## SERIES 1250 UNIVERSAL SWITCH CONTROLLER

## PUBLICATION NO. 980609 Volume 1 of 2



## RACAL INSTRUMENTS

Racal Instruments, Inc.
4 Goodyear St., Irvine, CA 92618-2002
Tel: (800) RACAL-ATE, (800) 722-2528, (949) 859-8999; FAX: (949) 859-7139

Racal Instruments, Ltd.
480 Bath Road, Slough, Berkshire, SL1 6BE, United Kingdom
Tel: +44 (0) 1628 604455; FAX: +44 (0) 1628662017
Racal Systems Electronique S.A.
18 Avenue Dutartre, 78150 LeChesnay, France
Tel: +33 (1) 3923 2222; FAX: +33 (1) 39232225

Racal Systems Elettronica s.r.I.
Strada 2-Palazzo C4, 20090 Milanofiori Assago, Milan, Italy
Tel: +39 (0)2 5750 1796; FAX +39 (0)2 57501828
Racal Elektronik System GmbH.
Technologiepark Bergisch Gladbach, Friedrich-Ebert-Strasse, D-51429
Bergisch Gladbach, Germany
Tel.: +49 22048442 00; FAX: +49 2204844219
Racal Instruments, Ltd.
Unit 5, 25F., Mega Trade Center, No 1, Mei Wan Road, Tsuen Wan, Hong Kong, PRC Tel: +852 2405 5500, FAX: +852 24164335
http://www.racalinstruments.com

## PUBLICATION DATE: March 21-2002

Copyright 2002 by Racal Instruments, Inc. Printed in the United States of America. All rights reserved.
This book or parts thereof may not be reproduced in any form without written permission of the publisher.

## WARRANTY STATEMENT

All Racal Instruments, Inc. products are designed and manufactured to exacting standards and in full conformance to Racal's ISO 9001 procedures.

For the specific terms of your standard warranty, or optional extended warranty or service agreement, contact your Racal customer service advisor. Please have the following information available to facilitate service.

1. Product serial number
2. Product model number
3. Your company and contact information

You may contact your customer service advisor by:

| E-Mail: | Helpdesk@racalinstruments.com |  |
| :---: | :---: | :---: |
| Telephone: | +1800 7223262 | (USA) |
|  | +44(0) 8706080134 | (UK) |
|  | +852 24055500 | (Hong Kong) |
| Fax: | +19498597309 | (USA) |
|  | +44(0) 1628662017 | (UK) |
|  | +852 24164335 | (Hong Kong) |

## RETURN of PRODUCT

Authorization is required from Racal Instruments before you send us your product for service or calibration. Call your nearest Racal Instruments support facility. A list is located on the last page of this manual. If you are unsure where to call, contact Racal Instruments, Inc. Customer Support Department in Irvine, California, USA at $1-800-722-3262$ or 1-949-859-8999 or via fax at 1-949-859-7139. We can be reached at: helpdesk@racalinstruments.com.

## PROPRIETARY NOTICE

This document and the technical data herein disclosed, are proprietary to Racal Instruments, and shall not, without express written permission of Racal Instruments, be used, in whole or in part to solicit quotations from a competitive source or used for manufacture by anyone other than Racal Instruments. The information herein has been developed at private expense, and may only be used for operation and maintenance reference purposes or for purposes of engineering evaluation and incorporation into technical specifications and other documents which specify procurement of products from Racal Instruments.

## FOR YOUR SAFETY

Before undertaking any troubleshooting, maintenance or exploratory procedure, read carefully the WARNINGS and CAUTION notices.

This equipment contains voltage hazardous to human life and safety, and is capable of inflicting personal injury.

If this instrument is to be powered from the AC line (mains) through an autotransformer, ensure the common connector is connected to the neutral (earth pole) of the power supply.

Before operating the unit, ensure the conductor (green wire) is connected to the ground (earth) conductor of the power outlet. Do not use a two-conductor extension cord or a three-prong/twoprong adapter. This will defeat the protective feature of the third conductor in the power cord.

Maintenance and calibration procedures sometimes call for operation of the unit with power applied and protective covers removed. Read the procedures and heed warnings to avoid "live" circuit points.

Before operating this instrument:

1. Ensure the instrument is configured to operate on the voltage at the power source. See Installation Section.
2. Ensure the proper fuse is in place for the power source to operate.
3. Ensure all other devices connected to or in proximity to this instrument are properly grounded or connected to the protective third-wire earth ground.

If the instrument:

- fails to operate satisfactorily
- $\quad$ shows visible damage
- has been stored under unfavorable conditions
- has sustained stress

Do not operate until performance is checked by qualified personnel.

This page was left intentionally blank.

## Table of Contents Volume 1

Chapter 1
GENERAL INFORMATION ..... 1-1
Introduction ..... 1-1
1250 and 1250 Series Switch modules ..... 1-1
1250 Series Latching Switch modules ..... 1-3
Specifications ..... 1-4
1250 Universal Switch Controller. ..... 1-4
Option 1250-10 ..... 1-7
Specifications ..... 1-7
Option 1250-12 ..... 1-8
Specifications ..... 1-8
Option 1250-14 ..... 1-10
Specifications ..... 1-10
Option 1250-15 ..... 1-12
Specifications ..... 1-12
Option 1250-15A ..... 1-13
Specifications ..... 1-13
Option 1250-16 ..... 1-14
Option 1250-20 ..... 1-16
Specifications ..... 1-16
Option 1250-30 Series ..... 1-18
Option 1250-35 ..... 1-23
Specifications ..... 1-23
Option 1250-40 ..... 1-26
Specifications ..... 1-27
Option 1250-40B ..... 1-28
Specifications ..... 1-29
Option 1250-45 ..... 1-30
Specifications ..... 1-31
Option 1250-50 ..... 1-32
Specifications ..... 1-33
Options 1250-51A and 1250-51B ..... 1-34
Specifications ..... 1-35
Options 1250-52A and 1250-52B ..... 1-36
Specifications ..... 1-37
Option 1250-54B ..... 1-38
Specifications ..... 1-39
Option 1250-55B ..... 1-40
Specifications ..... 1-41
Options 1250-60 and 1250-61 ..... 1-42
Specifications ..... 1-43
Option 1250-65 ..... 1-44
Option 1250-750 ..... 1-46
Chapter 2
INSTALLATION ..... 2-1
Introduction ..... 2-1
Unpacking and Inspection ..... 2-1
Reshipment Instructions ..... 2-1
Preparation for use. ..... 2-1
Power Connections ..... 2-1
Line Voltage Selection. ..... 2-2
Power Cord and Grounding ..... 2-3
1250 Series Plug-in Modules ..... 2-4
Switch modules ..... 2-4
Switching Module Installation ..... 2-4
Strain Relief Screw Terminals ..... 2-5
GPIB interface ..... 2-6
GPIB Bus Organization. ..... 2-6
GPIB Interconnections ..... 2-9
GPIB Cable Length Limits ..... 2-9
GPIB Address Assignment ..... 2-9
GPIB Rear-Panel Connector ..... 2-10
GPIB Interface Signal Pin Assignments ..... 2-11
Equipment Rack Installation ..... 2-12
ii
Introduction ..... 2-12
Slide-Mount Option 65 Installation ..... 2-13
Intelligent Front Panel (Option 90) Installation ..... 2-22
Standard Mounting ..... 2-22
Remote Mounting ..... 2-22
Rear-Forward Rack Mounting ..... 2-22
Standard Mounting ..... 2-22
Remote Mounting ..... 2-24
Storage and Temperature ..... 2-25
Ventilation Requirements ..... 2-25
Chapter 3
OPERATION ..... 3-1
Introduction ..... 3-1
1250 Home State ..... 3-1
1250 Front and Rear Panels ..... 3-2
GPIB Input Format ..... 3-4
GPIB Output Format ..... 3-5
Serial Poll Status Byte ..... 3-5
Power-up Self Tests ..... 3-6
Device Dependant Command Codes ..... 3-7
CLOSE ..... 3-7
CNF ..... 3-7
DLY ..... 3-8
EQU ..... 3-8
EXCL ..... 3-9
OPEN ..... 3-9
PDATAOUT ..... 3-10
PSETUP ..... 3-11
PUPRCL ..... 3-12
READ ..... 3-12
RECALL ..... 3-12
RESET ..... 3-13
SCAN ..... 3-13
SETUP ..... 3-13
SLIST ..... 3-14
SRQMASK ..... 3-15
STORE ..... 3-16
TEST ..... 3-16
WRITE ..... 3-17
YERR ..... 3-17
1250 Series Module Specific Syntax ..... 3-19
1250-10 Breadboard Module Specific Syntax ..... 3-19
1250-12 Relay Actuator Module Specific Syntax Specific Syntax ..... 3-19
1250-14 Digital Input/Output Module Specific Syntax ..... 3-21
1250-15 Relay Driver Module Specific Syntax ..... 3-30
1250-15A Relay Driver Module Specific Syntax ..... 3-36
1250-16 High Density Signal Switching Module Specific Syntax ..... 3-49
1250-20 Relay Power Module Specific Syntax ..... 3-52
1250-30 Scanner / Multiplexer Module Specific Syntax ..... 3-55
1250-35 Module Specific Syntax ..... 3-58
1250-40 Module Specific Syntax ..... 3-69
1250-40B Module Specific Syntax ..... 3-70
1250-45 Module Specific Syntax ..... 3-72
1250-50, 1250-51A, and 1250-51B, R.F. Multiplexer Module Specific Syntax ..... 3-74
1250-52A and 1250-52B R.F. Multiplexer Module Specific Syntax ..... 3-78
1250-54B and 1250-55B RF Multiplexer Module Specific Syntax ..... 3-81
1250-60 and 1250-61 Microwave Switching Module Specific Syntax ..... 3-83
1250-65 Latching 18 GHz Microwave Switching Module Specific Syntax ..... 3-84
1250-750 RF Multiplexer Module Specific Syntax. ..... 3-87
Local Control ..... 3-90
Introduction ..... 3-90
1250 Intelligent Front Panel (Option 90) ..... 3-90
Local Operation. ..... 3-93
Introduction ..... 3-93
OPEN and CLOSE keys ..... 3-93
READ and WRITE keys ..... 3-94
STORE and RECALL keys ..... 3-95
TEST key ..... 3-96
LOCAL key ..... 3-96
TRIG / SCAN key ..... 3-96
VIEW key. ..... 3-97
EDIT key ..... 3-98
DEL key. ..... 3-99
CLR key. ..... 3-100
EXEC key ..... 3-100
RESET key ..... 3-100
ERR key ..... 3-100
DISPLAY keys ..... 3-100
SEL keys ..... 3-101
Chapter 4
OPERATION Verification. ..... 4-1
Introduction ..... 4-1
General Information ..... 4-1
Required Equipment. ..... 4-1
Performance Verification Procedures ..... 4-2
Mainframe Self-Test ..... 4-2
Test Procedure ..... 4-3
GPIB Test ..... 4-3
1250-10 Breadboard Module Test ..... 4-5
Test Procedure ..... 4-5
1250-14 Digital Input/Output Module Test. ..... 4-7
Test Procedure ..... 4-8
1250-40 Signal Matrix Module Test. ..... 4-11
Test Procedure ..... 4-13
1250-60/1250-61 18/26.5 GHZ Microwave Switching Module Tests ..... 4-14
Test Procedure ..... 4-14
Low Frequency Relay Module Tests ..... 4-16
1250-12 Relay Actuator Module Test ..... 4-16
1250-15 Relay Driver Module Test. ..... 4-19
1250-20 Relay Power Module Test. ..... 4-20
1250-30 Scanner/Multiplexer Module Test ..... 4-23
RF Relay Module Tests ..... 4-26
1250-50 and 1250-750 200 MHz RF Switching Module Test ..... 4-26

## List of Figures

Figure 1-1, 1250 Front Panel ..... 1-1
Figure 1-2, 1250 Option 90, Intelligent Front Panel. ..... 1-2
Figure 1-3, Dimensions of the 1250 ..... 1-5
Figure 1-4, Block Diagram of 1250-12 ..... 1-8
Figure 1-5, Block Diagram of 1250-14 ..... 1-10
Figure 1-6, Block Diagram of 1250-15 ..... 1-12
Figure 1-7, Block Diagram of 1250-16 ..... 1-14
Figure 1-8, Block Diagram of 1250-20 ..... 1-16
Figure 1-9, Block Diagram of 1250-30 Series ..... 1-19
Figure 1-10, Block Diagram of 1250-35 ..... 1-23
Figure 1-11, Block Diagram of 1250-40 ..... 1-26
Figure 1-12, Block Diagram of 1250-40B ..... 1-28
Figure 1-13 ..... 1-30
Figure 1-14, Block Diagram of 1250-50 and Insertion Loss vs, Frequency ..... 1-32
Figure 1-15, Block Diagram of 1250-51 and Insertion Loss vs, Frequency ..... 1-34
Figure 1-16, Block Diagram of 1250-52B and Insertion Loss vs. Frequency. ..... 1-36
Figure 1-17, Block Diagram of 1250-54B ..... 1-38
Figure 1-18, Block Diagram of 1250-55B ..... 1-40
Figure 1-19, Block Diagram of 1250-60 and 1250-61 ..... 1-42
Figure 1-20, Block Diagram of 1250-65 ..... 1-44
Figure 1-21, Block Diagram of 1250-750 and Insertion Loss vs. Frequency ..... 1-46
Figure 2-1, AC Line Voltage Selection ..... 2-3
Figure 2-2, 1250 Switching Module Installation Showing Use of Quick-Release Disconnector (common guard assembly not shown in the figure and not supplied with all models) ..... 2-4
Figure 2-3, 1250 Option 80 Guard Connection Procedure ..... 2-5
Figure 2-4, Linear (A) and Cluster (B) Bus Organizations ..... 2-6
Figure 2-5, GPIB-Connector (Rear Panel) ..... 2-10
Figure 2-6, A \& B Slide-Mount and Bracket Assembly ..... 2-17
Figure 2-7, Rear End Slide-Mount Rack Dimensions ..... 2-18Figure 2-8, Standard (A) and Optional Rear-Forward Rack-Mount
(B and C) Assembly-to-Instrument Configurations ..... 2-20
Figure 2-9, Slide Assembly-to-Side Channel Installation ..... 2-21
Figure 2-10, 1250 Side View (Left) ..... 2-22
Figure 2-11, Option 90 to 1250 Chassis Installation ..... 2-23
Figure 2-12, Rear View of Option 90 Showing Ribbon Cable ..... 2-24
Figure 2-13, Front View of Standard Front Panel Showing Option 90 D Receptacle ..... 2-24
Figure 3-1, 1250 Front Panel ..... 3-2
Figure 3-2, 1250 Rear Panel ..... 3-3
Figure 3-3, 1250-14 Module Handshake Lines ..... 3-24
Figure 3-4, 1250-14 Timing Diagrams ..... 3-25
Figure 3-4, 1250-14 Timing Diagrams (Cont) ..... 3-26
Figure 3-4, 1250-14 Timing Diagrams (Cont) ..... 3-27
Figure 3-4, 1250-14 Timing Diagrams (Cont) ..... 3-28
Figure 3-4, 1250-14 Timing Diagrams(Cont) ..... 3-29
Figure 3-5, 1250-15 Relay Driver Connection Diagram ..... 3-32
Figure 3-5, 1250-15 Relay Driver Connection Diagram (Cont) ..... 3-33
Figure 3-6, 1250-15 Coil Sense ..... 3-34
Figure 3-7, 1250-15 Form A Sense ..... 3-35
Figure 3-8, 1250-15 Form B Sense ..... 3-36
Figure 3-9, 1250-15A Switch Locations ..... 3-40
Figure 3-10, 1250-15A Form B Sense ..... 3-41
Figure 3-11, 1250-15A Form A Sense ..... 3-42
Figure 3-12, 1250-15A Coil Current Sense. ..... 3-43
Figure 3-13, 1250-15A No Relay Sense ..... 3-44
Figure 3-14, 1250-15A Using an External Power Supply ..... 3-45
Figure 3-15,1250-15A, Relay Driver Connection Diagram Group 1 ..... 3-46
Figure 3-16, 1250-15A Relay Driver Connection Diagram Group 2 ..... 3-47
Figure 3-17, 1250-15A Relay Driver Connection Diagram Group 3 ..... 3-48
Figure 3-18, Detail A - 1250-16 ..... 3-51
Figure 3-19, 1250-20 Relay Power Module Connection Diagram ..... 3-54
Figure 3-20, 1250-30 Scanner/Multiplexer Connection Diagram ..... 3-57
Figure 3-21, 1250-35 Inputs and Outputs ..... 3-64
Figure 3-22, 1250-35 Configuration ..... 3-65
Figure 3-23, 1250-40 Block Diagram ..... 3-70
viii
Figure 3-24, 1250-40B Block Diagram ..... 3-71
Figure 3-25, 1250-45 Block Diagram ..... 3-73
Figure 2-26, 1250-50 Top View ..... 3-76
Figure 2-27, 1250-51A/B Top View ..... 3-77
Figure 3-28, 1250-52A/B Top View ..... 3-80
Figure 3-29, 1250-60 and 1250-61 Block Diagram ..... 3-84
Figure 3-30, Orientation of front panel connectors ..... 3-85
Figure 3-31, 1250 Intelligent Front Panel ..... 3-90
Figure 4-1, 1250-14 Test Configuration ..... 4-7
Figure 4-2, 1250-40 Test Configuration ..... 4-12
Figure 4-3, 1250-12 Test Configuration ..... 4-17
Figure 4-4, 1250-15 Test Configuration ..... 4-19
Figure 4-5, 1250-20 Test Configuration ..... 4-21
Figure 4-6, 1250-30 Test Configuration ..... 4-24

## List of Tables

Table 2-1, GPIB Connector Pins ..... 2-11
Table 2-2, Interface Signal Pin Assingments ..... 2-12
Table 3-1, Status Byte Format ..... 3-5
Table 3-2, 1250 Status Byte ..... 3-16
Table 3-3, 1250 Series Error Codes ..... 3-18
Table 3-4, 1250-15A Pins D and S ..... 3-39
Table 3-5, ..... 3-58
Table 3-6, ..... 3-61
Table 3-7 ..... 3-63
Table 3-8 ..... 3-66
Table 3-9, 1250 Intelligent Front Panel Features ..... 3-90
Table 4-1 ..... 4-4
Table 4-2, 1250-10 Breadboard Module Test Program ..... 4-5
Table 4-3, 1250-14 Digital Input/Output Module Test Program ..... 4-9
Table 4-4, 1250-40 Signal Matrix Module Test Program ..... 4-13
Table 4-5, 1250-60/1250-61 18/26.5 GHz Microwave Switching Module Test Program. ..... 4-15
Table 4.6-1250-12 Relay Actuator Module Test Program ..... 4-18
Table 4-7, 1250-15 Relay Driver Module Test Program ..... 4-20
Table 4-8, 1250-20 Power Relay Module Test Program ..... 4-22
Table 4-9, 1250-30 Scanner/Multiplexer Module Test Program ..... 4-25
Table 4-10, 1250-50 and 1250-750 200 MHz RF Switching Module Test Program ..... 4-27
Table 4-11, 1250-51A/51B 500MHz RF Switching Module Test Program ..... 4-29
Table 4-12, 1250-52A/52B 1GHz RF Switching Module Test Program ..... 4-30

## Chapter 1

## GENERAL INFORMATION

## Introduction

This manual provides the information necessary to install and operate the Racal-Dana Model 1250 Universal Switch Controller. Section two (Installation) provides the procedures necessary to unpack and inspect the 1250, install the intelligent front panel, install 1250 Series switch modules in the chassis and connect the 1250 to the GPIB. Section three (Operation) provides the command codes and keystrokes required in both local and remote control of the 1250.

## 1250 and 1250 Series Switch modules

The 1250 Universal Switch Controller allows signals to be switched in a single system from DC to 26.5 GHz . The 1250 Series is a general purpose switching system designed for both manual and automatic test systems. Low level, power, R.F. and microwave switching requirements are addressed by the switch modules available in the 1250 Series.

The 1250 is designed for use in automatic test systems, but local control of the switching system is supported by Option 90, which supplies an intelligent front panel with a display and keyboard. Refer to Figures 1-1 and 1-2 for illustrations of the 1250 front panel and Option 90, the intelligent front panel, respectively.


Figure 1-1, 1250 Front Panel


Figure 1-2, 1250 Option 90, Intelligent Front Panel
Extensive software capabilities are available for use in the 1250. These include:

## Exclude Lists

The exclusion of possibly dangerous or damaging system configurations from the configurations that the 1250 regards as valid is available via an Exclude list.

## Equate Lists

The equating together of more than one switching module to reduce programming time, so that a command sent to one equated module is obeyed by all of the modules equated together.

## Scan Lists

A list of relays that may be entered into a Scan list that will be sequenced through on receipt of a trigger pulse, use of the Manual key on the front panel or the GPIB Group Execute Trigger (GET) command.

## Confidence

A non-destructive confidence check mode which can monitor the state of all relays in the chassis to ensure that all 1250 Series switch modules fitted to the 1250 chassis have operated as programmed.

## Power Up Recall

The automatic recalling of a switching system configuration from non-volatile memory at power up.

## Test

A self-test capability to ensure that the system ROM, RAM, CPU, backplane and switching module handshaking are functioning correctly. This test is carried out at power up and may also be invoked over the GPIB or the optional front panel.

## Non-Volatile Memory

A 47 location non-volatile memory for the storage and recall of complete switching system configurations.

The 1250 is of a modular construction that allows easy removal and replacement of all major assemblies. These assemblies are as follows:

1) Switch modules
2) Card Cage
3) Microprocessor Controller
4) Power Supply
5) (Optional) Front Panel

The signals to be switched by the 1250 are routed through up to five plug-in relay cards installed in the 1250 chassis. These plugin cards allow the 1250 System to be easily reconfigured as required.

The switching capabilities of the 1250 are enhanced by providing a 10-wire Analog bus. This allows switch modules to be interconnected to expand beyond the capabilities of each individual switching module. This is particularly useful in configuring large switching matrices. The Analog Bus may also be cut to separate selected 1250 Series modules, as required.

## 1250 Series Latching Switch modules

Several of the 1250 Series switch modules are also available in latching versions. A latching switching module will retain its configuration even when power is removed from the 1250 chassis. These switch modules perform electrically the same as the non-latching switch modules that they are based on and use a similar 1250 Series option number. The latching feature is indicated by the presence of the letter ' $L$ ' in the option number, e.g. 1250-L30.

The 1250 Series latching switch modules available are as follows:

1250-L12 Latching Relay Actuator Module
1250-L30 Latching 20 Channel Signal Multiplexer
1250-L40 Latching 4 x 4 Matrix
1250-L52B Latching RF Multiplexer
The command codes required to operate the 1250 Series latching switch modules are the same as those required to operate the non-latching versions.

## Specifications

## 1250 Universal

Switch Controller

## General

Annunciators: $\quad 2$ status LED indicators
3 GPIB LED indicators
16 character alphanumeric display
(Option 90)
$100,115,215,230 \mathrm{VAC} \pm 10 \%$
$47-66 \mathrm{~Hz}$ ( 400 Hz operation also available. Contact Racal-Dana for details.)
133.4 mm ( 5.25 in ) High x 421.6 mm (16.6 in) Wide x 304.8 mm (12 in) Deep
Weight: Main Chassis: 11.4 kg (25 lb.)
Rack Mounting:
Environmental:

Temperature
Range:
Humidity:
Vibration:

GPIB Transfer Rate:

Standard or reversed positions
Designed to meet MIL-T-28800C
Type III, Class 5, Style F
$0^{\circ} \mathrm{C}$ to $50^{\circ} \mathrm{C}$ operation
$-40^{\circ} \mathrm{C}$ to $70^{\circ} \mathrm{C}$ storage
95\% Non-condensing
0.013 in. double-amplitude, 20-55

Hz ; designed to meet MIL-T-28800C
Type III, Class 5, Style F
10 kHz typical


Figure 1-3, Dimensions of the 1250

| IEEE-488-1978 Standard <br> Interface Subset Capability | GPIB |  |  |
| :---: | :---: | :---: | :---: |
|  | Subset SH1 | Description <br> Source <br> Handshake | Applicable Capability Complete Capability |
|  | AH1 | Acceptor | Complete Capability |
|  |  | Handshake |  |
|  | T6 | Talker | Complete Capability |
|  |  |  | (1) Basic Talker |
|  |  |  | (2) Serial Poll |
|  |  |  | (3) Unaddress if MLA |
|  | TI0 | Extended <br> Talker | None |
|  |  |  |  |
|  | L4 | Listener | Complete except Listen Only |
|  |  |  | (1) Basic Listener |
|  |  |  | (2) Unaddress if MTA |
|  | LE0 | Extended <br> Listener | None |
|  |  |  |  |
|  | SR1 | Service | Complete Capability |
|  |  | Request |  |
|  | RL1 | Remote/ Local | Complete Capability |
|  |  |  | (1) REN-Remote Enable |
|  |  |  | (2) LLO-Local Lockout |
|  |  |  | (3) GTL-Go to Local |
|  | PP0 | Parallel | No Capability |
|  |  | Poll |  |

## Option 1250-10

## Specifications

The 1250-10 Breadboard module is designed to allow the user to create custom circuits and incorporate them under switching system control. Forty square inches of surface area are provided for user implementation of designs. Fused +5 V and +13 V DC supplies are provided and LEDs indicate the status of each supply. Latched inputs and outputs interface to the system backplane to allow programming via the GPIB.

## I/O Characteristics

Power: $\quad+13 \mathrm{~V}$ DC $\pm 10 \%$ at 1.7 A (Fused)
$+5 \mathrm{~V} \mathrm{DC} \pm 10 \%$ at 1.7 A (Fused)

## Interface to User Circuitry:

Inputs:
Outputs:

## General

User Connector: Quick Disconnect screw terminal (1250-80)
Breadboard Area:
Mounting Holes:
Maximum component height: $0.5 "$
Maximum lead length below board: $0.062 "$

## Option 1250-12 Description

The $1250-12$ is designed for general purpose signal switching and actuation of external devices. Each channel switches up to 2 amps and 250 V dc or 250 V rms. Relay contacts are monitored to provide user selectable confidence checking. Each channel provides mounting holes to allow the addition of shunt and series elements such as arc suppressors, filters, etc.


Model 1250-12. Ten independent relays. One channel is shown, with provision for addition of series and shunt elements.

Figure 1-4, Block Diagram of 1250-12

## Specifications

Switch configuration:
Ten DPST
User Connector:
Quick Disconnect
screw terminal (1250-80)
Maximum Switchable Voltage
(Terminal-Terminal or Terminal-Chassis): 250 VDC, 250 VAC RMS and 350 VAC pk
Maximum Switchable Current per channel: 2 A DC or rms
Maximum Switchable Power per channel: 60 W DC, 500 VA AC
DC Performance
Differential Thermal Offset: $<3 \mu \mathrm{~V}$ per channel,
Path Resistance: 200 milliohm at 2A
Isolation ( $40^{\circ} \mathrm{C}, 50 \% \mathrm{RH}$ )
Open Channel, channel-channel: $>10^{11}$ ohms
Channel-Chassis: $\quad>5 \times 10^{10}$ ohms Hi-Lo: $>10^{11}$ ohms

## AC Performance

Capacitance

Open Channel:
Channel-Channel:
Channel-Chassis:
Hi-Lo:
Bandwidth, (-3 dB, 50 ohm termination): Insertion Loss, (50 ohm termination):

Crosstalk, (50 ohm termination):

Switching Time:
$<5 \mathrm{pF}$
$<5 \mathrm{pF}$
$<15 \mathrm{pF}$
$<10 \mathrm{pF}$
20 MHz
$<.20 \mathrm{~dB}$ at 100 kHz
$<25 \mathrm{~dB}$ at 1 MHz
$<0.5 \mathrm{~dB}$ at 10 MHz
$<-75 \mathrm{~dB}$ at 100 kHz
$<-60 \mathrm{~dB}$ at 1 MHz
$<-40 \mathrm{~dB}$ at 10 MHz
\#10 ms / channel

## Option 1250-14

The 1250-14 Digital I/O Module provides 16 digital input/output lines for the generation of control signals, digital stimulus and the input of digital responses. Data can be manipulated in a byte or a word format. The module memory supports storage of up to 127 16 -bit words or 2548 bit bytes for input or output operations. Five input/output control modes are available: two static modes, two strobe modes and one full handshake mode.


Figure 1-5, Block Diagram of 1250-14

## Specifications

| User Connector: | 40 pin DIL |
| :--- | :--- |
| I/O Lines: | 16, each fused |
| Data Rate: | Static to $>1 \mathrm{kHz}$ |
| Output |  |
| $\mathrm{V}_{\text {out }}$ (High): | $\$ 2.4 \mathrm{~V}$ at 8 mA |
| $\mathrm{~V}_{\text {out }}($ Low $):$ | $\# 0.4 \mathrm{~V}$ at 126 mA |
| $\mathrm{I}_{\text {low }}$ (Max): | 125 mA at $\mathrm{V}_{\text {out }}$ (Low) |
| Input |  |
| $\mathrm{V}_{\text {in }}$ (High): | $\$ 2.0 \mathrm{~V}$ |
| $\mathrm{~V}_{\text {in }}$ (Low): | $\# 0.4 \mathrm{~V}$ |
| $\mathrm{~V}_{\text {in }}$ (Max): | 30 VDC (line to chassis) |
| Handshake Lines: | 3 |
| Output Characteristics: |  |
| $V_{\text {out }}$ (High): | $\$ 2.4 \mathrm{~V}$ at $400 \mu \mathrm{~A}$ output |


| $V_{\text {out }}$ (Low): | $\# 0.5 \mathrm{~V}$ at 2 mA output |
| :--- | :--- |
| Input Characteristics: |  |
| $\mathrm{V}_{\text {in }}$ (High): | $\$ 2.0 \mathrm{~V}$ |
| $\mathrm{~V}_{\text {in }}$ (Low): | $\# 0.8 \mathrm{~V}$ |
| $\mathrm{~V}_{\text {in }}$ (Max): | $\# 5 \mathrm{~V}$ |

## Option 1250-15

Figure 1-6, Block Diagram of 1250-15

## Description

 testing for these external relays. An internal +13 V supply is to +40 V may also be used.

