RACAL INSTRUMENTS
1260-67
18GHz MICROWAVE
SWITCH CARD

PUBLICATION NO. 980673-061

PUBLICATION DATE: December 22, 1999

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2. Product model number

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PROPRIETARY NOTICE

DISCLAIMER

FOR YOUR SAFETY

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

CAUTION
RISK OF ELECTRICAL SHOCK
DO NOT OPEN

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/two-prong adapter. This will defeat the protective feature of the third conductor in the power cord.

CAUTION
SENSITIVE ELECTRONIC DEVICES
DO NOT SHIP OR STORE NEAR
STRONG ELECTROSTATIC,
ELECTROMAGNETIC, MAGNETIC OR
RADIOACTIVE FIELDS

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 proper fuse is in place for the power source to operate.

2. 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
-     shows visible damage
-     has been stored under unfavorable conditions
-     has sustained stress

Do not operate until, performance is checked by qualified personnel.

Racal Instruments

EC Declaration of Conformity

We

Racal Instruments Inc.
4 Goodyear Street
Irvine, CA 92718

declare under sole responsibility that the

1260-67A Microwave Switch, 18 GHz P/N 407716-001
1260-67B Microwave Switch, 18 GHz P/N 407716-002
1260-67C Microwave Switch, 18 GHz P/N 407716-003

conforms to the following Product Specifications:

Safety: EN61010-1

EMC: EN50081-1
CISPR 22:1990/EN 55022 (1995): Group 1 Class A
IEC 801-2:1991/EN 50082-1 (1992): 4 kV CD, 8 kV AD
IEC 801-3:1984/EN 50082-1 (1992): 10 V/m, 27-1000 MHz
IEC 801-4:1988/EN 50082-1 (1992): 1 kV

Supplementary Information:
The above specifications are met when the product is installed
in a Racal Instruments certified mainframe with faceplates
installed over all unused slots, as applicable.

The product herewith complies with the requirements of the
EMC Directive 89/336/EEC.

Irvine, CA, August 25, 1999

Quality Manager

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Chapter 1

MODULE SPECIFICATION

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Introduction

The 1260-67 is a High Frequency VXI Switch Module developed for the 1260 Series of switch modules.

The 1260-67 is available configured from the factory and can be ordered with the Option-01T Switch Control Interface.

The following features are included in the 1260-67:

- Available with 2, 4, or 6 1P6T microwave switches

- > 18 GHz bandwidth

- High-quality Narda relay switches

- Occupies a single VXI slot

- Message-Based and Register-Based Interface Option available
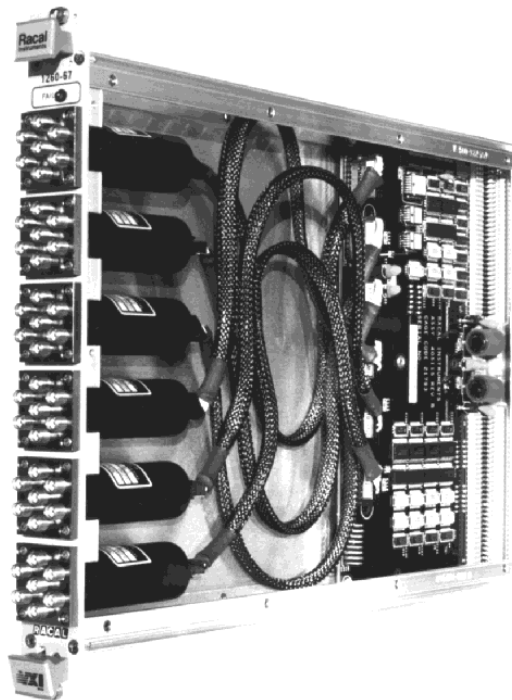
Figure 1-1, The 1260-67

Specifications

Maximum Cold Switching power

DC - 100 MHz	490 Watts
100 MHz - 1 GHz	180 Watts
1 GHz - 10 GHz	60 Watts
10 GHz - 18 GHz	50 Watts

Insertion Loss (50Ω)

DC - 3 GHz	< 0.2 dB
3 GHz - 8 GHz	< 0.3 dB
8 GHz - 12.4 GHz	< 0.4 dB
12.4 GHz - 18 GHz	< 0.5 dB

Bandwidth (50Ω)   > 18 GHz

Isolation (50Ω)

DC - 3 GHz	> 85 dB
3 GHz - 8 GHz	> 75 dB
8 GHz - 12.4 GHz	> 60 dB
12.4 GHz - 18 GHz	> 60 dB

VSWR (50Ω)

DC - 3 GHz	1.25:1
3 GHz - 8 GHz	1.3:1
8 GHz - 12.4 GHz	1.4:1
12.4 GHz - 18 GHz	1.5:1

Switching Time   < 15 ms

Shock   10g, 11 msec, ½ sine wave

Vibration   0.013" PK-PK, 5-55 Hz

Bench Handling   4 in, 45°

Temperature

Operating	0 to +55 degrees Centigrade
Non-operating	-40 to +75 degrees Centigrade

Relative Humidity   85 +/- 5% non-condensing @ < 35 degrees Centigrade

Altitude

Operating	10,000 feet
Non-operating	15,000 feet

Power requirements   5 VDC at 1.4 Amps W/Option 01T
5 VDC at 0.4 Amps WO/Option 01T
12 VDC at 365 mA per energized relay

Cooling Requirements	4.75 liter/sec @ .65mmH$_2$O at 35 Watts (See Power and Cooling Considerations in Chapter 3)
Dimensions	C-Size, Single Slot VXIbus Module
Module Weight	
w/ OPT 01T	3 Lbs 7 oz.
w/o OPT 01T	3 Lbs 2 oz.
MTBF	295,376 Telcordia (Bellcore 6) 324,239 (MIL-STD-211 FN2) (Relays included)

Ordering Information

Listed below are part numbers for both the 1260-67 switch module. Each switch card uses standard SMA barrel connectors.

Item	Description	Part #
1260-67A Switch Module	1260-67A, 6 SP6T Switch, 18 GHz	407716-001
1260-67B Switch Module	1260-67B, 4 SP6T Switch, 18 GHz	407716-002
1260-67C Switch Module	1260-67C, 2 SP6T Switch, 18 GHz	407716-003
1260-67 Shipping Kit	Manual, Key Locks	407717
Replacement Switch	SP6T Microwave Switch	310284
Additional Manual	1260-67 User Manual	980673-061
Torque Wrench Bit	SMA Torque Wrench Bit	991017

Safety

Refer to the **"FOR YOUR SAFETY"** page preceding the Table of Contents. Follow all **NOTES, CAUTIONS,** and **WARNINGS** to ensure personnel safety and prevent damage to the instrument.

About MTBF

The 1260-67 MTBF is 295,376 Telcordia (Bellcore 6) or 324,239 (MIL-STD-211 FN2). Reliability figures include relays; however, many factors affect relay life expectancy.

1. Switched voltage

2. Switched current

3. Switched power

4. Maximum switching capacity

5. Maximum rated carrying current

6. Load type (resistive, inductive, capacitive)

7. Switching repetition rate

8. Ambient temperature

The most important factor is the maximum switching capacity, which is an interrelationship of maximum switching power, maximum switching voltage and maximum switching current. When a relay operates at a lower percentage of its maximum switching capacity, its life expectancy is longer. The maximum switching capacity specification is based on a resistive load, and must be further de-rated for inductive and capacitive loads.

