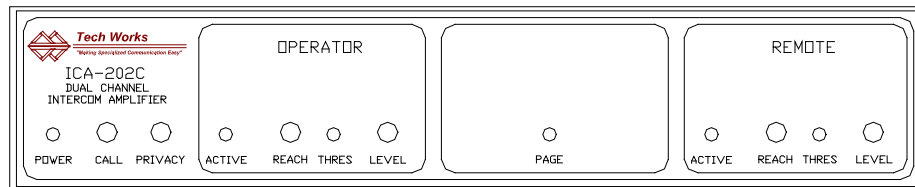




# ICA-202C DUAL CHANNEL AUDIO INTERCOM AMPLIFIER



## OPERATION AND INSTALLATION MANUAL

**Tech Works™**



“Making Specialized Communication Easy”

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## How to use this Manual

Those wishing to use one of the standard **Configuration Templates**, should first read the *Overview*, and then precede to the appropriate **Configuration Template** for your application. The *Setup* and *Adjustments* section should also be read before installation.

For those users who wish to do their own engineering, all sections may be useful. You may also wish to contact a **Tech Works** application engineer for assistance.

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## Overview

The ICA-202C is designed to be the audio heart of integrated services communications systems.

The ICA-202C features true 25-Volt audio outputs, with excellent features for two-way communications. **20 Watts** of reserve output power allows for All-Call and Paging without the use of auxiliary amplifiers, greatly simplifying systems design and reducing overall cost.

The ICA-202C is designed with the **System Integrator** in mind. The logic interface will function well in a simple two-station setup. However, its strength is a robust logic interface that is ideal for remote control from an external source such as a PLC, or computer, making integration into larger systems easy.

**Configuration Templates** support common applications. If there is not a template for your application, give us a call; we will be pleased to assist you to configure the ICA-202C into your design.

The audio quality of the ICA-202C is superb. Noise and distortion are very low. Selectable equalization optimizes voice communications. The **Automatic Level Control** assures optimum performance. There are separate controls for Audio Level and Reach. Once set, the audio level remains constant over a wide dynamic input range. The independent Reach Control allows for optimized accommodation of the input signal level. The user may wander throughout the room and still be heard at a nearly constant level without any operator adjustments!

The ICA-202C features an integrated **Call Tone** and selectable **Privacy Tone**. These signals are fully adjustable independent of the audio communications settings.

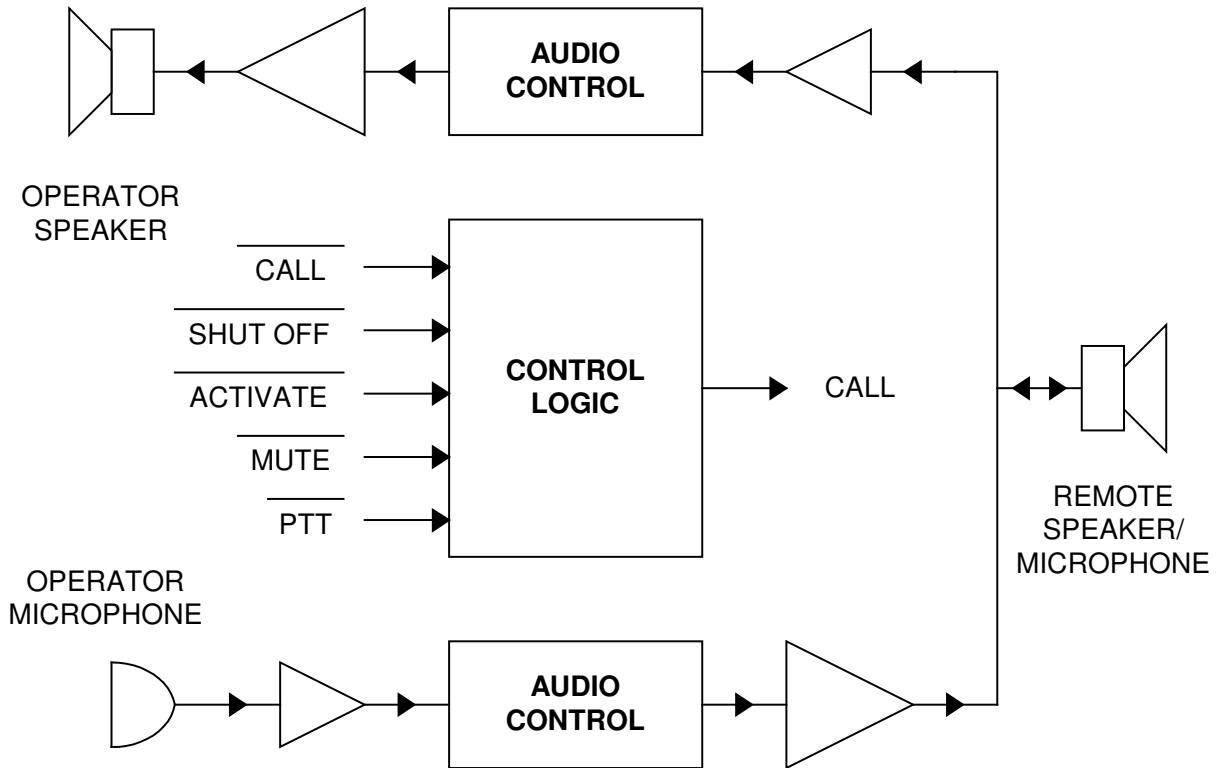
A **line level transformer isolated output** is provided for **Monitoring, or Paging**. This output may be configured so each side of the conversation is mixed to a single output ideal for recording, or only be present when the Page Switch Input is active, eliminating the need for an external relay.

Modular Construction makes the ICA-202C ideal for integrated designs. The unit is small; mounting is flexible and easy. Power is from a Universal Plug-in DC power adapter or screw terminals for connection of any regulated 24VDC-2A Power Supply. All I/O is through Euro-Style connectorized barrier strips.

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## ICA-202C Functional Diagram



Each channel has its own audio control section, which provides Automatic Gain Control, Amplifier Muting, and other functions. The ICA-202C is configured for Remote Station(s) to be a 25-Volt speaker. The Operator has a separate microphone and speaker.

The Logic Control section provides for complete control of the audio functions. A muting input is provided to mask station switchover noise.

Internal Call and Privacy Tones are included to simplify the external systems design.