The 1250-15 Relay Driver Module is designed for applications where it is necessary to locate relays externally. Each module provides 20 current sink output drivers and 20 high impedance sense inputs. Sense feedback circuitry supports confidence available as a source for relay coil currents. External supplies up

## Specifications

## User Connector:

Quick Disconnect screw terminal (1250-80)
Maximum Voltage at Output Driver
Off: $\quad 40 \mathrm{~V}$
On: $\quad 1.6 \mathrm{~V}$
Maximum Current:
Per Driver: $\quad 350 \mathrm{~mA}$
Per Module: 3 A
Number of Channels: 20
Sense Input Voltage
Relay OFF: $9-40 \mathrm{~V}$
Relay ON: $\quad 0-1.6 \mathrm{~V}$
Sense Input Impedance: 150 kS
Internal Supply: $\quad+13 \mathrm{~V}$ at 1.7 A (Fused)

## Option 1250-15A

## Description

The 1250-15 Relay Driver Module is designed for applications where it is necessary to locate relays externally. Each module provides 24 current sink output drivers and 24 sense inputs. Sense feedback circuitry supports confidence testing for these external relays. An internal +13 V supply is available as a source for relay coil currents. External supplies up to +30 V may also be used.

## Specifications

| Switch configuration: | 24 output drivers (sinking) <br> 24 Sense inputs |
| :---: | :---: |
| User Connector: | 3 DB25 connectors. Each connector carries 8 output drivers, 8 sense inputs, supply voltage and corresponding return line. |
| Maximum Voltage at Output Driver |  |
| Off: | 30 V |
| ON: | 1.6V |
| Maximum Current at 100\% duty Cycle: |  |
| Per Driver | 350mA |
| Per Group: |  |
| CH00-07 | 1.0A |
| CH08-15 | 1.0A |
| Ch16-23 | 1.0A |
| Per Module | 3.0A with external supply |
| Number of Channels: | 24 |
| Sense Input impedance: | $6.8 \mathrm{k} \Omega$ |
| Sense Input Voltage: |  |
| Relay de-energized | $9-30 \mathrm{~V}$ |
| Relay energized | 0-1.6V |
| Internal Supply: | +12 V at 1.7 A , fused at 2 A |
| Maximum driver switching time: | 1.0رs/driver |

## Option 1250-16

## Description

The 1250-16 is designed for general purpose multiple line switching up to 10 MHz . Each channel switches up to 2 amps and 250 V . Relay contacts are monitored to provide user selectable confidence checking. Separate isolating relays allow 10 lines to access the Analog bus. The 1250-16 is configured as five channels to a common bus, with fifteen lines per channel, twelve of which are switched. Jumpers at the relays allow for user reconfiguration.


Figure 1-7, Block Diagram of 1250-16

| Specifications | Switch configuration: | Five channels, twelve lines per channel, switched to a common 12 line bus. |
| :---: | :---: | :---: |
|  | User Connector: | D-type subminiature |
|  | Maximum Switchable Voltage | 250 VDC, 250 VAC RMS and 350 VAC pk |
|  | Maximum Switchable Current: | 2 A DC or AC rms |
|  | Maximum Switchable Power: | 60 W DC, 500 VA AC |
|  | DC Performance |  |
|  | Path Resistance: | 600 milliohm at 2A DC |
|  | AC Performance |  |
|  | Bandwidth, ( $-3 \mathrm{~dB}, 50$ ohm termination) : | 10 MHz |
|  | Switching Time: | \#10 ms |

## Option 1250-20

## Description

The 1250-20 Power switching module provides switching for AC or DC power supplies and current sources. Switching networks may be configured from the ten independent DPST relays provided. The 1250-20 switches up to 8 A at 250 VAC rms or 5 A at 48 VDC. Relay contacts are monitored to provide user selectable confidence checking. Each channel provides mounting holes to allow the addition of shunt and series elements such as arc suppressors, filters, etc. A fused +13 V DC supply is provided for driving external relays. Separate connections to both sides of the relay allow each channel to function independently or to be configured as custom networks


Figure 1-8, Block Diagram of 1250-20

## Specifications

Switch configuration:
User Connector:
Maximum Switchable Voltage
Maximum Switchable Current (DC or AC rms)
Per Terminal:
Per Channel:
Per Module:
Maximum Switchable Power

10 DPST
Quick Disconnect screw terminal (1250-80) 250 VDC, 250 VAC RMS or 350 VAC pk 5s) 5 A
8 A
30 A
Per Terminal:

150 W DC, 1250 VA
Per Channel:
Per Module:
240 W DC, 2000 VA 900 W DC, 7500 VA

## DC Performance

Path Resistance:
150 milliohm at 5 A
DC

## AC Performance

Bandwidth, (-3 dB, 50 ohm termination): 20 MHz
Switching Time: \#15 ms

# Option 1250-30 

Series

## Description

The 1250-30 Series Scanner/Multiplexer Switch modules are configurable as a $20 \times 1$ two wire or two $10 x 1$ two wire multiplexer networks for use at up to 20 MHz . For larger multiplexers or scanners, the analog bus may be accessed via a separate relay. Relay coil currents are monitored to provide user selectable confidence checking. Each channel provides mounting points to allow the addition of shunt and series elements such as arc suppressors, filters, etc.

The 1250-30B Scanner / Multiplexer provides either one $1 \times 20$, two $1 \times 10$ or two $1 \times 5$ and two $1 \times 4$ two wire multiplexers for use at frequencies up to 20 MHz . All configurations are user selectable. The 1250-30B allows the automatic connection to each channel of a user specified termination when the channel is open.

The 1250-30C Scanner / Multiplexer provides either one $1 \times 20$ or two $1 \times 10$ one wire multiplexers for use at frequencies up to 20 MHz . All configurations are user selectable.

The 1250-30D Scanner / Multiplexer provides either one $1 \times 20$ or two $1 \times 10$ one wire multiplexers for use at frequencies up to 20 MHz . The 1250-30D supports applications where regular calibration is required without removal of instruments from the system. All configurations are user selectable.


Figure 1-9, Block Diagram of 1250-30 Series

## Scanner / Multiplexer Module Model 1250-30B Specifications

Maximum Switchable Voltage
(Terminal-Terminal or Terminal-Chassis): 250 VDC or AC rms, 350 VAC Peak
Maximum Switchable Current
(DC or AC rms) Per Channel:
2 A
Maximum Switchable Power
Per Channel:
60 WDC, 500 VA
Per Module:
60 WDC, 500 VA
DC Performance
Differential Thermal Offset: $3 \mu \mathrm{~V}$ per channel
Path Resistance: 300 millohm at

2ADC
Isolation
Open Channel, Channel-Channel: $>10^{11}$ ohm
Channel-Chassis: $\quad>10^{10}$ ohm
High-Low: $\quad>10^{11}$ ohm

## AC Performance

Capacitance
Open Channel: $<10 \mathrm{pF}$
Channel-Channel: <10 pF
Channel-Chassis: $<125 \mathrm{pF}$
High-Low: $<20 \mathrm{pF}$
20 MHz (50 ohm
termination)
Insertion Loss (50 Ohm Termination)
100 kHz : $<0.20 \mathrm{~dB}$
$1 \mathrm{MHz}: \quad<0.25 \mathrm{~dB}$
$10 \mathrm{MHz}: \quad<1.50 \mathrm{~dB}$
Cross Talk (50 Ohm Termination)
$100 \mathrm{kHz}: \quad-70 \mathrm{~dB}$
$1 \mathrm{MHz}: \quad-55 \mathrm{~dB}$
10 MHz :
-36dB
Switching Time:
10 mSec per channel

## Scanner / Multiplexer Module Model 1250-30C

 SpecificationsMaximum Switchable Voltage
(Terminal-Terminal or Terminal-Chassis): 250 VDC or AC rms, 350 VAC Peak
Maximum Switchable Current
(DC or AC rms) per Channel: 2 A
Maximum Switchable Power
Per Channel: 60 WDC, 500 VA
Per Module: $\quad 60$ WDC, 500 VA
DC Performance
Differential Thermal Offset: $3 \mu \mathrm{~V}$ per channel
Path Resistance:
300 millohm at 2ADC
Isolation
Open Channel, Channel-Channel: $>10^{11}$ ohm
Channel-Chassis: $\quad>10^{10}$ ohm
High-Low: $\quad>10^{11} \mathrm{ohm}$

## AC Performance

Capacitance
Open Channel: $<10 \mathrm{pF}$
Channel-Channel: <10 pF
Channel-Chassis: $<125 \mathrm{pF}$
High-Low:
Bandwidth (-3dB):
<20 pF
20 MHz (50 ohm
termination)
Insertion Loss (50 Ohm Termination)
100 kHz :
$<0.20 \mathrm{~dB}$
$1 \mathrm{MHz}: \quad<0.25 \mathrm{~dB}$
$10 \mathrm{MHz}: \quad<1.50 \mathrm{~dB}$
Cross Talk (50 Ohm Termination)
$100 \mathrm{kHz}: \quad-70 \mathrm{~dB}$
$1 \mathrm{MHz}: \quad-55 \mathrm{~dB}$
$10 \mathrm{MHz}: \quad-36 \mathrm{~dB}$
Switching Time: 10 mSec per
channel

## Scanner / Multiplexer Module Model 1250-30D

 SpecificationsMaximum Switchable Voltage
(Terminal-Terminal or Terminal-Chassis): 250 VDC or AC rms, 350 VAC Peak
Maximum Switchable Current
(DC or AC rms) Per Channel: 2 A
Maximum Switchable Power
Per Channel: 60 WDC, 500 VA
Per Module: $\quad 60$ WDC, 500 VA
DC Performance
Differential Thermal Offset: $3 \mu \mathrm{~V}$ per channel

Path Resistance:
300 millohm at 2ADC
Isolation
Open Channel, Channel-Channel: $>10^{11} \mathrm{ohm}$
Channel-Chassis: $\quad>10^{10}$ ohm
High-Low:
$>10^{11} \mathrm{ohm}$

## AC Performance

Capacitance
Open Channel: $<10 \mathrm{pF}$
Channel-Channel: $<10 \mathrm{pF}$
Channel-Chassis: $<125 \mathrm{pF}$
High-Low: <20 pF

| Bandwidth (-3dB): | 20 MHz (50 ohm <br> termination) |
| :--- | :--- |
| Insertion Loss (50 Ohm Termination) |  |
| 100 kHz : | $<0.20 \mathrm{~dB}$ |
| 1 MHz | $<0.25 \mathrm{~dB}$ |
| 10 MHz | $<1.50 \mathrm{~dB}$ |
| Cross Talk (50 Ohm Termination) |  |
| 100 kHz : | -70 dB |
| 1 MHz | -55 dB |
| 10 MHz | -36 dB |
| Switching Time: | 10 mSec per |
|  | channel |

## Option 1250-35

The 1250-35 Scanner / Multiplexer Module is a user configurable switching module that may be configured in eight different configurations for use at frequencies up to 30 MHz . These are :

1) Eight $1 \times 6$ two wire scanner / multiplexers
2) Four $1 \times 6$ four-wire scanner / multiplexers
3) Four $1 \times 12$ two-wire scanner / multiplexers
4) Two $1 \times 12$ four wire scanner / multiplexers
5) Two $1 \times 24$ two-wire scanner / multiplexers
6) One $1 \times 24$ four-wire scanner / multiplexers
7) One $1 \times 48$ two-wire scanner / multiplexers
8) One $1 \times 96$ one-wire scanner / multiplexer

Figure 1-10, Block Diagram of 1250-35


Maximum Switchable Current per channel: 1 A DC or rms Maximum Switchable Power per channel: 30 W DC, 62.5 VA AC

## DC Performance

Differential Thermal Offset: \#4 V V per channel,
Path Resistance: \#1 S
Isolation
Open Channel, channel-channel: $>5 \times 10^{8} \mathrm{~S}$
Channel-Chassis: $\quad>5 \times 10^{8} \mathrm{~S}$
Hi-Lo: $\quad>5 \times 10^{8} \mathrm{~S}$

## AC Performance

Capacitance
Open Channel:
$<5 \mathrm{pF}$
Channel-Channel:
Channel-Chassis:
$<10 \mathrm{pF}$
$<100 \mathrm{pF}$
Bandwidth, (-3 dB, 50 ohm termination): 30 MHz Insertion Loss, ( 50 ohm termination): $\quad<.25 \mathrm{~dB}$ at 1 MHz

Crosstalk, (50 ohm termination): $<-90 \mathrm{~dB}$ at 10 kHz
$<-70 \mathrm{~dB}$ at 100 kHz
$<-50 \mathrm{~dB}$ at 1 MHz
\#2 ms / channel
(typical)

Refer to the section on 1250-35 Module Specific Syntax in Section 3 for instructions on how to select the 1250-35 configuration.

In most of the above configurations the 1250-35 may be user configured to access the 1250 Analog bus. The Analog bus allows internal expansion for the configuration of larger scanner / multiplexers than the 1250-35 may achieve alone.

The 30 MHz bandwidth specified for the 1250-35 is a worst-case specification for the $1 \times 6$ two wire configuration only.
Unterminated stubs on the signal paths are the cause of the band-limiting effects that may reduce the bandwidth to as low as 3 MHz in the case of the $1 \times 96$ one wire mode.

NOTE
The 1250-35 is supported by 1250 operating systems at rev. Levels 14.1 and above.

## Option 1250-40 <br> Description

The 1250-40 Matrix Module supplies a two wire $4 \times 5$ signal switching matrix for use at up to 10 MHz . The Analog bus allows internal expansion for the configuration of matrices of up to $4 \times 25$. Relay contacts are monitored to provide user selectable confidence checking.


Figure 1-11, Block Diagram of 1250-40
The 10 MHz bandwidth specified for the $1250-40$ is a worst-case specification. Unterminated stubs on the matrix signal paths are the cause of the band-limiting effects that reduce the 1250-40 bandwidth to 10 MHz . Choosing the longest path length possible for a signal will reduce the length of these unterminated stubs and also reduces the band limiting effects that they cause. This allows the $1250-40$ to be used above 10 MHz .

The 1250-40 has been superceded by the 1250-40B. It is still available to users with systems configured to use the 1250-40, however, as the pin configuration used by the $1250-40 \mathrm{~B}$ is different from that of the 1250-40.

## Specifications

Switch Configuration: matrix
User Connector:
Maximum Switchable Voltage:
Maximum Switchable Current (DC or AC rms):
Per Channel:
2 A
Per Module: 8 A
Maximum Switchable Power
Per channel:
Per module:
60 W DC, 500 VA
AC
240 W DC, 2000 VA
AC

## DC Performance

Differential Thermal Offset: \#3 $\mu \mathrm{V}$ per channel
Path Resistance: 300 milliohm at 2A
DC
Isolation at $40^{\circ} \mathrm{C}, 50 \% \mathrm{RH}$
Open Channel, channel-channel: $>10^{10}$ ohms
Channel-Chassis: $\quad>10^{10}$ ohms
Hi-Lo: $\quad>10^{10}$ ohms
Capacitance
Open Channel: $<10 \mathrm{pF}$
Channel-Channel: $<10 \mathrm{pF}$
Channel-Chassis: $<75 \mathrm{pF}$
Hi-Lo:
Bandwidth, (-3 dB, 50 ohm termination): 10 MHz
Insertion Loss, 50 ohm termination:

Crosstalk, 50 ohm termination:

Switching Time:
$4 \times 5$ two wire

Quick Disconnect screw terminal 250 VDC, 250 VAC RMS or 350 VAC pk
\#3 $\mu \mathrm{V}$ per channel
300 milliohm at 2 A
<15 pF
$<.20 \mathrm{~dB}$ at 100 kHz $<.30 \mathrm{~dB}$ at 1 MHz $<3.00 \mathrm{~dB}$ at 10 MHz $<-70 \mathrm{~dB}$ at 100 kHz $<-50 \mathrm{~dB}$ at 1 MHz $<-30 \mathrm{~dB}$ at 10 MHz 10 ms / channel

## Option 1250-40B Description

The 1250-40B supplies a four wire $4 \times 5$ signal switching matrix for use at up to 10 MHz . Relay coil currents are monitored to provide user selectable confidence checking. Access to the analog bus is provided by the addition of jumper wires.

The 10 MHz bandwidth specified for the 1250-40B is a worstcase specification. Unterminated stubs on the matrix signal paths are the cause of the band-limiting effects that reduce the 1250-40B bandwidth to 10 MHz . Choosing the longest path length possible for a signal will reduce the length of these unterminated stubs and also reduces the band limiting effects that they cause. This allows the 1250-40B to be used above 10 MHz .


Figure 1-12, Block Diagram of 1250-40B

## Specifications

User Connector:
Quick Disconnect screw terminal
Maximum Switchable Voltage
(Terminal-Terminal or Terminal-Chassis): 250 VDC, 250 VAC RMS and 350 VAC pk
Maximum Switchable Current per channel: 2 A DC, 2A AC RMS per module: 8 A DC, 8A AC RMS
Maximum Switchable Power per channel: 60 W DC, 500 VA
AC
per module:
Thermal Offset:
Path Resistance:
240 W DC, 2000 VA
AC
< 3uV per channel, differential
300 milliohm at 2 A
DC
Isolation
Open Channel, channel-channel:
Channel-Chassis:
Hi-Lo:
Capacitance
Open Channel: $<10 \mathrm{pF}$
Channel-Channel: $<10 \mathrm{pF}$
Channel-Chassis: $<75 \mathrm{pF}$
Hi-Lo:
Bandwidth, 50 ohm termination:
Insertion Loss, 50 ohm termination:

Crosstalk, 50 ohm termination:

Switching Time:
$>10^{10}$ ohms
$>10^{10}$ ohms
$>10^{10}$ ohms
<15 pF
10 MHz
$<.20 \mathrm{~dB}$ at 100 kHz
$<.30 \mathrm{~dB}$ at 1 MHz $<3.00 \mathrm{~dB}$ at 10 MHz $<-70 \mathrm{~dB}$ at 100 kHz $<-45 \mathrm{~dB}$ at 1 MHz $<-30 \mathrm{~dB}$ at 10 MHz 10 ms

## Option 1250-45

## Description

The 1250-45 supplies a two wire $4 \times 12$ signal switching matrix or it may be configured in the factory as two $4 \times 6$ matrices, for use at up to 10 MHz . Relay coil currents are monitored to provide user selectable confidence checking.


Figure 1-13

## NOTE

The 1250-45 is not supported by 1250 operating systems at rev. levels 13.1 or lower. To introduce the 1250-45 into a 1250 system at a lower operating system rev. level than 13.1, contact Racal-Dana for details of the software upgrade required.

The 10 MHz bandwidth specified for the 1250-45 is a worst-case specification. Unterminated stubs on the matrix signal paths are the cause of the band-limiting effects that reduce the 1250-45 bandwidth to 10 MHz . Choosing the longest path length possible for a signal will reduce the length of these unterminated stubs and also reduces the band limiting effects that they cause. This allows the $1250-45$ to be used above 10 MHz .

## Specifications

User Connector:
Quick Disconnect screw terminal
Maximum Switchable Voltage
(Terminal-Terminal or Terminal-Chassis): 220 VDC, 250 VAC RMS and 350 VAC pk
Maximum Switchable Current per channel: 2 A DC, 2A AC RMS per module: 8 A DC, 8A AC RMS
Maximum Switchable Power per channel: 60 W DC, 125 VA
AC
per module: 240 W DC, 500 VA
AC
Thermal Offset:
< 15uV per channel, differential
Path Resistance: 300 milliohm at 2 A DC
Isolation
Open Channel, channel-channel: $>10^{10}$ ohms
Channel-Chassis: $\quad>10^{10}$ ohms
Hi-Lo:
Capacitance
Open Channel: $<80 \mathrm{pF}$
Channel-Channel: $<30 \mathrm{pF}$
Channel-Chassis: $<200 \mathrm{pF}$
Hi-Lo:
Bandwidth, 50 ohm termination:
Insertion Loss, 50 ohm termination:

Crosstalk, 50 ohm termination:

Switching Time:
<100 pF
10 MHz
$<.20 \mathrm{~dB}$ at 100 kHz
$<.30 \mathrm{~dB}$ at 1 MHz $<3.00 \mathrm{~dB}$ at 10 MHz $<-70 \mathrm{~dB}$ at 100 kHz $<-45 \mathrm{~dB}$ at 1 MHz $<-25 \mathrm{~dB}$ at 10 MHz 10 ms

## Option 1250-50

## Description

The 1250-50 RF Multiplexer Module provides four 1x4, two $1 \times 9$ or one $1 \times 17$ multiplexers for use at up to 200 MHz . The addition of user installable BNC connectors allows two $1 \times 5$ and two $1 \times 4$, one $1 \times 10$ and one $1 \times 9$ and one $1 \times 19$ multiplexers to be configured. Relay contacts are monitored to provide user selectable confidence checking.


Model 1250-50

- Requires an additional connector.


Figure 1-14, Block Diagram of 1250-50 and Insertion Loss vs, Frequency

## Specifications

| User Connector: | BNC Plug |
| :---: | :---: |
| Maximum Switchable Voltage |  |
| Signal - Signal Ground: | $\begin{aligned} & 200 \text { VDC, } 200 \text { VAC } \\ & \mathrm{pk} \end{aligned}$ |
| Maximum Switchable Current |  |
| Per Channel: | 5 A DC, 1 A AC pk |
| Maximum Switchable Power: | 10 W DC, 10 VA, 10 W RF into 50 S |
| DC Performance |  |
| Path Resistance: | \#500 milliohm |
| AC Performance |  |
| Impedance: | 50 S |
| Bandwidth, (-3 dB, 50 ohm termination): | 200 MHz |
| Insertion Loss, 50 ohm termination: | 0.5 dB typical at 100 MHz |
| Crosstalk, 50 ohm termination: | $<-75 \mathrm{~dB}$ at 10 MHz |
|  | $<-55 \mathrm{~dB}$ at 100 MHz |
|  | $<-50 \mathrm{~dB}$ at 200 MHz |
| Isolation (50S termination) |  |
| 10 MHz : | \#-55 dB |
| 100 MHz | \#-40 dB |
| 200 MHz | \#-35 dB |
| VSWR (50 S termination) | \#1.5 : 1 at 100 MHz |
| Switching Time: | \#2 ms |

## Description

The 1250-51A RF Multiplexer Module supplies two $1 \times 4$ or one $1 \times 9$ multiplexers for use at up to 500 MHz . The 1250-51B supplies four $1 \times 4$, two $1 \times 9$ or one $1 \times 17$ multiplexers and is also for use at up to 500 MHz . Relay coil currents are monitored to provide user selectable confidence checking.


Model 1250-51B

Channel Insertion Loss vs. Frequency


Figure 1-15, Block Diagram of 1250-51 and Insertion Loss vs, Frequency

## Specifications

User Connector:
BNC
Maximum Switchable Voltage
Signal - Signal Ground: 30VDC, 100VAC
rms
Maximum Switchable Current Per
Channel: 2 A DC, 2 A rms
Maximum Switchable Power Per
Channel: 60 W DC, 60 VA, 60 W RF into 50 S
Maximum Voltage, Signal Ground to
Chassis: $\quad 52 \mathrm{~V}$ DC or peak AC
DC Performance
Path Resistance: $\quad \# 600$ milliohm at 2A

## AC Performance

Impedance:
Bandwidth, (-3 dB, 50 ohm termination): Insertion Loss, 50 ohm termination:

Crosstalk, 50 ohm termination:

Isolation ( 50 S termination)

VSWR (50 S termination)
Switching Time:

50 S
500 MHz
$<0.5 \mathrm{~dB}$ at 100 MHz
$<1.0 \mathrm{~dB}$ at 250 MHz
$<-100 \mathrm{~dB}$ at 10 MHz
$<-90 \mathrm{~dB}$ at 100 MHz
$<-60 \mathrm{~dB}$ at 500 MHz
\#-70 dB at 10 MHz
\#-60 dB at 100 MHz
\#-50 dB at 500 MHz
$1.2: 1$ at 100 MHz
\#10 ms

## Description

The 1250-52A Multiplexer Module provides two 1x4 multiplexers for use at up to 1 GHz . The 1250-52B Multiplexer Module provides four $1 \times 4$ multiplexers for use at up to 1 GHz . Binary tree configurations are employed to avoid unterminated stub effects that would otherwise limit the bandwidth of the modules signal paths. Unused paths are isolated and grounded to reduce the effects of radiated and conducted noise. Relay coil currents are monitored to provide user selectable confidence checking.


1250-52A
Model 1250-52A uses channels 00-13 only.

Model 1250-52B


Figure 1-16, Block Diagram of 1250-52B and Insertion Loss vs. Frequency

## Specifications

User Connector:
BNC
Maximum Switchable Voltage
Signal - Ground: 30 VDC, 100VAC rms
Maximum Switchable Current Per
Channel: 2 A DC, 2 A rms
Maximum Switchable Power Per
Channel: 60 W DC, 60 VA, 60 W RF power
Maximum Voltage, Signal Ground to
Chassis: $\quad 42$ V DC or peak AC
DC Performance
Path Resistance:

## AC Performance

Impedance: 50 S
Bandwidth, ( $-3 \mathrm{~dB}, 50$ ohm termination): 1 GHz
Insertion Loss, ( 50 S termination): $\quad 0.5 \mathrm{~dB}$ at 100 MHz ,
1.0 dB at 500 MHz

Crosstalk, (50 S termination): $<-100 \mathrm{~dB}$ at 10 MHz
$<-95 \mathrm{~dB}$ at 100 MHz
$<-55 \mathrm{~dB}$ at 1 GHz
\#-100dB at 10 MHz
\#-90dB at 100 MHz
\#-55dB at 1 GHz
$1.4: 1$ at 500 MHz
\#10 ms

## Option 1250-54B

## Description

The 1250-54B supplies four $4: 1$ multiplexers for use at up to 1 GHz . Any unused inputs may be terminated into 50 ohms. Binary tree configurations are employed to avoid unterminated stub effects that would otherwise limit the bandwidth of the modules signal paths. Relay coil currents are monitored to provide user selectable confidence checking.

Note:
A version of the 1250-54B with a characteristic impedance of $75 \mathbf{S}$ is available and is designated the 1250-55B.


Figure 1-17, Block Diagram of 1250-54B

## Specifications

| User Connector: | BNC |
| :---: | :---: |
| Maximum Switchable Voltage |  |
| (Signal - Ground): | 30 VDC, 100 VAC rms |
| Maximum Switchable Current: | 2 A DC or AC rms |
| Maximum Switchable Power: | 60 WDC, 600 VA, 60 W RF Power |
| Maximum Voltage <br> (Signal Ground - Chassis): | 42 VDC or peak AC |
| DC Performance |  |
| Path Resistance: | 500 mS at 2 ADC |
| AC Performance |  |
| Impedance: | 50 S |
| Bandwidth (-3dB, 50S termination): | 1 GHz |
| Insertion Loss (50 S termination): | 0.5 dB at 100 MHz |
|  | 1.0 dB at 500 MHz |
| Crosstalk (50 S termination): | \#-100 dB at 10 MHz |
|  | \#-85 dB at 100 MHz |
|  | \#-55 dB at 1 GHz |
| Isolation: (50 S termination) | \#-100 dB at 10 MHz |
|  | \#-80 dB at 100 MHz |
|  | \#-55 dB at 1 GHz |
| VSWR: (50 S termination) | $1.4: 1$ at 500 MHz |
| Switching Time: | \#10 mSec |

## Option 1250-55B

## Description

The 1250-55B supplies four 4:1 multiplexers for use at up to 1 GHz . Any unused inputs may be terminated into 50 ohms. Binary tree configurations are employed to avoid unterminated stub effects that would otherwise limit the bandwidth of the modules signal paths. Relay coil currents are monitored to provide user selectable confidence checking.

## Note:

A version of the 1250-55B with a characteristic impedance of $50 \mathbf{S}$ is available and is designated the 1250-54B. The module will be reported to the user as a $1250-54 \mathrm{~B}$, regardless of weather it is a 1250-45B or 1250-55B. In either case, the module will operate correctly.


