NORTHROP GRUMMAN

PAE M7

M7X V/UHF Multimode Transceiver
M7R V/UHF Multimode Receiver

PAE M7 V/UHF software defined multimode radios deliver outstanding communications performance for fixed site, naval and transportable applications. Providing voice and data communications in normal and secure modes, M7 includes extensive capability for remote operation via a comprehensive set of interfaces and a dedicated full function remote control unit.

M7 is ideally suited for dual use operations; continuous AM and FM coverage from 100 to 400 MHz includes the 118 137 MHz Commercial ATC band, the 137-156 MHz Land Mobile band, the 156-163 MHz Maritime band and the 225-400 MHz Military band.
The transceiver tunes to all ICAO standard 25 kHz and 8.33 kHz VHF ATC channels and can communicate on all standard International and US VHF FM Marine Channels as either a Ship or Shore station.

Military applications include 12.5 kHz/25 kHz channels, AM/FM voice and wideband data waveforms and compatibility with a wide range of external encryption devices for secure speech operation.

The M7X transceiver features a rugged high power RF transmitter and a high dynamic range receiver for reliable long range communications. It has a 100% transmit duty cycle, even under severe environmental conditions and is designed to tolerate high antenna VSWRs. Adjustable transmit power levels and alternative receiver sensitivity settings allow optimized performance in confined or congested operational areas. The M7R is a receiver only model for separated transmit and receive site applications.

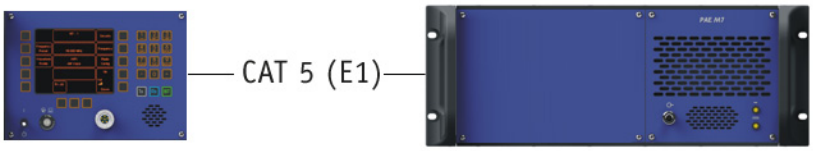
Features

- Multimode software defined radio
- High RF power, 50W AM, 100W FM
- Continuous 100-400 MHz coverage
- Comprehensive interfaces

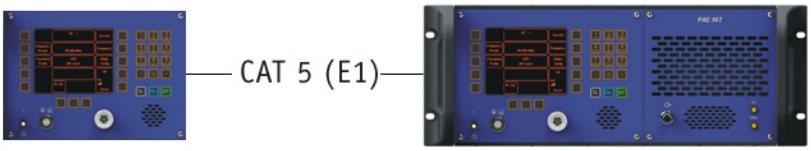
M7 supports a variety of analogue and digital interfaces allowing both modern and legacy command and control systems to integrate to the radio. Standard interfaces include 4-wire E&M for both narrowband and wideband applications, E1 2MBit for comprehensive digital end-to-end connectivity, Ethernet for RCMS and the latest VoIP protocols defined by EUROCAE and RS422/485 for general purpose serial connections to peripheral equipment.

Radio control is very flexible. Full control of the radio is possible locally from the front panel, remotely from a dedicated control unit through an E1 link, or with a PC through a standard Ethernet connection. The front panel controller can be removed and remotely connected to the Radio by cable. Robust control software and an intuitive user interface make networking multiple radios and/or controllers simple. Fixed-site applications with separated transmit and receive sites are supported and can utilize the M7R receiver model in conjunction with the M7X transceiver.

M7 can easily be upgraded for seamless interoperability with a wide variety of radio platforms. Modular construction enables the radio to be configured as required by operational demands. An optional dedicated guard receiver is available for monitoring 121.5 MHz and 243 MHz emergency channels and new waveforms may be installed in the radio by software download. Modules are individually configuration controlled and have electronic serial numbers for simplified logistics.



