

T/X-DDC/AFE

RF Aplifier for Digital Radio Receiver DCM

User's Guide

covers:
T/X-DDC/AFE rev.1A

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About this Document

This user's guide contains description for *T/X-DDC/AFE* external RF amplifier for digital radio receiver DCM for *TORNADO* DSP systems/controllers/coprocessors from MicroLAB Systems Ltd.

This document does not include detail description neither for *TORNADO* systems, nor for TI DSP and corresponding software and hardware applications. To get the corresponding information please refer to the following documentation:

1. ***T/SDAS-DDC1 Digital Radio-Receiver SIOX DCM for TORNADO DSP Systems/Controllers/Coprocessors. User's Guide.*** MicroLAB Systems, 1999.
2. ***TORNADO-PX/DDC4 Quad Digital Radio-Receiver PLOX Coprocessor DCM for TORNADO DSP Systems/Controllers. User's Guide.*** MicroLAB Systems, 2000.

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Chapter 1. Introduction

This chapter contains general description for *T/X-DDC/AFE* external RF amplifier.

1.1 General Information

T/X-DDC/AFE (fig.1-1) is a single-channel external RF amplifier for digital radio receiver daughter-card modules (DCM) for *TORNADO* DSP systems/controllers/coprocessors from MicroLAB Systems Ltd.



Fig. 1-1. *T/X-DDC/AFE* external RF amplifier.

Installation

T/X-DDC/AFE RF amplifier connects as external device to *T/SDAC-DDC1* SIOX digital radio receiver DCM and *TORNADO-PX/DDC4* quad-channel digital radio receiver coprocessor DCM from MicroLAB Systems Ltd. Fig.1-2 shows connection of *T/X-DDC/AFE* RF amplifier to *T/SDAC-DDC1* SIOX DCM.

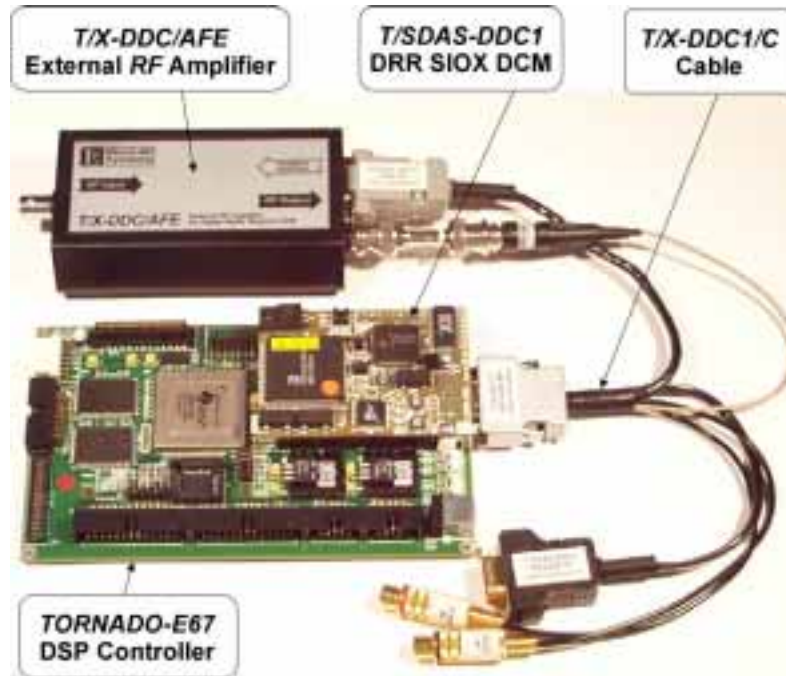


Fig. 1-2. T/X-DDC/AFE connected to T/SDAS-DDC1 digital radio receiver DCM, which is installed onto TORNADO-E67 stand-alone DSP controller.

Overview

T/X-DDC/AFE external RF amplifier provides one channel of RF bandpass RF amplifier with internal gain control feature, which can be controlled by external DC voltage.

