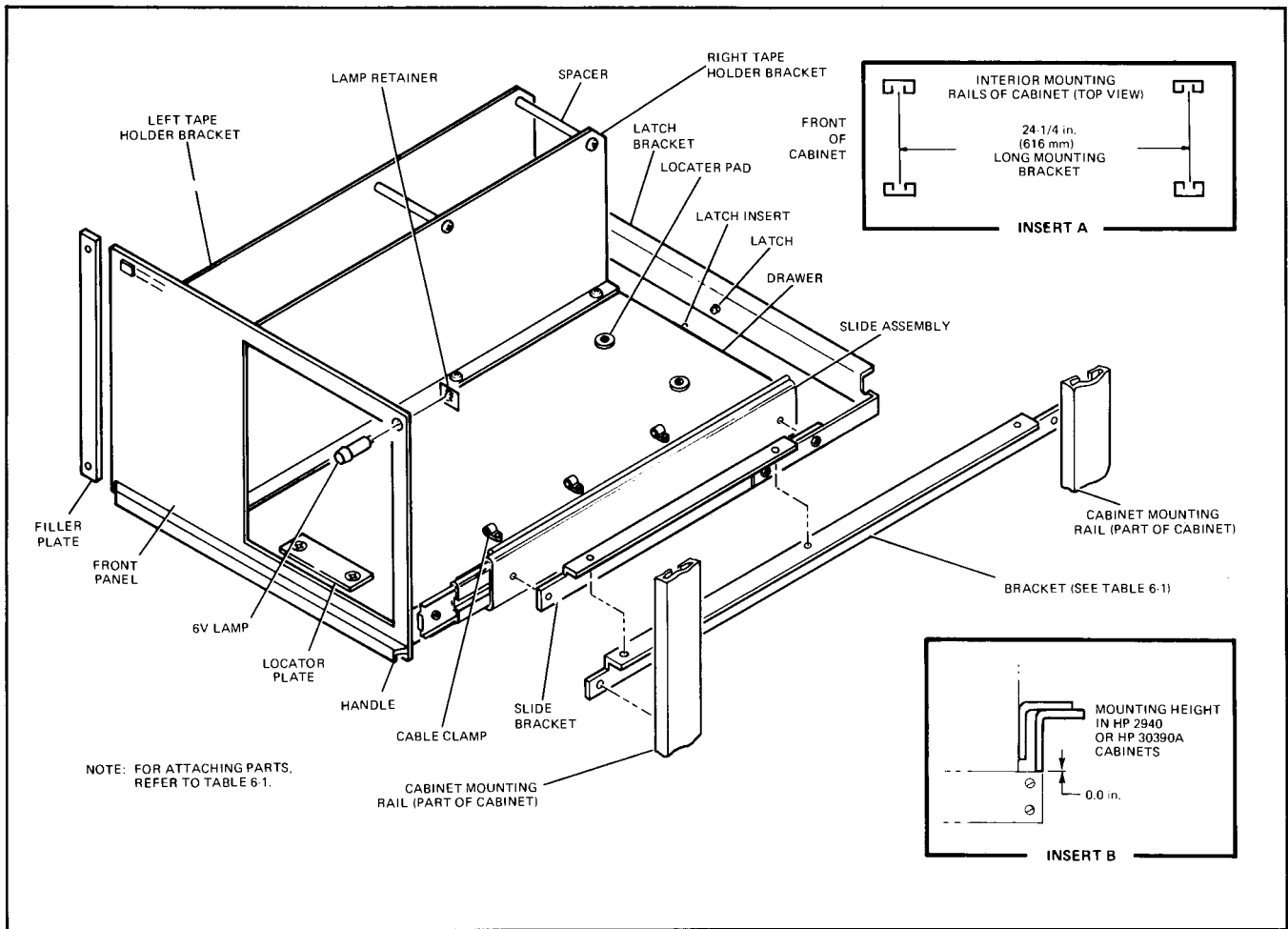
2-16. RESHIPMENT.

2-17. If the tape punch is to be shipped to Hewlett-Packard for service or repair, attach a tag to identify the owner and indicate the service or repair to be accomplished. Include the model number and full serial number of the unit.

2-18. Place the tape punch in the original container if available. If the original container is not available, a suitable container and packing material can be purchased from a local Hewlett-Packard Sales and Service Office.

2-19. If the original container is not used, wrap the tape punch in heavy paper and place it in an inner container. Place adequate packing material around all sides of the unit and place a cardboard strip over the operator panel. Place the punch and inner container in a heavy carton or wooden box and bind with strong tape or metal bands. Mark the shipping container "FRAGILE."

Note: In any correspondence, identify the unit by model number and full serial number. Refer any questions to the nearest Hewlett-Packard Sales and Service Office.



2157-12A

Figure 2-3. Assembling the Slide Drawer

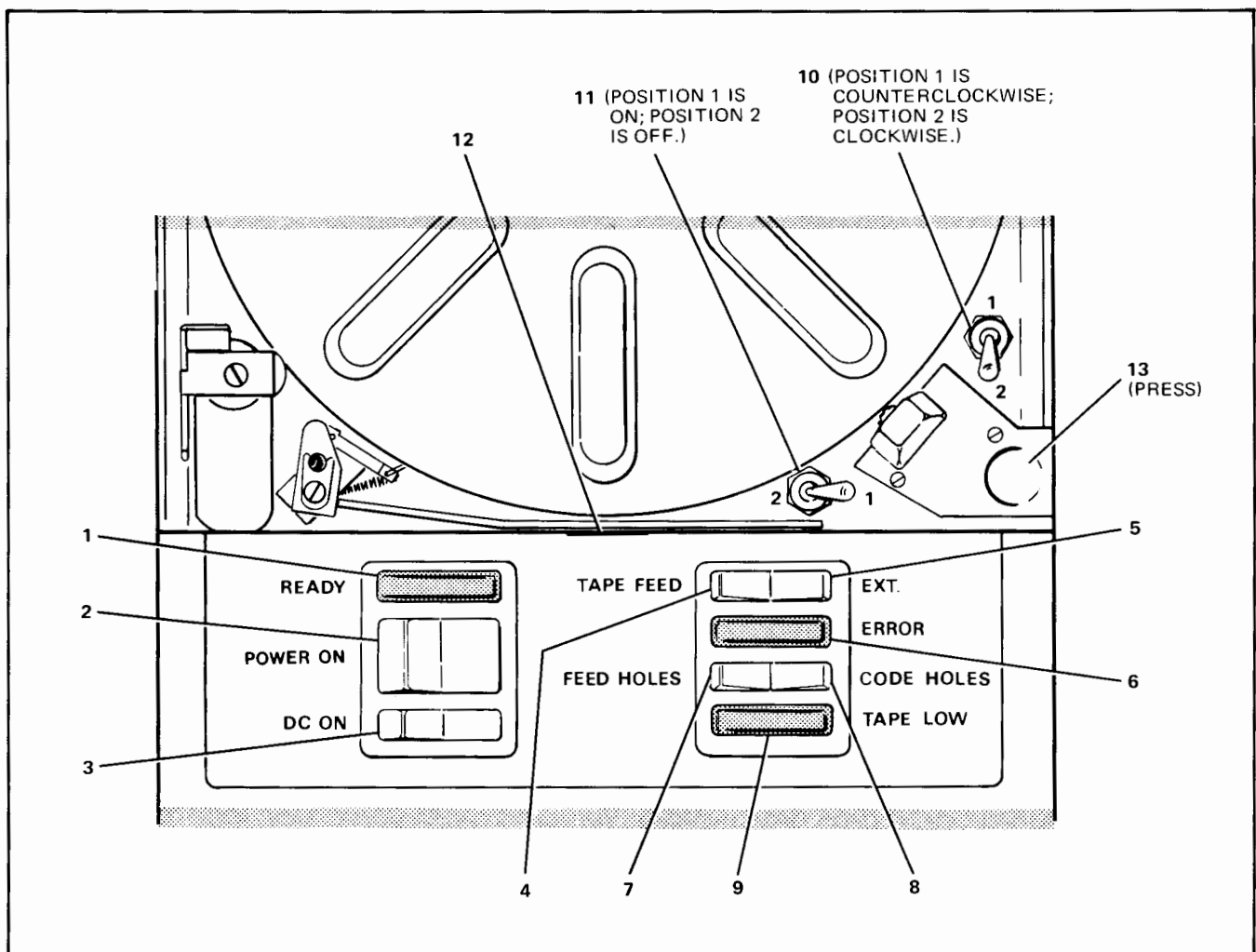
3-1. INTRODUCTION.

3-2. This section contains a description of the operating controls and indicators, and operating instructions for the tape punch.

3-3. OPERATING CONTROLS AND INDICATORS.

3-4. The following is a listing of the tape punch operating controls and indicators, and an explanation of the respective functions of each. Numbers in parenthesis correspond to the index numbers shown in figure 3-1.

- a. **READY lamp (1):** Lights when the **POWER ON** switch is set to **ON** and the **DC ON** switch is pressed. Indicates that the unit is ready to operate.
 - b. **POWER ON switch (2):** Applies primary ac power to the unit.
 - c. **DC ON switch (3):** Applies dc power to the internal circuits of the unit.
 - d. **TAPE FEED switch (4):** Feeds blank tape without feed holes through the unit.
 - e. **EXT. switch (5):** May be used to manually signal the computer to request data.
- Note: When the **POWER ON** switch is set to the off position, there is about a 5-second delay before the **READY** lamp goes out.



2157-5

Figure 3-1. Operating Controls and Indicators

- f. **ERROR lamp (6):** Lights when the tape breaks or when the tape binds in the tape transport system.
- g. **FEED HOLES switch (7):** Feeds tape, and punches only feed holes as the tape passes through the tape punch.
- h. **CODE HOLES switch (8):** Feeds tape and punches every track (8-level code and feed hole) as the tape passes through the tape punch.
- i. **TAPE LOW lamp (9):** Lights to indicate that the tape on the supply reel is almost depleted.
- j. **Tape Winding Direction switch (10):** Allows the take-up reel to take up punched tape in either direction.
- k. **Tape Winding Motor switch (11):** Allows the tape punch user to take up punched tape on the take-up reel or to allow the tape to flow away from the tape punch.
- l. **Power Selection Switch (12):** Allows the tape punch user to select an operating power setting that is compatible with the primary ac power source.
- m. **Tape Winding Motor lever (13):** Moves the tape winding motor away from the take-up reel so that the take-up reel can be installed or removed.
- n. **POWER lamp (located on drawer front panel):** Lights when the **POWER ON** switch is set to **ON** and the **DC ON** switch is pressed. Indicates that the tape punch is ready to operate.

3-5. OPERATING PROCEDURES.

3-6. To operate, the tape punch requires data information and punch commands from a computer. However, the unit must be prepared to operate prior to the reception of a signal from the computer. To prepare the tape punch for operation, proceed to paragraph 3-7 if the tape supply reel is empty, or proceed to paragraph 3-9 if the tape supply reel has an adequate amount of tape.

3-7. LOADING TAPE.

3-8. Refer to the index numbers in figure 3-2 and load and thread the tape in the unit as follows:

- a. Pull the drawer-mounted unit out on the drawer slides.
- b. Press downward on the tape winding motor lever (10) and remove the take-up reel (7).
- c. Move the tape guide arm (4) to the left until it locks in place.
- d. Release the bobbin lock on the tape supply reel (3) as shown in insert A of figure 3-2, and remove the empty cardboard bobbin of the previous roll of tape.

Note: While performing the procedures in step e, be careful when placing a new roll of tape on the tape supply reel bobbin. If the rubber ring is dislodged (see insert C of figure 3-2), the new roll of tape will not be properly secured to the tape supply reel.

- e. Unroll about 6 feet (2 meters) of tape from the tape roll and place the roll on the tape supply reel so that the tape unrolls clockwise toward the right side of the tape punch. For Hewlett-Packard paper tape, part no. 9280-0063, the printing along the edge of the tape will face toward the top of the unit.
- f. Lock the roll of tape in place by pressing downward on the outer edge of the bobbin lock as shown in insert B of figure 3-2. The bobbin lock has two locking positions; one for large-diameter bobbins (two clicks down) and one for small-diameter bobbins (one click down).
- g. Thread the tape around the tape guides (6,4,5) then along the edge of the tape punch towards the front panel of the drawer. Insert the tape through the opening in the drawer front panel.
- h. Slide the tape into the front slot (12) of the unit.
- i. If the punched tape is not going to be taken up by the take-up reel, set the tape winding motor switch (11, figure 3-1) to the off position and continue to the next step. If the punched tape is to be taken up by the take-up reel, proceed to step k.
- j. Press downward on the tape winding motor lever (10) and install the take-up reel (7) over the tape supply reel. Read the following caution and proceed to step 0.

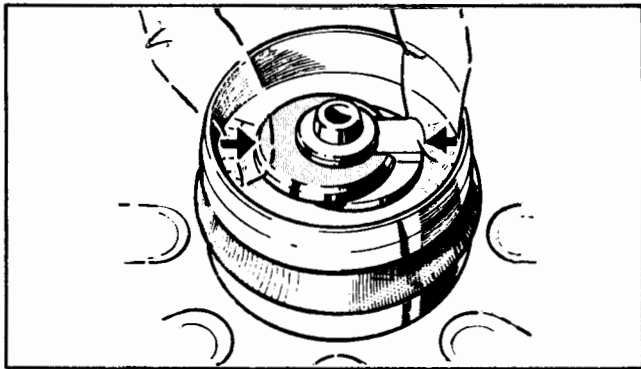
CAUTION

Do not operate the tape punch without the take-up reel in place. The absence of the take-up reel may cause the spring-loaded winding motor to bind the tape supply reel. The take-up reel driver gear and the tape supply reel will be damaged as a result.

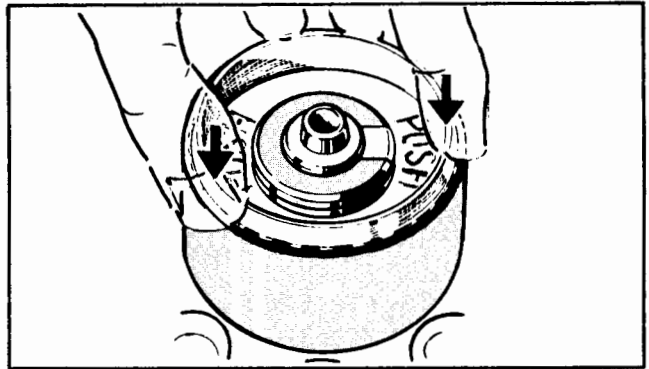
- k. Set the tape winding motor switch (11, figure 3-1) to the on position. Set the tape winding direction switch (9) to take up tape either clockwise or counter-clockwise depending on the direction desired.

Note: Hewlett-Packard recommends that the punched tape be taken up in the clockwise direction.

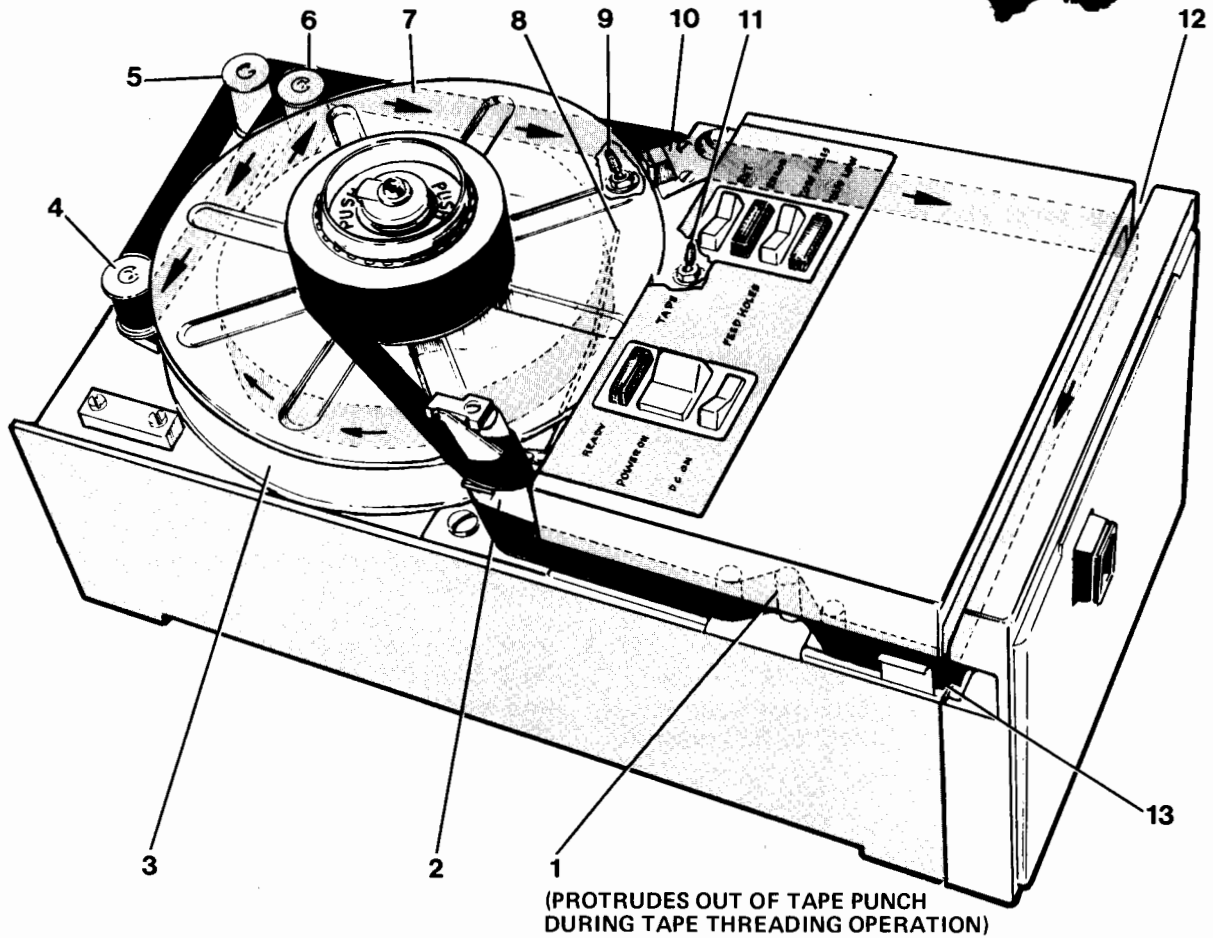
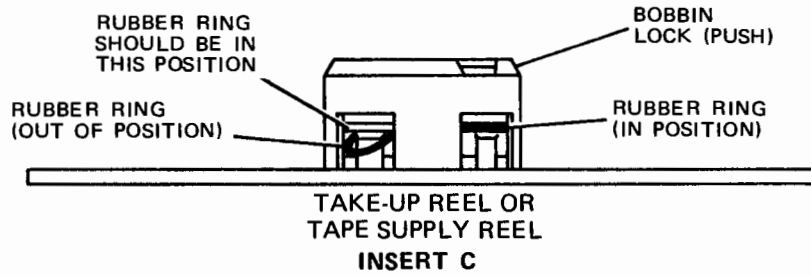
- l. Press downward on the tape winding motor lever (10) and install the take-up reel (7) over the tape supply reel.



RELEASING BOBBIN
INSERT A



LOCKING BOBBIN
INSERT B



2229-6

Figure 3-2. Loading and Threading Tape

- m. Pass the loose end of the tape through the metal tape guide (13) and through the protruding loop controller (1).
- n. Wrap one complete loop of tape around the tape lifter (2) and wrap the tape on the take-up reel in the direction the take-up reel was selected to operate in step k.

Note: Cardboard bobbins from empty rolls of tape can be used to collect tape on the take-up reel. In this manner, the bobbin lock on the take-up reel provides a convenient way to separate the punched tape from the take-up reel.

- o. Press the POWER ON switch and the DC ON switch. The POWER lamp on front panel, READY lamp, and the ERROR lamp should light.

CAUTION

Do not press in on the protruding loop controller while the tape guide arm is secured to the magnet at the rear of the unit. The pressure exerted on the loop controller wire will be excessive, possibly causing it to break. Units after serial no. 6038700 have weaker retaining magnets for the tape guide which alleviates this problem. The correct procedure for removing the tape guide arm from the magnet is listed in step p.

- p. Unlock the tape guide arm (4) by physically moving it to the right, away from the retaining magnet. The loop controller (1) will retract and not protrude from the side of the tape punch when the tape guide arm (4) is unlocked.
- q. Move the tape guide arm (4) to the right until the ERROR lamp goes out. Then press the TAPE FEED switch to take up the slack in the tape. When the slack is taken out of the tape path, the tape pressure should hold the tape guide arm in position so that the ERROR lamp remains extinguished. Release the TAPE FEED switch.
- r. The tape punch is ready to operate under computer control.

3-9. INITIAL TURN ON.

3-10. The initial turn on procedure applies if the tape punch has an adequate supply of tape. If the tape supply is not adequate as indicated when the TAPE LOW lamp on

the control panel goes on, refer to paragraph 3-7. To turn on the tape punch, proceed as follows:

- a. Pull the drawer-mounted tape punch out on the drawer slides.
- b. Press the POWER ON and DC ON switches. The POWER lamp on the front panel and READY lamp on the control panel should light.
- c. Check the ERROR and TAPE LOW lamps. If the ERROR lamp is lit, check the tape path for slack tape, binding tape, or the position of the tape guide arm (4, figure 3-2). If the problem is slack tape, move the tape guide arm to the right and press the TAPE FEED switch until the slack is gone. If the problem is binding tape, make sure the take-up reel is in place and the tape winding motor is not stopping the supply reel from turning. If the tape guide arm (4, figure 3-2) is positioned to the far left of the tape punch, push the tape guide arm to the right until the ERROR lamp goes out. Then press the TAPE FEED switch. If the TAPE LOW lamp is lit, refill the tape supply reel according to paragraph 3-7.
- d. If punched tape is not going to be taken up, proceed to step e. If the tape is to be taken up by the take-up reel, thread the tape on the take-up reel as described in paragraph 3-8, steps k through n.
- e. Press the TAPE FEED switch or FEED HOLES switch, depending on the type of tape leader desired. (Refer to paragraph 3-4, steps d and g.)

CAUTION

When not taking up the punched tape, make sure the tape leader exits the tape punch in front of the drawer front panel. If the punched tape falls behind the front panel, the tape may become entangled in other equipment and damage the tape and equipment.

- f. Install the chad box.
- g. The tape punch is ready to operate under computer control.
- h. To shut the tape punch off, press the up-side rocker of the POWER ON switch. The POWER lamp and READY lamp should go out about 5 seconds after the POWER ON switch is set to off.

4-1. INTRODUCTION.

4-2. This section contains an overall functional description of the electrical operation of the tape punch used in association with a computer equipped with a tape punch interface PCA. A detailed circuit description and description of the mechanical operation of the tape punch are included in sections 4 and 5 of the attached *Facit 4070 Tape Punch Service Manual*.

4-3. OVERALL FUNCTIONAL DESCRIPTION.

4-4. The tape punch is an electromechanical device that accepts coded bits from a computer and actuates mechanical mechanisms to punch an eight-bit code into a tape. Figure 4-1 is a diagram of the tape punch components. The electrical parts of the tape punch consist of a logic inverter PCA, control circuit PCA, diode PCA, tape winding motor/ fan motor filter PCA, and a power supply. The mechanical parts consist of nine punch solenoids and punch pins, three increment motor solenoids that advance the tape, a tape winding motor, and a fan motor.

4-5. In operation, the computer equipped with a tape punch interface PCA initiates a punch operation by presenting data to the data channel circuits, then issuing a "not" Punch Instruction (PI) signal to the punch logic circuit. (See figure 5-2.) The signals are inverted by the logic inverter PCA from the ground-true positive-false signals of the interface PCA to the positive-true signals of the control circuit PCA.

4-6. Assuming the tape punch is not processing a previous "not" PI signal or performing a manual operation (CODE HOLES, FEED HOLES, or TAPE FEED switches), a high PI signal sets the Tape Feed Flip-Flop (TF FF) and develops a Clock signal to increment the Increment-Motor Counter (C1 and C2 FFs). C1 and C2 FFs are JK flip-flops of the master slave type; therefore, the outputs do not change until the trailing edge of the Clock signal. The trailing edge of the Clock signal occurs six microseconds after the TF FF sets. The outputs of the Increment-Motor Counter are decoded and gated by the TF FF to energize one of the increment motor solenoids, thereby moving the tape forward one row. At this time the PI-signal circuit is disabled, thus preventing another "not" PI signal from interrupting the tape punch operation. As the solenoid energizes, the +6-volt dc-regulator circuit biasing changes to allow better regulation. Also, the tape winding motor and fan motor are energized for the duration of the feed and punch cycle plus 20 milliseconds.

4-7. In addition to causing tape movement, setting the TF FF enables the nine-channel buffer-register input circuit to store the data signals from the interface PCA. After 0.2 milliseconds, the buffer-register input circuit is disabled. This prevents interface-PCA cable noise from altering the contents of the buffer register.

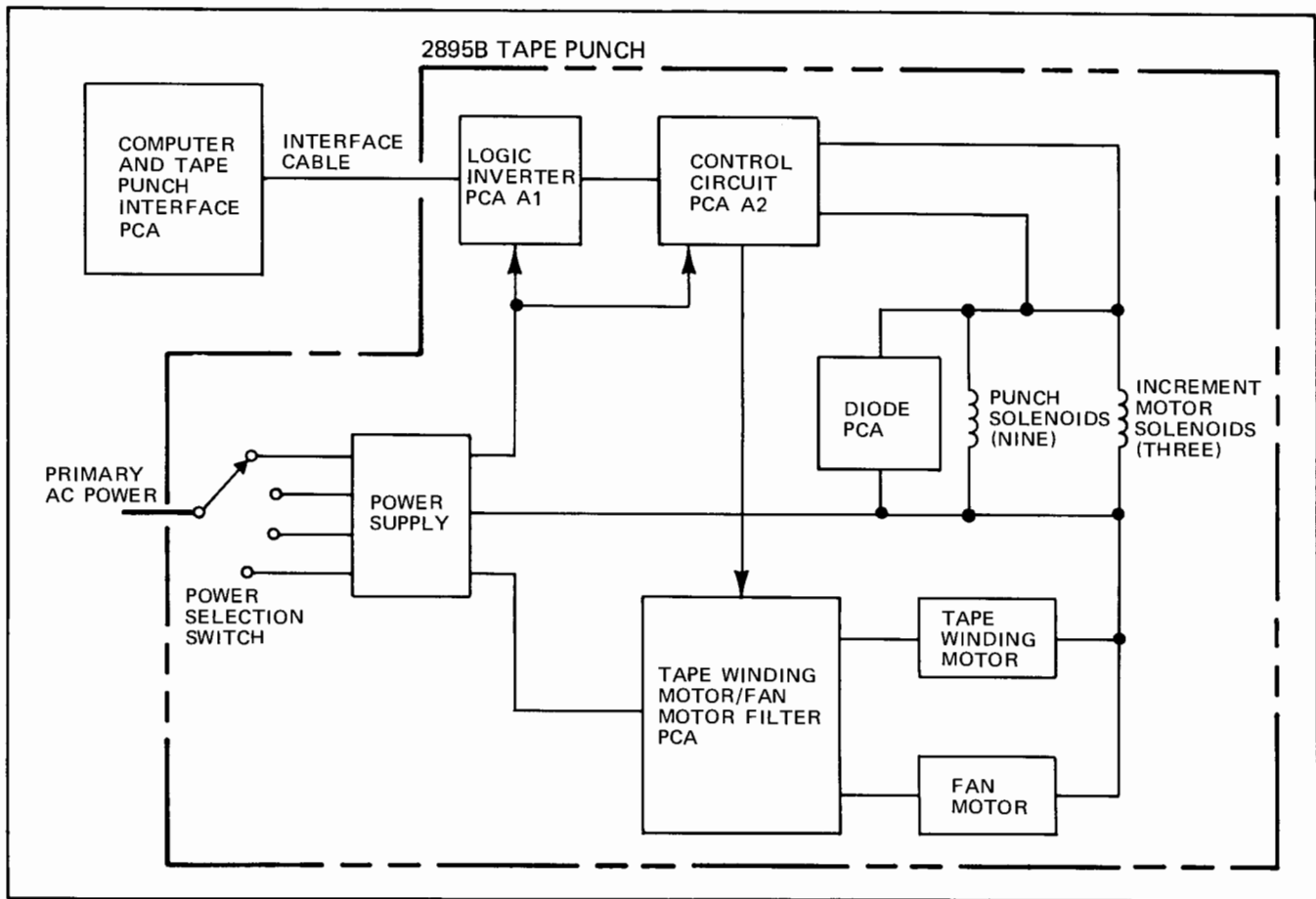
4-8. As the timing sequence continues, the TF FF clears itself (refer to note 2 on figure 5-2), and clearing the TF FF sets the Tape Punch Flip-Flop (TP FF). The PI-signal circuit and nine-channel buffer-register input circuit remain disabled, and the one increment motor solenoid (see paragraph 4-6) remains energized even through tape motion has been completed. The energized solenoid merely provides stability to prevent tape movement during the data punching operation.

4-9. Although the TP FF sustains circuit operations which began when the TF FF set, its fundamental purpose is to initiate the recording of data stored in the nine-channel buffer-register. The punch-solenoid driver circuits are enabled when the TP FF sets, and the punch solenoids drive the punch pins through the tape respective to the stored data. When the TP FF clears itself (refer to note 2 on figure 5-2), the magnetic field associated with each de-energizing solenoid collapses. The diode PCA provides a low impedance path for the induced current caused by the back electromotive force.

4-10. Clearing the TP FF ends a punch cycle. The PR signal (the signal nomenclature changes to Flag signal at the interface PCA) goes high to notify the computer that the punch cycle has ended. The PI-signal circuit is enabled and the nine-channel buffer-register is cleared. At this point, the unit is ready to accept another "not" Punch Instruction ("not" PI) signal from the computer.

4-11. Tape can be fed manually in three ways, depending on the switch pressed on the operator panel (TAPE FEED, FEED HOLES, or CODE HOLES switch; see paragraph 3-3 and figure 3-1).

4-12. When a manual feed operation is selected, the Manual FF sets. The Manual FF increments the count of the Increment-Motor Counter and sets the TF FF as if a "not" PI signal were issued from the computer (paragraph 4-6 through 4-9); however, the PI-signal circuit and the nine-channel buffer-register input circuit are disabled without a signal delay. If the CODE HOLES or FEED HOLES switch is pressed, an internal source sets the nine-channel buffer-register for punching all nine tracks, or only the feed hole, respectively. If the TAPE FEED switch is pressed, no holes are punched in the tape.



2229-7

Figure 4-1. Tape Punch Functional Diagram

4-13. The manual feed operation stays in a feed loop as long as one of the switches is pressed. At the end of each complete manual punch cycle comprised of the TF FF timing (10.5 milliseconds), TP FF timing (1.85 milliseconds), and 7-millisecond delay added during a manual operation, a 400-microsecond pulse is gated to the Increment-Motor Counter and TF FF to initiate the next manual punch cycle. This limits the manual operating speed to 50 characters per second.

4-14. During a power-down sequence, including normal POWER OFF switch actuation, the Level Monitor FF is set by the decaying dc voltage output of the dc power supply. The Level Monitor FF and either the C1 or C2 FF outputs set the Manual FF. This will cause feed holes to be punched until C1 and C2 FFs are both cleared. At this time, the increment motor is at the "home" (increment motor solenoid L10) position. This prevents the possibility of backspacing when the ac power is turned on again.

4-15. A signal that indicates a tape error (ERR 2) disables all tape punch operations. Tape slack, binding, or breakage holds tape error switch S8 open. When S8 opens, the Manual FF is cleared and the PI signal is inhibited. The tape error signal does not interrupt an operation in progress.

4-16. The power supply located on the diode PCA provides unregulated +24 volts dc to the control PCA, increment motor solenoids, and punch solenoids. In turn, the control circuit PCA uses the +24 volts to generate a +6-volt dc regulated power supply for the logic circuits. The power supply is equipped with a power selection switch allowing the customer to select an operating voltage that is compatible with the primary ac power.

4-17. When dc power is applied to the internal circuitry of the tape punch, a "not" RDY signal is generated to inform the computer that the unit is prepared to input data and begin punching tape.

5-1. INTRODUCTION.

5-2. This section contains information that is intended as an aid to using the preventive maintenance, adjustment, and troubleshooting procedures located in section 6 of the attached *Facit 4070 Tape Punch Service Manual*. The required tools, which are shown in the Facit manual, have been assigned HP part numbers and are listed in table 5-1. Table 5-1 also lists the test equipment required to implement the printed-circuit assembly checks listed in 6.2 of the *Facit Service Manual*.

5-3. PREVENTIVE MAINTENANCE.

5-4. The preventive maintenance procedures and schedules are listed as "periodic servicing" in paragraph 6.4 of the attached *Facit Service Manual*. The letters shown in the "section" column refer to the maintenance procedure listed in paragraph 6.1.

5-5. ADJUSTMENTS.

5-6. The adjustment procedures are listed as "mechanical checks and adjustments" in paragraph 6.1 of the attached *Facit Service Manual*. The adjustment specifications and tolerances are shown in the metric system. If it is necessary to convert the metric specifications and tolerances to the English Measurement System (inches, feet, etc) or vice versa, refer to the formulas for conversions shown below. Note that the Swedish term "pond", which is used in the *Facit* manual, is equivalent to the metric term "gram."

MULTIPLY	BY	TO OBTAIN
millimeters	0.03937	inches
feet	0.3048	meters
grams	2.205×10^{-3}	pounds
grams	3.527×10^{-2}	ounces
inches	25.4	millimeters
meters	3.281	feet
pounds	453.6	grams
ounces	28.35	grams

Table 5-1. Maintenance Tools and Test Equipment

HP PART NO.	TOOLS OR EQUIPMENT	FACIT PART NO.
—	HP 180A Oscilloscope, or equivalent	—
—	HP 6203B DC Power Supply, or equivalent	—
1535-0268	Template, registration	15.027.690.00
*	Hex key wrench, 1.5 mm	11.440.050.00
*	Hex key wrench, 2.5 mm	11.590.670.00
*	Hex key wrench, 3 mm	11.587.520.00
*	Hex key wrench, 4 mm	11.587.510.00
8710-0009	Pliers	11.586.250.00
1535-0780	Tape guide rule	11.587.500.00
1535-0779	Punch pin feeler gauge	11.587.130.00
1535-0771	Grease nipple	11.587.150.00
1150-0015	Multi-blade feeler gauge	11.587.160.00
1150-0016	Spring gauge, 1 kg	11.587.290.00
8750-0063	Spring gauge, 100 grams	11.587.320.00
1535-0772	Extender board	11.587.300.00
1535-0773	Grease, Rocal MT-320 or MTS-2000 (50 grams)	11.587.610.00
1535-0763	Mandrel for pressing in capstan	11.590.980.00
1535-0764	Mandrel for pressing out capstan	11.587.050.00
1535-0765	Solenoid armature adjuster (tracks 1-3 and feed hole)	11.587.140.00
1535-0766	Solenoid armature adjuster (tracks 4-8)	11.587.330.00
1150-0014	Dial gauge, 0-1 mm	11.587.340.00
1150-0013	Dial gauge holder, magnetic	11.586.190.00
1535-0781	Take-up arm holder	11.586.080.00
1535-0768	Punch head turning tool	11.587.070.00
1535-0769	Capstan play gauge (part one)	11.587.020.00
1535-0770	Capstan play gauge (part two)	11.587.210.00
1535-1206	Reverse buffer-arm template	11.587.060.00
1535-1207	Friction tool	11.587.370.00
		11.583.060.00

*Part No. 1535-0751 for set of wrenches including 4 with Facit part numbers.

CAUTION

The tape punch parts manufactured by Facit are manufactured to metric measurement specifications; therefore, the attaching parts (i.e., screws and nuts, etc.) have metric size threads. The parts added by Hewlett-Packard in table 6-4 conform to S.A.E. (Society of Automotive Engineers) standards. If the tape punch is disassembled, be sure to use the proper tools and keep the metric and S.A.E. parts separated to prevent possible thread damage during reassembly.

5-7. TROUBLESHOOTING.

5-8. The troubleshooting procedures are listed as "fault tracing" in paragraph 6.3 of the attached *Facit Service Manual*. The terminology of central workshop and local workshop used by Facit corresponds to the Hewlett-Packard Field Service.

5-9. The *Facit Service Manual* provides a fault tracing table (appendix 1), logic diagram (appendix 2), circuit diagram (appendix 3), and interconnection diagram with diode board and filter board (appendix 4) to aid in troubleshooting. Illustrations and tables in this section are

intended to supplement the *Facit Service Manual* troubleshooting information as follows:

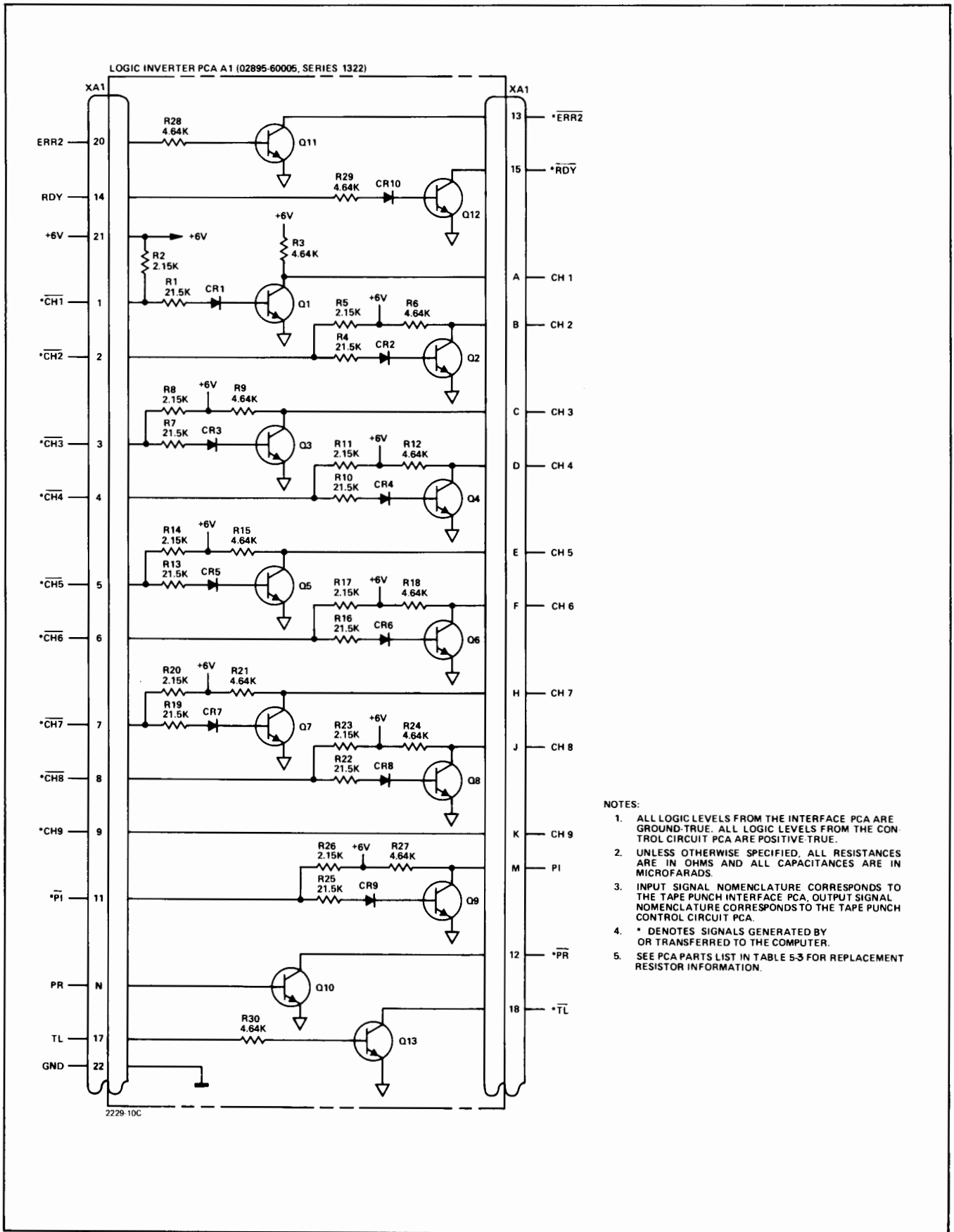
- a. Table 5-1 (Maintenance tools and test equipment): Provides cross reference part number information for maintenance tools and model numbers of test equipment required to implement circuit testing.
- b. Table 5-2 (Tape Punch Connector Signal Index): Lists the tape punch pin number, signal name, and function for each signal available at the rear of the tape punch.
- c. Table 5-3 (Logic Inverter PCA A1 Replaceable Parts): Lists each part used on the logic inverter PCA.
- d. Figure 5-1 (Logic Inverter PCA A1 Parts Location Diagram) and figure 5-2 (Logic Inverter PCA A1 Schematic Diagram): provide information concerning the logic inverter PCA.
- e. Figure 5-3 (Tape Punch Functional Logic Diagram): Logic diagram using logic symbols as explained in Hewlett-Packard Logic Symbology Application Note 88 to illustrate the functional operation of the tape punch.
- f. Figure 5-4 (HP 2895B Tape Punch Wiring Diagram): Wiring diagram to illustrate the additions of the front panel POWER lamp, logic inverter PCA, and ac power protection fuse.

Table 5-2. Tape Punch Connector Signal Index

25-PIN CONNECTOR PIN NO.	TAPE PUNCH SIGNAL MNEMONIC	FUNCTION
1 thru 8	$\overline{\text{CH1}}$ thru $\overline{\text{CH8}}$	Data Bits 1 thru 8.
9	CH9	Feedhole track jumpered to +6 volts inside interface cable connector.
10	SD	Computer generated signal to tape punch causing forward or backward stepping of tape depending on logic state of input signal.
11	$\overline{\text{PI}}$	Computer generated signal to tape punch that starts punching cycle.
12	PR	Tape punch generated signal to computer indicating that the unit has completed one punching cycle and is ready to begin a new cycle.
13	$\overline{\text{ERR 2}}$	Tape punch generated signal to computer indicating that tape is binding or broken.
14	RDY	Ready input signal to logic inverter PCA jumpered to +6 volts in the 2895B.
15	$\overline{\text{RDY}}$	Tape punch generated signal to computer indicating dc power is applied to internal circuits.
17	TL	Tape Low input signal to logic inverter PCA from control PCA via jumper inside interface cable connector.
18	$\overline{\text{TL}}$	Tape punch generated signal to computer indicating tape on supply reel is near depletion.
19	$\overline{\text{EXT}}$	Manually generated tape punch signal asking computer to request data.
20	ERR 1	Tape punch generated signal to computer indicating that tape is binding or broken.
21	+6V	+6 volts from control circuit PCA jumpered to pin 17 inside the interface cable connector.
22	+24V	Provides a source of +24 volts for an external device.
24	+6V	Provides a source of +6 volts for an external device.
25	Ground	Ground line between computer and tape punch.
All others	Not Used	---

Table 5-3. Logic Inverter PCA A1 Replaceable Parts

REFERENCE DESIGNATION	HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.
A1	02895-60005	Logic Inverter PCA	28480	02895-60005
CR1 thru CR10	1901-0040	Diode, Si, 30 mA, 30 WV	07263	FDG1088
Q1 thru Q13	1854-0215	Transistor, Si, NPN	80131	2N3904
R1,4,7,10,13,16,19,22,25	0757-0199	Resistor, Fxd, Flm, 21.5k, 1%, 1/8W	28480	0757-0199
R2,5,8,11,14,17,20,23,26	0698-0084	Resistor, Fxd, Flm, 2.15k, 1%, 1/8W	28480	0698-0084
R3,6,9,12,15,18,21,24,27-30	0698-3155	Resistor, Fxd, Flm, 4.64k, 1%, 1/8W	28480	0698-3155
<p>Note: Resistors shown on PCA A1 are direct replacements for previous resistors and may be used along with them without affecting operation. First used on PCA series code 1322.</p>				



2229-10C

Figure 5-2. Logic Inverter PCA A1 Schematic

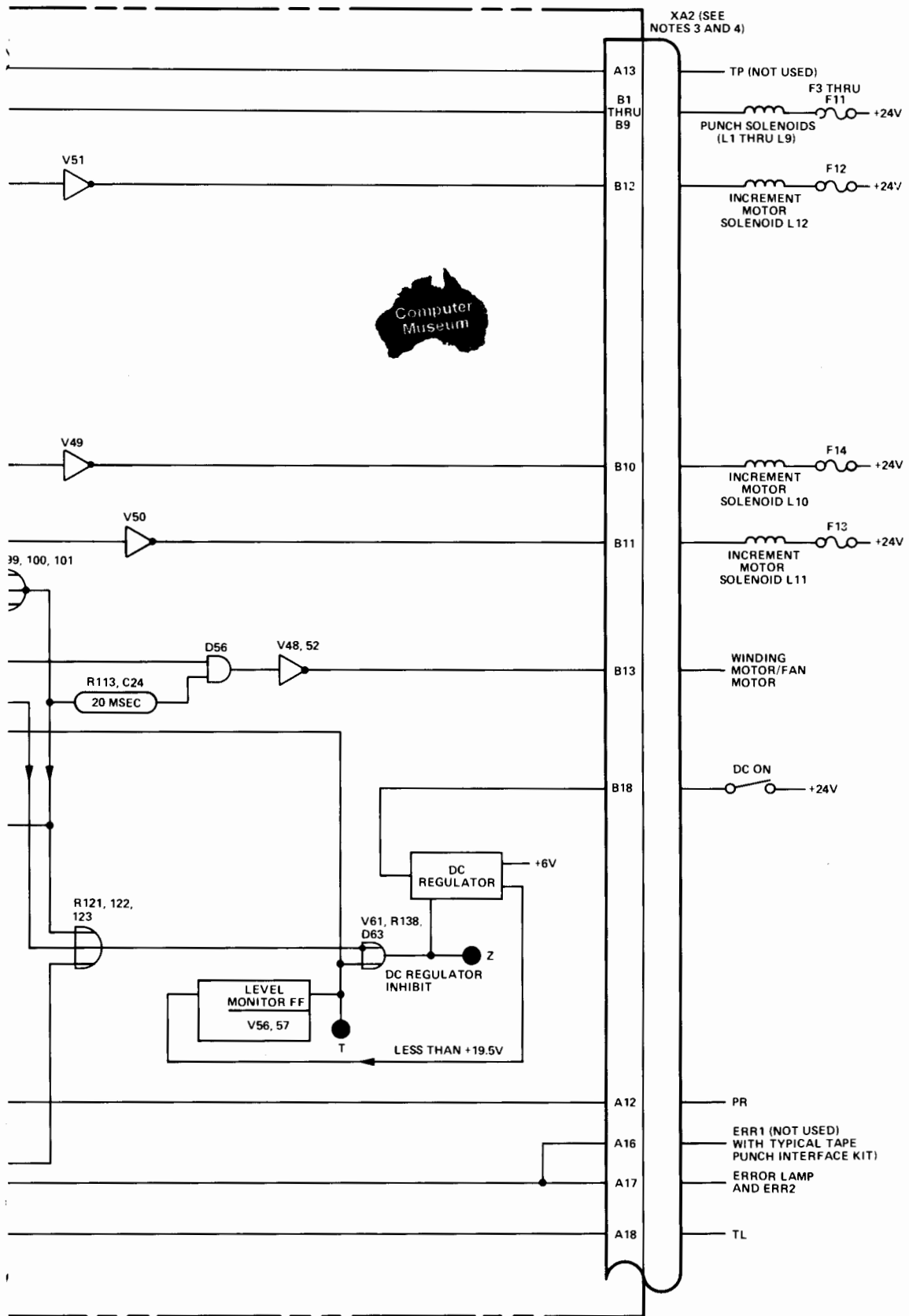
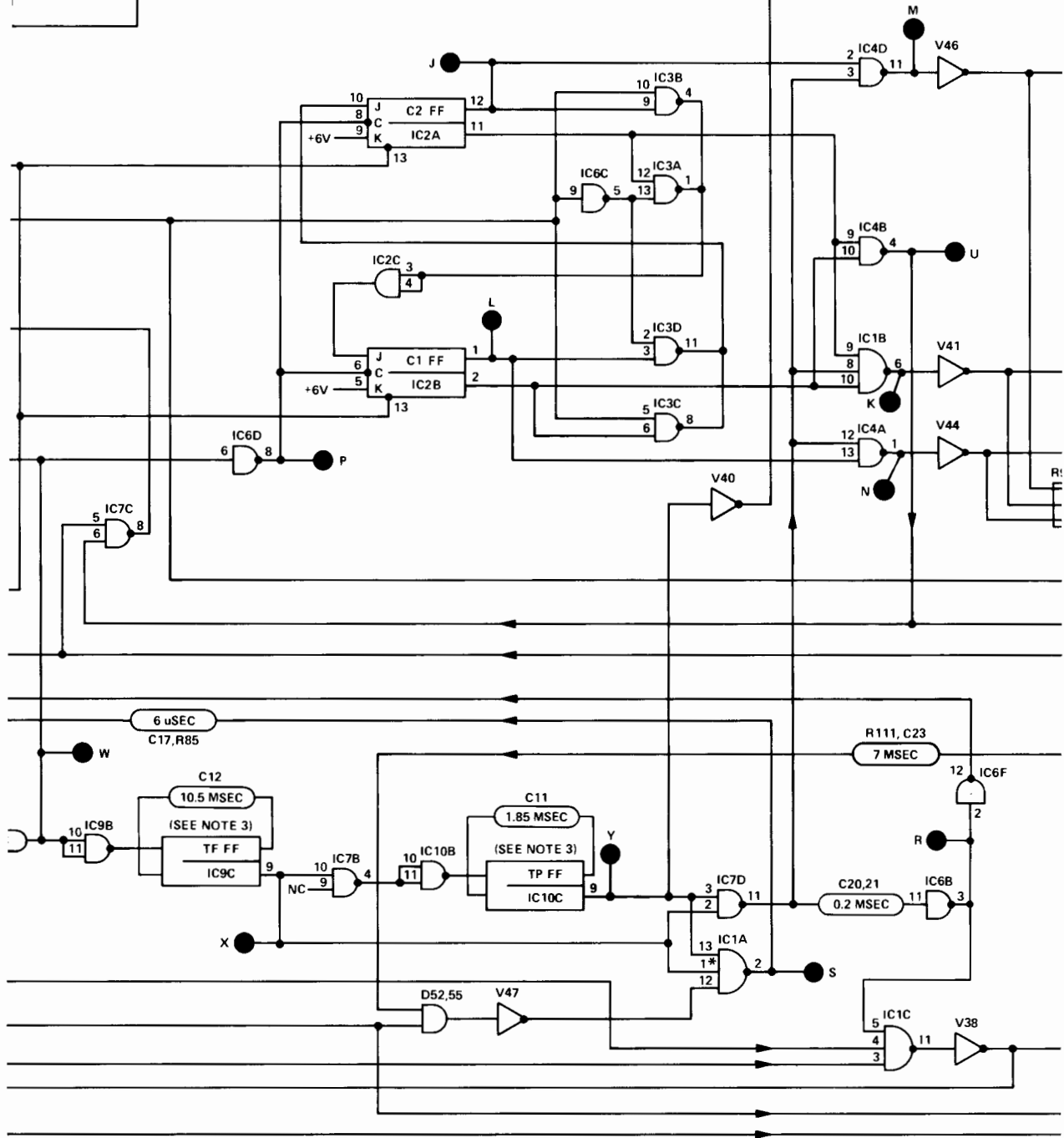
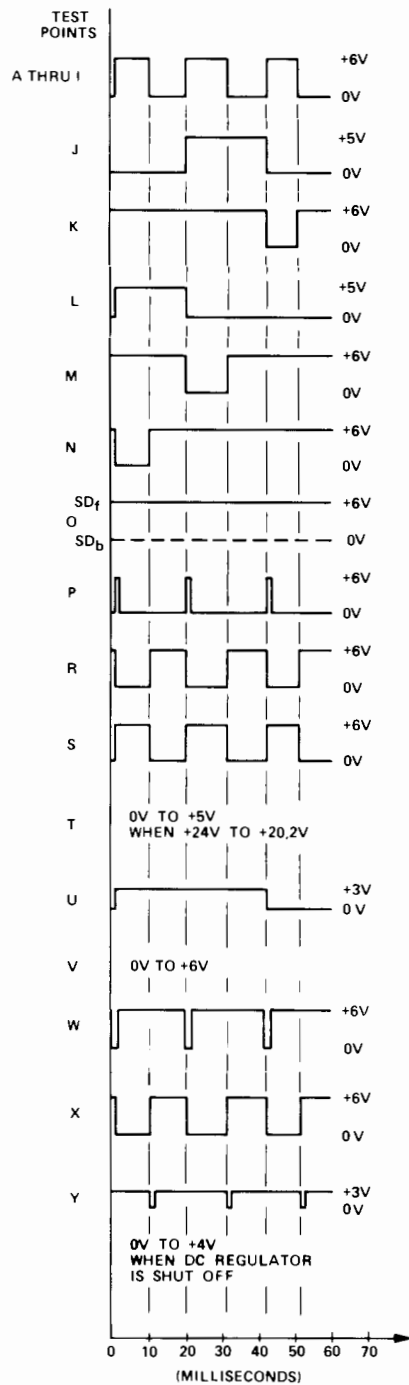


Figure 5-3. Tape Punch Functional Logic Diagram

LDRIVER
13, 3, 16, 4,
25, 7, 28,

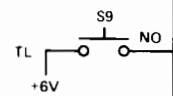
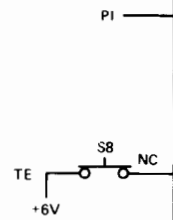
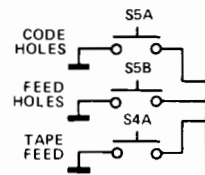




8 DATA CHANNELS

CH9 FEEDHOLE

SD (NOT USED WITH TYPICAL TAPE PUNCH INTERFACE KIT)



NOTES:

1. *DENOTES EXPANDED GATE INPUT.
2. IC9 AND IC10 ARE MONOSTABLE MULTIVIBRATORS.
3. CONTROL CIRCUIT PCA PINS ARE NUMBERED A1 THRU A22 ON THE COMPONENT SIDE OF THE CARD, AND B1 THRU B22 ON THE OPPOSITE SIDE.
4. HEWLETT PACKARD LOGIC INVERTER PCA (PART NO. 02895-60005) IS ASSIGNED REFERENCE DESIGNATION PCA A1 FACIT CONTROL CIRCUIT IS ARBITRARILY ASSIGNED REFERENCE DESIGNATION PCA A2.