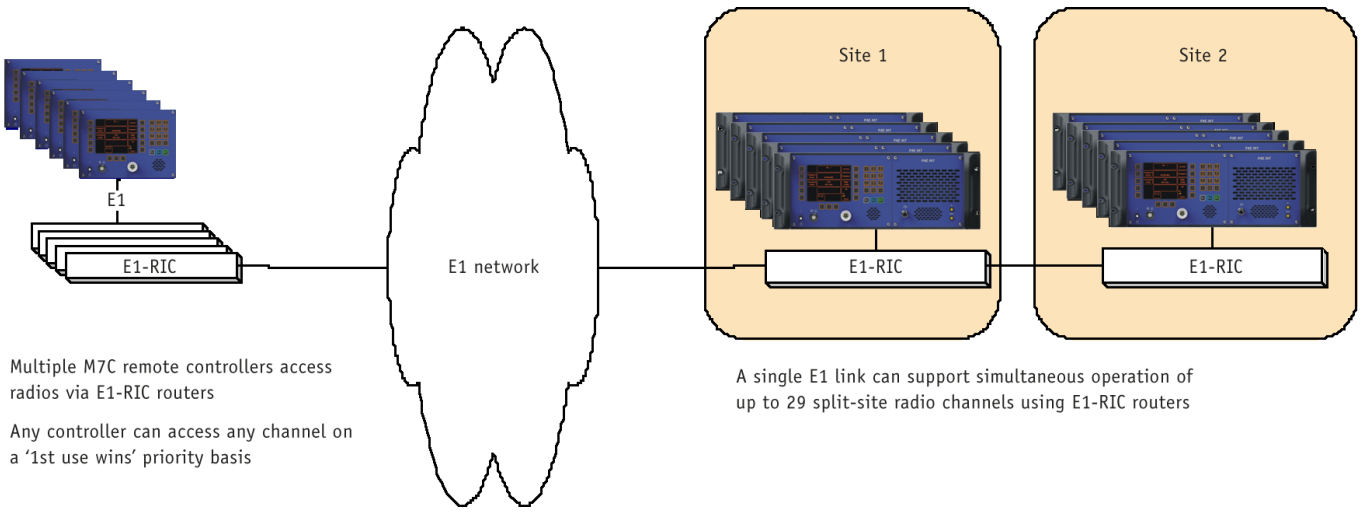
Control Head removed and used remotely



Additional Control Head used remotely

Comprehensive built-in-test (BIT) systems continuously self-monitor key parameters without affecting normal operation and report status information. When the BIT system detects a fault, it indicates which module contains the fault so it can be replaced. The BIT system also detects external environmental conditions that could lead to degraded performance of the radio, such as high temperature, bad VSWR, etc.

Primary power can be provided from a variety of AC or DC sources. Switchover from AC to DC power is fully automatic when AC power is removed. High reliability guarantees many years of trouble free service and, should service eventually be required, the robust Built-In-Test (BIT) capabilities will isolate the fault, and plug-in modular construction will minimize module level Mean-Time-To-Repair (MTTR) to 15 minutes or less.



Multiple M7C remote controllers access radios via E1-RIC routers

Any controller can access any channel on a '1st use wins' priority basis

A single E1 link can support simultaneous operation of up to 29 split-site radio channels using E1-RIC routers

Example control network

GENERAL CHARACTERISTICS	
Frequency range	100 to 400MHz (four user-defined band edges)
Frequency accuracy	0.15ppm
Waveforms	AM voice, AM wideband FM voice, FM wideband Link 11, Link 22 (external modem) International Maritime
Waveform profiles	20 profiles with settings
Frequency presets	400 presets containing a frequency and a waveform profile
Security	2 PIN controlled security profiles
Dimensions	483mm wide (19" rack), 548mm deep, 177mm high (4U)
Weight	M7X 25.1kg, M7R 20.7kg
Supply voltage	
AC	99 to 264V 48 to 62 Hz
DC	21.6 to 32V Automatic reversion to DC in the event of an AC supply failure
Power consumption	(Typical under normal conditions)
M7X	AC 650VA, DC 550W transmit, AC 350VA, DC 120W receive
M7R	AC 350VA, DC 120W
Temperature range	
Operating	-20 to +55°C
Storage	-40 to +70°C
Humidity	5 to 95% non-condensing (EN60068-2-30/ MIL-STD-810F)
Shock	40g from 45 Hz to 2 kHz (EN 60068-2-27/ MIL-STD-810F)
Vibration	4 to 500 Hz (EN 60068-2-6/MIL-STD-810F)
Ingress	Radio IP20, Control Head IP34 (EN 60529)
Ventilation	Internal fans, speed dependent on environmental conditions
Altitude	Operating 5000 m, Transport 15,000 m
EMC	Applicable sections of MIL-STD-461 and EN 301-489

TRANSMIT CHARACTERISTICS (APPLIES TO M7X ONLY)	
Carrier power output	
AM waveforms	1W to 50W
FM waveforms	1W to 100W
Maritime	1W to 25W(ship) 50W(shore)
Power flatness	< ±1 dB with frequency < ±1 dB with temperature < ±1 dB with VSWR up to 2:1 < ±3 dB with VSWR up to 3:1 (∞ VSWR without damage)
Duty cycle	Continuous
Offset carrier	In AM voice, 2, 3, 4 and 5 offsets according to ICAO annex 10
Spectral mask	<-115dBc/Hz at 25 kHz offset <-155 dBc/Hz at >1% frequency offset
Harmonics	<-80dBc (for Fc 100-165MHz and 225-400MHz)
Spurious	< - 90 dBc for Fc 100-163 MHz < - 80 dBc for Fc 225-400 MHz
Modulation setting	
AM waveforms	85%
FM voice	±3.5 kHz
FM wideband	±6.25 kHz
Link 11	±20 kHz
Modulation noise	
AM waveforms	-45 dB
FM waveforms	-40 dB
Frequency response	
AM/FM voice	+0.5 to -2 dB, 300 to 3400 Hz
(25kHz)	-20 dB at <100 Hz, -30 dB at >5000 Hz
AM voice	+0.5 to -2 dB, 350 to 2500 Hz
(8.33kHz/12.5kHz)	-10 dB at <100 Hz, -25 dB at >3200 Hz
AM/FM wideband	+0.5 to -2 dB, 20 Hz to 20 kHz
(ref 5.5kHz)	-12 dB at >25 kHz
Distortion	<5% normal conditions <10% extreme conditions (VSWR >2:1, temperature below 0°C or above 40°C, Fc <108 MHz)
Transmit time out	Adjustable up to 10 minutes