Figure 1-18, Block Diagram of 1250-55B

## Specifications

| User Connector: | BNC |
| :--- | :--- |
| Maximum Switchable Voltage |  |
| (Signal - Ground): | $30 \mathrm{VDC}, 100 \mathrm{VACrms}$ |
| Maximum Switchable Current: | 2 A DC or AC rms |
| Maximum Switchable Power: | $60 \mathrm{WDC}, 600 \mathrm{VA}, 60$ |
| W RF Power |  |
| Maximum Voltage | 42 VDC or peak AC |
| (Signal Ground - Chassis): |  |
| DC Performance | 500 mS at 2 ADC |
| Path Resistance: |  |
| AC Performance | 50 S |
| Impedance: | 1 GHz |
| Bandwidth (-3 dB, 50 S termination): | 0.5 dB at 100 MHz |
| Insertion Loss (50 S termination): | 1.0 dB at 500 MHz |
|  | $\#-100 \mathrm{~dB}$ at 10 MHz |
| Crosstalk (50 S termination): | $\#-85 \mathrm{~dB}$ at 100 MHz |
|  | \#-55 dB at 1 GHz |
|  | $\#-100 \mathrm{~dB}$ at 10 MHz |
| Isolation: (50 S termination) | $\#-80 \mathrm{~dB}$ at 100 MHz |
|  | \#-55 dB at 1 GHz |
| VSWR: (50 S termination) | $1.4: 1$ at 500 MHz |
| Switching Time: | $\# 10 \mathrm{mSec}$ |

## Description

The 1250-60 and 1250-61 Microwave Switch modules provide up to four SPDT coaxial switches per module. The 1250-60 is for use at up to 18 GHz and the $1250-61$ is for use at up to 26.5 GHz . The A version of these switch modules provides two SPDT relays per module and the B version provides four SPDT relays per module. Relay coil currents are monitored to provide user selectable confidence checking.


Model 1250-60A/61A microwave switch and power supply configuration. Model 1250-60B/61B contains four relays.

Figure 1-19, Block Diagram of 1250-60 and 1250-61

## Specifications



## Option 1250-65

The 1250-65 consist of 4 transfer switches capable of operating at frequencies up to 180 Hz . Each transfer switch has a built-in latching circuit which eliminates the need to provide continuous coil current. Each transfer switch also has 4 SMA connectors which are configured in 2 ways. The 2 configurations are implemented through the OPEN, CLOSE, and RESET commands.

The 2 configurations of each transfer switch are shown below.


Figure 1-20, Block Diagram of 1250-65

Two configurations of the transfer switch used on the 1250-65 module.

1250-65 Latching 18 GHz Microwave Switching Module Specifications

| User Connector: | SMA |
| :--- | :--- |
| Maximum Power Per Channel: | 400 W to 100 MHz |
|  | 150 W to 1 GHz |
|  | 80 W to 4 GHz |
|  | 45 W to 12 GHz |
|  | 35 W to 18 GHz |
|  |  |
| Insertion Loss | 0.2 dB to 4 GHz |
| (50-ohm termination): | 0.3 dB to 12 GHz |
|  | 0.5 dB to 18 GHz |
|  | -80 dB to 4 GHz |
| Isolation (50-ohm termination): | -70 db to 12 GHz |
|  | -60 dB to 18 GHz |
|  | -80 dB to 4 GHz |
| Isolation (50-ohm termination): | -70 dB to 12 GHz |
|  | -60 dB to 18 GHz |
|  | 1.25 to 4 GHz |
| VSWR (50-ohm termination): | 1.4 to 12 GHz |
|  | 1.6 dB to 18 GHz |
| Switching Time: | $<15 \mathrm{~ms}$ |
| Latching Circuit Recovery Time: | $<100 \mathrm{~ms}$ |

# Option 1250-750 

The 1250-750 Mulfiplexer Module is a 75 ohm system that provides four 1x4 or two $1 \times 9$ mulfiplexers for use at up to 200 MHz . Relay contacts are monitored to provide user selectable confidence checking.




Model 1250-750


Figure 1-21, Block Diagram of 1250-750 and Insertion Loss vs. Frequency

## Chapter 2

Introduction

Unpacking and Inspection

This section describes the unpacking and inspection, reshipment, preparation for use, plug-in modules, General Purpose Interface Bus (GPIB), equipment rack installation, Option 90 Intelligent Front Panel installation, storage/temperature, and ventilation requirements for the 1250.

Before unpacking the 1250, check the exterior of the shipping carton for any signs of damage. All irregularities should be noted on the shipping bill. Remove the instrument from its carton, preserving the factory packaging as much as possible. Inspect the 1250 for any defect or damage. Notify the carrier immediately if any damage is apparent. Have a qualified person check the instrument for safety before use.

Use the original packaging if it is necessary to return the 1250 to Racal-Dana for servicing. The original shipping carton and the instrument's plastic-foam form will provide the necessary support for safe reshipment. If the original packaging is unavailable, reconstruct it as much as possible. Wrap the 1250 in plastic; then use plastic spray foam to surround and protect the instrument. Reship in either the original or new, sturdy shipping carton.

## Preparation for <br> use

Power Connections

Before operating the 1250, verify that the AC voltage selector is correctly set for the local AC supply. The 1250 operates on 100, 120,220 , or 240 volts, 50 to 60 Hz (or 100 and 120 volts on the 50 to 440 Hz version). The present voltage range in use can be seen through the small window in the power input module on the rear panel.

## NOTE:

The 1250 modular family of systems and subsystems has been designed with the capability to utilize a system-supplied negative power supply, dubbed -13 V . This capability has not been implemented in the present 1250 family of products.

## Line Voltage Selection

The line voltage setting is easily changed by repositioning the small voltage selector card in its slot. Refer to Figure 2-1 and use the following procedure:
a. Remove the power cord from the power input module
b. Fully slide the transparent fuse cover to the left. This exposes the fuse and voltage selector card
c. Pull the small lever marked FUSE PULL completely to the left. This ejects the fuse from its holder, permitting access to the selector card
d. Remove the selector card, then reposition it in its slot so that the desired line voltage designation is visible. (Using a small pair of needle-nose pliers can be helpful in completing this step.)
e. Pull the lever completely back to the right, snapping it closed
f. Replace the fuse in its holder. Line voltage settings of 100 or 120 V should have a 1.5 A (. 75 on the $50-440 \mathrm{~Hz}$ version) Slow-Blow fuse installed; settings of 220 or 240A should have a .75 V (.375A on the $50-440 \mathrm{~Hz}$ version) Slow-Blow fuse installed
g. Slide the fuse cover completely to the right covering the voltage selector card and fuse. The correct line voltage designation should be visible through the window
h. Connect the power cord to the 1250 again


Figure 2-1, AC Line Voltage Selection

## Power Cord and Grounding

The 1250 is grounded in accordance with MIL-T-28800C, protecting the user from possible injury due to shorted circuits.

A protective ground terminal, forming part of the rear-panel input socket, is provided. The 1250 is supplied with a detachable 3core power cord. Only this cord should be used.

Use only AC power outlets having a protective ground for connection to the 1250. DO NOT USE 2-core extension cords or 3-prong to 2-prong adaptors that don't provide a protective ground connection. Connection of the power cord to the power outlet must be made in accordance with the following standard color code:

|  | American | European |
| :--- | :--- | :--- | :--- |
| Live | Black | Brown |
| Neutral | White | Blue |
| Ground (Earth) | Green | Green/Yellow |

All devices connected to or in proximity with the 1250 must maintain the third-wire ground (earth) intact.

## 1250 Series Plug-in Modules

Switch modules

Up to five user-selected plug-in modules can be placed in the 1250. Modules measure approximately 9 in . Wide $x 10 \mathrm{in}$. Deep x 1 in . Thick and are polarized, along with the card cage, to prevent any module from being installed upside-down. By use of card guides, 1250 modules are easily installed and extracted from the card cage. All plug-in modules provide for a maximum component height of 0.625 in . Basic modules are designed to provide high-voltage shielding on the top, bottom, and sides (1000V max.; max. component height of 0.4 in ).

## Switching Module Installation

Each of the five plug-in switch modules is easily installed, using its corresponding card guides, into the rear of the 1250 mainframe as shown in Figure 2-2. Modules may be removed without the need for desoldering or removing the mainframe from the system. At installation, ensure that the front of the plug-in module is securely connected to the Analog and Interconnect


Figure 2-2, 1250 Switching Module Installation
Showing Use of Quick-Release Disconnector (common guard assembly not shown in the figure and not supplied with all models)

# Strain Relief Screw Terminals 

All low-frequency switch modules, like the 1250-30 Scanner/Multiplexer module, have special screw terminal blocks which incorporate strain-relief cable supports. Again refer to Figure 2-2 showing these features. The terminal blocks are attached to the module with gold-plated edge connectors secured with a rapid-release screw. The user may either remove only the terminal block assembly or the entire module with attached terminal block from the 1250 mainframe. The terminal block assembly has a quick-release feature (using two slotted fastoperating screws) which permits rapid connection/disconnection of terminal blocks from the 1250 mainframe. Terminal block assemblies may be pre-wired (loosen and remove the three screws shown in the figure) for easy interchange on any of the plug-in modules. To complete cabling, insert the stripped wires into the appropriate connector holes (as shown) and retighten the corresponding screws. Ensure that each wire is positioned evenly between the two sections of the strain-relief support.

If the user's signal shields must be commoned, the common guard assembly may be used. Terminate the drain (guard) wires to the connector as shown in Figure 2-3 below. The connectors are supplied with the Option 80.

## NOTE



The Common guard assembly is not supplied with all models
Figure 2-3, 1250 Option 80 Guard Connection Procedure

## GPIB interface

## GPIB Bus Organization

Shown below in Figure 2-4A and $B$ are the linear and cluster bus organizations possible for the 1250/GPIB.

A

## Linear Bus Organization



B

## Cluster Bus Organization



Figure 2-4, Linear (A) and Cluster (B) Bus Organizations

| $\begin{gathered} \text { ASCII } \\ \text { CHARACTERS } \end{gathered}$ |  | DATA LINES |  |  |  |  |  |  |  | $\begin{aligned} & \text { DECIMAL } \\ & \text { ADDRESS } \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $\mathrm{D}_{7}$ | $\mathrm{D}_{6}$ | $\mathrm{D}_{5}$ | $\mathrm{D}_{4}$ | $\mathrm{D}_{3}$ | $\mathrm{D}_{2}$ | $\mathrm{D}_{1}$ |  |  |
| TALK | LISTEN | TALK | LISTEN | ADDRESS |  |  |  |  |  |  |
|  |  |  |  | 16 | 8 | 4 | 2 | 1 |  |  |
| ＠ | SP | 0 | 1 | 0 | 0 | 0 | 0 | 0 |  | 00 |
|  |  | 1 | 0 | 0 | 0 | 0 | 0 | 0 |  |  |
|  | ！ | 0 | 1 | 0 | 0 | 0 | 0 | 1 |  | 01 |
| A |  | 1 | 0 | 0 | 0 | 0 | 0 | 1 |  |  |
|  | ＂ | 0 | 1 | 0 | 0 | 0 | 1 | 0 |  | 02 |
| B |  | 1 | 0 | 0 | 0 | 0 | 1 | 0 |  |  |
|  | \＃ | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 距早品 | 03 |
| C |  | 1 | 0 | 0 | 0 | 0 | 1 | 1 |  |  |
|  | \＄ | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 品品品是 | 04 |
| D |  | 1 | 0 | 0 | 0 | 1 | 0 | 0 |  |  |
|  | \％ | 0 | 1 | 0 | 0 | 1 | 0 | 1 |  | 05 |
| E |  | 1 | 0 | 0 | 0 | 1 | 0 | 1 |  |  |
|  | \＆ | 0 | 1 | 0 | 0 | 1 | 1 | 0 |  | 06 |
| F |  | 1 | 0 | 0 | 0 | 1 | 1 | 0 |  |  |
|  | （APos． | 0 | 1 | 0 | 0 | 1 | 1 | 1 | in | 07 |
| G |  | 1 | 0 | 0 | 0 | 1 | 1 | 1 |  |  |
|  | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |  | 08 |
| H |  | 1 | 0 | 0 | 1 | 0 | 0 | 0 |  |  |
|  | 1 | 0 | 1 | 0 | 1 | 0 | $\cdots$ | 1 | $i_{\square}^{\square} \square \square \square \square \square$ | 09 |
| 1 |  | 1 | 0 | 0 | 1 | 0 | 0 | 1 |  |  |
|  | ＊ | 0 | 1 | 0 | 1. | 0 | 1. | 0 |  | 10 |
| J |  | 1 | 0 | 0 | 1 | 0 | 1 | 0 |  |  |
|  | ＋ | 0 | 1 | 0 | 1 | 0 | 1 | 1 |  | 11 |
| K |  | 1 | 0 | 0 | 1 | 0 | 1 | 1 |  |  |
|  |  | 0 | 1 | 0 | 1 | 1 | 0 | 0 |  | 12 |
| L |  | 1 | 0 | 0 | 1 | 1 | 0 | 0 |  |  |
|  | － | 0 | 1 | 0 | 1 | 1 | 0 | 1 |  | 13 |
| M |  | 1 | 0 | 0 | 1 | 1 | 0 | 1 |  |  |
| $N$ |  | 0 | 1 | 0 | 1 | 1 | 1 | 0 |  | 14 |
|  |  | 1 | 0 | 0 | 1 | 1 | 1 | 0 |  |  |
|  | ／ | 0 | 1 | 0 | 1 | 1 | 1 | 1 | $\stackrel{\circ}{4} \square \square \square \square \square \square \square \square \square \square$ | 15 |
| 0 |  | 1 | 0 | 0 | 1 | 1 | 1 | 1 |  |  |


| ASCII CHARACTERS |  | DATA LINES |  |  |  |  |  |  |  | $\begin{aligned} & \text { DECIMAL } \\ & \text { ADDRESS } \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $\mathrm{D}_{7}$ | $\mathrm{D}_{6}$ | $\mathrm{D}_{5}$ | $\mathrm{D}_{4}$ | $\mathrm{D}_{3}$ | $\mathrm{D}_{2}$ | $0_{1}$ |  |  |
| TALK | LISTEN | TALK | LISTEN | ADDRESS |  |  |  |  |  |  |
|  |  |  |  | 16 | 8 | 4 | 2 | 1 |  |  |
|  | $\emptyset$ | 0 | 1 | 1 | 0 | 0 | 0 | 0 |  | 16 |
| P |  | 1 | 0 | 1 | 0 | 0 | 0 | 0 |  |  |
|  | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1. |  | 17 |
| Q |  | 1 | 0 | 1 | 0 | 0 | 0 | 1 |  |  |
|  | 2 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |  | 18 |
| R |  | 1 | 0 | 1 | 0 | 0 | 1 | 0 |  |  |
|  | 3 | 0 | 1 | 1. | 0 | 0 | 1 | 1 |  | 19 |
| S |  | 1 | 0 | 1 | 0 | 0 | 1 | 1 |  |  |
|  | 4 | 0 | 1 | 1 | 0 | 1 | 0 | 0 |  | 20 |
| T |  | 1 | 0 | 1 | 0 | 1 | 0 | 0 |  |  |
|  | 5 | 0 | 1 | 1 | 0 | 1 | 0 | 1 |  | 21 |
| $\cup$ |  | 1 | 0 | 1 | 0 | 1 | 0 | 1 |  |  |
|  | 6 | 0 | 1 | 1 | 0 | 1 | 1 | 0 |  | 22 |
| V |  | 1 | 0 | 1 | 0 | 1 | 1 | 0 |  |  |
|  | 7. | 0 | 1 | 1 | 0 | 1 | 1 | 1 |  | 23 |
| W |  | 1 | 0 | 1 | 0 | 1 | 1 | 1 |  |  |
|  | 8 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |  | 24 |
| X |  | 1 | 0 | 1 | 1 | 0 | 0 | 0 |  |  |
|  | 9 | 0 | 1 | 1 | 1 | 0 | 0 | 1 |  | 25 |
| Y |  | 1 | 0 | 1 | 1 | 0 | 0 | 1 |  |  |
|  | ： | 0 | 1 | 1 | 1. | 0 | 1. | 0 |  | 26 |
| Z |  | 1 | 0 | 1 | 1 | 0 | 1 | 0 |  |  |
|  | ； | 0 | 1 | 1 | 1 | 0 | 1 | 1 |  | 27 |
| ［ |  | 1 | 0 | 1 | 1 | 0 | 1 | 1 |  |  |
|  | $<$ | 0 | 1 | 1 | 1 | 1 | 0 | 0 |  | 28 |
| 1 |  | 1 | 0 | 1 | 1 | 1 | 0 | 0 |  |  |
|  | $=$ | 0 | 1 | 1 | 1 | 1 | 0 | 1 |  | 29 |
| ］ |  | 1 | 0 | 1 | 1 | 1 | 0 | 1 |  |  |
|  | ＞ | 0 | 1 | 1 | 1 | 1 | 1 | 0 |  | 30 |
| $\wedge$ |  | 1 | 0 | 1 | 1 | 1 | 1 | 0 |  |  |
| US | － | ILLEGAL |  |  |  |  |  |  | ¢ロロロana | 31 |

## GPIB

Interconnections

The GPIB system permits up to 15 instruments (including the controller) to interconnect and reside on a single bus. The GPIB cables have identical "piggyback" connectors on both ends permitting several cables to be connected to a single source. System devices and instruments may be interconnected in almost any desired configuration. There must be a path, however, from the controller to every device residing on the bus. Avoid stacking more than three or four cables on any single connector for if the stack gets too large, the force may damage the connector mounting. Be certain that each connector is firmly (finger-tight) screwed in place. Refer to Table 3.2 and associated figure for the 1250's rear-panel connections.

## GPIB Cable Length

 LimitsIf the system cabling is too long, the lines cannot be properly driven and the system will not perform correctly. It is important to ensure that the following guidelines are strictly met:
a. Total cable length for the system must be less than or equal to 65.6 feet ( 20 meters)
b. Total cable length for the system must be equal to or less than 6.6 feet ( 2 meters) times the total number of devices residing on the bus
c. Total number of instruments residing on the bus must not exceed 15

## GPIB Address Assignment

The 1250 as a bus member must be assigned a unique address when operating in a GPIB system. By assigning a GPIB-Bus address to the 1250, it can be "called up" by the computer controller or another device on the bus without interfering with other units residing on the 488 bus. The coding used for setting the 1250 address is binary.

The 1250 is equipped with a rear-panel switch bank, enabling the user to assign one of 31 addresses (numbers 00 to 30 ).

Table 2.1 contains all the information required for setting the 1250's address and determining the talk and listen address codes used in programming the controller. Switches A1 to A5 define the listen/talk addresses for the 1250 in the addressed mode. The PWR ON SRQ, when set to 1, permits the instrument to transmit a service request to the controller when the 1250 is first poweredon.

Note in the table the column headed "ADDRESS SWITCH

SETTING". It illustrates the positions of switches A1 to A5 for each number address listed in the far right column. To set the GPIB address, simply select the desired decimal address for the 1250, refer to the table, and set the switches on the address selector to the corresponding pattern in the column.

Once an address has been assigned, the controller may then address the 1250 as a talker/listener by transmitting the appropriate ASCII character on the data lines and asserting the ATN line. The "DATA LINES" column of the table shows the 7-bit binary codes for every talk/listen address assigned to the 1250. The controller transmits these codes to the 1250 to establish its talker/listener status.

Note also in the table that there are two address codes for each GPIB address number. Each code represents a different ASCII character. For example, if an address of 02 is assigned to the 1250, the talk address is the ASCII character B and the listen address is the ASCII character ". The only difference in the binary code in each case is the state of data lines D6 and D7.

The 1250 is preset at GPIB address 00 when shipped.

## GPIB Rear-Panel Connector

The GPIB-Bus with its interface circuitry provides for reception and execution of programmed commands between a GPIB bus controller and the 1250 switch controller (shown in Figure 2-5) located on the rear panel of the 1250. The pin location, line identification, and operation of the GPIB-Bus are in compliance with IEEE-Standard-488-1978.


Figure 2-5, GPIB-Connector (Rear Panel)

Table 2-1, GPIB Connector Pins

| Pin No. | Assignment | Pin No. | Assignment |
| :--- | :--- | :--- | :--- |
| 1 | DIO 1 | 13 | DIO 5 |
| 2 | DIO 2 | 14 | DIO 6 |
| 3 | DIO 3 | 15 | DIO 7 |
| 4 | DIO 4 | 16 | DIO 8 |
| 5 | EOI | 17 | REN |
| 6 | DAV | 18 | GND, (6) |
| 7 | NRFD | 19 | GND, (7) |
| 8 | NDAC | 20 | GDN, (8) |
| 9 | IFC | 21 | GND, (9) |
| 10 | SRQ | 22 | GND, (10) |
| 11 | ATN | 23 | GND, (11) |
| 12 | SHIELD | 24 | GND, (5 AND 17) |

## GPIB Interface Signal Pin Assignments

GPIB interface signal pin assignments are shown in Figure 2-6. Also, refer as required to the GPIB interface subsets available using the 1250 shown in Table 1.1.

There are 24 lines available at the GPIB connector, including 16 signal and 7 ground return lines, and one shield. All of the data bus lines are bidirectional, having the following characteristics:

Logic Levels: $1=$ Low $=.8 \mathrm{~V}$

$$
0=\mathrm{High}=2.0 \mathrm{~V}
$$

Input Loading: Each input = one TTL load
Output: $\quad$ The output is capable of driving 15 interface bus loads. It consists of an open-collector driver and is capable of sinking 48 mA with a maximum voltage drop of 0.4 volts.

Table 2-2, Interface Signal Pin Assingments

| Pin | Nomenclature | Description |  |
| :--- | :--- | :--- | :--- |
| 1 | DIO-1 | Data In/Out Bit 1 (LSB) |  |
| 2 | DIO-2 | Data In/Out Bit 2 |  |
| 3 | DIO-3 | Data In/Out Bit 3 | Data lines are used |
| 4 | DIO-4 | Data In/Out Bit 4 | to transfer data from |
| 13 | DIO-5 | Data In/Out Bit 5 | one instrument to |
| 14 | DIO-6 | Data In/Out Bit 6 | another |
| 15 | DIO-7 | Data In/Out Bit 7 |  |
| 16 | DIO-8 | Data In/Out Bit 8 |  |
| 6 | DAV | (Data Valid) |  |
| 7 | NRFD | (Not Ready for Data) |  |
| 8 | NDAC | (Not Data Accepted) |  |
| 5 | EOI | (End or Identify) |  |
| 9 | IFC | (Interface Clear) |  |
| 10 | SRQ | (Service Request) |  |
| 11 | ATN | (Attention) |  |
| 17 | REN | (Remote Enable) |  |
| 12 | SHIELD |  |  |
| 18 | GND (6) |  |  |
| 19 | GND (7) |  |  |
| 20 | GND (8) |  |  |
| 21 | GND (9) |  |  |
| 22 | GND (10) |  |  |
| 23 | GND (11) |  |  |
| 24 | GND (5 and 17) |  |  |

## Equipment Rack <br> Installation

## Introduction

The 1250 may be mounted in a standard 19-inch equipment rack. The 1250 may be rack-mounted front-forward or rear-forward. Using Slide Mount Option 65, the 1250 must be slide-mounted front-forward. Installation instructions for this option follow.

# Slide-Mount Option 65 Installation 

Refer to Figures 2-6 and 2-7 for this procedure. The installation package includes:
a. Front rack-brackets (2); part of P/N 454488
b. Rear rack-brackets (2); part of P/N 454488
c. Triple-rail slide-mount assemblies (2); P/N 454489
d. Self-anchoring \#10-32 tinnerman nuts (12); P/N 610920
e. Phillips panhead \#10-32 x 1/2 screws (8); P/N 615091
f. Slotted panhead \#8-32 x 3/8 screws, nuts, flat washers, and lock washers (8 each); part of P/N 454488
g. Phillips panhead self-tapping \#8-32 $\times 5 / 16$ screws (4); P/N 610910
h. Phillips panhead \#10-32 x 3/4 screws (4); P/N 615093

Refer to Figure 2-6. Prepare the triple-rail slide-mount assembly for equipment rack installation. First, note that the instrument-rail and rack-rail holes are accessible either directly or through the enlarged holes in the center-rail (as the assembly is extended or retracted). Complete the following procedure:
a. Place a front rack-bracket (with one mounting slot) on the workbench, slotted flange facing down
b. Position the front end (i.e., slide-out end) of the slidemount assembly over and parallel to the front rackbracket. The rack-rail should rest within the bracket, about 3 1/4 inches from the bracket's front edge
c. Adjust the rails, aligning the front rack-rail hole with the center-rail access hole and mounting slot in the front rackbracket. Insert a slotted panhead \#8-32 x 3/8 screw through the holes. Attach a washer, lock washer, and nut to the screw and secure firmly, maintaining the $31 / 4$-inch dimension to the front of the bracket

## AMENDMENT

## SLIDE RACK-MOUNT KIT INSTALLATION INSTRUCTIONS

In recent slide rack-mount kits, the front and rear rack-brackets are the same size and each has only one screw slot. Otherwise, the installation procedure remains as described in the manual.

## NOTE


#### Abstract

Measure the distance between the front and rear mounting-rails of the rack at this point. If the distance is less than 20 inches, follow instruction "d" next; if the distance is greater than 20 inches, follow instruction "e".


d. Fully extend the slide-mount assembly. Position a rear rack-bracket (with two elongated mounting slots) on the rear of the assembly in the same way as the front rackbracket. Align the mounting slot closest to the slotted flange with the rear rack-rail nail hole. Insert a slotted panhead \#8-32 $\times 3 / 8$ screw through the holes. Attach a washer, lock washer, and nut to the screw and secure the rear rack-bracket loosely to the slide-mount assembly
e. Fully extend the slide-mount assembly. Position a rear rack-bracket (with two elongated mounting slots) on the rear of the assembly in the same way as the front rackbracket. Align the mounting slot farthest from the slotted flange with the rear rack-rail nail hole. Insert a slotted panhead \#8-32 x 3/8 screw through the holes. Attach a washer, lock washer, and nut to the screw and secure the rear rack-bracket loosely to the slide-mount assembly
f. Complete the other slide-mount and rack-bracket assembly in the same manner as just described
g. Slide two self-anchoring \#10-32 tinnerman nuts on the front and rear rack-brackets at the top and bottom slots of both slide-mount assemblies

The assistance of a second person will be needed for the following instrument-rack assembly. Secure the slide-mount assembly in the designated area of the instrument rack using the procedure below.

## NOTE

If the mounting rail of the instrument rack is tapped for \#10-32 screws, drill out two places for each bracket using a $1 / 4$ inch diameter bit. Proceed with the assembly.
a. Hold the front end of the slide-mount assembly behind the front mounting-rail of the rack, while the second person
holds the rear end of the assembly
b. Secure the front rack-bracket to the front mounting-rail using two phillips panhead \#10-32 $\times 1 / 2$ screws. Seat the front rack-bracket firmly against the mounting-rail before tightening these screws
c. Install the other front rack-bracket on its front mounting-rail in the same manner
d. Set the front dimension between the two slide-mount assemblies at $165 / 8$ inches
e. Adjust the length of the rear rack-brackets so that they touch the inside of the rear mounting-rail. Tighten the rear rack-bracket assembly screws
f. The distance between the two slide-mount assemblies at the rear-bracket should be $165 / 8$ inches. Should a filler plate be required to secure the slide-mount assembly to the rear rack mounting-rail at $165 / 8$ inches, use the dimensions given in Figure 2-7 to determine filler- plate size

## NOTE

The rear rack-bracket may require adjustment to accommodate the thickness of the filler plate.
g. Secure the rear rack-bracket to the rear rack mounting-rail (or filler plate) using two phillips panhead \#10-32 x 1/2 screws in each bracket
h. The triple-rail slide-mount assemblies should move freely to their maximum extended positions. If not, remove any obstacle before installing the instrument


Figure 2-6, A \& B Slide-Mount and Bracket Assembly


Figure 2-7, Rear End Slide-Mount Rack Dimensions

Refer to Figures 2-8 A, B, and C and Figure 2-9 for the following procedure. Figure 2-8 A shows the 1250 with the standard configuration with the flange-mount angle-bracket located at the front of the instrument. Figure 2-8 B shows the 1250 with one of the two rear-forward rack-mount configurations.

## NOTE

Rear-forward rack-mount configurations may not use the Option 65 slide mounts.

This installation has the angle-brackets mounted on the rear of the instrument with the 1250's rear panel recessed. This installation is accomplished by completing the following procedure:
a. Extend the rails of the slide-mount assemblies to their maximum positions for installation
b. Remove the flange-mount angle-brackets from the front of the instrument. Rescrew the front handles in their normal front locations using two \#8-32 $\times 1 / 2$ angle-bracket screws
c. Remove the four rubber plugs at the rear of the instrument using a sturdy, pointed instrument
d. Using the two remaining phillips panhead self-tapping \#8$32 \times 1 / 2$ screws (from the previously front-mounted anglebrackets), reattach the two angle-brackets securely at the rear of the instrument as shown in Figure 2-8 B.

Figure 2-8 C shows the second rear-forward rack-mount configuration for the 1250. This installation has the anglebrackets mounted on the rear of the instrument with the 1250's rear panel nearly flush with these brackets. This installation is achieved by completing the following procedure:
a. Extend the rails of the slide-mount assemblies to their maximum positions for installation
b. Remove the flange-mount angle-brackets from the front of the instrument. Rescrew the front handles in their normal front locations using two \#8-32 $\times 1 / 2$ angle-bracket screws
c. Remove the four rubber plugs at the rear of the instrument using a sturdy, pointed instrument
d. Reverse the positions of the instrument's side panels as shown in the figure. (The angle-bracket holes formerly at the front will now be at the rear of the instrument.)
e. Using the two remaining phillips panhead self-tapping \#8$32 \times 1 / 2$ screws (from the previously front-mounted anglebrackets), reattach the two angle-brackets securely at the rear of the instrument as shown in Figure 2-8 C


Figure 2-8, Standard (A) and Optional Rear-Forward Rack-Mount (B and C) Assembly-to-Instrument Configurations

Refer to Figure 2-9. Mount the instrument-rail of the slide assembly securely to the side channel using the top slot and two phillips panhead self-tapping \#8-32 x $5 / 16$ screws. Ensure that the instrument-rail is flush against the rear of the flange-mount angle-bracket. Complete the same procedure for the other side of the instrument.


