



VS-900
Security Intercom Systems

**Architectural and Engineering
Specification**

1	GENERAL	4
1.1	MANUFACTURER	4
1.2	CONTRACTOR	4
1.3	QUALIFICATIONS.....	4
1.4	STANDARD PRODUCTS.....	4
1.5	SERVICE FACILITIES.....	4
1.6	AGENCY APPROVALS.....	4
2	SYSTEM CONFIGURATION AND COMPONENTS.....	5
2.1	SYSTEM DESCRIPTION	5
2.2	SYSTEM STATION CAPACITY	5
2.3	STATION EQUIPMENT.....	5
2.3.1	DESKTOP/WALL-MOUNT MASTER STATION	5
2.3.2	TELEPHONE MASTER STATION.....	5
2.3.3	ECONOMY SUB-STATION	6
2.3.4	INDOOR SUB-STATION.....	6
2.3.5	OUTDOOR SUB-STATION.....	6
2.3.6	PANIC SUB-STATION	7
2.4	EXCHANGE COMPONENTS	8
2.4.1	EXCHANGE MAINFRAME	8
2.4.2	POWER SUPPLY UNIT	8
2.4.3	MASTER STATION LINE CARD	8
2.4.4	TELEPHONE MASTER STATION LINE CARD	9
2.4.5	SUB-STATION LINE CARD.....	9
2.4.6	C/O TELEPHONE LINE CARD.....	9
2.4.7	AUDIO FUNCTION CARD	9
2.4.8	TIE-LINE INTERFACE CARD.....	10
2.4.9	SITE CONNECTOR TIE-LINE INTERFACE.....	10
2.5	PERIPHERAL COMPONENTS	10
2.5.1	DIRECT SELECT INTERFACE	10
2.5.2	DIRECT SELECT I/O (INPUT/OUTPUT) CARD.....	11
2.5.3	DIRECT SELECT POWER SUPPLY	11
2.6	REMOTE CONTROL AND MONITORING	11
3	SYSTEM FUNCTIONS.....	12
3.1	STATION COMMUNICATION.....	12
3.1.1	SUB-STATION TO MASTER STATION (OR TELEPHONE MASTER STATION)..	12
3.1.2	MASTER STATION (OR TELEPHONE MASTER STATION) TO SUB-STATION..	12
3.1.3	MASTER STATION TO MASTER STATION (OR TELEPHONE MASTER STATION).....	12
3.2	CALL-IN TIME-OUT	12
3.3	CONVERSATION TIME-OUT	12
3.4	CONVERSATION MODES.....	12
3.4.1	FULL-DUPLEX.....	13

3.4.2	VOICE-OPERATED (VOX) SWITCHING (HALF-DUPLEX)	13
3.4.3	"PRESS-TO-TALK" (PTT) CONTROL	13
3.5	CALLING PARTY DISPLAY	13
3.6	SUB-STATION PRIORITY LEVEL	13
3.7	SELECTIVE RESPONSE/CALL QUEUE	13
3.8	AUTO-DIAL	13
3.9	REDIAL	13
3.10	CAMP-ON-BUSY	14
3.11	GROUP CALL	14
3.12	CALL TRANSFER	14
3.13	CALL HOLD	14
3.14	CALL FORWARDING	14
3.14.1	MANUAL CALL FORWARDING	14
3.14.2	REMOTE CALL FORWARDING (CALL CAPTURE)	14
3.14.3	TIME-BASED CALL FORWARDING	14
3.14.4	OUTSIDE TELEPHONE LINE CALL FORWARDING	15
3.14.5	TIME-BASED OUTSIDE TELEPHONE LINE CALL FORWARDING	15
3.14.6	NO-ANSWER CALL FORWARDING	15
3.14.7	BUSY CALL FORWARDING	15
3.15	SCAN MONITOR	15
3.16	CONFERENCE	16
3.17	EMERGENCY CONFERENCE	16
3.18	PAGING	16
3.18.1	ZONE PAGING	16
3.18.2	ALL-ZONE PAGING	16
3.18.3	EMERGENCY PAGING	16
3.18.4	BROADCAST PRIORITY	16
3.18.5	PAGING TIME-OUT	16
3.19	EXTERNAL SOURCE DISTRIBUTION	17
3.20	TELEPHONE LINE FUNCTIONS	17
3.20.1	OUTGOING TELEPHONE CALLS	17
3.20.2	INCOMING OUTSIDE TELEPHONE LINE CALLS (DIRECT-IN LINE)	17
3.20.3	INCOMING OUTSIDE TELEPHONE LINE CALLS (DIRECT-IN DIALING)	17
3.20.4	OUTSIDE TELEPHONE LINE CONNECTION TIME-OUT	17
3.20.5	OUTSIDE TELEPHONE LINE CALL FORWARDING	17
3.20.6	TIME-BASED OUTSIDE TELEPHONE LINE CALL FORWARDING	17
3.21	CONVERSATION RECORDING	18

1 GENERAL

1.1 MANUFACTURER

The manufacturer shall have been in the business of manufacturing microprocessor-based communication systems for more than ten years, and shall provide a minimum of two years limited warranty to the authorized installing dealer.

1.2 CONTRACTOR

The contractor shall only submit products for which they are factory authorized to sell, install and service. The contractor shall furnish all equipment, accessories and material. This shall be done in strict accordance with specifications and applicable drawings as required for a complete and working solid state microprocessor-based intercom system. All material and/or equipment necessary for proper operation of the system not specified or described herein shall be deemed part of the specifications.

1.3 QUALIFICATIONS

Any system substitution proposed as an equal to that herein specified shall be proven to be such by the contractor. The contractor shall send the name and model numbers of substitute equipment and material together with three copies of specifications and dimensional drawings to the architect no less than _____ days prior to the bid date. The contractor shall obtain the architect's approval in writing, by addendum, prior to bid date.