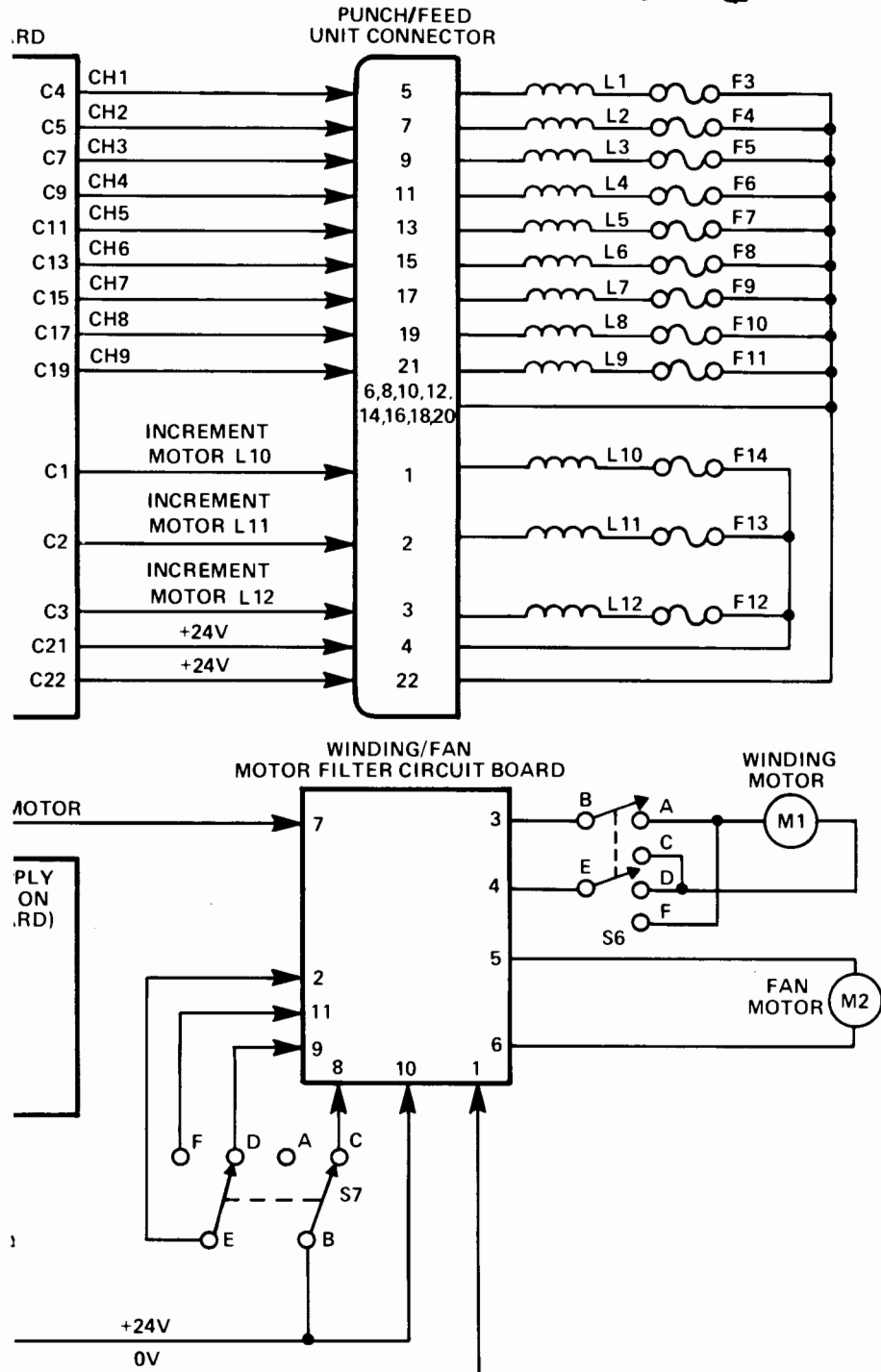
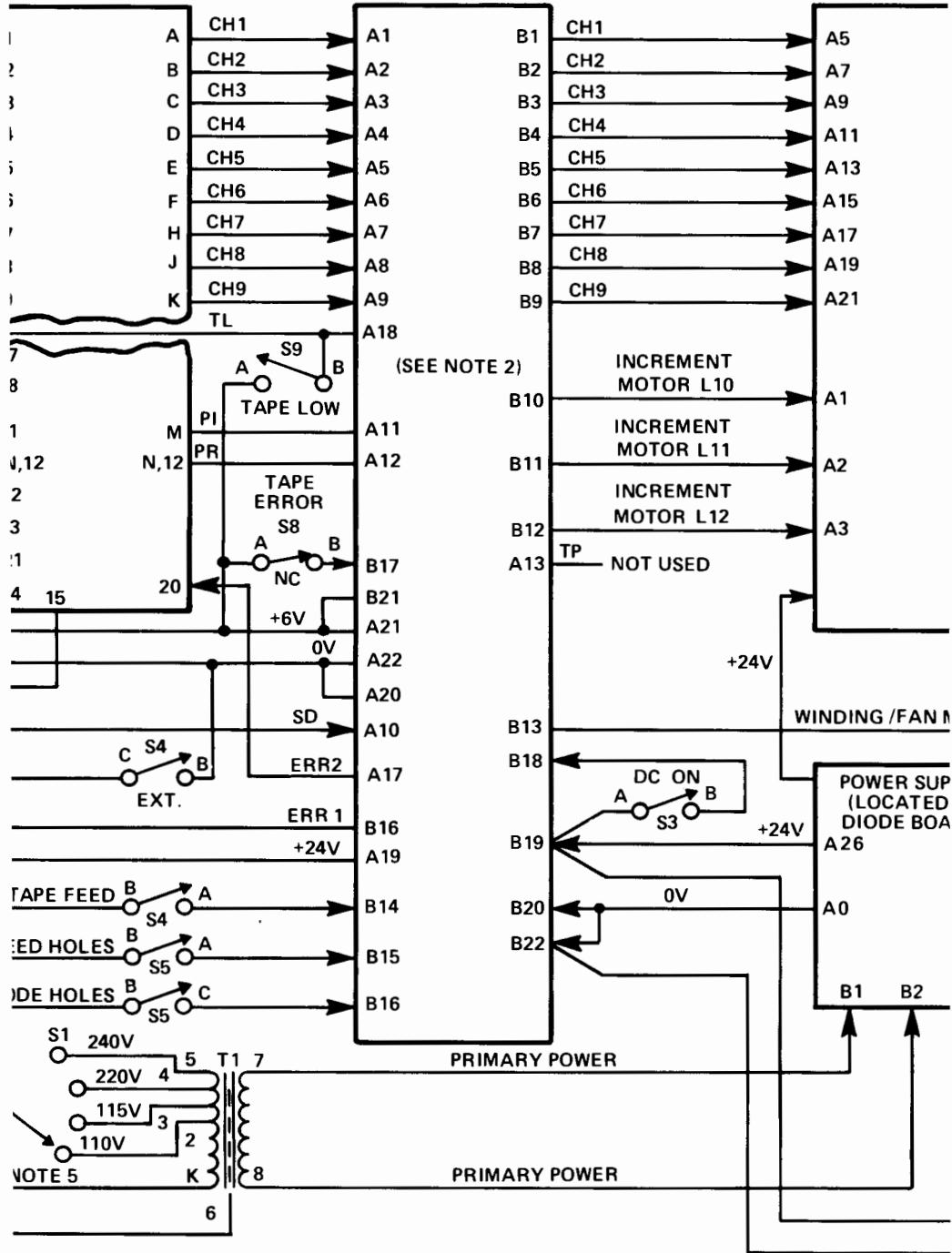


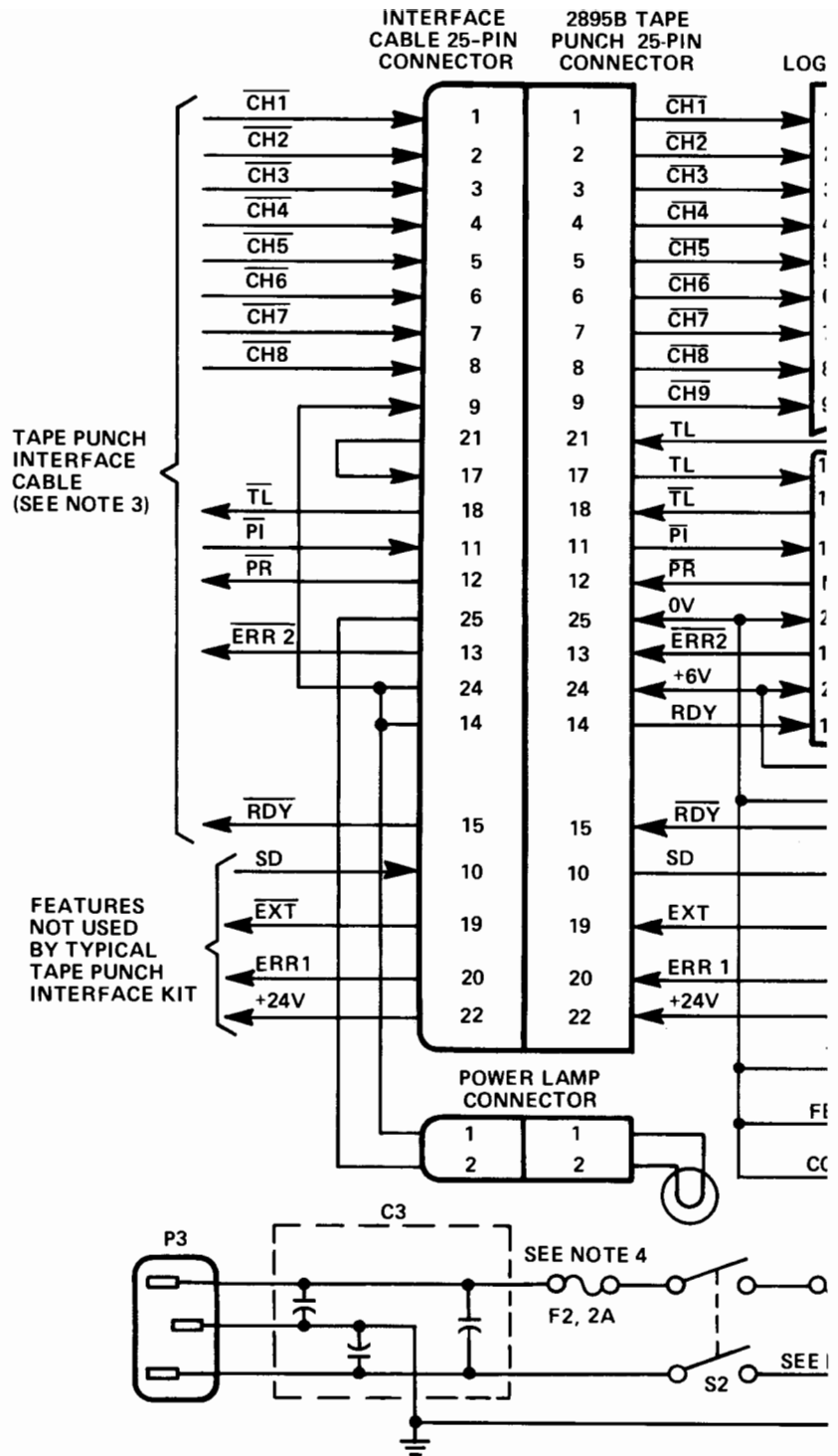
Figure 5-4. HP 2895B Tape Punch Wiring Diagram

IC INVERTER PCA A1

CONTROL CIRCUIT PCA A2

DIODE BOA





AL

NOTES:

1. CROSS REFERENCE DRAWING IS APPENDIX 1 OF FACIT 4070 TAPE PUNCH MANUAL.
2. A1 THRU A2 DENOTES PINS ON COMPONENT OF PCA. B1 THRU B22 DENOTES PINS ON OPPOSITE SIDE OF PCA.
3. PINS 17 AND 21, AND PINS 9, 14, AND 24 ARE JUMPERED WITHIN THE INTERFACE CABLE 25 PIN CONNECTOR. REFER TO APPROPRIATE INTERFACE CABLE DIAGRAM FOR ADDITIONAL JUMPER AND WIRING INFORMATION.
4. F2, 2A FIRST USED ON SERIAL PREFIX 1231 AND HIGHER.
5. T1 PRIMARY TAPS SHOULD READ 115V, 127V, 220V, 240V FOR SERIAL PREFIXES 1231 AND BELOW.
6. THE BATTERY OPERATED FEATURE OF THE FACIT 4070 IS NOT USED FOR THE HP 2895B.



6-1. INTRODUCTION.

6-2. This section contains information for ordering replaceable parts for the tape punch. Figure 6-1 is a parts location diagram of the parts that make up the tape punch, and table 6-1 lists the parts in disassembly order by index number sequence. Replaceable parts information for the portion of the tape punch manufactured by Facit (7, figure 6-1) is provided in the spare parts section of the attached *Facit 4070 Tape Punch Service Manual*; however, a few of the parts are modified to meet Hewlett-Packard requirements. These parts are denoted in table 6-1 of this section.

CAUTION

The tape punch parts manufactured by Facit are manufactured to metric measurement specifications; therefore, the attaching parts (screws and nuts, etc) have metric size threads. The parts added by Hewlett-Packard in table 6-4 conform to S.A.E. (Society of Automotive Engineers) standards. If the tape punch is disassembled, be sure to use the proper tools and keep the metric and S.A.E. parts separated to prevent possible thread damage during reassembly.

6-3. Various Facit parts and special tools have been assigned HP part numbers. These parts and special tools are listed in tables 6-2 and 6-3, and may be ordered directly from Hewlett-Packard. Table 6-2 lists the parts numerically by HP part number, then by description and corresponding Facit part number. Table 6-3 lists the parts numerically by Facit part number, then by description and corresponding HP part number.

Note: Sweden has modified its replaceable parts numbering system to show the least significant digit as a zero. The *HP 2895B Operating and Service Manual* and the *Facit 4070 Service Manual* have implemented this change. The new format is XX.XXX.XXX.XX.

6-4. A parts list for the logic inverter PCA added by Hewlett-Packard is provided as table 5-4. The table is located near the schematic and parts location diagram in

section V, preceding. Because the control circuit PCA is manufactured by Facit, the parts list, schematic diagram, and parts location diagram are located in the attached *Facit Service Manual*.

6-5. Table 6-4 numerically lists the parts for the tape punch that are added by Hewlett-Packard. The list also includes all the parts modified by Facit to meet Hewlett-Packard requirements. Table 6-4 provides the following information for each part.

- a. Description of the part. (Refer to table 6-5 for an explanation of abbreviations and reference designations used in the description column.)
- b. Typical manufacturer of the part in a five-digit code. The five-digit code is explained in table 6-6.
- c. Manufacturer's part number.
- d. Total quantity of each part added by Hewlett-Packard to the original Facit tape punch.

6-6. Items in the DESCRIPTION column of the replaceable parts lists are indented to indicate item relationships as follows:

MAJOR ASSEMBLY

- * Subassembly
- * Attaching Parts for Subassembly
---- x ----
- ** Subassembly Parts Breakdown
- ** Attaching Parts for Subassembly Parts Breakdown
---- x ----

6-7. ORDERING INFORMATION.

6-8. To order replaceable parts, address the order or inquiry to the local Hewlett-Packard Sales and Service Office. For Sales and Service Office locations, refer to the list at the end of this manual. Specify the following information for each part ordered.

- a. Instrument model and serial number.
- b. Hewlett-Packard part number for each part.
- c. Description of each part.
- d. Circuit reference designation if applicable.

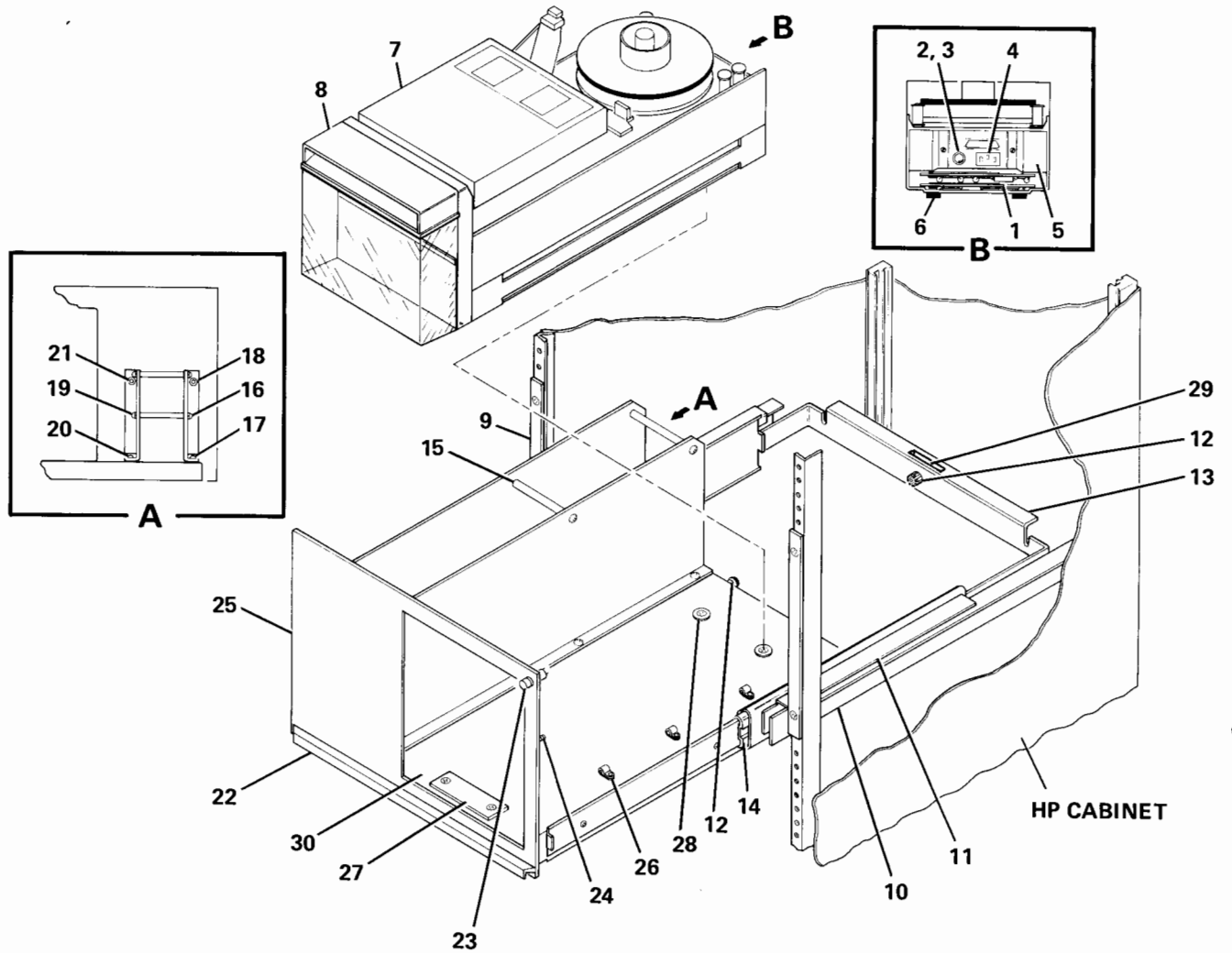
Table 6-1. HP 2895B Tape Punch Replaceable Parts

FIG & INDEX NO.	HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.	UNITS PER ASSY
6-1-1	2895B	TAPE PUNCH, Hewlett-Packard	28480	2895B	1
	02895-60005	* Logic Inverter PCA (see table 5-4)	28480	02895-60005	1
2†	0950-1313	* Tape Punch, Facit 4070, Modified	28480	0950-1313	1
	2110-0381	** Fuse, 3A, 250V, SB(F2) (115-volt operation, serial prefix 1201)	71400	MDA-3	1
2†	2110-0303	** Fuse, 2A, 250V, SB(F2) (115 or 230-volt operation, serial prefix 1231 and on; 230-volt operation only, serial prefix 1201)	71400	MDX-2A	1
3†	1400-0084	** Fuseholder (XF2)	75915	342014	1
4†	No Number	** Connector, 6A, 250V (J3)	††	10.987.101.00	1
5†	No Number	** Rear Panel	††	No Facit No.	1
6†	No Number	** Foot, Rubber (includes attaching parts)	††	R-109	4
7†	No Number	** Tape Punch Assembly	††	4070	1
8†	02895-60004	** Chad Box (with magnetic catch)	28480	02895-60004	1
9	02895-20005	* Filter Plate (Light gray)	28480	02895-20005	2
	02895-20007	* Filter Plate (moss gray) (Attaching Parts)	28480	02895-20007	2
	2680-0108	* Screw, Machine, FH, No. 10-32, 3/4 in.	00000	OBD	4
	3050-0007	* Washer, Cup, Metal, No. 10	00000	OBD	4
	3050-0248	* Washer, Cup, Filler, Plastic, No. 10	00000	OBD	4
		---- x ----			
10	02895-00008	* Bracket, long (25 in.) (for HP 2940 Cabinet, shown in fig. 6-1) (Attaching Parts)	28480	02895-00008	2
	2940-0103	* Bolt, Hexagon Head, 1/4-20, 1/2 in.	00000	OBD	4
	7101-0171	* Channel Plate	09097	5033-1	4
	0590-0789	* Channel Nut	96195	P4006-1420	4
	2510-0109	* Screw, Machine, PH, No. 8-32, 5/8 in.	00000	OBD	4
	2190-0073	* Washer, Lock split, No. 8	00000	OBD	4
	3050-0019	* Washer, Flat, No. 8, 1/2 in. OD	00000	OBD	4
		---- x ----			
11	02895-00007	* Bracket, Slide (Attaching Parts)	28480	02895-00007	2
	2510-0107	* Screw, Machine, PH, No. 8-32, 1/2 in.	00000	OBD	8
	2580-0004	* Nut, Assembled Washer, No. 8-32	00000	OBD	8
	3050-0001	* Washer, Flat, No. 8, 3/8 in. OD	00000	OBD	8
	---- x ----				
12	1390-0107	* Latch Set (Attaching Parts)	28480	1390-0107	1
	2360-0202	* Screw, Machine, FH, No. 6-32, 5/8 in.	00000	OBD	1
	2420-0001	* Nut, Assembled Washer, No. 6-32	00000	OBD	1
	2200-0144	* Screw, Machine, FH, No. 4-40, 3/8 in.	00000	OBD	1
	2260-0009	* Nut, Assembled Washer, No. 4-40	00000	OBD	1
	3050-0222	* Washer, Flat, No. 4, 5/16 in. OD	00000	OBD	1
		---- x ----			
13	02895-00013	* Bracket, Latch	28480	02895-00013	1
14	1490-0966	* Slide Assembly (Attaching Parts)	28480	1490-0966	2
	2510-0107	* Screw, Machine, PH, No. 8-32, 1/2 in.	00000	OBD	8
	2580-0004	* Nut, Assembled Washer, No. 8-32	00000	OBD	8
	3050-0010	* Washer, Flat, No. 8, 3/8 in. OD	00000	OBD	8
	---- x ----				
15	0380-0909	* Spacer (Attaching Parts)	28480	0380-0909	4
	2360-0197	* Screw, Machine, PH, No. 6-32, 3/8 in.	00000	OBD	8
	2190-0851	* Washer, Lock, split, No. 6	00000	OBD	8
	---- x ----				

† Denotes parts modified by Facit to meet Hewlett-Packard requirements.
 †† Facit AB, Solna, Sweden

Table 6-1. HP 2895B Tape Punch Replaceable Parts (Continued)

FIG & INDEX NO.	HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.	UNITS PER ASSY
6-1-16	02895-00005	* Bracket, Left, Tape Holder (light gray)	28480	02895-00005	1
	02895-00012	* Bracket, Left, Tape Holder (moss gray) (Attaching Parts)	28480	02895-00012	1
17	2360-0197	* Screw, Machine, PH, No. 6-32, 3/8 in.	00000	OBD	3
18	2420-0001	* Nut, Assembled Washer, No. 6-32 ---- x ----	00000	OBD	1
19	02895-00004	* Bracket, Right, Tape Holder (light gray)	28480	02895-00004	1
	02895-00011	* Bracket, Right, Tape Holder (moss gray) (Attaching Parts)	28480	02895-00011	1
20	2360-0197	* Screw, Machine, PH, No. 6-32, 3/8 in.	00000	OBD	3
21	2420-0001	* Nut, Assembled Washer, No. 6-32 ---- x ----	00000	OBD	1
22	02895-20004	* Handle (Attaching Parts)	28480	02895-20004	1
	2360-0201	* Screw, Machine, PH, No. 6-32, 1/2 in.	00000	OBD	3
	2190-0851	* Washer, Lock, split, No. 6 ---- x ----	00000	OBD	3
23	1450-0738	* Lamp, 6V (Attaching Parts)	28480	1450-0738	1
	1450-0148	* Retainer, Lamp ---- x ----	28480	1450-0148	1
24	1400-0082	* Cable Clamp (Attaching Parts)	00000	OBD	1
	2420-0001	* Nut, Assembled Washer, ext-tooth, No. 6-32	00000	OBD	1
	3050-0010	* Washer, Flat, No. 6 ---- x ----	00000	OBD	1
25	02895-00015	* Panel, Front (light gray)	28480	02895-00015	1
	02895-00016	* Panel, Front (moss gray)	28480	02895-00016	1
26	1400-0082	* Cable Clamp (Attaching Parts)	00000	OBD	3
	2360-0201	* Screw, Machine, PH, No. 6-32, 1/2 in.	00000	OBD	3
	3050-0010	* Washer, Flat, No. 6 ---- x ----	00000	OBD	3
27	02895-20002	* Plate, Locator (light gray)	28480	02895-20002	1
	02895-20006	* Plate, Locator (moss gray) (Attaching Parts)	28480	02895-20006	1
	2360-0202	* Screw, Machine, FH, No. 6-32, 5/8 in.	00000	OBD	2
	3050-0010	* Washer, Flat, No. 6 ---- x ----	00000	OBD	2
28	02895-20001	* Pad, Locator (Attaching Parts)	28480	02895-20001	2
	2360-0200	* Screw, Machine, FH, No. 6-32, 1/2 in.	00000	OBD	2
	3050-0010	* Washer, Flat, No. 6 ---- x ----	00000	OBD	2
29	0400-0082	* Grommet ---- x ----	28480	0400-0082	1
30	02895-00003	* Drawer (light gray)	28480	02895-00003	1
	02895-00010	* Drawer (moss gray)	28480	02895-00010	1
	8120-1348	Cable, Power (not shown in fig. 6-1)	28480	8120-1348	1
31	02895-90008	Operating and Service Manual	28480	02895-90008	1



2157-9A

Figure 6-1. HP 2895B Tape Punch Exploded View

Table 6-2. Hewlett-Packard-to-Facit Part Number Cross Reference Listing

HP PART NO.	DESCRIPTION	FACIT PART NO.
1150-0013	Dial gauge holder, magnetic	11.586.080.00
1150-0014	Dial gauge, 0-1 mm	11.586.190.00
1150-0015	Multi-blade feeler gauge	11.587.290.00
1150-0016	Spring gauge, 1 kg	11.587.320.00
1150-1201	Control panel (DC)	11.492.350.00
1535-0070	Control panel	11.017.550.00
1535-0071	Screw	11.065.813.10
1535-0072	Cover complete	15.021.720.00
1535-0073	Screw	10.081.222.10
1535-0074	Sidewall assembly	15.015.140.00
1535-0075	Sidewall	15.028.470.00
1535-0076	Screw	15.037.550.00
1535-0077	Roller	15.015.210.00
1535-0078	Screw	10.061.299.00
1535-0079	Spacer sleeve	15.015.220.00
1535-0080	Shaft	15.015.170.00
1535-0081	Locking pin	15.015.240.00
1535-0082	Wire driver	15.015.230.00
1535-0083	Stop screw	10.069.287.00
1535-0084	Torsion spring	15.015.250.00
1535-0085	Wire	15.015.430.00
1535-0086	Reversing buffer arm assembly complete	15.015.180.00
1535-0087	Reversing buffer arm	15.032.920.00
1535-0089	Screw	10.061.284.00
1535-0090	Tape lifter assembly complete	15.015.450.00
1535-0091	Screw	10.081.804.10
1535-0092	Tape lifter	15.015.460.00
1535-0093	Tape tearer	15.038.690.00
1535-0094	Torsion spring	15.038.740.00
1535-0095	Plate	15.038.680.00
1535-0096	Retainer ring	10.032.103.00
1535-0097	Screw	10.065.814.10
1535-0098	Spring	11.467.770.00
1535-0099	Steel Ball	10.047.416.00
1535-0100	Guide plate	15.015.480.00
1535-0101	Rubber shim	15.038.910.00
1535-0102	Spacer sleeve	15.033.190.00
1535-0103	Pulley	15.015.490.00
1535-0104	Screw	10.065.815.10
1535-0105	Bracket	15.033.670.00
1535-0106	Retainer plate	15.017.500.00
1535-0107	Plate	15.011.340.00
1535-0108	Magnet	15.955.540.00
1535-0109	Guide roller mount	15.015.790.00
1535-0110	Screw	10.057.289.00
1535-0111	Guide roller	11.402.590.00
1535-0112	Retainer ring	10.032.106.00
1535-0113	Washer	15.037.570.00
1535-0114	Sidewall	15.028.480.00
1535-0116	Rear panel	15.017.710.00
1535-0118	PC board catch	15.017.760.00
1535-0119	Screw	10.065.812.10
1535-0120	Rubber mounting	15.031.290.00

Table 6-2. Hewlett-Packard-to-Facit Part Number Cross Reference Listing (Continued)

HP PART NO.	DESCRIPTION	FACIT PART NO.
1535-0121	Front lid complete	15.017.560.00
1535-0122	Front lid	15.015.870.00
1535-0123	Washer	15.017.570.00
1535-0124	Rubber spacer	15.017.720.00
1535-0126	Pin	15.953.410.80
1535-0127	Plate	15.021.470.00
1535-0128	Bottom plate	15.015.900.00
1535-0129	Rubber foot	15.011.440.00
1535-0130	Screw	10.061.218.00
1535-0131	Shield plate	15.017.790.00
1535-0132	Shield plate	15.017.780.00
1535-0134	Bracket for PC board	15.015.890.00
1535-0135	Screw	10.081.327.00
1535-0136	Takeup flange with rubber ring and hub complete	15.011.570.00
1535-0137	Supply flange with hub complete	15.011.570.30
1535-0138	Retainer ring	11.102.650.30
1535-0139	Takeup flange	15.011.580.00
1535-0140	Rubber ring	15.038.940.00
1535-0141	Supply flange	15.011.580.10
1535-0142	Screw	10.065.808.10
1535-0143	Helical expander spring	15.953.450.00
1535-0144	Hub	11.401.830.00
1535-0145	Compression spring	11.412.031.10
1535-0146	Sleeve	15.011.610.00
1535-0147	Catch	15.011.620.00
1535-0148	Catch	15.011.630.00
1535-0149	Screw	10.057.162.00
1535-0150	Compression spring	E112.031.00
1535-0151	Rubber ring	15.036.330.00
1535-0152	Tape low sensor arm	15.015.580.00
1535-0153	Screw	10.065.807.10
1535-0154	Washer	15.033.680.00
1535-0155	Brake assembly complete	15.033.930.00
1535-0156	Brake bracket	15.033.000.00
1535-0157	Screw	10.061.191.00
1535-0158	Brake shoe holder	15.015.550.00
1535-0159	Brake shoe	15.033.070.00
1535-0160	Pin	15.953.411.10
1535-0161	Arm	15.015.520.00
1535-0162	Spring mount screw	11.102.220.10
1535-0163	Nut	10.110.310.00
1535-0164	Extension spring	15.028.000.20
1535-0165	Magnet	15.995.620.00
1535-0166	Magnet holder	15.015.410.00
1535-0167	Dry reed relay	15.957.330.00
1535-0168	Holder	11.421.050.00
1535-0169	Surge takeup arm assembly complete	15.015.270.00
1535-0170	Surge takeup arm	11.401.820.00
1535-0171	Insulator plate	15.034.710.00
1535-0172	Bridging board	15.039.020.00
1535-0173	PC board connector	10.506.002.00
1535-0174	Screw	10.061.224.00
1535-0176	Nut	10.110.310.00

Table 6-2. Hewlett-Packard-to-Facit Part Number Cross Reference Listing (Continued)

HP PART NO.	DESCRIPTION	FACIT PART NO.
1535-0177	Nut	10,065,810.10
1535-0178	Signal connector	15,958,180.00
1535-0179	Special screw	15,955,480.00
1535-0181	Filter circuit board	15,028,630.00
1535-0182	Screw	10,061,222.00
1535-0183	Washer	11,440,130.00
1535-0184	Diode circuit board complete	15,013,980.00
1535-0185	2-diode unit	15,009,380.00
1535-0187	Washer	10,037,124.00
1535-0188	Cable clamp	11,435,480.30
1535-0189	Spacer sleeve	11,428,140.20
1535-0190	Screw	10,057,227.00
1535-0191	Washer	15,955,740.90
1535-0192	Diode (D1)	11,591,060.00
1535-0193	Screw	10,057,224.00
1535-0194	Nut	10,110,312.00
1535-0195	Mounting Bracket	15,015,120.00
1535-0196	Plate	15,015,650.00
1535-0197	Mounting bracket	15,015,110.00
1535-0198	Screw	10,061,287.00
1535-0199	Screw	10,057,226.00
1535-0200	Fuse 630 mA (fast action)	11,591,221.20
1535-0203	Coil (L1,2)	15,028,620.00
1535-0204	Resistor, 4.7 ohms, 8W, 10% (R1)	11,592,230.10
1535-0205	Resistor 22 ohms, 8W, 10% (R2,4)	11,592,230.90
1535-0206	Resistor, 47 ohms, 5.5W, 10% (R3)	11,594,211.30
1535-0207	Capacitor, 0.1 uF (C1,2,4-9)	10,505,610.00
1535-0208	Capacitor, 100 uF, 20V (C3)	11,593,080.20
1535-0210	Tape reel	11,440,100.30
1535-0212	25-pin male connect	15,958,160.00
1535-0213	Connector catch with screws	15,958,200.00
1535-0214	Connector casing with screws for angular cable mounting	15,958,240.00
1535-0217	Retainer ring	10,032,106.00
1535-0218	Circular spring	15,015,380.00
1535-0221	Extension spring	15,028,000.00
1535-0222	Connecting rod	15,015,640.00
1535-0224	Connecting rod	15,015,557.00
1535-0225	Extension spring	15,028,000.10
1535-0226	Washer, 0.1 mm	15,022,870.00
1535-0227	Washer, 0.3 mm	15,022,870.10
1535-0228	Washer, 0.5 mm	15,022,870.20
1535-0229	Retainer screw	10,081,323.00
1535-0230	Washer	10,037,146.00
1535-0231	Winding motor complete	15,021,780.00
1535-0232	Motor	15,955,580.00
1535-0233	Gear housing	15,015,730.00

Table 6-2. Hewlett-Packard-to-Facit Part Number Cross Reference Listing (Continued)

HP PART NO.	DESCRIPTION	FACIT PART NO.
1535-0234	Screw	10,065,198.10
1535-0235	Driver	15,015,690.00
1535-0236	Gear	15,015,670.00
1535-0237	Insulating washer	15,015,660.00
1535-0238	Ball bearing	15,953,830.20
1535-0239	Ring	15,039,490.00
1535-0240	Shaft	15,034,790.00
1535-0241	Flange driver	15,015,710.00
1535-0243	Screw	10,061,285.00
1535-0244	Motor bracket	15,015,740.00
1535-0245	Switch	15,955,420.00
1535-0246	Fan complete	15,015,750.00
1535-0248	Impeller	15,015,780.00
1535-0249	Stop screw	10,078,188.00
1535-0250	Motor mount half	15,021,810.00
1535-0251	Screw	10,061,227.00
1535-0252	Motor mount half with bracket	15,021,800.00
1535-0254	O-ring	15,954,350.20
1535-0255	Selector switch	15,955,030.00
1535-0257	2-button/1-lamp assembly	15,958,440.00
1535-0258	2-button/2-lamp assembly	15,958,420.00
1535-0259	Capacitor	11,591,120.40
1535-0260	Rubber washer	11,591,210.10
1535-0261	Special nut	11,591,200.10
1535-0262	Transformer	15,007,900.60
1535-0263	Nut	10,110,314.00
1535-0264	Punch/feed unit connector plug	10,506,001.00
1535-0266	Locking screw	15,021,820.00
1535-0268	Template, registration	{ 15,027,690.00 11,440,050.00
1535-0751	Hex key wrench set, metric	Any satisfactory source
1535-0763	Mandrel for pressing in capstan	11,587,050.00
1535-0764	Mandrel for pressing out capstan	11,587,140.00
1535-0765	Solenoid armature adjuster (tracks 1-3 and feed hole)	11,587,330.00
1535-0766	Solenoid armature adjuster (tracks 4-8)	11,587,340.00
1535-0767	Torque meter	11,587,430.00
1535-0768	Punch head turning tool	11,587,020.00
1535-0769	Capstan play gauge (part one)	11,587,210.00
1535-0770	Capstan play gauge (part two)	11,587,060.00
1535-0771	Grease nipple	11,587,160.00
1535-0772	Extender board	11,587,610.00
1535-0773	Grease, Rocol MT-320, (50 grams)	11,590,980.00
1535-0774	Rubber chad tube adapter	15,034,700.00
1535-0775	Surge take-up spring	15,013,180.00
1535-0779	Punch pin feeler gauge	11,587,150.00
1535-0780	Tape guide rule	11,587,130.00
1535-0781	Take-up arm holder	11,587,070.00
1535-0792	Washer	15,013,190.00
1535-0793	Screw	10,081,801.00
1535-0794	Eccentric pin	15,011,740.00
1535-0795	Shaft	15,012,220.00

Table 6-2. Hewlett-Packard-to-Facit Part Number Cross Reference Listing (Continued)

HP PART NO.	DESCRIPTION	FACIT PART NO.
1535-0796	Screw	10,061,190.00
1535-0797	Spring mount nut	15,012,230.00
1535-0798	Lever	15,012,180.00
1535-0799	Extension spring	10,050,056.10
1535-0800	Tape tearer	15,012,150.00
1535-0801	Spacer sleeve, 3.1 mm	15,039,920.00
1535-0802	Punch roller with shaft and bearings	15,039,790.00
1535-0803	Arm	15,012,160.00
1535-0804	Compression spring	15,028,010.00
1535-0805	Spring mounted tape guide	15,013,140.00
1535-0806	Screw	10,061,220.00
1535-0807	Screw	10,057,178.10
1535-0808	O-ring	15,954,350.00
1535-0809	Retainer ring	10,032,105.00
1535-0810	Solenoid armature	15,011,090.00
1535-0811	Spring	15,013,100.00
1535-0812	Retainer screw	10,081,285.00
1535-0813	Rubber washer	15,036,060.00
1535-0814	Rubber mounting	15,011,750.00
1535-0815	Pin	15,034,780.00
1535-0816	Punch head with pins (ECMA)	11,490,670.00
1535-0817	Punch pin driver	15,013,550.30
1535-0818	Punch pin driver	15,013,550.20
1535-0819	Punch pin driver	15,013,550.10
1535-0820	Punch pin driver	15,013,550.00
1535-0821	Punch pin driver	15,013,540.00
1535-0822	Punch pin driver shaft	15,953,410.00
1535-0823	Locking screw	10,078,220.00
1535-0824	Punch solenoid, complete	15,011,010.00
1535-0825	Punch solenoid, complete	15,011,000.00
1535-0826	Solenoid armature	15,011,080.00
1535-0827	Dust cover	15,015,160.00
1535-0828	Sealing screw	15,034,620.00
1535-0829	Locking screw	10,078,323.00
1535-0830	Capstan	15,011,370.00
1535-0831	Cable clamp	11,435,480.50
1535-0832	Screw	10,061,222.00
1535-0833	Spacer	15,033,620.00
1535-0834	Bracket	15,025,190.00
1535-0835	Stator with windings	15,028,660.00
1535-0836	Motor mount	15,017,390.00
1535-0837	Screw	10,061,230.00
1535-0838	Screw	10,061,232.00
1535-0839	Brake housing	15,035,750.00
1535-0840	Brake spring	15,035,770.00
1535-0841	Rubber pad	15,035,780.00
1535-0842	Spacer sleeve	15,022,860.00
1535-0843	Incremental motor with brake	15,017,380.00
1535-0844	Motor brake	15,035,740.00
1535-0855	Hardware assortment kit	10,40,70.5
1535-0856	Fuse, 2A, special	11,591,811.70
1535-0864	Transistor, U2668/1S	11,592,130.20
1535-0865	Transistor, U2668/1S	11,592,130.10



Table 6-2. Hewlett-Packard-to-Facit Part Number Cross Reference Listing (Continued)

HP PART NO.	DESCRIPTION	FACIT PART NO.
*1535-0918	IC, FCH 211	11.594.840.00
*1535-0919	IC, FCK 111	11.594.820.00
*1535-0920	IC, FCH 161	11.594.820.00
*1535-0921	IC, FCJ 121	11.594.850.00
*1535-0922	IC, FCH 191	11.594.830.00
*1535-0923	Transistor, BFY 50	11.591.010.00
*1535-0924	Transistor, TIO 33A	11.594.870.00
*1535-0925	Diode, AAZ15	11.591.040.00
*1535-0926	Diode, Zener, 1N747A	11.591.970.20
*1535-0927	Diode, Zener, 1ZA	11.594.880.00
*1535-0928	Diode, MR 831	11.591.840.00
*1535-0929	Transistor, 2N3704	11.591.940.00
1535-1206	Reverse buffer-arm template	11.587.370.00
1535-1207	Friction tool	11.583.060.00
1535-1543	Rubber Ring	11.490.500.00
1535-1544	Hub Assembly	11.491.190.00
1535-1569	Wire	11.490.640.00
1535-1570	Reversing Buffer Arm	11.490.600.00
1535-1571	Spring	10.050.048.10
1535-1572	Spring	10.050.103.10
1535-3306	Lamp	10.665.014.50
1535-3307	Lamp	10.665.015.50
1535-3308	Lamp	10.665.016.50
1535-3309	Switch	11.593.530.10
1535-3310	Switch	10.663.013.50
1535-3311	Switch	10.663.015.50
*1853-0013	Transistor, 2N2904	11.592.150.00
*1853-0023	Transistor, 2N3703	11.592.140.00
*1854-0063	Transistor, 2N3055	11.591.870.00
*1901-0191	Diode, 1N4002	11.591.060.00
*1901-1007	Diode, 1N914	11.591.910.00
1150-0448	Punch/feed unit, complete	4071
1150-0449	Control circuit board	15.038.720.00
1150-0581	Control circuit board, exchange	15.038.720.00
8710-0009	Pliers	11.587.500.00
*8750-0063	Spring gauge, 100 grams	11.587.300.00

*Denotes a Hewlett-Packard equivalent part for the Facit part.

Table 6-3. Facit-to-Hewlett-Packard Part Number Cross Reference Listing

FACIT PART NO.	DESCRIPTION	HP PART NO.
4071	Punch/feed unit, complete	5080-1057
10.40.70.S	Hardware assortment kit	1535-0855
E11203-10	Compression spring	1535-0150
10.032.103.00	Retainer ring	1535-0096
10.032.105.00	Retainer ring	1535-0809
10.032.106.00	Retainer ring	1535-0112
10.032.106.00	Retainer ring	1535-0217
10.037.124.00	Washer	1535-0187
10.037.146.00	Washer	1535-0230
10.047.416.00	Steel ball	1535-0099
1050.048.10	Spring	1535-0799
10.050.056.10	Extension spring	1535-0799
10.057.162.00	Screw	1535-0149
10.057.178.10	Screw	1535-0807
10.057.224.00	Screw	1535-0193
10.057.226.00	Screw	1535-0199
10.057.227.00	Screw	1535-0190
10.050.103.10	Spring	1535-1572
10.057.289.00	Screw	1535-0110
10.061.190.00	Screw	1535-0796
10.061.191.00	Screw	1535-0157
10.061.218.00	Screw	1535-0130
10.061.220.00	Screw	1535-0806
10.061.222.00	Screw	1535-0182
10.061.222.00	Screw	1535-0832
10.061.224.00	Screw	1535-0174
10.061.227.00	Screw	1535-0251
10.061.230.00	Screw	1535-0837
10.061.232.00	Screw	1535-0838
10.061.284.00	Screw	1535-0089
10.061.285.00	Screw	1535-0243
10.061.287.00	Screw	1535-0198
10.061.299.00	Screw	1535-0078
10.065.198.10	Screw	1535-0234
10.065.807.00	Screw	1535-0153
10.065.808.10	Screw	1535-0142
10.065.810.10	Screw	1535-0177
10.065.812.10	Screw	1535-0119
10.065.813.10	Screw	1535-0071
10.065.814.10	Screw	1535-0097
10.065.815.10	Screw	1535-0104
10.069.287.00	Screw	1535-0083
10.078.188.00	Screw	1535-0249
10.078.220.00	Locking screw	1535-0823
10.078.323.00	Locking screw	1535-0829
10.081.222.10	Screw	1535-0073
10.081.285.00	Retainer ring	1535-0812
10.081.323.00	Screw	1535-0229
10.081.327.00	Screw	1535-0135
10.081.801.10	Screw	1535-0793
10.081.804.10	Screw	1535-0091
10.110.310.00	Nut	1535-0163
10.110.312.00	Nut	1535-0194
10.110.314.00	Nut	1535-0263
10.505.610.00	Capacitor, 0.1 uF	1535-0207
10.506.001.00	Punch/feed unit connector	1535-0264
10.506.002.00	PC board connector	1535-0173
10.663.013.50	Switch	1535-3310
10.663.015.50	Switch	1535-3311
10.665.014.50	Lamp	1535-3306
10.665.015.50	Lamp	1535-3307
10.665.016.50	Lamp	1535-3308
10.999.101.00	Mains cable	8120-1348

Table 6-3. Facit-to-Hewlett-Packard Part Number Cross Reference Listing (Continued)

FACIT PART NO.	DESCRIPTION	HP PART NO.
11.102.220.10	Spring mount screw	1535-0162
11.102.650.30	Retainer ring	1535-0138
11.401.820.00	Surge takeup arm	1535-0170
11.401.830.00	Hub	1535-0144
11.402.950.00	Guide roller	1535-0111
11.412.031.10	Compression spring	1535-0145
11.421.050.00	Holder	1535-0168
11.428.140.20	Spacer sleeve	1535-0189
11.435.480.30	Cable clamp	1535-0188
11.435.480.50	Cable clamp	1535-0831
11.440.050.00	Template, registration	1535-0268
11.440.100.30	Tape reel (Facit 4070)	1535-0210
11.440.130.00	Washer	1535-0183
11.467.770.00	Spring	1535-0098
11.490.050.00	Rubber ring	1535-1543
11.490.060.00	Reversing buffer arm	1535-1570
11.490.064.00	Wire	1535-1569
11.490.670.00	Punch head with pins (ECMA)	1535-0816
11.491.190.00	Hub assembly	1535-1544
11.492.350.00	Control panel (DC)	1150-1201
11.583.060.00	Friction tool	1535-1207
11.586.080.00	Dial gauge holder, magnetic	1150-0013
11.586.190.00	Dial gauge, 0-1 mm	1150-0014
11.587.020.00	Punch head turning tool	1535-0768
11.587.050.00	Mandrel for pressing in capstan	1535-0763
11.587.060.00	Capstan play gauge (part two)	1535-0770
11.587.070.00	Take-up arm holder	1535-0781
11.587.130.00	Tape guide rule	1535-0780
11.587.140.00	Mandrel for pressing out capstan	1535-0764
11.587.150.00	Punch pin feeler gauge	1535-0779
11.587.160.00	Grease nipple	1535-0771
11.587.210.00	Capstan play gauge (part one)	1535-0769
11.587.290.00	Multi-blade feeler gauge	1150-0015
11.587.300.00	Spring gauge, 100 grams	*8750-0063
11.587.320.00	Spring gauge, 1 kg	1150-0016
11.587.330.00	Solenoid armature adjuster (tracks 1-3 and feed hole)	1535-0765
11.587.340.00	Solenoid armature adjuster (tracks 4-8)	1535-0766
11.587.370.00	Reverse buffer-arm template	1535-1206
11.587.430.00	Torque meter	1535-0767
11.587.500.00	Pliers	8710-0009
11.587.610.00	Extender board	1535-0772
11.590.980.00	Grease, Rocol MT-320 (50 grams)	1535-0773
11.591.010.00	Transistor, BFY50	*1535-0923
11.591.040.00	Diode, AAZ15	*1535-0925
11.591.060.00	Diode, 1N4002	*1901-0191
11.591.120.40	Capacitor	1535-0259
11.591.200.10	Special nut	1535-0261
11.591.210.10	Rubber washer	1535-0260
11.591.221.20	Fuse 630 mA	1535-0200
11.591.811.70	Fuse, 2A Special	1535-0856
11.591.840.00	Diode, MR 831	*1535-0928
11.591.870.00	Transistor, 2N3055	*1854-0063
11.591.910.00	Diode, 1N914	*1901-1007
11.591.940.00	Transistor, 2N3704	*1535-0929
11.591.970.20	Diode, Zener, 1N747A	*1535-0926
11.592.130.10	Transistor, U2668/1S	1535-0865
11.592.130.20	Transistor, U2668/1S	1535-0864
11.592.140.00	Transistor, 2N3703	*1853-0023
11.592.150.00	Transistor, 2N2904	*1853-0013
11.592.230.10	Resistors	1535-0204
11.593.530.10	Switch	1535-3309

*Denotes a Hewlett-Packard equivalent part for the Facit part.

Table 6-3. Facit-to-Hewlett-Packard Part Number Cross Reference Listing (Continued)

FAÇIT PART NO.	DESCRIPTION	HP PART NO.
11.592.230.90	Resistors	1535-0205
11.593.080.20	Capacitor	1535-0208
11.594.211.30	Resistors	1535-0206
11.594.820.00	IC, FCH 161	*1535-0920
11.594.830.00	IC, FCH 191	*1535-0922
11.594.840.00	IC, FCH 211	*1535-0918
11.594.850.00	IC, FCJ 121	*1535-0921
11.594.860.00	IC, FCK 111	*1535-0919
11.594.870.00	Transistor, TIP33A	*1535-0924
11.594.880.00	Diode, Zener, 1ZA	*1535-0927
15.007.900.60	Transformer	1535-0262
15.009.380.00	2-diode unit	1535-0185
15.011.000.00	Punch solenoid, complete	1535-0825
15.011.010.00	Punch solenoid, complete	1535-0824
15.011.080.00	Solenoid armature	1535-0826
15.011.090.00	Solenoid armature	1535-0810
15.011.340.00	Plate	1535-0107
15.011.370.00	Capstan	1535-0830
15.011.440.00	Rubber foot	1535-0129
15.011.570.00	Takeup flange with rubber ring and hub complete	1535-0136
15.011.570.30	Supply flange with hub complete	1535-0137
15.011.580.00	Takeup flange	1535-0139
15.011.580.10	Supply flange	1535-0141
15.011.610.00	Sleeve	1535-0146
15.011.620.00	Catch	1535-0147
15.011.630.00	Catch	1535-0148
15.011.740.00	Eccentric pin	1535-0794
15.011.750.00	Rubber mounting	1535-0814
15.012.150.00	Tape tearer	1535-0800
15.012.160.00	Arm	1535-0803
15.012.180.00	Lever	1535-0798
15.012.220.00	Shaft	1535-0795
15.012.230.00	Spring mount nut	1535-0797
15.013.100.00	Spring	1535-0811
15.013.140.00	Spring mounted tape guide	1535-0805
15.013.180.00	Surge take-up spring	1535-0775
15.013.190.00	Washer	1535-0792
15.013.540.00	Punch pin driver	1535-0821
15.013.550.00	Punch pin driver	1535-0820
15.013.550.10	Punch pin driver	1535-0819
15.013.550.20	Punch pin driver	1535-0818
15.013.550.03	Punch pin driver	1535-0817
15.013.980.00	Diode circuit board complete	1535-0184
15.015.110.00	Mounting bracket	1535-0197
15.015.120.00	Mounting bracket	1535-0195
15.015.140.00	Side wall assembly	1535-0074
15.015.160.00	Dust cover	1535-0827
15.015.170.00	Shaft	1535-0080
15.015.180.00	Reversing buffer arm assembly complete	1535-0086
15.015.210.00	Roller	1535-0077
15.015.220.00	Spacer sleeve	1535-0079
15.015.230.00	Wire driver	1535-0082
15.015.240.00	Locking pin	1535-0081
15.015.250.00	Torsion spring	1535-0084
15.015.270.00	Surge takeup arm assembly complete	1535-0169

*Denotes a Hewlett-Packard equivalent part for the Facit part.

Table 6-3. Facit-to-Hewlett-Packard Part Number Cross Reference Listing (Continued)

FACIT PART NO.	DESCRIPTION	HP PART NO.
15.015.380.00	Circular spring	1535-0218
15.015.410.00	Magnet holder	1535-0166
15.015.430.00	Wire	1535-0085
15.015.450.00	Tape lifter assembly complete	1535-0090
15.015.460.00	Tape lifter	1535-0092
15.015.480.00	Guide plate	1535-0100
15.015.490.00	Pulley	1535-0103
15.015.520.00	Arm	1535-0161
15.015.550.00	Brake shoe holder	1535-0158
15.015.570.00	Connecting rod	1535-0224
15.015.580.00	Tape low sensor arm	1535-0152
15.015.640.00	Connecting rod	1535-0222
15.015.650.00	Plate	1535-0196
15.015.660.00	Insulating washer	1535-0237
15.015.670.00	Gear	1535-0236
15.015.690.00	Driver	1535-0235
15.015.710.00	Flange driver	1535-0241
15.015.730.00	Gear housing	1535-0233
15.015.740.00	Motor bracket	1535-0244
15.015.750.00	Fan, complete	1535-0246
15.015.780.00	Impeller	1535-0248
15.015.790.00	Guide roller mount	1535-0109
15.015.870.00	Front lid	1535-0122
15.015.890.00	Bracket for PC board connector	1535-0134
15.015.900.00	Bottom plate	1535-0128
15.015.920.00	Chad box	02895-60004
15.017.380.00	Incremental motor with brake	1535-0843
15.017.390.00	Motor mount	1535-0836
15.017.500.00	Retainer plate	1535-0106
15.017.550.00	Control panel	1535-0070
15.017.560.00	Front lid complete	1535-0121
15.017.570.00	Washer	1535-0123
15.017.710.00	Rear panel	1535-0116
15.017.720.00	Rubber spacer	1535-0124
15.017.760.00	PC board catch	1535-0118
15.017.780.00	Shield plate	1535-0132
15.017.790.00	Shield plate	1535-0131
15.021.720.00	Cover	1535-0072
15.021.740.00	Plate	1535-0127
15.021.780.00	Winding motor, complete	1535-0231
15.021.800.00	Motor mount half with bracket	1535-0252
15.021.810.00	Motor mount half	1535-0250
15.021.820.00	Locking screw	1535-0266
15.022.860.00	Spacer sleeve	1535-0842
15.022.870.00	Washer, 0.1 mm	1535-0226
15.022.870.10	Washer, 0.3 mm	1535-0227
15.022.870.20	Washer, 0.5 mm	1535-0228
15.025.190.00	Bracket	1535-0834
15.027.690.00	Template, registration	1535-0268
15.028.000.00	Extension spring	1535-0221
15.028.000.10	Extension spring	1535-0225
15.028.000.20	Extension spring	1535-0164
15.028.010.00	Compression spring	1535-0804
15.028.470.00	Sidewall	1535-0075
15.028.480.00	Sidewall	1535-0114

Table 6-3. Facit-to-Hewlett-Packard Part Number Cross Reference Listing (Continued)

FACIT PART NO.	DESCRIPTION	HP PART NO.
15,028,620.00	Coil	1535-0203
15,028,630.00	Filter circuit board complete	1535-0181
15,028,660.00	Stator with windings	1535-0835
15,031,290.00	Rubber mounting	1535-0120
15,032,920.00	Reversing buffer arm	1535-0087
15,033,000.00	Brake bracket	1535-0156
15,033,070.00	Brake shoe	1535-0159
15,033,190.00	Spacer sleeve	1535-0102
15,033,620.00	Spacer	1535-0833
15,033,670.00	Bracket	1535-0105
15,033,680.00	Washer	1535-0154
15,033,930.00	Brake assembly complete	1535-0155
15,034,620.00	Sealing screw	1535-0828
15,034,700.00	Rubber chad chute adapter	1535-0774
15,034,710.00	Insulator plate	1535-0171
15,034,780.00	Pin	1535-0815
15,034,790.00	Shaft	1535-0240
15,035,740.00	Motor brake	1535-0844
15,035,750.00	Brake housing	1535-0839
15,035,770.00	Brake spring	1535-0840
15,035,780.00	Rubber pad	1535-0841
15,036,060.00	Rubber washer	1535-0813
15,036,330.00	Rubber ring	1535-0151
15,037,550.00	Screw	1535-0076
15,037,570.00	Washer	1535-0113
15,038,680.00	Plate	1535-0095
15,038,690.00	Tape tearer	1535-0093
15,038,720.20	Control circuit PCA	1150-0449
15,038,740.00	Torsion spring	1535-0094
15,038,910.00	Rubber shim	1535-0101
15,038,940.00	Rubber ring	1535-0140
15,039,020.00	Bridging board	1535-0172
15,039,490.00	Ring	1535-0239
15,039,790.00	Pinch roller with shaft and bearings	1535-0802
15,039,920.00	Spacer sleeve, 3.1 mm	1535-0801
15,053,410.00	Punch pin driver shaft	1535-0822
15,953,410.80	Pin	1535-0126
15,953,411.10	Pin	1535-0160
15,953,450.00	Helical expander spring	1535-0143
15,953,830.20	Ball bearing	1535-0238
15,954,350.00	O-ring	1535-0808
15,954,350.20	O-ring	1535-0254
15,955,030.00	Selector switch	1535-0255
15,955,420.00	Switch	1535-0245
15,955,480.00	Special screw	1535-0179
15,955,540.00	Magnet	1535-0108
15,955,580.00	Motor	1535-0232
15,955,620.00	Magnet	1535-0165
15,955,740.90	Washer	1535-0191
15,957,330.00	Dry reed relay	1535-0167
15,958,160.00	25-pin male connector	1535-0212
15,958,180.00	Signal connector	1535-0178
15,958,200.00	Connector catch	1535-0213
15,958,240.00	Connector casing with screws for angular cable mounting	1535-0214
15,958,420.00	2-button/2-lamp assembly	1535-0258
15,958,440.00	2-button/1-lamp assembly	1535-0257

Table 6-4. Numerical Listing of the Replaceable Parts for the Hewlett-Packard Additions and Modifications to the Facit Tape Punch

HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.	TQ
0380-0909	Spacer	28480	0380-0909	4
0400-0082	Grommet	28480	0400-0082	1
2940-0103	Bolt, Hexagon Head, 1/4-20, 1/2 in.	00000	OBD	4
0590-0789	Channel nut	96195	P4006-1420	4
0698-0084	Resistor, Fxd, Flm, 2.15k, 1%, 1/8W	28480	0698-0084	9
0698-3155	Resistor, Fxd, Flm, 4.64k, 1%, 1/8W	28480	0698-3155	12
0757-0199	Resistor, Fxd, Flm, 21.5k, 1%, 1/8W	28480	0757-0199	9
0950-1313	Tape Punch, Facit, 4070, Modified	28480	0950-1313	1
1390-0107	Latch Set	28480	1390-0107	1
1400-0082	Cable Clamp	00000	OBD	4
†1400-0084	Fuseholder	79515	342014	1
1450-0148	Retainer, Lamp	28480	1450-0148	1
1450-0738	Lamp, 6V	28480	1450-0738	1
1854-0215	Transistor, Si, NPN	80131	2N3094	13
1901-0040	Diode, Si, 30 mA, 30 WV	07263	FDG1088	11
†2110-0381	Fuse, 3A, 250V, SB(F2) (115-volt operation, serial prefix 1201)	71400	MDA-3	1
†2110-0303	Fuse, 2A, 250V, SB(F2) (115 or 230-volt operation, serial prefix 1231 and on; 230-volt operation only, serial prefix 1201)	71400	MDX-2A	1
2190-0073	Washer, Lock, split, No. 8	00000	OBD	20
2190-0851	Washer, Lock, split, No. 6	00000	OBD	11
22000-0144	Screw, Machine, FH, No. 4-40, 5/8 in.	00000	OBD	1
2260-0009	Nut, Assembled Washer, No. 4-40	00000	OBD	1
2360-0197	Screw, Machine, PH, No. 6-32, 3/8 in.	00000	OBD	14
2360-0200	Screw, Machine, FH, No. 6-32, 1/2 in.	00000	OBD	2
2360-0201	Screw, Machine, PH, No. 6-32, 1/2 in.	00000	OBD	6
2360-0202	Screw, Machine, PH, No. 6-32, 5/8 in.	00000	OBD	3
2420-0001	Nut, Assembled Washer, No. 6-32	00000	OBD	4
2510-0107	Screw, Machine, PH, No. 8-32, 1/2 in.	00000	OBD	20
2510-0109	Screw, Machine, PH, No. 8-32, 5/8 in.	00000	OBD	4
2580-0004	Nut, Assembled Washer, No. 8-32	00000	OBD	16
2680-0108	Screw, Machine, FH, No. 10-32, 3/4 in.	00000	OBD	4
3050-0001	Washer, Flat, No. 8, 3/8 in. OD	00000	OBD	16
3050-0007	Washer, Cup, Metal, No. 10	00000	OBD	4
3050-0010	Washer, Flat, No. 6, 5/16 in. OD	00000	OBD	13
3050-0C19	Washer, Flat, No. 8, 1/2 in. OD	00000	OBD	4
3050-0222	Washer, Flat, No. 4, 5/16 in. OD	00000	OBD	1
3050-0248	Washer, Cup, Filler, Plastic, No. 10	00000	OBD	4
7101-0171	Channel Plate	09097	5033-1	4
8120-1348	Cable, Power	28480	8120-1348	1
02895-00015	Panel, Front (light gray)	28480	02895-00015	1
02895-00003	Drawer (light gray)	28480	02895-00003	1
02895-00004	Bracket, Right, Tape Holder (light gray)	28480	02895-00004	1
02895-00005	Bracket, Left, Tape Holder (light gray)	28480	02895-00005	1
02895-00007	Bracket, Slide	28480	02895-00007	2
02895-00008	Bracket, Long (25 in.)	28480	02895-00008	2
02895-00016	Panel, Front (moss gray)	28480	02895-00016	1
02895-00010	Drawer (moss gray)	28480	02895-00010	1
02895-00011	Bracket, Right, Tape Holder (moss gray)	28480	02895-00011	1
02895-00012	Bracket, Left, Tape Holder (moss gray)	28480	02895-00012	1
02895-00013	Bracket, Latch	28480	02895-00013	1
02895-20001	Pad, Locator	28480	02895-20001	2
02895-20002	Plate, Locator (light gray)	28480	02895-20002	1
02895-20004	Handle	28480	02895-20004	1
02895-20005	Filter Plate (light gray)	28480	02895-20005	2
02895-20006	Plate, Locator (moss gray)	28480	02895-20006	1
02895-20007	Filter Plate (moss gray)	28480	02895-20007	2
02895-60006	Rack Mounting Assembly (light gray)	28480	02895-60006	1
02895-60007	Rack Mounting Assembly (moss gray)	28480	02895-60007	1
†02895-60004	Chad Box (with magnetic catch)	28480	02895-60004	1
02895-60005	Logic Inverter PCA	28480	02895-60005	1
†No Number	Rear Panel	-	No Facit No.	1
†No Number	Connector, 6A, 250V	-	10.987.101.00	1
†No Number	Foot, Rubber (includes attaching parts)	-	R-109	1

† Denotes parts modified by Facit to meet Hewlett-Packard requirements.