Figure 2-9, Slide Assembly-to-Side Channel Installation
The instrument should now slide freely on the rails.
The following assembly is required to lock the instrument into its operating position on the racks:
a. Slide two self-anchoring \#10-32 tinnerman nuts on the mounting-rail of the rack (each side). These nuts should be aligned with the angle-bracket slots. Omit the tinnerman nuts if the mounting-rail is tapped for \#10-32 screws
b. Slide the instrument fully into the rack until the angle brackets strike the slide-mount bracket screws. Secure the instrument in place using four phillips panhead \#10-32 x $3 / 4$ screws

## Intelligent Front <br> Panel (Option 90) <br> Installation

## Standard Mounting

## Remote Mounting

Refer to Figures 2-10 and 2-11 and complete steps a-e to install the Option 90 on the front of the 1250.

Refer to Figures 2-12 and 2-13 and complete step for "remote" mounting or use of Option 90 with the 1250.

Rear-Forward Rack Mounting

Refer to the previous section "Equipment Rack Installation", including Figure 2-8, of the 1250 Manual for rear-forward rackmounting instructions.


Figure 2-10, 1250 Side View (Left)

## Standard Mounting

a. Refer to Figure 2-11. Remove the two phillips panhead \#8$32 \times 3 / 8$ screws and two phillips panhead \#8-32 $\times 1 / 2$ screws from each side of the 1250
b. Remove the two rack-mount flanges and the two handles from the unit; store parts for possible separate mounting of the 1250 chassis and Intelligent Front Panel in the future


Figure 2-11, Option 90 to 1250 Chassis Installation
c. Refer to Figure 2-12. Secure the Option 90 cable connector into its receptacle on the front panel of the 1250 chassis with the two supplied \#4-40 x $1 / 4$ screws and place the power switch on the 1250 chassis in the OFF position
d. Place the Option 90 onto the front of the 1250 chassis. Align the two standoffs/mounting holes on the inside of each Option 90 rack-mount flange with the existing two standoffs/mounting holes in the front of each 1250 side panel
e. Use the four phillips panhead \#8-32 x $1 / 2$ screws removed in step a to securely fasten the Option 90 to the 1250 chassis. Replace all four phillips panhead \#8-32 x 3/8 screws removed in step a.

## Remote Mounting

f. Refer to Figures 2-12 and 2-13. If you wish to mount or use the Option 90 Intelligent Front Panel "remote" from the 1250, first unhook the 36-inch ribbon cable from its two flat cable clips on the rear of the front panel option. Then, simply plug the option's cable connector into the 37-pin Dsubminiature receptacle on the standard front panel and secure the connector with the two supplied \#4-40 x 1/4 screws


Figure 2-12, Rear View of Option 90 Showing Ribbon Cable


Figure 2-13, Front View of Standard Front Panel Showing Option 90 D Receptacle

## Storage and <br> Temperature

## Ventilation Requirements

The 1250 can be stored at temperatures ranging from -40EC to +70 EC at $95 \%$ relative humidity without adverse effects to PCBs or components. The 1250 must be brought within its specified operating range of 0 EC to +55 EC before commencing operation.

To maintain internal temperatures within safe limits it is important not to obstruct the airflow to the instrument.

This page was left intentionally blank.

## Chapter 3

## OPERATION

## Introduction

1250 Home State

This section supplies the information required to operate the 1250 Universal Switch Controller, both remotely and locally. The information required for each of the 1250 Series modules is different, so a section detailing the command formats required for each module is also supplied.

The default condition (Home State) of the 1250 is as follows:
CNF (Confidence test) OFF
DLY (Delay) 0
DSP (Display) ON
EQU (Equate list) 0
EXCL (Exclude list) 0
SCAN ON
SLIST (Scan list) 0
SRQMASK 44
TRIG (Trigger) ON
PUPRCL (Power up recall) - Same as on power down
All non-latching relays fitted to the 1250 Series switch modules are in their de-energised states.

The 1250 will not power up in the Home state if the power up recall mode is active. This mode sets the 1250 Relay switch modules to the configuration stored in non volatile memory location 1 at power up. Note that the 1250 mainframe (slot 0 ) will power up in the home state regardless of whether the Power up recall is active or not.

The 1250 will return to the home state in response to the RESET command and the GPIB SDC and DCL commands.

## 1250 Front and Rear Panels



Figure 3-1, 1250 Front Panel

Reference Description
1 Power Switch. This rocker switch places the 1250 in either the operating mode or the standby mode.

2 OPER LED. This LED lights to show that the 1250 is in the operating mode.

3 STBY LED. This LED lights to show that the 1250 is in the standby mode.

4 Option 90 (Intelligent Front Panel) connector. This 37 pin D-Subminiature connector is provided to allow installation of Option 90 on the 1250.

5 REM LED. This LED lights to show that the 1250 is in the GPIB remote mode.

6 ADDR LED. This LED lights to show that the 1250 is addressed over the GPIB.

7 SRQ LED. This LED lights to show that the 1250 has asserted the GPIB SRQ line.

Refer to Figure 3-2 for a view of the 1250 Rear Panel and to Table 3-2 for descriptions of the 1250 Rear Panel features.


Figure 3-2, 1250 Rear Panel

## Reference Description

1 GPIB (IEEE-STD-488) Connector.
2 GPIB address switch. The lower five switches fitted in this switch bank are used to set the GPIB address of the 1250. The sixth switch determines whether the 1250 Power Up SRQ feature is active. This feature, when active, causes the 1250 to unconditionally assert SRQ on power up.

3 SYNC OUT connector. This BNC connector outputs a TTL compatible, active high signal while a command string is being processed. A delay between relay switching and the Sync pulse returning to a low level may be achieved by the use of the DLY command.

4 TRIG IN connector. This BNC connector input accepts TTL level signals to cause the 1250 to proceed to the next element of the scan list. The trigger input must be enabled by the TRIG ON command or from the Intelligent Front Panel (Option 90) and the scan mode activated for this to occur.

5 Fan. This supplies the forced air cooling required by the 1250.

6 Line input. This is a standard AC supply connector.
7 Line voltage selector. This removable printed circuit card selects the line voltage that the 1250 will operate on. The
voltage selected is printed on the card and is visible through the fuse cover fitted. To change the voltage selected, remove the card and reinsert with the desired voltage visible. The line voltages that the 1250 will operate on are 100, 120, 220 and 240 V .

8 Line fuse. This is a glass cartridge slow blow fuse, value 1.5 A for 100 and 120 volt operation and 0.75 A for 220 and 240 volt operation.
$9 \quad$ AC power switch. This rocker switch connects the AC line to the 1250 power supply. It glows red in position 1 to show that the 1250 has power applied. Note that the front panel power switch must also be in the OPER position for the 1250 to be operated.

## GPIB Input Format

The 1250 will recognize commands as soon as two or more characters are received, (a "wild card parser"). For example, a CLOSE command would be recognized by the 1250 if the characters CL, CLO, CLOS, or CLOSE were detected. Similarly, OP, OPE, or OPEN are valid for an OPEN command.

The following two restrictions apply:
a. The spelling of the command must be correct. For example, "OPD", "OPR", "OP (any letter besides E)" would be considered errors for the OPEN command.
b. All commands in the command set can be recognized from two letters with the exception of the RESET, READ, and RECALL commands, which require a minimum of three letters.

The general syntax for all 1250 command lines is the following:
<command> [arg 1] [arg 2] ... [arg n] <terminator>. Hyphenated expression-arguments must be in ascending order.

Only one individual 1250 command and its arguments may appear on each command line.

Commands may be upper or lower-case or a combination of the two.

In general, there is no limit on the length of a 1250 command string. Several commands do, however, place a limit on the number of arguments which may appear in the command string. The EXCLUDE function allows a maximum of 50 arguments in the list, the EQUATE function and the SCAN LIST allow 85

## Operation 3-4

arguments.
Each 1250 command line must be properly terminated. The 1250 recognizes two different terminators: line feed (ASCII \$0A) and EOI. Any combination of these two terminators is acceptable. Note that a carriage return - line feed pair is also acceptable because of the line feed present.

## GPIB Output Format

## Serial Poll Status Byte

Each line of text output from the 1250 will have a leading space (ASCII value \$20).

All output strings are in upper case.

Table 3-1 shows the status byte format for the 1250. This byte is returned to the controller in response to a serial poll enable (SPE) message.

Table 3-1, Status Byte Format

| Bit Number | Description |
| :--- | :--- |
| 1 (LSB) | Unused |
| 2 | Unused |
| 3 | Power-On SRQ |
| 4 | Scan List at Break Point |
| 5 | Ready |
| 6 | Programming Error |
| 7 | Service Requested |
| 8 (MSB) | Unused |

NOTE
When bit 7 of the status byte (Service Requested) is set to show that SRQ is asserted, the 1250 will not respond to any GPIB commands until the interrupt is serviced. This may be done remotely with a serial poll, or locally with the RESET key. After the interrupt has been serviced, the error code generated may be obtained over the GPIB in response to the YERR command.

Bits 3, 4, 6, and 7 are cleared after each Serial Poll Enable (SPE) command. Bit 5 is cleared by sending instructions to the 1250 and is set when the 1250 finishes executing a command. These transitions are coincident with the rising and falling edges of the SYNC OUT output, respectively. All status bits are activehigh.

## Power-up Self Tests

At power-up, the 1250 completes a series of self-tests and configures itself for the current complement of modules. If any phase of the self-test fails, or if an error is detected during the configuration process, the 1250 flags an error and alerts the user. With the Option 90 Intelligent Front Panel installed, a successful power-up will display the following message:

RACAL DANA 1250
The 1250 Power-up tests occur in the following order:
a. ROM/RAM/NON-VOL Test
b. CPU Circuitry/Backplane Bus Test
c. Self-Configuration

Errors that occur during the 1250 power up sequence are reported by the 1250 front panel LEDs as follows:

REM LED ADDR LED FAILURE
OFF ON ROM/RAM/NON-VOL Test
ON OFF CPU Circuitry/Backplane Bus Test
ON ON Self-Configuration Test
All three of the above self test failures are fatal. The 1250 will enter a "lockout" state after a self-test or configuration error occurs. In this state, the 1250 will not respond to any GPIB commands and if Option 90 is fitted, the front panel controls will be inoperative.

## Device Dependant Command Codes

This section of the manual gives the GPIB command codes used to control the 1250 Series switch modules. It describes the general syntax required for each command code and then describes the action taken to implement the command. Note that not all commands are supported by the 1250 Series switch modules. This is because:

1) The command may be inappropriate for the switching module in question, e.g. the WRITE command does not apply to a relay switching module.
2) The command may be directed to the 1250 chassis controller rather than the plug-in modules themselves, e.g. the CNF command will turn the 1250 confidence check on or off or the SLIST command will enter the scan list into the 1250. Both of these affect the 1250 Series plug-in modules indirectly, but do not affect the state of the switch modules immediately.

Refer to Section 3.4 for the module specific syntax used by each 1250 Series switching module. This section will also supply information on the commands that do not follow exactly the command code syntax specified here.

## CLOSE

CLOSE <module specific syntax> [;<module specific syntax>]........

This command causes one or more connections on a switching module to close. It is the converse of the OPEN command. Any number of connections in more than one slot may be closed in one CLOSE statement if the <slotnumber>.<module specific syntax> sections are concatenated using a semi-colon (;). Refer to Section 3.5 for the <module specific syntax> to be used for each 1250 Series switching module.

## CNF

## CNF <ON|OFF>

This command turns the 1250 Confidence test on or off. The Confidence test checks that the state of all relays is as programmed. It causes the 1250 to assert the SRQ line after each OPEN or CLOSE command is processed and lights the ERR LED if Option 90 (Intelligent Front Panel) is fitted. A character string detailing the `error' (error 99, Passed
Confidence Test or error 51, Failed Confidence Test,) may be obtained from the 1250 in response to a Serial poll followed by
the YERR command. The character string that the YERR command causes the 1250 to generate is "error <slotnumber>.51" or "error <slotnumber>.99". The default (power-up) state for the confidence test is OFF.

## DLY

DLY <value>
This command is used to cause a delay between the last relay closure after a command string is processed and the SYNC OUT pulse. <value> may be $0-655 \mathrm{~ms}$, and is set to zero at power up.

## EQU

EQU <equate list>
This command causes any OPEN, CLOSE or TRIG/SCAN commands addressed to any switching module on the <equate list> to be carried out for all switch modules on the <equate list>. All modules on the list are required to be identical.

The <equate list> is made up of the slot numbers of the switch modules that are to be equated separated by a semi-colon (;). Continuous groups of switch modules may be entered onto the <equate list> by entering the first and last modules to appear on the list joined by a hyphen (-). More than one equate group may be set up in a single EQU statement by separating the equate groups with a comma (,).

## Example:EQU 1;3-6

This command will equate slots $1,3,4$ and 5 as one equate group.

## NOTE

All switch modules must be of the same type to be accepted in the same equate list or the 1250 will generate an error.

## NOTE

Use of the EQU command will overwrite all previously entered <equate list>s. An <equate list> of 0 may be used to clear all equate groups.

NOTE
When an <equate list> is entered, all switch

## modules on the list adopt the state of the first module to appear on the list.

## EXCL

EXCL <exclude list>
This command causes the 1250 to regard the channel closures specified in the <exclude list> as mutually exclusive. A channel is described in the <exclude list> by the slotnumber of a switching module and module specific syntax to describe the relay closures in a channel. Refer to Section 3.9 for the module specific syntax of the various switch modules available.
Continuous groups of switch modules may be entered onto the <exclude list> by entering the first and last modules to appear on the list joined by a hyphen (-). More than one <exclude list> may be specified in an EXCL statement by separating the Exclude groups with the letter $E$ and a semi-colon ( E ;). In this case, only one of the channels in each exclude group may be closed.

## NOTE

Use of the EXCL command will overwrite all previously entered <exclude list>s. An <exclude list> of 0 may be used to clear all exclude groups.

## OPEN

OPEN <module specific syntax> [;<module specific syntax>]....
This command causes one or more connections on a switching module to open. It is the converse of the CLOSE command. Any number of connections in more than one slot may be opened in one OPEN statement if the <slotnumber>.<module specific syntax> sections are concatenated using a semi-colon (;). Refer to Section 3.9 for the <module specific syntax> to be used for each 1250 Series switching module.

## PDATAOUT

PDATAOUT <slotnumber>;<slotnumber>.....
This command causes the specified switch modules to output the present state of the relays contained in those modules. Data for slot 0 (the controller), after the identification string consists of the revision level of the 1250 operating system.

More than one slot number may be specified for this command by hyphenating the first and last slots to be examined. In this case, all 1250 slots with a 1250 Series module fitted in the range specified will respond to the PDATAOUT command in ascending slot number order.

An example character string output by a 1250 with switch modules installed in slots 1 and 5 in response to a PDATAOUT $0-5$ command is given below.
0.MODEL 1250 UNIVERSAL SWITCH CONTROLLER
0.OS Rev 1.21250
1.1250-50 200 MHZ RF SWITCHING MODULE
1.20-22
5.1250-30 SCANNER/MULTIPLEXER MODULE
5.1-4,8,13
5.END

## NOTE

The switching module configuration is described in the same format as is required by the OPEN and CLOSE commands.

## NOTE

The character string output by the 1250 is made up of multiple lines and contains carriage-return, linefeed pairs. These may terminate the output string and so the PDATAOUT RESPONSE must be read repeatedly until all lines of the output have been read for all modules specified. The final line output by the 1250 is <slotnumber>.END where <slotnumber> is the address of the slot that the last 1250 Series module described is resident.

## PSETUP

PSETUP <slotnumber>[;<slotnumber>]....
This command causes the 1250 to output a character string describing the setup of the switching system master and switch modules. An example of a character string obtained in response to a PSETUP command from a 1250 with switch modules installed in slots 1 and 5 is given below.

```
0.MODEL }1250\mathrm{ UNIVERSAL SWITCH CONTROLLER
0.CNF OFF
0.DLY O
0.DSP ON
0.EQU 0
0.EXCL 0
0.SCAN ON
0.SLIST 0
0.SRQMASK 44
0.PUPRCL OFF
0.END
1.1250-50 200 MHZ RF SWITCHING MODULE
1.BBM
5.1250-30 SCANNER/MULTIPLEXER MODULE
5.IMM
5.END
```


## NOTE

The character string output by the 1250 is made up of multiple lines and contains carriage-return, linefeed pairs. These will terminate the output string and so the PSETUP output string must be read repeatedly until all lines of the output have been read for all modules specified. The final line output by the 1250 is <slotnumber>.END where <slotnumber> is the address of the chassis slot that the last 1250 Series module present in the chassis.

## PUPRCL

## PUPRCL <ON|OFF>

This command enables and disables the automatic recall of the switch settings stored in non-volatile memory location 1 at power up. The configuration in non-vol location 1 is stored by the use of the STORE command. Refer to Section 3.8.18 for details of the STORE command.

| NOTE |
| :--- |
| If non-volatile location 1 is cleared and PUPRCL is |
| ON, no recall will take place at power up. |
| NOTE |
| The Power up recall feature status is not changed |
| by the RESET command. This feature will retain the |
| status that it had on power down. |

## READ

READ <slotnumber>.<portnumber>
where <slotnumber> ::=1|2|3|4|5
<portnumber> ::=0|1|2
This command is supported by 1250 Series digital and breadboard cards only. It allows the data appearing at one of the 1250 Series digital or breadboard cards eight bit ports to be read by the system controller via the GPIB or the optiona intelligent front panel.

## RECALL

RECALL <non-vol location>
where <non-vol location> $=1|2| \ldots . . . \mid 47$
This command will set all switch modules in the 1250 chassis to the configuration stored in the non-volatile location specified.
Note that an error will be generated if an attempt is made to RECALL a memory setting into a switching system configuration that differs from the configuration present when the memory setting was stored. An error will also be generated if an attempt is made to RECALL a memory setting from an empty location.

NOTE

# 1250 Universal Switch Controllers containing operating systems at level 13.1 or lower have 63 non-volatile memory locations available. The operating system level installed may be obtained with the command "PDATAOUT 0". 

## RESET

This command causes the 1250 to return to its home state and all 1250 Series switch modules to be set to their de-energised states. Note that the RESET command will not change the Power up recall (PUPRCL) feature.

## SCAN

## SCAN <ON|OFF|CONT>

The SCAN ON command causes the 1250 to open and close the channels as specified in the scan list in turn. Each channel is closed on receipt of a trigger input or command. The 1250 will scan the channels until it reaches a break point or the SCAN OFF command is received. Refer to Section 3.4.16 for further details of the scan list. Note that connecting the 1250 SYNC OUT output to the TRIG IN input will result in the 1250 scanning the channels specified with a delay between each closure equal in duration to that specified by the DLY command until a break point or SCAN OFF command is encountered.

SCAN OFF causes the 1250 to stop scanning. Scanning may only be resumed by the use of the SCAN ON or SCAN CONT commands.

## NOTE

The SCAN command may also be used to recall non volatile memory settings in turn. Refer to Section 3.8.16 for further details of the scan list.

The SCAN CONT command causes the 1250 to resume scanning the channels on the scan list after pausing at a break point in the scan list. The 1250 will continue to scan until it reaches a break point on the scan list or it receives the SCAN OFF command.

SETUP
SETUP <slotnumber>.<seqmode>
This command is used to control the sequence in which a switch modules relays are opened and closed. The sequence
modes (<seqmode>s) are IMM (Immediate), BBM (Break-beforemake) and MBB (Make-before-break).

The Immediate (IMM) sequence mode will cause the opening and closing of switching module channels as quickly as possible, and the sequence of opening and closing is indeterminate. Care must be taken to avoid potentially damaging connections while the switching module is in a state of transition, (e.g.) short circuiting power supplies to ground, connecting high power outputs together or applying excessive power to low impedance inputs.

The Break-before-make (BBM) sequence mode causes existing channel closures to be opened before new channel closures are made. BBM is the default (power up) state.

The Make-before-break (MBB) sequence mode causes new channel closures to be executed before existing channel closures are opened.

## SLIST

SLIST <scan list>
where <scan list> is <slotnumber>.<channel> [;<slotnumber>. <channel>];....

This command enters the slot and channel information to be used in the scan list while in the SCAN mode. The <scanlist> describes the channels that are to be closed in the order given in the scan list. The closures are made on receipt of a trigger pulse input to the rear panel TRIG IN connector or the GPIB Group Execute Trigger (GET) command. The SCAN and TRIG modes must both be ON for this to occur.

Non-volatile memory locations may be recalled in the scanlist by specifying the memory location delimited by semicolons (;) in the scan list. On reaching the non-volatile location in the scan list, any previous closures not specified in the non-volatile location are opened and the switch configuration is recalled from memory. Note that when the 1250 proceeds to the next element in the scan list, the switch closures recalled from memory are not opened.

The range of values of <slotnumber> is from 1 to 5 . Switching channels are closed if <channel> is a module specific statement. If a non volatile memory setting is to be recalled, <channel> must have an integer value between 1 and 47.

NOTE

## Operation 3-14

> 1250 Universal Switch Controllers containing operating systems at level 13.1 or lower have 63 non-volatile memory locations available. The operating system level installed may be obtained with the command "PDATAOUT 0".

A break point in the scan list will cause the 1250 to stop scanning after opening the previous channel. A break point in the scan list is defined as the character zero (0), delimited by semicolons (;0;). On reaching a scanlist break point, the scan mode is set to SCAN OFF. Scanning is resumed only after receipt of the SCAN CONT or SCAN ON commands. SCAN CONT will cause the 1250 to resume scanning from the scan list break point it was paused at and the SCAN ON command will cause the 1250 to resume scanning from the beginning of the scan list.

If the 1250 pauses at a scan list break point, bit 4 of the GPIB status byte, Scan list at break point, is asserted and SRQ asserted if the SRQMASK permits. Refer to the next section for further details of the SRQMASK command.

## SRQMASK

## SRQMASK <integer>

This command controls the circumstances under which the 1250 will assert SRQ by masking the 1250 status byte. The mask value, <integer> is the decimal equivalent of the binary weighted eight bit byte ANDED with the status byte, (i.e.) if a bit in the mask is a logic 1 , then the assertion of the corresponding bit in the status byte will cause the 1250 to assert SRQ. Refer to Table 3-2 for the bit assignments of the 1250 GPIB Status byte. Note that the status byte also details the possible responses of the 1250 to a GPIB serial poll.

Table 3-2, 1250 Status Byte

| Bit Number | Description |
| :--- | :--- |
| $1(\mathrm{Isb})$ | Unused |
| 2 | Unused |
| 3 | Unused |
| 4 | Scan list at break point |
| 5 | Ready |
| 6 | Programming error |
| 7 | Service requested |
| $8(\mathrm{msb})$ | Unused |

The Programming error bit cannot be masked and so the range of values for <integer> is 32-63, 96-127, 160-191 and 224-255.

The power up (default) value of the SRQMASK is 44 , (i.e.) Programming error and Scanlist at break point will cause SRQ to be asserted.

STORE <non-vol location> where <non-vol location> = 1|2|. |47

This command will store the present state of all switch modules resident in the 1250 chassis in the non-volatile memory location specified.

## NOTE

1250 Universal Switch Controllers containing operating systems at level 13.1 or lower have 63 non-volatile memory locations available. The operating system level installed may be obtained with the command "PDATAOUT 0".

## TEST

TEST $0 .<$ testnumber> where <testnumber>::=1|2|3
This command causes the 1250 to carry out a self test. The possible tests are:

1 - Non-destructive RAM test
2 - EPROM checksum test
3 - Non-destructive non-volatile memory test

On commencing a test, the Ready bit of the status byte is reset until the test is completed.

## WRITE

WRITE <slotnumber>.<portnumber>,<data>
where <slotnumber> is in the range 1-5
<portnumber> is in the range 0-2
<data> is in the range $0-255$ for 8 bit operations and $+32,767$ to $-32,768$ for 16 bit operations.

This command is supported by 1250 Series digital and breadboard cards only. It allows the system controller to write data to one of the three eight bit ports on a 1250 Series digital or breadboard module.

## YERR

This command causes the 1250 to transmit the location (<slotnumber>) of the most recent error and a two digit number (<errornumber>) that describes the error. Refer to Table 3-3 for a listing of all possible values of <errornumber> and corresponding error descriptions.

## NOTE

In the event of an error being generated, the GPIB SRQ line is asserted. The interrupt must be serviced remotely with either a serial poll or locally with the RESET key before the YERR command can be used. Any attempt to use the YERR command without servicing the interrupt will cause the GPIB to lock up, unless a timeout condition has been set.

Table 3-3, 1250 Series Error Codes

| <errornumber> | Error Description |
| :---: | :--- |
| 0 | No error |
| 1 | Invalid module number specified |
| 2 | Specified module not installed |
| 3 | Invalid channel number specified |
| 4 | Invalid port number specified |
| 5 | Command syntax error |
| 6 | Read value larger than expected |
| 7 | Function not supported by module |
| 8 | Expected line terminator not found |
| 9 | Valid command not found |
| 20 | Exclude list too long |
| 21 | Channel entered on exclude list twice |
| 22 | Module doesn't allow exclude function |
| 23 | Scan list too long |
| 24 | Module doesn't allow scan |
| 25 | Equate list too long |
| 26 | Module entered on equate list twice |
| 27 | Incompatible modules equated or digital modules invalid |
| 31 | SRQMASK invalid |
| 40 | Number invalid as a test number |
| $41^{*}$ | RAM test failure |
| $42^{*}$ | ROM test failure |
| $43^{*}$ | Non-vol memory test failure |
| $44^{*}$ | Incompatible operating system EPROMS, software revisions |
| $45^{*}$ | Self-test CPU or related circuitry failure |
| $46^{*}$ | Self-test 13 V supply failure |
| $47^{*}$ | Self-test timer chip failure |
| $48^{*}$ | Insufficient RAM for option module |
| $49^{*}$ | Checksum error reading from option module EPROM |
| $50^{*}$ | Option module EPROM incompatible with CPU EPROM |
| 51 | Failed confidence test |
| 55 | Error STOREing to non-vol memory |
| 56 | Error RECALLing from non-vol memory |
| 57 | Non-vol storage location number out of range |
| 58 | RECALLing from an empty non-vol location not allowed |
| 99 | Passed Confidence Test |
|  |  |
| 29 |  |

Note: * denotes a 'fatal' error

# 1250 Series <br> Module Specific 

## Syntax

## 1250-10 Breadboard Module Specific Syntax

The 1250-10 supports the READ, WRITE, RESET and PDATAOUT commands.

The module specific syntax for the $1250-10$ is of the form
<slotnumber>.<portnumber>,<data>
where <slotnumber> is the 1250 chassis slot that the 1250-10 resides in, value 1-5.
<portnumber> is in the range 0-2
<data> is in the range 0-255
The PDATAOUT command outputs the data which was read or written during the last transaction to or from the 1250-10. The output is of the form:
<slotnumber>.1250-10 BREADBOARD MODULE
<slotnumber>.<portnumber>,<data>
<slotnumber>.END

## 1250-12 Relay

Actuator Module Specific Syntax Specific Syntax

The 1250-12 Relay Actuator Module Supports the OPEN, CLOSE, SETUP, PSETUP, RESET and PDATAOUT commands.

The module specific syntax for the $1250-12$ is of the form:
OPEN <slotnumber>.<channel>[;<slotnumber>.<channel>
where <slotnumber> is the 1250 chassis slot that the 1250-12 resides in, value 1-5.
<channel> is the reference of a channel of 2 FORM A (2 SPST) relays implemented on the 1250-12.

The module specific syntax used for the CLOSE command is the same as for the OPEN command.

The SETUP command controls the sequence mode of the 125012 only. The syntax used is:

SETUP <slotnumber>.<seqmode>
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.
<seqmode> is BBM, (Break before make)
MBB, (Make before break)
IMM, (Immediate)
The default value for <seqmode> is BBM.
The PSETUP command causes the specified module setup to be transmitted to the 1250s controller. The syntax used is:

PSETUP <slotnumber>[;<slotnumber>][;<slotnumber>].......
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.

The responses to the PSETUP command for the 1250-60 and 1250-61 microwave switch modules are as follows:
<slotnumber>.1250-12 RELAY ACTUATOR MODULE
<slotnumber>.<seqmode>
<slotnumber>.END
The PDATAOUT command causes the specified module to transmit the CLOSED state of the relays fitted to the board to the 1250s controller. The syntax used is:

PDATAOUT <slotnumber>[;<slotnumber>][;<slotnumber>].......
where <slotnumber> is the 1250 chassis slot that the 1250
Series module resides in, value 1-5.
The response to the PDATAOUT command for the 1250-12 Relay Actuator Module is as follows:
<slotnumber>.1250-12 Relay Actuator Module
<slotnumber>.<channel>[,<channel>][,<channel>].......
<slotnumber>.END
where <channel> is $0-9$ for the 1250-12

# 1250-14 Digital Input/Output Module Specific Syntax 

The 1250-14 Digital Input/Output Module supports the WRITE, READ and SETUP commands.

The WRITE command permits the writing of 8 or 16 bit data to a port, W.

The module specific syntax used with the 1250-14 in the WRITE command is of the form:

WRITE <slotnumber>.<portnumber>,<data>
where <slotnumber> is the 1250 chassis slot that the 1250-14 resides in, value 1-5.
<portnumber> is the port written to, value $0-2$. Port 0 writes to the lower 8 bits of a 16 bit word, port 1 writes to the upper 8 bits of a 16 bit word and port 2 writes to all 16 bits of the word. For ports 0 and 1 , each data output is the decimal equivalent of the binary data written. The range of values of data written to ports 0 and 1 is $0-255$. For port 2, each data output is in the 2's complement form of the 16 bit word written. The range of values of data written to port 2 is $+32,767$ to $-32,768$.

