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WTD

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23-25 GHz MICROWAVE MODULES

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23-25 GHz MICROWAVE MODULES

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ALCATEL
WTD – DIVISION

Report N° : PE091

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MODIFICATIONS

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1. GENERAL

This document outlines technical specifications and construction characteristics of the microwave modules for Urban Radio Link 9623/9625 USY series.

1.1 PRODUCT DESCRIPTION

The transmitter module performs the following functions:

- up-conversion from the IF input signal to RF frequency
- band pass filtering
- linear microwave amplification
- availability of auxiliary outputs for output power monitoring and local loop testing.

The receiver module performs the following functions:

- low noise amplification of the RF incoming signal
- signal variable attenuation to follow the incoming signal variations
- down-conversion to an IF signal.
- frequency shifting of the TX signal to RX frequency for local loop testing.

1.2 Structural characteristics

1.2.1 Dimensions

Transmitter module: See drawing annex

Receiver module : See drawing annex

1.2.2 Connection

See drawing annex

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1.3 General characteristics

	MIN	TYP	MAX	UNIT
Operating Temperature	-45		80(*)	°C
Temperature Non operating	-55		85	°C
Altitude Operating			5000	m
Altitude Non operating			12000	m
Humidity Operating	Up to 40% relative humidity at 50° Up to 95% relative humidity at 29° C			
Non Stationary Vibration Including Shock		Shock response spectrum type L peak acceleration 4g		
Safety	Meets EN 60950 IEC 215 Bellcore TR-NWT-001089			
Radiate Emission	Meet EN 50022 Classe B			
Electromagnetic Compatibility (^)	Meets ETS 300 385			
Transportation	Meet ETS 300 019-2-2 Test T 2.3			
Storage	Meet ETS 300 019-2-1 Test T 1.2			
Weight	T.B.D.			

* $\Delta T = 25^\circ C$

^Systems spec.

2 TRANSMITTER MODULE

2.1 GENERAL

The input of the module is connected to the Local Oscillator unit, from which accepts the IF and LO signals.

The IF signal coming from the IF TX chain is converted to an RF signal by mean of an image rejection mixer working on the second harmonic of the local oscillator. This function can be implemented by a subharmonic mixer or a fundamental mixer with a time two multiplier on the LO signal.

A bandpass filter is placed after the mixer to eliminate the spurious frequencies, particularly the image frequency and the second harmonic of the local oscillator.

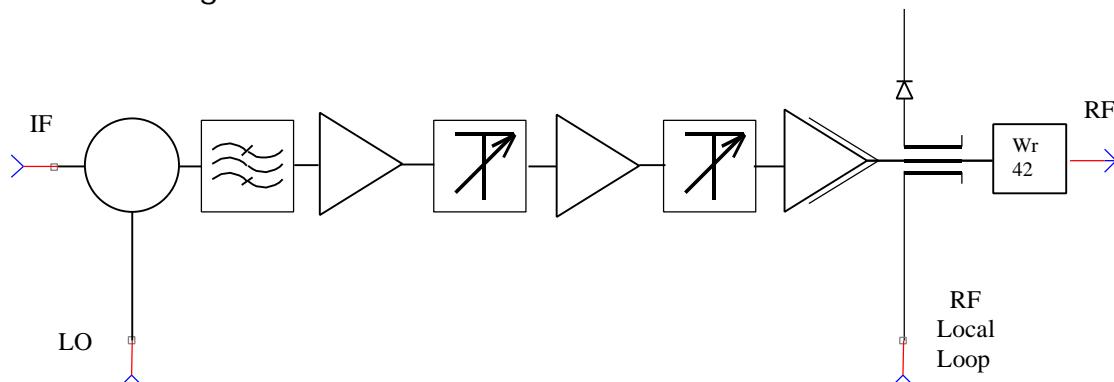
Variable attenuators, controlled by V1 and V2 voltages, allow the compensation of Rf gain variation due to temperature, frequency and spreading of characteristics of active components. They permit also to adjust the output power following the indications provided by ATPC control loop. Their position in the microwave chain must be optimized in order to achieve the best compromise between noise figure at low output power and distortion at high output power, using different ranges of control voltage for the different attenuation stages if needed. When V1=-3.2V and V2=-0.5V Pout is at minimum level, when V1=-0.5V and V2=-3.2V Pout is at maximum level.

