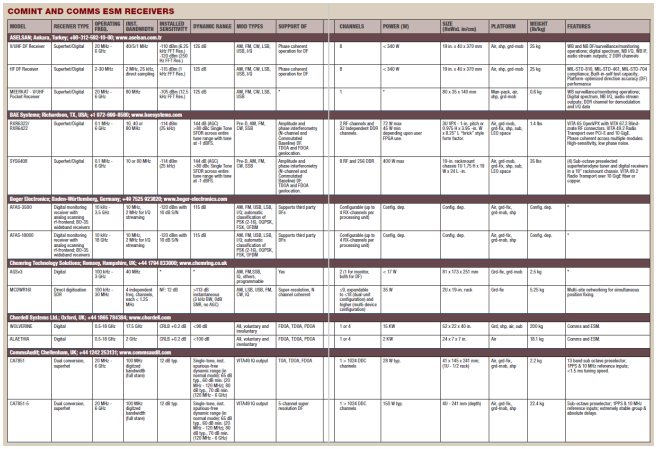
Technology Survey: A Sampling of COMINT and Communications ESM Receivers – JED, July 2019

– By John Knowles –

This month, JED is surveying communications intelligence (COMINT) and communications electronic support measures (comms ESM) receivers. Traditionally, COMINT has involved collecting the information within a message (signals internals) as well as the information about a message (signals externals), such as signals type, frequency, duration, emitter location, etc. This was more or less an arrangement of convenience, because the personnel and units who were collecting and recording the signals internals where also capturing the external signal parameters as part of the intelligence process. Before high-data-rate battlefield networks became available, tactical forces relied on intelligence units to collect COMINT and share tactical information (emitter type, location, etc.) about communications emitters in their mission area. However, the tactical commander did not have much control over this process. The message internals had to be handled separately by intelligence analysts, and the relatively small number of COMINT assets were typically tasked and controlled by higher-echelon commanders. For the tactical commander of the past, this meant he would receive a less detailed enemy comms picture than desired and that information would usually be slower to arrive than if he had control of his own comms ESM assets.



