TM 11-7010-200-10-4

TECHNICAL MANUAL

OPERATION AND MAINTENANCE MANUAL

FOR

TEST SET TS-3596/GYX

DAAB03-75-C-0505

HEADQUARTERS, DEPARTMENT OF THE ARMY

NOVEMBER 1979

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" # AO049 (1)
" # SC392 (3)
" # JO861 (10)
" # CO214 (2)

NG: NONE

USAR: NONE

For explanation of abbreviations see, AR 310-50.

INTRODUCTION

1. GENERAL. - The information contained in this manual describes the Test Set TS-3596/GYX, manufactured under contract number DAAB03-75-C-0505.

2. SCOPE AND PURPOSE OF MANUAL. - This manual contains all information necessary for the installation, operation, and maintenance of the equipment. The contents of chapters 1 through 5 are described below. The appendices to the manual contain the signal test points, program listings, and reference alphabets.

Chapter 1. Description of Equipment. - This chapter provides a general description of the equipment, its security classification, and its characteristics.

Chapter 2. Installation. - This chapter contains installation procedures for the equipment. The installation procedures include step-by-step procedures for initial inspection and connection to the Optical Character Reader RP238/GYX.

Chapter 3. Operating Instructions. - This chapter contains information required to operate the equipment, including a description of the operating controls, indicators, and operating instruct ions,

Chapter 4. Principles of Operation. - This chapter provides the functional system operation and the functional operation of electronic circuits in the order of signal flow.

Chapter 5. PREVENTIVE MAINTENANCE. - This chapter provides all the necessary preventive maintenance procedures that should be performed to prevent major: equipment failures. Included in this chapter are preventive maintenance schedules and instructions for periodic inspection and cleaning.

Illustrated Parts Breakdown. TO 31S5-4-516-14 is an Illustrated Parts Breakdown of all parts contained in the Test Set.

3. RELATED PUBLICATIONS. - The following is a list of documents used in the preparation of this manual,

MILITARY STANDARDS:	
MIL-STD-12	**Abbreviations for Use on Drawings and in Technical-Type Publications.**
MIL-STD-15	**Electrical and Electronic Symbols.**
MIL-STD-188	**Military Communication System Technical Standards.**
MIL-STD-806	**Graphic Symbols for Logic Diagrams.**
HANDBOOKS:	
H4-1	**Federal Code to Manufacturers (Name to Code)**
H4-2	**Federal Code to Manufacturers (Code to Name)**
H6-1	**Federal Item Identification Guide for Supply Cataloging.**
AMERICAN ASSOCIATION STANDARDS:	
USAY32.16-1965	**Electrical and Electronic Reference Designations.**

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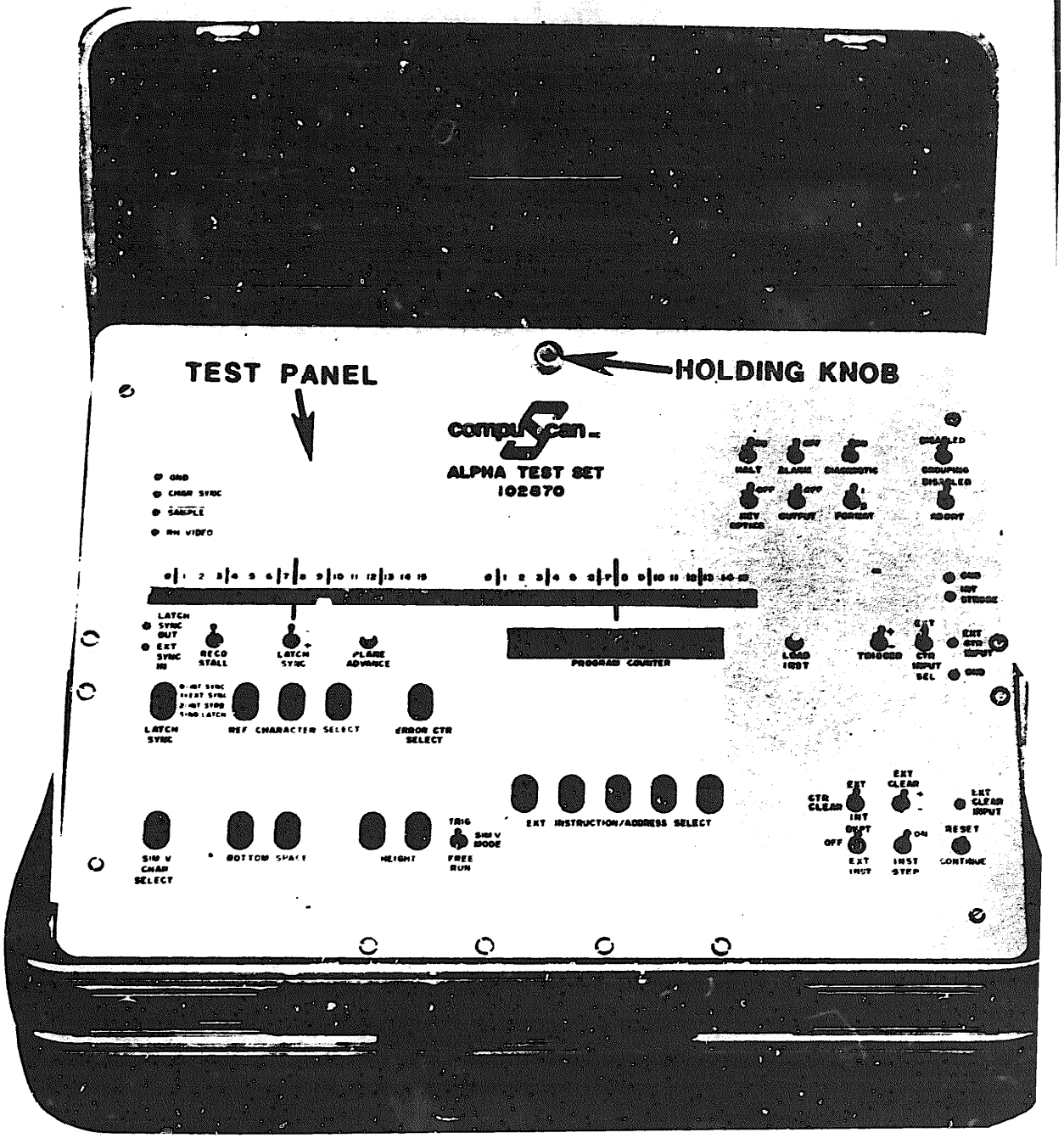


Figure 1-1. Test Set TS-3596/GYX

CHAPTER 1

DESCRIPTION OF EQUIPMENT

1-1. SECURITY CLASSIFICATION. - The Program Test Set TS-3596/GYX, hereafter referred to as the Test Set, including all its assemblies and subassemblies, is unclassified.

1-2. PURPOSE OF EQUIPMENT. - The purpose of the Test Set (Figure 1-1) is to assist the maintenance technician in localizing a malfunction within the RP238/GYX Optical Character Reader. Various diagnostic circuits built into the Test Set enable the technician to check the following ALPHA functions:

a. monitor the locations and instruction words in the ALPHA's microprocessor,

b. Inspect scanned unknown characters or any one of the preprogrammed reference characters.

c. Stop the program at any desired breakpoint.

d. Substitute an instruction with a program jump command.

e. Replace the normal scanning information with simulated video.

f. Monitor the various hardware latches and counters-

1-3. PHYSICAL DESCRIPTION. - The Test Set is completely contained in a lockable carrying case, seven inches in height, eighteen and a half inches wide, and fourteen and a half inches deep; the total weight is approximately 40 pounds. The contents of the Test Set are listed in Table 1-1.

TABLE 1-1

Test Set Contents

Amount	Contents
1	Carrying Case
1	Control Panel
2	Printed Circuit Cards
2	Foam Blankets
1	Diagnostic Printed Circuit Cards
1	Extender Board
7	Cables consisting of: A. 1-3 wire cable (power cable) B. 1-20 pin ribbon cable C. 4-40 pin ribbon cables D. 1-34 pin short ribbon cable connecting the two printed circuit boards of the test panel
1	Plastic Box containing: A. 10-wire jumpers B. 2-blue I.C. extender clips C. 4-small red plugs D. 2-keys (for case locks) E. 1-clutch locating tool CompuScan part number 101907

CHAPTER 2

INSPECTION AND CONNECTION

2-1. INSPECTION. -

a. Open Test Set case by depressing the two latches located on either side of the carrying handle-

b. Check latches for ability to open and latch properly. Leave case in open position.

c. Unhook holding knob (Figure 1-1) and check underneath test panel for the following:

(1) foam blankets

(2) 1 diagnostic printed circuit card

(3) 1 extender board

(4) 7 cables consisting of:

(a) 1-3 wire cable (power cable)

(b) 1-20 pin ribbon cable

(c) 4-40 pin ribbon cables

(d) 1-34 pin short ribbon cable connecting the two printed circuit boards of the test panel

d. Check upper half of case for plastic box containing the following items :

(1) 2 foam pads secured to the top and bottom of the box

(2) 10 wire jumpers

(3) 2 blue I.C. extender clips

(4) 4 smal red plugs

(5) 2 keys (for case locks)

(6) 1 clutch locating tool CompuScan part number 101907

e. Check for ease of locking and unlocking of the test panel to the lower half of the case.

f. Check for binding of all toggle switches. Note that toggle switches BKPT/OFF/EXT INST and RESET/CONTINUE have three positions with the latter being momentary in the upper and lower positions.

g. Check the following rotary switches for non-binding:

(1) SIM V CHAR SELECT - selects and displays 0-7.

(2) BOTTOM SPACE (2) - both select and display the numbers 0-9 with no stops,

(3) HEIGHT (2) - both select and display the numbers 0-9 with no stops.

(4) LATCH SYNC - selects and displays the numbers 0-3 only.

(5) REF CHARACTER SELECT (3) - all select and display the numbers 0-7 only.

(6) ERROR CTR SELECT - selects and displays numbers 0-7 only.

(7) EXT INSTRUCTION/ADDRESS SELECT (5) - the four right switches select and display the numbers 0-7 only; the one left most switch selects and displays 0 and 1 only.

h. Check the following push buttons for clicking sound when depressed:

(1) PLANE ADVANCE

(2) LOAD INST

i. Check the two plastic window displays for broken or missing panes.

j. Inspect the Diagnostic Program P.C. Card for:

(1) Any cracked or broken glass panes on program chips

(2) Any broken capacitors

k. Check Extender Card for:

(1) Tightness of the two white guides

(2) Tightness of the black connector

l. Check that the two keys are able to lock and unlock the catches on the handle side of the case.

2-2. INSTALLATION/CONNECTION. -

a. Test Set Stand Alone. -

(1) Turn power OFF on ALPHA.

(2) Connect Test Set multicolored three-wired power cable to connector J204 located in power supply of ALPHA.

(3) Connect Test Set cable J4 to connector J29 or, the chip side of the Main Wire Wrap P.C. Card of ALPHA.

(4) Place all toggle switches on Test Set to down position with the exception of BKPT/OFF/EXT INST which should be in OFF position.

b. **Test Set with Diagnostic Program.**

(1) Turn power OFF on ALPHA.

(2) connect Test Set multicolored three-wired power cable to connector J204 located in power supply of ALPHA,

(3) Connect Test Set cable J4 to connector J29 on the chip side of the Main Wire Wrap P.C. Card of ALPHA,

(4) Place all toggle switches on Test Set to down position with the exception of BKPT/OFF/EXT INST which should be in OFF position,

(5) Remove ALPHA's Program Board J46.

(6) Insert Diagnostic Program P.C. Card into slot J46.

(7) On Test Set place DIAGNOSTIC switch to the ON position.

2-3. **INTERCONNECTION BETWEEN TEST SET AND ALPHA.** - When using the Test Set in conjunction with the ALPHA it is necessary to connect the two devices via the ribbon cables supplied in the Set. Figure 2-1 identifies the various cables referred to in the instructions. Figure 2-2 identifies the various test connectors on the ALPHA which will be referred to in the instructions. Figure 2-3 denotes the pin configuration of the lest Set cables.

Note:- Whenever connecting a cable to ALPHA, ALWAYS connect the cable to the connectors on the CHIP side of the Main Wire Wrap Assembly. Also, when making the connection,

be careful to seat the connector correctly on the pins. Failure to do this will sometimes cause an individual pin or pins, to be pushed through the Main Wire Wrap P.C. Card.

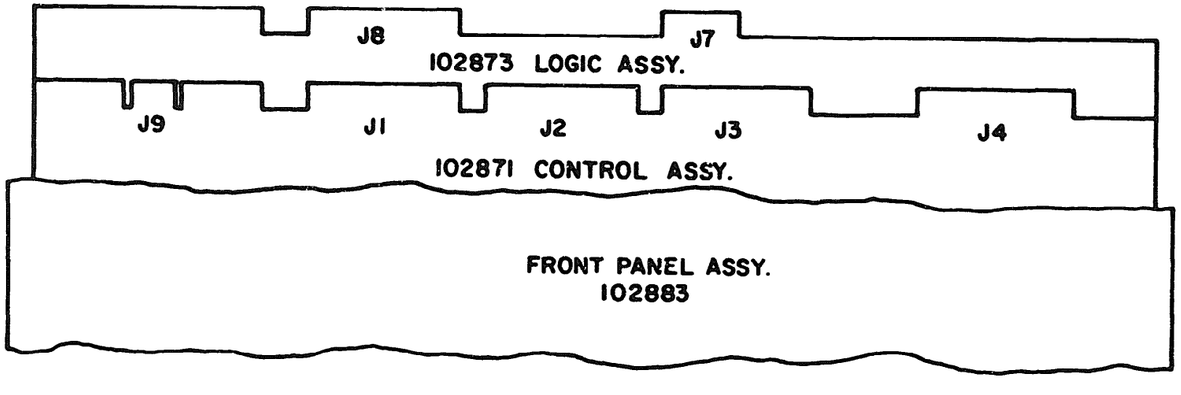


Figure 2-1. Cable Identification Diagram

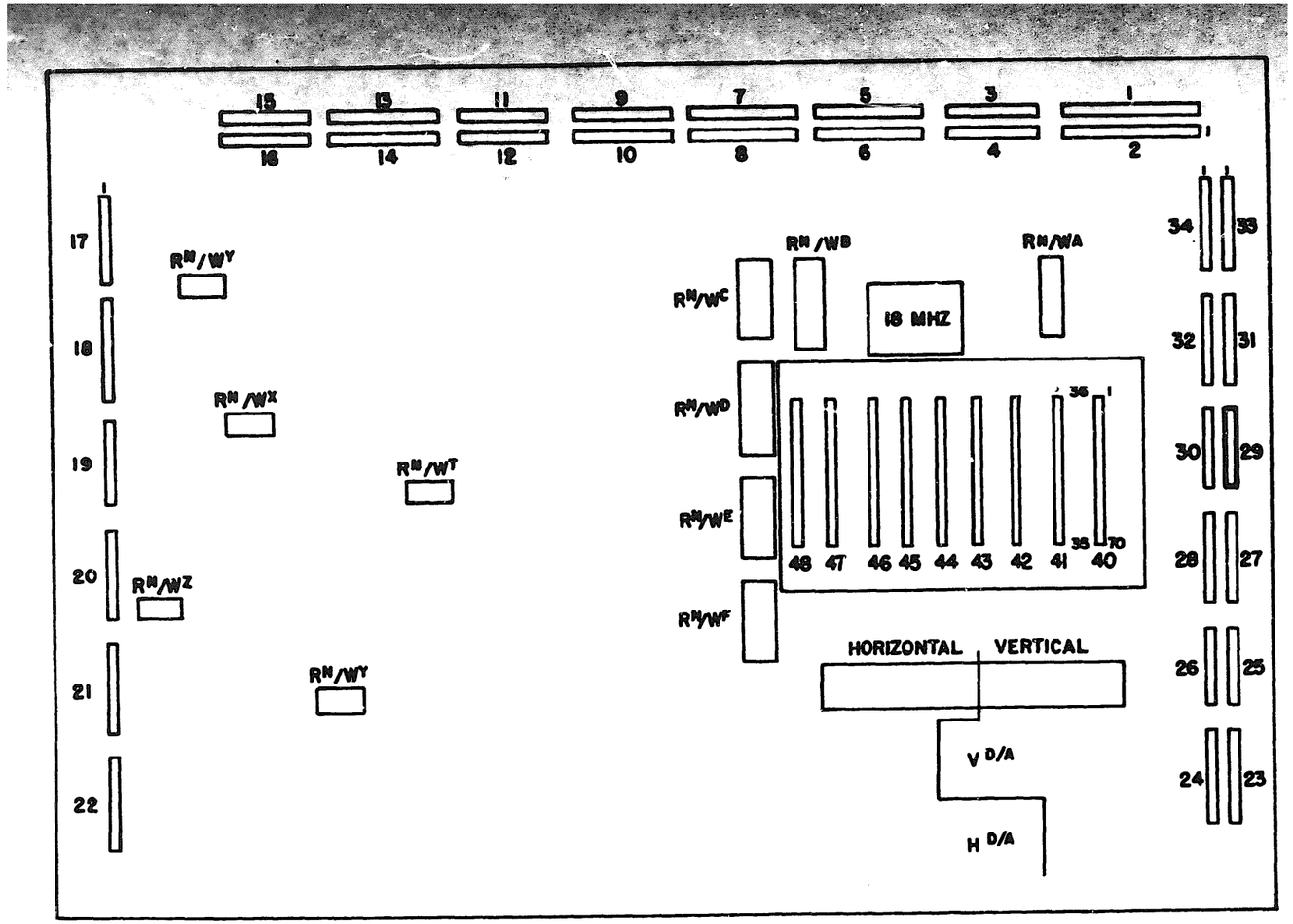


Figure 2-2. Main Wire Wrap Card Test Connector Locations

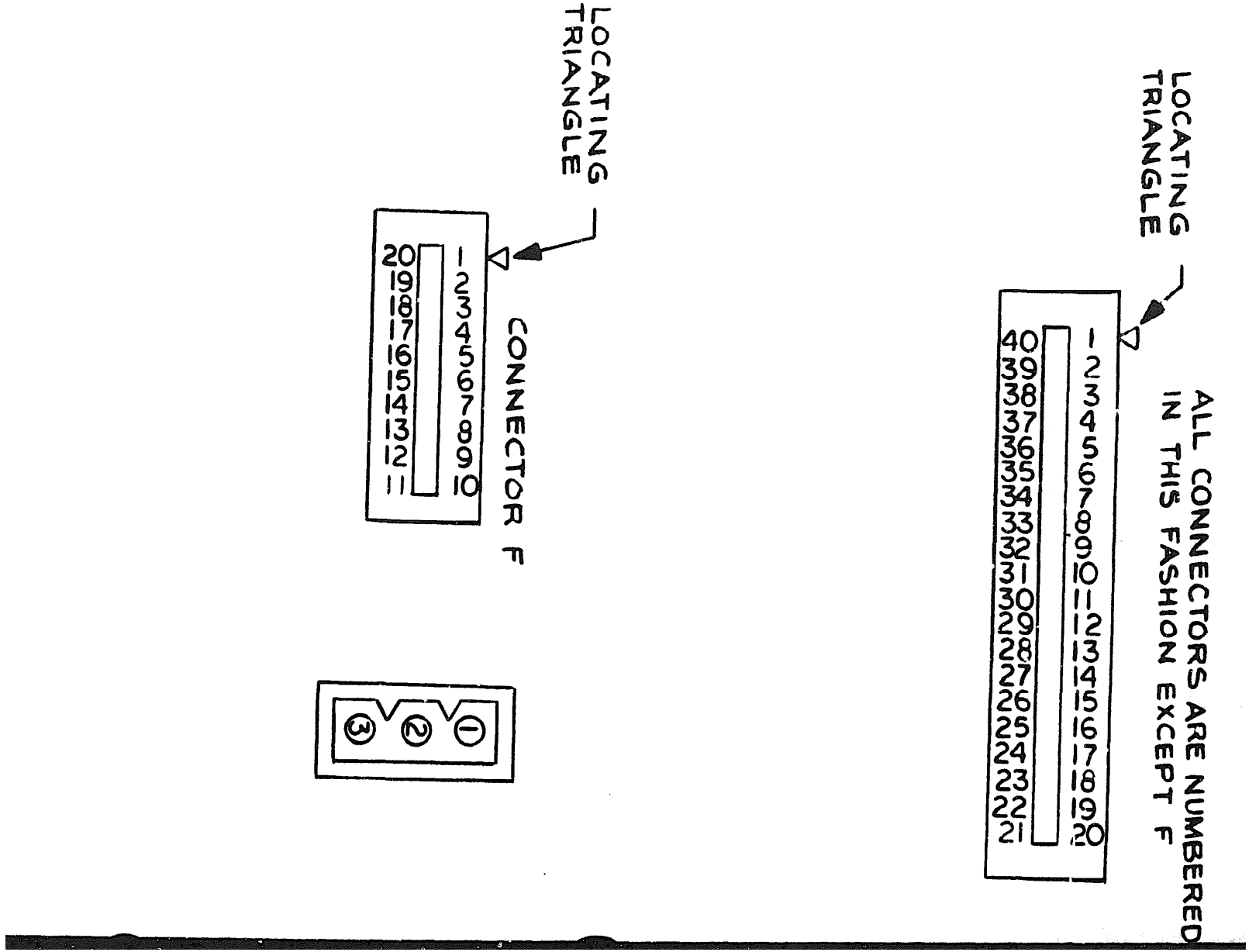


Figure 2-3. Cable Pin Configuration

CHAPTER 3

OPERATING INSTRUCTIONS

3-1. CONTROLS AND INDICATORS. - All operating controls and indicators are located on the test panel. The functions of the controls and indicators and test points are described in Tables 3-1 and 3-2. (See Figure 3-1.)

3-2. OPERATING PROCEDURE. - While the Test Set is designed to exercise and/or test the majority of the ALPHA's soft and hardware the technician must first ascertain whether the need for the Set exists before hooking it up, This section establishes simple guidelines to help the technician in determining if a malfunction requires the aid of the Test Set and a way of troubleshooting it. Basically there are three ways to effectively troubleshoot the ALPHA:

a. With the regular Scanning Program

b. Test Set with regular Scanning Program

c. Test Set with Diagnostic Program

Before explaining any of these techniques, one should first make careful observation as to the nature of a malfunction. Many common problems can be located and remedied without involved troubleshooting procedures.

A majority of the malfunctions of the ALPHA can be attributed to operator error. Here the technician, while exploring the nature of a problem, must be careful that all switches are in the proper positions, that the copy is the correct font (OCR-A

or OCR-B) and that there are no obstructions in the paper path, Next, an interrogation of the operator is helpful. Were there any paper jams recently? Were the Header Sheets (code sheets) loaded lately? When did the machine act up? What did it do? Were there any error indications? If so, what? These are some of the questions the technician should ask.

After this initial questioning, one should follow Table 6-3 of the ALPHA maintenance manual to find where the machine, with regular Scanning Program, first deviates. Most, if not all, mechanical malfunctions can be identified by this method. If a malfunction cannot be isolated to operator error or a mechanical failure, then electrical/electronic troubleshooting must take place. Electrical problems will fall into two categories, constant and erratic.

a. Constant Type Problems, - Most constant type problems usually fall into three categories: microprocessor, recognition, and output. Problems in the microprocessor can be recognized by the machine's departure from the normal sequence of events (refer to the maintenance manual). Tracing the processor's activities can be executed by single stepping the Program and following either the Scan or Diagnostic Program listings supplied in this manual.

In that the ALPHA is a character recognition machine, people have a tendency, when it doesn't output correctly, to say that it isn't reading right (bad recognition), In a lot

of these cases, the character recognition circuits are functioning correctly and the data is mishandled somewhere else internally; for example, the Line Buffer, Core Memory, Output Macro, or the Interface. When poor character identification is suspected, the technician should first compare the LED Display on the Control Console against the first three characters of each line as it is scanned. If they contain the same characters then it can safely be assumed that the Macros in the recognition and evaluation circuitry are functioning correctly. The logic from the input to the Line Buffer to the Interface should then be tested and checked. If the display and the text do not match, the following procedure is suggested:

(1) With power OFF, remove the SRECO P.C. Card from slot J43 of the card cage on the Main Wire Wrap Board.

(2) Connect the Test Set (as described in the Stand Alone mode, chapter 2, of this manual).

(3) Place the DIAGNOSTIC switch to the ON position.

(4) Place the Format Panel Rotary switch to TEST A-

(5) Power up, toggle START and scan some text.

If the display and characters on the paper match, replace the SRECO Card. DO NOT, under any circumstances, operate the ALPHA under the above procedure with actual Message forms for it is not a TEMPEST approved mode of operation- If the characters do not agree, then the Scan and Recognition Diagnostic tests should be performed.

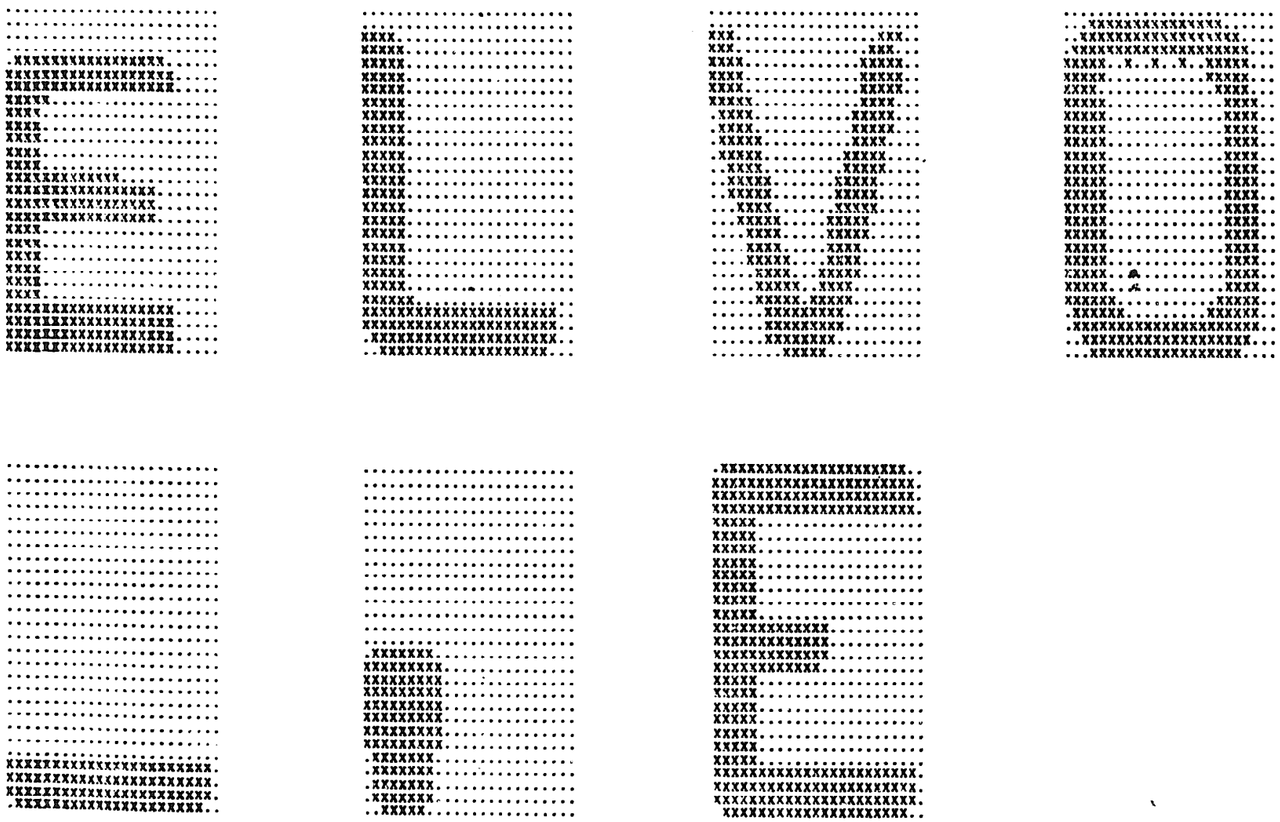


TABLE 3-1

Controls and Indicators

Switch	Position	Function
HALT	ON	Causes program to stop at one of various Halt instructions
	(DOWN)	No effect
KEY OPTICS *	OFF	When cable J4 is connected to J29 on ALPHA, Key Optics feature is disabled
	(DOWN)	No effect - except during certain diagnostic tests
ALARM	OFF	Disables audible alarm on ALPHA
	(DOWN)	Audible alarm is enabled
OUTPUT *	OFF	Disables ALPHA from outputting
	(DOWN)	Enables output
DIAGNOSTIC	ON	Disables random operation of ALPHA
	(DOWN)	No effect
FORMAT *	1	Used in certain diagnostic tests
	2	Used in certain diagnostic tests
GROUPING		Not Used
ABORT	DISABLED	Prevents recognition circuitry in ALPHA from aborting character comparisons
	(DOWN)	Allows recognition circuitry in ALPHA to abort character comparisons

* During some diagnostic tests, the functions of these switches vary.

TABLE 3-1

Controls and Indicators (continued)

Switch	Position	Function
EXT/CTR INPUT SEL	EXT	Selects "PROGRAM COUNTER" to be used as a straight counter clocked by any signal on "EXT CTR INPUT"
	CTR INPUT SEL	Selects "PROGRAM COUNTER" to display program count of ALPHA
TRIGGER	(+)	Allows Positive Trigger on "EXT CTR INPUT" to clock "PROGRAM COUNTER"
	(-)	Allows Negative Trigger on "EXT CTR INPUT" to clock "PROGRAM COUNTER"
CTR CLEAR	EXT	Allows a signal placed on EXT CLEAR INPUT to clear "PROGRAM COUNTER" display
	INT	When a value set in the EXT INSTRUCTION/ADDRESS SELECT switches equals the Program Counter display, the display is cleared
EXT CLEAR	(+)	Selects a Positive transition to clear the "PROGRAM COUNTER" display when the external clear is enabled.
	(-)	Selects a Negative transition to clear the "PROGRAM COUNTER" display when the external clear is enabled

TABLE 3-1

Controls and Indicators (continued)

Switch	Position	Function
BKPT/OFF/ EXT INST	BKPT	Enables the program Breakpoint feature. When the "PROGRAM COUNTER" display matches the value set in the EXT INSTRUCTION/ADDRESS SELECT the program in the ALPHA will halt.
	OFF	No effect
	EXT INST	Allows a previously loaded JUMP instruction to replace an instruction when Program Counter equals address selected in EXT INSTRUCTION/ ADDRESS SELECT
INST STEP	ON	Allows technician to step through the program in the ALPHA at an instruction at a time by pressing "CONTINUE" on the Test Set
	(DOWN)	Allows automatic instruction execution
RESET/CONTINUE	RESET	Resets the logic in the ALPHA (Same as RESET switch on Control Panel of ALPHA)
	CONTINUE	Aids operation in single stepping program in ALPHA
SIM V MODE	TRIG	Allows operation of Simulated Video feature to be synchronized with the STROBE 7 pulse issued by the Scanning Program
	FREE RUN	Allows the simulated video character to be fed to ALPHA asynchronously - used when troubleshooting Digital P.C. Card

TABLE 3-1

Controls and Indicators (continued)

Switch	Position	Function
ADDRESS SELECT		The four least significant dials may select an octal number from 0 to 7. The most significant dial may select 0 to 1. The dials have three separate functions depending upon desired test. 1. An address may be dialed which, when used with the Breakpoint feature, will generate a pulse at the INT STROBE test point. If BREAKPOINT is selected the ALPHA will be stopped prior to executing the instruction shown in the PROGRAM COUNTER and ADDRESS SELECT switches. 2. When using the External Instruction feature the JUMP instruction is entered into the Test Set via these dials. After the External Instruction is loaded via LOAD INST the address at which the External Instruction is to be executed at is entered into these dials. 3. When using PROGRAM COUNTER with External Counter Input a value may be placed in these dials which when the PROGRAM COUNTER equals them a signal will be supplied on the INT STROBE point.
LOAD INST		When the BKPT/OFF/EXT INST switch is placed in the EXT INST position and an External Instruction is placed in the EXT INSTRUCTION/ADDRESS 5ELECT switches, it is loaded via this push-button into a temporary memory in the Test Set.
HEIGHT		These two dial ups are used to select the height of the simulated character going to the ALPHA. They address the top of the area within the SIM V PROMS that will be used.

TABLE 3-1

Controls and Indicators (continued)

Switch	Position	Function
BOTTOM SPACE		These two switches are used to select the amount of space between the bottom of the Scanning Window and the bottom of the SIM V character. The ALPHA will move the window to adjust the Bottom Space to the normal value.
SIM V CHAR SELECT		This dial is used to select one of the simulated characters stored within the Test Set.
LATCH SYNC		Enables various latching options for latching data on cables J1/J3 into the Binary LED Display. These being:
	0 -	Internal Sync (REF CHARACTER SELECT)
	1 -	External Sync (EXT SYNC IN)
	2 -	Internal Strobe (when the value in the EXT INSTRUCTION/ADDRESS SELECT switches equals the PROGRAM COUNTER Display)
	3 -	Allows Binary LED Display to constantly reflect data on cables J1/J3.
REF CHARACTER SELECT		These three dials are used to select one of the 64 reference characters stored on the Reference Alphabet.
ERROR CTR SELECT		This dial is used to select one of the 8 Error Counters. Position 0 corresponds to error Counter 1 and position 7 corresponds to Error Counter 8.
PLANE ADVANCE		This push button is used when examining the contents of the Unknown Random Access Memory or when inspecting the contents of the Reference Alphabet

TABLE 3-1

Controls and Indicators (continued)

Switch	Functions
RECO STALL UP	This will cause the recognition sequencer in the ALPHA to cease operation when the value in the REF CHARACTER SELECT dials equals the Reference Character in the Alphabet which has just been processed, and also the PROGRAM COUNTER is equal to the ADDRESS SELECT switches.
	Indicators
Indicator	Function
PROGRAM COUNTER	This indicator has a two-fold function depending upon usage. 1. The display will contain an octal representat ion of the PROGRAM COUNTER in the ALPHA. 2. When used in the External Input Select mode it will contain an octal display of the number of pulses felt on the EXT CTR INPUT test point.
BINARY LED DISPLAY	The Binary Display contains 32 LEDs. The left 16 LEDs display a visual representation for Test Set cable in J1. The right most LEDs display a representation of whatever is placed on Test Set cable J3.

Table 3-2

Test Points

Test Point	Function
EXT CTR INPUT	This is a clock input to the PROGRAM COUNTER when the External Counter Input is selected.
GND	Grounding point for scope probe or the lest Set to the ALPHA,
INT STROBE	Whenever a value in the PROGRAM COUNTER equals the value set in the EXT INSTRUCTION/ ADDRESS SELECT dials a signal will be generated on this test point. The GND test point is supplied to ground a scope probe.
EXT CLEAR INPUT	A positive or negative level on this test point depending upon the position of the EXT CLEAR switch will clear the PROGRAM COUNTER if CTR CLEAR switch is placed in the EXT position.
EXT SYNC IN	Used in conjunction with LATCH SYNC; allows latching of data on cables J1/J3 in Binary LED Display by a negative or positive external selected signal.
LATCH SYNC OUT	Produces a sync signal when data is latched in the Binary LED Display.
RH VIDEO	When using Simulated Video feature the data being supplied to the ALPHA may be monitored at this point.
SAMPLE	Here the Simulated Sample signal to the ALPHA may be monitored.
CHAR SYNC	A sync signal is generated at the beginning of a Simulated Character.
GND	Grounding point for scope probe or the Test Set to the ALPHA.

As mentioned previously, when the characters in the LED Display and on the paper match, but data outputted from the ALPHA does not agree with what was scanned, the "output circuitry" should be tested and checked. The Communication and External Memory Diagnostic tests can successfully assist the technician in troubleshooting these areas by either constantly exercising or testing the circuits.

b. Typical Erratic Malfunctions. - Heat sensitive component failures are always difficult to isolate. Canned freon and heat gun are, of course, helpful. The technician would be well advised to concentrate his efforts on the first failure encountered when using Table 6-3 of the maintenance manual for ALPHA or the diagnostics (as is true with any malfunction).

Another erratic problem sometimes encountered is the changing or transient malfunction. Here the technician may be tracing signals with a scope, find a supposedly defective chip, power down the machine, open the logic door,, change the I.C.; then upon repowering find that the symptoms have changed. This type of occurrence many times can be traced to a small sliver of wire which finds its way onto the wire side of the Main Wire Wrap Assembly. If a technician feels he has this type of problem, he should first carefully inspect (with power off) the pins in the area which contains the logic he is having problems with and try to find and remove the sliver. If the sliver cannot be located, then a high Pressure air hose may be employed to blow it out, Take care that the air is well filtered and free from oil,

Other forms of erratic machine behavior can be attributed to a bad program board or loose or dirty connections. It's a pretty good indication of a bad or poorly seated program board if, when the diagnostic program is inserted, all tests pass. Also, depending on environment and/or age of the machine, carbon build-up on board contacts is possible. If carbon build-up is suspected, clean contacts with carbon tetrachloride and reseat. Do not clean contacts with pencil erasers or abrasives. Take care that no polarizing keys fall out of the connectors.

3-3. OPERATING INSTRUCTIONS - TEST SET. -

a. Procedures for Setting a Program Breakpoint. -

(1) Place the POWER switch to the OFF position.

(2) Connect Test Set power cable to ALPHA.

(3) Connect Test Set cable J4 to J29 on the chip side of the Main Wire Wrap P.C. Card on the ALPHA.

(4) Place the following switches to the indicated settings:

(a) BKPT/OFF/EXT INST to BKPT

(b) INST STEP/ON to INST STEP

(c) CTR INPUT SEL/EXT to CTR INPUT SEL

(d) CTR CLEAR - INT/EXT to INT

(e) RECO STALL to OFF (place switch down)

(5) Set the EXT INSTRUCTION/ADDRESS SELECT switches to the octal address at which the Breakpoint is desired.

(6) Place the POWER switch in the ON position.

(7) Toggle the START switch on the ALPHA. The program will be halted at the selected address before the instruction at that address is executed. The address will be displayed in the Program Counter Display.

(8) To continue from the Breakpoint, toggle the CONTINUE switch on the Test Set.

Note:- If the BKPT/OFF/EXT INST switch is placed in the OFF position, a sync pulse will be generated at the INT STROBE pin every time the instruction at the selected address is executed but the program will not halt.

b. Procedures for Single Stepping the Program. -

(1) Place the POWER switch to the OFF position.

(2) Connect Test Set power cable to ALPHA.

(3) Connect Test Set cable J4 to J29 on the chip side of the Main Wire Wrap P.C. Card on the ALPHA.

(4) Place the POWER switch to the ON position.

(5) Toggle the START switch on the ALPHA. When the INST STEP switch is placed in the ON position, the program in the ALPHA will immediately halt and the program address will be shown in the Program Counter Display. Each time the CONTINUE switch on the Test Set is toggled, the program will advance one instruction. Note that the Program Counter Display will always show the address of the next instruction to be executed.

Note:- This procedure is useful, in conjunction with a Breakpoint or to determine where the ALPHA program is looping.

c. Procedures for External Instruction Replacement. -

(1) Place the POWER switch to the OFF position.

(2) Connect Test Set power cable to ALPHA.

(3) Connect Test Set cable J4 to J29 on the chip side of the Msin Wire Wrap P.C. Card on the ALPHA.

(4) Connect Test Set cable J3 to J8 on the chip side of the Main Wire Wrap P.C. Card on the ALPHA.

(5) Place the POWER switch to the ON position.

(6) Place the following switches to the indicated settings:

(a) BKPT/OFF/EXT INST to EXT INST

(b) INST STEP/ON to ON

(c) CTR INPUT SEL/EXT to CTR INPUT SEL

(d) CTR CLEAR - INT/EXT to INT

(e) RECO STALL switch to OFF (place switch down)

(7) Set the desired instruction (which must be a JUMP instruction into the EXT INSTRUCTION/ADDRESS SELECT rotary switches.

(8) Press the LOAD INST push button switch.

Note:- If ALPHA is powered down at any time after Step 8, that step must be repeated again.

(9) Set the EXT INSTRUCTION/ADDRESS SELECT rotary switches to the octal program address at which the external (replacement) instruction is to be executed.

(10) Toggle the START switch on the ALPHA. In addition to the external instruction being executed, a sync pulse will be generated at the IN? STROBE pin when the external instruction is executed.

d. Procedures for Generating "Simulated" Video Characters (R/H Digital). -

(1) Place the POWER switch to the OFF position.

(2) Connect Test Set power cable to ALPHA.

(3) Connect Test Set cable J4 to J29 on the chip side of the Main Wire Wrap P.C. Card on the ALPHA.

(4) Connect Test Set cable J8 to J3 on the chip side of the Main Wire Wrap P.C. Card on the ALPHA.

(5) Remove R/H Digital Board from slot J40 of the card cage on the ALPHA.

(6) Place the following switches to the indicated settings:

(a) BKPT/OFF/EXT INST to OFF

(b) DIAGNOSTIC to ON

(c) SIM V MODE to TRIG

(d) OUTPUT to OFF

(e) RECO STALL to OFF (place switch down)

(f) SIM V CHAR SELECT:

0 = E

1 = L

2 = V

3 = 0

4 = -

5 = ,

6 = (E in some other alphabet)

(g) BOTTOM SPACE: 32

(h) HEIGHT: 36

(7) Place the POWER switch to the ON position.

(8) Set rotary switch on Format Panel of ALPHA to TEST A.

(9) Toggle the START switch. The LED Display should contain the selected character.

e. Procedures for Generating ‘“Simulated” Video Characters CR/H Analog). -

(1) Place the POWER switch to the OFF position.

(2) Connect Test Set power cable to ALPHA.

(3) Connect Test-Set cable J4 to J29 on the chip side of the Main Wire Wrap P.C. Card on the ALPHA.

(4) Connect Test Set cable J8 to J3 on the chip side of the Main Wire Wrap P.C. Card on the ALPHA.

(5) Connect Test Set cable J7 to J40A of the R/H Digital Board.

(6) Place the following switches to the indicated settings:

(a) BKPT/OFF/EXT INST to OFF

(b) DIAGNOSTIC to ON

(c) SIM V MODE to TRIG

(d) OUTPUT to OFF

(e) RECO STALL to OFF (place switch down)

(f) SIM V CHAR SELECT: 0 (for the character "E")

(g) BOTTOM SPACE: 32

(h) HEIGHT: 36

(7) Place the POWER switch to the ON position.

(8) Set rotary switch on Format Panel of ALPHA to TEST A.

(9) Toggle the START switch. The LED Display should contain the character "E".

Note:- When not running simulated characters through the Read Head Digital Board, disconnect the cable to J40A, since automatic switchover occurs whenever this cable is connected.

f. Procedures' for Inspecting a Scanned Character in the Unknown RAM. -

(1) Place the POWER switch to the OFF position.

(2) Connect Test Set cable J1 to J18 on the chip side of the Main Wire Wrap P.C. Card on the ALPHA.

(3) Connect Test Set cable J3 to J20 on the chip side of the Main Wire Wrap P.C. Card on the ALPHA.

(4) Connect Test Set cable J4 to J29 on the chip side of the Main Wire Wrap P.C. Card on the ALPHA.

(5) Connect a wire jumper from 24U-8 on the Main Wire Wrap P.C. Card of the ALPHA (RECOG) to the EXT CTR INPUT test point on the Test Set. This lead should be short.

(6) Place a slow-down resistor (approximately 2.7K) between pins 56 and 57 in the Horizontal Servo area of the Main Wire Wrap P.C. Card. This is necessary because Abort will be disabled and the character identification process will be greatly extended.

(7) Place the following switches to the indicated settings:

(a) ALARM to OFF

(b) DIAGNOSTIC to ON

(c) ABORT to DISABLED

(d) TRIGGER to +

(e) CTR INPUT SEL to EXT

(f) BKPT/OFF/EXT INST to OFF

(g) EXT INSTRUCTION/ADDRESS SELECT: Set switches to the octal number of the character on the line to be scanned which will be installed in the Unknown RAM. Start with the first character as #1; also count spaces. Example: (Assuming there are no spaces between the characters)

A	B	C	D	E	F	G	H	I	J	K	L
1	2	3	4	5	6	7	10	11	12	13	14

(h) REF CHARACTER SELECT switches: Set switches to the octal number of the character in the reference alphabet which will be compared against the Unknown RAM.

(i) LATCH SYNC switch to #3 (No Latch)

(j) RECO STALL switch to ON (place switch up)

(8) Place 'the POWER switch to the ON position

(9) Set the top margin so that the first line scanned i s the desired line.

(10) With OCR RESET, push PLANE ADVANCE button to clear Test Set.

(11) Place the EXT CLEAR switch momentarily to the (+) position. This will clear the Program Counter Display of the Test Set.

(12) Toggle the START snitch.

(13) Press the START switch on the ALPHA. As soon as paper is fed (Read Head drives left) press STOP. The paper advances to the line to be scanned. If the line was scanned, the Read Head should go to the extreme right, then halt. Proceed to Step (16).

(14) If the line wasn't scanned the Read Head halts at the left side of the paper handler. Clear the Program Counter by placing EXT CLEAR momentarily in the (+) position, then press CONTINUE - STOP in quick succession.

(15) Repeat Step (14) until the line is scanned.

Note:- When the line is scanned, a S3 error message appears in the LED Display. The Test Set Program Counter wilt display in octal the character on the line which is stalled in the Unknown RAN.

(16) Press PLANE ADVANCE to check the character in the Unknown RAM which will be displayed in the individual LEDs (see Figure 3-1).

PUB601

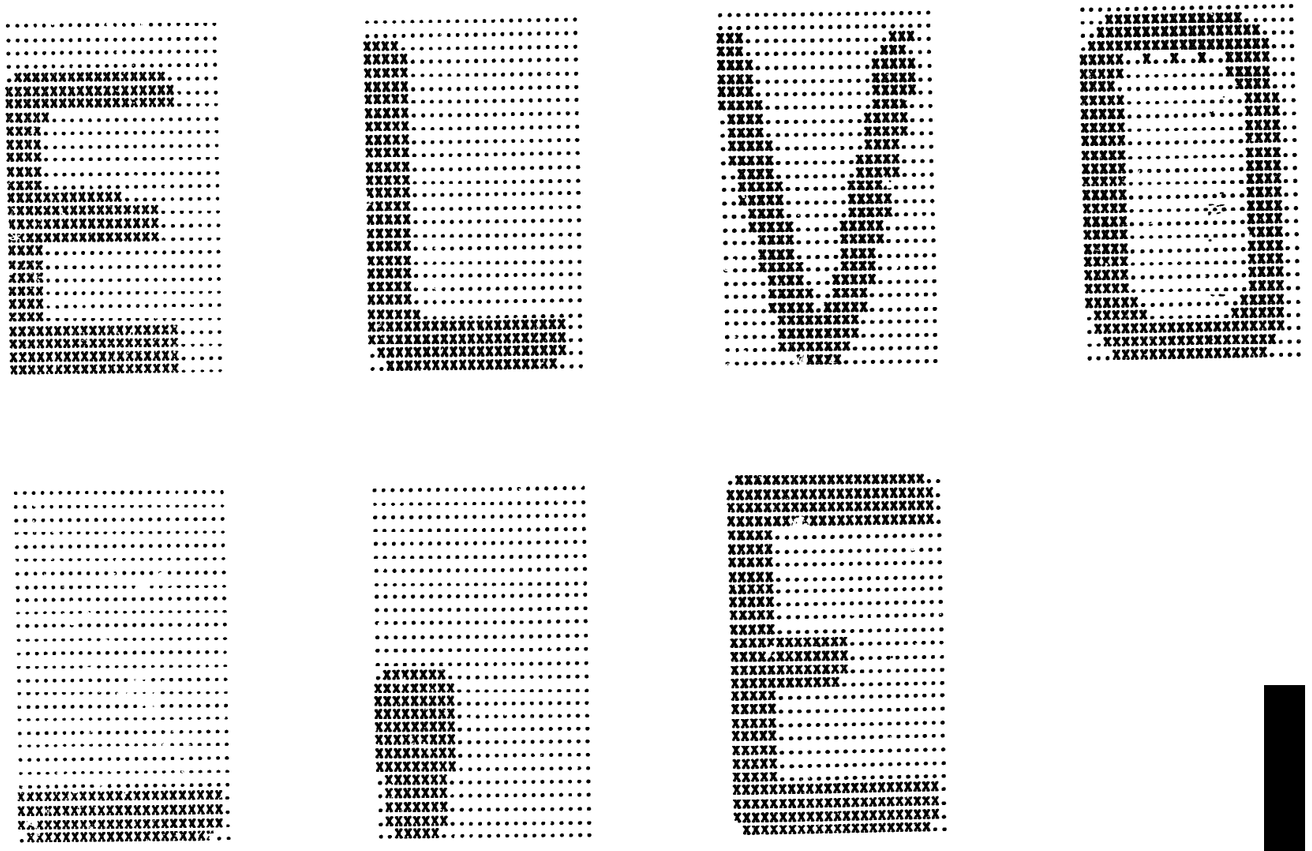


Figure 3-1. Perry SIM V Characters

g. Procedure for Dynamic Error Counter Checking During Simulated Video. -

(1) Place the POWER switch to the OFF position.

(2) Set up to run SIM V as in 3-3(d) or (e).

(3) Connect Test Set cable J1 to J17 on the chip side of the Main Wire Wrap P.C. Card on the ALPHA.

(4) Place the following switch to the indica settings:

(a) COUNTER CLEAR to EXT

(b) EXT CLEAR polarity to (+)

(c) ADDRESS SELECT to all zeros

(d) RECO STALL to OFF

(e) LATCH SYNC polarity to (+)

(f) LATCH SYNC to 1 (Ext Sync)

(g) REF CHAR SELECT to desired reference character

(5) Place the POWER switch to the ON position.

(6) Toggle the START switch.

(7) Rotate the ERROR COUNTER SELECT switch to the Error Counter desired.

SWITCH POSITION	ERROR CTR
0	1
1	2
2	3
3	4
4	5
5	6
6	7

SWITCH POSITION	ERROR CTR
7	8

Note:- Disable ABORT switch to see total error count.

Read the left **lamps with:**

No. 15 Lamp = 1 to the 0 power = 1 (decimal)

No. 10 Lamp = 2 to the 5th power = 32 (decimal)

Note:.. Unless the reference character selected is the same as the SIM V character, the error counts will usually be 62 or 63.

h. Procedures for Monitoring Various Hardware Latches. -

At times it may be necessary to monitor various hardware latches while troubleshooting a malfunction. While it will not be attempted here to explain an exact procedure to examine each and every latch, general type procedures will be outlined by logic block.

Appendix A lists the various test connectors found on the left, top, and right sides of the Main Wire Wrap P.C. Board in the ALPHA and the logic signals found on their pins. These connectors provide a convenient means of monitoring the important counters, latches, and signals one would normally want to check. Usually it would be difficult to check a counter consisting of multiple individual four bit counter I.C.s due to their pin configuration within the alphanumeric chip matrix of the main board; so the test

connectors were designed and installed to place a counter's output in a logical pin sequence. This, therefore, enables the Test Set to visually represent the counter/latch's output in LEDs. Test Set cables J1 and J3 are internally connected to the two rows of LEDs located towards the top of the Test Set Control Console,

i. **Mechanical Counters/Latches.** - To monitor any counters/latches in the Servo/Paper Movement logic area, the Mechanical Diagnostic can be used to provide constant patterns while attempting to read their outputs with the Test Set.

j. Video Acquisition Counters/Latches. - Because the logic in this area is contained on two P.C. Cards, only a few counters/latches can be monitored by the Test Set, They may be checked by using the Read Head Alignment Sheet or Simulated Video for best results.

k. Video Processing. - Use Scan Diagnostic or SIM V.

l. Character Identification Counters/Latches. - To monitor any counters/Latches in the Character Identification logic area, the Recognition Diagnostic or Simulated Video feature can be used to provide constant patterns while attempting to read their outputs with the Test Set.

m. **Executive Macro.** - Use External Memory Diagnostic or other diagnostic.

n. **Core Memory and Output Control Counters/Latches.** Because the logic in this area is contained on P.C. Cards, only a few counters/latches can be monitored by the Test Set. They

may be checked by using the External Memory or Communication Diagnostics for best results.

3-4. DIAGNOSTIC QUICK CHECK-OUT. - If a malfunction cannot be isolated by using the Scanning Program, then this procedure should be used to test the various logic circuits. When the machine does not produce the indication listed below, the long version of the particular diagnostic should be consulted for additional directions.

Connect the equipment according to the Test Set With Diagnostic Program procedures in Section 2 of this manual, then follow the instructions outlined here. Refer to Table 3-3 for LED Display Visual Representation.

a. **Test One - Executive Macro.**

(1) Toggle RESET switch on ALPHA Control Panel. LED Display on ALPHA should be:

NUL

Unreadable

SOH

(2) Toggle STOP switch on ALPHA Control Panel. LED Display on ALPHA should be:

NUL

Some character

STX

(3) Toggle CONTINUE switch on ALPHA Control Panel. LED Display on ALPHA should be:

NUC

Unreadable

STX

(4) Repeat Steps (2) and (3) three or four times. Each time Step (2) is executed, LED 3 will increment by 1.

b. **Test Two - Communications.**

(1) Toggle RESET then STOP on ALPHA.

(2) Rotate rotary switch to TOP MARGIN.

(3) Toggle START on ALPHA. LED Display on ALPHA should be:

NUL

NUL

NUL

(4) Rotate rotary switch to BOTTOM MARGIN.

(5) Place following toggle switches on Test Set in indicated positions:

KEY OPTICS - OFF

OUTPUT - OFF

FORMAT - 1

(6) Toggle START on ALPHA. LED Display on ALPHA should increment through all possible characters. Allow LEDs to cycle through all characters at least twice.

c. Test Three - Scan. -

(1) Toggle RESET.

(2) Toggle STOP.

(3) Rotate rotary switch to LEFT MARGIN.

TABLE 3-3

LED DISPLAY PATTERNS

NOTE: To find the ASCII code for a character, add the octal value for the column to the octal value for the row of the character.

NOTE: Lower-Case alphabet characters are not recognized; they are keyed, displayed and output as upper-case characters.

SYN = PAGE ABORT

BEL = ERROR CODE

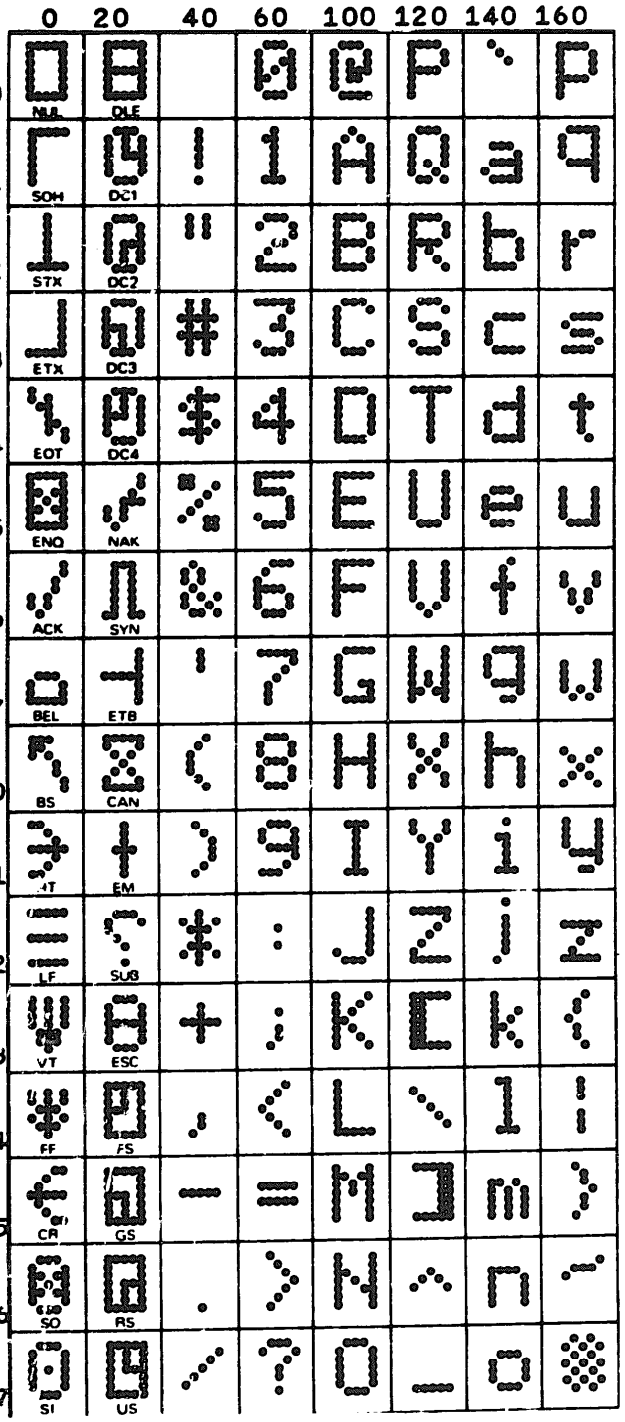
BS = BACK SPACE
CAN = TIME OUT CODE

LF = BEGINNING OF LINE

FS = BEGINNING OF PAGE

RS = END OF PAGE

US = CROSSOUT



(4) Toggle START. LED Display on ALPHA should be:

?

