ITT

Model 5400 Underwater Telephone

Underwater Communications

Engineered for life

Model 5400 Underwater Telephone

The Model 5400 UWT is a compact, high-power acoustic underwater telephone for single sideband voice and modulated CW operation. Fully synthesized, the Model 5400 UWT covers a frequency range of 5 to 45* kHz, selectable in 1 Hz increments plus the AN/WQC and ARD-8000 frequencies. It is fully compatible with AN/UQC, AN/BQC, and ATM-504 series.

FEATURES

Advanced Digital Signal Processing results in a large number of selectable functions and frequencies with superior voice quality.

AN/UQC compatible default settings: In default mode, the system is compatible with AN/UQC series systems (carrier frequency 8.087 kHz, USB, 200 watt output power). TIPE default frequencies are also selected.

TIPE (Transponder, Interrogator and Pinger/Echo Sounder) Modes provide automatic ranging, tracking pinger, and when used with a vertically oriented transducer, depth below the surface or altitude above the bottom. It also operates on operator selected frequencies between 5 - 45* kHz.

AN/WQC Mode: In WQC Mode the system can communicate with the AN/WQC system and provide automatic ranging against an ARD-8000.

If used with an external power amplifier, the system is capable of the same output acoustic source levels as the AN/WQC.

Emergency Underwater Telephone Interface via a connector on the front panel allows access to a designated transducer by a compatible telephone.

Interface to External Equipment via rear panel connections: For XMTR Input/Output, the telephone's signal can be routed to an external power amplifier. An external source can utilize the Model 5400 UWT's power amplifier and transducer(s) for transmission. An Auxiliary Transducer Input allows an independent user access to the transducer not currently selected by the Model 5400 UWT. In addition, the Model 5400 UWT can mute external equipment when transmitting. The Receiver Output allows unprocessed data to be fed to external equipment for processing.

Interface to Data Communications Equipment by customer Data Communications Equipment (DCE) via an RS-232/RS-422 Serial Interface: Baud rate can be set from the front panel.

Up to four remote control stations can be accessed. The fourth remote control port can be used for DCE via an RS-232/RS-422 interface.

Built-in test Performance Monitor and Fault Location: The UWT automatically performs a self-diagnostic and front panel lamp test routine. If an error is detected, one of six error messages will be displayed, and the operator can perform a further series of tests to isolate the fault to circuit board level.

Two transducer outputs are standard on the Model 5400 UWT. For installations requiring multiple transducers, a separate Transducer Interface Unit is available.

The Model 5400 UWT is housed in a drip-proof cabinet, suitable for rack mount as well as table top installation. Cooling is by forced air from an internal fan.

The system is designed to Best Commercial Standards, using Military Specifications as design guidelines.

Mean Time Between Failure (MTBF) predicted at 2,600 hours when calculated in accordance with MIL-HDBK-217E, Parts Count Method.

*May be limited by the bandwidth of the installed transducer(s).

AVAILABLE OPTIONS

Remote Control Unit: The Model 5400 UWT can be controlled from up to four remote locations. The Remote Control Unit can perform all the functions of the master station, except for the EMERGENCY UWT interface which is disabled. The Remote Control Unit can be installed either in a standard 19-inch rack, or be bulkhead mounted. Power requirements are 110 or 220 V, 50-60 Hz.

Model SP23LT & SB31CT Transducers

Transducers: A selection of transducers is available, to suit a variety of applications.

Transducer Interface Unit (TIU): Where more than two transducers are to be connected (typically sector transducers), an interface unit is available. The TIU connects to the telephone transceiver via transducer position #2 and is controlled from the UWT front panel.

Optional AC/DC Power Supply

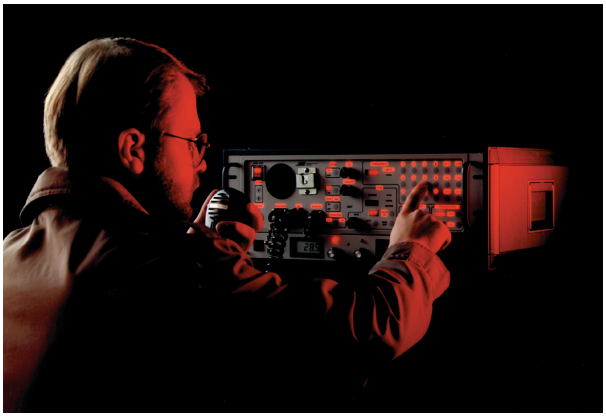
AC/DC Power Supply: AC to DC power supplies are optionally available for operation from 110 or 220 Vac. The power supply unit is configured for installation in a 19-inch rack.

