



## HF/SSB 5/10 KW TRANSMITTERS

The ST-5000 is a recent addition to the family of solid state, broadband high power HF/SSB Transmitters, designed to meet the new standards of software reprogrammable radios to satisfy the performance required in the use of HF radios in modern, digital communication systems.

Broadband RF amplification, with the complete elimination of tuneable elements, gives the ST-5000 the frequency agility characteristics required by ALE (Automatic Link Establishment) operation over the HF band, when associated with broadband antennas and can be optionally upgraded via software to STANAG 4444 for EPM (Electronic Protection Measures).

The highly modular design combined with the broadband architecture gives a new dimension of flexibility for adaptation to specific applications, such as the integration of the ST-5000 into infrastructural communication networks to support voice and high data rate traffic over the HF band.

In this perspective, the modular structure of the hardware and software of the ST-5000 has been designed to allow the addition of new elements to implement the “gateway” function of the Transmitter in terms of high data rate capabilities (expanded HF channel bandwidth, multi-level modulation), and interfaces for adapting the IP protocols used in infrastructural systems to the HF band.

The company has recently developed a suite of software applications supporting the transfer of file messages and e-mail using the data link protocol set out in NATO STANAG 5066, for use in products for the defence market. The ST-5000 can be configured to meet different Customer requirements.

The basic components, common to all transmitter configurations, are:

- HF/SSB Exciter, which processes the input baseband information into a low-level RF signal at the selected frequency and mode.

# SSB FAMILY

The Exciter is based on most of the requirements of the Software Defined Radio Forum Architecture and can be programmed to operate as an exciter or a receiver/exciter.

- RF amplification stages, which amplify the Exciter's low-level signal to the nominal 5kW rated RF power. The amplifier stages consist of six 1kW RF modules, combined in a powerbank configuration.

The ST-5000 is built as a standard 19" cabinet suitable for ground fixed, semi-fixed and shipboard installations, with a cooling air inlet on one side and an outlet on the top fitted for connection to a cooling air exhaust system, where available.

Two 5kW transmitters can be associated with a High power combiner to implement the 10kW ST10000/SS transmitter.

The ST-10000/SS is fully compliant with MIL STD 188 141A ALE (Automatic Link Establishment) requirements and can be optionally upgraded via software to STANAG 4444 for EPM (Electronic Protection Measures). The 10kW ST-10000/SS can be programmed as a transceiver and associated with a receive antenna, properly isolated from the transmit antenna.

The ST-10000/SS is not only a single 10kW RF transmitter; via software it can also be programmed to implement a dual 5kW RF transmitter or transceiver. The presence of two 5kW transmitters gives operators a greater availability than all other 10kW RF HF transmitters on the market.



## ST-10085

Designed for low cost, the transmitter can operate as a single frequency transmitter in conjunction with the fully solid state version ST-10000/SS to implement a High Power Shore SSB (Ship Shore Buffer) station.

The ST-10085 10kW HF/SSB Transmitter combines Modern RF low line power amplifier technologies with innovative design, resulting in reliable performance, simple operation, very compact size and low weight.

The ST-10085 is configured in a self-contained metal cabinet containing the following components:

- Exciter Unit SP-649/E
  - Common to all the company's HF/SSB Transmitters, which processes the voice/data baseband input to the RF communication channel with a fully digital design including most of the requirements of the Software Defined Radio Forum.
- RF power amplification stages
  - These amplify the exciter's output to the rated 10kW RF output level
- Power supply circuits
  - Which derive all the ST-10085 operating voltages from the 380VAC three phase primary power voltage
- Load matching network
  - Consisting of variable reactances, which automatically matches the antenna impedance to the Transmitter's 50 Ohm unbalanced output impedance over the entire 2MHz to 30MHz frequency range
- Automatic control circuits.

The ST-10085 finds specific applications in ground fixed and semi-fixed installations. To date, the ST-10085 has been supplied in quantity to military and civil organisations to meet requirements for reliable communication in the HF frequency band. More specifically, the ST-10085 is currently being used in the following:

- Shore stations of the Merchant Navy Radio Communication Service to establish communication between subscribers of the public telephone network and ships at sea.
- Shore stations of the Italian Navy and Navies of other NATO countries to support naval broadcast and other shore-to ship services.

## MAIN FEATURES

### ST-5000 & ST-10000

- Innovative software-based design to comply with the latest trends in HF radio communication
- All solid state RF power amplification based on a “powerbank” architecture, with complete elimination of tuning elements
- Broadband, linear operation to support high data rate modulation
- Frequency agility for 3rd generation ALE operation capable of software upgrade to STANAG 4444 “Slow Frequency Hopping” NATO standard for EPM operation
- Graceful degradation of performance in the event of failure of one or more RF power module
- Software downloadable capabilities for operation as HF gateway in infrastructural networks
- High data rate, software-based waveforms via embedded modem
- Modular hardware and software architecture, capable of growth
- Provisions for local control of the operating functions and remote control over an RS-232/422 interface (optionally up-gradable to TCP/IP interface)
- BITE facilities with failure isolation to module level for easy on-line maintenance
- Protection and alarms for personnel and equipment safety
- Forced air cooling by internal fan.



