GTM WGASS-XTRANS MODULE

DESIGN DOCUMENT

INTERMAP

DOC-1011
Version 2.00
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DOCUMENT HISTORY

Version	Date	Comment/Description of Change	Author(s)
1.00	May 12, 2003	First Draft Release	TRM, WRT
1.10	July 01, 2003	Blockdiagrams updated for review	ML
1.12	July 23, 2003	Added error information to software	TRM
1.13	August 11, 2003	RF Blockdiagram changed	ML
2.00	June 01, 2006	Updating of design doc with respect to new STAR4 module developments (05535)	PG, ML

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Purpose

This document describes the design of the GTM waveguide assembly, X-band transmitter module as part of the GTM core technology. The GTM core technology provides the basic subsystems required for an interferometric radar system.

1.2 Scope

This document first provides a functional description and the design requirements. It then describes the detailed design in terms of hardware, software, and mechanics. Finally the theory of operation, test procedures, and calibration is included.

The document assumes that the reader has a basic understanding of interferometric radar systems, airborne remote sensing platforms, Intermap products and processes and computer systems technology.

1.3 Definitions, Acronyms, and Abbreviations

GTM.....Global Terrain Mapper
LRU.....Line Replaceable Units
TCP/IP.....Network Communication protocol
MCC.....Master Control Computer
ANT..... Antenna Module
RCVEX-RCAS..... Receiver Exciter – Radar Control and Acquisition System Module
PWRDIST..... Power Distribution Module
NAV.....Navigation Module
WGASS-XTRANS..... Wave Guide Assembly – X-Band Transmitter

1.4 References

1. DOC1000_v 1.01d – GTM SRS
2. DOC1002_v1.1 – GTM System ICD
3. DOC1008_v1.00 – GTM Hardware ICD

2 FUNCTIONAL DESCRIPTION

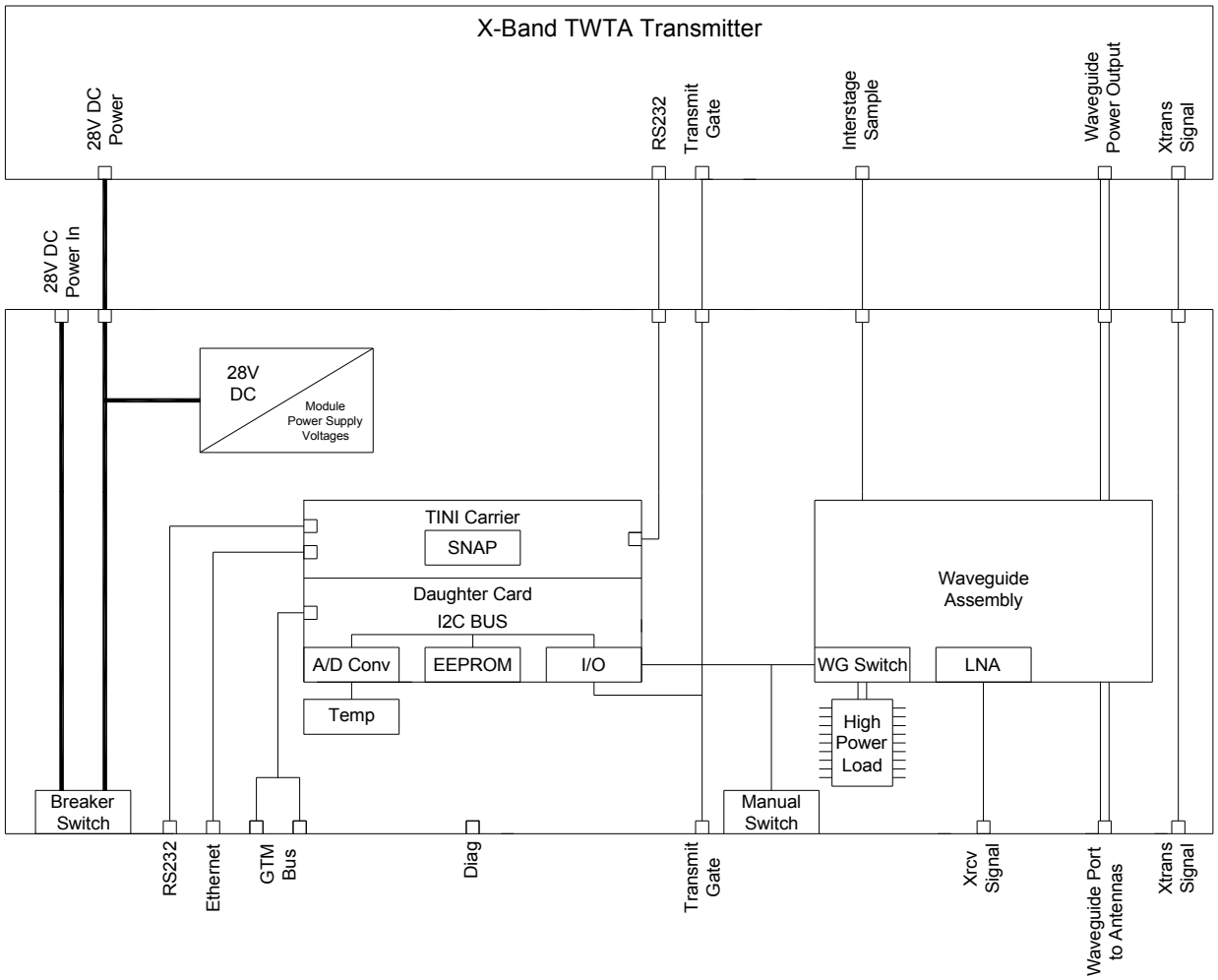
The GTM WGASS-XTRANS module provides an interface to the Transmitter and controls antenna switching.

