SIEMENS

INSTRUCTION

INTERLOGIC PROGRAM (LOGIC EQUATION EDITING)

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DOCUMENT HISTORY

Version	Release Date	Sections Changed	Details of Change
A	Aug. 2013		Initial Release

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NOTES, CAUTIONS, AND WARNINGS

Throughout this manual, notes, cautions, and warnings are frequently used to direct the reader's attention to specific information. Use of the three terms is defined as follows:

WARNING

INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS INJURY. WARN-INGS ALWAYS TAKE PRECEDENCE OVER NOTES, CAUTIONS, AND ALL OTHER INFORMATION.

CAUTION

REFERS TO PROPER PROCEDURES OR PRACTICES WHICH IF NOT STRICTLY OBSERVED, COULD RESULT IN A POTENTIALLY HAZARDOUS SITUATION AND/OR POSSIBLE DAMAGE TO EQUIPMENT. CAUTIONS TAKE PRECEDENCE OVER NOTES AND ALL OTHER INFORMATION, EXCEPT WARNINGS.

NOTE

Generally used to highlight certain information relating to the topic under discussion.

If there are any questions, contact Siemens Rail Automation Corporation Application Engineering.

1.0 INTERLOGIC PROGRAM (LOGIC EQUATION EDITING)

The Interlogic Program creates the logic equations (ladder logic) that are used by the SEAR II to detect and process different alarms and events. It provides a graphical tool to enable signal engineers to create the non-vital logic typically found in interlockings. Once designed, the logic can be transferred to the SEAR II, tested, and commissioned. On-line debugging is also fully supported from within Interlogic.

Logic equations are normally unique to a particular railroad and can be preloaded at the factory or loaded on-site from a laptop computer.

NOTE

NOTE	**NOTE** Interlogic software is not compatible with the Windows® 7 operating system.

1.1 PRINCIPLES OF INTERLOGIC OPERATION

The Interlogic package is used to create networks of contacts leading to coils. The networks are then compiled into Boolean logic and uploaded to the SEAR II where they are used to detect and process the different alarms and events monitored by the SEAR II inputs. A network leading to one coil is referred to as a rung, and up to 4,096 rungs can be used in a single rung file. Each rung accepts up to nine serial contacts in each of its seven parallel lines. However, additional contacts may be combined by creating internal coils.

Not all coils are driven by rungs. Some are updated by the executive software (e.g., received controls, events, etc.). Coils can be of different types and have different functions. When referencing a coil, refer to it either by absolute bit address, or by a designated label.

1.1.1 Coil Types

The types of coils supported are: relay coils, latch coils, timer coils, up counters, and clocks. These types of coils are described in the following paragraphs.

1.1.1.1 Relay Coils

Relay coils are standard coils that remain energized while power is applied. When power is removed, the coil deenergizes.

1.1.1.2 Latch Coils

A latch coil uses two signals to drive the same coil; two networks lead to different ends of the coil. The top network sets the latch when power is applied, while the second network resets (unlatches) the coil when power is applied to its network. If power is applied to both networks simultaneously, the relay remains deenergized.

1.1.1.3 Timer Coils

A timer coil uses two networks that lead to two different parts of the same coil. The top network is used to enable the timer while the bottom network presets the timer. When power is applied to the top line only, the timer is enabled and begins to free run, recording time in selected increments (seconds or hours). When power to the top of the rung is interrupted, the timer is halted and the last value stored in its register is retained. When power is restored, the timer

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continues from the point at which it was halted. When the value in its counting register equals the preset value, the coil is energized.

The lower part of the rung leads to the timer preset input and, when power is applied to this network, the value in the counting register is set to zero and the coil is deenergized.

1.1.1.4   Up Counter

Up counter operation is similar to that of a timer, except that transitions on the top line, not steady-states, trigger the counter. When the transition count reaches the preset value, the coil energizes and the count continues until it reaches the maximum value of the counting register (65,535). The bottom line resets the counter to 0 (zero) and deenergizes the coil.

The value in the counting register is incremented by each off/on transition in the top network. Power must be removed and then restored to produce another increment.

1.1.1.5   Clocks

A coil may also be used as a clock pulse generator. When power is applied to the coil, the clock is enabled and begins to generate a pulse at the selected increments (seconds or hours). A user-selectable preset value determines the clock rate. The clock stops when power is removed from the coil.

1.1.2   Coil Functions

Coils are further classified by function. Some coils are used exclusively for output while others are used for transmitted data, input, etc. The address locations for the coils are bit mapped according to function. The coil functions are listed in Table 1.

Table 1. Coil Function Bits

Input Function	Bit Address Format	Output Function	Bit Address Format
GEO indications	Ixxxx	GEO controls	Oxxxx
Received office controls	Rxxxx	Office indications	Pxxxx
ULCP or Panel I/O switches	Sxxxx	Temporary bits	Txxxx
Executive bits	Exxxx	ULCP/Panel LED steady bits	Lxxxx
Internal bits	Nxxxx	ULCP/Panel LED flash bits	Fxxxx
Remote bits received A	Axxxx	Remote bits to send X	Xxxxx
Remote bits received B	Bxxxx	Remote bits to send Y	Yxxxx
Bits set by CDL (input to ladder logic)	Cxxxx	Bits read by CDL (output from ladder logic)	Zxxxx

In Table 1 above, the first character of the bit address format is the function identifier. The four digits following the identifier are the coil bit address in decimal format. For example, R0002 would be the second control bit received from the office.

NOTE

Coils may be referenced either by bit address (e.g., R0002) or by label (e.g., Control.002). (More on labels later.)

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1.1.2.1   GEO Indications (Ixxxx)

Up to 256 coils are available in the GEO indications area. The SEAR II or Communications Manager receives indication messages from GEOs and sets the I bits from those messages. Each GEO is assigned its own range of bits in the I bits.

The Communications Manager will also copy received indication data from a DC code unit into the I bits. The data bits are reversed within each byte when viewed on the ladder logic status screen and when using the ladder logic bits. For example, if the DC code unit sends the indication data E550 and this data is copied into the ladder logic bit map starting at I0001, the bits will be set as follows (each byte has the bits reversed so E5 becomes A7 and 50 becomes 0A):

I0001	I0002	I0003	I0004	I0005	I0006	I0007	I0008	I0009	I0010	I0011	I0012	I0013	I0014	I0015	I0016
1	0	1	0	0	1	1	1	0	0	0	0	1	0	1	0
A7								0A							

1.1.2.2   GEO Controls (Oxxxx)

Currently the SEAR II and the Communications Manager can have up to 256 GEO control bits. Each coil in this area is transferred to the GEOs by the executive software. When the O bits change, the executive software builds a control message and sends it to the GEO. Each GEO is assigned a range of bits from the O bits.

The Communications Manager will also deliver control bits to a DC code unit from the O bits.

1.1.2.3   Received Office Controls (Rxxxx)

Up to 256 control bits may be received from the office.

NOTE

NOTE
NOTE The compiler detects the number of coils used in the received controls area and uses the figure to calculate the number of control words expected from the office equipment.

NOTE

NOTE
NOTE Do not use logic rungs to drive coils in this area.

1.1.2.4   Office Indication Bits (Pxxxx)

The status of coils in this area is sent to the office as an indication message when:

1. any coil changes state
2. whenever the office rechecks
3. periodically

NOTE

NOTE
NOTE The compiler detects the number of coils used in this area and uses it to calculate the number of indication words to send back to the office equipment.

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1.1.2.5 ULCP/Panel Switches (Sxxxx)

The coils in this area correspond to the push buttons on the Universal Local Control Panel (ULCP) or the Panel I/O module. The corresponding S bit energizes when a button is pressed (or an input is energized on the Panel), and deenergizes when the button is released. There are 256 coils in this area. Each ULCP or Panel is assigned a range of bits in the S bits.

NOTE

NOTE
Do not use logic rungs to update coils in this area.

See the ULCP manual for mapping of the push-button switches and physical inputs to the S bits.

1.1.2.6 Temporary Bits (Txxxx)

The coils in this area can be used to hold temporary or intermediate states.

1.1.2.7 Executive Bits (Exxxx)

The coils in this area provide an interface to status and control of the SEAR II (see Table 2) and the Communications Manager (see Table 3). Some bits in this area are designed to be read-only while others are driven by logic rungs.

NOTE

NOTE
Interlogic was repurposed for use with the SEAR II and Comms Manager without modifications to the software. The executive bits will maintain their original SEA/R labeling when viewed and the default labels may not match the assignments described in this section.

Table 2. SEAR II Executive Bits

Address	Function	Description
E0001	Recheck	Set for one cycle of the logic when a recall is received from the office.
E0002	Control	Set for one cycle of the logic when a control is received from the office.
E0003	Execute	Set for one cycle of the logic when a control execute command is received from the office.
E0004	Codefail	Set when the executive software has determined there is a code line failure (unable to communicate with the office)
E0005 thru E0011	(reserved)	(for future use) Note: Bits in this area should not be driven by logic rungs.
E0012	Indicate Enable	The ladder logic program uses this bit to control whether the executive software will send indications or not. If this bit is not set, the executive will only respond to recalls and will not send periodic indication messages to the office.

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Table 2 Continued

Address	Function	Description
E0013 thru E0024	(reserved)	(for future use) **Note: Bits in this area should not be driven by logic rungs.**
E0025 thru E0040	Node online (Node*xx*.Online)	The bits in this area are used to determine whether a node is operational (where *xx* = node number). "1" indicates node is online "0" indicates node is offline. Note: Bits in this area should not be driven by logic rungs.
E0041 thru E0072	(reserved)	(for future use) Note: Bits in this area should not be driven by logic rungs.
E0073	Delivery Failed	Set for one cycle when the execute software receives a delivery failed signal from the communications system for an office indication message.
E0074	Delivery Success	Set for one cycle when the executive software receives delivery successful signal from the communications system for an office indication message.
E0075	Radio ACK	Set for one cycle when the executive software receives one of the following: - Genisys or ATCS/Gen Poll-Ack for an indication frame - HDLC ACK for an indication frame This bit indicates the message was transferred to the communications system but the executive does not yet know if the message was successfully delivered.
E0076 thru E00256	(reserved)	(for future use) Note: Bits in this area should not be driven by logic rungs.

Table 3. Communications Manager Executive Bits

Address	Function	Description
E0001	Recheck	Set for one cycle of the logic when a recall is received from the office.
E0002	Control	Set for one cycle of the logic when a control is received from the office.
E0003	Execute	Set for one cycle of the logic when a control execute command is received from the office.
E0004	Codefail	Set when the executive software has determined there is a code line failure (unable to communicate with the office)
E0005	DC Code Unit Online	Set when an indication has been successfully decoded from a DC code unit. Cleared when no indications have been received from the DC code unit for the Recheck Period plus 5 minutes
E0006	DC Code RX Abort	Set when the DC code receive procedure aborts decoding the receive frame due to an error (e.g. pulse too long or short). Cleared automatically by the ladder logic engine after one logic cycle.

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Table 3 Continued

Address	Function	Description
E0007 - E0011	Reserved	(for future use) Note: Bits in this area should not be driven by logic rungs.
E0012	Indicate Enable	The ladder logic program uses this bit to control whether the executive software will send indications or not. If this bit is not set, the executive will only respond to recalls and will not send periodic indication messages to the office.
E0013 - E0024	Reserved	(for future use) Note: Bits in this area should not be driven by logic rungs.
E0025 - E0048	Node Online Bits	The bits in this area are used to determine whether a node is operational (where *xx* = node number). "1" indicates node is online "0" indicates node is offline. Note: Bits in this area should not be driven by logic rungs.
E0049 - E0072	Reserved	(for future use) Note: Bits in this area should not be driven by logic rungs.
E0073	Delv Failure	Set for one cycle when the execute software receives a delivery failed signal from the communications system for an office indication message.
E0074	Delv Success	Set for one cycle when the executive software receives delivery successful signal from the communications system for an office indication message.
E0075	Radio Ack	Not functional on Communications Manager
E0076 - E0083	DI Steady Bits	Set by the executive software when the corresponding digital input is energized (either ON or TOGGLE). Cleared by the executive software when the corresponding digital input is OFF.
E0084 - E0091	DI Toggle Bits	Set the executive software when the corresponding digital input is toggling. Cleared by the executive software when the corresponding digital input is not toggling.
E0092 - E0093	Relay Steady Bits	Set by the ladder logic program to tell the executive software to energize the corresponding relay output. Cleared by the ladder logic program to de-energize the corresponding relay output.
E0094 - E0095	Relay Toggle Bits	Set by the ladder logic program to tell the executive software to toggle the corresponding relay output. The relay's steady bit must also be set. Cleared by the ladder logic program to tell the executive software to stop toggling the corresponding relay output.
E0096 - E0103	Digital input LED steady bits	Set by the ladder logic program to tell the executive software to turn on the digital input LEDs. If the digital input flashing bit is also set, the LED will be flashing. Cleared by the ladder logic program to turn off the digital input LEDs.
E0104 - E0111	Digital input LED flashing bits	Set by the ladder logic program to control the state of the digital input LEDs. If this bit and the steady bit are set, the LED flashes fast. If this bit is set and the steady bit is not set, the LED flashes slowly. Cleared by the ladder logic program to control the state of the LED.

Continued on next page

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Table 3 Continued

Address	Function	Description
E0112 - E0113	Relay output LED steady bits	Set by the ladder logic program to control the state of the relay output LEDs. Follows the same rules as the digital input LED bits. Cleared by the ladder logic program to control the state of the LED.
E0114 - E0115	Relay output LED flashing bits	Set by the ladder logic program to control the state of the relay output LEDs. Follows the same rules as the digital input LED bits. Cleared by the ladder logic program to control the state of the LED.
E0116	Digital input LED control	Set by the ladder logic program allow control of the digital input LEDs. If this bit is not set, the digital input LED bits above have no affect and the LEDs are controlled directly by the executive. Cleared by the ladder logic program to indicate it does not wish to control the digital input LEDs. Any bit sets/clears to the digital input LED bits will have no effect.
E0117	Relay output LED control	Set by the ladder logic program to indicate the ladder logic program wishes to control the relay output LEDs. If this bit is not set, the relay output LED bits above have no affect and the LEDs are controlled directly by the executive. Cleared by the ladder logic program to indicate the ladder logic program does NOT wish to control the relay output LEDs. Any bit sets/clears to the relay output LED bits will have no effect.
E0118 - E0120	Reserved	
E0121 - E0184	GFT status bits	These bits store the status of external GFTs connected to the Comms Mgr. Each GFT uses 8 bits. The bits are set by the execute to match the status of the external GFT. For the bit details, see the GFT information in Table 4.
E0185 - E0256	Reserved	

Table 4. Communications Manager Ground Fault Tester (GFT) bits

Bits	Function	Values	Description
1	Discrete or GFT	0 = Discrete input (following bits not valid) 1 = GFT input	Used to determine if the physical input is in GFT mode or in standard discrete mode.
2, 3		00 = Line OK 01 = Line stuck low 10 = Line stuck high 11 = invalid	Used to determine the status of the signal from the GFT on this input
4	Health Bit	0 = Health OK 1 = Health bad	Used to determine the health of the GFT module hardware.
5	Test Mode Bit	0 = Normal mode 1 = Test mode	Used to determine if the GFT is currently testing itself or is in normal detection mode.
6	Battery 1 Fault	0 = No fault detected 1 = Fault detected	Used to determine if the GFT detected a fault on battery input 1.
7	Battery 2 Fault	0 = No fault detected 1 = Fault detected	Used to determine if the GFT detected a fault on battery input 2.
8	Reserved		

1.1.2.8   Internal Bits (Nxxxx)

This area is provided to hold up to 256 coils, which may be set and tested by any rung. This is useful for intermediate results that are not required to be output or transmitted.

1.1.2.9   LED Steady Bit (Lxxxx)

There are 256 coils provided in this area to light LEDs steadily on ULCPs or Panels. Energizing a bit in this area causes the corresponding LED to light steadily. Each ULCP or Panel in the system is assigned a range of bits from the L bits.

See the ULCP manual for the mapping of the LEDs.

Unlike the SEAR II, the Communications Manager User LEDs can be controlled without the need for a CDL program. The Communications Manager reserves the first 32 bits of the L bits (and F bits) for controlling the onboard User LEDs. The Communications Manager has 16 dual-color LEDs (each User LED has a red LED and a green LED). The first 16 bits control the red LED and the next 16 bits control the green LED. The LEDs are controlled the same way as ULCP or Panel I/O LEDs.

1.1.2.10   LED Flash Bit (Fxxxx)

There are 256 coils provided in this area to flash LEDs on ULCPs or Panels. Setting a bit in this area causes the corresponding LED to flash. Each ULCP or Panel in the system is assigned a range of bits from the F bits.

See the ULCP manual for the mapping of the LEDs.

The Communications Manager reserves the first 32 bits of the F bits (and L bits) for controlling the onboard User LEDs. The Communications Manager has 16 dual-color LEDs (each User LED has a red LED and a green LED). The first 16 bits control the red LED and the next 16 bits control the green LED. The LEDs are controlled the same way as ULCP or Panel I/O LEDs.

NOTE
NOTE
Flashing (F bits) always take precedence over steady LEDs (L bits).

1.1.2.11   Remote Bits Received A, B (Axxxx, Bxxxx)

Locations may have a direct connection to the office, or they may be remote to a master location that has a direct connection to the office (the master location processes the data from the remote locations and passes it to the office). For indications from a remote location to reach the office through a master, bits must be mapped using ladder logic. At the remote location, I bits (GEO indications) are mapped to X or Y bits (remote bits to send). At the master location, A or B bits (remote bits received) are mapped to P bits (indications to office).

A location may also be remote to another location for its indications. For indications from a remote location to reach the master location, bits must be mapped using ladder logic. At the remote location, I bits (GEO indications) are mapped to X or Y bits (remote bits to send). At the master location, A or B bits (remote bits received) are mapped to L and F bits (indications to a ULCP or Panel).