### ST-10085

- Fully solid state design of the RF amplification circuits, with the exception of one valve in the final RF amplification stage
- Fully solid state design of the primary power distribution system without any electromechanical switches
- Microprocessor-controlled automatic operation once the desired frequency and mode of operation have been set, with provision for manual operation by use of front panel controls
- Logging of operating parameters, number and type of failures, hours of service etc.
- Interface to a higher-level management function for integration in large radio communication systems and provision of “ad hoc” electrical and mechanical interfaces to meet specific requirements
- Remote control and monitoring of the operating functions over an RS-485 interface
- Compatibility with voice digitisation/encryption devices
- Low and high data rate operation up to 9600 bps with optional modem supporting different traffic formats (text, facsimile, low speed video, data files, etc.)
- Use of digital signal processing to implement modulation, IF filtering and audio/IF amplification
- Use of safety devices and interlocks for personnel and equipment protection.



# SSB FAMILY

## TECHNICAL SPECIFICATION

### ST-5000 & ST-10000

GENERAL CHARACTERISTICS	
Frequency range	1.5MHz to 29.99999MHz in 1Hz minimum steps
Type of services	
J3E	Analogue voice
A1A	Carrier telegraphy
A2A	Amplitude modulated telegraphy
J2A	Sideband telegraphy
A3E	Compatible amplitude modulation
B7D	Two independent data channel
B9D	Two independent data and voice
F2B	Frequency modulated telegraphy
F1B	Carrier frequency modulated telegraphy
LINK-11	As per STANAG 5511 requirements

TRANSMITTER CHARACTERISTICS	
RF power output	5kW PEP and avg, or 10kW for ST10000/SS
RF power levels	20 attenuation steps (1 dB each) from nominal RF output
Antennas	Broadband, with VSWR less than 3:1 max
Frequency stability	1part in 10 <sup>-8</sup> per day
Harmonic attenuation	-50dB minimum (55dB typical)
Intermodulation products	36dB below the PEP in a standard two-tone test
Undesired sideband attenuation	Better than 60dB in SSB modes
Carrier attenuation in SSB modes	Better than 60dB

AUDIO INPUT LEVEL	
Microphone	-46dBm into 150 Ohm ± 10dB
Balanced line	0dBm ± 10dB
Remote controlled parameters	Frequency, mode, RF power level, BITE and preset channel operation
Preset channels	255, with storage of frequency, mode and RF power level for each channel
Alarms	Primary power failure, over voltage, overcurrent, overtemperature, high VSWR
Primary power	380 VAC ± 10%, three-phase, 45 Hz to 65Hz, power consumption 20 kW max (40kW in ST-10000)
Environmental	0°C to +50°C operating, relative humidity up to 95%
Cooling	Forced air
Size	1800 x 545 x 850mm (H x W x D) (1800 x 1640 x 850mm for ST-10000)
Weight	520kg (1200Kg in ST-10000)

### ST-10085

GENERAL CHARACTERISTICS	
Frequency range	2MHz to 29.99999MHz
Tuning	Automatic and digital in 1Hz minimum steps
Tuning time	4 sec. typical
Operating modes	J3E analogue voice, A1A carrier telegraphy, A2A amplitude modulated telegraphy J2A sideband telegraphy A3E, compatible amplitude modulation B7D, two independent data channel, B9D two independent data and voice F2B, frequency modulated telegraphy F1B, carrier frequency modulated telegraphy LINK-11 as per STANAG 5511 requirements

TRANSMITTER CHARACTERISTICS	
RF power output	10kW PEP and avg
RF power level	1/1, 1/2, 1/5, 1/10 of nominal RF output
Antennas	Broadband, with VSWR less than 3:1 max
Frequency stability	1 part in 10 exp-8 per day
Harmonic attenuation	Better than 53dB
Spurious attenuation	Better than 60dB
Intermodulation products	36dB below the PEP in a standard two-tone test
Undesired sideband attenuation	Better than 50dB in SSB modes
Carrier attenuation in SSB modes	Better than 50dB

AUDIO INPUT LEVEL	
Microphone	-56dBm into 150 Ohm
Balanced line	0dBm
Remote controlled parameters	Frequency, mode, RF power level, BITE and preset channel operation
Preset channels	100, with storage of frequency, mode and RF power level for each channel
Alarms	Primary power failure, Overvoltage, overcurrent and overtemperature conditions, High VSWR
Primary power	380 VAC ± 10%, three-phase, 45Hz to 65Hz, power consumption 30kW max.
Environmental	0°C to +50°C operating, relative humidity up to 95%
Cooling	Forced air
Size	600kg