The CI-BUSS is the most full-featured, flexible communications system available anywhere, at any price. Designed for the most demanding environments, CI-BUSS systems can be custom configured to fit any network and any space. Easy to install, easy to configure, easy to integrate, the CI-BUSS' modular design makes system design a breeze. The modular design enables you to custom configure the best system for the job. Select components you need, locate them where they need to be, and put them together via fast, dependable CAT6 connectivity.

Systems include Microphones, Speakers, Headsets, the CI-MSI-22 Microphone Speaker Interface control unit, the CI-HSI-41 Headset Interface unit, the CI-ODC-1 Operator Desk Console, and many more accessories like foot operated switches, Call buttons, and more.

BENEFITS
- Fully Configurable
- Full Duplex, Hands-free Audio
- Universal Microphone Inputs
- Built In Phantom Power
- Built In Equalization
- Automatic Level Control
- Background Music Ducking
- 25 Volt Audio Power Amplifiers
- VOX or Push-To-Talk Operation
- Broadcast Quality Balanced Line In/Out for Interface to Teleconferencing

Design Information
- Power: 24VDC
- Wiring: CAT6 Cable

Architects’ and Engineers' Specifications
The Procedure Room Intercommunication System shall be a hands-free open voice communication system capable of clear, high quality audio with no distortion or acoustic feedback under normal operating conditions. The Intercommunication system shall be capable of including Microphones, Speakers, Wireless Headsets, Operator Desk Consoles and Background Music reproduction and control.

The Intercommunication System shall be Tech Works CI-BUSS Series
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CI-BUSS Collaborative Intercom Components

CI-ODC-1 – Operator Desk Console

The Tech Works CI-ODC-1 Operator Desk Console includes a professional cardioid, condenser, gooseneck microphone, and a speaker. Buttons and indicators provide control to allow the operator to just listen to the CI-Buss communication or to talk, and collaborate hands free. A headset jack on the side of the console allows connection of a local operator headset such as the CS-540 wireless unit.

Setup is plug and play with an integral speaker level control to adjust the listening level. No further adjustments should be required for standard operation. Integral VOX and ALC allow for full duplex conversations without feedback.

Internal, installer settable, jumper options allow the functionality of the CI-ODC-1 to be Hands-Free or Push-To-Talk. The Push-To-Talk button can be either latching (Push On, Push Off) or momentary, meaning the microphone is active as long as the operator holds the button down.

The CI-ODC-1 is a CI-BUSS Master device designed to control other units or functional blocks in a system. If there is a device in the system that has a “Call” input, like the CI-MSI-22, when a contact closure on the Call input sends a buss Call signal the CI-ODC-1 will emit a tone sequence to let the Operator know that someone is trying to get their attention.

CI-ODC-4 – Operator Desk Console

The CI-ODC-4 allows a single operator location to communicate selectively with up to 4 separate systems in 4 separate rooms. It includes a professional cardioid, condenser, gooseneck microphone, and a speaker. Buttons and indicators provide control to allow the operator to just listen to the CI-Buss communication or to talk, and collaborate hands free. A headset jack on the side of the console allows connection of a local operator headset such as the CS-540 wireless unit.

Setup is plug and play with an integral speaker level control to adjust the listening level. No further adjustments should be required for standard operation. Integral VOX and ALC allow for full duplex conversations without feedback.

The CI-ODC-4 can be used in a small Intercom when connected to a single CI-Buss product or as an addition to larger systems using microphones, speakers. The CI-ODC-4 can also function as an audio combiner to allow multiple rooms to collaborate.

Internal, installer settable, jumper options allow the functionality of the CI-ODC-4 to be Hands-Free or Push-To-Talk. The Push-To-Talk button can be either latching (Push On, Push Off) or momentary, meaning the microphone is active as long as the operator holds the button down.

