MWX-1000S

SMD WINCHESTER DISK DRIVE ANALYZER

OPERATOR'S MANUAL

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PREFACE

This manual provides you with the information required for operating the Wilson Laboratories microprocessor-based MWX-1000S SMD Winchester Disk Drive Analyzer. This information is designed to enable you to obtain the best utilization of the Analyzer.

You should read this manual in advance to establish a base of familiarity. Then, when performing a function for the first time, you should follow the procedures outlined in the manual very closely. After becoming familiar with the product, you may find the manual useful as a reference and refresher.

CHAPTER ORGANIZATION

The primary information in this manual is organized into nine Chapters, as follows:

- Chapter 1 provides a general description of the Analyzer, including features, physical characteristics, power requirements, and pertinent specifications.
- Chapter 2 contains a description of the Analyzer's major functional components. Logic and control modules are discussed, as are MWX-1000S interfaces. Also included is a simplified block diagram of the Analyzer.
- Chapter 3 provides a general discussion on the Analyzer's front control panel keys and indicators. This chapter is helpful for users requiring a basic understanding of the operation keypad.
- Chapter 4 contains the procedures required for connecting disk drives and a printer to the Analyzer. In addition to installation guidelines, interface cable pin assignments are provided.
- Chapter 5 provides a variety of initial Analyzer set-up procedures. Included are such topics as configuring the Analyzer for specific drive type, printing configuration data, and setting optional test parameters.
- Chapter 6 contains step-by-step instructions for basic Analyzer operations and drive test procedures. Basic operations include measuring drive status, formatting and verifying the disk, seeking heads, and writing and reading the disk, among others.

- Chapter 7 describes all of the available MWX-1000S Functions, and the steps required to implement them. Functions are special operations not assigned to specific front panel keys. They are stored in non-volatile CMOS RAM.

- Chapter 8 describes the numerous factory-written "canned" Special Programs. These programs are ROM-based, and are used to perform comprehensive drive tests. Most important is the Wilson standard drive verification test, Special Program 0.

- Chapter 9 describes the User Program mode, which enables you to generate custom programs for specific drive test applications. A sample User Program is provided.

APPENDICES

This manual also provides additional helpful information in three Appendices, as follows:

- Appendix A provides a description of the unique MWX-1000S "wildcard" facility.

- Appendix B provides miscellaneous information regarding Fujitsu-type flaw map support by the Analyzer.

- Appendix C is separated into three related sections, as follows:

    - Appendix C1 describes error messages which may be displayed during the course of operations, and shows examples of printed error reports.

    - Appendix C2 describes status messages which are displayed during normal operations, and provides examples of printed drive and test status reports.

    - Appendix C3 combines the error and status reports into a complete Special Program 0/10 test report.

TABLE OF CONTENTS

TABLE OF CONTENTS (cont.)

TABLE OF CONTENTS (cont.)

TABLE OF CONTENTS (cont.)

TABLE OF CONTENTS (cont.)

LIST OF ILLUSTRATIONS

CHAPTER 1

GENERAL DESCRIPTION

1.1 INTRODUCTION

This chapter provides a brief overview of the MWX-1000S SMD Winchester Disk Drive Analyzer. Information includes various applications, operating features, physical characteristics, and pertinent specifications.

1.2 GENERAL DESCRIPTION

The MWX-1000S Disk Drive Analyzer is a microprocessor-based digital tester designed for use with Storage Module Drive (SMD) Winchester disk drives. SMD-type drives include standard SMD, high-speed XSMD and ESMD, and CMD cartridge module drives.

The Analyzer performs all standard off-line exerciser/test functions, making it a valuable tool for manufacturing, quality assurance, field service, and engineering. It is housed in a self-contained portable case, but it may be removed from the case and mounted in any standard RETMA-type rack.

The simplicity of the Analyzer's operation, made possible by the embedded intelligence of its microprocessors, allows unskilled personnel to quickly and easily perform independent drive test operations, or to run any of the factory-stored comprehensive programs held in the Analyzer's non-volatile ROM.

In addition, technical and engineering personnel can readily generate custom programs on-site, with data patterns and operation parameters tailored for the specific application.

Upon completion of drive tests, the Analyzer will write a defect map to the drive's flaw map locations. This defect map can also be output to the connected printer.

If hardcopy results of any tests are required, a printer may be attached to the Analyzer through an EIA RS-232-C serial interface or Centronics-type parallel interface.

Drive variations between manufacturers are easily accommodated by the Analyzer. Up to four drives of the same type may be attached simultaneously to the Analyzer, with any one selectable through the front panel for analysis.

1.3 FEATURES

The MWX-1000S provides many unique operating features. A few of these features are listed below:

- Supports SMD interface drives, including high-speed XSMD and ESMD, and cartridge-type CMD drives.
- Sequentially tests up to four drives of the same type in a daisy-chain configuration.
- Provides comprehensive console and program modes of operation.
- Supports 20 MHz data transfer rate (20 MBits per sec).
- Supports single and multiple sector drives.
- Supports generation of Fujitsu-type flaw map.
- Servo and data strobe offset selection.
- Supports fixed and soft sector formats.
- Programmable PLO and gap length.
- Formatting/verification of media.
- Measures index, sector, and seek timing.
- Allows user-specified stop on error (test abort) limits.
- Supports wildcard operations.
- Provides numerous function codes which are used to implement a variety of special operations and test conditions.
- Provides many factory-written "special" programs contained in non-volatile ROM. Two of these Special Programs are used for final drive verification. The remaining programs may be called by User Programs to invoke various modes of operation.
- Allows custom test programs to be user-generated and stored in non-volatile CMOS RAM. User Programs are easily created by calling Special Programs, Functions, and keypad operations as individual program statements.
- Allows connection of a parallel or serial printer for a hardcopy of test results.

1.4 PACKAGING

The MWX-1000S Disk Analyzer is a fully self-contained unit packaged in a heavy-duty, lightweight carrying case. Two removable covers (top and bottom) are provided for ease of access. The top cover stores the required user documentation, and the bottom cover is used for storage of an AC power cord and interface cables.

1.5 DIMENSIONS

Approximate dimensions of the Analyzer are as follows:

- Length: 20 inches
- Weight: 17 pounds
- Depth: 11 inches
- Height: 6.5 inches

1.6 AC POWER REQUIREMENTS

The MWX-1000S uses a standard AC power plug. The cord is stored in the bottom cover of the carrying case. AC power requirements are as follows:

- 100/110/115/120 or 200/215/230/240 VAC
- 50/60 Hertz
- 1.0 amp @ 115 VAC
- 0.5 amp @ 220 VAC

1.7 DRIVE POWER OUTPUT

The MWX-1000S Analyzer contains a multi-level switching power supply. This power supply provides DC power to the connected disk drive, as follows:

- +12 VDC @ 2 amps (nominal); 4.5 amps (peak)
- +5 VDC @ 2.5 amps

1.8 OTHER CHARACTERISTICS

Additional characteristics of the MWX-1000S are as follows:

- Operating Temperature: 0-45 degrees C, non-condensing
- Electronics: TTL logic, 8X305 and Z80A microprocessors
- Timing: Crystal-controlled
- Humidity: 10% to 95%, non-condensing

CHAPTER 2

FUNCTIONAL COMPONENTS

2.1 GENERAL

The main functional components of the MWX-1000S Disk Drive Analyzer are:

- Four Logic/Control Modules
- User/Drive Interfaces
- Power Supply

These items are illustrated in the simplified block diagram in Figure 2-1, and are described briefly in the following paragraphs.

2.2 LOGIC/CONTROL MODULES

The MWX-1000S electronics consist of four printed circuit boards (PCBs), stacked behind the metal front panel. This logic "stack" consists of the following PCBs:

- Keyboard/Display
- Z80 CPU
- High-Speed I/O (HSIO) Processor
- SMD Drive Interface Board

2.2.1 Keyboard/Display Module

The sixteen-position alphanumeric display utilizes a vacuum fluorescent element to provide easily-read characters. Display refresh and character storage are provided on this module. Eight discrete LED indicators provide general status/mode display. The keyboard consists of 54 individual, printed-circuit-mounted, pushbutton switches. The switches are of instrument quality and capable of millions of actuations. Keyboard scanning logic is used to interrogate this switch matrix.

2.2.2 Z80 CPU Module

The "main" board of the Analyzer is the Z80 CPU Module which provides control of the Analyzer. Control is achieved through a Z80A microprocessor and its related firmware in ROM memory. The Z80 CPU Module contains the following elements:

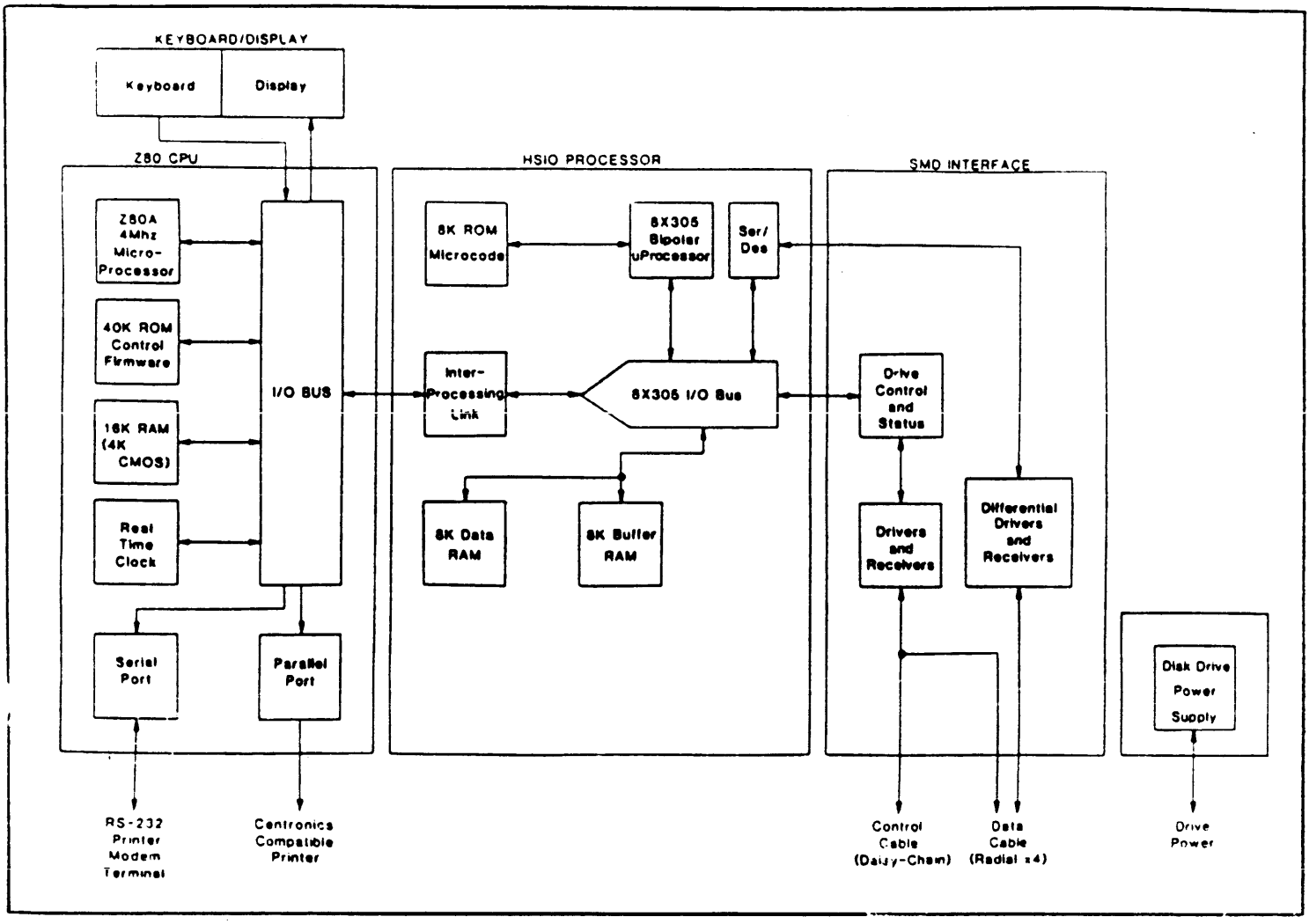
- Z80A Microprocessor operating at 4 MHz with memory mapped I/O.
- 40K bytes of ROM memory space (2732/2764 technology) for control firmware storage.
- 16K bytes of RAM memory space with 4K of this area assigned to CMOS memory (with battery back-up).
- Real-time clock (with battery back-up) for time and date maintenance and display.
- Serial port with complete EIA RS-232-C controls for CRT, modem, or printer connection.
- Parallel port for support of a Centronics-type printer.

2.2.3 High-Speed I/O (HSIO) Processor

The I/O Processor acts as a high-speed controller for the attached disk drive. It provides all drive control signals, monitors drive status, and handles all data transfers. Main elements of this module are:

- 8X305 Bipolar Microprocessor.
- 8K words of high-speed ROM memory (24-bits wide) for 8X305 firmware storage.
- 2K bytes of high-speed RAM memory for read/write data.
- Up to 8K bytes of high-speed RAM memory for data and error buffering and general use.
- Interprocessor link to the Z80 CPU board; consists of a bidirectional parallel transfer port for communication between processors.

Figure 2-1
MWX-1000S Simplified Block Diagram



2.2.4 SMD Drive Interface Board

This PCB provides the electrical and physical connections for up to four SMD disk drives. It comprises the following elements:

- Drive control and status signal latches.
- Drive signal receivers and drivers.
- One Control signal cable connector (for connection of a daisy-chain ribbon cable).
- Four Data signal cable connectors (for connection of individual radial cables).

2.3 INTERFACES

A variety of interfaces are provided on the Analyzer's rear panel. They consist of a Drive Interface and two User Interfaces. Refer to Chapter 4 for a simplified diagram of the interface connectors, and specific interface pin assignments.

2.3.1 Drive Interface

The Analyzer provides a complete drive interface, meeting industry standard SMD interface requirements. A 60-conductor Control "A" Cable allows the connection of up to four drives in a daisy-chain configuration. The Analyzer can also accommodate four 26-conductor Data "B" Cables (radial connection).

2.3.2 User Interfaces

The following interfaces are provided for use in connecting the Analyzer with output devices:

- EIA RS-232-C serial interface providing full modem control; a standard 25-pin D-shell connector is provided.
- Centronics-compatible parallel printer port, provided at a 36-pin Amphenol-type connector.

2.4 POWER SUPPLY

The Analyzer contains a multi-output level switching power supply. The power supply provides DC power both to the internal electronic modules and to a single external disk drive (via the rear panel Drive Power Connector). The power output to the connected disk drive is maintained at +5 VDC @ 2.5 amps and +12 VDC @ 2 amps (4.5 amps peak).

CHAPTER 3

FRONT PANEL CONTROLS

3.1 INTRODUCTION

This chapter describes the MWX-1000S Analyzer front panel controls and indicators. Major elements are an Alphanumeric Display and Operation Keyboard, and Mode and Error Indicators.

3.2 ALPHANUMERIC DISPLAY

The sixteen-character Alphanumeric Display (Figure 3-1) provides prompts, status and error messages, instructions from stored test programs, and data. During parameter entry, the field corresponding to the expected data flashes to indicate that operator input is required.

3.3 KEYBOARD

The MWX-1000S Keyboard (Figure 3-1) contains numerous keys which are functionally grouped as follows:

- o Reset Key
- o Command Keys
- o Entry Pad Keys
- o Operation Keys
- o Set Keys
- o Measure Keys

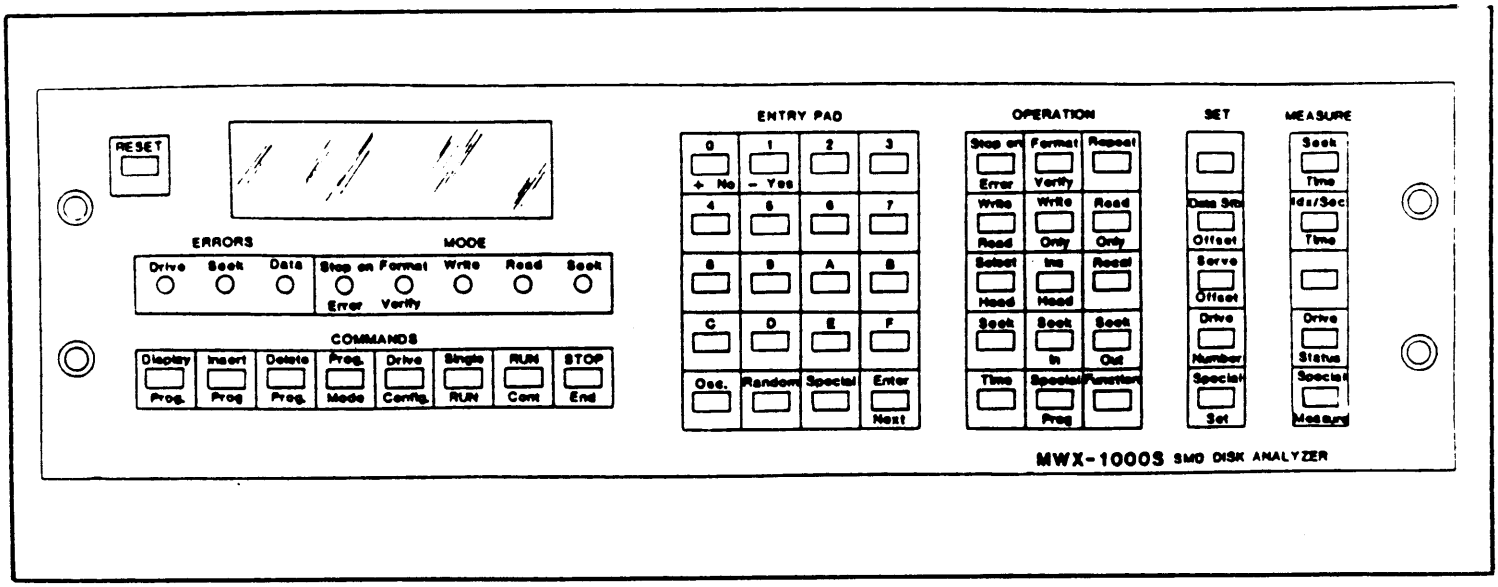
These keys allow you to specify the Analyzer's operating mode, the function/operation/program to perform, and any data required to perform the selected operation. All keys are described in the following paragraphs.

3.3.1 Reset Key

<Reset> causes the Analyzer to terminate any current activity and to reset its internal logic. The following functions are performed upon Analyzer reset:

- o Self-test is executed.
- o Error flags and hardware registers are cleared.
- o All LEDs are lit to allow detection of a bad element.

Figure 3-1
MWX-1000S Front Panel Keyboard



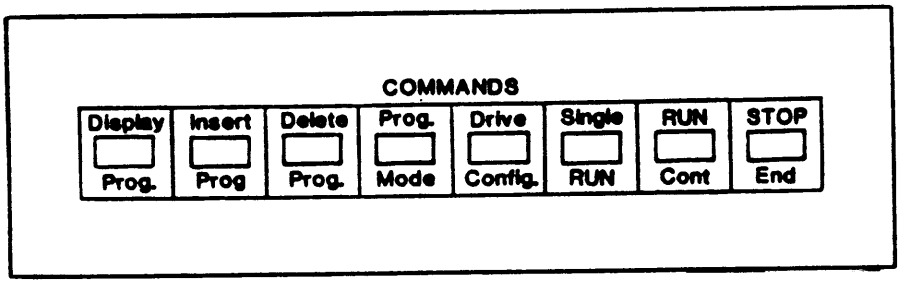
3.3.2 Command Keys

The eight Command keys (Figure 3-2) listed below allow you to control the operation of the Analyzer.

- o Drive Config
- o Single RUN
- o RUN Cont
- o STOP/End
- o Prog Mode
- o Display Prog
- o Insert Prog (not used)
- o Delete Prog

These keys are described in more detail below.

Figure 3-2
Command Keys



3.3.2.1 Drive Config

This key places the Analyzer into the Drive Configuration routine, during which the parameters of the drives under test can be entered through the entry pad. The red LED in the **<Drive Config>** key illuminates when the Drive Configuration mode is active. The Analyzer prompts through the Alphanumeric Display for a variety of parameters such as first and last head numbers, first and last cylinder numbers, etc.

With each prompt from the Analyzer, a default value is shown blinking in the display. You may either retain this value or enter a new parameter value to meet your drive test requirements.

NOTE

The configuration parameters specified must apply to all drives attached to the Analyzer; that is, mixed drive types are not allowed. Each time a different drive type is connected, you must reconfigure the Analyzer to recognize the new parameters.

The drive configuration procedure is discussed in detail in Chapter 5.

3.3.2.2 Single RUN

This key causes the selected operation to be run one time only. **<Single RUN>** may be used in the Console mode only.

3.3.2.3 RUN Cont

This key causes the selected operation to be run repeatedly until **<STOP/End>** is pressed, or until the number of errors specified with the Stop on Error procedure (paragraph 5.7) are detected. **<RUN Cont>** is used in the Console mode only.

3.3.2.4 STOP/End

This key stops the continuous running of an operation or program and displays the prompt **"MWX-1000S READY."** **<STOP/End>** is a terminator for most procedures.

3.3.2.5 Prog Mode

This key places the Analyzer into the User Program mode, during which you may examine, change, or enter program statements.

NOTE

<Prog Mode> is NOT used to execute a User Program. All programs, whether User or Special, are executed via the <Special Prog> key.

The red LED in the **<Prog Mode>** key illuminates when the Program mode is active. The drive operations you specify while in the Program mode are stored in non-volatile CMOS RAM, to be executed any time later.

After you press **<Prog Mode>**, enter the number of the program you wish to create or modify, followed by **<Enter/Next>**. Valid numbers for User Programs are 300-499.

Refer to Chapter 9 for detailed information concerning the User Program mode.

3.3.2.6 Display Prog

This key is used only in the User Program mode. It causes the "next" line (statement) of the selected test program to be shown in the display. **<Enter/Next>** may then be used to modify that line of the program.

3.3.2.7 Insert Prog

This key is not used.

3.3.2.8 Delete Prog

Used only in the User Program mode. This key deletes the program statement currently shown in the display.

CAUTION

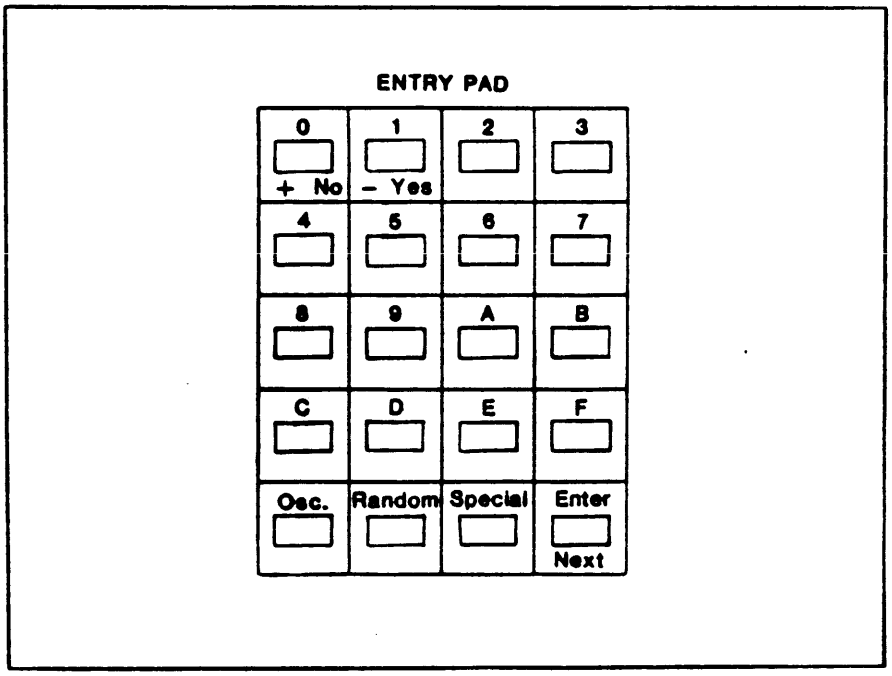
THE <DELETE PROG> KEY WILL ERASE AN ENTIRE PROGRAM WHEN IT IS PRESSED IMMEDIATELY AFTER SELECTING A USER PROGRAM; I.E., BEFORE DISPLAYING AN INDIVIDUAL PROGRAM STATEMENT.

3.3.3 Entry Pad Keys

The Entry Pad (Figure 3-3) provides data entry keys as well as a number of special keys.

- o Entry (Numeric) Keys
- o No/Yes, +/-
- o OSC
- o Random
- o Enter/Next
- o Special

Figure 3-3
Entry Pad Keys



3.3.3.1 Entry (Numeric) Keys

Sixteen keys, with hexadecimal values of 0 through F, are used for entering data qualifying a previously selected Operation, Command, Set, or Measure key.

3.3.3.2 No/Yes, +/-

This pair of keys provides for "yes" or "no" answers when requested by queries on the display. The same keys provide for plus (+) or minus (-) designations when entering positive or negative values.

3.3.3.3 OSC

This key is used in conjunction with **<Seek>** to perform an oscillating seek operation (paragraph 6.6.4).

3.3.3.4 Random

This key is used to select a random number for use as data, head, or cylinder number in Write/Read (paragraph 6.5.2) or Random Seek operations (6.6.5).

3.3.3.5 Special

This key is used to specify a "rotating" data pattern for Write/Read and Write operations. For example, when a data pattern of 6DBh is selected, it is written on the first cylinder. Then, the pattern rotates so that B6Dh is written on the second cylinder, DB6h on the third, 6DBh on the next, and so on. Refer to paragraphs 6.5.2 and 6.5.3 for additional information.

3.3.3.6 Enter/Next

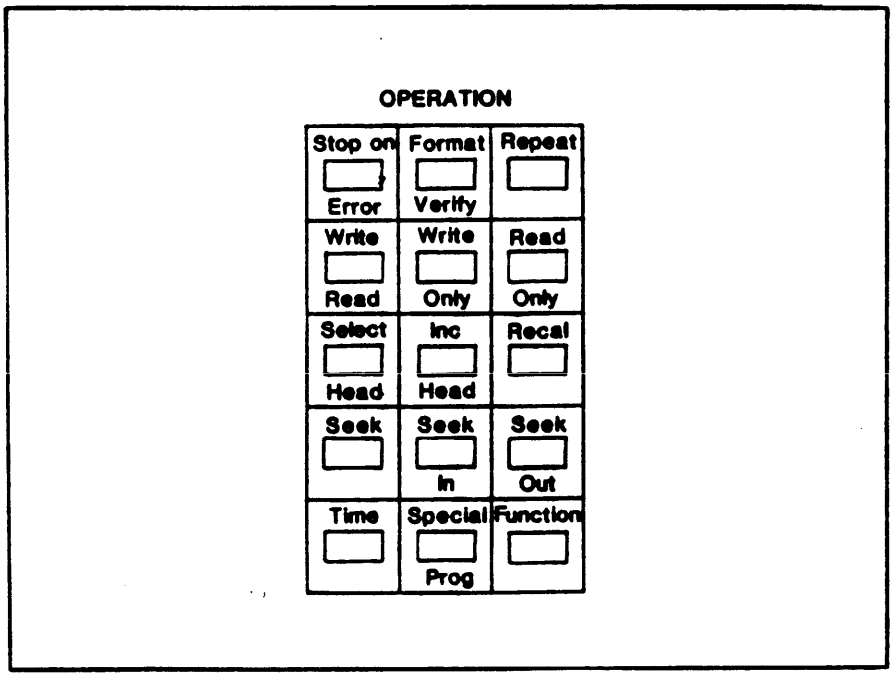
This is the most frequently used key. In the **"Enter"** function, it stores (enters) the values last keyed in through the entry pad. In the **"Next"** function, it sequences to the next program statements, status signals, etc.

3.3.4 Operation Keys

Fifteen Operation keys (Figure 3-4) allow you to select the drive operation to be performed. Each operation is additionally qualified by data entered through the entry pad. After each key is activated, the display will prompt for any additional information required. The following Operation keys are provided:

- Stop on Error
- Format/Verify
- Repeat
- Write/Read
- Write Only
- Read Only
- Select Head
- Inc Head
- RTZ
- Seek
- Seek In
- Seek Out
- Time
- Special Prog
- Function

Figure 3-4
Operation Keys



3.3.4.1 Stop on Error

When activated, this key places the Analyzer into the "Stop-on-Error" routine, during which you are requested to specify the number of errors required to halt a particular drive operation; e.g., the number of soft, hard, and format errors necessary to

take the Analyzer out of the "run" mode. After activating **<Stop on Error>**, you are prompted for numerous test abort parameters, as described in paragraph 5.7.

3.3.4.2 Format/Verify

This key instructs the Analyzer to format and, if enabled, verify the selected drive. The type of format used (i.e., hard or soft sector) is determined by the drive's current configuration.

See Figure 5-1 for a diagram of the available track formats. Refer to paragraph 6.5.1 for a complete description of the format/verify operation.

3.3.4.3 Repeat

Used only in the User Program mode. This key returns control to an earlier instruction of a program, for a specified number of times. After **<Repeat>** has been pressed, the intended instruction (statement number), and the number of times to return to it, are specified through the entry pad. A User Program accommodates a maximum of 8 repeats. Refer to Chapter 9 for details.

3.3.4.4 Write/Read

Instructs the Analyzer to write the selected drive, then to read the data back and compare the data read with the data written (write-check operation). The data word to be written throughout the data fields is specified through the entry pad. A user-specified, rotating, or random data pattern may be implemented. Refer to paragraph 6.5.2 for a complete description.

3.3.4.5 Write Only

This key instructs the Analyzer to write the selected drive. The data word written is specified through the entry pad. A user-specified, rotating, or random data pattern may be utilized. Refer to paragraph 6.5.3 for a complete description.

3.3.4.6 Read Only

This key instructs the Analyzer to read the selected drive. The data that is read is compared with the data word specified through the entry pad. Refer to paragraph 6.5.4 for details.