Table 6-5. Reference Designations and Abbreviations

REFERENCE DESIGNATIONS		
A = assembly	K = relay	TB = terminal board
B = motor, synchro	L = inductor	TP = test point
BT = battery	M = meter	U = integrated circuit, non-repairable assembly
C = capacitor	MC = microcircuit	V = vacuum tube, photocell, etc.
CB = circuit breaker	P = plug connector	VR = voltage regulator
CR = diode	Q = semiconductor device other than diode or microcircuit	W = cable, jumper
DL = delay line	R = resistor	X = socket
DS = indicator	RT = thermistor	Y = crystal
E = Misc electrical parts	S = switch	Z = tuned cavity, network
F = fuse	T = transformer	
FL = filter		
J = receptacle connector		
ABBREVIATIONS		
A = amperes	gra = gray	ph = Phillips head
ac = alternating current	grn = green	pk = peak
ad = anode	H = henries	p-p = peak-to-peak
Al = aluminum	Hg = mercury	pt = point
AR = as required	hr = hour(s)	PIV = peak inverse voltage
adj = adjust	Hz = hertz	PNP = positive-negative-positive
assy = assembly	hdw = hardware	PWV = peak working voltage
B = base	hex = hexagon, hexagonal	porc = porcelain
bp = bandpass	ID = inside diameter	posn = position(s)
blk = black	IF = intermediate frequency	pozi = pozidrive
blu = blue	in. = inch, inches	
brn = brown	I/O = input/output	rf = radio frequency
brs = brass	int = internal	rdh = round head
Btu = British thermal unit	incl = include(s)	rmo = rack mount only
Be Cu = beryllium copper	insul = insulation, insulated	rms = root-mean-square
C = collector	impgrg = impregnated	RWV = reverse working voltage
cw = clockwise	incand = incandescent	rect = rectifier
ccw = counterclockwise	k = kilo (10^3), kilohm	r/min = revolutions per minute
cer = ceramic	lp = low pass	RTL = resistor-transistor logic
cmo = cabinet mount only	m = milli (10^{-3})	s = second
com = common	M = mega (10^6), megohm	SB = slow blow
crt = cathode-ray tube	My = Mylar	Se = selenium
CTL = complementary-transistor logic	mfr = manufacturer	Si = silicon
cath = cathode	mom = momentary	scr = silicon controlled rectifier
cd pl = cadmium plate	mtg = mounting	sil = silver
Comp = composition	misc = miscellaneous	sst = stainless steel
conn = connector	Met Ox = metal oxide	stl = steel
compl = complete	mintr = miniature	spcl = special
dc = direct current	n = nano (10^{-9})	spdt = single-pole, double-throw
dr = drive	n.c. = normally closed or no connection	spst = single-pole, single-throw
DTL = diode-transistor logic	Ne = neon	semicond = semiconductor
depc = deposited carbon	no. = number	Ta = tantalum
dpdt = double-pole, double-throw	n.o. = normally open	td = time delay
dpst = double-pole, single-throw	np. = nickel plated	Ti = titanium
E = emitter	NPN = negative-positive-negative	tgl = toggle
ECL = emitter-coupled logic	NPO = negative-positive zero (zero temperature coefficient)	thd = thread
ext = external	NSR = not separately replaceable	tol = tolerance
encap = encapsulated	NRFR = not recommended for field replacement	TTL = transistor transistor logic
elctlt = electrolytic	OD = outside diameter	U(μ) = micro (10^{-6})
F = farads	OBD = order by description	V = volt(s)
FF = flip-flop	orn = orange	var = variable
filh = flat head	ovh = oval head	vio = violet
Fim = film	oxd = oxide	VDCW = direct current working volts
Fxd = fixed	p = pico (10^{-12})	W = watts
filh = fillister head	PC = printed circuit	WW = wirewound
G = giga (10^9)		wht = white
Ge = germanium		WIV = working inverse voltage
gl = glass		yel = yellow
gnd = ground(ed)		

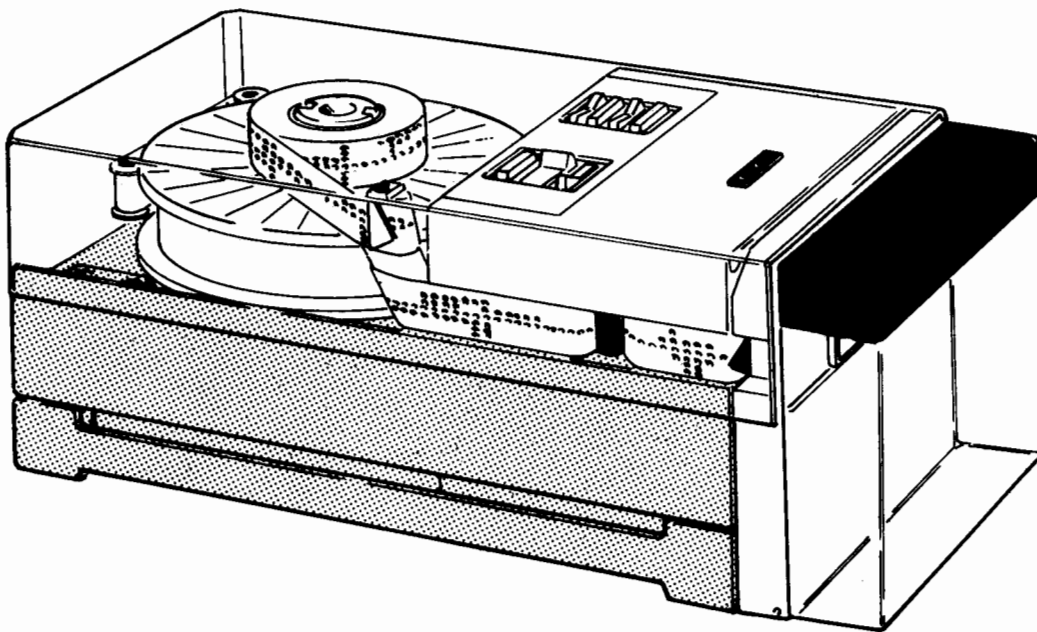
Table 6-6. Code List of Manufacturers

The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbooks H4-1 and H4-2, and their latest supplements.					
Code No.	Manufacturer	Address	Code No.	Manufacturer	Address
00000	U.S.A. Common	Any supplier of U.S.	71400	Bussmann Mfg. Div. of McGraw-	
07263	Fairchild Camera and Inst. Corp.	Mountain View, Calif.	75915	Edison Co.	St. Louis, Mo.
09097	Electronic Enclosures Inc.	Los Angeles, Calif.	80131	Littlefuse, Inc.	Des Plaines, Ill.
28480	Hewlett-Packard Co.	Palo Alto, Calif.	96195	Electronic Industries Association	Any manufacturer
				Unistrut Corp.	Wayne, Mich.

FACIT 4070

Tape punch

SERVICE MANUAL



FACIT AB · SWEDEN

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- A. Removing punch/feed unit**
- B. Disassembling and checking punch solenoid**
- C. Assembling punch solenoid**
- D. Checking punch pin drivers**
- E. Replacing punch pin drivers**
- F. Fitting and adjusting punch solenoid**
- G. Replacing punch head**
- H. Checking incremental motor**
- I. Checking motor brake**
- J. Checking and replacing capstan**
- K. Checking transmission between incremental motor and capstan**
- L. Checking pinch roller**
- M. Fitting punch/feed unit**
- N. Checking braking force on supply flange**
- O. Checking sensor arm**
- P. Checking pulling force of winding motor**
- Q. Checking unwinding force**
- R. Checking reversing buffer arm**
- S. Checking adjustment of spring mounted tape guide**
- T. Checking tape feed**
- U. Checking incremental motor pulling force**
- V. Checking inter-row spacing**
- W. Checking punching action**
- X. Checking tape check functions**

6.2 CHECKING PRINTED CIRCUIT BOARDS

6.2.1 General

6.2.2 Handling integrated circuits

6.2.3 Testing integrated circuits

6.3 FAULT TRACING

6.4 PERIODIC SERVICING

6.5 LUBRICATION INSTRUCTIONS

Appendix 1 Fault tracing table

Appendix 2 Logical diagram

Appendix 3 Circuit diagram

Appendix 4 Interconnection diagram with diode board and filter board – mains operated

Appendix 5 Interconnection diagram with diode board and filter board – battery operated

1 INTRODUCTION

FACIT 4070 tape punch records data on 5-, 6/7- or 8-track tape. Punching speed depends on the flow of data to the punch and can vary from 0 to 75 rows per second.

The tape is fed by a tape-feed mechanism that operates independently of the feed holes. All nine punch pins are solenoid-operated, thus enabling the feed-hole track to be used as a code track for recording 9-bit codes. The tape is unwound and rewound inside the punch.

The punch is provided with control circuits that synchronize the tape-feed and punching cycles. The control circuits are mounted on a plug-in circuit board. Beneath this control circuit board is a bridging circuit board.

To adapt the punch to a particular system, the bridging circuit board is replaced with a system adaptation board.

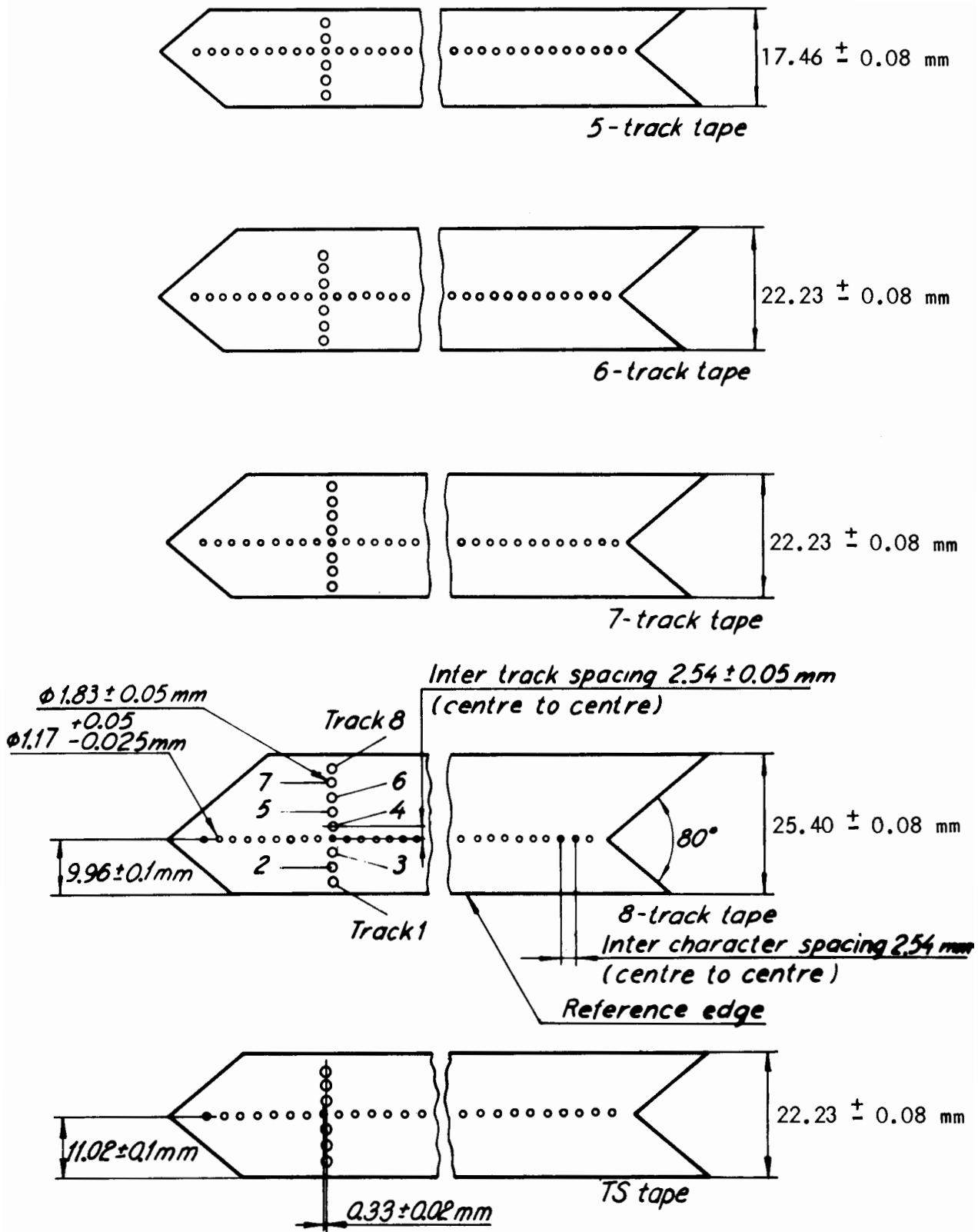


Fig 2.1 Tape dimensions and hole configurations

2 SPECIFICATIONS

2.1 TAPE

Fig 2.1

Type:

Paper tapes

8-track tape as per ISO recommendation.
5 and 6/7 track tape and TS (typesetting)
tape as per applicable sections of ISO
recommendation for 8-track tape.

Hole configuration:

ISO standard R 1154 for 8-track punched tape.

Hole configuration for 5- and 6/7-track tape
complies with applicable sections of ISO
standard for 8-track tape.

6-track TS tape punched as shown in Fig 2.1.
Other data complies with applicable sections
of ISO standard for 8-track tape.

Width:

5-track tape 17.46 ± 0.08 mm (0.687" ± 0.003").
6-track tape 22.23 ± 0.08 mm (0.875" ± 0.003").
7-track tape 22.23 ± 0.08 mm (0.875" ± 0.003").
8-track tape 25.40 ± 0.08 mm (1.000" ± 0.003").

Thickness:

0.08 - 0.11 mm

Tape coil:

Inner diameter, 50.8 - 52.4 mm (2")
Outside diameter, max 203 mm (8").

2.2 VARIANTS

Following variants of FACIT 4070 are manufactured partly in desk version
and partly in rack version for either AC or DC.

FACIT 4070 variants are available for punching the following tapes:

- 5-, 6/7- and 8-track standard tapes.
- 6-track TS tape.

2.3 MECHANICAL DATA

Punching speed:	Up to 75 rows per second
Tape feed:	Asynchronous, externally controlled
Backspacing:	Up to 10 rows, depending on the tape quality
Feed accuracy: (ISO standard)	Adjacent rows, better than 3% 10 rows, 1% 50 rows, 0.5%
Buffer register:	Built in, stores 1 row
Mark character:	Programmed using diodes on control circuit board
Ambient temperature:	+5°C - +40°C
Relative humidity:	Max 85%
Dimensions:	Length, 432 mm (17"), 482 mm (19") incl. chad box Width, 200 mm (8.7") Height, 198 mm (7.8")
Weight:	AC variants, 13.5 kg (30 lb) DC variants, 9.5 kg (21 lb)

2.4 ELECTRICAL DATA**2.4.1 Input signals**

Signals having a duration of less than approx 10 μ s are treated as noise (integrated out).

Start pulse (PI):	Duration	- min 100 μ s
	Rise time	- max 10 μ s
	Input impedance	- min 2.2 kilo-ohms
	Logical 1	- +3.5 V to +12 V
	Logical 0	- -12 V to +1.5 V

Data signals (Ch 1-9):

Duration	- min 200 μ s
Rise time	- max 10 μ s
Input impedance	- min 22 kilo-ohms
Logical 1	- +3.5 V to +12 V
Logical 0	- -12 V to +1.5 V

- Data signals shall be defined no later than 1 μ s after PI.

Stepping direction signal (SD):

Input impedance	- min 2.2 kilo-ohms
Forward feed	- -12 V to +1.5 V
Backspace	- +3.5 V to +12 V

2.4.2 Output signals

Punch ready signal (PR):

Logical 1	- +6 V; output impedance, 1 kilo-ohm
Logical 0	- max +0.4 V and max 10 mA

- Changes to 0 when data is stored in buffer register. Changes to 1 when punching is completed.

Tape low signal (TL):

Logical 1	- +6 V and max load 10 mA
Logical 0	- 0 V via 470 ohms

- Becomes 1 when TL signal is generated.

Error signal 1 (ERR 1):

Logical 1	- +5 V at 3 mA; output impedance, 100 ohms
Logical 0	- max +0.6 V at 1 mA

- Becomes 1 when ERR 1 signal is generated.

Error signal 2 (ERR 2):

Logical 1	- min +3.0 V at 3 mA
Logical 0	- max +0.6 V at 2 mA

- Available only via system adaptation circuit board. Board connector K2/A20.

External signal (EXT): 0 V when EXT button is depressed.

2.4.3 Supply voltage

AC variants: 115/127/220/240 V • (serial no. 6039342 and below)
100/115/220/240 V $\begin{matrix} +15\% \\ -10\% \end{matrix}$ (serial no. 6039343 and above)
Single-phase, 50 – 100 Hz.
Grounded power inlet.

DC variants: 24 V $\begin{matrix} +20\% \\ -15\% \end{matrix}$

AC variants: Max 200 W
Min 50 W

DC variants: Max 180 W
Min 2 – 5 W
Max peak current, 30 A

Both AC and DC variants are dimensioned to provide an extra current output of 1 A from the +6 V circuitry and 1 A from the +24 V circuitry. These outputs are intended primarily for use with the system adaptation board.

Fuses: 0.63 A (located on control circuit board).

Twelve 2 A fuses on standard version.
Ten 2 A fuses on TS version. On both versions there is one fuse for each punch solenoid and motor winding.

The transformer is provided with a thermal protector that is self-resetting.

DC variants are provided with a 5 A time-delay fuse located on the rear panel.

AC variants are provided with a 2 A time-delay fuse located on the rear panel.

2.4.4**Connections****External connections**

Power inlet P3 (AC): Grounded CEE 22/VI or standard American 3-pin inlet.

Power inlet P3 (DC): Grounded 2-pin inlet.

Signal in/output connector P1: 25-pin connector.

Internal connections

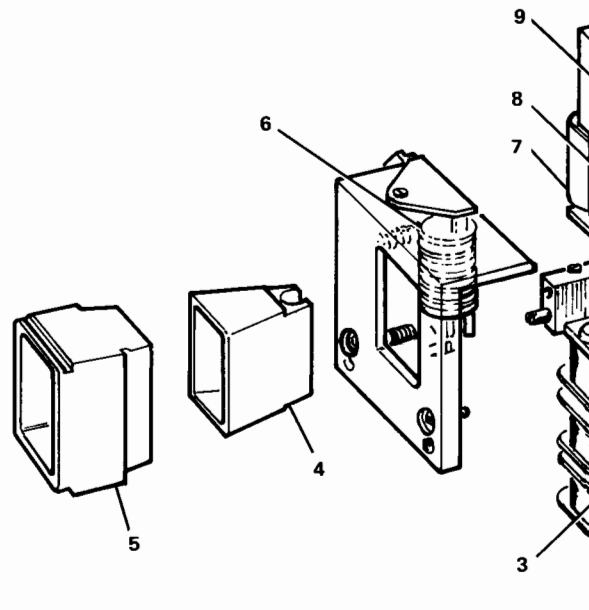
K1: 22-contact connector for control circuit board.

K2: 22-contact connector for bridging board or system adaptation board.

K3: 22-contact connector for PC board containing fuses for punch solenoids and incremental motor.

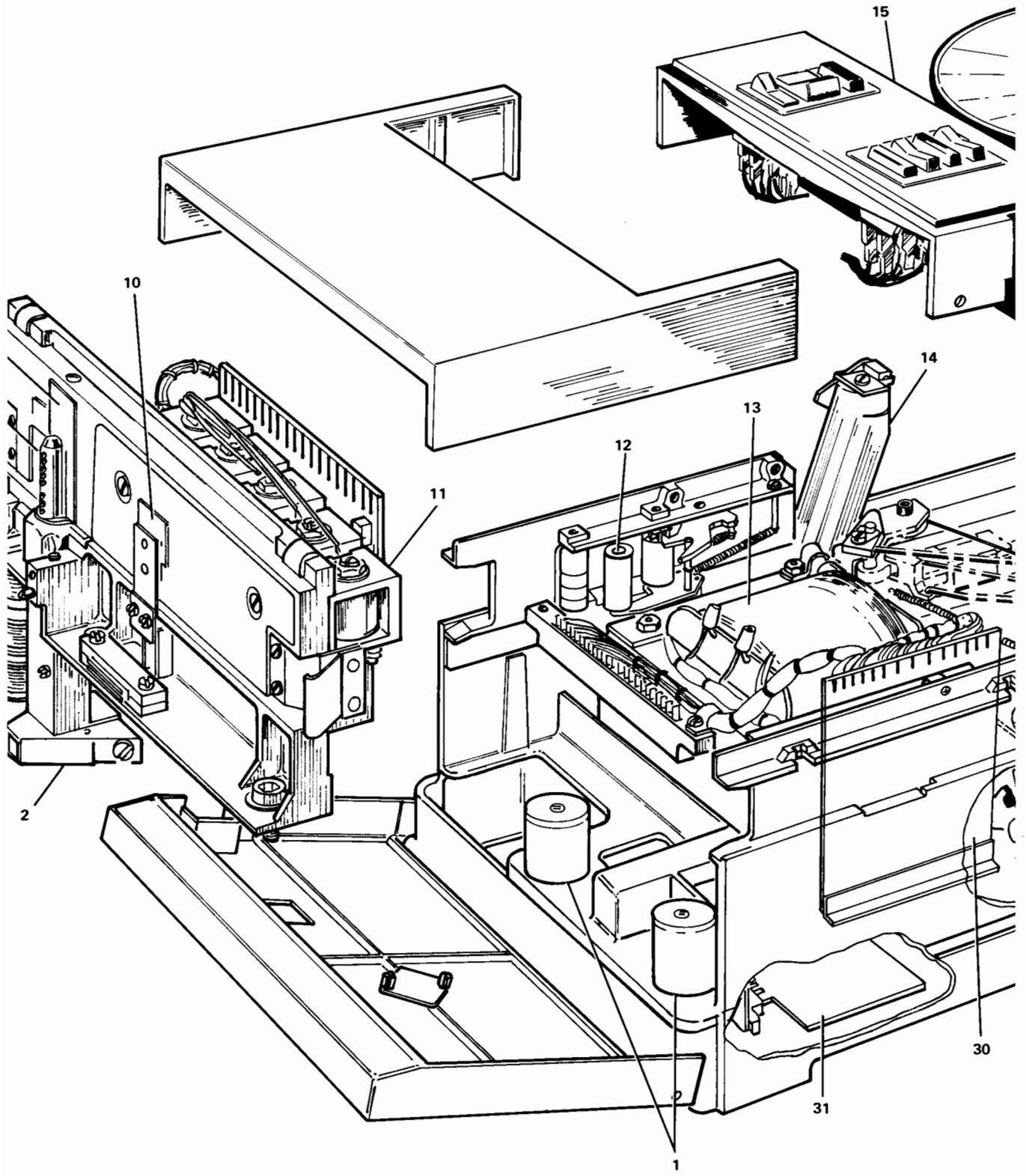


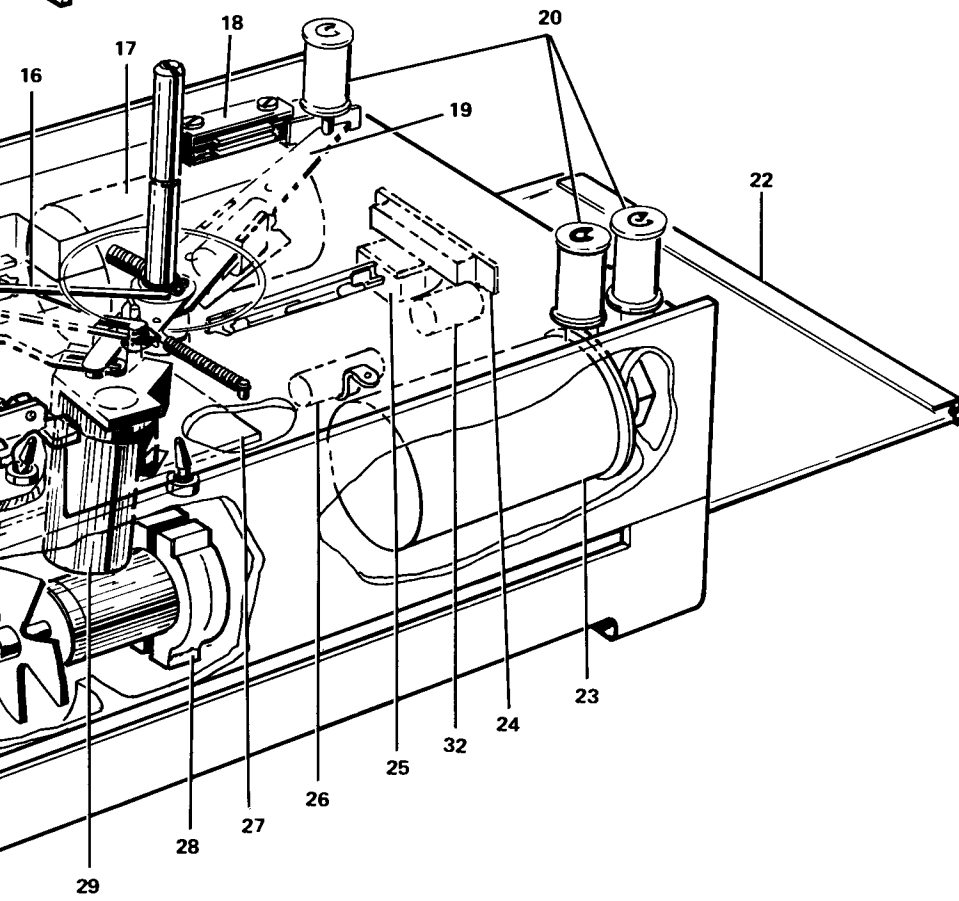
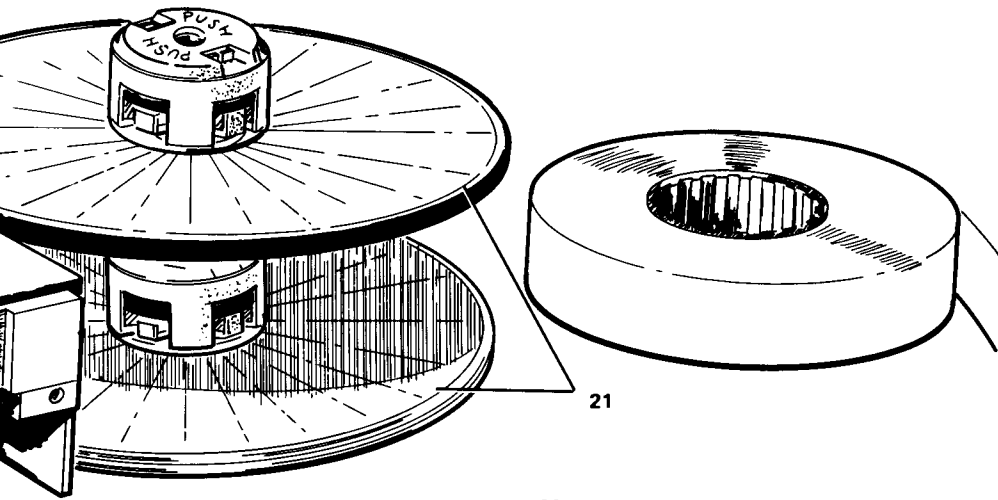
- 1 Rubber anti-vibration mountings
(attached to chassis)
- 2 Motor brake
- 3 Incremental motor
- 4 Chad exhaust
- 5 Connection for chad tube
- 6 Pinch roller
- 7 Die
- 8 Capstan
- 9 Punch pin guide
- 10 Spring-mounted tape guide
- 11 Punch solenoids
- 12 Reversing buffer arm
- 13 Transformer (T1)
- 14 Tape lifter
- 15 Control panel
- 16 Tape low sensor arm
- 17 Capacitor (C1)
- 18 Retainer magnet
- 19 Surge takeup arm
- 20 Guide rollers
- 21 Supply and takeup flanges
- 22 Control circuit board
- 23 Capacitor (C2)
- 24 Signal connector (P1)
- 25 Power inlet (P3)
- 26 Disturbance suppressor
- 27 Filter circuit board
- 28 Fan motor
- 29 Winding motor
- 30 Rectifier circuit board
- 31 Bridging board (can be replaced
by a systems adaption circuit board)
- 32 Fuse (F1)



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Fig 3.1 Exploded View of the 4070





3 DESIGN AND CONSTRUCTION

Fig 3.1 The 4070 is built up on a cast chassis. It contains the following units. See Fig 3.1.

- Punch/feed unit, index numbers 2 through 11, contains punch mechanism and incremental motor.
- Tape supply/takeup unit, index numbers 12, 14, 20(2), 21(2), and 29.
- Tape check devices, index numbers 16, 19, and 20(1).
- Power supply, index numbers 13, 22, 23, 27, and 28. Includes filter circuits and circuit boards.

3.1 PUNCH/FEED UNIT

The punch/feed unit is screwed onto two rubber anti-vibration mountings (1) which, in turn, are attached to the chassis.

The punch mechanism comprises punch solenoids (11), the punch pin drivers, the punch pins and the punch head. The punch head comprises punch pin guide (9) and die (7). The punch pins run on greased ways in the punch pin guide.

The incremental motor (3) is screwed onto the punch/feed unit. It drives the tape via capstan (8). Pinch roller (6) presses the tape against the capstan. Brake (2) is located on the lower part of the incremental motor. It damps out motor shaft oscillations.

3.2 TAPE SUPPLY/TAKEUP UNIT

The tape supply/takeup unit comprises supply and takeup flanges (21), winding motor (29), guide rollers (20) reversing buffer arm (12) and tape lifter (14). The takeup flange is located directly above the supply flange.

3.3 TAPE CHECK DEVICES

The tape check devices comprise two movable arms - surge takeup arm (19) and tape low sensor arm (16). On each of these arms there is a permanent magnet that actuates a reed relay when the arm lies within a given sector.

3.4 POWER SUPPLY

The power supply comprises transformer (13), designated T1, rectifier circuit board (30) and capacitors (17 and 23), designated C1 and C2 respectively.

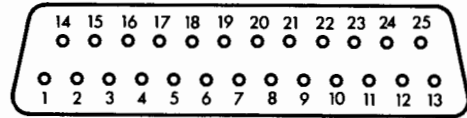
The transformer is located beneath control panel (15). Changeover for different mains voltages is accomplished with mains voltage selector switch S1 on the rear of the control panel. The rectifier comprises four bridge-coupled power diodes mounted on rectifier circuit board (30) to the right of the transformer. This circuit board is secured by two sheet metal angles that are screwed in place from beneath the chassis. Filter circuit board (27) removes disturbances caused by winding motor (29) and fan motor (28).

In the lower part of the punch there is room for two plug-in circuit board (22 and 31). Circuit board 22 is included in all variants of the punch. It contains the circuits that enable the punch to operate as a stand-alone unit. Board 31 is the board that can be replaced by a system adaptation circuit board. The circuit boards are inserted from the rear of the punch and are secured by one plastic holder. Power inlet (25), designated P3, signal in/output connector (24), designated P1, and fuse holder with fuse (32), designated F1, are located at the rear. Line filter (26), designated C3, is provided inside the power inlet between capacitors C1 (17) and C2 (23).



Layout of signal in/output connector P1:

Pin No	Signal	Pin No	Signal
1	Ch 1	14	-
2	Ch 2	15	-
3	Ch 3	16	-
4	Ch 4	17	-
5	Ch 5	18	-
6	Ch 6	19	EXT
7	Ch 7	20	ERR 1
8	Ch 8	21	TL
9	Ch 9	22	+24 V
10	SD	23	-
11	PI	24	+6 V
12	PR	25	0 V
13	-		



Signal designations:

- Ch 1 - Ch 9 Data signals on channels 1-9 (Ch 9 is for feed hole track)
- ERR 1 Error signal
- EXT External signal
- PI Punch instruction (start pulse) signal
- PR Punch ready signal
- SD Stepping direction signal
- TL Tape low signal

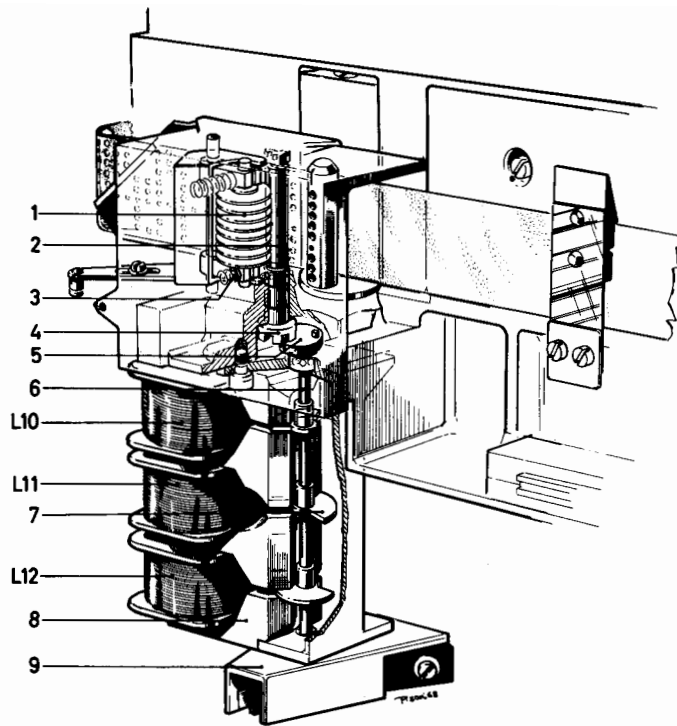


Fig 4.1 Cutaway view of the feed mechanism. At centre is the non-linear transmission 4 and 5. The motor brake 9 is at bottom

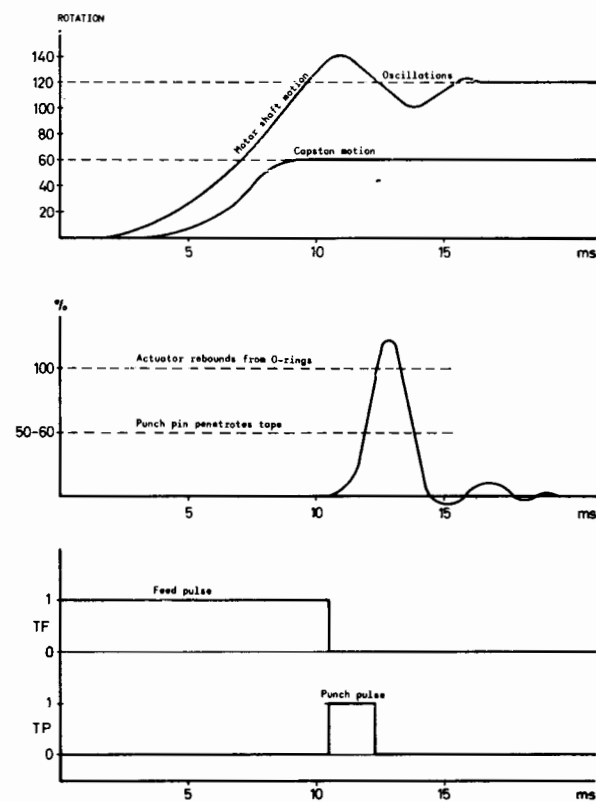


Fig 4.2 Pulse and motion diagrams for punching and feeding

4 MECHANICAL OPERATION

4.1 TAPE FEED

Fig 4.1 The feed mechanism comprises the incremental motor, the capstan and the pinch roller. See Fig.4.1.

Pinch roller (1) presses the tape against capstan (2). Springs (3) provide the pinching force. The capstan is driven by the incremental motor via a non-linear transmission arrangement. Slotted wheel (4) on the bottom of the capstan engages pinwheel (5) that is pressed onto motor shaft (6). The transmission ratio is 1:2, i.e. the capstan turns half a revolution for every motor revolution. The motor shaft (6) is provided with three vanes (7) that are staggered at 120° intervals. Each vane passes through an air gap in stator (8) as the motor shaft turns. There are three motor windings L10, L11 and L12 on the stator. They are energized sequentially by the control circuits. When a winding is energized, magnetic flux passes through the corresponding air gap in the stator, wherewith the associated vane is pulled in and turns the motor shaft through 120° . For backspacing, the motor windings are energized in reverse sequence.

Fig 4.2 Fig 4.2 illustrates the timing of the tape-feed and punching cycles. The motor shaft and capstan motions are shown in the upper diagram. The non-linear transmission between capstan and motor shaft reduces the amplitude of capstan oscillations. The amplitude of motor shaft oscillations is damped by the motor brake (see more detailed explanation below).

The centre diagram shows how the punch solenoids and the punch pins move. Oscillation results when the actuators on the punch solenoid armatures return and rebound from the O-rings. Note that the punch pulse TP vanishes before the punch pin movement is completed.

The incremental motor is provided with brake (9) to damp motor shaft oscillations. Triangular shoe (1), made of friction material, is attached to the motor shaft. See Fig 4.3. When the shaft turns one increment (120°), springs (2) are pressed apart, after which they help to turn the shaft to its new incremental position. The brake also serves to hold motor stationary between operations.

Fig 4.3

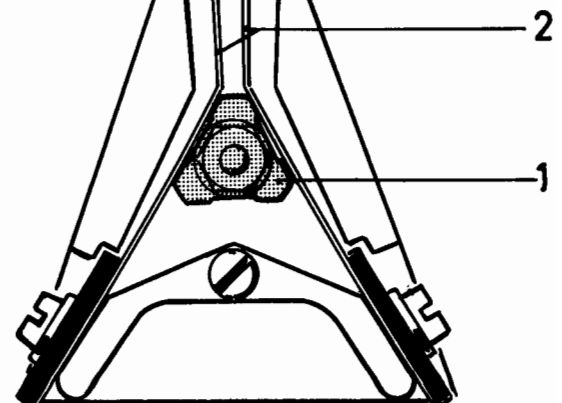


Fig 4.3 Motor brake

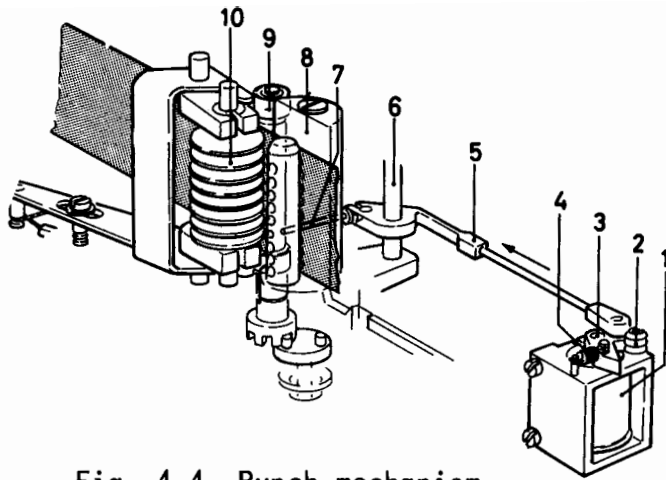


Fig 4.4 Punch mechanism

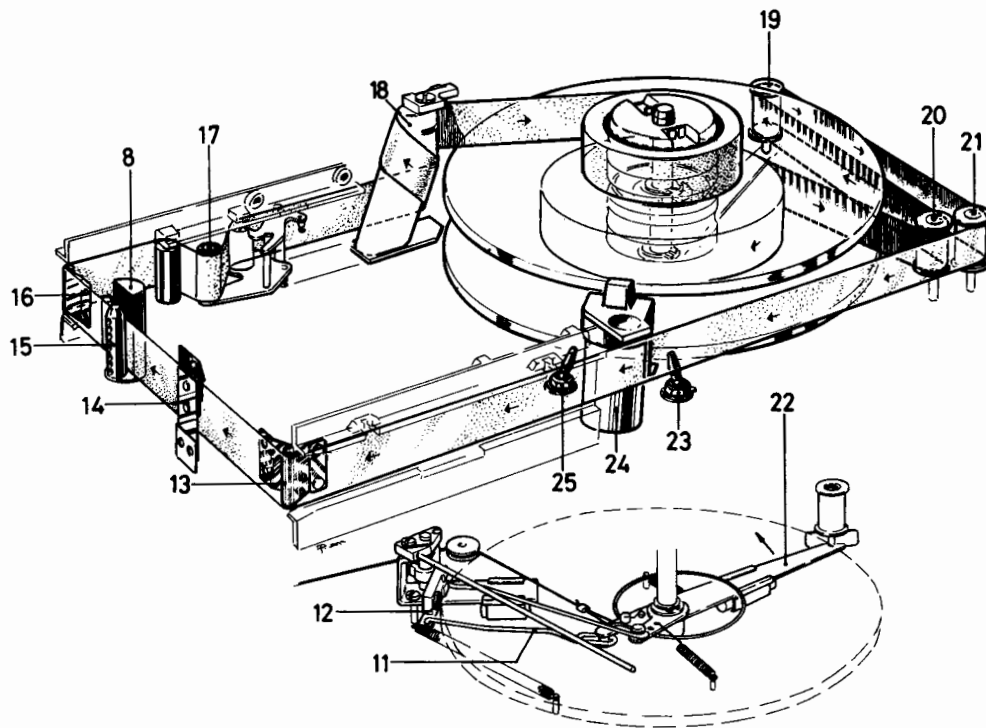


Fig 4.5 Components past which the tape moves. The parts that control the speed of the supply flange are shown at bottom

4.2 PUNCHING

The punch mechanism comprises nine punch solenoids, the punch pin drivers, the punch pins and the punch head. Punching takes place when one or more punch solenoids are energized. The incremental motor first advances the tape one row (one increment), then the data on the channels is punched. Signals for synchronizing the punch solenoids and the incremental motor are obtained from the control circuits.

Operating cycle

Fig 4.4 The tape is first advanced one row between capstan (9) and pinch roller (10). When punch solenoid (1) is energized, its actuator (3) turns to move punch pin driver (5) in the direction shown by the arrow. The punch pin driver turns about shaft (6). Punch pin (7) is thus moved through punch pin guide (8) wherewith a hole is punched in the tape. When the punch solenoid is de-energized the punch pin and the punch pin driver are returned to their initial positions by extension spring (4). At its initial position, the actuator rests against 0-rings (2).

4.3 TAPE SUPPLY AND TAKEUP

Fig 4.5 Fig 4.5 shows the various components past which the tape moves. Smooth unwinding is assured by letting the tape loop around guide rollers (19, 20 and 21). Guide roller (19) is mounted on movable surge takeup arm (22) which is carried on the same shaft as the takeup and supply flanges. If tape is unwound to rapidly, the surge takeup arm moves in the direction shown by the arrow and actuates brake shoe (12) via link (11). The brake shoe is pressed against the supply flange, thus braking it until the surge takeup arm re-assumes its normal operating position. From the guide rollers, the tape runs through a slot in the right-hand sidewall and into the punch/feed unit where it passes between punch pin guide (8) and die (15), both in the punch head, and between the pinch roller and capstan.

Two surge takeup springs (13 and 16) and a spring-mounted tape guide (14) are provided on the punch/feed unit. The spring-mounted tape guide holds the tape at the correct position regardless of whether the punch is loaded with 5- or 8-track tape. (However the spring-mounted tape guide must be readjusted vertically to handle 6/7-track tape). At the left-hand sidewall, the tape forms a buffer loop around springloaded reversing buffer arm (17). This buffer permits the tape to be backspaced. Current to the winding motor is shut off during backspacing. From the reversing buffer arm, the tape spirals once around tape lifter (18) from which it

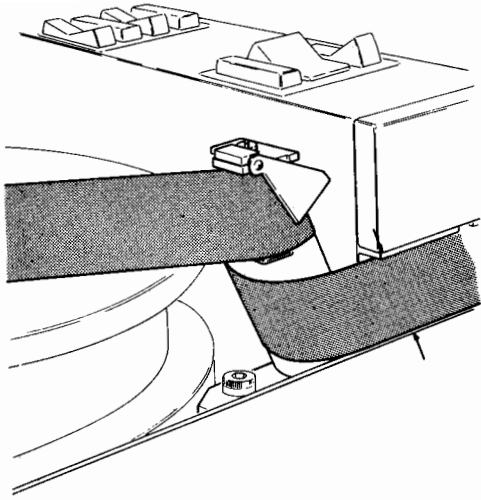


Fig 4.6 Tape lifter

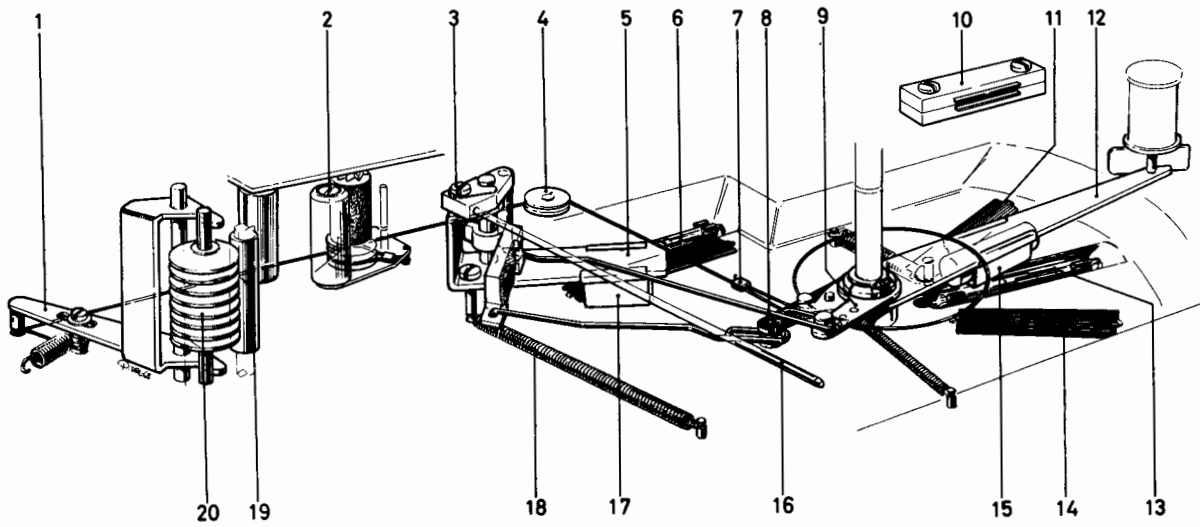


Fig 4.7 Tape check devices located beneath the supply flange. The parts at far left are incorporated into the tape feed mechanism

Fig 4.6

proceeds to the takeup flange. The tape lifter leans at an angle chosen to prevent the tape from running against the top or bottom edge of the tape slot in the left-hand sidewall. See Fig 4.6. The tape lifter is slightly roughened so that force exerted by the winding motor cannot affect the inter-row spacing on the tape. It is also provided with a tape tearer and with an adjuster for 5-track tape. The takeup flange is driven by winding motor (24) which presses against a rubber ring at the periphery of the flange. Switch (23) can change the direction of rotation of the winding motor. Power to the winding motor can be turned off with switch (25). The supply and takeup flanges are provided with expansion-type latches for securing tape coil cores.

4.4 TAPE CHECKS

Fig 4.7

Tape unwinding is checked automatically when three situations arise (see Fig 4.7):

- A. Tape ruptured
- B. Tape too tight
- C. Tape low (supply almost exhausted).

Situations A and B are handled by permanent magnet (15) that is located in its holder beneath surge takeup arm (12). This magnet actuates reed relay (13) within a sector that is bounded by shield plates (11 and 14). When the magnet is within this sector, the reed relay closes a circuit that provides one of the conditions for punching.

When situation A (tape ruptured) arises, surge takeup arm (12) moves toward shield plate (11), when the magnet leaves the working sector, reed relay (13) opens, therewith opening the aforesaid circuit and inhibiting the Punch Ready (PR) signal. In addition, the ERROR lamp on the control panel lights.

When situation B (tape too tight) arises, the surge takeup arm is forced toward shield plate (14); when the magnet leaves the working sector, reed relay (13) opens, therewith inhibiting the Punch Ready (PR) signal (as in situation A) and the ERROR lamp lights.

NOTE: Beginning with Facit serial number 6039990, manual punching from the control panel will override situations A and B without damaging the 4070.

In situation C (tape low) when a predetermined number of rows remains before end of tape, tape low sensor arm (16) provides an indication by lighting the TAPE LOW lamp on the control panel. Tape low sensor arm (16) is pressed against the periphery of the supply reel by spring (18). Adjusting screw (3) joins the tape low sensor arm with arm (5) on which is mounted permanent magnet (17). This magnet actuates reed relay (6).

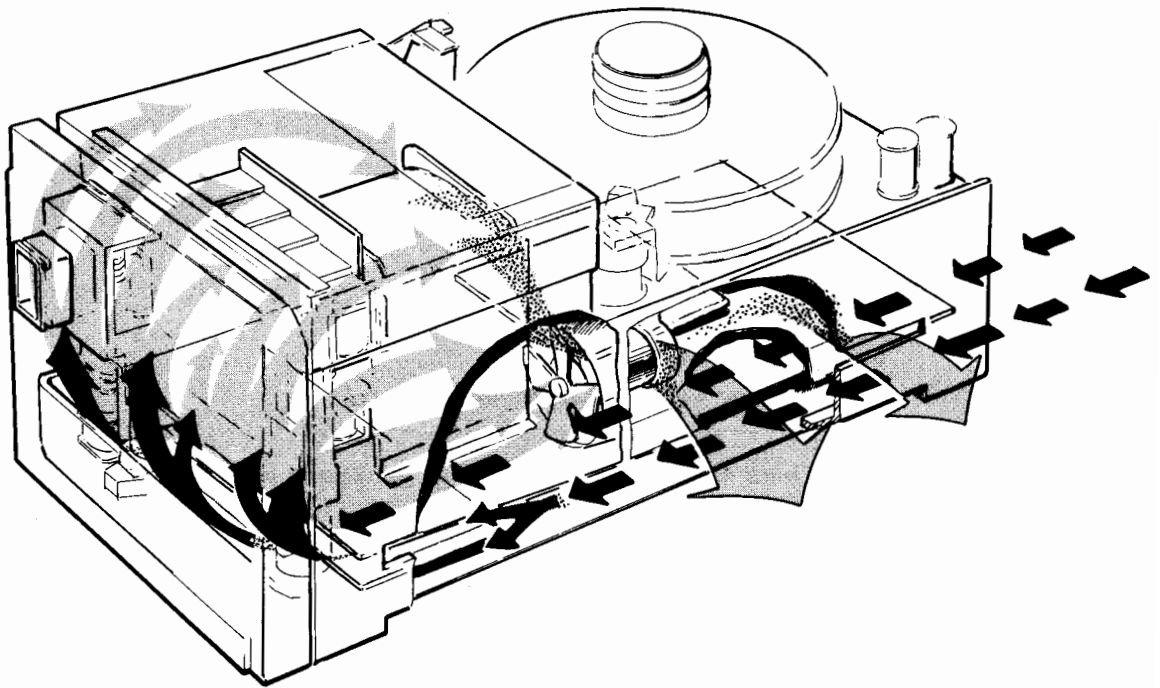


Fig. 4.8 Path taken by cooling air

As the tape is unwound, the tape low sensor arm moves gradually toward the centre, taking with its arm (5). When magnet (17) reaches a certain point, reed relay (6) closes the circuit that lights the TAPE LOW lamp on the control panel. The tape low indication can be adjusted from 1,000 to 10,000 rows before end of tape using screw (3).

Loading position

To load a coil of tape, surge takeup arm (12) must first be secured against retainer magnet (10). This will move tape low sensor arm (16) to one side [via lever (9) and link (8)], thus providing room for the coil of tape. In addition, wire (7) will be tensioned, thereby swinging out reversing buffer arm (2) and lifting pinch roller (20) away from capstan (19) via lever (1).

At this position the punch components are ready for loading tape.

4.5 COOLING

Fig 4.8

The circuit boards and the punch/feed unit are cooled by the motor-driven fan. Cool air is drawn in from the rear of the punch and sweeps across both sides of the control circuit board and the bridging board or system adaptation board, whichever is in use. See Fig 4.8.

When it reaches the punch/feed unit, the airstream is led past the punch solenoids and past the incremental motor. It then passes the fan motor and is blown out through crevices located on the two long sides of the punch.

Important: position the punch so that air can circulate freely to ensure satisfactory operation.

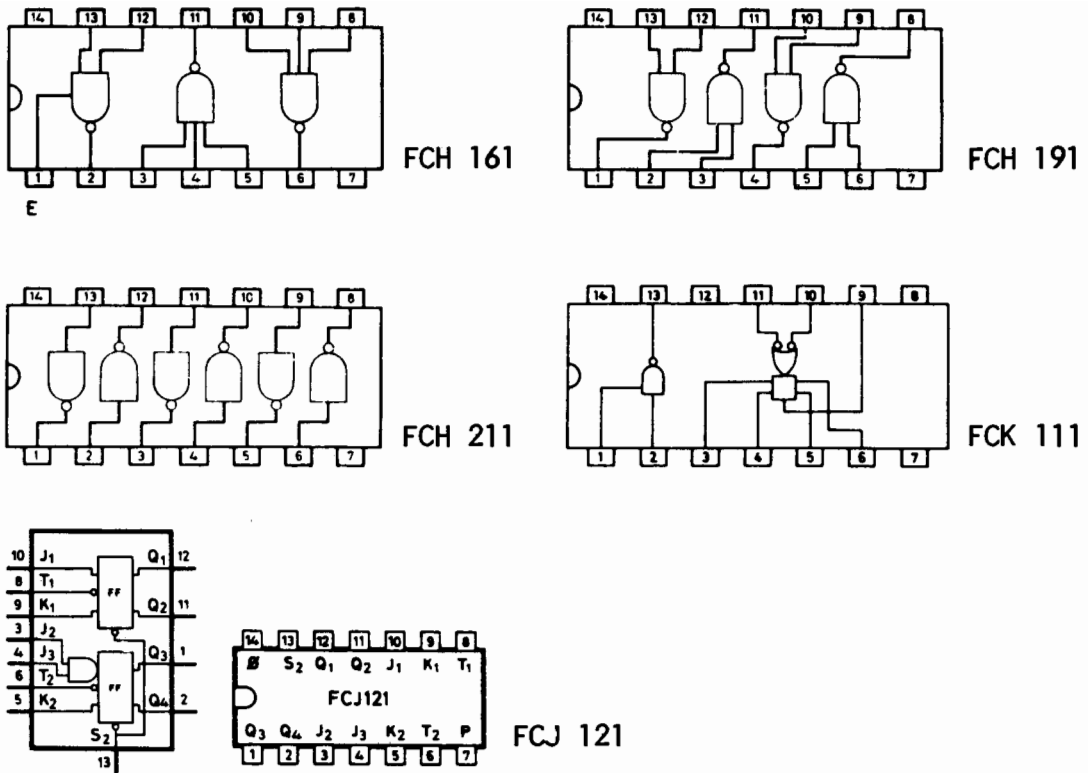


Fig 5.1 IC packages on the 4070. Logic diagrams and pin numbering

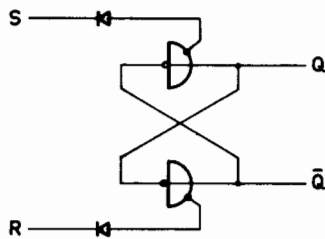


Fig 5.2 Circuit diagram of RS flip-flop with fan-in diodes

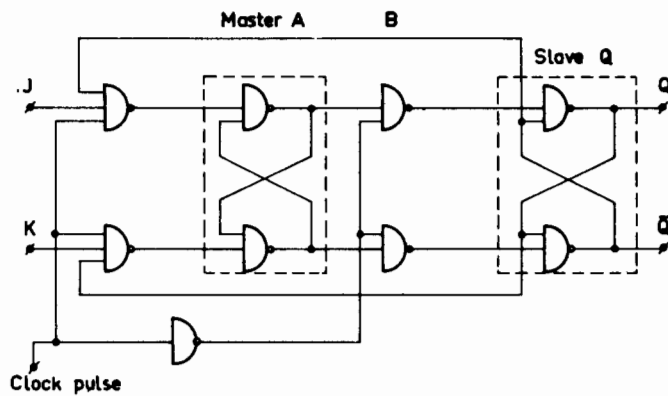


Fig 5.3 Circuit diagram of JK flip-flop

5 ELECTRICAL OPERATION

5.1 GENERAL

The logic circuits in the 4070 are built up of discrete components and IC packages. The voltage level of an active signal - a logical 1 - is positive.

5.1.1 Special circuits

Fig 5.1 The following types of integrated DTL circuits are used in the 4070. Fig 5.1 shows the logic diagrams and pin numbering.

- Type FCH 161 Triple 3-3-2-input NAND gate with expander input
- Type FCH 191 Quadruple 2-input NAND gate
- Type FCH 211 Sextuple inverter
- Type FCK 111 Monostable flip-flop
- Type FCJ 121 Dual JK master-slave flip-flop

Three types of IC flip-flops are used in the 4070:

1. FCK 111 - monostable flip-flop

The FCK 111 package contains a threshold triggered monostable flip-flop and a NAND gate with expander input.

2. RS flip-flop

Fig 5.2 The RS flip-flop comprises two cross-coupled gates. See Fig 5.2. The letters S and R mean set and reset. This threshold-triggered flip-flop changes state when the 1-setting or 0-setting pulse goes low (0 V).

