**AR*i*-195e**
**ANI and Status Desk Top Console**

**MAN78 Version**

**Firmware Version  1.2**

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# 1.0 Introduction

We are very pleased that you have selected the CES AR*i*-195e ANI and Status Display Console. If you have any questions or concerns, we will guarantee you complete satisfaction through direct assistance from our factory.

For maximum benefit, please read this manual carefully **before** commencing programming or installation.

This manual provides complete details on the configuration, programming and installation of the AR*i*-195e ANI and Status Display Console. There are many programmable parameters in the AR*i*-195E. It is easy to become over zealous by introducing many of these into a system without a concern for what the customer wants. We ask you to exercise caution, and consult the customer before introducing a level of functionality that defeats the purpose of the system. As always, each console must be compatible with the mobile equipment.

This product has been carefully engineered and manufactured to provide reliable service in virtually any wireless communications system. Occasionally, particular systems may require special functions not available in standard products. Please call your CES Applications Engineer to discuss special applications to meet other needs.

Because we are engaged in a program of continual product development, the specifications and descriptions outlined in this manual are subject to change. **Please consult the amendment section for changes.**
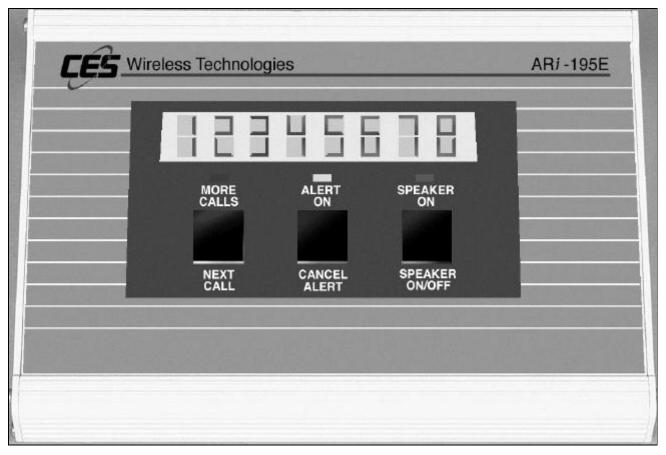
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CES WIRELESS TECHNOLOGIES CORP.

## 2.0 Product Overview

The AR*i*-195e is an advanced desk top ANI/Status decoder and display console featuring intelligent messaging capabilities that works with your existing mobile radio system. The unit decodes DTMF, 5-tone and n-tone tone sequences. When used in conjunction with the CES AR*i*-2000 easi-DISPATCH™ software system, the ARi-195e can be operated in a multi-channel environment and can be programmed using the AR*i*-2000 software.

The device will display valid tone sequences (mobile identities, status messages etc.) transmitted by mobiles fitted with compatible ANI and signaling modules. The base operator can view these tone sequences which are also stored in memory for later retrieval. A parallel port allows the connection of a printer. Alternatively, the serial port can be used to send the received sequences to the CES AR*i*-2000 easi-DISPATCH™ software system, or any compatible software system.



### 2.1 Terms

**ANI**

ANI (Automatic Number Identification) within the mobile radio industry can be described as the process of automatically identifying the current user of a radio channel. This is normally realized by the transmission of a rapid sequence of tones when the user activates the radio microphone PTT switch, representing the preprogrammed mobile users identity. This identity sequence is decoded and displayed by the AR*i*-195e and provides the dispatcher with a visual indication of the current radio user.

The frequency and time period of these tones can comply with the international DTMF or Tone Sequential formats or can be user programmable.

**Status**

By appending additional digits to the preprogrammed identity sequence, the driver can send messages to the dispatcher, with each additional digit having a "canned" or pre determined understanding. For example, if using the AR*i*-100 module as the mobile signaling device, the driver can have three external switchs representing say, "on route", "lunch" and "arrived". By activating any of the switches, the radio will transmit the mobile users identity, together with the status digit representing the switch activated.

This is then decoded and displayed by the AR*i*-195e for the dispatcher to view.

**Autocall**

By installing the CES AR*i*-100 module in the mobile radio, the mobile user can double click the microphone PTT to send an *autocall* sequence (as distinct form a single pressel with transmits an ANI). This is in fact a "status' as defined above, with the exception that the "status" transmission" is activated by the "double click" of the microphone PTT.

This message is decoded by the AR*i*-195e and displayed as an Autocall as opposed to an ANI (because it differs from the ANI by an extra digit appended to the identity sequence). This "double click" can be interpreted by the dispatcher as a "*request to talk*" by the mobile user.

**Emergency**

A separate emergency input is provided in the CES AR*i*-100 mobile module. It this input is activated, the AR*i*-195e will decode and display it as an *emergency* transmission from the mobile.

**Tone Sequential**

An internationally recognized set of tone frequencies and tone periods for the transmission of ANI and Status information over wireless infrastructures. See page 22 for a complete list. The AR*i*-195e base display console and the AR*i*-100 mobile module allow the user to determine their own set of frequencies. This is termed "user-defined frequencies" or "n-tone" in this manual and other CES manuals.

**DTMF**

An internationally accepted set of tone frequencies and tone periods for the transmission of ANI and Status information over various communications infrastructures. CES recommends *tone sequential* formats whenever possible.

**Precode**

These are the digits the AR*i*-195e will expect to see first in any transmission received from a mobile. Programming *precode* digits reduces false decoding. These digits are fixed and common to all units in the fleet. If programmed in the system and not present when a sequence is received, the AR*i*-195e ignores the signal received.

For example, if there are 300 vehicles in the fleet, and a 5 digit identity is planned, fix the first two digits to 10 throughout the entire fleet, and the last three digits according to the mobile identity. Program the AR*i*-195e for a *precode* of 10. The AR*i*-195e will then not decode a sequence unless it commences with 10.

**Tone Blanking**

When using a precode, the AR*i*-195e will mute the base radio receiver when it decodes the *precode* digits. This prevents dispatch annoyance, particularly when long tone sequences are received. To mute the entire sequence received, use the optional VAD1 or VAD-8 Audio Delay Board. See *Audio Delay Technology* below.

**Tone Period**

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This dictates the tone period of each digit in the identity sequence. For *tone sequential* or *user defined* sequences this can be programmed from 20ms to 100ms. For *DTMF* an *interdigit time* and *digit time* of 20ms to 100ms can be programmed.

**Audio Delay Technology**

CES has developed *voice audio delay technology* as an optional item for the AR*i*-195e. This completely mutes all tone sequences received to prevent dispatcher annoyance. When the correct sequence is received, decoded and displayed the radio receiver speaker is unmuted. The Audio Delay Module is normally installed in the base radio.