Note: To convert from 2's complement to binary, invert each bit and add (binary) 1.

The module specific syntax used with the 1250-14 in the READ command is of the form:

READ <slotnumber>.<portnumber>,[<number of readings>]
where <slotnumber> and <portnumber> are the same as for the WRITE command.
<number of readings> sets the number of data words to be captured and stored by the 1250 . The default value is 1 , and the valid ranges for <number of readings> is 1-127 for 16 bit words and 1-254 for 8 bit words. The read rate is as defined by the SETUP command. When the data captured by the READ command is read by the system controller, it is returned over the GPIB as multiple lines of data. The number of lines returned will be the number specified in <number of readings>. The data read by the 1250-14 does not require an instruction to load the data into the GPIB output buffer, but may be read over the GPIB

The module specific syntax used with the 1250-14 in the SETUP command is of the form:

SETUP <slotnumber>.<modenumber>,<polarity code>
where: <slotnumber> is the same as in the WRITE command. <modenumber> sets the 1250-14 to one of the five modes available. The range of values for <modenumber> is 1-5. There are three control lines used to qualify data transfers, I/O, PFLG and PCTL. The lines used in each mode are described below. Modes 1 and 2 are available at all three ports, and modes 3, 4 and 5 are available at ports 0 and 2 only.
Mode 1 is Static Mode 1. This mode will clear the data written to the output port when a READ command is issued. It causes data to be read synchronously, at a nominal 1 kHz rate. The I/O line is active as a data direction indicator. This mode is the default power up mode employed by the 1250-14.

Mode 2 is Static Mode 2. This mode permits the reading of data previously written to the output port, otherwise it is the same as mode 1. Multiple READs are carried out at a nominal 1 kHz rate.

Mode 3 is Strobe Mode 1. This mode uses the I/O line to indicate data direction and the PCTL line to output a strobe to trigger data transfer. Multiple READs are carried out at a nominal 1 kHz rate.

Mode 4 is Strobe Mode 2. This mode uses the WR line as the write data strobe and the RD line is the read data strobe. The I/O line is used to indicate data direction. Multiple READs are carried out at a nominal 1 kHz rate.

Mode 5 is the Handshake mode. This carries out all data transfers using a three wire handshake. The lines used are I/O, PFLG and PCTL. Both single and multiple READs are carried out at the speed of the slowest handshake line.
<polarity code> sets the logic levels that are to be interpreted as true and false. The default value is $\mathrm{P}=0$. The decimal number entered is the weighted sum of the following:
$\mathrm{P}=1 \quad$ The lower byte polarity is low true. $\mathrm{P}=0$ sets the lower byte polarity to high true.
$\mathrm{P}=4 \quad$ The upper byte polarity is low true. $\mathrm{P}=0$ sets the upper byte polarity to high true.
$\mathrm{P}=2 \quad \mathrm{PCTL}$ polarity is low busy. $\mathrm{P}=0$ sets the PCTL polarity to low ready.
$\mathrm{P}=16$ PFLG polarity is low busy. $\mathrm{P}=0$ sets the PFLG polarity to low ready.
$\mathrm{P}=8 \quad \mathrm{I} / \mathrm{O}$ polarity is low input. $\mathrm{P}=0$ sets the $\mathrm{I} / \mathrm{O}$ polarity to low output.

| PIN |  |
| :--- | :--- |
| 1 | GNO |
| 2 | GNO |
| 3 | H7 |
| 4 | GND |
| 5 | H6 |
| 6 | GND |
| 7 | H5 |
| 8 | GND |
| 9 | H4 |
| 10 | GND |
| 11 | H3 |
| 12 | GND |
| 13 | H2 |
| 14 | GND |
| 15 | H1 |
| 16 | GND |
| 17 | HO |
| 18 | GND |



| PIN |  |
| :--- | :--- |
| 19 | L7 |
| 20 | GND |
| 21 | L6 |
| 22 | GND |
| 23 | L5 |
| 24 | GND |
| 25 | L4 |
| 26 | GND |
| 27 | L3 |
| 28 | GND |
| 29 | L2 |
| 30 | GND |
| 31 | L1 |
| 32 | GND |
| 33 | LO |
| 34 | GND |
| 35 | I/ $\overline{ }$ |
| 36 | GND |
| 37 | PFLG |
| 38 | PCTL |
| 39 | GND |
| 40 | GND |



Figure 3-3, 1250-14 Module Handshake Lines

## NOTE

Handshaking ( $\mathrm{M}=3,4$, or 5 ) is only available for ports 0 and 2, whereas port 1 is always static ( $\mathrm{M}=1$, 2). Also, attempting to execute an Open or Close operation on a module will generate and error. The I/O, PCTL, and PFLG lines are always associated with port 0 or port 2. Writing/reading to/from port 1 will not affect these lines.

Shown below are the timing diagrams for the four I/O control modes of the 1250-14:
(a) Static 1 and 2

$t_{1}$ is the time from when $I / \bar{O}$ equals output until the output is enabled ( $250 \mu$ s typical)

$t_{1}$ is the time from output disabled until $I / \bar{O}$ equals the input ( $90 \mu s$ typical)
${ }^{t}{ }_{2}$ is the time from when $I / \bar{O}$ equals input until data is latched (100 $\mu$ s typical)

Figure 3-4, 1250-14 Timing Diagrams
(b) Strobe 1

${ }^{t} 1$ is the time from when $I / \bar{O}$ equals output until the output is enabled ( $260 \mu$ s typical)
$t_{2}$ is the time from output enabled to the start of strobe ( $90 \mu \mathrm{~s}$ typical)
$\mathrm{t}_{3}$ is the strobe width ( $90 \mu \mathrm{~s}$ typical)

$t_{1}$ is the time from output disabled until $I / \bar{O}$ equals the input ( $100 \mu$ s typical)
${ }^{t} 2$ is the time when $I / \bar{O}$ equals the input until the start of strobe ( $90 \mu$ s typical)
$\mathrm{t}_{3}$ is the strobe width ( $200 \mu$ s typical)
Figure 3-4, 1250-14 Timing Diagrams (Cont)
(c) Strobe 2

$t_{1}$ is the time from data valid (output enabled) to the start of strobe ( $90 \mu \mathrm{~s}$ typical)
$\mathrm{t}_{2}$ is the strobe width ( $90 \mu$ s typical)

$\mathrm{t}_{1}$ is the time from output disable to the start of strobe ( $80 \mu \mathrm{~s}$ typical)
$\mathrm{t}_{2}$ is the strobe width ( $200 \mu$ s typical)

Figure 3-4, 1250-14 Timing Diagrams (Cont)
(d) Handshake

$t_{1}$ is the time from when PFLG is true until $I / \bar{O}$ equals the output ( $400 \mu$ s typical)
$\mathrm{t}_{2}$ is the time from PFLG true until the output is enabled ( 1 ms typical)
$\mathrm{t}_{3}$ is the time from output enabled until line PCTL is true ( $100 \mu$ s typical)
${ }^{\mathrm{t}}{ }_{4}$ is the time from PFLG false until line PCTL is false ( 1 ms typical)
where:
A - peripheral indicates "ready for data"
B - I/O indicates Output (i.e., write)
C - Data lines are set
D-1250-14 module indicates "output data valid"
E - Peripheral indicates "not ready for next data"
F-1250-14 module indicates "not ready for next transfer"

Figure 3-4, 1250-14 Timing Diagrams (Cont)

$t_{1}$ is the time from output disabled until when $1 / \vec{O}$ equals the input ( $100 \mu \mathrm{~s}$ typical)
$\mathrm{t}_{2}$ is the time from PFLG true until line PCTL is true (1 ms typical)
$\mathrm{t}_{3}$ is the time from PFLG false until line PCTL is false and data latched ( $500 \mu$ s typical)
where:
A - peripheral indicates "ready for transfer"
B - I/O indicates Input (i.e., read)
C - Data lines set by peripheral
D - 1250-14 module indicates "ready for input"
E - Peripheral indicates "data valid and not ready for next transfer"
F - 1250-14 module indicates "not ready for next input and data accepted"

Figure 3-4, 1250-14 Timing Diagrams(Cont)

# 1250-15 Relay Driver Module Specific Syntax 

The 1250-15 Relay Driver Module Supports the OPEN, CLOSE, SETUP, PSETUP, RESET and PDATAOUT commands.

The module specific syntax for the $1250-15$ is of the form:
OPEN <slotnumber>.<channel>[;<slotnumber>.<channel>
where <slotnumber> is the 1250 chassis slot that the 1250-15 resides in, value 1-5.
<channel> is the reference of a channel that is to be used to actuate a relay external to the 1250-15. The range of values for <channel> is 0-19.

The module specific syntax used for the CLOSE command is the same as for the OPEN command.

The SETUP command controls the sequence mode of the 125060 and 1250-61 only. The syntax used is:

SETUP <slotnumber>.<seqmode>
where <slotnumber> is the 1250 chassis slot that the 1250
Series module resides in, value 1-5.
<seqmode> is BBM, (Break before make)
MBB, (Make before break)
IMM, (Immediate)
The PSETUP command causes the specified module setup to be transmitted to the 1250s controller. The syntax used is:

PSETUP <slotnumber>[;<slotnumber>][;<slotnumber>].......
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.

The responses to the PSETUP command for the 1250-60 and 1250-
61 microwave switch modules are as follows:
<slotnumber>.1250-15 RELAY ACTUATOR MODULE
<slotnumber>.<seqmode>
<slotnumber>.END
The PDATAOUT command causes the specified module to transmit the CLOSED state of the relays fitted to the board to the 1250s controller. The syntax used is:

PDATAOUT <slotnumber>[;<slotnumber>][;<slotnumber>].......
where <slotnumber> is the 1250 chassis slot that the 1250

Series module resides in, value 1-5.
The responses to the PDATAOUT command for the 1250-60 and 1250-61 microwave switch modules are as follows:
<slotnumber>.1250-15 RELAY ACTUATOR MODULE
<slotnumber>.<channel>[,<channel>][,<channel>]....... <slotnumber>.END
where <channel> is $0-19$ for the 1250-15.


Figure 3-5, 1250-15 Relay Driver Connection Diagram


This example of Form A, B, and Censing uses the 3 different channel groups 1, 2, and 3 on Relay Driver PCB shown above. See text for configuring to meet your particular needs.

Sensing Examples:

"Switches "ON" will provide confidence mode feedback.
Switches "OFF" user must provide external sense to pass confidence mode.

Figure 3-5, 1250-15 Relay Driver Connection Diagram (Cont)

## 1250-15 Confidence Mode Support

The 1250-15 may be configured to support confidence testing in one or more ways, depending on the types of relays that the card is driving and the users requirements. Two types of confidence testing are available, coil current sensing and spare contact sensing. The spare contact sensing is available only if the relay is a DPDT type with one of the pair of contacts unused and the exact configuration depends on whether the relay is normally open or normally closed. More than one type of confidence test may be implemented on a single board and Racal-Dana recommend that channels 0-7, 8-15 and 16-19 have one type of confidence feedback per group implemented.

The 1259-15 is factory configured with DIP switches installed in sockets Z10, Z11 and Z12. These simulate the FORM A sense mode and allow the 1250-15 to pass the confidence mode test without external connections. If external relays are connected, the DIP switches must be removed or switched off and external coil or contact feedback supplied.

To implement coil current sensing, remove resistor blocks Z13, Z14 and Z15 from the 1250-15 and install them in the sockets for Z10, Z11 and Z12. Connect the relay coil to pins D and P3-2 on the 1250-15. Fit jumper W1 if it is required to use the 1250 internal +13 V supply to supply the relay coil current, as shown below.


Figure 3-6, 1250-15 Coil Sense

To implement FORM A (normally open) sensing, remove resistor blocks Z10, Z11 and Z12 from the 1250-15 and install them in the sockets for Z13, Z14 and Z15. Connect the relay coil to pins D and P3-2 on the 1250-15 and the unused switch contacts to pins S and P4-1,2. Fit jumper W1 if it is required to use the 1250 internal +13 V supply to supply the relay coil current as shown below.


Figure 3-7, 1250-15 Form A Sense
To implement FORM $B$ (normally closed) sensing, remove resistor blocks Z13, Z14, Z15, Z10, Z11 and Z12 from the 125015. Connect the relay coil to pins D and P3-2 on the 1250-15 and the unused switch contacts to pins S and P3-1. Fit jumper W1 if it is required to use the 1250 internal +13 V supply to supply the relay coil current.


Figure 3-8, 1250-15 Form B Sense

## 1250-15A Relay Driver Module Specific Syntax

The 1250-15A Relay Driver Module Supports the OPEN, CLOSE, SETUP, PSETUP, RESET and PDATAOUT commands.

The module specific syntax for the 1250-15A is of the form:
OPEN <slotnumber>.<channel>[;<slotnumber>.<channel>
where <slotnumber> is the 1250 chassis slot that the 1250-15A resides in, value 1-5.
<channel> is the reference of a channel that is to be used to actuate a relay external to the 1250-15A. The range of values for <channel> is 0-23.

The module specific syntax used for the CLOSE command is the same as for the OPEN command.

The SETUP command controls the sequence mode of the 125015A. The syntax used is:

SETUP <slotnumber>.<seqmode>
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.

| <seqmode> is | BBM, (Break before make) |
| :--- | :--- |
|  | MBB, (Make before break) |
|  | IMM, (Immediate) |

The PSETUP command causes the specified module setup to be transmitted to the 1250s controller. The syntax used is:

PSETUP <slotnumber>[;<slotnumber>][;<slotnumber>].......
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.

The responses to the PSETUP command for the $1250-15 \mathrm{~A}$ is as follows:
<slotnumber>.1250-15A RELAY ACTUATOR MODULE
<slotnumber>.<seqmode>
<slotnumber>.END
The PDATAOUT command causes the specified module to transmit the CLOSED state of the relays fitted to the board to the 1250s controller. The syntax used is:

## Operation 3-36

PDATAOUT <slotnumber>[;<slotnumber>][;<slotnumber>].......
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.

The responses to the PDATAOUT command for the 1250-15A is as follows:
<slotnumber>.1250-15A RELAY ACTUATOR MODULE <slotnumber>.<channel>[,<channel>][,<channel>]....... <slotnumber>.END
where <channel> is $0-23$ for the $1250-15 \mathrm{~A}$.

## 1250-15A Confidence Mode Support

The 1250-15A may be configured to support confidence testing in one or more ways, depending on the types of relays that the card is driving and the users requirements. Two types of confidence testing are available, coil current sensing and spare contact sensing. The spare contact sensing is available only if the relay is a DPDT type with one of the pair of contacts unused and the exact configuration depends on whether the relay is normally open or normally closed. More than one type of confidence test may be implemented on a single board and Racal-Dana recommend that channels 0-7, 8-15 and 16-19 have one type of confidence feedback per group implemented.

The $1250-15$ A is factory configured with DIP switches SW1 to SW6. The position of these switches determines the type of confidence testing to be used.

## NOTE

The 1250-15A is shipped with al switches in the ON position, allowing all channels to pass the Confidence mode test without external connections. If external relays are connected, the Dip switches must be set to allow the type of confidence mode testing desired and external coil or contact feedback supplied

Each of the 24 channels of the 1250-15A may be configured to use any of the three confidence test modes available. Two switches must be set per channel to set the confidence mode for that channel.

The DIP switches that correspond to the particular channel
groups are as follows:
Group 1 (Channels 0-7) SW1 and SW2
Group 2 (Channels 8-15) SW3 and Sw4
Group 3 (Channels 16-23) SW5 and SW6
The switches contained in the switch blocks that are associated with a particular channel are as follows:

$$
\begin{array}{ll}
\text { SW1 and SW2, switches } 1 \text { to } 8 \text {, respectively, } & \text { Channels } 0 \text { to } 7 \text {, respectively } \\
\text { SW3 and SW4, switches } 1 \text { to } 8 \text {, respectively, } & \text { Channels } 8 \text { to } 15 \text {, respectively } \\
\text { SW5 and SW6, switches } 1 \text { to } 8 \text {, respectively, } & \text { Channels } 16 \text { to } 23 \text {, respectively }
\end{array}
$$

NOTE
The switch numbers and the ON position for each switch block are marked on the switch block body rather that silk screened on to the PCB itself.

The switch settings for the confidence modes available for each channel are as follows:

| Confidence mode | Switch SW1 | Switch SW2 |
| :--- | :---: | :---: |
| FORM B | OFF (open) | OFF (open) |
| FORM A | OFF (open) | ON (closed) |
| Coil Current | ON (closed) | OFF (open) |
| No Relay | ON (closed) | ON (closed) |

NOTE
All unused channels must be set to the No Relay mode when the Confidence mode is enabled for the 1250-15A to Pass the Confidence test.

Refer to Table 3-4 for the 1250-15A DB25 pins that correspond to pins $S$ and $D$ for each channel and to Figure 3-9 for the locations of switches SW1 through SW6.

Table 3-4, 1250-15A Pins D and S

| Channel | Pin D | Pin S |
| :---: | :---: | :---: |
| 00 | $\mathrm{~J} 1-1$ | $\mathrm{~J} 1-7$ |
| 01 | $\mathrm{~J} 1-14$ | $\mathrm{~J} 1-20$ |
| 02 | $\mathrm{~J} 1-2$ | $\mathrm{~J} 1-8$ |
| 03 | $\mathrm{~J} 1-15$ | $\mathrm{~J} 1-21$ |
| 04 | $\mathrm{~J} 1-3$ | $\mathrm{~J} 1-9$ |
| 05 | $\mathrm{~J} 1-16$ | $\mathrm{~J} 1-22$ |
| 06 | $\mathrm{~J}-4$ | $\mathrm{~J} 1-10$ |
| 07 | $\mathrm{~J} 1-17$ | $\mathrm{~J} 1-23$ |
| 08 | $\mathrm{~J} 2-1$ | $\mathrm{~J}-7$ |
| 09 | $\mathrm{~J}-14$ | $\mathrm{~J} 2-20$ |
| 10 | $\mathrm{~J} 2-2$ | $\mathrm{~J} 2-8$ |
| 11 | $\mathrm{~J} 2-15$ | $\mathrm{~J} 2-21$ |
| 12 | $\mathrm{~J} 2-3$ | $\mathrm{~J} 2-9$ |
| 13 | $\mathrm{~J} 2-16$ | $\mathrm{~J} 2-22$ |
| 14 | $\mathrm{~J}-4$ | $\mathrm{~J} 2-10$ |
| 15 | $\mathrm{~J} 2-17$ | $\mathrm{~J} 2-23$ |
| 16 | $\mathrm{~J} 3-1$ | $\mathrm{~J} 3-7$ |
| 17 | $\mathrm{~J} 3-14$ | $\mathrm{~J} 3-20$ |
| 18 | $\mathrm{~J} 3-2$ | $\mathrm{~J} 3-8$ |
| 19 | $\mathrm{~J} 3-15$ | $\mathrm{~J} 3-21$ |
| 20 | $\mathrm{~J} 3-3$ | $\mathrm{~J} 3-9$ |
| 21 | $\mathrm{~J} 3-16$ | $\mathrm{~J} 3-22$ |
| 22 | $\mathrm{~J} 3-4$ | $\mathrm{~J} 3-10$ |
| 23 | $\mathrm{J3}-17$ | $\mathrm{~J} 3-23$ |



Figure 3-9, 1250-15A Switch Locations

Form B sense


Figure 3-10, 1250-15A Form B Sense

To implement FORM B (normally closed) sensing, set both switches that correspond to the channel to be monitored to the OFF position. For a polarization relay coil, connect the positive side to pin 12 of the corresponding DB25 connector and the negative side of the coil to bin D. Connect the spare contacts of relay to pin 11 and pin S . There is no connection to pin 24.

Refer to Table 3-4 for the 1250-15A DB25 connector pin numbers that correspond to pins D and S in the above diagram.

## Form A sense



Figure 3-11, 1250-15A Form A Sense

To implement FORM A (normally open) sensing, set switch 1 for that channel to OFF and switch 2 to ON. For a polarization relay coil, connect the positive side to pin 12 of the corresponding DB25 connector and the negative side of the coil to bin D. Connect the spare contacts of the relay to pin 24 and pin S. There is no connection to pin 11.

Refer to Table 3-4 for the 1250-15A DB25 connector pin numbers that correspond to pins D and S in the above diagram.

Coil Current Sense


Figure 3-12, 1250-15A Coil Current Sense

To implement Coil current sensing, set switch 1 for that channel to ON and switch 2 to OFF. For a polarization relay coil, connect the positive side to pin 12 of the corresponding DB25 connector and the negative side of the coil to bin D. Connect the spare contacts of the relay to pin 24 and pin S . There is no connection to pin 11.

Refer to Table 3-4 for the 1250-15A DB25 connector pin numbers that correspond to pins D and S in the above diagram.

## No Relay Sense



Figure 3-13, 1250-15A No Relay Sense

To implement No Relay sensing, set switch 1 for that channel to ON and switch 2 to ON. There are no connections to pin 11, pin 12 , pin 24 , pin S, and pin D. This is the default mode for the 1250-15A, and it allows any channel to pass the confidence test with no external connections. All channels not used must be set to this mode to avoid interference with the active channels when the 1250-15A fails the confidence test.

Refer to Table 3-4 for the 1250-15A DB25 connector pin numbers that correspond to pins D and S in the above diagram.

## Internal and External Power Supply Configuration

The 1250-15A is shipped with jumper W1 installed. This allows the relays on the 1250-15A to draw power from the 1250 internal +13 V power supply. If an external power supply is to be used, remove jumper W1 and supply the external power to the 125015A through the DB25 connectors as shown below. An external supply may be required when the relays used require a different coil voltage or when the coil currents required are greater than the rated current for the board. Refer to the 1250-15A Specifications for further details.

## NOTE

Only one external power supply ca be used on a single board.


Figure 3-14, 1250-15A Using an External Power Supply
To use an external supply, connect the positive terminal of the supply to pins 11 and 12 of the DB25 connector and the negative terminal to pins 24 and 25.


Figure 3-15,1250-15A, Relay Driver Connection Diagram Group 1


Figure 3-16, 1250-15A Relay Driver Connection Diagram Group 2


Figure 3-17, 1250-15A Relay Driver Connection Diagram Group 3

# 1250-16 High Density Signal Switching Module Specific Syntax 

The 1250-16 High Density Signal Switching Module Supports the OPEN, CLOSE, SETUP, PSETUP, RESET and PDATAOUT commands.

The module specific syntax for the $1250-16$ is of the form:
OPEN <slotnumber>.<port>[;<slotnumber>.<port>].....
where <slotnumber> is the 1250 chassis slot that the 1250-16 resides in, value 1-5.
<port> is a 12 wire port, each wire of which is to be switched.
Any port may be selected as the `common' terminal and each port closed individually, as required. The range of values for <port> is 00-05. Note that <port> $=05$ connects the 1250-16 to the analog bus.

## CAUTION

The analog bus only supports 10 wire operation and so two of the 12 wires switched by the 1250-16 are not connected to the analog bus if port 5 is closed.

The module specific syntax used for the CLOSE command is the same as for the OPEN command.

The SETUP command controls the sequence mode of the 125016 only. The syntax used is:

SETUP <slotnumber>.<seqmode>
where <slotnumber> is the 1250 chassis slot that the 1250
Series module resides in, value 1-5.

$$
\begin{array}{ll}
\text { <seqmode> is } & \text { BBM, (Break before make) } \\
& \text { MBB, (Make before break) } \\
& \text { IMM, (Immediate) }
\end{array}
$$

The default value for <seqmode> is BBM.
The PSETUP command causes the specified module setup to be transmitted to the 1250s controller. The syntax used is:

PSETUP <slotnumber>[;<slotnumber>][;<slotnumber>].......
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.

The responses to the PSETUP command for the 1250-16 switch module is as follows:
<slotnumber>. 1250-16 HIGH DENSITY SIGNAL SWITCHING MODULE
<slotnumber>.<seqmode>
<slotnumber>.END
The PDATAOUT command causes the specified module to transmit the CLOSED state of the relays fitted to the board to the 1250 s controller. The syntax used is:

PDATAOUT <slotnumber>[;<slotnumber>][;<slotnumber>].......
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.

The response to the PDATAOUT command for the 1250-16 Module is as follows:
<slotnumber>.1250-16 HIGH DENSITY SIGNAL SWITCHING MODULE <slotnumber>.<port>[,<port>][,<port>]....... <slotnumber>.END
where <port> is $0-5$ for the $1250-16$


Figure 3-18, Detail A - 1250-16

# 1250-20 Relay Power Module Specific Syntax 

The 1250-20 Relay Power Module Supports the OPEN, CLOSE, SETUP, PSETUP, RESET and PDATAOUT commands.

The module specific syntax for the $1250-20$ is of the form:
OPEN <slotnumber>.<channel>[;<slotnumber>.<channel> where <slotnumber> is the 1250 chassis slot that the 1250-20 resides in, value 1-5.
<channel> is the reference of a 2 FORM A (2 SPST) relays implemented on the 1250-20. The range of values for <channel> is 0-9.

The module specific syntax used for the CLOSE command is the same as for the OPEN command.

The SETUP command controls the sequence mode of the 125020 only. The syntax used is:

SETUP <slotnumber>.<seqmode>
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.

$$
\begin{array}{ll}
\text { <seqmode> is } & \text { BBM, (Break before make) } \\
& \text { MBB, (Make before break) } \\
& \text { IMM, (Immediate) }
\end{array}
$$

The default value for <seqmode> is BBM.
The PSETUP command causes the specified module setup to be transmitted to the 1250s controller. The syntax used is:

PSETUP <slotnumber>[;<slotnumber>][;<slotnumber>].......
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.

The responses to the PSETUP command for the 1250-20 Relay Power modules are as follows:
<slotnumber>.1250-20 RELAY POWER MODULE
<slotnumber>.<seqmode>
<slotnumber>.END
The PDATAOUT command causes the specified module to transmit the CLOSED state of the relays fitted to the board to the 1250s controller. The syntax used is:

PDATAOUT <slotnumber>[;<slotnumber>][;<slotnumber>].......
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.

The response to the PDATAOUT command for the 1250-20 Relay Power Module is as follows:
<slotnumber>.1250-20 RELAY POWER MODULE <slotnumber>.<channel>[,<channel>][,<channel>]....... <slotnumber>.END
where <channel> is $0-9$ for the $1250-20$


Figure 3-19, 1250-20 Relay Power Module Connection Diagram

# 1250-30 Scanner / Multiplexer Module Specific Syntax 

The 1250-30 Scanner / Multiplexer Module Supports the OPEN, CLOSE, SETUP, PSETUP, RESET and PDATAOUT commands.

The module specific syntax for the $1250-30$ is of the form:
OPEN <slotnumber>.<channel>[;<slotnumber>.<channel>
where <slotnumber> is the 1250 chassis slot that the 1250-30 resides in, value 1-5.
<channel> is the reference of the channel implemented in the 1250-30.

The module specific syntax used for the CLOSE command is the same as for the OPEN command.

The SETUP command controls the sequence mode of the 125030 only. The syntax used is:

SETUP <slotnumber>.<seqmode>
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.
<seqmode> is BBM, (Break before make)
MBB, (Make before break)
IMM, (Immediate)
The default value for <seqmode> is BBM.
The PSETUP command causes the specified module setup to be transmitted to the 1250s controller. The syntax used is:

PSETUP <slotnumber>[;<slotnumber>][;<slotnumber>].......
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.

The responses to the PSETUP command for the 1250-30 Scanner/ Multiplexer modules are as follows:
<slotnumber>.1250-30 SCANNER / MULTIPLEXER MODULE
<slotnumber>.<seqmode>
<slotnumber>.END
The PDATAOUT command causes the specified module to transmit the CLOSED state of the relays fitted to the board to the 1250 s controller. The syntax used is:

PDATAOUT <slotnumber>[;<slotnumber>][;<slotnumber>].......
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.

The response to the PDATAOUT command for the 1250-30
Scanner / Multiplexer Module is as follows:
<slotnumber>.1250-30 SCANNER / MULTIPLEXER MODULE
<slotnumber>.<channel>[,<channel>][,<channel>].......
<slotnumber>.END
where <channel> is $0-19$ for the 1250-30.


Figure 3-20, 1250-30 Scanner/Multiplexer Connection Diagram

## 1250-35 Module Specific Syntax

The 1250-35 supports the OPEN, CLOSE, SETUP, PSETUP, PDATAOUT and RESET commands.

NOTE
The $1250-35$ is supported by 1250 operating systems at rev. Levels 14.1 and above.

The module specific syntax for the 1250-35 is divided into three sections. The section to be used is dependant on the configuration implemented for the switching module.

OPEN <slotnumber>.<channel>[;<slotnumber>.<channel>;.......]
where <slotnumber> is $1-5$. It describes the chassis slot that the 1250 Series module is resident in.
<channel> is the reference of the channel to be closed.
In a four wire mode, the range of values for <channel> is 0-23. In a two wire mode, the range of values for <channel> is 0-47. In a one wire mode, the range of values for <channel> is 0-95.
The 4, 2, or 1 wire mode of the 1250-35 is set by jumpers on the switching module PCB. To select a particular mode, set jumpers W15 and W16 to connect the jumper pins as follows:

> W15 W16

Four wire 1 to 21 to 2
Two wire 2 to 31 to 2
One wire 1 to 22 to 3

## CAUTION

If jumpers W15 and W16 are both set to connect pins 2 to 3, an illegal state occurs and the 1250-35 will default to a four wire mode of operation. The configuration of the 1250-35 is determined by jumper pairs W1 to W14, and so if the hard wired configuration and the mode of operation are in conflict, the overall 1250-35 configuration is indeterminate.

