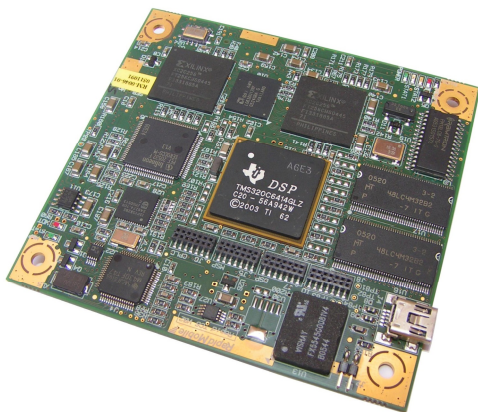


TC6 HF Modem & ALE Module

High-speed HF Data Modem Waveforms

The **TC6** is a high-performance *HF modem and ALE Controller* module (daughterboard). The module is intended for integration into HF radio transceivers and systems.



Key Features & Benefits

- MIL-STD-188-110 A/B
- STANAG 4539 (QAM)
- STANAG 4285 (PSK)
- STANAG 4529 (NB PSK)
- STANAG 4415 (robust)
- STANAG 4481 (P/FSK)
- STANAG 5065 (MSK)
- 9600bps in 3 kHz
- 19200bps (ISB radio)

The options **ALE** and **Signal Detection** are built-in and can be installed with a *RapidM* license key.

Data is transferred at rates of up to **9600 bps full-duplex** over a standard 3 kHz HF radio link and **19k2** over an ISB link when integrated with an ISB transceiver.

Adaptive equalization mitigates the effects of channel multi-path. Convolutional encoding and soft-decision Viterbi decoding provides forward error correction.

Cancellation of narrowband co-channel interference is accomplished via adaptive tone excision capable of eliminating up to four signals.

Modem Software Packs

The waveforms that are included in the **TC6** can be customised by choosing from two software packs. Please see the reverse page for more details.

2nd Generation ALE

Optional embedded Automatic Link Establishment with linking protection (MIL-STD-188-141B Appendix A/B) enables the module to connect to other stations without operator intervention.

- Software Option
- MIL-STD-188-141B App A
- FED-STD 1045
- Occupancy Detection
- MIL-STD-188-141B App B
- FED-STD 1049
- Linking Protection

This software option performs all the **ALE** protocol functions namely individual calling, one-to-many calling, sounding and scanning of up to 5 channels per second. The Listen before transmit functionality operates concurrently with all of the data waveforms.

Interfaces

The **TC6** has the following interfaces:

Control	Synchronous serial I/F McBSP port
Digital Audio	Synchronous serial I/F McBSP port
DTE	USART, sync & async LVTTTL levels
Keyline	3.3V LVTTTL levels
PPS	Pulse-Per-Second input (for ALE LP)
Zeroise	3.3V LVTTTL clears FLASH & RAM
Supply	3.3VDC
Expansion port	proprietary 100-way connector

Control Protocol

The **TC6** uses a sub-set of the **RM6** Control Protocol. This covers the following.

- General Hardware commands
- DTE, Audio commands
- Waveform, ALE control commands
- Signal Detection control commands.

The **TC6** control Protocol also enables the user to log key communication parameters:

- Signal to noise ratio
- Bit Error rate (for STANAG 5066 DRC decisions)
- Channel parameters (Doppler offset, Doppler spread, multi-path spread, number of paths etc.)

Signal Detection

- Software Option
- ± 200 Hz Carrier Offsets
- S 4285 / 4529 AUTOBAUD

The Signal Detection option includes the capability to detect and classify ALE and a number of PSK waveforms.