3.3.4.7 Select Head

Instructs the Analyzer to select the head specified through the entry pad. Refer to paragraph 6.7.2 for additional information.

3.3.4.8 Inc Head

Instructs the Analyzer to increment the number of the current head by the amount specified. See paragraph 6.7.3 for details.

3.3.4.9 RTZ

This key issues a Return-to-Zero (RTZ) command to the drive, which causes the drive heads to move to Track 0. Refer to paragraph 6.7.1 for details.

3.3.4.10 Seek

Instructs the Analyzer to seek the heads to the desired cylinder, as specified through the entry pad. Refer to paragraph 6.6.1. This key may also be used in conjunction with **<OSC>** or **<Random>** to select oscillating and random seek operations.

3.3.4.11 Seek In

Instructs the Analyzer to seek the drive heads in (toward higher cylinder numbers) by the number of cylinders specified through the entry pad. Refer to paragraph 6.6.2 for details.

3.3.4.12 Seek Out

This key instructs the Analyzer to seek the drive heads out (toward lower cylinder numbers), by the number of cylinders specified. Refer to paragraph 6.6.3 for details.

3.3.4.13 Time

Instructs the Analyzer to display the time and date. Refer to paragraph 6.7.5 for details. You may change the time and date via Function 10, which is described in Chapter 7.

3.3.4.14 Special Prog

This key is used to select the Wilson "factory-canned" Special Programs for execution. Over 45 programs are currently provided. These programs are stored in non-volatile ROM.

Most important of all factory-canned programs are the comprehensive final drive verification tests, Special Programs 0 and 10. Refer to Chapter 8 for a complete description of the Special Programs available.

In addition, all User Programs (held in CMOS RAM) are executed with this key.

3.3.4.15 Function

This key is used to select and execute the Analyzer's unique Functions. Functions are various drive and Analyzer operations that cannot be assigned to specific front panel keys (due to lack of physical space), but are stored in non-volatile CMOS RAM. At present, about 40 functions are provided. See Chapter 7 for a complete description of the available functions.

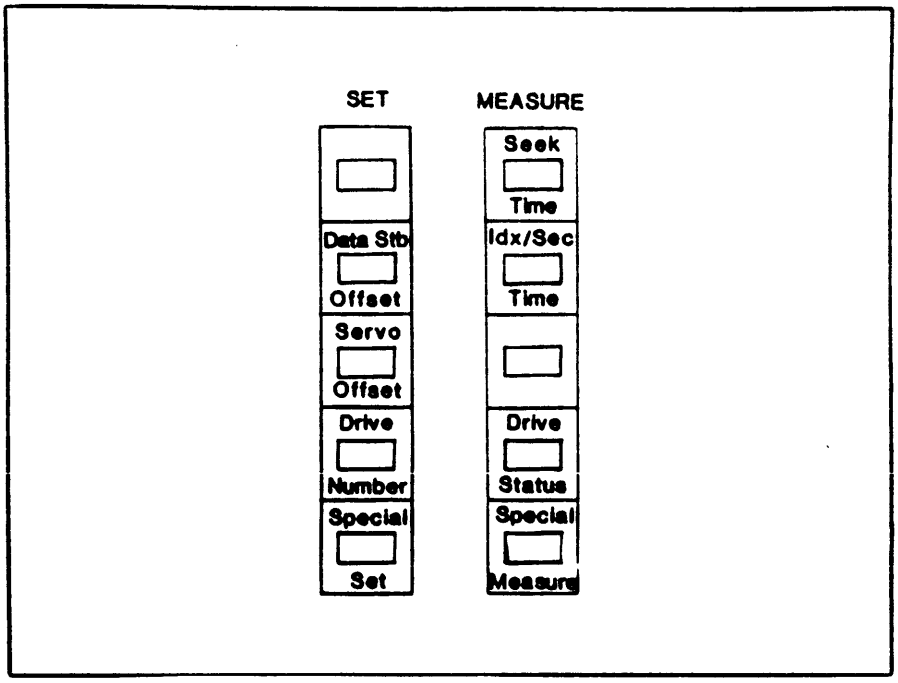
3.3.5 Set Keys

Four Set keys (Figure 3-5) allow you to specify the interface parameters used to control the drives under test.

- **Data Stb Offset**
- **Servo Offset**
- **Drive Number**
- **Special Set (not used)**

When you select a Set key, a prompt appears in the display requesting additional information. Shown with each prompt is the current value, which may be retained by pressing **<Enter/Next>** directly. Alternatively, you may enter a new value and then press **<Enter/Next>**.

Figure 3-5
Set and Measure Keys



3.3.5.1 Data Stb Offset

This key selects either a Normal, Early, or Late data strobe offset (specified by entering **<0>**, **<1>**, or **<2>**, respectively) to allow the Analyzer's read data window to recover marginal data. The offset increments are determined by the connected drive. For additional information, refer to paragraph 5.8.1.

3.3.5.2 Servo Offset

This key instructs the drive to move the write/read head to either a Normal, Positive, or Negative servo offset position (specified by entering **<0>**, **<1>**, or **<2>**, respectively), to allow recovery of marginal data. Servo offset increments are determined by the drive. For details, refer to paragraph 5.8.2.

3.3.5.3 Drive Number

Used to select a specific drive for testing. Valid drive numbers are 0-3. These numbers correspond directly to the "B" cable numbers on the Analyzer's rear panel. Refer to 5.3 for details.

3.3.5.4 Special Set

This key is not used.

3.3.6 Measure Keys

Four Measure keys (Figure 3-5) allow you to measure and display the selected drive's fundamental parameters. The keys are:

- Seek Time
- Idx/Sec Time
- Drive Status
- Special Measure (not used)

When a Measure key is pressed, a prompt appears in the display requesting additional information. Shown with each prompt is a current value, which may be retained by pressing **<Enter/Next>** directly. Alternatively, you may enter a new value and then press **<Enter/Next>**.

3.3.6.1 Seek Time

Measures the time, to thousandths of a millisecond, from the time a Seek command is issued (via 'TAG 1) until the drive indicates an "ON CYLINDER" condition. For details, refer to paragraph 6.4.3.

3.3.6.2 Idx/Sec Time

Measures the time interval, to thousandths of a millisecond, between leading edges of the index signal, and the leading edge of the index and first sector pulse. Refer to paragraph 6.4.2.

3.3.6.3 Drive Status

Displays the logic levels (true/false) on the basic drive status signal lines: Plug Number, Drive Select, Ready, Index A, Index B, On Cylinder, Seek End, Sector A, Sector B, Fault, Seek Error, Write Protect, Sector Count, Tag 4, and Tag 5. **<Enter/Next>** is used to sequence through each status signal display. For details, refer to paragraph 6.4.1.

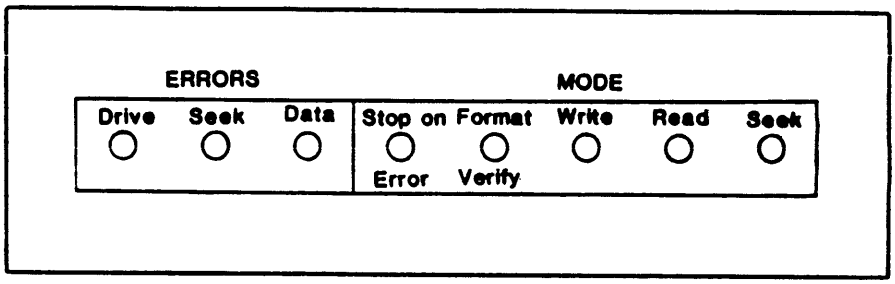
3.3.6.4 Special Measure

This key is not used.

3.4 LED INDICATORS

The Analyzer contains five green **"Mode"** and three red **"Error"** LEDs (Figure 3-6) which indicate current operation and status.

Figure 3-6
Error and Mode LED Indicators



3.4.1 Mode Indicators

Five green LED indicators in the MODE field describe the current operation of the Analyzer. They are:

- Stop on Error
- Format/Verify
- Write
- Read
- Seek

3.4.1.1 Stop on Error

This LED indicates that the Stop-on-Error feature is enabled; that is, the Analyzer will halt the current operation when it detects the number of errors specified. This LED may be lit in addition to other indicators.

3.4.1.2 Format/Verify

Indicates that the Analyzer is currently formatting a track of the selected drive. Format consists of writing header and data fields.

3.4.1.3 Write

Indicates that the Analyzer is currently writing data onto the selected drive.

3.4.1.4 Read

Indicates that the Analyzer is currently reading data from the selected drive.

3.4.1.5 Seek

Indicates that the Analyzer is currently performing a seek operation.

3.4.2 Error Indicators

Three red LED indicators in the ERROR field indicate types of errors detected by the Analyzer in the selected drive. They are:

- Drive Error
- Seek Error
- Data Error

3.4.2.1 Drive Error

Indicates one of the following conditions:

- The desired drive cannot be selected.
- A Drive Fault has been detected.
- The selected drive is not ready.
- Absence of an index pulse from the selected drive.

3.4.2.2 Seek Error

Indicates one of the following conditions:

- Absence of a true signal on the Seek Complete line for a specified time after a seek has been initiated.
- The Analyzer cannot recalibrate the drive seek mechanism.
- The header read did not compare with the expected header (cylinder or head number).
- The drive indicated that a seek error occurred.

3.4.2.3 Data Error

Indicates that the data read from the disk does not compare with the data expected (read operations only).

CHAPTER 4

INSTALLATION GUIDELINES

4.1 GENERAL

This chapter describes the following installation procedures:

- o Connecting disk drives to the MWX-1000S Analyzer.
- o Connecting a printer for output of test results.

Also provided are pin assignments for the drive and printer interface cables.

4.2 CONNECTING DRIVES TO THE ANALYZER

The Analyzer will accommodate the connection of up to four (4) SMD disk drives, any one of which may be independently selected through the front panel for analysis. When a daisy-chain configuration is employed for testing multiple drives, the Analyzer will perform asynchronous sequential testing of each drive in the chain.

Drive power may be supplied by the Analyzer for single drive connections only. Power for a multiple drive configuration must be supplied by the user.

A simplified diagram of the rear panel interface connectors is provided in Figure 4-1. The connection of a single drive is illustrated in Figure 4-2, and a multiple drive connection is shown in Figure 4-3.

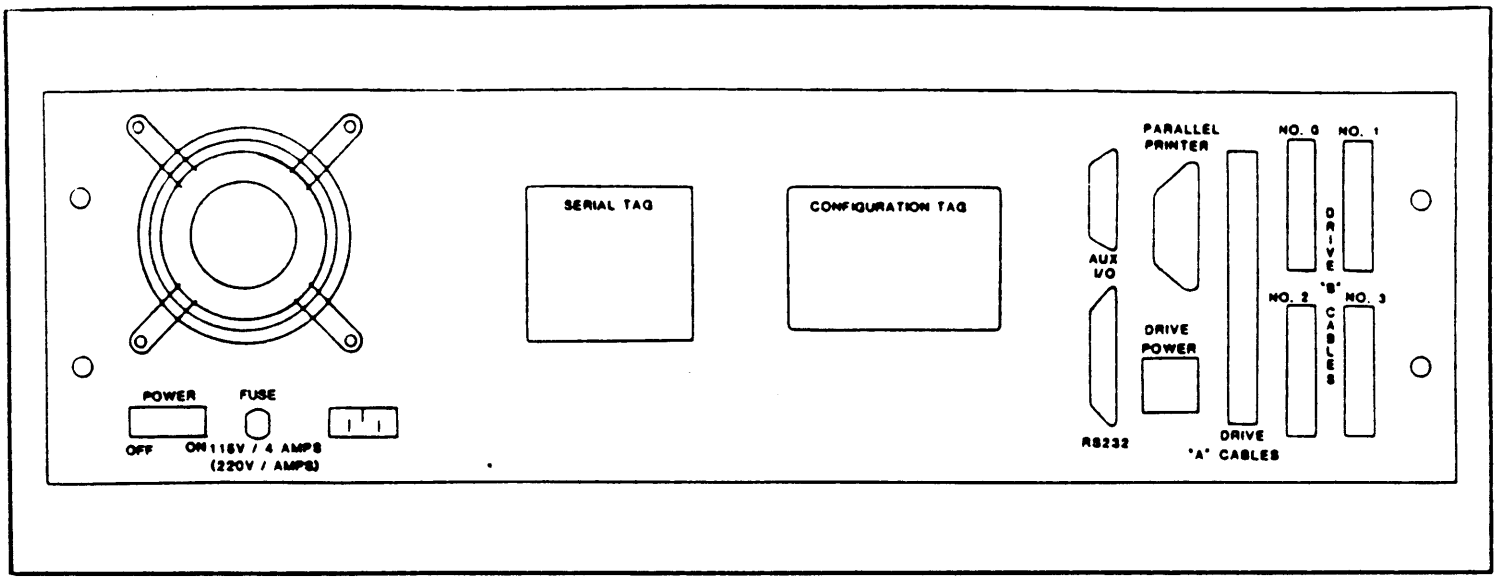
To connect disk drives to the Analyzer:

1. Connect a 26-conductor radial "Data" cable (Part No. 700478) from J2 of each disk drive under test to one of the four 26-pin edge connectors ("labeled B") on the rear panel of the Analyzer .

2. Connect the 60-conductor daisy-chain "Control" cable (Part No. 700477) from the 60-pin connector (labeled "A") on the rear of the Analyzer to J1 of the first drive in the daisy-chain configuration.

3. Continue linking the 60-conductor daisy-chain cable to J1 of each drive, as shown in Figure 4-3.

Figure 4-1
MWX-1000S Interface Connectors (Rear Panel)



4. Terminate the daisy-chain cable at the last drive only, per drive manufacturer specifications. Normally, termination is accomplished by installing a resistor pack in a socket provided on the drive interface board.

5. If only one drive is being tested and power is being drawn from the Analyzer, connect the power cable (Part No. 100445) from the **"DRIVE POWER"** connector on the rear of the Analyzer to the appropriate connector on the drive. (Note that the Analyzer provides +12V/+5V only.)

   If multiple drives are being tested, connect them to an appropriate external power source.

6. Plug the Analyzer's AC power cord into a standard 115 VAC/60 Hz wall outlet (or 220 VAC/50 Hz, if applicable).

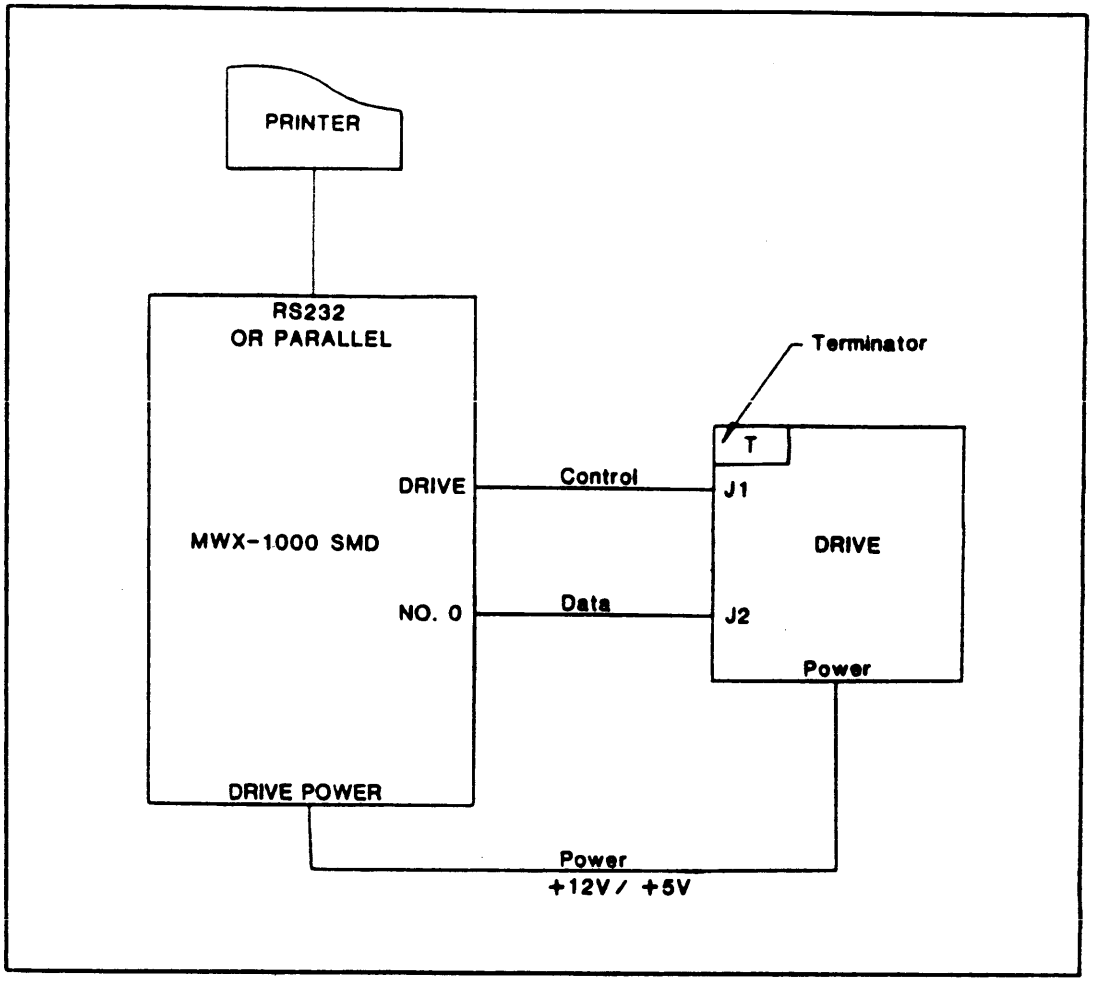
7. Place the AC **"POWER"** switch on the rear of the Analyzer in the **"ON"** position. The alphanumeric display should illuminate and show the prompt **"MWX-1000S READY."**

8. If more than one drive is connected, apply power to the drives as described in the drive manufacturer's documentation.

The Analyzer and connected disk drives are now ready for testing.

Prior to drive testing, however, you should connect a printer to output a hardcopy of test results, as described in paragraph 4.3.

Figure 4-2
Single Drive Connection



4.3 CONNECTING A PRINTER TO THE ANALYZER

To provide an output of test results, an EIA RS-232-C serial or Centronics-type parallel interfaced printer may be connected to the Analyzer. If a printer is not available, you may connect another output device such as a video monitor for the display of test results. In most applications, however, the use of a printer is recommended.

To connect a printer to the Analyzer:

1. If an EIA serial interface printer is used for the output of test results, connect a standard 25-conductor interface cable from the DB-25 connector labeled

"RS232" on the rear of the Analyzer to the appropriate connector on the printer.

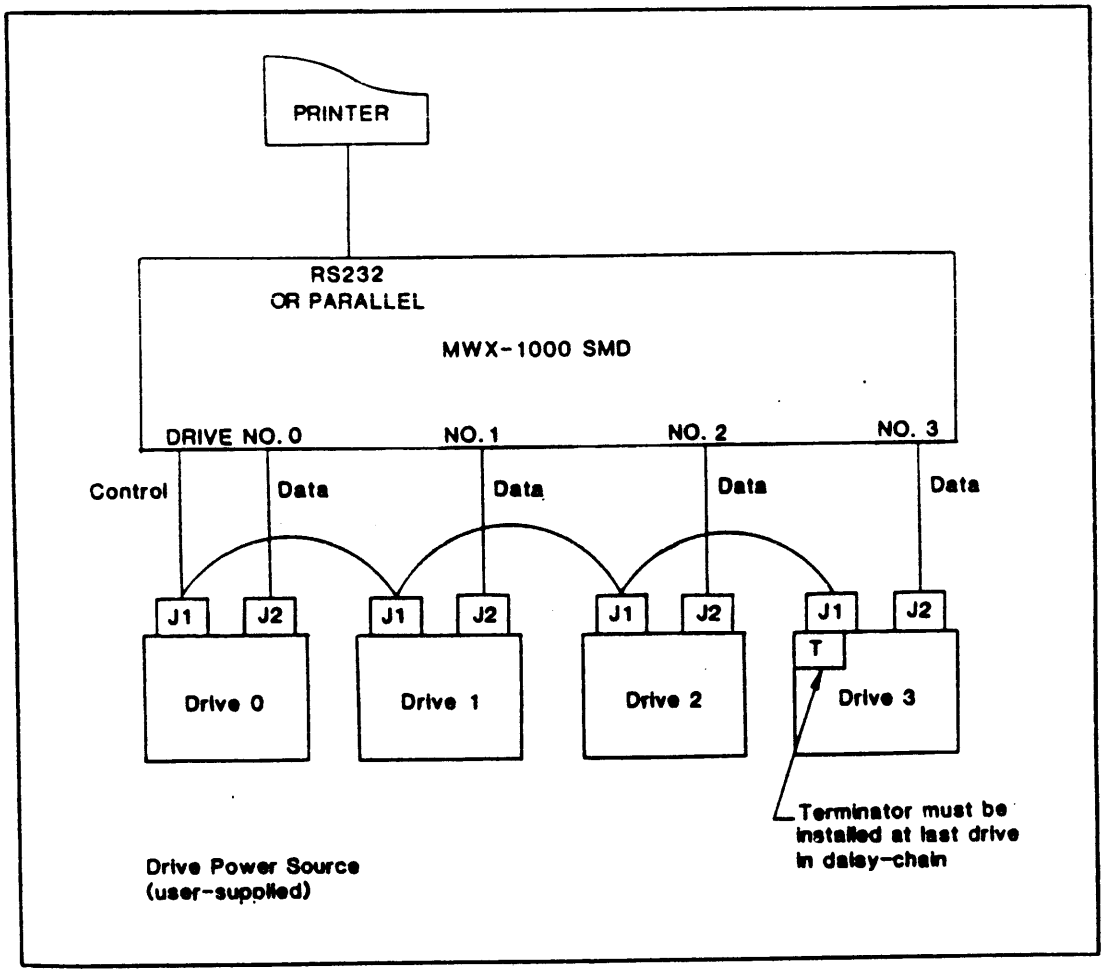
2. If a Centronics-compatible parallel interface printer is used, connect the provided 36-conductor interface cable (Part No. 701154) from the 36-pin Amphenol-type connector labeled **"PARALLEL PRINTER"** on the rear of the Analyzer to the appropriate connector on the printer.

3. To ensure communications between the Analyzer and printer, configure various printer parameters (e.g., interface type, baud rate, etc.) via Function 20, as described in paragraph 7.2.21.

4. Connect the printer power cord to an appropriate power source and power-on the printer as described in the printer manufacturer's documentation.

Pin assignments for the RS-232-C serial and parallel printer interfaces are provided in paragraph 4.4.

Figure 4-3
Multiple Drive Connection



4.4 INTERFACE CABLE PIN ASSIGNMENTS

The following diagrams illustrate the signal direction and connector pin assignments for the two SMD drive interface cables; that is, the 60-conductor daisy-chain Control "A" cable (Figure 4-4) and the 26-conductor radial Data "B" cable (Figure 4-5). Also provided are pin assignments for the EIA RS-232-C serial printer interface (Figure 4-6) and Centronics-compatible parallel printer interface (Figure 4-7).

Figure 4-4
Drive Interface Control "A" Cable Pin Assignments

			Low	High		
		Tag 1	1	31	----->	
		Tag 2	2	32	----->	
		Tag 3	3	33	----->	
		Bus 0	4	34	----->	
		Bus 1	5	35	----->	
		Bus 2	6	36	----->	
		Bus 3	7	37	----->	
		Bus 4	8	38	----->	
		Bus 5	9	39	----->	
		Bus 6	10	40	----->	
		Bus 7	11	41	----->	
		Bus 8	12	42	----->	
		Bus 9	13	43	----->	
		Open Cable Detect	14	44	----->	
MWX	<-----	Fault	15	45		**DRIVE**
	<-----	Seek Error	16	46		
	<-----	On Cylinder	17	47		
	<-----	Index	18	48		
	<-----	Unit Ready	19	49		
	<-----	Address Mark Found	20	50		
		Not Used	21	51		
		Unit Select Tag	22	52	----->	
		Unit Select 0	23	53	----->	
		Unit Select 1	24	54	----->	
	<-----	Sector	25	55		
		Unit Select 2	26	56	----->	
		Unit Select 3/Tag 5	27	57	----->	
	<-----	Write Protected	28	58		
		Not Used	29	59		
		Tag 4	30	60	----->	

Figure 4-5
Drive Interface Data "B" Cable Pin Assignments

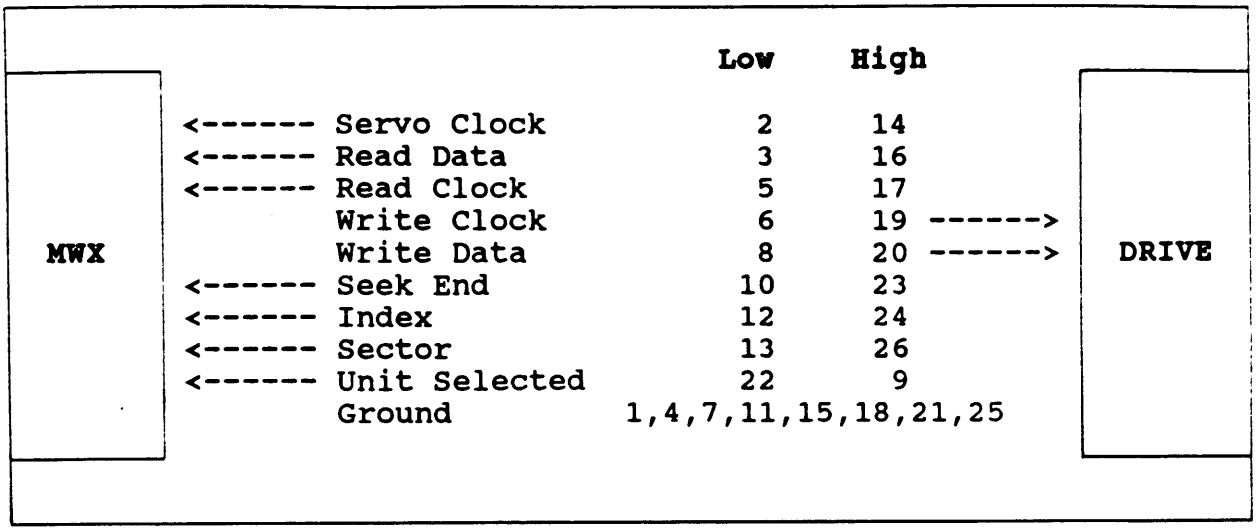
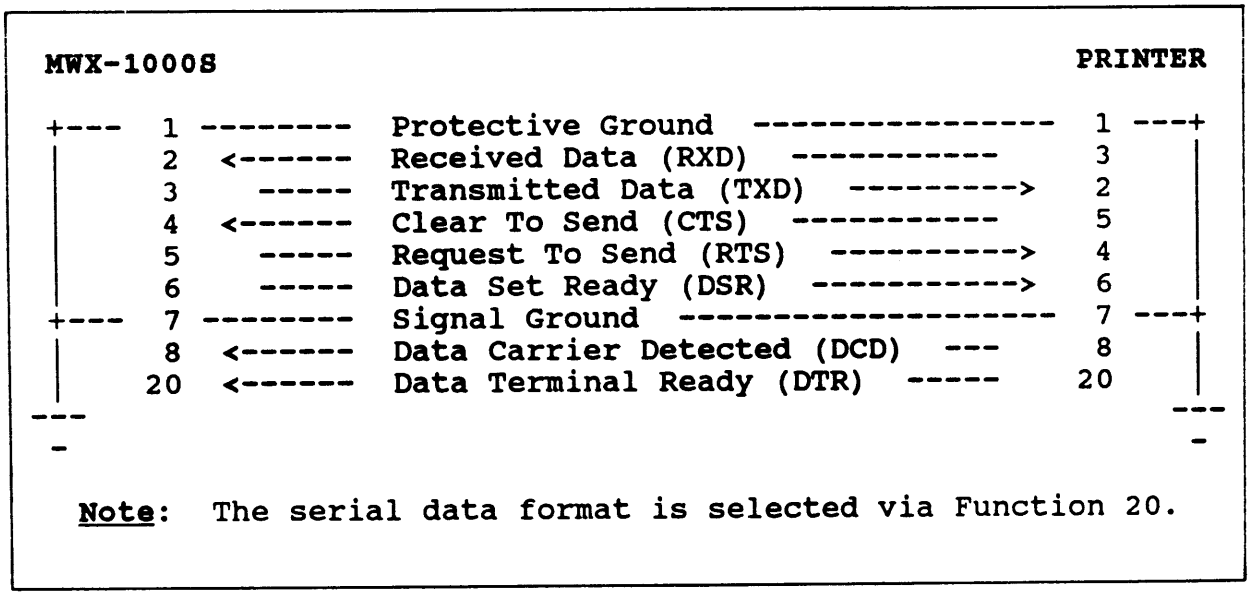
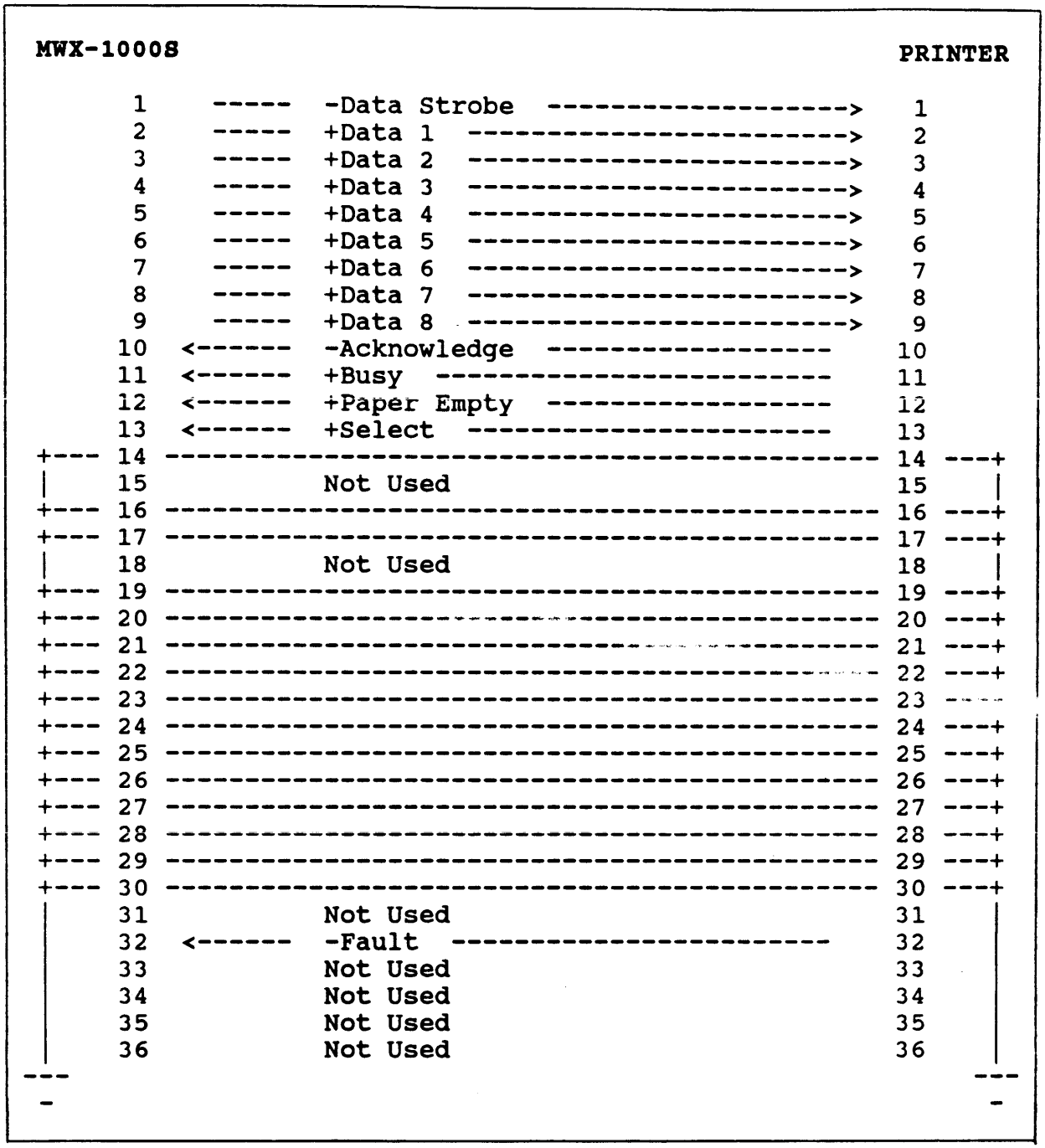


Figure 4-6
EIA RS-232-C Serial Printer Interface



Note: The serial data format is selected via Function 20.

