

# **IP7<sup>TM</sup> -FD**

**IP Intercom/Amplifier**

## **Reference Manual**



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# Table of Contents

<b>Overview .....</b>	<b>- 1 -</b>
<b>Specifications .....</b>	<b>- 2 -</b>
<b>IP7-FD Layout.....</b>	<b>- 3 -</b>
<b>LED Indicators .....</b>	<b>- 6 -</b>
<b>Connecting to an Ethernet Network .....</b>	<b>- 7 -</b>
<b>Connecting Power .....</b>	<b>- 7 -</b>
PoE .....	- 7 -
External Power .....	- 7 -
USB Power .....	- 7 -
<b>Audio - Mic and Speaker .....</b>	<b>- 8 -</b>
Understanding Full Duplex Audio .....	- 8 -
IP7-FD Panel Models and Installations .....	- 8 -
Wiring Overview .....	- 9 -
Wiring to FD Panels.....	- 10 -
Wiring the FD Panels - Summary .....	- 11 -
<b>Connecting the Relay .....</b>	<b>- 12 -</b>
<b>Connecting the Sensor .....</b>	<b>- 12 -</b>
<b>Alternate Operational Modes .....</b>	<b>- 13 -</b>
Line In .....	- 13 -
External Microphone Connection Mode.....	- 13 -
<b>Mounting Instructions .....</b>	<b>- 14 -</b>
Din Rail Mounting .....	- 14 -
Surface Mounting.....	- 14 -
<b>Setting Volume Levels .....</b>	<b>- 14 -</b>
<b>Configuration .....</b>	<b>- 15 -</b>
IP Configuration.....	- 15 -
Intercom Options.....	- 15 -
<b>Physical Dimensions .....</b>	<b>- 16 -</b>
<b>Environmental .....</b>	<b>- 16 -</b>
<b>Troubleshooting.....</b>	<b>- 17 -</b>
Reset to Factory Defaults.....	- 17 -
Connecting 1/8" (3.5mm) Audio Plug to the Pluggable connectors ....	- 17 -
Reducing electrical noise in audio.....	- 17 -
Viewing tech support info via the USB port.....	- 17 -
Low Level Flashing Utility .....	- 18 -
<b>Contacting Technical Support .....</b>	<b>- 18 -</b>
<b>Regulatory Notices .....</b>	<b>- 19 -</b>
<b>Index .....</b>	<b>- 20 -</b>

## Overview

The Digital Acoustics IP7-FD is an IP (Internet Protocol) 2-way intercom with an integrated output amplifier, relay, sensor and 2-port network switch.

The “FD” is designed to work in tandem with Digital Acoustics FD “Full Duplex” panels and enclosures to support high definition Full Duplex audio and simultaneous 2-way hands free conversations.

Standard features of the IP7-FD include:

- IP connectivity for Intercom and Paging with TalkMaster™ and SIP based VoIP telephones
- Full duplex audio when used in conjunction with ‘FD’ series wall panels



- Highly scalable, seamless expansion
- Paging capability
- Mounting via rail or surface mount
- Fixed or DHCP compliant IP assignment
- Auto sensing power from 12VDC - 15VDC
- PoE (802.3af) standard
- Integrated 2-port switch
- Field upgradeable OS