In the one wire mode, the scanner output is always connector J2, Pin N. The inputs selected and deselected by OPEN <channel> and CLOSE <channel> commands are as follows for each value of <channel>:


| <channel> | Connector | Pin |
| :---: | :---: | :---: |
| 46 | J3 | N |
| 47 | J3 | D |
| 48 | J1 | BB |
| 49 | J1 | t |
| 50 | J1 | h |
| 51 | J1 | Y |
| 52 | J1 | P |
| 53 | J1 | E |
| 54 | J3 | BB |
| 55 | J3 | t |
| 56 | J3 | h |
| 57 | J3 | Y |
| 58 | J3 | P |
| 59 | J3 | E |
| 60 | J1 | x |
| 61 | J1 | n |
| 62 | J1 | c |
| 63 | J1 | U |
| 64 | J1 | K |
| 65 | J1 | A |
| 66 | J3 | x |
| 67 | J3 | n |
| 68 | J3 | c |
| 69 | J3 | U |
| 70 | J3 | K |
| 71 | J3 | A |
| 72 | J1 | y |
| 73 | J1 | p |
| 74 | J1 | d |
| 75 | J1 | V |
| 76 | J1 | L |
| 77 | J1 | B |
| 78 | J3 | CC |
| 79 | J3 | u |
| 80 | J3 | j |
| 81 | J3 | Z |
| 82 | J3 | R |
| 83 | J3 | F |
| 84 | J1 | CC |
| 85 | J1 | u |
| 86 | J1 | j |
| 87 | J1 | Z |
| 88 | J1 | R |
| 89 | J1 | F |
| 90 | J3 | y |
| 91 | J3 | p |
| 92 | J3 | d |
| Table 3-5, (Cont) |  |  |
| <channel> | Connector | Pin |

93
94
95

J3
J3
J3

V
L
B

## NOTE

In the One wire mode, channels 0-47 and 48-95 are mutually exclusive if more than one input is to be selected at one time. This is because the 1250-35 uses double pole, double throw relays which are mechanically ganged together and selects between the high and low sides of the relays.

Example: Channel 0 is the high side of K 1 and channel 50 is the low side of K3. As the 1250-35 selects between the high and low sides of its relays, it cannot select both high and low sides. Closing channel 0 while channel 95 is closed will result in the selection of the relays high side, which will open channel 95 and close channel 48.

In the two wire modes, there are several scanner outputs available, depending on the configuration selected. Refer to Figure 3-3 for the outputs available in the various two wire configurations. The inputs selected by CLOSE <channel> commands are as follows for each value of <channel>:

Table 3-6,

| <channel> | Connector | Pins |
| :---: | :---: | :---: |
| 0 | J 1 | DD and BB |
| 1 | J 1 | v and t |
| 2 | J 1 | k and h |
| 3 | J 1 | a and Y |
| 3 | J 1 | S and P |
| 4 | J 1 | H and E |
| 5 | J 3 | DD and BB |
| 6 | J 3 | v and t |
| 7 | J 3 | k and h |
| 8 | J 3 | a and Y |
| 9 | J 3 | S and P |
| 10 | J 3 | H and E |
| 11 | J 1 | r and n |

Table 3-6 (Cont)
<channel>

| 14 | J1 | e and c |
| :---: | :---: | :---: |
| 15 | J1 | $W$ and U |
| 16 | J1 | M and K |
| 17 | J1 | C and A |
| 18 | J3 | $z$ and $x$ |
| 19 | J3 | $r$ and $n$ |
| 20 | J3 | e and c |
| 21 | J3 | W and U |
| 22 | J3 | M and K |
| 23 | J3 | C and A |
| 24 | J1 | AA and w |
| 25 | J1 | $s$ and $p$ |
| 26 | J1 | $f$ and d |
| 27 | J1 | X and V |
| 28 | J1 | N and L |
| 29 | J1 | $D$ and $B$ |
| 30 | J3 | EE and CC |
| 31 | J3 | w and $u$ |
| 32 | J3 | $m$ and j |
| 33 | J3 | $b$ and $z$ |
| 34 | J3 | T and R |
| 35 | J3 | $J$ and $F$ |
| 36 | J1 | EE and CC |
| 37 | J1 | w and $u$ |
| 38 | J1 | $m$ and j |
| 39 | J1 | $b$ and Z |
| 40 | J1 | T and R |
| 41 | J1 | $J$ and $F$ |
| 42 | J3 | AA and y |
| 43 | J3 | $s$ and $p$ |
| 44 | J3 | f and d |
| 45 | J3 | X and V |
| 46 | J3 | N and L |
| 47 | J3 | $D$ and B |

In the four wire modes, there are several scanner outputs available, depending on the configuration selected. Refer to Figure 3-3 for the outputs available in the various four wire configurations. The inputs selected by CLOSE <channel> commands are as follows for each value of <channel>:

Table 3-7

| <channel> | Connector | Pins <br> 0 | J 1 | Connector |
| :---: | :---: | :---: | :---: | :---: |$\quad$| Pins |
| :---: |
| 1 |

The module specific syntax used for the CLOSE command is the same as for the OPEN command.

The SETUP command controls the relay sequence mode of the 1250-35 only. The syntax used is:

SETUP <slotnumber>.<seqmode>
where <slotnumber> is $1-5$. It describes the chassis slot that the 1250 Series module is resident in.

$$
\begin{array}{ll}
\text { <seqmode> is } & \text { BBM, (Break before make) } \\
& \text { MBB, (Make before break) } \\
& \text { IMM, (Immediate) }
\end{array}
$$

The default value for <seqmode> is BBM.
The PSETUP command causes the specified module setup to be transmitted over the GPIB to the 1250s controller. The syntax used is:

PSETUP <slotnumber>[;<slotnumber>][;<slotnumber>].......

Mating face of female connector or Rear face of male connector shown


Figure 3-21, 1250-35 Inputs and Outputs

## 1250-35 Configuration Setting

The 1250-35 configuration is set by the addition of jumper wires to the 1250-35 PCB. The following Table gives the jumpers necessary to configure the 1250-35 in all of its configurations. An X indicates that the jumper is to be fitted and an $(\mathrm{X})$ indicates that the jumper is optional, depending on whether access to the Analog bus is required.

Jumper pairs W1 to W14 set the 1250-35 switching topology and moveable jumpers W15 and W16 control the 1250-35 ID byte.
This ID byte informs the 1251 whether the $1250-35$ is in a 1,2 or 4 wire configuration

The 1250-35 is despatched from the factory with no jumpers fitted except jumpers W15 and W16, which are both in positions connecting pins 1 to 2 . This is the $4(1 \times 6)$ four wire configuration.


Figure 3-22, 1250-35 Configuration

Table 3-8

|  | $4(1 \times 6) 4$ wire | $\begin{aligned} & 4(1 \times 12) \\ & 2 \text { wire } \end{aligned}$ | $\begin{aligned} & 2(1 \times 12) \\ & 4 \text { wire } \end{aligned}$ | $8(1 \times 6) 2$ <br> wire | $\begin{aligned} & \text { 2(1x24) } \\ & 2 \text { wire } \end{aligned}$ | $\begin{aligned} & 1(1 \times 24) \\ & 4 \text { wire } \end{aligned}$ | $\begin{aligned} & 1(1 \times 48) \\ & 2 \text { wire } \end{aligned}$ | $\begin{aligned} & 1(1 \times 96) \\ & 1 \text { wire } \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| W1L W1H |  | $\begin{array}{\|l\|} \hline(X) \\ (X) \end{array}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ |  | $\begin{array}{\|l} \hline X \\ X \end{array}$ | $\begin{array}{\|l} \hline X \\ X \end{array}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{array}{\|l} \hline X \\ X \end{array}$ |
| $\begin{aligned} & \hline \text { W2L } \\ & \text { W2H } \end{aligned}$ |  | $\begin{aligned} & \mathrm{X} \\ & \mathrm{X} \end{aligned}$ |  |  | $\begin{aligned} & \mathrm{X} \\ & \mathrm{X} \end{aligned}$ |  | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{aligned} & \mathrm{X} \\ & \mathrm{X} \end{aligned}$ |
| $\begin{aligned} & \hline \text { W3L } \\ & \text { W3H } \end{aligned}$ |  |  | $\begin{aligned} & \hline X \\ & X \end{aligned}$ |  | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{array}{\|l} \hline X \\ X \end{array}$ |
| $\begin{aligned} & \text { W4L } \\ & \text { W4H } \end{aligned}$ |  |  | $\begin{aligned} & \hline X \\ & X \end{aligned}$ |  | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ |
| $\begin{aligned} & \text { W5L } \\ & \text { W5H } \end{aligned}$ |  | $\begin{aligned} & \hline X \\ & X \end{aligned}$ |  |  | $\begin{aligned} & \hline X \\ & X \end{aligned}$ |  | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ |
| W6L W6K |  | $\begin{array}{\|l\|} \hline(X) \\ (X) \end{array}$ | $\begin{aligned} & \mathrm{X} \\ & \mathrm{X} \end{aligned}$ |  | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ |
| $\begin{aligned} & \hline \text { W7L } \\ & \text { W7H } \end{aligned}$ |  |  |  |  |  | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ |
| W8L W8H |  |  |  |  |  | $\begin{array}{\|l\|} \hline X \\ X \end{array}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ |
| $\begin{aligned} & \text { W9L } \\ & \text { W9H } \end{aligned}$ |  | $\begin{array}{\|l} \hline(X) \\ (X) \\ \hline \end{array}$ | $\begin{aligned} & \mathrm{X} \\ & \mathrm{X} \end{aligned}$ |  | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{array}{\|l\|} \hline X \\ X \\ \hline \end{array}$ |
| W10L W10H |  | $\begin{aligned} & \hline X \\ & X \end{aligned}$ |  |  | $\begin{array}{\|l} \hline X \\ X \end{array}$ |  | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ |
| W11L W11H |  |  | $\begin{aligned} & \hline X \\ & X \end{aligned}$ |  | $\begin{array}{\|l\|} \hline X \\ X \end{array}$ | $\begin{array}{\|l\|} \hline x \\ x \end{array}$ | $\begin{aligned} & \hline x \\ & x \end{aligned}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ |
| W12L W12H |  |  | $\begin{aligned} & \mathrm{X} \\ & \mathrm{X} \end{aligned}$ |  | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{array}{\|l} \hline X \\ X \end{array}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ |
| W13L W13H |  | $\begin{aligned} & \hline X \\ & X \end{aligned}$ |  |  | $\begin{aligned} & \hline X \\ & X \end{aligned}$ |  | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ |
| W14L W14H |  | $\begin{array}{\|l\|} \hline(X) \\ (X) \end{array}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ |  | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ | $\begin{aligned} & \hline X \\ & X \end{aligned}$ |
| W15 W16 | $\begin{aligned} & 1 \text { to } 2 \\ & 1 \text { to } 2 \end{aligned}$ | $\begin{aligned} & 2 \text { to } 3 \\ & 1 \text { to } 2 \end{aligned}$ | $\begin{aligned} & 1 \text { to } 2 \\ & 1 \text { to } 2 \end{aligned}$ | $\begin{aligned} & 2 \text { to } 3 \\ & 1 \text { to } 2 \end{aligned}$ | $\begin{aligned} & 2 \text { to } 3 \\ & 1 \text { to } 2 \end{aligned}$ | $\begin{aligned} & 1 \text { to } 2 \\ & 1 \text { to } 2 \end{aligned}$ | $\begin{aligned} & 2 \text { to } 3 \\ & 1 \text { to } 2 \end{aligned}$ | $\begin{aligned} & 1 \text { to } 2 \\ & 2 \text { to } 3 \end{aligned}$ |

## Analog Bus Support

The 1250-35 may be configured to access the analog bus by the fitting of jumpers. This access may be via relays or hard wired, depending on the jumpers fitted.

To access the analog bus via relays, fit 24-gauge twisted pairs to the 1250-35 as follows:

E17 to E9 and E18 to E10
E19 to E4 and E20 to E3
E21 to E13 and E22 to E14
E23 to E8 and E24 to E7
To connect and disconnect the 1250-35 to and from the Analog bus, the OPEN and CLOSE commands are used. The values of <channel> used are as follows:

In a four wire mode, <channel> is in the range 24-27.
In a two wire mode, <channel> is in the range 48-51.
In a one wire mode,<channel> is in the range 96-99.
<channel> values 24-27, 48-51 and 96-99 close relays K4952 , respectively.

Note that all four relays must be closed to connect the 1250-35 to the Analog bus completely. Each relay connects two wires to the Analog bus. This allows the connection of selected wires to the Analog bus if desired.

To hard wire permanent access to the analog bus, fit 24-gauge jumpers to the 1250-35 as follows:
E17 to E1 and E18 to E2
E19 to E3 and E20 to E4
E21 to E5 and E22 to E6
E23 to E7 and E24 to E8
Note that Analog bus access is not supported in the $4(1 \times 6)$ four wire configuration. The fitting of jumpers to connect to the analog bus in this configuration would change the configuration of the switching module.

Analog bus access is supported for the $4(1 \times 12)$ two wire configuration only if the optional jumpers shown in the 1250-35 configuration table are installed. These jumpers are in addition to the jumpers required to access the analog bus as described above.

## 1250-35 Performance Enhancements

The 1250-35 path resistance may be reduced and the bandwidth available increased by short circuiting connections to J 2 on the 1250-35 EXTERNAL to the 1250-35. These performance improvements arise by connecting used and unused signal paths in parallel. This reduces path resistance and causes what were previously unterminated stubs to become current carrying conductors, which removes the band-limiting effects previously caused by the stubs.

In a four wire mode, short circuit the following pins EXTERNAL to connector J2 for the following configurations:

| $4(1 \times 6):$ | No jumpers |
| :--- | :--- |
| $2(1 \times 12):$ | C and D |
|  | A and B |
|  | T and X |
|  | U and W |
|  | M and R |
|  | S and V |
|  | J and E |
|  | F and K |
|  | C, D, F and K |
|  | A, B, J and E |
|  | T, X, V and S |
|  | W, U, R and M |

In a two wire mode, short circuit the following pins EXTERNAL to connector J2 for the following configurations:

| 2 (1x24): | D, T, X and C |  |
| :---: | :---: | :---: |
|  | $\mathrm{A}, \mathrm{W}, \mathrm{U}$ and B |  |
|  | $\mathrm{M}, \mathrm{J}, \mathrm{R}$ and E |  |
|  | V, F, K amd S |  |
| 4(1×12): | A and w | $R$ and $E$ |
|  | D and T | $V$ and $F$ |
|  | $U$ and $B$ | j and M |
|  | $X$ and $C$ | K and S |
| 1(1x 48): | D, T, X, C, V, F, K and S |  |
|  | $M, J, R, E, B, U, W$ and $A$ |  |

In a one wire mode, short circuit the following pins EXTERNAL to connector J 2 for the following configuration:
$1 \times 96$ :
D, T, X, C, V, F, K and S
$M, J, R, E, B, U, W$ and $A$

## 1250-40 Module Specific Syntax

The 1250-40 supports the OPEN, CLOSE, RESET, and PDATAOUT commands.

The Module Specific Syntax for the 1260-40 $4 \times 5$ Signal Matrix module is as follows:
<slotnumber>.<rownumber><columnnumber>
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.
<rownumber> is the matrix row to be connected to <columnnumber>, value 00 through 03.
<columnnumber> is the matrix column to be connected to <rownumber>, value 00 through 04.

The follnwing relav enntrol matrix nives the noscihle nommand


1250-40 Signal Matrix Module Simplified Connection Diggram
$\overline{9}$
<rownumber><columnnumber>-<rownumber><columnnumber>
Example: OPEN 3.0101-0204
This OPEN statement has the same effect as a series of open commands to open all of the connections between rows from 1 through 3 and columns 1 through 4. i.e. connections 0101, 0102, 0103, 0104, 0200, 0201, 0202, 0203 and 0204 are opened.

Figure 3-23, 1250-40 Block Diagram

## 1250-40B Module Specific Syntax

The 1250-40B supports the OPEN, CLOSE, RESET, and PDATAOUT commands.

The Module Specific Syntax for the 1260-40B $4 \times 5$ Signal Matrix module is as follows:
<slotnumber>.<rownumber><columnnumber>
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.
<rownumber> is the matrix row to be connected to <columnnumber>, value 00 through 03.
<columnnumber> is the matrix column to be connected to <rownumber>, value 00 through 04.

The following relay control matrix gives the possible command codes used to implement row and column closures for the 125040B

Column number

|  | 00 | 01 | 02 | 03 | 04 |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  | 00 | 0000 | 0001 | 0002 | 0003 | 0004 |
| Row Number | 01 | 0100 | 0101 | 0102 | 0103 | 0104 |
|  | 02 | 0200 | 0201 | 0202 | 0203 | 0204 |
|  | 03 | 0300 | 0301 | 0302 | 0303 | 0304 |
|  | 04 | 0400 | 0401 | 0402 | 0403 | 0404 |

Two digits are required to describe <rownumber> and <columnnumber>. A leading zero is added to both <rownumber> and <columnnumber>.

Example: CLOSE 3.0204
This CLOSE statement will connect row 2 to column 4 on the 1250-40B resident in 1250 slot 3.

## Operation 3-70

In the case that more than one connection is to be made or broken on the 1260-40B with contiguous rows or columns, then the following format is supported:
<rownumber><columnnumber>-<rownumber><columnnumber>
Example: OPEN 3.0101-0204
This OPEN statement has the same effect as a series of open commands to open all of the connections between rows from 1 through 3 and columns 1 through 4 . i.e. connections 0101, 0102, 0103, 0104, 0200, 0201, 0202, 0203 and 0204 are opened.



Figure 3-24, 1250-40B Block Diagram

## 1250-45 Module Specific Syntax

The 1250-45 supplies a two wire $4 \times 12$ signal switching matrix or it may be configured in the factory as two $4 \times 6$ matrices, for use at up to 10 MHz .

The 1250-45 supports the OPEN, CLOSE, RESET, and PDATAOUT commands.

The Module Specific Syntax for the $1260-454 \times 12$ Signal Matrix module is as follows:
<slotnumber>.<rownumber><columnnumber>
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.
<rownumber> is the matrix row to be connected to <columnnumber>, value 00 through 03.
<columnnumber> is the matrix column to be connected to <rownumber>, value 00 through 12

Two digits are required to describe <rownumber> and <columnnumber>. A leading zero is added to both <rownumber> and <columnnumber>.

## Example: CLOSE 3.0204

This CLOSE statement will connect row 2 to column 4 on the 1250-45 resident in 1250 slot 3 .

In the case that more than one connection is to be made or broken on the 1250-45 with contiguous rows or columns, then the following format is supported:
<rownumber><columnnumber>-
<rownumber><columnnumber>
Example: OPEN 3.0101-0204
This OPEN statement has the same effect as a series of open commands to open all of the connections between rows from 1 through 3 and columns 1 through 4. i.e. connections 0101, 0102, 0103, 0104, 0200, 0201, 0202, 0203 and 0204 are opened.

## NOTE

To close the relays that connect and disconnect the matrix rows to the analog bus, via column 12, OPEN and CLOSE commands are used. For example, if

## Operation 3-72

this card were installed in slot 1, CLOSE 1.0012 and OPEN 1.0012 will connect and disconnect the matrix rows to and from the analog bus.


Figure 3-25, 1250-45 Block Diagram

> 1250-50, 1250-51A, and 1250-51B, R.F. Multiplexer Module Specific Syntax

The 1250-50, 51A and 51B R.F. multiplexer modules support the OPEN, CLOSE, SETUP, PSETUP, RESET and PDATAOUT commands.

The module specific syntax for the 1250-50, 1250-51A and 1250$51 B$, R.F. Switch modules is as follows:

OPEN <slotnumber>.<channel>[;<slotnumber>.<channel>]......
where <channel> is the relay to be closed to connect an input or output to the Common line. Note that two connections at least are required to connect an input to an output. Channels remain closed until opened by an OPEN command. Care must be taken not to leave connections closed if not required, as this may lead to unwanted connections to instruments, etc.

The range of values for <channel> is:
1250-50 and 51B: $\quad 00-04,10-14,19,20-24,30-34$ and 39
1250-51A: $\quad 00-04,10-14$ and 19
The Module Specific Syntax for the CLOSE command is the same as for the OPEN command.

The SETUP command controls the sequence mode of the 1250-50, 51A and 51B only. The syntax used is:

SETUP <slotnumber>.<seqmode>
where <slotnumber> is the 1250 chassis slot that the 1250
Series module resides in, value 1-5.

| <seqmode> is | BBM, (Break before make) <br>  <br>  <br>  <br>  <br> IMBB, (Make before break) (Immediate) |
| :--- | :--- |

The PSETUP command causes the specified module setup to be transmitted to the 1250s controller. The syntax used is:

PSETUP <slotnumber>[;<slotnumber>][;<slotnumber>].......
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.

The responses to the PSETUP command for the 1250-50, 51A and 51B switch modules are as follows:

```
<slotnumber>.1250-NN <MODULE NAME>
<slotnumber>.<seqmode>
<slotnumber>.END
```

The PDATAOUT command causes the specified module to transmit the CLOSED state of the relays fitted to the switching module to the 1250s controller. The syntax used is:

PDATAOUT <slotnumber>[;<slotnumber>][;<slotnumber>].......
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.

The responses to the PDATAOUT command for the 1250-50, 51A and 51B RF switch modules are as follows:
<slotnumber>.1250-NN <MODULE NAME> <slotnumber>.<channel>[,<channel>][,<channel>].. <slotnumber>.END

The range of values for <channel> is:
1250-50 and 51B: $\quad 00-04,10-14,19,20-24,30-34$ and 39
1250-51A: $\quad 00-04,10-14$ and 19


Figure 2-26, 1250-50 Top View


Figure 2-27, 1250-51A/B Top View

## 1250-52A and 125052B R.F. Multiplexer Module Specific Syntax

The 1250-52A and 1250-52B R.F.Switch modules support the OPEN, CLOSE, PSETUP, RESET and PDATAOUT commands.

The module specific syntax for the 1250-52A and 1250-52B R.F. Switch modules is as follows:

OPEN <slotnumber>.<channel>[;<slotnumber>.<channel>]......
where <channel> is the relay to be closed to connect an input to an output.

The range of values for <channel> is:

| 1250-52A: | $00-04$ and $10-14$ |
| :--- | :--- |
| 1250-52B: | $00-04,10-14,20-24$ and $30-34$ |

The Module Specific Syntax for the CLOSE command is the same as for the OPEN command. Note that connections to 04, 14,24 and 34 are connections to a "not connected" pin and any connections in a group are opened. The commands OPEN and CLOSE will both open an existing connection if directed to one of the "not connected" pins.

Connections between input and output are mutually exclusive within a group in the 1250-52 switch modules. A CLOSE command will open an existing connection and close the new connection and an OPEN command will open any existing connection in the group and open circuit the Common connection.

The 1250-52A and 1250-52B are restricted to the Break Before Make sequence mode only.

The PSETUP command causes the specified module setup to be transmitted to the 1250s controller. The syntax used is:

PSETUP <slotnumber>[;<slotnumber>][;<slotnumber>].......
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.

The responses to the PSETUP command for the 1250-52A and 1250-52B modules are as follows:
<slotnumber>. $1250-\mathrm{NN}$ <MODULE NAME>
<slotnumber>. BBM
<slotnumber>.END
The PDATAOUT command causes the specified module to transmit the CLOSED state of the relays fitted to the switching

## Operation 3-78

module to the 1250 s controller. The syntax used is:
PDATAOUT <slotnumber>[;<slotnumber>][;<slotnumber>].......
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.

The responses to the PDATAOUT command for the 1250-52A and 52B RF switch modules are as follows:
<slotnumber>.1250-NN <MODULE NAME> <slotnumber>.<channel>[,<channel>][,<channel>]....... <slotnumber>.END
The range of values for <channel> is:

| $1250-52 \mathrm{~A}:$ | $00-04$ and $10-14$ |
| :--- | :--- |
| $1250-52 \mathrm{~B}:$ | $00-04,10-14,20-24$ and $30-34$ |



Figure 3-28, 1250-52A/B Top View

## 1250-54B and 125055B RF Multiplexer Module Specific Syntax

The 1250-54B and 1250-55B R.F. multiplexer support the OPEN, CLOSE, SETUP, PSETUP, RESET and PDATAOUT commands.

The module specific syntax for the 1250-54B and 1250-55B R.F. Multiplexers is as follows:

OPEN <slotnumber>.<channel>[;<slotnumber>.<channel>]......
where <channel> is the relay to be closed to connect an input to the output. Channels remain closed until opened by an OPEN command.
The range of values for <channel> is:
00-03
10-13
20-23
30-33
The Module Specific Syntax for the CLOSE command is the same as for the OPEN command. To connect to a "not connected" pin, open all echannels in a group. The default connection on power-up is a connection to the "not connected" pin in each group.

Connections between input and output are mutually exclusive within a group in the $1250-54 \mathrm{~B}$ and $1250-55 \mathrm{~B}$ switch modules. A CLOSE command will open an existing connection and close the new connection and an OPEN command will open any existing connection in the group and open circuit the Common connection.

The 1250-54B and 1250-55B switching modules are restricted to the Break Before Make sequence mode.

The PSETUP command causes the specified module setup to be transmitted to the 1250s controller. The syntax used is:

PSETUP <slotnumber>[;<slotnumber>][;<slotnumber>].......
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.

The responses to the PSETUP command for the 1250-54B multiplexer is as follows:
<slotnumber>.1250-NN <MODULE NAME>
<slotnumber>.BBM
<slotnumber>.END

The PDATAOUT command causes the specified module to transmit the CLOSED state of the relays fitted to the switching module to the 1250s controller. The syntax used is:

PDATAOUT <slotnumber>[;<slotnumber>][;<slotnumber>]....... where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.

The responses to the PDATAOUT command for the 1250-50, 51A, 51B and 52A RF switch modules are as follows:

```
<slotnumber>.1250-NN <MODULE NAME>
<slotnumber>.<channel>[,<channel>][,<channel>]......
<slotnumber>.END
```

The range of values for <channel> is:
00-03, $10-13,20-23$ and $30-33$.

# 1250-60 and 1250-61 Microwave Switching Module Specific Syntax 

The 1250-60 and 1250-61 support the OPEN, CLOSE, SETUP, PSETUP, PDATAOUT and RESET commands.

The module specific syntax for the 1250-60 and 1250-61 is of the form:

OPEN <slotnumber>.<channel>[;<slotnumber>.<channel> where <slotnumber> is the 1250 chassis slot that the 1250-60 and 1250-61 switch modules reside in, value 1-5.
<channel> is the reference of a SPDT relay resident on the switching module. The range of values for <channel> is 0 -1 for the 1250-60A and 1250-61A, and $0-3$ for the 1250-60B and 1250-61B.

The module specific syntax used for the CLOSE command is the same as for the OPEN command.

The SETUP command controls the sequence mode of the 1250-

1250-60B/61B Rear Panel Connectors Showing Channel Numbering and Connector Placement


1250-60A/B and 1250-61A/B Mierowave Switching Module Simplified Connection Diagram
ler>].......
250 Series

1250-60A/61A Rear Panel Connectors Showing Channel Numbering and Connector Placement

250 Series
stup to be used is:

_E

le to transmit ard to the
where <slotnumber> is the 1250 chassis slot that the 1250 Series module resides in, value 1-5.
The responses to the PDATAOUT command for the 1250-60 and 1250-61 microwave switch modules are as follows:
<slotnumber>.1250-60A/61A MICROWAVE MODULE <slotnumber>.<channel>[,<channel>][,<channel>]....... <slotnumber>.END
where <channel> is 0 or 1 for the $1250-60 \mathrm{~A}$ and $1250-61 \mathrm{~A}$. <slotnumber>.1250-60B/61B MICROWAVE MODULE <slotnumber>.<channel>[,<channel>][,<channel>]....... <slotnumber>.END where <channel> is $0,1,2$ or 3 for the 1250-60B and 1250-61B.

Figure 3-29, 1250-60 and 1250-61 Block Diagram

## 1250-65 Latching 18 GHz Microwave Switching Module Specific Syntax

The 1250-65 supports the OPEN, CLOSE, SETUP and PDATAOUT commands.

The module specific syntax for the 1250-65 is of the form:
OPEN <slotnumber>. <channel> [; <slotnumber>. <channel ~...] where <slotnumber> is the 1250 chassis slot that the $1250-65$ module resides in, value 1-5.

Note
The 1250-65 occupies two chassis slots, and is configured such that the chassis backplane connector mates with the higher numbered slot of the two slots occupied. Care must be taken to use the connect value of <slotnumber> for the 1250-65. For example, if a 1250-65 occupies slots 1 and 2 , a value for <slotnumber> of 2 is used.

Note, however, that this constraint is imposed by the physical construction of the 1250-65. The electronics and software of the chassis fully support the use of the full range of values of <slotnumber>. In the event of controlling the 1250-65 via extender cables, any of the chassis backplane slots may be used to drive the card.
<channel> refers to one of four transfer switches residing on the $1250-65$. The range of values of <channel> is $0-3$. The relationship of each channel number to the transfer switch and front panel connectors reference designations is shown below.

Number
0
1
2
3

K1
K2
K3
K4

## Panel Connectors

$$
\mathrm{J} 1-\mathrm{J} 4
$$

J5-J8
J9-J12
J13-J16

The module specific syntax used for the CLOSE command is the same as for the OPEN command.

