

# **ARC-16**

## **Transmitter Remote Control System**

### **INSTALLATION & OPERATION MANUAL**

**Firmware Versions 4.6 & Above**

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*Includes Instructions for  
Enhanced Speech Interface (ESI)  
& AutoLoad Software*

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**BURK**  
TECHNOLOGY

**ARC-16 Installation & Operation Manual**  
Revision B (September 2004)

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# Contents

- Warranty.....vii
- New In Firmware 5.6 .....viii
- Firmware Compatability .....ix
- Chapter 1: Introduction ..... 1**
  - Contacting Burk Technology..... 1
  - Unpacking.....2
  - System Overview ..... 2
    - ARC-16 Configurations .....2
    - Expanding Channel Capacity..... 4
    - Metering, Status and Command Channels ..... 4
    - Link Options..... 5
    - Computer Control ..... 5
    - AutoLoad..... 5
    - Telephone Control..... 6
  - Front Panel Switches And Indicators ..... 6
  - Rear Panel Connections ..... 8
  - Surge Protection And Battery Backup Power Supply ..... 9
  - Important Safety Information ..... 9
  - Getting The Most From Your ARC-16..... 9
    - IP-8 Interface Panel..... 9
    - ARC-16 Options ..... 9
    - Communication Hardware ..... 11
- Chapter 2: Front Panel Configuration And Channel Setup..... 13**
  - Setting Up A New ARC-16 System ..... 13
  - Adding A Unit Or Making Changes To An Existing System..... 13
  - Master Initialization ..... 14
    - Entering Master Initialization ..... 14
    - Master Initialization Menu ..... 14
    - Site Identifier Selection ..... 14
  - Edit Mode ..... 15
    - DATA RCVD..... 15

DATA SENT.....	16
BAUD RATE.....	16
SITE NAME.....	16
MASTER/USER PASSWORDS.....	17
HIGHEST CHANNEL.....	17
OPTIONS.....	17
<i>Logical Site Designations</i> .....	19
Mode Menus And Channel Setup.....	19
<i>Select Site</i> .....	19
<i>Limits Monitoring</i> .....	19
<i>Alarm Dial-Out and ESI Answering</i> .....	20
<i>Calibrate</i> .....	20
<i>Decimal Point</i> .....	21
<i>Low Limits / High Limits</i> .....	21
<i>Type</i> .....	21
<i>Polarity</i> .....	21
<i>Set Alarm</i> .....	22
<i>Edit Channel Labels</i> .....	22
<i>Version and Serial Number</i> .....	22
<i>Exiting the Mode Menu</i> .....	22
Expanded Configuration Menu View.....	23
<b>Chapter 3: Configuration With AutoLoad Software.....</b>	<b>25</b>
Installing AutoLoad.....	25
How To Get Help.....	26
Connecting To The ARC-16.....	26
<i>Connection Wizard</i> .....	26
<i>ARC-16 Settings (via direct connection with a null modem cable)</i> .....	27
<i>ARC-16 Settings (via parent site)</i> .....	27
<i>Connection Settings</i> .....	28
<i>Finish</i> .....	28
<i>Connect Using Saved Settings</i> .....	28
<i>Connect Using Recent Settings</i> .....	29
<i>Downloading</i> .....	29
<i>Uploading</i> .....	29
<i>Restoring Calibration Settings</i> .....	29
Configuration.....	30
<i>Local Options</i> .....	30
<i>Communication Settings</i> .....	31
<i>Channel Settings</i> .....	32
<i>ESI Settings</i> .....	33
<i>ESI Labels</i> .....	33
Saving And Opening Files.....	34
<i>Opening</i> .....	34
<i>Saving</i> .....	34

<b>Chapter 4: Installation .....</b>	<b>35</b>
Rack Installation.....	35
The Communication Link.....	35
<i>Two-Wire Circuits .....</i>	<i>36</i>
<i>Subcarrier, Four-Wire and Digital Circuits .....</i>	<i>36</i>
<i>Increasing the Baud Rate for Four-Wire Audio Links .....</i>	<i>37</i>
<i>Using Two Modems .....</i>	<i>37</i>
<i>Testing the Internal Modem Configurations .....</i>	<i>38</i>
<i>Linking the ARC-16 to a Subcarrier (STL or TRL).....</i>	<i>38</i>
I/O Channel Specifications And Wiring Considerations .....	39
Control Outputs.....	39
Metering Inputs .....	39
Status Inputs .....	40
Additional Control Outputs .....	40
Connecting Site Equipment .....	41
Using IP-8 Interface Panels.....	41
Installing An ARC-16T32 .....	42
Using an Additional ARC-16 to Expand Channel Capacity .....	44
<b>Chapter 5: Operation.....</b>	<b>45</b>
Metering And Status Channel Readings .....	45
Switching Channels.....	45
Selecting Sites .....	45
Issuing Commands .....	46
Command Durations .....	46
Data Updates After Commands are Issued.....	46
Alarm Management .....	47
Enabling Alarm Notifications .....	47
Alarm LED Indicator .....	47
Reviewing and Clearing Alarms .....	47
Disabling Alarm Notification .....	48
Alarm Delays.....	48
Calibration.....	48
Maintenance Mode .....	48
<b>Chapter 6: Using The Enhanced Speech Interface (ESI) .....</b>	<b>49</b>
Introduction.....	49
Installing The ESI.....	49
Connection To ESI .....	50
Telephone Connection.....	50
Audio Monitoring .....	50
Computer Connection.....	50
Lightning Protection.....	50
Configuration.....	50
Activating the ESI.....	50
Setting the Call and Answer Mode.....	50

Local Mode .....	52
Changing Passwords .....	52
Number of Rings .....	52
Label Editing .....	52
Dial-Out Telephone Number Entry.....	53
Operation.....	54
Call-Out and Answer Modes.....	54
Operating Tips .....	54
Calling the ESI.....	55
Site Selection .....	55
Meter Readings and Issuing Commands .....	55
Alarm Reporting.....	56
Status Reporting.....	56
Limits Monitoring .....	57
Audio Monitoring.....	57
Disconnecting a Call.....	57
Diagnostics .....	58
Command List .....	59
Vocabulary List.....	60
<b>Chapter 7: Installing New Hardware Options.....</b>	<b>63</b>
Computer Interface (CI).....	64
Enhanced Speech Interface (ESI) .....	65
Universal Modem (RMS/RMT).....	66
Wire Modem (WMS/WMT) .....	67
Studio I/O (SIO) .....	67
Studio Status Indicator (SSI) .....	68
Installing a Second Wire or Universal Modem.....	70
<b>Appendix A: Specifications .....</b>	<b>73</b>
<b>Appendix B: Pinouts .....</b>	<b>75</b>
Null Modem Cable .....	75
Analog/Status Inputs.....	76
Control Outputs.....	77
<b>Appendix C: Modifying the ESI for Firmware Version 5.4.....</b>	<b>79</b>
<b>Appendix D: Modifying Your ARC-16 To Operate At 1200 Baud .....</b>	<b>81</b>
<b>Appendix E: Troubleshooting .....</b>	<b>83</b>
Troubleshooting Chart .....	83
Spare Parts Kits .....	86
ARC-16 I/O Board Rev 1 Spare Parts Kit .....	86
ARC-16 I/O Board Spare Parts Kit .....	86
ARC-16 CPU Spare Parts Kit (CPU-A only) .....	87

## **WARRANTY**

Burk Technology, Inc. warrants the ARC-16 Transmitter Remote Control System to be free of defects in materials and workmanship for a period of 24 months from the date of purchase. Equipment will be repaired or replaced at the option of Burk Technology and returned freight prepaid to the customer. Damage due to abuse or improper operation or installation of the equipment or caused by fire or flood or harsh environment is not to be covered by this warranty. Damage in shipping is not the responsibility of Burk Technology. A return authorization must be obtained before returning any equipment. Materials returned under this warranty must be shipped freight prepaid and insured in the original shipping carton or suitable substitute to Burk Technology, Inc., 7 Beaver Brook Road, Littleton, MA 01460. Repairs not covered under this warranty will be made at prevailing shop rates established by Burk Technology.

THE WARRANTY SET FORTH ABOVE IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. BURK TECHNOLOGY SHALL NOT BE LIABLE TO ANY PARTY FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES ARISING FROM THE USE OF THIS EQUIPMENT.

## NEW IN FIRMWARE VERSION 5.6

Version 5.6 firmware introduces several improvements to the features supported in previous versions:

- **Eight times as fast**  
The ARC-16 now supports 1200, 2400, 4800 and 9600 baud rates for digital links, resulting in faster data updates from remote sites. Audio and subcarrier links are still supported at 300 baud.
- **Improved handling of remote command durations and alarm delays**  
Now, commands issued from an ESI always respond to the specified command duration, regardless of the location of the ESI. Alarm delays no longer cause repeat alarm notifications once the alarm has been cleared.
- **Updated configuration menus**  
Firmware 5.6 automatically sends outgoing data on both communication ports, eliminating the need for a DATA SENT OUT setting and avoiding configuration errors. Both communication ports are active in firmware version 5.6, so the 2 PORTS setting is no longer needed.
- **New AutoLoad 2.1 software**  
AutoLoad 2.1 software was released for use with firmware version 5.6, and is included with all version 5.6 shipments. It is also available for download on the Burk Technology web site. AutoLoad 2.1 can be used with firmware versions 5.4, 5.5 and 5.6. AutoLoad 2.0 may still be used with ARC-16 firmware versions 5.4 and 5.5.

*IMPORTANT! Firmware version 5.6 is for use with revision B of the ARC-16 CPU (CPU-B). If you are currently using firmware version 5.4 or below, your ARC-16 has the original CPU. The upgraded CPU is included when you order the 5.6 firmware upgrade package.*

## FIRMWARE COMPATABILITY

The ARC-16 internal programming is stored in firmware, on a replaceable EPROM. ARC-16 firmware is issued in series, and different versions within the same series are compatible with one another. The firmware series is identified by the first digit in the firmware version. For example, firmware versions 5.0, 5.1, 5.2, and all 5.x versions are considered 5-series firmware.

Within the same series, there may be some operational differences between versions that affect how a unit with one version will communicate with another, and with software options. The firmware compatibility chart below shows compatibility considerations for firmware versions back to version 4.6. For firmware versions previous to version 4.6, contact Burk Technology for upgrade information.

Firmware Version	Firmware Compatability	Software Compatability*	Available Baud Rates
4.6	All 4-series firmware versions	CDL/AutoPilot (DOS) version 4.6	300 baud
5.0-5.3	All 5-series firmware versions	CDL/AutoPilot (DOS) version 5.4 AutoPilot 2.x (Windows)	300 baud 1200 baud (digital) <i>1200 baud supported only by 5.3 and requires CPU baud rate modification</i>
5.4-5.5	All 5-series firmware versions <i>For remote command durations and alarm delays, the unit receiving the command or registering the alarm must run firmware 5.4 or higher. Only units running firmware 5.4. or higher support AutoLoad configuration.</i>	CDL/AutoPilot (DOS) version 5.4 AutoPilot 2.x (Windows) AutoLoad 2.x (Windows)	300 baud (audio links) 1200 baud (digital) <i>Version 5.4 requires CPU modification for 1200 baud</i>
5.6	All 5-series firmware versions	CDL/AutoPilot (DOS) version 5.4 AutoPilot 2.x (Windows) AutoLoad 2.1 or later (Windows)	300 baud (audio links) 1200-9600 baud (digital)

\*Burk Technology encourages users to stay current with the latest versions of software. Customer Support may not be available for non-current versions, even though compatibility may be maintained.

**Note:** Standard versions of ARC-16 firmware communicate at odd parity. If the designator EP, NP or ADT appears when you advance the Mode Menu to the firmware version display, your unit uses even parity or no parity and will not communicate with new units in the system. Even parity or no parity firmware must be replaced with a standard firmware version when adding a new unit or upgrading firmware. Contact Burk Technology for more information.



# 1 Introduction

The ARC-16 transmitter remote control system provides a reliable and expandable means of monitoring and controlling your broadcast facilities. The system is designed for flexibility, allowing monitoring and control of transmission equipment, program feeds, studio facilities, building infrastructure and other assets. Burk Technology's promise of product quality and commitment to customer satisfaction means that you can expect long-lasting benefit from your system.

## **CONTACTING BURK TECHNOLOGY**

### ***Customer Support***

A number of resources are at your disposal when you need help. An expanded troubleshooting section is included in this manual starting on page 83, and the support section of our web site at [www.burk.com](http://www.burk.com) has support tips, links to support documents, and software updates. If you need help, a dedicated customer support team is available Monday through Friday from 9AM to 5PM Eastern Time. You can reach Customer Support by phone, fax or email:

Phone: 978-486-3711  
Fax: 978-486-0081  
Email: [support@burk.com](mailto:support@burk.com)

### ***Sales***

For information on Burk Technology's complete line of transmitter remote control systems and accessories, please visit our web site at [www.burk.com](http://www.burk.com), or contact one of our sales engineers:

Phone: 800-255-8090 (Main Office)  
800-736-9165 (Kansas City)  
Fax: 978-486-0081  
Email: [sales@burk.com](mailto:sales@burk.com)

# UNPACKING

Each order includes a packing list that indicates everything included with your shipment.

With every system order, you receive:

- ARC-16 Installation and Operation Manual
- AutoLoad CD and Manual

AutoPilot® software is included on the AutoLoad CD-ROM. If you purchased AutoPilot for use with your ARC-16 system, you can use the same CD to install both AutoLoad and AutoPilot. If you have not purchased AutoPilot, you have the option to install AutoPilot software to connect to Burk Technology's demo site. See the instructions on the CD-ROM. You can purchase AutoPilot 2 through any of our dealers (a list is available on our website). Contact our sales department for more information on AutoPilot.

In addition, each ARC-16 package contains:

- ARC-16 Transmitter Remote Control Unit
- Factory Configuration Sheet
- Power Cord

The outside of each package is marked to indicate whether the box contains a Studio, Transmitter or Stand-Alone unit.

If you ordered optional items in addition to your ARC-16, they may be packed with an ARC-16 unit or shipped in a separate package. Carefully check all the packages you received against the packing list, and if anything is missing, please contact Customer Support.

All product manuals, along with the AutoLoad software, may be downloaded free from the Burk Technology web site at [www.burk.com](http://www.burk.com). If you own licenses for AutoPilot or CDL software, and need a replacement copy, you can download the software from the web site and use your existing authorization code(s).

## SYSTEM OVERVIEW

### *ARC-16 Systems*

The ARC-16 is fully scalable by allowing multiple ARC-16 units to operate within a system, and by offering the option to monitor and control an unlimited number of systems using AutoPilot software. An ARC-16 "system" consists of a group of one to four ARC-16 units independently connected to one another over a serial link. For example, the full-time ARC-16 system is comprised of one ARC-16 at the transmitter site and one at the studio location, with both connected over a data link. A system could be as simple as a single ARC-16 unit at the transmitter site with telephone control, or a more complex arrangement with multiple transmitter sites. Using AutoPilot software, an unlimited number of independent ARC-16 systems may be monitored and controlled simultaneously.

The descriptions and diagrams in the section offer an overview of how the ARC-16 can be used in your operation. Any ARC-16 can be integrated in the available configurations (additional hardware may be necessary), and the sales and support departments at Burk Technology can help you implement a new configuration should your needs change.

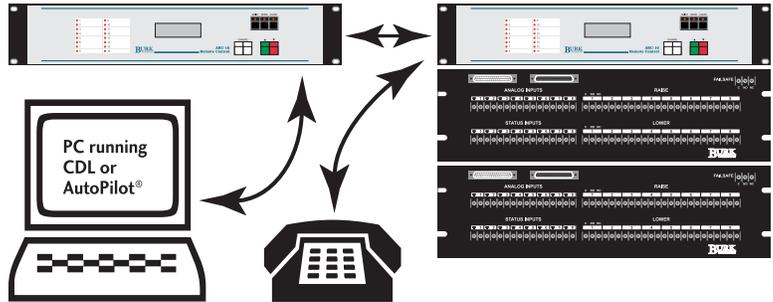
**Note:** In the diagrams, IP-8 Relay Panels are shown with each ARC-16. IP-8s are used to interface equipment wiring with the ARC-16. If an ARC-16 is not connected to any local equipment, you do not need to install an IP-8 at the location.

## ARC-16 Configurations

Up to four 16-channel ARC-16 units can be combined to form an ARC-16 system with a maximum of 64 channels – all at one site, or spread out among two, three or four. Three different configurations are possible: stand-alone, full-time and multi-site. Each of the configurations may be monitored using a PC and AutoPilot software.

### Full-Time System

With AutoPilot software, the ARC-16 operation can support an unlimited number of sites and channels. To increase channel capacity at a given location, the ARC-16T32 may be added. The T32 can be installed in systems with fewer than four existing ARC-16 units. If there are four ARC-16 units already in place, more channels can be added by creating a new single-unit ARC-16 system and linking it to the existing system with AutoPilot. The units are linked with internal modems to provide a bi-directional communication path (see page 35 for more on communication links). With the Studio Input Output option (SIO) (see page 10), the studio ARC-16 can be used to monitor and control studio equipment.



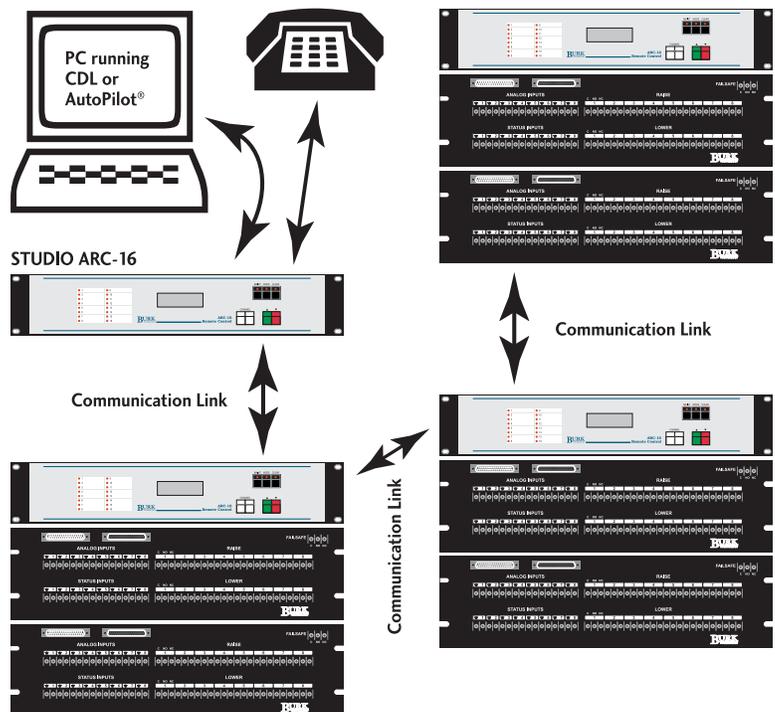
*Full-Time ARC-16 system with optional Computer Interface at the studio site for AutoPilot and AutoLoad software, and Enhanced speech interface at the transmitter site for telephone dial-up control.*

If you add another site to your operation, you can easily expand a full-time system to a multi-site system.

### Multi-Site System

The ability to link multiple sites and issue commands to all sites from the front panel of any connected unit gives the ARC-16 its multi-site control capability. An independent multi-site configuration can contain a maximum of four connected ARC-16 units. Commands may be issued from any ARC-16 unit to any other connected ARC-16, allowing site-to-site control. Multiple T32 units may be installed, to accommodate as many as 64 channels per independent system, with no limit to the number of separate systems.

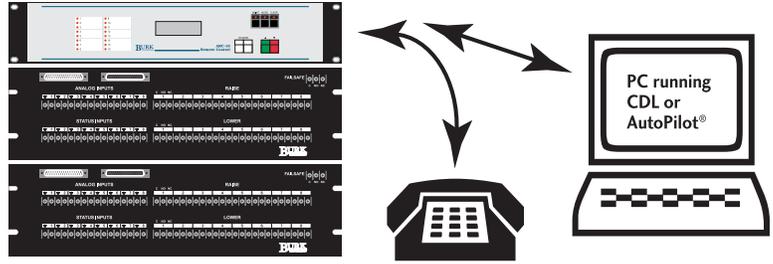
**Note:** There is a high level of flexibility for installing the ESI or CI options at locations convenient for the operators. Contact Burk Technology for more information.



*Multi-Site ARC-16 System with studio control for three transmitter sites. Optional telephone control via ESI includes Computer Interface.*

### Stand-Alone System

The basic stand-alone configuration consists of a single ARC-16 Stand Alone unit (ARC-16SA) at the remote site, equipped with an ESI Enhanced Speech Interface for dial-up telephone control over a standard telephone line. The stand-alone configuration is easily expanded to a full-time or multi-site system. When you expand a stand-alone system, the only needed hardware change to the existing ARC-16SA is purchasing and installing internal link modems. For more on the communication link, see page 35.



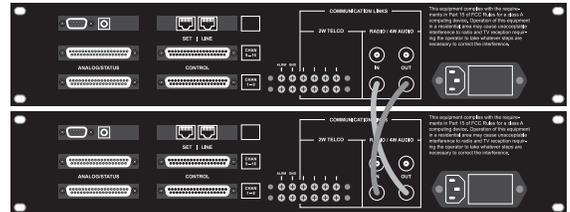
Stand-Alone ARC-16 System includes ESI for telephone control and access using optional AutoPilot software.

### Site to Site Capability

The ARC-16 features exclusive site-to-site capability, allowing users to issue commands to a remote site while they are at another remote location. For example, an operator can use the front panel of the ARC-16 to take control of a backup facility while they are at the primary location. You can even send commands to equipment at the studio location while you are at the transmitter building. Any ARC-16 in the system can communicate with all other sites, allowing maximum flexibility.

### Expanding Channel Capacity

You can expand channel capacity at any site by adding an ARC-16T32 unit. The T32 provides an additional 16 channels of metering, status and command, and it may be used in any of the site configurations above. Multiple T32 units may be installed to achieve a maximum of 64 channels in a single-site operation.



The ARC-16T32 expands channel capacity at any location.

**Note:** While each independent ARC-16 system may contain up to four units, using AutoPilot software allows you to connect an unlimited number of sites and control them centrally using a PC interface.

### Metering, Status and Command Channels

Equipment at your site is connected to the ARC-16 through sixteen channels each of metering, status and command connected to the rear panel of the unit. The equipment wiring is normally routed through IP-8 Interface Panels. The CHANNEL, RAISE and LOWER switches on the front panel of the ARC-16 are used to select channels and issue commands.

For more on channel specifications, see Chapter 4 on Installation, or refer to Appendix A.

### Metering Channels

Sixteen metering channels allow you to monitor sixteen DC samples from your transmitter or other site equipment. Values are shown on the LCD display of the ARC-16, and may also be shown on any ARC-16 in your system. The displayed value may be one of four selected types: degree/millivolt, linear, power or indirect. Typical applications for metering channels include transmitter power output, room or equipment temperature, line voltage, etc.

## Status Channels

Sixteen status inputs monitor various ON/OFF conditions. The status of each channel is displayed on the front panel status LED array. When the user selects a new site for display on the front panel LCD, the status indicators show the status for the newly selected site. The polarity of each status channel is selectable, allowing the user to determine whether the LED turns on or off when a contact closure occurs. Typical applications for status channels include monitoring antenna switches, transmitter status, overload indicators, generator status, security alarms and smoke detectors.

## Command Channels

Thirty-two outputs – designated as “raise” and “lower” for each of sixteen channels – allow control of transmitters, generators, antenna switches and other site equipment.

## Link Options

Virtually any type of link can be used to connect ARC-16 units to one another, including dedicated telco loops, STL, RS-232, telemetry return links, and FM subcarrier. Every unit for full-time or multi-site use includes modems for the appropriate type of link. If you ever change your communication link, you can easily replace the internal modems in the field. For more on the modems in the ARC-16, see page 35.

The ARC-16SA Stand-Alone system does not contain a modem for a site-to-site link. Instead, Stand-Alone units are equipped with the ESI Enhanced Speech Interface, allowing dial-up telephone control from anywhere (see Telephone Control, below). You can always add an internal modem to the ARC-16SA to make the unit part of a full-time or multi-site system.

## Computer Control

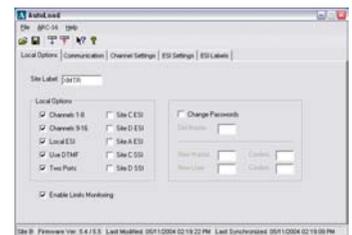
The optional AutoPilot® software provides a PC interface to an unlimited number of ARC-16 sites/systems. With AutoPilot, you can monitor conditions and issue commands just as if you were at the front panel of the ARC-16. AutoPilot also handles site logging, and can run automatic functions such as power and pattern changes, generator activation, starting a backup transmitter, etc. An ESI Enhanced Speech Interface or CI Computer Interface option is needed to run AutoPilot.



*Optional AutoPilot software provides PC-based control of an unlimited number of ARC-16 sites.*

## AutoLoad

AutoLoad is included with ARC-16s shipping with firmware version 5.4 or above. It allows users to load and edit configuration settings from a PC. With a direct or modem connection, AutoLoad can access settings on any connected ARC-16 in the system – regardless of the site link configuration. The AutoLoad CD-ROM is included with ARC-16 systems running versions 5.4 and above. You can also download AutoLoad free from the Burk Technology web site at [www.burk.com](http://www.burk.com).



*AutoLoad software is included for use with ARC-16s running firmware version 5.4 or higher. With AutoLoad and a Computer Interface, you can edit your ARC-16 configuration using a PC.*

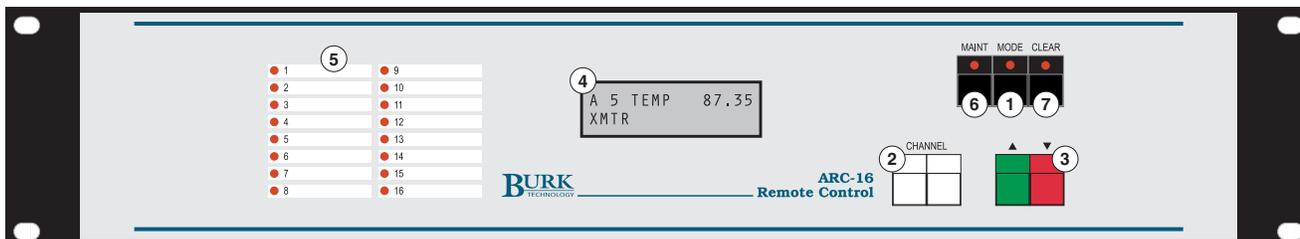
Any version of AutoLoad 2 will work with firmware versions 5.4 and 5.5. If you are using firmware version 5.6, you must use AutoLoad 2.1 or higher. AutoLoad is included on CD-ROM with new ARC-16 orders, and is available for download from the Burk Technology web site.

**Note:** If you are running firmware version 5.3 or below and would like to upgrade to a version that supports AutoLoad configuration, contact Burk Technology.

### Telephone Control

The ESI Enhanced Speech Interface provides control from anywhere via a standard touch-tone telephone. With a single phone call, you can retrieve site conditions from all your connected ARC-16 locations, as well as issue commands and receive alarm detail. The ESI ships standard with ARC-16 Stand-Alone systems, and is available as an option for full-time and multi-site configurations. Many users choose to install the ESI at the remote site and the CI at the studio site. This allows a direct computer connection at the studio, while the ESI provides a redundant connection to the transmitter site in case the link fails.

## FRONT PANEL SWITCHES AND INDICATORS



### 1. MODE Switch

The MODE switch is used to advance through the setup and configuration menus, and to select a new site to be displayed on the LCD. When you press the MODE switch and enter a menu, the MODE LED illuminates to indicate that you are outside the normal operating mode. Once inside the Mode menus, arrows appear on the LCD when appropriate to indicate the function of the CHANNEL switches (left and right) and RAISE and LOWER switches (up and down).

If you are in a configuration menu, you can press and hold the MODE switch to return to the normal operating mode.