?

(SPACE)

(5) Rotate rotary switch to TOP MARGIN.

(6) Toggle START. LED Display on ALPHA should be:

S

?

(SPACE)

(7) Place following toggle switches on Test Set in indicated positions:

KEY OPTICS - OFF

OUTPUT - OFF

FORMAT - 2

DIAGNOSTIC - ON

(8) Toggle START, on ALPHA. LED Display on ALPHA should be:

Unreadable

Unreadable

Blank (space)

d Test Four - Recognition. -

(1) Toggle RESET.

(2) Toggle STOP on ALPHA,

(3) Rotate rotary switch to LEFT MARGIN.

(4) Toggle START on ALPHA. LED Display on ALPHA should be:

?

?

(SPACE)

(5) Toggle START. LED Display on ALPHA should be:

R

?

(SPACE)

(6) Place following toggle witches on Test Set in indicated positions:

KEY OPTICS - OFF

OUTPUT - ON

FORMAT - 1

DIAGNOSTIC - ON

ABORT - DISABLED

(7) Rotate rotary switch to TOP MARGIN.

(8) Toggle START on ALPHA. LED Display on ALPHA should be:

Unreadable

Noisy 5

Noisy 9

e. Test Five - External Memory. -

Note:- Running this diagnostic will destroy the contents of the external memory. After this test is run, and before any scanning, the rotary switch must be turned to PARAMETER RESET (with Scanning Program

in the ALPHA) and before outputting, the Header Sheets must be scanned.

(1) Toggle RESET.

(2) Toggle STOP on ALPHA.

(3) Rotate rotary switch to LEFT MARGIN then toggle START on ALPHA. LED Display on ALPHA should be:

?

?

(SPACE)

(4) Rotate rotary switch to BOTTOM MARGIN.

(5) Toggle START on ALPHA. LED Display on ALPHA should be:

E

?

(SPACE)

(6) Place following toggle switches on Test Set in indicated positions:

KEY OPTICS - OFF

OUTPUT - ON

FORMAT - 2

(7) Rotate rotary switch to TOP MARGIN.

(8) Toggle START on ALPHA, LED Display on ALPHA should be:

Cycles through numbers 1 through 7

Cycles through numbers 1 through 8

Blank (space)

Note:- (Only 2 and 3 are clearly visible-)

f. Test Six - Mechanical. -

(1) Turn POWER OFF on ALPHA.

(2) Remove Page Feeder.

(3) Turn POWER ON.

(4) Toggle RESET-

(5) Toggle STOP on ALPHA.

(6) Rotate rotary switch to LEFT MARGIN then toggle START on ALPHA. LED Display on ALPHA should be:

?

?

(SPACE)

(7) Rotate rotary switch to RIGHT MARGIN.

(8) Toggle START on ALPHA. LED Display on ALPHA should be:

M

?

(SPACE)

(9) Place following toggle switches on Test Set in indicated positions:

KEY OPTICS - OFF

OUTPUT - OFF

FORMAT - 1

(10) Rotate rotary switch to TOP MARGIN.

(11) Toggle START on ALPHA. LED Display on ALPHA should be:

Some hexidecimal number

Some hexidecimal number

Some hexidecimal number

Read Head will move back and forth very slowly from stop to stop. LED Display should not vary by more than 5 counts. Toggling CONTINUE switch on ALPHA will cause the speed to increase and the LED Display to change. Four different speeds will be tested. After all speeds have been tested, Read Head will go to left stop and then will drive to right in small increments.

(12) Place OUTPUT ON on Test Set.

(13) Toggling STOP switch on ALPHA will cause the increments to increase with a corresponding change in the LED Display. Eight different increments will be tested.

(14) After all increments have been tested, Read Head will drive to center, Read Lamp will come on. LED Display on ALPHA should be:

3

0

1

(15) Place Servo Test Sheet against rollers.

(16) Toggle START switch on ALPHA. Test Sheet will be fed into ALPHA and should stop such that “line pair 0” is within the reading slot.

(17) Toggle START switch on ALPHA. LED Display on ALPHA should be:

4

Blank

Blank

(18) Toggle STOP switch on ALPHA twice. Read Head will move to Left stop and then to right, pausing at the vertical lines on Test Sheet. When pointer reaches right most pair of Lines it will reverse and go back to left stop, pausing at the vertical lines.

(19) Toggle STOP switch on ALPHA while Read Head is near center of paper. Test Sheet should be ejected into output hopper.

3-5. REPROGRAMMED DIAGNOSTIC TESTS - DESCRIPTION. -

a. **Executive Macro Diagnostic.** - This program starts at location 0 and is designed to exercise and check most of the circuitry in the microprocessor, It runs without the Test Set unless an error is detected, in which case a Test Set, Scope, and Program Listing are required, It is intended that this test be executed be-tore all others. It establishes the proper operation of the circuitry which will control the rest of the diagnostic tests. Therefore, no qualitative information can be relied upon without first a test of the microprocessor.

After toggling RESET the LED Display should be (LED 1 - NUL; LED 2 - unreadable; LED 3 - SOH). This indicates that the program is running and there are no errors. Any other LED Display indicates some type of error. The order of tests performed and LED indications are indicated below. See Table 3-4 for visual character representations.

Test No.	LED 2	Description
T1	Note 1	HALT (RST 7)
T2	Note 2	JMP (within chip)
T3	(ETX)	CMPR (necessarily includes LDR and LOAD MUX and TST)
T4	(EOT)	LDR, PLB 1, PLB 2, PLB 4
T5	(ENQ)	JMPS (See Note 2)
T6	(ACK)	INCR, SET 1, SET 2, OVERFLOW
T7	(BEL)	JMP (to another chip) (See Note 2)
T8	(BS)	INCR
T9	(HT)	LDR

Note: - 1. HALT is normally disabled. Program has no way of knowing if HALT works unless the HALT switch on the Test Set is placed in the ON position.

2. If JMP does not work, the LED Display is unpredictable. Naturally, if JMP does not work there is no possible way to Loop,

Assuming no errors, toggling STOP will cause testing to stop, LED 2 to stop at some character, and LED 3 to increment to the next character.

After STOP, toggling CONTINUE will cause testing to continue, LED 2 to become unreadable, and LED 3 to remain stationery, If after STOP the rotary switch is put in OPERATE and START is toggled, the rotary switch will be tested. (See rotary switch test description.)

If RESET is toggled, the test will restart. In case of errors, LED 3 is incremented for each error and LED 2 should display a character indicating which test failed. The first instruction of all tests which loop (T3 through T9) is used only once in that test to facilitate scope synchronizing, If Test Set is used and HALT is enabled, the program should HALT at Location 4 (i.e. during the T1 test) and after any error.

Note:- TO enter Rotary Switch Subtest set rotary switch to OPERATE, toggle RESET, STOP, START.,

b. Rotary Switch Subtest. - LED 1 and 2 should always display NUL. Upon entry, LED 3 will display NUL as indicated in the table below whenever the rotary switch is moved to a new position. LED 3 will be incremented by an amount equal to the new switch position number.

When CONTINUE is toggled, LED 3 will display the character indicated in the table below. Putting the rotary switch in an unnamed position (or between positions) will have no effect on the display.

Toggle RESET to exit.

The following table outlines rotary switch position and the character which should be displayed in LED 3:

SW POS No.	Name	LED 3
0	OPERATE	NUL
1	TOP MARGIN	SOH
2	LEFT MARGIN	STX
3	RIGHT MARGIN	ETX

SW POS No.	Name	LED 3
4	BOTTOM MARGIN	EOT
5	Test A	ENQ
6	Test B	ACK
7	PARAMETER RESET	BEL

c. Communications Exerciser. - This program starts at location 1000. The program assumes that the Executive Macro Diagnostic (DMAC) passed.

This exerciser consists of four subtests. They exercise the LED Generator P.C. Card, LED Matrix, Keyboard and related circuitry, the Line Buffer and their supporting Executive Macro logic.

To enter test:

(1) Place the rotary switch in TOP MARGIN

(2) Toggle RESET

(3) Toggle STOP

(4) Toggle START. The LED Display on the ALPHA should be:

LED 1 - NUL

LED 2 - NUL

LED 3 - NUL

(5) Place rotary switch to desired subtest and toggle START,

OPERATE	Go Back to Exec Macro
TOP MARGIN	Subtest 1
LEFT MARGIN	Subtest 2

RIGHT MARGIN	Subtest 3
BOTTOM MARGIN	Subtest 4
Test A	LED should read "RT2"
Test B	LED should read "RT3"
PARAMETER RESET	LED should read "RT4"

(6) Toggle START.

Note:- In Subtests 2 and 4 the OUTPUT switch must be OFF, In general: toggling STOP will stop the test and clear all LEDs; toggling CONTINUE will restart the test at the point it was stopped; toggling START will cause the program to read the rotary switch to select a new subtest.

Subtest 1: This test loads the LED Display using STB 4,5,6. Characters are displayed three at a time, followed by a pause, in increasing numerical order from 0 through 377 (the first three characters displayed should correspond to ASCII codes 0,1,2) after a pause, the characters for codes 3,4,5 will be displayed,

Subtest 2: This test loads keystrokes into the LEDs in two modes.

The test starts in Mode 1 wherein keystrokes are displayed as they are struck (first character in LED 1, second in LED 2, third in LED 3, fourth clears all LEDs and then displays in LED 1, etc.),

Pressing STOP, filling all LEDs, and then pressing CONTINUE will switch to Mode 2. Mode 2 continuously displays the last character struck. New characters may be keyed at any time. Pressing STOP and CONTINUE will switch back to Mode 1.

Subtest 3: This test checks the Format Panel toggle switches and displays ON/OFF status in LEDs. Switch and displays are as follows:

Switches Located on ALPHA

Switch	Position	Display
PITCH	10/12	SE +/-
LINE SPACING	1/2	LS 1/2
OUTPUT	ON/OFF	OP +/- (if OUTPUT on Test Set is in ON position)
ALPHABET	1/2	AL 1/2

Switches Located on Test Set

Switch	Position	Display
KEY OPTICS	ON/OFF	KO +/-
OUTPUT	ON/OFF	OP +/- (if OUTPUT on ALPHA is in ON position)
FORMAT	1/2	FM 1/2

Pressing STOP and CONTINUE will step from switch to switch.

Subtest 4: This test loads the Line Buffer from the Keyboard Latch with the numbers 0 through 255. These are then loaded, in parallel, into all three LEDs with a pause after all LEDs are load

Place the LINE SPACING switch to the 1 position for this test.

If the KEY OPTICS switch is in the ON position, the program **will hang up if an error is detected at the Line Buffer's output. The LEDs display the expected number,** not the output of the Line Buffer. **To continue,** turn KEY OPTICS off.

d. Diagnostic Executive. - This program starts at location 1400. **The program assumes that the Executive Macro and Communication Diagnostics (DMAC) passed.**

This program allows entry to four major diagnostics; three of which are of a self-checking nature.

Before starting, put the following switches in the indicated positions:

Switch	Position
PITCH	1
LINE SPACING	1
KEY OPTICS	ON
OUTPUT	ON
FORMAT	1
ROTARY SWITCH	**LEFT MARGIN**

Toggle RESET, STOP, START.

The LED Display on ALPHA should read:

LED 1 - ?

LED 2 - ?

LED 3 - (SPACE)

Select major test desired via rotary switch as follows:

Rot. Sw. Pos.	Major Test	Letter
0. OPERATE	DIAGNOSTIC EXEC	?
1. TOP MARGIN	SCAN 'TEST	S
2. LEFT MARGIN	RECOGNITION TEST	R
3. RIGHT MARGIN	MECHANICAL TEST	M
4. BOTTOM MARGIN	EXT. MEMORY TEST	E

After selecting test toggle START. LED Display 1 will display a letter signifying the major test selected (from table above). LED 2 will display "?". Set the rotary switch to subtest desired, then toggle START. LED 1 will display subtest number.

To loop on selected subtest, set LINE SPACING switch to 2 before toggling START.

To loop on all subtests, beginning with selected subtest through last subtest, set LINE SPACING switch to 1. In this case, LED 1 may be unreadable as it will be cycling through the various subtest numbers.

If an error is detected in any subtest, that subtest will be recycled until the operator toggles STOP or CONTINUE. This is true regardless of the LINE SPACING switch and regardless of the test passing in subsequent tries.

CAUTION. - The START, STOP, and CONTINUE switches should not be toggled at random. These switches ale tested at specific times and have specific meaning.

The accompanying flow chart (Figure 3-2) shows when they are tested and when they are reset. The CONTINUE switch is also used in certain subtests to enable the operator to look at various lights on the Test Set.

At the beginning of each subtest a sync pulse (STB 7 15L-9) is generated.

e. Scan Diagnostic. - This self-checking diagnostic is designed to test most of the circuitry connected with Video Processing end the Unknown RAMs by generating simulated blank and non-blank frames, There are five subtests:

SMP 1	Checks the ability to accept samples and the timing of the shifting in of samples, Position Mode, Justification, Recognition (Figure 3-3).
SMP 2	Checks the FB1, FB2, FC, POPF logic (Figure 3-4).
SMP 3	Checks the operation of SRI and Position Mode logic (Figures 3-5 and 3-6).
SMP 4,5	Checks the operation of SR2 and the Unknown RAMs (Figures 3-7 through 3-9).

SMP 4 and 5: Scan Diagnostics Subtests 4 and 5 check SR2, the Unknown RAM and the Unknown RAM Counter.

LED 1 will display the subtest number, LED 2 will display which address should have all 1's (see Figure 3-7) and LED 3 will normally display a space (blank). In case of an error, LED 3 will display which of the 12 RAMs was in error. (See Figure 3-7 for chip correspondence.) Note that the first error

found is the one displayed; i.e., if all RAMs are in error, LED 3 will display an A. This condition may be checked by connecting cables from Test Set to J18 and J20 on the chip side of the main board and examining the contents of all RAMs.

Switch	Position	Action
KEY OPTICS	ON	- Do not stop on errors.
	OFF	- Stop if error detected. Wait for operator to toggle CONTINUE
LINE SPACING		- Same as all tests (see Diagnostic Exec)
OUTPUT	ON	Read each address 100 times
	OFF	- See FORMAT switch
PITCH	10	- Check for errors
	12	- Do not check for errors
FORMAT	1	- If Output OFF, loop in read until "CONTINUE"
	2	- If Output OFF, read only once

Subtest 4 loads SR1 with a pattern that always has a bottom space of 0 and a height of 32. This means that SR2 will not be bottom justified and that all of the Unknown RAM is loaded, SR2 is loaded with a 24 bit wide by 1 bit high pattern, Initially the pattern is bottom justified. The Unknown RAM is loaded and all addresses are checked 100 times (see switch settings). The pattern in SR2 is then shifted "up" 1, the Unknown RAM is loaded again and checked. This Process is repeated until all locations in the Unknown RAM have been loaded with both 0's and 1's.

Subtest 5 loads SR1 and SR2 with a 1 bit wide by 32 bit high pat tern with a bottom space of 0 and right justified in SR2; the rest of SR2 is cleared. The Unknown RAM is loaded and all addresses are checked 100 times (see switch settings), The pattern in SR2 is then shifted "left" 1, the Unknown RAM is loaded again and checked. This process is repeated until all locations in the Unknown RAM have been loaded with both 0's and 1's.

f. Recognition Diagnostic. - The purpose of this self-checking diagnostic is to test the Character Identification logic (Recognition and Evaluation). For these tests, the ABORT switch on the Test Set must be in the DISABLED position.

Each of the four subtests generates a different pattern, but all subtests are functionally the same. All patterns have a bottom space of 0, a top space of 24, and, therefore, a height of 24 (in SR1). (See Figures 3-10 and 3-11.)

The functions of the following switches are described be low:

Switch	Position	Function
KEY OPTICS	ON	Do not stop on errors
	OFF	Stop if error detected. Wait for operator to toggle CONTINUE.
LINE SPACING	1	To loop on all subtests beginning with selected subtest through last subtest. In this case, LED 1

Switch	Position	Function
		may be unreadable as it will be cycling through the various subtest numbers.
	2	To loop on the subtest selected.
OUTPUT	ON	Normal
	OFF	Repeat test on same pattern without regenerating pattern. (Saves generating time and overrides line spacing switch.)
PITCH	10	Single mode operation (see FORMAT switch).
	12	Reset single mode operation (RECO will never stall).
FORMAT	1	Reset single mode after stalling on the fifth Reference Character.
	2	Stall after all Reference Characters.

Note:- Single mode enables the program to "stall" recognition between character comparisons in order to check the error counters.

If this diagnostic is started with Pattern 1 and all switches are in the positions indicated:

Switch	Position
PITCH	1
LINE SPACING	1
KEY OPTICS	ON

Switch	Position
OUTPUT	ON
FORMAT	1
DIAGNOSTIC	ON

and all tests pass, LED I will be unreadable, LED 2 will display a "noisy" 5, and LED 3 will display a "noisy" 9. Any deviation from this indicates an error.

LED Display error indication legend:

LED 1 - Subtest number (pattern number)

LED 2 - May be 0,1,3,4,5

0 = UNREC Flag Reset, Best ID wrong (see LED 3)

1 = UNREC Flag Set, Best ID may or may not be wrong (see LED 3)

3,4,5 = Reference character number

LED 3 - If LED 2 = 0 or 1, LED 3 = Best ID

For LED 1 = 1, Best ID should be space.

2 or 3, Best ID should be rubout

4, Best ID should be 376

If LED 2 = 3, 4, or 5 LED 3 = Error Counter number (refer to Table 3-4 for expected error count.)

Note:- All generated patterns should result in a zero error count with the UNREC Flag reset from comparison with Reference Characters 3, 4, or 5. Generated pattern 1 is a space (Ref Char 5). Patterns 2 and 3 match Ref Char 3, which carries the ASCII code for a rubout (377). Pattern 4

matches Ref Char 4, which carries the ASCII code for a tilde (376).

When using scope to check logic, best external sync is RECO 17U-3. By using delayed internal sync on channel 1 various parts of the logic may be looked at in detail. If PITCH is on 12, there should be no jitter on the scope. Jitter indicates trouble. (PITCH on 12 will cause errors so KEY OPTICS must be OFF.)

g. External Memory Diagnostic. - Each subtest generates a different pattern but all subtests are functionally the same ex 7. Tests are completed whether or not errors occur.

(1) LED 1 will display the subtest (pattern) number as follows:

1. Data in each location = address of location
2. Data in each location = l's complement of address
3. Data = 0000 in even addresses
   7777 in odd addresses
4. Data = 7777 in even addresses
   0000 in odd addresses
5. Data = 5252 in even addresses
   2525 in odd addresses
6. Data = 2525 in even addresses
   5252 in odd addresses
7. See Test 7

TABLE 3-4

Recognition Diagnostic Error Counter Values (Decimal)

Pat. No.	Ref. Char.	1	2	3	4	5	6	7	8
1	3	63	63	63	63	63	63	63	63
	4	63	63	63	63	63	63	63	63
	5	0	0	0	0	0	0	0	0
2	3	33	6	8	4	10	33	0	9
	4	63	63	63	63	63	63	63	63
	5	63	63	63	63	63	63	63	63
3	3	33	8	6	10	4	33	0	5
	4	63	63	63	63	63	63	63	63
	5	63	63	63	63	63	63	63	63
4	3	63	63	63	63	63	63	63	63
	4	4	21	21	21	21	4	0	21
	5	21	21	21	21	21	21	21	21

Notes:- 1. Reference Characters 1 and 2 are not tested because they change from alphabet to alphabet.,

2. Errors of 63 may be 62.

3. Values in table are actual error counts (in decimal). The error counters cannot hold values from 48 through 61. They jump from 47 to 62,

4. The ABORT switch must be in the DISABLED position,

(2) LED 2 will display the operation (number) being performed as follows:

1. Write into all of memory starting at Loc. 7777 and progressing downward loading addresses each time.
2. Read from all of memory starting at Loc. 7777 and progressing downward loading addresses each time.
3. Read from all of memory starting at Loc. 0000 loading address first time only then using auto increment.
4. Write into all of memory starting at Loc. 0000 loading address first time only then using auto increment.
5. Read from all of memory starting at Loc. 7777 and progressing downward loading addresses each time.
6. Read from all of memory starting at Loc. 0000 loading address first time only then using auto increment.

Note:- A PLA 1 (15S-2) is executed at the start of each operation for scope synching.

LED 3 will start with an ASCII space and will be incremented for each error. The nature of each error may be examined by turning Key Optics OFF and connecting Test Set cable J1 or J3 to J7. Upon detecting an error the program will display

information in the following order and wait for the operator to toggle the CONTINUE switch between displays:

a. 4 most significant bits of address (LEDs 12-15)

b. 8 least significant bits of address (LEDs 8-15)

c. 4 most significant bits of data written (4 MSB of ACC = 1)

d. 8 least significant bits of data written

e. 4 most significant bits of data read (4 MSB of ACC = 1)

f. 8 least significant bits of data read

The functions of the following switches are described below:

Switch	Position	Function
KEY OPTICS	ON	Do not stop on errors.
	OFF	Stop if error detected. Wait for operator.
LINE SPACING	1	To loop on all subtests beginning with selected subtest through last subtest.
	2	To loop on the subtest selected.
OUTPUT	ON	Normal (loop through all operations given in paragraph 3-5g(2).
	OFF	Repeat operation given in paragraph 3-5g(1) until the CONTINUE switch is set. Then advance to the next operation.
FORMAT	1	Start output Macro at Loc. 0 if Macro not busy.
	2	Do nothing to Macro.

Switch	Position	Function
ALPHABET	1	Output via on-line Macro.
	2	Output via punch-

Test 7 functions somewhat differently than other subtests. The sequence along with LED display is given below:

(a) LED 1-7
LED 2-1
LED 3-space

Write the address of each location into all of memory starting at Location 7777 and progressing downward loading addresses each time.

(b) LED 1-7
LED 2-2
LED 3-space

Read the data from Test 71 from all of memory starting at Location 7777 and progressing downward loading addresses each time.

(c) LED 1 - 7
LED 2 - 5
LED 3 - space

Load address, read low, write low sequence starting at Location 7776 and progressing downward to 0000. Note that a RDLO causes the memory address to increment so that at the end of Test 75 each location should contain the 8 least significant bits of its address minus one.

(d) LED 1 - 7

LED 2 - 6

LED 3 - space

Reads data generated by Test 75 using auto increment.

(e) LED 1 -7

LED 2 - 7

LED 3 - space

Loads the Line Buffer with the numbers 0 through 127. This data is then Loaded in groups of 11 into RAMs 0 through 9 and 11 (of the microprocessor) using the Transfer 6 instruction (XFER 6). The Line Buffer is shifted by one bit for each load. (The first time through RAM 0 = 0, RAM 1 = 1, etc. The second time RAM 0 = 11, RAM 1 - 12, etc.) When all 11 RAMs are loaded, 11 consecutive WRLO's are executed (the Memory Address Counter is initialized to 0 at start and auto increments). All of memory is loaded in this fashion.

(f) LED 1 -7

LED 2 - 8

LED 3 - space

This test is similar to 75 but reads instead of writing. The data read is checked against the Line Buffer's output.

Note:- The Pitch switch (in Test 7) may be used to Loop Tests 71 through 76, 77, or 78. The Output switch may be used to LOOP Tests 71, 72, or 75 through 78. Error readouts for Tests 75, 76, and 78 will

only show the 8 LSB of data read and 8 LSB of data expected.

h. Mechanical Diagnostic. - In order of suggested execution:

(1) Mec 1 Stationary Horizontal and Vertical Test.- Tests Horizontal Position Register, Full Adder, Horizontal Reference Register of Horizontal Servo Controller, and Vertical Servo Controller, Switches - none.

(2) Mec 2 Dynamic Horizontal lest. - Tests left and right Speed Registers, Horizontal Encoder, Executive Macro Sample Flop, and related Position Mode hardware.

(a) Speed Test. - The Read Head will be driven right and left while counting samples. The number of samples for each left or right sweep will be displayed in the LEDs in hexadecimal, The count should not vary by more than about five samples, A striped test sheet may be used to scope PAPER PRESENT.

(b) Horizontal Position Mode. - The Read Head will move in incrementally. Initially, the least significant increment is used, thus the Read Head moves in very small increments, Each time STOP is toggled, the next larger increment is selected, Eight different increments may be used. The Read Head must be observed for movement. NO ERROR displays are generated, The LEDs will show which incremental value is being used.

The functions of the following switches are described below:

Switch	Position	Function
KEY OPTICS	ON	Performs LCTST. Turn KO OFF to exit to Test C.
	OFF	Bypass LCTST.
FORMAT	1	Short drive right in LCTST,
	2	Long drive right in LCTST.
STOP		(During position mode test) drive left and use next larger value to increment HMARG.

(3) Mec 3-4 Dynamic Vertical and Key Optics Positioning Tests. - Tests Vertical Controller, PAPER IN POSITION, PAPER PRESENT, and Key Optics positioning, The operator should place a specially ruled mechanical test sheet against the paper handler rollers. Follow operating instructions below. Mec 4 can be entered only via Mec 3.

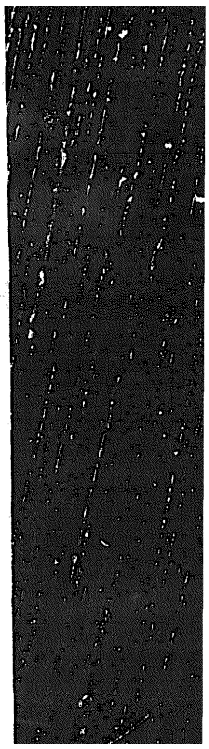
(a) Entry and Paper Positioning. - Enter Mec 4 via Mec 3 or by starting Subtest 3. LED Displays will pause showing 301.

(b) With mechanical test sheet against rollers, toggle START.

(c) Page will move up until line pair 0 is centered in aperture.

(d) Toggle START. LEDs will show 4 in LED 1.

(e) Toggle STOP twice. Read Head will move to left stop and then to right pausing at the vertical lines on the test sheet. When the pointer reaches the right most



pair of lines it will reverse and go back to the left stop pausing at the vertical lines.

(f) Toggle STOP WHEN READ HEAD IS NEAR CENTER. Test sheet should be ejected into output hopper.

(g) Vertical rollers will then turn very slowly.

(h) Toggle STOP to get next higher speed.

(i) Two more speeds (total 4) may be selected by toggling STOP,

(j) Toggle STOP to eject page and return to step "N".

The switch functions are described below:

Switch	Position	Function
KEY OPTICS	ON	(Test B) high tolerance to rollers moving.
	OFF	Low tolerance to rollers moving.
LINE SPACING	1	MUS? BE SET TO THIS POSITION
OUTPUT	ON	Skip remainder of vertical test - skip to Test C.
FORMAT	1	Long delays.
	2	Short timeouts (High speed ALPHA - RP238/GYX).
PITCH	ON	(Test B) do not wait for continue.
	OFF	Wait for continue.

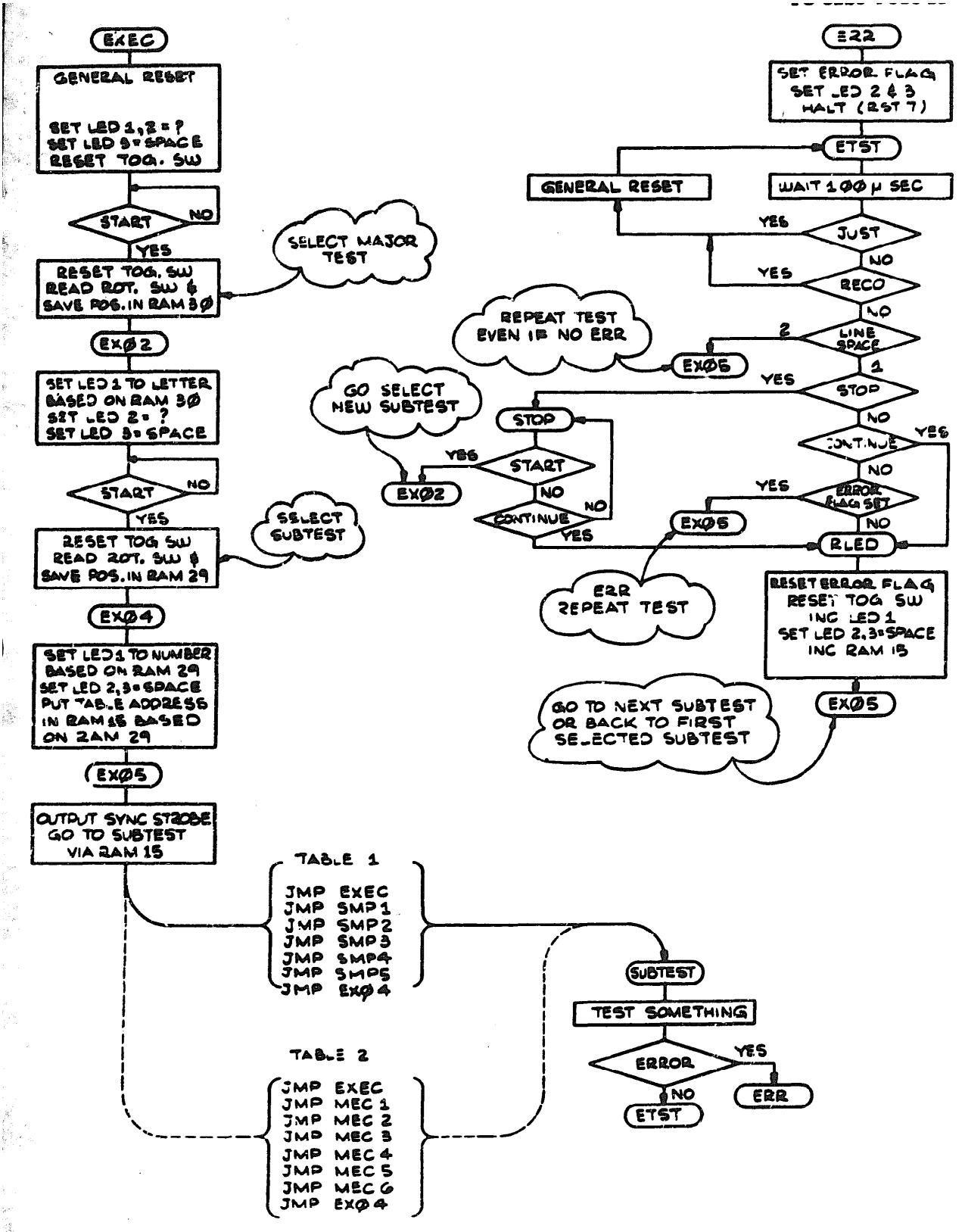


FIGURE 3-2
DIAGNOSTIC EXECUTIVE FLOW CHART A/S

Figure 3-2. Diagnostic Executive Flow Chart

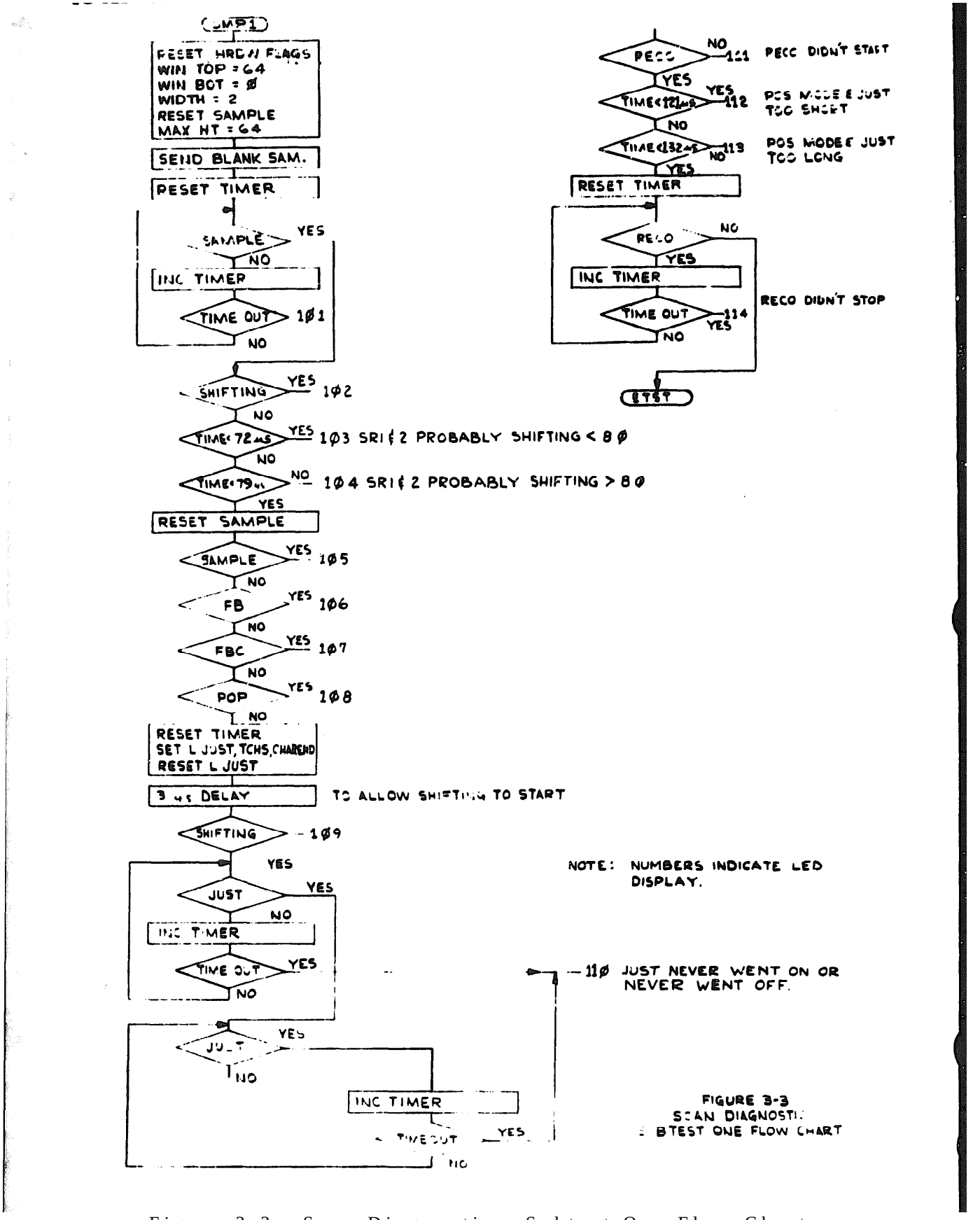


FIGURE 3-3
SCAN DIAGNOSTIC
BTEST ONE FLOW CHART

Figure 3-3. Scan Diagnostic - Subtest One Flow Chart

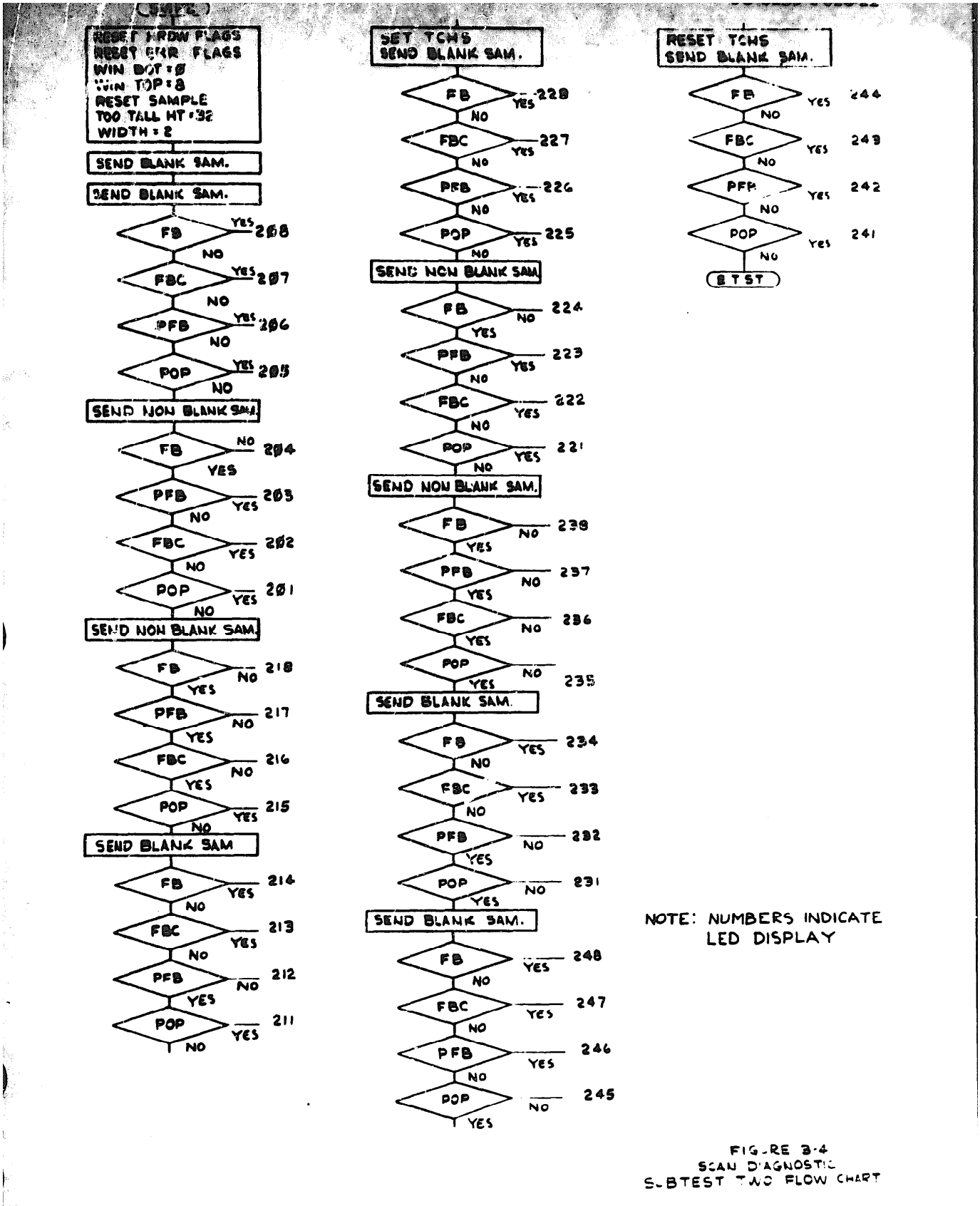


Figure 3-4. Scan Diagnostic - Subtest Two Flow Chart

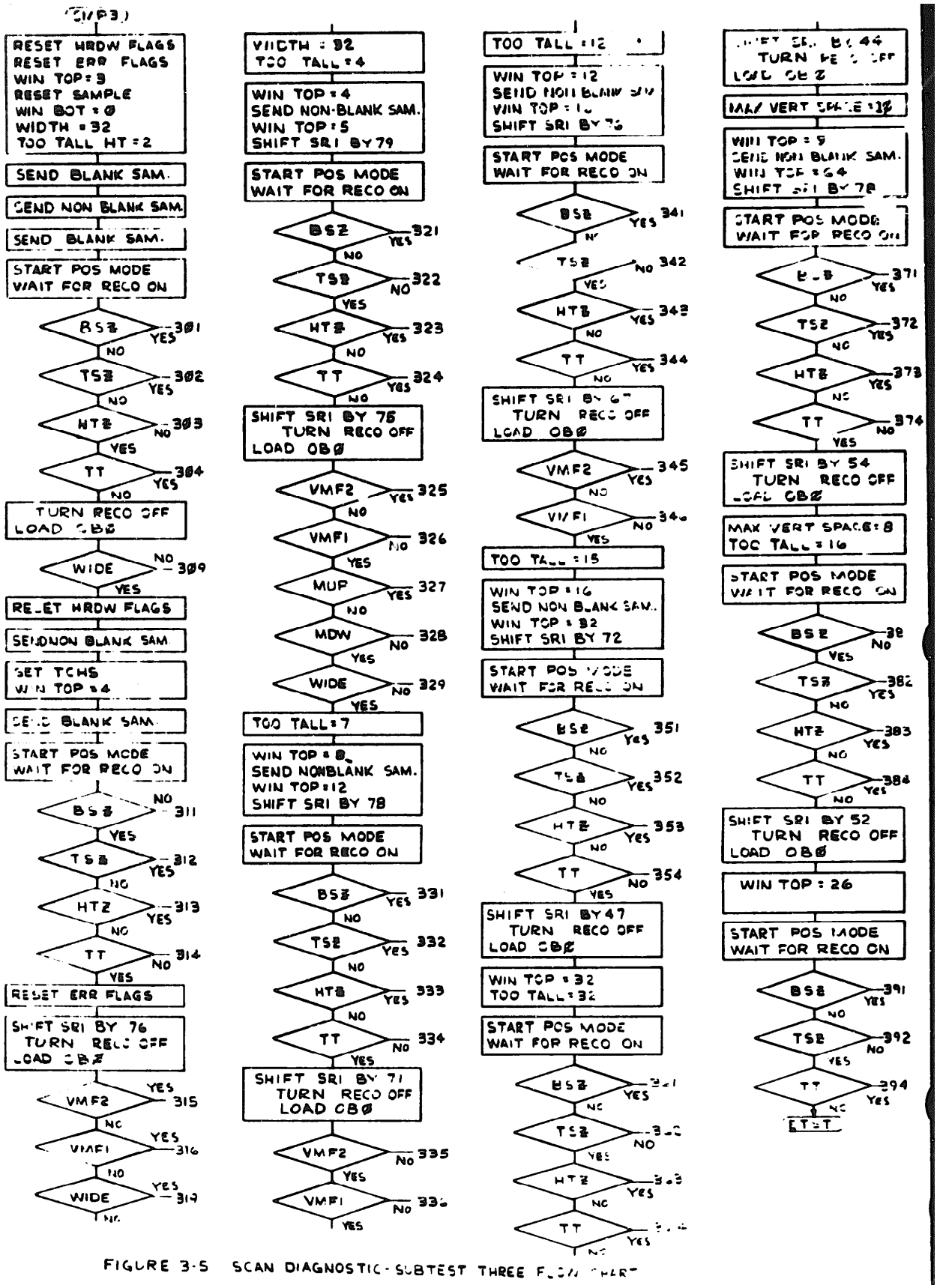


FIGURE 3-5 SCAN DIAGNOSTIC - SUBTEST THREE FLOW CHART

Figure 3-5. Scan Diagnostic - Subtest Three Flow Chart

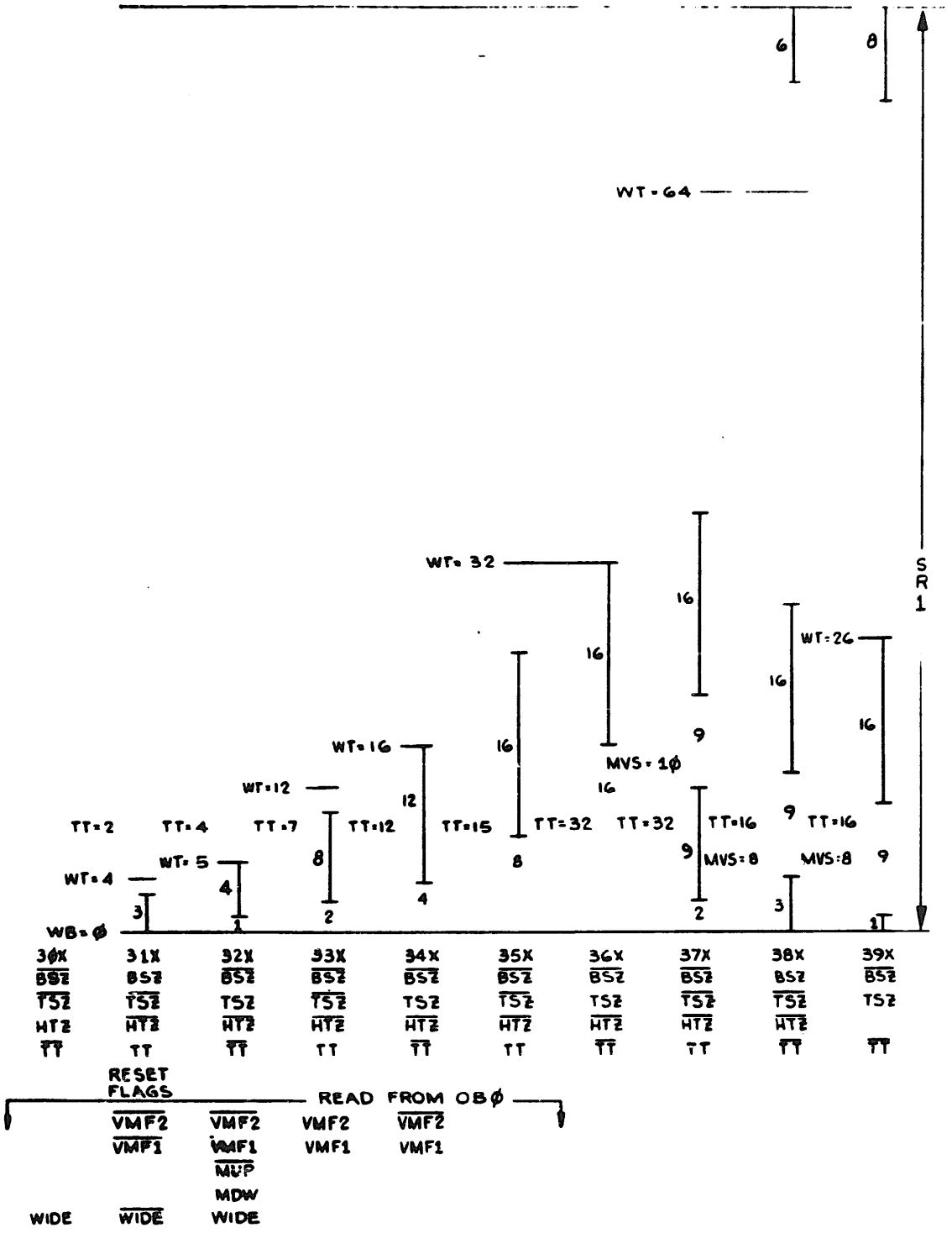


FIGURE 3-6
SCAN DIAGNOSTIC - SUBTEST THREE TEST PATTERNS

Figure 3-6. Scan Diagnostic - Subtest Three Test Patterns

SMP 4,5 LED DISPLAY TABLE

LED 2 indicates column/row where 1's written.
LED 3 indicates RAM chip in error.

		SMP 5 LED 2							RAM ADR
		@ ~ } | {zyx	wvut	srqp	onml	kjih			
	@								0
	~	BOTTOM OF CHARACTER							1
	}								2
	|	F	E	D	C	B	A	LED 3	3
S	{								4
	z	25R	26P	24P	31R	32P	30P	CHIP WW	5
M	y							CHIP PC	6
	x								7
P	w								8
	v								9
	u	R							10
4	t	I					L		11
	s	G					E		12
	r	H					F		13
	q	T					T		14
	p								15
	o								16
	n	E					E		17
	m	D					D		18
	l	G					G		19
L	k	E					E		20
	j								21
E	i	L	K	J	I	H	G	LED 3	22
	h								23
D	g	26R	24R	25P	32R	30R	31P	CHIP WW	24
	f							CHIP PC	25
	e								26
2	d								27
	c								28
	b								29
	a	TOP OF CHARACTER							30
	`								31

Figure 3-7. Scan Diagnostic - Subtests 4 & 5 - URAM Key

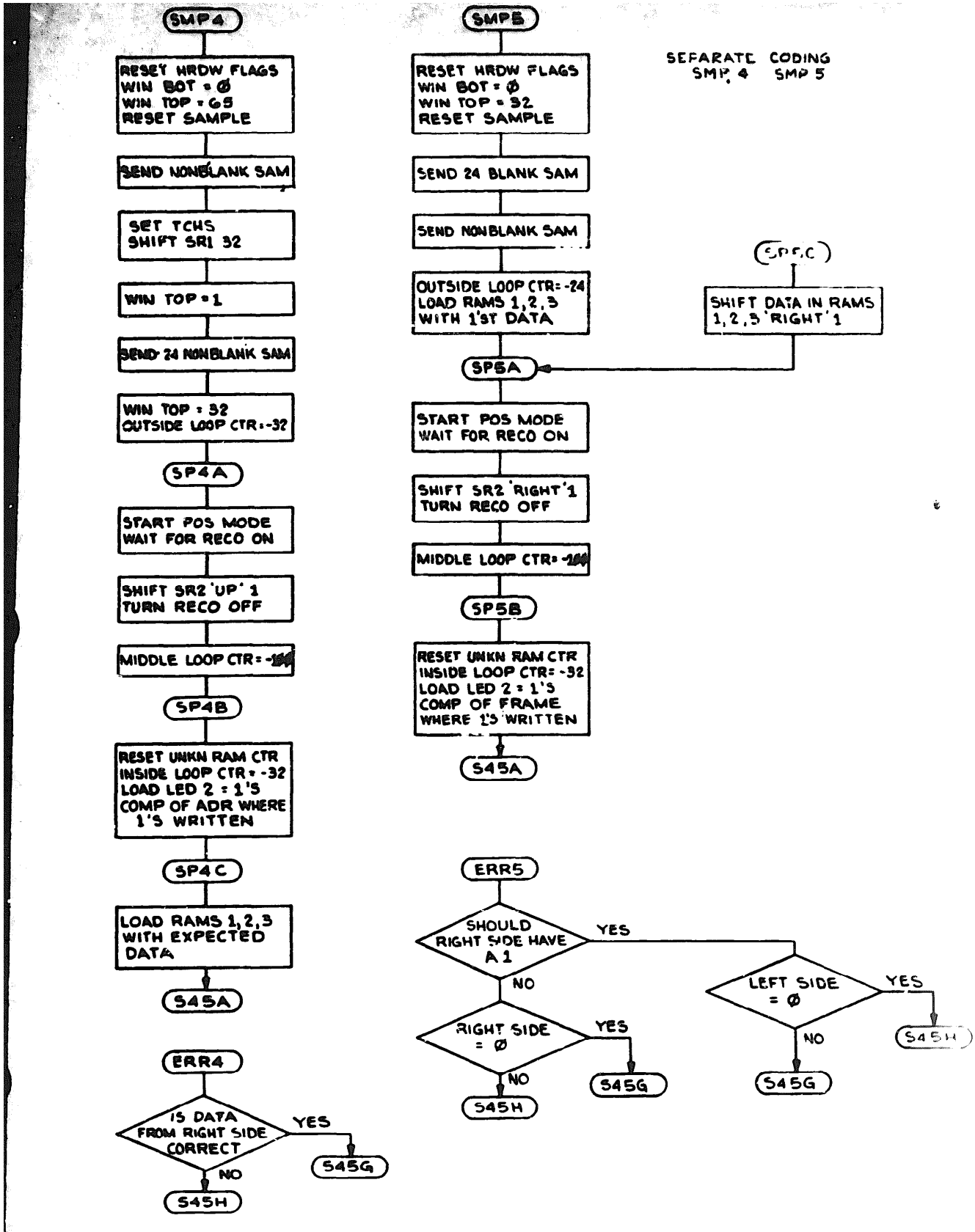


FIGURE 3-8
SCAN DIAGNOSTIC - SUBTEST 4 & 5 FLOW CHART

Figure 3-8. Scan Diagnostic - Subtest 4 & 5 Flow Chart

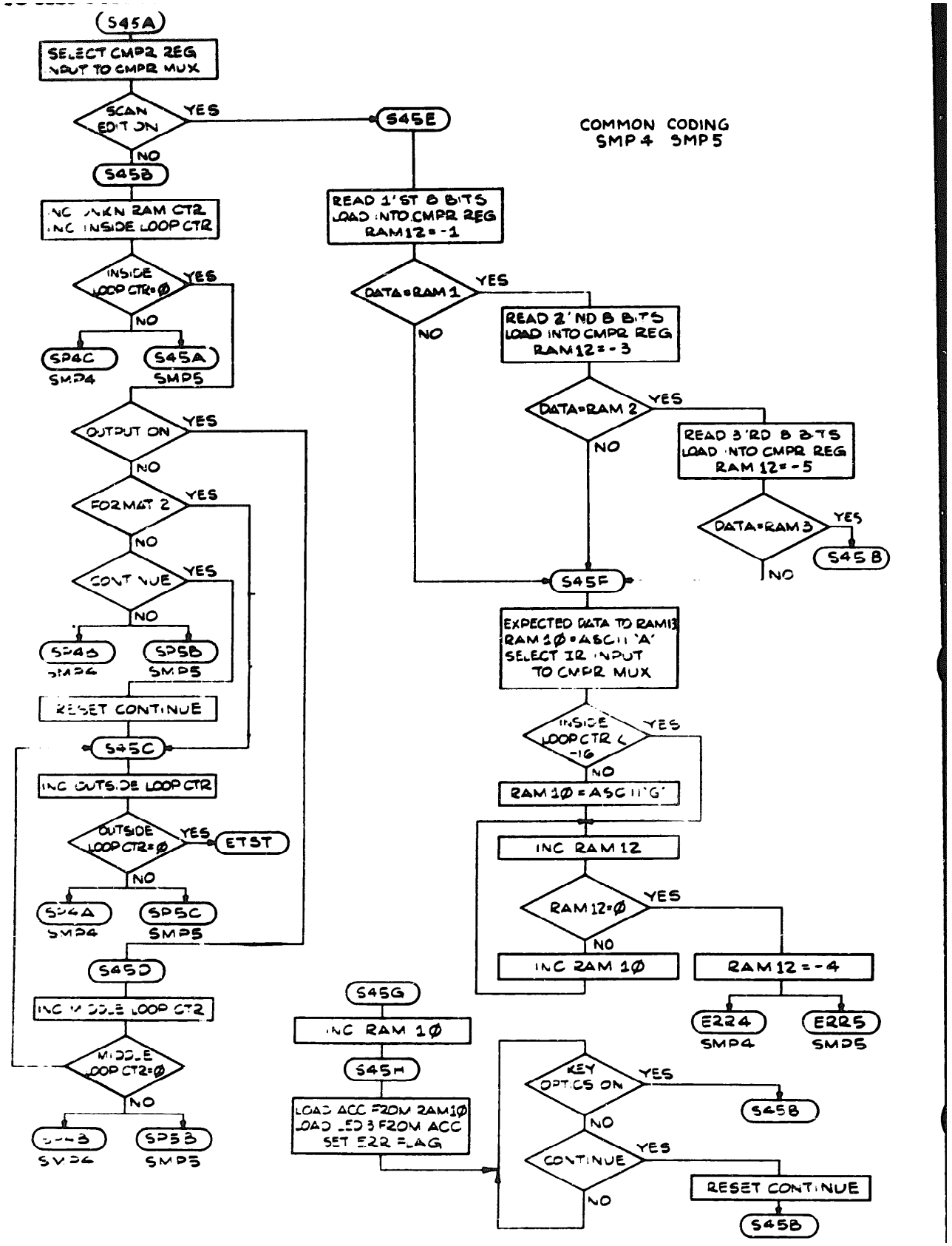


FIGURE 3-9

SCAN DIAGNOSTIC - SUBTESTS 4 & 5 FLOW CHART

Figure 3-9. Scan Diagnostic - Subtest 4 & 5 Flow Chart

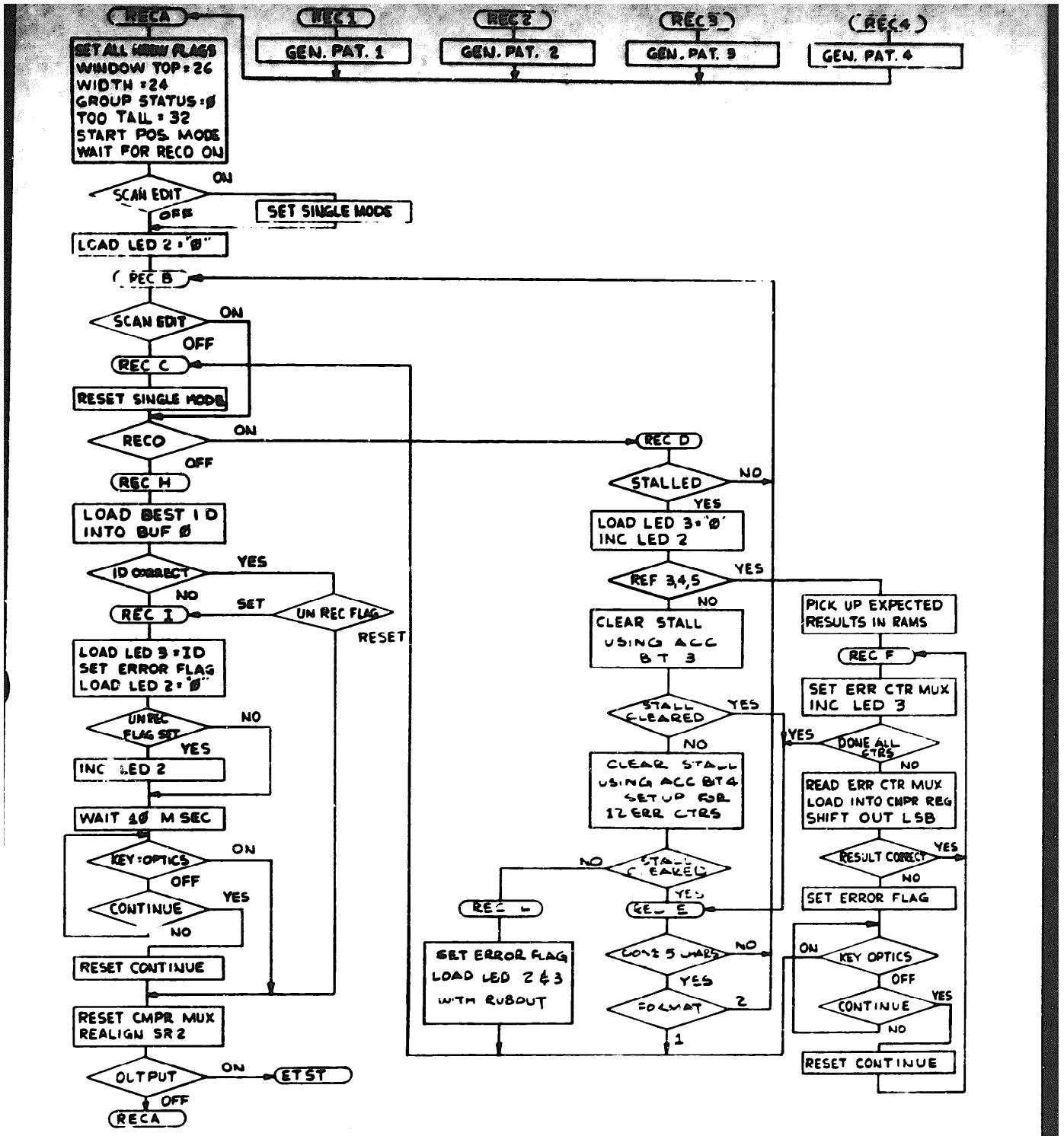


FIG 3-10
RECOGNITION DIAGNOSTIC
FLOW CHART

Figure 3-10. Recognition Diagnostic Flow Chart

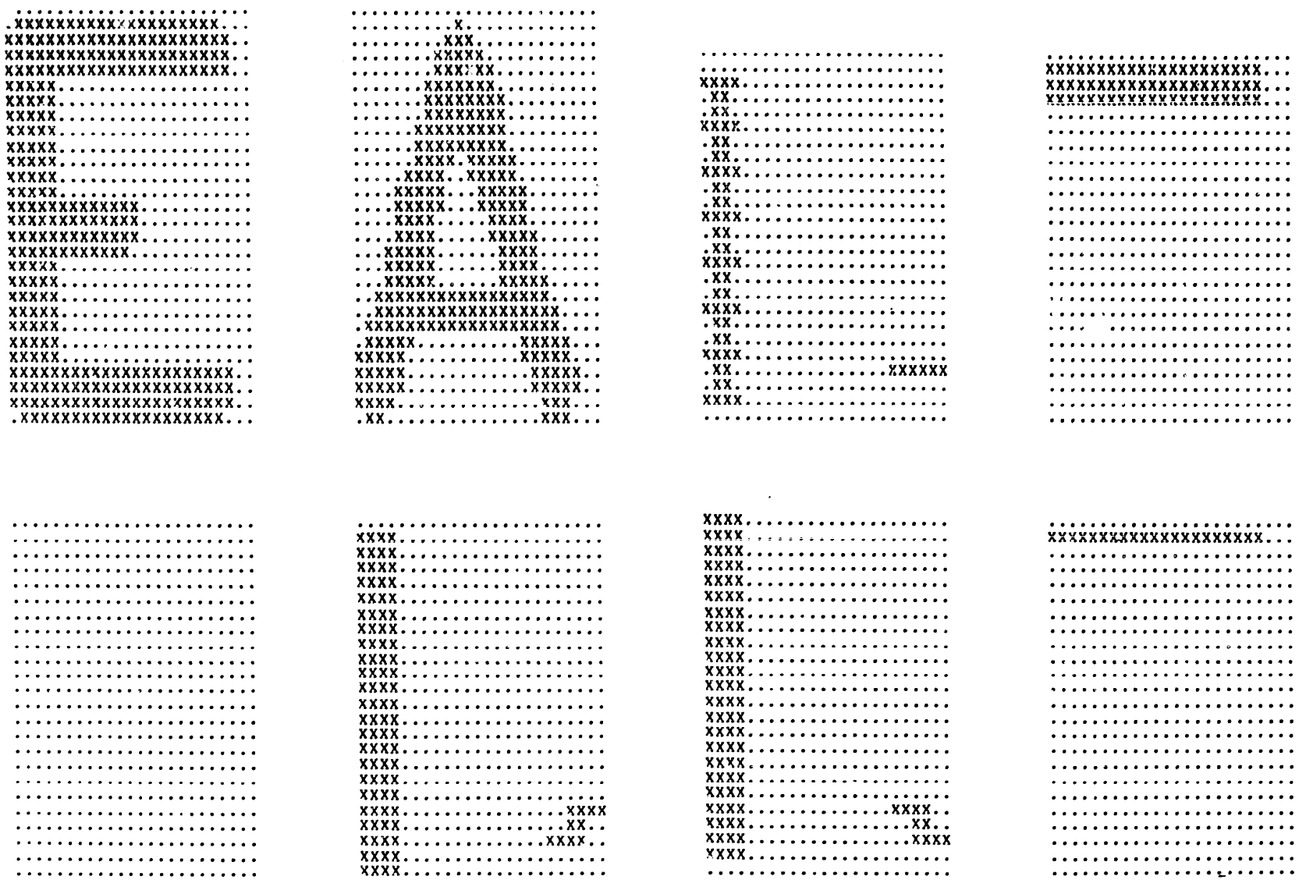


Figure 3-11. Recognition Diagnostic - Character Patterns

CHAPTER 4

THEORY OF OPERATION

4-1. PROGRAM CONTROL CIRCUITRY (Figure 4-1). - In the Internal Strobe Mode (S18 selected to U20-6), the Program Counter, U38 through U41, is enabled by a low out of U18-10 and S13 in the CTR INPUT SEL. A value selected in the S17 switches is compared to the Program Counter at U51, 50, 49, and 48. When they match, U48-6 goes high to U20-2. U20-5 sets wrong. INT STROBE is generated and if BREAKPOINT is ON the signal EXT BKPT is generated.