The OPEN and CLOSE commands determine which of the 2 configurations the transfer switches will be set to. The orientation of the connectors on the 1250-65 module's front panel is shown below.


Figure 3-30, Orientation of front panel connectors
The "EXTERN. 13V" on the 1250-65 module's front panel is not used.

The operation of the transfer switches in relation to the module specific syntax for the 1250-65 is as follows:

RESET Command -Execution of the RESET command will cause all of the following configurations:

J1 connected to J2; J3 connected to J4 J 5 connected to J6; J7 connected to J8 J 9 connected to J10; J11 connected to J12 J 13 connected to J14; J15 connected to J16
At power-up the state of the transfer switches on the 1250-65 module will not have changed since the preceeding power down state. But because the transfer switches are latching their state will be unknown to the 1250 chassis. The RESET command can be used to faorce all the switches to a known state.

CLOSE Command - A CLOSE command specifying the corresponding channel number will cause the following configuration:
Channel Number Configuration
$0 \quad \mathrm{~J} 1$ connected to J3;J2 connected to J4
1 J 5 connected to J7;J6 connected to J8
2 J 9 connected to $\mathrm{J} 11 ; \mathrm{J} 10$ connected to J 12
3 J 13 connected to J15; J14 connected to J16
OPEN Command - An OPEN command specifying the corresponding channel number will cause the following configuration:

Channel Number Configuration
$0 \quad \mathrm{~J} 1$ connected to J2;J3 connected to J4
1 J 5 connected to J6;J7 connected to J8
2 J 9 connected to J10;J11 connected to J12
3 J 13 connected to $\mathrm{J} 14 ; \mathrm{J} 15$ connected to J 16
NOTE
The latching circuit recovery time of 100 milliseconds given in the specifications for this 1250-65 will limit the time interval between and OPEN or CLOSE command and the next command to a minimum of 100 milliseconds. This is necessary to allow sufficient settling time for the latching circuit (built-in each transfer switch) after an OPEN or CLOSE command.

The SETUP command controls the sequence mode of the 125065 . The module only supports the break-before-make (BBM) mode, therefor, the module is always set to

BBM.
The PDATAOUT command causes the specified module to transmit the CLOSED state of the transfer switches to the 1250's controller. The syntax used is:

PDATAOUT <slotnumber> [;< slotnumber> ... 1
where <slotnumber> is the 1250 chassis slot where the $1250-65$ module is as resides in, value 1-5.

The responses to the PDATAOUT command for the 1250-65 module is as follows:
<slotnumber>.1250-65 LATCHING 18 GHZ MICROWAVE SWITCHING MODULE
<slotnumber> . < channel> [(, or -) <channel>...]
<slotnumber>> .END
where <channel> is the channel number of the 1250-65 module that is currently in the CLOSED state.
Immediately after power-up, the result of a PDATAOUT command will not reflect the actual state of the latching transfer switches. This is because their state' are unknown to the 1250 chassis at power-up. The PUPRCL (Power-Up ReCaL1) command can be used to refresh the 1250 chassis with the previous states of the transfer switches. This can be done as follows:

1. The present states of the transfer switches are stored in non-volatile memory location 1 (This also stores the present states of 11 modules resident in the 1250 chassis).
2. The PUPRCL is turned ON.
3. The 1250 chassis is powered down.

On the next power-up, the states of the transfer switches will not have changed, but the automatic recall of non-volatile memory location 1 will enable the PDATAOUT command to print the actual configuration of the transfer switches (Refer to the section on System Operation for details on the STORE and PUPRCL commands).

## 1250-750 RF

Multiplexer Module Specific Syntax

The 1250-750 RF multiplexer modules support the OPEN, CLOSE, SETUP, PSETUP, RESET and PDATAOUT commands.

The Module Specific Syntax for the 1250-750 RF Switch module is as follows:

OPEN < slotnumber> . <channel> [; < slotnumber> . <channel>]
where <channel> is the relay to be closed to connect an input or output to the Common line. Note that two connections at least are required to connect an input to an output. Channels remain closed until opened by an OPEN command. Care must be taken not to leave connections closed if not required, as this may led to unwanted connections to instruments, etc.

The range of values for < channel> is:
1250-750: $00-04,10-14,19,20-24,30-34$ and 39

The Module Specific Syntax for the CLOSE command is the same as for the OPEN command.

The SETUP command controls the sequence mode of the 1250750. The syntax used is:

SETUP < slotnumber> . < seqmode>
where < slotnumber > is the 1250 or 1251 chassis slot the 1250
Series module resides in, value 1-5.

$$
\begin{array}{ll}
<\text { seqmode> is } & \text { BBM (Break-Before-Make) } \\
& \text { MBB (Make-Before-Break) } \\
& \text { IMM (Immediate) }
\end{array}
$$

The PSETUP command causes the specified module setup to be transmitted to the 1250 or 1251's controller. The syntax used is:

PSETUP < slotnumber> [ ; < slotnumber>] [; <slotnumber>] where < slotnumber > is the 1250 or 1251 chassis slot the 1250 Series module resides in, and is in the range 1-14 or 112, depending on the number of chassis slaved to the master.

The responses to the PSETUP command for the 1250-750 switch module is as follows:
<slotnumber>. 1250-NN < MODULE NAME>
<slotnumber>. < seqmode>
<slotnumber>. END
The PDATAOUT command causes the specified module to transmit the CLOSED state of the relays fitted to the switching module to the 1250 or 1251 controller. The syntax used is:

PDATAOUT < slotnumber> [ ; < slotnumber>] [ ; <slotnumber>]
where < slotnumber > is the $1250 / 1251$ chassis slot the 1250 Series module resides in, and is in the range 1-14 or 112, depending on the number of chassis slaved to the master.

The responses to the PDATAOUT command for the 1250-750 RF switch module is as follows:
<slotnumber>. $1250-$ NN < MODULE NAME>
<slotnumber>. <channel> [ , < channel>] [ , < channel>]
<slotnumber>. END
The range of values for < channel> is:
1250-750: $\quad 00-04,10-14,19,20-24,30-34$ and 39

## Operation 3-88

## Local Control

## Introduction

Local control of the 1250 is only available through the use of the Intelligent front panel, Option 90. This option allows the operator to control all 1250 functions from the front panel using keystrokes similar in format to the GPIB commands used to control the 1250.

## 1250 Intelligent Front Panel (Option 90)

Refer to Figure 3-31 for an illustration of the 1250 Intelligent Front Panel (Option 90) and to Table 3-9 for descriptions of the features of the 1250 Intelligent Front Panel.


Figure 3-31, 1250 Intelligent Front Panel

Table 3-9, 1250 Intelligent Front Panel Features

| Reference | Description |
| :---: | :--- |
| 1 | Display keys. These four keys are used to scroll the 1250 display UP, DOWN, <br> LEFT or RIGHT, when it is necessary to view more information than may be <br> displayed at one time. The information to be viewed may be more than the 16 <br> character LED display can show or may be contained in more than one line, <br> requiring the use of these keys. The direction of scrolling that each key causes <br> is as marked on the front panel with arrows. |


| 2 | RESET key. This key, when used with the EXEC key, causes the 1250 to return to its home state and to open all channel closures. All slot 0 settings are lost except the power up recall. |
| :---: | :---: |
| 3 | ERR (Error) key. This key causes any errors that have occurred to be displayed on the 1250 front panel display. The error message is of the form ERROR X.YY where X is the slot number associated with the error, value $0-5$ (slot 0 is the mainframe) or $X X$ if the error is not associated with a particular slot. $Y Y$ is a two digit decimal number detailing the error. Refer to the YERR section in the Device Dependant Command Codes on page 3-17 for a listing of all error codes. The error is displayed while the ERR key is depressed and remains in the system until cleared by the CLR key or the 1250 is RESET. |
| 4 | EXEC (Execute) key. This key is used to cause the 1250 to carry out the commands associated with the different keys on the front panel after the keys selected are used. |
| 5 | Entry keys. These keys are used to enter data for use with the various command keys. The . and - keys are used to enter the delimiters required by the various command keys. The SEL keys are used to select between the various option available for the 1250 Series modules setups. The CLR key clears the current display, clears reported errors and returns the 1250 display to the power up condition. It also clears any commands entered since the last use of the EXEC key. The DEL key is used to delete the last data entry made, one character at a time, starting with the most recently entered. |
| 6 | OPEN key. This key is used to command the opening of previously closed 1250 Series switching module relays. Note that each switching module requires different descriptors for the command to be implemented. |
| 7 | CLOSE key. This key is used to command the closing of previously open 1250 Series switching module relays. Note that each switching module requires different descriptors for the command to be implemented. |
| 8 | READ key. This key is used to read digital data from the 1250 Series boards that support digital I/O operations. |
| 9 | WRITE key. This key is used to write digital data to the 1250 Series boards that support digital I/O operations. |
| 10 | VIEW key. This key is used to examine the operating conditions (setup or specific module data) used in the 1250 Series modules fitted to the 1250 and for the 1250 itself. Use with the SETUP and DATA keys and a numeric specifier that defines the slot to be viewed. |
| 11 | EDIT key. This key is used to change the operating conditions (setup or specific module data) used in the 1250 Series modules fitted to the 1250 and for the 1250 mainframe. Use with the SETUP key and a numeric specifier that defines the slot to be edited. |


| 12 | SETUP key. This key specifies the type of information to be viewed in the 1250. <br> Use with the VIEW and EDIT keys. |
| :---: | :--- |
| 13 | DATA key. This key specifies the type of information to be viewed. Use with the <br> VIEW key. |
| 14 | STORE key. This key is used to store switch settings for all relay modules fitted <br> to the 1250 in non-volatile memory. |
| 15 | RECALL key. This key is used to recall switch settings for all switch modules <br> fitted to the 1250 from non-volatile memory. |
| 16 | TRIG / SCAN key. This key causes the 1250 to execute the next switch closure <br> described in the scan list and open the previous switch closure if the scan mode <br> is active. |
| 18 | TEST key. This key allows the operator to carry out the five 1250 self tests. <br> Used with the entry keys. |
| 19 | LOCAL key. This key returns the 1250 to the GPIB local mode if it is in the <br> remote mode. The 1250 will also display the power on SRQ status of the 1250 <br> and the GPIB address. |
| 20 | REM LED. This LED lights to show that the 1250 is in the GPIB remote mode. |
| 21 | ADDR LED. This LED lights to show that the 1250 is addressed over the GPIB. |
| 24 | SRQ LED. This LED lights to show that the 1250 has asserted the GPIB SRQ <br> line. |
| 22 | SEL LED. This LED lights to show that the SEL keys should be used. <br> 23 <br> UPDen commands are issued over the GPIB. |
| ERROR LED. This LED lights to show that an error has occurred and that the |  |
| ERR key should be used to determine the error reported. The LED remains lit |  |
| until the CLR or RESET key is used. |  |

## Local Operation

## Introduction

This section provides the information necessary to operate the 1250 using Option 90, the Intelligent front panel. As each 1250 Series switching module has a different configuration, different keystrokes are required to control the different modules. The keystrokes required are given in the section on Module Specific Syntax and are the same as the syntax used in the command codes used for remote control of the switch modules.

A close correspondence between the command codes used in the remote control of the 1250 and the keystrokes used to control it locally exists. It is recommended that the user be familiar with these command codes before operating the 1250 locally.

In general, each command is entered by pressing the front panel key that defines the type of operation to be performed, entering the data that defines the specific actions to be carried out and then carrying out the command by pressing the EXEC key. No action is taken by the 1250 until the EXEC key is pressed.

The two main keys used to control the 1250 Series switch modules are the OPEN and CLOSE keys. Pressing either key causes the command to appear in the 1250 display. The 1250 then waits for the relay paths to be opened or closed to be specified. The details of the path to be opened or closed are entered from the front panel entry keys. The various paths that each 1250 Series switching module can implement are detailed in the section on Module Specific Syntax.

More than one path opening or closure may be carried out by concatenating the module specific commands with the semicolon key. The two operations cannot be mixed.

All paths must be individually opened or closed. Existing path openings or closures are not affected by subsequent commands.

Example 1: To close a connection between row 02 and column 03 and row 04 and column 05 on a 1250-40 Matrix module in chassis slot 2 and close path 3 on a 1250-60B Microwave Switching module in chassis slot 4 with one command, enter the following keystrokes.

CLOSE 2. 0203 ; 2. 0304 ; 4 . 3 EXEC
Example 2: To open channel 8 on a 1250-12 Relay Actuator
module in chassis slot 3, enter the following keystrokes:
OPEN 3.8

## READ and WRITE

 keysThe READ and WRITE keys are used to transfer digital data to and from the 1250-10 and 1250-14 modules. The data is entered in binary weighted decimal form from the front panel entry keys.

To write digital data out to a module, the WRITE key is used, along with the data entry keys. The module specific syntax required is <slotnumber>.<portnumber>,<data> as described in the section on Device Dependant Command Codes.

To READ data back from a port, the READ key is used, along with the data entry keys. The module specific syntax required is <slotnumber>.<portnumber> as described in the section on Device Dependant Command Codes.

## NOTE

> The format of the data returned from a Digital I/O Module varies according to the I/O port read. Ports 1 and 2 return the data in a binary weighted decimal form and port 2 returns the data in 2 s complement form.

More than one READ or WRITE command may be entered at a time by concatenating the module specific syntaxes together with semi-colons (;).

The results of a READ operation are obtained by the use of the VIEW and DATA keys. If the 1250 is in the VIEW DATA mode for the slot containing the Digital I/O module, the slot number, port selected and data obtained from the READ operation is displayed on the 1250 front panel automatically.

The VIEW DATA mode displays the slotnumber, port and data transferred in the last digital I/O operation, regardless of whether it was a READ or a WRITE operation.

Example 1: To write 55 out to a 1250-14 Digital I/O module port 1 in chassis slot 1 and 170 to port 1 of a Digital I/O Module in chassis slot 3 , enter the following keystrokes:

WRITE 1.1, 55 ; 3.1 , 170 EXEC
Example 2: To read the data at port 2 of a 1250-14 Digital I/O module in chassis slot 5 , enter the following key strokes:

READ 5. 2 EXEC
To examine the data obtained from the READ operation, press:

## VIEW DATA 5 EXEC

To change the Digital I/O module mode and polarity codes, enter the key sequence:

EDIT SETUP <slotnumber> EXEC <modenumber> , <polaritycode>

The 1250 will insert a decimal point after the <slotnumber> after the EXEC key is pressed as a prompt to enter the mode and polarity code numbers. Both mode and polarity codes must be entered, even if one of the default settings is resident and is not to be changed. The mode and polarity codes are as described in the section on Device Dependant Command Codes.

## STORE and RECALL

 keysThe STORE and RECALL keys are used to store 1250 switching module configurations in the non-volatile memory provided and recall those settings as required. The configurations of all switch modules resident in the chassis are stored and the same module types must be resident in the same chassis slots when the configuration is recalled. If the module configuration recalled is not the same as the configuration that was stored, an error will be generated.

To store a 1250 chassis switching module configuration, enter the key sequence:

STORE <non-vol location> EXEC
where <non-vol location> is in the range 1-47.

## NOTE

1250s with operating system software at level 13.1 or below have 63 non-vol locations.

To recall a 1250 configuration, enter the key sequence:
RECALL <non-vol location> EXEC
where <non-vol location> is the same as for the STORE key.
If the 1250 power up recall (PUPRCL) feature is active, the 1250 will automatically set the 1250 to the configuration stored in nonvol location 1 at power up. The legend PUPRCL . . . will be
displayed after the power up self test is completed to indicate that this is occurring.

## TEST key

## LOCAL key

The LOCAL key is used to remove the 1250 from the GPIB REMOTE state and place it in the LOCAL state. While pressed, the 1250 will display its GPIB address and whether the power up recall feature is active or not.

Revised 3-21-02

## TRIG / SCAN key

The TRIG / SCAN key is used to sequence the 1250 through the switch closures described in the scan list. Each time the key is pressed, the 1250 will open the previously specified switch closures and closes the next set of relays specified.

Refer to the section on the scan list for the details of the 1250 response to the various elements of the scanlist.

A break point in the scan list will cause the 1250 to stop scanning after opening the previous channel. A break point in the scan list is defined as the character zero delimited by semi-colons (;0;). On reaching a scanlist break point, the scan mode is set to SCAN OFF. Scanning is resumed after editing the slot 0 SETUP to SCAN ON or SCAN CONT. SCAN CONT will cause the 1250 to resume scanning from the scan list break point it was paused at and the SCAN ON command will cause the 1250 to resume scanning from the beginning of the scan list.

## VIEW key

The VIEW key is used with either the SETUP or DATA key to display information about the modules installed in the 1250 chassis. VIEW SETUP will display the slot number and information about the setup of the module specified in a multiline format. VIEW DATA will display the slot number and module type and the configuration for the slot specified in a multiline format. The DISPLAY up, down, left and right keys are used to scroll through the information displayed.

To view the setup of a slot, enter the key sequence:
VIEW SETUP <slotnumber> EXEC
and use the display keys to scroll through the lines of information presented.

The SETUP for slot 0 is as follows:
O.MODEL 1250 UNIVERSAL SWITCH CONTROLLER
0.CNF OFF or ON
0.DLY <value>
0.DSP ON or OFF
O.EQU <list>
0.EXCL <list>
0.SCAN ON, OFF or CONT
0.SLIST <list>
0.SRQMASK <VALUE>
0.TRIG ON or OFF
0.PUPRCL ON or OFF

The setup for switch modules is a two line message consisting of a module identifying header and the relay actuation sequence, (MBB, BBM or IMM). Each line is preceded by the slotnumber that the module is resident in.

The setup for the 1250-14 Digital I/O module is a two line message consisting of a module identifying header and the port number and data transferred in the last digital I/O operation. Each line is preceded by the slotnumber that the module is resident in.

To view the data available for a slot, enter the key sequence:
VIEW DATA <slotnumber> EXEC
The data for slot 0 is a two line statement consisting of an identifying header and the 1250 operating system rev. level. Each line is preceded by the slotnumber that the module is resident in. The data for switch modules in slots $1-5$ is a two line statement consisting of an identifying header and the channels closed on the module in the slot specified. The data for the 1250-14 Digital I/O module is a two line statement consisting of an identifying header and the slotnumber, portnumber and digital data transferred in the last I/O operation.

The SETUP or DATA for more than one slot may be obtained by hyphenating the first and last slot numbers of interest. In this case, several continuous lines of information will be available and the slot information is distinguished by the relevant slotnumber being the first element of each line.

The 1250 will remain in the VIEW DATA mode until the 1250 is RESET or the CLR key is used. The 1250 display will temporarily display new instructions until the EXEC key is pressed and then return to the VIEW DATA mode. GPIB activity will not cause the 1250 to exit this mode unless it is a RESET command.

## EDIT key

The edit key is used with the SETUP key to change the operating parameters of the 1250. All parameters that can be examined with the VIEW SETUP key sequence may be changed with the EDIT key.

To edit a slot setup, enter the key sequence

## EDIT SETUP <slotnumber> EXEC

and then use the DISPLAY keys to display the parameter to be changed. Enter data or use the SEL keys to display the desired parameter. Press the EXEC key to make the new parameter active.

For slot 0 , the parameters to be edited are presented in the same order as they are given for the VIEW SETUP command. The operating condition is blank until the operator enters information via the SEL keys or the ENTRY keypad. Operating parameters

## Operation 3-98

requiring the use of the SEL keys are indicated by the SEL LED lighting. The parameters requiring data entry via the ENTRY keypad are the Equate, Exclude and Scan lists. The format for this data is as described in the section on Device Dependant Command Codes. Only one operating parameter may be edited at a time. The operating parameter displayed on the front panel is entered into the 1250 memory by the use of the EXEC key.

For switch modules in slots 1-5, the only operating parameter that can be edited is the relay actuation mode. The three options are Make Before Break (MBB), Break Before Make (BBM) and Immediate (IMM). The SEL LED lights to show that the SEL keys are to be used to scroll through the options for the sequence mode. The sequence mode selected is the one displayed when the EXEC key is pressed.

For the 1250-14 Digital I/O module, the mode number and polarity code may be edited. These parameters are as described in the Device Dependant Command Code section. Note that both of these parameters must be entered from the ENTRY keypad, even if one of them is not to be changed.

Example 1: To change the relay actuation mode of a 1250-51B 500 MHz RF switching module in chassis slot 4, enter the following key sequence:

EDIT SETUP 3 EXEC
Scroll through the possible actuation modes until the required mode is displayed. Press EXEC to make the new sequence mode active.

Example 2: To turn the power up recall feature off, enter the key sequence:

## EDIT SETUP 0 EXEC

Scroll down the slot 0 operating parameters with the DISPLAY keys until the 1250 displays 'PUPRCL _'. Use the SEL keys to change the display to PUPRCL OFF and press EXEC to deactivate the power up recall feature.

DEL key

The DEL key is used to remove data from the 1250 display in the EDIT mode before it is entered into the 1250 memory. Each time the key is pressed, the last character in the display will be removed, until the cursor reaches the operating parameter legend displayed. Further use of the DEL key will have no effect.

CLR key

EXEC key

RESET key

## ERR key

## DISPLAY keys

The CLR key clears the 1250 display and causes the 1250 to display the message "RACAL DANA 1250". All action taken since the last use of the EXEC key is cleared.

The EXEC key is used to execute all commands entered from the 1250 front panel. After its use, the 1250 becomes quiescent until another command is entered and executed.

The RESET key is used with the EXEC key to return the 1250 to its power up (Home) state and to open all relay closures. To reset the 1250, enter the key sequence:

## RESET EXEC

Note that the RESET key will not affect the status of the Power up recall (PUPRCL) feature.

The ERR key is used to display the error number associated with a 1250 failure. The ERR LED lights to show that an error has occurred and that an error code is available. The 1250 will display "ERROR <slotnumber>.<error code> while the ERR key is pressed, where <slotnumber> is the slot that generated the error and <error code> is the two digit error code that details the error. Refer to the table of error codes given in the YERR section of the Device Dependant Command Codes section for the details of the possible errors. Note that if the error is not specific to one module, the 1250 will display the letter X and then the error code.

The ERR LED remains lit until the error is cleared with the CLR key or the 1250 is reset. Displaying the error will not clear the error from the 1250.

The DISPLAY keys are used to scroll back and forth through displayed information if that information is made up of more characters than can be displayed on the 1250 front panel at one time or multiline information.

The DISPLAY left and DISPLAY right keys are used to scroll along a line of information if that line is too long to be completely displayed. Each time one of these keys is pressed, the display is shifted left or right by one character, according to which key is pressed. If the key is held down, the display will scroll as far as it can and then stop.

The DISPLAY up and DISPLAY down keys are used to scroll up and down through the lines of available information. Each time one of these keys is pressed, a new line is displayed from the beginning, regardless of the section of the previous line displayed. The new line displayed is from above or below the previous line, depending on the key pressed. Repeatedly pressing the same key will scroll the display to the one end of the multiline display and then stop. The display does not wrap around and begin to repeat any additional lines of information available.

## SEL keys

The SEL keys are used to choose between the various options available in the EDIT mode. If a choice is to be made, then the SEL LED will light and a prompt will appear in the 1250 display. Use of the SEL up and SEL down will display the options available and the EXEC key will select the option displayed.

The SEL keys do not display the options available in a wraparound manner. Once the end of a list of options is reached, the other SEL key must be used to scroll through the options until the other end of the list is reached.

## Chapter 4

## OPERATION VERIFICATION

Introduction

## General Information

## Required Equipment

By correctly completing the following Performance Verification Procedures (PVP), functional operation of the 1250 mainframe, its plug-in modules, and the Option 90 Intelligent Front Panel is verified.

The primary purpose of these tests is to provide a relatively fast and easy method for determining the operability of the 1250 and its' various plug-in modules and Intelligent Front Panel.

These PVPs should be performed whenever it is necessary to determine whether the 1250 and its plug-in modules/Intelligent Front Panel are operating correctly. These tests may also be used as an incoming inspection procedure to verify a suspected failure after the 1250 has been installed into a system. After diagnosing and repairing a 1250 failure, these PVPs can be used to confirm a satisfactory repair.

A Test Fixture is needed for several performance tests, and is noted in each appropriate subsection. The fixture simplifies testing and acts as an interface between the module and test multimeter. The test fixture can be fashioned for each module, using a removable wiring block configured as described in the corresponding subsection of the manual for each module.

The following test equipment is recommended for these PVPs. Equivalent test equipment may be substituted when desired.
a. Digital Multimeter - Racal Instruments Model 5004 or equivalent
b. GPIB Instrument Controller - Hewlett-Packard Series 200

## Performance Verification Procedures

The PVP's described in this section are divided into the following 9 subsections:
a. Mainframe Self-Test
b. GPIB Test
c. 1250-10 Breadboard Module Test
d. 1250-14 Digital Input/Output Module Test
e. 1250-40 Signal Matrix Module Test
f. $1250-60 / 1250-6118 / 26.5 \mathrm{GHz}$ Microwave Switching Module Test
g. Low Frequency Relay Module Test for the 1250-12, 125015, 1250-20, and 1250-30
h. RF Relay Module Tests for the 1250-50, 1250-51A/B, and 1250-52A/B
i. 1250-90 Intelligent Front Panel Option Test NOTE

Always perform the mainframe self-test and GPIB test before any of the remaining module tests. This helps ensure the most comprehensive approach toward isolating an actual problem or failure.

The mainframe self-test verifies operation of the display circuitry and most of the microprocessor-related circuitry on the computer board. This test does not verify the operation of the backplane or associated drivers of the 1250 mainframe. The operation of the backplane and drivers is verified when the specific modules are tested.

## NOTE

If the mainframe self-test passes, this does not ensure that the 1250 is completely operational. Verification of proper operation is confirmed as the result of completing the specific module tests.

Initiate the mainframe self-test as follows:
a. Power-down the 1250.
b. Power-up the 1250.
c. The 1250 mainframe will have successfully passed a power-up self-test if after power-up the REM and ADDR LEDs are not illuminated. A failure is indicated as follows:

1. ADDR LED illuminated - ROM/RAM failure
2. REM LED illuminated - Microprocessor support circuitry/NonVol memory failure
3. ADDR and REM LEDs both illuminated - Self-configuration failure
d. If Option 90 is installed and the unit passes the power-up self-test, the following messages are displayed:

## SELFTEST OK

RACAL-DANA 1250
If the self-test fails, refer to Table 3.7 for an explanation of error codes.

## GPIB Test

See Table 4-1, which provides a test program for conducting the 1250 GPIB operational verification test.

## Table 4-1



## 1250-10 Breadboard Module Test

The 1250-10 Breadboard module permits the user to create circuits that will interact with the 1250. This module has three 8bit output ports and three corresponding 8-bit input ports. Also, this module provides +5 VDC and +13 VDC (both at 1.7A) power supplies both of which are fused at 2A and have LED indicators. The module test consists of connecting each port output to its corresponding input and verifying that the port output data is valid by reading back the data written on each output port.

WARNING
If the $\mathbf{1 2 5 0}$ switch controller is currently installed in a system, the 1250 must be disconnected from the system observing the following precautions. Completing this disconnection presents two potential safety hazards to the individual:
a. If high voltage exists in the system, the user may come in contact with it
b. Damage to equipment may occur if the wrong electrical lines are accidentally connected or disconnected

Therefore, the user must take the necessary precautions to prevent either a or b from occurring disconnecting the wiring or the wiring block. This WARNING applies to all following test procedures.

## Test Procedure

## NOTE:

Disconnect any user circuit from the three input or output ports that could cause a false failure.

1. Remove any wiring block from the 1250-10's rear edge connector
2. Enter the test program listed in Table 4.2 into the controller
3. Connect the GPIB cable of the controller to the 1250
4. Verify that LEDs CR1 and CR2 are illuminated
5. Execute the test program and follow the displayed prompts

Table 4-2, 1250-10 Breadboard Module Test Program

```
10! 1250-10 PERFDRMANCE VERIFICATION TEST FROGRAM - 7/19/88 - MDOR
20 PRINT "COMNECT THE UUT TO THE BREADGOARD TEST FIXTURE*
30 PAUSE
40 OUTFUT 2:K
50 INFUT "WHAT SLDT IS THE MODULE INGTALLED IN ? I-5n.S
60 OUTPUT 2;%*;
70 FOR X=0 T0 2
80 FOR Y=0 T07
90 EBTPUT 710:"HR "&VAL$(S)&","&VAL}(X)&","&UGL$(2^y)
100 OUTPUT 710;"READ "SUAL${S\&"."&VAL$(X)
110 ENTER 710;A
120 IF BINEOR(A,2^Y)=0 THEN GOTO [50
```



```
140 GOTS 160
150 PRINT "PORT "dUAL$(X)&", D"&VGL$(Y)&" FASSED"
```




```
100 NEXT Y
190 PRINT "TEST COMPLETE"
200 ENE
```


## 1250-14 Digital Input/Output Module Test

The 1250-14 Digital Input/Output module consists of 16 bidirectional data lines and 3 control lines. The test fixture is shown in Figure 4.1 and the test procedure for this module includes the following:
a. Data line input/output test
b. I/O and PCTL line test
c. PFLG line test


Figure 4-1, 1250-14 Test Configuration
The first test uses the test fixture to connect the eight Lo Byte data lines to the eight Hi Byte data lines. Therefore, by writing to one set of data lines and reading the data from the other set, the operation of the data lines and the continuity of the fuses and connectors can be verified. The second test checks the
operation of the I/O and PCTL lines by individually connecting each line to a DC voltmeter, using the controller to change the logic states of each line, and verifying the state change using the DC voltmeter. The third test verifies the proper operation of the PFLG line as a function of the level presented to its input.