### 2. CHANNEL Switches

In normal operating mode, the CHANNEL switches are used to select the channel to view on the LCD. In configuration modes and menus, the CHANNEL switches are used to advance the selected channel or for menu navigation. When used for menu navigation, left and right arrows appear on the LCD, along with a description of the CHANNEL switch function.

### 3. RAISE and LOWER Switches

In normal operating mode, the RAISE and LOWER switches are used to issue commands to the currently selected site and channel. The green RAISE switch (with the UP triangle) may refer to On, Raise, Advance or another similar function. The red LOWER switch (with the DOWN triangle) may refer to Off, Lower, or another function, depending on the application.

For commands to the local ARC-16 unit, pressing these switches causes the associated command output to activate for the length of time the switch is held. Starting in firmware version 5.4, commands to remote sites are active for the command duration specified in the AutoLoad software (see Chapter 3). If no duration is entered in AutoLoad, the default is 0.7 seconds. Note that even when command durations are specified in AutoLoad, front panel commands issued to the local unit will respond to the amount of time the switch is held.

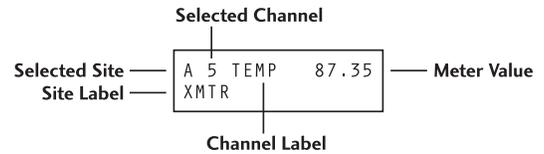
**Note:** See page 46 for more information on command durations when an ESI is in use.

**IMPORTANT!** Command durations entered in AutoLoad override the durations used in AutoPilot scripts and CDL modes.

During configuration, the RAISE and LOWER switches are used to select responses in the configuration menus. Up and down arrows appear on the LCD to indicate the function of the RAISE and LOWER switches.

#### 4. LCD Display

The 32-character LCD displays the currently selected site and channel, along with the real-time metering value for that channel. The second line of the display shows the site name. When you enter another operating mode by pressing the MODE switch (see Chapter 2), the LCD guides you through the Operating Mode menus.



In an ARC-16 unit with an ESI installed, a number between 1 and 11 will appear at the bottom left of the LCD when then ESI is in use. This notifies operators that the ESI is currently in operation, and the number corresponds to a diagnostic condition (see page 58).

**Note:** If no label has been set up for a particular display parameter, dashes will appear in place of the label.

#### 5. Status LEDs

Sixteen LEDs on the left side of the front panel display the state of the status inputs connected to the currently selected site. Each LED is labeled by channel number, and a space is provided to identify the function of each LED.

**Note:** The ON and OFF indication for each LED is governed by the status channel's polarity. Normal polarity is standard for each channel, which results in a lit LED when the status input closes to ground. Inverted polarity may be selected (see page 21) to cause the LED to turn off only when a contact closure occurs.

If all of the status LEDs blink rapidly, it is an indication that the ARC-16 is unable to connect to the site selected on the front panel. See Appendix E for troubleshooting.

#### 6. MAINT Switch

The MAINT switch is used to put the local unit into Maintenance Mode. Maintenance Mode disables remote commands so that an operator may safely perform work on equipment connected to the ARC-16. Maintenance Mode also overrides the failsafe output, so that the transmitter may be operated while maintenance personnel are on site. (For more on Maintenance Mode, see page 48). The MAINT LED illuminates when the unit selected on the front panel is in Maintenance Mode.

**Note:** When you select a remote site that is currently in Maintenance Mode, the MAINT LED on the local unit will illuminate as an indication. Pressing the MAINT switch on the local unit will not change the Maintenance Mode status at the remote site. For safety reasons, Maintenance Mode cannot be controlled remotely.

#### 7. CLEAR Switch

The CLEAR switch is used to acknowledge alarm conditions and display active alarm conditions on the LCD. Each press of the CLEAR switch will clear the current alarm and display the next pending alarm condition on the LCD. The ARC-16 will store up to ten of the most recent alarm conditions.

**Note:** Each ARC-16 maintains its own alarm stack. Clearing an alarm on the studio unit does not clear the alarm on the transmitter unit.

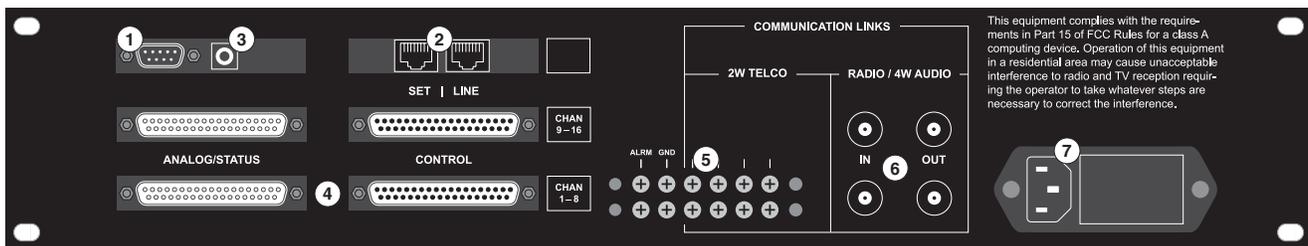
If you are in a configuration menu, you can press the CLEAR switch to return to the normal operating mode.

## REAR PANEL CONNECTIONS

New ARC-16 systems ship with all hardware options installed as ordered. The illustration below shows a current production ARC-16 with two I/O boards, two Universal Modems, and an ESI installed. ARC-16s configured differently may have fewer connectors, and they may appear in different locations. For example, if no I/O boards are installed but an ESI is present, the DB9 port and RJ-11 jacks will appear in the bottom row of connectors instead of in the top row, as pictured. The connector labels may differ in units that are several years old.

**Note:** When ARC-16s ship with unused rear panel slots, Burk Technology installs slot covers. To order new or replacement slot covers, please contact Burk Technology.

If you are installing new hardware options to an existing ARC-16 unit, refer to **Chapter 8** for instructions.



### 1. DB9 or DB25 connector (For ESI or CI)

When an ESI or CI is installed in the ARC-16 unit, the rear panel is equipped with a DB9 or DB25 connector, respectively. The connector accepts a null modem cable to establish a computer connection for CDL, AutoLoad or AutoPilot software.

**Note:** The DB9 or DB25 connector is independent from the communication link. Digital inputs and outputs must be connected using the BNC connectors and Universal Modems, not the DB9 or DB25 connector on the ESI or CI. See page 36 for more information on the Universal Modem.

### 2. ESI Set/Line Jacks

The RJ-11 jacks marked SET and LINE are present when an ESI is installed in the ARC-16. The LINE jack is for the incoming phone line, and the SET jack can be used to connect a telephone set to the ARC-16 and share the line or to make a local voice connection to the ESI.

### 3. Audio In Jack (For ESI)

An Audio In phono jack (RCA) is present on the rear panel when an ESI is installed in the ARC-16 unit. Operators may connect a source of unbalanced audio (one volt RMS or less) to the ESI, allowing users to listen to the audio source during an ESI session. This is useful for monitoring the station while away from the broadcast coverage area. See page 57 for more on audio monitoring with the ESI.

### 4. Analog/Status & Control DB-37 Connectors

For each I/O board installed, the rear panel will contain one male DB-37 connector for metering and status inputs, and one female DB-37 connector for control outputs. Two I/O boards may be installed, for a total of sixteen channels. With the IP-8 interface panel, the included cable is used to link the relay panel to the ARC-16.

### 5. Wire Modem Barrier Strip Connections

The barrier strip connectors handle the alarm output and wire modem connections. For more on the alarm output, see page 41. For instructions on making Wire Modem connections, see page 36.

### 6. Universal Modem BNC Connectors

The BNC connectors on the rear panel are for connection to a Universal Modem, which accommodates subcarrier, RS-232, FSK audio and four-wire telco links. The BNC connectors accept standard coaxial cable for input and output.

**Note:** The bottom row of BNC connectors are installed standard at the factory, whether or not a Universal Modem is present.

## 7. Power Supply

The standard power supply is 115V nominal. A 220V power supply is available. The power supply is protected by a 0.5-amp AGC fast-blow fuse.

## SURGE PROTECTION AND BACKUP POWER SUPPLY

ARC-16 components have built-in surge suppression to withstand normal spikes during routine operation, but external protection against severe transients (such as lightning) and a well-designed lightning protection plan for the transmitter site are strongly recommended. Contact Burk Technology for more information on surge suppression devices for the data link, telephone connection and power supply.

Burk Technology also recommends connecting the ARC-16 to a UPS battery backup system. In a power outage, if the ARC-16 is connected to a battery backup, the system can continue to inform operators of alarm conditions and – in conjunction with AutoPilot software – initiate power recovery or backup transmitter switching.

## IMPORTANT SAFETY INFORMATION

The ARC-16 is equipped with a Maintenance Mode, which disables remote commands so that operators may safely perform equipment maintenance at the remote site. When a unit is in Maintenance Mode, no one may remotely issue commands to that unit until Maintenance Mode is turned off. Site data is still remotely accessible, and alarm reporting is active, but the operator performing maintenance is protected against unexpected equipment control, including commands executed from an ESI or via AutoPilot software. Turn Maintenance Mode on and off by pressing the MAINT switch on the front panel of the unit (the red LED on the switch confirms Maintenance Mode is active). Maintenance Mode may only be controlled at the local unit - it cannot be turned on or off remotely by any means.

**Note:** Maintenance Mode also overrides the failsafe output. See page 40 for more on the failsafe feature.

**IMPORTANT!** Never depend on Maintenance Mode as the sole safeguard measure. Some operators choose to disconnect the IP-8 relay panel (see below) from the ARC-16 when performing maintenance. Also, make sure that all transmitter interlocks are functioning properly.

## GETTING THE MOST FROM YOUR ARC-16

### ***IP-8 Interface Panel***

The ARC-16 is designed to connect to site equipment using IP-8 interface panels. The IP-8 simplifies equipment wiring to the ARC-16 by providing barrier strip connections and momentary relay closures for all raise and lower outputs, plus failsafe. The provided shielded cable connects the IP-8 to the ARC-16 DB-37 connectors. Each IP-8 accommodates eight channels of metering, status and command; two IP-8s are used in a sixteen-channel system.

### ***ARC-16 Options***

A number of options are available to help you get maximum benefit from the ARC-16 system. All of the options can be added to the ARC-16 system at any time, and are easily field-installed. Below is a list of available options, with descriptions of the most prominent features. For more information on any of these options, contact Burk Technology or visit the web site at [www.burk.com](http://www.burk.com).

In addition to the options listed below, a wide range of accessories is available for use with the ARC-16 and other Burk Technology systems. Temperature sensing equipment, AC current and line voltage monitors, surge suppression, tower light monitoring, and other facility management solutions are all available from Burk Technology.

### **ESI Enhanced Speech Interface**

The ESI allows dial-up telephone control of the ARC-16 system. In a stand-alone system, the ESI is included to provide the primary link between the operator and the remote location. In other system configurations, the ESI may be added as an option. Only one ESI is needed to connect to any site in the ARC-16 system. A computer interface (see below) is included on the ESI to allow simultaneous voice and computer control.

**Note:** Installing multiple ESIs is an effective way to create redundant access to each individual site in case your primary link fails.

### **CI Computer Interface**

The CI allows you to establish an RS-232 serial connection between your ARC-16 and a computer running AutoLoad, AutoPilot or CDL software (see below). A CI is built into the ESI board, so the CI is not necessary if an ESI is installed. However, many users choose to install the ESI at the remote site and use the CI at the studio for direct computer connection.

### **AutoPilot Software**

AutoPilot is advanced control, monitoring and logging software for the ARC-16. With AutoPilot, users can monitor any number of ARC-16 sites and gain site-to-site control of multiple systems. AutoPilot integrates Microsoft VBScript for powerful and flexible automatic functions, ideal for unattended operation. AutoPilot requires an ESI or CI to be installed in at least one ARC-16 unit per system.

**Note:** Features in the DOS version of AutoPilot differ from those in the current Windows version, described above.

### **SP-16 Status Panel**

The SP-16 Status Panel connects to your ARC-16 studio unit to provide a continuous display of all the status channels for a remote unit. This allows operators to monitor conditions at a remote location when a different site is displayed on the studio ARC-16 itself. Up to two SP-16s may be installed at the studio location, allowing operators to monitor status conditions at three sites simultaneously. The SP-16 includes the required SSI board (see below) and interconnecting cable.

### **SSI Studio Status Indicator**

The SSI allows status conditions at a remote site to be displayed on an external annunciator panel at the studio. A studio unit can accommodate up to two SSIs, permitting fulltime status display of two additional transmitter sites. The outputs on the SSI are electrically identical to the outputs on the I/O board.

### **SIO Studio Input Output**

The SIO installs in the ARC-16 Studio unit and allows remote control and monitoring of equipment at the studio location. The SIO provides eight channels of metering, status and command, and up to two SIOs may be installed for a total of sixteen channels. The SIO board is identical to the I/O board installed in transmitter units, and equipment wiring is also the same.

In order to connect equipment to an ARC-16 studio unit with an SIO installed, an IP-8 relay panel is used (see page 41).

**Note:** There are two positions in the studio chassis to accommodate SIO and SSI boards, so users have the option to install two SIOs or two SSIs, or one of each.

## **Communication Hardware**

In addition to the options listed above, Burk Technology supplies hardware used with the ARC-16 communication links. If you ever change the type of link used with the system, replacing the ARC-16 internal modems can be accomplished in the field. As long as opposite ends of the communication link have opposite designations, the S and T designations can occur in any type of ARC-16 unit (studio or transmitter unit). See page 36 for more information.

### **WMS/WMT Wire Modem**

Wire Modems are used on two-wire circuits, such as dedicated phone lines (dry pair). In two-unit systems, WMS is configured for operation in a studio unit, and WMT is configured for a transmitter unit. The only difference between a WMS modem and WMT modem is the jumper setting. The jumper on the modem board may be selected for studio (S) OR transmitter (T) modes.

### **RMS/RMT Universal Modem**

Universal Modems are used whenever the communication link is not a two-wire circuit. This includes four-wire telco, STL subcarrier frequencies, TRL, and digital RS-232. Available subcarrier frequencies are 39 KHz, 67 KHz, 92 KHz, 110 KHz, 152 KHz and 185 KHz.

For radio and digital links, an add-on module card is included with the modem board for the appropriate type of service. When an audio link is used, the Universal Modem requires no module. If you ever need to change the type of link or radio frequency, replacement modules are available from Burk Technology.

*IMPORTANT! The only difference between the RMS and RMT, and the WMS and WMT, is the jumper setting on the modem board. See page 36 for more information.*

### **SCA-2 Subcarrier Receiver**

The SCA-2 is required when telemetry return is via an SCA channel on an FM carrier. Specify the main carrier frequency and subcarrier frequency when ordering. An external antenna is required.



# 2 Front Panel Configuration & Channel Setup

## SETTING UP A NEW ARC-16 SYSTEM

Configuring the ARC-16 consists of establishing the basic settings that allow the ARC-16 to communicate with other units, along with setting up site and channel names, passwords, limits and alarm settings, etc. New ARC-16s ship from the factory pre-configured, except for user settings (such as passwords, labels, limits, etc). Your configuration settings appear on the factory configuration sheet included with your order. Any options you ordered with your system have already been installed and activated in the configuration menus.

Before you begin installation, take a minute to review the factory configuration sheet. You may wish to edit the Site Name, Passwords, or Highest Channel. Follow the instructions under Edit Mode, below, for changing these settings.

Each ARC-16 unit must have a unique site ID, which allows the ARC-16 system to differentiate one site from another. Site IDs consist of a single letter A, B, C or D. The default site ID for new transmitter units is A, and for new studio units, the default site ID is D. If you have more than one transmitter unit, you will have to change the site ID as necessary to ensure that every unit has a unique identifier. To make this change, see the instructions below for Adding a Unit or Making Changes to an Existing System. Keep your factory configuration sheet readily available, because you will have to reenter the configuration settings in Edit Mode once you have changed the Site ID in Master Initialization.

## ADDING A UNIT OR MAKING CHANGES TO AN EXISTING SYSTEM

If you are adding a new unit to an existing ARC-16 system, or if you are configuring a second or third transmitter site in a new system, you will have to configure the new unit using both the Master Initialization and Edit Mode so that the new unit has a unique site ID and is aware of any options installed at other sites (see instructions below). Similarly, when you install new options or make other changes to your ARC-16 setup, you will have to edit the configuration of all the units in that system to reflect those changes.

You can configure the ARC-16 either before or after you connect your site equipment, but it is usually easier to configure the unit on the bench and then install it at the remote site. In either case, make sure that all desired options (such as an ESI) are installed before completing configuration.

There are two basic levels of ARC-16 configuration - Master Initialization and Edit Mode. Master Initialization is only used to define whether the ARC-16 is a Transmitter or Studio unit and sets up the Site ID (A, B, C or D). You will seldom need to change those settings. The menus in Edit Mode are used to inform the unit which ports are used to send and receive data, the communication speed, the site name, passwords, the highest channel at the site, and which options are installed in the system. Once the settings in Edit Mode are specified, additional functionality can be customized in the Mode Menu (see page 19).

**Note:** The purpose of defining the studio/transmitter designation in the Master Initialization menu is to set the default configuration options in the Edit Mode menus and to set the default site ID. If you ever move a studio unit to a transmitter location or vice-versa, you only have to enter Master Initialization if you are changing the site ID. Otherwise, all the necessary changes can be made using the Edit Mode menus.

Master Initialization must be accomplished from the front panel of the ARC-16 unit, while Edit Mode is available either from the front panel or by using AutoLoad software from any PC. Instructions for front panel configuration are found in this chapter. For PC-based configuration with AutoLoad, see Chapter 3.

### ***Navigating ARC-16 Menus***

Menu navigation in the ARC-16 is accomplished by using the MODE switch to advance from one menu to the next and using the RAISE and LOWER switches to make selections. The up and down arrows on the LCD appear next to the menu choices, prompting you to press either RAISE and LOWER to make the desired selection. Some menus have multiple steps. When you see the left and right arrows on the LCD, press the left or right CHANNEL switch to advance forward and backward within the current menu.

## **MASTER INITIALIZATION**

### ***Entering Master Initialization***

*IMPORTANT! Master Initialization erases all factory and user settings. A Master Initialization should only be done if you have installed new firmware or need to change the site identifier. If you are simply making changes to the unit configuration and do not need to change the site identifier, enter the configuration menus in Edit Mode (see below).*

To access the Master Initialization menu:

Power up the ARC-16 while pressing the two CHANNEL switches. Hold the switches for at least two full seconds and release. Upon release of the buttons, the ARC-16 will display the following menus:

### ***Master Initialization Menu***

```
MASTER INIT.  
↑ XMTR STUDIO ↓
```

The first menu in the Master Initialization mode asks you to select whether this is a Studio or Transmitter unit. Press RAISE if this is a transmitter unit, or LOWER if this is a studio unit. Your selection determines the default configuration settings, which you will be able to edit later on.

### ***Site ID Selection***

```
A=LOCAL ARC-16  
↑↓ EDIT NEXT ←→
```

Once you make your selection, you are asked to select the Site ID for the unit. Every ARC-16 in your system must have a unique site identifier: A, B, C or D. Stand-Alone units are usually assigned A for the site ID, as is the first transmitter unit in a full-time system. The site identifier D is typically assigned to a studio unit. The choice of designators affects how the failsafe operates and which site is reported on an SSI. Refer to your ARC-16 Factory Configuration Sheet for the system's original settings, or set up site IDs based on any installed SSI or SIO options.

Use the CHANNEL or RAISE and LOWER switches to select the site identifier for this unit, and press MODE to advance to the configuration menus in Edit Mode.

## EDIT MODE

**IMPORTANT!** When installing a factory new system, most users enter Edit Mode to change the Site Name, Passwords or Highest Channel settings. Port settings, baud rate, and installed option settings are pre-configured at the factory, and do not normally require editing. Refer to your factory configuration sheet for the factory settings.

The Edit Mode menus appear automatically after you complete the Master Initialization. If you are using firmware version 5.01 or later and you want to edit your configuration settings without going through Master Initialization, press and hold the MAINT switch, followed by the CLEAR switch. Hold both switches for at least two full seconds, and release them together. The ARC-16 will display the menus below.

If you are using a firmware version below 5.01, enter Edit Mode by pressing and holding the MODE and CLEAR switches for two seconds and simultaneously cycling the power (unplug the unit and plug it back in).

**Note:** Starting with firmware version 5.4, you can also edit your configuration settings using the included AutoLoad software. See Chapter 3 for details.

Once you enter Edit Mode, use the CHANNEL switches to tab forward and backward within each menu and use the RAISE and LOWER switches to edit the selections. Press MODE to accept the setting and advance to the next menu. When you are done editing settings, press MODE to advance through any remaining menus until you return to the normal operating mode. As a shortcut, you can press CLEAR from within any menu. Your changes will be saved, and you will return to the normal operating mode. Note that pressing CLEAR will also clear alarms, so use this shortcut only if no alarms are registered.

See page 23 for an expanded menu diagram showing all ARC-16 configuration menus.

**IMPORTANT!** Except when using AutoLoad software (firmware versions 5.4 and above only), Edit Mode settings for each unit must be programmed locally. You cannot use a studio unit to program a transmitter unit.

### DATA RCVD (Receive Port)

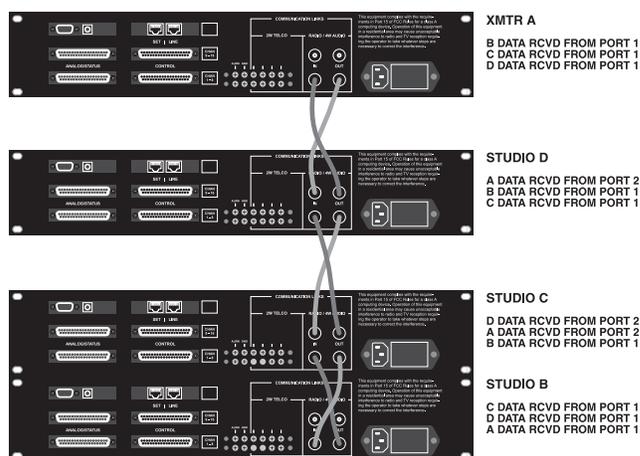


Each ARC-16 unit may use up to two modem ports to communicate with other units. The modem ports may be any combination of Wire Modems or Universal Modems. When you configure the unit, you instruct the ARC-16 as to which port to use when sending and receiving data to or from other sites.

The Receive Port tells this local unit which port to use to receive data from the specified remote unit. The port assignment should correspond with the physical connection. For example, if remote unit D is physically connected to this local unit on Port 1, then select to receive remote unit D on Port 1 (D DATA RCVD FROM PORT 1).

In a multi-site system, it is possible to link all units in the system even when they are not directly connected to one another. This is called a “daisy-chained” configuration, in which case one ARC-16 serves as a middle/repeater unit, because it will relay data from one remote site to another. The diagram on the right shows this setup.

When setting the Receive Port settings for a unit that receives data from a remote unit by way of a middle/repeater unit, set the local unit to receive both the remote and the middle/repeater unit on the same port, as indicated in the diagram.



Use the CHANNEL switches to scroll through the three possible remote sites, and use RAISE and LOWER to edit the settings for each. When finished, press MODE to advance to the next menu.

### DATA SENT (Send Port)

A DATA SENT OUT  
←→ PORTS 1+2 ↑↓

The Send Port setting for the local unit must remain at PORTS 1+2. For remote sites, set the Send Port to be the opposite of the Receive Port setting. Even if the port is not in use, it should still be specified in the Send Port menu.

**Note:** In firmware version 5.6, data is automatically sent out both ports by default and the DATA SENT menu does not appear.

Use the CHANNEL switches to select each available site, and assign the port by using RAISE and LOWER. After reviewing or editing the Send Port settings, press MODE to advance to the next menu.

### BAUD RATE

BAUD RATE DIV.  
←→ PORT 1 DIV 0 ↑↓

The Baud Rate menu is available starting with firmware version 5.3. This feature may be used to adjust the baud rate separately for Ports 1 and 2. Depending on the firmware version, available baud rates are 300, 1200, 2400, 4800 and 9600. Baud rates higher than 300 are for ports with Universal Modems and Digital (RS-232) send/receive modules installed. FSK audio and subcarrier frequencies are not supported at speeds higher than 300 baud.

*IMPORTANT! Communication speeds higher than 300 baud can only be used with a bi-directional digital (RS-232) communication link. If your communication link is digital in only one direction, you must use 300 baud. The baud rate selection affects the internal modem port only, not the computer interface. The ARC-16 always communicates with AutoLoad and AutoPilot software at 1200 baud.*

Move from one port to the next with the CHANNEL switches, and make selections by using RAISE and LOWER. After reviewing or editing the Baud Rate settings, press MODE to advance to the next menu.

**For firmware version 5.6:** For each port, select whether that port will run at 300, 1200, 2400, 4800, or 9600 baud.

**For firmware version 5.5:** For each port, select whether that port will run at 300 or 1200 baud.

**For firmware versions 5.3 and 5.4:** In firmware versions 5.3 and 5.4 the baud rate is adjustable by selecting a divisor, which specifies the appropriate clock speed on the CPU. If your CPU is at the factory standard 300 baud, leave all divisors at 0, so that all ports will operate at default settings.

Units with firmware versions 5.3 and 5.4 may be modified in the field to allow 1200 baud communication (this modification is detailed in Appendix D). If you have completed this modification, designate a port to run at 300 baud by selecting divisor 64, or designate a port to run at 1200 baud by selecting divisor 16. The Computer Interface (Port 3) must remain at the default setting of 1200 baud, divisor 0.

**Note:** If you ordered the ARC-16 unit for operation at 1200 baud, the CPU modification discussed above was completed at the factory, and the 1200 baud rate is already enabled. The initial port configurations are noted on the factory configuration sheet included with your ARC-16.

For firmware versions below 5.3: Because the baud rate is not selectable in firmware versions prior to 5.3, the Baud Rate menu will not appear.

### SITE NAME

XMTR  
← ↑ SITE NAME ↓ →

The Site Name for each unit may be customized using up to seven characters. In a multi-site system, this makes it easy to identify which site is selected on the front panel of the unit.

Choose a character position with the CHANNEL switches, and edit that character by using RAISE and LOWER. After reviewing or editing the Site Name, press MODE to advance to the next menu.

### MASTER/USER PASSWORDS

0000--0000  
←MASTER↑↓USER →

Master and User Passwords affect the local unit only, and determine the available functions when accessing the site from a telephone (when an ESI is installed). When the Master password is entered, all ESI functions are available. When the User password is entered, the user can review alarms and enter commands, but cannot change labels or phone numbers.

**Note: AutoPilot and AutoLoad software accept only the User password, which allows full access to the unit. User privileges are managed within the software, so the Master password is not needed.**

Master and User passwords are only available from the front panel of the local unit, so be sure to make a note of the password to avoid traveling to a remote site to retrieve it.

Use the CHANNEL switches to tab left and right across the digits. Change the selected number with RAISE and LOWER. After reviewing or editing the Master and User passwords, press MODE to advance to the next menu.

### HIGHEST CHANNEL

A16 HIGHEST CHAN  
↑↓EDIT NEXT←→

You may assign a highest channel for each site, on each ARC-16 unit, so that only in-use channels are displayed on each unit's front panel. This feature makes site-to-site communication links more efficient, eliminates the need to scroll through unused channels and allows you to restrict access to certain channels or sites at any location. Access to any site can be prevented by setting that site's highest channel to 0 (zero).

The Highest Channel settings for a particular site can be different on each unit in your system. For example, if you want local access to all channels at transmitter site A, use the front panel of the site A unit to set the Highest Channel setting for site A to 16 (or the highest channel in use). If you want to disable studio access to certain transmitter site channels, use the front panel of the studio unit to set the highest channel for site A to the highest channel to which you would like to allow access. In this case, the restricted channels would be connected to the higher-numbered inputs and outputs on the IP-8.

Select each available site with the CHANNEL switches, and set the highest channel value for each site using RAISE and LOWER. After reviewing or editing the highest channel settings, press MODE to advance to the next menu.

### OPTIONS

The Options menus ask for YES/NO responses regarding your system's installed options. Be sure that the desired options are physically installed before attempting to enable them in the menu. Remember that factory-installed options are enabled before the unit ships.

Scroll through the available options using the CHANNEL switches, and change the selections with RAISE and LOWER.