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# Specifications

## General:

Dual Channel Universal Audio Intercom Amplifier  
Inputs: R.F. and static electricity protected  
Outputs: short circuit protected  
Frequency Response: 250 Hz to 10 KHz  
20-Watts RMS Sine Wave output, 25 Volts (Balanced)  
Distortion at full voltage output < 1% T.H.D.  
Power Supply Required: 24 Volts DC @ 2.2 Amps for full rated output, continuous Sign Wave.

## Operator Microphone Inputs:

1000 Ohms Balanced  
-75dBm minimum input for full rated output  
Selectable Equalization, 3 settings optimized for voice communication  
Phantom Power, short circuit protected (15 Volts, Current limited @ 7 MA)

## Remote Microphone (Also used as the Remote Speaker) Inputs:

1000 Ohms Balanced  
-75dBm minimum input for full rated output  
Selectable Equalization, 3 settings optimized for voice communication

## Operator Speaker Output:

Balanced  
25-Volts, Built out with 66 ohms  
Operator Speaker, 2.25-Watts @ 45 Ohms  
Or 25-Volt Speaker tapped at ~2 Watts (See page 15)

## Remote Speaker Output:

Balanced  
25-Volts, 20-Watts (Maximum)

## Line Output:

600-Ohm, Balanced Transformer Coupled  
Processed by Automatic Level Control, for 0dBm output  
Configurable for Monitoring, or Paging

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**Automatic Level Control:**

Operator and Remote  
Greater than 40dB Automatic level accommodation  
Fast Attack, <10 mS  
Feed Forward Control, no 'Pumping'  
Adjustable 'Reach' (Sensitivity)

**Call Tone:**

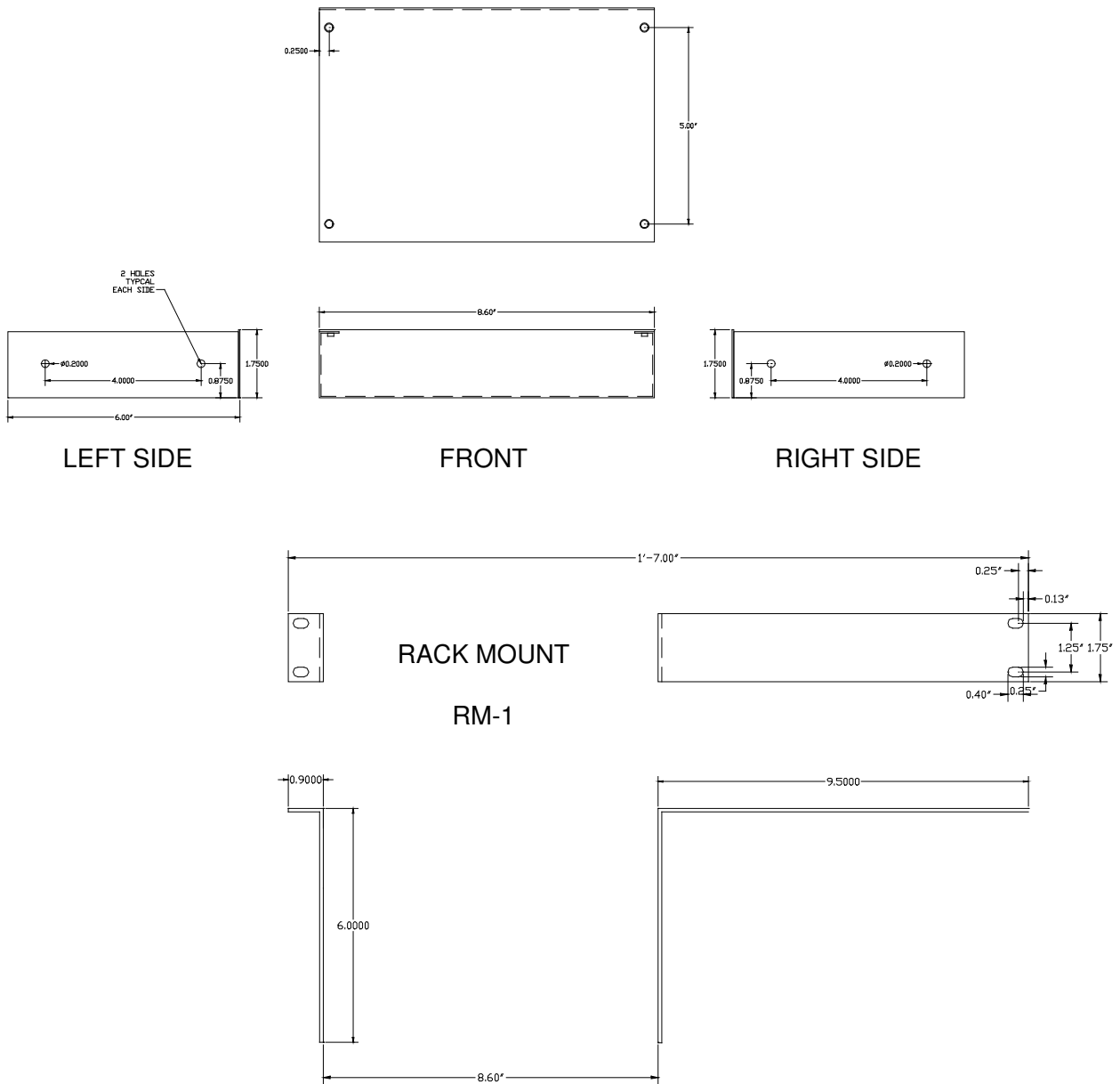
Uses Operator Speaker  
Selectable, Edge or Level Triggered  
Latched, or Momentary Control  
Adjustable Level  
Selectable Tone Character: Constant; Intermittent; Warble  
Logic Output for Silent Call

**Privacy Alert Tone:**

Uses Remote Speaker  
Selectable: None, or Two hundred-millisecond tone burst  
Privacy Alert Tone on Activation  
Periodic Privacy Alert Tone, if Eavesdropping  
Adjustable Level

**Mechanical and Electrical:**

1U, Half Rack, 8.60" X 1.75" X 6.00"  
Mounting Options: Table-Top; Under Counter; Rack  
Approximately 3 lbs  
Modular aluminum and steel enclosure  
Euro-Style connectorized barrier strips  
24 Volts D.C. 24-Watts Maximum, 50 Watts

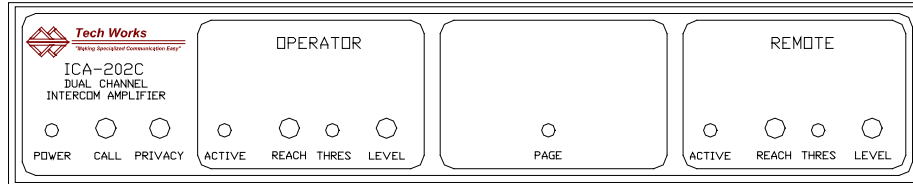


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# FRONT PANEL CONTROLS AND INDICATORS

## ICA-202C Front View



### Front Panel Audio Controls:

#### 'Call'

Control trimpot, sets the level of the tone from the Operator speaker associated with a 'Call Switch' closure.

