INSTALLATION INSTRUCTIONS

MicroComm DXI

IMS-130/MAI-420 Intercom Master Station

1. Intent & Scope

This document describes the installation procedure for the IMS-130 Intercom Master Station and the MAI-420 or MAI-120 Master Audio Interface. The earliest version of the MAI-420 (MAI-420-A) had model numbers MAI-420-1 or MAI-420-2 i.e. MAI-425 with a single option. The second version of the MAI-420 (MAI-420-AB) has model numbers MAI-420-11, MAI-425-21, MAI 420-10 or MAI-420-20 i.e. MAI-420 with two option numbers. This document describes the installation procedures for both versions. The installation procedures for MAI-420-A and MAI-120 are identical and any place the term MAI-420-A is used it could be replaced with MAI-120.

2. Description

Intercom master stations are offered in three basic models -- rack mounted, panel mounted, and desktop. The IMS-130 Intercom Master Station is the panel mount, standard sized display master station. The IMS-130, used in conjunction with a MAI-420 Master Audio Interface, can be connected to the DXI system via a SAB-400, SAB-401 or SAB-300 Station Audio Board. The IMS-130, used in conjunction with a MAI-120 Master Audio Interface can be connected to the DXI system via a SAB-100 Station Audio Board. These combinations provide the operator with audio communications, paging, control over monitoring functions, and alerts the operator when alarms or events occur. Control panel audio functions permit the operator to receive and place calls, put calls on hold, make public address and station call announcements, and manage system background music operations. Control functions include the ability to acknowledge, cancel, and reset incoming alarms and to monitor, activate and deactivate output points.

The IMS-130 and MAI-420 (or MAI-120) are connected by a ribbon cable. **(This cable must be less than 10 inches (25cm) in length)**. In turn the MAI-420 (MAI-120) connects to the intercom system via a SAB-400, SAB-401 or SAB-300 (SAB-100) Station Audio Board. The MAI-420 (MAI-120) provides an audio communication channel from a master station to a DXI exchange.

The MAI-420 and MAI-120 function identically. The only difference between 100 series and 400 series is the audio level of signals transmitted between the SAB and intercom or master stations. If the technical description applies to both the MAI-120 and MAI-420 we will use the notation MAI-x20.

The MAI-x20 provides interface connectors for a telephone handset, hookswitch, speaker, microphone, and headset. Any combination of these audio devices can be used. The MAI-x20 supports both electret and phantom powered microphones. If more than one audio/input device is connected to the MAI the hookswitch and speaker/headset switch will determine which speaker receives audio and which microphone is active. If the hookswitch is off hook the speaker audio is connected to the handset speaker and handset microphone audio is connected to the microphone audio lines. If the hookswitch is on hook the speaker audio is connected to either the headset or hands free speaker depending on the state of the speaker/headset switch. If the speaker/headset switch is closed (corresponding to having a headset jack plugged in) the headset microphone is active and the speaker audio is connected to the headset. If the hookswitch is on hook and the speaker/headset switch is open

then hands free operation is possible with either an electret or phantom powered microphone. The following table summarizes the operation of the hookswitch and speaker/headset switch.

SPEAKER/HEADSET SWITCH	HOOKSWITCH: ON HOOK	HOOKSWITCH: OFF HOOK
CLOSED	HEADSET	HANDSET
OPEN	HANDS FREE	HANDSET

The IMS-130 has a front panel key marked HEAD for headset. This key normally toggles the unit to switch between hands free operation to use either the built in speaker/microphone or to use a headset. As shipped from the factory this switch is disabled and the unit will operate only in hands free mode or with the handset.

The MAI-x20 has provisions for several press-to-talk (PTT) inputs. The PTT switches can be used to control the audio direction of half duplex calls. The PTT inputs appear on the main DB-25 connector, the handset connector, and the headset connector. As well the keypad of the IMS-130 has a PTT switch. Although all inputs are in parallel, and perform the same function, the additional PTT inputs simplify interfacing wiring. For example a PTT switch can be located in the handset, on a graphics panel, or a footswitch. If more than one type of PTT switch is used a switch closure on any one of the switches will cause the MAI-x20 to transmit audio to the device being called.