CH. 1-8 YES  
←OPTION→ SET↑↓

**CH. 1-8 (First I/O board).** Answer YES if this unit contains an I/O board in the lowest slot. I/O boards control eight channels of metering, status and command to the ARC-16. Identify an I/O board by looking at the rear panel of the ARC-16 and noting one DB37 Female connector (for control output) and one DB37 Male connector (for metering and status input connections) in the bottom left opening.

CH. 9-16 YES  
←OPTION→ SET↑↓

**CH. 9-16 (Second I/O board).** Answer YES if this unit has an I/O board in the middle slot.

LCL ESI YES  
←OPTION→ SET↑↓

**LCL ESI (Local Enhanced Speech Interface).** Answer YES if an ESI is installed in this unit. The presence of two RJ-11 telephone jacks, a DB9 connector, and a phono jack on the rear panel of the ARC-16 confirms that an ESI is installed.

**Note:** In firmware version 4.6, the configuration menus refer to the DSU, even though an ESI may be installed. The DSU, programmed with a man's voice, preceded the ESI, which is programmed with a woman's voice. The DSU is not compatible with firmware version 4.6 or higher. If an ESI is installed, set LCL DSU to YES.

DTMF	YES
←OPTION→	SET↑↓

**DTMF (Tone Dial/Pulse Dial).** If you have LCL ESI set to YES in the previous menu, choose pulse dial by selecting NO, or tone dial by selecting YES.

P1-ESI	NO
←OPTION→	SET↑↓

**P-1 ESI (Remote ESI located at the next logical Site).** Answer YES if you have an ESI installed in the unit designated as the next logical site. Refer to the table below for logical site designations.

P2-ESI	NO
←OPTION→	SET↑↓

**P-2 ESI (Remote ESI located at the second logical Site).** Answer YES if you have an ESI installed in the unit designated as the second logical site. Refer to the table below for logical site designations.

P3-ESI	NO
←OPTION→	SET↑↓

**P-3 ESI (Remote ESI located at the third logical Site).** Answer YES if you have an ESI installed in the unit designated as the third logical site. Refer to the table below for logical site designations.

AMI-2	NO
←OPTION→	SET↑↓

**AMI-2 (Antenna Monitoring Interface).** If you are using a firmware version from 4.6 to 5.5, select NO in this menu. For antenna monitoring in firmware versions 4.6 and above, use the AutoPilot software version 2 or later.

**For firmware version 5.6:** Because antenna monitoring is now handled using AutoPilot, the AMI-2 menu does not appear.

P1-SSI	NO
←OPTION→	SET↑↓

**P-1 SSI (Studio Status Indicator to monitor next logical site).** Answer YES if an SSI is installed in this unit to monitor the next logical site and is plugged into J1 on the AUX board (CPU-A) or J9 (CPU-B). An SSI can be identified from the Studio Unit rear panel by the presence of a single DB37 Female connector. Refer to the table below for logical site designations.

P2-SSI	NO
←OPTION→	SET↑↓

**P-2 SSI (Studio Status Indicator to monitor second logical site).** Answer YES if an SSI is installed in this unit to monitor the second next logical site and is plugged into J2 on the AUX board (CPU-A) or J10 (CPU-B). Refer to the table below for logical site designations.

2 PORTS	NO
←OPTION→	SET↑↓

**2 PORTS (Two Port Adapter installed).** The 2 PORTS menu option appears in firmware versions 5.5 and below, and prompts the user to indicate whether two modems are installed.

**For firmware version 5.6:** Because firmware version 5.6 enables both modem ports by default, the 2 PORTS menu does not appear.

**For firmware version 5.5:** In firmware version 5.5, both modem ports are enabled by default, but you must still set 2 PORTS to yes, even if only one modem is installed.

**For firmware versions 5.4 and below:** Answer YES only if two modems are installed in this ARC-16.

**Note:** In firmware versions 5.4 and below, a Two Port Adapter (TPA) board is necessary to install a second modem. Firmware versions 5.5 and above are for use with revision B of the ARC-16 CPU (CPU-B), which does not require a Two Port Adapter board for a second modem. Instead, a TPA B Kit is used, which supplies the hardware for mounting the second modem.

When you are done selecting your options, press MODE to exit the configuration process. The ARC-16 will return to the normal operating mode. To make additional changes to the configuration, re-enter the configuration menus as described at the beginning of the Edit Mode section on page 15.

## Logical Site Designations

In a multi-site system, the ARC-16 must know which options are installed not only in the local unit, but also in other units within the system. When you configure the ARC-16, you inform the unit where other options are installed by indicating whether the option is at the next, second or third logical site. Logical site designations correspond with site letters according to the following table:

Local Site ID	Next Logical Site	Second Logical Site	Third Logical Site
D	A	B	C
C	D	A	B
B	C	D	A
A	B	C	D

## Expanded Configuration Menu View

A menu tree showing all the configuration menus in the ARC-16 Master Initialization and Edit Mode, described on pages 15-19, can be found on page 23.

## MODE MENUS AND CHANNEL SETUP

After you configure the ARC-16 unit, you can set up channel- and site-specific parameters, such as limits, alarms, and channel labels – or you can connect your site equipment and define the channel parameters later. These settings are available from the front panel in the Mode Menus, as well as through the AutoLoad software (see Chapter 3).

Access each Mode Menu by pressing the MODE switch once, and change menu selections using the CHANNEL, RAISE and LOWER switches as indicated. Each Mode Menu is presented below in the order in which it appears. Pressing the MODE switch advances to the next menu.

After making the desired selection in each menu, press MODE to confirm the selection and advance to the next menu. You can return to the normal operating mode at any time by pressing and holding the MODE switch for one second. If no alarms are active, pressing the CLEAR switch also saves your configuration changes and returns you to the normal operating mode.

**Note:** The available Mode Menus depend on the configuration of the ARC-16 system. For example, if only one unit in the system has a Highest Channel setting greater than zero, the Select Site Mode Menu will not appear (because only one unit has channels assigned).

### Select Site

```
A  XMTR
↑↓ SELECT SITE
```

SELECT SITE is the first option available in the Mode Menus. Use the RAISE and LOWER switches to scroll through the available sites and change the site displayed on the local unit's front panel.

**Note:** The Select Site menu does not appear if only one ARC-16 site has a Highest Channel setting greater than zero.

### Limits Monitoring

```
LIMITS MONITORS
↑↓ OFF
```

In the Limits Monitoring menu (LIMITS MONITORS), you can turn limits monitoring on or off by pressing RAISE or LOWER. When limits monitoring is on, any metering channel at any site with a non-zero upper or lower limit – or any status channel configured for alarm reporting – will trigger an alarm if an out-of-tolerance condition is reported. The alarm will be reported on the unit for which Limits Monitoring is enabled. The CLEAR LED will illuminate, and in full-time and multi-site units, the external alarm output will be turned on.

In a multi-site system, enabling Limits Monitoring not only allows the ARC-16 to report its own alarms, but also to receive alarm notifications from other sites. If Limits Monitoring is turned off, the ARC-16 will neither send nor receive alarms.

**Note:** ARC-16 Stand-Alone systems do not feature an external alarm output because the output is located on the ARC-16's internal modem board, which is not installed on Stand-Alone units. An Alarm Output Accessory Board is available to provide the external alarm output on a Stand-Alone system. Contact Burk Technology if you would like to enable the alarm output at your Stand-Alone site.

When you enable Limits Monitoring in the Mode Menu, you turn this option on for all channels in the unit, but only for the currently selected unit. To disable alarm reporting for an individual channel, use the Set Alarm menu option (for a status channel), or set the low limit and high limit to zero (for a metering channel). Both of these settings are available later on in the Mode Menus.

For more information on alarm management, see page 47.

### **Alarm Dial-Out and ESI Answering**

A	CALL?	NO
←OPTION→	SET↑↓	

A	ANSWER?	YES
←OPTION→	SET↑↓	

If an ESI is installed in the unit and enabled in the configuration menu (see page 50), you can turn alarm dial-out on and off for any ESI from the front panel of the ARC-16. This requires that the location of the ESI

has been set up in other units as well (see page 18). You can also select whether the unit will answer incoming calls.

Use the RAISE and LOWER switches to turn dial-out (CALL) and answering (ANSWER) on and off for each site as desired. Selecting YES turns the feature on for the selected unit, and selecting NO turns the feature off. Then use the CHANNEL switches to advance to another site's ESI settings (if you have more than one site with an ESI).

### **Calibrate**

A	1	-----	0100.
CALIBRATE			LIN

Front panel calibration allows each metering channel to be calibrated by entering the actual reading from the equipment directly into the ARC-16. The CALIBRATE menu appears at sites only when at least one channel is active.

**Note:** Before calibrating metering channels, set up the conversion type (see the Type menu below for more information).

Use the CHANNEL switches to select the desired channel, and use the RAISE and LOWER switches to adjust the value for each channel. The calibrated value will change more rapidly when the switch is held down for longer durations.

**Note:** It is not possible to calibrate a channel that is set to display the actual sample voltage. In 4-series firmware, this applies to the Millivolts (MV) conversion type, and in 5-series firmware, this applies to the Degree (DEG) conversion type. The only difference between the MV and DEG scales is that DEG allows negative values (as low as -999).

To assure accuracy on the entire input range, channels with a sample input value below 250mV may not calibrate. Excessive input (above 4.5VDC) is indicated by a metering readout of 9999 that cannot be calibrated and does not change when reading the channel in the millivolts position.

## Decimal Point

```
A 1 ----- 100.0
DEC. POINT  ↑ ↓
```

The decimal point may be moved into any of four positions using the RAISE and LOWER switches. The decimal position will display the same at all sites in the system when this channel is selected.

**Note:** For a channel set to read in millivolts or degrees (MV or DEG), the voltage input will always be displayed in millivolts, regardless of the decimal place location. In other words, an input of 2 volts will read 2.000, 20.00, 200.0 or 2000 depending on the decimal point selection.

## Low Limits / High Limits

```
A 1 ----- 100.0
LOW LIMIT  ↑ ↓
```

```
A 1 ----- 100.0
HIGH LIMIT ↑ ↓
```

The Low Limit and High Limit settings for each metering channel determine the values that trigger alarm reporting, when Limits Monitoring is enabled (see page 19).

The upper and lower limits may be set for any metering channel by using RAISE and LOWER to change the value displayed on the LCD. To disable alarm reporting on a particular channel, set both the high and low limits to zero.

## Type

```
A 1 ----- 100.0
SELECT TYPE ↑ ↓
```

Each metering channel may be set to display one of four types of conversion. For more information on power measurements with the ARC-16, see Appendix A.

**Degree (DEG) or Millivolt (MV)** reads the voltage of the input sample (and cannot be calibrated). If the voltage input is 300MV, the ARC-16 will display a reading of 300. DEG appears on units with 5-series firmware, and MV appears on units with 4-series firmware. DEG is the only conversion type that will display a negative value (to -999).

When the Burk Technology BTU-4 temperature unit is used for temperature readings, channels set for MV or DEG will display the actual temperature reading (in degrees Fahrenheit or Celsius depending on the BTU-4 model). The BTU-4 provides an output in MV that corresponds directly with the temperature reading, so users can connect the temperature sensor to ARC-16 without converting the reading.

**Linear (LIN)** results in the sample voltage being multiplied by the calibration constant. This is the most common conversion type. The ARC-16 determines the calibration constant automatically by comparing the actual reading (entered by the user during calibration) to the raw sample voltage on the input channel. The unit then applies that calibration constant to the entire range of inputs on that channel.

**Power (PWR)** squares the input sample so that a voltage representation of power may be used accurately. Use this conversion type for RF power samples.

**Indirect (IND)** offers a calculated indirect output power by multiplying the selected channel by the previous channel. To use this feature, connect plate current to this channel and plate voltage to one channel lower. (You may wish to connect one of the samples to two inputs so that you can still read the direct value.) This channel is calibrated as any other channel, and uses the raw input from the two samples, so it is unaffected by the previous channel's calibration.

## Polarity

```
A 1 STATUS NORM
SET POLARITY ↑ ↓
```

The polarity for each status channel may be set to Normal or Inverted. Normal polarity means that the status LED for the selected channel is normally off, and turns on only when the status input closes to ground. When inverted polarity is selected, the LED is normally on, and turns off only when the status input closes to ground.

### ***Set Alarm***

A 1	STATUS	OFF
←	SET ALARM	↑↓

Each status channel may be set to activate an alarm when the status LED illuminates. Toggle this function on or off with the RAISE and LOWER switches.

**Note:** Because the status alarm activates when the status LED is on, you may have to invert the polarity of the status channel for the desired condition to trigger the status alarm. See Polarity, above, for more information on normal and inverted polarity.

### ***Edit Channel Labels***

A 1	-----	
←	↑EDIT↓	→

Use this mode to assign a label to be displayed for each channel. Up to seven characters may be used for each label.

The CHANNEL switches are used to change the cursor position and the RAISE and LOWER switches select the characters for the label. When you reach the end of the label, you will be prompted to use the CHANNEL switches to advance to the next channel label, go to the previous channel label, or return to re-edit the current label.

**Note:** It may take a few minutes for new channel labels to transfer to remote sites. If you edit the currently selected channel, you may have to reselect the channel to see the new label.

### ***Version and Serial Number***

ARC-16	VER.	5.4
SERIAL	#	A098765

The final Mode Menu displays the unit's serial number and firmware version. Both are coded on the ARC-16 firmware. It is a good idea to keep a record of the firmware versions and serial numbers in all of your ARC-16 units so that you have them on-hand when the unit is at a remote site.

### ***Exiting the Mode Menu***

Once you have advanced to the final Mode Menu showing the firmware version and serial number of the unit, press the MODE button one more time to return to the normal operating mode.

You can exit the Mode Menus at any time by pressing the CLEAR button, or by pressing and holding the MODE button. The ARC-16 will save all changes no matter how you choose to return to the normal operating mode.

## EXPANDED CONFIGURATION MENU VIEW

The following menu tree shows all the configuration menus in the ARC-16 Master Initialization and Edit Mode, described on pages 15-19.

### Master Initialization

When entering configuration in Master Initialization Mode (see page 14), the first two menus you see are the **Master Initialization** menu and the **Site ID** selection menu.

MASTER INIT. ↑ XMTR STUDIO ↓	A=LOCAL ARC-16 ↑↓ EDIT NEXT ↔
---------------------------------	----------------------------------

### Data Received

When entering configuration in Edit Mode (see page 15), the first menu to appear is the **Data Received** menu.

A DATA RCVD FROM ↔ PORT 1 ↑↓	B DATA RCVD FROM ↔ NO PORT ↑↓	C DATA RCVD FROM ↔ NO PORT ↑↓	D DATA RCVD FROM ↔ PORT 1 ↑↓
---------------------------------	----------------------------------	----------------------------------	---------------------------------

### Data Sent

A DATA SENT OUT ↔ PORTS 1+2 ↑↓	B DATA SENT OUT ↔ NO PORT ↑↓	C DATA SENT OUT ↔ NO PORT ↑↓	D DATA SENT OUT ↔ NO PORT ↑↓
-----------------------------------	---------------------------------	---------------------------------	---------------------------------

### Baud Rate

VERSION 5.3-5.4

BAUD RATE DIV. ↔ PORT 1 DIV 0 ↑↓	BAUD RATE DIV. ↔ PORT 1 DIV 16 ↑↓	BAUD RATE DIV. ↔ PORT 1 DIV 64 ↑↓
-------------------------------------	--------------------------------------	--------------------------------------

Port 2 and C1 Baud Rate settings (not shown) are identical to Port 1

VERSION 5.5

BAUD RATE ↔ PORT 1 1200 ↑↓	BAUD RATE ↔ PORT 1 300 ↑↓
-------------------------------	------------------------------

Port 2 Baud Rate settings (not shown) are identical to Port 1

VERSION 5.6

BAUD RATE ↔ PORT 1 9600 ↑↓	BAUD RATE ↔ PORT 1 4800 ↑↓	BAUD RATE ↔ PORT 1 2400 ↑↓	BAUD RATE ↔ PORT 1 1200 ↑↓	BAUD RATE ↔ PORT 1 300 ↑↓
-------------------------------	-------------------------------	-------------------------------	-------------------------------	------------------------------

Port 2 Baud Rate settings (not shown) are identical to Port 1

### Site Name

XMTR ← ↑ SITE NAME ↓ →
---------------------------

### Master & User Passwords

0000 - 0000 ← MASTER ↑ ↓ USER →
------------------------------------

### Highest Channel

A16 HIGHEST CHAN ↑ ↓ EDIT NEXT ↔	B 0 HIGHEST CHAN ↑ ↓ EDIT NEXT ↔	C 0 HIGHEST CHAN ↑ ↓ EDIT NEXT ↔	D 0 HIGHEST CHAN ↑ ↓ EDIT NEXT ↔
-------------------------------------	-------------------------------------	-------------------------------------	-------------------------------------

### Options

CH. 1-8 YES ← OPTION → SET ↑ ↓	CH. 9-16 YES ← OPTION → SET ↑ ↓	LCL ESI YES ← OPTION → SET ↑ ↓	DTMF YES ← OPTION → SET ↑ ↓	P1-ESI NO ← OPTION → SET ↑ ↓	P2-ESI NO ← OPTION → SET ↑ ↓
P3-ESI NO ← OPTION → SET ↑ ↓	AMI-2 NO ← OPTION → SET ↑ ↓	P1-SSI NO ← OPTION → SET ↑ ↓	P2-SSI NO ← OPTION → SET ↑ ↓	2 PORTS NO ← OPTION → SET ↑ ↓	

\*In firmware version 4.6, P1-P3 ESI is labeled as P1-P3 DSU

\*\*In firmware Version 5.6, the AMI-2 and 2 Ports options do not appear in this menu.



# 3 Configuration With AutoLoad Software

AutoLoad is available for use with ARC-16 units that have an ESI or CI installed and are running firmware version 5.4 or above. The software gives you access to your ARC-16 configuration settings from your computer, so you can load configurations locally or remotely without using the front panel. AutoLoad is useful for backing up your configuration to disk, so that you can easily restore your settings in the future, such as after a Master Initialization. You can also use AutoLoad to enter channel labels and ESI vocabulary.

## ***System Requirements***

- ARC-16 firmware version 5.4 or above, with ESI or CI
- Pentium 133MHz or higher
- 32 MB RAM
- Windows 98; ME; NT 4.0 Workstation SP5; 2000 Professional SP1; XP
- Bell 212A compatible modem (if using a modem connection)

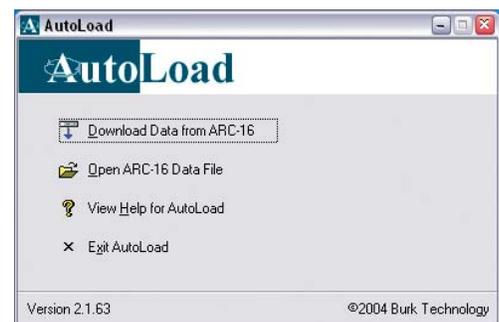
**Note:** The Support section of the Burk Technology web site features a list of several compatible modems with installation notes and initialization strings where needed. Additional modems may work; you should verify Bell 212A compatibility with the modem manufacturer.

## **INSTALLING AUTOLOAD**

To install AutoLoad, insert the CD-ROM into your CD drive. If the CD does not start automatically, click Start, then select Run. Enter d:\launch.exe (where “d” is the letter of your CD-ROM drive). Click “Install AutoLoad” to begin the installation.

Launch AutoLoad by clicking on the AutoLoad icon in the Start menu, under Burk Technology\AutoLoad.

When the opening screen appears, select whether you want to download data from the ARC-16 (to save or edit) or open a previously-saved ARC-16 configuration file. You can also access the AutoLoad Help File from this screen, or exit the program.



### HOW TO GET HELP

The help file can be accessed from AutoLoad by clicking on the Help menu. “What’s This” help is also available to provide quick descriptions of AutoLoad features. Click the “?” What’s This icon in the toolbar, and then click the item you need help with.

### CONNECTING TO THE ARC-16

Before you can download configuration settings from your ARC-16, and before you can upload previously saved settings, you need to define a connection. If you have never connected to an ARC-16 before, the Connection Wizard will automatically open to guide you through establishing a connection to the ARC-16. Once you have at least one connection, you can connect using a saved connection, or just use the most recent settings.

#### Connection Wizard

Whether you are downloading your ARC-16 configuration, or preparing to upload a previously saved configuration, if you have not yet established a connection to the ARC-16 after installing AutoLoad, the Connection Wizard will load automatically. If you have already established a connection to the ARC-16, the Connection Settings dialog will be shown (see page 29).

#### Welcome

The first page of the Connection Wizard asks you to determine if your ARC-16 is connected directly to the computer, or via another unit. Here are some examples if you want to download settings from Site A:

#### Select the first option if:

- Your computer uses a null modem cable to physically connect to the site from which you are downloading; or
- The site from which you are downloading has an ESI that you can call using your computer’s modem.

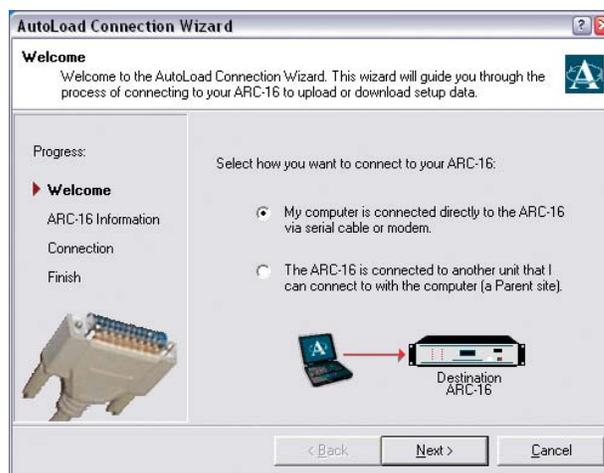
Go on to ARC-16 Settings (via direct connection with null modem cable).

#### Select the second option if:

- Your computer is physically connected to an ARC-16 site, but not the site from which you are downloading. This “parent” site is connected to the site from which you are downloading; or
- An ARC-16 site other than the one from which you are downloading has an ESI that you can call using your computer’s modem. This “parent” site is connected to the site from which you are downloading.

**Note:** In order for AutoLoad to connect to one unit via another, the site letter and send/receive port settings must be set up for both units using the front panel controls (see the previous chapter for configuration from the front panel). You cannot use AutoLoad for the initial configuration of remote unit port settings.

Go on to ARC-16 Settings (via parent site).



## ARC-16 Settings (via direct connection with a null modem cable)

### Serial Number

Enter the serial number of the ARC-16 to which your computer is directly connected. The serial number consists of the letter A followed by a six-digit number, and can be retrieved from the front panel display by pressing the MODE switch to advance to the last mode menu, which displays the unit firmware version and serial number. The serial number is also printed on the back or side of the unit, but it is always better to enter the serial number as displayed on the front panel.

### Site Letter

Enter the site letter (A, B, C, or D) of the ARC-16 to which your computer is directly connected.

### Password

Enter the USER password for the ARC-16 to which your computer is directly connected.

**IMPORTANT!** The Master password will not work here. Be sure to enter the User password for the ARC-16.

## ARC-16 Settings (via parent site)

### Serial Number

Enter the serial number of the ARC-16 to which your computer is directly connected. The serial number consists of the letter A followed by a six-digit number, and can be retrieved from the front panel display by pressing the MODE switch to advance to the last mode menu, which displays the unit firmware version and serial number. The serial number is also printed on the back or side of the unit, but the front panel confirms the serial number stored on the EPROM. Use the serial number displayed on the front panel. If it is different from the rear panel serial number tag, the EPROM may belong to a different ARC-16 unit.

### Site Letter

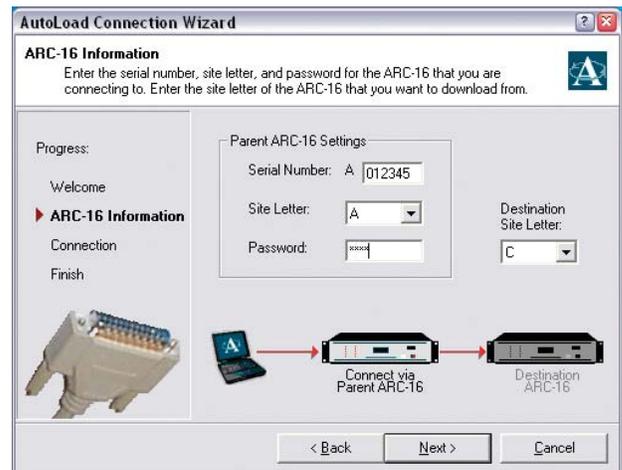
Enter the site letter of the ARC-16 that your computer is directly connected to (A, B, C, or D).

### Password

Enter the USER password of the ARC-16 to which your computer is directly connected.

### Destination Site Letter

Enter the site letter (A, B, C, or D) of the ARC-16 that you are downloading from or uploading to.



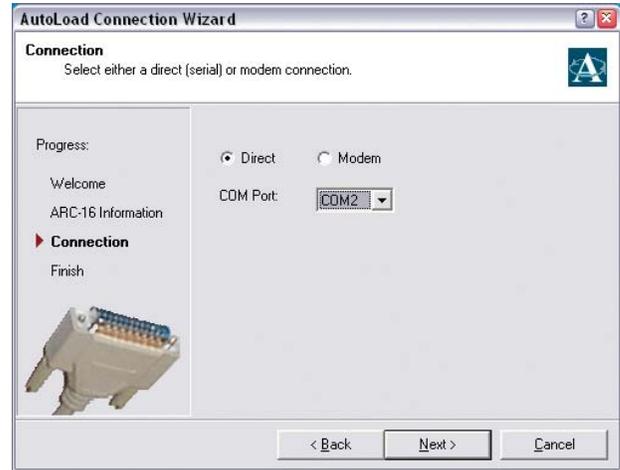
## Connection Settings

### Direct Connection

When you choose Direct Connection, a drop-down menu appears, prompting you to select the PC COM port you are using.

### Modem Connection (not shown)

When you select Modem Connection, a drop-down menu appears, prompting you to select the desired modem, and enter the phone number for the telephone line connected to the remote site.

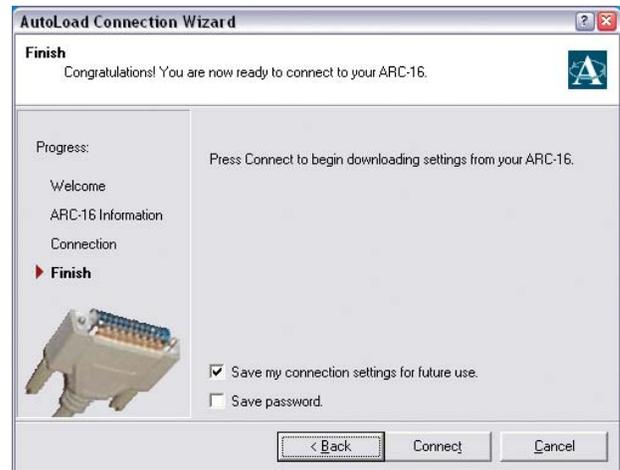


### Finish

Check “Save my connection settings for future use” to save these settings to a file.

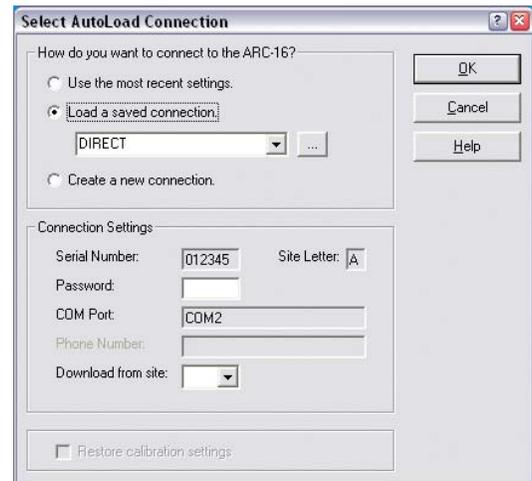
Check “Save password” if you want your password saved along with the other settings. If you are not the only user of your computer, you may not want to do this for security purposes.

