GAI-TRONICS®

Serverless Page/Party® (SP2)

SP2 Intelligent Intra-Plant Communication and Emergency Notification System

GENERAL

1. GENERAL

a. Scope of Work

Furnish all labor, materials, equipment, and services necessary and required for a complete and operating intelligent (addressable and supervised) communication [and emergency notification] system. Any material not specifically mentioned in this specification or shown on the applicable drawings, but required for proper performance and operation shall be provided.

b. Work Included

Intelligent paging, intercom and alarm system, including controls, software, handset stations, amplifiers, loudspeakers and horns, wiring and all specified and/or required accessories.

c. Seller Warranties

The Seller warrants the satisfactory and successful operation of all equipment furnished under this specification at the ratings, under the conditions, and for the type of service specified herein. Goods manufactured by the seller are warranted to be free from defects in material and workmanship until one year after the date of shipment.

d. Workmanship

All work shall be performed in accordance with the best practice in design, manufacture, and fabrication of all material and apparatus by this specification, notwithstanding any omission from the specifications or drawings.

e. Material and Construction

All materials used in the construction of the apparatus shall be new and selected as the best available for the intended purpose, considering long life and best engineering practices. Factors of safety shall be used throughout the design. Only heavy-duty industrial components rated to operate within the temperature ranges and other environmental conditions specified in section 4.

f. Work Not Covered

1. System installation, including labor and materials.
2. System detail design, including riser diagrams.
3. Fire alarm system, including control panel and alarm initiating devices (detectors, pull stations, flow switches, etc.)
4. Fire alarm system visual indicating devices (strobes.)

g. References

1. National Fire Protection Association (NFPA)
    - NFPA 70 – National Electric Code
2. Occupational Safety and Health Act
3. Underwriters Laboratory (UL)
    - UL 464 – Audible Signal Appliances

- UL 1604 – Electrical Equipment For Use In Class I and II, Division 2 and Class III Hazardous Locations
- UL 1638 – Visual Signaling Appliances

4. Institute of Electrical and Electronics Engineers (IEEE)
   - IEEE 323-2003 Standard For Qualifying Class 1 E Equipment For Nuclear Power Generating Stations
5. Safety Of Life At Sea (SOLAS)
6. American Bureau of Shipping (ABS)
7. American Petroleum Institute (API)

h. Documentation

After award of contract, and at the buyer's request, the seller shall furnish two sets of the following:

1. Installation, Operation and Maintenance literature complete with mounting details and dimensions, installation and connection instructions, operating and maintenance instructions, a list of replacement parts and equipment specifications.
2. Outline and connection drawings.

i. Quality Assurance

1. All work shall be performed in accordance with this specification, applicable drawings and the best practices in design, manufacture and fabrication.
2. The system equipment manufacturer shall be ISO 9001 registered for the design, manufacture, contract installation management and service of industrial intelligent communication [and
emergency notification] systems. The system manufacturer shall have at least 10 years documented experience in the manufacture of similar systems currently demonstrating proven satisfactory service.
3. The system installer shall be a company having the approval of the manufacturer and having at least 5 years documented experience in the installation of similar systems currently demonstrating satisfactory service.

2. SYSTEM OVERVIEW AND ARCHITECTURE

a. Overview

The Serverless Page Party (SP2) system shall consist of intelligent paging amplifier stations, intercom stations and ancillary devices located throughout the facility. All paging amplifier stations and intercom stations shall be arranged in a distributed topography such that loss of a single device will not adversely affect the system as a whole.

The SP2 system shall provide four main functions:

1. PAGE – the ability to make announcements for public address and emergency notification to personnel throughout the facility. The system shall have the ability to be divided into separate paging zones to minimize page traffic. Page zones shall be immediately accessed by means of a selector switch. No keypad call-in shall be required.
2. PARTY – the ability to communicate in a full-duplex manner on an intercom "party" line. All party lines shall be non-private to allow instant conference calls of at least five users. Party lines shall be immediately accessed by means of a selector switch. No keypad call-in shall be required.
3. ALARM – the ability to broadcast messages and process alarms to personnel throughout the facility. There shall be at least 25MB of audio storage available for alarm tones and messages.
   A priority scheme shall be included to ensure that more important alarms override less important alarms.
4. INPUT/OUTPUT (I/O) – the ability to accept contact closure inputs to and provide relay outputs from other systems. Other systems include alarm detection, process control and other communications systems.

