Standard Products

UT28F64/LV and UT28F256/LV PROMs
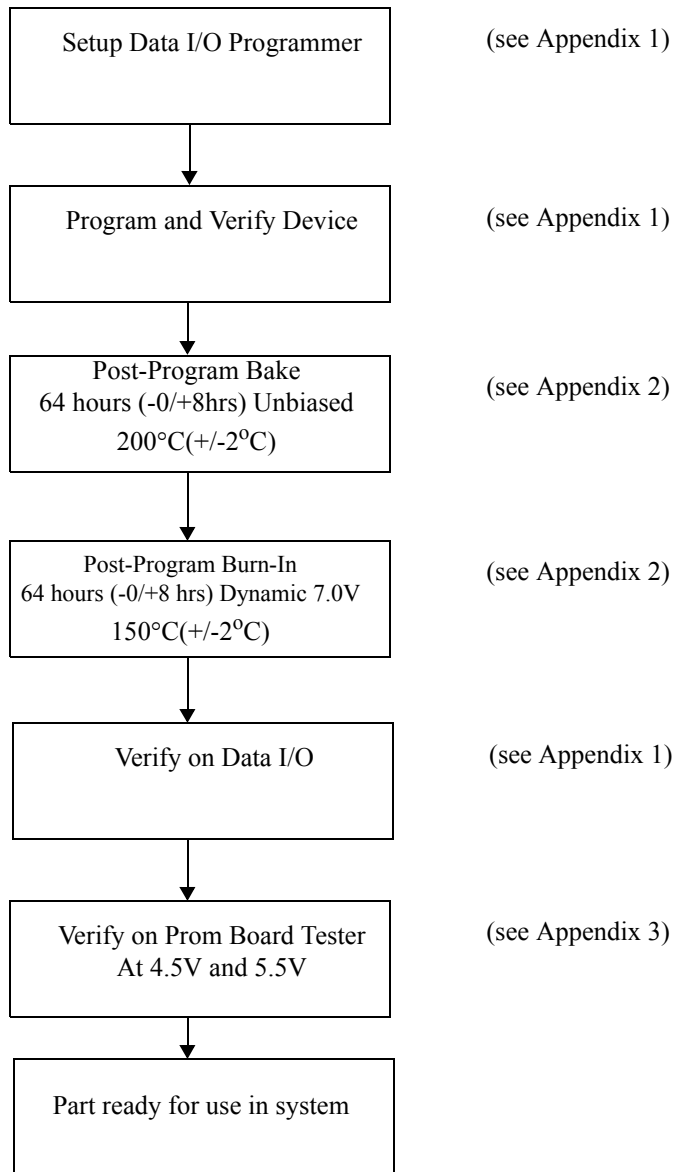
Programming User Guide

Legacy Products

June 2011

PROM PROGRAMMING FLOW FOR UT28F64, UT28F256, UT28F64LV and UT28F256LV PROM for Legacy Products

The UT28F64 and UT28F256 are 5-volt parts. The UT28F64LV and UT28F256LV are 5-volt parts that have been characterized for 3V operation. All four of these parts should follow the same flow for Post-Program Conditioning. These parts will be burned in at 7.0V and the Verify on the Prom Board Tester shall be performed at 4.5V and 5.5V. The UT28F64LV and UT28F256LV will not be damaged when tested at the higher voltages.

Parts are programmed and verified using a Data I/O 2900, 3900, 3980, or 3980xpi Programmer. After programming, the parts go through Post-Programming Conditioning (PPC). PPC is used to enhance the reliability (and radiation tolerance) of the Aeroflex UTMC PROMs following programming. PPC consists of a 64-hour unbiased bake and a 64-hour dynamic burn-in. Parts are verified using the Data I/O Programmer and the Aeroflex UTMC PROM Board Tester. This verification identifies parts that fail after PPC. The PROM Board Tester verifies the product by doing an at-speed test using the same functional test as the production tester. After the parts have been through this flow (see Figure 1), they are ready for use in your system.

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┌─────────────────────────────┐
│                             │
│  Setup Data I/O Programmer  │         (see Appendix 1)
│                             │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│                             │
│  Program and Verify Device  │         (see Appendix 1)
│                             │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│    Post-Program Bake        │
│ 64 hours (-0/+8hrs) Unbiased│         (see Appendix 2)
│      200°C(+/-2°C)          │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│    Post-Program Burn-In     │
│64 hours (-0/+8 hrs) Dynamic 7.0V│     (see Appendix 2)
│      150°C(+/-2°C)          │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│                             │
│      Verify on Data I/O     │         (see Appendix 1)
│                             │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│   Verify on Prom Board Tester│        (see Appendix 3)
│        At 4.5V and 5.5V     │
│                             │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│                             │
│  Part ready for use in system│
│                             │
└─────────────────────────────┘
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Figure 1. PROM Programming Flow

DATA I/O Programming Set-Up Guide

The following reviews the installation of programming software for the UT28F64/UT28F256 and UT28F64LV/UT28F256LV PROM. To program the PROMs with an industry standard data file, the user simply loads the programming algorithm and data file into the DATA I/O programming hardware.

HiTerm Software:

1) Insert diskette with appropriate algorithm into DATA I/O floppy drive.

