

Exhibit B-1 Mandatory Technical Requirements

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BIDDER INSTRUCTIONS: *Bidders may choose to submit a response to any categories/sub-categories. Each category/sub-category will be evaluated and awarded separately. Each category/sub-category includes specifications for a sample product. Bidders must indicate in the space provided whether their sample product complies with the requirement. Bidder may provide clarification or comment in the space provided. Exhibit B-1 must not be altered. Bidders not submitting a bid in a category/sub-category must indicate “NO BID” for the relevant category/sub-category. Exhibit B-1 must be completed and submitted with Bidder’s response.*

Bidders may offer additional products/services in the space below provided for each category/sub-category. Bidder will be required to submit a complete list of products/services in each category/sub-category for approval within fifteen (15) days of award.

Only Radio Manufacturers who receive an award in 1.7 Sub-Category: Base Station/Repeater and Category 3: Dispatch Console may have the opportunity to offer a turnkey (complete) radio solution and advance to the next evaluation phase. A radio solution may include an upgrade to existing system or a brand new system.

“P25” or “Project 25” is defined as the suite of standards for digital radio communications for public safety as defined by the Department of Homeland Security.

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1. CATEGORY: RADIO

1.1 RADIO SUB-CATEGORY: SINGLE -BAND PORTABLE RADIO (P25)

Sub-Category Description: *Phase I 12.5 Digital Trunking capable, backwards compatible. Software – Defined Radio Architecture.*

The following specifications and equipment configuration describes requirements for a target product Mission Critical Public Safety Equipment. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12-point font labeled "**RadioSubCategory-Single-BandPortableP25**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

PROPOSED PUBLIC SAFETY RADIO EQUIPMENT MUST MEET THE FOLLOWING MINIMUM REQUIREMENTS. ALL PROPOSED EQUIPMENT OF THE SUB-CATEGORY REQUIREMENTS BELOW ARE PASS/FAIL. PROPOSED EQUIPMENT NOT MEETING THE SUB-CATEGORY REQUIREMENTS WILL NOT BE FURTHER EVALUATED.

Manufacturer: EFJohnson

Product Model Name: VP5000 VHF, Model 2, Black

Product Number: VP5230F2

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	<i>Current TIA/EIA standards for Public Safety Radio systems, and</i>	Y	
2.	<i>Current P25 CAP compliance found at the following link, https://www.dhs.gov/science-and-technology/approved-grant-eligible-equipment, and</i>	Y	Compliance can be found at the referenced link under the description "EF Johnson VP5000 Portable Subscriber". Direct link to current P25 CAP compliance SDOC: https://www.dhs.gov/science-and-technology/p25-cap/ef-johnson-vp5000-portable-subscriber
3.	<i>Capable of operating on P25 Phase I trunked and/or conventional (analog/ P25) systems, and</i>	Y	Capable of operating on: • Conventional Analog Systems • P25 Phase 1 Conventional Systems • P25 Phase 1 Trunked Systems • P25 Phase II TDMA Trunked Systems With options selected per system type
4.	<i>Capable of operating on Public Safety spectrum at 136 to 174 MHz for interoperability, and</i>	Y	

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5.	Capable of operating using Encryption Standard (AES-256).	Y	Capable. Requires purchase of AES 256 Encryption option.
6.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for use by supporting technician.	Y	
7.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.	Y	3-Year Standard Warranty included.
8.	SHIPPING REQUIREMENTS - F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.	Y	
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	
Viking VP6230BKF2, VP6330BKF2, VP6430BKF2		VP6000 Portable Subscriber, available in VHF, UHF, or 7/800 MHz; Limited Keypad, Black (Hi-Viz Green housing optional).	
Viking VP6230BKF3, VP6330BKF3, VP6430BKF3		VP6000 Portable Subscriber, available in VHF, UHF, or 7/800 MHz; Full Numeric Keypad, Black (Hi-Viz Green housing optional).	

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VP5230F3, VP5330F3, VP5430F3	VP5000 Portable Subscriber, available in VHF, UHF, or 7/800 MHz; Full Keypad, Black.
VP5230F2, VP5330F2, VP5430F2	VP5000 Portable Subscriber, available VHF, UHF, or 7/800 MHz; Limited Keypad, Black.
WARRANTY OPTIONS	
<i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>	
WARRANTY OPTION	DESCRIPTION
TWO-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty".</i> Year two warranty coverage is included. The KENWOOD Viking series subscriber radios have a 3-year standard warranty from date of shipment at no additional cost.
THREE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty".</i> Year three warranty coverage is included. The KENWOOD Viking series subscriber radios have a 3-year standard warranty from date of shipment at no additional cost.
FOUR-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".</i> Viking subscribers are eligible for a one- or two-year extended warranty to provide up to five years of total coverage; the one-year warranty extension is \$100 per unit
FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".</i> Viking subscribers are eligible for a one- or two-year extended warranty to provide up to five years of total coverage; the two-year extension costs \$175 per unit.

Exhibit B-1 Mandatory Technical Requirements

1.2 RADIO SUB-CATEGORY: SINGLE -BAND MOBILE RADIO (P25)

Sub-Category Description: *Phase I Digital Trunking capable, backwards compatible. Software – Defined Radio Architecture.*

The following specifications and equipment configuration describes requirements for a target product Mission Critical Public Safety Equipment. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12-point font labeled "**RadioSubCategory-Single-BandMobileP25**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

PROPOSED PUBLIC SAFETY RADIO EQUIPMENT MUST MEET THE FOLLOWING MINIMUM REQUIREMENTS. ALL PROPOSED EQUIPMENT OF THE SUB-CATEGORY REQUIREMENTS BELOW ARE PASS/FAIL. PROPOSED EQUIPMENT NOT MEETING THE SUB-CATEGORY REQUIREMENTS WILL NOT BE FURTHER EVALUATED.

Manufacturer: EFJohnson

Product Model Name: VM5000, VHF, Dash, KCH-19, Mobile

Product Number: VM5730BF

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	<i>Current TIA/EIA standards for Public Safety Radio systems, and</i>	Y	
2.	<i>Current P25 CAP compliance found at the following link, https://www.dhs.gov/science-and-technology/approved-grant-eligible-equipment, and, and</i>	Y	Compliance can be found at the referenced link under the description "EF Johnson VM5000 Mobile Subscriber". Direct link to current P25 CAP compliance SDOC: https://www.dhs.gov/science-and-technology/p25-cap/ef-johnson-vm5000-mobile-subscriber
3.	<i>Capable of operating on P25 Phase I trunked and/ or conventional (analog/ P25) systems, and</i>	Y	Capable of operating on: • Conventional Analog Systems • P25 Phase 1 Conventional Systems • P25 Phase 1 Trunked Systems • P25 Phase II TDMA Trunked Systems With options selected per system type
4.	<i>Capable of operating on Public Safety spectrum at 136 to 174 MHz, and</i>	Y	
5.	<i>Capable of operating using Encryption Standard (AES-256).</i>	Y	Capable. Requires purchase of AES 256 Encryption option.

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6.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for use by supporting technician.	Y	
7.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.	Y	3-Year Standard Warranty included
8.	SHIPPING REQUIREMENTS - F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.	Y	
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	
VM6730BF, VM6830BF, VM6830BF2, or VM6930BF		VM6000 Mobile Subscriber, available in VHF, UHF Lo, UHF Hi, or 7/800 MHz; Black; Remote Mount Control Head.	
VM5730BF, VM5830BF, VM5830BF2, VM5930BF		VM5000 Mobile Subscriber, available in VHF, UHF Lo, UHF Hi, or 7/800 MHz; Black; Dash Mount Control Head (Remote mount optional).	
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>			

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WARRANTY OPTION	DESCRIPTION
TWO-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty".</i> Year two warranty coverage is included. The KENWOOD Viking series subscriber radios have a 3-year standard warranty from date of shipment at no additional cost.
THREE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty".</i> Year three warranty coverage is included. The KENWOOD Viking series subscriber radios have a 3-year standard warranty from date of shipment at no additional cost.
FOUR-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".</i> Viking subscribers are eligible for a one- or two-year extended warranty to provide up to five years of total coverage; the one-year warranty extension is \$100 per unit
FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".</i> Viking subscribers are eligible for a one- or two-year extended warranty to provide up to five years of total coverage; the two-year extension costs \$175 per unit.

Exhibit B-1 Mandatory Technical Requirements

1.3 RADIO SUB-CATEGORY: SINGLE-BAND DESKTOP RADIO (P25)

Sub-Category Description: *Phase I Digital Trunking capable, backwards compatible. Software – Defined Radio Architecture.*

The following specifications and equipment configuration describes requirements for a target product Mission Critical Public Safety Equipment. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12-point font labeled **"RadioSubCategory-Single-BandDesktop-ConsoleRadioP25"**). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

PROPOSED PUBLIC SAFETY RADIO EQUIPMENT MUST MEET THE FOLLOWING MINIMUM REQUIREMENTS ALL PROPOSED EQUIPMENT OF THE SUB-CATEGORY REQUIREMENTS BELOW ARE PASS/FAIL. PROPOSED EQUIPMENT NOT MEETING THE SUB-CATEGORY REQUIREMENTS WILL NOT BE FURTHER EVALUATED.

Manufacturer: EFJohnson

Product Model Name: VM5000, VHF, Dash Desktop, KCH-19, Control Station **Product Number:** VM5730BF CONTROL STATION

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	<i>Current TIA/EIA standards for Public Safety Radio systems, and</i>	Y	
2.	<i>Current P25 CAP compliance found at the following link, https://www.dhs.gov/science-and-technology/approved-grant-eligible-equipment, and, and</i>	Y	Compliance can be found at the referenced link under the description "EF Johnson VM5000 Mobile Subscriber". Direct link to current P25 CAP compliance SDOC: https://www.dhs.gov/science-and-technology/p25-cap/ef-johnson-vm5000-mobile-subscriber Requires purchase of "CONTROL STATION" configuration addition for desktop operation of mobile.
3.	<i>Capable of operating on P25 Phase I trunked and/ or conventional (analog/ P25) systems, and</i>	Y	Capable of operating on: • Conventional Analog Systems • P25 Phase 1 Conventional Systems • P25 Phase 1 Trunked Systems • P25 Phase II TDMA Trunked Systems With options selected per system type
4.	<i>Capable of operating on Public Safety spectrum at 136 to 174 MHz, and</i>	Y	

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5.	Capable of operating using Encryption Standard (AES-256).	Y	Capable. Requires purchase of AES 256 Encryption option.
6.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for use by supporting technician.	Y	
7.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.	Y	3-Year Standard Warranty included.
8.	SHIPPING REQUIREMENTS - F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.	Y	
ADDITIONAL PRODUCTS FOR CONSIDERATION			
<i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	
VM5730BF, VM5830BF, VM5830BF2, VM5930BF		VM5000 Desktop Control Station Subscriber, available in VHF, UHF Lo, UHF Hi, or 7/800 MHz; Black; Power Supply Mounted Control Head (Remote mount optional)	

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WARRANTY OPTIONS	
<i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>	
WARRANTY OPTION	DESCRIPTION
TWO-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty".</i> Year two warranty coverage is included. The KENWOOD Viking series subscriber radios have a 3-year standard warranty from date of shipment at no additional cost.
THREE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty".</i> Year three warranty coverage is included. The KENWOOD Viking series subscriber radios have a 3-year standard warranty from date of shipment at no additional cost.
FOUR-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".</i> Viking subscribers are eligible for a one- or two-year extended warranty to provide up to five years of total coverage; the one-year warranty extension is \$100 per unit.
FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".</i> Viking subscribers are eligible for a one- or two-year extended warranty to provide up to five years of total coverage; the two-year extension costs \$175 per unit.

Exhibit B-1 Mandatory Technical Requirements

1.4 RADIO SUB-CATEGORY: MULTI-BAND PORTABLE RADIO (P25)

Sub-Category Description: *P25 Phase I FDMA 12.5 kHz and 6.25 kHz P25 Phase II TDMA capable, backwards compatible. Software – Defined Radio Architecture.*

The following specifications and equipment configuration describes requirements for a target product Mission Critical Public Safety Equipment. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12-point font labeled "**RadioSubCategory-Multi-BandPortableP25**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

PROPOSED PUBLIC SAFETY RADIO EQUIPMENT MUST MEET THE FOLLOWING MINIMUM REQUIREMENTS.. ALL PROPOSED EQUIPMENT OF THE SUB-CATEGORY REQUIREMENTS BELOW ARE PASS/FAIL. PROPOSED EQUIPMENT NOT MEETING THE SUB-CATEGORY REQUIREMENTS WILL NOT BE FURTHER EVALUATED.

Manufacturer: EFJohnson

Product Model Name: VP900 VHF/700/800 MHz Portable Subscriber

Product Number: 2425AABA53xxx

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	<i>Current TIA/EIA standards for Public Safety Radio systems, and</i>	Y	
2.	<i>Current P25 CAP compliance found at the following link, https://www.dhs.gov/science-and-technology/approved-grant-eligible-equipment, and, and</i>	Y	Compliance can be found at the referenced link under the description "EF Johnson VP900 Portable Subscriber". Direct link to current P25 CAP compliance SDOC: https://www.dhs.gov/science-and-technology/p25-cap/ef-johnson-vp900-portable-subscriber
3.	<i>Capable of operating on P25 Phase I trunked and/or conventional (analog/ P25) systems, and</i>	Y	Capable of operating on: • Conventional Analog Systems • P25 Phase 1 Conventional Systems • P25 Phase 1 Trunked Systems • P25 Phase II TDMA Trunked Systems With options selected per system type
4.	<i>Capable of operating on Public Safety spectrum at 136 to 174 MHz, and</i>	Y	Operates in Public Safety Spectrum 136-174 MHz, and additionally operates in Public Safety Spectrum 700/800 MHz.

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5.	Capable of operating using Encryption Standard (AES-256).	Y	Capable. Requires purchase of AES 256 Encryption option.
6.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for use by supporting technician.	Y	
7.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.	Y	3-Year Standard Warranty included.
8.	SHIPPING REQUIREMENTS - F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.	Y	
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	

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WARRANTY OPTIONS

(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)

WARRANTY OPTION	DESCRIPTION
TWO-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty".</i> Year two warranty coverage is included. The KENWOOD Viking series subscriber radios have a 3-year standard warranty from date of shipment at no additional cost.
THREE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty".</i> Year three warranty coverage is included. The KENWOOD Viking series subscriber radios have a 3-year standard warranty from date of shipment at no additional cost.
FOUR-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".</i> Viking subscribers are eligible for a one- or two-year extended warranty to provide up to five years of total coverage; the one-year warranty extension is \$100 per unit.
FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".</i> Viking subscribers are eligible for a one- or two-year extended warranty to provide up to five years of total coverage; the two-year extension costs \$175 per unit.

Exhibit B-1 Mandatory Technical Requirements

1.5 RADIO SUB-CATEGORY: MULTI-BAND MOBILE RADIO (P25)

Sub-Category Description: *P P25 Phase I FDMA 12.5 kHz and 6.25 kHz P25 Phase II TDMA capable, backwards compatible. Software – Defined Radio Architecture.*

The following specifications and equipment configuration describes requirements for a target product Mission Critical Public Safety Equipment. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12-point font labeled "**RadioSubCategory-Multi-BandMobileP25**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

PROPOSED PUBLIC SAFETY RADIO EQUIPMENT MUST MEET THE FOLLOWING MINIMUM REQUIREMENTS. ALL PROPOSED EQUIPMENT OF THE SUB-CATEGORY REQUIREMENTS BELOW ARE PASS/FAIL. PROPOSED EQUIPMENT NOT MEETING THE SUB-CATEGORY REQUIREMENTS WILL NOT BE FURTHER EVALUATED.

Manufacturer: EFJohnson

Product Model Name: VM7000 Quad-Deck Mobile, Single Remote, KCH-20

Product Number: VM7730BF-P + VM7830BF2-S

+VM7830BF2-S + VM7930BF-S

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	<i>Current TIA/EIA standards for Public Safety Radio systems, and</i>	Y	
2.	<i>Current P25 CAP compliance found at the following link, https://www.dhs.gov/science-and-technology/approved-grant-eligible-equipment, and, and</i>	Y	Compliance can be found at the referenced link under the description "EF Johnson VM7000 Mobile Subscriber". Direct link to current P25 CAP compliance SDOC: https://www.dhs.gov/science-and-technology/p25-cap/ef-johnson-vm7000-mobile-subscriber
3.	<i>Capable of operating on P25 Phase I trunked and/ or conventional (analog/ P25) systems, and</i>	Y	Capable of operating on: • Conventional Analog Systems • P25 Phase 1 Conventional Systems • P25 Phase 1 Trunked Systems • P25 Phase II TDMA Trunked Systems With options selected per system type

Exhibit B-1 Mandatory Technical Requirements

4.	Capable of operating on Public Safety spectrum at 136 to 174 MHz, and	Y	Operates in Public Safety Spectrum 136-174 MHz, and additionally operates in Public Safety Spectrum 450-520 MHz, 380-470 MHz, and 700/800 MHz.
5.	Capable of operating using Encryption Standard (AES-256).	Y	Capable. Requires purchase of AES 256 Encryption option.
6.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for use by supporting technician.	Y	
7.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.	Y	3-Year Standard Warranty included.
8.	SHIPPING REQUIREMENTS - F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.	Y	
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	

Exhibit B-1 Mandatory Technical Requirements

WARRANTY OPTIONS	
<i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>	
WARRANTY OPTION	DESCRIPTION
TWO-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty".</i> Year two warranty coverage is included. The KENWOOD Viking series subscriber radios have a 3-year standard warranty from date of shipment at no additional cost.
THREE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty".</i> Year three warranty coverage is included. The KENWOOD Viking series subscriber radios have a 3-year standard warranty from date of shipment at no additional cost.
FOUR-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".</i> Viking subscribers are eligible for a one- or two-year extended warranty to provide up to five years of total coverage; the one-year warranty extension is \$100 per unit.
FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".</i> Viking subscribers are eligible for a one- or two-year extended warranty to provide up to five years of total coverage; the two-year extension costs \$175 per unit. Note: Year 4 and 5 pricing on the VM7000 warranty is dependent on the number of decks.

Exhibit B-1 Mandatory Technical Requirements

1.6 RADIO SUB-CATEGORY: MULTI-BAND DESKTOP RADIO (P25)

Sub-Category Description: *P25 Phase I FDMA and P25 Phase II TDMA capable backwards compatible. Software – Defined Radio Architecture*

The following specifications and equipment configuration describes requirements for a target product Mission Critical Public Safety Equipment. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12-point font labeled "**RadioSubCategory-Multi-BandDesktop-ConsoleRadio**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

PROPOSED PUBLIC SAFETY RADIO EQUIPMENT MUST MEET THE FOLLOWING MINIMUM REQUIREMENTS. ALL PROPOSED EQUIPMENT OF THE SUB-CATEGORY REQUIREMENTS BELOW ARE PASS/FAIL. PROPOSED EQUIPMENT NOT MEETING THE SUB-CATEGORY REQUIREMENTS WILL NOT BE FURTHER EVALUATED.

Manufacturer: EFJohnson **Product Model Name:** VM7000 Quad-Deck Desktop, Single Remote, KCH-20, Control Station
VM7730BF-P + VM7830BF2-S + VM7830BF2-S + VM7930BF-S + CONTROL STATION

Product Number:

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	<i>Current TIA/EIA standards for Public Safety Radio systems, and</i>	Y	
2.	<i>Current P25 CAP compliance found at the following link, https://www.dhs.gov/science-and-technology/approved-grant-eligible-equipment, and, and</i>	Y	Compliance can be found at the referenced link under the description "EF Johnson VM7000 Mobile Subscriber". Direct link to current P25 CAP compliance SDOC: https://www.dhs.gov/science-and-technology/p25-cap/ef-johnson-vm7000-mobile-subscriber
3.	<i>Capable of operating on P25 Phase I trunked and/ or conventional (analog/ P25) systems, and</i>	Y	Capable of operating on: • Conventional Analog Systems • P25 Phase 1 Conventional Systems • P25 Phase 1 Trunked Systems • P25 Phase II TDMA Trunked Systems With options selected per system type
4.	<i>Capable of operating on Public Safety spectrum at 136 to 174 MHz, and</i>	Y	Operates in Public Safety Spectrum 136-174 MHz, and additionally operates in Public Safety Spectrum 450-520 MHz, 380-470 MHz, and 700/800 MHz.

Exhibit B-1 Mandatory Technical Requirements

[illegible]

Exhibit B-1 Mandatory Technical Requirements

WARRANTY OPTIONS	
<i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>	
WARRANTY OPTION	DESCRIPTION
TWO-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty".</i> Year two warranty coverage is included. The KENWOOD Viking series subscriber radios have a 3-year standard warranty from date of shipment at no additional cost.
THREE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty".</i> Year three warranty coverage is included. The KENWOOD Viking series subscriber radios have a 3-year standard warranty from date of shipment at no additional cost.
FOUR-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".</i> Viking subscribers are eligible for a one- or two-year extended warranty to provide up to five years of total coverage; the one-year warranty extension is \$100 per unit.
FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".</i> Viking subscribers are eligible for a one- or two-year extended warranty to provide up to five years of total coverage; the two-year extension costs \$175 per unit. Note: Year 4 and 5 pricing on the VM7000 warranty is dependent on the number of decks.

Exhibit B-1 Mandatory Technical Requirements

1.7 RADIO SUB-CATEGORY: BASE STATION/REPEATER (P25)

Sub-Category Description: *P25 Phase I FDMA backwards compatible. Software – Defined Radio Architecture.*

The following specifications and equipment configuration describes requirements for a target product Mission Critical Public Safety Equipment. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12-point font labeled "**RadioSubCategory-BaseStation-Repeater**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

PROPOSED PUBLIC SAFETY RADIO EQUIPMENT MUST MEET THE FOLLOWING MINIMUM REQUIREMENTS ALL PROPOSED EQUIPMENT OF THE SUB-CATEGORY REQUIREMENTS BELOW ARE PASS/FAIL. PROPOSED EQUIPMENT NOT MEETING THE SUB-CATEGORY REQUIREMENTS WILL NOT BE FURTHER EVALUATED.

Manufacturer: EFJohnson

Product Model Name: ATLAS BASE STATION/REPEATER

Product Number: ATLAS 4500

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	<i>Current TIA/EIA standards for Public Safety Radio systems, and</i>	Y	
2.	<i>Current P25 CAP compliance found at the following link, https://www.dhs.gov/science-and-technology/approved-grant-eligible-equipment, and, and</i>	Y	
3.	<i>Capable of operating on P25 Phase I trunked and/ or conventional (analog/ P25) systems, and</i>	Y	
4.	<i>Capable of operating on Public Safety spectrum at 150 to 174 MHz, and</i>	Y	
5.	<i>Capable of operating using Encryption Standard (AES-256).</i>	Y	

Exhibit B-1 Mandatory Technical Requirements

6.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for use by supporting technician.	Y	
7.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.	Y	
8.	SHIPPING REQUIREMENTS - F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.	Y	
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	
ATLAS 1200		ATLAS 1200 100W conventional base station/repeater available in VHF, UHF, 800 MHz	
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>			
WARRANTY OPTION		DESCRIPTION	

Exhibit B-1 Mandatory Technical Requirements

TWO-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty".</i> Extended warranty for ATLAS components is customized based on the system design and equipment ordered. Extended warranties can be purchased for up to 15 years.
THREE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty".</i> Extended warranty for ATLAS components is customized based on the system design and equipment ordered. Extended warranties can be purchased for up to 15 years.
FOUR-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".</i> Extended warranty for ATLAS components is customized based on the system design and equipment ordered. Extended warranties can be purchased for up to 15 years.
FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".</i> Extended warranty for ATLAS components is customized based on the system design and equipment ordered. Extended warranties can be purchased for up to 15 years.

Exhibit B-1 Mandatory Technical Requirements

2. RADIO CATEGORY: CONVENTIONAL ANALOG PORTABLE (NON-P25)

2.1 RADIO SUB-CATEGORY: CONVENTIONAL ANALOG PORTABLE (NON-P25)

Sub-Category Description: *Conventional Analog Portable radio. Minimum channel capacity of 4 transmit and 4 receive. Software – Defined Radio Architecture.*

IMPORTANT NOTE: *Products in this sub-category may not qualify for federal funding.*

The following specifications and equipment configuration describes requirements for a target product Mission Critical Public Safety Equipment. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12-point font labeled "**RadioSubCategory-ConventionalAnalogPortable**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

PROPOSED PUBLIC SAFETY RADIO EQUIPMENT MUST MEET THE FOLLOWING MINIMUM REQUIREMENTS. ALL PROPOSED EQUIPMENT OF THE SUB-CATEGORY REQUIREMENTS BELOW ARE PASS/FAIL. PROPOSED EQUIPMENT NOT MEETING THE SUB-CATEGORY REQUIREMENTS WILL NOT BE FURTHER EVALUATED.

Manufacturer: EFJohnson

Product Model Name: NEXEDGE

Product Number: NX-5200

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER'S CLARIFICATIONS AND COMMENTS
1.	<i>Current TIA/EIA-603-C standards for Public Safety Radio systems</i>	Y	
2.	<i>Code of Federal Regulations Title 47 Telecommunications Chapter I Federal Communications Commission Rules and regulations,</i>	Y	
3.	<i>Part 15 Radio Frequency Devices (47CFR15) Part 90, Private Land Mobile Radio Service (47CFR90).</i>	Y	
4.	<i>Output Power 1-5 Watts (adjustable minimum range)</i>	Y	6–1 W

Exhibit B-1 Mandatory Technical Requirements

5.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for use by supporting technician.	Y	
6.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.	Y	
7.	SHIPPING REQUIREMENTS - F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.	Y	
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	
NX-3200		VHF Digital and FM Analog portable radio capable of operating in both Digital – NXDN Mode, Digital – DMR Mode and Analog mode.	
NX-3300		UHF Digital and FM Analog portable radio capable of operating in both Digital – NXDN Mode, Digital – DMR Mode and Analog mode.	
NX-3400		800/900 MHz Digital and FM Analog portable radio capable of operating in both Digital – NXDN Mode, Digital – DMR Mode and Analog mode.	
NX-5300		UHF Digital and FM Analog portable radio capable of operating in both Digital – NXDN Mode, Digital – DMR Mode and Analog mode.	
NX-5400		700/800 MHz Digital and FM Analog portable radio capable of operating in both Digital – NXDN Mode, Digital – DMR Mode and Analog mode.	
NX-3220		VHF 5W Digital and FM Analog portable radio capable of operating in both Digital – NXDN Mode, Digital – DMR Mode and Analog mode.	

Exhibit B-1 Mandatory Technical Requirements

NX-3320	UHF 5W Digital and FM Analog portable radio capable of operating in both Digital – NXDN Mode, Digital – DMR Mode and Analog mode.																																										
NX-3420	800/900 MHz 3W Digital and FM Analog portable radio capable of operating in both Digital – NXDN Mode, Digital – DMR Mode and Analog mode.																																										
WARRANTY OPTIONS																																											
(Warranty options listed below and may be considered upon award and included in Bidder’s offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)																																											
WARRANTY OPTION	DESCRIPTION																																										
TWO-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, “Exhibit B-1Category/Sub-CategoryTwo-YearWarranty”. Year two warranty coverage is included. The KENWOOD NEXEDGE series subscriber radios have a 2-year standard warranty from date of shipment at no additional cost.																																										
THREE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, “Exhibit B-1Category/Sub-CategoryThree-YearWarranty”. NEXEDGE subscribers are eligible for extended warranties to provide up to five years of total coverage as detailed below: <table><tr><th>Product</th><th>Type</th><th>1-2 Year</th><th>3rd Year</th><th>4th Year</th><th>5th Year</th></tr><tr><td>Analog</td><td>Portable</td><td>Included in Standard Warranty</td><td>\$24.00</td><td>\$36.00</td><td>\$48.00</td></tr><tr><td>Analog</td><td>Mobile</td><td>Included in Standard Warranty</td><td>\$36.00</td><td>\$48.00</td><td>\$60.00</td></tr><tr><td>Digital/P25</td><td>Portable</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$36.00</td><td>\$48.00</td></tr><tr><td>Digital/P25</td><td>Mobile</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$48.00</td><td>\$60.00</td></tr><tr><td>NX-5000</td><td>Portable</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$45.00</td><td>\$95.00</td></tr><tr><td>NX-5000</td><td>Mobile</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$45.00</td><td>\$95.00</td></tr></table>	Product	Type	1-2 Year	3rd Year	4th Year	5th Year	Analog	Portable	Included in Standard Warranty	\$24.00	\$36.00	\$48.00	Analog	Mobile	Included in Standard Warranty	\$36.00	\$48.00	\$60.00	Digital/P25	Portable	Included in Standard Warranty	Included in Standard Warranty	\$36.00	\$48.00	Digital/P25	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$48.00	\$60.00	NX-5000	Portable	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00	NX-5000	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00
Product	Type	1-2 Year	3rd Year	4th Year	5th Year																																						
Analog	Portable	Included in Standard Warranty	\$24.00	\$36.00	\$48.00																																						
Analog	Mobile	Included in Standard Warranty	\$36.00	\$48.00	\$60.00																																						
Digital/P25	Portable	Included in Standard Warranty	Included in Standard Warranty	\$36.00	\$48.00																																						
Digital/P25	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$48.00	\$60.00																																						
NX-5000	Portable	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00																																						
NX-5000	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00																																						

Exhibit B-1 Mandatory Technical Requirements

FOUR-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, “Exhibit B-1Category/Sub-CategoryFour-YearWarranty”. NEXEDGE subscribers are eligible for extended warranties to provide up to five years of total coverage as detailed below: <table><tr><th>Product</th><th>Type</th><th>1-2 Year</th><th>3rd Year</th><th>4th Year</th><th>5th Year</th></tr><tr><td>Analog</td><td>Portable</td><td>Included in Standard Warranty</td><td>\$24.00</td><td>\$36.00</td><td>\$48.00</td></tr><tr><td>Analog</td><td>Mobile</td><td>Included in Standard Warranty</td><td>\$36.00</td><td>\$48.00</td><td>\$60.00</td></tr><tr><td>Digital/P25</td><td>Portable</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$36.00</td><td>\$48.00</td></tr><tr><td>Digital/P25</td><td>Mobile</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$48.00</td><td>\$60.00</td></tr><tr><td>NX-5000</td><td>Portable</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$45.00</td><td>\$95.00</td></tr><tr><td>NX-5000</td><td>Mobile</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$45.00</td><td>\$95.00</td></tr></table>	Product	Type	1-2 Year	3rd Year	4th Year	5th Year	Analog	Portable	Included in Standard Warranty	\$24.00	\$36.00	\$48.00	Analog	Mobile	Included in Standard Warranty	\$36.00	\$48.00	\$60.00	Digital/P25	Portable	Included in Standard Warranty	Included in Standard Warranty	\$36.00	\$48.00	Digital/P25	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$48.00	\$60.00	NX-5000	Portable	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00	NX-5000	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00
Product	Type	1-2 Year	3rd Year	4th Year	5th Year																																						
Analog	Portable	Included in Standard Warranty	\$24.00	\$36.00	\$48.00																																						
Analog	Mobile	Included in Standard Warranty	\$36.00	\$48.00	\$60.00																																						
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Digital/P25	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$48.00	\$60.00																																						
NX-5000	Portable	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00																																						
NX-5000	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00																																						
FIVE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, “Exhibit B-1Category/Sub-CategoryFive-YearWarranty”. NEXEDGE subscribers are eligible for extended warranties to provide up to five years of total coverage as detailed below: <table><tr><th>Product</th><th>Type</th><th>1-2 Year</th><th>3rd Year</th><th>4th Year</th><th>5th Year</th></tr><tr><td>Analog</td><td>Portable</td><td>Included in Standard Warranty</td><td>\$24.00</td><td>\$36.00</td><td>\$48.00</td></tr><tr><td>Analog</td><td>Mobile</td><td>Included in Standard Warranty</td><td>\$36.00</td><td>\$48.00</td><td>\$60.00</td></tr><tr><td>Digital/P25</td><td>Portable</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$36.00</td><td>\$48.00</td></tr><tr><td>Digital/P25</td><td>Mobile</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$48.00</td><td>\$60.00</td></tr><tr><td>NX-5000</td><td>Portable</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$45.00</td><td>\$95.00</td></tr><tr><td>NX-5000</td><td>Mobile</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$45.00</td><td>\$95.00</td></tr></table>	Product	Type	1-2 Year	3rd Year	4th Year	5th Year	Analog	Portable	Included in Standard Warranty	\$24.00	\$36.00	\$48.00	Analog	Mobile	Included in Standard Warranty	\$36.00	\$48.00	\$60.00	Digital/P25	Portable	Included in Standard Warranty	Included in Standard Warranty	\$36.00	\$48.00	Digital/P25	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$48.00	\$60.00	NX-5000	Portable	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00	NX-5000	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00
Product	Type	1-2 Year	3rd Year	4th Year	5th Year																																						
Analog	Portable	Included in Standard Warranty	\$24.00	\$36.00	\$48.00																																						
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Digital/P25	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$48.00	\$60.00																																						
NX-5000	Portable	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00																																						
NX-5000	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00																																						

Exhibit B-1 Mandatory Technical Requirements

2.2 RADIO SUB-CATEGORY: CONVENTIONAL ANALOG MOBILE (NON-P25)

Sub-Category Description: *Conventional Analog Mobile Radio: Minimum channel capacity of 32 transmit and 32 receive. Software – Defined Radio Architecture.*

IMPORTANT NOTE: Products in this sub-category may not qualify for federal funding.

The following specifications and equipment configuration describes requirements for a target product Mission Critical Public Safety Equipment. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12-point font labeled ***"RadioSubCategory-ConventionalAnalogMobile"***). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

PROPOSED PUBLIC SAFETY RADIO EQUIPMENT MUST MEET THE FOLLOWING MINIMUM REQUIREMENTS. ALL PROPOSED EQUIPMENT OF THE SUB-CATEGORY REQUIREMENTS BELOW ARE PASS/FAIL. PROPOSED EQUIPMENT NOT MEETING THE SUB-CATEGORY REQUIREMENTS WILL NOT BE FURTHER EVALUATED.

Manufacturer: EFJohnson

Product Model Name: NEXEDGE

Product Number: NX-5700

[illegible]

Exhibit B-1 Mandatory Technical Requirements

5.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for use by supporting technician.	Y	
5.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.	Y	
8.	SHIPPING REQUIREMENTS - F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.	Y	

ADDITIONAL PRODUCTS FOR CONSIDERATION

(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)

PRODUCT MODEL NAME/NUMBER	DESCRIPTION
NX-5600H	Low band Digital and FM Analog mobile radio capable of operating in both Digital – NXDN Mode and Analog mode.
NX-5700H	VHF Digital and FM Analog mobile radio capable of operating in Digital – NXDN Mode, Digital P25 mode and Analog mode.
NX-5800H	UHF Digital and FM Analog mobile radio capable of operating in Digital – NXDN Mode, Digital P25 mode and Analog mode.
NX-5800	UHF Digital and FM Analog mobile radio capable of operating in Digital – NXDN Mode, Digital DMR mode and Analog mode.
NX-5900	700/800 MHz Digital and FM Analog mobile radio capable of operating in Digital – NXDN Mode, Digital DMR mode and Analog mode.
NX-3720HG	VHF 50W Digital and FM Analog mobile radio capable of operating in Digital – NXDN Mode, Digital DMR mode and Analog mode.
NX-3820HG	UHF 45W Digital and FM Analog mobile radio capable of operating in Digital – NXDN Mode, Digital DMR mode and Analog mode.
NX-3920G	800 MHz 15W Digital and FM Analog mobile radio capable of operating in Digital – NXDN Mode, Digital DMR mode and Analog mode.
NX-3921G	900 MHz 15W Digital and FM Analog mobile radio capable of operating in Digital – NXDN Mode, Digital DMR mode and Analog mode.

Exhibit B-1 Mandatory Technical Requirements

WARRANTY OPTIONS

(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)

WARRANTY OPTION	DESCRIPTION																																										
TWO-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty". Year two warranty coverage is included. The KENWOOD NEXEDGE series subscriber radios have a 2-year standard warranty from date of shipment at no additional cost.																																										
THREE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty". NEXEDGE subscribers are eligible for extended warranties to provide up to five years of total coverage as detailed below: <table><tr><th>Product</th><th>Type</th><th>1-2 Year</th><th>3rd Year</th><th>4th Year</th><th>5th Year</th></tr><tr><td>Analog</td><td>Portable</td><td>Included in Standard Warranty</td><td>\$24.00</td><td>\$36.00</td><td>\$48.00</td></tr><tr><td>Analog</td><td>Mobile</td><td>Included in Standard Warranty</td><td>\$36.00</td><td>\$48.00</td><td>\$60.00</td></tr><tr><td>Digital/P25</td><td>Portable</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$36.00</td><td>\$48.00</td></tr><tr><td>Digital/P25</td><td>Mobile</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$48.00</td><td>\$60.00</td></tr><tr><td>NX-5000</td><td>Portable</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$45.00</td><td>\$95.00</td></tr><tr><td>NX-5000</td><td>Mobile</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$45.00</td><td>\$95.00</td></tr></table>	Product	Type	1-2 Year	3rd Year	4th Year	5th Year	Analog	Portable	Included in Standard Warranty	\$24.00	\$36.00	\$48.00	Analog	Mobile	Included in Standard Warranty	\$36.00	\$48.00	\$60.00	Digital/P25	Portable	Included in Standard Warranty	Included in Standard Warranty	\$36.00	\$48.00	Digital/P25	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$48.00	\$60.00	NX-5000	Portable	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00	NX-5000	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00
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Exhibit B-1 Mandatory Technical Requirements

FOUR-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, “Exhibit B-1Category/Sub-CategoryFour-YearWarranty”. NEXEDGE subscribers are eligible for extended warranties to provide up to five years of total coverage as detailed below: <table><tr><th>Product</th><th>Type</th><th>1-2 Year</th><th>3rd Year</th><th>4th Year</th><th>5th Year</th></tr><tr><td>Analog</td><td>Portable</td><td>Included in Standard Warranty</td><td>\$24.00</td><td>\$36.00</td><td>\$48.00</td></tr><tr><td>Analog</td><td>Mobile</td><td>Included in Standard Warranty</td><td>\$36.00</td><td>\$48.00</td><td>\$60.00</td></tr><tr><td>Digital/P25</td><td>Portable</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$36.00</td><td>\$48.00</td></tr><tr><td>Digital/P25</td><td>Mobile</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$48.00</td><td>\$60.00</td></tr><tr><td>NX-5000</td><td>Portable</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$45.00</td><td>\$95.00</td></tr><tr><td>NX-5000</td><td>Mobile</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$45.00</td><td>\$95.00</td></tr></table>	Product	Type	1-2 Year	3rd Year	4th Year	5th Year	Analog	Portable	Included in Standard Warranty	\$24.00	\$36.00	\$48.00	Analog	Mobile	Included in Standard Warranty	\$36.00	\$48.00	\$60.00	Digital/P25	Portable	Included in Standard Warranty	Included in Standard Warranty	\$36.00	\$48.00	Digital/P25	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$48.00	\$60.00	NX-5000	Portable	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00	NX-5000	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00
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FIVE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, “Exhibit B-1Category/Sub-CategoryFive-YearWarranty”. NEXEDGE subscribers are eligible for extended warranties to provide up to five years of total coverage as detailed below: <table><tr><th>Product</th><th>Type</th><th>1-2 Year</th><th>3rd Year</th><th>4th Year</th><th>5th Year</th></tr><tr><td>Analog</td><td>Portable</td><td>Included in Standard Warranty</td><td>\$24.00</td><td>\$36.00</td><td>\$48.00</td></tr><tr><td>Analog</td><td>Mobile</td><td>Included in Standard Warranty</td><td>\$36.00</td><td>\$48.00</td><td>\$60.00</td></tr><tr><td>Digital/P25</td><td>Portable</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$36.00</td><td>\$48.00</td></tr><tr><td>Digital/P25</td><td>Mobile</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$48.00</td><td>\$60.00</td></tr><tr><td>NX-5000</td><td>Portable</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$45.00</td><td>\$95.00</td></tr><tr><td>NX-5000</td><td>Mobile</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$45.00</td><td>\$95.00</td></tr></table>	Product	Type	1-2 Year	3rd Year	4th Year	5th Year	Analog	Portable	Included in Standard Warranty	\$24.00	\$36.00	\$48.00	Analog	Mobile	Included in Standard Warranty	\$36.00	\$48.00	\$60.00	Digital/P25	Portable	Included in Standard Warranty	Included in Standard Warranty	\$36.00	\$48.00	Digital/P25	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$48.00	\$60.00	NX-5000	Portable	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00	NX-5000	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00
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Exhibit B-1 Mandatory Technical Requirements

2.3 RADIO SUB-CATEGORY: CONVENTIONAL ANALOG DESKTOP (NON-P25)

Sub-Category Description: *Conventional Analog Desktop Radio: Minimum channel capacity of 32 transmit and 32 receive. Software – Defined Radio Architecture.*

IMPORTANT NOTE: *Products in this sub-category may not qualify for federal funding.*

The following specifications and equipment configuration describes requirements for a target product Mission Critical Public Safety Equipment. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12-point font labeled [*RadioSubCategory-ConventionalAnalogDesktop*]). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

PROPOSED PUBLIC SAFETY RADIO EQUIPMENT MUST MEET THE FOLLOWING MINIMUM REQUIREMENTS ALL PROPOSED EQUIPMENT OF THE SUB-CATEGORY REQUIREMENTS BELOW ARE PASS/FAIL. PROPOSED EQUIPMENT NOT MEETING THE SUB-CATEGORY REQUIREMENTS WILL NOT BE FURTHER EVALUATED.

Manufacturer: EFJohnson

Product Model Name: NEXEDGE

Product Number: NX-5700

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	<i>Current TIA/EIA-603-C standards for Public Safety Radio systems</i>	Y	
2.	<i>Code of Federal Regulations Title 47 Telecommunications Chapter I Federal Communications Commission Rules and regulations,</i>	Y	
3.	<i>Part 15 Radio Frequency Devices (47CFR15) Part 90, Private Land Mobile Radio Service (47CFR90).</i>	Y	
4.	Output Power 2-30 Watts (adjustable minimum range)	Y	50W to 5W

Exhibit B-1 Mandatory Technical Requirements

5.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for use by supporting technician.	Y	
6.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.	Y	
7.	SHIPPING REQUIREMENTS - F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.	Y	
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	
NX-5600H		Low band Digital and FM Analog mobile radio capable of operating in both Digital – NXDN Mode and Analog mode.	
NX-5700H		VHF Digital and FM Analog mobile radio capable of operating in Digital – NXDN Mode, Digital P25 mode and Analog mode.	
NX-5800H		UHF Digital and FM Analog mobile radio capable of operating in Digital – NXDN Mode, Digital P25 mode and Analog mode.	
NX-5800		UHF Digital and FM Analog mobile radio capable of operating in Digital – NXDN Mode, Digital DMR mode and Analog mode.	
NX-5900		700/800 MHz Digital and FM Analog mobile radio capable of operating in Digital – NXDN Mode, Digital DMR mode and Analog mode.	
NX-3720HG		VHF 50W Digital and FM Analog mobile radio capable of operating in Digital – NXDN Mode, Digital DMR mode and Analog mode.	
NX-3820HG		UHF 45W Digital and FM Analog mobile radio capable of operating in Digital – NXDN Mode, Digital DMR mode and Analog mode.	