The Program Counter Display will continually display the data on cable J4 unless EXT CNTR is selected (S13), in which case it may be clocked by the EXT CNTR INPUT, INST STEP allows one instruction to be executed at a time by the RP238/GYX by generating EXT BKPT during each instruction.

A Jump instruction can be loaded in U11, 13, 15, 16 by selecting it on the EXT INSTRUCTION/ADDRESS SELECT switches S17 and momentarily pushing switch S11. It will then be displayed on the BDS LEDs U14, 12, and 10.

The LEDs are connected in parallel to J3, and display whatever is connected there when U16, 15, 13, and 11 are turned off by EXT INSTR high.

4-2. URAM, REF CHAR, AND ERROR DISPLAY CONTROLLER CIRCUITRY. -

a, ERROR Display (Figure 4-2). - The Reference Character to be compared is selected by switches S15. U46 and 47 use SO pulses

to count Reference Character cycles in the RP238/GYX, While the selected Reference Character is being processed the comparator U44-6 will be high enabling U22-6. RECO low clears this circuit between Recognition cycles. COUNTER CLEAR should be high for Error display,

When the last plane of the character is processed, ABORT CYCL high will enable U22-6. S16 is set for the desired Error Counter and compared to ECT 1, 2, and 4 by U42. U42-6 goes high enabling U22-6 while the selected Error Counter is available from the Error Mux (connected to J1), ECLK generates a low pulse out of U22-6 disabling U22-8 which toads U9, 7, 2, and 1 with the error count which is displayed by LEDs 11-16.

b. URAM and REF CHARACTER Display. - As described previously in paragraph 4-2a, U44-6 goes high for the selected Reference Character. When looking at a particular scanned character, COUNTER CLEAR disables this circuit except during recognition of the character selected by the Address Select switches. U44-6 enables U23 and U24 so that Recognition will be stalled during each plane by LOAD X-Y SHIFT REGISTER. The Plane Advance button is used to clear the stall and advance one plane. S14 and S9 are used to put a constant load condition on U9, 7, 2, and 1 so the LEDs always display the input from J1. J1 and J3 are connected to the Test Connectors for the desired character, Reference or Unknown.

4-3. SIMULATED VIDEO CONTROL AND GENERATOR/CIRCUITRY (Figures 4-3 and 4-4). - With SIM V Mode set to FREE RUN, 1.8 Mhz is divided

down by U38, U37, and U29 to generate SAMPLE. With SIMV Mode set to TRIGGERED, STROBE 7 is used to gate U36 at pin 1 to generate SAMPLE under program control. If SIMV is run through the Read Head Digital Board START PLSE (RSTART) generates SAMPLE through U30-11, either free running or gated by STROBE 7. SAMPLE goes to the RP238/GYX starting the Video Processing to read in the frame which will be generated by the SIMV circuit. U30-6 increments the PROM Address to select the next vertical frame of the SIMV character. After 32 frames counter stage U28-2 will change state, causing U24-11 to reload U35 and U28 with the address of the first frame of the SIMV character selected by S20.

As each frame is addressed in the PROMs U1-U6, the bits are serially read out by PAO-5 selecting them through 8-1 MUX chips U8-U13. U14-8 generates RH VIDEO to the Video Processing unless J7 is connected to the input of the Read Head Digital Board. In this case D VIDEO goes into the Digital Board and F/H SELECT disables the RH VIDEO output. Addressing of bits within a frame is done by VAO-7 from Video Processing unless the Digital Board is used. In that case MUX U33 and U34 selects RHAO-7 from counter U40 and U41. This counter uses the clock and start pulse from the Digital Board to duplicate the address counter on that board.

The output of the MUX is modified by subtracting the setting of the Bottom Space switches (invert and add in U19

and U20). If the Bottom Space setting is greater than the address from U33 and U34, the low on U19-14 (carry out) disables U14-8 generating light bits. The resultant address PAO-7 selects bits through U8-U13. When PAO-7 reaches the setting of the Height switches, comparator U26 and U27 at U26-5 disables U14-8 generating light bits for the rest of the frame.

Note:- 1. The values placed in the Bottom Space and Height switches are not the same as the values derived by the Position Mode logic for Bottom Space and Height.

2. If the Bottom Space switches are changed the program will move the "window" to follow the characters as far as possible

4-4. SIMULATED VIDEO CHARACTER SELECT CIRCUITRY (Figure 4-4). U30-6 triggers single shot U23 generating SAMPLE, incrementing the PROM Address Counters U35 and U28. U35 and U28 count up until U28-1 and A5-2 aren't the same (one is high and one is low). U24-11 then goes high, resetting U35 and loading U28 with the number on S20 (Character Select) and generating CHARACTER SYNC. S20 selects one of the simulated characters. Here, one of the eight possible characters is loaded into U28 and U35. They are incremented, selecting each vertical frame of the character. Each time S20 is loaded into U28 a CHARACTER SYNC pulse is generated.

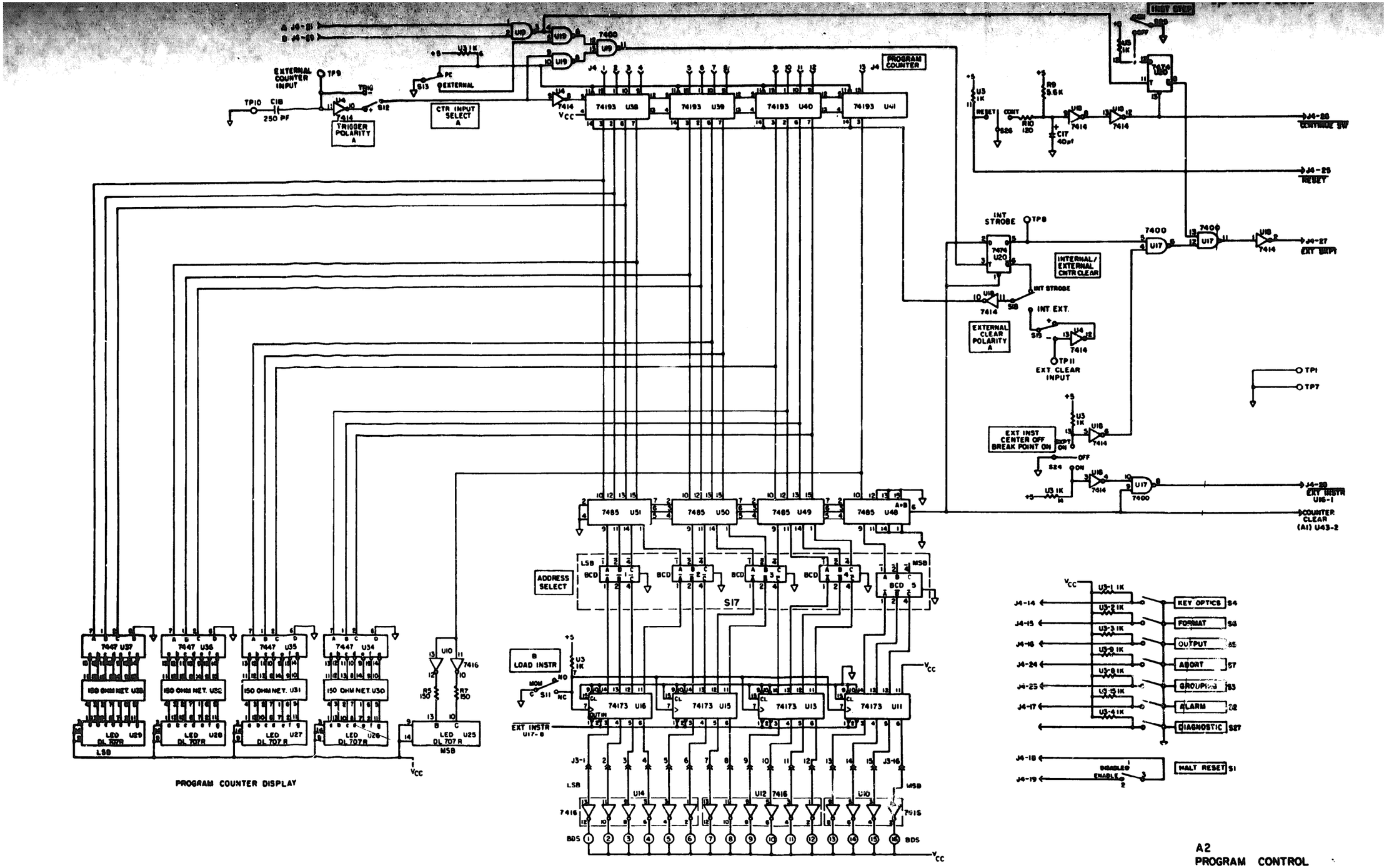


Figure 4-1. Program Control (A2), Schematic Diagram

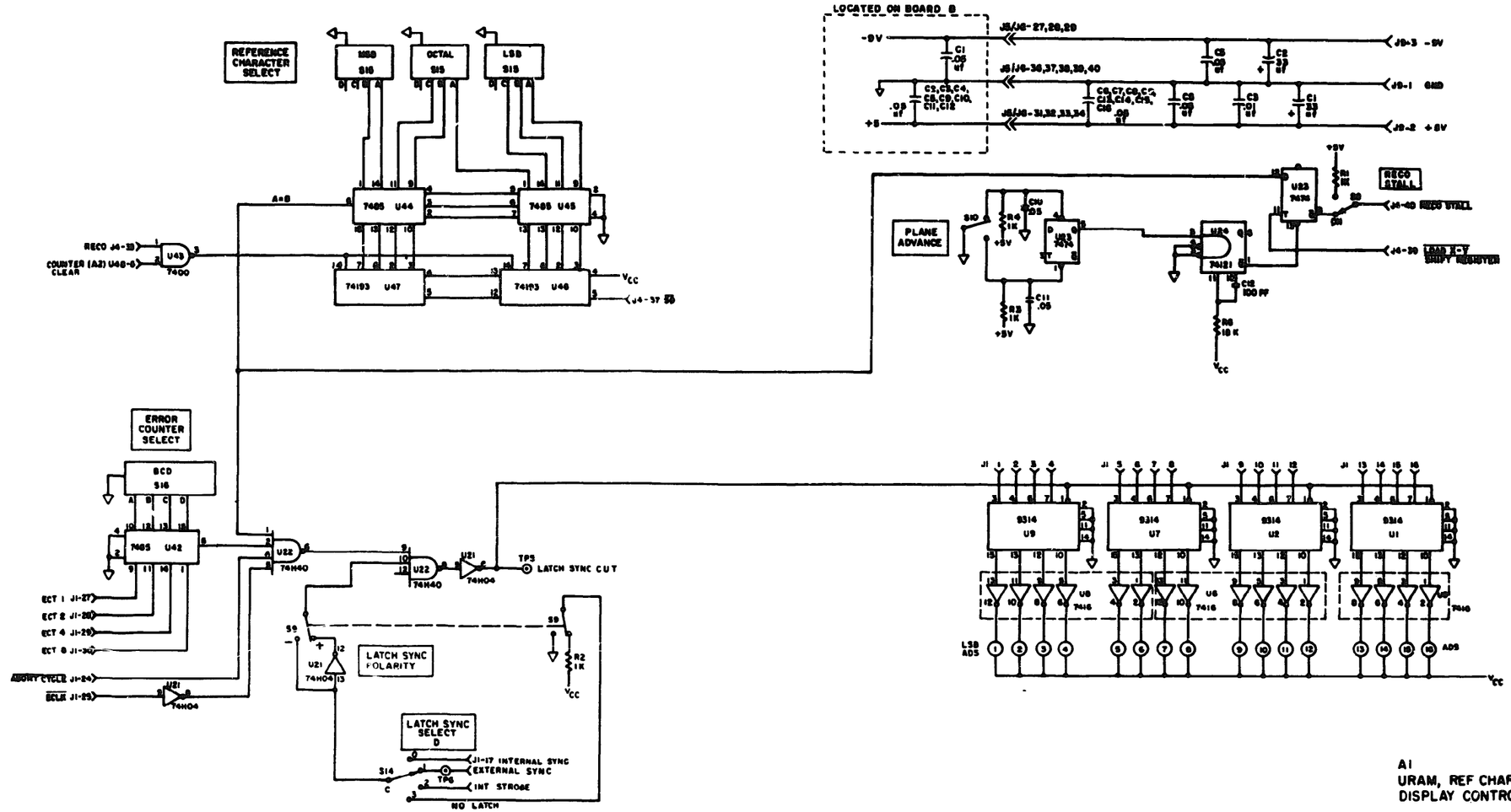


Figure 4-2. URAM REF CHAR and Error Display Controller, Schematic Diagram

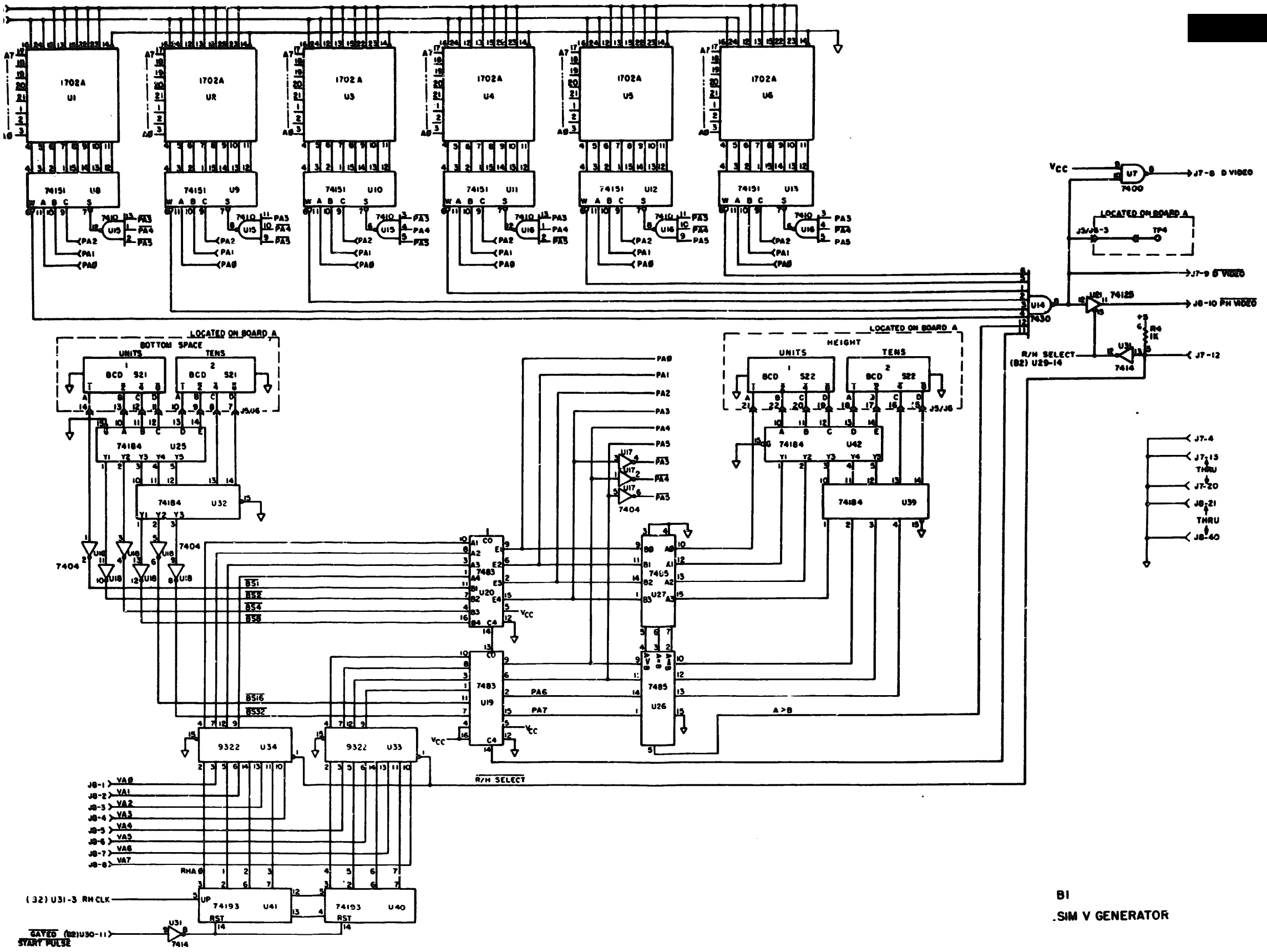


Figure 4-3. SIM V Generator (B1), Schematic Diagram

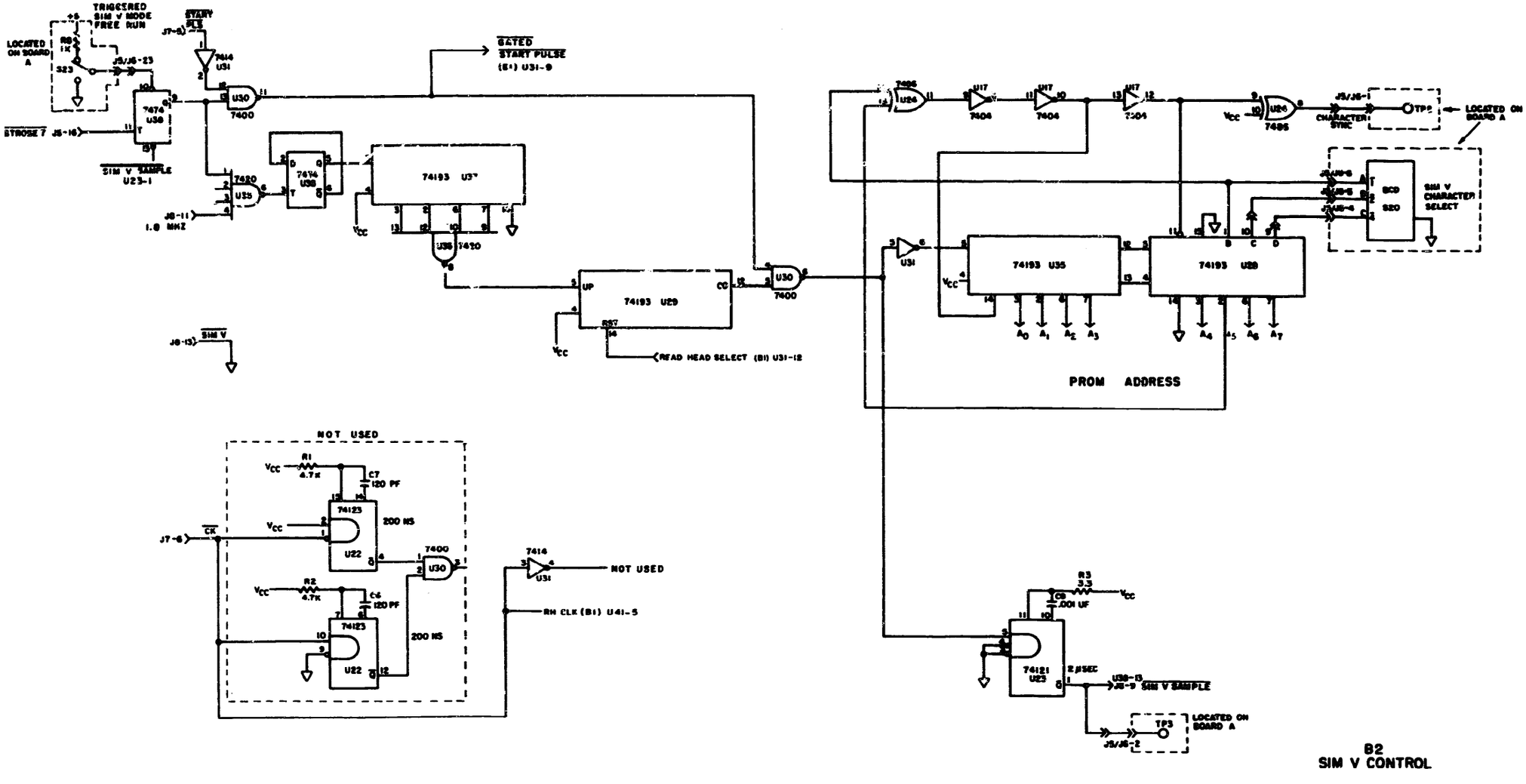


Figure 4-4. SIM V Control (B2), Schematic Diagram

CHAPTER 5

PREVENTIVE MAINTENANCE

5-1. INTRODUCTION. - This chapter contains the necessary preventive maintenance procedures that should be performed periodically to prevent major equipment failures. Preventive maintenance depends primarily upon performance checks of the equipment, and includes visual inspection of mechanical components. Visual inspections aid in the discovery of conditions which, if not remedied, may result in faulty operation, unwanted service interruptions, and breakdowns. Adherence to the preventive maintenance procedures presented herein ensures optimum equipment performance, maximum service lite, and minimum down time resulting from equipment failure.

5-2. TOOLS AND TEST EQUIPMEN? REQUIRED. - Standard test equipment required for preventive maintenance of the ALPHA is listed in Table 5-1, The table contains the name of the test equipment, manufacturer, and its application, Tools normally found in a maintenance tool box are not listed.

5-3. PREVENTIVE MAINTENANCE SCHEDULE. - To ensure optimum operating performance of the ALPHA, the preventive maintenance schedule set forth in Table 5-2 should be rigidly observed. Table 5-2 lists the maintenance routine and the intervals at which the routine should be performed,

TABLE 5-1

Standard Tools and Test Equipment

NOMENCLATURE	ALTERNATE MANUFACTURER AND PART NUMBER	APPLICATION
Oscilloscope AN/USM-196	Tektronix, Type 545A with probe	Observe wave-shapes
Voltmeter	Cimron, Type 6000 or equivalent	Measure voltages
Multimeter AN/PSM-6	Simpson, Type 260	Check continuity
Optical Character Reader RP238 GYX	CompuScan, Inc.	Check Input/Output Signals

TABLE 5-2

Preventive Maintenance Schedule

Period	Item	Action
Quarterly	1. Switches	Operate switches. Performance should be smooth and positive; detents should hold switch firmly in selected position. Spring loaded switches should return sharply (snap) to their off position.
	2. Connectors	Check that all connections are tight. Tighten loose connectors, if required.
	3. Electrical Components	Check electrical components for bulges, discoloration, and blisters. Replace defective component.
	4. Cables	Check all interconnecting and intraconnecting cables for cracked, cut, or frayed insulation. Repair or replace defective cables.
	5. Cabinet Access Door Hinges	Lubricate with Type 100 centistroke viscosity G.E. Versilube Silicone Oil (OH).
	6. Cabinet	Check for dents, scratches, and rusted or bare metal. Notify appropriate maintenance personnel regarding dents greater than one-quarter inch that impair operation of doors.

5-4. INSPECTION. - Periodic inspections should be made to determine if any unusual or abnormal wear is occurring and to determine the need for cleaning. Particular attention must be paid to any wear of the rotary number switches. Inspect each printed circuit card for:

a. Loose or missing I.C. on P.C. Cards.

b. Loose or damaged cables.

c. Presence of foreign matter.

d. Discolored or scorched components.

e. Cracked or frayed insulation.

f. Loose connections.

g. Bulged or leaking capacitors.

5-5. CLEANING. - Proper cleaning of the Test Set is essential for efficient operation. When cleaning, do not allow any liquid to run or drip into the case. Similarly, when cleaning with compressed air, use only moderate pressure to avoid injury to components. Clean the unit as follows:

a. Exterior Surface. - Exterior surfaces may be cleaned with a cloth moistened with a detergent solution.

Note:- Do not apply aerosol spray cleansers directly to the exterior of the case-

b. Interior. - the interior of the Test Set may be cleaned as required with compressed air and/or a vacuum cleaner. This is accomplished as follows:

(1) Depress two front Catches and lift up Test Set case top cover.

(2) Loosen center 'knurled knob and carefully pull front panel forward. This will expose the back of the lest Set and the component side of the Logic Circuit Card. The component side of Control Card extends through the front marking panel.

(3) Carefully remove and clean each board if required. Use a soft brush or a gentle stream of clean, dry, compressed air to remove any dust or dirt.

(4) Blow out and vacuum the Test Set case-

(5) upon completion, replace all components in the back of the case and secure the hinged front panel. Close the Test Set case.

APPENDIX A

SIGNAL TEST POINTS

TEST CONNECTOR: NO. 1 UNKNOWN RAM OUTPUT

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	UOB 1	CHAR LEFT SIDE	21		
2	UOB 2		22		
3	UOB 3		23		
4	UOB 4		24		
5	UOB 5		25		
6	UOB 6		26		
7	UOB 7		27		
8	UOB 8		28		
9	UOB 9		29		
10	UOB 10		30		
11	UOB 11		31		
12	UOB 12		32		
13	UOB 13		43	UOB 24	CHAR RIGHT SIDE
14	UOB 14		44	UOB 23	
15	UOB 15		45	UOB 22	
16	UOB 16		46	UOB 21	
17			47	UOB 20	
18			48	UOB 19	
19			49	UOB 18	
20			50	UOB 17	

TEST CONNECTOR: NO. 2 REFERENCE ALPHABET OUTPUT

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	RFB 1	CHAR LEFT SIDE	21		
2	RFB 2		22		
3	RFB 3		23		
4	RFB 4		24		
5	RFB 5		25		
6	RFB 6		26		
7	RFB 7		27		
8	RFB 8		28		
9	RFB 9		29		
10	RFB 10		30		
11	RFB 11		31		
12	RFB 12		32		
13	RFB 13		43	RFB 24	CHAR RIGHT SIDE
14	RFB 14		44	RFB 23	
15	RFB 15		45	RFB 22	
16	RFB 16		46	RFB 21	
17			47	RFB 20	
18			48	RFB 19	
19			49	RFB 18	
20			50	RFB 17	

TEST CONNECTOR: NO. 3 READ HEAD SIGNALS

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	VA 0	VIDEO RAM ADR	21		
2	VA 1	2	22		
3	VA 2	4	23		
4	VA 3	8	24		
5	VA 4	16	25		
6	VA 5	32	26		
7	VA 6	64	27		
8	VA 7	128	28		
9	SAMPLE	TEST	29		
10	$\overline{\text{RH VIDEO}}$	DIGITAL VIDEO	30		
11	2 MHZ		31		
12	$\overline{\text{SAMPLE}}$	ENCODER SAMPLE	32		
13	$\overline{\text{SIM V}}$	SIM V TEST	33		
14			34		
15			35		
16			36		
17			37		
18			38		
19			39		
20			40		

REMARKS: 21-40 GND

TEST CONNECTOR: NO. 4 REFERENCE ALPHABET OUTPUT 17-24
CPM ADDRESS

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	RFB 17		21		
2	RFB 18		22		
3	RFB 19		23		
4	RFB 20		24		
5	RFB 21		25		
6	RFB 22		26		
7	RFB 23		27		
8	RFB 24	CHAR RIGHT SIDE	28		
9	CPA 0	CPM ADR LSB	29		
10	CPA 1	2	30		
11	CPA 2	4	31		
12	CPA 3	8	32		
13	CPA 4	16	33		
14	CPA 5	32	34		
15	CPA 6	64	35		
16	CPA 7	128 MSB	36		
17			37		
18			38		
19			39		
20			40		

REMARKS: 21-40 GND

TEST CONNECTOR: NO. 5 BUFFER 0

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	OBFR 0	1 LSB	21		
2	OBFR 1	2	22		
3	OBFR 2	4	23		
4	OBFR 3	10	24		
5	OBFR 4	20	25		
6	OBFR 5	40	26		
7	OBFR 6	100	27		
8	OBFR 7	200 MSB	28		
9	OBFR 8	UNREC	29		
10	OBFR 9	TOUCHING	30		
11	OBFR 10	TOP ZERO	31		
12	OBFR 11	BOT ZERO	32		
13			33		
14			34		
15			35		
16			36		
17			37		
18			38		
19			39		
20			40		

REMARKS: 21-40 GND

TEST CONNECTOR: NO. 6

EX MACRO RAM OUTPUT
PROGRAM COUNTER INPUT

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	RAM 0	1 LSB	21		
2	RAM 1	2	22		
3	RAM 2	4	23		
4	RAM 3	8	24		
5	RAM 4	16	25		
6	RAM 5	32	26		
7	RAM 6	64	27		
8	RAM 7	128 MSB	28		
9	IEMAB 0	1 LSB	29		
10	IEMAB 1	2	30		
11	IEMAB 2	4	31		
12	IEMAB 3	10	32		
13	IEMAB 4	20	33		
14	IEMAB 5	40	34		
15	IEMAB 6	100	35		
16	IEMAB 7	200 MSB	36		
17	$\overline{\text{XFR}}$	MEM INST	37		
18			38		
19			39		
20			40		

REMARKS: 21-40 GND

TEST CONNECTOR: NO. 7

ACCUMULATOR OUTPUT
RAM C OUTPUT *

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	ACC 0	ACC OUT LSB	21		
2	ACC 1	2	22		
3	ACC 2	4	23		
4	ACC 3	8	24		
5	ACC 4	16	25		
6	ACC 5	32	26		
7	ACC 6	64	27		
8	ACC 7	128 MSB	28		
9			29		
10			30		
11			31		
12			32		
13			33		
14			34		
15			35		
16			36		
17			37		
18			38		
19			39		
20			40		

REMARKS:

Long cables on the accumulator lines may cause noise and affect operation.

* Special wiring for test card enabling self-checking diagnostics

21-40 GND

TEST CONNECTOR: NO. 8 PROGRAM PROM OUTPUT

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	EMOB 15	PROM OUT LSB	21		
2	EMOB 14	2	22		
3	EMOB 13	4	23		
4	EMOB 12	10	24		
5	EMOB 11	20	25		
6	EMOB 10	40	26		
7	EMOB 9	100	27		
8	EMOB 8	200	28		
9	EMOB 7	400	29		
10	EMOB 6	1000	30		
11	EMOB 5	2000	31		
12	EMOB 4	4000	32		
13	EMOB 3	10000	33		
14	EMOB 2	20000	34		
15	EMOB 1	40000	35		
16	EMOB 0	100000 MSB	36		
17			37		
18			38		
19			39		
20			40		

REMARKS: 21-40 GND

TEST CONNECTOR: NO. 9 ERROR COUNTER INPUT

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	ERROR 1		21		
2	ERROR 2		22		
3	ERROR 3		23		
4	ERROR 4		24		
5	ERROR 5		25		
6	ERROR 6		26		
7	ERROR 7		27		
8	ERROR 8		28		
9			29		
10			30		
11			31		
12			32		
13			33		
14			34		
15			35		
16			36		
17			37		
18			38		
19			39		
20			40		

REMARKS:

These signals are very noisy. A high when $\overline{\text{SHIFT XY SR}}$ goes low represents one error.

21-40 GND

TEST CONNECTOR: NO. 10 SCAN WINDOW CONTROL

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	BWL 0	WIND BOT LSB	21		
2	BWL 1		22		
3	BWL 2		23		
4	BWL 3		24		
5	BWL 4		25		
6	BWL 5		26		
7	BWL 6		27		
8	BWL 7	MSB	28		
9	TWL 0	WIND TOP LSB	29		
10	TWL 1		30		
11	TWL 2		31		
12	TWL 3		32		
13	TWL 4		33		
14	TWL 5		34		
15	TWL 6		35		
16	TWL 7	MSB	36		
17			37		
18			38		
19			39		
20			40		

REMARKS: 21-40 GND

TEST CONNECTOR: NO. 11

HEIGHT LATCH
WIDTH LATCH

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	HT 1	HEIGHT LSB	21		
2	HT 2		22		
3	HT 4		23		
4	HT 8		24		
5	HT 16		25		
6	HT 32		26		
7	HT 64		27		
8	HT 128	HEIGHT MSB	28		
9	CW 2	WIDTH	29		
10	CW 4		30		
11	CW 8		31		
12	CW 16		32		
13	CW 32	TOUCHING CHAR	33		
14			34		
15			35		
16			36		
17			37		
18			38		
19			39		
20			40		

REMARKS: 21-40 GND

TEST CONNECTOR: NO. 12 BOTTOM SPACE - TOP SPACE

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	B 0	BOT SPACE LSB	21		
2	B 1	2	22		
3	B 2	4	23		
4	B 3	8	24		
5	B 4	16	25		
6	B 5	32	26		
7	B 6	64	27		
8	B 7	128 MSB	28		
9	T 0	TOP SPACE LSB	29		
10	T 1	2	30		
11	T 2	4	31		
12	T 3	8	32		
13	T 4	16	33		
14	T 5	32	34		
15	T 6	64	35		
16	T 7	128 MSB	36		
17			37		
18			38		
19			39		
20			40		

REMARKS: 21-40 GND

TEST CONNECTOR: NO. 13 CHARACTER PARAMETER MEMORY OUTPUT

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	CPM 15	1 LSB	21		
2	CPM 14	2	22		
3	CPM 13	4	23		
4	CPM 12	10	24		
5	CPM 11	20	25		
6	CPM 10	40	26		
7	CPM 9	100	27		
8	CPM 8	200	28		
9	CPM 7	400	29		
10	CPM 6	1000	30		
11	CPM 5	2000	31		
12	CPM 4	4000	32		
13	CPM 3	10000	33		
14	CPM 2	20000	34		
15	CPM 1	40000	35		
16	CPM 0	100000 MSB	36		
17			37		
18			38		
19			39		
20			40		

REMARKS: 21-40 GND

TEST CONNECTOR: NO. 14 MISC. FLAGS

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	TCSF	TENT CHAR START	21		
2	RECRF	SR2 RECIR	22		
3	CEF	CHAR END	23		
4	LJUST	LEFT JUST	24		
5	RECOG	RECOGNITION	25		
6	PARTIAL 2		26		
7	REQ SER		27		
8	JUST	JUSTIFICATION	28		
9	BSZF	BOT SPACE 0	29		
10	TSZF	TOP SPACE 0	30		
11	CTTF	CHAR TOO TALL	31		
12	HTZ	HEIGHT 0	32		
13			33		
14	UNREC	UNRECOGNIZED	34		
15	STEP DOWN		35		
16	STEP UP		36		
17			37		
18			38		
19			39		
20			40		

REMARKS: 21-40 GND

TEST CONNECTOR: NO. 15 BREAKPOINT BOX CONTROL

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	EXT BKPT		21		
2	EXT INST		22		
3	A TIME		23		
4	B TIME		24		
5	LOAD IR		25		
6	CONTINUE	FROM BKPT	26		
7	RESET		27		
8			28		
9			29		
10			30		
11			31		
12			32		
13			33		
14			34		
15			35		
16			36		
17			37		
18			38		
19			39		
20			40		

REMARKS: 21-40 GND

TEST CONNECTOR: NO. 16 BEST ERROR - BEST ID

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	BID 0	BEST ID LSB	21		
2	BID 1	2	22		
3	BID 2	4	23		
4	BID 3	10	24		
5	BID 4	20	25		
6	BID 5	40	26		
7	BID 6	100	27		
8	BID 7	200 MSB	28		
9	BE 0	BEST ERR LSB	29		
10	BE 1	2	30		
11	BE 2	4	31		
12	BE 3	8	32		
13	BE 4	16	33		
14	BE 5	32 MSB	34		
15			35		
16			36		
17			37		
18			38		
19			39		
20			40		

REMARKS: 21-40 GND

TEST CONNECTOR: NO. 17

ERROR COUNTER MUX OUTPUT
SPECIAL CONTROL *

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	E 0	1 LSB	21		
2	E 1	2	22		
3	E 2	4	23		
4	E 3	8	24		
5	E 4	16	25		
6	E 5	32 MSB	26		
7			27		
8			28		
9			29		
10			30		
11			31		
12			32		
13			33		
14			34		
15			35		
16			36		
17			37		
18			38		
19			39		
20			40		

REMARKS: 21-40 GND

* Special wiring for test card enabling self-checking diagnostics.

TEST CONNECTOR: NO. 18 UNKNOWN RAM OUTPUT 17-24
UNKNOWN RAM ADDRESS COUNTER

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	UOB 17		21		
2	UOB 18		22		
3	UOB 19		23		
4	UOB 20		24		
5	UOB 21		25		
6	UOB 22		26		
7	UOB 23		27		
8	UOB 24	CHAR RIGHT SIDE	28		
9	URMA 1	UNKN RAM ADR LSB	29		
10	URMA 2	2	30		
11	URMA 3	4	31		
12	URMA 4	8	32		
13	URMA 5	16	33		
14	URMA 6	32 MSB	34		
15			35		
16			36		
17			37		
18			38		
19			39		
20			40		

REMARKS: 21-40 GND

TEST CONNECTOR: NO. 19 FEATURES OF UNKNOWN

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	BSZF		21		
2	TSZF		22		
3	VMF 1		23		
4	VMF 2		24		
5			25		
6			26		
7	PART 2 LO		27		
8	PART 2 HI		28		
9	PART 1 LO		29		
10	PART 1 HI		30		
11	NAR UNKN		31		
12	WIDE UNKN		32		
13	SHORT UNKN		33		
14	TALL UNKN		34		
15	SEL 1		35		
16	SEL 0		36		
17			37		
18			38		
19			39		
20			40		

REMARKS: 21-40 GND

TEST CONNECTOR: NO. 21 HORIZONTAL POSITION COUNTER

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	HCNT 5	0.05 IN	21		
2	HCNT 6	0.1 IN	22		
3	HCNT 7	0.2 IN	23		
4	HCNT 8	0.4 IN	24		
5	HCNT 9	0.8 IN	25		
6	HCNT 10	1.6 IN	26		
7	HCNT 11	3.2 IN	27		
8	HCNT 12	6.4 IN	28		
9			29		
10			30		
11			31		
12			32		
13			33		
14			34		
15			35		
16			36		
17			37		
18			38		
19			39		
20			40		

REMARKS: 21-40 GND

TEST CONNECTOR: NO. 22 VERTICAL POSITION COUNTER

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	VCNT 0	0.00625 IN	21		
2	VCNT 1	0.0125 IN	22		
3	VCNT 2	0.025 IN	23		
4	VCNT 3	0.05 IN	24		
5	VCNT 4	0.1 IN	25		
6	VCNT 5	0.2 IN	26		
7	VCNT 6	0.4 IN	27		
8	VCNT 7	0.8 IN	28		
9	VCNT 8	1.6 IN	29		
10	VCNT 9	3.2 IN	30		
11	VCNT 10	6.4 IN	31		
12	VCNT 11	12.8 IN	32		
13			33		
14			34		
15			35		
16			36		
17			37		
18			38		
19			39		
20			40		

REMARKS: 21-40 GND

TEST CONNECTOR: NO. 23 SR2 OUTPUT 17-24

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	UB 17		21		
2	UB 18		22		
3	UB 19		23		
4	UB 20		24		
5	UB 21		25		
6	UB 22		26		
7	UB 23		27		
8	UB 24	CHAR RIGHT SIDE	28		
9			29		
10			30		
11			31		
12			32		
13			33		
14			34		
15			35		
16			36		
17			37		
18			38		
19			39		
20			40		

REMARKS: 17-4G GND

TEST CONNECTOR: NO. 24 PAPER HANDLER CONTROL

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	GND		21		
2	GND		22		
3	FANFOLD		23		
4	GND		24		
5	HE 1	HOR ENCODER	25		
6	HE 2	HOR ENCODER	26		
7	GND		27		
8	HTC -	HOR TACH	28		
9	HTC +	HOR TACH	29	RPC	RIGHT PHOTOCELL
10	GND		30	GND	
11	HSA -	H SERVO AMP IN	31	RIR	RIGHT PHOTOCELL
12	HSA +	H SERVO AMP IN	32	LPC	LEFT PHOTOCELL
13	GND		33	GND	
14	VE 1	VER ENCODER	34	LIR	LEFT PHOTOCELL
15	VE 2	VER ENCODER	35	VSA +	V SERVO AMP IN
16	RH LAMP		36	VSA -	V SERVO AMP IN
17			37	GND	
18			38	VTC +	VER TACH
19			39	VTC -	VER TACH
20			40	GND	

REMARKS: 21-28 GND

TEST CONNECTOR: NO. 25 SR2 OUTPUT 1-16

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	UB 1	CHAR LEFT SIDE	21		
2	UB 2		22		
3	UB 3		23		
4	UB 4		24		
5	UB 5		25		
6	UB 6		26		
7	UB 7		27		
8	UB 8		28		
9	UB 9		29		
10	UB 10		30		
11	UB 11		31		
12	UB 12		32		
13	UB 13		33		
14	UB 14		34		
15	UB 15		35		
16	UB 16		36		
17			37		
18			38		
19			39		
20			40		

REMARKS: 17-40 GND

TEST CONNECTOR: NO. 26 INSTRUCTION REGISTER

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	IR 15	1 LSB	21		
2	IR 14	2	22		
3	IR 13	4	23		
4	IR 12	10	24		
5	IR 11	20	25		
6	IR 10	40	26		
7	IR 9	100	27		
8	IR 8	200	28		
9	IR 7	400	29		
10	IR 6	1000	30		
11	IR 5	2000	31		
12	IR 4	4000	32		
13	IR 3	10000	33		
14	IR 2	20000	34		
15	IR 1	40000	35		
16	IR 0	100000 MSB	36		
17			37		
18			38		
19			39		
20			40		

REMARKS: 17-40 GND

TEST CONNECTOR: NO.. 27 TEST MUX INPUT

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	IBT 1		21		
2	IBT 2		22		
3	IBT 3		23		
4	IBT 4		24		
5	IBT 5		25		
6	IBT 6		26		
7	IBT 7		27		
8	IBT 8		28		
9	IBT 9		29		
10	IBT 10		30		
11	IBT 11		31		
12	IBT 12		32		
13	IBT 13		33	IBT 24	
14	IBT 14		34	IBT 23	
15	IBT 15		35	IBT 22	
16	IBT 16		36	IBT 21	
17			37	IBT 20	
18			38	IBT 19	
19			39	IBT 18	
20			40	IBT 17	

TEST CONNECTOR: NO. 28 UNUSED

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1			21		
2			22		
3			23		
4			24		
5			25		
6			26		
7			27		
8			28		
9			29		
10			30		
11			31		
12			32		
13			33		
14			34		
15			35		
16			36		
17			37		
18			38		
19			39		
20			40		

TEST CONNECTOR: NO. 29

PROGRAM COUNTER OUTPUT
TEST SET CONTROL *

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	EMAB 0	1 LSB	21	A TIME	
2	EMAB 1	2	22		
3	EMAB 2	4	23	GROUP	GROUPING
4	EMAB 3	10	24	ABORT	
5	EMAB 4	20	25	RES SW	RESET
6	EMAB 5	40	26	CONTINUE	
7	EMAB 6	100	27	EXT BKPT	
8	EMAB 7	200	28	EXT INST	
9	EMAB 11	400	29	B TIME	
10	EMAB 10	1000	30		
11	EMAB 9	2000	31	GND	
12	EMAB 8	4000	32		
13	GND		33		
14	KO SW	KEY OPTICS	34		
15	FOR SW	FORMAT	35		
16	OUT SW	OUTPUT	36		
17	ALARM	SPEAKER	37	$\overline{SO}$	
18	HALT		38	RECO	
19	HALT		39	LOAD XY SR	
20			40	$\overline{\text{RECO STALL}}$	

REMARKS:

* Al Stream - may be wired to use ALPHA Test Set - otherwise GND 14-40.