The microwave amplification is obtained by a chain of GaAs MMIC amplifiers:

A microstrip directional coupler after the last amplifier collects part of the signal to the detector that generates a DC voltage used for output power measurements, low gain alarm, PTX level alarm, automatic level control loop (ALC, ATPC). Detector should be temperature compensated in order to increase performance stability versus temperature.

A second directional coupler is used to have a signal for local loop function through an auxiliary output to be connected to Rx module.

The block diagram of the unit is shown below.



2.2 ELECTRICAL TX CHARACTERISTICS

Electrical specification guaranteed in temperature.

		23 GHz				25 GHz			
IF frequencies	MHz	2088 and 2312				2088			
Output RF range	GHz	21.20	22.60	22.40	23.60	24.50	25.50	25.50	26.50
LO freq. range	GHz	11.64	12.46	10.04	10.76	13.29	13.79	11.71	12.21
LO input level		dBm				12 ₋₂ ⁺²			
IF input level		dBm				-15 ₋₁ ⁺¹			
Nominal output level		dBm				18			
Output power range (room temp.)		dBm				-13 / +24			
Output power range (guaranteed)		dBm				-10 / +21			
Local Loop output level@nominal output		dBm				-20 ₋₂ ⁺²			
detected voltage level@24 dBm		mV/10KO				2200 ₋₂₀₀ ⁺²⁰⁰			
detected voltage level@-13 dBm		mV/10KO				> 10 mV			
Linear Gain (RF/IF)		dB				>40			
Gain flatness		dB				<3			
Gain flatness on every 50 MHz		dB				<0.75			
Tuning Voltage		Volt				see note 1			
P1dB (Typ.)		dBm				29			
IM3@ -10 to 18 dBm		dBc				<-42			
NF@ -10 to 18 dBm		dB				<35			
IF return loss		dB				>10			
LO return loss		dB				>13			
RF return loss		dB				>8			
Local Loop retun loss		db				>13			
Image freq. level output		dBm				<-30			
LO (or 2*LO) level output		dBm				<-10			
Spurious output level		dBm		f<21.2GHz <-50 dBm / f>21.2GHz <-30 dBm					
Stability						unconditional			
positive DC bias		V				+5 ₋₆ ⁺⁶			
negative DC bias		V				-5			
Power consumption (+5V, +6V)		W				<15			
LO connector						SMA fem.			
IF connector						SMA fem.			
RF connector						WR42			
Local Loop connector						SMA fem.			

Note 1: V1 and V2 from -0.5 to 3.2 V, Pout max with V1= -0.5V and V2= -3.2V , Pout min with V1= -3.2V and V2= -0.5V. Current from V1 and V2 < 100 mA.

3 RECEIVER MODULE

3.1 GENERAL

The RF input of the module is connected to the branching.

The RF incoming signal is amplified by a two stage low noise MMIC amplifier.

A variable attenuator, driven by the AGC voltage, allows to compensate the variation of the RF incoming signal.

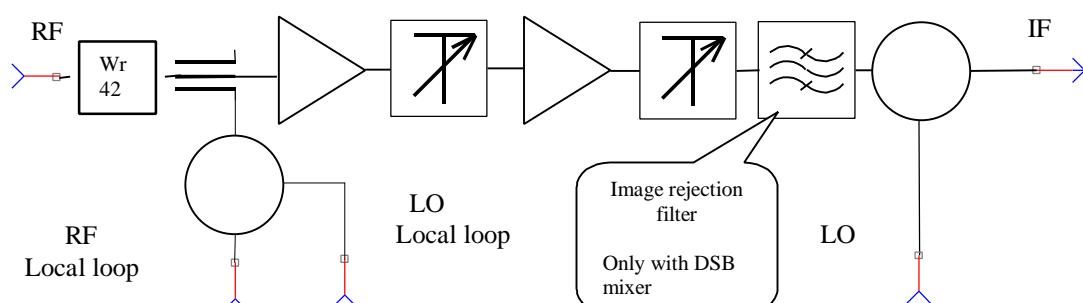
A second fixed attenuator allows to compensate the gain variation due to spreading of characteristics of the active devices and to set the proper maximum gain.

The down-conversion from RF to IF frequency is performed by an SSB (single side band) mixer or DBS+image rejection filter (subharmonic or fundamental + multiplier like in TX module). The reference LO signal, coming from the LO input connected to the Local Oscillator, is such that in any configuration the frequency of the generated IF signal is 1080 MHz.

