

NAKED MINI 4

AUTO LOAD

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SECTION 1. INTRODUCTION

NAKED MINI 4 AutoLoad loads programs into memory from peripheral devices. It also can initiate execution of the loaded programs.

NAKED MINI 4 AutoLoad is preprogrammed into a Read Only Memory (ROM) chip and installed in the AutoLoad socket provided on each of the LSI-4 processors, the 4/10, 4/30, and 4/90. Socket locations vary on each processor board and are described in the Computer Reference Manuals listed in Subsection 1.1. Computer Automation offers three different NAKED MINI 4 AutoLoad ROM chips.

ROM chip #01-49682-37 (Type 2) loads programs from the following devices:

- Mini-floppy disk, unit 0 or 1 (under Distributed I/O)
- Floppy disk
- Magnetic tape (under Distributed I/O)
- Medium capacity disk, fixed or removable platters
- High capacity disk

ROM chip #01-49682-38 (Type 3) loads programs from the following devices:

- Teletypewriter paper tape reader (under Distributed I/O)
- High-speed paper tape reader (under Distributed I/O)
- Floppy disk

ROM chip #01-49682-39 (Type 4) loads programs from the following devices:

- Teletypewriter paper tape reader (under Distributed I/O)
- High-speed paper tape reader (under Distributed I/O)
- Mini-floppy disk, unit 0 or 1 (under Distributed I/O)

1.1 REFERENCE DOCUMENTATION

The following 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

SECTION 2. PROGRAM OPERATION

NAKED MINI 4 AutoLoad is initiated manually 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.

The device from which loading occurs determines the mode of operation. The NAKED MINI 4 AutoLoad program provides three modes of operation:

- Loading binary format program tapes from a paper tape reader
- Bootstrapping from a magnetic device
- Loading from the first available device

2.1 PAPER TAPE LOADING

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

AutoLoad allows type codes to cross record boundaries. The type codes used by NAKED MINI 4 AutoLoad are:

TYPE CODE	DESCRIPTION
: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	Byte Address Constant
:18	Begin Program, LSI-3/05
:40	Null
:4F	List Segment Names (list location counters)
:69	Location Counter
:6D	Note Record
:6F	List Segment Attributes

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The paper tape is prepared for loading in a paper tape reader. If the system contains more than one paper tape reader, the reader from which loading is to occur must be the only reader in a ready state.

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

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

When the tape is loaded, AutoLoad interrogates bit 0 of the Console Data Register to determine whether or not the loaded program is to be executed. If bit 0 is on and an execution address is provided on the paper tape, the program begins executing at that address. If bit 0 is off, AutoLoad halts. The execution address is now in the X Register; the highest address that was loaded is in the Q Register; and the Extended Addressing (XA) bit is set "on" in the Status Register. If a halt occurs, the execution of the loaded program may be initiated manually, or another program may be loaded from paper tape.

Another program may be loaded when the computer is halted by altering the contents of the Console Data Register, if necessary, and pressing the RUN switch. AutoLoad can load several paper tape programs without destroying the contents of low memory each time.

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

2.2 MAGNETIC DEVICE BOOTSTRAPPING

AutoLoad reads the first record of a 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
Mini-Floppy Disk		
Unit 0	64 words	Unit 0, Track 0, Head 0, Sector 1
Unit 1	64 words	Unit 1, Track 0, Head 0, Sector 1
Magnetic Tape	200 words	First record on the tape
Floppy Disk	256 words	Unit 0, Cylinder 0, Head 0, Sector 1
Medium Capacity Disk		
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 or Head 2

A 256-word record is read from any device except a magnetic tape and a mini-floppy. The size of the first record on a magnetic tape depends on the amount of words written and the contents of the bootstrap. Record size is limited to 200 words because larger record sizes cause the contents of the standard magnetic tape interrupt location (:C8) to be overwritten.

AutoLoad cannot differentiate noise from valid records on a magnetic tape. If a noise record is read, it is treated as the tape bootstrap.

2.3 FIRST AVAILABLE DEVICE LOADING

When the SENSE indicator on the console is "on", or if no console is installed, AutoLoad loads from the first available device following the order below:

Type 2 AutoLoad

1. Mini-floppy disk (unit 0)
2. Floppy disk
3. Magnetic tape
4. Medium or high capacity disk

Type 3 AutoLoad

1. Paper tape reader (high speed or teletype writer)
2. Floppy disk

Type 4 AutoLoad

1. Paper tape reader (High-speed or teletype writer)
2. Mini-floppy disk (unit 0)

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AutoLoad initially tests the device with the highest priority. If the device is in a ready state, AutoLoad loads from it. If the device is not installed or not ready for loading, AutoLoad attempts to load from the device with the next highest priority. If loading has been attempted from all devices, AutoLoad attempts to load from the first device again. If the first device is not in a ready state, AutoLoad continues trying devices until a device in a ready state is found. A magnetic tape is in a ready state only if it is at loading point.

NOTE

The standard Distributed I/O channel assignments for magnetic tapes and mini-floppy disks are channels one and six, respectively. If either of these channels are assigned to another peripheral device, such as a paper tape punch on channel six, that device must not be in a ready state when AutoLoad is initiated to insure proper operation of first available device loading.

SECTION 3. INITIATION PROCEDURES

The NAKED MINI 4 AutoLoad is initiated manually 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 displays information in binary form; the new console displays it in hexadecimal form.