Figure 4-7
Centronics-Type Parallel Printer Interface



CHAPTER 5

INITIAL SET-UP PROCEDURES

5.1 INTRODUCTION

Once you've installed the Analyzer and drives as described in Chapter 4, you should perform a variety of initial set-up procedures to check the status and configuration of the Analyzer and connected drives prior to testing. The following items are discussed in this chapter:

- Setting the Analyzer's battery-backed calendar clock.
- Selecting a drive for test (set drive number).
- Printing Analyzer function names and status.
- Configuring the Analyzer for a specific drive type.
- Printing drive configuration data.
- Specifying "stop-on-error" or test abort limits.
- Setting various optional test parameters such as data strobe offset and servo offset.

These items are described in detail in the following paragraphs.

5.2 SET THE CALENDAR CLOCK

The Analyzer contains a battery-backed calendar clock which provides an accurate time-stamp for printed test reports. Upon receipt of the test unit, you should set the clock with the Function 10; that is, press **<Function>**, **<10>**, and **<Enter/Next>**, and enter the appropriate information in response to the following prompts:

HOUR	**DAY**
MINUTE	**MONTH**
SECOND	**YEAR**

Make sure you press **<Enter/Next>** after each entry to store the values in CMOS.

5.3 SELECT A DRIVE FOR TEST (SET DRIVE NUMBER)

To enable communication between the Analyzer and one of the four connected disk drives, the desired drive must be selected via the "Set Drive Number" procedure. Only one drive may be selected at a time. Once the drive is selected, it can recognize and respond to commands from the Analyzer.

Each drive should be assigned a unique drive select code, according to the instructions in the drive manufacturer's manual. However, these drive select codes are not directly used by the Analyzer to select a drive.

A drive is selected by pressing **<Drive Number>** and specifying the number (0-3) which corresponds to the 26-pin "B" Drive Connector on the rear of the Analyzer to which the drive is attached. On all printouts, the "B" value entered is used as the logical drive number. When a particular drive is selected for an operation, the Analyzer automatically locates the physical drive address.

To select a drive for test:

1. Verify that each drive has been assigned a select code that is different from the codes assigned to the other drives attached to the Analyzer.

2. Press **<Drive Number>**.

3. Enter the number (0-3) of the "B" connector to which the drive is connected, followed by **<Enter/Next>**.

This procedure should be repeated every time you want to run a test on a drive that is not currently selected by the Analyzer.

5.4 PRINT ANALYZER FUNCTION STATUS

The Analyzer provides numerous special functions in battery-backed CMOS ROM which should be configured prior to initiating drive tests. To check the current setting of the functions which might affect drive operations, use Function 0 to output a list of all functions to the printer. Upon initial power-up, the default function status will be printed. (Remember to configure the Analyzer for your printer via Function 20.)

To print Analyzer function status, simply press **<Function>**, **<0>**, and **<Enter/Next>**. A sample function status report is shown below. The initial default values are provided.

```
TESTER STATUS

MWX-1000S   Z01.06/X01.03

TIME-09:12:45  DATE-09MAR87

FUNCTION    DESCRIPTION                                STATUS      MODE
    0       PRINT TESTER STATUS                                     C
    1       PRINT USER PROGRAM                                      C
    2       SET # DRIVES                                  1           P
    3       DISPLAY FIRMWARE VERSION          Z01.06 X01.03         C
    4       SET TEST STATION NUMBER             00000000            C P
    5       LOOP ON SAME TRACK                      0FF             C P
    6       PRINT ERROR STATUS DURING PGM 00         ON             C
    7       PRINT TEST STATUS DURING PGM 00          ON             C
    8       ENTER/ALTER DRIVE CONFIGURATION                         C
    9       DELETE DRIVE CONFIGURATION                              C
   10       SET TIME & DATE                                         C
   11       ENABLE/DISABLE BAD TRACK TABLE           ON             C P
   12       ENABLE/DISABLE ERROR STATUS             OFF             C P
   13       ENABLE/DISABLE STOP ON ERROR            OFF             C P
   14       ENABLE/DISABLE TRACK LOCKOUT             ON             C P
   15       ENTER TRACK LOCKOUT VALUES                              C
   16       DELETE TRACK LOCKOUT ENTRY                              C
   17       ENABLE/DISABLE CYLINDER MODE            OFF             C P
   18       DUPLICATE ERRORS IN ERROR STATUS         ON             C P
   19       DISPLAY DRIVE POSITION                                  C
   20       CONFIGURE PRINTER                  PAR   ON             C
   21       SKIP IF FLAG TRUE                                        K
   22       SKIP IF FLAG FALSE                                       K
   23       SOFT ERRORS PRINTED IN BAD TRACK TABLE  OFF             C
   24       SET DRIVE CONFIG                                          P
   25       DISPLAY BAD TRACK TABLE                                 C
   26       BTT KEYBOARD ENTRY/UPDATE                               C P
   27       DELETE BTT ENTRY                                        C P
   28       CONVERT ERRORS TO BYTES FROM INDEX      OFF             C P
   29       PRINT DRIVE CONFIGURATIONS                              C
   30       DELAY (X 100 MSEC)                                       K
   31       GET PGM 31-35 DATA PATTERN              6DB             C P
   32       SELECT FLAW MAP TYPE                     0              C P
   33       SET LOOP COUNT FOR PGM 33                1              C P
   34       SET LOOP COUNT FOR PGM 34              200              C P
   35       ENABLE/DISABLE STROBES IN PGM 33        OFF             C
   36       ENABLE/DISABLE SERVO OFFSETS IN PGM 33  OFF             C
   37       ENABLE/DISABLE MEASURE SEEK DELAY        ON             C
```

Verify that the function settings are suitable for your drive test application. If not, change the status of the functions in question before attempting to test your drive.

It is important to understand that the "MODE" designations "C" (Console), "P" (Program), and "K" (Keyboard Extension) merely indicate the Analyzer mode from which the particular function can be accessed; they do not necessarily specify the mode in which the function is used.

For example, some functions (e.g., 31, 35, 36) which can be accessed through the console mode are useful only during execution of Special and User Programs. Other functions (e.g., 2, 21, 22, 24, 30) are not available through the console mode at all, but must be "called" as individual User Program statements.

For a detailed description of all available MWX-1000S functions, refer to Chapter 7.

5.5 CONFIGURE THE ANALYZER FOR DRIVE TYPE

Before the MWX-1000S can properly perform basic test operations on the connected disk drive, it must be configured for a variety of drive and test parameters. This is accomplished via the "Drive Configuration" process, which is the most important of all of the initial set-up procedures discussed in this chapter.

The Analyzer allows you to create 100 unique drive configuration "files" to match the parameters of the drive types to be tested. All of these drive configuration files are assigned a number and stored in the Analyzer's non-volatile CMOS RAM. When a specific configuration is required, it can quickly be called by pressing <Drive Config> and selecting the corresponding two-digit number, rather than stepping through the lengthy prompt/response sequence every time you want to use a different configuration.

This feature is especially useful when a unique drive configuration is required for a User Program, or when running Special Program 0 or 10.

Of the 100 drive configuration files, 99 are created and modified through Function 8, as described in paragraph 7.2.9. Numbers 01-99 are reserved for these drive configurations.

The one remaining configuration is designated Number 00. This drive configuration file may be modified through the Console mode without the use of Function 8.

The actual configuration process is identical, regardless of the number you assign to a particular configuration file. You are

required to enter the appropriate parameter information in response to various prompts appearing in the display. Each prompt includes a default value, which may be retained by pressing **<Enter/Next>** directly, or changed by entering a new value before pressing **<Enter/Next>**.

NOTE

If multiple drives of mixed configurations are tested by the Analyzer in a daisy-chain fashion, the parameters of the smallest drive (e.g., lowest head and cylinder) must be entered as the configuration data for all of the drives. As a result, only portions of the larger capacity drives are actually tested.

The following paragraphs provide the information necessary to configure the Analyzer for a specific drive type. The information is divided into the following two sections:

- Configuring the Analyzer for a single sector drive.
- Configuring the Analyzer for a multiple sector drive.

5.5.1 Single Sector Drive Configuration

To configure the MWX-1000S for a single sector drive, simply press **<Drive Config>** and enter the appropriate parameter value in response to the configuration prompts. As usual, press **<Enter/Next>** after each display and parameter entry. The single-sector mode configuration prompts are shown below:

Prompt	Description
DRV CONFIG	Drive configuration number Configuration #00 is the only drive configuration which may be modified without first selecting Function 8. Refer to 7.2.9 for details.
INTERFACE	Drive interface type **0** = SMD interface **1** = CMD interface (cartridge) **2** = SMD-E interface

SINGLE SECTR Enable single sector mode

Enter **<Yes>** to select the single sector mode.

FORMAT TYPE Format type

0 = soft sector
1 = hard sector

See Figure 5-1 for SMD soft and hard sector formats.

NUMBER TAGS Number of "tags" supported by drive

3 = standard SMD
4 = compatible w/NEC D22X6 Series
5 = compatible with Fujitsu Eagle
6 = compatible with Fujitsu with extended status

SFT = HRD Number of soft errors needed to flag a hard error

INDEX CBL Index pulse on A or B cable

0 = both A and B cables
1 = A cable only
2 = B cable only

SECTOR CBL Sector pulse on A or B cable

0 = both A and B cables
1 = A cable only
2 = B cable only

FRST CYL First cylinder number

LAST CYL Last cylinder number (4095 maximum)

FIRST HEAD First head number

This prompt appears for SMD type drives only (as specified above).

FRST RMV HEAD First removable head number

This prompt appears for CMD type drives only. Typically, a value of "**0**" should be specified.

LAST HEAD Last head number (SMD only)

LAST RMV HEAD Last removable head number (CMD only)

Typically, a value of "**0**" or "**1**" should be specified.

FRST FXD HEAD First fixed head number (CMD only)

On CMD drives, 16 is designated as the standard address for the first fixed head. Therefore, enter "**16.**"

LAST FXD HEAD Last fixed head number (CMD only)

Since 16 is assigned as the first fixed head address, add the total number of fixed heads (minus one) to 16. For example, if the drive contains 3 fixed heads, enter "**18**" as the last fixed head address.

BYTES/TRCK Number of unformatted bytes per track

HEADER CRCS Enable header CRCs (Yes/No)

Since each byte is verified individually, header CRCs are not necessary to verify the media. If header CRCs are not used, the time normally spent verifying media will be decreased.

HEADER SYNC Hexadecimal value of header sync byte

DATA SYNC Hex value of data field sync byte

INDEX GAP Number of bytes in the gap between the index pulse and the first address mark (see CAUTION below)

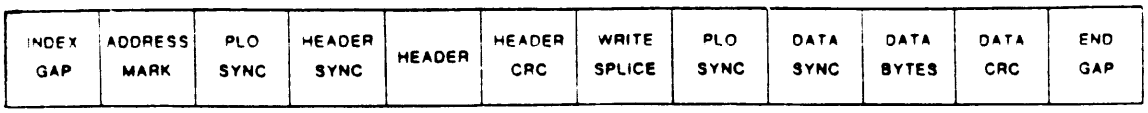
BYTES/PLO Number of bytes in PLO sync field

CAUTION

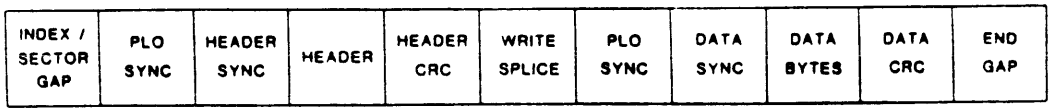
TO BYPASS THE EXISTING MEDIA DEFECT MAP LOCATIONS DURING DRIVE TESTS, THE NUMBER OF BYTES IN THE INDEX GAP MUST BE SET TO "165" OR GREATER; OTHERWISE THE EXISTING DEFECT MAP WILL BE DESTROYED.

Figure 5-1
SMD Soft/Fixed Sector Formats

SOFT SECTOR



FIXED SECTOR



INDEX/SECTOR GAP The number of bytes is set in the drive configuration; data is always zero.

ADDRESS MARK Pseudo sector pulse (soft sector format only).

PLO SYNC The number of bytes is set in the drive configuration; data is always zero.

HEADER SYNC One-byte field used for synchronization; data is set in drive configuration.

HEADER Five-byte field where the cylinder, head, and sector numbers are stored.

HEADER CRC Two-byte Cyclic Redundancy Check character.

WRITE SPLICE Write splice area; data is always zero.

DATA SYNC One-byte field used for synchronization; data is set in drive configuration.

DATA BYTES Data field; number of bytes is set in the drive configuration.

DATA CRC	Two-byte Cyclic Redundancy Check character.
END GAP	Gap where no data is written.

5.5.2 Multiple Sector Drive Configuration

To configure the MWX-1000S for a multiple sector drive, press **<Drive Config>** and enter the appropriate parameter value in response to the configuration prompts. Remember to press **<Enter/Next>** after each display and parameter entry. The multiple sector mode configuration prompts are shown below:

Prompt	Description
DRV CONFIG	Drive configuration number Configuration #00 is the only drive configuration which may be modified without first selecting Function 8. Refer to 7.2.9 for details.
INTERFACE	Drive interface type **0** = SMD interface **1** = CMD interface (cartridge) **2** = SMD-E interface
SINGLE SECTR	Enable single sector mode Enter **<No>** to disable the single sector mode and select the multiple sector mode.
FORMAT TYPE	Format type **0** = hard sector 1 **1** = hard sector 2 (embedded servo) See Figure 5-1 for an illustration of the SMD fixed sector format.
NUMBER TAGS	Number of "tags" supported by drive **3** = standard SMD **4** = compatible w/NEC D22X6 Series **5** = compatible with Fujitsu Eagle **6** = compatible with Fujitsu with extended status
SFT = HRD	Number of soft errors needed to flag a hard error

INDEX CBL Index pulse on A or B cable

0 = both A and B cables
1 = A cable only
2 = B cable only

SECTOR CBL Sector pulse on A or B cable

0 = both A and B cables
1 = A cable only
2 = B cable only

FRST CYL First cylinder number

LAST CYL Last cylinder number (4095 maximum)

FIRST HEAD First head number

This prompt appears for SMD type drives only (as specified above).

FRST RMV HEAD First removable head number

This prompt appears for CMD type drives only. Typically, a value of **"0"** should be specified.

LAST HEAD Last head number (SMD only)

LAST RMV HEAD Last removable head number (CMD only)

Typically, a value of **"0"** or **"1"** should be specified.

FRST FXD HEAD First fixed head number (CMD only)

On CMD drives, 16 is designated as the standard address for the first fixed head. Therefore, enter **"16."**

LAST FXD HEAD Last fixed head number (CMD only)

Since 16 is assigned as the first fixed head address, add the total number of fixed heads (minus one) to 16. For example, if the drive contains 3 fixed heads, you should enter **"18"** as the last fixed head address.

FIRST SECTOR First sector number

Typically, a value of "0" or "1" should be specified.

LAST SECTOR Last sector number

BYTES/SCTR Unformatted bytes per sector

HEADER CRCS Enable header CRCs (Yes/No)

Since each byte is verified individually, header CRCs are not necessary to verify the media. If header CRCs are not used, the time normally spent verifying media will be decreased.

HEADER SYNC Hexadecimal value of header sync byte

DATA SYNC Hex value of data field sync byte

IDX/SEC GAP Number of bytes in the gap between the index or sector pulse and the PLO sync field

BYTES/PLO Number of bytes in PLO sync field

5.6 PRINT DRIVE CONFIGURATION DATA

After you've defined a configuration for your drive, you might want to produce a reference copy of the information by outputting the configuration data to the printer. This can be accomplished by activating either Function 29 or Special Program 49. Function 29 will print ALL of the configurations which reside in CMOS, while Special Program 49 will print only the currently active configuration.

To print all drive configurations, press **<Function>**, **<29>**, and **<Enter/Next>**. To print the current configuration only, press **<Function>**, **<49>**, **<Enter/Next>**, and **<Single RUN>**. A sample is provided below.

DRIVE CONFIGURATION 00			
INTERFACE	SMD	FORMAT TYPE	SOFT
NUMBER TAGS	3	SOFT=HARD	3
INDEX CABLE	A	SECTOR CABLE	BOTH
FIRST CYLINDER	0	LAST CYLINDER	822
FIRST HEAD	0	LAST HEAD	9
FIRST SECTOR	1	LAST SECTOR	32
BYTES/SECTOR	650	HEADER CRCS	NO
HEADER SYNC	09	DATA SYNC	0E
INDEX/SECTOR GAP	16	BYTES/PLO	11

Although SMD drive configuration parameters are described briefly in various sections of this manual (e.g., 5.5), you should refer to the appropriate drive manufacturer's manual for details regarding specific configuration parameters.

5.7 SET STOP-ON-ERROR LIMITS

Another initial set-up procedure is the selection of "stop-on-error" limits. The stop-on-error facility allows you to instruct the Analyzer to abort operations on the current drive after the specified number of errors (e.g., hard, soft, format, etc.) have been detected.

NOTE

Function 13 must be enabled for the Analyzer to "stop on error." When Function 13 is off, the Analyzer will never abort a test as a result of the types of errors listed below.

To select the desired stop-on-error parameters, simply press **<Stop on Error>** and respond to the prompts displayed by the Analyzer, as listed below. Follow each parameter entry with **<Enter/Next>**.

Prompt	Description
TOTAL HARD	Hard errors per drive
TOTAL SOFT	Soft errors per drive
TOTAL FMT	Format errors per drive
SOFT/HEAD	Soft errors per head
HARD/HEAD	Hard errors per head
TOT TRK ERR	Track errors per drive
TOTAL HD ERR	Head errors per drive
TOTAL FAULTS	Drive fault conditions
TOTAL SK ERR	Seek errors per drive
INDEX LOW	Minimum time (ms) between index pulses
INDEX HI	Maximum time (ms) between index pulses
SECTOR LOW	Minimum time (ms) between sector pulses
SECTOR HI	Maximum time (ms) between sector pulses

5.8 SET OPTIONAL TEST PARAMETERS

In addition to the required and recommended Analyzer set-up procedures, you may find the need to specify a variety of optional test parameters prior to executing drive tests. The following paragraphs describe two of these optional settings:

- o Set Data Strobe Offset
- o Set Servo Offset

All parameters selected are stored in non-volatile CMOS and will change only when you perform another set parameter operation.

5.8.1 Set Data Strobe Offset

This procedure allows you to set the desired data strobe offset value for Console mode read operations. You may select either a normal, early, or late offset value. The offset increments are defined by the drive manufacturer.

To set the data strobe offset:

1. Press **<Data Stb Offset>**.

2. Select the desired data strobe offset, as follows:

   0 = normal
   1 = early
   2 = late

3. Press **<Enter/Next>**.

5.8.2 Set Servo Offset

This procedure allows you to specify the desired servo offset value for Console mode read operations. You may select either a normal, plus, and minus offset value. The offset increments are defined by the drive manufacturer.
To set the servo offset:

1. Press **<Servo Offset>**.

2. Select the desired servo offset, as follows:

   0 = normal
   1 = plus
   2 = minus

3. Press **<Enter/Next>**.

CHAPTER 6

BASIC DRIVE OPERATIONS

6.1 GENERAL

This chapter describes the different types of operating modes, and the procedures necessary to perform basic drive operations and test procedures.

6.2 OPERATION MODES

The Analyzer is used in one of following basic operation modes:

- Console Mode
- User Program Mode

The **Console** mode is the basic operation mode from which all test procedures are initiated. The Analyzer is placed into the Console mode after a power-on or **<Reset>**. While in this mode, all Operation and Measure key operations are executed immediately.

In addition, the Console mode is used to execute any of the numerous factory-written Special Programs or user-generated programs.

The **Program** mode enables you to design, write, and edit custom User Programs for specific drive test applications. The User Programs are stored in the Analyzer's CMOS RAM for execution at a later time (via the Console mode).

The procedures for initiating basic Console mode operations are provided in this chapter. Since Special and User Programs are actually run through the Console mode, they are also mentioned in this chapter. However, because these Program features are such important test facilities and require detailed explanations, two chapters are dedicated for this purpose. Refer to Chapter 8 for Special Program information, and to Chapter 9 for guidelines and examples on implementing User Programs.

6.3 OVERVIEW OF BASIC DRIVE OPERATIONS

The Analyzer may be used to perform several operations on the connected drive. These operations are described in the following paragraphs. Each procedure should be initiated from the **"MWX-1000S READY"** prompt, which is obtained by pressing **<STOP/End>** or **<Reset>**.

- **Measure Operations**
  - Drive Status
  - Index/Sector Time
  - Seek Time
- **Write/Read Data Operations**
  - Format/Verify
  - Write/Read
  - Write Only
  - Read Only
- **Seek Operations**
  - Seek the Heads to a Specific Cylinder
  - Seek the Heads In
  - Seek the Heads Out
  - Oscillating Seek
  - Random Seek
- **Miscellaneous Operations**
  - Return the Heads to Zero
  - Select a Specific Head
  - Increment Head Number
  - Execute a Function
  - Display Time and Date
  - Print Drive Defect Map
- **Program Operations**
  - Run a Special Program
  - Run a User Program

6.4 MEASURE OPERATIONS

The Analyzer will perform a variety of operations which "measure" pertinent drive characteristics and capabilities. The operations are invoked by activating the appropriate keys in the **MEASURE** field on the front control panel. Results obtained from the operations are shown in the alphanumeric display.

The following measure commands are available:

- Drive Status
- Index/Sector Time
- Seek Time

The following paragraphs describe the procedures required to initiate these measure operations.

6.4.1 Measure Drive Status

This operation measures the level on the interface signal lines from the currently selected drive, and displays the results in the format shown below.

To measure drive status, simply press **<Drive Status>**. In response to the prompt **"MEA DRV STS,"** press **<Single RUN>**. Then, sequence through all interface status signals by pressing **<Enter/Next>** after each display. You may interrupt the process at any time by pressing **<STOP/End>** or **<Reset>**.

The following drive status signals are measured and displayed:

Status Display		Description
PLUG NUMBER	**0-15**	Drive unit select code
SELECT	**YES/NO**	Drive selected
READY	**YES/NO**	Drive ready
INDEX A	**YES/NO**	Index pulse on A cable
INDEX B	**YES/NO**	Index pulse on B cable
ON CYLINDER	**YES/NO**	Heads are positioned over track
SEEK END	**YES/NO**	Seek operation complete
SECTOR A	**YES/NO**	Sector pulse on A cable
SECTOR B	**YES/NO**	Sector pulse on B cable
FAULT	**YES/NO**	Drive fault
SEEK ERROR	**YES/NO**	Error during seek
WRITE PROTCT	**YES/NO**	Write protect enabled

SECTOR COUNT	**nn**	Physical (fixed) sectors (NOTE)
BIT 8T 9F	**nn**	Vendor defined drive status information which is displayed only when Tag 4 is enabled.
BIT 8F 9T	**nn**	
BIT 8T 9T	**nn**	
TAG 4T 5F	**nn**	Vendor defined drive status information which is displayed only when Tags 4/5 are enabled.
TAG 4F 5T	**nn**	
TAG 4T 5T	**nn**	
TAG 0T 1F	**nn**	Extended status provided when Tag 6 is selected.
TAG 0F 1T	**nn**	

NOTE

The sector count is determined by the number of sector pulses received from the drive between successive index pulses. To obtain a true count, it is important to realize that the last sector may be a small or "runt" sector. As a result, the actual sector count may be the total number of sectors minus one.

If desired, you may output the drive status results to the printer by running Special Program 50, as described in Chapter 8.

6.4.2 Measure Index/Sector Time

This operation measures and displays the time (in milliseconds) between the leading edge of two consecutive index pulses and the time between index and the first sector pulse. Also shown is the drive number for each Index/Sector Time measurement.

1. Press **<Idx/Sec Time>**.

2. Press **<Single RUN>** to measure and display the Index and Sector Time once only. Press **<RUN Cont>** to repeatedly measure and display Index and Sector Time, until **<STOP/End>** is pressed.

6.4.3 Measure Seek Time

This operation measures and displays the time required to seek the specified number of cylinders. The time is measured from the falling edge of the drive interface signal TAG 1 to the leading edge of ON CYLINDER.

1. Press **<Seek Time>**. The display will prompt:

   DIRECTION

2. Respond to the prompt by entering a **"0"** (IN) or **"1"** (OUT) to specify the direction of the seek operation.

3. Press **<Enter/Next>**. The display will show:

   MEA SEEK n TK

   n = number of tracks

4. Enter the number (n) of tracks to seek across for each Seek Time measurement, followed by **<Enter/Next>**.

5. Press **<Single RUN>** to measure once and display the Seek Time required to seek across the specified number of tracks.

   Press **<RUN Cont>** to repeatedly measure and display the time to seek across "n" tracks until **<STOP/End>** is pressed.

The display will show time, to thousandths of millisecond, to move the heads the selected number of tracks along with the end cylinder number for each seek measurement.

6.5 WRITE/READ DATA OPERATIONS

The Analyzer will perform numerous operations which "write/read" data to and from the selected drive. The operations are initiated by activating the appropriate keys in the **OPERATION** field on the front control panel.

The following write/read data commands are provided:

- Format/Verify
- Write/Read
- Write Only
- Read Only

6.5.1 Format/Verify

The Format/Verify operation first formats each track of the selected drive by writing the ID and data fields. If the verify phase of the operation is enabled, the formatted sectors are then read back and the data that is read is verified against the data written. Errors in Format/Verify may be in either the ID field or the data field. Format/Verify may be performed once or continuously until the number of errors specified through the Stop on Error routine (paragraph 5.7) have occurred.

In the Run Continuous mode, Format/Verify operates from the first cylinder to last cylinder as defined by the Drive Configuration. When used in the Single Run mode, Format/Verify operates only on the previously selected track (or cylinder, if enabled via Function 17).

To format/verify the drive:

1. Press **<Format/Verify>**. The display will prompt:

   VERIFY

2. This prompt requests you to enable or disable the read portion of the format process to verify that the operation was successful. Enter **<Yes>** or **<No>**, and press **<Enter/Next>**.

3. Specify the data pattern to be used during the Format/Verify operation, and press **<Enter/Next>**.

4. Press **<RUN Cont>** to format and, if enabled, verify the disk continuously until **<STOP/End>** is pressed, or until the number of errors specified with Stop on Error occur. The display will show the number of the cylinder currently being formatted.

   Press **<Single RUN>** to format/verify the selected track (or cylinder) one time only.

6.5.2 Write/Read

The Write/Read operation writes a user-specified data pattern onto the selected drive, reads the data back, and compares the data read with the data written. The ID field of each sector is read before writing or reading the data field to verify that the heads are over the correct area of the disk surface. Write/Read may be performed once, or until the operation fails the number of times specified with Stop on Error.

In the Run Continuous mode, Write/Read operates from the first to the last cylinder, as defined by the drive configuration. In the Single Run mode, Write/Read operates only on the selected track (or cylinder, if enabled by Function 17).