Exhibit B-1 Mandatory Technical Requirements

NX-3920G	800 MHz 15W Digital and FM Analog mobile radio capable of operating in Digital – NXDN Mode, Digital DMR mode and Analog mode.																																										
NX-3921G	900 MHz 15W Digital and FM Analog mobile radio capable of operating in Digital – NXDN Mode, Digital DMR mode and Analog mode.																																										
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder’s offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>																																											
WARRANTY OPTION	DESCRIPTION																																										
TWO-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, “Exhibit B-1Category/Sub-CategoryTwo-YearWarranty”. Year two warranty coverage is included. The KENWOOD NEXEDGE series subscriber radios have a 2-year standard warranty from date of shipment at no additional cost.																																										
THREE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, “Exhibit B-1Category/Sub-CategoryThree-YearWarranty”. NEXEDGE subscribers are eligible for extended warranties to provide up to five years of total coverage as detailed below: <table><tr><th>Product</th><th>Type</th><th>1-2 Year</th><th>3rd Year</th><th>4th Year</th><th>5th Year</th></tr><tr><td>Analog</td><td>Portable</td><td>Included in Standard Warranty</td><td>\$24.00</td><td>\$36.00</td><td>\$48.00</td></tr><tr><td>Analog</td><td>Mobile</td><td>Included in Standard Warranty</td><td>\$36.00</td><td>\$48.00</td><td>\$60.00</td></tr><tr><td>Digital/P25</td><td>Portable</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$36.00</td><td>\$48.00</td></tr><tr><td>Digital/P25</td><td>Mobile</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$48.00</td><td>\$60.00</td></tr><tr><td>NX-5000</td><td>Portable</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$45.00</td><td>\$95.00</td></tr><tr><td>NX-5000</td><td>Mobile</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$45.00</td><td>\$95.00</td></tr></table>	Product	Type	1-2 Year	3rd Year	4th Year	5th Year	Analog	Portable	Included in Standard Warranty	\$24.00	\$36.00	\$48.00	Analog	Mobile	Included in Standard Warranty	\$36.00	\$48.00	\$60.00	Digital/P25	Portable	Included in Standard Warranty	Included in Standard Warranty	\$36.00	\$48.00	Digital/P25	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$48.00	\$60.00	NX-5000	Portable	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00	NX-5000	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00
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FOUR-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, “Exhibit B-1Category/Sub-CategoryFour-YearWarranty”. NEXEDGE subscribers are eligible for extended warranties to provide up to five years of total coverage as detailed below: <table><tr><th>Product</th><th>Type</th><th>1-2 Year</th><th>3rd Year</th><th>4th Year</th><th>5th Year</th></tr><tr><td>Analog</td><td>Portable</td><td>Included in Standard Warranty</td><td>\$24.00</td><td>\$36.00</td><td>\$48.00</td></tr><tr><td>Analog</td><td>Mobile</td><td>Included in Standard Warranty</td><td>\$36.00</td><td>\$48.00</td><td>\$60.00</td></tr><tr><td>Digital/P25</td><td>Portable</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$36.00</td><td>\$48.00</td></tr><tr><td>Digital/P25</td><td>Mobile</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$48.00</td><td>\$60.00</td></tr><tr><td>NX-5000</td><td>Portable</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$45.00</td><td>\$95.00</td></tr><tr><td>NX-5000</td><td>Mobile</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$45.00</td><td>\$95.00</td></tr></table>	Product	Type	1-2 Year	3rd Year	4th Year	5th Year	Analog	Portable	Included in Standard Warranty	\$24.00	\$36.00	\$48.00	Analog	Mobile	Included in Standard Warranty	\$36.00	\$48.00	\$60.00	Digital/P25	Portable	Included in Standard Warranty	Included in Standard Warranty	\$36.00	\$48.00	Digital/P25	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$48.00	\$60.00	NX-5000	Portable	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00	NX-5000	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00
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FIVE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, “Exhibit B-1Category/Sub-CategoryFive-YearWarranty”. NEXEDGE subscribers are eligible for extended warranties to provide up to five years of total coverage as detailed below: <table><tr><th>Product</th><th>Type</th><th>1-2 Year</th><th>3rd Year</th><th>4th Year</th><th>5th Year</th></tr><tr><td>Analog</td><td>Portable</td><td>Included in Standard Warranty</td><td>\$24.00</td><td>\$36.00</td><td>\$48.00</td></tr><tr><td>Analog</td><td>Mobile</td><td>Included in Standard Warranty</td><td>\$36.00</td><td>\$48.00</td><td>\$60.00</td></tr><tr><td>Digital/P25</td><td>Portable</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$36.00</td><td>\$48.00</td></tr><tr><td>Digital/P25</td><td>Mobile</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$48.00</td><td>\$60.00</td></tr><tr><td>NX-5000</td><td>Portable</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$45.00</td><td>\$95.00</td></tr><tr><td>NX-5000</td><td>Mobile</td><td>Included in Standard Warranty</td><td>Included in Standard Warranty</td><td>\$45.00</td><td>\$95.00</td></tr></table>	Product	Type	1-2 Year	3rd Year	4th Year	5th Year	Analog	Portable	Included in Standard Warranty	\$24.00	\$36.00	\$48.00	Analog	Mobile	Included in Standard Warranty	\$36.00	\$48.00	\$60.00	Digital/P25	Portable	Included in Standard Warranty	Included in Standard Warranty	\$36.00	\$48.00	Digital/P25	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$48.00	\$60.00	NX-5000	Portable	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00	NX-5000	Mobile	Included in Standard Warranty	Included in Standard Warranty	\$45.00	\$95.00
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Exhibit B-1 Mandatory Technical Requirements

2.4 RADIO SUB-CATEGORY: CONVENTIONAL ANALOG BASE STATION/REPEATER (NON-P25)

Sub-Category Description: *Conventional Analog Base Station/Repeater: Minimum channel capacity of 4 transmit and 4 receive. Software – Defined Radio Architecture.*

IMPORTANT NOTE: *Products in this sub-category may not qualify for federal funding.*

The following specifications and equipment configuration describes requirements for a target product Mission Critical Public Safety Equipment. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12-point font labeled **"RadioSubCategory-ConventionalAnalogBaseStation-Repeater"**). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

PROPOSED PUBLIC SAFETY RADIO EQUIPMENT MUST MEET THE FOLLOWING MINIMUM REQUIREMENTS. ALL PROPOSED EQUIPMENT OF THE SUB-CATEGORY REQUIREMENTS BELOW ARE PASS/FAIL. PROPOSED EQUIPMENT NOT MEETING THE SUB-CATEGORY REQUIREMENTS WILL NOT BE FURTHER EVALUATED.

Manufacturer: EFJohnson

Product Model Name: NEXEDGE

Product Number: NXR-5700

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	<i>Current TIA/EIA-603-C standards for Public Safety Radio systems</i>	Y	
2.	<i>Code of Federal Regulations Title 47 Telecommunications Chapter I Federal Communications Commission Rules and regulations,</i>	Y	
3.	<i>Part 15 Radio Frequency Devices (47CFR15) Part 90, Private Land Mobile Radio Service (47CFR90).</i>	Y	
4.	<i>Output Power 2-30 Watts (adjustable minimum range)</i>	Y	25/5/0.5 W

Exhibit B-1 Mandatory Technical Requirements

5.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for use by supporting technician.	Y	
6.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.	Y	
7.	SHIPPING REQUIREMENTS - F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.	Y	
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	
KA160		Kairos Analog/DMR VHF Repeater	
KA500		Kairos Analog/DMR UHF Repeater	
NXR-5800		UHF Digital and FM Base Repeater	
NXR-5900		800 MHz Digital and FM Base Repeater	
NXR-5901		900 MHz Digital and FM Base Repeater	
NXR-710		VHF High Performance Base Station and Repeater	
NXR-810		UHF base Station and Repeater	
TKR-D710		DMR VHF Repeater	
TKR-D810		DMR UHF Repeater	
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>			
WARRANTY OPTION		DESCRIPTION	

Exhibit B-1 Mandatory Technical Requirements

TWO-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, “Exhibit B-1Category/Sub-CategoryTwo-YearWarranty”.</i> Extended warranty for NEXEDGE infrastructure components is customized based on the system design and equipment ordered. Extended warranties can be purchased for up to five years of total warranty.
THREE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, “Exhibit B-1Category/Sub-CategoryThree-YearWarranty”.</i> Extended warranty for NEXEDGE infrastructure components is customized based on the system design and equipment ordered. Extended warranties can be purchased for up to five years of total warranty.
FOUR-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, “Exhibit B-1Category/Sub-CategoryFour-YearWarranty”.</i> Extended warranty for NEXEDGE infrastructure components is customized based on the system design and equipment ordered. Extended warranties can be purchased for up to five years of total warranty.
FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, “Exhibit B-1Category/Sub-CategoryFive-YearWarranty”.</i> Extended warranty for NEXEDGE infrastructure components is customized based on the system design and equipment ordered. Extended warranties can be purchased for up to five years of total warranty.

Exhibit B-1 Mandatory Technical Requirements

3. CATEGORY: VEHICULAR REPEATER SYSTEMS (VRS) P25

Category Description: Radio / Subcategory Description: Vehicular Repeater Systems (VRS) P25 Trunking capable, backwards compatible, (to analog conventional) and encryption capable. Personnel, while out of their vehicles, will use their existing portable radios to operate the VRS in the vehicle and provide communications with dispatch. The portable radio will activate the VRS which will function as a repeater and control the existing mobile radio in the vehicle. The mobile will provide communications with dispatch through existing base stations.

The following specifications are the minimum target product requirements for this category of public safety communication equipment. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12-point font labeled "VRS"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

For bidding purposes, Bidders are to offer a model for the VHF (136-174MHz) band.

Manufacturer: NO BID Product Model Name: NO BID

Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	TRANSMITTER		
1.1.	Frequency Range (MHz)		
1.1.1.	Bidder's model identified above must be capable of being ordered in any of the following bands: VHF (136-174MHz) UHF (380-470MHz) Range1 UHF (450-520MHz) Range2 (769-775MHz) (799-805MHz) (806-824MHz) 851-869MHZ)		
1.2.	Rated RF Output Power minimum: adjustable range		
1.2.1.	VHF UHF 700/800 250 mW-2 Watts		
1.3.	Carrier Frequency Stability. (-30° to +60° C) - ±1.5 PPM		
1.4.	Modulation Limiting:		
1.4.1.	±2.5 kHz (12.5 kHz)		
1.4.2.	±4 kHz (NPSPAC)		
1.5.	FM Hum and Noise Ratio: 40 dB		

Exhibit B-1 Mandatory Technical Requirements

1.6.	Conducted Spurious Emissions: -50 dBc		
1.7.	Channel Spacing KHz: 12.5		
1.8.	Time-Out-Timer, factory adjusted for one minute. The electronic transmission timer shall limit the duration of each VRS transmission, whether initiated locally or remotely. The timer shall be adjustable to time-out over the minimum range of 1 to 4 minutes. Interruption of the transmitter circuit shall cause the timer to reset within 100 milliseconds.		
2.	RECEIVER		
2.1.	Frequency Range (MHz) Simplex		
2.1.1.	Bidder's model identified above must be capable of being ordered in any of the following bands: VHF (136-174 MHz) UHF(380-470 MHz) Range 1 UHF(450-520 MHz) Range 2 (769-775 MHz) (799-805MHz) (806-824MHz) (851-869MHz)		
2.2.	Reference Sensitivity: 0.35 uV		
2.3.	Carrier Frequency Stability. (-30° to +60° C) - ±1.5 PPM		
2.4.	Adjacent Channel Rejection @ 30kHz: 60dB		
2.5.	Spurious Response Rejection: 70dB (12.5KHz		
2.6.	Intermodulation Rejection: 60dB		
3.	USER MANUAL		
3.1.	Operator Manual		
3.1.1.	Provide a hardcopy of the manual		
3.1.2.	Provide soft copy on digital media (CD, DVD or flash drive or web download).		
3.2.	Manual Contents		
3.2.1.	Location of all switches, controls and indicators.		
3.2.2.	Step-by-step instructions to operate all equipment features.		
4.	GENERAL REQUIREMENTS		

Exhibit B-1 Mandatory Technical Requirements

4.1.	The VRS shall include all necessary cables and connectors to interface with the mobile radio of choice. The make and model of the mobile radio acquired on a separate bid and required to interface with the VRS, will be supplied within two weeks of purchase order issuance.		
4.2.	When the VRS is turned on it shall not automatically be placed in repeat mode.		
4.3.	Operational Requirements		
4.3.1.	Repeater Prioritizing Logic		
4.3.2.	Control logic in the VRS shall exist to enable multiple VRS units within range of each other to negotiate which of the VRS units will be the Master repeater unit for the group in order to prevent interference from multiple repeaters transmitting simultaneously.		
4.3.3.	When the repeat mode is activated, the VRS shall automatically rebroadcast the received signal from the mobile to the portable radios.		
4.3.4.	When the repeat mode is activated, the VRS shall automatically route the signal received from the portable to the mobile radio. The mobile radio shall then retransmit the signal to the mountain top base station.		
4.3.5.	If no other units are on the scene, the VRS will assume master status and repeat radio traffic as described above.		
4.3.6.	When additional units arrive on the scene and are activated, one VRS shall assume master status and all other VRS's shall automatically cease repeating radio traffic.		
4.3.7.	When the master VRS leaves the scene or is disabled, the remaining VRS's shall select another master by a method that results in only one VRS assigned master status.		
4.3.8.	If a unit arrives on the scene that is still in master status, then there shall be a method that results in only one of the master status VRS's assigned master status.		
4.3.9.	If the mobile radio in the master unit is keyed locally, the transmission shall be repeated to portable radios and the status of all VRS's shall be preserved.		

Exhibit B-1 Mandatory Technical Requirements

5.	PHYSICAL REQUIREMENTS		
5.1.	The VRS configured for dash mount or trunk mount.		
5.2.	Controls		
5.2.1.	Controls mounted separately or included in the mobile control head as a user installable option.		
5.2.2.	Activate repeat mode.		
5.3.	Indicators		
5.3.1.	Indicators mounted separately or included in the mobile control head as a user installable option.		
5.3.2.	A repeat-mode-activated indicator.		
6.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for use by supporting technician.		
7.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.		
8.	SHIPPING REQUIREMENTS - F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION			
(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder’s offering)			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	
WARRANTY OPTIONS			
(Warranty options listed below and may be considered upon award and included in Bidder’s offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)			

Exhibit B-1 Mandatory Technical Requirements

WARRANTY OPTION	DESCRIPTION
TWO-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, “Exhibit B-1Category/Sub-CategoryTwo-YearWarranty”.</i>
THREE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, “Exhibit B-1Category/Sub-CategoryThree-YearWarranty”.</i>
FOUR-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, “Exhibit B-1Category/Sub-CategoryFour-YearWarranty”.</i>
FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, “Exhibit B-1Category/Sub-CategoryFive-YearWarranty”.</i>

Exhibit B-1 Mandatory Technical Requirements

4. CATEGORY: DISPATCH CONSOLES

Category Description: *Dispatch Consoles, Radio Dispatch Console Systems*

The following specifications are the minimum target product requirements for this category/subcategory of public safety communication equipment. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12-point font labeled "**DispatchConsole**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Manufacturer: EFJohnson

Product Model Name: STARGATE

Product Number: ATLAS 7000 STARGATE

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	SOFTWARE-BASED DISPATCH CONSOLE SYSTEM		
1.1.	Software-Only operator position;-system/hardware does not require an external interface sub-system; console positions are connected on an IP network to communicate with other console positions and communicate with digital radios and IP gateways to analog radios.	Y	
1.2.	Runs on current generation personal or desktop computer and current generation operating system.	Y	
1.3.	Support for multiple monitors.	Y	
1.4.	Programmable Graphical User Interface (GUI).	Y	
1.5.	Support for Project-25 Digital Fixed Station Interface (DFSI) to connect digital base radios to IP network.	Y	
1.6.	16-key keypad for DTMF and other paging functions.	Y	
1.7.	Per-line call history.	Y	
1.8.	Instant Recall Recorder of last 10 minutes of select and un-select audio received.	Y	
1.9.	Interface to speakers, microphones, headset adapter box, and foot switch.	Y	
1.10.	Intercom between dispatch console positions.	Y	
1.11.	Alert tones, multiple programmable.	Y	
1.12.	ANI display and/or UID interface.	Y	

Exhibit B-1 Mandatory Technical Requirements

1.13.	Display of selected functions or talkgroups on a dispatch console will be displayed on all associated consoles.	Y	
1.14.	Support for Project-25 Digital Fixed Station Interface (DFSI) to connect digital base radios to IP network.	Y	
1.15.	Radio to IP gateway device to connect analog base radios to IP network.	Y	
1.16.	Console system with minimum 2 or more operator positions.	Y	
1.17.	Console system with minimum 4 radio channels and/or 4 call modules.	Y	
1.18.	Capable of cross patching call modules together.	Y	
2.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for use by supporting technician.	Y	
3.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.	Y	
4.	SHIPPING REQUIREMENTS - F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.	Y	
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			

Exhibit B-1 Mandatory Technical Requirements

PRODUCT MODEL NAME/NUMBER	DESCRIPTION
ZETRON MAX DISPATCH RADIO CONSOLE	(Multiple Model/Part Numbers dependent upon console system design) The MAX Central is the hardware platform which runs on a Linux operating system that hosts several software services used in the MAX Dispatch system. These software services provide essential management and control to the system as well as act as a gateway to various third party devices for additional functionality such as telephony gateways, IP voice loggers, MODBUS IP auxiliary I/O devices and Location Services (AVL). It also hosts the service that provides remote console, remote radio gateway and multiple MAX Dispatch site linkage. The MAX Infrastructure Gateway (IG) serves as the interface point between the EFJohnson ATLAS trunked radio system via a CSSI connection to the rest of the MAX console system. The MAX Radio Gateway serves as the interface point between a radio or base station and the rest of the MAX console system. Radio Gateways are available in both analog and digital forms depending on the EFJohnson radio interface requirement.
ZETRON ACOM COMMAND AND CONTROL	(Multiple Model/Part Numbers dependent upon console system design) The ACOM Radio Dispatch system is designed with a fully redundant core cluster comprised of Commercial off-the-shelf (COTS) Linux-based servers. Core software services provide essential management and control to the system (Media Controller Service). They also act as a gateway to various third-party devices such as IP voice loggers, MODBUS IP auxiliary I/O devices, and direct infrastructure connectivity (Infrastructure Gateway Service) to the EFJohnson Atlas trunked radio system. Users are connected to a redundant core over IP using a Windows-based user application. In addition analog and digital radio gateways may be used to provide an analog/digital radio interface to many Viking base station radios. These types of radio gateways allow the ACOM console operators to communicate with P25 and analog/digital radios in the field.
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>	
WARRANTY OPTION	DESCRIPTION
TWO-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty". Extended warranty for ATLAS components (including StarGate) is customized based on the system design and equipment ordered. Extended warranties can be purchased for up to 15 years.

Exhibit B-1 Mandatory Technical Requirements

THREE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty".</i> Extended warranty for ATLAS components (including StarGate) is customized based on the system design and equipment ordered. Extended warranties can be purchased for up to 15 years.
FOUR-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".</i> Extended warranty for ATLAS components (including StarGate) is customized based on the system design and equipment ordered. Extended warranties can be purchased for up to 15 years.
FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".</i> Extended warranty for ATLAS components (including StarGate) is customized based on the system design and equipment ordered. Extended warranties can be purchased for up to 15 years.

Exhibit B-1 Mandatory Technical Requirements

5. CATEGORY: MICROWAVE RADIO

5.1 MICROWAVE SUB-CATEGORY: CARRIER GRADE, PACKET DATA (NATIVE IP)

Sub-Category Description: *Includes: Point-to-Point digital microwave radio equipment to operate on Part 101 licensed frequencies above 5925 MHz; available in all-indoor or split system , capable of space diversity, fixed or adaptive modulation,; providing native IP with minimum MTU size of 2048, capable of transporting emulated TDM, with high throughput capacity; supporting N+1 hot standby, and/or XPIC, and/or ring redundancy; along with required bandwidth management/ routing equipment and software; and with antennas, feedline systems, hardware (which may be from other manufacturers) to provide a complete system.*

For evaluation purposes, all Bidders must offer a product meeting the following example product: 6 GHz microwave radio, all-indoor installation, space diversity, providing 150 Mbps data throughput, and 1+1 hot-standby. For evaluation purposes only, all antenna system components and hardware, and routing equipment provided by the customer.

The following specifications and equipment configuration describes requirements for a target product Mission Critical Public Safety Equipment. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12-point font labeled “*MicrowaveSubCategory-Carrier Grade-PacketData-NativeIP*”). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Manufacturer: NO BID Product Model Name: NO BID

Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	GENERAL DESCRIPTION		
1.1.	Frequency Range: 5925 – 6425 MHz (Lower 6 GHz band) Plus 11 and 18 GHz Part 101 frequency bands		
1.2.	Radio Type: Packet Data (Native IP)		
1.3.	Link Throughput: 150 Mb per second data minimum		
1.4.	Operate on a 30MHz RF channel, at 128QAM.		
1.5.	Configuration: All-indoor or split system installation		
1.6.	Electrical Power: Customer Supplied -48 VDC		
1.7.	Licensing: Bidder to assume coordination and licensing successfully completed.		
2.	TECHNICAL STANDARDS		

Exhibit B-1 Mandatory Technical Requirements

2.1.	Frequency Tolerance: per FCC 101.107		
2.2.	Channel Bandwidth: per FCC 101.109		
2.3.	Emission limitations: per FCC 101.111		
2.4.	Transmit Power: per FCC 101.113		
2.5.	Operating Environment: per Telcordia GR-63 as applicable.		
3.	OPERATIONAL PARAMETERS		
3.1.	Transmit RF Power: < 22 dBm optional > 30 dBm.		
3.2.	Should be Capable of Automatic TX Power Control.		
3.3.	Minimum Receive Threshold Level at TX/RX Unit Port: <-65dBm.		
4.	RESILIENCY AND PROTECTION		
4.1.	1+1 Hot Standby TX/RX plus Space Diversity.		
5.	NETWORK		
5.1.	Interface: Copper Gig E Port or Optical Port.		
5.2.	Monitoring: SNMP Traps		
6.	SERVICE MANUALS - One (1) set system documentation, operations and service manuals, printed or electronic copy, for use by supporting technician.		
7.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.		
8.	SHIPPING REQUIREMENTS - F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			

Exhibit B-1 Mandatory Technical Requirements

PRODUCT MODEL NAME/NUMBER	DESCRIPTION
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>	
WARRANTY OPTION	DESCRIPTION
TWO-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty" .
THREE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty" .
FOUR-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty" .
FIVE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty" .

Exhibit B-1 Mandatory Technical Requirements

5.2 MICROWAVE SUB-CATEGORY: NETWORK GRADE

Sub-Category Description: *Point-to-Point digital microwave radio equipment to operate on Part 101 licensed frequencies above 5925 MHz; capable of fix or adaptive modulation, RF power above +15 dBm; providing native packet data with high throughput capacity supporting emulated TDM over packet data; minimum MTU size of 2048; integrated or non-integrated antenna systems; along with required bandwidth management/routing equipment and software; and with antennas, feedline systems, hardware (which may be from other manufacturers) to provide a complete system.*

For evaluation purposes, all Bidders must offer a product meeting the following example product: 11 GHz microwave radio, split indoor-outdoor installation, providing 100 Mbps raw data throughput, non-integrated antenna system. For purposes of evaluation only, all antenna system components and hardware, and routing equipment provided by the customer.

The following specifications and equipment configuration describes requirements for the example products above. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12-point font and labeled [*"MicrowaveSubcategory-NetworkGrade"*]). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Manufacturer: NO BID Product Model Name: NO BID

Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	GENERAL DESCRIPTION		
1.1.	Frequency Range: 5925-6425 MHz (6 GHz band) 10.7 – 11.7 GHz (11 GHz band).		
1.2.	Radio Type: IP Packet.		
1.3.	Link Throughput: 100 Mb per second raw data.		
1.4.	Modulation & Bandwidth: as determined by bidder to achieve the specified link throughput.		
1.5.	Configuration: Split Indoor-Outdoor Installation.		
1.6.	Outdoor Mounting: feed location of antenna (antenna make and model shall be specified but not priced to provide equal comparison).		
1.7.	Electrical Power: Customer Supplied -48 VDC.		
1.8.	Licensing: Bidder to assume coordination and licensing successfully completed.		

Exhibit B-1 Mandatory Technical Requirements

2.	TECHNICAL STANDARDS		
2.1.	Frequency Tolerance: per FCC 101.107		
2.2.	Channel Bandwidth: per FCC 101.109		
2.3.	Emission limitations: per FCC 101.111		
2.4.	Transmit Power: per FCC 101.113		
2.5.	Operating Environment: per Telcordia GR-63 and IEC 60721 class 4M5 IP67 as applicable.		
3.	OPERATIONAL PARAMETERS		
3.1.	Transmit RF Power: >15 dBm minimum.		
3.2.	Should be Capable of Automatic TX Power Control.		
4.	NETWORK		
4.1.	Interface: Copper Gig E Port or Optical Port.		
4.2.	Monitoring: SNMP Traps.		
5.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for use by supporting technician.		
6.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.		
7.	SHIPPING REQUIREMENTS - F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION			
<i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	

Exhibit B-1 Mandatory Technical Requirements

WARRANTY OPTIONS	
<i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>	
WARRANTY OPTION	DESCRIPTION
TWO-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty".</i>
THREE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty".</i>
FOUR-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".</i>
FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".</i>

Exhibit B-1 Mandatory Technical Requirements

5.3 MICROWAVE SUB-CATEGORY: NATIVE IP, SUB 5.925 GHz

Sub-Category Description: *Point-to-Point digital microwave radio equipment to operate on Part 15 unlicensed frequencies and on Part 90 and Part 101 licensed frequencies above 1 GHz and below 5.925 GHz; capable of RF power above +20 dBm; providing native packet data and analog interfaces; with mid to high throughput capacity; minimum MTU size of 2048; along with required bandwidth management/routing equipment and software.*

For evaluation purposes, all Bidders must offer a product meeting the following example product: Quantity one (1) Terminal – 4.9 GHz microwave radio, providing 20 Mbps data throughput.

The following specifications and equipment configuration describes requirements for the example product above. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12-point font and labeled [*"MicrowaveSubCategory-NativeIP-Sub5.925"*]). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Note: Symbols for less-than (<) or greater-than (>) shall be interpreted to include equal-to the specified value. The symbol for approximate (~) indicates an imprecise or nominal value where variations will be acceptable.

Manufacturer: NO BID Product Model Name: NO BID

Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	GENERAL DESCRIPTION		
1.1.	Frequency Range: 4940 – 4990 MHz (4.9 GHz licensed public safety band).		
1.2.	Radio Type: Packet Data.		
1.3.	Link Throughput: >20 Mb per second data.		
1.4.	Modulation & Bandwidth: as determined by bidder to achieve the specified link throughput.		
1.5.	Outdoor Mounting: feed location of antenna (antenna make and model shall be specified but not priced to provide equal comparison).		
1.6.	Electrical Power: Customer Supplied -48 VDC.		
2.	TECHNICAL STANDARDS		

Exhibit B-1 Mandatory Technical Requirements

2.1.	Frequency Tolerance: per FCC 90.1201 through 90.1217 or most current standards.		
2.2.	Channel Bandwidth: per FCC 90.1201 through 90.1217 or most current standards.		
2.3.	Emission limitations: per FCC 90.1201 through 90.1217 or most current standards.		
2.4.	Transmit Power: per FCC 90.1201 through 90.1217 or most current standards.		
2.5.	Operating Environment: per Telcordia GR-63 as applicable and IEC 60721 class 4M5 IP67.		
3.	OPERATIONAL PARAMETERS		
3.1.	Transmit RF Power: >15 dBm.		
3.2.	Manual Transmitter Power Adjustment.		
4.	NETWORK		
4.1.	Interface: Interface should be capable of supporting copper Ethernet or Optical interface supporting IP.		
4.2.	Monitoring: SNMP Traps.		
5.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for use by supporting technician.		
6.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.		
7.	SHIPPING REQUIREMENTS: F.O.B. All Destinations. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION			

Exhibit B-1 Mandatory Technical Requirements

<i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>	
PRODUCT MODEL NAME/NUMBER	DESCRIPTION
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>	
WARRANTY OPTION	DESCRIPTION
TWO-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty" .
THREE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty" .
FOUR-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty" .
FIVE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty" .

Exhibit B-1 Mandatory Technical Requirements

5.4 MICROWAVE SUB-CATEGORY: NATIVE IP, 900 MHZ

Sub-Category Description: *Point-to-Point digital radio equipment to operate on Part 90 and Part 101 licensed frequencies below 3 GHz; capable of RF power above +25 dBm; providing native packet data with low throughput capacity; minimum MTU size of 2048; with digital and analog interfaces; along with antennas and associated hardware.*

For evaluation purposes, all Bidders must offer a product meeting the following example product: Quantity one (1) Terminal – 900 MHz digital radio, providing >300 Kbps data throughput.

The following specifications and equipment configuration describes requirements for the example products above. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12-point font and labeled [*"MicrowaveSubCategory-NativeIP-900"*]). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Note: Symbols for less-than (<) or greater-than (>) shall be interpreted to include equal-to the specified value. The symbol for approximate (~) indicates an imprecise or nominal value where variations will be acceptable.

Manufacturer: NO BID Product Model Name: NO BID

Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	GENERAL DESCRIPTION		
1.1.	Frequency Range: 928 - 960 MHz (900 MHz licensed OFS band with 9 MHz T-R split).		
1.2.	Radio Type: Packet Data.		
1.3.	Link Throughput: >300 Kb per second data.		
1.4.	Modulation & Bandwidth: as determined by bidder to achieve the specified link throughput.		
1.5.	Outdoor Mounting: feed location of antenna (antenna make and model shall be specified but not priced to provide equal comparison).		
1.6.	Electrical Power: Customer Supplied -48 VDC.		
2.	TECHNICAL STANDARDS		

Exhibit B-1 Mandatory Technical Requirements

2.1.	Frequency Tolerance: per FCC 101.107 or most current standards.		
2.2.	Channel Bandwidth: per FCC 101.109 or most current standards.		
2.3.	Emission limitations: per FCC 101.111 or most current standards.		
2.4.	Transmit Power: per FCC 101.113 or most current standards.		
2.5.	Operating Environment: per Telcordia GR-63 as applicable and IEC 60721 class 4M5 IP67 or most current Operating Environment standards.		
3.	OPERATIONAL PARAMETERS		
3.1.	Transmit RF Power: >25 dBm.		
3.2.	TX Power Control Range: >15 dB Capability of manual transmitter power adjustment.		
3.3.	Optional N+1 redundancy and receive diversity.		
4.	NETWORK		
4.1.	Interface: Capable of supporting copper Ethernet or Optical interface supporting IP.		
4.2.	Monitoring: SNMP Traps.		
5.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for technician.		
6.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.		
7.	SHIPPING REQUIREMENTS: F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION			

Exhibit B-1 Mandatory Technical Requirements

<i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>	
PRODUCT MODEL NAME/NUMBER	DESCRIPTION
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>	
WARRANTY OPTION	DESCRIPTION
TWO-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty" .
THREE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty" .
FOUR-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty" .
FIVE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty" .

Exhibit B-1 Mandatory Technical Requirements

5.5 MICROWAVE RADIO SUB-CATEGORY: CARRIER GRADE, NATIVE TIME DIVISION MULTIPLEX (TDM)

Sub-Category Description: *Microwave Radios, Carrier Grade, TDM — includes: Point-to-Point digital microwave radio equipment to operate on Part 101 licensed frequencies above 5925 MHz; available in all-indoor or split system, capable of space diversity, fix or adaptive modulation; providing native TDM interface with high throughput capacity; supporting N+1 hot standby, and/or XPIC, and/or ring redundancy; along with required bandwidth management / routing equipment and software; and with antennas, feedline systems, hardware (which may be from other manufacturers) to provide a complete system.*

For evaluation purposes, all Bidders must offer a product meeting the following example product: Lower 6 GHz microwave radio, all-indoor installation, space diversity, providing three (3) DS-3 throughput, and 1+1 hot-standby. All antenna system components and hardware, and routing equipment provided by the customer.

The following specifications and equipment configuration describes requirements for the example product above. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12-point font and labeled [*"MicrowaveSubCategory-CarrierGrade-TDM"*]). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Note: Symbols for less-than (<) or greater-than (>) shall be interpreted to include equal-to the specified value. The symbol for approximate (~) indicates an imprecise or nominal value where variations will be acceptable.

Manufacturer: NO BID Product Model Name: NO BID

Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	GENERAL DESCRIPTION		
1.1.	Frequency Range: 5925 – 6425 MHz (Lower 6 GHz band) plus 11 and 18 GHz Part 101 frequency bands.		
1.2.	Radio Type: Native Time Division Multiplexed (TDM).		
1.3.	Link Throughput: Three(3) DS-3.		
1.4.	Operate on a 30MHz RF channel, at 128QAM.		
1.5.	Configuration: All-Indoor Installation.		
1.6.	Indoor Mounting: Customer supplied standard 19 inch wide — 84 inch tall equipment rack.		
1.7.	Electrical Power: Customer Supplied -48 VDC.		

Exhibit B-1 Mandatory Technical Requirements

1.8.	Licensing: Bidder to assume coordination and licensing successfully completed.		
2.	TECHNICAL STANDARDS		
2.1.	Frequency Tolerance: per FCC 101.107.		
2.2.	Channel Bandwidth: per FCC 101.109.		
2.3.	Emission limitations: per FCC 101.111.		
2.4.	Transmit Power: per FCC 101.113.		
2.5.	Operating Environment: per Telcordia GR-63 as applicable.		
3.	OPERATIONAL PARAMETERS		
3.1.	Transmit RF Power: >28 dBm, optional <30 dBm.		
3.2.	Should be Capable of Automatic TX Power Control.		
3.3.	Minimum Receive Threshold Level at TX/RX Unit Port: <-65dBm.		
4.	RESILIENCY AND PROTECTION		
4.1.	1+1 Hot Standby TX/RX plus Receive Diversity.		
5.	NETWORK		
5.1.	Interface: Copper DS-3.		
5.2.	Monitoring: SNMP Traps.		
5.3.	Optional DS-3 to T1 Multiplex.		
6.	SERVICES MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for use by supporting technician.		
7.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.		

Exhibit B-1 Mandatory Technical Requirements

8.	SHIPPING REQUIREMENTS: F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>			
WARRANTY OPTION		DESCRIPTION	
TWO-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty".</i>		
THREE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty".</i>		
FOUR-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".</i>		
FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".</i>		

Exhibit B-1 Mandatory Technical Requirements

6. CATEGORY: INTEROPERABILITY GATEWAY DEVICES

Category Definition: *Devices that interface multiple radios, of multiple makes and models, to analog telephones, to IP telephone networks, and to other devices; allowing multiple simultaneous voice communications to facilitate incident interoperability between respondents equipped with otherwise incompatible technologies; fixed, mobile, and portable devices; analog, digital, or IP-based devices; along with associated firmware and software, interface devices, connecting cables, and accessories.*

For evaluation purposes, all Bidders must offer a product meeting the following example product: Quantity one (1) — IP Gateway Device Configured to Support a Mobile Command Post.

The following specifications and equipment configuration describes requirements for the example product above. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12-point font labeled [*Category-Interoperability-Gateway*]). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Note: Symbols for less-than (<) or greater-than (>) shall be interpreted to include equal-to the specified value. The symbol for approximate (~) indicates an imprecise or nominal value where variations will be acceptable.

Manufacturer: EFJohnson

Product Model Name: ATLAS ISSI Gateway

Product Number: ATLAS 6600 ISSI

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	GENERAL FEATURES		
1.1.	The device creates a Local Interoperability System, linking devices such as radios, telephones, or satellite phones into a unified communications system.	Y	
1.2.	The device shall be configured with software control, supporting remote radios, SIP devices, and connections to other Local Interoperability Systems.	Y	
1.3.	The device shall be capable of interfacing any standard radio, as described above, to any analog or digital public telephone network (PSTN) or private branch exchange (PBX).	Y	
1.4.	The device shall allow a minimum of four (4) cross-connect nets at one time (Talk-groups).	Y	

Exhibit B-1 Mandatory Technical Requirements

2.	MOUNTING		
2.1.	Customer supplied standard 19 inch equipment rack (84 inch tall).	Y	
3.	POWER		
3.1.	~12 VDC from Customer supplied power system.	Y	
3.2.	AC powered equipment shall be provided with an inverter to support operation on DC power.	Y	
4.	CONTROLLER / OPERATING SYSTEM		
4.1.	The Operating System shall use a current version Windows-based operating system to provide a user-friendly interface depicting system operations, allowing programming of features, and providing password protection of features. (Customer supplied PC.).	Y	
4.2.	The Operating System shall allow connection or disconnection of any channel to any other channel.	Y	
4.3.	The Operating System shall provide for the programming of all interface features, such as public telephone interface, SATCOM interface, cellular interface, and two-way radio interface.	Y	
4.4.	The Operating System shall provide the ability to create and store specific interoperability response combinations for pre-planning.	Y	
4.5.	All Call: the Operating System shall provide for a quick and easy broadcast of emergency messages over all channels simultaneously.	Y	
4.6.	IP (VoIP) Interface.	Y	
4.7.	RJ-45 connector.	Y	
4.8.	10/100 base-T Ethernet, 100 Mbps.	Y	
4.9.	Audio delay and jitter buffers to handle network latency.	Y	
4.10.	Embedded COR, PTT, and audio vocoder.	Y	
5.	LOCAL OPERATOR CONTROL		
5.1.	Local control to modify configuration or select from available stored configurations.	Y	
5.2.	Local speaker, with volume control and speaker on/off.	Y	
5.3.	Microphone input with PTT.	Y	

Exhibit B-1 Mandatory Technical Requirements

5.4.	Headphone connection.	Y	
6.	IP TELEPHONE (SIP) INTERFACE		
6.1.	Standard: RFC 3261 or current modifications.	Y	
6.2.	SIP Support Vcoders: GSM and G711u, with auto-detect/select if the primary codec is not available.	Y	
7.	TONE REMOTE INTERFACE (analog)		
7.1.	Standard: EIA tone remote.	Y	
7.2.	RJ-11 jack or terminals.	Y	
7.3.	Interface: selectable 2-Wire or 4-Wire, with selectable 600 ohm termination or hi-Z for parallel operation.	Y	
7.4.	Levels: -20 dBm to +10 dBm, with AGC and/or compression to compensate for variations.	Y	
8.	RADIO INTERFACES		
8.1.	Bidder shall supply interface cables to connect a wide range of user radios to the Gateway system.	Y	
9.	CONFIGURATION: Bidder shall provide the following configuration a hypothetical mobile command post for a multi-agency event. (<i>See illustration below</i>)		
9.1.	Interface to one (1) Kenwood TK-5710-G conventional mobile radio.	Y	
9.2.	Interface to one (1) Motorola XLT 5000 conventional mobile radio.	Y	
9.3.	Interface to one (1) ICOM 9511T conventional mobile radio.	Y	
9.4.	Interface to one (1) Motorola APX 6500 trunked mobile radio.	Y	
9.5.	Interface to one (1) Relm-BK KNG-P150 conventional portable radio.	Y	
9.6.	Interface to one (1) Codan/Daniels MT-4E base radio, which links to tactical repeaters.	Y	
9.7.	Interface to one (1) SIP telephone.	Y	
9.8.	Interface to one (1) Tone Remote external dispatch console.	Y	
10.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for technician.	Y	

Exhibit B-1 Mandatory Technical Requirements

11.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.	Y	
12.	SHIPPING REQUIREMENTS: F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.	Y	
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder’s offering)</i>			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	
ATLAS 8300 MOBILE RADIO GATEWAY		Gateway device for Viking control stations to StarGate consoles	
ATLAS 8410 ANALOG/LOGGING GATEWAY		Gateway device for legacy/analog radios to ATLAS systems	
ZETRON DISPATCH/DIGITAL RADIO GATEWAYS		Radio Gateways used when interfacing via IP directly to a Radio System (multiple models)	
ZETRON TELEPHONY GATEWAYS		Gateway used when interfacing analog telephone networks, SIP tunnels, etc. (multiple models)	
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder’s offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>			
WARRANTY OPTION		DESCRIPTION	
TWO-YEAR ADDITIONAL OPTION		Describe in the space provided or submit a separate document describing the two-year warranty option labeled, “Exhibit B-1Category/Sub-CategoryTwo-YearWarranty”. Extended warranty for ATLAS components is customized based on the system design and equipment ordered. Extended warranties can be purchased for up to 15 years.	
THREE-YEAR ADDITIONAL OPTION		Describe in the space provided or submit a separate document describing the two-year warranty option labeled, “Exhibit B-1Category/Sub-CategoryThree-YearWarranty”. Extended warranty for ATLAS components is customized based on the system design and equipment ordered. Extended warranties can be purchased for up to 15 years.	

Exhibit B-1 Mandatory Technical Requirements

FOUR-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".</i> Extended warranty for ATLAS components is customized based on the system design and equipment ordered. Extended warranties can be purchased for up to 15 years.
FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".</i> Extended warranty for ATLAS components is customized based on the system design and equipment ordered. Extended warranties can be purchased for up to 15 years.

Exhibit B-1 Mandatory Technical Requirements

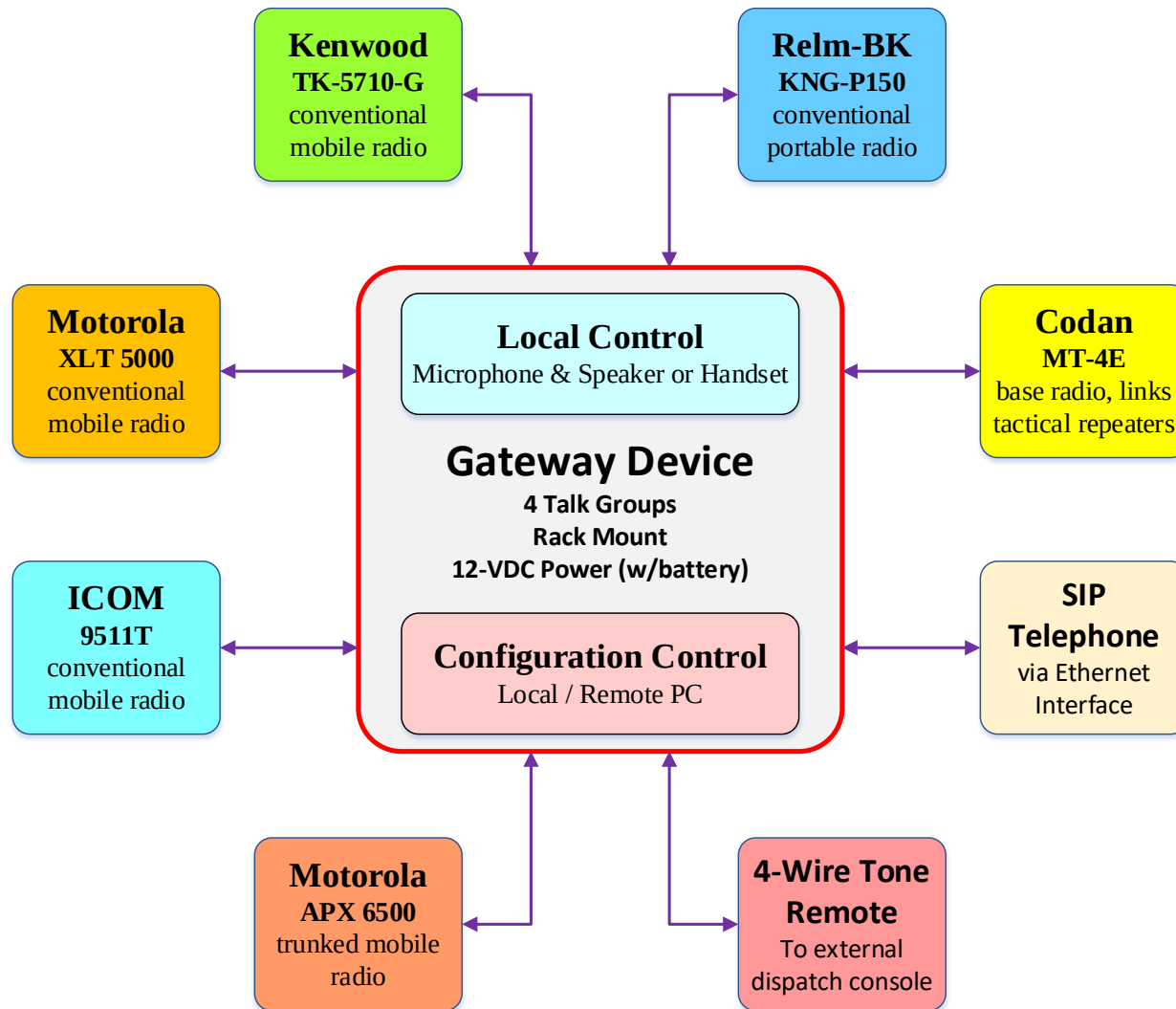


Exhibit B-1 Mandatory Technical Requirements

7. CATEGORY: POWER SUPPLY PRODUCTS AND SOLUTIONS

Instructions: Responses to the Power Systems Solutions 7.1 and 7.2 will be captured in Exhibit B-2 System Solution Narratives. Bidder may submit a solution for either of the categories below. Each category will be evaluated and awarded separately.

7.1 DC POWER SYSTEM SOLUTIONS NO BID

7.2 VRLA (VALVE REGULATED LEAD ACID) BATTERY SYSTEMS SOLUTIONS NO BID

Exhibit B-1 Mandatory Technical Requirements

7.3 RACK-MOUNTED DISTRIBUTION PANELS

Sub-Category Description: *Rack-Mounted Power Distribution Panels providing protected outputs.*

For evaluation purposes, all Bidders must offer a product meeting the following example product: Quantity one (1) — Rack-Mounted Power Distribution panel with six (6) protected outputs.

Manufacturer: **NO BID** Product Model Name: **NO BID** Product Number: **NO BID**

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	GENERAL REQUIREMENTS		
1.1	Rack mounting (19 in.)		
1.2	Circuit protection (breakers with alarming for tripped breakers)		
1.3	Buss bar power connections and returns		
1.4	Voltage (12, 24, or 48 VDC)		
2.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for technician.		
3.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.		
4.	SHIPPING REQUIREMENTS: F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	

Exhibit B-1 Mandatory Technical Requirements

WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>	
WARRANTY OPTION	DESCRIPTION
TWO-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty".
THREE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty".
FOUR-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".
FIVE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".

Exhibit B-1 Mandatory Technical Requirements

7.4 CONVERTERS/INVERTERS

7.4.1 VOLTAGE CONVERTERS

Sub-Category Description: *Rack mounted DC to DC converters.*

For evaluation purposes, all Bidders must offer a product meeting the following example product: Quantity one (1) — Voltage Converter converting 48 VDC to 24 VDC output.

Manufacturer: **NO BID** Product Model Name: **NO BID** Product Number: **NO BID**

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	GENERAL REQUIREMENTS		
1.1	Rack-mounted		
1.2	Capable of converting:		
1.2.1	12 VDC to 24 VDC or 48 VDC		
1.2.2	24 VDC to 12 VDC or 48 VDC		
1.2.3	48 VDC to 12 VDC or 24VDC		
1.3	Minimum output (10 amps)		
2.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for technician.		
3.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.		
4.	SHIPPING REQUIREMENTS: F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION			

Exhibit B-1 Mandatory Technical Requirements

<i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>	
PRODUCT MODEL NAME/NUMBER	DESCRIPTION
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>	
WARRANTY OPTION	DESCRIPTION
TWO-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty" .
THREE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty" .
FOUR-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty" .
FIVE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty" .

Exhibit B-1 Mandatory Technical Requirements

7.4.2 INVERTERS

Sub-Category Description: *Rack mounted DC to AC inverters.*

For evaluation purposes, all Bidders must offer a product meeting the following example product: Quantity one (1) — Voltage Inverter converting 48 VDC to 120 VAC output.

Manufacturer: Click or tap here to enter text.

Product Model Name: Click or tap here to enter text.

