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SuperTerm Maintenance Manual #1100500-00

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Section 1

GENERAL DESCRIPTION AND SPECIFICATIONS

1.1 Introduction

The Intertec SuperTerm Data Communication Terminal is a highly flexible, fully programmable, data terminal/line printer for use in computer applications requiring hard-copy, impact printed output. Its wide range of features were designed to make SuperTerm easy to use and compatible with virtually any computer system or data communications network.

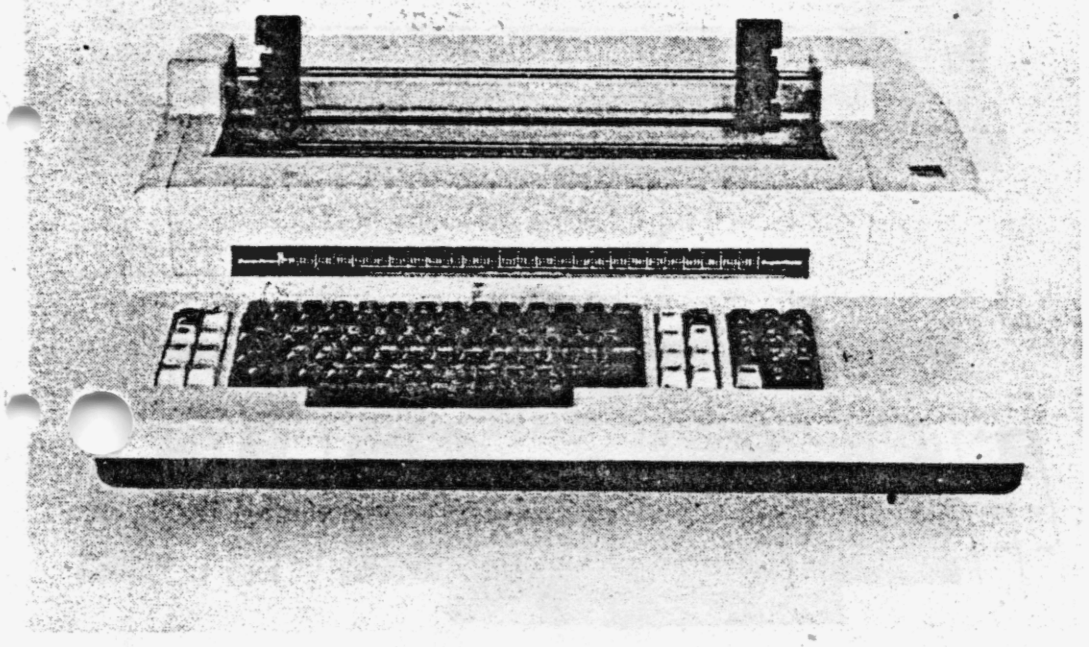


FIG. 1.1 The SuperTerm Data Communications Terminal

The SuperTerm employs state-of-the art microprocesor technology which is highly reliable and easy to service and maintain. Moving parts are few and necessary cleaning and lubrication may often be carried out by the user thereby minimizing expensive field service calls. The electronic modules in SuperTerm were designed for a long service life allowing the user to operate the terminal for extended periods of time without any damage or overheating. Should any module fail, minimum downtime is required to effect a repair since all modules were designed for easy access and quick replacement.

1.2 General Specifications

The Intertec SuperTerm may be custom configured for differing applications. Special options are available that allow each terminal to be tailored to meet specific user requirements. These options are discussed in detail in Section 6. The basic SuperTerm has many standard features found only as expensive options on other machines. These features are listed in Table 1-1.

TABLE 1-1
STANDARD FEATURES

- Microprocessor Control
- 60, 30, 15 and 10 Characters Per Second Print Rate
- 128 Character ASCII Set
- 7 x 7 Dot Matrix Impact Printing
- Cartridge Ribbon
- Adjustable Head for Printing Up to 8 Copies
- Upper and Lower Case ASCII Characters
- Adjustable Forms Tractor: 1" to 16" Wide
- 10 Characters/inch: Horizontal
- 6 Characters/inch: Vertical
- Selectric Configured Keyboard With N-key Rollover
- 22-Key Numeric Pad With Gear-Shifted Function Keys
- Repeat Key
- Last Character Visibility Key
- Paper Advance Key
- Parity Selection (odd, even, none)
- Mode Selection (half duplex, full duplex, local)
- 1,000 Character Print Buffer
- RS-232C Interface
- Text-Optimized Printing
- Auto Line Feed On Carriage Return
- Portability: Self-contained, Desktop
- Bottom Feed
- Quietizing Package

TABLE 1-2
USER OPTION PACKAGES

OPTION PACKAGE A:

Forward and Reverse Horizontal Tabs, Vertical Tabs, Keyboard Lock-out, Fixed Horizontal Tabs, Top of Form.

OPTION PACKAGE B:

Adjustable Right & Left Margins, Auto EOL-CR, Super & Subscripts, 1, 1½ and Double Vertical Line Spacing, 6/8 Lines Per Vertical Inch, Half Line Feed (forward and reverse), Pagination, Auto IBM ATS Setting Routine**, Variable Vertical Pitch.

OPTION PACKAGE C:

Reverse Printing, Absolute Horizontal Tabs, Absolute Vertical Tabs, Double Width Characters, Reprogrammable Escape Characters, Disable Escape Sensitivity.

OPTION PACKAGE D:

All 3 Option Packages (A, B and C).

**Execution of "ATS" Tabs Requires Option Package A.

1.3 Technical Specifications

PRINT SPEED:
10, 15, 30, 60 CPS Standard
120, 180 CPS Optional

CHARACTER SET:
128 Character, Upper and Lower Case ASCII Standard
APL/ASCII Optional
32 User Font-Programmable Characters
Other special or custom character sets are available.

PRINTED LINE LENGTH:

132 Column printing is standard (10 pitch)

PAPER WIDTH:

1 inch to 16 inches (2.54cm to 40.64cm)

PAPER THICKNESS:

Standard factory adjustments are for paper thickness to .005" (0.127mm)

Manual adjustments allow the printer to accept up to 8 copies.

PAPER FEED:

Forward Only

Paper may be moved in reverse only for "FORM-DOWN" and subscripting

LINE SPACING:

6 lines per inch - Standard.

8 lines per inch - Option (OPT-B)

Line spacing is fully programmable allowing any vertical pitch that is a multiple of 1/48" (0.529mm). **This is an optional feature** (OPT-B).

TABULATION: (OPT-A)

Horizontally: left or right

Vertically: Forward only

Tabs are fully programmable allowing any column spacing that is a multiple of of 1/10" (2.54mm).

An "Absolute Tab" feature is also available allowing a specific line and/or column to be addressed (OPT-C).

MINIMUM MOVEMENT:

Vertical (Paper-Feed) - 1/48" (0.529mm)

Horizontal (Carriage) - 1/10" (2.54mm)

INTERFACING:

See Section 3

ENVIRONMENT:

Storage: -20° F to +135° F (-29° C to +57° C) at 0% to 90% relative humidity.

Operating: +45° F to +105° F (+7° C to +40° C) at 10% to 80% relative humidity (with no condensation).

POWER REQUIREMENTS:

105 - 130 Volts at 60 HZ

1.0 AMPS (RMS) Maximum at idle

3.0 AMPS (RMS) Maximum while printing

205 - 230 Volts at 50 HZ

0.5 AMPS (RMS) Maximum at idle

1.5 AMPS (RMS) Maximum while printing

PHYSICAL:

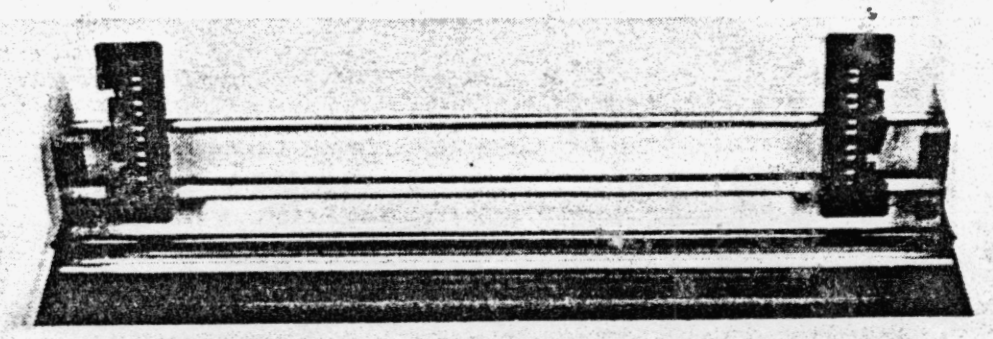
Overall Dimensions:

Length: 24.50" (0.622m.)

Depth: 20.19" (0.513m.)

Height: 10.25" (0.260m.)

Overall Weight - 55 lbs. (25kg.)



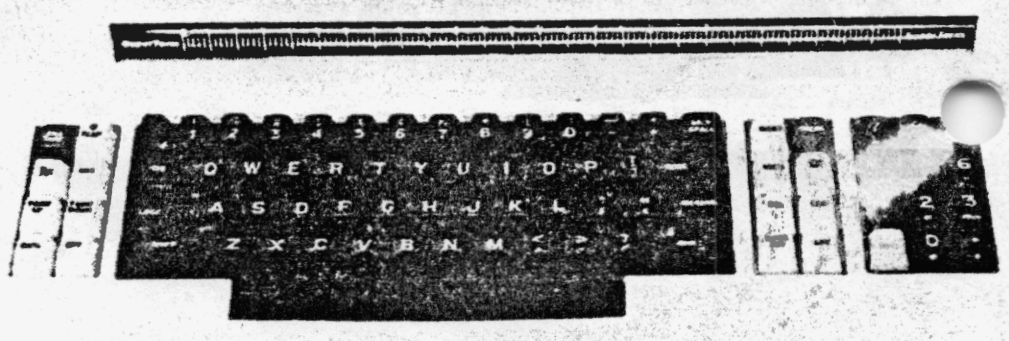


FIGURE 2-1

FIGURE 2-2

FIGURE 2-3

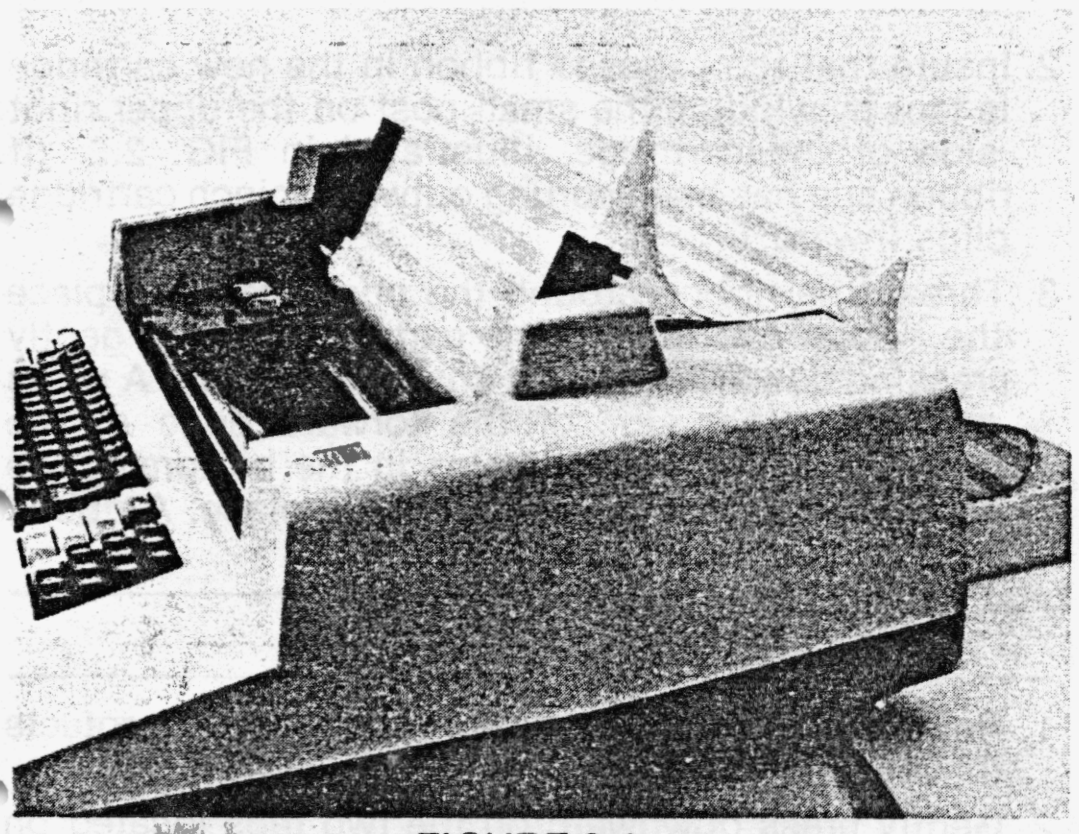


FIGURE 2-4

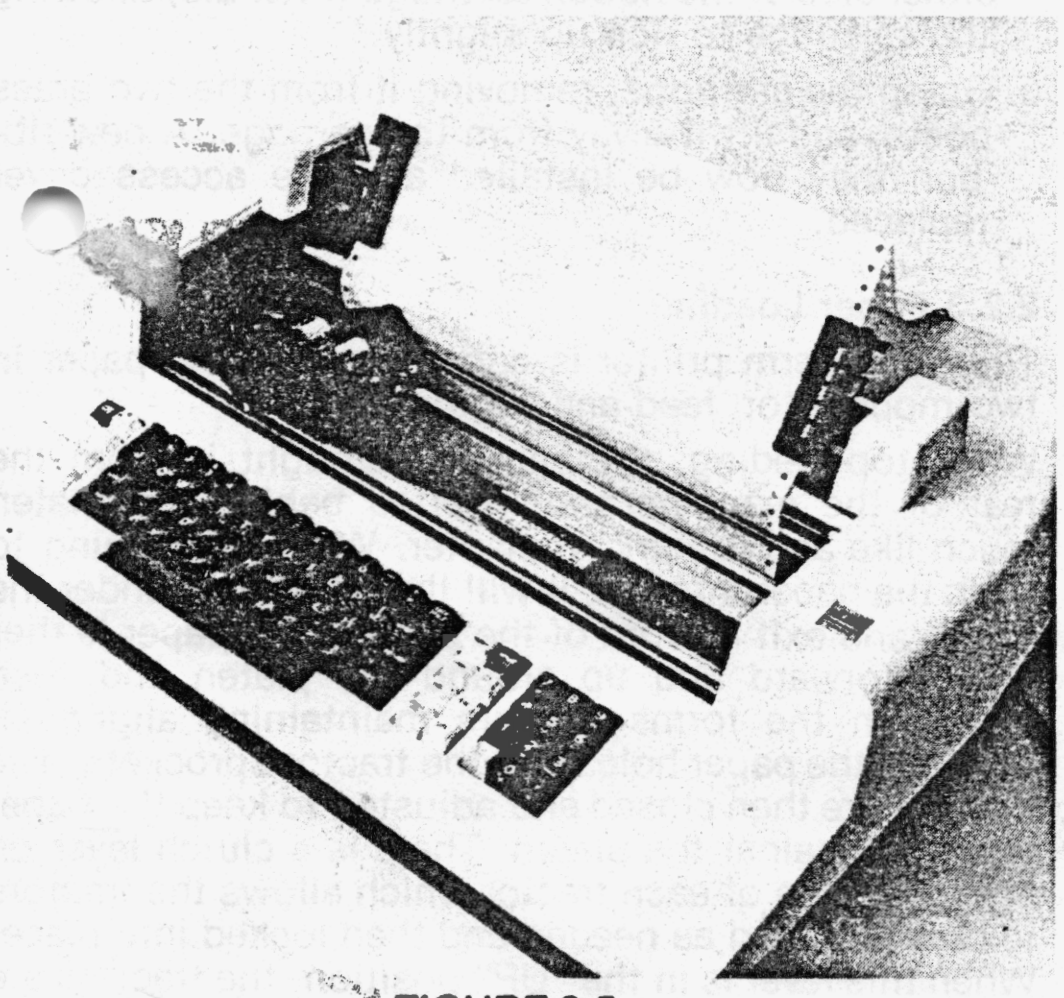


FIGURE 2-5

Section 2

INSTALLATION AND OPERATION

2.1 Installation/Cable Connection

Installation of the SuperTerm is quite simple and may be performed by any user. One only needs to find a suitable location, (i.e. - an atmosphere free of high concentrations of dust and that has an acceptable ambient temperature range,) connect the power and interface cables and the installation is complete. No further adjustment or connection is necessary. Once the SuperTerm is setup, it is capable of running indefinitely with only the periodic preventive maintenance discussed in Section 5.3.

2.1.1 A.C. Line Cord Connection

The SuperTerm is supplied with a durable 3-conductor A.C. line cord 9 feet (2.74m) in length. All machines are shipped terminated with a U.S. Standard 115 VAC. at 15A plug. Those machines requiring 220 VAC. must have this plug cut off and a proper one installed to meet local requirements.

The power requirements for the particular SuperTerm being installed must be determined and the A.C. line cord properly terminated. After insuring the [POWER] switch is in the "OFF" position, the machine may be plugged into an outlet providing the proper voltage as specified in Section 1.3.

2.1.2 Input/Output (I/O) Cable Connection

The SuperTerm incorporates the EIA Standard RS-232C interface as a standard feature. However, the cable must either be purchased as an accessory, (Order #1150500-00), or supplied by the user.

The Intertec SuperTerm is also available with optional Current Loop (order # 1172000-00) and Parallel (order # 1173000-00) interfaces. If the appropriate cable is specified at time of order, the machine will be shipped with the cable installed.

If the cable is purchased separately or is user supplied, it must be connected to the SuperTerm by removing the printer from its cover in order to plug in the interface cable. The proper removal procedure is discussed in Section 5.4.3.1. A description of the interface cables and their connection to SuperTerm can be found in Section 4.9.6, Section 4.9.7 and Section 4.9.8.

Assuming that the interface cable is internally connected to the SuperTerm, the free end must be connected to a modem, the I/O Port of a host computer, or other data communications line. The user must ascertain the compatibility of the interface he has chosen and the device to which it is to be connected. Specific information on the interfaces can be found in Section 3.

The factory standard length for all interface cables is 10 feet (3.05m). For cables of longer length, electrical noise and losses in the cable must be considered. For information regarding special interface cables, consult your local Intertec Representative.

2.2 Operation

2.2.1 General Procedures

In this section, no attempt is made to give an exhaustive discussion on the use and operation of the SuperTerm Data Communications Terminal. Outlined below are the most basic procedures needed to operate any SuperTerm. For complete details, consult a **SuperTerm Communications Terminal Operator's Manual # 1100100-00.**

TERMINAL OPERATION

A. Powering-On:

1. Flip the [POWER] switch, located just under the right hand side of the keyboard, to the "ON" position.* (See FIG. 2.1.)

   NOTE: The [READY] indicator will illuminate momentarily and the carriage will restore itself by slewing slowly to the true left margin.
2. The terminal is absolutely quiet when not printing.

3. Note that all terminal conditions are reset to their default values. If tabs or margins have been set prior to the terminal being powered off, these must be reset.

* If the carriage slams into the end-stop during power-on, **Turn the machine OFF IMMEDIATELY** and call your service representative.

B. Powering-Off:

1. The terminal may be powered off at any time without ill effect. However, there is no harm done by leaving it powered on for extended periods.
2. When left powered-on, the terminal will retain any programmed settings indefinitely.
3. To power off, merely flip the [POWER] switch to the "OFF" position. (See FIG. 2.1.).

C. ON-LINE OPERATION: In order to allow the terminal to communicate with a local storage unit or the central computer system, the terminal must be in the "ON-LINE" mode.

To go "ON-LINE":

1. Insure that the [LOCAL] switch, (FIG. 2.1.) is not depressed ("OFF"). If the switch is depressed, depress the switch again and it will return to the up ("OFF") position and thereby place the terminal "ON-LINE".
2. Any function or control keys may now be depressed to specifically configure the terminal to be compatible with the host system. NOTE: Speed selection must be made in local mode.
3. When the terminal senses the carrier signal from the host system, the [READY] indicator will illuminate, signaling the operator that the terminal is ready to communicate.

D. LOCAL OPERATION: This feature is used when it is necessary to set up functions, program operations, feed paper, or type material not to be transmitted to the host system.

To go "LOCAL":

1. Depress the [LOCAL] switch, FIG. 2.1) until it stays in the detent position ("ON"). The [READY] indicator should illuminate.
2. The Terminal may now operate in LOCAL.

2.2.2. Ribbon Installation

The SuperTerm printer uses Intertec's own snap-in ribbon cartridge, (See FIG. 2.2), which provides approximately three quarters of a million high quality characters per cartridge. It may be quickly and easily changed and the user's hand need never touch the ribbon. Outlined below is the simple procedure followed when installing or replacing a ribbon cartridge.

RIBBON INSTALLATION

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1. Remove the terminal's access cover which protects the carriage area.
2. Insure that the exposed ribbon in the new cartridge is taut by winding the small post on the upper right side of the cartridge, illustrated in FIG. 2.2. (If ribbon clip has been sprung outward, pinch cartridge clips inward.)
3. Thread the ribbon around the print-head and place the ribbon cartridge in the cartridge holder, gently pressing downward until it snaps into place. A brass post on either side of the forward edge of the carriage will insert into holes in the bottom of the ribbon cartridge holding it rigidly in place. A ribbon is shown being installed in FIG. 2.3.

RIBBON REMOVAL

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1. Remove the terminal's access cover which protects the cartridge area.
2. Gently press downward on the two tabs located on either side of the ribbon cartridge (FIG. 2.3) allowing the cartridge to pop up slightly.
3. Grasp the cartridge, removing it from the two brass posts, and lift it away from the carriage. A new ribbon may now be installed and the access cover replaced.

2.2.3 Paper Loading

The SuperTerm printer is capable of feeding paper in two modes: top feed and bottom feed.

When top-feeding, the paper is brought in from the rear of the machine and inserted behind the platen much like an ordinary typewriter. When continuing to push the paper through, it will thread its way under the platen and exit in front of the platen. The paper is then pulled forward and up around the platen and then placed in the forms tractors maintaining alignment between the paper holes and the tractor sprockets. The tractors are then closed and adjusted to keep the paper taut and against the platen. There is a clutch lever on the outer side of each tractor which allows the tractors to be positioned as needed and then locked into place. When this lever is in the "UP" position, the tractors are locked: When in the "DOWN" position, the tractors are free to move horizontally. Figure 2.4 shows a top-fed machine.

When bottom feeding, it is necessary that the SuperTerm be installed on a special table or stand with clear access to the bottom feed slot in the printer cover (Intertec's optional roll-a-round stand # 1190300-00 is an excellent choice).

When using bottom feed, the paper is fed through both a slot in the cover and a slot in the bottom of the printer chassis. The paper is then pulled up and fed **behind** the small guide rod just under the platen, up past the platen, and is then placed in the forms tractors and adjusted as noted above. Figure 2.5 shows a machine being bottom-fed.

IMPORTANT NOTE:

All paper loading should be done with the carriage at the true left margin.

Bottom feeding will yield best results when operating with high volume throughput using fanfold paper.

Section 3

INTERFACING

3.1 General Information

The three interfaces available for SuperTerm enable it to be compatible with virtually any data processing or data communications system. All interfaces are compatible with current industry standard signal levels.

This section details all interface specifications. A technical discussion on the interface circuitry is contained in Section 4.4.

3.2 Interface Specifications

3.2.1 RS-232C Interface/Bell 202C Interface: The Electronic Industries Association (EIA) has released an RS-232C specification which details the requirements for a standard interface between data communications equipment and data processing equipment. RS-232C specifies the type and the number of conductors to be used as well as the voltage levels to be used. Intertec's SuperTerm employs this specification for its standard interface.

The Bell System 202C interface is an option (#1176655-00) on the SuperTerm. It is covered here because it uses the same line receivers/drivers but with a different timing setup for communications. Machines which have this option installed may operate using only the RS-232C interface if the 202C feature is deselected. The interface cables are identical.

Table 3-1 outlines the signal names and pin connections for the RS-232C/Bell 202C interface.

4-6-11

Table 3-1
RS-232C/BELL 202C INTERFACING

DB-25 SERIES PIN NO.	EIA (RS232) Circuit	CCITT (V24) Circuit	K4 SuperTerm Digital Card BERG Connector	Signal Name
2	BA	103	4	Transmitted Data 103
3	BB	104	1	Received Data 104
4	CA	105	5	Request to Send 105
5	CB	106	3	Clear to Send 106
7	AB	102	7	Signal Ground 102
8	CF	109	2	Rec'd Line Signal Detector 109
11	*SCA/SA	120	8	Secondary Request to Send
12	*SCF/SB	122	6	Secondary Rec'd Line Signal Detector
20	CD	108.2	9	Data Terminal Ready 108/2

*There is a discrepancy between RS-232C and Standard assignments on a Bell System 202 modem; i.e.,

202-name	202 Pin #	RS232 name	RS232 Pin #
SA	11	SCA	19
SB	12	SCF	12

We have chosen to use RS232 signal names and a pin assignment for SCA/SA in accordance with Bell 202 modems.

3.2.2 Current Loop Interface

NOT YET AVAILABLE

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TECHNICAL BULLETIN #: _____

3.2.3 Parallel Interface

NOT YET AVAILABLE

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Section 4

INTERNAL OPERATION

4.1 General Overview

Intertec's SuperTerm Data Communications Terminal is a state-of-the-art design utilizing the highly acclaimed and field proven 8080 microcomputer system. This 8080 system is the heart of the SuperTerm, controlling all functions and data manipulation. Figure 4-1 shows a basic block diagram of the SuperTerm.

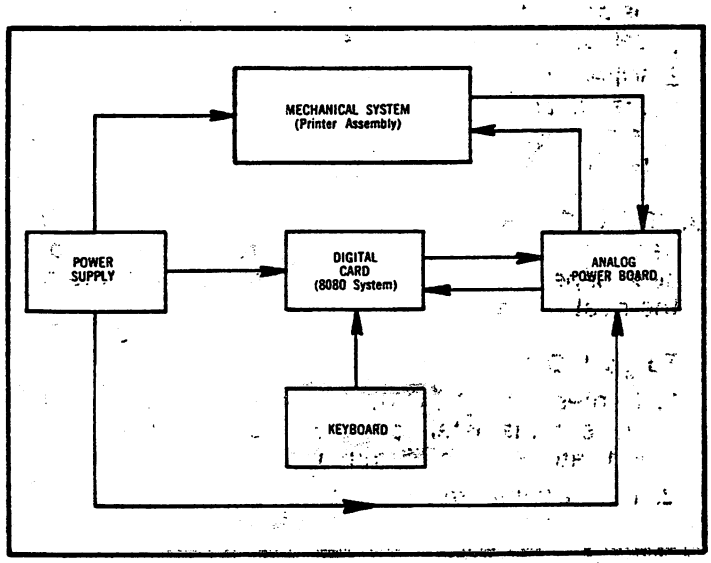

FIG. 4-1 SuperTerm Block Diagram

Each of the blocks in the above diagram will be broken down and discussed in detail in this section. While some particular circuits may be shown for illustration, complete schematics are available in Section 7.

4.2 Power Supply

The SuperTerm power supply regulates all voltages and is of conventional linear design employing solid-state voltage regulators.

For purposes of circuit identification and error reduction, a standard color code is used in SuperTerm. This color code is listed in Table 4-1.

SuperTerm POWER DISTRIBUTION COLOR CODE	
+ 5 VDC	Orange
Logic Ground	Black
+ 12 VDC	Purple
± 12 V. Return	Gray
-12 VDC	Blue
+ 48 VDC	Red
+ 48 V. Return	White
+ 24 VDC	Green
± 24 V. Return	Brown
-24 VDC	Yellow

Table 4-1

The power supply is divided into two sections: the rectifier/filter section and the regulator section.

4.2.1 Rectifier/Filter Section

The rectifier/filter section of the power supply steps down the A.C. line voltage to levels required for the SuperTerm. The A.C. line fuse is located in the "hot" side of the power transformer primary circuit. The three (3) secondaries of the power transformer are connected to three (3) encapsulated bridge type rectifiers mounted to the chassis as shown in figure 4-2.

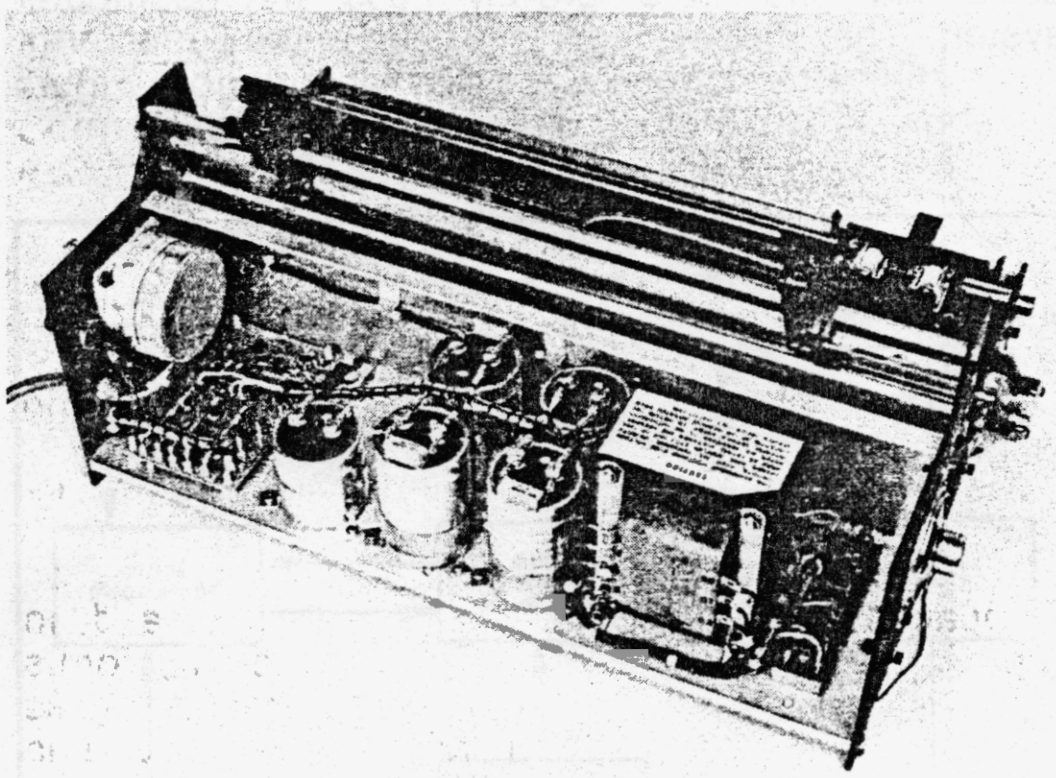

FIG. 4-2 SuperTerm Power Supply

The outputs of the bridge rectifiers go to a bank of filter capacitors mounted in the center of the power supply section of the chassis. These filter capacitors remove any A.C. component from the rectified voltages and provide a near pure D.C. input to the voltage regulators. A complete schematic of this section of the power supply is available in Section 7.6.2.

4.2.2 Regulator Section

4.2.2.1 Regulator PCB Assembly #1131000-01

This regulator card was used in the early SuperTerm terminals. It is no longer being produced but is included to aid in troubleshooting early machines.

The regulator card contains the circuitry for a + 5 VDC regulator and a ± 12 VDC regulator. These are the only regulated voltages in the SuperTerm. ± 24 VDC and + 48 VDC pass through the regulator card but only for fusing.

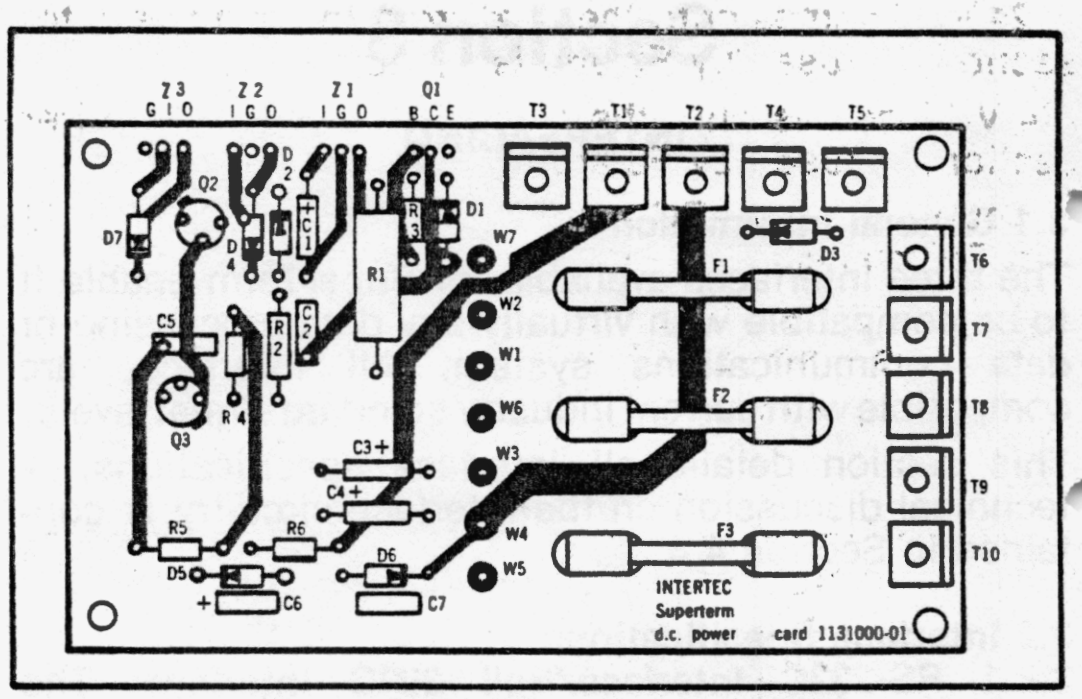

FIGURE 4-3

Figure 4-3 shows the layout of the card and the component locations. This view is taken from the component side of the card.

The + 5 VDC regulator circuit receives + 13 VDC, unregulated, and using a series pass transistor (Q1) and a + 5 V. regulator (Z1), outputs + 5 VDC (± 250 mv.) at T4. Q1 is used to carry the output load current while Z1 monitors the output voltage at terminal T4. Z1 controls the base bias current on Q1 and thereby regulates the output voltage. D1, D2 and D3 provide transient protection for Q1 and Z1.

C1 and C2 provide bypassing and R1, R2 and R3 set up the base bias on Q1. The output of the + 5 VDC regulator circuit is taken across terminals T4 and T5.

CAUTION

T5 is logic ground and should NEVER be connected to earth ground (Chassis)! Erratic operation of the terminal may result due to high levels of electrical noise on Earth ground.

The ± 12 VDC regulator circuit uses a tracking design such that + 12 V is always within a few millivolts of the -12 V line. The circuit is configured such that the -12 V regulator receives -24 VDC, unregulated, from the rectifier/filter section and using a - 12 V regulator (Z3), outputs -12 VDC (± 600 mv.) at T1.

The + 12 VDC regulator receives + 24 VDC, unregulated, from the rectifier/filter section and using a + 5V. regulator (Z2), with its ground reference input floating **above** ground due to Q2, outputs + 12V. (± 600 mv.) at T3. R5 and R6 form a precision voltage divider and develop a tracking-error voltage on the base of Q3. Q3 is a simple error amplifier used to control Q2. Transistor Q2 is used to control the floating reference input on Z2. If the 12V. output starts to drop, Q3 conducts more heavily pulling Q2 toward cut-off. Z2's reference is forced to a higher potential causing the regulator output to rise back toward 12V. If the + 12V. output starts to rise, exactly the opposite reaction occurs. If the absolute value of the + 12 and -12V. outputs are equal, the voltage on the base of Q3 is equal to zero (OV.).

D4, D5, D6 and D7 provide transient protection to Z1 and Z2. C3, C4, C6 and C7 provide bypassing while C5 is used to prevent oscillation in the tracking circuit. R4 is simply for biasing.

Outputs for the + 12 VDC and -12 VDC regulator circuit are taken from T3 and T1 respectively with reference to T2.

+ 24 VDC comes onto the card from the rectifier/filter section, is fused by F2 and is output at T8.

-24 VDC comes onto the card from the rectifier/filter section, is fused by F3 and is output at T10.

Outputs for + 24 VDC and -24 VDC are taken from T8 and T10 respectively with reference to T9.

+ 48 VDC comes onto the card from the rectifier/filter section, is fused by F4, and is output at T6.

Output for + 48 VDC is taken from T6 with reference to T7.

> NOTE: None of the outputs from the regulator card have common references except for ± 24 V. return and ± 12 V. return.

4.2.2.2 Regulator PCB Assembly #1131000-01-Rev. 01

This board differs from the previous board in that it does not contain a tracking regulator circuit for + 12 VDC.

Instead of the tracking circuit, this board uses an independent + 12V. regulator for Z2. Q2 and Q3 have been deleted as have R4, R5, R6 and C5.

A jumper has been added from the collector to the emitter pads of the former Q2 location.

The revised board is shown from the component side in Figure 4-4.

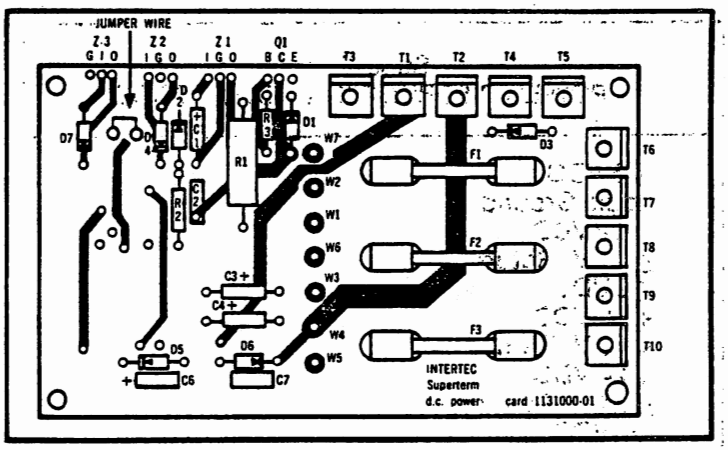

FIGURE 4-4
Regulator PCB Assembly #1131000-01-REV. 01

4.3 Analog Power Board #1130000-02

4.3.1 Overview

The Analog Power Board receives commands from the Digital Card; provides the necessary digital-to-analog (D/A) conversion, and drives all moving components of the printer assembly. It mounts on the bottom of the printer chassis as shown in Figure 4-5.