SP2 system stations shall be capable of operating as a stand-alone system without the requirement of a head-end central control cabinet.

b. System Architecture

SP2 system stations shall be connected to a standard Ethernet router using standard Ethernet cable or fiber-optic cable in a "star" configuration. Ethernet routers shall be interconnected to provide a network backbone.

3. SYSTEM FEATURES

The system shall have the following features as a minimum:

1. One-way live paging and alarm announcements over system speakers. Pages shall be live to prevent the delay associated with record/play paging. Paging shall be available from any SP2 station.
2. Real-time operation such that page or party line communication is available instantly without delays associated with a SIP server or conference bridge.
3. Handset with pressbar to control Page/Party mode.
4. Five configurable Multicast channels for full-duplex conference speech with Party Line Selector.
5. Eight configurable Multicast channels for paging announcements with Page Line Selector.
6. Automatic Ambient Noise Sensing circuitry to compensate for changing background noise levels at each station.
7. Class D paging amplifiers with a minimum output of 30 watts at 8Ω, or 24 watts at 70/100V.
8. Non-audible self-check of paging amplifiers.

9. Noise-cancelling microphone to enable use in high noise areas.
10. Local speaker to prevent acoustical feedback of live pages.
11. Off-hook and page switch time out function.
12. Distributed amplifier topography such that the loss of a single amplifier shall not adversely affect the system as a whole.
13. Configurable priority scheme to allow more important pages to override less important pages.
14. Interfacing of system to telephone, radio and other audio systems via 600Ω input/output..
15. Station supervision for faults and system activity.
16. Speaker monitoring for cable and voice coil faults.
17. Ability to accept contact inputs.
18. Activation of relay for use with beacons, strobes, etc.
19. Monitoring of contact inputs and relay outputs.
20. Virtual zoning ability.
21. Auxiliary analog (600Ω) audio input with contact closure input.
22. Auxiliary analog (600Ω) audio output with contact closure output.
23. Operation with between 2 and 4096 stations per system.
24. Mutual Configuration Mode to allow easy system deployment.
25. Output of health checks to other devices using SMTP.
26. Configuration storage in non-volatile memory to prevent the need to reprogram after a power failure.

4. ENVIRONMENTAL AND APPROVAL REQUIREMENTS

a. Indoor Safe-area Locations

1. Indoor safe-area equipment shall have a minimum environmental rating of Type 1
2. Operating temperature range shall be +32ºF to + 122ºF with relative humidity of up to 80% (non-condensing)
3. Equipment shall be compliant with the CE Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC amended by the Directive 93/68/EEC.

b. Indoor UL Division 2 Locations

1. Indoor UL Division 2 equipment shall have a minimum environmental rating of Type 1
2. Operating temperature range shall be +32ºF to + 122ºF with relative humidity of up to 80% (non-condensing)
3. Equipment shall be NRTL listed for USA and Canada as follows:

- Class I, Division 2, Groups A, B, C, D
- Class II, Division 2, Groups F, G
- Class III, Division 2
- Temperature code T4

4. Equipment shall also be listed Class I, Zone 2

c. Outdoor (Weatherproof) UL Division 2 Locations

1. Weatherproof UL Division 2 area equipment shall have a minimum environmental rating of Type 3R with door open, Type 4X with door closed.
2. Operating temperature range shall be +32ºF to + 122ºF with relative humidity of up to 80% (non-condensing)
3. Equipment shall be NRTL listed for USA and Canada as follows:
   - Class I, Division 2, Groups A, B, C, D
   - Class II, Division 2, Groups F, G
   - Class III, Division 2
   - Temperature code T4
4. Equipment shall also be listed Class I, Zone 2

d. Hazardous-area UL Division 1 Locations

1. UL Division 1 area equipment shall have a minimum environmental rating of Type 4X
2. Operating temperature range shall be +32ºF to + 122ºF with relative humidity of up to 80% (non-condensing)
3. Equipment shall be NRTL listed for USA and Canada as follows:
   - Class I, Division 1, Groups B, C, D
   - Class II, Division 1, Groups F, G
   - Class III, Division 1
   - Temperature code T6
4. Equipment shall also be listed Class I, Zone

