# M1704

## 8-Channel Form-C Switch

# M1705

## 4-Channel Form-C Power Relay

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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/two-prong 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 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.

# Table of Contents

## Racal M1704, M1705 User's Manual

# Chapter 1
# Configuring the Modules

## What's in this Manual?

This manual contains general information, block diagram descriptions, configuration and wiring information, register maps, and specifications for these M-Modules:

- Racal M1704 8-Channel Form C Switch (P/N 407874)
- Racal M1705 4-Channel Form C Power Relay (P/N 407875)

The contents of this chapter are:

# Module Descriptions

## General Features

- Simple driver commands to operate switches provide for easy operation.
- Single-width M-Modules provide high density and maximum flexibility of configuration.
- Low cost switching in VXI environment.
- General Purpose Relays provide the way to activate external devices with a single switch closure.

## Racal M1704 Description

Racal M1704 8-Channel Form C Switch is a single-wide, register-based M-Module. It provides 8 individual Form C (SPDT) channels for general purpose switching and control of external devices. Using an external power supply, you can use this module to drive programmable attenuators and microwave switches. The simplified switching schematic and user connector diagram are shown in Figure 1-2. on Page 1-5.

## Racal M1705 Description

Racal M1705 4-Channel Form C Power Relay is a single-wide, register-based M-Module. It provides 4 individual Form C (SPDT) channels for general purpose switching and control of external devices. With its 5 ADC per channel current rating, it can be used to switch external power supplies. The simplified switching schematic and user connector diagram are shown in Figure 1-3. on Page 1-6.

# Wiring and Configuration

This section describes how to connect user wiring to the Racal M1704 and M1705 M-Modules.

**Note** The procedures in this section assume the M-Module(s) have already been installed into an M-Module Carrier such as the C&H Technologies Model VX405C. Since installation is dependent on the carrier used, instructions for installing M-Modules into the carrier are not included here. Refer to your M-Module carrier documentation for installation instructions.

**WARNING** **SHOCK HAZARD. Only service-trained personnel aware of the hazards involved should install, configure, or remove the modules. Disconnect all power sources from the mainframe, the terminal module(s) and the installed modules before installing or removing a module.**

**Caution** **STATIC ELECTRICITY. Static electricity is a major cause of component failure. To prevent damage to the electrical components on an M-Module or the carrier, observe anti-static precautions whenever installing, removing, or working on a carrier or M-Module.**

## Identfying M-Modules

Racal Instruments M-Modules have a module ID number on the back of the PC-board. The ID number consists of a model number prefix. For example, “M1704” is the ID number for the Racal M1704 M-Module. The locations of these numbers are shown in Figures 1-2 and 1-3.

## Assembling the Field Wiring Connector

Each M-Module includes a 44-pin connector and hood. You must supply your own cable. The figure below shows how to connect wiring and assemble the connector and hood.

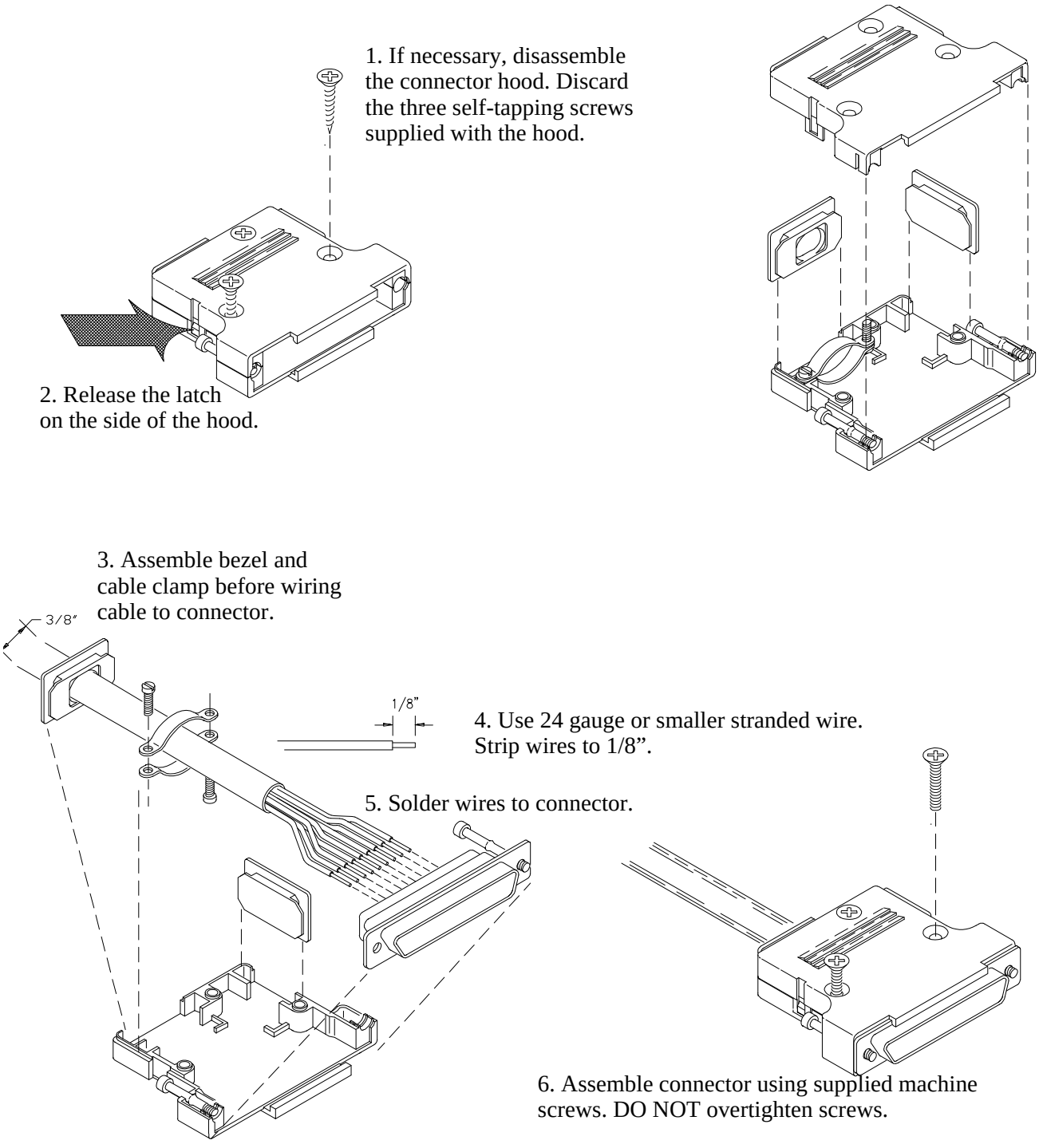
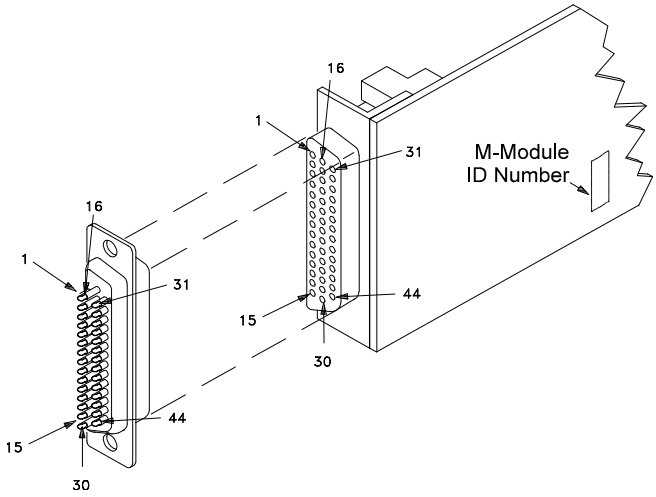



