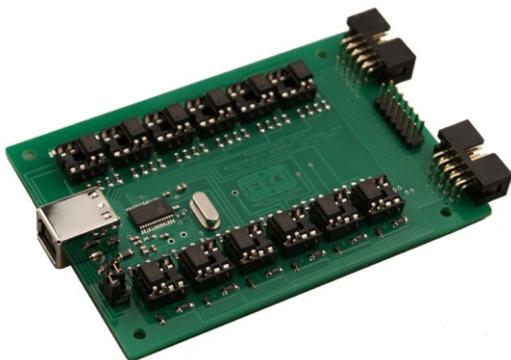


# AR-12MF MULTI-FUNCTION RELAY INTERFACE

TECHNICAL REFERENCE



Click for more info: [www.eeci.com/ar-12mfp.htm](http://www.eeci.com/ar-12mfp.htm)

PHONE..... (937) 349-6000  
ORDERS..... (800) 842-7714  
TECH SUPPORT... (937) 349-6000  
E-mail..... [sales@eeci.com](mailto:sales@eeci.com)

[www.eeci.com](http://www.eeci.com)  
*Click for Website*

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## SPECIFICATIONS

Power Supply.....	5VDC (powered from USB port)
Serial Data Protocol.....	75 to 6,000,000 baud - auto detect (defaults to 115,200 baud) (data bits, parity, stop bits will auto detect)
Channels.....	12 relays/outputs or 12 inputs (or combinations)
Input Voltage Range.....	3.3 volts up to 18 volts (default) other voltage ranges available Minimum 1.5ma needed to turn input on (DC or AC)
Output Signal.....	Photo transistor, maximum 100mW draw (20ma at 5V) switching voltage range 3.3 VDC to 48 VDC
Expansion Capability.....	Optional Dual I/O Input Port
Weight.....	1.5 ounces
Size.....	2.75 inches by 4 inches
Options Available.....	Dual I/O Input Port

## DESCRIPTION

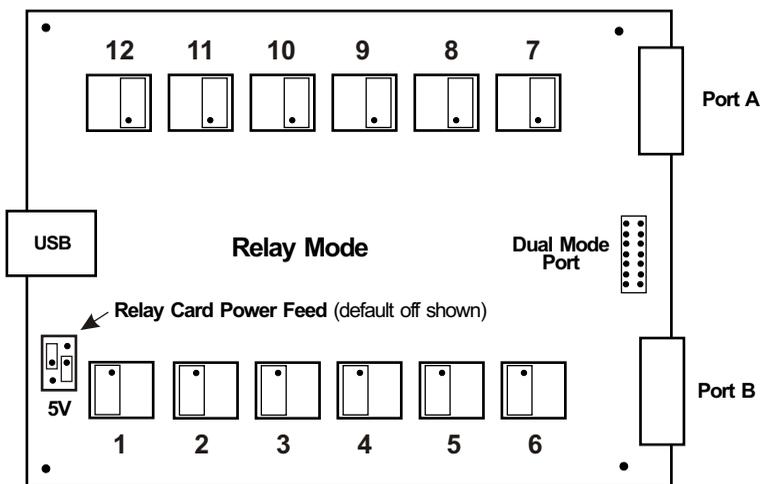
The AR-12MF provides software control of 12 relays/outputs or monitoring of 12 inputs (or combinations of inputs and outputs). An optional dual I/O mode will allow input of information along with relay control. The input mode will provide input interfacing for on/off equipment status, keypads or other types of digital signals. Inputs may be used to monitor contact status or to monitor AC or DC voltages (+) or (-) 3.3 volts to 18 volts (other voltage ranges available). The optically isolated inputs are bidirectional and may be used with a positive common, a negative common or AC signals. Multi-Function capability allows connection of a variety of 8 or 12 bit I/O devices. A large variety of relay cards may be connected.

## 24 HOUR TECHNICAL SUPPORT

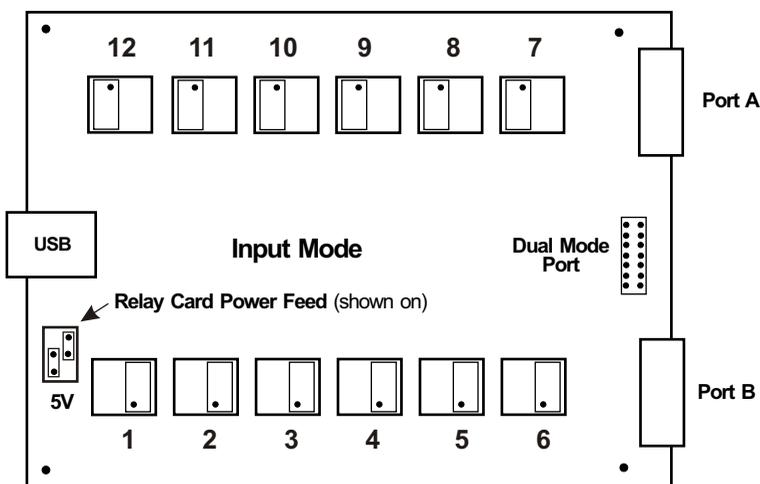
Technical support for our products is available by calling (937) 349-6000. If a technical adviser is not available, please leave your name, phone number and a time that you can be reached. Your call will be returned as soon as possible and within 8 hours. Calls received during normal business hours are usually returned within minutes.

**CONNECTION DIAGRAM**

**AR - 12MF  
MULTI-FUNCTION  
RELAY INTERFACE**



The opto isolator positions above are shown in their default position (all set for relay mode)



The opto isolator positions above are all shown in input mode

**IMPORTANT:** Always discharge any static electricity from your body by touching the bare metal on the back of your computer before handling your AR-12MF Interface card or attached USB cable.