## 2.2 Signaling Format

The CES AR*i*-195e ANI and Status Display Console uses 5-tone sequential, DTMF or n-tone format. This provides international compatibly for use in a wide range of radio systems, or user defined frequencies.

## 2.3 Front Panel Status Keys

3 front panel operator keys are provided. These provide "*next call*", "*cancel alert*" and "*speaker on/off*" functions. In addition, a combination of these keys are used to set the time clock. From firmware version 1.2 onward, the mute button can be enabled or disabled. When disabled, pressing the button has no function except to change the clock.

## 2.4 Display

The AR*i*-195e features an 8 digit LED display for visual indication of received sequences. The first digit is used for sequence type, e.g. "E" for emergency. The next 5 digits are mobile identity. The last two digits are used for status digits.

In addition three LED's indicate the current status of the Alert, Speaker, and Calls in memory.

## 2.5 Additional Features

♦ Aluminum enclosure for rugged reliability

♦ 8 digit LED display, Clock Display

♦ Three programmable status decode sequences, e.g. ANI, Autocall, Emergency

♦ Three operator keys labeled '*next call*", "*cancel alert*" and "*speaker on/off*"

♦ Three LED's labeled '*more calls*", "*alert on*" and "*speaker on*"

♦ First in/ First out, or Last in/First out display format programmable

♦ Supports 5-tone sequential, DTMF, and n-tone formats (user programmable)

♦ Parallel and serial ports

♦ Multi channel operation

♦ Alert outputs

♦ Emergency protocol

♦ Speaker mute relay provides tone blanking to prevent user distraction, mute button programmable on or off.

♦ Complete muting of received sequences using the CES universal delay module VAD-1 or VAD-8

♦ Visual LED indicators

♦ Conventional and trunking radio compatible

♦ Real Time Stamping of incoming messages

♦ Reverse polarity protection

- Balanced and unbalanced audio input

- Suppress timer to prevent duplicates within a programmable time period

- Programmed using internal keypad or serially using AR-195S software

- PTT polarity programmable

- External alert relay provide for user application

## 2.6 Programming & Installation

The AR*i*-195e  is designed to interface to most mobile radio products.  In addition to the small physical size, power consumption is also held at an absolute minimum within the realm of current technology. Flash memory is provided. A common interface connector is provided for ease in programming and installation. Programming is achieved using an internal onboard keypad, or alternatively, the AR-195e can be programmed using the CES
AR*i*-2000 easi-DISPATCH™ Software System.

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The AR*i*-2000 easi-DISPATCH™ software system provides a dispatcher with a multi channel computer aided dispatch system. The AR*i*-195e is connected to each radio channel and in turn interfaced to the PC.  A utility program on the AR*i*-2000 permits rapid, user-friendly programming by the installing technician to configure the AR*i*-195e. Each AR*i*-195e unit configuration may be saved to an individual file for later retrieval, review, changes, and reprogramming of the module.  Alternatively, the unit can be programmed using the internal on board keypad.

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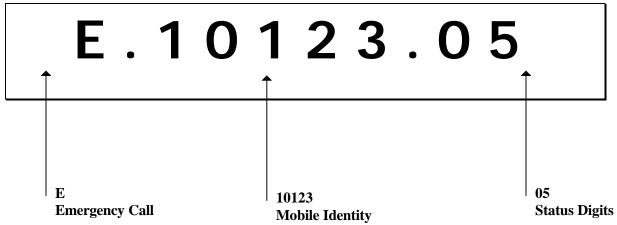**See section 4.0 for complete installation details.**

## 3.0 OPERATION

Operation of the AR*i*-195e ANI and Status Display Console is determined in many respects by programming. This is dictated by the required system configuration. Remember, compatibility must be maintained at all times with the mobile signaling system !

### 3.1 Display Operation

When power is first applied or if there are no sequences in the memory queue, the time is displayed. The display is also used to show incoming valid sequences from the mobile fleet and is also used during programming.

The format for displaying a valid sequence from a mobile is:

```
 E . 1 0 1 2 3 . 0 5
```

**E**
**Emergency Call**

**10123**
**Mobile Identity**

**05**
**Status Digits**

The AR*i*-195e can decode up to 99 different status's which are then displayed on the right hand side of the console. To further assist the dispatcher, "emergency" calls and "request to talk" calls (also called autoCALL) have an associated Alpha character, E and A respectively, which are also displayed when the appropriate sequence is received from a mobile. A separate "alert tone" is generated for the three types of calls, Emergency, AutoCALL and Normal calls.

*Emergency Calls*
If enabled, the AR*i*-195e will display the character E and emit a Emergency Alert when received. Emergency sequences are displayed as soon as they are received and are preempted by new sequences, even if the new sequence is an emergency. This applies to all queue modes. Emergency sequences are suppressed and are never placed in the queue. While the emergency sequence is displayed all other received sequences are sent out the parallel and serial port but alert tones are not generated.

The mobile unit must be programmed with compatible sequence information. If using the CES AR*i*-100 mobile module, a separate emergency input is available. An externally mounted button can be installed in close proximity to the driver for quick activation in the event of an emergency. A separate emergency sending protocol can be programmed in the AR*i*-100.

*AutoCALL*
If using the CES AR*i*-100 mobile module, a double click of the mobile microphone PTT will send a unique status to the AR*i*-195E. This is displayed as an "A" on the console, indicating that the driver wished to talk to the base dispatcher. Of course this feature can be used for whatever purpose, this is just an example. This eliminates the need to mount a separate 'request to talk' key on the mobile radio.

*Normal Calls*
Valid ANI calls and normal status calls will be displayed. An alpha character is not displayed.

### *Display Format*

The received mobile identity sequences can be displayed in one of two programmable methods:

When programmed for 'FIFO' (first in first out) the oldest sequence is displayed. When the "next call" button is pressed, the oldest sequence is removed and the next oldest is displayed. In this mode the next call button is used to see received sequences from the oldest to the newest. If no more calls are in the queue and the next call button is pressed, the time is displayed. If the queue is full and a new call is received, the currently displayed (and oldest) call is deleted, the next oldest call is displayed, and the call just decoded is placed at the end of the queue. All calls received are sent to the parallel and serial port.

When programmed for 'LIFO' (last in first out) the most recently received sequence will be displayed. If a new sequence is received, the previous one will be moved down in the queue and the new one will be displayed. The *next call* button is used to view received sequences from the newest to the oldest. If the queue is full, a new sequence will not be queued. All calls received, regardless of the queue condition, are sent to the parallel and serial port.

An external LED is on to indicate when the queue is not empty.

### *Display Suppress Timer*

To further assist the base dispatcher and to prevent the decode and display of sequences received within a short time period, the ARi-195e has a "suppress timer" feature.