Through two auxiliary inputs, connected one to the transmitter module and the other to the Local Oscillator, the module receives the RF transmitted signal and the oscillator signal such as to perform local loop function. A single ended mixer shifts the RF transmitted signal to the RF receiver frequency; a microstrip directional coupler placed at the input, before the first low noise amplifier, allows to send this signal to the receiver chain.

The IF output is connected to the IF RX unit.

The block diagram of the unit is shown below.



3.2 ELECTRICAL RX CHARACTERISTICS

Electrical specification guaranteed in temperature.

		23 GHz				25 GHz			
IF frequencies	MHz	1080				1080			
Output RF range	GHz	21.20 22.60 22.40 23.60				24.50 25.50 25.50 26.50			
LO freq. range	GHz	10.06 10.76 11.74 12.34				11.71 12.21 13.29 13.79			
Local Loop	MHz	1008 and 1232				1008			
LO input level	dBm					12+2			
Local Loop LO level	dBm					0+2			
Noise Figure@ min. atten. (*)	dB					4.8			
Linear Gain @ min. atten.	dB					12+2			
Gain flatness	dB					<2			
Gain flatness on every 50 MHz	dB					<0.5			
Max input RF level	dBm					-17			
Attenuation range	dB					>25			
IM3 @ max input level	dBc					<-40			
Tuning Voltage	V					from -4 to 0			
Local loop RF input level	dBm					-20			
IF output level due to L. L. @ min. atten.	dBm					-40+5			
IM3 Local loop @ -20 dBm input	dBm					<-44			
IF return loss	dB					>10			
LO return loss	dB					>13			
RF return loss	dB					>10			
local loop return loss	dB					>15			
LO/IF injection noise isolation mixer	dB					>30			
Image freq. rejection	dB					>30			
2*LO (or 4*LO)/RF isolation	dB					>55			
LO/IF isolation	dB					>50			
RF_local_loop/RF isolation	dB					>40			
Stability						unconditional			
positive DC bias	V					5			
negative DC bias	V					-5			
Power consumption (+5V)	W					1.5			
LO connector						SMA fem.			
IF connector						SMA fem.			
RF connector						WR42			
LO Local Loop connector						SMA fem.			
RF Local Loop connector						SMA fem.			

(*) With broadband LO noise floor @-150dBm/Hz

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4 ENVIRONMENTAL CONDITIONS

Performance is guaranteed under the following conditions:

- Low case temperature: -20 °C
- High case temperature: +80 °C
- High relative Humidity: 95% @ 29 °C
- Rate of change of temperature: 0.5 °C/min

The RF modules shall continue to work in the following conditions:

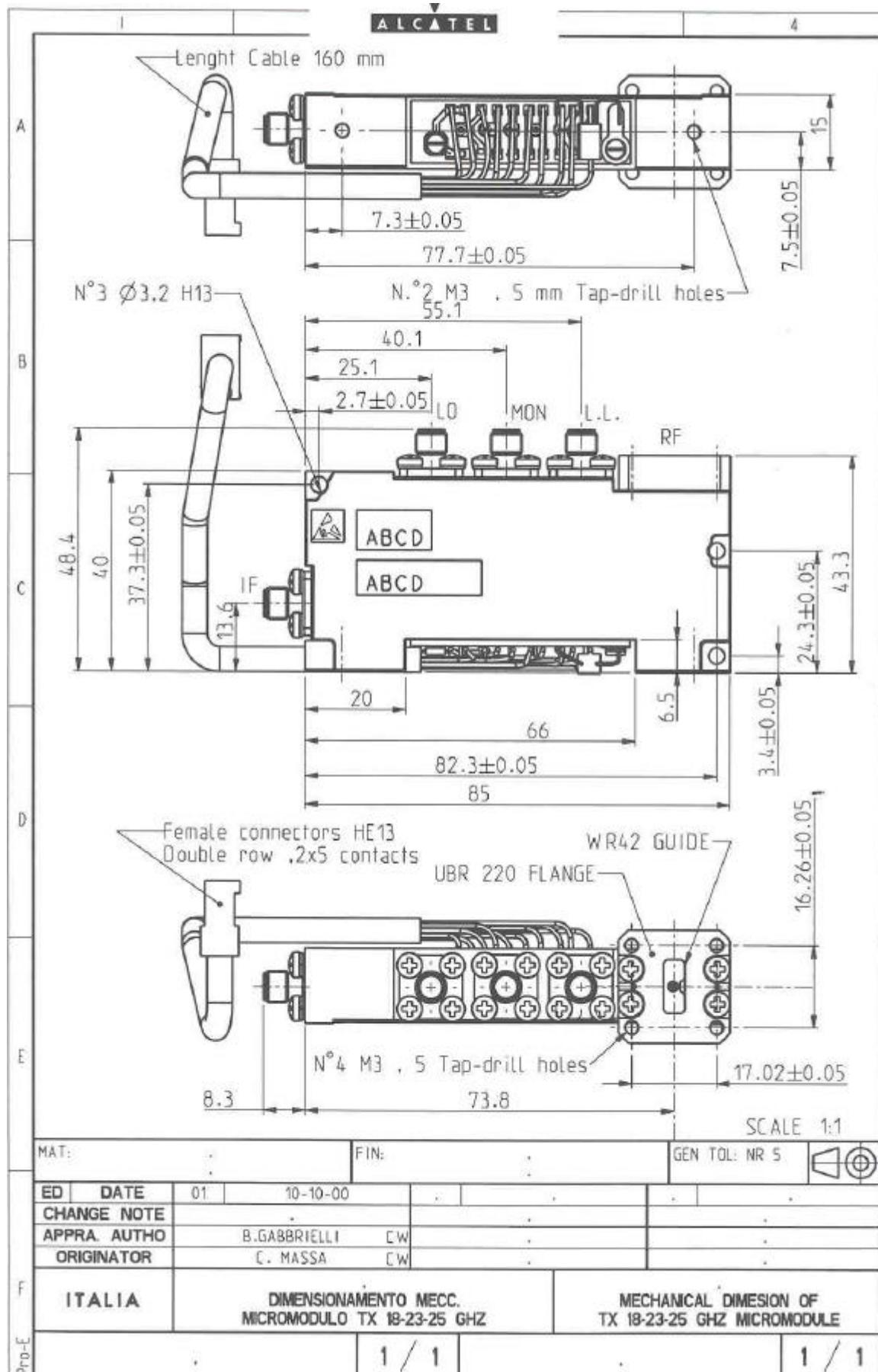
Cold start at -45 °C with degraded performance, but without oscillations and damage.