Click Connect to start downloading. When the download is complete, your ARC-16 settings will be displayed in the configuration window.



## Connect Using Saved Settings

If you have previously connected to an ARC-16, selecting upload or download from the startup screen will open the Select a Connection window instead of launching the Connection Wizard. If you have previously saved one or more connection settings by checking the Save my connection settings box in the final screen of the Connection Wizard, select the Load a saved connection option. The drop down list will contain all the saved connections found in AutoLoad’s default connection folder. If you saved your settings in a different folder, click the “browse” button (...) to find the connection file. At least one connection must be saved in the default folder before the browse option is available. The serial number, site letter, COM port or modem/phone number will be loaded. You will have to enter the User password before connecting, unless you elected to save the password in the Connection Wizard.



**Note:** If you have previously saved connection settings, but would like to launch the Connection Wizard to create a new one, select “Create a new connection” and click OK.

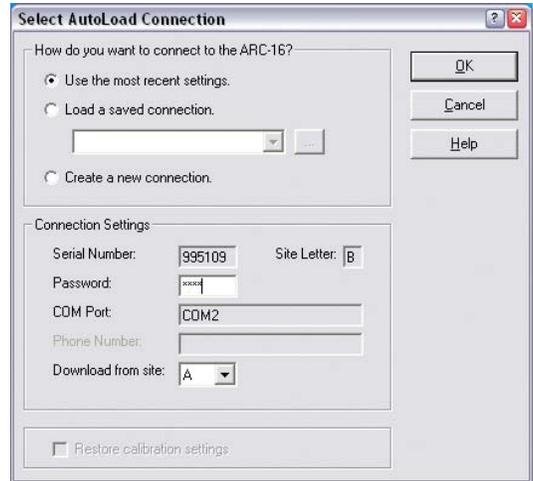
In the “Download from site” field, select the site letter of the ARC-16 containing the settings you wish to download. To prevent ARC-16 configuration errors, you will be able to upload settings to this site ID only.

### Connect Using Recent Settings

If you have previously connected to an ARC-16, you can connect using the same connection settings you used the last time you connected.

Select the option “Use the most recent settings.” The serial number, site letter, COM port or modem/phone number that you last used to connect will be loaded. You will need to enter the USER password, and select the site letter of the ARC-16 containing the settings you wish to download. To prevent ARC-16 configuration errors, you will be able to upload settings to the same site letter only.

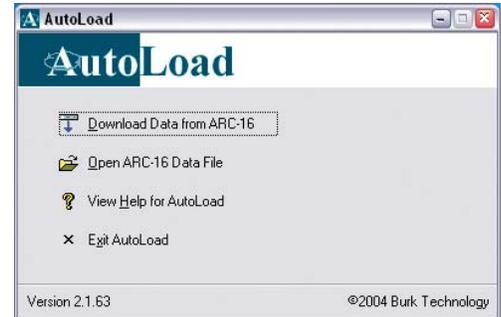
**Note:** If you are connecting directly to the ARC-16, the “Download from site” letter will be the same as the site letter you entered above. However, if your ARC-16 is connected via another unit, these site letters will differ.



### Downloading

To download settings from your ARC-16, click “Download...” from the ARC-16 menu, or click the Download button from the AutoLoad startup screen (below).

You will be prompted for connection settings. When the download is complete, your ARC-16 settings will be displayed in the configuration window.



### Uploading

To upload settings to your ARC-16, you must first load configuration settings either by downloading or by opening a saved file. To start the upload, click “Upload...” from the ARC-16 menu. You will be prompted for connection settings.

The upload process may take several minutes.

**IMPORTANT!** Each site in an ARC-16 system has unique configuration settings. You cannot upload a saved configuration to an ARC-16 unit when the saved configuration was originally downloaded from a different site letter.

### Restoring Calibration Settings

If you want to restore your ARC-16 calibration settings to the calibration settings last downloaded, check the box labeled “Restore calibration settings” from the Select AutoLoad Connection dialog.

**IMPORTANT!** If you have changed your calibration settings since the last time you downloaded your site configuration, and you want to keep those changes, do not check the “Restore calibration settings” box.

## CONFIGURATION

After you have downloaded your ARC-16 configuration, or when you open a saved configuration (see page 34), your settings will be displayed in the configuration window. The settings are divided into five categories, each accessible on a separate tab:

- Local Options
- Communication
- Channel Settings
- ESI Settings
- ESI Labels

All changes made in the Configuration Window will take effect after you upload your settings.

### Local Options

#### Site Label

Set up a site label for the local unit, using up to seven characters. The site label you enter here is displayed on the front panel of the unit when this site is selected on any unit in the system.

**Note:** Whether you configure labels using AutoLoad or the front panel, the maximum size is seven characters. Even though AutoLoad allows an entry longer than seven characters, you cannot upload a channel label longer than seven characters.

#### Channels 1-8

Check this box if the local unit has an I/O board for channels 1-8.

#### Channels 9-16

Check this box if the local unit has an I/O board for channels 9-16.

#### Local ESI

Check this box if the local unit has an ESI (Enhanced Speech Interface) installed.

#### Use DTMF

Check this box to enable DTMF (only applicable if the unit has an ESI).

#### Two Ports

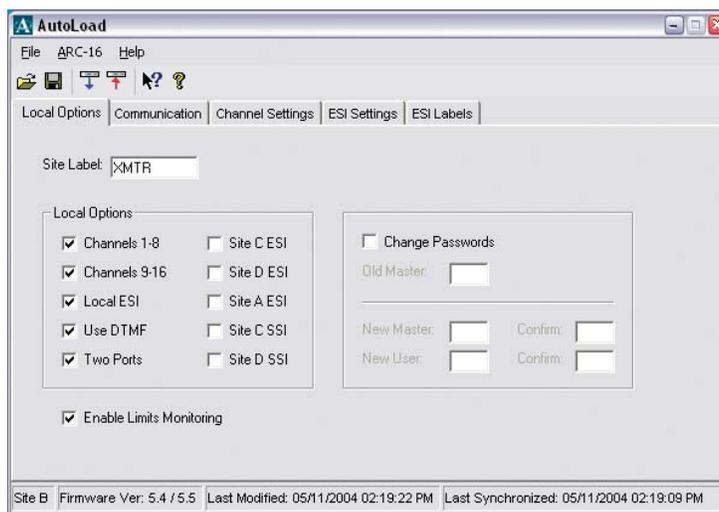
In firmware versions below 5.5, check this box only if the local unit has a TPA board (Two Port Adapter) installed. Starting in firmware version 5.5, both modem ports available by default. Check this box even if only one modem is installed.

#### Site (A-D) ESI

Use these check boxes to indicate which ARC-16 sites in your system have ESIs installed.

#### Site (A-D) SSI

Check the boxes for any site that has an SSI (Studio Status Indicator).



### Enable Limits Monitoring

Check this box to enable limits monitoring on the local unit. Limits monitoring must be enabled in order for alarms to be reported.

### Changing Passwords

If you want to change the passwords(s), check the “Change Password” box. Enter the existing MASTER password. Then enter and confirm the new passwords for MASTER and USER. If you want to change one password and not the other, simply reenter the current password when asked for the new one.

## Communication Settings

### Data Received From

The Receive Port tells the local ARC-16 which port to use when receiving data from the specified remote unit. The port assignment should correspond with the physical connection. For example, if you are configuring a studio unit D, and the communication link to transmitter site A is connected to unit D’s Port 1, set the local unit to receive unit A on Port 1.

In a “daisy-chained” configuration, for any unit not physically connected to the local unit you are configuring, use the same receive port that the middle unit is received on. For example, if you have local unit D receiving receiving site A on Port 1, yet Site A also has a connection Site B, receive remote unit B on Port 1 (as it is the same port that the middle/repeater unit is received on).

### Data Sent Out

The Send Port identifies the port that the local unit uses data from Site (X) to other sites. For the local unit, you cannot change the default Send Port setting (PORTS 1+2). For remote units, set the Send Port to the opposite of the Receive Port, even if that port is not in use.

### Highest Channel

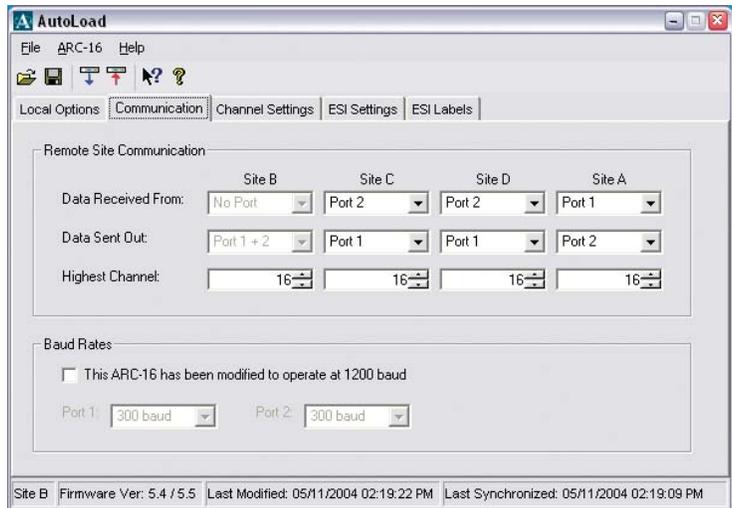
You may assign a Highest Channel at each site so that only in-use channels are displayed on the front panel. This feature makes each site’s communication link more efficient, and allows you to restrict access to certain channels at any location.

### Baud Rates

Any ARC-16 unit that supports AutoLoad configuration also supports faster baud rates for digital links (1200 baud in versions 5.4 and 5.5, and 1200, 2400, 4800 or 9600 baud in version 5.6). Note that firmware version 5.4 requires a CPU hardware modification for the 1200 baud selection to take effect (see Appendix D). Version 5.3 requires the same modification, but is not compatible with AutoLoad.

If you are using a digital link with your ARC-16 system, check the box under Baud Rates and set the baud rate for Ports 1 and 2 as desired.

*IMPORTANT! Only bi-directional digital links are supported at speeds faster than 300 baud. If you are using an audio or subcarrier link, or if your link is digital in one direction only, the baud rate setting should remain at 300 baud.*



## Channel Settings

### Label

Set up a channel label for each channel, using up to seven characters.

**Note:** Whether you configure labels using AutoLoad or the front panel, the maximum size is seven characters. Even though AutoLoad allows an entry longer than seven characters, you cannot upload a channel label longer than seven characters.

### Status Alarm

Check this box if you want status alarms reported on this channel.

### Invert Status

Check this box to invert the polarity of the status channel.

### Decimal Point

Select the location of the decimal point.

### Low Limit/High Limit

Enter the low and high limits limit for this channel. The limit will use the decimal point setting for the channel.

### Raise/Lower Durations

Enter the duration of the Raise and Lower commands (in seconds). The command, when activated, will be held for the amount of time specified here. The duration can range from .2 to 28 seconds, and can be specified to the tenth of a second. A value of 0 can be used for the default duration of .7 second.

**Note:** The command duration is not fully accurate to 1/10 second; some rounding may occur.

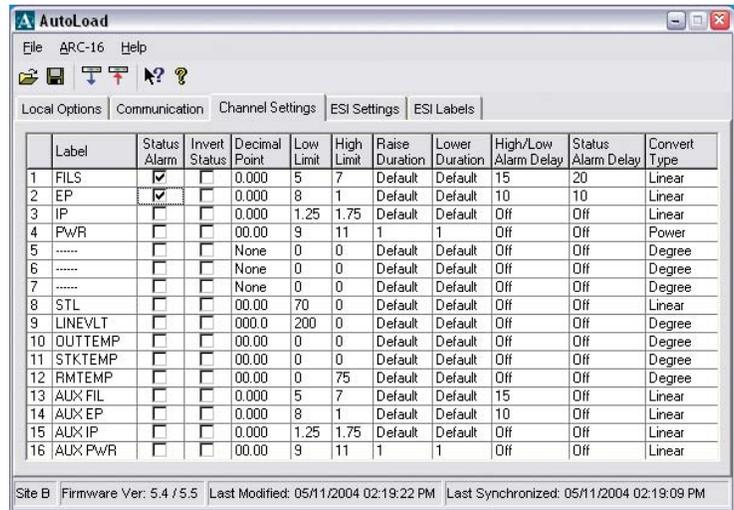
*IMPORTANT!* Raise and Lower durations specified in AutoLoad override the durations specified in AutoPilot scripts and CDL modes.

### High/Low and Status Alarm Delays

Enter an alarm delay duration (in seconds) for the status alarms and the high and low limit alarms. For no delay, enter 0. When a delay is specified, an alarm will be issued only after the out-of-tolerance condition is continuously asserted for the delay duration.

### Convert Type

Choose whether the conversion type for this channel is Degree, Linear, Power or Indirect. The ARC-16 will apply this conversion type to the sample input to calculate the reported value.



## ESI Settings

When you configure ESI settings, you determine whether the ESI in this ARC-16 will dial out to report alarms, answer incoming calls, or both. If you choose to have this ESI answer incoming calls, also specify the number of rings the ESI should wait before picking up the line. If you use a modem to connect to the ARC-16 using AutoLoad or AutoPilot, set the number of rings to be less than 9 to prevent the PC modem from timing out before the ESI answers. In the Phone Numbers field, enter up to nine phone numbers for the ESI to dial when an alarm occurs. The ESI will call these numbers in rotation until the alarm is cleared either from the front panel of any ARC-16 unit in the system or via telephone.

When you are configuring your ESI settings, you can enter words quickly by typing the start of the word you want. The drop down list will fill in the rest of the word once it finds a match. To remove a word, choose the blank entry from the bottom of the list. A list of all ESI vocabulary words starts on page 60.

### Sign-On Message

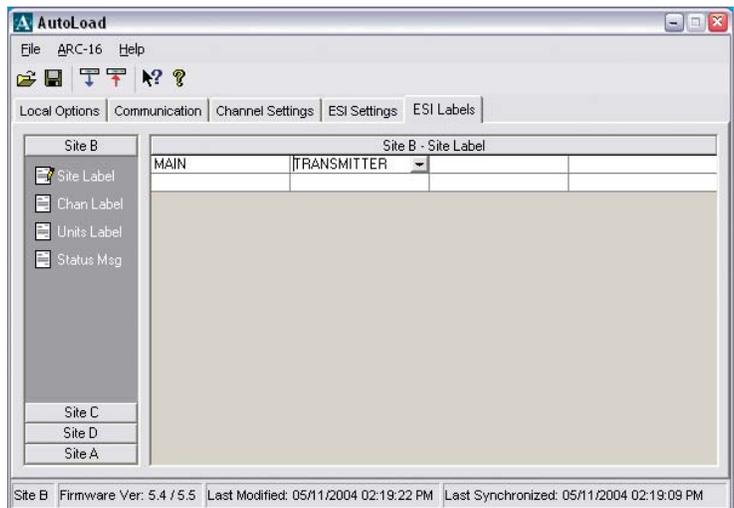
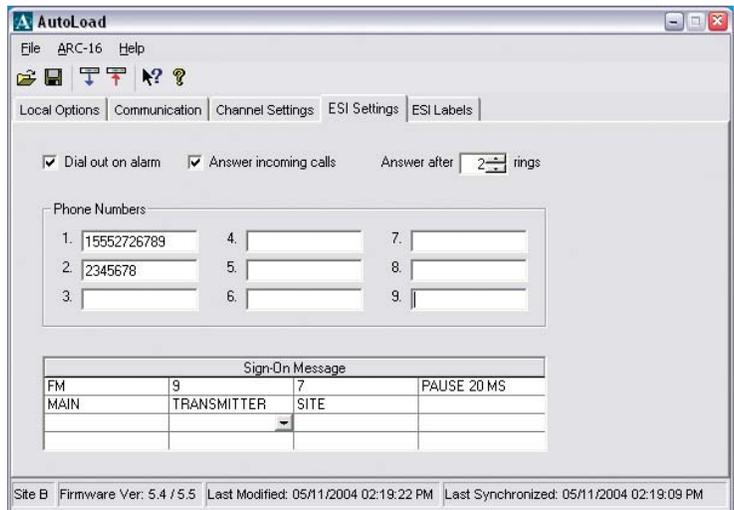
When the ESI answers an incoming call, it speaks the word “Hello,” followed by the message entered in the Sign-On Message field. To enter the message, select up to 16 words using the drop down lists in the table (the order is left to right, then top to bottom).

### ESI Labels

To enter Site, Channel, Unit, and Status labels to be spoken by the ESI, first select the site letter from the navigation bar on the left. Then select the icon for the type of label you want to edit. The icon will change to the “edit” icon (as seen above), and the grid caption will show the site and label type.

Use the drop down list to enter each word of the label. A complete vocabulary list can be found on page 60.

**Note:** ESI labels must be uploaded to the unit containing the ESI you are configuring. If there is more than one ESI in your ARC-16 system, each can have a unique set of labels. Make sure you load labels to each ARC-16 that contains an ESI.



## OPENING AND SAVING FILES

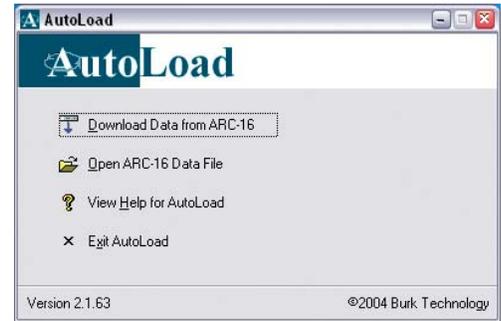
### *Opening*

To open a previously saved file, click “Open” from the File menu or click the toolbar icon in the configuration window; or click the Open button from the AutoLoad startup dialog (seen below). AutoLoad configuration files use the file extension .a16. Select the file that you want to open. The ARC-16 settings will be displayed in the configuration window.

### *Saving*

To save configuration changes to a file, click “Save” from the File menu, or click the toolbar icon. If you want to discard your changes, simply exit the program without saving.

**Note:** The configuration file is specific to the site letter from which it was downloaded. However, it is not serial number specific. This means that if you downloaded these settings from Site A, you can only upload back to a Site A. If you need to replace an ARC-16 with a backup unit, configure the backup to be the same site letter as the old unit, and then use AutoLoad to restore your original settings.



# 4 Installation

Installing the ARC-16 involves mounting the unit in a standard nineteen-inch rack, establishing the communication link, and connecting site equipment to control outputs and monitoring inputs.

For specifications on the input and output channels on the ARC-16, see Appendix A.

## RACK INSTALLATION

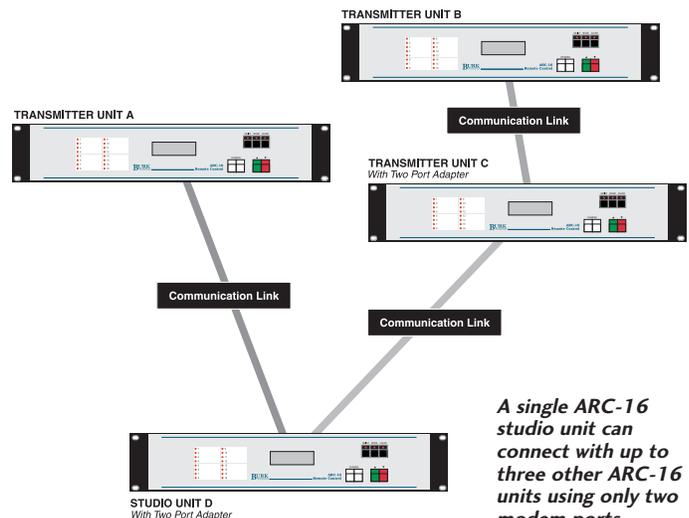
The ARC-16 requires two units of standard rack space (3 1/2"), and installation is straightforward. As long as input samples are well shielded and properly grounded, the ARC-16 may be situated in high RF environments with no performance degradation. When used with IP-8 Relay Panels, the ARC-16 should be installed less than 5' away from the IP-8 in order to make use of the cables provided with the IP-8 Relay Panels. For IP-8 installation instructions, see page 41.

## THE COMMUNICATION LINK

Full-time and multi-site systems require a bi-directional link between the studio and transmitter sites, and appropriate internal modems are included for the type of link you plan to use. If you ever change the communication link, replacement modems are available from Burk Technology and are easily field-installed.

### *Multi-Site "Daisy Chained" Configuration*

In multi-site systems, a single studio unit can communicate with up to three other ARC-16 units using two modem ports. This is possible by setting up a "daisy-chained" configuration, where the studio unit has a bi-directional link to two transmitter units, and one of those two transmitter units has a bi-directional link to a third transmitter site. The data from that third transmitter site is returned to the studio location by way of an intermediary ARC-16 acting as a repeater. In this configuration, all sites are displayable at each connected ARC-16 unit. See the diagram. Note that the Two Port Adapters shown in the diagram may be installed in any ARC-16 in the system, not just the units shown.



Tip: You may wish to consider redundancy when planning your communication link. Installing an ESI for telephone and software control or a CI for software control not only increases the versatility of the system, but also keeps you in control of your transmitter in case your primary link fails.

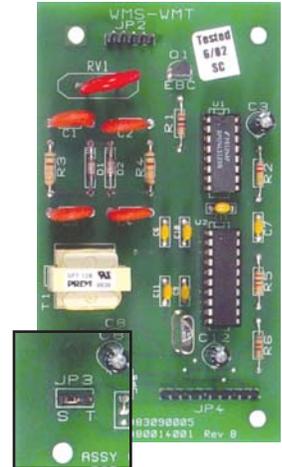
**Note:** In a Stand-Alone system (ARC-16SA), the ESI provides the link to the remote site. There are no internal modems.

**Two-Wire Circuits**

Voice grade phone lines provide the simplest communication link. For a two-wire telco circuit, wire modems are used with the ARC-16. Wire modems are compatible with the Bell 103 standard and will work well over almost any two-wire telephone circuit that will pass voice frequencies. To use the wire modems with a dial line, you must install a coupler to keep the line open.

Each modem has a jumper to select “S” or “T.” In a two-unit system, select S for the studio unit and T for the transmitter unit. In a system with more than one transmitter site, select S or T so that there are opposite designations on each side of the link.

**Note:** If you are using a four-wire dedicated telephone line, use Universal Modems instead of Wire Modems (see below).



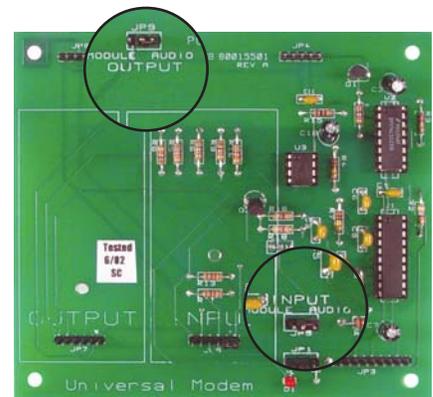
*Jumper location on the Wire Modem (WMS/WMT). Opposite sides of the communication link must have opposite jumper settings.*

**Two-Wire Circuit Connections**

The two-wire line is connected to the barrier strip terminals marked PORT 1 or LINE 1 on the rear panel of the ARC-16. If a second modem board is installed, an additional line may be connected to PORT 2 or LINE 2.

**Subcarrier, Four-Wire and Digital Circuits**

If your communication link is not a two-wire telephone circuit, a Universal Modem is needed. Common configurations include a 950 MHz STL with an FM subcarrier or 450MHz TRL for return; a bi-directional spread-spectrum data transceiver; and four-wire dedicated lines. Each Universal Modem has a set of headers to accept plug-in send and receive modules specific to the type of service your operation requires. Digital modules are available for digital links, and modules for subcarrier frequencies 39, 67, 92, 100, 152 or 185KHz, are also offered. For audio circuits, no module is needed. Use the jumper on the modem board to indicate whether you are using an audio circuit (no module) or a module is in use.



*Use the Input and Output jumpers on the Universal Modem to indicate whether the modem uses a module (for digital or subcarrier links) or Audio (no module).*

The following is a list of popular site links matched with the appropriate Universal Modem modules. The list represents just a few of the possible link types that can be used with the ARC-16. If you ever change your send and receive configuration, you can contact Burk Technology for replacement modules.

***Transmitter to Studio Link***

Marti TSL-15	AUDIO
FM SCA*	67 or 92 KHz
T-1	AUDIO
Intraplex	DIGITAL OR AUDIO

***Studio to Transmitter Link***

Harris CD Link	DIGITAL
Intraplex T-1	DIGITAL or AUDIO
Marti STL-8**	39 or 67 KHz
Marti STL-1	39, 67 or 92 KHz
Marti STL-15	92 or 110 KHz
Moseley Composite	110, 152 or 185 KHz
Moseley DSP-6000	DIGITAL
Moseley Starlink	DIGITAL
Moseley LanLink	DIGITAL
TFT 7700B and 8300	152 KHz
TFT 8600	Requires AUDIO input with 39 KHz generator
TFT 9100	152 or 185 KHz
TFT DMM92	DIGITAL

***Dedicated Line Circuits***

Four-wire telco	AUDIO (for both SEND and RECEIVE)
QE1 Cat Link & T-1	AUDIO (for both SEND and RECEIVE)
Two-wire voice grade	Use Wire Modem
Fiber	DIGITAL

***Intraplex T1***

Model X4160/IX4240	DIGITAL
Model X4104	AUDIO

*\*When using an FM subcarrier for the return link, an external subcarrier receiver is required. Contact Burk Technology for information on the SCA-2 subcarrier receiver.*

*\*\*The Marti STL-8 requires a Marti BPF-39/67 filter amplifier.*

**Note:** The Burk Technology BAL-1 Balancing Kit is recommended when the unbalanced output of the Universal Modem is connected to a balanced circuit. The BAL-1 connects to the BNC connector and provides barrier strip connections.

***Increasing the Baud Rate for Four-Wire Audio Links***

While the Universal Modems in the ARC-16 handle audio links at 300 baud, it is possible – if desired – to increase the baud rate to 1200, 2400, 4800 or 9600 by connecting the telco line to an external four-wire modem and linking the modem to the ARC-16 using RS-232-to-BNC. In this case, the ARC-16 Universal Modem must be equipped with digital input and digital output modules, and the higher baud must be selected in the configuration menu (see page 16). A higher baud rate results in faster status updates from remote sites, especially in systems with three or four ARC-16 units connected. This link method works with firmware versions 5.3-5.5 for 1200 baud, and 5.6 or above for speeds to 9600 baud.

**Note:** For more information on outfitting the ARC-16 with external four-wire modems, contact Burk Technology.

***Using Two Modems***

A second modem may be installed in any ARC-16 system when an appropriate TPA Two Port Adapter kit is installed. For firmware versions prior to 5.5, a “TPA KIT” – containing a PCB assembly and mounting hardware – is needed. Starting with versions 5.5, the ARC-16 requires a “TPA B KIT” – which includes the hardware necessary to install the second modem (no PCB assembly).

When you order your ARC-16 system for use with two modem ports, the appropriate hardware is installed at the factory. If you are adding either the TPA KIT or TPA B KIT in the field, installation instructions are included with the hardware and in Chapter 8 of this manual.

### ***Testing the Internal Modem Configurations***

Burk Technology tests the modem hardware before it leaves the factory, but it is always a good idea to connect ARC-16 units back-to-back to make sure the modems are configured correctly. This is especially true when adding a new ARC-16 to an existing system or installing new modems in the field.

If wire modems are installed, use copper wire (a standard phone cord with the wires exposed will work) to connect the barrier strip terminals marked LINE from one ARC-16 unit to the other. If Universal Modems are installed, use coaxial cable to connect the RADIO IN port from one ARC-16 unit to the RADIO OUT port on the other unit, and vice versa.

Once connected, you should be able to power up the units and view the channels at the transmitter sites from the studio unit by pressing the MODE switch and selecting a transmitter site from the studio unit front panel. If the status LEDs are blinking rapidly in sequence, the modems are not communicating (see Appendix E for troubleshooting).

### ***Linking the ARC-16 to a Subcarrier (STL or TRL)***

#### **STL Transmitter Connection**

The ARC-16 studio unit BNC output must be connected to the subcarrier input of the STL transmitter using a cable with a BNC connector on the ARC-16 end. Make certain that the studio and transmitter units are equipped with modems configured for the desired frequency before connecting the ARC-16 output to the STL transmitter.