The relay used on the 1260-67 module is part no. 310284. The relay manufacturer's specifications for this relay are:

Life Expectancy 10^6 operations (Cold Switch Only)

Chapter 2

INSTALLATION INSTRUCTIONS

Unpacking and Inspection

CAUTION
SENSITIVE ELECTRONIC DEVICES
DO NOT SHIP OR STORE NEAR
STRONG ELECTROSTATIC,
ELECTROMAGNETIC, MAGNETIC OR
RADIOACTIVE FIELDS

1. Remove the 1260-67 module and inspect it for damage. If any damage is apparent, inform the carrier immediately. Retain shipping carton and packing material for the carrier's inspection.

2. Verify that the pieces in the package you received contain the correct 1260-67 module option and the 1260-67 Users Manual. Notify EADS North America Defense Test and Services, Inc. if the module appears damaged in any way. Do not attempt to install a damaged module into a VXI chassis.

3. The 1260-67 module is shipped in an anti-static bag to prevent electrostatic damage to the module. Do not remove the module from the anti-static bag unless it is in a static-controlled area.

Reshipment Instructions

1. Use the original packing when returning the switching module to EADS North America Defense Test and Services, Inc. for calibration or servicing. The original shipping carton and the instrument's plastic foam will provide the necessary support for safe reshipment.

2. If the original packing material is unavailable, wrap the switching module in an ESD Shielding bag and use plastic spray foam to surround and protect the instrument.

3. Reship in either the original or a new shipping carton.

Option 01T Installation

Installation of the Option 01T is described in the Installation and Setup section of the 1260A-Option 01T Users Manual, Publication No. 980806-999.

Module Installation

Installation of the 1260-67 Switching Module into a VXI mainframe, including the setting of switches SW1-1 through SW1-4, SW2, and SW3, is described in the Installation and Setup Section of the 1260A Option 01T Users Manual, Publication No. 980806-999.

Module Configuration

The 1260-67 module is available in three versions providing 2, 4, or 6 SP6T independent 18 GHz switches per module.

Front Panel Connectors

The 1260-67 SP6T 18 GHz switches utilize industry-standardized SMA barrel connectors. **Maximum connector engagement should not exceed 9 in.-lbs. torque**. It is highly recommended that a torque wrench (Ma-Com P/N 2098-5065-54 or equivalent) be used to torque the SMA connectors. A wrench bit (P/N 991017) is available for use with the Ma-Com torque wrench. Physical switch placement on the module front panel is shown in **Figure 2-1.** Software assignments for each switch and relay are shown in **Figure 2-2.**

Switch Replacement

The 1260-67 module was designed with maximum reliability in mind and utilizes high-quality Narda relays to minimize failures. Should (a) relay(s) need to be replaced, this operation can be performed in the field with nothing more than a screwdriver. The procedure for replacing a switch is as follows:

1. Remove power from the chassis containing the 1260-67 module.

2. Remove the four mounting screws holding the switch in need of replacement. Set aside the screws and washers in a safe place.

3. Gently pull the switch from the front panel until the rear connector and cable assembly are clearly visible.

4. Disconnect the cable assembly from the old switch and plug the cable in to the new switch.

5. Gently push the switch and cable assembly back into the front bezel until the mounting flange of the switch is flush with the front panel.

6. Replace the four mounting screws with washers to secure the switch to the front panel.

Switch 1 1260-67A
1260-67B
1260-67C

Switch 2 1260-67A
1260-67B
1260-67C

Switch 3 1260-67A
1260-67B

Switch 4 1260-67A
1260-67B

Switch 5 1260-67A

Switch 6 1260-67A

**Physical Relay
Numbering Inset**

From a physical labeling standpoint, switch and relay numbering begin at one.
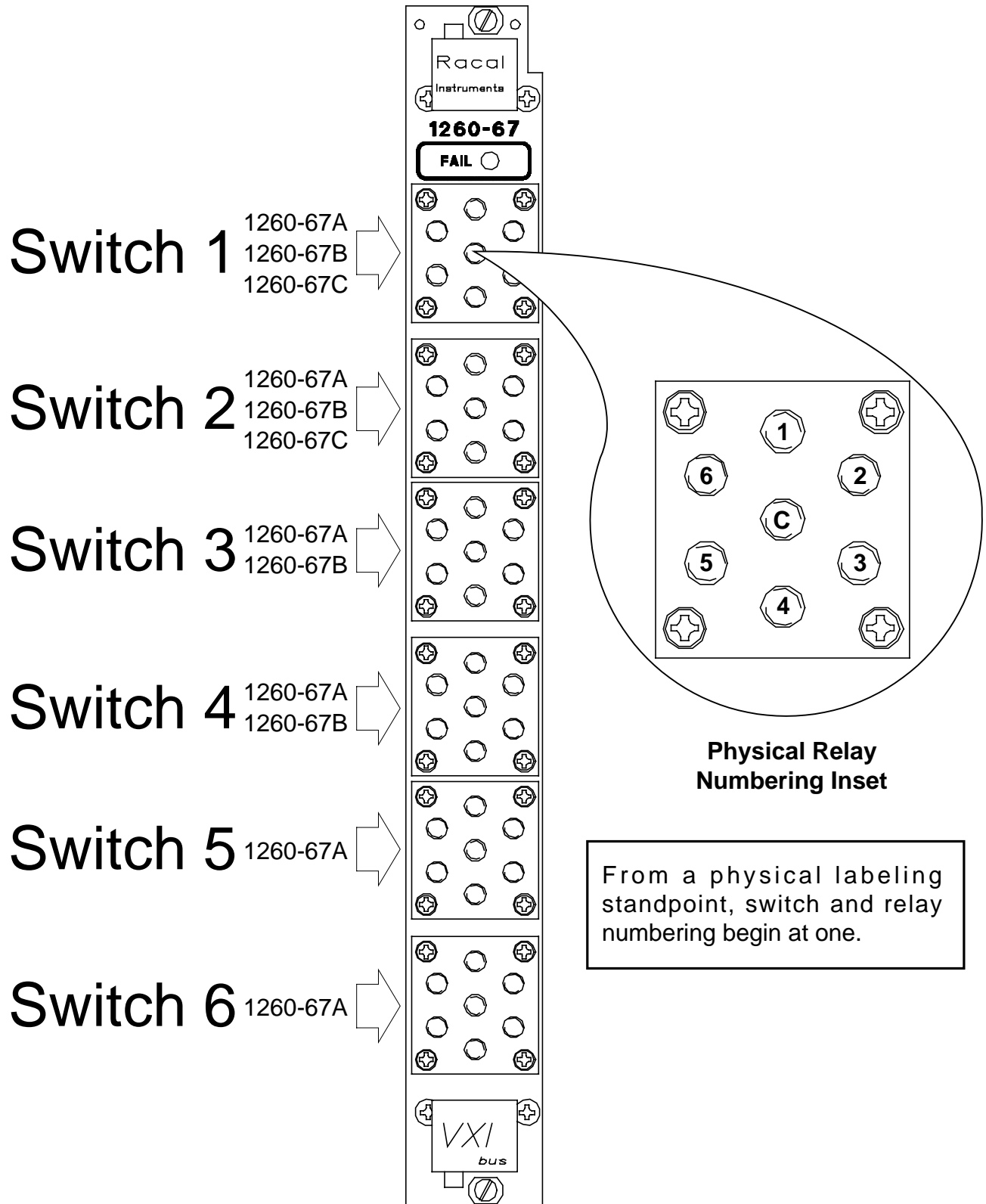
Figure 2-1, 1260-67 Front Panel Physical Switch Layout, Front View