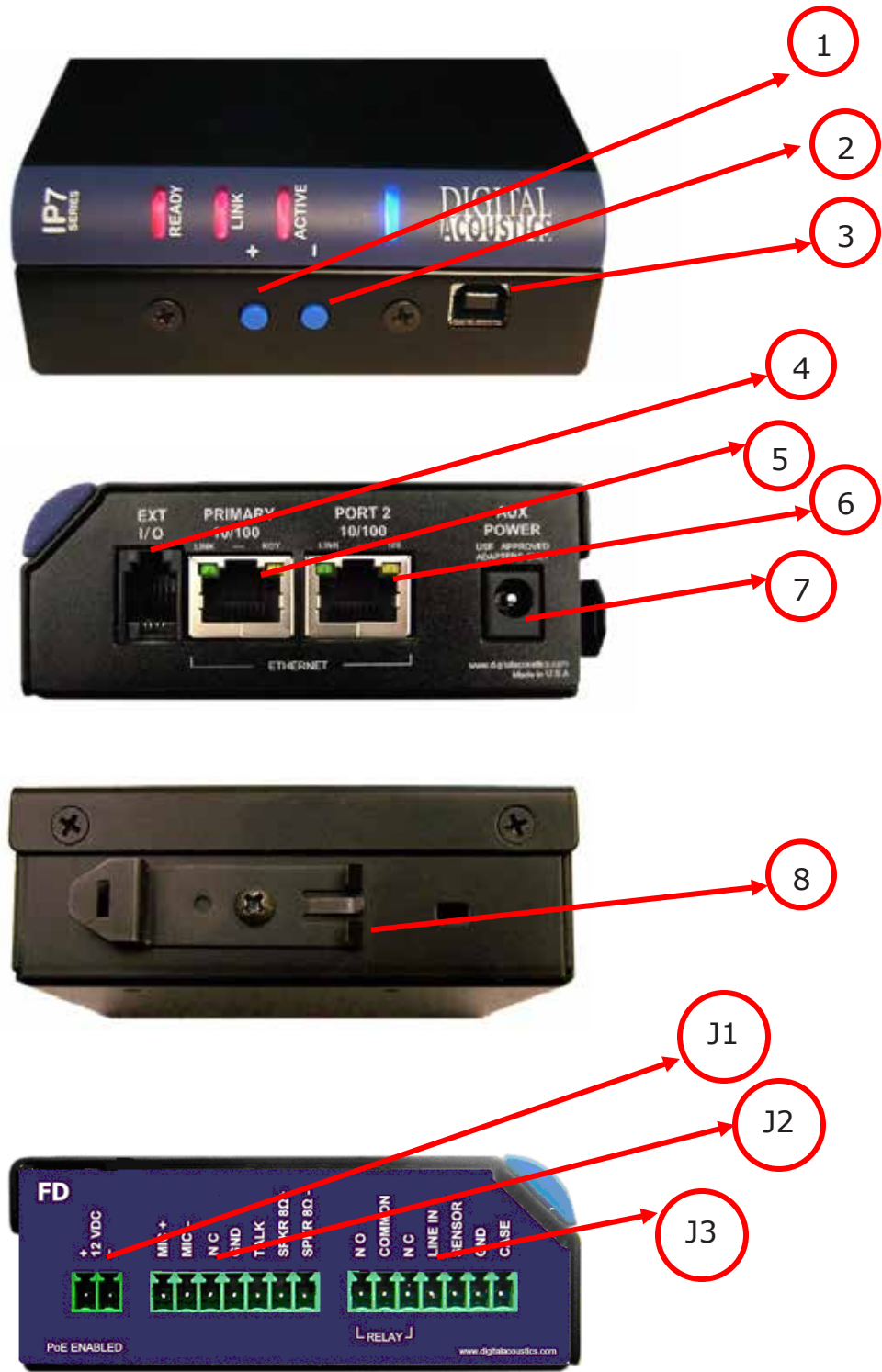


*The IP7-FD must be configured using the TalkMaster software before being used. Please consult the configuration section of the software manual for details.*

## Specifications

Items	Specification
Network Protocols	TCP, UDP, SIP, RTP, ICMP, IGMP Multicast
Network Interface	10/100 Ethernet (Auto detection, Auto MDIX)
Command protocols	Proprietary and Standards Based
Audio Resolution	G.711 (8-bit PCM and 16-bit uLaw)
Audio Sample Rate	8K (Voice band) , 22K (Background Music)
Audio Frequency	90-4kHz (Voice band) , 90-11khz (Background Music)
Internal Amplifier	8 watt @ 8 Ohms 1% THD
Humidity	10~90%
Power	External Power 12-15 VDC @ 15 watts nominal.
	PoE (802.3af) compliant (requires 15.4 watts from PSE). External Power overrides PoE power
Size	3.85. x 3.59 x 1.37 in
	98 mm x 91mm x 35mm

IP7-FD Layout



## Connections and Controls

Refer to the preceding pictures.

Connector	Connector / Control	Notes
1	+ Button	Volume up button
2	- Button	Volume down button
3	USB-B	Provides for low level firmware flashing as well as viewing technical support information. Will also power the unit for diagnostic purposes.