**SET-UP AND TESTING**

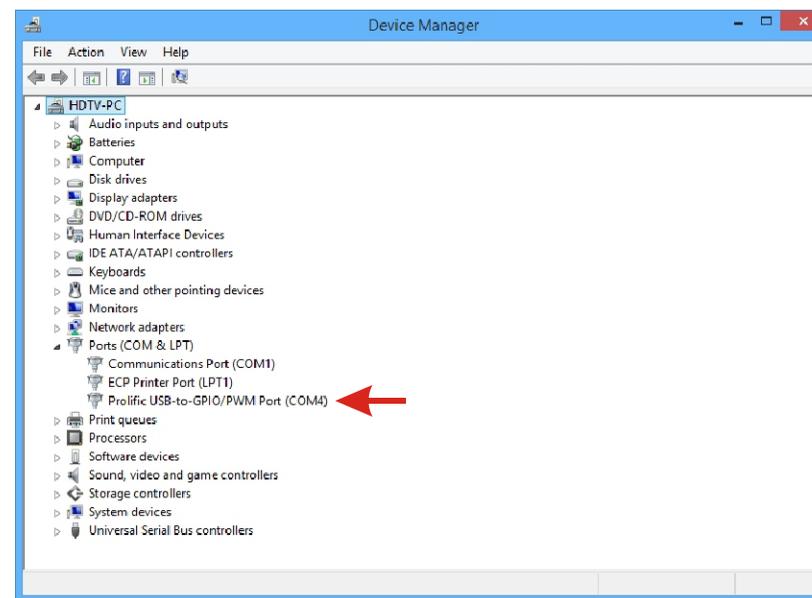
Upon receiving your AR-12MF, you should connect and test the operation of the hardware to verify proper operation. Please set-up and test the AR-12MF as follows (Windows XP\*, Vista, Windows Server, Windows 7, 8.1, Windows 10 or Windows 11) \*service pack 3

**(Step 1) Connect to the Internet.** This permits any security or software updates to occur during installation. If you do not have an Internet connection, you may skip this step (please note that if you are not connected to the Internet, the installer will delay for about 30 seconds while attempting to connect).

**(Step 2) Connect your AR-12MF Relay Interface** to any available USB port on your computer using a CC-USB B cable (1 to 15 foot). A high percentage of systems will be up to date and you will not see any activity or a pop-up message (allow up to 30 seconds for any system message). If your USB Com driver is out of date, you may receive a message that your system is being updated or a new driver is being installed. Allow the update to occur before you move to the next step. If you do not see activity or receive a system message, proceed to step 3.

**(Step 3) Insert the installation CD or USB flash drive** and wait for the security message (with a USB flash drive, you may need to browse to the drive icon from your My Computer link). OK or click the startup.exe file to start the installer dialog.

**(Step 4) Check your USB Com driver** by clicking on the "Open Device Manager" button in the installer dialog window and expanding the "Ports (COM & LPT)" category (expand the category by clicking on the + or arrow, see Device



Manager on page 4 or go directly to Device Manager from Control Panel). If you see a "Prolific USB-to-GPIO Com Port" entry, this is your USB Com driver\* and the com port assigned is to the right of the entry. Right click on the entry and select "Properties" and click the "Driver" tab. Your USB Com driver must be Prolific version 3.8.25.0 or higher (dated 7/12/2018 or later). If your USB Com driver is not up to date, right click on the entry and select "Update Driver Software". If your USB Com driver is up to date then please note the Com port number assigned and jump to step 5.

\*verify that this is the com port assigned to the AR-12MF by unplugging the AR-12MF from your USB port and watching

the entry in device manager. The entry should disappear and then reappear when you plug the AR-12MF back in.

If you do not have an Internet connection or are having problems with the USB Com driver installation, disconnect the AR-12MF USB cable from your computer and install the USB Com driver from your CD by clicking on the "Install USB Com Driver" button. Please note that you may have to remove any out of date Prolific Com drivers on your system before the current driver will install correctly. It is important that you use the remove feature on your CD (not the remove feature in Device Manager). The remove feature is shown after clicking the "Install USB Com Driver" button from the installer dialog window (allow up to 30 seconds for the installer to load and appear).

**(Step 5) After you have verified** or installed the up to date USB Com driver, reconnect (if not already connected\*) your AR-12MF Relay Interface to the same USB port and install the AR-12MF device driver\*\* by clicking the "Install EECI Device Driver" button from the installer dialog window (if you have auto start disabled, you may browse to the Windows Driver folder and double click on setup.exe). A desktop icon for the AR-12MF will be created. When installing the AR-12MF device driver on a Windows XP or Vista computer, double click on setup.exe in the XP-Vista folder. \*if you reconnect your AR-12MF to a different USB port, a different com port may be assigned.

\*\*Please note that the Microsoft .Net Framework must be installed on your system. The .Net Framework is already installed if you have Windows 7 or higher. If the .Net Framework is not installed on your computer, the installation program will attempt to download and install the .Net Framework from the Microsoft Update website through your internet connection. This may take 5 minutes or longer. In order for the .Net Framework to install correctly, your computer must be up to date with Windows Update. This is especially important with Windows XP\* and Vista. You may update your computer by clicking on the start button, All Programs, Windows Update and clicking on "Check for updates". \*for XP, Service Pack 3 must be installed.

**(Step 6) After the AR-12MF device driver is installed,** the AR-12MF com port should be detected and a pop-up will prompt you for the com port to be used with your AR-12MF Relay Interface (correct com port should be shown). You may edit the com port if incorrect. The AR-12MF User Interface will now open and the label just under the COM port indicator should show that Com port open. Click the "Install Help Files" button to install important trouble-shooting and reference information before you close the installer.