The CI-ODC-4 is a CI-BUSS Master device designed to control other units or functional blocks in a system. If there is a device in the system that has a “Call” input, like the CI-MSI-22, when a contact closure on the Call input sends a buss Call signal the CI-ODC-4 will emit a tone sequence to let the Operator know which room is trying to get their attention.
CI-HSI-41 – Headset Interface

The Tech Works CI-HSI-41 Headset Combiner is designed to take standard Plantronics headsets and let them talk to each other as well as other Tech Works CI-Buss products. The CI-HSI-41 accommodates up to four Plantronics CS-540 lightweight, Wireless Headsets. The headsets communicate with each other, as a single headset with four summed microphones.

The Intercom can simply plug together using standard CAT-6 patch cables. When connected to another unit all headsets become part of that system. Two CI-HIS-41 can be connected together to make a single system of up to 8 headsets. The eight headsets act as one unit.

Initial setup is accomplished with built in level indicator lights and the controls on the receiver/charging base. Once completed, no further adjustments should be required.

The CI-HSI-41 can be used as a small stand-alone Wireless Headset Intercom or as an addition to systems using microphones, speakers, and other CI-Buss and PA-Buss devices. By adding a PA-402 the headset conversation can be played over ceiling speakers so observers can hear the conversation.

CI-MSI-22 – Microphone Speaker Interface

The CI-MSI-22 consists of five Functional Modules; Two Inputs; The local Microphone/Line Input and the PA-BUSS Input, Two Outputs; a 25 Volt Speaker Output and the PA-BUSS Output, and the CI-BUSS Interface. The Jumper Options determine how these Modules interact and function with each other. The "Standard Configuration" is a Remote (Single Location) for use with an Operator Console. The Power Amplifier, is used for a Procedure Room Speaker while the Microphone Input is used for a boom mounted or hanging Procedure Room Microphone. The PA-OUT, is used as Procedure Room Monitor Output, perhaps for Background Music. The PA-IN, may be used for an additional Microphone. The CI-BUSS, may be used with other Interfaces, such as a CI-HSI-41 to include Headsets.

Initial setup is accomplished with built in level indicator lights and the controls. Once completed, no further adjustments should be required. Integral ALC, Variable Notch Filters, and Speaker Ducking allow for full duplex conversations without feedback.
PA-402 - Paging/Program Amplifier

![PA-402 Diagram](image)

The PA-402 is a Professional Audio Power Amplifier designed with the System Integrator in mind. It is specifically designed for Background Music, and Paging Applications and may be used with other Tech Works products to augment a variety of system designs. The PA-402 has Program Audio Inputs, Paging Audio Inputs, and Control signals that select which Audio inputs are directed to the Speaker. These inputs are transformer balanced allowing several PA-402's to be connected in tandem, for large distributed systems. There is also an unbalanced Stereo Input for “Local” Music insertion.

The logic allows for a wide range of control requirements including; Enabling, Muting, Program, or Page selection. Logic options are selected from a set of dipswitches located on the rear of the amplifier. The PA-402 comes ready to use for most applications, and there are Application Templates for other common uses. The audio quality of the PA-402 is superb. The undistorted output is 40-Watts. The PA-402 is fully protected against overloads. The unit automatically recovers when any overload is removed.

PA-SI-1 – Speaker Interface

![PA-SI-1 Diagram](image)

The PA-SI-1 Speaker Interface is a 1 Watt Utility Audio Power Amplifier designed with the System Integrator in mind. The input is transformer balanced allowing several PA-SI-1’s to be connected in tandem. Power comes from the PA-BUSS, to simplify wiring. The audio quality of the PA-SI-1 is superb. The undistorted output is 1-Watt. The PA-SI-1 is fully protected against overloads. The unit automatically recovers when any overload is removed.

Modular Construction makes the PA-SI-1 ideal for integrated designs. The unit is small; mounting is flexible, and easy, so it is ideal for space conscious requirements. Mounting options include Snap Track or stud mounting. All signals are connectorized for ease of installation.
PA-HS – Vandalproof Handset Module

Tech Works PA-HS is a rugged Vandalproof Handset with 2 foot armored cable and chrome hook switch mounted to a 12 gauge stainless steel plate. The “M” version includes electronics and a magnetic hook switch for powering and controlling communication.