4	Ext I/O	I2C expansion bus interface that can be used for custom applications. Requires custom firmware from Digital Acoustics
5	Ethernet 10/100	10/100 Ethernet network interface. Supports auto negotiation and auto-MDIX
6	Port 2 10/100	Provides a 10/100 Ethernet network connection for another device. Supports auto negotiation and auto-MDIX
7	Aux Power	2.1mm power connector with center tip positive. 12VDC - 15VDC @ 15 watts. Overrides PoE power.  <b>Warning:</b> Connecting power to both the 2.1mm Power jack and the J1-1 and J1-2 power connectors at the same time will damage the unit

8	DIN Rail Mounting Clip	Allows unit to be snapped on to standard 35mm DIN Rail stock
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There are three sets of pluggable DIN connectors (3.81mm centers) on the FD:

### J1 Connector

Connector	Signal	Notes
J1-1	Power +	12VDC at 15 watts. Overrides PoE power. <b>Warning:</b> Connecting power to both the 2.1mm power jack and the J1-1 and J1-2 power connectors at the same time will damage the unit
J1-2	Power -	

### J2 Connector

Connector	Signal	Notes
J2-1	MIC +	Microphone Inputs. Pseudo differential (Actively Balanced differential). Also capable of accepting Line In signal
J2-2	MIC -	
J2-3	N/C	This connector is not used
J2-4	GND	System Ground. Same as J3-6
J2-5	TALK	Talk or Call button. Initiates a call to the configured Server. Reference to J2-4
J2-6	SPKR 8Ω+	Floated differential output. Able to drive an 8 Ohm load @ 8 watts or a 600 Ohm load
J2-7	SPKR 8Ω-	

### J3 Connector

Connector	Signal	Notes
J3-1	NO	Isolated Dry Contact Relay output. Connect J3-2 and either J3-1 for NO (Normally Open) or J3-3 for NC (Normally Closed)
J3-2	COMMON	
J3-3	NC	
J3-4	LINE IN	Multi Use Connector <b>Speaker Mix</b> - Audio is sent directly to the Speaker Outputs (default action). Unbalanced. Reference to J3-6 <b>Standard Line In</b> - Unbalanced. Reference to J3-6. Requires special Audio Profile. This will bypass Acoustic Echo Cancellation!
J3-5	SENSOR	Door Sensor. Active when closed to ground or Active when open to ground. Reference to J3-6
J3-6	GND	System Ground. Same as J2-4
J3-7	CASE	Optional connection to earth ground

## LED Indicators

### Intercom LEDs

There are four LEDs present on the curved bezel on the front of the product.

- The blue LED indicates that the IP7-FD has powered up.
- The three red LEDs indicate status of the unit.

LED	Description
Ready	Indicates whether the unit has connected to a Server
Link	Indicates whether the unit has a valid network Connection
Active	Indicates whether audio is being transmitted or received

### ***LED Status Table***

Description	Ready	Link	Activity
Normal operational mode. Intercom can communicate with its Server	On	On	Off
Playing Audio	On	On	Flashing
Playing Broadcast Audio	Fast Flash	On	Flashing
Sending Audio	On	On	On
Attempting to connect to make a connection or unit has not been configured	Flashing	On	
LAN connection is inactive. The RJ45 may be unplugged	Flashing	Off	
Unit has been detected by the Intercom Configuration Tool	Fast Flash	On	

### ***LAN Connector LEDs***

On the **Ethernet 10/100** RJ-45 connector:

- The Green LED tracks to the Ready LED
- The Yellow LED tracks to the Link LED

On the **Port 2 10/100** RJ-45 connector

- The Green LED tracks to network transmit activity
- The Yellow LED tracks to network receive activity

## Connecting to an Ethernet Network

The **Ethernet 10/100** connector allows the unit to be attached to a 10/100 network. **Port 2 10/100** allows an additional IP device to be connected to the network without the need for an additional network drop. The second port is not PoE capable.

- Plug a Cat5 cable into the RJ-45 connector labeled **Ethernet 10/100** and connect the other end to a 10/100 switch.
- To connect a second IP device to the network, plug a Cat5 cable in the RJ-45 connector labeled **Port 2 10/100**
- The **Ethernet 10/100** connector supports auto “MDIX” and can be plugged directly into a PC for diagnostic purposes.