The MAI-x20 provides a pair of contacts on the hookswitch connector that can be used for attaching a microphone-muting switch. As well the keypad of the IMS-130 has a Mute switch. If the muting switch is closed all of the microphone inputs connected to the MAI are muted. This feature ensures that the operator can control the audio that is transmitted over an open audio circuit.

The MAI-420-AB can be used with either a mechanical or magnetic hookswitch, while the MAI-420-A and MAI-120 can only be used with a mechanical hookswitch.

3. Panel Mounted IMS-130 Intercom Master Station

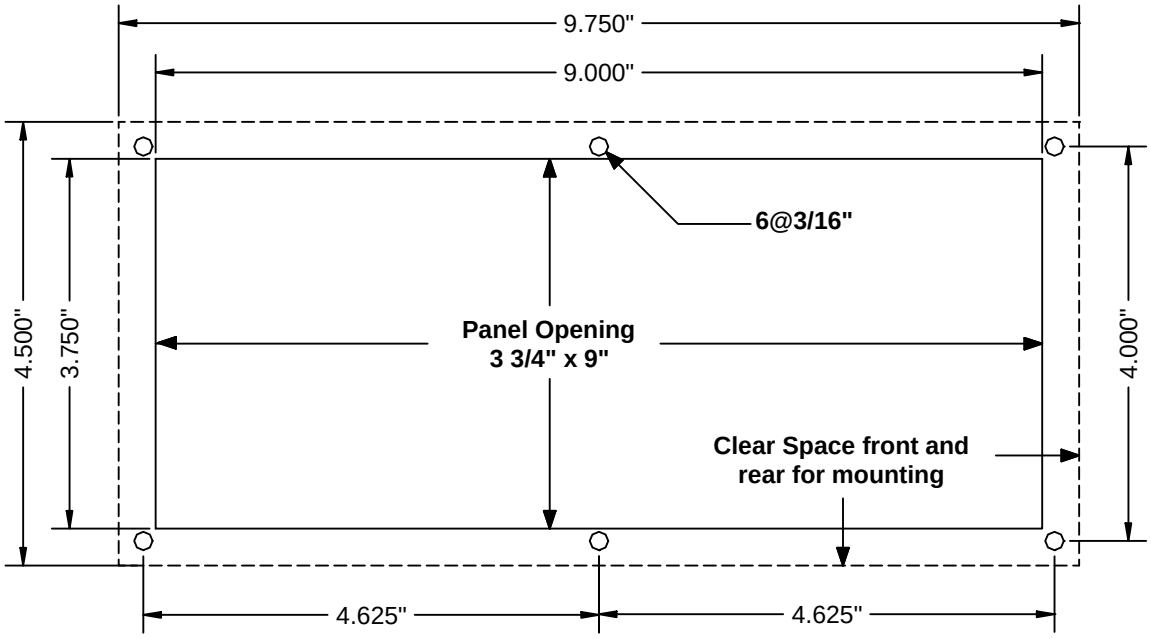
The panel mount intercom master station consists of the IMS-130 display module, the MAI-120 (or MAI-420) interface module, and audio accessories such as a speaker/microphone, telephone headset, etc.

3.1 IMS-130 Display Module

The master station display module is shown below.

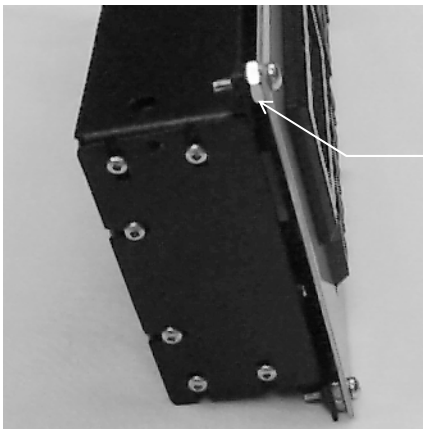
IMS-130 Panel Mounted Intercom Master Station

The master station display module mounts through a rectangular hole in the panel. The dimensions of this hole and the associated mounting screw hole locations are shown below.



Mounting Hole Detail of Panel Mounted Intercom Master Station

The master station display module is designed to mount on a 0.125-inch thick panel. If a thinner panel material is used, shims or washers must be added behind the panel to make a total thickness of at least 0.125 inch. When it is shipped from the factory #10 nuts are placed between the front panel and the main body to act as spacers. These spacer nuts must be removed and discarded when the master station is installed.