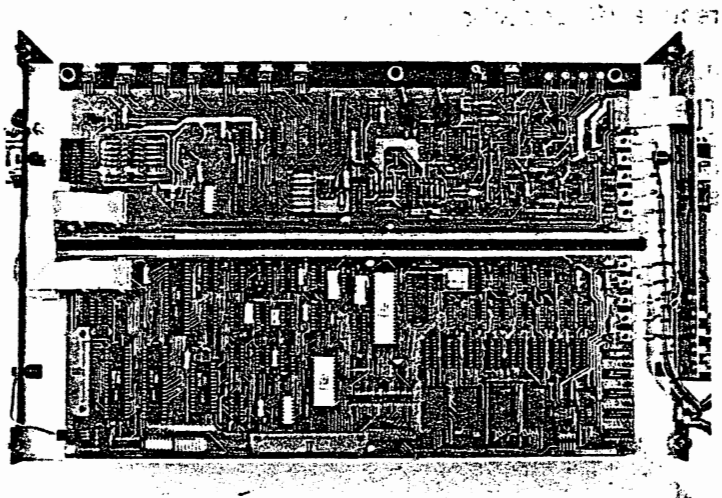

FIGURE 4-5

Figure 4-6 shows a block diagram of the Analog Power Board with interface lines to the Digital Card and the Printer Assembly. Complete schematics of the Analog Power Board are available in Section 7.6.4.

In the remainder of Section 4.3, each of the five (5) circuits shown on the block diagram will be broken down and discussed in detail.

4.3.2 Paper Feed Drive

The Paper Feed Drive circuitry receives two (2) incoming signals from the Digital Card and provides precise paper movements and positioning accuracy to within 1/48" (0.529 mm).

The Paper Feed Drive circuitry consists of two (2) identical constant-current, bipolar amplifiers with negative feedback closed-loop control. The Paper Feed motor is a 2φ stepper motor with each phase being driven by one of the two constant current amplifiers. Figure 4-7 shows a simplified schematic of one phase.

With no incoming command from the Digital Card, the Paper Feed (P.F.) Drive continuously sources current through the P.F. stepper motor. (The P.F. stepper motor is located on the right end-plate of the Printer Assembly as shown in Figure 4-8). This steady-state current through the motor is termed its "holding current". Typical P.F. holding current in the SuperTerm is 200 ma.

A stepper motor with a steady DC current flowing in each of its phases will not turn and is said to be in "detent". For a stepper motor to turn, one of its phases must transition, changing the magnetic field. The stepper motor will then rotate until the magnetic fields are again aligned. This constitutes one "step" and, in SuperTerm, results in the advancement of the forms tractors by 1/48" (0.529 mm). The transition pulse amplitude is termed the "operating current" and is typically 2 amps.

> NOTE: The components being referenced in this discussion may be found in either Figure 4-7 or the schematics in section 7.6.4.

Assuming steady-state conditions, the inverting input of the OP-AMP (Z8) sees either + 200mv. or -200mv. depending on the status of the digital input. This voltage is set up by R13, R14 and a resistor located in pull-up package Z6(10). This steady-state voltage on the input mode of Z8 is our control loop reference voltage, V_{REF}. The polarity of V_{REF} is determined by the status of the digital input line. If the digital input is HIGH, V_{REF} will be + 200mv. If the digital input is LOW, V_{REF} will be -200mv.

Since OP-AMP (Z8) is running open-loop with extremely high gain, Z8 saturates and sources base current for Q10 if positive or Q11 if negative. If Z8 saturates positive and in turn drives Q10 into saturation, Q12 will

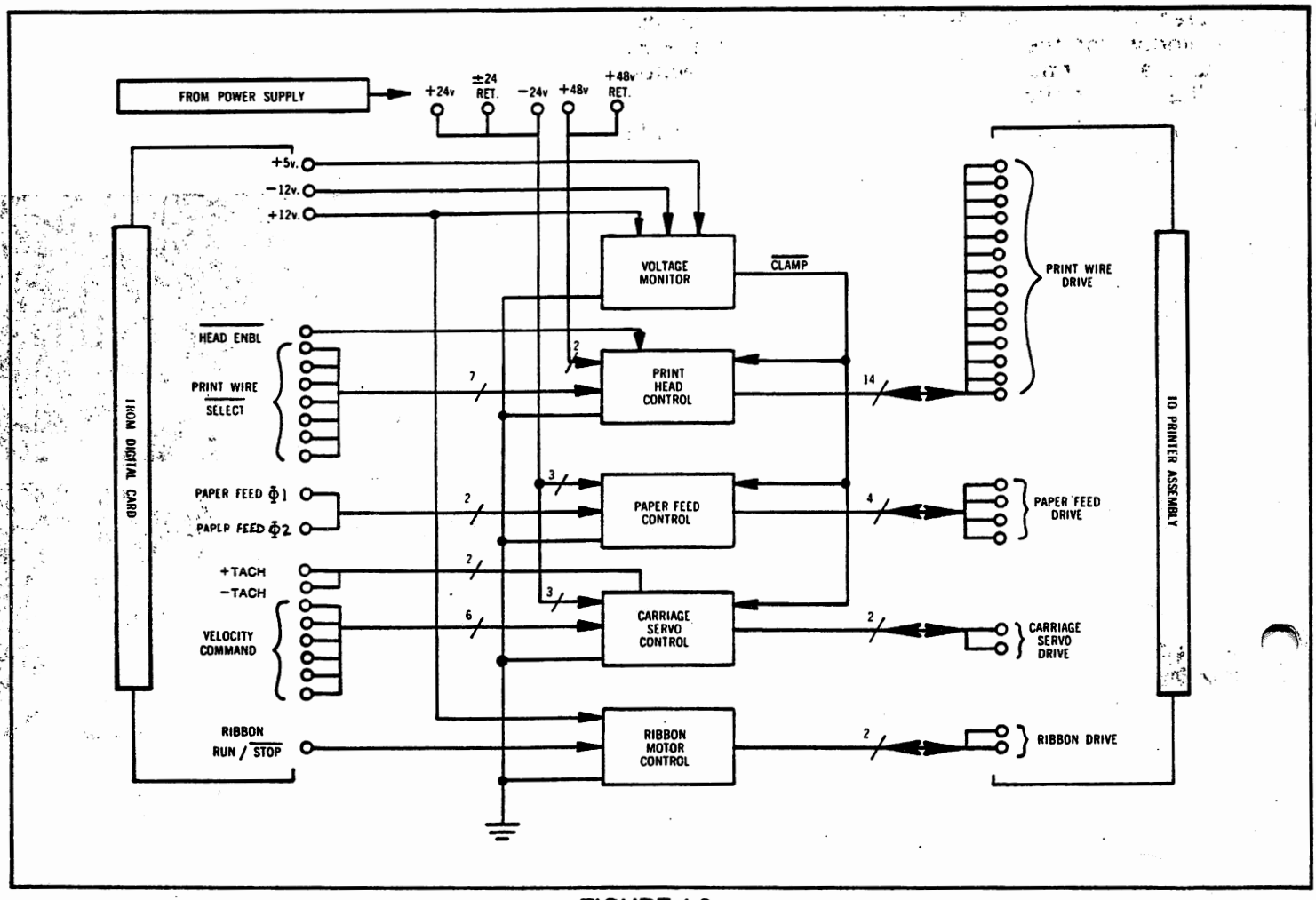

FIGURE 4-6
Analog Power Board - Block Diagram -

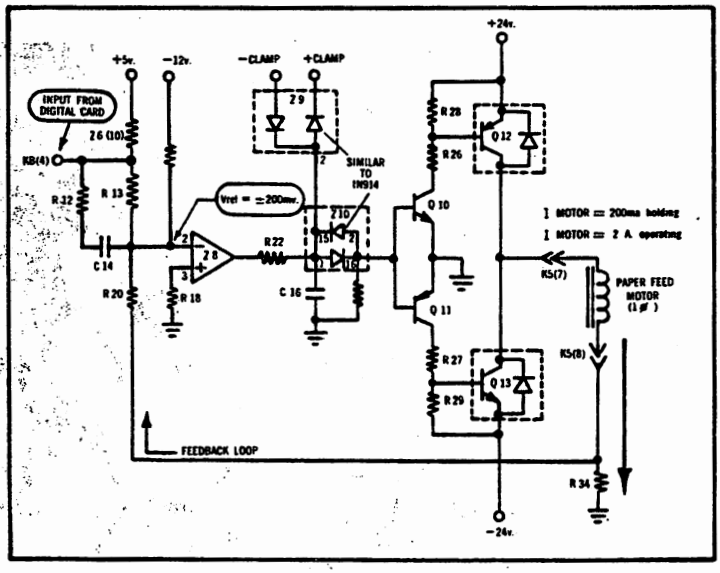

FIGURE 4-7
Φ φ Of Paper Feed Drive Circuit

be driven into saturation and the P.F. motor current will be sourced by the +24V. power supply. If Z8 saturates negative, it will drive Q11 into saturation and in turn drive Q13 into saturation. This condition causes the P.F. motor current to be sourced by the -24V. power supply.

Since the stepper motor is an inductive device, it takes a finite amount of rise-time for the current, I_{motor}, to begin to flow. As I_{motor} increases, the voltage across the current-sensing resistor, R34, begins to rise. When I_{motor} reaches 200 ma, (typical holding current) the voltage across R34 is 200 mv. This voltage is fed back to the V_{REF} node and nulls the reference voltage causing the output of Z8 to return to 0V. When this occurs, the output drivers, Q10 and Q12, or Q11 and Q13 are cut off and I_{motor} begins to decrease. The feedback loop senses this at R34 and causes Z8 to saturate again. Knowing that Z8 is running a quite l[illegible] open-loop gain and that Q12 and Q13 are high-gain Darlington type transistors, response time around the control loop is quite short. This fact, coupled with the dynamic characteristics of the stepper motor, produces an oscillating control loop.

Because of this oscillating control loop, we are able to maintain our desired I_{motor}, but at the same time reduce heat dissipation in the active devices. This results in lower power consumption and increased component life.

To step the P.F. motor, the digital input must reverse its status. The edge of the transition is differentiated by R12 and C14 producing a pulse at the V_{REF} node. The polarity of the pulse is determined by the direction of the transition on the digital input. This pulse causes a momentary increase in V_{REF} and the control loop obliges by momentarily increasing the motor current while reversing the direction of the current. As the pulse dies away, the voltage returns to its steady-state level of 200mv. and the control loop returns the motor current to its normal 200ma. holding current. Note that the current flow has now changed direction.

Figures 4-9, 4-10 and 4-11 show input and output waveforms for the Paper Feed Drive. As the P.F. phases are identical, all information in this section applies to both circuits.

The purpose of the + CLAMP and -CLAMP inputs will be discussed in Section 4.3.5.

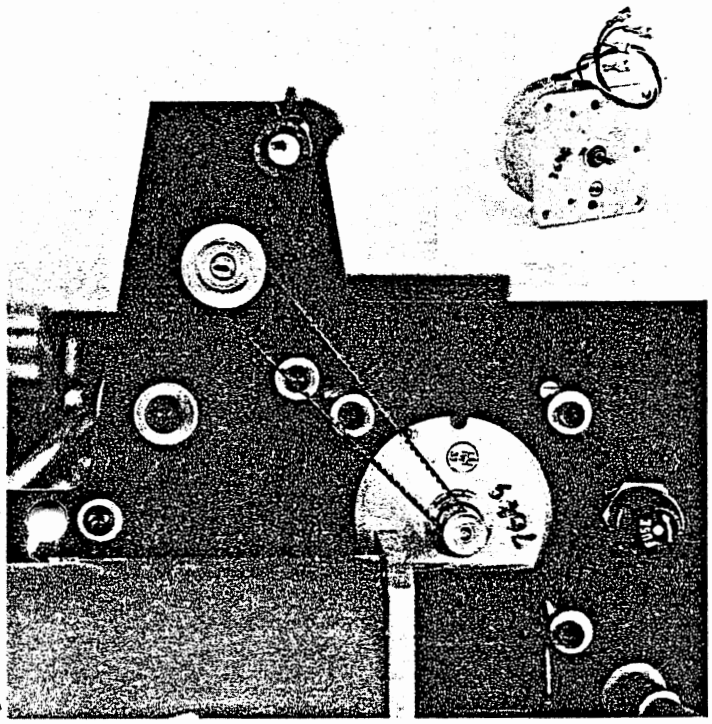

FIGURE 4-8
Paper Feed Stepper Motor

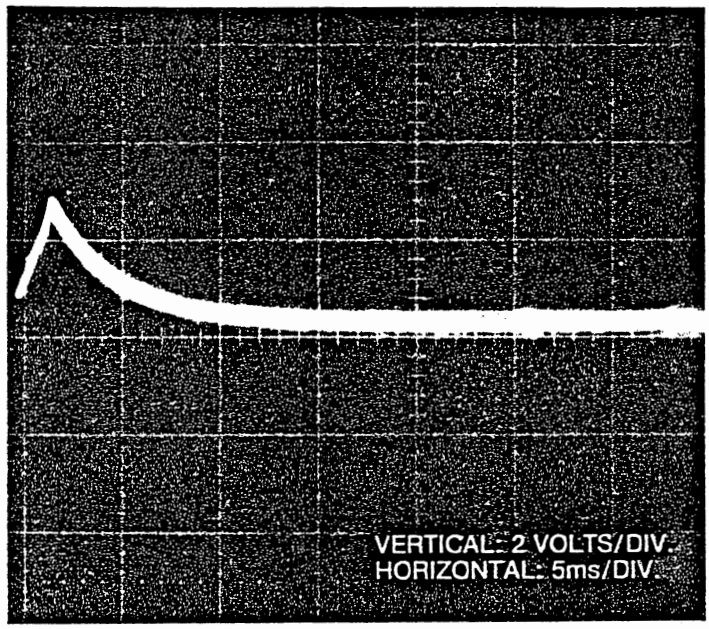

FIGURE 4-10
P.F. $\bar{\phi}$ ϕ Output (1 Step)

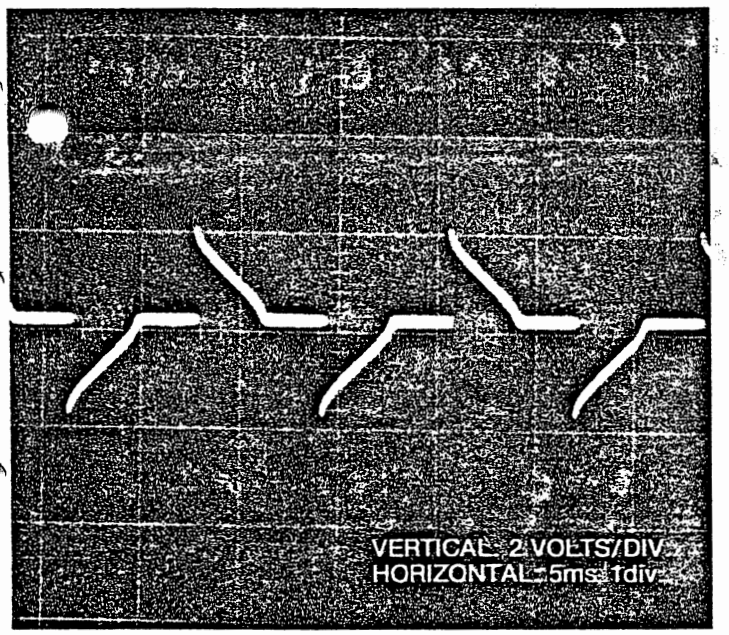

FIGURE 4-9
P.F. $\bar{\phi}$ ϕ Input (Slew Mode)

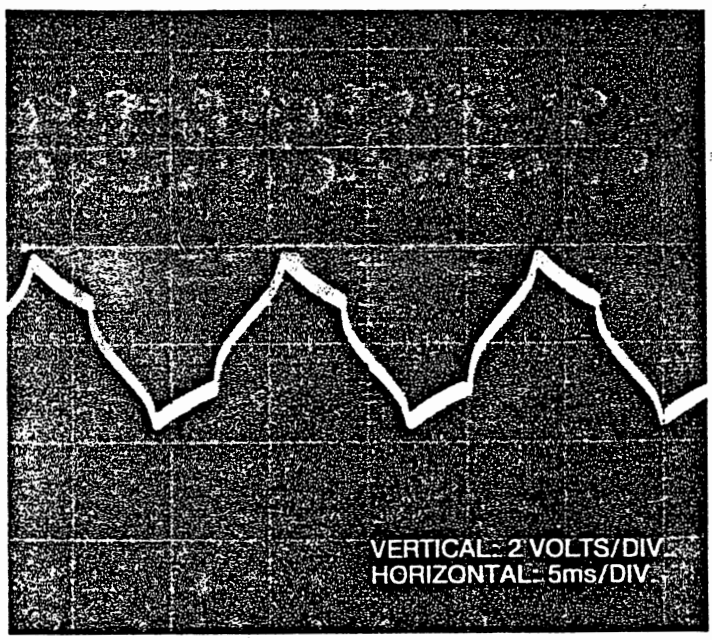

FIGURE 4-11
P.F. $\bar{\phi}$ ϕ Output (Slew Mode)

4.3.3 Carriage Servo Drive

The Carriage Servo Drive circuitry receives eight (8) incoming signals from the Digital Card and provides precise carriage positioning with accuracy to within 1/100" (0.254 mm).

The Carriage Servo Drive consists of a D/A converter, a constant-speed servo drive, and a tachometer circuit. The servo motor is located on the right end-plate of the Printer Assembly as shown in Figure 4-12.

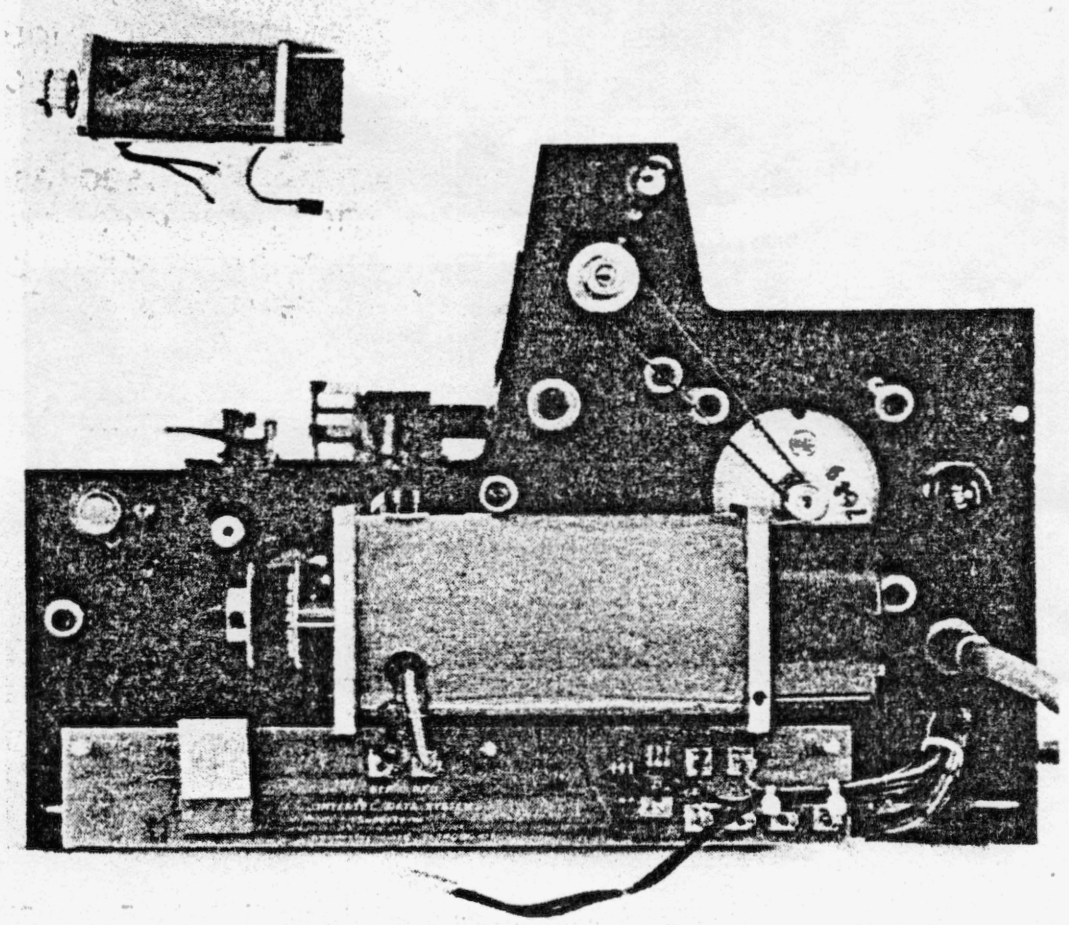

FIGURE 4-12 Carriage Servo Motor

NOTE: The components being referenced in this discussion may be found in either Figure 4-13 or the schematics in section 7.6.4.

The D/A converter receives an octal coded command from the Digital Card and converts the octal code into an analog voltage level. The output of the D/A converter (DAC) is fed into a unity-gain, inverting amplifier (Z12) which is biased such that the output of the OP-AMP (Z12-1) swings between + 5V. and -5V. This DAC circuit output becomes the VELOCITY REFERENCE VOLTAGE (VEL. REF.).

Table 4-2
DAC-AMPLIFIER OFF-SET TRIM RESISTOR VALUES

OFF-SET VOLTAGE	TRIM RESISTOR VALUE
10mv.	5.98 meg.
15 mv.	3.99 meg.
20mv.	2.99 meg.
25mv.	2.39 meg.
30mv.	1.99 meg.
35mv.	1.71 meg.
40mv.	1.49 meg.
45mv.	1.33 meg.
50mv.	1.19 meg.
55mv.	1.08 meg.
60mv.	998 K
65mv.	921 K
70mv.	855 K
75mv.	798 K
80mv.	748 K
85mv.	704 K
90mv.	665 K
95mv.	630 K
100mv.	598 K

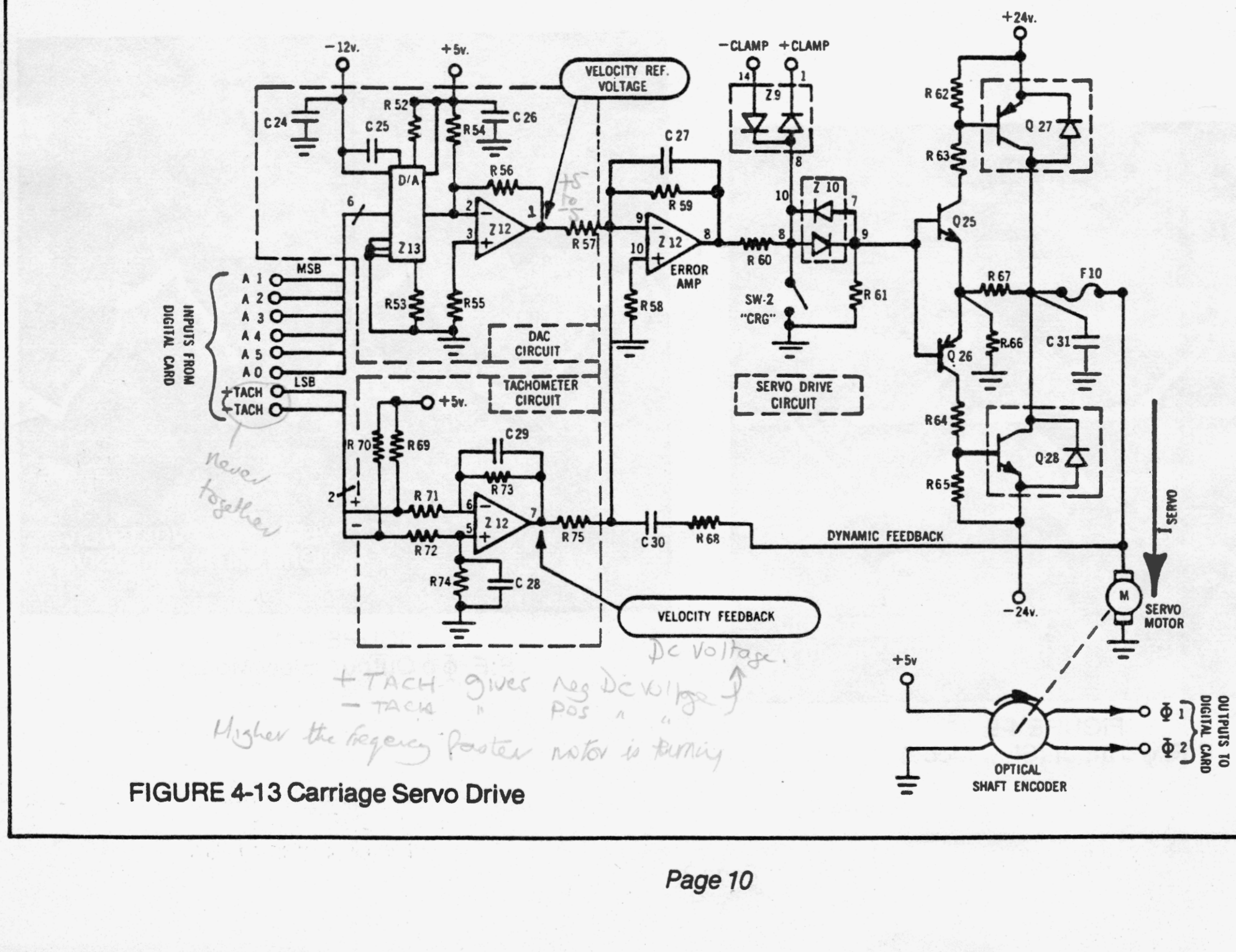

FIGURE 4-13 Carriage Servo Drive

Accumulation of component tolerances may cause the DAC Amplifier to produce an error voltage of sufficient amplitude to turn-on the servo power amplifier even with a zero-velocity command. To counteract this effect, a trim resistor may be added to the DAC Amplifier summing node at Z12(2). The free end of this trim resistor is connected to either +12V or -12V. This supply voltage polarity should be the same as the error voltage polarity.

Table 4-2 shows the appropriate trim resistor value for a given error voltage measured at Z12(1), the output of the DAC Amplifier.

The Tachometer Circuit provides VELOCITY FEEDBACK. This Velocity Feedback is originated by the OPTICAL SHAFT ENCODER which is attached to the rear of the carriage servo motor. (See FIG. 4-12). The encoder produces a 2-phase output from which is available both speed and directional information. These outputs, ΦA and ΦB, are routed to the Digital Card where the signal waveforms are shaped into uniform pulses using Schmitt Trigger devices and a one-shot multivibrator. These processed signals are labeled "+ TACH" and "-TACH" and are routed to the Analog Card as inputs for the Tachometer circuit.

The Tachometer Circuit uses a unity-gain OP-AMP (Z12) as a linear integrator. When a pulse train is input on either + TACH or -TACH, the Tachometer integrates the pulses to obtain a D.C. voltage at Z12, pin 7, which is the TACH output or VELOCITY FEEDBACK.

> NOTE: It is important to know at this point that + TACH and - TACH are gated on the Digital Card such that the two signals may never appear simultaneously.

An input on + TACH will produce a negative D.C. voltage at the TACH output. An input of -TACH will produce a positive D.C. voltage at the TACH output. Since the pulses are so conditioned as to be of uniform amplitude and width, the only variable is frequency. The pulse frequency is determined by the speed of the servo motor. The faster the servo turns, the higher the pulse frequency and the higher the VELOCITY FEEDBACK voltage. The polarity of the VELOCITY FEEDBACK is determined by the direction of servo rotation. (This reverses the phase relationship of the Encoder outputs and determines whether + TACH or -TACH will be gated into the Tachometer Circuit).

The outputs of the DAC circuit and the TACH circuit are tied together at Z12, pin 9. This junction is termed the "summing node". The VEL. REF. Voltage, summed with the (negative feedback) VELOCITY FEEDBACK voltage, produces an "error voltage" which is amplified by the ERROR AMPLIFIER. The error amplifier output, Z12, pin 8, sources the base current for Q25 and Q26. The remainder of the circuit works much the same way as the Paper Feed Drive output stage but with one major exception.

The control loop for the Carriage Servo Drive does not oscillate. The "dynamic feedback" loop formed by R68 and C30 cancels out any oscillation tendencies and maintains linear mode operation.

The [CRG] switch, SW-2, allows the servo drive circuit to be manually disabled simply by grounding the output of the error amplifier.

The purpose of the + CLAMP and -CLAMP inputs will be discussed in Section 4.3.5.

4.3.4 Print-Wire Solenoid Drive

The Print-Wire Solenoid Drive receives eight (8) incoming signals from the Digital Card and provides constant-current control of Intertec's seven (7)-wire Print Head.

The Print-Wire Solenoid Drive circuitry consists of a reference voltage divider, an enable circuit, and seven (7) constant-current solenoid drivers. The reference voltage divider and the enable circuit, shown in Figure 4-14, provide outputs that are common to all 7 solenoid drivers.

As in the previous two circuits, V_{REF} is used as a reference for the control loop. As shown in Figure 4-15, the solenoid drive circuits are similar in principle but less complex than either the Paper Feed Drive or Carriage Servo Drive.

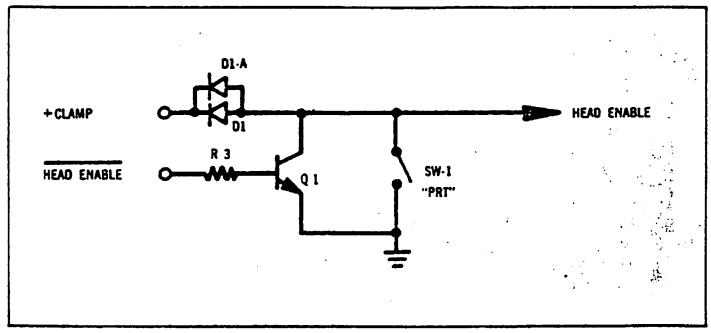

FIGURE 4-14 (a)
Print-Head Enable Circuit

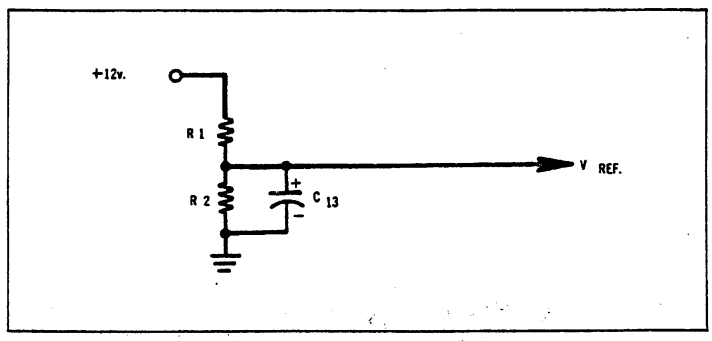

FIGURE 4-14 (b)
Print-Head Reference Voltage

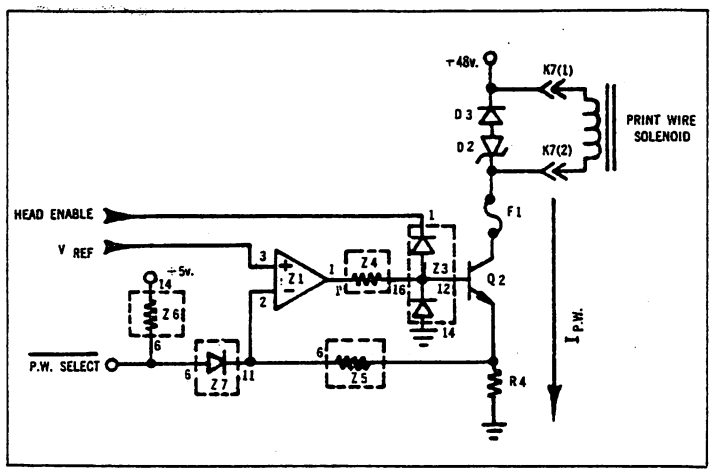

FIGURE 4-15
#1 Print-Wire Solenoid Drive

For the wire to be able to fire, both HEAD ENABLE and PRINT-WIRE (P.W.) SELECT must be active. With this condition, Z1 will switch high and saturate Q2, allowing the solenoid to be activated. R4 is the current-sensing resistor for the feedback loop. Once again, the control loop does oscillate, maintaining a low duty-cycle in the solenoid coil and active devices.

When HEAD ENABLE is active, (See Fig. 4-14 (a)) Q1 is cutoff, allowing Q2 to be driven. At all other times, Q1 is saturated, grounding the base of Q2, (Fig. 4-15).

The PRT switch, SW-1, allows the Print-Head Solenoid Drive to be manually disabled by shorting Q1.

The purpose of the + CLAMP input, (Fig. 4-14 (a)) will be discussed in Section 4.3.5.

4.3.5 Voltage Monitor

The Voltage Monitor monitors the three regulated voltages, + 5V., + 12V., -12V. from the Digital Card and prevents movement of the carriage, forms tractors, or print-wires during powering-ON, powering-OFF, and in the event of a Power Supply failure.

Figure 4-16 shows the Voltage Monitor Circuit and its two outputs, + CLAMP and -CLAMP.

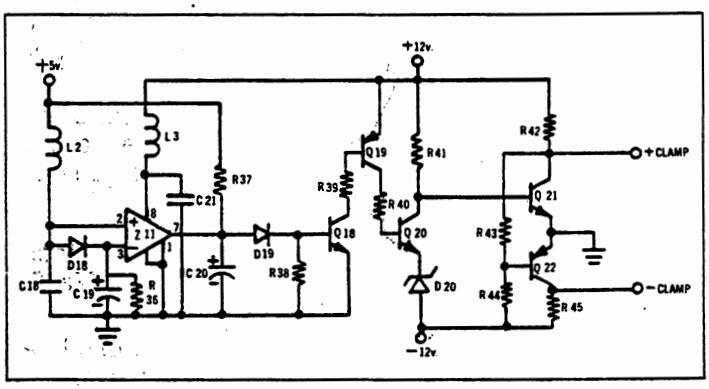

FIGURE 4-16 Voltage Monitor

The CLAMP outputs connect to the carriage Servo Drive, the Paper Feed Drive, and the Print-Wire Solenoid Drive and are polarity-protected by the local diodes in each circuit. The purpose of the CLAMP outputs is to ground the driving signal for the output stage of each circuit. Figure 4-6 illustrates how the Voltage Monitor is connected to the circuits it controls.

When the terminal is powered-ON, Q21 and Q22 come up in the saturated mode. C20 is charged through R37 by the + 5V. line until the potential on C20 is sufficient to turn-on Q18. Q18 in turn forces Q19 and Q20 to turn-on. When Q20 turns on, Q21 is starved for base current and turns off, forcing Q22 into cutoff. At this point, ± CLAMP are allowed to float and all circuits may operate.

When the terminal is powered-OFF, an additional portion of the circuit comes into play. Assuming that the terminal has been powered-ON and operating properly, C19 has been charged to one diode-drop less than + 5V., causing the output of Z11 to remain high. When the terminal is powered-OFF and + 5V. begins to drop, C19 remains charged, holding Z11, pin 3, high. When the voltage on Z11, pin 2, drops below that on pin 3, the output of Z11 switches low, pulling all of the charge from C20. This causes Q18 to cut off and start the chain reaction to saturate Q21 and Q22, pulling + CLAMP and -CLAMP to ground level.

If either + 5V. or ± 12V. is lost due to any malfunction, Q21 and Q22 are forced to saturate and pull the CLAMP lines to ground.

L2, L3, and C18, C21 provide input filtering to prevent clamping action due to noise transients.

4.3.6 Ribbon Drive

The Ribbon Drive circuit receives only one (1) incoming signal from the Digital Card and provides ribbon movement for every printable character received by the terminal.

The Ribbon Drive circuit is quite simple, as shown in Figure 4-17. The + 12V. line is dropped to approximately 9V. by D24. C22 and C23 provide brush-noise filtering and D25, transient protection. A HIGH on the base of Q24 will saturate it and cause the ribbon motor to run. A LOW on the base of Q24 will cause the ribbon motor to be cut off.

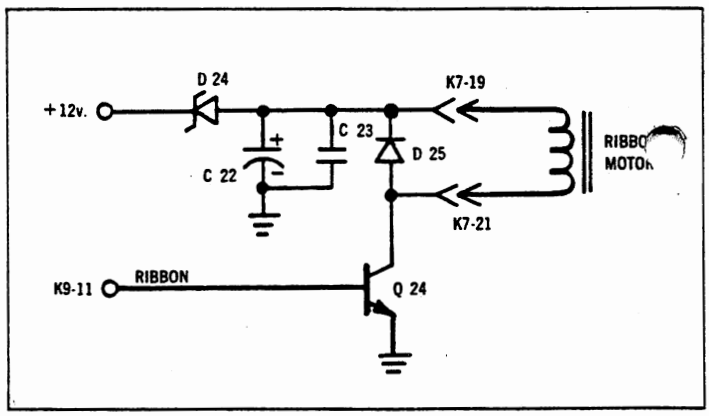

FIGURE 4-17 Ribbon Drive Circuit

4.3.7 PCB Assembly Revision History

4.3.7.1 PCB Assembly #1130000-01

- C28 is piggy-back with R74
- C29 is piggy-back with R73
- Q27 base and emitter leads reversed
- Q28 base and emitter leads reversed
- R38 is piggy-back with Q18
- K5 pin 12 is bused to pin 11 - no other connection to pin 12

Refer to Section 7.6.4 for component positioning.

4.4 Digital Card PCB Assembly #1132000-03

4.4.1 Overview

The Digital Card contains a complete digital micro-computer system with memory and interfacing. Utilized is the highly acclaimed and proven 8080 microcomputer system, with reliable MOS and TTL peripherials for interface and control. The system monitors all I/O ports and generates the necessary responses for all inputs from either the keyboard or host computer or from within the system itself. Since the 8080 CPU is under stored program control, it is possible to reprogram the system for special customer requirements. (Contact your Intertec representative for information on this feature as special software development cost maybe involved.)

Figure 4-19 shows a simplified block diagram of the SuperTerm's 8080 system. There are three basic buses over which system information travels; the data bus, the address bus, and the control bus.

The Data Bus originates at the CPU and is buffered by the 8228 System Controller. The data bus is bi-directional, allowing data to flow into and out of the CPU and any other device connected to it. The data bus contains eight (8) lines which the 8080 CPU utilizes as an 8-bit word which connects to the system memory, data lines, and all I/O ports.

The Address Bus also originates at the CPU. This bus contains sixteen (16) lines and enables the CPU to directly address up to 65,536 8-bit bytes of data from memory or I/O devices. The address bus is also buffered using tri-state devices which provide extra drive and allow the system bus to be floated for purposes of external control, etc.

The Control Bus originates at the 8228 System Controller and consists of status and timing signals from the CPU and the 8224 Clock generator. This bus controls READ, WRITE and I/O operations.

The 8080 micro-computer system and its functions will be broken down and discussed in the remainder of Section 4.4.

Complete schematics and component placement diagrams may be found in Section 7.6.5.

The Digital Card and its location are shown in Figure 4-1o.