Auxiliary Power Unit: This unit contains the WQC-2A equivalent power amplifier, output transformer and 115VacC/28Vdc power Supply.

Headset with Boom Microphone: The headset with boom microphone comes with a six-foot coil cord and belt clip push-to-talk switch.

OPERATOR INTERFACE

All operator controls are located on the front panel. The front panel has adjustable backlighting, except for Power On/Off, speaker Volume, Squelch and TIPE Transmission Rate, all system operator controls are membrane switches. Frequently used functions have dedicated controls, while less frequently used functions are selected by numeric code entries on the keypad. This makes operation simple while allowing flexibility and a virtually unlimited number of functions. Functions selected and parameter values are displayed on red LEDs. The frequency and Range displays are also used for display of warning messages and for results of initiated tests.



Mode changes and modifications to operating parameters are accomplished by touch switches and code entries on the front panel.

Up to 50 operator selected front panel set-ups (frequency/mode) can be stored in RAM for easy recall at any time. Five operator selectable output power levels, 200-, 100-, 60-, 10-, and 2-watts provide communication at ranges to 20,000 yards.

TYPICAL APPLICATIONS

VOICE & CW COMMUNICATION

Voice and Continuous Wave (CW) communication is the Model 5400 UWT's primary application. Communication can be established between any two points (surface ships, submarines, fixed installations, or any combination of these) in the same body of water at ranges to 20,000 yards. Operating frequencies are selectable.

Broad frequency range, adjustable output power, and selectable USB/LSB modulation, allows the Model 5400 UWT to provide discrete communication when multiple telephones are used in the same operating area as well as communication with diver carried underwater telephones.

CW transmission is available from either the front panel push button, or by Morse key via a back panel connector.

The system is designed for simultaneous voice and TIPE operation and, when proper frequency separation is maintained, mutual interference is minimized.

TIPE OPERATION

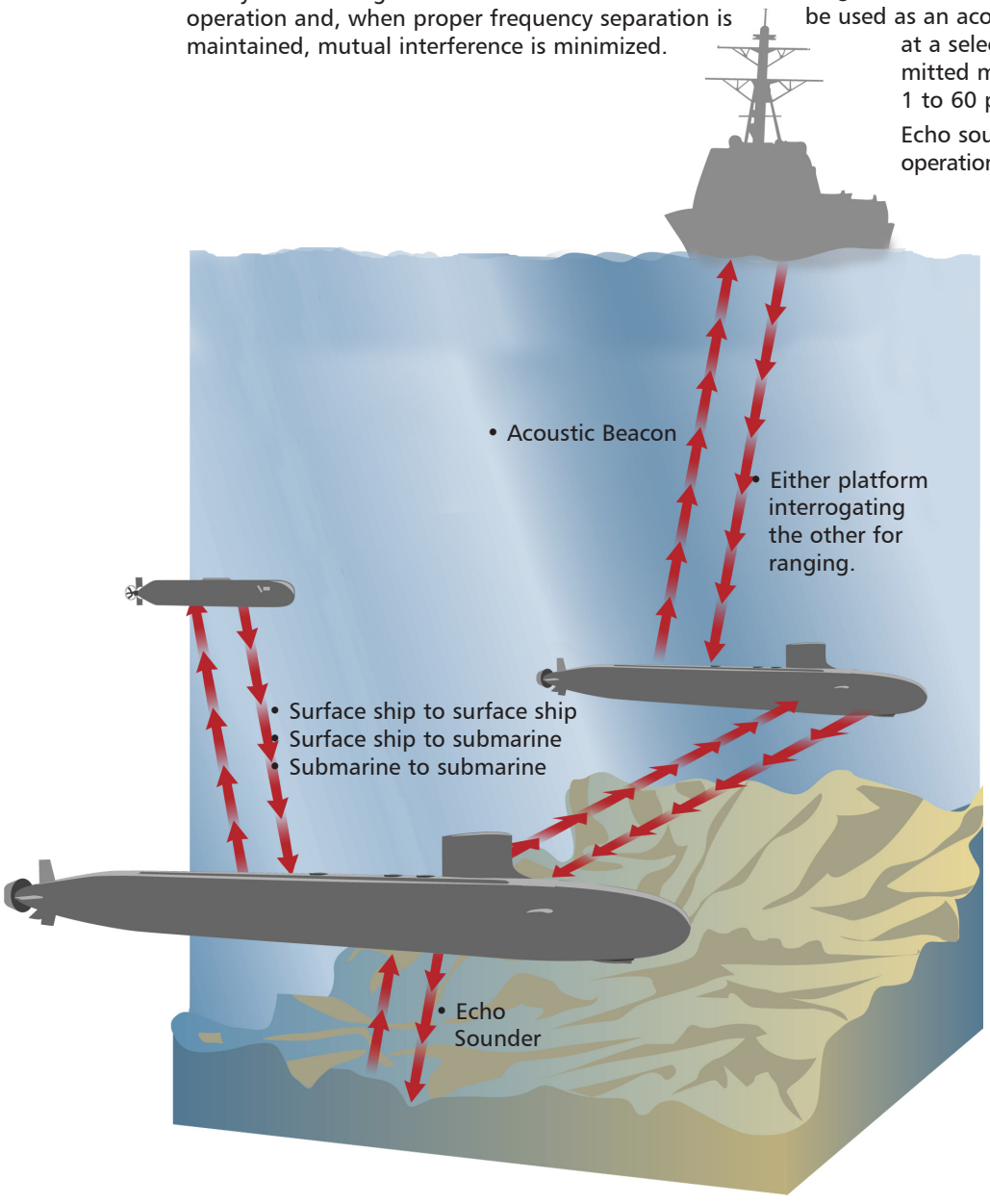
While operating in any TIPE submode, voice operation retains priority; the voice receiving channel remains audible and immediate voice transmission is available via the selected microphone.