TEST CONNECTOR: NO. 30

REFERENCE OUTPUT 1-16

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	RFB 1	CHAR LEFT SIDE	21		
2	RFB 2		22		
3	RFB 3		23		
4	RFB 4		24		
5	RFB 5		25		
6	RFB 6		26		
7	RFB 7		27		
8	RFB 8		28		
9	RFB 9		29		
10	RFB 10		30		
11	RFB 11		31		
12	RFB 12		32		
13	RFB 13		33		
14	RFB 14		34		
15	RFB 15		35		
16	RFB 16		36		
17			37		
18			38		
19			39		
20			40		

REMARKS: 17-40 GND

TEST CONNECTOR: NO. 31 KEYBOARD OUTPUT

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	GND		21		
2	-12 V		22		
3	STROBE		23		
4	+5 V		24		
5	KB 0	1 LSB	25		
6	KB 1	2	26		
7	KB 2	4	27		
8	KB 3	10	28		
9	KB 4	20	29		
10	KB 5	40	30		
11	KB 6	100	31		
12	KB 7	200 MSB	32		
13			33		
14			34		
15			35		
16			36		
17			37		
18			38		
19			39		
20			40		

REMARKS: 21-40 GND

TEST CONNECTOR: NO. 32 REFERENCE ALPHABET ADDRESS

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	RFA 0	LSB	21		
2	RFA 1		22		
3	RFA 2		23		
4	RFA 3		24		
5	RFA 4		25		
6	RFA 5		26		
7	RFA 6		27		
8	RFA 7		28		
9	RFA 8		29		
10	RFA 9		30		
11	RFA 10		31		
12	RFA 11	MSB	32		
13			33		
14			34		
15			35		
16			36		
17			37		
18			38		
19			39		
20			40		

REMARKS: 17-40 GND

TEST CONNECTOR: NO. 33 FORMAT PANEL

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1	GND		21		
2	KO SW	KEY OPTICS	22		
3	LS SW	LINE SPACING	23		
4			24		
5	+5 V		25		
6	DP SW	DOUBLE PAGE	26		
7			27		
8	$\overline{\text{ARO 4}}$		28		
9	$\overline{\text{LD SW}}$	LOAD SWITCH	29		
10	$\overline{\text{RD SW}}$	READ SWITCH	30		
11			31	GND	
12			32	GND	
13			33	GND	
14			34	FOR SW	FORMAT
15			35	SE SW	SCAN EDIT
16			36		
17			37		
18			38	ALPH SW	ALPHABET
19			39	OUT SW	OUTPUT
20			40		

REMARKS:

TEST CONNECTOR: NO. 34 CONTROL PANEL

PIN NO.	MNEMONIC	FUNCTION	PIN NO.	MNEMONIC	FUNCTION
1			21		
2	ALARM		22		
3			23	GND	
4			24	STOP	
5			25	$\overline{\text{RESET}}$	
6			26	PS SW	PAPER SENSE
7			27	PAGE	PAGE LAMP
8			28	MOTOR	FEEDER MOTOR
9			29	RUN	RUN LAMP
10			30	KEY	KEY LAMP
11			31		
12			32		
13			33	RESET SW	
14			34	START SW	
15			35	GND	
16			36	FANFOLD	FANFOLD LAMP
17			37	FEED	FEED LAMP
18			38	CONT SW	
19			39	DP	DOUBLE PAGE
20			40	FEED	FEED LAMP

REMARKS: 3-19 GND

APPENDIX B

SCANNING PROGRAM LISTING

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                                        LOC     0
**                                      *
**                                      *TITLE  SG5
**                                      *
**                                      *       ALPHA SCANNING PROGRAM
**                                      *       FOR USE WITH HEADER
**                                      *
**                                      *       12/3/75    W.K.C.
**                                      *
**                                      *       ALSTREAM PROGRAM
**                                      *       SUPPORTS 10/12 PITCH
**                                      *       WINDOW MADE SMALLER FOR 6 LPI
**                                      *       NO SCAN EDIT
**                                      *       BOTTOM MARGIN ADDED
**                                      *
**                                      *       TRANSFER (XFR) INSTRUCTION MNEMONICS
                              LDHI      EXTC    0
                              LDLO      EXTC    1
                              WRHI      EXTC    2
                              WRLO      EXTC    3
                              RDLO      EXTC    5
**                                      *       MEMORY ADDRESS OF SCANNING VARIABLES
                              TMLL      EXTC    26
                              TMAD      EXTC    27
                              BMAD      EXTC    30
                              TMUL      EXTC    31
                              LMLL      EXTC    32
                              LMAD      EXTC    33
                              RMAD      EXTC    34
                              RMUL      EXTC    35
                              ELAD      EXTC    36
                              NELAD     EXTC    37
                              PFAD      EXTC    40
                              SSP       EXTC    41
                              DSP       EXTC    42
                              DVCF      EXTC    44
                              PITAD     EXTC    46
**                                      *
**                                      *
                              LFEED     EXTC    12
                              CRET      EXTC    15
                              SEARCH    EXTC    30          LINE SEARCH CONSTANT
                              WLIM      EXTC    40          WIDE CHAR LIMIT
                              WWLIM     EXTC    74
                              W12LIM    EXTC    26.
                              WW12LM    EXTC    56.
                              WTOP      EXTC    120         NORMAL WINDOW TOP
                              TTHT      EXTC    41
                              EDIT      EXTC    1400
                              CURAM     EXTC    2377
                              INIM      EXTC    3374
                              STOUT     EXTC    3375
**                                      *
     0000   030007   INIT     PLA     7           GENERAL RESET
     0000   030017            PLB+    1           SELECT RAM 0 TO 15
     0001   060441            LOAD    1,TTHT      SET TOO TALL HT
**                                      *SET SPEEDS
     0002   062370            LOAD    4,370       VEL = 24
**                                      *
**                                      *
**                                      *
**                                      *       READ SWITCHES IS ENTERED AT PROGRAM
**                                      *       START TIME AND AFTER THE PROGRAM HAS
**                                      *       DETECTED THE STOP SWITCH SET AND THE
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**                              *       ROTARY SWITCH IS NOT IN [illegible], IT
**                              *       WILL WAIT FOR THE ROTARY [illegible] TO BE
**                              *       IN OPERATE AND START SWITCH PRESSED.
**                              *       IT WILL POLL THE ROTARY SWITCH FOR A
**                              *       MARGIN UPDATE OR TEST.
**                                      *
     0003   020600   RSW       RST     6           RESET TOG SW
     0004   060000              LOAD    0,0         RESET MUX'S
     0005   020070   RTST      TOG     7           READ ROT SW
     0005   022070              SET+    2
     0005   022470              RST+    4           RESET LED DISPLAY
     0006   020300              RST     3           RESET KYBD
     0007   070007              LDR     0,7
     0010   070425              LDR     1,OPER
     0011   102015              INC     4,RJMP
     0012   110413              INCR    1,.+1
     0013   110005              INCR    0,RTST
     0014   000011              JMP     .-3
     0015   010400   RJMP      JMPS    1
     0016   003374              JMP     INIM
     0017   000003              JMP     RSW
     0020   000030              JMP     ATST
     0021   001253              JMP     BMARG
     0022   001250              JMP     RMARG
     0023   001245              JMP     LMARG
     0024   001242              JMP     TMARG
     0025   125405   OPER      CMP     11,RTST     NO FRECO ?
     0026   055032              TST     26,RSTR     START ?
     0027   000005              JMP     RTST
     0030   125426   ATST      CMP     11,.-2      STANDARD ?
     0031   000005              JMP     RTST
**                                      *
**                              *       *           *
     0032   073440   RSTR      LDR     7,PGSTRT    GET RETURN
**                              *       *           *
     0033   020600   CONT      RST     6           RESET TOG SW
     0034   030003              PLA     3           TURN ON RUN & SCAN LAMP
     0035   072776              LDR     5,376       -2 FOR 1/2 SEC DELAY
     0036   070732              LDR     1,D25A      RETURN FOR MLSEC
     0037   000331              JMP     D250        GO WAIT 1/2 SEC.
**                                      *
**                              *       *           *
**                              *       *           *
**                              *       *           *
     0040   062357   PGSTRT    LOAD    4,357       SET LEFT SPEED = 47
     0041   062103              LOAD    4,103       DRIVE LEFT
     0042   062330              LOAD    4,330       SET RIGHT SPEED = 24
     0043   071520              LDR     3,WTOP      NORM WINDOW TOP
**                                      *
**                                      *WAIT FOR LEFT STOP
     0044   053446              TST     23,.+2      LEFT STOP ?
     0045   000044              JMP     .-1         NO - WAIT
**                                      *
**                                      *NOW DRIVE RIGHT
**                                      *SET HOR. MARG. TO CENTER
**                                      *WHEN HEAD REACHES MARG. SET HOR. POS. MODE
**                                      *CLEAR RAM 15
     0046   062106              LOAD    4,106       DRIVE RIGHT - DISABLE CLEAR
     0047   101451              INC     3,.+2       ZERO HOR. MARG.
     0050   000047              JMP     .-1
     0051   077540              LDR     15,140
     0052   101453              INC     3,.+1       SET HOR. MARG
     0053   117455              INCR    15,.+2
     0054   000052              JMP     .-2
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     0055  052055           TST     20,.+0      WAIT FOR HEAD AT CENTER
**                                  *HOLD HEAD IN HOR. POS. MODE WITH CLEA
**                                  *           DISABLED UNTIL NEW PAGE
**                                  *           APPEARS
     0056  062105           LOAD    4,105       SET HOR. POS. MODE CLEAR DI
**                                  *
     0057  101061  NP1      INC     2,.+2       ZERO TOP MARGIN
     0060  000057           JMP     .-1
     0061  020500           RST     5           RESET VER. POS. & BOT. MARG.
**                          *       *           *
**                          *       *           *
**                                  *CHECK FOR SIMV
     0062  056565           TST     29,NP3      SIMV ?
**                                  *IF PAPER PRESENT MUST BE OLD PAGE
     0063  053252           TST     22,OLDPG    PAPER PRESENT ?
**                          *       *           *
**                          *       *           *
**                                  *START ROLLERS & FEED WITH GUILLOTINE
**                                  *           AND CLEAR ENABLED
**                                  *SET TOP MARGIN
**                                  *WAIT 1 MIN. FOR PAPER
**                                  *WAIT 1/4 SEC. BEFORE RAISING GUILLOTI
**                                  *           PAPER AT GUILLOTINE
**                                  *WAIT 3 SEC. MAX FOR PAPER TO STOP
**                                  *CHECK FOR DOUBLE DOCUMENT
**                                  *CHECK FOR STOP SWITCH
**                          *
     0064  062233           LOAD    4,233       START ROLLERS & FEED
     0065  147400           XFR     15,LDHI     SET HI ORDER ADD. = 0
     0066  070027           LDR     0,TMAD      ADDRESS OF TMARG
     0067  140001           XFR     0,LDLO      SET LOW ORDER + READ
     0070  150005           XFR     0,RDLO      GET TMARG
     0071  150405           XFR     1,RDLO      GET BMARG
     0072  110473           INCR    1,.+1       ADD OFFSET
     0073  110074           INCR    0,.+1       ADD OFFSET
     0074  110075           INCR    0,.+1
     0075  110076           INCR    0,.+1
     0076  022000           SET     2
     0077  110502           INCR    1,SETTOP
     0100  103101           INC     6,.+1       SET BMARG
     0101  000077           JMP     .-2
     0102  070420  SETTOP    LDR     1,20        SCALING
     0103  110107           INCR    0,TOPSET
     0104  110502           INCR    1,SETTOP
     0105  101106           INC     2,.+1       MARG = TMARG X 16
     0106  000104           JMP     .-2
     0107  073534  TOPSET    LDR     7,DTOUT     DEST. AT END OF 1 MIN.
     0110  070513           LDR     1,TGUILO    DEST. AT END OF 1 MSEC.
     0111  072420  RR5       LDR     5,20        -240 FOR 1 MIN LOOP
     0112  000331           JMP     D250        SETUP 1/4 SEC. DELAY
     0113  124120  TGUILO    CMP     8,RGL       PAPER AT GUILLOTINE ?
     0114  123674  TDDOC     CMP     7,DDOC      DOUBLE DOCUMENT ?
     0115  053154           TST     22,NP2      PAPER PRESENT ?
     0116  055536           TST     27,PSTOP    STOP ?
     0117  000332           JMP     D25A        1 MS DLAY - RET VIA RAM 1
     0120  070522  RGL       LDR     1,.+2
     0121  000331           JMP     D250        SETUP 1/4 SEC. DELAY
     0122  117125           INCR    14,.+3      WAIT 1/4 SEC.
     0123  053114           TST     22,TDDOC    IF PAPER PRESENT, DON'T WAI
     0124  000333           JMP     MLSEC
     0125  124127           CMP     8,.+2       PAPER STILL THERE ?
     0126  000107           JMP     TOPSET      TRY AGAIN
     0127  062211           LOAD    4,211       RAISE GUILLOTINE
     0130  070514           LDR     1,TDDOC     DEST. AT END OF 1MSEC.
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     0131  073672          LDR     7,PER3      DEST. AT END OF 3 SEC.
     0132  072764          LDR     5,364       -12 FOR 3 SEC. DELAY
     0133  000331          JMP     D250        SETUP 3 SEC. DELAY
     0134  077350  DTOUT    LDR     14,350      TIMEOUT CODE
     0135  000346          JMP     SETOB       OUTPUT CODE
     0136  073457  PSTOP    LDR     7,NP1       DEST. FOR CONTINUE
     0137  062200  PGWT     LOAD    4,200       STOP ALL VER. MOTION
     0140  030003  LSTOP    PLA     3           TURN OFF RUN & SCAN LAMPS
     0141  020600          RST     6           RESET TOG SW
     0142  056033  PCT?     TST     28,CONT     CONTINUE ?
     0143  055315          TST     26,ABT?     START ?
     0144  020070          TOG     7           READ ROT SW
     0145  102142          INC     4,PCT?      OPERATE ?
     0146  102003          INC     4,RSW       MARGIN ?
     0147  102003          INC     4,RSW       MARGIN ?
     0150  102003          INC     4,RSW       MARGIN ?
     0151  102003          INC     4,RSW       MARGIN ?
     0152  102142          INC     4,PCT?      TEST A ?
     0153  000003          JMP     RSW         NO - GO SEE WHAT
**                         *       *           *
**                         *       *           *
**                                 *PAPER IS IN! DRIVE LEFT
**                                 *STOP FEED & SET VER. POS. MODE
**                                 *           WITH CLEAR DISABLED
     0154  062103  NP2      LOAD    4,103       DRIVE LEFT
     0155  062205          LOAD    4,205       STOP FEED - DISABLE CLEAR
     0156  070046          LDR     0,PITAD     ADDRESS OF PITCH SW
     0157  140001          XFR     0,LDLO      SET LOW ORDER
     0160  070000          LDR     0,0
     0161  125164          CMP     10,.+3      10 PITCH ?
     0162  070377          LDR     0,377
     0163  062326          LOAD    4,326       SET RIGHT SPEED = 18
     0164  140003          XFR     0,WRLO      SET PITCH SW
     0165  071000  NP3      LDR     2,0         CLEAR RAM 2
     0166  072000          LDR     4,0         CLEAR RAM 4
     0167  075000          LDR     10,0        CLEAR RAM 10
     0170  076777          LDR     13,377
     0171  077344          LDR     14,344      PAGE START CODE
     0172  000346          JMP     SETOB       OUTPUT PAGE START
**                         *       *           *
**                         *       *           *
**                         *       *           *
**                                 *THIS IS THE START OF EACH NEW LINE
**                                 *PAPER IS GENERALLY MOVING UP
**                                 *HEAD IS DRIVING LEFT
**                                 *BYPASS ALL MECH. TESTS IF IN SIMV
**                         *
     0173  061000  LSTRT    LOAD    2,0         RESET HRDW FLAGS
     0174  075446          LDR     11,PITAD    GET ADDRESS OF PITCH SW
     0175  145401          XFR     11,LDLO     SET LOW ADDRESS
     0176  155405          XFR     11,RDLO     GET SW
     0177  002377          JMP     CURAM       CLEAR UNKNOWN RAM
     0200  054202  NL1      TST     24,NL2      ROLLERS STOPPED ?
     0201  000200          JMP     .-1         NO - WAIT
**                                 *
**                                 *ROLLERS STOPPED - PAPER IN POSITION
**                                 *SET LEFT MARGIN JUST OFF LEFT EDGE
**                                 *WAIT FOR LEFT OF MARGIN OR LEFT STOP
**                                 *SET LEFT MARGIN & WAIT FOR LEFT EDGE
**                                 *
     0202  126341  NL2      CMP     12,EPAGE    BELOW BOT. MARG. ?
     0203  101605          INC     3,.+2       CLEAR HOR. MARGIN
     0204  000203          JMP     .-1
     0205  071044          LDR     2,44        NO OFFSET
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     0206  111211          INCR    2,.+3
     0207  101610          INC     3,.+1
     0210  000206          JMP     .-2
     0211  053614          TST     23,.+3      LEFT STOP ?
     0212  052214          TST     20,.+2      LEFT OF MARGIN ? (HEAD OFF PAPE
     0213  000211          JMP     .-2
     0214  030020          PLB     2           SELECT RAM 16 TO 31
     0215  076433          LDR     13,LMAD     ADDRESS OF LMARG
     0216  146401          XFR     13,LDLO     SET LO ORDER & READ LMARG
     0217  156405          XFR     13,RDLO'    GET LMARG & READ RMARG
     0220  157005          XFR     14,RDLO     GET RMARG
     0221  071334          LDR     2,334       PUT OFFSET IN RAM 2
     0222  077402  NL3     LDR     15,2        SCALING
     0223  117224          INCR    14,.+1      DECREMENT RMARG BY LMARG
     0224  116631          INCR    13,NL4
     0225  117622          INCR    15,NL3      LEFT MARGIN = 2 X LMARG
     0226  111227          INCR    2,.+1       SET RAM 2 = - LEFT MARGIN
     0227  101630          INC     3,.+1       SET LEFT MARGIN
     0230  000225          JMP     .-3
**                                             *
**                                             *DRIVE RIGHT
**                                             *WAIT FOR MARGIN OR RIGHT STOP
**                                             *
     0231  062102  NL4     LOAD    4,102       DRIVE RIGHT-CLEAR ENABLED
     0232  020200          RST     2           RESET SAMPLE
     0233  127341          CMP     14,EPAGE    RIGHT STOP ?
     0234  045632          TST     11,.-2      SAMPLE ?
     0235  052233          TST     20,.-2      NO MARGIN YET ?
     0236  062106          LOAD    4,106       DISABLE CLEAR
**                                             *
**                                             *AT LEFT MARGIN - SWAP MARGINS
**                                             *
     0237  117243          INCR    14,NL6
     0240  101641          INC     3,.+1       SET RIGHT MARGIN
     0241  101642          INC     3,.+1
     0242  000237          JMP     .-3
     0243  030010  NL6     PLB     1           SELECT RAM 0 TO 15
**                 *       *       *
**                 *       *       *
**                 *       *       *
**                                             *READY TO SCAN - INIT VARIOUS THINGS
**                         *
     0244  072400  CSMT    LDR     5,0         *CLEAR RAMS
     0245  077000          LDR     14,0        *
     0246  073770          LDR     7,370       INIT DIV. BY 8 CTR
     0247  071050          LDR     2,50
     0250  071520          LDR     3,WTOP
     0251  000706          JMP     ENDC
**                 *       *       *
**                 *       *       *
**                 *       *       *
     0252  102653  OLDPG    INC     5,.+1       DECREMENT TOP MARGIN
     0253  062201          LOAD    4,201       SET VER. POS. MODE
     0254  072730          LDR     5,330       -40 FOR 10 SEC. LOOP
     0255  073670          LDR     7,OPG1      DEST. AT END OF 10 SEC.
     0256  070660          LDR     1,.+2       DEST. AT END OF 1 MSEC
     0257  000331          JMP     D250        SETUP DELAY
     0260  020500          RST     5           RESET VER. POS.
     0261  053332          TST     22,D25A     PAPER PRESENT ?
     0262  070732          LDR     1,D25A      RETURN FOR MISEC
     0263  072776          LDR     5,376       -2 FOR 1/2 SEC. LOOP
     0264  073666          LDR     7,.+2       DEST. AT END OF 1/2 SEC.
     0265  000331          JMP     D250        SETUP 1/2 SEC. DELAY
     0266  062200          LOAD    4,200       STOP ROLLERS
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     0267  000057            JMP     NP1         NO
     0270  072714  OPG1      LDR     5,314       -ASCII 4
     0271  000275            JMP     PERR        GO TELL OPER.
**                            *       *           *
**                            *       *           *
**                            *       *           *
**                                    *ERROR MESSAGES
**                            *
     0272  072715  PER3      LDR     5,315       -ASCII 3
     0273  000275            JMP     PERR
     0274  072716  DDOC      LDR     5,316       -ASCII 2
     0275  073457  PERR      LDR     7,NP1       DEST. FOR CONTINUE
     0276  062200            LOAD    4,200       STOP ALL VER. MOTION
     0277  072260            LDR     4,260       -ASCII P
     0300  030003  EMES      PLA     3           TURN OFF RUN & SCAN LAMPS
     0301  020400            RST     4           CLEAR LED LATCHS
     0301  021400            SET+    1
     0302  020005            STB     5,.+1       SET DISP 2
     0303  112305            INCR    4,.+2
     0304  000302            JMP     .-2
     0305  072371            LDR     4,371       -ASCII BEL CODE
     0306  020004            STB     4,.+1       SET DISP 1
     0307  112311            INCR    4,.+2
     0310  000306            JMP     .-2
     0311  020006            STB     6,.+1       SET DISP 3
     0311  020606            RST+    6           RESET TOG SW
     0312  112714            INCR    5,.+2
     0313  000311            JMP     .-2
     0314  030004  TONE      PLA     4           TOG SPEAKER
     0315  055321  ABT?      TST     26,ABORT    START ?     TST  26,RSTP
     0316  056033            TST     28,CONT     CONTINUE ?
     0317  110314            INCR    0,TONE
     0320  000315            JMP     .-3         408 CYCLE TONE
**                            *       *               *
     0321  137400  ABORT     CMPR    15,0
     0322  040432            TST     1,RSTR      NO BOP ?
     0323  073725            LDR     7,.+2       DEST. AFTER 'CONT'
     0324  000033            JMP     CONT
     0325  077352            LDR     14,352      PAGE ABORT CODE
     0326  000343            JMP     APAGE       OUTPUT CODE
**                            *       *               *
**                            *       *               *
**                            *       *               *
**                                    *NX250MSEC DELAY ROUTINE WHERE RAM 5 = N
**                                    *RETURNS EVERY MSEC VIA RAM 1
**                                    *FINAL RETURN VIA RAM 7
**                                    *ENTER AT D250
**                                    *USES RAM 14 & MLSEC
     0327  013400            JMPS    7           END OF DELAY RETURN
     0330  112727            INCR    5,.-1       BUMP 1/4 SEC CTR
     0331  077005  D250      LDR     14,5        -251 FOR 1/4 SEC LOOP
     0332  117330  D25A      INCR    14,.-2      BUMP MSEC CTR
**                                    *
**                                    *MLSEC IS A 1 MSEC DELAY ROUTINE
**                                    *RETURNS VIA RAM 1
**                                    *USES RAM 0
     0333  070005  MLSEC     LDR     0,5
     0334  021000            SET     1
     0335  000336            JMP     .+1
     0336  110340            INCR    0,.+2
     0337  000335            JMP     .-2
     0340  010400            JMPS    1
**                            *       *               *
**                            *       *               *
```

```
**                              *       *                   *
**                              *       *
**                              *
**                              *
**                              *       END OF PAGE ROUTINE
**                                      *
    0341  030010  EPAGE     PLB     1           SELECT RAM 0 TO 15
    0342  077342            LDR     14,342      END PAGE CODE
    0343  056745  APAGE     TST     29,.+2      SIMV ?
    0344  062203            LOAD    4,203       DRIVE UP TO GET PAPER OUT
    0345  077777            LDR     15,377      SET END PAGE FLAG
    0346  060120  SETOB     LOAD    0,120       KYBD TO OB, CLEAR FLAGS
    0347  070006            LDR     0,6
    0350  030002            PLA     2           SET MAX VER SPACE = 10
    0351  070000            LDR     0,0
    0352  030010            PLB     1           SELECT RAM 0 TO 15
    0352  030011            PLA+    1           SELECT OB 0
    0353  020300            RST     3           RESET KYBD
    0354  020400            RST     4           CLEAR LED DISPLAY
    0354  021400            SET+    1
    0355  020060            TOG     6           LOAD KYBD
    0355  020064            STB+    4           LOAD LED 1
    0356  117360            INCR    14,.+2
    0357  000355            JMP     .-2
    0360  075601            LDR     11,201
    0361  020001            STB     1           PUT CHAR IN OB
    0362  020300            RST     3           CLEAR KYBD LATCH
    0362  020301            STB+    1           CLEAR & SHIFT OB
    0363  115766            INCR    11,IEDIT
    0364  000362            JMP     .-2
**                              *       *                   *
    0365  001373  MARG      JMP     DLAY
    0366  001400  IEDIT     JMP     EDIT
**                              *
**                              *
**                              *
**                              *       *                   *
                      ERTN    EXTC    1777                EDIT ERROR RTN
                      ERET    EXTC    3376
**                            *THESE JUMPS MUST REMAIN ABSOLUTE
**                            *THEY ARE USED BY ROUTINES ASSEMBLED SEPERATELY
                              LOC     372
    0372  001777            JMP     ERTN        EDIT ERROR RETURN
    0373  003376            JMP     ERET        OUTPUT ERROR RETURN
    0374  000300            JMP     ENES
    0375  000200  INL1      JMP     NL1
    0376  000243  INL6      JMP     NL6
    0377  000003  IRSW      JMP     RSW
**                              *       *           *
**                              *       *           *
**                              *       *           *
**                              *       *           *
**                              *       *           *
                              LOC     400
    0400  021000  SWAIT     SET     1           SET INCREMENT
    0400  021007            STB+    7           SYNC STROBE
    0401  045405  SWLP      TST     11,SAMPLE   SAMPLE ?
    0402  056401            TST     29,SWLP     SIMV ?
    0403  053001            TST     22,SWLP     PAPER PRESENT ?
    0404  000341            JMP     EPAGE
    0405  020200  SAMPLE    RST     2           RESET SAMPLE
    0406  042410            TST     5,.+2       FB1 = 1 ?
    0407  110410            INCR    1,.+1       NO FB = ODD STATE
    0410  010400            JMPS    1           JUMP THRU STATE TABLE
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     0411  001227  ST02    JMP     SPA1        1'ST FB
     0412  000733          JMP     SPA2        COUNT SPACES
     0413  000431  ST04    JMP     TCS1        POSSIBLE CHAR START
     0414  000733          JMP     SPA2        FALSE START
     0415  000446  ST06    JMP     CHS1        CHAR START
     0416  000476          JMP     CHS2        POSSIBLE CHAR END
     0417  000452  ST08    JMP     CHW1        WIDE CHAR
     0420  000513          JMP     CWID        POSSIBLE WIDE CHAR
     0421  000523  ST10    JMP     C1END       NON BLANK CHAR END
     0422  000523          JMP     C1END
     0423  000574  ST12    JMP     C3END       BLANK CHAR END
     0424  000574          JMP     C3END
     0425  112426  ST14    INCR    5,.+1       WIDE CHAR
     0426  000523          JMP     C1END       NORMAL CHAR
     0427  000452  ST16    JMP     CHW1
     0430  000523          JMP     C1END
**                         *       *           *
**                         *       *           *
     0431  043433  TCS1    TST     7,.+2       CORRELATE ?
     0432  000736          JMP     SPA5
     0433  112434          INCR    5,.+1       BUMP WIDTH
     0434  113035          INCR    6,.+1       BUMP WIDTH LIMIT
     0435  044443          TST     9,CSTRT     POPULATION HIGH ENOUGH ?
     0436  132405          CMPR    5,5
     0437  040443          TST     1,CSTRT     CHAR WIDE ENOUGH ?
     0440  132444          CMPR    5,44
     0441  040443          TST     1,CSTRT     WIDE CHAR START ?
     0442  000400          JMP     SWAIT
**                         *
**                         *CHAR START
     0443  074000  CSTRT   LDR     8,0         CLEAR CHAR END CTR
     0444  070415  SET6    LDR     1,ST06      SET NEW STATE
     0445  000400          JMP     SWAIT
**                         *       *           *
     0446  113050  CHS1    INCR    6,.+2
     0447  000452          JMP     CHW1
     0450  070417  CHW2    LDR     1,ST08      SET NEW STATE
     0451  061003          LOAD    2,03        SET TCHS & RECIR
**                         *       *           *
     0452  021000  CHW1    SET     1
     0453  112454          INCR    5,.+1       BUMP WIDTH
     0454  135777          CMPR    11,377
     0455  040515          TST     1,T12P      12 PITCH ?
     0456  132434          CMPR    5,34
     0457  040471          TST     1,CHW3      28 WIDE ?
     0460  132440          CMPR    5,WLIM
     0461  040473          TST     1,WWIDE     WIDE CHAR ?
     0462  132474          CMPR    5,WWLIM
     0463  040474  CHW4    TST     1,PWIDE     PREV & THIS CHAR WIDE ?
     0464  134000          CMPR    8,0
     0465  040400          TST     1,SWAIT     CHAR END CTR = 0 ?
     0466  022000          SET     2
     0467  114070          INCR    8,.+1       LOOP TO ADD POSSIBLE BLANK
     0470  000452          JMP     CHW1        SAMPLES TO CHAR WIDTH
     0471  070427  CHW3    LDR     1,ST16      SET NEW STATE
     0472  000400          JMP     SWAIT
     0473  072437  WWIDE   LDR     5,31.
     0474  070425  PWIDE   LDR     1,ST14      SET NEW STATE
     0475  000400          JMP     SWAIT
**                         *       *           *
     0476  113113  CHS2    INCR    6,CWID      WIDE CHAR ?
     0477  114100          INCR    8,.+1       BUMP CHAR END CTR
     0500  043044          TST     6,SET6      PREV FB = 1 ?
     0501  132440          CMPR    5,40
```

```
     0502  040104          TST     0,.+2       NON TOUCHING CHAR ?
     0503  000511          JMP     SCE
     0504  133370          CMPR    6,370
     0505  040107          TST     0,.+2       WIDTH LIMIT TOO BIG ?
     0506  000511          JMP     SCE
     0507  134010          CMPR    8,10
     0510  040044          TST     0,SET6      NOT ENOUGH BLANKS YET ?
     0511  070421  SCE     LDR     1,ST10      SET CHAR END STATE
     0512  000400          JMP     SWAIT       GET 1 MORE SAMPLE
**                         *       *           *
     0513  043050  CWID    TST     6,CHW2      PREV FB = 1 ?
     0514  000511          JMP     SCE         GO SET NEW STATE
     0515  132426  T12P    CMPR    5,22.
     0516  040471          TST     1,CHW3      22 WIDE ?
     0517  132432          CMPR    5,W12LIM
     0520  040473          TST     1,WWIDE     WIDE CHAR ?
     0521  132470          CMPR    5,WW12LM
     0522  000463          JMP     CHW4
**                         *       *           *
**                         *       *           *
**                         *       *           *
**                         *       THIS IS THE END OF A NON-BLANK CHAR
**                         *
     0523  061015  C1END    LOAD    2,15        *SET LJUST, CHAR END, TC.S
**                                               *RESET RECIR
     0524  133000          CMPR    6,0
     0525  040534          TST     1,NBS3      WAS CHAR WIDE ?
     0526  113134  NBS2    INCR    6,NBS3      *INC 1'ST BECAUSE OF EXTRA
**                                               *SAMPLE AT CHAR END
     0527  020002          STB     2           SHIFT SR2
     0530  070342          LDR     0,342
     0531  110357          INCR    0,SERR      SHIFT TOO LONG ?
     0532  042131          TST     4,.-1       STILL SHIFTING ?
     0533  000526          JMP     NBS2
     0534  070624  NBS3    LDR     1,EOCN      GET RETURN FOR EORC
     0535  132020          CMPR    4,20
     0536  040171          TST     0,LS1       1'ST CHAR ?
     0537  074357  RWAIT   LDR     8,357
     0540  114363          INCR    8,RERR      RECO > 9 MSEC ?
     0541  110140          INCR    0,.-1
     0542  050141          TST     16,.-1      RECO STILL ON ?
     0543  020001          STB     1           PUT LAST CHAR IN OB
     0544  061007  NBS4    LOAD    2,07        *RESET LJUST
**                                               *TURN ON RECIR FOR DIAG.
**                         *       *           *
     0545  070164  EORC    LDR     0,JWAIT     GET RETURN FOR REPOS & LF1
     0546  132400          CMPR    5,0         PUT WIDTH IN ACC
     0547  020040          TOG     4           LOAD WIDTH LATCH
     0550  060001          LOAD    0,01        SET CMPR MUX TO OB
     0551  074000          LDR     8,0         CLEAR FB0 CTR
     0552  134000          CMPR    8,0
     0553  060000          LOAD    0,00        RESET MUX
     0554  040556          TST     1,.+2       OB NOT FULL ?
     0555  001052          JMP     ELINE       OB FULL !
     0556  116164          INCR    12,JWAIT    LAST CHAR SPACE ?
     0557  132021          CMPR    4,21
     0560  040647          TST     1,REPOS     LINE NOT FOUND & NOT 1'ST CHAR ?
     0561  040164          TST     0,JWAIT     1'ST CHAR ?
**                                               *LINE MUST HAVE BEEN FOUND
     0562  050721  LF1     TST     17,UP       BOT SPACE TOO BIG ?
     0563  051327          TST     18,DOWN     BOT SPACE TOO SMALL ?
     0564  070300  JWAIT   LDR     0,300
     0565  110361          INCR    0,JERR      POS MODE + JUST TOO LONG ?
     0566  050170          TST     16,.+2      RECO STARTED ?
```

```
     0567  000565           JMP     .-2
     0570  010400           JMPS    1           GO TO EOCN OR EOCB
     0571  072020  LS1      LDR     4,20        SET LINE STATE CTR
     0572  076000           LDR     12,0        RESET SPACE FLAG
     0573  000544           JMP     NBS4
**                          *       *           *
**                          *       *           *
**                          *       *           *
**                          *       THIS IS THE END OF A BLANK CHAR
**                          *
     0574  061014  C3END     LOAD    2,14        *SET LJUST, CHAR END
**                                                *RESET RECIR, TCHS
     0575  070602           LDR     1,EOCB      GET RETURN FOR EORC
     0576  072404           LDR     5,4         LOAD WIDTH CTR
     0577  000537           JMP     RWAIT
**                          *
     0600  132020  ZHGT      CMPR    4,20
     0601  040606           TST     1,NOCHAR    1'ST CHAR ?
**                          *       *           *
**                          *       *           *
**                                  *EORC WILL RETURN HERE FOR SPACES
**                          *
     0602  021000  EOCB      SET     1
     0603  113716           INCR    7,R3WAT     ENOUGH SPACES TO END LINE ?
     0604  076377           LDR     12,377      SET SPACE FLAG
     0605  000706           JMP     ENDC
     0606  072000  NOCHAR    LDR     4,0         RESET LINE STATE CTR
     0607  070411           LDR     1,ST02      RESET CHAR STATE CTR
     0610  073770  NOC1      LDR     7,370
     0611  022000  NOC2      SET     2
     0612  112621           INCR    5,NOC3
     0613  021000           SET     1
     0614  113616           INCR    7,.+2
     0615  000611           JMP     NOC2
     0616  117220           INCR    14,.+2
     0617  000610           JMP     NOC1
     0620  001161           JMP     EBLINE
     0621  061000  NOC3      LOAD    2,0         RESET HRDW FLAGS
     0622  021000           SET     1           SET INCREMENT
     0623  001147           JMP     CEBL        CHECK FOR POSSIBLE END OF LINE
**                          *       *           *
**                          *       *           *
**                                  *EORC WILL RETURN HERE FOR NON SPACE CHARS
**                                  *
     0624  126600  EOCN      CMP     13,ZHGT     HEIGHT = ZERO
     0625  076000           LDR     12,0        RESET SPACE FLAG
     0626  073436  CLIM      LDR     7,ELAD      ADDRESS OF EOL CRITERIA
     0627  143401           XFR     7,LDLO      SET LOW ORDER & READ
     0630  153405           XFR     7,RDLO      GET EOL
     0631  046306           TST     12,ENDC     CHAR TOO TALL ?
     0632  070306           LDR     0,ENDC      GET RETURN
     0633  132022           CMPR    4,22
     0634  040704           TST     1,CBTZ      LINE FOUND ?
     0635  072021           LDR     4,21        *SET LINE STATE SO NEXT
**                                                *CHAR WILL GO TO REPOS
     0636  041241           TST     2,UAJ4      TOP SPACE ZERO ?
     0637  041644           TST     3,DAJ4      BOT SPACE ZERO ?
     0640  000706           JMP     ENDC
     0641  073373  UAJ4      LDR     6,373       -5
     0642  074400           LDR     9,0         SET RESCAN FLAG
     0643  000661           JMP     UADJW
     0644  073004  DAJ4      LDR     6,4
     0645  074400           LDR     9,0         SET RESCAN FLAG
     0646  000700           JMP     DADJW
```

```
**                                  *       *           *
**                                  *       *           *
     0647  050655  REPOS     TST    17,UAJ2     BOT SPACE TOO BIG ?
     0650  051273            TST    18,DAJ2     BOT SPACE TOO SMALL ?
**                                  *LINE FOUND !
     0651  134400  LFOUND    CMPR   9,0
     0652  040703            TST    1,IFLRSC    ANY BOT OR TOP ZERO ?
     0653  072022            LDR    4,22        SET LINE STATE CTR
     0654  000564            JMP    JWAIT
     0655  135200  UAJ2      CMPR   10,200
     0656  040260            TST    0,.+2       ONLY MOVED UP BEFORE ?
     0657  000651            JMP    LFOUND      NO - CHANGE OF DIRECTION
     0660  073375            LDR    6,375       -3
     0661  021000  UADJW     SET    1           SET INCREMENT
     0662  131003  ADJW      CMPR   2,3
     0663  040703            TST    1,IFLRSC    AT BOT LIMIT ?
     0664  131576            CMPR   3,176
     0665  040703            TST    1,IFLRSC    AT TOP LIMIT ?
     0666  113302            INCR   6,AWRET     FINISHED ?
     0667  111270            INCR   2,.+1
     0670  111671            INCR   3,.+1
     0671  115272            INCR   10,.+1      KEEP TRACK OF TOTAL MOVE
     0672  000662            JMP    ADJW
     0673  135000  DAJ2      CMPR   10,0
     0674  040677            TST    1,.+3       NO PRIOR MOVE ?
     0675  135200            CMPR   10,200
     0676  040251            TST    0,LFOUND    MOVED UP BEFORE ?
     0677  073002            LDR    6,2
     0700  022000  DADJW     SET    2           SET DECREMENT
     0701  000662            JMP    ADJW
     0702  010000  AWRET     JMPS   0           GO TO JWAIT OR ENDC
     0703  001134  IFLRSC    JMP    FLRSC
     0704  041321  CBTZ      TST    2,UP        TOP SPACE ZERO ?
     0705  041727            TST    3,DOWN      BOT SPACE ZERO ?
**                                  *       *           *
**                                  *       *           *
     0706  070411  ENDC      LDR    1,ST02      RESET CHAR STATE CTR
     0707  131000            CMPR   2,0         LOAD ACC
     0710  020010            TOG    1           SET NEW BOT WINDOW
     0711  131400            CMPR   3,0         LOAD ACC
     0712  020020            TOG    2           SET NEW TOP WINDOW
     0713  061000            LOAD   2,0         RESET HRDW FLAGS
     0714  056400            TST    29,SWAIT    SIMV ?
     0715  052000            TST    20,SWAIT    NO MARGIN YET ?
     0716  050316  R3WAT     TST    16,R3WAT    WAIT FOR RECO TO FINISH
     0717  020001            STB    1           SHIFT LAST CHAR INTO OB
     0720  001052            JMP    ELINE
     0721  131576  UP        CMPR   3,176
     0722  040726            TST    1,MOVED     AT TOP LIMIT ?
     0723  021000            SET    1           SET INCREMENT
     0724  111325  UPDW      INCR   2,.+1
     0725  111726            INCR   3,.+1
     0726  010000  MOVED     JMPS   0           GO TO JWAIT OR ENDC
     0727  131003  DOWN      CMPR   2,3
     0730  040726            TST    1,MOVED     AT BOT LIMIT ?
     0731  022000            SET    2           SET DECREMENT
     0732  000724            JMP    UPDW
**                                  *       *           *
**                                  *       *           *
**                                  *       *           *
**                                  *       *           *
     0733  072400  SPA2      LDR    5,0         RESET WIDTH CTR
     0734  070411            LDR    1,ST02      RESET CHAR STATE CTR
     0735  061000            LOAD   2,0         RESET TCHS FLOP
```

```
     0736  132020  SPA5    CMPR    4,20
     0737  040350          TST     0,IBLINE  1'ST CHAR ?
     0740  114341          INCR    8,.+1
     0741  135777          CMPR    11,377
     0742  116351          INCR    12,PCS    PREV CHAR SPACE ?
     0743  040755          TST     1,T20     12 PITCH ?
     0744  134032  T26     CMPR    8,26.
     0745  040000  EOST    TST     0,SWAIT   NOT ENOUGH FOR SPACE ?
     0746  070423          LDR     1,ST12    SET BLANK CHAR END STATE
     0747  000400          JMP     SWAIT
     0750  001143  IBLINE  JMP     BLINE
     0751  076377  PCS     LDR     12,377    RELOAD SPACE FLAG
     0752  040744          TST     1,T26     12 PITCH ?
     0753  134037          CMPR    8,31.
     0754  000745          JMP     EOST
     0755  134024  T20     CMPR    8,20.
     0756  000745          JMP     EOST
**                         *       *         *
**                         *       *         *
     0757  072717  SERR    LDR     5,317     -ASCII 1
     0760  000762          JMP     .+2
     0761  072716  JERR    LDR     5,316     -ASCII 2
     0762  000764          JMP     .+2
     0763  072715  RERR    LDR     5,315     -ASCII 3
     0764  072255          LDR     4,255     -ASCII S
     0765  073714          LDR     7,TONE    DEST FOR CONTINUE
     0766  000300          JMP     EMES
**                         *       *         *
**                         *       *         *
**                         *       *         *
                           LOC     1000
**                         *
**                                 *EDIT & OUTPUT ROUTINES RETURN HERE
**                                 *
     1000  060000          LOAD    0,0       RESET MUX'S
     1001  030010          PLB     1         SELECT RAM 0 TO 15
     1002  021000          SET     1         SET INCREMENT
     1003  070000          LDR     0,0
     1004  140000          XFR     0,LDHI    SET HI ORDER MEMORY ADR.
     1005  117447          INCR    15,NEWPG  BUMP LINE CTR - END OF PAGE ?
     1006  136777          CMPR    13,377
     1007  040214          TST     0,JOUT    MORE BLANK LINES TO OUTPUT ?
     1010  076400          LDR     13,0      CLEAR RAM 13
**                         *       *         *
**                         *       *         *
     1011  074776  RRSCN   LDR     9,376     RESET RESCAN CTR
**                         *       *         *
**                         *       CLEAR SELECTED OB
**                         *
     1012  060120  CLOB    LOAD    0,120     SELECT KYBD TO OB, CLEAR FLAGS
     1013  070177          LDR     0,177     LOAD LOOP CTR
     1014  020300          RST     3         CLEAR KYBD LATCH
     1014  020301          STB+    1         SHIFT OB
     1014  021301          SET+    1         SET INCREMENT
     1015  110017          INCR    0,.+2
     1016  001014          JMP     .-2
     1017  060000          LOAD    0,0       RESET MUX'S
**                         *
**                         *
**                         *       *         *
**                                 *ADJUST AMOUNT PAPER IS TO BE MOVED
**                                 *BY AMOUNT WINDOWN HAD TO MOVE
**                         *
     1020  135200  TUD     CMPR    10,200
```

```
     0736  132020  SPA5    CMPR    4,20
     0737  040350          TST     0,IBLINE    1'ST CHAR ?
     0740  114341          INCR    8,.+1
     0741  135777          CMPR    11,377
     0742  116351          INCR    12,PCS      PREV CHAR SPACE ?
     0743  040755          TST     1,T20       12 PITCH ?
     0744  134032  T26     CMPR    8,26.
     0745  040000  EOST    TST     0,SWAIT     NOT ENOUGH FOR SPACE ?
     0746  070423          LDR     1,STI2      SET BLANK CHAR END STATE
     0747  000400          JMP     SWAIT
     0750  001143  IBLINE  JMP     BLINE
     0751  076377  PCS     LDR     12,377      RELOAD SPACE FLAG
     0752  040744          TST     1,T26       12 PITCH ?
     0753  134037          CMPR    8,31.
     0754  000745          JMP     EOST
     0755  134024  T20     CMPR    8,20.
     0756  000745          JMP     EOST
**                         *       *           *
**                         *       *           *
     0757  072717  SERR    LDR     5,317       -ASCII 1
     0760  000762          JMP     .+2
     0761  072716  JERR    LDR     5,316       -ASCII 2
     0762  000764          JMP     .+2
     0763  072715  RERR    LDR     5,315       -ASCII 3
     0764  072255          LDR     4,255       -ASCII S
     0765  073714          LDR     7,TONE      DEST FOR CONTINUE
     0766  000300          JMP     EMES
**                         *       *           *
**                         *       *           *
**                         *       *           *
                           LOC     1000
**                                 *
**                                 *EDIT & OUTPUT ROUTINES RETURN HERE
**                                 *
     1000  060000          LOAD    0,0         RESET MUX'S
     1001  030010          PLB     1           SELECT RAM 0 TO 15
     1002  021000          SET     1           SET INCREMENT
     1003  070000          LDR     0,0
     1004  140000          XFR     0,LDHI      SET HI ORDER MEMORY ADR.
     1005  117447          INCR    15,NEWPG    BUMP LINE CTR - END OF PAGE ?
     1006  136777          CMPR    13,377
     1007  040214          TST     0,JOUT      MORE BLANK LINES TO OUTPUT ?
     1010  076400          LDR     13,0        CLEAR RAM 13
**                         *       *           *
**                         *       *           *
     1011  074776  RRSCN   LDR     9,376       RESET RESCAN CTR
**                         *       *           *
**                         *       CLEAR SELECTED OB
**                         *
     1012  060120  CLOB    LOAD    0,120       SELECT KYBD TO OB, CLEAR FLAGS
     1013  070177          LDR     0,177       LOAD LOOP CTR
     1014  020300          RST     3           CLEAR KYBD LATCH
     1014  020301          STB+    1           SHIFT OB
     1014  021301          SET+    1           SET INCREMENT
     1015  110017          INCR    0,.+2
     1016  001014          JMP     .-2
     1017  060000          LOAD    0,0         RESET MUX'S
**                         *
**                         *
**                         *       *           *
**                                 *ADJUST AMOUNT PAPER IS TO BE MOVED
**                                 *BY AMOUNT WINDOWN HAD TO MOVE
**                         *
     1020  135200  TUD     CMPR    10,200
```

```
    1101  072200          LDR     4,200       LOAD LOOP CTR
    1102  057106  FLOOP    TST     30,FSHF     WIDE CHAR ?
    1103  051511          TST     19,TSZR     TOP ZERO ?
    1104  052513          TST     21,INCT     BOT ZERO ?
    1105  057515          TST     31,UNREC    UNRECOGNIZED ?
    1106  020001  FSHF    STB     1           SHIFT OB
    1107  112117          INCR    4,CKFLG     FINISHED ?
    1110  001102          JMP     FLOOP
    1111  052506  TSZR    TST     21,FSHF     BOT ZERO = TOO TALL ?
    1112  112513          INCR    5,.+1       BUMP TZ CTR
    1113  110514  INCT    INCR    1,.+1       BUMP OVERALL CTR
    1114  001106          JMP     FSHF
    1115  113116  UNREC   INCR    6,.+1       BUMP UNREC CTR
    1116  001113          JMP     INCT
**                        *       *           *
    1117  060000  CKFLG   LOAD    0,0         RESET COMPARE MUX, RECIR
    1120  130400          CMPR    1,0
    1121  040614          TST     1,JOUT      ALL OK ?
    1122  132400          CMPR    5,0
    1123  040526          TST     1,TSTU      TOPS OK ?
    1124  114614          INCR    9,JOUT      TRIED ENOUGH ?
    1125  001132          JMP     RSCN
    1126  133000  TSTU    CMPR    6,0
    1127  040614          TST     1,JOUT      NO UNREC ?
    1130  114614          INCR    9,JOUT      TRIED ENOUGH ?
    1131  075000          LDR     10,0        DON'T MOVE THE PAPER !
**                        *       *           *
    1132  071000  RSCN    LDR     2,0         GET NO SPACE CONSTANT
    1133  001012          JMP     CLOB
**                        *       *           *
    1134  074776  FLRSC   LDR     9,376       INIT RESCAN CTR
    1135  072000          LDR     4,0         RESET LINE STATE CTR
    1136  070532          LDR     1,RSCN      GET RETURN
    1137  021000  DLTW    SET     1           SET INCREMENT
    1140  056542          TST     29,.+2      SIMV ?
    1141  062107          LOAD    4,107       DRIVE LEFT - CLEAR DISABLED
    1142  010400  CMXJ    JMPS    1           RETURN
**                        *       *           *
**                        *       *           *
**                        *       LEADING BLANK SAMPLES DIVIDED BY 8
**                        *       ARE COUNTED IN RAM 14. RAM 7 IS USED
**                        *       TO DIVIDE BY 8. THIS GIVES LEADING SPACE
**                        *       IN UNITS OF 1/40 INCH.
**                        *
    1143  113545  BLINE   INCR    7,.+2
    1144  000400  ISWAIT  JMP     SWAIT
    1145  073770          LDR     7,370       RESET DIV BY 8 CTR
    1146  117161          INCR    14,EBLINE   WRAP AROUND ?
**                        *
    1147  052151  CEBL    TST     20,.+2      NO MARGIN YET ?
    1150  001161          JMP     EBLINE
    1151  070037          LDR     0,NELAD
    1152  140001          XFR     0,LDLO      SET LOW ORDER + READ
    1153  150005          XFR     0,RDLO      GET BLANK END LINE CRITERIA
    1154  030030          PLB     3           LOAD COMPARE LATCH
    1155  060003          LOAD    0,03        SET COMPARE MUX
    1156  137000          CMPR    14,0        COMPARE RAM TO LIMIT
    1157  060000          LOAD    0,00        RESET MUX
    1160  040144          TST     0,ISWAIT    LESS THAN LIMIT ?
**                        *       *           *
**                        *       *           *
**                        *       THIS IS THE END OF A BLANK LINE
**                        *
    1161  070563  EBLINE   LDR     1,.+2       GET RETURN
```

```
     1162  001137          JMP     DLTW        *DRIVE LEFT IF NO SIMV.
     1163  071030          LDR     2,SEARCH    GET LINE SEARCH CONSTANT
     1164  137401          CMPR    15,1
     1165  040411          TST     1,RRSCN     1'ST LINE ?
     1166  075400          LDR     11,0        NO INDENT
     1167  116570          INCR    13,.+1      BUMP PAGE END CTR
     1170  030030          PLB     3           LOAD COMPARE LATCH
     1171  070040          LDR     0,PPAD      ADDRESS OF EOP CRITERIA
     1172  140001          XFR     0,LDLO      SET LOW ORDER + READ
     1173  150005          XFR     0,RDLO      GET END OF PAGE CRITERIA
     1174  060003          LOAD    0,03        SET COMPARE MUX
     1175  130000          CMPR    0,0         COMPARE TO RAM 13
     1176  060000          LOAD    0,00        RESET MUX
     1177  040641          TST     1,IEPGE     END OF PAGE ?
     1200  120603  TSPACE  CMP     1,SNG       SINGLE SPACED ?
     1201  071042          LDR     2,DSP       GET DBL SPACE CONSTANT
     1202  001204          JMP     .+2
     1203  071041  SNG     LDR     2,SSP       GET SGL SPACE CONSTANT
     1204  141001          XFR     2,LDLO      SET LOW ORDER + READ
     1205  151005          XFR     2,RDLO      GET SPACING CONSTANT
     1206  021000          SET     1           SET INCREMENT FOR EDIT
     1207  136777          CMPR    13,377
     1210  040011          TST     0,RRSCN     BLANK TEXT LINE ?
     1211  137000          CMPR    14,0
     1212  035440          PLB     4,11        SAVE LEADING SPACE CTR
     1213  001400          JMP     EDIT
     1214  022000  JOUT    SET     2
     1215  116600          INCR    13,TSPACE   NO BLANK LINES TO OUTPUT ?
     1216  075401          LDR     11,1
     1217  145400          XFR     11,LDHI     SET HIGH ORDER
     1220  142001          XFR     4,LDLO      SET LOW ORDER TO 0
     1221  070012          LDR     0,LFEED
     1222  140003          XFR     0,WRLO      WRITE BOL
     1223  070015          LDR     0,CRET
     1224  140003          XFR     0,WRLO      WRITE EOL
     1225  142003          XFR     4,WRLO      WRITE NULL
     1226  003375          JMP     STOUT       GO TO OUTPUT
**                          *       *           *
**                          *       *           *
     1227  073351  SPA1    LDR     6,351       WLIM = -23
     1230  061001          LOAD    2,01        SET TCHS
     1231  070413          LDR     1,ST04      SET NEW STATE
     1232  132440          CMPR    5,40
     1233  040235          TST     0,.+2       PREV CHAR NORMAL ?
     1234  043237          TST     6,.+3       PREV FB = 1 ?
     1235  072401          LDR     5,1         START WIDTH CTR = 1
     1236  000400          JMP     SWAIT
     1237  072437          LDR     5,37        START WIDTH CTR = 31
     1240  000400          JMP     SWAIT
**                          *       *           *
     1241  000341  IEPGE   JMP     EPAGE
**                          *       *           *
**                          *       *           *
     1242  075426  TMARG   LDR     11,TMLL     GET LOWER LIMIT ADDRESS
     1243  073777          LDR     7,377       GET SW SETTING
     1244  001255          JMP     GETM
     1245  075432  LMARG   LDR     11,LMLL     GET LOWER LIMIT ADDRESS
     1246  073776          LDR     7,376       GET SW SETTING
     1247  001255          JMP     GETM
     1250  075433  RMARG   LDR     11,LMAD     GET LOWER LIMIT ADDRESS
     1251  073775          LDR     7,375       GET SW SETTING
     1252  001255          JMP     GETM
     1253  075427  BMARG   LDR     11,TMAD     GET LOWER LIMIT ADDRESS
     1254  073774          LDR     7,374       GET SW SETTING
```

```
1255  075000  GETM    LDR     10,0
1256  145000          XFR     10,LDHI   LOAD HI ORDER BITS
1257  145401          XFR     11,LDLO   LOAD LO ORDER BITS & READ
1260  156005          XFR     12,RDLO   GET LOWER LIMIT
1261  155005          XFR     10,RDLO   GET MARGIN
1262  156405          XFR     13,RDLO   GET UPPER LIMIT
1263  077323          LDR     14,KEY    BID MUST GO TO KEY
1264  135000  BID     CMPR    10,0
1265  030040          PLB     4,0       SAVE RAM 10
1266  022000          SET     2         SET DECREMENT
1266  022400          RST+    4         RESET LED DISPLAY
1267  070460          LDR     1,60
1270  110673          INCR    1,.+3     *
1271  020004          STB     4         *SET HUNDREDS DISPLAY TO 0
1272  001270          JMP     .-2       *
1273  070411  ITEN    LDR     1,11      INIT TENS
1274  071011  IUNIT   LDR     2,11            UNITS
1275  110304          INCR    0,DISP    DEC MARGIN
1276  111300          INCR    2,TEN     DEC UNITS
1277  001275          JMP     .-2
1300  110702  TEN     INCR    1,HUND    DEC TENS
1301  001274          JMP     IUNIT     REINIT UNITS
1302  020004  HUND    STB     4         INC HUNDREDS DISPLAY
1303  001273          JMP     ITEN      REINIT TENS & UNITS
1304  070071  DISP    LDR     0,71
1305  110306          INCR    0,.+1     *
1306  110710          INCR    1,.+2     *GET RAM 0 = ASCII
1307  001305          JMP     .-2       *
**                    *
1310  020005          STB     5         *SET TENS DISPLAY
1311  110313          INCR    0,.+2     *
1312  001310          JMP     .-2       *
1313  070071          LDR     0,71
1314  110315          INCR    0,.+1     *
1315  111317          INCR    2,.+2     *
1316  001314          JMP     .-2       *
1317  020006          STB     6         *SET UNITS DISPLAY
1320  110322          INCR    0,.+2     *
1321  001317          JMP     .-2       *
1322  017000          JMPS    14        RETURN
1323  074634  KEY     LDR     9,234     INIT DELAY TO 100 MSEC
1324  021000  KEY2    SET     1
1324  021300          RST+    3         RESET KYBD
1325  060002          LOAD    0,02      SET MUX TO KYBD
1326  023000          SET     3         ENABLE KYBD
1326  023070          TOG+    7         READ ROT SW
1327  070101          LDR     0,101     ADD
1330  130000          CMPR    0,0
1331  040756          TST     1,UPMG    JUMP IF LATCH = A
1332  070141          LDR     0,141
1333  130000          CMPR    0,0
1334  040756          TST     1,UPMG    ALLOW LOWER CASE
1335  070123          LDR     0,123     SUBTRACT
1336  130000          CMPR    0,0
1337  040755          TST     1,DWNG    JUMP IF LATCH = S
1340  070163          LDR     0,163
1341  130000          CMPR    0,0
1342  040755          TST     1,DWNG    ALLOW LOWER CASE
1343  133400  NOKEY   CMPR    7,0
1344  030040          PLB     4,0       GET SW # IN RAM 0
1345  102351          INC     4,FIN     JUMP IF NO MATCH
1346  110350          INCR    0,.+2
1347  001345          JMP     .-2
1350  102323          INC     4,KEY     JUMP IF MATCH
```

```
1351  115752  FIN     INCR    11,.+1      GET MARGIN ADDRESS
1352  145401          XFR     11,LDLO     LOAD LO ORDER BITS
1353  145003          XFR     10,WRLO     WRITE NEW MARGIN
1354  000003          JMP     RSW         RETURN
1355  022000  DWMC    SET     2
1356  115357  UPMG    INCR    10,.+1      INC/DEC MARGIN IN 10THS
1357  030030          PLB     3           LOAD COMPARE LATCH
1360  060003          LOAD    0,03        SET COMPARE MUX
1361  136000          CMPR    12,0        COMPARE TO LOWER LIMIT
1362  040775          TST     1,TOSMAL    TOO SMALL ?
1363  136400          CMPR    13,0        COMPARE TO UPPER LIMIT
1364  040755          TST     1,DWMG      TOO BIG ?
1365  077367  OK      LDR     14,.+2      GET RETURN
1366  001264          JMP     BID         DISPLAY NEW MARGIN
1367  134400          CMPR    9,0         SAVE DELAY
1370  031440          PLB     4,3         PUT TIMEOUT INTO RAM3
1371  074716          LDR     9,316       CHANGE DELAY TO 50 MSEC
1372  070765          LDR     1,MARG      FOR MLSEC RETURN
1373  111724  DLAY    INCR    3,KEY2
1374  000333          JMP     MLSEC       1 MSEC DELAY
1375  021000  TOSMAL  SET     1
1376  001356          JMP     UPMG
1377  000000          END
ABOP  0321
  00315
ABT?  0315
  00143
ADJV  1022
  01027 01051
ADJW  0662
  00672 00701
APAG  0343
  00326
ATST  0030
  00020 01163
AWRE  0702
  00666
BID   1264
  01366
BLIN  1143
  00750
BMAD  0030
  00020 01163
BMAR  1253
  00021
C1EN  0523
  00421 00422 00426 00430
C3EN  0574
  00423 00424
CBTZ  0704
  00634
CEBL  1147
  00623
CHS1  0446
  00415
CHS2  0476
  00416
CHW1  0452
  00417 00427 00447 00470
CHW2  0450
  00513
CHW3  0471
  00457 00516
CHW4  0463
```

```
  00522
CKFL  1117
  01107
CLIM  0626

CLOB  1012
  01133
CMX1  1142

CONT  0033
  00142 00215 00316 00324 01250
CRET  0015
  00011 01223
CSTR  0443
  00435 00437 00441
CURA  2377
  00177
CWID  0513
  00420 00476
D250  0331
  00037 00112 00121 00133 00257 00265
D25A  0332
  00036 00117 00261 00262
DADJ  0700
  00646
DAJ2  0673
  00650
DAJ4  0644
  00637
DDOC  0274
  00114
DISP  1304
  01275
DLAY  1373
  00365
DLTW  1137
  01055 01162
DOWN  0727
  00563 00705
DSP   0042
  01201
DTOU  0134
  00107
DVCF  0044

DWMG  1355
  01337 01342 01364
EBLI  1161
  00620 01146 01150
EDIT  1400
  00366 01213
ELAD  0036
  00626
ELIN  1052
  00555 00720
EMES  0300
  00374 00766
ENDC  0706
  00251 00605 00631 00632 00640
ENVP  1043
  01034 01040
EOCB  0602
  00575
EOCN  0624
```

```
  00534
EORC  0545

EOST  0745
  00754 00756
EPAG  0341
  00202 00233 00404 01241
ERET  3376
  00373
ERTN  1777
  00372
FIN   1351
  01345
FLGO  1102
  01110
FLRS  1134
  00703 01053
FSHF  1106
  01102 01111 01114
GETM  1255
  01244 01247 01252
GSWT  0244

HUND  1302
  01300
IBLI  0750
  00737
IEDI  0366
  00363
IEPG  1241
  01177
IFLR  0703
  00652 00663 00665
INCT  1113
  01104 01116
INIM  3374
  00016
INIT  0000
  00065 01004 01217 01256
INL1  0375

INL6  0376

IRSW  0377

ISWA  1144
  01160
ITEN  1273
  01303
IUNI  1274
  01301
JERR  0761
  00565
JOUT  1214
  01007 01121 01124 01127 01130
JWAI  0564
  00545 00556 00561 00654
KEY   1323
  01263 01350
KEY2  1324
  01373
LDUI  0000
  00065 01004 01217 01256
LDLC  0001
```

```
  00067 00157 00175 00216 00627 01152 01172 01204
  01220 01257 01352
LF1   0562

LFEE  0012
  01221
LFOU  0651
  00657 00676
LMAD  0033
  00142 00215 00316 00324 01250
LMAR  1245
  00023
LMLL  0032
  00026 00322 00517 01245
LS1   0571
  00536
LSTO  0140
  01046
LSTR  0173
  01044 01045
MARG  0365
  01372
MLSE  0333
  00124 01374
MOVE  0726
  00722 00730
NBS2  0526
  00533
NBS3  0534
  00525 00526
NBS4  0544
  00573
NELA  0037
  01151
NEWP  1047
  01005
NL1   0200
  00375
NL2   0202
  00200
NL3   0222
  00225
NL4   0231
  00224
NL6   0243
  00237 00376
NOC1  0610
  00617
NOC2  0611
  00615
NOC3  0621
  00612
NOCH  0606
  00601
NOKE  1343

NP1   0057
  00136 00267 00275
NP2   0154
  00115
NP3   0165
  00062
NVP   1030
  01022 01024 01026
```

```
OK    1365

OLDP  0252
  00063
OPER  0025
  00010
OPG1  0270
  00255
PCS   0751
  00742
PCT?  0142
  00145 00152
PER3  0272
  00131
PERR  0275
  00271 00273
PFAD  0040
  00032 00460 01047 01171
PGST  0040
  00032 00460 01047 01171
PGWT  0137

PITA  0046
  00156 00174
PSTO  0136
  00116
PUP   1037
  01032
PWID  0474
  00463
R3WA  0716
  00603 00716
RDLO  0005
  00013 00025 00027 00031 00070 00071 00176 00217
  00220 00630 01153 01173 01205 01260 01261 01262

REPO  0647
  00560
RERR  0763
  00540
RGL   0120
  00043 00113 00250
RJMP  0015
  00011 01223
RMAD  0034

RMAR  1250
  00022
RMUL  0035

RR5   0111

RRSC  1011
  01165 01210
RSCN  1132
  01125 01136
RSTR  0032
  00026 00322 00517 01245
RSW   0003
  00017 00146 00147 00150 00151 00153 00164 00377
  01222 01224 01225 01353 01354
RTST  0005
  00013 00025 00027 00031 00070 00071 00176 00217
  00220 00630 01153 01173 01205 01260 01261 01262
```