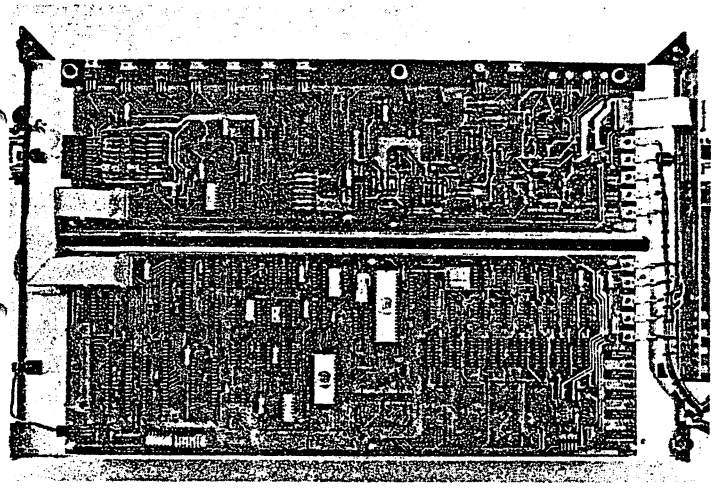

FIGURE 4-18

4.4.2 Power Distribution and Filtering

The Digital Card receives +5VDC, Logic Ground and +12VDC, -12VDC, ±12V RET. from the Regulator PCB via the D.C. Power Distribution Harness. These connections are made to the power-tab connectors located along the right edge of the card. The -5V. Substrate Bias for the 8080 CPU comes from the Analog Power Board and is input on K6, pin 14. All of these voltages are regulated and should be within 5% tolerances.

All power buses are heavily filtered. Across the input connectors are electrolytic and ceramic bypass capacitors on each bus with the +5V bus being filtered additionally by distributed electrolytic capacitors. In addition to these bus filters, each I.C. is bypassed by a 0.1 ufd ceramic capacitor.

4.4.3 Microprocessor System Bus and Control Logic

The 8080 CPU (Z10) controls every operation performed in the SuperTerm. It accesses memory via the Address Bus, receives programmed instructions via the Data Bus and outputs commands over the Data Bus.

The CPU is a dynamic device and therefore requires clocking signals to time and coordinate its operations. The 8224 Clock Generator (Z22) provides these timing signals in addition to providing automatic power-on reset of the system and system synchronization. The Φ2 (TTL) output of the 8224 is fed to a divider, (Z14) which produces 1MHZ, 500 KHZ, and 7.81 KHZ signals for timing of the Servo/Head Control circuitry and Serial Interface circuitry.

The 8228 System Controller (Z35) interfaces with the 8224 and the 8080 to produce system control signals on the Control Bus. These signals control memory operations and I/O operations throughout the system. The 8228 also provides bi-directional buffering for the CPU Data Bus. This gives the system a higher fan-out capacity and also enables the Data Bus and Control Bus to be allowed to float for purposes of external control, DMA, etc.

The CPU Address Bus is also buffered using the 74367 tri-state buffers. These devices, (Z36), (Z37) and (Z21) isolate the CPU Address Bus to allow a higher system fan-out and to provide the ability to float the Address Bus.

Access to all bus lines is available on connector (K3) for connection of special options and system configurations. Other lines available provide for external control of the CPU and timing synchronization of peripheral equipment.

The device (Z50) shown connected to the data bus is simply a pull-up resistor pac which insures a true logical HIGH on the bus lines when they are active.

4.4.4 Memory/I/O Gating Logic

This circuitry is shown in Figure 4-19 as three blocks labeled MEMORY PAGE DECODER, I/O STROBE GENERATOR, and I/O CHIP DECODER.

The MEMORY PAGE DECODER receives Address lines BA10 through BA15 and decodes chip select information used to access the RAM or any given section of ROM. The MEMORY PAGE DECODER is (Z24) and is a 74LS138 one-of-eight decoder. One of the decoder enable inputs is available on (K3) for external disabling of the system memory.

The I/O STROBE GENERATOR receives Address lines BA0 through BA3 and generates control signals for the Servo/Head Control Logic (Section 4.4.9) and the SYSTEM TIMERS AND INTERRUPT CONTROL (Section 4.4.10). Additional signals from the I/O STROBE GEN. are available on connector (K3) for handshaking with peripheral equipment and for system expansion. The I/O STROBE GENERATOR (Z11) is a 74154 4-line to 16-line decoder.

The I/O CHIP DECODER receives address lines BA4 through BA7 and generates chip select signals for the three 8255 programmable interface chips (Section 4.4.8) and the 8251 USART (Section 4.4.11). An I/O FLOAT line is input from (K3) to allow all I/O to be disabled and two additional CHIP SELECT lines are output to (K3) to allow for system I/O expansion. The I/O CHIP DECODER (Z23) is a 74LS138 one-of-eight decoder.

4.4.5 System RAM (Read/Write Memory)

The SuperTerm's internal system RAM consists of eight (8) type 2102 1024-bit static MOS RAM'S organized into a 1024 x 8 architecture. The RAM provides an operational stack for CPU status and data, and storage for programmable system parameters.

The RAM is enabled by the RAM CS output of the MEMORY PAGE DECODER (Section 4.4.4) and addressed by lines BA0 through BA9 of the Address Bus. Read or Write mode is selected by MEMR and MEMW of the Control Bus. Data I/O is over the bi-directional system Data Bus.

System RAM consists of, from LSB to MSB, Z61, Z59, Z27, Z28, Z26, Z60, Z58 and Z62.

4.4.6 System ROM (Read-Only Memory)

As previously mentioned, the system CPU is under stored-program control. The standard SuperTerm operating software is contained in (Z51) through (Z55) which are mask-programmed ROM devices.

The ROM chips are individually enabled by CS signals from the MEMORY PAGE DECODER (Section 4.4.4). ROM's are addressed by BA0 through BA10 of the Address Bus and accessed by the MEM R line of the Control Bus. Data output is on the system's Data Bus.

4.4.7 Option Decoding Logic

Some of the options available on the SuperTerm are implemented via firmware and are not available in the standard operating software package.

Firmware options are also implemented using ROM devices and are included as such in Figure 4-19. Option ROMs are (Z38) through (Z45).

The 8255's interface directly to the system's bi-directional Data Bus and receive data and status information from the CPU over this bus. Any information being input to the system by an 8255 also travels on this bus. The 8255's are individually enabled by CHIP 1, CHIP 2, or CHIP 3 signals from the I/O CHIP DECODER (Section 4.4.4). Read or Write mode is selected by the I/O-R and the I/O-W lines of the Control Bus. Each 8255 accommodates three (3) I/O ports, of 8-bits each, addressed by BA0 and BA1 of the Address Bus.

Figure 4-19 illustrates the circuitry with which each 8255 interfaces.

CHIP 1 handles the dot-matrix pattern being transmitted to the Analog Power Board. The dot pattern for each column to be printed is brought out and latched by two (2) 74174 hex D-type flip-flops. This section is synchronized by the HEAD STROBE signal from the Servo/Head Control Logic (Section 4.4.9).

(Note that provision is made in the hardware on both the Digital Card and the Analog Power Board to accommodate a nine (9) wire print head. This leaves an open door for future development and improvement.)

CHIP 1 also handles the two (2) output lines for control of the Paper Feed Drive on the Analog Power Bo[illegible] (Section 4.3.2), eight (8) baud-rate selection lines output to the BAUD RATE DECODER (Section 4.4.11), one

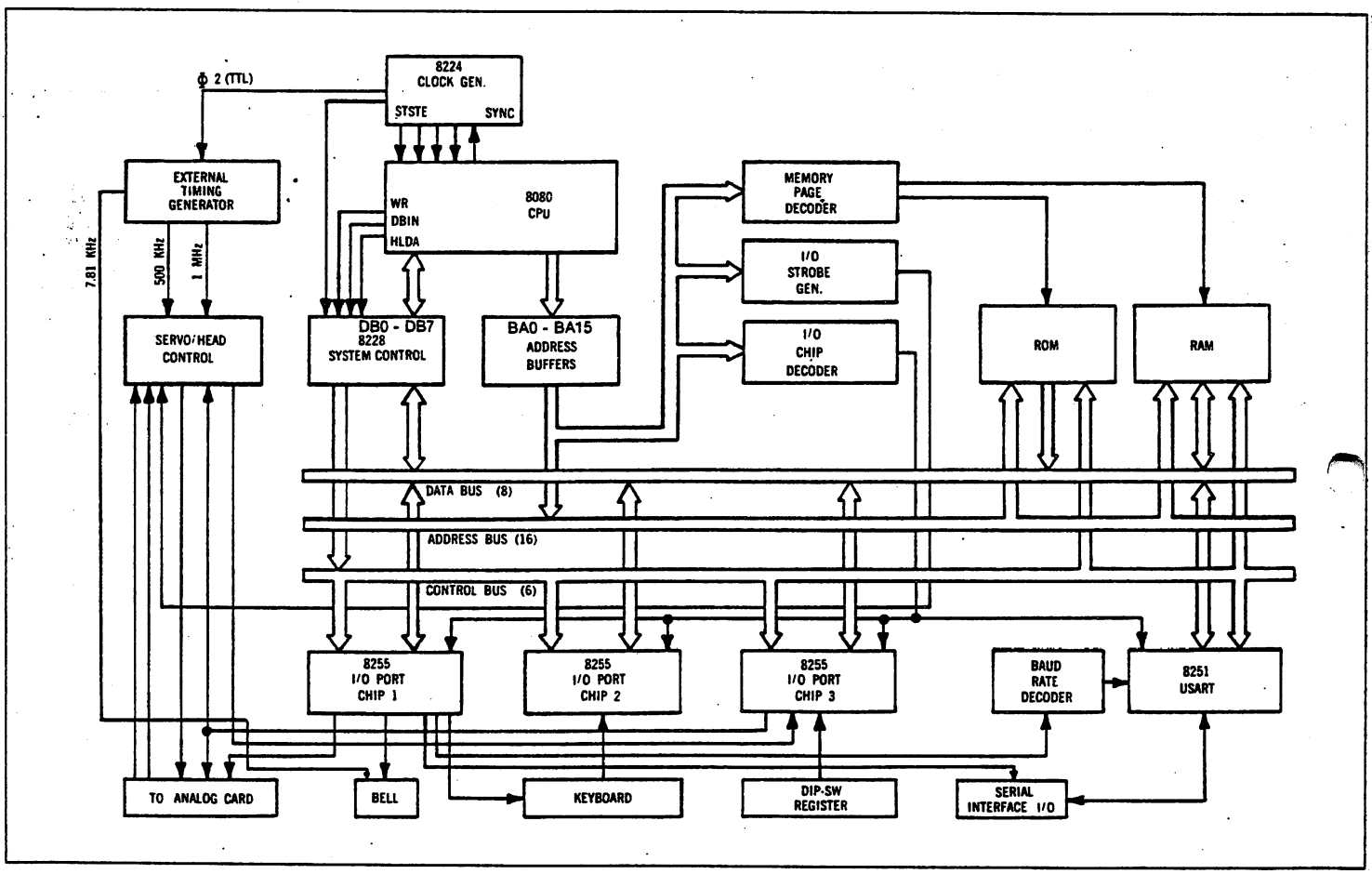

FIGURE 4-19 Digital Card Block Diagram

4.4.8 System I/O

Interface between the internal micro-computer system and its various inputs and outputs is handled by three (3) 8255 programmable interface chips. These are designated as CHIP 1 (Z23), CHIP 2 (Z29) and CHIP 3 (Z30).

(1) line to the keyboard [READY] LED (Section 4.7.1), one (1) line to enable the BELL circuit and one (1) line for the DATA TERMINAL READY signal to the Serial Interface Logic (Section 4.4.11).

The BELL circuit receives a 7.81 KHZ square wave from the 74393 EXTERNAL TIMING GENERATOR (Z14) and divides it by four (4) using a 7474 dual D-type flip-flop Z46. The 7474 is enabled from CHIP 1 and turns transistor (Q1) on and off at 1.95 KHZ. Transistor (Q1) sinks current through the loudspeaker to produce the BELL tone. Resistor (R9) establishes the necessary load resistance for (Q1) and (CR2) suppresses transients from the speaker's voice-coil.

CHIP 2 handles the keyboard interfacing. Alphanumeric characters are received from (K1), the keyboard connector, as an 8-bit code. All function keys and the KEYBOARD STROBE signal are received on dedicated lines from (K1). In addition, the KEYBOARD INTERRUPT REQUEST signal is generated by the 8255.

The keyboard [READY] switch is also brought in from (K1) through a 74LS14 (Z5) Schmitt Trigger device and differentiated by (C25) and (CR3). Transistor (Q2) is pulsed "on" and a CPU RESET signal is transmitted to the 8224 CLOCK GENERATOR which initiates a reset sequence within the CPU.

CHIP 2 also receives the CARRIER DETECT and CLEAR-TO-SEND, lines from the Serial Interface line receiver (Section 4.4.11).

CHIP 3 handles interfacing for the servo velocity commands, servo position, servo direction, DIP-SWITCH register and priority codes interrupts.

The SERVO VELOCITY COMMANDS are output from CHIP 3 to connector (K6) over six (6) lines. The bit pattern on these lines determine the speed and direction of the carriage travel.

Servo position information is generated by the COLUMN COUNTER in the Servo/Head Logic (Section 4.4.9) and is input to CHIP 3 as a 4-bit BCD count over the lines CELL 0, CELL 1, CELL 2 and CELL 3.

Servo direction information is generated by the DIRECTION HOLD flip-flop in the Servo/Head Logic (Section 4.4.9) and is input to CHIP 3 via a single line. The status of this line, HIGH or LOW, enables the CPU to determine the current direction of carriage travel.

The DIP-SWITCH register is also interfaced by CHIP 3. Switches 1 through 8 are pulled up to insure a true logic HIGH by pull-up resistor pac (Z47) and are connected to I/O port B of CHIP 3. The remaining terminal of each switch is connected to LOGIC GROUND. Note that the DIP-SWITCH lines are active LOW. If a switch is selected or turned on, it will pull its corresponding CHIP 3 input low. Switch 8 is a spare.

IMPORTANT: The CPU reads the DIP-SWITCH register only during a power-on reset sequence. If a switch is changed while the SuperTerm is powered on, a power-on reset must be executed to make the system aware of the change.

Priority Coded Interrupt information is generated by the INTERRUPT PRIORITY ENCODER (Z49), (Section 4.4.10). This information is in the form of a 3-bit number representing the particular device requesting an interrupt and a single status line that signals the presence of an interrupt request. This information is input to I/O CHIP 3 for interface onto the system data bus.

An additional line from CHIP 3, port A, bit 6, is used to select open or closed loop control of the Carriage Servo Drive. This enables the CPU to open the VELOCITY FEEDBACK path to obtain the full speed of the carriage servo. This feature is used on such operations as a carriage return when the carriage has to be moved a considerable distance in minimum time. This signal is output to the Servo Head Control Logic (Section 4.4.9).

Port A, bit 7, of CHIP 3 is connected to (K5), pin 16 and is a spare.

4.4.9 Servo/Head Control Logic

The Servo/Head Control Logic receives PHASE A and PHASE B outputs of the OPTICAL SHAFT ENCODER and processes these two signals to determine the carriage position and direction of movement. The processed signals are fed back to the Analog Power Board as input to the Tachometer Circuit. PHASE A and PHASE B of the encoder are input on connector (K6) to a Schmitt trigger (Z5), a 74LS14, which insures a clean square-wave pulse. These square-wave signals are input to a dual D-type flip-flop, (Z6) which determines the direction of carriage travel by decoding the leading encoder phase. This information is latched in the DIRECTION HOLD flip-flop and (Z6) is reset and the COLUMN COUNTER clocked by the + INC RESET flip-flop. This action occurs on every encoder pulse so that the COLUMN COUNTER, (Z33, a 74190) is clocked at every cell the carriage passes through.

NOTE: A cell is a sub-column *within* a character. the OPTICAL SHAFT ENCODER generates 100 pulses per linear inch of carriage travel yielding 100 cells per linear inch. This also allows the carriage positioning to be accurate to within 1/100 of an inch.

The COLUMN COUNTER interfaces with the microprocessor system via I/O CHIP 3 and informs the CPU of the current relative carriage position.

The COLUMN COUNTER overflow is used to clock the SERVO INTERRUPT REQUEST flip-flop. This flip-flop sends a servo interrupt request to the INTERRUPT PRIORITY ENCODER (Z49). After the interrupt has been acknowledged and serviced, a CLEAR SERVO signal is sent from the I/O STROBE GENERATOR (Z11) to clear the SERVO INTERRUPT REQUEST flip-flop.

The COLUMN COUNTER also receives a reset line from the I/O STROBE GENERATOR. During a [READY] or POWER-ON RESET execution, the servo is commanded to move toward the left true margin at approximately two (2) inches per second. When the carriage reaches the left end-stop, it ceases to move and the OPTICAL SHAFT ENCODER ceases to generate pulses. The system monitors the encoder pulses and, if none are received for a specified period of time, the CPU assumes that the carriage is at the true left margin and resets the COLUMN COUNTER with the COL RESET output of the I/O STROBE GENERATOR.

PHASE A and PHASE B, after waveshaping by the Schmitt triggers, are also input to the FREQUENCY QUADRUPLER, (Z17), a 74C86. The output of the quadrupler triggers a 74LS221 one-shot multivibrator (Z18). The one-shot is enabled by the OPEN/CLOSED LOOP output from I/O chip 3. When enabled, the one-shot produces 33 µs pulses which are gated onto the + TACH and -TACH outputs, depending on the direction of servo motion. + TACH and -TACH provide the Analog Power Board with velocity feedback. When the one-shot is disabled, no velocity feedback is generated, allowing maximum servo speed.

The encoder pulses are also used to time the firing of the print-wires. The ± INC PULSE signal from (Z7), pin 8, is used to trigger the print head one-shot multivibrator, also in (Z18), which is enabled by the HEAD-ON output of I/O CHIP 1. When enabled, the print-head one-shot generates a 400 µs pulse each time the carriage moves through a cell. This 400 µs pulse is inverted and output to the Analog Power Board to fire the print-wires already selected by I/O CHIP 1. This is the HEAD ENABLE strobe. In its non-inverted state, this signal is named the HEAD STROBE and is used to clock the HEAD INTERRUPT REQUEST flip-flop (Section 4.4.10).

4.4.10 System Timers and Interrupt Control

This circuitry receives interrupt requests and generates a MASTER INTERRUPT REQUEST signal to the CPU and an interrupting - device identification code to be interfaced onto the system Data Bus via I/O CHIP 3.

The INTERRUPT PRIORITY ENCODER (Z49) receives interrupt requests from up to eight (8) devices. It receives the SERVO INTERRUPT REQUEST from the SERVO INTR. REQ. flip-flop (Z40), the KEYBOARD INTERRUPT REQUEST from I/O CHIP 2, the USART INTERRUPT REQUEST from the USART (Z31) (Section 4.4.11), the 25 ms INTERVAL TIMER interrupt request, the 5ms INTERVAL TIMER/HEAD INTERRUPT request, and three external option interrupt requests. All of these inputs are active LOW.

The INTERRUPT PRIORITY ENCODER generates an identifying 3-bit code for each of the interrupting devices. The I.D. codes are listed in order of priority in Table 4-3.

TABLE 4-3
INTERRUPT PRIORITY CODES

DEVICE	I.D.
1. Servo	000
2. 5ms/Head	001
3. Option	010
4. Tape (Opt.)	011
5. USART	100
6. 25ms	101
7. Keyboard	110
8. Parallel Data	111

The 5ms INTERVAL TIMER is controlled by the CPU via the I/O STROBE GENERATOR (Section 4.4.4). The ENABLE 5ms line activated the timer which outputs to the 5 ms INTR. REQUEST flip-flop, (Z8).

The output of the 5ms INTR. REQUEST flip-flop is ORed with the output of the HEAD INTR. REQUEST flip-flop. This signal is the 5ms/HEAD INTERRUPT REQUEST.

The CLEAR 5ms output of the I/O STROBE GENERATOR clears the timer, the 5ms INTR. REQUEST flip-flop, and the HEAD INTR. REQUEST flip-flop.

The 25ms INTERVAL TIMER is also CPU controlled. It is activated by the ENABLE 25ms output of the I/O STROBE GENERATOR and outputs to the 25ms INTR. REQUEST flip-flop. The output of this flip-flop, also in (Z8), is the 25ms INTERRUPT REQUEST. The timer and the flip-flop are both cleared by the CLEAR 25ms output of the I/O STROBE GENERATOR.

Note that the three external option interrupt request lines are input on connector (K3) and are pulled up by pull-up pac (Z47) to insure against false interrupts on these lines.

4.4.11 Serial Interface Logic

General information and specifications for the RS-232C/BELL 202C serial interface are given in Section 3.

Communication over the serial interface is controlled by the 8251 UNIVERSAL SYNCHRONOUS/ASYNCHRONOUS RECEIVER - TRANSMITTER (USART), (Z31). As shown in Figure 4-19, the USART interfaces with the internal system Data Bus and BA0 of the Address Bus. Input or Output mode is selected by the I/O-R and I/O-W lines of the system Control Bus. It is enabled by the USART output of the I/O CHIP DECODER (Section 4.4.4).

The USART is synchronized with the internal system by the 2MHZ MASTER CLOCK signal from Φ2 (TTL) of the 8224 CLOCK GENERATOR (Z22).

The communication rate of the USART is determined by the BAUD RATE CLOCK which is the output of the BAUD RATE DECODER (Z16) and (Z4) which are 74[illegible] synchronous 4-bit counters. These counters are clocked by the 1 MHZ output of the EXTERNAL TIMING GENERATOR (Z14). The BAUD RATE CLOCK frequency is determined by the data inputs to the counters. The CARRY OUTPUT of (Z4) provides the BAUD RATE CLOCK and reloads the counters with the data present on the BAUD 0 through BAUD 7 data input lines. These lines originate at I/O CHIP 1 and their status is under CPU control.

The BAUD RATE CLOCK is input to the USART on the TXC and RXC inputs. The USART generates an interrupt request on its RXRDY output which is inverted by a 7404 (Z32) and output as the USART INTR. REQ.

Serial communication I/O occurs at connector (K4). Standard RS232C interface chips are used as line receivers/drivers. The MC1489L (Z57) is used as line receiver. The SUPERVISORY RECEIVE and SERIAL DATA inputs are received by the USART while the CARRIER DETECT and CLEAR TO SEND inputs [illegible] interfaced onto the internal system Data Bus by I/O CHIP 2.

The MC1488L (Z56) is used as line driver. The SERIAL DATA, SUPERVISORY TRANSMIT, and REQUEST TO SEND outputs are all generated by the USART. The DATA TERMINAL READY output is generated by the CPU via I/O CHIP 1.

Signal descriptions and pin-outs are given in Table 3-1.

4.4.12. Current Loop Interface and Control

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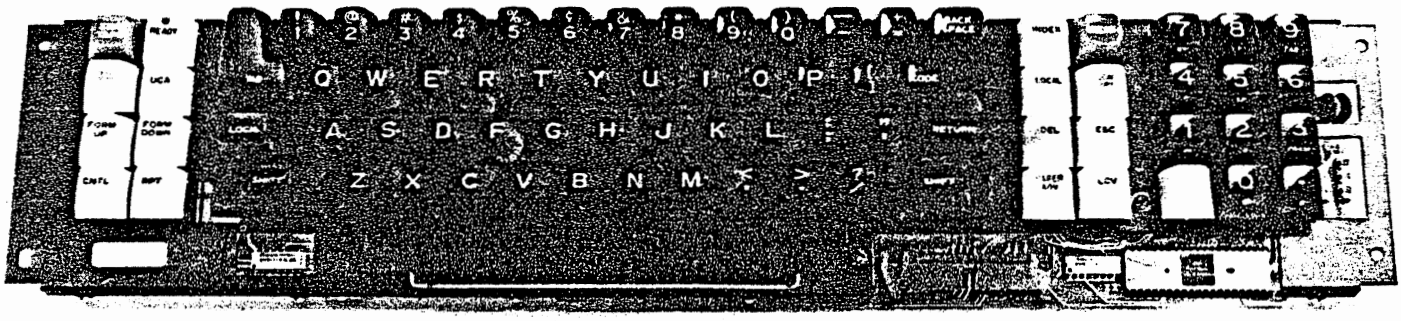

Figure 4-23
SuperTerm Keyboard #1140000-00

4.8 Printer Assembly

4.8.1 Printer Frame Assembly #1110000-00

The SuperTerm's printer is built around a one-piece extruded aluminum frame which provides a strong and rigid base for the terminal and allows easy assembly with minimum hardware.

The SuperTerm printer has few moving parts and few maintenance requirements.

Printer maintenance is covered in detail in Section 5.

The Printer itself contains no electronic circuitry but provides a mounting base for all of the SuperTerm's electronics except for the keyboard. Figure 4-2 and Figure 4-18 illustrate the mounting of all electronic modules on the Printer Assembly.

Should repair or replacement of a printer component become necessary, it may be accomplished easily. Figures 4-24 through 4-27 show exploded views of the Printer Frame Assembly with Parts List references for all components. (A complete Parts List for the SuperTerm may be found in Appendix A.)

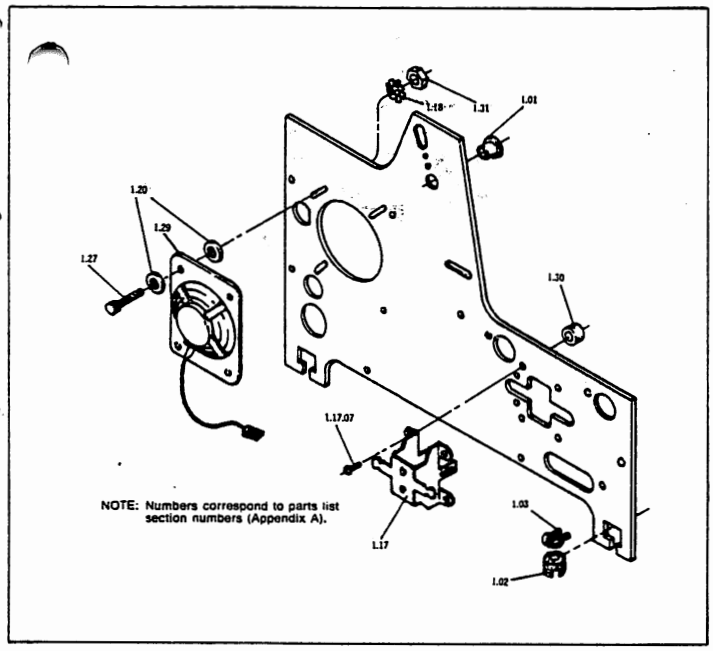

FIGURE 4-24
SuperTerm Printer Left End-Plate Assembly

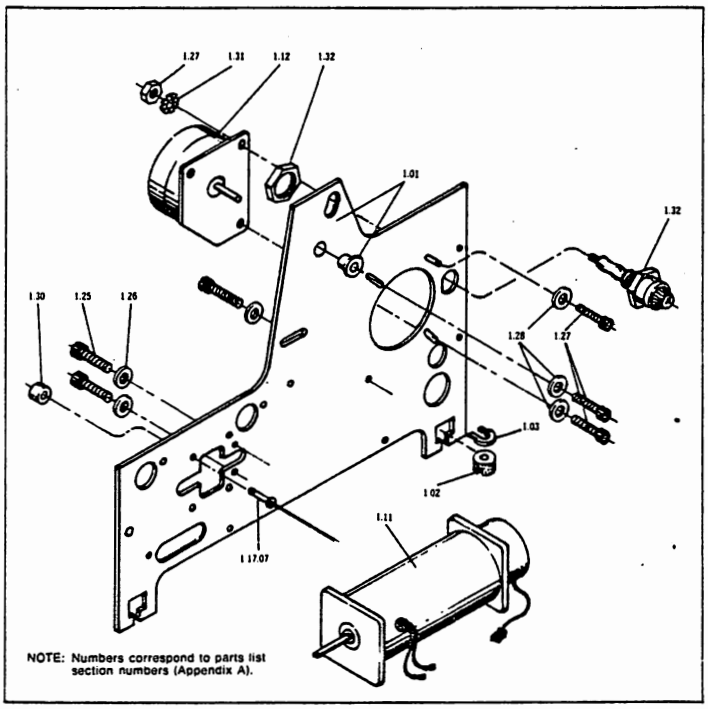

FIGURE 4-25
SuperTerm Printer Right End-Plate Assembly

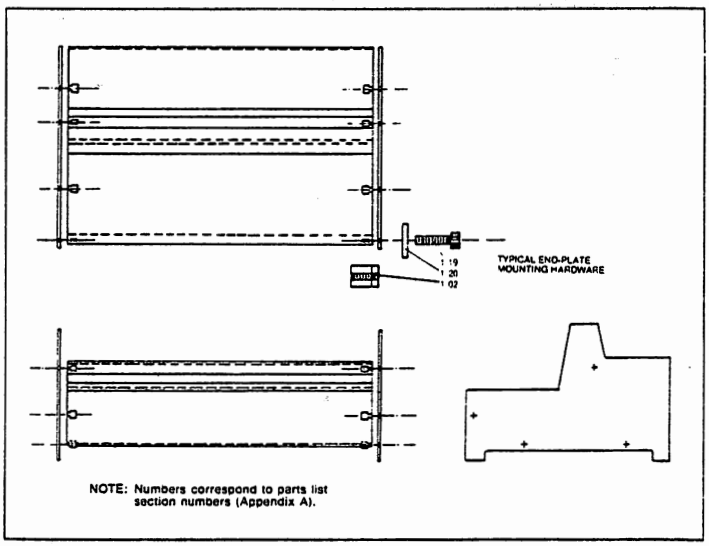

FIGURE 4-26
SuperTerm Printer End-Plate Mounting

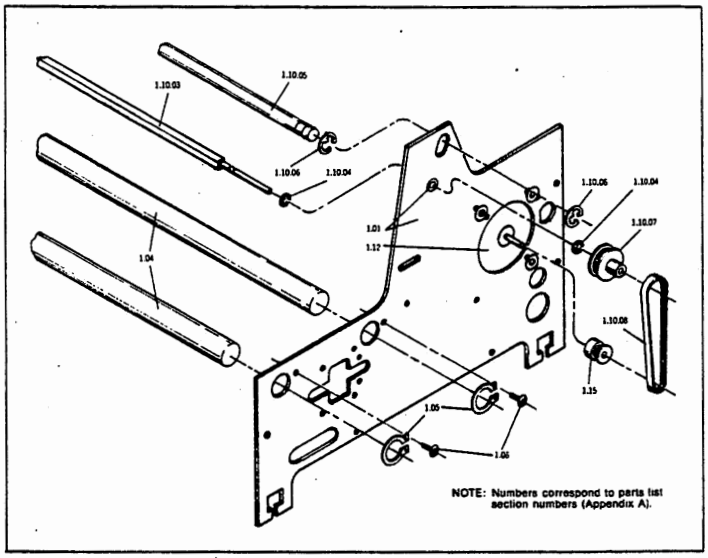

FIGURE 4-27 SuperTerm Printer
Tractor Rod/Carriage Rail Mounting
Right End-Plate

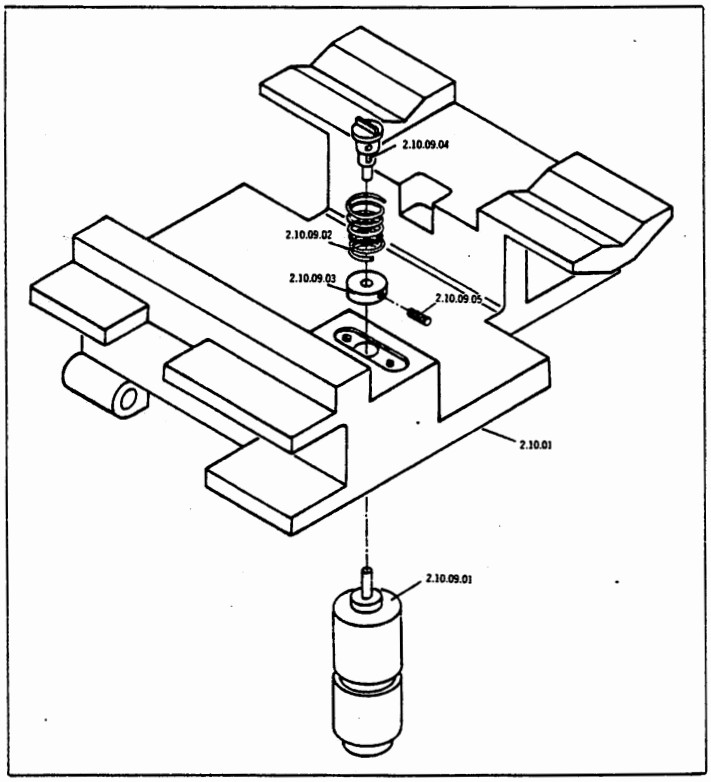

FIGURE 4-28
Ribbon Drive/Carriage Assembly

4.8.2 Carriage Sub-Assembly #1111000-00

The Carriage Sub-Assembly travels horizontally along the carriage rails in the Printer Frame Assembly providing a solid mounting for the Print Head, ribbon cartridge and ribbon drive assembly.

The only field replaceable parts of the carriage assembly are those of the Ribbon Drive Assembly. Figure 4-28 shows an exploded view of the Ribbon Drive Assembly and its carriage mounting.

The Carriage Sub-Assembly may be removed from the Printer Frame Assembly by removing the carriage-rail "C" rings and sliding one of the carriage rails out through one of the end plates. The carriage drive belt clamp may now be removed and the Carriage Sub Assembly is free.

4.8.3 Print-Head Sub-Assembly #1112000-00

The Print-Head is the heart of the printing mechanism and rides on the Carriage Sub-Assembly. It can produce one line of hard-copy impact printing per pass across the page.
The SuperTerm Print-Head used a technique called the "anvil" concept. The technique is so named because the head solenoids do not directly drive the print wires but instead drive "clappers" which impact with the butt ends of the print wires and project them toward the platen where they impact the ribbon and paper to form a character.

The Print Head is illustrated in Figure 4-29.

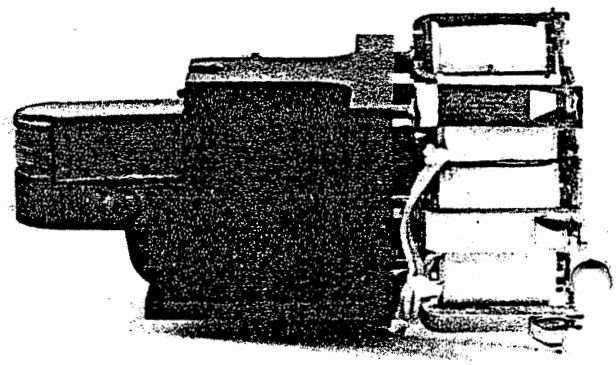

FIGURE 4-29 SuperTerm Print-Head

4.8.4 Printer Cover Assembly #1160000-00

The Printer Cover Assembly is a three-piece Noryl structural foam acoustic cover which encases the entire SuperTerm. It has been designed for sound deadening and easy access to the terminal's interior.

The Printer Assembly is held to the bottom cover by four (4) bolts inserted from the bottom through sound-deadening shock-mount feet. As illustrated in Figure 4-30, a slot is provided for using bottom forms-feed and an exit hold for the A.C. line and interface cables.

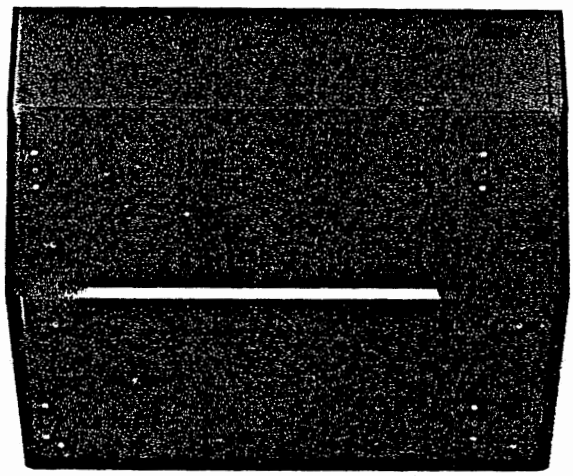

FIGURE 4-30 Bottom Cover

The top cover provides a mount for the keyboard, as shown in Figure 4-31, and fits snuggly over a lip around the top edge of the bottom cover. A latch on either side of the interior of the top cover fastens the two cover halves together, completely encasing the SuperTerm.

The small access cover snaps into the top cover to provide easy access to the Print-Head for replacement of the Ribbon Cartridge or head adjustments. Mounted into the front of the access cover is the column position indicator which shows current Print-Head position.

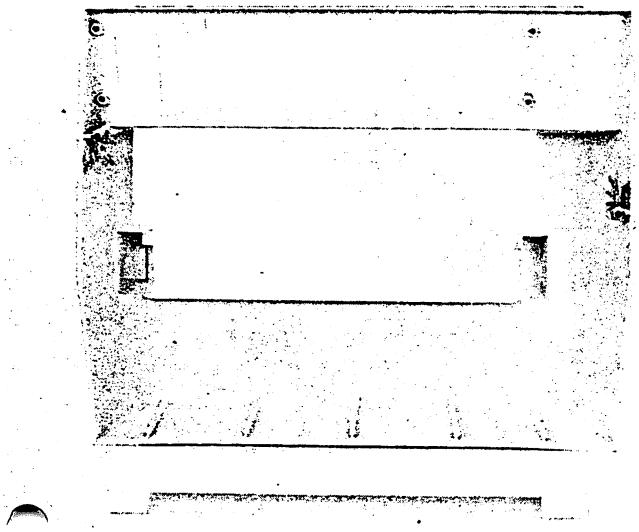

FIGURE 4-31 Top Cover & Access Cover

4.9 Internal Cabling

4.9.1 Analog-to-Digital Card (long) #1150101-00

This is a 16-conductor ribbon cable which runs from connector (K6) of the Digital Card to connector K9 of the Analog Power Board.

It carries the following signals:

Conductor #	Signal	Conductor #	Signal
1	Speed 0	9	Encoder Phase A
2	Speed 1	10	Encoder Phase B
3	Speed 2	11	Ribbon
4	Speed 3	12	Logic Ground
5	Speed 4	13	+ 5V.
6	Speed 5	14	-5V. Substrate Bias
7	+ TACH	15	+ 12V.
8	-TACH	16	-12V.

4.9.2 Analog-to-Digital Card (short) #1150100-00

This is a 16-conductor ribbon cable which runs from connector (K5) of the Digital Card to connector K8 of the Analog Power Board.

