

# ***9100 Series***

## **9100A-030 9010A To 9100A Program Translator**

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# Section 1

## Introduction

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### GENERAL DESCRIPTION

#### 1.1.

The 9100A-030 9010A to 9100A Program Translator (referred to in this manual as the translator) is a program that converts 9010A programs to the 9100A TL/1 programming language. These translated TL/1 programs can be executed on either the 9100A or 9105A. The translator program is written in the TL/1 language and executes only on a 9100A with a programmer's station.

The translator allows an existing base of 9010A programs to be used on a 9100A or 9105A. The translator is also a valuable teaching tool for test engineers and programmers familiar with the 9010A and with little or no 9100A experience.

**PRODUCT DESCRIPTION****1.2.**

The translator consists of this User's Manual and a 3.5-inch diskette. The diskette contains programs in a UUT (Unit Under Test) directory named TRANSLATE. The following is a list of files contained on the diskette:

<u>PROGRAM</u>	<u>DESCRIPTION</u>
TRANSLATE	The 9010A to 9100A Program Translator.
9010TAPE	A sample 9010A program that can be translated and executed.
9010RDPROB	TL/1 version of 9010A READ PROBE.
9010INPUT	TL/1 version of 9010A DPY input.
9010ROMTST	TL/1 version of 9010A ROM TEST.
9010ADD32	TL/1 version of 9010A 32-bit unsigned add (binary program).
9010SUB32	TL/1 version of 9010A 32-bit unsigned subtract (binary program).
9010FREQ	TL/1 version of 9010A probe frequency (binary program).
9010PULSER	TL/1 version of 9010A probe pulser (binary program).
9010SETUP	TL/1 version of 9010A setup program (binary program).

## OPERATION

### 1.3.

The 9010A is able to read and write test programs via its auxiliary RS-232-C interface. The entire contents of the 9010A program memory (including setup parameters and address space descriptors) can be transferred through the serial interface to the 9100A as ASCII text.

Once the program transfer is made to the 9100A, the translator processes the input file containing the 9010A programs and generates an output text file containing the TL/1 version of the programs. Finally, the 9100A COPY command converts the translated program from the text file into an executable TL/1 program file. Section 3 contains step-by-step procedures on how to transfer, translate, and convert programs to TL/1.

The following is an example of an output file from the translator. This example is a 9010A program that has been translated into TL/1. The original 9010A statements are included as comments in the TL/1 program by the translator.

```
function P_10                                ! PROGRAM 10    78 BYTES
  declare
    global numeric array [0:$F] reg
    global numeric dpy
    global numeric aux
    global numeric syncmode
  end declare

  reg[1] = $8000                              ! REG1 = 8000
L_1:                                          ! 1:LABEL 1
  reg[$F] = reg[$1]                          ! READ @ REG1
  reg[$E] = readvirtual extaddr 0, addr reg[$F]
  reg[8] = $20                                ! REG8 = 20
  '9010exec' (40)                             ! EXECUTE PROGRAM 40
  if reg[$1] = $801F then goto L_2           ! IF REG1 = 801F GOTO 2
  reg[1] = reg[1] + 1                         ! INC REG1
  goto L_1                                    ! GOTO 1
L_2:                                          ! 2:LABEL 2
  print using "-COMPLETE", on dpy!          ! DPY-+COMPLETE
end function
```

## **TRANSLATOR EFFICIENCY**

**1.4.**

9010A source files can contain address space information, setup information, 9010A programs, and binary programs. The translator can convert 81% of these statements into TL/1. An additional 12% can be partially translated or can be set manually from the operator's keypad on the front panel of the 9100A/9105A. For typical 9010A programs, more than 95% of the statements are translated.

The 9010A statements in Table 1-1 are not translated. For information on how to manually complete the translation of these statements, refer to Section 4.

When the translator encounters a statement that cannot be converted to TL/1, the translator inserts the statement into the TL/1 program as a comment and displays an error message. The error messages are also written to a log file that can be reviewed later.

## **OPERATIONAL DIFFERENCES BETWEEN THE 9010A AND 9100A/9105A**

**1.5.**

There are differences between the 9010A and 9100A/9105A that may affect the operation of the translated programs. Arithmetic underflow, probe transition counts, use of the probe pulser, and special addresses are differences that cannot be detected by the translator and are described in the following paragraphs

**Table 1-1. Non-translated or Partially Translated 9100A Statements**

SETUP STATEMENTS	PROGRAM STATEMENTS	BINARY PROGRAMS
BEEP ON ERR TRANSITION- <YES/NO>	ROM TEST‡	Merge Tape
EXERCISE ERRORS- < YES/NO>*	AUTO TEST‡	Pod Self-Test Program
STALL <hex number>	RUN UUT†	Pod Setup Program£
UNSTALL <hex number>	ASYNCHRONOUS INPUT (with the DPY statement)§	9000A-006 Programs (Asynchronous Signature Probe Option)
TRAP ILLEGAL ADDRESS	LEARN	
LINESIZE <decimal number>		
NEWLINE <hex number>		
<p><b>NOTES</b></p> <p>Most of the setup items do not affect program operation.</p> <p>* Can be set from the front panel of the 9100A/9105A</p> <p>‡ Partially translated. The translation can be completed after the ROM signatures have been relearned on the 9100A/9105A. For more information, see Section 4.</p> <p>† Partially translated. The translation can be completed by adding a haltuut () statement to the TL/1 program. For more information, see Section 4.</p> <p>§ This manual describes a workaround for asynchronous input. For more information, see Section 4.</p> <p>£ This program is partially translated.</p>		

## Arithmetic Underflow

### 1.5.1.

The 9010A ignores arithmetic underflow and decrements from 0 to FFFFFFFF. The 9100A/9105A detects and reports arithmetic underflow errors during TL/1 program execution. Comparisons that depend on the underflow wraparound will not work. The following are examples of 9010A and 9100A/9105A subtraction:

9010A subtraction:                     $0 - 1 = \text{FFFFFFFF}$

9100A/9105A subtraction:         $0 - 1 = \text{arithmetic overflow error}$

## Probe Transition Count

### 1.5.2.

The 9010A counts high to low transitions, but the 9100A counts low to high transitions. This condition can cause a difference of one count.

Transition counts are asynchronous and the number of counts depends on the number of transitions that occur between two READ PROBE statements. The timing of this window is different on the 9010A and 9100A and can cause the counts to be different on nodes where there is asynchronous activity.

## Probe Pulser

### 1.5.3.

9010A programs control the probe pulser with operator prompts to press the PULSE HIGH or PULSE LOW keys during program execution. On the 9100A/9105A, the operator cannot change the probe pulser mode while a TL/1 program is running. Instead, the program uses the TL/1 pulser function to control the probe pulser directly.

The difference in the way the probe pulser is controlled affects any 9010A program that prompts the operator to change the probe pulser mode. Refer to Appendix C for instructions on how to complete the translation.

## Special Addresses

### 1.5.4.

Special addresses are addresses that are outside the normal address space of a microprocessor. Some 9010A programs use special addresses to access other address spaces (such as I/O), or to access pod special functions. The 9100A built-in tests do not accept special addresses. Instead, the TL/1 function `setspace` sets the address space before calling these tests.

This situation affects any 9010A program that uses special addresses with `BUS TEST`, `RAM SHORT`, `RAM LONG`, `ROM TEST`, `IO TEST`, and `AUTO TEST`. Refer to Appendix C for instructions on how to complete the translation.

## HOW TO USE THIS MANUAL

### 1.6.

This manual is the reference source for the 9010A to 9100A Program Translator. The manual is written with the assumption that you are already familiar with the operation of the 9010A Micro-System Troubleshooter and have some TL/1 programming experience.

A good source of reference for answering 9100A/9105A questions is the 9100-Series Manual Set. Information on how to use the 9100A/9105A is located in the *9100-Series Technical User's Manual*, and programming information is located in the *9100-Series Programmer's* and *9100-Series TL/1 Reference Manuals*.

## ORGANIZATION OF MANUAL

## 1.7.

The *9010A to 9100A Program Translator User's Manual* is organized as follows:

- **Section 1  
Introduction** Introduces the translator and describes the basic features.
- **Section 2  
Getting Started** Describes what you need to get started. Before using the translator, it is essential that you read this section to avoid problems. This section shows how to hook up the 9010A to the 9100A and lists other hardware requirements.
- **Section 3  
How To Use  
The Translator** Provides step-by-step guide through the entire translator process with figures to compare your progress with the manual.
- **Section 4  
Language Reference** Provides quick reference for mapping between 9010A statements and TL/1 with workarounds for non-translated and partially translated statements.
- **Appendices A - C** Provides detailed information of the different types of translator program output, how to handle errors during translation, and additional information on related subjects not covered in previous sections of the manual.

# Section 2

## Getting Started

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### OVERVIEW

2.1.

Section 2 contains information required to operate the translator. The following topics are covered in this section:

- Hardware Requirements
- Backing Up the Translator Diskette
- Hooking Up the System

### HARDWARE REQUIREMENTS

2.2.

The following hardware is required to operate the translator:

- A Fluke 9100A Digital Test System with 4M bytes of memory, version 4.0 or later 9100A software, and a 9100A-004 Programmer's Station
- Fluke 9010A Micro-System Troubleshooter with Option 9010A-001 (RS-232-C interface)
- Null modem RS-232-C cable

Refer to Table 2-1 for ordering information necessary to obtain the required components for translator operation. These items may be ordered from John Fluke Mfg. Co., Inc. or an authorized representative by using the Fluke order number.

**NOTE**

*4M bytes of memory is only required to translate the 9010A programs to TL/I programs. Translated TL/I programs can be executed on 9100A/9105As with less memory.*

**Table 2-1. Ordering Information**

<b>Description</b>	<b>Order Number</b>
9100A Programmer's Station	9100A-004
Software Upgrade Kit	9100A-003
Software Upgrade w/Programmer's Kit	91004-904
Null Modem RS-232 Cable (4 meter)	Y1703
or	Y1705
Null Modem RS-232 Cable (1 foot)	Y1702
or	
Null Modem RS-232 Cable (2 meter)	
9010A to 9100A Program Translator	9100A-030
<b>NOTE</b>	
If your 9100A does not have 4M bytes of memory, contact your local Fluke Technical Service Center for ordering information.	