Switch 0 1260-67A
          1260-67B
          1260-67C

Switch 1 1260-67A
          1260-67B
          1260-67C

Switch 2 1260-67A
          1260-67B

Switch 3 1260-67A
          1260-67B

Switch 4 1260-67A

Switch 5 1260-67A

**Software Relay
Numbering Inset**

From a software control standpoint, switch and relay numbering begin at zero.
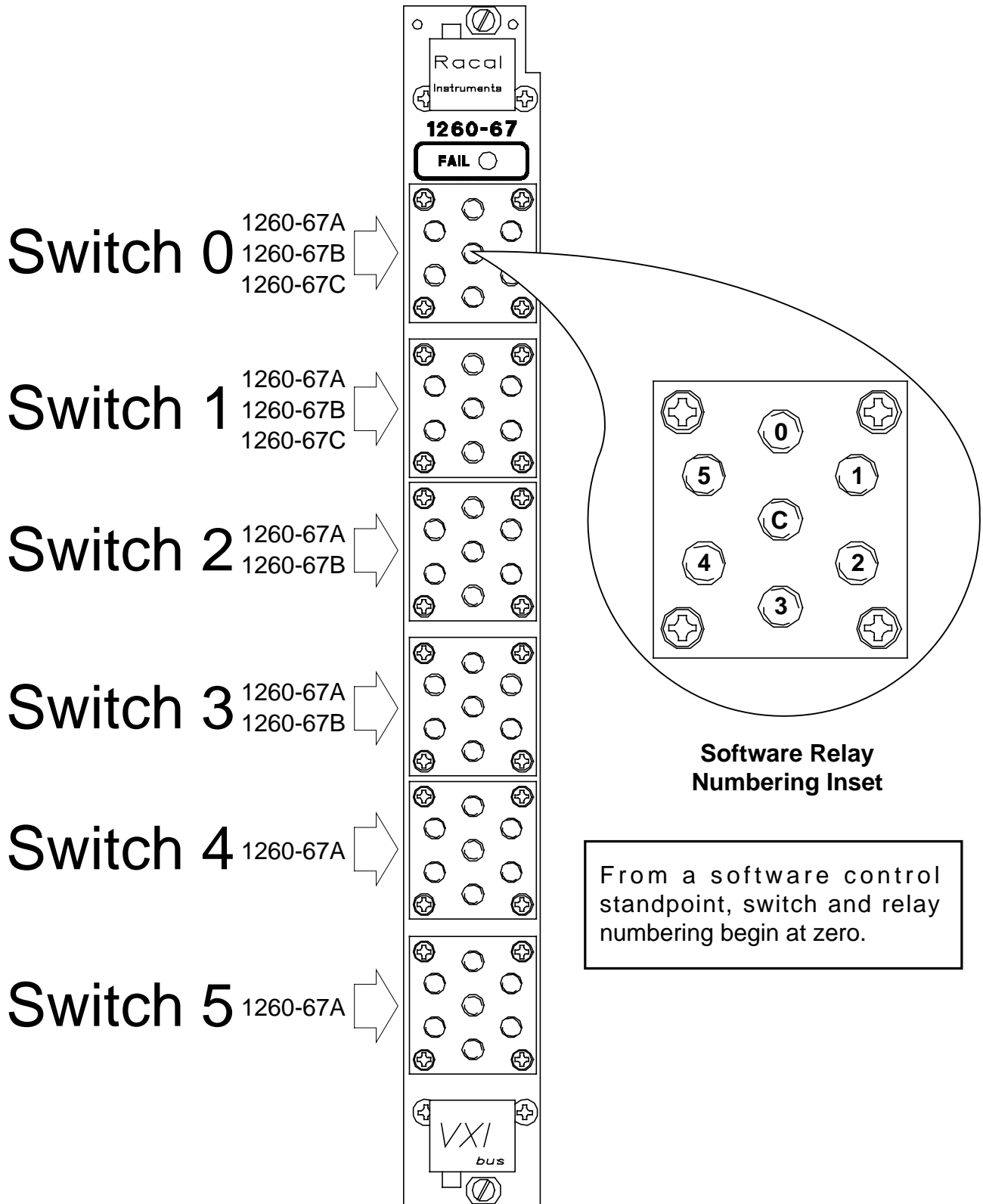
Figure 2-2, 1260-67 Software Switch/Relay Mapping, Front View

Chapter 3

MODULE OPERATION

General Information

The 1260-67 may be operated either in *message-based mode* or in *register-based mode*.

When the *message-based mode* of operation is used, commands are sent to the 1260-01T command module. The 1260-01T command module interprets the commands, and operates the 1260-67 module by sending 8-bit bytes to control registers on the 1260-67 module.

As an example, if a module seven maps to the base address of 0x205001 and the control register controlling software switch 1, relay 1 is at an offset of 0x02 - bit 1, a conceptual view of the message-based mode of operation is shown in **Figure 3-1** below.

```
┌──────────┐  "CLOSE (@7(11))"  ┌──────────┐  Write value 2 to A24 Address 205005  ┌──────────┐
│          │                    │          │                                        │          │
│ PC (MXI) │   VXIbus  ───────> │ 1260-01T │  ───────────────────────────────────> │ 1260-67  │
│          │                    │          │                                        │          │
└──────────┘                    └──────────┘                                        └──────────┘
```
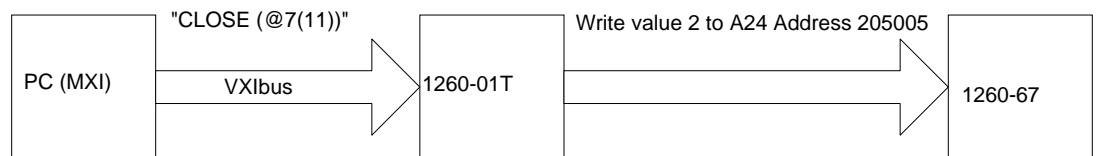
Figure 3-1, Message-Based Mode of Operation

When the *register-based mode* of operation is used, the user writes to the control register on the 1260-67 module directly. The 1260-01T command module does not monitor the operations, and does not track the state of the relays on the module in this mode.

A conceptual view of the register-based mode of operation is shown in **Figure 3-2** below.

```
┌──────────┐   Write value 2 to A24 Address 205005   ┌──────────┐
│          │                                          │          │
│ PC (MXI) │  ──────────────────────────────────────>│ 1260-67  │
│          │                                          │          │
└──────────┘                                          └──────────┘
```
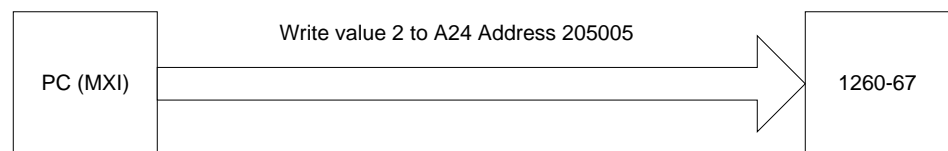
Figure 3-2, Register-Based Mode of Operation

Since the 1260-01T command module does not monitor the register-based mode of operation, it is advisable to select **either** the message-based or the register-based mode of operation, and continue to use the same mode throughout the application program.

In general, the message-based mode of operation is easier to use with utility programs, such as National Instruments VIC program. The message-based mode allows the user to send ASCII text commands to the 1260-01T and to read replies from the 1260-01T. In addition, there are a few features, such as a SCAN list, which are available only with the message-based mode of operation.

The register-based mode of operation provides a faster update of relay channels. This mode provides for relay operations in less than 4.5 microseconds (not counting software overhead inherent in I/O libraries such as VISA).

Consult the 1260-01T User's Manual for a comparison of the message-based and register-based modes of operation.

Operating The 1260-67 In Message-Based Mode

Channel Descriptors For The 1260-67 Module

The standard 1260-01T commands are used to operate the 1260-67 module. These commands are described in the 1260-01T User's Manual.

Each 1260-01T relay command uses a *channel descriptor* to select the relay(s) of interest. The syntax for a channel descriptor is the same for all 1260 series modules. In general, the following syntax is used to select a single channel:

```
(@ <module address> ( <channel> ) )
```

Where:

<module address>   is the address of the 1260-67 module, as set by the logical address DIP switch SW1 on the 1260-67.