From the Main Menu:
2)	Choose: _Select Device_ (This will bring up the Manufacturer List)
3)	 Choose: _UTMC_ (This will bring up the part menu for UTMC)
4)	 From the Part Menu select:
- UT28F256
- UT28F256-FP
- UT28F64
- UT28F64-FP

PROMlink or TASKLink Software:

1) Insert diskette with appropriate algorithm into DATA I/O floppy drive.

2) Choose _Setup_ from the menu bar
3)	 From the _Setup_ menu choose: _Select Device_ (This will bring up a Manufacturer List)
4)	 From the _Manufacturer List_ choose: _UTMC_ (This will bring up a UTMC device menu)
5)	 Select one of the following device types from the _UTMC Device Menu_:
- UT28F256
- UT28F256-FP
- UT28F64
- UT28F64-FP

Programming All Unused Bit Locations

Aeroflex UTMC requires that you program all bits in the UT28F64/UT28F256 and the UT28F64LV/UT28F256LV. If your program does not require all of the space within the PROMs, you should program the unused locations with a default value, or configure the DATA I/O programmer to write zero's to the unused bit locations. The following instructions describe the steps required by HighTerm, TaskLink, and PROMLink to properly configure the DATA I/O system to program zeros into all unused bit locations.

HighTerm Software:

From the Main Menu:

1) Choose: *More Commands* (This will bring up a list of command menus)
2) Choose: *Edit Data* (This will bring up a list of data editing options)
3) Choose: *Fill Memory* (This will bring up the memory configuration options)
4) From the *Fill Memory* page:
    -Set Memory Begin Address to "0"
    -Set Block Size to "2000" (hexadecimal) (UT28F64/UT28F64LV)
     or Set Block Size to "8000" (hexadecimal) (UT28F256/UT28F256LV)
    -Set Fill Variable to "0"
    -Hit the [ENTER] key

TaskLink/PROMLink Software:

1) Choose *Setup* from the menu bar
2) From the *Setup* menu choose: *Memory Parameters*
    (This will bring up memory configuration parameters)

3) Set the following option in the *Memory Parameters* menu:
    Under "*Automatic RAM Fill*", click between the parenthesis ( ) next to
     "Specific: 00". You will see (●) next to "Specific: 00" when the item is
    properly selected. The default value for the RAM fill is 00h, and is displayed
    by the two zeros next to "Specific:". If you want the default fill value to be
    something other than 00h, you can click on the field next to "Specific:" and
    change the number to a desired hexadecimal value.

Notes:

1. For programming, make sure that the continuity check, fuse verify and functional test are on. Failure to have these parameters properly set could result in an improperly programmed device that appears as a "PASS" after programming.

   Setting up the programmer to perform continuity check and functional verification under HiTerm, PROMLink, and TASKLink is described below.

   In Highterm:
   From the Main Menu:

   1) Choose: *More Commands* (This will bring up a list of command menus)
   2)   Choose: *Configure System* (This will bring up a list of system configuration options)
   3)   Choose: *Edit* (This will bring up the option to set up the programming configuration)
   4)   Choose: *Programming* (This will bring up the the programming configuration options)
   5)   From the *Edit Programming Parameters* page:
                           - Set <u>Logic Verification</u> to "A"
                           - Set <u>Continuity Check</u> to "Y."

   In TASKLink/PROMLink:
   From the Main Menu Bar:

   1) Choose: *Setup*
   2)   From the *Setup* menu choose: *General Parameters*
         (This will show general programmer configuration settings)

   3)   Set the following options in the *General Parameters* menu:
               - Set <u>Verify Passes</u> to "TWO VCC LOW/HIGH."
               - Click on the Check Box next to Continuity Checking
           (The box should have an "X" when enabled.)

   Now **return** to the *Setup* menu, and perform the following:

   1) From the *Setup* menu choose: *Logic Parameters*:
   2)   Configure the following option from the *Logic Parameter* menu:
           - Set <u>Verify Options</u> to "FUSE VERIFY AND FUNCTIONAL TEST."

2. If the part fails continuity when attempting to program, try again with the part reseated in the socket. If that fails, make sure the part is correctly oriented in the Data I/O programmer. DIPs must be oriented as per the diagram on the programmer base. Flatpack parts must be oriented in their carriers correctly (see attached carrier orientation diagram).

3. The DATA I/O 2900, 3900, 3980, 3980xpi "Blank Check" utility does not function properly on the UT28F64/LV and UT28F256/LV PROM.

4. Programmer Pin Interface (PPI) boards are available from DATA I/O. (see Table 1)

UT28F64/LV and UT28F256/LV PROM Alignment Within Carrier

The following diagram shows the alignment of the UT28F64/UT28F256 and UT28F64LV/UT28F256LV PROM within its carrier. It is very important that the PROM is properly aligned in the carrier during programming. If you attempt to program the PROM when it is not properly aligned, the Data I/O programmer will fail continuity check.