**Figure 1-1. Assembling the Field Wiring Connector**

# Racal M1704 8-Ch. Form C Switch Wiring Information




**MAXIMUM VOLTAGE/CURRENT: The maximum voltage that may be applied to any connector on the Racal M1704 is 200 VDC, 141 VAC rms, or 200 VAC peak. These limits apply only if the product is installed in a humidity-controlled (<60% RH) environment where airborne contaminants and transients are controlled, and there is NOT a relay connection made to power mains. If these conditions CANNOT be maintained, then the maximum voltage is 60 VDC, 43 VAC rms or 68 VAC peak.**

**The maximum current (non-inductive) that may be applied to the Racal M1704 is 1 ADC, 1 AAC peak per switch. Maximum power is 40W DC, 40VA AC per switch; 100W DC, 100 VA AC per M-Module.**

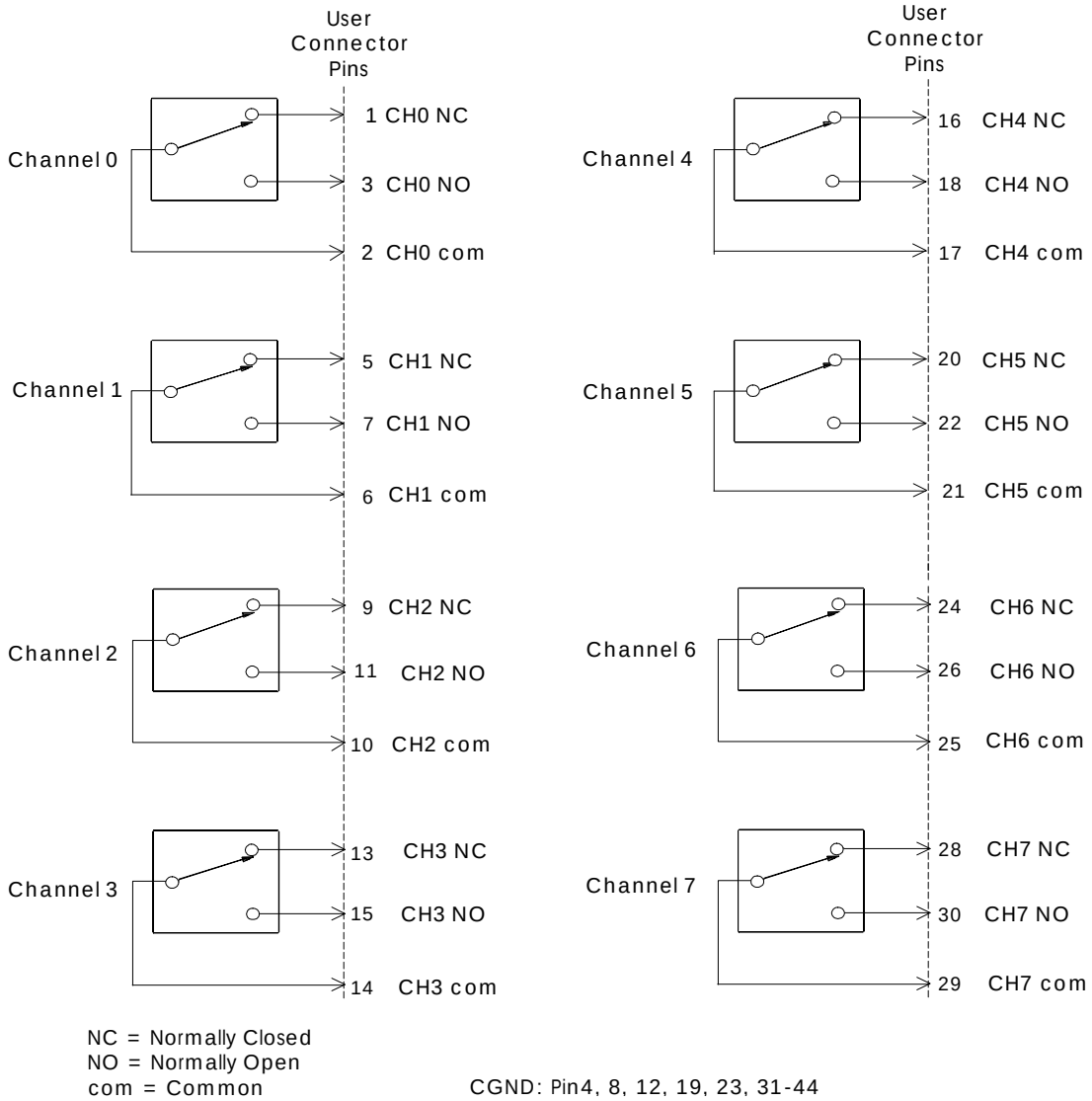
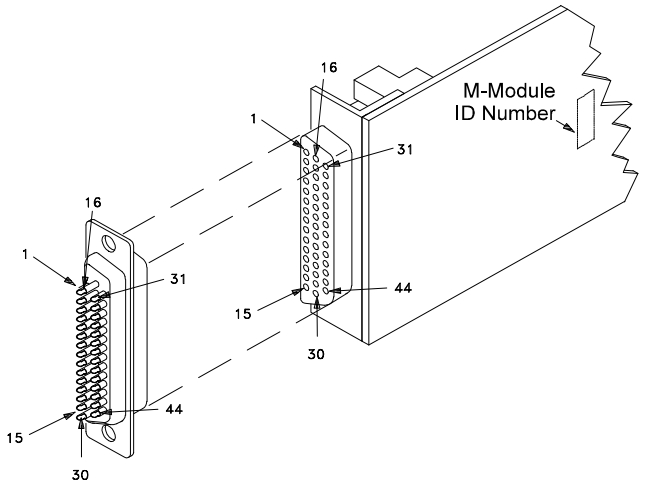