**BACKING UP THE DISKETTE****2.3.**

Before using the translator program, you should make a copy of the translator diskette. This copy should be used for normal day- to-day operations, while the original diskette should be kept in a safe place as a backup so that the working copy can be restored if it is ever damaged.

For instructions on how to duplicate the diskette, refer to Typical 9100A/9105A Operations located in the *9100-Series Technical User's Manual*.

## CONNECTING THE 9010A TO THE 9100A

### 2.4.

Transferring data between the 9010A and the 9100A requires an RS-232-C cable connected to either RS-232-C Port 1 or 2 of the 9100A and the RS-232-C port of the 9010A. Refer to Figure 2-1 for the correct wiring configuration of the cable.

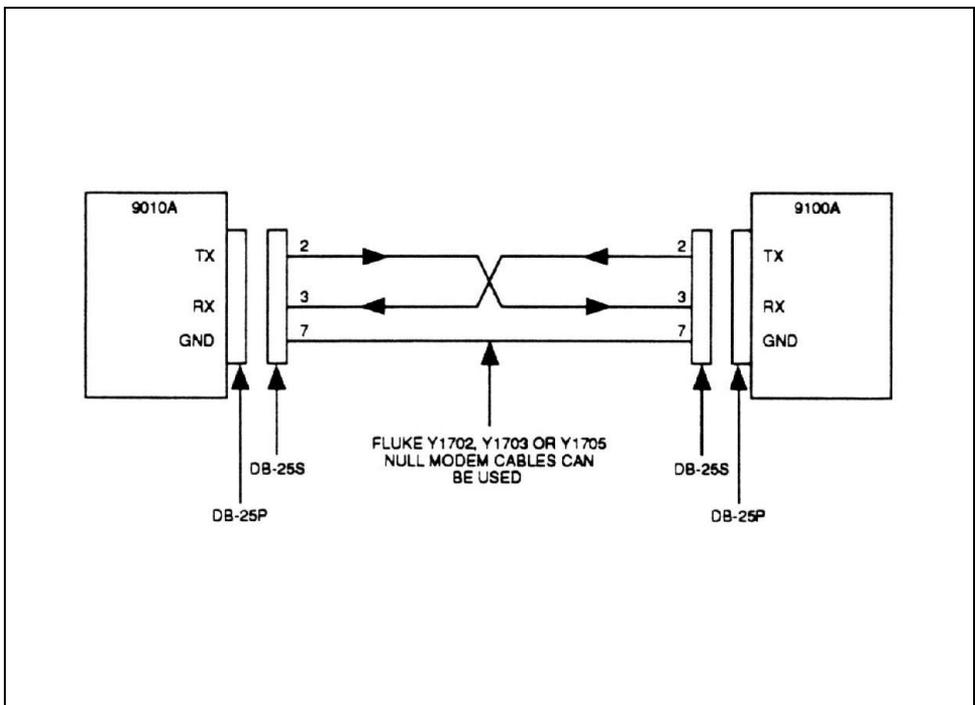


Figure 2-1. RS-232-C Wiring Diagram

Connect the cable to the 9010A and the 9100A, and set the RS-232-C parameters on the rear panel of the 9010A as shown in Table 2-2. Set the parameters of the 9100A serial port (under the SETUP MENU key) to correspond to those of the 9010A.

**Table 2-2. RS-232-C Parameter Settings**

<b>9010A</b>	<b>9100A</b>
Baud: 9600 (switch setting 7) Parity: odd Data bits: 7 Stop bits: 1 Parity: on	Baud: 9600 Parity: odd Data bits: 7 Stop bits: 1 XON/XOFF: enable Clear to send: disable Newline: CRLF

*NOTE*

*The 9100A software handshaking protocol (XON/XOFF) must be enabled for compatibility between the 9010A and the 9100A.*

# Section 3

## How to Use the Translator

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### OVERVIEW

### 3.1.

Section 3 contains procedures on creating a UUT directory for storage of 9010A programs, transferring programs to the 9100A, translating the programs into TL/1 as text files, and converting the files into executable TL/1 program files.

The translator process requires the following steps:

1. Creating a new UUT directory on the 9100A hard disk.
2. Copying the translator programs into the UUT directory.
3. Transferring programs from the 9010A to the 9100A into the UUT directory.
4. Translating the 9010A programs to TL/1, producing a text file.
5. Copying the text file to an executable TL/1 program file.
6. Editing the program file for statements that are not translated and completing the translation.
7. Executing the translated programs.

Figure 3-1 shows the translation process. The boxes represent translation steps and the arrows determine if the file is an input or output file. A file following an arrow going into a box (step) is an input file. An arrow coming out of a box (step) points to an output file.

## **CREATE A UUT DIRECTORY ON THE 9100A HARD DISK**

### **3.2.**

Before the translation process begins, the 9100A should be powered up and operational. If this is not the case, refer to the *9100-Series Getting Started* for power-up information. For more information on using the 9100A Editor, refer to the *9100-Series Programmer's Manual*.

To create a UUT directory:

1. Start the Editor by pressing the EDIT key on the operator's keypad. The 9100A prompts you to name the UUT. (For demonstration purposes the UUT directory name is 9010UUT.)
2. Type /HDR/9010UUT at the "EDIT NAME" prompt, and press the Return key.
3. Press the 9100A Field-Select key on the programmer's keyboard to scroll through the Reply field at the bottom-right of the 9100A monitor.
4. Select UUT by pressing the Return key when UUT is shown in the Reply field.

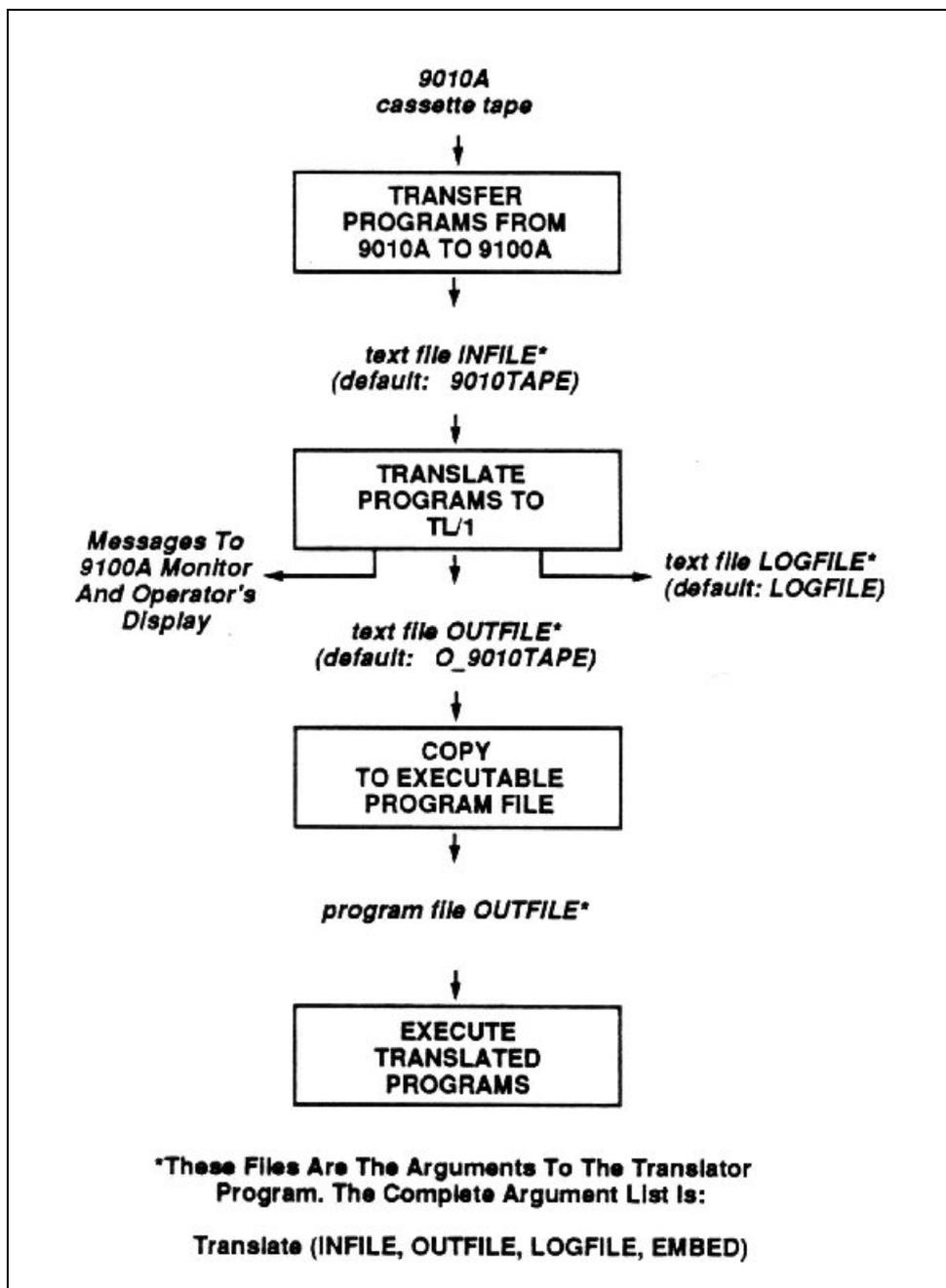


Figure 3-1. The Translation Process

The UUT directory is now created and should be similar to the monitor display shown in Figure 3-2.