No. 28

No. 15

Bottom Side
of the UT28F64/LV and
UT28F256/LV

70007

No. 1

No. 14

MARK/LID DOWN
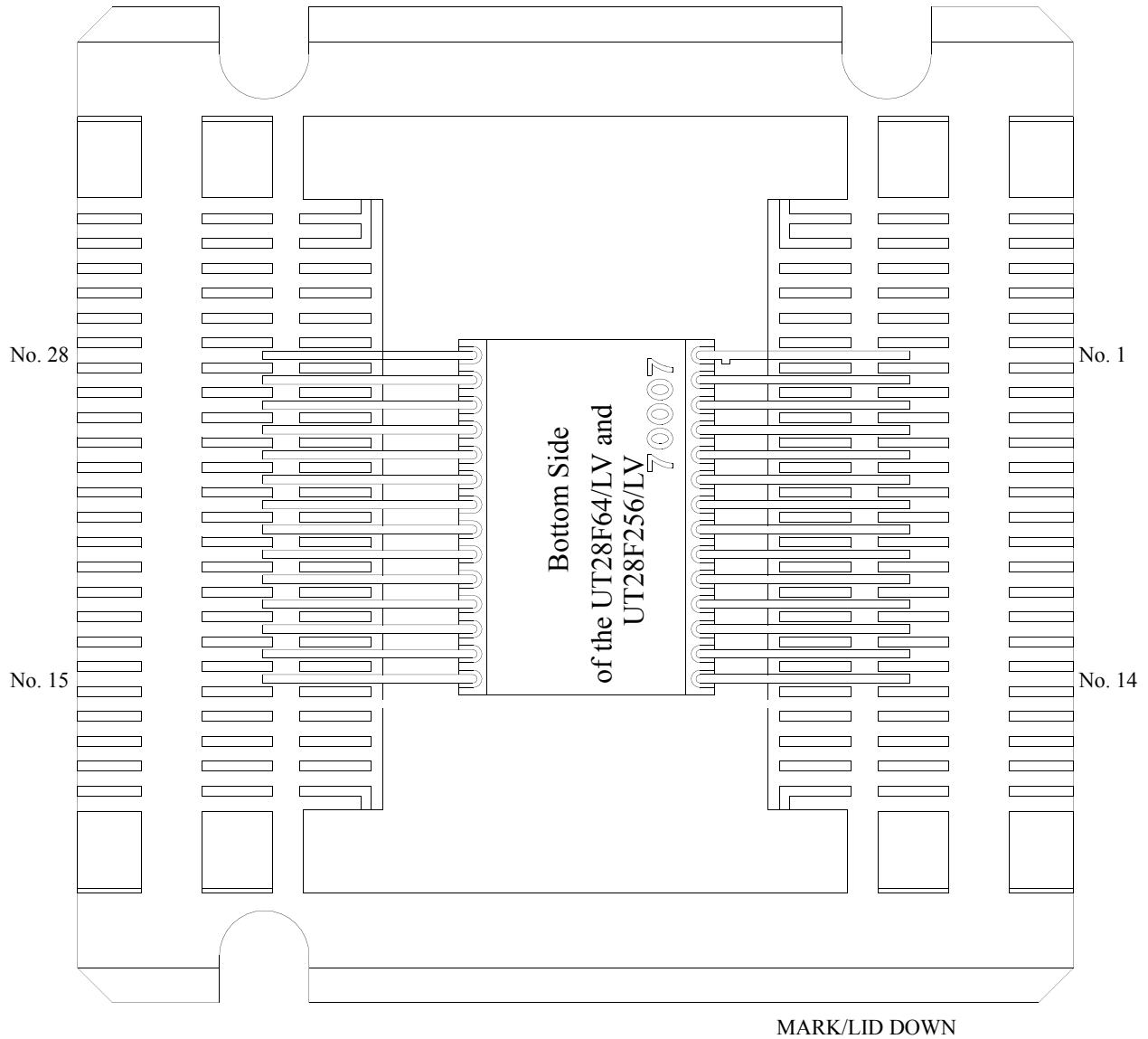
Figure 2. Diagram of the UT28F64/LV and UT28F256/LV PROM 28 Pin Flat Pack in Carrier

Programmer Options

Data I/O supports PROM on the following programmers:

      2900

      3900

      3980

      3980xpi

Table 1: DATA I/O Platforms for PROM

Product Type	DATA I/O 2900	DATA I/O 3900, 3980 and 3980xpi	DATA I/O Uni-Site
PROM	Yes DIP BASE: 29BASE-0102 PPI BASE: 29BASE 9901 PPI-1004 (FP)	Yes DIP BASE: 39BASE-0101 PPI BASE: 39BASE 9901 PPI-1004 (FP)	Not Available

UTRH00SC Burn-In Stimulus Controller

Stimulus Controller and Post-Program Conditioning Operating Instructions

Introduction:

The following reviews the setup and operation of the PROM Burn-In Stimulus Controller, and discusses the post-program conditioning process. The Stimulus Controller is used to supply all the appropriate signals to the PROM Burn-In boards during post-program conditioning. The post-program conditioning is required to optimize the performance, and increase the reliability of the UT28F64/LV and UT28F256/LV PROMs.

Stimulus Controller Setup:

Please refer to Figure 1 to assist with these instructions.

1) Insert the PROMs into the burn-in board using standard ESD procedures.

2) The burn-in board is supplied with approximately 5 feet of Teflon ribbon cable. The cable and burn-in board will withstand 152°C maximum temperature. Place the cable through the port of the burn-in oven, with the burn-in board on a flat surface.

3) Connect the Teflon ribbon cable from the burn-in board to one of the connectors on the Stimulus Controller. The Stimulus Controller is capable of driving two burn-in boards. Note that the cable connector is keyed such that the notch will face away from the power jacks.