This sets a time period that begins when a sequence is received, and it disables any other receptions of that exact sequence until the timer expires. The AR*i*-195e maintains 20 suppress timers / sequences. If all timers / sequences are used and another sequence is received, no suppress action will occur for it.

### Audio Alerts

Alert tone sequences can be generated for three events, normal call, autocall and emergency tone sequence receptions. Each of these events has assigned unique alert tones. Call is a 1khz tone with a 240ms on and off period. Autocall is a 400hz tone with a 240ms on and off time. Emergency is an alternating 1khz and 400hz tones at 120ms on and 30ms off times. Each of the three events can generate a certain number of beeps or continue until the cancel alert button is pressed, the PTT input becomes active or any button is pressed. The tone being generated relates to the last sequence ID received, if another call is received before the previous alert is canceled, the old alert tone will be replaced with the new. If the FIFO buffer is full or the call is suppressed, no tone will be generated.

### Alert Relay

In addition to generating an alert tone, the alert relay can be activated with reception of a valid sequence. The relay can be activated with the alert tone or until the cancel alert button, PTT in is activated or any button is pressed. When set to "continuous", the relay is not toggled with alert beeps but becomes active when the call is received and deactivated when PTT in or cancel alert or any other button is pressed.

When alert tones are actually being generated, the "alert" LED is on and the speaker enable output is active.

### Operator Key Action

Three dispatcher keys are provide.

- Next Call - displays the next call if additional calls are in the memory queue
- Cancel Alert - cancels the alert tone when a valid sequence is received
- Speaker on / off  - turns the radio speaker on and off

### LED Operation

Three LEDS provide operational information to the dispatcher.

- More Calls - if illuminated indicates that there are more calls in the memory queue
- Alert On - provides visual indication that a call has been received

- Speaker on / off - is illuminated when the radio speaker in enabled

**Speaker Mute**

The speaker mute relay is used to mute the speaker when a sequence is being received. The relay will only activate if precode digits are programmed. Once a valid sequence of precode digits has been received the relay will turn on until the remainder of the sequence is received.

The relay can also be controlled by the speaker on / off button. This button is a toggle, if the speaker mute relay is off and the button is pressed, the relay is turned on and vice versa.

Muting of sequences and use of the speaker on / off button should work together as follows: if the relay is off (muted) because of the button and a sequence is received, nothing should happen to the relay. If the relay is on (unmuted) and a sequence is received, the relay should turn off (mute) for the duration of the sequence.

When the relay is on, the speaker on LED should be lit. Also at power up the relay should be turned on (unmuted).

<u>**Variation:**</u> *From firmware version 1.2 onward, the mute button can be enabled or disabled. When disabled, pressing the button has no function except to change the clock.*

**Serial Output**

The RS232 port is designed to allow connection of the AR*i*-195e to a serial printer or a computer. The computer connection can operate in a polled environment to support multiple channel operation when using a dispatch software system.

**Parallel Output**

The parallel port is designed to connect to a printer. It requires no setup parameters. Each received sequence is sent as one line of text as follows:

- Sequence type; "Call:", "autoCall:" or "Emergency:"
- Received mobile identity (ID)
- If status digits were received they are displayed preceded by a dash
- Two spaces,
- Date
- Time
  - Each line would appear as: "Call: 12345-67  6/26/96 14:29:34".
  - Information is always sent out the parallel port unless the printer indicates an error.

**Real Time Clock**

An internal clock is included to time stamp received sequences when printed. The clock is set by using the *next call, cancel alert* and *speaker on / off* buttons as follows:

- To increase the hours, press and hold *cancel alert*, momentarily pressing *next call* increments hours
- To decrease the hours, press and hold *next call,* momentarily pressing *cancel alert* decreases hours
- To increase the minutes, press and hold *cancel alert*, momentarily pressing *speaker on / off* increments minutes
- To decrease the minutes, press and hold speaker on / off first, then momentarily pressing cancel alert decreases minutes

Time can also be set using programming parameters.  Time is displayed when no sequences are in the queue and at power up. It is sent to the printer as part of the received sequence string. Time is always in the 24 hour format.

# 4.0 Installation

Installation and programming of this CES product must be completed by a qualified two-way radio technician or engineer. CES is not responsible for any operational problems caused by system design, outside interference, or improper installation. Observe normal static prevention practices.

## 4.1 Radio Application/Interface Notes

Application Notes for selected radio models may be obtained by contacting your CES sales representative. If not available, CES, at a nominal charge will prepare an application note for you. Please contact CES at 407-679-9440 for further information.

## 4.2 Before Installing

The AR*i*-195e may be interfaced to almost any mobile radio. The AR*i*-195e should be programmed prior to field installation.

## 4.3 Required Equipment for Installation

- Communications service monitor or deviation meter with oscilloscope
- Temperature-controlled soldering iron (fine tip, if surface mount components are used in radio)
- Oscilloscope
- Volt-ohm-meter
- Alignment tool

## 4.4 Wire Interface Overview

Please read through the following descriptions to decide on the level of functionality required before undertaking the actual installation. If you need help please call CES at 407-679-9440.

## 4.5 Radio Interface and Serial Cable

Radio Interface / Serial Connector Cable (DB25 male)

| Pin | Wire Color | Function | Direction | Signal |
|-----|-----------|----------|-----------|--------|
| 1 | Red | Power | | 8 to 35v operational, 1 amp fused, reverse polarity protected |
| 2 | Black | Ground | | |
| 3 | Blue | Ground | | |
| 4 | Dark Brown | PTT in | Input | Z = 100k, -35 to 35v |
| 5 | Dark Green | Speaker enable | Output | Open collector, no pull up |
| 6 | LightGreen | Alert tone | Output | Z = 67k, cap coupled |
| 7 | White/Green | | | |
| 8 | White/Blue | TXS | Output | RS232 |
| 9 | Violet | RXS | Output | RS232 |
| 10 | Yellow | | | |
| 11 | Orange | Alert relay, common | Output | Relay contacts |
| 12 | Light Brown | Speaker mute, normally open | Output | Relay contacts |
| 13 | White | Speaker mute, normally closed | Output | Relay contacts |
| 14 | Gray | Power | Output | 8 to 35v |
| 15 | White/Red | Receive audio unbalanced | Input | Z = 67k or 20k, cap coupled |
| 16 | | Received audio balanced | Input | Z = 600 ohm, transformer coupled |
| 17 | | Received audio balanced | Input | Z = 600 ohm, transformer coupled |

| 18 | | Delay Mute | Output | Open collector, no pull up |
|---|---|---|---|---|
| 19 | | Delay SCLK | Output | Open collector, no pull up |
| 20 | | Delay Data | Output | Open collector, no pull up |
| 21 | | Ground | | |
| 22 | | Ground | | |
| 23 | | Alert relay, normally open | Output | Relay contacts |
| 24 | | Alert relay, normally closed | Output | Relay contacts |
| 25 | | Speaker mute, common | Output | Relay contacts |