**(Step 7) Test your relays** by clicking the relay buttons for each relay. The relay should energize when the button is red and de-energize when the button is green.

**(Step 8) You may set your AR-12MF Relay Interface** to input mode by reversing the opto isolators\* on the circuit board as shown on page 2 and connecting the RCT-8 terminal block to port A or B on your AR-12MF Relay Interface (unplug relay card).

\*Note: when using the dual I/O mode, the opto isolators should be left in the relay mode (dual mode port required).

**(Step 9) Test your inputs** by clicking the Setup button on the AR-12MF User Interface and then checking all 12 input boxes. Click apply and then click OK. The indicator box to the right of the relay button will show a zero when no voltage is applied to the input terminal on the RCT-8 and a one when voltage is applied to the input terminal. Terminal 10 on the RCT-8 is the common (- or +) for all twelve inputs. The default voltage input range for the AR-12MF is 3.3V to 18 volts (DC or AC). See page 6 for RCT-8 terminal assignments. Move the RCT-8 to Port B to test inputs 9-12.

Click the "Tray" button to place the User Interface in "driver only" mode. You will see a blue 12 icon in your system tray by the clock (bottom right of screen as shown below).



Click the blue 12 icon to re-open the AR-12MF User Interface. Click the "Unload Device Driver" to unload the AR-12MF device driver. Please note that by default, the AR-12MF device driver is only loaded on demand to conserve system resources. To re-start the AR-12MF device driver, double click the red and blue AR-12MF desktop icon.

#### HOW TO OPEN DEVICE MANAGER

##### Windows XP, VISTA or Windows 7

Click the Start Button (lower left of screen), then Control Panel (right side). With the view set to classic view, small or large icons, click (or double click) the Device Manager icon. With Windows XP you will need to click the System icon (in Control Panel) then the Hardware Tab then the Device Manager button. You may also use the supplied CD to open Device Manager by clicking the "Open Device Manager" button when the CD auto starts.

##### Windows 8.1, 10 and Windows Server

Move your mouse cursor to the lower right side of your screen and click on Settings. Click on Control Panel near the top and click on the Device Manager icon.

#### TROUBLE-SHOOTING THE AR-12MF

**(1)** Verify that your USB com driver is installed by going to Device Manager and checking for the Prolific USB to GPIO Com Port entry. Right click on the entry, then Properties, select the Driver tab and verify that the driver is dated 7/12/2018 or later. If the driver is out of date, connect to the Internet and click the Update Driver button. Please note that an out of date driver may allow the AR-12MF to partially function and/or with erratic operation. When installing on a Windows 7 or 8.1 computer, it may be necessary to install the Com driver that is supplied on your installation CD due to the 2019 Windows security requirements (be sure to un-install existing Prolific driver).

**(2)** Verify that the Prolific USB to GPIO Com Port entry is the com port used by your AR-12MF. You may do this by watching the entry in Device Manager and unplugging your AR-12MF from your computer USB port. The entry should disappear and then re-appear when you plug the AR-12MF back in to your computer USB port. Always reconnect to the same USB port or a different com port will be assigned.

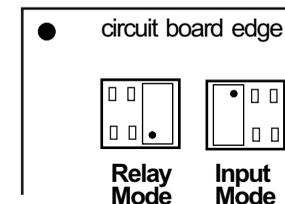
**(3)** If you are using a direct connect relay card, verify that the 5V power shunts are in place (see page 2). The shunts should be set to ON if you are powering the relays from your USB port. Verify that the relay card that you are using has 5V relay coils (shown on top of each relay) when powering from USB. Shunts must be removed when powering from 12 volts or external 5 volts. Verify that you are supplying 12VDC to the relay card when the relay card is connected via ribbon cable (relays will show 12VDC on top). A multi-meter may be used to measure the voltage and for the correct polarity.

**(4)** Try replacing the USB cable and/or using a different USB port.

**(5)** Verify that the AR-12MF Device Driver is correctly installed and loaded. Click the blue 12 icon in your system tray (bottom right) and check for the correct com port setting (should show the correct com port open). If the window below the COM indicator shows "COM Not Found!" then a com port issue is the problem (check for another program that may be using the com port.). You may right click the taskbar at the bottom of your screen, then Task Manager to view running applications.

**(6)** Remove the AR-12MF USB cable from your computer, wait 15 seconds and plug back in. Open the AR-12MF User Interface by clicking on the blue 12 icon in your system tray and double click on the blue EECI logo to reset the com port. You should see a reset message followed by a COM open indication. Click Setup and uncheck "Allow External Commands". If this corrects the issue that you are experiencing then an external application is the problem.

#### USING THE AR-12MF INPUT MODE



Each channel may be set independently for input mode or to control a relay. Channel numbers are located next to the 8 pin sockets.

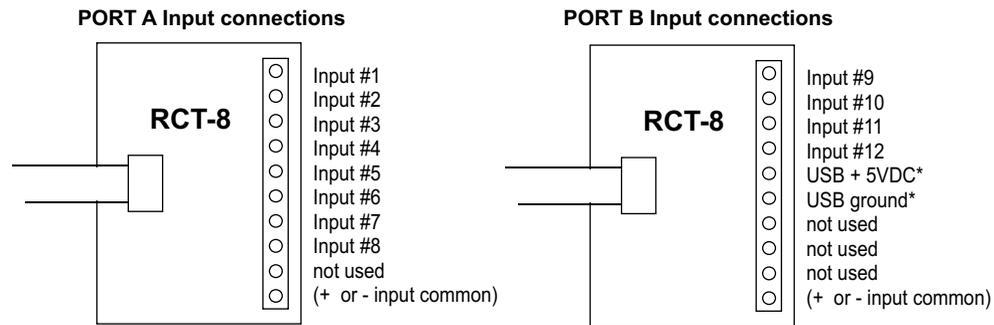
Inputs are turned on with a voltage input or contact closure. The default voltage input range is 3.3 volt up to 18 volts. Any voltage within this range will turn on the input as long as a minimum of 1.5ma is supplied. The voltage may be AC or DC and may have a common (+) or a common (-). Other voltage ranges are available.