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NOTE

NOTE

Remote bits can be exchanged between a SEAR II and a Communications Manager since the messages used are identical.

1.1.2.12   Remote Bits to Send X, Y (Xxxxx, Yxxxx)

Locations may have a direct connection to the office, or they may be remote to a master location that has a direct connection to the office (the master location processes the data from the office and passes it to the remote). For controls from the office to reach a remote location through a master, bits must be mapped using ladder logic. At the master location, R bits (controls from office) are mapped to X or Y bits (remote bits to send). At the remote location, A or B bits (remote bits received) are mapped to O bits (GEO controls).

A location may also be remote to another location for its control. For controls from a master location to reach the remote location, bits must be mapped using ladder logic. At the master location, S bits (control from the ULCP or Panel I/O) are mapped to X or Y bits (remote bits to send). At the remote location, A or B bits (remote bits received) are mapped to O bits (GEO controls).

NOTE

NOTE

Remote bits can be exchanged between a SEAR II and a Communications Manager since the messages used are identical.

1.1.2.13   Bits set by CDL (Cxxxx)

The coils in this area are set and cleared by the CDL program running on the system. CDL is a separate application programming interface, which can use these bits to communication with the ladder logic program.

1.1.2.14   Bits Read by CDL (Zxxxx)

The coils in this area can be set or cleared by the ladder logic and read by the CDL. However, the CDL can read any bit in the entire ladder logic bitmap. You do not have to use this area to set bits the CDL program can read.

1.2   STARTING THE INTERLOGIC PROGRAM

1.2.1   Keystroke Conventions

This program makes extensive use of function (soft) keys to facilitate entry. As different options are selected, functionality of the keys changes. Available function keys are generally listed at the bottom of the screen for each menu that uses function keys. For some menus, the list of available function keys is extended by using the <Ctrl> key in combination with a function key.

Throughout this manual, reference to keys are bracketed (< >) to indicate a specific key or key sequence to be entered on the keyboard. When making a keyboard entry, the brackets are not to be entered, but simply the indicated key or key sequence (see examples below).

    <F2>   Press the function key marked **F2**

<Ctrl> + <F1>   Press and hold the key marked **Ctrl** and then press the key marked **F1**

<Esc>   Press the key marked **Esc**

Keys used for input string editing are described in paragraph 1.3 and listed in Table 6.

1.2.2 Accessing The Interlogic Utility

The Interlogic program is started by double clicking *il.exe* in the Interlogic program directory. The following splash screen appears.

Press any keyboard key to continue.

The screen containing Menu 1 of the Interlogic program appears on the display as shown below. A prompt window, shown and described in paragraph 1.3.3, overlays the menu at the top of the screen requesting a file name.

The Interlogic editing menus are listed in Table 5.

Table 5. Interlogic Edit Menus

Menu	Description	Refer To Paragraph
1	Interlogic Main Menu	1.3.5
11	Ladder Logic Editor	1.3.6
111	Edit Rung Menu	1.3.6.1
12	Label File	1.3.7
132	Logic Compiler	1.3.8
14	Printing Reports	1.3.9
141	Print Rungfile	1.3.9.1
142	Print Cross-Reference	1.3.9.2
143	Print Label File	1.3.9.3
144	Print Description File	1.3.9.4
145	Examine Print File	1.3.9.5
147	Set Print Parameters	1.3.9.6
16	Utility Programs	1.3.11

The Interlogic editing menu structure is presented in figures 1 and 2.

Figure 1a. Interlogic Edit Menu Structure-Ladder Logic Mode

continued from
Figure 1a

Simlte Mode
(Menu 111)

Examine Label
(Menu 111)

Coil
(Menu 111)

F1 → Relay
(see tables 15 & 14)

F2 → (n/a)

F3 → Latch
(see tables 15 & 14)

F4 → Vert
(see tables 15 & 14)

F5 → Timer Count
(Menu 111- see
table 15)

F1 → Count Up
(see tables 16)

F2 → Clock 1 sec
(see tables 16)

F3 → Clock 1 Hrs
(see tables 16)

F4 → Timer 1 sec
(see tables 16)

F5 → Timer 1 Hrs
(see tables 16)

F6 → Preset Valu
(see table 16)

F7 → Erase Coil
(see table 16)

F8 → Edit Menu
(see table 16)

F6 → Screen Save
(see table 15)

F7 → Screen Load
(see table 15)

F8 → Accept Rung
(see table 15)

F9 → Zoom In
(see table 15)

F10 → Zoom Out
(see table 15)

F1 → (n/a)

F2 → Toggle State
(see table 11)

F3 → (n/a)

F4 → (n/a)

F5 → (n/a)

F6 → (n/a)

F7 → (n/a)

F8 → Exit
(see table 11)

F9 → Zoom In
(see table 11)

F10 → Zoom Out
(see table 11)

F1 → (n/a)

F2 → Next Page
(see table 13)

F3 → Prev Page
(see table 13)

F4 → Goto Page
(see table 13)

F5 → (n/a)

F6 → Toggle I/O
(see table 13)

F7 → (n/a)

F8 → Main Menu
(see table 13)

Figure 1b. Interlogic Edit Menu Structure-Ladder Logic Mode

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Interlogic Main Menu (Menu 1) (continued from Figure 1a)

F2 → Label File (Menu 12 - see paragraph 1.3.7)

- **F1** → Edit Page (Menu 121 - see table 18)
  - **F1** → Edit Name (see table 19)
  - **F2** → Copy Prev (see table 19)
  - **F3** → Delete Name (see table 19)
  - **F4** → Save Page (see table 19)
  - **F5** → (n/a)
  - **F6** → Undo Edit (see table 19)
  - **F7** → (n/a)
  - **F8** → Display Menu (see table 19)
- **F2** → Next Page (see table 18)
- **F3** → Prev Page (see table 18)
- **F4** → GoTo Page (see table 18)
- **F5** → Search Label (see table 18)
- **F6** → Toggle I/O (see table 18)
- **F7** → Move Label (see table 18)
- **F8** → Main Menu (see table 18)

F3 → Logic Compiler (Menu 132 - see paragraph 1.3.8)

F4 → Printing Reports (Menu 14 - see paragraph 1.3.9)

- **F1** → Print Rungfile (Menu 141 - see paragraph 1.3.9.1)
- **F2** → Print Cross-Reference (Menu 142 - see paragraph 1.3.9.2)
- **F3** → Print Label File (Menu 143 - see paragraph 1.3.9.3)
- **F4** → Print Description File (Menu 144 - see paragraph 1.3.9.4)
- **F5** → (n/a)
- **F6** → Examine Print File (Menu 145 - see paragraph 1.3.9.5)
- **F7** → Set Print Parameters (Menu 147 – see paragraph 1.3.9.6)
  - **F1** → Page Length
  - **F2** → Use Form Feeds
  - **F3** → Use Graphic Character Set
  - **F4** → Print Bit Numbers
  - **F5** → Print Labels
  - **F6** → Print To File
  - **F7** → Page Footing
  - **F8** → Return to Printing Menu
- **F8** → Back to Main Menu (see paragraph 1.3.9.7)

(continued on Figure 2b)
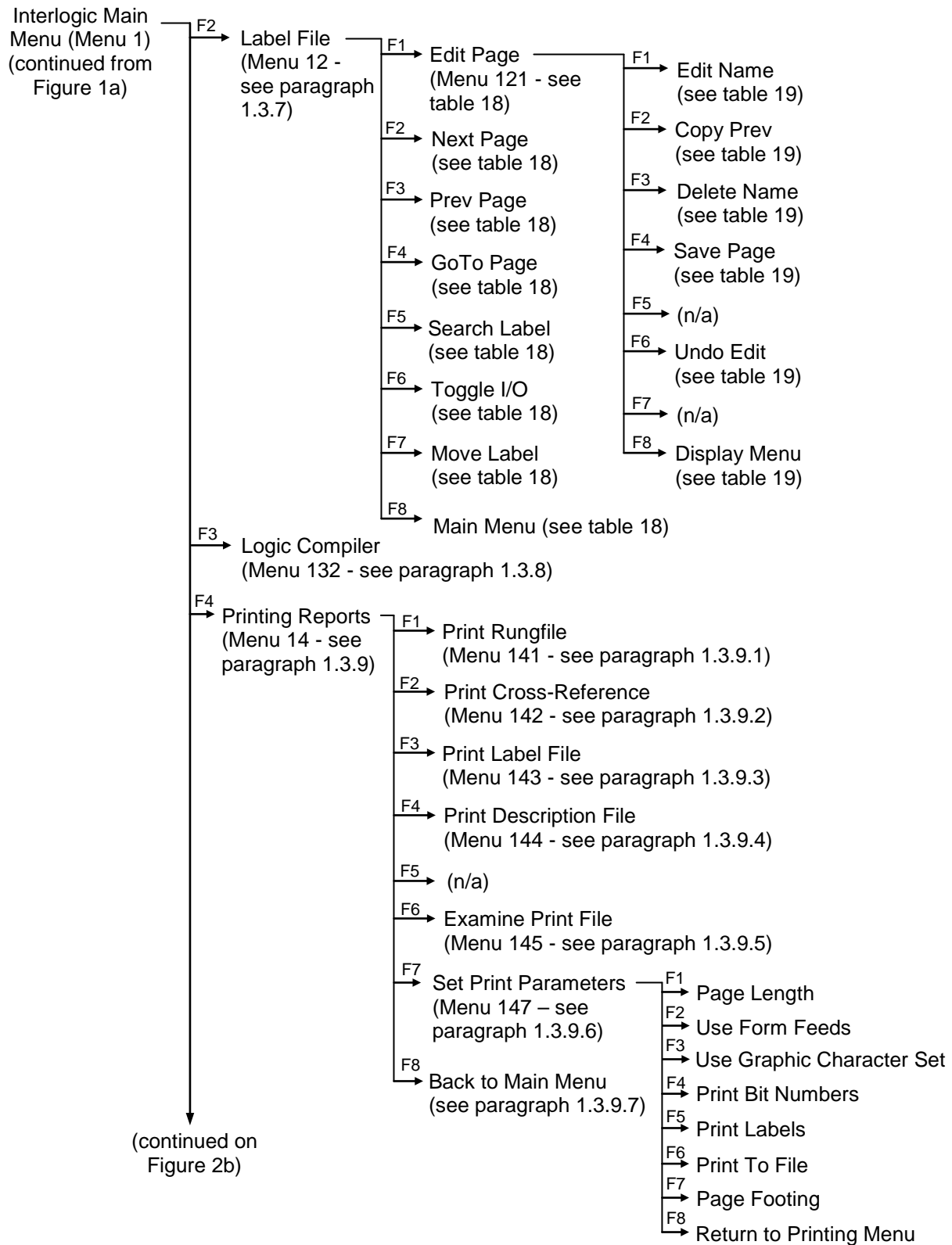
Figure 2a. Interlogic Edit Menu Structure-Label File Mode, Logic Compiler, & Printing Reports
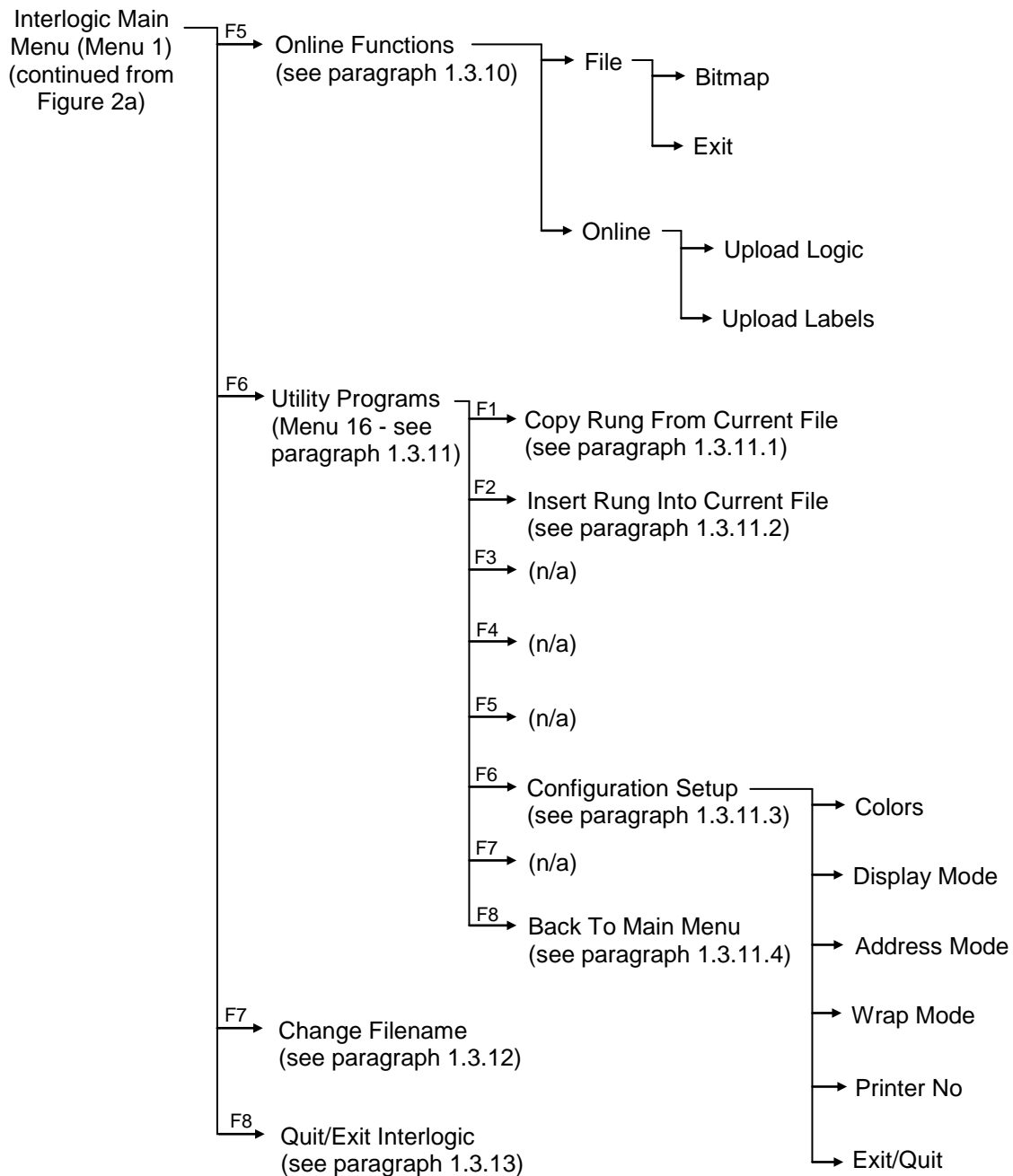
14

Figure 2b. Interlogic Edit Menu Structure-Online Functions, Utility Programs, Change Filename, & Quit/Exit Interlogic

The individual entries on Menu 1, and all sub-menus accessible from this screen, are described in the remainder of this section.

1.3 **USING INTERLOGIC**

Use the tools in this section to create new ladder logic or to edit an existing ladder logic file.

NOTE
NOTE
It is generally easier to first create or modify the label file (refer to paragraph 1.3.7) and then create or modify rungs (refer to paragraph 1.3.6).

The general operating principles applicable to the Interlogic program are described in the paragraphs that follow.

1.3.1 Editing Input Strings

When the Interlogic program accepts keyboard inputs other than from function keys (for example when entering or editing bit addresses, labels, and file names), a range of editing functions are available to the user. These input string editing keys and their associated functions are listed and described in Table 6.

Table 6. Input String Editing Functions

Key	Function
Home	Moves the cursor to leftmost position of the input field
End	Moves the cursor to the right end of the input field
Left Arrow	Moves the cursor left one character position (if not at left end)
Right Arrow	Moves the cursor right one character position (if not at the end of a string)
Insert	Toggles between the insert mode and overwrite mode
Delete	Deletes any character at the cursor position
Backspace	Deletes any character to the left of the cursor, and backspaces the cursor one character position to the left
Enter	Completes string editing
Escape	Aborts the edit function

The input string editing field appears as an inverse video box or a window with a prompt such as **Enter Filename**. When appropriate, the program displays the default entry in the input field. The first character typed overwrites the default selection; however, if any of the keys listed in Table 6 above are pressed before the first character is entered, the default selection is retained and can be edited.

1.3.2 Escape Key (Esc)

The <Esc> key 'backs out' or cancels a currently selected task, but does _not_ undo an edit function. The key can also be used to step to the next higher menu level.

1.3.3   File Names

When the program requests a file name, a window with the prompt **Enter Filename** appears on the screen as shown below.

```
┌──────────────────────── Enter Filename ────────────────────────┐
│ *.LLT                                                           │
└─────────────────────────────────────────────────────────────────┘
```

The appropriate file extension (**.LLT**) is displayed in the window (see paragraph 1.3.1 for input string editing options). Enter or select a file name using one of the following methods:

- To create a new file, type a file name (maximum eight characters plus the .LLT extension) and then press <Enter>.

- To use an existing file from the current directory when you know the file name, type the file name (including **.LLT** extension) and then press <Enter>.

- To select an existing file (correct spelling unknown) from the current directory, press the <Enter> key to display a list of available files, highlight the name of the desired file using the arrow keys, and then press <Enter>.

- To select a file located in a directory other than the current directory, type the drive letter, directory name, and file name (including extension) using the following format: drive:\directory\filename.LLT (e.g., **C:\LADDER\MAIN.LLT**), and then press the <Enter> key.

- Replace the file name with ***.*** to display <u>all</u> files in the current directory, or another directory if so indicated (e.g., **C:\LL*.***), or with ***.LLT** to display a list of only the files with the .LLT extension.

1.3.4   Menu Screen Status Line

The status line located at the top of each menu screen (shown below) provides information concerning the current menu and currently selected file.

```
┌─────────────────────────── MS-DOS Prompt ───────────────────────┬─┬─┐
│                                                                 │▼│▲│
├─────────────────────────────────────────────────────────────────┴─┴─┤
│ Menu 11    C:\A80252\LL\TEST3.LLT        (    6>              Mem 220k│
└─────────────────────────────────────────────────────────────────────┘
```

The general format for the status line is as follows:

Menu *m*   *X:\PATH\FILENAME.EXT*   (*n*)   Mem *xxxk*

Each element of the line is listed and described in Table 7.