## 4.6 Parallel/Printer Interface

| Pin | Function | Direction | Signal |
|---|---|---|---|
| 1 | Strobe | Output | TTL open collector with 27 ohm series resistor and 10k pullup |
| 2 | D0 | Output | TTL with 27 ohm series resistor |
| 3 | D1 | Output | TTL with 27 ohm series resistor |
| 4 | D2 | Output | TTL with 27 ohm series resistor |
| 5 | D3 | Output | TTL with 27 ohm series resistor |
| 6 | D4 | Output | TTL with 27 ohm series resistor |
| 7 | D5 | Output | TTL with 27 ohm series resistor |
| 8 | D6 | Output | TTL with 27 ohm series resistor |
| 9 | D7 | Output | TTL with 27 ohm series resistor |
| 10 | Acknowledge | Input | TTL |
| 11 | Busy | Input | TTL |
| 12 | | | |
| 13 | Selected | Input | TTL |
| 14 | | | |
| 15 | Error | Input | TTL |
| 16 | Init | Output | TTL open collector with 10k pullup |
| 17 | Selected in | Output | TTL open collector with 10k pullup |
| 18 | Ground | | |
| 19 | Ground | | |
| 20 | Ground | | |
| 21 | Ground | | |
| 22 | Ground | | |
| 23 | Ground | | |
| 24 | Ground | | |
| 25 | Ground | | |

## 4.7 ARi-195e  Adjustments

After programming the ARi-195e and connecting the radio interface harness to the radio transceiver, attach the terminal to the interface harness. Observe normal static prevention practices.

- Apply power to the radio and turn the power switch on.
- Set the service monitor to receive on the transmitter frequency.  If the service monitor does not incorporate an oscilloscope, connect an external oscilloscope to the demodulation output.
- Using a service monitor generate a 1000 Hz signal deviated at 4.0 KHz and adjust R8 to obtain 100mvp-p at TP1.

# 5.0 Programming

Programming the unit is accomplished using
- The internal keypad or
- Serially using the ARi-2000 easi-DISPATCH software system

## Internal Keypad Programming

To access the internal keypad, remove the front cover. Programming is accomplished by activating the keypad keys and listening for the program alert tone. A chirp will be generated with each press of a key. Programming proceeds as follows:

- Expose the keypad by removing the right side panel and slide the keypad out from under the main PCB
- Enter the programming mode by pressing the star key
  - The 'done' tone will be generated and a **P** is displayed.
- Enter the item number to program.
- Press pound
  - If item number is valid accept tone will be generated, and the current value displayed
  - If item number is invalid, error tone will be generated
- Enter the new number
  - The current value is erased and the digit is displayed
  - If more than 5 digits are entered, error tone will be generated
- Press pound
  - If data was in range, "done" tone will be generated and **P** will flash 5 times
  - If an error occurred, error tone will be generated
- Item number and data as entered remain on the display until another key is pressed or device "program mode" time-out timer occurs
- To abort an entry at any time press star
  - Error tone will be generated


*Programming parameters, programming:*

**00#**   Enter this item to exit program mode. Command is executed as soon as the item number is entered, no data is required. When executed, the done tone will be generated. Mode can also be exited by removing power or no key activity for 2 minutes. Any exit of program mode will cause the unit to reset after the done tone is complete.

**99#**   Enter this item to program all locations to factory defaults. Command is executed as soon as the item number is entered, no data is required.


## Note:
The * is used to **abort** or reset an entry
The # is used to **confirm** an entry

## Alert

Alert tone sequences can be generated for three events: *normal call, autocall* and *emergency* tone sequence receptions. Each of these events has assigned unique alert tones. *Call* is a 1khz tone with a 240ms on and off period. *Autocall* is a 400hz tone with a 240ms on and off time. *Emergency* is an alternating 1khz and 400hz tones at 120ms on and 30ms off times. Each of the three events can generate a certain number of beeps or continue until the cancel alert button is pressed, the PTT input becomes active or any button is pressed. The tone being generated relates to the last sequence ID received, if another call is received before the previous alert is canceled, the old alert tone will be replaced with the new. If the FIFO buffer is full or the call is suppressed, no tone will be generated.

In addition to generating an alert tone, the *alert relay* can be activated with reception of an event. The relay can be activated with the alert tone or until the cancel alert button, PTT in is activated or any button is pressed. When set to '*on till acknowledged*', the relay is not toggled with alert beeps but becomes active when the call is received and deactivated when PTT in or cancel alert or any other button is pressed.

When alert tones are actually being generated, the alert LED is on and the *speaker enable* output is active.

*Programming parameters, alert:*

*Alert, call, enable:* Enables alert tone generation when a call sequence is received.

*Alert, call, duration:* Indicates the duration of the alert tone.

*Alert, call, relay action:* Enables the activation of the alert relay with the reception of a call sequence. The relay can be turned off when the beeps time out, when the cancel alert button is pressed or when the PTT input becomes active. Turning *alert, call, enable* 'off' and *alert, call, relay action* to 'on with beeps' is invalid since no beeps would be generated. In this case the relay would never be activated.

*Alert, autocall, enable:* Enables alert tone generation when an Autocall sequence is received.

*Alert, autocall, duration:* Indicates the duration of the alert tone.

*Alert, autocall, relay action:* Enables the activation of the alert relay with the reception of an autocall sequence. See *alert, call, relay action*.

*Alert, emergency, enable:* Enables alert tone generation when an emergency sequence is received.

*Alert, emergency, duration:* Indicates the duration of the alert tone.

*Alert, emergency, relay action:* Enables the activation of the alert relay with the reception of an emergency sequence. See *alert, call, relay action*.

| Item | Description | Range | Representation | Default |
|------|-------------|-------|----------------|---------|
| 1 | Alert, call, enable | 0,1 | 0 = off, 1 = on | 1 |
| 2 | Alert, call, duration | 0 - 255 | beeps, 0 = continuous | 0 |
| 3 | Alert, call, relay action | 0 - 2 | 0 = none, 1 = on with beeps, 2 = on till acknowledged | 1 |
| 4 | Alert, autocall, enable | 0,1 | 0 = off, 1 = on | 1 |
| 5 | Alert, autocall, duration | 0 - 255 | beeps, 0 = continuous | 0 |
| 6 | Alert, autocall, relay action | 0 - 2 | 0 = none, 1 = on with beeps, 2 = on till acknowledged | 1 |
| 7 | Alert, emergency, enable | 0,1 | 0 = off, 1 = on | 1 |
| 8 | Alert, emergency, duration | 0 - 255 | beeps, 0 = continuous | 0 |
| 9 | Alert, emergency, relay action | 0 - 2 | 0 = none, 1 = on with beeps, 2 = on till acknowledged | 1 |

## Autocall

The *autocall* sequence is a received tone sequence that has status digit(s) appended to the identity that match the AR*i*-195e programmed *autocall* status digit(s). See *sequence*.

