

waycom LTD

Bracknell (0344)

mini computer div

424871

49599-34

Watlington Rd

NAKED MINI-4 AUTOLOAD

Bracknell Bucks

Mr Richard

RG12 1ND

Passcoe

## 1. INTRODUCTION

NAKED MINI-4 AutoLoad loads programs into memory from peripheral devices and, if desired, automatically initiates execution of the loaded program.

NAKED MINI-4 AutoLoad is preprogrammed into a Read Only Memory (ROM) chip which mounts on the Processor Card (Socket 27 for LSI 4/10, Socket 5 for LSI 4/30 and Socket 108 for LSI 4/90).

Computer Automation offers two different NAKED MINI-4 AutoLoad ROM chips. ROM chip 01-49599-34 supports loading from the following devices:

- TTY paper tape reader (under Distributed I/O)
- High-Speed Paper Tape Reader (under Distributed I/O)
- Magnetic Tape (under Distributed I/O)
- Floppy Disk

ROM chip 01-49599-09 supports loading from the four devices above, and additionally supports loading from these two devices:

- Medium Capacity Disk, fixed or removable platters
- High Capacity Disk

Whittle Lab

## 1.1 AUTOLOAD OPERATION

NAKED MINI-4 AutoLoad can be manually initiated from a Programmer's Console, a Remote Console or an Operator's Console, using the procedures described in Section 3. Once initiated, the operational sequence is as follows:

1. The computer reads the 256-word contents of the AutoLoad ROM into memory locations :0000 through :00FF.
2. The computer starts executing at memory location :0000, which contains the first instruction of the AutoLoad program.
3. AutoLoad searches for the end of writable memory, and copies itself into the last 256 word locations of writable memory.
4. Based on the state of the SENSE indicator and the contents of the Console Data Register, AutoLoad loads or bootstraps from the appropriate input device.



## 1.2 REFERENCE DOCUMENTATION

These documents provide supplementary information:

- NAKED MINI-4 Software Manual, 90-21050-00
- LSI 4/10 Computer Reference Manual, 91-20990-00
- LSI 4/30 Computer Reference Manual, 91-20991-00
- LSI 4/90 Computer Reference Manual, 91-20945-00



## 2. PROGRAM DESCRIPTION

The NAKED MINI-4 AutoLoad program provides three modes of operation:

- Loading binary format program tapes from a paper tape reader
- Bootstrapping from magnetic devices
- Either of the above, on a "first available device" basis

### 2.1 PAPER TAPE LOADING

Paper tape information to be loaded must be in the binary loader format described in the NAKED MINI-4 Family Software Manual.

The type codes supported by NAKED MINI-4 AutoLoad are:

| TYPE CODE | DESCRIPTION                                       |
|-----------|---------------------------------------------------|
| :01       | Begin Program, LSI-2                              |
| :02       | End Program, ABS                                  |
| :03       | End Program, REL                                  |
| :04       | Origin, ABS                                       |
| :05       | Origin, REL                                       |
| :06       | Data Here, ABS                                    |
| :07       | Data Here, REL                                    |
| :08       | Reserve and Fill Here                             |
| :09       | BAC                                               |
| :0D       | Entry Here (ignored)                              |
| :0E       | External Address, primary (value stored is :FFFF) |
| :0F       | Primary Entry Declaration (ignored)               |
| :18       | Begin Program, LSI-3/05 and NAKED MINI-4          |

The paper tape to be loaded must be made ready in the selected paper tape reader. If the system contains more than one paper tape reader, only the selected reader must be in a ready state.

The program may be loaded into any available memory locations, except the last 256 word locations (which are occupied by the AutoLoad program).

The paper tape may be loaded either absolute or relative. If loaded absolute, a relocation offset of zero will be used for sections of code following relative origins. If loaded relative, the contents of the Q Register will be added to any relocation bias in the program.

After the tape has loaded, AutoLoad will interrogate bit 0 of the Console Data Register to determine whether the loaded program is to be executed. If bit 0 is on and an execution address was provided on the paper tape, the program will execute at that address. If bit 0 is off, AutoLoad will halt with the execution address in the X Register, the highest address loaded in the Q Register and the Extended Addressing (XA) bit set on in the Status Register. Upon a halt, the user may either manually initiate execution of the loaded program, or load another program from paper tape.