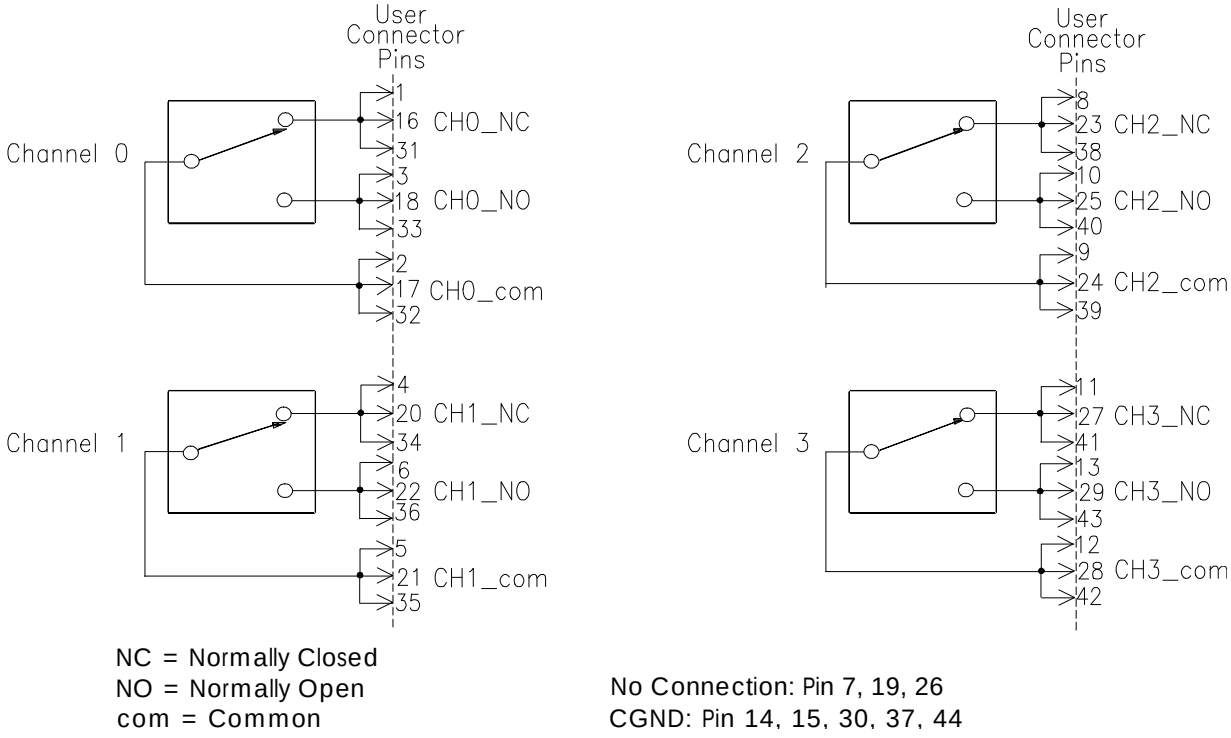

**Figure 1-2. Simplified M1704 Switch Schematic and User Connector**

# Racal M1705 4-Ch. Form C Power Relay Wiring Information




**MAXIMUM VOLTAGE/CURRENT: The maximum voltage that may be applied to any connector on the Racal M1705 is 125 VDC, 141 VAC rms, or 200 VAC peak. These limits apply only if the product is installed in a humidity-controlled (<60% RH) environment where airborne contaminants and transients are controlled, and there is NOT a relay connection made to power mains. If these conditions CANNOT be maintained, then the maximum voltage is 60 VDC, 43 VAC rms or 68 VAC peak.**