*NOTE*

*It is recommended that you create a new UUT directory. Allowing the translator to operate in a new (empty) UUT, prevents overwriting any existing UUT text files or TL/I programs.*

*If a mistake is made at the prompt, press the 9100A Quit key to return you to where you were before the prompt.*

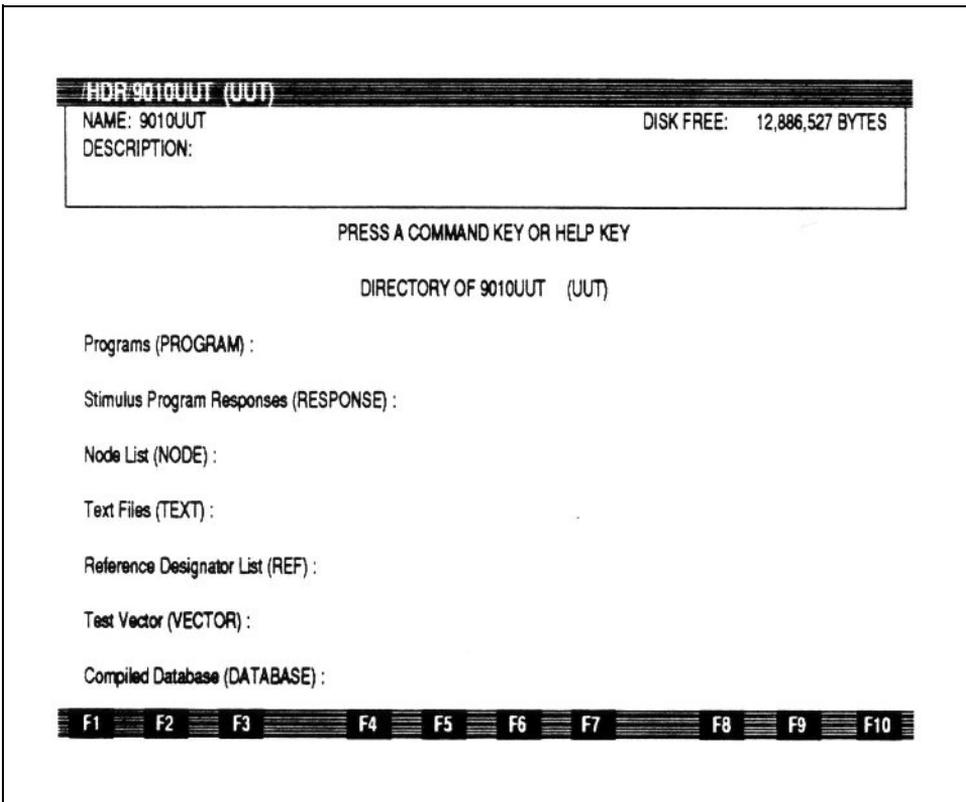


Figure 3-2. UUT Directory

## **COPY THE TRANSLATOR PROGRAMS INTO THE UUT**

**3.3.**

To copy all of the translator programs into the UUT directory:

1. Insert the translator disk into the 9100A floppy disk drive (/DR1). Make sure that you are in your empty UUT directory and press the COPY (F4) softkey.
2. Enter /DR1/TRANSLATE/\* at the "FROM NAME" prompt, then press the Return key.
3. Use the Field-Select key to choose "PROGRAM" in the Reply field, and press the Return key.
4. Enter /HDR/9010UUT at the "TO NAME" prompt, and press the Return key.
5. Use the Field-Select key to choose UUT in the Reply field, and press the Return key.

A status message appears on the bottom of the 9100A monitor. The message lists each translator program as it is copied into the UUT directory. The softkey labels return to the monitor display when the copy process is complete.

## **TRANSFER PROGRAMS FROM THE 9010A TO THE 9100A**

**3.4.**

To transfer the 9010A address descriptors, setup information, and programs to the 9100A through the RS-232-C interface:

1. Load the programs to be translated into the 9010A.
2. Initiate the data transfer (receive) on the 9100A.
3. Initiate the data transfer (send) on the 9010A.
4. Terminate the data transfer on the 9100A.

*NOTE*

*Before transferring programs, the 9100A and 9010A should be powered up, connected together with the RS-232-C cable, and the port parameters should be set, as described in Table 2-2.*

**Load the 9010A Programs to be Translated into the 9010A**

**3.4.1.**

To load the 9010A programs to be translated into the 9010A:

1. Insert the cassette into the 9010A and press the READ TAPE key.
2. When the READ TAPE operation is complete (the 9010A displays the message "READ TAPE OK"), change the 9010A serial port setup parameters (under the SETUP key) to the following values (these parameters can change each time a tape is read):

```
NEWLINE 0000D0A  
STALL 13  
UNSTALL 11  
LINESIZE 255
```

*NOTE*

*To avoid a Syntax Error during translation, set the linesize value to 255. The 9010A's linesize default value is 79. If LINESIZE is not increased to 255, the 9010A splits long lines as they are sent out the serial port. Each partial line causes a "Syntax Error" during translation. LINESIZE is reset each time a 9010A READ TAPE operation is performed.*

*For more information on changing the 9010A Setup parameters, refer to the 9010A Operator's Manual.*

## Initiate Data Transfer on the 9100A

### 3.4.2.

The 9100A terminal emulator allows the 9100A to receive data from the 9010A and store it in a text file. To initiate the data receive operation on the 9100A:

1. Edit the UUT directory.
2. Press the TERM (F5) softkey and use the Field- Select key to choose "/PORT1" or "/PORT2" depending on which RS-232-C port you connected the cable to, then press the Return key.
3. Press the 9100A Info key. The information window appears at the top of the monitor display, and softkey labels appear at the bottom.
4. Press the RECEIVE (F4) softkey and at the "RECEIVE NAME" prompt, enter a name (for demonstration purposes 9010TAPE is used) for the text file receiving the data.
5. Press the Return key twice. The second Return acknowledges that the data received is text.

#### *NOTE*

*If the text file name already exists, a prompt asks if the existing file should be replaced. Use the Field- Select key to respond. Entering no aborts the data receive operation.*

The status message "RECEIVING" appears on the bottom of the monitor display as shown in Figure 3-3, indicating that the 9100A is ready to receive data. Press the Return key to acknowledge the message. The 9100A monitor displays data as it is received on the RS-232-C port.



To initiate the data send operation on the 9010A:

1. Send the address descriptors by pressing the AUX I/F key followed by the LEARN key.
2. Send the setup information by pressing the AUX I/F key followed by the SETUP key. Figure 3-4 shows the 9100A monitor when the setup information is received.
3. Send all the programs contained in the 9010A memory (do not send the programs individually) by pressing the AUX I/F key followed by the PROGM key.

The data is displayed on the 9100A monitor as it is received from the 9010A.

```
SETUP INFORMATION

POD - 8085

TRAP BAD POWER SUPPLY-YES
TRAP ILLEGAL ADDRESS-YES
TRAP ACTIVE INTERRUPT-NO
TRAP ACTIVE FORCE LINE-YES
TRAP CONTROL ERROR-YES
TRAP ADDRESS ERROR-YES
TRAP DATA ERROR-YES

EXERCISE ERRORS-YES
BEEP ON ERR TRANSITION-YES

BUS TEST @ 0000
RUN UUT @ 0000
TIMEOUT 200
STALL 13
UNSTALL 11
NEWLINE 0000D0A
LINESIZE 255
```

Figure 3-4. Setup Information on 9100A Monitor

## Terminate Data Transfer on the 9100A

### 3.4.4.

To terminate the data receive operation on the 9100A, press the 9100A Quit key. A status message is displayed at the bottom of the 9100A monitor indicating that the Receive operation is complete. Press the Return key to acknowledge the message and exit the terminal emulator. The 9100A monitor now displays the UUT directory.

You can verify the data transfer by looking at the monitor where the text file name "9010TAPE" appears below the Text Files (TEXT): line. For more information on the terminal emulator, refer to the Terminal Emulator section of the *9100-Series Programmer's Manual*.

## TRANSLATE THE 9010A PROGRAMS TO TL/1

### 3.5.

The following group of procedures requires you to create several types of files for translation to take place. After the 9010A programs are translated, the 9100A monitor, the operator's display, the log file, and the TL/1 output file contains startup, error, and termination information about the translation. Appendix A contains descriptions of the different types of messages and the contents of the TL/1 output file.

To begin translation of the 9010A programs (you must be in your UUT directory):

1. Press the 9100A Edit key. Enter Translate at the "EDIT NAME" prompt, and press the Return key.
2. Press the Field-Select key until "PROGRAM" appears in the Reply field and press the Return key. There is a slight delay while the 9100A loads the Translate program. When the Translate program is successfully loaded, the first part of the Translate program appears on the 9100A monitor.

3. Press the DEBUG (F3) softkey. There is a slight delay while the 9100A loads the debugger program. For more information on the debugger program, see the *9100-Series Programmer's Manual*.
4. Execute the Translate program by pressing the EXECUTE (F4) softkey. The 9100A prompts for the program name.
5. Enter Translate, and press the Return key. The default may be Translate; in that case, press the Return key.

Before translation begins, you are prompted for the following program arguments:

- **INFILE:** This is the input file to the translator that contains the 9010A address descriptors, setup information, and/or programs to be translated. Enter a file name at the "INFILE" prompt. This name must be the same as the file name you previously used for the text file to receive the 9010A programs, or an error message appears after all of the arguments have been prompted for. (The default name is: 9010TAPE. For demonstration purposes the default name is used.) Figure 3-5 shows an example of the 9100A monitor with an "INFILE" prompt. Press the Return key.
- **OUTFILE:** This is the output file generated by the translator that contains the TL/1 translation. Enter a file name at the "OUTFILE" prompt. An existing file with the same name is overwritten. (The default name is: O\_9010TAPE. For demonstration purposes the default name is used.) Press the Return key.

- **LOGFILE:** This is the log file that errors are recorded in. Enter a file name at the "LOGFILE" prompt. An existing file with the same name is overwritten. (The default name is: LOGFILE. For demonstration purposes the default name is used.) Press the Return key.
- **EMBED:** Enter Y (YES) to instruct the translator to output the 9010A statements as comments in the TL/1 code. Enter N (NO) if the 9010A statements should not appear in the TL/1 code. (The default is: Y. For demonstration purposes the default is used.) Press the Return key.

Figure 3-1 shows the relationship between these program arguments and the translation process.

When all of the arguments have been supplied, the translator begins processing the input file. The translator displays status messages on the operator's display and error messages on the 9100A monitor as it is running. The error messages are also sent to the log file for future reference. For more information on log file output and error messages, see Appendices A and B.