Programming parameters, *autocall:*

*Autocall, status digit 1:* Sets the first status digit for the *autocall* sequence. If programmed to 'not applicable' the autocall feature is shut off.

*Autocall, status digit 2:* Sets the second status digit for the *autocall* sequence. If programmed to 'not applicable' only status digit 1 must match to receive an *autocall* sequence.

| Item | Description | Size | Range | Representation | Default |
|------|-------------|------|-------|----------------|---------|
| 10 | Autocall, status digit 1 | Byte | 0 - 16 | 16 = not applicable | 16 |
| 11 | Autocall, status digit 2 | Byte | 0 - 16 | 16 = not applicable | 16 |

## Clock

An internal clock is included to time stamp received sequences when printed. The clock is set by using the *next call, cancel alert* and *speaker on / off* buttons as follows:

- To increase the hours, press and hold *cancel alert*, momentarily pressing *next call* increments hours
- To decrease the hours, press and hold *next call,* momentarily pressing *cancel alert* decreases hours
- To increase the minutes, press and hold *cancel alert*, momentarily pressing *speaker on / off* increments minutes
- To decrease the minutes, press and hold speaker on / off first, then momentarily pressing cancel alert decreases minutes

Time can also be set using programming parameters.

Time is displayed when no sequences are in the queue and at power up. It is sent to the printer as part of the received sequence string. Time is always in the 24 hour format.

*Programming parameters, clock:*

*Clock, year:* Sets the year in the clock.   *Clock, month:* Sets the month.

*Clock, day:* Sets the day.   *Clock, hours:* Sets the hour.

*Clock, minutes:* Sets the minutes.   *Clock, seconds:* Sets the seconds.

| Item | Description | Range | Representation | Default |
|------|-------------|-------|----------------|---------|
| 12 | Clock, year | 0 - 99 | | |
| 13 | Clock, month | 1 - 12 | | |
| 14 | Clock, day | 1 - 31 | | |
| 15 | Clock, hours | 0 - 23 | | |
| 16 | Clock, minutes | 0 - 59 | | |
| 17 | Clock, seconds | 0 - 59 | | |

## Display

When no sequences are in the queue and when power is first applied the time is displayed. The display is also used to show received sequences and in the programming mode.

The format for displaying a sequence is:

- First digit is sequence type, blank for call, 'A' for autocall and 'E' for emergency followed by decimal point
- Next digits are ID digits followed by decimal point

- Last one or two digits are status

The receive queue stores sequences and displays them according to the next call button operation. The programming item **display, call queue size** defines the number of received sequences that can be stored. If set to one then each call is displayed as it is received and the next call button causes the clock to display.

When the programming item **display, call queue type** is set to 'FIFO' (first in first out) each sequence is placed in the FIFO but only the oldest sequence is displayed. When the next call button is pressed, the oldest sequence is removed and the next oldest is displayed. In this mode the next call button is used to see received sequences from the oldest to the newest. If no more calls are in the queue and the next call button is pressed, the time is displayed. If the queue is full and a sequence is received, it will not be placed in the queue and so can never be displayed.

When the programming item **display, call queue type** is set to 'LIFO' (last in first out) then the most recent sequence will be displayed. If a new sequence is received the previous one will be moved down in the queue and the new one will be displayed when the next call button is pressed. Therefore the next call button is used to view received sequences from the newest to the oldest. If the queue is full and a sequence is received, the oldest sequence will be lost.

An external LED is on to indicate when the queue is not empty.

The programming item **display, suppress timer** sets a time period that begins when a sequence is received, it disables any other receptions of that exact sequence until the timer expires. The ARI-190 maintains 20 suppress timers / sequences. If all timers / sequences are used and another sequence is received, no suppress action will occur for it.

*Programming parameters, display:*

*Display, call queue size:* Sets the size of the call queue.

*Display, call queue type:* Sets the type of call queue. It can be FIFO (first in first out) or LIFO (last in first out).

*Display, suppress timer:* Sets the duration of the suppress timers. Twenty timers / sequence memory locations are provided for.

| Item | Description | Range | Representation | Default |
|------|-------------|-------|----------------|---------|
| 18 | Display, call queue size | 1 - 20 | Number of calls | 20 |
| 19 | Display, call queue type | 0,1 | 0 = FIFO, 1 = LIFO | 0 |
| 20 | Display, suppress timer | 0 - 15 | min, 0 = off | 0 |

## Emergency

The emergency sequence is a received tone sequence that has status digit(s) that match the programmed emergency status digit(s). See **sequence**.

*Programming parameters, emergency:*

*Emergency, status digit 1:* Sets the first status digit for the emergency sequence. If programmed to 'not applicable' the feature is shut off.

*Emergency, status digit 2:* Sets the second status digit for the emergency sequence. If programmed to 'not applicable' only status digit 1 must match to receive an emergency sequence

| Item | Description | Range | Representation | Default |
|------|-------------|-------|----------------|---------|
| 21 | Emergency, status digit 1 | 0 - 16 | 16 = not applicable | 16 |
| 22 | Emergency, status digit 2 | 0 - 16 | 16 = not applicable | 16 |

## Polarity

Sets the active state of the input or output.

*Programming parameters, polarity:*

*Polarity, PTT input:* Indicates the active level of the PTT input.

*Polarity, speaker enable output:* Sets the active level of the speaker enable output which is activated when alert tones are generated.

| Item | Description | Range | Representation | Default |
|------|-------------|-------|----------------|---------|
| 23 | Polarity, PTT input | 0,1 | 0 = active lo, 1 = active hi | 0 |
| 24 | Polarity, speaker enable output | 0,1 | 0 = active lo, 1 = active hi | 0 |

## Serial Port

| Item | Description | Range | Representation | Default |
|------|-------------|-------|----------------|---------|
| 25 | RS232 port, baud rate | 0 - 4 | 0 = 300, 1 = 1200, 2 = 2400, 3 = 4800, 4 = 9600 | 4 |
| 26 | RS232 port, arbitration | 0,1 | 0 = send immediately, 1 = wait for poll | 0 |
| 27 | RS232 port, send time and date | 0,1 | 0 = no, 1 = yes | 1 |
| 28 | RS232 port, polling address | 0 - 99 | | 1 |

The RS232 port is designed to allow connection to a serial printer or a computer. The computer connection can operate in a polled environment.