1.4 STANDARD PRODUCTS

The equipment furnished under this specification shall be equal in every way to that manufactured by TOA Electronics Inc. Catalog and model numbers are intended to indicate type and quality of design and material, as well as exact operating features. All equipment shall be designed by the manufacturer to operate as a complete system, and shall be accompanied by the manufacturer's complete installation and operating instructions. Contractor shall provide drawings showing all system interconnections and programming documentation.

1.5 SERVICE FACILITIES

The contractor shall make available to the purchaser a service department for the manufacturer's equipment. This contractor shall stock the manufacturer's components and shall provide maintenance during normal working hours at no cost to the purchaser for the warranty period of ____ years. Damage caused by misuse, abuse or accident is exempt from this warranty. On-site service provided outside of normal working hours shall be available at the prevailing overtime labor rate.

1.6 AGENCY APPROVALS

The security intercom system shall be listed under UL-1950 and manufactured to ISO-9001 standards.

2 SYSTEM CONFIGURATION AND COMPONENTS

2.1 SYSTEM DESCRIPTION

The security intercom system shall be designed for security applications and provide reliable and intelligible voice communication between Master Stations, Telephone Master Stations and Sub-stations. A Master Station shall be defined as a station that can selectively dial any other Master Station or Sub-station in the system. A Telephone Master Station shall be defined as a single line telephone with Caller-ID used as a limited-function Master Station to selectively dial any other Master Station or Sub-station in the system. A Sub-station shall be defined as a station that calls in to a pre-programmed Master Station or group of Master Stations by pressing and releasing a call button.

2.2 SYSTEM STATION CAPACITY

The security intercom system exchange mainframe shall be modular, expandable for optimum station configuration and capable of future expansion by adding additional station line cards and/or exchanges as required. Each exchange mainframe shall be capable of supporting a maximum configuration of four (4) Master Stations or Telephone Master Stations and sixty-four (64) Sub-stations or a minimum configuration of two (2) Master Stations or Telephone Master Stations and sixteen (16) Sub-stations. Optional tie-line cards shall allow interconnection of up to sixteen exchange mainframes for a maximum system capacity of sixty-four (64) Master Stations or Telephone Master Stations and one thousand and twenty-four (1024) Sub-stations.

2.3 STATION EQUIPMENT

2.3.1 DESKTOP/WALL-MOUNT MASTER STATION

The Master Station shall support duplex, half-duplex and Press-To-Talk (PTT) communication modes, depending on the conversation partner and hook-switch status. The Master Station shall be exclusively powered by the Master Station Line Card port. Specifications shall include a handset and hook-switch, hands-free microphone, electret condenser type and station speaker, dynamic type, 8 ohms, 2.24" (57 mm), 0.6 W with high/low volume switch. The Master Station shall have an in-use lamp, handset speaker volume control (0 to +12 dB) and station number directory. The Master Station shall also have external speaker output, 8 ohms, 0.6 W, with screw terminal connector. The Master Station keypad shall utilize membrane-type switches and include numeric [0-9], [*], [#], [PTT], [Cancel], [Redial], [Transfer] keys and eight user-programmable Auto-Dial keys. A 12 digit LCD shall provide alphanumeric station number and priority status, function and digital clock indication. The Master Station shall be suitable for desktop use or wall-mounting with an included bracket. The operating temperature range shall be 32 to 104 degrees F (0 to 40 degrees C). Finish shall be ABS resin, pale white with dimensions (W x H x D) of 8.50" x 2.93" x 8.39" (216 x 74.5 x 213 mm) and weight of 2.07 lbs. (940 g).

Each Master Station shall have an integral 6-position 4-contact RJ11-type modular telephone jack and connect to a unique Master Station Line Card port with one twisted two pair cable with maximum service distance as follows: #20 AWG: 7546 ft./1.43 mile (2.3 km); #22 AWG: 4921 ft./0.93 mile (1.5 km); #24 AWG: 2953 ft./0.56 mile (0.9km).

The Desktop/Wall-Mount Master Station shall be the TOA MS-900.

2.3.2 TELEPHONE MASTER STATION

The security intercom system shall provide direct connection capability with standard DTMF-type analog telephones with caller-ID conforming to FCC Part #68 as limited function Master Stations referred to within this specification as "Telephone Master Stations". The security intercom system shall support Caller-ID signaling and provide alphanumeric station number indication. The Telephone Master Station shall support duplex and half-duplex communication modes,

depending on the conversation partner. Each Telephone Master Station shall connect to a unique Telephone Master Station Line Card port with a single twisted pair cable with total loop resistance, including telephone, to be no greater than 500 ohms.

The Telephone Master Station shall be the (insert preferred manufacturer and model here)

2.3.3 ECONOMY SUB-STATION

The Economy Sub-station shall include a heavy-duty faceplate, momentary-action call switch, loudspeaker and matching transformer. The faceplate shall be brushed stainless steel, #14 gauge. Pushing and releasing the sub-station's call button shall initiate call-in to a pre-programmed Master Station, Telephone Master Station or Master Station Group. The loudspeaker shall have a 1.57" (4 cm) Mylar cone with a frequency response of 300 Hz to 4 kHz. The output sound pressure level at a distance of 1 meter with 1 W of input power applied shall be 82 dB SPL. The matching transformer shall be rated at 1 W at 25 V line with rated primary impedance of 625 ohms. The sub-station shall mount to a two-gang electrical box with adapter ring using included #6-32 nickel-plated steel, slotted, oval head mounting screws. The faceplate dimensions shall be 4.72" x 4.72" (120 mm x 120 mm). The sub-station shall maintain reliable operation in the ambient temperature range of +14 to +122 degrees F (-10 to +50 degrees C). The sub-station shall weigh 0.90 lb. (410 g)

Each Sub-station shall connect to a unique Sub-station Line Card port with a single, shielded, twisted pair cable with maximum service distance as follows: #20 AWG: 4265 ft./0.81 miles (1.3 km); #22 AWG: 2625 ft./0.5 miles (0.8 km); #24 AWG: 1,640 ft./0.31 miles (0.5 km). Systems requiring more than one shielded, twisted pair cable for each Sub-station shall not be acceptable.