```
RWAI  0537
  00577
SAMP  0405
  00401
SCE   0511
  00503 00506 00514
SEAR  0030
  00020 01163
SERR  0757
  00531
SET6  0444
  00500 00510
SETD  1050
  01021
SETO  0346
  00135 00172
SETT  0102
  00077 00104
SHB2  1060
  01063
SNG   1203
  01200
SPA1  1227
  00411
SPA2  0733
  00412 00414
SPA5  0736
  00432
SSP   0041
  00001 01203
ST02  0411
  00607 00706 00734
ST04  0413
  01231
ST06  0415
  00444
ST08  0417
  00450
ST10  0421
  00511
ST12  0423
  00746
ST14  0425
  00474
ST16  0427
  00471
STOU  3375
  01226
SWAI  0400
  00442 00445 00465 00472 00475 00512 00714 00715
  00745 00747 01144 01236 01240
SWLP  0401
  00402 00403
T12P  0515
  00455
T20   0755
  00743
T26   0744
  00752
TCS1  0431
  00413
TDDO  0114
  00123 00130
```

```
TEN   1300
  01276
TGUI  0113
  00110
TMAD  0027
  00066 01253
TMAR  1242
  00024
TMLL  0026
  01242
TMUL  0031

TONE  0314
  00317 00765
TOPS  0107
  00103 00126
TOSM  1375
  01362
TSPA  1200
  01215
TSTU  1126
  01123
TSZR  1111
  01103
TTHT  0041
  00001 01203
TUD   1020

UADJ  0661
  00643
UAJ2  0655
  00647
UAJ4  0641
  00636
UNRE  1115
  01105
UP    0721
  00562 00704
UPDN  0724
  00732
UPMG  1356
  01331 01334 01376
W12L  0032
  00026 00322 00517 01245
WLIM  0040
  00032 00460 01047 01171
WRHI  0002

WRLO  0003
  00017 00146 00147 00150 00151 00153 00164 00377
  01222 01224 01225 01353 01354
WTOP  0120
  00043 00113 00250
WW12  0070
  00521
WWID  0473
  00461 00520
WWLI  0074
  00462
ZHGT  0600
  00624
```

```
                                LOC     0
**                              *
**                              *TITLE  DMAC4
**                              *
**                              *
**                              *       EXECUTIVE MACRO DIAGNOSTIC
**                              *
**                              *       8/24/75    W.K.C.
**                              *
    0000  030007                PLA     7          GENERAL RESET
    0001  020400                RST     4          RESET LED DISPLAY
**                              *       TEST 'HALT' & INC LED 3
    0002  020005  T0            STB     5          INC LED 2
    0003  020700  T1            RST     7
    0003  020706                STB+    6
**                              *       TEST 'JMP' - SHOULD GO TO 377 & BACK TO T3
    0004  020005                STB     5          INC LED 2
    0005  000377  T2            JMP     377
    0006  020700                RST     7
    0006  020706                STB+    6
**                              *       TEST 'INCR'  (BOTH INC & DEC)
    0007  020005                STB     5          INC LED 2
    0010  021000  T6            SET     1          SET INCREMENT
    0011  070776                LDR     1,376
    0012  110444                INCR    1,T6E1
    0013  130777                CMPR    1,377
    0014  040417                TST     1,.+3
    0015  020700                RST     7
    0015  020706                STB+    6
    0016  000010                JMP     T6
    0017  110422                INCR    1,.+3
    0020  020700                RST     7
    0020  020706                STB+    6
    0021  000010                JMP     T6
    0022  130400                CMPR    1,0
    0023  040426                TST     1,.+3
    0024  020700                RST     7
    0024  020706                STB+    6
    0025  000010                JMP     T6
    0026  022000                SET     2          SET DECREMENT
    0027  070401                LDR     1,1
    0030  110446                INCR    1,T6E2
    0031  130400                CMPR    1,0
    0032  040435                TST     1,.+3
    0033  020700                RST     7
    0033  020706                STB+    6
    0034  000010                JMP     T6
    0035  110440                INCR    1,.+3
    0036  020700                RST     7
    0036  020706                STB+    6
    0037  000010                JMP     T6
    0040  130777                CMPR    1,377
    0041  040450                TST     1,T7A
    0042  020700                RST     7
    0042  020706                STB+    6
    0043  000010                JMP     T6
    0044  020700  T6E1            RST     7
    0044  020706                STB+    6
    0045  000010                JMP     T6
    0046  020700  T6E2            RST     7
    0046  020706                STB+    6
    0047  000010                JMP     T6
    0050  020005  T7A           STB     5          INC LED 2
    0051  000400  T7            JMP     400        JUMP TO NEXT CHIP
```

```
0052  020700          RST     7
0052  020706          STB+    6
0053  000051          JMP     T7
**                    *       TEST 'CMPR' - 'TST 0' (>), 'TST 1' (=)
0054  020005  T3A     STB     5           INC LED 2
0055  030010  T3      PLB     1           SELECT RAM 0 TO 15
0056  060000          LOAD    0,0         SELECT IR INPUT TO MUX
0057  070401          LDR     1,1
0060  070200          LDR     0,200       MAKE SURE 'CMPR' LOADS AC
0061  130400          CMPR    1,0
0062  040074          TST     0,GTERR
0063  040467          TST     1,EQERR
0064  130401          CMPR    1,1
0065  040074          TST     0,GTERR
0066  040471          TST     1,.+3
0067  020700  EQERR   RST     7
0067  020706          STB+    6
0070  000055          JMP     T3
0071  130402          CMPR    1,2
0072  040467          TST     1,EQERR
0073  040076          TST     0,.+3
0074  020700  GTERR   RST     7
0074  020706          STB+    6
0075  000055          JMP     T3
0076  070776          LDR     1,376
0077  070200          LDR     0,200       MAKE SURE 'CMPR' LOADS AC
0100  130775          CMPR    1,375
0101  040074          TST     0,GTERR
0102  040467          TST     1,EQERR
0103  130776          CMPR    1,376
0104  040074          TST     0,GTERR
0105  040507          TST     1,.+2
0106  000067          JMP     EQERR
0107  130777          CMPR    1,377
0110  040467          TST     1,EQERR
0111  040113          TST     0,T4A
0112  000074          JMP     GTERR
0113  020005  T4A     STB     5           INC LED 2
0114  000116          JMP     T4
0115  020700  T4ERR   RST     7
0115  020706          STB+    6
**                    *       TEST LOADING OF ALL RAMS
0116  060000  T4      LOAD    0,0         SELECT IR INPUT TO MUX
0117  030010          PLB     1           SELECT RAM 0 TO 15
0120  070000          LDR     0,0
0121  070401          LDR     1,1
0122  071002          LDR     2,2
0123  071403          LDR     3,3
0124  072004          LDR     4,4
0125  072405          LDR     5,5
0126  073006          LDR     6,6
0127  073407          LDR     7,7
0130  074010          LDR     8,10
0131  074411          LDR     9,11
0132  075012          LDR     10,12
0133  075413          LDR     11,13
0134  076014          LDR     12,14
0135  076415          LDR     13,15
0136  077016          LDR     14,16
0137  077417          LDR     15,17
0140  030020          PLB     2           SELECT RAM 16 TO 31
0141  070020          LDR     0,20
0142  070421          LDR     1,21
0143  071022          LDR     2,22
```

```
0144  071423        LDR     3,23
0145  072024        LDR     4,24
0146  072425        LDR     5,25
0147  073026        LDR     6,26
0150  073427        LDR     7,27
0151  074030        LDR     8,30
0152  074431        LDR     9,31
0153  075032        LDR     10,32
0154  075433        LDR     11,33
0155  076034        LDR     12,34
0156  076435        LDR     13,35
0157  0  36         LDR     14,36
0160  0  37         LDR     15,37
0161  030010        PLB     1           SELECT RAM 0 TO 15
0162  130000        CMPR    0,0
0163  040565        TST     1,.+2
0164  000115        JMP     T4ERR
0165  130401        CMPR    1,1
0166  040570        TST     1,.+2
0167  000115        JMP     T4ERR
0170  131002        CMPR    2,2
0171  040573        TST     1,.+2
0172  000115        JMP     T4ERR
0173  131403        CMPR    3,3
0174  040576        TST     1,.+2
0175  000115        JMP     T4ERR
0176  132004        CMPR    4,4
0177  040601        TST     1,.+2
0200  000115        JMP     T4ERR
0201  132405        CMPR    5,5
0202  040604        TST     1,.+2
0203  000115        JMP     T4ERR
0204  133006        CMPR    6,6
0205  040607        TST     1,.+2
0206  000115        JMP     T4ERR
0207  133407        CMPR    7,7
0210  040612        TST     1,.+2
0211  000115        JMP     T4ERR
0212  134010        CMPR    8,10
0213  040615        TST     1,.+2
0214  000115        JMP     T4ERR
0215  134411        CMPR    9,11
0216  040620        TST     1,.+2
0217  000115        JMP     T4ERR
0220  135012        CMPR    10,12
0221  040623        TST     1,.+2
0222  000115        JMP     T4ERR
0223  135413        CMPR    11,13
0224  040626        TST     1,.+2
0225  000115        JMP     T4ERR
0226  136014        CMPR    12,14
0227  040631        TST     1,.+2
0230  000115        JMP     T4ERR
0231  136415        CMPR    13,15
0232  040634        TST     1,.+2
0233  000115        JMP     T4ERR
0234  137016        CMPR    14,16
0235  040637        TST     1,.+2
0236  000115        JMP     T4ERR
0237  137417        CMPR    15,17
0240  040642        TST     1,.+2
0241  000115        JMP     T4ERR
0242  030020        PLB     2           SELECT RAM 16 TO 31
0243  130020        CMPR    0,20
```

```
0244  040646          TST     1,.+2
0245  000115          JMP     T4ERR
0246  130421          CMPR    1,21
0247  040651          TST     1,.+2
0250  000115          JMP     T4ERR
0251  030040          PLB     4,0
0252  131022          CMPR    2,22
0253  040655          TST     1,.+2
0254  000115          JMP     T4ERR
0255  030440          PLB     4,1
0256  131423          CMPR    3,23
0257  040661          TST     1,.+2
0260  000115          JMP     T4ERR
0261  031040          PLB     4,2
0262  132024          CMPR    4,24
0263  040665          TST     1,.+2
0264  000115          JMP     T4ERR
0265  031440          PLB     4,3
0266  132425          CMPR    5,25
0267  040671          TST     1,.+2
0270  000115          JMP     T4ERR
0271  032040          PLB     4,4
0272  133026          CMPR    6,26
0273  040675          TST     1,.+2
0274  000115          JMP     T4ERR
0275  032440          PLB     4,5
0276  133427          CMPR    7,27
0277  040701          TST     1,.+2
0300  000115          JMP     T4ERR
0301  033040          PLB     4,6
0302  134030          CMPR    8,30
0303  040705          TST     1,.+2
0304  000115          JMP     T4ERR
0305  033440          PLB     4,7
0306  134431          CMPR    9,31
0307  040711          TST     1,.+2
0310  000115          JMP     T4ERR
0311  135032          CMPR    10,32
0312  040714          TST     1,.+2
0313  000115          JMP     T4ERR
0314  135433          CMPR    11,33
0315  040717          TST     1,.+2
0316  000115          JMP     T4ERR
0317  136034          CMPR    12,34
0320  040722          TST     1,.+2
0321  000115          JMP     T4ERR
0322  136435          CMPR    13,35
0323  040725          TST     1,.+2
0324  000115          JMP     T4ERR
0325  137036          CMPR    14,36
0326  040730          TST     1,.+2
0327  000115          JMP     T4ERR
0330  137437          CMPR    15,37
0331  040733          TST     1,.+2
0332  000115          JMP     T4ERR
0333  130021          CMPR    0,21
0334  040736          TST     1,.+2
0335  000362          JMP     T4AER
0336  130422          CMPR    1,22
0337  040741          TST     1,.+2
0340  000362          JMP     T4AER
0341  131023          CMPR    2,23
0342  040744          TST     1,.+2
0343  000362          JMP     T4AER
```

```
     0344  131424          CMPR    3,24
     0345  040747          TST     1,.+2
     0346  000362          JMP     T4AER
     0347  132025          CMPR    4,25
     0350  040752          TST     1,.+2
     0351  000362          JMP     T4AER
     0352  132426          CMPR    5,26
     0353  040755          TST     1,.+2
     0354  000362          JMP     T4AER
     0355  133027          CMPR    6,27
     0356  040760          TST     1,.+2
     0357  000362          JMP     T4AER
     0360  133430          CMPR    7,30
     0361  040764          TST     1,.+3
     0362  020700  T4AER    RST     7
     0362  020706          STB+    6
     0363  000116          JMP     T4
**                         *       TEST 'JMPS'
     0364  020005          STB     5          INC LED 2
     0365  030010  T5      PLB     1          SELECT RAM 0 TO 15
     0366  013400          JMPS    7          RAM 7 = 7 FROM T4
     0367  020700          RST     7
     0367  020706          STB+    6
     0370  000365          JMP     T5
                           LOC     377
     0377  000054          JMP     T3A
                           LOC     400
     0400  020005          STB     5          INC LED 2
     0401  030010  T8      PLB     1          SELECT RAM 0 TO 15
     0402  021000          SET     1          SET INCREMENT
     0403  070000          LDR     0,0
     0404  070776          LDR     1,376
     0405  071376  LD2I    LDR     2,376
     0406  071776  LD3I    LDR     3,376
     0407  072376  LD4I    LDR     4,376
     0410  072776  LD5I    LDR     5,376
     0411  073376  LD6I    LDR     6,376
     0412  073776  LD7I    LDR     7,376
     0413  074376  LD8I    LDR     8,376
     0414  114017  INC8    INCR    8,.+3
     0415  110047          INCR    0,T8E1
     0416  000414          JMP     INC8
     0417  113422          INCR    7,.+3
     0420  110047          INCR    0,T8E1
     0421  000413          JMP     LD8I
     0422  113025          INCR    6,.+3
     0423  110047          INCR    0,T8E1
     0424  000412          JMP     LD7I
     0425  112430          INCR    5,.+3
     0426  110047          INCR    0,T8E1
     0427  000411          JMP     LD6I
     0430  112033          INCR    4,.+3
     0431  110047          INCR    0,T8E1
     0432  000410          JMP     LD5I
     0433  111436          INCR    3,.+3
     0434  110047          INCR    0,T8E1
     0435  000407          JMP     LD4I
     0436  111041          INCR    2,.+3
     0437  110047          INCR    0,T8E1
     0440  000406          JMP     LD3I
     0441  110444          INCR    1,.+3
     0442  110047          INCR    0,T8E1
     0443  000405          JMP     LD2I
     0444  110051          INCR    0,CK0AC
```

```
0445  020700          RST     7
0445  020706          STB+    6
0446  000401          JMP     T8
0447  020700  T8E1    RST     7
0447  020706          STB+    6
0450  000401          JMP     T8
0451  130000  CK0AC   CMPR    0,0
0452  040455          TST     1,.+3
0453  020700          RST     7
0453  020706          STB+    6
0454  000401          JMP     T8
0455  022000          SET     2           SET DECREMENT
0456  070377          LDR     0,377
0457  070401          LDR     1,1
0460  071001  LD2D    LDR     2,1
0461  071401  LD3D    LDR     3,1
0462  072001  LD4D    LDR     4,1
0463  072401  LD5D    LDR     5,1
0464  073001  LD6D    LDR     6,1
0465  073401  LD7D    LDR     7,1
0466  074001  LD8D    LDR     8,1
0467  114072  DEC8    INCR    8,.+3
0470  110122          INCR    0,T8E2
0471  000467          JMP     DEC8
0472  113475          INCR    7,.+3
0473  110122          INCR    0,T8E2
0474  000466          JMP     LD8D
0475  113100          INCR    6,.+3
0476  110122          INCR    0,T8E2
0477  000465          JMP     LD7D
0500  112503          INCR    5,.+3
0501  110122          INCR    0,T8E2
0502  000464          JMP     LD6D
0503  112106          INCR    4,.+3
0504  110122          INCR    0,T8E2
0505  000463          JMP     LD5D
0506  111511          INCR    3,.+3
0507  110122          INCR    0,T8E2
0510  000462          JMP     LD4D
0511  111114          INCR    2,.+3
0512  110122          INCR    0,T8E2
0513  000461          JMP     LD3D
0514  110517          INCR    1,.+3
0515  110122          INCR    0,T8E2
0516  000460          JMP     LD2D
0517  110124          INCR    0,CK1AC
0520  020700          RST     7
0520  020706          STB+    6
0521  000401          JMP     T8
0522  020700  T8E2    RST     7
0522  020706          STB+    6
0523  000401          JMP     T8
0524  130377  CK1AC   CMPR    0,377
0525  040530          TST     1,T9A
0526  020700          RST     7
0526  020706          STB+    6
0527  000401          JMP     T8
0530  020005  T9A     STB     5           INC LED 2
0531  000533          JMP     T9
0532  020700  T9ERR   RST     7
0532  020706          STB+    6
0533  060000  T9      LOAD    0,0         SELECT IR INPUT TO MUX
0534  030010          PLB     1           SELECT RAM 0 TO 15
0535  070377          LDR     0,377
```

```
0536  071375          LDR     2,375
0537  071774          LDR     3,374
0540  072373          LDR     4,373
0541  072772          LDR     5,372
0542  073371          LDR     6,371
0543  073770          LDR     7,370
0544  074367          LDR     8,367
0545  074766          LDR     9,366
0546  075365          LDR     10,365
0547  075764          LDR     11,364
0550  076363          LDR     12,363
0551  076762          LDR     13,362
0552  077361          LDR     14,361
0553  077760          LDR     15,360
0554  030020          PLB     2           SELECT RAM 16 TO 31
0555  070357          LDR     0,357
0556  070756          LDR     1,356
0557  071355          LDR     2,355
0560  071754          LDR     3,354
0561  072353          LDR     4,353
0562  072752          LDR     5,352
0563  073351          LDR     6,351
0564  073750          LDR     7,350
0565  074347          LDR     8,347
0566  074746          LDR     9,346
0567  075345          LDR     10,345
0570  075744          LDR     11,344
0571  076343          LDR     12,343
0572  076742          LDR     13,342
0573  077341          LDR     14,341
0574  077740          LDR     15,340
0575  030010          PLB     1           SELECT RAM 0 TO 15
0576  130377          CMPR    0,377
0577  040601          TST     1,.+2
0600  000532          JMP     T9ERR
0601  131375          CMPR    2,375
0602  040604          TST     1,.+2
0603  000532          JMP     T9ERR
0604  131774          CMPR    3,374
0605  040607          TST     1,.+2
0606  000532          JMP     T9ERR
0607  132373          CMPR    4,373
0610  040612          TST     1,.+2
0611  000532          JMP     T9ERR
0612  132772          CMPR    5,372
0613  040615          TST     1,.+2
0614  000532          JMP     T9ERR
0615  133371          CMPR    6,371
0616  040620          TST     1,.+2
0617  000532          JMP     T9ERR
0620  133770          CMPR    7,370
0621  040623          TST     1,.+2
0622  000532          JMP     T9ERR
0623  134367          CMPR    8,367
0624  040626          TST     1,.+2
0625  000532          JMP     T9ERR
0626  134766          CMPR    9,366
0627  040631          TST     1,.+2
0630  000532          JMP     T9ERR
0631  135365          CMPR    10,365
0632  040634          TST     1,.+2
0633  000532          JMP     T9ERR
0634  135764          CMPR    11,364
0635  040637          TST     1,.+2
```

```
0636  000532          JMP     T9ERR
0637  136363          CMPR    12,363
0640  040642          TST     1,.+2
0641  000532          JMP     T9ERR
0642  136762          CMPR    13,362
0643  040645          TST     1,.+2
0644  000532          JMP     T9ERR
0645  137361          CMPR    14,361
0646  040650          TST     1,.+2
0647  000532          JMP     T9ERR
0650  137760          CMPR    15,360
0651  040653          TST     1,.+2
0652  000532          JMP     T9ERR
0653  030020          PLB     2           SELECT RAM 16 TO 31
0654  130357          CMPR    0,357
0655  040657          TST     1,.+2
0656  000532          JMP     T9ERR
0657  130756          CMPR    1,356
0660  040662          TST     1,.+2
0661  000532          JMP     T9ERR
0662  131355          CMPR    2,355
0663  040665          TST     1,.+2
0664  000532          JMP     T9ERR
0665  131754          CMPR    3,354
0666  040670          TST     1,.+2
0667  000532          JMP     T9ERR
0670  132353          CMPR    4,353
0671  040673          TST     1,.+2
0672  000532          JMP     T9ERR
0673  132752          CMPR    5,352
0674  040676          TST     1,.+2
0675  000532          JMP     T9ERR
0676  133351          CMPR    6,351
0677  040701          TST     1,.+2
0700  000532          JMP     T9ERR
0701  133750          CMPR    7,350
0702  040704          TST     1,.+2
0703  000532          JMP     T9ERR
0704  134347          CMPR    8,347
0705  040707          TST     1,.+2
0706  000532          JMP     T9ERR
0707  134746          CMPR    9,346
0710  040712          TST     1,.+2
0711  000532          JMP     T9ERR
0712  135345          CMPR    10,345
0713  040715          TST     1,.+2
0714  000532          JMP     T9ERR
0715  135744          CMPR    11,344
0716  040720          TST     1,.+2
0717  000532          JMP     T9ERR
0720  136343          CMPR    12,343
0721  040723          TST     1,.+2
0722  000532          JMP     T9ERR
0723  136742          CMPR    13,342
0724  040726          TST     1,.+2
0725  000532          JMP     T9ERR
0726  137341          CMPR    14,341
0727  040731          TST     1,.+2
0730  000532          JMP     T9ERR
0731  137740          CMPR    15,340
0732  040734          TST     1,.+2
0733  000532          JMP     T9ERR
0734  055736          TST     27,.+2      STOP ?
0735  000005          JMP     T2
```

```
0736  020600          RST     6           RESET SW
0737  020700          RST     7
0737  020706          STB+    6
0740  055344          TST     26,LDSW     START ?
0741  056343          TST     28,.+2      CONTINUE ?
0742  000740          JMP     .-2
0743  000005          JMP     T2
0744  020070  LDSW    TOG     7           READ ROT SW
0744  020670          RST+    6           RESET SW
0745  102353          INC     4,TRSW
0746  102351          INC     4,TST2
0747  102352          INC     4,TST3
0750  000744          JMP     LDSW
0751  001000  TST2    JMP     1000
0752  001400  TST3    JMP     1400
0753  070377  TRSW    LDR     0,377
0754  020400  RESET   RST     4           RESET LED'S
0754  021400          SET+    1           SET INC
0755  130000  SLED    CMPR    0,0         LOAD ACC
0756  030440          PLB     4,1         COPY TO RAM 1
0757  020600          RST     6           RESET TOG SW
0760  110763          INCR    1,RDROT
0761  020006          STB     6           INC LED 3
0762  000760          JMP     .-2
0763  020070  RDROT   TOG     7           READ ROT SW
0764  056354          TST     28,RESET    CONTINUE ?
0765  130000          CMPR    0,0
0766  030440          PLB     4,1
0767  071367          LDR     2,367       LOOP COUNT
0770  111363          INCR    2,RDROT
0771  102374          INC     4,.+3       THIS POS ?
0772  110773          INCR    1,.+1
0773  000770          JMP     .-3
0774  110763          INCR    1,RDROT     NO CHANGE ?
0775  110376          INCR    0,.+1
0776  110755          INCR    1,SLED
0777  000775          JMP     .-2
1000  000000          END
CK0A  0451
  00444
CK1A  0524
  00517
DEC8  0467
  00471
EQER  0067
  00063 00072 00102 00106 00110
GTER  0074
  00062 00065 00101 00104 00112
INC8  0414
  00416
LD2D  0460
  00516
LD2I  0405
  00443
LD3D  0461
  00513
LD3I  0406
  00440
LD4D  0462
  00510
LD4I  0407
  00435
LD5D  0463
  00505
```

```
LD5I  0410
  00432
LD6D  0464
  00502
LD6I  0411
  00427
LD7D  0465
  00477
LD7I  0412
  00424
LD8D  0466
  00474
LD8I  0413
  00421
LDSW  0744
  00740 00750
RDRO  0763
  00760 00770 00774
RESE  0754
  00764
SLED  0755
  00776
T0    0002

T1    0003

T2    0005
  00735 00743
T3    0055
  00070 00075
T3A   0054
  00377
T4    0116
  00114 00363
T4A   0113
  00111
T4AE  0362
  00335 00340 00343 00346 00351 00354 00357
T4ER  0115
  00164 00167 00172 00175 00200 00203 00206 00211
  00214 00217 00222 00225 00230 00233 00236 00241
  00245 00250 00254 00260 00264 00270 00274 00300
  00304 00310 00313 00315 00321 00324 00327 00332

T5    0365
  00370
T6    0010
  00016 00021 00025 00034 00037 00043 00045 00047

T6E1  0044
  00012
T6E2  0046
  00030
T7    0051
  00053
T7A   0050
  00041
T8    0401
  00446 00450 00454 00521 00523 00527
T8E1  0447
  00415 00420 00423 00426 00431 00434 00437 00442

T8E2  0522
  00470 00473 00476 00501 00504 00507 00512 00515
```

```
T9     0533
   00531
T9A    0530
   00525
T9ER   0532
   00600 00603 00606 00611 00614 00617 00622 00625
   00630 00633 00636 00641 00644 00647 00652 00656
   00661 00664 00667 00672 00675 00700 00703 00706
   00711 00714 00717 00722 00725 00730 00733
TRSW   0753
   00745
TST2   0751
   00746
TST3   0752
   00747
```

```
                                LOC     1000
**                              *
**                              *TITLE  DCOM4
**                              *
**                              *
**                              *       COMMUNICATIONS TEST
**                              *
**                              *       9/11/75    W.K.C.
**                              *
                        DMAC    EXTC    0
**                              *
**                              *
    1000  060000                LOAD    0,0         RESET MUX
    1001  062410                LOAD    5,10        TURN ON PUNCH
**                              *       THIS IS FOR OLD MACHINES
**                              *       WITHOUT OUTPUT MACRO
    1002  071003                LDR     2,CWAIT
    1003  020600  CWAIT         RST     6           RESET TOG SWITCHES
    1004  020400                RST     4           RESET LED DISPLAY
    1005  056023                TST     28,CONT             TEST CONTINUE
    1006  055010                TST     26,.+2              TEST START
    1007  001005                JMP     .-2                 WAIT
**                              CTAB IS THE ROTARTY SWITCH TABLE FOR THE
**                              COMMUNICATIONS TEST. IF THE ROTARY SWITCH IS IN
**                              THE OPERATE POSITION, THE COMMUNICATIONS TEST IS
**                              ENDED AND A NEW TEST MAY BE STARTED
**                              BY RESETTING THE ROTARY SWITCH FOR A NEW
**                              TEST AND HITTING START AGAIN.
**                                      IF THE ROTARY SWITCH IS NOT IN THE
**                              OPERATE POSITION, THE SWITCH POSITION IS
**                              INTERPRETED AS A COMMUNICATIONS TEST NO.
    1010  020070  CTAB         TOG     7
    1010  020670               RST+    6
    1011  102377                INC     4,IDMAC     OPERATE
    1012  102025                INC     4,SDSP      TOP MARGIN
    1013  102076                INC     4,KDSP      LEFT MARGIN
    1014  102132                INC     4,KO        RIGHT MARGIN
    1015  102222                INC     4,OBT       TEST 1 OR BOTTOM MARGIN
    1016  102315                INC     4,TST2      TEST 2 OR TEST A
    1017  102324                INC     4,TST3      TEST 3 OR TEST B
    1020  102326                INC     4,TST4      TEST 4 OR PARAMETER RESET
    1021  020400                RST     4           RESET LED DISPLAY
    1022  001010                JMP     CTAB
    1023  020600  CONT          RST     6                   RESET SWITCHES
    1024  011000                JMPS    2           RETURN TO TEST
**                              *       *           *
**                              *       *           *
**                              TEST 1: TEST INCREMENT OF LED DISPLAY
**                              NO ERROR CHECKING.
**                                  THIS TEST LOADS THE LED DISPLAY
**                              FROM THE EXEC MACRO. CHARACTERS ARE
**                              DISPLAYED 3 AT A TIME,FOLLOWED BY A PAUSE,
**                              IN INCREASING NUMERICAL ORDER FROM 0
**                              TO 377 AND THEN WRAPPED AROUND
**                                  E.G. THE FIRST 3 CHAR. DISPLAYED
**                              SHOULD CORRESPOND TO ASCII CODES 0,1,
**                              AND 2. AFTER A PAUSE, THE CHARS FOR
**                              CODES 3,4,AND 5 WILL BE DISPLAYED.
**                                  PRESSING THE FRONT PANEL STOP WILL
**                              STOP THE TEST.
**                                  PRESSING THE FRONT PANEL CONTINUE
**                              AFTER A STOP WILL CAUSE THE TEST TO CONTINUE
**                              DISPLAYING CHAR'S FROM THE POINT AT
**                              WHICH IT WAS STOPPED.
```

```
**                                        PRESSING THE FRONT PANEL START
**                                      AFTER A STOP WILL CAUSE THE PROGRAM
**                                      TO GO TO THE ROTARY SWITCH ROUTINE
**                                      FOR THE COMMUNICATIONS TEST
**                              *       *                       *
     1025  071027  SDSP        LDR     2,DSP
     1026  072400              LDR     5,0                     CLEAR ACTR
     1027  020400  DSP         RST     4                       CLEAR CHAR DISP
     1030  070377              LDR     0,377
     1031  022000              SET     2
     1031  022600              RST+    6                       RESET START,STOP,CONT
     1032  112436  LP1         INCR    5,RES1
     1033  110034              INCR    0,.+1
     1034  020004              STB     4                       INC CHAR 1
     1035  001032              JMP     LP1
**                                      RESTORE 1
     1036  021000  RES1        SET     1
     1037  112440  RS1         INCR    5,.+1
     1040  110042              INCR    0,DSP2
     1041  001037              JMP     RS1
**                                      DISPLAY 2 -MIDDLE
     1042  112443  DSP2        INCR    5,.+1
     1043  070377              LDR     0,377
     1044  022000              SET     2
     1045  112451  LP2         INCR    5,RES2
     1046  110047              INCR    0,.+1
     1047  020005              STB     5                       INC CHAR 2
     1050  001045              JMP     LP2
**                                      RESTORE 2
     1051  021000  RES2        SET     1
     1052  112453  RS2         INCR    5,.+1
     1053  110055              INCR    0,DSP3
     1054  001052              JMP     RS2
**                                      DISPLAY  3 - RIGHT
     1055  112456  DSP3        INCR    5,.+1
     1056  070377              LDR     0,377
     1057  022000              SET     2
     1060  112465  LP3         INCR    5,RES3
     1061  075000              LDR     10,0
     1062  110063              INCR    0,.+1
     1063  020006              STB     6                       INC CHAR 3
     1064  001060              JMP     LP3
     1065  021000  RES3        SET     1
     1066  112467  RS3         INCR    5,.+1
     1067  110071              INCR    0,JDLY
     1070  001066              JMP     RS3
     1071  073074  JDLY        LDR     6,EDLY
     1072  112473              INCR    5,.+1
     1073  001351              JMP     DELY
     1074  055403  EDLY        TST     27,CWAIT    STOP ?
     1075  011000              JMPS    2           RETURN TO TEST
**                              *       *                       *
**                              *       *                       *
**                                      TEST 2:
**                                          THIS TEST WILL ATTEMPT TO PUNCH IF
**                                      THE OUTPUT SWITCH IS ON.
**                                          THIS TEST ASSUMES THAT THE EXEC
**                                      MACRO CAN CONTROL THE LED DISPLAY AND
**                                      TESTS THE EXEC MACRO READING OF
**                                      THE KEYBOARD.
**                                          THE TEST STARTS IN MODE 1.
**                                      MODE 1 DISPLAYS KEYSTROKES,
**                                      AS THEY ARE STRUCK, FROM LEFT TO RIGHT
**                                      ON THE LED DISPLAY. AFTER 3
```

```
**                                                  CHARS ARE DISPLAYED THE LED
**                                                  IS CLEARED WITH THE NEXT KEYSTROKE,
**                                                  WHICH IS THEN DISPLAYED ON THE
**                                                  LEFT.
**                                                       IN MODE 2, THE KEYBOARD
**                                                  LATCH IS CONTINUALLY READ AND
**                                                  DISPLAYED IN ALL 3 LED'S REGARDLESS OF
**                                                  WHETHER OR NOT A KEY IS STRUCK.
**                                                      PRESSING THE FRONT PANEL STOP WILL
**                                                  STOP THE TEST.
**                                                      PRESSING THE FRONT PANEL CONTINUE
**                                                  AFTER A STOP WILL CAUSE THE MODE TO BE
**                                                  SWITCHED AND THE TEST WILL CONTINUE.
**                                                      PRESSING THE FRONT PANEL START
**                                                  AFTER A STOP WILL CAUSE THE PROGRAM
**                                                  TO GO TO THE ROTARY SWITCH ROUTINE
**                                                  FOR THE COMMUNICATIONS TEST
**                                  *               *                   *
     1076   071127   KDSP     LDR     2,MOD2              LOAD CONTINUE ADDRESS
     1077   073730            LDR     7,RDKY              MODE 1, WAIT FOR KEYSTROKE
     1100   020 0             RST     3                   RESET KEYBOARD
     1101   073 0  KEY1      LDR     6,.+2
     1102   013 0             JMPS    7
     1103   022000            SET     2
     1103   022400            RST+    4                   RESET CHAR DISP
     1104   110107            INCR    0,KEY2
     1105   020004            STB     4                   INC CHAR DISP 1
     1106   001104            JMP     .-2
     1107   073111   KEY2     LDR     6,.+2
     1110   013400            JMPS    7
     1111   022000            SET     2
     1112   110115            INCR    0,KEY3
     1113   020005            STB     5                   INC CHAR DISP 2
     1114   001112            JMP     .-2
     1115   073117   KEY3     LDR     6,.+2
     1116   013400            JMPS    7
     1117   022000            SET     2
     1120   110123            INCR    0,CSTP
     1121   020006            STB     6                   INC CH. DISP 3
     1122   001120            JMP     .-2
     1123   055403   CSTP     TST     27,CWAIT
     1124   073126            LDR     6,.+2
     1125   122670            CMP     5,PUNCH             OUTPUT ON ?
     1126   001101            JMP     KEY1
     1127   071076   MOD2     LDR     2,KDSP              SET CONTINUE ADD
     1130   073733            LDR     7,R2KY              MODE 2,DONT WAIT FOR KEYSTR
     1131   001101            JMP     KEY1
**                                  *               *                   *
**                                  *               *                   *
**                                                  TEST 3: TEST TOGGLE SWITCHES - DISPLAY ON LEI
**                                                  ASSUME LED, STOP SW AND START SW ARE WORKING
**                                                  TEST CONTINUE SW,KEY OPTICS SW, SCAN EDIT SW,
**                                                  LINE SPACE SW,OUTPUT SW, FORMAT SW, ALPHABET
**                                                  USE STOP TO END A SWITCH TEST
**                                                  USE START TO GO TO NEXT TEST BY ROTARY SW
**                                                  USE CONTINUE TO GO TO NEXT SW
**                                                  SWITCH:             ON:     OFF:
**                                                  KEY OPTICS          KO+     KO-
**                                                  LINE SPACE          LS1     LS2 (DOUBLE SPACE)
**                                                  OUTPUT              OP+     OP-
**                                                  SCAN EDIT OR        SE+     SE-
**                                                  PITCH 10/12
**                                                  FORMAT #            FM1     FM2
**                                                  ALPHABET            AL1     AL2
```

```
**                                  *       *                   *
**                                          KEY OPTICS
     1132  076513  KO        LDR     13,113              K
     1133  077117            LDR     14,117              O
     1134  073577            LDR     7,KOT
     1135  120140            CMP     0,ON
     1136  077455  OFF       LDR     15,55               -
     1137  001141            JMP     LD6
     1140  077453  ON        LDR     15,53               +
     1141  073206  LD6       LDR     6,CKSW
     1142  001364            JMP     MESS
**                                        LINE SPACING
     1143  076514  LS        LDR     13,114              L
     1144  077123            LDR     14,123              S
     1145  073600            LDR     7,LST
     1146  120551            CMP     1,ONE
     1147  077462  DOUB      LDR     15,62               2
     1150  001141            JMP     LD6
     1151  077461  ONE       LDR     15,61               1
     1152  001141            JMP     LD6
**                                        OUTPUT
     1153  076517  OUTP      LDR     13,117              O
     1154  077120            LDR     14,120              P
     1155  073601            LDR     7,OPT
     1156  122540            CMP     5,ON
     1157  001136            JMP     OFF
**                                        SCAN EDIT OR PITCH
     1160  076523  SE        LDR     13,123              S
     1161  077105            LDR     14,105              E
     1162  073602            LDR     7,SET
     1163  125140            CMP     10,ON
     1164  001136            JMP     OFF
**                                        FORMAT
     1165  076506  FM        LDR     13,106              F
     1166  077115            LDR     14,115              M
     1167  073603            LDR     7,FMT
     1170  123147            CMP     6,DOUB
     1171  001151            JMP     ONE
**                                        ALPHABET
     1172  076501  AL        LDR     13,101              A
     1173  077114            LDR     14,114              L
     1174  073604            LDR     7,ALP
     1175  127551            CMP     15,ONE
     1176  001147            JMP     DOUB
**                                  *       *                   *
**                                        JUMP TABLE
     1177  001132  KOT       JMP     KO
     1200  001143  LST       JMP     LS
     1201  001153  OPT       JMP     OUTP
     1202  001160  SET       JMP     SE
     1203  001165  FMT       JMP     FM
     1204  001172  ALP       JMP     AL
     1205  001132            JMP     KO
**                                        CHECK SWITCHES
     1206  055612  CKSW      TST     27,STP3
     1207  073211            LDR     6,.+2               SET RETURN
     1210  001347            JMP     DEL2                DELAY
     1211  013400            JMPS    7
     1212  020600  STP3      RST     6                   RESET SWITCHES
     1213  055010            TST     26,CTAB
     1214  056216            TST     28,CT3
     1215  001213            JMP     .-2
     1216  021000  CT3       SET     1
     1216  021600            RST+    6                   RESET SWITCHES
```

```
     1217  113620          INCR    7,.+1
     1220  013400          JMPS    7
**                         *       *                   *
**                         *       *                   *
**                                 TEST 4:
**                                     THIS TEST WILL ATTEMPT TO PUNCH IF
**                                 THE OUTPUT SWITCH IS ON.
**                                     THIS TEST LOADS THE BUFFER(S)
**                                 WITH, THE NUMBERS 0 THRU 127 & 128 THRU
**                                 255 FROM THE KEYBOARD LATCH. THESE ARE
**                                 THEN CHECKED & STROBED IN PARALLEL TO
**                                 THE LED'S.
**                         *       *                   *
     1221  112633  OBT7    INCR    5,OBT0
     1222  022000  OBT     SET     2           SET DEC
     1222  022300          RST+    3           CLEAR KYBD
     1223  071252          LDR     2,OBT5
     1224  060021          LOAD    0,21        * KYBD TO OB, DON'T RECIRCULATE
**                                               * OB TO COMPARE MUX
     1225  071777          LDR     3,377
     1226  072001          LDR     4,1
     1227  072400          LDR     5,0
     1230  120633          CMP     1,.+3       LINE SPACING = 1 ?
     1231  072005          LDR     4,5         NO - MUST BE
     1232  072405          LDR     5,5         4 BUFFERS
     1233  132000  OBT0    CMPR    4,0
     1234  030040          PLB     4,0         COPY RAM 4 TO RAM 0
     1235  070577  OBT1    LDR     1,177
     1236  110244          INCR    0,OBT3
     1237  030001          PLA     1           SELECT OB
     1240  020001  OBT2    STB     1           SHIFT OB
     1241  020060          TOG     6           INC KYBD
     1242  110635          INCR    1,OBT1
     1243  001240          JMP     OBT2
     1244  132000  OBT3    CMPR    4,0
     1245  030040          PLB     4,0         COPY RAM 4 TO RAM 0
     1246  070577  OBT4    LDR     1,177
     1247  110221          INCR    0,OBT7
     1250  030001          PLA     1           SELECT OB
     1251  001074          JMP     EDLY        CHECK FOR STOP
     1252  021000  OBT5    SET     1           SET INC
     1253  111654          INCR    3,.+1       LOAD ACC
     1254  025000          SET     5           LOAD LED 1
     1255  026000          SET     6                    2
     1256  027000          SET     7                    3
     1256  027003          STB+    3                XLATE
     1257  131400          CMPR    3,0         COMPARE TO OB
     1260  040662          TST     1,.+2       OB CORRECT ?
     1261  120257          CMP     0,.-2       NO!  KO ON ?
     1262  073265          LDR     6,OBT6
     1263  122670          CMP     5,PUNCH     OUTPUT ?
     1264  001351          JMP     DELY        DELAY
     1265  020001  OBT6    STB     1           SHIFT OB
     1265  022001          SET+    2           SET DEC
     1266  110646          INCR    1,OBT4
     1267  001074          JMP     EDLY        CHECK FOR 'STOP'
**                         *       *                   *
**                         *       *                   *
     1270  123306  PUNCH   CMP     6,FM2       FORMAT 2 ?
     1271  024000  FM1     SET     4           SET REQ. FOR SER.
     1272  121672          CMP     3,.+0       WAIT FOR PUNCH
     1273  060031          LOAD    0,31        SELECT XLATE
     1274  022000          SET     2           SET DECREMENT
     1274  022030          TOG+    3           TURN ON OUTPUT STROBE
```

```
     1275  075010          LDR     10,10       *
     1276  075673          LDR     11,273      *
     1277  115701          INCR    11,.+2      * 4.5 MS DELAY
     1300  001277          JMP     .-1         *
     1301  115303          INCR    10,.+2      *
     1302  001276          JMP     .-4         *
     1303  020030          TOG     3           TURN OFF STROBE
     1304  060021          LOAD    0,21        RESET MUX FOR OBT
     1305  013000          JMPS    6
     1306  114713  FM2     INCR    9,FM4
     1307  074400          LDR     9,0
     1310  075252          LDR     10,252
     1311  020003  FM3     STB     3           LOAD XLATE
     1312  001271          JMP     FM1
     1313  075125  FM4     LDR     10,125
     1314  001311          JMP     FM3
**                         *
**                         *
**                         *
**                         *
     1315  077462  TST2    LDR     15,62       2
     1316  077124  TSTR    LDR     14,124      T
     1317  076522          LDR     13,122      R
     1320  073322          LDR     6,.+2
     1321  001364          JMP     MESS
     1322  073010          LDR     6,CTAB
     1323  001347          JMP     DEL2
     1324  077463  TST3    LDR     15,63       3
     1325  001316          JMP     TSTR
     1326  077464  TST4    LDR     15,64       4
     1327  001316          JMP     TSTR
**                         *
**                         *
**                         *
**                         *
**
**                         SUBROUTINE RDKY: WAITS FOR KYBD ENTRY
**                                                 TRANSFERS ENTRY TO RAM CTR
     1330  023000  RDKY    SET     3                   ENABLE KEYBORAD
     1331  121333          CMP     2,.+2
     1332  001331          JMP     .-1
**                         AN ENTRY AT R2KY CUASES THE KEYBOARD LATCH TO BE
**                         READ WITHOUT WAITING FOR A KEYSTROKE.
     1333  070377  R2KY    LDR     0,377
     1334  060002          LOAD    0,02                CMPR W/ KYBP
     1335  022000          SET     2                   DEC
     1336  130000          CMPR    0,0
     1337  040744          TST     1,RDEX
     1340  110342          INCR    0,.+2
     1341  001336          JMP     .-3
     1342  020700          RST     7
     1343  001336          JMP     .-5                 LOOP ON COMPARE
     1344  060000  RDEX    LOAD    0,0                 RESET MX
     1345  023000          SET     3           ENABLE KYBD
     1345  023003          STB+    3           LOAD XLATE
     1346  013000          JMPS    6                   RETURN
**                         *       *
**                                 DELAY
**                         *       *
     1347  074776  DEL2    LDR     9,376               HALF DELAY
     1350  001352          JMP     ST10
     1351  074774  DELY    LDR     9,374       3 SEC DELAY
     1352  075000  ST10    LDR     10,0
     1353  075400          LDR     11,0
```

```
     1354  021000            SET     1
     1355  115757  LP11      INCR    11,LP10
     1356  001355            JMP     .-1
     1357  115361  LP10      INCR    10,LP9
     1360  001355            JMP     LP11
     1361  114763  LP9       INCR    9,.+2
     1362  001355            JMP     LP11
     1363  013000            JMPS    6
**                             SUBROUTINE MESS
**                             DISPLAY MAR CTRS 29,30,31 ON LED DISPLAY
**                             RETURN BY RAM CTR 16+6
     1364  020400  MESS      RST     4                 RESET CHAR DISP
     1364  022400            SET+    2                 SET DEC
     1365  116770            INCR    13,MCHR
     1366  020004            STB     4                 INC CHAR 1
     1367  001365            JMP     .-2
     1370  117373  MCHR      INCR    14,RCHR
     1371  020005            STB     5                 INC CHAR 2
     1372  001370            JMP     .-2
     1373  117776  RCHR      INCR    15,MRET
     1374  020006            STB     6                 INC CHAR 3
     1375  001373            JMP     .-2
     1376  013000  MRET      JMPS    6
     1377  000000  DMAC      JMP     DMAC
     1400  000000            END
AL     1172
  01204
ALP    1204
  01174
CKSW   1206
  01141
CONT   1023
  01005
CSTP   1123
  01120
CT3    1216
  01214
CTAB   1010
  01022 01213 01322
CWAI   1003
  01002 01074 01123
DEL2   1347
  01210 01323
DELY   1351
  01073 01264
DMAC   0000
  01377
DOUB   1147
  01170 01176
DSP    1027
  01025
DSP2   1042
  01040
DSP3   1055
  01053
EDLY   1074
  01071 01251 01267
FM     1165
  01203
FM1    1271
  01312
FM2    1306
  01270
FM3    1311
```

```
  01314
FM4   1313
  01306
FMT   1203
  01167
IDMA  1377
  01011
JDLY  1071
  01067
KDSP  1076
  01013 01127
KEY1  1101
  01126 01131
KEY2  1107
  01104
KEY3  1115
  01112
KO    1132
  01014 01177 01205
KOT   1177
  01134
LD6   1141
  01137 01150 01152
LP1   1032
  01035
LP10  1357
  01355
LP11  1355
  01360 01362
LP2   1045
  01050
LP3   1060
  01064
LP9   1361
  01357
LS    1143
  01200
LST   1200
  01145
MCHR  1370
  01365
MESS  1364
  01142 01321
MOD2  1127
  01076
MRET  1376
  01373
OBT   1222
  01015
OBT0  1233
  01221
OBT1  1235
  01242
OBT2  1240
  01243
OBT3  1244
  01236
OBT4  1246
  01266
OBT5  1252
  01222
OBT6  1265
  01262
OBT7  1221
```

```
   01247
OFF    1136
   01157 01164
ON     1140
   01135 01156 01163
ONE    1151
   01146 01171 01175
OPT    1201
   01155
OUTP   1153
   01201
PUNC   1270
   01125 01263
R2KY   1333
   01130
RCHR   1373
   01370
RDEX   1344
   01337
RDKY   1330
   01077
RES1   1036
   01032
RES2   1051
   01045
RES3   1065
   01060
RS1    1037
   01041
RS2    1052
   01054
RS3    1066
   01070
SDSP   1025
   01012
SE     1160
   01202
SET    1202
   01162
ST10   1352
   01350
STP3   1212
   01206
TST2   1315
   01016
TST3   1324
   01017
TST4   1326
   01020
TSTR   1316
   01325 01327
```

```
                                LOC     1400
**                              *
**                              *TITLE  DEX4
**                              *
**                              *
**                              *       DIAGNOSTIC EXEC
**                              *
**                              *       9/1 /75    W.K.C.
**                              *
                        SMP1    EXTC    2000
                        SMP2    EXTC    2001
                        SMP3    EXTC    2002
                        SMP4    EXTC    2003
                        SMP5    EXTC    2004
                        REC1    EXTC    3400
                        REC2    EXTC    3401
                        REC3    EXTC    3402
                        REC4    EXTC    3403
                        EM1     EXTC    5400
                        EM2     EXTC    5401
                        EM3     EXTC    5402
                        EM4     EXTC    5403
                        EM5     EXTC    5404
                        EM6     EXTC    5405
                        EM7     EXTC    6000
                        MEC1    EXTC    4000
                        MEC2    EXTC    4001
                        MEC3    EXTC    4002
                        MEC4    EXTC    4003
**                              *
    1400   020600  EXEC   RST     6          RESET TOG SW
    1401   030007         PLA     7          GENERAL RESET
    1401   030017         PLB+    1          SELECT RAM 0 TO 15
    1402   021000         SET     1
    1402   021300         RST+    3          RESET KYBD
    1403   075340         LDR     10,340
    1404   020060         TOG     6          SET KYBD = ASCII SPACE
    1405   115007         INCR    10,.+2
    1406   001404         JMP     .-2
    1407   075002         LDR     10,2
    1410   030001         PLA     1          SELECT OB 2
    1411   060020         LOAD    0,20       KYBD TO OB
    1412   075200         LDR     10,200
    1413   020001         STB     1          LOAD OB FROM KYBD
    1414   115016         INCR    10,.+2
    1415   001413         JMP     .-2
    1416   070040         LDR     0,40       LOAD ACC
    1417   025000         SET     5          SET ALL LEDS TO SPACE
    1420   026000         SET     6
    1421   027000         SET     7
    1422   075360         LDR     10,360     SET KYBD = ASCII 0
    1423   020060         TOG     6
    1424   115026         INCR    10,.+2
    1425   001423         JMP     .-2
    1426   075001         LDR     10,1
    1427   030001         PLA     1          SELECT OB 1
    1430   075200         LDR     10,200
    1431   020001         STB     1          LOAD OB FROM KYBD
    1432   115034         INCR    10,.+2
    1433   001431         JMP     .-2
    1434   070341         LDR     0,341
    1435   020004         STB     4          LOAD LED 1 WITH ?
    1436   020005         STB     5          LOAD LED 2 WITH ?
    1437   110041         INCR    0,.+2
```

```
1440  001435          JMP     .-3
1441  030020  EX01    PLB     2           SELECT RAM 16 TO 31
1442  077611          LDR     15,OPER
1443  071370          LDR     2,370
1444  073446          LDR     7,.+2
1445  001524          JMP     RDROT       WAIT FOR START - READ ROT SW
1446  137400          CMPR    15,0
1447  037040          PLB     4,14        SAVE FOR FUTURE REF.
1450  030020  EX02    PLB     2           SELECT RAM 16 TO 31
1451  017000          JMPS    14          PICKUP LETTER & TABLE INDEX
1452  070401  EX03    LDR     1,1
1453  030001          PLA     1           SELECT OB 1
1454  021000          SET     1
1455  070460          LDR     1,60        LOAD ACC
1456  025000          SET     5           LOAD LED 1 = ASCII 0
1457  110062          INCR    0,.+3
1460  020004          STB     4           INC UPTO LETTER
1461  001457          JMP     .-2
1462  070460          LDR     1,60        LOAD ACC
1463  026000          SET     6           LOAD LED 2 = ASCII 0
1464  070360          LDR     0,360
1465  110070          INCR    0,.+3
1466  020005          STB     5           INC UPTO ?
1467  001465          JMP     .-2
1470  070002          LDR     0,2
1471  030001          PLA     1           SELECT OB 2
1472  070440          LDR     1,40        LOAD ACC
1473  027000          SET     7           LOAD LED 3 = ASCII SPACE
1474  073476          LDR     7,.+2
1475  001524          JMP     RDROT       WAIT FOR START - READ ROT SW
1476  130000          CMPR    0,0
1477  036440          PLB     4,13        SAVE FOR FUTURE REF.
1500  030020  EX04    PLB     2           SELECT RAM 16 TO 31
1501  136400          CMPR    13,0
1502  030040          PLB     4,0
1503  070402          LDR     1,2
1504  030001          PLA     1           SELECT OB 2
1505  070440          LDR     1,40        LOAD ACC
1506  026000          SET     6           LOAD LED 2 = ASCII SPACE
1507  070401          LDR     1,1
1510  030001          PLA     1           SELECT OB 1
1511  070460          LDR     1,60        LOAD ACC
1512  025000          SET     5           LOAD LED 1 = ASCII 0
1513  022000          SET     2
1513  022004          STB+    4           INC UPTO NUMBER
1514  110116          INCR    0,.+2
1515  001513          JMP     .-2
1516  137400          CMPR    15,0
1517  030010          PLB     1           SELECT RAM 0 TO 15
1520  037440          PLB     4,15        SAVE FOR FUTURE REF.
1521  076377  EX05    LDR     12,377
1522  020007          STB     7           FOR SYNC
1522  021007          SET+    1
1523  017400          JMPS    15          GO TO SUBTEST
**                    *
**                    *
1524  055126  RDROT   TST     26,.+2      START ?
1525  001524          JMP     .-1
1526  131000          CMPR    2,0         SAVE # OF SUBTESTS
1527  030440          PLB     4,1
1530  020070          TOG     7           READ ROT SW
1530  020670          RST+    6           RESET TOG SW
1531  070377          LDR     0,377
1532  102137          INC     4,.+5       THIS POS ?
```

```
1532  [illegible]                [illegible]  0,.+1
1534  [illegible]                [illegible]  15,.+1      BUMP INDEX POINTER
1535  [illegible]                [illegible]  1,[illegible]
1536  [illegible]                JMP          .-6
1537  [illegible]                [illegible]  7           RETURN
**                               *
**                               *
1540  [illegible]  [illegible]   [illegible]  10,1        SET ERROR FLAG
1541  030001                     PLA          1           SELECT OB 1
1542  021000                     SET          1
1543  070060                     LDR          0,60        LOAD ACC
1544  026000                     SET          6           LOAD LED 2 = ASCII 0
1545  116150                     INCR         12,.+3
1546  020005                     STB          5           SET LED 2 = RAM 12
1547  001545                     JMP          .-2
1550  070060                     LDR          0,60        LOAD ACC
1551  027000                     SET          7           LOAD LED 3 = ASCII 0
1552  116555                     INCR         13,.+3
1553  020006                     STB          6           SET LED 3 = RAM 13
1554  001552                     JMP          .-2
1555  020700                     RST          7           HALT
**                               *
**                               *
1556  021000  ETST               SET          1
1557  060000                     LOAD         0,0
1560  070320                     LDR          0,320
1561  110163                     INCR         0,.+2       100USEC DELAY
1562  001561                     JMP          .-1
1563  047606                     TST          15,RETST    JUST ON ?
1564  050206                     TST          16,RETST    RECO ON ?
1565  120567                     CMP          1,.+2       SINGLE SPACE ?
1566  001521  LOOP               JMP          EX05        STAY IN THIS TEST
1567  055603                     TST          27,STOP     STOP ?
1570  056173                     TST          28,RLED     CONTINUE ?
1571  135001                     CMPR         10,1
1572  040566                     TST          1,LOOP      ERR FLAG SET ?
1573  020004  RLED               STB          4           INC LED 1 TO NEXT NUMBER
1574  075002                     LDR          10,2        RESET ERR FLAG
1575  030001                     PLA          1           SELECT OB 2
1576  070040                     LDR          0,40        LOAD ACC
1577  026000                     SET          6           CLEAR LED 2
1600  027000                     SET          7           CLEAR LED 3
1600  027600                     RST+         6           RESET TOG SW
1601  117602                     INCR         15,.+1
1602  001521                     JMP          EX05        GO TO NEXT TEST
1603  055050  STOP               TST          26,EX02     START ?
1604  056173                     TST          28,RLED     CONTINUE ?
1605  001603                     JMP          STOP
**                               *
1606  030007  RETST              PLA          7           GENERAL RESET
1607  062106                     LOAD         4,106
1610  001556                     JMP          ETST
**                               *
**                               *           MAJOR TEST TABLE
**                               *
1611  001400  OPER               JMP          EXEC
1612  001621                     JMP          SMP
1613  001625                     JMP          RECO
1614  001633                     JMP          MECH
1615  001637                     JMP          EMEM
1616  001400                     JMP          EXEC
1617  001400                     JMP          EXEC
1620  001400                     JMP          EXEC
1621  070334  SMP                LDR          0,334       -(ASCII S-0)
```