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Table 7. Menu Screen Status Line Elements

Element	Description
Menu *m*	*m* = the number of the menu currently on display.
X:\PATH\FILENAME.EXT	Indicates the drive (*X:*), path (directory) name (*PATH*), rung file name (*FILENAME*), and extension (*.EXT*) of the rung file being processed. If a file name is not specified, NONAME is assigned, which is the Interlogic default file name.
(*n*)	*n* indicates number of rungs in the currently selected file. A newly created file shows one rung (the END rung, which is automatically created by the program).
Mem *xxxk*	*xxx* = the amount of memory available (e.g., Mem 220k) (*k* = kilo-bytes; *m* = megabytes).

In various modes, additional information may be displayed on the status line. This information can include the cursor column and row positions on the display, logic element labels, etc. This additional information will be discussed along with the appropriate menu or display.

1.3.5   Interlogic Main Menu (Menu 1)

When the Interlogic program is started, a status save file is accessed to retrieve information applicable to the last Interlogic session. This enables resumption of operation from the previous exit point. Interlogic also copies the .BIN file from the current session to a file LADDAT.BIN, which is used in the on-line mode to boot the SEAR II with the latest application data.

Following these operations, the Interlogic main menu (Menu 1) is displayed (see paragraph 1.2 for an illustration). The available selections from Menu 1 are listed in Table 8. Each menu selection has a corresponding function key listed with it which, when pressed, accesses a submenu or an appropriate editing screen.

Table 8. Interlogic Menu 1 Selections

Function Key	Menu Selection	Submenu/Screen	Reference Paragraph
F1	Ladder Logic	Menu 11	1.3.6
F2	Label File	Menu 12	1.3.7
F3	Logic Compiler	Menu 132	1.3.8
F4	Printing Reports	Menu 14	1.3.9
F5	Online Functions	Online screen	1.3.10
F6	Utility Programs	Menu 16	1.3.11
F7	Change Filename	File name window	1.3.12
F8	Quit/Exit Interlogic	Exit to DOS prompt	1.3.13

### 1.3.6 Ladder Logic Editor (Menu 11)

When the ladder logic edit mode is entered (select the **F1** function from Menu 1), the program reads and displays the current rung (last rung used) from the current rung file indicated in the status line. Each rung is displayed as a maximum of seven lines of relay logic.

<table>
<tr><td>NOTE</td><td>NOTE
When the SEAR II is on-line and a rung is selected that corresponds to a monitored function at the location, the display indicates power flow through the relay logic contacts. This is shown by using inverse video or a different color for a change of contact state (open-to-closed and vice versa).</td></tr>
</table>

Below, a typical ladder logic edit screen (Menu 11) is shown in label mode. The current rung file represented is FACTORY.LLT, and the current directory is INSTALL. This file contains 27 rungs with Rung 25 displayed (rung number displayed immediately below the menu number). This rung contains two rows of relay logic. To the right of the rung number is an area (Desc) for an optional rung description (e.g., "Online Active", "Battery alarm detection", etc.).
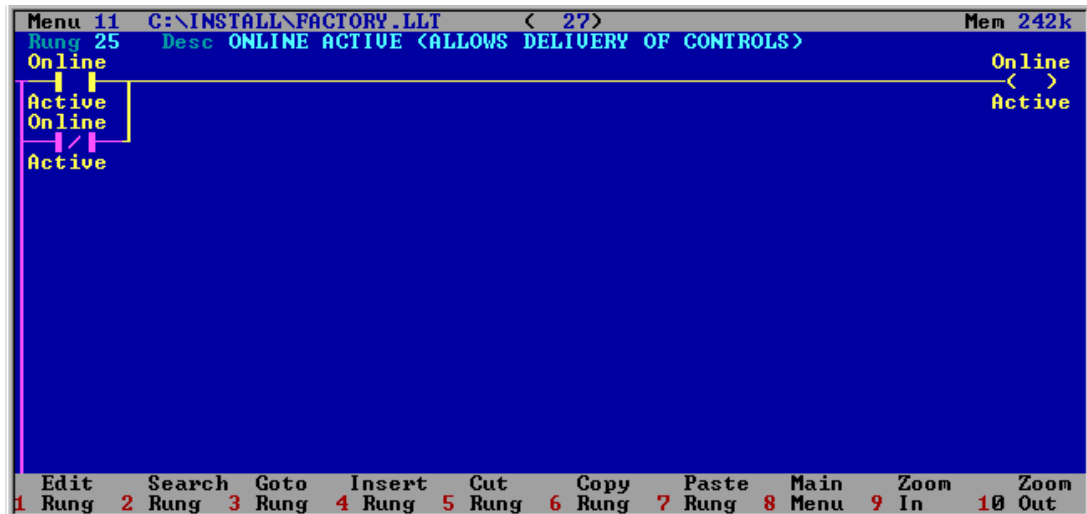
Located at the bottom of the editing screen is a function key menu bar (see example rung 25 above). The functions available are listed and described in Table 9.

The last rung in the rung file is an "END" rung, not usable for logic, and "End of Rungs" is displayed in the description area when this rung is displayed (see example rung 27 below).
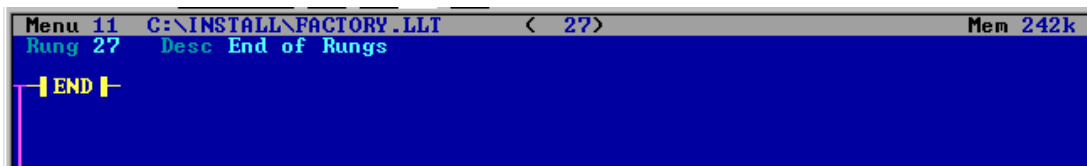
Start creating ladder logic by placing contacts and coils for each rung and assigning labels and addresses. Each rung may have multiple contacts but only one coil. A coil does not necessarily need to be driven by contacts.

If a new rung file is begun, the "End" rung is the only rung in the file initially. Rungs must be inserted or pasted before the "End" rung.

For use of the editing function keys, refer to tables 9 and 10. Refer to paragraphs 1.3.1 and 1.3.2 for line editing keystroke functions. Refer to paragraph 1.3.3 for calling up files. Refer to paragraph 1.3.4 for a description of the menu screen status line. Refer to paragraph 1.3.5 for the Interlogic Main menu.

When each rung is finished, accept the rung using the <F8> function key. Changes made to the rung file are automatically saved. If error messages are displayed when attempting to accept a rung, refer to Appendix A for corrective action. When the rung file is completed, it must be compiled (refer to paragraph 1.3.8).

NOTE
NOTE
The Ladder Logic edit functions described in the following paragraphs **do not** include an "Undo" function. If an error is made during editing, for example inadvertently deleting a line of logic or an entire rung, that data must be reentered.

Table 9. Ladder Logic Edit Screen (Menu 11) Edit Functions

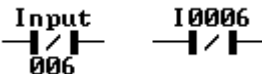| Function Key	Function Name	Editing Function
F1	Edit Rung	This function enables modification of the selected rung file. The program displays a new menu screen (Menu 111) when the <F1> function key is pressed (see paragraph 1.3.6.1).
F2	Search Rung	This function enables search for a rung (within the open file) containing a specified label. Press the <F2> function key to display the search window. Type first half of label (7 characters max), press <Enter>, type second half of label (6 characters max), press <Enter>. After entering the label (see paragraph 1.3.1 for editing input strings), the program initiates a search beginning at rung number 1. If a label is located, it is identified by bit address (see example below). Press any key to display the rung containing the label. The "Verify" window is also displayed. Type **Y** (yes) to continue search for the next occurrence of the same label. Type **N** (no) to abort the search.

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Table 9 Continued

Function Key	Function Name	Editing Function
F3	Goto Rung	Displays a rung selection window that prompts for a specific rung number (range of valid entries corresponds to number of rungs in the file, e.g., a range of (1 . . 27) corresponds to a file containing 27 rungs). Type a number within the range and press <Enter>. The selected rung is displayed. Select new rung number Enter Value (1..27)
F4	Insert Rung	Inserts an empty rung _before_ the currently displayed rung, then displays the new (empty) rung and enters the Edit Rung mode. Pressing the <Esc> key prior to saving any edits to the new rung abandons the new rung and restores the rung that was displayed prior to inserting the new rung.
F5	Cut Rung	Deletes currently displayed rung. Press the **<F5>** function key and the "Verify" window appears (see below). Verify Delete this rung ? (Y/N) Type **Y** to delete the current rung (rung count decreases by one); type **N** to abort the function.
F6	Copy Rung	Press the <F6> function key to copy the currently displayed rung to memory.
F7	Paste Rung	Press the <F7> function key to paste a copy of the last copied rung (function **F6**) to the current screen display. The rung copy is inserted before the currently displayed rung and the rung count increases by one.
F8	Main Menu	Returns the display to Menu 1
F9	Zoom In	Use to locate contacts associated with a coil and vise versa. Press the <F1> function key to enter Edit mode (switches to Menu 111), highlight a contact/coil, press the <F9> function key-the rung containing the associated coil/contact appears on the display.
F10	Zoom Out	Use after using the <F9> function key (above) to return to the original rung and Menu 11

The function key menu bar just described (located at the bottom of the editing screen) can be switched to an alternate set of functions available at this level by pressing and holding the <Ctrl> (control) key. The functions in this new set are selected by simultaneously pressing the <Ctrl> key and the indicated function key. The available functions are listed and described in Table 10.

Table 10. Ladder Logic Edit Screen (Menu 11) Control Key Edit Functions

| Function Key	Function Name	Editing Function
Ctrl-F1	Change Mode	Pressing the <Ctrl> + <F1> keys toggles the display mode between Label and Bit Address mode. In bit address mode, rung file logic elements (contacts and coils) are displayed with the associated bit address. In label mode, elements are displayed with labels instead of bit addresses. The sample below on the left is in label mode and the one on the right is in bit address mode. Input I0006 ─┤ ╱ ├─ ─┤ ╱ ├─ 006
Ctrl-F2	Simlte Mode (simulate)	Pressing the <Ctrl> + <F2> keys selects simulation mode, which permits testing of logic circuit diagrams without going on-line. When the <Ctrl> + <F2> keys are pressed, the screen switches to Menu 111 and a new set of function key options appears in the function key menu bar (see Table 11). Simulation mode is accessible from Menu 11 only.
Ctrl-F3	Change Wrap	Pressing the <Ctrl> + <F3> keys toggles the cell cursor wrap mode off and on. The cell cursor is the large inverse-video box that highlights logic elements in edit mode. The cursor is moved across or up and down the screen using the arrow keys (←→↑↓). With the wrap mode off, the cursor stops at the beginning or end of a row, and at the top or bottom of a column. To return the cursor to the other end of the row or column, it must be moved in the opposite direction the full length of the row or column. With the wrap mode enabled, the cursor automatically returns to the other end of a row or column when it reaches the end.
Ctrl-F4	Change Color	Each time the <Ctrl> + <F4> keys are pressed, the display changes to a different screen color combination. To return to a particular combination, continue to press the <Ctrl> + <F4> keys until the desired color combination appears.

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When in the simulation mode (by pressing the <Ctrl> + <F2> keys simultaneously) from the Ladder Logic Edit screen (Menu 11), the function keys listed in Table 11 apply.

Table 11. Simulation Mode Edit Functions (Menu 111)

Function Key	Function Name	Editing Function
F2	Toggle State	Each time the <F2> function key is pressed, the physical state of the logic element highlighted by the cell cursor toggles (open/closed, energized/deenergized). The change of state is indicated by a color change of the logic element. This function permits logic diagrams (rungs) containing timers, latches, counters, clocks, etc. to be tested.
F8	Exit	Pressing the <F8> function key aborts the simulation mode and switches to the edit screen (Menu 111). Logic elements retain their current state when the simulation mode is aborted.
F9	Zoom In	Highlight a logic element (contact or coil), then press the <F9> function key. The simulation mode is aborted, the display switches to the edit screen (Menu 111), and the rung containing the associated coil or contact appears on the display. If the state of the highlighted logic element was changed while in simulation mode, the state of the associated coil or contact is indicated as changed (different color) if so applicable.
F10	Zoom Out	Use after using the <F9> key (above) to return to the original rung and Menu 11 (does not restart the simulation mode)

1.3.6.1   Edit Rung Menu (Menu 111)

With Menu 11 on the display, press the <F1> function key to access the Edit Rung mode for the currently selected rung file. Menu 111 (shown below) appears on the display with the cell cursor in the top left corner of the edit area and a function key menu bar at the bottom of the screen.
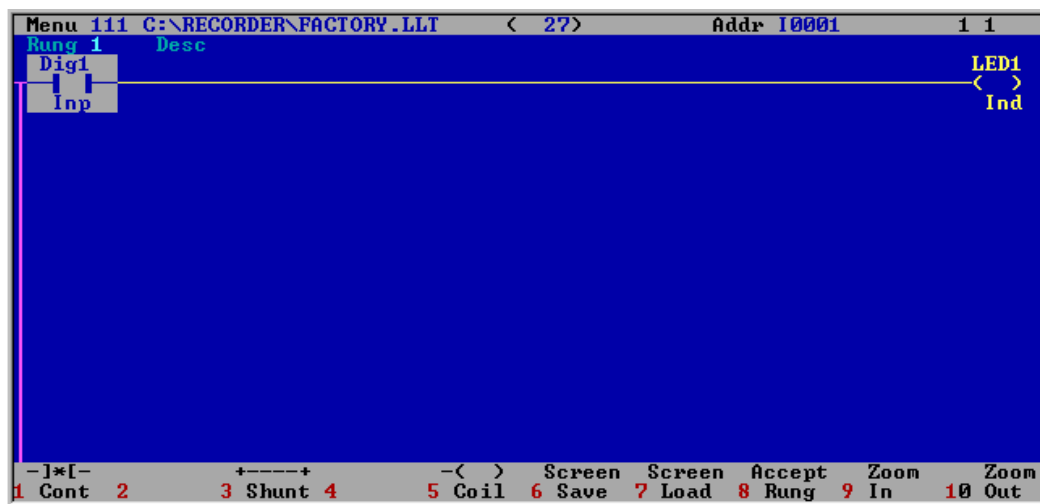
NOTE

NOTE

If a specific rung is to be edited, select that rung using the arrow keys while Menu 11 is displayed, then change to the Edit Rung mode by pressing the <F1> function key.

The edit screen is composed of 70 cells (10 columns by 7 rows). The 4 arrow keys (←→↑↓) are used to move the cell cursor to any of the 70 cells. The function key assignments at the bottom of the screen change dynamically as the cell cursor is moved to different logic elements or blank areas on the screen. The cell cursor coordinates, indicated as a column/row number pair at the right end of the status line (top of screen), also changes as the cell cursor is moved.

Each logic element is assigned a bit address and a label. When the screen is in the _address mode_ (Table 10, **Ctrl-F1**), the bit address appears directly above the logic element. When the cell cursor is on the logic element, the corresponding _label_ for the element is displayed in the status line at the top of the screen (just to the left of the cell cursor coordinates). Similarly, with the screen in the _label mode_, the label appears with the logic element and the associated _bit address_ is displayed in the status line.

The functions available from the function key menu bar are listed and described in Table 12. Use these functions to create ladder logic networks. Note that certain selections are unavailable at various times depending upon the position of the cell cursor.

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Table 12. Rung Edit Screen (Menu 111) Edit Functions

Function Key	Function Name And Symbol	Editing Function
F1	Cont (contact)	Press the <F1> function key to place a relay contact at the cell cursor position (not allowed in column 10). Four types of contacts are available as indicated by the symbols to the left. From top to bottom, the symbols represent the following:
	⊣ ⊢	• normally-open contact
	⊣/⊢	• normally-closed contact
	⊣+⊢	• positive-going edge trigger generated when contact closes
	⊣-⊢	• negative-going edge trigger generated when contact closes
		Each time the <F1> function key is pressed, the contact symbol at the cell cursor position changes. Continue to press the <F1> function key until the desired symbol appears.
F3	Shunt +----+ Shunt	When the cell cursor is covering a blank cell (except in column 10), press the <F3> function key to place a solid horizontal line in the cell.
	Open + + Open	When the cell cursor is covering a cell occupied either by a solid line or a logic element (except in column 10), press the <F3> function key to place an open space in the cell (becomes a blank cell).
F4	Vert (vertical) ¦ Vert ¦ Conn	This function permits a vertical line to be inserted between two rows of logic. Restrictions: Vertical line cannot be inserted in column 1 (function not displayed in function key menu bar when cursor in column 1).

Continued on next page

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Table 12 continued

Function Key	Function Name And Symbol	Editing Function
F4 cont'd	Vert (vertical) ┊ **Vert** ┊ **Conn** cont'd	• Vertical line cannot be inserted between the lines leading to a coil and the coil reset input. • Vertical line is drawn down from the left end of the cell cursor; therefore, both rows of logic to be joined by the vertical must be intersected by the cell cursor column or occupy the cell immediately to the left of the cell cursor column. Rows containing logic lines that do not meet these criteria are bypassed by the vertical line. • Vertical line cannot be inserted from row 7; it must be inserted from row 6 or above to connect to row 7. To insert a vertical line, place the cell cursor on a line of logic and press the <F4> function key. If the cursor is placed on a logic element (coil or contact), the vertical is connected to the left end of that element.
	Vert (vertical) + **Vert** + **Open**	When a vertical line connects two rows of logic, that line may be removed using this function. Place the cell cursor in any row so that the left end of the cell cursor is touching the vertical line. Press the <F4> function key to remove the entire line.
F5	Coil –( ) **Coil**	Press the <F5> function key to automatically move the cell cursor to row 1, column 10. Coils can only be placed in the row 1, column 10 position, and only 1 coil is permitted per rung. The rung must contain at least one contact or shunt in the row 1, column 1 position before this function is enabled. When the <F5> function key is pressed, the cell cursor marks a blank cell in row 1, column 10, and a new set of function key options is displayed in the function key menu bar (see Table 15 for coil option function keys).

