Technical description

Bandpass Filters & Duplexer (02-007306 & 16-041401)

1.1 Description

The bandpass filters are multi-section designs with a bandwidth dependent upon the passband frequencies, (both tuned to customer requirements). The response shape is basically Chebyshev with a passband design ripple of 0.1dB. The filters are of combline design, and are carefully aligned during manufacture in order to optimise the insertion loss, VSWR and intermodulation characteristics of the unit. The tuned elements are silver-plated to reduce surface ohmic losses and maintain a good VSWR figure and 50Ω load at the input and output ports.

No adjustments should be attempted without full network sweep analysis facilities to monitor both insertion loss and VSWR simultaneously.

1.2 Technical Specification (02-007306)

PARAMETER		SPECIFICATION
Response type:		Chebyshev
Frequency range:		350 – 500MHz (tuned to spec.)
Bandwidth:		>5.0 MHz (tuned to spec.)
Number of sections:		5
Insertion loss:		1.2 dB
VSWR:		better than 1.2:1
Connectors:		SMA
Power handling:		100W max
Temperature range	operation:	-10°C to +55°C
	storage:	-40°C to +70°C
Weight:		3 kg
Size:		266 x 143 x 39.5mm

1.3 Technical Specification (16-041401)

RX Pass Band:	380-385MHz
TX Pass Band:	390-395MHz
Bandwidth:	5 MHz
Channel Separation:	5 MHz
Insertion Loss:	< 1.8 dB
Rejection (between channels)	>70 dB
Rejection at crossover:	>50 dB (+2.5MHz low band -2.5MHz high band)
Return Loss:	> 20 dB (at all ports)
Power Handling (CW):	20W
Connectors:	SMA (Tx/Rx ports)
	N type (Antenna ports)
Weight:	<6kg

2 ¼Watt 0- -30dB Switched Attenuator (10-000701)

2.1 General Application

In many practical applications for Cell Enhancers etc., the gain in each path is found to be excessive. Therefore, provision is made within the unit for the setting of attenuation in each path, to reduce the gain.

2.2 Switched Attenuators

The AFL switched attenuators are available in two different types; 0 – 30dB in 2 dB steps (as in this case), or 0 – 15dB in 1 dB steps. The attenuation is simply set using the four miniature toggle switches on the top of each unit. Each switch is clearly marked with the attenuation it provides, and the total attenuation in line is the sum of the values switched in. They are designed to maintain an accurate 50Ω impedance over their operating frequency at both input and output.

3 Low Noise Amplifiers (11-007302 & 11-007402)

3.1 Description

The low noise amplifiers used are double stage solid-state low-noise amplifiers. Class A circuitry is used in the units to ensure excellent linearity over a very wide dynamic range. The two active devices are very moderately rated to provide a long trouble-free working life. There are no adjustments on these amplifies, and in the unlikely event of failure then the entire amplifier should be replaced.

3.2 Technical Specification, 11-007302

PARAMETER		SPECIFICATION
Frequency range:		380-500MHz
Bandwidth:		<140MHz
Gain:		20-22dB
1dB Compression Point:		+23.5dB (typical)
3rd order intercept:		+36dB (typical)
Input/Output return loss:		>20dB
Noise figure:		<1.3dB
Connectors:		SMA female
Supply:		200-230mA @ 24V DC
Temperature range:	operational:	-10°C to +55°C
	storage:	-30°C to +70°C
Weight:		<300gm
Size:		90 x 55 x 30.2 (case only)

3.3 Technical Specification, 11-007402

PARAMETER		SPECIFICATION
Frequency range:		380-500MHz
Bandwidth:		<140MHz
Gain:		30-32dB
1dB Compression Point:		+22dBm (typical)
3rd order intercept:		+34-35dBm (typical)
Input/Output return loss:		>20dB
Noise figure:		<1.3dB
Connectors:		SMA female
Supply:		300-330mA @ 24V DC
Weight:		<300gm
Size:		90 x 55 x 30.2 (case only)
Temperature range:	operation:	-10°C to +55°C
	storage:	-30°C to +70°C

4 1Watt Low Power Amplifier (11-007901)

4.1 Description

This amplifier is designed as a 1.0 W driver from 380 MHz to 470 MHz for the 10W output amplifier. It is a 2 stage amplifier where each stage is in balanced configuration. It demonstrates very high linearity and good input/output VSWR. There is a Current Fault Alarm Function, which indicates failure of each one of the RF transistors by various alarm output options. The amplifier is housed in an aluminium case (Alocrom 1200 finish) with SMA connectors for the RF input/output and a 9way D-type connector for DC and alarm outputs.

4.2 Technical Specifications

PARAMETER		SPECIFICATION
Frequency range:		380-470MHz
Small signal gain:		37.5dB
Gain flatness:		±0.5dB
Gain vs. temperature:		1.5dB
Temperature range:	operational:	-10°C to +55°C
	storage:	-40°C to +70°C
Input/output return loss:		18dB
Maximum output power:		30.4dBm (@ 1dB comp. point)
OIP3:		43dBm
Supply voltage:		10-15V DC
Current consumption:		780mA (typical)
Noise Figure:		<1.75dB

5 10W Power Amplifier (12-016302)

5.1 Description

This amplifier is a Class A 10W power amplifier from 380MHz to 470MHz in a 1 stage balanced configuration. It demonstrates a very high linearity and a very good input/output return loss (RL). It has a built-in Current Fault Alarm Function.
Its housing is an aluminium case (Alocrom 1200 finish) with SMA connectors for the RF input/output and a D-Type connector for the power supply and the Current Fault Alarm Function.