```
      1622  077700          LDR     15,ISMP   TABLE INDEX
      1623  071372          LDR     2,372     -# OF SUBTESTS
      1624  001630          JMP     SR
      1625  070335  RECO    LDR     0,335     -(ASCII R-0)
      1626  077710          LDR     15,IRECO  TABLE INDEX
      1627  071373          LDR     2,373     -# OF SUBTESTS
      1630  062320  SR      LOAD    4,320     RIGHT SPEED = 0
      1631  062106          LOAD    4,106     DRIVE RIGHT
      1632  001452          JMP     EX03
      1633  070342  MECH    LDR     0,342     -(ASCII M-0)
      1634  077720          LDR     15,IMECH  TABLE INDEX
      1635  071374          LDR     2,374     -# OF SUBTESTS
      1636  001452          JMP     EX03
      1637  070352  EMEM    LDR     0,352     -(ASCII E-0)
      1640  077730          LDR     15,IEMEM  TABLE INDEX
      1641  071370          LDR     2,370     -# OF SUBTESTS
      1642  001452          JMP     EX03
**                          *
**                          *       SUBTEST TABLES
                            LOC     1700
**                          *
                  SPARE     EXTC    0
**                          *
      1700  001400  ISMP    JMP     EXEC
      1701  002000          JMP     SMP1
      1702  002001          JMP     SMP2
      1703  002002          JMP     SMP3
      1704  002003          JMP     SMP4
      1705  002004          JMP     SMP5
      1706  001500          JMP     EX04
      1707  000000          JMP     SPARE
      1710  001400  IRECO   JMP     EXEC
      1711  003400          JMP     REC1
      1712  003401          JMP     REC2
      1713  003402          JMP     REC3
      1714  003403          JMP     REC4
      1715  001500          JMP     EX04
      1716  000000          JMP     SPARE
      1717  000000          JMP     SPARE
      1720  001400  IMECH   JMP     EXEC
      1721  004000          JMP     MEC1
      1722  004001          JMP     MEC2
      1723  004002          JMP     MEC3
      1724  004003          JMP     MEC4
      1725  001500          JMP     EX04
      1726  000000          JMP     SPARE
      1727  000000          JMP     SPARE
      1730  001400  IEMEM   JMP     EXEC
      1731  005400          JMP     EM1
      1732  005401          JMP     EM2
      1733  005402          JMP     EM3
      1734  005403          JMP     EM4
      1735  005404          JMP     EM5
      1736  005405          JMP     EM6
      1737  006000          JMP     EM7
      1740  001500          JMP     EX04
                            LOC     1776
      1776  001540  IERR    JMP     ERR
      1777  001556  IETST   JMP     ETST
      2000  000000          END
      EM1   5400
        01731
      EM2   5401
        01732
```

```
EM3   5402
  01733
EM4   5403
  01734
EM5   5404
  01735
EM6   5405
  01736
EM7   6000
  01737
EMEM  1637
  01615
ERR   1540
  01776
ETST  1556
  01610 01777
EX01  1441

EX02  1450
  01603
EX03  1452
  01632 01636 01642
EX04  1500
  01706 01715 01725 01740
EX05  1521
  01566 01602
EXEC  1400
  01611 01616 01617 01620 01700 01710 01720 01730

IEME  1730
  01640
IERR  1776

IETS  1777

IMEC  1720
  01634
IREC  1710
  01626
ISMP  1700
  01622
LOOP  1566
  01572
MEC1  4000
  01721
MEC2  4001
  01722
MEC3  4002
  01723
MEC4  4003
  01724
MECH  1633
  01614
OPER  1611
  01442
RDRO  1524
  01445 01475 01535
REC1  3400
  01711
REC2  3401
  01712
REC3  3402
  01713
REC4  3403
```

```
  01714
RECO  1625
  01613
RETS  1606
  01563 01564
RLED  1573
  01570 01604
SMP   1621
  01612
SMP1  2000
  01701
SMP2  2001
  01702
SMP3  2002
  01703
SMP4  2003
  01704
SMP5  2004
  01705
SPAR  0000
  01707 01716 01717 01726 01727
SR    1630
  01624
STOP  1603
  01567 01605
```

```
                                    LOC     2000
**                                  *
**                                  *TITLE  DSR4
**                                  *
**                                  *
**                                  *       SCAN DIAGNOSTIC SUBTESTS 1, 2
**                                  *       SCAN DIAGNOSTIC SUBTEST  3
**                                  *       SCAN DIAGNOSTIC SUBTESTS 4, 5
**                                  *       RECOGNITION DIAGNOSTIC
**                                  *
**                                  *       1/9/76      W.K.C.
**                                  *
                        RDM1        EXTC    34
                        RDM2        EXTC    35
                        RDM3        EXTC    36
                        RDER        EXTC    37
                        IERR        EXTC    1776
                        IETST       EXTC    1777
**                                  *
     2000   002005                  JMP     SMP1
     2001   002121                  JMP     SMP2
     2002   002400                  JMP     SMP3
     2003   003000                  JMP     SMP4
     2004   003067                  JMP     SMP5
**                                  *
**                                  *       SCAN DIAGNOSTIC SUBTEST 1
**                                  *
     2005   061000   SMP1           LOAD    2,0         RESET HRDW FLAGS
     2006   076776                 LDR     13,376      FOR LED 3
     2007   070100                 LDR     0,100
     2010   020020                 TOG     2           SET WINDOW TOP
     2011   070000                 LDR     0,0
     2012   020010                 TOG     1           SET WINDOW BOT
     2013   070002                 LDR     0,2
     2014   020040                 TOG     4           LOAD WIDTH
     2014   020240                 RST+    2           RESET SAMPLE
     2015   060500                 LOAD    1,100       LOAD 4X HT
**                                  *       SEND BLANK SAMPLE
     2016   063640                 LOAD    7,240
     2017   063640                 LOAD    7,240
     2020   063440                 LOAD    7,40
     2021   063640                 LOAD    7,240
     2022   063640                 LOAD    7,240
     2023   063440                 LOAD    7,40
     2024   070000                 LDR     0,0         RESET TIMER
     2025   002026                 JMP     .+1         DELAY
**                                  *       TEST SAMPLE FLOP
     2026   045431                 TST     11,.+3      SAMPLE SET ?
     2027   110041                 INCR    0,I1ERR
     2030   002026                 JMP     .-2
     2031   076775                 LDR     13,375
     2032   042041                 TST     4,I1ERR     STILL SHIFTING ?
     2033   076774                 LDR     13,374
     2034   130021                 CMPR    0,21
     2035   040041                 TST     0,I1ERR     < 65.5 USEC ?
     2036   076773                 LDR     13,373
     2037   130023                 CMPR    0,23
     2040   040042                 TST     0,.+2       < 71.8 USEC ?
     2041   001776   I1ERR         JMP     IERR
     2042   076772                 LDR     13,372
     2043   020200                 RST     2           RESET SAMPLE
     2044   045441                 TST     11,I1ERR    SAMPLE STILL SET ?
     2045   076771                 LDR     13,371
     2046   042441                 TST     5,I1ERR     FB ?
```

```
     2047  076770          LDR     13,370
     2050  043441          TST     7,I1ERR     FBC ?
     2051  076767          LDR     13,367
     2052  044441          TST     9,I1ERR     POP ?
     2053  076766          LDR     13,366
     2054  070000          LDR     0,0         RESET TIMER
     2055  061015          LOAD    2,15        SET LJUST, TCHS, CHAR END
     2056  061005          LOAD    2,05        RESET LJUST TO START POS. MODE
     2057  002060          JMP     .+1         DELAY
     2060  002061          JMP     .+1         DELAY
     2061  042063          TST     4,.+2       SHIFTING ?
     2062  001776          JMP     IERR
     2063  076376          LDR     12,376
     2064  076777          LDR     13,377
     2065  047470          TST     15,.+3      JUST ON YET ?
     2066  110041          INCR    0,I1ERR
     2067  002065          JMP     .-2
     2070  047472          TST     15,.+2      JUST STILL ON ?
     2071  002074          JMP     .+3
     2072  110041          INCR    0,I1ERR
     2073  002070          JMP     .-3
     2074  076776          LDR     13,376
     2075  070742          LDR     1,342       -30
     2076  050101          TST     16,.+3      RECOGNITION ON ?
     2077  110441          INCR    1,I1ERR
     2100  002076          JMP     .-2
     2101  076775          LDR     13,375
     2102  130034          CMPR    0,34
     2103  040041          TST     0,I1ERR     < 120 USEC ?
     2104  076774          LDR     13,374
     2105  130037          CMPR    0,37
     2106  040110          TST     0,.+2       < 132 USEC ?
     2107  001776          JMP     IERR
     2110  070000          LDR     0,0         RESET TIMER
     2111  070766          LDR     1,366       OUTER LOOP = 10 MSEC
     2112  076773          LDR     13,373
     2113  050115          TST     16,.+2      RECO ON ?
     2114  001777          JMP     IETST
     2115  110117          INCR    0,.+2
     2116  002113          JMP     .-3
     2117  110441          INCR    1,I1ERR
     2120  002113          JMP     .-5
**                         *
**                         *
**                         *       SCAN DIAGNOSTIC SUBTEST 2
**                         *
**                         *
     2121  061000  SMP2    LOAD    2,0         RESET HRDW FLAGS
     2122  076766          LDR     13,366
     2123  060100          LOAD    0,100       RESET ERR FLAGS
     2124  070000          LDR     0,0
     2125  020010          TOG     1           SET WINDOW BOT
     2126  070010          LDR     0,10
     2127  020020          TOG     2           SET WINDOW TOP
     2127  020220          RST+    2           RESET SAMPLE
     2130  060440          LOAD    1,40        SET TOO TALL HT
     2131  070002          LDR     0,2
     2132  020040          TOG     4           LOAD WIDTH
     2133  073535          LDR     7,.+2
     2134  002253          JMP     BLSMP       GENERATE BLANK SAMPLE
     2135  073677          LDR     7,TBSM
     2136  074540          LDR     9,.+2
     2137  002253          JMP     BLSMP       GENERATE BLANK SAMPLE
     2140  043160          TST     6,I2ERR     PFB ?
```

```
2141  116542          INCR    13,.+1
2142  044560          TST     9,I2ERR     POP ?
2143  074305          LDR     8,TNSM
2144  074546          LDR     9,.+2
2145  002265          JMP     NBSMP       GENERATE NON BLANK SAMPLE
2146  043160          TST     6,I2ERR     PFB ?
2147  116550          INCR    13,.+1
2150  043560          TST     7,I2ERR     FBC ?
2151  116552          INCR    13,.+1
2152  044560          TST     9,I2ERR     POP ?
2153  076376          LDR     12,376
2154  076766          LDR     13,366
2155  074557          LDR     9,.+2
2156  002265          JMP     NBSMP       GENERATE NON BLANK SAMPLE
2157  043161          TST     6,.+2       PFB ?
2160  001776  I2ERR   JMP     IERR
2161  116562          INCR    13,.+1
2162  043564          TST     7,.+2       FBC ?
2163  001776          JMP     IERR
2164  116565          INCR    13,.+1
2165  044560          TST     9,I2ERR     POP ?
2166  074570          LDR     9,.+2
2167  002253          JMP     BLSMP       GENERATE BLANK SAMPLE
2170  043172          TST     6,.+2       PFB ?
2171  001776          JMP     IERR
2172  116573          INCR    13,.+1
2173  044560          TST     9,I2ERR     POP ?
2174  061001          LOAD    2,01        SET TCHS
2175  076375          LDR     12,375
2176  076766          LDR     13,366
2177  074601          LDR     9,.+2
2200  002253          JMP     BLSMP       GENERATE BLANK SAMPLE
2201  043160          TST     6,I2ERR     PFB ?
2202  116603          INCR    13,.+1
2203  044560          TST     9,I2ERR     POP ?
2204  074606          LDR     9,.+2
2205  002265          JMP     NBSMP       GENERATE NON BLANK SAMPLE
2206  043160          TST     6,I2ERR     PFB ?
2207  116610          INCR    13,.+1
2210  043560          TST     7,I2ERR     FBC ?
2211  116612          INCR    13,.+1
2212  044560          TST     9,I2ERR     POP ?
2213  076374          LDR     12,374
2214  076766          LDR     13,366
2215  074617          LDR     9,.+2
2216  002265          JMP     NBSMP       GENERATE NON BLANK SAMPLE
2217  043221          TST     6,.+2       PFB ?
2220  001776          JMP     IERR
2221  116622          INCR    13,.+1
2222  043624          TST     7,.+2       FBC ?
2223  001776          JMP     IERR
2224  116625          INCR    13,.+1
2225  044627          TST     9,.+2       POP ?
2226  001776          JMP     IERR
2227  074631          LDR     9,.+2
2230  002253          JMP     BLSMP       GENERATE BLANK SAMPLE
2231  043233          TST     6,.+2       PFB ?
2232  001776          JMP     IERR
2233  116634          INCR    13,.+1
2234  044636          TST     9,.+2       POP ?
2235  001776          JMP     IERR
2236  076373          LDR     12,373
2237  076766          LDR     13,366
2240  074642          LDR     9,.+2
```

```
2241  002253          JMP     BLSMP       GENERATE BLANK SAMPLE
2242  043160          TST     0,I2ERR     PFB ?
2243  116644          INCR    13,.+1
2244  044646          TST     9,.+2       POP ?
2245  001776          JMP     IERR
2246  061000          LOAD    2,0         RESET TCHS
2247  074651          LDR     9,.+2
2250  002253          JMP     BLSMP       GENERATE BLANK SAMPLE
2251  044560          TST     9,I2ERR     POP ?
2252  001777          JMP     IETST
2253  063640  BLSMP   LOAD    7,240       SEND BLANK SAMPLE
2254  063640          LOAD    7,240
2255  063440          LOAD    7,040
2256  063640          LOAD    7,240
2257  063640          LOAD    7,240
2260  063440          LOAD    7,040
2261  045663          TST     11,.+2      SAMPLE ?
2262  002261          JMP     .-1
2263  020200          RST     2           RESET SAMPLE
2264  013400          JMPS    7           RETURN
2265  063700  NBSMP   LOAD    7,300       SEND NON BLANK SAMPLE
2266  063700          LOAD    7,300
2267  063500          LOAD    7,100
2270  063700          LOAD    7,300
2271  063700          LOAD    7,300
2272  063500          LOAD    7,100
2273  045675          TST     11,.+2      SAMPLE ?
2274  002273          JMP     .-1
2275  020200          RST     2           RESET SAMPLE
2276  014000          JMPS    8           RETURN
2277  116700  TBSM    INCR    13,.+1
2300  042707          TST     5,ITERR     FB ?
2301  116702          INCR    13,.+1
2302  043707          TST     7,ITERR     FBC ?
2303  116704          INCR    13,.+1
2304  014400          JMPS    9           RETURN
2305  116706  TNSM    INCR    13,.+1
2306  042710          TST     5,.+2       FB ?
2307  001776  ITERR   JMP     IERR
2310  116711          INCR    13,.+1
2311  014400          JMPS    9           RETURN
**                    *
**                    *
                      LOC     2366
**                    *
2366  002414  IP3A    JMP     SP3A
2367  002436  IP3B    JMP     SP3B
2370  002675  IPS0A   JMP     PS0A
2371  002703  IPS1    JMP     PS1
**                    *
2372  003007  IP41    JMP     SP41
2373  003021  IP42    JMP     SP42
2374  003077  IP51    JMP     SP51
2375  003103  IP52    JMP     SP52
**                    *
2376  003740  IGNA    JMP     GENA
2377  003745  IGNB    JMP     GENB
**                    *
                      LOC     2400
**                    *
**                    *
**                    *       SCAN DIAGNOSTIC SUBTEST 3
**                    *
**                    *
```

```
     2400  061000  SMP3    LOAD    2,0         RESET HRDW FLAGS
     2401  060100          LOAD    0,100       RESET ERR FLAGS
     2402  070003          LDR     0,3
     2403  020020          TOG     2           SET WINDOW TOP
     2403  020220          RST+    2           RESET SAMPLE
     2404  070000          LDR     0,0
     2405  020010          TOG     1           SET WINDOW BOT
     2406  070040          LDR     0,40
     2407  020040          TOG     4           LOAD WIDTH
     2410  060402          LOAD    1,2         SET TOO TALL HT
     2411  073665          LDR     7,NBSMP
     2412  074366          LDR     8,IP3A
     2413  002253          JMP     BLSMP       GENERATE BLANK SAMPLE
**                                             *THEN GENERATE NON BLANK SAMPLE
     2414  073771  SP3A    LDR     7,IPS1
     2415  074417          LDR     9,.+2
     2416  002253          JMP     BLSMP       GENERATE BLANK SAMPLE
**                                             *START POS. MODE
**                                             *WAIT FOR RECO ON
**                           *
**                           *30X
**                           *
     2417  041423          TST     3,I3ERR     BSZ ?
     2420  041075          TST     2,S3E2      TSZ ?
     2421  126424          CMP     13,.+3      HTZ ?
     2422  076774  S3E3    LDR     13,374
     2423  001776  I3ERR   JMP     IERR
     2424  046051          TST     12,S3E4     TT ?
     2425  070377          LDR     0,377
     2426  074430          LDR     9,.+2
     2427  002711          JMP     POS2        REPOSITION SR1 BY RAM 0
**                                             *WAIT FOR RECO OFF
**                                             *LOAD OB0
     2430  057033          TST     30,.+3      WIDE ?
     2431  076766  S3E9    LDR     13,366
     2432  001776          JMP     IERR
     2433  061000          LOAD    2,0         RESET HRDW FLAGS
     2434  074367          LDR     8,IP3B
     2435  002265          JMP     NBSMP       GENERATE NON BLANK SAMPLE
     2436  061001  SP3B    LOAD    2,01        SET TCHS
     2437  070004          LDR     0,4
     2440  020020          TOG     2           SET WINDOW TOP
     2441  076376          LDR     12,376
     2442  074444          LDR     9,.+2
     2443  002253          JMP     BLSMP       GENERATE BLANK SAMPLE
**                                             *START POS. MODE.
**                                             *WAIT FOR RECO ON
**                           *
**                           *31X
**                           *
     2444  041446          TST     3,.+2       BSZ ?
     2445  001776          JMP     IERR
     2446  041075          TST     2,S3E2      TSZ ?
     2447  126422          CMP     13,S3E3     HTZ ?
     2450  046053          TST     12,.+3      TT ?
     2451  076773  S3E4    LDR     13,373
     2452  001776          JMP     IERR
     2453  060100          LOAD    0,100       RESET ERR FLAGS
     2454  070263          LDR     0,263
     2455  074457          LDR     9,.+2
     2456  002711          JMP     POS2        REPOSITION SR1 BY RAM 0
**                                             *WAIT FOR RECO OFF
**                                             *LOAD OB0
     2457  052423          TST     21,I3ERR    VMF2 ?
```

```
     2460  051506          TST     19,S3E6     VMF1 ?
     2461  057031          TST     30,S3E9     WIDE ?
     2462  070040          LDR     0,40
     2463  020040          TOG     4           LOAD WIDTH
     2464  076375          LDR     12,375
     2465  000404          LOAD    1,4         SET TOO TALL HT
     2466  070404          LDR     1,4
     2467  071005          LDR     2,5
     2470  070260          LDR     0,260
     2471  074473          LDR     9,.+2
     2472  002671          JMP     POS0        GENERATE SAMPLE WITH WINDOW
**                                             *TOP = RAM 1, RESETS WINDOW
**                                             *TOP = RAM 2, SHIFTS SR1 =
**                                             *RAM 0, CALLS POS1 TO START
**                                             *POS MODE.
**                                     *
**                                     *32X
**                                     *
     2473  041423          TST     3,I3ERR     BSZ ?
     2474  041077          TST     2,.+3       TSZ ?
     2475  076775  S3E2    LDR     13,375
     2476  001776          JMP     IERR
     2477  126422          CMP     13,S3E3     HTZ ?
     2500  046051          TST     12,S3E4     TT ?
     2501  070264          LDR     0,264
     2502  074504          LDR     9,.+2
     2503  002711          JMP     POS2        REPOSITION SR1 BY RAM 0
**                                             *WAIT FOR RECO OFF
**                                             *LOAD OBO
     2504  052423          TST     21,I3ERR    VMF2 ?
     2505  051510          TST     19,.+3      VMF1 ?
     2506  076771  S3E6    LDR     13,371
     2507  001776          JMP     IERR
     2510  076770          LDR     13,370
     2511  050423          TST     17,I3ERR    MCP ?
     2512  076767          LDR     13,367
     2513  051115          TST     18,.+2      NDW ?
     2514  001776          JMP     IERR
     2515  057117          TST     30,.+2      WIDE ?
     2516  002431          JMP     S3E9
     2517  060407          LOAD    1,7         SET TOO TALL HT
     2520  076374          LDR     12,374
     2521  070410          LDR     1,10
     2522  071014          LDR     2,14
     2523  070261          LDR     0,261
     2524  074526          LDR     9,.+2
     2525  002671          JMP     POS0        GENERATE SAMPLE WITH WINDOW
**                                             *TOP = RAM 1, RESETS WINDOW
**                                             *TOP = RAM 2, SHIFTS SR1 =
**                                             *RAM 0, CALLS POS1 TO START
**                                             *POS MODE.
**                                     *
**                                     *33X
**                                     *
     2526  041423          TST     3,I3ERR     BSZ ?
     2527  041075          TST     2,S3E2      TSZ ?
     2530  126422          CMP     13,S3E3     HTZ ?
     2531  046133          TST     12,.+2      TT ?
     2532  002451          JMP     S3E4
     2533  070270          LDR     0,270
     2534  074536          LDR     9,.+2
     2535  002711          JMP     POS2        REPOSITION SR1 BY RAM 0
**                                             *WAIT FOR RECO OFF
**                                             *LOAD OBO
```

```
     2536  052540          TST     21,.+2      VMF2 ?
     2537  001776          JMP     IERR
     2540  051542          TST     19,.+2      VMF1 ?
     2541  002506          JMP     S3E6
     2542  060414          LOAD    1,14        SET TOO TALL HT
     2543  076372          LDR     12,373
     2544  070414          LDR     1,14
     2545  071020          LDR     2,20
     2546  070263          LDR     0,263
     2547  074551          LDR     9,.+2
     2550  002671          JMP     POS0        GENERATE SAMPLE WITH WINDOW
**                                               *TOP = RAM 1, RESETS WINDOW
**                                               *TOP = RAM 2, SHIFTS SR1 =
**                                               *RAM 0, CALLS POS1 TO START
**                                               *POS MODE.
**                                   *
**                                   *34X
**                                   *
     2551  041423          TST     3,I3ERR     BSZ ?
     2552  041154          TST     2,.+2       TSZ ?
     2553  002475          JMP     S3E2
     2554  126422          CMP     13,S3E3     HTZ ?
     2555  046051          TST     12,S3E4     TT ?
     2556  070274          LDR     0,274
     2557  074561          LDR     9,.+2
     2560  002711          JMP     POS2        REPOSITION SR1 BY RAM 0
**                                               *WAIT FOR RECO OFF
**                                               *LOAD OBO
     2561  052423          TST     21,I3ERR    VMF2 ?
     2562  051564          TST     19,.+2      VMF1 ?
     2563  002506          JMP     S3E6
     2564  060417          LOAD    1,17        SET TOO TALL HT
     2565  076372          LDR     12,372
     2566  070420          LDR     1,20
     2567  071040          LDR     2,40
     2570  070267          LDR     0,267
     2571  074573          LDR     9,.+2
     2572  002671          JMP     POS0        GENERATE SAMPLE WITH WINDOW
**                                               *TOP = RAM 1, RESETS WINDOW
**                                               *TOP = RAM 2, SHIFTS SR1 =
**                                               *RAM 0, CALLS POS1 TO START
**                                               *POS MODE.
**                                   *
**                                   *35X
**                                   *
     2573  041423          TST     3,I3ERR     BSZ ?
     2574  041075          TST     2,S3E2      TSZ ?
     2575  126422          CMP     13,S3E3     HTZ ?
     2576  046200          TST     12,.+2      TT ?
     2577  002451          JMP     S3E4
     2600  070320          LDR     0,320
     2601  074603          LDR     9,.+2
     2602  002711          JMP     POS2        REPOSITION SR1 BY RAM 0
**                                               *WAIT FOR RECO OFF
**                                               *LOAD OBO
     2603  070040          LDR     0,40
     2604  020020          TOG     2           SET WINDOW TOP
     2605  060440          LOAD    1,40        SET TOO TALL HT
     2606  076371          LDR     12,371
     2607  074611          LDR     9,.+2
     2610  002703          JMP     POS1
**                                   *
**                                   *36X
**                                   *
```

```
          2611  041423          TST     3,I3ERR     BSZ ?
          2612  041214          TST     2,.+2       TSZ ?
          2613  002475          JMP     S3E2
          2614  126422          CMP     13,S3E3     HTZ ?
          2615  046051          TST     12,S3E4     TT ?
          2616  070322          LDR     0,322
          2617  074621          LDR     9,.+2
          2620  002711          JMP     POS2        REPOSITION SR1 BY RAM 0
     **                                               *WAIT FOR RECO OFF
     **                                               *LOAD OB0
          2621  076370          LDR     12,370
          2622  070006          LDR     0,6
          2623  030002          PLA     2           SET MAX VERT SPACE = 10
          2624  070411          LDR     1,11
          2625  071100          LDR     2,100
          2626  070261          LDR     0,261
          2627  074631          LDR     9,.+2
          2630  002671          JMP     POS0        GENERATE SAMPLE WITH WINDOW
     **                                               *TOP = RAM 1, RESETS WINDOW
     **                                               *TOP = RAM 2, SHIFTS SR1 =
     **                                               *RAM 0, CALLS POS1 TO START
     **                                               *POS MODE.
     **                                     *
     **                                     *37X
     **                                     *
          2631  041423          TST     3,I3ERR     BSZ ?
          2632  041075          TST     2,S3E2      TSZ ?
          2633  126422          CMP     13,S3E3     HTZ ?
          2634  046236          TST     12,.+2      TT ?
          2635  002451          JMP     S3E4
          2636  070311          LDR     0,311
          2637  074641          LDR     9,.+2
          2640  002711          JMP     POS2        REPOSITION SR1 BY RAM 0
     **                                               *WAIT FOR RECO OFF
     **                                               *LOAD OB0
          2641  076367          LDR     12,367
          2642  070010          LDR     0,10
          2643  030002          PLA     2           SET MAX VERT SPACE = 8
          2644  060420          LOAD    1,20        SET TOO TALL HT
          2645  074647          LDR     9,.+2
          2646  002703          JMP     POS1
     **                                     *
     **                                     *38X
     **                                     *
          2647  041651          TST     3,.+2       BSZ ?
          2650  001776          JMP     IERR
          2651  041075          TST     2,S3E2      TSZ ?
          2652  126422          CMP     13,S3E3     HTZ ?
          2653  046051          TST     12,S3E4     TT ?
          2654  070261          LDR     0,261
          2655  074657          LDR     9,.+2
          2656  002711          JMP     POS2        REPOSITION SR1 BY RAM 0
     **                                               *WAIT FOR RECO OFF
     **                                               *LOAD OB0
          2657  076366          LDR     12,366
          2660  070032          LDR     0,32
          2661  020020          TOG     2           SET WINDOW TOP
          2662  074664          LDR     9,.+2
          2663  002703          JMP     POS1
     **                                     *
     **                                     *39X
     **                                     *
          2664  041423          TST     3,I3ERR     BSZ ?
          2665  041267          TST     2,.+2       TSZ ?
```

```
2666  002475          JMP     S3E2
2667  046051          TST     12,S3E4     TT ?
2670  001777          JMP     IETST
2671  130400  POS0    CMPR    1,0         LOAD ACC
2672  020020          TOG     2           SET WINDOW TOP
2673  074370          LDR     8,IPS0A
2674  002265          JMP     NBSMP
2675  063440  PS0A    LOAD    7,40        CLEAR SRDATA INPUT
2676  110301          INCR    0,.+3
2677  030006          PLA     6           SHIFT SR1&2 BY 1
2700  002676          JMP     .-2
2701  131000          CMPR    2,0         LOAD ACC
2702  020020          TOG     2           SET WINDOW TOP
2703  061013  POS1    LOAD    2,13        SET LJUST, TCHS, RECIRCULATION
2704  076776          LDR     13,376
2705  061003          LOAD    2,03        RESET LJUST TO START POS. MODE
2706  050310          TST     16,.+2      RECO ON ?
2707  002706          JMP     .-1         WAIT
2710  014400          JMPS    9           RETURN
2711  110314  POS2    INCR    0,.+3
2712  030006          PLA     6           SHIFT SR1&2 BY 1
2713  002711          JMP     .-2
2714  050314          TST     16,.+0      WAIT TIL RECO OVER
2715  070000          LDR     0,0
2716  030001          PLA     1           SELECT OB 0
2717  070200          LDR     0,200
2720  020001          STB     1           SHIFT OB
2720  021001          SET+    1
2721  110323          INCR    0,.+2
2722  002720          JMP     .-2
2723  076772          LDR     13,372
2724  014400          JMPS    9           RETURN
**                    *
**                    *
                      LOC     2775
**                    *
2775  003034  IP43    JMP     SP43
2776  003040  IP44    JMP     SP44
2777  003116  IP53    JMP     SP53
**                    *
                      LOC     3000
**                    *
**                    *
**                    *       SCAN DIAGNOSTIC SUBTEST 4
**                    *
**                    *
3000  061000  SMP4    LOAD    2,0         CLEAR ALL HREW FLAGS
3001  070000          LDR     0,0
3002  020010          TOG     1           SET WINDOW BOT = 0
3003  070101          LDR     0,65.
3004  020020          TOG     2           SET WINDOW TOP = 65
3004  020220          RST+    2           RESET SAMPLE
3004  021220          SET+    1           SET INCREMENT
3005  074372          LDR     8,IP41
3006  002265          JMP     NBSMP       GENERATE NON BLANK SAMPLE
3007  061001  SP41    LOAD    2,01        SET TCHS
3010  070340          LDR     0,340       -32
3011  030006          PLA     6           SHIFT SR1 BY 1
3012  110014          INCR    0,.+2       DO IT 32 TIMES
3013  003011          JMP     .-2
3014  070001          LDR     0,1
3015  020020          TOG     2           SET WINDOW TOP = 1
3016  070350          LDR     0,350       -24
3017  074373          LDR     8,IP42
```

```
     3020  002265          JMP     NBSMP     GENERATE NON BLANK SAMPLE
     3021  110023  SP42    INCR    0,.+2     DO IT 24 TIMES
     3022  003020          JMP     .-2
     3023  070040          LDR     0,32.
     3024  020020          TOG     2         SET WINDOW TOP = 32
     3025  072340          LDR     4,340     -32  OUTSIDE LOOP CTR
     3026  077377          LDR     14,377    -0
     3027  063440          LOAD    7,40      CLEAR SRDATA INPUT
     3030  073032          LDR     6,SP4A
     3031  073442          LDR     7,SP4B
     3032  074775  SP4A    LDR     9,IP43
     3033  002703          JMP     POS1      START POS MODE - WAIT FOR RECO
     3034  070320  SP43    LDR     0,320     -48
     3035  063404          LOAD    7,4       TURN OFF RECO
     3036  074776          LDR     9,IP44
     3037  002711          JMP     POS2      SHIFT SR2 'UP' 1 - WAIT TILL
**                                           *RECO OVER
     3040  074047  SP44    LDR     8,SP4C
     3041  070234          LDR     0,234     -100  MIDDLE LOOP CTR
     3042  063450  SP4B    LOAD    7,50      RESET UNKN RAM CTR
     3043  072740          LDR     5,340     -32  INSIDE LOOP CTR
     3044  137000          CMPR    14,0
     3045  035440          PLB     4,11      COPY RAM 14 INTO RAM 11
     3046  026000          SET     6         LOAD LED 2
     3047  071777  SP4C    LDR     3,377
     3050  115452          INCR    11,.+2    DATA = 1'S ?
     3051  071400          LDR     3,0
     3052  131400          CMPR    3,0       *COPY DATA
     3053  031040          PLB     4,2       *
     3054  030440          PLB     4,1       *
     3055  074457          LDR     9,ERR4
     3056  003173          JMP     S45A      READ & TEST UNKN RAM
     3057  116463  ERR4    INCR    13,.+4    SHOULD DATA BE 1'S ?
     3060  100252          INC     0,S45H    SHIFT COMP REG RIGHT
     3061  116251          INCR    12,S45G   DONE IT 4 TIMES ?
     3062  003060          JMP     .-2
     3063  100065          INC     0,.+2     SHIFT COMP REG RIGHT
     3064  003252          JMP     S45H
     3065  116251          INCR    12,S45G   DONE IT 4 TIMES ?
     3066  003063          JMP     .-3
**                           *
**                           *
**                           *         SCAN DIAGNOSTIC SUBTEST 5
**                           *
**                           *
     3067  061000  SMP5    LOAD    2,0       RESET ALL HRDW FLAGS
     3070  070000          LDR     0,0
     3071  020010          TOG     1         SET WINDOW BOT = 0
     3072  070040          LDR     0,32.
     3073  020020          TOG     2         SET WINDOW TOP = 32
     3073  020220          RST+    2         RESET SAMPLE
     3073  021220          SET+    1         SET INCREMENT
     3074  070350          LDR     0,350     -24
     3075  073774          LDR     7,IP51
     3076  002253          JMP     BLSMP     GENERATE BLANK SAMPLE
     3077  110101  SP51    INCR    0,.+2     DO IT 24 TIMES TO CLEAR SR2
     3100  003076          JMP     .-2
     3101  074375          LDR     8,IP52
     3102  002265          JMP     NBSMP     GENERATE NON BLANK SAMPLE
     3103  072350  SP52    LDR     4,350     -24  OUTSIDE LOOP CTR
     3104  077377          LDR     14,377    -0
     3105  063440          LOAD    7,40      CLEAR SRDATA INPUT
     3106  070400          LDR     1,0       *DATA EXPECTED 1'ST TIME
     3107  071000          LDR     2,0       *
```

```
     3110  071600          LDR     3,200     *
     3111  073136          LDR     6,SP5C
     3112  073530          LDR     7,SP58
     3113  074173          LDR     8,S45A
     3114  074777  SP5A    LDR     9,IP53
     3115  002703          JMP     POS1      START POS MODE - WAIT FOR RECO
     3116  070320  SP53    LDR     0,320     -48
     3117  030006          PLA     6         SHIFT SR2 BY 1
     3120  110122          INCR    0,.+2     REALIGN SR2 & SR1
     3121  003117          JMP     .-2
     3122  061005          LOAD    2,05      SET CEND, RESET RECIR
     3123  020002          STB     2         SHIFT SR2 'RIGHT' 1 (80 SHIFTS)
     3124  070234          LDR     0,234     -100 MIDDLE LOOP CTR
     3125  063404          LOAD    7,4       TURN OFF RECO
     3126  050126          TST     16,.+0    WAIT TILL RECO OVER
     3127  042127          TST     4,.+0     WAIT TILL SHIFTING OVER
     3130  063450  SP5B    LOAD    7,50      RESET UNKN RAM CTR
     3131  072740          LDR     5,340     -32  INSIDE LOOP CTR
     3132  137000          CMPR    14,0
     3133  026000          SET     6         LOAD LED 2
     3134  074563          LDR     9,ERR5
     3135  003173          JMP     S45A      READ & TEST UNKN RAM
     3136  022000  SP5C    SET     2         SERIAL INPUT TO COMP REG = 0
     3137  131400          CMPR    3,0
     3140  030030          PLB     3         LOAD COMP REG = RAM 3
     3141  100143          INC     0,.+2     SHIFT RIGHT - OVERFLOW ?
     3142  003144          JMP     .+2
     3143  021000          SET     1         SERIAL INPUT = 1
     3144  060003          LOAD    0,03      COMP REG TO COMP MUX
     3145  151406          XFR     3,6       RELOAD RAM 3
     3146  131000          CMPR    2,0
     3147  030030          PLB     3         LOAD COMP REG = RAM 2
     3150  100153          INC     0,.+3     SHIFT RIGHT - OVERFLOW ?
     3151  022000          SET     2         NO - SERIAL IN = 0
     3152  003154          JMP     .+2
     3153  021000          SET     1         YES - SERIAL IN = 1
     3154  151006          XFR     2,6       RELOAD RAM 2
     3155  130400          CMPR    1,0
     3156  030030          PLB     3         LOAD COMP REG = RAM 1
     3157  100160          INC     0,.+1     SHIFT RIGHT
     3160  150406          XFR     1,6       RELOAD RAM 1
     3161  021000          SET     1         SET INCREMENT
     3162  003114          JMP     SP5A
     3163  136420  ERR5    CMPR    13,20
     3164  040170          TST     0,.+4     SHOULD 1 BE IN LOWER HALF ?
     3165  100252          INC     0,S45H    SHIFT COMP REG RIGHT
     3166  116251          INCR    12,S45G   DONE IT 4 TIMES ?
     3167  003165          JMP     .-2
     3170  100651          INC     1,S45G    SHIFT COMP REG LEFT
     3171  116252          INCR    12,S45H   DONE IT 4 TIMES ?
     3172  003170          JMP     .-2
**                         *
**                         *
     3173  060003  S45A    LOAD    0,03      COMP REG TO COMP MUX
     3174  125215          CMP     10,S45E   SCAN EDIT ON ?
     3175  063451  S45B    LOAD    7,51      INC UNKN RAM CTR
     3176  112600          INCR    5,.+2     READ ALL LOCATIONS ?
     3177  014000          JMPS    8         GO TO SP4C OR S45A
     3200  122613          CMP     5,S45D    OUTPUT ON ?
     3201  123205          CMP     6,S45C    FORMAT 2 ?
     3202  056204          TST     28,.+2    CONTINUE ?
     3203  013400          JMPS    7         GO TO SP4B OR SP5B
     3204  020600          RST     6         RESET SW
     3205  022000  S45C    SET     2         SET DECREMENT
```

```
3206  117207          INCR    14,.+1      DECREMENT RAM 14
3207  021000          SET     1           SET INCREMENT
3210  112212          INCR    4,.+2       ALL FINISHED ?
3211  013000          JMPS    6           GO TO SP4A OR SP5C
3212  001777          JMP     IETST
3213  110205  S45D    INCR    0,S45C      DONE IT 100 TIMES ?
3214  013400          JMPS    7           GO TO SP4B OR SP5B
3215  156434  S45E    XFR     13,RDM1     READ 1'ST 8 BITS FROM UNKN RAM
3216  030030          PLB     3           COPY TO COMP REG
3217  076377          LDR     12,377      IN CASE OF ERROR
3220  130400          CMPR    1,0         COMPARE DATA TO RAM 1
3221  040623          TST     1,.+2       DATA CORRECT ?
3222  003236          JMP     S45F
3223  156435          XFR     13,RDM2     READ 2'ND 8 BITS FROM UNKN RAM
3224  030030          PLB     3
3225  076375          LDR     12,375
3226  131000          CMPR    2,0
3227  040631          TST     1,.+2
3230  003236          JMP     S45F
3231  156436          XFR     13,RDM3     READ 3'RD 8 BITS
3232  030030          PLB     3
3233  076373          LDR     12,373
3234  131400          CMPR    3,0
3235  040575          TST     1,S45B
3236  036440  S45F    PLB     4,13        PUT EXPECTED DATA IN RAM 13
3237  075101          LDR     10,101      ASCII A
3240  060000          LOAD    0,0         IR TO COMP MUX
3241  132760          CMPR    5,360
3242  040244          TST     0,.+2       ERR IN LOWER HALF OF RAM ?
3243  075107          LDR     10,107      ASCII G
3244  116247          INCR    12,.+3
3245  115246          INCR    10,.+1      INC 10 DEPENDING ON WHICH 3'RD
3246  003244          JMP     .-2
3247  076374          LDR     12,374      -4
3250  014400          JMPS    9           GO TO ERR4 OR ERR5
3251  115252  S45G    INCR    10,.+1
3252  135000  S45H    CMPR    10,0        LOAD ACC
3253  027000          SET     7           LOAD LED 3
3254  075001          LDR     10,1        SET ERROR FLAG
3255  120175          CMP     0,S45B      K.O. ON ?
3256  056260          TST     28,.+2      CONTINUE ?
3257  003255          JMP     .-2         WAIT
3260  020600          RST     6           RESET SW
3261  003175          JMP     S45B
**                    *
**                    *
**                    *
3262  071200  RECH    LDR     2,200
3263  030001          LDA     1           SELECT OB 0
3264  020001          STB     1           SHIFT BEST ID INTO OB 0
3265  111267          INCR    2,.+2
3266  003264          JMP     .-2
3267  070440          LDR     1,40
3270  136627          CMPR    13,PAT1
3271  040675          TST     1,.+4       PATTERN 1 ?
3272  070777          LDR     1,377
3273  040275          TST     0,.+2       PATTERN 2 OR 3 ?
3274  070776          LDR     1,376
3275  060001          LOAD    0,01        SELECT OB TO COMP MUX
3276  130400          CMPR    1,0
3277  040724          TST     1,RECJ      BEST ID OK ?
3300  151006  RECI    XFR     2,6         LOAD ID INTO ACC
3301  027000          SET     7           LOAD LED 3
3302  075001          LDR     10,1        SET ERR FLAG
```

```
      3303  030001          PLA     1           SELECT OB 1
      3304  071060          LDR     2,60
      3305  026000          SET     6           LOAD LED 2 = ASCII 0
      3306  057710          TST     31,.+2      UNREC FLAG SET ?
      3307  003311          JMP     .+2
      3310  020005          STB     5           INC LED 2
      3311  070760          LDR     1,360       *
      3312  111314          INCR    2,.+2       *
      3313  003312          JMP     .-1         *WAIT 10 MSEC
      3314  110716          INCR    1,.+2       *
      3315  003312          JMP     .-3         *
      3316  120322          CMP     0,.+4       KEY OPTICS ON ?
      3317  056321          TST     28,.+2      CONTINUE ?
      3320  003316          JMP     .-2
      3321  020600          RST     6           RESET CONTINUE
      3322  060000          LOAD    0,00        RESET COMP MUX
      3323  003747          JMP     GENC        REALIGN SR1 & 2
      3324  057700  RECJ    TST     31,RECI     UNREC FLAG SET ?
      3325  003322          JMP     .-3
**                            *
**                            *
**                            *
                              LOC     3400
**                            *
**                            *
**                            *       RECOGNITION DIAGNOSTIC
**                            *
**                            *
**                            *
**                            *
      3400  003404          JMP     REC1
      3401  003413          JMP     REC2
      3402  003437          JMP     REC3
      3403  003466          JMP     REC4
**                            *
      3404  061000  REC1    LOAD    2,0         RESET HRDW FLAGS
      3405  076627          LDR     13,PAT1
      3406  074410          LDR     9,.+2
      3407  003727          JMP     GNS24       MAKE PATTERN IN SR1 24 HIGH
      3410  071347          LDR     2,347       1'S COMP OF # BLANK SMP
      3411  074507          LDR     9,RECA
      3412  003742          JMP     GBS
      3413  061000  REC2    LOAD    2,0         RESET HRDW FLAGS
      3414  076625          LDR     13,PAT2
      3415  074417          LDR     9,.+2
      3416  003727          JMP     GNS24
      3417  073021          LDR     6,.+2
      3420  003755          JMP     GENE
      3421  070375          LDR     0,375
      3422  073765          LDR     7,GENF
      3423  074425          LDR     9,.+2
      3424  003747          JMP     GENC
      3425  070003          LDR     0,3
      3426  074430          LDR     9,.+2
      3427  003766          JMP     GENG
      3430  070375          LDR     0,375
      3431  073765          LDR     7,GENF
      3432  074434          LDR     9,.+2
      3433  003747          JMP     GENC
      3434  070263          LDR     0,263
      3435  073507          LDR     7,RECA
      3436  003747          JMP     GENC
      3437  061000  REC3    LOAD    2,0         RESET HRDW FLAGS
      3440  076626          LDR     13,PAT3
```

```
3441  074443          LDR     9,.+2
3442  003727          JMP     GNS24
3443  070376          LDR     0,376
3444  073755          LDR     7,GFNE
3445  073047          LDR     6,.+2
3446  003747          JMP     GENC
3447  070374          LDR     0,374
3450  073765          LDR     7,GENF
3451  074453          LDR     9,.+2
3452  003747          JMP     GENC
3453  070261          LDR     0,261
3454  073456          LDR     7,.+2
3455  003747          JMP     GENC
3456  070003          LDR     0,3
3457  074461          LDR     9,.+2
3460  003766          JMP     GENG
3461  074463          LDR     9,.+2
3462  003765          JMP     GENF
3463  070261          LDR     0,261
3464  073507          LDR     7,RECA
3465  003747          JMP     GENC
3466  061000  REC4    LOAD    2,0         RESET HRDW FLAGS
3467  076632          LDR     13,PAT4
3470  074472          LDR     9,.+2
3471  003727          JMP     GNS24
3472  070351          LDR     0,351
3473  073475          LDR     7,.+2
3474  003747          JMP     GENC
3475  070001          LDR     0,1
3476  070752          LDR     1,352       1'S COMP OF # NON BLANK SMP
3477  074501          LDR     9,.+2
3500  003731          JMP     GNSA
3501  071374          LDR     2,374       1'S COMP OF # BLANK SMP
3502  074504          LDR     9,.+2
3503  003742          JMP     GBS
3504  070305          LDR     0,305
3505  073507          LDR     7,RECA
3506  003747          JMP     GENC
3507  061017  RECA    LOAD    2,17        SET LJUST, CHAR END, TCHS, RECIR
3510  136400          CMPR    13,0
3511  036040          PLB     4,12
3512  070032          LDR     0,32
3513  020020          TOG     2           SET WINDOW TOP
3514  070030          LDR     0,30
3515  020040          TOG     4           LOAD WIDTH
3516  020050          TOG     5           SET RECO GROUP STATUS
3517  060440          LOAD    1,40        LOAD MAX HT
3520  061007          LOAD    2,07        RESET LJUST TO START POS MODE
3521  050123          TST     16,.+2      WAIT FOR RECO ON
3522  003521          JMP     .-1
3523  125125          CMP     10,.+2      SCAN EDIT ON ?
3524  003527          JMP     .+3
3525  070200          LDR     0,200
3526  030060          PLB     6           SET SINGLE MODE
3527  070001          LDR     0,1
3530  030001          PLA     1           SELECT OB 1
3531  125535          CMP     11,.+4      STANDARD ?
3532  077377          LDR     14,377
3533  070057          LDR     0,57
3534  003537          JMP     .+3
3535  077000          LDR     14,0        REF CHAR CTR
3536  070060          LDR     0,60        LOAD ACC
3537  026000          SET     6           SET LED 2 = 0
3540  125143  RECB    CMP     10,.+3      SCAN EDIT ON ?
```

```
3541  070000  RECC    LDR     0,0
3542  030060          PLB     6           RESET SINGLE MODE
3543  050153          TST     16,RECD     RECO STILL ON ?
3544  070310          LDR     0,310
3545  073547          LDR     7,.+2
3546  003262          JMP     RECH        GO TEST BEST ID
3547  061007          LOAD    2,07        SET CHAR END, RECIR
3550  122552          CMP     5,.+2       OUTPUT ON ?
3551  003507          JMP     RECA        LOOP THIS PATTERN
3552  001777          JMP     IETST
3553  044155  RECD    TST     8,.+2       RECO STALLED ?
3554  003540          JMP     RECB        WAIT
3555  044157          TST     8,.+2       STILL STALLED ?
3556  003540          JMP     RECB
3557  117160          INCR    14,.+1
3560  075635          LDR     11,TST1
3561  070060          LDR     0,60        LOAD ACC
3562  027000          SET     7           SET LED 3 = 0
3563  020005          STB     5           INC LED 2
3564  070377          LDR     0,377
3565  137006          CMPR    14,6
3566  040170          TST     0,.+2
3567  003573          JMP     .+4
3570  137003          CMPR    14,3
3571  040173          TST     0,.+2
3572  016000          JMPS    12          GO PICK UP EXPECTED RESULTS
3573  070010          LDR     0,10
3574  030070          PLB     7           CLEAR STALL
3575  137005  RECE    CMPR    14,5
3576  040140          TST     0,RECB      NOT FINISHED WITH 1'ST 5 ?
3577  123140          CMP     6,REC       FORMAT 2 ?
3600  003541          JMP     RECC
3601  110202  RECF    INCR    0,.+1
3602  030070          PLB     7           LOAD ERR CTR MUX
3603  020006          STB     6           INC LED 3
3604  130010          CMPR    0,10
3605  040575          TST     1,RECE      FINISHED ALL ERR CTR'S ?
3606  154437          XFR     9,RDER      READ ERR CTR MUX
3607  030030          PLB     3           PUT IN COMP REG
3610  100211          INC     0,.+1       GET RID OF LSB
3611  060003          LOAD    0,03        SET COMP MUX TO COMP REG
3612  015400          JMPS    11          COMPARE
3613  060000  RECG    LOAD    0,00        RESET COMP MUX
3614  115615          INCR    11,.+1
3615  115616          INCR    11,.+1
3616  040601          TST     1,RECF      RESULT OK ?
3617  075001          LDR     10,1        SET ERR FLAG
3620  120141          CMP     0,RECC      KEY OPTICS ON ?
3621  056223          TST     28,.+2      CONTINUE ?
3622  003620          JMP     .-2
3623  020600          RST     6           RESET CONTINUE
3624  003601          JMP     RECF
3625  003673  PAT2    JMP     P2V
3626  003705  PAT3    JMP     P3V
3627  003661  PAT1    JMP     E63
3630  003661          JMP     E63
3631  003655          JMP     E0
3632  003661  PAT4    JMP     E63
3633  003716          JMP     P4V
3634  003657          JMP     E21
3635  130400  TST1    CMPR    1,0
3636  003613          JMP     RECG
3637  131000          CMPR    2,0
3640  003613          JMP     RECG
```

```
3641  131400          CMPR    3,0
3642  003613          JMP     RECG
3643  132000          CMPR    4,0
3644  003613          JMP     RECG
3645  132400          CMPR    5,0
3646  00361           JMP     RECG
3647  13300           CMPR    6,0
3650  00361           JMP     RECG
3651  133400          CMPR    7,0
3652  003613          JMP     RECG
3653  134000          CMPR    8,0
3654  003613          JMP     RECG
3655  070600  E0      LDR     1,200
3656  003662          JMP     .+4
3657  070612  E21     LDR     1,212
3660  003662          JMP     .+2
3661  070637  E63     LDR     1,237
3662  031040          PLB     4,2
3663  031440          PLB     4,3
3664  032040          PLB     4,4
3665  032440          PLB     4,5
3666  033040          PLB     4,6
3667  033440          PLB     4,7
3670  034040          PLB     4,8
3671  116272  ELD     INCR    12,.+1
3672  003601          JMP     RECF
3673  070620  P2V     LDR     1,220
3674  071203          LDR     2,203
3675  071604          LDR     3,204
3676  072202          LDR     4,202
3677  072605          LDR     5,205
3700  073220          LDR     6,220
3701  073600          LDR     7,200
3702  074204          LDR     8,204
3703  116304          INCR    12,.+1
3704  003671          JMP     ELD
3705  070620  P3V     LDR     1,220
3706  071204          LDR     2,204
3707  071603          LDR     3,203
3710  072205          LDR     4,205
3711  072602          LDR     5,202
3712  073220          LDR     6,220
3713  073600          LDR     7,200
3714  074202          LDR     8,202
3715  003671          JMP     ELD
3716  070602  P4V     LDR     1,202
3717  071212          LDR     2,212
3720  071612          LDR     3,212
3721  072212          LDR     4,212
3722  072612          LDR     5,212
3723  073202          LDR     6,202
3724  073600          LDR     7,200
3725  074212          LDR     8,212
3726  003671          JMP     ELD
3727  070030  GNS24   LDR     0,30
3730  070776          LDR     1,376
3731  130000  GNSA    CMPR    0,0         LOAD ACC = RAM 0
3732  020020          TOG     2           SET WINDOW TOP
3733  070000          LDR     0,0
3734  020010          TOG     1           SET WINDOW BOT
3734  021010          SET+    1
3734  021210          RST+    2           RESET SAMPLE
3735  074376          LDR     8,IGNA
3736  110746          INCR    1,GEND
```

```
3737  002265            JMP     NBSMP     GENERATE NON BLANK SMP
3740  061001  GENA      LOAD    2,01      SET TCHS
3741  003736            JMP     .-3
3742  073777  GBS       LDR     7,IGNB
3743  111346            INCR    2,GEND
3744  002253            JMP     BLSMP     GENERATE BLANK SMP
3745  003743  GENB      JMP     .-2
3746  014400  GEND      JMPS    9         RETURN
3747  061003  GENC      LOAD    2,03      SET RECIR, TCHS
3750  110353            INCR    0,.+3
3751  030006            PLA     6         SHIFT SR1 & 2
3752  003750            JMP     .-2
3753  061001            LOAD    2,01      RESET RECIR
3754  013400            JMPS    7         RETURN
3755  070027  GENE      LDR     0,27
3756  070773            LDR     1,373
3757  074761            LDR     9,.+2
3760  003731            JMP     GNSA
3761  071361            LDR     2,361
3762  074764            LDR     9,.+2
3763  003742            JMP     GBS
3764  013000            JMPS    6         RETURN
3765  070001  GENF      LDR     0,1
3766  070775  GENG      LDR     1,375
3767  003731            JMP     GNSA
3770  000000            END
BLSM  2253
  02134 02137 02167 02200 02230 02241 02250 02413
  02416 02443 03076 03744
E0    3655
  03631
E21   3657
  03634
E63   3661
  03627 03630 03632
ELD   3671
  03704 03715 03726
ERR4  3057
  03055
ERR5  3163
  03134
GBS   3742
  03412 03503 03763
GENA  3740
  02376
GENB  3745
  02377
GENC  3747
  03323 03424 03433 03436 03446 03452 03455 03465
  03474 03506
GEND  3746
  03736 03743
GENE  3755
  03420 03444
GENF  3765
  03422 03431 03450 03462
GENG  3766
  03427 03460
GNS2  3727
  03407 03416 03442 03471
GNSA  3731
  03500 03760 03767
IIER  2041
  02027 02032 02035 02044 02046 02050 02052 02066
```

```
  02072 02077 02105 02117
I2ER  2160
  02140 02142 02146 02150 02152 02165 02173 02201
  02203 02206 02210 02212 02242 02251
I3ER  2423
  02417 02457 02473 02504 02511 02526 02551 02561
  02573 02611 02631 02664
IERR  1776
  02041 02062 02107 02160 02163 02171 02220 02223
  02226 02232 02235 02245 02307 02423 02432 02445
  02452 02476 02507 02514 02537 02650
IETS  1777
  02114 02252 02670 03212 03552
IGNA  2376
  03735
IGNB  2377
  03742
IP3A  2366
  02412
IP3B  2367
  02434
IP41  2372
  03005
IP42  2373
  03017
IP43  2775
  03032
IP44  2776
  03036
IP51  2374
  03075
IP52  2375
  03101
IP53  2777
  03114
IPS0  2370
  02673
IPS1  2371
  02414
ITER  2307
  02300 02302
NBSH  2265
  02145 02156 02205 02216 02411 02435 02674 03006
  03020 03102 03737
P2V   3673
  03625
P3V   3705
  03626
P4V   3716
  03633
PAT1  3627
  03270 03405
PAT2  3625
  03414
PAT3  3626
  03440
PAT4  3632
  03467
POS0  2671
  02472 02525 02550 02572 02630
POS1  2703
  02371 02610 02646 02663 03033 03115
POS2  2711
  02427 02456 02503 02535 02560 02602 02620 02640
```

```
  02656 03037
PS0A  2675
  02370
RDER  0037
  03606
RDM1  0034
  03215
RDM2  0035
  03223
RDM3  0036
  03231
REC1  3404
  03400
REC2  3413
  03401
REC3  3437
  03402
REC4  3466
  03403
RECA  3507
  03411 03435 03464 03505 03551
RECB  3540
  03554 03556 03576 03577
RECC  3541
  03600 03620
RECD  3553
  03543
RECE  3575
  03605
RECF  3601
  03616 03624 03672
RECG  3613
  03636 03640 03642 03644 03646 03650 03652 03654

RECH  3262
  03546
RECI  3300
  03324
RECJ  3324
  03277
S3E2  2475
  02420 02446 02527 02553 02574 02613 02632 02651
  02666
S3E3  2422
  02447 02477 02530 02554 02575 02614 02633 02652

S3E4  2451
  02424 02500 02532 02555 02577 02615 02635 02653
  02667
S3E6  2506
  02460 02541 02563
S3E9  2431
  02461 02516
S45A  3173
  03056 03113 03135
S45B  3175
  03235 03255 03261
S45C  3205
  03201 03213
S45D  3213
  03200
S45E  3215
  03174
S45F  3236
```

```
  03222 03230
S45G  3251
  03061 03065 03166 03170
S45H  3252
  03060 03064 03165 03171
SMP1  2005
  02000
SMP2  2121
  02001
SMP3  2400
  02002
SMP4  3000
  02003
SMP5  3067
  02004
SP3A  2414
  02366
SP3B  2436
  02367
SP41  3007
  02372
SP42  3021
  02373
SP43  3034
  02775
SP44  3040
  02776
SP4A  3032
  03030
SP4B  3042
  03031
SP4C  3047
  03040
SP51  3077
  02374
SP52  3103
  02375
SP53  3116
  02777
SP5A  3114
  03162
SP5B  3130
  03112
SP5C  3136
  03111
TBSM  2277
  02135
TNSM  2305
  02143
TST1  3635
  03560
```