A channel is set to relay/output mode by placing the opto coupler on the right side of the 8 pin socket with the dot on the opto coupler away from the edge of the circuit board (as shown above).

A channel is set to input mode by placing the opto coupler on the left side of the 8 pin socket with the dot on the opto coupler closest to the circuit board edge.

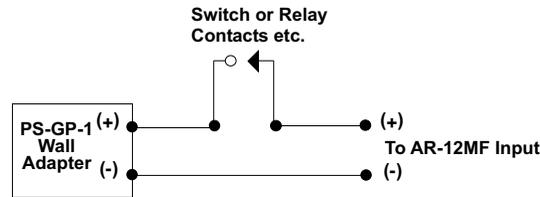
When using the dual I/O mode, all opto couplers should be left in the relay mode position (output).

### USING THE AR-12MF INPUT MODE (continued)



Note: An RCT-16 terminal block may be used in place of (2) RCT-8 \*power feed shunts must be on (see page 2)  
 Port A and Port B header connector pin outs are shown on page 12

The PS-GP-1 wall adapter (or other power source) may be used to monitor for a contact closure (shown below). The 5 volt USB power feed on Port B may also be used, but it is best to maintain electrical isolation from the USB port to protect your computer and the AR-12MF.



### USING THE OPTIONAL AR-12MF DUAL I/O MODE

The dual I/O port permits the AR-12M to be switched back and forth from relay mode to input mode from software. This switching can occur at a very high rate if needed for I/O devices. The inputs are no longer connected via Ports A and B so that relays or outputs may remain connected to these Ports. Inputs are connected to the 14 pin header in the middle (between Port A and Port B). An auxiliary card with opto isolators and a 14 position terminal block is attached to the 14 pin header to allow the inputs to be connected.

The dual I/O port is useful in security applications where a manual door opener device is used to unlock a door (by energizing an AR-12MF relay) while at the same time logging the event using the same AR-12MF channel switched to input mode (or other types of scenarios). Please contact EECl technical support for more information.

### USING THE AR-12MF OUTPUT MODE

The AR-12MF outputs have a photo transistor output that is capable of directly driving LEDs, solid state relays, small reed relays and other devices that require 100mW or less of power to operate (use the RCT-8 terminal block to connect, see page 12). The maximum voltage that may be applied to pin 9 on Ports A or B is 48 volts DC. The maximum allowed current through the photo transistor must be limited to 20ma at 5 volt, 10ma at 10 volts, 5ma at 20 volts and lower at higher voltages (ratio metrically). A variety of relay cards and relays are available for connection to the AR-12MF outputs. The RYD-8 driver card may be used to directly power devices that require more than the 100mW that the photo transistors allow. The RYD-8 may be used to control large power relays, contactors or other devices that draw up to 3 amps or less. See page 2 or 5 for the opto isolator position for output (relay mode).

### THE AR-12MF USER INTERFACE



The AR-12MF User Interface allows you to set all of the basic operating characteristics of the hardware and permits the AR-12MF to send and receive data from other Windows applications or programs that you create.

When the device driver is loaded for the first time you are prompted for the com port that is to be used with the AR-12MF. This com port number is saved in the settings file "ar12mf-set.ini" which is created in the folder c:\eeci\ar-12mf. The user interface will then open using the com port assigned. The com port indicator should have a "COM Open" message as shown to the left with the correct com port shown. The com port may be changed by clicking the Setup button and changing the com number in the Com Port window and clicking Apply.

You can manually set the state of the relays by clicking on the relay buttons. The button will turn red when the relay is energized and will turn green when the relay is de-energized. Clicking a relay button with that channel set to input mode will turn off input mode and force that channel into relay mode. The button names may be changed using Setup. The four boxes below the com indicator show the outgoing relay control bytes for use with external Windows applications. The box on the top left shows the byte for relays 1 thru 8 and the box on the top right shows the byte for relays 9 thru 12. The box on the bottom left shows the byte for inputs 1 thru 8 enable and the box on the bottom right shows the byte for inputs 9 thru 12 enable.

Clicking the Setup button allows you to set the input enable for each of the 12 channels. Checking the box for an input sets that channel to input mode (opto isolator must be in the input position if the dual I/O port is not in use - see page 2 and 5). The com port, baud rate and sampling rate settings are changed below. Un-checking the Allow External Commands box will prevent other Windows applications from sending or receiving data from the AR-12MF. A password protected version of the AR-12MF Software Interface is available. Please contact technical support for more information.

The AR-12MF may be started in "driver only mode" by checking the Start Minimized box. Any changes made to Setup will not take effect until you click the Apply button. Clicking the Apply button saves the new settings to the ar12mf-set.ini file so that if the device driver is unloaded, it will restart with all the new settings. Click the Tray button to close the user interface after the AR-12MF is set-up for

your application. A blue 12 icon will appear in your system tray (click to re-open the user interface). The AR-12MF may be completely shut down by clicking the Unload Driver button. Once shut down, you will need to double click the AR-12MF desktop icon to re-load the AR-12MF device driver. The Help button will provide additional assistance if you installed the Help files from the AR-12MF installation CD.