5. POWER REQUIREMENTS

SP2 stations shall operate from one of the following power options:

- 120/230VAC (nominal), 50/60Hz
  - o Maximum current draw shall be 550mA at 120VAC or 350mA at 230VAC.
- 24VDC +/-20%
  - o Maximum current draw shall be 1.95A at 24VDC.
- Power over Ethernet (PoE), IEE 802.23af Class 0
  - o Maximum power consumption shall be 12.95W
  - o Speaker output shall be limited to a maximum of 6W
- Power over Ethernet plus (PoE+), IEE 802.23at Class 4
  - o Maximum power consumption shall be 25.5W

- Speaker output shall be limited to a maximum of 12W

6. SERVERLESS PAGE PARTY (SP2) STATIONS

a. Standard SP2 Station

The standard SP2 station shall be used to produce one-way page announcements over system loudspeakers, support two-way party line communications and reproduce paging audio over attached speakers.

The standard SP2 station shall support contact closure inputs and outputs to/from the system as an optional feature (RTU). The standard SP2 station with RTU option shall feature two configurable dry-contact inputs and one relay output. Relay outputs shall be fused and have load current handling of 1.6A at up to 250VAC.

The standard SP2 station shall be equipped with a 600Ω audio output. This output shall be available to provide audio to an external amplifier. Audio presence shall be indicated to the external amplifier by a contact closure.

The standard SP2 station shall be equipped with a 600Ω audio input. This input shall be available for an external device to introduce audio into the SP2 system per the SP2 station's configuration.

Station health shall be monitored by configuring a standard SP2 station to output to an SMTP device on the network. Health checks shall include the following at a minimum:

1. Station is on-line and functioning normally
2. Handset is on-hook or off-hook
3. Station is in page or party mode
4. Handset integrity
5. Handset amplifier integrity
6. Speaker amplifier integrity
7. Speaker coil and wiring integrity

It shall be possible to install a new standard SP2 station into an existing system without changing the system configuration file.

b. Master SP2 Station

The Master SP2 station shall perform all the same functions as a standard SP2 station. In addition, the Master SP2 station shall be used to maintain the system configuration on behalf of all SP2 stations within a system. The Master station shall also be used by a system administrator or technician to access
the system.

The Master SP2 station shall be identical to a standard SP2 station, but shall be designated as a Master SP2 station by its programmed configuration. Multiple Master SP2 stations may be present in a system to provide backup in the event of a Master SP2 station failure.

7. SERVERLESS PAGE PARTY (SP2) STATION OPTIONS

1. Party Line Switch – this switch (if present) shall select one of five available "Party Line" multicast addresses.
2. Page Zone Switch – this switch (if present) shall select one of five "Page Zone" multicast addresses for the SP2 station to broadcast to. The SP2 station shall continue to receive page broadcasts for the zone(s) that the station belongs to.
3. Remote Terminal Unit (RTU) – this option (if present) shall equip an SP2 station with two configurable dry-contact inputs and one relay output.

8. ANCILLARY DEVICES AND CABLE

a. Voice/Tone Generator

600Ω Voice Tone Generator

A 600 Ω voice/tone generator assembly may be used. The voice/tone generator shall be available with an optional analog telephone interface.

The 600 Ω voice/tone generator and analog telephone interface shall require power input of 12-26V dc. The unit shall be housed in a non-metallic enclosure with non-intrusive mounting holes and measure approximately 9.5 x 13.0 x 4.0 inches (height x width x depth.) The unit shall be suitable for use in indoor safe-area locations.