3. JK flip-flop of master-slave type

Fig 5.3 IC package FCJ 121 contains two JK flip-flops. See Fig 5.3. The JK flip-flop comprises two pairs of cross-coupled NAND gates. One pair serves as memory element A (master); the other as memory element Q (slave). These elements are connected via a pair of gates. In addition, there are two input-signal gates designated J and K. Output Q is fed back to gate K; output \bar{Q} is fed back to gate J. The JK flip-flop can thus change state when signals are present at both inputs. The JK flip-flop is triggered by a clock pulse. It operates as follows:

	a	b	c	d	e	f	g	h	i	q
	H									L
	L									H
		H	H							H
		H	L							L
		L	H							L
		L	L							L
				H	H					L
				H	L					H
				L	H					H
				L	L					H
						H	H			L
						H	L			L
						L	H			L
						L	L			H
								H	H	L
								H	L	H
								L	H	H
								L	L	H

Fig 5.4 Truth table for symbols used on logic diagram in Appendix 2 and on circuit diagram in Appendix 3

Assume that input $J=1$, input $K=0$ and output $Q=0$. The leading edge of the clock pulse provides the low level at the output of the J gate, and the master flip-flop is 1-set. Information is now stored in the master flip-flop, and the input signals can be removed without changing its state. The trailing edge of the clock pulse, together with signals from the master flip-flop, provides the low level at the output of gate B and 1-sets the slave flip-flop, i.e. $Q=1$. If Q had been 1 previously, neither the master nor the slave flip-flop would have had to change state for the input signals assumed above.

If, instead, inputs $K=1$ and $J=0$, the JK flip-flop will be 0-set. If both J and $K=1$, the JK flip-flop will change state each time a clock pulse arrives. In such case, the JK flip-flop is controlled only via outputs Q and \bar{Q} . If both J and $K=0$, the JK flip-flop cannot change state.

Briefly, the master-slave flip-flop functions as follows:

1. Master flip-flop is isolated from slave flip-flop
2. Master flip-flop changes state
3. Master flip-flop is isolated from J and K inputs
4. Slave flip-flop changes state

5.1.2 Logic symbols

Positive logic is incorporated into the logic diagram. Circuits within IC packages are represented by logic symbols (positive logic) appearing on the circuit diagram. Fig 5.4 illustrates the functions represented by the various logic symbols.

5.2 DESIGNATIONS

Ch 1 - 9	Data signals on channels 1 - 9 (Channel 9 is for feed hole track)
PI	Punch instruction signal
SD	Stepping direction signal
	SD _f - forward feed
	SD _b - backspacing
PR	Punch ready signal
ERR 1	Error 1 signal
ERR 2	Error 2 signal
TL	Tape low signal
EXT	External signal
TF	Timing signal for tape feed

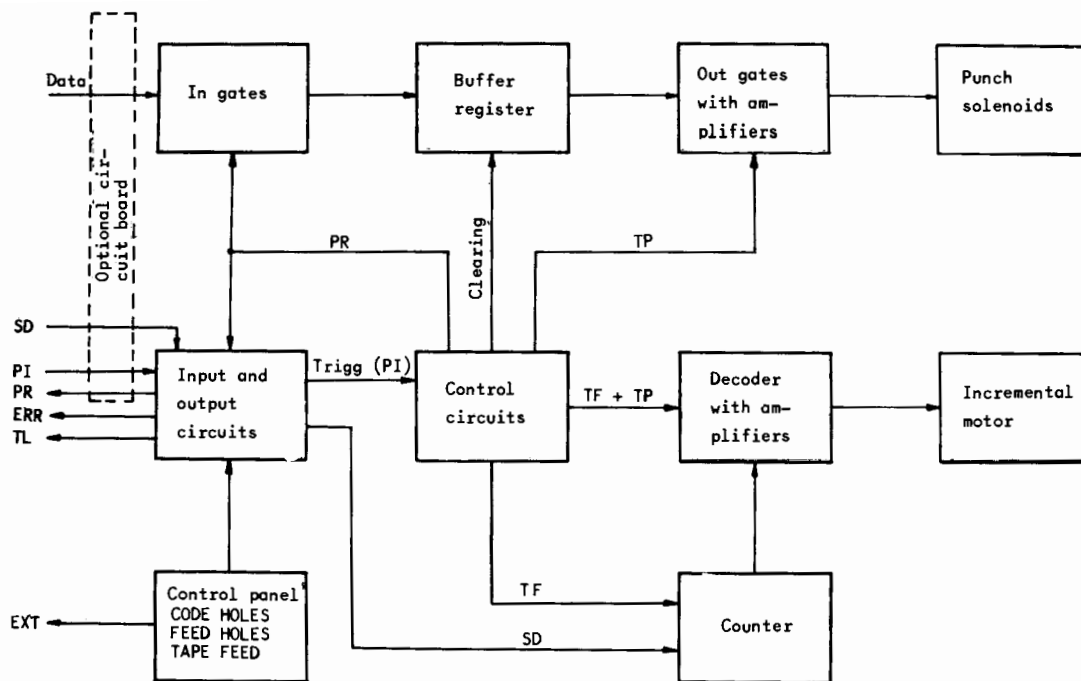


Fig 5.5 Block diagram of 4070

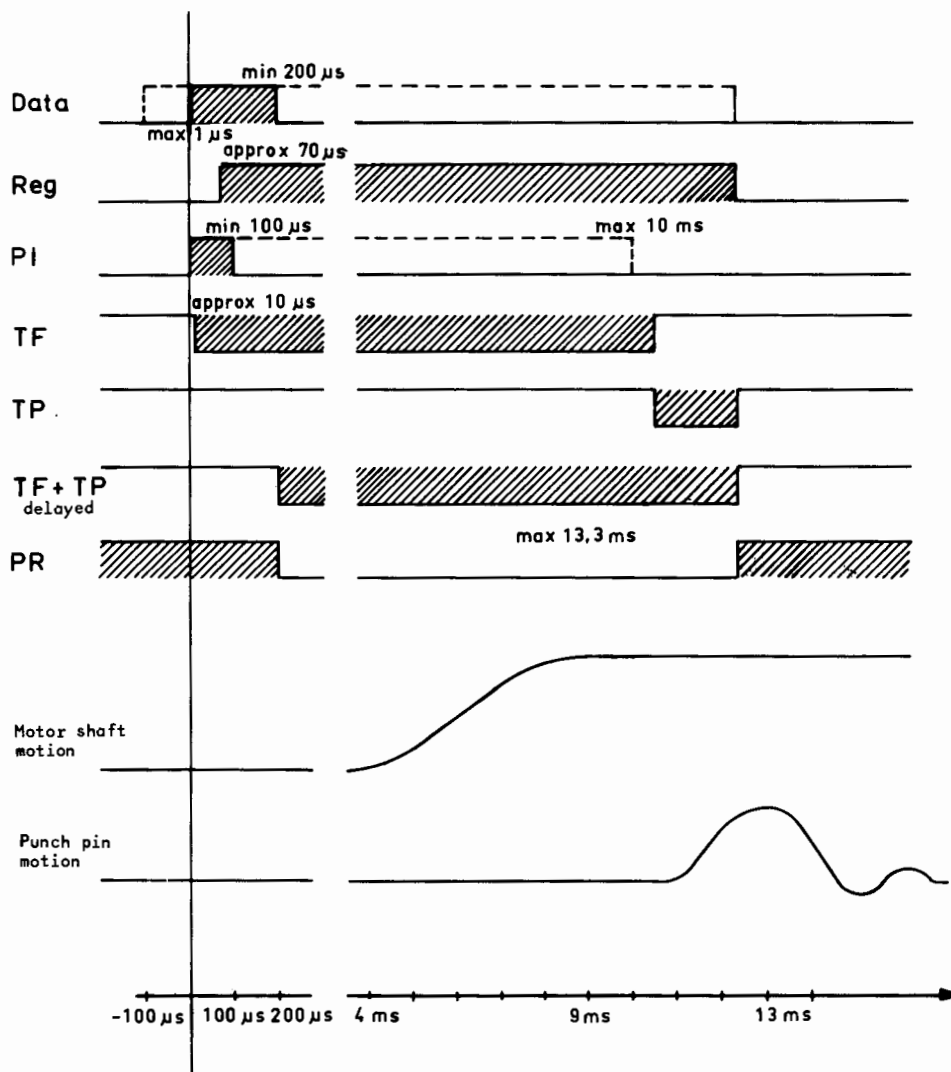


Fig 5.6 Timing diagram of punching cycle

TP	Timing signal for punching
FF-C1 and FF-C2	Counter flip-flops 1 and 2
MAN.FEED	Memory flip-flop for manual tape feed via control panel
LS	Level sensor flip-flop that monitors +24 V
PO	Power on signal

The logic description makes frequent references to the circuit diagram. IC elements mentioned in the description are designated by referring to their outputs. For example, the gate appearing below is referred to as IC7/1 (pin 1 on IC package 7).

Insofar as possible, symbol designations on the logic diagram correspond to those used in the circuit diagram.

5.3 STARTING THE PUNCHING CYCLE



Fig 5.5

The logic circuits can be divided up into functional blocks as shown in Fig 5.5. The upper blocks represent the route taken by the data; the lower blocks represent the circuits used to control the incremental motor and data output. The data proceeds via input gates to the buffer register which can store one row of information. It then passes through output gates provided with amplifiers for the punch solenoids. The buffer register is cleared after each row is punched. The control circuits comprise timing flip-flops FF-TF and FF-TP (See Appendices 2 and 3) and a 2-bit counter. The output signal from the counter is decoded and used to gate stepping pulses to the incremental motor.

Fig 5.6

The punching cycle comprises two phases: feed and recording. See Fig 5.6. Feed takes place during time TF (approx 10.5 ms); recording takes place during time TP (approx 1.85 ms). Power is supplied to the incremental motor during the entire punching cycle TF + TP. The motor thus keeps the tape stationary while it is punched. 200 μs after the data is entered into the buffer register, signal PR goes low and remains low until the row has been punched.

Signal PI triggers FF-TF via gate V42. IC201/11 goes high simultaneously, and as a result a trigger pulse can proceed to counter flip-flops FF-C1 and FF-C2. The TF signal is differentiated and triggers the counter flip-flops via IC6. When the PI signal vanishes, the inputs to the counter flip-flops are blocked, thus eliminating the effects of any unwanted pulses.

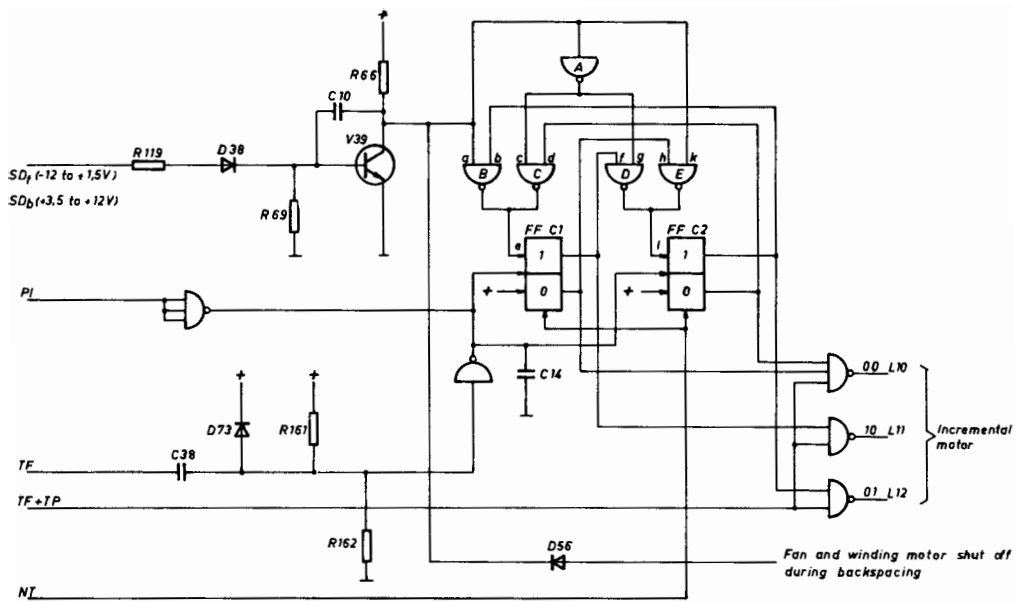


Fig 5.7 Circuit diagram of incremental motor counter

When FF-TF is triggered, test point S goes high. Transistor V45 therewith becomes conducting and gates out the signal from V42 via diode D45. Consequently, PI cannot trigger FF-TF again before the punching cycle is completed, i.e. when test point S goes low. Capacitor C35 located between the base and collector of V42, prevents signals having a duration of less than about 10 μ s from starting a punching cycle. When the collector of V45 goes low, the register inputs are opened and the character that is to be punched is entered into the register. Register flip-flops that are 1-set receive holding current via feedback resistors R10 - R18. 0-setting takes place when V45 is cut off.

Signal TF also triggers timing flip-flop FF-A1 which, in turn, triggers timing flip-flop FF-A2. The purpose of these flip-flops is to keep signal PP low for 13.3 ms, thus limiting the punching speed to 75 characters per second.

The signal from the timing flip-flops proceeds via OR circuit IC201 and a 200 μ s delay circuit to transistor V43. V43 becomes conducting and gates out data signals via diodes D1 - D9. Simultaneously, the gate used for the PI signal is closed via diode D46, and transistor V38 becomes conducting. The PR signal goes low and remains low during the entire punching cycle.

During time TF (and TP) the incremental motor steps one increment. See section 5.4 below.

When flip-flop FF-TF returns to the 0 state, flip-flop FF-TP is triggered. The TP signal (0 V) cuts off transistor V40, wherewith diodes D28 - D36 are blocked and the information in the register is gated to the punch solenoids. When FF-TP returns to the 0 state, V45 is cut off, wherewith the register is 0-set. When FF-A2 returns to the 0 state, V43 is cut off, wherewith signal PR goes high, thus indicating externally that the punch is ready to receive and punch a new character.

5.4 INCREMENTAL MOTOR CONTROL

The incremental motor windings receive signals from 2-bits counter FF-C1 and FF-C2. These signals are decoded in gating system IC1/6, IC4/1 and IC4/11. The signals are gated out during times TF + TP. See Fig 5.7

Flip-flops FF-C1 and FF-C2 are JK flip-flops. The way in which they operate is described in section 5.1.1. The counter is triggered by the leading edge of signal TF. It can count to 3, either up or down, depen-

ding on the polarity of condition SD. For forward feed, the counter assumes states 10, 01, 00, 10 etc. As a result, the windings in the incremental motor are energized in ascending sequence L11, L12, L10 etc. For backspacing, the counter assumes states 01, 10, 00, 01 etc. Consequently, the windings are energized in descending sequence L12, L11, L10 etc. See tables on page 5.5

Table 1 - forward feed (10, 01, 00)

Trigger pulse (TF)	Condition a b e	State of FF-C1	Condition h k l	State of FF-C2	Energized motor winding
1	H L H	0	H H L	0	L10 *) initial pos.
2	H L H	1	L H H	0	L11
3	H H L	0	H H L	1	L12
4	H L H	0	H H L	0	L10 initial pos.
5	H L H	1	L H H	0	L11

H = high level. L = low level.

Gates C and D are blocked during forward stepping, SD_f, (inputs c and g obtain the low level via inverter A). This means that the polarity at points e and l is determined by the output signals from gates B and E respectively.

*) When the counter is at its initial state (00) the motor is at its L10-energized position. The motor thus steps to its L11-energized position when the trigger pulse 1 changes the counter state to 10.

Table 2 - backspacing (01, 10, 00)

Trigger Pulse (TF)	Condition c d e	State of FF-C1	Condition f g l	State of FF-C2	Energized motor winding
1	H H L	0	L H H	0	L10 initial pos.
2	H L H	0	L H H	1	L12
3	H H L	1	H H L	0	L11
4	H H L	0	L H H	0	L10 initial pos.
5	H L H	0	L H H	1	L12

Pulses from the counter are sent via the amplifier (V49 - V51) to a) the incremental motor which steps one increment for each pulse and b) the winding motor and fan motor via the pulse-prolonging circuit C24 and R113. For backspacing diode D56 becomes conducting via transistor V39, whereupon power to the winding motor and fan motor is shut off.

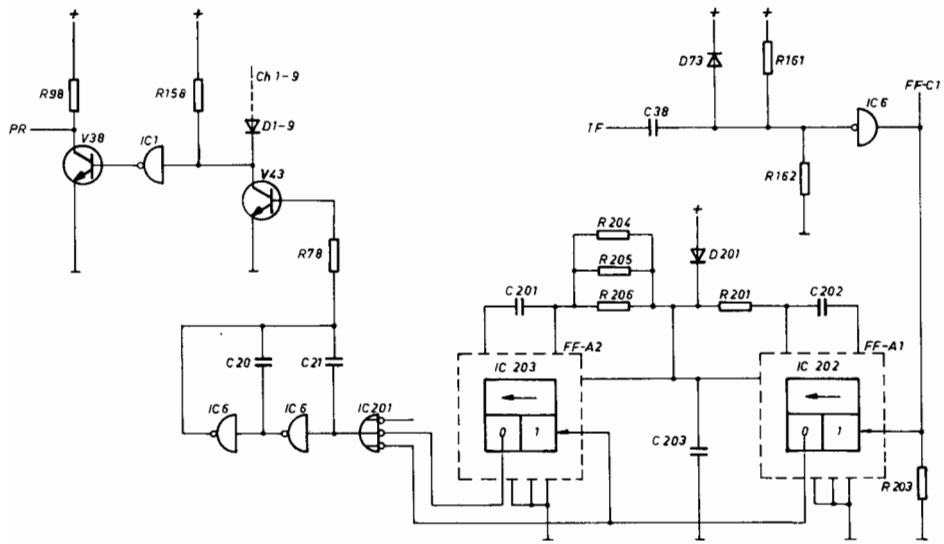


Fig 5.8 Circuit diagram, max. velocity control

Stepping to the initial position

When the power is turned on, the counter flip-flops are always set to state 00 by "power on" circuit V 65. State 00 - the initial state - corresponds to the L10-energized position of the incremental motor.

The position of the incremental motor when the power is turned off is unpredictable. To prevent a backspace when starting up, it is necessary to step the motor to its initial position when the power is turned off. This is accomplished as follows:

When the +24 V supply drops beneath approx +19.0 V, the level monitor flip-flop V56 and V57 is 1-set, whereupon the level at test point T becomes high. Transistor V43 thereupon becomes conducting and gates out data signals and PI signals via diodes D1 - D9 and D46. In addition, one condition is met at gate IC7/8. The gate opens if the counter is at state 10 or 01, herewith 1-setting the MAN.FEED flip-flop via diode D41 and 1-setting buffer register flip-flop 9 via diode D67. This flip-flop is for the feed hole track. Flip-flop FF-TF is triggered via gate IC7/1 when the MAN.FEED flip-flop is 1-set. The incremental motor steps until the counter has reached state 00, after which gate IC7/8 is blocked when the output of gate IC4/4 goes low. When the last punching cycle is finished, the voltage at test point S goes low, and as a result the MAN.FEED flip-flop is 0-set via diode D51. The shutting off of the DC voltage (see section 5.9.1) is inhibited while the motor is being stepped to its initial position. The incremental motor and DC voltage regulator are supplied from filter capacitors C1 and C2 in the power supply during this inhibition interval. See Fig 3.1 and Appendix 4.

5.5 PUNCHING THE MARK CHARACTER

Fig 5.8 The mark character is programmed using diodes D19 - D27 on the control circuit board (see Fig 5.8). Tape punched with the mark character is fed out when the CODE HOLES button is depressed. This 1-sets the flip-flops corresponding to the mark character bits in the buffer register and also 1-sets the MAN.FEED flip-flop, wherewith the counter and motor are stepped in the aforesaid manner.

When the MAN.FEED flip-flop is 1-set, diode D55 is cut off. Transistor V47 then obtains base current from the common point in the motor amplifiers via R102, D52, R111 and D54. When the motor pulse has vanished, capacitor C23 discharges via R111 and D54, and as a result V47 is kept conducting for approx an additional 7 ms. The signal from the collector of V47 triggers FF-TF and the counter via gate IC7/1, whereupon a new punching cycle commences. The punching speed is approx 50 rows per second.

5.5.1 Coding the mark character

The control circuit board is programmed for an all-hole mark character at the factory (usually used as a delete character to overpunch erroneous rows). If some other mark character is desired, the circuit board must be re-programmed. This is accomplished by removing diodes for the tracks where no hole is to be punched.

The nine tracks are programmed using the following diodes:

Track 1 corresponds to diode D19					
"	2	"	"	"	D20
"	3	"	"	"	D21
"	4	"	"	"	D22
"	5	"	"	"	D23
"	6	"	"	"	D24
"	7	"	"	"	D25
"	8	"	"	"	D26
"	9	"	"	"	D27

Fig 5.9 The location of these diodes on the control circuit board is shown in large print in Fig 5.9.

5.6 FEEDING OUT BLANK TAPE

Blank tape (feed holes only) is fed out when the FEED HOLES button is depressed. This operation is identical with mark character punching with one exception: only buffer register flip-flop 9 is 1-set (via diode D67).

5.7 FEEDING OUT VIRGIN TAPE

Virgin tape (no holes at all) is fed out when the TAPE FEED button is depressed. The feed operation is the same as for mark character punching.

5.8 TAPE CHECKS

Tape unwinding is checked with regard to:

1. Tape ruptured - provides tape error indication
2. Tape too tight - provides tape error indication
3. Tape about to run out - provides tape low indication

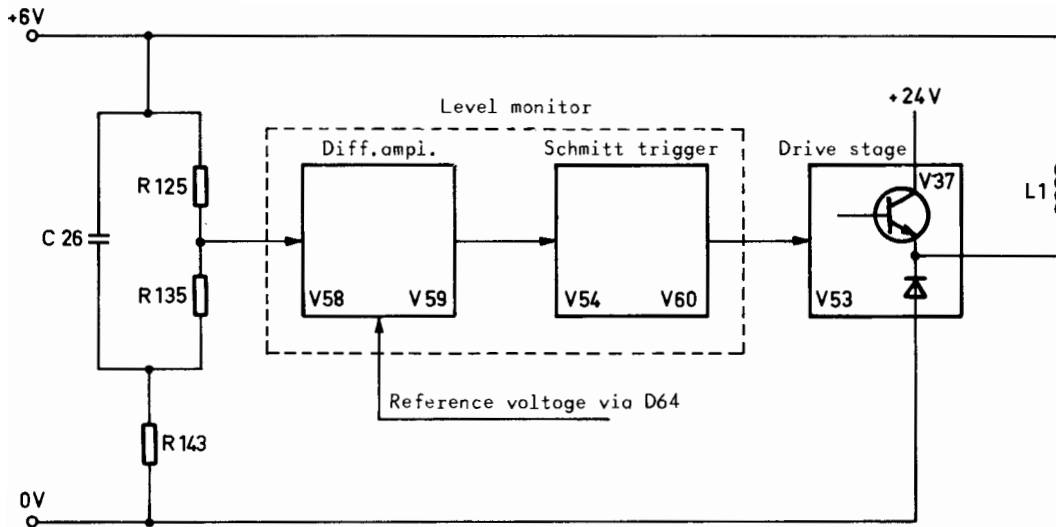


Fig 5.10 Schematic diagram of DC voltage regulator

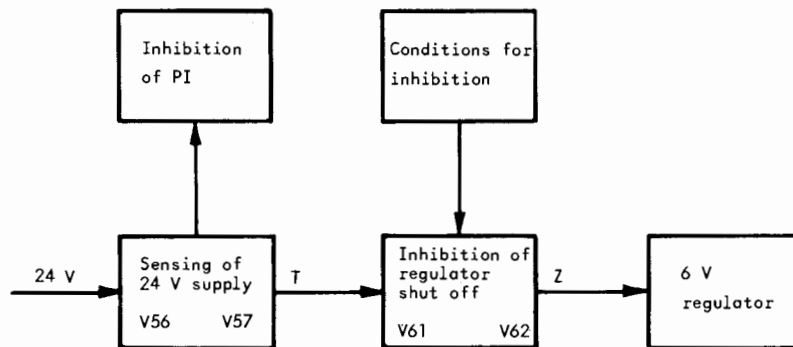


Fig 5.11 Block diagram for regulator shut off inhibition

If the tape breaks or is under too much tension, reed relay S8 opens (see Appendix 2, lower left-hand corner). Since base current can flow through R108, transistor V64 becomes conducting, whereupon the ERROR lamp on the control panel is supplied with current via pin A17. Signal PR goes low, thus indicating that the punch is not ready for punching.

Reed relay S9 closes when the tape is about to run out, whereupon the TAPE LOW lamp on the control panel lights.

5.9 DC VOLTAGE REGULATOR

Fig 5.10 The DC voltage regulator generates and regulates the +6 V supplied to the logic circuitry. See schematic diagram in Fig 5.10. In principle the +24 V supply is switched on and off at a rate that provides the desired +6 V.

The regulator comprises a level monitor made up of differential amplifier V58 and V59 and Schmitt trigger V54 and V60 together with a drive stage V37 and V53. The drive stage is supplied with +24 V from the power supply. The level monitor controls the drive stage by sensing +6 V via resistor bridge R125, R126, R135 and R136. Capacitor C26 and resistor R143 are connected up in parallel across the +6 V load. When the voltage across this circuit drops just below +6 V, the drive stage is actuated via the level monitor. (R143 senses rapid variations in the output voltage). Current through the drive stage and coil L1 charges capacitor C26, and when the voltage across C26 rises to approx +6 V the drive stage is cut off. The pulse frequency of approx 35 kHz varies somewhat with the load.

5.9.1 DC voltage regulator shutoff

Fig 5.11 The DC voltage regulator for +6 V is shut off when the +24 V supply drops beneath approx +19.0 V. Voltage is sensed by transistors V56 and V57. When the voltage at the base of V56 drops beneath approx +5.5 V, V56 (and therewith V57) become conducting. The voltage at test point T goes high and cuts off the differential amplifier via diode D63. See Fig 5.11. If the +24 V supply drops while a punching cycle is under way or while the incremental motor is not at its initial position, voltage shutoff is inhibited until the punching cycle has been completed and the counter reaches its initial position. The inhibition circuit comprises transistors V61 and V62. For inhibition, V61 becomes conducting and blocks diode D63. When inhibition ceases, V61 is cut off. V62 then becomes conducting and helps to cut off V61.

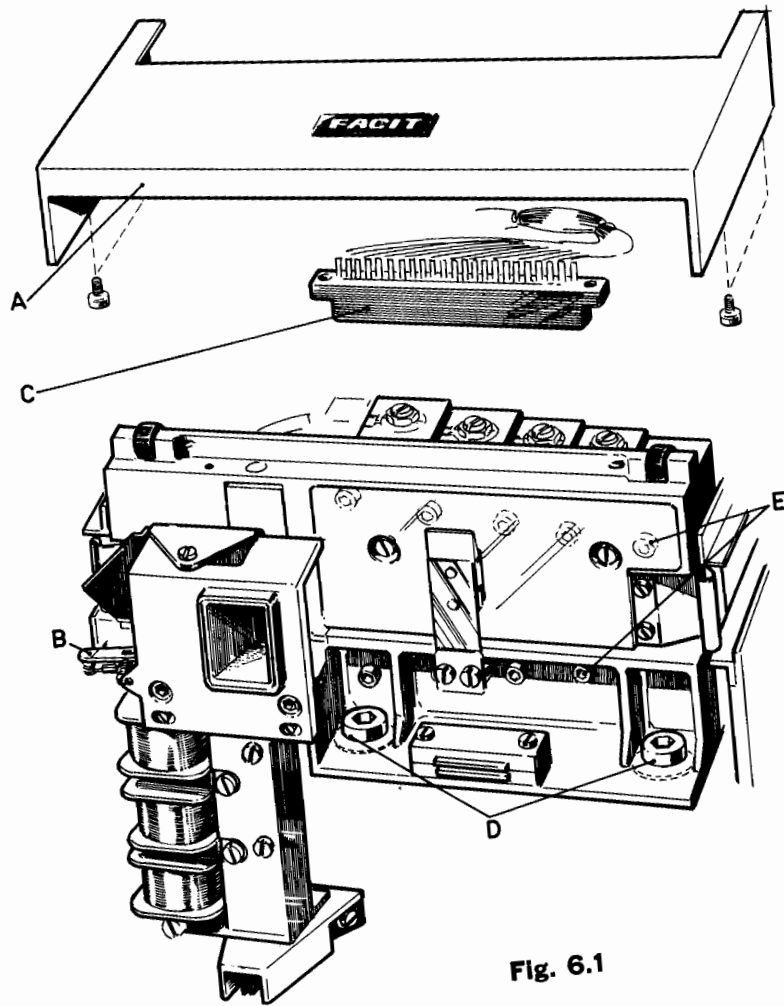


Fig. 6.1

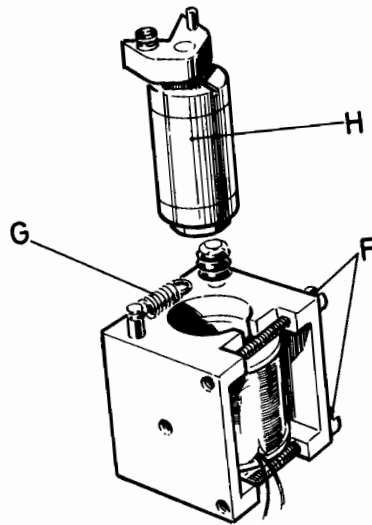


Fig. 6.2

6 SERVICE

The chapter on service is divided into five sections: MECHANICAL CHECKS AND ADJUSTMENTS, CHECKING PRINTED CIRCUIT BOARDS, FAULT TRACING, PERIODIC SERVICING and LUBRICATION INSTRUCTIONS.

Section 6.1 is written in the imperative mood. The steps to be taken are numbered and refer to a particular illustration. The number of the illustration (Fig) appears in the left-hand margin. It is intended that this section is used as a reference when consulting the fault tracing and periodic servicing sections.

The special tools and instruments needed to service the 4070 are listed in Chapter 10 of the spare parts catalogue. Here they are numbered, using Roman numerals.

6.1 MECHANICAL CHECKS AND ADJUSTMENTS

A. Removing punch/feed unit

- Fig 6.1
1. Unscrew and remove protective cover A.
 2. Unhook the wire from arm B.
 3. Remove connector C from the punch/feed unit.
 4. Remove screws D and carefully lift out the punch/feed unit.

B. Disassembling and checking punch solenoid

- Fig 6.2
1. Remove retaining screw E for the solenoid(s) that are to be checked.
 2. Loosen screws F.
 3. Unhook spring G and press out solenoid armature H.
 4. Check that the spring attachments are not defective.
Remedy: Replace the spring attachments.

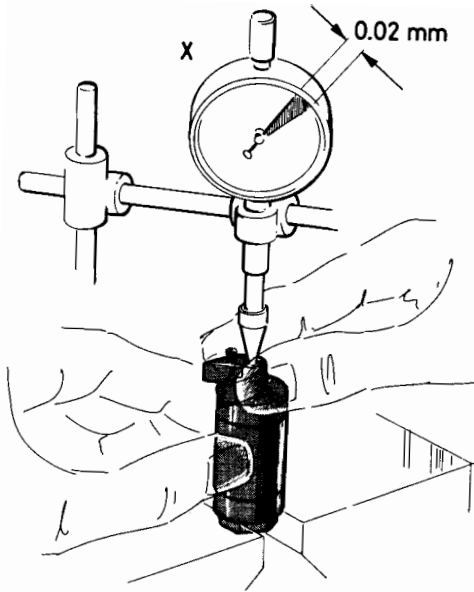


Fig. 6.3

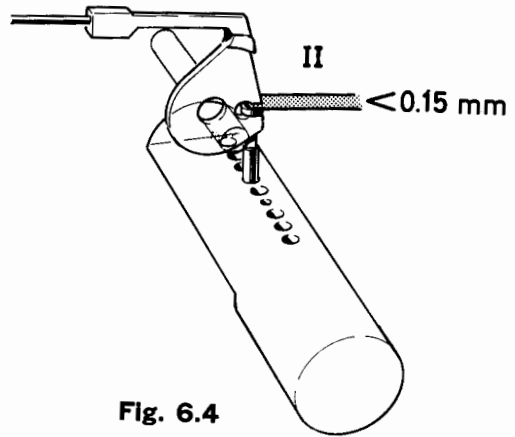


Fig. 6.4

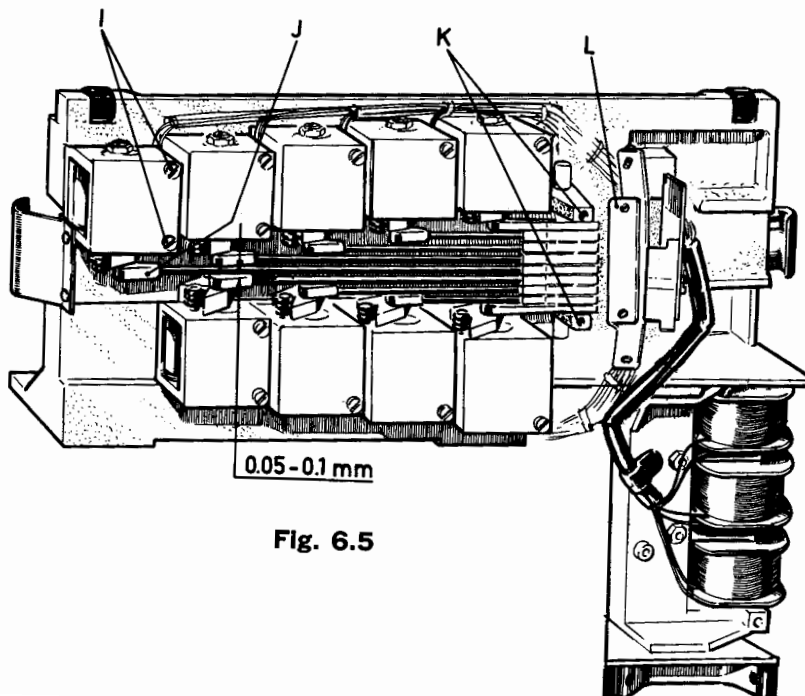


Fig. 6.5

Fig 6.3

5. Check that the axial play does not exceed 0.02 mm.
Remedy: Replace solenoid armature.
6. Check that the actuator rotates easily and that it does not bind when depressed.
Remedy: Replace solenoid armature.
7. Check that the spring eyes G are not defective.
Remedy: Replace the spring G.

C. Assembling punch solenoid

1. Press the solenoid armature into the solenoid.
2. Hook spring G in place making certain that the spring eyelets assume the correct positions in the slots on the spring attachments.

D. Checking punch pin drivers

Fig 6.4

1. Using feeler gauge II, check that the play between the punch pins and the punch pin drivers is less than 0.15 mm.
Remedy: Replace punch pin drivers having excessive play and defective punch pin drivers.

E. Replacing punch pin drivers

Fig 6.5

1. Remove the punch solenoid for the punch pin driver that is to be replaced.
2. Loosen stop screws K for the punch pin driver shaft and press out the shaft. These stop screws are accessible after bracket L has been removed.
3. Replace the punch pin driver.
4. Press in the punch pin driver shaft, tighten stop screws K and replace bracket L.
5. Carry out steps F1 through F10 (see below).

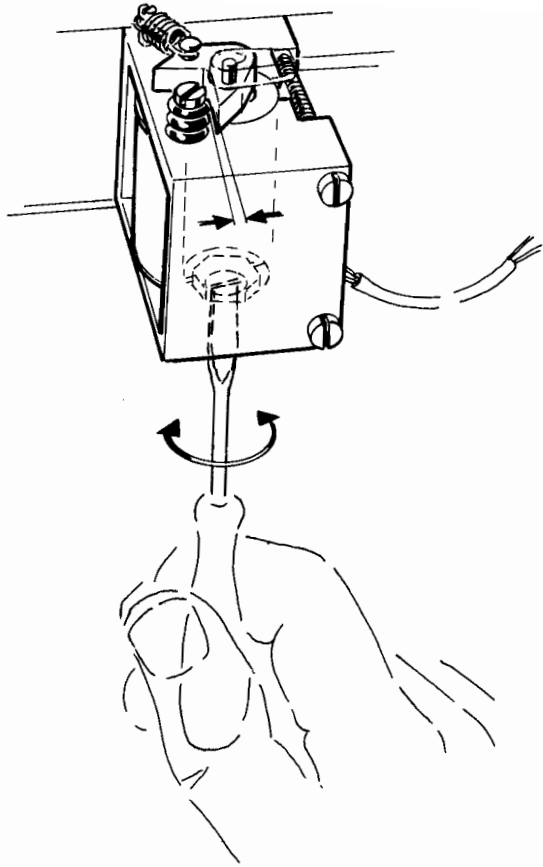


Fig. 6.6

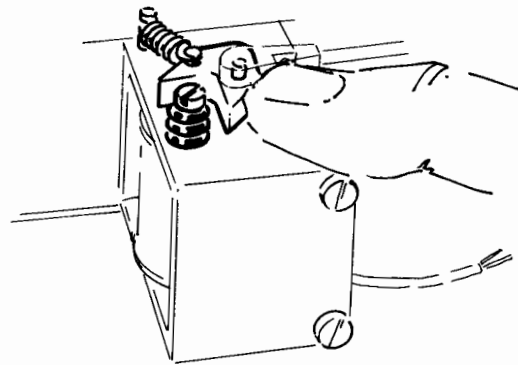


Fig. 6.7

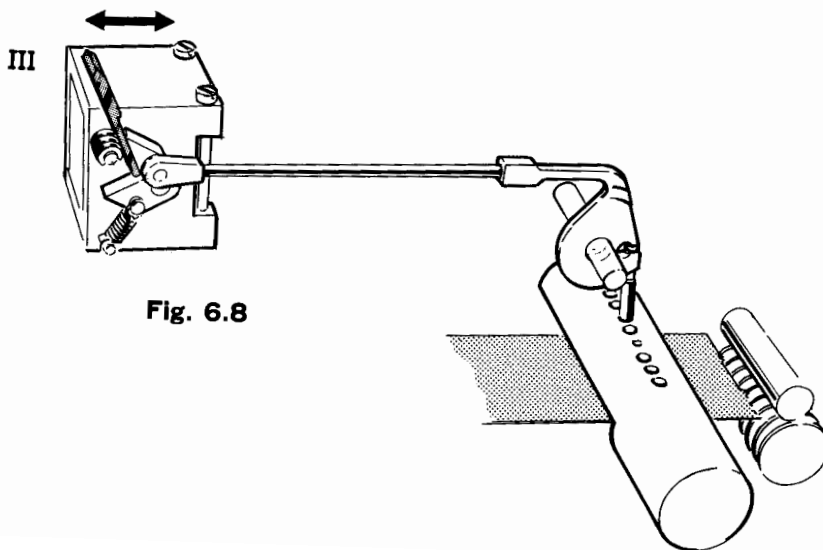


Fig. 6.8



F. Fitting and adjusting punch solenoid

- Fig 6.6
1. Screw the punch solenoid onto the punch/feed unit. Make sure that the pin on the actuator fits into punch pin driver J.
 2. Adjust the solenoid armature axially in the solenoid until there is a clearance of 0.05-0.1 mm between the punch pin driver and the adjacent actuator.
- Fig 6.7
3. Connect a DC voltage to the solenoid coil and adjust so that a current of 1.0 A \pm 5% runs through the coil.
 4. Turn the solenoid core using a screwdriver until the actuator just leaves its resting position on the O-rings.
 5. Tighten screws I.
- Fig 6.8
6. Adjust the DC voltage connected to the solenoid coil so that a current of 2 A \pm 5% runs through the coil.
 7. Check that the actuator turns through its full stroke and contacts the O-rings. (A very small clearance between actuator and O-rings is permissible.)
 8. Use your finger to press the actuator back from the O-rings. If properly adjusted you should feel an abrupt reduction in force as the actuator is pressed back to its initial position.
Remedy: Loosen screws I and repeat from step F3 with the adjustment position slightly changed.
NOTE: When testing with current flowing as in steps F3 and F6, the current shall only be allowed to flow for short intervals so that the coil will not overheat.
 A stabilized DC power supply that provides 0 - +6 V and 2 A is recommended.
 9. Check the axial play as instructed in F2. If adjustment is necessary, F3 to F8 must be re-checked.
 10. Tighten screws I.
 11. Insert a piece of 0.1 mm paper tape between the punch pin guide and the die.
 12. Insert feeler gauge III between the actuator and the O-rings. Use the 1.85 mm end of the gauge for data tracks and the 2.0 mm end for the feed hole track.
 13. Adjust the longitudinal position of the solenoid until punch pin presses the tape lightly against the die without cutting into the tape. Move feeler gauge III lightly back and forth as adjustment proceeds, to achieve a stable position against the O-rings. Lift the pinch roller and check by moving the tape back and forth.
 14. Tighten the punch solenoid retaining screw.
 15. Re- check the adjustment as instructed in step F7.
 16. Remove the feeler gauge.

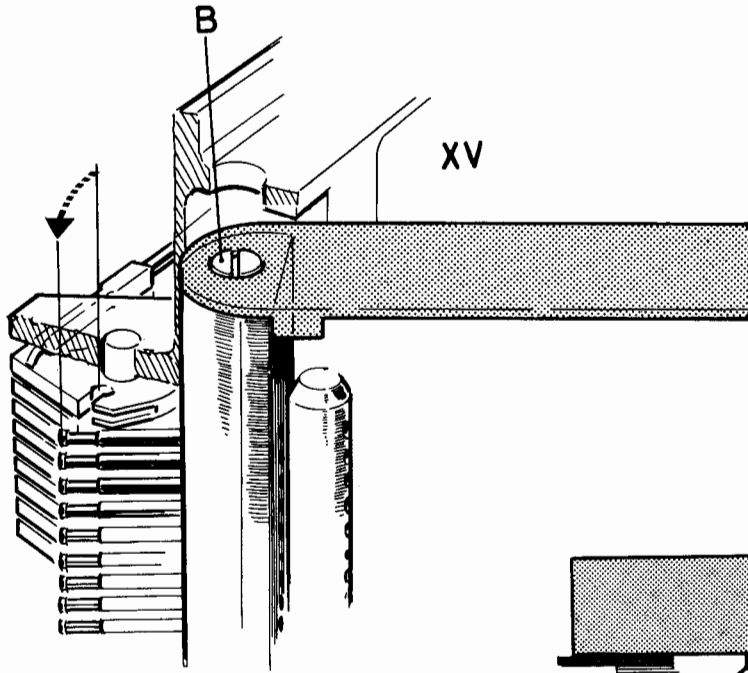


Fig. 6.9

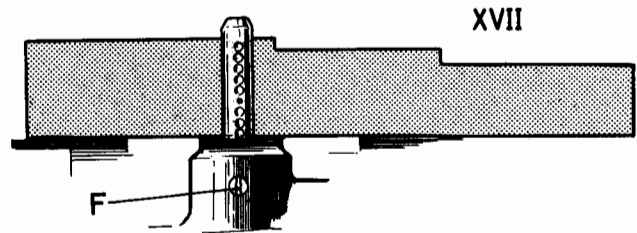


Fig. 6.10

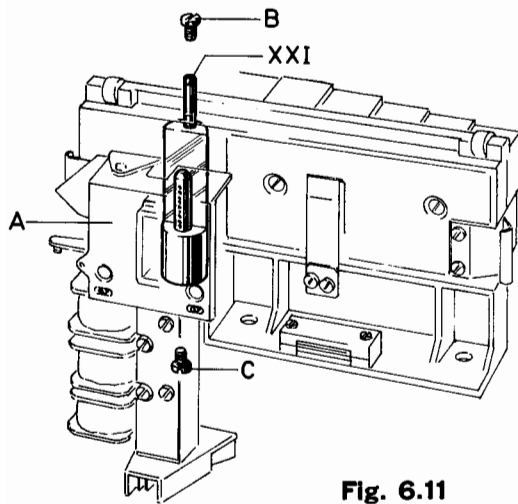


Fig. 6.11

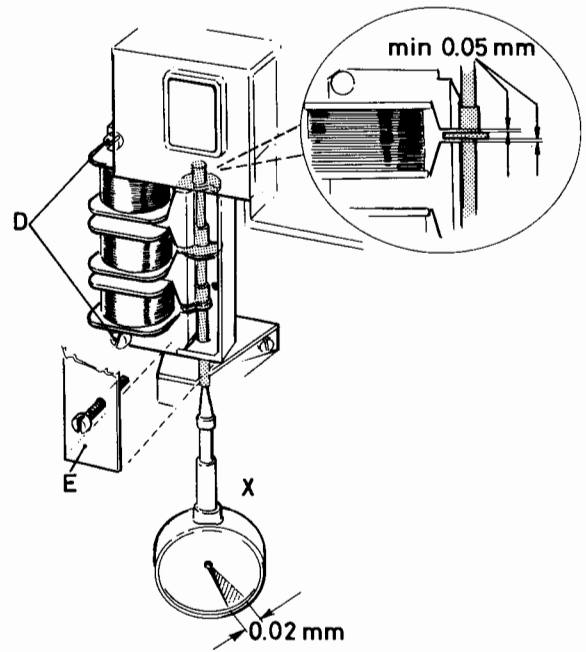


Fig. 6.12

G. Replacing punch head

1. Unscrew and remove the incremental motor and cover A as shown in Fig 6.11. See that the chad exhaust is not pulled along when cover A is removed.
2. Loosen lock screw F. See Fig 6.10.
3. Position special tool XV on the punch pin guide and loosen screw B about 1 mm to provide guidance for the tool.
4. Turn the punch head with tool XV until the punch pins disengage the punch pin guides.
5. Remove the punch pins. NOTE: Be sure to remember their track sequence if they are to be used again in the old punch head.
6. Press out the old punch head and insert a new one.
7. Turn the punch head and insert the pins which accompanied it (note that the pins are matched with the holes in the punch head).
8. Turn the punch head until the punch pins engage their punch pin drivers.
9. Align the reference surfaces of the punch pin guide and the punch/feed unit using tool XVII.
10. Lock the punch head using lock screw F.
11. Screw out and remove screws B and C on the punch head and check that there is grease - Rocol MT 320 - in the punch pin guide.
Lubrication: Position grease nipple XXI as in Fig 6.11. Insert grease tube in nipple and pinch tube to press in grease. Continue pressing until all old grease is forced out on the other side. Remove excess grease and replace screws B and C.
12. Repeat steps F11 through F16.
13. Punch a bit of tape by turning the solenoid armatures manually. Check that the feed hole is 9.96 ± 0.1 mm from the reference edge.

H. Checking incremental motor

1. Remove protective plate E.
2. Check that the axial play of the motor shaft does not exceed 0.02 mm.
Remedy: Replace the motor mount.
3. Supply approx 1 A to each individual motor winding in sequence.
4. While the current is flowing, check that the clearance between the individual vanes and the stator is not less than 0.05 mm.
Adjustment: Loosen screws D. Then make a rough adjustment by inserting two feeler gauges having sequential thicknesses (0.07 and 0.08 mm for example) on each side of the vane closest to the punch/feed unit so that play between stator and vane is entirely taken up. Press the stator and motor mount together and tighten screws D. Repeat steps H3 and H4. Try to have the two air gaps between stator and vane as equal as possible.

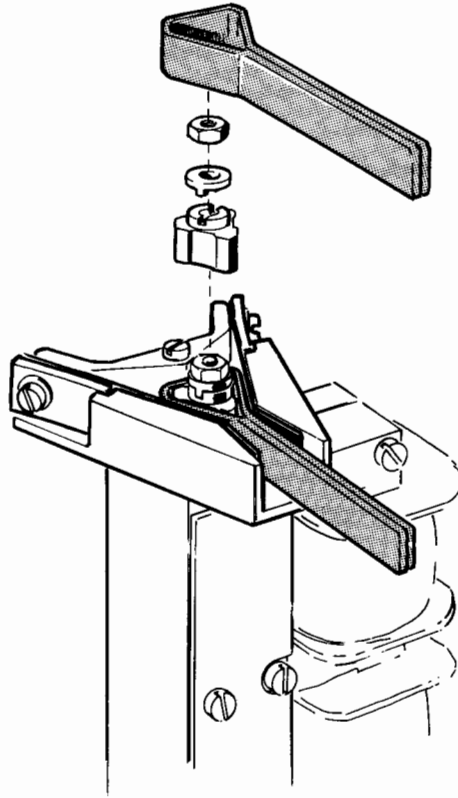


Fig. 6.13

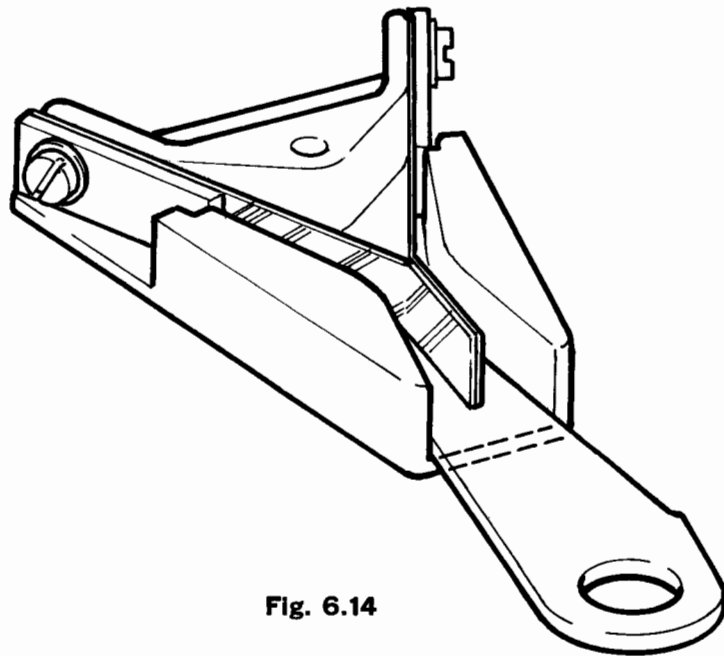


Fig. 6.14

5. Check that the pinwheel, brake shoe and vanes have not turned relative to each other.
Remedy: Replace motor mount.
- Fig 6.13 6. Check that feeding accuracy between adjacent rows is better than 3%.
Remedy: Replace brake shoe S as instructed below.

Replacement procedures:

1. Fit the holding tool on the brake shoe as indicated in the figure.
2. Unscrew nut 10.110.309.00 carefully. Remove locating washer 11.491.890.00 and brake shoe 15.035.901.10.
3. Mount the new brake shoe. Kindly observe that it fits only in one position due to the fact that the locating slot is placed un-symmetrically.
4. Fit the locating washer observing the same as in point three (3).
5. Fit the nut and tighten it carefully.
6. Remove the holding tool and check and adjust as described in "Checking motor brake".

I. Checking motor brake

- Fig 6.14 1. Turn brake shoe A and check that springs B do not touch the brake housing at point C.
2. Check that springs B do not contact the dust washer inside the brake shoe.
- Adjustment: Insert a feeler gauge 11.587.440.00 (1.1 ± 0.1 mm) as to Fig 6.14. Loosen the retaining screws holding the brake springs and adjust the springs. Tighten the retaining screws and remove feeler gauge and repeat checks 1 and 2.

If the brake housing has been removed from the motor mount or the brake shoe has been replaced, the brake housing must be positioned correctly relative to the electrical zero position of the motor shaft. Supply approx. 1A to the motor winding L-10 and tighten the brake at the position assumed by the brake shoe.

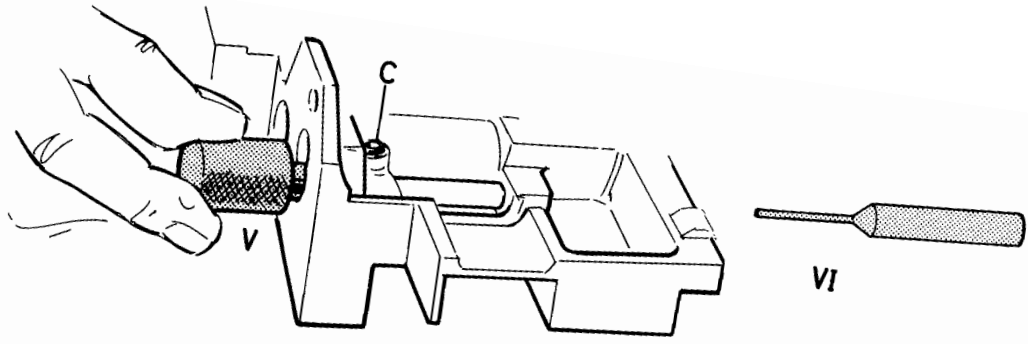


Fig. 6.15

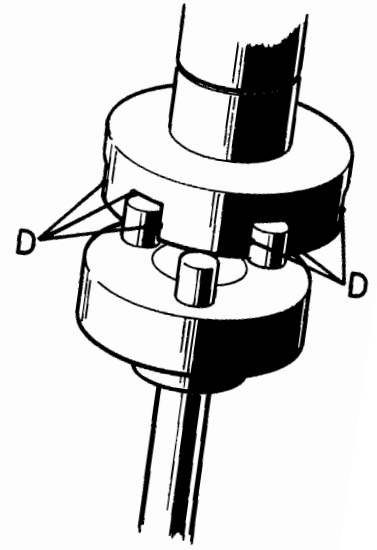
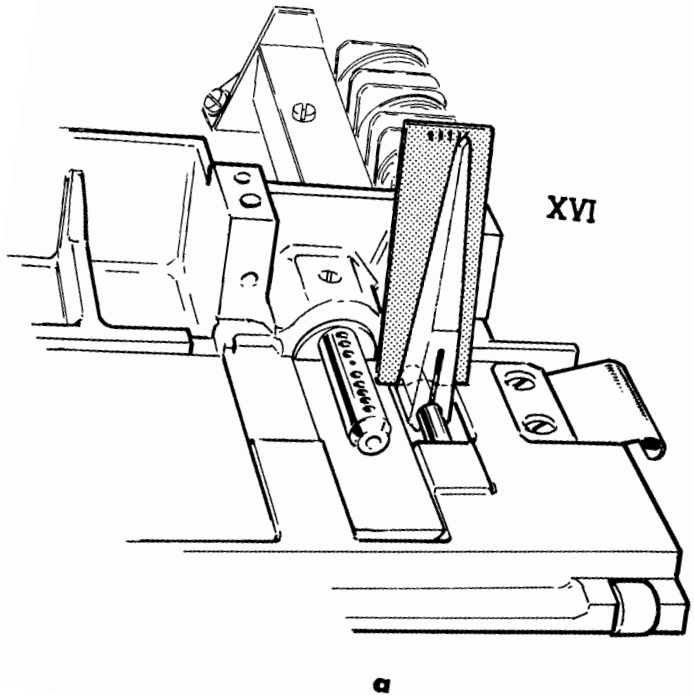


Fig. 6.16

a

b

J. Checking and replacing capstan

- Fig 6.15
1. Remove the incremental motor and cover A (Fig 6.11) and check that the capstan rotates easily. See that the chad exhaust is not pulled out when cover A is removed.
Remedy: Replace capstan as instructed below.
 2. Loosen lock screw C.
 3. Press capstan out carefully using mandrel VI.
 4. Press in the new capstan manually.
 5. Press in the capstan to its correct position using mandrel V.
 6. Tighten lock screw C.
 7. Check that the capstan rotates freely.

K. Checking transmission between incremental motor and capstan

- Fig 6.16
1. Using gauge XVI, check that the radial play of the capstan does not exceed 2°. Check at all 6 positions.
Explanation: This check is important to assure correct inter-row spacing. If play is present the reason can be
 - a. the pinwheel and brake shoe have turned relative to each other
 - b. the motor brake is incorrectly positioned relative to the electrical zero position of the motor shaft
 - c. the slotted wheel on the capstan is worn.Adjustment: a. replace motor mount, b. see last sentence under adjustment in section I above or c. replace capstan.
 2. Unscrew and remove the motor brake.
 3. Lift the pinch roller away from the capstan.
 4. Turn the motor shaft using a screwdriver and check that the transmission does not bind.
Adjustment: Unscrew the motor mount, disengage from capstan wheel, turn the motor shaft 120° or 240°, re-engage and assemble. If it still binds, replace the capstan. When replacing capstan, check that there are no fins or mould marks at D (6 grooves). See Fig 6.16b. If binding persists after capstan is replaced, the motor mount must be replaced.

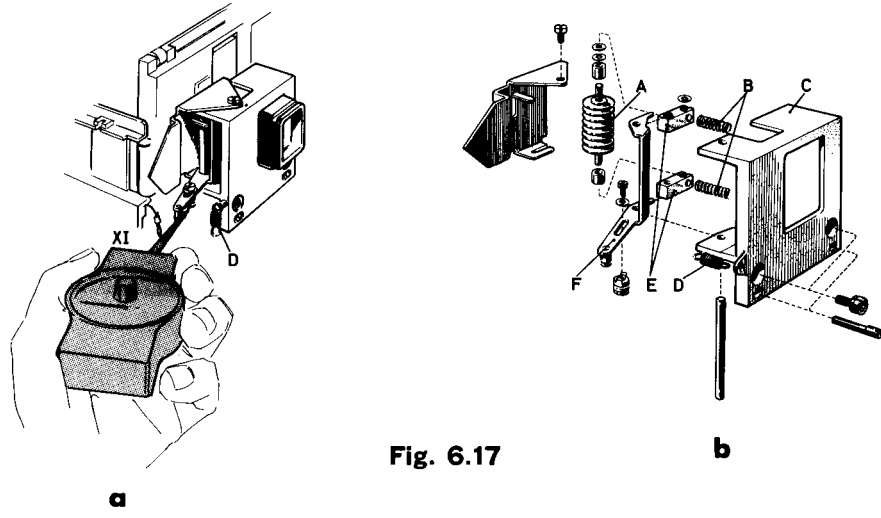


Fig. 6.17

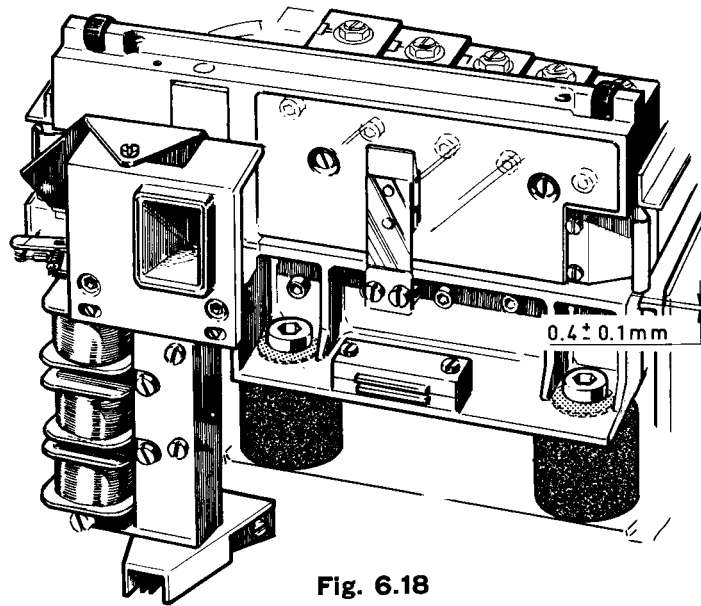


Fig. 6.18

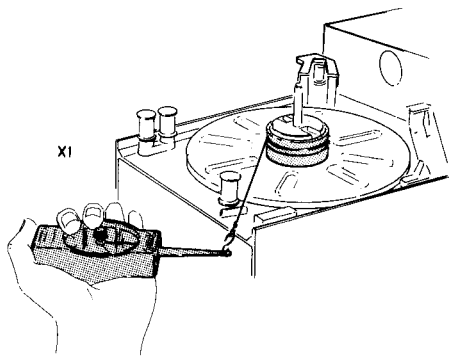


Fig. 6.19

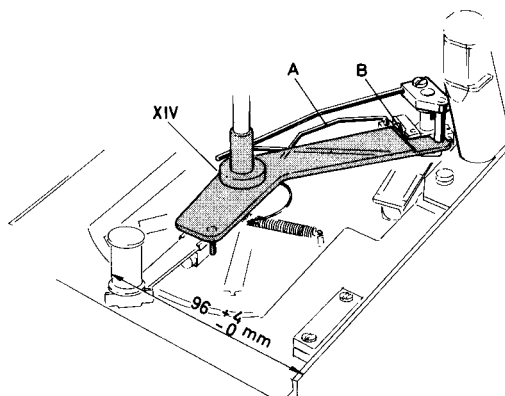


Fig. 6.20

L. Checking pinch roller

Fig 6.17

1. Unhook spring D.
2. Check as shown in Fig 6.17a that the pinch roller exerts a force of 600 ± 50 gf against the capstan.
Remedy: Replace springs B.
3. Remove cover C.
4. Check that pinch roller A rotates easily.
Remedy: Replace pinch roller.
5. Check that there are no defects on the periphery of the pinch roller.
Remedy: Replace pinch roller.
6. Check that the pinch roller flanges do not run in any of the tracks on the tape.
Adjustment: Insert washers between arms E and yoke F.