#### 'Privacy'

Control trimpot, sets the level of the tone from the Remote speaker associated with the eavesdropping privacy tone.

#### 'Reach'

Control, sets preamplifier sensitivity for minimum acceptable Microphone input level (At the Threshold of Limiting)

#### 'Level'

Control trimpot, set for desired listening level

### Front Panel Indicators:

#### Power

Off, when no power  
Green when operating normally

#### Operator

**Active**, Green when Operator Listening  
**Threshold** of Limiting, Red when limiting

#### Page

Green when Operator is 'Paging'

#### Remote

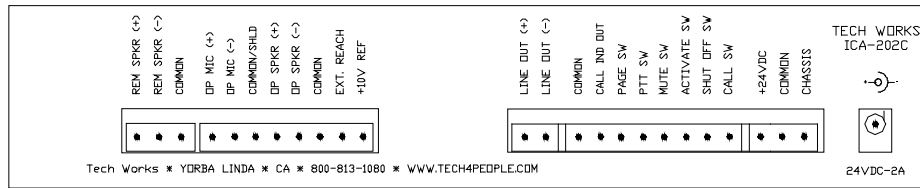
**Active**, Green when Remote Listening (Operator Talking)  
**Threshold** of Limiting, Red when limiting

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# REAR PANEL CONNECTIONS

## ICA-202C Rear View



### External Indicator Output, Calling:

Flashing ~ 2 Hz rate  
Sink to Common, 100MA @ 28 Volts Maximum

### Logic Control Inputs:

#### Common sensing for Switches, or PLC

**Shutoff** (Lowest Priority) - Active low, momentary, or sustained, see below  
Disables both Operator and Remote Speakers  
(Overridden by “Activate”, “Push to Talk”, or “Page”)

**Activate** - Active Low, momentary, or sustained  
Overrides “Shut Off”  
Quiescent state, Operator on  
Cancels Call Tone (Jumper Option)  
Cause Privacy Tone to be sent (Jumper Option)

**Push to Talk (PTT)** - Active Low, momentary or sustained  
Forces the Remote speaker on while depressed (Sustained)  
Cancels “Call Tone” (Jumper Option)  
Activates the Intercom if Inactive  
Does not cause the Privacy Tone to be sent

**Page**- Active low (Same functions as PTT)  
Can be configured to cause Line Out to carry the Operator Microphone audio signal

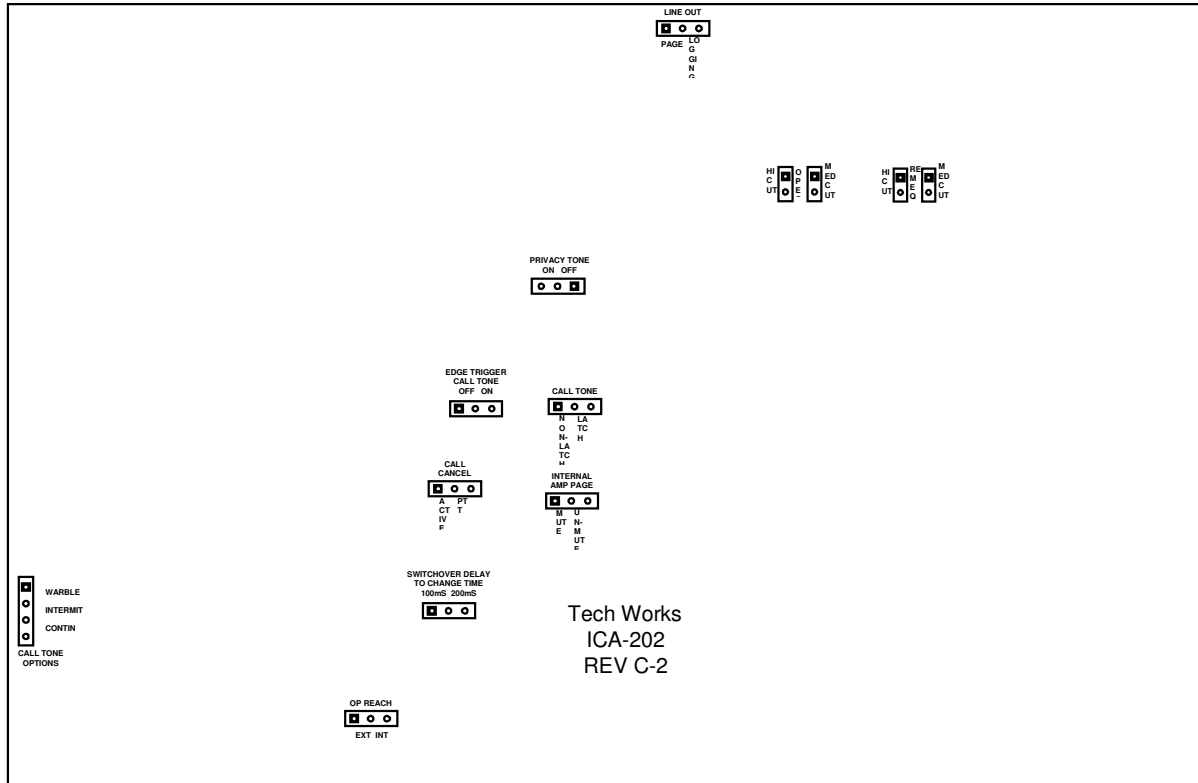
**Mute** (Highest Priority) – Active Low, momentary, or sustained  
Causes both channels to mute  
Does not change the state Active or Call Flip-Flops  
Sounds Privacy Tone when un-muting (Jumper Option)

**Call** - Active low, momentary, or sustained  
Causes “Call Tone” to be sent to the Operator speaker

### External Operator Reach Control:

External 0 to 10 Volt input (PLC), or linear 10K-Ohm Potentiometer  
The control range is ~50dB, ~5dB/Volt