4) Supply power to the Stimulus Controller using two banana plug cables. The power supply must limit a maximum of 1 Amp of current at +12VDC (-0V/+0.5V). Insert the cable attached to the GROUND output of the power supply to the BLACK banana jack located on the end of the Stimulus Controller. Insert the cable attached to the +12Volt output of the power supply to the RED banana jack located on the end of the Stimulus Controller. Turn on the power supply and verify that the POWER ON LED is lit up, and that the FREQ. ON LED is flashing. Check the burn-in board with a voltmeter between the GND and the PS1 (VDD) terminals for 7.0VDC (-0.2V/+0V). Turn off the power supply.

5) The post-program Stimulus Controller is now ready for operation. After the burn-in oven has reached 150°C, turn on the power supply and check the voltages as in step 4 above. Be careful not to be harmed by hot metal surfaces in the oven as you verify that there is 7.0VDC (-0.2V/+0V) between the PS1 and GND terminals on the burn-in board.

NOTE: Verify that the power supply is set to +12VDC (-0V/+0.5V) before applying power to the Stimulus Controller.
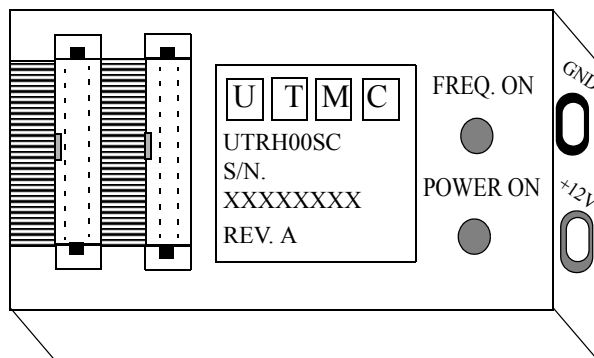.

Figure 1. Aeroflex UTMC Stimulus Controller

Post-Program Conditioning Flow:

The post-program conditioning is a very important step in the PROM programming process. It performs two major tasks:

1) Increases the reliability of the UT28F64/LV and UT28F256/LV PROM
2) Optimizes the performance of the UT28F64/LV and UT28F256/LV PROM

The required post-programming flow is shown on page 1 of the User Guide. The user first programs the UT28F64/LV and UT28F256/LV PROM on either the DATA I/O 2900, or the DATA I/O 3900/3980/3980xpi programmer.

Then the PROMs are placed on a tray suitable for burn-in temperatures, loaded into the burn-in oven, and are run through a 64 hour (-0/+8Hrs), unbiased, post-program bake at 200^oC ($\pm2^oC$)*. The PROM does not need to be removed from the carrier.

Following this bake process, the temperature is decreased to 150^oC ($\pm2^oC$), the PROMs are loaded into the burn-in board, and the Stimulus Controller is connected to the teflon ribbon cable on the burn-in board. Now the user will perform a 64 hour dynamic burn-in with the stimulus applied to the burn-in board.

Finally, the user will remove the PROMs from the burn-in board, and verify full functionality with the DATA I/O programmer and the PROM Board Tester.

Note: The burn-in board is only good up to 152^oC maximum.

The Dynamic Burn-In Circuit:

The dynamic burn-in circuit is shown in Table 1 and Table 2. The circuit describes the bias to each pin of the UT28F64/LV and UT28F256/LV PROM and the frequency that the stimulus is applied. Additionally, the power supply voltage (V_{DD}) is set by the Stimulus Controller at 7.0VDC +0/-0.2V, and the temperature for the burn-in process is described in the post-program conditioning flow (Figure 2) as 150°C $\pm$2°C. The stimulus duty cycle is 50% $\pm$10% except for $\overline{PE}$, and the dynamic frequency tolerance is $\pm$10%. See Figures 3 and 4, for a description of the dynamic burn-in timing.

Table 1. UT28F64/LV Dynamic Burn-In Circuit

| Pin	Signal Name	I/O Type	Series Resistor	Dynamic
1	NC	Input	2.49KΩ	NC
2	A12	Input	2.49KΩ	48.8Hz
3	A7	Input	2.49KΩ	1.56KHz
4	A6	Input	2.49KΩ	3.13KHz
5	A5	Input	2.49KΩ	6.25KHz
6	A4	Input	2.49KΩ	12.5KHz
7	A3	Input	2.49KΩ	25KHz
8	A2	Input	2.49KΩ	50KHz
9	A1	Input	2.49KΩ	100KHz
10	A0	Input	2.49KΩ	200KHz
11	DQ0	BiDirect	2.49KΩ	6.1Hz
12	DQ1	BiDirect	2.49KΩ	6.1Hz
13	DQ2	BiDirect	2.49KΩ	6.1Hz
14	VSS	Ground	N/A	Ground
15	DQ3	BiDirect	2.49KΩ	6.1Hz
16	DQ4	BiDirect	2.49KΩ	6.1Hz
17	DQ5	BiDirect	2.49KΩ	6.1Hz
18	DQ6	BiDirect	2.49KΩ	6.1Hz
19	DQ7	BiDirect	2.49KΩ	6.1Hz
20	/CE	Input	2.49KΩ	Ground
21	A10	Input	2.49KΩ	195Hz
22	/OE	Input	2.49KΩ	VDD
23	A11	Input	2.49KΩ	97.7Hz
24	A9	Input	2.49KΩ	391Hz
25	A8	Input	2.49KΩ	781Hz
26	NC	Input	2.49KΩ	NC
27	/PE	Input	2.49KΩ	400KHz
28	VDD	Power	N/A	VDD