The module address is a number from 1 through 12, inclusive.

Set the module addresses for the 1260-67 and other 1260-Series modules so that no address is used by more than one 1260-Series module. For instructions on setting module addresses for a 1260-Series module, see the label on the side panel of the module.

<channel>   is a concatenation of <switch><relay> where <switch> has a value of 0-5 (1260-67A), 0-3 (1260-67B), or 0-1 (1260-67C) and <relay> has a value of 0-5.

Multiple individual channels may be specified using the following channel descriptor syntax:

```
(@ <module address> ( <chan1> , <chan2> , .
. ., <chanN> ))
```

The following examples illustrate the use of the channel descriptors for the 1260-67A:

```
OPEN (@8(03))
```
Open relay 3 in switch 0 on the 1260-67 located at module address 8.

```
CLOSE (@7(21,34))
```
Closes relay 1 in switch 2 and relay 4 in switch 3 at module address 7.

It is important to remember that the 1260-67 switch is mutually exclusive and is implemented as break-before-make to insure that at most 1 of 6 poles per switch is closed at a time. Message-based commands controlling inclusivity, therefore are not applicable to the 1260-67 module.

Reply To The MOD:LIST? Command

The 1260-01T returns a reply to the MOD:LIST? command. This reply is unique for each different 1260 series switch module. The syntax for the reply is:

<module address> : <module-specific identification string>

The <module-specific identification string> for the 1260-67 cards are:

1260-67A SIX 1x6 SWITCHING MODULE

1260-67B QUAD 1x6 SWITCHING MODULE

1260-67C DUAL 1x6 SWITCHING MODULE

So, for a 1260-67C whose <module address> is set to 8, the reply to this query would be:

8 : 1260-67C DUAL 1x6 SWITCHING MODULE

Operating The 1260-67 in Register-Based Mode

The 1260-67 may be operated by directly setting one of the six control registers on the 1260-67 module. The first control register on the module operates switch S1, the second operates S2, the third operates S3, the fourth operates S4, the fifth operates S5, and the sixth operates S6.

The control registers are located in the VXIbus A24 Address Space. The actual A24 address for a control register depends on:

1. The A24 Address Offset assigned to the 1260-01T module by the Resource Manager program. The Resource Manager program is provided by the VXIbus slot-0 controller vendor. The A24 Address Offset is placed into the "Offset Register" of the 1260-01T by the Resource Manager.

2. The <module address> of the 1260-67 module. This is set by the setting of the logical Address DIP switch SW1 on the 1260-67 to a value between 1 and 12 inclusive.

3. The control register on the 1260-67 to update. Each control register on the 1260-67 has a unique address.

The base A24 Address for the 1260-67 module may be calculated by:

(A24 Offset of the 1260-01T) + (1024 x Module Address of 1260-67).

The A24 Offset is usually expressed in hexadecimal. A typical value of 204000_{16} will be used in the examples which follow. So, a sample 1260-67 with a module address of 7 would have the base A24 Address computed as follows:

Base A24 Address of 1260-67 = 204000_{16} + (400_{16} x 7_{10}) = $205C00_{16}$

The control registers for 1260 series modules are always on odd A24 addresses. The six control registers for the 1260-67 reside at the first six odd A24 addresses for the module:

(Base A24 Address of 1260-67) + 1 = Control Register 0

(Base A24 Address of 1260-67) + 3 = Control Register 1

(Base A24 Address of 1260-67) + 5 = Control Register 2

(Base A24 Address of 1260-67) + 7 = Control Register 3

(Base A24 Address of 1260-67) + 9 = Control Register 4

(Base A24 Address of 1260-67) + 11 = Control Register 5

So, for our example, the six control registers are located at:

205C01   Control Register 0, controls switch 1.

205C03   Control Register 1, controls switch 2.

205C05   Control Register 2, controls switch 3.

205C07   Control Register 3, controls switch 4.

205C09   Control Register 4, controls switch 5.

205C0B   Control Register 5, controls switch 6.

Each control register has eight bits that control which relay in the switch is closed. **Tables 3-1 through 3-6** provide the control mapping for each switch. Unlike the message-based mode that guarantees break-before-make action, no such guarantee exists in the register-based mode of operation. It is the users responsibility, therefore, when using the register-based mode of operation, to implement this feature if needed.

Table 3-1 through Table 3-6, Control Register Mapping

Control Register 0

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Unused	Unused	Relay 6	Relay 5	Relay 4	Relay 3	Relay 2	Relay 1
-	-	Switch 1	Switch 1	Switch 1	Switch 1	Switch 1	Switch 1

Control Register 1

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Unused	Unused	Relay 6	Relay 5	Relay 4	Relay 3	Relay 2	Relay 1
-	-	Switch 2	Switch 2	Switch 2	Switch 2	Switch 2	Switch 2

Control Register 2

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Unused	Unused	Relay 6	Relay 5	Relay 4	Relay 3	Relay 2	Relay 1
-	-	Switch 3	Switch 3	Switch 3	Switch 3	Switch 3	Switch 3

Control Register 3

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Unused	Unused	Relay 6	Relay 5	Relay 4	Relay 3	Relay 2	Relay 1
-	-	Switch 4	Switch 4	Switch 4	Switch 4	Switch 4	Switch 4

Control Register 4

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Unused	Unused	Relay 6	Relay 5	Relay 4	Relay 3	Relay 2	Relay 1
-	-	Switch 5	Switch 5	Switch 5	Switch 5	Switch 5	Switch 5

Control Register 5

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Unused	Unused	Relay 6	Relay 5	Relay 4	Relay 3	Relay 2	Relay 1
-	-	Switch 6	Switch 6	Switch 6	Switch 6	Switch 6	Switch 6

Relays are closed when the corresponding control bit is set to 1 and are opened when the corresponding control bit is cleared to 0. Thus, if you write the value 0000 0100 binary = 4 decimal = 4 hexadecimal to Control Register 0, relay K3 will be closed, while the remaining relays will be open.

The present control register value may be read back by reading an 8-bit value from the control register address. **The value is inverted by the 1260-67 hardware.**

Visa I/O libraries can also be used to control the 1260-67. A short example follows.

1260-67 Example Code

```
#include <visa.h>

/* This example shows a 1260-01T at logical address 16 and a VXI/MXI */
/* interface */
#define RI1260_01_DESC  "VXI::16"

/* For a GPIB-VXI interface, and a logical address of 77 */
/* the descriptor would be:  "GPIB-VXI::77" */


/* this example shows a 1260-67 with module address 7 */
#define MOD_ADDR_22      7


void example_operate_1260_67(void)
{
     ViUInt8 creg_val;
     ViBusAddress creg0_addr;
     ViSession hdl1260;      /* VISA handle to the 1260-01T */
     ViSession hdlRM;        /* VISA handle to the resource manager */
     ViStatus error;         /* VISA error code */

     /* open the resource manager */
     /* this must be done once in application program */
     error = viOpenDefaultRM (&hdlRM);

     if (error < 0) {
          /* error handling code goes here */
     }

     /* get a handle for the 1260-01T */
     error = viOpen (hdlRM, RI1260_01_DESC, VI_NULL,VI_NULL, &hdl1260);
     if (error < 0) {
          /* error handling code goes here */
     }


     /* form the offset for control register 0 */
     /* note that the base A24 Address for the 1260-01T */
     /* is already accounted for by VISA calls viIn8() and */
     /* viOut8() */

          /* module address shifted 10 places = module address x 1024 */
     creg0_addr = (MOD_ADDR_22 << 10) + 1;

     error = viIn8 (hdl1260, VI_A24_SPACE, creg0_addr, &creg_val);
```

```
    if (error < 0) {
         /* error handling code goes here */
    }
    creg_val = (0x01); /* Close relay 1 */

    /* write the updated control register value */
    error = viOut8 (hdl1260, VI_A24_SPACE, creg0_addr, creg_val);
    if (error < 0) {
         /* error handling code goes here */
    }

    /* close the VISA session */
    error = viClose( hdl1260 );
    if (error < 0) {
         /* error handling code goes here */
    }
}
```

Power and Module Cooling Considerations

The 1260-67 is a high density, high power switch module. Because of this certain precautions should be applied when using the switch module.