T/X-DDC/AFE external RF amplifier is available in a variety of off-the-shelf configurations for the band-pass and central frequency parameters. Also available are the customized bandpass and central frequency parameters for T/X-DDC/AFE external RF amplifier.

T/X-DDC/AFE external RF amplifier features externally voltage controlled gain parameter within a wide gain range. This output voltage for external gain control is available as standard from all digital radio receiver DCMs for TORNADO DSP systems/controllers/coprocessors from MicroLAB Systems Ltd.

applications

T/X-DDC/AFE RF amplifier has been designed for IF/RF pre-amplifiers for digital radio applications using TORNADO DSP systems/controllers/coprocessors with the corresponding digital radio receiver DCM.

T/X-DDC/AFE RF amplifier can be also used as external RF amplifier option with a variety of 3rd party RF equipment.

1.2 Technical Specifications

The following are technical specifications for *T/X-DDC/AFE* external RF amplifier for temperature of external environment +25°C.

<i><u>parameter description</u></i>	<i><u>parameter value</u></i>
<i>RF channel:</i>	
number of I/O channels	1
input impedance for RF-IN input	50 Ohm ±5%
output impedance for RF-OUT output	50 Ohm ±5%
maximum input RF voltage range	0.5 Vrms
maximum output RF voltage range	1.4 Vrms
gain factor, controlled by external DC voltage	0dB..+80dB (log function)
external DC voltage range for gain control	0V..+4V
gain settling time within 10% accuracy	12mS typ
central frequency / bandpass configurations	10.7MHz/150kHz 10.7MHz/330kHz 10.7MHz/1MHz 10.7MHz/2MHz 10.7MHz/5MHz 21.4MHz/2MHz 21.4MHz/5MHz 21.4MHz/10MHz (customized configurations are available on request)
bandpass ripple	±3 dB typ (refer to individual certificate)
bandstop ripple	- with 160kHz bandpass: -40dB at 400kHz bandpass - with 330kHz bandpass: -40dB at 680kHz bandpass - with ≥1MHz bandpass: 36dB/octave typ (refer to individual certificate)
THD	64dB typ at 0.7Vrms output voltage

physical/power

external power supply voltages	$\pm 9V.. \pm 15V$
power consumption	+12V@80mA, -12V@80mA
dimensions	2.6"x4.25"x1.12"

Chapter 2. Construction

This chapter contains description of architecture and construction for *T/X-DDC/AFE* external RF amplifier.

2.1 Block Diagram

Basic configuration and connectivity of *T/X-DDC/AFE* module is presented at fig.2-1.

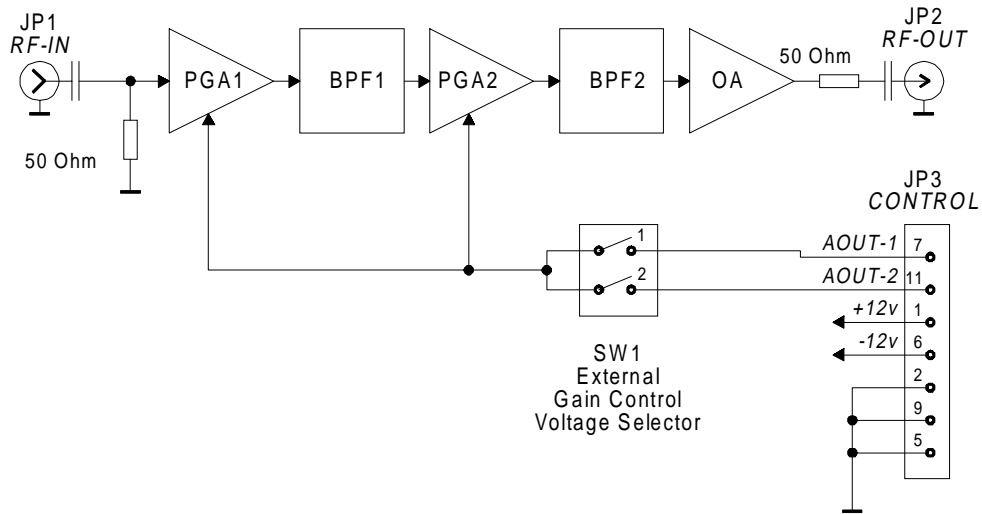


Fig. 2-1. Block diagram of *T/X-DDC/AFE* RF amplifier.