VDD = 7.0 + 0/- 0.2V
Temperature = 150 degrees Celsius
Time 64 hours -0/+8hrs
Duty Cycle 50% +/-10% except for /PE
Dynamic Frequency Tolerance = +/-10%

Table 2. UT28F256/LV Dynamic Burn-In Circuit

Pin	Signal Name	I/O Type	Series Resistor	Dynamic
1	A14	Input	2.49KΩ	12.2Hz
2	A12	Input	2.49KΩ	48.8Hz
3	A7	Input	2.49KΩ	1.56KHz
4	A6	Input	2.49KΩ	3.13KHz
5	A5	Input	2.49KΩ	6.25KHz
6	A4	Input	2.49KΩ	12.5KHz
7	A3	Input	2.49KΩ	25KHz
8	A2	Input	2.49KΩ	50KHz
9	A1	Input	2.49KΩ	100KHz
10	A0	Input	2.49KΩ	200KHz
11	DQ0	BiDirect	2.49KΩ	6.1Hz
12	DQ1	BiDirect	2.49KΩ	6.1Hz
13	DQ2	BiDirect	2.49KΩ	6.1Hz
14	VSS	Ground	N/A	Ground
15	DQ3	BiDirect	2.49KΩ	6.1Hz
16	DQ4	BiDirect	2.49KΩ	6.1Hz
17	DQ5	BiDirect	2.49KΩ	6.1Hz
18	DQ6	BiDirect	2.49KΩ	6.1Hz
19	DQ7	BiDirect	2.49KΩ	6.1Hz
20	/CE	Input	2.49KΩ	Ground
21	A10	Input	2.49KΩ	195Hz
22	/OE	Input	2.49KΩ	VDD
23	A11	Input	2.49KΩ	97.7Hz
24	A9	Input	2.49KΩ	391Hz
25	A8	Input	2.49KΩ	781Hz
26	A13	Input	2.49KΩ	24.4Hz
27	/PE	Input	2.49KΩ	400KHz
28	VDD	Power	N/A	VDD

VDD = 7.0 + 0/- 0.2V
Temperature = 150 degrees Celsius
Time 64 hours -0/+8hrs
Duty Cycle 50% +/-10% except for /PE
Dynamic Frequency Tolerance = +/-10%
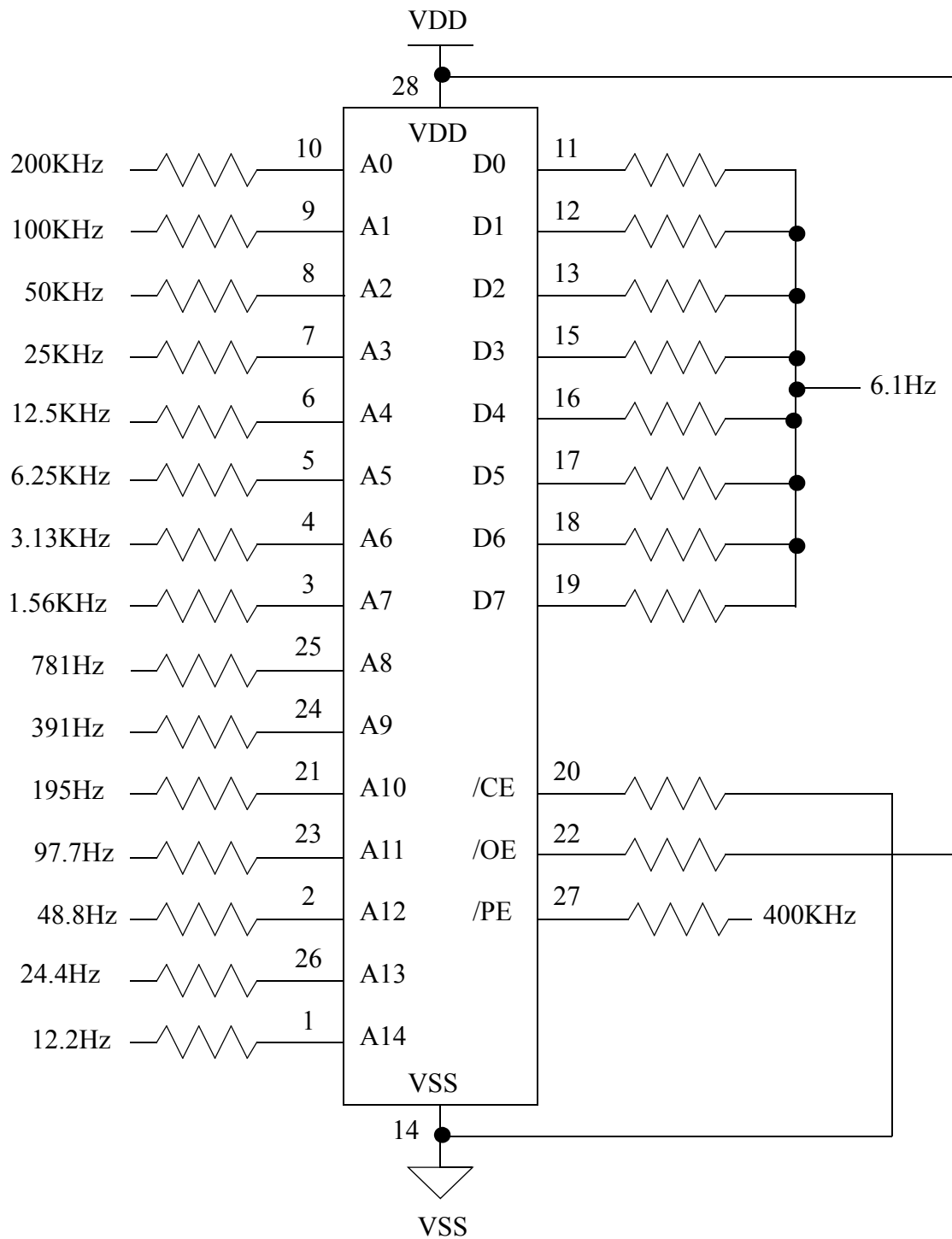
Figure 2. UT28F64/LV and UT28F256/LV PROM BURN-IN CIRCUIT