1. 600 Ω Voice/tone generator:

   The 600 Ω voice/tone generator shall be a self-contained unit and shall be activated by use of dry contacts. It shall provide a supervisory dry contact output upon activation.

   The 600 Ω voice/tone generator shall be configurable by use of a Microsoft Windows compatible software tool. The user shall be able to set all parameters of the unit as well as create and program both tones and speech messages. The unit's configuration shall be stored on a minimum 128mB Compact Flash card.

   The 600 Ω voice/tone generator shall provide a 600Ω/0dBm audio output. The unit shall accept up to eight voltage-free input contacts. These contacts shall be programmed by use of the software tool for either normally open (NO) or normally closed (NC) contacts with either momentary or maintained operation. The user shall be able to configure the priority of the input, the output combination to be initiated by the input and the message to be played by the input.

   The voice/tone generator shall provide 8 voltage-free output contacts. These contacts shall be configured by use of the configuration software tool for maintained, momentary or cycled initiation. The user shall create output combinations that groups outputs and these combinations are mapped to initiate to specific inputs.

   The unit shall include an onboard real-time clock. The clock shall allow the voice/tone generator to play scheduled events at specific times or intervals such as daily, weekly, monthly or specific days or dates. The user shall be able to program up to 29 scheduled

events in addition to the eight input messages.

User controls shall include an LCD display, and scroll up, scroll down, select and enter buttons. The user shall be able to initiate or cancel messages by use of these controls. The LCD shall display current time and indicate current message playing. A microphone input shall be included to allow live speech broadcast form the voice/tone generator.

The voice/tone generator shall include a supervisory output. This output shall remain active (closed) when the unit's processor is healthy. The contact shall be opened if the processor fails.

2. Optional analog telephone interface

An optional analog telephone interface shall be available to allow users to access the system via a telephone network. The analog telephone interface shall auto-answer and may either provide a live audio path to the system or be programmed by the user for record and playback to avoid acoustical feedback.

b. Loudspeakers

1. Weatherproof re-entrant horn and driver loudspeaker

Weatherproof re-entrant horn shall be constructed of spun aluminum with a gray epoxy coating. The horn shall be reflexed, with a minimum air column length of 3.5 feet. Overall length shall not exceed 16 inches, and diameter shall not exceed 21 inches. Dispersion angle shall be 65º nominal, and efficient frequency range shall be at least 440 to 3,400Hz. Sound pressure level shall be at least 120dB at 30W rated power when used with a Class I, Division 2 driver. Threaded throat area to accommodate screw-in driver shall have standard 1⅜ inch - 18 UNEF thread. Horn shall include a U-type mounting bracket. Shipping weight shall not exceed 13 lbs.

Weatherproof re-entrant horn shall be used with either of the following drivers:

- Class I, Division 2 driver:

Class I, Division 2 driver shall be NRTL approved for use in Class I, Division 2 areas. The driver shall have a power handling capacity of 30 watts with a frequency response of 300 to 4,500 Hz. Voice coil shall have an impedance of 8Ω. Sound pressure level shall be 111 dB at 1 watt, 1 meter (swept sine average) when used with a suitable re-entrant horn. Complete housing assembly shall be weatherproof (type 4X) molded black VALOX equipped with standard 1⅜ inch - 18 UNEF threads for screw-in connection to horn. An electro-formed metal mesh screen shall be integral in the throat of unit to prevent the entrance of foreign particles. Electrical connections shall be made to a 3-foot cable pre-connected to the driver. Dimensions of unit shall not exceed 5 inches in diameter and 5.5 inches in length. Shipping weight shall not exceed 3.1 lbs.

- Class I, Division 1 driver:

Class I, Division 1 driver shall be NRTL approved for use in Class I, Division 1, Groups B, C and D areas. The driver shall have a power handling capacity of 30 watts with a frequency response of 320 to 3,580 Hz. Voice coil shall have an impedance of 16Ω. Sound pressure

level shall be 110 dB at 1 watt, 1 meter (swept sine average) when used with a suitable re-entrant horn. Case shall be heavy die-cast aluminum, epoxy coated with standard 1⅜ inch - 18 UNEF threads for screw-in connection to horn. Rear of case shall be made removable to facilitate wiring and provisions made for connection of standard ½ inch pipe conduit. Dimensions of unit shall not exceed 8.0 inches in diameter and 9.0 inches in length. Shipping weight shall not exceed 12.8 lbs.