Table 12 continued

Function Key	Function Name And Symbol	Editing Function
F6	Screen Save	This function permits the currently displayed rung (logic network) to be saved to a separate file without accepting the rung (see **F8** below). When the <F6> function key is pressed, the prompt shown below requesting a file name appears. Type the file name (maximum eight characters plus an optional 3-character extension) and press <Enter>. The program stores the screen image to disk using the supplied file name. Hint: To make it easier to locate these rung data files in the future (refer to **F7** below), consider the following: • Assign the same 3-character extension to all files of this type (e.g., use the 8-character file name to describe the logic structure and give each file an extension such as .RLF (Rung Logic File)). Example: BATTALRM.RLF If a file with the same file name already exists, a prompt similar to the one shown below is displayed. Type **N** to abort the entry and return to editing, or type **Y** to overwrite the existing file. This feature is the cut portion of a "cut and paste" function that allows creation of a personal library of frequently used logic networks.

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Table 12 continued

Function Key	Function Name And Symbol	Editing Function

F7	Screen Load	This function permits stored rung data (logic networks) to be retrieved from disk and inserted in the currently displayed rung.
		
		When the <F7> function key is pressed, the prompt shown below requesting a file name appears.
		
		      Enter the file name to be loaded:
		
		Type the file name (maximum eight characters plus an optional 3-character extension) and press <Enter>. The program retrieves the rung data from disk using the supplied file name.
		
		This feature is the paste portion of a "cut and paste" function (see **F6** above) which enables rungs to be built quickly using the stored logic networks as building blocks. _The Screen Load function may be used as many times as desired in a single rung; however, each time it is used, the newly inserted data replaces any existing logic networks in that rung._
		
		Hint:
		
		    To display a listing of _all_ files in the directory containing the rung data files, type that directory path followed by ***.***, and then press <Enter>. For example, if the files reside on the C drive in the IL subdirectory of the RECORDER directory, type the following:
		
		            C:\RECORDER\IL*.*
		
		    If all rung data files are given the same extension following the file name (e.g., **.RLF**), substitute that extension for the second asterisk in the example above (e.g., **C:\RECORDER\IL*.RLF**). This causes only those files with the designated extension to display.
		
		    When the directory listing appears, use the arrow keys to highlight the desired file and then press the <Enter> key to select it.

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Table 12 continued

Function Key	Function Name And Symbol	Editing Function
F8	Accept Rung	Pressing the <F8> function key saves the completed rung to the rung file, if acceptable (see below).
		A number of checks are performed at this stage and, if the rung is found to be unacceptable (missing bit address or label, etc.), the acceptance is halted and the operator is alerted by various error messages (error messages are listed in Appendix A). Following acceptance, the system returns to Menu 11.
		During acceptance, the word ACCEPT is displayed at the right end of the status line followed by the number of tokens created (the length of time this information is displayed is proportionate to the size of the rung; for very small rungs, it may appear as a flicker of the cursor coordinates, or not at all).
F9	Zoom In	Use this function to locate contacts associated with a coil and vice versa.
		Place cell cursor on a contact/coil and then press the <F9> key- the screen reverts to Menu 11 and the rung containing the associated coil/contact appears on the display.
F10	Zoom Out	Use this function after using the <F9> function key (above) to return to the original rung (does not return to Menu 111).

NOTE

NOTE

The <Esc> (escape) key may be used to abort a rung editing session. However, if editing changes have been made but not saved (Accept Rung, **F8**), the program displays the following prompt:

```
┌───────────────── Verify ─────────────────┐
║ Changes have been made! Abort anyway (Y/N) ? ║
└───────────────────────────────────────────┘
```

This allows the user to recover from an accidentally pressed <Esc> key without abandoning the edited data.

With Menu 111 on the screen, press and hold the <Ctrl> (control) key to switch the function key menu bar (located at the bottom of the editing screen) to a second set of functions which are available at this level. The functions are selected by simultaneously pressing the <Ctrl> key and the indicated function key. The functions available are listed and described in Table 13.

NOTE

NOTE

Several of the functions at this level are also accessible with single key strokes instead of the Ctrl-function key combination. These single key strokes are indicated in the Function Key column enclosed by parenthesis. For single letters, either upper or lower case is accepted.

Table 13. Rung Edit Screen (Menu 111) Control Key Edit Functions

Function Key	Function Name	Editing Function
Ctrl-F1	Bit Addr (address)	This function allows assignment of a bit address to the selected logic element (contact or coil).
		Place the cell cursor on the logic element (element may or may not already display a bit address or label) and simultaneously press the <Ctrl> + <F1> keys. A small inverse-video rectangle with a flashing cursor appears on top of the logic element. Type the five-character bit address (first character is the function identifier followed by the four-digit bit address in decimal format, reference paragraph 1.1.2, *Coil Functions*). (The bit address must be one of the valid bit addresses listed in the Label File; see **Ctrl-F5** below.) When complete, press the <Enter> key (if an invalid bit address is entered, the **Ctrl-F5** function is aborted and no bit address or label is displayed). The logic element and new bit address or label (depends on display mode selected, Table 10, **Ctrl-F1**) are highlighted by the cell cursor. The corresponding label or bit address also appears in the status line to the left of the cursor coordinates.
		<u>**NOTE**</u> *Each bit address has a corresponding label that is assigned to the logic element when the bit address is entered. The labels are listed in the Label File (paragraph 1.3.7).*

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Table 13 continued

Function Key	Function Name	Editing Function
Ctrl-F3 (**L** or **I**)	Enter Label	This function permits assignment of a label to a new logic element (coil or contact), or the change of an existing logic element label. Logic element labels consist of two halves. The first half appears above the element and can contain up to seven alphanumeric characters (including spaces). The second half appears below the element and can contain a maximum of six alphanumeric characters (including spaces). **General Procedure** Place the cell cursor on a logic element and simultaneously press the <Ctrl> + <F3> keys. A small inverse-video rectangle with a flashing cursor appears above the logic element. Type the new entry for the first half of the label and then press the <Enter> key. A small inverse-video rectangle with a flashing cursor appears below the logic element. Type the second half of the label and then press the <Enter> key**.** **Restrictions For New Logic Elements** Each valid bit address corresponds to a label in the Label File (paragraph 1.3.7). If the logic element is new and has no assigned bit address, the Label File is scanned for the entered label. If the label matches one in the Label File, the corresponding bit address is retrieved and assigned to the logic element along with the label. However, if the label does not match any label listed in the Label File, an error message (containing the entered label) similar to the one shown below is displayed. ``` ———————————— ** ERROR ** ———————————— Label 'Alarm.Input' not found ! * Hit <ESC> to continue * ``` To review valid labels for new logic elements, access the Label File (see **Ctrl-F5** below).

Table 13 continued

Function Key	Function Name	Editing Function
Ctrl-F3 cont'd		**Restrictions For Elements With Existing Labels** If the logic element already has a label, a warning message containing the associated bit address (see example below) appears in the status bar when <Ctrl> + <F3> keys are pressed. `Assigning new Label to 'I0005'  (ESC to abort)!` Either type new label, or press <Esc> to abort the label change. Since this function also changes the label for the indicated bit address in the Label File, care should be exercised when changing a label. Avoid duplicating an existing label in the Label File that belongs to a bit address other than the one assigned to the logic element, as this can lead to problems (duplicate labels) during label searches. Review the Label File when in doubt (see **Ctrl-F5** below).

Ctrl-F4
 (**R** or **r**)
	Replace Label	This function allows an existing logic element label to be replaced by another label (and bit address) from the Label File.
		
		 Place the cell cursor on a logic element (coil or contact) that currently has an assigned bit address/label and press the <Ctrl> + <F4> keys simultaneously. A small inverse-video rectangle with a flashing cursor appears above the logic element. Type the new entry for the first half of the label and then press the <Enter> key. A small inverse-video rectangle with a flashing cursor appears below the logic element. Type the second half of the label and then press the <Enter> key. The Label File (paragraph 1.3.7) is then scanned for the entered label. If the label is valid (exists in the Label File), it is assigned along with the corresponding bit address to the logic element. However, if the label does not match any label listed in the Label File, an error message (containing the entered label) similar to the one shown below is displayed.
		
		 `** ERROR **`
		 `Label 'Input.257' not found !`
		 `* Hit <ESC> to continue *`
		
		 To review valid labels, access the Label File (see **Ctrl-F5**).

Table 13 continued

Function Key	Function Name	Editing Function

Ctrl-F5	Examine Label	This function permits viewing access to the Label File.
		
		When entering labels for new logic elements (coils or contacts) (**Ctrl-F3**), or replacing labels on existing logic elements (**Ctrl-F4**), it is necessary that the labels correspond to existing labels in the Label File.
		
		Press the <Ctrl> + <F5> keys simultaneously to view the Label File contents. A window similar to the one shown below appears and the function key menu bar (located at the bottom of the editing screen) switches to a second set of functions which are available at this level. The window contains eight rows of four labels each (32 labels with each label enclosed by parenthesis). At the left end of each row is the first bit address for that row - the first label in the row corresponds to that bit address. Each successive label to the right corresponds to the next higher bit address (bit address increments by 1).
		
		<pre>┌─────────────────────── Labels ───────────────────────┐
		│ I0001 <Input .001 ><Input .002 ><Input .003 ><Input .004 > │
		│ I0005 <Input .005 ><Input .006 ><Input .007 ><Input .008 > │
		│ I0009 <Input .009 ><Input .010 ><Input .011 ><Input .012 > │
		│ I0013 <Input .013 ><Input .014 ><Input .015 ><Input .016 > │
		│ I0017 <Input .017 ><Input .018 ><Input .019 ><Input .020 > │
		│ I0021 <Input .021 ><Input .022 ><Input .023 ><Input .024 > │
		│ I0025 <Input .025 ><Input .026 ><Input .027 ><Input .028 > │
		│ I0029 <Input .029 ><Input .030 ><Input .031 ><Input .032 > │
		└───┘</pre>
		The functions available with this window provide viewing access to different portions of the Label File. These functions are described below.
		
		F2 (Next Page) - (same as Page Down key on keyboard) - scrolls down the Label File to the next set of 32 labels.
		
		F3 (Prev Page) - (same as Page Up key on keyboard) - scrolls up the Label File to the previous set of 32 labels.
		
		F4 (Goto Page) - displays a prompt in a pop-up window indicating the total number of pages in the Label File. Type a number within the indicated range and press the <Enter> key. The labels on the corresponding page appear in the window.

Table 13 continued

Function Key	Function Name	Editing Function
Ctrl-F5 cont'd		**F6** (Toggle I/O) - toggles labels displayed in window between input labels and corresponding output labels (e.g., Input/Outputs, Controls/Indications). **F8** (Main Menu) - returns the display to the previous edit level and function key menu.
Ctrl-F6 (**Insert** key)	Insert Line	This function provides two types of line insertion: a blank line (row) between existing rows of logic, or solid lines (shunts) at the cell cursor column position in all rows occupied by logic. When the <Ctrl> + <F6> keys are pressed, the prompt shown below appears on the screen. Type **R** (row) or **C** (column) and press <Enter> to achieve the results described below. Choose! Insert Row or Column (R/C) ? Row - with the cell cursor on a line of logic (other than row 1 or 7) or on a blank row above a line of logic, type **R** and press <Enter> to insert a blank row above the row containing the cursor. The row containing the cursor and all lines of logic below it are moved down one row. When the bottom line of logic is in row 7, no more blank rows may be inserted. Column - with the cell cursor in any column (except 1 or 10) that contains a contact, a shunt, an open, a blank cell immediately to the right of an occupied cell, or in a blank column with columns containing logic elements or shunts to the right, type **C** and press <Enter>. A shunt (solid line) is inserted in the cell cursor column position of all rows with occupied cells immediately to the left of the cell cursor column position. The cell cursor column contents and all columns to the right of the cell cursor column position (except column 10) are shifted one column to the right, unless this action would shift a contact into column 10, in which case the function is aborted.

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Table 13 continued

Function Key	Function Name	Editing Function
Ctrl-F7 (**Delete** key)	Delete Line	This function provides two types of line deletion: an entire row (blank or containing logic), or all solid lines (shunts) and logic elements in each row at the cell cursor column position. When the <Ctrl> + <F7> keys are pressed, the prompt shown below appears on the screen. Type **R** (row) or **C** (column) and press <Enter> to achieve the results described below. **Choose!** Delete Row or Column (R/C) ? ▨ <u>Row</u> - with the cell cursor on a row (blank or containing logic, type **R** and press <Enter> to delete the row containing the cursor. All blank rows, and rows containing lines of logic located below the deleted row, are moved up one row. <u>Column</u> - with the cell cursor on any cell (except in column 10), type **C** and press <Enter> to delete the column containing the cell cursor in all rows of the rung. All logic elements in the columns to the right of the deleted column (except column 10), are shifted one column to the left when a column is deleted.
Ctrl-F8 (**D** or **d**)	Descrb (describe) Rung	Immediately to the right of the rung number on the edit screen is the label "Desc". The area to the right of this label can be used to display a rung description containing up to 64 characters (including spaces). Press the <Ctrl> + <F8> keys and an inverse video text box appears to the right of the label "Desc". Type the desired description and then press <Enter>. **NOTE** *If the last rung description entered (for another rung) during the current edit session can be used again (all or part) for the rung currently being edited, hold down the <Ctrl> key and type **D** (upper or lower case). The last description entered and saved appears in the rung description area and may be edited as required.*
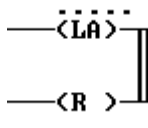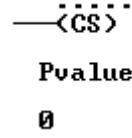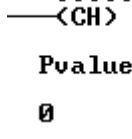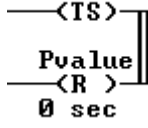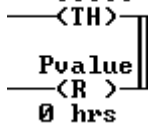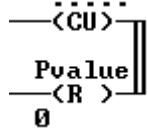
Table 13 continued

Function Key	Function Name	Editing Function
Ctrl-F9	Prev Addr (previous address)	This function allows the logic element (contact or coil) bit address to be decreased by 1.
		Place the cell cursor on a logic element with an assigned bit address and press the <Ctrl> + <F9> keys. The bit address displayed above the element decreases by 1 (e.g., I0005 to I0004). If the <Ctrl> + <F9> keys are held down, the bit address continues to decrease until bit 1 of the bit function classification (inputs, outputs, etc.) is reached. The label corresponding to the bit address is displayed in the status line to the left of the cursor coordinates. The label changes as the bit address changes. If the edit screen display mode is changed so that labels appear on the logic diagram, the label on the highlighted logic element changes when the <Ctrl> + <F9> keys are pressed and the corresponding bit address appears in the status line.
Ctrl-F10	Next Addr (address)	This function allows the logic element (contact or coil) bit address to be increased by 1.
		Place the cell cursor on a logic element with an assigned bit address and press the <Ctrl> + <F10> keys. The bit address displayed above the element increases by 1 (e.g., I0005 to I0006). If the <Ctrl> + <F10> keys are held down, the bit address continues to increase until the last bit (e.g., I0256) of the bit function classification (inputs, outputs, etc.) is reached. The label corresponding to the bit address is displayed in the status line to the left of the cursor coordinates. The label changes as the bit address changes. If the edit screen display mode is changed so that labels appear on the logic diagram, the label on the highlighted logic element changes when the <Ctrl> + <F10> keys are pressed and the corresponding bit address appears in the status line.

The Interlogic rung files can contain any of five types of relay coil configurations (basic relay, latch, clock, timer, or up counter), but only one coil per rung. Each of the coils is assigned a logic symbol as shown in Table 14, *Relay Coil Types And Associated Logic Symbols*. As indicated, latch coils, timer coils, and up counters are provided with two inputs, the coil control input (top line) and a reset input (bottom line). Additional information is provided for each coil type, where applicable, in Table 15, *Coil Option Function Keys*.

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Table 14. Relay Coil Types And Associated Logic Symbols

Relay Coil Type	Logic Symbols
Basic Relay Coil Coil is energized whenever current is applied to the control input.	—( )—
Latch Coil Coil energizes and latches when current is applied to the control input. Apply current to the reset line to deenergize coil. If current is applied to both control input and reset line simultaneously, the coil does not energize.	—(LA)⌐ —(R)⌐
Clock (second increments) Pvalue setting is the length of time in seconds between clock pulses (clock frequency) (see Table 16, **F6**, Preset Valu). Clock generates a pulsed output at the selected frequency only while current is applied to the control input.	—(CS) Pvalue 0
Clock (hour increments) Pvalue setting is the length of time in hours between clock pulses (clock frequency) (see Table 16, **F6**, Preset Valu). Clock generates a pulsed output at the selected frequency only while current is applied to the control input.	—(CH) Pvalue 0
Timer (second increments) Pvalue setting is the timer duration in seconds (see Table 16, **F6**, Preset Valu). The timer operates only while current is applied to the control input. The timer output energizes when the timer times out. Apply current to the reset line to reset the timer.	—(TS)⌐ Pvalue —(R)⌐ 0 sec
Timer (hour increments) Pvalue setting is the timer duration in hours (see Table 16, **F6**, Preset Valu). The timer operates only while current is applied to the control input. The timer output energizes when the timer times out. Apply current to the reset line to reset the timer.	—(TH)⌐ Pvalue —(R)⌐ 0 hrs
Up Counter Pvalue setting determines the maximum count of the counter (see Table 16, **F6**, Preset Valu). The counter increments once each time current is applied to the control input. The counter output energizes when the maximum count is reached. Apply current to reset line to reset the counter.	—(CU)⌐ Pvalue —(R)⌐ 0

When the Interlogic program is in the edit rung mode (Menu 111 on the screen), and the insert coil function is enabled by pressing the <F5> function key (see Table 12), the cell cursor moves to row 1, column 10, and the function key menu bar (located at the bottom of the editing screen) switches to a second set of functions which relate to coil editing. The functions available are listed and described in Table 15.