Transponder/Interrogator: The Transponder/Interrogator Modes are used for ranging between two platforms equipped with Model 5400 UWTs, or between a Model 5400 UWT and any other acoustic device capable of generating a compatible interrogation or response signal.

Interrogation pulses can be transmitted manually, or automatically at a rate of 1 to 60 interrogations per minute. The rate is adjustable by means of the RATE potentiometer control.

Pinger/Echo Sounder: In this mode, the telephone can be used as an acoustic beacon by transmitting a signal at a selected frequency. Pulses can be transmitted manually, or automatically at a rate of 1 to 60 pulses per minute.

Echo sounder operation is the same as Pinger operation except that the transmitted signal is directed either up or down (to the surface or to the bottom) by a directional transducer. The telephone calculates the delay of the return signal and displays the depth or altitude in yards or meters.



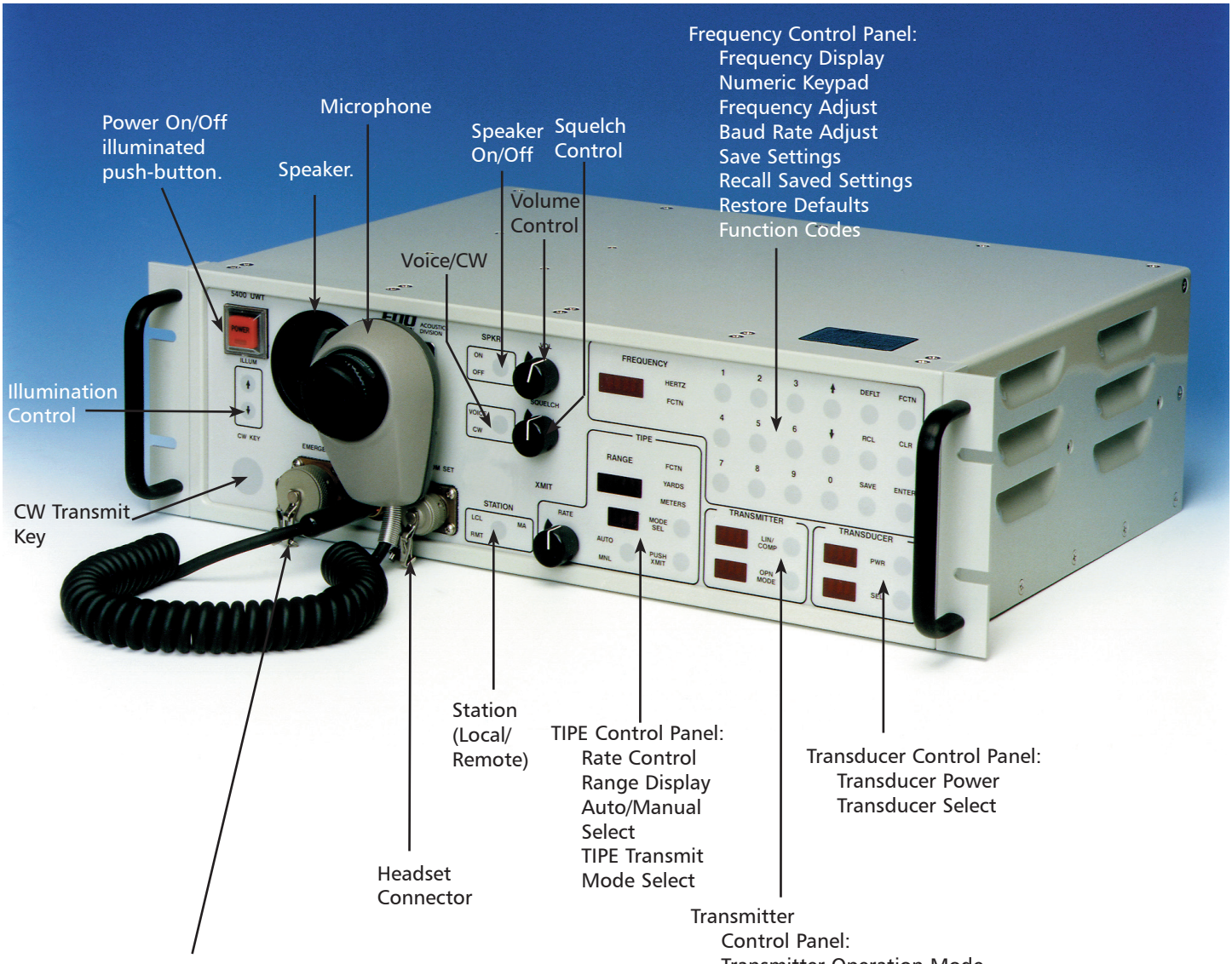
TELEMETRY

The Model 5400 UWT's transceiver and transducer(s) can be used to transmit and receive data from peripheral equipment via a connector located on the telephone's back panel.

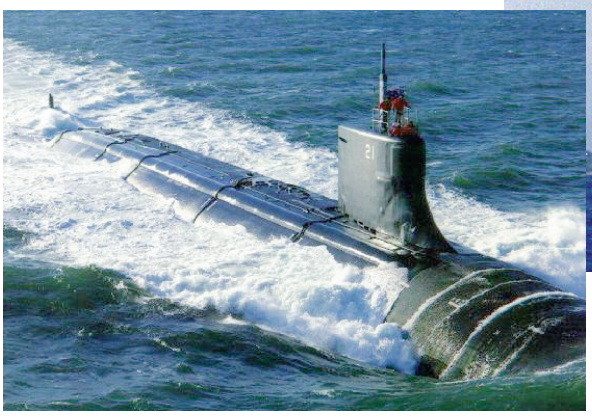
Typical applications are interrogation of coded transponders, and Identification Friend or Foe (IFF).

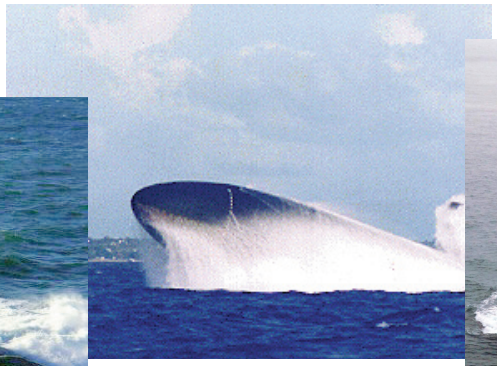
Frequency coverage is 5 to 45* kHz in 1 Hz increments.

*May be limited by the bandwidth of the installed transducer(s).