If the arbitration type is 'send immediately' then data sent out the RS232 port is in the same format as the **parallel port**. The only difference being that sending of the date and time can be turned off. Data is sent as soon as it is received. No handshake formats are supported so in this arbitration mode the serial receive line is ignored. All data is sent even if it is not displayed because the FIFO was full unless the sequence was suppressed.

## Sequence

Received sequences are processed as follows:

1) The first tone in the sequence must be about the length programmed in *sequence, first tone time.*
2) The remainder of the tones in the sequence must be about the length programmed in the *sequence*, *remainder tone time*.
3) Intertone times must be about the time programmed in *sequence, intertone time*. This does not apply to N tone sequences.
4) The first digits must match the precode digits.
5) The number of digits after the precode digits must be at least the number programmed in *sequence*, *number of ID digits* but not more than two plus this number
6) The sequence is considered emergency if the status digits match as programmed in *emergency, status digit 1* and *2*. The reception is considered a match if one status digit is programmed and it matches but two were sent.
7) The sequence is considered *autocall* if the status digits match as programmed in *autocall, status digit 1* and *2*. The reception is considered a match if one status digit is programmed and it matches but two were sent.
8) If the sequence is not autocall or emergency, it is considered a normal call.

Sequences can be DTMF or N tone with programmable frequencies per digit. The tone timings, precode digit(s) and number of ID digits can be programmed. Precode digits are recommended because they add to falsing protection and provide the ability to activate the speaker mute relay.

*Programming parameters, sequence:*

*Sequence, type:* Sets the tone set to receive, DTMF or N tone.

*Sequence, first tone time:* Indicates the expected length of the first tone to be received.

*Sequence, remainder tone time:* Indicates the expected length of all tones following the first tone.

*Sequence, intertone time:* Defines the expected length of the space between received tones.

*Sequence, precode digit 1:* Defines the first precode digit. A precode digit is a fixed digit that is always located in the same place in the sequence.

*Sequence, precode digit 2:* Defines the second precode digit. The first digit must be programmed to use the second.

*Sequence, precode digit 3:* Defines the third precode digit. The first and second digits must be programmed to use the third.

*Sequence, number of ID digits:* Defines the number of ID digits expected. If more are received, these will be considered status digits. If fewer are received, the sequence will be rejected.

*Sequence, N tone frq 0 - F:* Sets the frequencies of the N tone set. Digit E is fixed as the repeat digit.

**(see next page for entire list of programmable values including "sequence" values)**

## 6.0 Programmable Values and Customer Record

| Item | Description | Range | Representation | Default | Cust. |
|------|-------------|-------|----------------|---------|-------|
| * | Enter Programming mode | | | | |
| 00 | Program, exit program mode | | | | |
| | | | | | |
| 1 | Alert, call, enable | 0,1 | 0 = off, 1 = on | 1 | |
| 2 | Alert, call, duration | 0 - 255 | beeps, 0 = continuous | 0 | |
| 3 | Alert, call, relay action | 0 - 2 | 0 = none, 1 = on with beeps, 2 = on till acknowledged | 1 | |
| 4 | Alert, autocall, enable | 0,1 | 0 = off, 1 = on | 1 | |
| 5 | Alert, autocall, duration | 0 - 255 | beeps, 0 = continuous | 0 | |
| 6 | Alert, autocall, relay action | 0 - 2 | 0 = none, 1 = on with beeps, 2 = on till acknowledged | 1 | |
| 7 | Alert, emergency, enable | 0,1 | 0 = off, 1 = on | 1 | |
| 8 | Alert, emergency, duration | 0 - 255 | beeps, 0 = continuous | 0 | |
| 9 | Alert, emergency, relay action | 0 - 2 | 0 = none, 1 = on with beeps, 2 = on till acknowledged | 1 | |
| | | | | | |
| 10 | Autocall, status digit 1 | 0 - 16 | 16 = not applicable | 16 | |
| 11 | Autocall, status digit 2 | 0 - 16 | 16 = not applicable | 16 | |
| | | | | | |
| 12 | Clock, year | 0 - 99 | | | |
| 13 | Clock, month | 1 - 12 | | | |
| 14 | Clock, day | 1 - 31 | | | |
| 15 | Clock, hours | 0 - 23 | | | |
| 16 | Clock, minutes | 0 - 59 | | | |
| 17 | Clock, seconds | 0 - 59 | | | |
| | | | | | |
| 18 | Display, call queue size | 1 - 20 | Number of calls | 20 | |
| 19 | Display, call queue type | 0,1 | 0 = FIFO, 1 = LIFO | 1 | |
| 20 | Display, suppress timer | 0 - 15 | min, 0 = off | 0 | |
| | | | | | |
| 21 | Emergency, status digit 1 | 0 - 16 | 16 = not applicable | 16 | |
| 22 | Emergency, status digit 2 | 0 - 16 | 16 = not applicable | 16 | |
| | | | | | |
| 23 | Polarity, PTT input | 0,1 | 0 = active lo, 1 = active hi | 0 | |
| 24 | Polarity, speaker enable o/p | 0,1 | 0 = active lo, 1 = active hi | 0 | |
| | | | | | |
| 25 | RS232 port, baud rate | 0 - 4 | 0 = 300, 1 = 1200, 2 = 2400, 3 = 4800, 4 = 9600 | 2 | |
| 26 | RS232 port, arbitration | 0,1 | 0 = send immediately, 1 = wait for poll | 0 | |
| 27 | RS232 port, send time, date | 0,1 | 0 = no, 1 = yes | 1 | |
| 28 | RS232 port, polling address | 0 - 99 | | 1 | |
| | | | | | |
| | | | | | |