# Jumper Options



## ICA-202C Main Board Jumper Locations

### Logic Jumpers:

#### Privacy Tone (ON or OFF)

Enables Privacy Tone burst temporarily forcing the Remote Speaker on  
 The Privacy Tone is initiated when the Intercom is activated  
 Or when the Intercom is un-muted  
 Activation from "Push to Talk" or "Page" does not sound the Privacy Tone  
 The tone burst also sounds every 18-20 seconds if there is continuous listening

#### Call Tone:

**Call Tone, Non-Latched** (Momentary control by external PLC, **Edge Trigger=OFF**)

**Call Tone, Latched** (Uses the internal Registers to sustain the call)

**Edge Triggered Call Tone** (When in "ON" position, Normal)

**Level Triggered Call Tone** (When in "OFF" position)

**Call Cancelled by Active State**

**Call Cancelled by PTT Switch**

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## The three sets of Call Tone jumpers accommodate many control schemes

The **Call Tone** sounds through the **Operator Speaker**

The **Call Switch** may be **internally latched** (Jumper Option) using the internal register  
Or the **Call** signal may be **controlled by an External Controller** (Jumper Option)  
When the external controller is used the state of the Intercom is ignored, and the Call signal sounds whenever the 'Call Switch' is low (The Jumper selection for Level Triggered is used)

If the **Call Switch** request is **latched** (Jumper Option),  
only a **momentary closure** of the Call switch is required.

When the **Intercom** becomes **Active** (Jumper Option), the **Call Tone** is **canceled**.  
If the **Call Switch** is pressed while the Intercom is Active it is **ignored**.

When the **PTT** Switch is pressed (Jumper Option), the **Call Tone** is **canceled**.  
If the **Call Switch** is pressed while the Intercom is Active the **Call Tone will sound**.

When the **Call Switch** is '**edge triggered**' (Jumper Option) the normal setting, the Call Tone switch must be **released and re-pushed** while the intercom is inactive (Jumper Option) to cause a **new call** tone to sound. This option is helpful if the Remote Station user is in a panic, and will not release the Call Switch.

When the **Call Switch** is '**level triggered**' (Jumper Option), the Call Tone will sound whenever the Call Tone switch is closed and the intercom becomes inactive (Jumper Option)

## Jumpers Associated with Control Functions

### Switch Over Delay:

This Jumper controls the switching time from the Remote Speaker being active, to the Remote Microphone turning on. When a Remote Speaker is also used as the Remote Microphone it is necessary to have a small delay or an acoustic pop will be heard at the Operator position. The amount of delay is determined by experiment.

### Jumper settings:

100mS, Applications with moderate Remote Speaker levels  
200mS, Applications with loud Remote Speaker levels

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# Audio Function Jumpers

## EQ, Equalization:

Both Jumpers Installed, Lowest frequency Roll-off  
(Used with most gooseneck mounted microphones)

Only MED CUT Jumper Installed, Medium frequency Roll-off  
(Used with most flush mounted microphones)

Only HI CUT Jumper Installed, Highest frequency Roll-off  
(Used with most Speakers used as a microphone)  
This is the normal setting for the Remote Microphone/Speaker.

No Jumpers Installed, ~100 Hz Roll-off, Sensitivity reduced to -27 dBm for full Output

## External Operator Reach Control:

**Internal** (Normal), the **Front Panel Trimpot** Controls the Operator Reach

**External**, the Front Panel trimpot is ignored

The **Operator Reach** is **controlled by** an external 0 to 10 Volt (Maximum Sensitivity) **PLC**

The control range is ~50dB, ~5dB/Volt

Or, an **external linear potentiometer** may be used, with the 10 Volt Reference output connected to the "top" of the potentiometer.

## Line Level Output & Internal Page Amplifier:

The Line Level **Output** has two configurations, **Monitoring**, or **Paging**

When **Monitoring** (Jumper Option) the **active direction is output**

This option is ideal for Logging (And can also be used for paging with and external relay)

When **Paging** (Jumper Option) the output is only present when the **Page Switch** is pressed

The **Operator Microphone** is routed to the Line Level **Output**

This option is used with an external Paging Amplifier; no external amplifier input relay is required

The **Internal Remote Amplifier** may be active or muted during a Page

**Un-Mute** (Jumper Option)

**Muted** (Jumper Option)

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# Setup Adjustments

## Level and Reach:

The ICA-202C has two adjustments for the audio listening level, for each Channel, 'Level' and 'Reach'.

Once they are setup the trimpots should never need to be adjusted by the user.

The Limiter Threshold is fixed; no matter how great the input level becomes the output level will not exceed the 'Limiting Level'.

The 'Reach' Control sets the microphone gain. The greater the 'Reach' the fainter the input level that can be heard, and of course the greater the background noise! Therefore, 'Reach' should be set for the minimum amount (At the threshold of limiting) that allows normal communications.

Setup is accomplished with the use of an Assistant (best) or a Radio, or other sound source.

The sound source should be set for the minimum expected input level.

First set the 'REACH' trimpot until the 'Threshold' LED just flashes.

Next set the 'LEVEL' control for a normal listening level.

When an **External Reach Control** is used a different setup procedure is more appropriate.

Please see the "Basic Prison" Application Template, Page 19.

## Call Tone Level:

The Call Tone alert signal comes through the Operator's speaker.

This adjustment should be made after Communications levels are set.

The Call Tone level may be set to any appropriate level, from fully off to the listening level.

Setup is accomplished by activating the 'call signal' by pushing the 'Call' Switch.

Adjust the Call Tone alert to a suitable level.

## Privacy Tone Level:

The Privacy Tone signal comes through the Remote speaker.

This adjustment should be made after Communications levels are set.

The Privacy Tone level may be set to any appropriate level, from fully off to the listening level.

Setup is accomplished by performing a sequence that causes a Privacy Tone

(Assuming the Privacy Tone is enabled, see *Jumper Options*).

First push and release the 'Shut Off' Switch, then push the 'Activate/On' Switch.

The Privacy Tone will sound briefly. If your system does not have a push to 'Activate/On' Switch the Privacy Tone will sound briefly every 18 seconds when the Intercom is active.