2. Class I Division 2 integral driver horn loudspeaker

   Class I, Division 2 integral driver loudspeaker shall be NTRL approved for use in Class I, Division 2 areas. The loudspeaker shall have a power handling capacity of 25 watts with a frequency response of 300 to 8,000 Hz. Voice coil shall have an impedance of 8Ω. Sound pressure level shall be 111 dB at 1 watt, 1 meter (pink noise). Housing assembly shall be weatherproof (type 4X) molded black UL94VO PPS and ABS with a single ½ inch NPT cable gland entry. Electrical connections shall be made to a terminal block located within the loudspeaker. Dimensions of unit shall not exceed 9 inches in diameter and 13 inches in length. Shipping weight shall not exceed 6 lbs.

3. Safe area integral driver horn loudspeaker

   Safe area integral driver loudspeaker shall have a power handling capacity of 30 watts with a frequency response of 310 to 8,000 Hz. Voice coil shall have an impedance of 8Ω. Sound pressure level shall be 110 dB at 1 watt, 1 meter. Housing assembly shall be weatherproof (IP67) molded gray polycarbonate with two cable gland entries. Electrical connections shall be made to internal screw terminals. Dimensions of unit shall not exceed 9.5 inches in diameter and 11.25 inches in length. Shipping weight shall not exceed 5.0 lbs.

4. Safe area cabinet loudspeaker

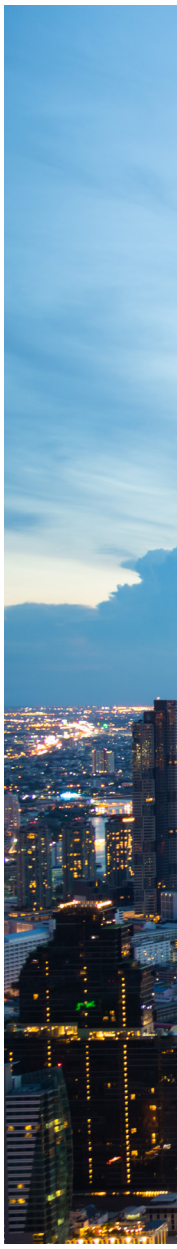
   Safe area cabinet loudspeaker shall have a power handling capacity of 6 watts with a frequency response of 320 to 11,500 Hz. Voice coil shall have an impedance of 8Ω. Sound pressure level shall be 97 dB at 1 watt, 1 meter. Housing assembly shall be molded gray ABS. Electrical connections shall be made to internal spring clamp terminals. Dimensions of unit shall not exceed 8.5 x 8.5 x 3.0 inches (height x width x depth.) Shipping weight shall not exceed 2.7 lbs.

5. Safe area ceiling loudspeaker

   Safe area ceiling loudspeaker shall have a power handling capacity of 6 watts with a frequency response of 210 to 8,100 Hz. Voice coil shall have an impedance of 8Ω. Sound pressure level shall be 90 dB at 1 watt, 1 meter. Housing assembly shall be molded ABS. Electrical connections shall be made to internal spring clamp terminals. Dimensions of unit shall not exceed 9.5 inches in diameter and 5.0 inches in depth. Shipping weight shall not exceed 3.3 lbs.

c. Ethernet cable

Ethernet cable shall be CAT5 or better. Cable shall be terminated at the station using screw connectors.



GAI-TRONICS USA
3030 Kutztown Road, Reading, PA 19605 USA
1-800-492-1200 | 1-610-777-1374 | GTCsales@gai-tronics.com

GAI-TRONICS UK
Brunel, Stretton Park, Burton Upon Trent, Staffordshire, DE13 OBZ, UK
+44 (0)1283 500500 | sales@gai-tronics.co.uk

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