STANDARD	CODING MODULATION		DATA RATES & CHARACTERISTICS	MODEM SOFTWARE PACK	
				M1	M2
MIL-STD-188-110B APPENDIX C	C	PSK/ QAM	3200, 4800, 6400, 8000, 9600 bps	•	•
	U		12800 bps	•	•
STANAG 4539	C	PSK/ QAM	75, 150, 300, 600, 1200, 2400, 3200, 4800, 6400, 8000, 9600 bps	•	•
	U		12800 bps	•	•
MIL-STD-188-110B	C	PSK/ QAM	75, 150, 300, 600, 1200, 2400, 3200, 4800, 6400, 8000, bps	•	•
MIL-STD-188-110B APPENDIX F	C	PSK/ QAM	ISB: 9600, 12800, 16000, 19200 bps	•	-
MIL-STD-188-110A § 5.3	C	PSK	75, 150, 300, 600, 1200, 2400 bps	•	•
	U		4800 bps	•	•
STANAG 4415	C	PSK	NATO robust: 75 bps	•	•
STANAG 4285	C	PSK	75, 150, 300, 600, 1200, 2400 bps	•	•
	U		1200, 2400, 3600 bps	•	•
STANAG 4529	C	PSK	75, 150, 300, 600, 1200 bps	•	•
	U		600, 1200, 1800 bps	•	•
STANAG 4481 PSK	C	PSK	300 bps	•	•
STANAG 5065	C	FSK MSK	75 bps (FSK) 300 bps (MSK)	•	-
STANAG 4481 FSK	U	FSK	Single channel: 75 bps Multi-channel: 75 bps selectable carrier	•	•
FSK VARIABLE	U	FSK	Data Rates: 50, 75, 100, 150, 200, 300, 400, 600, 1200 bps Mark & Space Frequency: 350 to 3000 Hz	•	•

GENERAL	
ALL WAVEFORMS	Carrier capture range ± 200 Hz. Sync-on-Data Frequency tracking of up to 75 Hz changing at 3.5 Hz per second (triangular sweep)
BIT	Comprehensive BIT (Built-In-Test), Continuous error detection
PRESETS	20 Factory Presets, 10 Custom Presets
AGC CONTROL	Transceiver AGC control is necessary for optimum performance of QAM W/Fs
REMOTE CONTROL	All W/Fs and 2G ALE settings are remote controllable via Remote Control Port
AUTOBAUD	All PSK waveforms except for STANAG 4285 & 4529. Sync-on-Data capability.
TOPEXCISION	Narrowband Interference cancellation of up to 4 signals

SOFTWARE OPTION	CHARACTERISTICS
ALE 2G [OPTION] MIL-STD-188-141B APPENDIX A, B & FED-STD 1045 FED-STD 1049	<p>Automatic Link Establishment 2nd Generation (2G ALE) Occupancy Detection: MS 110A/B, S 4539, S 4285, S 4415, S 4529, S 4481, FSK, 8-FSK, SSB Voice Protocol: Calling, AMD, DTM, Excluding: DBM, AQC-ALE</p> <ul style="list-style-type: none"> • Link Quality Analysis (LOA) • Scanning (2 or 5 channels per second) • Selective Calling • Automatic Sounding • Automatic Hand-Off to Internal Modem • Linking protection (AL-2), requires GPS inputs <p>The control protocol is available from <i>RapidM</i>.</p> <p>The module may already support a particular radio. If not radio control protocol must be available to <i>RapidM</i> for integration & testing.</p>

INTERFACES	
DTE (DATA) PORT	<p>EIA 530E USART interface (suitable for RS-422 balanced, RS-423/RS-232D unbalanced):</p> <ul style="list-style-type: none"> • Synchronous: <ul style="list-style-type: none"> • Data Rates: 50, 75, 100, 150, 200, 300, 400, 600, 1200, 1800, 2400, 3200, 3600, 4800, 6400, 8000, 9600, 12800, 16000, 19200 bps • Internal or external data clock, 75 to 19,200 bps Full Duplex • Clock Internal (DCE supplied), External (DTE supplied) • Asynchronous: <ul style="list-style-type: none"> • Data Rates: 75 to 115200 bps • Full Duplex, 5/6/7/8 bit data, 1 or 2 stop bits, • Flow Control: CTS/RTS or XON/XOFF
REMOTE CONTROL & AUDIO PORT	<p>2 channels: Texas Instruments TMS320C64xx McBSP port. The control protocol is available from <i>RapidM</i>.</p>

INSTALLATION		ENVIRONMENTAL	
SIZE	85 x 90 x 11mm (w x d x h)	TEMPERATURE	-40°C to +85°C (operating); -40°C to +90°C (storage)
POWER	3.3V DC		

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