At the completion of the translation process, the 9100A monitor redisplay the Translate program and the message "COMPLETE, STATUS = PASS" appears at the bottom of the 9100A monitor. The message "Translation Complete" appears on the operator's display.

```

/HDR/9010OUT/TRANSLATE (PROGRAM)                                line 7
program translate (infile, outfile, logfile, embed)

declare

| program arguments
string infile = "9010TAPE"                                     | name of input file
string outfile = "O_9010TAPE"                                 | name of output file
string logfile = "LOGFILE"                                    | name of log file
string embed = "Y"                                           | embed 9010 strmts as comments

| program options
global numeric opt_logfile                                   | 1 to create logfile, 0 otherwise
global numeric opt_embed                                    | 1 to embed 9010 code, 0 otherwise
global string indent                                         | indent before statements

| input file globals
global numeric EOL                                           | 1 if end-of-line, 0 otherwise
global numeric EOF                                           | 1 if end-of-line, 0 otherwise
global numeric curch                                          | index of current char in input line
global numeric last_curch                                     | last value of curch
global numeric linelen                                        | length of input line

F1  F2  F3  F4  F5  F6  F7  F8  F9  F10
infile 9010TAPE

```

**Figure 3-5. 9100A Monitor with a INFILE Argument Prompt**

6. Use the MSGS key to toggle between the debugger and the error message list.

*NOTE*

*If the Scroll Lock key is not active, the error messages will scroll off the monitor. The entire list of error messages can be seen by editing the log file.*

7. To exit the debugger and return to the Editor, press the 9100A Quit key. You are now looking at the Translate program.
8. To return to your UUT directory, press the 9100A Quit key.

## **COPY THE TRANSLATOR OUTPUT TO TL/1 PROGRAM FILES**

### **3.6.**

After the 9010A programs are translated to TL/1, the translator OUTFILE text file is converted to an actual TL/1 program that can be executed. This process changes the disk storage format of the programs to a format that is unique to TL/1 programs.

To copy the translator output to a TL/1 program file (you must be in your UUT directory):

1. Press the COPY (F4) softkey. Enter your translator output file name (for demonstration purposes, O\_9010TAPE is used) to be copied at the "FROM NAME" prompt, and press the Return key. This name must be the same as the file name you used as the OUTFILE argument to the translator.
2. Use the Field-Select key to specify "TEXT" in the Reply field, and press the Return key.
3. Enter the name of the translator output file (O\_9010TAPE) again at the "TO NAME" prompt and press the Return key.
4. Use the Field-Select key to specify "PROGRAM" in the Reply field and press the Return key.

### NOTE

*The COPY destination file must be given the same name as the COPY source file that is being copied. If you give a destination file name that is different from the source file name, an error message appears when you try to execute the TL/1 program.*

A status message appears on the bottom of the 9100A monitor indicating that the copy is in progress. When the copy is complete, the 9100A monitor displays the UUT directory. No errors should be reported during the copy.

## **REVIEW THE TRANSLATOR ERRORS AND COMPLETE THE TRANSLATION**

### **3.7.**

As the translator input file is converted to TL/1, statements that could not be translated are displayed on the 9100A monitor, sent to the log file, and embedded in the output file as comments. This list of statements must be examined to determine if the errors affect the operation of TL/1 program.

To examine the log file (you must be in your UUT directory):

1. Press the 9100A Edit key.
2. Enter your translator log file name (for demonstration purposes, LOGFILE is used) at the "EDIT NAME" prompt and press the Return key.
3. Press the Field-Select key until TEXT appears and press the Return key. You are now editing the log file.
4. To return to your UUT directory, press the 9100A Quit key.

If you are not sure whether a statement affects program operation, refer to the *9010A Operator's Manual* and the *9010A Programmer's Manual* to review the function of the 9010A statement. Also refer to Section 4 of this manual and review the comments about that particular statement.

Normally, statements that appear in 9010A programs do affect the operation of your TL/1 program. However, many statements in the setup information do not affect program operation. For example, LINESIZE, NEWLINE, STALL, and UNSTALL all pertain to the RS-232-C port. If your program does not use the port, the statements that were not translated do not affect your program.

If a statement does not affect program operation, you can ignore that error message and no further action is required. If a statement does affect program operation, you must complete the translation of that statement. To do this, edit the TL/1 program file and make your changes in that file. Refer to the Section 4 for workarounds and instructions on how to complete the translation of each statement. Refer to the Editor in Section 2 and the Overview of TL/1 in Section 3 of the *9100-Series Programmer's Manual* for more information on how to edit the TL/1 program file.

## **EXECUTE THE TRANSLATED PROGRAM**

### **3.8.**

The translated program can be executed from the operator's keypad or from the debugger. The following paragraphs describe the debugger method and the operator's keypad method. If you choose to use the debugger method, disregard the operator's keypad method and continue to the Program Execution paragraphs.

## The Debugger Method

### 3.8.1.

The debugger method operates by executing the translated program from the 9100A Debugger.

From your UUT directory:

1. Press the 9100A Edit key.
2. At the "EDIT NAME" prompt, enter the name of the OUTFILE, and press the Return key.
3. Press the 9100A Field-Select key until "PROGRAM" appears in the Reply field, and press the Return key. You are now editing the translated program.
4. Press the (F3) DEBUG softkey.
5. When the debugger program is loaded, press the EXECUTE (F4) softkey.
6. At the "EXECUTE" prompt, enter the translated OUTFILE name, and press the Return key.

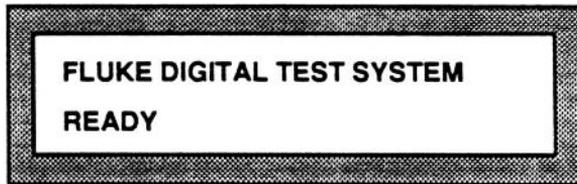
During program execution, EXECUTING appears on the 9100A monitor and EXECUTE PROGRAM on the operator's display. Continue by referring to the Program Execution paragraphs that follow.

## The Operator's Keypad Method

### 3.8.2.

The operator's keypad method operates when the operator's keypad is active and the programmer's keyboard is inactive. If you are in the Editor:

1. Press the 9100A Shift and Quit keys on the programmer's keyboard together to quit the Editor. The operator's keypad is now active and the following message appears on the operator's display:



2. Press the operator's keypad EXEC key. You are prompted for the UUT directory and OUTFILE name.
3. Enter the UUT directory name and use the RIGHT ARROW key to move the cursor to access the PROGRAM name field.
4. Enter the OUTFILE name and press the ENTER key. There is a slight delay while the program is loaded and then the message "EXECUTE PROGRAM" appears on the operator's display.

You can avoid entering each character of a UUT or program name by using the HELP key. After you press the EXEC key from the previous Step 2:

1. Press the HELP key. A list of your UUT directories should appear on the operator's display.
2. Use the ARROW keys to move through the display fields to select the name of your UUT directory.

3. Once the correct name is highlighted, press the ENTER key. This copies the selected name into the UUT name field.
4. Use the RIGHT ARROW key to access the PROGRAM name field. Press the HELP key, and use the ARROW keys to move through the display fields to select the OUTFILE name.
5. Press the ENTER key twice to begin execution.

*NOTE*

*For more information on the HELP key, refer to Section 5 of the 9100-Series Technical User's Manual.*

### **Program Execution**

### **3.8.3.**

When the program begins executing, it goes into a loop that simulates the 9010A EXECUTE key. The message "EXECUTE PROGRAM" is displayed on the operator's display prompting for a 9010A program number.

Use the operator's keypad to:

1. Enter the program number and press the ENTER key. The TL/1 version of the specified program is then executed. At the completion of the program the STOPPED LED comes on.
2. Press the CONT key on the operator's keypad to continue. The message "EXECUTE PROGRAM" is displayed again.

3. Enter the number of the next program to be executed. The program remains in this loop (prompting for a program number and then executing it), until the STOP key is pressed (if the program was executed from the operator's keypad).

*NOTE*

*If the program was executed from the debugger, use the 9100A Quit key to get out of the program loop.*

Using the CONT key ensures that you have the opportunity to read the final message displayed by the 9010A program before it is overwritten by the "EXECUTE PROGRAM" message.

To execute the translated programs on another 9100A/9105A system, copy the following programs to a UUT on that system:

- The translated TL/1 program (OUTFILE).
- All external TL/1 programs that are required by your program.
- The translator's termination message lists the external programs that are required. This message is sent to the 9100A monitor and the log file. For example, the following termination message indicates that external TL/1 programs are required:

The following external TL/1 programs are required:  
9010input, 9010rdprob, 9010add32, 9010pulser

The external programs are provided on the translator diskette.

# Section 4

## Language Reference

---

### OVERVIEW

4.1.

Section 4 provides a quick reference for the mapping between 9010A statements and TL/1. It also contains workarounds for the statements that cannot be translated to TL/1 and statements that are partially translated.

### ADDRESS DESCRIPTORS

4.2.

Address descriptors describe the UUT memory map. Each descriptor identifies a contiguous block of RAM, ROM, or I/O.

Address descriptors are not translated directly, but are used as default address ranges when a ROM TEST, RAM SHORT, RAM LONG, or IO TEST statement is encountered in a 9010A program. If any of these statements defaults the address range, the translator generates a TL/1 statement for each corresponding address block that is defined with a descriptor. Table 4-1 summarizes the mapping between 9010A address descriptors and TL/1 functions.

**Table 4-1. Mapping between 9010A Address Descriptors and TL/1 Functions**

<b>9010A Address Descriptor</b>	<b>TL/1 Function</b>
RAM @ <addr1> - <addr2>	testramfast, testramfull
ROM @ <addr1> - <addr2> SIG <hex number>	testromfull
I/O @ <addr1> - <addr2> BITS <bitmask>	testramfast

**SETUP INFORMATION****4.3.**

Setup information allows you to control the reporting of UUT errors, enable microprocessor lines, and configure operating parameters. Table 4-2 summarizes the mapping between 9010A setup statements and TL/1 functions.

Table 4-2. Mapping between 9010A Setup Statements and TL/1 Functions

9010A Statement	TL/1 Function
BEEP ON ERR TRANSITION	not translated
BUS TEST	no code generated, address saved for later use
ENABLE <forcing line>	podsetup
EXERCISE ERRORS	not translated
LINESIZE	not translated
NEWLINE	not translated
POD - <pod name>	no code generated, name saved for later use
RUN UUT	no code generated, address saved for later use
STALL	not translated
TIMEOUT	podsetup
UNSTALL	not translated

## Statements That Are Not Translated

### 4.3.1.

Statements that cannot be performed through TL/1 and are not translated are described in the following paragraphs. A workaround for each statement is included.