The security intercom sub-station shall be the TOA model RS-150.

2.3.4 INDOOR SUB-STATION

The Indoor Sub-station shall include a heavy-duty faceplate, momentary-action call switch, loudspeaker and matching transformer. The faceplate shall be brushed stainless steel, #11 gauge. The call switch shall be vandal-resistant. Pushing and releasing the sub-station's call button shall initiate call-in to a pre-programmed Master Station, Telephone Master Station or Master Station Group. The loudspeaker shall have a 1.57" (4 cm) Mylar cone with a frequency response of 300 Hz to 4 kHz. The output sound pressure level at a distance of 1 meter with 1 W of input power applied shall be 82 dB SPL. The matching transformer shall be rated at 1 W at 25 V line with rated primary impedance of 625 ohms. The sub-station shall mount to a two-gang electrical box with adapter ring using included #6-32 nickel-plated steel, slotted, oval head mounting screws. The faceplate dimensions shall be 4.72" x 4.72" (120 mm x 120 mm). The sub-station shall maintain reliable operation in the ambient temperature range of +14 to +131 degrees F (-10 to +55 degrees C). The sub-station shall weigh 1.19 lb. (540 g).

Each Sub-station shall connect to a unique Sub-station Line Card port with a single, shielded, twisted pair cable with maximum service distance as follows: #20 AWG: 4265 ft./0.81 miles (1.3 km); #22 AWG: 2625 ft./0.5 miles (0.8 km); #24 AWG: 1,640 ft./0.31 miles (0.5 km). Systems requiring more than one shielded, twisted pair cable for each Sub-station shall not be acceptable.

The security intercom sub-station shall be the TOA model RS-160.

2.3.5 OUTDOOR SUB-STATION

The Outdoor Sub-station shall include a heavy-duty faceplate, momentary-action call switch, loudspeaker and matching transformer. The faceplate shall be brushed stainless steel, #11 gauge. The call switch shall be vandal-resistant. Pushing and releasing the sub-station's call button shall initiate call-in to a pre-programmed Master Station, Telephone Master Station or Master Station Group. The loudspeaker shall have a 1.57" (4 cm) Mylar cone with a frequency response of 300 Hz to 4 kHz. The output sound pressure level at a distance of 1 meter with 1 W of input power applied shall be 82 dB SPL. The matching transformer shall be rated at 1 W at 25

V line with rated primary impedance of 625 ohms. The sub-station shall be weather-resistant for use in outdoor applications. The sub-station shall mount to a two-gang electrical box with adapter ring using included #6-32 nickel-plated steel, slotted, oval head mounting screws. The faceplate dimensions shall be 4.72" x 4.72" (120 mm x 120 mm). The sub-station shall maintain reliable operation in the ambient temperature range of +14 to +131 degrees F (-10 to +55 degrees C). The sub-station shall weigh 1.19 lb. (540 g).

Each Sub-station shall connect to a unique Sub-station Line Card port with a single, shielded, twisted pair cable with maximum service distance as follows: #20 AWG: 4265 ft./0.81 miles (1.3 km); #22 AWG: 2625 ft./0.5 miles (0.8 km); #24 AWG: 1,640 ft./0.31 miles (0.5 km). Systems requiring more than one shielded, twisted pair cable for each Sub-station shall not be acceptable.

The security intercom sub-station shall be the TOA model RS-170.

2.3.6 PANIC SUB-STATION

The Panic Sub-station shall include a heavy-duty faceplate, momentary-action call switch, loudspeaker and matching transformer. The faceplate shall be brushed stainless steel, #11 gauge. The call switch shall be vandal-resistant and shall include a red push button. Pushing and releasing the sub-station's call button shall initiate call-in to a pre-programmed Master Station, Telephone Master Station or Master Station Group. The loudspeaker shall have a 1.57" (4 cm) Mylar cone with a frequency response of 300 Hz to 4 kHz. The output sound pressure level at a distance of 1 meter with 1 W of input power applied shall be 82 dB SPL. The matching transformer shall be rated at 1 W at 25 V line with rated primary impedance of 625 ohms. The sub-station shall include a red call LED that flashes immediately after pushing the call button and lights continuously during conversation. A control output, 30 mA, 24 VDC, open-collector type, shall activate immediately after pushing call button and remain active until call is cancelled. The sub-station shall be weather-resistant for use in outdoor applications. The sub-station shall mount to a two-gang electrical box with adapter ring using included #6-32 nickel-plated steel, slotted, oval head mounting screws. The faceplate dimensions shall be 4.72" x 4.72" (120 mm x 120 mm). The sub-station shall maintain reliable operation in the ambient temperature range of +14 to +131 degrees F (-10 to +55 degrees C). The sub-station shall weigh 1.26 lb. (570 g).

Each Sub-station shall connect to a unique Sub-station Line Card port with a single, shielded, twisted pair cable with maximum service distance as follows: #20 AWG: 4265 ft./0.81 miles (1.3 km); #22 AWG: 2625 ft./0.5 miles (0.8 km); #24 AWG: 1,640 ft./0.31 miles (0.5 km). Systems requiring more than one shielded, twisted pair cable for each Sub-station shall not be acceptable.

The security intercom sub-station shall be the TOA model RS-180.

2.4 EXCHANGE COMPONENTS

2.4.1 EXCHANGE MAINFRAME

The Exchange Mainframe shall be modular and support up to four (4) Master Stations or Telephone Master Stations and sixty-four (64) Sub-stations. Each mainframe shall have the capacity to accept two Master Station or Telephone Master Station Line Cards, four Sub-station Line Cards, one C/O Telephone Line Interface Card, one Audio Function Card and one Tie-Line Interface Card. All system cards shall have removable terminal blocks for solderless wiring terminations.