## Connecting Power

The IP7-FD auto senses the power source and voltage. An external power source will always override PoE power.

### ***PoE***

Plug a Cat5 cable from an 802.3af compatible switch or injector into the RJ-45 connector that is next to the 2.1mm Power Jack connector. 15.4 watts will be requested from PoE (802.3af compatible) Power Source Equipment (PSE).

### ***External Power***

- The 2.1mm Power Jack (center tip positive) accepts 12VDC. The J1-1(+) and J1-2(-) connector accepts 12VDC
- **DO NOT** supply power to both the 2.1mm Power Jack and the J1-1 and J1-2

### ***USB Power***

The USB connector can be used to power up the unit for diagnostics or low level firmware flashing. Plug a USB cable from a PC into the USB-B connector. The unit will power up, but will not be able to be used for audio operations.

## Audio - Mic and Speaker

### *Understanding Full Duplex Audio*

The IP7-FD Full Duplex Operation is often referred to as Speakerphone or Hands Free mode. The technology to enable 2-way conversation without acoustic feedback involves a process called Acoustics Echo Cancellation (AEC). For AEC to be effective, the total system design needs to be considered. This includes incorporating sophisticated DSP electronics and optimizing the Speaker Frequencies and placement of the speaker and microphone based on the maximum volume to be played on the speaker.

Digital Acoustics FD series has highly advanced DSP electronics developed exclusively for IP Intercoms with software that can optimize the endpoint based on the physical environment.

Simple 'dialog' choices in the TalkMaster™ software offer several instant profiles for CIS4-FD, SPKR-IP 5-FD and other call station endpoint panels. Please refer to the Admin Console Reference Guide for more information on selecting Audio Profiles.

### *IP7-FD Panel Models and Installations*



**CIS4-FD**

Indoor Install



**CIS4-FD**

Outdoor Install



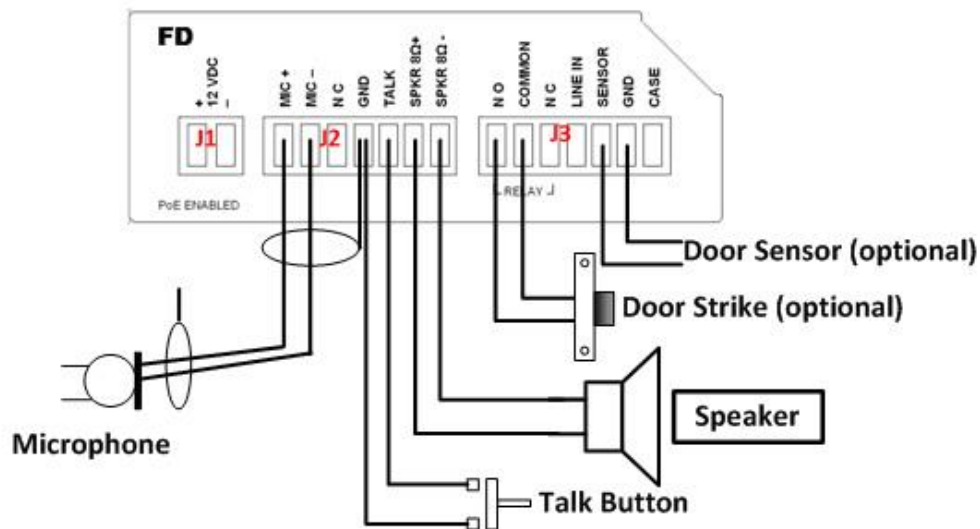
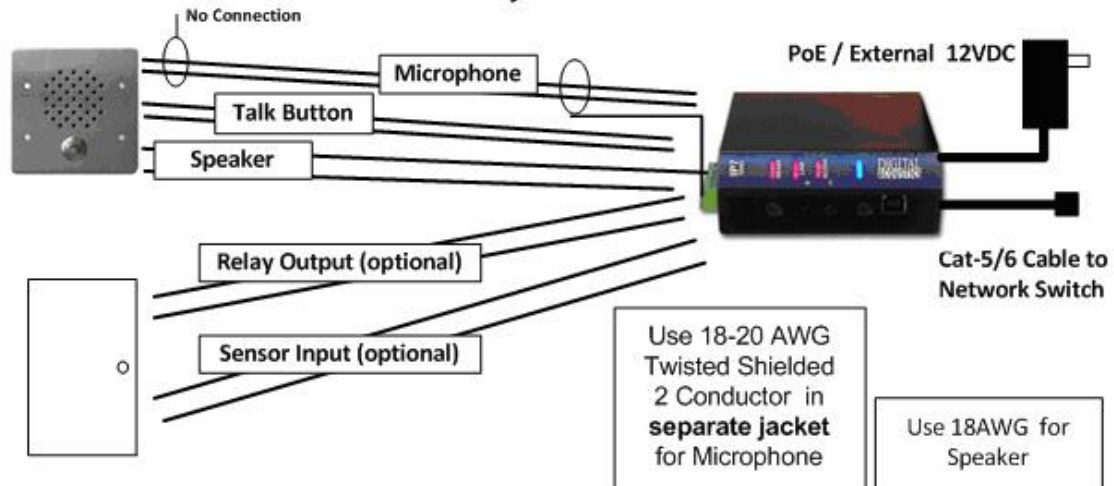
**SPKR-IP 5-FD**