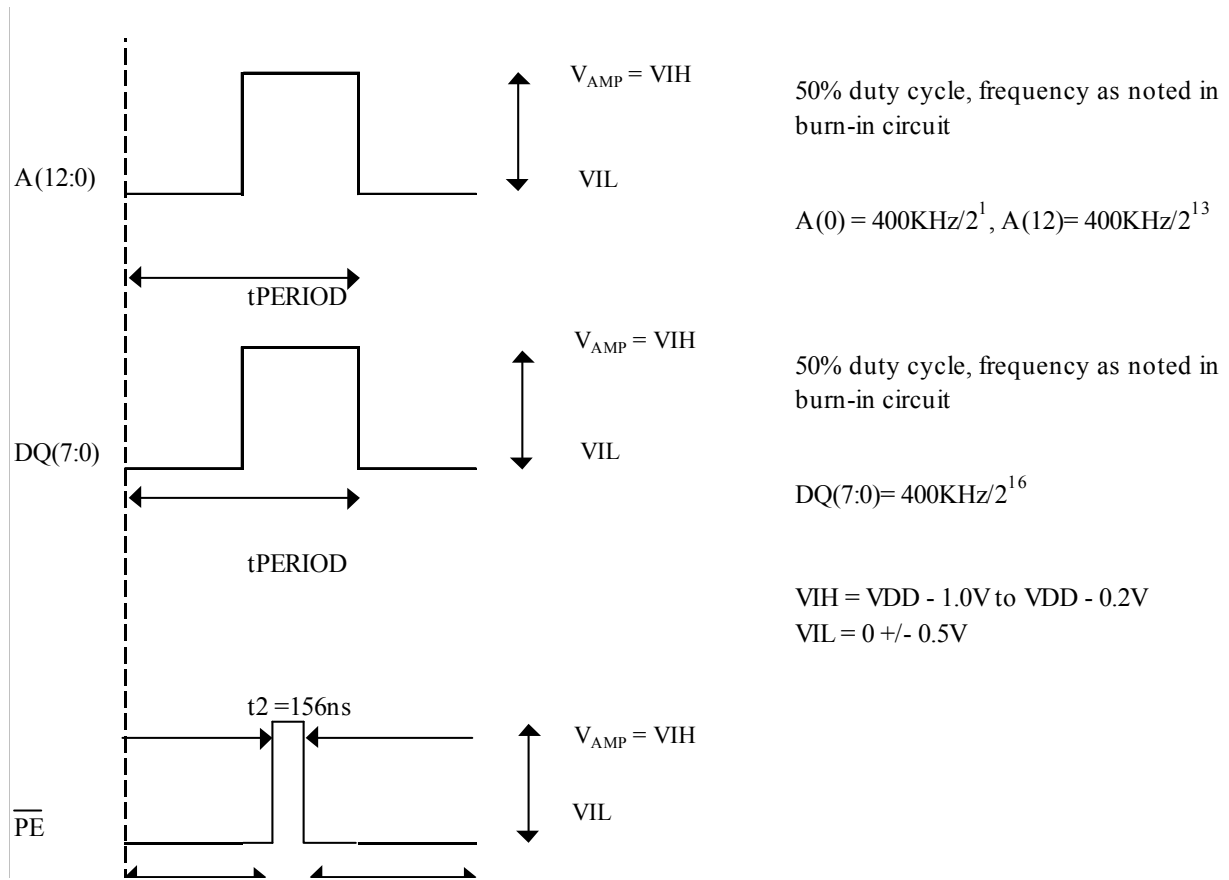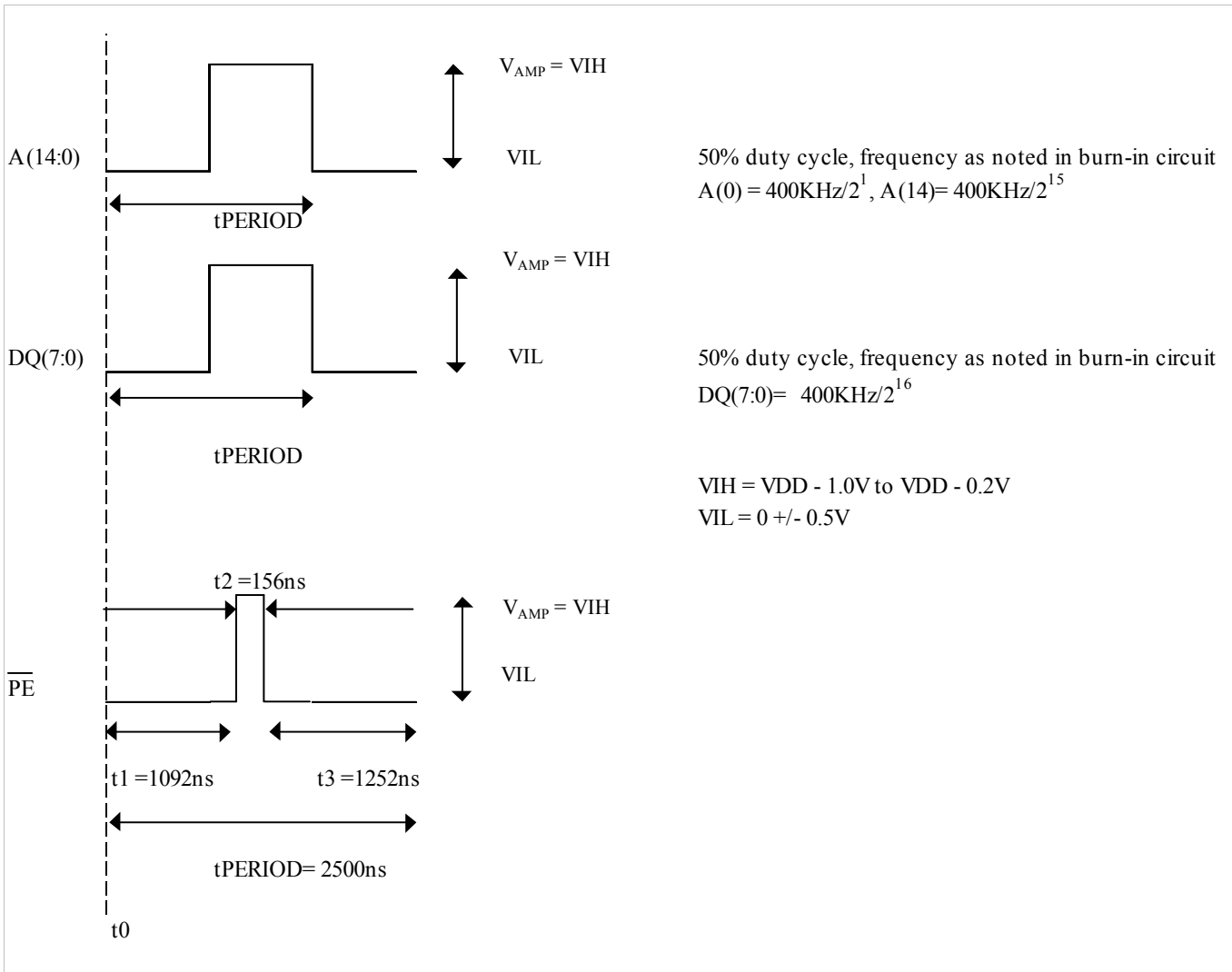**Note:** All resistors = 2.49K, Pins 1 and 26 are no connects for the UT28F64/LV