Write/Read may be performed with one of three different data patterns: a user-specified 12-bit pattern for all cylinders, a random pattern, or a user-specified pattern which rotates right from one cylinder to the next. For example, a rotating data pattern of "6DBh" will write/read 6DBh on the first track, B6Dh on the second, DB6h on the third, 6DBh on the fourth, and so on.

To perform a Write/Read operation:

1. Press **<Write/Read>**.

2. To write/read the same data pattern on all cylinders, enter the desired 12-bit hexadecimal value.

   To utilize a random data pattern, press **<Random>**.

   To specify a rotating data pattern, enter the desired pattern and press **<Special>**.

3. Press **<Enter/Next>**.

4. Press **<RUN Cont>** to Write/Read the entire disk continuously, until **<STOP/End>** is pressed or the number of errors specified with Stop on Error occur. During continuous running, the display shows the current drive, head, and cylinder number as it is being accessed.

   Press **<Single RUN>** to Write/Read the selected track (or cylinder) and head one time only.

6.5.3 Write Only

The Write Only operation writes a user-specified data pattern on the selected drive. The ID field of each sector is read before writing the data field to verify that the heads are over the correct area of the disk surface. Write Only may be performed once, or continuously until the operation fails the number of times specified with Stop on Error.

In the Run Continuous mode, Write operates from the first cylinder to the last cylinder as defined by Drive Configuration. In the Single Run mode, Write operates only on the selected track (or cylinder).

Write Only ma be performed with one of three different data patterns: a user-specified 12-bit pattern for all cylinders, a random pattern, or a user-specified pattern which rotates right from one cylinder to the next. For example, a rotating data pattern of "6DBh" will write/read 6DBh on the first track, B6Dh on the second, DB6h on the third, 6DBh on the fourth, and so on.

To perform a Write Only operation:

1. Press **<Write Only>**.

2. To write the same data pattern on all cylinders, enter the desired 12-bit hexadecimal value.

   To utilize a random data pattern, press **<Random>**.

   To specify a rotating data pattern, enter the desired pattern and press **<Special>**.

3. Press **<Enter/Next>**.

4. Press **<RUN Cont>** to write the entire disk continuously, until **<STOP/End>** is pressed or until the number of errors specified with Stop on Error occur. During continuous running, the display shows the current drive, head, and cylinder number as it is being accessed.

   Press **<Single RUN>** to write the currently selected track (or cylinder) and head one time only.

6.5.4 Read Only

The Read Only operation reads the selected drive and compares the data read with the user-specified data pattern. The ID field of each sector is read before reading the data field to verify that the heads are positioned correctly and the proper head is selected. The operation may be performed once, or continuously until the operation fails the number of times specified with Stop on Error.

In the Run Continuous mode, Read operates on all heads from the first to last cylinder as defined by the Drive Configuration. In the Single Run mode, Read operates only on the selected track (or cylinder).

The Read Only operation is performed with a user-specified 12-bit data pattern for all cylinders.

To perform a Read Only operation:

1. Press **<Read Only>**.

2. Enter the hex value of the data pattern to be compared with the data read. Then press **<Enter/Next>**.

3. Press **<RUN Cont>** to read the entire disk continuously, until **<STOP/End>** is pressed, or until the number of errors specified with Stop on Error occur. During continuous running, the display shows the current drive, head, and cylinder number as it is being accessed.

   Press **<Single RUN>** to read the currently selected track (or cylinder) and head one time only.

6.6 SEEK OPERATIONS

The Analyzer can be used to initiate numerous "seek" operations, as follows:

- Seek to a Specific Cylinder
- Seek In
- Seek Out
- Oscillating Seek
- Random Seek

NOTE

For all seek operations, the Analyzer will verify the seek position after completion. This is accomplished by reading a header off the drive and comparing the cylinder and head numbers. During the "verify" operation, the Read LED in the MODE field will be illuminated. Note that the drive must be formatted for this feature to function properly.

All seek operations are discussed in the following paragraphs.

6.6.1 Seek to a Specific Cylinc

The Seek operation moves the heads to the cylinder specified through the entry pad.

1. Press **<Seek>** and enter the number of the cylinder to which the heads are to be seeked, and press **<Enter/Next>**. If desired, the wildcard character **<C>** may be entered to represent the first cylinder (FCYL). (Refer to Appendix B for a description of wildcard operations.)

2. Respond to the prompt **"VERIFY"** by entering **<Yes>** or **<No>**, followed by **<Enter/Next>**.

3. Press **<Single RUN>** to seek the heads to the target cylinder. **<RUN Cont>** is not normally used for this operation in the Console mode.

6.6.2 Seek In

The Seek In operation seeks the heads inward (toward higher cylinder numbers), by the number of cylinders specified through the entry pad.

1. Press **<Seek In>** and enter the number of cylinders to seek the heads inward. Press **<Enter/Next>**.

2. Respond to the prompt **"VERIFY"** by entering **<Yes>** or **<No>**, followed by **<Enter/Next>**.

3. Press **<RUN Cont>** to repeatedly seek the heads inward by the number of cylinders specified. When the last cylinder is reached, the Seek In operation will switch automatically to a Seek Out operation, seeking the heads out by the specified number until the first cylinder is reached. At that time, the operation will repeat. During continuous running of the Seek In operation, the display shows the number of each cylinder as it is reached.

   Press **<Single RUN>** to seek the heads inward by the specified amount one time only.

6.6.3 Seek Out

The Seek Out operation seeks the heads outward (toward lower cylinder numbers) by the number of cylinders specified through the entry pad.

1. Press **<Seek Out>** and enter the number of cylinders to seek the heads outward. Press **<Enter/Next>**.

2. Respond to the prompt **"VERIFY"** by entering **<Yes>** or **<No>**, followed by **<Enter/Next>**.

3. Press **<RUN Cont>** to repeatedly seek the heads outward by the number of cylinders specified. When the first cylinder is reached, the Seek Out operation will switch automatically to a Seek In operation, seeking the heads back in by the number specified until the last cylinder is reached. At that time, the operation will repeat. During continuous running of the Seek Out operation, the display shows the number of each cylinder as it is reached.

   Press **<Single RUN>** to seek the heads outward by the specified amount one time only.

6.6.4 Oscillating Seek

The Oscillating Seek operation begins at the middle cylinder and seeks back and forth across the drive surface, incrementing the number of tracks to seek with each change in direction, until the minimum and maximum cylinders are reached.

The starting cylinder is determined by subtracting the minimum cylinder number from the maximum cylinder number and dividing the result by two. An example is shown below:

first cylinder = 0; last cylinder = 822

(822-0) divided by 2 = 411 (starting cylinder)

Once the starting cylinder is determined, the test utilizes that number to perform the following seeks back and forth:

- Seek to cylinder 411.
- Seek in one cylinder (to 412).
- Seek out two cylinders (to 410).
- Seek in three cylinders (to 413).

- Seek out four cylinders (to 409).
- Seek in five cylinders (to 414).
- Seek out six cylinders (to 408).
- Continue this pattern until the maximum (822) and minimum (0) cylinder number are reached.

To initiate an oscillating seek:

1. Press **<Seek>**, **<OSC>**, and **<Enter/Next>**.
2. Respond to the prompt **"VERIFY"** by entering **<Yes>** or **<No>**, followed by **<Enter/Next>**.
3. Press **<RUN Cont>** to repeatedly perform the oscillating seek until terminated by **<Stop/END>** is pressed.

   Press **<Single RUN>** to perform the operation once only.

6.6.5 Random Seek

The Random Seek operation will continuously seek the heads back and forth across the surfaces of the drive, using random cylinder numbers for each seek.

1. Press **<Seek>** and **<Random>**, followed by **<Enter/Next>**.
2. Respond to the prompt **"VERIFY"** by entering **<Yes>** or **<No>**, followed by **<Enter/Next>**.
3. Press **<RUN Cont>** to repeatedly perform the Random seek until terminated by **<Stop/END>** is pressed.

   Press **<Single RUN>** to perform the operation once only.

6.7 MISCELLANEOUS OPERATIONS

This category comprises a variety of operations that do not fit easily into the previously described areas. They are:

- Return the Heads to Zero
- Select a Specific Head
- Increment Head Number
- Execute a Function
- Display Time and Date
- Print Drive Defect Map

6.7.1 Return the Heads to Zero (RTZ)

This operation returns the currently selected head to track zero. To perform a Return-to-Zero operation, simply press **<RTZ>**, **<Enter/Next>**, and **<Single RUN>**.

6.7.2 Select a Specific Head

The Select Head operation chooses one of the surfaces of the selected drive for a data operation. Note that the head is not physically selected until an operation (e.g., format, write/read) is performed.

To select a specific head:

1. Press **<Select Head>** and enter the number of the head to select, followed by **<Enter/Next>**. If desired, **<A>** may be entered as a wildcard character to represent the first head (FHD). (Refer to Appendix B for a description of wildcard operations.)

2. Press **<Single RUN>** to select the desired head. Due to the static nature of the head select lines, the Run Continuous function is not normally needed for a Select Head operation.

6.7.3 Increment Head Number

The Increment Head operation increments the number of the currently selected head by the value entered through the entry pad. As with the Select Head operation, the head is not physically selected until an operation is performed.

To increment the head number:

1. Press **<Inc Head>** and enter the value to add to the current head number. Then press **<Enter/Next>**.

2. Press **<RUN Cont>** to repeatedly increment and select heads until **<STOP/End>** is pressed. When the maximum head number is reached, the number will be reset to the first head number.

   Press **<Single RUN>** to increment the head one time only.

During each increment operation, the display shows the currently selected head, cylinder, and drive number.

6.7.4 Execute a Function

Due to the lack of physical area on the MWX-1000S front panel, not all possible operations can be assigned to specific keys. Therefore, a "Function" facility is provided to enable quick implementation of these unassigned operations. At present, about 40 different Functions are stored in the Analyzer's non-volatile RAM, and may be called at any time.

All Functions are selected with the following routine:

1. Press **<Function>** and enter the desired Function number.

2. Press **<Enter/Next>** and the display will either prompt for additional information or initiate the Function operation.

For a list of available Functions and the steps required to implement them, refer to Chapter 7.

6.7.5 Display Time and Date

This operation displays the time and date, which are stored within the Analyzer and maintained continuously by a battery backup.

1. Press **<Time>**. The time and date are displayed in the following format:

HH MM SS DDMMMYY

HH MM SS = Hour Minute Second
DDMMMYY = Day Month Year

6.7.6 Print Drive Defect Map

This operation is used to read the Fujitsu-type media defect map from the drive and output the information to the printer. Special Program 100 is provided for this purpose. The printed defect map specifies the cylinder, head, byte count from index, and bit length of each defect.

To print the defect map, simply press **<Special Prog>**, **<100>**, **<Enter/Next>**, and **<Single RUN>**. An example is shown below.

MEDIA DEFECT LIST

CYLINDER	HEAD	COUNT	LENGTH
65	0	19344	20
775	0	597	6
253	1	6730	18
687	2	13654	12
96	3	14293	20
8	4	655	28
431	4	17236	35
805	5	7597	10
22	5	36303	28
519	6	25102	7
300	7	5208	13
205	8	10080	12
136	9	3484	45
319	9	856	5

6.8 PROGRAM OPERATIONS

One of the most important features of the Analyzer is its ability to store and run pre-written test programs. The following program operations are provided:

- Run a Special Program
- Run a User Program

6.8.1 Run a Special Program

The MWX-1000S contains numerous "canned" programs which may be run while in the Console Mode via the **<Special Prog>** key. These Special Programs may also be "called" and run by a User Program. At present, over 45 Special Programs are stored in the Analyzer's non-volatile ROM.

All of these Special Programs may be run from the Console mode, as follows:

1. Press **<Special Prog>** and enter the number of the Special Program to execute, followed by **<Enter/Next>**.

2. Press **<Single RUN>** to initiate program execution.

3. The program may prompt for additional information. After each prompt, enter the data requested, followed by **<Enter/Next>**.

4. Press **<STOP/End>** at any time to terminate program execution.

For additional Special Programs information, refer to Chapter 8.

6.8.2 Run a User Program

Perhaps the most powerful feature of the Analyzer is its ability to remember keystroke sequences and repeat them later as stored User Programs. The Analyzer is placed into its programmable mode by pressing **<Prog Mode>**. The Analyzer will then store the keystrokes entered, rather than execute them directly. A total of 300 keystrokes from all User Programs entered can be stored. One program may contain up to 99 keystrokes.

NOTE

Once a User Program has been written and stored in the Analyzer's non-volatile CMOS RAM, it is invoked and executed via **<Special Prog>** while in the Console Mode. **<Prog Mode>** is used only when writing or editing User Programs; it is NOT used to execute programs.

To run a User Program:

1. Press **<Special Prog>** and enter the number of the User Program to execute, followed by **<Enter/Next>**.

2. Press **<Single RUN>** to initiate program execution.

3. The program may prompt for additional information (e.g., drive serial number, etc.). After each prompt, enter the data requested, followed by **<Enter/Next>**.

4. Press **<STOP/End>** at any time to terminate program execution.

For additional information on the User Program mode, including details on the required procedures to create, display, and edit custom programs, refer to Chapter 9. Also included are User Program examples.

CHAPTER 7

FUNCTION DEFINITIONS

7.1 INTRODUCTION

This chapter describes all available MWX-1000S Function Codes, and provides the steps required to implement them.

7.2 FUNCTIONS

Due to the lack of actual space on the MWX-1000S front panel, not all possible operations can be assigned to a specific key. Therefore, a "Function" facility is provided to enable quick implementation of these unassigned operations. At present, about 40 different Functions are stored in the Analyzer's non-volatile RAM, and may be called at any time.

The Functions are "called" from one or more of the following operating modes:

- **Console** - Functions are called from the Console mode.
- **Program** - Functions are called from the User Program mode.
- **Keyboard Extension** - Functions are applicable in the User Program mode only. These Functions allow you to specify commands that have no front panel key equivalent.

It is important to understand that the designations "**Console**," "**Program**," and "**Keyboard Extension**" merely indicate the Analyzer mode from which the particular function can be accessed; they do not necessarily specify the mode in which the function is used.

For example, some functions (e.g., 31, 35, 36) which can be accessed through the console mode are useful only during execution of Special and User Programs. Other functions (e.g., 2, 21, 22, 24, 30) are not available through the console mode at all, but must be "called" as individual User Program statements.

The following paragraphs provide brief descriptions of MWX-1000S Functions and the procedures required to utilize them. Note that

7.2.1 Function 0 - Print Analyzer Function Names and Status

This function is used to output a list of all function names to the connected printer, along with the current status of each. At initial power-up, the default settings will be printed. In addition to function status, pertinent drive configuration and test parameter information is provided.

To print function status, simply press **<Function>**, **<0>**, and **<Enter/Next>**. A sample function status report is shown below. The initial power-up default values are indicated.

TESTER STATUS

MWX-1000S Z01.06/X01.03

TIME-09:12:45 DATE-09MAR87

FUNCTION	DESCRIPTION	STATUS	MODE
0	PRINT TESTER STATUS		C
1	PRINT USER PROGRAM		C
2	SET # DRIVES	1	P
3	DISPLAY FIRMWARE VERSION	Z01.06 X01.03	C
4	SET TEST STATION NUMBER	00000000	C P
5	LOOP ON SAME TRACK	OFF	C P
6	PRINT ERROR STATUS DURING PGM 00	ON	C
7	PRINT TEST STATUS DURING PGM 00	ON	C
8	ENTER/ALTER DRIVE CONFIGURATION		C
9	DELETE DRIVE CONFIGURATION		C
10	SET TIME & DATE		C
11	ENABLE/DISABLE BAD TRACK TABLE	ON	C P
12	ENABLE/DISABLE ERROR STATUS	OFF	C P
13	ENABLE/DISABLE STOP ON ERROR	OFF	C P
14	ENABLE/DISABLE TRACK LOCKOUT	ON	C P
15	ENTER TRACK LOCKOUT VALUES		C
16	DELETE TRACK LOCKOUT ENTRY		C
17	ENABLE/DISABLE CYLINDER MODE	OFF	C P
18	DUPLICATE ERRORS IN ERROR STATUS	ON	C P
19	DISPLAY DRIVE POSITION		C
20	CONFIGURE PRINTER	PAR ON	C
21	SKIP IF FLAG TRUE		K
22	SKIP IF FLAG FALSE		K
23	SOFT ERRORS PRINTED IN BAD TRACK TABLE	OFF	C
24	SET DRIVE CONFIG		P
25	DISPLAY BAD TRACK TABLE		C
26	BTT KEYBOARD ENTRY/UPDATE		C P
27	DELETE BTT ENTRY		C P
28	CONVERT ERRORS TO BYTES FROM INDEX	OFF	C P

```
29      PRINT DRIVE CONFIGURATIONS                              C
30      DELAY (X 100 MSEC)                                        K
31      GET PGM 31-35 DATA PATTERN                    6DB       C P
32      SELECT FLAW MAP TYPE                            0       C P
33      SET LOOP COUNT FOR PGM 33                       1       C P
34      SET LOOP COUNT FOR PGM 34                     200       C P
35      ENABLE/DISABLE STROBES IN PGM 33              OFF       C
36      ENABLE/DISABLE SERVO OFFSETS IN PGM 33        OFF       C
37      ENABLE/DISABLE MEASURE SEEK DELAY              ON       C
```

7.2.2 Function 1 - Print a User Program

This function is used to output a listing of any User Program to the output device.

To list a User Program:

1. Press **<Function>**, **<1>**, and **<Enter/Next>**.

2. Enter the number (300-499) of the User Program to list, followed by **<Enter/Next>**.

A sample User Program listing is shown below. This program can be used to format/verify the entire disk drive, and print test results.

```
PROGRAM      300

01 PROGRAM    41      - call SP 41 (clear test status)
02 PROGRAM    55      - call SP 55 (clear elapsed timer)
03 PROGRAM    42      - call SP 42 (enable error status)
04 SRV OFF  PLUS      - set servo offset to plus
05 DTA STB  LATE      - set data strobe offset to late
06 SEEK     FCYL      - seek to first cylinder
07 PROGRAM    56      - call SP 56 (display drive position)
08 FMT/VFY   6DB      - format/verify with data pattern 6DB
09 INC HD     01      - increment head count by one
10 LOOP   7  NHD      - repeat 7-9 by total number of heads
11 SEEK IN     1      - seek in one cylinder
12 LOOP   7 NCYL      - repeat 7-11 by total number of cyls
13 PROGRAM    40      - call SP 40 (print test status)
14 PROGRAM    54      - call SP 54 (print elapsed time)
15 END                - program end
```

7.2.3 Function 2 - Set Number of Drives

Selects the number of drives to be tested during the execution of a User or Special Program. This function is used in the program mode only, and should be inserted as a User Program statement.

To implement this function while in the User Program mode, press **<Function>**, **<2>**, and **<Enter/Next>**.

During the execution of a program, the display will prompt for the number of drives to be tested.

7.2.4 Function 3 - Display Firmware Version

This function is used to display the version number of the Z80 and 8X305 firmware currently installed in the Analyzer. Simply press **<Function>**, **<3>**, and **<Enter/Next>**. The version number will be displayed in the following format:

VER Zxx.xx Xyy.yy

xx.xx = Z80 version **yy.yy** = 8x305 version

7.2.5 Function 4 - Set Test Station Number

This function allows the assignment of a Test Station number to the Analyzer. The specified number will be printed in the header of all program listings and error reports.

1. Press **<Function>**, **<4>**, and **<Enter/Next>**.
2. Enter the desired test station number, followed by **<Enter/Next>**.

7.2.6 Function 5 - Read/Write Loop on Same Track

This function is used in conjunction with a Write/Read data operation to provide a continuous data action without a seek operation. When this function is enabled, all seek operations are disabled when running a read, write, or format operation while in the Console mode. This function has no affect during Program mode operations.

To place the Analyzer in the loop on track mode:

1. Press **<Function>**, **<5>**, and **<Enter/Next>**.

2. Enter **<Yes>** or **<No>**, respectively, to enable or disable the loop on track mode, followed by **<Enter/Next>**.

The selected data operation will be performed at the current track (or cylinder, if enabled via Function 17).

7.2.7 Function 6 - Print Error Status During Program 0-10

This function is used to enable/disable the read errors encountered during execution of Special Programs 0 through 10 to be printed "on-the-fly." Note, however, that Function 12 MUST also be enabled for the error status to be printed.

Regardless of the Function 6 and 12 settings, the errors will be stored in the Bad Track Table, which is enabled with Function 11.

To enable or disable error status printing during execution of Special Programs 0 through 10:

1. Press **<Function>**, **<6>**, and **<Enter/Next>**.

2. Enter **<Yes>** or **<No>** to enable or disable, respectively, the "on-the-fly" printing of the error status. Then press **<Enter/Next>**.

A sample Error Status is provided below:

ERROR STATUS-

TYPE	CYLINDER	HEAD	SECTOR	COUNT	STROBE	SERVO
HARD	137	5	25	53	NORML	----
SOFT	257	2	0	17109	EARLY	PLUS
AMRK	16	0	16	02/03	EARLY	MINUS
SYNC1	819	5	0	03/03	LATE	NORML
SYNC2	259	0	62	01/03	LATE	NORML
HARD	137	5	25	53	NORML	----
SOFT	443	8	0	5298	NORML	NORML
HARD	687	7	0	13654	NORML	NORML
HARD	300	4	0	10080	NORML	NORML
HARD	137	5	25	53	NORML	----

7.2.8 Function 7 - Print Test Status During Program 0-10

The Test Status Summary is a brief synopsis of current Analyzer test activity including number of Reads, Writes, Errors (Hard, Soft, Format, Seek), and total Seeks. This test status information can be included in Special Programs 0 through 10 printouts, as follows:

1. Press **<Function>**, **<7>**, and **<Enter/Next>**.

2. Enter **<Yes>** or **<No>** to enable or disable the test summary printout, followed by **<Enter/Next>**.

When enabled, the Test Summary Report will be included with all test results or printed separately with Special Program 40 (see Chapter 8). A sample Test Summary printout is provided below:

TEST STATUS SUMMARY-

SOFT ERRORS-	**1**
HARD ERRORS-	**5**
FORMAT ERRORS-	**1**
TRACK' ERRORS-	**0**
HEAD ERRORS-	**0**
FAULT ERRORS-	**0**
SEEK ERRORS-	**0**
NUMBER OF WRITES-	**30870**
NUMBER OF READS-	**30870**
NUMBER OF SEEKS-	**6174**

7.2.9 Function 8 - Enter/Alter Drive Configuration

This function is used to create, modify, and store up to 99 different drive configurations which may be "called" from a User Program or Special Program. The configurations may be numbered from 1-99 only; a value of "0" may **NOT** be used.

1. Press **<Function>**, **<8>**, and **<Enter/Next>**.

2. Enter the desired Drive Configuration number (1-99) and press **<Enter/Next>**.

3. Respond to the subsequent drive configuration prompts as described in Chapter 5 of this manual.

You may then print ALL drive configurations contained in CMOS by activating Function 29, or print the current configuration only by executing Special Program 49.

7.2.10 Function 9 - Delete Drive Configuration

Used to delete a drive configuration generated by Function 8.

1. Press **<Function>**, **<9>**, and **<Enter/Next>**.

2. Enter the number (1-99) of the drive configuration to be deleted, followed by **<Enter/Next>**.

7.2.11 Function 10 - Set Time and Date

Used to set the time and date, which are printed on program listings and test reports, or displayed when **<Time>** is activated.

1. Press **<Function>**, **<10>**, and **<Enter/Next>**.

2. Enter the appropriate information in response to the **HOUR, MINUTE, SECOND, DAY, MONTH,** and **YEAR** prompts. Follow each response with **<Enter/Next>**.

7.2.12 Function 11 - Enable/Disable Bad Track Table

This function enables or disables the generation of a bad track table. In the default state, the bad track table is enabled. The capacity of the bad track table is approximately 150 entries. In most applications, this capacity should be adequate. However, some drives contain so many errors that the bad track table cannot hold all of the entries; thus, the bad track table will overflow and the operation will automatically be aborted. To enable the test to continue on this type of drive, Function 11 allows you to disable the bad track table.

1. Press **<Function>**, **<11>**, and **<Enter/Next>**.

2. Enter **<Yes>** or **<No>**, respectively, to enable or disable the generation of a bad track table, followed by **<Enter/Next>**.

7.2.13 Function 12 - Enable/Disable Error Status

This function serves as a "global" facility to enable or disable the printing of MAX-1000S error status information. This status is maintained as a real-time (on-the-fly) error report. The setting of this function applies for all operations, including Special Programs.

To enable/disable error status printouts:

1. Press **<Function>**, **<12>**, and **<Enter/Next>**.

2. Enter **<Yes>** or **<No>**, respectively, to enable or disable this function, followed by **<Enter/Next>**.

An example printout is shown below.

ERROR STATUS-

TYPE	CYLINDER	HEAD	SECTOR	COUNT	STROBE	SERVO
SOFT	257	2	0	17109	EARLY	PLUS
AMRK	16	0	16	02/03	EARLY	MINUS
SYNC1	819	5	0	03/03	LATE	NORML
HARD	137	5	25	53	NORML	----
HARD	687	7	0	13654	NORML	NORML
HARD	300	4	0	10080	NORML	NORML

7.2.14 Function 13 - Enable/Disable Stop on Error

This function allows you to enable or disable the STOP ON ERROR mode. While enabled, each time a unique error (e.g., soft, hard, format) is detected, the error counts are updated and compared with the abort levels specified through **<Stop on Error>**. If a match is detected, the current operation is aborted and the appropriate message is displayed and printed. Refer to paragraph 5.7 for details on specifying "stop on error" limits.

1. Press **<Function>**, **<13>**, and **<Enter/Next>**.

2. Enter **<Yes>** or **<No>**, respectively, to enable or disable the stop on error mode. Then press **<Enter/Next>**.

7.2.15 Function 14 - Enable/Disable Track Lockout

This function is used to enable or disable the Bad Track Lockout feature. When enabled, the heads and cylinders specified by Function 15 (for tracks known to be defective) will not be accessed during a write, format, or verify operation.

1. Press **<Function>**, **<14>**, and **<Enter/Next>**.

2. Enter **<Yes>** or **<No>** to enable or disable the bad track lockout feature, followed by **<Enter/Next>**.

7.2.16 Function 15 - Enter Track Lockout Values

This function is used to specify the head and cylinder numbers of defective tracks that should be "locked out" during write, format, and verify operations (see Function 14). Note that these lockout entries apply to the CURRENT drive only.

1. Press **<Function>**, **<15>**, and **<Enter/Next>**.

2. Enter the appropriate lockout numbers in response to the **"HEAD"** and **"CYLINDER"** prompts. Follow each prompt with **<Enter/Next>**.

NOTE

If the wildcard character **"D"** is entered in response to the **"CYLINDER"** prompt, the entire head number will be locked out. Refer to Appendix B for a description of Wildcard Operations.

7.2.17 Function 16 - Delete Track Lockout Entry

This function is used to delete the track "lockout" entries previously entered via Function 15.

1. Press **<Function>**, **<16>**, and **<Enter/Next>**.

2. Enter the appropriate numbers in response to the **"HEAD"** and **"CYLINDER"** prompts. Follow each prompt with **<Enter/Next>**.

7.2.18 Function 17 - Enable/Disable Cylinder Mode

When in the Cylinder Mode, the Analyzer will perform all Format, Write, or Read operations at optimum speed. This high-speed data mode is accomplished by performing the operation on ALL heads at the current cylinder automatically and without a time loss due to drive latency.

1. Press **<Function>**, **<17>**, and **<Enter/Next>**.

2. Enter **<Yes>** or **<No>** to enable/disable the cylinder mode for all Write, Read, or Format operations. Then press **<Enter/Next>**.

7.2.19 Function 18 - Duplicate Error in Error Status

This function is used to enable or disable the "duplicate" mode. When enabled, ALL errors encountered are printed "on-the-fly." When disabled, only those errors not already in the Bad Track Table will be printed. Note that error counts are always updated in the test status regardless of this setting.

1. Press **<Function>**, **<18>**, and **<Enter/Next>**.

2. Enter **<Yes>** or **<No>**, respectively, to enable or disable the duplicate mode. Then press **<Enter/Next>**.

7.2.20 Function 19 - Display Drive Position

Displays the current drive position (i.e., drive, head, track). Simply press **<Function>**, **<19>**, and **<Enter/Next>**. The current drive position will be displayed in the following format:

x HD yy TRK zzzz

x = drive number **y** = head number **z** = track number

7.2.21 Function 20 - Configure Printer

This function is used to configure the Analyzer for compatibility with the parameters of the connected printer (i.e., printer on/off status, parallel or serial interface, baud rate, parity, and data bits).

To select the appropriate printer configuration parameters, press **<Function>**, **<20>**, and **<Enter/Next>**. Then, enter the desired value for each parameter, as shown below. Press **<Enter/Next>** after each parameter entry. Note that the prompts after **"INTERFACE PAR/SER"** are displayed only if the serial interface is enabled.

Parameter	Description
PRINTER	Enable/disable printer
INTERFACE	Select interface type, as follows: **0** = parallel interface **1** = serial interface
BAUD RATE	Select data transfer rate, as follows: **0** = 110 **4** = 1200 **7** = 4800 **1** = 150 **5** = 1800 **8** = 9600 **2** = 300 **6** = 2400 **9** = 19,200 **3** = 600
PARITY	Select parity, as follows: **0** = no parity **1** = odd parity **2** = even parity
DATA BITS	Select number of data bits, as follows: **7** = 7 data bits per character **8** = 8 data bits per character

7.2.22 Function 21 - Skip if Flag True

This "keyboard extension" function allows you to insert conditional branches in a User Program. A target program statement number, to which the program will branch if the variable is true, and a flag number are requested. The various options are listed below.