#### **STL Subcarrier Levels**

The injection level of the subcarrier must be adjusted prior to operating the remote control system. Normally the STL transmitter will provide a metering position for the subcarrier. The meter is typically calibrated so that a 100% reading corresponds to the recommended subcarrier level. Adjust the injection control potentiometer located on the ARC-16's output module (next to location R1) until the STL meter reads 100%.

#### **STL Receiver Connection**

Connect the STL receiver subcarrier output to the RADIO IN BNC connector on the ARC-16. No adjustments to the ARC-16 are required on this end of the link.

#### **FM Exciter Connection**

Connect the RADIO OUT BNC on the ARC-16 to the subcarrier input of the FM exciter. Usually, the exciter has a subcarrier level adjustment. If not, adjust the injection level on the ARC-16 output module. In either case, set the injection to 5% as read on a subcarrier modulation monitor.

If a subcarrier modulation monitor is not available, the adjustment may be made by removing the stereo pilot and all other sources of modulation and adjusting for 5 percent total modulation. After the system has been tested, the injection level can often be reduced to as little as 1-2%.

#### **FM Subcarrier Receiver**

Where an FM subcarrier is used for metering and status return, it is necessary to receive the FM subcarrier signal at the studio and feed the subcarrier audio into the ARC-16. Using a modulation monitor for this purpose frequently results in insufficient input levels, requiring the subcarrier injection level to be increased. A dedicated subcarrier receiver, such as the Burk SCA-2, is required when using an FM subcarrier.

Connect the FM subcarrier receiver to a good antenna and confirm that data is heard at the receiver output. The output of the receiver should then be connected to the RADIO IN BNC connector on the ARC-16. No further adjustment should be necessary. However, you may wish to confirm that approximately one volt peak-to-peak is available at the output of the receiver.

### **TRL Connections**

A TRL transmitter and receiver may be directly connected to the ARC-16 as long as Universal Modems with proper modules are installed. Note that the connections are made to the BNC connectors on the ARC-16 and not to the LINE terminals.

## **I/O CHANNEL SPECIFICATIONS AND WIRING CONSIDERATIONS**

Each Input/Output board in the ARC-16 accommodates eight channels of metering, status and command, using two DB-37 connectors per board. Two I/O boards are installed in an ARC-16 Stand-Alone or Transmitter unit, and standard ARC-16 Studio units ship with no I/O boards installed. To control studio equipment, up to two SIO (Studio Input/Output) kits may be purchased for the ARC-16 Studio unit. Each SIO kit adds one I/O board. Wiring connections are the same whether the board is installed at the studio or transmitter site.

### **Control Outputs**

The RAISE and LOWER command outputs are brought out the rear panel DB-37 connectors, which are designed to connect to IP-8 relay panels (see page 41). IP-8 panels allow direct connection of AC or DC switching contacts. Note that high-current switching loads (greater than .5 amps) should still use slave relays of adequate rating.

*IMPORTANT! If 110V control circuits are used, do not leave the contacts exposed. For safety, we recommend using low voltage DC for control, with slave relays mounted within the equipment cabinets where necessary.*

DC power supplies used to provide the operating voltage should be limited to some reasonable size for safety and reliability. A 2-amp regulated supply of 12 or 24 volts is suitable.

### **Using Open Collector Outputs**

To use the open collector outputs, it is necessary to provide a proper source of voltage to the controlled device and bring the ground side of the device to the ARC-16 output. This is commonly referred to as “ground operate,” as the open collector output provides the required ground when the command is executed. You must also provide a ground return to the power supply. Be sure to observe the polarity on all outputs. The output voltage must be above ground for the output to work. The ground for all outputs is common, but at least one ground return should be provided to each external unit. Do not depend on station ground for this, as ground loops will surely result. It is not necessary to run control circuits in shielded cable.

### **Latching Outputs**

With the exception of the failsafe, all outputs are momentary and normally open. In some cases, it may be necessary to provide a latching or normally closed output. This can be accomplished by using external relays. Latching relays are available as mechanical latches or as magnetic latches that hold with remnant magnetism. They are typically operated by connecting the RAISE output to one coil (ON) and the LOWER output to the other coil (OFF).

### **Metering Inputs**

For specifications on the input and output channels on the ARC-16, see Appendix A.

Most transmitters provide remote metering outputs that provide a sample voltage within the acceptable range. In some cases, it will be necessary to convert the signal to a DC sample or install a voltage divider to bring the sample within range. Some equipment produces extremely low output samples and it may be desirable to install an instrumentation amplifier to improve the accuracy of the sample. The ARC-16 will meet specs with an input as low as 250mV, which is adequate for most equipment. The sample should be pre-scaled to provide 4VDC for the highest expected value. This will provide maximum resolution and accuracy.

**Note:** The ARC-16 will not accept a floating ground sample. To connect equipment that provides a floating sample, use a DC isolation amplifier.

**Sample Voltage Connections**

Each sample should be connected to the ARC-16 using shielded cable to reduce noise on the sample. All metering inputs have a common ground but it is important to provide the best possible ground return for each sample. In extremely noisy environments, it may be necessary to carry the signal ground as a separate conductor in a shielded cable with the shield tied to chassis ground at only one end. For instructions on making the physical connection to the ARC-16, see page 42.

**Multiple Power Levels**

Where the station operates at more than one power level with the same transmitter, it is often difficult to achieve accurate samples over the entire range. This is due to poor tracking of the sample voltage as opposed to any limitation of the ARC-16. The simplest solution is to connect the same sample to two ARC-16 inputs and calibrate one for each power level. This limits the tracking requirements to about ten percent of the range instead of the entire difference from high to low power. This solution utilizes two input channels, and metering values for each operating mode would be read on two separate channels.

**Status Inputs**

The status inputs are provided with internal pull-up resistors so that they may be used with switch closures or active outputs. The minimum acceptable signal is an LS TTL output. The input has a fan-in of one unit load. The highest acceptable signal is 28 VDC. Hysteresis is provided on all status inputs to improve noise immunity. Care should still be exercised to assure a good, direct ground return for each input and to make certain that the source comes as close to ground as possible.

Where switch closures are used, the inputs are relatively immune to bounce but the switch contacts must provide a good low resistance path to assure reliable operation. Switch closures are connected directly from ground to the status input. Again, use a separate, dedicated ground return for each piece of equipment.

**Additional Control Outputs**

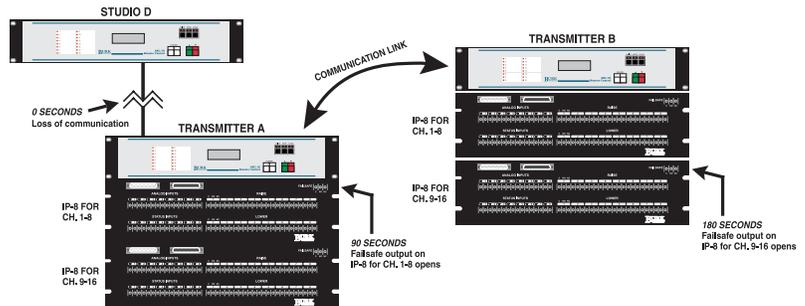
**Failsafe Output**

The failsafe output is labeled on the IP-8. It can be used to turn off the transmitter should your remote control link fail. It has the same specifications as the RAISE and LOWER relays.

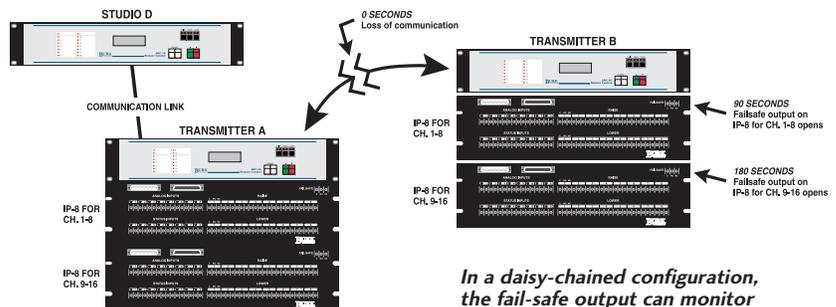
The fail-safe circuit is held closed as long as the ARC-16 unit detects a functional communication link, or whenever the unit is in maintenance mode. If you need a closure to keep the transmitter on the air, connect equipment to the normally open contacts (C NO).

After 90 seconds of link loss, the failsafe output opens. In multi-site systems, it will take 180 seconds for the fail-safe output to open when a remote site is connected to the studio via a third ARC-16 unit. When the unit is in Maintenance Mode the fail-safe relay will be held regardless of the link status.

**Communication Loss from the Studio Site**



**Communication Loss from the Middle/Repeater Site**



*In a daisy-chained configuration, the fail-safe output can monitor loss of communication from both the studio location and the middle or repeater unit.*

The site IDs set up in the configuration process (see page 14) determine how the failsafe works. Each I/O board controls one failsafe. The I/O board for channels 1-8 watches for a communication loss with the site designated as one site previous. The I/O board for channels 9-16 watches for a communication loss with the site designated as two sites previous. For example, if the local unit is site A, one site previous is site D, and two sites previous is site C. See page 19 for a table showing logical site designations. In multi-site systems, this setup is helpful if your units are “daisy-chained” and not directly linked to the studio site.

Tip: In a Stand-Alone system, there is no link to another ARC-16 unit, so the failsafe circuit is never held closed, except when the unit is Maintenance Mode. Some Stand-Alone operators wire lights or an audible alarm to the failsafe output. When the Stand-Alone is placed in Maintenance Mode, the failsafe output activates the lights or alarm to serve as a reminder to disengage Maintenance Mode before leaving the transmitter site.

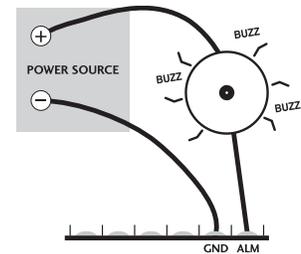
### Alarm Output

Each ARC-16 unit with at least one internal modem installed has an alarm output, which closes when a new alarm condition is registered anywhere in the system. The alarm output is a low-current open collector output capable of driving loads up to 50 mA (such as lights or buzzers). The connection to the external alarm device is made to the ALRM and GND connectors on the rear panel modem barrier strip as shown below:

**Note:** The alarm output always connects to the labeled terminals on the rear panel barrier strip, regardless of the type of modem being used.

Because Stand-Alone units do not contain an internal modem, there is no alarm output built into standard ARC-16SA units. If you would like an external alarm output with your ARC-16SA, contact Burk Technology for more information on the External Alarm Output board assembly.

**Note:** The rear panel barrier strip provides just one connection for the alarm output. Even though the internal modem drives the alarm output, installing a second modem does not result in a second alarm output.



*The alarm output can be wired to lights or to an audible alarm using the terminals marked GND and ALRM and located next to the wire modem connections on the rear panel.*

## CONNECTING SITE EQUIPMENT

Metering, status and command channels from the site equipment are connected to connected to the IP-8 relay panel, which then connects to the ARC-16’s rear-panel DB-37 connectors.

### Using IP-8 Interface Panels

The IP-8 interface panel provides momentary relay closures for all raise and lower outputs plus failsafe. Connection to the relay contacts is by means of barrier strips. Additional barrier strips are used to connect the status and metering inputs to the remote control unit. Each relay has single Form C contacts (SPDT) rated 28VDC or 110VAC up to 10 amps.

### Installing the IP-8

The IP-8 requires three units of standard rack space (5 ¼”), and is typically installed in the rear of the rack, within 5’ of the ARC-16. If rear rack rails are not available, a Front Mount Adapter (FMA) is available to allow the IP-8 to be mounted in the rear but using the front rack rails.

The IP-8 connects to the ARC-16 using the two 5’ cables supplied with the IP-8. The cables are interchangeable. To utilize all sixteen metering, status and command channels, use two IP-8 panels.

**Installation Testing**

After connecting the IP-8 to the ARC-16, you may wish to use an ohmmeter to verify that closures are obtained at the appropriate terminals when the RAISE and LOWER switches are pressed. Terminals C and NO will close, while terminals C and NC will open for the duration that the switch is pressed. Note that the C, NO, NC pattern indicated above Channel 1 on the IP-8 is the same for all outputs.

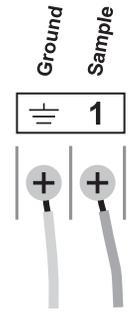
**Connection to External Equipment**

The IP-8 uses a screw terminal barrier strip to simplify the connection of your metering and status inputs, and your command outputs. Two IP-8 panels are needed to utilize all sixteen channels in the ARC-16.

**Metering Inputs**

Each IP-8 has eight metering inputs, labeled ANALOG on the IP-8. There are two screw terminals for each channel, one for the ground sample and the other for the voltage sample (see the illustration). Connections are the same for each channel.

To connect inputs, screw down the wire for ground to the terminal designated by the ground symbol, and the wire for the voltage sample to the terminal labeled with the channel number.



*Metering and Status input wiring.*

**Status Inputs**

Each IP-8 also has eight status inputs, labeled STATUS. Connections are made using the same procedure as those for metering, and are the same for each channel.

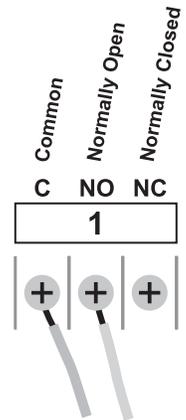
**Command Outputs**

The Command Output channels are labeled RAISE and LOWER. Each IP-8 has sixteen command outputs – eight for LOWER and eight for RAISE. The connections are the same for each channel.

To connect command outputs, screw down the wire for ground to the terminal designated by the ground symbol, and then wire a normally open contact to the NO terminal, or a normally closed contact to the NC terminal. One of the three screw-down terminals will remain unused.

Where a momentary closure is required, use the C and NO terminals. Some older transmitters require that a circuit be interrupted to turn the plates off. In this case, use the C and NC terminals.

Where latching is required, an external latching relay will be necessary. A double pole relay may be electrically latched using a normally closed output from the IP-8 to break the latch. Note that this arrangement will unlatch during any power interruption.



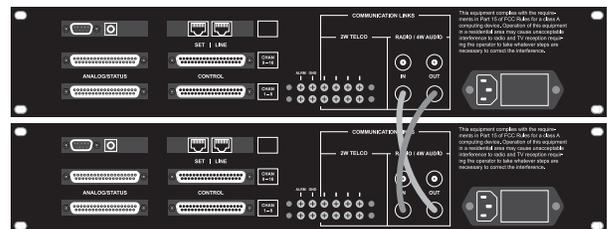
*Command Wiring.*

**Failsafe Output**

The failsafe output is labeled FAILSAFE. Connections for the failsafe are the same as the command outputs, except the circuit is held as long as the communication link is active or the ARC-16 is in Maintenance Mode. If you need a closure to keep the transmitter on the air, use the C and NO terminals. For more information on how the failsafe output functions, see page 40.

**INSTALLING AN ARC-16T32**

The ARC-16T32 is designed to connect directly to another ARC-16 unit to provide sixteen additional metering, status and command channels. The T32 is functionally identical to a standard ARC-16 transmitter unit; however, no modems are installed. Instead, the T32 connects directly to another ARC-16 using BNCs and the two supplied 12” cables (see



*The ARC-16T32 expands channel capacity at any site, and is most often connected using the BNC connectors, with no need for internal modems.*

the diagram below).

If the units must be connected over a distance greater than 12", internal modems must be installed in both the T32 and the existing ARC-16 units. One option is to use a two-wire link using Wire Modems (WMS/WMT). You can also use Universal Modems and connect coaxial cable between the BNC connectors on an existing ARC-16 unit.

### **Internal Connector Cable**

**Note:** If you are using internal modems instead of the 12" cables, the internal connector cable described below is not needed.

T32 units ship from the factory with an internal connector cable to link the BNC connectors to the IC modem driver on the CPU board. A second cable and set of BNCs are supplied loose, and must be installed in the existing ARC-16 unit to serve the same function. For full-time or multi-site systems running firmware versions 5.4 and below, a TPA kit must be purchased and installed in order to accommodate a T32 (see Chapter 8 for installation instructions).

To install the BNC connectors and 10-pin connector cable in the existing ARC-16 unit:

1. If the existing set of BNC connectors is already in use, install a second set of BNC connectors and grounding lugs (included with the cable) on the rear panel in the available mounting holes. Use the existing set of BNC connectors as a guide. If the ARC-16 is equipped with BNC connectors that are not in use, it is not necessary to install the BNC connectors included with the cable.
2. Solder the 3-wire connector assembly to the BNCs. The yellow lead should meet the BNC near the barrier strip assembly, and the red lead should meet the BNC near the power module. Solder the black wire to the pair of ground lugs. It is not necessary to link this new set of ground lugs to the existing set; they are interconnected through the chassis wall.
3. In firmware versions later than 5.4, and for ARC-16 Stand Alone systems running any version of firmware, connect the 10-pin connector to the available modem port on the existing ARC-16 CPU.
4. For firmware versions 5.4 and earlier, connect the 10-pin connector to the 10-pin TPA ribbon/jumper assembly.



*The ARC-16T32 uses an internal connector cable to link the BNC connectors on the rear panel to the CPU board. This allows the T32 to connect to another ARC-16 unit without using an internal modem when the distance is less than 12".*

Even though you are not installing an additional modem, adding this cable for the ARC-16 T32 utilizes the modem port. Similarly, one modem port in the T32 unit is occupied.

The T32 constitutes a distinct site in the ARC-16 system. It must have its own site ID, and it must be configured to recognize its own installed options, as well as options installed in other units.

***Using an Additional ARC-16 to Expand Channel Capacity***

If a spare unit is on hand, it is not difficult to install the unit in the same manner as an ARC-16T32 to expand channel capacity. One or two I/O boards need to be installed in the unit to add eight or sixteen channels, respectively. The same configuration considerations apply: the spare ARC-16 must have its own site ID, and it must be configured to recognize its own installed options, as well as options installed in other units. The existing ARC-16 must also have at least one available modem port.

Also, be sure to verify that the firmware version in the spare unit is compatible with the existing unit. The firmware version can be identified from the front panel of the unit by pressing the MODE switch to advance to the last Mode Menu, where the firmware version and serial number are displayed. See page ix for a complete firmware compatibility chart.

**If the unit will be installed within twelve inches of the existing ARC-16**

Any internal modems in the spare unit should be removed. The internal connector cable discussed on page 43 needs to be purchased and installed in both the spare and existing ARC-16 units. Order two (2) of part 84000004 and see installation instructions for the 10-pin internal connector cable on page 43. You will also need to order the external cables used to connect the BNCs on the existing unit to the BNCs on the new unit. Order two (2) of part 31190050.

**If the units must be connected over a distance greater than twelve inches**

Internal modems must be installed in both the spare and the existing ARC-16 units if they will be more than 12 inches from each other. One option is to use a two-wire link using Wire Modems (WMS/WMT). The link can be as simple as a length of standard telephone cord with the wires exposed at both ends so that they may be secured to the barrier strips on both units. You can also use Universal Modems and connect coaxial cable between the BNC connectors on each unit.

# 5 Operation

Once you have connected your communication link and site equipment, you are ready to take full advantage of the monitoring, control and alarm notification functions of the ARC-16.

## METERING AND STATUS CHANNEL READINGS

Every ARC-16 can display metering and status channel readings for any site connected to that unit. Meter readings are displayed one channel at a time, while all status channel conditions are simultaneously displayed on the status LED array on the left side of the front panel.

The polarity of each status channel is adjustable, allowing the user to define whether the LED indicates a high or low state. In normal polarity, a HIGH status signal results in an illuminated LED. When the polarity is inverted, a HIGH signal causes the LED to turn off. See page 24 for configuring the polarity of a status channel.

### *Switching Channels*

Use the CHANNEL switches to select a new metering channel to display. The number of displayable channels at each site depends on the Highest Channel setting selected for that site (see page 17).

### *Selecting Sites*

As long as the ARC-16 system contains more than one unit with channels assigned (the Highest Channel setting is greater than 0), the operator can change the currently selected site by pressing MODE. The screen will then prompt you to select a new site using the RAISE and LOWER switches. Select the new site and press MODE for several seconds to return to the normal display. The values and status indicators are now valid for the newly selected site.

A	XMTR
↑↓	SELECT SITE

At any given time, only one site may be selected for display on an ARC-16 unit. The selected site letter is displayed in the upper left corner of the LCD, with the user-defined site description on the second line of the LCD. The metering values and status conditions are valid for that site only.

In full-time and multi-site systems, it is important to remember that the selected site may be different from the local site, and if more than one operator uses the ARC-16, it may be a different site from when you last used the system.

**Note:** The SSI and SP-16 options allow you to view status conditions from multiple sites at the same time. See page 10 for more information.

## **ISSUING COMMANDS**

To issue a command, select the desired channel on the front panel and press the RAISE or LOWER switch. A relay closure results for the selected channel.

Commands issued from the front panel of the ARC-16 take effect at the site that is currently selected on the LCD. This allows you to issue commands to any site in the system from the front panel of any other ARC-16 unit in that system. For example, if you are at studio site D, you can issue commands to transmitter sites A, B or C by simply selecting site A, B or C from the front panel of the studio unit. Likewise, you can issue commands from one transmitter unit to another, and you can control studio equipment from the transmitter, all by selecting the appropriate site to display on the front panel any ARC-16 unit in the system. Of course, you can also use the ARC-16 to issue local commands to equipment connected to the unit you are using. Just make sure the local site it selected on the front panel display.

**Note:** If you are using an ARC-16T32 in conjunction with a standard studio or transmitter unit, both units must have unique site letters, even though they are installed at the same location. When you are issuing commands to a site with a T32 installed, be sure to select the appropriate site letter for each unit.

### ***Command Durations***

The ability to set command durations – and how those command durations take effect – depends on the firmware version you are using and whether the command is being issued to a remote or local ARC-16. To verify your firmware version, press the MODE switch to advance to the final screen in the Mode menus, which display the firmware version and serial number of the unit.

#### **In Firmware Versions Below 5.4**

Firmware versions 5.0 to 5.3 use pre-defined command durations. When you press the RAISE or LOWER switch briefly, the default command duration is .7 seconds. To exert the command for a longer duration, press and hold the switch for the desired length of time. In firmware version 4.6, the command duration is equal to the amount of time the RAISE or LOWER switch is held.

#### **In Firmware Versions 5.4 and 5.5**

Firmware versions 5.4 and 5.5 allow users to set up remote command durations using the AutoLoad software. Once the desired duration is set in AutoLoad (see Chapter 3), you can press the RAISE or LOWER switch briefly and achieve the desired command duration at a remote site. Remote command durations do not take effect when issuing local commands to equipment connected to the ARC-16 unit you are using. You must press and hold the RAISE or LOWER switch for the desired length of time in this case.

When an ESI is installed in the unit receiving the commands, commands issued via the ESI are considered local, and remote command durations do not take effect. For example, when the ESI is located at the transmitter site A, commands to site A will use the default command duration of .7 seconds. Commands issued to any other site will use the remote command durations set up using AutoLoad.

#### **In Firmware Version 5.6**

Version 5.6 firmware handles command durations in the same way as versions 5.4 and 5.5, except all commands issued via ESI are considered remote commands, and the command duration will take effect regardless of where the ESI is installed and which unit is receiving the command.

### ***Data Updates After Commands are Issued***

For remote commands, the amount of time it takes for new data to appear on the front panel depends primarily on the communication link between the ARC-16 used to send the command and the ARC-16 used to receive the command.

Higher baud rates and direct communication links result in faster updates on the front panel. Slower baud rates and “daisy-chained” links may generate some lag between the issue of the command and the receipt of the status or metering update. Lag can be minimized by running digital links at 1200 baud (in firmware versions 5.3 and greater), and by using direct communication links between sites wherever possible.

## ALARM MANAGEMENT

### *Enabling Alarm Notifications*

In order for the ARC-16 or an ESI to report alarms, alarm reporting must be enabled by turning Limits Monitoring to ON in the configuration Mode menus (see page 18). In addition, high and low limits must be set for each desired metering channel (see page 19). For status channels, each desired status channel must be set to alarm (see page 19).

### *Alarm LED Indicator*

The LED indicator on the CLEAR switch illuminates when an alarm condition is reported on any ARC-16 unit in the system. At the same time, the alarm output activates (see page 41). The alarm stack in each ARC-16 will store up to the ten most recent alarms in the system, allowing operators to manage multiple alarms at multiple sites from a single ARC-16 unit.

### *Reviewing and Clearing Alarms*

The operator can review and clear each alarm in chronological order by pressing the CLEAR switch. Presence of an alarm, or multiple alarms, is indicated by an illuminated LED above the CLEAR switch. When you press CLEAR while alarms are registered, the ARC-16 automatically selects the site and channel of the most recent alarm and displays the alarm condition on the LCD. Pressing CLEAR again will display the next alarm in the stack, or it will exit the alarm review if no other alarms are present. If there are other alarms present, pressing CLEAR will display the next most recent alarm and will clear the alarm already displayed on the LCD. Once all alarms are cleared, the alarm output will return to its inactive state and the LED indicator will turn off until a new alarm condition occurs.

B 7 RM TMP 68.50
XMTR B LO LIMIT

B 1 STATUS ALARM
XMTR B

Once an alarm is cleared at one location, the alarm on that channel will not recur until the channel returns to a normal state and goes out of tolerance again. Accordingly, it is important that alarms are not cleared unless some kind of response is initiated to correct the condition.

**Note:** To retrieve an alarm condition that was cleared by mistake, turn Limits Monitoring off and back on (see page 19). The ARC-16 will report all current alarms. If the alarm condition has already reverted to within tolerance, it cannot be redisplayed after clearing it.

In a system with more than one ARC-16 connected, each ARC-16 maintains its own alarm stack. Clearing alarms at the studio location does not clear them at the transmitter site.

When you clear alarms during an ESI session, alarms are cleared from the alarm stack of the unit containing the ESI.

**Note:** In addition to the front panel and ESI alarm notifications, the ESI is also equipped with an Alarm Output for audible or visual notification via an external device. See page 41 for more information.

### ***Disabling Alarm Notification***

To suspend alarm reporting, simply turn off Limits Monitoring in the configuration Mode menus (see page 19). Disabling alarm notification can be helpful if you plan to take equipment offline for maintenance, or if you wish to cancel ESI dial-out while you tend to the alarm condition. Be sure to restore Limits Monitoring when you are ready to begin receiving alarms again.

### ***Alarm Delays***

In firmware versions 5.4 and above, you can set a delay duration for each alarm using the AutoLoad software. When an alarm delay is specified, an out-of-tolerance condition must exist for the full delay duration before the alarm is rendered on the ARC-16 front panel or AutoPilot software, and before the ESI will begin dial-out.

## **CALIBRATION**

Front panel calibration allows each metering channel to be calibrated from the transmitter without the assistance of studio personnel. Enter the calibration mode by pressing the MODE switch until the CALIBRATE menu appears. Use the CHANNEL switches to select the desired channel, and use the RAISE and LOWER switches to adjust the value for each channel. The calibrated value will change more rapidly when the switch is held down for longer durations.

For full details on calibrating the ARC-16 input channels, see page 20.

## **MAINTENANCE MODE**

The ARC-16 is equipped with a Maintenance Mode, which disables remote commands so that operators may safely perform equipment maintenance at the remote site. When a unit is in Maintenance Mode, commands may be issued only from the front panel of the local ARC-16 unit. No one may remotely issue commands to the unit until Maintenance Mode is turned off. Site data is still remotely accessible, and alarm reporting is active, but the operator performing maintenance is protected against unexpected equipment control, including commands executed from an ESI or via the AutoPilot software.

Turn Maintenance Mode on and off by pressing the MAINT switch on the front panel of the unit. The red LED on the switch confirms that Maintenance Mode is active. Maintenance Mode may only be controlled at the local unit - it cannot be turned off remotely by any means.

When the ARC-16 is in Maintenance Mode, the failsafe output remains active regardless of the communication link status. If the failsafe output has already been deactivated due to a link loss, pressing the MAINT switch will cause the failsafe to immediately close. Disconnecting the IP-8 while the ARC-16 is in Maintenance Mode is good practice, and will avoid undesired output on the failsafe relay.