The module takes the low power high frequency signal and amplifies it before being sent out the wave guide assembly to the antennas. The return signal is received by the antennas and sent back the module. The power of the receive signal is adjusted in the module to a calibrated value for the RCVEX-RCAS.

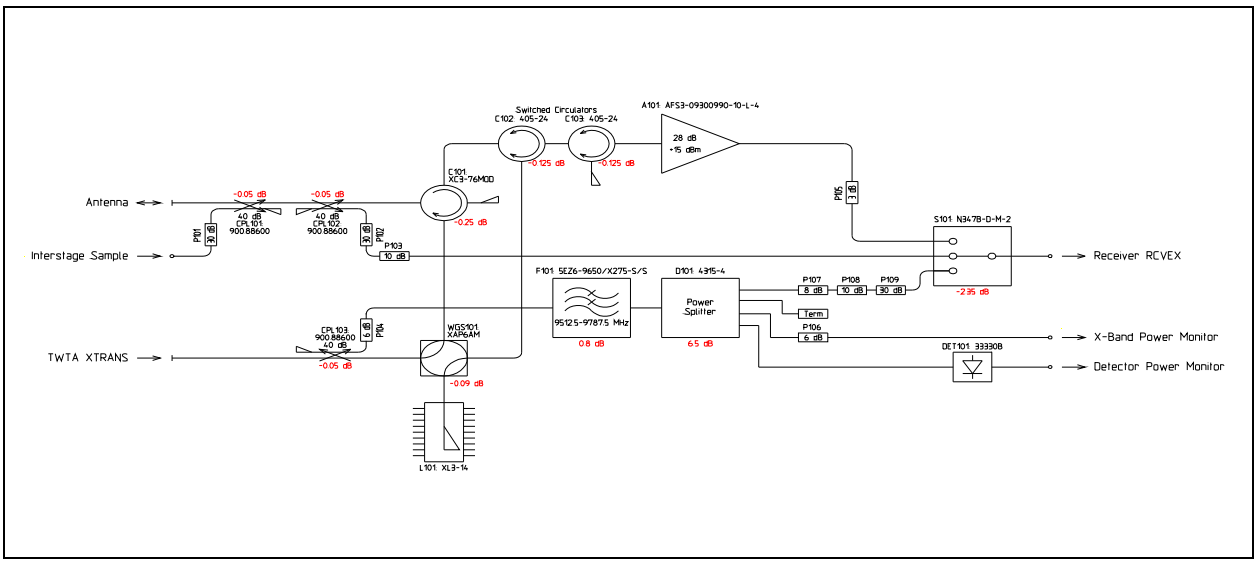
The Module contains a DC power supply for the transmitter. Communication to the transmitter is done over an RS232 connection to the SNAP micro controller. The module contains a Switchable Dummy load to dissipate the high power. The dummy load may be switched using software or a front panel switch.