M. Fitting punch/feed unit

Fig 6.18

1. When fitting the punch/feed unit, check that its reference edge is 0.4 ± 0.1 mm above the reference edges of the tape slots in the right-hand and left-hand sidewalls.
Adjustment: Adjust by inserting washers between the rubber anti-vibration mountings and the punch/feed unit.

N. Checking braking force on supply flange

Fig 6.19

1. Loosen the surge takeup arm and check the braking force on the supply flange as shown in Fig 6.19. The braking force shall be 400 ± 150 gf.
Explanation: If the braking force is too high or too low the reason can be
 - a. too little torque exerted by the surge takeup arm
 - b. worn or improperly mounted brake shoe.

Fig 6.20

Adjustment: a. see steps N2 and N3 below or b. replace brake shoe B. Then secure the surge takeup arm using holder XIV. Adjust the length of link A so that the brake shoe just touches the edge of the tool. When the brake shoe is adjusted correctly, the surge takeup arm is $96 \begin{smallmatrix} + 4 \\ - 0 \end{smallmatrix}$ mm from the edge of the punch.

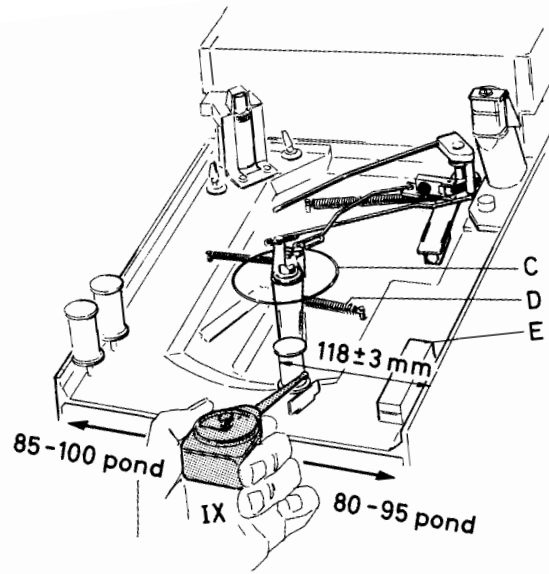


Fig. 6.21

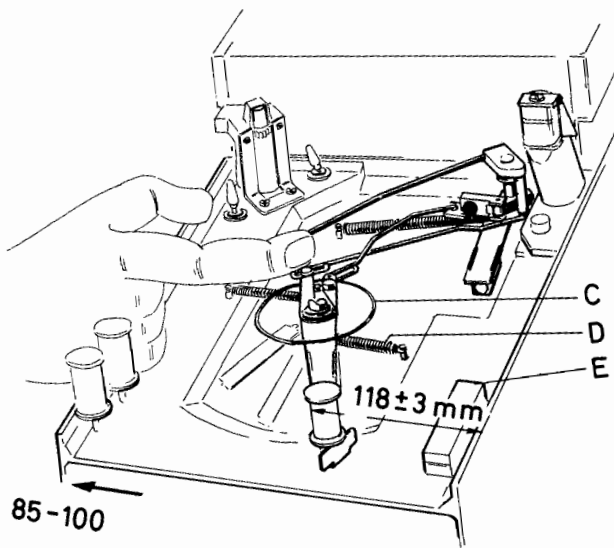


Fig. 6.22

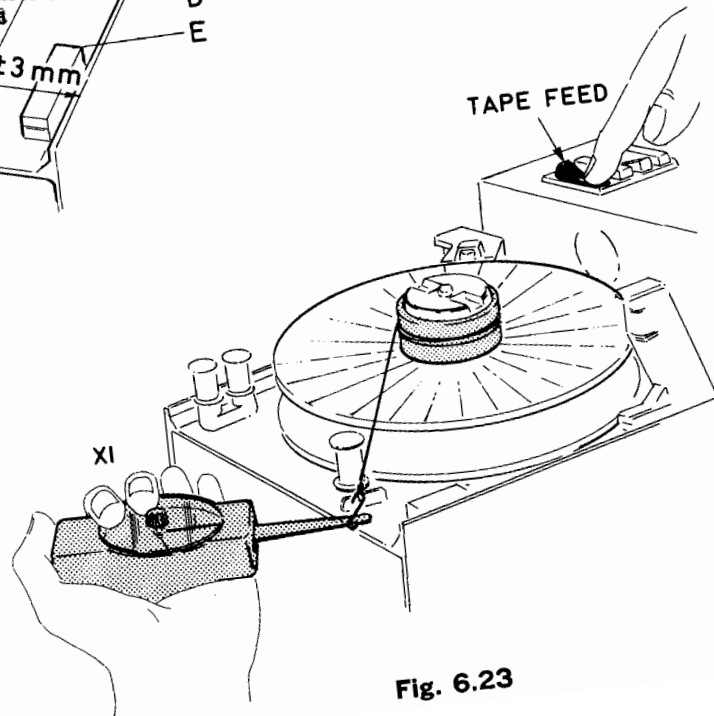


Fig. 6.23

- Fig 6.21
2. Measure the torque exerted by the surge takeup arm dynamically at a point 118 ± 3 mm to the left of the sidewall. Readings shall be taken as the arm moves in both directions. The torque shall be 85 - 100 gf as spring D is tightened and 80 - 95 gf as spring D is slacked off. Note arrow and dimension in illustration.
Adjustment: Clean the surge takeup arm shaft hole and/or replace spring D.
 3. Measure the torque exerted by the surge takeup arm dynamically at a point 78 ± 3 mm to the left of the sidewall. Readings shall be taken as the arm moves in both directions. The torque shall be 55 - 60 gf as spring C is tightened and 40 - 50 gf as spring C is slacked off.
Adjustment: Replace spring C.

O. Checking sensor arm

- Fig 6.22
1. Loosen the surge takeup arm from the retainer magnet.
 2. Check that sensor arm E does not bind. You should be able to move it out easily to both end positions. After moving the sensor arm to its rear end position, allow it to return carefully, while checking to see that the surge takeup arm is moved down toward the centre of the punch.
Adjustment: Clean the sensor arm shaft hole and/or replace spring F.

P. Checking pulling force of winding motor

- Fig 6.23
1. Check as shown in Fig 6.23 that the pulling force which the winding motor exerts on the takeup flange is not less than 950 gf.
Explanation: If the pulling force is too low the reason can be
 - a. that the winding motor is not pressing against the takeup flange properly
 - b. that the winding motor drive wheel is worn
 - c. that the transmission between drive wheel and capstan is binding or
 - d. the winding motor is faulty.
Adjustment: a. see step P2 b. replace the drive wheel c. replace the motor mount or d. replace the winding motor.

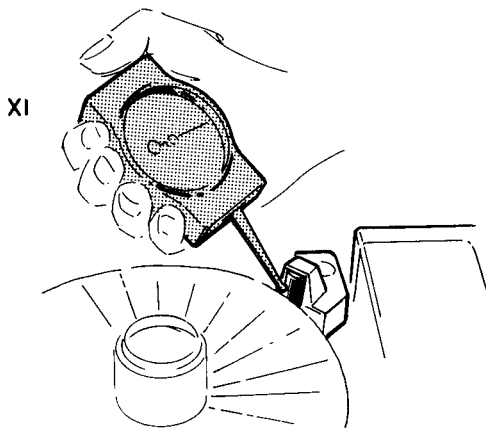


Fig. 6.24

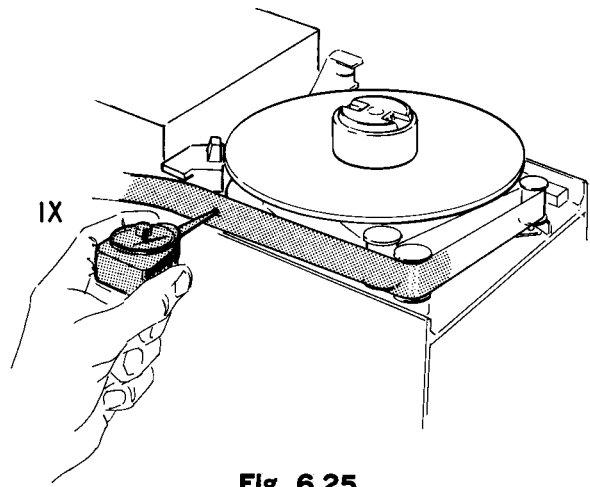


Fig. 6.25

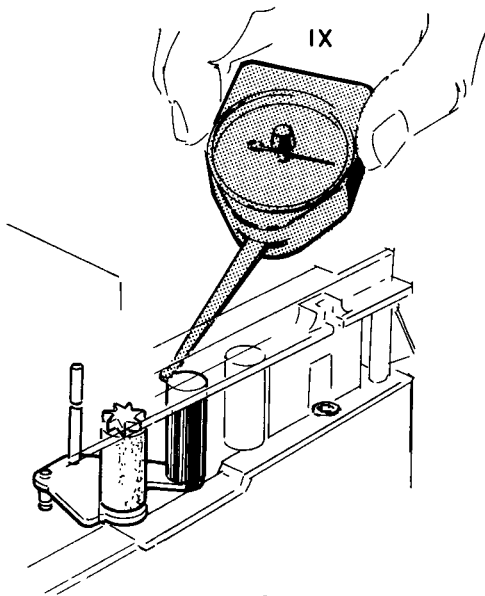


Fig. 6.26

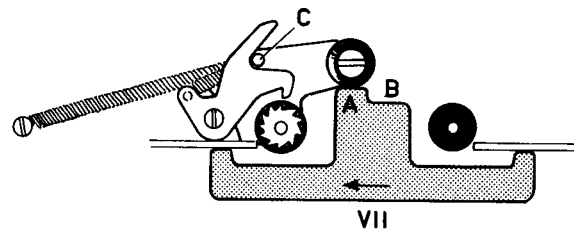


Fig. 6.27

- Fig 6.24 2. Check that the winding motor drive wheel presses against the takeup flange with a force of 650 - 800 gf.
Adjustment: Adjust the position of the motor by bending the motor retaining spring.

Q. Checking unwinding force

- Fig 6.25 1. Fit the supply flange and takeup flange and load the punch with a full coil of tape.
2. Loosen the surge takeup arm from the retainer magnet and check as shown in Fig 6.25 that the force exerted for unwinding the tape does not exceed 50 gf.
Explanation: This check is important to assure correct inter-row spacing. If the pulling force is too high the reason can be
a. binding at the supply flange hub
b. warped supply flange or
c. binding guide rollers.
Adjustment: a. remove the supply flange and clean both the shaft and its hole, b. straighten the supply flange or replace it or c. clean the guide roller shafts and their holes.

R. Checking reversing buffer arm

- Fig 6.26 1. Check that the torque exerted by the reversing buffer arm is 180 ± 20 gf when the guide rollers are all aligned.
Adjustment: Clean and lubricate the reversing buffer arm shaft hole, the rubber-coated roller shaft hole and the shaft.
- Fig 6.27 2. Hold special tool VII as shown in Fig 6.27.
3. Check that the rubber-coated roller is not caught by the catch when the reversing buffer arm is moved out against stop A on the special tool.
4. Now move the tool in the direction shown by the arrow, move the reversing buffer arm against stop B and check that the roller is picked up and that there is ample engagement between the ratchet wheel and catch.
Adjustment: Engagement can be increased or decreased by carefully bending pin C.

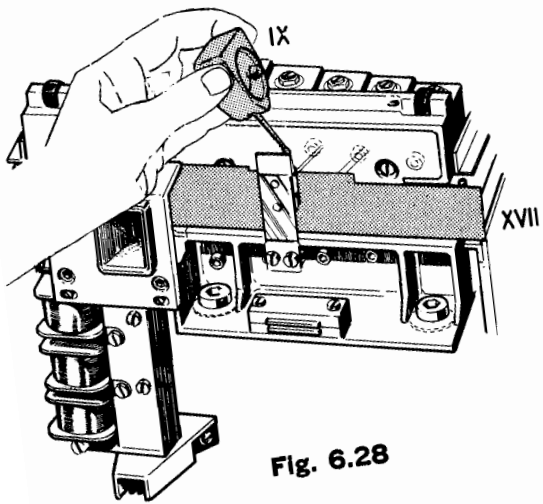


Fig. 6.28

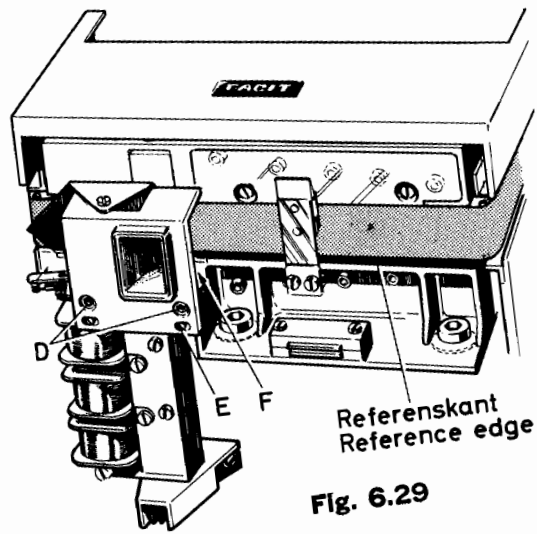


Fig. 6.29

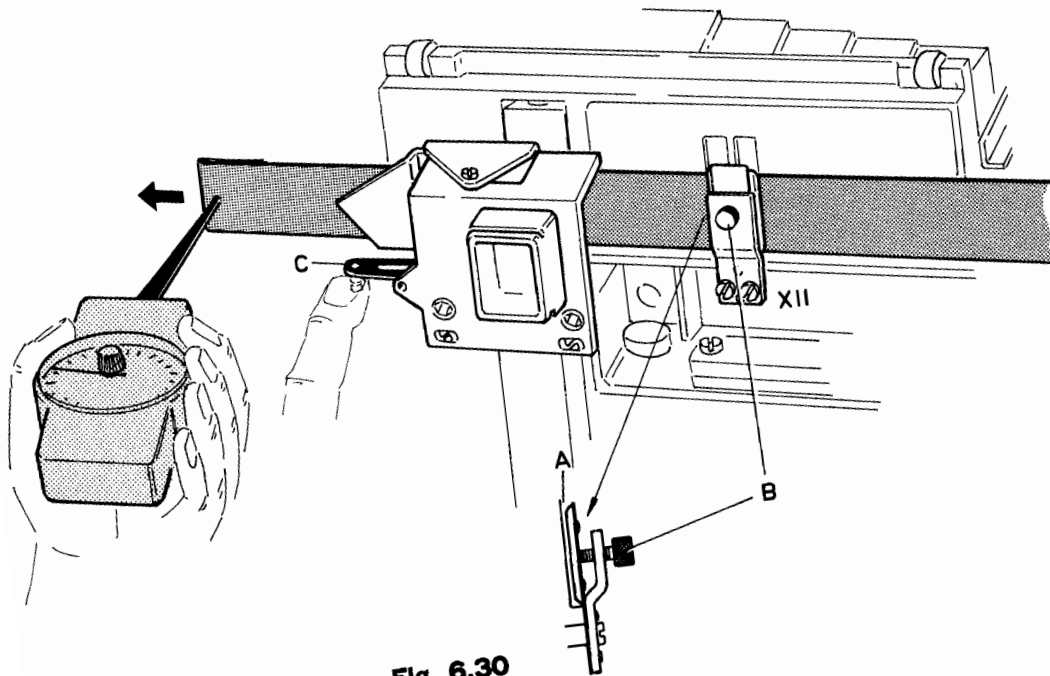


Fig. 6.30

S. Checking adjustment of spring mounted tape guide

- Fig 6.28
1. Check that the spring-mounted tape guide exerts a max force of 25 gf on the tape.
Adjustment: Unscrew and remove the spring-mounted tape guide and straighten it. When replacing with tool XVII, adjust vertical position of spring-mounted tape guide.

T. Checking tape feed

- Fig 6.29
1. Load the punch with tape.
 2. Run the punch by depressing the TAPE FEED button and check that tape is fed down along the reference edge of the punch/feed unit. Note that the cover above the punch solenoids shall be in place and that the spring-mounted tape guide shall not press against the tape.
Adjustment: Loosen lock screw F. Loosen retaining screws D slightly. Run the tape punch using the TAPE FEED button or a data generator (50 rows per second). Turn eccentric screw E slowly until the tape eases away from the reference edge. Then turn the eccentric screw back until the tape is fed down along the reference edge. Lock the eccentric screw using lock screw F and tighten retaining screws D.
 3. Run the punch and check that the tape does not strike the edge of the takeup flange.
Adjustment: Straighten the takeup flange or replace it.

U. Checking incremental motor pulling force

- Fig 6.30
1. Remove spring-mounted tape guide and screw special tool XII in place as shown in Fig 6.30.
 2. Load the punch with a piece of paper tape and run the tape through gap A on the special tool.
 3. Depress the TAPE FEED button.
 4. Increase the friction on the tape by screwing in screw B.
 5. Release the TAPE FEED button when the friction becomes so high that the incremental motor is unable to feed the tape without missing an increment (row) occasionally.

XX

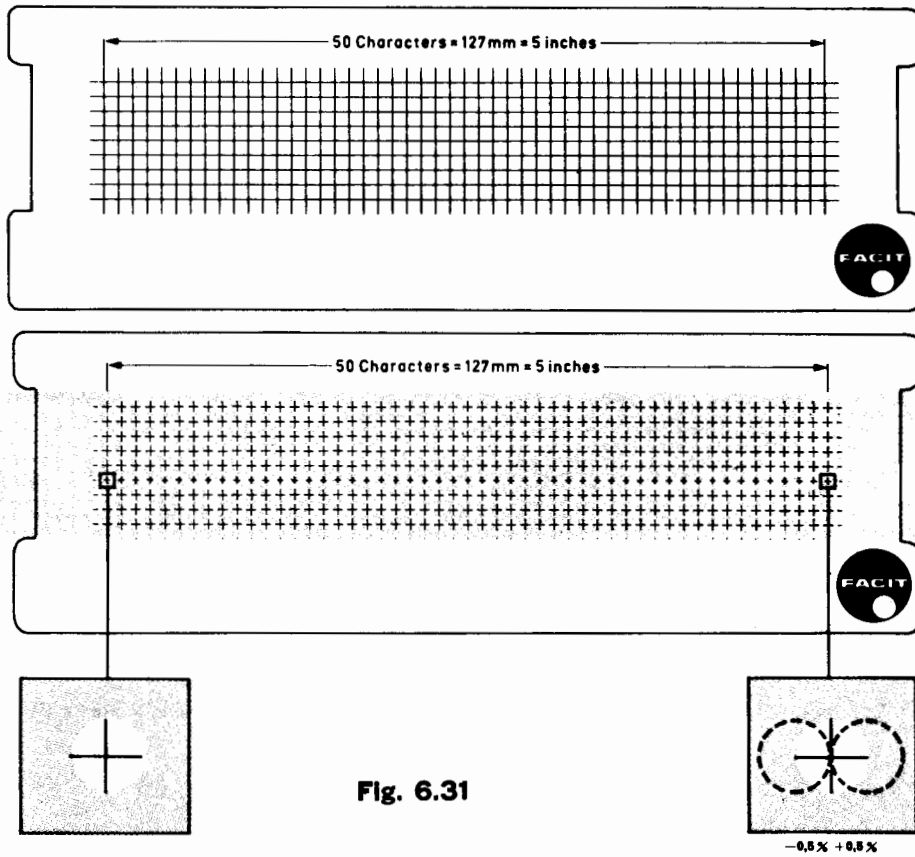


Fig. 6.31

6. Cut off the tape at the tape lifter. Bend over the end of the tape and make a hole for the dial-type spring tension gauge.
7. Lift aside the pinch roller by pressing arm C and insert the tip of the spring tension gauge into the hole in the folded-over tape end.
8. Move the spring tension gauge perpendicularly to the tape in the direction shown by the arrow.
9. Read the spring tension gauge when the pulling force it exerts is sufficient to just about cancel out the friction at special tool XII. The reading shall be at least 200 gf.
10. Screw the spring-mounted tape guide in place and adjust as instructed in step S1.

**V. Checking inter-row spacing**

Fig 6.31

1. Position a punched tape on the template so that the centre of a feed hole coincides with the leftmost vertical line on the template and one of the horizontal track lines.
2. Check that the centres of the feed track holes - from the leftmost to the rightmost vertical line - are directly above the track line. Check that one vertical line is visible in every feed hole.
3. The inter-row spacing is indicated by the rightmost vertical line. The max permissible deviation is $\pm 0.5\%$.

W. Checking punching action

1. Load the punch with a coil of tape and connect it to mains via a variable autotransformer set to the rated voltage.
2. Run the punch via a data generator (75 rows per second) so that holes are punched in all tracks.
3. Slowly lower the output voltage from the variable autotransformer until the DC voltage is shut off.
4. Check that holes are punched fully in all tracks on the tape.

X. Checking tape check functionsTape low

1. Move the sensor arm (6 in Fig 4.7) toward the centre of the supply flange.
2. Check that the TAPE LOW lamp lights just before the sensor arm reaches the hub of the supply flange.

Adjustment: The actuation point can be adjusted between 1,000 and 10,000 rows before end of tape using screw (14) as shown in Fig 4.7.

Tape ruptured/tape too tight

3. Load the punch with a coil of tape.
4. Run the punch with a data generator and move the surge takeup arm to its two end positions.
5. Check that the punch stops and that the ERROR lamp lights. See section 4.4.

Mark character

6. Depress the CODE HOLES button and check that the programmed mark character is punched into the tape. See section 5.5.

Blank tape

7. Depress the FEED HOLES button and check that blank tape (only the feed hole punched) is obtained.

Virgin tape

8. Depress the TAPE FEED button and check that virgin tape is obtained.

EXT function

9. Connect an ohmmeter to pins 19 and 25 on the signal in/output connector P1.
10. Depress the EXT button and check that the resistance shown on the ohmmeter is 0 ohm.

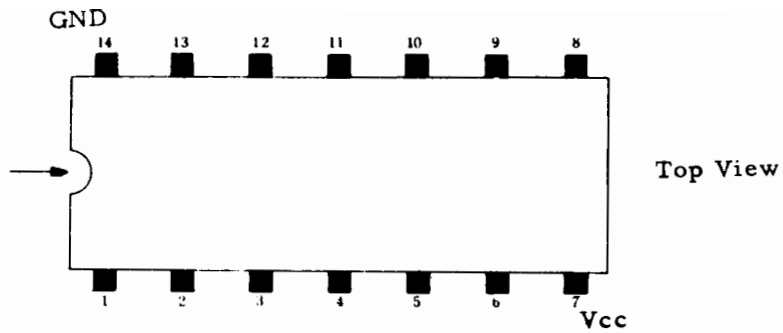


Fig 6.32 IC package pin numbering

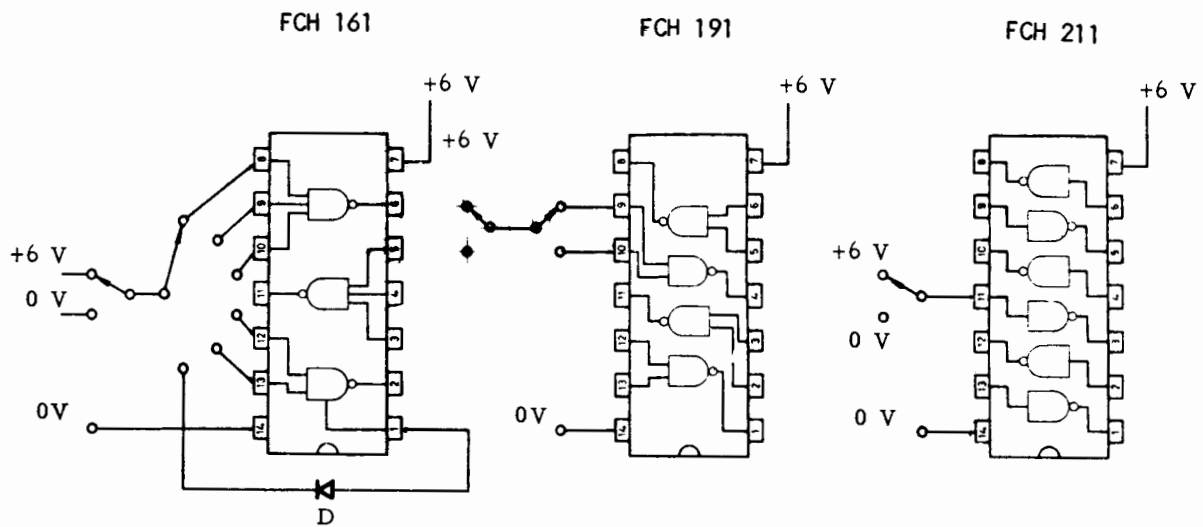


Fig 6.33 Testing IC packages - types FCH 161, FCH 191 and FCH 211.
The FCH 161 package can be provided with a number of fan-in diodes D

6.2 CHECKING PRINTED CIRCUIT BOARDS**6.2.1 General**

SEE TO IT THAT THE MAINS VOLTAGE IS DISCONNECTED BEFORE REPLACING PRINTED CIRCUIT BOARDS

Check the printed circuit board connectors. If necessary, clean with trichloroethylene.

6.2.2 Handling integrated circuits

Integrated circuits must be handled very gently during fault tracing. They are easily damaged by overvoltages and short circuits. A low-voltage soldering iron shall thus be used for all soldering work.

Integrated circuits must be removed from printed circuit boards to test their logical functions. They shall be tested using the hookups shown in Figs 6.33, 6.34 and 6.35.

Fig 6.32

Since the IC package is built up symmetrically, care must be taken to see that +6 V is connected to the correct pin. The semi-circular cutout on the package (see arrow in Fig 6.32) indicates the end at which pins 1 and 14 are located. +6 V ($\pm 5\%$) shall be connected to pin 7 and 0 V (ground) to pin 14.

NOTE: +6 V shall not be connected directly to any output. Moreover, integrated circuits shall not be tested using an ohmmeter because of the over-voltage risk.

6.2.3 Testing integrated circuits

The five different IC packages used in the 4070 have been grouped into three classes for testing purposes:

Fig 6.33

Class A - types FCH 161, 191 and 211 - see Fig 6.33

Connect +6 V to pin 7 and 0 V to pin 14. If all inputs to a gate are floating (not connected to anything), its output shall be 0 V (from 0 to +0.4 V). If all inputs to a gate are connected to +6 V its output shall be 0 V. If 0 V is connected to any of the inputs, the corresponding output shall be +6 V.

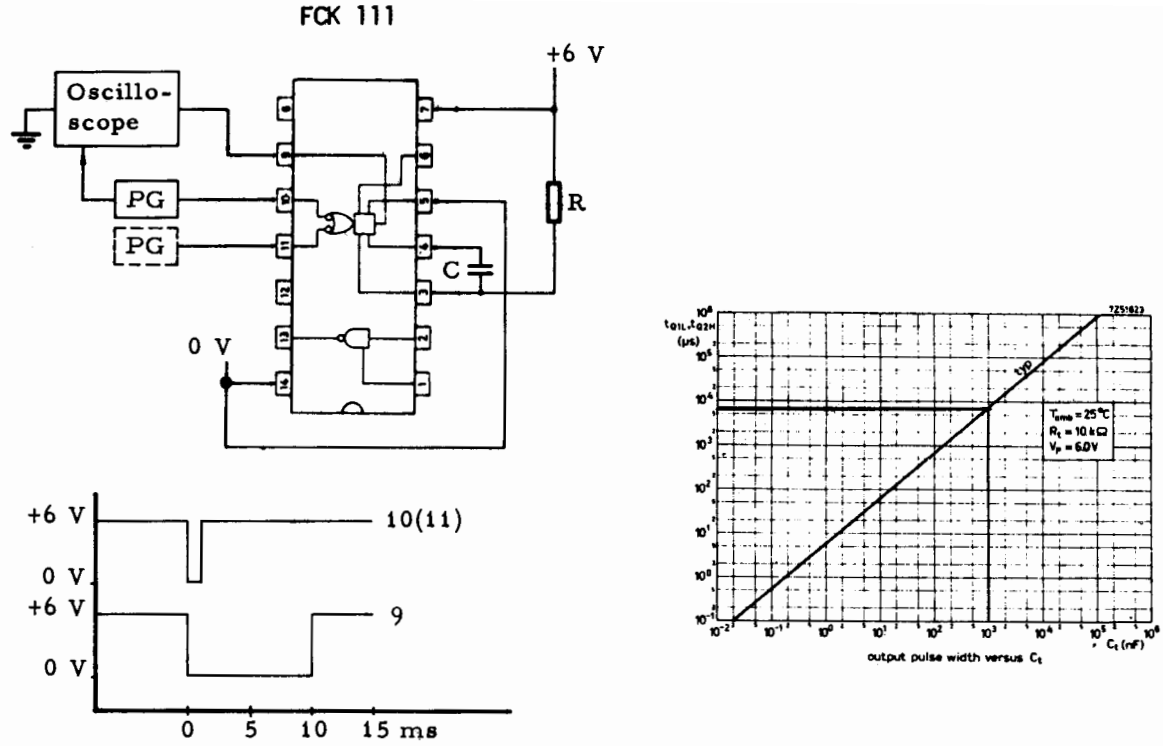


Fig 6.34 Testing IC package - type FKC 111, monostable flip-flop

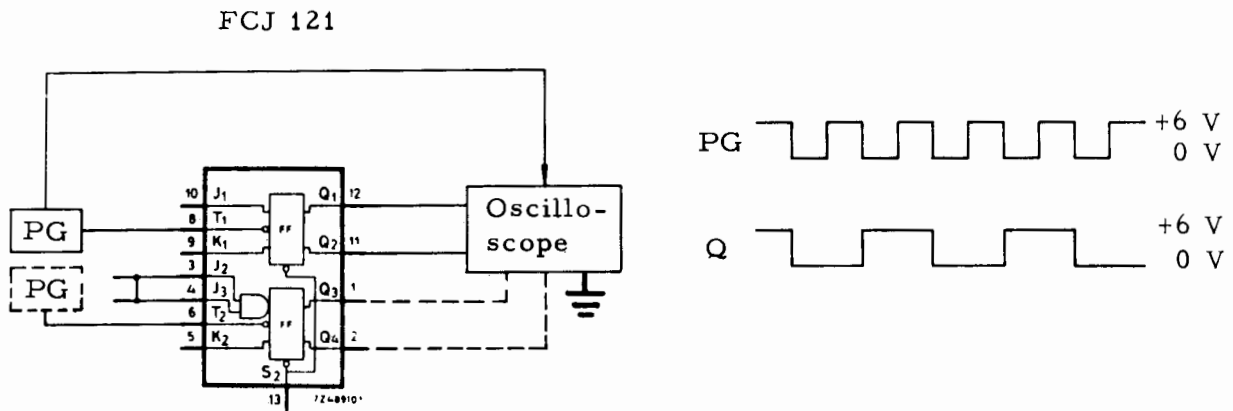


Fig 6.35 Testing IC package - type FCJ 121, JK flip-flop
 Oscillograms (punching speed, 50 rows/second)

Class B - type FCK 111

Fig 6.34 Connect as shown in Fig 6.34. When R is 10 kilohms and C is 1 μ F, the pulse duration shall be about 10 ms.

NOTE: The trigger pulse from the pulse generator must be shorter than the output pulse from the flip-flop.

Class C - type FCJ 121

Fig 6.35 Fig 6.35 shows the hookup for testing this type of package. Table 1 is the truth table for a flip-flop triggered via its T input. The flip-flop having 2 J inputs shall be tested with pins 3 and 4 joined together. Table 2 is the truth table for a flip-flop triggered via its S input.

Table 1 - triggering via T input (both flip-flops)

T=HIGH		T=LOW	
J1	K1	Q1	Q2
J2	K2	Q3	Q4
H	H	Change of state	
L	H	L	H
H	L	H	L
L	L	No change of state	

Information at the J and K inputs is transferred to the master flip-flop when T becomes HIGH. When T subsequently goes LOW, the outputs assume the levels appearing in the table. Input S2 must be HIGH or floating.

Table 2 - 0-setting via input S2 (both flip-flops)

S2	Q1	Q2
	Q3	Q4
L	L	H
H	No change of state	

A signal at input S2 overrides the signals at other inputs, thus determining the levels at the outputs of both flip-flops.

H= HIGH (the more positive voltage)

L= LOW (the less positive voltage)

6.3 FAULT TRACING

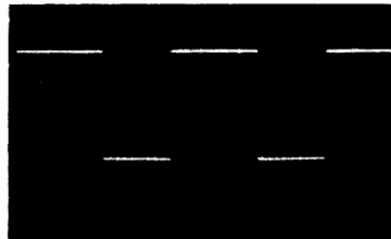
These fault tracing routines are based on the instrumentation normally available in two types of workshops - central workshops and local workshops. They are therefore presented on two levels.

Commonly encountered mechanical faults, their probable causes and remedies recommended for central workshops and local workshops are presented in Appendix 1. The following oscillograms can be of some assistance for fault tracing on the circuit boards. In addition, waveforms are shown for all the points on the logic diagram.

A checklist appears on page 6.17. It shall always be run through step by step when the punch has undergone mechanical fault tracing or any sort of adjustment.

Oscillograms (punching speed, 50 rows/second)

Test points A - I



Trigg

Scale

PI

2 V/cm
5 ms/cm

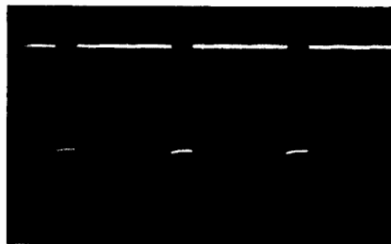
Test points J and L



PI

2 V/cm
20 ms/cm

Test points K, M and N

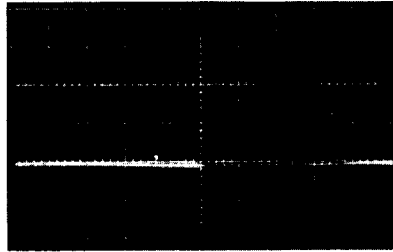


PI

2 V/cm
20 ms/cm

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Test point P



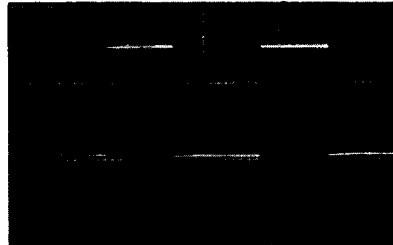
Trigg

Scale

PI

5 V/cm
5 ms/cm

Test point R

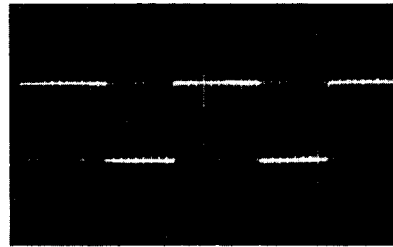


PI

2 V/cm
5 ms/cm



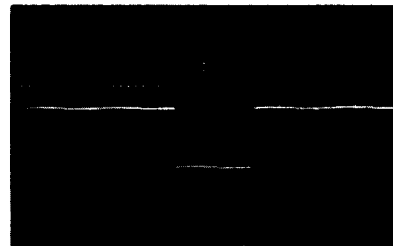
Test point S



PI

2 V/cm
5 ms/cm

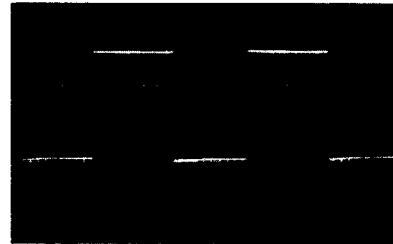
Test point U



PI

2 V/cm
10 ms/cm

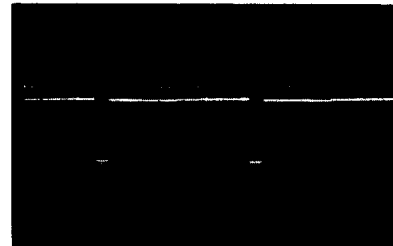
Test point X



PI

2 V/cm
5 ms/cm

Test point Y



PI

2 V/cm
5 ms/cm

6.4 PERIODIC SERVICING

Periodic servicing shall be undertaken at intervals determined by the number of reels punched, namely 50, 500, 1,000, and 2,000-reels intervals.

50-reel service is carried out by the customer. It entails dust removal and a check to see that the data fed to the punch is, in fact, punched out on the tape.

The remaining service should be carried out by a suitable trained serviceman as indicated below.

With respect to certain operating conditions such as -
 irregular duty cycles with very long stop periods
 characteristics of the tape being used
 a lubrication of the tape punch head as per section G 11 might be required between each 500-reel service.

<u>500-reel service</u>	<u>Section</u>
1. = Lubricate the punch head	G 11

Check wear on

2. Winding up motor drive	P
3. Supply flange brake	N
4. Rubber ring on core catch	
5. Spring attachment on punch solenoids	
6. Brake triangle of incremental motor (feeding accuracy adjacent rows, 3%)	H 6
7. Punch pin driver	D

Check bearings on

8. Supply and takeup flanges	
9. Surge takeup arm	N
10. Tape low sensor arm	O
11. Guide rollers	
12. Reversing buffer arm	R
13. Pinch roller	L
14. Motor shaft	H
15. Capstan	J
16. Punch solenoids	B

Run through list on page 6.19

1,000-reel serviceReplaceSection

1. Punch head and punch pins
2. Punch solenoids
3. Incremental motor mount
4. = 500-reel service, when applicable

G
B
H

2,000-reel service

1. = 1,000-reel service

Remove, clean and check

2. Movable parts
3. Shafts
4. Bearing sleeves

Check and if necessary replace

5. Winding motor
6. Fan motor
7. Capstan
8. Pinch roller
9. Supply and takeup flanges
10. Supply flange brake
11. Springs

J
L
N

Checklist

<u>Check:</u>	<u>Limits:</u>	<u>Section/step:</u>
1. Unactuated position of surge takeup arm	96 $\begin{smallmatrix} +4 \\ -0 \end{smallmatrix}$ mm edge of punch	N1
2. Torque exerted by surge takeup arm	80 - 100 gf 40 - 60 gf	N2 N3
3. Braking force on supply flange	400 \pm 150 gf	N1
4. Unwinding force	max 50 gf	Q
5. Force exerted against takeup flange by winding motor	650 - 800 gf	P
6. That sensor arm moves easily		O
7. Torque exerted by reversing buffer arm	180 \pm 20 gf	R1
8. Fan motor blows air out through side crevices		
9. Force exerted against tape by spring-mounted tape guide	max 25 gf	S
10. Force exerted by pinch roller against capstan	600 \pm 50 gf	L1
11. Pulling force of winding motor	min 950 gf	P
12. Pulling force of incremental motor	min 200 gf	U
13. Inter-row spacing		V
14. Punching action		W
15. Tape check functions		X

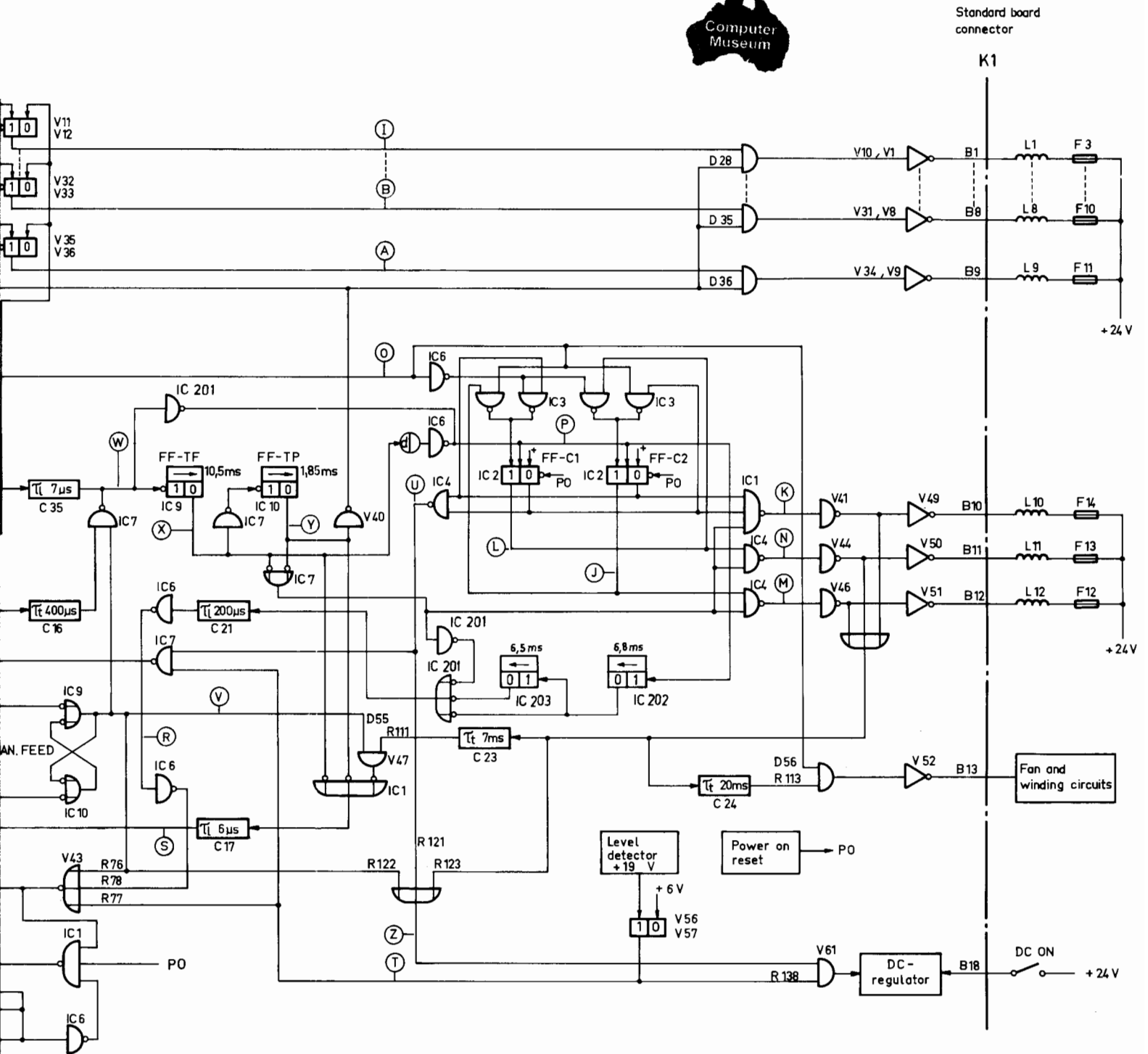
6.5 LUBRICATION INSTRUCTIONS

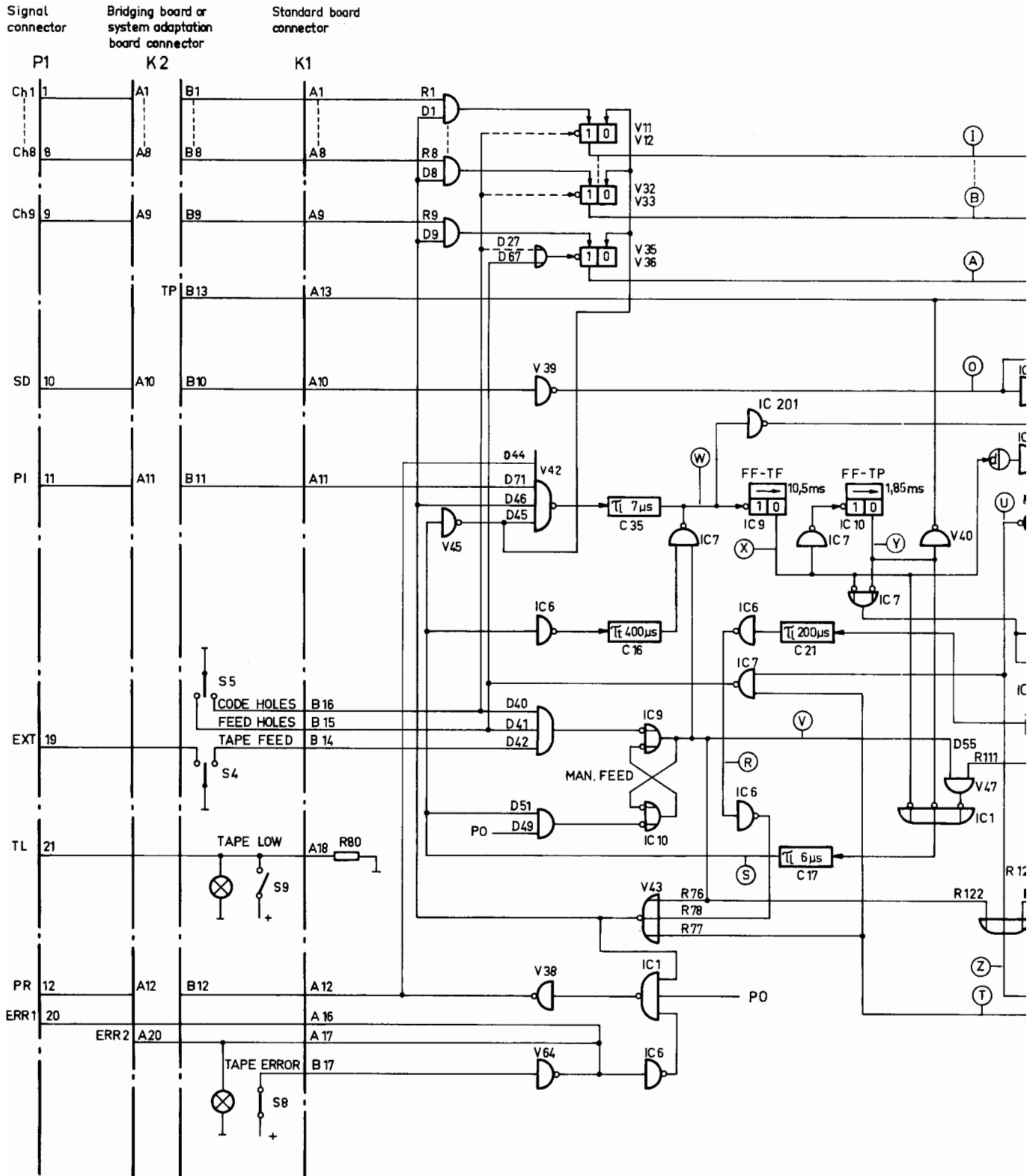
1. Plastic parts
Clean shafts and shaft holes for all plastic rollers carefully with methylated spirits or equivalent.
NOTE: Never permit oil or grease to contact plastic parts.
2. Punch/feed unit
Lubricate with - Rocol MT 320 - the punch head as instructed in step 6 11.
3. Surge takeup arm
Clean the surge takeup arm shaft and its hole and the bearing sleeves of the two arms located above the surge takeup arm. Lubricate all these parts with a thin coat of oil.
4. Reversing buffer arm
Lubricate the reversing buffer arm with grease Esso P 290. or equivalent.

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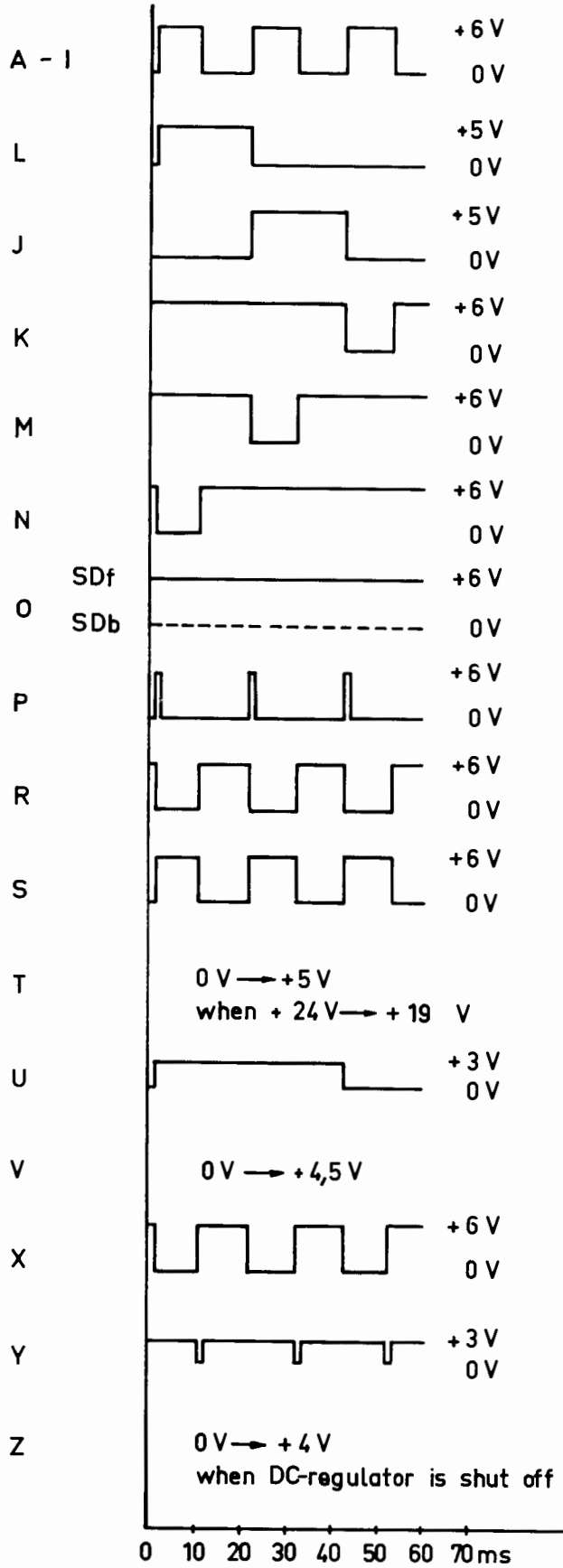
	PROBABLE CAUSE	REMEDY	
		Central workshop	Local workshop
ng	<ol style="list-style-type: none"> 1. Incorrect pulling force 2. Transmission between motor shaft and capstan binding 3. Motor or brake binding 4. Pinch roller binding 5. Unwinding mechanism 6. Flanges on pinch roller run in code-hole tracks on tape 	<ol style="list-style-type: none"> 1. Section V 2. Section K 3. Section H and I 4. Section L 5. Section Q 6. Section L 	<ol style="list-style-type: none"> 1. Replace punch/feed unit 2. Replace punch/feed unit 3. Replace punch/feed unit 4. Replace punch/feed unit 5. Replace punch/feed unit 6. Replace punch/feed unit
	<ol style="list-style-type: none"> 1. Faulty printed circuit board 2. Faulty cabling 3. Broken punch pin driver 4. Faulty punch solenoid 5. Punch solenoid loose on punch/feed unit chassis 6. Punch solenoid coil loose in solenoid frame 	<ol style="list-style-type: none"> 1. Section 5 2. Section 5 3. Section E 4. Sections B, C and F 5. Sections B, C and F 6. Sections B, C and F 	<ol style="list-style-type: none"> 1. Replace printed circuit board 2. Replace punch 3. Replace punch/feed unit 4. Replace punch/feed unit 5. Replace punch/feed unit 6. Replace punch/feed unit
lity	<ol style="list-style-type: none"> 1. Worn or damaged punch pins 	<ol style="list-style-type: none"> 1. Section G 	<ol style="list-style-type: none"> 1. Replace punch/feed unit
rack	<ol style="list-style-type: none"> 1. Incorrect punch pin vertical adjustment 2. Improperly adjusted punch solenoid 3. Play in punch pin driver 4. Punch pins binding 5. Chads jammed in die 6. Faulty printed circuit board 	<ol style="list-style-type: none"> 1. Steps F11 through F16 2. Section C and steps F11 through F16 3. Sections D and E 4. Step G11 5. Clean carefully 6. Section 5 	<ol style="list-style-type: none"> 1. Replace punch/feed unit 2. Replace punch/feed unit 3. Replace punch/feed unit 4. Step G11 or replace punch/feed unit 5. Clean carefully 6. Replace printed circuit board
ation	<ol style="list-style-type: none"> 1. Supply reel core not secured or faulty core latch 2. Supply flange brake improperly adjusted or worn 	<ol style="list-style-type: none"> 1. Secure core or repair latch 2. Section N 	<ol style="list-style-type: none"> 1. Secure core or replace supply flange 2. Replace punch
ation	<ol style="list-style-type: none"> 1. Supply flange binding 2. Surge takeup arm binding 3. Supply flange warped 4. Sticky tape 	<ol style="list-style-type: none"> 1. Clean 2. Steps N2 and N3 3. Replace or straighten supply flange 4. Replace tape 	<ol style="list-style-type: none"> 1. Clean 2. Replace punch 3. Replace supply flange 4. Replace tape
	<ol style="list-style-type: none"> 1. Winding motor pulling force too low 2. Takeup flange warped 3. Punch pins worn 4. Reversing buffer rollers binding 5. Reversing buffer arm twisted 	<ol style="list-style-type: none"> 1. Section P 2. Replace or straighten 3. Section G 4. Clean 5. Replace or straighten 	<ol style="list-style-type: none"> 1. Section P 2. Replace takeup flange 3. Replace punch/feed unit 4. Clean 5. Straighten reversing buffer arm

FACIT 4070



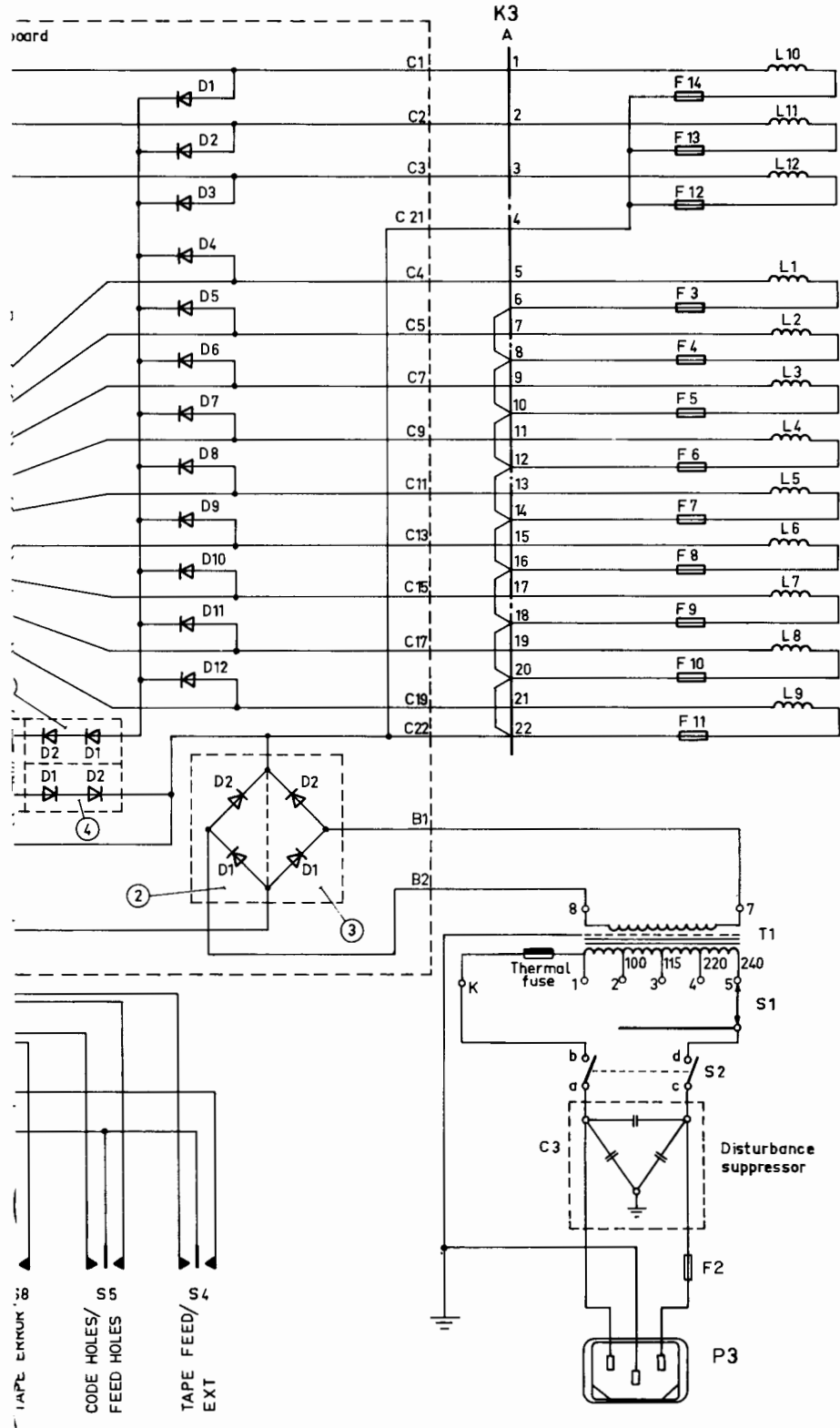


Test point



Punch/feed unit
connector

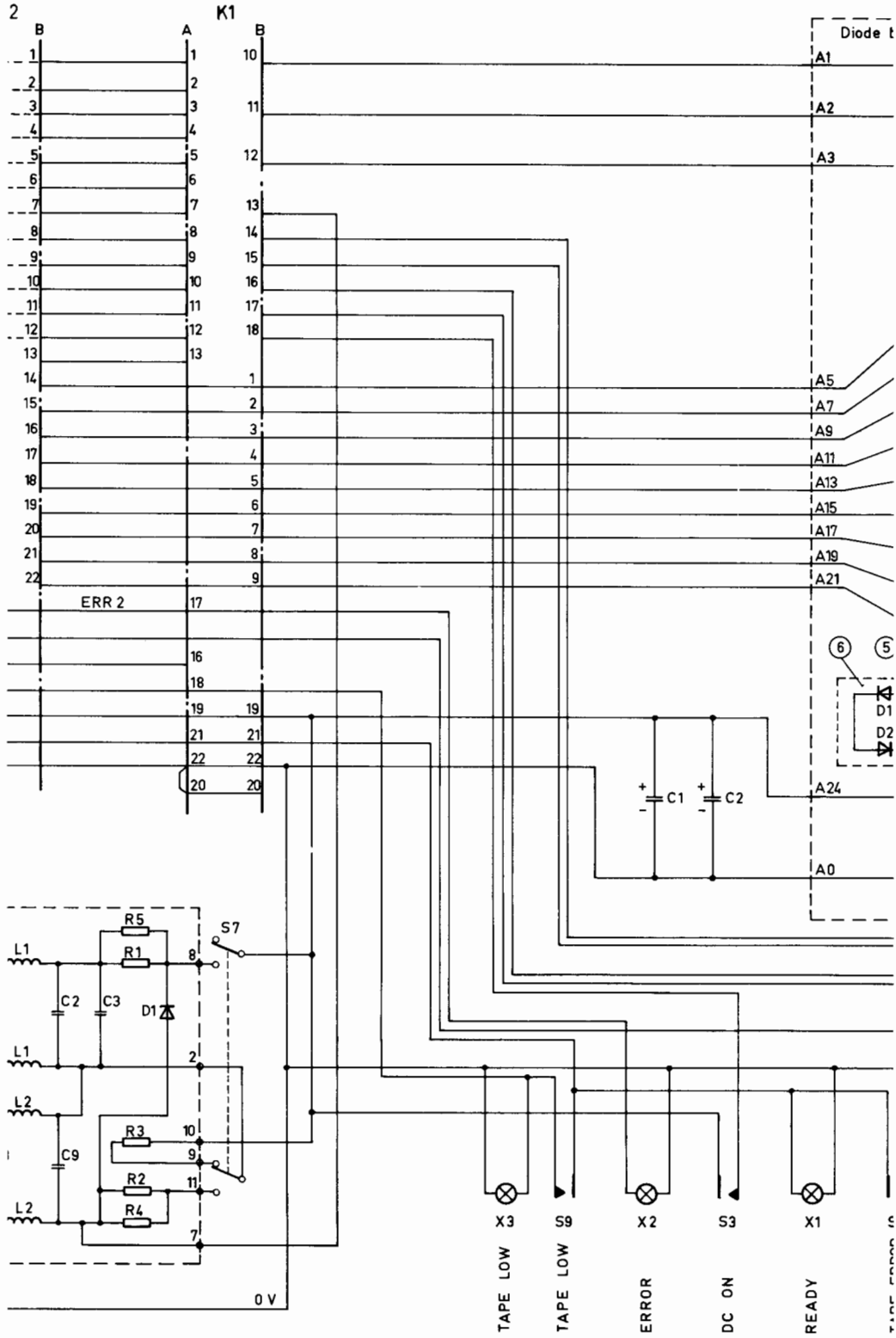
FACIT 4070



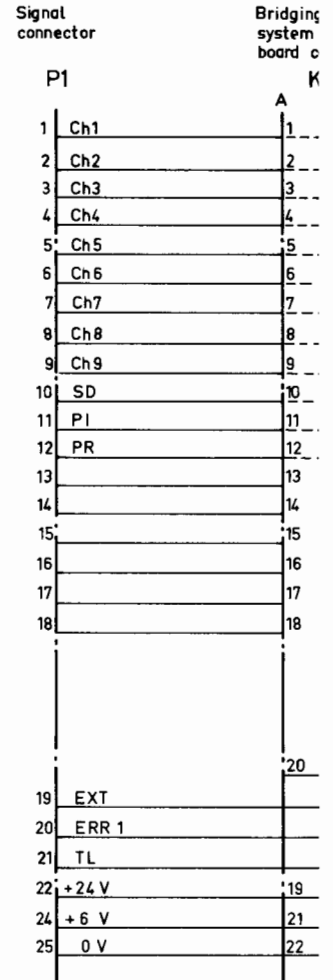
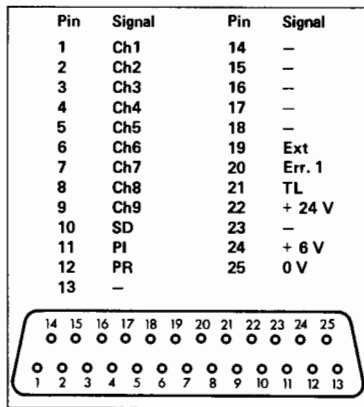
Appendix 4 Mains operated FACIT 4070
Interconnection diagram with diode board and filter board

board or
adaptation
connector

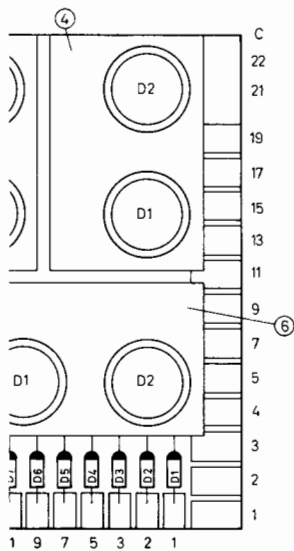
Standard board
connector



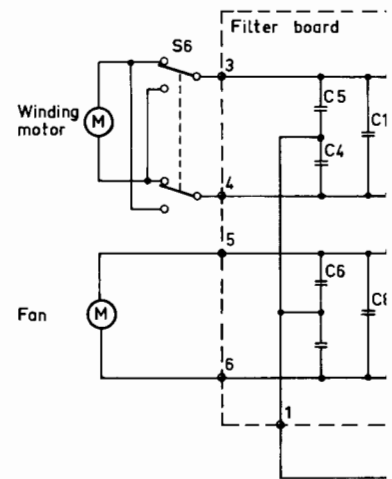
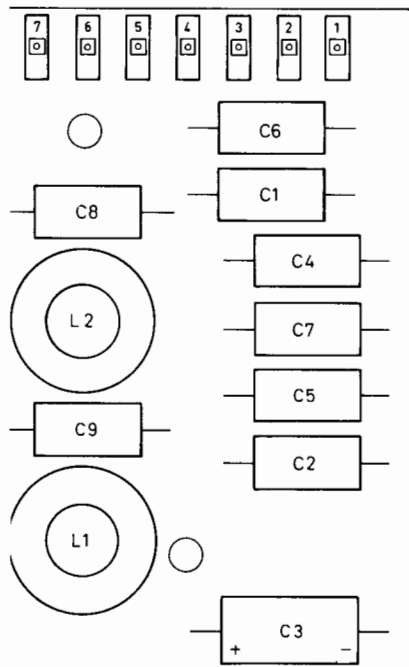
Signal connector P1



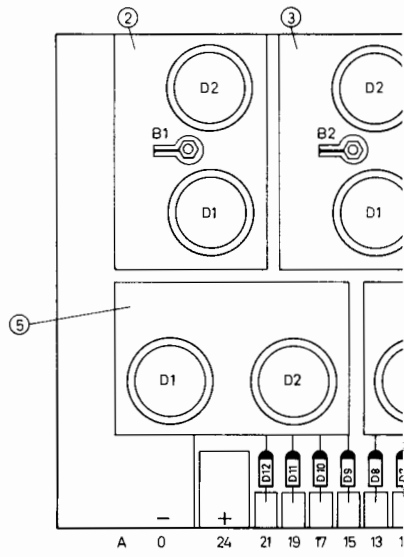
rd



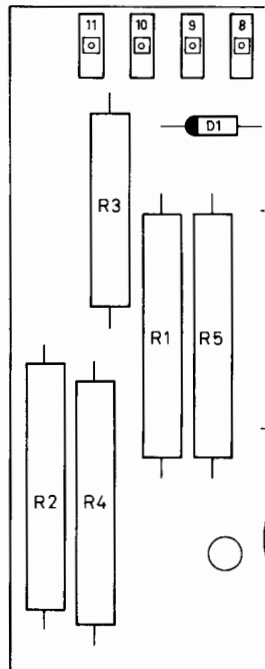
er circuit board



Diode boa.