**The maximum current (non-inductive) that may be applied to the Racal M1705 is 5 ADC, 5 AAC peak per switch. Maximum power is 100 WDC, 100 VA AC, per switch; 300 WDC, 300 VA AC per M-module.**




NC = Normally Closed
NO = Normally Open
com = Common

No Connection: Pin 7, 19, 26
CGND: Pin 14, 15, 30, 37, 44

**Figure 1-3. Simplified M1705 Power Switching Schematic and User Connector**

**Caution** **All three pins of each relay contact must be connected together in the field wiring for maximum current capability.**
**For example, for Channel 0, pins 1, 16, and 31(for NC contacts must be wired together in the field wiring, likewise pins 3, 18, and 33 (for the NO contact) and pins 2, 17, and 32 for channel common.**

# Chapter 2
# Register Descriptions

## About This Chapter

This chapter describes how to program the Racal M1704 or M1705 at the register level. Register programming is recommended only if you cannot use the VXI*plug&play* driver. Chapter contents include:



## Register Addressing

Register Addresses for register-based devices are located in the upper 25% of VXI A16 address space. Every VXI device (up to 256 devices) is allocated a 32-word (64-byte) block of addresses.

The Racal M1704/M1705 M-Modules are register based devices each having two memory windows. One is the same as any other VXIbus register based device (in the A16 address space), all the configuration registers are stored in this area. The other window contains the I/O registers and is located in the A24 address space.

### A16 Address Base

In the A16 address space, when reading from or writing to a VXIbus instrument register, a hexadecimal or decimal register address is specified. This address consists of a base address plus a register offset.

The base address used in register-based programming depends on whether the A16 address space is outside or inside the VXI chassis GBIB Slot 0 controller.

#### A16 Address Space Outside the Command Module

When the Slot 0 controller is not GPIB, the module's base address is computed as (see "Register within A16 Address Space" on page 2-2):

$C000_h + (LADDR * 64)_h$ *or* $49{,}152_{10} + (LADDR * 64)_{10}$

where $C000_h$ (49,152) is the starting location of the register addresses, LADDR is the M-Module's logical address, and 64 is the number of address bytes per VXI device. For example, if one M-Module's logical address is 120 ($78_h$), the module's register will have a base address of:

$C000_h + (120 * 64)_h = \mathbf{DE00_h}$ or

$49{,}152_{10} + (120 * 64)_{10} = 40{,}152_{10} + 7680_{10} = \mathbf{56{,}832_{10}}$

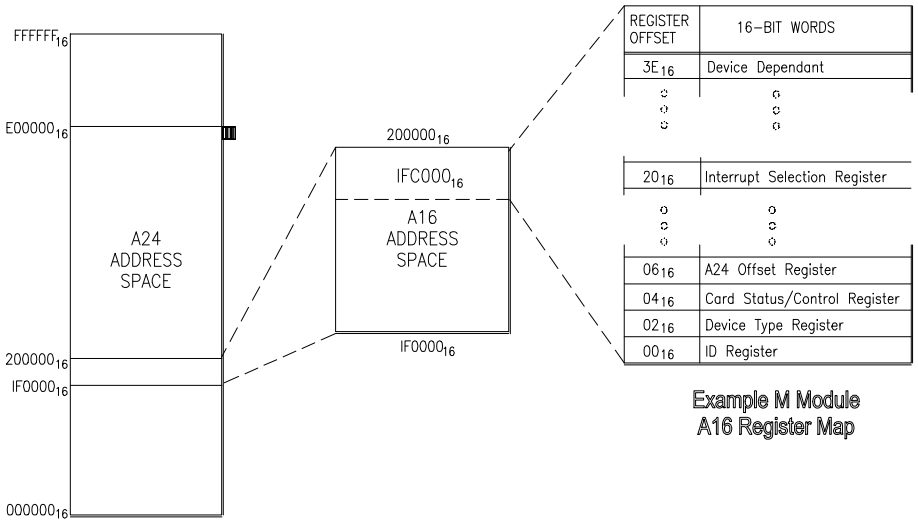



**Figure 2-1. Register within A16 Address Space**

## A16 Address Space Inside the Command Module or Mainframe

When the A16 address space is inside the GPIB Slot 0 controller (see "Registers within the GPIB Slot 0 A16 Address Space" on page 40), the M-module's base address is computed as:

$1FC000_h + (120 * 64)_h$ *or* 2,080,768 + (LADDR * 64)

where $1FC000_h$ (2,080,768) is the starting location of the VXI A16 address space, LADDR is the M-Module's logical address, and 64 is the number of address bytes per register-based device. Again, the M-Module's logical address is 120, then the M-Module will have a base register address of:

$1FC000_h + (120 * 64)_h$ = **$1FDE00_h$**

*or (decimal)*

$2{,}080{,}768_{10} + (120 * 64)_{10} = 2{,}080{,}768_{10} + 7{,}680_{10}$ = **$2{,}080{,}768_{10}$**