Indoor Speaker

## Wiring Overview

### IP7-FD Installation

For 2-way Intercom Audio



**Wiring to FD Panels**

**Microphone Wire** 18-20 AWG – 2 Conductor, Shielded

For best results and to minimize interference, the Microphone must connect to the IP7-FD with 18-20 AWG 2 conductor **Shielded** wire. Connect the Shield to the J2-4 (GND) connector on the IP7. Do not connect the Shield to the call station.



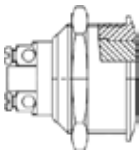
**The Microphone wire must not be in the same jacket as the Speaker wire!**

**Speaker** 18 AWG - 2 Conductor

For best results and to improve performance, connect the speaker to the IP7-FD using 18 AWG - 2 Conductor.



**Talk (Call) Button** 18 AWG - 2 Conductor

The optional Talk Button connector is used to initiate a call to the TalkMaster software or to a SIP Server.





To wire the Talk Button, connect J2-5 to the Button, and then connect J2-4 to the Button’s other contact. Optionally, the Button’s other contact can be attached directly to one of the Speaker terminals.

**With TALK/CALL signal**

M I C		<b>Shield</b>  <b>M- M+</b> Connect Shield to GND at IP7	18-20 AWG 2-Conductor Shielded	WP 293 or Equivalent Wire
S P K R / T A L K		<b>SP+ SP- TALK GND</b>	18 AWG 4-Conductor	WP 244 or Equivalent Wire

### Without TALK/CALL signal

<b>M I C</b>		<b>Shield</b> <b>M-</b> <b>M+</b>	Connect Shield to GND at IP7  18-20 AWG 2-Cond Shielded	WP 293 or Equivalent Wire
		<b>SP-</b> <b>SP+</b>	18 AWG 2-Cond 2 Conductor	WP 224 or Equivalent Wire

### Wiring the FD Panels - Summary

IP7 Connector	Panel Connection	Wire	Comment
J2-1 MIC+	Microphone + (red)	M+	Mic Audio
J2-2 MIC-	Microphone - (black)	M-	Mic ground
J2-4 GND	N/A	Shield	Drain
J2-4 GND	Call Button (if used)	Ground	Button can optionally be grounded to one of the Speaker terminals
J2-5 TALK	Call Button (if used)	TALK	Call initiation
J2-6 SPKR 8Ω+	Speaker	S+	Speaker Audio
J2-7 SPKR 8Ω-	Speaker	S-	Speaker Audio

## Connecting the Relay

The **Relay** connector provides a dry contact output from the IP7-FD suitable for activating equipment such as electronic door strikes, strobe lights or CCTV cameras. Normally Open (N/O) or Normally Closed (N/C) can be chosen. The **Relay** is rated at 250 VAC / 30VDC @ 60W / 1500 VAC Isolation.

- J3-1 is N/O
- J3-2 is Common
- J3-3 is N/C
- Ensure **Relay** has been properly configured in the Intercom's Software Configuration program

## Connecting the Sensor

The IP7-FD supports an input **Sensor** that can be used for a variety of applications. The Sensor can be defined as **Active when closed to ground** or **Active when open to ground** via software. Digital Acoustics' TalkMaster™ Software provides functionality for monitoring the status (open or closed) of a door via the **Sensor**.