The PA-HS handset comes with the electronics to power two handsets for a visitation intercom system or to interface to other Tech Works Intercoms. The PA-HS has a line level audio output for remote recording or monitoring of the conversation. The “M” also includes supervision circuitry to alert someone if the handset is tampered with.

When the PA-HS is used with Tech Works Collaborative Intercom products, it creates a private communication with someone like a pharmacist to discuss medications. The guest can pick up the handset and have a private conversation with the pharmacist rather than have other customers listen in on their medical conditions.

When used with the PA-402 the PA-HS is the Paging input device in Factories, Airports, and Retail stores. Simply connect the PA-HS to the PA-402 and if Music is connected it will automatically mute and clear intelligible Page audio will be send to the speakers.
Tech Works products use two simple Buss structures that support Collaboration Intercoms (CI-BUSS), and Paging Amplifier (PA-BUSS) Signal Distribution. The use of standard busses allows Tech Works products to plug together.

Simple systems may require a single Box; more complex systems may require several boxes.

The Collaboration Intercom Buss, CI-BUSS; has bi-directional Audio pathways for Communications, and Control. Expansion is easy; units daisy-chain together to form Collaborative Groups.

The PA-BUSS supports one direction; Background Music, Paging, Announcement Loops, selective Monitoring/Communications and many other features.

All signals are electrically isolated to perform in the harshest environments, using transformers, Opto-isolators, and floating elements, to eliminate ground loops. Short Circuit Protection insures units recover from temporary faults. Standard Category-6 wiring and terminations are used for ease of installation.

Audio Signals are low impedance, transformer balanced and "Line Level" to provide maximum isolation from crosstalk, and noise.

Each Product is "configurable", the functional sections are connected with jumpers. Therefore products may be 'customized' for the application.

**CI-BUSS Chain**

A CI-BUSS system is made up of a chain of functional blocks of products each designed to do a special job or function.

![Diagram of CI-BUSS Chain](image)

*The Inputs and Outputs, are transformer coupled; not shown here for clarity.*

The box marked "THIS BLOCK" defines the function of this Building Block. A "BLOCK" represents a functional component which is a CI part # and may have an "INPUT", or an "OUTPUT", or both. The SUMers, shown below, are part of every Block, and support the CI-BUSS Interface. Each Summer Mixes the Buss Audio signals with the local Audio Signals and Routes them based on the installer configuration.
The Buss structure allows "Blocks" to be "Added" to form a "Chain. Most system requirements are satisfied with a single "Chain". Very large system may have several "Chains", defined as Groups. Groups may be joined together by a Hub, such as the CI-ODC-4.

Jumpers inside of each unit or Block allow the installer to select what comes in from the BUSS and what goes out to the Buss. Please see the individual Installation Guide for each product for more information about jumper selections and settings of each electronic component.

Automatic Level Control is used to achieve the standard Output signal levels to keep the sound quality consistent throughout a system.

The Call Pair is a "Party Line" passing through to all the Blocks forming a Group. The Operator Console Responds to a Switch Closure by initiating a Calling Sequence. All Switches must be floating, or isolated with Opto-Couplers.

The Alert Pair is a "Party Line" passing through to all the Blocks forming a Group. The Operator Console sends a signal to all the Other Blocks, such as my Microphone is On. The other Blocks may be configured to "Respond" in an appropriate manner. Responder Blocks, are electrically isolated, with Opto-couplers.

In order to fully implement these products, an understanding of both the CI-BUSS and the PA-BUSS is beneficial as they are different and intended for different purposes. The CI-BUSS is a bidirectional audio structure for two way “Collaborative” conversations while the PA-BUSS is a one way communication structure for distribution of audio program.