The return to normal temperature conditions give a return to standard performance.

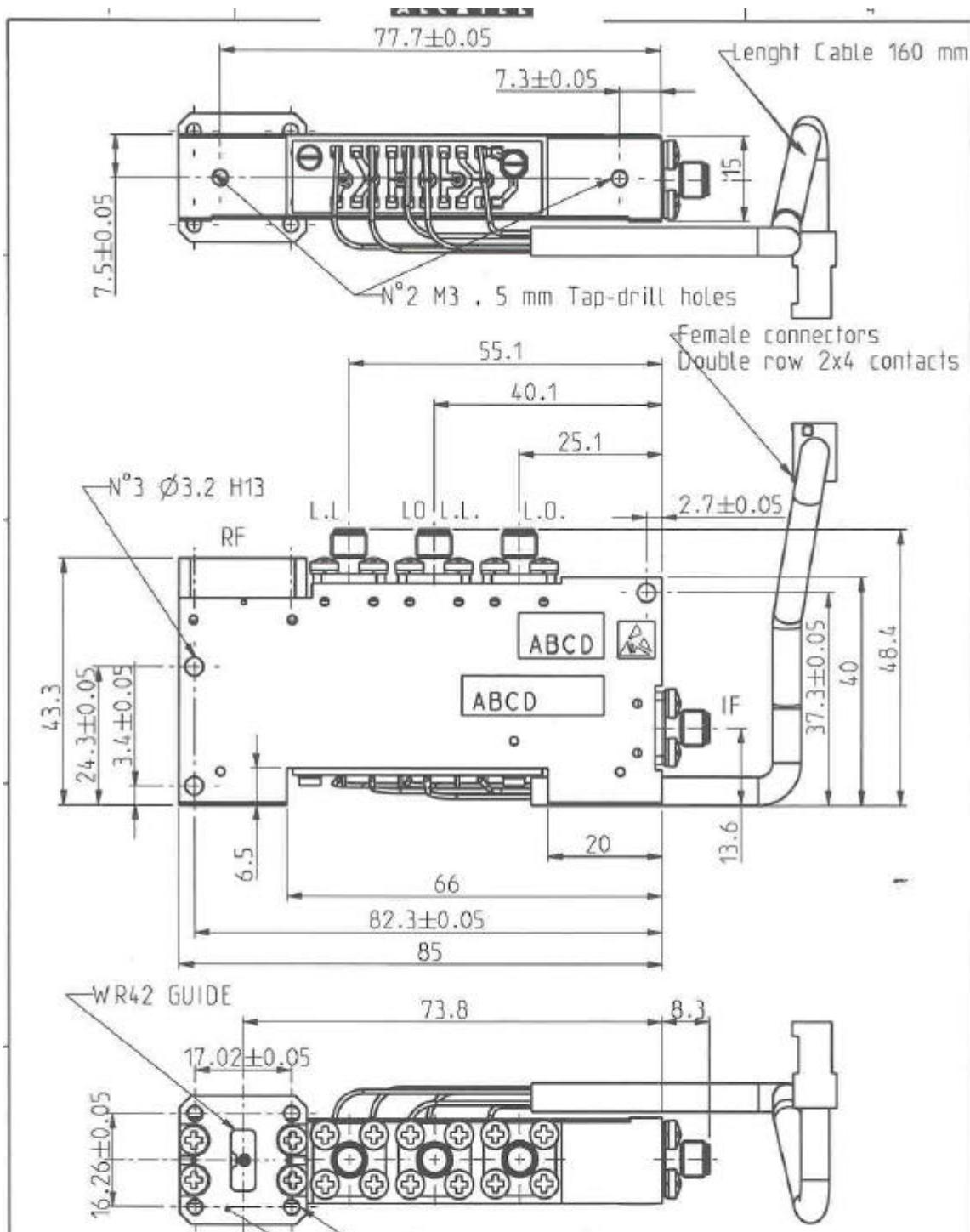
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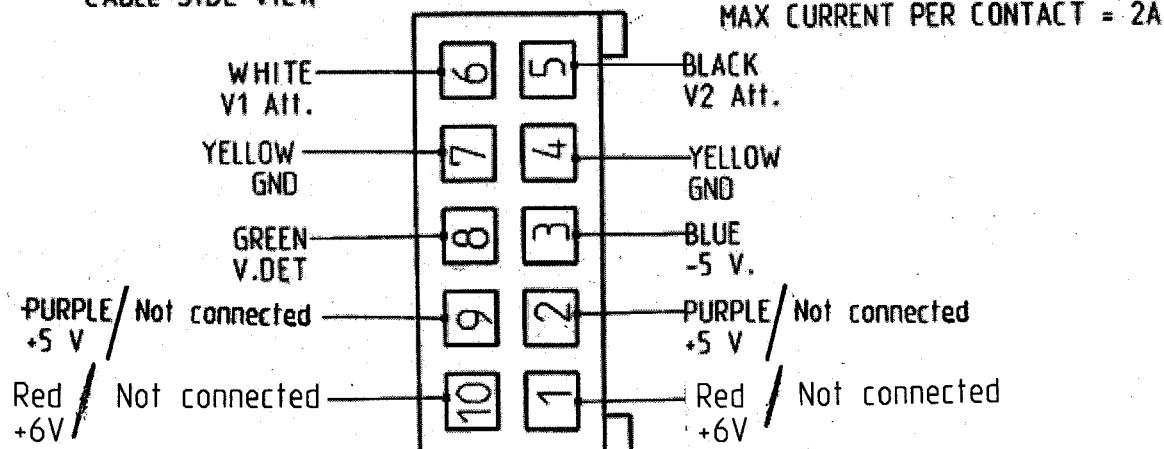
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MAT:	FIN:	GEN TDL: NR 5
ED DATE	01 00-10-10	.
CHANGE NOTE	.	.
APPROV. AUTHO	B.GABBRIELLI CW	.
ORIGINATOR	C.MASSA CW	.
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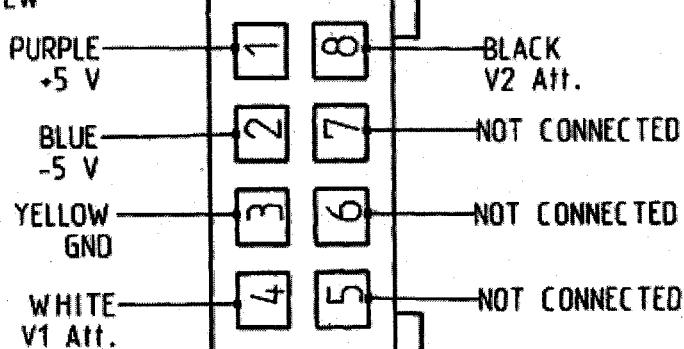
For TX module

CABLE SIDE VIEW



MAX CURRENT PER CONTACT = 2A

CABLE SIDE VIEW



For RX module

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