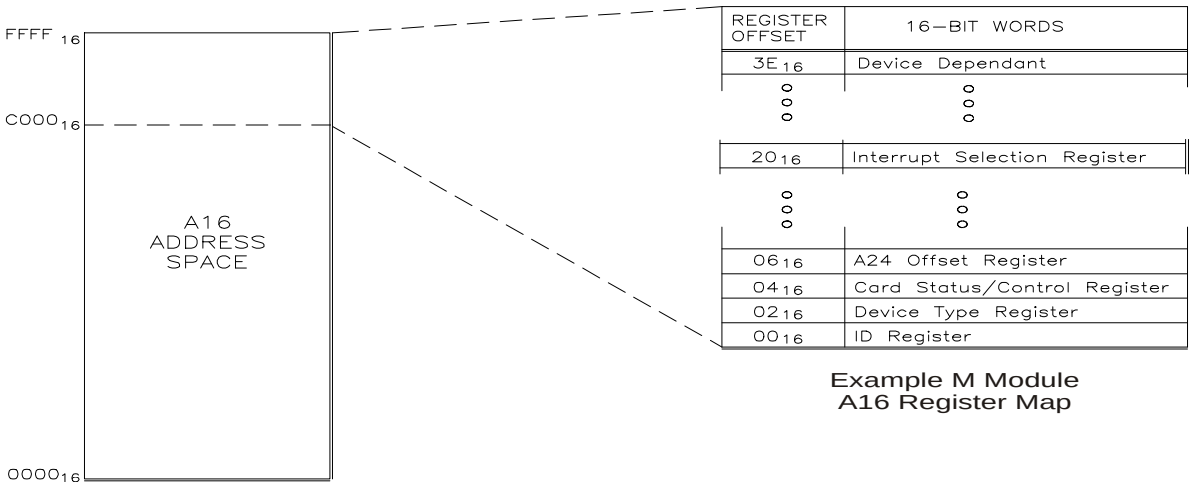



**Figure 2-2. Registers within the GPIB Slot 0 A16 Address Space**

## A16 Addressing

The register address in A16 address space equals the Base Address plus the register offset. For example, the Racal M1704/M1705's Offset Register has an offset of $06_h$. To access this register, add the offset to the base address to form the register address:

$DE00_h + 06_h = \mathbf{DE06_h}$

$1FDE00_h + 06_h = \mathbf{1FDE06_h}$

*or (decimal)*

56,832 + 06 = **56,838**

2,088,448 + 06 = **2,088,454**

For the Racal M1704 and M1705, there are five registers in the A16 address space (see "Relay Modules Register Address" on page 2-4):

- VXI ID Register
- VXI Device Type Register
- VXI Status/Control Register
- VXI Offset Register
- M-Module's Interrupt Control Register

## A24 Addressing

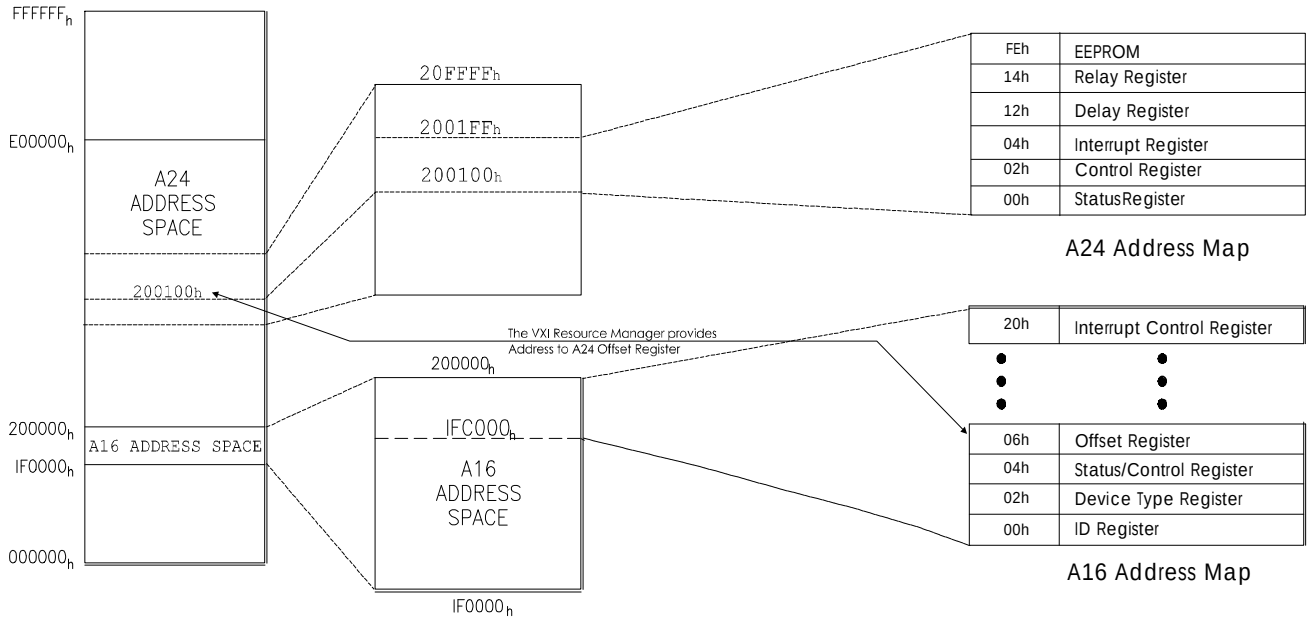
When the VXIbus system is powered on, the resource manager determines which area is available for M-Module in the A24 address space. The resource manager will then write the highest 16 bits of the starting address to the Offset Register in A16 address space. The M-Module's register address in A24 address space is determined by combining the value of the Offset Register (as the highest 16 bits) and the register offset (as the lowest 8 bits) of the M-Module (See "Relay Modules Register Address" on page 2-4.)