To install the master station display module, you must separate the front plate from the main body by removing the supplied mounting screws. Then place the main body in position behind the panel. Finally place the front plate in position on the front of the panel and install the mounting screws. The master station display module is shipped with standard #6-32 screws in the 6 mounting holes. If special tamper resistant mounting hardware is being used, these screws should be replaced with #6-32 x 1/2" screws with the required tamper resistant heads.

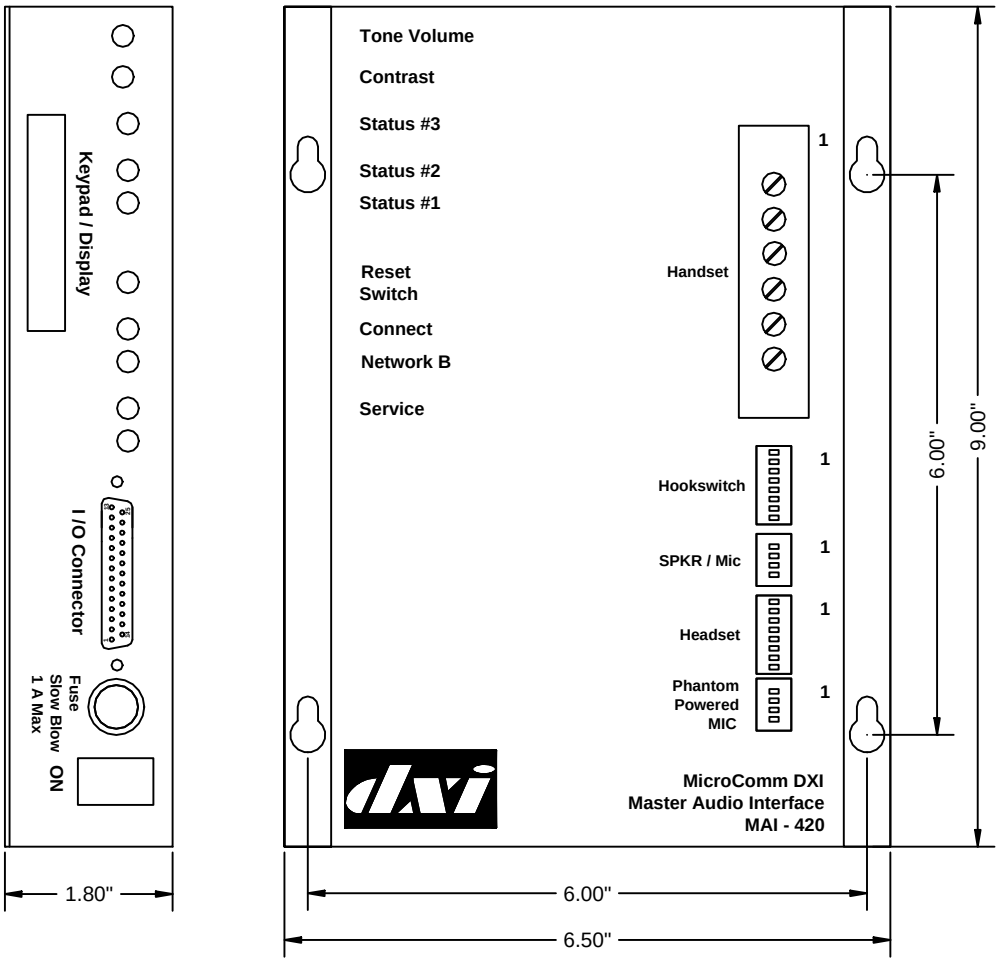
When handling the display module you should be careful not to touch the display or the backside of the display window because this may leave fingerprints. Any fingerprints should be cleaned off the inside of the glass before the face is installed.

All of the connections between the display module and the interface module are made via the 10" ribbon cable on the display module. This cable **cannot** be extended, so the MAI-x20 must be located close enough to the IMS-130 so that the two units can be connected.