It carries the following signals:

Conductor #	Signal	Conductor #	Signal
1	Logic Ground	9	HEAD 4
2	Logic Ground	10	HEAD 5
3	Logic Ground	11	HEAD 6
4	P.F. -0	12	HEAD 7
5	P.F. -1	13	HEAD 8
6	HEAD 1	14	HEAD 9
7	HEAD 2	15	HEAD ENABLE
8	HEAD 3	16	SPARE *

*NOTE: Connects to I/O PORT A, Bit-7 of I/O CHIP 3 on Digital Card.

4.9.3 Converter Card-to-Analog

This is a 16-conductor ribbon cable which runs from the Converter Card to connector K5 of the Analog Power Board. This cable is considered to be part of the Converter Card and is not assigned a separate part number and is not available separately.

It carries the following signals:

Conductor #	Signal	Conductor #	Signal
1	P.F. Motor ϕ1 Return	9	Crg. Servo Motor
2	P.F. Motor ϕ1 Return	10	Crg. Servo Motor
3	P.F. Motor ϕ1 Drive	11	Print Intensity
4	P.F. Motor ϕ1 Drive	12	Ground
5	P.F. Motor ϕ ϕ Drive	13	Print Intensity
6	P.F. Motor ϕ ϕ Drive	14	Ground
7	P.F. Motor ϕ ϕ Return	15	Encoder Phase A
8	P.F. Motor ϕ ϕ Return	16	Encoder Phase B

4.9.4 Keyboard Cable #11502-00

This is a 34-conductor ribbon cable which runs from connector (K1) of the Digital Card to the 34-pin connector on the keyboard PCB. Sufficient length is allowed for the top-cover of the terminal to be removed without disconnecting the Keyboard Cable.

It carries the following signals:

Conductor #	Signal	Conductor #	Signal
1	Ground	18	Ground
2	Ground	19	-12V.
3	-12V.	20	Ground
4	+ 5V.	21	+ 5V.
5	+ 5V.	22	FORM—DOWN
6	Spare	23	Spare
7	REPEAT	24	TAPE—ENBL
8	U/CA	25	BELL 202C
9	KYBD-READY L.E.D.	26	KYBD Ready Switch
10	LOCAL COPY	27	LOCAL
11	Spare	28	FORM-UP
12	Kybd Strobe	29	Paper Advance
13	Keypad	30	CODE
14	Data 7	31	Data 6
15	Data 5	32	Data 4
16	Data 3	33	Data 2
17	Data 1	34	Data 0

4.9.5 Option Card (EPROM Card, etc.) Cable #1150300-00

This is a 50-conductor ribbon cable approximately three (3) inches in length which runs from connector (K2) of the Digital Card to a 50-pin connector on the Option Card used (i.e. EPROM Card or other optional equipment).

It carries the following signals:

Conductor #	Signal	Conductor #	Signal
1	BA0	26	Ground
2	BA1	27	Ground
3	BA2	28	Ground
4	BA3	29	MEM R
5	BA4	30	MEM W
6	BA5	31	I/O - R
7	BA6	32	I/O - W
8	BA7	33	Single Step
9	BA8	34	Hold Req.
10	BA9	35	Instr. Fetch
11	BA10	36	Chip 4
12	BA11	37	Chip 5
13	BA12	38	CPU Reset
14	BA13	39	Mem. Float
15	BA14	40	Spare
16	BA15	41	REGOUT Data
17	DB0	42	REGOUT Reset
18	DB1	43	Option Intr. Req.
19	DB2	44	Option
20	DB3	45	Tape Data
21	DB4	46	Tape Intr. Req.
22	DB5	47	Ext. Clock
23	DB6	48	Parallel Data
24	DB7	49	Parallel Data Intr. Req.
25	I/O Float	50	Ground

4.9.6 A.C. Line Cord #1150600-00

This is a 3-conductor round cable approximately eight (8) feet in length which supplies power to the SuperTerm. It is secured to the right Printer Frame endplate by a moulded strain relief and is routed out the cable exit hole in the right rear corner of the bottom cover.

Standard A.C. color coding is utilized.

Black - A.C. Hot
White - A.C. Neutral
Green - Earth/Chassis Ground

IMPORTANT: Chassis Ground and Logic Ground are not and should never be connected together in the SuperTerm! Severe problems could result due to high noise levels on EARTH/CHASSIS GROUND!

4.9.7 RS-232C Interface Cable #1150500-00

This is a 10-conductor round cable approximately ten (10) feet in length which is used to connect the SuperTerm to a compatible interface. The cable pinout is compatible with EIA RS-232C/BELL 202C interfaces and is terminated with a standard DB-25P connector.

It carries the following signals:

Digital Card Conn. Pin #	DB-25P Pin #	Wire Color	Signal
1	3	Blue	Received Data
6	8	Violet	Rec'd Line Signal Detect
2	5	Yellow	Clear to Send
7	2	Red	Transmitted Data
3	4	Green	Request to Send
8	12	Orange	Sec. Rec'd Line Signal Detect
4	7	Black	Signal Ground
9	20	White	Data Terminal Ready
5	11	Gray	Sec. Req. to Send
N/A	N/A	Brown	Spare

NOTE: If the user desires a modem cable of longer length, a shielded or twisted pair cable is recommended due to noise considerations.

4.9.8 Current Loop Interface Cable

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4.9.9 Parallel Interface Cable

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TECHNICAL BULLETIN #: _____

4.9.10 Power Supply Harness

This is a 17-wire laced harness, internal to the Power Supply (See Fig. 4-2), which makes all interconnections between the rectifiers, filter capacitors and Regulator Card.

The standard color code shown in Table 4-1 is followed.

4.9.11 D.C. Power-Distribution Harness

This is a 12-wire laced harness which distributes the Power Supply outputs from the Regulator Card to the Digital Card, the Analog Power Board and the Converter Card. All wires are color-coded according to Table 4-1 and are terminated with push-on connectors which allow easy servicing.

The D.C. Power-Distribution Harness originates at the Regulator Card and it is routed through the right endplate of the Printer Assembly and underneath to the SuperTerm's electronic boards. (See Figures 4-2 & 4-

Section 5
MAINTENANCE

5.1 General Maintenance Techniques

The SuperTerm uses few moving parts thereby reducing the complexity of maintenance, troubleshooting and down-time.

Extensive on-site repair or troubleshooting is not necessary as all subassemblies can be quickly and easily replaced and the defective subassembly repaired or returned to the factory.

Section 5 details maintenance procedures, spares inventory, and tool/equipment requirements.

5.1.1 General Maintenance Requirements

With the simplicity of the SuperTerm, normal preventive maintenance is reduced to periodic cleaning, inspection and lubrication of the Printer Assembly and cleaning of the Cover and Keyboard. These procedures are detailed in Section 5.3.

5.1.2 General Maintenance Instructions

SuperTerm users who intend to maintain their own terminals must obtain factory authorization for the intended maintenance levels. Once this has been achieved, the user must determine his spares inventory and tool requirements based on the quantity of machines to be maintained and the desired level of maintenance. Intertec will supply assistance in determining one's requirements if necessary.

5.1.3 General Maintenance Precautions

When performing maintenance of the SuperTerm, one must take any precautions necessary to avoid consequential damage to the terminal.

The following list should be used as a basic guide:

1. Insure that the SuperTerm is connected to the proper voltage for the specific machine being serviced. Connection to the wrong line voltage could result in severe damage to the electronics assemblies.
2. Use only Intertec ribbon cartridge #1190100. This is an oil base inked ribbon while most others are dye based. In addition to causing damage to the printer, use of any other ribbons will automatically void the Print-Head Warranty.
3. If the SuperTerm to be serviced has an EPROM or other Option Card installed, DO NOT STAND ON ITS REAR SIDE. This could easily damage the Option Card or its associated cable.
4. Use only Intertec approved solvents for cleaning as others may cause damage to the unit.

   CAUTION: Solvents are flammable and should be used only with adequate ventilation.

   Be sure to use the correct solvent for the intended use.
5. If the carriage rails or bearings are cleaned using a solvent, they should be immediately relubricated even if the terminal is not to be used at that time.
6. Use only Intertec approved lubricants as others may actually damage or impair the operation of the printer.
7. Never make or break connections within the terminal with the power on. This could cause damage due to transients.
8. NEVER ATTEMPT ANY MAINTENANCE PROCEDURE FOR WHICH YOU ARE NOT AUTHORIZED. ANY SUCH ATTEMPT WILL WARRANT CANCELLATION OF ALL WARRANTIES, EXPRESSED OR IMPLIED. Damage incurred during any such attempt will not be covered by any warranty.

5.2 Maintenance Levels, Necessary Equipment, Spare Parts

5.2.1 Maintenance Levels

SuperTerm maintenance is broken up into three (3) categories or levels. Authorization may be granted by Intertec to any user for any level of maintenance according to the needs, abilities and training of the user or his personnel.

Level 1 procedures are entirely for Preventive Maintenance and may be performed by any user.

Level 2 procedures include all those of Level 1 with the addition of on-site replacement of modules, sub- assemblies and printed circuit boards (PCB's), as well as minor adjustments to the Printer Assembly.

Level 3 procedures are those performed by either Service Depot or Factory personnel.

They include all items covered by Levels 1 and 2 with the addition of extensive mechanical repair or refurbishment and component-level troubleshooting and repair of printed circuit board assemblies.

5.2.1.1 Level 1 - Print Head/Platen adjustment; cleaning of carriage rails and bearings; lubrication of carriage rails and bearings; cleaning of cover; cleaning of keyboard; replacement of ribbon cartridge.

5.2.1.2 Level 2 - Level 1 items plus Print Quality check and adjustment; inspection and replacement of all sub-assemblies; inspection and replacement of cables (except head cable #1111120-00).

5.2.1.3 Level 3 - Level 1 and 2 items plus major disassembly and repair or refurbishment of all assemblies and sub-assemblies, both mechanical and electronic; up-dates and ECO's; warranty service.

5.2.2 Required Tools, Equipment and Parts. Highly specialized tools are not required to service the SuperTerm. However, it is recommended that only high quality hardened steel tools of precision size be used. This is especially important where button-head or socket-cap screws are used since a distorted or poorly sized tool could round out a screw head and cause a simple repair job to turn into a major operation. Extreme care should be used during *all* maintenance procedures and the proper tools and supplies used. A simple mistake could cause a machine to have to be returned to the factory to complete an operation that should have taken only 10 minutes time.

5.2.2.1 Level 1 - The following items are minimum requirements for Preventive Maintenance procedures:

1. Solvent #1190410-00 for Cover, keyboard, plastic parts.
2. Solvent #1190420-00 for printer metal parts.

DANGER

FLAMMABLE MIXTURE. Do not use near fire or flame. Use only with adequate ventilation. Avoid prolonged or repeated inhaling of vapors or contact with skin. Contains petroleum distillates.

3. MOLYKOTE-557 Silicone Lubricant
4. 3/32" (0.0937"/2.379mm) HEX type screwdriver.
5. 1/8" (0.125"/3.175mm) HEX type screwdriver.
6. 0.004" (0.102mm) feeler gauge.
7. 1/16" (0.0625"/1.587mm) Allen wrench.
8. Small, stiff, long bristle brush.
9. Clean, low-pressure compressed air (optional).

5.2.2.2 Level 2 - The following items are minimum requirements for corrective maintenance - Level 2 procedures:

1. All items required for Level 1.
2. 9/64" (0.1406"/3.571mm) HEX type screwdriver.
3. 7/64" (0.1093"/2.776mm) HEX type screwdriver.
4. 1/16" (0.0625"/1.587mm) HEX type screwdriver.
5. 5/16" (0.3125"/7.937mm) flat-blade offset or ratchet type screwdriver.
6. 3/32" (0.0937"/2.379mm) flat-blade screwdriver.
7. 3/16" (0.1875"/4.762mm) flat-blade screwdriver.

8. 5/16" (0.3125"/7.937mm) flat-blade screwdriver.
9. Small chain-nose pliers.
10. Small diagonal cutting pliers.
11. Silicone-based thermal compound.
12. I.C. Puller (AUGAT T114-1 or equiv.)
13. Small, soft, long bristle dusting brush.
14. 0.050" (1.270mm) Allen wrench/Hex screwdriver.
15. 0.012" (0.305mm) feeler gauge.
16. "Berg" Pin extractor.
17. A supply of 4" (10.16cm) nylon wire/cable ties.
18. One set of fully tested P.C. Boards (inc. keyboard).
19. One set of fully tested cables (exc. Head Cable).
20. One fully tested and aligned Print-Head.
21. One tested Ribbon Motor w/mounting hardware.
22. Complete hardware assortment.
23. Copy of this Maintenance Manual #1100500-00.

5.2.2.3 Level 3 - The following items are considered essential for complete support of Level 3 Corrective Maintenance procedures:

1. All items for Level 2.
2. Complete stock of all electronic components.
3. Complete stock of all moving parts for the Printer Assembly (incl. Print-Head).
4. One set of new carriage rails #1110300-02.
5. One new platen #1110600-02.
6. One set of end-plates w/tractor bearings #1110200-01.
7. One set of drive belts.
8. "Pop-Rivet" tool and rivet assortment.
9. One set of laced wiring harnesses.
10. One complete cover assembly w/hardware.
11. Assortment of spare keycaps for keyboard.
12. One tested P.F. Stepper motor w/pulley.
13. One tested Carriage Servo motor w/pulley.
14. "MOLEX" crimping tool and pin assortment.
15. 15-25W. soldering iron.
16. 40-75W. soldering iron.
17. Desoldering tool (suction type).
18. Oscilloscope (vbw 15 MHZ, vds 100 mv/div., horiz. sweep. speed 5ns/div.).
19. Digital tester
20. Analog tester

5.3 Preventive Maintenance (Level 1)

5.3.1 Preventive Maintenance Philosophy

The prime objective of Preventive Maintenance is to minimize failures and maintain maximum availability of a machine. With this in mind, P.M. procedures were designed to enhance machine operation and life without restricting use or availability.

If a machine is operating properly, no maintenance procedures other than P.M. should be performed.

5.3.2 Preventive Maintenance Procedures

Preventive Maintenance entails a thorough cleaning, visual inspection and lubrication every six (6) months or 10-million characters, whichever comes first. This requirement should not be exceeded. Total time for the required procedure should be less than 30 minutes.

If the SuperTerm is used in dusty, extremely moist, or other harsh environments, it is recommended that Preventive Maintenance be scheduled more frequently on an as required basis.

If a terminal is allowed to sit unused for long periods of time, it is recommended that Preventive Maintenance be executed prior to returning the machine to service.

5.3.3 Cleaning and Inspection

It must be remembered that careful cleaning, inspection and lubrication are essential to obtaining maximum working life from any machine. Perform Preventive Maintenance with meticulous care.

5.3.3.1 Printer Cover

The Printer Cover requires only periodic cleaning with a soft lint-free cloth moistened with solvent #1190410-00 to maintain appearance. During cleaning, all hardware, column indicator, keyboard and mounting feet should be checked for security.

5.3.3.2 Printer Assembly

The Cover and Top Cover should be removed and set aside. (Do not attempt to remove the Keyboard Cable.) Blow out dust and bits of paper from the printer assembly and bottom cover. Moisten a lint-free cloth with solvent #1190420-00 and wipe the carriage rails and platen face clean. All old lubricants and dirt deposits should be removed as well as any ink deposits on the platen.

DANGER: Solvent #1190420-00 is a flammable mixture. Do not use near fire or flame. Use only with adequ[illegible] ventilation. Avoid prolonged or repeated inhaling of vapors or skin contact. Contains petroleum distillates.

While slowly moving the carriage by hand, hold the solvent-moistened cloth against each carriage bearing. This will remove dirt and lubricant deposits from the face of the bearings as they turn.

Remove the two black button-head screws which hold the print-head to the carriage assembly. Loosen the two small button-head screws on either side of the neck of the print-head and remove the small, black dust cover from the print-head neck, exposing the print-wires.

Using extreme care not to stress the Print-Head harness, immerse the neck of the Print-head in a small pan or bottle of solvent #(1190420-00) for Approximately five (5) minutes while gently brushing the ruby-bearing from the front and rear. This removes build-up of ink and ribbon particles that cause premature wear of Print-Head components.

CAUTION: DO NOT ALLOW ANY OF THE SOLVE[illegible] TO GET TO ANY OTHER AREA OF THE PRINTHEA[illegible] - ESPECIALLY INTERNAL TO THE PRINT-HEAD. This could cause severe, permanent damage to the head.

Dry the Print-Head by blowing it out.

Secure the dust cover to the Print-Head and remount the head to the carriage assembly, but do not tighten.

Feed paper through the maching and install a ribbon on the Print-Head. Insert a 0.004" clearance at both ends of the carriage travel to insure proper alignment with the platen. If necessary, loosen the two (2) platen mounting screws and adjust the platen as needed.

Recheck the Print-Head and Platen hardware for security.

If desired, other Printer Assembly surfaces may be cleaned at this time. Use care not to spill solvents on the drive-belts or other rubber items as this will cause premature wear and/or failure of these items.

5.3.3.3 Keyboard

The keyboard may be cleaned by blowing or brushing it out. If necessary, the keycaps may be cleaned with a lint-free cloth and solvent #(1190410-00).

It is not necessary to remove the keyboard for cleaning.

NOTE: BEFORE PROCEEDING TO THE LUBRICATION SECTION, IT IS RECOMMENDED THAT THE TERMINAL BE INSPECTED FOR WEAR AND/OR CONSEQUENTIAL DAMAGES. It is most important to inspect the Print-Head for wear. If the clappers show more than about 0.015" (0.381mm) wear, about half its original thickness, the Print-Head needs to be rebuilt.

5.3.4 Lubrication

Lubrication of the Printer Assembly is needed only at the points specified in the following procedures. All motors are permanently lubricated at the factory and should never need additional lubrication. No components of the Paper Feed system need lubrication at anytime.

5.3.4.1 Carriage Rails

The carriage rails should be lubricated anytime that they have been cleaned. They should never be lubricated without first being cleaned.

Spray the rails with a light coating of *MOLYKOTE 557 silicone spray. Completely cover each rail but do not apply too heavily.

* NOTE: MOLYKOTE is a registered trademark of the Dow-Corning Corp.

5.3.4.2 Carriage Assembly Bearings

The Carriage Assembly bearings should also be lubricated at each cleaning. Again, use the MOLYKOTE (with an extender tube) to lightly lub the bearings. The user will notice an appreciable decrease in carriage movement noise.

The bearings should be thoroughly cleaned before lubrication.

Insure that all eight (8) bearings are lubricated.

5.3.4.3 Carriage - Belt Tension Assembly

The pulley in the tension assembly at the left side of the printer rotates on ball-bearings which also need periodic cleaning and lubrication.

Inspect the assembly for freedon of movement and lube bearings as outlined for the carriage assembly.

5.4 Corrective Mainetenance (LEVEL 2)

5.4.1 Corrective Maintenance Philosophy

The prime objective of Corrective Maintenance (LEVEL 2), since it will generally be performed at the user's location, is to minimize machine down-time.

No matter what the problem is, or what caused it, top priority should be given to machine repair and return to service. Remember that no maintenance procedure should be performed, (except preventive maintenance) unless a specific problem deems it necessary.

All procedures should be followed with meticulous care so as not to cause new problems during the repair process.

5.4.2 Level - 2 Test and Adjustment Procedures

CAUTION

It is recommended that the SuperTerm be powered OFF and UNPLUGGED when performing Corrective Maintenance. This could prevent injury due to electrical shock or a run-away carriage.

5.4.2.1 Carriage Drive-Belt Inspection

Throughly inspect the carriage drive - belt for any signs of wear, deterioration or cuts. Extreme wear, cracking, or deep cuts indicate that belt replacement is needed.

The belt clamp under the carriage assembly should also be checked for security.

Insure that the belt is tracking properly in the pulleys.Improper tracking will cause premature belt wear.

5.4.2.2 Paper-Feed Drive Inspection

Thoroughly inspect the paper-feed drive-belt for any signs of wear, deterioration, or cuts. Extreme wear, cracking, or deep cuts indicate that belt replacement is necessary.

Insure that the belt is tracking properly in the pulleys. Improper tracking will cause premature belt wear.

Inspect the two (2) tractor Drive-Rod Bearings for excessive wear. At this same time, check the paper-feed drive-belt tension. If the belt is too loose, the forms tractors will slip. If the belt is too tight, premature wear of the tractor drive-rod bearings and the paper-feed motor bearings will occur.

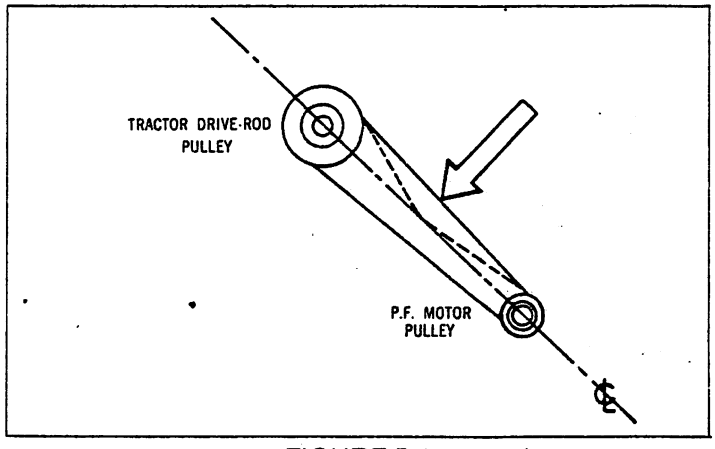


FIGURE 5-1
Paper-Feed Belt Tensioning

Figure 5-1 illustrated an easy method for determining the paper-feed drive belt tension. If the belt has the proper tension, moderate pressure as shown by the arrow will depress the belt to approximately the position of the dashed line.

Belt tension is adjusted by loosening the Paper-Feed motor.

5.4.2.3 Ribbon Drive Inspection

Inspect the motor mounting screws and the set-screw in the coupling clamp for security. The drive coupling and spring should move freely when depressed and should be set to the dimensions in Figure 5-2 when fully extended.

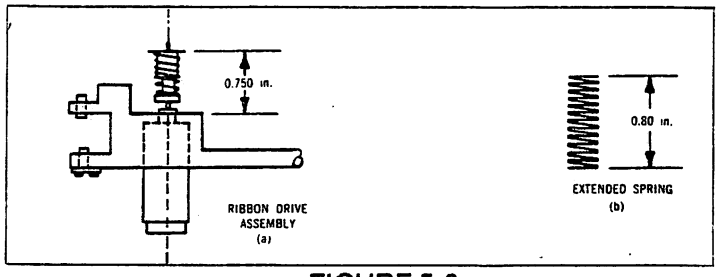


FIGURE 5-2
Ribbon Drive Assembly

To achieve the proper tension on the drive coupling, the spring must equal the dimension shown in Figure 5-2(b) when disassembled. This will insure a firm engagement between the ribbon cartridge and ribbon-drive assembly.

5.4.2.4 Keyboard Inspection

The keyboard inspection should be done with power on the machine.

Check all keys for sticking. This could be due to either binding within the switch or rubbing against the cover. The latter may be cured by loosening the keyboard mounting screws and repositioning the keyboard within its opening. If the switch itself is sticking, replace the keyboard.

If the machine is otherwise functional, install paper and a ribbon cartridge in the printer and type each keyboard character. If any alphanumeric keys do not type, the keyboard is defective. If the terminal does not print any character from the keyboard, the problem lies between the keyboard and the Digital Card.

Check each function key for proper operation as described in the Operator's Manual.

Insure that all locking switches latch when depressed and release when depressed again.

5.4.2.5 Print Quality Inspection

To obtain a usable print-out for a print-quality inspection, one should use a new ribbon cartridge and a good grade paper.

Feed the paper through the machine and insure that it is properly tensioned by the forms tractors and is flat against the platen.

Print a full line of upper case "I's" and a full line of upper case "H's". Use the terminal's fastest print speed.

Remove the paper from the machine to perform the inspection. All dots should be sharp and clear with no dragging or streaking. All dots should line up in a perfectly straight line both horizontally and vertically with no perceptible difference in dot intensity. If discrepancies appear, proceed to Section 5.4.2.6.

IF NO DISCREPANCIES APPEAR, PRINT QUALITY ADJUSTMENTS SHOULD NOT BE NEEDLESSLY ATTEMPTED.

5.4.2.6 Print Quality Adjustment

Print Quality adjustments should never be attempted unless a specific problem shows up in the quality of the print-out and a print quality inspection has been made.

Identify the problem and the specific print-wire involved before beginning adjustment procedures. (On the print-out, print-wires are numbered 1 through 7, from top to bottom. See Figure 5-3.)

5.4.2.6.1 Remove the print-head from the carriage assembly by removing the two black button head socket cap screws which hold the print-head to the carriage assembly.

5.4.2.6.2 Remove the ribbon clip by removing the two black button head socket cap screws which fasten it to the carriage assembly.

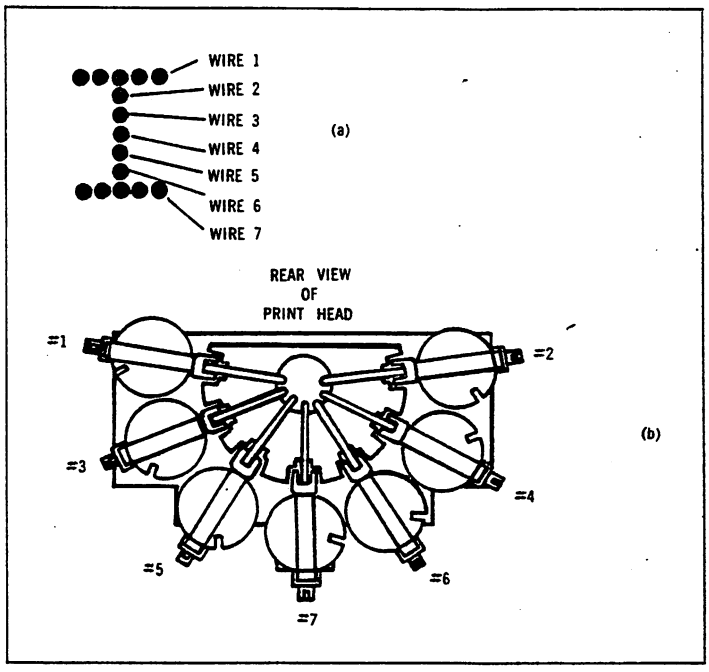


FIGURE 5-3
Print-Wire Positioning

5.4.2.6.3 Unplug the print-head from the head cable and remove the ribbon motor pins using the Berg pin extractor. The print-head is now free of the machine.

5.4.2.6.5 Adjust clapper travel. Loosen the two small 0-80 screws on the short side of the clapper frame and insert a 0.012" (0.305mm) feeler gauge between the clapper and the clapper stop. Apply pressure on the top of the brass clapper stop so that the clapper is fully depressed and the clapper stop is pressed firmly against the gauge. Retighten the two 0-80 screws by first tightening the bottom screw and then the top screw (closest to clapper).

Recheck clearance ! This is a most critical adjustment!

It is important to tighten the bottom screw first as the top one may cause considerable drift as it is being tightened. Check this adjustment on all solenoids.

5.4.2.6.6 Adjust print-wire alignment. Loosen the solenoid set screws and insure that each solenoid is properly seated in the rear registration plate.

Turn the print-head to the side view so that the profile of the print-wire may be seen as they protrude through the ruby print-wire bearing.

Start with the bottom (#7) print-wire and work up to the top (#1) print-wire adjusting each solenoid in or out until the ends of all seven (7) print-wires are flush with the face of the ruby bearing.

Tighten each set screw while insuring that all print-wires remain flush with the ruby.

5.4.2.6.7 Clean the print-head as specified in Section 5.3.3.2.

5.4.2.6.8 Reinstall the print-head by reversing the first three steps of this procedure.

NOTE: The red ribbon motor pin is inserted into the print-head connector on the side opposite the connector key. Insure that the print-head connector is clamped under the ribbon clip.

5.4.2.6.9 Adjust the print-head-to-platen clearance as in Section 5.3.3.2. This should restore "factory fresh" print quality.

5.4.3 Level - 2 Module R&R Procedures

5.4.3.1 Removing SuperTerm From Cover

1. Remove access cover and top cover by releasing the latches on either side of the printer.
2. Remove printer assembly from bottom cover by removing the socket cap screw from each of the four shock-mount feet.
3. Unplug the in-line connector from the A.C. line switch and the printer assembly may be lifted up and away from the bottom cover. The keyboard cable may be removed for convenience.

   NOTE: Use care not to damage the power and interface cables routed through the exit hole in the bottom cover.
4. The printer assembly may be reinstalled by reversing the above steps. Be sure to key the keyboard connectors according to the arrow molded into the top of the connector.

5.4.3.2 Print-Head

See Sections 5.4.2.6.1 thru 5.4.2.6.3.

5.4.3.3 Analog Power Board

With all interface cables removed and the printer assembly sitting up on its rear side, both the analog and Digital Cards may be easily accessed.

Removal Procedure:

1. Disconnect D.C. Distribution Harness
2. Disconnect head cable
3. Use I.C. puller to disconnect all three (3) ribbon cables (Do not bend connector pins!)
4. Remove the three black socket cap screws from the heat-sink bar.
5. Use long-nose pliers to compress the tabs on the nylon card holders while pulling the card away from the chassis. Once removed from the three (3) nylon card holders, the card is free of the machine.
6. Reverse for reassembly.

5.4.3.4 Digital Card

For Digital Card removal, the printer assembly should be sitting up on its rear side with interface cables connected.

Removal Procedure:

1. Disconnect D.C. Distribution Harness
2. Disconnect keyboard cable if not previously done
3. Disconnect loudspeaker cable
4. Disconnect 50-cond. ribbon cable (K2) if present
5. Use I.C. puller to disconnect the two (2) 16-conductor ribbon cables
6. Compress each nylon card holder while pulling the card away from the chassis
7. The card is now free of the machine
8. If a different Digital Card is to be installed in the machine, set up the Dip-switch register in accordance with the card being removed. If the same ROM's are to be used, carefully remove them from the old card and install them in the identical positions on the new card.

5.4.3.5 Converter Card

For Converter Card removal, the printer assembly should be sitting up on its rear side with interface cables disconnected.

Removal Procedure:

1. Use I.C. puller to disconnect 16-conductor ribbon cable from Analog Power Board (Cable is an integral part of the Converter Card)
2. Disconnect optical shaft encoder
3. Disconnect motors and D.C. distribution harness
4. Compress the tabs on the three (3) nylon card holders while pulling the card away from the chasis
5. The card is now free of the machine
6. Reverse for reassembly.

5.4.3.6 Power Supply Regulator Card

For regulator card removal, the printer assembly should be sitting flat on its four feet and positioned for easiest access to the power supply section.

Removal Procedure:

1. Remove the two (2) black socket cap screws from the regulator heat-sink bar
2. Disconnect the D.C. distribution harness
3. Compress the tabs on the four (4) nylon card holders and remove the card from the chasis
4. Turn the card so that the reverse side is accessable and unsolder the wires from the Power supply harness
5. The card is now free of the machine
6. Reverse for reassembly.

5.4.3.7 Keyboard

For keyboard removal, the top cover should be inverted and placed on a padded surface.

Removal Procedure:

1. Remove the four slot-head screws from the mounting flanges on the ends of the keyboard
2. Lift the keyboard from the cover and remove the keyboard cable
3. The keyboard is free of the machine
4. Reverse for reassembly. (Insure that the keyboard cable is keyed by the molded arrow on the connector and that no keys bind against the cover.)

5.4.3.8 EPROM Card (Option)

For EPROM (Option) Card removal, the printer assembly should be sitting flat on its four feet and positioned for easy access to the power supply (rear) area.

Removal Procedure:

1. Disconnect the 50-conductor cable from the Digital Card
2. Unsolder the four (4) power supply wires to the EPROM Card
3. Remove the two (2) slot-head screws and spacers from the lower corners of the card.
4. The card is now free of the machine
5. Reverse for reassembly. (Be sure to key the 50-pin connectors properly.)

5.5 Corrective Maintenance (Level 3)

5.5.1 Corrective Maintenance Level 3

The prime objective of Corrective Maintenance (Level 3) is to provide support to field service. Most level 3 operations are too difficult or lengthy to perform at the user's site.

Level 3 operations involve machine refurbishment and component level troubleshooting and repair. It is recommended that any person attempting such operations have a thorough knowledge of electronic fundamentals and troubleshooting procedures as well as good mechanical skill and perception.

5.5.2 Mechanical Assembly R & R Procedures

5.5.2.1 Carriage Servo Motor Assembly

1. Disconnect servo leads and shaft encoder leads.
2. Remove front two socket cap screws which mount the servo motor.
3. Slowly remove the rear socket cap screw (behind the paper-feed motor) while keeping pressure on the motor to counteract the carriage drive-belt tension.
4. Allow the rear of the motor to swing out thereby releasing the belt tension.
5. The motor is now free of the machine.
6. Reverse for reassembly. (A wedge behind the carriage drive belt tension assembly will make the task somewhat easier. Be sure that the belt properly engages the two pulleys.)

5.5.2.2 Paper-Feed Stepper Motor

1. Disconnect the four (4) stepper motor leads from the converter card.
2. Cut any wire ties necessary to release the leads from the D.C. distribution harness and pull them through the feed-thru grommet.
3. Loosen the three (3) socket cap screws that mount the stepper motor and remove the P.F. drive belt.
4. Remove the three (3) mounting screws.
5. The motor is now free of the machine.
6. Reverse for reassembly. (Be sure to replace any removed wire ties.)

5.5.2.3 Ribbon-Drive Motor

1. Remove the ribbon clip from the carriage assembly.
2. Disconnect the head connector
3. Remove the two (2) ribbon motor pins using the Berg pin extractor.
4. Remove the ribbon drive coupling assembly
5. Remove the two (2) small slot head screws on either side of the motor bearing.
6. The motor is now free of the machine.
7. Reverse for reassembly. Be sure to properly polarize the ribbon motor leads.

5.5.2.5 Carriage Drive Belt

1. Remove the two (2) carriage rails.
2. Rotate the carriage and remove the two (2) socket cap screws securing the belt retainer.
3. Remove the shaft from the tension assembly (Release the two (2) springs before removing shaft).
4. The belt may now be removed from the machine.
5. Reverse for reassembly. (Loosening the carriage servo motor will aid in reassembly.)

5.5.2.6 Paper-Feed Drive Belt

1. Loosen the three (3) socket cap screws which mount the P.F. motor.
2. The belt may now be removed.
3. Reverse for reassembly. See Section 5.4.2.2 for proper tensioning of the P.F. drive belt.

5.5.2.7 Print-Head Spring-Cable Assembly

1. Remove the ribbon clip from the carriage assembly and disconnect the head cable.
2. Disconnect the head cable from the Analog Power Board.
3. Remove the two (2) carriage rails.
4. Rotate the carriage and remove the two (2) socket cap screws from the head cable clamp.
5. Remove the four (4) socket cap screws from the two (2) head cable clamps mounted on the chassis in the carriage cavity area.
6. The head cable assembly is now free of the machine.
7. Reverse for reassembly. Insure that there is no twist in the replacement cable.

5.5.3 Electronic Troubleshooting Procedures

To troubleshoot the SuperTerm's electronics cards is nearly impossible without a Digital Card tester and an Analog Power Board tester and an in-depth knowledge of basic electronic circuits and programmed logic systems.

The chart below will give some aid in isolating problems to the modular level.

TROUBLESHOOTING CHART	
*PROBLEM	POSSIBLE CAUSE
1. No response to random keyboard keys.	Keyboard Failure
2. No response to keyboard	1. Keyboard failure 2. Digital card failure 3. Bad keyboard cable
3. Print-wire/wires not firing	1. Analog card failure 2. Bad head cable 3. Bad D/A ribbon cable 4. Bad print-head
4. Carriage crashes	1. Digital failure 2. Analog failure 3. Servo/encoder failure 4. Bad cable
5. Carriage losing position	1. Servo/encoder failure 2. Digital failure 3. Loose carriage drive belt retainer
6. Will not communicate on-line	1. Interface cable bad 2. Digital failure
7. No "READY" light	1. Digital failure 2. Keyboard failure 3. Bad keyboard cable

*NOTE: No matter what the problem, always check all power supply voltages and all connectors first.

Section 6

ACCESSORIES AND OPTIONS

6.1 General Information

The purpose of this section is to describe the basic SuperTerm terminal and to provide general information about the accessories and options available.

For specific information concerning the implementation and/or use of any feature or option, consult the Operator's Manual.

6.2 The Basic SuperTerm Data Communications Terminal

Listed below are the standard features included in a standard SuperTerm with no options or accessories.

60,30,15 and 10 CPS print speed
128 Character ASCII set
10 pitch-horizontal
6 pitch-vertical
RS-232C interface
Auto line-feed on carriage return
Bottom-feed
Quietizing package
115 VAC 60 HZ power supply
Operator's Manual

6.3 Accessories

6.3.1 Ribbon Cartridges (6-pack) #1190100-00

The ribbon cartridges are designed so that the operator need never touch the ribbon. Installation is simple and requires only one hand. Available only in black.

6.3.2 Stand #1190300-00

The stand is a compact unit constructed much like a small desk. Four rubber recepticles on the stand-top automatically position the terminal over the stand's paper-feed slot. An anodized aluminum shelf provides paper and supplies storage underneath the stand. Paper may be fed from a box on the shelf up through the terminal for bottom-feed operation. Four spherical casters allow the entire assembly to be moved about without disturbing the set-up. Stand height is comfortable for typing.

6.3.3 Operator's Manual #1100100-00

An operator's guide on the implementation and operation of the SuperTerm with a host system. Gives instructions on the use of all features and options.

6.3.4 Maintenance Manual #1100500-00

A technician's guide on the installation and maintenance of the SuperTerm. Gives technical specifications and in-depth information on the internal operation of the terminal. Includes instructions on disassembly, maintenance, troubleshooting, and repair of the SuperTerm.

6.4 Options

6.4.1 Option Package A #1176150

Includes: forward and reverse horizontal tabs, vertical tabs, print inhibit, fixed horizontal tabs, top-of-form.

6.4.2 Option Package B #1176200

Includes: Adjustable (programmable) right and left margins, auto EOL-CR, super and subscripts, 1, 1½ and double vertical line spacing, 6/8 lines per vertical inch, forward and reverse ½ line feed, pagination, variable vertical pitch, auto IBM ATS tab setting routine.*

* Requires Option Package A.

6.4.3 Option Package C #1176250

Includes: Reverse printing, absolute horizontal tabs, absolute vertical tabs, double-width characters, reprogrammable escape characters, disable escape sensitivity.

6.4.4 Option Package D #1176100

Includes: All three option packages (A, B, and C).

6.4.5 APL/ASCII #1176300

This option allows the SuperTerm to be used on an APL system. Machines which include this option have both the APL and the ASCII character sets and either may be selected at anytime.

Unless otherwise specified before shipment, terminals equipped with this feature will power-on in the APL mode.