Product Number: Click or tap here to enter text.

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	GENERAL REQUIREMENTS		
1.1	Rack-mounted		
1.2	Capable of converting:		
1.2.1	12 VDC to 120 VAC or 240 VAC		
1.2.2	24 VDC to 120 VAC or 240 VAC		
1.2.3	48 VDC to 120 VAC or 240 VAC		
1.3	Minimum output (5 amps)		
2.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for technician.		
3.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.		
4.	SHIPPING REQUIREMENTS: F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			

Exhibit B-1 Mandatory Technical Requirements

PRODUCT MODEL NAME/NUMBER	DESCRIPTION
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>	
WARRANTY OPTION	DESCRIPTION
TWO-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty".</i>
THREE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty".</i>
FOUR-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".</i>
FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".</i>

Exhibit B-1 Mandatory Technical Requirements

8. CATEGORY: TEST EQUIPMENT

8.1 TEST EQUIPMENT SUB-CATEGORY: MULTIFUNCTION RADIO TEST SET

Sub-Category Definition: *Specialized high-accuracy multi-function test instrument for the testing of two-way radios. Includes: portable instruments, rugged field service instruments, laboratory instruments, along with related test adapters and accessories.*

For evaluation purposes, all Bidders must offer a product meeting the following example product: Quantity one (1) — Compact multifunction instrument for testing and alignment of two-way radios (AKA: Radio Service Monitor).

The following specifications and equipment configuration describes requirements for the example products above. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12-point font labeled "**TestEquipSubCategory-Multifunction-Radio-Test-Set**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Note: Symbols for less-than (<) or greater-than (>) shall be interpreted to include equal-to the specified value. The symbol for approximate (~) indicates an imprecise or nominal value where variations will be acceptable.

Manufacturer: NO BID Product Model Name: NO BID Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	SUMMARY OF FUNCTIONS		
1.1.	AM/FM/P-25 Monitor		
1.2.	AM/FM/P-25 Generator		
1.3.	Duplex Generator		
1.4.	Signal Strength Meter		
1.5.	RF Power Meter		
1.6.	Spectrum Analyzer		
1.7.	Tracking Generator		
1.8.	RF Cable Fault Locator		
1.9.	RF Frequency Counter		
1.10.	Frequency Error Meter		

Exhibit B-1 Mandatory Technical Requirements

1.11.	AM Modulation Meter		
1.12.	FM Deviation Meter		
1.13.	SINAD/Distortion Meter		
1.14.	Audio Synthesizer		
1.15.	Oscilloscope		
1.16.	Digital Voltmeter		
2.	TIME-BASE		
2.1.	Temperature Stability = ± 0.15 ppm at -20° C to 70° C		
2.2.	Aging = 0.5 ppm First Year / 0.3 ppm After First Year		
3.	RF GENERATOR (RECEIVER TEST)		
3.1.	Port Input Protection		
3.1.1.	GEN Port: +20 dBm (Input Power Alarm Typical)		
3.1.2.	T/R Port: +49 dBm CW (Input Power Alarm Typical)		
3.1.3.	T/R Port: >+90° C (Temperature Alarm Typical)		
3.2.	Frequency		
3.2.1.	Range = 2 MHz to 1000 MHz		
3.2.2.	Accuracy = Same as time-base		
3.3.3.	Resolution = 1 Hz		
3.3.	Output Level.		
3.3.1.	Range - T/R Port: -50 to -125 dBm - GEN Port: -5 to -65 dBm		
3.3.2.	Accuracy = ± 2 dB or better.		
3.3.3.	Resolution = 1 dB		
3.4.	Signal Purity		
3.4.1.	Port VSWR < 1.5:1 (all ports)		
3.4.2.	SSB Phase Noise = -90 dBc/Hz at 20 kHz offset		
3.4.3.	Spurious - Harmonics = -20 dBc maximum, - Non-Harmonics = -35 dBc maximum (± 20 kHz offset from carrier; 0 to 1 GHz)		

Exhibit B-1 Mandatory Technical Requirements

3.4.4.	Residual FM - <20 Hz rms in 300 Hz to 3 kHz BW -		
3.4.5.	Residual AM <1% rms in 300 Hz to 3 kHz BW		
3.5.	Modulation Types		
3.5.1.	1 kHz Tone		
3.5.2.	Private Line		
3.5.3.	Digital Private Line (w/ DPL Invert)		
3.5.4.	Single Tone		
3.5.5.	DTMF		
3.5.6.	Paging - Two-Tone & 5/6 Tone		
3.5.7.	External microphone & input connector		
3.6.	FM Modulation		
3.6.1.	Deviation Range = 0 to 75 kHz		
3.6.2.	Total Harmonic Distortion < 3%		
3.6.3.	Resolution < 10 Hz		
3.6.4.	Accuracy < ±10% (2 kHz to 50 kHz deviation)		
3.7.	AM Modulation		
3.7.1.	Range = 0 to 90%		
3.7.2.	Resolution < 1%		
3.7.3.	Total Harmonic Distortion < 3% (20% to 90% mod)		
3.7.4.	Accuracy < 10% of setting (20% to 90% mod)		
4.	RF RECEIVER (TRANSMITTER TEST)		
4.1.	Port Input Protection		
4.1.1.	ANT Port: +20 dBm (Input Power Alarm Typical)		
4.1.2.	T/R Port: +49 dBm CW (Input Power Alarm Typical)		
4.1.3.	T/R Port: >+90° C (Temperature Alarm Typical)		
4.2.	Frequency		
4.2.1.	Range = 2 MHz to 1000 MHz		
4.2.2.	Accuracy = Same as Time-base		

Exhibit B-1 Mandatory Technical Requirements

4.2.3.	Resolution = 1 Hz		
4.3.	Input Amplitude		
4.3.1.	Sensitivity with pre-amplifier - ANT: -110 dBm for 10 dB SINAD - T/R: -40 dBm for 10 dB SINAD		
4.3.2.	Minimum Level Receiver Measurements with pre-amplifier - ANT: -80 dBm for RF Error Meter - T/R: -40 dBm for RF Error Meter		
4.3.3.	DEMODO Meters - Modulation - Distortion - SINAD - AF Counter		
4.4.	IF Bandwidth		
4.4.1.	FM: - 6.25 kHz to 25 kHz -		
4.4.2.	AM: - 6.25 kHz to 25 kHz -		
4.5.	RF Frequency Error Meter		
4.5.1.	Units = Hz, PPM		
4.5.2.	Range = ± 200 kHz, ± 1000 PPM		
4.5.3.	Resolution = 1 Hz		
4.5.4.	Accuracy = Time-base ± 1 Hz		
4.6.	RF Power Meter (RF Power Into T/R Port)		
4.6.1.	Maximum Input Level = 50 Watts continuous		
4.6.2.	Input RF Power Alarm = +49 dBm		
4.6.3.	Temperature Alarm > +90° C		
4.6.4.	Meter Range = +20 to +53 dBm		
4.6.5.	Display Units = Watts, dBm		
4.6.6.	Resolution = 0.01 W, 0.1 dBm		

Exhibit B-1 Mandatory Technical Requirements

4.6.7.	Accuracy < 10% of reading		
4.7.	FM Deviation Meter		
4.7.1.	Range = ± 500 Hz to ± 75 Hz		
4.7.2.	Meter Type = Peak+, Peak-, (Peak-Peak)/2, RMS		
4.7.3.	Resolution = 0.1 Hz		
4.7.4.	Accuracy < $\pm 5\%$ of reading, 1 kHz to 10 kHz Dev.		
4.8.	AM Percent Meter		
4.8.1.	Range = 5% to 100%		
4.8.2.	Meter Type = Peak+, Peak-, (Peak-Peak)/2, RMS		
4.8.3.	Resolution = 0.1%		
4.8.4.	Accuracy = $\pm 5\%$ of reading		
4.9.	SINAD Meter		
4.9.1.	Measurement Sources = Audio IN, DEMOD		
4.9.2.	Audio Frequency Notch = 1 kHz		
4.9.3.	Reading Range = 0 dB to 60 dB		
4.9.4.	Resolution = 0.1 dB to .0.1 dB		
4.9.5.	Accuracy < ± 1.5 dB,		
4.10.	Distortion Meter		
4.10.1.	Measurement Sources = AUD IN, DEMOD		
4.10.2.	Audio Frequency Notch = 1 kHz		
4.10.3.	Reading Range = 0% to 100%		
4.10.4.	Resolution = 0.1%		
4.10.5.	Accuracy = $\pm 10\%$ of reading		
4.11.	Audio Frequency Counter		
4.11.1.	Measurement Sources = AUD IN, DEMOD		
4.11.2.	Frequency Range = 15 Hz to 20 kHz		
4.11.3.	Resolution = 0.1 Hz		
4.11.4.	Accuracy < ± 1 Hz		
4.12.	Audio Frequency Level Meter		

Exhibit B-1 Mandatory Technical Requirements

4.12.1.	Measurement Sources = AUD IN, SCOPE		
4.12.2.	Input Range = - Audio In Range = 3 V, 30 V - Scope Range = 2 VDC, 40 VDC		
4.12.3.	Frequency Range = 200 Hz to <5 kHz		
	-		
4.12.5.	Accuracy < ±5% AUD IN Port		
4.13.	Oscilloscope		
4.13.1.	Source = SCOPE, AUD IN, DEMOD		
4.13.2.	Bandwidth = 5 kHz		
4.14.	Digital Multimeter (DMM)		
4.14.1.	Functions - AC/DC Voltmeter -		
4.14.3.	Accuracy < ±5% AC, < ±2% DC		
4.15.	Power		
4.15.1.	AC adapter and/or a vehicle adapter.		
4.15.2.	DC Input Voltage Range = 12 to 32 VDC (12-24 nominal)		
4.15.3.	Battery Power, with full display backlight and field swappable.		
4.15.4.	Battery Recharge, with unit on = 4 hours or less		
4.16.	Environmental — tested in accordance with MIL-PRF-28800F, Class 3		
4.16.1.	Storage Temperature = -20° C to +60° C with battery		
4.16.2.	Operating Temperature = 0°C to +40°C with battery		
4.16.3.	Operating Relative Humidity = 5% to 80%		
4.16.4.	Operating Altitude = up to 10,000 feet		
4.16.5.	Shock = 30 G (Functional Shock)		
4.16.6.	Vibration = 5 to 500 Hz random vibrations		
4.17.	Physical		

Exhibit B-1 Mandatory Technical Requirements

4.17.1.	Dimensions = less than 14 in x 12 in x 8 in (width x height, depth)		
4.17.2.	Weight = less than 20 pounds		
4.17.3.	Case = Hard transit case		
5.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for technician.		
6.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.		
7.	SHIPPING REQUIREMENTS: F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER	DESCRIPTION		
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>			
WARRANTY OPTION	DESCRIPTION		
TWO-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty" .		
THREE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty" .		

Exhibit B-1 Mandatory Technical Requirements

FOUR-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".</i>
FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".</i>

Exhibit B-1 Mandatory Technical Requirements

8.2 TEST EQUIPMENT SUB-CATEGORY: SPECIALIZED RF INSTRUMENTS

Sub-Category Definition: *Specialized high-accuracy radio frequency instrument for the analysis of radio systems. Includes: Signal generators, signal analyzers, spectrum analyzers, vector network analyzers, power meters, antenna measurement instruments; and related specialized instruments, configured as portable instruments, rugged field service instruments, laboratory instruments; along with related test adapters and required accessories.*

Example Product: Quantity one (1) — Portable & Spectrum Analyzer — a field instrument for the analysis of RF systems and the identification of interference.

The following specifications and equipment configuration describes requirements for the EXAMPLE PRODUCT. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12-point font labeled "**ExhibitB1-TestEquipment8.2**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Note: Symbols for less-than (<) or greater-than (>) shall be interpreted to include equal-to the specified value. The symbol for approximate (~) indicates an imprecise or nominal value where variations will be acceptable.

Manufacturer: NO BID Product Model Name: NO BID

Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	PHYSICAL /ENVIRONMENTAL		
1.1.	Dimensions: < 12" x 12" x 4"		
1.2.	Weight: < 8 lbs		
1.3.	Transit Shock/Drop: MIL-PRF-28800F Class 2		
1.4.	Operating Temperature: -10°C to +55°C		
1.5.	Operating Altitude: > 12,000 feet		
1.6.	RF Port Connectors: Type N, Female, 50 ohm		
1.7.	RF Input: > +20 dBm (100 mw)		
2.	POWER		
2.1.	External AC: 110/220 V nominal		
2.2.	External DC = 12 V nominal		
2.3.	Internal Battery > 3 hours run time		

Exhibit B-1 Mandatory Technical Requirements

3.	USER INTERFACE		
3.1.	Display: - > 6.5" flat panel, - Daylight viewable, - 99.999% good pixels.		
3.2.	Intuitive User menus		
3.3.	Help files accessible from the user screen		
3.4.	PC Interface to configure and access files		
3.5.	Output files in standard format (PDF, DOC, etc.)		
3.6.	Data Interface: USB port		
3.7.	Data Storage, Internal: > 150 traces & settings		
3.8.	Data Storage, External: USB device capacity > 16GB		
4.	SPECTRUM ANALYZER		
4.1.	Frequency Range: > 100 kHz to 3.0 GHz		
4.2.	Reference Aging: ± 1 ppm / year		
4.3.	Tuning Resolution: 1 Hz		
4.4.	Spectral Purity: < -85 dBc @ 30 kHz		
4.5.	Sweep Time: 2.0 s, full span; 1 ms, zero span		
4.6.	Resolution Bandwidth: 100 Hz to 1 MHz RBW		
4.7.	Video Bandwidth: 10 Hz to 300 kHz VBW		
4.8.	Amplitude Accuracy: < ± 1.5 dB		
4.9.	Dynamic Range: > 60dB, intermod-free		
4.10.	Noise Floor: -135 dBm		
5.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for technician.		
6.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser.		

Exhibit B-1 Mandatory Technical Requirements

	Provide additional warranty options below.		
7.	SHIPPING REQUIREMENTS: F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER	DESCRIPTION		
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>			
WARRANTY OPTION	DESCRIPTION		
TWO-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty" .		
THREE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty" .		
FOUR-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty" .		
FIVE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty" .		

Exhibit B-1 Mandatory Technical Requirements

9. CATEGORY: MONITORING & ALARM EQUIPMENT

9.1 MONITORING & ALARM SUB-CATEGORY: ENVIRONMENTAL

Sub-Category Definition: *Automated communication systems for collecting and transmitting environmental data for emergency notification (fire, flood, volcanic eruption, tsunami, etc.), along with all associated hardware, software, and accessories to complete and maintain the system.*

Example Product: Quantity one (1) — Remote Automated Weather Station (RAWS) per NFDRS Standards

The following specifications and equipment configuration describes requirements for the EXAMPLE PRODUCT. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12 point font labeled "*ExhibitB1-Monitoring-9.1*"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Note: Symbols for less-than (<) or greater-than (>) shall be interpreted to include equal-to the specified value. The symbol for approximate (~) indicates an imprecise or nominal value where variations will be acceptable.

Manufacturer: NO BID **Product Model Name:** NO BID

Product Number: NO BID

ITEM No.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	Remote Automatic Weather Station should include the following: National Fire Danger Rating System NFDRS Remote automated Weather Station (RAWS) per National Wildfire Coordination Group standard PMS 426-3.		
2.	Dedicated Data Acquisition System for AWS. (data logger).		
3.	The data logger should have battery-backed SRAM for CPU usage, program storage, and data storage for up to at least one million data values with upgradeable memory size at a later date without any hardware replacements and with inherent noise reducing facility. It should be compatible with 12VDC power supply and should have programming and math functions capability for deriving calculated parameters with high program execution rate of up to 100 Hz for making fast measurements. It should have ability		

Exhibit B-1 Mandatory Technical Requirements

	to implement conditional statements in the data logger programming. The Histogram instruction is required to process input data as either a standard histogram (frequency distribution) or a weighted value histogram. It should be possible to calculate the standard deviation of the Source over the output interval and store the results in a Data Table. The data logger should have ability to reject the 50Hz noise for accurate measurements. Special Software with Data logger should be provided to monitor various sensors.		
4.	SOFTWARE: Special Software should be provided with Data logger to monitor various sensors.		
5.	RANGE AND AUTO RANGING: Support of +/-5VDC range and should have auto ranging facility apart from making measurements on following ranges specific to a channel: e.g., ± 5000 mv, ± 2500 mv, ± 250 mv, ± 25 mv, ± 7.5 mv, ± 2.5 mv, with resolution on the most sensitive range better than 0.5 microvolt.		
6.	SWITCHED VOLTAGE EXCITATIONS: The system should have switched outputs provided for precision excitation voltages.		
7.	DIGITAL I/O PORTS: Minimum eight ports should be provided for frequency measurements, digital control, and triggering.		
8.	SWITCHED 12 VOLT: Two independent 12 V unregulated sources switched on & off under program control.		
9.	OPERATING TEMPERATURE RANGE: -55° to +50°C		
10.	ENCLOSURE: The data logger should be housed in a weatherproof enclosure of NEMA-IV rating.		
11.	POWER SUPPLY: Charger/Regulator 12VDC		
12.	WALL ADAPTOR: AC-DC 120 VAC TO 18 VDC		
13.	CORD WITH TYPE-C PLUG		
14.	BATTERY: 12V 7AH (minimum)		
15.	SENSORS: (All sensors should be compatible with data logger, include mounting hardware and have a cable sufficient to allow mounting, and Operating Temperature: (40° to +60°C).		
16.	AIR TEMPERATURE & RELATIVE HUMIDITY SENSOR COMBINED		

Exhibit B-1 Mandatory Technical Requirements

16.1.	Relative Humidity Measurement Range: 0 to 100% RH, non-condensing.		
16.2.	Output Signal Range: 0 to 2 V dc max.		
16.3.	Typical Long-Term Stability: Better than 1% RH per year		
16.4.	Voltage: 12 V dc Nominal or equivalent		
16.5.	Current Consumption: max 4 mA		
16.6.	PRT based Measurement Range: -40° to +60°C		
16.7.	Output signal range: 0 to 1.0 V		
17.	ATMOSPHERIC PRESSURE SENSOR:		
17.1.	Pressure Range 600 to 1100 hPa (mbar)		
17.2.	Operating Temperature -50 to +60°C Accuracy at least ±0.5 hPa (mbar) at -50 to +60°C.		
18.	SOLAR RADIATION SENSOR: - Pyranometer based		
18.1.	Light Spectrum Waveband: 400 to 1100 nm		
18.2.	Sensitivity: Typically 80 per1000		
18.3.	Wm-2 Linearity: Maximum deviation of 1% up to 3000 W m-2 Accuracy: ±5%		
18.4.	Tipping Bucket Rain Gauge		
18.5.	Tips at 0.1 mm increments (0.004 in) Orifice diameter is max 24.5 cm (9.66 in) Accuracy is ±1% at rates up to 1 in per hr.		
18.6.	Output: Momentary switch closure activated by tipping bucket mechanism.		
18.7.	Environmental Limits: Temperature: 0° to +50°C and Humidity: 0 to 100% The bucket should have leveling arrangement for horizontal mounting.		
19.	WIND SPEED AND DIRECTION SENSOR: (Identify type, i.e. propeller, ultrasonic, etc.) (The sensor should be made out of rigid UV-stabilized thermoplastic with corrosion proof stainless steel and anodized aluminum fittings. The sensor should have stainless steel precision-grade ball bearings for the propeller shaft and vertical shaft bearings).		
19.1.	Wind Speed Range: 0-100 m/s		

Exhibit B-1 Mandatory Technical Requirements

19.2.	Accuracy: ±0.3 m s		
19.3.	Starting threshold: 1.0 m/s		
19.4.	Wind Direction Range: 0-360°		
19.5.	Accuracy: ±3° Starting threshold: 1.1 m/s		
19.6.	Damping ratio: max 0.25 Output: Analog dc voltage from potentiometer linearity 0.25%		
20.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for technician.		
21.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options below.		
22.	SHIPPING REQUIREMENTS: F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder’s offering)</i>			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder’s offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>			
WARRANTY OPTION		DESCRIPTION	
TWO-YEAR ADDITIONAL OPTION		Describe in the space provided or submit a separate document describing the two-year warranty option labeled, “Exhibit B-1Category/Sub-CategoryTwo-YearWarranty”.	

Exhibit B-1 Mandatory Technical Requirements

THREE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty".</i>
FOUR-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".</i>
FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".</i>

Exhibit B-1 Mandatory Technical Requirements

9.2 MONITORING & ALARM SUB-CATEGORY: RADIO NETWORK

Sub-Category Definition: IP and analog radio network monitoring software & hardware, SCADA software & hardware, SNMP manager and agent software & hardware, remote terminal units (RTU), RF and radio site sensors.

Example Product: Quantity one (1) — Hypothetical radio system monitoring (RSM) configuration.

The following specifications and equipment configuration describes requirements for the EXAMPLE PRODUCT. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12 point font labeled "**ExhibitB1-Monitoring9.2**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Note: Symbols for less-than (<) or greater-than (>) shall be interpreted to include equal-to the specified value. The symbol for approximate (~) indicates an imprecise or nominal value where variations will be acceptable.

Manufacturer: NO BID **Product Model Name:** NO BID

Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	OVERALL SPECIFICATION		
1.1.	The RSM shall provide indications, alarms and status of the equipment and systems being monitored that facilitate timely, precise interpretation of abnormal or failed conditions within the radio network		
1.2.	The RSM shall consist of (a) server software {physical or virtual servers}, (b) IP and analog transmission paths, and (c) interfaces to remote equipment and/or sensors.		
1.3.	The RSM shall integrate into a single unified system alarm and status messages from multiple types of equipment from multiple manufacturers — such as radio repeaters, microwave radios, IP switches, power supplies, solar controllers, generators, HVAC equipment, and access control systems.		
1.4.	The RSM shall be designed to minimize the loss of status, alarm, and event messages during transmission to the server.		

Exhibit B-1 Mandatory Technical Requirements

1.5.	The RSM shall easily configured and expanded to accommodate additional inputs and monitored sites.		
2.	RSM SERVER		
	The RSM server software shall operate on a virtual-server environment. (Customer supplied and managed server).		
	The RSM server shall operate within the network security and antivirus requirements of the customer agency. (Customer supplied and managed firewall and antivirus).		
2.3.	The RSM server shall support multiple simultaneous access to status and alarm information.		
2.3.1.	Interface via a PC client for configuration and monitoring.		
2.3.2.	Interface via web client for access to monitoring.		
2.3.3.	Interface via smart phone application for access to monitoring.		
2.4.	The RSM server shall support multiple password protected user accounts to manage system access.		
2.4.1.	Control access to (a) specific monitored equipment, (b) specific types of groups of equipment, or (c) specific sites, or (d) any combination.		
2.4.2.	Provide multiple levels of access: (a) view only, (b) view and remote control, (c) view, remote control, and configure.		
2.5.	The RSM server software shall record and process alarm and status data according to individualized and categorized scripts, which include: severity of alarm, time of day, season, and on-call duty assignments.		
2.5.1.	RSM software shall provide logs of monitored parameters, alarms, and alarm responses. (Log capacity not specified; assumed to be a server capacity issue).		
2.6.	The RSM server shall provide external messaging in response to alarm and status data:		
2.6.1.	Messaging via SMTP (email)		
2.6.2.	Messaging via SMS (text)		
2.6.3.	Messaging via SNMP traps (to other systems).		
2.6.4.	Messaging via SIP phone (voice messages).		

Exhibit B-1 Mandatory Technical Requirements

2.7.	The RSM server shall provide response escalation, sending additional messages and including additional recipients if the required acknowledgment is not received in the defined response time.		
2.8.	The RSM configuration shall be expandable to accommodate future additional sites and monitor inputs.		
3.	HYPOTHETICAL RADIO SYSTEM — The hypothetical radio system consists of a central dispatch center and two radio sites, with a separate radio shop that maintains the radio system.		
4.	RADIO SHOP — located on the same campus and with IP network connectivity to, the Dispatch Center. The radio shop has the following resources that shall be integrated into RSM:		
4.1.	PC workstation (customer supplied) dedicated to configuration and monitoring of RSM.		
4.2.	Test radio for evaluation and maintenance of the radio system. RSM shall be configured to provide off-site access to the test radio for radio system evaluation as follows:		
4.2.1.	Channel Change, via four separate contact closures to steer channel selection.		
4.2.2.	PTT, via contact closure		
4.2.3.	Transmit Indicator (TX)		
4.2.4.	Receive Signal Strength Indicator (RSSI)		
5.	DISPATCH CENTER — site is AC powered with backup generator, UPS, and DC power system. RSM shall monitor the following equipment and test points:		
5.1.	Backup Generator, which communicates using MODBUS protocol. RSM shall display the following: (all sensors provided as part of generator).		
5.1.1.	Fuel Level		
5.1.2.	Engine Temperature		
5.1.3.	Oil Pressure		
5.1.4.	Output Voltage		
5.1.5.	Output Current		

Exhibit B-1 Mandatory Technical Requirements

5.2.	Uninterruptible Power System, which communicates using SNMP. RSM shall display the following:		
5.2.1.	Incoming AC Line Voltage		
5.2.2.	Output AC line voltage		
5.2.3.	Output AC load		
5.3.	12VDC Power System with battery backup. RSM shall display the following:		
5.3.1.	Output DC voltage		
5.3.2.	Output DC current		
5.3.3.	Battery Load Current (0-30 A)		
5.4.	Equipment Room Sensors		
5.4.1.	Room Temperature Sensor		
5.4.2.	Door Alarm (contact closure, customer supplied)		
5.4.3.	Room smoke alarm (contact closure, customer supplied)		
5.5.	Codan MT-4E base radio, which provides analog link to radio #1 at site #1. RSM shall display the following:		
5.5.1.	Transmit Indicator (TX)		
5.5.2.	Receive Signal Strength Indicator (RSSI)		
5.5.3.	Forward & Reflected RF Power — taken from an antenna line sensor installed at the output of filter cavities and circulators.		
5.6.	IP Microwave to Radio Site #2, which communicates using SNMP. RSM shall report alarm indications provided by the SNMP.		
6.	RADIO SITE #1 — Site is a solar powered with 12 VDC power system. Site communicates with Dispatch Center via analog radio. RSM shall monitor the following equipment and test points:		
6.1.	MorningStar Pro-Star solar power controller. RSM shall display the following:		
6.1.1.	Solar Array Voltage (0-150 V)		
6.1.2.	Output Voltage (nominal 12 V)		
6.1.3.	Charge Current (0-30 A)		
6.1.4.	Battery Load Current (0-30 A)		

Exhibit B-1 Mandatory Technical Requirements

6.2.	Building Alarms		
6.2.1.	Room Temperature Sensor		
6.2.2.	Door Alarm (contact closure, customer supplied)		
6.2.3.	Smoke Alarm (contact closure, customer supplied)		
6.2.4.	Water Intrusion Alarm (contact closure, customer supplied)		
6.3.	Codan MT-4E repeater radio. RSM shall display the following:		
6.3.1.	Transmit Indicator (TX)		
6.3.2.	Receive Signal Strength Indicator (RSSI)		
6.3.3.	Forward & Reflected RF Power — antenna line sensor installed at the output of filter cavities and circulators, which provides RS232 and Ethernets port – UDP/IP or SNMP interfaces (customer supplied)		
6.4	RSM shall also provide capability to detect faults at remote site and to automatically reset, reboot or start backup site equipment without external user intervention.		
7.	RADIO SITE #2 — Site is AC powered with 12 VDC and 48 VDC power systems. Site communicates with Dispatch Center via Ethernet microwave. RSM shall monitor the following equipment and test points:		
7.1.	Backup Generator, which communicates using MODBUS protocol. RSM shall display the following: (all sensors provided as part of generator)		
7.1.1.	Fuel Level		
7.1.2.	Engine Temperature		
7.1.3.	Oil Pressure		
7.1.4.	Output Voltage		
7.1.5.	Output Current		
7.2.	+12VDC Power System with battery backup. RSM shall display the following:		
7.2.1.	Output DC voltage		
7.2.2.	Output DC current		
7.2.3.	Battery Load Current (0-60 A)		

Exhibit B-1 Mandatory Technical Requirements

7.3.	-48VDC Power System with battery backup. RSM shall display the following:		
7.3.1.	Output DC voltage		
7.3.2.	Output DC current		
7.3.3.	Battery Load Current (0-60 A)		
7.4.	Building Alarms		
7.4.1.	Room Temperature Sensor		
7.4.2.	Door Alarm (contact closure, customer supplied)		
7.4.3.	Smoke Alarm (contact closure, customer supplied)		
7.4.4.	Water Intrusion Alarm (contact closure, customer supplied)		
7.5.	IP Microwave to Radio Site #1, which communicates using SNMP. RSM shall report alarm indications provided by the SNMP.		
7.6.	Quantity = 3, Motorola Quantar base radios, configured with RF <i>combiner</i> and receive multicoupler with one transmit and one receive antenna.		
7.6.1.	Transmit Indicator (TX) {one per radio}		
7.6.2.	Receive Signal Strength Indicator (RSSI) {one per radio}		
7.6.3.	Forward & Reflected RF Power — TX antenna line sensor installed at the output of filter cavities and circulators, which provides RS232 and Ethernets port – UDP/IP or SNMP interfaces (customer supplied)		
7.7.	RSM shall also provide capability to detect faults at remote site and to automatically reset, reboot or start backup site equipment without external user intervention.		
8.	SERVICE MANUAL - One (1) set system documentation, operations and service manuals, printed or electronic copy, for technician.		
9.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser.		

Exhibit B-1 Mandatory Technical Requirements

10.	SHIPPING REQUIREMENTS: F.O.B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>			
WARRANTY OPTION		DESCRIPTION	
TWO-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty" .		
THREE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty" .		
FOUR-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty" .		
FIVE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty" .		

Exhibit B-1 Mandatory Technical Requirements

10. CATEGORY: FURNITURE, DISPATCH CONSOLE

Category Definition: *Specialized dispatch center workstations, CPU enclosures, and auxiliary furniture such as storage units, printer cabinets, files, and tables.*

Example Product: Quantity one (1) — 911-Center Dispatch Workstation with partitioned screens.

The following specifications and equipment configuration describes requirements for the EXAMPLE PRODUCT. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12 point font labeled "**ExhibitB1-ConsoleFurniture**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Note: Symbols for less-than (<) or greater-than (>) shall be interpreted to include equal-to the specified value. The symbol for approximate (~) indicates an imprecise or nominal value where variations will be acceptable.

Manufacturer: NO BID Product Model Name: NO BID

Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	CONSOLE FURNITURE		
1.1.	Electric Height Adjustable Desks – This is for height adjustable desks specific to 24/7 environments.		
1.2.	Console furniture unit in a corner configuration, in a cockpit design. Monitor surface to accommodate up to Quantity and size of flat screen monitors for "Dispatch Consoles."		
1.3.	Work surfaces shall have lifting equipment weight capacity of 500 lbs. to prevent damage from users sitting / leaning on or using the surface as an aid in standing. Minimum which does not include weight of work surface. Console must demonstrate stability at full extension. Maximum deflection of ½" is allowed when a horizontal load of 100 lbs. is applied to the center of each work surface.		
1.4.	Adjustment speed to be minimum 1.5"/second.		

Exhibit B-1 Mandatory Technical Requirements

1.5	Safety finger clearance of 1½" minimum between stationary returns and moving surfaces.		
1.6	Controller shall not be located where it can be damaged by chair arms. Location under front edge of keyboard surface is unacceptable.		
1.7	Controller shall include collision detection technology which will detect sudden changes in load to identify obstructions in the path of the moving surface. Collision detection technology to cause work surface to stop on detection of obstruction and reverse direction approximately 10cm to avoid entrapment of obstruction. Collision detection shall function in both upward and downward directions, and on both surfaces.		
1.8	Surface must lower to 5th percentile seated female elbow height dimension (22.5") according to ANSI/HFES 100 -2007. Provide elevation drawing of both surfaces.		
1.9	Surface must raise to at least standing elbow height for 95th percentile male user (46.5") from the floor to the home row of keyboard. ANSI/HFES 100 -2007.		
1.10	All surfaces, moving and fixed height, must be non-glare, 3-D Laminate. Edges shall be continuous from top through to the bottom of the surface with chamfer style edge. No seams between laminate and edge will be acceptable due to buildup of germs.		
2.	ADJUSTABLE MONITOR RACK - 27/7 furniture usually has several monitors that are used by the dispatcher and need to be ergonomic for optimum health.		
2.1.	Parabolic monitor rack shall be curved to match the cockpit shape of the workstation and achieve as close to equal focal lengths from the user's eyes to the face of each monitor as possible and position monitors for a view angle perpendicular to the screen. ANSI/HFES 100 -2007.		
2.2.	Parabolic monitor rack shall be available in various sizes to accommodate up to 50" monitors and an individual weight of 70lbs on a single or dual level mount for future ready consoles.		

Exhibit B-1 Mandatory Technical Requirements

2.3.	Monitor rack platform shall be mounted on a movable platform which will permit a 10" focal length adjustment – from 19.7" to 29.7" with a maximum of 5lbs push/pull effort required to move all monitors simultaneously. ANSI/HFES100 -2007.		
2.4.	LCD mounts shall provide for all VESA monitor mount sizes.		
2.5	Monitor rack shall be designed to permit stacking of a single monitor up to a complete additional row without removal or disassembly of any existing monitors or any portion of the base unit.		
2.6	Vendor shall supply premium cable extensions as required to reach CPUs in CPU cabinets and provide adequate length to extend CPUs for service.		
3.	DATA DOCK - This is a quick connect and disconnect for keyboards, mice, etc. and must be done by the operator.		
3.1.	A data dock shall be located on the work surface to provide easy, instant operator accessible location to plug in keyboards, mice and USB charging ports.		
3.2.	Data dock shall have at least (8) locations for USB, two (2) powered USB locations for charging and two (2) locations for RJ11, RJ45 or DB9 ports.		
4.	CPU ENCLOSURES – Computers must be stored in cabinetry which keeps them off of the floor, cool, and lockable.		
4.1.	CPU cabinets, drawer pedestals and other caseworks must be made of a material and construction to withstand 500 pounds of weight when freestanding and not requiring a wall system to support it. Doors shall be a dent free material such as a laminate with continuous face through edge material.		
4.2.	CPU enclosures shall be available in a vertical tower or lower cabinet (29" standard work surface height) off to the side of the immediate user workspace. CPU enclosure shall be available in sizes to accommodate tower and mini-tower cases up to 8" wide x 18" high and available in 1, 2, 3, 4, 5, or 6 unit capacity depending on requirements.		

Exhibit B-1 Mandatory Technical Requirements

4.3	CPU enclosures shall not be located underneath a height adjustable surface due to potential crush zones.		
4.4	CPU enclosures shall be equipped as standard with active ventilation fans using quiet, 28db (decibel) 45 cfm fans to keep electronic equipment cool.		
4.5.	CPU enclosures shall have an internal motion sensing LED service light as standard equipment.		
5.	DRAWERS AND OTHER STORAGE – Same performance specification as 4.1		
5.1.	Drawer Configuration - 1 File drawer (12") and 1 File drawer (12"). Optional drawer configurations /depths to be available. Please list common sizes.		
5.2.	All drawers to have full extension 100 lb. rated - soft close - steel ball bearing drawer slides.		
5.3.	Mobile peds shall have a weighted base to keep it from tilting when drawers are open.		
6.	SUPPORT ADJUSTMENT		
6.1.	Adjustment speed shall not be less than 1.25" per second and not greater than 1.5" per second.		
6.2.	Adjustment controls to be flush mounted into surface or beneath work surface and have a smooth surface for easy cleaning.		
6.3.	Lifting system must operate quietly. Max sound level of 50 db.		
7.	WIRING MANAGEMENT. This is for both electrical and data cabling. All cabling must be well managed and clean with easy access when needed.		
7.1.	An appropriate vertical and horizontal cable management system will be essential to maintain the equipment cables to prevent cables from being pinched and damaged. Cable pathways must be easy for the tech to access from the front of the console. Consoles which require rear access will not be considered.		
7.2.	Monitor and Keyboard/Mouse cables must have separate pathways from the computer to the end point for easy access when needed.		

Exhibit B-1 Mandatory Technical Requirements

7.3.	Cable entry path from computer cabinet to the console must have an opening large enough for all cables and a hand to fit through.		
7.4.	Cabling shall be guided from CPU cabinet or panel enclosure to the monitor surface of the adjustable table in an energy chain with easy flip-up cable channel access.		
7.5.	Keyboard cabling shall be guided from cabinet through energy chain to keyboard surface without any exposed cables.		
7.6.	Cabling shall be guided through a 3rd energy chain from the back of the monitor surface to the focal depth platform to keep cables organized during focal depth adjustments.		
7.7.	Vendor shall supply 3-5 power bars with a total of about 45 outlets at each station. Power bar cords must be long enough to reach through the station and down into the floor to plug into a power receptacle. Two power bars shall be located close to the monitors to keep monitor power cords short. Colored labels shall be supplied to differentiate between UPS and building power circuits.		
7.8.	Station must have ability to mount power receptacles in cabinets or internal panel frame.		
8.	HOUSING AND FRAMEWORK. Any portion of the furniture must withstand the day to day abuse of a 24/7 room.		
8.1.	Housing and framework must be of enough strength to prevent sagging or deflection and capable of sustaining the accumulated weight of monitors, CPUs and associated hardware. All metal framework will be painted or powder coated, with a durable finish. Panel partitions must be attached to the console to assure unified construction for stability and grounding. Must meet ANSI/BIFMA X5.6 and X5.9. Provide test results.		
9.	PANEL SYSTEM. Specified to provide for minimal cable management, visual separation of tasks and both sound barrier and sound absorptive functions. Consoles without panel divider systems do not meet base bid requirements.		
9.1.	Internal Cable management within the panel frame system is required.		

Exhibit B-1 Mandatory Technical Requirements

	Must have separate horizontal pathways to run electrical and cat5 type cabling from one station to another if needed.		
9.2.	Stackable panel frames - Panel heights shall be vertically modular - The system shall be constructed in a manner to allow additional segments to be “stacked” on base panel frames to change panel heights for future change or reconfiguration.		
9.3.	Panel Segments and Panel Top Caps are to be user removable/replaceable without tools.		
9.4.	Acoustical panel construction – all panels above work surface height shall be of acoustical construction. Panels shall have a minimum of .55 NRC (noise reduction coefficient) rating and Class A flame spread/smoke developed certification. Provide testing results.		
9.5.	Optional panel segment types shall be painted or powder coat paint durable finish, fabric over steel, airflow and clear or frosted glass. Please state which are available.		
10.	PERSONAL ENVIRONMENT - Each station shall have a fan, heater and task lights controllable by the operator through an easy to reach controller.		
10.1.	Fans shall be moveable to maximize cooling.		
10.2.	Heaters shall not exceed 500 watts of electrical to minimize total power draw of the station.		
10.3.	Task lights shall be LED and dimmable. Lights that just light the keyboard area are preferred.		
11.	OPTIONAL EQUIPMENT AND ACCESSORIES		
11.1.	R-56 Grounding		
11.2.	Cup holder which can be placed out of the way to prevent hitting knees.		
11.3.	Status indicator light with options between 1 and 4 total lights. Must be mountable in different places on the station to maximize viewing in the room depending on need.		
11.4.	Clear or smoked acrylic on top of the panel system.		

Exhibit B-1 Mandatory Technical Requirements

11.5.	Option of under lit with LED lights. Logo or descriptions can be etched into acrylic.		
12.	WARRANTY AND CUSTOMER SERVICE		
12.1.	Describe your warranty.		
12.2	Describe a typical call for customer service during normal work hours.		
12.3.	Describe a typical call for customer service during off work hours.		
12.4.	Where do parts ship from?		
12.5.	Manufacturer of consoles shall assume primary responsibility for warranty claims – deference to third party suppliers is not acceptable. Customer agrees to assist in troubleshooting procedure.		
13.	DELIVERY, INSTALLATION AND TRAINING		
13.1.	Based on the information provided, please identify vendor lead time for manufacturing and delivery of this product to the project location.		
13.2.	All bids to include delivery and installation charges.		
13.3.	Vendor shall schedule a delivery and installation timeline in the form of a GANTT chart.		
14.	SHIPPING REQUIREMENTS: F.O. B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>			

Exhibit B-1 Mandatory Technical Requirements

WARRANTY OPTION	DESCRIPTION
TWO-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty".</i>
THREE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty".</i>
FOUR-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".</i>
FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".</i>

Exhibit B-1 Mandatory Technical Requirements

11. CATEGORY: EQUIPMENT SHELTERS

11.1 EQUIPMENT SHELTER SUB-CATEGORY: BALLASTED

Sub-Category Definition: *Equipment shelters of various sizes specifically designed and constructed for extreme installation locations and to be installed with minimal soil disruption and without site-build foundation; along with necessary accessories and appurtenances, including antenna mast, RF shielding, and grounding systems.*

Example Product: Quantity one (1) — 40 ft.² equipment shelter equipped for helicopter transport.

The following specifications and equipment configuration describes requirements for the EXAMPLE PRODUCT. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12 point font labeled "**ExhibitB1-Shelters11.1-Ballasted**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Note: Symbols for less-than (<) or greater-than (>) shall be interpreted to include equal-to the specified value. The symbol for approximate (~) indicates an imprecise or nominal value where variations will be acceptable.

Manufacturer: NO BID **Product Model Name:** NO BID

Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	GENERAL REQUIREMENTS		
1.1.	Shelter area: ~40 ft. ² (±10%)		
1.2.	Shelter height: >7 ft		
1.3.	Temperature range: -50°F to +150°F		
1.4.	Rated Wind Velocity: (2" radial ice): >150 mph		
2.	DESIGN AND CONSTRUCTION		
2.1.	Shelter shall be impact resistant to flying debris at the rated wind velocity.		
2.2.	Shelter shall be installed without conventional foundation and with only minimal ground disruption – for installation in sensitive locations.		

Exhibit B-1 Mandatory Technical Requirements

2.3.	Shelter shall provide for lightning protection and grounding features that meet or exceed current industry applicable standards.		
2.4.	Floor Load: >180 lbs-ft. ²		
2.5.	Roof Load: >100 lbs-ft. ²		
2.6.	Roof Impact Resistance: >100 lbs-ft. ² with no damage to exterior or interior of the roof or shelter.		
2.7.	Roof and wall exteriors shall be constructed to provide full weather resistance and resistance to flying embers from adjacent fire; asphalt roofing and other combustible materials shall not be used.		
2.8.	Screened Ventilation shall adequately provide to permit occupancy by persons in the event adverse weather prohibits travel.		
2.9.	Cable entry panel: two each, 4-inch ports		
2.10.	Vendor shall note that compliance with state specific requirements for Factory Assembled Structures will be addressed in individual state Participating Agreements.		
2.11.	Vendor may offer integration of components from other manufacturers (HVAC, generators, UPS, equipment racks, cable trays, etc.) as an additional service so as to deliver a complete shelter.		
3.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser.		
4.	SHIPPING REQUIREMENTS: F.O. B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		

ADDITIONAL PRODUCTS FOR CONSIDERATION

Exhibit B-1 Mandatory Technical Requirements

<i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>	
PRODUCT MODEL NAME/NUMBER	DESCRIPTION
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>	
WARRANTY OPTION	DESCRIPTION
TWO-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty" .
THREE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty" .
FOUR-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty" .
FIVE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty" .

Exhibit B-1 Mandatory Technical Requirements

11.2 EQUIPMENT SHELTER SUB-CATEGORY: CONCRETE

Sub-Category Definition: *Equipment shelters of various sizes constructed of precast concrete, specifically designed and constructed for extreme installation locations.*

Example Product = Quantity one (1) — 40 ft.² equipment shelter

The following specifications and equipment configuration describes requirements for the EXAMPLE PRODUCT. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12 point font labeled "**ExhibitB1-Shelters11.2-Concrete**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Note: Symbols for less-than (<) or greater-than (>) shall be interpreted to include equal-to the specified value. The symbol for approximate (~) indicates an imprecise or nominal value where variations will be acceptable.

Manufacturer: NO BID Product Model Name: NO BID Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	GENERAL REQUIREMENTS		
1.1.	Shelter area: ~40 ft. ² (±10%)		
1.2.	Shelter height: >7 ft		
1.3.	Temperature range: -50°F to +150°F		
1.4.	Rated Wind Velocity: (2" radial ice): >150 mph		
2.	DESIGN AND CONSTRUCTION		
2.1.	Shelter shall be impact resistant to flying debris at the rated wind velocity and bullet resistant (30:06 @ point-blank range)		
2.2.	Floor Load: >200 lbs-ft. ²		
2.3.	Roof Load: >100 lbs-ft. ²		
2.4.	Roof Impact Resistance: >200 lbs-ft. ² with no damage to exterior or interior of the roof or shelter.		

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2.5.	Adequate Screened Ventilation shall be provided to permit occupancy by persons in the event adverse weather prohibits travel.		
2.6.	The structure shall be of precast steel reinforced concrete (5000 psi) panels with welded connections.		
2.7.	All exterior metallic components and fasteners shall be stainless steel or hot-dipped galvanized.		
2.8.	Roof shall be coated/sealed with an elastomeric coating.		
2.9.	All joints shall be sealed inside and outside with an elastomeric caulking.		
2.10.	Flooring: commercial grade floor tile		
2.11.	Doors: galvanized steel primed & painted, 16-gauge door with 14-gauge frame.		
2.12.	Cable entry panel: six each, 4-inch ports		
2.13.	Shelter shall provide for Lightning Protection and grounding features that meet or exceed current industry applicable standards		
2.14.	Vendor shall supply Foundation Design based on customer supplied soils report.		
2.15.	Vendor shall note that compliance with state specific requirements for Factory Assembled Structures will be addressed in individual state Participating Agreements.		
2.16.	Vendor may offer integration of components from other manufacturers (HVAC, generators, UPS, equipment racks, cable trays, etc.) as an additional service so as to deliver a complete shelter.		
3.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser.		
4.	SHIPPING REQUIREMENTS: F.O. B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the		

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	Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER	DESCRIPTION		
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>			
WARRANTY OPTION	DESCRIPTION		
TWO-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty".		
THREE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty".		
FOUR-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".		
FIVE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".		