See page 40 for more on the Failsafe feature.

# 6 Using the Enhanced Speech Interface (ESI)

## INTRODUCTION

The ESI Enhanced Speech Interface provides access to the ARC-16 system via touch-tone telephone. All monitoring and control functions are available with voice prompts and DTMF commands, and the ESI can be set to dial out to report alarm conditions. The ESI also accepts data connections via the dial-up phone line for communication with AutoLoad, AutoPilot and CDL software. In addition, an RS-232 Computer Interface is built into the ESI, allowing users to connect directly to the ARC-16 using the same software.

The ESI is included in all ARC-16 Stand-Alone systems. In full-time and multi-site systems, the ESI is optional. When the ESI is ordered at the same time as the full-time or multi-site system, the ESI is installed at the factory. If you add the ESI to an existing system, the option is easily field-installed.

## INSTALLING THE ESI

If you are adding an ESI to an ARC-16 with version 5.4 firmware, a hardware modification is necessary in order to accommodate a new ESI. It will add the necessary interrupt port that is required for firmware version 5.4 to work with the ESI.

You do not need to complete this modification if:

- Your ARC-16 is running firmware version 5.5 or higher
- The ARC-16 shipped with firmware version 5.4 and you purchased the ARC-16 with an ESI or CI installed at the factory.
- The ARC-16 is running firmware version 5.3 or lower.

To verify the firmware version in your unit, use the MODE switch to advance to the last Mode Menu, which displays the serial number and firmware version.

Please see Chapter 7 for ESI installation instructions, and Appendix D for details on the modification for version 5.4.

## CONNECTION TO ESI



### **Telephone Connection**

Connect a standard modular telephone line to the “LINE” jack to complete the telephone line connection to the ESI. You may optionally connect a telephone set to the second jack marked “SET.” This telephone set may be used to share the ESI line for outgoing and incoming calls, or to access the ESI locally (see page 52).

**Note:** When a telephone set is used for incoming calls, keep in mind that the ESI will pick up after the specified number of rings. See page 52 for details on changing the number of rings.

### **Audio Monitoring**

If desired, connect a source of unbalanced audio (one volt RMS or less) to the phono jack on the rear of the ESI. Operators may listen to the audio source during an ESI session, which is useful for monitoring the station while away from the broadcast coverage area. See page 57 for more on accessing the audio monitoring function during a call.

### **Computer Connection**

The ESI includes a Computer Interface (CI) port on the rear panel of the ARC-16. This allows operators to use a null modem cable to directly connect a computer to the DB9 connector. The Computer Interface facilitates a direct connection for AutoLoad or AutoPilot software. See Appendix B for null modem cable pinouts.

**Note:** When the CI port is in use for an AutoLoad software connection, the ESI cannot be used for incoming and outgoing calls. Similarly, AutoLoad connectivity is disabled when the ESI is currently on the line in a voice session.

### **Lightning Protection**

Although the ESI is equipped with onboard overvoltage protection, external transient protection for the incoming telephone line is strongly recommended to protect against lightning damage and other strong surges. Contact Burk Technology for available transient suppressors.

## CONFIGURATION

Starting with firmware version 5.4, all of the ESI configuration settings below can be set up using AutoLoad software (see Chapter 3). Where an AutoLoad connection is unavailable, some settings may be configured from the front panel of the ARC-16, and the remaining parameters are set via a telephone connection to the ESI – either from a remote location or using local telephone control (see page 52).

### **Activating the ESI**

Once the ESI is installed, the ESI option needs to be activated in the ARC-16 configuration menu, and the configurations for other ARC-16 units in the system need to be updated so that they are aware of the location of the ESI.

To configure the ESI manually, follow the instructions below:

1. With series 5 firmware, enter configuration in Edit Mode by pressing and holding the MAINT switch first, followed by the CLEAR switch. Hold both switches for at least two seconds, until the Edit Mode menus appear on the LCD.

If you are running 4 series firmware, press and hold the MODE and CLEAR switches for two seconds and simultaneously cycle the power.

2. Press MODE to advance to the options menus. When you see “CH. 1-8” followed by YES or NO, press the right-hand CHANNEL button to advance to the ESI options.

3. When the display reads, “LCL ESI” (or “LCL DSU” in firmware version 4.6), press RAISE or LOWER to turn the option on at the ARC-16 where the ESI is located, and off for any other ARC-16 that does not contain an ESI.

LCL ESI	YES
←OPTION→	SET↑↓

4. Press CHANNEL to advance to the next menu (“DTMF”) and select YES if the line connected to the ARC-16 uses tone dialing, or NO if the line uses pulse dialing.

DTMF	YES
←OPTION→	SET↑↓

5. Press CHANNEL to advance to the next three menus, which ask about ESI boards installed in remote ARC-16 units. Refer to the table on page 19 for logical site designations.

**P-1 ESI.** Answer YES if you have an ESI installed at the site designated as the next logical site.

P1-ESI	NO
←OPTION→	SET↑↓

**P-2 ESI.** Answer YES if you have an ESI installed at the site designated as the second logical site.

P2-ESI	NO
←OPTION→	SET↑↓

**P-3 ESI.** Answer YES if you have an ESI installed at the site designated as the third logical site.

P3-ESI	NO
←OPTION→	SET↑↓

**Note:** Firmware version 4.6 refers to the DSU in the configuration menus, even though the speech unit installed may be an ESI. The DSU, programmed with a man’s voice, preceded the ESI, which uses a female voice.

### Setting the Call and Answer Modes

Once the Local ESI option is enabled (see Activating the ESI, above), the CALL and ANSWER Mode Menus are available. The ESI may be operated in answer mode, call-out mode, or both. Answer mode instructs the ESI to pick up incoming phone calls. Call-out mode instructs the ESI to dial out for all alarms reported by the ARC-16 system. When both modes are selected, the ESI will handle incoming calls as well as make outgoing calls when there is an alarm condition at any site in the system.

Press MODE until the LCD displays “CALL?” and use the RAISE or LOWER switches to set this option to YES or NO as desired.

A CALL?	NO
←OPTION→	SET↑↓

Press the right-hand CHANNEL button to advance to the ANSWER menu, and use RAISE and LOWER to adjust the setting as desired.

A ANSWER?	YES
←OPTION→	SET↑↓

Once the ESI option has been configured in all ARC-16 units in the system (see P1, P2, P3 ESI configuration, page 18), the Answer and Call Out modes may be selected from any unit. This means you can change CALL and ANSWER preferences for a remote ESI when you are not present at the remote location. If you are selecting this mode from a remote site, it may take a few moments for the request to reach the remote site and update on the LCD on the unit you are using.

**Note:** If more than one ESI is installed in the ARC-16 system, each ESI configured for dial-out will call to report alarms. If you do not want multiple ESIs to dial out, enable dial-out for only one of them.

### **Local Mode**

Local Mode allows the operator to connect a telephone set directly to the rear panel SET jack and access the ESI from that telephone using the phone line. It is not necessary to enable ANSWER mode in order to access the ESI in Local Mode. Simply pick up the phone and press and hold the MAINT switch for several seconds. The ESI will respond with a normal sign-on message and expect a password.

Since pressing the MAINT switch to access the ESI will also toggle the unit into or out of maintenance mode, it is a good idea to press the MAINT switch briefly before pressing it again to access the ESI. This will leave maintenance mode set as desired when accessing the ESI.

**Note:** In Local Mode, the ESI supplies power to the telephone. Some telephones, especially those with external power supplies, may not work with the Local Mode. If you are unable to use your telephone with Local Mode, try replacing it with a simple telephone.

### **Changing Passwords**

The ESI responds to the master and user passwords set up from the front panel of the ARC-16, or set up using AutoLoad software in firmware versions 5.4 and above. To change the passwords, enter the configuration menu in Edit Mode, as described in step 1 under “Activating the ESI,” and press mode until the master and user passwords appear. Use the CHANNEL, RAISE and LOWER switches to change the password as desired.

### **Number of Rings**

The number of rings the ESI waits before taking an incoming call is selectable during a call to the ESI. The default number of rings is 3.

Establish a telephone connection to the ESI from an outside line. When the ESI speaks the greeting, enter the master password. (You do not have to wait for the entire greeting to play). Press 60 on the telephone keypad to report the current number of rings. Press a number 61 to 69 to set the number of rings to 1-9, respectively. The ESI will speak your selection to confirm.

*IMPORTANT! When using AutoPilot or AutoLoad to connect to the ESI, set the number of rings to a value lower than 8 to prevent the modem connection from “timing out” before the ESI answers.*

### **Label Editing**

When the ESI is in a call and the master password has been entered, the following functions allow the master operator to enter and edit various messages and labels associated with channel labels, the sign-on message, unit labels, status labels and site names.

Each word in the ESI vocabulary list has a three-digit code. See page 60 for a complete vocabulary list.

*IMPORTANT! With the exception of the sign-on message, ESI labels are site-specific. Be sure to select the appropriate site before editing labels. Press 40 to hear the currently selected site. To change the site, press 41, 42, 43, or 44 for sites A, B, C or D, respectively. If the selection is not a valid site, the ESI responds with “Error.” Otherwise, the ESI announces the site ID followed by the user-defined site label.*

### **Sign-On Message**

The ESI automatically speaks “Hello” before the sign-on message. You may customize the sign-on message using up to sixteen words.

Start by pressing 70. The ESI will speak any existing sign-on message. Press # to select message entry mode, and the ESI will respond with “Enter.”

Now enter a three-digit number corresponding to the word in the vocabulary list you would like to use in the message (see page 60 for the vocabulary list). The ESI will recite the selected word.

Continue entering three-digit sequences until the entire phrase is complete. When you are finished, press \* to terminate the entry, and the phrase will be spoken again. To start over, press #.

### **Channel Labels**

In addition to the channel labels set up on the front panel of the ARC-16, each channel should have label assignments for ESI reporting purposes. To edit the channel labels at the currently selected site, first select a channel using 01 through 16. Press 71 to hear the current label, and press # to edit it.

Enter the three digit codes for up to four vocabulary words you would like to use for your label. When you are finished, press \*, and you may then select a new channel to edit. If you use all four words, the label editing is terminated automatically.

### **Unit Labels**

Unit labels are normally used to assign units of measurement such as “kilovolts” or “milliamps” following the value reported for each metering channel. First, select a channel by pressing 01 through 16. To hear the current label, enter 72, and to edit it, press #. Enter the three-digit vocabulary codes for up to two words you would like to use for the label. If the label is only one word, press \* to terminate the label. Otherwise, simply select a new channel to edit.

### **Status Labels**

Each status channel may have a four-word label, which is reported by the ESI when the status LED on the ARC-16 front panel is on. For example, if you have a status channel that is on when the main transmitter is operating, the label might read “Main Transmitter On Air” or something similar.

To edit status labels, first select the desired channel by pressing 01 through 16. Then press 73 to hear the current label, and press # to edit it. Enter the three-digit codes for the desired words, and press the \* key when you are finished. You may then select a new channel to edit. If you use all four words, label editing is automatically terminated.

### **Site Label**

Each site may have an eight-word label to identify the site whenever the site selection commands are used. A typical site label might be “WXXX FM Transmitter Site” (uses all eight vocabulary words). Press 74 to hear the current site label, and # to edit it. Enter the three-digit codes for the words you would like to use, followed by \* when you are finished.

### ***Dial-Out Telephone Number Entry***

If the ESI is set for call out mode (see Mode Selection, above), at least one telephone number needs to be entered in the telephone list in order for the ESI to dial out. The master password must be entered to allow telephone number entry.

There are nine telephone number positions stored on the ESI. When dial-out is initiated, the ESI dials the numbers in order from 1 to 9. Be sure to fill the positions in order, as the ESI will stop dialing when a blank entry is encountered. If you want the ESI to continuously dial out until the call is acknowledged, enter phone numbers for all nine entries.

### Number Selection

Select a position 1-9 by pressing 81-89, respectively. If a telephone number is currently stored in that location, the ESI will report the number.

### Entering a New Number

Once you have selected a number position, press # to edit the phone number in that location. The ESI will respond with "Enter," and you can then enter up to 15 digits. Press \* when you are done, and the ESI will read the number back to you.

### Entering a Pause

If it is necessary to insert a pause into the dialing string, enter the first portion of the string in one phone number position, and continue the string in the next position, with a leading 0 in the next position. The leading 0 instructs the ESI to consider the position as a continuation of the previous number, and pause for 5 seconds before dialing the remaining portion.

Multiple zeroes may be used for greater delay durations, and you can use as many phone number positions as needed for complex dialing sequences. The example below shows how you would enter a sequence that first dials a prefix, waits 5 seconds before dialing a pager, and then waits ten seconds before entering the numeric page:

```
81 # 9 *
82 # 0 1 800 555 5555 *
83 # 0 0 123 4567 *
```

### Clearing a Number

To remove an existing entry from the telephone list, select the entry using 81 through 89, and press # \*. This will replace the current number with a blank entry.

**Note:** The ESI will stop dialing when a blank entry is encountered. If you want the ESI to continuously dial, fill all nine positions.

## OPERATION

The ESI is operated via DTMF commands from a telephone set. Operation is the same whether the ESI dials out or the user calls the ESI.

### *Call-Out and Answer Modes*

#### Alarm Dial-Out

In the call-out mode, the ESI will begin dialing as soon as an alarm condition is detected, unless an alarm delay has been set up using AutoLoad software and firmware version 5.4 or later. The unit then repeatedly speaks the sign-on message and waits for a valid password entry. If no user response is received, the next number in the list is dialed. A short delay between numbers allows for a possible incoming call during an alarm condition.

#### Answer Mode

In the Answer Mode, the ESI will answer after the specified number of rings (see page 52). A brief answer tone is heard while the ESI establishes communication with the incoming call. The sign-on message is repeated until the user begins to enter the password. You may enter your password as soon as the answer tone begins.

### *Operating Tips*

#### Voice Help

ESI operation is not difficult, but a voice help feature is built in for your convenience. When a key has not been pressed for several seconds, a voice prompt will announce the currently available options (i.e. suggesting raise and lower commands after you have selected a channel). Dial 98 at any time for a complete ESI help menu.

### **Command Timeouts**

There are context-sensitive timeout durations, allowing longer periods in situations that require more time to consider a response. You will be prompted for a command as the timeout approaches. If no commands are received within fifteen seconds after the prompt, the ESI will disconnect the call. If you need more time to enter a command, press “00” before the timeout duration has elapsed. This will reset the timeout duration.

**Note:** To extend the timeout duration for all commands to one minute, press 54. The ESI will wait up to one minute for a new command. As soon as you press another key, the normal timeout duration will be restored.

### **Repeat Reading**

To repeat the current reading, enter 00. The ESI will respond with an updated reading, followed by the unit of measurement, if one has been set up for this channel.

### **Errors**

The ESI will respond, “Error” any time you select an invalid site, channel or function. Only sites installed in the system may be accessed, and you can only select channels available at the selected unit. If you select a new site during the ESI session and there is a disruption to the link between that site and the site containing the ESI, the ESI will announce a “Link Error” message.

### **Calling the ESI**

There are two ways to initiate a call to the ESI. You can pick up an outside line and dial the phone number of the ESI line, or you can connect a telephone set to the “SET” jack on the rear panel of the ARC-16 and access the ESI in Local Mode (see page 52). When using a locally connected phone set, pick up the phone and press the MAINT switch for several seconds until the ESI responds with the programmed greeting (see Local Mode on page 52).

### **Password Entry**

The ESI greets the user with the programmed greeting message and waits for a password to be entered. For normal monitoring and control, you can enter either the master or the user password as soon as the ESI answers. For editing labels, phone numbers, messages, etc., the master password is required.

The ESI will disconnect if an incorrect password is entered.

### **Site Selection**

Press 40 to report the currently selected site ID and user-defined site name. Press 41, 42, 43 or 44 to select sites A, B, C or D, respectively. If the selection is not a valid site, the ESI reports an error. Otherwise, the ESI announces the newly selected site ID and name.

### **Meter Readings and Issuing Commands**

To select a metering channel and receive a current reading for that channel, press 01 through 16 for the desired channel number. When the channel is selected, the ESI reports the channel information in the following format: “[Channel Number] [Site Designation] [Channel Label] equals [Meter Value] [Units Label]”.

**Note:** If channel labels or unit labels are not set up, the ESI will omit them from the readout. To specify channel and unit labels for the ESI, see page 53, or refer to Chapter 3 for instructions on using AutoLoad to set up the labels (firmware versions 5.4 and above).

Once a channel is selected, the Raise and Lower commands are available on that channel until a new channel is chosen. To issue a “Raise” command to the channel, press #. To issue a “Lower” command to the channel, press \*. The ESI will repeat the command.

### **Command Durations**

Firmware versions 5.4 and above allow users to specify remote command durations and alarm delays using the AutoLoad software. In firmware version 5.4, the location of the ESI (if one is installed) affects how command durations are handled.

If the ESI is located in the unit receiving the command via DTMF, the command is considered “local” and the remote command durations will not take effect. If the ESI is not located in the unit receiving the command, the command is considered “remote” and the ARC-16 will respond to the specified duration.

Effective with firmware version 5.5, command durations take effect regardless of the location of any ESI.

### **Alarm Reporting**

#### **Alarm Message**

If a new alarm occurs during the course of a call, the ESI will announce “Alarm.” No action is required for the user to continue, but the announcement may be used as a reminder to check the alarm stack.

If the ESI calls with an alarm, it will say “Hello” followed by the user-programmed greeting. The alarm condition is not reported until your password has been entered.

#### **Checking Alarms**

Enter 30 to hear a current alarm report. Alarms are read from the alarm stack of the unit in which the ESI is installed, with the most recent alarm reported first. You can interrupt the alarm report at any time by entering a new command.

The alarm stack contains alarms from all connected sites. Therefore, the ESI reports the ten most recently registered alarms system-wide.

Status alarms are reported in the following format: “[Site ID] Status Channel [Status Channel Number] [Status Message]”.

Metering channel alarms are reported as follows: “Channel [Site ID] [Channel Number] [Channel Label] is above (below) upper (lower) limit.”

**Note:** If channel labels are not set up, the ESI will omit them from the readout. To specify channel labels for the ESI, see page 53, or refer to Chapter 3 for instructions on using AutoLoad to set up the labels (firmware versions 5.4 and above).

#### **Clearing Alarms**

At the end of the alarm report, the ESI prompts you to clear alarms by pressing #. Clearing the alarms removes them from the alarm stack, and will extinguish the alarm LED above the CLEAR switch on the ARC-16 containing the ESI. Note that once alarms are cleared, they can only be retrieved by turning limits monitoring off, and then back on (see Limits Monitoring, below).

To leave alarms on the alarm stack and exit alarm reporting, press \*, or simply enter a new command.

### **Status Reporting**

To hear a report on all status channels that are currently on (that is, the front panel status LED is illuminated), enter 20. The ESI will provide a list of all active status channels, including the user-programmed status label.

### ***Limits Monitoring***

Press 50, and the ESI will report whether Limits Monitoring is currently on or off. If Limits Monitoring is off, you can enable it by pressing 51. If it is on, you can turn it off by pressing 52. The ESI will confirm the new limits monitoring status. Remember that turning limits monitoring off will prevent notification of alarms on the ESI, on the front panel of the ARC-16, and on AutoPilot and CDL software. It may be useful to disable limits monitoring and prevent continued alarm reporting only long enough to correct the alarm condition.

### ***Audio Monitoring***

An audio source connected to the rear-panel phono (RCA) jack may be monitored in thirty-second intervals by pressing 55. Commands may be entered during playback, but the ESI voice is suspended. To cancel audio playback, press 56.

### ***Disconnecting a Call***

Press 99 to disconnect the call.

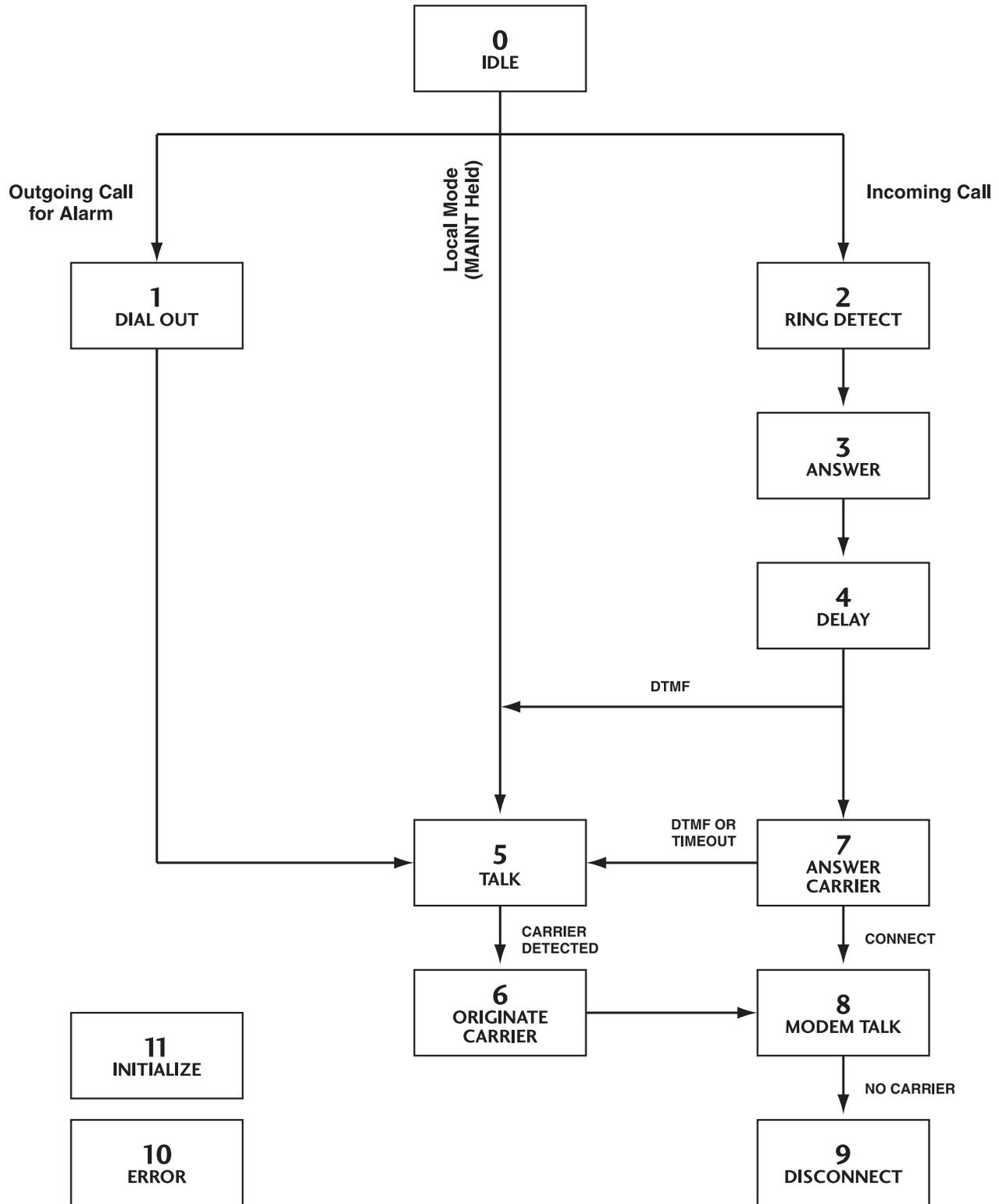
*IMPORTANT! If you hang up without dialing 99 to disconnect the call, the ESI will remain on the line until the three-minute timeout duration lapses. Be sure to disconnect using the DTMF code so that the phone line will be ready to accept new incoming calls or place outgoing calls.*

## **DIAGNOSTICS**

The state of the ESI operation can be determined at any time by observing the number of successive LED flashes on the rear of the unit. This can help in assessing a unit that is not operating as expected. The number of LED flashes is also displayed on the front panel during ESI operation.

The chart on the next page shows the normal operation of the ESI, with the LED codes above each operating state.

**ESI LED Diagnostic Chart**



**COMMAND LIST**

<b>00</b>	<b>Repeat last reading</b>
<b>01-16</b>	<b>Select Channel</b>
#	Raise
*	Lower
<b>20</b>	<b>Status Report</b>
<b>30</b>	<b>Alarm Report</b>
#	Clear Alarms
*	Exit without clearing
<b>40</b>	<b>Site Selection</b>
41	Site A
42	Site B
43	Site C
44	Site D
<b>50</b>	<b>Limits Monitor</b>
51	Limits Monitor On
52	Limits Monitor Off
<b>54</b>	<b>Extend Timeout</b>
<b>55</b>	<b>Audio Monitor On</b>
<b>56</b>	<b>Audio Monitor Off</b>
<b>60</b>	<b>Number of Rings</b>
61	Set Number of Rings to 1
62	Set Number of Rings to 2
63	Set Number of Rings to 3
64	Set Number of Rings to 4
65	Set Number of Rings to 5
66	Set Number of Rings to 6
67	Set Number of Rings to 7
68	Set Number of Rings to 8
69	Set Number of Rings to 9
<b>70</b>	<b>Sign-on Message</b>
<b>71</b>	<b>Channel Label</b>
<b>72</b>	<b>Channel Units</b>
<b>73</b>	<b>Status Message</b>
<b>74</b>	<b>Site Label</b>
#	Enter new message
*	End Entry, Playback Message
<b>81-89</b>	<b>Dial-Out Telephone Numbers</b>
#	Enter New Number
*	End Entry, Playback Number

*Commands in gray are accessible only with the Master Password.*

**VOCABULARY LIST**

<u>Word</u>	<u>Code</u>	<u>Word</u>	<u>Code</u>	<u>Word</u>	<u>Code</u>
00	000	CONTACT	105	GENERATOR	290
01	001	CONTROL	106	GOODBYE	127
02	002	CONVERTER	269	GROUND	291
03	003	CURRENT	107	<b>H</b>	<b>072</b>
04	004	<b>D</b>	<b>068</b>	HEATER	292
05	005	DAY	108	HELLO	128
06	006	DECREASE	109	HELP	129
07	007	DEGREE	110	HERTZ	130
08	008	DEICER	270	HIGH	131
09	009	DELAY	271	HOT	132
10	010	DETECTOR	272	<b>I</b>	<b>073</b>
11	011	DIAL	111	IN	133
12	012	DOOR	273	INCREASE	134
13	013	DOWN	112	INTERFACE	293
14	014	DRIVE	274	INTRUSION	135
15	015	DUMMY	275	IS	136
16	016	<b>E</b>	<b>069</b>	<b>J</b>	<b>074</b>
<b>A</b>	<b>065</b>	ELECTRIC	276	<b>K</b>	<b>075</b>
ABOVE	091	EMERGENCY	113	KILO	137
AIR	092	ENTER	114	KILOVOLTS	138
ALARM	093	EQUALS	115	KILOWATTS	139
AM	094	EQUIPMENT	277	<b>L</b>	<b>076</b>
AMP	095	ERROR	116	LEFT	140
AMPS	096	EXCITER	278	LEVEL	141
ANTENNA	097	EXIT	117	LIGHT	142
AUDIO	098	EXTERNAL	118	LIMIT	143
AURAL	256	EXTREME	119	LINE	144
AUTO	099	<b>F</b>	<b>070</b>	LINK	145
AUXILIARY	257	FADE	279	LOAD	146
<b>B</b>	<b>066</b>	FAHRENHEIT	121	LOCAL	147
BACKUP	258	FAIL	120	LOOP	148
BASE	259	FAN	280	LOW	149
BATTERY	260	FAULT	281	LOWER	150
BEACON	261	FILAMENT	122	<b>M</b>	<b>077</b>
BEAM	262	FINAL	282	MAGNET	294
BELOW	100	FIRE	123	MAIN	151
BUILDING	263	FLOOR	283	MEGA	295
<b>C</b>	<b>067</b>	FLOW	284	MEGAWATTS	296
CARRIER	101	FM	124	METER	152
CELSIUS	264	FORWARD	285	MICRO	153
CHANNEL	102	FREEZING	286	MICROWAVE	297
CLEAR	103	FREQUENCY	287	MIDDLE	298
COAX	265	FRONT	125	MILLI	155
COMBINER	266	FUEL	126	MILLIAMPS	154
COMMAND	104	FURNACE	288	MINUS	156
COMPOSITE	267	<b>G</b>	<b>071</b>	MONITOR	157
COMPUTER	268	GAS	289	MONO	299

<u>Word</u>	<u>Code</u>	<u>Word</u>	<u>Code</u>	<u>Word</u>	<u>Code</u>
MOTOR	300	SATELLITE	309	VSWR	327
<b>N</b>	<b>078</b>	SCREEN	310	<b>W</b>	<b>087</b>
NIGHT	158	SECURITY	192	WAIT	220
NO	159	SENSOR	311	WARNING	221
NORMAL	160	SET	193	WATER	328
NOT	161	SHUT	194	WATTS	222
NOW	162	SIDE	312	<b>X</b>	<b>088</b>
NUMBER	301	SIGNAL	195	<b>Y</b>	<b>089</b>
<b>O</b>	<b>079</b>	SITE	196	<b>Z</b>	<b>090</b>
OFF	163	SMOKE	313	ZONE	329
ON	164	SPEED	314		
OPEN	165	STANDBY	197	(PAUSE) 20 ms	059
OUT	166	STAR	198	(PAUSE) 40 ms	060
OVER	167	START	199	(PAUSE) 80 ms	061
OVERLOAD	168	STATION	200	(PAUSE) 160 ms	062
<b>P</b>	<b>080</b>	STATUS	201	(PAUSE) 320 ms	063
PEAK	169	STEREO	315	(PAUSE) 640 ms	064
PERCENT	170	STOP	202		
PHASE	171	STROBE	316		
PHONE	172	STUDIO	203		
PILOT	173	SUB	317		
PLATE	174	SUBCARRIER	318		
PLEASE	175	SUPPLY	319		
POINT	176	SWITCH	204		
POUND	177	SYNC	320		
POWER	178	SYSTEM	205		
PRESSURE	302	<b>T</b>	<b>084</b>		
PRINTER	303	TAPE	321		
PROGRAM	179	TELEMETRY	322		
PUMP	304	TEMPERATURE	206		
PUT	180	TEST	207		
<b>Q</b>	<b>081</b>	THANKYOU	208		
<b>R</b>	<b>082</b>	THERMAL	323		
RADIO	181	THIS	209		
RAISE	182	TOTAL	210		
RATIO	183	TOWER	211		
READY	184	TRANSFER	212		
RECEIVER	185	TRANSMITTER	213		
RECORD	305	TV	214		
REFLECTED	306	TWOWAY	324		
RELAY	186	<b>U</b>	<b>085</b>		
REMOTE	187	UNDER	215		
RESET	188	UP	216		
RETURN	189	UTILITY	217		
REVERSE	307	<b>V</b>	<b>086</b>		
RIGHT	190	VIDEO	325		
ROOM	308	VISUAL	326		
<b>S</b>	<b>083</b>	VOICE	218		
SAFE	191	VOLTS	219		



# 7 Installing New Hardware Options

When operational needs change, the ARC-16 can be updated in the field with new hardware options. Examples include adding the Studio Input/Output option to an ARC-16 studio unit, replacing Wire Modems with Universal Modems, adding an ESI, etc. Instructions are included with each option you order. For your convenience, we have included board installation instructions in this chapter, as well.