6.4.6 1200 Baud #1176650

Machines equipped with this option are capable of printing at the rate of 120 CPS in addition to all of the standard speeds.

Terminals with this option will power-on at 1200 Baud unless otherwise requested at time of shipment.

6.4.7 1800 Baud #1176700

NOT YET AVAILABLE

6.4.8 Current Loop Interface #1172000

NOT YET AVAILABLE

6.4.9 Parallel Interface #1173000

NOT YET AVAILABLE

6.4.10 Date Concentration

These options allow the terminal and the host system to work together to obtain maximum through-put without over-run and loss of data.

6.4.10.1 DTR Technique #1176800

This option utilizes the "DATA TERMINAL READY" line of the RS-232C interface to handshake with the host system. The number of characters in the character buffer is monitored and the DTR line "dropped" if the buffer approaches its 256 character capacity. This signals the host system to cease transmission. When the number of characters in the buffer drops below 100, the DTR line is "raised" and host transmission is resumed. In this way, the terminal may print at its maximum speed without the danger of lost data due to buffer overflow.

This technique is intended for applications using a dedicated hard-wired communications link.

6.4.10.2 CNTL S - CNTL Q Technique #1176810

This option operated identically to the DTR technique except that instead of modulating the DTR line, a CNTL S is transmitted by the terminal to indicate a full buffer to the host system and a CNTL Q is transmitted to indicate an empty buffer. Again, data loss due to buffer overflow is avoided.

This technique is intended for applications using an acoustic coupler in the full duplex mode.

6.4.11 IBM 2740/41 Emulator #1176350

This option allows the SuperTerm to be used with IBM-2741 type interfaces. IBM correspondence or EBCD line codes are available.

6.4.12 Bell System 202C Interface #1176655

This option, in conjunction with the RS-232C interface, allows the SuperTerm to be used with a Bell 202C, S, or T data set (or other modem having similar line characteristics).

6.4.13 Selective Addressing #1176450

This option allows the SuperTerm to be used in a polled evnironment. A 7-bit Selector Address allows a specific terminal to be accessed by the host system over a common interface structure.

The Selector Address may be programmed at the factory (permanent), or from the keyboard. The Selector Address may be reprogrammed at any time by the host system or keyboard but is restored to the factory programmed value during a power-on reset sequence.

6.4.14 Non-standard Character Set #1176550

This option provides for users requiring foreign language or other non-standard character sets. Contact your Intertec Representative for further information.

6.4.15 Automatic Reverse Printing (ARP) #1176900

When receiving data at high speeds, buffer overflow conditions frequently occur due to the loss of printing time when doing a carriage return.

Terminals equipped with this option will automatically reverse print every other line in lieu of doing a carriage return.

6.4.16 Reprogrammed Keypad #1176400

Terminals equipped with this option allow the operator to change the ASCII code printed and transmitted upon activation of the "GOLD 3" sequence. This is convenient when a special character is needed for rapid data entry from the numeric keypad.

6.4.17 Reprogrammed Escape Character (Power-on) #1176830

The reprogram of escape character feature is primarily useful when the host system utilizes escape characters for purposes other than for controlling the terminal's particular configuration. In such cases, the user may dynamically reprogram (or map) the escape character to any other one of the 128 ASCII character codes.

6.4.18 Auto Echo #1176820

Auto echo provides the terminal operator with an extremely useful technique for programming the terminal's response to reception from either keyboard or host system of a specific stimulus character.

6.4.19 HERE-IS Sequence #1176500

Terminals equipped with this feature, upon the receipt of a CODE E/e, will transmit a pre-programmed answer-back character sequence. Contact your Intertec Representative for further information.

6.4.20.32 User Font-Programmable Characters #1176840

This option is for applications requiring character sets which differ in font from these provided as standard or option on the SuperTerm. It differs from the "Non-Standard Character Set" in that it is dynamically Programmable.

Section 7

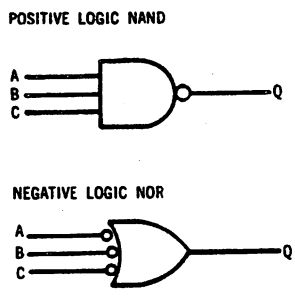
CIRCUIT DIAGRAMS AND LOGIC CONVENTIONS

7.1 General Information

This device and circuit diagrams included in this section are primarily for the convenience and understanding of service personnel.

Symbology and nomenclature were chosen to allow quick referencing of information and at-a-glance signal tracing.

The symbology used is for functional reference as opposed to actual device types.As shown below, a NAND gate may be drawn either as a positive logic AND gate with the output inverted or as a negative logic OR gate with the inputs inverted.



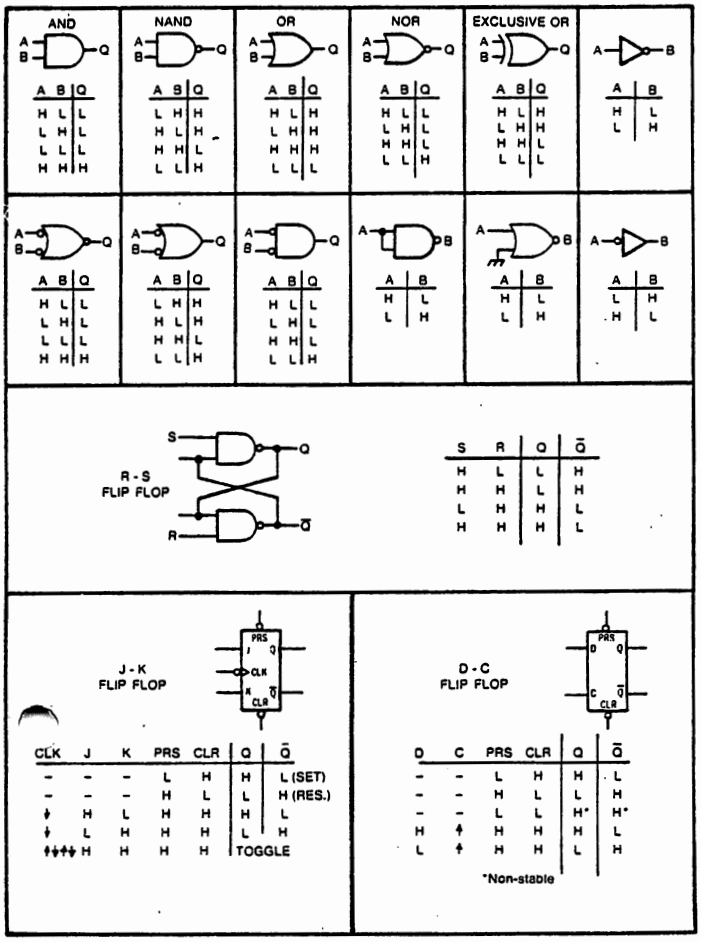
A	B	C	Q
L	L	L	H
H	L	L	H
L	H	L	H
H	H	L	H
L	L	H	H
H	L	H	H
L	H	H	H
H	H	H	L

H = Logic 1 (HI)
L = Logic 0 (LO)

7.2 Signal Nomenclature

Signals that are active at their logical LO state are called "bar" signals.

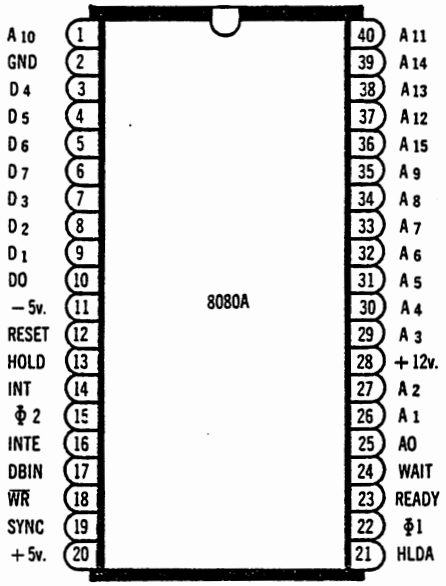
Signals that are active at their logical HI state are labeled as above but without the "bar".



7.3 Integrated Circuit Device Listing and Diagrams

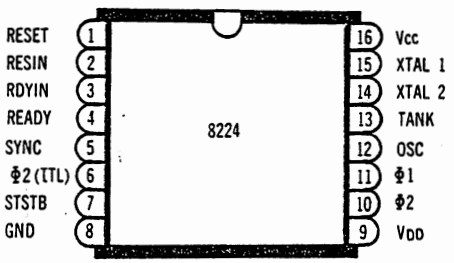
This section contains a listing of all integrated circuit devices used in the SuperTerm and pin-out diagrams of those devices.

DIGITAL	ANALOG CARD
C8080A C8224 C8228 C8255 C8251 2102 556 1488 1489 7400 7404 7408 7473 7474 74148 74154 74161 74174 74190 74367 74393 74C86 74LS14 74LS138 74LS221 3.3K Resistor PAC (PULL-UP) 10 K Resistor PAC (PULL-UP)	324 311 1408L-6 3.3K Resistor PAC (PULL-UP) 1 K Resistor PAC (DISCREET) 10 K Resistor PAC (DISCREET) 2510 DIODE PAC 2719 DIODE PAC
	REGULATOR CARD
	LM-320T/79XX Types LM-340T/78XX Types 2955



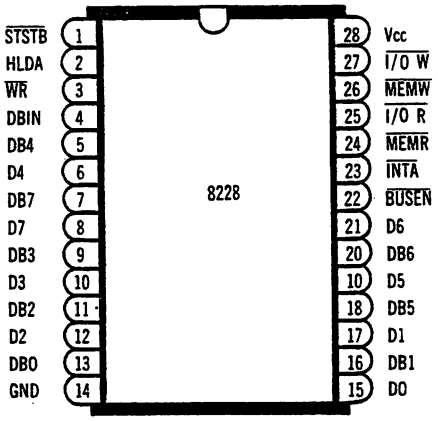
PIN NAMES

A15- AO	ADDRESS BUS
D7 - DO	DATA BUS
SYNC	SYNCHRONIZING OUTPUT
DBIN	DATA BUS IN (OUTPUT)
READY	(INPUT)
WAIT	(OUTPUT)
WR	WRITE (OUTPUT)
HOLD	(INPUT)
HLDA	HOLD ACKNOWLEDGE (OUTPUT)
INTE	INTERRUPT ENABLE (OUTPUT)
INT	INTERRUPT REQUEST (INPUT)
RESET	(INPUT)
V_{SS}	GROUND REFERENCE
V_{DD}	+12v. ±5%
V_{CC}	+5v. ±5%
V_{BB}	-5v. ±5% SUBSTRATE BIAS
Φ1	CPU CLOCK INPUTS
Φ2	



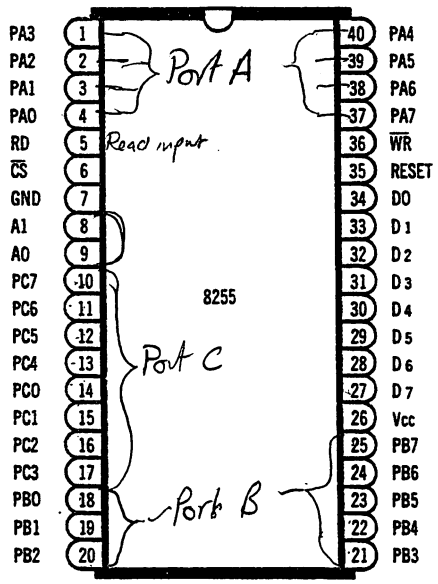
PIN NAMES

RESIN	RESET INPUT
RESET	RESET OUTPUT
RDYIN	READY INPUT
READY	READY OUTPUT
SYNC	SYNC INPUT
STSTB	STATUS STROBE (ACTIVE LOW)
Φ1	8080 CLOCKS
Φ2	
XTAL 1	CRYSTAL CONNECTIONS
XTAL 2	
TANK	USED w/OVERTONE XTAL
OSC	OSCILLATOR OUTPUT
Φ2 (TTL)	TTL COMPATIBLE CLOCK
Vcc	+5v.
V_{DD}	+12v.
GND	OV. (LOGIC GROUND)



PIN NAMES

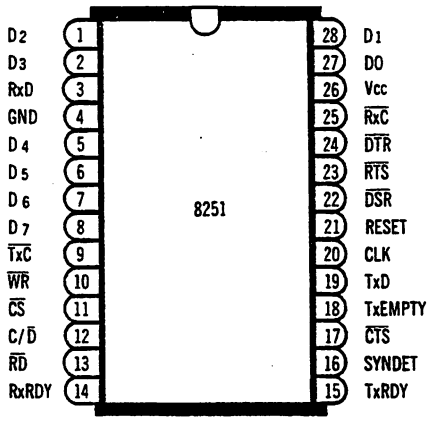
D7- DO	DATA BUS - 8080 SIDE
DB7-DBo	DATA BUS - SYSTEM SIDE
I/O R	I/O READ
I/O W	I/O WRITE
MEMR	MEMORY READ
MEMW	MEMORY WRITE
DBIN	DBW (FROM 8080)
INTA	INTERRUPT ACKNOWLEDGE
HLDA	HLDA (FROM 8080)
WR	WR (FROM 8080)
BUSEN	BUS ENABLE INPUT
STSTB	STATUS STROBE (FROM 8224)
Vcc	+5v.
GND	Ov. (LOGIC GROUND)



PIN NAMES

D7- DO	BI-DIRECTIONAL DATA BUS
-RESET	RESET INPUT
CS	CHIP SELECT
RD	READ INPUT
WR	WRITE INPUT
AO, A1	PORT ADDRESS
PA7-PAO	PORT A (BIT)
PB7-PBO	PORT B (BIT)
PC7-PCO	PORT C (BIT)
Vcc	+5v.
GND	Ov. (LOGIC GROUND)

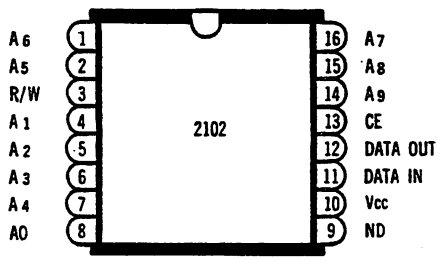
USART



PIN NAMES

D7- DO	DATA BUS
C/D	CONTROL OR DATA IS TO BE WRITTEN OR READ
RD	READ DATA COMMAND
WR	WRITE DATA OR CONTROL COMMAND
CS	CHIP SELECT
CLK	TTL CLOCK INPUT
RESET	RESET
TxC	TRANSMITTER CLOCK
TxD	TRANSMITTER DATA
RxC	RECEIVER CLOCK
RxD	RECEIVER DATA
RxRDY	RECEIVER READY
TxRDY	TRANSMITTER READY
DSR	DATA SET READY
DTR	DATA TERMINAL READY
SYNDET	SYNC DETECT
RTS	REQUEST TO SEND DATA
CTS	CLEAR TO SEND DATA
TxE	TRANSMITTER EMPTY
Vcc	+5v.
GND	Ov. (LOGIC GROUND)

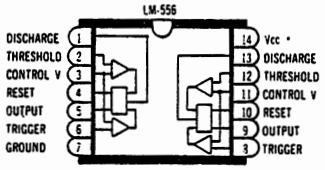
1024 × 1 STATIC ROM



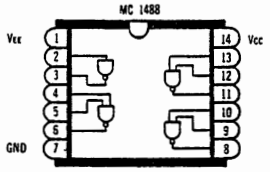
PIN NAMES

A - A	ADDRESS BUS
DATA IN	DATA INPUT
DATA OUT	DATA OUTPUT
R/W	READ/WRITE SELECT
CE	CHIP ENABLE
Vcc	+5v.
GND	Ov. (LOGIC GROUND)

LM-556

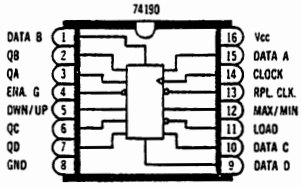


MC 1488

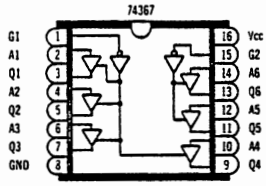


QUAD LINE DRIVER
(RS-232C)

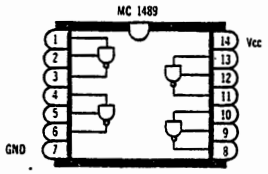
74190



74367

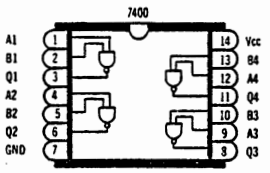


MC 1489



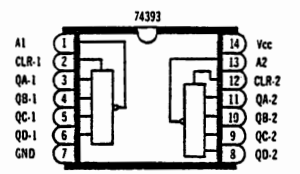
QUAD LINE RECEIVER
(RS-232C)

7400

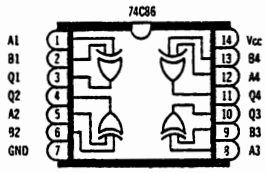


QUAD 2-INPUT NAND

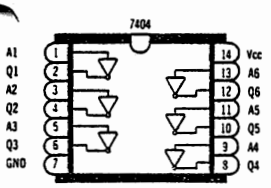
74393



74C86

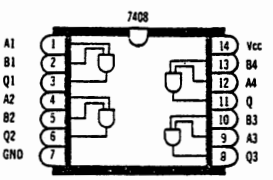


7404



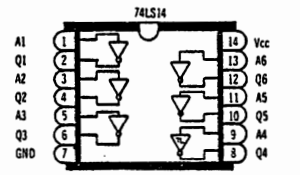
HEX INVERTER

7408

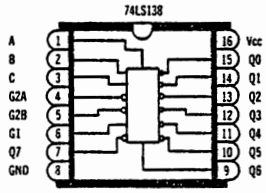


QUAD 2-INPUT AND

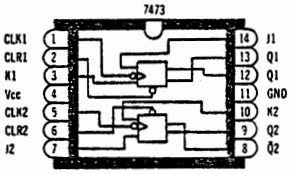
74LS14



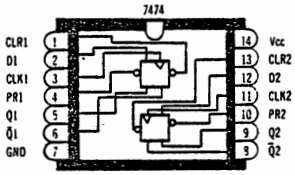
74LS138



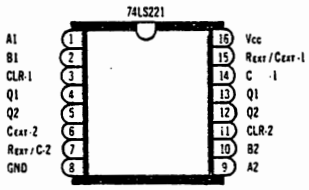
7473



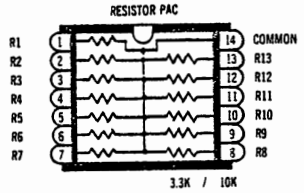
7474



74LS221

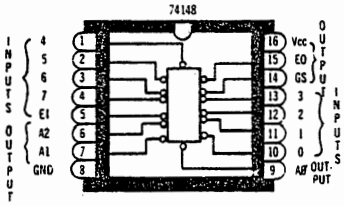


PULL-UP
RESISTOR PAC

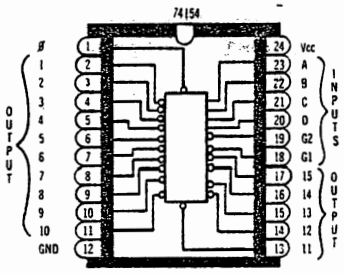


3.3K / 10K

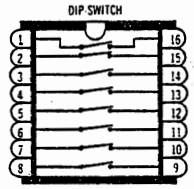
74148



74154



DIP SWITCH



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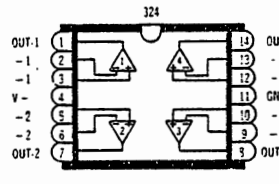

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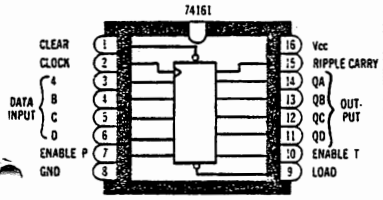

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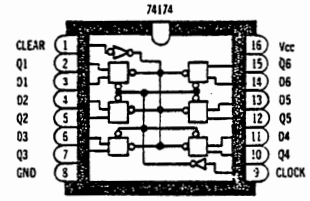
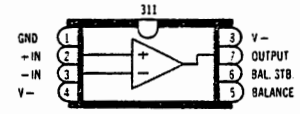
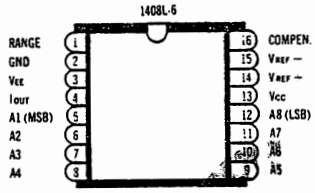
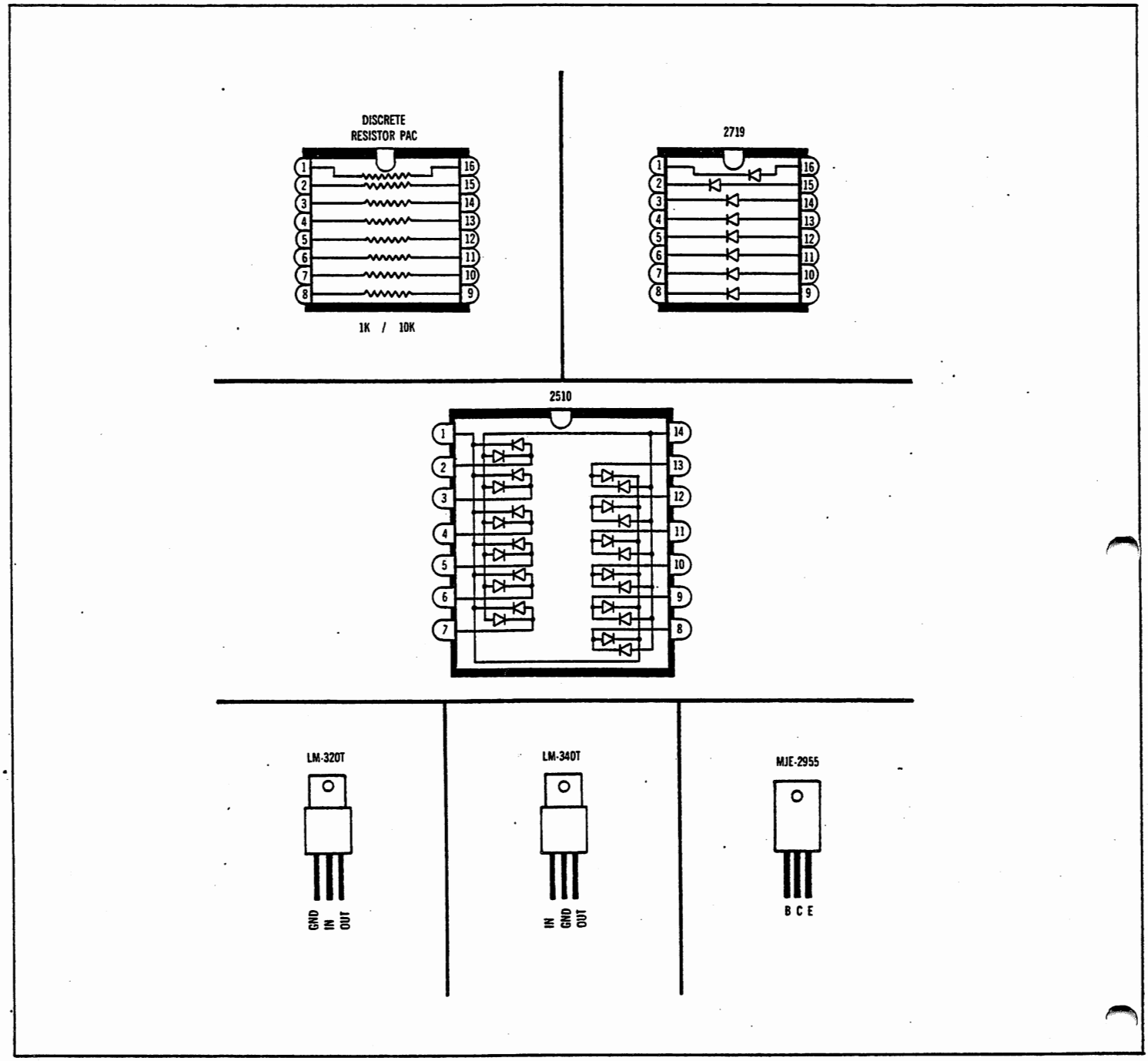


311



1408L-6





7.4 SuperTerm Schematic Diagrams

The following diagrams are included in this section:

7.4.1 Module Interconnection

7.4.2 Power Supply Rectifier/Filter Section

7.4.2.1 Standard Configurations

7.4.2.2 Optional Configurations

7.4.3 Regulator Card

7.4.3.1 PCB Assembly #1131000-01

7.4.3.2 PCB Assembly #1131000-01-REV. 01

7.4.4 Analog Power Board

7.4.4.1 Component Location Diagram

7.4.4.2 Power Buses/Voltage Monitor/Paper-feed Drive

7.4.4.3 Print-Wire Solenoid Drive

7.4.4.4 Carriage Servo Drive/Ribbon Drive

7.4.5 Digital Card

7.4.5.1 PCB Assembly #1132001-00

7.4.5.2 D.C. Power Buss

7.4.5.3 Microprocessor System

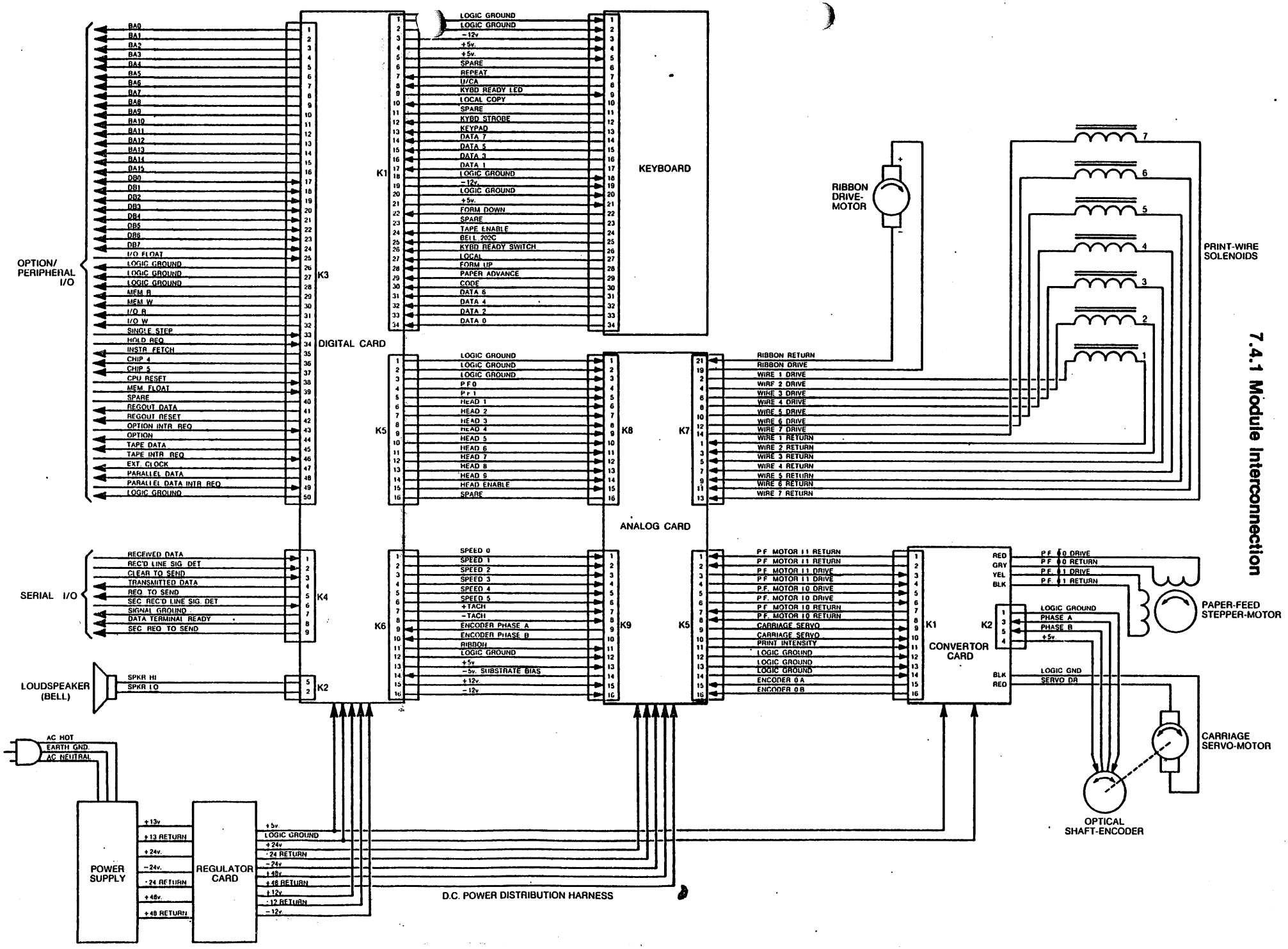
7.4.5.4 System I/O

7.4.5.5 Interval Timers/Interrupts/Servo Control

7.4.6 Converter Card

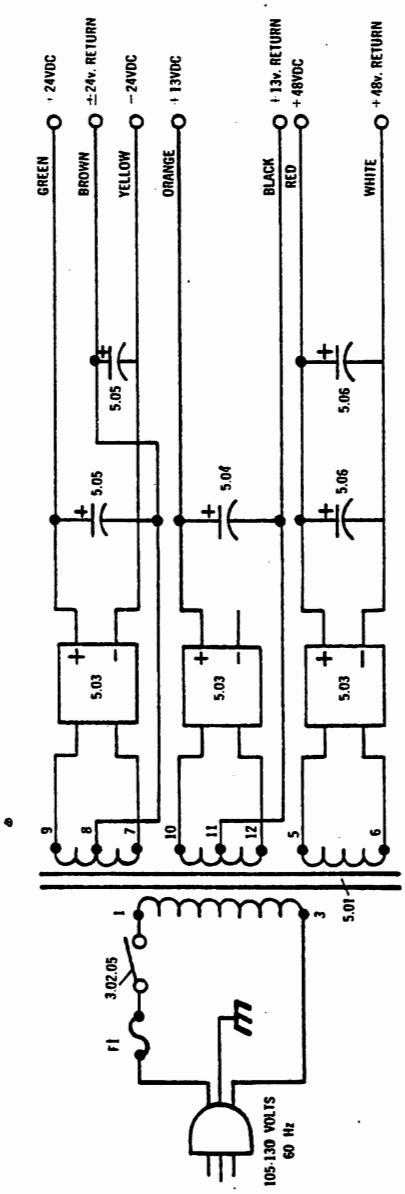
7.4.6.1 PCB Assembly #1134000-00

7.4.6.2 PCB Assembly #1134000-01


7.4.1 Module Interconnection
OPTION/ PERIPHERAL I/O
DIGITAL CARD
K3
BA0
BA1
BA2
BA3
BA4
BA5
BA6
BA7
BA8
BA9
BA10
BA11
BA12
BA13
BA14
BA15
DB0
DB1
DB2
DB3
DB4
DB5
DB6
DB7
I/O FLOAT
LOGIC GROUND
LOGIC GROUND
LOGIC GROUND
MEM R
MEM W
I/O R
I/O W
SINGLE STEP
HOLD REQ
INSTR FETCH
CHIP 4
CHIP 5
CPU RESET
MEM FLOAT
SPARE
REGOUT DATA
REGOUT RESET
OPTION INTR REQ
OPTION
TAPE DATA
TAPE INTR REQ
EXT CLOCK
PARALLEL DATA
PARALLEL DATA INTR REQ
LOGIC GROUND
K1
KEYBOARD
LOGIC GROUND
LOGIC GROUND
-12v
+5v
+5v
SPARE
REPEAT
U/CA
KYBD READY LED
LOCAL COPY
SPARE
KYBD STROBE
KEYPAD
DATA 7
DATA 6
DATA 5
DATA 4
DATA 3
DATA 2
DATA 1
DATA 0
LOGIC GROUND
-12v
LOGIC GROUND
+5v
FORM DOWN
SPARE
TAPE ENABLE
BELL 202C
KYBD READY SWITCH
LOCAL
FORM UP
PAPER ADVANCE
CODE
RIBBON DRIVE-MOTOR
PRINT-WIRE SOLENOIDS
7
6
5
4
3
2
1
K5
K8
K7
ANALOG CARD
LOGIC GROUND
LOGIC GROUND
LOGIC GROUND
PF0
PF1
HEAD 1
HEAD 2
HEAD 3
HEAD 4
HEAD 5
HEAD 6
HEAD 7
HEAD 8
HEAD 9
HEAD ENABLE
SPARE
RIBBON RETURN
RIBBON DRIVE
WIRE 1 DRIVE
WIRE 2 DRIVE
WIRE 3 DRIVE
WIRE 4 DRIVE
WIRE 5 DRIVE
WIRE 6 DRIVE
WIRE 7 DRIVE
WIRE 1 RETURN
WIRE 2 RETURN
WIRE 3 RETURN
WIRE 4 RETURN
WIRE 5 RETURN
WIRE 6 RETURN
WIRE 7 RETURN
SERIAL I/O
K4
RECEIVED DATA
REC'D LINE SIG DET
CLEAR TO SEND
TRANSMITTED DATA
REQ TO SEND
SEC REC'D LINE SIG DET
SIGNAL GROUND
DATA TERMINAL READY
SEC REQ TO SEND
K6
K9
K5
SPEED 0
SPEED 1
SPEED 2
SPEED 3
SPEED 4
SPEED 5
+TACH
-TACH
ENCODER PHASE A
ENCODER PHASE B
RIBBON
LOGIC GROUND
+5v
-5v SUBSTRATE BIAS
+12v
-12v
PF MOTOR 11 RETURN
PF MOTOR 11 RETURN
PF MOTOR 11 DRIVE
PF MOTOR 11 DRIVE
PF MOTOR 10 DRIVE
PF MOTOR 10 DRIVE
PF MOTOR 10 RETURN
PF MOTOR 10 RETURN
CARRIAGE SERVO
CARRIAGE SERVO
PRINT INTENSITY
LOGIC GROUND
LOGIC GROUND
LOGIC GROUND
ENCODER 0 A
ENCODER 0 B
K1
K2
CONVERTOR CARD
RED
GRY
YEL
BLK
PF 00 DRIVE
PF 00 RETURN
PF 01 DRIVE
PF 01 RETURN
PAPER-FEED STEPPER-MOTOR
LOGIC GROUND
PHASE A
PHASE B
+5v
BLK
RED
LOGIC GND
SERVO DR
CARRIAGE SERVO-MOTOR
OPTICAL SHAFT-ENCODER
LOUDSPEAKER (BELL)
SPKR HI
SPKR LO
K2
AC HOT
EARTH GND.
AC NEUTRAL
POWER SUPPLY
+13v
+13 RETURN
+24v
-24v
-24 RETURN
+48v
+48 RETURN
REGULATOR CARD
+5v
LOGIC GROUND
+24v
-24 RETURN
-24v
+48v
+48 RETURN
+12v
-12 RETURN
-12v
D.C. POWER DISTRIBUTION HARNESS

7.4.2 Power Supply Rectifier/Filter Section

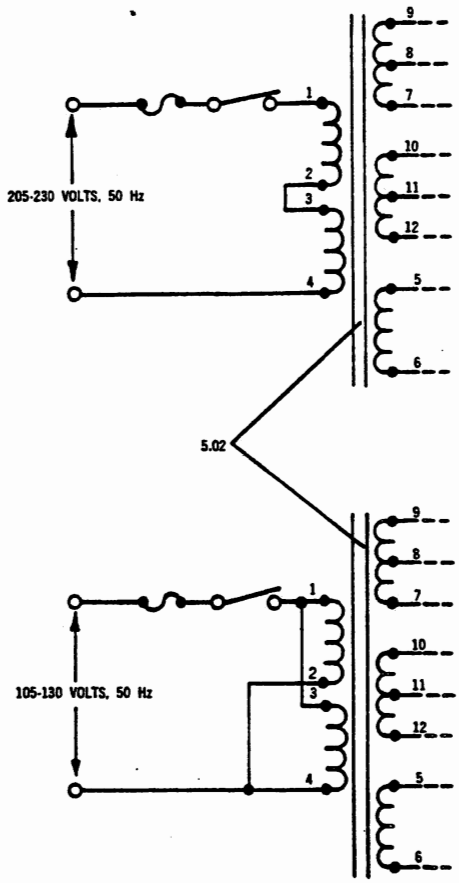
7.4.2.1 Standard Configurations



NOTE:

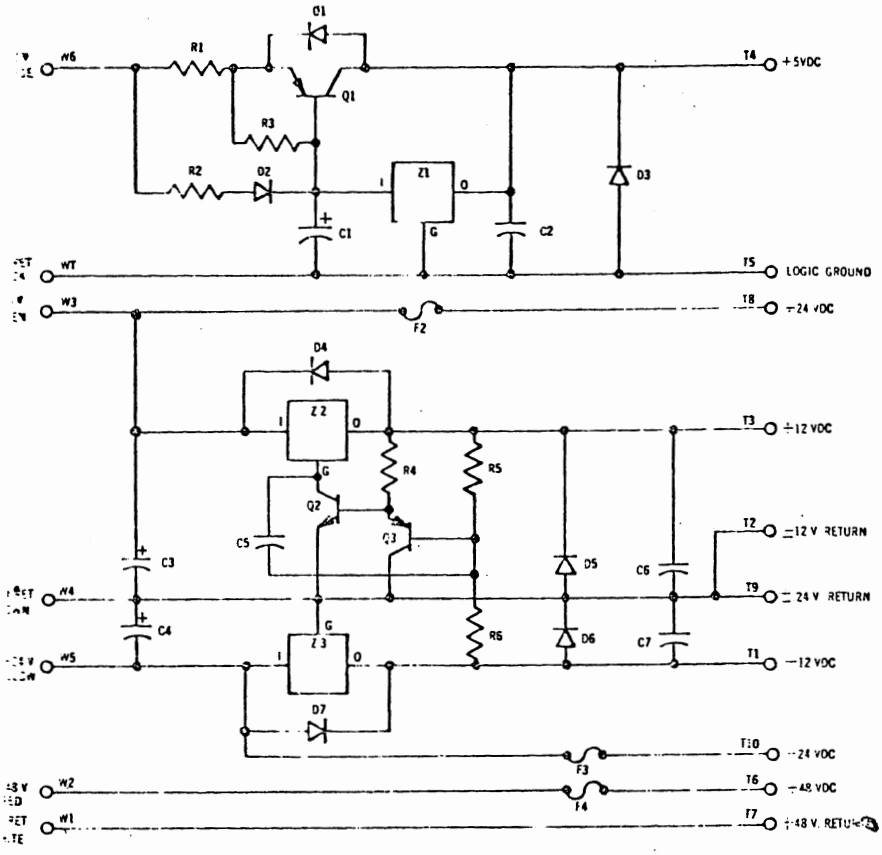
1. Standard 60Hz Configuration.
2. Some early SuperTerms utilized a dual-primary transformer for 60Hz operation.. These can be configured similar to the 50Hz dual-primary transformer.
3. Numbers shown correspond to parts-list section numbers (Appendix A).