## AR-12MF CONTROL SOFTWARE

The software control interface uses just 6 bytes to send and receive data to and from the AR-12MF. Two bytes are used for relay control, two bytes are used for input enable control and 2 bytes are used for monitoring inputs. Shown below is a description of these control bytes:

**RELAY BYTE 1:** **00110101** controls Relays 1 thru 8

bit 7  
bit 0  
relay 8  
relay 1

The above byte shows relays 1, 3, 5 and 6 energized with a decimal equivalent of 53.  
To energize all 8 relays, set all bits to 1 (decimal equivalent of 255).  
To de-energize all 8 relays, set all bits to 0 (decimal equivalent 0).

**RELAY BYTE 2:** **00001111** controls Relays 9 thru 12

The above byte shows all 4 relays energized, bits 4 to 7 are not used (decimal equivalent 15).

**INPUT ENABLE BYTE 1:** **11000100** sets channels 1 thru 8 to Input Mode

The above byte shows inputs 3, 7 and 8 enabled with a decimal equivalent of 196.

**INPUT ENABLE BYTE 2:** **00000110** sets channels 9 thru 12 to Input Mode

The above byte shows inputs 10 and 11 enabled, bits 4 to 7 are not used (decimal equivalent 6).

**INPUT BYTE 1:** **00110001** provides state of Inputs 1 thru 8

The above byte shows inputs 1, 5 and 6 turned on (decimal equivalent 49).

**INPUT BYTE 2:** **00001100** provides state of Inputs 9 thru 12

The above byte shows inputs 11 and 12 turned on, bits 4 to 7 are not used (decimal equivalent 12).

The AR-12MF relays are controlled by sending Relay Byte 1 and/or Relay Byte 2 to AR-12MF memory.

The AR-12MF channels are switched to Input Mode or Relay Mode by sending Input Enable Byte 1 and/or Input Enable Byte 2 to AR-12MF memory.

These 4 control bytes (Relay and Input Enable) may be sent one at a time or all four and in any sequence.

The state of the AR-12MF inputs are determined by reading one or both of the Input Bytes. Bits set high indicate that the input is on.

The update rate of the relay/outputs and/or inputs are set in the AR-12MF User Interface by clicking the Setup button, entering the Sample Rate and clicking Apply. The default rate is 200ms (5 times per second). The Allow External Commands box in Setup must be checked in order for other applications to interact with the AR-12MF.

Shown on the following page are several examples for use with the Microsoft .Net Framework. These examples will run in all versions of Visual Studio including Visual Studio Express. The AR-12MF is most widely used with Microsoft Visual Studio and the programming languages Visual Basic, Visual C#, Visual C++ or ASP.Net which are the source codes that the AR-12MF software interface has been developed around. The AR-12MF software examples are available in several other variations which may be more suitable for alternate programming languages. Please contact EECI technical support for more information.

## SIMPLE PROGRAMING EXAMPLE IN MICROSOFT VISUAL BASIC .NET

### AR-12MF Relay Control Example

To use this example in Visual Basic, copy the code module (supplied on your CD) to a sub called setRelay(). From the toolbox drag two buttons and a textbox to your form. Insert the following code into the button click subs. One button will energize the relay number that you enter into the textbox. The other button will de-energize the relay.

```
Private Sub Button1_Click(sender As Object, e As EventArgs) Handles Button1.Click
    relay = Int(Val(TextBox1.Text)) 'set variable relay to an integer 1 to 12
    If relay > 0 And relay < 13 Then setRelay() 'set AR-12MF relay - energize relay
End Sub
```

```
Private Sub Button2_Click(sender As Object, e As EventArgs) Handles Button2.Click
    relay = Int(Val(TextBox1.Text)) + 12 'set variable relay to an integer 13 to 24
    If relay > 12 And relay < 25 Then setRelay() 'set AR-12MF relay - de-energize relay
End Sub
```

### AR-12MF Input example

To use this example in Visual Basic, copy the code module (supplied on your CD) to a sub called readInputs(). From the toolbox, drag (12) labels and a timer control to your form. Insert the following code into the timer sub. The state of the (12) AR-12MF inputs are displayed in labels 1 through 12.

```
Private Sub Timer1_Tick(sender As Object, e As EventArgs) Handles Timer1.Tick
    readInputs()

    If inputs <> inputByte(0) Then 'have inputs changed?
        Z = 1 'select bit 0 (first byte)
        For W = 1 To 8
            B = inputByte(0) And Z 'check bit
            If B > 0 Then MyLabelArray(W).Text = "1" Else MyLabelArray(W).Text = "0" 'bit set?
            Z = Z * 2 'advance to next bit
        Next W
        inputs = inputByte(0) 'input states 1 to 8 are stored in inputByte(0)
    End If

    If inputs2 <> inputByte(1) Then 'have inputs changed?
        Z = 1 'select bit 0 (second byte)
        For W = 1 To 4
            B = inputByte(1) And Z 'check bit
            If B > 0 Then MyLabelArray(W + 8).Text = "1" Else MyLabelArray(W + 8).Text = "0" 'bit set?
            Z = Z * 2 'advance to next bit
        Next W
        inputs2 = inputByte(1) 'input states 9 to 12 are stored in inputByte(1)
    End If
End Sub
```

## SIMPLE PROGRAMING EXAMPLE IN MICROSOFT C# .NET

### AR-12MF Relay Control Example

To use this example in Visual C#, copy the code module (supplied on your CD) to a sub called set\_relay(). From the toolbox drag two buttons and a textbox to your form. Insert the following code into the button click subs. One button will energize the relay number that you enter into the textbox. The other button will de-energize the relay.

```
private void button1_Click(object sender, EventArgs e)
{
    relayNumber = Convert.ToInt32(textBox1.Text);
    relayByte = relayByte |= 1 << relayNumber-1;    //set relay bit
    set_relay();    //energize relay
}

private void button2_Click(object sender, EventArgs e)
{
    relayNumber = Convert.ToInt32(textBox1.Text);
    relayByte = relayByte &= ~(1 << relayNumber-1);    //clear relay bit
    set_relay();    //de-energize relay
}
```