T/X-DDC/AFE RF amplifier is an external device, which connects to either of digital radio receiver DCM for *TORNADO* DSP systems/controllers/coprocessors, which are available from MicroLAB Systems Ltd.

T/X-DDC/AFE external RD amplifier comprises of the following components:

- PGA1/BPDF1 programmable gain amplifier and band-pass filter of stage #1
- PGA2/BPDF2 programmable gain amplifier and band-pass filter of stage #2
- OA output RF buffer, which allows 50 Ohm low-impedance loads
- JP1 and JP2 RF-IN and RF-OUT BNC connectors
- JP2 control/power connector.

central frequency and-pass

T/X-DDC/AFE external RF amplifier is available in a variety of off-the-shelf configurations for the band-pass and central frequency parameters, and moreover, the customized versions are also available upon request. Typical band-pass plot for *T/X-DDC/AFE-10.7M/B330K* RF amplifier with 10.7MHz central frequency and 330kHz band-pass is presented at fig.2-2.

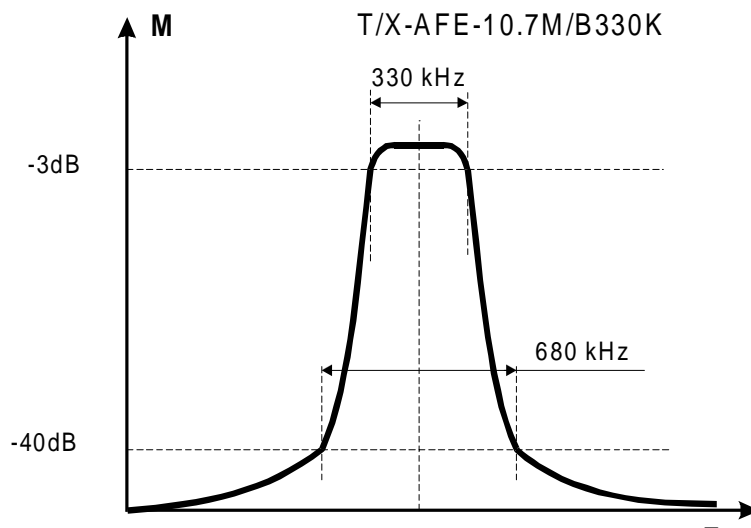


Fig. 2-2. Band-pass plot for *T/X-DDC/AFE-10.7M/B330K* external RF amplifier.

gain control

T/X-DDC/AFE external RF amplifier provides external voltage controlled gain within the range 0dB..+80dB. This external gain controlled voltage can be sourced from any of two AOUT-1/2 inputs of the JP3 control/power connector, which are the DC voltage outputs from the on-board DACs of digital radio receiver DCMs from MicroLAB Systems Ltd.

The particular AOUT-1/2 voltage input, which is used for gain controlled is defined by means of the on-board two-button SW1 switch in accordance with table 2-1. SW1 switch is located at the bottom of *T/X-DDC/AFE* RF amplifier box.

Table 2-1. Source gain control voltage selector for *T/X-DDC/AFE* RF amplifier.

SW-1	SW-2	description
ON	OFF	AOUT-1 DC voltage input of JP3 connector is used for gain control.
OFF	ON	AOUT-2 DC voltage input of JP3 connector is used for gain control.
OFF	OFF	No gain control is used. Gain factor is about 0dB.

Notes: 1. Shaded configuration corresponds to default factory setting.

Typical gain plot against the gain control voltage for *T/X-DDC/AFE* RF amplifier is presented at fig.2-3.