RECEIVE CHARACTERISTICS	
Sensitivity (default)	S+N/N or SINAD, ITU/T weighting
AM voice	≥10 dB at -101 dBm for m=30%
FM voice	≥10 dB at -104 dBm for m=±3.5 kHz
AM wideband	≥10 dB at -95 dBm for m=60%
FM wideband	≥10 dB at -95 dBm for m=±6.25 kHz
Link 11	≥10 dB at -95 dBm for m=±20 kHz
Maritime	≥10 dB at -104 dBm, m=±1.5 kHz at 1 kHz
Sensitivity (high)	Selecting high sensitivity mode increases sensitivity by 6 dB
Selectivity	
AM/FM voice (25 kHz)	<6 dB at ±12 kHz >80 dB at ±25 kHz
AM voice (8.33/12.5 kHz)	<6 dB at ±3.5 kHz >70 dB at ±8.33/12.5kHz
AM/FM wideband (25 kHz)	>6 dB at ±25 kHz >70 dB at ±75 kHz
Dynamic range	3rd order intercept point +19 dBm
Intermodulation	≥80 dB for interferers 100 kHz and 200 kHz from F_o
Blocking and cross-modulation	≥80 dB at >200 kHz ≥100 dB at >4 MHz
Antenna radiation	<-90 dBm
Maximum input	+36 dBm for 20 seconds +27 dBm continuous
Frequency response	
AM/FM voice	+1 to -2 dB, 300 to 3400 Hz
(25 kHz)	-20 dB at <100 Hz, -30 dB at >5000 Hz
AM voice	+1 to -2 dB, 350 to 2500 Hz
(8.33 kHz/12.5 kHz)	-10 dB at <100 Hz, -25 dB at >3200 Hz
AM/FM wideband	+1 to -2 dB, 20 Hz to 20 kHz
(ref 5.5 k Hz)	-12 dB at >25kHz
Distortion	
AM/FM voice	<5%
AM/FM wideband	<10%
RF AGC	<3 dB change in output from reference sensitivity to +10 dBm. At least 10 dB SINAD with input up to +17 dBm
Audio AGC (AM voice)	<1dB change in output for 30% to 100% change in modulation depth
Squelch	Carrier operated (noise compensation and carrier override in AM Voice, FM Voice and Maritime) Threshold adjustable from -110 dBm to -60 dBm in 1 dB steps

GUARD RECEIVER (OPTIONAL)	
Frequency	Simultaneous or independent reception on 121.500 MHz and 243.000 MHz Audio output combined with main receiver output or routed independently
Antenna	Separate antenna or combined with the main receiver antenna. When combined, the sensitivity of both main and guard receivers reduces by 3.5 dB
Sensitivity	(S+N/N with ITU/T weighting) ≥10 dB at -107dBm for 30% modulation

INTERFACES	
Microphone	Provision for active or passive microphone
Headset	RX and sidetone, 0 to 3V
USB	USB (maintenance) port
Fill	GC283 connection for crypto fill device
Frequency reference	BNC for monitoring internal reference frequency accuracy
Antenna	Three configurable N-type antenna ports enable TX, RX or TX/RX combinations
Audio	Local loudspeaker 2 off 4-wire E&M narrowband 600Ω balanced interfaces. Adjustable from -20 to +10 dBm in 1 dB steps . Incorporates ALC to maintain modulation index 2 off 4-wire E&M wideband 600Ω balanced interfaces. Adjustable from -10 to +10 dBm in 1 dB steps . Incorporates ALC to maintain modulation index 1 off 2-wire 600Ω balanced TX/RX Tape recorder output, fixed level of -13 dBm
PTT (M7X)	Multiple PTT inputs (key from contact closure, phantom, positive voltage, and negative voltage)
E1	Balanced 120Ω, 2.048 Mbps E1 (G703, G704, G711) digital interface
Ethernet	Connection to 10/100Base-T network. Provides SNMP and RCMS functionality and supports VoIP to EUROCAE ED137 protocols
Serial	2 off multi-purpose RS422/485 serial ports for connection to peripherals
External reference	External 10MHz frequency reference input

MODEL INFORMATION	
BM7X	V/UHF Transceiver 100 to 400 MHz
BM7R	V/UHF Receiver 100 to 400 MHz

Options	
BM7GUARD	Internal Guard Receiver module for monitoring 121.5 MHz and 243 MHz emergency channels

M7 remote unit with handset

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