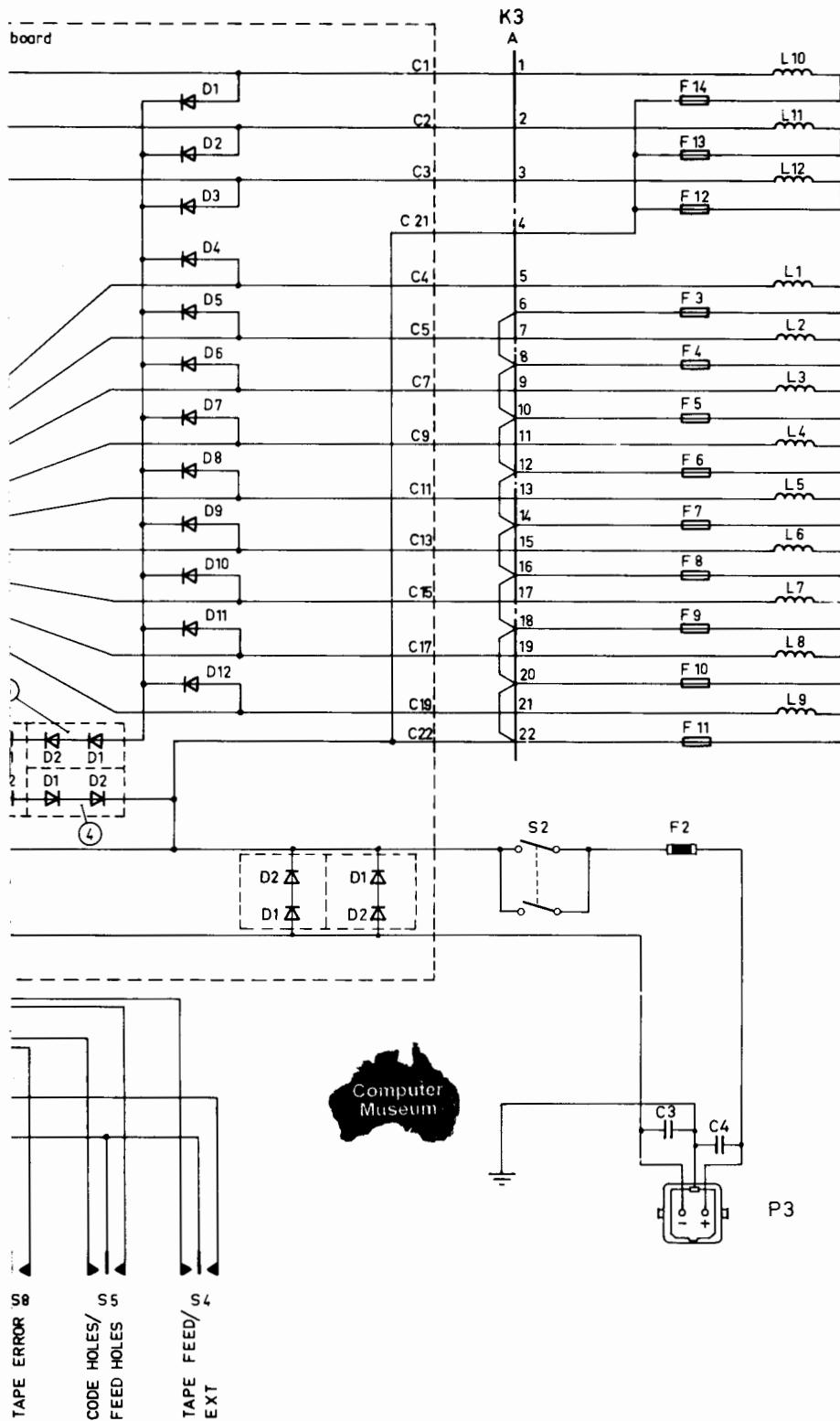


Filt



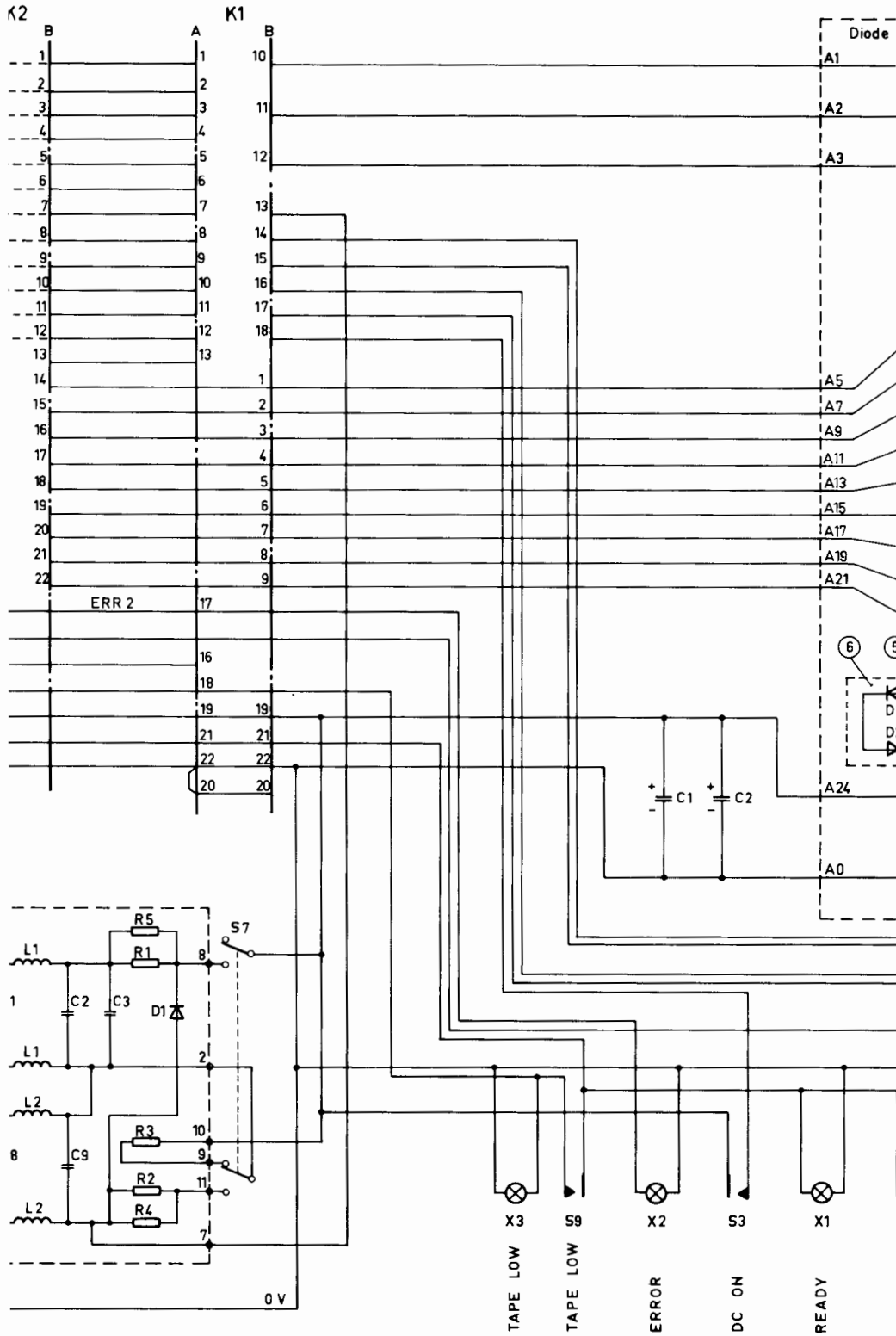
Punch/feed unit
connector

FACIT 4070



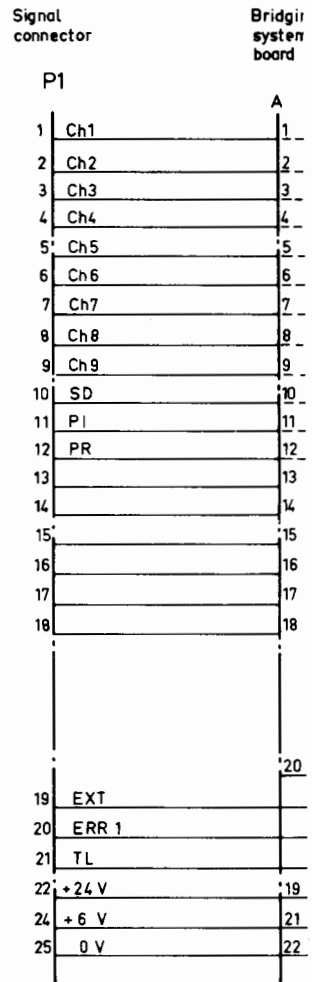
ig board or
adaptation
connector

Standard board
connector

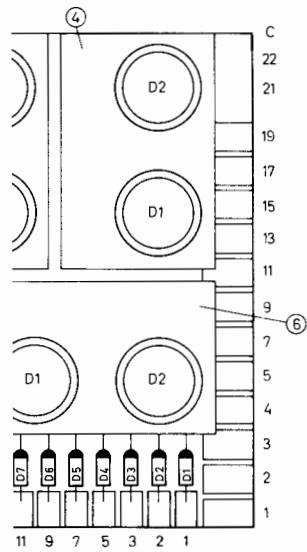


Signal connector P1

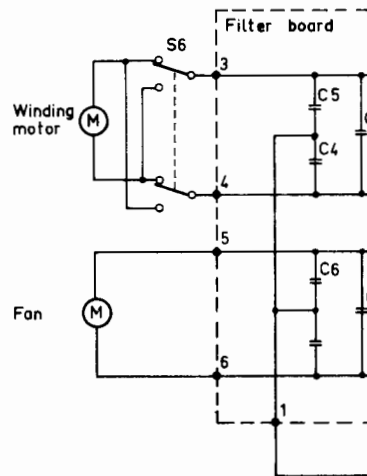
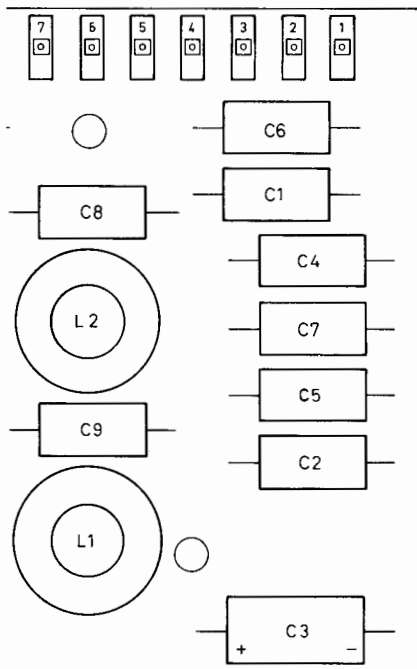
Pin	Signal	Pin	Signal
1	Ch1	14	—
2	Ch2	15	—
3	Ch3	16	—
4	Ch4	17	—
5	Ch5	18	—
6	Ch6	19	Ext
7	Ch7	20	Err. 1
8	Ch8	21	TL
9	Ch9	22	+ 24 V
10	SD	23	—
11	PI	24	+ 6 V
12	PR	25	0 V
13	—		



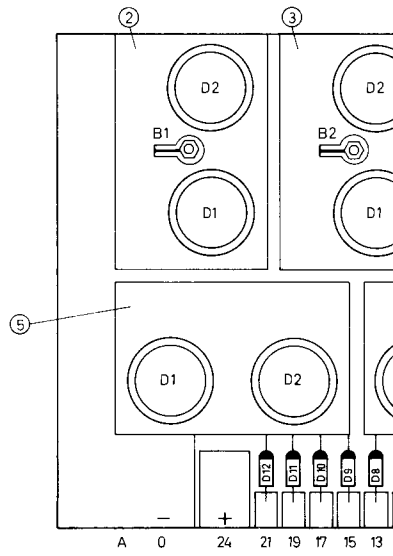
ird



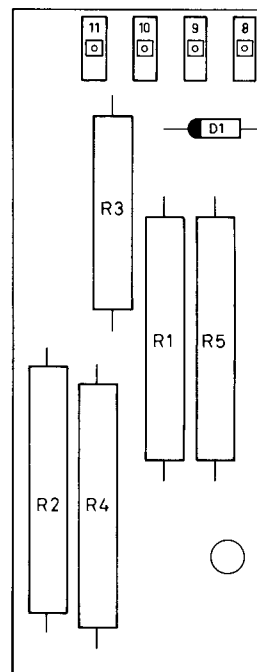
ter circuit board



Diode boc



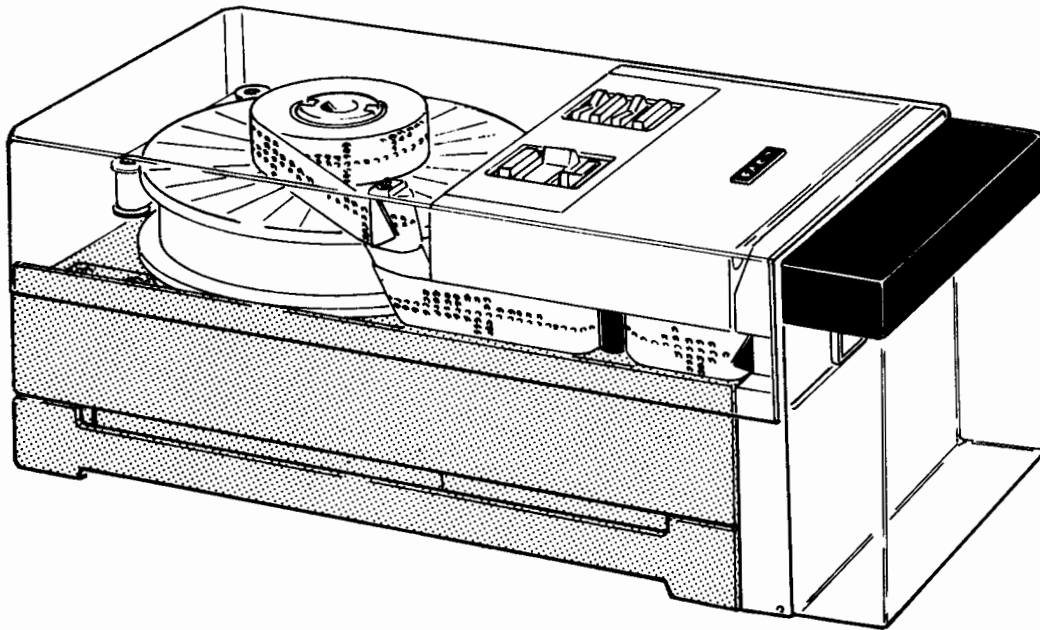
Fil



FACIT 4070

Tape punch

SPARE PARTS LIST



FACIT AB · SWEDEN

TABLE OF CONTENTS — SECTION II

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GENERAL

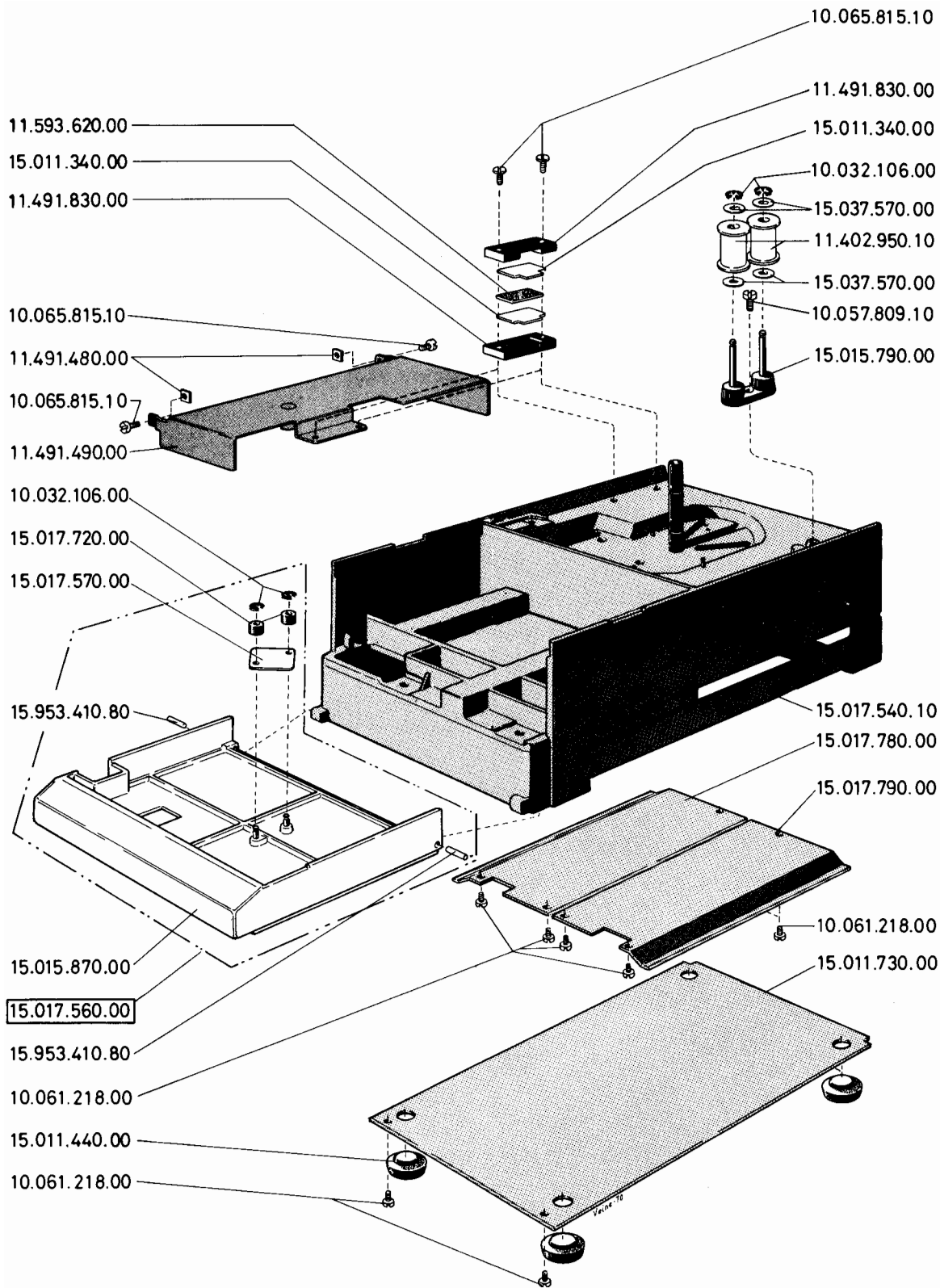
This spare part list contains a complete set of spare parts for the FACIT 4070 tape punch. Sub-units and associated parts are grouped together in the parts list. However, every spare part must be specified separately.

Numbers of complete sub-units are shown in boxes

15.017.650.00

On control circuit board kindly observe that alternative components are accepted on certain places.



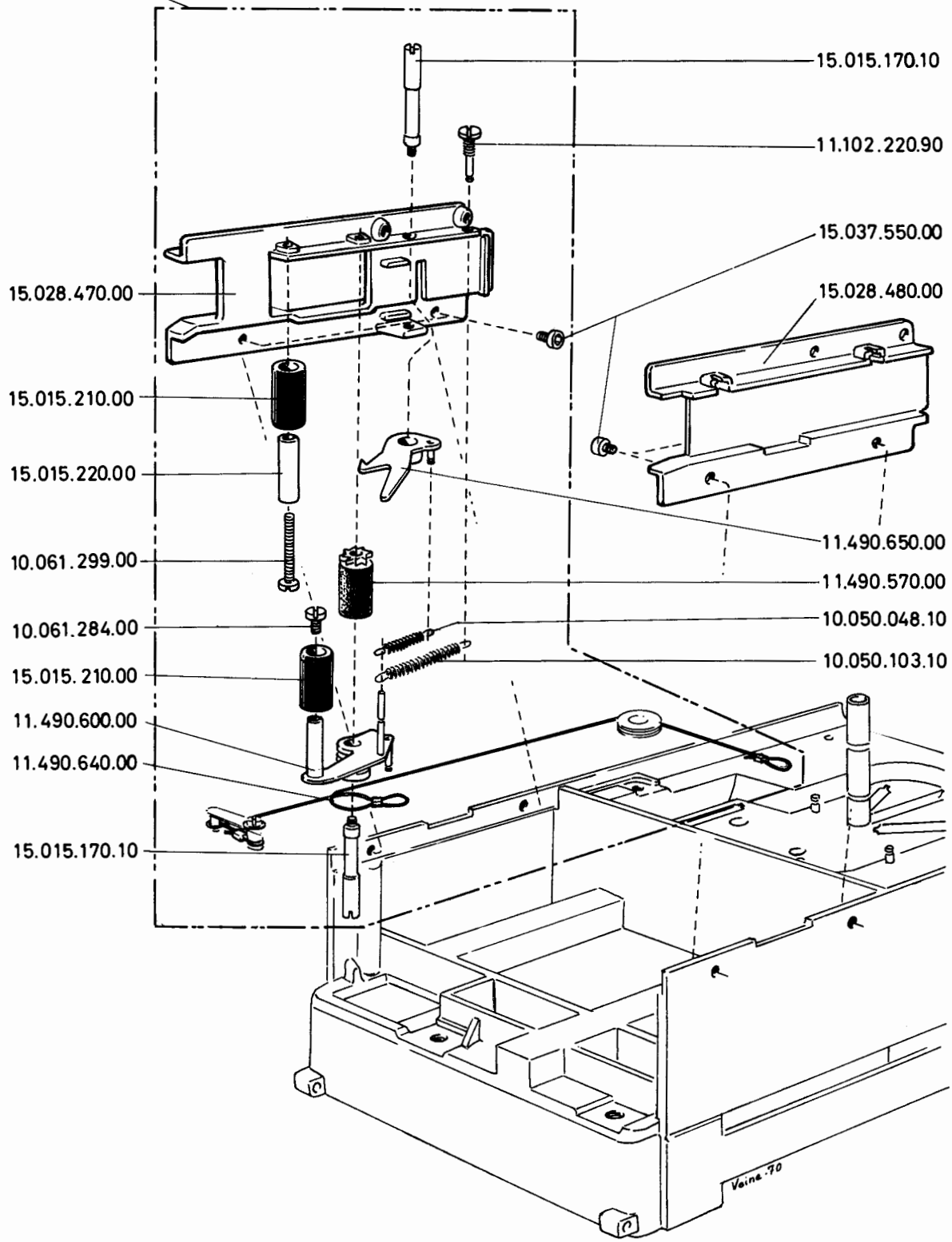


1 CHASSIS, SIDEWALL AND TAPE LIFTER

1.1 CHASSIS

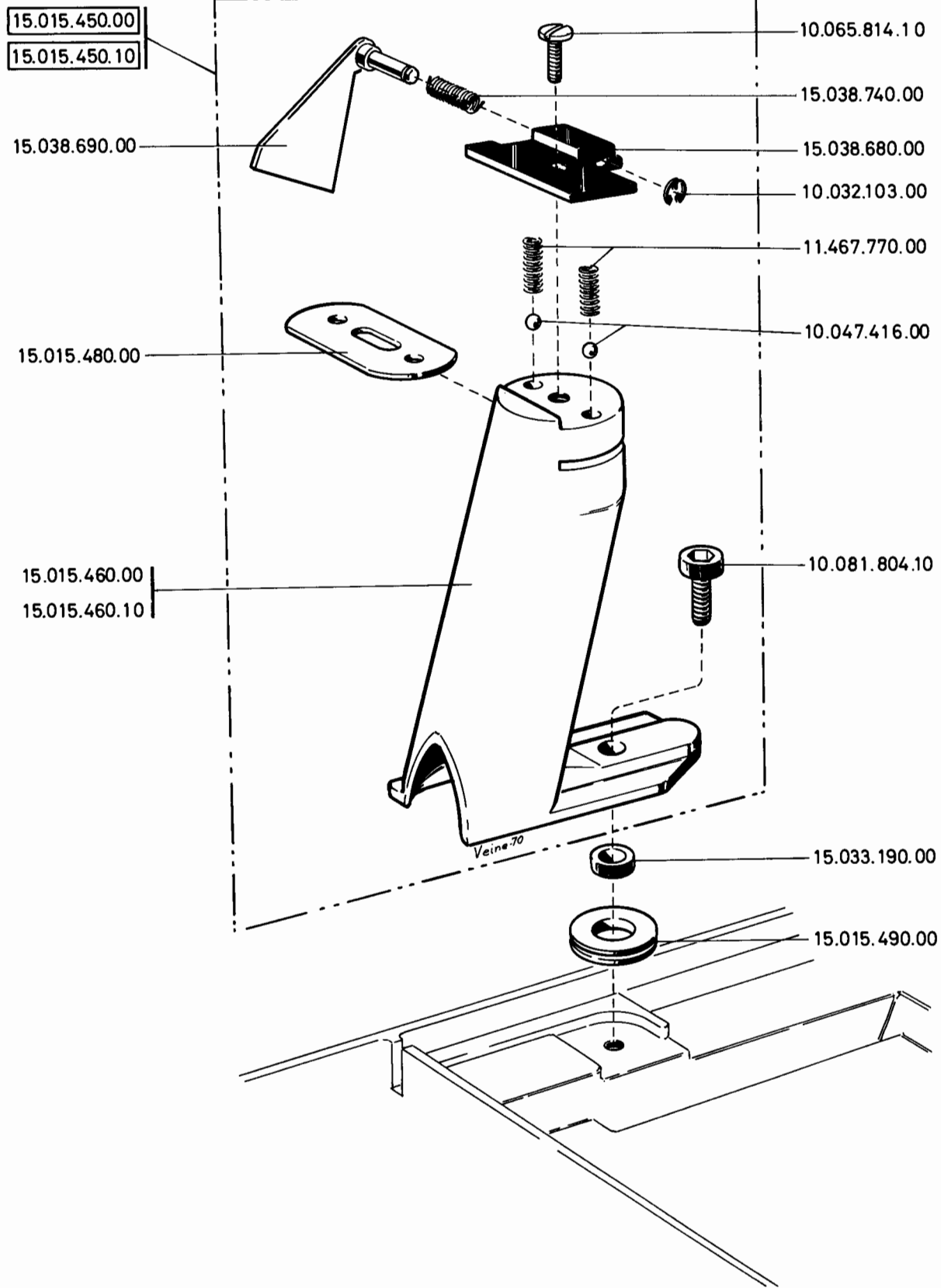
Part No	Component designation	Description	Qty
10.065.815.10		Screw	2
11.491.830.00		Retainer plate	2
15.011.340.00		Plate	2
11.593.620.00		Magnet	1
10.032.106.00		Retainer ring	2
15.037.570.00		Washer	4
11.402.950.10		Guide roller	2
15.015.790.00		Guide roller mount	1
10.057.809.10		Screw	1
15.017.540.10		Chassis	1
15.017.560.00		Front lid assembly	
15.015.870.00		Front lid	1
15.017.570.00		Washer	1
15.017.720.00		Rubber spacer	2
10.032.106.00		Retainer ring	2
15.953.410.80		Pin	2
15.017.790.00		Shield plate	1
15.017.780.00		Shield plate	1
10.061.218.00		Screw	6
15.011.730.00		Bottom plate	1
15.011.440.00		Rubber foot	4
10.061.218.00		Screw	2
11.491.490.00		Front lid, rack version	1
10.065.815.10		Screw	2
11.491.480.00		Nut	2
10.065.815.10		Screw	2
11.491.830.00		Retainer plate	2
15.011.340.00		Plate	2
11.593.620.00		Magnet	1

11.490.560.00



1.2 SIDEWALL

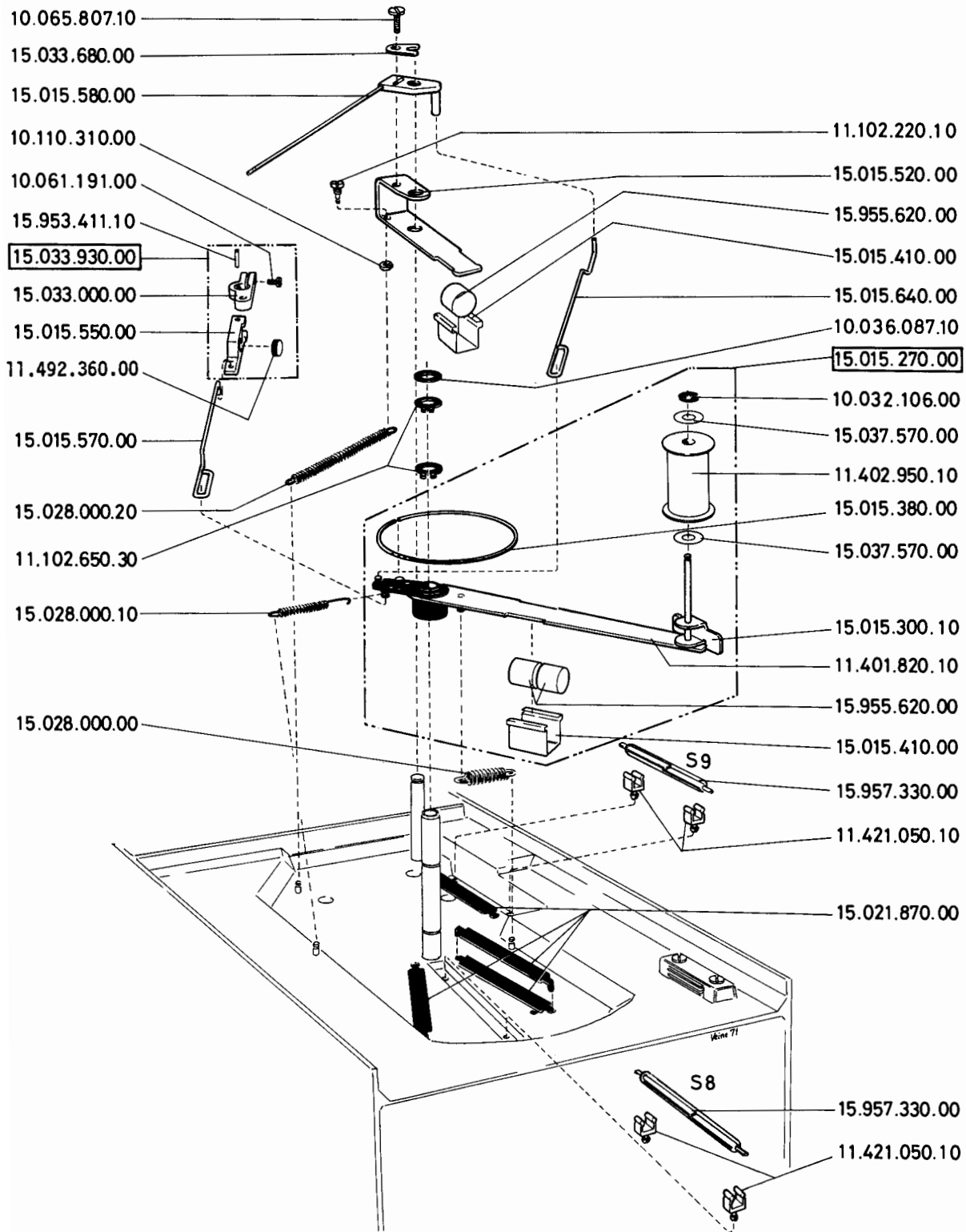
Part No	Component designation	Description	Qty
<u>11.490.560.00</u>		Sidewall with reversing bufferarm assembly	
15.015.170.10		Shaft	2
11.102.220.90		Spring mount screw	1
15.028.470.00		Sidewall	1
15.015.210.00		Roller	2
15.015.220.00		Spacer sleeve	1
10.061.299.00		Screw	1
11.490.650.00		Locking pawl	1
11.490.570.00		Rubber roller	1
10.050.048.10		Spring	1
10.050.103.10		Spring	1
10.061.284.00		Screw	1
11.490.600.00		Reversing buffer arm	1
11.490.640.00		Wire	1
15.037.550.00		Screw	2
15.028.480.00		Sidewall	1
15.037.550.00		Screw	2



1.3 TAPE LIFTER

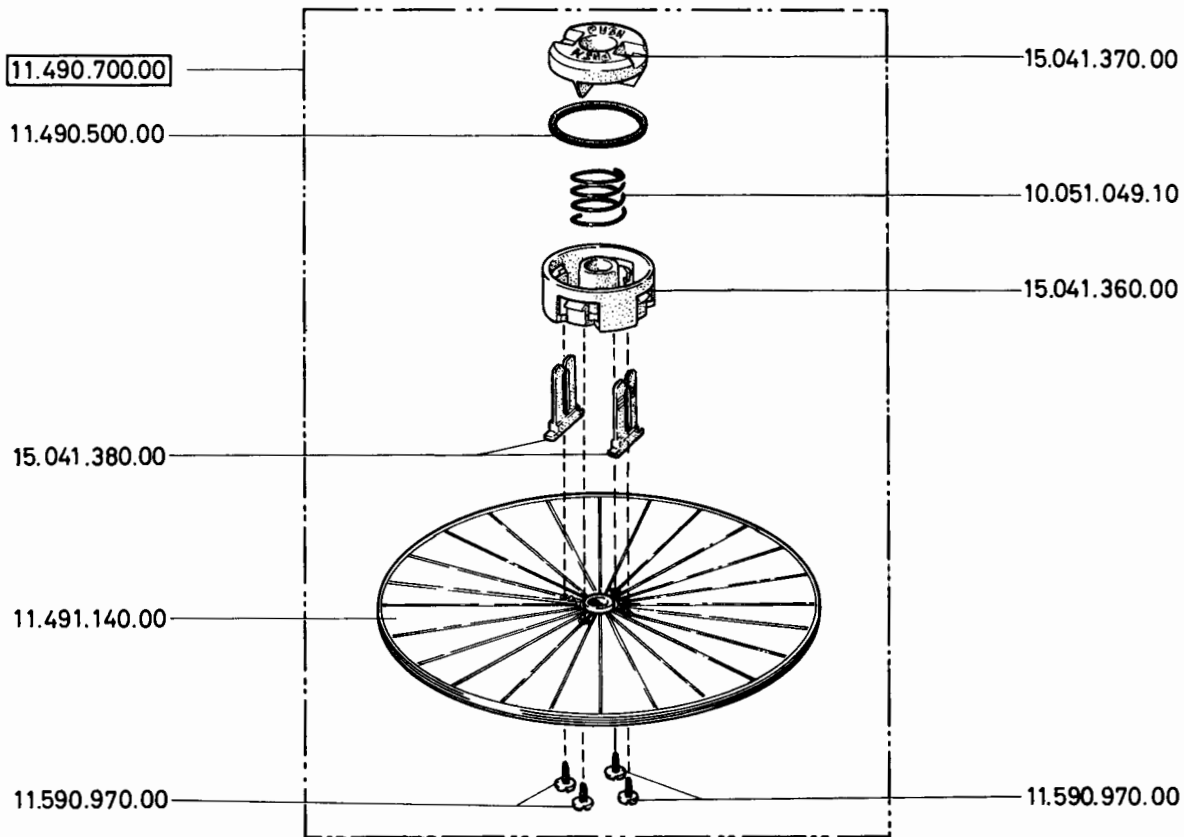
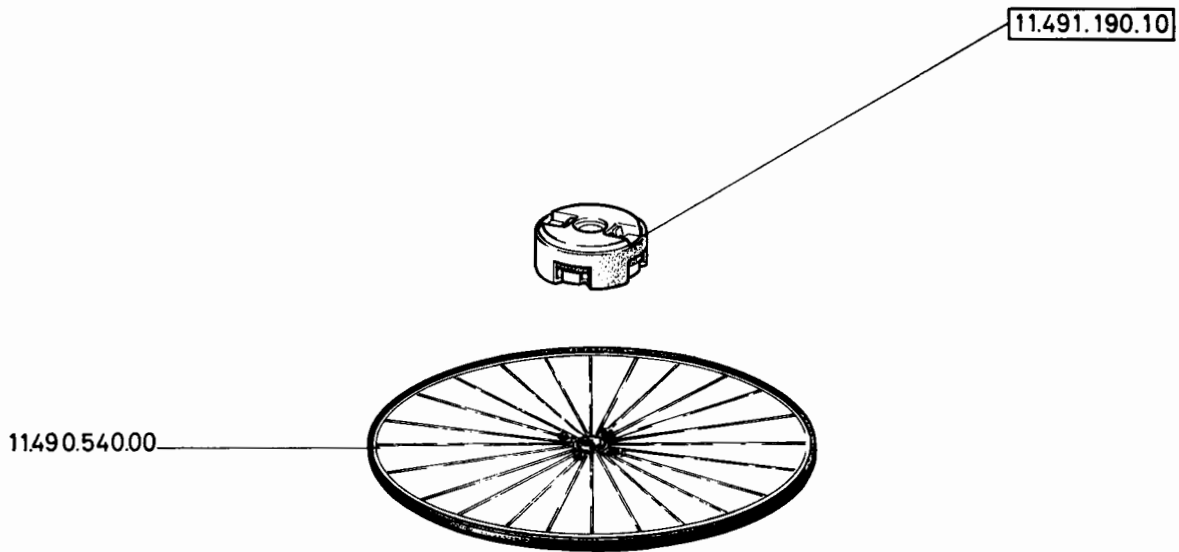
Part No	Component designation	Description	Qty
15.015.450.00		Tape lifter standard assembly	
15.015.450.10		Tape lifter TS assembly	
10.065.814.10		Screw	1
15.038.690.00		Tape tearer	1
15.038.740.00		Torsion spring	1
15.038.680.00		Plate	1
10.032.103.00		Retainer ring	1
11.467.770.00		Spring	2
10.047.416.00		Steel ball	2
15.015.480.00		Guide plate	1
15.015.460.00		Tape lifter standard	1
15.015.460.10		Tape lifter TS	1
10.081.804.10		Screw	1
15.033.190.00		Spacer sleeve	1
15.015.490.00		Pulley	1





2 TAPE CHECK DEVICES

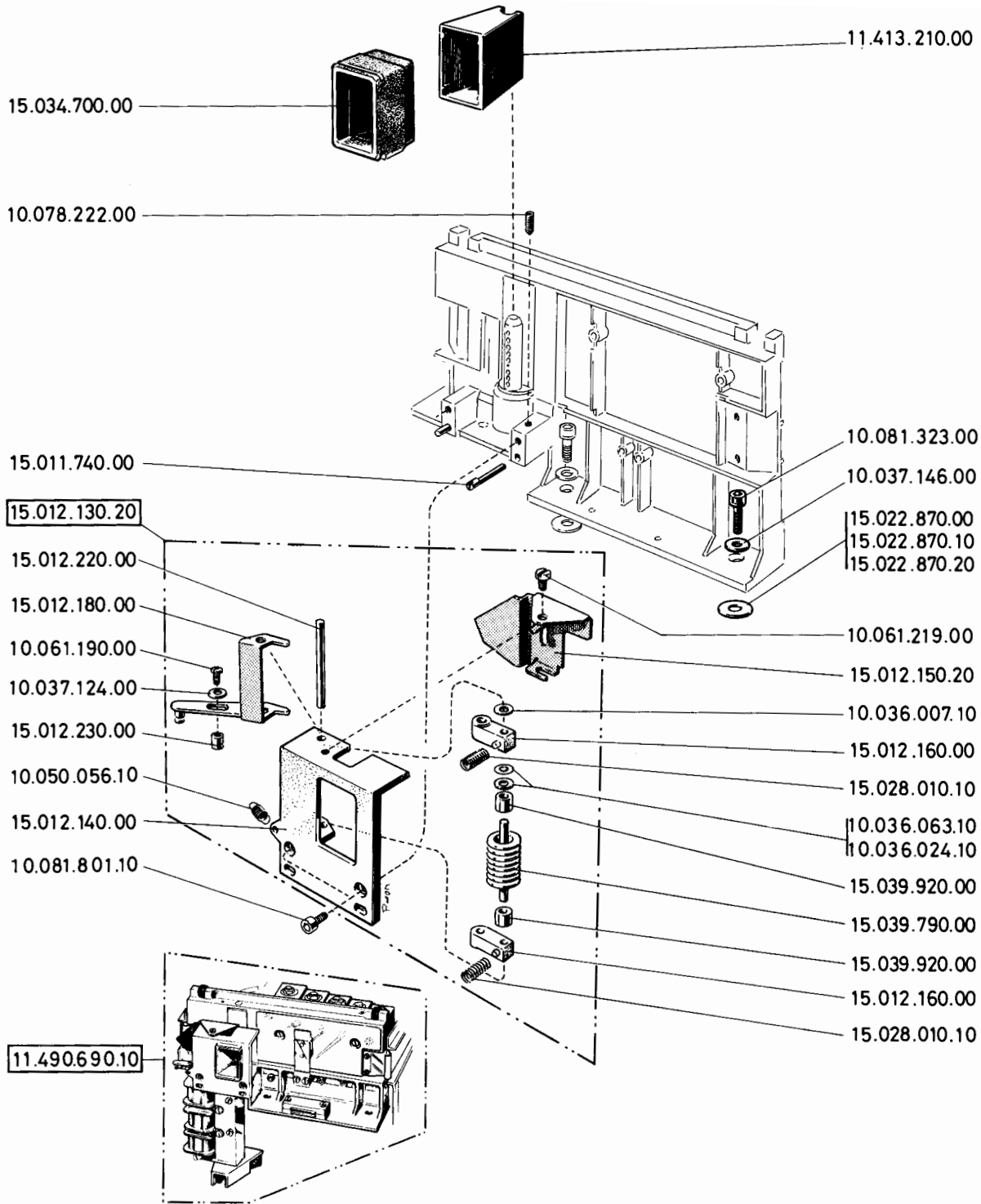
Part No	Component designation	Description	Qty
10.065.807.10		Screw	1
15.033.680.00		Washer	1
15.015.580.00		Tape low sensor arm	1
15.033.930.00		Brake assembly	
15.033.000.00		Brake bracket	1
10.061.191.00		Screw	1
15.953.411.10		Pin	1
15.015.550.00		Brake shoe holder	1
11.492.360.00		Brake shoe	1
11.102.220.10		Spring mount screw	1
15.015.520.00		Arm	1
10.110.310.00		Nut	1
15.028.000.20		Extension spring	1
15.955.620.00		Magnet	1
15.015.410.00		Magnet holder	1
15.015.270.00		Surge takeup arm assembly	
15.015.380.00		Circular spring	1
10.032.106.00		Retainer ring	1
15.037.570.00		Washer	2
11.402.950.10		Guide roller	1
15.015.300.10		Plate	1
11.401.820.10		Surge takeup arm	1
15.955.620.00		Magnet	2
15.015.410.00		Magnet holder	1
15.028.000.10		Extension spring	1
15.015.570.00		Connecting rod	1
15.028.000.00		Extension spring	1
15.015.640.00		Connecting rod	1
11.102.650.30		Retainer ring	2
10.036.087.10		Washer	1
15.957.330.00	S8,9	Dry reed relay	2
11.421.050.10		Holder	4
15.021.870.00		Shield plate	4



3

SUPPLY AND TAKEUP FLANGE

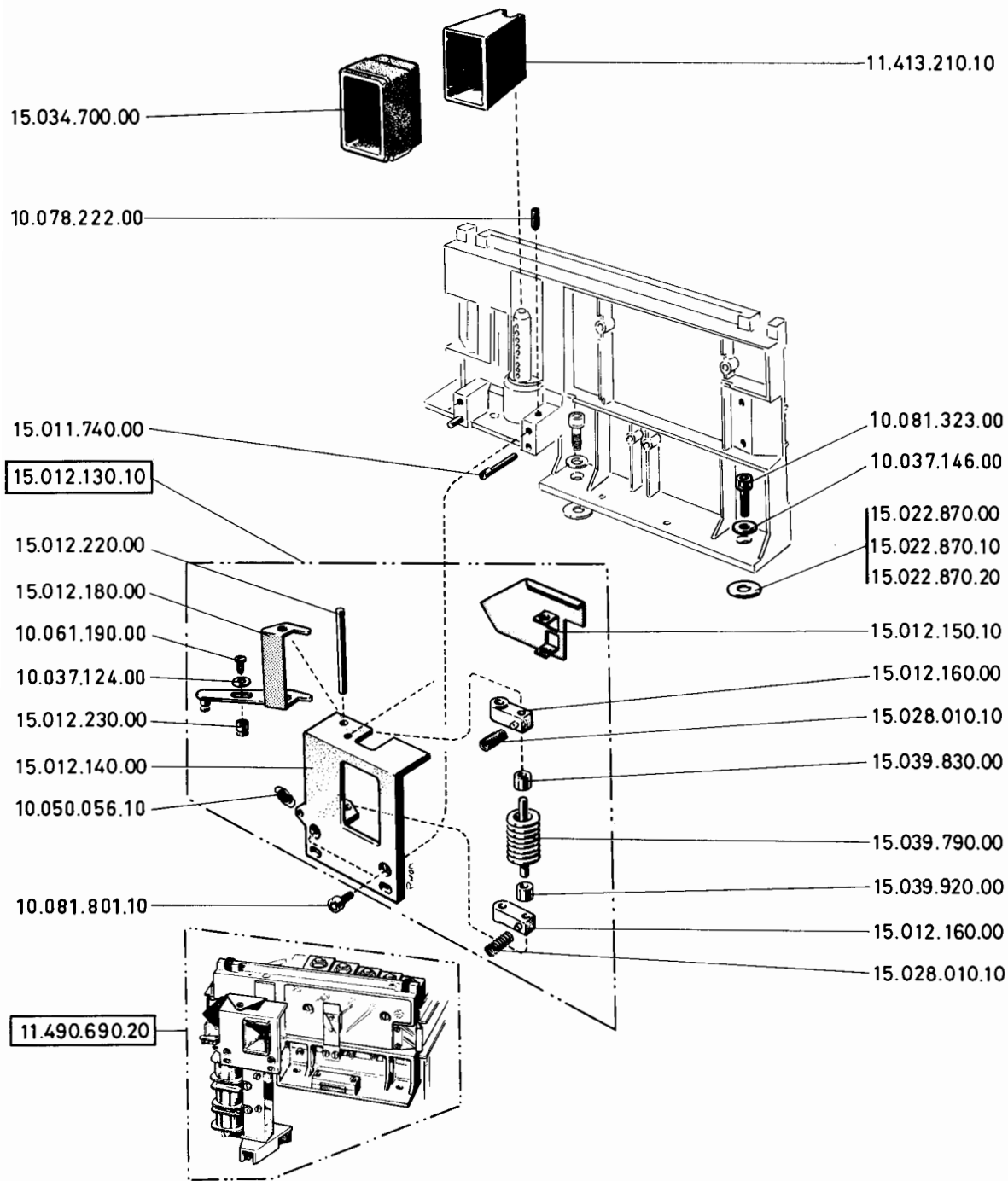
Part No	Component designation	Description	Qty
11.491.190.10		Hub assembly	
11.490.540.00		Takeup flange with rubber ring	1
11.490.700.00		Supply and takeup flange with hub assembly	
15.041.370.00		Sleeve	1
11.490.500.00		Rubber ring	1
10.051.049.10		Compression spring	1
15.041.360.00		Hub	1
15.041.380.00		Catch	2
11.491.140.00		Flange	1
11.590.970.00		Screw	4



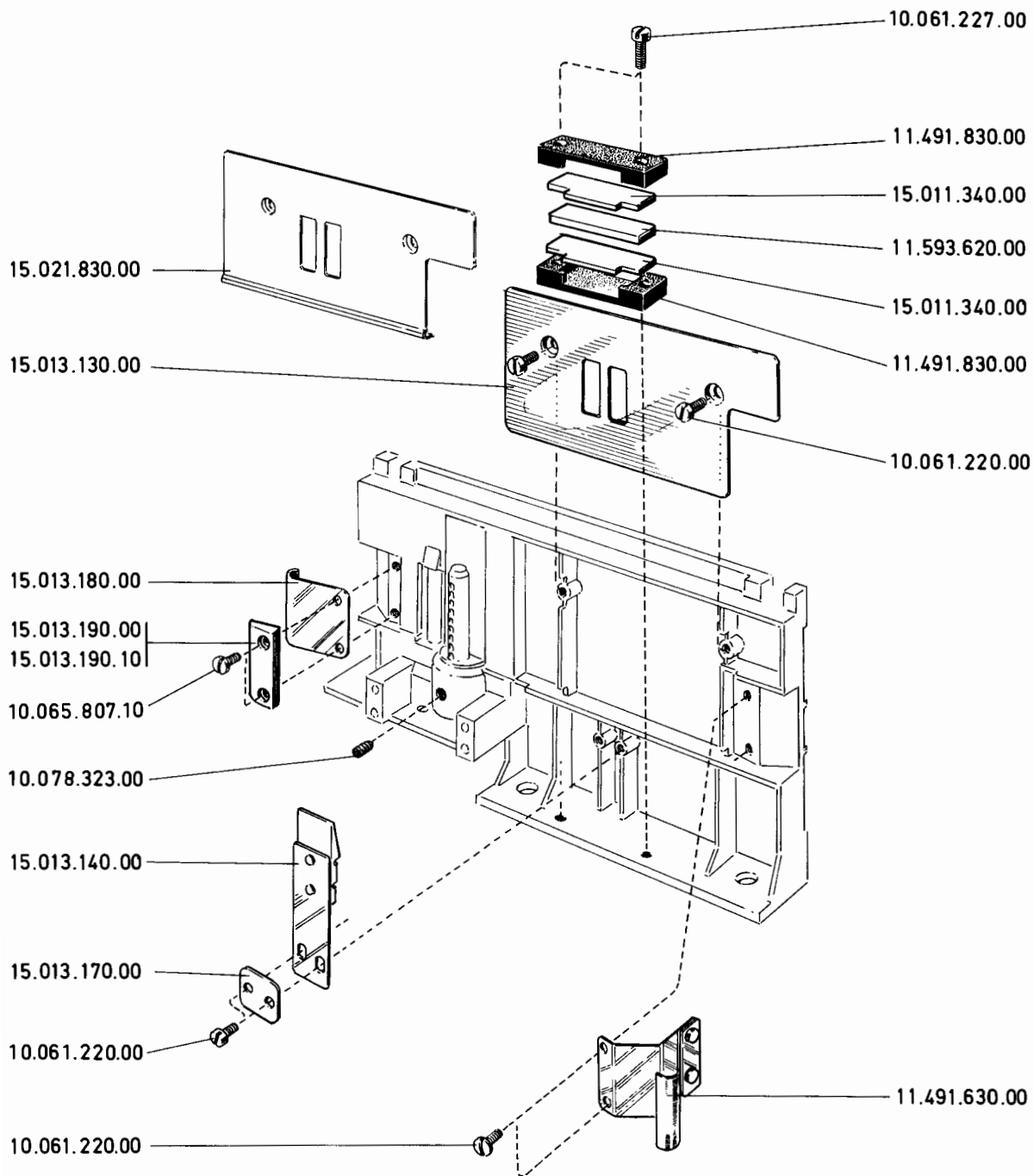
4 PUNCH/FEED UNIT

4.1 FRONT VIEW

Part No	Component designation	Description	Qty
11.490.690.10		Punch/feed unit standard complete	
11.413.210.00		Chad exhaust standard	1
15.034.700.00		Rubber chad-tube adapter	1
15.012.130.20		Cover complete standard	
15.012.140.00		Cover	1
15.012.220.00		Shaft	1
15.012.180.00		Lever	1
10.061.190.00		Screw	1
10.037.124.00		Washer	1
15.012.230.00		Spring mount nut	1
10.050.056.10		Extension spring	1
15.012.150.20		Tape tearer standard	1
10.061.219.00		Screw	2
10.036.007.10		Washer	1
15.012.160.00		Arm	2
15.028.010.10		Compression spring	2
10.036.063.10		Shim washer 0.2 mm	-
10.036.024.10		Shim washer 0.3 mm	-
15.039.920.00		Spacer sleeve 3.1 mm	2
15.039.790.00		Pinch roller with shaft and ballbearings	1
10.078.222.00		Screw	1
15.011.740.00		Eccentric pin	1
10.081.801.10		Screw	2
10.081.323.00		Retainer screw	2
10.037.146.00		Washer	2
15.022.870.00		Shim washer 0.1 mm	-
15.022.870.10		Shim washer 0.3 mm	-
15.022.870.20		Shim washer 0.5 mm	-