### AR-12MF Input example

To use this example in Visual C#, copy the code module (supplied on your CD) to a sub called read\_inputs(). From the toolbox, drag (12) labels and a timer control to your form. Insert the following code into the timer sub. The state of the (12) AR-12MF inputs are displayed in labels 1 through 12.

```
private void timer1_Tick(object sender, EventArgs e)
{
    read_inputs();    //collect the status of inputs from the AR-12MF

    bitOfByte = 0;    //set to input 1
    check_bit();    //determine if input bit is set
    if (bit == true){
        label1.Text = "1";    //display input state
    }
    else {
        label1.Text = "0";
    }

    bitOfByte = 1;    //set to input 2
    check_bit();
    if (bit == true)
    {
        label2.Text = "1";
    }
    else
    {
        label2.Text = "0";
    }
}

private void check_bit()
{
    bit = (inputByte[0] & (1 << bitOfByte)) != 0;    //determine if bit is set - bit 0 to 7 - result bool
}
```

## RELAY RESPONSE SPEED

The speed at which the relays respond to a software command is directly related the baud rate setting of the AR-12MF and the sample rate set in the AR-12MF user interface. The higher the baud rate setting, the faster a relay (or group of relays) will respond to software transmissions. The default setting of 115,200 baud will allow your software to energize and de-energize groups of relays almost instantly when the sample rate is set to 50 ms (located in the AR-12MF User Interface Settings).

## AUTO START-UP FOR THE AR-12MF DEVICE DRIVER

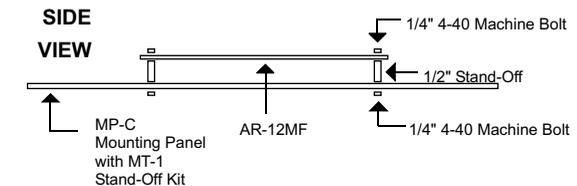
By default, the AR-12MF device driver is only loaded on demand to conserve system resources. You may install the AR-12MF device driver permanently by checking the "Driver Only" check box under Setup in the AR-12MF User Interface. The "Driver Only" check box should not be checked unless the AR-12MF is connected at all times. You will then always see the AR-12MF system icon in your system tray\* along with the other system devices (such as your speaker, printer or display adapter). Click the blue 12 icon in your system tray to open the AR-12MF User Interface. If the AR-12MF device driver is not installed permanently, you will need to double click the AR-12MF desktop icon to load the AR-12MF device driver in order to use the AR-12MF Relay Interface.

\*you may need to expand the arrow in your system tray to see all the icons (the tray is the row of icons on the lower right of your screen, next to your clock)

When the AR-12MF is first powered, the relays which are connected will normally power-up in a de-energised state. It is possible under certain conditions (such as fluctuating power) that the relays may power-up in a random state (several relays may energize, while others may not). Your program should reset all the relays to a known state when your program is first started.

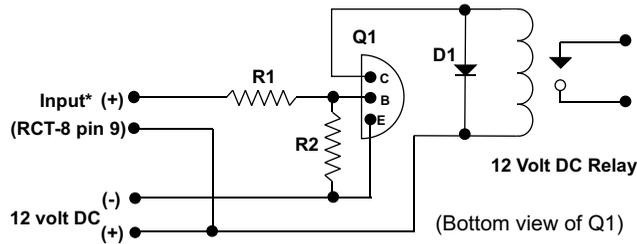
## MOUNTING

The AR-12MF Multi-Function Relay Interface card may be mounted in an enclosure or on a metal mounting panel using the MT-1 stand-off mounting hardware as shown below. The AR-12MF will attach to the 4 stand-off spacers using 4-40 machine screws (4 mounting holes are provided on the AR-12MF). Contact technical support for more information on mounting panels and various mounting layouts.



### RELAY INTERFACING

In the event that you wish to use existing control relays with the AR-12MF, you may use the RYD-8 relay driver card or construct a relay driver circuit as shown below. The voltage and current output of the relay output port is too low for most relays (with the exception of some types of solid state relays and reed relays). We recommend the use of the following circuit to drive most types of mechanical and reed relays with 12 volt DC coils (200 MA maximum).

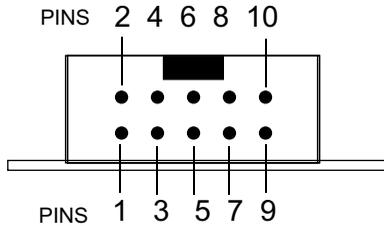


#### PARTS LIST

- (Q1) NPN Transistor...MPS6560 or (Radio Shack 276-2009)
- (D1) Diode.....1N4148 or (Radio Shack 276-1122)
- (R1, R2) Resistor.....3K, 33K (Radio Shack 271-1328, 1341)
- (Relay) Radio Shack 275-214, 275-206, 275-233 or equivalent

\*connect to opto isolator output from the AR-8MF using the RCT-8 (pin 9 is common)

#### PORT A HEADER CONNECTOR PIN-OUT



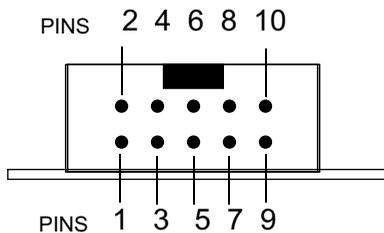
HEADER PIN-OUT FOR PORT A ON THE AR-12MF

NOTE: Key notch is on top. View is looking into header pins.