Exhibit B-1 Mandatory Technical Requirements

11.3 EQUIPMENT SHELTER SUB-CATEGORY: FIBERGLASS

Sub-Category Definition: *Equipment shelters of molded fiberglass construction, specifically designed and constructed for extreme installation locations.*

Example Product: Quantity one (1) — 40 ft.² equipment shelter equipped for helicopter transport.

The following specifications and equipment configuration describes requirements for the EXAMPLE PRODUCT. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12 point font labeled "**ExhibitB1-Shelters11.3-Fiberglass**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Note: Symbols for less-than (<) or greater-than (>) shall be interpreted to include equal-to the specified value. The symbol for approximate (~) indicates an imprecise or nominal value where variations will be acceptable.

Manufacturer: NO BID **Product Model Name:** NO BID

Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	GENERAL REQUIREMENTS		
1.1.	Shelter area: ~40 ft. ² (±10%)		
1.2.	Shelter height: >7 ft		
1.3.	Temperature range: -50°F to +150°F		
1.4.	Rated wind velocity: (2" radial ice): >150 mph		
2.	DESIGN AND CONSTRUCTION		
2.1.	Shelter design and construction shall be impact resistant to flying debris at the rated wind velocity.		
2.2.	Adequate screened ventilation shall be provided to permit occupancy by persons in the event adverse weather prohibits travel.		
2.3.	The primary structure shall be a one-piece Fiber Reinforce Plastic (FRP) structural laminate with foam insulating core.		
2.4.	All metallic components shall be stainless steel.		
2.5.	All doors and access panels will be locked.		

Exhibit B-1 Mandatory Technical Requirements

2.6.	Shelter shall provide for lightning protection and grounding features that meet or exceed current industry applicable standards.		
2.7.	Vendor shall supply foundation design based on customer supplied soils report.		
2.8.	Vendor may offer integration of components from other manufacturers (HVAC, generators, UPS, equipment racks, cable trays, etc.) as an additional service so as to deliver a complete shelter.		
3.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser.		
4.	SHIPPING REQUIREMENTS: F.O. B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		

ADDITIONAL PRODUCTS FOR CONSIDERATION

(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)

PRODUCT MODEL NAME/NUMBER	DESCRIPTION

WARRANTY OPTIONS

(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)

WARRANTY OPTION	DESCRIPTION
TWO-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty" .
THREE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty" .

Exhibit B-1 Mandatory Technical Requirements

FOUR-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".</i>
FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".</i>

Exhibit B-1 Mandatory Technical Requirements

11.4 EQUIPMENT SHELTER SUB-CATEGORY: FRAMED, LIGHT WEIGHT

Sub-Category Definition: *Equipment shelters of framed construction; with metal, cement board, or other composite exterior; specifically designed and constructed for extreme installation locations.*

Example Product: Quantity one (1) — 40 ft.² equipment shelter

The following specifications and equipment configuration describes requirements for the EXAMPLE PRODUCT. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12 point font labeled "**ExhibitB1-Shelters11.4-Framed-LightWeight**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Note: Symbols for less-than (<) or greater-than (>) shall be interpreted to include equal-to the specified value. The symbol for approximate (~) indicates an imprecise or nominal value where variations will be acceptable.

Manufacturer: NO BID **Product Model Name:** NO BID

Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	Shelter area: ~40 ft. ² (±10%)		
2.	Shelter height: >7 ft.		
3.	Temperature range: -50°F to +150°F		
4.	Rated Wind Velocity (2" radial ice): >100 mph		
5.	DESIGN AND CONSTRUCTION		
5.1.	Shelter design and construction shall be impact resistant to flying debris at the rated wind velocity.		
5.2.	Floor Load: >180 lbs-ft. ²		
5.3.	Roof Load: > 80 lbs-ft. ²		
5.4.	Roof Impact Resistance: 100 lbs-ft. ² with no damage to exterior or interior of the roof or shelter.		
5.5.	Adequate screened ventilation shall be provided to permit occupancy by persons in the event adverse weather prohibits travel.		

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5.6.	Insulation shall be installed between interior and exterior wall providing a value of >R13.		
5.7.	All exterior metallic components and fasteners shall be stainless steel or hot-dipped galvanized.		
5.8.	Roof and wall exteriors shall be constructed to provide full weather resistance and resistance to flying embers from adjacent fire; asphalt roofing and other combustible materials shall not be used.		
5.9.	All joints/seams shall be sealed and fully weather-tight.		
5.10.	Flooring: commercial grade floor tile		
5.11.	Doors: galvanized steel primed & painted, 16-gauge door with 14-gauge frame.		
5.12.	Cable entry panel: six each, 4-inch ports or equivalent grounded multiport entry panel.		
5.13.	Shelter shall provide for lightning protection and grounding features that meet or exceed current industry applicable standards.		
5.14.	Vendor shall supply foundation design based on customer supplied soils report.		
5.15.	Vendor shall note that compliance with state specific requirements for Factory Assembled Structures will be addressed in individual state Participating Agreements.		
5.16.	Vendor may offer integration of components from other manufacturers (HVAC, generators, UPS, equipment racks, cable trays, etc.) as an additional service so as to deliver a complete shelter.		
6.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser.		

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7.	SHIPPING REQUIREMENTS – F.O. B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>			
WARRANTY OPTION		DESCRIPTION	
TWO-YEAR ADDITIONAL OPTION		Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty" .	
THREE-YEAR ADDITIONAL OPTION		Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty" .	
FOUR-YEAR ADDITIONAL OPTION		Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty" .	
FIVE-YEAR ADDITIONAL OPTION		Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty" .	

Exhibit B-1 Mandatory Technical Requirements

11.5 EQUIPMENT SHELTER SUB-CATEGORY: OUTDOOR CABINET

Sub-Category Definition: *Equipment cabinets of single and multiple widths of EIA standard 19” and 23” rack, in various depths and heights; specifically designed and constructed for extreme installation locations; providing protection conforming to NEMA-3R, UL50, and UL50E standards, along with associated components and hardware.*

Example Product: Quantity one (1) — Single width, 19” - 84 RU cabinet of 25 inch depth.

The following specifications and equipment configuration describes requirements for the EXAMPLE PRODUCT. It is the Bidder’s responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12 point font labeled “**ExhibitB1-Shelters11.5-OutdoorCabinet**”). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Note: Symbols for less-than (<) or greater-than (>) shall be interpreted to include equal-to the specified value. The symbol for approximate (~) indicates an imprecise or nominal value where variations will be acceptable.

Manufacturer: NO BID Product Model Name: NO BID

Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	CABINET DIMENSIONS		
1.1.	Width: EIA standard 19” rack, single width, ~25 inches		
1.2.	Height: 42 Rack Units (RU), ~ 78 inches		
1.3.	Depth: ~25 inches		
2.	CONSTRUCTION – resistant to impact and corrosion		
2.1.	Exterior: high strength aluminum		
2.2.	Hardware: stainless steel		
2.3.	Weather-tight: NEMA 3R standard		
3.	RACK RAILS: 2 pair, individually depth adjustable		
3.1.	Two pair		
3.2.	Fully drilled and tapped		
4.	THERMAL PROTECTION		

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4.1.	Solar shield roof with air gap to dissipate radiant heat.		
4.2.	Solar shield vent and perimeter screened to prevent insect entry.		
4.3.	Insulation bonded to interior walls.		
4.4.	Exhaust fans: 12 VDC, with thermostat.		
4.5.	Cabinet shall provide for lightning protection and grounding features that meet or exceed current industry applicable standards.		
5.	DOORS		
5.1.	Two (2) doors, front and back.		
5.2.	Continuous hinge.		
5.3.	Three point locking mechanism.		
5.4.	Internal lock or external padlock.		
6.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser.		
7.	SHIPPING REQUIREMENTS: F.O. B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION			
(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder’s offering)			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	
WARRANTY OPTIONS			
(Warranty options listed below and may be considered upon award and included in Bidder’s offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)			

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WARRANTY OPTION	DESCRIPTION
TWO-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty".</i>
THREE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty".</i>
FOUR-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".</i>
FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".</i>

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12. CATEGORY: TOWERS

12.1 TOWER OVERALL SPECIFICATIONS **NO BID**

The following overall specification shall apply to all sub-categories of tower product, as referenced within each specification below. ALL components must be new. ALL components, fabrication and construction must adhere to most recent industry standards as shown below.

NOTE: Individual states may have additional or more restrictive requirements.

ITEM NO.	DESCRIPTION
1.	CODES AND STANDARDS
1.1.	The International Building Code (IBC) 2018
1.2.	The Operational Safety & Health Administration (OSHA)
1.3.	American Institute of Steel Construction (AISC) — Manual of Steel Construction 15th Edition
1.4.	Telecommunications Industries Association (TIA) Standard TIA-222-H — Structural Standard for Antenna Supporting Structures, Antennas and Small Wind Turbine Support Structures; and all Addenda
1.5.	American Welding Society (AWS) D1.1 — Structural Welding Code
1.6.	FAA Advisory Circular #AC 70/7460 — Obstruction Marking and Lighting
1.7.	National Electric Code (NEC) — Tower Lighting Kits
1.8.	American Institute of Steel Construction (AISC) — Specification for Structural Joints using ASTM A325 or A490 Bolts
1.9.	Federal Communications Commission Rules and Regulations - Part 17
1.10.	American Concrete Institute ACI 318 — Building Code Requirements for Reinforced and Structural Concrete
1.11.	American Concrete Institute ACI 347 Recommended Practice for Concrete Framework
1.12.	Post-Tensioning Institute (PTI) Recommendations for Pre stressed Rock and Soil Anchors (at customer request)
1.13.	American Society for Testing and Materials (ASTM) for:
1.14.	A36, A441, A500, A572, A588 and A992 — Structural Steel
1.14.1.	A-123 — Zinc (hot-dipped galvanized coatings on products fabricated from rolled, pressed, and forged steel shapes, plates, bars and strips)
1.14.2.	A-153 — Zinc Coatings (hot-dip) on Iron and Steel Hardware
1.14.3.	B-695 — Coatings of Zinc Mechanically Deposited on Iron and Steel (minimum thickness 0.0026")
1.14.4.	A-385 — Zinc Coatings (hot-dip) on Assembled Steel Products
1.14.5.	A-307 — Low-Carbon Steel Externally and Internally Threaded Standard Fasteners
1.14.6.	A-325 — High Strength Steel Bolts

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1.14.7.	A-615 and A-706 — Reinforcing Bars
1.10.8.	ASTM C-9— Ready-mixed Concrete
1.15.	The customer will arrange for building permits and advise the tower manufacturer of local codes and regulations that affect this specification.
1.16.	Where local ordinances specify higher standards than those represented in this specification, the local ordinances shall govern. Pertinent sections of those codes shall be provided by the customer to the tower manufacturer.
1.17.	The customer will report the results of special air navigational studies for marking and lighting towers. If special navigational reports are not a part of the contract, the tower vendor will apply the standards rules of the FAA, FCC and NEC when specified by the customer.
1.18.	Site work specifications on the roadway condition, access, concrete washout, leave no marking, no haz mat, no storage, staking, tower center point locate, no removal of any trees, erosion control. (At Customer Request)
2.	ANALYSIS AND DESIGN
2.1.	Towers shall be designed by or under the direct supervision of a registered professional engineer, specifically experienced in the design of radio and microwave towers.
2.2.	All design and analysis computations and installation drawings shall be certified and stamped by a licensed Professional Engineer.
2.3.	The structure shall be designed to support all specified antennas, including future antennas, and to hold all antennas on path within the twist, sway and displacement limits of TIA-222-H. Where multiple frequencies are specified, the most critical twist, sway and displacement limits shall govern.
2.4.	The tower, when fully loaded with antenna assemblies, waveguide, and other appurtenances, shall be designed for the minimum wind loads as specified by TIA-222-H, unless otherwise specified.
2.5.	When specified by the customer, tower designs shall consider the concurrent accumulation of radial ice to all parts of the tower, antennas, and accessories. Loadings shall take into account both the resultant added wind load and dead load.
2.6.	Under basic wind speeds up to 35 mph, all horizontal members shall be capable of supporting a 250 lb. vertical load at mid-span, in addition to all other design loads. A load factor of 1.5 shall be applied to this required load.
2.7.	Tower deflection limits are to be held both vertically and horizontally. Deflection must be determined at each specific point on the tower where an antenna is attached. The twist and sway of the tower at all antenna mounting elevations shall be determined by analytical methods and shall be noted on the formal stress analysis.
2.8.	The antenna loading (present and future) to be applied to the structure is as follows: (Customer to specify).
2.9.	The allowable unit stresses and the actual member stresses resulting from the specified design loads shall not exceed those given in the AISC specifications.
2.10.	All members of the structure shall be considered primary members for the purpose of establishing allowable compressive stresses per AISC, except those members whose sole function is to reduce the kl/r ratio of primary members.
2.11.	For self-supporting and guyed tower footings, the resistance factors for uplift shall be as described in TIA-222-H, latest edition.
2.12.	Foundations shall be designed with sufficient reserve capacity to match the least tower leg reserve capacity.

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2.13.	Combined tower wind loads and antenna loads shall be applied in combination such that the maximum axial forces are produced in girts, diagonals, and legs. Multiple analyses may be necessary to ensure that worst case design conditions have been investigated.
2.14.	Provide One (1) set of complete as-built drawings including foundation, grounding, tower, cable bridge, transmission, qualifications of independent inspection individuals
3.	TOWER PRODUCTS
3.1.	<i>Fabrication</i>
3.1.1.	All fabrication, erection and identification of structural steel shall conform to AISC specifications.
3.1.2.	Under no circumstances shall "dissimilar metals" be used in contact with one another. All structural tower components shall be of steel construction. All steel components shall be fabricated in the United States of America from materials produced in the United States of America.
3.1.3.	Hot-dipped galvanizing of tubular sections shall be inside and outside per ASTM A123 or A153 as appropriate with no less than two (2) ounces of zinc per square foot of surface area throughout, including nuts and bolts.
3.1.4.	Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."
3.1.5.	Properly mark and match-mark materials for field assembly. Fabricate for a delivery sequence which will expedite erection and minimize field handling of materials. Or Design/Build entity shall supply all equipment necessary to transport and erect the tower per all applicable laws, codes and standards.
3.1.6	If a round or tubular tower is provided vendor must supply a moisture weep hole at the base of the tower to ensure any accumulated moisture can drain from the bottom of the tower leg. Weep holes shall be at least 0.25 inches in diameter and 0.375 inches in diameter for tubes greater than 2 inches in diameter. Weep holes that are cast into grout placed below the tower baseplate shall be at least 0.75 inches in diameter.
3.1.7	Mill certificates shall be submitted to the State for all tower components BEFORE materials are delivered on site for approval. Any materials delivered on site without prior approval by the State may be rejected and shall be replaced at the Design/Build Entity's expense. A complete set of mill certificates shall be submitted in one package that clearly indicates where each component is used on the structure. Incomplete submittals will be rejected without review. Certificates shall, at a minimum, be supplied for the tower: 3.7.1. Legs; 3.7.2. Bracing; 3.7.3. Flanges and Tab Plates; 3.7.4. Bolt Assemblies; 3.7.5. Anchor Bolts; 3.7.6. Step Bolts; 3.7.7. Mounts; 3.7.8. Climbing and Waveguide Ladders; and 3.7.9. Threaded Rods and Associated Components for Rock Anchors.
3.2.	<i>Connections and Locking Devices</i>

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3.2.1.	No field welding shall be permitted unless specifically approved in writing.																	
3.2.2.	All members shall be connected with galvanized ASTM A325 Type 1 high-strength structural bolts unless otherwise approved.																	
3.2.3.	The vendor shall provide bolts, nuts and lock-washers in a quantity in excess of the actual bolt count, for each size required for each tower site. <table><tr><td>Bolt Count</td><td>Percentage Excess</td><td>Minimum Excess</td></tr><tr><td>0-200</td><td>5%</td><td>1</td></tr><tr><td>200-500</td><td>4 %</td><td>10</td></tr><tr><td>500-1000</td><td>3%</td><td>20</td></tr><tr><td>1000 and over</td><td>2 %</td><td>30</td></tr></table>			Bolt Count	Percentage Excess	Minimum Excess	0-200	5%	1	200-500	4 %	10	500-1000	3%	20	1000 and over	2 %	30
Bolt Count	Percentage Excess	Minimum Excess																
0-200	5%	1																
200-500	4 %	10																
500-1000	3%	20																
1000 and over	2 %	30																
3.2.4	If the bolts provided by the tower manufacturer are not sufficient length to accommodate all necessary hardware the vendor shall replace the bolts with ones of sufficient length at no cost to the State. All bolted connections shall be installed with a nut locking device. ANCO® style nuts or any other nut that damages the galvanization on the bolt will not be accepted. All bolts shall be installed nut-end-up. All bolts, washers and nuts shall be supplied from one vendor as a fastener assembly, as defined by RCSC. All tower leg members shall be fabricated from pipes or solid rounds. Tower leg members constructed from a lattice design will not be accepted. All self-supporting tower bracing shall be fabricated from angle members. All guyed tower bracing shall be fabricated from solid round members.																	
3.2.5.	All towers will be provided with the correct size and length of anchor bolts necessary to carry the anticipated tower loads.																	
3.2.6.	All threaded fasteners shall extend not less than 1-1/2 threads beyond nuts and locking devices.																	
3.3.	Climbing Ladders																	
3.3.1	Lattice self-supporting towers shall be equipped with a 16” outside climbing ladder with 7” toe clearance (for self-supporting towers only) spanning from the ground to the top of the tower structure. The ladder shall meet the requirements of TIA-222-H Section 12 Monopoles - shall be equipped with step bolts starting at 10’ AGL to the top of the tower in conformance with TIA-222-H. Guyed towers shall have integrated climbing ladders pre-welded into the tower face that is in conformance with TIA-222-H.																	
3.3.2	The climbing ladders or climbing pegs shall be supplied with “Tuf-Tug Step Bolt Anchor Bracket – Flat”. The safety-climb system shall be installed at the ladder location and allow a climber to remain connected to the safety-climb for the entire length of the ladder. The safety climb cable shall be a 3/8 (0.375) inch diameter cable constructed from stainless steel and shall comply with the stated requirements.																	
3.4.	Rest Platforms																	
3.4.1.	For towers greater than 50 feet in height, rest platforms shall be placed at intervals no greater than 50 feet.																	
3.4.2.	A rest platform will consist of a level platform of grating which allows room for one person to sit or stand.																	
3.5.	Work Platforms																	
3.5.1.	When work platforms are required they shall consist of level platforms of grating. They shall be either walkways with a minimum width of 24 inches or full coverage platforms and they shall provide reasonable access to appropriate work areas.																	
3.5.2.	Safety handrails shall be provided around the perimeter of the platforms with the upper railing at 42 inches above the deck and the intermediate rail approximately halfway between the top rail and the deck with a 4” toe board around the outer edge of the platform deck.																	

Exhibit B-1 Mandatory Technical Requirements

3.5.3.	When platform access is via an inside climbing ladder, a hatch shall be provided to eliminate the hazard of an access opening in the work area.
3.5.4.	Work platforms shall be designed to support two concentrated live loads of 250 lbs. each. Live loads imposed by persons on the platform shall be considered to concentrate at such points that will cause maximum stress in the structural members being considered.
3.6.	<i>Finishes</i>
3.6.1.	All steel members and fasteners shall be galvanized (zinc coated) per standards in Section 2.0 of this specification.
3.6.2.	Under no circumstances shall any coating on any metal member or fastener be cathodic relative to the base material.
3.6.3.	Use "Devcon", or equivalent, zinc rich paint, or approved equal, to touch up damaged galvanizing. Touch up may be done by either a spray or brush application.
3.6.4.	When required, tower structures shall be painted per FAA specification AC70/7460.
3.6.5.	All painting shall be performed in the shop using an acrylic latex paint specifically formulated for application to galvanized material.
3.6.6.	Field painting shall be limited to touch-up of paint damaged during transportation and erection. Use the same paint as was used in the shop to touch up damaged paint and provide the same protection as original shop painting.
4.	TOWER ACCESSORIES
4.1.	<i>Tower Lighting</i>
4.1.1.	When required, an obstruction lighting system shall be supplied with the tower and installed as required by FAA.
4.1.2.	All obstruction lighting equipment shall be FAA approved.
4.1.3.	Lighting shall be activated and deactivated by photoelectric control for unattended stations, and the method of activation for attended stations is to be specified.
4.1.4.	All wire shall be SO cable. All electrical installation shall conform to the National Electric Code requirements for outdoor installation.
4.2.	<i>Lightning Protection</i>
4.2.1.	All towers shall be supplied with a complete grounding system which conforms to the minimum requirements of EIA RS-222, Section 12, and "Protective Grounding".
4.2.2.	Each tower with a height greater than 30 feet must be equipped with a lightning rod fastened at the extreme top of the tower.
4.2.3.	A galvanized steel lightning rod, with minimum dimensions of 5/8 inch diameter by 4 feet long, shall be attached so as to extend a minimum of 36 inches above the highest point of the tower, including all attachments.
4.2.4.	Any and all equipment mounted on the tower shall be so fastened as to be effectively grounded.
4.2.5.	Testing of grounding systems are the responsibility of the radio installer or others, not that of the tower vendor.
4.3.	<i>Antenna Mounts</i>
4.3.1.	Pipe mounts shall be plumb in each axis unless specified otherwise.
4.3.2.	Pipe mounts shall be positioned to prevent the antenna feed horn assembly from being directly opposite a tower member. Pipe mount positioning should not prevent direct waveguide installation to any antenna.

Exhibit B-1 Mandatory Technical Requirements

4.3.3.	Mounts and stiff arm support locations shall meet or exceed the standards specified by the antenna manufacturer in their latest installation bulletin.
4.3.4.	Waveguide support shall be engineered to provide supports at intervals not greater than 4 feet O.C. This support can be in the form of leg clamps, waveguide ladders or horizontal bridges.
4.3.5.	Waveguide support capacity shall provide for one waveguide run for each present and future antenna, unless otherwise specified.
4.3.6.	The waveguide bridge shall provide support and protection of waveguide runs between the tower and building structures.
4.3.7.	Waveguide support structures shall be grounded in accordance with the tower grounding specification.
4.3.8.	Wall entries must be specified by the customer in terms of sizes and number of openings required. They shall be designed and installed to be completely weatherproof and to accommodate all present and future waveguide runs.
5.	FOUNDATION DESIGN
5.1.	The vendor will be required to develop foundation designs based on soil conditions reported by the customer.
5.2.	Foundation recommendations contained within soils reports are general in nature and are made without benefit of tower reaction information. The ultimate authority and responsibility for the foundation design rests with the vendor.
5.3.	In the absence of a customer furnished soils report, presumptive soil conditions as described in TIA Standard TIA-222-H will be assumed for the foundation design.
5.4.	Foundation designs should utilize, as a minimum, 4500 psi concrete and grade 60 reinforcing steel. When specified, a concrete mix design shall be submitted to the tower engineer to ensure that materials are proportioned by weight to produce concrete with a minimum compressive strength at 28 days of 4500 psi. Maximum w/cm 0.45, Slump 3"-5" Air Entrainment Per ACI 318-14 Table 19.3.3.1
5.5.	Where a soil investigation indicates that adequate rock conditions exist, grouted anchors may be designed. Field tension testing shall be done when specified.
5.6.	When abnormal soil conditions are encountered to the extent that additional charges may be incurred, the customer must verify said conditions. Soil tests shall be provided by the customer.

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12.2 TOWERS SUB-CATEGORY: ACCESSORIES & APPURTENANCES

Sub-Category Definition: *Radio tower accessories, antenna stand-offs, antenna array mounts, ice shields, cable bridges, grounding materials, cable entry-panels, non-penetrating and ballasted antenna mounts, anti-climb panels, and related products.*

Example Product: Quantity one (1) — Non-penetrating/ballasted antenna mount.

For Bidding Purposes: vendor shall assume that (1) customer will resolve all the building structural capacity issues, (2) manage all permits, (3) provide ballast material, and (4) contract for erection services.

The following specifications and equipment configuration describes requirements for the EXAMPLE PRODUCT. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12 point font labeled "**ExhibitB1-Towers12.2-Accessories**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Manufacturer: NO BID Product Model Name: NO BID

Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	DESCRIPTION		
1.1.	Non-penetrating mount that provides a single mast.		
1.2.	Load = One (1) panel antenna.		
1.3.	Antenna Height = 10 feet.		
1.4.	Roof Protection pads (1/2" rubber mat) are required.		
2.	Conform to " OVERALL SPECIFICATION " requirements.		
3.	SITE INFORMATION		
3.1.	Location = 44 56 30.73N 122 56 33.77W / Marion County / Salem, OR 97317 Wind and Ice 104 mph + 0" ice & 30 mph + 2" ice.		
3.2.	Building has a Flat roof 24' AGL.		
4.	ANTENNA DETAILS – PANEL ANTENNA		
4.1.	Dimensions: W x H x T = 10' x 3" omni antenna with one (1) 7/8" coax.		

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5.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser.		
6.	SHIPPING REQUIREMENTS: F.O. B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>			
WARRANTY OPTION		DESCRIPTION	
TWO-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty".</i>		
THREE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty".</i>		
FOUR-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".</i>		
FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".</i>		

Exhibit B-1 Mandatory Technical Requirements

12.3 TOWERS SUB-CATEGORY: DEPLOYABLE/TEMPORARY

Sub-Category Definition: Deployable radio towers designed and constructed for temporary installation, fixed or transportable configurations, along with specially configured transport vehicles, accessories and appurtenances.

Example Product: Quantity one (1) — 40-foot extendable tower mounted on 16 foot enclosed cargo trailer for rapid deployment to tactical events.

The following specifications and equipment configuration describes requirements for the EXAMPLE PRODUCT. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12 point font labeled "**ExhibitB1-Shelters12.3-Deployable-Temporary**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Vendors should submit descriptive literature for the product offered confirming its compliance with specifications.

Note: Symbols for less-than (<) or greater-than (>) shall be interpreted to include equal-to the specified value. The symbol for approximate (~) indicates an imprecise or nominal value where variations will be acceptable.

Manufacturer: NO BID Product Model Name: NO BID Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	TOWER		
1.1.	Structure type: extendable guy wire supported.		
1.2.	Maximum height: 40 feet.		
1.3.	Maximum payload: > 120 pounds.		
1.4.	Maximum antenna load: >15 ft. ² .		
1.5.	Rated wind speed: 70 mph.		
1.6.	Antenna mount: 2 inch diameter pipe, with > 72" extending above the tower.		
2.	TOWER MOUNTING / DEPLOYMENT		
2.1.	When retracted the tower shall tilt to horizontal position for transport atop the trailer.		

Exhibit B-1 Mandatory Technical Requirements

2.2.	A carried mechanism shall allow the tower to move from the stored position to a position where it can be tilted for deployment.		
2.3.	When in the vertical position, the tower sections shall be extended by means of a 12 V DC electric winch, with manual override.		
2.4.	All guy wire materials shall be supplied with the tower.		
2.5.	Guy wire anchors for normal soil conditions shall be supplied with the tower. (Other anchor configurations shall be available as options.)		
3.	TRAILER		
3.1.	Gross vehicle weight rating (GCWR): > 6500 lbs.		
3.2.	Number of axles: 2 (tandem).		
3.3.	Overall width: < 102 inches.		
3.4.	Overall length, excluding coupler: <22 feet.		
3.5.	Coupler Size: Standard ball @ 2-5/16 inches.		
3.6.	Electrical connector: Standard 7-pin.		
3.7.	Electric brakes: all wheels.		
3.8.	All DOT required lighting (LED), safety change, and breakaway switch with battery shall be included.		
3.9.	The trailer interior shall be open space ready for customization.		
3.9.1.	Interior width: 96 inches.		
3.9.2.	Interior height: > 76 inches.		
3.9.3.	Interior length: > 200 inches.		
3.9.4.	Doors: rear = full width; right front equal 36 inch.		
4.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser.		

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5.	SHIPPING REQUIREMENTS: F.O. B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>			
WARRANTY OPTION		DESCRIPTION	
TWO-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty" .		
THREE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty" .		
FOUR-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty" .		
FIVE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty" .		

Exhibit B-1 Mandatory Technical Requirements

12.4 TOWER SUB-CATEGORY: GUYED

Sub-Category Definition: Guy wire supported type towers, tower engineering and design, foundation engineering and design, along with associated components and hardware.

Example Product: Quantity one (1) — 140-foot guy-wire-supported communications tower.

For Bidding Purposes: Vendor shall assume that (1) customer will supply geotechnical report, (2) manage all permits, and (3) contract for foundation and tower erection services. Note: (4) antenna mounts, stand-offs, ice-shields, and waveguide bridges are to be specified and priced under a separate sub-category.

The following specifications and equipment configuration describes requirements for the EXAMPLE PRODUCT. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12 point font labeled "**ExhibitB1-Towers12.4-Guyed**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Manufacturer: NO BID **Product Model Name:** NO BID

Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	SUMMARY DESCRIPTION		
1.1.	ANSI/TIA-222-H or current nationally approved standard, Risk Category III, Essential Communications.		
1.2.	Tower Type = Guy-Wire-Supported.		
1.3.	Overall height = 140 feet, excluding lightning rod.		
2.	Conform to " OVERALL SPECIFICATION " requirements.		
3.	Climb-Safety per " OVERALL SPECIFICATIONS ".		
4.	Foundation design per " OVERALL SPECIFICATION " and identified site conditions.		
5.	PE stamped plans per " OVERALL SPECIFICATIONS ".		
6.	SITE INFORMATION		
6.1.	Location = Oregon, east side of Willamette Valley, Cascade foothills Wind and Ice 104 mph + 0" ice & 30 mph + 2" ice.		

Exhibit B-1 Mandatory Technical Requirements

6.2.	Topographical Category 3, located at the top of a hill - Crest Height 2,063.		
6.3.	Exposure Classification C, open terrain without forest or significant structures.		
6.4.	Geotechnical = TIA 222 - Rev H "Presumptive Soil".		
6.5.	Site Access = gravel road.		
6.6.	FAA Clearance = lighting not required.		
7.	HEIGHT & LOAD INFORMATION - includes future capacity - refer to antenna details (section 5)		
7.1.	@40-feet = Microwave antenna, with mounts and ice shield – orientation = 220° (per 5.1 below).		
7.2.	@40-feet = Microwave antenna, with mounts and ice shield – orientation = 130° (per 5.1 below).		
7.3.	@60-feet = Enclosed Yagi antenna, with mounts and ice shield – orientation = 100° (per 5.4 below).		
7.4.	@60-feet = Enclosed Yagi antenna, with mounts and ice shield – orientation = 180° (per 5.4 below).		
7.5.	@60-feet = Enclosed Yagi antenna, with mounts and ice shield – orientation = 270° (per 5.4 below).		
7.6.	@80-feet = Base Radio antenna, with bottom and top mounts and 4-foot side arms – orientation = 0° (per 5.3 below).		
7.7.	@80-feet = Base Radio antenna, with bottom and top mounts and 4-foot side arms – orientation = 120° (per 5.3 below).		
7.8.	@80-feet = Base Radio antenna, with bottom and top mounts and 4-foot side arms – orientation = 240° (per 5.3 below).		
7.9.	@110-feet = Panel antenna, with mounts – orientation = 40° (per 5.2 below).		
7.10.	@110-feet = Panel antenna, with mounts – orientation = 160° (per 5.2 below).		
7.11.	@130-feet = Base Radio antenna, with bottom and center mounts and 4-foot side arms – orientation = 0° (per 5.3 below).		

Exhibit B-1 Mandatory Technical Requirements

7.12.	@130-feet = Base Radio antenna, with bottom and center mounts and 4-foot side arms – orientation = 120° (per 5.3 below).		
7.13.	@130-feet = Base Radio antenna, with bottom and center mounts and 4-foot side arms – orientation = 240° (per 5.3 below).		
7.14.	@140-feet = Lightning Rod > 10-feet, to extend above topmost antenna.		
8.	ANTENNA DETAILS		
8.1.	Microwave Antenna.		
8.2.	Antenna Diameter = 6' HP microwave dish @ 6Ghz with (1) EW63.		
8.3.1	Mounting Pipe Diameter = 4.5 in.		
8.3.2	Net Weight = 254 lbs.		
8.4.	Panel Antenna.		
8.4.1	Mounting = Flush Mount.		
8.4.2	Dimensions: W x H x T = 3'x18"x6" Panel Antenna with one (1) 7/8" coax.		
8.5.	Base Radio Antenna (Open Dipole).		
8.5.1	Antenna Model # Decibel DB224 with one (1) 7/8" coax.		
8.5.2	Mounted on one (1) 3' sidearm.		
8.6.	Enclosed Yagi Antenna.		
5.6.1	Antenna Model # Scala RY-900B w/ Radome and one (1) 7/8" coax.		
5.6.2	Mounted on Flush Mount.		
9.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser.		

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10.	SHIPPING REQUIREMENTS: F.O. B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>			
WARRANTY OPTION		DESCRIPTION	
TWO-YEAR ADDITIONAL OPTION		Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty" .	
THREE-YEAR ADDITIONAL OPTION		Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty" .	
FOUR-YEAR ADDITIONAL OPTION		Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty" .	
FIVE-YEAR ADDITIONAL OPTION		Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty" .	

Exhibit B-1 Mandatory Technical Requirements

12.5 TOWER SUB-CATEGORY: GUYED, LIGHT

Sub-Category Definition: *Light duty lattice type towers, tower engineering and design, foundation engineering and design, and associated components and hardware.*

Example Product: Quantity one (1) — Light duty 60-foot self-supported communications tower.

For Bidding Purposes: Vendor shall assume that (1) customer will supply geotechnical report, (2) manage all permits, and (3) contract for foundation and tower erection services. Note: (4) antenna mounts, stand-offs, ice-shields, and waveguide bridges are to be specified and priced under a separate sub-category.

The following specifications and equipment configuration describes requirements for the EXAMPLE PRODUCT. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12 point font labeled "**ExhibitB1-Towers12.5Guyed-Light**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Manufacturer: NO BID **Product Model Name:** NO BID

Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	SUMMARY DESCRIPTION		
1.1.	ANSITIA-222-H or current nationally approved standard, Risk Category III, Essential Communications.		
1.2.	Tower Type = Self-Supported.		
1.3.	Overall height = 60 feet, excluding lightning rod.		
2.	Conform to " Overall Specification " requirements.		
3.	Climb-Safety per " Overall Specifications ".		
4.	Foundation design per " Overall Specification " and identified site conditions.		
5.	PE stamped plans per " Overall Specifications ".		
6.	LIGHT DUTY DEFINITION		
6.1.	Decreased height and loading requirements.		
6.2.	Component transport in units of 10-feet or less.		

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6.3.	Erection can be accomplished without the use of heavy equipment.		
7.	SITE INFORMATION		
7.1.	Location = Oregon, east side of Willamette Valley, Cascade foothills Wind and Ice 104 mph + 0" ice & 30 mph + 2" ice.		
7.2.	Topographical Category 3, located at the top of a hill Crest Height 2,063.		
7.3.	Exposure Classification C, open terrain without forest or significant structures.		
7.4.	Geotechnical = TIA 222 - Rev H "Presumptive Soil".		
7.5.	Site Access = gravel road.		
7.6.	FAA Clearance = lighting not required.		
8.	HEIGHT & LOAD INFORMATION - includes future capacity - refer to antenna details (refer to antenna details in section 6)		
8.1.	@40-feet = Enclosed Yagi antenna, with mounts – orientation = 100° (per 6.3 below).		
8.2.	@40-feet = Enclosed Yagi antenna, with mounts – orientation = 200° (per 6.3 below)		
8.3.	@40-feet = Panel antenna, with mounts – orientation = 40° (per 6.1 below).		
8.4.	@50-feet = Base Radio antenna, with bottom and center mounts and 4-foot side arms – orientation = 0° (per 6.2 below).		
8.5.	@50-feet = Base Radio antenna, with bottom and center mounts and 4-foot side arms – orientation = 180° (per 6.2 below).		
8.6.	@50-feet = Base Radio antenna, with bottom and center mounts and 4-foot side arms – orientation = 240° (per 6.2 below).		
9.	ANTENNA DETAILS		
9.1.	Panel Antenna.		
9.1.1	Mounting = Flush Mount.		
9.1.2.	Dimensions: W x H x T = 3'x18"x6" panel antenna with one (1) 7/8" coax.		

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9.2.	Base Radio Antenna (Open Dipole).		
9.2.1.	Antenna Model # Decibel DB224 with one (1) 7/8" coax.		
9.2.2.	Mounted on one (1) 3' sidearm.		
9.3.	Enclosed Yagi Antenna.		
9.3.1.	Antenna Model # Scala RY-900B w/ Radome and one (1) 7/8" coax.		
9.3.2.	Mounted on Flush Mount.		
10.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser.		
11.	SHIPPING REQUIREMENTS: F.O. B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>			
WARRANTY OPTION		DESCRIPTION	
TWO-YEAR ADDITIONAL OPTION		Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty" .	
THREE-YEAR ADDITIONAL OPTION		Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty" .	

Exhibit B-1 Mandatory Technical Requirements

FOUR-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".</i>
FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".</i>

Exhibit B-1 Mandatory Technical Requirements

12.6 TOWER SUB-CATEGORY: LATTICE

Sub-Category Definition: Self-supporting type towers (3-leg and 4 leg), tower engineering and design, foundation engineering and design, and associated components and hardware.

Example Product: Quantity one (1) — 140-foot self-supporting communications tower.

For Bidding Purposes: Vendor shall assume that (1) customer will supply geotechnical report, (2) manage all permits, and (3) contract for foundation and tower erection services. Note: (4) antenna mounts, stand-offs, ice-shields, and waveguide bridges are to be specified and priced under a separate sub-category.

The following specifications and equipment configuration describes requirements for the EXAMPLE PRODUCT. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12 point font labeled "**ExhibitB1-Towers12.6-Lattice**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Manufacturer: NO BID **Product Model Name:** NO BID

Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	SUMMARY DESCRIPTION		
1.1.	ANSITIA-222-H or current nationally approved standard, Risk Category III, Essential Communications.		
1.2.	Tower Type = Self-Supporting, 3-Leg.		
1.3.	Overall height = 140 feet, excluding lightning rod.		
2.	Conform to " Overall Specification " requirements.		
3.	Climb-Safety per " Overall Specifications ".		
4.	Foundation design per " Overall Specification " and identified site conditions.		
5.	PE stamped plans per " Overall Specifications ".		
6.	SITE INFORMATION		
6.1.	Location = Oregon, east side of Willamette Valley, Cascade foothills Wind and Ice 104 mph + 0" ice & 30 mph + 2" ice.		
6.2.	Topographical Category 3, located at the top of a hill		

Exhibit B-1 Mandatory Technical Requirements

	Crest Height 2,063'.		
6.3.	Exposure Classification C, open terrain without forest or significant structures.		
6.4.	Geotechnical = TIA 222 - Rev H "Presumptive Soil".		
6.5.	Site Access = gravel road.		
6.6.	FAA Clearance = lighting not required.		
7.	HEIGHT & LOAD INFORMATION - includes future capacity - refer to antenna details (section 5)		
7.1.	@40-feet = Microwave antenna, with mounts and ice shield – orientation = 220° (per section 5.1 below).		
7.2.	@40-feet = Microwave antenna, with mounts and ice shield – orientation = 130° (per section 5.1 below).		
7.3.	@60-feet = Enclosed Yagi antenna, with mounts and ice shield – orientation = 100° (per section 5.4 below).		
7.4.	@60-feet = Enclosed Yagi antenna, with mounts and ice shield – orientation = 180° (per section 5.4 below).		
7.5.	@60-feet = Enclosed Yagi antenna, with mounts and ice shield – orientation = 270° (per section 5.4 below).		
7.6.	@80-feet = Base Radio antenna, with bottom and top mounts and 4-foot side arms – orientation = 0° (per section 5.3 below).		
7.7.	@80-feet = Base Radio antenna, with bottom and top mounts and 4-foot side arms – orientation = 120° (per section 5.3 below).		
7.8.	@80-feet = Base Radio antenna, with bottom and top mounts and 4-foot side arms – orientation = 240° (per section 5.3 below).		
7.9.	@110-feet = Panel antenna, with mounts – orientation = 40° (per section 5.2 below).		
7.10.	@110-feet = Panel antenna, with mounts – orientation = 160° (per section 5.2 below).		
7.11.	@130-feet = Base Radio antenna, with bottom and center mounts and 4-foot side arms – orientation = 0° (per section 5.3 below).		

Exhibit B-1 Mandatory Technical Requirements

7.12.	@130-feet = Base Radio antenna, with bottom and center mounts and 4-foot side arms – orientation = 120° (per section 5.3 below).		
7.13.	@130-feet = Base Radio antenna, with bottom and center mounts and 4-foot side arms – orientation = 240° (per section 5.3 below)		
8.	ANTENNA DETAILS		
8.1.	Microwave Antenna.		
8.1.1.	Antenna Diameter = 6' 6GHz HP microwave dish with one (1) EW63.		
8.1.2.	Mounting Pipe Diameter = 4.5 in.		
8.2.	Panel Antenna.		
8.2.1.	Mounting = Flush Mount.		
8.2.2.	Dimensions: W x H x T = 3'x18"x6" panel antenna with one (1) 7/8" coax.		
8.3.	Base Radio Antenna (Open Dipole).		
8.3.1.	Antenna Model Decibel DB224 with one (1) 7/8" coax.		
8.3.2.	Mounted on one (1) 3' sidearm.		
8.4.	Enclosed Yagi Antenna.		
8.4.1.	Antenna Model # Scala RY-900Y with one (1) 7/8" coax.		
8.4.2.	Mounted to Flush Mount.		
9.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser.		
10.	SHIPPING REQUIREMENTS: F.O. B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION			

Exhibit B-1 Mandatory Technical Requirements

<i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>	
PRODUCT MODEL NAME/NUMBER	DESCRIPTION
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>	
WARRANTY OPTION	DESCRIPTION
TWO-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty" .
THREE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty" .
FOUR-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty" .
FIVE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty" .

Exhibit B-1 Mandatory Technical Requirements

12.7 TOWER SUB-CATEGORY: LATTICE, LIGHT

Sub-Category Definition: *Light duty lattice type towers, tower engineering and design, foundation engineering and design, and associated components and hardware.*

Example Product: Quantity one (1) — Light duty 60-foot self-supported communications tower.

For Bidding Purposes: Vendor shall assume that (1) customer will supply geotechnical report, (2) manage all permits, and (3) contract for foundation and tower erection services. Note: (4) antenna mounts, stand-offs, ice-shields, and waveguide bridges are to be specified and priced under a separate sub-category.

The following specifications and equipment configuration describes requirements for the EXAMPLE PRODUCT. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12 point font labeled "*ExhibitB1-Towers12.7-Lattice-Light*"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Note: Symbols for less-than (<) or greater-than (>) shall be interpreted to include equal-to the specified value. The symbol for approximate (~) indicates an imprecise or nominal value where variations will be acceptable.

Manufacturer: NO BID **Product Model Name:** NO BID

Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	SUMMARY DESCRIPTION		
1.1.	ANSI/TIA-222-H or current nationally approved standard, Risk Category III, Essential Communications.		
1.2.	Tower Type = Self-Supported.		
1.3.	Overall height = 60 feet, excluding lightning rod.		
2.	Conform to " Overall Specification " requirements.		
3.	Climb-Safety per " Overall Specifications ".		
4.	Foundation design per " Overall Specification " and identified site conditions.		
5.	PE stamped plans per " Overall Specifications ".		
6.	LIGHT DUTY DEFINITION		

Exhibit B-1 Mandatory Technical Requirements

6.1.	Decreased height and loading requirements.		
6.2.	Component transport in units of 10-feet or less.		
6.3.	Erection can be accomplished without the use of heavy equipment.		
7.	SITE INFORMATION		
7.1.	Location = Oregon, east side of Willamette Valley, Cascade foothills Wind and Ice 104 mph + 0" ice & 30 mph + 2" ice.		
7.2.	Topographical Category 3, located at the top of a hill Crest Height 2,063'.		
7.3.	Exposure Classification C, open terrain without forest or significant structures.		
7.4.	Geotechnical = TIA 222 - Rev H "Presumptive Soil".		
7.5.	Site Access = gravel road.		
7.6.	FAA Clearance = lighting not required.		
8.	HEIGHT & LOAD INFORMATION - includes future capacity - refer to antenna details (section 6)		
8.1.	@40-feet = Enclosed Yagi antenna, with mounts – orientation = 100° (per section 6.3 below).		
8.2.	@40-feet = Enclosed Yagi antenna, with mounts – orientation = 200° (per section 6.3 below).		
8.3.	@40-feet = Panel antenna, with mounts – orientation = 40° (per section 6.1 below).		
8.4.	@50-feet = Base Radio antenna, with bottom and center mounts and 4-foot side arms – orientation = 0° (per section 6.2 below).		
8.5.	@50-feet = Base Radio antenna, with bottom and center mounts and 4-foot side arms – orientation = 180° (per section 6.2 below).		
8.6.	@50-feet = Base Radio antenna, with bottom and center mounts and 4-foot side arms – orientation = 240° (per section 6.2 below).		
8.7.	@60-feet = Lightning Rod > 10-feet, to extend above topmost antenna.		
9.	ANTENNA DETAILS		

Exhibit B-1 Mandatory Technical Requirements

9.1.	Panel Antenna.		
9.1.1.	Mounting = Flush Mount.		
9.1.2.	Dimensions: W x H x T = 3’x18”x6” panel antenna with one (1) 7/8” coax.		
9.2.	Base Radio Antenna (Open Dipole).		
9.2.1.	Antenna Model # Decibel DB224 with one (1) 7/8” coax.		
9.2.2.	Mounting = one (1) 3’ sidearm.		
9.3.	Enclosed Yagi Antenna.		
9.3.1.	Antenna Model # Scala RY-900B with one (1) 7/8” coax.		
9.3.2.	Antenna Mount = Flush Mount.		
10.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser.		
11.	SHIPPING REQUIREMENTS: F.O. B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder’s offering)</i>			
PRODUCT MODEL NAME/NUMBER		DESCRIPTION	
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder’s offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>			
WARRANTY OPTION		DESCRIPTION	

Exhibit B-1 Mandatory Technical Requirements

TWO-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty".</i>
THREE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty".</i>
FOUR-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".</i>
FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".</i>

Exhibit B-1 Mandatory Technical Requirements

12.8 TOWER SUB-CATEGORY: MONOPOLE

Sub-Category Definition: *Monopole type towers, tower engineering and design, foundation engineering and design, and associated components and hardware.*

Example Product: Quantity one (1) — 140-foot monopole communications tower.