Flag No.	Skip if True
0	Always Skip
1	Function 17 (Cylinder Mode)
2	Verify (Format)
3	Verify (Seek)

4	Verify (Seek In/Out)
5	Function 5 (Loop on Same Track)
6	Function 6 (Print Error Status During Program 0)
7	Function 7 (Print Test Status During Program 0)

To implement Function 21 during User Program creation:

1. Press **<Function>**, **<21>**, and **<Enter/Next>**. The display will prompt **"STATEMENT n."**

2. Enter the number of the program statement to skip to if the specified variable is flagged true. The press **<Enter/Next>**. The display will prompt **"FLAG n."**

3. Enter the desired flag number in accordance with the table above, followed by **<Enter/Next>**.

7.2.23 Function 22 - Skip if Flag False

This "keyboard extension" function allows you to insert conditional branches in a User Program. A target program statement number, to which the program will branch if the variable is false, and a flag number are requested. The various options are listed below.

Flag No.	Skip if False
0	Never Skip
1	Function 17 (Cylinder Mode)
2	Verify (Format)
3	Verify (Seek)
4	Verify (Seek In/Out)
5	Function 5 (Loop on Same Track)
6	Function 6 (Print Error Status During Program 0)
7	Function 7 (Print Test Status During Program 0)

To implement Function 22 during User Program creation:

1. Press **<Function>**, **<22>**, and **<Enter/Next>**. The display will prompt **"STATEMENT n."**

2. Enter the number of the program statement to skip to if the specified variable is flagged false. The press **<Enter/Next>**. The display will prompt **"FLAG n."**

3. Enter the desired flag number in accordance with the table above, followed by **<Enter/Next>**.

7.2.24 Function 23 - Print Soft Errors in Bad Track Table

This function enables or disables the printing of soft errors in the Bad Track Table.

1. Press **<Function>**, **<23>**, and **<Enter/Next>**.

2. Enter **<Yes>** or **<No>** to enable/disable soft errors to be printed in the Bad Track Table, and press **<Enter/Next>**.

At initial power-up, this function defaults to the disabled state. Thereafter, the selected state is stored in non-volatile memory.

A sample Bad Track Table, including one soft error, is shown below:

BAD TRACK SUMMARY-

HEAD	CYLINDER	SECTOR	TYPE	COUNT	LENGTH	# ERRORS
0	344	0	HARD	1209	12	6
0	870	0	KEYD	17587	15	1
3	903	0	FMAP	518	31	1
6	25	0	SOFT	232	1	1

7.2.25 Function 24 - User Program Drive Configuration Prompt

This "keyboard extension" function may be utilized in the User Program mode only. It causes the program to prompt during execution for a specific drive configuration number.

To insert this function during program creation, press **<Function>**, **<24>**, and **<Enter/Next>**.

When the function is encountered as a statement during execution of the User Program, the configuration prompt will be displayed.

7.2.26 Function 25 - Display Bad Track Table

Used to display the accumulated bad track table for the currently selected drive only.

1. Press **<Function>**, **<25>**, and **<Enter/Next>**.

2. Press **<Enter/Next>** repeatedly to sequence through the entries in the bad track table for the current drive. The message **"DONE"** is displayed after the final entry.

7.2.27 Function 26 - Key-In (Update) Bad Track Table Entries

This function is used to add entries to the bad track table for the current drive. All entries added to the table through this function are designated as **"KEYD"** under the **"TYPE"** column on bad track table printouts.

To add entries to the bad track table, press **<Function>**, **<26>**, and **<Enter/Next>**. Then, enter the appropriate value in response to the prompts listed below. Remember to press **<Enter/Next>** after each entry.

Prompt	Description
HEAD	Bad track head number
CYLINDER	Cylinder number
SECTOR	Sector number
BYTE COUNT	Number of bytes from index
LENGTH	Bit length of the error

After you've specified the error bit length, the new entry is automatically added to the current bad track table. In addition, the display will prompt:

MORE YES/NO

to allow you to further update the bad track table. To add another entry, enter **<Yes>**. The display will return to the **"HEAD"** display as shown above. Simply repeat the procedure for each bad track. If no additional entries are required, enter **<No>**.

7.2.28 Function 27 - Delete Bad Track Table Entries

This function is the opposite of Function 26. It is used to delete entries from the Bad Track Table.

To delete entries from the bad track table, press **<Function>**, **<27>**, and **<Enter/Next>**. Then, enter the appropriate value in response to the prompts displayed, as described in paragraph 7.2.27.

7.2.29 Function 28 - Convert Errors to "Bytes from Index"

This function is used to enable or disable the "convert errors" mode. It is applicable in the multiple sector mode only (see paragraph 5.5.2). When enabled, all errors encountered in the "bytes from sector" format are converted to "bytes from index" and the sector number is forced to 0. In essence, this makes a multiple sector drive look like a single sector drive. This is especially useful when attempting to write a flaw map to the drive, which is only possible in the single sector mode.

1. Press **<Function>**, **<28>**, and **<Enter/Next>**.

2. Enter **<Yes>** or **<No>**, respectively, to enable or disable the conversion of "bytes from sector" to "bytes from index." Then press **<Enter/Next>**.

7.2.30 Function 29 - Print Drive Configurations

As discussed in paragraph 5.3 (and the description of Function 8), up to 100 different drive configurations (numbered 0-99) may be created and stored in Analyzer memory. This function allows you to obtain a hardcopy printout of ALL configurations residing in memory. (Alternatively, Special Program 49 may be used to print the current drive configuration only.)

To print all drive configurations, press **<Function>**, **<29>**, and **<Enter/Next>**. A sample printout is shown below.

DRIVE CONFIGURATION 00			
INTERFACE	SMD	FORMAT TYPE	SOFT
NUMBER TAGS	3	SOFT=HARD	3
INDEX CABLE	A	SECTOR CABLE	BOTH
FIRST CYLINDER	0	LAST CYLINDER	822
FIRST HEAD	0	LAST HEAD	9
FIRST SECTOR	1	LAST SECTOR	32
BYTES/TRACK	650	HEADER CRCS	NO
HEADER SYNC	09	DATA SYNC	0E
INDEX/SECTOR GAP	16	BYTES/PLO	11
DRIVE CONFIGURATION 01			
INTERFACE	CMD	FORMAT TYPE	HRD1
NUMBER TAGS	3	SOFT=HARD	3
INDEX CABLE	B	SECTOR CABLE	B
FIRST CYLINDER	0	LAST CYLINDER	822
FIRST RMV HEAD	0	LAST RMV HEAD	0
FIRST FIXED HEAD	16	LAST FIXED HEAD	19
FIRST SECTOR	0	LAST SECTOR	0
BYTES/TRACK	20160	HEADER CRCS	NO
HEADER SYNC	09	DATA SYNC	0E
INDEX/SECTOR GAP	165	BYTES/PLO	11
DRIVE CONFIGURATION 02			
INTERFACE	SMD	FORMAT TYPE	SOFT
NUMBER TAGS	3	SOFT=HARD	3
INDEX CABLE	A	SECTOR CABLE	A
FIRST CYLINDER	0	LAST CYLINDER	822
FIRST HEAD	0	LAST HEAD	9
FIRST SECTOR	0	LAST SECTOR	0
BYTES/TRACK	630	HEADER CRCS	NO
HEADER SYNC	0E	DATA SYNC	09
INDEX/SECTOR GAP	165	BYTES/PLO	11
DRIVE CONFIGURATION 03			
INTERFACE	SMD	FORMAT TYPE	HRD2
NUMBER TAGS	5	SOFT=HARD	3
INDEX CABLE	BOTH	SECTOR CABLE	BOTH
FIRST CYLINDER	0	LAST CYLINDER	822
FIRST HEAD	0	LAST HEAD	9
FIRST SECTOR	0	LAST SECTOR	63
BYTES/TRACK	640	HEADER CRCS	NO
HEADER SYNC	CC	DATA SYNC	CC
INDEX/SECTOR GAP	16	BYTES/PLO	21

7.2.31 Function 30 - Delay (x 0.1 sec)

This "keyboard extension" function allows you to insert a specific delay in a User Program. The valid delay entries are from 0.1 through 65.0 seconds. Note that User Program mode must be active to use this function.

To insert a delay as a User Program statement:

1. Press **<Function>**, **<30>**, and **<Enter/Next>**.

2. Enter the desired delay value, followed by **<Enter/Next>**.

When the function is encountered as a statement during execution of the User Program, the specified delay will occur.

7.2.32 Function 31 - Set Data Pattern for Programs 31-35

This function is used to set the 12-bit hexadecimal data pattern to be written for Special Programs 31-35 (Basic Drive Verify, Inner Track Address, Media Verify, Random Seek/Verify, and Radial Scratch). The default data pattern is 6DBh.

1. Press **<Function>**, **<31>**, and **<Enter/Next>**.

2. Enter the desired 12-bit data pattern for Programs 31-35, and press **<Enter/Next>**.

7.2.33 Function 32 - Select Flaw Map Type

This function allows you to select the appropriate flaw map type for your SMD drive. Most SMD drives support soft sectoring, while others do not; therefore, a different type of flaw map is required for each drive.

1. Press **<Function>**, **<32>**, and **<Enter/Next>**.

2. Enter either **<0>** or **<1>**, followed by **<Enter/Next>**, to select the appropriate type of flaw map, as follows:

   0 = the flaw map is written ONCE with no address mark (for drives not supporting soft sectoring). For example, the Fujitsu M2331K and M2333K utilize a "Type 0" flaw map format.

   1 = the flaw map is written TWICE with address mark (for drives supporting soft sectoring). The Fujitsu M2361A uses a "Type 1" format.

7.2.34 Function 33 - Set Loop Count for Program 33

For Special Program 33, the number of passes through the Media Verify test is user-selectable with this function. Multiple passes through the Media Verify test are frequently required to guarantee that the final bad track table will completely define all media defects. The optimum number of test repeats is best selected after a review of specific test results.

1. Press **<Function>**, **<33>**, and **<Enter/Next>**.

2. Enter the desired loop count number for Program 33, and press **<Enter/Next>**.

7.2.35 Function 34 - Set Loop Count for Program 34

This function is used to set the number of random seek/verify operations to be performed in Special Program 34.

1. Press **<Function>**, **<34>**, and **<Enter/Next>**.

2. Enter the desired loop count number for Program 34, and press **<Enter/Next>**.

7.2.36 Function 35 - Enable/Disable Data Strobe in Program 33

This function enables or disables the use of the data strobe during execution of Special Program 33 (Media Verify).

1. Press **<Function>**, **<35>**, and **<Enter/Next>**.

2. Enter **<Yes>** or **<No>**, respectively, to enable or disable the data strobe for Program 33. Then press **<Enter/Next>**.

7.2.37 Function 36 - Enable/Disable Servo Offset in Program 33

This function enables or disables the use of the servo offset during execution of Special Program 33 (Media Verify).

1. Press **<Function>**, **<36>**, and **<Enter/Next>**.

2. Enter **<Yes>** or **<No>**, respectively, to enable or disable the servo offset for Program 33. Then press **<Enter/Next>**.

7.2.38 Function 37 - Enable/Disable Measure Seek Time Delay

During a seek time measurement, the display is delayed long enough to allow the operator to read the results. This function is used to enable or disable this delay.

1. Press **<Function>**, **<37>**, and **<Enter/Next>**.

2. Enter **<Yes>** or **<No>**, respectively, to enable or disable this function, followed by **<Enter/Next>**.

C H A P T E R 8

S P E C I A L P R O G R A M S

8.1 INTRODUCTION

Two different types of MWX-1000S test programs may be executed for drive verification. Special Programs are factory-written and stored in non-volatile ROM. All available Special Programs are described in this chapter. User Programs may be user-generated and stored in CMOS RAM. Implementation of the User Program mode is discussed in Chapter 9.

8.2 SPECIAL PROGRAMS

The MWX-1000S contains numerous "canned" programs which may be run while in the Console Mode via **<Special Prog>**. These Special Programs may also be "called" and run by a User Program. At present, over 45 Special Programs are stored in the Analyzer's non-volatile ROM.

To execute a Special Program in the Console Mode:

1. Press **<Special Prog>** and enter the number of the Special Program to execute, followed by **<Enter/Next>**.

2. Press **<Single RUN>** to initiate program execution.

3. The program may prompt for additional information. After each prompt, enter the data requested, followed by **<Enter/Next>**.

4. Press **<STOP/End>** at any time to terminate the execution of the program.

The following Special Programs are provided by the MWX-1000S:

Program	Description
0	Wilson Final Drive Verification Test
1	Special Program 0 - Subtest 1
2	Special Program 0 - Subtest 2

3	Special Program 0 - Subtest 3
4	Special Program 0 - Subtest 4
5	Special Program 0 - Subtest 5
10	Final Test with Flaw Map Read/Write Support
31	Basic Drive Verify
32	Inner Track Access
33	Media Verify
34	Random Seek and Verify
35	Radial Scratch
40	Print Test Status
41	Clear Test Status
42	Enable Error Status
43	Disable Error Status
44	Enable Stop on Error
45	Disable Stop on Error
46	Print Bad Track Table
47	Clear Bad Track Table
49	Print Drive Configuration
50	Print Drive Status
51	Print Index/Sector Time
52	Print Time and Date
53	Print Track Lockout Table
54	Print Elapsed Time Counter
55	Clear Elapsed Time Counter
56	Display Drive Position
57	Display Cylinder

59	Print Firmware Version Numbers
60	Print Drive Numbers
61	Verify Drive Position
62	Enable Track Lockout Function
63	Disable Track Lockout Function
64	Enable Bad Track Table
65	Disable Bad Track Table
66	Print Station Number
67	Select Next Drive
68	Enable Cylinder Mode
69	Disable Cylinder Mode
70	Enable Duplicate Mode
71	Disable Duplicate Mode
72	Enter Drive Serial Number
73	Print Drive Serial Number
100	Read and Print Fujitsu Type Flaw Map
101	Read Fujitsu Flaw Map and Add to Bad Track Table
102	Write Bad Track Table to Fujitsu Type Flaw Map

The following paragraphs provide a brief description of each Special Program. In many instances, this description is in the form of a program listing. You'll notice that the actual "test" programs (0-35) are comprised almost exclusively of calls to Functions and other Special Programs. This should give you some hint on how to assemble your own User Programs.

8.2.1 Special Program 0 - Final Drive Verification Test

Special Program 0 is the standard Wilson Laboratories final drive verification test. It is designed to exercise the full functionality of any SMD interface drive.

```
          DRIVE CONFIGURATION
          FUNCTION 31 - get data pattern
          FUNCTION 02 - get number of drives (NDRV)
          ASK: "Clear BTT"  <Yes>, <No>
               If <Yes>
1001:                PROGRAM 47 - clear bad track table
                     PROGRAM 67 - select next drive
                     LOOP 4, 1001
               If <No>
                     continue
          FUNCTION 13 - stop on error select
          Get desired test (1-5)
          Get number of passes
1002:     PROGRAM 72 - enter serial number
          PROGRAM 67 - select next drive
          LOOP NDRV, 1002
1003:     Print Program 0 header
          PROGRAM 55 - clear elapsed timer
          PROGRAM 59 - print firmware revision
          PROGRAM 66 - print station number
          PROGRAM 73 - print serial number
          Print drive number, number of heads and cylinders
          PROGRAM 52 - print time and date
          If program 1 selected
               PROGRAM 1 - subtest 1
          If program 2 selected
               PROGRAM 2 - subtest 2
          If program 3 selected
               PROGRAM 3 - subtest 3
          If program 4 selected
               PROGRAM 4 - subtest 4
          If program 5 selected
               PROGRAM 5 - subtest 5
          PROGRAM 54 - print elapsed timer
          PROGRAM 59 - print firmware revision
          PROGRAM 66 - print station number
          PROGRAM 73 - print serial number
          PROGRAM 52 - print time and date
          PROGRAM 46 - print bad track table
          Print total hard, soft, format, miscellaneous errors
          PROGRAM 59 - print firmware revision
          PROGRAM 66 - print station number
          PROGRAM 73 - print serial number
          PROGRAM 52 - print time and date
          PROGRAM 46 - print bad track table
          PROGRAM 47 - clear bad track table
          PROGRAM 67 - select next drive
          LOOP NDRV, 1003
```

Note: Refer to paragraph 8.3 for details on calling Special Program 0 for execution.

8.2.2 Special Program 1 - SP 0 - Subtest 1

Special Program 1 utilizes SP 31 to execute a basic drive verify test.

```
Print Test 1 header
PROGRAM 41 - clear test status
PROGRAM 43 - disable test status
PROGRAM 31 - basic drive verify
If FUNCTION 7 = ON
     PROGRAM 40 - print test status
PROGRAM 41 - clear test status
```

8.2.3 Special Program 2 - SP 0 - Subtest 2

Special Program 2 calls SP 32 to perform an inner track access test.

```
Print Test 2 header
PROGRAM 41 - clear test status
If FUNCTION 6 = OFF
     PROGRAM 43 - disable error status
If FUNCTION 6 = ON
     PROGRAM 42 - enable error status
PROGRAM 32 - inner track access
PROGRAM 43 - disable error status
If FUNCTION 7 = ON
     PROGRAM 40 - print test status
PROGRAM 41 - clear test status
```

8.2.4 Special Program 3 - SP 0 - Subtest 3

Special Program 3 calls SP 33 to perform a media verify test.

```
Print Test 3 header
PROGRAM 41 - clear test status
If FUNCTION 6 = OFF
     PROGRAM 43 - disable error status
If FUNCTION 6 = ON
     PROGRAM 42 - enable error status
PROGRAM 33 - media verify
PROGRAM 43 - disable error status
If FUNCTION 7 = ON
     PROGRAM 40 - print test status
PROGRAM 41 - clear test status
```

8.2.5 Special Program 4 - SP 0 - Subtest 4

Special Program 4 utilizes SP 34 to execute a random seek and verify test.

```
Print Test 4 header
PROGRAM 41 - clear test status
PROGRAM 43 - disable error status
PROGRAM 34 - random seek and verify
PROGRAM 43 - disable error status
If FUNCTION 7 = ON
     PROGRAM 40 - print test status
PROGRAM 41 - clear test status
```

8.2.6 Special Program 5 - SP 0 - Subtest 5

Special Program 5 utilizes SP 35 to perform a radial scratch test.

```
Print Test 5 header
PROGRAM 41 - clear test status
PROGRAM 71 - duplicate mode off
If FUNCTION 6 = OFF
     PROGRAM 43 - disable error status
If FUNCTION 6 = ON
     PROGRAM 42 - enable error status
PROGRAM 35 - radial scratch
PROGRAM 43 - disable error status
If FUNCTION 7 = ON
     PROGRAM 40 - print test status
PROGRAM 70 - duplicate mode on
PROGRAM 41 - clear test status
```

8.2.7 Special Program 10 - Final Test with Flaw Map Support

Special Program 10 is a standard disk exerciser test which is designed to test the full functionality of any SMD drive. In most respects, it is identical to Special Program 0. However, this program may also be used to read and/or write a Fujitsu-type flaw map from/to the drive during the test.

```
          DRIVE CONFIGURATION
          FUNCTION 31 - get data pattern
          FUNCTION 02 - get number of drives (NDRV)
          ASK: "Clear BTT"  <Yes>, <No>
               If <Yes>
1101:               PROGRAM 47 - clear bad track table
                    PROGRAM 67 - select next drive
```

```
                LOOP 4, 1101
          If <No>
                continue
     FUNCTION 13 - stop on error select
     Get desired test (1-5)
     Get number of passes
1102:PROGRAM 72 - enter serial number
     PROGRAM 67 - select next drive
     LOOP NDRV, 1102
     ASK: "Read flaw map"  <Yes>, <No>
     ASK: "Write flaw map"  <Yes>, <No>
     FUNCTION 32 - flaw map type
1103:Print Program 10 header
     PROGRAM 55 - clear elapsed timer
     If "Read flaw map" = Yes
          PROGRAM 101 - read flaw map, add to BTT
     PROGRAM 59 - print firmware revision
     PROGRAM 66 - print station number
     PROGRAM 73 - print serial number
     Print drive number, number heads and number cylinders
     PROGRAM 52 - print time and date
     If program 1 selected
          PROGRAM 1 - subtest 1
     If program 2 selected
          PROGRAM 2 - subtest 2
     If program 3 selected
          PROGRAM 3 - subtest 3
     If program 4 selected
          PROGRAM 4 - subtest 4
     If program 5 selected
          PROGRAM 5 - subtest 5
     If "Write flaw map" = Yes
          PROGRAM 102 - write flaw map
     PROGRAM 54 - print elapsed timer
     PROGRAM 59 - print firmware revision
     PROGRAM 66 - print station number
     PROGRAM 73 - print serial number
     PROGRAM 52 - print time and date
     PROGRAM 46 - print bad track table
     Print total hard, soft, format, miscellaneous errors
     PROGRAM 59 - print firmware revision
     PROGRAM 66 - print station number
     PROGRAM 73 - print serial number
     PROGRAM 52 - print time and date
     PROGRAM 46 - print bad track table
     PROGRAM 47 - clear bad track table
     PROGRAM 67 - select next drive
     LOOP NDRV, 1103
```

Note: Refer to paragraph 8.3 for details on calling Special Program 10 for execution.

8.2.8 Special Program 31 - Basic Drive Verify

Special Program 31 performs a basic drive verify test.

```
          PROGRAM 69 - cylinder mode off
          SET SERVO OFFSET = normal
          SET DATA STROBE = normal
          PROGRAM 50 - measure and print drive status
          PROGRAM 51 - measure and print index/sector times
          RTZ
          measure and print seek in 1 track
          PROGRAM 57 - display cylinder
          RTZ
          measure and print seek in (LCYL/3)
          PROGRAM 57 - display cylinder
          RTZ
          measure and print seek in LCYL
          PROGRAM 57 - display cylinder
          SEEK-FCYL
13100:    PROGRAM 56 - display track
          FORMAT
          INCREMENT HEAD
          LOOP NHD, 13100
          SELECT FHD
13101:    PROGRAM 56 - display track
          READ
          INCREMENT HEAD
          LOOP NHD, 13101
          If error
               print "FAIL"
          If no error
               print "PASS"
```

8.2.9 Special Program 32 - Inner Track Access

Special Program 32 tests the five inner-most tracks of the drive.

```
          PROGRAM 68 - cylinder mode on
          SET DATA STROBE = normal
          SET SERVO OFFSET = normal
          SEEK LCYL-5
13200:    SEEK IN 1
          PROGRAM 57 - display cylinder
          FORMAT (cylinder # = data pattern)
          LOOP 5, 13200
13201:    PROGRAM 57 - display cylinder
          VERIFY
          SEEK OUT 1
          LOOP 5, 13201
```

8.2.10 Special Program 33 - Media Verify

This program attempts to locate all media defects on the drive. A soft single sector format is used whenever possible for the best coverage. Three read/write passes are used per loop to locate any defects. The data pattern is shifted one character and a different servo offset and data strobe offset is used during each pass (if selected via Functions 35 and 36). The loop count is set via Function 33.

```
          PROGRAM 68 - cylinder mode on
          SET DATA STROBE = normal
          SET SERVO OFFSET = normal
          RTZ
          Rotate data pattern
13300:    SEEK first even cylinder
          DO until CCYL </= LCYL
               PROGRAM 56 - display cylinder
               FORMAT
          SEEK last odd cylinder
          DO until CCYL > FCYL
               PROGRAM 56 - display cylinder
               FORMAT
          SEEK first even cylinder
          DO until CCYL </= LCYL
               PROGRAM 56 - display cylinder
               READ
          SEEK last odd cylinder
          DO until CCYL > FCYL
               PROGRAM 56 - display cylinder
               READ
          Rotate data pattern
          If FUNCTION 35 = ON
               Select next data strobe offset
          If FUNCTION 36 = ON
               Select next servo offset
          SEEK first even cylinder
          DO until CCYL </= LCYL
               PROGRAM 56 - display cylinder
               WRITE
          SEEK last odd cylinder
          DO until CCYL > FCYL
               PROGRAM 56 - display cylinder
               WRITE
          SEEK first even cylinder
          DO until CCYL </= LCYL
               PROGRAM 56 - display cylinder
               READ
          SEEK last odd cylinder
          DO until CCYL > FCYL
               PROGRAM 56 - display cylinder
               READ
```

```
Rotate data pattern
If FUNCTION 35 = ON
     Select next data strobe offset
If FUNCTION 36 = ON
     Select next servo offset
SEEK first even cylinder
DO until CCYL </= LCYL
     PROGRAM 56 - display cylinder
     WRITE
SEEK last odd cylinder
DO until CCYL > FCYL
     PROGRAM 56 - display cylinder
     WRITE
SEEK first even cylinder
DO until CCYL </= LCYL
     PROGRAM 56 - display cylinder
     READ
SEEK last odd cylinder
DO until CCYL > FCYL
     PROGRAM 56 - display cylinder
     READ
Rotate data pattern
If FUNCTION 35 = ON
     Select next data strobe offset
If FUNCTION 36 = ON
     Select next servo offset
LOOP FUNCTION 33, 13300
```

8.2.11 Special Program 34 - Random Seek and Verify

This program performs a random seek and then verifies its position by reading the first header of the track. The loop count is set via Function 34.

```
          PROGRAM 69 - cylinder mode off
          SET DATA STROBE = normal
          SET SERVO OFFSET = normal
13400:    SEEK random
          SELECT HEAD random
          PROGRAM 61 - verify drive position
          LOOP FUNCTION 34, 13400
```

8.2.12 Special Program 35 - Radial Scratch

This program uses the bad track table as the center track for intense read activity to reveal any tendency in the media to reveal a scratch condition.

```
          PROGRAM 69 - cylinder mode off
          SET DATA STROBE = normal
          SET SERVO OFFSET = normal
          Scan bad track table
          If entry found
               SEEK track in error
13500:         Cylinder-1
               FORMAT track
               READ
13501:         Rotate data pattern
               WRITE
               READ
               LOOP 4, 13501
               If error detected goto 13500
               SEEK track in error
13502:         Cylinder+1
               FORMAT track
               READ
13503:         Rotate data pattern
               WRITE
               READ
               LOOP 4, 13503
               If error detected goto 13502
```

8.2.13 Special Program 40 - Print Test Status

This program is similar to Function 7 in that it is used to print the test status report for the current drive. An example of this report is shown below. If the printer is disabled via Function 20, this program will do nothing.

TEST STATUS SUMMARY-

SOFT	**ERRORS-**	**0**
HARD	**ERRORS-**	**2**
FORMAT	**ERRORS-**	**0**
TRACK	**ERRORS-**	**0**
HEAD	**ERRORS-**	**0**
FAULT	**ERRORS-**	**0**
SEEK	**ERRORS-**	**0**
NUMBER OF	**WRITES-**	**8230**
NUMBER OF	**READS-**	**8666**
NUMBER OF	**SEEKS-**	**1690**

8.2.14 Special Program 41 - Clear Test Status

This program clears the test status for the current drive.

8.2.15 Special Program 42 - Enable Error Status

This program is similar to Function 12. It enables the printing of an error status report. An example is provided below. All errors are printed "on-the-fly"; they are never stored. This is the default mode.

ERROR STATUS-

TYPE	CYLINDER	HEAD	SECTOR	COUNT	STROBE	SERVO	TAG	4T	5F	4F	5T	4T	5T
HARD	300	7	0	5208	NORML	NORML							
SOFT	687	2	0	13655	NORML	NORML							
SEEK	426							01		00		2E	
HARD	205	8	0	10007	NORML	NORML							
HARD	562	2	0	4643	NORML	----							

8.2.16 Special Program 43 - Disable Error Status

This program is also related to Function 12. is used to disable printing of an error status report.

8.2.17 Special Program 44 - Enable Stop On Error

This program is similar to Function 13 in that it enables the "Stop On Error" feature. Each time a unique error is detected, the error counts are updated and compared with the abort levels which are user-specified through the <Stop on Error> key. If a match is detected, the current operation is aborted and the appropriate message is displayed and printed. This is the factory default mode.

8.2.18 Special Program 45 - Disable Stop On Error

This program is also similar to Function 13. It is used to disable the Stop on Error feature.

8.2.19 Special Program 46 - Print Bad Track Table

This program prints the bad track table for the current drive as shown below. Configure Functions 11, 20, and 23 as required.

```
BAD TRACK SUMMARY-

HEAD CYLINDER SECTOR TYPE COUNT LENGTH # ERRORS

  0      344      0   HARD  1209     12        6
  0      870      0   KEYD 17587     15        1
  3      903      0   FMAP   518     31        1
  6       25      0   SOFT   232      1        1
```

8.2.20 Special Program 47 - Clear Bad Track Table

This program clears the bad track table for the current drive.

8.2.21 Special Program 49 - Print Drive Configuration

This program prints the current drive configuration only, as shown in the example below. To print ALL configurations residing in memory, use Function 29.

```
INTERFACE          SMD     FORMAT TYPE       SOFT
NUMBER TAGS          3     SOFT=HARD            3
INDEX CABLE          A     SECTOR CABLE      BOTH
FIRST CYLINDER       0     LAST CYLINDER      822
FIRST HEAD           0     LAST HEAD            9
FIRST SECTOR         1     LAST SECTOR         32
BYTES/SECTOR       650     HEADER CRCS         NO
HEADER SYNC         09     DATA SYNC           0E
INDEX/SECTOR GAP    16     BYTES/PLO           11
```

8.2.22 Special Program 50 - Print Drive Status

This program prints the status of the currently selected drive. An example is provided below.

```
PLUG NUMBER          0
SELECT             YES
READY              YES
INDEX A            YES
INDEX B            YES
ON CYLINDER        YES
SEEK END           YES
SECTOR A           YES
SECTOR B            NO
FAULT               NO
SEEK ERROR          NO
WRITE PROTECT       NO
SECTOR COUNT        32
TAG 4T 5F           01
TAG 4F 5T           00
TAG 4T 5T           2E
```

8.2.23 Special Program 51 - Print Index and Sector Time

This program is used to print the index and sector times of the current drive. An example is shown in Appendix C2.

8.2.24 Special Program 52 - Print Time and Date

This program is used to print the time and date, as shown in Appendix C2.

8.2.25 Special Program 53 - Print Track Lockout Table

This program prints the contents on the track lockout table for the current drive. An example is shown below. The lockout table will NOT be printed if Function 14 (track lockout enable) is off.

