

Exhibit 12 Revision A – Operational Description

General Dynamics C4 Systems VHF CM-350 Digital Transmitter (VDT)

FCC ID: MIJCM350V

Model No. CM-350

12.0 Operational Description

OVERALL FUNCTIONING

Presentation

The CM-350 VHF Digital Transmitter (VDT) is a VHF multimode transmitter (A3E-ACARS-MODE2) operating with an output power of 5 W to 50 W. It is used in accordance with analog modulation (AM type) and digital modulation (AM-MSK or D8PSK type). The transmitter is fully digital controlled.

Architecture

The CM-350 transmitter is formed of five principal parts: Mains power, control/monitoring, RF processing, signaling on the front panel and rear connectors.

a) Mains:

It is generated from a 24 V typical power battery input. The REAL16069PCB ensures the monitoring of this source.

For version A, it is generated from a mains power supply block and a 24 V typical power battery input. In this case, the REAL 16061 PCB in the ALIM 26233 module ensures the monitoring of these two sources and their switch-over. The operation is fully analog in both the cases.

b) Control/ monitoring:

It is processed by the CTRL 11179 PCB, which stores the operating information and executes the associated operations in an analog and/or digital way. It uses a microcontroller for that (transmitter monitoring) and a DSP (modulating signal processing).

c) RF processing:

A frequency synthesizer on the CTRL 11179 PCB generates the VHF carrier frequency. This frequency is then transmitted to the independent VHF module AMPV26188, providing a modulator stage, and several gain stages to supply the necessary power, a demodulator stage and a directional coupler stage (CODI) for retrieving an output image. Like the mains supply this part is totally analog.

d) Front panel signaling:

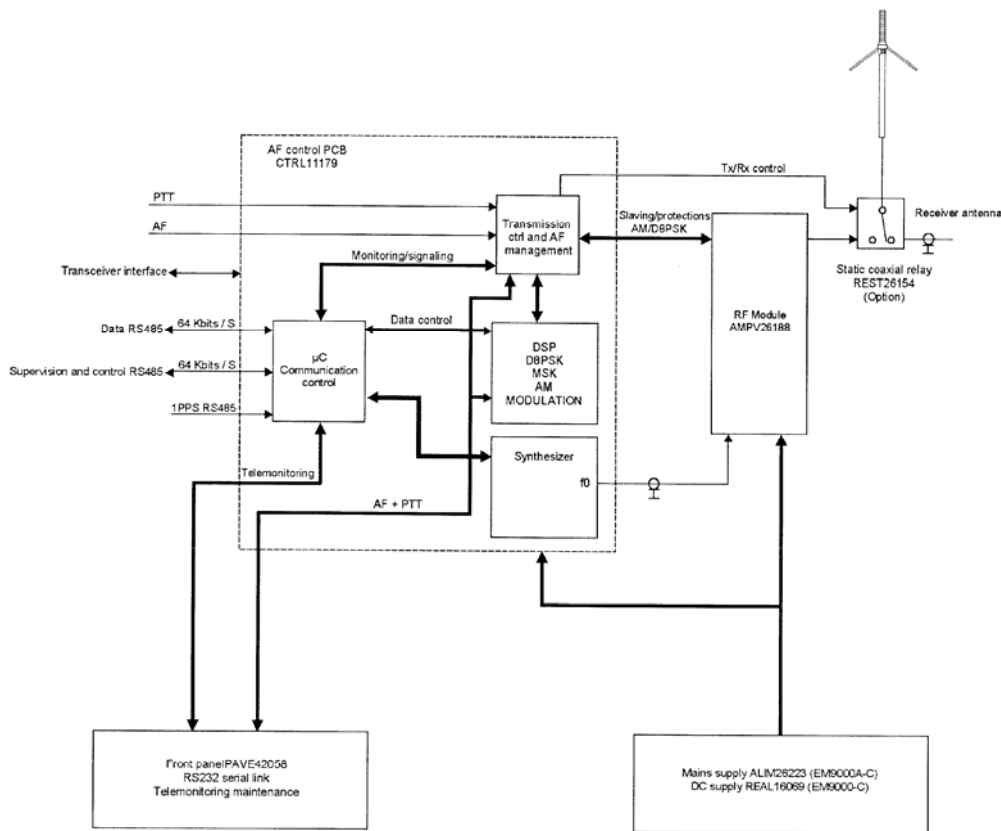
The signaling is generated by the CTRL 11179 PCB and sent to the front panel through the PAVE42055 (for EM 9000-C), or PAVE42058 (for EM 9000A-C). It indicates the transmitter status.

e) Rear connectors:

Apart from the front panel maintenance connection all the other connectors are in the rear (see Chapter 6 - Connections). This allows for the unit to be used by remote control and its connection to the antenna.

