

### 14.3.5. Attenuator 25W, 60dB (10-002960)

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. Attenuator 25W, 60dB (10-002960) is a fixed attenuator providing 60dB of signal attenuation.

#### 10-002960 Specification

PARAMETER		SPECIFICATION
Frequency Range		DC to 2.5GHz
Power Handling		25 W
Attenuation		60 dB
Attenuation Accuracy		± 0.5dB
Return Loss to 2.2GHz		18dB
Nominal Impedance		50 Ω
RF Conectors		N male to N female
Finish		Matt Black Anodise
Temperature range	operational	-20°C to +55°C
	storage	-20°C to +70°C

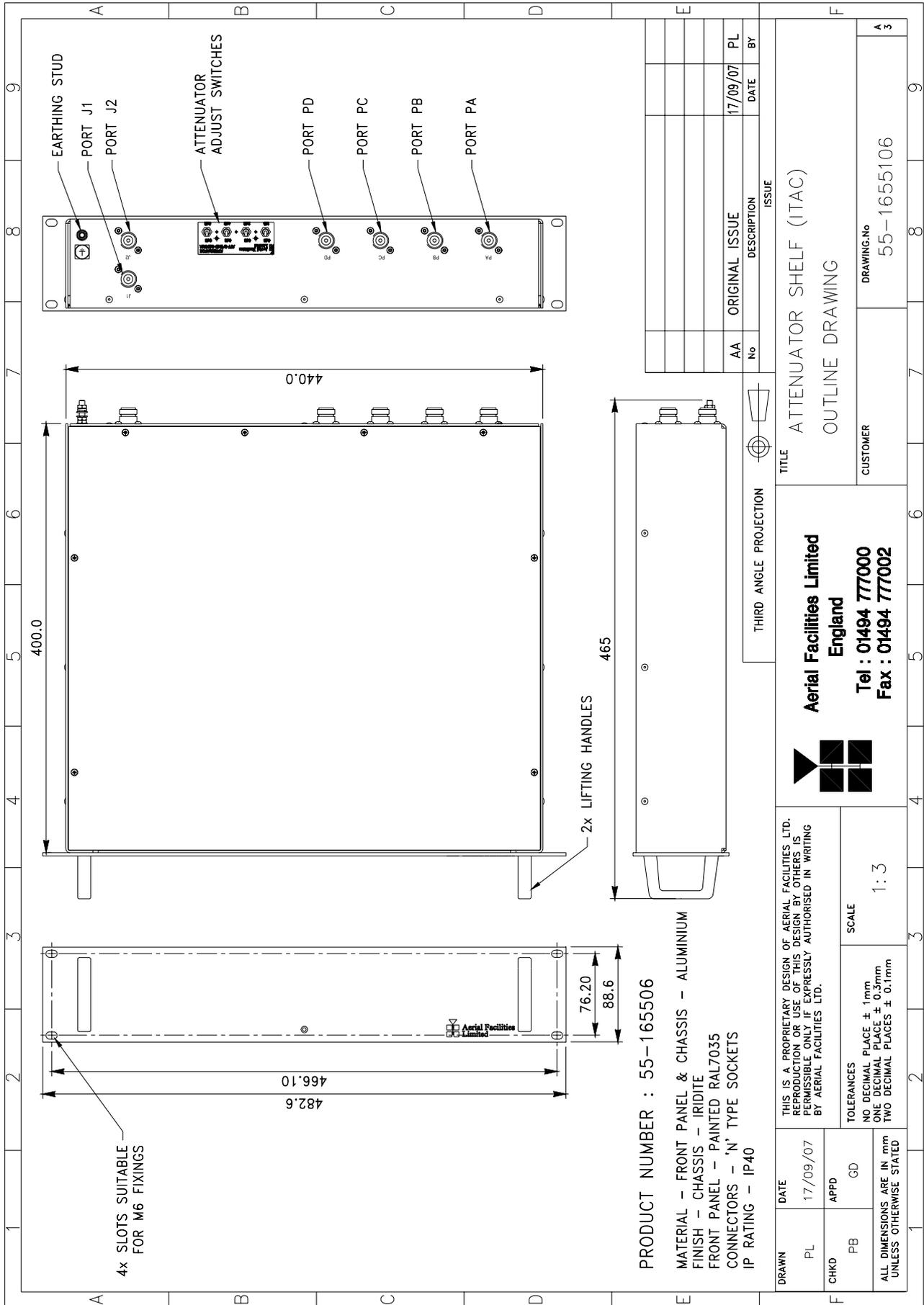
## 15 ATTENUATOR SHELF (ITAC) 3 (55-165506)