Table 15. Coil Option Function Keys

Function Key	Function Name	Editing Function
F1	Relay $-\langle\ \ \rangle$	Press the <F1> function key to insert a basic relay coil logic element in the row 1, column 10 position with no assigned bit address or label (see Table 13 for bit address and label insertion). If a coil of any type, other than a basic relay coil, already occupies this cell, it is replaced by the basic relay coil logic element and any bit address or label that existed is removed.
F3	Latch $-\langle LA \rangle$	Press the <F3> function key to insert a latch coil logic network (see below) anchored in the row 1, column 10 position with no assigned bit address or label (see Table 13 for bit address and label insertion). ![latch coil network diagram showing ⟨LA⟩ and ⟨R⟩] If the rung already contains a clock, timer, or up counter relay coil, pressing the <F3> key to change it to a latch coil has no effect. The existing coil must first be changed to a basic relay (see **F1** above) and then to a latch (this operation removes any label or bit address assigned to the previous coil type). If the rung already contains a basic relay coil, pressing the <F3> function key replaces the basic coil with a latch coil logic network and assigns the bit address and label from the basic coil to the latch. The reset input line is normally placed in row 2; however, if any of the rows below row 1 contain contact logic elements or shunts, the reset input line is placed in the first vacant row. If no vacant row exists below row 1, the latch cannot be inserted in the rung.

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Table 15 continued

Function Key	Function Name	Editing Function
F3 Cont'd		Hint: If all rows are used, consider moving some of the logic network to other rungs. Assign the coil on each of the other rungs an internal type bit address (e.g., N0001, see paragraph 1.1.2, *Coil Functions*). Then, on the rung containing the latch, provide a contact for each of the internal coils on the other rungs as inputs to the latch coil.
F4	Vert (vertical) ╏ Vert ╏ Conn	This function permits a vertical line to be inserted between two rows of logic. Restrictions: • Vertical line cannot be inserted in column 1 (function not displayed in function key menu bar when cursor is in column 1). • Vertical line cannot be inserted between the lines leading to a coil and the coil reset input (short across coil inputs). • Vertical line is drawn down from the left end of the cell cursor; therefore, both rows of logic to be joined by the vertical must be intersected by the cell cursor column or occupy the cell immediately to the left of the cell cursor column. Rows containing logic lines that do not meet these criteria are bypassed by the vertical line. • Vertical line cannot be inserted from row 7; it must be inserted from row 6 or above to connect to row 7. To insert a vertical line, place the cell cursor on a line of logic and press the <F4> function key. If the cursor is placed on a logic element (coil or contact), the vertical is connected to the left end of that element.
	Vert (vertical) + Vert + Open	When a vertical line already connects two rows of logic, that line may be removed using this function. Place the cell cursor in any row so that the left end of the cell cursor is touching the vertical line. Press the <F4> function key to remove the entire line.

Continued on next page

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Table 15 continued

Function Key	Function Name	Editing Function
F5	Timer Count	Clock, timer, and up counter coils are inserted and configured using another set of function key options. This new set of function key options is made available at the bottom of the screen when the <F5> function key is pressed (see Table 16).
F6	Screen Save	This function permits the currently displayed rung (logic network) to be saved to a separate file without accepting the rung (see **F8** below). When the <F6> function key is pressed, a prompt requesting a file name appears (shown below). _(screen: Enter the file name to be saved:)_ Type the file name (maximum eight characters plus an optional 3-character extension) and press the <Enter> key. The program stores the screen image to disk using the supplied file name. Hint: To make it easier to locate these rung data files in the future (see **F7** below), consider the following: • Assign the same three-character extension to all files of this type. For example, use the eight-character file name to describe the logic structure and give each file an extension such as .RLF (Rung Logic File). Example: BATTALRM.RLF If a file with the same file name already exists, a prompt similar to the one shown below is displayed. _(screen: Verify — File 'C:\A80252\LL\RUNG1' exists. Overwrite it ?)_ Type **N** to abort the entry and return to editing, or type **Y** to overwrite the existing file. This feature is the cut portion of a "cut and paste" function that allows creation of a personal library of frequently used logic networks.

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Table 15 continued

Function Key	Function Name	Editing Function
F7	Screen Load	This function permits stored rung data (logic networks) to be retrieved from disk and inserted in the currently displayed rung.
		When the <F7> function key is pressed, a prompt requesting a file name appears (shown below).
		Type the file name (maximum eight characters plus an optional 3-character extension) and press the <Enter> key. The program retrieves the rung data from disk using the supplied file name.
		This feature is the paste portion of a "cut and paste" function (see **F6** above) which enables rungs to be built quickly using the stored logic networks as building blocks. Note: *The Screen Load function may be used as many times as desired in a single rung; however, each time it is used, the newly inserted data replaces any existing logic networks in that rung.*
		Hint:
		To display a listing of <u>all</u> files in the directory containing the rung data files, type that directory path followed by ***.***, and then press the <Enter> key. For example, if the files reside on the C drive in the IL subdirectory of the RECORDER directory, type the following:
		C:\RECORDER\IL*.*
		If all rung data files are given the same extension following the file name (e.g., **.RLF**), substitute that extension for the second asterisk in the example above (e.g., **C:\RECORDER\IL*.RLF)**. This causes only those files with the designated extension to display.
		When the directory listing appears, use the arrow keys to highlight the desired file and then press the <Enter> key to select it.

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Table 15 continued

Function Key	Function Name	Editing Function
F8	Accept Rung	Pressing the <F8> function key saves the completed rung to the rung file, if acceptable (see below).
		A number of checks are performed at this stage, and if the rung is found to be unacceptable (missing bit address or label, etc.), acceptance is halted and the operator is alerted by various error messages (error messages are in Appendix A). Following acceptance, the system returns to Menu 11.
		During acceptance, the word **ACCEPT** is displayed at the right end of the status line followed by the number of tokens created (the length of time this information is displayed is proportionate to the size of the rung; for small rungs, it may appear as a flicker of the cursor coordinates, or not at all).
F9	Zoom In	Use this function to locate contacts associated with a coil and vice versa.
		Place cell cursor on a contact/coil and then press the <F9> key- the screen reverts to Menu 11 and the rung containing the associated coil/contact appears on the display.
F10	Zoom Out	Use this function after using the <F9> key (above) to return to the original rung (does not return to Menu 111).
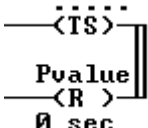
When the Interlogic program is in the Timer Count (F5) function of the Insert Coil (F5) function of the Edit Rung Window (Menu 111 on the screen), a new set of function key options is made available (listed at the bottom of the screen) for inserting and configuring clock, timer, and up counter coils. Table 16 lists and describes the clock, timer, and counter edit functions.

Table 16. Clock, Timer, and Counter Edit Functions

Function Key	Function Name	Editing Function
F1	Count up	Press the <F1> function key to insert an up counter logic network (see below) anchored in the row 1, column 10 position with no assigned bit address or label (see Table 13 for bit address and label insertion). This device also requires the assignment of a preset value to set the maximum count for the counter (see **F6** below). $$\begin{array}{l} \text{——}\langle\text{CU}\rangle\text{——}\rceil \\ \quad\quad\quad\quad\quad \rceil \\ \quad\text{Pvalue}\; \rceil\rceil \\ \text{——}\langle\text{R }\rangle\text{—}\rceil \\ \quad\quad 0 \end{array}$$ If a coil of any type already occupies this cell, it is replaced by the up counter logic element and the existing bit address or label is retained. The reset input line is normally placed in row 2; however, if any of the rows below row 1 contain contact logic elements or shunts, the reset input line is placed in the first vacant row. If no vacant row exists below row 1, the up counter cannot be inserted in the rung. Hint: If all rows are used, consider moving some of the logic network to other rungs. Assign the coil on each of the other rungs an internal type bit address (e.g., N0001, see paragraph 1.1.2, *Coil Functions*). Then, on the rung containing the up counter, provide a contact for each of the internal coils on the other rungs as inputs to the up counter coil.
F2	Clock 1 sec (seconds)	Press the <F2> function key to insert a clock coil (with timing defined in seconds) in the row 1, column 10 position with no assigned bit address or label (see Table 13 for bit address and label insertion). This device also requires the assignment of a preset value to set the length of time in seconds between clock pulses (clock frequency) (see **F6** below). If a coil of any type already occupies this cell, it is replaced by the clock coil and the existing bit address or label and the preset value (if applicable) are retained.

Table 16 continued

Function Key	Function Name	Editing Function
F3	Clock 1 Hrs (hours)	Press the <F3> function key to insert a clock coil (with timing defined in hours) in the row 1, column 10 position with no assigned bit address or label (see Table 13 for bit address and label insertion). This device also requires the assignment of a preset value to set the length of time in hours between clock pulses (clock frequency) (see **F6** below).
		If a coil of any type already occupies this cell, it is replaced by the clock coil and the existing bit address or label and the preset value (if applicable) are retained.
F4	Timer 1 sec (seconds)	Press the <F4> function key to insert a timer logic network (see below) (with timing defined in seconds) anchored in the row 1, column 10 position with no assigned bit address or label (see Table 13 for bit address and label insertion). This device also requires the assignment of a preset value to set the timer duration in seconds (see **F6** below).
		If a coil of any type already occupies this cell, it is replaced by the timer coil and the existing bit address or label and the preset value (if applicable) are retained.
		The reset input line is normally placed in row 2; however, if any of the rows below row 1 contain contact logic elements or shunts, the reset input line is placed in the first vacant row. If no vacant row exists below row 1, the timer cannot be inserted in the rung.
		Hint:
		If all rows are used, consider moving some of the logic network to other rungs. Assign the coil on each of the other rungs an internal type bit address (e.g., N0001, see paragraph 1.1.2, *Coil Functions*). Then, on the rung containing the timer, provide a contact for each of the internal coils on the other rungs as inputs to the timer coil.

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Table 16 continued

Function Key	Function Name	Editing Function
F5	Timer 1 Hrs (hours)	Press the <F5> key to insert a timer logic network (see below) (with timing defined in hours) anchored in the row 1, column 10 position with no assigned bit address or label (see Table 13). This device also requires the assignment of a preset value to set the timer duration in hours (see **F6** below).
		If a coil of any type already occupies this cell, it is replaced by the timer coil and the existing bit address or label and the preset value (if applicable) are retained. The reset input line is normally placed in row 2; however, if any of the rows below row 1 contain contact logic elements or shunts, the reset input line is placed in the first vacant row. If no vacant row exists below row 1, the timer cannot be inserted in the rung.
		Hint:
		If all rows are used, consider moving some of the logic network to other rungs. Assign the coil on each of the other rungs an internal type bit address (e.g., N0001, see paragraph 1.1.2, *Coil Functions*). Then, on the rung containing the timer, provide a contact for each of the internal coils on the other rungs as inputs to the timer coil.
F6	Preset Valu (value)	This function is used to set duration for timer coils, frequency for clock coils, or maximum count for up counter coils (also used to edit existing assigned values). Place cell cursor on the coil and then press the <F6> function key. The prompt shown below appears on the screen. Enter the desired value for the coil (timer, clock, or up counter) and then press the <Enter> key; the value appears below the coil reset line.
F7	Erase Coil	When the cell cursor is highlighting a coil, press the <F7> key to delete the coil and associated reset line if applicable.
F8	Edit Menu	Press the <F8> function key to return to the previous edit level and function key menu.

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1.3.7   Label File (Menu 12)

Each input and output logic element in a rung file can be assigned a descriptive label in addition to the bit address (see Table 13). The label can consist of one or two parts. The first part appears above the logic element on the rung display and consists of seven alphanumeric characters maximum, including spaces. The second part appears below the logic element and consists of six alphanumeric characters maximum, including spaces.

These logic element labels are maintained in a label file (Menu 12) which is associated with the rung file and is accessible by selecting the "Label File" entry (by pressing the <F2> function key) from the Main Menu (Menu 1). The label file is divided into 64 pages. The first 32 pages (0 through 31) are reserved for labels which describe input logic elements while the second 32 pages (32 through 63) are reserved for output logic element labels. Each page holds labels for 64 different bit addresses arranged in 16 rows with four labels per row. The bit address at the left end of each row is associated with the first label in the row. Each successive label to the right is associated with the next higher bit address (bit addresses increment by 1). The first and second parts of each label are separated by a period.

When the <F2> function key is pressed while Menu 1 is displayed, a label file screen similar to the screen below appears on the display. In addition to the usual status information, the status line at the top of the screen also indicates the type of labels (by function) currently displayed (see paragraph 1.3.4, *Menu Screen Status Line*). This function identifier appears immediately to the right of the rung quantity near the center of the status line. In the screen below, the label function type indicated is INPUTS.

```
Menu 12   C:\RECORDER\FACTORY.LLT      (  27) INPUTS   0            Mem 246k


 I0001 <Dig1   .Inp   > <Dig2   .Inp   > <Dig3   .Inp   > <Dig4   .Inp   >
 I0005 <Dig5   .Inp   > <Dig6   .Inp   > <Dig7   .Inp   > <Dig8   .Inp   >
 I0009 <Dig9   .Inp   > <Dig10  .Inp   > <Dig11  .Inp   > <Dig12  .Inp   >
 I0013 <Dig13  .Inp   > <Dig14  .Inp   > <Dig15  .Inp   > <Dig16  .Inp   >
 I0017 <Dig17  .Inp   > <Dig18  .Inp   > <Dig19  .Inp   > <Dig20  .Inp   >
 I0021 <Dig21  .Inp   > <Dig22  .Inp   > <Dig23  .Inp   > <Dig24  .Inp   >
 I0025 <       .      > <       .      > <       .      > <       .      >
 I0029 <       .      > <       .      > <       .      > <       .      >
 I0033 <       .      > <       .      > <       .      > <       .      >
 I0037 <       .      > <       .      > <       .      > <       .      >
 I0041 <       .      > <       .      > <       .      > <       .      >
 I0045 <       .      > <       .      > <       .      > <       .      >
 I0049 <       .      > <       .      > <       .      > <       .      >
 I0053 <       .      > <       .      > <       .      > <       .      >
 I0057 <       .      > <       .      > <       .      > <       .      >
 I0061 <       .      > <       .      > <       .      > <       .      >

   Edit      Next      Prev      Goto    Search  Toggle    Move    Main
 1 Page    2 Page    3 Page    4 Page   5 Label 6 I/O    7 Label 8 Menu
```

Labels are grouped in the label file by function with each group represented by four pages of labels. These pages are indicated as 0 through 3 in the status line to the right of the label function identifier. In the screen above, the first page (0) of the INPUTS label group is displayed. Table 17 shows the relationship between the function group pages and the Label File page numbers.

Table 17. Label File Page Identification

Function Group	Function Identifier (in Menu 12 status line)	Function Group Page Number (status line)	Bit Address Range	Corresponding Label File Page Number
Input Labels				
GEO Indications	INPUTS	0 1 2 3	I0001 - I0064 I0065 - I0128 I0129 - I0192 I0193 - I0256	0 1 2 3
Controls from office	CNTRLS	0 1 2 3	R0001 – R0064 R0065 – R0128 R0129 – R0192 R0193 – R0256	4 5 6 7
ULCP/Panel Switches	SWITCH	0 1 2 3	S0001 - S0064 S0065 - S0128 S0129 - S0192 S0193 - S0256	8 9 10 11
Executive bits	EXEC	0 1 2 3	E0001 - E0064 E0065 - E0128 E0129 - E0192 E0193 - E0256	12 13 14 15
Internal bits	INTERN	0 1 2 3	N0001 - N0064 N0065 - N0128 N0129 - N0192 N0193 - N0256	16 17 18 19
Remote bits received A	SLVA I	0 1 2 3	A0001 - A0064 A0065 - A0128 A0129 - A0192 A0193 - A0256	20 21 22 23
Remote bits received B	SLVB I	0 1 2 3	B0001 - B0064 B0065 - B0128 B0129 - B0192 B0193 - B0256	24 25 26 27
Bits set by CDL (as input to logic)	SLVC I	0 1 2 3	C0001 - C0064 C0065 - C0128 C0129 - C0192 C0193 - C0256	28 29 30 31

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Table 17 Continued

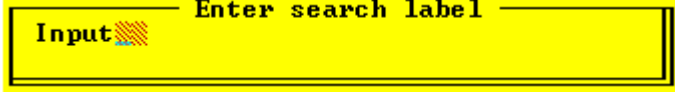| Function Group	Function Identifier (in Menu 12 status line)	Function Group Page Number (status line)	Bit Address Range	Corresponding Label File Page Number
Output Labels				
GEO Controls	OUTPUT	0 1 2 3	O0001 - O0064 O0065 - O0128 O0129 - O0192 O0193 - O0256	32 33 34 35
Indications to office	PTX	0 1 2 3	P0001 - P0064 P0065 - P0128 P0129 - P0192 P0193 - P0256	36 37 38 39
Temporary bits	LTX	0 1 2 3	T0001 - T0064 T0065 - T0128 T0129 - T0192 T0193 - T0256	40 41 42 43
LED steady bit	LEDS	0 1 2 3	L0001 - L0064 L0065 - L0128 L0129 - L0192 L0193 - L0256	44 45 46 47
LED flash bit	LEDF	0 1 2 3	F0001 - F0064 F0065 - F0128 F0129 - F0192 F0193 - F0256	48 49 50 51
Remote bits to send X	SLVX O	0 1 2 3	X0001 - X0064 X0065 - X0128 X0129 - X0192 X0193 - X0256	52 53 54 55
Remote bits to send Y	SLVY O	0 1 2 3	Y0001 - Y0064 Y0065 - Y0128 Y0129 - Y0192 Y0193 - Y0256	56 57 58 59
Bits read by CDL	SLVZ O	0 1 2 3	Z0001 - Z0064 Z0065 - Z0128 Z0129 - Z0192 Z0193 - Z0256	60 61 62 63
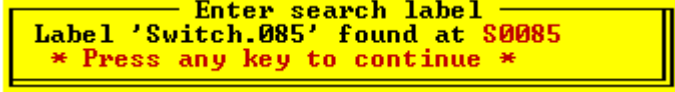
Located at the bottom of the label file screen (Menu 12) is a function key menu bar. The functions available are listed and described in Table 18, *Label File Screen (Menu 12) Edit Functions*.