**IMPORTANT!** Before you start, verify which revision of the ARC-16 CPU board is installed in your unit. This document applies to both the original ARC-16 CPU design and the new version B CPU (CPU-A and CPU-B), and some steps depend on which CPU is installed. You can determine the CPU revision based on the firmware version installed in your ARC-16. **Firmware versions 5.4 and below are installed on CPU-A. CPU-B was introduced with firmware version 5.5.** There are no operational differences; however, the AUX board and Two Port Adapter used with CPU-A are now integrated on the CPU-B board.

## **Computer Interface (CI) – page 64**

Allows you to establish a direct connection between a computer and an ARC-16 when using optional AutoPilot® software.

## **Enhanced Speech Interface (ESI) – page 65**

Provides computer and telephone access to your ARC-16 sites using optional AutoPilot software or a touch-tone phone.

## **Universal Modem (RMS/RMT) – page 66**

Used whenever the communications link is not a 2-wire circuit. This includes 4-wire telco, STL subcarriers, SCA channels, TRL, and digital RS-232 links.

## **Wire Modem (WMS/WMT) – page 67**

Used on 2-wire circuits, such as dedicated phone lines.

## **Studio I/O (SIO) – page 67**

Provides eight channels of metering, status and command for controlling and monitoring equipment at the studio site. Two SIOs may be installed in an ARC-16 Studio unit for a total of sixteen channels.

## **Studio Status Indicator (SSI) – page 68**

The SSI provides full-time status monitoring of a remote site by supplying 16 independent open collector outputs to drive user supplied alarms, buzzers or indicators. It can also be connected to the SP-16 status panel.

## **Installing a Second Wire or Universal Modem – page 70**

Instructions for adding a second modem to an ARC-16. Includes TPA board installation instructions for CPU-A. For CPU-B, there is no TPA board, but a hardware kit – part number TPA B KIT – is required.

## COMPUTER INTERFACE (CI)

When used with AutoPilot® or AutoLoad software, the Computer Interface allows you to establish a direct connection between a computer and an ARC-16.

### *Installing the CI*

The CI must be installed as the top board in the right rear of the ARC-16 (opposite the corner used by the power supply). If the ARC-16 has no I/O boards installed, the CI will sit on the floor of the unit. If one or more I/O boards are installed, the CI must sit above these.

If I/O boards are installed, remove the front center, rear center, and rear right-hand mounting screws from the uppermost I/O board and replace them with the standoffs provided.

1. Install the CI on the standoffs so that the DB-25 connector extends through the slot in the rear of the ARC-16. Secure with the screws provided.
2. Connect one end of the 24-pin ribbon cable to the header on the CI so that it extends away from the board.
3. If CPU-A is installed, connect the 24-pin cable to the AUX board, which is at the right end of the CPU board. The cable must be connected to the header closest to the display board. Exercise caution to avoid misaligned connectors.

If CPU-B is installed, the headers are mounted directly on the CPU board.

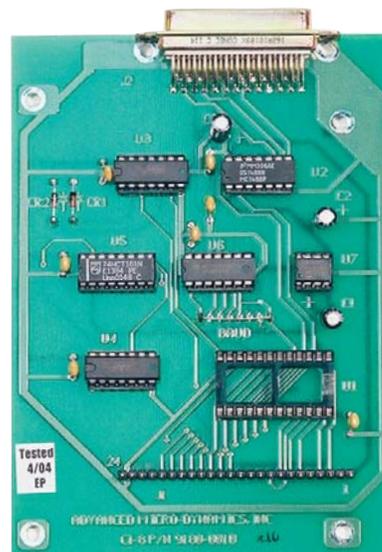
4. Skip this step if you are using firmware version 5.3 or below. If you are using firmware 5.4 with CPU-A, there is a wire ending with a female two-pin header coming out from the bottom of the CI. This two-pin header connects the CI to the male two-pin header P3 on the AUX board. A document titled “Modifying Your ARC-16 For Firmware Version 5.4” ships with the hardware modification kit and explains the AUX board modification.

If you are using CPU-B, there is a cable that links the 6850 socket to header J5 on the CPU. Remove the 6850 chip and use the new cable to connect the 6850 socket to the J5 on the CPU.

**Note:** There are no ARC-16 configuration changes necessary to activate the CI.

### *Connecting a PC to the ARC-16*

Use a null-modem cable to directly connect your computer to the CI in the ARC-16. The pin-outs for a null-modem cable can be found in Appendix B.



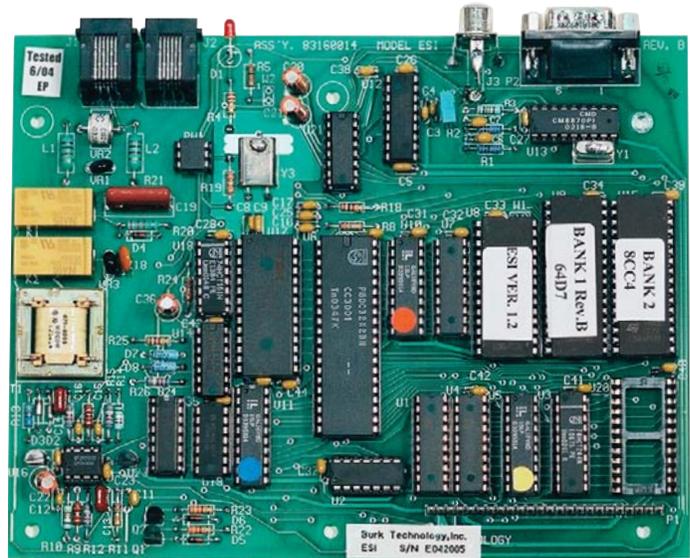
## ENHANCED SPEECH INTERFACE (ESI)

The Enhanced Speech Interface lets you monitor and control all connected sites with one phone call. Included on the ESI is a computer interface for direct connection to a computer, and a built-in data modem for dial-up connection using the AutoPilot® or AutoLoad software.

### Installing the ESI

The ESI must be installed as the top board in the right rear of the ARC-16 (opposite the corner used by the power supply). If a CI is already installed, the ESI will replace the CI. If the ARC-16 has no I/O boards installed, the ESI will sit on the floor of the unit. Otherwise, the ESI must sit above these.

If I/O boards are installed, remove all mounting screws except the screw closest to the 24-pin ribbon cable and replace them with the standoffs provided.



1. Install the ESI on the standoffs so that the RJ-11 jacks and DB-9 connector extend through the slots in the rear of the ARC-16. Secure with the screws provided.
2. Connect one end of the 24-pin ribbon cable to the header on the ESI so that it extends away from the board.
3. If CPU-A is installed, connect the 24-pin cable to the AUX board, which is at the right end of the CPU board. The cable must be connected to the header closest to the display board. Exercise caution to avoid misaligned connectors.

If CPU-B is installed, the headers are mounted directly on the CPU board.

4. Effective with firmware version 5.4, a new interrupt address line is used by the ARC-16 program. Skip this step if you are using version 5.3 or below.

With CPU-A, there is a wire ending with a female two-pin header coming out from the bottom of the ESI. Use this two-pin header to connect the ESI to the male two-pin header P3 on the AUX board. A document titled “Modifying Your ARC-16 For Firmware Version 5.4” ships with the hardware modification kit and explains the AUX board modification.

With CPU-B, there is a cable that links the 6850 socket to header J5 on the CPU. Remove the 6850 chip and use the new cable to connect the 6850 socket to the J5 on the CPU.

**Note:** The ESI must be activated in the configuration menu. Please review the “Configuring the ARC-16 System” document for the necessary configuration changes. The ESI operates at 1200 bps.

### Connecting a PC to the ARC-16

Use a null-modem cable to directly connect your computer to the ESI’s DB-9 connector. The pin-outs for a null-modem cable can be found in Appendix B.

### **Telephone Connection**

Connect a standard modular telephone line cord to the “LINE” jack to complete the telephone line connection to the ESI. You may optionally connect a local telephone set to the second jack marked “SET.”

Although the ESI has transient protection on the board, it is strongly recommended that you install a surge suppressor on the phone line. A surge suppressor, model TS-1, is available from Burk Technology.

### **Audio Connection**

If desired, connect a source of unbalanced audio to the phono jack on the rear of the ESI. The signal should be one volt rms or less.

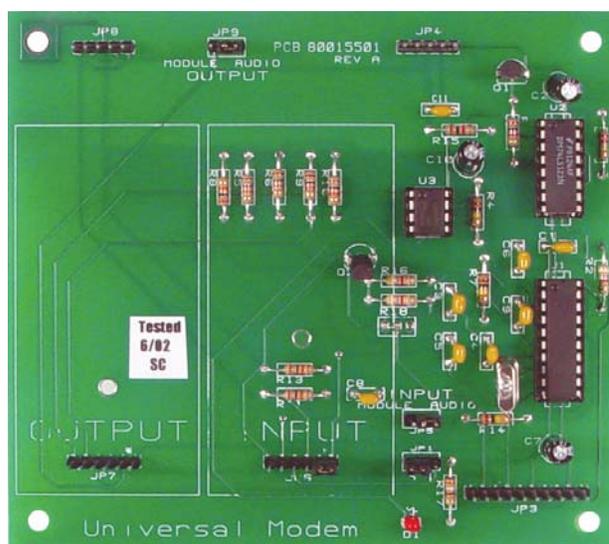
## **UNIVERSAL MODEM (RMS/RMT)**

The Universal Modem facilitates a variety of communication options for linking ARC-16 transmitter remote control units. Standard on the Universal Modem is FSK AUDIO communication, but it may be easily converted for use with STL and TSL systems, FM broadcast subcarriers, and RS-232 data links with simple plug-in modules. The universal modem is 2200 Ohms unbalanced, 1.5Vp-p out, 0.25Vp-p min. in.

### **Installing the Universal Modem**

The Universal modem installs on the floor of the ARC-16 in front of U13 on CPU-A or J2 on CPU-B as follows:

1. Secure the modem using the supplied screws.
2. Connect the 5-pin header attached to the BNCs to the Universal Modem header JP8.
3. Connect the 5-pin header attached to the barrier strip to Universal Modem header JP4.
4. Using the 2” 10-pin ribbon cable, connect Universal Modem header JP3 to header J4 on CPU-A or header J2 on CPU-B.



### **Configuring the Universal Modem**

To configure the Universal modem, there are INPUT and OUTPUT headers (JP6 and JP7, respectively), and three jumpers that need to be selected.

If FSK audio is desired, then no module is necessary. For the INPUT header only, jumper the last two pins of JP6 if no module is installed. The last two pins are highlighted by an asterisk on the board.

If a module is required, plug the module into the appropriate header. INPUT and OUTPUT are labeled on the module. Jumpers JP5 and JP9 select whether a module is installed. JP5 selects the input path, and JP9 selects the output path. Move the jumper to the left two pins if a module is used, or to the right two pins for audio.

Jumper JP1 selects whether the modem answers or originates. The designations S and T refer to Studio and Transmitter, and S is typically assigned to the originating modem. Users only need to ensure that modems on opposite ends of a bi-directional link have opposite designations (one modem is assigned S and the other T).

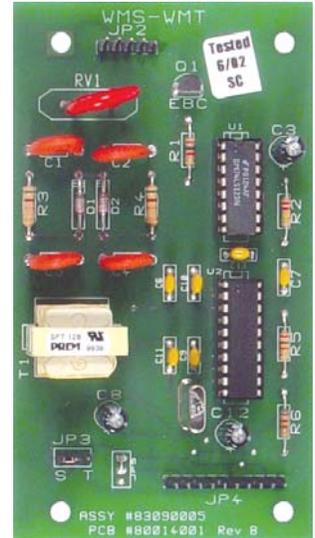
## WIRE MODEM (WMS/WMT)

The wire modem is for use with a 2-wire audio circuit only. The wire modems are 600 Ohms unbalanced, with -9dBm nominal output and -20dBm average input. Minimum input is -29dBm.

### Installing the Wire Modem

The WMS/WMT Two-Wire Modem installs on the floor of the ARC-16 in front of U13 on CPU-A and JP2 on CPU-B. The WMS is configured for use in a studio unit and the WMT for use in a transmitter unit.

1. Secure the modem using the supplied screws.
2. Connect the 5-pin header from the barrier strip to header JP2 on the Wire Modem.
3. Use the 10-pin ribbon cable to connect header JP4 on the Wire Modem to header J4 on CPU-A, or to header J2 on CPU-B.



### Configuring the Wire Modem

Jumper JP3 selects whether the modem answers or originates. The designations S and T refer to Studio and Transmitter, and S is typically assigned to the originating modem. Users only need to ensure that modems on opposite ends of a bi-directional link have opposite designations (one modem is assigned S and the other T).

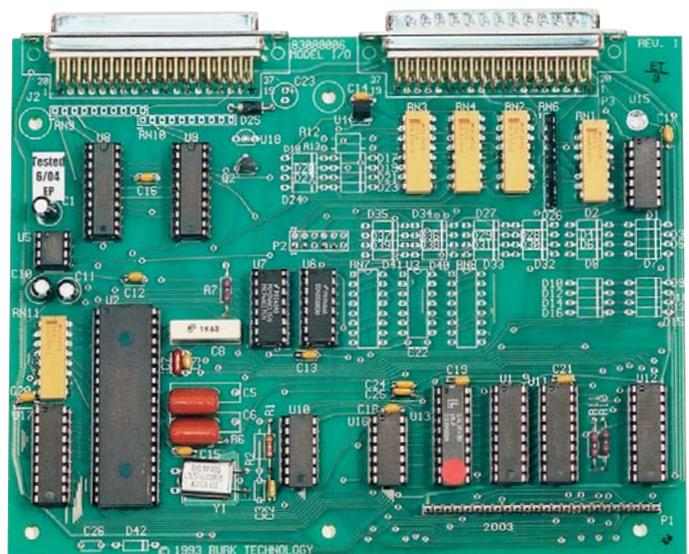
## STUDIO INPUT/OUTPUT (SIO)

The SIO kit includes an I/O board for your studio unit along with appropriate hardware to install. For a more detailed description of the I/O board, as well as instructions on making the external connections, see page 39.

### Installing the SIO

The I/O board is installed in the right rear of the ARC-16 (opposite the corner used by the power supply). If more than one I/O board is to be installed, secure the bottom I/O board with standoffs, providing a platform for the second I/O board to sit on.

1. Secure the I/O board using the supplied hardware. If you are installing two SIOs, secure the first board with standoffs, and the second with screws.



2. Connect one end of the 24-pin ribbon cable to the header on the I/O so that it extends away from the board.
3. If you are using CPU-A, connect the 24-pin ribbon cable on the bottom I/O board to the AUX board header closest to the I/O board. This defines the board as channels 1-8. When installing a second I/O board, connect the 24-pin cable to the center header on the AUX board. This defines the board as channels 9-16. The AUX board is a daughter card that sits on the right end of the CPU board. Exercise caution to avoid misaligned connectors.

**Note:** If you are using CPU-B, connections are made to the same headers, only the headers are located on the CPU board.

### **Configuring the I/O board**

To activate the I/O board, enter the ARC-16's configuration mode and set the highest channel for this local site to 8 and set the CHANNEL 1-8 option to ON. If installing a second I/O, set the highest channel to 16, and set the CHANNEL 9-16 option to ON.

Please review Chapter 2 for details on updating your unit's configuration from the front panel, or Chapter 3 for updating your unit's configuration using AutoLoad.

## **STUDIO STATUS INDICATOR (SSI)**

The model SSI Studio Status Indicator provides an external output tally for all ARC-16 status signals. The status signals received from a remote site are brought to the studio rear panel as high-current open collector outputs. This allows the SSI to display a remote site's channel status whether or not that site is currently selected on the studio front panel.

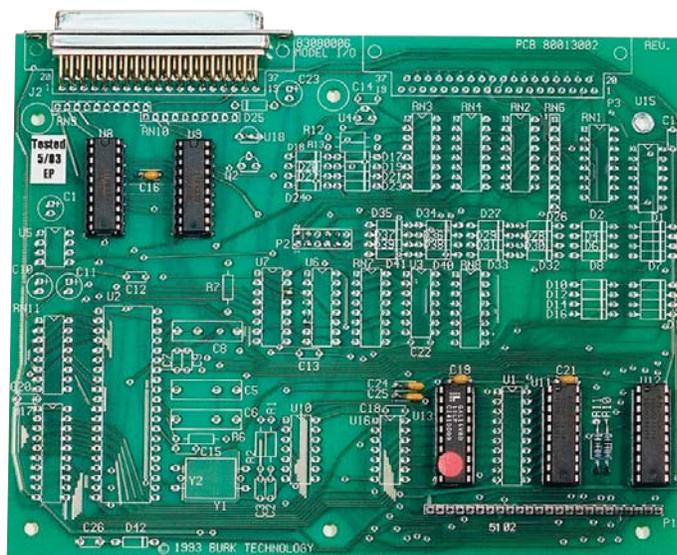
### **Installing the SSI**

The SSI board is installed in the ARC-16 Studio unit.

1. Install the SSI above any installed SIO board. When you install two SSI's, secure the first board with standoffs and the second with the supplied screws.

#### **2A. If your ARC-16 uses CPU-A:**

The SSI connects to the ARC-16 AUX board using the 4" 24-pin jumper cable. (The AUX board is a daughter card that sits on the right-hand end of the CPU board). One end of the cable connects to P1 on the SSI. The other end connects to J1 or J2. Use J1 if you want the SSI to monitor the next logical site, and use J2 if you want the SSI to monitor the second logical site. For logical site designations, see page 19.



2B. If your ARC-16 uses CPU-B:

The SSI connects to the ARC-16 CPU board using the 4" 24-pin jumper cable. One end of the cable connects to P1 on the SSI. The other end connects to J9 or J10. Use J9 if you want the SSI to monitor the next logical site, and use J10 if you want the SSI to monitor the second logical site. For logical site designations, see the table below.

**Configuring the SSI**

Enable the SSI by entering the ARC-16 configuration mode and selecting YES for the P-1 SSI option (if you connected the SSI to the J1 or J9 header) or select YES for the P-2 SSI option (if you connected the SSI to the J2 or J10 header).

**Table 1: Next Logical Site Assignments**

Studio Site ID	Next Logical Site for P1-SSI	Next Logical Site for P2-SSI
D	A	B
C	D	A
B	C	D
A	B	C

**Note:** You may need to change the site designator of your transmitter or studio unit for the SSI to monitor the desired site.

**External Connections**

The SSI outputs operate the same as control outputs (see page 39). Connect the external indicators as shown in the table below. A mating DB-37 Male connector is provided. Relays will be necessary if AC loads or high current DC loads must be switched.

**Table 2: External Indicator Connections**

Status #	Pin #						
1	1	5	3	9	5	13	7
2	9	6	11	10	13	14	15
3	2	7	4	11	6	15	8
4	10	8	12	12	14	16	16

## **INSTALLING A SECOND WIRE OR UNIVERSAL MODEM**

For an ARC-16 to communicate with more than one unit, two modems and two communication ports must be used. For CPU-A, this requires the installation of a Two Port Adapter (TPA). For CPU-B, the Two Port Adapter is not needed, but you will need a hardware kit (part number TPA B KIT) to secure the new modem and connect it to the CPU.

The TPA Kit (for CPU-A) contains the following items:

- 1 - TPA Board assembly with one MC6850 IC installed
- 1 - custom 2-port ribbon connector (two 10-pin ribbon connectors tied together with a black wire)
- 2 - 3/4" standoffs
- 3 - 1-1/4" standoff
- 3 - 1/4" machine screws
- 1 - 3-wire BNC connector assembly
- 2 - BNC female panel mount connectors
- 2 - grounding lugs

The TPA B Kit (for CPU-B) contains the following items:

- 1 - 4" 10-pin ribbon cable
- 3 - 1-1/4" standoff
- 3 - 1/4" machine screws
- 1 - 3-wire BNC connector assembly
- 2 - BNC female panel mount connectors
- 2 - grounding lugs

### ***Installing the TPA (CPU-A only)***

For CPU-B, go on to the next page.

- 1 Remove the 10-pin ribbon connector that connects the existing modem to the CPU board at J4. This ribbon assembly will not be used.
2. Remove the 6850 ACIA/UART device from location U13 on the CPU board, and install it in the empty socket of the TPA board.

Carefully note the location of Pin 1 on the board, and on the IC. The two ICs should be oriented in the same direction.

3. Replace the two 1/4" Phillips-type screws located at both ends of U11 on the CPU board with the supplied 3/4" standoffs. Set the screws aside to use in the next step.
4. Using one half of the supplied TPA 10-pin cable assembly, connect the CPU board J4 to the installed modem JP4.

The black conductor lead should meet the CPU board J4 at Pin 3 (counting right to left), and there should be no connection to Pin 3 of the connector on the modem board.

5. Carefully plug the TPA board into the socket at location U13 on the CPU board. Secure the board to the standoffs using the original set of screws from step 4.

## Installing the New Modem

1. If you are installing a Wire Modem, skip this step. Universal Modems require the installation and connection of BNC connectors, which are included with the TPA (or TPA B Kit). Install the two BNC connectors and grounding lugs on the rear panel in the available mounting holes. Use the existing set of BNC connectors as a guide. Then solder the 3-wire BNC connector assembly to the BNCs. The yellow lead should meet the BNC near the barrier strip assembly, and the red lead should meet the BNC near the power module. Solder the black wire to the pair of ground lugs. It is not necessary to link this new set of ground lugs to the existing set; they are interconnected through the chassis wall.

**Note:** The type of modems you are using determines which modem will be mounted on the floor of the chassis. If the new modem is the same as the original modem, it can be added above the existing modem (Port 2). If one modem is a 2-Wire, and the other modem is a Universal Modem, the size of the board requires that the 2-wire modem sits on the floor of the ARC-16 (Port 1), and the Universal Modem will sit above the 2-wire (Port 2).

2. Connect the barrier strip 5-pin connector to the modem mounted on the floor of the chassis. The connector goes to JP4 on Universal Modems, JP2 on Wire Modems. Universal Modems also connect to the lower 3-wire BNC connector at JP8.
3. Prepare the new modem for installation:

### Installing Two Modems of the Same Type (Two Wire Modems or Two Universal Modems)

If both ports will contain the same type of modem, install one of the 1/4" machine screws in the front corner of the board (near JP4 on the WMS/WMT, or near JP3 on Universal Modems). Use 1-1/4" standoffs to support the three remaining corners.

### Installing One Wire Modem and One Universal Modem

For systems using a single WMS/WMT modem along with a Universal Modem, install the WMS/WMT on the floor of the unit. This modem is designated as Port 1. Secure the WMS/WMT by using three of the 6-32 x 1/4" machine screws. Use two screws near JP4 and one near JP2. The remaining corner of the board will be secured using one of the 6-32 x 1-1/4" standoffs. Two more 1-1/4" standoffs support the Universal Modem under its JP8 and JP7 connectors.

4. Mount the upper modem to the three standoffs using the 1/4" screws.
5. For Universal Modems, connect the 3-wire BNC connector to JP8 and connect the barrier strip 3-pin connector left-justified to JP4. For Wire Modems, connect the barrier strip 3-pin connector JP2 on the Wire Modem.
6. If you have CPU-A and the custom 10-pin cable assembly, connect the remaining half of the TPA 10-pin ribbon/jumper assembly to the TPA board and the upper level modem. The black conductor should meet the modem, not the TPA.

If you have CPU-B, connect the second modem to the CPU header J3 using the supplied 10-pin cable.

After the new modem is installed, you must complete ARC-16 unit configuration before the modems will send or receive. Please refer to Chapter 2 for details on updating your unit's configuration from the front panel, or Chapter 3 for updating your unit's configuration using AutoLoad.



# A Appendix A: Specifications

## ARC-16

### **Dimensions**

3½" H x 19" W x 11" D (8.89cm x 48.3cm x 28cm)

### **Operating Temperature**

0° to 50°C

### **Metering & Status Inputs**

16 analog metering inputs ±4.5VDC maximum referenced to ground. 16 status inputs 0-28VDC or switch closure.

### **Control Outputs**

32 open collector outputs (16 raise, 16 lower) maximum 250mA, 28V; 20 amp maximum with optional IP-8 Interface Panel. Configurable command duration from .2 to 28 seconds per channel.

### **Failsafe & Alarm Outputs**

Open collector failsafe output activates 90 seconds after detection of studio to transmitter link failure. Low-current open collector alarm output, loads up to 50 mA. Configurable alarm delay from 0 to 126 seconds per channel.\*

\*Alarm delays and command durations are configured using the AutoLoad software.

### **Controls**

Front panel selection of mode, maintenance override, channel increment, channel decrement, on/raise, off/lower, alarm clear.

### **Calibration**

Each channel is calibrated using the raise and lower switches to adjust the reading of the sample to the proper display value. The speed of the change in value is proportional, permitting ±1 digit adjustment or rapid gross changes.

