

## 0.25Watt 0- -30dB Switched Attenuator (10-000701)

### 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.

### 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.

## Fibre Alarm Transmitter PCB (17-005001)

### Description

In order to have alarm information available in base stations or other sites remote from active units, the Fibre Optic Alarm Transmitter Module (17-005001) takes alarm information from active F/O modules, digitally combines them and modulates them at an intermediate frequency (usually 21.4MHz, but can be some other). This modulated signal can then be sent down fibre links to a Base Station, for example, where it will be demodulated (by a Fibre Optic Receiver Module (17-005011) back to a digital combined alarm signal, which in turn is decoded so that the original device alarms at the remote location may be monitored individually at the Base Station, for example.

### Technical Specification (17-005001, 21.4MHz Tx)

PARAMETER		SPECIFICATION
N $\bar{o}$ of alarm inputs:		8
N $\bar{o}$ of modulated outputs:		1
Intermediate frequency:		21.4MHz
Supply Voltage:		9V DC (nominal)
Power consumption:		<200mA @ 9V DC
Modulation:		PCM
Temperature range	operation:	-10 $\text{ }^{\circ}$ C to +60 $\text{ }^{\circ}$ C
	storage:	-20 $\text{ }^{\circ}$ C to +70 $\text{ }^{\circ}$ C
PCB size:		139.5 x 69mm
Weight:		<100grams

## Automatic Gain Control (17-001101, Det. & 17-001201, Atten.)

### 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.

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.

## 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 +60°C
	storage:	-20°C to +70°C
Size:	attenuator pcb	50 x 42 x 21mm
	detector/amp pcb	54 x 42 x 21mm
Weight:	attenuator:	90grams
	detector/amp:	100grams

## Wide Dynamic Range AGC (17-001105, Det. & 17-001201, Atten.)

### Description

The equipment is fitted with a wide dynamic range 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 wide dynamic range 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, (factory set @ time of system test) do not adjust unless able to monitor subsequent RF levels.

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.

### 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 +60°C
	storage:	-20°C to +70°C
Size:	attenuator (pcb)	50 x 42 x 21mm
	Detector (pcb)	54 x 42 x 21mm
Weight:	attenuator:	90grams
	detector/amp:	100grams

## Dual DC/DC Converter (13-001803)

### 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.

### Technical Specification

PARAMETER		SPECIFICATION
Operating Voltage:		21 – 27V DC
Output Voltages:		12.0V & 12.0V (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

## 20Watt Power Amplifier (20-003601)

### Description

The 20Watt power amplifier fitted to this unit is a multi-stage, solid state power amplifier. Class A circuitry is employed throughout the device to ensure excellent linearity over a wide dynamic frequency range. All the semi-conductor devices are very conservatively rated to ensure low device junction temperatures and a long, trouble free working lifetime.

The power amplifier should require no maintenance over its operating life. Under no circumstances should the cover be removed or the side adjustments disturbed unless it is certain that the amplifier has failed; since it is critically aligned during manufacture and any re-alignment will require extensive test equipment.

### Technical Specification

<b>PARAMETER</b>		<b>SPECIFICATION</b>
Frequency Range:		217.5 -218MHz
Bandwidth:		20MHz (typical, tuned to spec.)
Maximum Output Power:		>20W
Gain:		44dB
1dB Compression Point:		<+43dBm
3rd Order Intercept Point:		<+54dBm
VSWR:		better than 1.45:1
Connectors:		SMA female
Supply:		4.8A @ 24V DC
Temperature range:	operational:	-10°C to +60°C
	storage:	-20°C to +70°C
Size:		276 x 78 x 40mm (case only)
Weight:		1.5 kg (excluding heatsink)



## Low Noise Amplifier (11-006002)

### Description

The 21.3dB gain low noise amplifier used is a double stage solid-state low-noise amplifier. Class A circuitry is used throughout the unit 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 this amplifier, and in the unlikely event of failure then the entire amplifier should be replaced. The amplifier features a dedicated, in-built alarm monitoring system which gives a TTL 'open collector' type switched signal on alarm.

### Technical Specification

PARAMETER		SPECIFICATION
Frequency range:		70 – 500MHz
Bandwidth:		<430MHz
Gain:		21.3dB (typical)
1dB Compression Point:		+20 – 21dB (typical)
3rd order intercept:		+33dB (typical)
Input return loss:		>14dB
Output return loss:		>20dB
VSWR:		Better than 1.5:1
Noise figure:		<2.7dB
Connectors:		SMA female
Supply:		230mA @ 10 to 24VV DC
Size:		88 x 50 x 34mm (ex. connectors)
Temperature range:	operational:	-10°C to +60°C
	storage:	-20°C to +70°C
Weight:		260gm

### 3 Stage Amplifier Alarm Boards (12-002201)

#### Description

Amplifier Alarm Boards are fitted to monitor the bias conditions of AFL Class A amplifiers which remain constant in normal operation. Any departure from normal bias conditions is a result of device failure, excess temperature, over-driving or oscillation (excessive power).