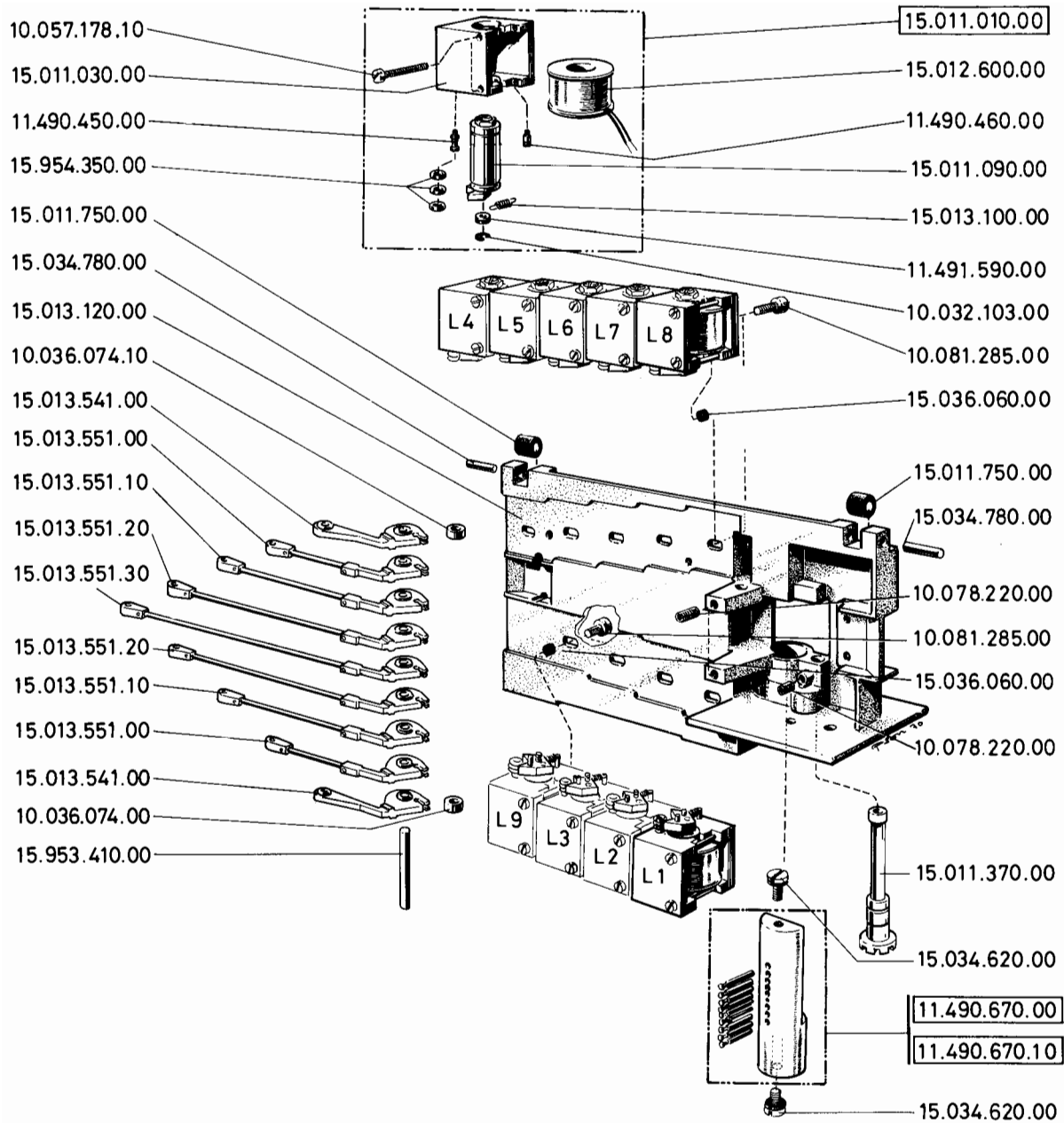
Part No	Component designation	Description	Qty
<u>11.490.690.20</u>		Punch/feed unit TS complete	
11.413.210.10		Chad exhaust TS	1
15.034.700.00		Rubber chad-tube adapter	1
<u>15.012.130.10</u>		Cover complete TS	
15.012.140.00		Cover	1
15.039.830.00		Spacer sleeve 3.4 mm	1
15.012.220.00		Shaft	1
10.061.190.00		Screw	1
10.037.124.00		Washer	1
15.012.230.00		Spring mount nut	1
15.012.180.00		Lever	1
10.050.056.10		Extension spring	1
15.012.150.10		Tape tearer TS	1
15.039.920.00		Spacer sleeve 3.1 mm	1
15.039.790.00		Pinch roller with shaft and ballbearings	1
15.012.160.00		Arm	2
15.028.010.10		Compression spring	2
10.078.222.00		Screw	1
15.011.740.00		Eccentric pin	1
10.081.801.10		Screw	2
10.081.323.00		Retainer screw	2
10.037.146.00		Washer	2
15.022.870.00		Shim washer 0.1 mm	-
15.022.870.10		Shim washer 0.3 mm	-
15.022.870.20		Shim washer 0.5 mm	-



FACIT 4070

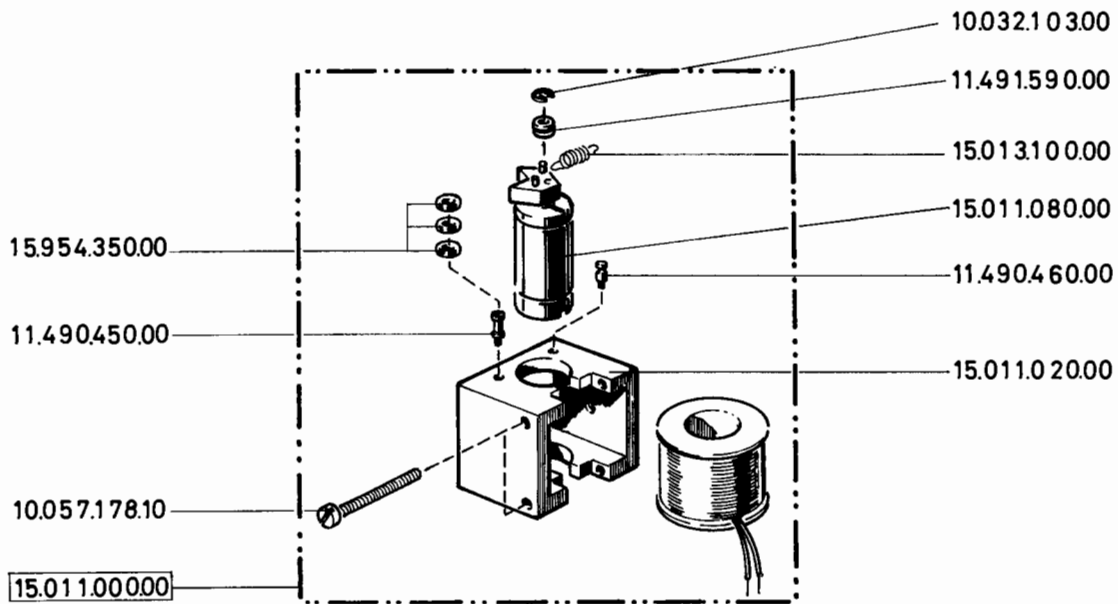
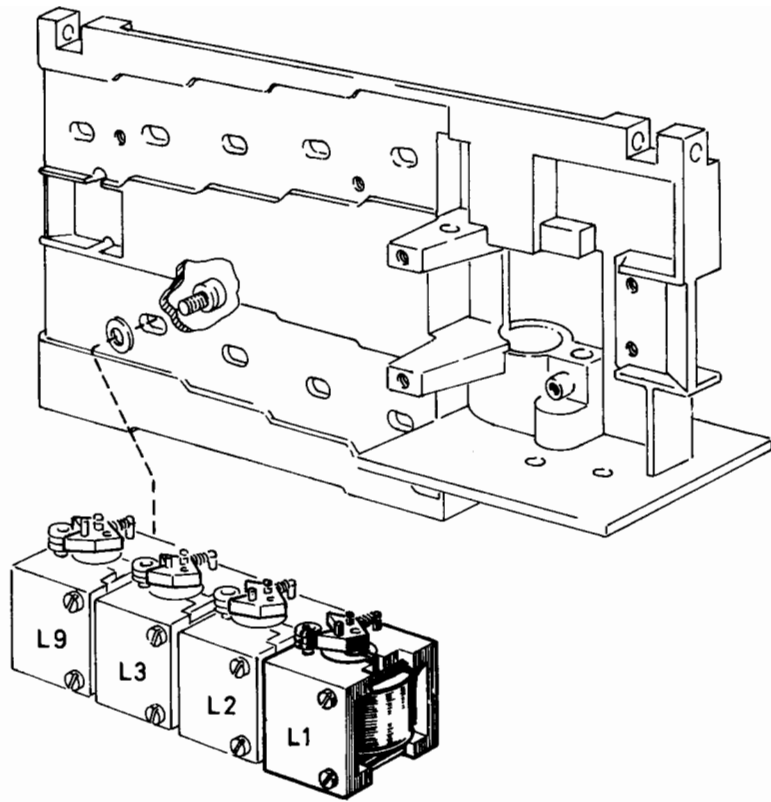
Part No	Component designation	Description	Qty
10.061.227.00		Screw	2
11.491.830.00		Retainer plate	2
15.011.340.00		Plate	2
11.593.620.00		Magnet	1
15.013.130.00		Cover plate standard	1
15.021.830.00		Cover plate TS	1
10.061.220.00		Screw	2
15.013.180.00		Surge takeup spring	1
11.491.630.00		Surge takeup spring	1
15.013.190.00		Washer standard	1
15.013.190.10		Washer TS	1
10.065.807.10		Screw	2
10.061.220.00		Screw	2
15.013.140.00		Spring mounted tape guide	1
15.013.170.00		Washer	1
10.061.220.00		Screw	2
10.078.323.00		Locking screw	1



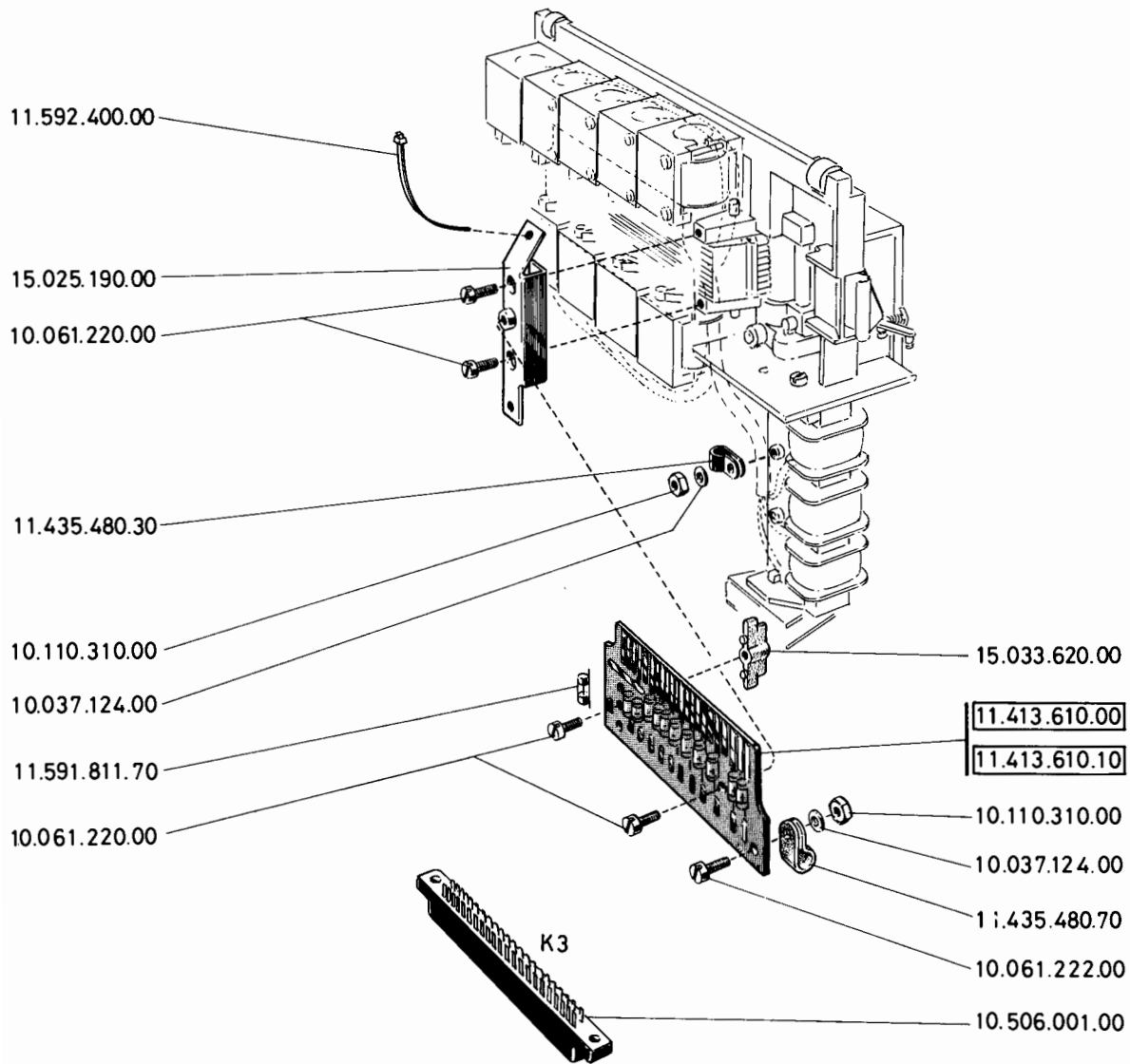


4.2 REAR VIEW

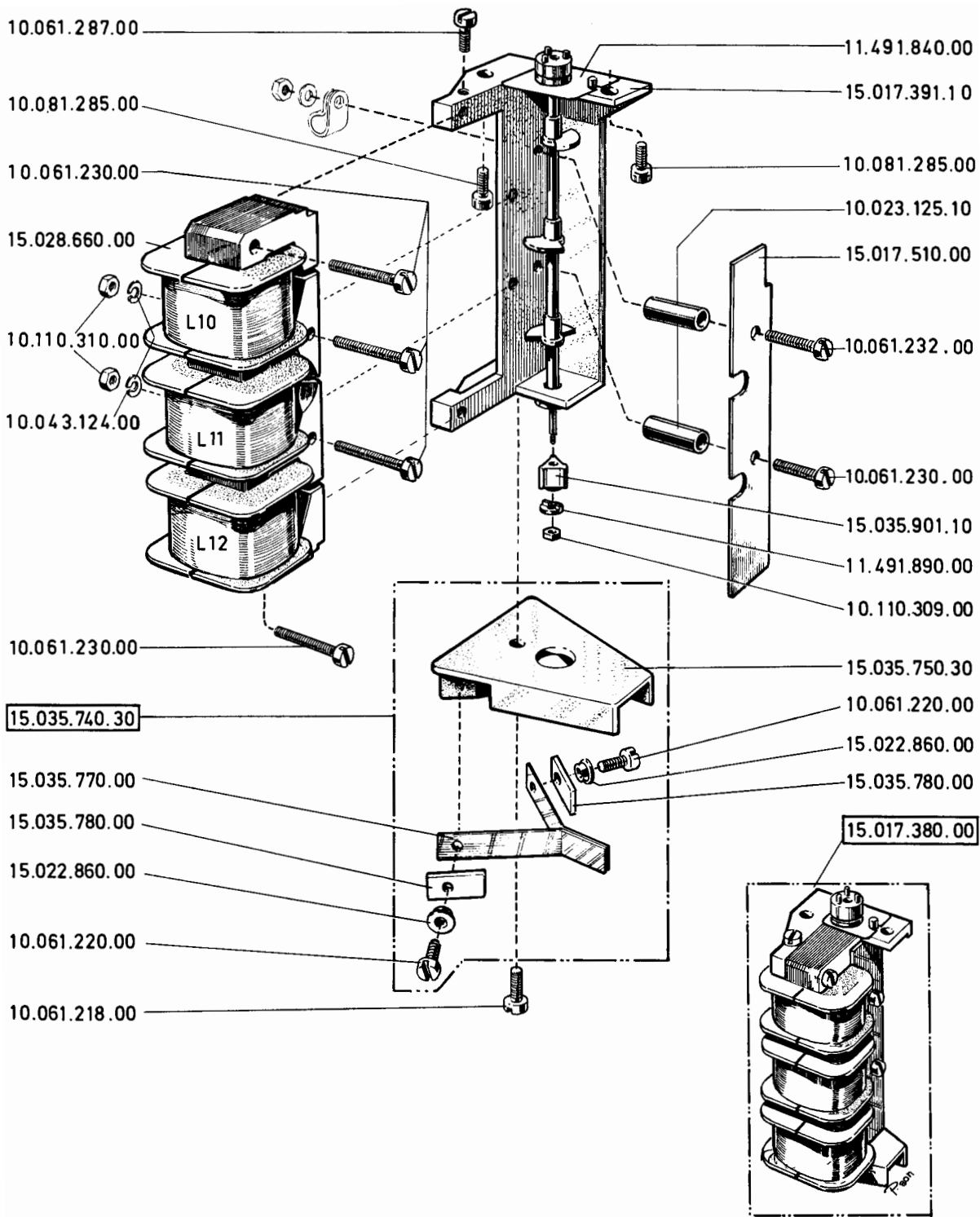
Part No	Component designation	Description	Qty
15.011.010.00	L4-8	Punch solenoid (Ch 4-8) complete	5
10.057.178.10		Screw	2
15.011.030.00		Solenoid housing	1
15.012.600.00	L4-8	Solenoid coil	1
11.490.450.00		Screw	1
15.954.350.00		O-ring	3
11.490.460.00		Spring post	1
15.011.090.00		Solenoid armature	1
11.491.590.00		Plastic sleeve	1
15.013.100.00		Spring	1
10.032.103.00		Retainer ring	1
10.081.285.00		Retainer screw	1
15.036.060.00		Rubber washer	1
15.013.120.00		Punch/feed unit chassis	1
15.011.750.00		Rubber mounting	2
15.034.780.00		Pin	2
15.013.541.00		Punch pin driver (Ch 1 and 8)	2
15.013.551.00		Punch pin driver (Ch 2 and 7)	2
15.013.551.10		Punch pin driver (Ch 3 and 6)	2
15.013.551.20		Punch pin driver (Ch 5 and feed hole channel)	2
15.013.551.30		Punch pin driver (Ch 4)	1
15.953.410.00		Punch pin driver shaft	1
10.078.220.00		Locking screw	2
10.036.074.10		Distance tube TS	2
15.011.370.00		Capstan	1
10.078.220.00		Locking screw	1
11.490.670.00		Punch head with punch pins, standard	
11.490.670.10		Punch head with punch pins, TS	
15.034.620.00		Sealing screw	2



Part No	Component designation	Description	Qty
<u>15.011.000.00</u>	L1-3,9	Punch solenoid (Ch 1-3 and feed hole channel)	4
10.057.178.10		Screw	2
15.011.020.00		Solenoid housing	1
15.012.600.00	L1-3,9	Solenoid coil	1
11.490.450.00		Screw	1
15.954.350.00		O-ring	3
11.490.460.00		Spring post	1
15.011.080.00		Solenoid armature	1
11.491.590.00		Plastic sleeve	1
15.013.100.00		Spring	1
10.032.103.00		Retainer ring	1
10.081.285.00		Retainer screw	1
15.036.060.00		Rubber washer	1

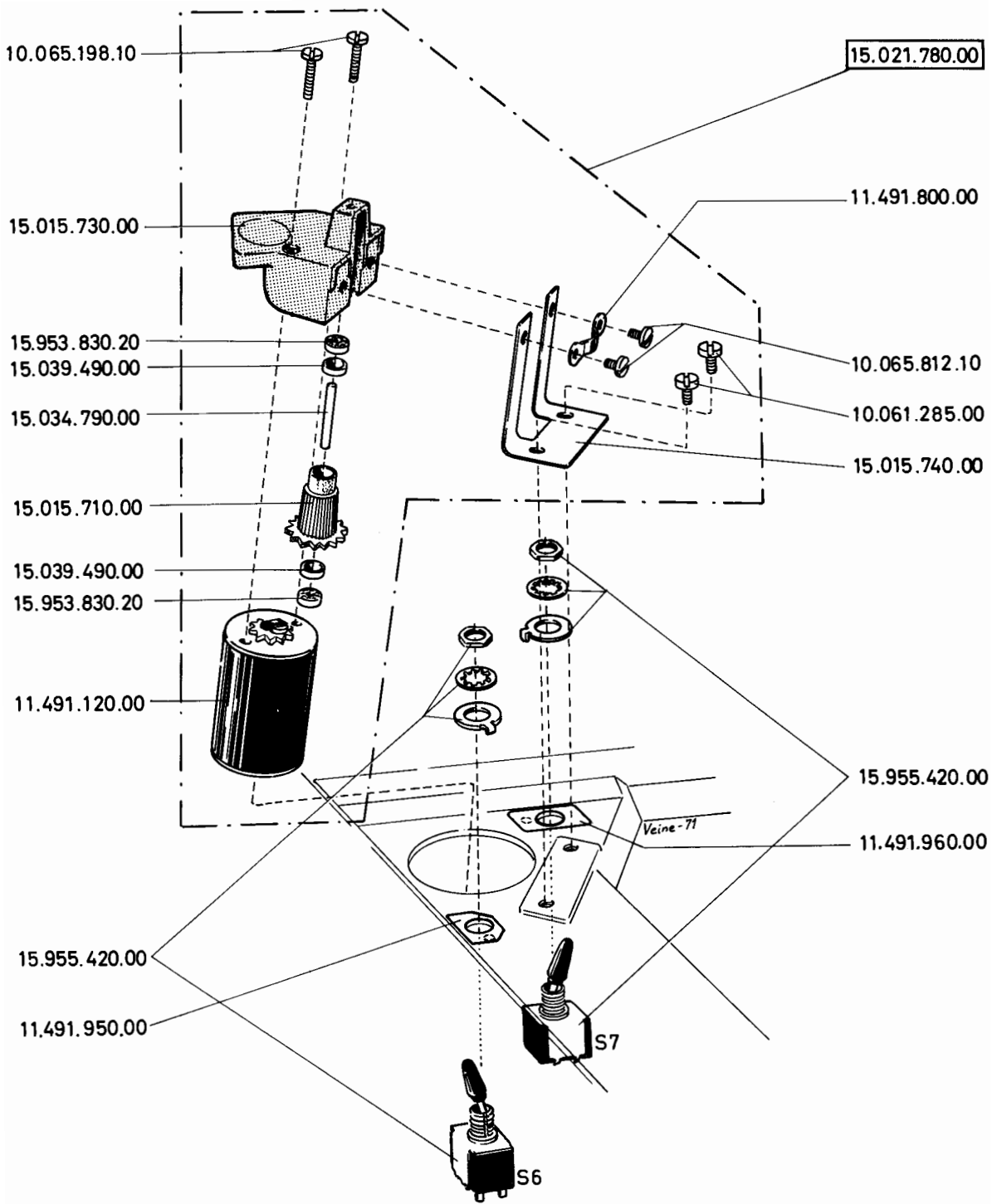


Part No	Component designation	Description	Qty
15.025.190.00		Bracket	1
10.061.220.00		Screw	2
11.592.400.00		Cable clamp	1
11.435.480.30		Cable clamp	1
10.110.310.00		Nut	1
10.037.124.00		Washer	1
<u>11.413.610.00</u>		Board with fuses standard complete	
11.591.811.70		Fuse, miniature 2A	12
<u>11.413.610.10</u>		Board with fuses TS, complete	
11.591.811.70		Fuse, miniature 2A	10
15.033.620.00		Spacer	1
10.061.220.00		Screw	2
11.435.480.70		Cable clamp	1
10.110.310.00		Nut	1
10.037.124.00		Washer	1
10.061.222.00		Screw	1
10.506.001.00	K3	PC board connector	1



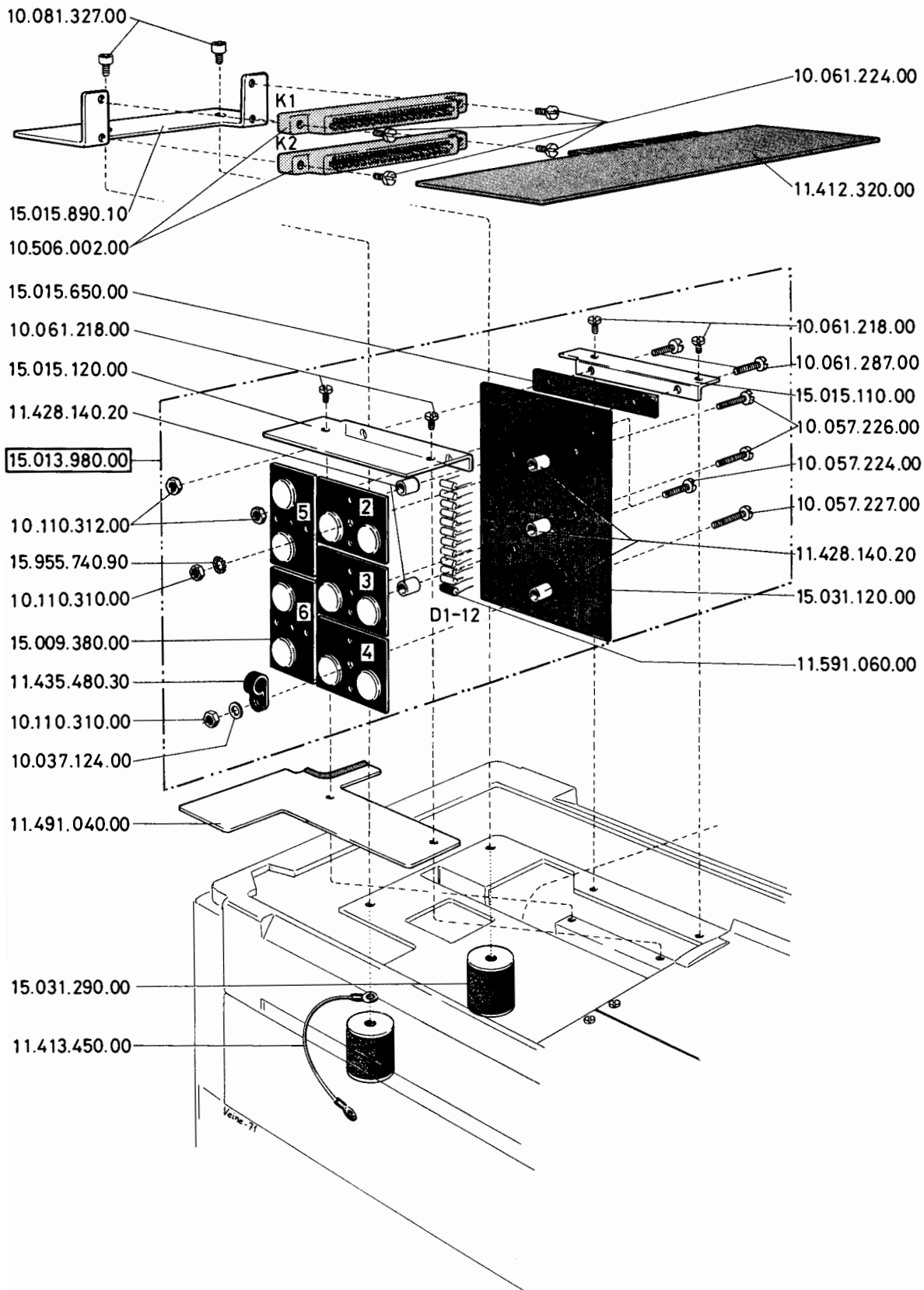
5 INCREMENTAL MOTOR

Part No	Component designation	Description	Qty
15.017.380.00		Incremental motor with brake, complete	
15.035.740.30		Motor brake complete	
15.028.660.00	L10-12	Stator with windings	1
15.017.391.10		Motor mount	1
11.491.840.00		Protective washer	1
15.035.901.10		Brake triangle	1
11.491.890.00		Locating washer	1
10.110.309.00		Nut	1
10.061.287.00		Screw	1
10.061.230.00		Screw	5
15.017.510.00		Protective cover	1
10.023.125.10		Spacer sleeve	2
10.061.232.00		Screw	1
10.043.124.00		Washer	2
10.110.310.00		Nut	2
10.061.218.00		Screw	1
10.081.285.00		Retainer screw	2
15.035.740.30		Motor brake, complete	
15.035.750.30		Brake housing	1
10.061.220.00		Screw	2
15.022.860.00		Spacer sleeve	2
15.035.770.00		Brake spring	2
15.035.780.00		Rubber pad	2



6 WINDING MOTOR

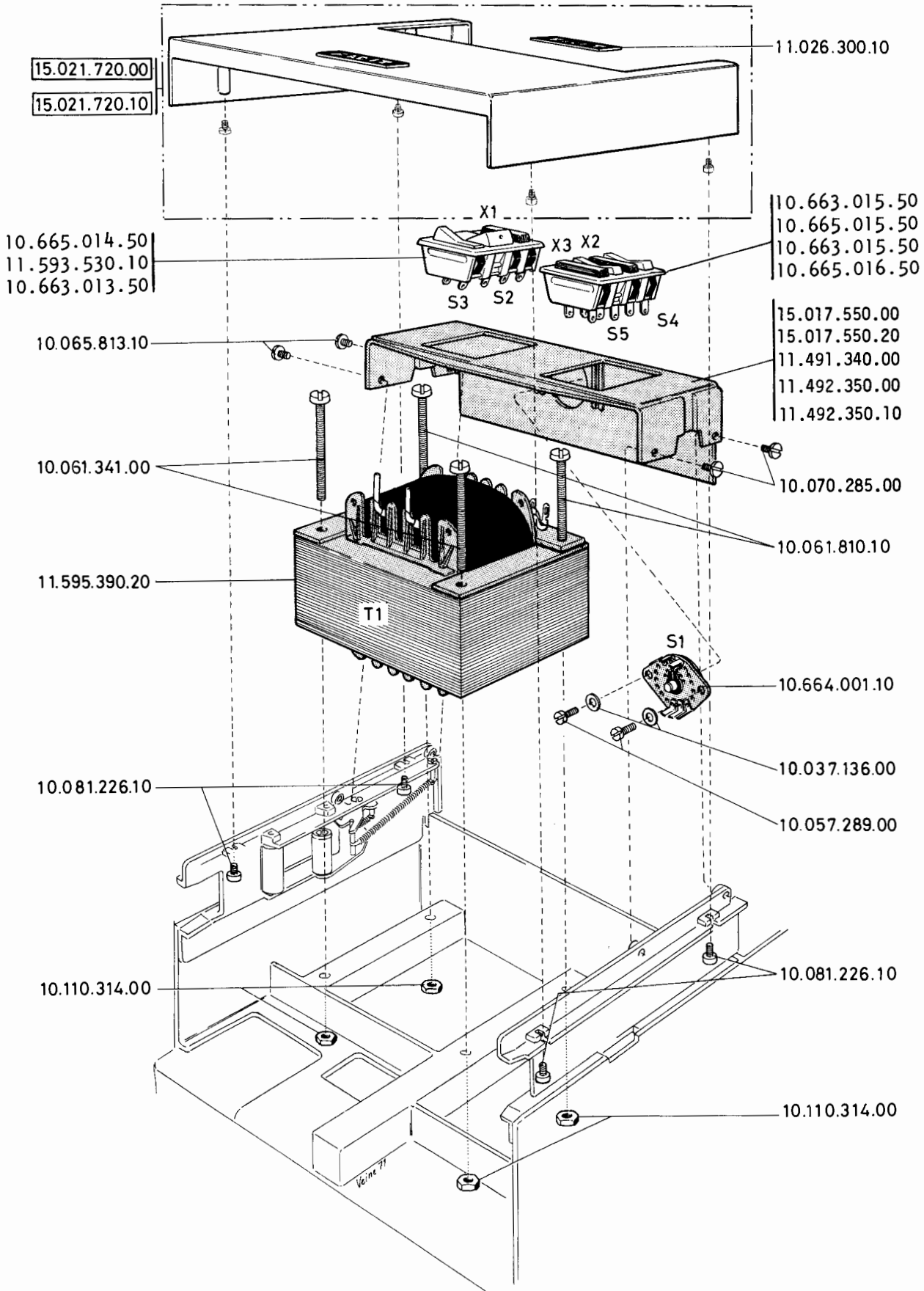
Part No	Component designation	Description	Qty
15.021.780.00		Winding motor assembly	
10.065.198.10		Screw	2
15.015.730.00		Gear housing	1
15.953.830.20		Ball bearing	2
15.039.490.00		Ring	2
15.034.790.00		Shaft	1
15.015.710.00		Flange driver	1
11.491.120.00		Motor	1
11.491.800.00		Protector bracket	1
10.065.812.10		Screw	2
10.061.285.00		Screw	2
15.015.740.00		Motor bracket	1
15.955.420.00	S6,7	Switch	2
11.491.950.00		Label	1
11.491.960.00		Label	1



7 POWER SUPPLY

7.1 DIODE CIRCUIT BOARD

Part No	Component designation	Description	Qty
15.015.890.10		Bracket for PC board connector	1
10.081.327.00		Screw	2
10.506.002.00	K1,2	PC board connector	2
10.061.224.00		Screw	4
11.412.320.00		Bridging board	1
15.013.980.00		Diode circuit board complete	
10.061.218.00		Screw	4
10.061.287.00		Screw	2
10.110.312.00		Nut	2
15.015.110.00		Mounting bracket	1
15.015.650.00		Plate	1
15.015.120.00		Mounting bracket	1
10.057.226.00		Screw	2
10.057.227.00		Screw	1
10.057.224.00		Screw	2
11.428.140.20		Spacer sleeve	5
15.955.740.90		Washer	1
10.110.310.00		Nut	2
11.435.480.30		Cable clamp	1
10.037.124.00		Washer	1
15.009.380.00	2-6	2-diode unit	5
11.591.060.00	D1-12	Diode 1N4002	12
15.031.120.00		Circuit board	1
11.491.040.00		Cooler	1
15.031.290.00		Rubber mounting	2
11.413.450.00		Ground lead	1



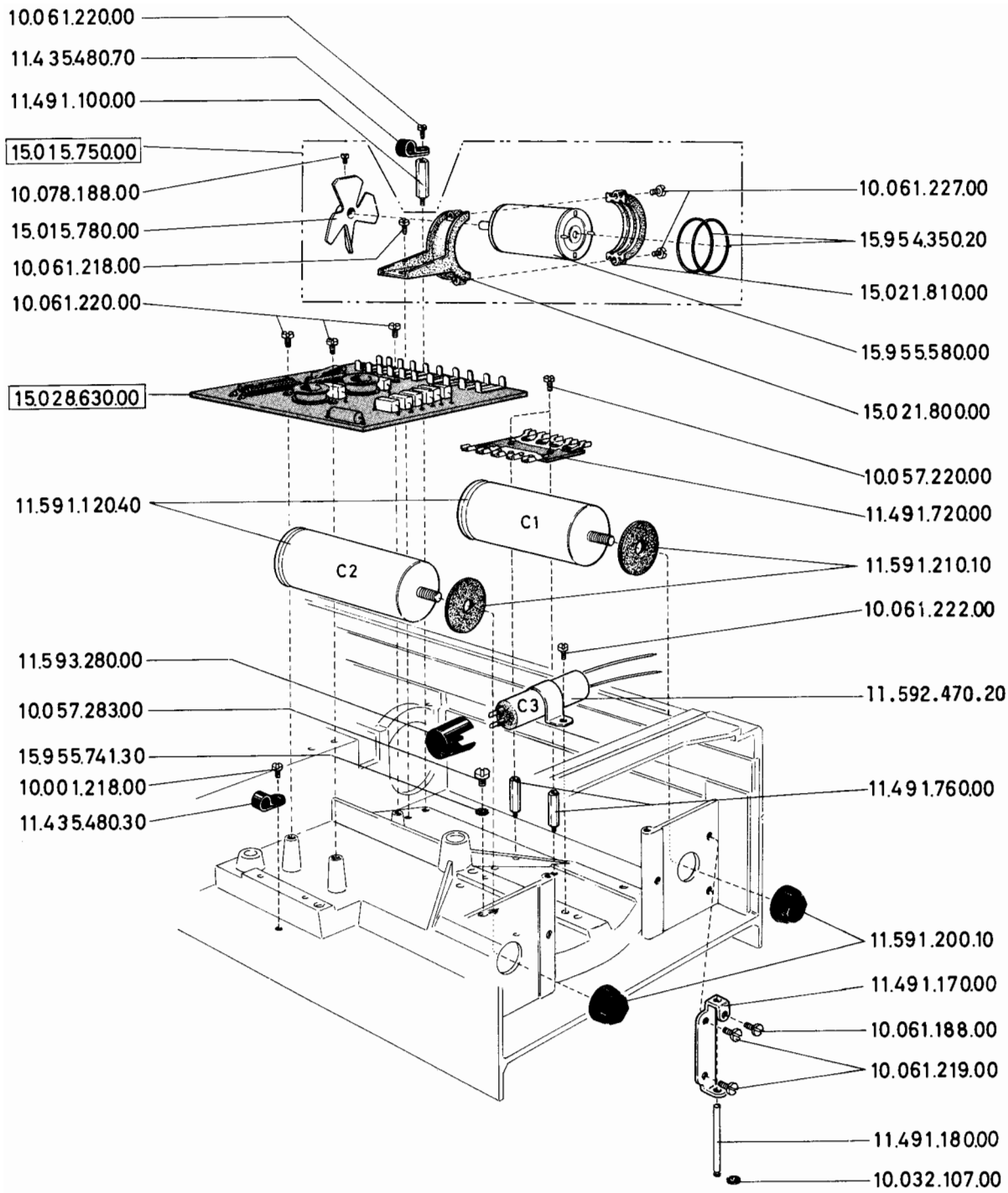
7.2

TRANSFORMER AND CONTROL PANEL

Part No.	Component Designation	Description	Qty
15.021.720.00		Cover assembly	
15.021.720.10		Cover assembly, Amer	
11.026.300.10		Sign plate	1
10.081.226.10		Screw	4
**10.665.014.50	X1	Ready lamp	1
**11.593.530.10	S2	Power-on switch	1
**10.663.013.50	S3	DC-on switch	1
**10.663.015.50	S4	Tape feed switch	1
**10.665.015.50	X2	Error lamp	1
**10.663.015.50	S5	Code/Feed hole switch	1
**10.665.016.50	X3	Tape low lamp	1
15.017.550.00		Control panel, standard	1
15.017.550.20		Control panel, Amer	1
11.491.340.00		Control panel, standard, rack version	1
**11.492.350.00		Control panel (DC)	1
11.492.350.10		Control panel, rack version (DC)	1
10.070.285.00		Screw	4
*11.595.390.20	T1	Transformer	1
10.110.314.00		Nut	4
10.061.341.00		Screw	2
10.061.810.10		Screw	2
*10.664.001.10	S1	Selector switch 100/115/220/240V	1
10.037.136.00		Washer	2
10.057.289.00		Screw	2

*These parts first used on units with serial numbers prefixed 1306 and may be used on prior units if both parts are replaced. Prior units use 11.595.390.00 Transformer and 15.955.750.10 Selector Switch.

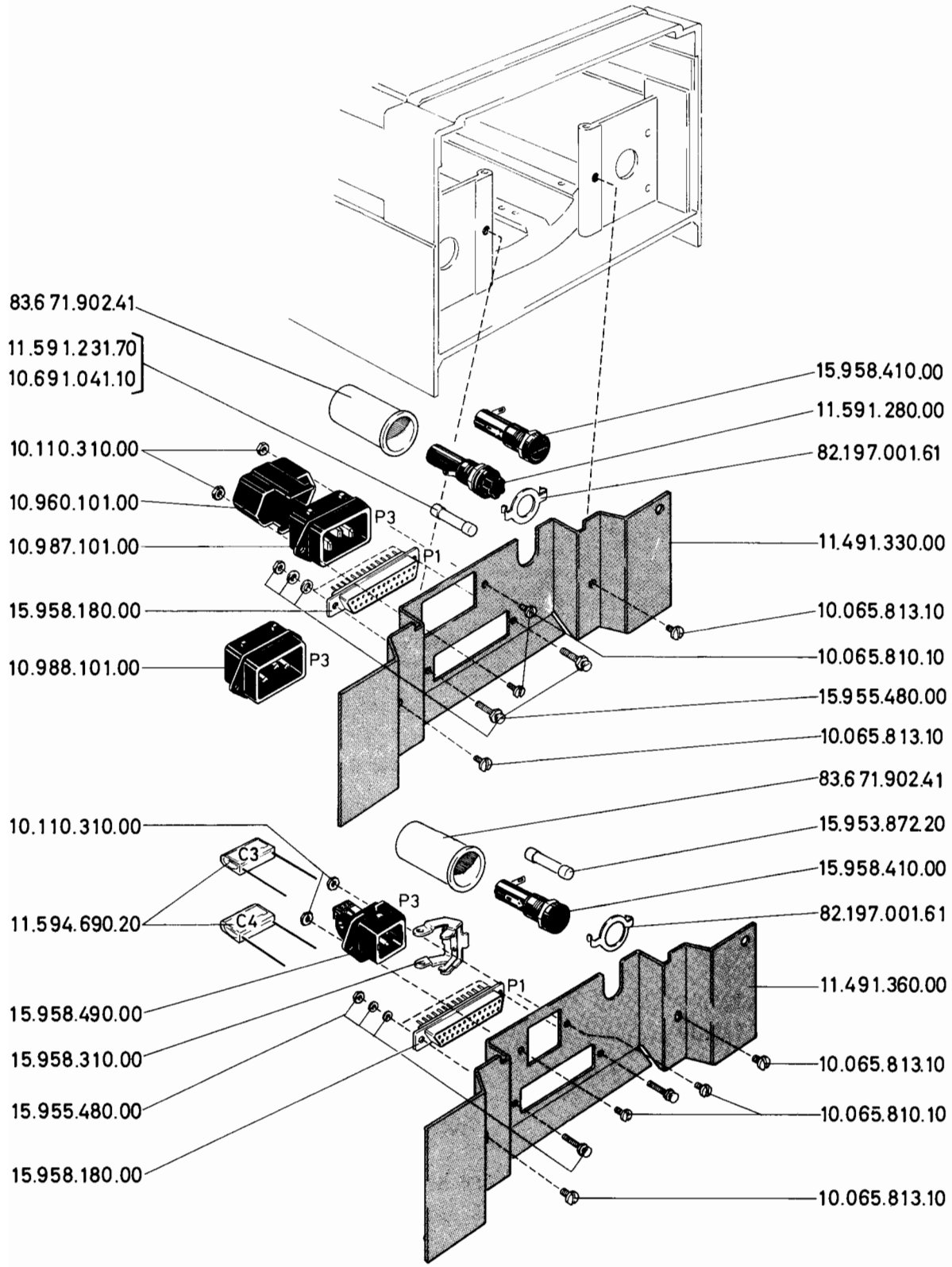
**These parts first used on units with serial numbers prefixed 1408 and may be used on prior units if all parts are replaced. Prior units use 15.017.550.00 Control Panel, 15.958.440.00 2-Button/1-Lamp Assy (S2, S3, X1), and 15.958.420.00 2-Button/2-Lamp Assy (S4, S5, X2, X3).



7.3 FAN AND FILTER

Part No	Component designation	Description	Qty
10.061.220.00		Screw	1
11.435.480.70		Cable clamp	1
11.491.100.00		Distance screw	1
<u>15.015.750.00</u>		Fan assembly	
15.015.780.00		Impeller	1
10.078.188.00		Stop screw	1
10.061.218.00		Screw	1
15.021.800.00		Motor mount half with bracket	1
10.061.227.00		Screw	2
15.021.810.00		Motor mount half	1
15.955.580.00		Motor	1
15.954.350.20		O-ring	2
<u>15.028.630.00</u>		Filter circuit board complete (See page II.8:8)	1
10.061.220.00		Screw	3
11.591.120.40	C1,2	Capacitor 10.000 μ F 35 V	2
11.591.210.10		Rubber washer	2
11.591.200.10		Special nut	2
11.491.720.00		Solder terminal	1
10.057.220.00		Screw	2
11.491.760.00		Distance screw	2
11.592.470.20	C3	Disturbance suppressor	1
11.593.280.00		Protector	1
10.061.222.00		Screw	1
10.057.283.00		Grounding screw	1
15.955.741.30		Washer	1
10.061.218.00		Screw	1
11.435.480.30		Cable clamp	1
11.491.170.00		PC board catch holder	1
10.061.219.00		Screw	2
10.061.188.00		Screw	1
11.491.180.00		PC board catch	1
10.032.107.00		Retainer ring	1





7.4 REAR PANEL

Part No	Component designation	Description	Qty
11.491.330.00		Rear panel (AC)	1
11.591.280.00		Fuse holder Amer.	1
15.958.410.00		Fuse holder	1
82.197.001.61		Locking washer	1
11.591.231.70		Fuse 2AT (AC)	1
10.691.041.10		Fuse 2AT (AC) Amer	1
83.671.902.41		Fuse Cover	1
10.987.101.00	P3	Mains voltage inlet CEE (AC)	1
10.988.101.00	P3	Mains voltage inlet Amer (AC)	1
10.960.101.00		Cover (AC)	1
10.065.810.10		Screw	2
10.110.310.00		Nut	2
15.958.180.00	P1	Signal connector	1
15.955.480.00		Special screw with nut and washers	2
10.065.813.10		Screw	2
11.491.360.00		Rear panel (DC)	1
15.958.410.00		Fuse holder	1
82.197.001.61		Locking washer	1
15.953.872.20		Fuse 5A (DC)	1
83.671.902.41		Fuse cover	1
15.958.180.00	P1	Signal connector	1
15.955.480.00		Special screw with nut and washers	2
15.958.490.00	P3	Mains voltage inlet (DC)	1
15.958.310.00		Locking device (DC)	1
10.065.810.10		Screw	2
10.110.310.00		Nut	2
11.594.690.20	C3,4	Disturbance suppressor 0.22 μ F (DC)	2
10.065.813.10		Screw	2

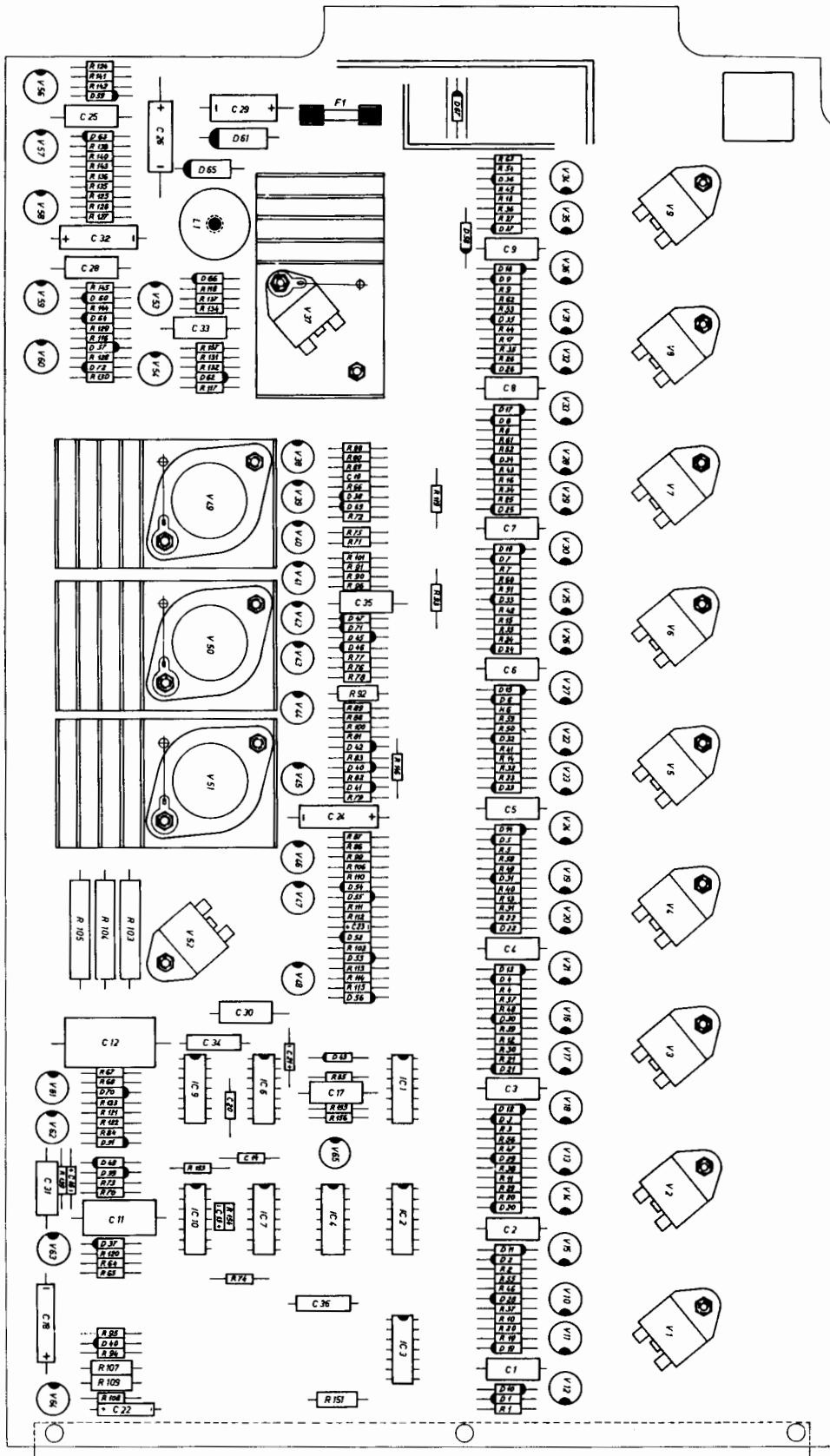
8 CIRCUIT BOARDS

8.1 *CONTROL CIRCUIT BOARD

Part No	Component designation	Description	Qty
** 15.038.720.00		Control circuit board GEL complete	
11.592.810.00	V1-9,52	Transistor TIP 33A, 2N 3055	10
11.591.870.00	V49-51	Transistor 2N 3055	3
11.594.870.00	V37	Transistor TIP 33A	1
10.061.222.00		Screw for V1-9, 37,49-52	18
15.955.740.90		Washer for V1-9,37,49-52	28
10.110.310.00		Nut for V1-9,37,49-52	18
11.594.310.10		Lug for V37,49-51	4
11.413.650.00		Cooler for V37,49-51	4
11.591.010.00	V10,13,16,19, 22,25,28,31, 34,48	Transistor BFY 50	10
11.592.150.00	V41,44,46,53, 64	Transistor 2N 2904	5
11.418.590.00		Washer for V10,13,16,19,22,25,28,31 34,40,41,44,46,48,53,64	16
11.591.930.00	V11,14,17,20, 23,26,29,32, 35,56,63	Transistor 2N 3703	11
11.591.010.00	V40	Transistor BFY 50 (special)	1
11.592.130.20	V39,42,61	Transistor 2N 3704 (special)	3
11.591.940.00	V12,15,18,21, 24,27,30,33, 36,38,43,45, 47,54,57-60, 62,65	Transistor 2N 3704	20
11.591.040.00	D28-36,56	Diode AAZ15, AAZ17	10
11.591.840.00	D65	Diode NS3001	1
11.591.910.00	D1-18,19-27 37,38,40-43 45-49,51-55, 57-60,62,63, 66,67,69-71	Diode 1N4148	54
11.591.970.20	D39,64,72	Zener-diode 3.6V 1N747A	3
11.594.880.00	D61	Zener-diode IZC 6.8 T5, 1S3006A	1
11.594.820.00	IC1	IC FCH 161	1
11.594.830.00	IC3,4,7	IC FCH 191	3

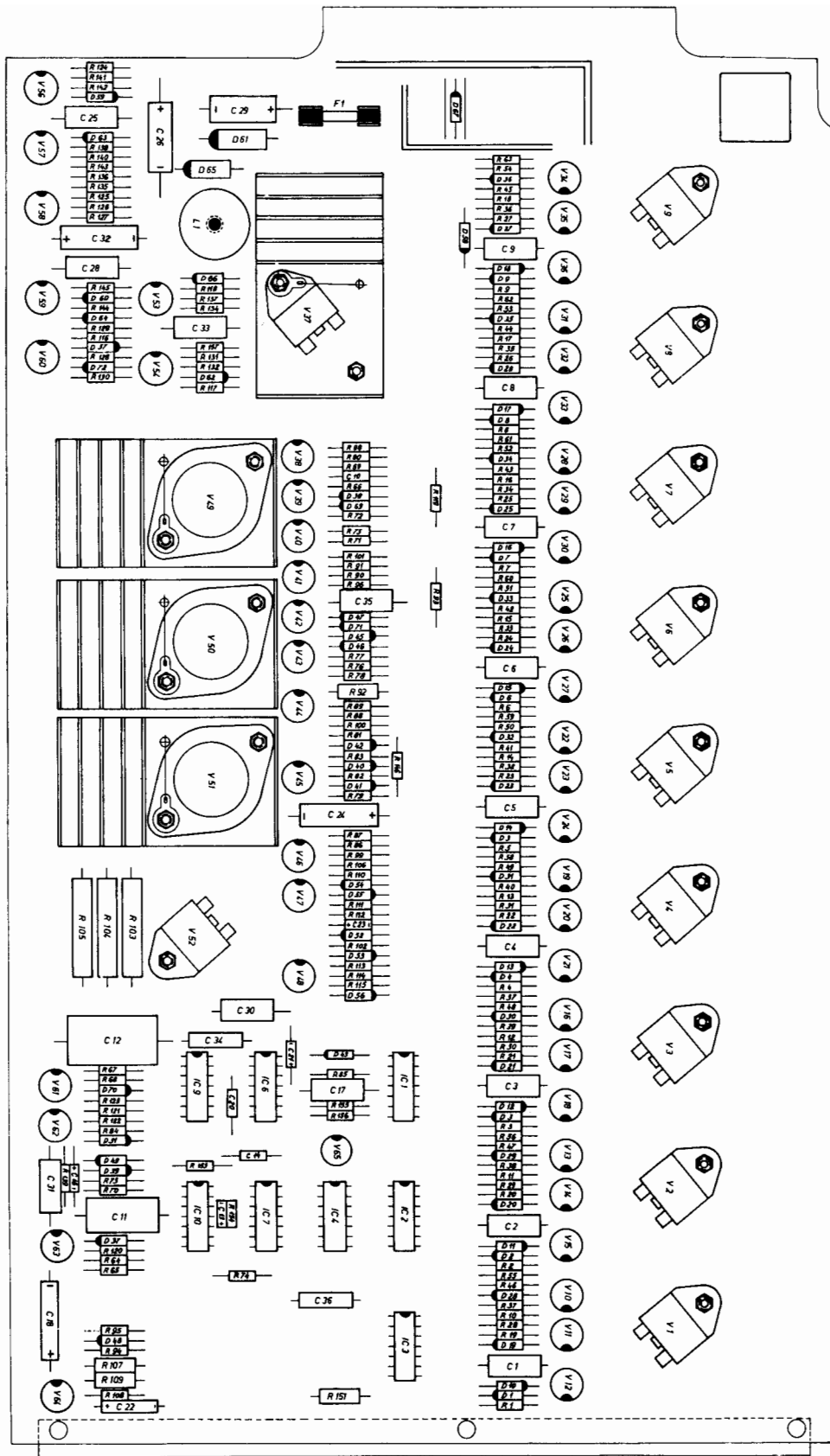
* Not used by Hewlett-Packard, see paragraph 8.2.