For Bidding Purposes: Vendor shall assume that (1) customer will supply geotechnical report, (2) manage all permits, and (3) contract for foundation and tower erection services. Note: (4) antenna mounts, stand-offs, ice-shields, and waveguide bridges are to be specified and priced under a separate sub-category.

The following specifications and equipment configuration describes requirements for the EXAMPLE PRODUCT. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12 point font labeled "**ExhibitB1-Towers12.8-Monopole**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Manufacturer: NO BID Product Model Name: NO BID

Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	SUMMARY DESCRIPTION		
1.1.	ANSI/TIA-222-H or current nationally approved standard, Risk Category III, Essential Communications.		
1.2.	Tower Type = Monopole.		
1.3.	Overall height = 140 feet, excluding lightning rod.		
2.	Conform to " Overall Specification " requirements.		
3.	Climb-Safety per " Overall Specifications ".		
4.	Foundation design per " Overall Specification " and identified site conditions.		
5.	PE stamped plans per " Overall Specifications ".		
6.	SITE INFORMATION		
6.1	Location = Oregon, east side of Willamette Valley, Cascade foothills Wind and Ice 104 mph + 0" ice & 30 mph + 2" ice.		
6.2.	Topographical Category 3, located at the top of a hill Crest Height 2,063'.		

Exhibit B-1 Mandatory Technical Requirements

6.3.	Exposure Classification C, open terrain without forest or significant structures.		
6.4.	Geotechnical = TIA 222 - Rev H "Presumptive Soil".		
6.5.	Site Access = gravel road.		
6.6.	FAA Clearance = lighting not required.		
7.	HEIGHT & LOAD INFORMATION - includes future capacity - refer to antenna details (section 15)		
7.1.	@40-feet = Microwave antenna, with mounts and ice shield – orientation = 220° (per section 15.1 below).		
7.2.	@40-feet = Microwave antenna, with mounts and ice shield – orientation = 130° (per section 15.1 below).		
7.3.	@60-feet = Enclosed Yagi antenna, with mounts and ice shield – orientation = 100° (per section 15.4 below).		
7.4.	@60-feet = Enclosed Yagi antenna, with mounts and ice shield – orientation = 180° (per section 15.4 below).		
7.5.	@60-feet = Enclosed Yagi antenna, with mounts and ice shield – orientation = 270° (per section 15.4 below).		
7.6.	@80-feet = Base Radio antenna, with bottom and top mounts and 4-foot side arms – orientation = 0° (per section 15.3 below).		
7.7.	@80-feet = Base Radio antenna, with bottom and top mounts and 4-foot side arms – orientation = 120° (per section 15.3 below).		
7.8.	@80-feet = Base Radio antenna, with bottom and top mounts and 4-foot side arms – orientation = 240° (per section 15.3 below).		
7.9.	@110-feet = Panel antenna, with mounts – orientation = 40° (per section 15.2 below).		
7.10.	@110-feet = Panel antenna, with mounts – orientation = 160° (per section 15.2 below).		
7.11.	@130-feet = Base Radio antenna, with bottom and center mounts and 4-foot side arms – orientation = 0° (per section 15.3 below).		

Exhibit B-1 Mandatory Technical Requirements

7.12.	@130-feet = Base Radio antenna, with bottom and center mounts and 4-foot side arms – orientation = 120° (per section 15.3 below).		
7.13.	@130-feet = Base Radio antenna, with bottom and center mounts and 4-foot side arms – orientation = 240° (per section 15.3 below).		
8.	ANTENNA DETAILS		
8.1.	Microwave Antenna.		
8.1.1.	Antenna Diameter = 6' 6GHz HP microwave dish with one (1) EW63.		
8.1.2.	Mounting = One (1) 4.5" OD Dish Mount with tri-collar.		
8.2.	Panel Antenna.		
8.2.1.	Mounting = Flush Mount with one (1) tri-collar.		
8.2.2.	Dimensions: W x H x T = 3'x16"x6" panel antenna with one (1) 7/8" coax.		
8.3.	Base Radio Antenna (Open Dipole).		
8.3.1.	Antenna Model # Decibel DB224 each with one (1) 7/8" coax.		
8.3.2.	Mounting = 3' sidearm with tri-collar.		
8.4.	Enclosed Yagi Antenna.		
8.4.1.	Antenna Model # Scala RY-900B with Radome each with one (1) 7/8" coax.		
8.4.2.	Mount = Flush Mount with tri-collar.		
9.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options.		
10.	SHIPPING REQUIREMENTS: F.O. B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the		

Exhibit B-1 Mandatory Technical Requirements

	Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER	DESCRIPTION		
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>			
WARRANTY OPTION	DESCRIPTION		
TWO-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty".		
THREE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty".		
FOUR-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty".		
FIVE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".		

Exhibit B-1 Mandatory Technical Requirements

12.9 TOWER SUB-CATEGORY: PASSIVE MICROWAVE REPEATER

Sub-Category Definition: *Passive microwave repeater (reflector) structures, structure engineering and design, foundation engineering and design, and associated components and hardware.*

Example Product: One - 20 foot by 32-foot passive microwave repeater.

For Bidding Purposes: Vendor shall assume that (1) customer will supply geotechnical report, (2) manage all permits, and (3) contract for foundation and tower erection services.

The following specifications and equipment configuration describes requirements for the EXAMPLE PRODUCT. It is the Bidder's responsibility to fully describe or explain how the product offered meets or exceeds each identified requirement. If more space is needed, Bidders may submit additional pages (up to a maximum equivalent of five single-sided pages – 12 point font labeled "**ExhibitB1-Towers12.9-MicrowaveRepeater**"). For evaluation purposes, only one product may be offered to meet or exceed these specifications on a pass/fail basis. Bidders are encouraged to submit descriptive literature for the product offered confirming its compliance with specifications. Additional products may be offered for consideration upon award as identified below.

Manufacturer: NO BID **Product Model Name:** NO BID

Product Number: NO BID

ITEM NO.	PERFORMANCE REQUIREMENT	BIDDER COMPLIES Y/N	BIDDER CLARIFICATIONS AND COMMENTS
1.	SUMMARY DESCRIPTION		
1.1.	ANSI/TIA-222-H or current nationally approved standard, Risk Category III, Essential Communications.		
1.2.	Structure Type = Passive Microwave Repeater (Reflector).		
1.3.	Size = 20 feet by 32 feet.		
2.	Conform to " Overall Specification " requirements.		
3.	Foundation design per " Overall Specification " and identified site conditions.		
4.	PE stamped plans per " Overall Specifications "		
5.	SITE INFORMATION		
5.1.	Location = Oregon, east side of Willamette Valley, Cascade foothills Wind and Ice 104 mph + 0" ice & 30 mph + 2" ice.		
5.2.	Topographical Category 3, located at the top of a hill Crest Height 2,063'.		

Exhibit B-1 Mandatory Technical Requirements

5.3.	Exposure Classification C, open terrain without forest or significant structures.		
5.4.	Geotechnical = TIA 222 - Rev H "Presumptive Soil".		
5.5.	Site Access = gravel road.		
6.	WARRANTY – Minimum one (1) year (standard warranty that includes all firmware and software updates within warranty period). Parts and related software will be free from defects in material and workmanship for one year. If equipment fails because of a defect in workmanship or materials within one year from the date of shipment manufacturer shall repair or replace the equipment or part without charge to purchaser. Provide additional warranty options.		
7.	SHIPPING REQUIREMENTS: F.O. B. Destination. Shipping charges may be negotiated and mutually agreed between the Purchaser and the Contractor. All shipping charges will be added as a separate line item to the invoice.		
ADDITIONAL PRODUCTS FOR CONSIDERATION <i>(For informational purposes ONLY. Listed items may be considered as additional option(s) upon award and included in Bidder's offering)</i>			
PRODUCT MODEL NAME/NUMBER	DESCRIPTION		
WARRANTY OPTIONS <i>(Warranty options listed below and may be considered upon award and included in Bidder's offering. Costs for additional warranty options beyond the minimum one-year warranty will be captured in Exhibit C Bid Price.)</i>			
WARRANTY OPTION	DESCRIPTION		
TWO-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryTwo-YearWarranty" .		
THREE-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryThree-YearWarranty" .		
FOUR-YEAR ADDITIONAL OPTION	Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFour-YearWarranty" .		

Exhibit B-1 Mandatory Technical Requirements

FIVE-YEAR ADDITIONAL OPTION	<i>Describe in the space provided or submit a separate document describing the two-year warranty option labeled, "Exhibit B-1Category/Sub-CategoryFive-YearWarranty".</i>
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SYSTEM EQUIPMENT WARRANTY – ATLAS®

E.F. Johnson Company ("EFJohnson") warrants to the original purchaser for use ("Customer") that all new ATLAS series system equipment provided in response to Customer requirements and/or contractual agreement on a system designed and installed by EFJohnson ("System") with products manufactured by EFJohnson ("Products") with a System Equipment Warranty purchase are free from defects in material and workmanship and will conform to EFJohnson's published technical specifications during the warranty period. The warranty program start date is the date of shipment from EFJohnson or, as expressly defined under the contractual agreement, the date of the earlier of: (i) Final Acceptance; or (ii) beneficial use by the customer, which means use for operational purposes, excluding training or testing. The warranty end date is one (1) year from the above warranty program start date or, as expressly defined under the contractual agreement between the Customer and EFJohnson ("Warranty Period"). EFJohnson makes no warranty with respect to the equipment not manufactured by EFJohnson, and any such equipment shall carry the original equipment manufacturer's warranty only. EFJohnson further makes no warranty as to, and specifically disclaims liability for, availability, range, coverage, grade of service or operation of the repeater system provided by the carrier or repeater operator.

Hardware Warranty: If any Product fails to meet the warranty set forth above during the applicable Warranty Period and is returned to a location designated by EFJohnson, EFJohnson, at its option, shall either repair or replace such defective Product, directly or through an authorized service agent, within thirty (30) days of receipt of same. No Product may be returned without the prior written authorization from EFJohnson. EFJohnson will pay the shipping charges if the Product is repaired or replaced under warranty. Repair or replacement of Products as set forth in this paragraph fulfills any and all warranty obligations on the part of EFJohnson.

Software Warranty: If any Software fails to meet the warranty set forth above during the applicable Warranty Period, the Customer must notify EFJohnson in writing before the expiration of the Warranty Period. Whether Software defects occur will be determined solely upon reference to EFJohnson's published operational and technical specifications as of the date of shipment, and to any additional technical documentation incorporated into the mutually agreed-upon contractual agreement. EFJohnson does not warrant that the use of the Software will be uninterrupted or error-free or that the Software will meet particular (other than contractually agreed-upon) requirements. Upon receipt of such notice, EFJohnson will investigate the warranty claim. If this investigation confirms a valid warranty claim, EFJohnson will, at its option and at no additional charge to the Customer, repair the defect, replace the defective Software or individual Product in which the Software is embedded for which it is provided. If the investigation indicates that the warranty claim is not valid, then EFJohnson may invoice the Customer for responding to a claim on a time and materials basis using EFJohnson's then current labor rates. Any repaired or replaced Software or Software Products shall be warranted for the remainder of the original Warranty Period or for thirty (30) days from the Customer's receipt of the repaired or replaced Software, whichever is longer.

Software Maintenance: EFJohnson will provide: (i) feature releases for System Software packages licensed pursuant to the contractual agreement between EFJohnson and Customer; (ii) enhancements to existing System Software features; (iii) new features implemented via existing System components and Software for product migration (may require purchase of new Products). The support will cover System Software updates and System upgrades to address Software issues during the Warranty but expressly excludes any priced options provided in the proposal, if applicable.

Customer Support: 7 day/24 hour (7/24) Customer Support: During the Warranty Period, EFJohnson shall provide the Customer a 7/24 toll free (in the United States) support line to reach an EFJohnson-employed customer support representative who will record the Customer's issue, open a trouble ticket, issue an RMA and/or provide further details as applicable.

Technical Support: 8:00 am – 5:00 CST Technical Support: During the Warranty Period, EFJohnson shall provide a technical support line available from 8:00 am – 5:00 CST, Monday-Friday, excluding national US holidays, staffed by an EFJohnson-employed factory technologist trained to answer the Customer's technical questions and to troubleshoot System performance issues. In order to maximize the ability for the technologist to resolve such issues, the Customer must sign a

system access agreement to authorize EFJohnson remote secure access to the Customer's System, including access to the Customer's System logs.

Exclusions: This warranty is void and EFJohnson shall not be obligated to replace or repair any Products and/or Software if: (i) the Product and/or Software has been used in other than its normal and customary manner; (ii) the Product and/or Software has been subject to misuse, accident, neglect or damage or has been used with other than EFJohnson approved accessories and equipment or has been improperly installed; (iii) the Products and/or Software have been repaired, installed and/or maintained by individuals who have not followed EFJohnson's then current installation or maintenance procedures and/or who are not trained and certified by EFJohnson on the Products and/or Software; (iv) unauthorized alterations or repairs have been made or unapproved parts have been used with the Product and/or Software; or (v) Customer failed to notify EFJohnson or EFJohnson authorized service agent of the defect during the applicable Warranty Period.

THE AFORESAID WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED AND IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. EFJOHNSON AND CUSTOMER AGREE THAT CUSTOMER'S EXCLUSIVE REMEDY FOR ANY BREACH OF ANY SAID WARRANTIES IS AS SET FORTH ABOVE. CUSTOMER AGREES THAT IN NO EVENT SHALL EFJOHNSON BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL, SPECIAL, INDIRECT, OR EXEMPLARY DAMAGES WHETHER ON THE BASIS OF NEGLIGENCE, STRICT LIABILITY OR OTHERWISE. THE TOTAL LIABILITY OF EFJOHNSON ON ANY AND ALL CLAIMS SHALL NOT EXCEED THE PRICE ALLOCABLE TO THE PRODUCTS OR SERVICES GIVING RISE TO THE CLAIM. The purpose of the exclusive remedies set forth above shall be to provide Customer with repair or replacement of non-complying Products or Software in the manner provided above. These exclusive remedies shall not be deemed to have failed of their essential purpose so long as EFJohnson is willing and able to repair or replace non-complying Products or Software in the manner set forth above.

E.F. JOHNSON COMPANY, 1440 Corporate Drive, Irving, Texas 75038

WARRANTY ON LAND MOBILE RADIOS AND ACCESSORIES – NEXEDGE®

E.F. Johnson Company ("EFJOHNSON") warrants its Land Mobile Radios and accessories purchased from an authorized EFJOHNSON dealer in the United States (the "Products") as follows:

WHAT IS COVERED AND WHAT IS EXCLUDED

Except as specified below, Products will be free from defects in material and workmanship under normal use and service for the time specified below. The following are not covered by this Warranty:

1. Damage, defects, deterioration, or failure resulting from:
 - A. Accident, misuse, negligence, abuse, neglect, improper handling, product modification, or failure to follow instructions contained in your Owner's Manual.
 - B. Improper or unauthorized testing, operation, alteration, disassembly, modification, adjustment, or repairs.
 - C. Exposure to fire, water, excessive moisture, dampness, extreme changes in climate or temperature, or other acts that are not the fault of EFJOHNSON and which the Product is not specified to tolerate.
 - D. Repair or attempted repair by anyone not authorized by EFJOHNSON.
 - E. Installation of parts or accessories that do not conform to the quality or specifications of the original parts or accessories.
 - F. Installation of the Product in, or removal of the Product from, the vehicle or other site of its use.
 - G. Use of a Product in conjunction with hardware or software electrically or mechanically incompatible with such Product.
 - H. Use of a Product in conjunction with accessories or ancillary equipment not supplied by EFJOHNSON.
 - I. Normal and customary wear and tear.
2. Damage, defects, deterioration, failure, or loss occurring during shipment (claims must be presented to the carrier).
3. Any unit that is not new when sold to the first end user or upon which the serial number has been defaced, modified, or removed.
4. Damage, defects, deterioration, or failure of antennas unless caused directly by defects in material and workmanship.
5. Damage, defects, deterioration, or failure of rechargeable batteries if any of the seals on the battery enclosure of cells are broken or show evidence of tampering or if caused by use of the batteries in equipment or service other than in conjunction with the Product for which it is specified.

USE OF THE PRODUCT WITH ACCESSORIES OR OTHER EQUIPMENT NOT SUPPLIED BY EFJOHNSON OR OTHERWISE NOT EXPRESSLY AUTHORIZED BY EFJOHNSON MAY BE DANGEROUS AND WILL VOID THE PRODUCT WARRANTY. ALL SUCH ACCESSORIES AND ANCILLARY EQUIPMENT ARE EXPRESSLY EXCLUDED FROM THIS WARRANTY. BECAUSE EACH SYSTEM THAT MAY INCORPORATE A PRODUCT IS UNIQUE, EFJOHNSON DISCLAIMS ANY LIABILITY OR WARRANTY COVERAGE FOR OR WITH RESPECT TO RANGE, COVERAGE, OR OPERATION OF THE SYSTEM AS A WHOLE.

HOW LONG IS THE WARRANTY

This Warranty will remain in effect for two (2) years for portables, mobiles, and repeaters (except models NX-xxxx and TK-x180, which have a three (3) year warranty). One (1) year for accessories, including rechargeable batteries. Warranty is measured from the date of purchase by the first end user.

WHO IS PROTECTED

This Warranty is enforceable only by the first end user. Transfer or resale of a Product will automatically terminate warranty coverage with respect to that Product. This Warranty is not transferable to any third party, including but not limited to any subsequent purchaser or owner of the Product.

WHAT WE WILL DO AND HOW TO OBTAIN WARRANTY SERVICE

EFJOHNSON will, at its sole absolute discretion, either repair or replace a Product with a new or a rebuilt unit (which unit may include new and/or reconditioned parts) if found by EFJOHNSON to be defective in material and workmanship. If EFJOHNSON determines that it is unable to repair or replace such Product, EFJOHNSON shall refund the purchase price for such Product. The foregoing is subject to your returning the defective Product to an authorized EFJOHNSON Land Mobile dealer or authorized service center within the Warranty period, accompanied by a sales receipt or other evidence of the date of purchase. If it is necessary to ship the Product for Warranty service, you are responsible for the initial shipping charges, but EFJOHNSON will pay the return shipping charges if the Product is repaired or replaced under Warranty. You are responsible for any charges incurred in removing the Product from the vehicle or other site of use and for reinstallation of the repaired or replaced Product. All replaced Products or parts, and Products or parts for which a refund has been given, will become the property of EFJOHNSON.

EXCLUSION OF OTHER WARRANTIES AND DAMAGES

Unless considered unlawful or unenforceable under applicable law:

- A. THIS IS THE COMPLETE WARRANTY GIVEN BY EFJOHNSON AND IT IS GIVEN IN LIEU OF ALL OTHER EXPRESS WARRANTIES. EFJOHNSON ASSUMES NO OBLIGATIONS OR LIABILITY FOR ADDITIONS OR MODIFICATIONS TO THIS WARRANTY. ALL IMPLIED WARRANTIES WITH RESPECT TO PRODUCTS, INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE EXCLUDED.
- B. EFJOHNSON'S LIABILITY UNDER THIS WARRANTY IS LIMITED TO THE REPAIR OR REPLACEMENT, AT EFJOHNSON'S OPTION, OF ANY DEFECTIVE PRODUCT, AND SHALL NOT INCLUDE DAMAGES OF ANY KIND, WHETHER DIRECT, INDIRECT, SPECIAL, GENERAL, INCIDENTAL, CONSEQUENTIAL, OR OTHERWISE, INCLUDING BUT NOT LIMITED TO LOSS OF USE, LOSS OF TIME, INCONVENIENCE, COMMERCIAL LOSS, OR LOSS OF PROFITS OR SAVINGS OR ANTICIPATED PROFITS OR SAVINGS.

This Warranty is enforceable only in the United States of America and governed by the laws of the State of Texas.

If a problem develops during or after the Warranty Period, or if you have any questions regarding the operation of the product, you should contact your EFJOHNSON Authorized Dealer or Authorized Service Center. If the problem or your question is not handled to your satisfaction, please contact our Customer Relations Department at (800) 328-3911.

E.F. Johnson Company
1440 Corporate Drive
Irving, TX 75038

LIMITED WARRANTY ON SYSTEMS, SYSTEM COMPONENTS AND SERVICES

E.F. Johnson Company ("EFJOHNSON") warrants its Systems and System Components, including but not limited to, repeaters, controllers, power amplifiers, power supplies, power distribution panels, combiners, receiver multi-couplers, antenna systems, reinforced antenna systems, control stations, consoles as follows:

HOW LONG IS THE WARRANTY

The Limited Warranty will remain in effect based on the following table, measured from the date of system acceptance on EFJOHNSON system contracts or date of invoice for standard systems and components.

PRODUCT CATEGORY	WARRANTY PERIOD
KENWOOD Labeled System Components and EFJOHNSON Integrated Complete Systems	2 Years
Non-EFJOHNSON System Components	2 Years
Portable Handheld Radios, Mobile Radios, and LandMobile Accessories	See EFJOHNSON Land Mobile Radio Warranty
Systems Services (Including Engineering, Installation, & Programming)	90 Days

WHO IS PROTECTED

This Warranty is enforceable only by the first end user ("Buyer").

PRODUCT WARRANTY

Except as specified below, this Warranty covers all defects in materials and workmanship in EFJOHNSON Systems and System Components. The following are not covered by the Warranty:

1. Damage, deterioration or failure resulting from:
 - A. Accident, misuse, abuse, neglect, product modification, or failure to follow instructions contained in the Owner's and Operations Manuals.
 - B. Repair or attempted repair by anyone not authorized by EFJOHNSON
 - C. Installation of parts or accessories that do not conform to the quality or specifications of the original parts or accessories.
 - D. Improper installation of the product in or improper removal of the product from any location.
 - E. Environmental conditions that adversely affect systems/product performance, including but not limited to temperature, water, excessive moisture, power surges, lightning, electro-static discharge, acts of God, or other casualties that are not the fault of EFJOHNSON and which the Product is not specified to tolerate.
 - F. Battery leakage, water, or other elements.
 - G. Failure due to the use of a Product in conjunction with hardware or software electrically or mechanically incompatible with such Product.
 - H. Failure due to the use of a Product in conjunction with accessories or ancillary equipment not supplied by EFJOHNSON.
 - I. Normal and customary wear and tear.
2. Damage or loss occurring during shipment (claims must be presented to the carrier).
3. Any product, which is not new when sold to the first end user unless otherwise specified at time of sale.
4. Any product, upon which the serial number has been defaced, modified, or removed.

USE OF PRODUCT WITH NON-EFJOHNSON SUPPLIED EQUIPMENT AND ACCESSORIES

USE OF THE PRODUCT WITH ACCESSORIES OR OTHER EQUIPMENT NOT SUPPLIED BY EFJOHNSON OR OTHERWISE NOT EXPRESSLY AUTHORIZED BY EFJOHNSON MAY BE DANGEROUS AND WILL VOID THE PRODUCT WARRANTY. ALL SUCH ACCESSORIES AND ANCILLARY EQUIPMENT ARE EXPRESSLY EXCLUDED FROM THIS WARRANTY. BECAUSE EACH SYSTEM THAT MAY INCORPORATE A PRODUCT IS UNIQUE, EFJOHNSON DISCLAIMS ANY LIABILITY OR WARRANTY COVERAGE FOR OR WITH RESPECT TO RANGE, COVERAGE, OR OPERATION OF THE SYSTEM AS A WHOLE.

WORKMANSHIP WARRANTY

EFJOHNSON warrants the Services performed by EFJOHNSON to be free from defects in workmanship for ninety (90) days from System Acceptance. EFJOHNSON's obligation and Buyer's remedy under this warranty for Services is limited to the correction of the defective Services. Such obligation and remedy are conditional upon the defect not being the result of mishandling, abuse, misuse, or improper maintenance by Buyer, or other causes not attributable to EFJOHNSON. The correction of defective Services shall be warranted for a period of thirty (30) days or the remainder of the original warranty period, whichever is longer.

WHAT WE WILL PAY FOR AND WHAT YOU MUST PAY FOR

EFJOHNSON will pay all labor and material expenses for items covered by this Warranty at EFJOHNSON's location in Irving, TX, or at one of the EFJOHNSON Authorized Service Centers. Contact the phone numbers below to determine where your product must be shipped (it depends on the product to be repaired as to where it is sent). If it is necessary to ship the product for Warranty service, you, the Buyer, are responsible for the initial shipping charges, but we will pay the return shipping charges at ground rates if the product is repaired or replaced under Warranty. The Buyer will pay any express return shipping costs. Unless EFJOHNSON has installed the system under contract, you are responsible for any charges incurred in diagnosing the problem; removing the product from the rack, cabinet, vehicle, or other site of use; and for reinstallation of the repaired or replaced product.

HOW TO OBTAIN WARRANTY SERVICE

Before sending any units for warranty work, please call one of the phone numbers below to find out where your unit must be sent. EFJOHNSON in Irving, TX, or an authorized service center (depending on the product) must service your EFJOHNSON System or System Component. EFJOHNSON Systems customer service staff is available between 8:30 a.m. and 5:00 p.m., Monday through Friday Central Time. If you have difficulty in obtaining service, please write or telephone EFJOHNSON Systems at the address and phone numbers below.

EXCLUSION OF IMPLIED WARRANTIES AND DAMAGES

Unless considered unlawful or unenforceable under applicable law:

- A. ALL EXPRESS OR IMPLIED WARRANTIES WITH RESPECT TO EFJOHNSON SYSTEMS AND SYSTEM COMPONENTS, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY EXCLUDED.
- B. EFJOHNSON'S LIABILITY UNDER THIS WARRANTY SHALL BE LIMITED TO THE REPAIR OR REPLACEMENT, AT EFJOHNSON'S OPTION, OF ANY DEFECTIVE PRODUCT, AND SHALL NOT INCLUDE DAMAGES OF ANY KIND, WHETHER INCIDENTAL, CONSEQUENTIAL, INDIRECT, EXEMPLARY, OR OTHERWISE.

This Warranty is enforceable only in the United States of America.
E.F. Johnson Company, 1440 Corporate Drive, Irving, TX 75038
(972) 819-0700 (800) 328-3911

SUBSCRIBER RADIO WARRANTY STATEMENT – VIKING® SERIES

E.F. Johnson Company ("EFJohnson") warrants to the original purchaser for use ("Customer") that the Viking series portable and mobile radio equipment manufactured by EFJohnson ("Products") and software implemented onto the Products ("Software") are free from defects in material and workmanship by conforming to EFJohnson's published technical specifications as of the date of shipment for a period of three (3) years from the date of shipment by EFJohnson (each respectively the "Warranty Period"). EFJohnson makes no warranty with respect to the equipment not manufactured by EFJohnson, and any such equipment shall carry the original equipment manufacturer's warranty. EFJohnson further makes no warranty as to, and specifically disclaims liability for, availability, range, coverage, grade of service or operation of the repeater system provided by the carrier or repeater operator. Any repaired or replaced Products or Software shall be warranted for the remainder of the original Warranty Period or for ninety (90) days from the Customer's receipt of the repaired or replaced Product or Software, whichever is longer.

If any Product fails to meet the warranty set forth above during the applicable Warranty Period and is returned to a location designated by EFJohnson, EFJohnson, at its option, shall either repair or replace such Product, directly or through an authorized service agent, within thirty (30) days of receipt of same. No Products may be returned without the prior written authorization from EFJohnson. EFJohnson will pay the shipping charges if the Product is repaired or replaced under warranty. Repair or replacement of Products as set forth in this paragraph fulfills any and all warranty obligations on the part of EFJohnson.

If any Software fails to meet the warranty set forth above during the applicable Warranty Period, the Customer must notify EFJohnson in writing before the expiration of the Warranty Period. Whether Software defects occur will be determined solely upon reference to EFJohnson's published operational and technical specifications as of the date of shipment, and to any additional technical documentation incorporated into the mutually agreed-upon contractual agreement. EFJohnson does not warrant that the use of the Software will be uninterrupted or error-free or that the Software will meet particular (other than contractually agreed-upon) requirements. Upon receipt of such notice, EFJohnson will investigate the warranty claim. If this investigation confirms a valid warranty claim, EFJohnson will, at its option and at no additional charge to the Customer, repair the defect, replace the defective Software with the same or equivalent Software, or refund the price of the defective Software or individual Product in which the Software is embedded or for which it is provided. Such action will be the full extent of EFJohnson's liability and the Customer's sole remedy for a breach of this Warranty. If the investigation indicates that the Warranty claim is not valid, then EFJohnson may invoice the Customer for responding to a claim on a time and materials basis using EFJohnson's then current labor rates.

This warranty is void and EFJohnson shall not be obligated to replace or repair any Products and/or Software if: (i) the Product and/or Software has been used in other than its normal and customary manner, (ii) the Product and/or Software has been subject to misuse, accident, neglect or damage or has been used with other than EFJohnson approved accessories and equipment or has been improperly installed, (iii) the Products and/or Software have been installed and/or maintained by individuals who have not followed EFJohnson's then current installation or maintenance procedures and/or are not trained and certified by EFJohnson on the Products and/or Software, (iv) unauthorized alterations or repairs have been made or unapproved parts have been used with the Product and/or Software, or (v) Customer failed to notify EFJohnson or an EFJohnson authorized service agent of the defect during the applicable Warranty Period.

THE AFORESAID WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED AND IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. EFJOHNSON AND CUSTOMER AGREE THAT CUSTOMER'S EXCLUSIVE REMEDY FOR ANY BREACH OF ANY SAID WARRANTIES IS AS SET FORTH ABOVE. CUSTOMER AGREES THAT IN NO EVENT SHALL EFJOHNSON BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL, SPECIAL, INDIRECT, OR EXEMPLARY DAMAGES WHETHER ON THE BASIS OF NEGLIGENCE, STRICT LIABILITY OR OTHERWISE. THE TOTAL LIABILITY OF EFJOHNSON ON ANY AND ALL CLAIMS SHALL NOT EXCEED THE PRICE ALLOCABLE TO THE PRODUCTS OR SERVICES GIVING RISE TO THE CLAIM.

The purpose of the exclusive remedies set forth above shall be to provide Customer with repair or replacement of non-complying Products or Software in the manner provided above. These exclusive remedies shall not be deemed to have failed of their essential purpose so long as EFJohnson is willing and able to repair or replace non-complying Products or Software in the manner set forth above.

E.F. JOHNSON COMPANY, 1440 Corporate Drive, Irving, Texas 75038

4500 Base Station

VHF, UHF, and 700/800 MHz

The smallest, fully software definable IP based linear base station operating in P25 Phase 1 and P25 Phase 2.

The ATLAS 4500 Multimode Base Station offers market-leading analog and P25 Phase 1 and Phase 2 TDMA mixed-mode capabilities in a robust, reliable, and compact form factor. Designed and built to exceed industry standards and specifications, it is available in a range of frequency bands including VHF, UHF, and 700/800 MHz.



Making Safe, Simple™



Flexible Architecture

- Leverages a common hardware platform to support 12.5 kHz Analog, 12.5kHz FDMA P25 Phase 1 and 6.25 kHz P25 Phase 2 TDMA and operates in Analog/P25 Conventional, P25 Trunked and Linear Simulcast mode
- Smallest P25 Phase 2 base station in the industry packaged in an ultra compact 2RU size chassis maximizing rack space usage
- Supports dynamic P25 Phase 1 and P25 Phase 2 mixed mode operation
- AC or DC power input
- P25CAP Compliant
- Supports P25 voice and data capability

Ease Of Use And Maintainability

- Modular architecture allows flexible expansion of sites and seamless scalability of the system
- Interactive front panel design displays status and diagnostics for rapid troubleshooting
- Flexible upgrades of software

Advanced Next Generation Design And Performance

- Improved multi band receiver design provides higher sensitivity along with very high intermodulation immunity for congested prime site locations
- High power ultra linear ultra compact RF power amplifier uses new state of the art digital and RF techniques and components that greatly simplify operation
- Full spectrum coverage in VHF, UHF, and 700/800 MHz

ATLAS 4500 Base Station Specifications

General	VHF		UHF	700 / 800 MHz
Mounting	19" rack or shelf			
Dimensions (Hx Wx D)	3.5 x 19 x 17.9 in. (89 x 483 x 455 mm)			
Weight	24.25 lbs. (11 kg)			
Operating Temeperature Range	-22°F to +140°F (-30°C to +60°C)			
Power Requirements	AC: 90-264 VAC, 47-63 Hz or DC: 24-58 VDC positive or negative ground.			
Power Consumption	100W Tx 480W 40 W Rx (C4FM) / 230 W Rx (LSM)			
RF Interconnects	TX:N Female, RX: N Female			
Channel Spacing	12.5 kHz			
FCC Compliance	Parts 15 and 90			
Modulation	TX: C4FM, H-DQPSK (Linear and Linear Simulcast), RX: C4FM,H-CPM, FM			
Transmitter	VHF		UHF	700 / 800 MHz
Frequency Range	136-174 MHz	380-520 MHz		763-776 MHz, 850-870 MHz
RF Power Output	5-100 Watts			
Electronic Switching Bandwidth	Full Bandwidth			
Duty Cycle	100%			
Output Impedence	50 Ohms			
Spurious Emissions	90 dB			
Harmonic Emmisions	90 dB			
Modulation Fidelity	<3%			
Intermodulation Attenuation	40 dB, 80 dB With External Isolator			
Audio Response	As per TIA			
Analog Audio distortion	<2%			
Frequency Stability [-22°F to +140°F (-30°C to +60°C)]	± 1.0 PPM (Internal) ± 0.1 PPM (External Ref: GPS Synchronized)			
Digital Emission Designator	8K10F1E, 8K10F1D, 9K80F7E			
Analog Emission Designator	11K0F3E	11K0F3E		16K0F3E, 14K0F3E, 11K0F3E
Analog FM Hum & Noise (S/N Ratio)	45 dB			
Maximum Deviation (Analog)	± 2.5 kHz	± 2.5 kHz		± 5 kHz
Maximum Deviation (Digital)	± 3110 Hz	± 3110 Hz		± 3110 Hz
Receiver	VHF		UHF	700 / 800 MHz
Frequency Range	136-174 MHz	380-520 MHz		792-825 MHz
Analog Sensitivity: 12dB SINAD	-119 dBm	-119 dBm		-119 dBm
Digital Sensitivity: for 5% BER	-119 dBm	-119 dBm		-119 dBm
Signal Displacement Bandwidth	± 1 kHz			
Frequency Stability [-22°F to +140°F (-30°C to +60°C)]	0.5 PPM			
Analog Adjacent Channel Rejection (TIA603D)	72 dB			
Digital Adjacent Channel Rejection	60 dB			
Intermodulation Rejection	82 dB			
Spurious and Image Response Rejection	90 dB			
Audio Response	+1, -3 dB From 6 dB per Octave De-Emphasis; 300-3000 Hz Referenced to 1000 Hz at Line Output			
Analog Audio distortion (at 1000 Hz)	2%			
Digital Audio distortion (at 1000 Hz)	As per TIA			
Analog Hum & Noise (TIA)	45 dB			
Digital Hum & Noise (TIA)	As per TIA			
RF Input Impedence	50 Ohms			

Standards Compliance

EFJohnson's stations comply with the following standard specifications:	
P25 Digital Operation	TIA-102.CAAB-D
P25 Phase 2 (TDMA) Operation	TIA-102.CCAB-A
Analog FM Operation	TIA 603-D
EMI/EMC	NTIA Manual Chapter 5
PSTN Line Isolation	FCC Part 68 (USA)

All specifications are subject to change without notice. Please check the website for the latest version.
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EF Johnson Technologies, Inc.

a JVCKENWOOD Company

1440 Corporate Drive, Irving, TX 75038-2401
Phone: 800.328.3911 • efjohnson.com

STARGATE 7000 Dispatch Console

Flexible, interoperable, and intuitive console solution with state-of-the-art audio, offering full-featured dispatch capability for multiple systems.

The StarGate 7000 Dispatch Console is EFJohnson's next generation console. It provides interoperability through direct IP connection to P25 trunked, conventional, analog, and Multi-Net[®] systems and connection to other disparate systems through control stations.

General

- IP based, fully distributed with no requirement for central control equipment allowing extensive scalability and expansion and no single point of failure
- Built in end-to-end encryption support (standard DES-OFB and AES)

Interoperability

- P25 conventional and trunked operation
- Interoperability with disparate systems through EFJohnson control station allowing group call, channel/zone change, scan, and emergency operations
- Analog signaling with tone support including two-tone paging, DTMF tones, and alert tones
- Built-in telephone interconnect and NENA operation

Audio

- AMBE+2 vocoder provides enhanced digital P25 audio
- Best-in-class voice clarity through custom audio management hardware
- Superior audio fidelity through Bose[®] speakers
- Built-in equalizer to allow operator specific transmit voice quality adjustments
- 10 speaker support



Making Safe, Simple[™]



Graphical User Interface

- Modular, intuitive, and easy to use GUI with multiple monitor support (including touch screen)
- Distinct shapes and colors with large, easy to read alphanumeric characters
- Fast multi-select and patching operation for responsive incident management
- Emergency window provides visual and audible emergency indication and emergency management
- Detailed history table allows storing and export of up to 1500 activity records

Fault & Performance Management

- Fully configurable through ATLAS[®] 6100 Basic or ATLAS[®] 6200 Advanced NMS
- Centralized configuration allows creation and reuse of dispatcher profiles
- Centralized management of subscriber and talkgroup ID/alias

StarGate® 7000 Dispatch Console Specifications

General	StarGate 7000
Number of configurable talkgroups/radio control modules	192
Number of configurable tabs	8 per monitor
Number of configurable talkgroups per tab	12
Number of active patches per dispatch position	30
Number of active preset groups per dispatch position	30
Number of entries (call and user activities) in history table	5000
Number of PSTN connections per dispatch position	2
Talkgroup alias character limit	16
Subscriber alias character limit	12
IRR (Instant Recall Recorder) Select/UnSelect	30 Minutes
General Purpose I/O	up to 80 input / 80 output
10 speaker support	Standard
Multi monitor capability	Standard
DES-OFB	Standard
AES	Standard
P25 Conventional and Trunking	Standard
Analog Operation	Standard
Control Station	Standard

Item	StarGate 7000
Foot Switch	Standard (1)
Operator Headset	Option (1)
Supervisor Headset	Option (1)
Desktop Microphone	Standard (1)
Bose® Speakers	Standard (2)
Additional Speakers	Option (8)
LCD Monitor	Option (3)
Touch Screen Monitor	Option (3)
PSTN Gateway	Option
General Purpose I/O	Option



LMR Communications

Made Simple.

ATLAS is the most modern & flexible P25 System

Our patented **Latitude™** technology makes the ATLAS® P25 application and transport network distinctive. This enables ATLAS systems to offer increased flexibility as compared with traditional LMR systems in various aspects of its operations.



Auto-Discovery & Self-Healing Sites

When a new site is added and connected to the network, the ATLAS system automatically configures the site. The system uses site peer-to-peer or inter-site communication to broadcast relevant adjacent site information to the other sites periodically. Because the system is exceptionally efficient, the broadcast message is particular and identifies the confirmed talkgroups for which the site is looking to connect. Then, the control message exchanged during the call setup indicates the availability to participate in the calls. This auto-discovery occurs each time a new site is deployed on the system, and it follows the Latitude technology protocol of exchanging messages with other sites. As a result, all sites in the system are rapidly aware of all other sites and only track which sites are interested in the same confirmed talkgroup and availability to participate in the call. Because of this communications protocol and information exchange, when a network connection is lost and then reestablished, the system can heal itself automatically.

The inter-site communication leverages the power of IP multicast to provide one-to-many and many-to-many communication using a standard IP gateway router. Any site on the ATLAS-enabled IP network that is capable of listening or sending voice packets can participate in the talkgroup. Network packets are simultaneously received and processed by all participating sites.



Distributed Call Control

The site initiating a call is responsible for call setup. Once the call is established, the initiating site encodes voice messages with a standard audio CODEC and uses standard IP multicasting to send real-time transport protocol (RTP) voice packets across the network to the other sites.

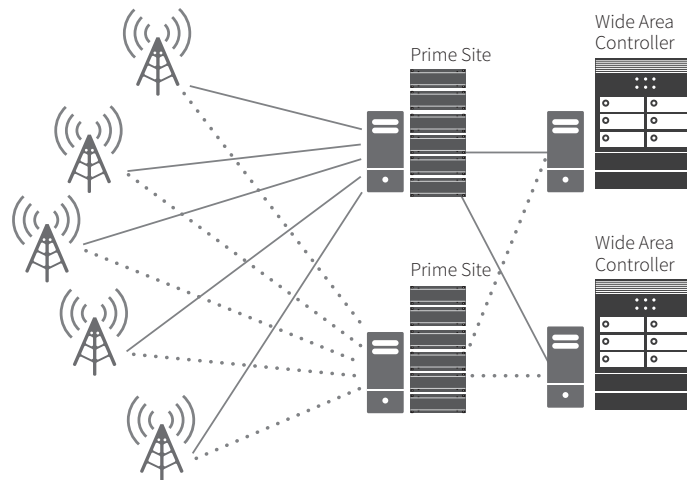
- | **No central controller is necessary to initiate a call**
- | **A failure at one site does not affect operation & performance of remaining sites**



Simulcast Control

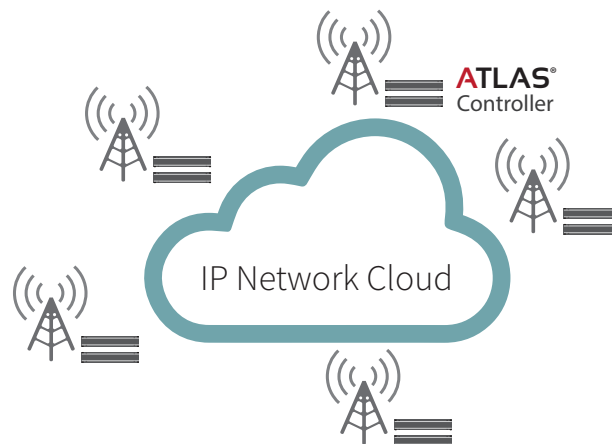
Our ATLAS simulcast solution has consolidated the traditional hardware elements of the comparator, prime site controller, and wide-area controller functionality into a software application. The ATLAS simulcast solution replicates this functionality at each site. Where traditional LMR systems may deploy a second instance of comparators and controllers, ATLAS provides redundancy equivalent to the number of sites times two, plus a hot standby controller installed at each site. Critical timing requirements for simulcast call launch are achieved using GPS-acquired time, which has unparalleled accuracy (on the order of nanoseconds).

**Traditional
Simulcast is
COMPLEX**



**Legacy
hardware based
solution**
One level of
expensive
redundancy

**ATLAS
Simulcast is
SIMPLE**



**Latitude
- modern
IT-based
solution**
Nine levels
of affordable
controller
redundancy

*"We never lost communication with any first responder in the county during two separate tornadoes in 2015. The ATLAS system worked just like it was designed to do. The tower sites were all in the storm damaged areas and **communications stayed up during the storm.**"*

- Randy Miller
Emergency Management Director, Huron County, MI



Simple Business Model

We offer a flat pricing model for ATLAS systems. All supported software features are included in the base system offering. There are no additional fees for operational licenses, console features, network management system features, number of user IDs, number of talkgroup IDs, or number of NMS client users.

Adding a channel, a site, a console, or an NMS to a system only requires you to purchase the extra infrastructure equipment—no additional or hidden fees will be charged.



Service Support Care

We make your critical communications safe and simple with support services customized to your needs.

You choose the level of services that is right for agency:

- **Basic** - Do it yourself and manage your own network and radio fleet with access to remote technical support and software updates when you need it.
- **Essential** - Basic support plus worry-free hardware warranty support.
- **Premium** - Access to fast on-site response from our certified technicians to network and radio issues as well as preventative maintenance.
- **Premium Plus** - We'll manage your network and radio fleet for you, maximizing performance and ensuring system health.

System & Subscriber Service Packages

	Basic	Essential	Premium	Premium Plus
Remote Support	•	•	•	•
Software Maintenance	•	•	•	•
Software Care ¹	•	•	•	•
Hardware Care		•	•	•
System Restoration ²			•	•
Preventative Maintenance			•	•
Advanced Replacement				•
Network Operations Center (NOC) Monitoring ²				•
Battery Care ³				•

¹ Available as OPTION in either of the four packages

² Systems Only

³ Subscribers Only

We give you the **freedom** to choose

We support interoperability to its fullest extent and make it simple to integrate multiple vendors' P25 solutions with our ATLAS system - subscribers, consoles, base stations, logging recorders - you can choose to use ATLAS products or a mix of other vendor's components at the time of implementation or any time during the life of the system.