7.4.2.2. OPTIONAL CONFIGURATIONS

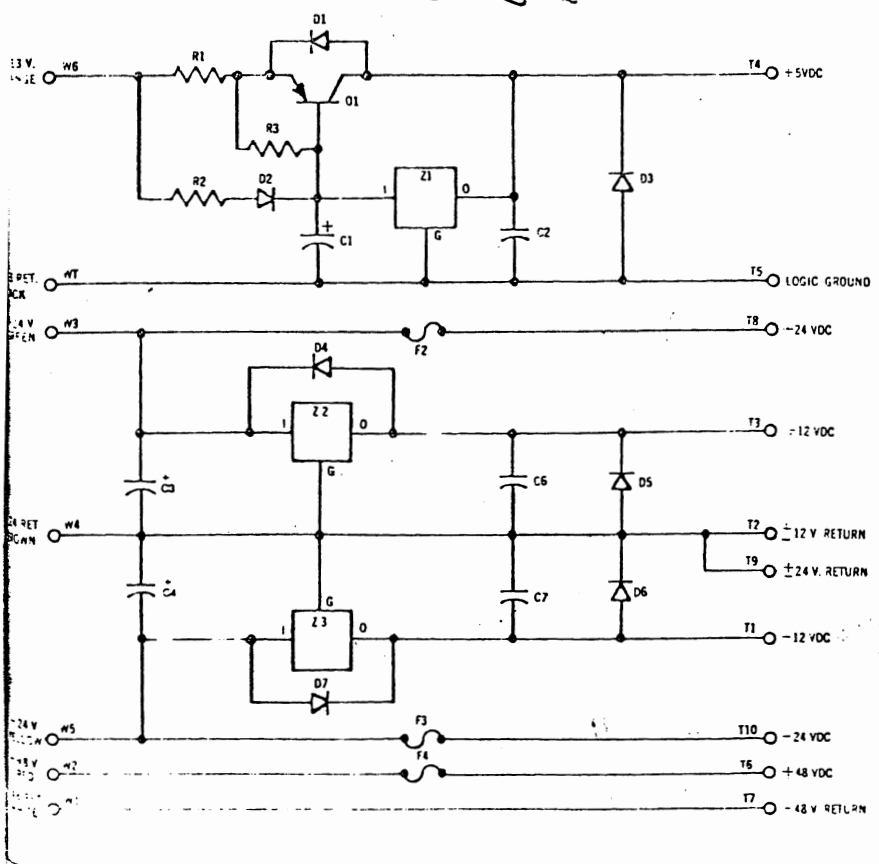


4.3 Regulator Card

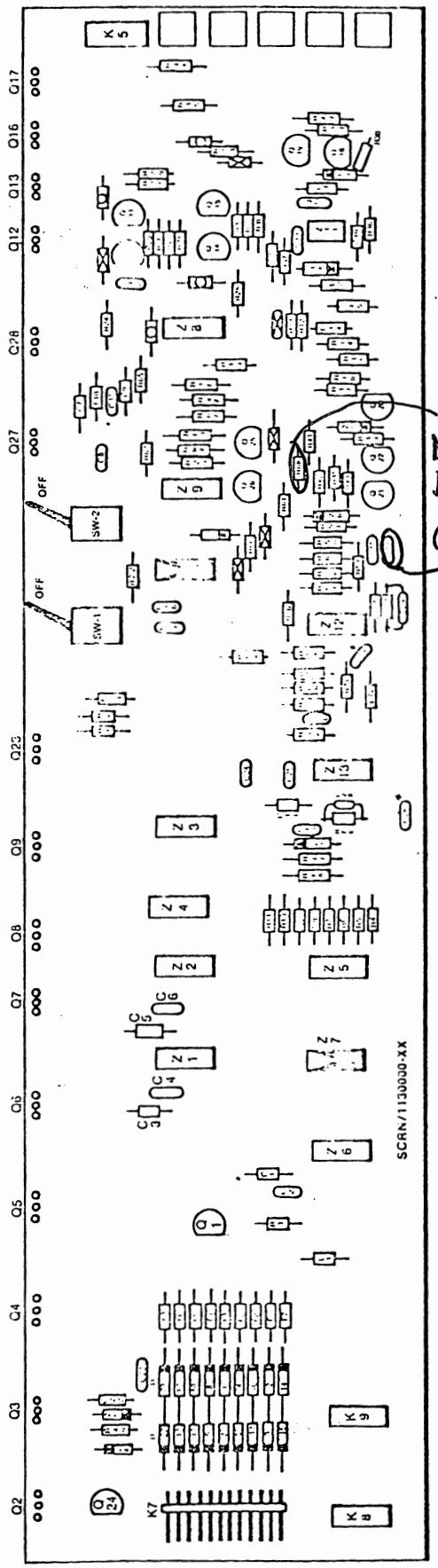
7.4.3.1 PCB Assembly #1131000-01



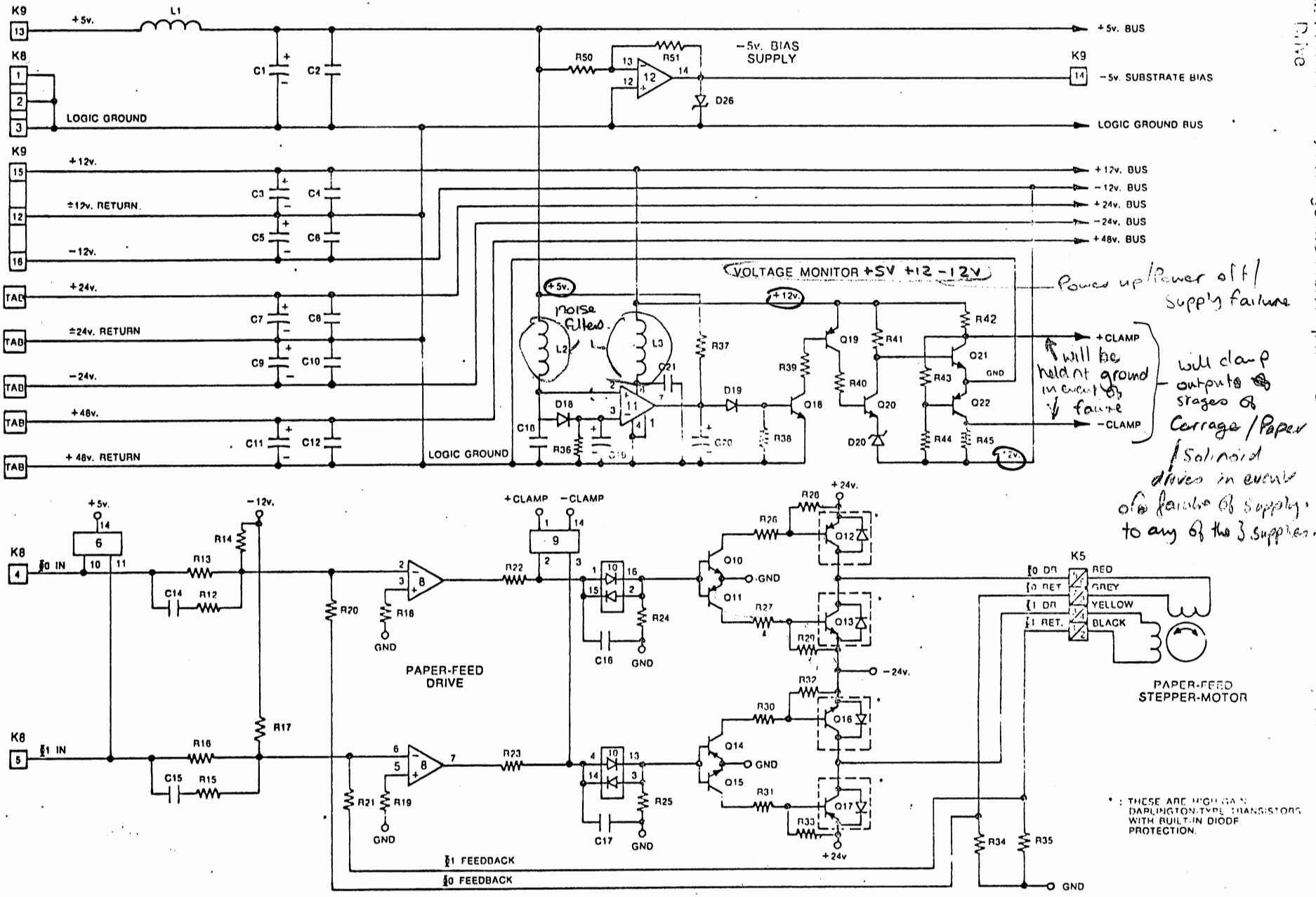
7.4.3.2 PCB Assembly #1131000-01-REV. 01



7.4.4.1 Component Location Diagram

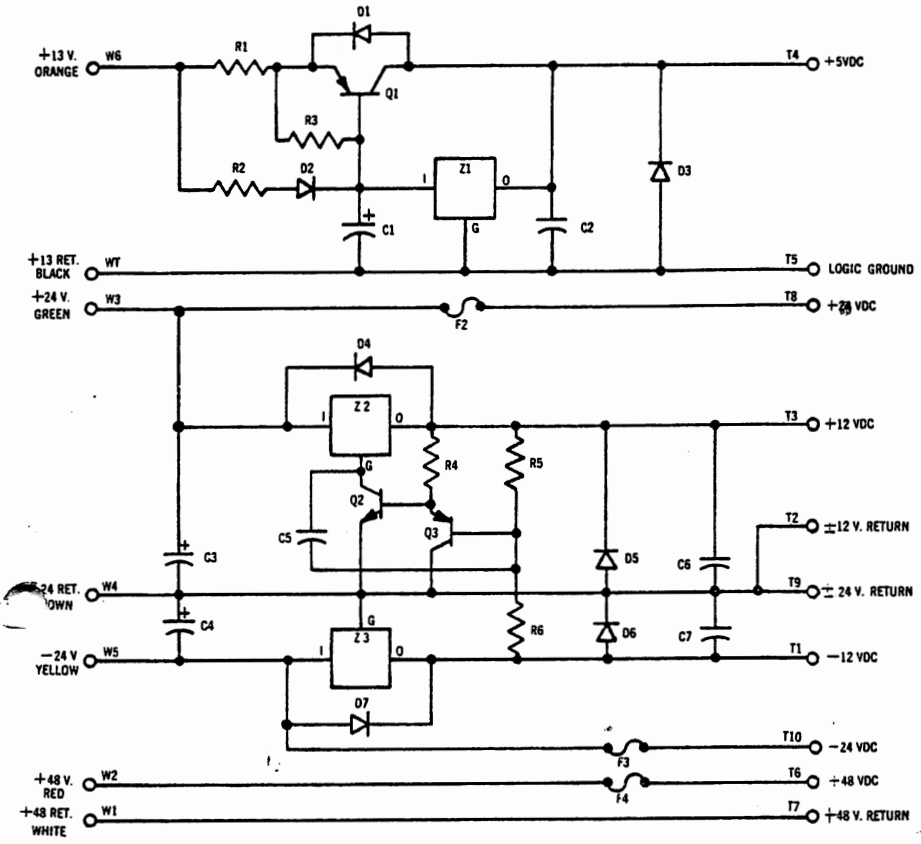


NOTE On Analog Card #1130000-01 C29 and C28 were mounted piggyback with R73 and R74 respectively. On #1130000-02 C28 and C29 were moved to the locations shown with an asterisk. R38 was mounted across the base and emitter leads of Q18 on #1130000-01. On #1130000-02, a location was provided on the card.

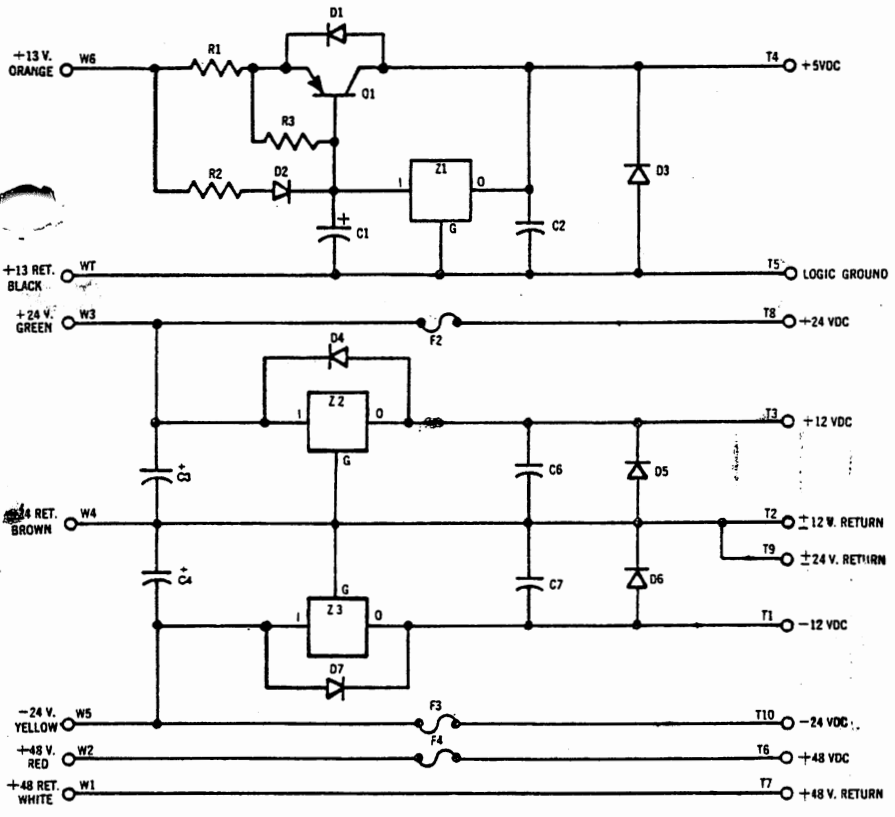

K9
13
+5v.
L1
C1
C2
+5v. BUS
K8
1
2
3
LOGIC GROUND
R50
R51
-5v. BIAS SUPPLY
D26
K9
14
-5v. SUBSTRATE BIAS
LOGIC GROUND BUS
K9
15
+12v.
12
±12v. RETURN.
16
-12v.
C3
C4
C5
C6
+12v. BUS
-12v. BUS
+24v. BUS
-24v. BUS
+48v. BUS
TAB
+24v.
±24v. RETURN
-24v.
+48v.
+ 48v. RETURN
C7
C8
C9
C10
C11
C12
LOGIC GROUND
VOLTAGE MONITOR +5V +12 -12V
+5v.
+12v.
noise filter
L2
L3
R37
Q21
D18
D19
C18
R36
C19
C20
R38
Q19
R41
R42
Q18
R39
R40
Q20
Q21
GND
R43
Q22
D20
R44
R45
-12v.
+CLAMP
-CLAMP
Power up/Power off/ Supply failure
will be held at ground in event of failure
will clamp outputs of stages of Carriage / Paper / Solenoid driven in event of failure of supply to any of the 3 supplies.
+5v.
-12v.
+CLAMP
-CLAMP
+24v.
K8
4
±0 IN
6
14
10
11
R14
R13
C14
R12
R20
2
3
8
R18
GND
R22
9
1
2
3
10
16
15
2
R24
C16
GND
Q10
GND
Q11
R26
R28
Q12
R27
Q13
R29
-24v.
PAPER-FEED DRIVE
K5
±0 DR
±0 RET
±1 DR
±1 RET.
RED
GREY
YELLOW
BLACK
PAPER-FEED STEPPER-MOTOR
K8
5
±1 IN
R16
R17
C15
R15
6
5
8
7
R23
R21
R19
GND
4
10
13
14
3
R25
C17
GND
Q14
GND
Q15
R30
R32
Q16
R31
Q17
R33
+24v
±1 FEEDBACK
±0 FEEDBACK
R34
R35
GND
* : THESE ARE HIGH GAIN DARLINGTON-TYPE TRANSISTORS WITH BUILT-IN DIODE PROTECTION.

7.4.3 Regulator Card

7.4.3.1 PCB Assembly #1131000-01

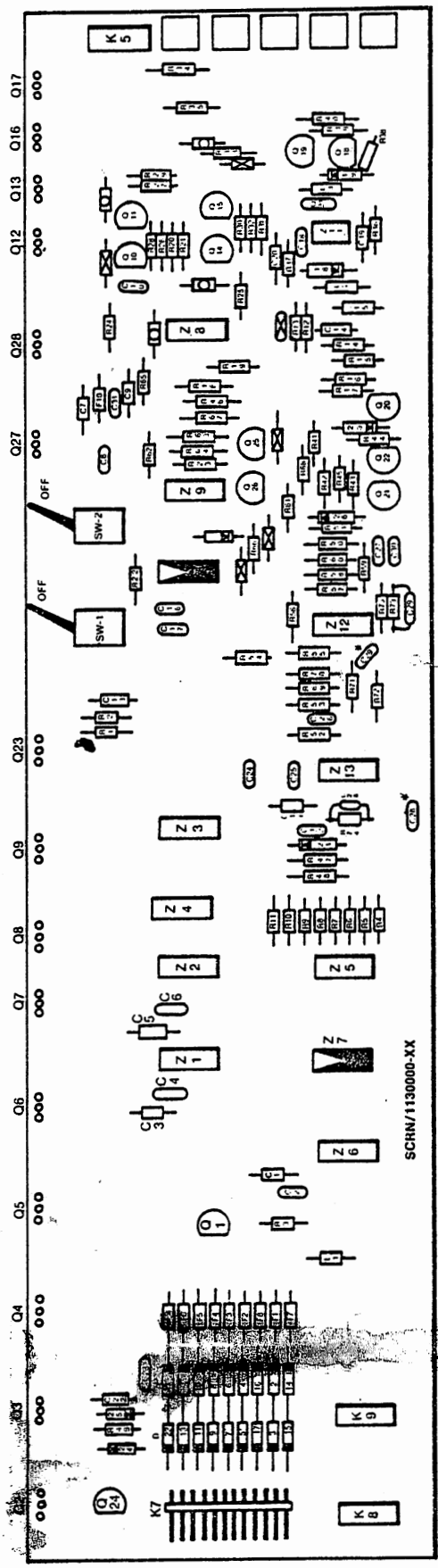


7.4.3.2 PCB Assembly #1131000-01-REV. 01

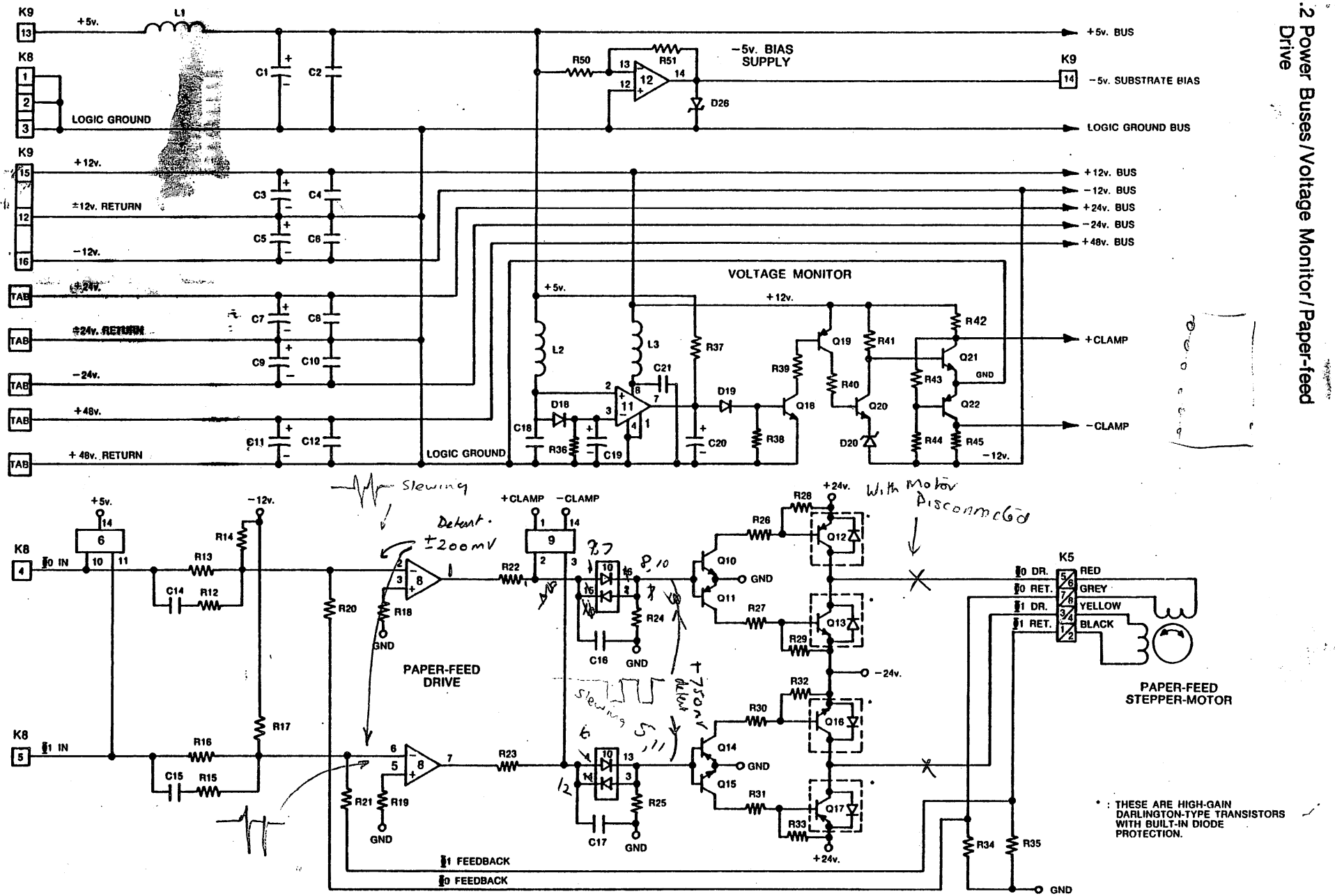


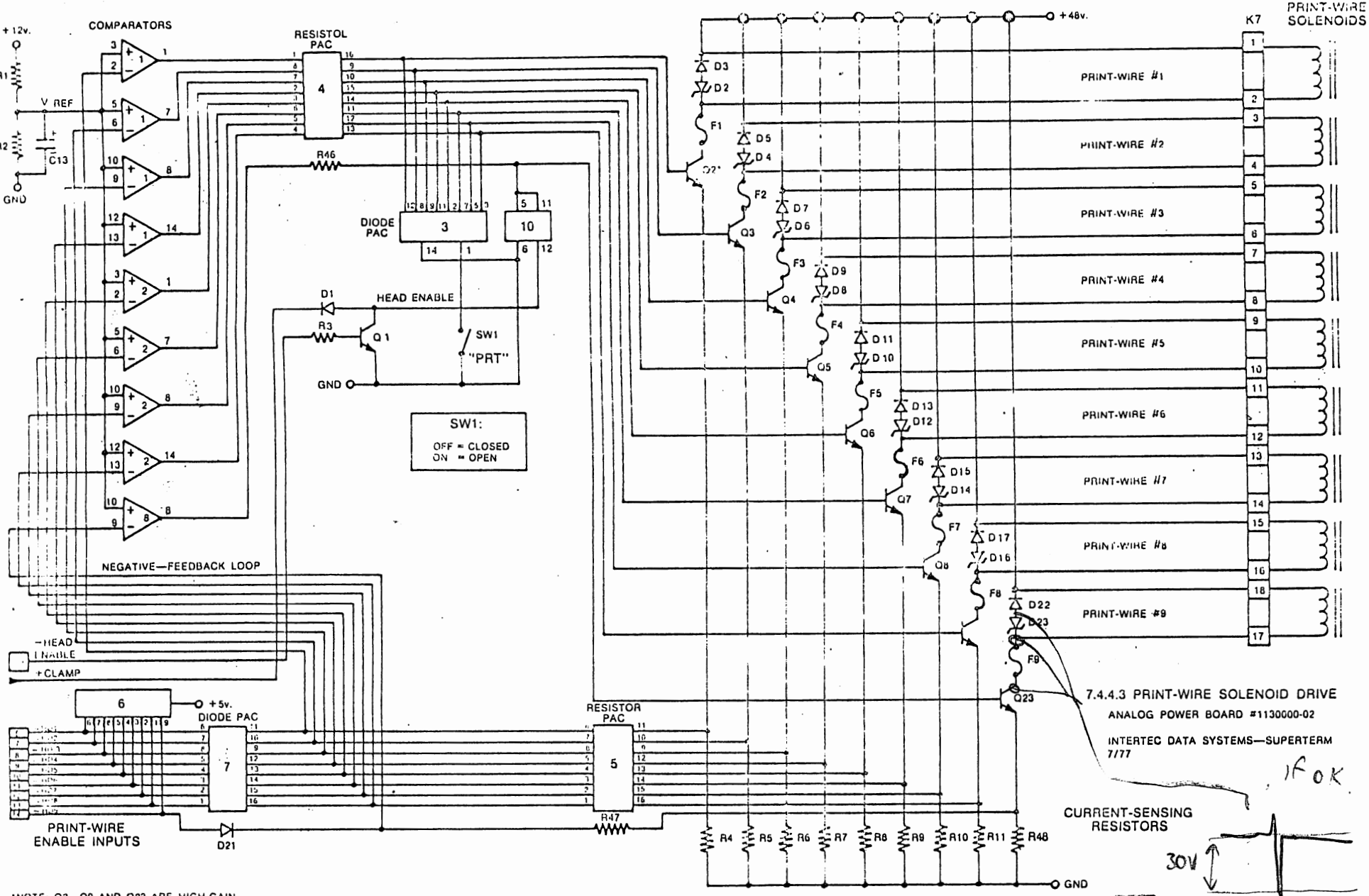
7.4.4 Analog Power Board

7.4.4.1 Component Location Diagram



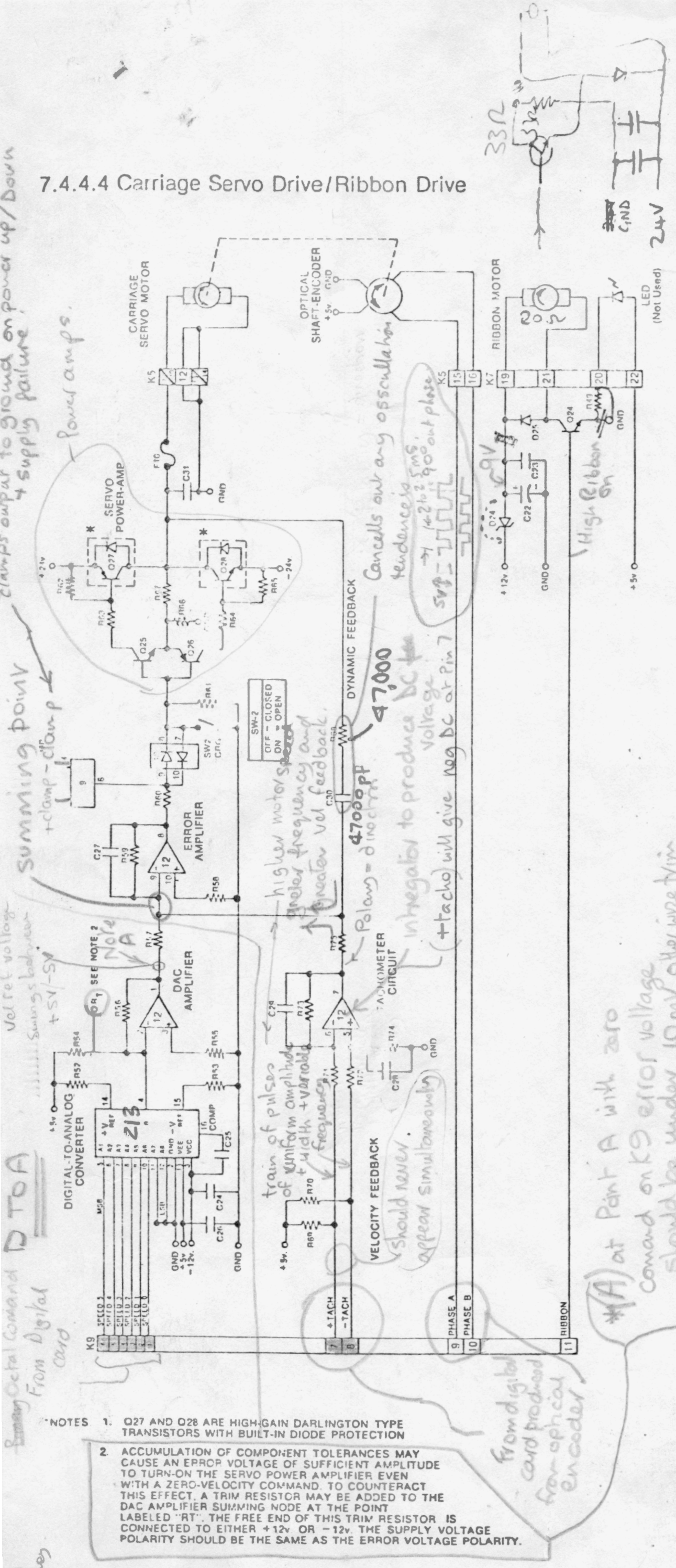
NOTE: On Analog Card =1130000-01, C29 and C28 were mounted piggyback with R73 and R74 respectively. On =1130000-02, C28 and C29 were moved to the locations shown with an asterisk. R38 was mounted across the base and emitter leads of Q18 on =1130000-01. On =1130000-02, a location was provided on the card.


K9
+5v.
L1
K8
LOGIC GROUND
C1
C2
R50
R51
-5v. BIAS SUPPLY
D26
+5v. BUS
-5v. SUBSTRATE BIAS
LOGIC GROUND BUS
+12v.
±12v. RETURN
-12v.
C3
C4
C5
C6
+12v. BUS
-12v. BUS
+24v. BUS
-24v. BUS
+48v. BUS
TAB
±24v.
±24v. RETURN
-24v.
+48v.
+48v. RETURN
C7
C8
C9
C10
C11
C12
VOLTAGE MONITOR
L2
L3
R37
C21
D18
D19
C18
R36
C19
C20
R38
Q18
Q19
Q20
R39
R40
R41
R42
Q21
Q22
R43
R44
R45
D20
+CLAMP
-CLAMP
GND
LOGIC GROUND
Slewing
Detent.
±200mV
+CLAMP
-CLAMP
With Motor Disconnected
R14
R13
C14
R12
R20
R18
R22
R24
C16
R26
R28
Q10
Q11
Q12
Q13
R27
R29
K5
RED
GREY
YELLOW
BLACK
PAPER-FEED STEPPER-MOTOR
PAPER-FEED DRIVE
R16
R17
C15
R15
R21
R19
R23
R25
C17
R30
R32
Q14
Q15
Q16
Q17
R31
R33
R34
R35
+750mV
Slewing
1 FEEDBACK
0 FEEDBACK
* : THESE ARE HIGH-GAIN DARLINGTON-TYPE TRANSISTORS WITH BUILT-IN DIODE PROTECTION.



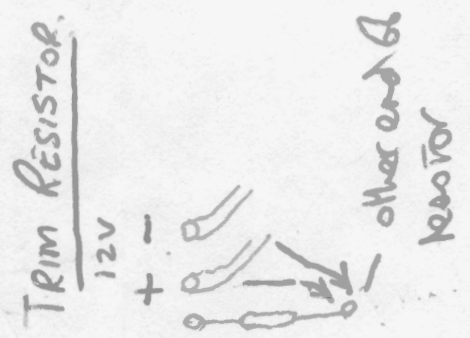
*NOTE: Q2—Q9 AND Q23 ARE HIGH-GAIN DARLINGTON-TYPE TRANSISTORS.

7.4.4.4 Carriage Servo Drive/Ribbon Drive



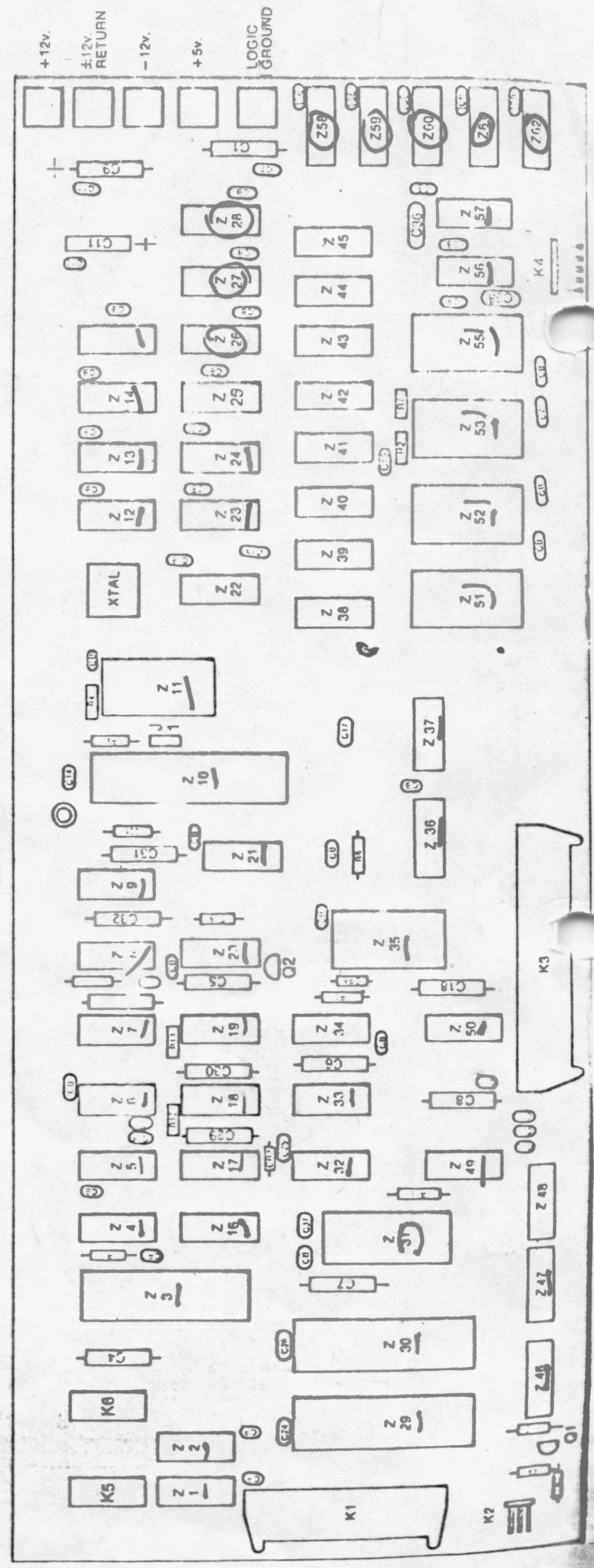
NOTES 1. Q27 AND Q28 ARE HIGH-GAIN DARLINGTON TYPE TRANSISTORS WITH BUILT-IN DIODE PROTECTION

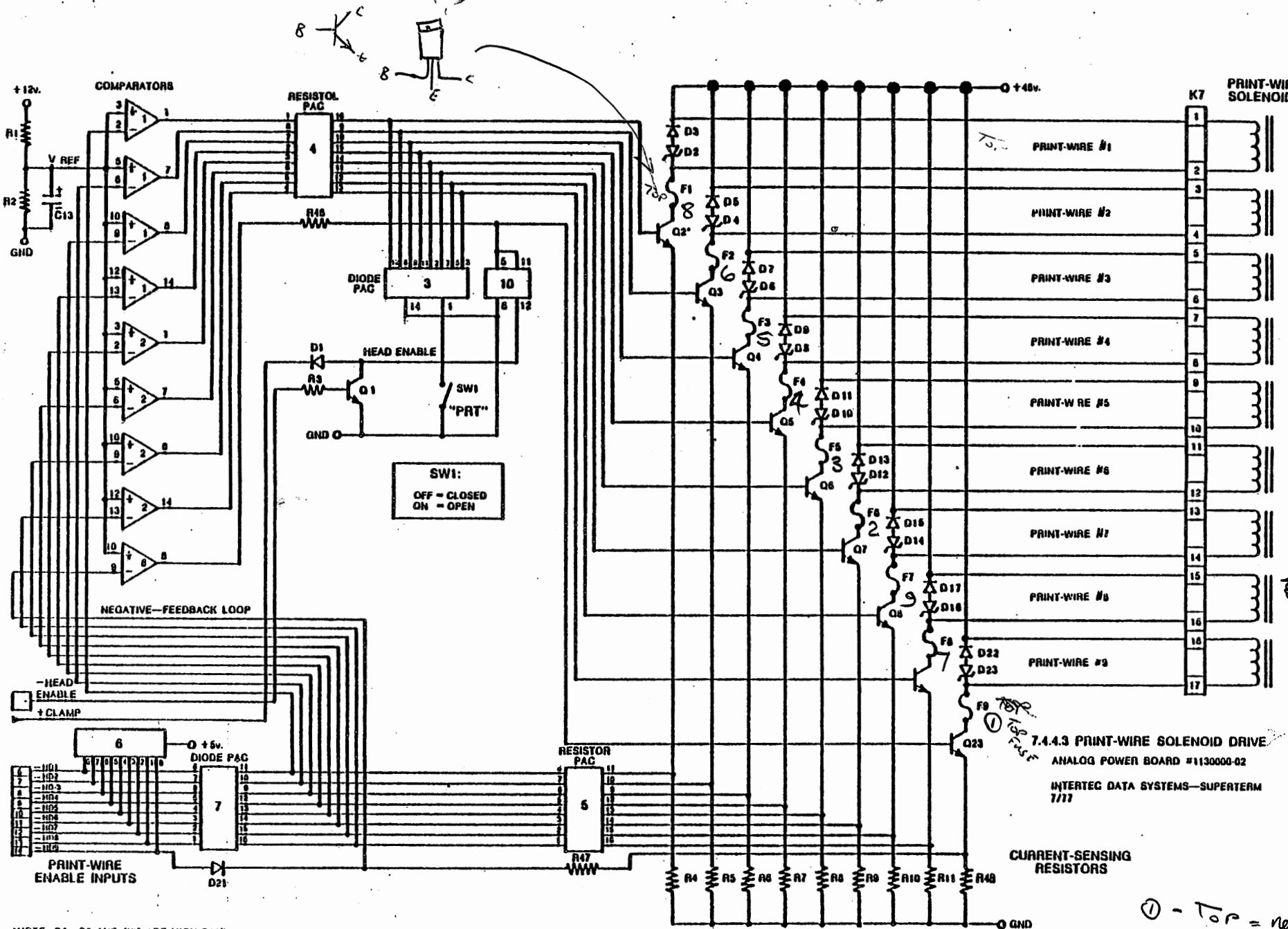
2. ACCUMULATION OF COMPONENT TOLERANCES MAY CAUSE AN ERROR VOLTAGE OF SUFFICIENT AMPLITUDE TO TURN-ON THE SERVO POWER AMPLIFIER EVEN WITH A ZERO-VELOCITY COMMAND. TO COUNTERACT THIS EFFECT, A TRIM RESISTOR MAY BE ADDED TO THE DAC AMPLIFIER SUMMING NODE AT THE POINT LABELED "RT". THE FREE END OF THIS TRIM RESISTOR IS CONNECTED TO EITHER +12v. OR −12v. THE SUPPLY VOLTAGE POLARITY SHOULD BE THE SAME AS THE ERROR VOLTAGE POLARITY.