- BEEP ON ERR TRANSITION - <YES/NO>

The 9100A/9105A does not support this feature. This does not affect the function of your program.

**Workaround:** When the program is looping on a fault, you can detect a transition by the changing messages on the operator's display.

- EXERCISE ERRORS - < YES/NO>

This statement can be set manually from the MAIN MENU key on the operator's keypad. (MAIN MENU - MODE menu).

**Workaround:** Set the mode from the operator's keypad before executing your program. To exercise errors, set the mode to: DIAGNOSE. To continue on errors, set the mode to: TEST and select NONE, PORT1, or PORT2 for error logging.

#### NOTE

*This item is part of the system settings that can be saved on disk (SETUP - SAVE menu). All the saved system settings can be restored manually in a single operation (SETUP - RESTORE menu). For more information, refer to Section 5 of the 9100-Series Technical User's Manual.*

- `LINESIZE <decimal number>`

The translator does not support this feature. Linesize sets the maximum length of lines sent out the RS-232-C port. This statement does not affect the operation of your program unless you use the 9010A AUX statement.

**Workaround:** To format lines to a maximum length, edit the TL/1 program generated by the translator. Search for all places where data is sent out the RS-232-C ports. (Search for print using statements that use channel aux.) If any of these statements send a message that is too long, insert an `\nl\0A` in the format string where the line should be split.

For example, to force a maximum linesize of 25, change:

from: `print using "THIS LINE IS TOO LONG AND SHOULD BE  
SPLIT UP\nl\0A"`

to: `print using "THIS LINE IS TOO LONG  
AND\nl\0ASHOULD BE SPLIT UP\nl\0A"`

- NEWLINE <hex number>

The translator does not support the NEWLINE feature. Newline sets the line terminator sequence and delay for lines sent out the RS-232-C port. This statement does not affect the operation of your program unless you use the 9010A AUX statement. The translator uses CRLF as the newline sequence.

*NOTE*

*TL/1 uses \nl instead of \0D to represent a carriage return (CR).*

**Workaround:** To change the terminator sequence, edit the TL/1 program generated by the translator. Search for all places where data is sent out the RS-232-C ports. (Search for print using statements that use channel aux.) Change each occurrence of \nl\0A to the desired sequence.

For example, to change the terminator sequence to a carriage return and two linefeeds, change:

```
from:  print using "TESTING VIDEO CONTROLLER\nl\0A"  
to:    print using "TESTING VIDEO CONTROLLER\nl\0A\0A"
```

- STALL <hex number>

The 9100A default (CTRL-S) cannot be overridden.

**Workaround:** If possible, change the communication protocol of the instrument connected to the 9100A RS-232-C port to also use CTRL-S and CTRL-Q.

- UNSTALL <hex number>

The 9100A default (CTRL-Q) cannot be overridden.

**Workaround:** If possible, change the communication protocol of the instrument connected to the 9100A RS-232-C port to also use CTRL-S and CTRL-Q

## 9010A PROGRAMS

## 4.4.

Programs are sequences of 9010A tests, functions, and operations. Any of the built-in tests or troubleshooting functions may be included in programs, as well as the Learn, Read Probe, and Arithmetic operations. In addition, test sequencing keys are available to help direct the flow of the programs, and allow the construction of conditional and unconditional branches.

Table 4-3 summarizes the mapping between 9010A program statements and TL/1 functions. It also identifies which 9010A registers are modified by each statement. The translator uses an array named `reg[ ]` to simulate the 9010A register set.

**Table 4-3. Mapping between 9010A Program Statements  
and TL/1 Functions**

<b>9010A Statement</b>	<b>TL/1 Function</b>	<b>9010A Register Usage</b>
ATOG	toggleaddr*	D,E,F
AUTO TEST	testbus, testramfast, testromfull (partially translated)	E,F
AUX	print using	---
BUS TEST	testbus	E,F
DPY	print using (asynchronous input not translated)	---
DTOG @ <addr>	toggledata*	D,E,F
DTOG @ CTL	toggledata*	C,D
EXECUTE	execute	---
GOTO	goto	---
IF	if	---
IO TEST	testramfast	A,F
LABEL	<label:>	---
LEARN	not translated	
LOOP	loop	---
PROBE	arm, readout	0
RAM LONG	testramfull	E,F

**Table 4-3. Mapping between 9010A Program Statements and TL/1 Functions (cont)**

<b>9010A Statement</b>	<b>TL/1 Function</b>	<b>9010A Register Usage</b>
RAM SHORT	testramfast	E,F
RAMP	rampdata*	E,F
READ @ <addr>	readvirtual	E,F
READ @ STS	readstatus	C
REG	<variable=>	---
REPT	loop	---
ROM TEST	testromfull (partially translated)	B, E, F
RUN UUT	runuutvirtual (partially translated)	F
STOP	input using	---
SYNC	sync	---
UNARY		
CPL	<variable = ~variable>	---
DEC	<variable = variable - 1	---
INC	<variable = variable + 1>	---
SHL	<variable = variable << 1>	---
SHR	<variable = variable >> 1>	---

**Table 4-3. Mapping between 9010A Program Statements  
and TL/1 Functions (cont)**

<b>9010A Statement</b>	<b>TL/1 Function</b>	<b>9010A Register Usage</b>
WALK	rotate*	E,F
WRITE@ <addr>	writevirtual	E,F
WRITE @ CTL	writecontrol	C
<p><b>NOTE</b></p> <p>* The translator uses readvirtual and writevirtual functions to support 9010A special addresses.</p>		

## Statements That Are Not Translated

### 4.4.1.

The following statements are not translated to TL/1. Included with the statements are workarounds to help you complete the translation.

- LEARN

LEARN generates address descriptors. The 9100A/9105A does not support this feature.

*Workaround:* None

- DPY (asynchronous input)

The 9100A/9105A does not support asynchronous input.

**Workaround:** The 9100A supports polling a channel for input. If your 9010A programs use asynchronous input, the translator inserts a TL/1 *async\_input* function in the output file with your programs. This function is given a register number (0 through \$F). The function polls the keyboard for input. If a key has been pressed, the function reads the key and places the key's value in the specified register. If a key has not been pressed, the register contents are unaltered.

To complete the translation, analyze your program flow to determine where the value of the register that was enabled for async input is checked. At each of these locations, insert a call to the *async\_input* function.

For example, the following 9010A program enables REG1 for asynchronous input and loops until you press a key.

```
PROGRAM 4
  REG1 = 40
  DPY-+%1
1: LABEL 1
  IF REG1 = 40 GOTO 1
```

The value of REG1 is checked in the if statement. Change the code generated by the translator as follows:

```
from:    if reg[1] = $40 then goto L_1 ! if REG1 = 40 GOTO 1
to:      if (async_input (1) = $40) then goto L_1
```

Also, the 9010A and 9100A/9105A return different hex values when a key is pressed. For example, the key value for CLEAR/NO is 1D (hex) on the 9010A, but is 7F (hex) on the 9100A/9105A. If your program checks for a particular key value, edit the TL/1 program generated by the translator, and change the key value to the value returned by the 9100A/9105A.

For example, the following 9010A program loops until you press the READ or WRITE key.

```
PROGRAM 5
  REG2 = 40
  DPY-+%2
  DPY-SELECT TEST (READ/WRITE)
1: LABEL 1
  IF REG2 = 1F GOTO 2      ! READ KEY
  IF REG2 = 20 GOTO 3     ! WRITE KEY
  GOTO 1
2: LABEL 2
  DPY-READ TEST SELECTED
  GOTO F
3: LABEL 3
  DPY-WRITE TEST SELECTED
F: LABEL F
```

The READ and WRITE key values are checked in the two if statements. Change the code generated by the translator as follows:

```
from:  if reg[2] = $1F then goto L_2    ! If REG2 = 1F GOTO 2
       if reg[2] = $20 then goto L_3    ! If REG2 = 20 GOTO 3

to:    if reg[2] = $4A then goto L_2
       if reg[2] = $4F then goto L_3
```

You could also modify the *async\_input()* function so that it remaps the key codes. Table 4-4 compares the key values for the 9010A and 9100A.

**Table 4-4. Comparison of 9010A and 9100A Input Values  
for Keys**

9010A		9100A		9010A		9100A	
VALUE	KEY	KEY	VALUE	VALUE	KEY	KEY	VALUE
0	0	0	30	20	WRITE	WRITE	4F
1	1	1	31	21	RAMP		
2	2	2	32	22	WALK		
3	3	3	33	23	TOGGLE ADDR		
4	4	4	34	24	TOGGLE DATA		
5	5	5	35	25	CONT	CONT	20
6	6	6	36	26	REPEAT	REPEAT	5F
7	7	7	37	27	LOOP	LOOP	5A
8	8	8	38	28	(not used)		
9	9	9	39	29	RUN UUT	RUN UUT	59
A	A	A	41	2A	PROGM		
B	B	B	42	2B	LABEL		
C	C	C	43	2C	GOTO		
D	D	D	44	2D	IF		
E	E	E	45	2E	>		
F	F	F	46	2F	=		
10	LEARN			30	AND		
11	RAM VIEW			31	OR		
12	I/O VIEW			32	SHIFT LEFT		
13	ROM VIEW			33	SHIFT RIGHT		
14	AUTO TEST			34	INCR		
15	BUSTEST	BUS	49	35	DECR		
16	ROM TEST	ROM	47	36	COMPL		
17	RAM LONG			37	EXEC	EXEC	47
18	RAM SHORT			38	REG		
19	I/O TEST			39	READ PROBE	PROBE	48
1A	PRIOR			3A	READ TAPE		
1B	MORE			3B	WRITE TAPE		
1C	ENTER/YES	ENTER/YES	\nl	3C	SYNC	SYNC	57
1D	CLEAR/NO	CLEAR/NO	7F	3D	SETUP		
1E	STS/CTL			3E	DISPL		
1F	READ	READ	4A	3F	AUXI/F		

**Table 4-4. Comparison of 9010A and 9100A Input Values  
for Keys (cont)**

<b>INPUT VALUES for 9100A SOFTKEYS</b>	
<b>KEY</b>	<b>VALUE</b>
F1	81
F2	82
F3	83
F4	84
F5	85
<b>NOTE</b>	
All input values are hex. Refer to Appendix C of the TL/1 Reference Manual for a complete list of input values for the 9100A keys.	