**DC (battery) version



FACIT 4070

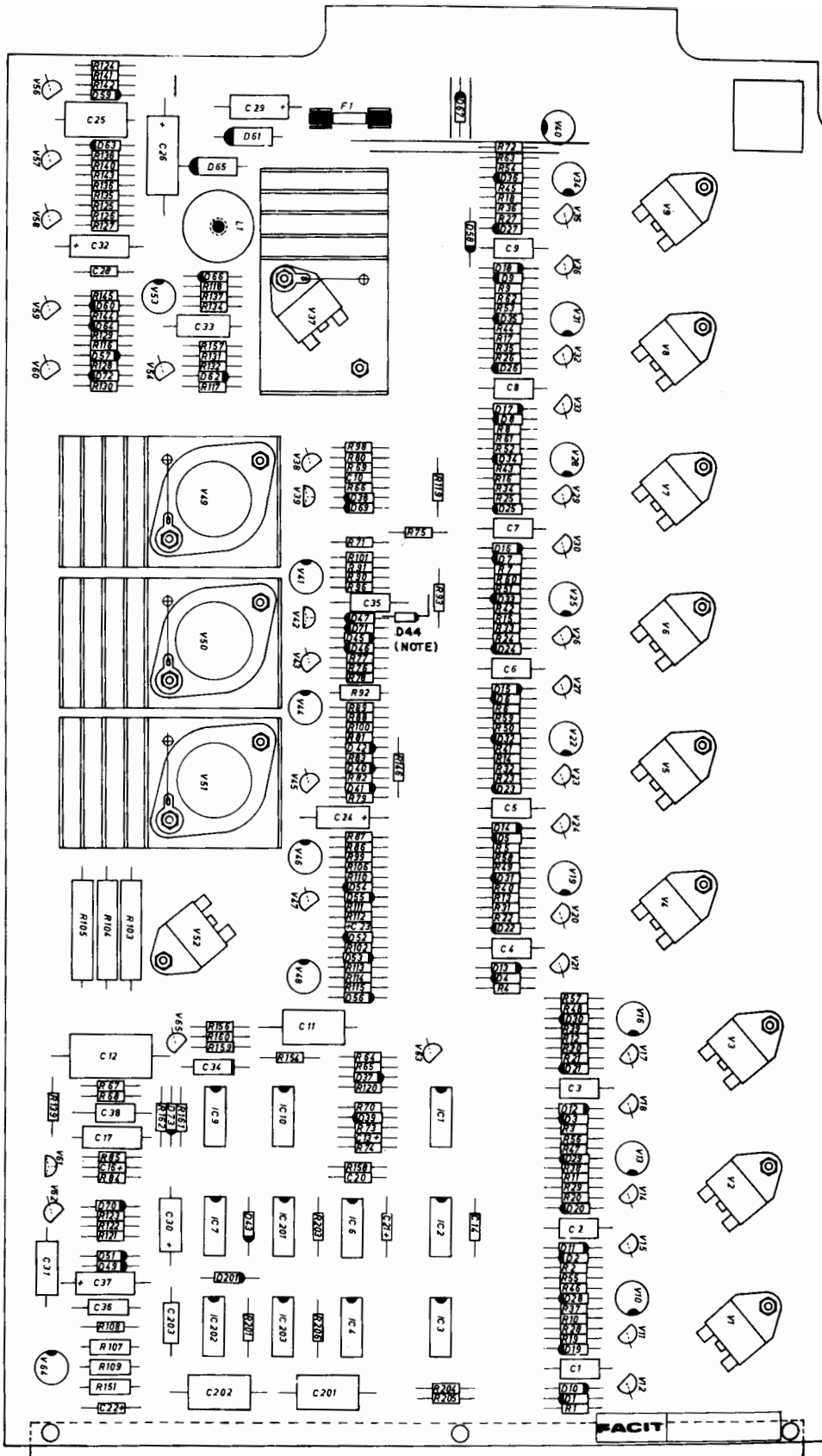
Part No	Component designation	Description	Qty
11.594.840.00	IC6	IC FCH 211	1
11.594.850.00	IC2	IC FCJ 121	1
11.594.860.00	IC9,10	IC FCK 111	2
15.038.750.00	L1	Coil	1
11.592.650.00		Potcore	1
10.057.771.10		Screw	1
15.039.850.00		Washer	1
15.042.180.00	R143	Resistance wire 0.05 ohms	1
11.591.250.70	R92	Resistor 2.2 ohms 1/2W 10%	1
11.592.207.10	R157	Resistor 4.7 ohms 1/4W 5%	1
11.592.230.10	R103-105	Resistor 4.7 ohms 8W 10%	3
11.592.200.10	R134	Resistor 10 ohms 1/4W 5%	1
11.591.730.30	R151	Resistor 15 ohms 1/2W 5%	1
11.592.200.90	R102	Resistor 47 ohms 1/4W 5%	1
11.592.201.30	R55-63,73,85, 94,99-101,115	Resistor 100 ohms 1/4W 5%	16
11.591.731.30	R107,109	Resistor 100 ohms 1/2W 5%	2
11.592.201.50	R117	Resistor 150 ohms 1/4W 5%	1
11.592.201.70	R87,89,91,108, 129,130	Resistor 220 ohms 1/4W 5%	6
11.592.201.90	R37-45,75,84, 86,88,90,113, 118,138	Resistor 330 ohms 1/4W 5%	18
11.592.202.10	R80,131,146	Resistor 470 ohms 1/4W 5%	3
11.592.202.30	R71,153	Resistor 680 ohms 1/4W 5%	2
11.592.202.50	R72,98,127, 132,137,154	Resistor 1k 1/4W 5%	6
11.592.210.10	R135	Resistor 1.2k 1/4W 2%	1
11.592.210.20	R125,144	Resistor 1.5k 1/4W 2%	2
11.592.202.90	R46-54,93,111, 119,120,123, 145	Resistor 2.2k 1/4W 5%	15
11.592.203.30	R19-36,69,79, 96,116,121, 122,128	Resistor 4.7k 1/4W 5%	25
11.592.203.70	R74,81-83,95 106,114,156	Resistor 10k 1/4W 5%	8
11.592.210.80	R67	Resistor 18k 1/4W 2%	1
11.592.210.30	R142	Resistor 22k 1/4W 2%	1
11.592.204.10	R1-18,66,70, 76-78,110, 139,140	Resistor 22k 1/4W 5%	26
11.592.210.40	R124,155	Resistor 47k 1/4W 2%	2



Part No	Component designation	Description	Qty
11.592.210.90	R65	Resistor 56k 1/4W 2%	1
11.592.204.90	R112	Resistor 100k 1/4W 5%	1
11.592.20x.x0	R126,136	Resistor 6.8k-150k 1/4W 5% to be tested out	2
11.592.20x.x0	R64,68	Resistor 82k-470k 1/4W 5% to be tested out	2
11.592.20x.x0	R141	Resistor 120k-180k 1/4W 5% to be tested out	1
10.505.322.00	C20	Capacitor 220 pF	1
10.505.410.00	C10,14,28	Capacitor 1.000 pF	3
10.505.422.00	C1-9,34,36	Capacitor 2.200 pF	11
10.505.447.00	C15,31,35	Capacitor 4.700 pF	3
10.505.510.00	C17	Capacitor 0.01 μ F	1
10.505.547.00	C33	Capacitor 0.047 μ F	1
11.594.760.20	C25,30	Capacitor 0.1 μ F 100V	2
11.593.050.30	C16,21	Capacitor 0.47 μ F 35V	2
11.594.760.60	C11	Capacitor 0.47 μ F 100V	1
11.593.050.40	C23	Capacitor 1 μ F 35V	1
11.594.760.80	C12	Capacitor 1 μ F 100V	1
11.593.050.60	C13,22	Capacitor 4.7 μ F 10V	2
11.593.060.30	C32	Capacitor 10 μ F 20V	1
11.593.070.10	C29	Capacitor 10 μ F 35V	1
11.593.070.30	C18,24	Capacitor 47 μ F 20V	2
11.593.080.30	C26	Capacitor 220 μ F 10V	1
11.591.221.20	F1	Fuse 630 mA (Fast action)	1
11.413.220.00		Fuse holder	2
15.015.990.00		Angle bar	1
15.955.070.10		Tubular rivet	3
11.413.600.00		Label	1

8.2 CONTROL CIRCUIT BOARD

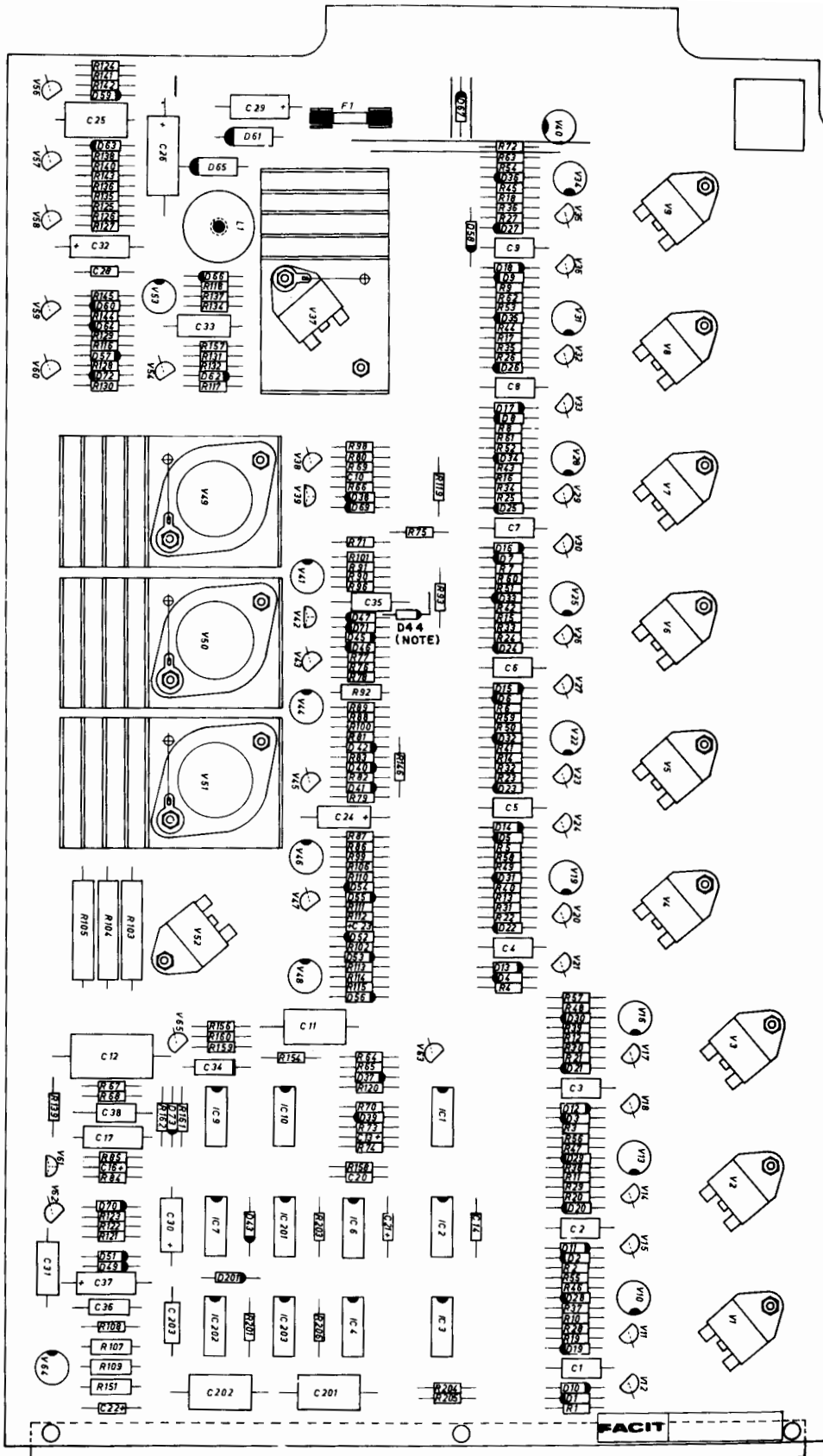
Part No	Component designation	Description	Qty
<u>15.038.720.20</u>		Control circuit board complete	
11.592.810.00	V1-9,52	Transistor TIP 33A,2N3055	10
10.023.117.10		Spacer for V1-9,52	10
10.061.226.00		Screw for V1-9,52	10
10.110.310.00		Nut for V1-9,52	10
15.955.740.90		Washer for V1-9,52	20
11.591.010.00	V10,13,16,19,22,25,28,31,34,40,48	Transistor BFY 50	11
11.418.590.00		Washer for V10,13,16,19,22,25,28,31,34,40,41,44,46,48,53,64	16
11.591.930.00	V11,14,17,20,23,26,29,32,35,56,63	Transistor 2N3703	11
11.591.940.00	V12,15,18,21,24,27,30,33,36,38,43,45,47,54,57-60,62,65	Transistor 2N3704	20
11.594.870.00	V37	Transistor TIP 33A	1
10.023.117.10		Spacer for V37	1
10.061.226.00		Screw for V37	1
10.110.310.00		Nut for V37	2
15.955.740.90		Washer for V37	2
11.594.310.10		Lug for V37	1
10.634.001.10	V39,42,61	Transistor BC238B	3
11.592.150.00	V41,44,46,64	Transistor 2N2904	4
11.591.870.00	V49-51	Transistor 2N3055	3
10.061.222.00		Screw for V49-51	6
10.110.310.00		Nut for V49-51	6
15.955.740.90		Washer for V49-51	6
11.413.650.00		Cooler for V49-51	4
11.594.310.10		Lug for V49-51	3
11.591.950.00	V53	Transistor 2N2905	1
11.591.910.00	D1-27,37,38,40-47,49,51-55,57-60,62,63,66,67,69-71,73	Diode 1N4148	55
11.591.040.00	D28-36,56	Diode AAZ15, AAZ17	10
11.591.970.20	D39,64,72	Zener-diode 3.6V, 1N747A	3
11.594.880.00	D61	Diode IZC 6.8 T5, 1S3006A	1
11.591.840.00	D65	Diode NS3001	1
11.595.360.00	D201	Diode 1S922	1



HP REV. A
 NOTE: D44 IS ACTUALLY INSTALLED ON CIRCUIT SIDE OF THE PCA.

FACIT 4070

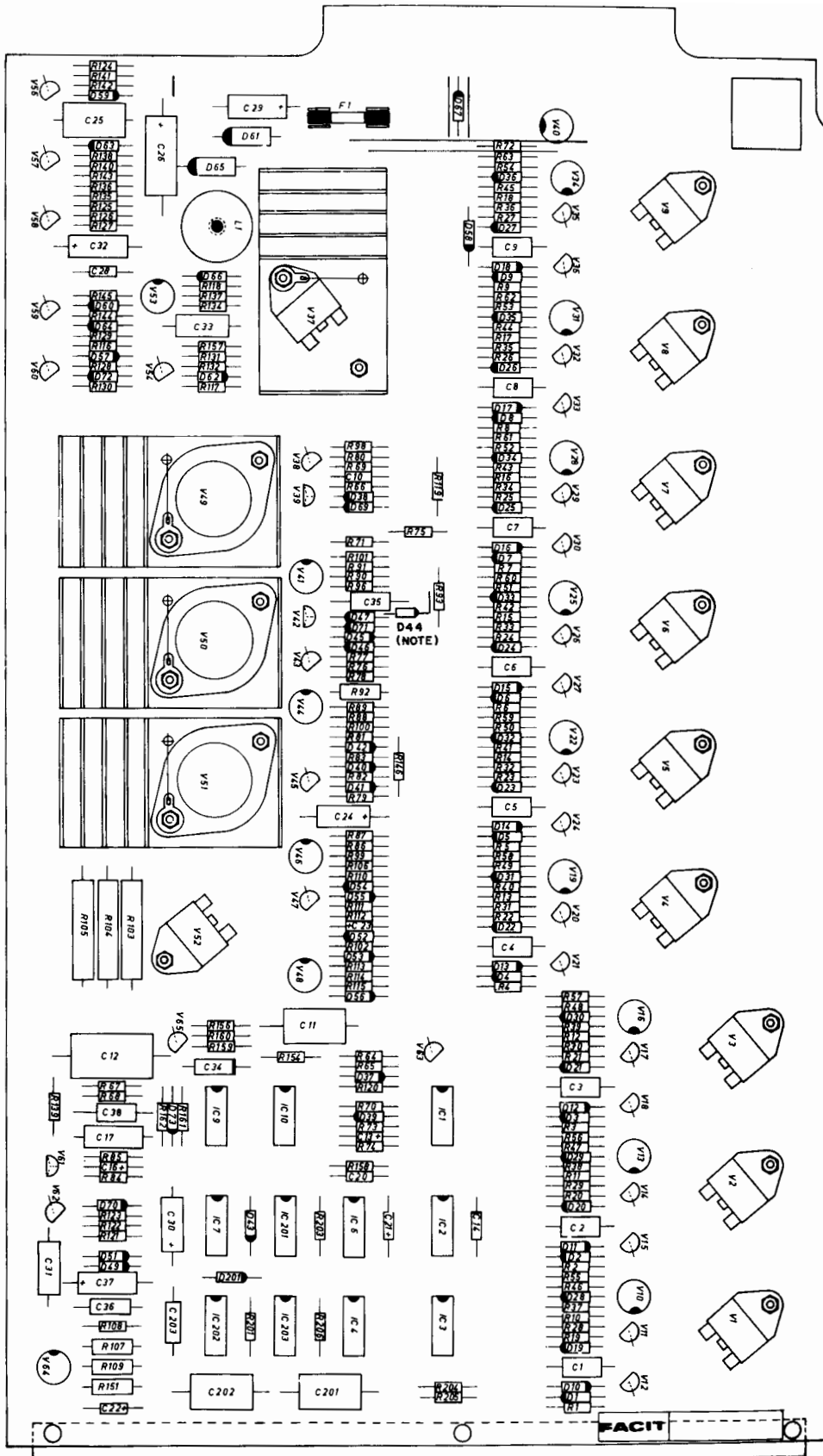
Part No	Component designation	Description	Qty
11.594.820.00	IC1,201	IC FCH 161	2
11.594.850.00	IC2	IC FCJ 121	1
11.594.830.00	IC3,4,7	IC FCH 191	3
11.594.840.00	IC6	IC FCH 211	1
11.594.860.00	IC9,10	IC FCK 111	2
11.593.460.00	IC202,203	IC SN74121N	2
15.038.750.00	L1	Coil	1
10.057.771.10		Screw	1
15.039.850.00		Washer	1
11.592.650.00		Potcore	1
11.592.204.10	R1-18,66,70, 110,139,140, 158	Resistor 22k 1/4W 5%	24
11.592.203.30	R19-36,69,79, 96,116,121, 122,128,159, 162	Resistor 4.7k 1/4W 5%	27
11.592.201.90	R37-45,71,84, 86,88,90,113, 118,138	Resistor 330 ohms 1/4W 5%	17
11.592.202.90	R46-54,93,111, 119,120,123, 145,161	Resistor 2.2k 1/4W 5%	16
11.592.201.30	R55-63,73,85, 99-101,115	Resistor 100 ohms 1/4W 5%	15
11.592.20X.X0	R64,68,126, 136,141	Resistor 4.7k - 2.2M 1/4W 5% To be tested, see list below	5
11.592.20X.X0	R204,205	Resistor 39k - 2.2M 1/4W 5% To be tested, see list below	2
11.592.210.90	R65	Resistor 56k 1/4W 2%	1
11.592.210.80	R67	Resistor 18k 1/4W 2%	1
11.592.210.60	R75	Resistor 180 ohms 1/4W 5%	1
11.592.202.50	R72,98,127, 132,137,154	Resistor 1k 1/4W 5%	6
11.592.203.70	R74,81-83, 106,114,156, 160	Resistor 10k 1/4W 5%	8
11.592.203.90	R76-78,203	Resistor 15k 1/4W 5%	4
11.592.202.10	R80,131,146	Resistor 470 ohms 1/4W 5%	3
11.592.201.70	R87,89,91 108,129,130	Resistor 220 ohms 1/4W 5%	6
11.591.250.70	R92	Resistor 2.2 ohms 1/2W 10%	1
11.592.200.90	R102	Resistor 47 ohms 1/4W 5%	1
10.613.100.10	R103-105	Resistor 4.7 ohms 8W 10%	3



HP REV. A
 NOTE: D44 IS ACTUALLY INSTALLED ON CIRCUIT DIDE OF THE PCA.

Part No	Component designation	Description	Qty
11.591.731.30	R107,109	Resistor 100 ohms 1/2W 5%	2
11.592.204.90	R112	Resistor 100k 1/4W 5%	1
11.592.201.50	R117	Resistor 150 ohms 1/4W 5%	1
11.592.210.40	R124	Resistor 47k 1/4W 2%	1
11.592.210.20	R125,144	Resistor 1.5k 1/4W 2%	2
11.592.200.10	R134	Resistor 10 ohms 1/4W 5%	1
11.592.210.10	R135	Resistor 1.2k 1/4W 2%	1
11.592.210.30	R142,201,206	Resistor 22k 1/4W 2%	3
15.042.180.00	R143	Resistance wire 0.05 ohms	1
11.591.730.30	R151	Resistor 15 ohms 1/2W 5%	1
11.592.207.10	R157	Resistor 4.7 ohms 1/4W 5%	1
10.505.422.00	C1-9,34	Capacitor 2200 pF	10
10.505.410.00	C10,28	Capacitor 1000 pF	2
11.594.760.60	C11,201,202	Capacitor 0.47 μF 100V	3
11.594.760.80	C12	Capacitor 1 μF 100V	1
11.593.050.60	C13,22	Capacitor 4.7 μF 10V	2
11.593.050.30	C16,21	Capacitor 0.47 μF 35V	2
10.505.510.00	C17	Capacitor 0.01 μF	1
10.505.322.00	C20	Capacitor 220 pF	1
11.593.050.40	C23	Capacitor 1 μF 35V	1
11.593.070.30	C24	Capacitor 47 μF 20V	1
11.594.760.20	C25,36	Capacitor 0.1 μF 100V	2
11.593.080.30	C26	Capacitor 220 μF 10V	1
11.593.070.10	C29	Capacitor 10 μF 35V	1
11.593.050.50	C30	Capacitor 2.2 μF 20V	1
10.505.447.00	C31,35,38	Capacitor 4700 pF	3
11.593.060.40	C32	Capacitor 22 μF 15V	1
10.505.547.00	C33	Capacitor 0.047 μF	1
11.593.060.30	C37	Capacitor 10 μF 20V	1
11.595.420.50	C203	Capacitor 0.047 μF	1
10.505.347.00	C14	Capacitor 470 pF	1
11.591.221.20	F1	Fuse 630 mA (Fast action)	1
11.413.220.00		Fuse holder	2
15.015.990.00		Angle bar	1
15.955.070.10		Tubular rivet	3
11.413.590.10		Label	1

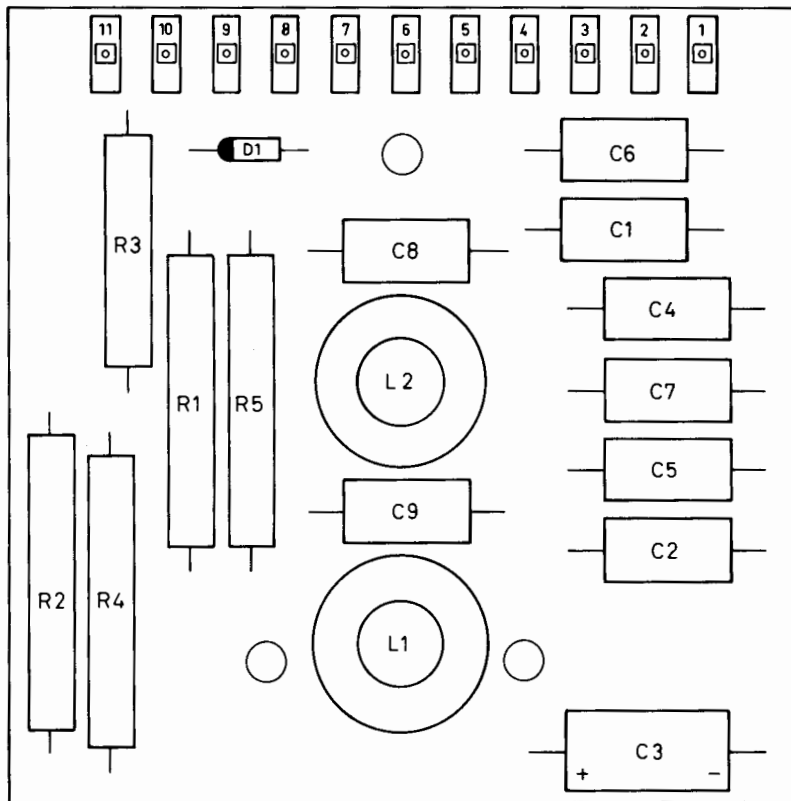




HP REV. A
 NOTE: D44 IS ACTUALLY INSTALLED ON CIRCUIT SIDE OF THE PCA.

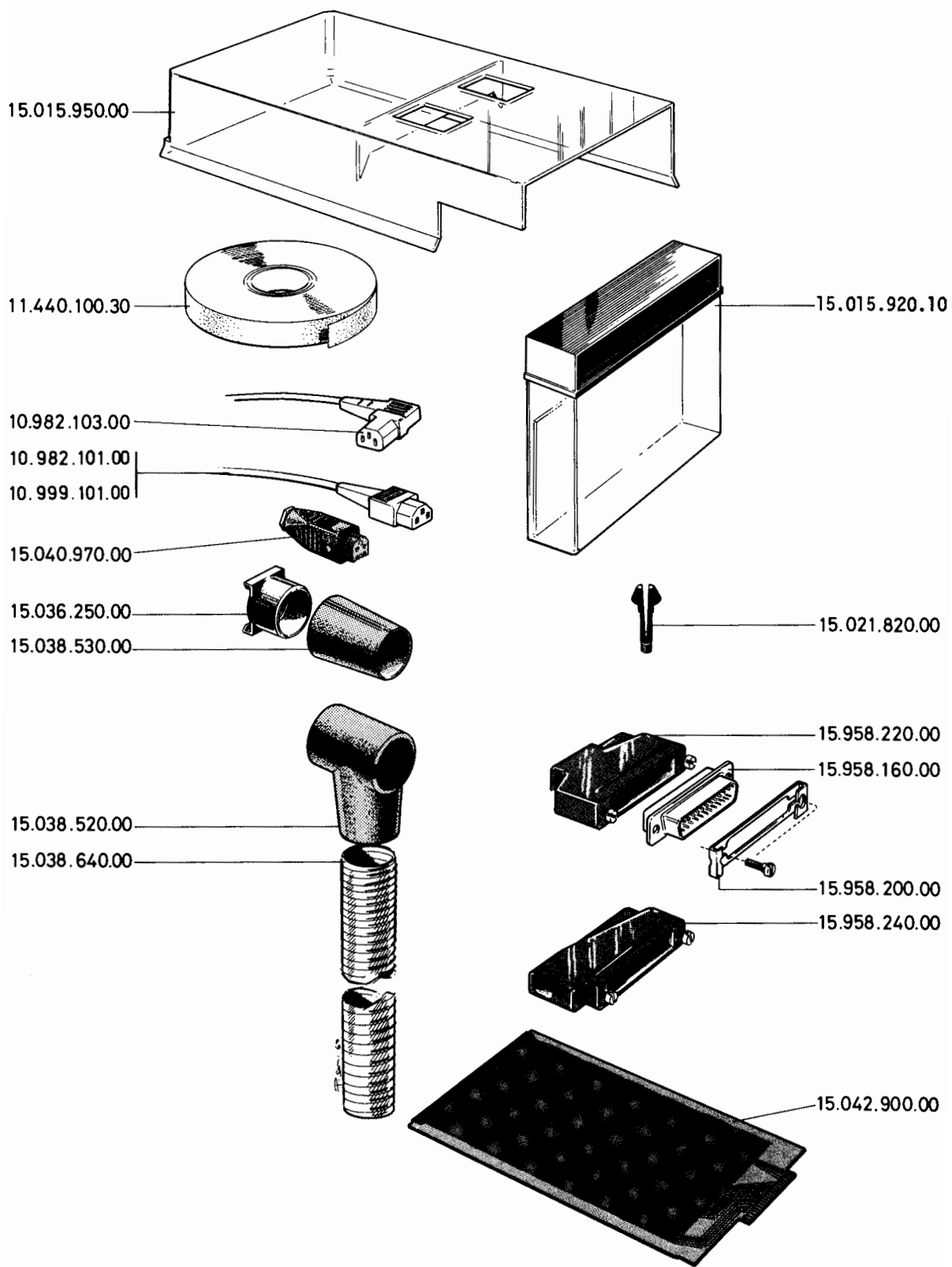
R64,68,126,136,141,204,205 To be tested

11.592.203.30	4.7k	11.592.204.40	39k	11.592.205.50	330k
11.592.203.40	5.6k	11.592.204.50	47k	11.592.205.60	390k
11.592.203.50	6.8k	11.592.204.60	56k	11.592.205.70	470k
11.592.203.60	8.2k	11.592.204.70	68k	11.592.205.80	560k
11.592.203.70	10k	11.592.204.80	82k	11.592.205.90	680k
11.592.203.80	12k	11.592.204.90	100k	11.592.206.00	820k
11.592.203.90	15k	11.592.205.00	120k	11.592.206.10	1M
11.592.204.00	18k	11.592.205.10	150k	11.592.206.20	1.2M
11.592.204.10	22k	11.592.205.20	180k	11.592.206.30	1.5M
11.592.204.20	27k	11.592.205.30	220k	11.592.206.40	1.8M
11.592.204.30	33k	11.592.205.40	270k	11.592.206.50	2.2M



8.3**FILTER CIRCUIT BOARD**

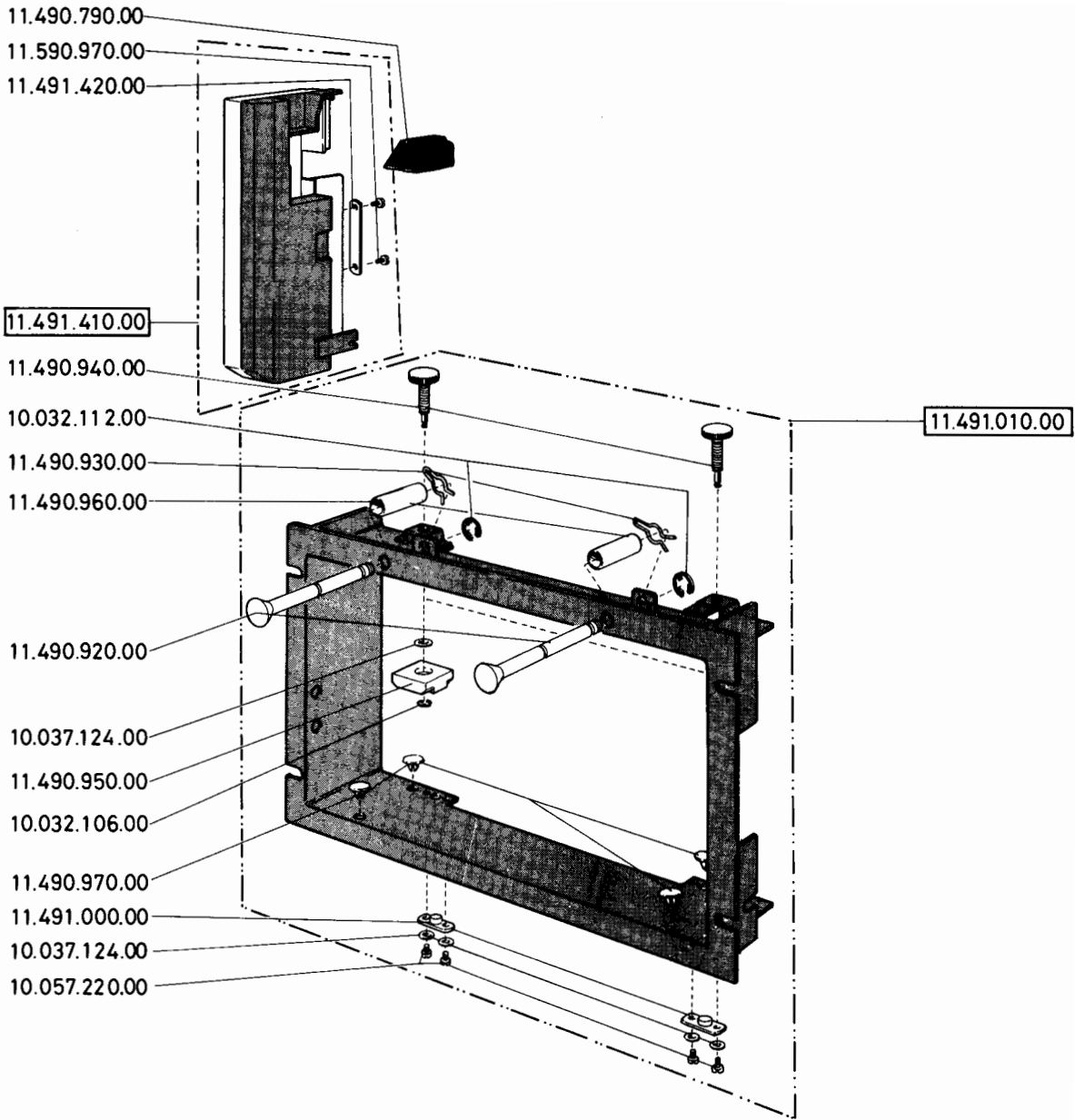
Part No	Component designation	Description	Qty
15.028.630.00		Filter circuit board complete	
11.591.060.00	D1	Diode 1N4002	1
15.028.620.00	L1,2	Coil	2
11.592.230.50	R1,5	Resistor 10 ohms 8W 10%	2
11.592.230.90	R2,4	Resistor 22 ohms 8W 10%	2
11.594.211.30	R3	Resistor 47 ohms 5.5W 10%	1
10.505.610.00	C1,2,4-9	Capacitor 0.1 μ F	8
11.593.080.20	C3	Capacitor 100 μ F 20V	1



9

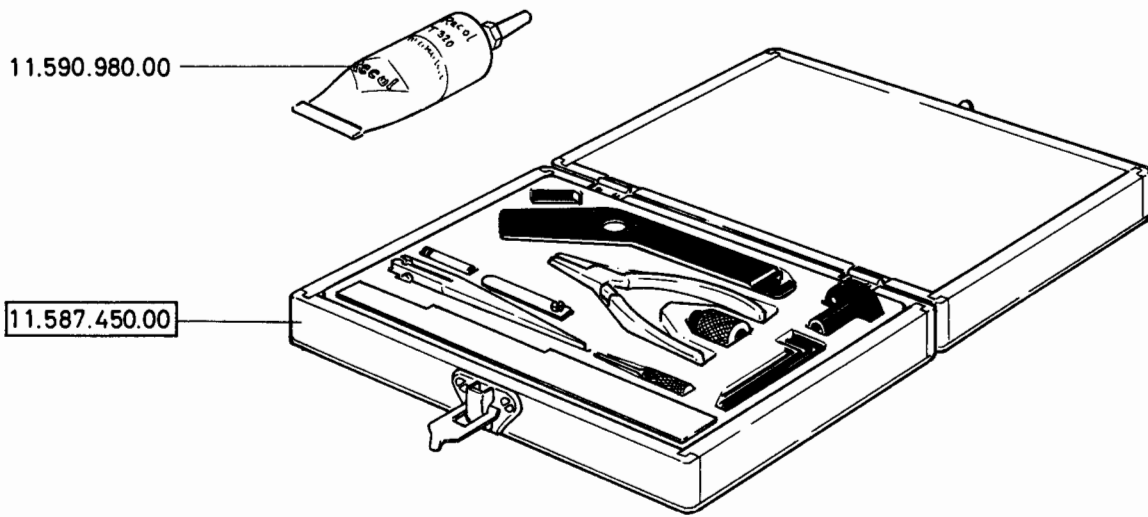
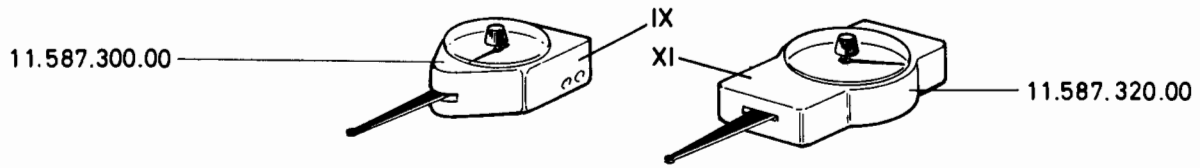
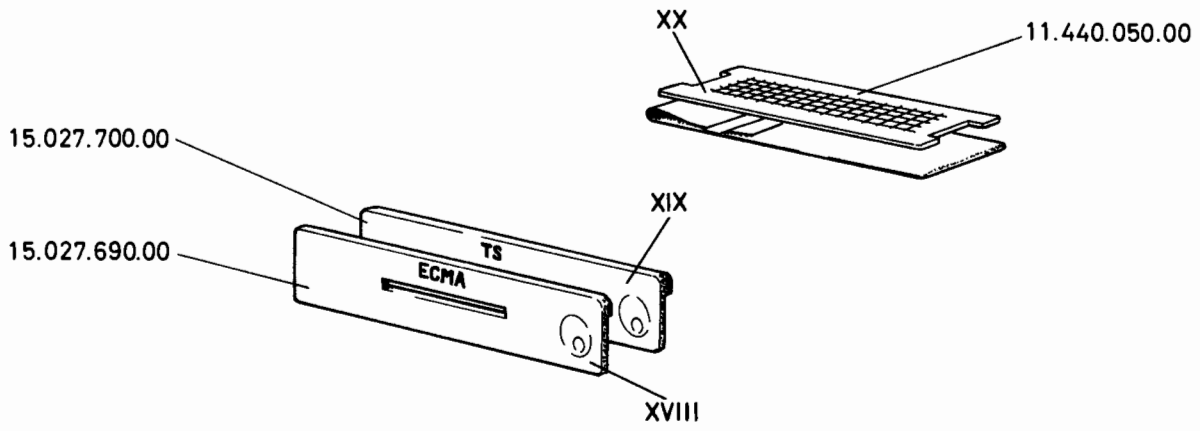
ACCESSORIES

Part No	Description
15.015.950.10	Transparent plastic cover
15.015.920.00	Chad box
11.440.100.30	Tape reel
10.982.101.00	Mains cable, Eur 3-pin plug (CEE 22/V)
10.982.103.00	Mains cable, Eur 3-pin plug (CEE 22/V), for rack version
10.999.101.00	Mains cable, Amer 3-pin plug
15.040.970.00	DC-connector 24V
15.036.250.00	Chad exhaust adapter
15.038.530.00	Straight tube connector
15.038.520.00	Angular tube connector
15.038.640.00	Chad tube
15.958.160.00	25-pin male connector
15.958.200.00	Connector catch with screws
15.958.220.00	Connector casing with screws for straight cable mounting
15.958.240.00	Connector casing with screws for angular cable mounting, for rack version
15.021.820.00	Flange locking
15.042.900.00	Circuit board for customers use



9.1 RACK MOUNTING

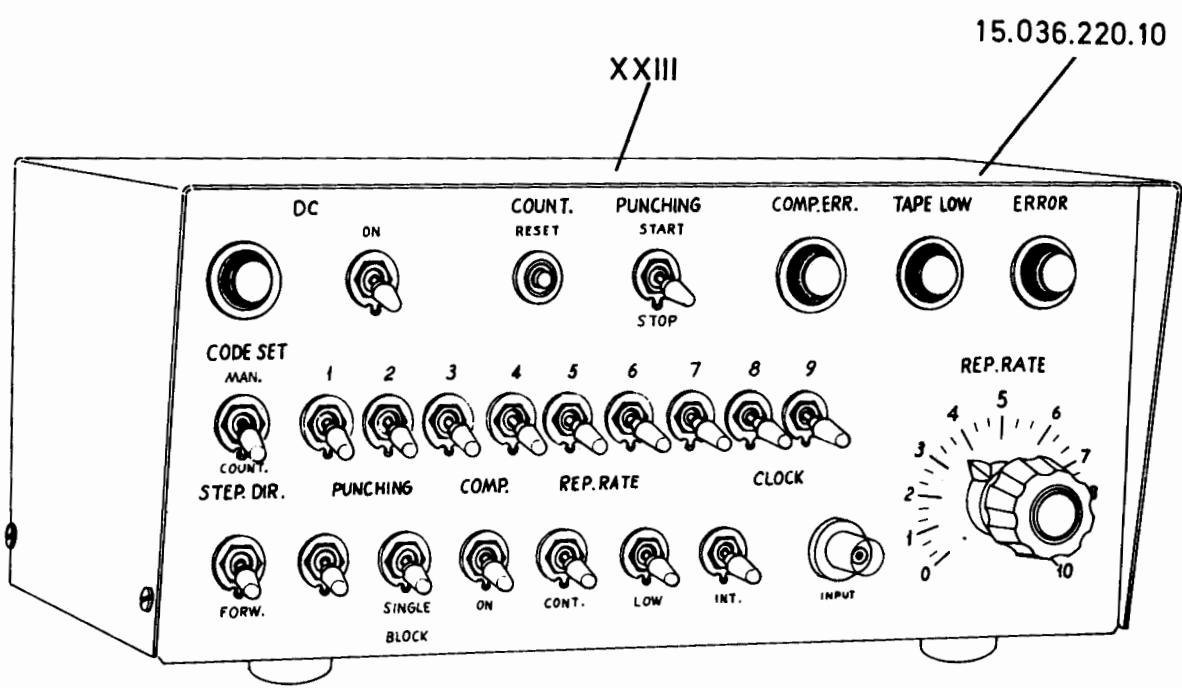
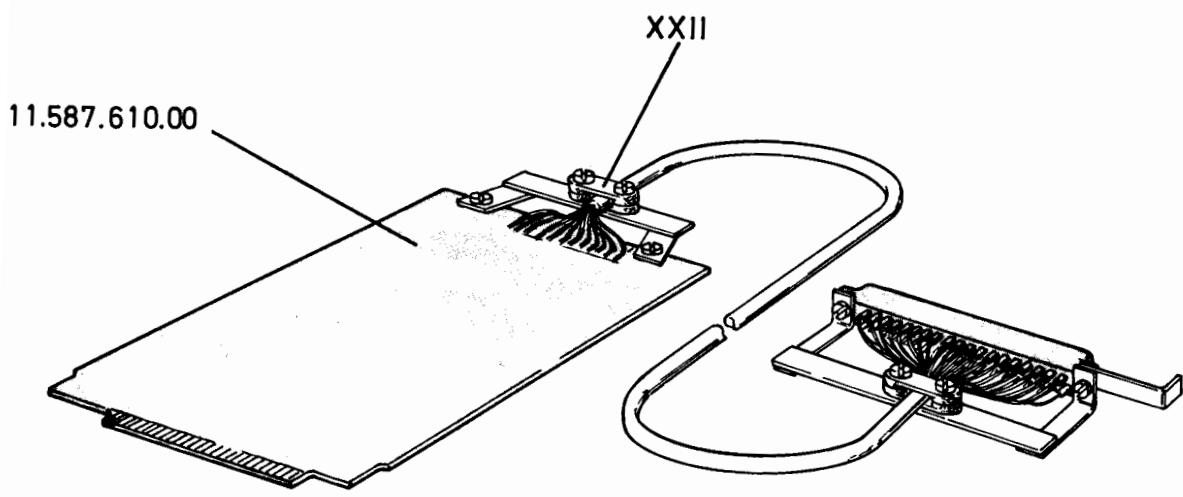
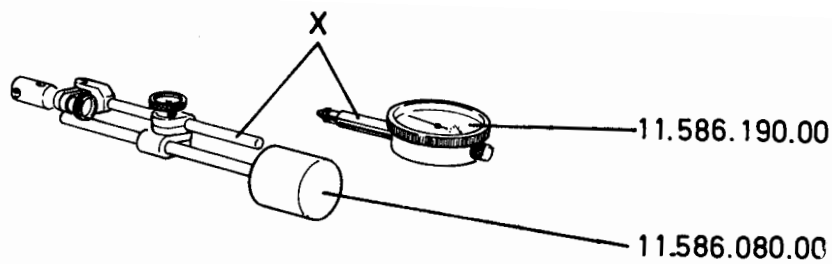
Part No	Description	Qty
11.491.010.00	Rack panel assembly	
11.490.940.00	Special screw	2
10.037.124.00	Washer	2
11.490.950.00	Support	2
10.032.106.00	Retainer ring	2
11.490.920.00	Handle	2
11.490.960.00	Spacer sleeve	2
11.490.930.00	Retainer ring	2
10.032.112.00	Retainer ring	2
11.490.970.00	Flange support	4
11.491.000.00	Support	2
10.037.124.00	Washer	4
10.057.220.00	Screw	4
11.491.410.00	Chad box	1
11.490.790.00	Rubber chad-tube adapter	1
11.590.970.00	Screw	2
11.491.420.00	Holder	1



10 SPECIAL TOOLS

Part No	Ref No	Description
<u>11.587.000.00</u>		Tool set, complete
<u>11.587.450.00</u>		Protective case (Includes interior and tools, see page II.10:2)
15.027.690.00	XVIII	Template for checking distance between reference edge and feed hole track, standard tape
15.027.700.00	XIX	Template for checking distance between reference edge and feed hole track, TS-tape
11.440.050.00	XX	Template for checking inter-row spacing
11.587.300.00	IX	Dial-type spring tension gauge, 100 p
11.587.320.00	XI	Dial-type spring tension gauge, 1 kp
11.590.980.00		Grease Rocol MT-320 or MTS-2000 50 g

Part No	Ref No	Description
11.587.450.00		Protective case, complete
11.587.290.00	I,II,IV	Multi-blade feeler gauge
11.587.150.00	III	Feeler gauge for adjusting punch pins
11.587.050.00	V	Mandrel for pressing in capstan
11.587.140.00	VI	Mandrel for pressing out capstan
11.587.020.00	XV	Punch head turning tool
11.587.500.00	VIII	Pliers for retainer ring
11.587.370.00	VII	Template for checking the reversing bufferarm
11.586.250.00		Hex-key wrench 4 mm
11.587.510.00		Hex-key wrench 3 mm
11.587.520.00		Hex-key wrench 2.5 mm
11.590.670.00		Hex-key wrench 1.5 mm
11.587.210.00	} XVI	Two-part capstan play gauge
11.587.060.00		
11.587.160.00	XXI	Grease nipple for punch head
11.587.130.00	XVII	Rule for adjusting spring mounted tape guide
11.587.070.00	XIV	Surge takeup arm holder for brake shoe adjustment
11.587.530.00		Interior for protective case
11.586.120.00		Protective case
11.583.060.00	XII	Friction tool



FACIT 4070

Part No	Ref No	Description
11.586.080.00	X	Magnetic holder for dial gauge
11.586.190.00		Dial gauge, 0-1 mm
11.587.610.00	XXII	Extension board
15.036.220.10	XXIII	Data generator
15.023.570.00		Data generator connection cable for 4070
15.023.560.00		Data generator connection cable for 4001

Note! These tools are delivered on special request only.

Cross-reference list

Part No.	Description	Page No.	Price Sw.Cr/each
10.023.117.10	Spacer	8:4	
10.023.125.10	Spacer sleeve	5:1	
10.032.103.00	Retainer ring	1:3, 4:4,5	
10.032.106.00	Retainer ring	1:1, 2:1, 9:2	
10.032.107.00	Retainer ring	7:3	
10.032.112.00	Retainer ring	9:2	
10.036.007.10	Washer	4:1	
10.036.024.10	Shim washer 0.3 mm	4:1	
10.036.063.10	Shim washer 0.2 mm	4:1	
10.036.074.10	Distance tube TS	4:4	
10.036.087.10	Washer	2:1	
10.037.124.00	Washer	4:1,2,6, 7:1, 9:2	
10.037.136.00	Washer	7:2	
10.037.146.00	Washer	4:1,2	
10.043.124.00	Washer	5:1	
10.047.416.00	Steel ball	1:3	
10.050.048.10	Spring	1:2	
10.050.056.10	Extension spring	4:1,2	
10.050.103.10	Spring	1:2	
10.051.049.10	Compression spring	3:1	
10.057.178.10	Screw	4:4,5	
10.057.220.00	Screw	7:3, 9:2	
10.057.224.00	Screw	7:1	
10.057.226.00	Screw	7:1	
10.057.227.00	Screw	7:1	
10.057.283.00	Grounding screw	7:3	
10.057.289.00	Screw	7:2	
10.057.771.10	Screw	8:2,5	
10.057.809.10	Screw	1:1	
10.061.188.00	Screw	7:3	
10.061.190.00	Screw	4:1,2	
10.061.191.00	Screw	2:1	
10.061.218.00	Screw	1:1, 5:1, 7:1,3	
10.061.219.00	Screw	4:1, 7:3	
10.061.220.00	Screw	4:3,6, 5:1, 7:3	

Part No.	Description	Page No.	Price Sw.Cr/each
10.061.222.00	Screw	4:6, 7:3, 8:1,4	
10.061.224.00	Screw	7:1	
10.061.226.00	Screw	8:4	
10.061.227.00	Screw	4:3, 7:3	
10.061.230.00	Screw	5:1	
10.061.232.00	Screw	5:1	
10.061.284.00	Screw	1:2	
10.061.285.00	Screw	6:1	
10.061.287.00	Screw	5:1, 7:1	
10.061.299.00	Screw	1:2	
10.061.341.00	Screw	7:2	
10.061.810.10	Screw	7:2	
10.065.198.10	Screw	6:1	
10.065.807.10	Screw	2:1, 4:3	
10.065.810.10	Screw	7:4	
10.065.812.10	Screw	6:1	
10.065.813.10	Screw	7:2,4	
10.065.814.10	Screw	1:3	
10.065.815.10	Screw	1:1	
10.078.188.00	Stop screw	7:3	
10.078.220.00	Locking screw	4:4	
10.078.222.00	Screw	4:1,2	
10.078.323.00	Locking screw	4:3	
10.081.226.10	Screw	7:2	
10.081.285.00	Retainer screw	4:4,5, 5:1	
10.081.323.00	Retainer screw	4:1,2	
10.081.327.00	Screw	7:1	
10.081.801.10	Screw	4:1,2	
10.081.804.10	Screw	1:3	
10.110.309.00	Nut	5:1	
10.110.310.00	Nut	2:1, 4:6, 5:1, 7:1,4	
10.110.312.00	Nut	7:1	
10.110.314.00	Nut	7:2	
10.505.322.00	Capacitor 220 pF	8:3,6	
10.505.347.00	Capacitor 470 pF	8:6	

Cross-reference list

Part No.	Description	Page No.	Price Sw.Cr/each
10.505.410.00	Capacitor 1000 pF	8:3,6	
10.505.422.00	Capacitor 2200 pF	8:3,6	
10.505.447.00	Capacitor 4700 pF	8:3,6	
10.505.510.00	Capacitor 0.01 μ F	8:3,6	
10.505.547.00	Capacitor 0.047 μ F	8:3,6	
10.505.610.00	Capacitor 0.1 μ F	8:8	
10.506.001.00	PC board connector	4:6	
10.506.002.00	PC board connector	7:1	
10.634.001.10	Transistor BC238B	8:4	
10.664.001.10	Selector switch 100/115/220/240V	7:2	
10.691.041.10	Fuse 2AT (AC) Amer	7:4	
10.960.101.00	Cover (AC)	7:4	
10.982.101.00	Mains cable Eur 3-pin plug	9:1	
10.982.103.00	Mains cable Eur 3-pin plug rack	9:1	
10.987.101.00	Mains voltage inlet CEE (AC)	7:4	
10.988.101.00	Mains voltage inlet Amer (AC)	7:4	
10.999.101.00	Mains cable Amer 3-pin plug	9:1	
11.026.300.10	Sign plate	7:2	
11.102.220.10	Spring mount screw	2:1	
11.102.220.90	Spring mount screw	1:2	
11.102.650.30	Retainer ring	2:1	
11.401.820.10	Surge takeup arm	2:1	
11.402.950.10	Guide roller	1:1, 2:1	
11.412.320.00	Bridging board	7:1	
11.413.210.00	Chad exhaust standard	4:1	
11.413.210.10	Chad exhaust TS	4:2	
11.413.220.00	Fuse holder	8:3,6	
11.413.450.00	Ground lead	7:1	
11.413.590.10	Label	8:6	
11.413.600.00	Label	8:3	
11.413.610.00	Board with fuses standard compl	4:6	
11.413.610.10	Board with fuses TS compl	4:6	
11.413.650.00	Cooler	8:1,4	
11.418.590.00	Washer	8:1,4	
11.421.050.10	Holder	2:1	



Part No.	Description	Page No.	Price Sw.Cr/each
11.428.140.20	Spacer sleeve	7:1	
11.435.480.30	Cable clamp	4:6, 7:1,3	
11.435.480.70	Cable clamp	4:6, 7:3	
11.440.050.00	Template checking interrow space	10:1	
11.440.100.30	Tape reel	9:1	
11.467.770.00	Spring	1:3	
11.490.450.00	Screw	4:4,5	
11.490.460.00	Spring post	4:4,5	
11.490.500.00	Rubber ring	3:1	
11.490.540.00	Takeup flange with rubber ring	3:1	
11.490.560.00	Sidewall with rev bufferarm assy	1:2	
11.490.570.00	Rubber roller	1:2	
11.490.600.00	Reversing buffer arm	1:2	
11.490.640.00	Wire	1:2	
11.490.650.00	Locking pawl	1:2	
11.490.670.00	Punch head with punch pins stand	4:4	
11.490.670.10	Punch head with punch pins TS	4:4	
11.490.690.10	Punch/feed unit stand compl	4:1	
11.490.690.20	Punch/feed unit TS compl	4:2	
11.490.700.00	Supply and takeup flange with hub assembly	3:1	
11.490.790.00	Rubber chad-tube adapter	9:2	
11.490.920.00	Handle	9:2	
11.490.930.00	Retainer ring	9:2	
11.490.940.00	Special screw	9:2	
11.490.950.00	Support	9:2	
11.490.960.00	Spacer sleeve	9:2	
11.490.970.00	Flange support	9:2	
11.491.000.00	Support	9:2	
11.491.010.00	Rack panel assembly	9:2	
11.491.040.00	Cooler	7:1	
11.491.100.00	Distance screw	7:3	
11.491.120.00	Motor	6:1	
11.491.140.00	Flange	3:1	
11.491.170.00	PC board catch holder	7:3	

Cross-reference list

Part No.	Description	Page No.	Price Sw. Cr/each
11.491.180.00	PC board catch	7:3	
11.491.190.10	Hub assembly	3:1	
11.491.330.00	Rear panel (AC)	7:4	
11.491.340.00	Control panel stand rack version	7:2	
11.491.350.00	Control panel rack version (DC)	7:2	
11.491.360.00	Rear panel (DC)	7:4	
11.491.410.00	Chad box	9:2	
11.491.420.00	Holder	9:2	
11.491.480.00	Nut	1:1	
11.491.490.00	Front lid rack version	1:1	
11.491.590.00	Plastic sleeve	4:4,5	
11.491.630.00	Surge takeup spring	4:3	
11.491.720.00	Solder terminal	7:3	
11.491.760.00	Distance screw	7:3	
11.491.800.00	Protector bracket	6:1	
11.491.830.00	Retainer plate	1:1, 4:3	
11.491.840.00	Protective washer	5:1	
11.491.890.00	Locating washer	5:1	
11.491.950.00	Label	6:1	
11.491.960.00	Label	6:1	
11.583.060.00	Friction tool	10:2	
11.586.080.00	Magnetic holder for dial gauge	10:3	
11.586.120.00	Protective case	10:2	
11.586.190.00	Dial gauge 0-1 mm	10:3	
11.586.250.00	Hex-key wrench 4 mm	10:2	
11.587.000.00	Tool set compl	10:1	
11.587.020.00	Punch head turning tool	10:2	
11.587.050.00	Mandrel for pressing in capstan	10:2	
11.587.060.00	Two-part capstan play gauge	10:2	
11.587.070.00	Surge takeup arm holder	10:2	
11.587.130.00	Rule for adjusting spring mounted tape guide	10:2	
11.587.140.00	Mandrel for pressing out capstan	10:2	
11.587.150.00	Feeler gauge adjusting punch pins	10:2	
11.587.160.00	Grease nipple for punch head	10:2	

Part No.	Description	Page No.	Price Sw.Cr/each
11.587.210.00	Two-part capstan play gauge	10:2	
11.587.290.00	Multi-blade feeler gauge	10:2	
11.587.300.00	Dial-type spring tension gauge	10:1	
11.587.320.00	Dial-type spring tension gauge	10:1	
11.587.370.00	Template checking rev bufferarm	10:2	
11.587.450.00	Protective case	10:1,2	
11.587.500.00	Pliers for retainer ring	10:2	
11.587.510.00	Hex-key wrench 3 mm	10:2	
11.587.520.00	Hex-key wrench 2.5 mm	10:2	
11.587.530.00	Interior for protective case	10:2	
11.587.610.00	Extension board	10:3	
11.590.670.00	Hex-key wrench 1.5 mm	10:2	
11.590.970.00	Screw	3:1, 9:2	
11.590.980.00	Grease Rocol MT-320 50 g	10:1	
11.591.010.00	Transistor BFY 50	8:1,4	
11.591.040.00	Diode AAZ15, AAZ17	8:1,4	
11.591.050.00	Diode U12019/3	8:1	
11.591.060.00	Diode 1N4002	7:1, 8:8	
11.591.120.40	Capacitor 10 000 μ F 35V	7:3	
11.591.200.10	Special nut	7:3	
11.591.210.10	Rubber washer	7:3	
11.591.221.20	Fuse 630 mA (Fast action)	8:3,6	
11.591.231.70	Fuse 2AT (AC)	7:4	
11.591.250.70	Resistor 2.2 ohms 1/2W 10%	8:2,5	
11.591.280.00	Fuse holder Amer	7:4	
11.591.730.30	Resistor 15 ohms 1/2W 5%	8:2,6	
11.591.731.30	Resistor 100 ohms 1/2W 5%	8:2,6	
11.591.811.70	Fuse miniature 2A	4:6	
11.591.840.00	Diode NS3001	8:1,4	
11.591.870.00	Transistor 2N3055	8:1,4	
11.591.910.00	Diode 1N4148	8:1,4	
11.591.930.00	Transistor 2N3703	8:1,4	
11.591.940.00	Transistor 2N3704	8:1,4	
11.591.950.00	Transistor 2N2905	8:4	
11.591.970.20	Zener-diode 3.6V 1N747A	8:1,4	

Cross-reference list

Part No.	Description	Page No.	Price Sw.Cr/each
11.592.130.20	Transistor 2N3704 (special)	8:1	
11.592.150.00	Transistor 2N2904	8:1,4	
11.592.200.10	Resistor 10 ohms 1/4W 5%	8:2,6	
11.592.200.90	Resistor 47 ohms 1/4W 5%	8:2,5	
11.592.201.30	Resistor 100 ohms 1/4W 5%	8:2,5	
11.592.201.50	Resistor 150 ohms 1/4W 5%	8:2,6	
11.592.201.70	Resistor 220 ohms 1/4W 5%	8:2,5	
11.592.201.90	Resistor 330 ohms 1/4W 5%	8:2,5	
11.592.202.10	Resistor 470 ohms 1/4W 5%	8:2,5	
11.592.202.30	Resistor 680 ohms 1/4W 5%	8:2	
11.592.202.50	Resistor 1k 1/4W 5%	8:2,5	
11.592.202.90	Resistor 2.2k 1/4W 5%	8:2,5	
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