3.2 MAI-420 (MAI-120) Master Audio Interface Module

The wall mounted MAI-420 or MAI-120 provides an intercom channel from audio devices to an exchange. The MAI-x20 is typically mounted under or inside a control console. Either #8 or #10 round head screws can be used to mount the MAI.

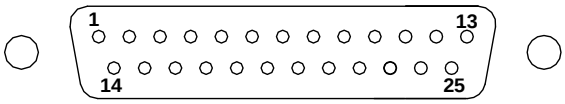
Wall Mounted MAI-120



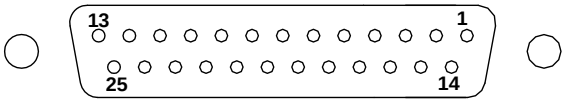
MAI Base Plate Showing Mounting Hole Detail

Electrical Connections to DB-25 Connector

Electrical connections to the MAI are made with a single DB-25 connector. The MAI has a male connector and the mating cable requires a female DB-25 connector.



Male DB-25 Connector



Female DB-25 Connector

The interface module I/O port requires a female DB-25 mating connector with the following pin configuration:

Pin	Signal	Pin	Signal
1	Main V +	14	Main V +
2	Main V- (Gnd)	15	Main V - (Gnd)
3	Network B +	16	Network B -
4	Earth Ground	17	Speaker -
5	Speaker +	18	Microphone -
6	Microphone +	19	Push to Talk Input.
7	Relay 2 NO	20	Relay 2 Common
8	Relay 2 NC	21	Relay 1 NO
9	Relay 1 Common	22	Relay 1 NC
10	Earth Ground	23	Network A -
11	Network A+	24	Backup V- (Gnd)
12	Backup V - (Gnd)	25	Backup V +
13	Backup V +		

DB-25 Pin Signals

The MAI-420 can be ordered for either +12 Vdc or +24 Vdc operation. For a MAI-420-1 (MAI-420-1B) the main power should be connected to a +12 Vdc power supply, while a MAI-420-2 (MAI-420-2B) requires a main power supply of +24 Vdc. For a 12 Vdc ±10% power supply the maximum distance that the power supply can be located from the MAI-420 is 300 feet (90 meters) using a single 22 gauge pair of wires to connect the power supply. For the 24 Vdc ±10% power supply, and a single 22 gauge pair wire feed, the maximum distance is 750 feet (230 meters). The dc supply can be connected to pins 1 and 2 as well as pins 14 and 15. This allows the supply wires to be conveniently paralleled to increase the distance the supply can be located away from the MAI.

The pins labeled Backup V+ and Backup V- (Gnd) can be used to connect a redundant power supply. This supply acts as a standby power source if the main supply fails. The backup supply must be the same voltage as the main supply.

The Speaker and Microphone audio pairs connect to two SAB audio ports through the cross connect blocks. This connection is made with two shielded pair cables.

When the MAI-420 is used with the SAB-300 the Speaker pair is connected to the SAB Audio 16 port and the Microphone pair is connected to the SAB Master Audio port. The shields are open at the MAI-420 end and

connected to the shield terminal at the terminal block end. The shields are connected together on pin 48 of the terminal block when using the Audio 16 and Master Audio pair.

When the MAI-420 is used with the SAB-400 (or SAB-401) the Speaker pair can be connected to the SAB Audio 16 pair and the Microphone pair connected to the SAB Mic pair. Again the shields are tied together on pin 48 of the terminal block. With the SAB-400 or SAB-401 the MAI-420 audio lines can also be connected to any two adjacent Audio pairs (1-2, 2-3, 3-4, 4-5, … 15-16), with the Speaker pair connected to the first SAB-400 (SAB-401) Audio port, the Microphone pair connected to the second SAB-400 (SAB-401) Audio port, and the shields connected to the individual shield terminals.

The Push to Talk (PTT) input is referenced to V- (Gnd) (as are the other PTT inputs), i.e. a PTT switch is connected between the PTT input and V- (Gnd). The Main V- and Backup V- are connected inside the MAI-420.

Hookswitch Connections

If the telephone hookswitch is used, it is wired to the interface module via an 8-pin MTA-100-08 female connector that plugs into the header labeled "Hookswitch". The hookswitch connections depend on the model of the MAI-420 that you have. We will refer to the two different models as MAI-420-A and MAI-420-A1.