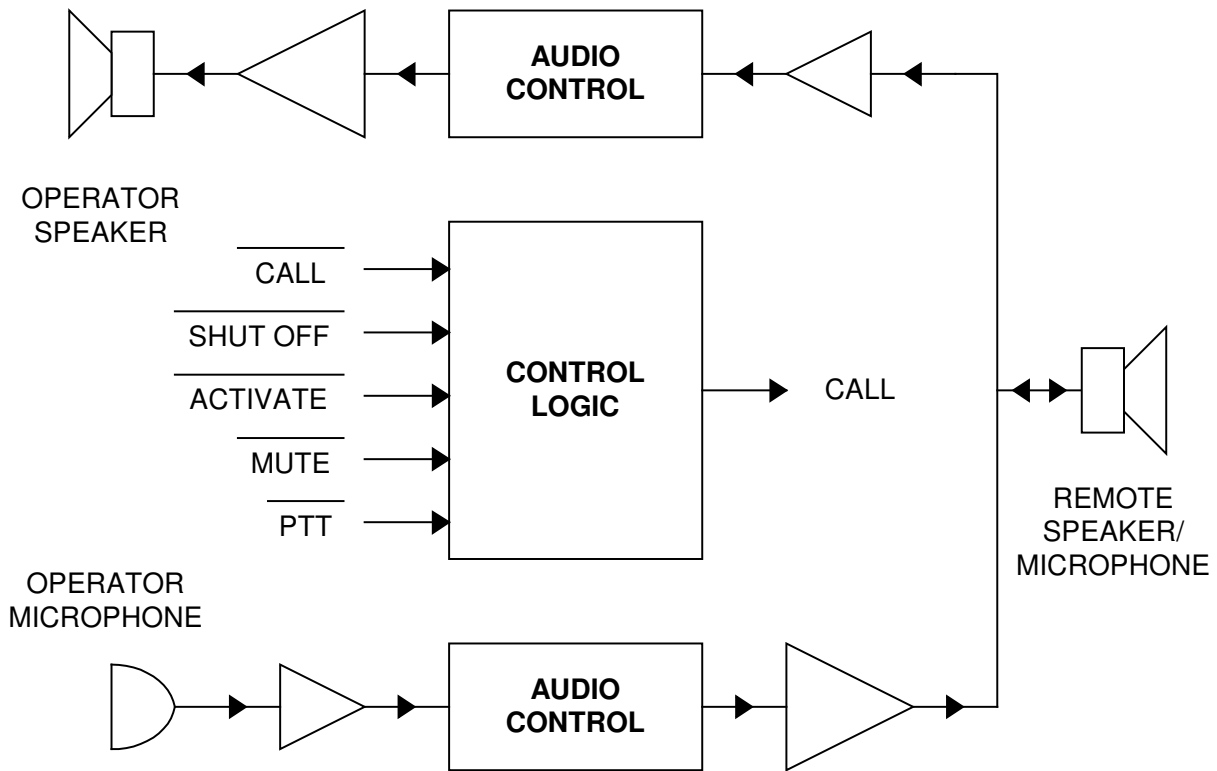
Adjust the Privacy Tone to a suitable level.

## Changeover Delay Jumpers:

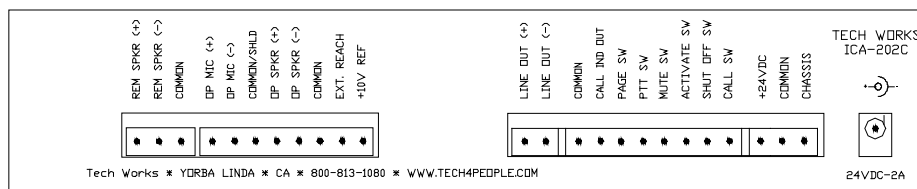
The changeover delay is the amount of time allowed to change from talking to listening mode.

This can be adjusted for optimal listening and room acoustics after the above adjustments are complete. See Jumper Options

# Integrated System Solutions



The ICA-202C provides a complete audio and logical interface for an integrated systems solution. In most applications the Remote Speaker is accessed through a Switching Matrix, controlled by a computer, or PLC.



The Operator microphone may be either a Dynamic, or Condenser type.  
 The Microphone is balanced and Phantom Powered.  
 If a flush mounted microphone is required, the Tech Works HM-1 is recommended

The Operator Speaker output is optimized for 100-Ohm voice coil speakers.  
 The Maximum Output is 25-Volts. Internally the unit is built out with 66-Ohm resistance.  
 A 45-Ohm at 2.2-Watts voice coil or higher impedance is acceptable.  
 A 25-Volt speaker tapped at 5 watts or less is also acceptable.

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The Remote Speaker(s) should be 25 Volt units, tapped at 2.5 Watts or less. Since the remote speakers are also used as microphones, all remote speakers on the system that are used for two-way communications should be tapped the same. It is assumed that two-way communications only takes place to one remote speaker at a time.

Speakers that are only used for paging may be tapped to any power level up to 20 Watts. It is important that in any paging application that the total load not exceed 20 Watts.

The logic interface is ideal for external control with features designed to ease system integration.

The ICA-202C has **two Flip-Flops**, one for **Activation**, and the other for the **Call** function. These Flip-Flops are configured so that the **external Control** Inputs **can override** the internal states.

If the **Shut Off input is tied to Common**, Activation follows the Active input, which is ideal for external use with an **external controller**

The internal **Call Flip-Flop** may be **used, or** bypassed for use by an **external controller**.

If the internal Call Flip-Flop is bypassed, the Call Switch input should also be set to non-edge triggered. The Call Switch input is then sustained to cause the Call Tone to Sound.

When the Internal Call Tone Flip-Flop is used several control variations are possible.

The **Call input** may be configured as **Edge Triggered** or **Level Triggered**. For PLC operation this determines whether the interface will respond to a Call Input that is pending when the Intercom becomes inactive. In some applications any pending call should be sounded immediately. In some systems the operator may be switching from one Station to another and not want to be annoyed by pending calls, just new calls, when the Intercom is inactive.

**Calls** may either be **cancelled** by the Intercom being **Active**, or only by pressing **PTT**. When the Active jumper option is chosen, a Call is ignored if the Operator is Listening or Talking.

When PTT jumper option is used, the Call Tone will sound even if the Operator is listening. The Call can only be cancelled by the Operator acknowledging the Call, by talking to the Remote Station.

The ICA-202C has a separate **Mute input**. The Mute Input affects both channels of the intercom; however, it does not change the activation state. The mute does affect the Call Flip-Flop. Mute has the highest priority. When muted, all signals to both Speakers are squelched. The mute signal is necessary on some systems to allow the Remote Speaker to switch to a new Station without causing pops in the Operator Speaker. Mute would momentarily be employed during switching while 'Listening' or returning to the 'Listening' state.

The PTT (**Push to Talk**) input activates the Intercom. If the Shut Off input is tied to common, then PTT only activates the intercom while the signal is asserted.