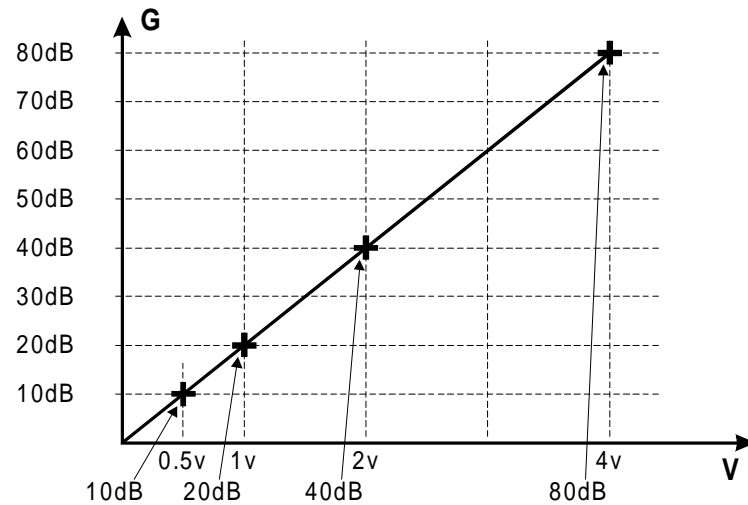


Fig. 2-3. Gain control plot for *T/X-DDC/AFE* external RF amplifier.

2.2 Construction

T/X-DDC/AFE external RF amplifier (fig.1-1) is designed in the plastic box with two-sided connectors and DIP-switch at the bottom of the box.

Connection of *T/X-DDC/AFE* external RF amplifier to external analog I/O world is performed via JP1 and JP2 RF-IN and RF-OUT industry standard BNC connectors correspondingly.

Connection of power and gain control voltage to *T/X-DDC/AFE* is performed via JP3 connector (refer to Appendix A for details).

Chapter 3. Installation

This chapter contains information for installation and configuration of *T/X-DDC/AFE* module.

3.1 Installation

T/X-DDC/AFE external RF amplifier connects as external device to digital radio-receiver DCMs from MicroLAB Systems Ltd. Installation procedure is as easy as the following:

1. Switch off the power of host PC with *TORNADO* DSP system installed or the power of *TORNADO-E* stand-alone DSP controller.
2. Connect JP3 connector of *T/X-DDC/AFE* to the AUX I/O connector of external cable set for either *T/SDAS-DDC1* digital radio receiver SIOX DCM or *TORNADO-PX/DDC4* quad-channel digital radio receiver coprocessor DCM.
3. Connect JP2 RF-OUT BNC connector of *T/X-DDC/AFE* to the RF-AIN connector from external cable set of either *T/SDAS-DDC1* digital radio receiver SIOX DCM or *TORNADO-PX/DDC4* quad-channel digital radio receiver coprocessor DCM via the BNC-to-BNC plug converter.
4. Configure SW1 at the bottom of *T/X-DDC/AFE* in order to select the AOUT-1/2 input DC voltage of JP3 connector for gain control.
5. Connect external RF input signal to the JP1 RF-IN BNC connector of *T/X-DDC/AFE*.
6. Switch on power of host PC or of *TORNADO-E* stand-alone DSP controller.

3.2 Connection to external signal I/O equipment

Connection of *T/X-DDC/AFE* to external RF equipment is performed by means of JP1 BNC connector (fig.1-1 and A-1).

CAUTION

It is highly recommended to plug-in and unplug external RF cable to JP1 RF-IN BNC connector of *T/X-DDC/AFE* when power is switched off.

The ground signal of *T/X-DDC/AFE* has no galvanic isolation from host *TORNADO* and/or PC ground signal and chassis.

Appendix A. Connectors and Switches

This appendix contains a summary for connectors and configuration switches for *T/X-DDC/AFE* external RF amplifier.

Connectors and configuration switches *T/X-DDC/AFE* external RF amplifier are presented at fig.A-1.