TRACK LOCKOUT SUMMARY-

HEAD	TRACK
0	802
2	NCYL *
3	532
3	22
6	735
9	243

* entire head is locked out

8.2.26 Special Program 54 - Print Elapsed Time Counter

This program is used to print the elapsed time of an operation or test program. An example is provided in Appendix C2.

8.2.27 Special Program 55 - Clear Elapsed Time Counter

This program clears the elapsed time counter.

8.2.28 Special Program 56 - Display Drive Position

This program displays the current drive position. Examples of track and cylinder mode displays are shown in Appendix C2.

8.2.29 Special Program 57 - Display Current Cylinder

This program displays the current drive position as shown in Appendix C2.

8.2.30 Special Program 59 - Print Firmware Version Numbers

This program prints the revision of the installed firmware. An example is shown in Appendix C2.

8.2.31 Special Program 60 - Print Drive Number

This program prints the current drive number (e.g., DRIVE 1).

8.2.32 Special Program 61 - Verify Drive Position

This program verifies the current drive position by reading the first header contained on the selected track and comparing the track and head numbers. If the track miscompares, the "Track Errors" count is incremented. Likewise, if the head miscompares, the "Head Errors" count is incremented.

8.2.33 Special Program 62 - Enable Track Lockout Function

This program is similar to Function 14. It enables the track lockout table which is entered via Function 15. Any track contained in this table will be bypassed during a Write, Format or Verify operation. Configure Functions 15 and 16 as required.

8.2.34 Special Program 63 - Disable Track Lockout Function

This program is also related to Function 14. It is used to disable the track lockout function. This is the factory default mode.

8.2.35 Special Program 64 - Enable Bad Track Table

Similar to Function 11, this program enables the bad track table. This is the default mode. Configure Functions 23, 25, and 26 as required.

8.2.36 Special Program 65 - Disable Bad Track Table

This program is also similar to Function 11. It is used to disable the bad track table. No entries will be added to the current bad track table if this program is selected. If the bad track table is disabled, the duplicate mode (see Function 18) will always be active. This program is provided to allow the testing of drives containing numerous defects that would normally fill up memory and abort the current operation.

8.2.37 Special Program 66 - Print Test Station Number

This program prints the test station number which is entered through Function 4. An example is provided in Appendix C2.

8.2.38 Special Program 67 - Select Next Drive

This program increments the drive number. If the current drive is greater than 3, drive 0 is selected.

8.2.39 Special Program 68 - Enable Cylinder Mode

Similar to Function 17, this program enables the cylinder mode. When the cylinder mode is enabled, all Read, Write, Format, and Verify operations are performed on the entire cylinder (FHD through LHD).

8.2.40 Special Program 69 - Disable Cylinder Mode

This program is similar to Function 17 in that it disables the cylinder mode. This is the factory default mode.

8.2.41 Special Program 70 - Enable Duplicate Mode

This program is related to Function 18. It is used to enable the duplicate mode. When the duplicate mode is enabled, any error detected, including those already in the Bad Track Table, will be printed in the error status report if the error status is enabled. This is the default mode.

8.2.42 Special Program 71 - Disable Duplicate Mode

Similar to Function 18, this program disables the duplicate mode. That is, any error detected will be included in the error status report only if the error is NOT already contained in the bad track table. The duplicate mode only applies to HARD, KEYD, FMAP, SOFT, or FIRM errors.

8.2.43 Special Program 72 - Enter Drive Serial Number

This program prompts you to enter the serial number for the current drive. This serial number can be printed via Special Program 73.

8.2.44 Special Program 73 - Print Drive Serial Number

This program prints the serial number of the current drive, as shown in Appendix C2.

8.2.45 Special Program 100 - Read and Print Flaw Map

This program reads the flaw map from the current drive and outputs the information to the printer. The flaw map is assumed to be compatible with the FUJITSU specification. An example is provided below.

*****MEDIA DEFECT LIST*****

CYLINDER	HEAD	COUNT	LENGTH
65	0	19344	20
775	0	597	6
253	1	6730	18
687	2	13654	12
96	3	14293	20
8	4	655	28
431	4	17236	35
22	5	36303	28
519	6	25102	7
300	7	5208	13
205	8	10080	12
136	9	3484	45

8.2.46 Special Program 101 - Read Flaw Map and Add to BTT

This program reads the flaw map from the current drive and adds the entries to the bad track table. The flaw map is assumed to be compatible with the FUJITSU specification. Configure Function 11 as required.

8.2.47 Special Program 102 - Write BTT to Flaw Map

This program writes the bad track table to the drive. This bad track table contains ONLY those entries which would be printed via Special Program 46. The flaw map is compatible with the FUJITSU specification.

8.3 EXECUTING SPECIAL PROGRAMS 0 AND 10

Special Program 0 is an industry-standard routine for the final testing of an SMD interface disk drive. It comprises five subtests which may be configured or tailored to your specific drive testing criteria. These subtests are actually calls to other Special Programs, as follows:

1. Basic Drive Verify (SP 1)
2. Inner Track Access (SP 2)
3. Media Verify (SP 3)
4. Seek and Verify (SP 4)
5. Radial Scratch (SP 5)

Special Program 10 is identical to Special Program 0, with one major exception: it may be configured to read/write a Fujitsu-type flaw map from/to the drive during the test.

The following is an explanation of the prompt/response sequence that is used to invoke Special Programs 0 and 10.

To initiate the Special Programs:

1. Press **<Special Prog>** and enter **<0>** or **<10>** in response to the prompt **"PROGRAM."** Then press **<Enter/Next>**, followed by **<Single RUN>** to begin program execution.

2. In response to the prompt "DRV CONFIG," enter the desired drive configuration number, followed by **<Enter/Next>**. If you enter **<0>**, the program will then prompt for all of the drive configuration parameters discussed in section 5.5. To bypass these configuration prompts, enter the number (1-99) of a configuration created via Function 8 (paragraph 7.2.9).

3. After the drive configuration has been specified, the program will prompt **"DATA."** Enter the appropriate 12-bit hexadecimal data pattern to be used during the test. "6DB" is the default data pattern. Press **<Enter/Next>**.

4. In response to **"NUMBER DRIVES,"** enter the number (1-4) of drives to be tested, followed by **<Enter/Next>**.

5. The Analyzer will then prompt "**CLEAR BTT.**" To clear the current bad track table, enter **<Yes>**, and press **<Enter/Next>**.

   However, if you've previously specified any tracks to be "locked out" during the test (Function 15), or updated the bad track table via the keyboard (Function 26), you should enter **<No>**, followed by **<Enter/Next>**. The bad track table will be retained during the test.

6. Then, enter **<Yes>** or **<No>**, followed by **<Enter/Next>**, in response to the prompt "**STOP ON ERR.**"

   A "Yes" response will cause the program to abort if the error limits specified through the **<Stop on Error>** key are reached.

   A "No" will enable the test to run uninterrupted, regardless of the number of errors encountered. (See paragraph 5.7 for stop on error details.)

7. To run all five subtests, enter **<Yes>** and **<Enter/Next>** in response to the prompt "**ALL TESTS.**"

   If you don't want to run all of the tests, enter **<No>** and **<Enter/Next>**. Then, specify the desired test numbers (1-5) in response to "**DO TEST.**" Follow each entry with **<Enter/Next>**.

8. The Analyzer will prompt "**NMBR PASSES.**" Enter the number of passes to run the Special Program, and press **<Enter/Next>**.

9. Finally, enter the serial number for each drive to be tested. Follow each number with **<Enter/Next>**.

   After the final serial number is specified, Special Program 0 will immediately begin execution. Special Program 10, however, requires two additional parameters to be specified, as described below.

10. In response to "**RD FLAW MAP,**" enter **<Yes>** or **<No>** and press **<Enter/Next>**.

    A "Yes" response instructs the Analyzer to read the current flaw map from the drive prior to the test. If the "write map" feature is enabled, the entries in this map will be merged with the any new defects located during the test.

    A "No" response instructs the Analyzer to ignore the

current flaw map. If the "write map" feature is enabled, only those defects encountered during the test will be written as the new flaw map; that is, the current map will be destroyed.

11. In response to the prompt "**WRT FLAW MAP**," enter **<Yes>** or **<No>**, followed by **<Enter/Next>**.

    A "Yes" response will cause the Analyzer to write a new Fujitsu-type flaw map to the drive upon completion of the test. The contents of this map may vary depending upon your response to the "read map" prompt.

    A "No" response prevents the Analyzer from writing a new flaw map to the drive. In this case, the current map is retained.

    After the final question has been answered, Special Program 10 will begin execution.

C H A P T E R 9

U S E R P R O G R A M S

9.1 INTRODUCTION

This chapter describes the procedures necessary to utilize the User Program mode.

9.2 USER PROGRAM EXECUTION

Perhaps the most powerful feature of the MWX-1000S Winchester Disk Analyzer is its ability to remember key stroke sequences and repeat them later as stored User Programs. The Analyzer is placed into its storing, or programmable mode by pressing **<Prog Mode>**. The Analyzer will then store the key strokes entered, rather than execute them directly. A total of 300 keystrokes from all User Programs entered can be stored. One program may only be as large as 99 keystrokes.

NOTE

Once a User Program has been written and stored in the Analyzer's non-volatile CMOS RAM, it is invoked and executed via **<Special Prog>** while in the Console Mode. **<Prog Mode>** is used only when writing or editing User Programs; it is NOT used to execute programs.

9.2.1 Select a Program

To select a specific User Program:

1. **Press <Prog Mode>.** The red indicator in the key will illuminate when the User Program Mode is entered.

2. Enter the number of the program to be edited or created, followed by **<Enter/Next>**. Program numbers 300 through 499 are available for User Programs.

   If an unused program number is selected, the display will show **"01 END."**

If an occupied program number is selected, the display will show **"PROGRAM nnn,"** where "nnn" designates the program number.

9.2.2 Display a Program

To display User Program statements:

1. Select an existing program number as shown above.

2. Press **<Display Prog>**. The Analyzer will respond by displaying the first line of the selected program with the format:

   LL FFFFFFFF AAAA

   L = Line Number **F** = Function **A** = Argument

   Pressing **<Display Prog>** repeatedly will display each succeeding line of the program in sequence.

9.2.3 Write and Store a New Program

To write a new User Program:

1. Select an unused program number as specified in 9.2.1.

2. Press the Operation key (e.g., **<Format/Verify>**, **<Write>**, **<Select Head>**, **<Function>**, etc.) for the first desired program step.

3. Enter the parameter required by the operation, and press **<Enter/Next>** to store the information in CMOS RAM. The selected operation then becomes a User Program statement.

4. Repeat steps 2 and 3 for each program statement desired. Statements are entered sequentially.

5. Program end is assumed to be after the last statement entered. You do not actually enter an "end" statement; it is entered automatically by the Analyzer. As many operations as required may be entered until the storage limits of the non-volatile CMOS RAM are exceeded.

9.2.4 Edit a Program

To edit a User Program:

1. Select an existing program number as specified in 9.2.1.

2. Display the line of program to be edited as described in paragraph 9.2.2.

3. To **delete** the displayed line, press **<Delete Prog>**. The next statement in the program will be moved up to the current line number and displayed.

4. To **insert** statements in the program, press the desired Operation key, followed by the required parameter value for that operation. Then, press **<Enter/Next>** to store the new operation. (Note that the **<Insert>** key is not used.)

9.2.5 Delete an Entire Program

To delete an entire User Program:

1. Select the program number to be deleted as specified in paragraph 9.2.1.

2. Press **<Delete Prog>** when the display shows the prompt **"PROGRAM nnn."**

You must activate **<Delete Prog>** before displaying any individual program statements; otherwise, the entire program will not be deleted.

9.2.6 Run a User Program

To execute a User Program:

1. Press **<Special Prog>** and enter the number of the User Program to execute, followed by **<Enter/Next>**.

2. Press **<Single RUN>** to initiate program execution.

3. During execution, the program may prompt for additional information (e.g., number of drives) After each prompt, enter the data requested, followed by **<Enter/Next>**.

4. Press **<STOP/End>** at any time to halt program execution.

9.2.7 Program Loops

Use **<Repeat>** to implement looping within a test program. Repeat requires two arguments: a target statement number, and the number of times to repeat the statement itself. After pressing **<Repeat>**, enter a 2-digit target statement number, and press **<Enter/Next>**; then enter a 2-digit repeat counter value, and press **<Enter/Next>** again. A program loop is thus established to cause repetition of the group of statements for the number of times in the repeat counter.

To facilitate the creation of program loops for certain operations, four entry pad wildcard characters (listed below) may be used to represent **<Repeat>** parameters.

Wildcard	Repeated Parameter
B	Number of Heads
D	Number of Cylinders
E	Number of Drives
F	Forever

Refer to Appendix A for details on Wildcard Operations.

9.3 FUNCTION CODE DEFAULTS IN PROGRAM EXECUTION

When a User Program is invoked, certain Function code default values are established. These Functions, and their corresponding defaults, are listed below.

Function	Description	Default
11	Enable/Disable Bad Track Table SP 64 = Enable Bad Track Table SP 65 = Disable Bad Track Table	Enabled
12	Enable/Disable Error Status SP 42 = Enable Error Status SP 43 = Disable Error Status	Enabled
13	Enable/Disable Stop on Error SP 44 = Enable Stop on Error SP 45 = Disable Stop on Error	Enabled

14	Enable/Disable Track Lockout SP 62 = Enable Track Lockout SP 63 = Disable Track Lockout	Disabled
17	Enable/Disable Cylinder Mode SP 68 = Enable Cylinder Mode SP 69 = Disable Cylinder Mode	Disabled
18	Duplicate Error in Error Status SP 70 = Enable Duplicate Mode SP 71 = Disable Duplicate Mode	Disabled

To change the defaults for User Program execution, you can either call the Function from the User Program and respond to the resulting "on/off" prompt every time you run the program, or you can call the appropriate Special Program to set the desired condition. The Special Program numbers which correspond to the Functions are shown above.

For example, suppose you want to disable the Stop on Error feature in your User Program. This function defaults to the enabled state. Therefore, to disable Stop on Error you must either call Function 13 from the User Program and respond to the "on/off" prompt through the entry pad, or call Special Program 45 from the program to automatically disable the Stop on Error function. The latter method eliminates the need for any user prompt/response sequence.

NOTE

When a Function setting is changed via the front panel Console Mode, it will have no effect on the Program Mode setting, and vice versa.

9.4 USER PROGRAM EXAMPLE

To help you develop custom User Programs to meet your specific drive test applications, a sample program is provided below.

This program, designated #398, prompts for the desired drive configuration, performs a complete format and verification of the entire disk drive, and prints test status results and the elapsed

test time upon completion of the exercise. Each operation is performed as a result of "calls" to Special Programs and Operation keys.

In addition, the sample program calls a Special Program (43) to disable the normally enabled (by default) error status printout function. The cylinder mode is also disabled, which requires no special user intervention since the cylinder mode defaults to the disabled state. (See paragraph 9.3.)

```
PROGRAM      398

01 FUNCTION   24      - prompt for drive configuration
02 PROGRAM    41      - call SP 41 (clear test status)
03 PROGRAM    55      - call SP 55 (clear elapsed timer)
04 PROGRAM    43      - call SP 43 (disable error status)
05 SEEK      FCYL     - seek to first cylinder
06 PROGRAM    56      - call SP 56 (display drive position)
07 FMT/VFY   6DB      - format/verify with data pattern 6DB
08 INC HD     01      - increment head count by one
09 LOOP   6  NHD      - repeat 6-8 by total number of heads
10 SEEK IN     1      - seek in one cylinder
11 LOOP   6 NCYL      - repeat 6-10 by total number of cyls
12 PROGRAM    40      - call SP 40 (print test status)
13 PROGRAM    54      - call SP 54 (print elapsed time)
14 END                - program end
```

To write the program listed above, perform the following steps:

1. Press **<Prog Mode>** and enter **<398>** to specify the desired User Program number. The display will show **"01 END"** to indicate that "398" is a previously unused program. Since no program operations have been specified, statement 01 is shown as the "end" statement. As program statements are entered, the "end" statement number will increment.

2. Press **<Function>**, **<24>**, and **<Enter/Next>**. Function 24 is then entered as the first program statement. It causes the program to prompt for the desired drive configuration number.

3. Press **<Special Prog>**, **<41>**, and **<Enter/Next>**. It clears the previous test status.

4. Press **<Special Prog>**, **<55>**, and **<Enter/Next>**. Special Program 55 clears the elapsed timer.

5. Press **<Special Prog>**, **<43>**, and **<Enter/Next>**. Special Program 43 disables error status printouts.

6. Press **<Seek>**, **<C>**, and **<Enter/Next>**. Then, in response to the **"VERIFY"** prompt, answer **<No>** and press **<Enter/Next>**. **"C" is a** wildcard character which represents "First Cylinder" (FCYL). Therefore, this statement instructs the drive to perform a seek operation to the first cylinder.

7. Press **<Special Prog>**, **<56>**, and **<Enter/Next>**. Special Program 56 is used to display the current drive position; i.e., head and cylinder number.

8. Press **<Format/Verify>** and answer **<Yes>** in response to the **"VERIFY"** prompt. Press **<Enter/Next>**. Then, enter **<6DB>** and press **<Enter/Next>** to select the desired data pattern.

9. Press **<Inc Head>**, **<1>**, and **<Enter/Next>** to cause the drive to increment the head count by one.

10. Press **<Repeat>**, and enter **<6>** in response to the prompt **"STATEMENT."** Press **<Enter/Next>**. Then, enter **<B>** in response to the prompt **"COUNT."** Press **<Enter/Next>** to cause the program to loop through statements 06-08 by the total number of heads (as defined by the drive configuration). "6" represents the statement number at which to begin the program loop, and "B" is a wildcard character which represents the number of heads (NHD).

    This program loop will display the current drive position, format/verify the drive for the current head and cylinder, increment the head by one, and repeat the entire procedure for all heads.

11. Press **<Seek In>**, **<1>**, and **<Enter/Next>**. Then, in response to the **"VERIFY"** prompt, answer **<No>** and press **<Enter/Next>**. This command causes the drive to seek the heads in by one cylinder.

12. Press **<Repeat>**, and enter **<6>** in response to the prompt **"STATEMENT."** Press **<Enter/Next>**. Then, enter **<D>** in response to the prompt **"COUNT."** Press **<Enter/Next>** to cause the program to loop through statements 06-10 by the total number of cylinders (as defined by the drive configuration). "5" represents the statement number at which to begin the program loop, and "D" is a wildcard which represents the number of cylinders (NCYL).

This program loop will display the current drive position, format/verify the drive for the current head and cylinder, increment the cylinder count by one, and repeat the entire procedure for all heads and cylinders.

13. Press **<Special Prog>**, **<40>**, and **<Enter/Next>**. Special Program 40 is used to output test status results to the connected printer. An example test status report is provided in Appendix C2.

14. Press **<Special Prog>**, **<54>**, and **<Enter/Next>**. Special Program 54 is used to output the elapsed test time to the printer, as shown in Appendix C2.

APPENDICES

APPENDIX A

WILDCARD OPERATIONS

When performing certain Console mode operations, or creating User Programs, you may enter a "wildcard" character to represent a particular drive parameter in response to an Operation key selection (i.e., **<Seek>**, **<Select Head>**, **<Repeat>**).

The wildcards are generic in nature; that is, the value for each is not actually specified until the operation is performed. Upon initiation of the operation, the Analyzer determines the appropriate value for the wildcard character (based upon the specific drive configuration) and substitutes that value for the wildcard.

This capability facilitates the test process because you can easily create a generic program to test numerous drives having different configurations, rather than writing a different program for each drive configuration.

For example, you can select "SEEK FIRST CYLINDER" as a program statement or console operation. When executed, the drive under test will seek to the first cylinder, even though you did not specify the actual number of the first cylinder for that drive.

The wildcard characters, and the Operation keys to which they apply, are shown below.

Operation Key	Wildcard	Description (Generic Parameter)
Seek	C	First Cylinder
Select Head	A	First Head
Repeat	B	Number of Heads
Repeat	D	Number of Cylinders
Repeat	E	Number of Drives
Repeat	F	Forever

APPENDIX B

FUJITSU FLAW MAP SUPPORT

The MWX-1000S supports reading and writing of the Fujitsu-type flaw maps via the following factory "canned" Special Programs:

Program	Comments
10	Wilson SMD Final Test. This program is identical to Special Program 0, except it optionally allows the reading and/or writing of the flaw map during execution of the test. You are prompted for these options.
100	Read the flaw map from the drive and output the information to the printer.
101	Read the flaw map from the drive and add the entries to the Bad Track Table.
102	Write the Bad Track Table to the drive in the Fujitsu flaw map format. All entries in the Bad Track Table (i.e., FMAP, KEYD, HARD, FIRM, SOFT) are written to the drive.

Note: If Function 23 is disabled, SOFT errors will not appear in a printed Bad Track Table, nor will they be written to the drive.

MISCELLANEOUS INFORMATION

The drive must be configured for the single-sector mode (or Function 28 must be "ON") to utilize the flaw map feature. Refer to paragraphs 5.5.1 and 7.2.29 for details.

In addition, if the drive supports soft sectoring, set Function 32 to "1," which causes the flaw map to be written to the drive twice, and includes the address mark as defined in the Fujitsu flaw map specification. This will hold true for most SMD drives. However, if the drive does not support soft sectoring, set Function 32 to "0," which causes the flaw map to be written once only, and no address mark will be included.

A P P E N D I X C

M E S S A G E S A N D R E P O R T S

This Appendix is divided into three parts. Appendix C1 describes error messages and reports, and Appendix C2 describes test status messages and reports. Appendix C3 utilizes both error and status reports in a sample Special Program 0/10 test report.

APPENDIX C1

ERROR MESSAGES AND REPORTS

This Appendix lists and describes the messages which may be displayed by the Analyzer in the event that an error is encountered during execution of SMD drive tests.

Two different types of errors are discussed, as follows:

- Internal MWX-1000S errors, normally associated with component failures or invalid configurations.
- Fatal drive and test abort errors.

Also provided are examples of a printed error status summary and bad track table. Where appropriate, the applicable Functions and Special Programs for all printed error messages are provided.

INTERNAL MWX-1000S ERROR MESSAGES

The errors messages described below are normally displayed during execution of the Analyzer's power-on self-test procedure to indicate that an internal component error has occurred.

"FIRMWARE MISMTCH"

The Z80 and 8X305 firmware installed in the unit are incompatible with each other.

"Z DIAG FAIL"

The Z80 power-on diagnostics detected an internal Z80 CPU failure.

"X DIAG FAIL"

The 8X305 power-on diagnostics detected an internal 8X305 CPU failure.

"PRNTR NOT READY"

The printer output driver detected an error condition when attempting to write to the printer. This failure can be caused by a number of conditions including the printer not being selected, connected, or powered-on, no paper in the printer, or printer configuration.

"8X305 TIMED OUT"

The 8X305 failed to respond to a command within a specified worst case time frame.

"ROM x FAIL"

The Z80 ROM indicated by "x" failed the initial checksum test. The ROM should be checked to ensure it is inserted properly.

FATAL DRIVE ERROR MESSAGES

Two different types of fatal drive errors are discussed below.

- Single Occurrence Errors
- Errors with Test Abort Limits

Single Occurrence Errors

These errors are considered fatal upon the first occurrence.

"DRV x NOT RDY"	The drive is not ready.
"DRV x NO INDEX"	The drive has no index pulse.
"DRV x SK TME OUT"	A seek operation has timed out.
"DRV x WRT PROT"	The drive is write protected.
"DRV x NO SRV CLK"	The drive has no servo clock.
"DRV x NO RD CLK"	The drive has no read clock.

Errors With Test Abort Limits

When a user-specified test abort limit is attained while the "Stop on Error" mode is enabled, the Analyzer will display **"STOPPED ON ERROR"** and the printer will output one of the messages shown below to indicate which error limit was reached.

Applicable Functions/Special Programs:

Function 13 - enable/disable stop on error
Function 20 - configure printer
SP 44 - enable stop on error
SP 45 - disable stop on error

Drive x fault error abort limit reached
Drive x seek error abort limit reached
Drive x head soft error abort limit reached
Drive x head hard error abort limit reached
Drive x head format error abort limit reached
Drive x track error limit abort reached
Drive x head error limit abort reached
Drive x soft error limit abort reached
Drive x hard error limit abort reached
Drive x format error limit abort reached
Drive x index out of tolerance
Drive x sector out of tolerance

Test abort limits are set via the stop on error procedure, as described in paragraph 5.7.

PRINTED DRIVE ERROR REPORTS

Shown below are examples of printed drive error reports, including a sample error status summary and a bad track table. Remember to configure your printer via Function 20.

Error Status

The error status is an "on-the-fly" report of all errors encountered during execution of drive tests.

Applicable Functions/Special Programs:

Function 6 - enab/disab error status printing during SP 0-10
Function 12 - enable/disable all error status
Function 18 - enable/disable duplicate mode
SP 42 - enable error status
SP 43 - disable error status
SP 69 - enable duplicate mode
SP 70 - disable duplicate mode

ERROR STATUS-

TYPE	CYLINDER	HEAD	SECTOR	COUNT	STROBE	SERVO	TAG 4T 5F	4F 5T	4T 5T
HARD	300	7	0	5208	NORML	NORML			
SOFT	687	2	0	13655	NORML	NORML			
HARD	205	8	0	10007	NORML	NORML			
SEEK	426						01	00	2E
HARD	137	5	25	53	NORML	----			
SOFT	257	2	0	17109	EARLY	PLUS			
AMRK	16	0	16	02/03	EARLY	MINUS			
SYNC1	859	5	0	03/03	LATE	NORML			
SYNC2	259	0	62	01/03	LATE	NORML			

TYPE
HARD - hard media error
SOFT - soft media error
AMRK - missing address mark detected
SYNC1 - header sync byte not found
SYNC2 - data sync byte not found

CYLINDER
Cylinder address at which the error was detected.

HEAD
Head address at which the error was detected.

SECTOR
Sector address at which the error was detected.

COUNT
HARD, SOFT - byte count from index where the error occurred.

AMRK, SYNC1, SYNC2 - "**xx/yy**" = "**xx**" misses in "**yy**" attempts.

STROBE
Current data strobe offset setting.

SERVO
Current servo offset setting. A "----" indicates that the error occurred while reading the header during a write operation.

BIT 8T 9F
BIT 8F 9T
BIT 8T 9T
Vendor defined drive status information is printed only when Tag 4 is enabled.

TAG 4T 5F
TAG 4F 5T
TAG 4T 5T
Vendor defined drive status information is printed only when Tags 4/5 are enabled.

TAG 0T 1F
TAG 0F 1T
Extended status which is printed only when 6 is enabled.

Bad Track Table

The bad track table lists all media defects on the drive.

Applicable Functions/Special Programs:

Function 11 - enable/disable bad track table
Function 23 - enab/disab printing of soft errors in BTT
Function 25 - display bad track table
Function 26 - update bad track table via keyboard
Function 27 - delete bad track table entry
SP 46 - print bad track table
SP 64 - enable bad track table
SP 65 - disable bad track table
SP 101 - read flaw map from drive and add entries to BTT
SP 102 - write BTT to drive in Fujitsu flaw map format

BAD TRACK SUMMARY-

HEAD	CYLINDER	SECTOR	TYPE	COUNT	LENGTH	# ERRORS
2	687	0	HARD	13655	12	3
7	300	0	HARD	5208	12	1
8	205	0	HARD	10007	12	3
0	344	0	HARD	209	12	6
0	870	0	KEYD	87	15	1
3	903	0	FMAP	218	31	1
6	25	0	SOFT	232	1	1
2	265	0	FIRM	79	1	1
4	177	MAP READ ERROR				

HEAD Head address at which the error was detected.

CYLINDER Cylinder address at which the error was detected.

SECTOR Sector address at which the error was detected.

TYPE
HARD - hard media error
SOFT - soft media error
FIRM - recurring soft media error (2 or more)
KEYD - entry was keyed-in via Function 26.
FMAP - entry was read from the drive flaw map.

COUNT	HARD, SOFT - byte count from index where the error occurred. AMRK, SYNC1, SYNC2 - "**xx/yy**" = "**xx**" misses in "**yy**" attempts.
LENGTH	Bit length of the error. Currently, the bit length will always be "**1**" for a soft error, and "**12**" for a hard error.
# ERRORS	Number of times the same error was encountered during the test.
MAP READ ERROR	Indicates that the Analyzer failed to read address/data of the flaw map of the drive.

APPENDIX C2

STATUS MESSAGES AND REPORTS

This Appendix lists and describes the status messages which may be displayed by the Analyzer during normal operations. Also provided are examples of a printed status reports.

Where appropriate, the applicable Functions and Special Programs for all printed or displayed status information are provided.

DISPLAYED STATUS MESSAGES

Listed below are the status messages which are displayed by the Analyzer during normal operations.

"MWX-1000S READY"

The MWX-1000S is in the console mode and ready to accept a new command.

"CMOS CLEARED"

This message can only be seen on power-up or reset. It signifies that the CMOS RAM has been re-initialized and the default values have been loaded. This message is normal when installing new firmware or if the battery is dead.

Drive Position/Current Cylinder

Applicable Functions/Special Programs:

Function 17 - enable/disable cylinder mode
Function 19 - display drive position
SP 56 - display drive position
SP 57 - display current cylinder

"d CYL cccc HD hh"

Track Mode Display: **d** = drive **cccc** = cylinder **hh** = head

"d CYLINDER cccc"

Cylinder Mode Display: **d** = drive **cccc** = cylinder

PRINTED STATUS REPORTS

Listed below are examples of status reports which may be output to the printer during normal operation of the MWX-1000S. Remember to configure your printer via Function 20.

Test Status Summary

The test status summary is a brief synopsis of current Analyzer test activity including the number of errors, writes, reads, and seeks that have occurred since the last "clear status" operation.