ATLAS Ecosystem

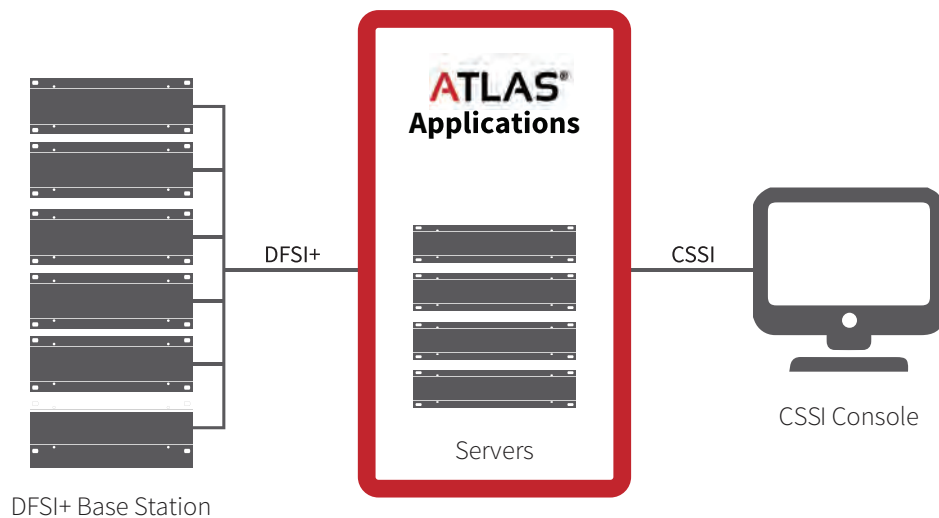
Licensed to operate
on an ATLAS network



Tested to support the
ATLAS network



Tested & certified to
interoperate with
ATLAS network



Our Guarantee to You

ATLAS is designed to work with all P25 subscriber manufacturers - we guarantee our coverage with all P25 Phase 1 CAP tested subscribers.

We also guarantee that we will not initiate any change order during the project implementation. Our customers will attest that every change order in their project was initiated at their request as a system enhancement outside of the scope of the original project.

*"Scaling up the system from a small beginning to become a state-wide system has not been a problem. **A flat IP-network has allowed us to grow this system very easily.** The audio quality on the ATLAS system is just outstanding."*

- Bob Hlivak
Hawaii State-wide Radio System



Just Four Basic Components

ATLAS systems consist of just four basic components. By using a common hardware platform to build the system components, the ATLAS solution reduces the need for spares by allowing a single pool of spares across multiple component types. The majority of ATLAS system components are based on commercial-off-the-shelf (COTS) hardware, significantly reducing system obsolescence and extending the life of your critical investment.

The ATLAS system's minimal space requirements lower risk and add flexibility to co-locating new equipment with existing equipment, mitigating difficult cutover problems and reducing additional shelter costs.



ATLAS

4000 P25 Phase 1 & 2 Base Stations/Repeaters

VHF | UHF | 700/800 MHz

The ATLAS 4000 series products offer the capability to deploy the full gamut of P25 solutions including conventional, trunked, simulcast, and hybrid systems. Available in analog and P25 mixed-mode, the base station/repeater line is designed to build out the ATLAS distributed architecture system solution in a cost-effective and scalable manner.



ATLAS

6100/6200 Network Management System (NMS)

The ATLAS NMS is a state-of-the-art web based network management system that provides centralized network management functionality for all ATLAS infrastructure products. A fully redundant solution with web based client access, the ATLAS NMS offers unified management and deployment of configuration to all infrastructure solutions including conventional systems, trunked systems, StarGate® consoles, and gateways. The ATLAS NMS is available in two options: ATLAS 6100 Basic NMS for small systems and ATLAS 6200 Advanced NMS for larger systems.



StarGate

7000 Dispatch Console

The StarGate® Dispatch Console is a next generation console that provides interoperability via direct connection to P25 trunked and conventional systems, analog systems, paging systems, and connection to other disparate systems via control stations. The StarGate console is IP-based and fully distributed with no requirement for central control equipment, allowing extensive scalability and expansion and with no single point of failure.



ATLAS

8000 Controller/Gateway

The ATLAS 8000 series controllers and gateways provide IP-based fully integrated solutions to support all the interoperability and interface capabilities across all the system types including conventional, trunked, hybrid, and simulcast solutions. In addition, the ATLAS 8000 gateways offer distributed call control, mobility functions, and also provide diverse interoperability solutions to interface multiple system types with the StarGate console.

ATLAS®

bit.ly/makingsafesimple

EF Johnson Technologies, Inc.

a JVCKENWOOD Company

1440 Corporate Drive, Irving, TX 75038-2401
Phone: 800.328.3911 • efjohnson.com

KENWOOD



P25 Mission Critical



Subscriber Overview

KENWOOD Viking radios are safe and simple to use.

KENWOOD Viking® radios bring together the proven Viking P25 software expertise and KENWOOD's recognized hardware quality and reliability. Viking radios are used throughout the world by police, fire, paramedics, military and homeland security personnel. We make our radios easier to budget for and buy with our perpetual software license program and Vault™ asset management tool. We use advanced technology like Armada® fleet management and programming software and TrueVoice™ software-based noise cancellation to make them easy to use and easy to maintain. **We make safe simple.**

PERPETUAL SOFTWARE LICENSE PROGRAM & VAULT ASSET MANAGEMENT

Previously today, every time you purchased a P25 land mobile radio you paid for the hardware plus all the software options. In some cases, the software options alone exceed 70% of the radio price. This buying model is outdated, and we think it's time the LMR market catches up to the rest of the consumer market. That's why we introduced the industry's first subscriber radio perpetual software license program, which transforms the way you purchase your radios and adds greater value by extending the life of the software into your next hardware platform — you own the software option forever. Your licenses are easy to manage with Vault, our cloud-based asset management tool.



Software Options Included

The program offers perpetual licenses on commonly purchased public safety software options. The current list price value of these software options is \$2,400. We will continue to expand capability on radios and offer new options.

- P25 Conventional
- MDC1200/GE-Star Signaling
- P25 Phase 1 Trunking
- P25 Data Conventional
- P25 Data Trunking
- FIRESafe® Responder
- FIRESafe® Command



Managing Assets with Vault

Designed to enable you to easily transfer your perpetual software licenses, your Vault account also gives you a comprehensive view of your existing KENWOOD Viking radio fleet and all software licenses, including non-perpetual licenses.

ARMADA Fleet Management

Quickly and easily maintain your fleet of radios and update your radio software with Armada, the industry's first fleet management and programming software with the most intuitive user interface.

Armada introduces the concept of templates to fleet management. Each user group can develop a single profile for its specific agency and designate it as a template. The template is linked to the selected agency's radio profiles and then as necessary, Armada will download this information into the Viking radio. Programming changes to agency radios only require an update of the template instead of updating each radio profile. You can also copy and paste an existing template to create new radio profiles for additional agencies.

For radio programming, Armada supports either a direct computer connection or Over-the-Air-Programming (OTAP). Because the direct link is a USB connection, multiple radios can connect via a USB hub for concurrent programming, which saves substantial time and effort.



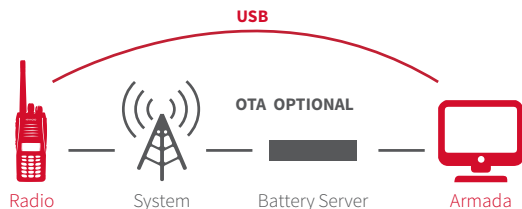
FREE Armada Quick Start Training

Learn the Armada basics in about an hour!
Available to you even before you buy.

bit.ly/armada-quickstart

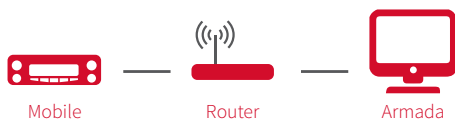
"The ease of use is just unbelievable and the ability to program multiple radios at the same time while they are in the field has been a huge timesaver."

- Sgt. John Desmond, City of Waterbury, CT Police Department



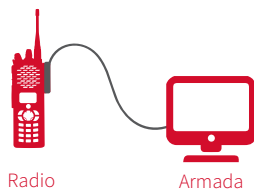
Elite Battery Management™

Track the health of batteries installed in your Viking portable radios. Radios can be configured to report battery health directly to the operator as well as to the battery server. Includes email/text message alerts.



Over-the-Internet Programming (OTIP)

Program Viking mobile radios remotely using IP-based network services. Works with both wired (Ethernet) and wireless (Wi-Fi) networks.



Kiosk Mode

A special view of Armada that simplifies radio interaction. Anyone can connect their radio and automatically install any available updates.

To clearly hear the words being transmitted is expected, but to be able to hear the tone of the voice and recognize distress immediately is a true advantage.

TrueVoice software-based noise cancellation works in analog or digital mode, eliminates the need for programming noise profiles, and works with any accessory.



What people are saying:

"Our officers complain about digitized voice on other manufacturers' radios. Because of the way the TrueVoice noise suppression works, the officers can hear the voice quality improvement with the Viking radios. Not only can they distinguish who's talking, but also the tone of their voice."

"We have spent hundreds of hours configuring the noise suppression on other radios and it does not match the performance of the Viking."

User Selectable Color Themes

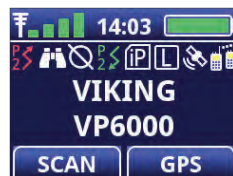
Seven user-selectable themes are available on Viking 5000/6000/7000 series portables and mobiles. Each theme has a day and night time mode. While all themes have various text and background colors, some elements have the same color across all themes. Emergency calls, for instance, will always be displayed in **orange**. In general, good or enabled items will be **green** (such as a full battery or good signal strength) and bad or disabled items will be **red** (such as a channel being busy).

8 themes available to choose from, including:

DAY



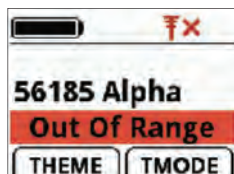
NIGHT



VIKING (Default)



LCH



NIGHT VISION

- Reduces pupil dilation for more effective night operations
- Minimizes light pollution for low detection nighttime activity

TOP DISPLAY WITH EVENT INDICATION

COLOR	INDICATION	EXAMPLE EVENT
Green	Good	• Receiving a call successfully • Sending a status successfully
Red	Alert	• Failed registration • Pressing an unprogrammed button
Orange	Emergency	• Declaring an emergency call • Receiving an emergency call



Flip display
changes text
orientation for
viewing while
in holster

Portable Specifications

	VP5000	VP600 Federal	VP6000	VP900
Frequency Band	VHF UHF Lo/UHF Hi 700-800 MHz	UHF (380-470 MHz)	VHF UHF Lo/UHF Hi 700-800 MHz	VHF/700-800 MHz
Multi-band				■
Speaker	1W	1W	1W	1W
Color Display	■		■	
Water Protection	MIL Standard 810G, IP67	MIL Standard 810G, IP67	MIL Standard 810G, IP67/IP68	MIL Standard 810G, IP67
Hazardous Location Certification	TIA 4950A	FM 3611	TIA 4950A	FM 3611
Channel Capacity	1024	1024	1024 (2048; 4096 option)	2048
Encryption	AES DES-OFB ARC 4	AES DES-OFB ARC4	AES DES-OFB ARC4	AES DES-OFB ARC4
Over-the-Air Rekeying (OTAR)	■	■	■	■
Over-the-Air Programming (OTAP)	■	■	■	■
AMBE+2 Vocoder	■	■	■	■
TrueVoice™ Noise Cancellation	■	■	■	■
P25 Phase 1	■	■	■	■
P25 Phase 2	■	■	■	■
Viking16	■	■	■	■
Internal GPS	■	■ ²	■	■
Bluetooth®	■		■	
Bluetooth® Programming	■ ¹		■ ¹	
P25 Paging	■		■	
Voice Recording	■ ¹		■ ¹	
Man Down	■		■	
Enhanced Vehicular Repeater (EVRS) Option	■	■	■	■
Color Option	Black	Black High Visibility Green	Black High Visibility Green	Black High Visibility Green

¹Future availability

²700/800 MHz only



VP5000 Single Band

VP600 Federal Single Band
VP900 Dual Band



VP6000 Single Band



VM7000 All-Band (Multi-Deck)



VM900 Dual Band



VM6000 Single Band



VM5000 Single Band



Standard Control Head



VM900

Basic Control Head



VM5000

Viking® HHCH



VM6000

Viking® Control Head



VM900/VM6000

Full-Featured Control Head



VM7000

Mobile Specifications

	VM5000	VM6000	VM900	VM7000
Frequency Band	VHF UHF Lo/UHF Hi 700/800 MHz	VHF UHF Lo/UHF Hi 700/800 MHz	VHF/700/800 MHz	Any combination of up to 4 bands
Control Head Options:				
Standard			■	
Basic	■			
Viking		■	■	
Full-Featured				■
Handheld		■		
Mounting Options	Dash Remote	Remote	Dash Remote	Remote
Dual Control Head Support	■	■	■	■
Multi-Deck Support				■
Color Display	■	■	■	■
Channel Capacity	1024	1024 (2048; 4096 option)	2048	1024 (2048; 4096 option)
Encryption	AES DES-OFB ARC4	AES DES-OFB ARC4	AES DES-OFB ARC4	AES DES-OFB ARC4
Over-the-Air Rekeying (OTAR)	■	■	■	■
Over-the-Air Programming (OTAP)	■	■	■	■
Over-the-Intranet Programming (OTIP)	■ ¹	■	■	■
Wi-Fi	■ ¹	■	■	■
AMBE+2 Vocoder	■	■	■	■
TrueVoice™ Noise Cancellation	■	■	■	■
P25 Phase 1	■	■	■	■
P25 Phase 2	■	■	■	■
Viking16	■	■	■	■
Internal GPS	■	■	■ ²	■
Bluetooth®	■	■		■
Bluetooth® Programming	■ ³	■ ³		■ ³
P25 Paging	■	■		■
Voice Recording	■ ³	■ ³		■ ³
Enhanced Vehicular Repeater (EVRS) Option	■	■	■	■

¹Remote mount only.

²Requires external GPS receiver.

³Future availability.

| Batteries |

Li-ion - Immersion Rated & FM 3611 or TIA
4950A
NiMH - Immersion Rated

| Chargers |

Single-Bay & Multi-Bay

| Audio |

Bluetooth Accessories
Speaker Mics
Palm Mics
Lapel Mics
Headsets
Surveillance Kits

| Carrying |

Leather & Nylon Cases
Belt Clips/Loops
Retaining Straps
D-ring Swivels
Shoulder Straps & Utility Belts

| Keyloading |

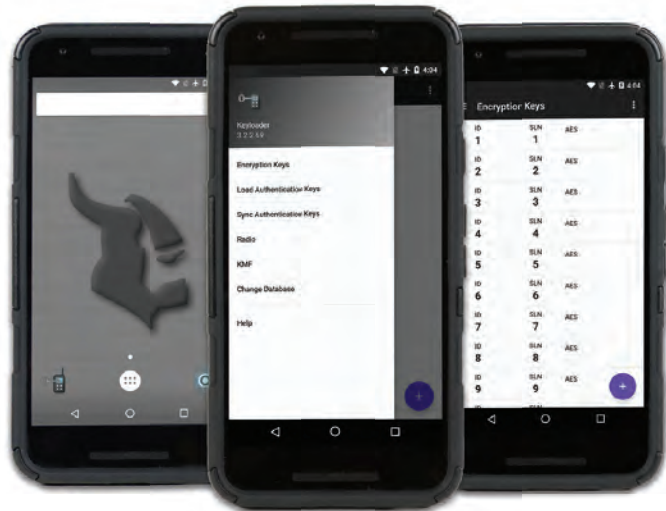
Viking VK5000 Keyloader
Keyloading Cables

| Programming |

Armada Fleet Management Software

| Antennas |

Portable & Mobile Radios



*To view the complete accessory
catalog, please visit:*

bit.ly/viking-accessories

Viking

FIRESafe Software

Designed for analog or P25
simplex fireground operations.

Enhances communication
awareness in a dynamic fire scene
environment, allowing firefighters
to **focus on the mission at hand.**

- Establish Commander & Responder Roles
- Set & Forget (single button lock function)
- Out of Range Indication
- Evacuation Alert
- P25 Auto Switch (extends communication range when operating in analog mode)
- Visual & Audible Communication Signal Strength Indicators

Making Safe, Simple™



KENWOOD



bit.ly/makingsafesimple

EF Johnson Technologies, Inc.

a JVCKENWOOD Company

1440 Corporate Drive, Irving, TX 75038-2401

Phone: 800.328.3911 • efjohnson.com

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VM5000

VHF · UHF (High & Low) · 700/800 MHz

P25 Phase 1 & 2 · Viking16

With uncompromised quality and performance, the VM5000 has built-in speakers to take the complexities out of mission-critical communications.

Features

- Mixed protocol operation (P25 Phase 1 & 2 Trunking, P25 Conventional, Viking16, FM Analog)
- 1024 channels
- Mixed protocol zones
- P25 Authentication (Link Layer Authentication)
- P25 IP packet data
- GPS AVL data (built in GPS)¹
- MDC-1200 & GE-Star signaling
- Analog & P25 Conventional vote scan
- Dash mount (KCH-19 control head only)
- Remote mount
- Dual control heads
- Internal or external speaker
- Fixed control station
- WiFi (remote mount configuration only)
- Bluetooth (Future)
- Instant Recording Replay (IRR)
- Voice Recording
- Text Messaging
- Bluetooth Low Energy
- Custom Transmit Power Levels
- Encryption
 - ARC4™ software encryption; compatible w/Motorola ADP™
 - DES-OFB
 - AES-256 (FIPS 140-2) Single and Multi-Key
 - Over-the-Air-Rekeying (OTAR)

¹Refer to the Viking VM5000 operating manual for detailed requirements & conditions for proper GPS operation.

Accessories

Complete line of accessories including microphones, speakers & antennas.

Download the accessory catalog at

www.efjohnson.com/products/accessories.

We combine P25 design expertise with recognized quality & reliability along with advanced technology to make KENWOOD Viking radios simple to use & maintain.



Perpetual Software Licensing

Adds greater value to your radios by extending the life of the software into your next hardware platform — you own the software option forever, and your licenses are simple to manage with our cloud-based tool — Vault™.



Armada® Fleet Management

Update your radios in a group rather than one at a time. One template programs both portables & mobiles. Supports direct computer connection, Over-the-Air Programming (OTAP), or Over-the-Internet Programming (OTIP).



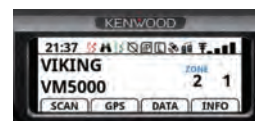
TrueVoice™ Noise Cancellation

Software-based noise cancellation automatically filters out noise source frequencies and eliminates the need for extra configuration. Works in analog or digital mode and with any accessory.



Basic Control Head

- Resolution of 422 x 154 pixel
- Viewing angle of 140°
- User selectable themes (8 themes available)
- Day & night display options



Day - High Contrast



Night - High Contrast

Compatible With P25 Systems

- ATLAS® P25 Phase 1 and Phase 2 System
- Motorola Astro® 25 - P25 Phase 1 & Phase 2
- Harris VIDA® - P25 Phase 1 & Phase 2
- Airbus (formerly Cassidian) VESTA™ Radio - P25 Phase 1 & Phase 2

VM5730/5830/5930 Mobile Specifications

General		VM5730	VM5830	VM5930
Frequency Range		136-174 MHz	Type 1: 450-520 MHz Type 2: 380-470 MHz	RX: 762-776, 851-870 MHz TX: 762-776, 792-806, 806-825, 851-870 MHz
Max. Channels Per Radio		1024		
Number of Zones		255		
Max. Channels Per Zone		255		
Channel Spacing	Analog	12.5/15/20/25*/30* kHz	12.5/25* kHz	12.5/25 kHz
	Digital	12.5 kHz	12.5 kHz	12.5 kHz
Power Supply		13.6 V DC $\pm$ 15 %		
Current Drain	Standby	0.45 A		
	RX	2.3 A		
	TX	13 A		
Operating Temperature		-22 °F to +140 °F (-30 °C to +60 °C)		
Frequency Stability		$\pm$ 1.5 ppm		
Dimensions (W x H x D) Radio w/Control Head, Projections not Included		6.73 x 1.89 x 6.93 in. (171 x 48 x 176 mm)		6.73x1.89x7.72 in. (171.0 x 48.0 x 196 mm)
Weight (Radio w/Control Head)		3.53 lbs (1.6 kg)		3.75 lbs (1.7kg)

Receiver		VM5730	VM5830	VM5930
Sensitivity	P25 Digital (5% BER)	-119 dBm (0.25 μ V)		
	Analog (12 dB SINAD)	-119 dBm (0.25 μ V)		
Selectivity	P25 Digital	60 dB		
	Analog @ 12.5 kHz	60 dB		
	Analog @ 25 kHz	75 dB		75 dB
Intermodulation		80 dB		
Spurious Rejection		85 dB		87 dB
Audio Distortion		2%		
Audio Output Power		4 W/4 Ω (Remote Control Head: 3 W/4 Ω)		
Transmitter		VM5730	VM5830	VM5930
RF Output Power		5W/50W	5W/45W – (Type 1: 450-485 MHz) 5W/40W – (Type 1: 485-520 MHz) 5W/40W – (Type 2: 380-470 MHz)	2W/30W (700 MHz) 2W/35W (800 MHz)
Spurious Emission		-73 dB	-75 dB	-80 dB
FM Hum & Noise	Analog @ 12.5 kHz	45 dB		40 dB
	Analog @ 25 kHz	50 dB		45 dB
Audio Distortion		2%		
Emission Designator		VM5730/5830: 16K0F3E, 11K0F3E, 8K10F1E, 8K10F1D, 8K10F1W VM5930: 16K0F3E, 14K0F3E, 11K0F3E, 8K10F1E, 8K10F1D, 8K10F1W		

Mil Standard	810C	810D	810E	810F	810G
Low Pressure	5001/ I	500.2/ I, II	500.3/ I, II	500.4/ I, II	500.5/ I, II
High Temperature	5011/ I, II	501.2/ I, II	501.3/ I, II	501.4/ I, II	501.5/ I, II
Low Temperature	5021/ I	502.2/ I, II	502.3/ I, II	502.4/ I, II	502.5/ I, II
Temp. Shock	5031/ I	503.2/ I	503.3/ I	503.4/ I, II	503.5/ I
Solar Radiation	5051/ I	505.2/ I	505.3/ I	505.4/ I	505.5/ I
Rain	5061/ I, II	506.2/ I, II	506.3/ I, II	506.4/ I, III	506.5/ I, III

Mil Standard	810C	810D	810E	810F	810G
Humidity	5071/ I, II	507.2/ II, III	507.3/ II, III	507.4	507.5/ II
Salt Fog	5091/ I	509.2/ I	509.3/ I	509.4	509.5
Dust	5101/ I	510.2/ I	510.3/ I	510.4/ I, III	510.5/ I
Vibration	514.2/ VIII, X	514.3/ I	514.4/ I	514.5/ I	514.6/ I
Shock	516.2/ I, V	516.3/ I, V	516.4/ I, V	516.5/ I, V	516.6/ I, V
INTERNATIONAL PROTECTION STANDARD					
Dust & Water	IP54, IP55 ¹				

¹IP54: RF Deck of the mobile radio; IP55: Remote Control Head for the mobile radio.

Encryption Options		FIPS 140-2
Supported Encryption	AES, DES-OFB, ARC4	
Encryption Key/ Radio	126 Common Key Reference (CKR), 126 Physical Identifier, (PID), Compatible w/ Motorola Key Variable Loader	
Encryption Frame Re-sync Interval	P25 CAI 360 MSEC	
Encryption Keying	External Key Loader, OTAR	
Mode	OFB-Output Feedback	
Encryption Type	Digital	
Key Erasure	Keyboard Command	
Standards	FIPS 46-3, FIPS 81, FIPS 140-2, FIPS 197	

*25/30 kHz in VHF/UHF Bands are not included in the models sold in the USA or US territories.

Analog measurements made per TIA 603 and specifications shown are typical. Digital measurements made per TIA 102CAAA and specifications shown are typical. All specifications are subject to change without notice. Please check the website for the latest version. V0708.19 © Copyright 2019 EF Johnson Technologies, Inc. (E.F. Johnson Company is operating entity)

EF Johnson Technologies, Inc.

a JVCKENWOOD Company

1440 Corporate Drive, Irving, TX 75038-2401

Phone: 800.328.3911 · efjohnson.com

VM7000

Low Band High Power² · VHF (with High Power option)
 UHF-Low · UHF-High · 700/800 MHz
 Analog · P25 Phase 1 & 2 · Viking16

With the VM7000 All-Band Multi-Deck Mobile, you can simultaneously receive and display up to four bands so you never miss a call. The "select" and "unselect" speakers give you the option for audio control similar to a dispatch console. KENWOOD Viking® is the industry's only mobile platform providing TrueVoice™ noise cancellation.

Features

- Mixed protocol operation (P25 Phase 1 & 2 Trunking, P25 Conventional, Viking16, FM Analog)
- 1024 channels (2048 and 4096 options)
- Mixed protocol zones
- P25 Authentication (Link Layer Authentication)
- P25 IP packet data
- P25 GPS data (built in GPS)¹
- MDC-1200 & GE-Star signaling
- P25 Conventional vote scan
- Single or Dual Remote Mount configuration
- External speaker
- Over-the-Internet-Programming (OTIP)
- Encryption
 - ARC4™ software encryption; compatible with Motorola ADP™
 - DES-OFB
 - AES-256 (FIPS 140-2) Single and Multi-Key
 - Over-the-Air-Rekeying (OTAR)
 - VK5000 or Motorola KVL3000/KVL4000 Keyloaders
- WiFi
- Instant Recording Replay (IRR)
- Voice Recording
- Text Messaging
- Bluetooth Low Energy
- Custom Transmit Power Levels

¹Refer to the Viking VM7000 operating manual for detailed requirements & conditions for proper GPS operation.

Accessories

Complete line of accessories including microphones, speakers & antennas.
 Download the accessory catalog at
www.efjohnson.com/products/accessories.



Enhanced Control Head

- Larger display - 2.75" (36 x 60 mm)
- Resolution of 400 x 240 pixels
- Viewing angle of 140°
- Multi-color LCD + TX/RX (green/red) LEDs
- D-Pad & more PF keys, dedicated emergency key & channel/volume control knobs
- Replaceable A/B/C button labels
- User selectable themes (8 themes available)
- Day & night display options



Day - High Contrast



Night - High Contrast

- The VM7000 can also use the KCH-21RV Handheld Control Head (HHCH)



Compatible With P25 Systems²

- ATLAS® P25 Phase 1 and Phase 2 System
- Motorola Astro® 25 - P25 Phase 1 & Phase 2
- L3Harris VIDA® - P25 Phase 1 & Phase 2
- Airbus (formerly Cassidian) VESTA™ Radio - P25 Phase 1 & Phase 2

We combine P25 design expertise with recognized quality & reliability along with advanced technology to make KENWOOD Viking radios simple to use & maintain.



Perpetual Software Licensing

Adds greater value to your radios by extending the life of the software into your next hardware platform — you own the software option forever, and your licenses are simple to manage with our cloud-based tool — Vault™.



Armada® Fleet Management

Update your radios in a group rather than one at a time. One template programs both portables & mobiles. Supports either a direct computer connection, Over-the-Air Programming (OTAP), or Over-the-Internet Programming (OTIP).



TrueVoice™ Noise Cancellation

Software-based noise cancellation automatically filters out noise source frequencies and eliminates the need for extra configuration. Works in analog or digital mode and with any accessory.

VM7000 Mobile Specifications

General		Low Band (110W) ²	VHF (110W)	VHF	UHF	700/800 MHz
Frequency Range		39-50 MHz	136-174 MHz	136-174 MHz	Type 1: 450-520 MHz Type 2: 380-470 MHz	RX: 762-776, 851-870 MHz TX: 762-776, 792-806, 806-825, 851-870 MHz
Max. Channels Per Radio		1024 (2048 and 4096 options)				
Number of Zones		255				
Max. Channels Per Zone		255				
Channel Spacing	Analog	20 kHz	12.5/15/20/25*/30* kHz		12.5/25* kHz	12.5/25 kHz
	Digital	Not applicable	12.5 kHz			
Power Supply		13.4 V DC ±15 %		13.6 V DC ±15 %		
Current Drain	Standby	1.3 A		1.2 A		
	RX	3.3 A		3.0 A		
	TX	28 A		14 A		
Operating Temperature		-22 °F to +140 °F (-30 °C to +60 °C)				
Frequency Stability		±1.0 ppm		±1.5 ppm		
Dimensions (W x H x D) RF Deck + Front Head Unit (not including KCH-20RV)		7.01 x 2.56 x 13.84 in. (178 x 65 x 351.5 mm)		6.73 x 1.89 x 7.24 in. (171 x 48 x 184 mm)		6.73 x 1.89 x 8.03 in. (171 x 48 x 204 mm)
Weight - RF Deck + Front Head Unit (not including KCH-20RV)		12.1 lbs (5.5 kg)		3.31 lbs (1.5 kg)		3.75 lbs (1.7 kg)
Receiver		VM7630H	VM7730H	VM7730	VM7830	VM7930
Sensitivity	P25 Digital (5% BER)	Not applicable	-119 dBm (0.25 µV)			
	Analog (12 dB SINAD)	-119 dBm (0.25 µV)				
Selectivity	P25 Digital	Not applicable	60 dB			
	Analog @ 12.5 kHz	Not applicable	60 dB			
	Analog @ 20/25 kHz	85 dB @ 20 kHz	75 dB @ 25 kHz			
Intermodulation		80 dB				
Spurious Rejection		90 dB	85 dB			87 dB
Audio Distortion		3%		2%		
Audio Output Power		12 W/4 Ω (External Audio Output)		4 W/4 Ω (Remote Control Head: 3 W/4 Ω)		
Transmitter		VM7630H	VM7730H	VM7730	VM7830	VM7930
RF Power Output Power		25W-110W		5W/50W	5W/45W – (Type 1: 450-485 MHz) 5W/40W – (Type 1: 485-520 MHz) 5W/40W – (Type 2: 380-470 MHz)	2W/30W (700 MHz) 2W/35W (800 MHz)
Spurious Emission		-80 dB		-73 dB	-75 dB	-80 dB
FM Hum & Noise	Analog @ 12.5 kHz	Not applicable	45 dB			40 dB
	Analog @ 20/25 kHz	55 dB @ 20 kHz	50 dB @ 25 kHz			45 dB
Audio Distortion		2%				
Emission Designator		16K0F3E	16K0F3E, 11K0F3E, 8K10F1E, 8K10F1D, 8K10F1W			16K0F3E, 14K0F3E,11K0F3E, 8K10F1E, 8K10F1D, 8K10F1W

Mil Standard	810C	810D	810E	810F	810G
Low Pressure	500.1/ I	500.2/ I, II	500.3/ I, II	500.4/ I, II	500.5/ I, II
High Temperature	501.1/ I, II	501.2/ I, II	501.3/ I, II	501.4/ I, II	501.5/ I, II
Low Temperature	502.1/ I	502.2/ I, II	502.3/ I, II	502.4/ I, II	502.5/ I, II
Temp. Shock	503.1/ I	503.2/ I	503.3/ I	503.4/ I, II	503.5/ I
Solar Radiation	505.1/ I	505.2/ I	505.3/ I	505.4/ I	505.5/ I
Rain	506.1/ I, II	506.2/ I, II	506.3/ I, II	506.4/ I, III	506.5/ I, III

International Protection Standard***

Dust & Water IP54, IP55**

*IP54: RF Deck + Front Head Unit of the mobile radio; IP55: Remote Control Head for the mobile radio.

**All interfaces must be fully sealed with appropriate covers unless they are connected to a genuine accessory.

*25/30 kHz in VHF/UHF Bands are not included in the models sold in the USA or US territories. Analog measurements made per TIA 603 and specifications shown are typical.

*Low Band High Power is analog 20 kHz mode only, multi-deck configuration only.

All specifications are subject to change without notice. Please check the website for the latest version.
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Mil Standard	810C	810D	810E	810F	810G
Humidity	507.1/ I, II	507.2/ II, III	507.3/ II, III	507.4	507.5/ II
Salt Fog	509.1/ I	509.2/ I	509.3/ I	509.4	509.5
Dust	510.1/ I	510.2/ I	510.3/ I	510.4/ I, III	510.5/ I
Vibration	514.2/ VIII, X	514.3/ I	514.4/ I	514.5/ I	514.6/ I
Shock	516.2/ I, V	516.3/ I, V	516.4/ I, V	516.5/ I, V	516.6/ I, V

Encryption Options	
Supported Encryption	AES, DES-OFB, ARC4 (VM7630H: Not applicable)
Encryption Key/ Radio	126 Common Key Reference (CKR), 126 Physical Identifier, (PID), Compatible w/ Motorola Key Variable Loader
Encryption Frame Re-sync Interval	P25 CAI 360 MSEC
Encryption Keying	External Key Loader, OTAR
Mode	OFB-Output Feedback
Encryption Type	Digital
Key Erasure	Keyboard Command
Standards	FIPS 46-3, FIPS 81, FIPS 140-2, FIPS 197

EF Johnson Technologies, Inc.

a JVCKENWOOD Company

1440 Corporate Drive, Irving, TX 75038-2401

Phone: 800.328.3911 · efjohnson.com

VP900

VHF · 700/800 MHz

P25 Phase 1 & 2 · Viking16

The Viking® VP900 is a dual-band, multi-protocol, P25 Phase 2 radio equipped with industry leading audio, display, and advanced feature capabilities that meet the needs of police, fire, EMS, and other mission critical users.

Features

- Mixed protocol operation (P25 Phase 1 & 2 Trunking, P25 Conventional, Viking16, FM Analog)
- Mixed protocol zones (each channel in a zone can be from a different system)
- 2048 channels
- Public safety ergonomics with large glove friendly knobs
- Top flip display changes text orientation for viewing while in holster
- Backlight on top display changes for event indication (ex. emergency turns display orange)
- Multiple visual indicators including battery health & signal strength
- 1 Watt audio output for high noise environments
- Voice annunciation & custom announcement creation
- Fully ruggedized - IP67 & MIL-STD-810 C/D/E/F/G
- Dual Shield design (internal metal housing & an external polycarbonate casing for exceptional durability)
- Available in three keypad options (none, limited, full)
- Integrated GPS¹
- MDC-1200 & GE-Star signaling
- P25 Authentication
- Instant Recording Replay (IRR)
- Text Messaging
- Encryption
 - ARC4™ software encryption; compatible with Motorola ADP™
 - DES-OFB
 - AES-256 (FIPS 140-2) Single and Multi-Key
 - Over-the-Air-Rekeying (OTAR)
 - VK5000 or Motorola KVL3000/KVL4000 Keyloaders

¹Refer to the Viking VPx00 operating manual for detailed requirements & conditions for proper GPS operation.



Compatible With P25 Systems

- ATLAS® P25 Phase 1 and Phase 2
- Motorola Astro® 25 - P25 Phase 1 & Phase 2
- Harris VIDA® - P25 Phase 1 & Phase 2
- Airbus (formerly Cassidian) VESTA™ Radio - P25 Phase 1 & Phase 2

Accessories

Complete line of accessories including microphones, speakers & antennas. Download the accessory catalog at www.efjohnson.com/products/accessories.

We combine P25 design expertise with recognized quality & reliability along with advanced technology to make KENWOOD Viking radios simple to use & maintain.



Perpetual Software Licensing

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Armada® Fleet Management

Update radios in a group rather than one at a time. One template programs both portables & mobiles. Supports either direct computer connection or Over-the-Air Programming (OTAP). Elite battery management enables wireless tracking of battery fleet.



TrueVoice™ Noise Cancellation

Software-based noise cancellation automatically filters out noise source frequencies and eliminates the need for extra configuration. Works in analog or digital mode and with any accessory.

Viking VP900 Portable Specifications

General	700/800	VHF
Frequency Range	763-805 MHz 806-869 MHz	136-174 MHz
Channel Spacing	12.5 kHz, 25 kHz ¹	
Max Frequency Separation	Full Bandsplit	
FCC Type Acceptance Certification	ATH2425780	
Canada Type Certification	IC:933B-2425780	
FCC Emissions Designators	16K0F3E, 14K0F3E, 11K0F3E, 8K10F1D, 8K10F1E, 8K10F7E	11K0F3E, 8K10F1D, 8K10F1E, 8K10F7E
Input Voltage	7.4 V	
Dimensions (w/o antenna) HxWxD	7.5" x 2.62" x 1.75" (19.1 cm x 6.7 cm x 4.4 cm)	
Weight (w/o standard battery)	12.4 oz (351.5 g)	
Case	Polycarbonate - black or high visibility (additional fee)	
Temperature Range	-22°F to +140°F (-30°C to +60°C)	
Vocoder/Noise Cancellation	AMBE+2 version 1.6 TrueVoice™ noise cancellation and audio enhancement	
Programmable Front Display	Backlit LCD Status Bar (time, date, signal strength, battery level), icon or text display options Up to 4 rows of 12 character lines	
Programmable Top Display	Backlit LCD Status Bar (time, date, signal strength, battery level) or text display options Up to 2 rows of 12 character lines	
Transmitter	700/800	VHF
RF Power Output	2.5/3 W	5 W
Frequency Stability [-22°F to +140°F (-30°C to +60°C)]	1.5 ppm	
Modulation Limiting 25 kHz Channels	5 kHz ¹	
Modulation Limiting 12.5 kHz Channels	2.5 kHz	
Emissions (Conducted/Radiated)	75 dB	70 dB
Audio Response	+1, -3 dB	
FM Hum and Noise 25 kHz Channels	49 dB ¹	
FM Hum and Noise 12.5 kHz Channels	43 dB	
Audio Distortion	1.5%	
Receiver	700/800	VHF
Audio Power Output	1 W rated	
Frequency Stability [-22°F to +140°F (-30°C to +60°C)]	1.5 ppm	
Analog Mode Sensitivity: 12 dB SINAD	-121 dBm	-122 dBm
Digital Mode Sensitivity: 5% BER	-121 dBm	-122 dBm
Selectivity: 25 kHz Channels	75 dB ¹	
Selectivity: 12.5 kHz Channels	60 dB	
Intermodulation	75 dB	
Spurious & Image Rejection	80 dB	
FM Hum and Noise 25 kHz Channels	50 dB ¹	
FM Hum and Noise 12.5 kHz Channels	44 dB	
Audio Distortion	1%	

Note 1: 25 kHz mode is not available in US FCC frequencies in VHF.

Battery	Dimensions (HxWxD)	Weight	Capacity
Lithium Ion	6.5" x 2.3" x .78" (16.5 cm x 5.8 cm x 2.0 cm)	8.1 oz (229.6 g)	4500 mAh

Specifications are measured per TIA-102.CAAA-E, TIA102.CAAB-D and per TIA-603-E.

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Environmental Specifications		
Environment	Mil Spec	810G
	M	P
Low Pressure	500.5	II
High Temp.	501.5	II
Low Temp.	502.5	II
Temp. Shock	503.5	I-D
Solar Radiation	505.5	I
Rain/Blown Rain	506.5	I
Humidity	507.5	I
Salt Fog	509.5	NA
Dust and Sand	510.5	I
Vibration	514.6	I
Shock	516.6	VI, V
Immersion	512.5	I
M=Method, P=Procedure Also meets equivalent superseded C, D, E, and F standards. Immersion meets IEC 529 IP67		
Encryption Options		
Supported Encryption	AES, DES-OFB, ARC4	
Encryption Key/ Radio	126 Common Key Reference (CKR), 126 Physical Identifier, (PID), Compatible w/ Motorola Key Variable Loader	
Encryption Frame Re-sync Interval	P25 CAI 360 MSEC	
Encryption Keying	External Key Loader, OTAR	
Mode	OFB-Output Feedback	
Encryption Type	Digital	
Key Erasure	Keyboard Command	
Standards	FIPS 46-3, FIPS 81, FIPS 140-2, FIPS 197	
Hazardous Location Certification		
Certification Lab	FM Approvals (FM)	
Standard Applied	FM3611	
Classification Rating	Class I, Division 2, Groups A, B, C, D	
Accessories		
Approved Battery	5875700373 (identified by lack of release button & presence of key slot on bottom of battery)	
Approved Speaker Microphones	5893211B18, 5893211B24, 5893211B30, 5893211G18, 5893211G24, 5893211G30 (KEN-WOOD Viking Premium Speaker Mic w/options for black or high visibility & three cord lengths)	

EF Johnson Technologies, Inc.

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1440 Corporate Drive, Irving, TX 75038-2401
Phone: 800.328.3911 · efjohnson.com

KENWOOD



P25 Mission Critical

VP5000

VHF · UHF (High & Low) · 700/800 MHz

P25 Phase 1 & 2 · Viking16

At just under 5.5 inches tall (140 mm), these small KENWOOD Viking portable radios are packed with advanced features for today's public safety agencies.

Features

- Mixed protocol operation (P25 Phase 1 & 2 Trunking, P25 Conventional, Viking16, FM Analog)
- Mixed protocol zones (each channel in a zone can be from a different system)
- 1024 channels
- 1 Watt audio output for high noise environments
- Voice annunciation & custom announcement creation
- Fully ruggedized - IP67 & MIL-STD-810 C/D/E/F/G
- Full key models (w/numeric keypad) & standard key models (w/o numeric keypad)
- Built-In GPS receiver/antenna for enhanced awareness¹
- MDC-1200 & GE-Star signaling
- P25 Authentication
- Bluetooth®
- Man Down
- Instant Recording Replay (IRR)
- Voice Recording
- Text Messaging
- Radio Cloning
- Bluetooth Low Energy
- Encryption
 - ARC4™ software encryption; compatible w/Motorola ADP™
 - DES-OFB
 - AES-256 (FIPS 140-2) Single and Multi-Key
 - Over-the-Air-Rekeying (OTAR)
 - VK5000 or Motorola KVL3000/KVL4000 Keyloader

Accessories

Complete line of accessories including microphones, speakers & antennas.
Download the accessory catalog at
www.effjohnson.com/products/accessories.

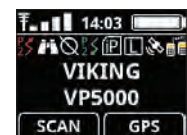


User Selectable Color Themes

- Multi-line text
- Multiple visual indicators including battery health & signal strength
- Day & night user selectable display options (8 themes available)



Day - High Contrast



Night - High Contrast

Compatible With P25 Systems

- ATLAS® P25 Phase 1 and Phase 2 System
- Motorola Astro® 25 - P25 Phase 1 & Phase 2
- Harris VIDA® - P25 Phase 1 & Phase 2
- Airbus (formerly Cassidian) VESTA™ Radio - P25 Phase 1 & Phase 2

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Update radios in a group rather than one at a time. One template programs both portables & mobiles. Supports either direct computer connection or Over-the-Air Programming (OTAP). Elite battery management enables wireless tracking of battery fleet.



TrueVoice™ Noise Cancellation

Software-based noise cancellation automatically filters out noise source frequencies and eliminates the need for extra configuration. Works in analog or digital mode and with any accessory.

VP5230/5330/5430 Portable Specifications

General		VP5230	VP5330	VP5430
Frequency Range		136-174 MHz (FCC ID K44431400)	Type 1: 450-520 MHz (FCC ID K44431500) Type 2: 380-470 MHz (FCC ID K44431501)	RX: 763-776, 851-870 MHz TX: 763-776, 793-806, 806-825, 851-870 MHz (FCC ID ALH442000)
Max. Channels Per Radio		1024		
Number of Zones		255		
Max. Channels Per Zone		255		
Channel Spacing	Analog	12.5/15/20/25*/30* kHz	12.5/25* kHz	12.5/25 kHz
	Digital	12.5 kHz	12.5 kHz	12.5 kHz
Power Supply		7.5 V DC ±20%		
Operating Temperature		-22 °F to +140 °F (-30 °C to +60 °C)		
Frequency Stability		±1.5 ppm	±1.5 ppm	±1.5 ppm
Dimensions (W x H x D) Projections Not Included	KNB-L2 (2,600 mAh)	2.28 x 5.47 x 1.56 in. (58.0 x 138.9 x 39.5 mm)		
	KNB-L3 (3,400 mAh)	2.28 x 5.47 x 1.77 in. (58.0 x 138.9 x 44.9 mm)		
Weight with Battery	KNB-L2 (2,600 mAh)	14.3 oz (406 g)		
	KNB-L3 (3,400 mAh)	15.8 oz (449 g)		
Receiver		VP5230	VP5330	VP5430
Sensitivity	P25 Digital (5% BER)	-119 dBm (0.025 µV)		
	Analog (12 dB SINAD)	-119 dBm (0.025 µV)		
Selectivity	P25 Digital	60 dB		
	Analog @ 12.5 kHz	65 dB		
	Analog @ 25 kHz	73 dB		
Intermodulation		73 dB		75 dB
Spurious Rejection		80 dB	75 dB	
Audio Distortion		3%		
Audio Output Power		500 mW/8 Ω (3% Distortion)/1,000 mW/8 Ω (5% Distortion)		
Transmitter		VP5230	VP5330	VP5430
RF Output Power		1W/6W	1W/5W	1W/3W
Spurious Emission		-70 dB		
FM Hum & Noise	Analog @ 12.5 kHz	40 dB		
	Analog @ 25 kHz	45 dB		
Audio Distortion		2%		
Emission Designator		16K0F3E, 11K0F3E, 8K10F1E, 8K10F1D, 8K10F1W		16K0F3E, 14K0F3E,11K0F3E, 8K10F1E, 8K10F1D, 8K10F1W

Mil Standard	810G
Low Pressure	500.5/ I, II
High Temperature	501.5/ I, II
Low Temperature	502.5/ I, II
Temp. Shock	503.5/ I
Solar Radiation	505.5/ I
Rain	506.5/ I, III
Humidity	507.5/ II
Salt Fog	509.5
Dust	510.5/ I
Vibration	514.6/ I
Immersion	512.5/ I
Shock	516.6/ I, IV

Encryption Options	
Supported Encryption	AES, DES-OFB, ARC4
Encryption Key/ Radio	126 Common Key Reference (CKR), 126 Physical Identifier, (PID), Compatible w/ Motorola Key Variable Loader
Encryption Frame Re-sync Interval	P25 CAI 360 MSEC
Encryption Keying	External Key Loader, OTAR
Mode	OFB-Output Feedback
Encryption Type	Digital
Key Erasure	Keyboard Command
Standards	FIPS 46-3, FIPS 81, FIPS 140-2, FIPS 197

Hazardous Location Certification	
Certification Lab	CSA Group
Standard Applied	ANSI/TIA 4950-A-2014, UL913 5th Edition & ANSI/ISA-12.12.01-2011
Classification Rating	Intrinsically Safe: Classes I, II, III, Division 1, Groups D, E, F, G Non-incendive: Class I, Division 2, Groups A, B, C, D
Approved Battery	KNB-LS7
Approved Speaker Micro-phones	KMC-54WDM, KMC-70M

International Protection Standard	
Dust & Water	IP54, IP55
Immersion	IP67**/68***

*Refer to the Viking VP5000 operating manual for detailed requirements & conditions for proper GPS operation.