3.1 INITIATION FROM INTERIM PROGRAMMER'S CONSOLE

The following procedure initiates NAKED MINI 4 AutoLoad from the interim programmer's console:

1. Slide the CONSOLE ENABLE switch to the up position. The ENABLE indicator light on the front panel turns on.
2. Press the RESET switch to clear the computer.
3. Press the STOP switch. The STOP indicator light turns on.
4. If relocation of addresses is desired, enter the relocation bias into the Q Register using the procedure below. This bias will be added to any relocation bias in the program being loaded. The procedure is:
 - a. If the DISPLAY ADDRESS indicator light is on, press the DISPLAY ADDRESS switch to turn it off. The REGISTER DISPLAY indicators then display the contents of the Console Data Register.

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- b. Press the CLEAR DATA switch to clear the Console Data Register.
 - c. Using the hexadecimal entry keyboard, enter the relocation bias into the Console Data Register, with the most-significant hex digit first.
 - d. Press the WRITE REGISTER switch. Its indicator light turns on.
 - 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. Indicate the input device from which loading is to occur by selecting the SENSE indicator setting combined with the proper Console Data Register entry. The SENSE indicator and the Console Data Register combinations for the different input devices are shown 3-1.
 7. Prepare the input device. If a magnetic tape unit is being used, ensure that it is at load point; AutoLoad does not rewind the tape.
 8. Press the STOP switch to enter "Run" mode. The STOP indicator light turns off.
 9. Press the AUTOLOAD switch to initiate AutoLoad. The AUTOLOAD indicator light turns on.

When the load operation is completed, the AUTOLOAD indicator light turns off. The Extended Addressing (XA) bit of the Status Register, Bit 6, is reset to logic 0, and the Y Register contains the value :0040.

The following table shows the SENSE indicator setting and the Console Data Register entry that are necessary for loading from each of the devices listed.

Table 3-1. Input Device Selection Table

INPUT DEVICE FROM WHICH LOADING IS TO OCCUR	SENSE INDICATOR SETTING	MODES TO BE ENTERED IN THE 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*, unit 0, fixed platter	Off	:0004	:0005
Medium Capacity Disk, unit 0, removable platter	Off	:000A	:000B
Mini-Floppy Disk*, Unit 0	Off	:000C	:000D
Mini-Floppy Disk, Unit 1	Off	:000E	:000F

*Applies to "first available device" mode

3.2 INITIATION FROM NEW PROGRAMMER'S CONSOLE OR REMOTE CONSOLE

This procedure initiates NAKED MINI 4 AutoLoad from the new programmer's console or remote console:

1. Slide the CONSOLE ENABLE switch to the up position.
2. If the RUN indicator light is on or if the display shows "IDLE", press the RUN/STOP switch. In the first case, pressing RUN/STOP halts the computer and turns off the RUN indicator light. In the second case, pressing RUN/STOP begins console operation.
3. Press the RESET switch to clear the computer. The display shows "RST".
4. If relocation of addresses is desired, enter the relocation bias into the Q Register using the procedure below. This bias will be added to any relocation bias in the program being loaded. The procedure is:
 - a. Press the CLEAR switch to clear the Console Data Register.
 - b. Using the hexadecimal entry keyboard, enter the relocation bias into the Console Data Register, with the most-significant hex digit first.
 - c. Press the Q key. While the key is depressed, the display shows "QREG".
 - d. Press the WRITE switch. While depressed, the display again shows "QREG".
5. Indicate the input device from which loading is to occur by selecting the SENSE indicator setting combined with the proper Console Data Register entry. The SENSE indicator and the Console Data Register combinations for the different input devices are shown in Table 3-1.

To load the Console Data Register:

- a. Press the CLEAR switch to clear the Console Data Register.
- b. Using the hexadecimal entry keyboard, enter the Mode Select code into the Console Data Register, with the most-significant hex digit first.
- c. Press the DATA REG switch. While the switch is depressed, the display shows "DATA".
- d. Press the WRITE switch. While depressed, the display again shows "DATA".

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6. Prepare the input device. If a magnetic tape unit is being used, ensure that it is at load point; AutoLoad does not rewind the tape.
7. Press the AUTOLOAD switch to enter "AUTOLOAD" mode. The display shows "AUTO".
8. Press the RUN/STOP switch to initiate AutoLoad. The AutoLoad indicator light turns on.

During the AutoLoad operation, the display shows the contents of the Console Data Register. When the load operation is completed, the AutoLoad indicator turns off. The Extended Addressing (XA) bit of the Status Register, Bit 6, is reset to logic 0, and the Y Register contains the value :0040.

3.3 INITIATION FROM OPERATOR'S CONSOLE

The Operator's Console does not permit alteration of the contents of the Console Data Register, the SENSE indicator, or the Q Register. Only a small subset of the AutoLoad features are available with computers having the operator's console.

The following procedure initiates NAKED MINI 4 AutoLoad from the Operator's Console:

1. While depressing the ENABLE switch, press the RESET switch to clear the computer.
2. Prepare the desired input device, making sure that no other devices are in a ready state.
3. While depressing the ENABLE switch, press the START switch to initiate AutoLoad.

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

3.4 INITIATION WITHOUT CONSOLE

The LSI-4 family of processors initiates AutoLoad when the input line External AutoLoad (XAL-) is grounded for a minimum of 50 microseconds while the processor is halted. AutoLoad loads a program into memory from the first available device and automatically executes that program. The reference manuals listed in Subsection 1.1 provide information that is needed to initiate AutoLoad in this manner.