Applicable Functions/Special Programs:

Function 7 - enab/disab test status printing during SP 0-10
SP 40 - print current test status
SP 41 - clear test status

TEST STATUS SUMMARY-

SOFT ERRORS-	**0**
HARD ERRORS-	**2**
FORMAT ERRORS-	**0**
TRACK ERRORS-	**0**
HEAD ERRORS-	**0**
FAULT ERRORS-	**0**
SEEK ERRORS-	**0**
NUMBER OF WRITES-	**30870**
NUMBER OF READS-	**30870**
NUMBER OF SEEKS-	**6174**

SOFT ERRORS	The number of soft errors detected since the last test status summary clear operation.
HARD ERRORS	The number of hard errors detected since the last test status clear.
FORMAT ERRORS	The number of format errors (Address Mark, Sync 1, and Sync 2) detected since the last test status clear.
TRACK ERRORS	The number of times the target track number and the track read did not match during a seek/verify.

HEAD ERRORS	The number of times the target head number and the head number read from the drive did not match during a seek/verify operation.
FAULT ERRORS	The number of times the drive indicated a fault condition since the last test status clear.
SEEK ERRORS	The number of times the drive indicated a seek error condition since the last test status clear.
NUMBER OF WRITES	The number of tracks written since the last test status clear operation. A format operation counts as a write.
NUMBER OF READS	The number of tracks read since the last test status clear.
NUMBER OF SEEKS	The number of seeks performed since the last test status clear. Zero track seeks are not included.

Drive Configuration

Applicable Functions/Special Programs:

Function 8 - enter/alter drive configuration (1-99)
Function 9 - delete drive configuration (1-99)
Function 24 - set drive configuration prompt in User Program
Function 29 - print all drive configurations
SP 49 - print current drive configuration

DRIVE CONFIGURATION 00

INTERFACE	**SMD**	**FORMAT TYPE**	**SOFT**
NUMBER TAGS	**3**	**SOFT=HARD**	**3**
INDEX CABLE	**A**	**SECTOR CABLE**	**BOTH**
FIRST CYLINDER	**0**	**LAST CYLINDER**	**822**
FIRST HEAD	**0**	**LAST HEAD**	**9**
FIRST SECTOR	**1**	**LAST SECTOR**	**32**
BYTES/SECTOR	**650**	**HEADER CRCS**	**NO**
HEADER SYNC	**09**	**DATA SYNC**	**0E**
INDEX/SECTOR GAP	**16**	**BYTES/PLO**	**11**

```
DRIVE CONFIGURATION 01
INTERFACE          CMD      FORMAT TYPE        HARD
NUMBER TAGS          3      SOFT=HARD             3
INDEX CABLE          B      SECTOR CABLE          B
FIRST CYLINDER       0      LAST CYLINDER       822
FIRST RMV HEAD       0      LAST RMV HEAD         0
FIRST FIXED HEAD    16      LAST FIXED HEAD      19
FIRST SECTOR         0      LAST SECTOR           0
BYTES/TRACK      20160      HEADER CRCS          NO
HEADER SYNC         09      DATA SYNC            0E
INDEX/SECTOR GAP    16      BYTES/PLO            11
```

Drive Status

Applicable Functions/Special Programs:

SP 50 - print current drive status

```
PLUG NUMBER          0
SELECT             YES
READY              YES
INDEX A            YES
INDEX B            YES
ON CYLINDER        YES
SEEK END           YES
SECTOR A           YES
SECTOR B            NO
FAULT               NO
SEEK ERROR          NO
WRITE PROTECT       NO
SECTOR COUNT        32
TAG 4T 5F           01
TAG 4F 5T           00
TAG 4T 5T           2E
```

Track Lockout Table

Applicable Functions/Special Programs:

Function 14 - enable/disable track lockout
Function 15 - enter track lockout values
Function 16 - delete track lockout values
SP 53 - print track lockout table

TRACK LOCKOUT SUMMARY-

HEAD	TRACK
0	802
2	NCYL *
3	22
3	532
6	735
9	243

---

* entire head is locked out

Index/Sector Time

Applicable Functions/Special Programs:

SP 51 - print index/sector time

INDEX TO INDEX TIME 16.672 MSEC
INDEX TO SECTOR TIME .259 MSEC

Time and Date

Applicable Functions/Special Programs:

Function 10 - set time and date
SP 52 - print time and date

TIME-15:30:24 DATE-12JAN87

Elapsed Time

Applicable Functions/Special Programs:

SP 54 - print elapsed time
SP 55 - clear elapsed time counter

ELAPSED TIME- 02 HOURS 27 MINUTES 42 SECONDS

Firmware Revision

Applicable Functions/Special Programs:

Function 3 - display firmware revision
SP 59 - print firmware revision

MWX-1000S Z01.03/X01.03

Drive Number

Applicable Functions/Special Programs:

SP 60 - print current drive number

DRIVE 1

Test Station Number

Applicable Functions/Special Programs:

Function 4 - set test station number
SP 66 - print test station number

TEST STATION 00000001

Serial Number

Applicable Functions/Special Programs:

SP 72 - enter drive serial number
SP 73 - print drive serial number

SERIAL NUMBER - A123456789

APPENDIX C3.

SPECIAL PROGRAM 0/10 TEST REPORT

This Appendix provides an example of a test report obtained by execution of Special Program 10.

```
WILSON SMD FINAL TEST

MWX-1000S  Z01.06/X01.03

TEST STATION 00000000

SERIAL NUMBER - 0123456789

DRIVE 0 CYLINDERS  823 HEADS 10

TIME-13:25:47 DATE-10MAR87

TEST 1-BASIC DRIVE VERIFY

PLUG NUMBER          0
SELECT             YES
READY              YES
INDEX A            YES
INDEX B            YES
ON CYLINDER        YES
SEEK END           YES
SECTOR A           YES
SECTOR B            NO
FAULT               NO
SEEK ERROR          NO
WRITE PROTECT       NO
SECTOR COUNT        64
TAG 4T 5F           01
TAG 4F 5T           00
TAG 4T 5T           2E
INDEX TO INDEX TIME              16.672 MSEC
INDEX TO SECTOR TIME               .259 MSEC
SEEK TIME TRACK    0 TO    1     4.285 MSEC
SEEK TIME TRACK    0 TO  274    19.213 MSEC
SEEK TIME TRACK    0 TO  822    30.922 MSEC
BASIC WRITE/READ                   PASS
```

```
 TEST STATUS SUMMARY-

       SOFT  ERRORS-       0
       HARD  ERRORS-       0
     FORMAT  ERRORS-       0
      TRACK  ERRORS-       0
       HEAD  ERRORS-       0
      FAULT  ERRORS-       0
       SEEK  ERRORS-       0
   NUMBER OF WRITES-      10
   NUMBER OF  READS-      10
   NUMBER OF  SEEKS-       6

TEST 2-INNER TRACK ACCESS


 TEST STATUS SUMMARY-

       SOFT  ERRORS-       0
       HARD  ERRORS-       0
     FORMAT  ERRORS-       0
      TRACK  ERRORS-       0
       HEAD  ERRORS-       0
      FAULT  ERRORS-       0
       SEEK  ERRORS-       0
   NUMBER OF WRITES-      50
   NUMBER OF  READS-      50
   NUMBER OF  SEEKS-       9

TEST 3-MEDIA VERIFY

     FORMAT  HARD SECTORS    1 BYTES/SECTR 40960

 ERROR STATUS-

  TYPE CYLINDER HEAD SECTOR COUNT STROBE SERVO TAG 4T 5F 4F 5T 4T 5T
  HARD     300     7      0   5208  NORML NORML
  HARD     687     2      0  13655  NORML NORML
  HARD     205     8      0  10007  NORML NORML
  HARD     300     7      0   5208  NORML NORML
  HARD     687     2      0  13655  NORML NORML
  HARD     205     8      0  10007  NORML NORML
  HARD     300     7      0   5208  NORML NORML
  HARD     687     2      0  13655  NORML NORML
  HARD     205     8      0  10007  NORML NORML
  SEEK     426                                  01    00    2E
```

```
 TEST STATUS SUMMARY-

       SOFT  ERRORS-       0
       HARD  ERRORS-       9
     FORMAT  ERRORS-       0
      TRACK  ERRORS-       0
       HEAD  ERRORS-       0
      FAULT  ERRORS-       0
       SEEK  ERRORS-       1
   NUMBER OF WRITES-   24690
   NUMBER OF  READS-   24690
   NUMBER OF  SEEKS-    4938

TEST 4-RANDOM SEEK & VERIFY


 TEST STATUS SUMMARY-

       SOFT  ERRORS-       0
       HARD  ERRORS-       0
     FORMAT  ERRORS-       0
      TRACK  ERRORS-       0
       HEAD  ERRORS-       0
      FAULT  ERRORS-       0
       SEEK  ERRORS-       0
   NUMBER OF WRITES-       0
   NUMBER OF  READS-     200
   NUMBER OF  SEEKS-     200

TEST 5-RADIAL SCRATCH


 TEST STATUS SUMMARY-

       SOFT  ERRORS-       0
       HARD  ERRORS-       0
     FORMAT  ERRORS-       0
      TRACK  ERRORS-       0
       HEAD  ERRORS-       0
      FAULT  ERRORS-       0
       SEEK  ERRORS-       0
   NUMBER OF WRITES-      48
   NUMBER OF  READS-      48
   NUMBER OF  SEEKS-       8

ELAPSED TIME-  00 HOURS  36 MINUTES  04 SECONDS

-----------------------------------------------------------------
```

```
WILSON SMD FINAL TEST

MWX-1000S  Z01.06/X01.03

TEST STATION 00000000

SERIAL NUMBER - 0123456789

TIME-14:01:51 DATE-10MAR87

BAD TRACK SUMMARY-

DRIVE 0 CYLINDERS  823 HEADS 10

HEAD CYLINDER SECTOR TYPE COUNT LENGTH # ERRORS
  2      687       0   HARD 13655   12        3
  3       22       0   FMAP  9825   45        1
  6      510       0   KEYD 25010    7        1
  7      300       0   HARD  5208   12        3
  8      205       0   HARD 10007   12        3
-------------------------------------------------------------------

       HARD  ERRORS-      3
       SOFT  ERRORS-      0
       FIRM  ERRORS-      0
       MISC  ERRORS-      1

-------------------------------------------------------------------

WILSON SMD FINAL TEST

MWX-1000S  Z01.06/X01.03

TEST STATION 00000000

SERIAL NUMBER - 0123456789

TIME-14:01:51 DATE-10MAR87

BAD TRACK SUMMARY-

DRIVE 0 CYLINDERS  823 HEADS 10

HEAD CYLINDER SECTOR TYPE COUNT LENGTH # ERRORS
  2      687       0   HARD 13655   12        3
  3       22       0   FMAP  9825   45        1
  6      510       0   KEYD 25010    7        1
  7      300       0   HARD  5208   12        3
  8      205       0   HARD 10007   12        3
-------------------------------------------------------------------
```

WILSON MWX-1000S (SMD) TESTER

SPECIAL PROGRAM #360 (M2298 M2333 M2361)

DESCRIPTION: This test program performs a format of all heads and all tracks of the device under test. Upon completion of Format, the drive is asked to verify that all surfaces and all tracks have been formatted correctly. The next function to take place is to command the drive to Seek to a random cylinder, Wrote data using all heads and Read data using all the heads. Then the drive is commanded to Seek to the next random cylinder and Repeat. The program will test as many as 4 drives in sequence. The data pattern used is (598). The following is a list of the Test Program:

	(INSTRUCTION)			(COMMENTS)
01	PROGRAM		41	CLEAR TEST STATUS
02	PROGRAM		47	CLEAR BAD TRACK TABLE
03	PROGRAM		55	CLEAR ELAPSED TIME COUNTER
04	PROGRAM		42	ENABLE ERROR STATUS
05	PROGRAM		44	ENABLE STOP ON ERROR
06	PROGRAM		68	ENABLE CYLINDER MODE
07	PROGRAM		71	DISABLE DUPLICATE MODE
08	PROGRAM		52	PRINT TIME AND DATE
09	PROGRAM		59	PRINT FIRMWARE REVISION
10	PROGRAM		49	PRINT DRIVE CONFIGURATION
11	SET DRIVE		0	SELECT DRIVE NO. 0
12	FUNCTION		2	SET NUMBER OF DRIVES
13	PROGRAM		72	ENTER DRIVE SERIAL NUMBER
14	PROGRAM		67	SELECT NEXT DRIVE
15	LOOP	13	NDRV	LOOP BACK TO INSTRUCTION #13 FOR ALL DRIVES
16	SET DRIVE		0	SELECT DRIVE NO. 0
17	PROGRAM		52	PRINT TIME AND DATE
18	PROGRAM		54	PRINT ELAPSED TIME COUNTER
19	PROGRAM		60	PRINT DRIVE NUMBER
20	PROGRAM		73	PRINT DRIVE SERIAL NUMBER
21	PROGRAM		50	PRINT DRIVE STATUS
22	SEEK		FCYL	SEEK TO CYLINDER NO. (0)
23	PROGRAM		56	DISPLAY DRIVE POSITION
24	FMT/VFY		589	FORMAT & VERIFY USING (598) DATA PATTERN
25	SEEK IN		1	SEEK IN BY ONE CYLINDER
26	LOOP	23	NCYL	LOOP BACK TO INSTRUCTION #23 FOR ALL CYLINDERS
27	PROGRAM		40	PRINT TEST STATUS
28	PROGRAM		46	PRINT BAD TRACK TABLE
29	PROGRAM		52	PRINT TIME AND DATE
30	PROGRAM		54	PRINT ELAPSED TIME COUNTER
31	PROGRAM		41	CLEAR TEST STATUS
32	PROGRAM		47	CLEAR BAD TRACK TABLE
33	SEEK		RNDM	SEEK TO A RANDOM TRACK
34	WRT/RD		589	WRITE THEN READ DATA PATTERN (598)
35	PROGRAM		56	DISPLAY DRIVE POSITION
36	LOOP	33	4000	LOOP BACK TO INSTRUCTION #33, 4000 TIMES
37	PROGRAM		40	PRINT TEST STATUS
38	PROGRAM		46	PRINT BAD TRACK TABLE
39	PROGRAM		41	CLEAR TEST STATUS
40	PROGRAM		47	CLEAR BAD TRACK TABLE
41	PROGRAM		52	PRINT TIME AND DATE
42	PROGRAM		54	PRINT ELAPSED TIME COUNTER
43	PROGRAM		67	SELECT THE NEXT DRIVE
44	LOOP	19	NDRV	LOOP BACK TO INSTRUCTION #19 FOR ALL DRIVES
45	END			

WILSON MWX-1000S (SMD) TESTER

SPECIAL PROGRAM #361 (M2284 M2294 M2312 M2322 M2350A M2351A M2351B)

DESCRIPTION: This test program performa a format of all heads and all tracks of the device under test. Upon completion of Format, the drive is asked to verify that all surfaces and all tracks have been formatted correctly. The next function to take place is to command the drive to Seek to a random cylinder, Write data using all heads and Read data using all the heads. Then the drive is commanded to Seek to the next random cylinder and Repeat. The program will test as many as 4 drives in sequence. The data pattern used is (6DB). The following is a list of the Test Program:

	(INSTRUCTION)			(COMMENTS)
01	PROGRAM		41	CLEAR TEST STATUS
02	PROGRAM		47	CLEAR BAD TRACK TABLE
03	PROGRAM		55	CLEAR ELAPSED TIME COUNTER
04	PROGRAM		42	ENABLE ERROR STATUS
05	PROGRAM		44	ENABLE STOP ON ERROR
06	PROGRAM		68	ENABLE CYLINDER MODE
07	PROGRAM		71	DISABLE DUPLICATE MODE
08	PROGRAM		52	PRINT TIME AND DATE
09	PROGRAM		59	PRINT FIRMWARE VERSION
10	PROGRAM		49	PRINT DRIVE CONFIGURATION
11	SET DRIVE		0	SELECT DRIVE NO. (0)
12	FUNCTION		2	SET NUMBER OF DRIVES
13	PROGRAM		72	ENTER DRIVE SERIAL NUMBER
14	PROGRAM		67	SELECT NEXT DRIVE
15	LOOP	13	NDRV	LOOP BACK TO INSTRUCTION #13 FOR ALL DRIVES
16	SET DRIVE		0	SELECT DRIVE NO. (0)
17	PROGRAM		52	PRINT TIME AND DATE
18	PROGRAM		54	PRINT ELAPSED TIME COUNTER
19	PROGRAM		60	PRINT DRIVE NUMBER
20	PROGRAM		73	PRINT DRIVE SERIAL NUMBER
21	PROGRAM		50	PRINT DRIVE STATUS
22	SEEK		FCYL	SEEK TO CYLINDER NO. (0)
23	PROGRAM		56	DISPLAY DRIVE POSITION
24	FMT/VFY		6DB	FORMAT & VERIFY USING (6DB) DATA PATTERN
25	SEEK IN		1	SEEK IN BY ONE CYLINDER
26	LOOP	23	NCYL	LOOP BACK TO INSTRUCTION #23 FOR ALL CYLINDERS
27	PROGRAM		40	PRINT TEST STATUS
28	PROGRAM		46	PRINT BAD TRACK TABLE
29	PROGRAM		52	PRINT TIME AND DATE
30	PROGRAM		54	PRINT ELAPSED TIME COUNTER
31	PROGRAM		41	CLEAR TEST STATUS
32	PROGRAM		47	CLEAR BAD TRACK TABLE
33	SEEK		RNDM	SEEK TO RANDOM CYLINDER
34	WRT/RD		6DB	WRITE THEN READ DATA PATTERN (6DB)
35	PROGRAM		56	DISPLAY DRIVE POSITION
36	LOOP	33	4000	LOOP BACK TO INSTRUCTION #33, 4000 TIMES
37	PROGRAM		40	PRINT TEST STATUS
38	PROGRAM		46	PRINT BAD TRACK TABLE
39	PROGRAM		41	CLEAR TEST STATUS
40	PROGRAM		47	CLEAR BAD TRACK TABLE
41	PROGRAM		52	PRINT TIME AND DATE
42	PROGRAM		54	PRINT ELAPSED TIME COUNTER
43	PROGRAM		67	SELECT THE NEXT DRIVE
44	LOOP	19	NDRV	LOOP BACK TO INSTRUCTION #19 FOR ALL DRIVES
45	END			

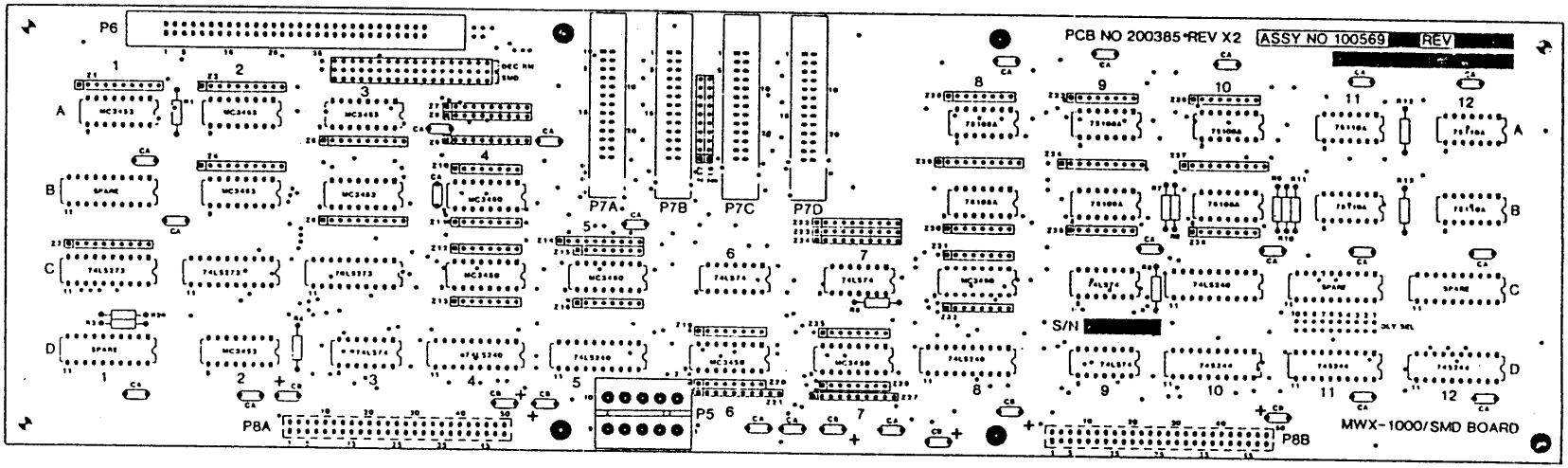
MWX-1000S FUJITSU DRIVE CONFIGURATIONS

MODEL	M2294	M2294	M2298	M2312	M2322	M2333	M2344K	M2350A	M2351A/E	M2361A	M2372K	M2382A	M2392D/K
DRIVE CONFIG	0	0	0	0	0	0	0	0	0	0	0	0	0
SINGLE SECTOR	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
FORMAT TYPE	HARD	HARD	HARD	HARD	HARD	HARD	HARD	HARD	HARD	HARD	SOFT	HARD	HARD
NUMBER TAGS	5	5	5	5	5	5	5	5	5	5	5	5	5
SOFT EQUALS HARD	4	4	4	4	4	4	4	4	4	4	4	3	4
INDEX CABLE	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH
SECTOR CABLE	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH
FIRST CYLINDER	0	0	0	0	0	0	0	0	0	0	0	0	0
LAST CYLINDER	822	1023	1023	538	822	822	823	841	841	841	744	740	1915
FIRST HEAD	0	0	0	0	0	0	0	0	0	0	0	0	0
LAST HEAD	9	15	15	6	9	9	26	19	19	19	19	26	20
BYTES PER TRACK	20480	20480	40960	20480	20480	40960	40960	28160	38160	40960	40960	40960	40960/46592
HEADER CRCs	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
INDEX SYNC	19	19	19	19	19	19	19	CC	19	CC	19	19	19
DATA SYNC	19	19	19	19	19	19	19	19	19	CC	19	19	19
INDEX GAP	165	165	165	165	165	165	165	165	165	165	165	165	165
BYTES PER PLO	14	14	18	14	14	18	18	28	17	21	21	22	20
RPM	361	361	360	361	361	360	360	362	361	360	360		
TEST TIME (MIN)	40	60	40	40	40	50	30	30	65	60	60		

MWX-1000S CDC DRIVE CONFIGURATIONS

DEL	9715-160	9715-340	9715-515	9720-368	9730(1.2G)	9730-80	9762	9766	9771 9772	9775	9778
TERFACE	SMD	SMD	SMD	SMD-E	SMD-E	SMD	SMD	SMD	SMD	SMD	SMD
RMAT TYPE	HARD	HARD	HARD	HARD	HARD	HARD	HARD	HARD	HARD	HARD	HARD
ADER TAGS	3	3	3	3	3	3	3	3	5	3	3
FI EQUALS HARD	3	3	3	3	3	3	3	3	4	7	3
DEX CABLE	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH
CTOR CABLE	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH	BOTH
RST CYLINDER	0	0	0	0	0	0	0	0	0	0	0
ST CYLINDER	822	710	710	1216	1213	822	822	822	1023	641	822
RST HEAD	0	0	0	0	0	0	0	0	0	0	0
ST HEAD	9	23	23	9	14	19	19	19	15	29	15
RST SECTOR	0	0	0	0	0	0	0	0	0	0	0
ST SECTOR	0	0	0	0	0	0	0	0	0	0	0
TES/TRACK	30000	30150	30240	30240	50400	30150	30150	30150	30480	30150	30150
[illegible]	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
SDI SYNC	0E	0E	0E	0E	0E	0E	0E	0E	19	0E	0E
N SYNC	09	09	09	09	09	09	09	09	19	09	09
DEX GAP	16	16	16	16	16	16	16	16	16	16	16
TES PER P.O	11	11	11	11	11	11	11	11	11	11	11

ZONE	LTR	DESCRIPTION	DATE	APPR.
	X1	ENGRG. RELEASE	5/7/85	
	X2	REVISED PER PROTO BUILD	8/12/85	
	X3	SEE E.O. 1344	8/13/85	
	A	PROD. RELEASE E.O. 1355	10/5/85	



PROPRIETARY INFORMATION

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5. RESISTOR NETWORKS ARE SHOWN AS:

   IN/OUT — 470 Ω Z10,11,12,13,15,16,19,20,25,26,28,30, 31,32,33,35,36,38

   PULL-UP — 20K TO −5V AT Z7,18,22, & 4.7K TO +5V AT Z8,17,23

   PULL-DOWN — 56 Ω Z1,2,3,4,5,6,9,14,24,27,21, & 82 Ω 29,34,37

4. CAPACITORS ARE IN MICROFARADS
3. RESISTORS ARE IN OHMS ±5%, 1/4W.
2. SYMBOLS ARE PER NATIONAL STANDARD.
1. REFERENCE DOCUMENTS
   ASSEMBLY: 100569
   PRODUCT SPEC.: 650173

NOTE: UNLESS OTHERWISE SPECIFIED

A	A	A	A	A	A	A	A	A	A				
1	2	3	4	5	6	7	8	9	10	11	12	13	14

REVISION FOR EACH SHEET

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS ± DEC ± ANGLES ±

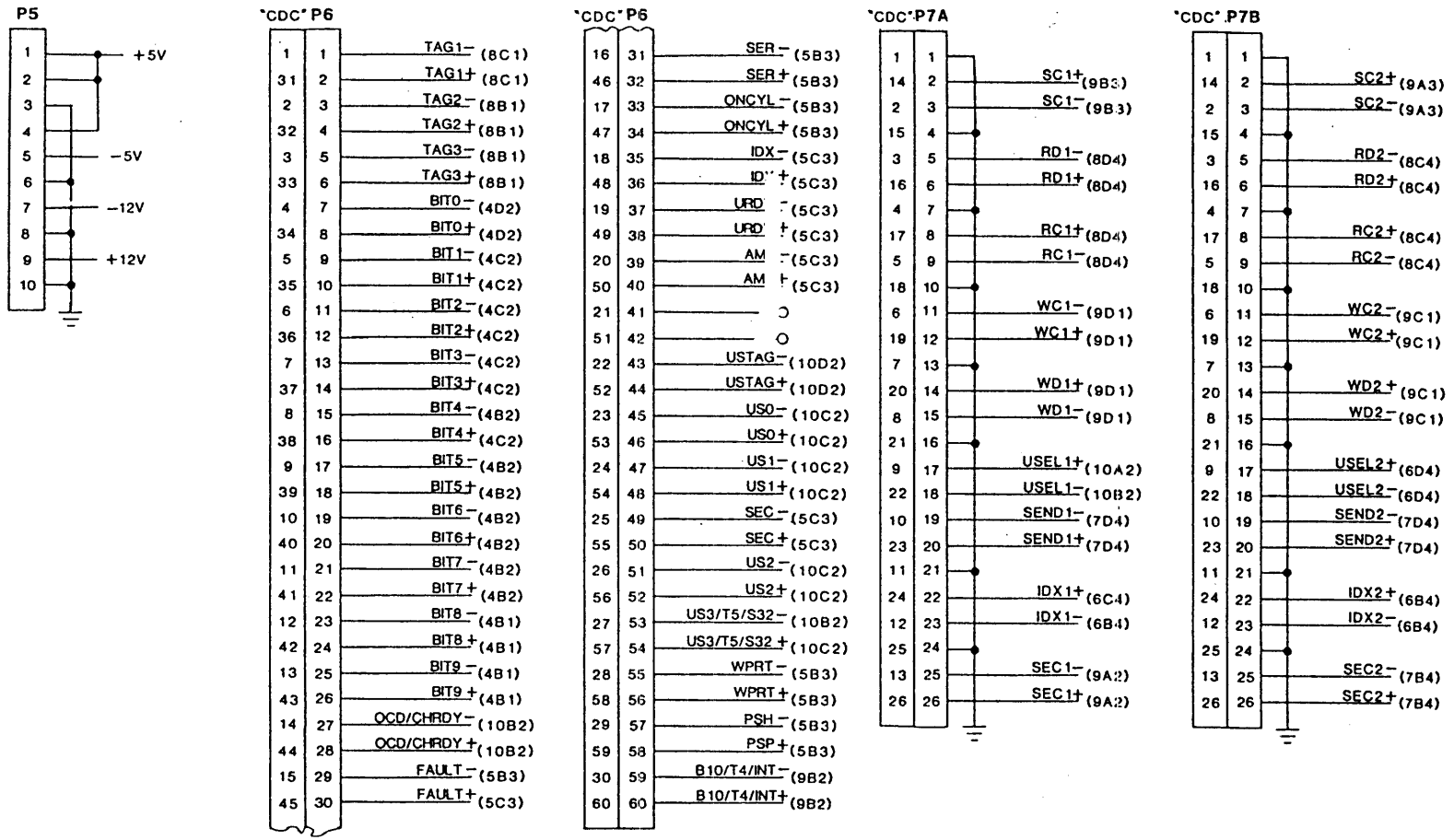
WILSON Laboratories, Inc

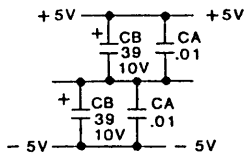
LOGIC DIAGRAM-
MWX-1000/SMD

APPROVALS	DATE
DRAWN Kelly	5-7-85
	5/23/85

SCALE | SIZE C | DRAWING NO 300149

DO NOT SCALE DRAWING | SHEET 1 of





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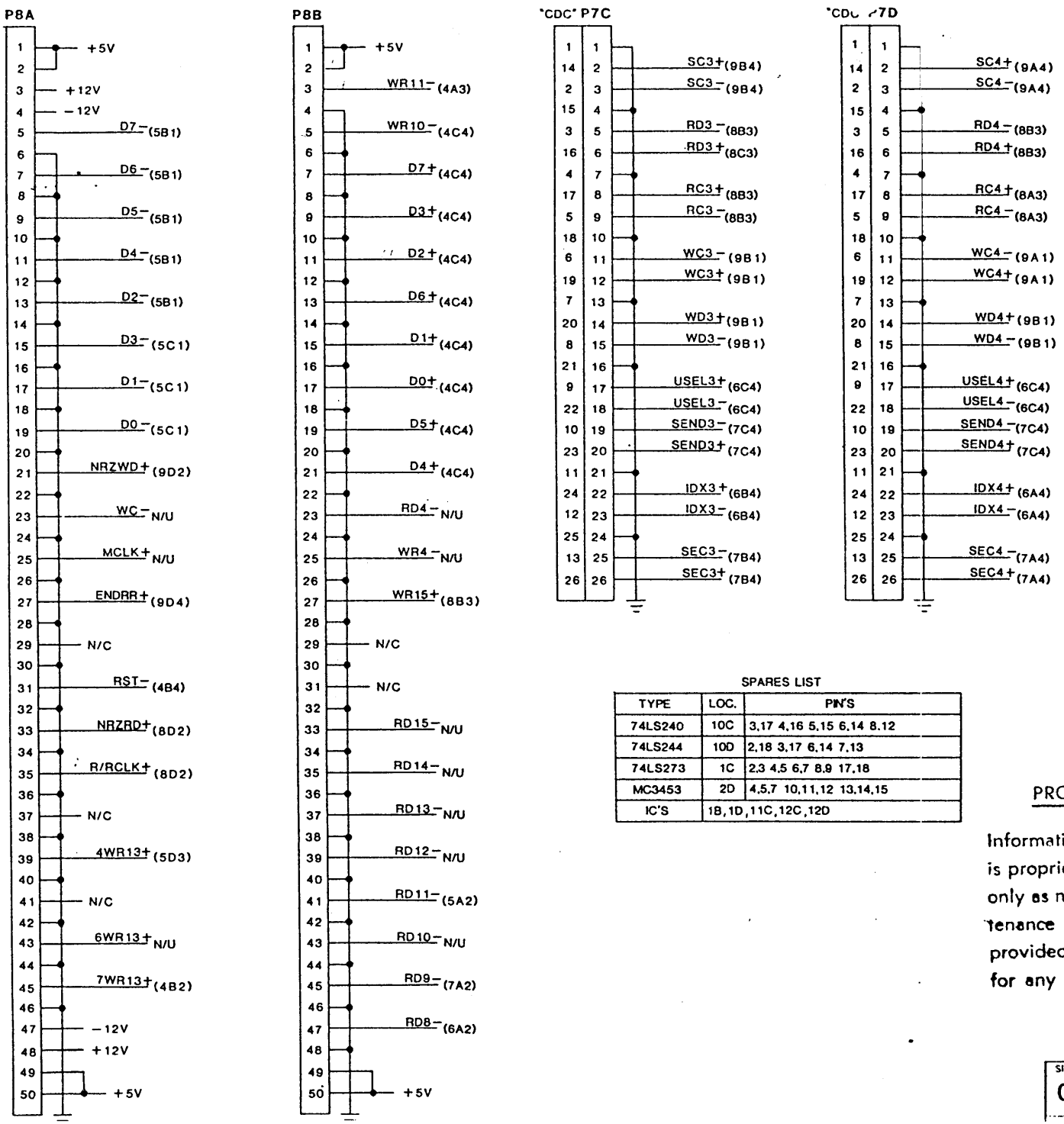