- Connect J3-5 and J3-6 to a door sensor or device that can provide a contact closure
- Ensure **Sensor** has been configured to be **Active when closed to ground** or **Active when open to ground** in the Intercom's Software Configuration program

## Alternate Operational Modes

### **Line In**

The IP7's **Line In** connector provides multiple uses. By default, audio from this connector acts as a **Speaker Mix** and is routed directly to the IP7's Speaker allowing the IP7 to be used as an analog amplifier. Contact Digital Acoustics Technical Support for instructions.

When connecting an audio source that provides a "line in" audio level, connect it to the IP7's **Mic+** and **Mic-** terminals. When configuring the Audio Profile for this device, edit the Audio Profile to include Register 0x101e with a value of 0x00.

**Line In** can also function as a traditional **Line In** with a standard unbalanced signal. *The audio from this source will bypass all of the DSP functions such as AEC and AGC.* If this is required, contact Digital Acoustics Technical Support for a custom audio profile.

- Ensure **Line In** has been selected in the IP7's **Input Source** configuration
- Connect J3-4 to the + side of the input source
- Connect J3-6 to the - side of the input source

### **External Microphone Connection Mode**

The IP7-FD can accept electret microphones. Certain weather proof speakers may also be used as a microphone.

#### **To connect an Electret Microphone**

- Connect J2-1 to the Mic + lead of the Electret Mic
- Connect J2-2 to the Mic - lead of the Electret Mic
- Connect a jumper between J2-2 and the J2-4 Ground



*If an external microphone is used, the default AEC "Full Duplex" audio profiles may not provide proper Acoustic Echo Cancellation. Please contact Digital Acoustics' technical support for additional information on the connecting microphones and speakers and the affect on Acoustic Echo Cancellation.*

## Mounting Instructions

The IP7-FD can be installed on a DIN Rail or surface mounted.

### *Din Rail Mounting*

To DIN rail mount:

- Cut a piece of 35mm DIN rail (not supplied) to the desired length and secure it to the wall
- Place the IP7-FD onto the DIN rail by tilting the top of the unit (J1, J2, J3 connectors facing up with Volume buttons and USB-B connector facing forward) back towards the DIN Rail until the IP7-FDs DIN clip catches the top of the rail
- Press in at the bottom of the IP7-FD to snap it in place

### *Surface Mounting*

To surface mount:

- Attach the surface mount plate to the back of the unit using the provided screws. The two mounting holes of the surface mount plate should be above the J1, J2, and J3 connectors



- Attach two (2) #8 pan head screws 2 inches (52 mm) apart and screw in to within 1/4"
- Place the mounting holes of the IP7-FD over the #8 screws
- Attach one (1) #8 screw to the remaining hole at the bottom of the mounting plate

## Setting Volume Levels

The IP7-FD supports seven volume levels for an attached speaker.

- Press the "+" or "-" button one time to increase or decrease the speaker volume
- If no audio is playing, a high frequency beep is heard when the volume "+" is pressed and a low frequency beep is heard when the volume "-" is pressed
- Pressing the "-" or "+" button seven times sets the unit at its lowest or highest setting.
- Refer to the software manuals for setting the volume via software.

## **Configuration**

### ***IP Configuration***

Refer to the TalkMaster software manuals for instructions on setting the IP address information for the IP7-FD

### ***Intercom Options***

Refer to the software manuals for instructions on setting the following Intercom options in the IP7-FD:

### **Dry Contact Relay**

Activate **Door Open** via Operator control from the software

Activate on Push-to-Talk (PTT)

Activate on Mic, Speaker or Mic and Speaker

### **Sensor**

Active when Closed to Ground (Door)