In normal operation, the Class A bias circuit of the amplifier develops a constant voltage of 1.20V across the collector current setting resistor. The Amplifier Alarm Board is a window comparator device, which is adjusted to sense a departure from this condition. Several different alarm outputs are provided to simplify interfacing, (Relay Contact, Open Collector, and TTL Logic Levels)

The basic version of the Alarm Board (12-002801) monitors a single amplifier stage. A three-stage version (12-002201) is used on complex amplifiers where three separate comparators have their outputs logically combined to a common output stage. Failure of any one stage will activate the alarms.

Note that the alarm board has a green Light Emitting Diode located near to the centre of the printed circuit board, which is illuminated on 'Good', and extinguished on 'Alarm'. It is therefore a simple matter to identify an active module failure, by searching for an Alarm Board which has its green LED extinguished. A simple test of the alarm board is possible by shorting across the monitor inputs, pins 1 and 2, 3 and 4 or across pins 5 and 6. This last monitor input is inactive if the board has been converted to a two way alarm board. (Refer to relevant amplifier alarm wiring diagram.)

- 1) Volt-free change over relay contacts.
- 2) Open collector NPN transistor pulls low on alarm.
- 3) TTL driver.

The use of precision voltage sources and resistors has eliminated the need for initial adjustment or calibration, and the board will function correctly with a wide variation in power supply voltage (8 to 30 volts, nominal supply is 12 or 24Volts).

There are two selectable link options on the three-way board:

- LINK1 - Removed to convert to two-way alarm board.
- LINK2 - Removed to isolate 0V from chassis earth.

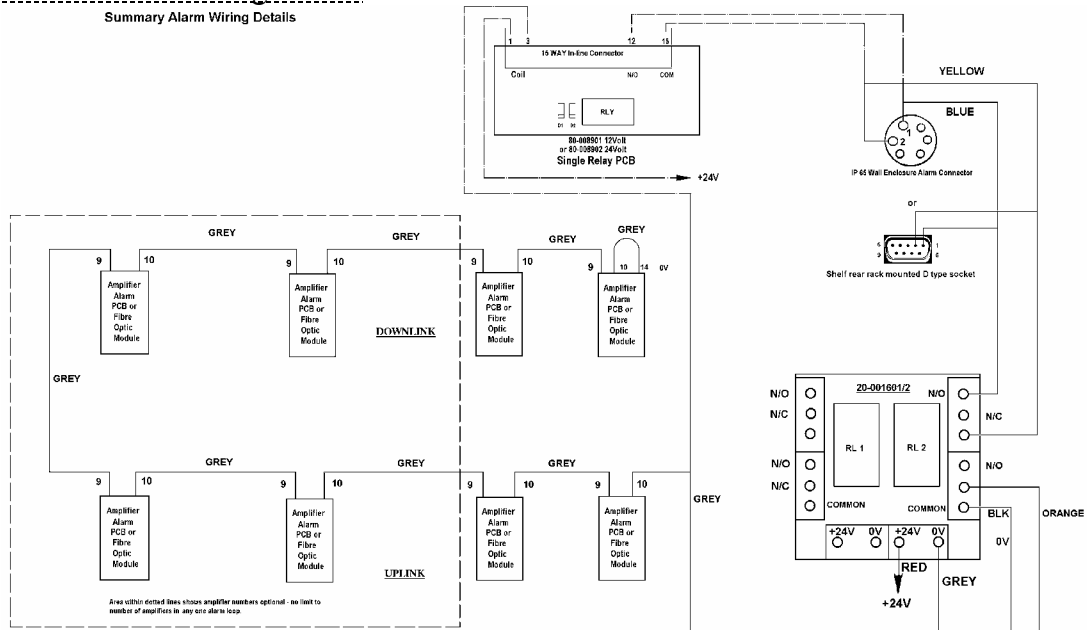
The one way alarm board only has the 0V isolation link (LINK2) fitted.

## Technical Specification

PARAMETER		SPECIFICATION
Operating voltage:		8 to 30V (floating earth)
Alarm Threshold:		Vcc - 1.20 volt $\pm$ 15%
<b>Alarm output relay contacts:</b>		
Max. switch current:		1.0Amp
Max. switch volts:		120Vdc/60VA
Max. switch power:		24W/60VA
Min. switch load:		10.0 $\mu$ A/10.0mV
Relay isolation:		1.5kV
Mechanical life:		>2x10 <sup>7</sup> operations
Relay approval:		BT type 56
Connector details:		15-way 0.1" pitch
Temperature range:	operational:	-10°C to +60°C
	storage:	-20°C to +70°C
PCB Size:		74 x 56mm (3 stage)
		54 x 56mm (1 stage)

## Generic Alarm Wiring Sketch

Summary Alarm Wiring Details



GENERIC CELL ENHANCER ALARM WIRING

Uplink & Downlink may be separated to make two dedicated summary alarm loops.