SPARES LIST

TYPE	LOC.	PIN'S
74LS240	10C	3,17 4,16 5,15 6,14 8,12
74LS244	10D	2,18 3,17 6,14 7,13
74LS273	1C	2,3 4,5 6,7 8,9 17,18
MC3453	2D	4,5,7 10,11,12 13,14,15
IC'S		1B,1D,11C,12C,12D

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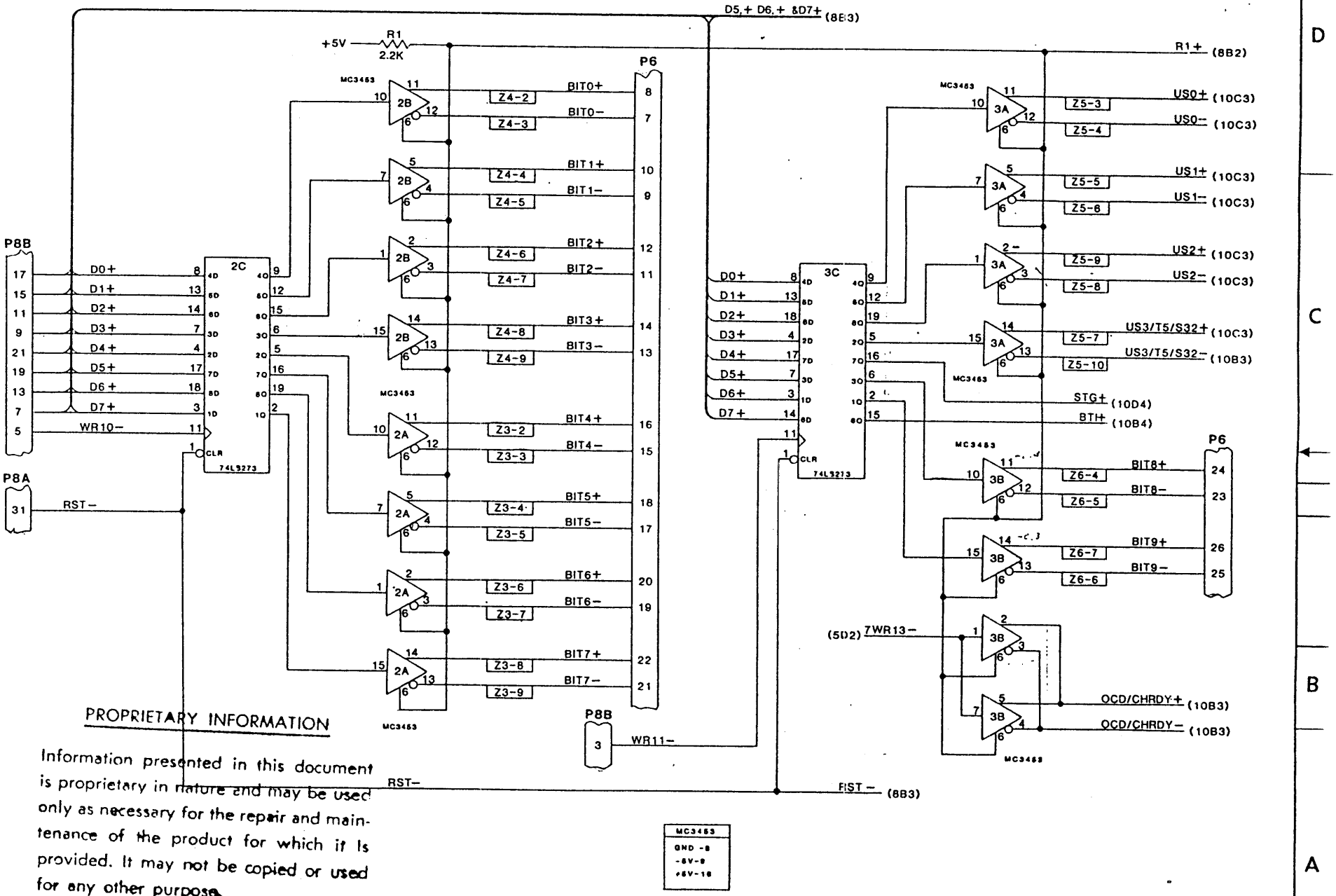

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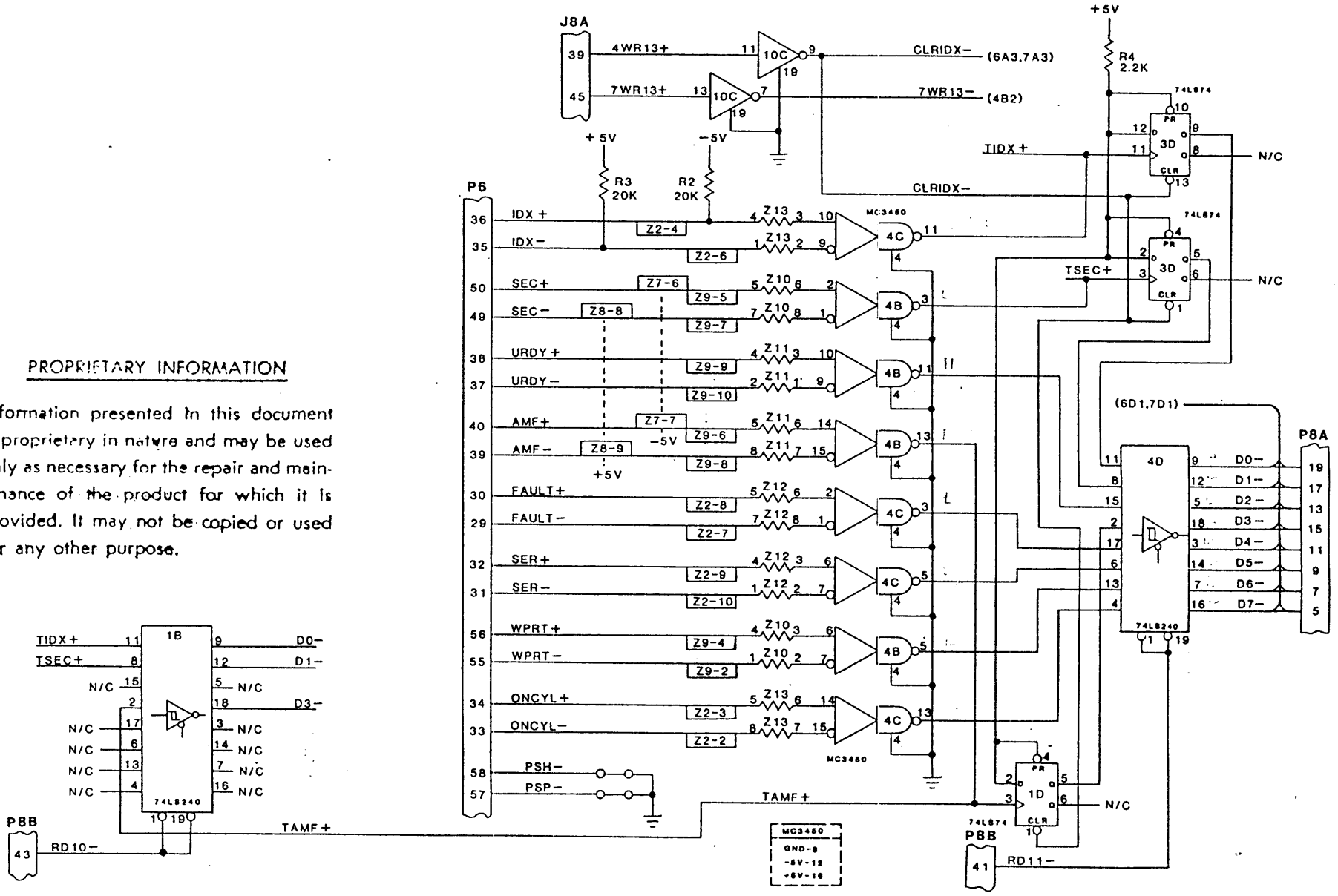

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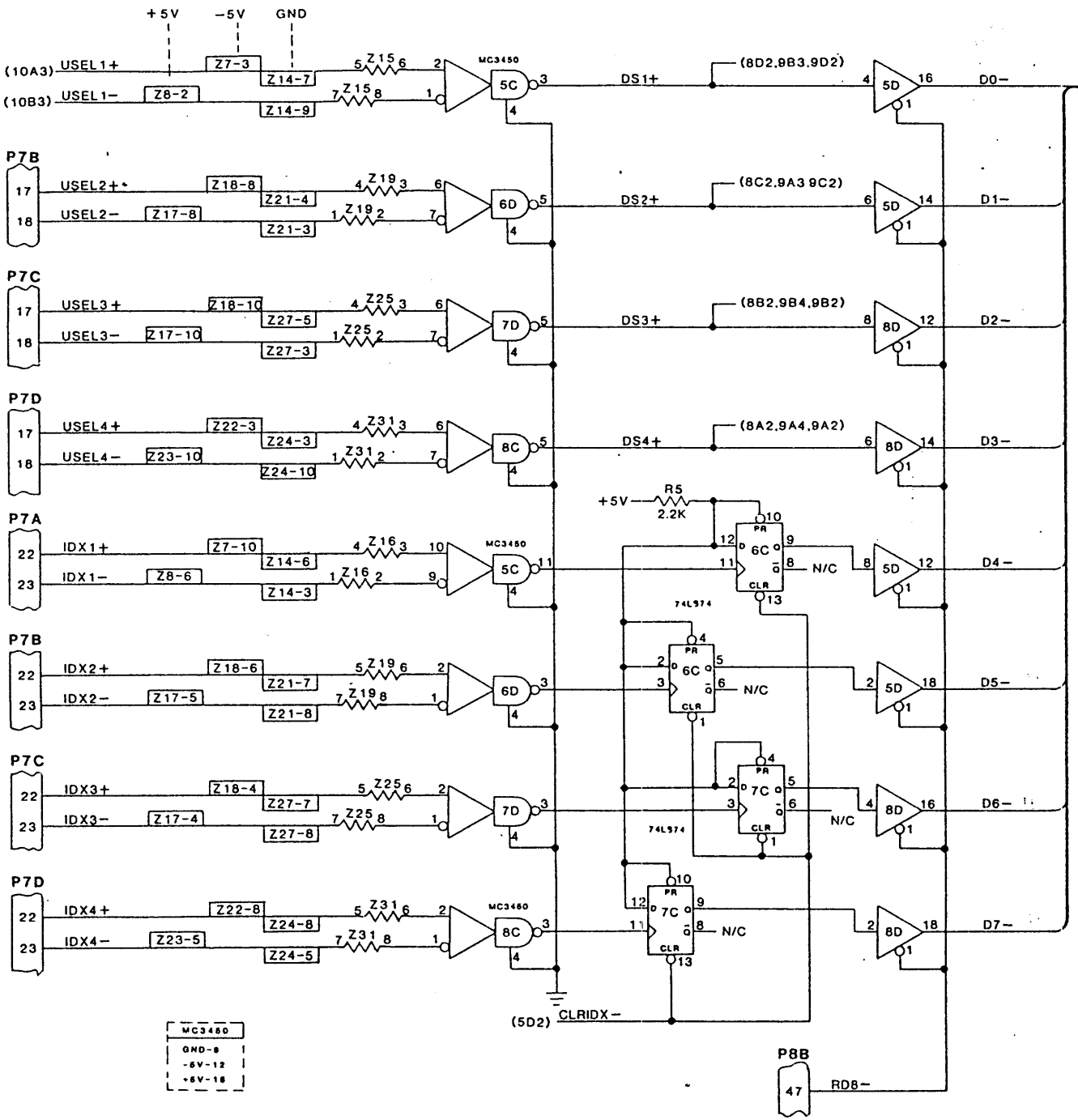

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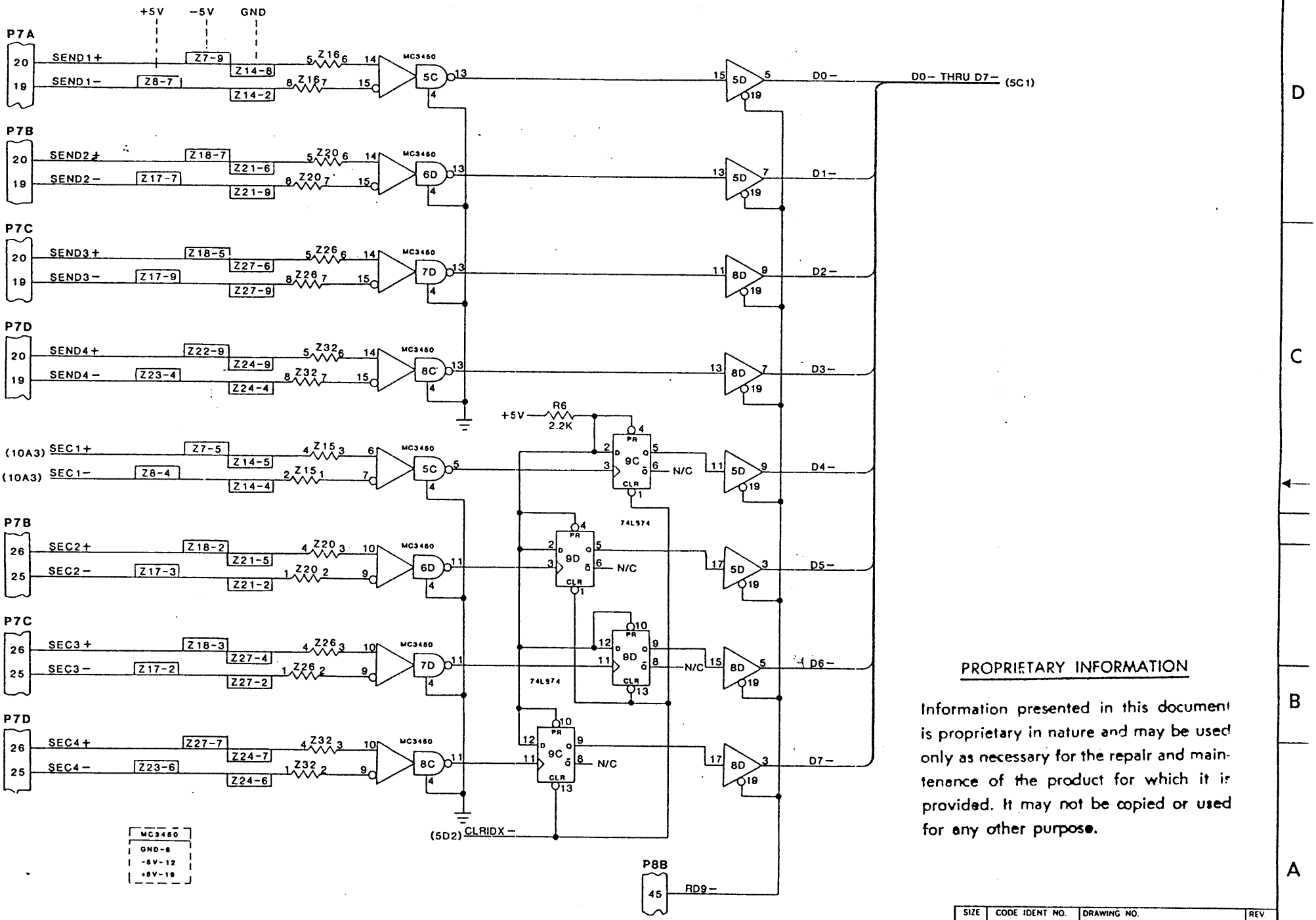

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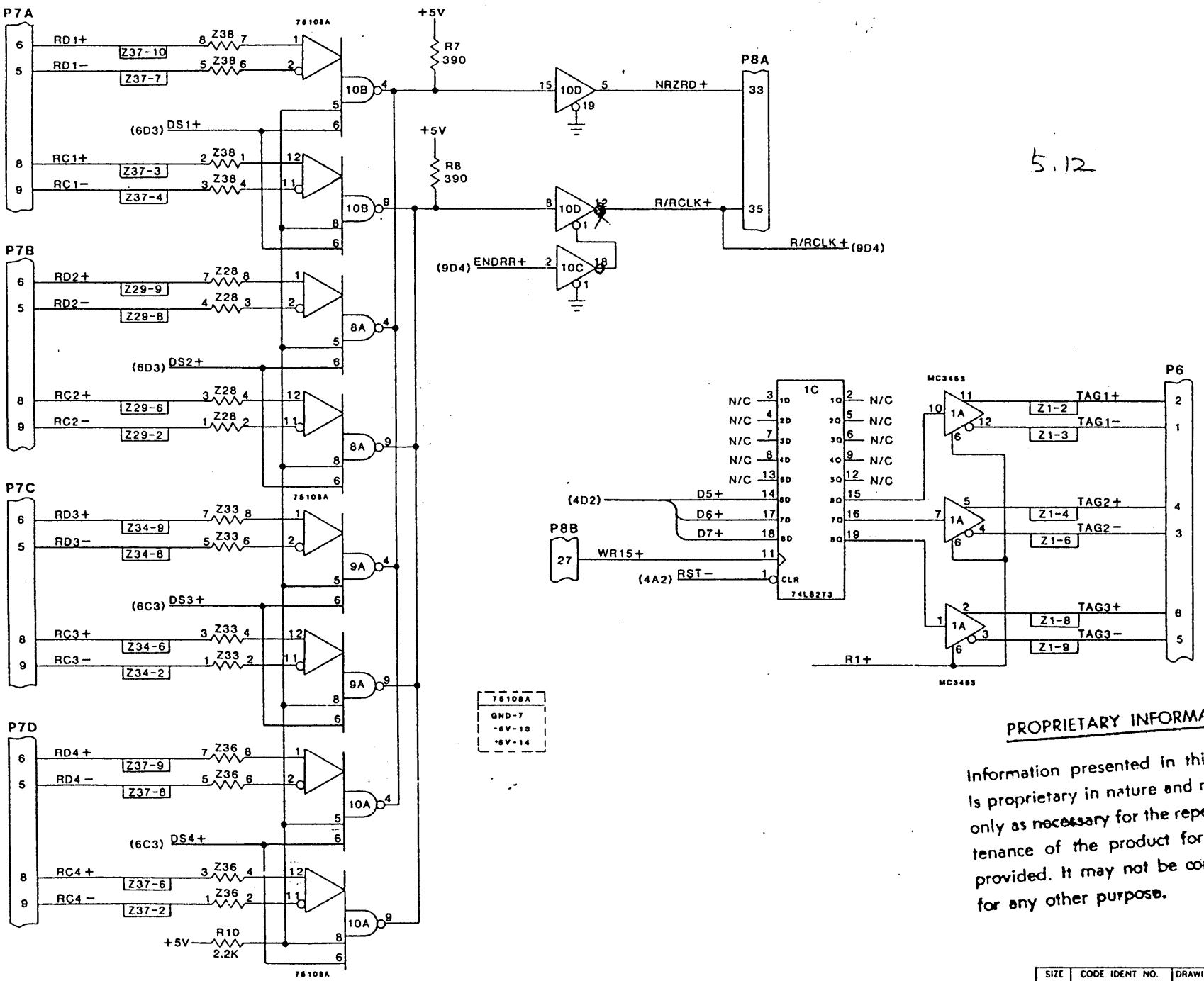

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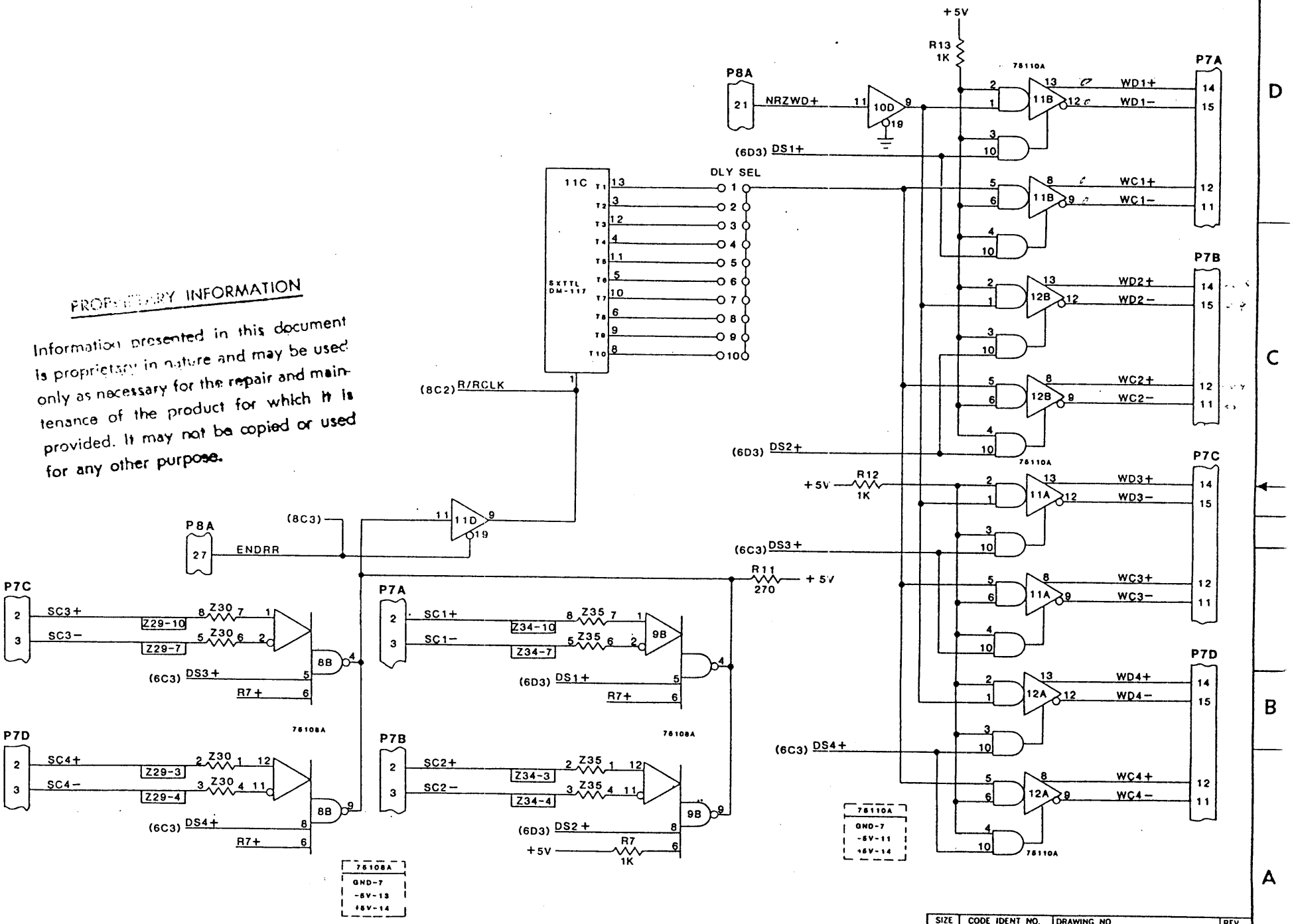

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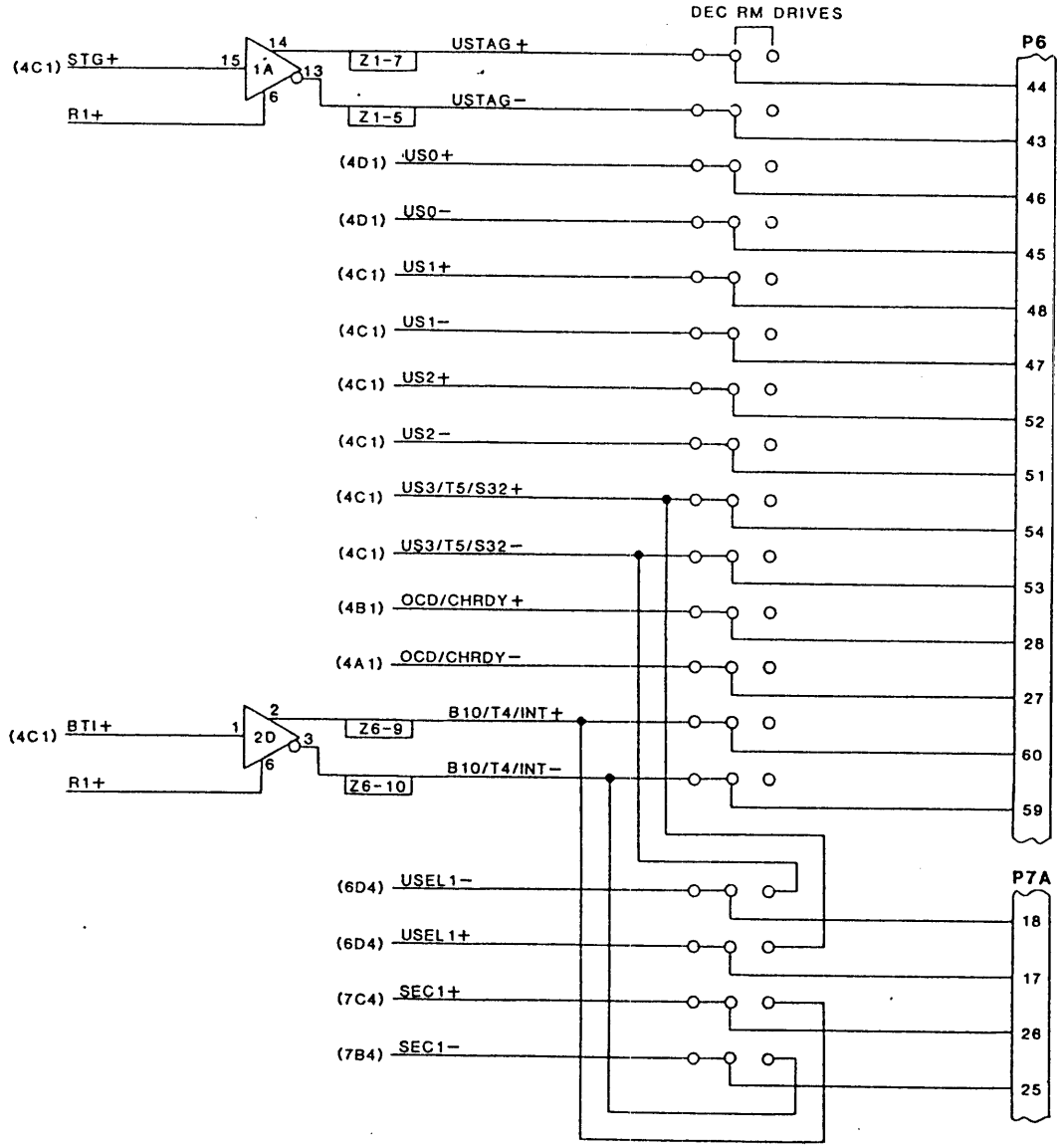

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