```
**                  ------------------------------------------------------------------
**
**                   DME4     2/27/76PM          MD
**                   CHANGED MEC2 TO DISPLAY TIME IN 100TH SECS AND SAMPLES IN HPOS
**                       BOTH DISPLAYED IN HEX
**
**                   DME3     2/26/76            MD
**                   CHANGED HDYN
**
**                  DME2      2/7/75             MD
**
**                   CHANGES FROM DME1:
**                  MEC2:     KO=ON    LCTST, BYPASS SPEED TEST
**                            KO=OFF    SPEED TEST, BYPASS LCTST
**
**                            TOLERANCES IN HPOS TEST INCREASED
**
**                  LCTST:    BRIGHT SPEED = 24 IPS NOMINAL
**                            READ HEAD LAMP STAYS ON
**
**                  MEC3:     ERR=302 IF LS =2
**                  CAPM:     MEC STOP AT CAPM+1
**
**                   -----MECHANICAL DIAGNOSTICS
**                   ---MEC1 - STATIC HORIZONTAL AND VERTICAL TESTS
**                   ---MEC2 - DYNAMIC HORIZONTAL TESTS
**                   ---MEC3 - SETUP FOR MEC4
**                   ---MEC4 - DYNAMIC VERTICAL TEST WITH PAPER PATTERN
**                   ------------------------------------------------------------------
**
**
                     ETST      EXTC     1777               END OF SUBTEST ABSOLUTE ADDR.
                     ERR       EXTC     1776               ERROR DISPLAY ABSOLUTE ADDR.
*
**
                               LOC      4000
     4000   004004   M1        JMP      MEC1
     4001   004121   M2        JMP      MEC2
     4002   004400   M3        JMP      MEC3
     4003   004454   M4        JMP      MEC4
**
**
**                             ------------------------------------------ ---------------
**                             ---------STATIONARY MECH TESTS-----------------------------
**                             ------------------------------------------------------------
**
     4004   062102   MEC1      LOAD     4,102              DRIVE RIGHT TO CLEAR PAP PRESENT
     4005   062100             LOAD     4,100              STOP MODE
     4006   076767             LDP      13,367             LED 3=8
     4007   053024             TST      22,MER1            PAPER PRESENT?
**                                                         PAPER MUST BE REMOVED FOR THIS TEST!!!!!!!!!
**
**                             ---HOR MARG LATCH CLEAR?
     4010   076776             LDR      13,376             LED 3= 1
     4011   070000             LDR      0,0                INIT COUNT
     4012   101415             INC      3,.+3              INC HOR MARG LATCH
     4013   110024             INCR     0,MER1             INC COUNT,ERROR IF OVERF HERE FIRST
     4014   004012             JMP      .-2
**
**
                               ---HOR MARG LATCH COUNTS?
     4015   076775             LDR      13,375             LED 3= 2
     4016   070000             LDR      0,0
     4017   101422             INC      3,.+3              INC HOR MARG LATCH
     4020   110021             INCR     0,.+1              INC CNT
```

```
     4021  004017          JMP     .-2
     4022  130377          CMPR    0,377
     4023  040425          TST     1,.+2              R0,2 SHOULD BE 377
     4024  001776  MER1    JMP     ERR
**
**                         ---HOR POS LATCH CLEARS ?
     4025  076774          LDR     13,374             LED 3= 3
     4026  062104          LOAD    4,104              INHIBIT HPOS CLEAR
     4027  052024          TST     20,MER1            LT/RT SHOULD BE LOW
**
     4030  076773          LDR     13,373             LED 3= 4
     4031  070330          LDR     0,330
     4032  101433          INC     3,.+1              INC HMARG TO HPOS CLEAR VLAUE
     4033  110036          INCR    0,.+3
     4034  052024          TST     20,MER1            ERROR IF HIGH PREMATURELY
     4035  004032          JMP     .-3
**
     4036  076772          LDR     13,372             LED 3= 5
     4037  052041          TST     20,.+2             LT/RT MARG SHOULD BE HIGH
     4040  001776          JMP     ERR                      OR ON TOO LATE
**
     4041  076771          LDR     13,371             SET LED 3=6
     4042  070120          LDR     0,120
     4043  110046          INCR    0,.+3
     4044  101445          INC     3,.+1              SET HMARG=COMP OF HPOS CLEAR
     4045  004043          JMP     .-2                      VALUE=327
     4046  070737          LDR     1,337
     4047  070120          LDR     0,120
     4050  110456          INCR    1,HDNE             INC OUTER LOOP
     4051  110047  I0      INCR    0,.-2              INC INNER CNT
     4052  063600          LOAD    7,200              PULSE HPOS CNTR 40 X 257 TIMES
     4053  063400          LOAD    7,0
     4054  052051          TST     20,I0              LT/RT MARG SHOULD STAY HIGH
     4055  001776          JMP     ERR
     4056  070340  HDNE    LDR     0,340              FINE ADJUST HPOS
     4057  063600  HDN+    LOAD    7,200
     4060  063400          LOAD    7,0
     4061  110064          INCR    0,PHA
     4062  052057          TST     20,HDN+
     4063  001776          JMP     ERR
     4064  076770  PHA     LDR     13,370             SET LED 3=7
     4065  052024          TST     20,MER1            LT/RT MARG SHOULD BE LOW
**
**
**
**                         ---STATIONARY VERTICAL TESTS----------------------------------
     4066  076375          LDR     12,375             SET LED2= 2
     4067  076776          LDR     13,376             SET LED3= 1
     4070  070360          LDR     0,360
     4071  070400          LDR     1,0
     4072  101100          INC     2,VOK              INC VERT MARG MAX OF 16. X 256.
**                                                      OK WHEN OVERFLOWS
     4073  110475          INCR    1,.+2
     4074  004072          JMP     .-2
     4075  110077          INCR    0,VME1             ERROR IF R0,2 OVERFLOWS FIRST
     4076  004072          JMP     .-4
     4077  001776  VME1    JMP     ERR
**
     4100  076775  VOK     LDR     13,375             SET LED3=2
     4101  070362          LDR     0,362
     4102  070400          LDR     1,0
     4103  101110          INC     2,VLOV             INC VERT MARG TO OVERFLOW
     4104  110506          INCR    1,.+2
     4105  004103          JMP     .-2
```

```
4106  110107          INCR    0,.+1
4107  004103          JMP     .-4
4110  130001  VLOV    CMPR    0,1             R0,2 =1 ?
4111  040513          TST     1,.+2
4112  001776  CE-6    JMP     ERR
4113  130777          CMPR    1,377           YES.   R1,2=377?
4114  040516          TST     1,.+2
4115  001776          JMP     ERR
*
4116  076774          LDR     13,374          YES, OK. LED3=3
4117  101077          INC     2,VMEI          INC VERT MARG. OVERF SHOULD BE OFF.
4120  001777          JMP     ETST
*
*
*
*
*                     ------------------------------------------------------------
*                     --------DYNAMIC MECHANICAL TESTS----------------------------
*                     ------------------------------------------------------------
*
*                     -------CEP SET TO PASS SAMPLES BY PLA 7 IN EXEC
4121  120365  MEC2    CMP     0,CSTEST        KO=ON, GO TO COUNT SAMPLES
4122  030020          PLB     2
4123  075262          LDR     10,CH1S
4124  030010          PLB     1
4125  062321          LOAD    4,321           LOAD RIGHT SPEED 3IPS NOMINAL
4126  062341          LOAD    4,341           LOAD LEFT SPEED 3IPS NOMINAL
4127  076366          LDR     12,366          SET LED2=9
4130  076765          LDR     13,365          SET LED3 =9 AFTER FIRST INC
*
4131  073530          LDR     7,.-1
4132  004302          JMP     DRIVE
*
4133  062322          LOAD    4,322           RSPEED 6IPS NOMINAL
4134  062342          LOAD    4,342           LSPEED 6IPS NOMINAL
4135  004302          JMP     DRIVE
*
4136  062324          LOAD    4,324           RSPEED 12IPS NOMINAL
4137  062344          LOAD    4,344           LSPEED 12IPS NOMINAL
4140  004302          JMP     DRIVE
*
4141  062330          LOAD    4,330           RSPEED 24IPS NOMINAL
4142  062350          LOAD    4,350           LSPEED 24IPS NOMINAL
4143  004302          JMP     DRIVE
*
*
*
4144  073545  SCRTN   LDR     7,.+1           RTN FROM COUNT SAMPLES
*
4145  074377          LDR     8,377           ADD 1 TO HMARG
4146  075777          LDR     11,377          LED 2=0
4147  077372          LDR     14,372          LED 3=5
4150  004206          JMP     SCNT
*
4151  074376          LDR     8,376           ADD 2 TO HMARG
4152  075776          LDR     11,376          LED 2=1
4153  077377          LDR     14,377          LED 3=0
4154  004206          JMP     SCNT
*
4155  074374          LDR     8,374           ADD 4 TO HMARG
4156  075776          LDR     11,376          LED 2=1
4157  077372          LDR     14,372          LED 3=5
4160  004206          JMP     SCNT
*
```

```
     4161  074370           LDR     8,370          ADD 8 TO HMARG
     4162  075775           LDR     11,375         LED 2=2
     4163  077377           LDR     14,377         LED 3=0
     4164  004206           JMP     SCNT
**
     4165  074360           LDR     8,360          ADD 16 TO HMARG
     4166  075775           LDR     11,375         LED 2=2
     4167  077372           LDR     14,372         LED 3=5
     4170  004206           JMP     SCNT
**
     4171  074340           LDR     8,340          ADD 32. TO HMARG
     4172  075774           LDR     11,374         LED 2=3
     4173  077377           LDR     14,377         LED 3=0
     4174  004206           JMP     SCNT
**
     4175  074300           LDR     8,300          ADD 64. TO HMARG
     4176  075774           LDR     11,374         LED 2=3
     4177  077372           LDR     14,372         LED 3=5
     4200  004206           JMP     SCNT
**
     4201  074200           LDR     8,200          ADD 128. TO HMARG
     4202  075773           LDR     11,373         LED 2=4
     4203  077377           LDR     14,377         LED 3=0
     4204  073512           LDR     7,CE-6
     4205  004206           JMP     SCNT
**
**
**                          ------------------------------------------------------------------
**                          ----SCNT - COUNT SAMPLES IN HPOS MODE--------
**                          R8,1= # TO ADD TO HMARG
**                          R11,1= BASE ERR # LED 2
**                          R7,1= RTN SCNT
**                          R14,1= BASE ERR # LED 3
**                          ------------------------------------------------------------------
     4206  101610  SCNT     INC     3,.+2          CLEAR HMARG
     4207  004206           JMP     .-1
**
     4210  030020           PLB     2
     4211  075262           LDR     10,CH1S
     4212  030010           PLB     1
     4213  074615           LDR     9,.+2
     4214  005300           JMP     SL1            SET LED 1 = 2 AND LEDS2+3= SPACES
**
     4215  062102           LOAD    4,102          DRIVE RIGHT
     4216  053616           TST     23,.           WAIT TIL OUT OF LEFT STOP
**
     4217  070330           LDR     0,330          SET HMARG TO HPOS CLEAR VALUE
     4220  101621           INC     3,.+1
     4221  110223           INCR    0,.+2
     4222  004220           JMP     .-2
**
     4223  076377           LDR     12,377         LED2=0
     4224  076776           LDR     13,376         LED3=1
     4225  054627           TST     25,.+2         HEAD SHOULD BE IN MOTION
     4226  001776           JMP     ERR
     4227  062101           LOAD    4,101          HPOS MODE, CLEAR ENABLED
     4230  054630           TST     25,.           WAIT FOR HEAD TO STOP
**
     4231  062104  HAGN     LOAD    4,104          HSTOP, CLEAR INHIB
     4232  055667           TST     27,FIN-        STOP?
     4233  134000           CMPR    8,0
     4234  030440           PLB     4,1
     4235  101670           INC     3,FINE         INC HMARG, END TEST ON OVERF
     4236  110640           INCF    1,.+2
```

```
4237  004235          JMP     .-2
**
4240  062105          LOAD    4,105           HPOS MODE, HPOS CLEAR INHIBIT
4241  020200          RST     2               RESET SAMPLE
4242  070000          LDR     0,0             RESET SAMPLE CNTRS
4243  070400          LDR     1,0
**
4244  071700  TSR     LDR     3,300           RESET TIMERS
4245  071000          LDR     2,0
**
4246  045662  TSAM    TST     11,SAMP         MAX TIME BETWEEN TESTS= 7USEC
4247  111251          INCR    2,.+2           :
4250  004246          JMP     .-2             :
4251  111653          INCR    3,.+2
4252  004246          JMP     .-4             :
**
4253  074655          LDR     9,.+2
4254  005300          JMP     SL1             SET LED 1 = 2 AND LEDS2+3= SPACES
4255  076774          LDR     13,374          LED3=3
4256  052260          TST     20,.+2          ERR IF LT/RT LOW
4257  001776          JMP     ERR
**
4260  074631          LDR     9,HAGN
4261  005203          JMP     DISP
**
**
**
4262  020200  SAMP    RST     2               RESET SAMPLE
4263  110265          INCR    0,.+2
4264  004244          JMP     TSR
4265  110666          INCR    1,.+1           INC SAMP CNT
4266  004244          JMP     TSR
**
**
4267  020600  FIN-    RST     6
4270  062103  FINE    LOAD    4,103           DRIVE LEFT
4271  053673          TST     23,.+2          LEFT STOP?
4272  004271          JMP     .-1
4273  071373          LDR     2,373
4274  122676          CMP     5,IRTN          IF OUTPUT ON, GO TO NEXT HMARG INC
4275  004206          JMP     SCNT
4276  111301  IRTN    INCR    2,.+3
4277  113700          INCR    7,.+1           ADJUST RTN
4300  004276          JMP     .-2
4301  013400          JMPS    7               RTN
**
**
**
**
**                    ------------------------------------------------------------
**                    DRIVE- DRIVE RIGHT, THEN LEFT. STOP MUST BE REACHED AFTER DELAY
**                         INCS ERROR NO.
**                           P7,2= RTN
4302  062106  DRIVE   LOAD    4,106           DRIVE RIGHT, HPOS CLEAR INHIBITED
4303  053703          TST     23,.            WAIT TIL OUT OF LEFT STOP
4304  071373          LDR     2,373           SET DELAY TO 10. SECS
4305  070000          LDR     0,0
4306  070400          LDR     1,0
4307  072311          LDR     4,.+2
4310  004336          JMP     D250            DELAY N*1/4 SECS
4311  116712  RRTN    INCR    13,.+1          INC ERROR NO.
4312  127314          CMP     14,.+2          RIGHT STOP YET?
4313  004371          JMP     CERR
4314  062107          LOAD    4,107           DRIVE LEGT, HPOS CLEAR INHIBITED
4315  127315          CMP     14,.            WAIT TIL OUT OF RIHT STOP
```

```
4316  071373          LDR     2,373           SET DELAY TO 10. SECS
4317  070000          LDR     0,0
4320  070400          LDR     1,0
4321  072323          LDR     4,.+2
4322  004336          JMP     D250            DELAY-R2,2*1/4 SECS
4323  116724  LRTN    INCR    13,.+1          INC ERROR NO.
4324  053726          TST     23,.+2          LEFT STOP YET
4325  004371          JMP     CERR
4326  071374          LDR     2,374
4327  122676          CMP     5,IRTN          IF OUTPUT ON, AUTOINC SPEED
4330  056332          TST     28,.+2          CONT?
4331  004302          JMP     DRIVE
4332  020600          RST     6
4333  004276          JMP     IRTN
**
**
**
**
**                    --------1/4 SEC DELAY ROUTINE----------------------------------------
**                            R2,2 = -N OF 1/4 SECS
**                            R3,2 = RTN FROM MLSEC
**                            R4,2 = RTN FROM D250
**                            R5,2 =-MSEC CNTR
**                    R6,2 = INNERMOST LOOP CNTR
**
4334  012000          JMPS    4
4335  111334          INCR    2,.-1           BUMP 1/4 SEC CNTR
4336  072405  D250    LDR     5,5             -251. FOR 1/4 SEC LOOP
4337  112735  D25A    INCR    5,.-2
4340  071737          LDR     3,D25A
**
4341  110343          INCR    0,.+2
4342  004344          JMP     .+2
4343  110744          INCR    1,.+1
**
4344  074711          LDR     9,RRTN
4345  127366          CMP     14,LDISP        RIGHT STOP?
4346  074723          LDR     9,LRTN
4347  053766          TST     23,LDISP        LEFT STOP?
**
4350  030020          PLB     2
4351  071366          LDR     2,366           INIT 10. MSEC CNTR
4352  030010  MLSEC   PLB     1
4353  073114          LDR     6,114           1.0 MSEC CONSTANT
4354  020200          RST     2               RESET SAMPLE - ALLOWS SCOPING EMSMPF
**                                                DUPING DRIVE
*  4354  021200          SET+    1
4355  004356          JMP     .+1             INNER LOOP= 5.56 USEC
4356  113360          INCR    6,.+2
4357  004354          JMP     .-3
4360  030020          PLB     2
4361  111363          INCR    2,EX3           INC 10. MSEC CNTR
4362  004352          JMP     MLSEC
**
4363  030010  EX3     PLB     1
4364  011400          JMPS    3
**
4365  005137  CSTEST  JMP     LCTST           LONG JUMP TO LCTST
4366  005203  LDISP   JMP     DISP
4367  030010  CH1L    PLB     1
4370  014400          JMPS    9
**
4371  074773  CERR    LDR     9,.+2
4372  005300          JMP     SL1
```

```
4373  001776            JMP     ERR


                        LOC     4400
                        ------------------------------------------------------------
                        ----DYNAMIC VERTICAL AND HORZ TESTS
                        SWITCHES:
                                LS=1 ALWAYS

                        EXECUTE HDYN UNCONDITIONALLY

                                KO=ON= HIGH TOLERANCE(LMARC SET HIGH)
                                  =OFF= LOW TOLERANCF (LMARG SET TO .4 IN)

                        HIT STOP(OR STOP,CONT IF SE OFF) TO DOUBLE VER. DISTANCE

                                 SE=ON  DO NOT WAIT FOR CONTINUE
                                   =OFF WAIT FOR CONTINUE

                        OUTPUT ON= SKIP REMAINDER OF VERTICAL TEST
                                AND GO TO HDYN

                                 FORMAT=1 LOW SPEED ALPHA
                                       =2 SUPER ALPHA OR DATA CHANNEL
                        ------------------------------------------------------------


4400  076463  MEC3      LDR     13,63           SET LED3=
4401  025000            SET     5
4402  076777            LDR     13,377          ERR=00
4403  124005            CMP     8,.+2           PAPER AT MICROSWITCH HIGH?
4404  001776            JMP     ERR             STACK FEEDER NOT REMOVED
4405  076775            LDR     13,375          LED3=2
4406  120410            CMP     1,.+2           LS=1?
4407  001776            JMP     ERR             NO.

4410  135001            CMPR    10,1            HERE FROM?
4411  040437            TST     1,NFIRST
4412  030007            PLA     7               GENERAL RESET, TURNS OFF RUN LAMP
4413  030003            PLA     3               TOGGLE RUN LAMP
4414  062337            LOAD    4,337           RSPEED 45 IPS
4415  062357            LOAD    4,357           LSPEED 45 IPS
4416  062103            LOAD    4,103           DRIVE LEFT
4417  053421            TST     23,.+2          WAIT FOR LEFT STOP
4420  004417            JMP     .-1
4421  070140            LDR     0,140           CONST TO CENTER HEAD
4422  101424            INC     3,.+2           CLEAR HMARG
4423  004422            JMP     .-1
4424  101425            INC     3,.+1           SET HMARG
4425  110027            INCR    0,.+2
4426  004424            JMP     .-2
4427  062106            LOAD    4,106           DRIVE RIGHT, CLEAR INHIB
4430  052030            TST     20,.            WAIT FOR MARG LOW
4431  062000            LOAD    4,000           STOP ALL MOTION
4432  101034            INC     2,.+2           CLEAR VMARG
4433  004432            JMP     .-1
4434  077360            LDR     14,360          :SET VMARG TO 1.6 IN
4435  074443            LDP     9,NF+           :
4436  004602            JMP     CIRP            :

4437  055041  NFIRST    TST     26,VPOS         WAIT FOR START
4440  004437            JMP     .-1
```

```
     4441  020600  VPOS    RST     6
     4442  062201          LOAD    4,201           VPOS MODE, CLEAR ENABLED
     4443  076576  NP+     LDR     13,176          LED 3=1 AND SET ACC TO SEL BUF2
     4444  053046          TST     22,.+2          PAPER PRESENT?
     4445  001776          JMP     ERR
**
     4446  030001          PLA     1               SELECT OB2
     4447  070040          LDP     0,40            SET ACC TO SPACE
     4450  026000          SET     6               LED2= SPACE
     4451  027000          SET     7               LED3= SPACE
     4452  075000          LDR     10,0            RESET ERROR FLAG
     4453  001777          JMP     ETST
**
**
**
**
     4454  062205  MEC4    LOAD    4,205           INHIBIT CLEAR
     4455  076775          LDR     13,375          ERR=02 IF PAP NOT PRES DURING VUP OR VDN
     4456  055062          TST     26,VUP          START?
     4457  055504          TST     27,STOP         STOP?
     4460  056073          TST     28,VDN          CONTINUE?
     4461  004456          JMP     .-3
**
     4462  020600  VUP     RST     6
     4463  101064  VUP+    INC     2,.+1           INC VMARG
     4464  055504          TST     27,STOP         STOP?
     4465  056073          TST     26,VDN          CONTINUE?
     4466  071377          LDR     2,377
     4467  072716          LDR     5,316           50 MSEC DELAY
     4470  074135          LDR     8,JERR          PAPER NOT PRES RTN
     4471  072063          LDP     4,VUP+
     4472  005122          JMP     T25A
**
     4473  020600  VDN     RST     6
     4474  102475  VDN+    INC     5,.+1           DEC VMARG
     4475  055504          TST     27,STOP         STOP?
     4476  055062          TST     26,VUP          START?
     4477  071377          LDP     2,377
     4500  072716          LDR     5,316           50 MSEC DELAY
     4501  074135          LDR     8,JERR          PAPER NOT PRES RTN
     4502  072074          LDP     4,VDN+
     4503  005122          JMP     T25A
**
     4504  020600  STOP    RST     6
     4505  055062          TST     26,VUP          START?
     4506  055511          TST     27,VAC-         STOP?
     4507  056073          TST     28,VDN          CONTINUE?
     4510  004505          JMP     .-3
**
**                         ------------------------------------------------------------------
**                         ----CALLS TO VACIN------------------------------------------------
**                         ------------------------------------------------------------------
**
     4511  020600  VAC-    RST     6
     4512  077376          LDP     14,376          SET BIT 248-2
     4513  073513          LDP     7,.             LOAD INITIAL RTN ADDR (WILL BE INC TWICE)
     4514  004532          JMP     VACIN
     4515  077374          LDP     14,374          SET BIT 248-6
     4516  004532          JMP     VACIN
     4517  077370          LDP     14,370          SET BIT 248-7
     4520  004532          JMP     VACIN
     4521  077360          LDP     14,360          SET BIT 234-3
     4522  004532          JMP     VACIN
     4523  077340          LDP     14,340          SET BIT 234-2
```

```
4524  004532          JMP     VAGIN
4525  077300          LDR     14,300          SET BIT 23M-6
4526  004532          JMP     VAGIN
4527  077200          LDR     14,200          SET BIT 23M-7
4530  004532          JMP     VAGIN
4531  004613          JMP     HDYN
*
*                     ------------------------------------------------------------------
*                     ----VAGIN: INC VMARG UP, THEN DEC BACK TO ZERO
*                     ------------------------------------------------------------------
*
4532  062204  VAGIN    LOAD    4,204           VERTICAL STOP, CLEAR INHIB
4533  122613          CMP     5,HDYN          OUTPUT?
*
4534  074536          LDR     9,.+2
4535  004602          JMP     CIRP
*
4536  062205          LOAD    4,205           VPOS MODE, CLEAR INHIBITED
4537  074541          LDR     9,.+2
4540  004563          JMP     PSC             PAPER IN POSITION,STOP,SE,CONT
*                                             TIMEOUT
4541  062204          LOAD    4,204           STOP, CLEAR INHIBITED
4542  137000          CMPR    14,0            COPY MSB VERT INCREMENT
4543  030440          PLB     4,1
4544  070360          LDR     0,360           TURN ON BITS= MULTIPLES OF 16 (24M-3)
4545  102546          INC     5,.+1           DEC VMARG
4546  110150          INCR    0,.+2
4547  004545          JMP     .-2
4550  110552          INCR    1,.+2
4551  004544          JMP     .-5
*
4552  062205          LOAD    4,205           VPOS MODE, CLEAR INHIBITED
4553  074555          LDR     9,.+2
4554  004563          JMP     PSC
*
4555  055557  VEXIT    TST     27,.+2          STOP?
4556  013400  VEX+     JMPS    7               RTN
4557  020600          RST     6               RESET SWITCHES
4560  113561          INCR    7,.+1           DOUBLE VMARG MAX NEXT TIME
4561  113562          INCR    7,.+1
4562  004556          JMP     VEX+
*
*
*                     ------------------------------------------------------------------
*                     ---------PSC-TIMEOUT, TEST PAPER IN POSITION,STOP,SE,CONT
*                     ------------------------------------------------------------------
4563  071377  PSC     LDR     2,377
4564  072760          LDR     5,360           16 MSEC DELAY
4565  074132          LDR     8,IGN           IGNORE PAP NOT PRES
4566  072170          LDR     4,.+2
4567  005122          JMP     T25A
*
4570  076376          LDR     12,376
4571  076772          LDR     13,372          ERR=15
4572  054307          TST     24,JER          ERROR IF ROLLERS STOPPED
*
4573  075575          LDR     11,.+2
4574  005000          JMP     *STOP
*
4575  125201          CMP     10,SE           SE ON?
*
4576  020600          RST     6               RESET SWITCHES
4577  056201          TST     28,.+2          SE OFF, WAIT FOR CONTINUE
4600  004577          JMP     .-1
```

```
     4601  014400  SF        JMPS    9
**
**
**
**                            ------------------------------------------------------------------
**                            CIPP - CLEAR VMARC, INC VMAPG TO P14,1, RESET VPOS
**                            ------------------------------------------------------------------
**
     4602  137000  CIRP      CMER    14,0              COPY MSB VERT INCREMENT
     4603  030440            PLB     4,1
     4604  070360            LDR     0,360             TURN ON BITS= MULTIPLES OF 16 (24M-3)
     4605  101206            INC     2,.+1             INC VMAPG
     4606  110210            INCR    0,.+2
     4607  004605            JMP     .-2
     4610  110612            INCR    1,.+2
     4611  004604            JMP     .-5
     4612  014400            JMPS    9
**
**
**                            ------------------------------------------------------------------
**                            ----HDYN: HORIZONTAL DYNAMIC- VISUAL TEST OF POS MODE
**                            ------------------------------------------------------------------
**
     4613  062321  HDYN      LOAD    4,321             LOAD RIGHT SPEED 3 IPS
     4614  062341            LOAD    4,341             LOAD LEFT SPEED 3 IPS
     4615  020600            RST     0                 RESET SWITCHES
**
     4616  062103            LOAD    4,103             DRIVE LEFT OFF PAPER, CLEAR ENABLED
     4617  053621            TST     23,.+2            WAIT FOR LEFT STOP
     4620  004617            JMP     .-1
**
     4621  076377            LDP     12,377
     4622  076767            LDF     13,367            ERR=08
     4623  053307            TST     22,JEP            PAPER SHOULD NOT BE PRESENT.
**
     4624  101626            INC     3,.+2             CLEAR HMARG
     4625  004624            JMP     .-1
     4626  070327            LDF     0,327
     4627  101630            INC     3,.+1             SET HMAPG TO HPOS CLEAR VAL + 1
     4630  110232            INCR    0,.+2
     4631  004627            JMP     .-2
**
     4632  062102            LOAD    4,102             DRIVE RIGHT,CLEAR ENABLED
     4633  052233            TST     20,.              WAIT FOR MARGIN
**
     4634  062104            LOAD    4,104             HSTOP, CLEAR DISABLED
     4635  070001            LDF     0,1
     4636  101637            INC     3,.+1
     4637  110241            INCR    0,WCONT           SUB 1 FROM HMAPG
     4640  004636            JMP     .-2
**
     4641  070367  WCONT     LDP     0,367             ADD 9. TO HMARG
     4642  074762            LDF     9,362             INIT OPERATION CNTR
     4643  077245            LDR     14,.+2
     4644  005070            JMP     CAPW
**
     4645  070011            LDP     0,11              SUBTRACT 9. FROM HMARG
     4646  077213            LDF     14,HDYN
     4647  005070            JMP     CAPW
**
**
     4650  062377  WHEX      LOAD    4,377             LOAD HIGHEST VERT SPEED
     4651  062203            LOAD    4,203             DRIVE UP
     4652  071304            LDF     2,304             3.00 SEC DELAY
     4653  074132            LDF     3,ION             PAP NOT PRESS ITN
```

```
4654  072256          LDR     4,.+2
4655  005121          JMP     T250
4656  076377          LDR     12,377
4657  076766          LDR     13,366          ERR=09
4660  053307          TST     22,JER
4661  073662          LDR     7,.+1
4662  062361          LOAD    4,361           DRIVE UP 3 IPS
4663  004676          JMP     WAIT
4664  062362          LOAD    4,362                     6IPS
4665  004676          JMP     WAIT
4666  062364          LOAD    4,364                       12 IPS
4667  004676          JMP     WAIT
4670  062370          LOAD    4,370                       24 IPS
4671  004676          JMP     WAIT
4672  062377          LOAD    4,377                       45 IPS
4673  004676          JMP     WAIT
4674  062000          LOAD    4,000           STOP ALL MOTION
4675  001777          JMP     ETST
**
4676  055700  WAIT    TST     27,.+2          WAIT FOR STOP
4677  004676          JMP     .-1
4700  020600          RST     6               RESET SWITCHES
4701  113702          INCR    7,.+1           INC RTN
4702  113703          INCR    7,.+1
4703  013400          JMPS    7                                                .
**
4704  012000  RTN4    JMPS    4
4705  015400  RTN11   JMPS    11
4706  017000  RT14    JMPS    14
4707  001776  JER     JMP     ERR
4710  005070  TRTN    JMP     CAPM
**
**
**
**
**
                      LOC     5000
**
**                    ------------------------------------------------------------
**                    -------RSTOP - WAIT FOR ROLLERS TO STOP,THEN DRIVE RIGHT AND TEST
**                                        THAT THEY REMAIN STOPPED
**                    ------------------------------------------------------------
5000  062337  RSTOP   LOAD    4,337           RSPEED 45 IPS NOMINAL
5001  062357          LOAD    4,357           LSPEED 45 IPS NOMINAL
5002  062103          LOAD    4,103           DRIVE LEFT
5003  076376          LDR     12,376          ERR=11
5004  076776          LDR     13,376
5005  071020          LDR     2,20            4.00 SEC DELAY
**
5006  111135          INCR    2,JERR          TIMED OUT?
5007  072405          LDR     5,5             -251. FOR 1/4 SEC DELAY
5010  112406  R25A    INCR    5,.-2
5011  071410          LDR     3,R25A
5012  054015          TST     24,OSTOP        TEST ROLLERS STOPPED EACH MSEC
5013  074132          LDR     d,IGN
5014  005124          JMP     TLSEC
**
5015  053015  OSTOP   TST     22,.+0          WAIT FOR NO PAP PRES
5016  070210          LDR     0,210           LMARG=4.0 IN
5017  120021          CMP     0,.+2           KO ON= HIGH TOLERANCE(LMARG)
5020  070320          LDR     0,320           LMARG=.4 IN
**
5021  101423          INC     3,.+2           CLEAR HMARG
5022  005021          JMP     .-1
```

```
**
     5023  101424           INC     3,.+1           SET RMARG
     5024  110026           INCR    0,.+2
     5025  005023           JMP     .-2
**
     5026  062102           LOAD    4,102           DRIVE RIGHT, CLEAR ENABLED
     5027  053031           TST     22,.+2          WAIT FOR PAP PRES
     5030  005027           JMP     .-1
**
     5031  071004           LDR     2,4             1.00 SEC TIMEOUT
     5032  076376 ATOUT     LDR     12,376          ERR=12
     5033  076775           LDR     13,375
     5034  111135           INCR    2,JERR
     5035  072405           LDR     5,5             -251. FOR 1/4 SEC LOOP
     5036  112432 S25A      INCR    5,ATOUT
     5037  071436           LDR     3,S25A
     5040  074135           LDR     8,JERR
     5041  076377           LDR     12,377          ERR=04  PAP NOT PRES
     5042  076773           LDR     13,373
     5043  052124           TST     20,TLSEC        FALL THROUGH IF AT MARG
**
     5044  070260           LDR     0,260           RMARG=8 IN
     5045  120047           CMP     0,.+2           KO OK= HIGH TOLERANCE
     5046  070150           LDR     0,150           RMARG=8 IN
     5047  101450           INC     3,.+1           INC TO RMARG
     5050  110052           INCR    0,.+2
     5051  005047           JMP     .-2
**
**                          WAIT FOR RMARG, TESTING PAP PRES AND ROLLERS STOPPED
     5052  076377 PSS       LDR     12,377          ERR=04
     5053  076773           LDR     13,373
     5054  053056           TST     22,.+2          PAP PRES?
     5055  001776           JMP     EPP
     5056  054064 TRSA      TST     24,RM?          ROLLERS STOPPED?
     5057  020006           STB     6               INC LED 3
     5060  072767           LDR     5,367           8 MSEC TIMEOUT
     5061  112456           INCR    5,TPSA
     5062  071461           LDR     3,.-1           RTN
     5063  005126           JMP     EXAC1           PAP PRES RTN SET TO JERR
     5064  052052 RM?       TST     20,RSS          FALL THROUGH IF RMARG
     5065  062103           LOAD    4,103           DRIVE LEFT
     5066  053066           TST     22,.            WAIT FOR PAP NOT PRES
     5067  004705           JMP     RTN11
**
**                          ------------------------------------------------------------
**                          ----CAPM - WAIT FOR CONTIUE, AD TO HMARG, HPOS MODE,
**                                     WAIT FOR HEAD STOPPED OR HEAD OFF PAGE
**                                P0,2=-CONST TO ADD TO HMARG
**                                P14,2= RTN
**                          ------------------------------------------------------------
**
     5070  055536 CAPM      TST     27,MEXIT        END TEST IF STOP HIT
     5071  062104           LOAD    4,104           STOP MODE, CLEAR INHIBITED
     5072  125076           CMP     10,.+4          SE ON?
     5073  056075           TST     26,.+2          WAIT FOR CONT IF SE OFF
     5074  005073           JMP     .-1
     5075  020600           RST     6
     5076  114506           INCR    5,EX4
**
     5077  130000           CMPP    0,0
     5100  030440           PLB     4,1
     5101  101502           INC     3,.+1
     5102  110504           INCR    1,.+2           ADD P0,2 TO HMARG
     5103  005101           JMP     .-2
```

```
5104  062105          LOAD    4,105           HPOS, CLEAR INHIBITED

5105  053107  RTIM    TST     22,.+2          PAPER PRESENT?
5106  004706  EX4     JMP     RT14

5107  005110          JMP     .+1

5110  054511          TST     25,.+1
5111  053113          TST     22,.+2          PAPER PRESENT WHEN HEAD NOT IN MOTION?
5112  005106          JMP     EX4
5113  074106          LDR     8,EX4
5114  071370          LDR     2,370
5115  072310          LDR     4,TRTN
5116  005121          JMP     T250

                      -----T250 - 1/4 SEC DELAY ROUTINE W/TEST PAPER PRESENT----------
                              RAMS SAME AS D250

5117  004704          JMP     RTN4
5120  111117          INCR    2,.-1           BUMP 1/4 SEC CNTR
5121  072405  T250    LDR     5,5             -251. FOR 1/4 SEC LOOP
5122  112520  T25A    INCR    5,.-2
5123  071522          LDR     3,T25A

5124  073255  TLSEC   LDR     6,255           SUPER ALPHA OR DATA CHANNEL   .5 MSEC
5125  123127          CMP     6,.+2           FORMAT=2
5126  073131  EXAC1   LDR     6,131           LOW SPEED ALPHA   1.0 MSEC
5127  053131          TST     22,.+2          PAPER PRESENT?
5130  014000          JMPS    8

5131  005132          JMP     .+1             INNER LOOP=6.0 USEC
5132  113134  IGN     INCR    6,.+2           IGNORE CONDITION OF PAP NOT PRESENT BRANCH
5133  005127          JMP     .-4
5134  011400          JMPS    3

5135  001776  JERR    JMP     ERR
5136  004650  MEXIT   JMP     M4EX

                      ------------------------------------------------------------
                      LCTST - COUNT SAMPLES IN GIVEN TIME AFTER CROSSING LEFT MARG DRIVING
                              RIGHT AT FULL SPEED
                      DISPLAY IN LED IN HEX

                      ENTER IF KO ON
                      EXIT WHEN KO TURNED OFF

                      PULSE PAP PRES TEST GATE AFTER EACH SAMPLE
                      SHOULD BE RUN WITH STRIPPED TEST SHEET

                      ------------------------------------------------------------
5137  062330  LCTST   LOAD    4,330           RSPEED 24 IPS
5140  062357          LOAD    4,357           LSPEED 45 IPS
5141  030003          PLA     3               TURN ON LAMP
5142  030020          PLB     2
5143  075263          LDR     10,CH3S
5144  030010          PLB     1
5145  062103          LOAD    4,103           DRIVE LEFT
5146  053550          TST     23,.+2          WAIT FOR LEFT STOP
5147  005146          JMP     .-1

5150  101552  LCT+    INC     3,.+2           CLEAR HMARG
```

```
          5151  005150          JMP     .-1
          **
          5152  070260          LDR     0,260           MARG= 2 IN FROM LEFT STOP
          5153  101554          INC     3,.+1           SET MARG
          5154  110156          INCR    0,.+2
          5155  005153          JMP     .-2
          **
          5156  0o2100          LOAD    4,100           CLEAR HPOS AT LEFT STOP
          5157  062106          LOAD    4,106           DRIGHT, CLEAR INHIB
          **
          5160  020200          RST     2               RESET SAMPLE
          5161  053162          TST     22,.+1          PULSE PAP PRES
          5162  045560          TST     11,.-2          SAMPLE?
          5163  052162          TST     20,.-1          MARGIN?
          **
          5164  020200          RST     2               FALL THROUGH IF RIGHT OF MARG
          5165  071000          LDR     2,0             RESET TIMERS
          5166  071627          LDR     3,227           150 MSEC
          5167  123171          CMP     0,.+2           FORMAT=2 FOR SHORT TIMEOUT
          5170  071457          LDR     3,57            300 MSEC TIMEOUT
          5171  070000          LDR     0,0             RESET CNTRS
          5172  070400          LDR     1,0
          **
          **                                    1152.= 480(16) DURING 150 MSEC IS 24 IPS
          5173  045665  GSAM    TST     11,SMPL         SAMPLE?
          5174  005175          JMP     .+1
          5175  111177  GSA+    INCR    2,.+2           INNER LOOP=5.6 USEC w/ 13.7 MHZ CLOCK
          5176  005172          JMP     GSAM
          5177  111601          INCR    3,.+2
          5200  005173          JMP     GSAM
          5201  062103          LOAD    4,103           DRIVE LEFT
          5202  074673          LDR     9,DONE
          **
          5203  022000  DISP    SET     2               SET DEC
          5203  022400          RST+    4               RESET DISPLAY
          5204  071001          LDR     2,1
          5205  030001          PLA     1               SELECT BUF 1
          5206  072060          LDR     4,o0            TO LOAD DISPLAY FROM ACC
          5207  025000          SET     5               PUT ASCII 0 IN DEC 1,2,3
          5210  026000          SET     6
          5211  027000          SET     7
          **
          5212  071017          LDR     2,17
          5213  071417          LDR     3,17
          5214  072011          LDR     4,11
          **
          **                    DISPLAY NUMBER OF SAMPLES IN DEC IN HEX
          **
          5215  11o241  DEC0    INCR    0,DEC1          DEC LSB CNTR
          521o  02000o  BIT3    STB     o               INC DEC 3
          5217  13100o          CMPR    2,o
          5220  040643          TST     1,ITA3
          5221  111223  DEC2    INCR    2,BIT2
          5222  005215          JMP     DEC0
          **
          5223  020005  BIT2    STB     5               INC DEC 2
          5224  071017          LDR     2,17
          5225  072460          LDR     5,o0            TO LOAD DISPLAY FROM ACC
          5226  027000          SET     7               SET DEC 3 TO ASCII 0
          5227  13140o          CMPR    3,6
          5230  040o47          TST     1,ITA2
          5231  111o33  DEC3    INCR    3,BIT1
          5232  005215          JMP     DEC0
          **
```

```
5233  020004  HIT1    STB     4               INC LED 1
5234  071417          LDR     3,17
5235  072460          LDR     5,60            TO LOAD DISPLAY FROM ACC
5236  026000          SET     6               SET LED 2 TO ASCII 0
5237  112253          INCR    4,ITA1
5240  005215          JMP     DEC0
**
5241  110657  DEC1    INCR    1,DEXIT         DEC MSB CNTR
5242  005216          JMP     HIT3
**
5243  072407  ITA3    LDR     5,7             BUMP LED 3 TO UC A
5244  112621          INCR    5,DEC2
5245  020006          STB     6
5246  005244          JMP     .-2
**
5247  072407  ITA2    LDR     5,7             BUMP LED 2 TO UCA
5250  112631          INCR    5,DEC3
5251  020005          STB     5
5252  005250          JMP     .-2
**
5253  072407  ITA1    LDR     5,7             BUMP LED 1 TO UC A
5254  112615          INCR    5,DEC0
5255  020004          STB     4
5256  005254          JMP     .-2
**
5257  021000  DEXIT    SET     1
5260  030020          PLB     2
5261  015000          JMPS    10
5262  004367  CH1S    JMP     CH1L
5263  030010  CH3S    PLB     1
5264  014400          JMPS    9
**
**
5265  020200  SMPL    RST     2               RESET SAMP
5266  053267          TST     22,.+1          PULSE PAP PRES
5267  110271          INCR    0,.+2           INC LSB CNTR
5270  005175          JMP     GSA+
5271  110672          INCR    1,.+1           INC MSB CNTR
5272  005175          JMP     GSA+
**
5273  053274  DONE    TST     22,.+1          PULSE PAP PRES
5274  053676          TST     23,.+2          LEFT STOP?
5275  005273          JMP     .-2
5276  120150          CMP     0,LCT+          CONTINUE TEST IF KG ON
5277  074712          LDR     9,LSCR
**
**                    ------------------------------------------------------------------
**                    SL1 - SUBTOUTINE TO LOAD LEDS WITH 2,SPACE,SPACE
**                    ------------------------------------------------------------------
5300  071060  SL1     LDR     2,60            TO LOAD DISPLAY FROM ACC
5301  025000          SET     5               PUT ASCII 0 IN LED 1
5302  020004          STB     4               INC TO ASCII 2
5303  020004          STB     4
5304  071002          LDR     2,2
5305  030001          PLA     1               SELECT OB2
5306  071040          LDR     2,40            TO LOAD DISPLAY FROM ACC
5307  026000          SET     6               PUT SPACE IN LED 2,3
5310  027000          SET     7
5311  005257          JMP     DEXIT
**
5312  004144  LSCR    JMP     SCRTN
**
**
5313  000000          END
```

```
CAM1  5070
  04644 04647 04710
CE-6  4112
  04204
C[illegible]R  4371
  04313 04325
CHIL  4367
  05262
CHIS  5262
  04123 04211
CH3S  5263
  05143
CIRP  4602
  04436 04535
CSTE  4365
  04121
D250  4336
  04310 04322
D25A  4337
  04340
DEC0  5215
  05222 05232 05240 05254
DEC1  5241
  05215
DEC2  5221
  05244
DEC3  5231
  05250
DEXI  5257
  05241 05311
DISP  5203
  04261 04366
DONE  5273
  05202
DRIV  4302
  04132 04135 04140 04143 04331
ERR   1776
  04024 04040 04055 04063 04077 04112 04115 04226
  04257 04373 04404 04407 04445 04707 05055 05135

ETST  1777
  04120 04453 04675
EX3   4363
  04361
EX4   5106
  05076 05112 05113
EXAC  5126
  05063
FIN-  4267
  04232
FINE  4270
  04235
GSA+  5175
  05270 05272
GSAM  5173
  05176 05200
HAGN  4231
  04260
HEN+  4057
  04062
HENE  4056
  04050
HEYN  4613
  04531 04533 04646
```

```
HIT1  5233
  05231
HIT3  5216
  05242
HT2   5223
  05221
IO    4051
  04054
IGN   5132
  04565 04653 05013
IRTN  4276
  04274 04327 04333
ITA1  5253
  05237
ITA2  5247
  05230
ITA3  5243
  05220
JER   4707
  04572 04623 04660
JERR  5135
  04470 04501 05006 05034 05040
LCT+  5150
  05276
LCTS  5137
  04365
LDIS  4366
  04345 04347
LRTN  4323
  04346
LSCR  5312
  05277
M1    4000

M2    4001

M3    4002

M4    4003

M4EX  4650
  05136
MEC1  4004
  04000
MEC2  4121
  04001
MEC3  4400
  04002
MEC4  4454
  04003
MER1  4024
  04007 04013 04027 04034 04065
MEXI  5136
  05070
MLSE  4352
  04362
MTCU  5032
  05036
MF+   4443
  04435
MFIR  4437
  04411
OSTO  5015
  05012
```

```
PBA    4064
  04061
PSC    4563
  04540 04554
R25A   5010
  05011
RMP    5064
  05056
RRTN   4311
  04344
RSS    5052
  05064
RSTO   5000
  04574
RT14   4706
  05106
RTIM   5105

RTN1   4705
  05067
RTN4   4704
  05117
S25A   5036
  05037
SAMP   4262
  04246
SCNT   4206
  04150 04154 04160 04164 04170 04174 04200 04205
  04275
SCRT   4144
  05312
SE     4601
  04575
SL1    5300
  04214 04254 04372
SMPL   5265
  05173
STOP   4504
  04457 04464 04475
T250   5121
  04655 05116
T25A   5122
  04472 04503 04567 05123
TLSE   5124
  05014 05043
TPSA   5056
  05061
TRTN   4710
  05115
TSAM   4246

TSR    4244
  04264 04266
VAG-   4511
  04506
VACI   4532
  04514 04516 04520 04522 04524 04526 04530
VDN    4473
  04460 04465 04507
VDN+   4474
  04502
VEX+   4556
  04562
VEXI   4555
```

```
VLOV  4110
  04103
VMEl  4077
  04075 04117
VOK   4100
  04072
VPOS  4441
  04437
VUP   4462
  04456 04476 04505
VUP+  4463
  04471
WAIT  4676
  04663 04665 04667 04671 04673
WCON  4641
  04637
```

```
                                LOC     5400
**                              *
**                              *TITLE  DEM4
**                              *
**                              *
**                              *       EXTERNAL MEMORY DIAGNOSTIC
**                              *
**                              *       9/11/75    W.K.C.
**                              *
**                              *       TRANSFER (XFR) INSTRUCTION MNEMONICS
                        LDHI    EXTC    0
                        LDLO    EXTC    1
                        WRHI    EXTC    2
                        WRLO    EXTC    3
                        RDHI    EXTC    4
                        RDLO    EXTC    5
                        OMHI    EXTC    10
                        OMLO    EXTC    20
                        IERR    EXTC    1776
                        IETST   EXTC    1777
**                              *       *
     5400  005406               JMP     EM1
     5401  005430               JMP     EM2
     5402  005460               JMP     EM3
     5403  005473               JMP     EM4
     5404  005476               JMP     EM5
     5405  005524               JMP     EM6
**                              *       *
     5406  074715  EM1          LDR     9,EM1T      GET TABLE PTR
     5407  074024  EM1A         LDR     8,EM16      GET INNER LOOP RETURN
     5410  070136  EM10         LDR     0,STW1      GET LOOP START
     5411  072377  EM11         LDR     4,377       GET 1'ST HI ORDER BYTE
     5412  072777               LDR     5,377       GET 1'ST LO ORDER BYTE
     5413  010000               JMPS    0           START LOOP
     5414  070173  EM12         LDR     0,STR1      GET LOOP START
     5415  005411               JMP     EM11
     5416  070176  EM13         LDR     0,STR2      GET LOOP START
     5417  072360  EM14         LDR     4,360       GET 1'ST HI ORDER BYTE
     5420  072400               LDR     5,0         GET 1'ST LO ORDER BYTE
     5421  010000               JMPS    0           START LOOP
     5422  070154  EM15         LDR     0,STW2      GET LOOP START
     5423  005417               JMP     EM14
     5424  112426  EM16         INCR    5,.+2       INC/DEC HI DATA
     5425  015400               JMPS    11          RETURN TO LOOP
     5426  112027               INCR    4,.+1       INC/DEC LO DATA
     5427  015400               JMPS    11          RETURN TO LOOP
**                              *       *
     5430  074724  EM2          LDR     9,EM2T
     5431  074044               LDR     8,EM26
     5432  070136  EM20         LDR     0,STW1
     5433  005417               JMP     EM14
     5434  074044  EM21         LDR     8,EM26
     5435  070173  EM22         LDR     0,STR1
     5436  005417               JMP     EM14
     5437  074052  EM23         LDR     8,EM27
     5440  070176  EM24         LDR     0,STR2
     5441  005411               JMP     EM11
     5442  070154  EM25         LDR     0,STW2
     5443  005411               JMP     EM11
     5444  021000  EM26         SET     1
     5445  112447               INCR    5,.+2       INC/DEC HI DATA
     5446  005450               JMP     .+2
     5447  112050               INCR    4,.+1       INC/DEC LO DATA
     5450  022000               SET     2
```

```
     5451  015400          JMPS    11          RETURN TO LOOP
     5452  022000  EM27     SET     2
     5453  112455          INCR    5,.+2       INC/DEC HI DATA
     5454  005456          JMP     .+2
     5455  112056          INCR    4,.+1       INC/DEC LO DATA
     5456  021000          SET     1
     5457  015400          JMPS    11          RETURN TO LOOP
**                          *       *
     5460  074733  EM3      LDR     9,EM3T
     5461  074063          LDR     8,EM30
     5462  005410          JMP     EM10
     5463  132400  EM30     CMPR    5,0
     546   040470          TST     1,.+4
     5465  072360          LDR     4,360
     5466  072400          LDR     5,0
     5467  015400          JMPS    11          RETURN TO LOOP
     5470  072377          LDR     4,377
     5471  072777          LDR     5,377
     5472  015400          JMPS    11          RETURN TO LOOP
**                          *       *
     5473  074742  EM4      LDR     9,EM4T
     5474  074063          LDR     8,EM30
     5475  005432          JMP     EM20
**                          *       *
     5476  074751  EM5      LDR     9,EM5T
     5477  074114          LDR     8,EM55
     5500  070136          LDR     0,STW1
     5501  072365  EM50     LDR     4,365
     5502  072525          LDR     5,125
     5503  010000          JMPS    0           START LOOP
     5504  070173  EM51     LDR     0,STR1
     5505  005501          JMP     EM50
     5506  070176  EM52     LDR     0,STR2
     5507  072372  EM53     LDR     4,372
     5510  072652          LDR     5,252
     5511  010000          JMPS    0           START LOOP
     5512  070154  EM54     LDR     0,STW2
     5513  005507          JMP     EM53
     5514  132652  EM55     CMPR    5,252
     5515  040521          TST     1,.+4
     5516  072372          LDR     4,372
     5517  072652          LDR     5,252
     5520  015400          JMPS    11          RETURN TO LOOP
     5521  072365          LDR     4,365
     5522  072525          LDR     5,125
     5523  015400          JMPS    11          RETURN TO LOOP
**                          *       *
     5524  074760  EM6      LDR     9,EM6T
     5525  074114          LDR     8,EM55
     5526  070136          LDR     0,STW1
     5527  005507          JMP     EM53
     5530  070173  EM61     LDR     0,STR1
     5531  005507          JMP     EM53
     5532  070176  EM62     LDR     0,STR2
     5533  005501          JMP     EM50
     5534  070154  EM63     LDR     0,STW2
     5535  005501          JMP     EM50
**                          *       *
**                          *       *
     5536  075602  STW1     LDR     11,MWS0     GET LOOP RETURN
     5537  071376          LDR     2,376
     5540  070001  SWR1     LDR     0,1         SET MEM ADR LOAD FLAG
     5541  030001          PLA     1           SELECT OB1
     5542  071460          LDR     3,60        LOAD ACC
```

```
5543  026000          SET     6           LOAD LED 2 = 0
5544  021000          SET     1
5545  111150          INCR    2,.+3
5546  020005          STB     5           INC LED 2
5547  005545          JMP     .-2
5550  071017          LDR     2,17        GET 1'ST HI ORDER ADR
5551  071777          LDR     3,377       GET 1'ST LO ORDER ADR
5552  022000          SET     2
5553  015400          JMPS    11          START LOOP
5554  075602  STW2    LDR     11,MWS0     GET LOOP RETURN
5555  070604          LDR     1,MWS1      GET LOOP START
5556  071373          LDR     2,373
5557  070000  SWR2    LDR     0,0         RESET MEM ADR LOAD FLAG
5560  071401          LDR     3,1
5561  030001          PLA     1           SELECT OB1
5562  071460          LDR     3,60        LOAD ACC
5563  026000          SET     6           LOAD LED 2 = 0
5564  021000          SET     1
5565  111170          INCR    2,.+3
5566  020005          STB     5           INC LED 2
5567  005565          JMP     .-2
5570  071360          LDR     2,360       GET 1'ST HI ORDER ADR
5571  071400          LDR     3,0         GET 1'ST LO ORDER ADR
5572  010400          JMPS    1           START LOOP
5573  075634  STR1    LDR     11,MRS0     GET LOOP RETURN
5574  071375          LDR     2,375
5575  005540          JMP     SWR1
5576  075634  STR2    LDR     11,MRS0     GET LOOP RETURN
5577  071374          LDR     2,374
5600  070636          LDR     1,MRS1      GET LOOP START
5601  005557          JMP     SWR2
**                    *       *
5602  130000  MWS0    CMPR    0,0
5603  040606          TST     1,.+3       AUTO INC ?
5604  141000  MWS1    XFR     2,LDHI      LOAD HI ORDER ADR
5605  141401          XFR     3,LDLO      LOAD LO ORDER ADR
5606  142002          XFR     4,WRHI      LOAD HI ORDER DATA
5607  142403          XFR     5,WRLO      LOAD LO ORDER DATA
5610  111612  MWS2    INCR    3,.+2       INC/DEC LO ORDER ADR
5611  014000          JMPS    8           CHANGE DATA
5612  111214          INCR    2,.+2       INC/DEC HI ORDER ADR
5613  014000          JMPS    8           CHANGE DATA
5614  123225          CMP     6,MWS3      FORMAT 2 ?
5615  124625          CMP     9,MWS3      MACRO BUSY ?
5616  127621          CMP     15,.+3      ALPHABET 1 ?
5617  062411          LOAD    5,11        START PUNCH, ENABLE MACRO
5620  005622          JMP     .+2
5621  062405          LOAD    5,05        ENABLE ON-LINE MACRO
5622  070000          LDR     0,0
5623  140010          XFR     0,OMHI      LOAD HI ORDER ADR
5624  140020          XFR     0,OMLO      LOAD LO ORDER & START MACRO
5625  122631  MWS3    CMP     5,.+4       OUTPUT ON ?
5626  056230          TST     28,.+2      CONTINUE ?
5627  014400          JMPS    9           REPEAT LOOP
5630  020600          RST     6           RESET SW
5631  021000          SET     1
5632  114633          INCR    9,.+1       BUMP TABLE PTR
5633  014400          JMPS    9           GO TO NEXT LOOP
5634  130000  MRS0    CMPR    0,0
5635  040640          TST     1,.+3       AUTO INC ?
5636  141000  MRS1    XFR     2,LDHI      LOAD HI ORDER ADR
5637  141401          XFR     3,LDLO      LOAD LO ORDER ADR
5640  153004          XFR     6,RDHI      READ HI ORDER DATA
5641  153405          XFR     7,RDLO      READ LO ORDER DATA
```