Module Power Calculation

The maximum power dissipation of the module needs to be considered for each application. The module power can be divided into three power components. They are the logic circuitry, the relays and the channel paths.

Logic Power

The first component, logic power is one of two fixed values depending on whether or not an Option –01T is installed. For a 1260-67 with an Option-01T installed the logic power is approximately 7 Watts, and if no Option –01T is installed the logic power is approximately 2 Watts.

Relay Power

The second component, relay power, depends on the number of relays that are energized. Each switch has six poles driven by independent coils dissipating approximately 4.5 W each. In a typical microwave switch application, only one pole is active at a time. If this assumption is made in a 1260-67A with six switches, total coil dissipation is about 27 Watts in a typical situation. If the one active pole at time assumption is removed, such that all relays in all switches are closed, the total coil dissipation jumps to 162 Watts! This is one reason why it is not recommended to depart from the break-before-make philosophy enforced in message-based operation while accessing the card in register-based operation.

Channel Power

The third component, channel power, is for all practical purposes negligible in a microwave cavity switch like those used in the 1260-67. Path lengths are extremely short in these type of switches and therefore do not exhibit significant resistive heating. Another factor that can result in thermal generation is dielectric losses at high frequencies. Similar to the resistive losses, high quality switches used in the 1260-67 module have minimized these losses as well. In short, channel losses for the purposes of thermal calculations can be ignored.

If the two dominant thermal generation factors are summed together, a typical application using a 1260-67 module would generate about 35 W of heat (logic power + relay power). To calculate the actual airflow requirements for 35 W, the following section addresses the actual calculations.

Airflow Requirements

VXI Modules are specified to require a particular airflow to maintain a specific temperature rise. The air flow required and the resultant back pressure (pressure drop across the module) values determine a specific operating point that is plotted or compared against a VXI chassis cooling curve. If the operating point is below the chassis cooling curve, there is a high probability that the module will remain within its specified temperature rise. If the operating point lies above the chassis cooling curve the temperature rise may exceed the specified value.

The following procedure details how to calculate the cooling requirements for the 1260-67.

1. Determine the maximum temperature rise allowed across the module. This is typically 10°C, but could be higher or lower depending the chassis ambient temperature, and the overall reliability requirements of the module.

2. Determine the required airflow to maintain the specified temperature rise of the module. This is calculated from the module power (calculated in previous section), the desired temperature rise, and the specific heat of air. For a given temperature rise the required air flow is:

> Airflow(liters/sec) = 0.83/Temp Rise(°C) x Module Power (Watts)
> As an example, for a 10 °C rise and a module power of 35 Watts: Airflow(liters/sec) = 0.83/10 °C x 35 Watts = 2.9 liters /sec

3. Determine the pressure drop across the module when the required airflow (liters/sec) is forced through the module. This can be determined by looking at pressure drop vs. airflow plot for the 1260-67 Module in **Figure 3-3**. Find the required airflow and then read the corresponding pressure in mm H_2O. For the case above, with an airflow of 4.7 liters/sec the pressure drop read from **Figure 3-3** is 0.65 mm H_2O.

4. Plot the 1260-67 operating point (Pressure, Airflow) on the chassis cooling curve. If the module operating point lies under the chassis curve, the module should remain within the specified temperature. An example of a 1260-67 Module in a 1261B VXI Chassis is shown in **Figure 3-3.** The chassis airflow plotted is for the worst case slot airflow. In the 1261B chassis, the 1260-67 could dissipate up to about 35 Watts in any slot without much concern for the temperature rise of 10 °C being exceeded. **Above 65 Watts, special considerations must be given to cooling. Either more air must be forced through the slot or a temperature rise greater than 10°C will occur.**

CAUTION:

The required airflow may need to be increased or decreased depending on airflow distribution across the module, the ambient temperature and reliability issues. Consult the VXI specification for more details.
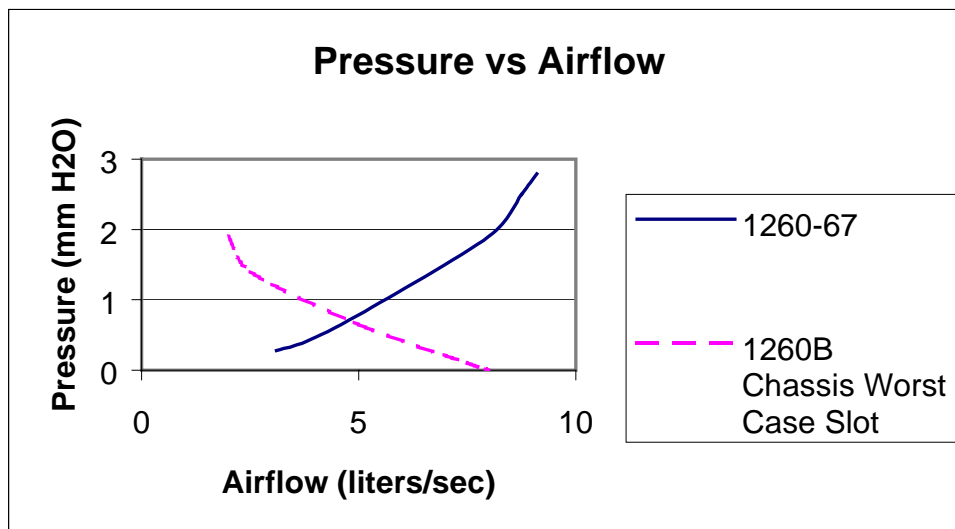
Figure 3-3, 1260-67/1261B Airflow Resistance Curves

Chapter 4

OPTIONAL ASSEMBLIES

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Assembly 407543   HARNESS Assy, 1260-66A, VP90   Rev Date 3/03/99 Revision A

#	Component	Description	U/M	Qty Reqd	Ref
1	500005	TIE CORD NYLON	FT	.00001	
3	500017	TBGSRK-POF. 500 ID-BLACK	FT	.00001	
5	500317	CACX-SHD-01C2 8G-1STR	FT	.00001	
7	602201-010	CON-RCV-PLGO32C. ---D-VP9O	EA	2.00000	J100, 101
9	602201-908	CONTACT,COAX, 20GHZ, 5F142,VP	EA	42.00000	W/J100, 101
11	602231	CON-CXL-PLGOO1C.	EA	42.00000	S1-6
13	610777	TIE-CA-LKG- .062-. 750	EA	.00001	
15	910541	POLYURETHANE CONFORMAL COAT	EA	.00001	
20	GRP-110-1/2	TBGWOV-POY. 2501D-BLACK	FT	.00001	
25	M23053/5-104-4	TBGSRK-POF. 131D-YELLOW	FT	.00001	
29	M23053/5-109-4	TBGSRK- POF .7501 D-YELLOW	FT	.00001	
31	M23053/5-204-C	TBGSRK-POF. 1251D-CLEAR	FT	.00001	
33	M23053/5-209-C	TBGSRK-POF. 750 ID-CLEAR	FT	.00001	

ENGINEERING WIRE LIST

WIRE	FROM	TO	TYPE	PART	WIRE LEN	REFERENCE
	BLK AA (J1OO)	Uxx-SLOT yy (S1-S4)	CABLE	407543		SYSTEM WIRE LIST
	BLK AA (J101)	Uxx-SLOT yy (S5,S6)	CABLE	407543		

This system wirelist serves as a template for incorporating this harness assembly into the overall system wirelist. It does not in any way affect the fabrication of this harness assembly.