The CI-BUSS (Collaboration Buss) is a wired network that has four signal pairs:

- "Call" (Control) Indicates a Station wants service
- "Slave" (Audio) Communications
- "Master" (Audio) Communications
- "Alert" (Control) Indicates Action is requested

**CI-BUSS: RJ-45 Cable wired 1 to 1; Ethernet Standard Wiring**

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Signal Pairing: (1,2) Control; (3,6) Audio; (4,5) Audio; (7,8) Control
The PA-BUSS (Audio Distribution Buss) has four signal pairs:

- **“Buss Power”** (Option) Current Limited, 23-Volts
- **“Program”** (Audio Option) Background Audio or Music
- **“Page/Communications”** (Audio) Page/Monitor/Communications Audio
- **“Alert”** (Control) Indicates Action is Requested

**Typical PA-BUSS Chain:**

The “Audio Monitoring” may be selectable, adding together the audio sources as desired. A separate Audio pair, "Program" may contain External Music or Program material. “Amplifiers” may respond to an “ALERT” logic signal, by muting Music, and outputting Page/Communications, or other action.

An “Amplifier” is defined as any Unit having a PA-BUSS Input.

Each PA Buss has one "Source", and a "Chain" of "Amplifiers". The Source provides Line Level "Page/Communications" Audio, and Control Signal.

A Power Pair is provided for Amplified Speakers, or Microphone Pre-Amplifiers. The Source and Amplifiers in the "Chain" may share a Power or Control Connection. The Amplifier may supply power to the Source, or The Source may supply power to the Amplifier. *The supply of power is one or the other, or neither, not both (Jumper Options).*

The Audio and Control signal paths are Galvanically Isolated using Transformers and Opto-Couplers. Sources and Amplifiers may be locally bonded to Earth by a metal stud on each chassis.
Tech Works Products have “Line Level” Inputs and Outputs, 0dBm (.775 Volts, RMS).

The Maximum Output of a "Source" is 0dBm, with the “LEVEL” Control set at maximum (Fully CW).
For Tech Works Amplifiers, a 0dBm input corresponds to a Maximum rated Output.
Therefore with all the “LEVEL” controls at Maximum the full rated output is achieved.
However this setting is never used; there should always be some attenuation in the system.

Normally if there are two level controls in tandem, only one is used to set the level, the other is set to maximum (Fully Clockwise).
When an Amplified Speaker is used, the Source PA-BUSS output Level Control is used.
When the PA-BUSS is used with an Amplifier (PA-402), the Amplifier Level Control is used.

In special circumstances with multiple amplifiers, there may be a desire for a “Master” Level Control, with the Individual Amplifier Controls used for Balancing the System.

The Alert Pair is a "Party Line" passing through to all the Units forming an Amplifier Chain.
The PA-BUSS Source is the "Initiator" of the Alert, other units may take appropriate action.
Responder Units are electrically isolated, with Opto-couplers.

The ALERT signal requests the Amplifier or Logging Device to take action.
For example, the amplifier switches from Background Music (Program), to Paging/Communication.

Tech Works BUSS products are designed to be configured for the application; functional sections are connected with jumpers.

The multitude of configuration possibilities allows a few products to be configured for a myriad of application possibilities! This design is very flexible; each system is customized for the application!

If amplifiers are in a chain, configuration switches allow different amplifiers to respond as required.
Some Units may ignore the request.

**Monitoring maybe selective:**

The, Source, /PA-BUSS Output, is the Sum of the appropriate Signal Sources.
Jumper Options select the audio signals on each Block to be output.
For example, only the "Slave" input, usually the Operator Microphone, may be sent to the output, which is normally the ceiling speaker in the procedure room.
The “ALERT” is a selectable sum (OR) of several keying signals options. The Monitor Audio may always be present, or may be Keyed. Keyed Audio is useful for Simple Logging/Monitor Devices, Audio is only present when desired.