#### PIN CONNECTIONS

- (1) Relay #1 or Input #1
- (2) Relay #2 or Input #2
- (3) Relay #3 or Input #3
- (4) Relay #4 or Input #4
- (5) Relay #5 or Input #5
- (6) Relay #6 or Input #6
- (7) Relay #7 or Input #7
- (8) Relay #8 or Input #8
- (9) Opto (+) (used for relay control only)
- (10) Signal Common (used for inputs only)

#### PORT B HEADER CONNECTOR PIN-OUT



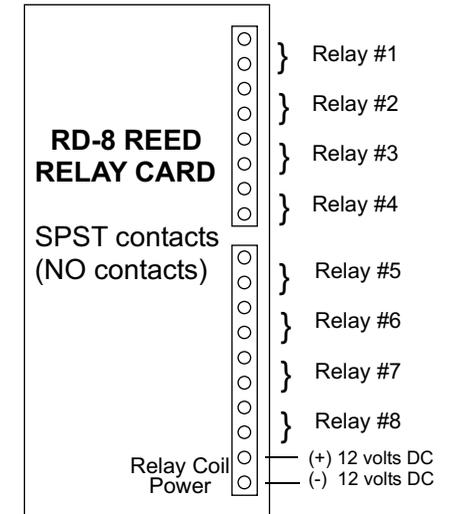
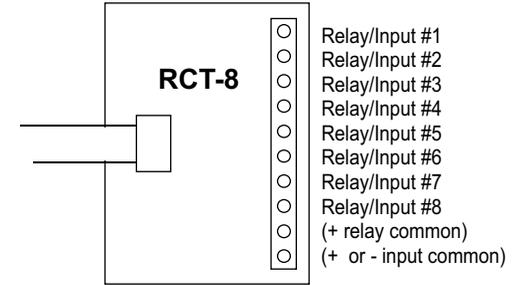
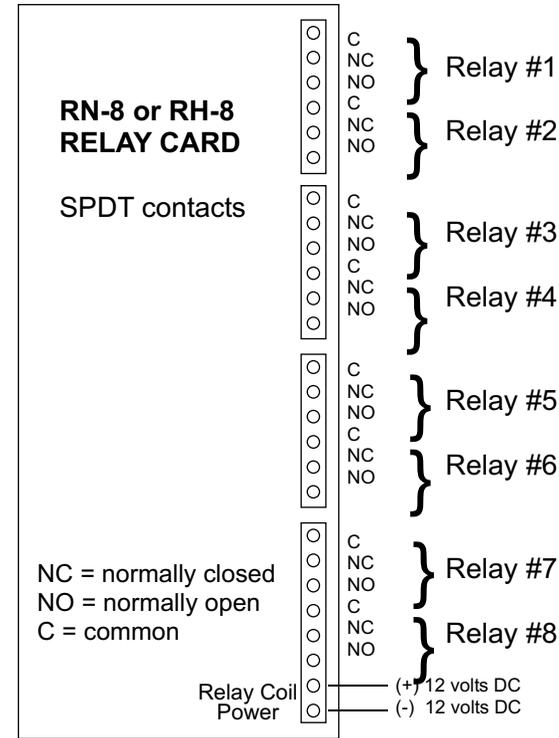
HEADER PIN-OUT FOR PORT B ON THE AR-12MF

NOTE: Key notch is on top. View is looking into header pins.

#### PIN CONNECTIONS

- (1) Relay #9 or Input #9
  - (2) Relay #10 or Input #10
  - (3) Relay #11 or Input #11
  - (4) Relay #12 or Input #12
  - (5) USB 5 VDC (+) Power Feed\*
  - (6) USB 5 VDC (-) Power Feed\*
  - (7) no connection
  - (8) no connection
  - (9) Opto (+) (used for relay control only)
  - (10) Signal Common (used for inputs only)
- \*power shunts must be set (see page 2)

### CONNECTION DIAGRAMS FOR RELAY CARDS AND RCT-8



#### SPECIFICATIONS RH-8 RELAY CARD

- Size..... 2.75" by 6"
- Weight..... 8 ounces
- Number of Relays..... 8
- Contact rating (AC)..... 12 amp 250 VAC
- Contact rating (tungsten)..... 3 amp 360 watt
- Contact rating (DC)..... 12 amp 24 VDC
- Contact rating (horsepower)... 1/3 HP 240 VAC
- Contacts..... SPDT
- Power requirements..... 12 volts DC 500ma
- Terminal block rating..... 125 volts
- Optional heavy duty block..... 250 volts

#### SPECIFICATIONS RD-8 REED RELAY CARD

- Size..... 2.25" by 4.875"
- Weight..... 3.5 ounces
- Number of relays..... 8
- Contact rating (DC)..... 10 VA 200 VDC
- Contact rating (AC)..... 10 VA 200 V peak
- Max switching current..... 1/2 amp
- Contacts..... SPST
- Power requirements..... 12 Volts DC 200ma
- Terminal block rating..... 125 volts
- Optional heavy duty block..... 200 volts