The Exchange Mainframe shall require up to two external Power Supply Units with a maximum current consumption of 7 A. A 24 VDC input shall be available for use with a backup power supply to maintain operating capability in the event of AC Mains power failure. The Exchange Mainframe shall have a Power ON/OFF switch and LED's for Power and Status indication. System cards shall connect to an integral backplane motherboard with onboard microprocessor, real-time clock and an internal power supply board with field-replaceable fuses. The speech path configuration shall be a time sharing switch with twelve types of internal sound sources. System programming shall be performed exclusively with an external computer and all parameters shall be stored in EEPROM. Systems requiring a backup battery for programming data storage shall not be acceptable. Two RS-232C ports, D-sub connector, 9-pin, female shall be available for separate programming and data logging connections.

Operating temperature range shall be +32 to +104 degrees F (0 to +40 degrees C). The enclosure finish shall be pre-coated steel plate, black, and 30% gloss. Dimensions (W x H x D), excluding the rack mounting bracket, shall be 16.54" x 17.47" x 11.35" (420 x 443.7 x 288.3 mm) and weight shall be 28 lbs. (12.7 kg). The exchange mainframe shall be rack-mountable and occupy (10) EIA 19" rack spaces. An accessory wall-mount bracket shall be available with material and finish steel, black, electrode position paint with dimensions (W x H x D) of 15.41" x 17.32" X 2.28" (391.4 x 440 x 58 mm) and weight of 4.63 lbs. (2.1 kg). System programming software, installation/operators manuals shall be included with each mainframe.

The Exchange Mainframe shall be the TOA VS-900MF.
The Exchange Wall-Mount Bracket shall be the TOA YC-303.

2.4.2 POWER SUPPLY UNIT

The Power Supply Unit shall provide two 20 VAC, 2 A AC outputs to the Exchange Mainframe and support a maximum of 2 Sub-station Line Cards. The AC mains power requirements shall be 110/120 VAC, 50/60 Hz. An optional rack-mount panel shall allow side-by-side rack mounting of two Power Supply Units and occupy four (4) EIA 19" rack spaces. The material and finish shall be steel plate with ivory color with dimensions (W x H x D) of 6.30" x 2.68" x 7.01" (160 x 68 x 178 mm) and weight of 6.17 lbs. (2.8 kg).

The Power Supply Unit shall be the TOA PU-200.
The Rack Mount Panel shall be the TOA PN-100B.

2.4.3 MASTER STATION LINE CARD

The Master Station Line Card shall be powered by the Exchange Mainframe and provide connection ports for two Master Stations. Each Master Station port shall have an associated recording output, 0 dBV, unbalanced and a control activation port, open collector, 24 VDC maximum, 20 mA. Control activation shall occur immediately after communication has been established and deactivate immediately after communication has been terminated.

Each Master Station shall connect to a unique Master Station Line Card port with a single twisted two pair cable with the following wire gauges and maximum service distances: #20 AWG: 7546

ft./1.43 mile (2.3 km); #22 AWG: 4921 ft./0.93 mile (1.5 km); #24 AWG: 2953 ft./0.56 mile (0.9km).

The Master Station Line Card shall be the TOA VS-900MS.

2.4.4 TELEPHONE MASTER STATION LINE CARD

The Telephone Master Station Line Card shall be powered by the Exchange Mainframe and provide connection ports for two DTMF-based analog telephones designed in compliance with FCC Part 68 with support for Caller-ID signaling. Each Telephone Master Station port shall have an associated recording output, 0 dBV, unbalanced and a control activation port, open collector, 24 VDC maximum, 20 mA. Control activation shall occur immediately after communication has been established and deactivate immediately after communication has been terminated.

Each Telephone Master Station shall connect to a unique Telephone Master Station Line Card port with a single twisted pair cable with total loop resistance, including telephone, to be no greater than 500 ohms.

The Telephone Master Station Line Card shall be the TOA VS-900AL.

2.4.5 SUB-STATION LINE CARD

The Sub-station Line Card shall be powered by the Exchange Mainframe and provide connection ports for sixteen Sub-stations. Two links: one voice link and one voice/paging link shall allow two simultaneous conversations or one conversation and one paging function. Conversation method shall be half-duplex by voice-operated switch controlled by the Master Station or Telephone Master Station and simplex conversation by PTT switch controlled by the Master Station. The combined maximum power output shall be 6 W at 25 V line. A paging output, unbalanced, -20 dBV and paging input, balanced, 25 V line, 30 W maximum shall allow connection of an external amplifier for sub-station paging.

Each Sub-station shall connect to a unique Sub-station Line Card port with a single, shielded, twisted pair cable with the following wire gauges and maximum service distances: #20 AWG: 4265 ft./0.81 miles (1.3 km); #22 AWG: 2625 ft./0.5 miles (0.8 km); #24 AWG: 1,640 ft./0.31 miles (0.5 km).

The Sub-station Line Card shall be the TOA VS-900RS.

2.4.6 C/O TELEPHONE LINE CARD

The Outside Telephone Line Card shall be powered by the Exchange Mainframe and provide connection ports for two outside telephone lines or trunks in compliance with FCC Part 68 regulations. The C/O Telephone Line Card shall be compatible with both loop and ground start systems and use DTMF dialing. Each telephone line port shall have an associated recording output, 0 dBV, unbalanced and a control activation port, open collector, 24 VDC maximum, 20 mA. Control activation shall occur immediately after communication has been established and deactivate immediately after communication has been terminated.

The C/O Telephone Line Card shall be the TOA VS-900CO.

2.4.7 AUDIO FUNCTION CARD

The Audio Function Card shall be powered by the Exchange Mainframe and provide the following: one paging line output, 0 dBV, unbalanced with sixteen associated open collector control outputs, 24 VDC maximum, 20 mA; one line input for external source distribution, 0 dBV, unbalanced with four associated trigger inputs, no-voltage make contact, open voltage: 24 VDC, short circuit current: 20 mA; and one Conference/Emergency Conference link to allow simultaneous communication/conversation between multiple Master Stations and/or Telephone Master Stations.