A(12:0)

$V_{AMP} = VIH$

VIL

50% duty cycle, frequency as noted in burn-in circuit

$A(0) = 400KHz/2^1$, $A(12) = 400KHz/2^{13}$

tPERIOD

DQ(7:0)

$V_{AMP} = VIH$

VIL

50% duty cycle, frequency as noted in burn-in circuit

$DQ(7:0) = 400KHz/2^{16}$

tPERIOD

$VIH = VDD - 1.0V$ to $VDD - 0.2V$
$VIL = 0 +/- 0.5V$

$t2 = 156ns$

$V_{AMP} = VIH$

VIL

$\overline{PE}$

Figure 3. UT28F64/LV Dynamic Burn-In Timing

A(14:0)

$V_{AMP} = VIH$

VIL

tPERIOD

50% duty cycle, frequency as noted in burn-in circuit
$A(0) = 400KHz/2^1$, $A(14) = 400KHz/2^{15}$

DQ(7:0)

$V_{AMP} = VIH$

VIL

tPERIOD

50% duty cycle, frequency as noted in burn-in circuit
$DQ(7:0) = 400KHz/2^{16}$

$VIH = VDD - 1.0V$ to $VDD - 0.2V$
$VIL = 0 +/- 0.5V$

$\overline{PE}$

t2 = 156ns

$V_{AMP} = VIH$

VIL

t1 = 1092ns

t3 = 1252ns

tPERIOD = 2500ns

t0

Figure 4. UT28F256/LV Dynamic Burn-In Timing

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PROM BOARD USER GUIDE

INTRODUCTION

The PROM Board Tester is used to verify all antifuses are programmed reliably after the PROM has been through Post-Programming Conditioning.

The PROM data is read into the SRAM at 1.5mS for the initial capture of the PROM contents. $\overline{CE}$ and $\overline{OE}$ are held active during this read. The PROM is then read in again at 25ns. During this read, $\overline{CE}$ and $\overline{OE}$ switch during each read cycle. This is a worst case read condition for this part. The contents of the SRAM are compared for the low speed read and the high speed read. If there are any differences they will be displayed with address location and data for that location. The user can then step through any additional failures.