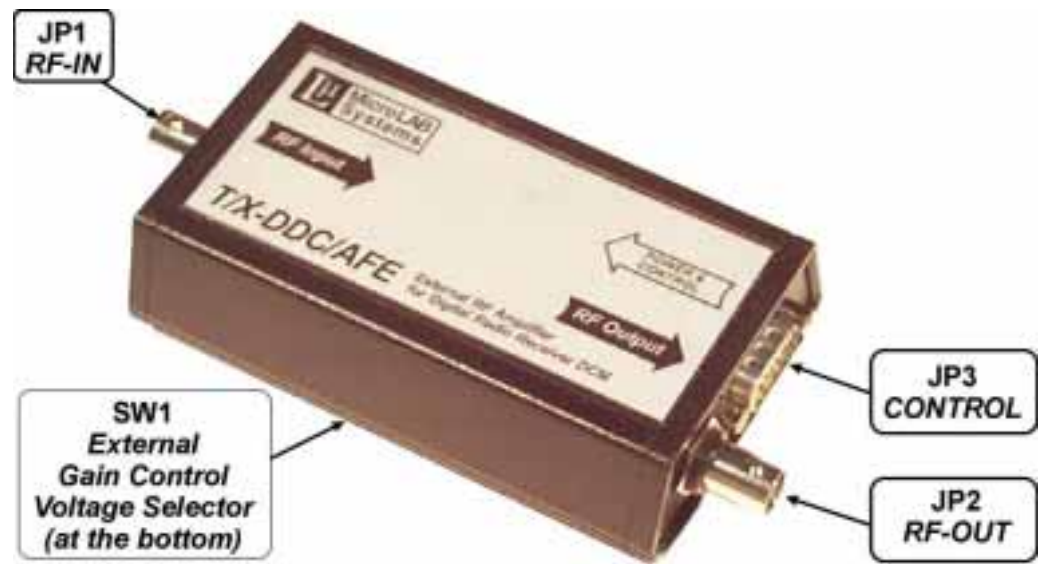


Fig. A-1. Connectors and configuration switches for *T/X-DDC/AFE* external RF amplifier.

A.1 Configuration Switches

Table A-1 specifies the list of configuration switches for *T/X-DDC/AFE* external RF amplifier.

Table A-1. Configuration switches for *T/X-DDC/AFE* module.

Switch	description	Reference information
SW1	Source DC voltage selector for gain control. This switch is located at the bottom of the box.	Section 2-1 table 2-1

A.2 Connectors

Table A-2 specifies the list of connectors for *T/X-DDC/AFE* external RF amplifier.

Table A-2. Connectors of T/X-DDC/AFE module.

Connector	description
JP1	RF-IN BNC connector for connection to external RF signal source.
JP2	RF-OUT BNC connector for connection to the RF-AIN input BNC connector of external cable set of digital radio receiver.
JP3	Power/control connector for connection to AUX I/O connector of external cable set of digital radio receiver DCM.

pinout for JP3 power/control connector

JP3 power/control connector of T/X-DDC/AFE is the industry-standard high-density DBH-15 15-pins male connector, which is compatible with connectors for PC VGA monitors. The compatible female plugs are available from multiple industry connector manufacturers.

Pinout for JP3 power/control connector for T/X-DDC/AFE is presented at fig.A-2, and description of signals is presented in table A-1.

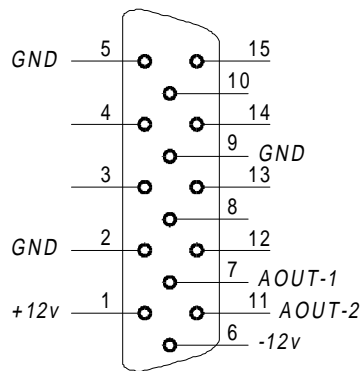


Fig. A-2. Pinout for JP3 power/control connector of T/X-DDC/AFE.

Table A-1. Signal description for JP3 power/control connector of T/X-DDC/AFE.

Signal name	description
AOUT-1 AOUT-2	DC voltage inputs for gain control.
GND	Ground.

+12v -12v	Power supply.
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