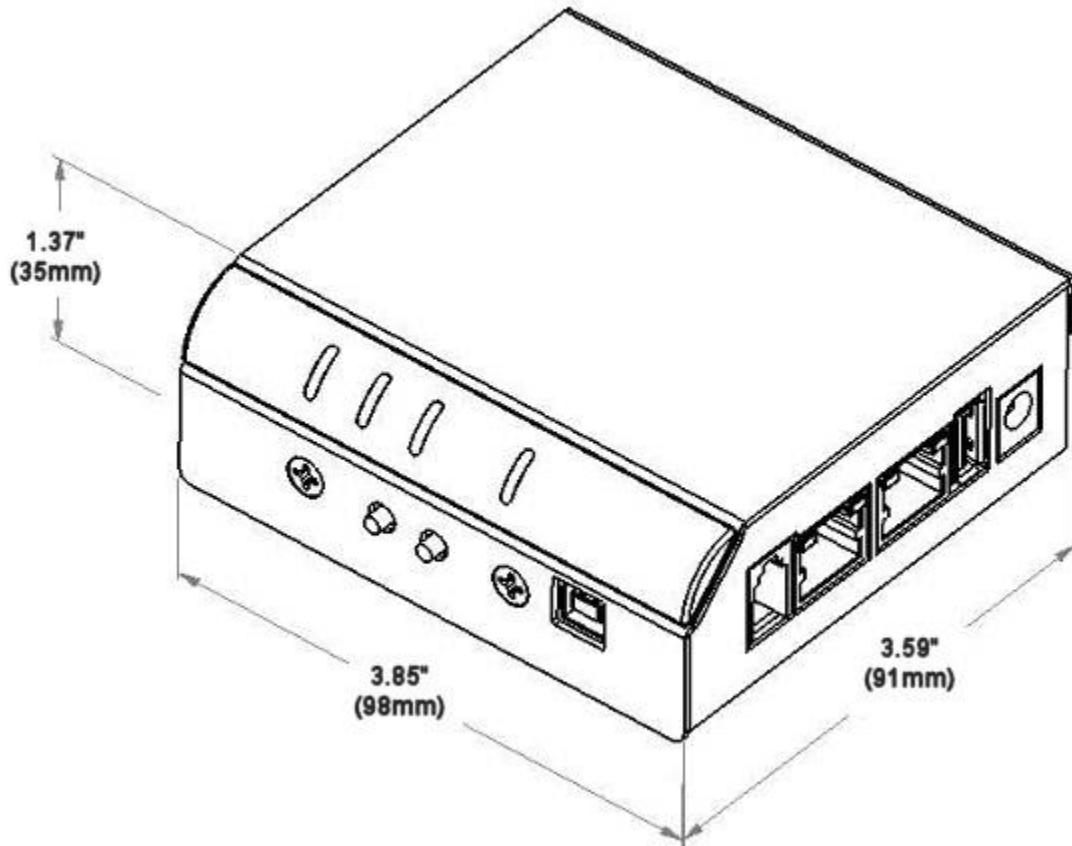
Active when Open to Ground (Door)

Active when Closed to Ground (Custom)

Active when Open to Ground (Custom)

## Physical Dimensions

The IP7-FD dimensions are as follows:



## Environmental

The IP7-FD is designed to operate indoors or in a weather proof box that has a NEMA4 or IP66 rating.

## **Troubleshooting**

Always refer the LED Indicator table when troubleshooting the IP7-FD.

### ***Reset to Factory Defaults***

The IP Address information and all Intercom options can be reset to factory defaults by the following procedure:

- Unplug the Power
- Press and hold the "Vol +" and "Vol -" buttons
- Power the unit
- Wait till the unit plays a 3 tone beep (about 5-8 seconds)
- Release the "Vol +" and "Vol -" buttons
- Refer to the software manuals for instructions on setting the IP address information

### ***Connecting 1/8" (3.5mm) Audio Plug to the Pluggable connectors***

To connect a Mic or Line In to the pluggable connectors via a 1/8" audio plug, the audio plug should be wired as follows:

- The Tip should be wired to positive
- The Sleeve should be wired to minus or ground
- On stereo plugs, the Ring should be left unconnected

### ***Reducing electrical noise in audio***

Improper wiring can cause noisy audio when transmitting microphone audio from the FD. To minimize the possibility of this:

- Locate the unit at least one meter away from transformers, stepper motors or other noise producing equipment
- Use shielded twisted multi-conductor cable for microphone audio and follow the grounding recommendations
- Do not run audio cable in the same conduit with AC power
- Attached J3-7 to an earth ground

### ***Viewing tech support info via the USB port***

If requested by Digital Acoustics Support, a USB cable can be attached to the IP7-FD to capture additional information.