EADS North America Defense Test and Services, Inc., 4 Goodyear St., Irvine, CA 92718				
DOCUMENT TITLE	SIZE	CODE NO.	DOCUMENT NO.	REV
HARNESS ASSEMBLY, 1260-66A, VP9O	A	21793	407543	A
	DRN		SHEET 2 of 5	

ENGINEERING WIRE LIST

WIRE	FROM	TO	TYPE	PART #	WIRE LEN	REFERENCE
1	J100-1 602201-908	S1-1 (602231)	COAX	500317	54"	S1-1
2	J100-2 602201-908	S1-2 (602231)	COAX	500317	54"	S1-2
3	J100-3 602201-908	S1-3 (602231)	COAX	500317	54"	S1-3
4	J100-4 602201-908	S1-4 (602231)	COAX	500317	54"	S1-4
5	J100-5 602201-908	S1-5 (602231)	COAX	500317	54"	S1-5
6	J100-6 602201-908	S1-6 (602231)	COAX	500317	54"	S1-6
7	J100-7 602201-908	S1-COM (602231)	COAX	500317	54"	S1-COM
8	J100-8 NO CONNECT					
9	J100-9 602201-908	S2-1 (602231)	COAX	500317	54"	S2-1
10	J100-10 602201-908	S2-2 (602231)	COAX	500317	54"	S2-2
11	J100-11 602201-908	S2-3 (602231)	COAX	500317	54"	S2-3
12	J100-12 602201-908	S2-4 (602231)	COAX	500317	54"	S2-4
13	J100-13 602201-908	S2-5 (602231)	COAX	500317	54"	S2-5
14	J100-14 602201-908	S2-6 (602231)	COAX	500317	54"	S2-6
15	J100-15 602201-908	S2-COM (602231)	COAX	500317	54"	S2-COM
16	J100-16 NO CONNECT					
17	J100-17 602201-908	S3-1 (602231)	COAX	500317	54"	S3-1
18	J100-18 602201-908	S3-2 (602231)	COAX	500317	54"	S3-2
19	J100-19 602201-908	S3-3 (602231)	COAX	500317	54"	S3-3
20	J100-20 602201-908	S3-4 (602231)	COAX	500317	54"	S3-4
21	J100-21 602201-908	S3-5 (602231)	COAX	500317	54"	S3-5
22	J100-22 602201-908	S3-6 (602231)	COAX	500317	54"	S3-6
23	J100-23 602201-908	S3-COM (602231)	COAX	500317	54"	S3-COM
24	J100-24 NO CONNECT					
25	J100-25 602201-908	S4-1 (602231)	COAX	500317	54"	S4-1

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DOCUMENT TITLE	SIZE	CODE NO.	DOCUMENT NO.		REV
HARNESS ASSEMBLY, 1260-66A, VP9O	A	21793	407543		A
	DRN			SHEET 3 of 5	

ENGINEERING WIRE LIST

WIRE	FROM	TO	TYPE	PART	WIRE LEN	REFERENCE
26	J100-26 602201-908	S4-2 (602231)	COAX	500317	54"	S4-2
27	J100-27 602201-908	S4-3 (602231)	COAX	500317	54"	S4-3
28	J100-28 602201-908	S4-4 (602231)	COAX	500317	54"	S4-4
29	J100-29 602201-908	S4-5 (602231)	COAX	500317	54"	S4-5
30	J100-30 602201-908	S4-6 (602231)	COAX	500317	54"	S4-6
31	J100-31 602201-908	S4-COM (602231)	COAX	500317	54"	S4-COM
32	J100-32 NO CONNECT					
33	J101-1 602201-908	S5-1 (602231)	COAX	500317	54"	S5-1
34	J101-2 602201-908	S5-2 (602231)	COAX	500317	54"	S5-2
35	J101-3 602201-908	S5-3 (602231)	COAX	500317	54"	S5-3
36	J1014 602201-908	S5-4 (602231)	COAX	500317	54"	S5-4
37	J101-S 602201-908	S5-5 (602231)	COAX	500317	54"	S5-5
38	J101-6 602201-908	S5-6 (602231)	COAX	500317	54"	S5-6
39	J101-7 602201-908	S5-COM (602231)	COAX	500317	54"	S5-COM
40	J101-8 NO CONNECT					
41	J101-9 602201-908	S6-1 (602231)	COAX	500317	54"	S6-1
42	J101-10 602201-908	S6-2 (602231)	COAX	500317	54"	S6-2
43	J101-11 602201-908	S6-3 (602231)	COAX	500317	54"	S6-3
44	J1O1-12 602201-908	S6-4 (602231)	COAX	500317	54"	S6-4
45	J101-13 602201-908	S6-5 (602231)	COAX	500317	54"	S6-5
46	J101-14 602201-908	S6-6 (602231)	COAX	500317	54"	S6-6
47	J101-15 602201-908	S6-COM (602231)	COAX	500317	54"	S6-COM
48	J101-16 NO CONNECT					
49	J101-17 NO CONNECT					

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DOCUMENT TITLE	SIZE	CODE NO.	DOCUMENT NO.		REV
HARNESS ASSEMBLY, 1260-66A, VP9O	A	21793	407543		A
	DRN			SHEET 4 of 5	

ENGINEERING WIRE LIST

WIRE	FROM	TO	TYPE	PART	WIRE LEN	REFERENCE
50	3101-18 NO CONNECT					
51	3101-19 NO CONNECT					
52	3101-20 NO CONNECT					
53	3101-21 NO CONNECT					
54	3101-22 NO CONNECT					
55	3101-23 NO CONNECT					
56	3101-24 NO CONNECT					
57	3101-25 NO CONNECT					
58	3101-26 NO CONNECT					
59	3101-27 NO CONNECT					
60	3101-28 NO CONNECT					
61	3101-29 NO CONNECT					
62	3101-30 NO CONNECT					
63	3101-31 NO CONNECT					
64	3101-32 NO CONNECT					

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DOCUMENT TITLE	SIZE	CODE NO.	DOCUMENT NO.		REV
HARNESS ASSEMBLY, 1260-66A, VP9O	A	21793	407543		A
	DRN			SHEET 5 of 5	

Assembly 407543-001   HARNESS Assy, 1260-66B, VP90   Rev Date 2/18/99 Revision A

#	Component	Description	U/M	Oty Reqd	Ref
1	500005	TIE CORD NYLON	FT	.00001	
3	500017	TBGSRK-POF. 500ID-BLACK	FT	.00001	
5	500317	CACX-SHD-01C28G-1STR	FT	.00001	
7	602201-010	CON-RCV-PLG032C. ---D-VP9O	EA	1.00000	J100
9	602201-908	CONTACT, COAX, 20GHZ, SF142,VP	EA	28.00000	w/J100
11	602231	CON-CXL-PLG001C.	EA	28.00000	S1-4
13	610777	TIE-CA-LKG-.062-. 750	EA	.00001	
15	910541	POLYURETHANE CONFORMAL COAT	EA	.00001	
20	GRP-110-1/2	TBGWOV-POY. 250ID-BLACK	FT	.00001	
21	M23053/5-207-C	TBGSRK-POF. 375ID-CLEAR	EA	.00001	
25	M23053/5-104-4	TBGSRK-POF. 13ID-YELLOW	FT	.00001	
29	M23053/5-109-4	TBGSRK-POF. 750ID-YELLOW	FT	.00001	
31	M23053/5-204-C	TBGSRK-POF. 125ID-CLEAR	FT	.00001	
33	M23053/5-209-C	TBGSRK-POF. 750ID-CLEAR	FT	.00001	

ENGINEERING WIRE LIST

WIRE	FROM	TO	TYPE	PART	WIRE LEN	REFERENCE
	BLK AA (J100)	Uxx-SLOT yy (S1-S4)	CABLE	407543-001		SYSTEM WIRE LIST

This system wirelist serves as a template for incorporating this harness assembly into the overall system wirelist. It does not in any way affect the fabrication of this harness assembly.