For example, the offset of the Relay Register is $14_h$, and, if the value in the Offset Register is $2001_h$, then the Relay Register's address in A24 address space is:

$200100_h + 14_h = \mathbf{200114_h}$

*or (decimal)*

$2{,}097{,}408_{10} + 20_{10} = \mathbf{2{,}097{,}428_{10}}$.




* Base Address = $1FC000_{16}$ + (Logical Address * 64)$_{16}$ or
= $2,080,768_{10}$ + (Logical Address*64)$_{10}$

A16 Register Address = Base Address + Register Offset

For M-Modules, the Register Address is Computed as:
Base Address = Value in Offset Register
Register Address = Base Address Combines the Register Offset
(A24 address space)

For Example, in above case, the Relay Register Address is:
Relay Register Address = $200100_{16}$ + $14_{16}$ = $200114_{16}$ or
= $2,097,408_{10}$ + $20_{10}$ = $2,907,428_{10}$

**Figure 2-3. Relay Modules Register Address**

# Program Example

The following C language program can be used with any of the Switch M-Modules and demonstrates how to program at the register level. The program closes channels 01 and 03 by writing a logic "1" to bits 0 and 3 in the Relay Register (address = base $+14_h$). This program will work on either a Racal M1704 or M1705. This program was written and tested in Microsoft Visual C++ but should compile with any standard ANSI C compiler.

To run this program you must have the NI VISA Library, an GPIB interface module installed in your PC, and a GPIB Slot 0 controller.

```
#include <visa.h>
#include <stdio.h>
#include <stdlib.h>

ViSession defaultRM,m_mod;
void err_handler();

void main(void)
{
    /*ID & device type registers*/
    unsigned short id_reg, dt_reg;

    /* create and open a device session */
    ViStatus err;
    viOpenDefaultRM (&defaultRM);
    /* Command Module is GPIB-VXI0, M-Module logical address 16 */
    err = viOpen (defaultRM,"GPIB-VXI0::16",VI_NULL,VI_NULL,&m_mod);
    if(err < VI_SUCCESS)
    {
    printf("Unable to open session ");
    return;
    }
    /* read and print the M-Module's ID and Device Type Registers */
    err = viIn16(m_mod,VI_A16_SPACE,0x00,&id_reg);
    if (err < VI_SUCCESS) err_handler(m_mod,err);

    err = viIn16(m_mod,VI_A16_SPACE,0x02,&dt_reg);
    if (err < VI_SUCCESS) err_handler(m_mod,err);

    printf("ID register = 0x%4X\n", id_reg);
    printf("Device Type register = 0x%4X\n", dt_reg);

    /*Close Channels 01 and 03*/
    err = viOut16(m_mod,VI_A24_SPACE,0x14,0xA);
    if (err < VI_SUCCESS) err_handler(m_mod,err);
```

**(Program Continued on Following Page)**

```
/*****************************************************************/
    /*Close Session */
    viClose (m_mod);
    viClose (defaultRM);
}
void err_handler ()
/* Error Handling Routine */
    {
    ViStatus err;
    char err_msg[1024] = {0};
    viStatusDesc(m_mod,err,err_msg);
    if (strcmp ("VI_SUCCESS: No error",err_msg) != 0)
    printf("ERROR = %s\n",err_msg);
    return;
    }
 /* End of Error Handling Routine */
```

# Register Descriptions

This section describes the Racal M1704/M1705 registers.

## Registers in A16 Address Space

The five registers including the VXI ID Register, VXI Device Type Register, Status/Control Register, Offset Register and Interrupt Control Register are mapped in A16 address space (Table 2-1).

**Table 2-1. VXIbus Instrument Registers**

| Address Mapping | Registers |
|---|---|
| $20_h$ | M-Module Interrupt Control Register |
| $06_h$ | VXI Offset Register |
| $04_h$ | VXI Status/Control Register |
| $02_h$ | VXI Device Type Register |
| $00_h$ | VXI ID Register |

### ID Register

This register contains the M-Module's Device Class, Address Space, and Manufacturer ID.

**Table 2-2. VXI ID Register (Base + $00_h$)**

| Bit# | 15 - 14 | 13 - 12 | 11 - 0 |
|---|---|---|---|
| Contents | Device Class | Address Space | Manufacturer ID |

- Device Class = 11: Register Based Instrument
- Address Space = 00: A16/A24
- MFG ID = 4091
- A read of the entire register returns $CFFF_h$.

### VXI Device Type Register

This register contains the M-Module's required memory and model code.

**Table 2-3. VXI Device Type Register (Base + $02_h$)**

| Bit# | 15 - 12 | 11 - 0 |
|---|---|---|
| Contents | Required Memory | Model Code |

- Required Memory = 15: number of 256-byte block required
- Model Code = $025E_h$ for Racal M1704, $025F_h$ for Racal M1705
- A read of the entire register returns $F25E_h$ (Racal M1704) or $F25F_h$ (Racal M1705).

## Status/Control Register

When reading from this register, it is a Status Register with the bit definitions listed in Table 2-4:

**Table 2-4. Status Register Bit Definition (Read/Write) Base + $04_h$**

| Bit# | 15 | 14 | 13 - 4 | 3 | 2 | 1 - 0 |
|---|---|---|---|---|---|---|
| Contents | A24/A32 Active | MODID* | Device Dependent | Ready | Passed | Device Dependent |

- A24/A32 Active: 1 - A24/A32 registers accessible,
  Default = 1;
- MODID*: 1 - Device is not selected via the P2 MODID line,
  0 - Device is selected via the P2 MODID line;
- Ready: 1 - Device is ready to accept full set of operational commands,
  0 - Device is not ready to accept the commands;
- Passed: 1 - Self Test Passed,
  0 - Self Test is either failed or executing;

When writing to this register, it is a Control Register with the following bit definitions:

**Table 2-5. Control Register Bit Definition (Read/Write) Base + $04_h$**

| Bit # | 15 | 14 - 2 | 1 | 0 |
|---|---|---|---|---|
| Contents | A24/A32 Enable | Device Dependent | Sysfail Inhabit | Reset |

- A24/A32 Enable: 1 - A24/A32 register accessible,
  0 - A24/A32 registers not accessible;
- Sysfail Inhabit: 1 - Stop driving the SYSFAIL* line,
  0 - Drive the SYSFAIL* line;
- Reset: 1 - Reset the device.