The Audio Function Card shall be the TOA VS-900AF.

2.4.8 TIE-LINE INTERFACE CARD

The Tie-Line Card shall be powered by the Exchange Mainframe and allow interconnection of up to sixteen exchanges in a multi-drop or “bussed” configuration. Systems requiring a closed loop among multiple exchanges shall not be acceptable. User-dialed key sequences required for inter-exchange calling and paging shall be identical to those used for intra-exchange calling and paging. The Tie-Line Interface shall provide four voice links, 0 dBu, balanced two, twisted pair cable each and data control, RS-485, shielded, twisted pair cable, shared among the tie-lined exchanges. The maximum service distance (total bus length) shall be as follows: #20 AWG: 4,921 ft./0.93 mile (1.5 km); #22 AWG: 3,281 ft./0.62 mile (1 km); #24 AWG: 1,969 ft./0.37 mile (0.6 km). It shall be possible to convert the voice paths to fixed-direction (send and receive) to accommodate standard audio media converters and the Site Connector Tie-Line Interface.

The Tie Line Interface Card shall be the TOA VS-900TI.

2.4.9 SITE CONNECTOR TIE-LINE INTERFACE

The Site Connector Tie-Line Interface shall allow the interconnection of multiple exchanges with standard audio fiber interfaces or other media converters by combining up to four voice links from two Exchange Mainframe Tie-Line Interface Cards. The Site Connector Tie-Line Interface shall require an external 20 VAC Power Supply Unit (see section 2.4.2) and occupy (2) EIA 19” rack spaces.

The Site Connector Tie-line Interface shall be the TOA VS-900SC.

2.5 PERIPHERAL COMPONENTS

2.5.1 DIRECT SELECT INTERFACE

The Direct Select Interface (DSI) Card shall connect between each Master Station and associated Master Station Line Card port and support up to thirty-two (32) Direct Select I/O (DSIO) Cards. The maximum number of DSI Cards shall be four (4) per exchange and (64) per system (16 tie-lined exchanges). The DSI Card shall require an external 24 VDC/1 A power supply.

The DSI Card shall provide headset, microphone input, speaker output and key inputs. A Master Station shall not be required to utilize the DSI Card’s headset, microphone input, speaker output and key inputs.

The headset interface shall have adjustable microphone sensitivity from -75 to -65 dBV, defeatable 5 VDC phantom power and support speaker impedance of 200 to 400 ohms with adjustable speaker volume. A detection jack contact input, 5 VDC/10 mA, contact resistance less than 10 ohms shall be available to support headset activation.

The microphone input shall have adjustable microphone sensitivity from -75 to -65 dBV with a defeatable 5 VDC phantom power supply. The speaker output shall provide one Watt power output into an eight ohm speaker load with adjustable speaker volume.

The function key inputs shall allow contact closure activation of the equivalent to the Master Station [C], [PTT], and [Transfer] key functions as well as a [Test] key input for activating and testing all of the connected DSIO Card outputs. The key inputs shall be activated with a dry contact switch closure with a rating of 5 VDC/0.5 mA and contact resistance of less than 50 ohms. An In-use Indication Output shall be available general purpose control, open collector type, 24 VDC/100 mA.

The Direct Select Interface Card shall include an RS-232C D-sub connector, 9-pin, female for programming the connected Direct Select I/O Card(s). The DSI shall include an integral 6-position 4-contact RJ11-type modular plug and connect to the Master Station port with twisted pair cable. When using the Master Station, the maximum cable distance shall be the total connected distance from the exchange to the Master Station via the VS-900DI and shall be #20 AWG: 7546 ft./1.43 mile (2.3 km); #22 AWG: 4921 ft./0.93 mile (1.5 km); #24 AWG: 2953 ft./0.56 mile (0.9km).

The Direct Select Interface Card shall be the TOA VS-900DI.

2.5.2 DIRECT SELECT I/O (INPUT/OUTPUT) CARD

The Direct Select I/O (DSIO) Card shall connect to the Direct Select Interface Card and provide 32 sets of I/O connections. Each I/O set shall include a relay, call LED driver and direct select input. System programming shall allow the user to associate each I/O set with a Master Station or Sub-station. The Direct Select Interface Card shall support a maximum of thirty-two (32) DSIO Cards. Each relay shall be normally-open type with contact capacity of 24 V DC/1 A. System programming shall allow global configuration of the relay activation mode as call-in or answer-activated. Each Call LED output (for LED indication of incoming and outgoing calls) shall be open collector-type, 24 V DC/100 mA. A current limiting resistor shall be required in series with each LED. Each Direct Select Input contact (for calling and response switch operation) shall be activated with a dry contact switch closure with a rating of 5 VDC/0.5 mA and contact resistance of less than 50 ohms. The DSIO Card shall require an external 24 VDC/1 A power supply. Each type of I/O shall require a 50-position "CHAMP" IDC type (Amphenol type) connector.

The Direct Select I/O Card shall be the TOA VS-910DI.

2.5.3 DIRECT SELECT POWER SUPPLY

The Direct Select Power Supply shall provide 24 VDC with rated 3 A current capacity to support one Direct Select Interface Card and two Direct Select I/O Cards.

The Direct Select Power Supply shall be the TOA XPS-24VS.

2.6 REMOTE CONTROL AND MONITORING

The security intercom system shall allow external remote control and monitoring of intercom system functions through the exchange mainframe serial port. The intercom manufacturer shall provide a serial communication protocol document. The installing contractor shall be solely responsible for the correct operation and performance of the security intercom system and all external equipment connected to the intercom system.