COMINT AND COMMS ESM RECEIVERS

MODEL	RECEIVER TYPE	OPERATING FREQ.	INST. BANDWIDTH	INSTALLED SENSITIVITY	DYNAMIC RANGE	MOD TYPES	SUPPORT OF	CHANNELS	POWER (W)	SIZE (HxWxL, in/cm)	PLATFORM	WEIGHT (lb/kg)	FEATURES
ASELSAN, Ankara, Turkey; +90-312-592-10-00; www.aselsan.com.tr													
VHF SIF Receiver	Superhet/Digital	20 MHz - 2 GHz	40/5/1 MHz	-110 dBm (8-25 kb/s FFT Res.); -120 dBm (250 kb/s FFT Res.)	125 dB	AM, FM, CW, LSB, USB, LVL	Phase coherent operation for DF	8	< 340 W	19 in. x 40 x 370 mm	Air, ship, grd-mob	25 kg	MSI and NB SIF transMilliance/monitoring operations; digital spectrum, NB I/Q, NB IF, audio stream outputs; 2 DDR channels
HF SIF Receiver	Superhet/Digital	2-30 MHz	2 MHz, 25 kHz, direct sampling	-110 dBm (1 kHz FFT Res.)	125 dB	AM, FM, CW, LSB, USB, LVL	Phase coherent operation for DF	8	< 340 W	19 in. x 40 x 370 mm	Air, ship, grd-mob	25 kg	MIL-STD-810, MIL-STD-461, MIL-STD-704
MISTRAT – VHF Pocket Receiver	Superhet/Digital	20 MHz - 6 GHz	80 MHz	-105 dBm (12.5 kHz FFT Res.)	125 dB	AM, FM, CW, LSB, USB	*	1	*	80 x 35 x 140 mm	Man-pack, air, ship, grd-mob	0.6 kg	Platform- optimized direction accuracy (DF) performance MIL-STD-810, MIL-STD-461 MIST surveillance/monitoring operations; Digital spectrum, NB I/Q, audio stream outputs; 1 DDR channel for demodulation and I/Q data
BAE Systems; Rickenbrien, TX, USA; +1 972-690-8100; www.baesystems.com													
ESSM(2)/ RAM(2)/ RAM(2)Z	Superhet/Digital	0.1 MHz - 6 GHz	10 - 80 or 80 MHz	144 dB (4/2C) >90 dBc Single Tone DFDR across entire tuno range with tone at -1 dBFS	Pico D, AM, FM, CW, SSB	Amplitude and phase interferometry 16-channel and Correlation/ Interferometry FDOA and FDOA geolocation.	3 DF channels and 32 independent DDR channels	73 W max 65 W min depending upon user FPGA use.	32 VPX - 1 in. pitch or 0.975 H x 3.56" w. W x 8.22" L "brick" style form factor.	Air, grd-mob, grd-fix, ship, sub, C2I/I space	1.4 lbs	STM 4/5 OpenVPX with STM 4/2.7 Mod-scale RF connectors. STM 4/6.2 Radio Transport over PCI-E and 10 GigE. Phase coherent across multiple modules; high-sensitivity, low phase noise.
SYS5400	Superhet/Digital	0.1 MHz - 6 GHz	10 or 80 MHz	-114 dBm (25 kHz)	144 dB (4/2C) >105 dBc Single Tone DFDR across entire tuno range with tone at -1 dBFS.	Pico D, AM, FM, CW, SSB	Amplitude and phase interferometry 16-channel and Correlation/ Interferometry FDOA and FDOA geolocation.	8 RF and 256 DDR	400 W max	19 in. rack-mount/ chassis: 8.9 7.75 in. x 19 W x 24 L in.	Air, grd-mob, grd-fix, ship, sub, C2I/I space	35 lbs	I/Q Sub-octave preselected channelized/wideband tuner and digital receivers in a 19" rackmount chassis. STM 4/6.2 Radio Transport over 10 GigE fiber or copper.
Beger Electronics; Bieten-Württemberg, Germany; +49 7525 923820; www.beger-electronics.com													
ATAS-2000	Digital monitoring receiver with analog scanning, Ambedand, GUI, embedded scanner	10 kHz - 3.5 GHz	10 MHz, 2 MHz for H/S streaming	-123 dBm with 10 dB S/N	115 dB	AM, FM, USB, LSB, I/Q, automatic classification of modulation, PSK, QPSK, FSK, CF/BW	Supports third party DFs	Configurable (up to 4 RX-Channels per processing unit)	Config. dep.	Config. dep.	Air, grd-fix, grd-mob, ship	Config. dep.	*
ATAS-10000	Digital monitoring receiver with analog scanning, Ambedand, GUI, embedded scanner	10 kHz - 18 GHz	10 MHz, 2 MHz for H/S streaming	-123 dBm with 10 dB S/N	115 dB	AM, FM, USB, LSB, I/Q, automatic classification of modulation, PSK, QPSK, FSK, CF/BW	Supports third party DFs	Configurable (up to 4 RX-Channels per processing unit)	Config. dep.	Config. dep.	Air, grd-fix, grd-mob, ship	Config. dep.	*
Chantelle Systems Ltd.; Oxford, UK; +44 1865 784304; www.chantelle.com													
AUDIO	Digital	100 kHz - 1 GHz	40 MHz	*	*	AM, FM, SSB, I/Q, others programmable	Yes	2-1/2 ice equalise, both for DF)	< 17 W	81 x 173 x 257 mm	Grd-fix, grd-mob	2.5 kg	*
MCDWR10	Direct digitisation SDR	100 kHz - 30 MHz	4 independent freq. channels, each 1 kHz - 3.25 MHz	NF: 12 dB	>115 dB (wideband) >130 dB (NB SMI, as AGC)	AM, LSB, USB, FM, CW, ILS	Super-resolution, N channel coherent	>5, expandable to >10 (dual-unit configuration) for higher channels (multi-Ambed configuration)	35 W	20 x 19 in. rack	Grd-fix	5.25 kg	Multi-site networking for simultaneous position fixing.
Chemring Technology Solutions; Romsey, Hampshire, UK; +44 1794 833000; www.chemring.co.uk													
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MCDWR10	Direct digitisation SDR	100 kHz - 30 MHz	4 independent freq. channels, each 1 kHz - 3.25 MHz	NF: 12 dB	>115 dB (wideband) >130 dB (NB SMI, as AGC)	AM, LSB, USB, FM, CW, ILS	Super-resolution, N channel coherent	>5, expandable to >10 (dual-unit configuration) for higher channels (multi-Ambed configuration)	35 W	20 x 19 in. rack	Grd-fix	5.25 kg	Multi-site networking for simultaneous position fixing.
Churchill Systems Ltd.; Oxford, UK; +44 1865 784304; www.churchill.com													
NVG/UVRINE	Digital	0.5-18 GHz	17.5 GHz	CPLD, +0.2 dB	>90 dB	AR, voluntary and involuntary	FDOA, TDOA, PDOA	1 or 4	15 KW	52 x 22 x 40 in.	Grd, ship, air, sub	2000 kg	Comms and ESM.
ALAETYRA	Digital	0.5-18 GHz	2 GHz	CPLD, +0.2 dB	<100 dB	AR, voluntary and involuntary	FDOA, TDOA, PDOA	1 or 4	2 KW	24 x 7 x 7 in.	Air	18.1 kg	Comms and ESM.
Commsantt; Cheltenham, UK; +44 1242 253131; www.commsantt.com													
CAT3U-1	Dual conversion, superhet	20 MHz - 6 GHz	1/2/3 MHz digitised bandwidth (full stream)	12 dB typ.	Single-tone, dual-spurious-free dynamic range (in bandwidth) of: 82 dB typ., 60 dB min. (20 MHz - 1/2 MHz); 90 dB typ., 72 dB min. (1/2 MHz - 1 GHz); 100 dB typ., 72 dB min. (1/2 MHz - 6 GHz)	WSTAR IQ output	TDA, TDOA, PDOA	1 - 1024 DOC channels	28 W typ.	87 x 140 x 297 mm; (1U - 1/2 rack)	Air, grd-fix, grd-mob, ship	2.2 kg	13 band sub octave preselector; 1PPS & 10 MHz reference inputs; <1 ms tuning speed.
CAT3U-1-G	Dual conversion, superhet	20 MHz - 6 GHz	1/2/3 MHz digitised bandwidth (full stream)	12 dB typ.	Single-tone, dual-spurious-free dynamic range (in bandwidth) of: 82 dB typ., 60 dB min. (20 MHz - 1/2 MHz); 90 dB typ., 72 dB min. (1/2 MHz - 6 GHz)	WSTAR IQ output	4-channel super resolution DF	1 - 1024 DOC channels	150 W typ.	431 - 241 mm (depth)	Air, grd-fix, grd-mob, ship	22.4 kg	Sub-octave preselector; 1PPS & 10 MHz reference inputs; extremely stable group & absolute delays.