The **Page** input has the same functionality as the PTT input, with added features. The **internal Remote Power Amplifier** may be **enabled, or disabled** during a page. The **Operator Microphone** is keyed to the **Line Level Output**, if the 'Page' option is chosen

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The ICA-202C has a **Privacy Tone** (Jumper Option). The philosophy of the Privacy tone is to alert the Remote Station that the Operator is listening. The Privacy Tone is a 200mS, 1000Hz burst.

There are three conditions which cause the Privacy Tone to be sounded:

1. When the Intercom is activated by the Activate Input (Not PTT)
2. When returning from the Muted State  
(The assumption being that a new Station has been selected)
3. After ~18-20 seconds of continuous listening

The ICA-202C has a '**Line Level Output**' with a nominal level of 0dBm.

The output has **two** optional output **configurations**:

**Paging**, the Operator Microphone keyed by the Page Switch input (See above)

**Monitoring**, the Operator or Remote Microphone, whichever is active

If a system requires **both Monitoring and Paging**, the Monitoring output option should be used. This may require external 'paging relay'; for use with some Paging Amplifiers.

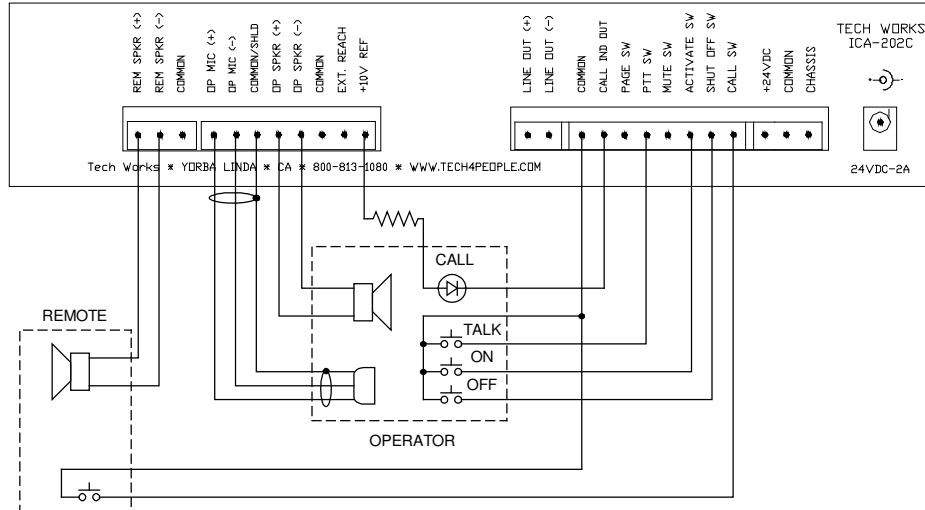
The Tech Works, 40-Watt MPA-401, has a logic level Paging Input (Enable) for convenience.

If more than 40 Watts of paging power is required, several PA-401's or MPA-401's may be used or a higher power 25 Volt output amplifier may be used.

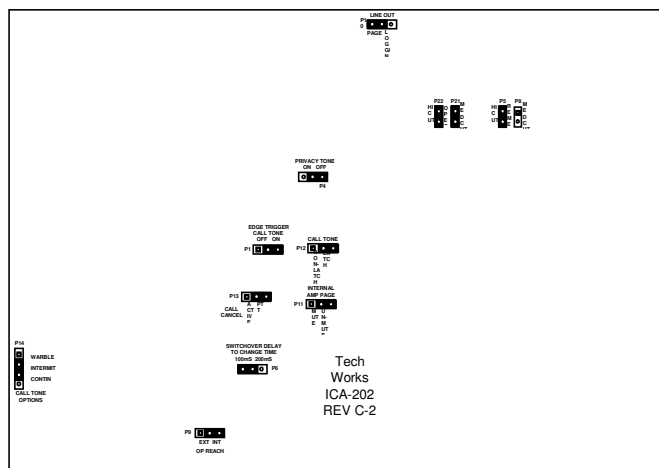
# Application Templates

## Basic Two-Station Intercom Setup

The application templates in this section show some of the most common uses of the ICA-202C. Below is the basic wiring of the components used for a simple two station Push To Talk Intercom.

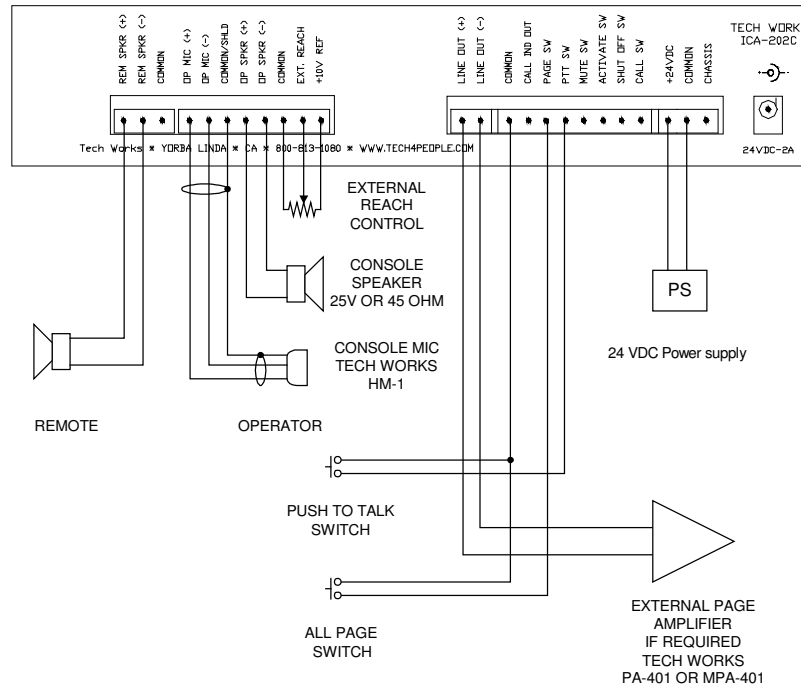


Below are the internal jumper settings for the basic intercom functions



# Basic Prison Intercom Setup

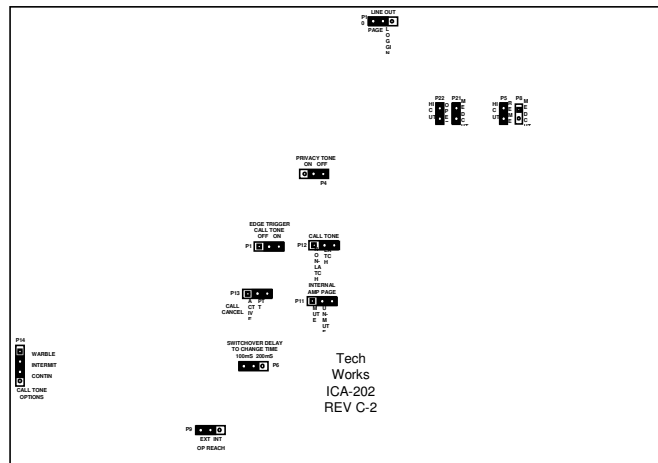
Below is the basic wiring of the components used for a simple Prison Guard Intercom.