## Statements That Are Partially Translated

### 4.4.2.

The following statements are partially translated to TL/1. Included with the statements are workarounds to complete translation.

- **AUTO TEST**

The TL/1 equivalent of AUTO TEST performs a bus test (testbus), RAM test (testramfast), and ROM test (testromfull). Because the 9010A ROM signatures cannot be used on the 9100A/9105A, the translator does a partial translation of the testromfull.

**Workaround:** Refer to ROM TEST below for instructions on how to complete the translation.

- ROM TEST

The 9010A and 9100A use different algorithms to compute ROM signatures. The signatures from the 9010A are not compatible with the 9100A. Because the 9010A ROM signature cannot be used on the 9100A/9105A, the translator does a partial translation and generates a testromfull statement using a signature of 0000.

**Workaround:** To complete the translation, relearn the ROM signatures on the 9100A/9105A, edit the TL/1 program, and correct the signature argument (sig) to each testromfull statement.

For example, the following 9010A program performs a ROM TEST:

```
PROGRAM 35
ROM TEST @ 8000 - 9FFF SIG AFC7
```

If the 9100A ROM signature is ABCD, change the following:

**from:** testromfull addr \$8000, upto \$9FFF, mask m,  
addrstep s, sig \$0000

**to:** testromfull addr \$8000, upto \$9FFF, mask m,  
addrstep s, sig \$ABCD

To relearn ROM signatures, use a known-good UUT to learn the ROM signatures on the 9100A/9105A. ROM signatures are learned through the operator's keypad ROM TEST key (ROM TEST - GETSIG menu). ROM signatures can also be learned using the TL/1 *getromsig()* function.

Correct the TL/1 program by editing the TL/1 program and finding each testromfull statement. Complete the TL/1 statement by correcting the signature.

For information on how to learn a ROM signature, refer to the Keypad Reference section of the *9100-Series Technical User's Manual*.

- RUN UUT

The 9010A halts an active RUNUUT before doing a pod access. The 9100A/9105A does not halt an active RUNUUT, and a runtime error (RUNUUT active) occurs. Program execution cannot be continued after this error.

Workaround: Analyze your program flow to locate the first pod access after a runuutvirtual statement. Edit the TL/1 program, and insert a haltuut() statement right before the first pod access.

For example, the following program performs a RUNUUT. The first pod access after the RUNUUT is a write.

```

program P_6                                ! PROGRAM 6
runuutvirtual addr $5B00                    !   RUN UUT @ 5B00
if reg[$E] = $20 then goto L_F             !   IF REGE = 20 GOTO F
reg[$E] = $B                               !   WRITE @ 10050 = B
reg[$F] = $10050
writevirtual extaddr 0,addr reg[$F], data reg[$E]

```

Insert a haltuut() statement before the WRITE is performed. Change the following:

```

from:  if reg[$E] = $20 then goto L_F reg[$E] = $B
to:    if reg[$E] = $20 then goto L_F haltuut()
       reg[$E] = $B

```

## BINARY PROGRAMS

## 4.5.

A binary program is a program compiled into Z-80 machine code for execution in the 9010A/9005A. Binary programs were distributed on the 9000A Utility Programs tape (9000A-910).

The translator package includes several TL/1 programs that simulate the actions of the 9010A binary programs. Table 4-5 summarizes the mapping between 9010A binary programs and TL/1 programs.

**Table 4-5. Mapping Between 9010A Binary Programs  
and TL/1 Programs**

9010A Program	TL/1 Program
Merge Tape	not translated
Unsigned 32-bit Add	program 9010ADD32
Unsigned 32-bit Subtract	program 9010SUB32
Frequency Counter	program 9010FREQ
Setup	program 9010SETUP
Probe Pulser	program 9010PULSER
Pod Self-Test	not translated

When the translator detects a binary program in the input file, it generates a call to the corresponding TL/1 program.

## Statements That Are Not Translated

### 4.5.1.

The following binary programs cannot be translated to TL/1. Workarounds to complete the translation are included with the programs.

- Merge Tape

N/A for the 9100A (allows 9010A cassette tapes to be *merged*).

**Workaround:** None.

- Pod Self Test Program

The Pod self test cannot be performed from TL/1.

**Workaround:** The self test can be done from the front panel MAIN MENU key (MAIN MENU - SELFTEST).

- 9010A-006 Programs (Asynchronous Signature Probe Option)

**Workaround:** The ability to take asynchronous probe measurements is built into the 9100A. The TL/1 language contains several statements to configure the probe and take measurements with the probe. For more information, refer to Section 3 of the *9100-Series Programmer's Manual*.



# Appendix A

# Translator Output

---

## OVERVIEW

## A.1.

During the translation of 9010A programs to TL/1, the translator outputs information in the following formats:

- Startup, error, and termination messages to the 9100A monitor.
- Startup and progress messages to the operator's display.
- Startup, error, and termination messages to a text log file.
- A TL/1 text output file containing the translated address descriptors, setup information, and translated 9010A programs.

The following paragraphs describe the different types of translator output. Also included are explanations of the different type of messages and a breakdown of the TL/1 output file.

## 9100A MONITOR OUTPUT

### A.2.

The start-up message, error messages, and termination message are displayed on the 9100A monitor during the processing of input file. The following paragraphs describe each of the displayed messages. Figure A-1 shows these messages on the 9100A monitor. Use the 9100A Scroll Lock key to stop the messages from scrolling off the 9100A monitor.

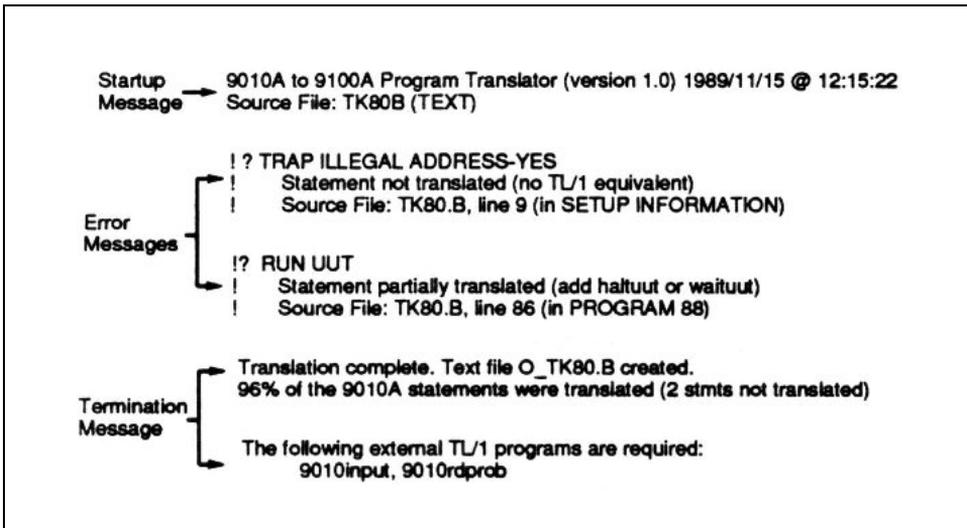


Figure A-1. Example of 9100A Monitor Output

### The Startup Message

#### A.2.1.

The startup message displays the version number of the translator, the date and time, and the name of the input file.

## The Error Message

### A.2.2.

Each error message identifies a 9010A statement that could not be translated to TL/1. Error messages are also written to the TL/1 output file. Refer to Figure A-2 for an example of an error message. Each three-line error message has the following format:

- The first line contains the 9010A statement that was not translated.
- The second line explains why the statement was not translated.
- The third line identifies where the 9010A statement appeared in the input file.

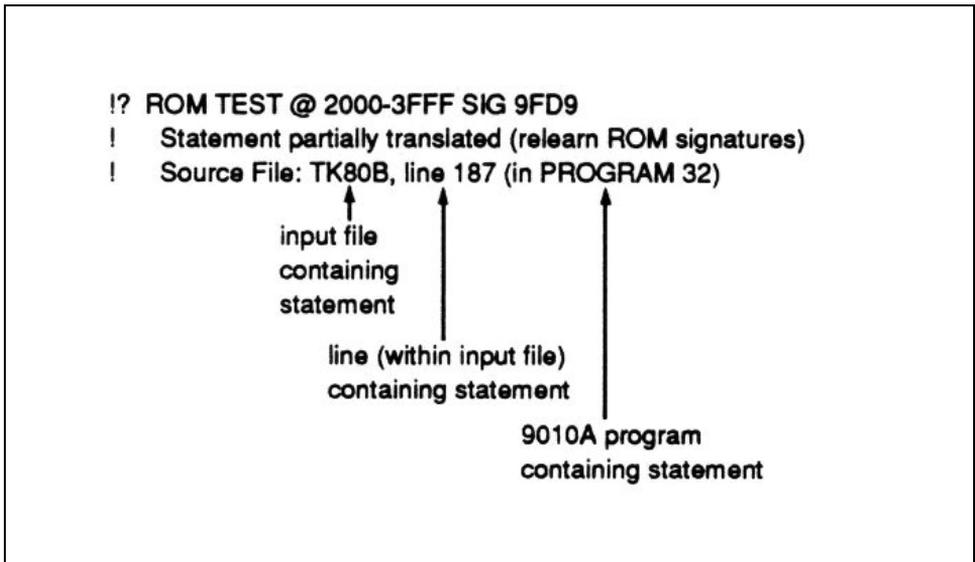


Figure A-2. Translator Error Message Example

*NOTE*

*Each time an error is found, an error message is written to the monitor.*

## **The Termination Message**

### **A.2.3.**

The termination message indicates that the translation is complete and identifies the percentage of 9010A statements that are successfully translated. The termination message also identifies the external TL/1 programs that are required by your translated program. These programs are provided on the translator disk. A copy of these programs must be present on all 9100A/9105A systems that your translated programs will be executed on.