The PA-BUSS, ALERT Signal may be configured to interrupt the “Music” when it's appropriate. For example, when the Microphone is active, to avoid music bleeding into the microphone.

Feedback Prevention:

Selective Gain Reduction, “Ducking” is used to determine how much to turn down the sound.

Many intercommunications systems require full Duplex Operation. That is, several users may be listening and talking at the same time. This introduces many acoustic feedback paths. When a user enables their microphone, the PA-BUSS, Monitor Speaker may have its output reduced, thus lowering the around the loop feedback gain, and Reducing Feedback.

Example: To appreciate the concept, consider the PA-BUSS Output of the MSI-22.

This is even simplified; "Ducking", Feedback Suppression, also has configuration Jumpers!!!
The Audio, and Alert Outputs are a function of what the user needs for the application. 

No jumpers; No outputs!!!

Install all of the Audio Source Jumpers, and set the MUX to "Always" and you get everything, all of the time.

Install the Master and Slave Audio Source Jumpers, set the MUX to Always, perhaps this is a Ceiling Speaker for the "This Room" (Where the Local Microphones are located).

Install the MIC and PA-BUSS Audio Source Jumpers, set the MUX to Always, perhaps this is a Ceiling Speaker for the "Operator".

Install the MIC Audio Source Jumper, Key the MUX with the TALK SWITCH, the Microphone could be used for Logging or Paging.

The ALERT control signal indicates a Special Function is required. For example, the PA-402 may respond by replacing Background Music with Communications. 

Key the ALERT with the CI-BUSS and Talk Switch...the Music goes away if someone is talking!

There are hundreds of ways to configure the PA-OUTPUT Functional Section, one of five Functional Sections of the MSI-22!!!

And, the MSI-22 may be connected to many other Configurable BUSS products!
Including another MSI-22!

Simple systems may require a single Box; more complex systems may require several boxes. 
The Collaboration Intercom Buss, CI-BUSS; has bi-directional Audio pathways for Communications, and Control. 
While Program/Paging applications are handled by th PA-BUSS for one way Audio Communication and Control.

Expansion is easy; units daisy-chain together to form Collaborative Groups.
Automatic Level Control, ALC:

To allow collaboration, all the users need to have similar Audio Levels
Even though the signal sources may vary in input level

The CI-BUSS products process the Audio Sources using Automatic Level Control, ALC
Each Input is adjusted to be approximately 6 dB into limiting, ~ twice the system level
So the user may talk louder, of if the signal is diminished, the output is not affected

The ALC is associated with the Microphone Gain (Reach) Control (16 Position Rotary Switch)
A Setup Indicator, Off, if source is muted, Green when the Source is keyed, Flashing Red when limiting

---

Setup:
The Microphone Gain Control is increased by ~3dB/Step
While an input is present, the Control is advanced CW until the “Threshold of Limiting”
*This establishes the “Normal Input Level”*
Advancing the Microphone Gain CW, increases the gain… *however the Output level remains the same*

For most Applications, two clicks, or ~6db of extra Gain is sufficient

Excessive Gain is not recommended:
The background noise level is increased
The susceptibility to Feedback is increased
Audio System Setup:

For successful system operation; a methodical approach to system setup is essential.
Audio Blocks, must provide gain structures, Controls and Indicators to assure that setup is both
simple, and affective.

Below are general setup instructions; for setup details, refer to the Product Sections.

CI-BUSS Product, Microphone Gain Setup:

Each Block has both Input and Output Controls with associated Indicators.
When the Indicators are green the associated control is active or enabled.
The Audio may be 'Keyed' depending on the system setup.
Refer to your configuration, and Block User Guides.
Do not attempt adjustments if the associated indicator is not lighted green!

The CI-BUSS uses a standard audio level of ~0dBm RMS.
All audio Blocks have a Digital Rotary Switch (3dB/Step) to set Microphone Sensitivity.
Each Block also includes a fast envelope Limiter, with a “Talk Level” Indicator.
The nominal Microphone gain is ~6dB into limiting, therefore the user has a wide range of inputs,
with a nearly constant output levels.