3 SYSTEM FUNCTIONS

Note: "Master Station" refers to proprietary system master station. "Telephone Master Station" refers to a single line telephone used as a limited-function Master Station. "Telephone Line" refers to outside telephone line communication.

3.1 STATION COMMUNICATION

3.1.1 SUB-STATION TO MASTER STATION (OR TELEPHONE MASTER STATION)

Sub-station call-in to a pre-assigned Master Station (or group of Master Stations) shall be activated by pushing and releasing the Sub-station call button. A brief call tone shall sound at the Sub-station to alert the caller when the call has been answered. Communication shall be hands-free at the Sub-station location. Sub-stations equipped with a call lamp shall flash the call lamp on and off immediately after call initiation. When the call is answered, the call lamp mode shall change from flashing to steady-on state. After the call is terminated, the call lamp shall revert back to the off state.

3.1.2 MASTER STATION (OR TELEPHONE MASTER STATION) TO SUB-STATION

Calling a Sub-station from a Master Station shall be accomplished by dialing the desired Sub-station number either with the handset on-hook or off-hook. Calling a Sub-station from a Master Station shall activate a brief tone at the Sub-station after which the calling party's voice may be heard and communication may commence. Sub-stations equipped with a call lamp shall light to steady-on state. Following a brief call tone, the Master Station shall be automatically connected to the Sub-station. The Master Station's voice shall be heard at the Sub-station while the Master Station operator is talking, and the Sub-station's voice shall only be heard at the Master Station when the Master Station operator stops talking. To terminate the conversation, the Master Station shall replace the handset or press the [C] key, which will also change the Sub-station call lamp to the off-state.

3.1.3 MASTER STATION TO MASTER STATION (OR TELEPHONE MASTER STATION)

Calling a Master Station or Telephone Master Station from a Master Station or Telephone Master Station shall be accomplished by dialing the desired station number either with the handset on-hook or off-hook. A trill call tone shall be heard at the calling station handset or from the station's internal speaker if dialed with the handset on-hook. A trill call tone shall be heard at the called station. Lifting the handset shall stop the call tone and allow conversation to proceed. Alternatively, the call may be answered by pressing the [PTT] key for hands-free conversation. Either party may terminate the conversation by replacing the handset or pressing the Master Station's [C] key.

3.2 CALL-IN TIME-OUT

The programmable Call-in Time-out function shall automatically terminate a call-in from "Normal" priority Sub-stations after a specific time if the call is not answered. The time-out period shall be programmable in one minute increments from one to ninety-nine minutes.

3.3 CONVERSATION TIME-OUT

The programmable Conversation Time-Out function shall automatically terminate intercom conversations after a pre-programmed duration, programmable in ten second increments from ten to nine hundred and ninety seconds. When the limited time is reached, a warning signal tone shall be transmitted to both the calling and called parties to terminate the conversation. The Conversation Time-Out shall not apply to "Emergency Conference", "Outside-Line Telephone Conversation" or "Emergency Priority Sub-Station Calls".

3.4 CONVERSATION MODES

Three different conversation modes shall be employed, depending on the type of stations in use.

3.4.1 FULL-DUPLEX

Communication between two Master Stations shall be full duplex if at least one handset is off-hook. Communication between two Telephone Master Stations shall be full-duplex. Communication between a Master Station and a Telephone Master Station shall be full duplex if the Master Station handset is off-hook.

3.4.2 VOICE-OPERATED (VOX) SWITCHING (HALF-DUPLEX)

Communication between a Master Station and a Telephone Master Station shall be VOX if the Master Station handset is on-hook. Communication between a Master Station and a Sub-station shall be VOX if the Master Station handset is off-hook. The voice level at the Master Station shall control the voice switching. Communication between a Telephone Master Station and a Sub-station shall be VOX.

3.4.3 "PRESS-TO-TALK" (PTT) CONTROL

The Master Station PTT key shall be pressed to talk, and released to listen. Communication between two Master Stations shall be PTT if both handsets are on-hook. Communication between a Master Station and a Sub-station shall be PTT if the Master Station handset is off-hook and PTT if the Master Station handset is on-hook.

3.5 CALLING PARTY DISPLAY

The Master Station shall display the 6-digit number or 8-character name of one of up to 64 calling stations. When the Master Station simultaneously receives calls from two or more stations, the station with the highest priority shall be displayed, and other waiting stations shall be displayed in order of priority as the [REDIAL] key is pressed. The display priority shall be displayed in the following order: Emergency Conference calls, Emergency priority Sub-station calls, Incoming Outside Telephone Line calls, "Normal" priority Sub-station calls and Master Station or Telephone Master Station calls.

3.6 SUB-STATION PRIORITY LEVEL

Each sub-station shall be assigned a display priority as "Normal" or "Emergency" by system programming at the time of installation. "Emergency" sub-station calls shall appear higher in the programmed Master Station's Call Queue.

3.7 SELECTIVE RESPONSE/CALL QUEUE

The Selective Response/Call Queue function shall allow a Master Station receiving multiple calls simultaneously to select and answer any desired calling party from up to 64 queued calls. Pressing the [REDIAL] key shall advance the display to the station number or name of the second calling party. Subsequent depressions of the [REDIAL] key will cycle the display through all waiting station numbers or names. Lifting the handset when the desired station number (name) is displayed shall terminate the calling tone and initiate conversation. Alternatively, the [PTT] key may also be pressed for hands-free response.

3.8 AUTO-DIAL

Each Master Station shall support an Auto-Dial function and include eight programmable Auto-Dial keys to allow one-touch dialing of an assigned station number or to activate functions such as Paging, Call Forwarding or other function. Programming the Auto-Dial keys shall be possible at the Master Station by the user.

3.9 REDIAL

The Redial function shall allow the Master Station operator to one-touch dial the last dialed station number or system function. The Redial function shall not be available for Emergency Paging.

3.10 CAMP-ON-BUSY

The Camp-On Busy function shall allow a caller to wait for a called station to become available if a busy tone is heard after dialing.