Table 18. Label File Screen (Menu 12) Edit Functions

Function Key	Function Name	Editing Function
F1	Edit Page	This function initiates the label file edit mode and permits any of the 64 labels on the currently displayed page to be edited.
		When the <F1> function key is pressed, the program enters the edit mode (Menu 121), the first label on the displayed page is highlighted, and the corresponding bit address is displayed in the status line to the right of the label group page number. Use the arrow keys to move the highlighting to the label that is to be edited. As the highlighting is moved from label to label, the corresponding bit address appears in the status line. See Table 19 for the available label edit functions.
F2	Next Page	Press the <F2> function key to display the next page of 64 labels until the end of the label file (page 63) is reached.
F3	Prev(ious) Page	Press the <F3> function key to display the previous page of 64 labels until the beginning of the label file (page 0) is reached.
F4	GoTo Page	Use this function to display a selected page of the label file.
		Press <F4> to display the page selection window (see below). Enter a number from 0 to 63 (see Table 17) and then press <Enter>. The selected label file page appears on the screen.
		`Enter the Page No to go to:` `Enter Value (0..127)`
F5	Search Label	Use this function to locate a specific label in the label file.
		Press the <F5> function key and a label search window appears (see below). Type the first part of the label (maximum seven alphanumeric characters including spaces), then press <Enter>. Type the second part of the label (maximum six alphanumeric characters including spaces), then press <Enter>. (Do not type the period between the two parts of the label; the program adds it automatically).
		<u>NOTE</u>
		The search is not case sensitive; upper/lower case differences are ignored.

Table 18 continued

Function Key	Function Name	Editing Function
F5 cont'd		 If the label exists in the label file, the location (bit address) is displayed in the search window (see sample below). Press any key and the display changes to the label file page containing the searched label. If the label does not exist, a message in the search window indicates "..... not found!".
F6	Toggle I/O	Press the <F6> function key to switch the display between input and corresponding output label types, and vice versa. The label file is divided in half between input and output labels. Pages 0 through 31 of the label file contain input-type logic element labels, and pages 32 through 63 contain output-type logic element labels. Each time F6 is pressed, the label file display switches to the corresponding page in the other half of the file. For example, if page 1 of the controls from office label group (CNTRLS, bit addresses R0065 through R0128) (page 5 of label file) is displayed, then page 1 of the indications to office label group (PTX, bit addresses P0065 through P0128) (page 37 of label file) is displayed when the <F6> function key is pressed. (See Table 17 for input and output labels.)
F7	Move Label	Use this function to move a label, or a block of labels, from one bit address to another in the label file. Press the <F7> function key and the word "From" appears in the upper left corner of the label display area (below Menu 12). Type the five-character bit address of the label (or first label of a block of labels) to be moved (not case sensitive, upper or lower case accepted). Press the <Enter> key.

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Table 18 continued

Function Key	Function Name	Editing Function
F7 cont'd		The label to be moved appears to the right of the entered bit address and the word "To" appears below "From" (if the wrong label appears, press the <Esc> key twice to abort the move). Type the five-character bit address of the location where the label is to be moved (this location is where the first label in a block of labels is placed). Press the <Enter> key. The label currently assigned to the "To" bit address is displayed and the window shown below appears on the screen. ━━ Number To Move? ━━ Enter Value (1..256) If a single label is being moved, type **1** and press the <Enter> key. The label at the "From" location replaces the label at the "To" location and the "From" label location is blank. If a block of labels is being moved, type the number of labels (2 to 256) in the block and press the <Enter> key. The label at the "From" location replaces the label at the "To" location and the "From" label location is blank. The remainder of the labels in the block will replace the labels in the corresponding label positions following the "To" location. The label positions following the "From" location, and corresponding to the block of labels moved, are blank. **NOTE** *Any label changes made in the label file affect the corresponding labels in the logic diagrams (rungs). For example, if a label in the label file is moved from bit address I0003 to I0006, any logic elements with bit address I0006 will assume the label formerly assigned to bit address I0003. Also, any logic element with bit address I0003 will retain the former label but will assume the bit address I0006. This also occurs when a block of labels is moved, but on a much larger scale.*
F8	Main Menu	Press the <F8> function key to update the label file with any changes made and return the display to Menu 1.

When the <F1> function key is pressed with Menu 12 on the display (see Table 18 for editing functions for Menu 12), the label file assumes the edit mode (Menu 121) for the currently displayed label file page.

NOTE

> **NOTE**
>
> Only the labels on the currently displayed page may be edited. To select another page, return to Menu 12 and use the <F2>, <F3>, or <F4> function key to select the desired page for editing, then press the <F1> function key to re-enter the edit mode.

With the edit mode selected, a new set of functions is displayed in the function key menu bar at the bottom of the screen (function keys <F5> and <F7> are unassigned). The assigned functions are listed and described in Table 19.

At any time during the edit operation, the <Esc> (escape) key may be pressed to abort the edit operation and return to Menu 12. If changes have been made to the current page but have not been written to disk, the verify prompt (shown below) appears on the display. A **Y** (yes) response aborts the edit operation without saving changes to the current page and returns the display to Menu 12.

```
                      ─── Verify ───
  Changes have been made! Abort anyway (Y/N) ?
```

An **N** (no) response allows recovery from an accidentally pressed <Esc> key and the unsaved edits are preserved. If it is desired to abort the edit function, but first preserve the current unsaved page, the page can be saved to a separate file without accepting the currently displayed rung by pressing the <F6> function key (refer to the Screen Save function in Table 12).

Table 19. Label File Edit Screen (Menu 121) Edit Functions

Function Key	Function Name	Editing Function
F1	Edit Name	This function permits editing of the currently highlighted label.
		When the <F1> function key is pressed, the highlighting shifts to the left half of the highlighted label position. If a label currently occupies the position, the label remains with a flashing cursor following the last character. Use the input string editing functions described in paragraph 1.3.1 and Table 6 to edit the label. When editing of the left half of the label is complete, press <Enter>. The highlighting moves to the right half of the label position to permit editing. When editing of the right half of the label is complete, press the <Enter> key. The highlighting moves to the next label position.
		If either portion of the label is to remain unchanged, merely press the <Enter> key when that portion is highlighted.

Table 19 continued

Function Key	Function Name	Editing Function
F2	Copy Prev(ious)	Use this function to duplicate a label at one or more label positions. This function duplicates the last label edited at any selected label position on the page. First edit a label using the **F1** function above. Move the highlighting to the label position where the duplicate label is to be placed and press the <F2> function key. The highlighting shifts to the left half of the highlighted label position and the left half of the previously edited label appears in the left half of the label position. Press the <Enter> key. The highlighting moves to the right half of the label position and the right half of the previously edited label appears in the right half of the label position. Press the <Enter> key. The highlighting moves to the next label position. The copied label may be edited using the input string editing functions described in paragraph 1.3.1 and Table 6, however, this edited version becomes the new source for the **F2** copy function.
F3	Delete Name	Use this function to delete a label. Move the highlighting to the label to be deleted and press the <F3> function key. The label is deleted and the highlighting remains at that label position.
F4	Save Page	Press the <F4> function key to save all changes that were made on the currently displayed page to disk, and remain in the page edit mode (Menu 121).
F6	Undo Edit	Use this function to undo any label edits on the currently displayed page that have not been saved to disk. All changes made to labels on the currently displayed page using functions **F1**, **F2**, or **F3** above are not saved to disk until function key <F4> or <F8> is pressed. When the <F6> function key is pressed, all unsaved changes are undone and the page display returns to the version currently stored on disk.
F8	Display Menu	Press the <F8> function key to save all changes that were made to the labels on the currently displayed page, and return Menu 12 to the display.

1.3.8   Logic Compiler (Menu 132)

As each rung of a ladder logic file is saved, the ladder logic editor builds a file that contains a token representation of the ladder logic networks. When the **F3** function (Logic Compiler) is selected from Menu 1, the compiler portion of the software reads the token file and produces a target database in two different formats which include:

1. A list file (extension ".LLL") holding assembler mnemonics for the target database.

2. An image (or absolute) file (extension ".LLW") which holds the memory image of the database. This file can be directly loaded into the target machine (e.g., the SEAR II).

When the **F3** function is selected from Menu 1, a logic compiler screen (Menu 132) containing a window similar to the one shown below appears on the display.

```
┌────────── Generating Code ──────────┐
│ Listfile         :    NEW.LLL        │
│ Processing Rung  :    82             │
│ Timers/Counters  :    3              │
│ Tokens           :    164            │
│ CRC              :    8440           │
│ Revision         :    1              │
│ Label data       :    10.9k          │
│ Equation data    :    0.6k           │
│ Hit any key to continue              │
└──────────────────────────────────────┘
```

If this is the first compile, a database version number of "1" is assigned, but if the ladder logic file was previously compiled and the process is being repeated due to changes, a higher version number will probably be in effect. An additional window similar to the one shown below is displayed indicating the current version of the database and prompting for an optional change in the database version number. To enter a "no" reply (to keep the same version number), merely type **N** or **n**. The database version number remains unchanged and the prompt disappears.

```
┌─────────── Verify ───────────┐
│ Database version number 75. Change? │
└──────────────────────────────┘
```

To change the version number, type **Y** or **y** and the window shown below appears.

```
┌──── Database Version Number ────┐
│ Enter Database Version Number ▨▨▨ │
└────────────────────────────────┘
```

Type the new version number (maximum three digits) and then press the <Enter> key. The new version number appears following the word "Revision" in the window on the Menu 132 screen ("Generating Code" window above). This value is stored in the EPROM, along with time and date of compilation.

The "Generating Code" window at the top center of the Menu 132 screen indicates certain parameters relating to the file being compiled. These parameters are described as follows:

Listfile: Indicates the name of the list file being compiled

Processing Rung: Indicates the rung currently being processed

Timers/Counters: Indicates the quantity of processed timers/counters contained in the file

Tokens: Indicates the number of tokens or logic elements in the token file (extension .LLT). Generally, each contact or coil is a token. For larger networks, however, the system generates additional tokens to store intermediate results.

CRC: The cyclic-redundancy check word appended to the compiled data and used for error detection during transmission

Revision: Indicates the version number of the database

Label data: Indicates the size of the created database list file (extension .LLL) in bytes. The size of the database is _not_ limited to 64k-bytes.

Equation data: Indicates the size of the created database file (extension .LLW) in bytes. The size of the database is _not_ limited to 64k-bytes.

The message **Hit any key to continue** appears at the bottom of the "Generating Code" window when the compile process is complete. Press any key to return to Menu 1.

1.3.9   Printing Reports (Menu 14)

Selection **F4** (Printing Reports) on Menu 1 displays a menu of printing options (Menu 14). This menu permits the operator to print or view various files related to the ladder logic file identified in the status line, and to modify certain parameters relating to the printout. The available selections from Menu 14 are listed in Table 20. Each menu selection has a corresponding function key listed with it which, when pressed, accesses a submenu or an appropriate screen display (Function key <F5> is unassigned).

Table 20. Printing Reports Menu (Menu 14) Selections

Function Key	Menu Selection	Submenu/Screen	Reference Paragraph
F1	Print Rungfile	Menu 141	1.3.9.1
F2	Print Cross-Reference	Menu 142	1.3.9.2
F3	Print Label File	Menu 143	1.3.9.3
F4	Print Description File	Menu 144	1.3.9.4
F6	Examine Print File	Print file display	1.3.9.5
F7	Set Print Parameters	Menu 147	1.3.9.6
F8	Back To Main Menu	Menu 1	(n/a)

NOTE

NOTE

Prior to generating a printout, refer to paragraph 1.3.9.6, Set Print Parameters (Menu 147), and tailor the print parameters.

1.3.9.1   Print Rungfile (Menu 141)

As the rungs of a ladder logic file are created and saved (refer to paragraph 1.3.6, _Ladder Logic Editor_), a token file is built that contains copies of the ladder logic graphics as they appear on the ladder logic editing screen. The **F1** selection (Print Rungfile) from Menu 14 allows a copy of this

token (rung) file to be printed. A portion of a typical page from a rung file printout is shown in Figure 3.

```
        INTERLOGIC v3.6, Tokenfile C:\RECORDER\IL\69THSTR1.LLT, 13:37:54, Oct 30 1996,
Page 1

    Rung 1 of 248: INDICATION  TO OFFICE.
B0001                                                                               P0001
  +--] [-------------------------------------------------------------------------(   )
  | 1NWK                                                                           1NWK
  | 67IND                                                                          IND
  |

    Rung 2 of 248: INDICATION TO LCP.
B0001                                                                               L0001
  +--] [-------------------------------------------------------------------------(   )
  | 1NWK                                                                           1NWKE
  | 67IND                                                                          LED
  |

    Rung 3 of 248: SWITCH OUT OF CORRESPONDENCE INDICATION TO LCP.
B0098                                                                               F0001
  +--]/[-------------------------------------------------------------------------(   )
  | 1WKC                                                                           1NWKE
  | 67IND                                                                          FLASH
|
```
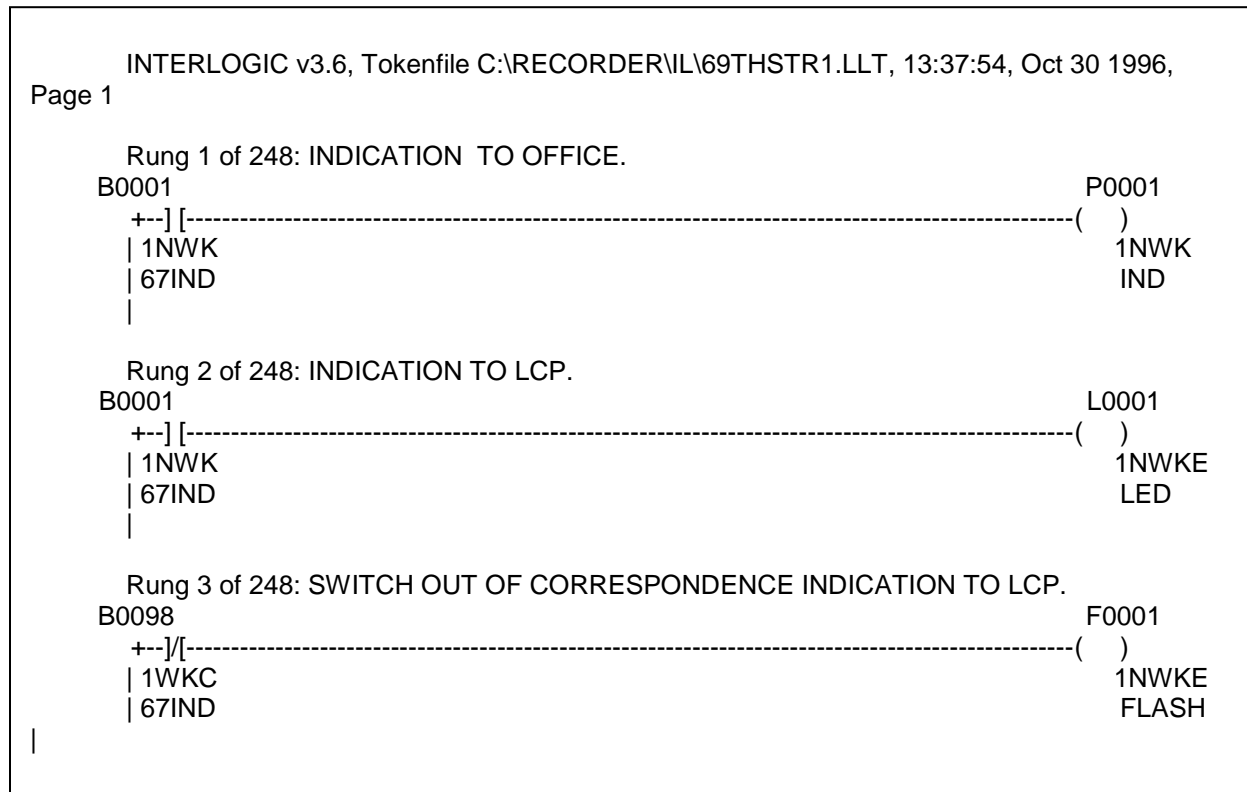
Figure 3. Rung File Printout Format (Typical)

The **F1** selection from Menu 14 displays the Menu 141 screen and begins the process of downloading the rung file to the printer (or print file). The Menu 141 screen contains a window similar to the one shown below. The window contains three lines of print-related information followed by a message line at the bottom of the window.

```
———————————— Printing Rung File ————————————
 Printing to:      C:\A80252\OCT1TEST
 Processing Line :      49
 Processing Page :       2
 Hit any key to interrupt printout
```

The first information line indicates the print destination which can be a printer (indicated as "Stdprn") or a print file (refer to paragraph 1.3.9.6 for setting print parameters). The second and third lines indicate, respectively, which line of logic and which page of the printout are currently being processed. While the printout is being generated, the number of the rung being processed is displayed in the upper left portion of the screen below the menu number.

During the print process, the message line at the bottom of the window indicates **Hit any key to interrupt printout**. If the printout is halted, press any key to resume or press the <Esc> key to abort the printout. Once the printout is complete, the message line indicates the elapsed time for the printout in minutes and seconds and the statement **Hit any key to continue**. At this point the user may press any key to return to Menu 14.

If the program detects a problem with the printer connection when the **F1** selection is made from the Menu 14 display, the following error message is displayed:

```
──────── ** ERROR ** ────────
Printer not connected or not ready
       * Hit <ESC> to continue *
```

Press the <Esc> key to return to the Menu 14 display, and correct any printer problems before attempting to print.