**NOTE**

To load from a magnetic device after loading from paper tape, AutoLoad must be re-initiated.

To load another program with the computer halted, alter the Console Data Register (if necessary) and then press the RUN switch. Note that AutoLoad can be used to load several paper tape programs without destroying the contents of low memory each time!

## 2.2 MAGNETIC DEVICE BOOTSTRAPPING

AutoLoad will read the first record of any supported magnetic device into memory, beginning at location :0000. This record should contain a bootstrap which continues the loading process. The user may choose whether or not to execute the bootstrap automatically.

The location and length of the first record is defined as follows:

| DEVICE                                 | RECORD SIZE     | RECORD LOCATION                      |
|----------------------------------------|-----------------|--------------------------------------|
| Magnetic Tape                          | Up to 200 words | First record on the tape             |
| Floppy Disk                            | 256 words       | Unit 0, Cylinder 0, Sectors 1-4      |
| Medium Capacity Disk,<br>fixed platter | 256 words       | Unit 0, Cylinder 0, Head 0, Sector 0 |
| removable platter                      | 256 words       | Unit 0, Cylinder 0, Head 2, Sector 0 |
| High Capacity Disk                     | 256 words       | Unit 0, Cylinder 0, Head 0, Sector 0 |

Note that a 256-word record is read from any device except Magnetic Tape. The size of the first record on Magnetic Tape depends on how many words were written and what is contained in the bootstrap, but record size is limited to 200 words because a larger record size would cause the contents of the standard Magnetic Tape interrupt location (:C8) to be overwritten.

With respect to Magnetic Tape, it should also be noted that AutoLoad cannot differentiate noise from valid records on the tape; if a noise record is read, it will be treated as the tape bootstrap!

## 2.3 FIRST AVAILABLE DEVICE LOADING

The user may specify that AutoLoad load from the first available device, by turning the SENSE indicator on during the operation procedure (see Section 3.1). In such a case, AutoLoad will attempt to load from devices in the following order:

- Paper Tape Reader (TTY or High Speed)
- Disk (High Capacity or Medium Capacity)
- Floppy Disk
- Magnetic Tape

If a device is either not installed or not ready, AutoLoad will attempt to load from the next device. When all devices have been tried, AutoLoad will retry the Paper Tape Reader and repeat the loop until a ready device is found. (Magnetic Tape is considered "ready" only if it is at load point.)



### 3. AUTOLOAD OPERATION PROCEDURES

This section describes how to manually initiate NAKED MINI-4 AutoLoad from either an interim console (Programmer's Console or Operator's Console) or a new console (Programmer's Console, Remote Console or Operator's Console). The interim console has an LED display, the new console has a hexadecimal display.

#### 3.1 OPERATION FROM INTERIM PROGRAMMER'S CONSOLE

This procedure should be used to initiate NAKED MINI-4 AutoLoad from the interim Programmer's Console:

1. Enable the Console by sliding the Console Enable switch to the up position. The ENABLE indicator on the front panel will light.
2. If the STOP indicator is off, press the STOP switch to halt the computer. The STOP indicator will light.
3. Press the RESET switch to clear the computer..
4. If relocation is desired, enter the relocation bias into the Q Register. (This bias will be added to any relocation bias in the program being loaded.) The procedure is:
  - a. If the DISPLAY ADDRESS indicator is lit, press the DISPLAY ADDRESS switch to turn it off. The contents of the Console Display Register will be displayed on the Register Display indicators.
  - b. Press the CLEAR DATA switch to clear the Console Data Register.
  - c. Using the Hexadecimal Entry Keyboard, key the relocation bias into the Console Data Register, most-significant hex digit first.
  - d. Press the WRITE REGISTER switch. Its indicator will light.
  - e. Press the 4/Q key of the Hexadecimal Entry Keyboard. The relocation bias is now in the Q Register.
5. Press the CLEAR DATA switch to clear the Console Data Register.
6. The state of the SENSE indicator and the contents of the Console Data Register select the input device and load mode desired. Table 3-1 summarizes the applicable combinations.
7. Ready the input device. If a magnetic tape unit is being used, ensure that it is at load point -- AutoLoad will not rewind the tape.
8. Press the STOP switch to enable Run mode. The STOP indicator will turn off.
9. Press the AUTOLOAD switch to initiate AutoLoad. The AUTOLOAD indicator will light.