3.11 GROUP CALL

The Group Call function shall allow sub-stations to simultaneously call a pre-programmed group of up to 16 Master Stations or Telephone Master Stations. Initiating a call from the Sub-station shall simultaneously sound a call tone at all Master Stations or Telephone Master Stations in the designated group. The first Master Station or Telephone Master Station in the group to respond shall be connected to the Sub-station, canceling the call to the other stations.

Each group shall include one designated "Representative" station, and up to fifteen designated "Member" stations. Each Sub-station shall be programmed to call the "Representative" station. It shall be possible for Master Stations and Telephone Master Stations to be "Members" of more than one group at a time. "Representative" stations in manual Call Forwarding mode shall automatically route calls to the designated receiving station without calling other "Member" stations. If the receiving station is also assigned to a group, the call shall be made to all stations in that same group. "Representative" or "Member" stations in Busy Call Forwarding or No-Answer Call Forwarding mode shall process the call as a normal Group Call. Calls between Master Stations and/or Telephone Master Stations shall not call other stations within the group.

3.12 CALL TRANSFER

The Call Transfer function shall allow a Master Station (or Telephone Master Station) to transfer the conversation partner to another Master Station (or Telephone Master Station).

3.13 CALL HOLD

The Call Hold function shall allow a Master Station or Telephone Master Station to place a conversation on hold and transmit a holding tone to the conversation partner.

3.14 CALL FORWARDING

3.14.1 MANUAL CALL FORWARDING

The Call Forwarding function shall allow incoming calls to be automatically forwarded to another receiving Master Station or Telephone Master Station by registering the receiving station number at the original station (forwarding station) or at the destination receiving station (see Remote Call Forwarding). Call Forwarding shall be enabled and cancelled at the original station by a simple key sequence. After enabled, the registered receiving station number shall be displayed. If the designated receiving station is also registered for a Call Forwarding-related function, calls shall not be forwarded from that receiving station.

3.14.2 REMOTE CALL FORWARDING (CALL CAPTURE)

The Remote Call Forwarding (Call Capture) function shall allow incoming calls to be remotely forwarded from the destination receiving station. After registration, the receiving station number shall be displayed on the original station. The designated receiving station shall be able to directly call the original station. If the designated receiving station is also registered for a Call Forwarding-related function, calls shall not be forwarded from that receiving station.

3.14.3 TIME-BASED CALL FORWARDING

The Time-Based Call Forwarding function shall allow incoming calls to be automatically forwarded to another receiving Master Station or Telephone Master Station during a pre-programmed daily time period. During the transfer interval, the registered receiving station number shall be displayed on the original station's display panel to indicate that the original station is in Time-Based Call Forwarding mode. The designated receiving station can directly call the original station without interference from the call forwarding function. If the designated

receiving station is also registered for a Call Forwarding-related function, calls shall not be forwarded from that receiving station.

3.14.4 OUTSIDE TELEPHONE LINE CALL FORWARDING

The Outside Telephone Line Call Forwarding function shall automatically route all incoming calls to a pre-programmed outside telephone line telephone number for each individual Master Station or Telephone Master Station. All outside telephone line telephones calls shall directly call the original station without interference from the call forwarding function.

3.14.5 TIME-BASED OUTSIDE TELEPHONE LINE CALL FORWARDING

The Time-Based Outside Telephone Line Call Forwarding function shall automatically route all incoming calls to an outside telephone line telephone number for each individual Master Station or Telephone Master Station during a pre-programmed interval within a twenty four hour time period. The forwarding interval (start and end times) shall be registered in system programming. All outside telephone line telephones can directly call the original station without interference from the call forwarding function.

3.14.6 NO-ANSWER CALL FORWARDING

The No-Answer Call Forwarding function shall automatically reroute calls to a Master Station or Telephone Master Station to a designated receiving station if the called party does not respond within a preset period of time, programmable from one to ninety-nine seconds in one second intervals. When several calls are simultaneously made to the original station, the original station shall begin its time count upon receiving the first call and then forward all waiting stations when the set interval time elapses. The designated receiving station can directly call the original station without interference from the No-Answer Call Forwarding function. When the designated receiving station is also registered for No-Answer Call Forwarding, the call shall be further rerouted to the second station. When the designated receiving station is busy, the original station continues to be called. The No-Answer Call Forwarding function shall be disabled when the designated receiving station has already been registered for Call Forwarding. The No-Answer Call Forwarding function does not interfere with a Sub-station call to a designated Group. Call representative station that is registered for No-Answer Call Forwarding. (The group call designation shall be given priority.)

3.14.7 BUSY CALL FORWARDING

The Busy Call Forwarding function shall automatically route calls to a busy Master Station or Telephone Master Station to a designated Master Station or Telephone Master Station. The Busy Call Forwarding function shall not interfere with a Sub-station call to a Group Call representative station that is registered for Busy Call Forwarding.

3.15 SCAN MONITOR

The Scan Monitor function shall allow any Master Station to automatically scan a designated group of up to sixteen Sub-stations for listen-only audio monitoring of each Sub-station. System programming shall allow a monitor interval time of one to ninety-nine seconds in one second intervals with a different interval time for each Master Station. The number or name of the Sub-station being monitored shall be displayed on the Master Station. The Scan Monitor function shall be available via hands-free or Master Station handset. It shall be possible to pause and restart the Scan Monitor function at any station within the group and advance or reverse monitoring by one Sub-station intervals. No audio shall be transmitted from the Master Station to the Sub-stations being monitored unless the Master Station's [PTT] key is pressed. When the Sub-station to be monitored is busy, the busy indication shall be displayed together with a busy tone at the Master Station. Incoming calls to the Master Station in the process of scanning Sub-stations shall be indicated on the calling party display.

3.16 CONFERENCE

The Conference function shall allow any Master Station or Telephone Master Station to initiate simultaneous conversation with up to two other Master Stations or Telephone Master Stations.