```
5642  030030          PLB     3          LOAD COMPARE LATCH
5643  060003          LOAD    0,03       SET MUX TO COMPARE LATCH
5644  076250          LDR     12,MRS2    GET RETURN
5645  132400          CMPR    5,0
5646  040712          TST     1,CKFS     DATA CORRECT ?
5647  005656          JMP     MERR
5650  133000  MRS2    CMPR    6,0
5651  030030          PLB     3          LOAD COMPARE LATCH
5652  076210          LDR     12,MWS2    GET RETURN
5653  132000          CMPR    4,0
5654  060000          LOAD    0,0        RESET MUX
5655  040712          TST     1,CKFS     DATA CORRECT ?
5656  075001  MERR    LDR     10,1       SET ERR FLAG
5657  020006          STB     6          INC LED 3
5660  120311          CMP     0,MER1     KEY OPTICS ON ?
5661  131000          CMPR    2,0        DISPLAY RAM
5662  056264          TST     28,.+2     CONTINUE ?
5663  005662          JMP     .-1        NO - WAIT
5664  020600          RST     6          RESET SW
5665  131400          CMPR    3,0        DISPLAY RAM
5666  056270          TST     28,.+2     CONTINUE ?
5667  005666          JMP     .-1        NO - WAIT
5670  020600          RST     6          RESET SW
5671  132000          CMPR    4,0        DISPLAY RAM
5672  056274          TST     28,.+2     CONTINUE ?
5673  005672          JMP     .-1        NO - WAIT
5674  020600          RST     6          RESET SW
5675  132400          CMPR    5,0        DISPLAY RAM
5676  056300          TST     28,.+2     CONTINUE ?
5677  005676          JMP     .-1        NO - WAIT
5700  020600          RST     6          RESET SW
5701  133000          CMPR    6,0        DISPLAY RAM
5702  056304          TST     28,.+2     CONTINUE ?
5703  005702          JMP     .-1        NO - WAIT
5704  020600          RST     6          RESET SW
5705  133400          CMPR    7,0        DISPLAY RAM
5706  056310          TST     28,.+2     CONTINUE ?
5707  005706          JMP     .-1        NO - WAIT
5710  020600          RST     6          RESET SW
5711  016000  MER1    JMPS    12         RETURN
5712  020060  CKFS    TOG     6          *
5713  135000          CMPR    10,0       *EQUALIZE TIME IN ERR LOOP
5714  005711          JMP     MER1       *
**                    *       *
5715  005406  EM1T    JMP     EM1
5716  005414          JMP     EM12
5717  005416          JMP     EM13
5720  005422          JMP     EM15
5721  005414          JMP     EM12
5722  005416          JMP     EM13
5723  005772          JMP     EEMT
5724  005430  EM2T    JMP     EM2
5725  005434          JMP     EM21
5726  005437          JMP     EM23
5727  005442          JMP     EM25
5730  005434          JMP     EM21
5731  005437          JMP     EM23
5732  005772          JMP     EEMT
5733  005460  EM3T    JMP     EM3
5734  005414          JMP     EM12
5735  005416          JMP     EM13
5736  005422          JMP     EM15
5737  005414          JMP     EM12
5740  005416          JMP     EM13
```

```
5741  005772          JMP     EEMT
5742  005473  EM4T    JMP     EM4
5743  005435          JMP     EM22
5744  005440          JMP     EM24
5745  005442          JMP     EM25
5746  005435          JMP     EM22
5747  005440          JMP     EM24
5750  005772          JMP     EEMT
5751  005476  EM5T    JMP     EM5
5752  005504          JMP     EM51
5753  005506          JMP     EM52
5754  005512          JMP     EM54
5755  005504          JMP     EM51
5756  005506          JMP     EM52
5757  005772          JMP     EEMT
5760  005524  EM6T    JMP     EM6
5761  005530          JMP     EM61
5762  005532          JMP     EM62
5763  005534          JMP     EM63
5764  005530          JMP     EM61
5765  005532          JMP     EM62
5766  005772          JMP     EEMT
5767  006000  EM7T    JMP     EM7
5770  005414          JMP     EM12
5771  006002          JMP     EM71
5772  135001  EEMT    CMPR    10,1
5773  040775          TST     1,.+2       ANY ERRORS ?
5774  001777          JMP     IETST
5775  076377          LDR     12,377
5776  076777          LDR     13,377
5777  001776          JMP     IERR
**                    *
**                    *
                      LOC     6000
**                    *
**                    *
6000  074767  EM7     LDR     9,EM7T      GET TABLE PTR
6001  005407          JMP     EM1A        DO 1'ST 2 PARTS OF TEST 1
6002  020005  EM71    STB     5
6003  020005          STB     5           SET LED 2 = 5
6004  020005          STB     5
6004  022005          SET+    2
6005  071017          LDR     2,17
6006  070777          LDR     1,377
6007  060003          LOAD    0,3         SELECT COMPARE MUX
6010  070011          LDR     0,RWL1
6011  141000  RWL1    XFR     2,LDHI
6012  110423          INCR    1,DHI
6013  030030  RWL2    PLB     3           LOAD COMPARE LATCH
6014  140401          XFR     1,LDLO
6015  155405          XFR     11,RDLO
6016  145403          XFR     11,WRLO
6017  135400          CMPR    11,0
6020  040411          TST     1,RWL1      READ OK ?
6021  035040          PLB     4,10        PUT DATA IN RAM 10
6022  006265          JMP     EM7D
6023  111027  DHI     INCR    2,.+4
6024  141000          XFR     2,LDHI
6025  130400          CMPR    1,0         LOAD ACC
6026  006013          JMP     RWL2
6027  020005          STB     5           SET LED 2 = 6
6027  021005          SET+    1
6030  071360          LDR     2,360
6031  070401          LDR     1,1
```

```
     6032  140401          XFR     1,LDLO
     6033  070035          LDR     0,RWL3
     6034  070400          LDR     1,0
     6035  130400  RWL3    CMPR    1,0         LOAD ACC
     6036  030030          PLB     3           LOAD COMPARE LATCH
     6037  110445          INCR    1,IHI
     6040  155405  RWL4    XFR     11,RDLO
     6041  135400          CMPR    11,0
     6042  040435          TST     1,RWL3      READ OK ?
     6043  035040          PLB     4,10        PUT DATA IN RAM 10
     6044  006265          JMP     EM7D
     6045  111047  IHI     INCR    2,.+2
     6046  006040          JMP     RWL4
     6047  060000          LOAD    0,0         RESET MUX
     6050  125054          CMP     10,.+4      SCAN EDIT ON ?
     6051  056053          TST     28,.+2      CONTINUE ?
     6052  006000          JMP     EM7         REPEAT LOOP
     6053  020600          RST     6           RESET SW
     6054  020300          RST     3           CLEAR KYBD
     6055  060020          LOAD    0,20        KYBD TO OB, DON'T RECIRCULATE
     6056  070200          LDR     0,200
     6057  030001          PLA     1           SELECT OB 0
**                         *
**                         *LOAD OB WITH DATA 0 - 127
**                         *
     6060  020001          STB     1           SHIFT OB
     6061  020060          TOG     6           INC KYBD
     6062  110064          INCR    0,.+2
     6063  006060          JMP     .-3
**                         *
     6064  070001  EM7W    LDR     0,1
     6065  030001          PLA     1           SELECT OB 1
     6066  070060          LDR     0,60        LOAD ACC
     6067  026000          SET     6           LOAD LED 2 = 0
     6070  070371          LDR     0,371
     6071  020005          STB     5           SET LED 2 = 7
     6072  110074          INCR    0,.+2
     6073  006071          JMP     .-2
     6074  140000          XFR     0,LDHI
     6075  140001          XFR     0,LDLO
     6076  030001          PLA     1           SELECT OB 0
     6077  077376          LDR     14,376
     6100  076506  WRL1    LDR     13,106
     6101  060041          LOAD    0,41        OB INPUT TO MUX, RECIRCULATE
**                         *
**                         *       LOAD RAMS 0-9,11 WITH DATA FROM OB
**                         *       DO 11 CONSECUTIVE WRITES
**                         *
     6102  150006  WRL2    XFR     0,6
     6103  020001          STB     1           SHIFT OB
     6104  150406          XFR     1,6
     6105  020001          STB     1           SHIFT OB
     6106  151006          XFR     2,6
     6107  020001          STB     1           SHIFT OB
     6110  151406          XFR     3,6
     6111  020001          STB     1           SHIFT OB
     6112  152006          XFR     4,6
     6113  020001          STB     1           SHIFT OB
     6114  152406          XFR     5,6
     6115  020001          STB     1           SHIFT OB
     6116  153006          XFR     6,6
     6117  020001          STB     1           SHIFT OB
     6120  153406          XFR     7,6
     6121  020001          STB     1           SHIFT OB
```

```
      6122  154006          XFR     8,6
      6123  020001          STB     1           SHIFT OB
      6124  154406          XFR     9,6
      6125  020001          STB     1           SHIFT OB
      6126  155406          XFR     11,6
      6127  020001          STB     1           SHIFT OB
      6130  140003          XFR     0,WRLO
      6131  140403          XFR     1,WRLO
      6132  141003          XFR     2,WRLO
      6133  141403          XFR     3,WRLO
      6134  142003          XFR     4,WRLO
      6135  142403          XFR     5,WRLO
      6136  143003          XFR     6,WRLO
      6137  143403          XFR     7,WRLO
      6140  144003          XFR     8,WRLO
      6141  144403          XFR     9,WRLO
      6142  145403          XFR     11,WRLO
**                          *
      6143  116545          INCR    13,.+2
      6144  006102          JMP     WRL2
      6145  117147          INCR    14,.+2
      6146  006100          JMP     WRL1
      6147  060040          LOAD    0,40        RESET MUX - RECIR OB0
      6150  125154          CMP     10,.+4      SCAN EDIT ON ?
      6151  056153          TST     28,.+2      CONTINUE ?
      6152  006064          JMP     EM7W        REPEAT LOOP
      6153  020600          RST     6           RESET SW
      6154  070001  EM7R    LDR     0,1
      6155  030001          PLA     1           SELECT OB 1
      6156  070060          LDR     0,60        LOAD ACC
      6157  026000          SET     6           LOAD LED 2 = 0
      6160  070370          LDR     0,370
      6161  020005          STB     5           SET LED 2 = 8
      6162  110164          INCR    0,.+2
      6163  006161          JMP     .-2
      6164  140000          XFR     0,LDHI
      6165  140001          XFR     0,LDLO
      6166  030001          PLA     1           SELECT OB 0
      6167  020001          STB     1           SHIFT OB
      6170  020001          STB     1           SHIFT OB
      6171  020001          STB     1           SHIFT OB
      6172  020001          STB     1           SHIFT OB
      6173  077376          LDR     14,376
      6174  076506  RDL1    LDR     13,106
**                          *
**                          *       DO 11 CONSECUTIVE READS
**                          *       CHECK RESULTS AGAINST OB
**                          *
      6175  150005  RDL2    XFR     0,RDLO
      6176  150405          XFR     1,RDLO
      6177  151005          XFR     2,RDLO
      6200  151405          XFR     3,RDLO
      6201  152005          XFR     4,RDLO
      6202  152405          XFR     5,RDLO
      6203  153005          XFR     6,RDLO
      6204  153405          XFR     7,RDLO
      6205  154005          XFR     8,RDLO
      6206  154405          XFR     9,RDLO
      6207  155405          XFR     11,RDLO
      6210  060041          LOAD    0,41        OB INPUT TO MUX, RECIRCULATE
      6211  076212          LDR     12,.+1
      6212  130000          CMPR    0,0
      6213  006262          JMP     TEST
      6214  130400          CMPR    1,0
```

```
6215  006262           JMP     TEST
6216  131000           CMPR    2,0
6217  006262           JMP     TEST
6220  131400           CMPR    3,0
6221  006262           JMP     TEST
6222  132000           CMPR    4,0
6223  006262           JMP     TEST
6224  132400           CMPR    5,0
6225  006262           JMP     TEST
6226  133000           CMPR    6,0
6227  006262           JMP     TEST
6230  133400           CMPR    7,0
6231  006262           JMP     TEST
6232  134000           CMPR    8,0
6233  006262           JMP     TEST
6234  134400           CMPR    9,0
6235  006262           JMP     TEST
6236  135400           CMPR    11,0
6237  006262           JMP     TEST
**                     *
6240  060040           LOAD    0,40        RESET MUX - RECIR OB0
6241  116643           INCR    13,.+2
6242  006175           JMP     RDL2
6243  117245           INCR    14,.+2
6244  006174           JMP     RDL1
6245  125251           CMP     10,.+4      SCAN EDIT ON ?
6246  056250           TST     28,.+2      CONTINUE ?
6247  006154           JMP     EM7R        REPEAT LOOP
6250  020600           RST     6           RESET SW
6251  122655           CMP     5,.+4       OUTPUT ON ?
6252  056254           TST     28,.+2      CONTINUE ?
6253  006064           JMP     EM7W        GO WRITE AGAIN
6254  020600           RST     6           RESET SW
6255  001777           JMP     IETST
6256  020001  NEXT     STB     1           SHIFT OB
6257  116260           INCR    12,.+1
6260  116261           INCR    12,.+1
6261  016000           JMPS    12
6262  040656  TEST     TST     1,NEXT      DATA CORRECT ?
6263  035040           PLB     4,10        PUT DATA IN RAM 10
6264  070256           LDR     0,NEXT
6265  020006  EM7D     STB     6           INC LED 3
6266  120277           CMP     0,ERET      KEY OPTICS ON ?
6267  135000           CMPR    10,0        RELOAD ACC WITH DATA READ
6270  056272           TST     28,.+2      CONTINUE ?
6271  006267           JMP     .-2         NO - WAIT
6272  020600           RST     6           RESET SW
6273  155006           XFR     10,6        RELOAD ACC WITH OB0 DATA
6274  056276           TST     28,.+2      CONTINUE ?
6275  006273           JMP     .-2         NO - WAIT
6276  020600           RST     6           RESET SW
6277  075001  ERET     LDR     10,1        SET ERROR FLAG
6300  010000           JMPS    0           RETURN
6301  000000           END
CKFS  5712
  05646 05655
DHI   6023
  06012
EEMT  5772
  05723 05732 05741 05750 05757 05766
EM1   5406
  05400 05715
EM10  5410
  05462
```

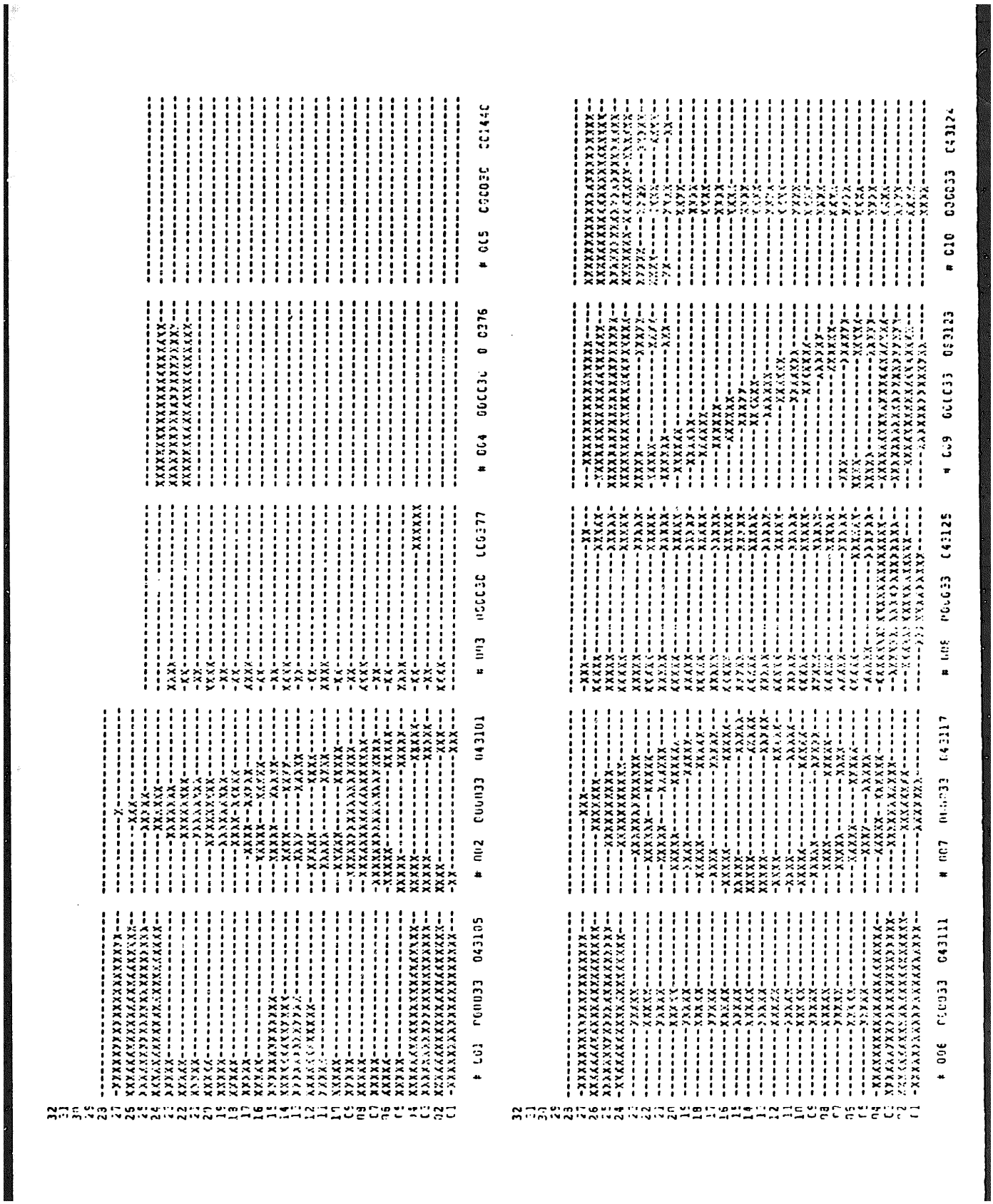
EM11 5411
05415 05441 05443
EM12 5414
05716 05721 05734 05737 05770
EM13 5416
05717 05722 05735 05740
EM14 5417
05423 05433 05436
EM15 5422
05720 05736
EM16 5424
05407
EM1A 5407
06001
EM1T 5715
05406
EM2 [illegible]
05401 05724
EM20 [illegible]32
0547[illegible]
EM21 [illegible]34
0572 05730
EM22 [illegible]35
0574[illegible] 05746
EM23 [illegible].37
05726 05731
EM24 5440
05744 05747
EM25 5442
05727 05745
EM26 5444
05431 05434
EM27 5452
05437
EM2T 5724
05430
EM3 5460
05402 05733
EM30 5463
05461 05474
EM3T 5733
05460
EM4 5473
05403 05742
EM4T 5742
05473
EM5 5476
05404 05751
EM50 5501
05505 05533 05535
EM51 5504
05752 05755
EM52 5506
05753 05756
EM53 5507
05513 05527 05531
EM54 5512
05754
EM55 5514
05477 05525
EM5T 5751
05476
EM6 5524
05405 05760

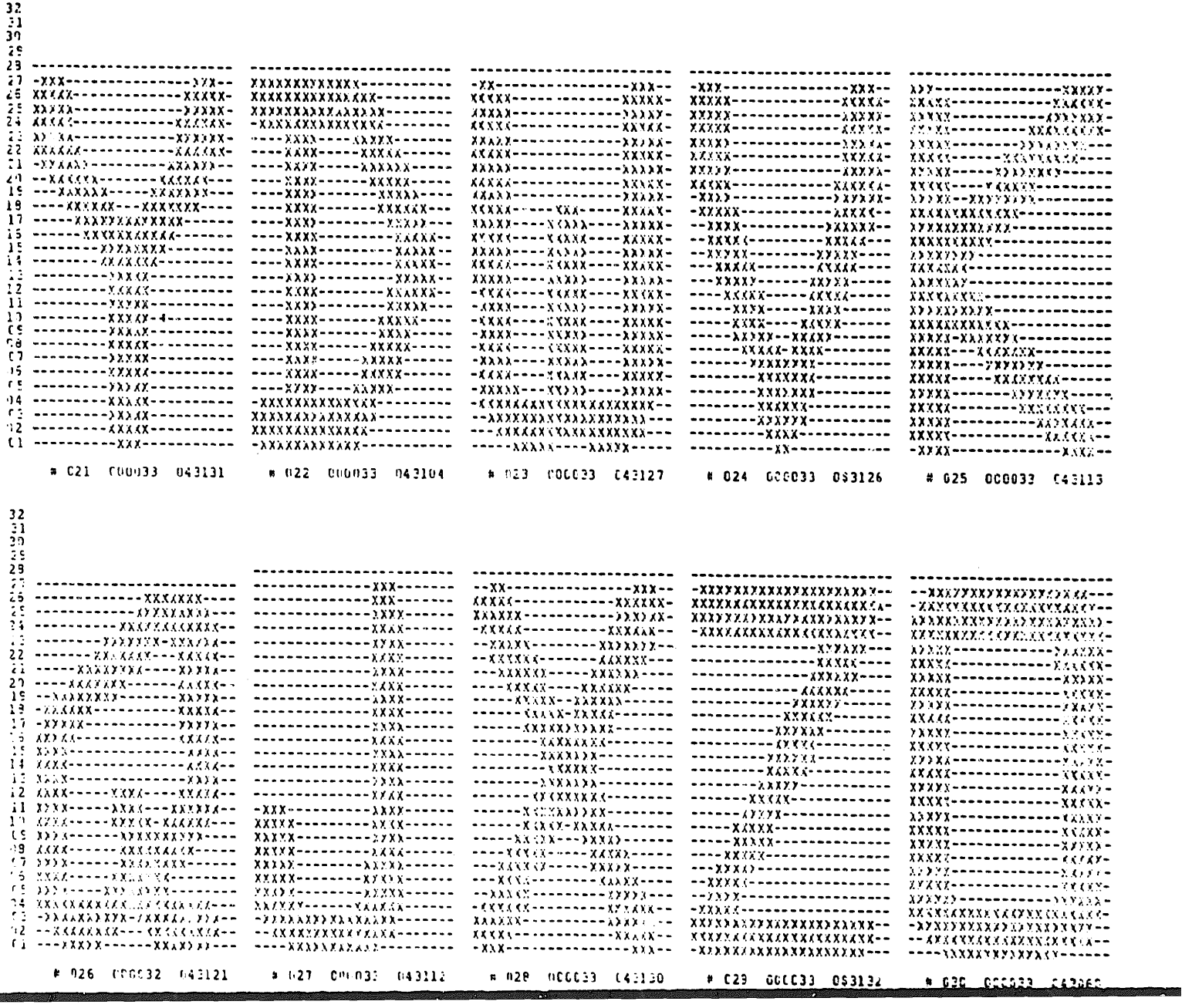
```
EM61  5530
  05761 05764
EM62  5532
  05762 05765
EM63  5534
  05763
EM6T  5760
  05524
EM7  . 6000
  05767 06052
EM71  6002
  05771
EM7B  6265
  06022 06044
EM7R  6154
  06247
EM7T  5767
  06000
EM7W  6064
  06152 06253
GRET  6277
  06266
IERR  1776
  05777
IETS  1777
  05774 06255
IHI   6045
  06037
LDHI  0000
  05604 05636 06011 06024 06074 06164
LDLO  0001
  05605 05637 06014 06032 06075 06165
MER1  5711
  05660 05714
MERR  5656
  05647
MRS0  5634
  05573 05576
MRS1  5636
  05600
MRS2  5650
  05644
MWS0  5602
  05536 05554
MWS1  5604
  05555
MWS2  5610
  05652
MWS3  5625
  05614 05615
NEXT  6256
  06262 06264
OMHI  0010
  05623
OMLO  0020
  05624
RDHI  0004
  05640
RDL1  6174
  06244
RDL2  6175
  06242
RDLO  0005
  05641 06015 06040 06175 06176 06177 06200 06201
```

```
  06202 06203 06204 06205 06206 06207
RWL1  6011
  06010 06020
RWL2  6013
  06026
RWL3  6035
 •06033 06042
RWL4  6040
  06046
STR1  5573
  05414 05435 05504 05530
STR2  5576
  05416 05440 05506 05532
STW1  5536
  05410 05432 05500 05526
STW2  5554
  05422 05442 05512 05534
SWR1  5540
  05575
SWR2  5557
  05601
TEST  6262
  06213 06215 06217 06221 06223 06225 06227 06231
  06233 06235 06237
WRHI  0002
  05606
WRL1  6100
  06146
WRL2  6102
  06144
WRLO  0003
  05607 06016 06130 06131 06132 06133 06134 06135
  06136 06137 06140 06141 06142
```

APPENDIX C

OCR A ALPHABET

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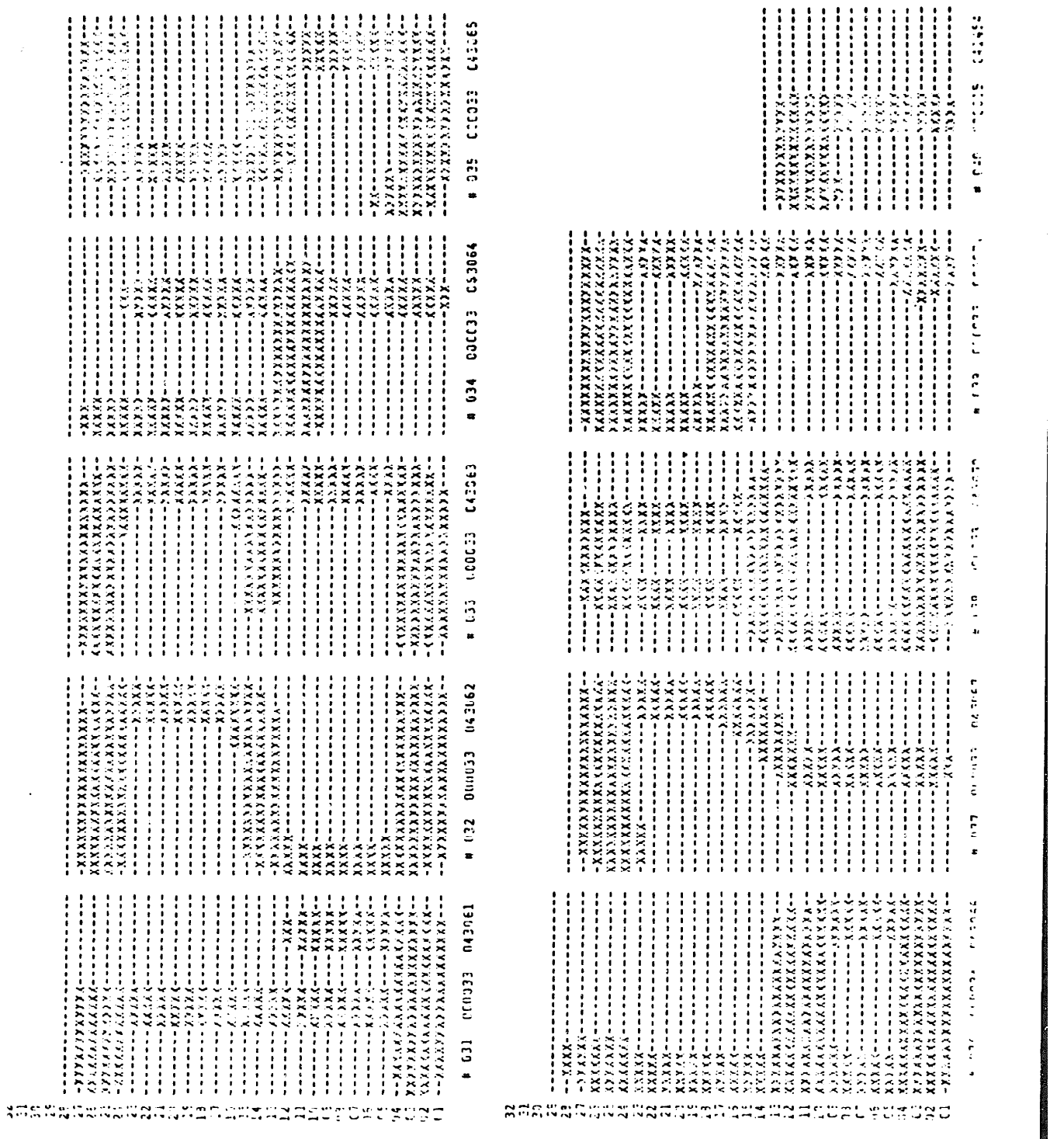
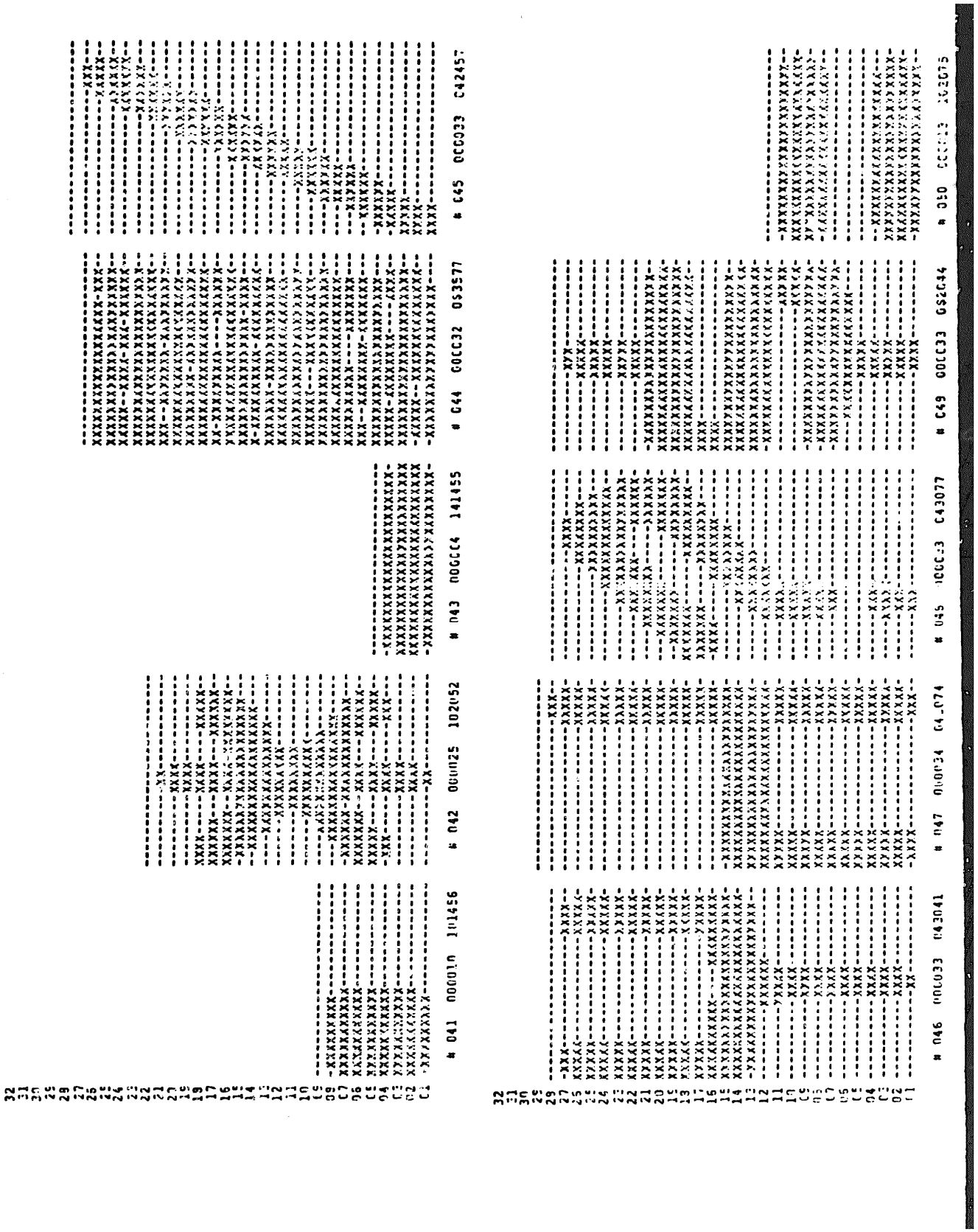
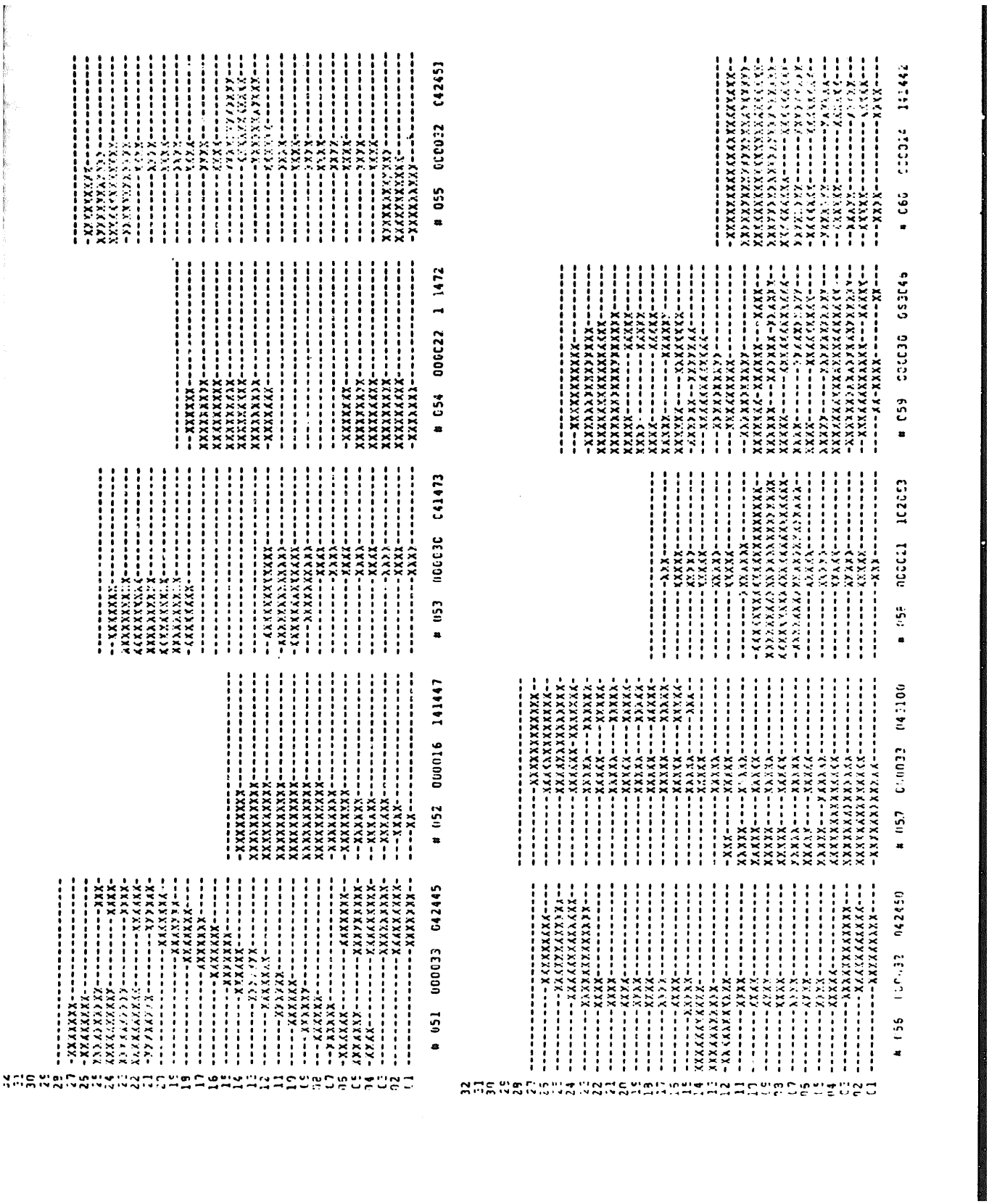
09
08
07
06
05
04
03
02
01
C21 000033 043131
022 000033 043104
023 000033 043127
024 000033 043126
025 000033 043113
026 000032 043121
027 000033 043112
028 000033 043130
C29 000033 043132
030 000033 043060

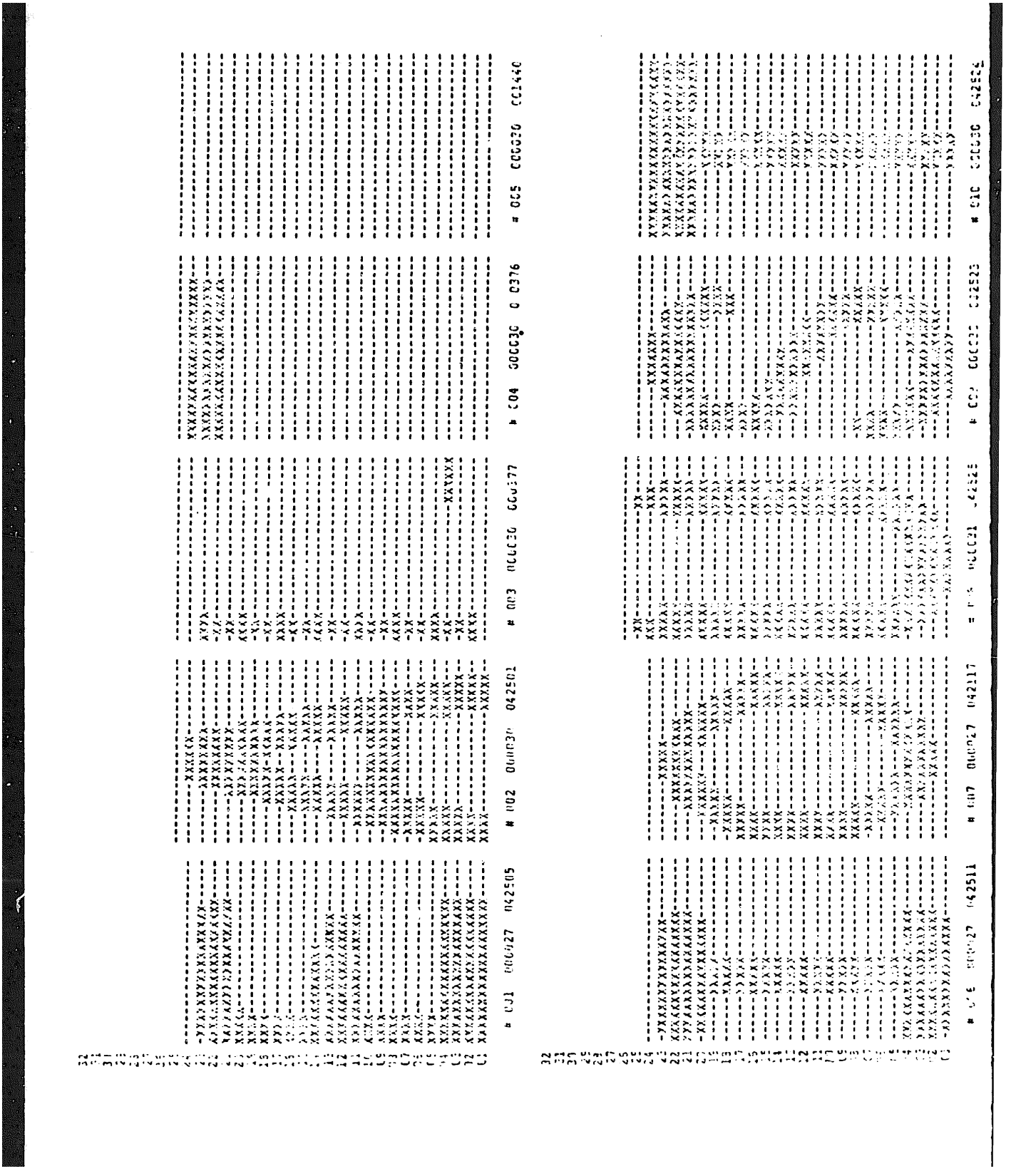


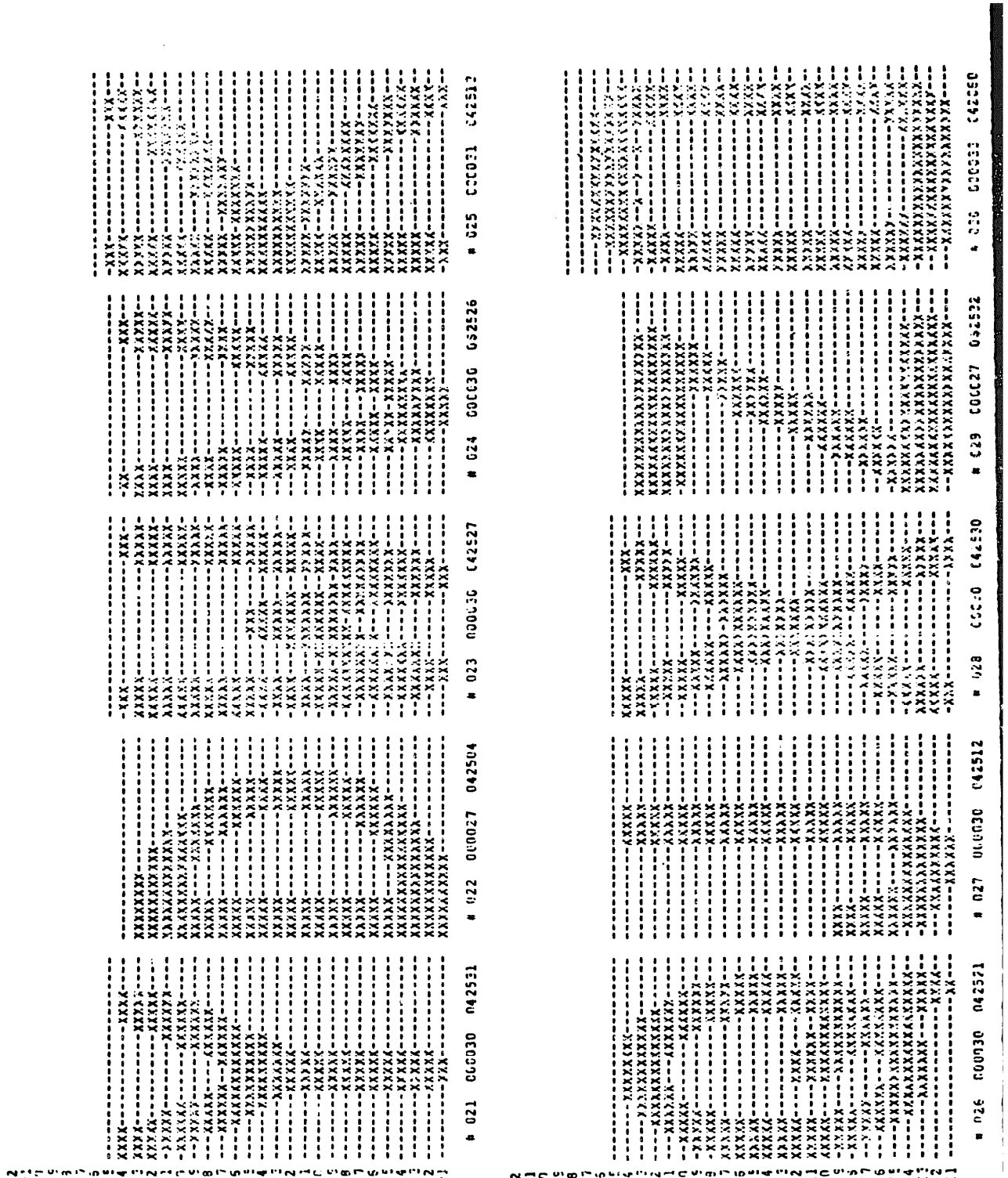


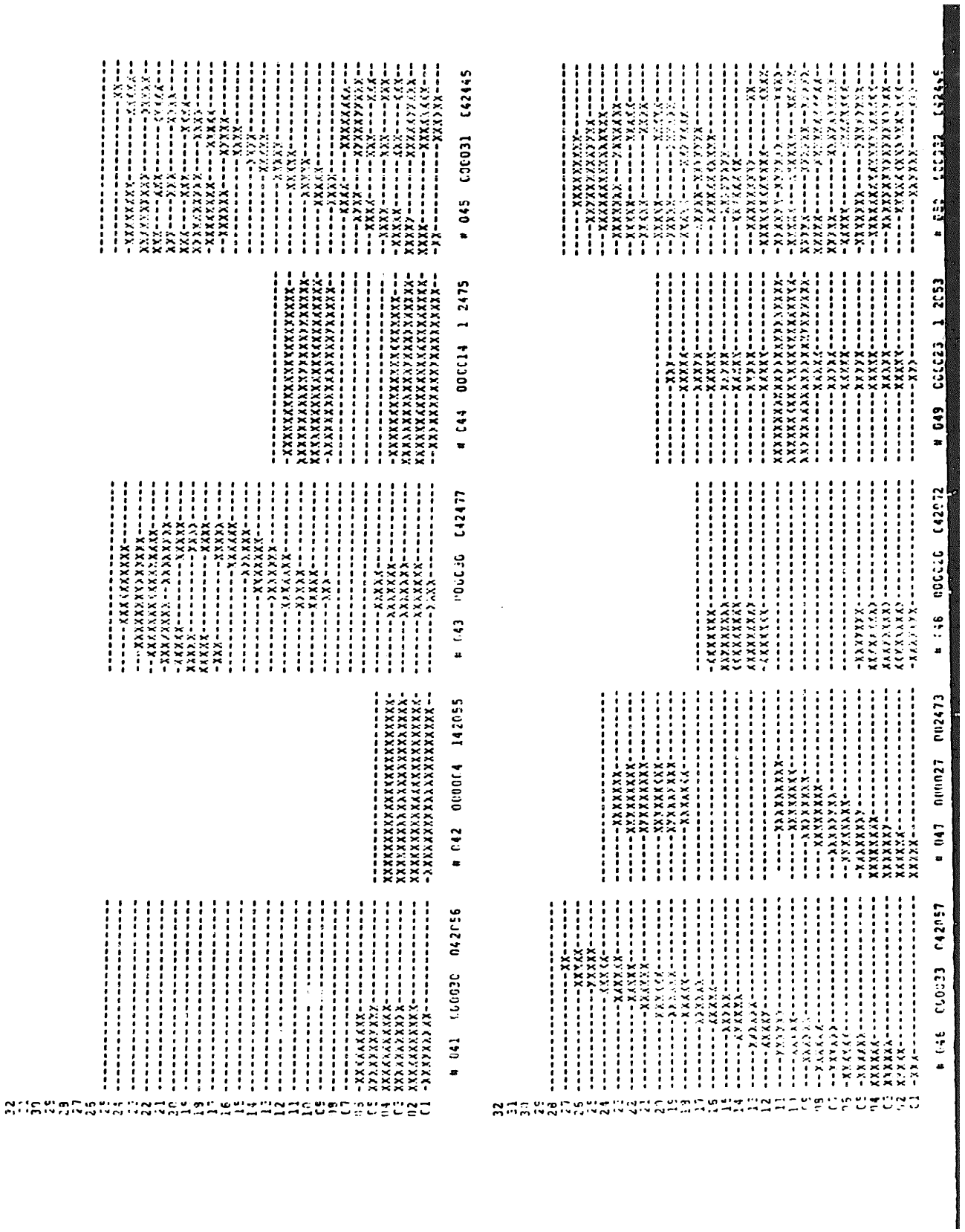


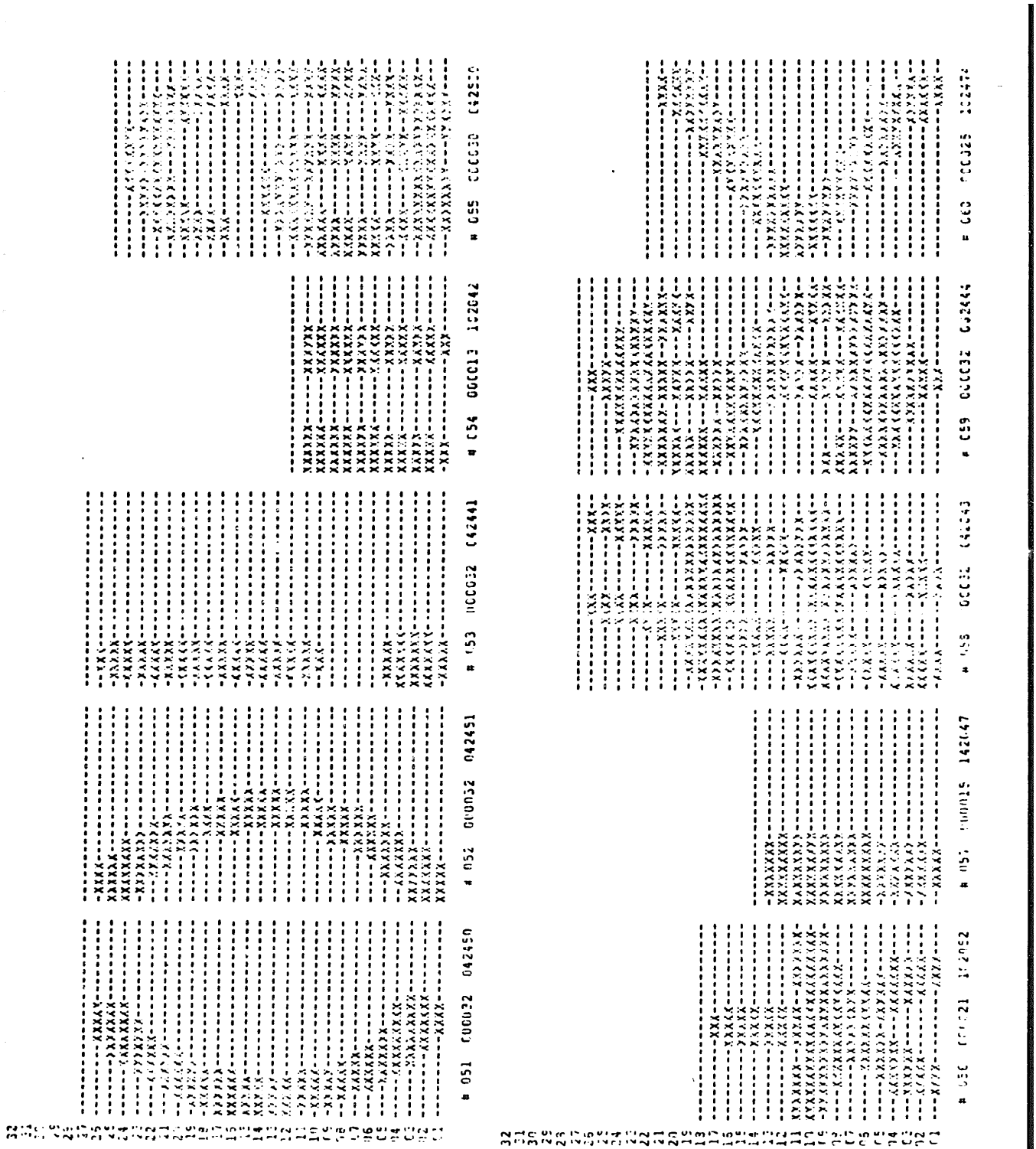
APPENDIX D

OCR B ALPHABET









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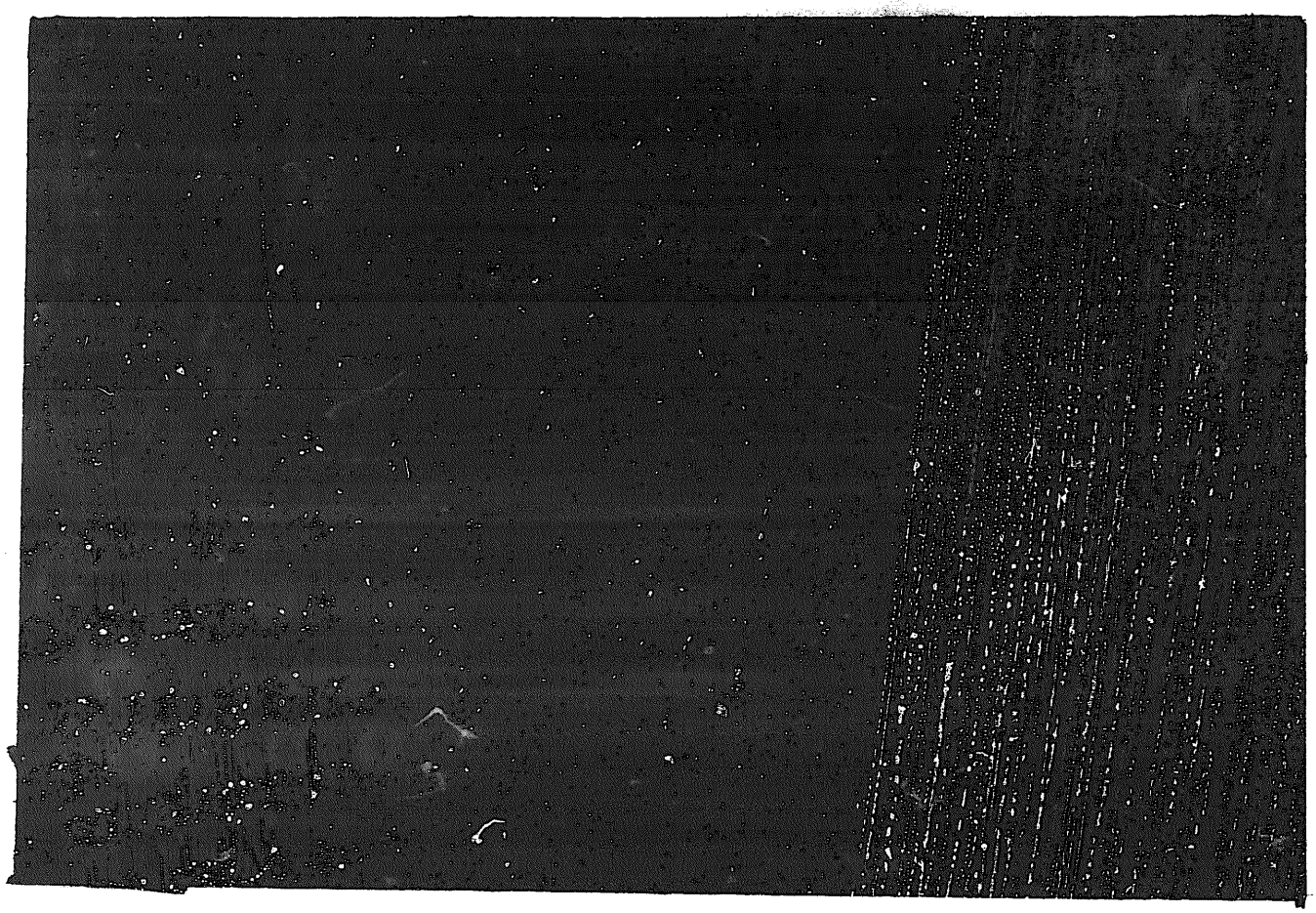

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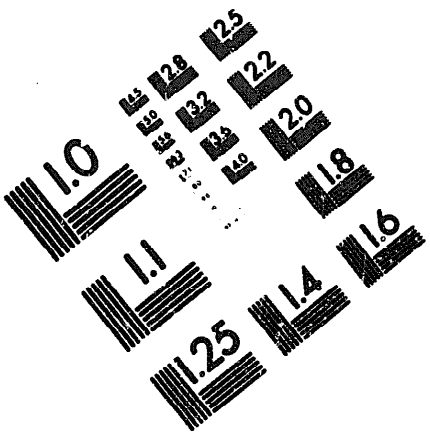
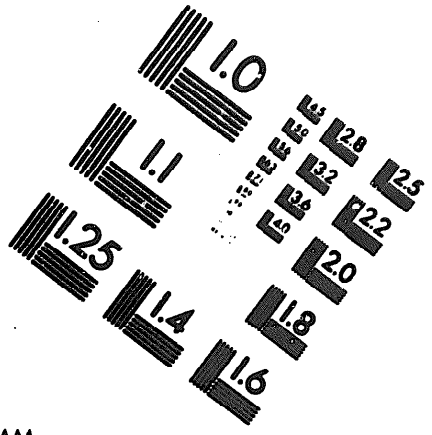
MICROFORM
TEST TARGET





150 MM

1.0 mm (e= .81 mm)

ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890
abcdefghijklmnopqrstuvwxyz$¢£/%#½¼¾—=+×&@*

1.5 mm (e= 1.09 mm)

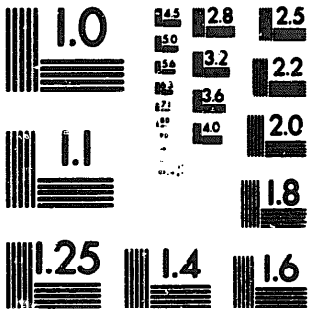
ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890
abcdefghijklmnopqrstuvwxyz$¢£/%#½¼¾—=+×&@*

2.0 mm (e= 1.37 mm)

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890$¢£/%#½¼¾—=+×&@*

2.5 mm (e= 1.77 mm)

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890$¢£/%#½¼¾—=+×&@*



1.0 mm (e= .81 mm)

ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890
abcdefghijklmnopqrstuvwxyz$¢£/%#½¼¾—=+×&@*

1.5 mm (e= 1.09 mm)

ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890
abcdefghijklmnopqrstuvwxyz$¢£/%#½¼¾—=+×&@*

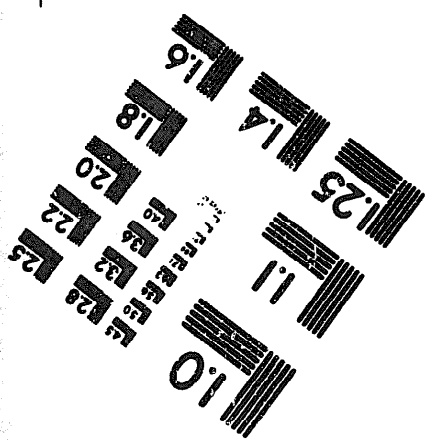
2.0 mm (e= 1.37 mm)

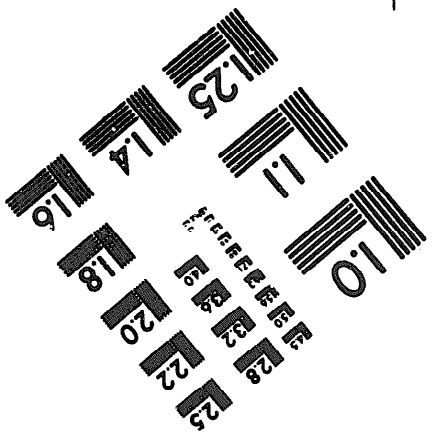
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890$¢£/%#½¼¾—=+×&@*

2.5 mm (e= 1.77 mm)

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890$¢£/%#½¼¾—=+×&@*

200 MM





250 MM