When there is an **External Operator Reach Control**, an optional setup is often used. The “Listen Level” trimpot may be considered as the Maximum Listening Level allowed.

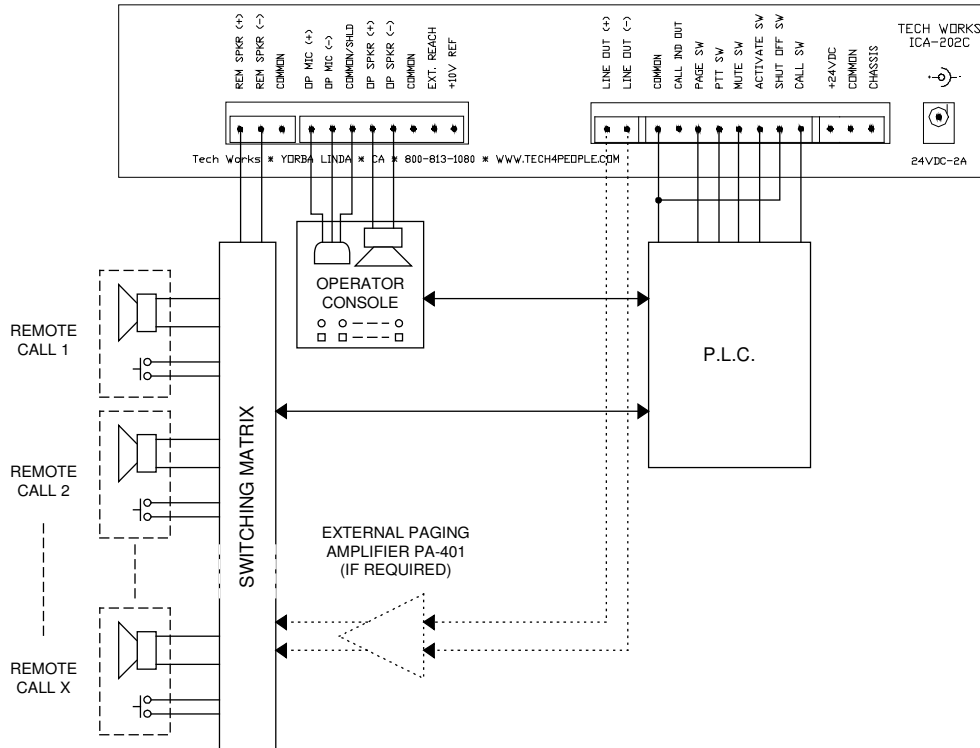
To setup the controls, first set the External Operator Reach Control to Maximum level (+10 Volts). Then set the “Listen Level” trimpot for the maximum listening level that is acceptable. Then reduce the External Operator Reach Control for a normal listening level.

Below are the internal jumper settings for the simple Prison Guard functions

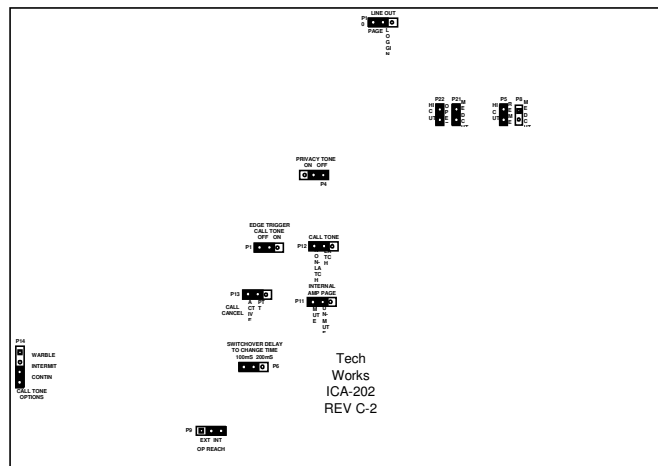


# Basic PLC Prison Intercom Setup

Below is the wiring of the components used for a Basic PLC Prison Guard Intercom.



Below are the internal jumper settings for the ICA-202 when used with a PLC. Note the Edge Triggered Call Tone is set to **Continuos** and the Internal Amp Page is set to Mute on All Page. This assumes the use of an external page amplifier.

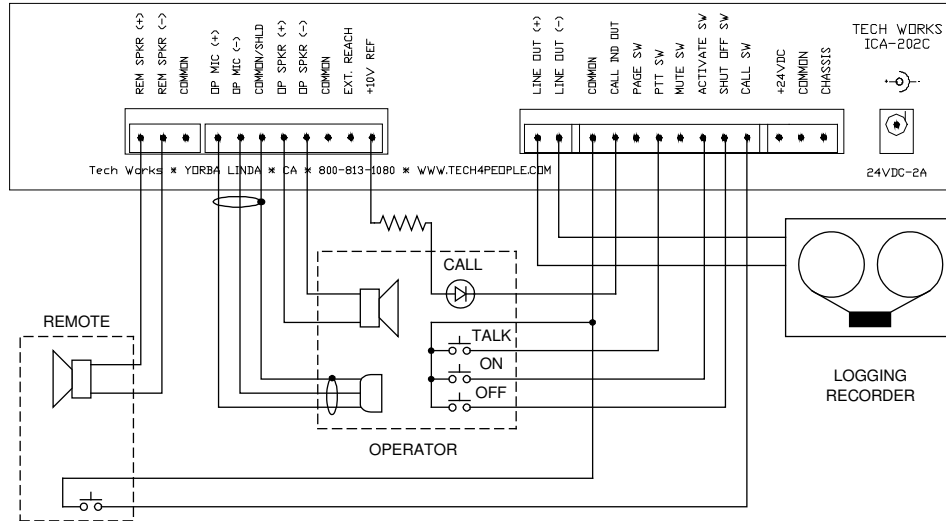






# Intercom with Logging Recording

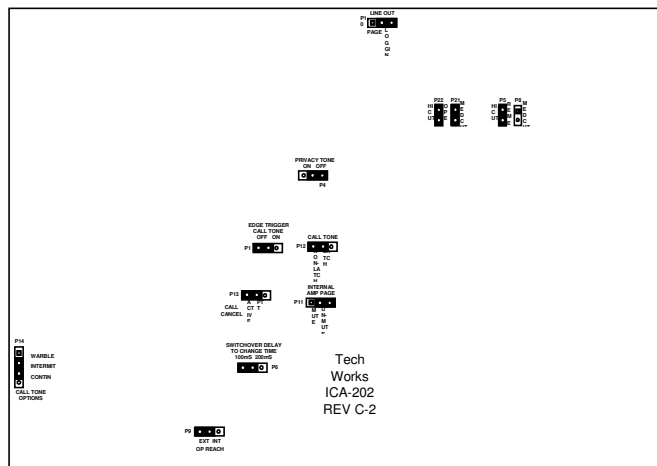
Below is a basic wiring diagram for intercom with a logging recorder.