## Offset Register

This register contains the value of the base address necessary to access the M-Module's A24 address space. This register's content is determined automatically by the Command Module.

**Table 2-6. Offset Register Bits Definition (Read/Write) Base + $06_h$**

| Bit# | 15 - 0 |
|---|---|
| Contents | Determined Automatically by the Command Module |

## M-Module Interrupt Control Register

This register specifies which interrupt line the M-Module will use. HP Command Modules service interrupt line 1 by default, so normally you do

not need to change the interrupt line

**Table 2-7. M-Module Interrupt Control Register (Base + $20_h$)**

| Bit# | 15 - 3 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|
| Contents | reserved | INTC | Interrupt Level | | |

- INTC: 1 - Support Interrupt C;
  0 - Support Interrupt A or B or no interrupt
  Default = 1
- Interrupt Level: Level 0 disable the interrupt
  Default = Interrupt 1
- Interrupt level selections are listed in Table 4-7:

**Table 2-8. Interrupt Level Selection**

| Bit 2 1 0 | Interrupt Level |
|---|---|
| 000 | Disable Interrupt |
| 001 | IRQ1 |
| 010 | IRQ2 |
| 011 | IRQ3 |
| 100 | IRQ4 |
| 101 | IRQ5 |
| 110 | IRQ6 |
| 111 | IRQ7 |

## Registers in A24 Address Space

There are five registers in A24 address space on both Racal M1704/1705. Table 2-9 lists the address mapping:

**Table 2-9. Racal M1704/M1705 Registers**

| Address Mapping | Registers |
|---|---|
| $FE_h$ | EEPROM |
| $(16\text{-}FD_h)$ | (Reserved) |
| $14_h$ | Relay Register |
| $(06\text{-}12_h)$ | (Reserved) |
| $04_h$ | Interrupt Register |
| $02_h$ | Control Register |
| $00_h$ | Status Register |

## Status Register

**Table 2-10. Status Register (Read Only) Base + $00_h$**

| Bit# | 15 - 8 | 7 | 6 - 1 | 0 |
|---|---|---|---|---|
| Contents | Reserved | BUSY* | Reserved | RIRQX |

- BUSY*: 0-Relay is busy (not stable yet).
- RIRQX: 1-Relay interrupt.
- The BUSY bit will be being “0” for 13 ms for Racal M1704 and 16 ms for Racal M1705 after the Relay Register is written.
- This BUSY* bit is re-triggerable.

## Control Register

**Table 2-11. Control Register (Read/Write) Base + $02_h$**

| Bit # | 15 - 5 | 1 | 0 |
|---|---|---|---|
| Contents | Reserved | RENABLE | Soft Reset |

- RENABLE: 1 - Enable relay interrupt (After BUSY timer).
- Soft Reset: 1 - Soft Reset the M-Module.

When power-on or reset, all bits of Control Register are set to zero.

## Interrupt Register

**Table 2-12. Interrupt Register (Read Only) Base + $04_h$**

| Bit # | 15 - 1 | 0 |
|---|---|---|
| Contents | Reserved | RIRQX |

- RIRQX: Relay interrupt

## Relay Register

**Table 2-13. Racal M1704 Relay Register (Read/Write) Base + $14_h$**

| Bit # | 15 - 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|
| Contents | Reserved | Chan 7 | Chan 6 | Chan 5 | Chan 4 | Chan 3 | Chan 2 | Chan 1 | Chan 0 |

- 0 = channel open, 1 = channel closed.

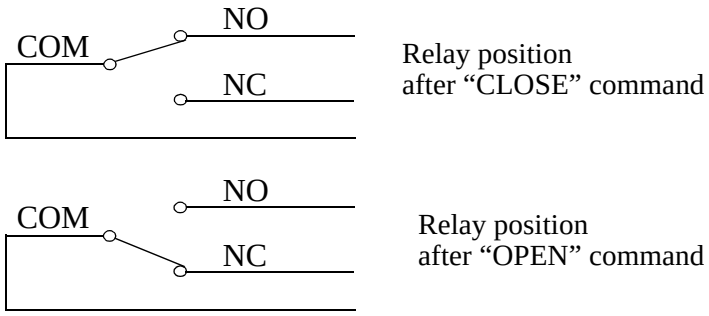



**Figure 2-4. Write a “1” or ”0” to the Register Bit to Close/Open the Relay**

**Table 2-14. Racal M1705 Relay Register (Read/Write) Base + $14_h$**

| Bit # | 15 - 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|
| Contents | Reserved | Chan 3 | Chan 2 | Chan 1 | Chan 0 |

- 0 = channel open, 1 = channel closed.

**EEPROM** The ID EEPROM contains sixty-four 16-bit words of M-Module ID data and VXI M-Module data.

**Note** It is much easier to read the module ID data from the VXI registers (A16 memory area) instead of reading the ID EEPROM Register. A16 addressing is discussed earlier in this chapter.