The module collects the raw status data from the transmitter and makes it available on the Ethernet. Additionally, it creates a modules status packet and broadcasts it to the GTM system. All Data sent from the module will be time stamped to GPS time.

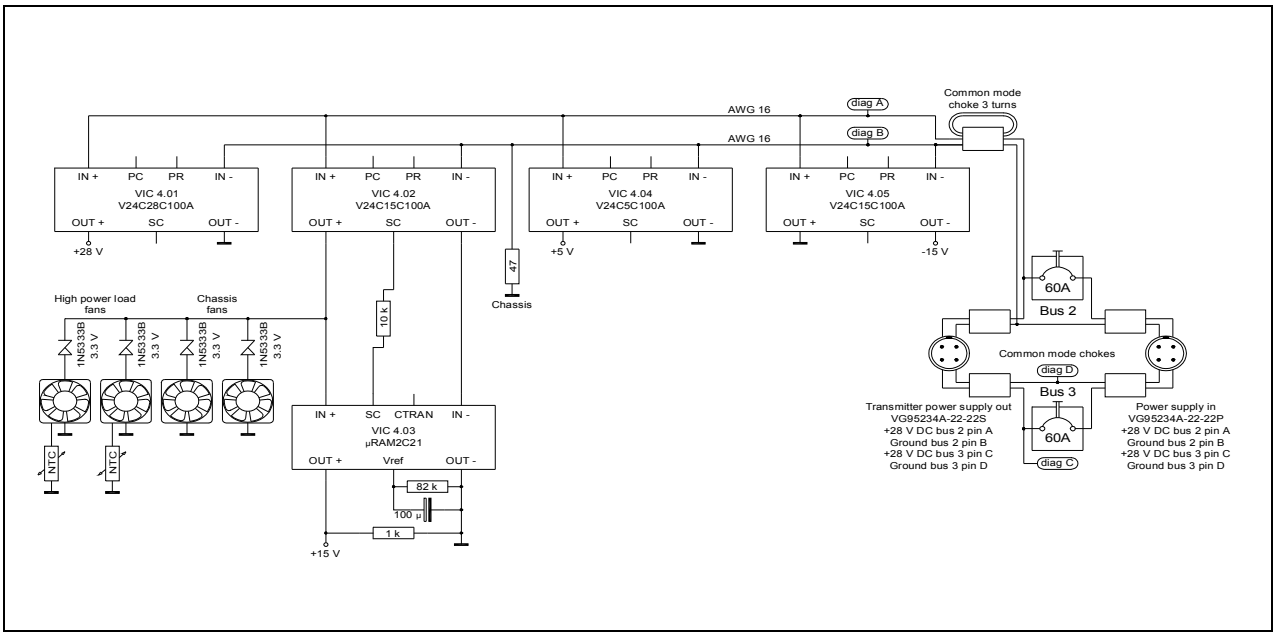
2.1 Functional Blockdiagram



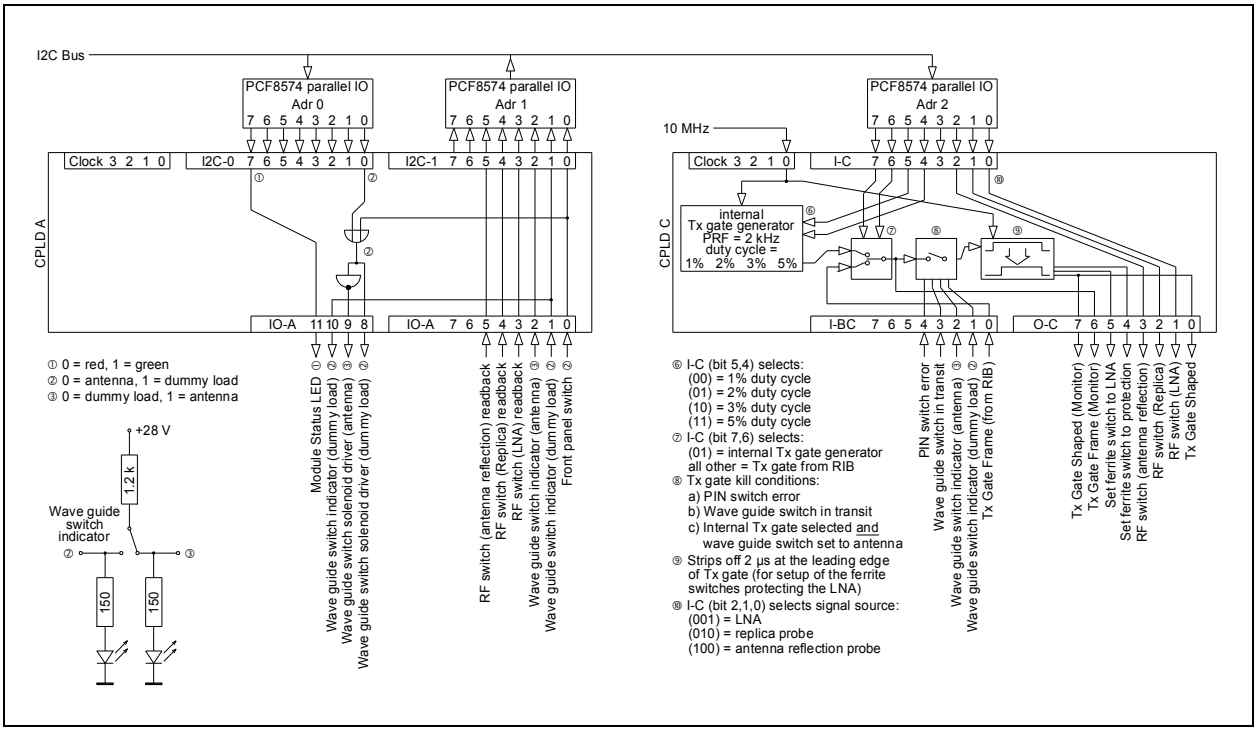
2.2 RF Blockdiagram



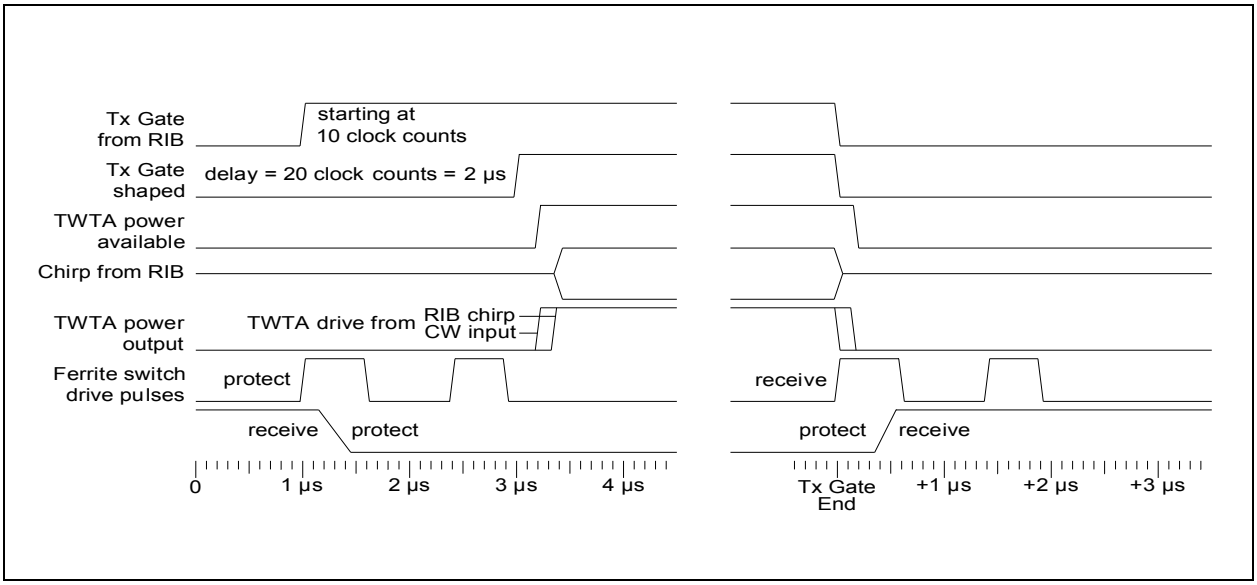
2.3 Power supply



2.4 CPLDs



2.5 Tx gate timing and LNA protection



3 DESIGN REQUIREMENTS

3.1 Transmitter Interface

The WGASS-XTRANS must provide an interface to the Quarterwave X-Band Transmitter. To accomplish this, the module contains a $28V_{DC}$ to $270V_{DC}$ power converter to provide power to the Quarterwave transmitter. The transmitter status and control is provided through an RS232 interface which feeds directly to the SNAP microcontroller.

3.2 Switchable Dummy Load

1. The WGASS module must provide a switch able dummy load, with proper forced air-cooling for sustained 400W power dissipation. Note: Testing at 400W requires an 8kW transmitter; if no 8kW is available the unit will be tested to 200W (4kW transmitter).
2. A Dummy load switch must be located on the front panel. The switch must toggle between dummy load and software controlled.