The Recording **Line Output** is the sum of the **Operator** and **Remote** channels, after the “Reach” control, and input limiter.

If an External Operator Reach control is used, the control range may need to be limited, So the Operator cannot completely cutoff recording the Remote Channel. To do this, limit the Minimum voltage to ~3 Volts.

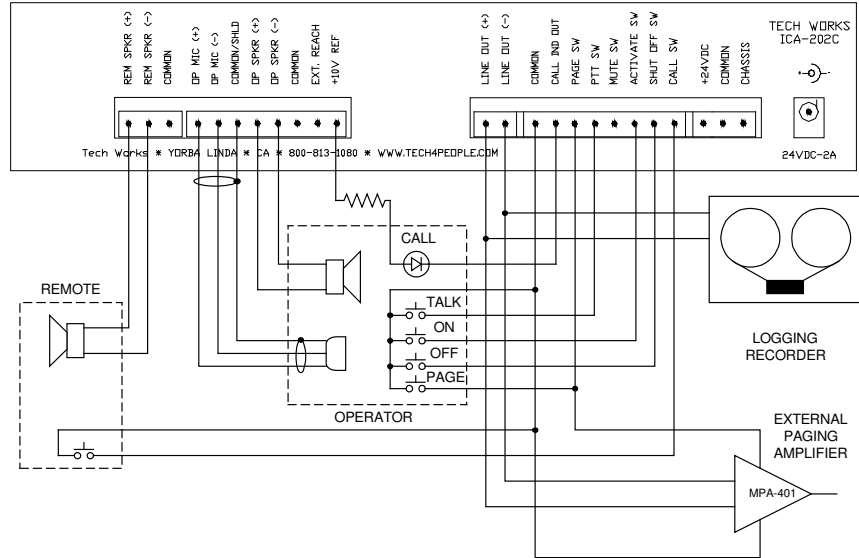
Below are the internal jumper settings for recording both sides of the conversation on to a single recording channel.



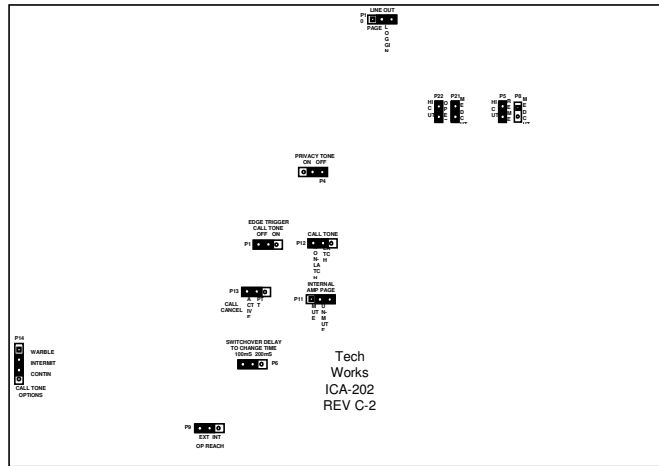
When logging is required with paging use external relays to mute the signal to the Page Amplifier when the Page contact is not active.

# Intercom with Logging Recording and Paging

Below is a basic wiring diagram for intercom with a logging recorder and external paging amplifier.



Below are the internal jumper settings for recording and paging from the same line output.



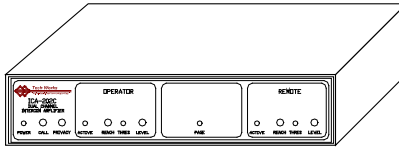
When using a Tech Works MPA-401 amplifier as shown or any other amplifier with internal “Enable” no external page relay is required. Many other configurations are available by combining this application with applications such as PLC control and others.

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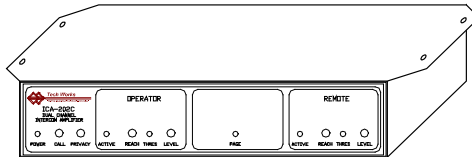
# Mounting Options

## Standard Desk Mount

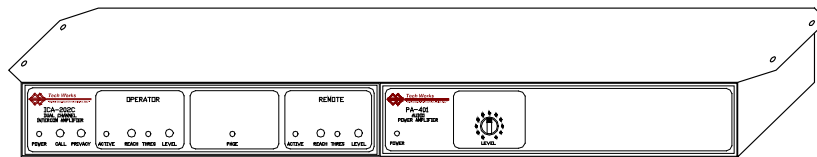


**ICA-202C-DM**

## Wall or Under Counter Mount

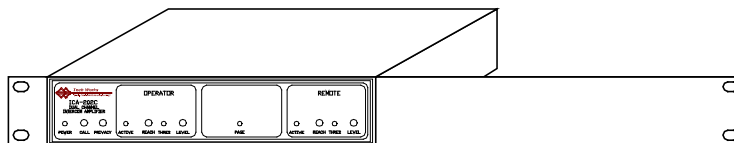


**ICA-202C-WM**

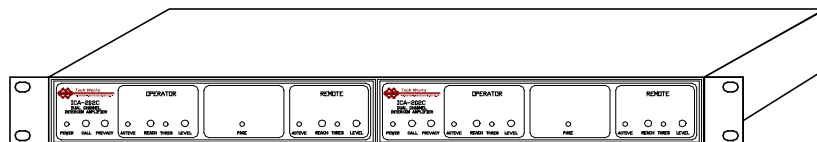


**WM2 Shown with an ICA-202C and a companion PA-401**

## Rack Mount Option



**ICA-202C-RM single unit rack mounted**



**RM2 Shown with two ICA-202C units mounted in a single rack space**

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## Accessories