**Table 2-15. ID EEPROM Contents**

| Word# | Description | Value |
|---|---|---|
| 0 | Sync code | $5346_h$ |
| 1 | module number (binary code) | $0689_h$ (M1704's Module Number)<br>$068A_h$ (M1705's Module Number) |
| 2 | revision number (binary code) | |
| 3 | module characteristics | $1868_h$ (According to M-Module Specification) |
| 4 - 7 | reserved | |
| 8 - 15 | User-defined | |
| 16 | VXI Sync code | $ACBA_h$ (2's complement of 0x5346) |
| 17 | VXI-ID | $CFFF_h$ (According to VXI Specification) |
| 18 | VXI-Device Type | $F25E_h$ (M1704M1705's Module Code)<br>$F25F_h$ (M1705's Module Code) |
| 19 - 31 | Reserved | |
| 32 - 63 | User-defined | |

The module characteristic words are defined below:

- D15 = 0: no burst access;
- D14 -D13: reserved
- D12 = 1: module need +/- 12V;
- D11 = 1: module need +/- 5V;
- D10 = 0: module without trigger output;
- D09 = 0: module without trigger input;
- D08-D07 = 00: no DMA requester;
- D06-D05 = 11: interrupt method C(INTC);
- D04-D03 = 01: 16-bit data bus(D16);
- D02-D01 = 00: 8-bit address bus(A08);
- D00 = 00: M-module does not support memory access.

# Appendix A
# Specifications

## M-Module Specification Compliance

The Racal M1704 and Racal M1705 M-Modules comply with the Mezzanine M-Module Specification.

## Racal M1704 8-Channel Form C Switch M-Module Specifications

**Caution** **The following voltage limits designated "Cleanroom Environment" apply only if the product is installed in a humidity-controlled (<60% RH) environment where airborne contaminants and transients are controlled, and there is NOT a relay connection made to power mains. If these conditions CANNOT be maintained, then the maximum voltage is 60 VDC, 43 VAC-rms or 68 VAC-peak.**

### Maximum Voltage--Cleanroom Environment (any terminal to any other terminal)

- 200 VDC
- 141 VAC rms
- 200 VAC peak

### Maximum Voltage--Non-Cleanroom Environment (any terminal to any other terminal)

- 60 VDC
- 43 VAC rms
- 68 VAC peak

### Maximum Current (non-inductive)

- Per Switch: 1 ADC, 0.707 AAC rms, 1 AAC peak

### Maximum Power

- Per Switch: 40 W DC, 40 VA AC
- Per Module: 100 W DC, 100 VA AC

## Racal M1704 Specifications (continued)

### Maximum Thermal Offset

- < 20 μV (typical)

### Closed Channel Resistance

- End of Life: < 3.5Ω

### Insulation Resistance (between any two points)

- ≤40°C, ≤65% RH: $10^7$ Ω (typical)
- ≤25°C, ≤40% RH: $10^7$ Ω (typical)

### AC Specifications

- Typical Bandwidth (-3dB): 10 MHz
- Crosstalk (dB, channel-to-channel):
  <10 kHz: <-80 dB
  <100 kHz: <-70 dB
  <1 MHz: <-50 dB
- Closed Channel Capacitance:
  Channel-to-Channel: <30 pF (typical)
  Channel-to-Common: <40 pF (typical)

### General Characteristics

- Typical Relay Life (number of operations)
  No Load: $5x10^6$
  Rated Load: $1x10^5$
  Time to open or close a channel (register programming): 13 msec

### Connector Type

- 44-pin D-Sub

### Power Up/Down States

Non-latching relays (all relays open at power up/down).

# Racal M1705 4-Channel Form C Power Relay M-Module Specifications

**Caution** **The following voltage limits designated "Cleanroom Environment" apply only if the product is installed in a humidity-controlled (<60% RH) environment where airborne contaminants and transients are controlled, and there is NOT a relay connection made to power mains. If these conditions CANNOT be maintained, then the maximum voltage is 60 VDC, 43 VAC-rms or 68 VAC-peak.**

### Maximum Voltage--Cleanroom Environment (any terminal to any other terminal)

- 125 VDC
- 141 VAC rms
- 200 VAC peak

### Maximum Voltage--Non-Cleanroom Environment (any terminal to any other terminal)

- 60 VDC
- 43 VAC rms
- 68 VAC peak

### Maximum Current (non-inductive)

- Per Switch: 5 ADC, 3.53 AAC rms, 5 AAC peak

### Maximum Power

- Per Switch: 100 W DC, 100 VA AC
- Per Module: 300 W DC, 300 VA AC

### Maximum Thermal Offset

- < 20 μV (typical)

### Closed Channel Resistance

- End of Life: < 2Ω

### Insulation Resistance (between any two points)

- ≤40°C, ≤65% RH: $10^8$ Ω (typical)
- ≤25°C, ≤40% RH: $10^8$ Ω (typical)

## Racal M1705 Specifications (continued)

### AC Specifications

- Typical Bandwidth (-3dB): > 10 MHz
- Crosstalk (dB, channel-to-channel):
  <100 kHz: <-80 dB
  <1 MHz: <-60 dB
  <10 MHz: <-40 dB
- Closed Channel Capacitance:
  Channel-to-Channel: 25 pF (typical)
  Channel-to-Common: 60 pF (typical)

### General Characteristics

- Typical Relay Life (number of operations)
  No Load: $5x10^7$
  Rated Load: $3.5x10^4$
  Time to open or close a channel (register programming): 16 msec

### Connector Type

- 44-pin D-Sub

### Power Up/Down States

Non-latching relays (all relays open at power up/down).

# Index
## Racal M1704, and M1705

**Racal Instruments**

## 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 Racal 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.