TEST PROCEDURE

1. Turn on main power switch, S1.

2. Hit Reset, S4.

3. Parts must be tested at 4.5V and 5.5V. (**Note:** PROM test voltage is determined by power supply voltage supplied to the board. UT28F64LV and UT28F256LV PROMs must be tested at 4.5V and 5.5V. The parts will not be damaged by the higher VDD).

4. Place part in socket (Address lines are in tristate mode on FPGA).

5. Turn on PROM Power switch, S2.

6. Hit Reset, S4.

7. Hit Start, S3.

8. If Error Count is 0, complete light will come on.

9. If Error Count is greater than 0, hit Step button, S5, to review all errors.

10. Complete light, D1, will come on when all errors have been reviewed.

11. Turn off Prom Power, S2, and go to step 4.

PROM VERIFICATION BOARD

J9   J10   S1   CCLK
                   DIN
                   INT
                   DONE
                   PROG
                   +5V
                   GND   R5   J1
+5V   GND   POWER J2   R4   R6   PC
                                      R7   GND
                                                  USER

C25   U19
C12

U7   U1   U14

U18

                                      R3

                             U2
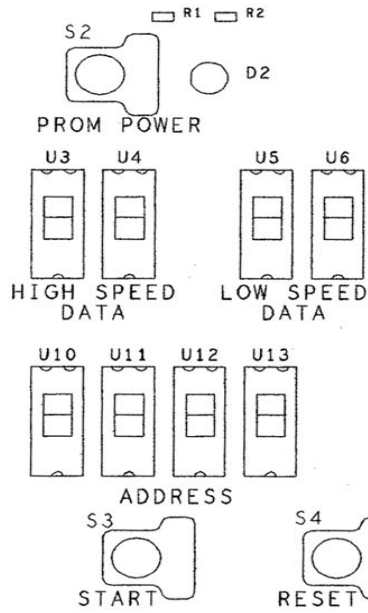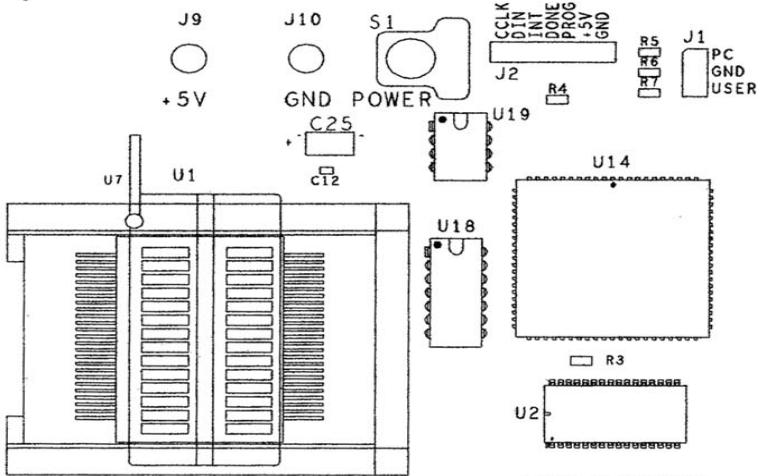
TEST PROCEDURE

1) TURN ON MAIN POWER SWITCH.
2) HIT RESET.
3) PARTS SHOULD BE TESTED AT 4.5 AND 5.5VDC.
4) PLACE PART IN SOCKET (ADDRESS LINES ARE IN TRISTATE MODE ON FPGA).
5) TURN ON PROM POWER.
6) HIT RESET.
7) HIT START.
8) IF ERROR COUNT IS 0 THEN COMPLETE LIGHT WILL COME ON.
9) IF ERROR COUNT IS GREATER THAN 0 THEN HIT STEP BUTTON TO REVIEW ALL ERRORS.
10) COMPLETE LIGHT WILL COME ON WHEN ALL ERRORS HAVE BEEN REVIEWED.
11) TURN OFF PROM POWER AND GOTO STEP 4.

R1   R2

S2

D2

PROM POWER

U3   U4   U5   U6

HIGH SPEED   LOW SPEED
DATA   DATA

U10   U11   U12   U13   U8   U9   D1

ADDRESS   ERROR COUNT   COMPLETE

S3   S4   S5

START   RESET   STEP

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PROM PROGRAMMING KITS - ORDER INFORMATION

**Listed below are the part numbers to order the PROM Programming Kits for the
UT28F256, UT28F256LV, UT28F64, AND UT28F64LV PROMs**

RH00VK Flat Pack Post Programming Conditioning Kit
Verification Card
4.5 foot cable
Stimulus Card
1/2 Size FP B/I Board
Instruction Manual

RH01VK DIP Post Programming Conditioning Kit
Verification Card
4.5 foot cable
Stimulus Card
1/2 Size DIP B/I Board
Instruction Manual

Listed below are the part numbers to order additional burn-in boards

RH00DPBB DIP Burn-in Board
1/2 size burn-in board is 13.50" by 11.45" and contains approximately 18 DIP sockets.
Instruction Manual

RH00FPBB Flat Pack Burn-in Board
1/2 size burn-in board is 13.50" by 11.45" and contains approximately 12 flat pack sockets.
Instruction Manual

Listed below are the part numbers to order Cards and Cable

RH00SC Stimulus Card
Burn-in board stimulus card, operates on a single DC supply voltage of 12VDC.
Instruction Manual

RH00VB Verification Card
Verification card, operates on a single DC supply voltage
Instruction Manual

RH00CB Cable
4.5 foot teflon ribbon cable
Instruction Manual