Attenuator Shelf (ITAC) 3 (55-165506) list of major components

Section	Component Part	Component Part Description	Qty. Per Assembly
15.3.1.	05-002602	900MHz Splitter/Combiner	1
15.3.2.	05-003007	4 Port Hybrid Coupler	1
15.3.3.	09-000902	Dummy load	1
15.3.4.	10-000901	Switched Attenuator 0.25W, 0 - 15dB	1
15.3.5.	10-002960	Attenuator 25W, 60dB	1

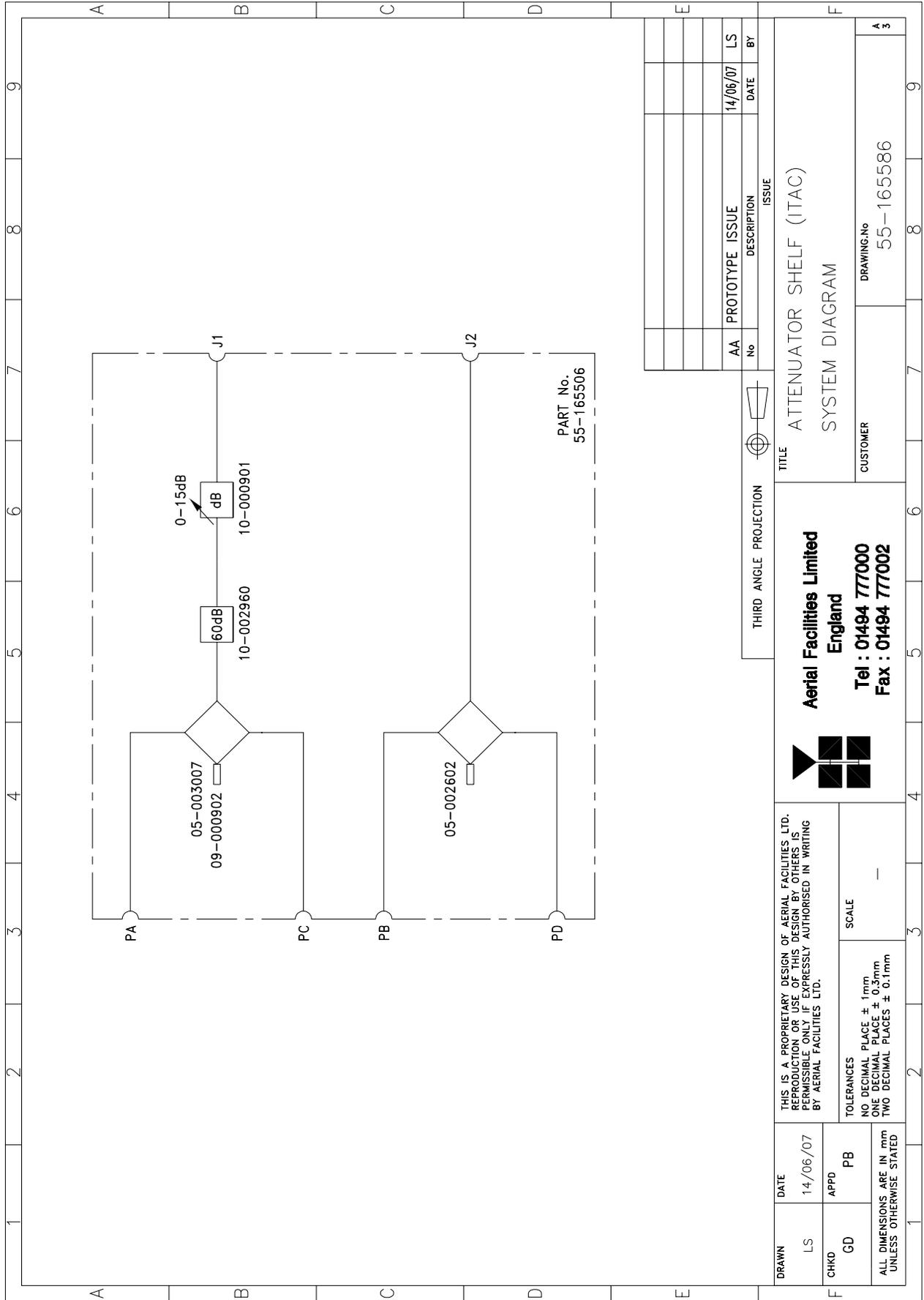
# 15.1. Attenuator Shelf (ITAC) 3 (55-165506) outline drawing