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Two things have changed over the past two decades. Tactical forces are now connected over more robust data networks, which means lower-echelon units can share information more easily. Secondly, as these data networks began to emerge, these lower echelon forces could operate their own sensor nodes (including comms ESM systems) and share the information with the mission commander quickly. These innovations are helping drive today's need for smaller comms ESM systems that can be integrated onto tactical UAVs or "ride along" on whatever tactical platforms (tanks, APCs, small boats, etc.) are operating in a local area of interest. The point is that the tactical commander can now see – with more precision and timeliness – what is happening in communications signal environment where his or her forces are operating. This trend is driving greater interest in comms ESM systems, while the demand for COMINT systems also remains strong. It is not a coincidence that this is *JED*'s largest technology survey, with more than 50 companies responding.

This month's survey covers COMINT and comms ESM receivers operating across the HF, VHF, UHF and SHF bands. The number of communications systems operating in these frequencies has

grown as military forces have become more networked and as commercial users' appetites for greater connectivity continue to grow. These trends create dense and complex signal environments, even at the local level, which in turn require high-performance COMINT and comms ESM systems to monitor them.

In the survey table that follows, the first column indicates the unit or model number, followed in the next column by the type of receiver its uses. The next two columns describe the receiver's operating frequency range and its instantaneous bandwidth. The following two columns address typical installed sensitivity and total dynamic range. These indicate how the receiver performs against low-power signals and in noisy environments. The types of modulations the receiver can handle are defined in the next column. The following column describes if the system can perform direction finding. During the Cold War, DF systems were typically separate from COMINT systems. Today, however, there are fewer discrete communications direction-finding systems, because this function is built into many (but not all) COMINT and comms ESM systems. The next column indicates how many channels the receiver provides, which gives an indication about how many signals can be monitored and processed at any time. The remaining columns describes the unit's power requirements, size, which types of weapons platforms it is designed for, and weight. ♦

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