If less than 100% of the statements are translated, there may be differences in the execution of the 9010A and the 9100A programs. Each statement that is not translated should be examined. In most cases, there are workarounds that allow the 9100A program to match the 9010A program. These workarounds are described in Section 4. Many of the Setup Information statements do not affect program operation.

## **OPERATOR'S DISPLAY OUTPUT**

### **A.3.**

The translator displays the startup and progress messages on the operator's display. The startup message contains the translator version number, and the progress message identifies the program that is currently being translated. Each time the translator encounters a new 9010A program in the input file, the display is updated. An example of the operator's display output is shown in Figure A-3.

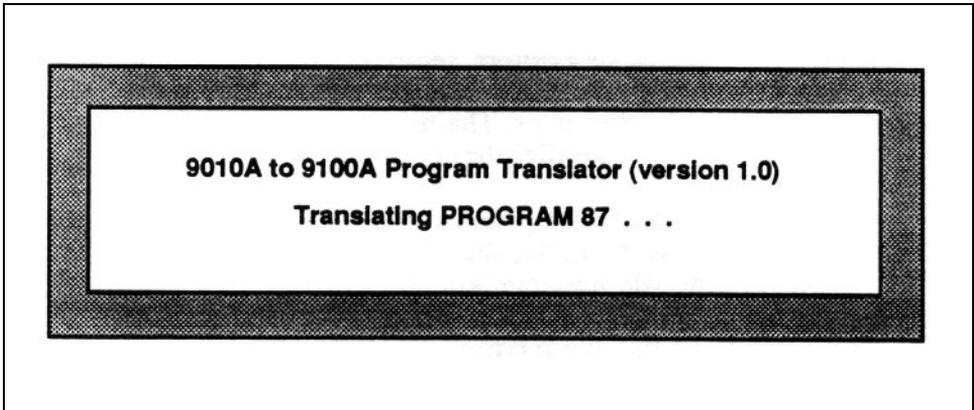


Figure A-3. Operator's Display Output Example

## LOG FILE OUTPUT

## A.4.

All of the information that appears on the monitor is also sent to a text log file. The log file contains the translator start-up message, error messages, and termination message. When the translation is complete, the log file can be edited and reviewed. For information on editing the log file, refer to Review the Translator Errors and Complete the Translation, in Section 3. The name of the log file is specified with the LOGFILE argument to the translator.

## TL/1 OUTPUT

## A.5.

The translator generates a text output file containing the translated address descriptors, setup information, and programs. The name of the text file is specified with the `OUTFILE` argument to the translator. The termination message printed to the 9100A monitor verifies the creation of this file.

The output file contains global variable declarations, a function for each 9010A program, the *9010exec* function, and a main program. The file may contain an *async\_input* function. The TL/1 output file also contains the translator errors embedded as comments. To find these errors, use the 9100A editor `SEARCH (F9)` softkey. Each error is prefixed with the characters `"!?"`, and this string can be searched for.

Figure A-4 shows two 9010A programs and the translated TL/1 version of these programs. Program 2 prompts for a number, multiplies it by 2 and displays the result. Program 3 prompts for a number, divides it by 2 and displays the result.

These 9010A programs are provided on the Translator diskette. They are in the file `/DR1/TRANSLATE/9010TAPE`. To familiarize yourself with the translation steps, it is recommended that you translate this file and execute the resulting TL/1 program

### 9010A PROGRAMS

PROGRAM 2     48 BYTES

```
DPY-ENTER A DECIMAL NUMBER \8
REG9 = REG8 SHL
DPY-@8 * 2 = @9
```

PROGRAM 3     48 BYTES

```
DPY-ENTER A DECIMAL NUMBER \8
REG9 = REG8 SHR
DPY-@8 / 2 = @9
```

**Figure A-4. TL/1 Output File Example**

## TL/1 TRANSLATED PROGRAMS

```

program 0_9010TAPE
  declare
    global numeric array [0:$F] reg
    global numeric dpy
    global numeric aux
    global numeric dpy_in
    global numeric aux_in
    global numeric syncmode
  end declare

!----- PROGRAM 2 -----
!
function P_2                                     ! PROGRAM 2   48 BYTES
  declare
    global numeric array [0:$F] reg
    global numeric dpy
    global numeric aux
    global numeric syncmode
  end declare

                                                !   DPY-ENTER A DECIMAL
                                                !   NUMBER \8
  print using "\nl\lB[KENTER A DECIMAL NUMBER ", on dpy
  '9010input' (10, $8)
  reg[$9] = (reg[$8]) << 1                    !   REG9 = REG8 SHL
                                                !   DPY-@8 * 2 = @9
  print using "\nl\lB[K?@ * 2 = ?@", on dpy, reg[$8], reg[$9]
end function

!----- PROGRAM 3 -----
!
function P_3                                     ! PROGRAM 3   48 BYTES
  declare
    global numeric array [0:$F] reg
    global numeric dpy
    global numeric aux
    global numeric syncmode
  end declare

```

Figure A-4. TL/1 Output File Example (cont)

```

! DPY-ENTER A DECIMAL
! NUMBER \8
print using "\nl\lB[KENTER A DECIMAL NUMBER ", on dpy
'9010input' (10, $8)
reg[$9] = (reg[$8]) >> 1          ! REG9 = REG8 SHR
! DPY-@8 / 2 = @9
print using "\nl\lB[K?@ # 2 = ?@", on dpy, reg[$8], "/", reg[$9]
end function

!----- 9010exec() -----
!
function '9010exec' (prognum)
  declare
    numeric prognum
    global numeric array [0:$F] reg
    global numeric array [0:10,0:7] lreg
    global numeric lreg_depth
  end declare

  ! push local registers
  if (lreg_depth = 10) then
    fault 'FATAL-DEPTH EXCEEDED'          ! 9010 programs nested
                                          ! too deeply
  end if
  lreg_depth = lreg_depth + 1
  loop for i = 0 to 7
    lreg[lreg_depth, i] = reg[i]
    reg[i] = 0
  end loop

  if (prognum = 2) then
    P_2()
  else if (prognum = 3) then
    P_3()
  end if

  ! pop local registers
  loop for i = 1 to 7
    reg[i] = lreg[lreg_depth, i]
  end loop
  lreg_depth = lreg_depth - 1
end function

```

Figure A-4. TL/1 Output File Example (cont)

```

!----- main program starts here -----
  dpy = open device "/term1", as "output", mode "unbuffered"
  aux = open device "/port2", as "output", mode "unbuffered",
  speed 9600, bits 7, stop 1, parity "odd", stall "on"
  dpy_in = open device "/term1", as "input", mode "unbuffered"
  aux_in = open device "/port2", as "input", mode "unbuffered",
  speed 9600, bits 7, stop 1, parity "odd", stall "on"
  syncmode = 0
  lreg_depth = 0

  loop while (1)
    print using "\n\1B[KEXECUTE PROGRAM ", on dpy
    tmp = reg[0]
    '9010input' (10, 0)
    prognum = reg[0] \ reg[0] = tmp
    '9010exec' (prognum)
  end loop

end program

```

**Figure A-4. TL/1 Output File Example (cont)**

Descriptions of the contents of the TL/1 output file are found in the following paragraphs.

## **Global Variable Declarations**

### **A.5.1.**

The global variables include an array (reg) that simulates the 9010A register set, several numerics that are I/O channels (dpy, dpy in, aux and aux\_in), and a numeric (syncmode) that keeps track of the current syncmode. The I/O channels are used by the translated DPY and AUX statements. Syncmode is used by the translated READ PROBE statement.

## Functions

### A.5.2.

Each 9010A program is translated into a TL/1 function. Each program number is prefixed with "P\_" to form the TL/1 function name. For example, function P\_15 is the TL/1 translation of PROGRAM 15. Execution of these functions is controlled by the main program.

## The 9010exec Function

### A.5.3.

The *9010exec* function is passed the number of a 9010A program by translator generated TL/1 code and maps it onto the TL/1 function that should be executed. This function is called by the main program, and the function is optimized by the translator to recognize only program numbers that appeared in the input file. Refer to the Appendix C for instructions on how to further optimize this function.

## The *async\_input* () Function

### A.5.4.

The *async\_input* function is included if your 9010A programs used asynchronous input in a DPY statement. Refer to Section 4 for instructions on how to use this function to complete the translation of DPY statements.

## The Main Program

### A.5.5.

The main program configures the Pod using several podsetup statements if your input file contained setup information. The main program opens I/O channels to the display, keypad, and RS-232-C port. The 9100A has two RS-232-C ports, and the translator assumes that /port2 should be used for AUX I/O. The following are defaults to the port parameters:

port: /port2, baud rate: 9600, data bits: 7, stop bits: 1,  
parity: odd, XON/XOFF: enabled

#### NOTE

*If the port selection or parameters are incorrect for your application, refer to Appendix C for instructions on how to change them.*

After opening the I/O channels, the main program goes into a loop that simulates the 9010A EXECUTE key. The main program prompts for a program number, then calls the *9010exec* function to execute the translated version of the 9010A program. When the current program terminates, the STOPPED LED turns on. Press the CONT key on the 9100A operator's keypad to continue. When the CONT key is pressed, the message "EXECUTE PROGRAM" is displayed. The main program prompts for the next program to be executed. To exit the main program, press the 9100A Stop key.



# Appendix B

## Translator Errors

---

### OVERVIEW

**B.1.**

This appendix describes the errors that can occur during the translation process. Included with the error are possible remedies or instructions to locate further information to eliminate these errors.

### ERRORS WHILE TRANSFERRING FROM THE 9010A TO THE 9100A

**B.2.**

Data is transferred from the 9010A to the 9100A through the RS-232-C ports. As data is received by the 9100A, the terminal emulator echoes the data on the 9100A monitor, allowing you to watch the transfer. If nothing appears on the 9100A monitor or if the data is garbled, a data transfer error has occurred.

Data transfer errors are most likely caused by problems with the RS-232-C cable wiring or port configuration. Refer to Section 2 for a description of the cable wiring and recommended port settings.