## Test Procedure

1. Install the test fixture onto the 1250-14~s rear edge connector
2. Enter the test program listed in Table 4.3 into the controller
3. Execute the test program and follow the displayed prompts

Table 4-3, 1250-14 Digital Input/Output Module Test Program

| $\begin{aligned} & 10! \\ & 20! \end{aligned}$ | 1250-14 PERTORMAHCE UERIIICRIIOK TEST PROGRRY - 6/13/86 - MOOR PRINT "1. SET 1250 ADORESS $1010 .{ }^{\circ}$ |
| :---: | :---: |
| 30 | PqItH '2. COMRECT TESI FIXIURE TO THE 1250-14.* |
| 40 | PRUSE |
| 50 | OUTPUI 2;"K'; |
| 60 | INPUT \#HMRT SLOT IS THE MODLULE IMSTALEED IN ? 1-5*, |
| 70 | OUIPJIT 710; ${ }^{\text {RRESET }}$ |
| 80 | Whit 1 |
| 90 | OUTPUT 710; "SETUP ";5; ${ }^{\text {a }} 1.00$ |
| 100 | FOR X00 TO 1 |
| 110 | If $Y=0$ IHEN $Y=1$ |
| 120 | If $X=1$ IHEN $Y=0$ |
| 130 |  |
| 140 | OUTPU] 710;"RE月D *;5; ". "; |
| 150 | ENTER 710:A |
| 160 | B=AINEOR(A,85) |
| 170 | If 8=0 THEH GOTO 200 |
| 180 |  |
| 190 | 6070210 |
| 200 | PRIHF "PASSED PORI ": X ; ", WRITE 01010101" |
| 210 |  |
| 220 |  |
| 230 | ENIER 710;R |
| 240 | 8*BIMEOR( $\mathrm{A}, 170$ ) |
| 250 | If $\mathrm{B}=0$ THEN 6050290 |
| 260 |  |
| 270 | g[EP 1500, 5 |
| 290 | 6050300 |
| 290 | PRINT "PGSSED PCRT ': ; $^{*}$, LRITE 10101010" |
| 300 | HEXT 8 |
| 310 | PRINT ** |
| 320 |  |
| 330 | PRINT "COHHECT DC UOLTMETER (+) LEaO TO PCTL" |
| 340 | FOR $\mathrm{X}=0$ T0 1 |
| 350 | OUTPUT 710; "RESET" |
| 360 | WAIT 1 |
| 370 |  |
| 300 | If $X=0$ THEN Id ${ }^{\text {d }}=$ "PCIL" |
| 390 |  |
| 400 | INPUT "EHTER LELTMEIER REAOING", ${ }^{\text {a }}$ |
| 410 | If A 32.4 THEN 450 |
| 420 | PRINT "FAILEC "\$IJSR" HISH LEvEL IEST" |
| 430 | REEP 1500,.5 |
| 440 | 6070460 |
| 450 |  |
| 450 |  |

Table 4-3, 1250-14 Digital Input/Output Module Test Program (Cont'd)
479 INPUT "ENTER UOLIMETER REFOIMG", A
480 If RK. 8 TKRN 520
490 point "failed "\&idsa" lou level tegt"
500 BEEP 1500,. 5
510 SOTO 530

530 HEXT X
540 PRIMT "1.) CONNECT PCIL TO PFL6"
550 PRIHT "2.) COHMECT OE VOLTMEIER ( + ) LEAD TO LO"
560 Imput "Enter volimiter refoing",a
570 IF A>2 THEN 600
580 PRIHT "FAILED PFLG TEST"
590 BEEP 1500.5
600 OUTPUI h10:"SETUP ";5;".5,16"

$-1,0,-1,0,-1,0{ }^{*}$
620 IMPUT "ENTER WOLHETER REROIMG",
630 If RK. 8 THEN 670
640 PRITT "falleg pflg iest *
650 BEEP 1500.5
660 6070 680
670 PRIM "PRSSED PFLG TEST"
GED PRIHT "GONE"
690 EXD

# 1250-40 Signal Matrix Module Test 

The 1250-40 Signal Matrix module consists of 20 double-pole, singlethrow relays arranged in a 4 row x 5 column channel switching matrix. As shown in Figure 4-5, each channel has a low and a high line which are switched simultaneously. The test fixture (see Figure 4-2) consists of the following:
a. Connection between all low line inputs
b. Connection between all high line inputs
c. Connection between all low line outputs
d. Connection between all high line outputs

With the test fixture installed and an ohmmeter connected between rows and columns, test the module by successively closing each channel while monitoring the ohmmeter for an indication of relay closure.


Figure 4-2, 1250-40 Test Configuration

## Test Procedure

1. Install the test fixture onto the 1250~0ls rear edge connector
2. Enter the test program listed in Table 4.4 into the controller
3. Execute the test program and follow all displayed prompts

Table 4-4, 1250-40 Signal Matrix Module Test Program

```
10! 1250-40 PERFDRMAMCE UERIFICPHION IEST PROGRFH - 6/12/86 - MOOR
20 con 0,4,5,2, Spee,Res
30 COH Fs[30],Reps[60]
40 [s=* "8CHPs(131)8"FAILEDRCHTS(128)
50 PS=' PASSED*
6 0 ~ S p e c = . ~ 3 0 ]
70 PRINT "1). SET 1250 ADDRESS TO 10."
80 PRIMT '2). COMHECI OHHLITER (4-HITRE) COHFIGURRIION CBBLES TOGETHER AT THE'
90 PRIMT " DISTRL ENG RNo MULL OHTETER OFFSET."
100 PaUSE
110 OUTPUT 2;"K";
120 Infut mimat SLDT IS The module InSTRlLED IN? 1-5",S
130 OUTPU# 71O;"RESET"
140 FOR }X=1\mathrm{ T0 2
150 IF X=1 THEN PRINT "COMHECT OHMETER BEJLEEN HI ROU AKO HI COL."
160 If K=2 HHCH PRINT "CONNECT OHNETER BETUEEN LO ROW RME LO COL."
170 Pallse
180 OUTPUT 2;"K";
190 FOR M=O TO 3
200 FOR Y=0 TO 4
210 2=H*100+Y
220 Output 710;"CL "&uals(5)8"."Buals(2)
230 IHPUT "ENTER OHHYITER REPOING EXPRESSED IN OMMS",Res
240 OUTPUT 2;"K";
```



```
260 ButPUT 710;"OP "RuALS(5)&"."&uRLs(Z)
270 IF Spec-Res)=0 THEN GOTO 320
280 If K=1 THEH PRIHT "H-ROU "RUALS(M)8" TO H-COL. "&UHL$(Y)RReps&FS
290 IF X=2 THEN PRINT "L-ROM "&GHLS(M)&" TO L-COL. "8URLS(Y)RRep$&FS
300 BEEP 1500,1
310 60TO 340
320 IF X=1 IHEH PRINT "H-ROU "&URLS(H)&" TO H-COL "QuRLS(Y)&RepS&PS
330 If }X=2\mathrm{ THEN PRINT "L-ROU "&UMLS(H)&" TO L-COL "BUALS(Y)&RepS8PS
340 NEXT Y
350 HEXI M
360 HEXT X
370 PRINT "TEST COHPLEIE"
380 END
```

1250-60/1250-61
18/26.5 GHZ
Microwave Switching Module Tests

The 1250-60A/61A consist of two single-pole, double-throw (SPDT) relays forming two channel groups. Each channel group consists of three terminals designated as normally-open (NO), normally-closed (NC), and a corresponding common (COM). The 1250~0B/61B consist of four SPDT relays forming four channel groups identical to those of the 1250-60A/61A, respectively. Each module is tested by connecting an ohmmeter between each channel group ${ }^{1}$ s COM and corresponding NO terminals. The channel is closed and the ohmmeter is monitored for an indication of relay closure. Only the signal line of the channel group is switched; the signal return line of each group is connected to each of the three group terminals. No special test fixture is required.

Test Procedure

1. Enter the test program listed in Table 4.5 into the controller

## NOTE:

Shown is the test program for the 1250-60A/60B. The program for the 1250-61A/61B is identical except for using the specific module option number whenever required.
2. Execute the test program and follow all displayed prompts

Table 4-5, 1250-60/1250-61 18/26.5 GHz Microwave Switching Module Test Program

| 10! |  |
| :---: | :---: |
| 20 | con R, K, S, Spee, Res |
| 30 | CHH fs[30], Reps[60], $\mathrm{Ks[1]}$ |
| 40 |  |
| 50 | Ps: ${ }^{\text {a }}$ P9SSED* |
| 60 | Specx. 5 |
| 70 | PRITT "1). SET 1250 AIDRESS T0 10.* |
| 80 | PRIMI '2). CORHECT OHMETER (4-UIRE) COMFIGURAIIOH CGBLLES TOGETHER AI THE' |
| 90 | primt * distal emd man mull ohmeerer offset." |
| 100 | P9us5 |
| 110 | OUIPUT 2; "K"; |
| 120 | IHPUI *UHAT SLOT IS THE MOOULE IMSThLLED IN ? 1-5", 5 |
| 130 | ITPUT "IEST OPTIOH 608? Y OR $\mathbb{N}^{*}$, $\times \$$ |
| 140 | $K=1$ |
| 150 | If $\mathrm{K} \delta=\times{ }^{\text {\% }}$ THEM $\mathrm{K}=3$ |
| 160 | OUTPut 210; "RESEI" |
| 170 | Whit 2 |
| 180 | FOR $\mathrm{X}=0$ T0 K |
| 190 | Print cconect ohmeter input hi to chankel con squals (x) |
| 200 |  |
| 210 | IMPUI "ENIER OMMETER REAOING EXPRESSED IN OMMS", Res |
| 220 | OUTPUT 2; 'K"; |
| 230 |  |
| 240 | If Spec-Res $=0$ THEN GOTO 280 |
| 250 |  |
| 260 | 6EEP 1500, 1 |
| 270 | G010 290 |
| 280 |  |
| 290 |  |
| 300 | PRİt "COnnect ohmeter input lo to chankel h/0 adunts (\%) |
| 310 | IMPUT "Emter ohmeiter reaining expressed in chms',Res |
| 320 | OUTPUT 2; "K"; |
| 330 |  |
| 340 |  |
| 350 | If Spec-Res $=0$ THEy 6050390 |
| 360 |  |
| 370 | BEEP 1500, |
| 380 | 6070400 |
| 390 |  |
| 403 | PRIMT " |
| 410 | HEXI $X$ |
| 420 | PRINT "TESI COMPLETE" |
| 430 | EHO |

## Low Frequency Relay Module Tests

This subsection provides PVPs for the following four lowfrequency relay modules: 1250-12, 1250-15, 1250-20, and 125030.

The 1250-12 Relay Actuator module contains a 10-channel array of double-pole single-throw (DPST) relays. The required test fixture (see Figure 4.3) connects all high inputs together, all low inputs together, all high outputs together, and all low outputs together. By connecting an ohmmeter between the connected inputs and corresponding connected outputs, the module is tested by successively closing each channel while monitoring the ohmmeter for an indication of relay closure.


Figure 4-3, 1250-12 Test Configuration

## Test Procedure

1. Remove the wiring block from the 1250-12's rear edge connector
2. Install the test fixture onto the 1250-12's rear edge connector
3. Set the multimeter to measure ohms. Connect and short P4 pins 19 and 21 of the 1250-12 assembly together using the shortest possible wire length. Connect the ohmmeter across TP1 and TP2 and zero the ohmmeter
4. Remove the short between pins 19 and 21 of P4
5. Enter the test program listed in Table 4.6 into the controller
6. Execute the test program and follow all displayed prompts

Table 4.6-1250-12 Relay Actuator Module Test Program

| 10! | 1250-12 PERfomarce uerifichiton test progray - 6/12/86-M00R |
| :---: | :---: |
| 20 | Con R,S,Spec,Res |
| 30 | COH Fs[30],Repsc60] |
| 40 | FS=" "8CHRS(131)8*FAILED"8CHRS(128) |
| 50 | PSz" PASSED" |
| 60 | Specz. 2 |
| 70 | PRIMT * 1 ). SET 1250 godress io 10." |
| 80 | PRINT "2). COnHECT OHMEIER (4-UIRE) COMfIGurafion chbles together at the" |
| 90 | Print * oistal ewo min mul ohmeter offset.* |
| 100 | Pause |
| 110 | OUTPUT 2; 'K"; |
| 120 |  |
| 130 | OUTPUT 710; "RESET" |
| 140 | Fer $\mathrm{X}=1$ 10 2 |
| 150 |  |
| 160 | If h=2 theik print "COnhect ohmeter betueen to chan. in and 10 chan. out" |
| 170 | PPUSE |
| 180 | OUIPUT 2; "K"; |
| 190 | FOR Y=0 109 |
| 200 | OUfPUT 710; "CL "8uals(s)8". "quals(Y) |
| 210 | IHPUT "Enter ohateter reaming expressed in ohis",Res |
| 220 | OUTPUT 2; "K"; |
| 230 |  |
| 240 |  |
| 250 | If Spec-Res>aO THEN G000 300 |
| 260 |  |
| 270 |  |
| 280 | BEEP 1500,1 |
| 290 | 6050320 |
| 300 |  |
| 310 |  |
| 320 | HEXI Y |
| 330 | HEXT $X$ |
| 340 | PRIMf "TEST COMPLEIE" |
| 350 | EME |

1250-15 Relay Driver Module Test

The 1250-15 Relay Driver module consists of 20 drive lines capable of sinking up to 350 mA of current and 20 corresponding readback lines. The test for this module consists of connecting each drive line to its corresponding readback line and pulling the two lines up through a 39~hm, 10-watt resistor to the 13-volt line, See Figure 4,4 for a schematic view of the 1250-15 test fixture. Each drive line should be actuated and the corresponding readback line interrogated to ensure that the line assumed a low logic level.

*R1-R20 $=$ resistor, 39 ohm, $\pm 5 \%, 10$ watt
Figure 4-4, 1250-15 Test Configuration

## Test Procedures

1. Install the test fixture onto the $1250-15^{1}$ s rear edge connector
2. Enter the test program listed in Table 4.7 into the controller
3. Execute the test program and follow the displayed prompts

Table 4.7-1250-15 Relay Driver Module Test Program
Table 4-7, 1250-15 Relay Driver Module Test Program

```
10! 1250-15 PERPOPMARCE UERIFTCRIION IEST PRGGRRH-6/13/85 - MOOR
20 PIINT '1. SET 1250 RODRESS TO 10."
30 PRINT "2. CONHECI TEST FIXIURE TO THE 1250-15."
40 PquSE
50 0UIPuT 2;"X";
60 input "haft slot is the mooule instflled in? 1-5",S
70 QuIput 710;"CNF OH"
80 FOR X=0 10 19
90 OUTPUI 710;"CL "&umLS(S)8"."&uHLS(X)
100 OUTPUT 710;"YERR"
110 EHTER 710;AS
120 If RS[12,13]=UR1S(99) THEH P=1
130 IF AS[12,13]=UALS(51) THEH P=0
140 UAII .5
150 OUTPUT 710;"OP "8URL$(5)&","BURE$(%)
160 OUIPUT 710;"YERR"
170 EHIER 710;AS
180 If AS[12,13]=U&LS(99) AND P=1 THEN PRINT "CHRNHEL "&UALS(K)/8" PRSSED"
190 If %S[12,13]=U#L$(51) OR P=0 THEE 60SUB fail
200 HEXI X
210 PRIHF "DONE"
220 6010 270
230 fail: !
240 PRINT "CHANMEL "&uRLS(X)8" "8CHRS(13!)a"FAILED"SCHRS(128)
250 BEEP 1500,.1
260 RETURN
270 EMO
```


## 1250-20 Relay

 Power Module TestThe 1250-20 Relay Power module consist of a 10-channel array of double-pole, single-throw (DPST) relays. The required test fixture (see Figure 4.5) connects all high inputs together, all low inputs together, all high outputs together, and all low outputs together. By connecting an ohmmeter between the connected inputs and corresponding connected outputs, the module is tested by successively closing each channel while monitoring the ohmmeter for an indication of relay closure.


Figure 4-5, 1250-20 Test Configuration

## Test Procedure

1. Install the test fixture onto the 1250-20's rear edge connector
2. Enter the test program listed in Table 4.8 into the controller
3. Execute the test program and follow the displayed prompts

Table 4-8, 1250-20 Power Relay Module Test Program

| 101 |  |
| :---: | :---: |
| 20 | COn A,S,Spec, Res |
| 30 | COH F\$[30], Reps[60] |
| 40 | FS=" "8CHRS(131)8"FAILED"BCHRE(128) |
| 50 | PS $=$ - P9SSED |
| 60 | Spec=. 15 |
| 70 | PRITT "1). SET 1250 RIDORESS to 10.* |
| 80 | PRINT "2). CONHECT OMmeter (4-UIRE) COMFIGURAIION CBELES together at the" |
| 90 | PRIHf * OISTREL EMO RMO RULL OHMETER OFFSET. |
| 100 | PRUSE |
| 110 | OUTPPUT 2; "K'; |
| 120 | IMPUT MHHRT SLOT IS THE MOBULE INSIRLLED IN ? 1-5*, 5 |
| 130 | OUTPUT 710; "RESET" |
| 140 | FOR $X=1$ TO 2 |
| 150 |  |
| 160 |  |
| 170 | PRESE |
| 180 | DUTPUT 2;"K"; |
| 190 | FOR Y=0 109 |
| 200 |  |
| 210 | input "Enter ohmmeter rehothg expressed in ohms', res |
| 220 | OUTPUT 2 ; "X'; |
| 230 |  |
| 240 |  |
| 250 | If Spec-Res $>=0$ THEN 6050300 |
| 260 |  |
| 270 |  |
| 280 | BEEP 1500, 1 |
| 298 | 6070320 |
| 300 |  |
| 310 |  |
| 320 | NEXT Y |
| 330 | HEXI K |
| 340 | PRINT "TEST COAPLEEE" |
| 350 | EMB |

1250-30
Scanner/Multiplexer Module Test

The 1250-30 is a 20-channel scanner/multiplexer consisting of a 20-channel array of double-pole, single-throw (DPST) relays. Each relay channel has a low line and a high line which are simultaneously switched. The required test fixture (see Figure 46) consists of:
a. Connection between all low lines (channels 0-19)
b. Connection between all high lines (channels 0-19)
c. Connection of high common 1 and 2
d. Connection of low common 1 and 2


Figure 4-6, 1250-30 Test Configuration

## Test Procedure

1. Install the test fixture onto the 1250~30?s rear edge connector
2. Enter the test program listed in Table 4,9 into the controller
3. Execute the test program and follow all displayed prompts

Table 4-9, 1250-30 Scanner/Multiplexer Module Test Program

```
10 1250-30 PERFORARMCE UERIFICRIIOH TEST PROGRRH}-6/12/86 - MOOR
20 COM R,S,Spec,Res
30 CON [S[30],Reps[60]
40 F5=" *CCHRS(131)*"FAILED"CHRS(128)
50 Ps** PASSEQ*
6 0 ~ S p e c = . 3
70 PRIHT '1>. SET 1250 RODRE5S tO 10."
80 PRINT "2). COHHECT OHMETER (4-UIRE) COMFIGURGIION CRBLES TOGETHER at THE"
90 PRIMT " disifl emo gmo null ohmeter offset.*
100 PAUSE
110 OUIPUT 2;"K";
120 INPUT "UHAT SLOT IS IHE MOONLE INSTRLEEO IN? 1-5",S
130 OUTPUT 710;"RESET"
140 FOR K=1 T02
```




```
170 PAUSE
180 OUTPUT 2;"K";
190 FOR Y=0 T0 !9
200 OHTPUT 710;"CL "8URLS(S)8"."BG9LS(Y)
210 INPUT "EMIER OHMETER REEDING EXPRESSED IH OHM",Res
220 OUTPUT 2;"K";
230 Reps=" DRTA: "&UALS(Res)d" SPEC: "BUMLS(Spec)&" DELIT: "&Ugl$(Spec-Res)
240 OUTPUI 210;"OP "RURLS(S)&"."&uALs(Y)
250 If Spec-Res)=0 THEN 6050 300
```



```
270 If X=2 THEN PRINT "L-CH IN "BUAL$(Y)&" TO L-CH OUT "BUALS(Y)&Reps&Fs
280 BEEP 1500,1
290 6070 320
300 IF X=1 THEN PRINT "H-CH IH "RUMLS(Y)A" TO H-CH OUT "&UALS(Y)&Rep$8Ps
310 IF %=2 THEN PRINT "L-CH IN "&uHLS(Y)&" To L-CH OUT "gurLS(Y)RRepsaps
320 NEXT Y
3 3 0 ~ N E X I ~ K ~
340 PRINT "TEST COMPLETE"
350 END
```


## RF Relay Module Tests

This subsection provides PVPs for the following RF relay modules: 1250-50, 1250-51A/51B, 1250-52A/52B, 1250-750.

1250-50 and 1250-<br>750200 MHz RF Switching Module Test

The 1250-50 200 MHz RF Switching module consists of 22 singlepole, single-throw (SPST) relays, grouped to form two arrays. Only the signal line of each channel is switched; the signal return lines of both groups channels are connected together. The module is tested by connecting an ohmmeter to the center conductor of two channels, closing the corresponding channel relays, and monitoring the ohm meter for an indication of relay closure. No special test fixture is required.

1. Enter the test program listed in Table 4.10 into the controller.
2. Execute the test program and follow all displayed prompts.
```
10: 1250-50 PERFORHBNEE UERIFICRIION IEST PROGRPG: 6/12/86 - MOOR
20 COH R,S,Spec,Res
30 COF F$[30],Rep$[60]
40 FS=* "RCHRS(131)8"FAILED"GCHRS(128)
50 P$=" PA5SE|"
60 Spec. }
70 PRINF *1). SET 1250 RDORESS TO 10."
BO PRINT "2). COHNECT OHNMETER (4-UIRE) COHFIGURATIOH CRBLES TOGETHER AT THE"
90 PRINT" DISTRL END ANO NGLL OHMETER OFFSEI."
100 PRULSE
110 OUTPUT 2;"K";
120 INPOT "UHAT SLOT IS THE MODULE INSTHLLED IN? 1-5",S
130 OUTPUT 710;"RESET"
140 WhIT 2
150 OUIPUT 710; "CL "8URL$(5)8*.0,19,20,39"
160 FOR X=0 IO 30 SIEP 10
170 IT X=O IHEN PRINT "CONHECT OHHHEIER INPUT HI TO CHRHNEL OC."
180 IF 8=20 THEN PRINT "CONHECI OHNHETER INPUT HI TO CHPRNEL 20."
190 FOR Y=0 TO 4
200 IF }X+Y=0\mathrm{ OR X Y Y=20 THEN 6050 350
210 OUTPUT T10; "CL "SURLS(S)8","&UPLS(X+Y)
220 PRINT "CONHECT OHANEYER IHPUT LO TO CHANMEL "RUALS( }x+Y\mathrm{ ()
230 INPUT "ENTER GHMMETER REHDI讲G EXPRESSED IN OHAS",Res
240 OUTPUT 2;"K";
250 Rep$=" DATA: "RUALS(Res)Q" SPEC: "QURLS(Spec)R" DELTR: "&URL$(Spec-Res)
260 GUTPUT 71O;"OP "RURLS(S)&"."&URL$(X+Y)
270 If Spec-Res>=0 THEN GOTO 320
280 IF X<2O THEN PRINT "CHAN, O TO CHAN. N&URLS (X+Y)RRED$8FS
```



```
300 BEEP 1500,1
310 6010 340
320 IF X<2O THEN PRINT "CH⿰月N. D TO CHRN, "BURLS(X+Y)&REp$APS
```



```
340 PRINT "'
350 NEXT Y
360 NEXI X
370 PRINT "EEST CQUPLEIE"
380 END
```

Table 4－10，1250－50 and 1250－750 200 MHz RF Switching Module Test Program

## 1250-51/1250-52 $500 \mathrm{MHz} / 1 \mathrm{GHz}$ RF Switching Module Tests

The 1250-51A/52A consist of either 12 double-pole, double-throw (DPDT) relays arranged to form two connecting 5-channel arrays (-51 A) or arranged as two 4:1 multiplexers (-52A). The 125051B/52B consist of either 24 DPIXI' relays arranged as two groups of two connecting 5-channel arrays (-52B) or arranged as four 4:1 multiplexers (-52B). For the 1250-51A/52B, the module is tested by connecting an ohmmeter between two channels of a particular group, closing the corresponding relays while monitoring the ohmmeter for an indication of relay closure. For the 1250-52A/52B, the module is tested by connecting an ohmmeter between the COM terminal and each of the four channel terminals, closing the corresponding relays while monitoring the ohmmeter for an indication of relay closure. In all testing, only the signal path of each channel is switched; the signal return lines are connected together. Also, no special test fixture is required.

Test Procedure

1. Enter the test program listed either Table 4-11 or 4-12 into the controller for the 1250-51/1250-52, respectively
2. Execute the test program and follow all displayed prompts
```
10: 1250-51A/51G PERFORTHNEE UERIFICATION TEST PROGRPM - 6/13/86 - MOOR
20 CON A,K,5,Spec,Res
30 CDH F$[30],Reps[60],kS[1]
40 F$=" "&CHR$(131)&"FAILED"BCHRs(128)
50 P% = PRSSED*
60 Specz.6
70 PRIHT "1), SET 1250 AODRESS T0 10."
80 PRINT *2). CONHECT OHMEIER (4-UIRE) COHFIGURATION CABLES TOGETHER AI THE"
90 PRINT * OISTAL END BND NHLLL OMMETER OFFSET."
100 PRUSE
110 0ilfPG 2;"K";
120 INPUF "UHMT SLOT IS THE MODULE INSTRLLED IN ? 1-5",S
130 INPUT "TEST OPTION 51G? Y OR N",KS
140 k=10
150 If K$="Y" THEN K=30
160 OUTPUT 710;"RESET"
170 WAIT ?
180 OUTPUT 710;"CL. "BUALS($)A",0,19,20,39"
190 FOR K=0 10 K SIEP 10
20O If X=O IHEN PRINT "CON#ECT OMMHEIER INPUT HI TO CHANKEL OO.*
210 If }8=20\mathrm{ THEN PRIHT "CONHECT OHNHETER INPUI HI TO CHPNKEL 20."
220 FOR Y=0 TO 4
230 IF X+Y=O OR K+Y=20 THEN GOTO 380
240 SUTPUT 710;"CL "RUAL$(S)A"."Bu&L$(Y+Y)
250 PRIMT "COMNECT OHTMETER IMPUT LO IO CHANHEL "&UFL$( }X+Y
260 INPUT "EhtER OHMIETER REPBING EXPRESSEG IN OMMS",Res
270 OUJPUT 2;"K";
```



```
290 QuTPHT 710;"Op "&ugl$(S)R","&ufl$( }X+Y
300 If Spec-Res>=0 THE# 60TO 350
310 If X<20 THEN PRINT "CHGN. O TO CHAN. "&uLL$(X+Y)ARep$BFs
```



```
330 BEEP 1500,1
340 GOTO 370
350 IF K<20 THEN PRINT "CHAK. O TO CHAK, "BURL$(X+Y)&Rep58PS
```



```
370 PRINT "•
300 NEXI Y
390 NEXT X
400 PRINT "YEST COHPLETE"
410 EMD
```

Table 4-11, 1250-51A/51B 500MHz RF Switching Module Test Program

Table 4-12, 1250-52A/52B 1GHz RF Switching Module Test Program

```
10! 1250-52F/52B PERFORTMMCE U[RIFICATION TEST PROGRPH-6/13/86 - MOOR
20 canl A,K,S,Spec,Res
30 Can [s[30],RepS[60],KS[1]
40 fs=" "ACHRS(131)8"FRILED"&CHRS(128)
50 PS=" PASSED"
60 Spec=.5
70 PRIHT `1%. SET 1250 RODRESS TO 10."
80 PriHf "2). CONHECI OHMEIER (4-UIRE) COMFIGURATION CFBLES TOGETHER AT THE"
90 PRINT * OISTGL ENO MNO MHLL OHHETER OFFSET.*
100 PPGSE
110 OUTPUT 2;"K";
120 IHP&T "UHAT SLOT IS THE MOOULE INSTRLLED IN ? 1-5",S
130 IMPUT "TEST OPTION 52B? Y OR N",KS
140 K=10
150 If KS= N"M THEN K=30
160 OUTPJJT 710; "RESET"
170 UATT 2
180 FOR Y=0 TO K STEP 10
190 PRINT "CO##ECY OHTETER IHPUI HI TO CHAMMEL COH "(UGIS(X/10)
200 FOR Y=0 T0 3
```



```
220 PRIHT COHHECT OHRHEIER INPUI LO TO CHMNHEL *SUALs(
230 IMPUT "EMEER OHNETER REAOIMG EXPRESSED IN OMS*",Res
240 OUTPUT 2;"K";
250 Reps=" DRTA: "8UMLS(Res)8" SPEC: "&UPI$(Spec)R" DELIP: "&UHLS(Spec-Res)
260 OUTPUT 710;"OP "&ufls(S)&"."&ugL$(X+Y)
270 If Spec-Res)=0 THEN 6070 310
280 PRINT "COH "8UAL$(K/10)&" TO CHAN. "BUHLS(K+Y)&RepSRFS
290 BEEP 1500,1
300 60TO 320
310 PRINT "COM "&UHLS(K/O)A* TO CHAN. "BURLS(X+Y)&RepSPPs
32O PRINT""
330 NEXT Y
3 4 0 ~ H E X I ~ X ~
350 PRINT "IEST COMPLETE"
360 ENO
```