1.3.9.2   <u>Print Cross-Reference (Menu 142)</u>

Selection **F2** (Print Cross-Reference) from Menu 14 displays the Menu 142 screen and begins the process of building a cross-reference file. The cross-reference list file contains information about the selected logic file regarding relationships between coils, contacts, and rungs.

The Menu 142 screen displays a window as the cross-reference file is being built. This window indicates the name of the list file being built, the rung currently being processed, and the number of contacts, inputs, and outputs contained in the file (see below).

```
─────── Building Cross-Reference ───────
Listfile        :   HARRIMAN.LLX
Processing Rung :   28
Contacts        :   30
Inputs          :   30
Outputs         :   3
Hit any key to interrupt X-reference
```

A message line at the bottom of the window indicates current system activity (i.e., sorting, reading, compressing, etc.).

Once generation of the cross-reference file is complete (processing time appears in the window message line), the system is ready to print and opens the print message window. This window contains information regarding print destination (e.g., Stdprn or a file name), plus the line and page currently being printed (see below).

```
─────── Printing Cross-Reference ───────
Printing to:    C:\A80252\LL\FILE69.LLT
Processing Line :122
Processing Page :1
Any key starts Printout (ESC to Abort)
```

To start the printout, press any key. The printout may be halted at any time by pressing any key. Press any key again to resume printing, or press the <Esc> key to abort the printout.

The cross-reference printout consists of three parts which include:

1. Input Reference - Data is sorted in bit address (number) order and indicates the rung(s) in which all input bit addresses used in the file occur as normally open ( ] [ ) and/or normally closed ( ]/[ ) contacts.

2. Output Reference - Data is sorted in bit address (number) order and indicates the rung(s) in which all output bit addresses used in the file occur as normally open ( ] [ ) contacts, normally closed ( ]/[ ) contacts, and/or as a coil.

3. Coil Reference - Data is sorted in rung order (beginning at rung 1) and indicates which rung(s) each coil appears in. The coils are identified by bit address (number).

A portion of a typical cross-reference printout is shown in Figure 4. This condensed sample includes all three parts: input, output, and coil references.

```
INTERLOGIC v3.6, Cross-Reference, C:\...\HAROLD.LLT, 09:25:46, Oct 05 1996, Page 1

Bit Number     Occurs in Rung
------------   -------------------------------------------------------------------------
I0001 ] [         1,  3,  5,  7,  8,  10,  12,  14,  15,  17,  19,  21
I0001 ]/[         5,  6,  12,  13,  19,  20,

I0002 ] [         3,  4,  7,  8,  10,  11,  14,  15,  17,  18,  21,  22
I0002 ]/[         1,  4,  5,  6,  7,  8,  11,  12,  13,  14,  15,  18,
                  19,  20,  21,  22,  25,

I0003 ] [         1,  2,  3,  5,  7,  8,  9,  10,  12,  14,  15,  16,
                  17,  19,  21,  22,  23,  24,
I0003 ]/[         5,  6,  12,  13,  19,  20,

 INTERLOGIC v3.6, Cross-Reference, C:\...\HAROLD.LLT, 09:25:46, Oct 05 1996, Page 2

Bit Number     Occurs in Rung
------------   -------------------------------------------------------------------------
O0001 ]/[         7,  14,  21,
O0001 Coil        4,

O0002 ] [         2,  3,  9,  10,  16,  17,  23,  24,
O0002 Coil        1,  2,  3,

O0003 ] [         4,  11,  18,  25,
O0003 ]/[         1,  7,  8,  14,  15,  21,  22,
O0003 Coil        5,

 INTERLOGIC v3.6, Cross-Reference, C:\...\HAROLD.LLT, 09:25:47, Oct 05 1996, Page 4

Bit Number     Occurs in Rung
------------   -------------------------------------------------------------------------
O0002 Coil        1,  2,  3,
O0001 Coil        4,
O0003 Coil        5,
```

Figure 4. Cross-Reference Printout Format (Typical)

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1.3.9.3   Print Label File (Menu 143)

A label file is associated with each rung file. The label file lists all logic element labels and their corresponding bit addresses as used in the rung file (see paragraph 1.3.7, *Label File* for Menu 143 functions). Selection **F3** (Print Label File) from Menu 14 displays the Menu 143 screen and provides access to the label file print function.

When the **F3** function is first selected, the windows shown below appear on the display.

```
─────────────── Printing Label File ───────────────
 Printing to:       C:\A80252\LL\LPT1
 Processing Line :
 Processing Page :
 Any key starts Printout <ESC to Abort>
```

```
──────── Verify ────────
 Sort in alpha order ? <Y/N> _
```

The large window initially indicates only the print destination (e.g., Stdprn or a file name) and the message line at the bottom of the window is blank. The prompt in the small window requests whether or not the printout should be in alphabetical order by label. Selecting the **Y** (yes) response (type **Y** or **y**) causes the program to immediately begin sorting the labels. This activity is indicated in the message line at the bottom of the large window (**Reading** and **Sorting** are displayed). When the sort is complete, the message **Any key starts the Printout <ESC to Abort>** appears in the message line.

If an **N** (no) response (type **N** or **n**) is entered for the alpha sort prompt, a second small window appears as shown below. The prompt in this small window requests whether or not the printout should be in numerical order by bit address.

```
──────── Verify ────────
 Sort in address order ? <Y/N> _
```

Once the print format is determined by responding to the prompts, press any key to start the printout. As the print progresses, the line and page currently being printed are indicated in the "Printing Label File" window (large window above). The printout may be halted at any time by pressing any key. Press any key again to resume printing, or press the <Esc> key to abort the printout. When the printout is complete, the message line in the "Printing Label File" window indicates the elapsed time for the printout in minutes and seconds and the statement **Hit any key to continue** is displayed. At this point, press any key to return to Menu 14.

If the printout is selected to be in alphabetical order by label, then all labels in the label file are printed together with the corresponding bit addresses as shown in Figure 5a. Labels for input functions are printed first followed by the output labels. Bit addresses without assigned labels are not printed in this format.

If the printout is selected _not_ to be in alphabetical order by label, the bit address order options are offered. When an **N** (no) response is entered for the bit address order prompt, only the bit addresses with assigned labels are printed along with the corresponding labels (see Figure 5b).

The input labels are listed first followed by the output labels. The bit addresses are in numerical order by bit number within each label group.

When a **Y** (yes) response is entered for the bit address order prompt, all bit addresses from the label file are printed regardless of whether a label is assigned or not. When a label is not assigned, the bit address appears in the label position on the printout (see Figure 5c). The input labels are listed first followed by the output labels. The bit addresses are in numerical order by bit number within each label group.

```
INTERLOGIC  v3.6,  Labelfile  HARRIMAN.LLM,  11:03:03,  Nov 04 1996,  Page 1

 Label                    Bit      Label                    Bit      Label
Bit
---------------------------------      ---------------------------------      ---------------------------------
<1LK    .FLD    >    I0009
<1NWK   .FLD    >    I0001
<1NWZ   .CTC    >    R0019
<1NWZ   .CTC    >    R0003
<1RWK   .FLD    >    I0002
<1RWZ   .CTC    >    R0020
<1RWZ   .CTC    >    R0004
<2ATK   .FLD    >    I0014
<2BTK   .FLD    >    I0013
<2E-1AK .FLD    >    I0019
<2E-1TBK.FLD    >    I0024
```

a. **Alphabetical Order By Label**

```
INTERLOGIC  v3.6,   Labelfile  HARRIMAN.LLM,  11:24:35,  Nov 04 1996,  Page 1

Label                     Bit       Label                           Bit       Label                          Bit
---------------------------------      ---------------------------------      ---------------------------------
<1NWK   .FLD    >    I0001
<1RWK   .FLD    >    I0002
<3NWK   .FLD    >    I0003
<3RWK   .FLD    >    I0004
<2EGK   .FLD    >    I0007
<2WGK   .FLD    >    I0008
<1LK    .FLD    >    I0009
<3LK    .FLD    >    I0010
<2BTK   .FLD    >    I0013
<2ATK   .FLD    >    I0014
<2WBK        .FLD    >        I0015
```

b. **Non Bit-Address Order**

Figure 5. Typical Label File Printout Formats

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Figure 3-5 (continued)

```
 INTERLOGIC  v3.6,  Labelfile  HARRIMAN.LLM,  11:14:59,  Nov 04 1996,  Page 1


I0001  <1NWK   .FLD  > <1RWK    .FLD  > <3NWK   .FLD  > <3RWK    .FLD  >
I0005  <I0005  .      > <I0006   .       > <2EGK   .FLD  > <2WGK    .FLD  >
I0009  <1LK    .FLD  > <3LK     .FLD  > <I0011  .       > <I0012   .       >
I0013  <2BTK   .FLD  > <2ATK    .FLD  > <2WBK   .FLD  > <2WAK    .FLD  >
I0017  <2E-2AK .FLD  > <2E-3AK  .FLD  > <2E-1AK .FLD  > <I0020   .       >
I0021  <SMK    .FLD  > <I0022   .       > <POK    .FLD  > <2E-1TBK .FLD  >
I0025  <2E-2TBK                  .FLD  > <2E-3TBK                  .FLD  > <2WTBK
.FLD  > <I0028  .       >
I0029  <I0029  .      > <I0030   .       > <I0031  .       > <LOK     .FLD  >
I0033  <I0033  .      > <I0034   .       > <I0035  .       > <I0036   .       >
```

c. Bit Address Order

1.3.9.4   Print Description File (Menu 144)

Each rung in a rung file can be assigned a descriptive label consisting of up to 64 alphanumeric characters (including spaces). Refer to the **Ctrl-F8** function key entry in Table 13 for a description of the "describe rung" function. These descriptions are maintained in a separate description file. The **F4** function (Print Description File) from Menu 14 displays the Menu 144 screen and provides access to the description file print function.

When the <F4> function key is pressed, the "Printing Description File" window (shown below) appears on the display. The window initially indicates only the print destination (e.g.,   **Stdprn** or a file name) and the message **Any key starts Printout <ESC to Abort>** appears in the message line at the bottom of the window. Press any key to start the printout.

```
┌───────── Printing Description File ─────────┐
│ Printing to:        C:\A80252\LL\LPT1       │
│ Processing Line :                           │
│ Processing Page :                           │
│ Any key starts Printout <ESC to Abort>      │
└─────────────────────────────────────────────┘
```

As the   print progresses, the line and page currently being printed are indicated in the window. The printout may be halted at any time by pressing any key. Press any key again to resume printing, or press the <Esc> key to abort the printout. When the printout is complete, the message line at the bottom of the "Printing Description File" window indicates the elapsed time for the printout in minutes and seconds, and the statement **Hit any key to continue** is displayed. At this point, the user may press any key to return to Menu 14.

A portion of a typical description file printout is shown in Figure 6. The descriptions are listed in rung order and if a rung is not assigned a description, that rung is omitted.

```
INTERLOGIC  v3.6,  Description file  69THSTR1.LLD,  08:44:19,  Nov 05 1996,  Page 1

  RUNG      DESCRIPTION
  --------  ------------------------------------------------------------------------------------------

    1       INDICATION TO OFFICE.
    2       INDICATION TO LCP.
    3       SWITCH OUT OF CORRESPONDENCE INDICATION TO LCP.
    4       SWITCH OUT OF CORRESPONDENCE INDICATION TO LCP.
    5       INDICATION TO OFFICE.
    6       INDICATION TO LCP.
    7       SWITCH CONTROL.
    8       SWITCH CORRESPONDENCE CHECK.
    9       SIGNAL REQUEST.
   10       SIGNAL CONTROL OUTPUT.
```

Figure 6. Description File Printout Format (Typical)

1.3.9.5   Examine Print File (Menu 145)

When any of the Menu 14 print functions (**F1** through **F4** functions) is directed to a file rather than to a printer, pressing the <F6> function key causes the contents of that print file to be displayed on the screen. The screen displays approximately 20 lines of print file data at a time. To view the next 20 lines of file data, press any key. To abort the print file display at any time, press the <Esc> key. When the end of the print file is reached, the display returns to the Menu 14 display.
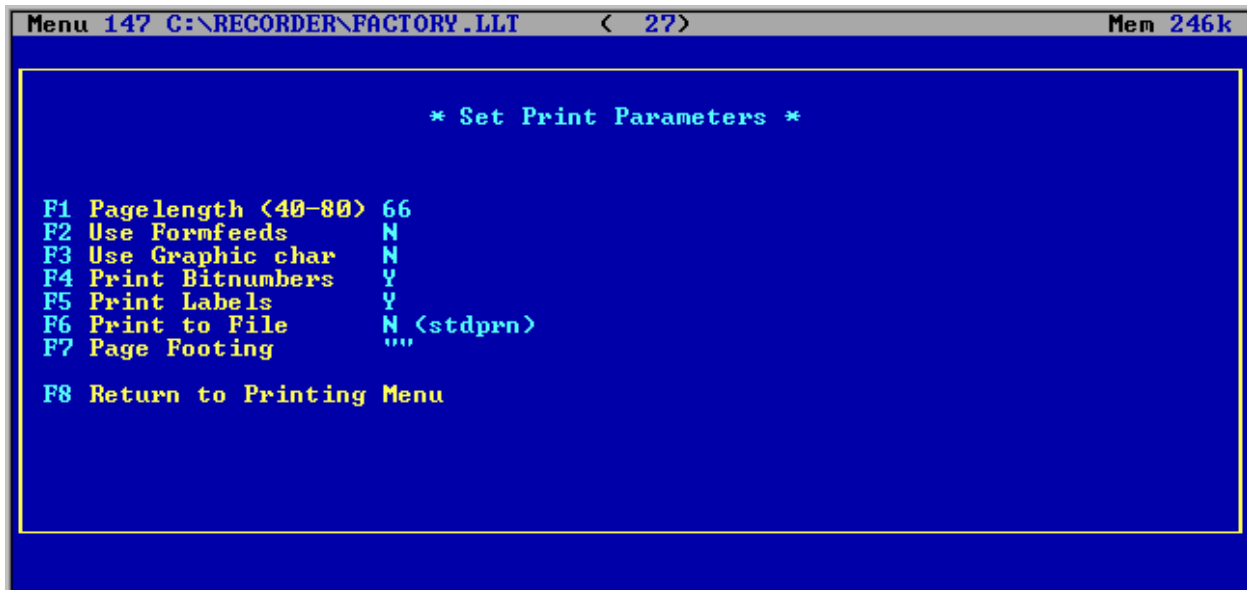
NOTE

NOTE
Any word processor or similar text editor program may be used to examine the print file in detail.

1.3.9.6   Set Print Parameters (Menu 147)

Function **F7** on Menu 14 provides access to another menu that permits changes to be made to several parameters related to the printout format and destination. When the <F7> function key is pressed, a Menu 147 screen similar to the one shown below appears on the display. Each of the seven parameters listed on the display is associated with a function key. The parameters are described in the following paragraphs.

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```
Menu 147 C:\RECORDER\FACTORY.LLT      ( 27)                    Mem 246k


                        * Set Print Parameters *


   F1 Pagelength (40-80) 66
   F2 Use Formfeeds       N
   F3 Use Graphic char    N
   F4 Print Bitnumbers    Y
   F5 Print Labels        Y
   F6 Print to File       N (stdprn)
   F7 Page Footing        ""