| Item | Description | Range | Representation | Default | Cust. |
|------|-------------|-------|----------------|---------|-------|
| 29 | Sequence, type | 0,1 | 0 = DTMF, 1 = N tone | 1 | |
| 30 | Sequence, first tone time | 20-100 | 1 ms | 33 | |
| 31 | Sequence, remainder tone time | 20-100 | 1 ms | 33 | |
| 32 | Sequence, intertone time | 20-100 | 1 ms | 40 | |
| | | | | | |
| 33 | Sequence, precode digit 1 | 0 - 16 | 16 = not applicable | 16 | |
| 34 | Sequence, precode digit 2 | 0 - 16 | 16 = not applicable | 16 | |
| 35 | Sequence, precode digit 3 | 0 - 16 | 16 = not applicable | 16 | |
| 36 | Sequence, number of ID digits | 1 - 5 | | 5 | |
| | | | | | |
| 37 | Sequence, N tone freq 0 | 625 - 3000 | Hz | 1981 | |
| 38 | Sequence, N tone freq 1 | 625 - 3000 | Hz | 1124 | |
| 39 | Sequence, N tone freq 2 | 625 - 3000 | Hz | 1197 | |
| 40 | Sequence, N tone freq 3 | 625 - 3000 | Hz | 1275 | |
| 41 | Sequence, N tone freq 4 | 625 - 3000 | Hz | 1358 | |
| 42 | Sequence, N tone freq 5 | 625 - 3000 | Hz | 1446 | |
| 43 | Sequence, N tone freq 6 | 625 - 3000 | Hz | 1540 | |
| 44 | Sequence, N tone freq 7 | 625 - 3000 | Hz | 1640 | |
| 45 | Sequence, N tone freq 8 | 625 - 3000 | Hz | 1747 | |
| 46 | Sequence, N tone freq 9 | 625 - 3000 | Hz | 1860 | |
| 47 | Sequence, N tone freq A | 625 - 3000 | Hz | 2400 | |
| 48 | Sequence, N tone freq B | 625 - 3000 | Hz | 930 | |
| 49 | Sequence, N tone freq C | 625 - 3000 | Hz | 2247 | |
| 50 | Sequence, N tone freq D | 625 - 3000 | Hz | 991 | |
| 51 | Sequence, N tone freq E, repeat digit | 625 - 3000 | Hz | 2110 | |
| 52 | Sequence, N tone freq F | 625 - 3000 | Hz | 1055 | |
| | | | | | |
| 60 | Speaker Mute Button | 0,1 | 0 = off,  1 = on | 1 | |
| | | | | | |
| 99 | Program, factory defaults | | | | |

# 7.0 Tone Sequential International Tone Set

| DIGIT | EEA | ZVEI 1 | ZVEI 2 | PZVEI | CCIR | ZVEI3 | EIA | DZVEI |
|-------|-----|--------|--------|-------|------|-------|-----|-------|
| 0 | 1981 | 2400 | 2400 | 2400 | 1981 | 2400 | 600 | 2200 |
| 1 | 1124 | 1060 | 1060 | 1060 | 1124 | 1060 | 741 | 970 |
| 2 | 1197 | 1160 | 1160 | 1160 | 1197 | 1160 | 882 | 1060 |
| 3 | 1275 | 1270 | 1270 | 1270 | 1275 | 1270 | 1023 | 1160 |
| 4 | 1358 | 1400 | 1400 | 1400 | 1358 | 1400 | 1164 | 1270 |
| 5 | 1446 | 1530 | 1530 | 1530 | 1446 | 1530 | 1305 | 1400 |
| 6 | 1540 | 1670 | 1670 | 1670 | 1540 | 1670 | 1446 | 1530 |
| 7 | 1640 | 1830 | 1830 | 1830 | 1640 | 1830 | 1587 | 1670 |
| 8 | 1747 | 2000 | 2000 | 2000 | 1747 | 2000 | 1728 | 1830 |
| 9 | 1860 | 2200 | 2200 | 2200 | 1860 | 2200 | 1869 | 2000 |
| A | 1055 | 2800 | 885 | 970 | 2400 | 885 | 2151 | 825 |
| B | 930 | 810 | 825 | 810 | 930 | 810 | 2433 | 740 |
| C | 2400 | 970 | 740 | 2800 | 2247 | 2800 | 2010 | 2600 |
| D | 991 | 885 | 680 | 885 | 991 | 680 | 2292 | 885 |
| E | 2110 | 2600 | 970 | 2600 | 2110 | 970 | 459 | 2400 |
| F | 2247 | 680 | 2600 | 680 | 1055 | 2600 | 1091 | 680 |

# 8.0 Specifications

**Mechanical**

| | |
|---|---|
| Physical size (less cable harness) | 8.75" x 6.0" x 2.0" inches |
| Ambient operating temperature range | 0 to + 70 deg. C |
| Weight | Less than 2lbs. |

**Electrical**

| | |
|---|---|
| Power Requirements | 6 to 35 VDC (-ve common) |
| Operating Current @ 12 Volts DC (typical) | 280 mA |
| Display Digits | 8 |
| Signaling Format | User Programmable: DTMF, n-tone, 5-tone |
| Sequence Length | 10 digits (including 3 precode digits not displayed) |
| Tone Input Level | 1 to 5V P-P |
| Tone Input Impedance | 100Kê/600ê balanced |
| Minimum Tone Time | 20 ms |
| Maximum Tone Length | 100 ms |
| Interdigit tone | 20~100 ms (DTMF) |
| Tone Input Level | Adjustable |
| Input Impedance | 2Kê /67Kê unbalanced, 600ê balanced |
| Dynamic Range | >25 dB |
| Display suppress timer | 1~15 minutes or OFF |
| Bandwidth | ñ20 Hz |
| Decode reliability (non-predictive decoder) | 99.90% for 3dB s/n @ 40ms CCIR |
| | 99.90% for 4dB s/n @ 20ms CCIR |
| Alert Tone level | 0~5V-pp |
| Alert Tone out | Relay contacts |
| Speaker mute out | Relay contacts |
| Open collector outputs (programmable logic) | |
|     PTT Output | Active high or low |
|     Speaker Enable Output | Active high or low |
| Real Time Clock | 24 hour format |

**Interface**

| | |
|---|---|
| Serial I/O | Std: RS-232,  Word Length: 8 bits, Stop Bits: 1 |
| | Baud Rate  300, 1200, 2400, 4800, 9600 |
| Parallel Printer I/O | STD Centronics Connector |
| Radio Interface | DB-25 with cable |

## 9.0 In Case Of Difficulty

(1) Ensure that the power and ground connections are properly connected.

(2) Ensure that the 'audio input' is connected and at a satisfactory level.

(3) Verify balanced or unbalance audio connection

(4) Verify correct programming of the AR*i*-195e, and check that the mobile is programmed with compatible information, e.g. if the AR*i*-195e is programmed for 40ms CCIR tones, make sure that the mobile module is as well.

(5) Verify that the precode sequence programmed in the AR*i*-195e is also used in the mobile module.

(6) Verify that the lead-in-delay programmed in the mobile module is sufficient, particularly when using CTCSS or Repeaters in the system. If the lead-in delay is inadequate only a fraction of the first tone in a sequence transmitted by the mobile will be received by the AR*i*-195e. This will prevent the AR*i*-195e from recognizing it as a valid sequence.