7.4.5 Digital Card

7.4.5.1 PCB Assembly #1132001-00



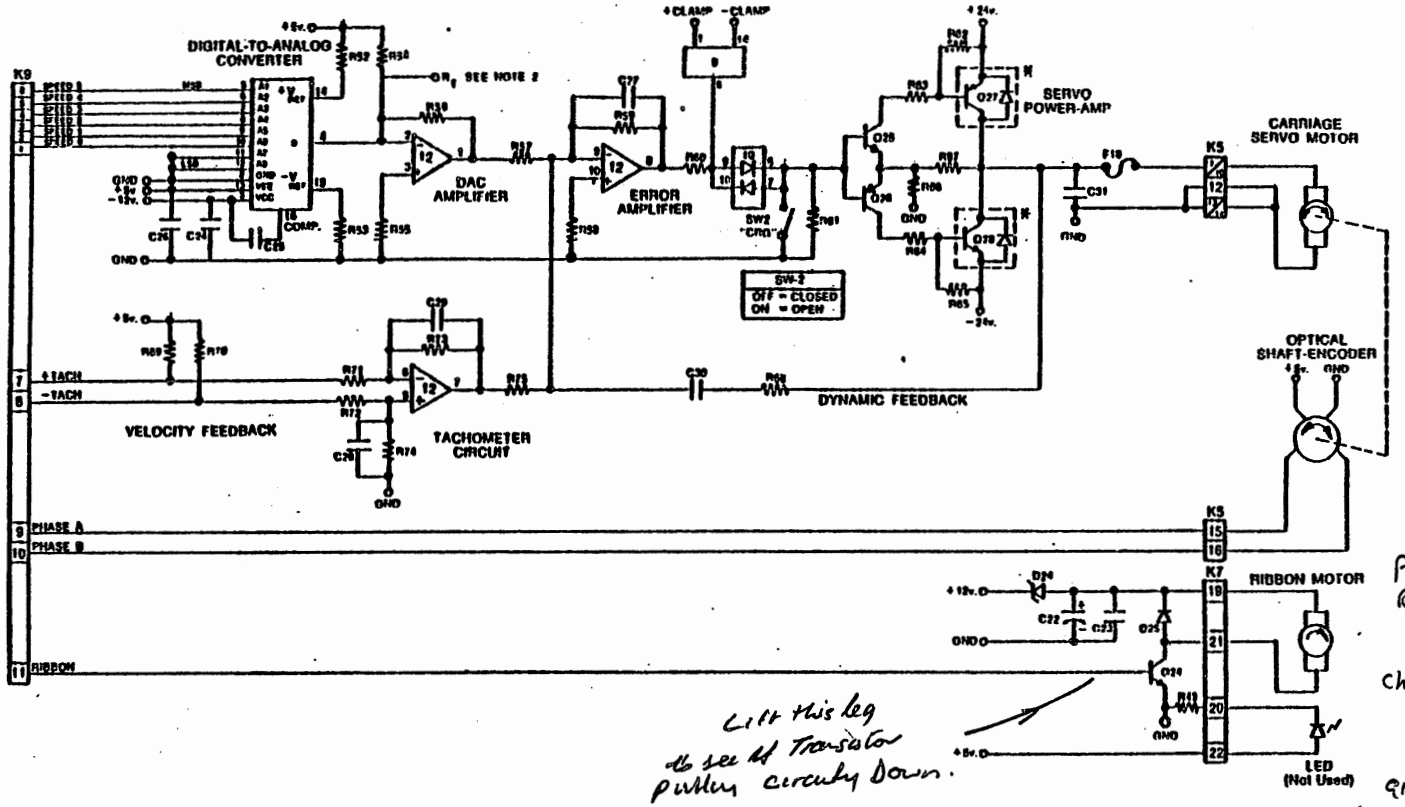


7.4.4.3 PRINT-WIRE SOLENOID DRIVE
ANALOG POWER BOARD #1130000-02

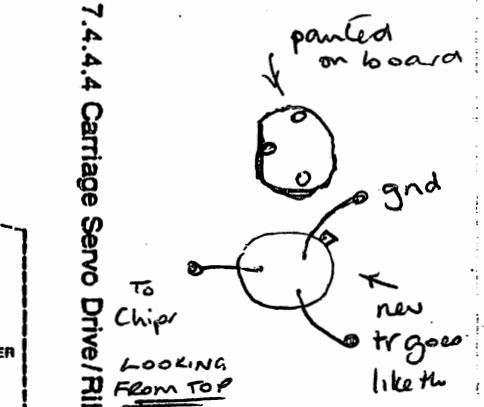
INTERTEC DATA SYSTEMS—SUPERTERM
7/77

*NOTE: Q2—Q9 AND Q23 ARE HIGH-GAIN DARLINGTON-TYPE TRANSISTORS

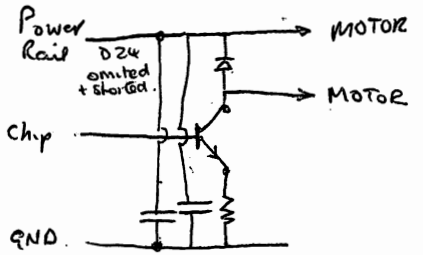
7.4.4.4 Carriage Servo Drive/Ribbon Drive



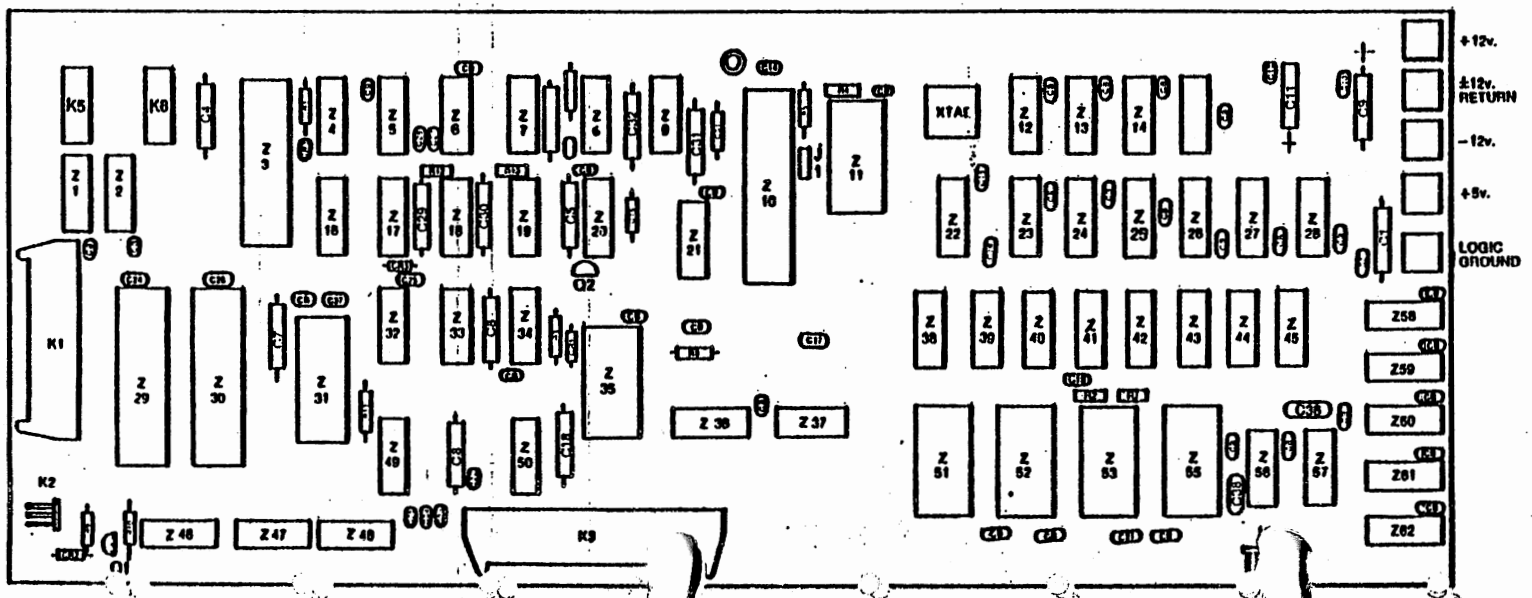
*NOTES:
1. Q27 AND Q28 ARE HIGH-GAIN DARLINGTON TYPE TRANSISTORS WITH BUILT-IN DIODE PROTECTION
2. ACCUMULATION OF COMPONENT TOLERANCES MAY CAUSE AN ERROR VOLTAGE OF SUFFICIENT AMPLITUDE TO UNBALANCE THE SERVO POWER AMPLIFIER EVEN WITH ZERO VELOCITY COMMAND. TO COUNTERACT THIS EFFECT, A TRIM RESISTOR MAY BE ADDED TO THE DAC AMPLIFIER SUMMING NODE AT THE POINT LABELED "RT". THE FREE END OF THIS TRIM RESISTOR IS CONNECTED TO EITHER +12v OR −12v, THE SUPPLY VOLTAGE POLARITY SHOULD BE THE SAME AS THE ERROR VOLTAGE POLARITY.

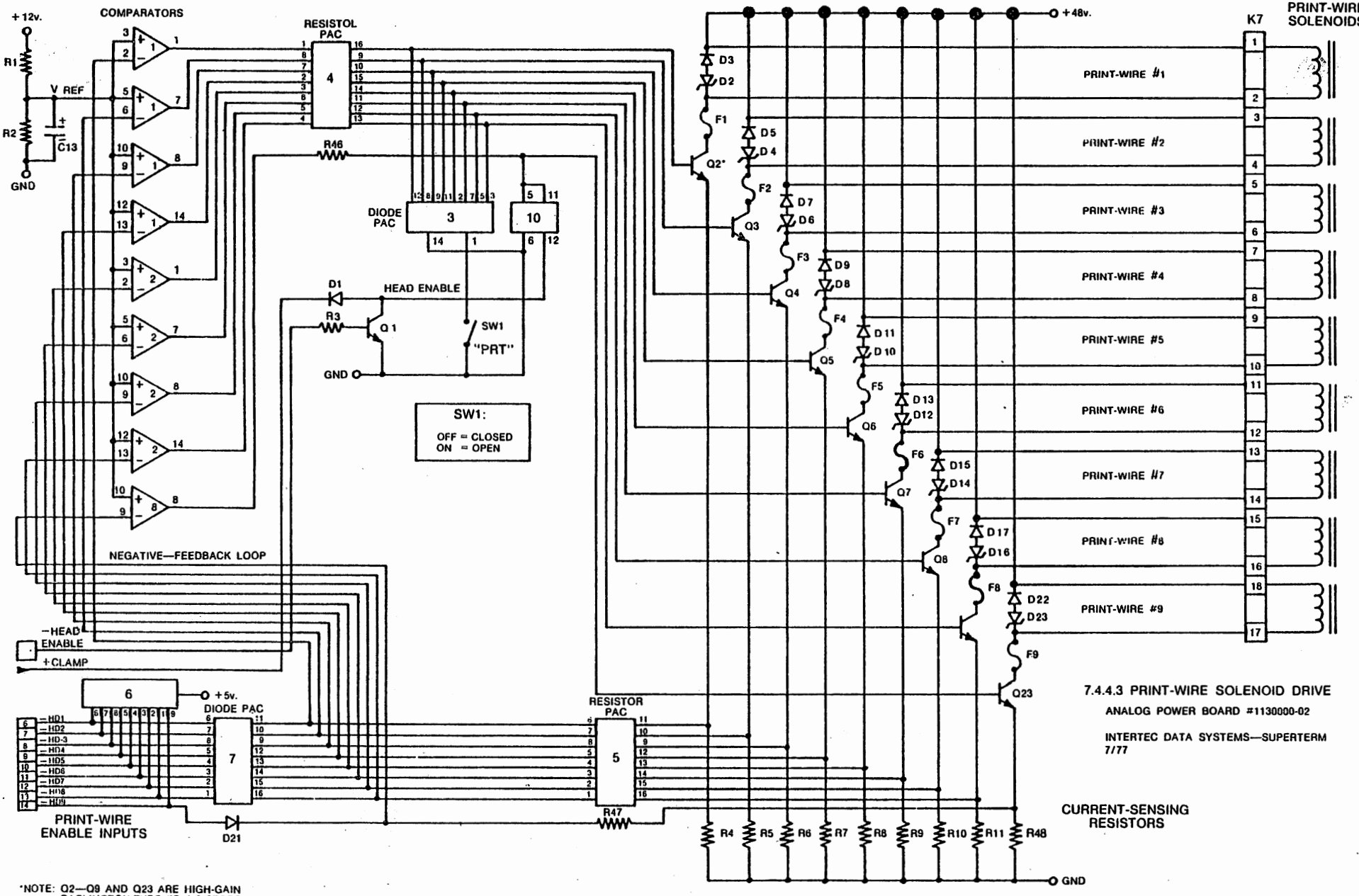


NEW RIBBON DRIVER TRANSISTOR 2N2219A



7.4.5 Digital Card
7.4.5.1 PCB Assembly #1132001-00





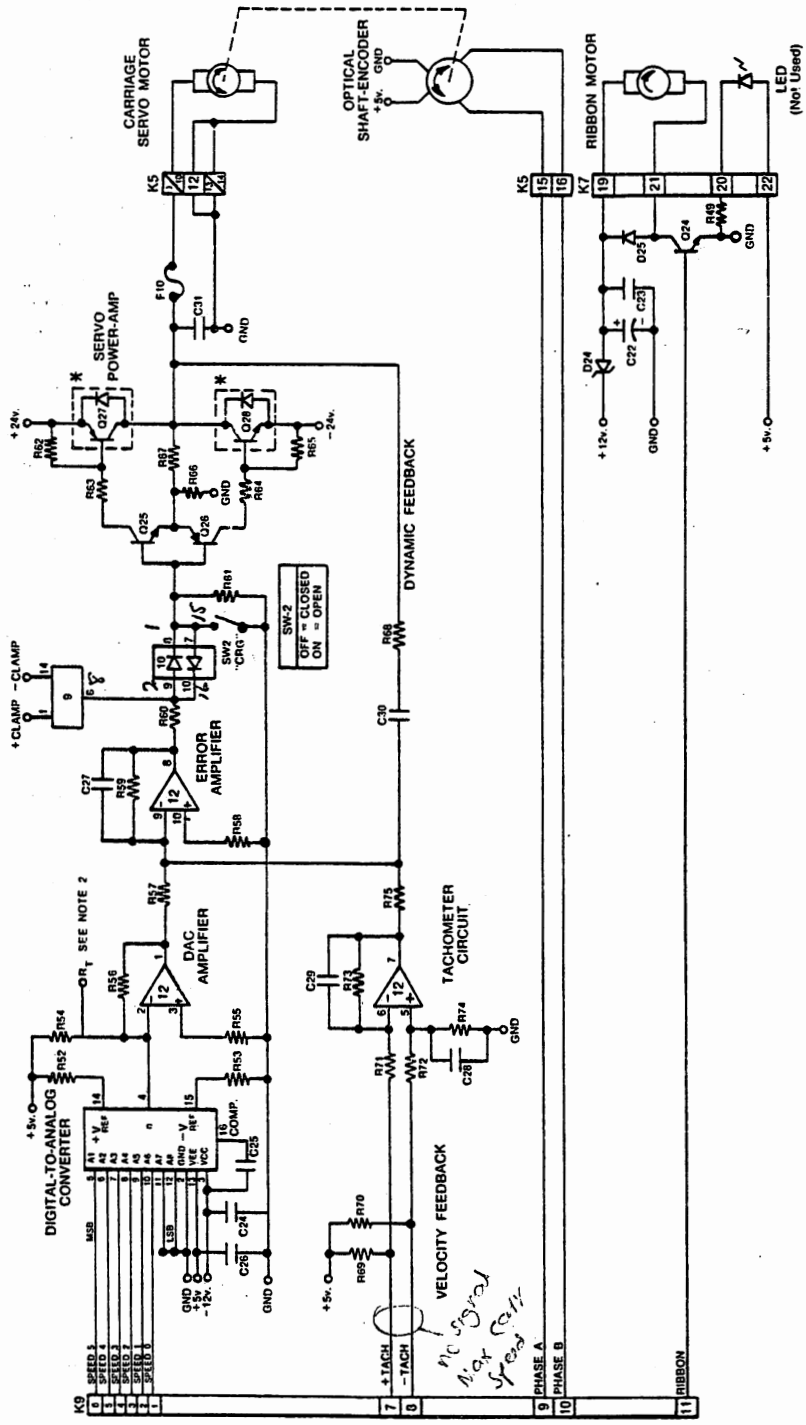
7.4.4.3 PRINT-WIRE SOLENOID DRIVE

ANALOG POWER BOARD #1130000-02

INTERTEC DATA SYSTEMS—SUPERTERM 7/77

*NOTE: Q2—Q9 AND Q23 ARE HIGH-GAIN DARLINGTON-TYPE TRANSISTORS.

7.4.4.4 Carriage Servo Drive/Ribbon Drive

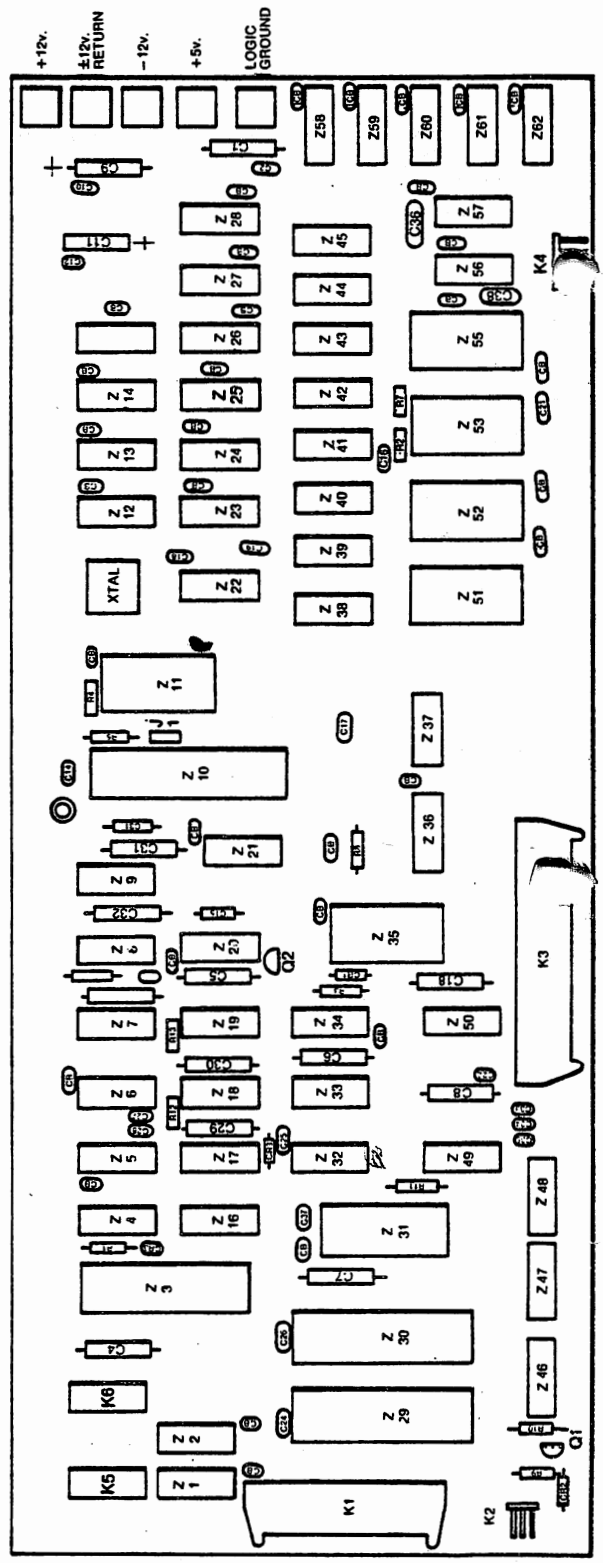


*NOTES: 1. Q27 AND Q28 ARE HIGH-GAIN DARLINGTON TYPE TRANSISTORS WITH BUILT-IN DIODE PROTECTION

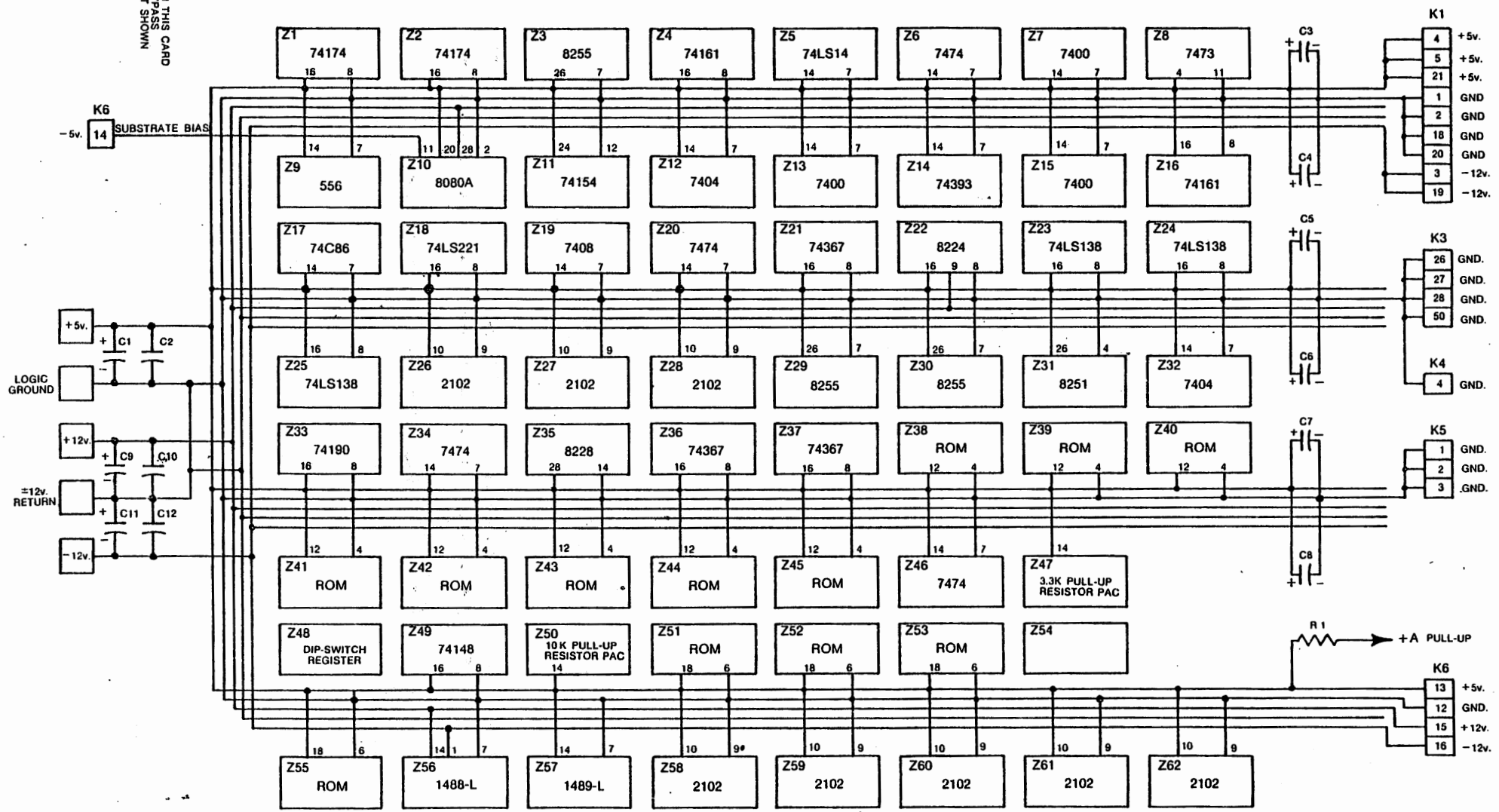
2. ACCUMULATION OF COMPONENT TOLERANCES MAY CAUSE AN ERROR VOLTAGE OF SUFFICIENT AMPLITUDE TO TURN-ON THE SERVO POWER AMPLIFIER EVEN WITH A ZERO-VELOCITY COMMAND. TO COUNTERACT THIS EFFECT, A TRIM RESISTOR MAY BE ADDED TO THE DAC AMPLIFIER SUMMING NODE AT THE POINT LABELED "RT". THE FREE END OF THIS TRIM RESISTOR IS CONNECTED TO EITHER +12v. OR −12v. THE SUPPLY VOLTAGE POLARITY SHOULD BE THE SAME AS THE ERROR VOLTAGE POLARITY.

7.4.5 Digital Card

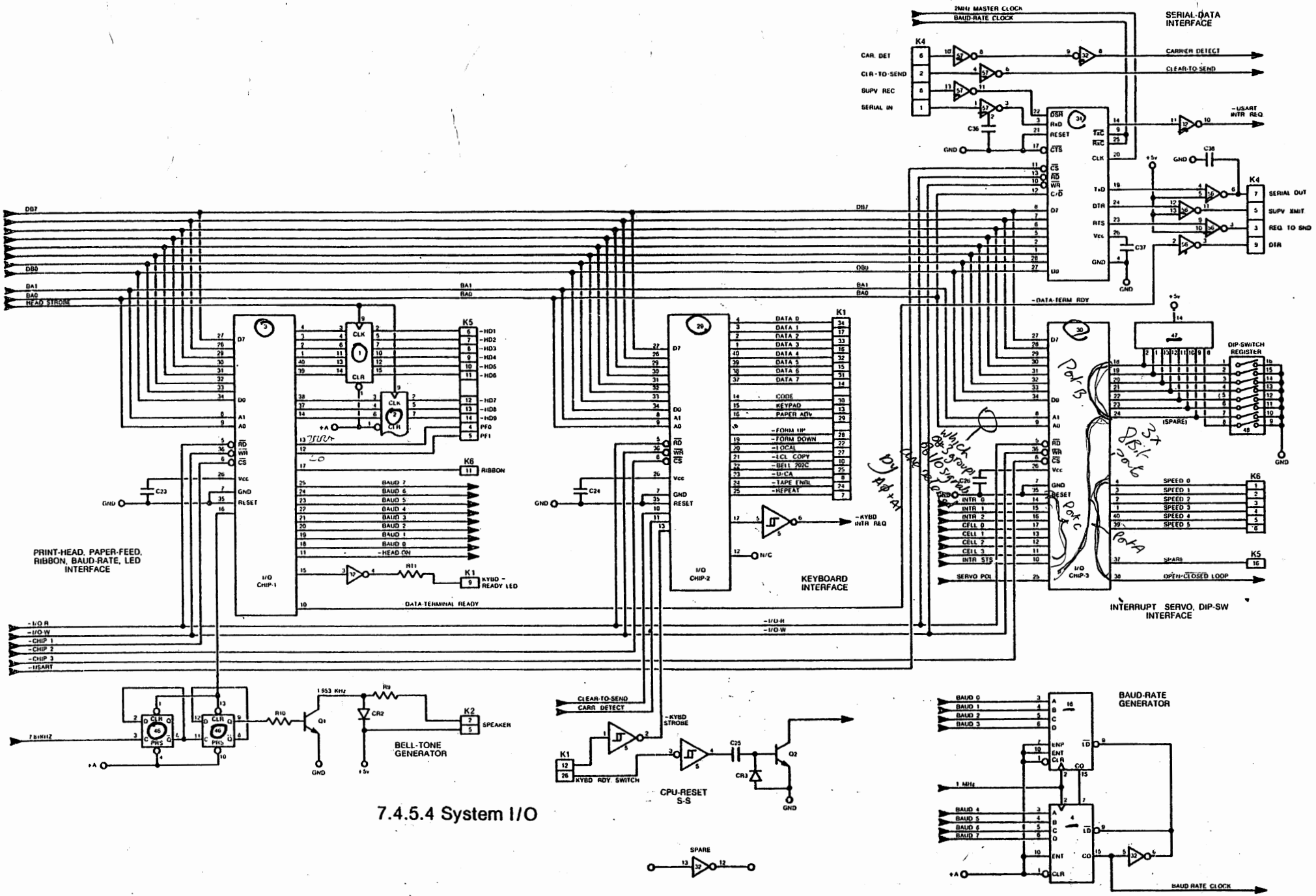
7.4.5.1 PCB Assembly #1132001-00



NOTE: EACH DIGITAL DEVICE ON THIS CARD IS ASSIGNED A 0.1 ufd. BYPASS CAPACITOR WHICH IS NOT SHOWN ON THIS SCHEMATIC.