Model 5400-1 Underwater Telephone

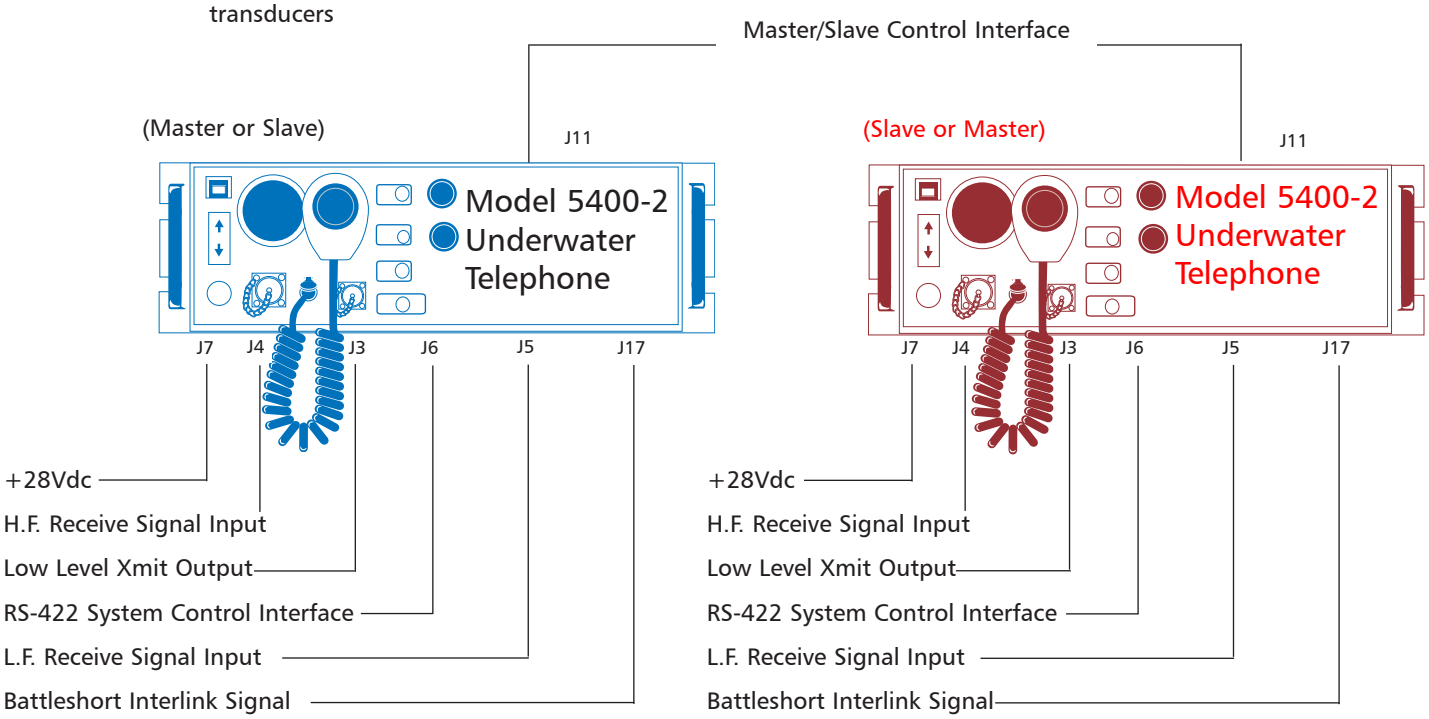




Model 5400-2 Underwater Telephone Transceiver

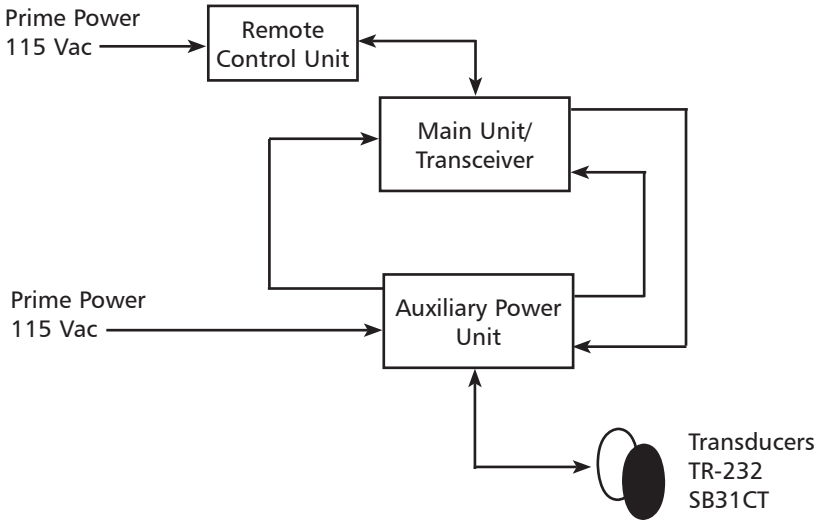
The ITT Model 5400 Underwater Telephone transceiver has been selected by Raytheon for the U.S. Navy New Attack Submarine program (NSSN), the Virginia Class SSN. This underwater telephone transceiver, designated Model 5400-2 has the following features:

- Master/Slave Operation between two Model-5400-2 transceivers
- Master/Slave selected by host computer
- Utilizes sonar system power amplifier
- Thermal warning/thermal overload sensor
- Battle short capability/indication
- Independent selection of transmit/receive transducers
- High/low power selection control
- Improved ranging accuracy
- Concurrent high/low dual band receive capability
- Ruggedized for environment condition



Model 5400/WQC Underwater Telephone System

ITT has been selected by Empresa Nacional Bazan, Factoria Naval de Ferrol to provide the Model 5400/WQC Underwater Telephone System for the F-100 Frigate Program. The Model 5400/WQC System is a modern, low life cycle cost NDI/COTS underwater communications system, which is equivalent to, or exceeds, the performance and functionality of the AN/WQC-2 system. The Model 5400/WQC Underwater Telephone System is a complete systems approach consisting of the Model 5400-1 Main Unit/ Transceiver, the Auxiliary Power Unit, Remote Control Unit, the TR-232 for LF operation, and the ITT SB31CT HF band omni-directional transducer .



5400-1 Underwater Telephone Specifications

Frequency Range (XMTR & RCVR)

Frequency,	
Operator Selectable	5-45 kHz in 1 Hz steps plus
WQC Mode	1.45 - 3.1 kHz
Accuracy	<+/-5 Hz
Passband @ -3 dB	
USB,5-42 kHz Carrier	3,000 Hz wide, up from selected carrier frequency
LSB, 8-45 kHz Carrier	3,000 Hz wide, down from selected frequency
WQC Mode (LSB).	1,650 Hz wide, down from 3600 Hz carrier frequency

Transmitter

XMT Power Levels	
5-45 kHz Range	Operator selectable, 2, 10, 50, 100, 200** watt RMS @ 28 Vdc
WQC Mode (Min)	Operator selectable, 1, 5, 25, 50, 100 watt RMS @ 28 Vdc
XMTR Output Impedance	50Ω
Audio Band	
Voice, 5-45 kHz Range	250-3,000 Hz @ -3dB
Voice,WQC Mode	500-2,150 Hz @ -3dB
CW	800 Hz heterodyned, single tone
Microphone Input	Dynamic, 600 Ω impedance
Boom Microphone (Headset)	600 Ω impedance
TIPE Modes Bandwidth	
XPNDR & INTRG Modes	30 Hz
Pinger Mode	60 Hz

Receiver

Sensitivity	10μ V for 10 dB SNR @10 kHz
Audio Band	
5-45 kHz Range	250-3,000 Hz
WQC Mode	500-2,150 Hz
Audio Output	
Headphones, Impedance	600 Ω
Built-in Speaker	2.5 watt
TIPE Modes Bandwidth	1.4 kHz

TIPE Parameters

Transponder Mode	
Frequency Selectable	5-45 kHz in 1 Hz steps
Pulse Length	28 ms
Response Delay	116 ms
Frequency, WQC Mode	2.35 kHz
Pulse Length	32 ms
Response Delay	116 ms
Interrogator Mode	
Frequency Selectable	5-45 kHz in 1 Hz steps
Pulse Length	28 ms
Frequency, WQC Mode	1.60 kHz
Pulse Length	32 ms
Pulse Rate	
Manual	Any rate < 60 pulses/minute
Auto	1-60 pulses/minute
Range Readout	Selectable, yards or meters
Max Displayed Range	26,375 yards/24,000 meters
Pinger/Echo Sounder Mode	
Frequency Selectable	5-45 kHz in 1 Hz steps
Pulse Length	14 ms
Pulse Rate	
Manual	Any rate < 60 pulses/minute
Auto	1-60 pulses/minute
Range Readout	Selectable, yards or meters
Max Displayed Range	26,375 yards/24,000 meters

System Default Parameters

Carrier Frequency (Voice/CW)	8.087 kHz
System Mode	Voice
Modulation Mode	Upper Sideband (USB)
Transmitter	
Output Power	200 watt
XMTR Configuration	Linear
Transducer Selected	Transducer #1
TIPE Modes' Defaults	
Transponder	9.337 kHz
Interrogator	10.084 kHz
Pulse Rate	Manual
Pinger/Echo Sounder	14.829 kHz
Pulse Rate	Manual
Range Readout	Yards
Speaker	On