(7) If using a remote base station, line signaling "filters" may preclude the use of certain tone frequencies. Please verify that the selected tone frequencies programmed in the ARi-195e and the mobile signaling module do not fall within the remote base "filter" frequencies.
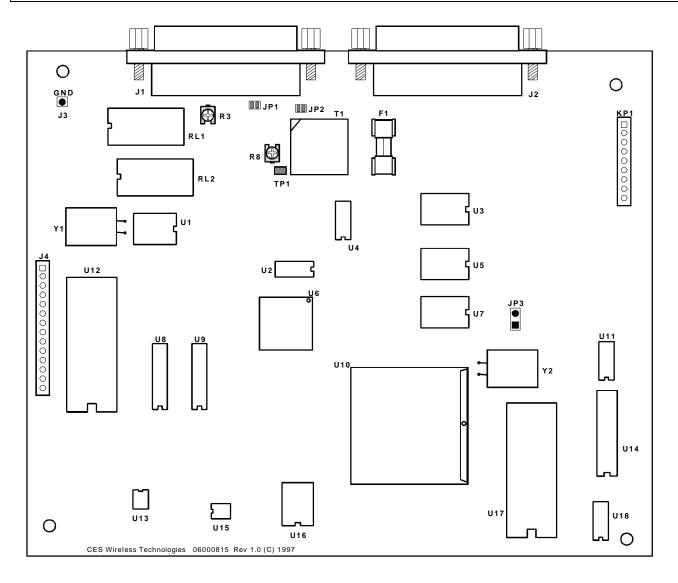

*If you need to call CES for HELP !*

Call 407-679-9440, and ask for product support.

Product support will ask you to verify the programmed parameters, and fax to CES for analysis. To do this complete the *customer chart* on page 27 and 28 (we suggest you copy these pages before completing).

Before calling please have information available on:

- the type of radio transceivers in use
- the type of mobile signaling modules
- the information programmed into the mobile modules
- the configuration of the radio system, CTCSS, Repeaters, Remote controls, line filters etc..

## 10.0 Parts Location



CES Wireless Technologies   06000815  Rev 1.0 (C) 1997

## AR*i*-195e Board Layout
## Figure 1

# 11.0 Circuit Diagram

# 11.0 Amendments

November 17, 1998

**Firmware V1.2** From firmware version 1.2 onward, the mute button can be enabled or disabled. When disabled, pressing the button has no function except to change the clock. See programmable parameter item number 60.

*[FROM THIS POINT TO THE END OF THE RS232 PORT SECTION IS NOT IMPLEMENTED AT THIS TIME]* If the arbitration type is 'wait for poll' the unit saves up received sequences until polled, then it sends one line. The format of data in this mode is quite different to support polling.

**Programming parameters, RS232:**

*RS232 port, baud rate:* Sets the baud rate of the RS232 port. The other serial parameters are fixed at no parity, 8 data bits and 1 stop bit.

*[NOT IMPLEMENTED AT THIS TIME] RS232 port, arbitration:* Sets the arbitration type for the RS232 port. If set to 'send immediately' received sequences are sent as soon as received. If set to 'wait for poll' they are stored in a queue and sent when polled. Queue size is ≥ 10 received sequences so polling must proceed quickly.

*RS232 port, send time and date:* Applies to the 'send immediately' mode only. If set to yes, received sequences sent out the RS232 port will be tagged with date and time.

RS232 port, polling address: Sets the address to respond to when being polled. [NOT IMPLEMENTED AT THIS TIME]

### Packet Structure

The structure of each packet is as follows: the first character is always STX ($02), the unit address in ASCII numeric digits is next, followed by the packet type, then any data, then the ETX ($03) character, then a check sum which is the sum of the previous bytes in the packet excluding the STX character, sent as 3 ASCII numeric digits, then the EOT character ($04).

Basic rules for packets are: all characters except STX, ETX and EOT are printable ASCII characters, no spaces exist and packets from the ARI-190 have lower case text, packets to it have upper case. The check sum data is sent as an ASCII number, always 3 digits long. Unit address is always 2 digits.

A summary of the polling packets follows.

| PC Command | Response |
|---|---|
| POLL (P) | queue_item (i) or queue_empty (e) |
| ALERT_RELAY ® | alert_relay ® |
| REQ_PGM_PARM (A) | req_pgm_parm (a) or pgm_err (m) |
| PGM_PARM (G) | pgm_parm (g) or pgm_err (m) |

### POLL

The poll packet is as follows:

<STX><unit address>P<ETX><check sum><EOT>

Where:

| | |
|---|---|
| <STX> | is one byte of type 02 hex |
| <unit address> | is the address of the ARI-190 unit to be polled, in ASCII |
| <ETX> | is one byte of type 03 hex |
| <check sum> | is the 8 bit sum of all the previous characters excluding STX |
| <EOT> | is one byte of type 04 hex |

When received the ARI-190 will immediately respond with a received sequence or the no poll packet. A received sequence packet is formatted as follows:

\<STX\>\<unit address\>i\<received sequence\>\<ETX\>\<check sum\>\<EOT\>

Where:

\<received sequence\>          is the received sequence exactly as received excluding precode digits

The poll response, no data packet is:

\<STX\>\<unit address\>e\<ETX\>\<check sum\>\<EOT\>

## ALERT_RELAY

The computer connected to the ARI-190 can also control the alert relay, it is controlled with the following packet.

\<STX\>\<unit address\>R\<state\>\<ETX\>\<check sum\>\<EOT\>

Where:

\<state\>                          is the state to put the relay in, "O" for on or "F" for off

The ARI-190 will respond to the alert relay command immediately as follows:

\<STX\>\<unit address\>r\<state\>\<ETX\>\<check sum\>\<EOT\>

Where:

\<state\>                          is the state the relay is in, "o" for on or "f" for off

## REQ_PGM_PARM

It is possible to read and change programming parameters through the serial port. The following packet is used to read a program parameter.

\<STX\>\<unit address\>A\<item number\>\<ETX\>\<check sum\>\<EOT\>

Where:

\<item number \>     is the number of the program item to return, always 2 digits

The ARI-190 will respond to the request program parameters command immediately as follows:

\<STX\>\<unit address\>a\<item number\>-\<value\>\<ETX\>\<check sum\>\<EOT\>

Where:

    \<item number\>     is the item number of the program data returned, always 2 digits
  \<value\>          is the program value, it is always 5 digits between 00000 and 65535

## PGM_PARM

The program parameters command is shown below:

\<STX\>\<unit address\>G\<item number\>-\<value\>\<ETX\>\<check sum\>\<EOT\>

Where:

    \<item number\>     is the number of the item to program, always 2 digits
    \<value\>               is the program value which will always 5 digits between 00000 and 65535

The ARI-190 will respond to the program parameters command as shown:

\<STX\>\<unit address\>g\<value\>\<ETX\>\<check sum\>\<EOT\>

Where:

    \<item number\>     is the program item number programmed, always 2 digits
    \<value\>               is the program value, it is always 5 digits between 00000 and 65535

The programming item and value are range checked by the ARI-190 before being written. If one of these is in error, the value is not written and the unit will respond with:

<STX><unit address>m<ETX><check sum><EOT>