- Attach a USB cable to the USB-B connector on the unit.
- Attach the other end of the cable to a PC running Windows®.
- If an "Install Hardware" prompt is displayed, insert the TalkMaster CD that came with the product and install the USB Virtual Com port.

- Open the Windows Device Manager to determine the virtual Serial port that has been assigned
- Open the Windows® Hyperterm program (or similar terminal emulation program) and set the properties to select the new Serial port with settings of 115kbs, 8,N,1, no flow control and ANSI Terminal
- Press the Enter key
- Provide the requested info to Digital Acoustics Tech support

### ***Low Level Flashing Utility***

If a power is removed from the unit while the firmware is being updated from the network, the unit may require a low level flash.

- Install the SAFMA - Low Level Flashing Utility from the TalkMaster installation CD
- Perform the Phase 1 Reset procedure, followed by the Phase 2 Flashing procedure
- If the Phase 1 Reset Procedure fails:
  - Remove the four screws (two on the front and two on the back)
  - Open the case by pulling up on the side opposite the Volume buttons till the top pops off
  - Connect the USB cable (this will power the unit up)
  - Position the unit with the Vol "+" and Vol "-" buttons facing you
  - Bend a paper clip or piece of wire and insert into the two holes to the right of the Vol "+" and Vol "-" buttons
  - Power cycle the unit by removing and reinserting the USB cable
  - Run the SAFMA utility and perform the Phase 2 Flashing procedure
  - Verify by repowering the IP7

### **Contacting Technical Support**

Information online at [www.digitalacoustics.com](http://www.digitalacoustics.com)

***Email support:***

[esupport@digitalacoustics.com](mailto:esupport@digitalacoustics.com)

## Regulatory Notices

### **Federal Communication Commission Class A Notice**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to **Part 15** of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

In compliance with FCC regulations, the following information is provided on the device or devices covered in this document.

- Product Name: IP7 Series
- Model number: SS20,Sx8,STx,FD
- Company name: Digital Acoustics LLC  
37 Sherwood Terrace  
Lake Bluff, IL 60044  
847-604-9246

### **IC Notice (Canada Only)**

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme **NMB-003** du Canada.



*NOTE: Industry Canada regulations provide that changes or modifications not expressly approved by Digital Acoustics, LLC could void your authority to operate this equipment*

### **CE Notice**

Marking by the symbol **CE** indicates compliance of this equipment to the EMC (Electromagnetic Compatibility) directive of the European Community. Such marking is indicative that this equipment meets or exceeds at least an **EN 55022:2006**

**Class A** device

### **VCCI Compliance**

Class A

### **AS/NZS CISPR22:2006 Compliance**

Class A

### **CNS 13438 Compliance**

Class A

## Index

- Button .....	- 4 - , - 14 -	MIC - .....	- 5 -
+ Button .....	- 4 - , - 14 -	MIC + .....	- 5 -
Aux Power .....	- 4 -	NC .....	- 5 -
CASE .....	- 5 -	NO .....	- 5 -
Common .....	- 5 -	Normally Closed .....	- 5 -
DIN rail mount .....	- 14 -	Normally Open .....	- 5 -
DIN Rail Mounting Clip .....	- 4 -	PoE .....	- 7 -
Earth ground .....	- 5 -	Port 2 10/100 .....	- 4 -
Electret Microphone .....	- 13 -	Power .....	- 5 -
Ethernet 10/100 .....	- 4 -	Power - .....	- 5 -
Ext I/O .....	- 4 -	Relay connector .....	- 12 -
External Power .....	- 7 -	SENSOR .....	- 5 -
GND .....	- 5 -	SPKR 8Ω- .....	- 5 -
Ground .....	- 5 -	SPKR 8Ω+ .....	- 5 -
Intercom Options .....	- 15 -	Surface mount .....	- 14 -
IP Configuration .....	- 15 -	TALK .....	- 5 -
LED .....	- 5 -	Talk connector .....	- 10 -
LED Status .....	- 6 -	USB Power .....	- 7 -
LINE IN .....	- 5 -	USB-B .....	- 4 -
Line In connector .....	- 13 -	Volume .....	- 14 -



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