3.17 EMERGENCY CONFERENCE

The Emergency Conference function shall allow any Master Station or Telephone Master Station to initiate simultaneous conversation with a pre-programmed group of up to three other Master Stations or Telephone Master Station with a short key sequence.

3.18 PAGING

The Paging function shall allow Master Stations or Telephone Master Stations to broadcast to pre-programmed zones or all-zones of multiple Sub-stations* and/or external public address equipment. It shall be possible to initiate the Paging function with the Master Station handset either off-hook or on-hook.

*External amplifier required.

3.18.1 ZONE PAGING

The Zone Paging function shall allow paging to up to nineteen (19) individual zones established in system programming by combining Sub-stations with external public address system equipment. Up to 1,024 Sub-stations and up to 16 external control outputs can be registered per zone. It shall be possible to randomly select two or more individual zones simultaneously (up to 19). A paging pre-announcement tone shall be transmitted to the selected zones.

3.18.2 ALL-ZONE PAGING

The All-Zone Paging function shall allow simultaneous broadcast to all programmed zones of Sub-stations and external public address equipment. Sub-stations and external public address equipment not assigned to zones shall not receive the All-Zone broadcast. A paging pre-announcement tone shall be transmitted to all zones. The Master Station shall initiate the Paging function with the handset either off-hook or on-hook and terminate the Paging function by replacing the handset or pressing the [C] key.

3.18.3 EMERGENCY PAGING

The Emergency Paging function shall allow simultaneous broadcast to all connected Master Stations, Sub-stations, and external public address equipment. It shall be possible to restrict access to the Emergency Paging function in system programming. A distinct "Emergency" paging pre-announcement tone shall be transmitted to all Sub-stations, Master Stations, Telephone Master Stations, and external public address equipment. A continuous ringing tone shall sound at each Telephone Master Station.

3.18.4 BROADCAST PRIORITY

The broadcast priority from highest to lowest shall be Emergency Paging, Emergency Conference, External Source Distribution and All-Zone Paging. A higher priority broadcast shall interrupt all lower priority paging or broadcast functions.

3.18.5 PAGING TIME-OUT

The Paging Time-Out function shall automatically terminate Zone and All-Call paging calls that exceed a pre-programmed time limit from ten (10) to nine-hundred and ninety (990) seconds in ten (10) second intervals. The Paging Time-Out function shall not affect the Emergency Paging function.

3.19 EXTERNAL SOURCE DISTRIBUTION

The External Source Distribution function shall allow distribution of an external audio source to up to nineteen (19) zones. The function shall be activated by providing a continuous make contact closure to one of four trigger inputs. Up to 19 paging zones can be assigned to each one of a total of four trigger inputs in system programming. Each zone shall include up to 1,024 Sub-stations and up to 16 selective external public address equipment outputs. During the activation input, the external source shall be distributed to the pre-programmed zones. The function shall be terminated when the activation input is broken. During operation, any other input will not accept a make contact closure. Sub-stations designated as "Emergency" priority shall not be accessed by the External Source Distribution function.

3.20 TELEPHONE LINE FUNCTIONS

The security intercom system shall accept up to two outside telephone lines per exchange, allowing the system's Master Stations and Telephone Master Stations to place or receive outside telephone line telephone calls.

3.20.1 OUTGOING TELEPHONE CALLS

Outside telephone lines shall be accessible by dialing a pre-programmed single-digit access number to produce an audible dial tone. The telephone number may then be dialed and after the called party answers, conversation may commence. Replacing the handset or pressing the [C] key shall terminate the conversation.

3.20.2 INCOMING OUTSIDE TELEPHONE LINE CALLS (DIRECT-IN LINE)

The Direct In-Line function shall allow an incoming outside telephone call to sound a call tone at a pre-programmed representative and up to 3 member Master Stations and/or Telephone Master Stations within the same exchange that is connected to the outside telephone line. Lifting the handset or pressing the [PTT] key (Master Station only) shall terminate the calling tones at all masters in the group, allowing conversation to begin.

3.20.3 INCOMING OUTSIDE TELEPHONE LINE CALLS (DIRECT-IN DIALING)

The Direct In-Dialing function shall allow outside telephone line calling parties to direct-dial a station number and be connected to a desired Master Station, Telephone Master Station or Sub-station. When a call is received from the outside telephone line, the security intercom system shall automatically respond by transmitting a dial tone to the calling party. After hearing the dial tone, dialing the station number shall connect the calling station to the called party. If the calling party does not dial a station number within 10 seconds after the dial tone is transmitted, the registered Direct-In Line stations shall be called. If the called station does not answer for 30 seconds or more after the calling party dials the station number, the call shall be canceled. Calls shall be automatically forwarded if the station called from the outside telephone line is currently in Call Forwarding, Busy Call Forwarding or No-Answer Call Forwarding mode. Calls shall not be automatically forwarded when the station called from the outside telephone line is currently in Outside telephone line Call Forwarding mode.

3.20.4 OUTSIDE TELEPHONE LINE CONNECTION TIME-OUT

The Outside Telephone Line Connection Time-Out function shall limit the duration of connection with the outside telephone line to a duration of one (1) to ninety-nine (99) minutes in one (1) minute intervals. When the limited time is reached, a warning signal tone shall be transmitted to both the calling and called parties.

3.20.5 OUTSIDE TELEPHONE LINE CALL FORWARDING

See section 3.12.4.

3.20.6 TIME-BASED OUTSIDE TELEPHONE LINE CALL FORWARDING

See section 3.12.5.

3.21 CONVERSATION RECORDING

The Conversation Recording function shall allow individual recording of each Master Station, Telephone Master Station and Telephone Line port. Each port shall have an associated recording output, 0 dBV, unbalanced and a control activation port, open collector, 24 VDC maximum, 20 mA. Control activation shall occur immediately after communication has been established and deactivate immediately after communication has been terminated.