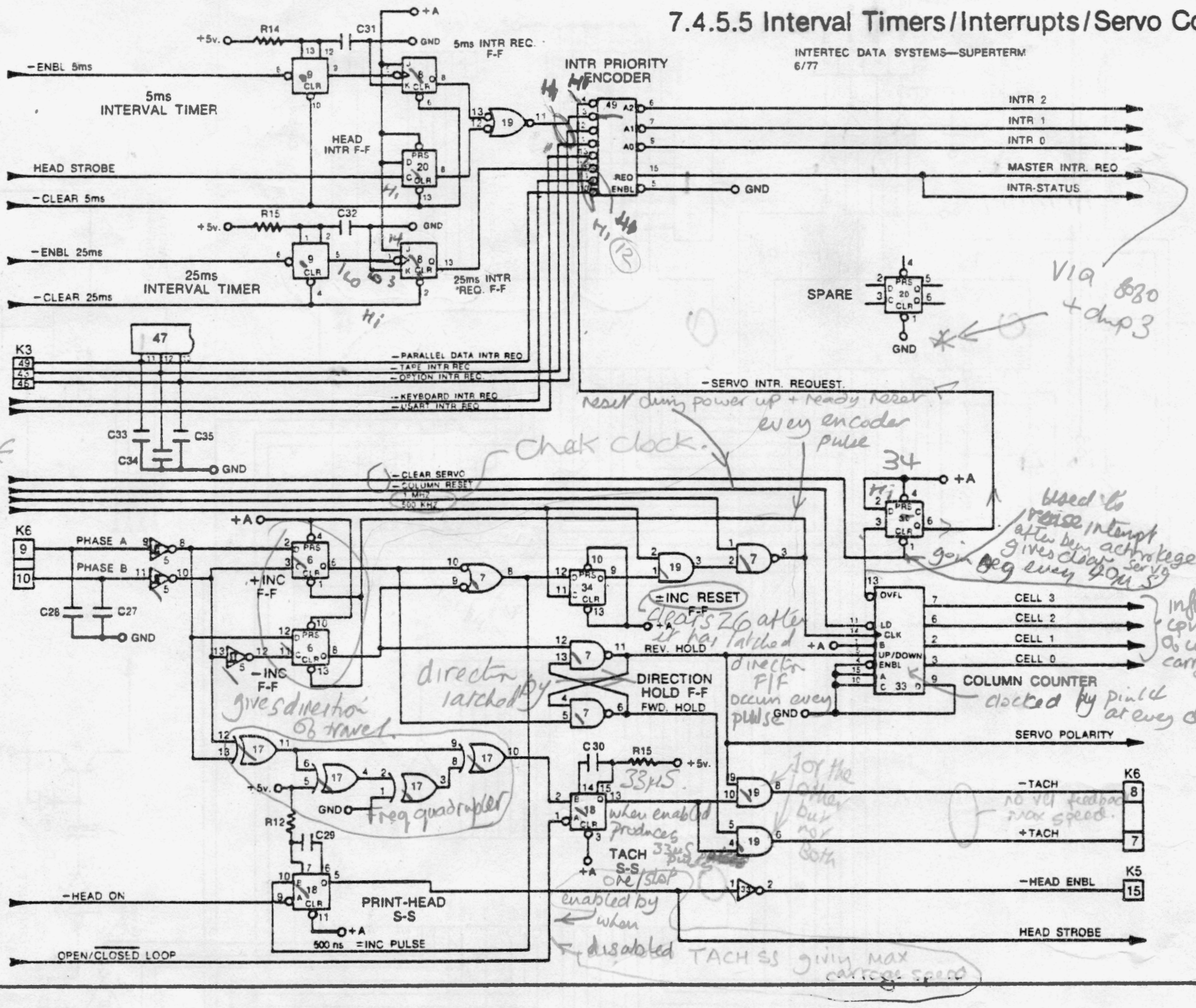


7.4.5.3 Microprocessor System



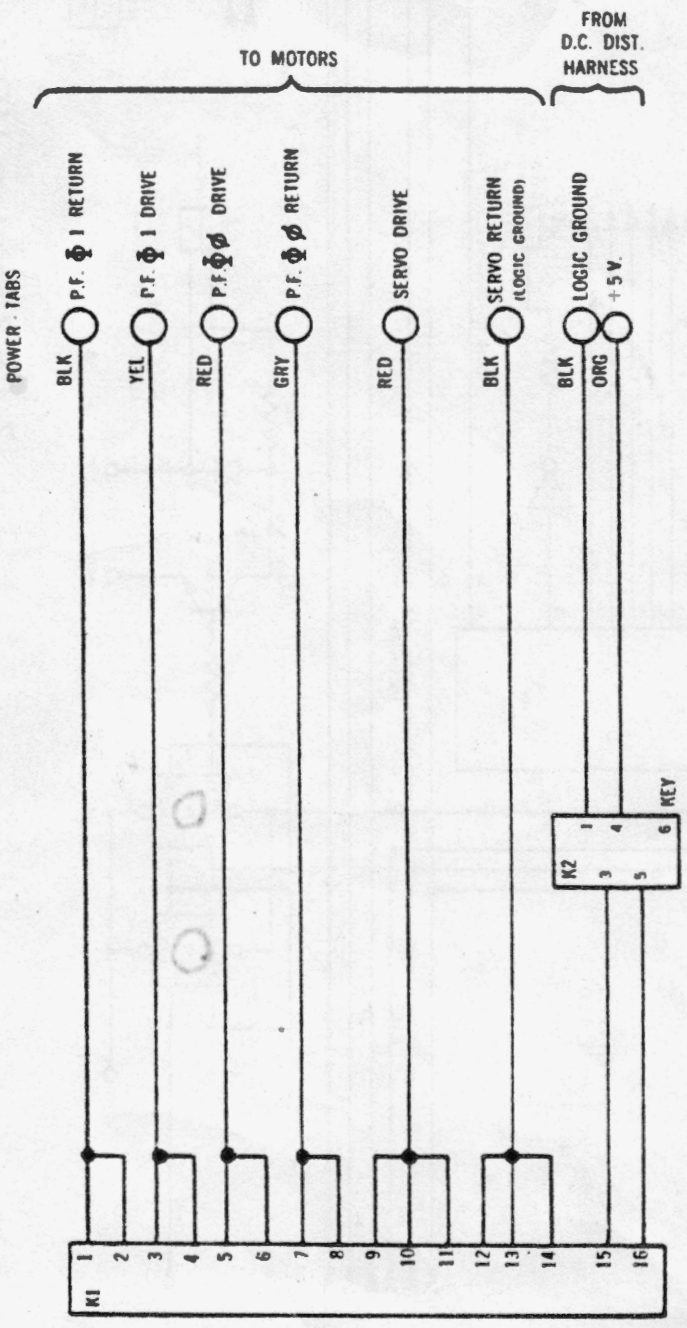
7.4.5.4 System I/O

7.4.5.5 Interval Timers/Interrupts/Servo Control

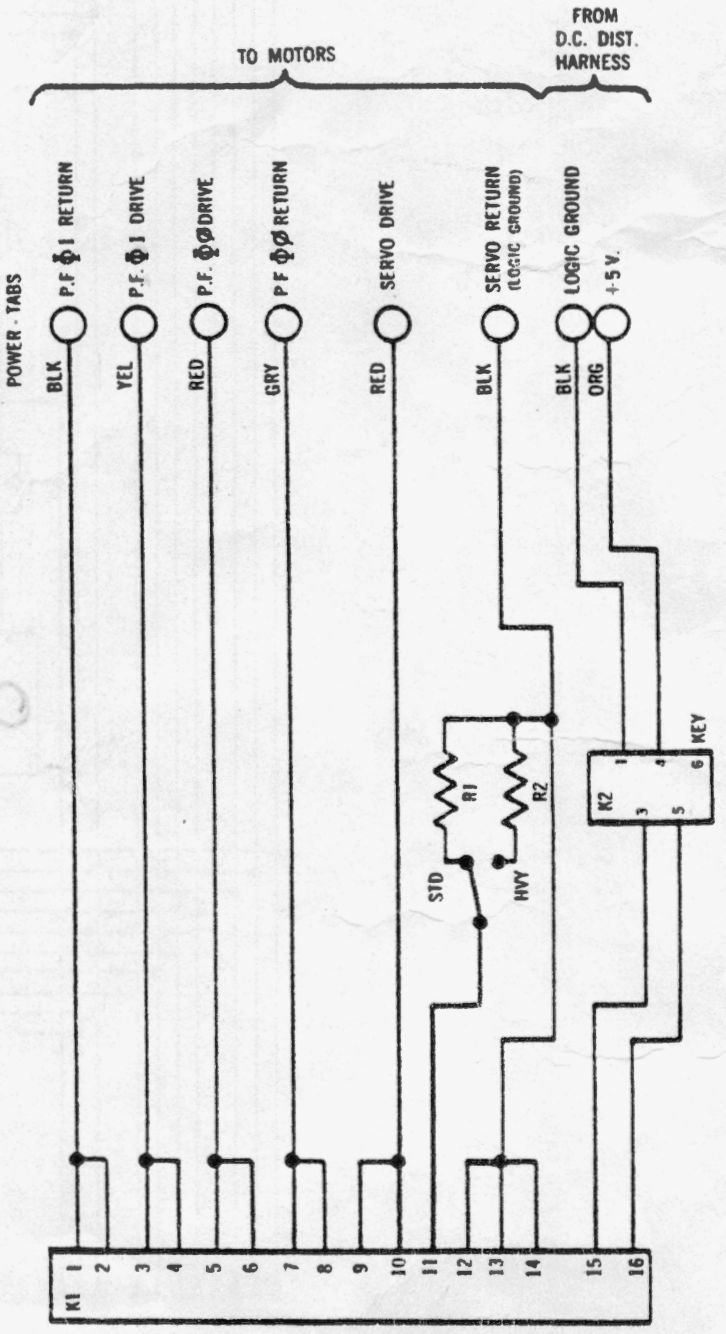


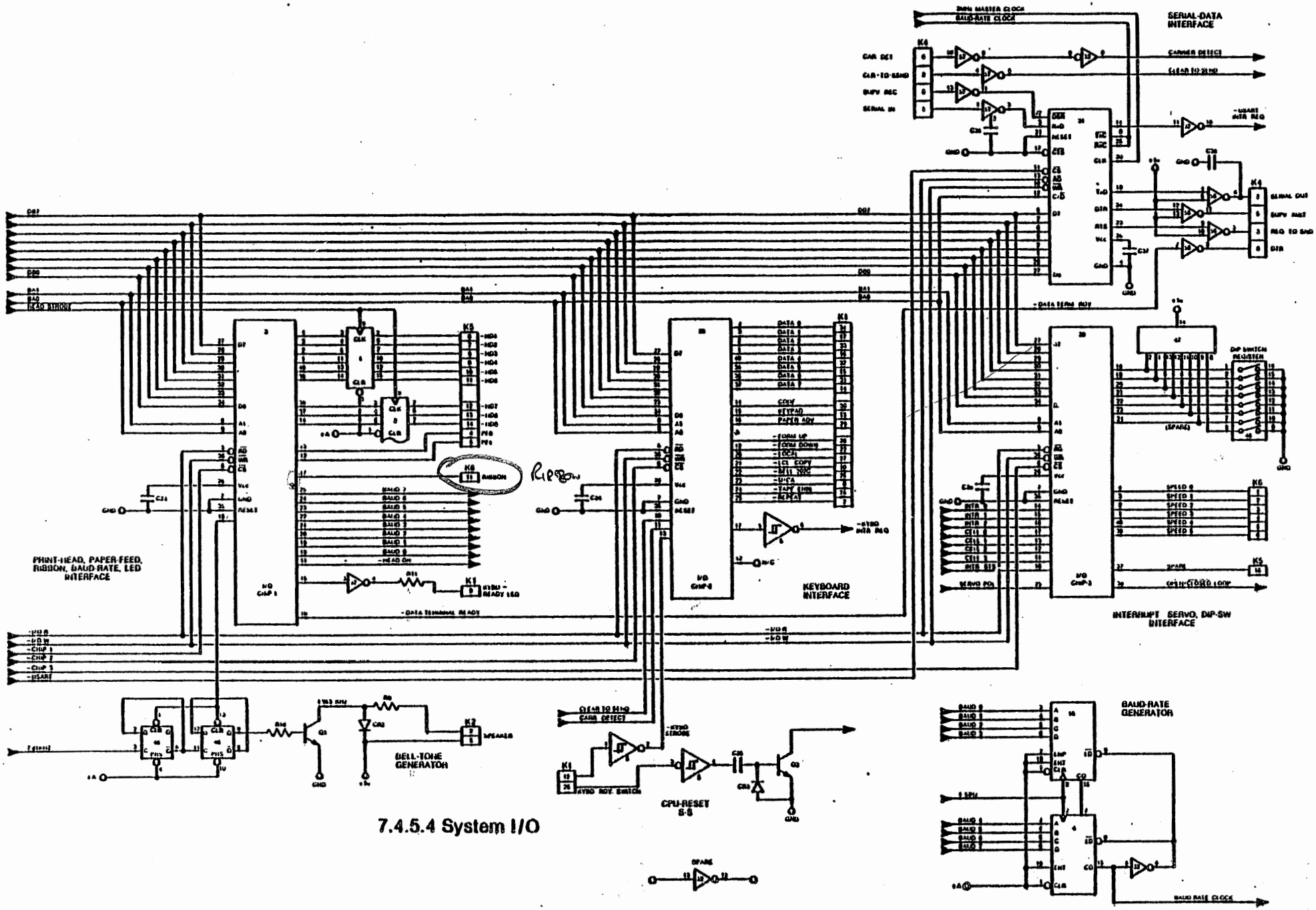
7.4.6 Converter Card

7.4.6.1 PCB Assembly #1134000-00



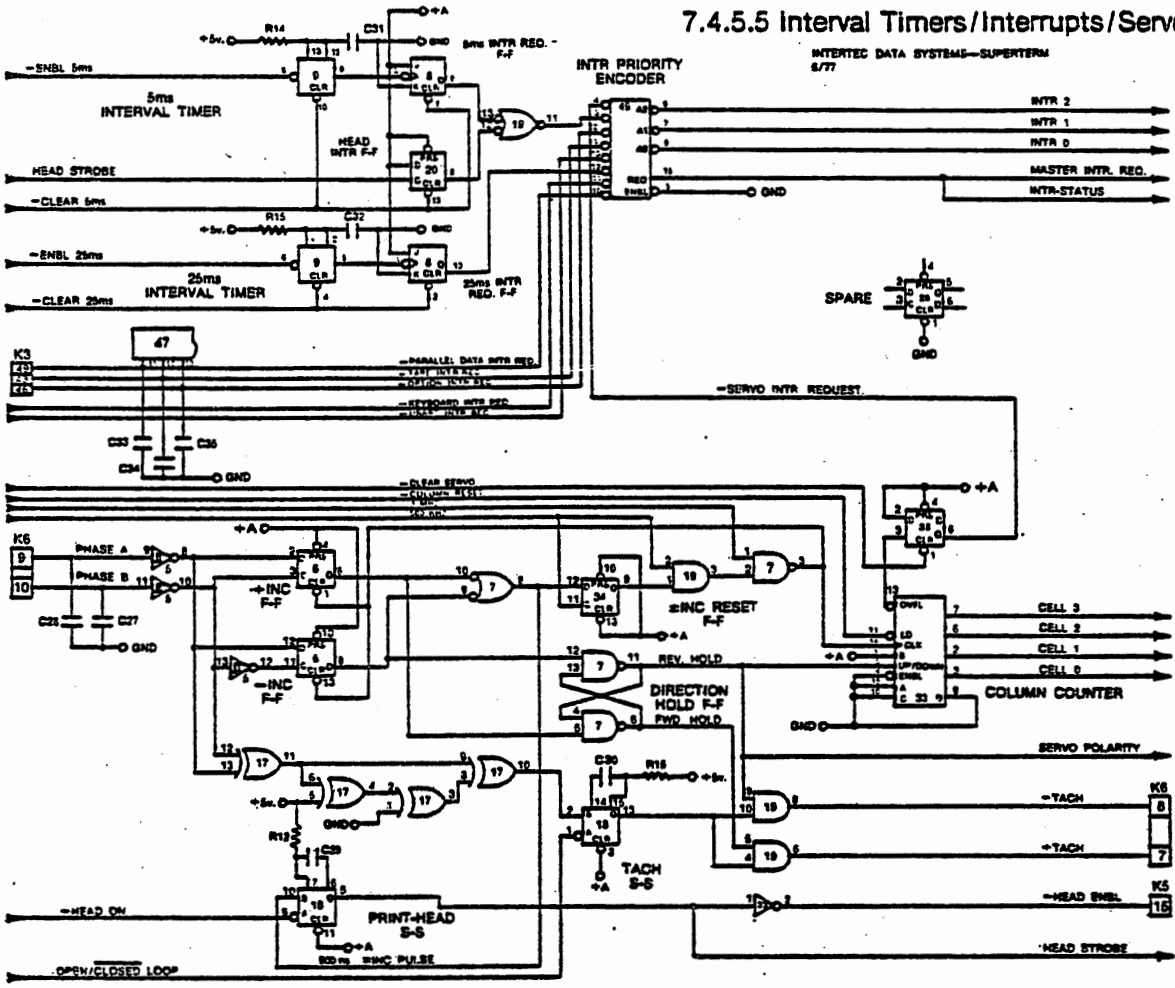
7.4.6.2 PCB Assembly #1134000-01





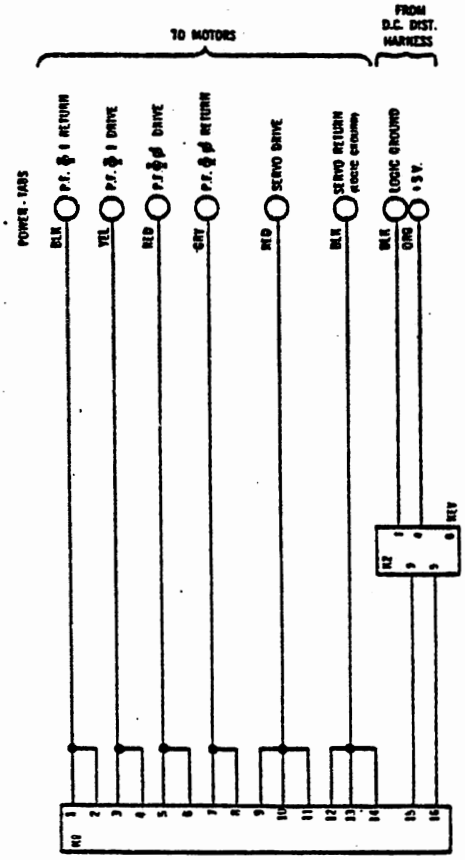
7.4.5.4 System I/O

7.4.5.5 Interval Timers/Interrupts/Servo Control

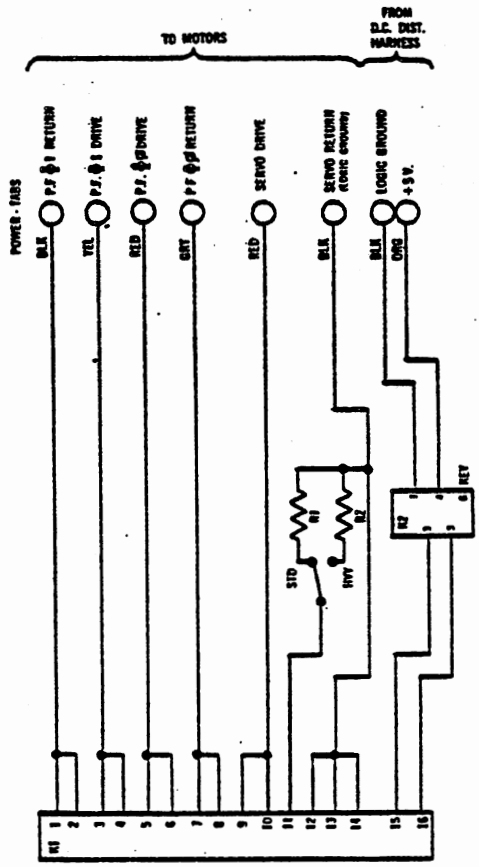


7.4.6 Converter Card

7.4.6.1 PCB Assembly #1134000-00



7.4.6.2 PCB Assembly #1134000-01



SECTION 8
APPENDICES

The following information is included in the form of appendices for general reference information.

8.1 APPENDIX - A
SUPERTERM PARTS LIST

DESCRIPTION	QTY. REQUIRED PER TERMINAL	PART NUMBER	UNIT PRICE
SECTION 1.0			
PRINTER ASSEMBLY	1	1110000-00	$1,267.00
(without Print Head & Carriage Assembly			
1.01 Plate, End w/Tractor Bearings	2	1110200-01	47.85
1.02 Nut, Mounting	10	1110201-00	3.16
1.03 Clip, Nut Retainer	4	1110202-00	1.48
1.04 Rail, Carriage	2	1110300-02	27.18
1.05 Clip Mounting, Rail	4	1110301-00	1.07
1.06 Screw, Mounting Clip	4	1110302-00	.87
1.07 Center Frame, Bottom Feed	1	1110500-00	557.18
1.08 Rod, Bottom Feed	1	1115010-00	18.75
1.09 Forms Tractor Sub-Assembly	1	1115000-00	127.14
1.09.01 Right Tractor	1	1115100-00	37.18
1.09.02 Left Tractor	1	1115200-00	37.18
1.09.03 Rod, Drive	1	1115500-00	27.52
1.09.04 E-Ring, Drive Rod	2	1115501-00	1.04
1.09.05 Rod, Guide	1	1115600-00	21.50
1.09.06 E-Ring, Guide Rod	2	1115602-00	1.04
1.09.07 Pulley, Drive Rod	1	1115502-00	9.67
1.09.08 Belt, Tractor Drive	1	1114200-00	15.89
1.10 Motor, Carriage	1	1113100-00	117.94
1.11 Motor, Paper Feed	1	1114100-00	73.16
1.12 Encoder, Carriage	1	1114300-00	116.03
1.13 Pulley, Carriage Motor	1	1113110-00	14.67
1.14 Pulley, Paper Feed	1	1114110-00	8.09
1.15 [illegible]t, Carriage	1	1113120-00	28.74
1.1[illegible] [illegible]sion Sub-Assembly, Drive Belt	1	1113300-00	87.50
1.16.01 Bracket	1	1113301-00	29.85
1.16.02 Shaft, Bearing	1	1113202-00	9.16
1.16.03 Washer, Shaft	2	1113203-00	1.46
1.16.04 E-Ring	2	1113204-00	1.07
1.16.05 Spring	2	1113205-00	3.16
1.16.06 Pulley	1	1113206-00	26.92
1.16.07 Rivet	4	1113209-00	.87
1.17 Nut, Frame	8	1110701-00	.87
1.18 Bolt, Frame	8	1110702-00	.87
1.19 Washer, Frame	8	1110703-00	.87
1.20 Bolt, Platen	2	1110601-00	1.47
1.21 Washer, Platen	2	1110602-00	1.07
1.22 Platen	1	1110600-02	
1.23 Shim, Platen	1	1110610-00	4.16
1.24 Bolt, Carriage Motor	3	1113101-00	1.07
1.25 Washer, Carriage Motor	3	1113102-00	.87
1.26 Bolt, Paper Feed Motor, Loudspeaker	3	1114101-00	.87
1.27 Washer, Paper Feed Motor	6	1114102-00	.87
1.28 Loudspeaker	1	1114103-00	7.63
1.29 Rubber Bumper	2	1114104-00	9.17
1.30 Star Washer	5	1114105-00	1.07
1.31 Fuse Holder	1	1114106-00	3.48
SECTION 2.0			
PRINT HEAD ASSEMBLY	1	1112900-00	849.84
2.01 Carriage Sub-Assembly	1	1111000-00	300.00
2.01.01 Frame, Carriage	1	1111100-00	187.94
2.01.02 Supports, Ribbon	2	1111230-00	13.84
2.01.03 Lower Bearing Sub-Assembly	3	1111200-00	16.93
2.01.03.01 Sprint Clip, Bearing	1	1111201-00	4.07
2.01.03.02 Shim, Clip	1	1111202-00	2.87
2.01.03.03 Mount Plate	1	1111203-00	2.89
2.01.03.04.E-Ring	2	1111204-00	1.07
2.01.03.05 Bearing	1	1111205-00	6.89
2.01.03.06 Shaft, Bearing	1	1111206-00	3.09
2.01.03.07 Screw	2	1111207-00	1.07
2.01.04 Bearing, Upper	5	1111103-00	7.62
2.01.05 Bushing, Bearing	5	1111104-00	4.09
2.01.06 Rivet, Bearing	4	1111101-00	3.18
2.01.07 Stud, Bearing, Rear	1	1111102-00	3.18
2.01.08 Hold Down, Ribbon	1	1111220-00	9.16
2.01.09 Ribbon Motor Drive Sub-Assembly	1	1111210-00	87.42
2.01.09.01 Motor	1	1111211-00	57.42
2.01.09.02 Spring, Tension	1	1111212-00	3.18
2.01.09.03 Clamp	1	1111213-00	4.09
2.01.09.04 Coupling	1	1111214-00	26.85
2.01.09.05 Screw	2	1111215-00	1.07
2.01.10 Clip, Drive Belt To Carriage	1	1111105-00	2.09
2.01.11 Screw, Drive Belt Clip	2	1111106-00	1.07
2.01.12 Spring, Cable Clip	2	1111110-00	2.18
2.01.13 Spring, Cable	1	1111120-00	14.68
SECTION 2.02			
Print Head Sub-Assembly	1	1112000-00	549.84
2.02.01 Block, Head	1	1112100-00	186.14
2.02.02 Coil Assembly	7	1112200-00	49.84
2.02.02.01 Clapper	1	1112250-00	N/A
2.02.02.02 Frame, Clapper	1	1112260-01	N/A
2.02.02.02.01 Center Post	1	1112261-00	N/A
2.02.02.03 Retainer, Clapper	1	1112270-00	N/A
2.02.02.04 Shim, Clapper	1	1112290-00	N/A
2.02.02.05 Spring, Retainer, Clapper	1	1112280-00	N/A
2.02.02.06 Coil	1	1112275-00	12.86
2.02.03 Print Wire (Set of 7)	7	1112300-00	30.59
2.02.04 Guide, Wire, Rear	1	1112310-00	18.97
2.02.05 Guide, Wire Inner-Middle	1	1112320-00	15.16
2.02.06 Guide, Wire, Inner-Front	1	1112330-00	14.08
2.02.07 Tube, Wire Guide	7	1112340-00	6.46
2.02.08 Ruby, Guide, Front	1	1112360-00	26.50
2.02.09 Spring, Wire (Set of 7)	7	1112350-00	8.75
2.02.10 Stand-offs, Spring	7	1112355-00	3.24
2.02.11 Dust Cover	1	1112110-00	5.16
2.02.12 Screw, Dust Cover	2	1112111-00	1.07
2.02.13 18-pin	1	1112210-00	8.16
2.02.14 Contact Pins	21	1112220-00	1.03
SECTION 3.0			
COVER ASSEMBLY	1	1160000-01	214.67
3.02 Bottom, Cover, Bottom Feed	1	1160150-00	186.50
3.02.01 Feet	4	1160110-00	4.16
3.02.02 Clips, Mounting	2	1161100-00	2.18
3.03.04 Screws, Mounting	2	1161101-00	1.07
3.02.04 Washers, Mounting	4	1161102-00	.87
3.02.05 Switch, Power	1	1160120-00	9.67
3.02.06 Switch, Power	1	1160120-01	9.67
3.03 Cover, Top	1	1160200-00	138.00
3.03.01 Latch, Mounting	2	1161200-00	6.15
3.03.02 Screw, Mounting	2	1161201-00	1.07
3.03.03 Washer, Mounting	4	1161202-00	.87
3.03.04 Cover Top	1	1162000-00	114.00
3.03.04.01 Screws, Mounting	4	1162010-00	1.07
3.03.04.01 Nut, Mounting	4	1162011-00	.87
3.03.05 Cover, Access	1	1160300-00	27.16
3.03.05.01 Hood, Accoustic	1	1160320-00	18.24
SECTION 4.0			
KEYBOARD	1	1140000-01	247.50
4.01 Switches (specify location)	N/A	1140100-00	5.07
4.02 Keytops	N/A	1140200-00	3.16
4.03 Encoder, I.C.		1140300-00	47.18
4.04 Resistor, IC	2	1140400-00	8.97
4.05 Connector, 34-pin	1	1140500-00	9.07
SECTION 5.0			
POWER SUPPLY	1	1120000-00	N/A
5.01 Transformer (110VAC @ 60HZ)	1	1120100-01	49.82
5.02 Transformer (220VAC @ 50HZ)	1-opt	1120200-00	79.64
5.03 Rectifier, Bridge	3	1120300-00	14.68
5.04 Capacitor, 15,000 mfd. @ 15V	1	1120400-00	18.94
5.05 Capacitor, 15,000 mfd. @ 30V	2	1120410-00	18.17
5.06 Capacitor, 7,500 mfd. @ 60V	2	1120420-00	18.37
5.07 Card, Regulator	1	1131000-00	74.89
5.07.01 Transistor, AO5	1	1131100-00	3.79
5.07.02 Transistor, A55	1	1131110-00	3.42
5.07.03 Transistor, 2955k	1	1131120-00	4.68
5.07.04 Regulator, 7805/LM-340T-5	2	1131130-00	15.68
5.07.05 Regulator, 7912/LN-320T-12	1	1131140-00	12.49
5.07.06 Precision Resistor, 1.0k @ 1%	2	1131200-00	2.05
5.07.07 Precision Resistor, 0.75 @ 5W @ 1%	1	1131210-00	4.79
5.07.08 Precision Resistor, 1.0 @ 2W @ 1%	1	1131200-00	3.26
5.07.09 Regulator, 7812/LM-340T-12	1	1131221-00	3.39

DESCRIPTION	QTY. REQUIRED PER TERMINAL	PART NUMBER	UNIT PRICE
SECTION 6.0			
DIGITAL CARD	1	1132000-00	550.00
6.01 8080 Integrated Circuit	1	1132010-00	55.00
6.02 8255 Integrated Circuit	3	1132020-00	28.60
6.03 8251 Integrated Circuit	1	1132030-00	28.70
6.04 8224 Integrated Circuit	1	1132040-00	19.85
6.05 8228 Integrated Circuit	1	1132050-00	19.05
6.06 2102 Integrated Circuit	8	1132060-00	12.18
6.07 NE556A Integrated Circuit	1	1132200-00	8.75
6.08 MC1488 Integrated Circuit	1	1132210-00	6.87
6.09 MC1489 Integrated Circuit	1	1132220-00	6.87
6.10 Dip Switch	1	1132230-00	12.49
6.11 Crystal	1	1132070-00	16.84
6.12 Connector, 34-pin	1	1132600-00	12.89
6.13 Connector, 50-pin	1	1132610-00	15.67
6.14 Connector, 10-pin, Right angle	1	1132620-00	8.09
6.15 Precision 1% Resistors (specify value)	N/A	1132500-00	2.07
6.16 Precision 2% Capacitors (specify value	N/A	1132550-00	8.67
6.17 14-02-103 Resistor Network (10K)	1	1132700-00	12.87
6.18 14-102-332 Resistor Network (3.3K)	1	1132710-00	12.16
6.19 Misc 5% Resistors (specify value)	N/A	1132300-00	.87
6.20 Misc Capacitors (specify value)	N/A	1132350-00	1.27
6.21 Misc. 7400 Series Integrated Circuit	N/A	1132400-00	4.67
SECTION 7.0			
ANALOG CARD	1	1130000-00	450.00
7.01 324 Integrated Circuit	4	1130200-00	6.85
7.02 1408L6	1	1130210-00	5.26
7.03 311	1	1130220-00	4.87
7.04 FSA2510M	2	1130250-00	9.62
7.05 FSA2719M	2	1130260-00	9.61
7.06 LDP 14-02-332 (3.3K)	1	1130270-00	12.87
7.07 LDP 16-01-102 (1K)	1	1130280-00	12.87
7.08 LDP 16-01-103 (10K)	1	1130290-00	12.87
7.09 Transistor, A05	8	1130100-00	3.79
7.10 Transistor, A55	5	1130110-00	3.42
7.11 Transistor, 6035/TIP-115*	2	1130120-00	5.67
7.12 Transistor, 6038/TIP-110*	2	1130130-00	4.98
7.13 Transistor, 6040/9402	1	1130140-00	6.18
7.14 Transistor, 6045/9301	7	1130150-00	3.87
7.15 Transistor, 6043	1	1130160-00	4.07
7.16 Switch, Control	2	1130010-00	3.16
7.17 Connector, 24-pin, right angle	2	1130300-00	8.16
7.18 Head Sink (6035/6038)	1	1130500-00	33.47
7.19 Heat Sink (TIP-110/TIP-115)	1	1130500-01	33.47
7.20 Choke	3	1130350-00	3.16
7.21 Misc. Precision 1%, Resistor (specify Value)	N/A	1130400-00	2.07
7.22 Misc. 5% Resistors ½W (specify value)	N/A	1130450-00	.87
7.23 Misc. Diodes (specify value)	N/A	1130600-00	2.03
7.24 Misc. Capacitors	N/A	1130650-00	1.07
7.25 Pico-Fuses 1.5A	7	1130020-00	2.08
7.26 Pico-Fuses 5.0A	1	1130030-00	2.08
7.27 Resistor, Wire-Wound, .5, 3W, 1%	7	1130040-00	3.16
7.28 Resistor, Wire-Wound, 1, 2W, 1%	2	1130050-00	2.87
SECTION 8.0			
CABLE CONVERTER CARD	1	1134000-00	49.75
SECTION 9.0			
CABLES			
9.01 Analog to digital Card (long)	1	1150101-00	16.89
9.02 Analog to digital Card (short)	1	1150100-00	16.14
9.03 Keyboard (long/short - specify)	1	1150200-00	24.69
NOTE: Long for keyboard #1140000-00 short for keyboard #1140000-01 - w/relocated connector)			
9.04 Option Card	1-opt	1150300-00	18.75
9.05 AC Power	1	1150600-00	9.82
9.06 RS-232C	1-opt	1150500-00	25.00
9.07 Power Supply Harness	1		
9.08 D.C. Distribution Harness	1		
SECTION 10.0			
RIBBON CARTRIDGE (6-pack)		1190100-01	30.00
10.1 Cover, Top	1	1190110-00	
10.2 Cover, Bottom	1	1190120-00	
10.3 Pinch Roller	1	1190130-00	
10.4 O-Rings	2	1190140-00	
10.5 Clip, Right	1	1190150-00	
10.6 Clip, Left	1	1190160-00	
10.7 Guide, Pinch Roller	1	1190170-00	
10.8 Ribbon	1	1190180-00	
SECTION 11.0			
DOCUMENTATION			
11.1 Operator's Manual	1	1100100-00	15.00
11.2 Maintenance Manual	N/A	1100500-00	85.00
11.3 Maintenance, Video Tape	N/A	1100530-00	1,000.00
11.4 Recorder, Video Tape	N/A	1100540-00	1,500.00
SECTION 12.0			
TERMINAL EXERCISER	N/A	1180100-00	1,800.00
SECTION 13.0			
MISCELLANEOUS			
13.1 Shipping Carton	1	1191000-00	37.50

NOTES:

A. All prices are F.O.B. Charlotte, North Carolina.

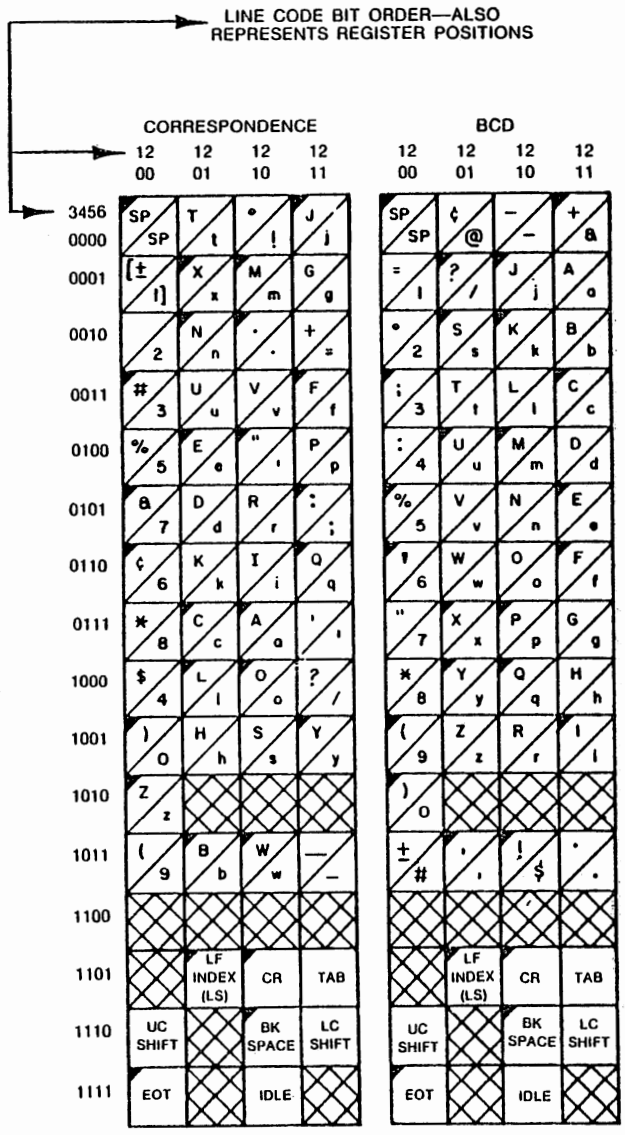
B. All prices are subject to change without notice.

C. Minimum parts order is $100.00.

8.2 Appendix - B
USASCII CODE CHART

b7 b6 b5 / Bits	000	001	010	011	100	101	110	111
b4 b3 b2 b1 / COLUMN / ROW	0	1	2	3	4	5	6	7
0 0 0 0	0 NUL	1 DLE	2 SP	3 0	4 @	5 P	6 `	7 p
0 0 0 1	1 SOH	1 DC1	2 !	3 1	4 A	5 Q	6 a	7 q
0 0 1 0	2 STX	1 DC2	2 "	3 2	4 B	5 R	6 b	7 r
0 0 1 1	3 ETX	1 DC3	2 #	3 3	4 C	5 S	6 c	7 s
0 1 0 0	4 EOT	1 DC4	2 $	3 4	4 D	5 T	6 d	7 t
0 1 0 1	5 ENQ	1 NAK	2 %	3 5	4 E	5 U	6 e	7 u
0 1 1 0	6 ACK	1 SYN	2 &	3 6	4 F	5 V	6 f	7 v
0 1 1 1	7 BEL	1 ETB	2 '	3 7	4 G	5 W	6 g	7 w
1 0 0 0	8 BS	1 CAN	2 (	3 8	4 H	5 X	6 h	7 x
1 0 0 1	9 HT	1 EM	2)	3 9	4 I	5 Y	6 i	7 y
1 0 1 0	10 LF	1 SUB	2 *	3 :	4 J	5 Z	6 j	7 z
1 0 1 1	11 VT	1 ESC	2 +	3 ;	4 K	5 [	6 k	7 {
1 1 0 0	12 FF	1 FS	2 ,	3 <	4 L	5 \	6 l	7 |
1 1 0 1	13 CR	1 GS	2 -	3 =	4 M	5]	6 m	7 }
1 1 1 0	14 SO	1 RS	2 .	3 >	4 N	5 ^	6 n	7 ~
1 1 1 1	15 SI	1 US	2 /	3 ?	4 O	5 _	6 o	7 DEL

8.3 APPENDIX - C
IBM CORRESPONDENCE/EBCD CODE CHARTS



APPENDIX - D

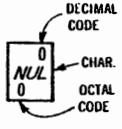
APL-ASCII TYPEWRITER-PAIRING TRANSMISSION CODES
ARBOUT VALUE IS ROW+16×COL

(SECOND THREE BINARY BITS)

FIRST FOUR BINARY BITS

	0	1	2	3	4	5	6	7
0	0 NUL 0	16 DLE 20	32 SP 40	48 0 60	64 — 100	80 ⋆ 120	96 ◊ 140	112 P 160
1	1 SOH 1	17 DC1 21	33 ¨ 41	49 1 61	65 a 101	81 ? 121	97 A 141	113 Q 161
2	2 STX 2	18 DC1 22	34) 42	50 2 62	66 ⊥ 102	82 P 122	98 B 142	114 R 162
3	3 ETX 3	19 DC3 23	35 < 43	51 3 63	67 n 103	83 r 123	99 C 143	115 S 163
4	4 EOT 4	20 DC4 24	36 ≤ 44	52 4 64	68 104	84 ~ 124	100 D 144	116 T 164
5	5 ENQ 5	21 NAK 25	37 = 45	53 5 65	69 ε 105	85 ↓ 125	101 E 145	117 U 165
6	6 ACK 6	22 SYN 26	38 > 46	54 6 66	70 _ 106	86 u 126	102 F 146	118 V 166
7	7 BEL 7	23 ETB 27	39] 47	55 7 67	71 ∇ 107	87 w 127	103 G 147	119 W 167
8	8 BS 10	24 CAN 30	40 v 50	56 8 70	72 Δ 110	88 ∪ 130	104 H 150	120 X 170
9	9 HT 11	25 EM 31	41 ^ 51	57 9 71	73 ι 111	89 ↑ 131	105 I 151	121 Y 171
10	10 LF 12	26 SUB 32	42 ≠ 52	58 (72	74 ∘ 112	90 ⊂ 132	106 J 152	122 Z 172
11	11 VT 13	27 ESC 33	43 ÷ 53	59 [73	75 , 113	91 ← 133	107 K 153	123 { 173
12	12 FF 14	28 FS 34	44 , 54	60 ; 74	76 □ 114	92 ⊢ 134	108 L 154	124 ⊣ 174
13	13 CR 15	29 GS 35	45 + 55	61 × 75	77 ! 115	93 → 135	109 M 155	125 } 175
14	14 SO 16	30 RS 36	46 . 56	62 : 76	78 ⊤ 116	94 ≥ 136	110 N 156	126 $ 176
15	15 SI 17	31 US 37	47 / 57	63 \ 77	79 o 117	95 − 137	111 O 157	127 DEL 177

NOTE: 19 DIFFERENCES EXIST BETWEEN THE TWO CONVENTIONS.



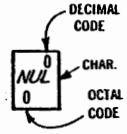
APL-ASCII BIT-PAIRING TRANSMISSION CODES
ARBOUT VALUE IS ROW+16×COL.

(SECOND THREE BINARY BITS)

FIRST FOUR BINARY BITS

	0	1	2	3	4	5	6	7
0	0 NUL 0	16 DLE 20	32 SP 40	48 0 60	64 ← 100	80 ⋆ 120	96 → 140	112 P 160
1	1 SOH 1	17 DC1 21	33 ¨ 41	49 1 61	65 a 101	81 ? 121	97 A 141	113 Q 161
2	2 STX 2	18 DC2 22	34 ¯ 42	50 2 62	66 ⊥ 102	82 P 122	98 B 142	114 R 162
3	3 ETX 3	19 DC3 23	35 < 43	51 3 63	67 n 103	83 r 123	99 C 143	115 S 163
4	4 EOT 4	20 DC4 24	36 ≤ 44	52 4 64	68 L 104	84 ~ 124	100 D 144	116 T 164
5	5 ENQ 5	21 NAK 25	37 = 45	53 5 65	69 ε 105	85 ↓ 125	101 E 145	117 U 165
6	6 ACK 6	22 SYN 26	38 ≥ 46	54 6 66	70 _ 106	86 u 126	102 F 146	118 V 166
7	7 BEL 7	23 ETB 27	39 ∨ 47	55 7 67	71 ∇ 107	87 w 127	103 G 147	119 W 167
8	8 BS 10	24 CAN 30	40 z 50	56 8 70	72 Δ 110	88 ∪ 130	104 H 150	120 X 170
9	9 HT 11	25 EM 31	41 ^ 51	57 9 71	73 ι 111	89 ↑ 131	105 I 151	121 Y 171
10	10 LF 12	26 SUB 32	42) 52	58] 72	74 ∘ 112	90 ⊂ 132	106 J 152	122 Z 172
11	11 VT 13	27 EST 33	43 (53	59 [73	75 , 113	91 ⊤ 133	107 K 153	123 ⊣ 173
12	12 FF 14	28 FS 34	44 , 54	60 ; 74	76 □ 114	92 ◇ 134	108 L 154	124 ⊢ 174
13	13 CR 15	29 GS 35	45 + 55	61 − 75	77 ⌈ 115	93 ⌊ 135	109 M 155	125 } 175
14	14 SO 16	30 RS 36	46 . 56	62 : 76	78 ⊤ 116	94 × 136	110 N 156	126 ÷ 176
15	15 SI 17	31 US 37	47 / 57	63 \ 77	79 o 117	95 ^ 137	111 O 157	127 DEL 177

NOTE: 19 DIFFERENCES EXIST BETWEEN THE TWO CONVENTIONS.



8.5 APPENDIX - E
CONTROL/FUNCTION KEY INDEX

This section consists of an alphabetical index of the control and function keys on the SuperTerm keyboard with a description of the operation and use of each key.

[BELL 202C]
If your terminal is to be operated with a Bell Telephone model 202C, S, or T data set, them this option must be requested at time of order. When the SuperTerm is used with a 202C or protocol equivalent modem then this switch must be depressed. When depressed, the terminal is in half duplex mode and accomplishes line turn around using the reverse channel technique. When using the terminal with modems not using a reverse channel this switch must be off. When off, the terminal may be said to be operating in full duplex mode. Local Copy (sometimes incorrectly called "half duplex") may be then activated using the [LOCAL COPY] switch.

[BREAK]
when this key is depressed, a tone 250 ms. long is transmitted over the serial data out line. The host system, in turn, recognizes this as a break character.

[CNTL]
This key when depressed in conjunction with one of the alphanumeric keys, generates the corresponding control character.

[CODE]
This key is used to initiate a "CODE SEQUENCE". The "CODE" key must be held down while the appropriate sequence is entered.

[ENA TAPE]
This switch, when depressed, enables writing on the Supercette tape device. As such, its function is that of write protecting the Supercette tape cartridge.

[ESC]
This key generates the ESCAPE character.

[DEL]
This key generates the DEL (DELETE) character.

[FORM DOWN]
Moves the form down in increments of 1/48" for each depression.

[FORM UP]
Moves the form up in increments of 1/48" for each depression.

["GOLD"]
This key is used to "shift" the keypad. The engraved gold character is generated when the "gold" key is held down and the key depressed.

[INDEX]
Causes the form to advance upward one line (linefeed).

[LCV]
Depression of this key (Last Character Visibility) causes the print head to space to the right and thereby allows the operator to view the last character entered. Note that the head will automatically reposition ifself to its original position when the LCV switch is again depressed or the next character is received.

[LOCAL]
When this switch is depressed the terminal may be used as a normal electric typewriter in that as each key on the keyboard is depressed, its corresponding legend will be printed by the printer. Note that when programming, all ESCAPE sequences (and selected Code Sequences) that are entered by the operator from the keyboard must be entered only when the terminal is in LOCAL mode.

[LOCAL COPY]
When this switch is depressed, the terminal will print each character as it is typed from the keyboard. When not depressed, data entered from the keyboard is not printed at the terminal but is transmitted to the host system.

[PAPER ADV]
Depression of this key results in the paper being continuously advanced.

[READY]
This is a momentary action switch (non-latching) which when depressed resets microprocessor's internal status registers, clears left and right margins and restores the printer to column zero. Note, however, that depression of this switch does not affect tab or form settings. Resetting of these options may be accomplished using the power-on reset sequence: Code P/p.
Located in the top half of the [READY] key is a small light. When on, this light indicates that data entered from the keyboard or received from the host system will be printed by the terminal. When the [LOCAL] switch on the keyboard is depressed this light should be on.
When [LOCAL] is not depressed, the lamp will be illuminated only when a carrier is detected from the host system or will remain illuminated if the carrier detect feature has been overriden by a dipswitch setting. Please refer to the Dipswitch Status Register section of this manual for further clarification concerning dipswitch status.

[RPT]
When depressed this key will cause the last character to be processed repeatedly.

[UCA]
When depressed this switch forces all alpha characters to upper case regardless of the position of the shift key.