When the load operation is completed, the AUTOLOAD indicator will turn off. Further, the Extended Addressing (XA) bit of the Status Register -- Bit 6 -- will be reset to logic 0 and the Y Register will contain the value :0040.

Table 3-1. Input Device/Load Mode Selection Table

| INPUT DEVICE                                       | SENSE INDICATOR | MODE (in Console Data Register) |                |
|----------------------------------------------------|-----------------|---------------------------------|----------------|
|                                                    |                 | LOAD                            | LOAD & EXECUTE |
| First available device                             | On              | N/A                             | N/A            |
| Paper Tape Reader*, absolute                       | Off             | :0002                           | :0003          |
| Paper Tape Reader, relative                        | Off             | :0000                           | :0001          |
| Magnetic Tape*, unit 0                             | Off             | :0008                           | :0009          |
| Floppy Disk*, unit 0                               | Off             | :0006                           | :0007          |
| High Capacity Disk*, unit 0                        | Off             | :0004                           | :0005          |
| Medium Capacity Disk*,<br>unit 0, fixed platter    | Off             | :0004                           | :0005          |
| Medium Capacity Disk,<br>unit 0, removable platter | Off             | :000A                           | :000B          |

\*Applies to "first available device" mode



### 3.2 OPERATION FROM NEW PROGRAMMER'S CONSOLE OR REMOTE CONSOLE

This procedure should be used to initiate NAKED MINI-4 AutoLoad from the new Programmer's Console or Remote Console:

1. Enable the Console via the Console Enable switch.
2. If the Run indicator is on, or if the display shows "IDLE", press the Run/Stop key. In the first case, pressing Run/Stop will halt the computer and turn off the Run indicator. In the second case, pressing Run/Stop will enable Console operation.
3. Press the Reset key to clear the computer. The display will show "RST".
4. If relocation is desired, enter the relocation bias into the Q Register. (This bias will be added to any relocation bias in the program being loaded. The procedure is:
  - a. Press the Clear key to clear the Console Entry Register.
  - b. Using the Hexadecimal Entry Keyboard, key the relocation bias into the Console Entry Register, most-significant hex digit first.
  - c. Press the Q key. While depressed, the display will show "QREG".
  - d. Press the Write key. While depressed, the display will again show "QREG".
5. The state of the Sense indicator and the Sense indicator and the contents of the Console Data Register select the input device and load mode desired. Table 3-1 of Section 3.1 summarizes the applicable combinations.

To load the Console Data Register:

  - a. Press the Clear key to clear the Console Entry Register.
  - b. Using the Hexadecimal Entry Keyboard, key the mode select code into the Console Entry Register, most-significant hex digit first.
  - c. Press the Data Reg key. While depressed, the display will show "DATA".
  - d. Press the Write key. While depressed, the display will again show "DATA".
6. Ready the input device. If a magnetic tape unit is being used, ensure that it is at load point -- AutoLoad will not rewind the tape.
7. Press the AutoLoad key to enter AutoLoad mode. While depressed, the display will show "AUTO".
8. Press the Run/Stop key to initiate AutoLoad. The AutoLoad indicator will turn on.



9. During the AutoLoad operation, the display will show the contents of the Console Data Register.

When the load operation is completed, the AutoLoad indicator will turn off. Further, the Extended Addressing (XA) bit of the Status Register -- Bit 6 -- will be reset to logic 0 and the Y Register will contain the value :0040.



### 3.3 OPERATION FROM OPERATOR'S CONSOLE

The Operator's Console does not permit the user to alter the contents of the Console Data Register, the SENSE indicator, or the Q Register, so only a small subset of the AutoLoad features are available with computers having this console.

This procedure should be used to initiate NAKED MINI-4 AutoLoad from the Operator's Console:

1. While depressing the ENABLE switch, press the RESET switch to clear the computer.
2. Ready the appropriate input device, making sure that no other device is also ready at that time.
3. While depressing the ENABLE switch, press the START switch to initiate AutoLoad.

Pressing the START switch will initiate absolute loading in "first available device" mode, followed by automatic execution of the loaded program.