* 25/30 kHz in VHF/UHF Bands (except T-Band) are not included in the models sold in the USA or US territories.

** IP67/68 - Must have the Speaker Mic Universal Connector or Universal Connector Protector connected.

***IP68=1m/2H Specifications shown are typical and subject to change without notice Please check the website for the latest version. V.070319

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EF Johnson Technologies, Inc.

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KENWOOD

DMR

Infrastructure Solutions for Digital Mobile Radio (DMR) Systems



KA-160/450/500

Analog, DMR Tier II, S-Trunking, DMR Tier III

KENWOOD KAIROS repeaters are the perfect platforms for any application, from simple standalone sites to large nationwide systems. Ideal for utilities, energy, education and manufacturing organizations, KAIROS Conventional/Trunked simulcast is a great fit for organizations that require wide area communications with limited frequencies.

KAIROS



Features

Multi-Protocol

KAIROS repeaters support Analog, DMR Tier II, S-Trunking, and DMR Tier III. Automatically switches between analog and digital modulation, according to the type of incoming signal.

Powerful Remote Control

The remote control tool also ensures secure software upgrades, diagnoses IP backbone issues, and continuously assesses the health of the entire radio system. KAIROS also integrates directly with third party network management systems using the standard SNMP protocol.

IP Multisite Multicast and Simulcast

Fully IP-based distributed network architecture supporting multisite, multi-protocol network solutions in multicast or simulcast mode of operation.

Soft Diversity Reception

KAIROS soft diversity receiver technology allows for enhanced coverage and improved signal reception in RF fading conditions.

RF Linking

Provides RF backhaul among DMR Tier II sites where the IP backbone is not available, carrying analog and digital signals. IP, UHF, and VHF links can be mixed in a single network.

Light and Ruggedized

Compact and lightweight. Thanks to its environmental robustness, KAIROS can perform in harsh conditions with extremely low power consumption.

System Redundancy

Supports flexible redundancy design as either 1+1 (Main + Standby) or with backup Primary functionality (a Secondary station that automatically replaces the failed main Primary, restoring all network functions).

Reliable

KAIROS repeaters come with standard reliability features including power range control, reverse polarity protection, peak and transient handling, soft start, current limiting and RF power limiting capabilities.

KAIROS Specifications

General			
Available Models	KA-160	KA-450	KA-500
Frequencies available	136-174 MHz	400-470 MHz	450-520 MHz
Protocols	Analog, DMR Tier II, S-Trunking and DMR Tier III (DMR available on KA-500 January 2020)		
Channelization	12.5 kHz/25 kHz (25 kHz not available in US)		
RF Output power	1-25 W / 100% duty cycle / selectable per channel (Higher RF output power available through standard external PA options in catalog)		
Synthesis step	50 Hz		
Frequency stability	0.5 p.p.m. (without GPS)		
Synchronization sources from	Internal, GPS/GLONASS, 2-wire, Digital RX, External, PTP based on IEEE1588 v2		
Operating temperature	-22°F to +140°F (-30°C to +60°C)		
Power supply (negative ground)	Minimum: 11V Typical: 13.8V Maximum: 15V		
Power consumption	TX: 60 W @25 W RF / RX: 5 W @Main+Div enabled		
Dimensions & weight	6.3 x 7.9 x 1.8 in. (160 x 200 x 45 mm) / 2.98 lbs. (1.35 kg)		
Audio lines	2 x (4-wire + E&M) - 1 x timeslot		
LAN port	Ethernet 10BT/100TX (auto MDI/MDI X) on an RJ45 socket		
Aux I/O	3xIO + 1xAnalog input		

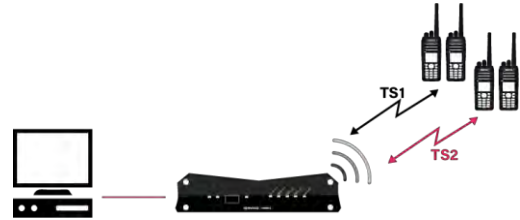
Transmitter All Models	
Output power at connector	1/5/10/15/20/25 W
Connector	SMA
Available modulation	FM, PM, 4FSK, 2FSK
Transmitting duty cycle	Continuous 100%
Adjacent Channel Noise	-75 dBc @ 25kHz / -65 dBc @ 12.5 kHz
FM distortion	< 1.5%
Noise	-56 dBp @ 25kHz / -50 dBp @ 12.5 kHz
Frequency Stability (without GPS)	0.5 ppm (without digital correction)

Receiver All Models	
Maximum Sensitivity	-116 dBm @ 20 dBp SINAD -118 dBm @ 5% BER without diversity - 121 dBm @ 5% BER with diversity
Operating Maximum input	-10 dBm
Maximum input without permanent damage	+10 dBm
Co-channel protection	8 dB @ 25kHz / 12 dB @ 12.5 kHz
Adjacent channel selectivity	73 dB @ 25kHz / 65 dB @ 12.5 kHz
Blocking protection	80 dB
Intermodulation protection	75 dB
Distortion	< 2% @ 1kHz

System Solutions

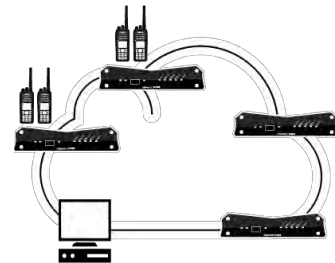
DMR Tier II Dual Timeslot Standalone Repeater

KAIROS repeaters support two talk paths in a single RF channel. KAIROS can be configured to connect to an analog or IP dispatch solution.



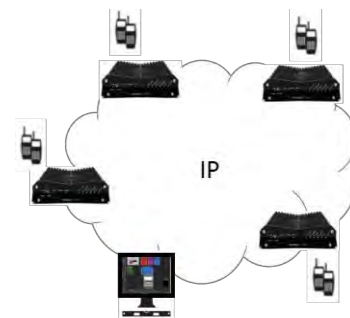
DMR Tier II IP Site Roaming

Multiple KAIROS base stations can be deployed across geographic sites and connected through an IP network to create a multisite conventional network.



Analog/DMR Tier II Multisite and Simulcast System

Multiple KAIROS base stations can be deployed across geographic sites and connected through IP network to create multisite or simulcast systems. The multisite and simulcast controllers reside in the controllers as software. Controller redundancy is included in the base system.



S-Trunking Single Site System (Future Release)

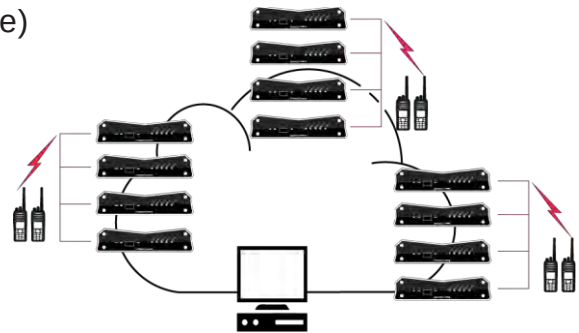
KAIROS repeaters are software-upgradeable to support single site S-Trunking functionality. S-Trunking is a DMR-based trunking solution that allows trunking operation on FB6 shared channels.



System Solutions

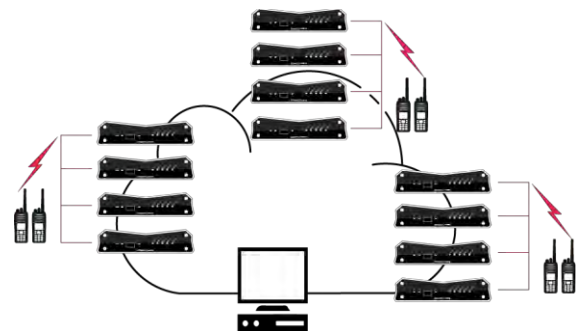
S-Trunking Multisite System (Future Release)

KAIROS S-Trunking can be configured as a multisite solution. This configuration is perfect for applications where exclusive channels are unavailable.



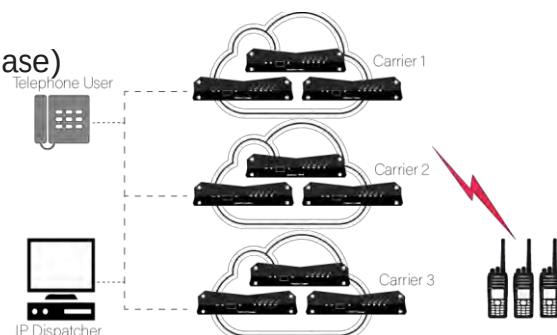
DMR Tier III Single and Multisite (Future Release)

KAIROS repeaters are software upgradeable to an open standard (ETSI) based DMR Tier III trunking system in single and multisite mode. DMR Tier III based trunking is the perfect solution for high density users who want to take advantage of the advanced Tier III features an open standard provides. The distributed architecture allows for single or multiple soft trunking controllers while managed by a Network Management System (NMS) controller and network.



DMR Tier III Simulcast System (Future Release)

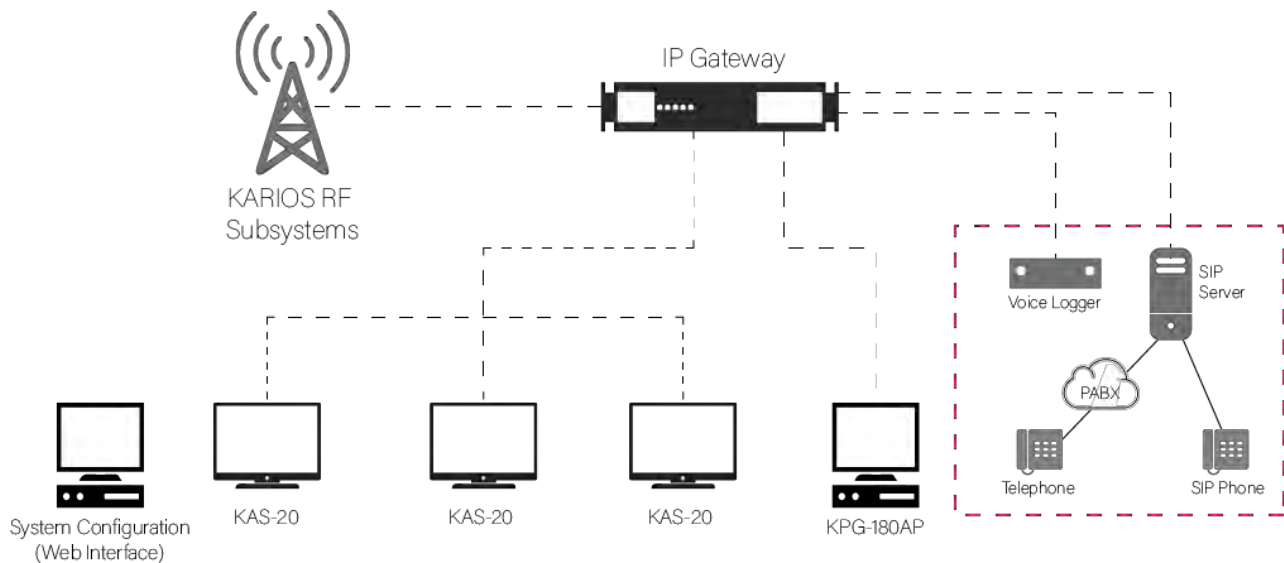
Multiple KAIROS DMR Tier III single site systems can be connected together over an IP network to create a Simulcast DMR Tier III trunking system. Distributed software controller can be deployed for redundancy.



Dispatch Solutions

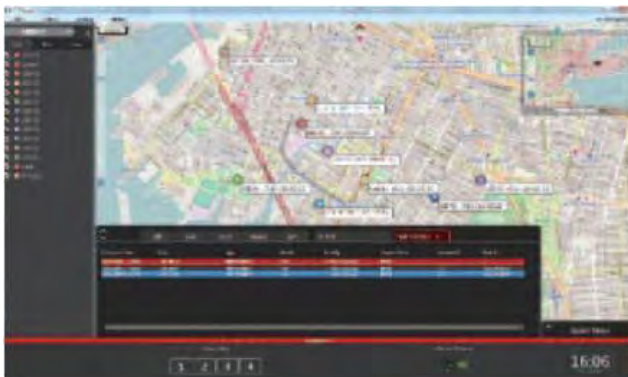
IP Gateway

The IP Gateway is used to interface console solutions, logging recorders, OTAP, a SIP server (April 2020), and other third party products to KAIROS DMR systems.



KAS-20 Dispatch Console

The KAS-20 Software provides AVL and Dispatch capability compatible with KENWOOD KAIROS DMR systems. With the capability to run under Windows and Windows Server operating systems, it provides a cost effective package for AVL and dispatch for business, supporting both the DMR digital protocols. The graphical user interface and map display are intuitive to the user, allowing seamless operation for the control of multiple subscriber units on a network or the ability to work with multiple clients with the server configuration.



KENWOOD | KAIROS



For more information, please contact
your local representative.

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All specifications are subject to change without notice. Please check the website for the latest version.
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NX-5700/5800/5900

VHF/UHF/700-800 MHz TRANSCEIVERS

NXDN™

DMR

P25

Gen2

DMR-based TBS

DMR Auto Slot Select

Bluetooth®

microSD

GPS

FleetSync

FEATURE HIGHLIGHTS

- **Multi-Digital** operation in NXDN, DMR, and P25 (Phase 1 & 2) protocols
- **Any combination of two digital protocols** can be selected from NXDN, DMR, and P25
- **Mixed Digital & FM Analog Operation** allows intelligent migration in mixed sites and easy migration with digital radios in other sites
- **Large, Color 2.55" (154 x 422 pixels) TFT Display** for at-a-glance operational status checking
- **Easy to follow GUI** and **Multi-line Text** to convey more information
- **Dual Remote Control Head and Multi-Band (Multi RF Deck) Control** Option providing scalable configurations for various operations and applications
- **Built-In GPS Receiver** for effective fleet management
- **Bluetooth® Module built-in** for hands-free operation
- Renowned KENWOOD Audio Quality can be achieved with **Active Noise Reduction (ANR)** that utilizes built-in DSP with two microphones for suppression of ambient noise
- **Built-in 56-bit DES Encryption**
- Optional **256-bit AES Encryption**
- **microSD/SDHC (up to 2GB/32GB) Memory Card Slot**
- **IP54/55 and MIL-STD-810 C/D/E/F/G**

GENERAL FEATURES

- 50 W to 5 W (136-174 MHz) Models
- 45 W to 5 W (380-470, 450-520 MHz) Models
- 30 W to 2 W (700 MHz) Model
- 35 W to 2 W (800 MHz) Model
- Maximum of 4,000 CH/Radio capacity, 512 CH/Zone, 128 Zones
- DB-25 Accessory Connector
- AMBE+2™ Enhanced Vocoder
- 4 W Speaker Audio

DIGITAL – NXDN MODE

- Gen2 & NXDN Type-C Trunked Operation
- NXDN Conventional Operation
- 6.25 & 12.5 kHz Channel Spacing
- Over-the-Air Alias
- Over-the-Air Programming
- Paging Call
- Emergency Call
- All Group Call
- Status Messaging
- Remote Stun/Kill
- Remote Check
- Short & Long Data Messages
- NXDN Digital Scrambler Included

DIGITAL – DMR MODE

- S-Trunking
- DMR Tier III Trunking
- DMR Tier II Conventional
- DMR Auto Slot Select
- Site Roaming
- Two-slot TDMA in 12.5kHz channels
- Call Interruption
- Dual-slot Direct Mode
- Energy Efficient

DIGITAL – P25 MODE

- P25 Phase 1 Conventional/Trunked Operation
- P25 Phase 2 Trunked Operation
- Talk Group ID Lists
- Individual ID Lists
- Caller ID Display
- Remote Monitor/Remote Check
- Radio Inhibit
- Encryption Key Zeroize & Retention
- P25 Over-the-Air Re-keying
- P25 Over-the-Air Programming

FM MODES – GENERAL

- Conventional & LTR Zones
- FleetSync®/II: PTT ID ANI / Caller ID Display, Selective / Group Call, Emergency Status / Text Messages
- MDC-1200: PTT ID ANI / Caller ID Display, Emergency, Radio Check / Inhibit
- QT / DQT & Two-Tone
- Built-in Voice Inversion Scrambler

MULTIPLE CONFIGURATIONS

The NX-5000 mobile series allows users to create a variety of configurations to suit different requirements by combining different options. Some of the standard configurations are:

- Single Remote Control Head x Single RF Deck
- Dual Remote Control Heads x Single RF Deck
- Dual Remote Control Heads x Multi RF Decks
- Other combinations are available. Consult your local KENWOOD dealer for more.



OPTIONAL ACCESSORIES

- **NX-5700B/5800B/5900B**
RF DECK

- **KCH-19**
BASIC CONTROL
HEAD KIT

- **KCH-20R**
FEATURED CONTROL
HEAD

- **KRK-14H**
CONTROL HEAD
INTERFACE KIT
(Adapter for the Head)

- **KRK-15B**
CONTROL HEAD
REMOTE KIT
(Adapter for the RF Deck)

- **KCT-71**
REMOTE CONTROL CABLE
(Available in 3 lengths of 17 ft (5.2 m),
25 ft (7.6 m), 1.6 ft (0.5 m))

- **KCT-72**
REMOTE CONTROL CABLE

- **KWD-AE30/AE31**
SECURE CRYPTOGRAPHIC MODULE

- **KPG-180AP**
OTAP MANAGER

- **KMC-35/36***
MICROPHONE [IP54/55] (without / with 12-keypad)
*To be discontinued

- **KMC-65/66**
MICROPHONE [IP54/55] (without / with 12-keypad)



- **KES-5 (A)**
EXTERNAL SPEAKER
(40 W max input,
Requires KAP-2)

- **KCT-23**
DC POWER CABLE
M: 10 ft (3 m) /
M3: 23 ft (7 m)

- **KCT-46**
IGNITION SENSE
CABLE

- **KLF-2**
LINE FILTER

- **KMB-10**
KEY LOCK ADAPTER

- **KAP-2**
HORN ALERT/P.A.
RELAY UNIT

- **KRA-40G**
GPS ACTIVE ANTENNA

- **KPS-15**
DC POWER SUPPLY
(23 A max)

All accessories and options may not be available in all markets.
Contact an authorized KENWOOD dealer for details and complete list of all accessories and options.

SPECIFICATIONS

GENERAL		NX-5700	NX-5800	NX-5900
Frequency Range		136-174 MHz	Type 1: 450-520 MHz Type 2: 380-470 MHz	RX: 763-776, 851-870 MHz TX: 763-776, 793-806, 806-825, 851-870 MHz
Max. Channels Per Radio		1024 (Up to 4000 channels with option)		
Number of Zones		128		
Max. Channels Per Zone		512		
Channel Spacing	Analog	12.5 / 15 / 20 / 25* / 30* kHz	12.5 / 25* kHz	12.5 / 25 kHz
	Digital	6.25 / 12.5 kHz	6.25 / 12.5 kHz	6.25 / 12.5 kHz
Power Supply		13.6 V DC $\pm$ 15 %		
Current Drain	Standby	0.45 A		
	RX	2.3 A		
	TX	13 A		
Operating Temperature		-22° F to +140 °F (-30 °C to +60 °C)		
Frequency Stability (-30°C to +60°C; +25°C Ref.)		$\pm$ 0.5 ppm		
Dimensions (W x H x D) Radio with Control Head, Projections Not Included		6.69 x 1.89 x 6.93 in. (170 x 48 x 176 mm)		6.73 x 1.89 x 7.72 in. (171.0 x 48.0 x 196 mm)
Weight: Radio with Control Head		3.53 lbs (1.6 kg)		3.53 lbs (1.6 kg)
FCC ID	Type 1	K44471100	K44471200	K44478500
	Type 2	—	K44471201	—
IC Certification	Type 1	282F-471100	—	282F-478500
	Type 2	—	282F-471201	—

*25 and 30 kHz are not included in the models sold in the USA or US territories.
P25 Digital measurements made per TIA 102CAA, analog measurements made per EN Standards or TIA 603 and
specifications shown are typical.
Specifications are subject change without notice, due to advancements in technology.

RECEIVER		NX-5700	NX-5800	NX-5900
Sensitivity	NXDN 6.25 kHz Digital (3 % BER)	0.20 μV		
	NXDN 12.5 kHz Digital (3 % BER)	0.25 μV		
	DMR Digital (5 % BER)	0.25 μV		
	DMR Digital (1 % BER)	0.40 μV		
	P25 Digital (5 % BER)	0.25 μV		
	P25 Digital (1 % BER)	0.40 μV		
	Analog (12dB SINAD)	0.25 μV		
Selectivity	Analog @ 12.5 kHz	71 dB	70 dB	
	Analog @ 25 kHz	81 dB	78 dB	
Intermodulation		80 dB		
Spurious Rejection		85 dB		
Audio Distortion		2 %		
Audio Output Power		4 W (Remote Control Head: 3 W)		
TRANSMITTER		NX-5700	NX-5800	NX-5900
RF Power Output Power		50 to 5 W	45 to 5 W	30 W to 2 W (700 MHz) 35 W to 2 W (800 MHz)
Spurious Emission		-73 dB	-75 dB	-80 dB
FM Hum & Noise	Analog @ 12.5 kHz	45 dB	40 dB	
	Analog @ 25 kHz	50 dB	45 dB	
Audio Distortion		2 %		
Emission Designator		16K0F3E, 14K0F3E**, 11K0F3E, 8K10F1E, 8K10F1D, 8K10F1W, 8K30F1E, 8K30F1D, 8K30F7W, 7K60FXE, 7K60FXD, 4K00F1E, 4K00F1D, 4K00F7W, 4K00F2D		

**NX-5900 model only.

APPLICABLE MIL-STD & IP*

MIL Standards	810C Methods/ Procedures	810D Methods/ Procedures	810E Methods/ Procedures	810F Methods/ Procedures	810G Methods/ Procedures
Low Pressure	500.1/ I	500.2/ I, II	500.3/ I, II	500.4/ I, II	500.5/ I, II
High Temperature	501.1/ I, II	501.2/ I, II	501.3/ I, II	501.4/ I, II	501.5/ I, II
Low Temperature	502.1/ I	502.2/ I, II	502.3/ I, II	502.4/ I, II	502.5/ I, II
Temp. Shock	503.1/ I	503.2/ I	503.3/ I	503.4/ I, II	503.5/ I
Solar Radiation	505.1/ I	505.2/ I	505.3/ I	505.4/ I	505.5/ I
Rain	506.1/ I, II	506.2/ I, II	506.3/ I, II	506.4/ I, III	506.5/ I, III
Humidity	507.1/ I, II	507.2/ II, III	507.3/ II, III	507.4	507.5/ II
Salt Fog	509.1/ I	509.2/ I	509.3/ I	509.4	509.5
Dust	510.1/ I	510.2/ I	510.3/ I	510.4/ I, III	510.5/ I
Vibration	514.2/ VIII, X	514.3/ I	514.4/ I	514.5/ I	514.6/ I
Shock	516.2/ I, II, V	516.3/ I, IV, V	516.4/ I, IV, V	516.5/ I, IV, V	516.6/ I, IV, V
International Protection Standards					
Dust & Water		IP54: RF Deck of the mobile radio; IP55: Remote Control Head for the mobile radio			

*All interfaces must be fully sealed with appropriate covers or by designated genuine accessories.

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JVCKENWOOD Corporation

CL855K-E-2R3

NX-5200/5300/5400

VHF/UHF/700-800 MHz TRANSCEIVERS

NXDN™

DMR

P25

Gen2

DMR-based T3&S

DMR Auto Slot Select

Bluetooth®

microSD

GPS

FleetSync®

FEATURE HIGHLIGHTS

- **Multi-Digital** operation in NXDN, DMR, and P25 (Phase 1 & 2) protocols
- Any combination of two digital protocols can be selected from NXDN, DMR, and P25
- **Mixed Digital & FM Analog Operation** allows intelligent migration in mixed sites and easy migration with digital radios in other sites
- **Large, Color 1.74" (240 x 180 pixels) Transflective TFT Display** for better interface even in direct sunlight and with use of polarized sunglasses
- **Easy to follow GUI** for at-a-glance operational status checking and **Multi-line Text** to convey more information
- **4-way Directional-pad (D-pad)** and **2-Position Lever Switch** for intuitive control and operation
- **Built-In GPS Receiver/Antenna** for effective fleet management
- **Bluetooth® Module built-in** for hands-free operation
- Renowned KENWOOD Audio Quality can be achieved with **Active Noise Reduction (ANR)** that utilizes built-in DSP with two microphones for suppression of ambient noise
- **Built-in 56-bit DES Encryption**
- **Optional 256-bit AES Encryption**
- **Built-in Motion Sensor** for life-critical man down detection
- **microSD/SDHC (up to 2GB/32GB) Memory Card Slot**
- **IP67/68 and MIL-STD-810 C/D/E/F/G**

GENERAL FEATURES

- 6 W (136-174 MHz) Models
- 5 W (380-470, 450-520 MHz) Models
- 3 W (700/800 MHz) Models
- Full Key Models (w/ numeric keypad) and Standard Key Models (w/o numeric keypad)
- Maximum of 4,000 CH/Radio capacity, 512 CH/Zone, 128 Zones
- AMBE+2™ Enhanced Vocoder
- 1 W Loud Speaker Audio

DIGITAL – NXDN MODE

- Gen2 & NXDN Type-C Trunked Operation
- NXDN Conventional Operation
- 6.25 & 12.5 kHz Channels
- Over-the-Air Alias
- Over-the-Air Programming
- Paging Call
- Emergency Call
- All Group Call
- Status Messaging
- Remote Stun/Kill
- Remote Check
- Short & Long Data Messages
- NXDN Digital Scrambler

DIGITAL – DMR MODE

- S-Trunking
- DMR Tier III Trunking
- DMR Tier II Conventional
- DMR Auto Slot Select
- Site Roaming
- Two-slot TDMA in 12.5kHz channels
- Call Interruption
- Dual-slot Direct Mode
- Energy Efficient

DIGITAL – P25 MODE

- P25 Phase 1 Conventional/Trunked Operation
- P25 Phase 2 Trunked Operation
- Talk Group ID Lists
- Individual ID Lists
- Caller ID Display
- Remote Monitor/Remote Check
- Radio Inhibit
- Encryption Key Zeroize & Retention
- P25 Over-the-Air Re-keying
- P25 Over-the-Air Programming

FM MODES – GENERAL

- Conventional & LTR Zones
- NPSPAC (USA only) Channels (±4.0 Modulation)
- FleetSync®/II: PTT ID ANI / Caller ID Display, Selective Group Call, Emergency Status / Text Messages
- MDC-1200: PTT ID ANI / Caller ID Display, Emergency, Radio Check / Inhibit
- QT / DQT & Two-Tone
- Built-in Voice Inversion Scrambler

INTELLIGENT BATTERY SYSTEM

- System consists of a Li-ion or Ni-MH rechargeable battery (KNB-L1/L2/L3/N4), Rapid Charger (KSC-Y32), and Battery Reader (KAS-12/12PRO) software
- Up to 60 Rapid Chargers can be chain-connected to a PC
- KAS-12 Battery Reader software can display and manage information
- Up to 5,000 batteries can be managed at a time with the addition of optional KAS-12PRO license upgrade



Full Keypad Model



Limited Keypad Model

OPTIONAL ACCESSORIES

- KNB-L1/L2/L3**
Li-ion BATTERY PACK (IP67/68 immersion)
- KNB-L1**
7.4 V/2000 mAh
- KNB-L2**
7.4 V/2600 mAh
- KNB-L3**
7.4 V/3400 mAh
- KNB-N4**
Ni-MH BATTERY PACK (IP67/68 Immersion)
- KBP-8**
BATTERY CASE (12AA Alkaline Battery)

Intrinsically Safe Batteries are also available.

- KSC-Y32**
RAPID CHARGER
- KSC-32/32S**
RAPID CHARGER
- KSC-326/326S**
MULTIPLE CHARGER (6-unit Rapid Rate)
- KAS-12/12PRO**
BATTERY READER (PC Software)

- KRA-22**
VHF HELICAL ANTENNA (Low Profile)
- KRA-23**
UHF HELICAL ANTENNA (Low Profile)
- KRA-26**
VHF HELICAL ANTENNA (Standard Length)
- KRA-27**
UHF WHIP ANTENNA (Standard Length)

- KRA-32**
700/800 MHz WHIP ANTENNA
- KRA-41**
VHF STUBBY ANTENNA
- KRA-42**
UHF STUBBY ANTENNA
- KWD-AE30/AE31**
SECURE CRYPTOGRAPHIC MODULE
- KPG-180AP**
OTAP MANAGER

- KMC-70**
SPEAKER MICROPHONE [IP68] (3-button, DSP Active Noise Reduction; Green Housing [GR] version is also available)
- KMC-72**
SPEAKER MICROPHONE [IP67] (2-button, Built-in noise canceler)
- KBH-11**
BELT CLIP

All accessories and options may not be available in all markets.
Contact an authorized KENWOOD dealer for details and complete list of all accessories and options.

SPECIFICATIONS

GENERAL		NX-5200	NX-5300	NX-5400
Frequency Range		136-174 MHz	Type 1: 450-520 MHz Type 2: 380-470 MHz	RX: 763-776, 851-870 MHz TX: 763-776, 793-806, 806-825, 851-870 MHz
Max. Channels Per Radio		1024 (Up to 4000 channels with option)		
Number of Zones		128		
Max. Channels Per Zone		512		
Channel Spacing	Analog	12.5 / 15 / 20 / 25 ¹ / 30 ¹ kHz	12.5 / 25 ¹ kHz	12.5 / 25 kHz
	Digital	6.25 / 12.5 kHz	6.25 / 12.5 kHz	12.5 kHz (6.25 kHz)
Power Supply		7.5 V DC ±20 %		
Battery Life (5-5-90/10-10-80 duty cycle)	KNB-L1 (2,000 mAh)	10 hours / 6.5 hours		
	KNB-L2 (2,600 mAh)	12.5 hours / 8.5 hours		
	KNB-L3 (3,400 mAh)	17 hours / 11 hours		
	KNB-N4 (2,500 mAh)	12 hours / 8.5 hours		
	KBP-8 (w/ AA x12)	High Power: 11 hours / 8 hours Low Power: 26 hours / 18.5 hours		
Operating Temperature (Radio only) ¹		-22 °F to +140 °F (-30 °C to +60 °C)		
Frequency Stability (-30°C to +60°C, +25°C Ref.)		±0.5 ppm		
Dimensions (W x H x D) Radio w/ Battery, Projections Not Included	KNB-L1 (2,000 mAh)	2.28 x 5.47 x 1.44 in (58.0 x 138.9 x 36.5 mm)		
	KNB-L2 (2,600 mAh)	2.28 x 5.47 x 1.56 in (58.0 x 138.9 x 39.5 mm)		
	KNB-L3 (3,400 mAh)	2.28 x 5.47 x 1.77 in (58.0 x 138.9 x 44.9 mm)		
	KNB-N4 (2,500 mAh)	2.28 x 6.55 x 1.78 in (58.0 x 166.4 x 45.2 mm)		
	KBP-8 (w/ AA x 12)	2.64 x 8.59 x 2.12 in (67.0 x 218.3 x 53.9 mm)		
Weight	KNB-L1 (2,000 mAh)	13.5 oz (382 g)		
	KNB-L2 (2,600 mAh)	14.3 oz (406 g)		
	KNB-L3 (3,400 mAh)	15.8 oz (449 g)		
	KNB-N4 (2,500 mAh)	20.4 oz (579 g)		
	KBP-8 (w/ AA x 12)	25.1 oz (712 g)		
FCC ID	Type 1	K44431400	K44431500	ALH442000
	Type 2	—	K44431501	—
IC Certification	Type 1	282F-431400	—	282D-442000
	Type 2	—	282F-431501	—

RECEIVER		NX-5200	NX-5300	NX-5400
Sensitivity	NXDN 6.25 kHz Digital (3 % BER)	0.20 μV		
	NXDN 12.5 kHz Digital (3 % BER)	0.25 μV		
	DMR Digital (5 % BER)	0.25 μV		
	DMR Digital (1 % BER)	0.40 μV		
	P25 Digital (5 % BER)	0.25 μV		
	P25 Digital (1 % BER)	0.40 μV		
	Analog (12 dB SINAD)	0.25 μV		
Selectivity	Analog @ 12.5 kHz	67 dB		64 dB
	Analog @ 25 kHz	73 dB		
Intermodulation		73 dB	75 dB	
Spurious Rejection		80 dB	75 dB	
Audio Distortion		3 %		
Audio Output Power		500 mW (3 % Distortion)/1,000 mW (5 % Distortion)		
TRANSMITTER		NX-5200	NX-5300	NX-5400
RF Power Output Power		6 to 1 W	5 to 1 W	3 to 1 W
Spurious Emission		-70 dB		
FM Hum & Noise	Analog @ 12.5 kHz	40 dB		
	Analog @ 25 kHz	45 dB		
Audio Distortion		2 %		
Emission Designator		16K0F3E, 11K0F3E, 8K10F1E, 8K10F1D, 8K10F1W, 8K30F1E, 8K30F1D, 8K30F7W, 7K60FXE, 7K60FXD, 4K00F1E, 4K00F1D, 4K00F7W, 4K00F2D		16K0F3E, 14K0F3E, 11K0F3E, 8K10F1E, 8K10F1D, 8K10F1W, 8K30F1E, 8K30F1D, 8K30F7W, 7K60FXE, 7K60FXD, 4K00F1E, 4K00F1D, 4K00F7W, 4K00F2D

¹ 1.25 and 30 kHz are not included in the models sold in the USA or US territories.
² Operating temperature specification for a Li-ion battery is 14°F to +140°F (-10°C to +60°C).
P25 Digital measurements made per TIA 102CAAA, analog measurements made per EN Standards or TIA 603 and specifications shown are typical.
Specifications are subject change without notice, due to advancements in technology.

APPLICABLE MIL-STD & IP*3

MIL Standards	810C Methods/ Procedures	810D Methods/ Procedures	810E Methods/ Procedures	810F Methods/ Procedures	810G Methods/ Procedures
Low Pressure	500.1/ I	500.2/ I, II	500.3/ I, II	500.4/ I, II	500.5/ I, II
High Temperature	501.1/ I, II	501.2/ I, II	501.3/ I, II	501.4/ I, II	501.5/ I, II
Low Temperature	502.1/ I	502.2/ I, II	502.3/ I, II	502.4/ I, II	502.5/ I, II
Temp. Shock	503.1/ I	503.2/ I	503.3/ I	503.4/ I, II	503.5/ I
Solar Radiation	505.1/ I	505.2/ I	505.3/ I	505.4/ I	505.5/ I
Rain	506.1/ I, II	506.2/ I, II	506.3/ I, II	506.4/ I, III	506.5/ I, III
Humidity	507.1/ I, II	507.2/ II, III	507.3/ II, III	507.4	507.5/ II
Salt Fog	509.1/ I	509.2/ I	509.3/ I	509.4	509.5
Dust	510.1/ I	510.2/ I	510.3/ I	510.4/ I, III	510.5/ I
Vibration	514.2/ VIII, X	514.3/ I	514.4/ I	514.5/ I	514.6/ I
Shock	516.2/ I, II, V	516.3/ I, IV	516.4/ I, IV	516.5/ I, IV	516.6/ I, IV
Immersion	—	—	—	512.4/ I	512.5/ I
International Protection Standards					
Dust & Water	IP54, IP55				
Immersion	IP67, IP68				

*3 All interfaces must be fully sealed with appropriate covers or by designated genuine accessories.

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KENWOOD Communications
Global Website



comms.kenwood.com



ISO9001 Registered
Communications Systems Business Unit
JVCKENWOOD Corporation

CL854K-E-2R2

Focused on the Future

Over 7 times faster and with 15 times more capacity than the previous models, these new NEXEDGE repeaters represent a breakthrough in performance. Extensive data storage means they can support everything from analog/digital conventional systems up to a highly sophisticated NEXEDGE Generation2 (Gen2) multi-site digital trunked network. And further adding to their future-proof credentials is upcoming support for Digital Simulcast. Stay ahead of the curve, with cutting-edge communications.

● GENERAL FEATURES

- Wideband Coverage
- 25/5/0.5 W RF Output Power (100% Duty Cycle)
- Two-Digit Numeric Display
- LED Status Indicators
- USB 2.0 Type-B Interface
- IP LAN/WAN Connectivity
- Ethernet Network Interface
- 6 Programmable Function Keys
- 0.3 W Front Panel Speaker
- 3 W External Speaker Audio
- Volume Control
- Program / Modem Interface
- Remote Termination Interface
- Programmable AUX I/O's
- DTMF Remote Control
- Flash Firmware Upgrading
- Remote System Firmware Updates
- Telephone Interconnect Option

● DIGITAL – GENERAL

- NXDN Digital Air Interface
- AMBE+2™ VOCODER
- 6.25 & 12.5 kHz Bandwidth
- Built-In 0.5 ppm TCXO
- OXCO Unit Option (KXK-3)
- UID & GID Validation
- NXR Over-the-Air Alias
- SNMP Protocol Ready
- FER (Frame Error Rate) / RSSI Output

● DIGITAL – TRUNKING MODE

- NEXEDGE Gen2 Network
 - * NXDN Type-C Trunking (Gen1) will be supported later
- Transmission Trunked Mode
- Message Trunked Mode
- Busy Call Queuing
- Call Queue Pre-emption
- Late Entry (UID & GID)
- Control / Traffic Channel Switching
- Control Channel Rotation

- Cross-Busy
- Failsoft Mode
- NXDN Traffic Channel Sharing
- ESN Validation
- Auto-Roaming / Registration
- Wide Area All Group Call

● DIGITAL – CONVENTIONAL MODE

- Mixed FM / Digital Operation
- Conventional IP Networks
- Site Roaming Capability
- Digital Simulcast
(To be supported in future)

● FM ANALOG MODE

- 16 QT/DQTs Repeater Control Built-in
- Hang Timer / Time Out Timer / CW ID
- External FM Controller Interface
- EIA Voter Tone Generation
- External LTR® Controller Interface
- External MPT1327 Controller Interface



OPTIONAL ACCESSORIES

■ **KXK-3**
OCXO UNIT



■ **KMC-30**
MICROPHONE



■ **KMC-35**
MICROPHONE



■ **KTI-4**
TELEPHONE INTERCONNECT ADAPTER



All accessories and options may not be available in all markets.
Contact our authorized dealer for details and complete list of all accessories and options.

SPECIFICATIONS

GENERAL		NXR-5700	NXR-5800
Frequency Range	Type 1 Type 2 Type 3	136-174 MHz	450-520 MHz 400-470 MHz 350-400 MHz
Channel Spacing	Analog Digital	30*/25*/15/12.5 kHz 12.5/6.25 kHz	25*/12.5 kHz 12.5/6.25 kHz
PLL Channel Step		6.25/5/3.125/2.5 kHz	6.25/5/3.125 kHz
Frequency Stability	Radio only With KXK-3 (M2) With KXK-3 (M3)	± 0.5 ppm ± 1.0 ppm ± 0.1 ppm	
Operating Voltage		13.6 V DC ± 15 %	
Operating Temperature Range		-22 °F to +140 °F (-30 °C to +60 °C)	
Antenna Impedance		50 Ω	
Dimensions (W x H x D), Projections not included		19.02 x 1.73 x 13.03 in (483 x 44 x 331 mm)	
Weight (net)		11 lb (5 kg)	
FCC ID	Type 1 Type 2	K44474500 —	K44474600 K44474601
IC Certification	Type 1 Type 2	282F-474500 —	— 282F-474601

*25 and 30 kHz are not included in the models sold in the USA or US territories.
Measurements made per CAI measurement procedures (digital) and TIA-603 (analog); specifications are typical.
Details and timing of firmware and software updates are subject to change without notice. Specifications are subject to change without notice, due to advancements in technology.

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AMBE+2 is a trademark of Digital Voice Systems Inc.

NXDN is a trademark of JVCKENWOOD Corporation and Icom Inc.

NEXEDGE is a registered trademark of JVCKENWOOD Corporation in U.S.A. and some countries.

RECEIVER		NXR-5700	NXR-5800
Sensitivity	Digital @ 6.25 kHz (3 % BER) Digital @ 12.5 kHz (3 % BER) Analog (12 dB SINAD)	0.27 μV 0.33 μV 0.30 μV	
Selectivity	Analog @ 25/30 kHz* Analog @ 12.5 kHz	92 dB (± 30 kHz) 84 dB (± 12.5 kHz)	86 dB (± 25 kHz) 80 dB (± 12.5 kHz)
FM Hum & Noise	Analog @ 25/30 kHz* Analog @ 12.5 kHz	55 dB 50 dB	
Intermodulation Distortion		85 dB (± 50/100 kHz)	
Spurious Response		100 dB	
Audio Distortion (Ext. SP)		Less than 2 % (at 0.3 W)	
Audio Output (Ext. SP)		3 W (at 4 Ω, less than 5 % distortion)	
TRANSMITTER		NXR-5700	NXR-5800
RF Power Output		25/5/0.5 W	
Max Duty Cycle		100 %	
Spurious & Harmonics		73 dB	
FM Hum & Noise	Analog @ 25/30 kHz* Analog @ 12.5 kHz	55 dB 50 dB	
Audio Distortion		Less than 1 % at 1000 Hz	
Emission Designator		16K0F3E, 11K0F3E, 8K30F1E, 8K30F1D, 8K30F7W, 4K00F1E, 4K00F1D, 4K00F7W, 4K00F2D	

APPLICABLE MIL-STD

MIL Standard	MIL 810C/D/E/F Methods/Procedures	MIL 810G Methods/Procedures
High Temperature	501.4/Procedure I, II	501.5/Procedure I, II
Low Temperature	502.4/Procedure I	502.5/Procedure II
Temperature Shock	503.4/Procedure I, II	503.5/Procedure I

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ISO9001 Registered
Communications Systems Business Unit
JVCKENWOOD Corporation



MISSION-CRITICAL SOLUTIONS



ZETRON®



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For specific examples of companies and agencies that have purchased Zetron products, go to **Markets** at www.zetron.com.



Learn More About Zetron

A Well-Earned Reputation

For almost 40 years, Zetron has been creating mission-critical communications solutions for customers in the fields of public safety, transportation, utilities, healthcare, and manufacturing. Zetron has installed and deployed thousands of systems worldwide. The success of these systems, and the reputation Zetron has earned as a result, are testaments to the high quality, performance and reliability of Zetron products.

A Global Network of Partners

In addition to offices in Redmond, Washington, U.S.A.; Hampshire, U.K.; and Brisbane, Australia; Zetron also supports a network of authorized resellers, distributors, and systems integrators in over 60 countries throughout the world. This allows Zetron to maintain a strong local presence in the regions it serves.

ISO-Certified Quality

Zetron's quality-management system is governed and certified by ISO 9001:2015. This means that each Zetron product meets the strictest standards of quality for design, performance, manufacturing, testing, and support.

Territory Managers to Support You

With their understanding of the regional markets they serve, Zetron's territory managers help their partners identify opportunities and act on them. For more information about Zetron territory managers, go to www.zetron.com.

Trade Shows Worldwide

Zetron attends and displays products at over 60 industry trade shows held throughout the world each year. This allows vendors to view Zetron's latest and greatest solutions and gives customers the opportunity to discuss their unique needs with Zetron technical experts. To view Zetron's trade show schedule, go to www.zetron.com.

Zetron's *Advantage* Newsletter: Solutions in the Real World

Zetron's free, monthly newsletter, the *Advantage*, features articles about how organizations throughout the world have used Zetron systems to solve real problems and improve their communications. To subscribe to the *Advantage*, or to view past issues, go to www.zetron.com.

A Leader in Open Standards

Radio equipment solutions based on open standards expand interoperability and offer customers a wider range of equipment choices than proprietary products do. That's why Zetron is actively involved in the development and application of open standards, including Project 25 (P25), Digital Mobile Radio (DMR), and Terrestrial Trunked Radio (TETRA). Zetron's ACOM Command and Control and MAX Dispatch systems equipped with the P25 Console Subsystem Interface (CSSI) has tested successfully with the equipment of most major radio vendors, including Auria Wireless, Cassidian, Daniels Electronics, Harris, Raytheon, Rohill, Tait, and Motorola. The success of these tests verifies ACOM and MAX Dispatch's ability to integrate seamlessly with these vendors' radios and networks.

About Zetron

Zetron is a critical communications technology company providing integrated command & control solutions and information services with legendary reliability & support. For almost 40 years, Zetron has delivered interoperable end-to-end command & control systems across multiple industries and international markets. With over 25,000 console positions, 1,000 established resellers, and coverage in 70 countries, Zetron has established itself as the technology leader in connecting command centers with field personnel using radio and telephony technologies. Its solutions empower first responders with situational awareness by enabling console operators to provide them the right information at the right time.