### **Communication Link**

Modem boards are installed for the class of service requested. A 2-wire modem is used for audio over a leased line or twisted pair. The Universal Modem provides independent paths for send and receive, each configurable for audio, RS-232 or subcarrier frequencies.

### **Modem Characteristics**

#### **Wire Modem:**

600 ohms balanced, -9dBm nominal out, -30dBm minimum in.

#### **Universal Modem:**

2200 ohms unbalanced, 1.5V p-p out, .25V p-p minimum in.

### **Modulation**

#### **FSK:**

1070Hz and 1270Hz transmitter to studio; 2025Hz and 2225Hz studio to transmitter.

#### **Available Subcarrier Frequencies:**

39, 67, 92, 110, 152 and 185KHz.

**Data Rate**

300 bps full duplex with error detection. 1200 bps available for use with digital link and Universal Modem with firmware versions 5.3 and above. Digital links to 9600 bps, effective with firmware version 5.6.

**Display**

32 character (16 x 2) LCD alphanumeric display, 16 LED status indicators, 3 mode indicators.

**A/D Converter**

12-bit dual slope integration with auto-zero and inherent RF and 60Hz rejection.

**Measurement Accuracy**

Better than 0.1% for 4V input; Better than 0.5% at minimum 0.25V input.

**Memory Retention**

Non-volatile memory for storage of calibration constants, setup information, and user defined labels for ten years without power.

**External Connections**

DB-37M for metering and status inputs, DB37F for control outputs, BNC connectors for use with radio modem, barrier strip for use with wire modem, IEC power cord for AC power.

**Power Supply**

117VAC nominal; 50/60Hz; 30W. 220V power supply available.

**AutoLoad Software Requirements**

- Pentium 133MHz minimum
- Windows 98, ME, NT 4.0 Workstation SP5, 2000 Pro. SP1, XP
- 20MB free hard drive space
- 32MB RAM
- One COM port for direct cable connection
- Bell 212A compatible modem for dial-up modem connection
- CD-ROM drive

**ENHANCED SPEECH INTERFACE****Data Rate**

**DB9M COM Port (Direct Serial Connection):**  
1200 bps, 8 data bits, 1 stop bit, no parity.

**Internal Data Modem:**

1200 baud, Bell 212A modulation.

**External Connections**

RJ-11 jacks for line and set connection, DB9M for direct serial connection to computer, phono jack for audio input connection.

**COMPUTER INTERFACE****Data Rate**

1200 bps, 8 data bits, 1 stop bit, no parity.

**External Connections**

DB25F for direct cable connection to computer.

**IP-8 INTERFACE PANEL****Dimensions**

5¼" H x 19" W x 2" D (13.34 cm x 48.3cm x 5.08cm)

**External Connections**

Barrier Strip screw-terminal connections for analog and status inputs and control outputs.

*Specifications are subject to change without notice.*

# B

# Appendix B:

# Pinouts

## NULL MODEM CABLE

The ESI Enhanced Speech Interface and Computer Interface require a null modem cable when connecting a PC to use AutoLoad or AutoPilot software. Pinouts for the null modem cable are as follows:

	<b>DB-9M (Computer)</b>	<b>DB-9M (ESI)</b>	
RxD	Pin 2.....	Pin 3	TxD
TxD	Pin 3.....	Pin 2	RxD
GND	Pin 5.....	Pin 5	GND
CTS	Pin 8.....	Pin 7	RTS

	<b>DB-9M (Computer)</b>	<b>DB-25F (CI)</b>	
RxD	Pin 2.....	Pin 2	TxD
TxD	Pin 3.....	Pin 3	RxD
GND	Pin 5.....	Pin 7	GND
RTS	Pin 7.....	Pin 5	CTS
CTS	Pin 8.....	Pin 4	RTS

	<b>DB-25F (Computer)</b>	<b>DB-9M (ESI)</b>	
TxD	Pin 2.....	Pin 2	RxD
RxD	Pin 3.....	Pin 3	TxD
CTS	Pin 5.....	Pin 7	RTS
GND	Pin 7.....	Pin 5	GND

	<b>DB-25F (Computer)</b>	<b>DB-25F (CI)</b>	
PGND	Pin 1.....	Pin 1	PGND
RxD	Pin 3.....	Pin 2	TxD
TxD	Pin 2.....	Pin 3	RxD
CTS	Pin 5.....	Pin 4	RTS
RTS	Pin 4.....	Pin 5	CTS
GND	Pin 7.....	Pin 7	GND
CD	Pin 8.....	Pin 20	DTR

Jumper computer Pin 20 to computer Pin 6

## ANALOG/STATUS INPUT (DB37 CONNECTOR)

### Channels 1-8

Pin	Description
1	100k pull-up to +5
2	Status #8 +
3	Status #7 +
4	Status #6 +
5	Status #5 +
6	Status #4 +
7	Status #3 +
8	Status #2 +

Pin	Description
9	Status #1 +
10	Status Ground
11	Analog Ground
12	Analog Channel 1
13	Analog Channel 2
14	Analog Channel 3
15	Analog Channel 4
16	Analog Channel 5

Pin	Description
17	Analog Channel 6
18	Analog Channel 7
19	Analog Channel 8
20-28	Status Ground
29-37	Analog Ground

### Channels 9-16

Pin	Description
1	100k pull-up to +5
2	Status #16 +
3	Status #15 +
4	Status #14 +
5	Status #13 +
6	Status #12 +
7	Status #11 +
8	Status #10 +

Pin	Description
9	Status #9 +
10	Status Ground
11	Analog Ground
12	Analog Channel 9
13	Analog Channel 10
14	Analog Channel 11
15	Analog Channel 12
16	Analog Channel 13

Pin	Description
17	Analog Channel 14
18	Analog Channel 15
19	Analog Channel 16
20-28	Status Ground
29-37	Analog Ground

**CONTROL OUTPUTS (DB37 CONNECTOR)****Channel 1-8**

Pin	Description
1	Channel 1 Raise
2	Channel 2 Raise
3	Channel 3 Raise
4	Channel 4 Raise
5	Channel 5 Raise
6	Channel 6 Raise
7	Channel 7 Raise
8	Channel 8 Raise

Pin	Description
9	Channel 1 Lower
10	Channel 2 Lower
11	Channel 3 Lower
12	Channel 4 Lower
13	Channel 5 Lower
14	Channel 6 Lower
15	Channel 7 Lower
16	Channel 8 Lower

Pin	Description
17	Failsafe
18	+11 VDC unregulated
19	+11 VDC unregulated
20-37	Ground

**Channel 9-16**

Pin	Description
1	Channel 9 Raise
2	Channel 10 Raise
3	Channel 11 Raise
4	Channel 12 Raise
5	Channel 13 Raise
6	Channel 14 Raise
7	Channel 15 Raise
8	Channel 16 Raise

Pin	Description
9	Channel 9 Lower
10	Channel 10 Lower
11	Channel 11 Lower
12	Channel 12 Lower
13	Channel 13 Lower
14	Channel 14 Lower
15	Channel 15 Lower
16	Channel 16 Lower

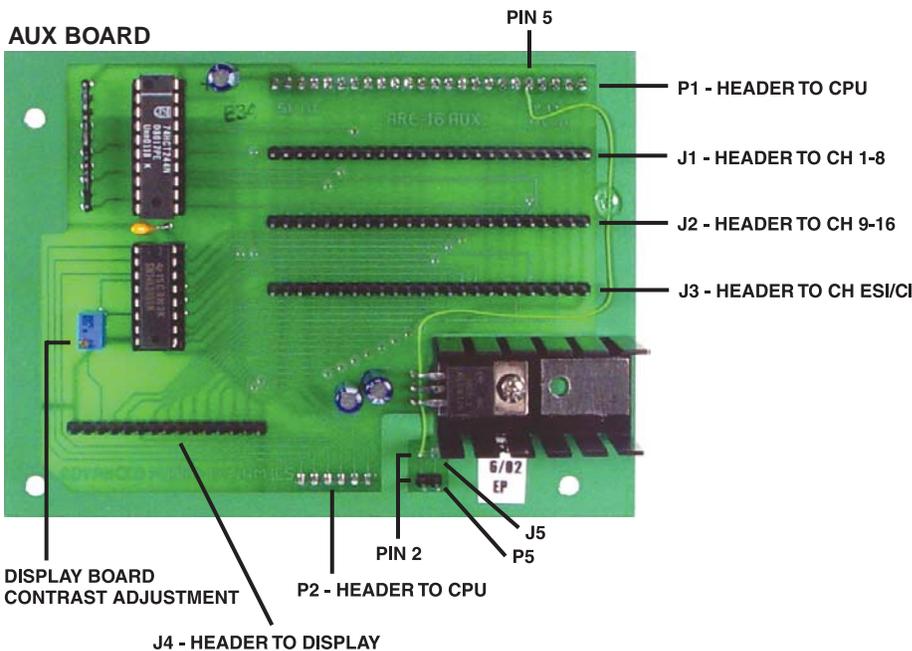
Pin	Description
17	Failsafe
18	+11 VDC unregulated
19	+11 VDC unregulated
20-37	Ground



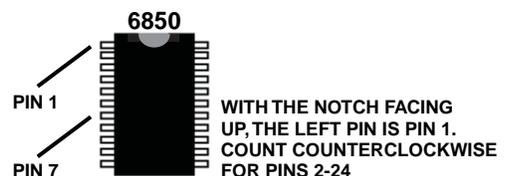
# Appendix C: Modifying the ESI for Firmware Version 5.4

Supplied for this modification are a 2-pin header, a 22-gauge wire, and a custom connector cable. This procedure will connect an IRQ pin from the ESI 6850 (Pin 7) to the ARC-16 CPU 6802 (Pin 4).

1. Remove the ESI and the AUX board from the ARC-16 chassis.
2. Solder the supplied 2-pin header to P3 on the AUX board.



3. On the component side of the AUX board, solder the supplied wire to connect Pin 2 of J5 to Pin 5 on P1.
4. Using the supplied custom connect cable, solder the wire end to connect to Pin 7 on the 6850 IC on the ESI or CI board. The 6850 is U20 on the ESI and U1 on the CI.



5. Go on to ESI Board Installation in Chapter 7.

**Note:** You can use a modified ESI with firmware versions 5.5 and above (CPU-B) if you reverse the hardware modification and order a custom cable for connecting the ESI to the new CPU. Contact Burk Technology Customer Support for details.

### **ESI Board Installation**

*IMPORTANT! Some installation steps depend on the version of the CPU board in use. Units with firmware version 5.4 or below have CPU-A installed. Units with firmware version 5.5 and above have CPU-B installed.*

The ESI is installed in the right rear of the ARC-16 (opposite the corner used by the power supply), on top of the I/O boards. If no I/O boards are installed, the ESI sits on the bottom of the chassis. The ESI contains a built-in Computer Interface. If a Computer Interface is already installed in the ARC-16, the ESI will replace it. Because the ESI and CI boards utilize the same data port on the ARC-16, both options cannot be installed in the same ARC-16 unit.

To install the ESI:

1. If I/O boards are installed, remove all mounting screws from the top I/O board, except the screw closest to the 24-pin ribbon cable, and replace them with the standoffs provided with the ESI board.
2. Install the ESI on the standoffs so that the RJ-11 jacks and DB9 connector extend through the slots in the rear of the ARC-16. Secure with the screws provided.
3. Connect one end of the 24-pin ribbon cable to the header on the ESI board, so that it extends away from the board.

**Follow steps 4A and 5A if CPU-A is installed:**

- 4A. Connect the other end of the 24-pin cable to the AUX board, which is at the right end of the CPU board. The cable must be connected to the header closest to the display board.
- 5A. There is a wire ending with a female two-pin header coming out from the bottom of the ESI. Use this two-pin header to connect the ESI to the male two-pin header P3 on the AUX board.

**Note:** The wire and female two-pin header on the ESI, and the male two-pin header on the AUX board are only present when the modification procedure detailed in the previous section is accomplished (either at the factory or in the field).

**Follow steps 4B and 5B if CPU-B is installed:**

- 4B. Connect the other end of the cable to J11 on the CPU board.
- 5B. Remove the 6850 chip from the ESI board and use the cable with the socket connector to connect the 6850 socket to J5 on the CPU. When making the connection, the red stripe on the cable remains on the left side, even as the cable bends at a right angle at the 6850 socket on the ESI.

# D Appendix D: Modifying Your ARC-16 To Operate At 1200 Baud

## FOR CPU-A, VERSIONS 5.3-5.4 ONLY

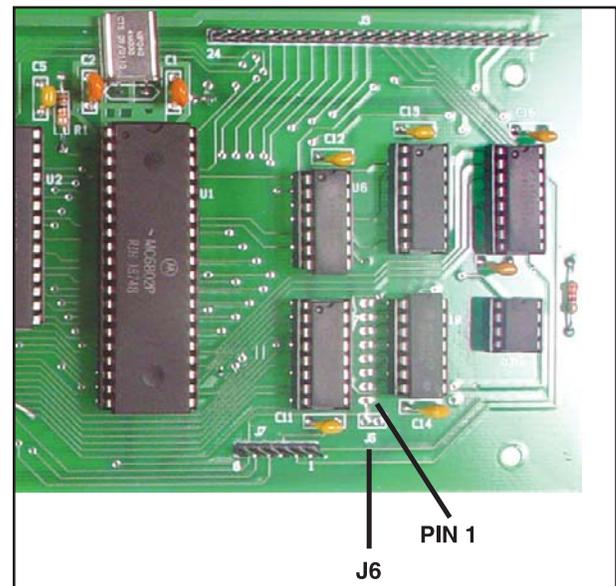
ARC-16 systems with digital communication links running firmware version 5.3-5.4 can operate at 1200 baud or 300 baud, depending on the type of communication link in use. Digital links with Universal Modems may run at 1200 baud, while FSK audio and subcarrier frequencies require 300 baud.

**Note:** For 1200 baud operation, the digital link must be bi-directional. If it is not, 300 baud must be used.

In versions 5.3 and 5.4, a physical modification to the ARC-16 CPU is necessary to allow 1200 baud. In versions 5.5 and above, the CPU is preset to support 1200 baud and no modification is needed.

The photograph below shows revision A of the CPU, which is standard on units with firmware version 5.4 and below. To complete the baud rate modification, refer to the instructions below:

1. Cut the link between the two pins of J6.
2. Jumper together pins 1 and 6 of the baud rate selector for 1200 baud. Pin 1 is the closest to J6.



CPU-A



# E

# Appendix E:

# Troubleshooting

This appendix is designed to get you started troubleshooting most ARC-16 problems. If you need assistance, or if the tips in this section do not resolve your problem, the Burk Technology Customer Support team is ready to assist you. Should your system require factory repair, please contact Customer Support for a Return Authorization. Same-day service is standard on all repairs.

**Note:** Most ARC-16 schematics are available on request. Please send email to [support@burk.com](mailto:support@burk.com) if you are troubleshooting a problem and need to review a schematic.

**Burk Technology Customer Support**  
Monday-Friday, 9AM to 5PM Eastern Time

Email: [support@burk.com](mailto:support@burk.com)  
Phone: 978-486-3711  
Fax: 978-486-0081

## TROUBLESHOOTING CHART

<b>Communication Trouble</b>	
<p>Tip: A good way to troubleshoot most communication problems in full-time or multi-site configurations is to connect units back-to-back. With wire modems, use two 12-inch lengths of copper wire to link the rear panel terminal connectors on each unit. With universal modems, use two 12-inch lengths of coaxial cable to link the BNC connectors on each unit. Internal modem drivers will carry the signal for about 12 inches regardless of any input or output modules installed. If communication is successful with the units connected back-to-back, there may be a problem with the communication link itself, or with the ARC-16 configuration.</p>	
<p><b>All the status LEDs on the ARC-16 front panel are flashing.</b></p>	<p>Make sure the site selected on the ARC-16 front panel is a valid site in the system. For example, if your system does not contain a location identified as site C, selecting site C on the front panel will cause the status LEDs to flash.</p>
	<p>When the status LEDs are flashing, the ARC-16 has lost communication with the remote site. This may be due to a failure of the link itself, or the ARC-16 communication settings are not configured properly. See the next troubleshooting problem for solutions to lost communication.</p>
<p><b>My ARC-16 does not appear to be communicating with other units. I'm not seeing data from the remote site.</b></p>	<p>Before troubleshooting link problems, take a moment to verify that the desired site is selected for display on the front panel. If you are expecting to see data from the transmitter site and the studio site is selected for display, you will need to select the transmitter site using the MODE menu. From the main display screen, press the MODE switch once to advance to the site selection menu. Use the CHANNEL switch to change the site selected on the front panel. Press and hold the MODE switch to return to the main display, and the front panel will display data from the selected site.</p>
	<p>Verify the communication link itself is up and running. If the STL/TSL is down, the ARC-16 will not communicate with remote sites.</p>

<p><b>My ARC-16 does not appear to be communicating with other units. I'm not seeing data from the remote site. (continued)</b></p>	<p>Double check to be sure the firmware versions are compatible. From the main display, use the MODE switch to advance to the last MODE menu, where the serial number and firmware version are displayed. See page ix for a table showing compatible firmware versions.</p>
	<p>Make sure the send and receive port settings are set up correctly in the Edit Mode menus. Refer to pages 15-16 for instructions.</p>
	<p>Make sure each ARC-16 unit is equipped with the correct internal modem for the type of communication link in use. Wire Modems are for two-wire telco loops, and Universal Modems support four-wire telco, FSK audio, digital, and subcarrier frequencies. If you are using a digital or subcarrier site link, input and output modules must be installed on the Universal Modem. See page 35 for more on modem configuration.</p>
	<p>The ARC-16 internal modems all have jumpers to configure the modem for use in the studio or transmitter unit. Refer to the instructions for your modem on page 36 and verify the jumper is set correctly.</p>
<p><b>I can get readings from my remote site, but I can't issue commands.</b></p>	<p>Verify that the site displayed on the front panel is the site to which you want your commands addressed. If the wrong site is displayed, press the MODE switch once and select the desired site with the CHANNEL switches. Press and hold the MODE switch to return to the main display, and the front panel will display data from the selected site.</p>
	<p>Make sure the send and receive port settings are set up correctly in the Edit Mode menus. Refer to pages 15-16 for instructions.</p>
	<p>Make sure each ARC-16 unit is equipped with the correct internal modem for the type of communication link in use. Wire Modems are for two-wire telco loops, and Universal Modems support four-wire telco, FSK audio, digital, and subcarrier frequencies. If you are using a digital or subcarrier site link, input and output modules must be installed on the Universal Modem. See page 35 for more on modem configuration.</p>
	<p>The ARC-16 internal modems all have jumpers to configure the modem for use in the studio or transmitter unit. Refer to the instructions for your modem on page 36 and verify the jumper is set correctly.</p>
	<p>RF interference or noise on a wire communication link may be affecting the ability to send commands. Check the noise level on the communication line against the specifications in Appendix A.</p>
<p><b>I can issue commands, but I'm not getting readings back from the site.</b></p>	<p>The return link may be inoperative or configured incorrectly. See the troubleshooting tips for the above problem.</p>
<p><b><i>ESI Problems</i></b></p>	
<p><b>My ESI doesn't answer incoming calls.</b></p>	<p>Verify the phone line is working by disconnecting any external surge suppression, connecting a telephone set to the line, and checking for a dial tone. A nonfunctional line that works normally after removing surge suppression usually indicates the suppressor took a severe transient and needs service.</p>
	<p>Make sure the phone line is plugged in to the jack marked LINE on the rear panel of the ARC-16.</p>
	<p>In order for the ESI to answer incoming calls, the ESI option must be enabled in the configuration menus, and ANSWER must be set to YES. Double-check the ESI settings in the ARC-16 unit containing the ESI (see page 50).</p>
	<p>Once installed in the ARC-16, the 24-pin ribbon connector on the ESI must be connected to the AUX board (if CPU-A is installed) or directly to the CPU board (if CPU-B is installed). In either case, the connection is at the header closest to the display.</p>
<p><b>My ESI won't dial out to report alarms.</b></p>	<p>Check that the Call? option is set to YES in the unit containing the ESI. See page 50 for instructions.</p>
	<p>Make sure the ESI option is configured in the ARC-16 containing the ESI board. This is done from the Edit Mode configuration menus described in Chapter 2.</p>

<p><b>My ESI won't dial out to report alarms. (continued)</b></p>	<p>Verify that Limits Monitoring is turned on in the configuration menus of all ARC-16 units you would like reported by the ESI. Limits monitoring is a global setting for the ARC-16 unit and will enable or disable alarm reporting for all sixteen channels at a site. Also make sure high and low limits are set for each metering channel you would like reported, and status alarms enabled for each status channel you would like reported. See pages 21 and 22 for instructions.</p>
<p><b>The ESI is reporting alarms on units for which I don't want alarm dial out.</b></p>	<p>To disable alarm reporting for a particular unit, turn limits monitoring OFF for that unit (see page 19).</p>
<p><b>I have more than one ESI installed and I'm getting multiple phone calls for the same alarm.</b></p>	<p>Since a single ESI will report alarms for any connected ARC-16, more than one ESI will result in duplicate alarm calls. However, many operations install an ESI at the studio and transmitter locations for redundancy purposes. To eliminate repeat alarm calls, simply turn the ESI Call? option OFF. See page 50 for more.</p>
<p><b>I need to stop the ESI from calling out to report alarm conditions while I travel out to the transmitter site to correct the problem.</b></p>	<p>You can suspend alarm call-out by dialing in to the ESI and disabling limits monitoring (the DTMF code is 52). Once you correct the problem at the remote site, be sure to turn limits monitoring back on (code 51).</p>
<p><b><i>ARC-16 Configuration</i></b></p>	
<p><b>I don't see where to set up adjustable remote command durations and alarm delays.</b></p>	<p>Adjustable command durations and alarm delays are set up using AutoLoad software. Instructions are in Chapter 3.</p>
<p><b>I'm changing my communication link and I need to swap my Universal Modems for Wire Modems, or vice-versa.</b></p>	<p>Replacement modems are available directly from Burk Technology or may be ordered through any of our dealers. All that is required when swapping modems is installing the physical modem hardware; no configuration changes to the ARC-16 are needed, unless you are changing the baud rate. See page 16 for information on configuring the baud rate for each modem port. Note that connections to Wire Modems are made to the terminal connectors on the rear panel of the ARC-16, while Universal Modem connections are made through the BNC connectors. When swapping modems, make sure to change the wiring as appropriate.</p>
<p><b><i>Unstable Meter Readings</i></b></p>	
<p><b>Readings on the ARC-16 are fluctuating, while the actual values on the transmitter are quite stable.</b></p>	<p>RF Interference may be traveling across the sample lines and into the ARC-16. To troubleshoot RF interference, first test your input samples to ensure that they do not exceed 4.5 volts DC. One over limit sample can alter the readings on the rest of the channels for that particular board. Next, be sure all samples are ground referenced; the ARC-16 will not accept a floating sample (use a DC isolation amplifier if the controlled equipment provides a floating sample). Finally, set the metering channel to the millivolts (degree) scale, and make sure that the sample voltage tracks linearly with the reading on the ARC-16. If readings continue to fluctuate, use a multi-meter to test the sample ground against a common ground. When selected to AC, the multi-meter should show RF interference if it is indeed traveling across this sample. To correct this occurrence, recheck the sample line. The sample line should have a proper ground before it reaches the remote control or relay panel. Remove the sample grounds and tie them to a common ground. As long as the ARC-16 and the samples are tied to common ground, it is not necessary to use the grounds on the IP-8 relay panel. Isolating the ARC-16 from these grounds will prevent the interference from traveling into the remote control, and still provide a common ground reference for both the sample and the chassis. This also removes a path for excessive transients that may occur from a lightning strike.</p> <p>Another way to search for interference in your ARC-16 is to connect a 1.5-volt battery to a sample input. If interference is corrupting your values, you should see the battery reading fluctuate as well. Disconnect your other samples, one at a time, to see if the battery reading stabilizes. If this does not work, disconnect all the samples and see if the reading stabilizes. When the battery reading stabilizes, you have removed the inputs that are introducing the RF interference. We recommend using a DC isolation amplifier to filter the interference from these inputs.</p>

## SPARE PARTS KITS

Burk Technology stocks spare parts kits for all versions of the ARC-16 I/O boards, as well as for the original ARC-16 CPU board. Starting with firmware version 5.5, revision B of the CPU board (CPU-B) was released. Replacement components for CPU-B are available on request. Contact Customer Support for more information.

Below is a list of the parts contained in each of the spare parts kits (subject to change).

### ***ARC-16 I/O Board Rev 1 Spare Parts Kit***

Part# SPK I/O REV 1

This Spare Parts Kit contains appropriate replacement parts for the current production version (REV 1) of the ARC-16 I/O board, which is GREEN in color. A different Spare Parts Kit is available for the original production I/O boards, which are blue in color.

Qty.	Burk Part Number	Description	Board Location
1	40024401	TRANSISTOR NPN 2N4401	Q2
1	41504051	IC 4051 8 X 1 ANALOG MUX	U6
2	41506259	IC TPIC6A259NE	U8, U9
2	41514014	IC 74HCT14 HEX INV SCHMIT	U15, U16
1	41514175	IC 74HC175 QUAD D F/FLOP	U7
4	41514245	IC 74HCT245 8-BUS XCEIVER	U1, U11, U12, U17
1	41517404	IC 74HC04 HEX INVERTER	U10
1	42017109	IC ICL7109CPL 12-BIT ADC	U2
1	42017660	IC 7660 VOLTAGE CONVERTER	U5
1	43006680	IC AD680JT 2.5V REFERENCE	U4
1	82400013	PAL I/O 16V8H-15PC/4 U13	U13

### ***ARC-16 I/O Board Spare Parts Kit***

Part# SPK I/O

The Spare Parts Kit for the ARC-16 I/O Board contains appropriate replacement parts for the factory's original production I/O boards, which are BLUE in color. Current production I/O boards are stamped "REV 1" and are

Qty.	Burk Part Number	Description	Board Location
6	40023906	TRANSISTOR PNP 2N3906	
5	40122003	IC N2003A PPHAL DVR ARR	U10-U14
1	41100175	IC 74LS175 QUAD D F/F	U7
2	41100259	IC 74LS259 BIT ADR LATCH	U8, U9
1	41504051	IC 4051 8 X 1 ANALOG MUX	U6
1	41514244	IC 74HCT244 OCT BUFR 3-ST	U10-U14
1	41600399	IC 399H PRECISION REF.	U4
2	42011489	IC 1489 RS-232 RECEIVER	U15, U16
1	42017109	IC ICL7109CPL 12-BIT ADC	U2
1	42017660	IC 7660 VOLTAGE CONVERTER	U5
6	82204148	ASSEMBLY DIODE 40014148	

green in color. A different Spare Parts Kit is available for REV 1 of the ARC-16 I/O board.

**ARC-16 CPU Spare Parts Kit (CPU-A only)**

Part# SPK CPU-16

The Spare Parts Kit for the ARC-16 CPU board is provided for use with the original CPU design (CPU-A). If your ARC-16 is running firmware version 5.4 or below, you have the ARC-16 CPU-A, and this spare parts kit contains appropriate parts.

**Note: The IC 6802 microprocessor on the board is no longer available and cannot be replaced. It is not included in**

Qty.	Burk Part Number	Description	Board Location
1	30601050	FUSE .5 AMP AGC	
2	40014007	DIODE 1N4007 1000V 1A	CR3, CR4
1	40066850	IC 6850 ACIA / UART	U13
1	40072817	IC 28C17A EPROM 2K X 8	U3
1	40076264	IC 6264 RAM 8K X 8	U2
1	41100004	IC 74LS04N HEX INVERTER	U8
2	41100138	IC 74LS138 1 OF 8 DECODE	U7, U12
1	41100161	IC 74LS161 4-BIT SYNC DIV	U9
1	41504024	IC 4024 RIPPLE COUNT/DIV	U10
1	41514244	IC 74HCT244 OCT BUFR 3-ST	U6
1	42501232	IC 1232 COP WATCHDOG	U16
2	43007805	IC 7805 +5V 1A VOLT REG	U14, U15

the spare parts kit. If your microprocessor needs replacement, please contact Customer Support for options.