Interfaces to External Equipment via Back Panel Connectors

J1 Receiver Output	50 Ω, transformer coupled
J2 Access to XDCR not in use	50 Ω
J3 External XMTR Input	600 Ω
XMTR Low Power Output	600 Ω, transformer coupled
J6 Main Serial Data Interface	RS232/RS422/RS423 at sel baud rate: 300/600/1200/2400/4800/9600/19200
J10 Mute Input/Output	Line to GND
External CW Key	Contact closure

Power Requirements

Input Voltage	28 Vdc +/- 15%
Power Supply	Current @ 28 Vdc
Transmit	Max 20 A @ 200 watt Output
Receive	1.1A

Environmental Service Conditions

Specifications and MIL Standards Used as design guidelines:	
General System Design	MIL-E-16400
Temperature	
Operating	0 degrees to 50 degrees C
Non-operating	-10 degrees to 70 degrees C
Humidity.	95% rel. humidity, condensing
Drip Proof	45 degree inclination, both axes
Shock	MIL-S-901C, Grade B. Class II
Vibration	MIL-STD-167, Type I, to 33 Hz @ 1G
Electromagnetic Radiation	MIL-STD-461, Class A5, Part 6; CE01. CE03, CS01, CS06, RE01, RS01, RS02, RS03 from 14 kHz to 1 GHz
Airborne Audible Noise.	<50 dB @ 3 ft from the UWT
Inclination	No limit of angle
Ambient Pressure (Inboard)	1,000 millibars +/- 400 millibars

Dimensions

Height	5.22" (132.6 mm)
Depth	13.88" (352.6 mm)
Width	17" (431.8 mm) on chassis
Weight	35 lbs (15.8 kg)

***At 50% Duty Cycle

Summary of ITT Model 5400/WQC System

Characteristic	Model 5400/WQC System
Power	115 Vac +/- 10% 60 Hz, single phase 25A max
Warm Up Time	6 seconds to complete built-in test functions
Heat Dissipation	700W (at full power)
Frequency Range High Band Low Band	 8.3 kHz to 11.1 kHz 1.45 kHz to 3.10 kHz
Transmit Output Power TypeSingle Sideband Rated Maximum	 1400 VA, 1.4 kHz to 11.1 kHz 1500 VA
Max Audio Output Power Control Station Remote Station	 2.5W 2.5W
Receiver Capability Type Reception Sensitivity High Band Low Band	 Single Sideband -160 dBV, 1 Hz BW for 10 dB SNR -157 dBV, 1 Hz BW for 10 dB SNR
Load Impedance Drive Capability	30 to 50 Ω at resonant frequency
Size & Weight Main Unit/Transceiver Remote Control Unit Auxiliary Power Unit	 5.22in. H, 17in. W, 13.9in. D, Weight - 35 lb. 5.22in. H, 17in. W, 6in. D, Weight- 11 lb. 8.75in. H, 17in. W, 20in. D, Weight- 60 lb.

Model 5400/WQC Auxiliary Amplifier Unit

The Auxiliary Power Unit contains the WQC-2A-equivalent power amplifier, output transformer and power supplies. The power amplifier utilizes a proven COTS-based auxiliary power unit with a power amplifier module of the PWM type. It is capable of delivering up to 1500 VA into highly reactive loads. The PWM technology provides a very efficient amplifier (85-90%) which maintains it's efficiency over a wide range of operating frequencies and also when driving highly reactive transducer loads. It operates from +48 Vdc. The unit includes a high power switching type power supply that is capable of delivering up to 1800 watts of +48 Vdc power.

An output transformer is provided to match the output of the power amplifier to the WQC band transducer loads. It is capable of operating at the 1400 VA power level over the frequency range of 1.4kHz to 11.1khz. An output relay switching matrix is also provided to select at least four different transducers. Transducer selection control is provided in the Model 5400-1 transceiver.

The Model 5400-1 transceiver has a built-in transmit/receive switch, however, in order to confine the high voltage to the power amplifier chassis, a T/R switch is provided within the Auxiliary Power Unit.

The high power amplifier will receive input drive signals by means of an existing 200 watt transmit power amplifier in the Main Unit which will be retained as a standby, redundant power amplifier in the event of main power amplifier failure.

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ISO 9001:2000 QUALITY

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