**ERRORS WHILE TRANSLATING****B.3.**

Each time the translator encounters a line in the input file that cannot be translated to TL/1, it displays an error message on the 9100A monitor. Each three-line error message has the following format:

- The first line contains the 9010A statement that was not translated.
- The second line explains why the statement was not translated.
- The third line identifies where the 9010A statement appeared in the input file.

For an example of an error message, see 9100A Monitor Output in Appendix A. Table B-1 contains possible errors issued by the translator.

**Table B-1. Possible Errors Issued By The Translator**

<b>MESSAGE</b>
Statement not translated (syntax error)*
Statement not translated (no address descriptors defined)§
Statement not translated (no TL/1 equivalent)†
Statement not translated (too many TRAP or ENABLE statements, maximum is 15 statements)£
Statement not translated (no TL/1 equivalent for asynchronous input)†
Statement not translated (unrecognized binary program)†
Statement not translated (no TL/1 equivalent for Merge Tape)†
Statement not translated (no TL/1 equivalent for PodSelfTest)†
Statement partially translated (add haltuut or waituut statement)†
Statement partially translated (relearn ROM signatures)†
Warning: Statement partially translated (if special address is used)‡
<b>NOTES</b>
<p>* The translator does not recognize the input line as a valid 9010A statement.</p> <p>If LINESIZE was not set to 255 when the 9010A programs were transferred to the 9100A, a long line could have been split in two during the transfer. This would result in two syntactically incorrect lines in the input file. If this was the case, edit the input file (INFILE), join the two lines, and repeat the translation.</p> <p>§ The input file did not contain address descriptors. Section 3 contains instructions on how to transfer all the information on the 9010 tape. Transfer the data again and repeat the translation.</p> <p>£ The input file contained more than 15 TRAP or ENABLE statements. This can happen if the setup information was sent more than once. Transfer the data again and repeat the translation.</p> <p>† Section 4 provides a workaround, or instructions on how to complete the translation.</p> <p>‡ Appendix C provides instructions on how to complete the translation.</p>

**ERRORS WHILE COPYING TO TL/1****B.4.**

No errors should occur during the copy. A copy error means that the text file contained a line that was not valid TL/1 syntax.

**EXECUTION ERRORS****B.5.**

If an error occurs when your translated TL/1 program is running, an error message is displayed on the operator's display, and the program terminates. Some possible errors are described below:

```
program '<program name>' is not on disk
```

Your translated program called a program or function that could not be found. If a 9010A program is being called, add that program to the translator's input file (INFILE) and repeat the translation. If an external program is being called, copy the program from the translator disk into the UUT.

```
program name doesn't match object name <name>
```

The name of a TL/1 program contained inside a file must be the same as the file name. The translator checks that the TL/1 program it generates has the same name as the output file it generates. If you used a different destination name when copying the translator output file from TEXT to PROGRAM, this error occurs at runtime. Edit the program and change the program name to match the filename.

```
cannot run program '<program name>' due to check errors
```

This error can result if the name of a program inside a file does not match the filename. This was described for the previous error. If this is not the problem, edit the program and press the CHECK softkey. Check inserts error messages in the program as TL/1 comments. Each error message is prefixed with "+++". Use the Editor SEARCH softkey to find this string.

# Appendix C

## Helpful Information

---

### OVERVIEW

C.1.

Appendix C contains additional information that may aid in understanding the translator and reinforce what has been presented in this manual.

### OPTIMIZING THE 9010EXEC () FUNCTION

C.2.

The translator generates a 9010exec() function. This function is the entry-point to the execution of your 9010A programs. It is passed a 9010A program number, and maps that onto the TL/1 function to be executed.

The following is a portion of this function:

```
function '9010exec' (prognum)
  :
  if (prognum = 0) then
    P_0()                                ! execute function P_0
  else if (prognum = 1) then
    P_1()                                ! execute function P_1
  else if (prognum = 3) then
    P_3()                                ! execute function P_3
  else if (prognum = 5) then
    P_5()                                ! execute function P_5
  end if
  :
end function
```

This function is optimized to compare only against program numbers that appeared in your 9010A input file.

*NOTE*

*The program numbers are compared in numerical order.*

A significant speed improvement can be made by editing the TL/1 program and reordering the if-then-else statements so that the program numbers are ordered from most commonly executed to least commonly executed. For example, program 5 may be a delay loop that is executed more than any other program. In this case, you would want the first comparison to be against program number 5 rather than 0.

## **AUX PORT SELECTION AND PORT PARAMETERS**

### **C.3.**

The 9100A/9105A have two serial ports named /port1 and /port2. On the 9010A, the baud rate, parity, number of data bits and stop bits were set with switches on the rear panel of the instrument. The translator assumes that /port2 should be used for AUX statements and inserts two TL/1 statements into your program to open the port:

```
aux = open device "/port2", as "output", mode  
"unbuffered", speed 9600, bits 7, stop 1, parity "odd",  
stall "on"
```

```
aux_in = open device "/port2", as "input", mode  
"unbuffered", speed 9600, bits 7, stop 1, parity "odd",  
stall "on"
```

If you want to use /port1 or the speed, bits, stop, parity, or stall parameters are configured incorrectly, edit the program and modify both open statements to reflect the desired port and port parameters. Use the 9100A Editor SEARCH softkey to find the open statements. Refer to the *9100-Series TL/1 Reference Manual* for details on the TL/1 open statement.

**9LC COMPATIBILITY****C.4.**

The translator can convert 9010A programs that were originally written on a PC with the 9010A Language Compiler (9LC). 9LC programs are translated like any other 9010A program. The compiled programs are first transferred from the PC to the 9010A, and then they are transferred to the 9100A for translation.

The translator cannot process the 9LC source directly because it does not accept the 9LC language extensions. 9LC extended the 9010A language to include program comments, keyword abbreviations, optional keywords, shorthand notation for unary operators, symbolic register, program, and label names, and includes files and lower-case alphabetic.

**PROBE PULSER****C.5.**

9010A programs control the probe pulser by prompting you to press the PULSE HIGH or PULSE LOW keys during program execution. On the 9100A/9105A the probe pulser mode cannot be changed from the operator's keypad while a TL/1 program is running. Instead, the program uses the TL/1 pulser function to control the probe pulser directly.

To complete the translation:

1. Edit the TL/1 program file and find all places where you are prompted to change the probe pulser mode.
2. Replace each prompt with the appropriate TL/1 statement:

```

pulser mode "high"      ! to pulse the probe high
pulser mode "low"      ! to pulse the probe low
pulser mode "toggle"   ! to pulse the probe high
                        ! and low

pulser mode "off"      ! to turn the probe pulser
                        ! off

```

## SPECIAL ADDRESSES

## C.6.

Special addresses are addresses that are outside the normal address space of a microprocessor. Some 9010A programs use special addresses to access other address spaces (such as I/O), or to access pod special functions. The 9100A/9105A built-in tests require valid addresses, and an "Illegal Address" error will occur at runtime if a special address is used.

To execute a built-in test at a special address on the 9100A/9105A, the 9010A special address should be split into its two components: the address space and the valid address. The TL/1 `setspace` function is called to set the address space. Then the built-in test is called, using only the valid portion of the address.

Each time the translator encounters a built-in test (BUS TEST, RAM SHORT, RAM LONG, ROM TEST, IO TEST, or AUTO TEST) in the 9010A program being translated, the program translates the statement and issues the following warning message:

```
Warning: Statement partially translated (if special address
      used)
```

To determine if the translation is complete, examine the address used in the 9010A built-in test. If it is not a special address, the translation is complete and no further action is required. You can safely ignore the warning message. If you are not sure if it is a special address, refer to your pod manual.

However, if a special address was used in the built-in test, you must complete the translation. To do this, edit the TL/1 program file and find the built-in test using the special address. Split the special address into its two components (address space and valid address). The following changes are required:

- Use the TL/1 `getspace` and `setspace` functions to set the address space before the built-in test is called.

- Modify the address used by the built-in test to only use the valid portion of the address.
- Use the TL/1 *getspace* and *setspace* functions to reset the address space to MEMORY after the built-in test is called. This ensures that later pod accesses will operate in the correct address space.

For example, on the Z-80 pod, hexadecimal 0000 to FFFF are valid addresses. The address 100C3 is a special address that refers to address 00C3 in I/O space. The 9010A statement:

```
IO TEST @ 100C3 BTS 3D
```

is translated as follows:

```
s = podinfo addrinc
testramfast addr $100C3, upto $100C3, mask $3D, addrstep s
```

This translation is incomplete because \$100C3 is a special address. To complete the translation, insert a *getspace* and *setspace* command and modify the address used in the testramfast built-in test as follows:

```
s2 = getspace space "I/O"
setspace space s2
s = podinfo addrinc
testramfast addr $00C3, upto $00C3, mask $3D, addrstep s
s2 = getspace space "MEMORY"
setspace space s2
```

Refer to the *getspace* and *setspace* commands in the *9100-Series TL/1 Reference Manual* for more information

## TRANSLATING IN BATCH MODE

## C.7.

If you have several 9010A tapes to be translated, you can create a TL/1 batch file to do the translation. A batch file allows you to do other things while the translator processes all the tapes. You start up the TL/1 batch file program and then return when it is complete. Although the early 9100A monitor output has scrolled off the screen, the translation results can be seen by reviewing the log file for each tape.

For example, assume you have five 9010A tapes to be translated. All five tapes have been transferred into the UUT directory on the 9100A. The tapes were transferred into text files named TAPE1, TAPE2, TAPE3, TAPE4, and TAPE5. The following TL/1 program translates all five tapes in batch mode:

```
! This program is a "batch file" to translate five 9010A
! tapes. The output file names are unique. The TL/1 output
! files are prefixed with "0_" and the log file names are
! prefixed with "L_".

program batch
! The translator arguments are:
!     translate (infile, outfile, logfile, embed)
  translate ("TAPE1", "O_TAPE1", "L_TAPE1", "Y")
  translate ("TAPE2", "O_TAPE2", "L_TAPE2", "Y")
  translate ("TAPE3", "O_TAPE3", "L_TAPE3", "Y")
  translate ("TAPE4", "O_TAPE4", "L_TAPE4", "Y")
  translate ("TAPE5", "O_TAPE5", "L_TAPE5", "Y")
end program
```