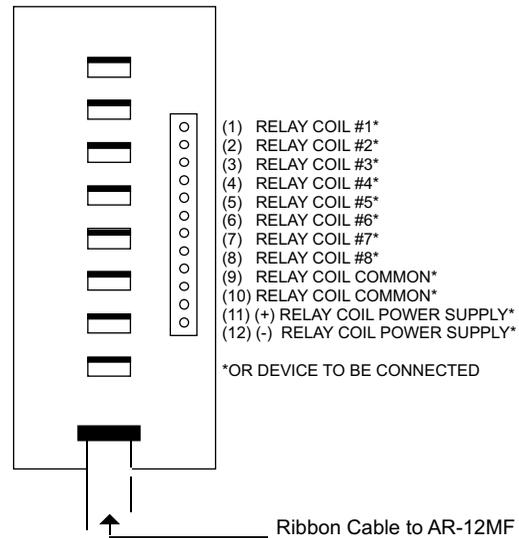
## CONNECTION OF THE RYD-8 TO THE AR-12MF

### SPECIFICATIONS RYD-8 RELAY DRIVER CARD

Size..... 2.25" by 4.875"  
 Weight..... 2.5 ounces  
 Relay Outputs..... 8  
 Maximum current rating..... 3 amp (requires heat sinks above 1.5 amps)  
 Input voltage range..... 5 to 48 volts DC (voltage must match relay coil requirement)

**DESCRIPTION:** The RYD-8 relay driver card provides (8) relay drivers for connection directly to relay coils, contactor coils or other devices (such as motors, lamps, solenoids, etc.). The ribbon cable provided with the RYD-8 will connect directly to a relay output port on the AR-12MF Interface which allows the RYD-8 relay driver to provide software control of the relay or device to be connected to the terminal block on the RYD-8. The RYD-8 relay driver card will power relays or other devices which require 3 amps or less and operate within the voltage range of 5 to 48 volts DC. The output voltage of the RYD-8 (for powering the relay coil or device) is equal to the RYD-8 power input which is applied to terminals (11) and (12) on the RYD-8 terminal block. All eight relay coils (or other devices which are connected to the RYD-8) must operate at the same voltage and must operate at the voltage that is applied to terminals (11) and (12) on the RYD-8 terminal block.

### RYD-8 CONNECTION DIAGRAM



One side of the relay coil of each relay must be connected to one of the relay common terminals (two terminals are provided for all eight relays, terminal #9 and terminal #10).

ALL EIGHT RELAY COILS (or connected device) MUST OPERATE AT THE SAME VOLTAGE.

**HEAT SINKS:** Heat sinks should be installed on the power transistors on the RYD-8 relay driver card if the relay coil or the device to be connected requires more than 1.5 amps continuous (or 5 watts). A heat sink kit is available for this purpose (specify RYD-8 heat sink kit). Please contact technical support for additional information.

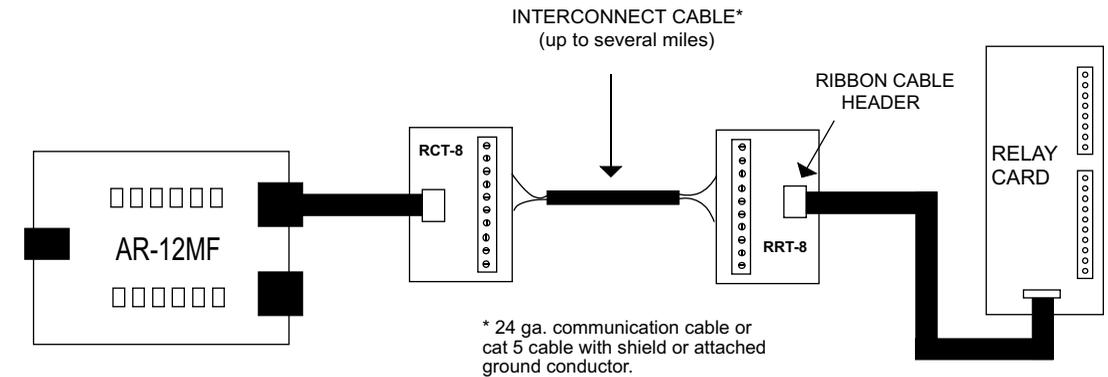
Relays or devices connected to the RYD-8 may be located up to several miles from the RYD-8. The only limiting factor is the voltage drop in the relay interconnect wire. A number of different types of relays with various contact configurations are available for connection to the RYD-8. Contact technical support for more information.

The ribbon cable on the RYD-8 may be connected to any of the relay output ports on the AR-12MF (in the same manner as the relay cards are connected).

### REMOTE CONNECTION OF RELAY CARDS OR RELAY DRIVER CARDS

Relay cards may be located up to several miles away from the AR-12MF. Plug the RCT-8 or RCT-16 into Port A and/or Port B of the AR-12MF. The remote relay card may then be connected to the RCT-8 using low cost 24 gauge 6 pair communication cable, cat 5 network cable or other types of cable. The RCT-8, RCT-16 terminal blocks or RCP-8 (DB-9 connector) ribbon cable adapters should be used at the AR-12MF for connection to the interconnect cable (see illustration on page 17). Relay cards may be ordered with a header in place of the ribbon cable or the RRT-8 or RRT-16 terminal blocks may be used to make the connection to the interconnect cable. The relay card ribbon connector may be replaced with a DB-9 connector in place of the header for direct connection to the interconnect cable. All relay cards are available with header sockets, RJ-45 or DB-9 connectors installed in place of the ribbon connector (specify when ordering).

The following illustration shows how relay cards or relay driver cards may be connected to the AR-12MF. The relay card or relay driver card must be powered at the remote location.



### WARRANTY AND CARE OF THE AR-12MF

The AR-12MF Relay Interface is warranted against factory defects for a period of 90 days from the date of purchase. The AR-12MF has proven to be extremely reliable in actual operation during field tests. We recommend that the AR-12MF and associated hardware be installed in a suitable enclosure (4 mounting holes are provided on the circuit board) and that reasonable precautions be taken to protect the circuit from static discharge. The most likely damage to occur is that caused by static discharge to the circuit board during handling.



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