Microphone Gain is always setup first.
Initially, the Output level controls should be set to minimum (No Output).

Limiter Setup with a Microphone:

Always do first
Talk into the microphone at a normal to loud level (don’t talk softly).
Insure the Microphone is Keyed, the indicator is Green.
Advance the “Microphone Gain”, from “0” until the “Talk Level” indicator just flashes Red.
Advance the “Microphone Gain” another two clicks (6dB into limiting).
Or set the "Microphone Gain" as instructed in that's products user Guide.

PA-BUSS Output and Speaker setup:

Assure there is an audio input.
With normal audio input levels, with Inputs and outputs keyed (Output Indicator Green).
Set the Speaker Listening Level.
See the PA-BUSS Section for Monitor/Communications Output Adjustments.

PA-BUSS, Audio Level Control Setup:

The PA-BUSS Audio Outputs Levels are dependent on establishing standard CI-BUSS levels.
CI-BUSS levels must be adjusted, on all system Blocks, first!

The setup strategy is dependent on the PA-BUSS Amplifier string.
The maximum PA-BUSS audio Signal Output is 0dBm.
All Tech Works Amplifiers, provide maximum rated output with a 0dBm input.
Therefore all controls, on each Block, and Amplifier may be considered an Attenuator (Below the
maximum output level).
The setup strategy is also often a matter of convenience. Access to Audio Source Level trim pots is usually easy. Access to Rack mounted Amplifiers is usually easy, but not as convenient as the Source. Access to a Speaker, especially ceiling mounted Speaker, usually is very difficult!

It is recommended, when two (or more) level controls are in tandem, all Controls but the one, used to set the listening level, are at full level (Clock Wise (CW)).

**Single Amplifier, no music:**
- Set the Amplifier for full output (Control fully CW).
- With a normal Input, set the Source “Level” Control for the desired Listening Level.

**Alternative Setup:**
- Set the Source “Level” Control for full output (Control fully CW).
- With a normal Input, set the Amplifier “Level” Control for the desired Listening Level.

**Chained Amplifier Balancing Setup:**
- Set the Source “Level” Control for full output (Control fully CW).
- With a normal Input, set each Amplifier “Level” Control for the desired Listening Level.

**Alternative Setup:**
- The Source Level Control, acts as a “Master Level” Control, and maintains balance as the Listening Level needs adjustment.
- Set the Amplifiers for full output (Control fully CW)
- With a normal Input, set the Source “Level” Control for the desired Listening Level, On the Speaker which is providing the lowest output

- Reduce the other Amplifier “Level” Controls to archive the desired Listening Level, at that location

**Feedback prevention, cautionary measures:**

Many Intercom systems require "full duplex" operation; simultaneous communications in all directions. When many microphones, and speakers, are in operation together, many feedback paths exist.

The most important feedback prevention technique is speaker Microphone Placement. *The sound level at the microphone from the user, must be much higher than the level from the speakers.*

Microphones should be directional, aimed at the user. Speakers should be placed away from the microphones, and out of the pattern of the Microphone.

The next most important feedback prevention technique is “Minimum Gain”

Minimum Microphone Gain; place the microphone in close proximity to the User(s)
Users need to 'Speak up' so the gain settings can be reduced
Minimum Speaker levels to accomplish reliable communications

The number of 'Open Microphones' should be kept to a minimum
When possible Microphones should be keyed; *Foot Switches*
And only enabled when the user needs to talk
This also reduces the background noise; making it easier for the listener to hear the talker.
Wireless headsets are preferable to individual microphones. This reduces the number of Microphones & Speakers required in 'large' systems. This also reduces background noise in the system.