   F8 Return to Printing Menu
```

Page Length (F1) - Permits selection of the number of text lines per page. Page length is expressed in total text lines per page and is determined by multiplying the paper length by 6 (6 text lines per inch). The default value is 66, which corresponds to 11-inch paper and 6 lines per inch. The valid range is from 40 to 79 lines. Each time the <F1> function key is pressed, the line count increments by one. When the count reaches 79, the next actuation of the <F1> function key starts the count over at 40. Press the <Ctrl> + <F1> key combination to return to the default value of 66 lines.

Use Form Feeds (F2) - A form feed is a nonprinting control character transmitted by the computer to the printer to advance the paper. When form feeds are used (option **Y**, yes), the program transmits a form feed character to the printer at the end of each page. When form feeds are disabled (option **N**, no), the system emulates a form feed by sending line feed (LF) characters to the printer using the page length as a count. Each time the <F2> function key is pressed, the form feed parameter toggles to the opposite selection (**N** or **Y**). The default setting for this parameter is no form feeds (option **N**). Press the <Ctrl> + <F2> key combination to return to the default setting.

Use Graphic Character Set (F3) - Most printers support the IBM® block graphic characters, which are used to display normally closed and normally open contacts on the ladder logic screens. If the printer does _not_ support these characters, switch the function off (option **N**, no). Most printers are significantly slower when using the graphic character set. When the option is switched off, the symbols -]/[- and -] [- are used to represent the normally closed and normally open contacts, respectively. Each time the <F3> function key is pressed, the graphic character parameter toggles to the opposite selection (**N** or **Y**). The default setting for this parameter is no graphic characters (option **N**). Press the <Ctrl> + <F3> key combination to return to the default setting.

Print Bit Numbers (F4) - When the Print Rung File function is selected from Menu 14, the rung file printout can identify logic elements by bit address providing the Print Bit Numbers function is set to option **Y** (yes). If the Print Bit Numbers parameter is set to option **N** (no), the logic element bit addresses do not appear on the printout. Each time the <F4> function key is pressed, the print bit numbers parameter toggles to the opposite selection (**N** or **Y**). The default setting for this parameter is to print bit numbers (option **Y**). Press the <Ctrl> + <F4> key combination to return to the default setting.

Print Labels (F5) - When the Print Rung File function is selected from Menu 14, the rung file printout can identify logic elements by label, providing the Print Labels function is set to option **Y** (yes). If the Print Labels parameter is set to option **N** (no), the logic element labels do not appear on the printout. Each time the <F5> function key is pressed, the "print labels" parameter toggles to the opposite selection (**N** or **Y**). The default setting for this parameter is to print labels (option **Y**). Press the <Ctrl> + <F5> key combination to return to the default setting.

NOTE

NOTE
If the Print Bit Numbers (F4) and Print Labels (F5) functions are both disabled (option N for both parameters), the rung file printout will contain only the graphic representations of the rung logic plus the rung numbers and rung descriptions (if entered in the rung file).

NOTE

NOTE
This DOS based program cannot print to a netwrok printer. Print to a text file first and then print the text file to the network printer..

Print To File (F6) - Any of the four possible file printouts (rung file, cross-reference file, label file, or description file) can be directed to a list file rather than to the printer. Function **F6** from Menu 147 permits selection (or naming) of a target list file or the printer. The "Print To File" parameter is originally set to **N <stdprn>** which directs the printout to the attached printer. To select or name a destination list file instead of the printer, press the <F6> function key. If no list file name was previously entered, a blank window like the one shown below appears.

Type only the list file name (maximum 8 characters, letters and numbers only, no spaces) and then press the <Enter> key. The path and file name appear in the menu at the **Print To File** parameter position preceded by a **Y**.

NOTE

NOTE
The program automatically adds the correct path in front of the file name (e.g., C:\RECORDER\). However, the path may be edited in the same manner as the file name.

If a list file name was previously entered, that file name and the path appear in the window when the <F6> function key is pressed. The name and path may be edited (refer to paragraph 1.3.1, *Editing Input Strings*), or accepted as is by pressing the <Enter> key. The path and file name appear in the menu at the **Print To File** parameter position preceded by a **Y**.

To redirect the printout to the printer (**N <stdprn>** displayed) when a list file name is displayed in the "Print To File" parameter position, press the <F6> function key.

Page Footing (F7) - Permits entry of a text string that will be displayed at the bottom of each page of the printout. A maximum of 52 alphanumeric characters may be entered (including spaces). To display the text entry window (shown below), press the <F7> function key. Type the desired text and then press the <Enter> key. The text entry appears in quotes at the Page Footing parameter position in Menu 147.

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If a text string was previously entered, that text is displayed in the window when the <F7> function key is pressed. The text string may be edited or deleted as desired (refer to paragraph 1.3.1, *Editing Input Strings*).

To return to the default setting (no page footing) and delete any previously entered text string, press the <Ctrl> and <F7> keys simultaneously.

Return to Printing Menu (F8) - Updates the configuration file and returns the "Printing Reports" menu (Menu 14) to the display. All print parameters are retained in the configuration file.

To return to the "Printing Reports" menu *without* updating the configuration file, press the <Esc> key.

1.3.9.7   Back to Main Menu

Press function key <F8> from Menu 14 to return the display to Menu 1.

1.3.10 Online Functions

Function **F5** on Menu 1 provides a window with two pull-down menus: 'File' and 'Online'. The File menu options are 'Bitmap' and 'Exit'. The Online menu options are 'Upload Logic' and 'Upload Labels'. The 'Upload Logic" and 'Upload Labels" options are not supported by the SEAR II or Comms Manager.

1.3.11 Utility Programs (Menu 16)

The utility programs allow a user to copy and paste rungs from one file to another and allow for the configuration of Interlogic.

See the illustration below for an example of the Menu 16 window, and refer to the paragraphs that follow discussing the utility programs available from Menu 16.
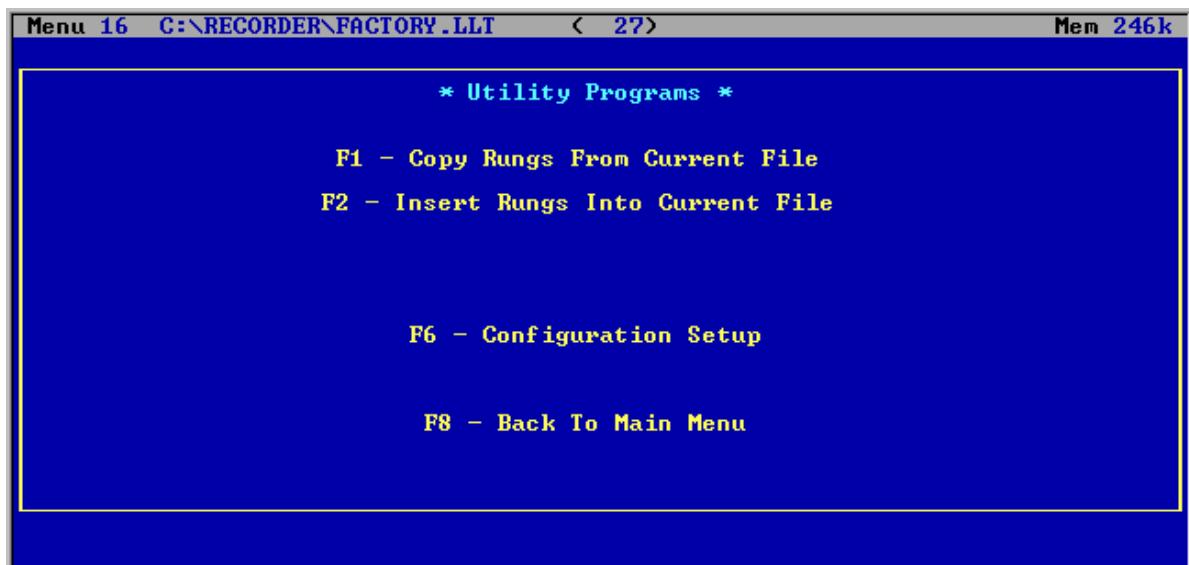
1.3.11.1 Copy Rungs From Current File (F1)

To copy rungs from the current file to another file, press the <F1> function key. The following prompt asking for the target filename is displayed:

```
──────────────── Target Filename ────────────────
*.LLT
```

Type the desired filename to copy the rungs to (include the .LLT extension), and press <Enter>.
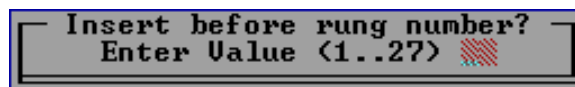
NOTE

NOTE
NOTE This utility is designed to copy rungs to a newly created file. If an existing filename is selected instead, the rungs in that file will be overwritten.

1.3.11.2 Insert Rungs Into Current File (F2)

To insert rungs into the current file press the <F2> function key (from the Menu 16 window). A prompt similar to the following is displayed:

```
┌─ Insert before rung number? ─┐
│      Enter Value (1..27)     │
```

In this example the current file contains 27 rungs. Enter the rung number before which the rungs are desired to be inserted and press <Enter>.

The following prompt asking for a source file is then displayed:

```
──────────────── Source Filename ────────────────
*.LLT
```

Type the name of the source file (including the .LLT extension) and press <Enter>. All rungs in the source file are copied into the current file.

NOTE

NOTE
NOTE The above procedure copies all rungs from a source file to a destination file. To copy a specific group of rungs from one file to another, it is necessary to create an intermediate file (see example below).

Example for copying specific rungs:

To copy rungs 70 through 75 from a logic file called Test1.LLT and paste them to a file called Test2.LLT between rung 10 and rung 11, it is necessary to create a temporary file. To create a temporary file, perform the following steps:

1. Ensure that Test1.LLT is selected as the current file (refer to the menu screen status line).

2. Press the <F6> function key (Utility Programs) from Menu 1 (Interlogic Main Menu) to display the Menu 16 window.

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3. From the Menu 16 window (Utility Programs), press the <F1> function key (Copy Rung From Current file).

4. When the prompt appears (see below) asking for "Target Filename", type "Temp.LLT" and press <Enter>.

```
┌──────────────────── Target Filename ────────────────────┐
│ *.LLT                                                    │
└──────────────────────────────────────────────────────────┘
```

NOTE

NOTE

If the designated target file (Temp.LLT in step 4 above) already exists, the prompt shown below is displayed. Type "Y" to overwrite the file.

```
┌──────────────────────── Verify ─────────────────────────┐
│ File 'C:\INSTALL\TEMP.LLT' exists.   Overwrite it ? _    │
└──────────────────────────────────────────────────────────┘
```

5. When the prompt appears (see below) asking for "Start At Rung", type "70" in the shaded field and press <Enter>.

```
┌──── Start At Rung ────┐
│ Enter Value (1..80)   │
└───────────────────────┘
```

6. When the prompt appears (see below) asking for "End With Rung", type "75" and press <Enter>.

```
┌──── End With Rung ────┐
│ Enter Value (70..80)  │
└───────────────────────┘
```

7. After the rungs have been copied into the Temp.LLT file, from the Menu 16 window (Utility Programs) press the <F8> function key (Back To Main Menu).

8. From the Interlogic Main Menu (Menu 1), change the current file to Test2.LLT by pressing the <F7> function key (Change Filename) and typing Test2.LLT when the prompt appears asking for a file name as shown below:

```
┌──────────────────── Enter Filename ─────────────────────┐
│ *.LLT                                                    │
└──────────────────────────────────────────────────────────┘
```

9. From the Interlogic Main Menu (Menu 1), press the <F6> function key (Utility Programs) to display the Menu 16 window.

10. From the Menu 16 window (Utility Programs), press the <F2> function key (Insert Rung Into Current File).

11. When the prompt appears (see below) asking for "Insert before rung number", type "11" and press <Enter>.

```
┌─ Insert before rung number? ─┐
│    Enter Value (1..161)      │
└──────────────────────────────┘
```

12. When the prompt appears (see below) asking for "Source Filename", type "Temp.LLT" and press <Enter>. The rungs are pasted and the screen returns to Menu 16.

```
┌──────────────────── Source Filename ────────────────────┐
│ *.LLT                                                    │
└──────────────────────────────────────────────────────────┘
```

1.3.11.3   Configuration Setup (F6)

The Configuration Setup menu allows the user to select parameters such as display colors, display mode, address mode, wrap mode, and printer number.

For Configuration Setup, press the <F6> function key (from the Utility Programs – Menu 16). The display at right is displayed. Move the highlighting to the desired setup parameter and press <Enter>.
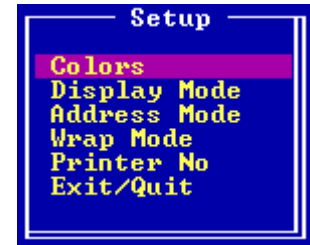
Colors

Selecting the "Colors" option provides a choice of color combinations for the display (see right). Use the arrow keys to move the highlighting up or down and press <Enter> to make the selection. The options are:

- Black characters on white background

- Yellow characters on blue background

- Green characters on yellow background

- Turquoise characters on blue background

- Red characters on black background

- Gray characters on Brown background

- **Last User** selects the user-defined colors as the current set

- **Create New** brings up a Color Descriptions window that presents the user with a color table to make other choices (see right). Press <Enter> on a highlighted selection to display the color palette on the left side of the screen. Different text colors can be tested on different background colors. Press <Enter> to assign the new color to the color table, or press <Esc> to leave the color unchanged. When all colors have been assigned, move the cursor bar to the **QUIT** entry and press <Enter> to return to the color selection men. The last selected color palette is the default.

- **Exit/Quit** leaves the Colors window and returns to the Setup window.

NOTE

Last User must be selected from the Colors window to make the new color combination the current set.

Table 21 lists and describes the choices in the Color Descriptions window.

Table 21. Color Descriptions

Location	Description
EDITPROMPT	Highlighted text
EDITNORMAL	Normal rung
EDITHIGH	Highlighted rung (cell cursor)
DESCRNORMAL	Constant in description line (template)
DESCRHIGH	Variable in description line (description text)
ADDRNORMAL	Normal bit address
ADDRHIGH	Highlighted bit address (cell cursor)
LABELNORMAL	Normal label
LABELHIGH	Highlighted label (cell cursor)
STATUSNORMAL	Constant in status line (template)
STATUSHIGH	Variable in status line
MENUBARNORMAL	Function key description in menu bar
MENUBARHIGH	Function key number in menu bar
ACTIVCOLOR	Closed contact in on-line mode
SHADOWCOLOR	Shadow of window outline
ERRORTITLE	Title of error window
ERRORBORDER	Border of error window
ERRORNORMAL	Text in error window
ERRORHIGH	Highlighted text in error window
VERIFYTITLE	Title of verify window
VERIFYBORDER	Border of verify window
VERIFYNORMAL	Text in verify window
VERIFYHIGH	Highlighted text in verify window
DIRBOXTITLE	Title of directory window
DIRBOXBORDER	Border of directory window
DIRBOXNORMAL	Text in directory window
DIRBOXHIGH	Highlighted text in directory window
WINDOWTITLE	Title of message window
WINDOWBORDER	Border of message window
WINDOWNORMAL	Text in message window
WINDOWHIGH	Highlighted text in message window
WINDOWBAR	Bottom bar of message window
WINDOWBARHIGH	Highlights in bottom bar of message window

Display Mode

Selecting the "Display Mode" option allows selection of one of five different fonts that can be used to display normally-open and normally-closed contacts. The currently selected font is displayed in the bottom line and changes each time <Enter> is pressed. The last font shown is the selected font. The default font is font 0. The font may also be changed from Menu 11 by pressing <Ctrl> + <F1>.

Address Mode

Selecting the "Address Mode" option from the configuration Setup option (**F6**) of Menu 16 (Utility Programs) permits changing the method in which labels and bit addresses are displayed while editing a rung. There are four different display modes as listed in Table 22.

Table 22. Address Display Modes

Mode Number	Mode	Description
0	Address only	Only the bit address is displayed above the contact/coil.
1	Address and label top	The bit address is displayed above the contact/coil and the first half of the label is displayed below the coil.
2	Address and label bottom	The bit address is displayed above the contact/coil and the second half of the label is displayed below the coil.
3	Label only	The complete label is displayed (first half above, second half below the contact/coil) but not the bit address.

Also, press <Ctrl> +<F1> from Menu 11 to change the mode (any of the modes may be selected, however Label Mode is the default).

Wrap Mode

Selecting the "Wrap Mode" option from the configuration Setup option (**F6**) of Menu 16 (Utility Programs) permits changing cursor cell operation during rung editing. When Wrap Mode is selected, the cursor cell wraps around at the end of a column or row. When Wrap Mode is offf, the cursor retains its position at the screeen boundary. The default is Wrap Mode off. The Wrap Mode may also be changed from Menu 11 (Ladder Logic) by pressing <Ctrl> + F3>.

Press <Enter> to toggle between Wrap Off and Wrap On

Printer No

The Interlogic program can determine whether a printer is connected, on-line, and/or out-of-paper. As a default, the printer assinged to LPT1 is checked (printer number 0). Selecting the "Printer No:" option allows the check to be accomplished on LPT2 (printer number 1). The printout is always routed to STDPRN, which is the standard printer stream.

Press <Enter> to toggle between Print 0 and Print 1

1.3.11.4   Back To Main Menu (F8)

Selecting the "Back to Main Menu" option (**F8**) of Menu 16 (Utility Programs) returns the screen to the Interlogic Main Menu (Menu 1). Refer to paragraph 1.3.5 for a description of the Main Menu.

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1.3.12 Change Filename

Selecting the "Change Filename" option (**F7**) from the Interlogic Main Menu (Menu 1) brings up a prompt on the screen asking for a file name as shown below.

Type a filename for the rung file (maximum eight characters plus the .LLT extension) and press <Enter>. If the file exists in the current directory, that file becomes the current one and the menu screen status line displays the filename.

If the file does not exist in the current directory, a "Verify" message similar to the one shown below is displayed.

Type **Y** to create a new file. If a new file is not desired, type **N**. The "Verify" prompt dissappears and returns to the "Enter Filename" prompt to allow another selection.

To select a file located in a directory other than the current directory, type the drive letter, directory name, and file name (including extension) and then press <Enter>.

NOTE	
NOTE	**NOTE** To browse the existing files in the current directory, at the prompt, press <Enter> without typing a filename.

1.3.13 Quit / Exit Interlogic

Press the <F8> function key to return from the Interlogic Utility Programs (Menu 16) window to the SEAR II Utilities main menu (refer to paragraph 1.2 for illustration and description of the main menu).

NOTE	
NOTE	**NOTE** Any changes made to the logic must be re-compiled and uploaded to the SEAR II.

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APPENDIX A - INTERLOGIC ERROR CODES

The following error messages are displayed during rung acceptance (by selecting the **F8** function from Menu 111) if the rung is unacceptable.

Error Message	Explanation
Short Circuit, Contact Expected	A short circuit has been detected in a network. Insert the missing contact or rearrange the network.
Short Circuit, Contact Inserted	A short circuit has been detected in a network and the system has inserted a contact to enable processing to continue. Assign a bit address to the new contact or rearrange the network.
Bit Address Missing	A contact or coil has a missing or an invalid bit address. Assign an input or output bit number to the contact or coil.
Irreducible Network Tree	An entry in the current expression has caused the token generator to be unable to generate tokens. This can be caused by a missing or misplaced contact, a dead-end connection, or an empty loop.
Error During Accept	The system has detected an error other than those listed. Examine the network and rearrange or simplify the expression if the error persists.
Unable To Open The File	The system was unable to open the specified file. In most cases, a file name has been misspelled or an incorrecxt drive and path name have been entered. Beyond these, the disk may be full or a DOS read error has occurred.
Cannot Copy File Onto Itself	The target file name specified is identical to the current file. Use a different file name for the target file.
Source File Is Empty	The source file is an empty rung file. Use a source file that is not empty.
Corrupt Rung In Token File	The rung found in the token file has been corrupted or cannot be read by the program.
Error Reading Rung From Rung File	The rung found in the token file has been corrupted or cannot be read by the program.
Index Overflow – Too Many Contacts In File	The total number of tokens exceeds 65,535, i.e., more than approximately 40,000 contacts have been entered. System capacity has been exceeded.
Label 'xxx.yyy' Not Found!	The Search Label function failed to locate the entered label. Check spelling and ensure that a two-word label is divided at the proper position. Uper/lower case differences do not affect the search.
Too Many Timers/Counters!	The maximum number of timers and/or counters has been used. The current version supports 250 timer/counters.
Not A Valid Rung File!	A file name that is not a valid Interlogic rungfile name has been specified. Check the file name for proper spelling and ensure that the correct extension has been given.

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September 2013