3. When the dummy load is selected, the high power signal is not transmitted through the antennas.

3.3 Low Noise Amplifier

The WGASS will provide for signal reception a low noise amplifier (LNA), calibrated to a specified gain.

3.4 Waveguide Connections

The WGASS will contain an output waveguide for the high power RF.

3.5 Antenna Switching

The WGASS-XTRANS will provide antenna switching on PRI. The firmware will monitor antenna switching and detect any faults.

Antenna switching performance requirements varies on integration.

3.6 GTM Software Interface

The embedded software will provide a Transmitter raw data stream. The WGASS-XTRANS module will also provide a software command interface and a broadcasted WGASS-XTRANS status stream. This Status stream will include current module status, GPS Time, RIB and RCVEX configuration.

The WGASS-XTRANS Status packet must be broadcast to all radar modules and the MCC at least 1 per second.

3.6.1 Transmitter Raw data stream

The Firmware will stream all raw status data read from the attached transmitter. The raw Data will be time tagged and sent the MCC.

3.7 Fault Indicator

The red chassis fault light will illuminate under any of the following circumstances:

- The maximum temperature of the unit is exceeded.
- The embedded software reports an error

3.8 Configuration / Calibration Tracking

The WGASS-TRANS module will contain the WGASS-TRANS configuration file (EEPROM) via the internal 1-wire data bus

4 INTERFACE

What connectors are available on this module?

5 HARDWARE DESIGN

5.1 PCBs

5.2 FPGA core

- register maps?

6 SOFTWARE DESIGN

6.1 Firmware

Table 1 - NAV Module Error flag source list

Condition	Source	Error flags
Cannot read the full command packet, or sync field is not accurate.	CommandServer	Command, Network
Cannot send a command response packet.	CommandServer	Command, Network
Cannot register External Interrupts	SnapIRQAdapter	Firmware
Illegal Address Exception (while servicing ISR)	SnapIRQAdapter	FPGA, Firmware
Error Sending Status	StatusServer	Network, Status
Illegal Address Exception (while Collecting Status)	StatusServer	FPGA, Firmware, Status
Cannot create UDP objects / Data gram	StatusServer	Firmware, Status
Serial Port in Use or Cannot be configured	XtransSerialAdapter	Serial Error
Illegal Address Exception	XTransCommandServer	FPGA, Firmware

1-wire
config
data handling
interrupts
command implementation

7 MECHANICAL DESIGN

Physical design (chassis)

Electrical characteristics

8 THEORY OF OPERATION

What happens in the system when a command is sent??
How is it connected?
How does it control?

9 MAINTANANCE

9.1 Test Procedures

How to test?

9.2 Calibration

How to calibrate??

APPENDIX 1: DRAWINGS

APPENDIX 2: SCHEMATICS