Operating block diagram

The general block includes the previously described constituent elements of the transmitter. The functions of each of these elements are described here below.



Mains power supply

The mains supply realizes the following two functions:

a) supplying of general mains power +24 V dc to the transmitter:

with an external 24V dc voltage (stand-by source), or mains voltage (main source) while controlling the inrush current at the power-up of the unit. The 24 V dc voltage supplied to the transmitter is monitored permanently and an inhibition signal is activated in case of low-level voltage.

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|--|-------------------------------|
| 1) DC Voltage into Final RF Amplifier: | 24 Volts DC, nominal |
| 2) DC Current in the Final RF Amplifier: | 13.5 Amps (@50W output power) |

b) monitoring of the automatic switching:

on stand-by source in case of main source failure.

Control/monitoring

The control and monitoring section of the transmitter regroups ten functions.

a) Transmitter operation:

In Local mode:

- For the AM mode, it ensures the AF modulation via the "mike" input, and listening of this AF via the "headset" output. A test push-button generates a modulated carrier at 1 kHz, 85% modulation.
- For the ACARS or MODE2 digital modes only the push-button test is active. It generates a carrier modulated by a random AF signal in AM-MSK (ACARS mode) or in D8PSK (Mode 2).

In Remote Control mode:

- For the AM mode, it uses the remote AF (coming from the "line" input) and PTT signals.
- For the ACARS or MODE2 digital modes, it provides the data link transmission.

b) Telemonitoring:

In the local mode, using a PGM 9000 or an ASCII terminal or in remote control through the JBUS connection, it gives the possibility to the user to modify or define some configuration parameters of the unit such as: operating mode, output power, AF line level, RF frequency, climax, data port transmission rate, JBUS address and rate, time out in transmission. It also allows for taking the measurements during the operation: forward power, SWR, power supply voltage, modulation ratio, VHF module temperature, power supply module temperature (only for version A).

c) Modulation signal processing:

After selection of the local or remote AF modulation, this is processed according to the AM or digital modulation mode (filtering, compression, coding, AM, AM-MSK or D8PSK modulation).

d) Signaling:

It indicates the operating state of the transmitter, either in the local mode through the front panel indicators, or in the remote mode, via the information signals provided by the operating connector.

e) Slaving:

Regardless of the operating mode and RF frequency, this ensures the correct smoothing of the power during its rise and fall time, relative to the references supplied by the unit and allows maintaining the power in the transmitter output when it is transmitting.

f) Protection:

During transmission, the transmitter is monitored through some operating parameters such as: modulator command level, SWR, temperature, mains voltage, PTT duration, watchdogs etc. In case of failure, the transmitter is put under protection to prevent it from causing any internal or external damage.

g) Frequency synthesis:

It allows the transmitter to operate in the VHF frequency band from 118 MHz to 136.975 MHz. This band can then be adapted to meet more specific demands, from 108 MHz up to 144 MHz.

h) Maintenance:

It is provided by a "TEST" push-button, in local, which checks the presence of the carrier RF and the modulating AF frequencies, or a "TEST" command, in local from the ASCII terminal connected to the front panel, or in remote through the JBUS connection.

i) Official updating:

It allows the downloading of software adaptations and releases.

j) Measuring:

Associated with the teleprocessing function, it informs the user on the value of several physical signals: forward and reflected power, temperature of the VHF and the power supply modules (version A only for the latter), mains voltage, modulation ratio, power of the modulating AF signal in AM.

Power section

The power section has four functions:

a) Carrier modulation:

It does the mixing of the carrier RF frequency and the modulating AF signals originating from the CTRL 11179 PCB and provides the resulting signal to the following power stages.

b) Amplification:

This helps to obtain the required power in the transmitter output.

c) RF Filtering:

It helps to reduce the level of harmonic lines in the carrier frequency appearing outside the transmitter operating range.

d) Demodulation:

It provides the demodulated AF information used in the slaving loops (demodulated I signal or demodulated Q signal) or in the display of power and SWR calculation (Pdir and Pref signals)