EADS North America Defense Test and Services, Inc., 4 Goodyear St., Irvine, CA 92718					
DOCUMENT TITLE	SIZE	CODE NO.	DOCUMENT NO.		REV
HARNESS ASSEMBLY, 1260-66B, VP9O	A	21793	407543-001		A
	DRN			SHEET 2 of 4	

ENGINEERING WIRE LIST

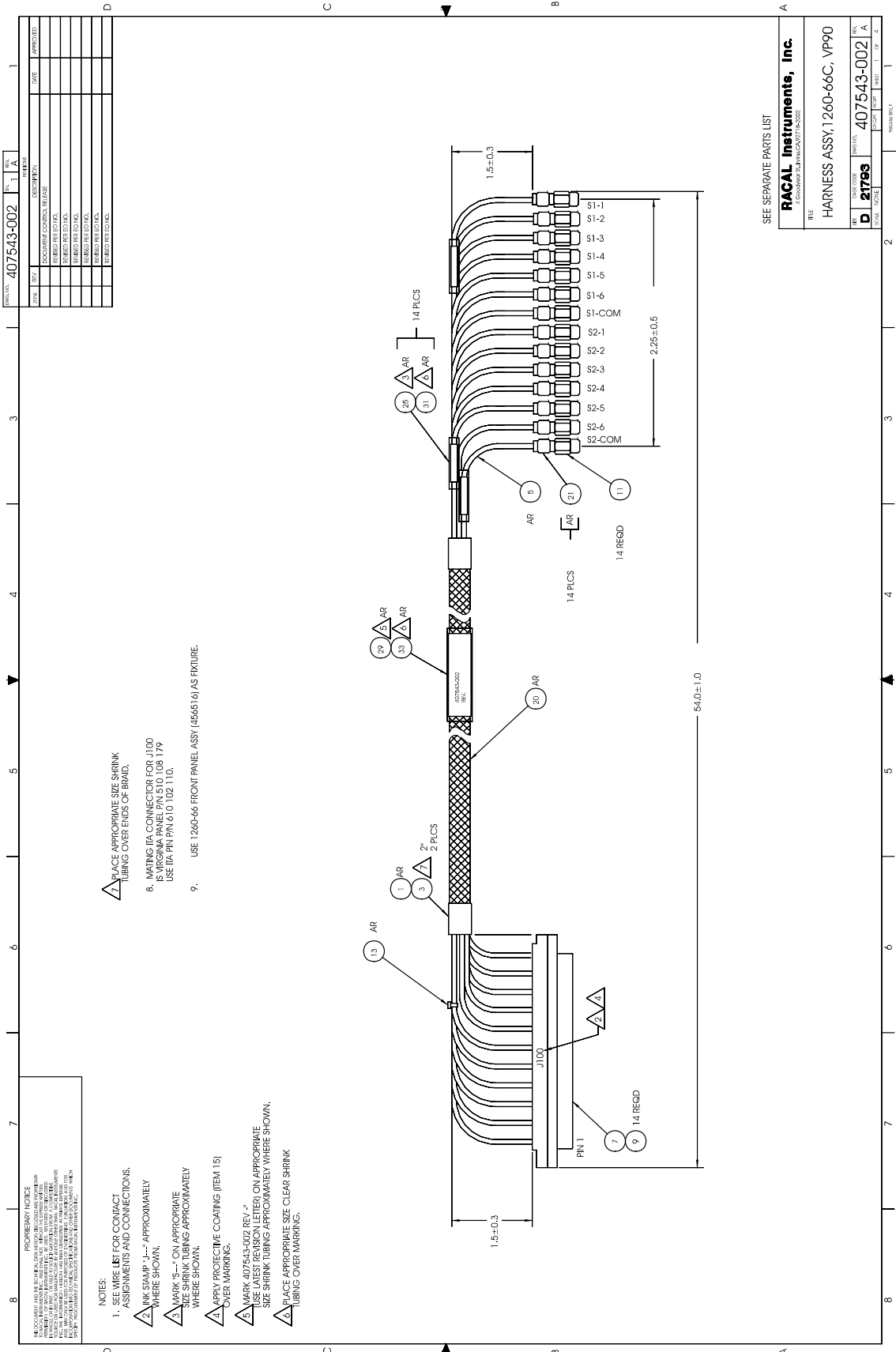| WIRE	FROM	TO	TYPE	PART	WIRE LEN	REFERENCE
1	J100-1 602201-908	S1-1 (602231)	COAX	500317	54"	S1-1
2	J100-2 602201-908	S1-2 (602231)	COAX	500317	54"	S1-2
3	J100-3 602201-908	S1-3 (602231)	COAX	500317	54"	S1-3
4	J100-4 602201-908	S1-4 (602231)	COAX	500317	54"	S1-4
5	J100-5 602201-908	S1-5 (602231)	COAX	500317	54"	S1-5
6	J100-6 602201-908	S1-6 (602231)	COAX	500317	54"	S1-6
7	J100-7 602201-908	S1-COM (602231)	COAX	500317	54"	S1-COM
8	J100-8 NO CONNECT					
9	J100-9 602201-908	S2-1 (602231)	COAX	500317	54"	S2-1
10	J100-10 602201-908	S2-2 (602231)	COAX	500317	54"	S2-2
11	J100-11 602201-908	S2-3 (602231)	COAX	500317	54"	S2-3
12	J100-12 602201-908	S2-4 (602231)	COAX	500317	54"	S24
13	J100-13 602201-908	S2-5 (602231)	COAX	500317	54"	S2-S
14	J100-14 602201-908	S2-6 (602231)	COAX	500317	54"	S2-6
15	J100-15 602201-908	S2-COM (602231)	COAX	500317	54"	S2-COM
16	J100-16 NO CONNECT					
17	J100-17 602201-908	S3-1 (602231)	COAX	500317	54"	S3-1
18	J100-18 602201-908	S3-2 (602231)	COAX	500317	54"	S3-2
19	J100-19 602201-908	S3-3 (602231)	COAX	500317	54"	S3-3
20	J100-20 602201-908	S3-4 (602231)	COAX	500317	54"	S3-4
21	J100-21 602201-908	S3-5 (602231)	COAX	500317	54"	S3-5
22	J100-22 602201-908	S3-6 (602231)	COAX	500317	54"	S3-6
23	J100-23 602201-908	S3-COM (602231)	COAX	500317	54"	S3-COM
24	J100-24 NO CONNECT					
25	J100-25 602201-908	S4-1 (602231)	COAX	500317	54"	S4-1

EADS North America Defense Test and Services, Inc., 4 Goodyear St., Irvine, CA 92718

DOCUMENT TITLE	SIZE	CODE NO.	DOCUMENT NO.		REV
HARNESS ASSEMBLY, 1260-66B, VP9O	A	21793	407543-001		A
	DRN			SHEET 3 of 4	

ENGINEERING WIRE LIST

WIRE	FROM	TO	TYPE	PART #	WIRE LEN	REFERENCE
26	J100-26 602201-908	S4-2 (602231)	COAX	500317	54"	S4-2
27	J100-27 602201-908	S4-3 (602231)	COAX	500317	54"	S4-3
28	J100-28 602201-908	S4-4 (602231)	COAX	500317	54"	S4-4
29	J100-29 602201-908	S4-5 (602231)	COAX	500317	54"	S4-5
30	J100-30 602201-908	S4-6 (602231)	COAX	500317	54"	S4-6
31	J100-31 602201-908	S4-COM (602231)	COAX	500317	54"	S4-COM
32	J100-32 NO CONNECT					