Hookswitch Connections for Model MAI-420-A

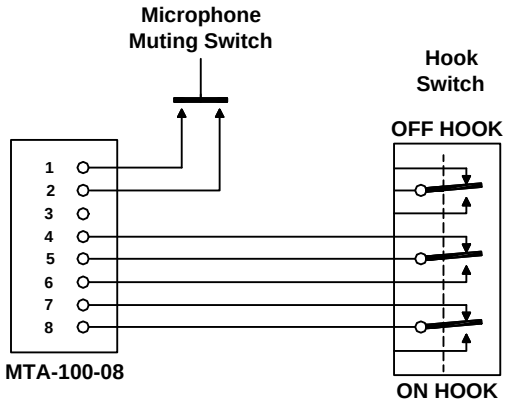
The following table gives the connections for a hookswitch to a MAI-420-A. This connector also provides two terminals that can be used to connect an external switch that allows all microphones to be muted.

Pin	Signal
1	Microphone Mute +
2	Microphone Mute - (Gnd)
3	NC
4[1]	Hand set Speaker+. Must connect to pin 5 when hand set is off-hook.
5[1]	Speaker+ common. Must connect to pin 4 when handset is off-hook, pin 6 when handset is on hook.
6[1]	Headset Speaker+. Must connect to pin 5 when hand set is on-hook.
7	Speaker/Hand set. Must connect to pin 8 when hand set is off hook.
8	Gnd

Interface Module Hookswitch Connector

[1]Note that if a hookswitch is not connected to the unit a jumper should be used to connect pins 5 and 6 to allow normal headset and hands free switching. If a handset is the only audio device that is going to be used then the hookswitch is not required. In this case a jumper should be installed between pins 5 and 4. As well a jumper must be installed between pins 7 and 8 to activate the handset microphone. These jumpers imitate the off hook state of the hookswitch.

If a hookswitch is required the following schematic shows the necessary field wiring. Harding Instruments provides a Hookswitch Kits HHK-130 or HHK-131 that can be used with the MAI-420-A.



Hookswitch Connections for MAI-420-A

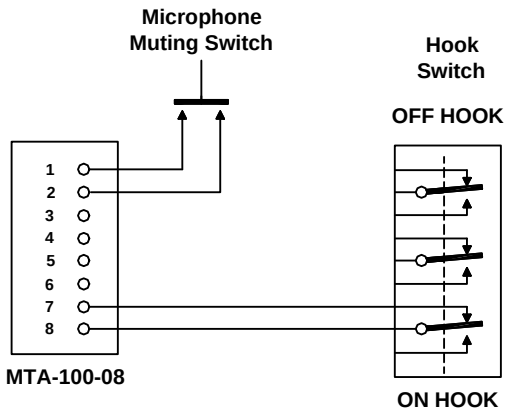
Connections to the Female MTA Connectors

Most connections to the MAI are made with a female AMP MTA-100 series connector that plugs into the appropriate header on the MAI. To make the connections shown in the above diagram the mute input connects to pins 1 and 2 on a female 8-pin AMP MTA-100 series connector that plugs onto the header labeled "Hookswitch". To make these connections you should use an AMP Handle Assy 58074-1 tool with a 58246-1 head. The cable should be cut to length and the outer jacket should be trimmed back about 1/2 inch.

To insert the signal wires into the connector you remove the white cover from the connector, insert the connector into the tool from the left side (it will travel through the tool in the direction indicated by the arrow), pull the trigger once to load the connector. Then insert the signal wire for pin 1 (only if you are connecting a muting switch) into the hole on the top of the tool and pull the trigger to insert the wire into the connector. If a wire is not required for a pin just pull the trigger to advance to the next position. Then repeat to install the other signal wires (do not strip the wires). Finally, remove the connector from the tool, replace the cover, and then slide the connector onto the header pins on the MAI.