Tech Works CI-Buss Products provide additional Feedback Prevention techniques:
- Selective Gain Reduction, "Ducking", can be very effective.
  When a Microphone is keyed, the associated speaker can have its level automatically reduced.
  Usually when the User is speaking, the listener is not talking, and only would need to interrupt.
  The speaker level can be much lowered because the user is paying attention to communications.
  Jumper Options on the Products allow the "Ducking Level" to be optimally set.

Notch Filtering the Microphone reduces acoustic room resonance peaking. Rooms without acoustic treatment have significant resonances. This 'peaking' has the effect of greatly increasing gain at these resonance frequencies. This is significant with directional hanging microphones; floor to ceiling resonances are magnified.
A notch filter can be used to reduce this peaking, without adversely affecting communications.
Some examples of system wiring are a Cath Lab or Procedure Room with a Shotgun Microphone and Headsets with the equipment rack mounted away from the work area:

A Cath Lab or Procedure Room with Headsets and a Background Music System with all of the electronics mounted under the counter in the Observation Room.
A Procedure Room with a Hanging Microphone and a Powered Speaker Interface to allow more people to hear what is going on in the Observation area.

Always connect the Collaborative Intercom active components from Master to Slave on the CI-BUSS.

By placing the CI-MSI-22 in the middle of the system it can act as an audio router for who hears who.

By placing the Power Supply on the last device in the chain you can back feed the entire system using standard Power Cords. To add more headsets just add another CI-HSI-41 to the one shown and move the power supply to the new unit. Expansion of up to, no more than, 6 units, on the CI-Buss will give the best performance.
Packaging & Mechanical:

1U, Half Rack, 8.60" X 1.75" X 6.00"
Mounting Options: Table-Top; Under Counter; Rack
Modular aluminum and steel enclosure
Accessories

**CS540 WIRELESS HEADSET** - When the user requires mobility, privacy, and quality the CS540 does it all in a light weight rechargeable package with an integral over the ear mounting band.

**PRO 45 HANGING MICROPHONE** - In the procedure room area such as an operating table the PRO 45 is a high quality condenser microphone with cardioid pattern for excellent signal to noise and 25’ cable included for easy connection.

**PRO ODM - MICROPHONE with a DESK STAND BASE and Two Switches.** This is the perfect solution for the Cath Lab operator location. It is an attractive professional assembly complete with a Blue “Talk” and an Amber “Listen” switch to allow complete control of communication flow.

**PRO42** - is a wide-range miniature condenser microphone with a hemi-cardioid polar pattern. It was designed for surface-mounted applications in high-quality sound reinforcement and other demanding sound pickup situations like procedure room boom arms.

**HM-1 - Hidden Microphone** - The HM-1 is an Omni-Directional Condenser Microphone with an electronically balanced preamp designed for interview pick up. This is a complete assembly including a 1-gang face plate and mounting hardware.

**FS-1-ODC – Foot Switch for the Operator Desk Console,** allows the operator to use the microphone as a Push-To-Talk unit without tying up their hands to use a button.

**FS-1-PLUS - CALL / CONTROL SWITCHES** - The FS-1-PLUS which includes a 15 foot cable with connectors and wall plate. Both offer a variety of hands free call in and control options.

**System 21** - is a complete cost, effective, assembly that includes a high-quality 8” loudspeaker, 25V transformer and perforated steel grill. This unit is made to “Blind Mount” in to hard ceilings.

**System 5 CEILING MOUNT SPEAKER System**- This is a complete assembly including a back box and mounting hardware. The System 5 comes complete with a 25 volt transformer or is available as the System 5-8 in 8 Ohm for Music playback.

**WM WALL OR UNDER COUNTER MOUNT** – All Tech Works Universal Box products are available with 1” metal tabs on each side of the unit for easy attachment to either a wall or the underside of a counter. Also available in a side by side WM2.

**RM RACK MOUNT** - All Tech Works Universal Box products can be rack mounted as either a single unit, dual units (side by side), or as companions with accessories like the PA-402 Amplifier. The rack mount is 1 rack unit (1-7/8”) High by EIA 19” Wide.