EADS North America Defense Test and Services, Inc., 4 Goodyear St., Irvine, CA 92718					
DOCUMENT TITLE	SIZE	CODE NO.	DOCUMENT NO.		REV
HARNESS ASSEMBLY, 1260-66B, VP9O	A	21793	407543-001		A
	DRN			SHEET 4 of 4	

Assembly 407543-002   HARNESS Assy, 1260-66C, VP90   Rev Date 2/18/99 Revision A

#	Component	Description	U/M	Qty Reqd	Ref
1	5000 OS	TIE CORD NYLON	FT	.00001	
3	500017	TBGSRK-POF. 500ID-BLACK	FT	.00001	
5	500317	CACX-SHD-01C28G-1STR	FT	.00001	
7	602201-010	CON-RCV-PLG032C. ---D-VP90	EA	1.00000	J100
9	602201-908	CONTACT, COAX, 20GHZ, SF142,VP	EA	14.00000	W/J100
11	602231	CON-CXL-PLG001C.	EA	14.00000	S1-2
13	610777	TIE-CA-LKG-. 062-. 750	EA	.00001	
15	910541	POLYURETHANE CONFORMAL COAT	EA	.00001	
20	GRP-110-1/2	TBGWOV-POY. 250ID-BLACK	FT	.00001	
21	M23053/5-207-C	TBGSRK-POF. 375ID-CLEAR	EA	.00001	
25	M23053/5-104-4	TBGSRK-POF. 13ID-YELLOW	FT	.00001	
29	M23053/5-109-4	TBGSRK-POF. 750ID-YELLOW	FT	.00001	
31	M23053/5-204-C	TBGSPK-POF. 125ID-CLEAR	FT	.00001	
33	M23053/5-209-C	TBGSRK-POF . 750ID-CLEAR	FT	.00001	

ENGINEERING WIRE LIST

WIRE	FROM	TO	TYPE	PART #	WIRE LEN	REFERENCE
	BLK AA (3100)	Uxx-SLOT yy (S1-S2)	CABLE	407543-002		SYSTEM WIRE UST

This system wirelist serves as a template for incorporating this harness assembly into the overall system wirelist. It does not in any way affect the fabrication of this harness assembly.

EADS North America Defense Test and Services, Inc., 4 Goodyear St., Irvine, CA 92718				
DOCUMENT TITLE	SIZE	CODE NO.	DOCUMENT NO.	REV
HARNESS ASSEMBLY, 1260-66C, VP9O	A	21793	407543-002	A
	DRN		SHEET 2 of 4	

ENGINEERING WIRE LIST

WIRE	FROM	TO	TYPE	PART #	WIRE LEN	REFERENCE
1	J100-1 602201-908	S1-1 (602231)	COAX	500317	54"	S1-1
2	J100-2 602201-908	S1-2 (602231)	COAX	500317	54"	S1-2
3	J100-3 602201-908	S1-3 (602231)	COAX	500317	54"	S1-3
4	J100-4 602201-908	S1-4 (602231)	COAX	500317	54"	S1-4
S	J100-5 602201-908	S1-5 (602231)	COAX	500317	54"	S1-5
6	J100-6 602201-908	S1-6 (602231)	COAX	500317	54"	S1-6
7	J100-7 602201-908	S1-COM (602231)	COAX	500317	54"	S1-COM
8	J100-8 NO CONNECT					
9	J100-9 602201-908	S2-1 (602231)	COAX	500317	54"	S2-1
10	J100-10 602201-908	S2-2 (602231)	COAX	500317	54"	S2-2
11	J100-11 602201-908	S2-3 (602231)	COAX	500317	54"	S2-3
12	J100-12 602201-908	S2-4 (602231)	COAX	500317	54"	S2-4
13	J100-13 602201-908	S2-S (602231)	COAX	500317	54"	S2-5
14	J100-14 602201-908	S2-6 (602231)	COAX	500317	54"	S2-6
15	J100-15 602201-908	S2-COM (602231)	COAX	500317	54"	S2-COM
16	J100-16 NO CONNECT					
17	J100-17 NO CONNECT					
18	J100-18 NO CONNECT					
19	J100-19 NO CONNECT					
20	J100-20 NO CONNECT					
21	J100-21 NO CONNECT					
22	J100-22 NO CONNECT					
23	J100-23 NO CONNECT					
24	J100-24 NO CONNECT					
25	J100-25 NO CONNECT					

EADS North America Defense Test and Services, Inc., 4 Goodyear St., Irvine, CA 92718

DOCUMENT TITLE	SIZE	CODE NO.	DOCUMENT NO.		REV
HARNESS ASSEMBLY, 1260-66C, VP9O	A	21793	407543-002		A
	DRN			SHEET 3 of 4	

ENGINEERING WIRE LIST

WIRE	FROM	TO	TYPE	PART #	WIRE LEN	REFERENCE
26	J100-26 NO CONNECT					
27	J100-27 NO CONNECT					
28	J100-28 NO CONNECT					
29	J100-29 NO CONNECT					
30	J100-30 NO CONNECT					
31	J100-31 NO CONNECT					
32	J100-32 NO CONNECT					

EADS North America Defense Test and Services, Inc., 4 Goodyear St., Irvine, CA 92718					
DOCUMENT TITLE	SIZE	CODE NO.	DOCUMENT NO.		REV
HARNESS ASSEMBLY, 1260-66C, VP9O	A	21793	407543-002		A
	DRN			SHEET 4 of 4	

Chapter 5

PRODUCT SUPPORT

Product Support

EADS North America Defense Test and Services, Inc. has a complete Service and Parts Department. If you need technical assistance or should it be necessary to return your product for repair or calibration, call 1-800-722-3262. If parts are required to repair the product at your facility, call 1-949-859-8999 and ask for the Parts Department.

When sending your instrument in for repair, complete the form in the back of this manual.

For worldwide support and the office closest to your facility, refer to the website for the most complete information http://www.eads-nadefense.com

Warranty

Use the original packing material when returning the 1260-67 to EADS North America Defense Test and Services, Inc. for calibration or servicing. The original shipping container and associated packaging material will provide the necessary protection for safe reshipment.

If the original packing material is unavailable, contact EADS North America Defense Test and Services, Inc. Customer Service at 1-800-722-3262 for information.

REPAIR AND CALIBRATION REQUEST FORM

To allow us to better understand your repair requests, we suggest you use the following outline when calling and include a copy with your instrument to be sent to the EADS North America Defense Test and Service, Inc. Repair Facility.

Model_____Serial No._____Date_____

Company Name_____Purchase Order #_____

Billing Address_____
                                                                                                                   City

| State/Province | Zip/Postal Code | Country |

Shipping Address_____
                                                                                                                   City

| State/Province | Zip/Postal Code | Country |

Technical Contact_____Phone Number (   )_____
Purchasing Contact_____Phone Number (   )_____

1. Describe, in detail, the problem and symptoms you are having. Please include all set up details, such as input/output levels, frequencies, waveform details, etc.

_____
_____
_____
_____

2. If problem is occurring when unit is in remote, please list the program strings used and the controller type.

_____
_____
_____
_____

3. Please give any additional information you feel would be beneficial in facilitating a faster repair time (i.e., modifications, etc.)

_____
_____
_____
_____

4. Is calibration data required?   Yes   No   (please circle one)

Call before shipping   Ship instruments to nearest support office.
Note: We do not accept
"collect" shipments.