5.2 Technical Specification

PARAMETER		SPECIFICATION
Frequency range:		380-470MHz
Small signal gain:		23dB
Gain flatness:		±1.7dB
I/O Return loss:		>18dB
1dB compression point:		+40dBm
OIP3:		+52dBm
Supply voltage:		24V DC
Supply current:		2.6Amps (Typical)
Temperature range	operational:	-10°C to +55°C
	storage:	-30°C to +70°C
Weight:		<2kg (no heatsink)

6 Dual DC/DC Converter (13-001803)

6.1 Description

This unit is employed where it is necessary to derive two fixed voltage power supply rails from some higher voltage. Typically it is used to derive 5, 8, 12 or 15V from a 24V input.

The circuit is based upon a pair of LM257 series variable voltage regulators (LM2576, 12 & 15V & LM2575, 5V), which are each capable of supplying an absolute maximum of 1.5A output current. Note that at full output current, the dissipation of the device must remain within design limits, bearing in mind the voltage which is being dropped across it. The maximum allowable dissipation will also depend on the efficiency of the heatsink on which the device is mounted.

6.2 Technical Specification

PARAMETER		SPECIFICATION
Operating Voltage:		21 – 27V DC
Output Voltage:		12V & 12V (typical)
Output Current:		1.0A (maximum per o/p)
Connections:		Screw Terminal Block
Temperature Range	operational:	-10°C to +55°C
	storage	-40°C to +70°C
PCB Size:		85 x 63mm

7 Automatic Gain Control (17-001101, det. & 17-001201, atten.)

7.1 Description

The equipment is fitted with an Automatic Gain Control (AGC) system. This is generally fitted in the Uplink path (not usually needed in the downlink path, as the signal here is at an almost constant level), to avoid overloading the amplifiers (with the associated performance degradation) should a mobile be operated very close to the unit.

The AFL Automatic Gain Control system consists of two units, a detector/amplifier and an attenuator. The detector/amplifier unit is inserted in the RF path on the output of the power amplifier, and the attenuator is situated in the RF path between the 1st and 2nd stages of amplification.

Normally the attenuator is at minimum attenuation. The detector/amplifier unit monitors the RF level being delivered by the power amplifier, and when a certain threshold is reached it begins to increase the value of the attenuator to limit the RF output to the (factory set) threshold. Therefore overloading of the power amplifier is avoided.

The factory set threshold is 1dB below the Enhancer 1dB compression point. Some adjustment of this AGC threshold level is possible, a 10dB range is mostly achieved. It is not recommended under any circumstances to adjust the AGC threshold to a level greater than the 1dB compression point as system degradation will occur.

The detector comprises of a 50Ω transmission line with a resistive tap which samples a small portion of the mainline power. The sampled signal is amplified and fed to a conventional half wave diode rectifier, the output of which is a DC voltage proportional to the RF input signal.

This DC voltage is passed via an inverting DC amplifier with integrating characteristics, to the output, which drives the attenuation control line of the corresponding AGC attenuator. This unit is fitted at some earlier point in the RF circuit.

The unit contains a 12V DC regulator in the detector module, which supplies stabilised voltage to the DC amplifier and via an external cableform to the AGC attenuator.

For small signals, below AGC onset, the output control line will be close to 12V and the AGC attenuator will have minimum attenuation. As the signal level increases the control line voltage will fall, increasing the attenuator value and keeping the system output level at a constant value.

The AGC onset level is adjusted by the choice of sampler resistor R1 and by the setting of potentiometer VR1.

The attenuator comprises a 50Ω P.I.N diode, voltage-variable attenuator with a range of 3 to 30dB. The attenuation is controlled by a DC voltage which is derived from the associated AGC detector unit.

7.2 Technical Specification

PARAMETER		SPECIFICATION
Frequency range:		up to 1000MHz
Attenuation range:		3 to 30dB
Attenuation steps:		continuously variable
VSWR:		better than 1.2:1
RF Connectors:		SMA female
Power Handling:	Attenuator:	1W
	Detector/amp:	>30W (or as required)
Temperature Range:	operation:	-10°C to +55°C
	storage:	-40°C to +70°C
Size:	Attenuator pcb:	50 x 42 x 21mm
	Detector/amp pcb	54 x 42 x 21mm
Weight:	Attenuator:	90gm
	Detector/amp:	100gm

.8 24V Single Relay Board (80-008902)

8.1 Description

The General Purpose Relay Board allows the inversion of signals and the isolation of circuits. It is equipped with a single dual pole change-over relay RL1, with completely isolated wiring, accessed via a 15 way in-line connector.

The relay is provided with polarity protection diodes and diodes for suppressing the transients caused by "flywheel effect" which can destroy switching transistors or induce spikes on neighbouring circuits. It’s common use is to amalgamate all the alarm signals into one, volts-free relay contact pair for the main alarm system.

Note that the board is available for different voltages (12 or 24V) depending on the type of relay fitted at RL1.