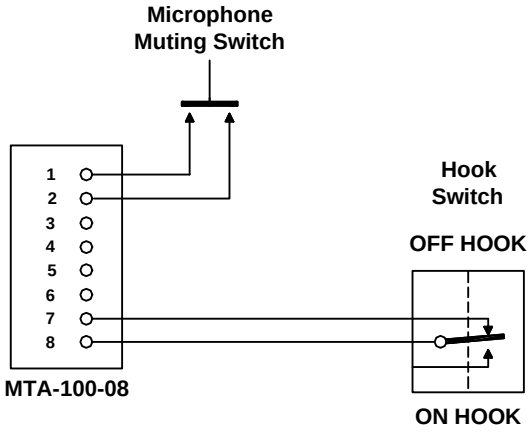
Hookswitch Connections for MAI-420-A1

This version of the MAI-420 can be configured to operate with either a mechanical or magnetic hookswitch. Two versions oif the magnetic hookswitch kits are available, the HHK-132 and the HHK-133. The difference between the two is that in the "on hook" position the HHK-133 is normally open (the same as the mechanical hookswitch) while the "on hook" position of the HHL-132 magnetic switch is normally closed. The position of a jumper on the printed circuit board allows for the two possible hookswitch configurations. The hookswitch connections for a mechanical hookswitch are shown below. When the "on hook" switch position is normally open a shorting jumper should be placed across the two pins of the 2-pin connector CN19, while CN18 remains open. (The jumper is located in this position when parts are shipped from Harding Instruments).



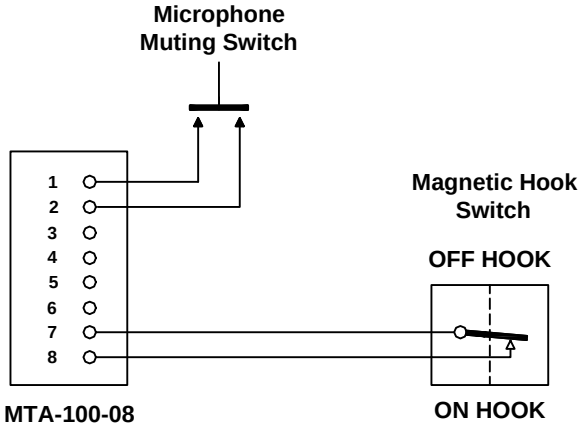
Hookswitch connections for Mechanical Switch (MAI-420-A1)

The hookswitch connections for a magnetic hookswitch HHK-133 are shown below. With this hookswitch the shorting jumper is placed across CN18, while the CN19 pins remain open.



HHK-133 Hookswitch Connections for Magnetic Switch (MAI-420-A1)

The hookswitch connections for a magnetic hookswitch HHK-132 are shown below. When the "on hook" switch position is normally closed the shorting jumper is placed across CN18, while the CN19 pins remain open.

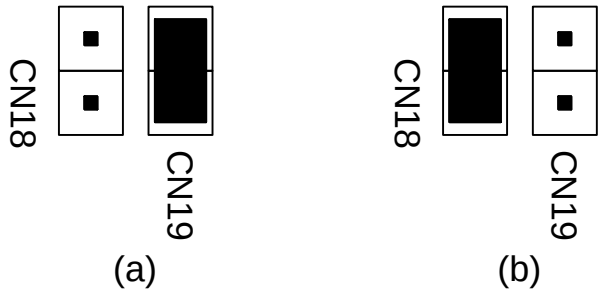


Hookswitch Connections for Magnetic Switch (MAI-420-A1)

To change the jumper position between CN18 and CN19 you will have to remove the top cover of the MAI-420. The printed circuit board is attached to the top cover by standoffs and a simplified view of the printed circuit board appears as shown in the following diagram. The location of the two connectors CN18 and CN19 is shown on the diagram. The printed circuit board used for the MAI-420-AB is identified by the designation PC06482-04.