Zetron's integrated IP-based solutions combine NG9-1-1 call-taking, CAD, GIS mapping, radio/telephony dispatch, and fire station alerting systems. They are expandable, interoperable, and able to support remote and geo-diverse operations. Zetron backs its products with technical support and project-management services (known for technical expertise and responsiveness). It has a worldwide network of resellers, system integrators and distributors. It is a wholly owned subsidiary of JVC Kenwood Corporation with offices in the United States, United Kingdom, Australia, and numerous field locations.

Markets

Work with an accomplished team that has the experience in delivering solutions in multiple industries and international markets with implementations in:

- Public Safety
- Campus Security
- National Security
- Utilities
- Petrochemical, Oil & Gas
- Airlines and Airports
- Maritime, Harbor and Port Authorities
- Rail and Mass Transit
- Border Patrol and Government agencies

MISSION-CRITICAL SOLUTIONS

MAX

ACOM

SPECIALTY

Maximize your command and control center with brilliant interoperable console solutions designed to enhance situational awareness and deliver quick, efficient and communications to both emergency or non-emergency response teams. Mission-critical solutions include:

MAX Systems

MAX Systems portfolio of products are tightly integrated to provide a complete command and control solution. Each solution can be purchased as a modular, cost-effective package, whether stand-alone or with one or more other console products.

ACOM Systems

ACOM Systems are designed to meet the complex demands of critical communications centers that are larger in size and require more tailored operational needs or have greater resource demands.

Specialty Products

Zetron provides a robust selection of reliable communication solutions. From consoles, radio adapters and remotes, to interconnects, console accessories, paging, remote monitoring and SCADA systems.



Max Systems portfolio of products are tightly integrated to provide a complete command and control solution. Each solution can be purchased as a modular, cost-effective package, whether stand-alone or with one or more other console products.

MAX Call-Taking

MAX Call-Taking is a 9-1-1 call-taking solution designed to give the telecommunicator the tools they need to increase efficiency and minimize distractions. It provides the solid reliability for which Zetron is known in an end-to-end Next-Generation 9-1-1 call handling solution built with scalability and redundancy at its core. It offers a full range of features and functionality that are important to Emergency Call Centers (ECC) and employs the latest standards-based IP protocols and IT best practices. The intelligent user interface (UI) is expressly designed to streamline and simplify tasks, reduce distractions and fatigue while improving efficiency. The system comes with built-in interfaces and shared components with other Zetron solutions such as MAX CAD/GIS, MAX Dispatch, and MAX Fire Station Alerting creating an integrated command & control suite. With MAX Call-Taking, you are buying more than a 9-1-1 call handling product, you are buying a solution that scales to the needs of your operation both today and tomorrow.



Automatic Call Distribution (ACD)

MAX Call-Taking offers built in skills based routing capable of sophisticated call distribution. Configurable call queues reduces transfers by delivering specific call types to call-takers who have defined roles, skill, and ability to handle them.

Optimized call handling

Integrated workstation controls and an efficient user experience optimizes a call takers ability to receive, process, and complete emergency 9-1-1 calls and texts. Selective display of information pertinent to the task, single action operation, and advanced call handling features and mid-call recovery.

Telephony PBX Support

The PBX support within MAX Call-Taking provides a robust feature set integrating office personnel and phone systems into the total 9-1-1 Call-Taking solution. Robust PBX support enables call control functions such as call answer/release, call transfers, call hold, call mute, call parking, conference calling, auto-attendant, intercom, paging and other handset features are just a few of the capabilities available for supporting office personnel.

Integrated i3 Text to 9-1-1

MAX Call-Taking delivers SMS Text to 9-1-1 calls to the call taker screen in a user friendly format. Text calls ring and are answered in the same format as voice calls. This feature is configurable so that a call-taker may be enabled to handle multiple text calls as well as voice calls at the same time.

Map Viewer displays calls using local ESRI GIS data

Map Viewer integration allows 9-1-1 calls and Text to display on the viewer prior to answer. This feature allows call-takers the ability to answer a call based on geographic location. Locations will update and map as the call-taker rebids for better location accuracy. Traditional ALI and RapidSOS location (when available) are displayed on the Map Viewer. 9-1-1 voice and text calls can be answered and released from the Map Viewer display. The Map Viewer uses your local ESRI GIS data.

Supports current and emerging NENA i3 standards

SIP-based solution with support of softphones and SIP phones, ready to meet existing and emerging NENA NG9-1-1 i3 functional and interface standards. Compatible with Emergency Services IP Networks (ESInets) supporting both single Emergency Call Centers and hosted solutions.

Supports RapidSOS Enhanced Location Services

Improve response times with enhanced location accuracy for 9-1-1 cell phone calls and texts through integration with RapidSOS location services. RapidSOS is partnering with leading device manufacturers and app developers to get precise handset location from all different sensors on modern devices, such as GPS, WiFi Access Points, cell towers, Bluetooth beacons and barometric pressure sensors. When a 9-1-1 call comes in, MAX Call-Taking 9-1-1 equipment queries the NG9-1-1 Clearinghouse for supplementary location straight from the device. This information is included in addition to standard ALI.

Zetron's MAX Computer Aided Dispatch (MAX CAD) helps public safety answering points (PSAPs), emergency services dispatchers and first responders provide real-time incident management for improving overall situational awareness. Scalable to support consolidation, multi-jurisdiction, and multi-agency deployments. MAX CAD integrates into the NG-911 environment and can accommodate future consolidation through its scalable architecture. As the number of communities and agencies served by the PSAP increase, MAX CAD provides support for multi-jurisdiction and multi-agency workflows.



Scalable to Support Multi-jurisdiction/Agencies

MAX CAD integrates into the NG-911 environment and is future proofed to accommodate future consolidation through a scalable architecture with the ability to add more workstations and locations. Multi-jurisdiction and multi-agency workflows are supported as the number of communities and agencies served by the PSAP increase.

Smart Work Assignment

MAX CAD is optimized to allow CAD operator incident assignments based on roles and responsibilities. With screens that can be optimized to assigned roles, call takers can focus on the responsibility of answering and responding to emergency requests, while dispatchers can focus on the need to manage and respond to incident resources. Workspace can be customized based on operator preferences greatly simplifying incident tracking, management, and data based dispatching.

Advanced Incident Management

MAX CAD is designed with efficiency allowing operators to open, close, reopen, void, merge, and clone incidents. Ability to manage incidents from multiple data types (user names, address, status, date, time, etc.) and automatically recommends resources based on location, capabilities, and status. Shared incident information with Mobile CAD users and robust ability to search open or closed historical incidents.

Local Administrative Control

MAX CAD can be configured by the CAD administrator to meet current and evolving agency requirements. This allows the application to grow and change along with PSAP. Local administrative control also reduces support costs and allows local customization without customized CAD development.

Simplified GUI

The clean, intuitive design of the graphical user interface (GUI) makes the system easy to learn and use. The MAX CAD screen supports a customized, administrator enabled, PSAP workflow by personalized call queues and a configurable CAD screen that changes both layout and color scheme base on dispatcher preference.

Integrated Operation

MAX CAD automatically populates incoming E9-1-1 information, performs NCIC queries/searches, and includes optional interfaces to RMS applications, protocol-integration solutions, and other third-party databases. This allows agencies to integrate third-party medical and disaster Standard Operating Procedures (SOPs) into MAX CAD. MAX CAD also provides robust integrations with MAX Call Taking and MAX Dispatch enabling a more efficient use of resources and operational efficiency.

Mobile CAD

MAX Mobile CAD works with MAX CAD to bring full CAD and mapping functionality into a vehicle or Windows mobile device. It gives first responders access to the same incident-history data and map files dispatchers and call takers are viewing, which improves the effectiveness and accuracy of the emergency response. MAX Mobile CAD offers easy access to critical tools, information, and resources, including detailed maps, GPS locations, National Crime Information Center (NCIC) data, Department of Motor Vehicle (DMV) queries, and subject or vehicle information.

GIS Mapping

MAX GIS is integrated with MAX CAD to allow dispatchers to create incidents and dispatch from the map. The map is integrated with the CAD database to provide location specific information such as prior incidents at the location.

Zetron's MAX GIS Mapping is an Esri-based map viewer providing map-editing and publishing applications along with an optional AVL (Automatic Vehicle Location) module to improve GIS file management. Operate MAX GIS as a standalone map viewer using ANI/ALI information to display an active accident or integrate GIS with an active CAD incident and historical database. This integration automatically maps the active CAD incident, allowing dispatchers to deliver routing information and other critical information to field personnel.



MAX GIS Mapping handles the entire mapping, addressing, and reporting needs of emergency response organizations. These maps and integrated data provide a complete automated map-viewing system used by city, county, and state emergency response centers. The solution facilitates integration with other departments and agencies and offers smooth interoperability with leading computer-aided dispatch (CAD) and geographic systems (GIS).

MAX GIS includes a Esri-based map viewer, optional AVL module, and map-editing and publishing applications that improve GIS file management. MAX GIS can operate as a standalone map viewer that uses ANI/ALI information to display an active incident, or it can be integrated with an active CAD incident and historical database. When the map viewer is integrated with the CAD database, it automatically maps the active CAD incident, enabling dispatchers to provide routing assistance and critical information to field personnel. The optional AVL module displays vehicle locations on the GIS map viewer. The AVL module can be integrated through an API to a Zetron MAX Dispatch console to allow map-based vehicle dispatch.

Robust Map Editor

Interactive tools make it easy to route roads and generate addressing according to your standards, as well as automate specific NG9-1-1 information such as Emergency Service Number (ESN) and Master Street Address Guide (MSAG) boundaries.

Deliver powerful Esri-based map customizations leveraging the mobile map editor along with real time GPS tracking technology. Add addresses, road centerlines, and landmarks that can include street signs, utility poles and even fire hydrants. Import, convert other map data formats, and synchronize with other map databases.

Intuitive Map Viewer

Instantaneously displays the mapped location, with or without aerial photographs, along with other mission critical information. This information can include details on callers, residents, utilities, and other geographic information system (GIS) entities such as fire-hydrant locations, hazardous material, and historical medical and event data. Dispatchers are able to quickly and efficiently provide routing assistance and important landmark information to emergency response personnel. Unlike other map viewers, MAX GIS supports unlimited map layers that can offer a richer array of local information, such as emergency escape routes, building schematics, fire hydrant locations, pre-defined helicopter-landing zones, local construction, and landmarks. The intuitive operator interface enables fast refresh, panning with local map caching, zoom In, zoom out, pan and layer selection to ensure desired map details are presented. Quickly navigate to map locations by latitude/longitude, address, name, or phone number.

CAD and Map Integration

MAX GIS is integrated with MAX CAD to allow dispatchers to create incidents and dispatch from the map. The map is integrated with the CAD database to provide location specific information such as prior incidents at the location. MAX Call-Taking leverages the same map viewer to locate an incoming NG9-1-1 call where ANI/ALI location information is displayed. AVL integration is additionally available to enable the map viewer to display vehicle locations in a dynamically updated map layer.

- Integrated with MAX CAD or MAX Call-Taking
- Track and display resources with AVL
- Display with ANI/ALI location information or other third party locations such as RAPID SOS
- Display Video, Alarms, and Sensors
- NG 9-1-1 call locations

Local Administration and Control

The optional map editor and publishing module allows map files to be created and administered locally. As a result, administrators can add locally relevant information to the GIS and update maps in response to changing local conditions. It also gives administrators the flexibility to make changes at their convenience.

MAX Dispatch

MAX Dispatch is a versatile software based dispatching console system for managing your radio and telephony operations while additionally managing robust alerting capabilities for fire stations or remote agencies. It effectively enables command and control operators to simultaneously talk to local and geographically dispersed users. Whether you're in the control center or out in the field, you're connected. The MAX Dispatch modern architecture enables your teams to cross radio & telephony technology boundaries easily providing unparalleled situational awareness to first responders.



Configurable, easy-to-use

With a configurable, modern, intuitive user interface, that allows the dispatcher access to the appropriate resources with the system while reducing screen clutter and information overload. The IP-based MAX Dispatch can integrate a wide range of tools and resources into a single console system. This provides dispatchers with instant access to the information they need by displaying only relevant data to the incident they are working. Through a simple drag and drop dispatchers can also communicate with assets that they seldom use. Multiple unique screen layouts can be created to meet the varying needs of your dispatch center.

Redundancy

MAX Dispatch will keep your vital operations up and running with redundancy for every end point. It can be set-up to provide the ability to tolerate any single point of failure with no loss of service. Redundancy can be set-up to meet your specific requirements.

Interoperability

An essential part to managing events across departments or jurisdictions, MAX Dispatch brings compatibility with all major radio interfaces and radio manufacturers equipment making it one of the most interoperable systems on the market. Leveraging industry standards such as CSSI (analog & P25 conventional), EDACS, Smartnet/SmartZone, P25 DFSI, DMR AIS Tier II & III, and NXDN, the system supports the robust radio communications offered on the market today. From Analog radios to Digital radios and using gateways or digital interfaces MAX Dispatch has a solution.

As broadband push to talk over cellular continues to be adopted, MAX Dispatch has a solution with direct integration to Kodiak Push-To-Talk (PTT). This solution connects users using smart devices with console operators and users on land mobile radio solutions enabling the same robust call features that are standard in LMR systems today.

Finally, MAX Dispatch integrates easily with most CAD systems providing Application Programmer Interfaces to CAD systems to enable radio communications, AVL, and radio paging.

Enhanced Broadband Push-To-Talk

MAX Dispatch Integrates broadband Push-To-Talk (PTT) capabilities with cell phones enabling communications with dispatch and directly through to radios and radio talk groups. This benefits both non-mission critical users (e.g. utilities, transportation, public works, schools, hospitality) and mission-critical users needing backup to LMR for indoor or extended-range coverage.

Expandability

MAX Dispatch is design for your needs now and into the future. You can easily add new dispatcher positions or new radio interfaces into your system. We are constantly monitoring the industry and adding new capability into MAX Dispatch.

Fire Station Alerting Systems

Zetron offers two fire station alerting options, MAX Fire Station Alerting and IP Fire Station Alerting. MAX FSA is a new product designed for existing MAX Dispatch customers as a cost effective solution that meets the basic fire station alerting needs of most dispatching operations. IPFSA, which is a mature solution with a robust feature list. IPFSA is designed to be implemented standalone without MAX Dispatch with both solutions offering CAD interfaces for easy integration into your control room.

MAX Fire Station Alerting

MAX Fire Station Alerting is designed to meet the extraordinary demands of fire houses today and into the future. Our unique approach of extending the MAX Dispatch console with additional alerting, acknowledgement, and auxiliary I/O communication capabilities provides your operation with a cost effective way of integrating dispatching and fire station alerting together as a single integrated solution. Standardize your fire station on a common platform that can provide fast, dependable, usable information from the dispatch center. It is delivered as a simple solution for existing MAX Dispatch customers allowing alerting from a central site with integration with any modern CAD system. Added to the console is an industry leading set of alerting capabilities such as ramp-up tones, pre-recorded voice announcements, live voice announcements, lighting controls, garage bay door controls, sensing alarm inputs, motor vehicle status, and relay controls for other unique functions. It includes built-in interfaces and shared components with other Zetron solutions creating an integrated command & control suite. No other solution in the market provides both voice and full alerting capabilities packaged together exposing data and voice interfaces for CAD and other third party systems.



Alerting You Can Count On!

Know that you have a alerting system in place that never fails in delivering those critical alerts to responders.

Combined Dispatch and Fire Station Alerting

Saves space and promotes ease of access/use. Easy integration with existing MAX Dispatch installs.

Voice Announcements through VoIP and Radio Links

MAX Fire Station Alerting is pure IP, making it extremely reliable and easy to work with. MAX Fire Station Alerting provides the flexibility of delivering and receiving audio transmissions over IP and radio at the same.

CAD Integration

Dispatcher can use their CAD and activate all alerting functions. The implementation can be automated so that the CAD system controls alerting automatically and manages station apparatus availability. For example, with station input CAD will know if a truck is out of service and automatically select an available truck for deployment, freeing the dispatcher to handle other issues. In addition CAD can automatically be set up to activate schemes based on the time of day or size of the incident.

Multiple Audio Paths

MAX Fire Station Alerting can alert single or multiple fire stations at the same time through VoIP or radio, which speeds up the process of getting alerts out to the stations.

Multiple Levels of Redundancy

MAX Fire Station Alerting has dual network connections throughout the system, and has hot standby capability, providing automatic failover in the event of a hardware failure. Any single point of failure can be eliminated with redundant MAX Central, MAX Radio Gateways (MRGs), and power supplies. MAX Fire Station Alerting has the ability to be configured with various levels of redundancy to meet your needs.

Secure two-way audio with the station

Station personnel have two-way audio through a MRG back directly to a dispatcher.

Control and Manage Fire Station Peripherals Using I/O

Using remote auxiliary input/output devices with MAX Fire Station Alerting allows dispatch to monitor and pull fire station unit status. It also allows operation of station lighting, door activations and alarm sensor inputs. MAX Fire Station Alerting can support hundreds of I/O devices.

Voice Logger Interface

Using the voice logger gateway will output all activity from the system into a third-party logging recorder for later extraction to recreate the event.

Modern User Interface

If alerting is implemented using the MAX interface, as opposed to CAD, the user will be comforted by a well-designed, intuitive, efficient user interface.

Zone Alerting and Zone Lighting

MAX Fire Station Alerting has zone alerting capability, so that within a station multiple areas can have different alerts. For example, if EMTs only are required for a night-time incident the dispatcher has the ability to notify only the EMT area within the station and allow other personnel to rest.

Supports Major Radio Interfaces, DMR Tier 2 & 3, P25 Trunked and Conventional

Because MAX Fire Station Alerting is combined with the MAX Dispatch system, announcements to the fire stations can be done through any of the radio interfaces that MAX Dispatch supports including DMR Tier 2 & 3, P25 trunked & conventional. Other IP based systems don't have the ability to communicate over multiple radio systems.

IP Fire Station Alerting

Zetron's IP Fire Station Alerting (IPFSA) system is ideal for any municipality that has IP links between its central communications center and its fire stations. Converting to IP between the central site and the fire station increases the alerting speed and broadens connectivity options.

The graphical user interface (GUI) on the PC at the console position gives dispatchers an intuitive, space-saving way to view status and control the PA, tones, and relays at the station. The server architecture manages the communication with individual fire stations and allows dispatchers at remote locations to interact with the system over an IP connection.

The GUI client application runs on a PC and includes an intuitive user interface with a "quick-look" status layout. It also provides tools for filtering, selecting, and controlling stations or individual apparatus. In addition, the system can be controlled entirely through a CAD interface.

The station unit can be configured to open bay doors, control station lights or alarm when station sense an external input. The IP station unit includes a response button that can be used for manual acknowledgements or to reach the communications center.



- Supports up to 254 stations per system.
- Supports up to 25 dispatch positions.
- Station unit includes flexible alerting, control and status capabilities.
- Near instantaneous alert times achieved with independent voice and data channels.
- Dispatcher announcement via Voice over Internet Protocol (VoIP) or radio.
- Includes dedicated dispatcher client application to initiate commands from each dispatch position.
- Console Application can alarm when station unit senses an external alarm input.
- Integrates easily with radio dispatch consoles.
- Provides computer aided dispatch (CAD) integration with existing M26 CAD protocol or XML.
- NFPA 1221-compliant for dispatch systems.

ACOM Systems

Acom Advanced Communications Platform

ACOM Command & Control

ACOM Command & Control is designed to meet the complex demands of critical communication centers throughout the world. The solution is an end-to-end console solution bringing both voice and data communication together to enable operators to orchestrate field personnel conveying situational awareness and response plans. With its combination of advanced telephony capabilities and radio integration, ACOM delivers a robust, command and control system, whether centralized or distributed, with unparalleled operational efficiency. Engineered with customization in mind, an extensive feature set, enterprise class server architecture, and end-to-end resiliency, ACOM offers the most complete mission critical communications solution.



More Interfaces, More Connections, More Control

There's a reason ACOM has received some of the highest customer satisfaction ratings in the industry. Scaling from a few consoles to hundreds and with support for more interfaces than any other system, ACOM gives you the vital connections you need, when you need them, quickly and efficiently. Whether in an emergency or large-scale event, ACOM gives you more control for when you need to operate across equipment, departments, agencies and jurisdictions.

Supported are a broad range of telephony technologies, including SIP, ISDN, and QSig; signaling protocols and radio protocols; standards-based radio interfaces such as Project 25, TETRA, DMR, and NXDN; and interfaces to conventional and proprietary systems and technologies.

Complimentary Command & Control Services

- CAD/AVL systems
- Voice recording systems
- Digital I/O
- Video cameras
- Paging
- Remote monitoring
- Voter Control

Customization, Evolved

Let our professionally trained customer fulfillment team work with you to help define what your system needs are. From how the screens work, or how resources appear to how your operations are handled. The UI is designed to give you the look and feel you want and your organization requires. ACOM is like no other as it is designed with configuration in mind and easily evolves with your operational changes. With its enterprise-class server architecture and high capacity, ACOM can be updated and expanded as the need arises without requiring expensive additional hardware.

Powerful Call Management

The ACOM's Call Management feature allows you to determine how calls are viewed, prioritized, and handled. Areas of Interest and Call Stacks working together, allow call activity to be tracked by supervisors to make sure staffing levels match the current call needs.

Smart Audio Routing

Scripted audio files allow an ACOM console to have any audio input source be directed to any audio output. Audio levels can be automatically adjusted based on the operator's console selections, configured to the needs of the control room without making expensive, hard-coded software changes.

Flexible Access

Profile-based logins gives users the ability to log in to any one of a number of ACOM systems simply by using a different login profile. This can be critically important during disaster-recovery operations or situations where different systems are deployed or interagency access is required. Profiles can reflect available resources, dispatch functions, duty shifts and schedules, supervisory and maintenance roles, and training exercise simulations.

Once logged in, the user has the additional ability of a simple drag-and-drop procedure to dynamically add resources or remove them from their screens, quickly and easily, in response to unexpected incidents, emergencies, or dispatchers' changing needs.

Bandwidth Efficient

ACOM ensures that IP connectivity is used efficiently and bandwidth is available when you need it most—during critical times and when network traffic is at its peak. That's because the system utilizes a consolidated audio stream to the console that allows an operator to select any or all resources simultaneously without affecting the IP-network bandwidth to the console.

Mobile & Remote Support

Quickly and securely setup temporary, back-up or mobile training positions with just a laptop or tablet and a USB headset. Unlike other console solutions which can limit you to a few channels, ACOM provides no channel limit, giving the user access to the full resource capabilities of the console system, at a fraction of the cost of a fixed position.

Delivering the Security of True End-to-End Encryption

ACOM's full end-to-end encryption is designed to keep your communications secure. DES and AES encryption are integral features of the ACOM interfaces. In addition, ACOM supports FIPS 140-2 and the use of a Key Fill Device (KFD) or connection to a Key Management Facility (KMF) for Over-the-Network Rekeying (OTNR).

Enhanced Broadband Push-To-Talk

With the emergence of high bandwidth LTE data networks, users are looking to augment their LMR systems with Broadband Push-To-Talk (PTT) platforms while consolidating operations with data centric applications to increase productivity. ACOM not only provides the ability to integrate with Commercial Broadband Push-To-Talk (PTT) services but to also be the linking conduit to the existing LMR networks.

High Availability

Because ACOM delivers the industry's highest levels of availability, it stays up and running and your communications get through, even if a fault condition occurs. From dual network connections, dual power, to hot-standby capability for all core controller services.

Optimal Performance

Built-in IP-diagnostic tools and web-based system-management capabilities simplify system maintenance and error diagnosis. They also monitor and report on the health of the network to ensure that it's running efficiently. This helps keep your system performing optimally and your cost of ownership low.

ACOM Automax

ACOM AutoMAX CAD and Mobility Suite delivers the next generation in Zetron's evolution of products. The best-in-class systems and software work together to improve operational control and situational awareness in the control center and out in the field. ACOM Command & Control software combined with CAD software provides the best in incident management, mapping, and full communication and dispatch capabilities. AutoMAX also helps achieve faster response times, quicker responses to calls, rapid dispatch of resources and complete incident documentation. This solution is primarily sold in the EMEA regions. AutoMAX includes:

ACOM Command & Control – Serves as the Acom AUTOMAX integrated dispatch and communication-control component.

Computer Aided Dispatch (CAD) – Integrates best-in-class CAD, geographical information system (GIS), and AVL Capabilities.

Mobile CAD – Works with the AutoMAX CAD to deliver the full range of CAD information and functionality to the field.

Incident Management – Works with AutoMAX CAD to quickly capture incident data from the field as it becomes available.

Case Management and Reporting – Simplifies and improves the collection, organization, analysis, and use of case information and reports.

**ACOM AutoMAX is not for sale in North America.*



SPECIALTY PRODUCTS

Zetron provides a robust selection of reliable communication solutions. From consoles, radio adapters and remotes, to interconnects, console accessories, paging, remote monitoring and SCADA systems.

Consoles

Zetron's DCS-5020, Series 4000 or the Model 4010 consoles are designed for small to medium-sized control rooms and communications centers and delivering unparalleled flexibility and scalability. And with the reliability you expect from Zetron, they are able to meet a range of demands in the public safety, transportation, utilities or private industry sectors. Operators are able to monitor and dispatch, both conventional and trunked, more efficiently. These consoles support industry standard tone remote control, local, and other legacy radio interfaces.

DCS-5020 Digital Console System

The DCS-5020 Digital Console System* is designed to meet the needs of the small to medium-sized integrated control rooms. Combining telephony with both digital and analogue radio control to either direct wired or IP connected dispatch positions, the DCS-5020 meets a range of professional applications for public safety, transportation, utilities, oil, gas, mining and private industry. It also provides specific applications including, mobile command, small control rooms and TETRA fallback systems

With an architecture of distributed processing, with no central switch provides the flexibility, scalability and high resilience mission-critical applications demand. The DCS-5020 also includes Selcall (5-Tone), Digital Input/Outputs and audio delay. It's strengthened by a range of technical requirements, building upon previous releases and integrating customer feedback.

**DCS-5020 is not for sale in North America.*



Series 4000

The Series 4000 is a communication control system designed for medium-sized communications centers and offers exceptional reliability. The Series 4000 also offers easy programming and economical upgrades along with three styles of operating positions and two common controller sizes allowing it to accommodate 8 to 48 channels and up to 16 operator positions.

Common Control Units

A Common Control Unit (CCU) is the central controller responsible for switching and routing multiple audio channels between operating positions and the external devices such as base stations, control stations, repeaters, telephones, monitor receivers and intercoms.



The Series 4000 offers two different Common Control Units to accommodate different capacity requirements.

Model 4020

- Up to 20 radio or telephone channels
- Up to 6 operating positions
- Up to 10 independent cross channel patches
- No single point of failure architecture
- Channel Check IRR option
- External time source reference
- Event logging port
- Dual power supplies w/automatic switching
- Economically upgradeable to Model 4048

Model 4048

- Up to 48 radio or telephone channels
- Up to 16 operating positions
- No single point of failure architecture
- Up to 24 independent cross channel patches
- Channel Check-IRR option
- External time source interface
- Event logging port
- Remote diagnostic monitoring
- Dual power supplies w/automatic switching

Model 4010

The Model 4010 (Desktop) and Model 4010R (Rackmount) Radio Consoles are self-contained, single position radio console systems designed for flexibility and programmability. The Model 4010 can be configured to meet a wide range of public safety, government, institutional and industrial applications by accommodating up to 12 radio channels and 2 telephone lines.

With its rigid construction, the Model 4010 is rated for continuous 24/7, around the clock applications with a proven track record in reliability under the most demanding conditions. In addition to the programmable function buttons, like group call, channel select and channel patch, the integrated keypad and LCD can display incoming calls. And operators are able to hear select audio with individual volume levels for each channel. Operators can choose from a handset, gooseneck or desk microphone, headset and footswitch.



Standard Product Features and Configuration

- Expandable rackmount or office-styled desktop configuration
- Flexible paging encoder
- Supports DTMF, Motorola/GE Two-Tone, Plectron, 5/6 Tone, Quick Call I (2+2), Knox, and Rotary Dial
- Accommodates most industry standard radio interfaces: Tone Remote, DC Remote, Local Control and E
- Supports one or two telephone lines with intuitive controls: “answer”, “release”, and “hold”

Adapters

Model 250 Tone Remote Adapter

Zetron's Model 250 Tone Remote Adapter adapts most common base-station radios allowing them to be controlled by a desktop remote. With support for monitor-and-transmit (PTT) operations the powerful Model 250 unit provides up to 15 frequencies and up to six control outputs. With 12 pre-set channel-combination configurations, control outputs, and monitor functions, the Model 250 is simple to install and easy to use. It can be used with the Zetron desktop remotes and with Zetron's Series 4000 Communication Control System.

- Exceptional audio quality
- Automatic line loss compensation
- Up to six control outputs; two relays
- Integrated setup utilities



Intelligent Radio Interface Module

iRIM provides access to newer radio protocols, allowing you to transition to a variety of proprietary two-way radio technologies. iRIM is compatible with a variety of dispatch consoles, including Zetron's Series 4000, VoIP Radio Dispatch System (RDS), and ACOM Command and Control System.



The iRIM provides control over PTT, privacy code monitor, channel or talk-group selection, repeat/talk-around, and coded/clear using a console's existing tone-remote control capability. This allows the dispatcher to see incoming PTT-IDs, Status and Emergency-IDs for consoles capable of decoding and displaying MDC-1200 signaling.

iRIM gives you control over:

- Talk Group Select – Allows you to select outbound talk groups, privacy code monitor, repeat/talk-around, and coded/clear.
- PTT-ID – Provides incoming PTT-IDs so dispatchers can see the source of the incoming call.
- Emergency Call Status and ID – Provides Status and Emergency-IDs for consoles capable of decoding and displaying MDC-1200.
- P25 Support – Allows consoles with tone-remote control to operate on P25 radios.

With iRIM, your console can display incoming FleetSync™ PTT-IDs. It also allows your dispatch equipment to work with trunked or conventional P25 systems, as well as LTR® and PassPort® trunked radio systems.

- Kenwood TK-x180
- Kenwood TK-5710/5810
- Kenwood NX 700/800
- EF Johnson RS5300 and compatible variants
- Radio-signaling technologies iRIM supports:
- NXDN/Kenwood NEXEDGE™*
- Kenwood Fleetsync
- EF Johnson LTR
- APCO Project 25 (P25)
- Trident PassPort
- Motorola ASTRO
- Motorola SmartNet®/SmartZone®

*NEXEDGE™ is a trademark of Kenwood Corporation.

RoIP Gateway

Zetron's Radio over-IP (RoIP) Gateway is designed to transport analog wireline two-way radio control circuits over modern IP networks. This allows you to take advantage of reduced recurring costs, while protecting your investment in existing analog wireline equipment.



The RoIP Gateway allows legacy Tone Remote Control (TRC) or E&M wireline control equipment to operate over modern IP networks. Typical applications include, remoting legacy analog LMR wireline equipment (e.g. base stations remotely connected to dispatch equipment) via IP, and connecting two base stations via IP for range or cross-band expansion. The RoIP Gateway is available in one or two channels.

- Transports voice (3-wire unbalanced or 4-wire balanced), I/O (PTT & COR) and Data (RS-232) for up to two radio circuits.
- Handles Tone Remote Control (TRC) and Local/E&M radio circuits.
- Remote PTT operation controlled by VOX or COR.
- Use of TCP and Unicast UDP allows operation over standard IP networks.
- Compatible with many IP-based RTP voice recorders.
- Field-selectable voice compression includes PCM (64 kbps) and ADPCM (16-32 kbps).
- Fully configurable via web browser, including all audio levels.
- Embedded operating system, and no moving parts. Designed for harsh, unattended radio site environments.
- Optional 1U x 19" rack mount for two units.
- Operates from 12 Volts DC.
- Optional direct, built-in support for the Department of Homeland Security (DHS).

Pathway+

The Pathway+ product is designed to provide a connection between radio infrastructure repeaters/base station and up to four console systems using the TIA P25 Digital Fixed Station Interface (DFSI) protocol. A single Pathway+ provides a pair of radio interfaces, allowing communication and control with legacy radios, via 4-Wire analog, Motorola Quantar Base Station through the v.24 interface, or modern DFSI enable radio devices. Pathway+ acts as a DFSI proxy providing arbitration and control of a radio and the multiple console systems sharing a single resource. It directs appropriate messages and handles message conflicts, overcoming the point-to-point limitations of the DFSI protocol allowing it to act as a multi-point communication device.



- Supports communication and control of P25 DFSI base stations, Analog 4-Wire E&M Radios, and Motorola V.24 Quantar Base Stations and infrastructure.
- Provides connections between modern IP Command and Control faculties and legacy radio infrastructure.
- Uses the TIA P25 Digital Fixed Station Interface protocol standard, provides a connection with any manufacturer's dispatch console that is compliant with the TIA P25 DFSI open standard.
- Provides connection and arbitration of up to four DFSI console systems, providing shared connections with two radio channels.
- Easy to use local or remote web based configuration.

Desktop Remotes

Model 284 Four Line Remote

The Model 284 has become a standard for hospital HEAR networks, state departments of transportation, and utilities. It's an ideal unit for backing-up a Zetron dispatch console and features a four-line, eight-frequency tone remote for use with popular brands of EIA-compatible base stations and repeaters. With four LINE keys allows operators to select between four base stations and up to eight frequencies on each (F1-F8).



Model 360 Kenwood Remote

The Model 360 is designed to operate with Kenwood radios. Operating in conjunction with its companion radio interface panel, the Model 360 desktop remote brings the power and convenience of the Kenwood mobile radios. The M360 is known for high-quality audio and support for advanced features.

Up to 25 desktop remotes may be paralleled on the same radio to provide access from multiple points within an organization. In conjunction with its companion radio interface panel, the Model 360 desktop remote brings the power and convenience of the Kenwood TK-x180, NX700/800/900, and NX-5x00 series radios into an office or dispatch center environment. The M360 also supports the EFJohnson TK-5x30 P25 series radios.



Model 390 TETRA Remote

The Model 390 is a versatile desktop controller designed to work with the Motorola MTM700, MTM800, MTM800e and MTM5400 TETRA radios. It provides public or private systems to radio operator dispatchers and where office personnel need radio access without the need for a radio placed in the office environment. The radio can be placed up to 600 meters away from the controller and up to 15 controllers can be connected to one radio allowing it to be placed in the best radio coverage area. And hands-free intercom between all controllers is possible in a multiple controller system.

Each unit has an individual rotary volume control, a numeric keypad and function buttons. The keypad is designed to provide fast access to all vital information. The function buttons make operation simple for anyone familiar with TETRA radios by mimicking the radio. LED indicators show which functions are activated and the presence of incoming messages.



Console Accessories

Zetron console accessories, software and equipment are designed to complement and enhance the functionality and efficiency of Zetron dispatch consoles and other manufacturers' consoles.

Zetron Speakers

Zetron speakers are specifically designed for mission critical applications where reliability, ease of use, and voice quality are important. Premium grade components are housed in an attractive yet rugged enclosure to optimize the reproduction of two-way radio voice-band communication. An individual volume control eliminates the confusion caused by the stereo balance control found on standard speakers. A high visibility call indication LED on the speaker instantly identifies the source of audio.



Zetron Microphone

Zetron Communications microphone has been designed from the ground up for your dispatch centers mission-critical radio communications. The stable base and reliable switches match with your choice of gooseneck and capsule combinations.

Microphone Features & Configurations

Available with either a generic capsule on a standard-duty gooseneck or a Shure noise cancelling capsule on a heavy-duty extended length gooseneck.



Logging Recorders

Zetron's authorized partnership with Eventide® makes it easy to use Eventide's NexLog™ NG911-ready, IP-based logging recorders with Zetron's MAX Dispatch, MAX Call-Taking, and ACOM systems. NexLog recorders help you securely capture, store, retrieve, reproduce, manage critical incident interactions and data. And when purchased with a MAX Dispatch console, the logging-recorder license is included.



Paging

Zetron offers a range of paging terminals, accessories and encoders that are designed to address a variety of operational needs.

Paging Terminals

Zetron paging terminals answer telephone calls to send a page, decode and record a message, certify the paging customer's validity, encode the message to the correct format for the customer's pager, and manage the page through the radio transmission network. Zetron paging terminals also provide statistics, diagnostics, and subscriber call-count information. Whether they are used as commercial systems or private, on-site systems, Zetron paging terminals can be configured to provide efficient, cost-effective service.

Series 2000 Paging Terminals

The Zetron Series 2000 Paging Terminals are designed for the paging operator needing a flexible, modular approach to system operation, with the capacity to expand to a region wide or national network. The terminals are incrementally expandable in both capacity and options.

The Series 2000 paging operator can offer customers direct system access by analogue or digital telephone trunks or through an operator paging bureau. Direct telephone users are instructed through system operation with voice prompts, locally recorded by the system operator. PC and e-mail users have direct access through a server or dial-up modem.



Model 640 Paging Terminal

The DAPT-XTRA is a combined dial access and PC driven paging terminal supporting up to 1,500 users with up to 4 telephone lines for direct user access or for connection to local or remote data entry terminals. PC software is also available. Callers dial into the Model 640 and hear voice prompts leading them through the system operation. Voice pages and numeric or pre-stored alphanumeric messages may be sent from the telephone.

The Model 640 can service all input ports simultaneously for higher traffic applications, sending out pages in user priority. This dial access and PC-driven paging terminal supports up to 1,500 users with up to four telephone lines. Voice pages and numeric or pre-stored alphanumeric messages may be sent by telephone.



Paging System Controllers

Zetron paging system accessories enhance paging system radio networks by controlling the communications among the system's radio sites.

Model 55B Page Buffer

The Model 55B is a high fidelity 'simplex repeater' suitable for storing and forwarding analog and digital pages. By storing pages received from a terminal for later transmission and allowing remote control transmitters on shared channels, the Model 55B eliminates the need for costly zone sequencing or simulcasting equipment. The Model 55B can monitor a COR input at the transmitter site to prevent transmission of pages when the frequency is busy.



Model 55D Digital Repeater

The Model 55D is used to extend the range of a paging system by decoding and retransmitting pages. Connected to a receiver/transmitter in the range of the main transmitter, the Digital Repeater decodes the incoming POCSAG page, error corrects it, and stores the page in memory. When the channel is clear, it reconstitutes the page and retransmits it.

The digital repeater can use the paging system ID feature to only respond to pages with the correct System ID. Individual Zone Address Steering enables multiple Model 55Ds to extend the range over several units in a sequence.



Model 66 Transmitter Control Panel

The Model 66 Transmitter Controller connects to a radio-paging transmitter and allows the transmitter to be remotely controlled from a central paging terminal. The Model 66 recognizes the site address, selects the modulation mode (analog or digital), keys up the transmitter, and transmits the audio or digital data.

Multiple transmitters can be synchronized, dual-frequency transmitters can be controlled, and four link 'hops' are allowed. The Model 66 is FLEX™ 1600 bps and Motorola PURC® compatible. The Model 66 is also recommended for in-plant applications where a single transmitter is located more than 30 feet from the terminal.



Model 600/620 High-Speed Simulcast Paging System

The Zetron High Speed Simulcast Paging System uses timing information from the Global Positioning System (GPS) to synchronize the transmission of digital paging signals to very tight tolerances. This provides the microsecond timing accuracy necessary for high-speed simulcast paging with protocols such as POCSAG and FLEX®.

The system consists of the Model 600 Wireless Data Manager (Source Unit) and multiple (up to 1000) Model 620 Wireless Data Encoders (Destination Units). The link between the Source and Destination units may be any type (or combination) of link that can reliably transport data. Designed for non-proprietary transmitters, the system is ideal for cost effective build-out of new transmitter sites for public or private paging system operators.



Manual Paging Encoders

A manual paging encoder is a desktop unit that an operator uses to enter a page message. Zetron paging encoders are ideal for single-site, single-operator paging operations that do not require the generation of administrative, billing, or management reports.

Model 15 Multi-Format Paging Encoder

The Model 15 is designed so all setup parameters are keypad programmable and be changed by a technician at the site to support any required system changes. The unit includes the Analog, Digital, and/or Custom Calls paging format packages. The installer can set up to 14 blocks of paging formats with no new Zetron firmware needed. This makes the Model 15 a good choice for most manual encoder applications.



Model 25 Programmable Encoder

The Model 25 is an instant call encoder for emergency dispatch. It's used in airports, fire and emergency centers to call out pager users with the press of a single button or through the Computer Aided Dispatch interface.

Each instant call key is programmable and can alert a single pager or team of pager users. Different types of pager may be combined in the same system, including both analog (5-tone) and digital (POCSAG) pagers.



Interconnects

An interconnect serves as the interface between the radio transmitter/receiver and the telephone system so two-way radio users can place and receive telephone calls.

Model 30 World Patch

The Model 30 World Patch is a low-cost, open channel telephone interconnect designed for installation on a simplex radio. It's an ideal way to add telephone interconnect to simplex radio systems for low power in-plant applications. Its low cost and simple operation make it well suited to applications in smaller radio systems.

APO (Advanced Programming Operation) provides 50 autodials, automatic autodial via 4-click PTT, landline security code for direct air access, FET relay, and other features.



Model 37 MAX-Repeater Panel

The Model 37-MAX Repeater Pal is a high-capacity, remotely programmable, community repeater controller. It provides individualized repeater service for up to 154 different customer groups, using CTCSS tone and digital coded squelch (DCS) signaling.



Model 45B Z-Patch

The Zetron Model 45B is a microprocessor-based radio-to-telephone interconnect. It's designed for radio common carriers, co-ops, utilities and private systems where a number of different users need to share the system, yet receive different service and separate accounting. This provides flexible operation as a full-featured telephone patch with selective calling, ANI decode, and advanced airtime billing features.

The Model 45B interfaces a radio system to the public telephone system for interconnected conversations. It also provides selective calling of mobile radios and pagers from the telephone system or from other mobile radios. An RS-232 serial port allows on-screen manipulation of all system and user information. Remote DTMF (Touch-Tone) programming is also supported.



DeadBolt Surge Arrestor

The DeadBolt is a five-stage surge arrestor for installation on telephone lines. The first and second stages are a pair of fusible resistors and a gas tube. Two standard, replaceable 3AG-type fuses form the third stage. The fourth stage is a solid-state, triple balanced SIDAC circuit. The fifth stage is a radio frequency filter.



Remote Monitoring & Control

M1516 SentiVoice

SentiVoice is an economical wireless voice alarm reporter for monitoring contact inputs. And when an alarm condition is sensed, transmits voice messages or pages over the radio or public address system.

Users can respond to alarms via radio to control lights, pumps, doors, and other control equipment via integrated output relays.



M1517 SentiVoice+ Alarm Reporter

SentiVoice+ provides a turnkey industrial solution for automatic voice and page alarming via radio or PA systems. It can be added to existing fire alarm and warning systems, allowing users to respond to alarms via handheld radios to control remote equipment or processes.

SentiVoice+ is housed in a rugged NEMA 4X enclosure and comes equipped with a power supply, battery and charger.



Model 1550 SentiMax

SentiMax is a powerful, industrial autodialer and wireless alarm annunciator. The Model 1550 connects directly to a radio and phone line and monitors/controls remote processes, sites and operations. Alarm messages are sent by text page or natural recorded voice over phone or radio.

Users can phone or radio the SentiMax to remote control local processes or conditions. Pre-recorded messages allow the SentiMax to report analog values such as temperature, pressure, etc. Built-in voice mailbox provides voice mail for users.



Telemetry Products

Wireless telemetry is an inexpensive way to monitor and control remote sites because it forwards status information to a central computer without requiring either leased telephone lines or buried cables.

Model 1700 Controller

The Model 1700 is an economical system controller used in wireless SCADA systems. The controller manages the transfer of data between RTUs and the control program over conventional or trunked radio systems.

The Model 1700 is ideal for small SCADA systems, including Zetron's Model 1708 or Model 1716 RTUs. It also includes four digital outputs and supports up to 250 RTUs.



Training, Services and Support

Operational and Technical Training

Zetron offers technical and operational training for its configured systems, such as dispatch and call-taking systems. Factory training is offered on a regular schedule; onsite and international training is provided as requested.

Technical Training

Technical classes are taught at Zetron's facilities. Classes are small and are held in a dedicated training environment on system equipment. These classes teach technicians how to install, configure, and maintain Zetron systems, emphasizing hands-on practice with hardware and software configuration tools. They are designed specifically for technicians and assume some technical knowledge and expertise.

Operation Training

Operation training classes are taught at the customer's facility whenever possible, or by arrangement at Zetron's facility in Redmond, Washington, U.S.A. The training utilizes a combination of methods, but emphasizes hands-on operational practice to teach dispatchers, operators, and call-takers how to use Zetron consoles and software tools.

On-site Training

Zetron can provide technical, operational, or train-the-trainer training at any location with functioning equipment. Classes can be customized to focus on your particular system configuration. These sessions require at least six weeks' advanced notice.

Training can be provided at Zetron's offices near Hampshire, U.K.; or Brisbane in Queensland, Australia. On-site international training may also be available. Some courses may be available with language assistance.

On-site and Remote Services

Zetron offers a range of on-site services to help ensure that a system is installed and configured to run optimally and best support the organization's operational needs. This is important because a system that is running optimally performs its intended functions and tasks effectively, reliably and predictably.

Available services include:

- System configuration and optimization
- On-site technical support
- On-site training
- Web seminar operator training

On-site services are available for all Zetron configured systems, including:

- Radio dispatch console systems
- Fire station alerting systems
- 9-1-1 call-taking systems
- Paging systems

Ongoing Support

Zetron's responsibility to customers does not end when a project is completed and approved. Zetron's ongoing support services include:

- Equipment replacement
- Extended warranty coverage
- Help Desk
- Individual support contracts based on a customer's system and requirements
- Upgrades on repaired equipment
- Comprehensive service support
- Software upgrades

For more information about Zetron training, service and support, contact your regional Zetron office, or visit www.zetron.com.

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