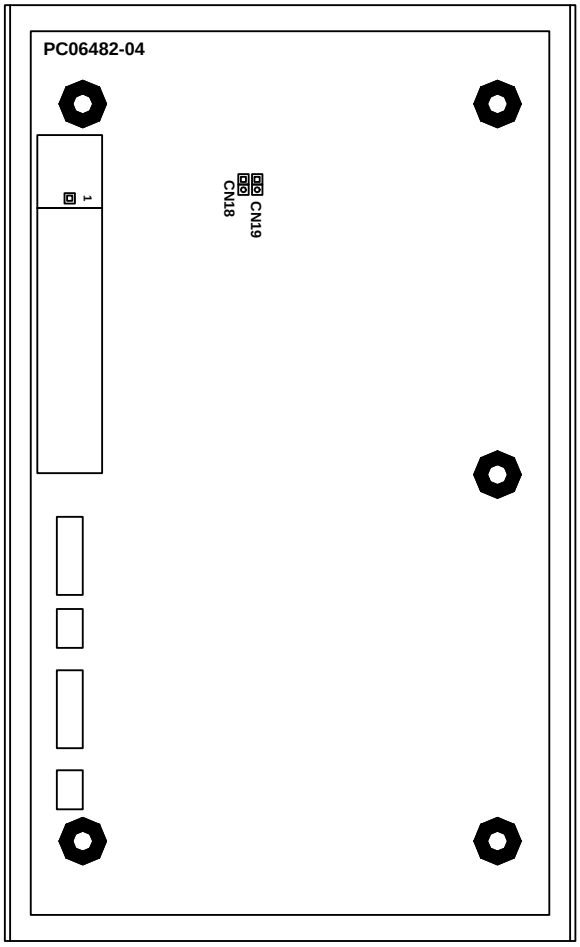
Harding Instruments provides Hookswitch Kits HHK-130, HHK-131, HHK-132 and HHK-133 that can be used with the MAI-420-A1. The following table summarizes the jumper positions for the various types of hookswitch kits.

Type of Hookswitch	Jumper CN18	Jumper CN19
HHK-130	NO	YES
HHK-131	NO	YES
HHK-132	YES	NO
HHK-133	NO	YES



Jumper Positions (a)CN18 open, CN19 shorted

(b)CN19 open, CN18 shorted



Location of CN18 and CN19

Handset Connections

The telephone handset is wired to the interface module terminal block according to the following table:

Pin	Signal
1	Speaker +
2	Speaker - (Gnd)
3	PTT switch +
4	PTT switch - (Gnd)
5	Microphone +
6	Microphone - (Gnd)

Interface Module Handset Connector

The telephone hand set must have an electret (or condenser) microphone. Connect the speaker (or receiver) wires to pins 1 and 2, and the Microphone (or transmitter) wires to pins 5 and 6. The PTT switch is connected to pins 4 and 5. Note the speaker connections are not polarity sensitive, however the electret microphone connections are polarity sensitive and must have the correct polarity connection for proper operation.

Headset Connections

The headset with boom microphone connects via an 8-pin MTA-100-08 connector as per the following table:

Pin	Signal
1	Speaker +
2	Speaker - (Gnd)
3	PTT switch +
4	PTT switch - (Gnd)
5	Microphone +
6	Microphone - (Gnd)
7	Speaker/Headset - Should connect to pin 8 when headset is used
8	Gnd

Interface Module Headset Connector

If a unit is ordered with both a speaker/microphone and a headset the **HEAD** switch on the IMS front panel is used to toggle between these two operations. The headset must have either a electret (or condenser) microphone.

In order to activate this switch a jumper must be placed across pins 7 and 8 of the Headset/Goosneck/Jackswitch connector (CN 14). A jumper is provided but as shipped from the factory is set onto only one of the pins.

Speaker/Microphone Connections

For hands free operation speaker and electret (or condenser) microphone connections are made through a 4-pin MTA-100 connector according to following table:

Pin	Signal
1	Speaker +
2	Speaker -
3	Microphone - (Gnd)
4	Microphone +

Interface Module Speaker/Microphone Connector

Harding Instruments provides a Speaker/Microphone Kit SMK-130 that includes a loudspeaker and microphone mounted on a baffle plate. It is intended to mount behind a console or panel faceplate. See the IM-SMK-130 Installation Bulletins for further details.

Note: Only a electret microphone should be used. Do not use a dynamic microphone

Phantom Powered Microphone Connections

A phantom powered microphone may be connected to the interface module as given by the following table. The phantom powered microphone must operate on a +12 Vdc supply. A panel microphone and/or a phantom microphone can be used with the MAI-420. With the MAI-420 only the microphone on the spkr/mic connector or the phantom mic connector can be used (but not both).

Pin	Signal
1	Phantom Mic +
2	Phantom Mic -
3	Gnd
4	Gnd

Interface Module Phantom Powered Microphone Connector