Drawing number 55-1655106



# 15.2 Attenuator Shelf (ITAC) 3 (55-165506) system diagram

Drawing number 55-165586



No	DESCRIPTION	DATE	BY
AA	PROTOTYPE ISSUE	14/06/07	LS

THIRD ANGLE PROJECTION

TITLE  
**ATTENUATOR SHELF (ITAC)  
SYSTEM DIAGRAM**

CUSTOMER  
DRAWING No 55-165586  
A 3

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TOLERANCES  
NO DECIMAL PLACE ± 1mm  
ONE DECIMAL PLACE ± 0.3mm  
TWO DECIMAL PLACES ± 0.1mm  
UNLESS OTHERWISE STATED

SCALE  
—

DATE 14/06/07  
DRAWN LS  
CHKD GD  
APPD PB

### 15.3. Attenuator Shelf (ITAC) 3 (55-165506) major components

#### 15.3.1. 900MHz Splitter/Combiner (05-002602)

The Splitter/Combiner used is a device for accurately matching two or more RF signals to single or multiple ports, whilst maintaining an accurate 50Ω load to all inputs/outputs and ensuring that the VSWR and insertion losses are kept to a minimum. Any unused ports should be terminated with an appropriate 50Ω load.

Being passive devices, the splitters should have an extremely long operational life and require no maintenance. Should a unit be suspect, it is usually most time efficient to replace the whole module rather than attempt repair or re-tuning.

05-002602 Specification

PARAMETER		SPECIFICATION
Frequency range	Narrowband	815 – 960MHz
	Broadband	800 – 1200MHz
Bandwidth	Narrowband	145MHz
	Broadband	400MHz
Input ports		1
Output ports		2
Insertion loss	Narrowband	3.3dB
	Broadband	3.5dB
Return loss input & output		1.3:1
Impedance		50Ω
Isolation	Narrowband	>20dB
	Broadband	>18dB
MTFB		>180,000 hours
Power rating	Splitting	20Watts
	Combining	0.5Watt
Connectors		SMA female
Weight		200g (approximately)
Size		54 x 44 x 21mm

#### 15.3.2. 4 Port Hybrid Coupler (05-003007)

This transmitter hybrid coupler is a device for accurately matching two or more RF signals to single or multiple ports, whilst maintaining an accurate 50Ω load to all inputs/outputs and ensuring that the insertion losses are kept to a minimum. Any unused ports should be terminated with an appropriate 50Ω load. In this specific instance one port of 4 Port Hybrid Coupler (05-003007) is terminated with Dummy load 09-000902 (see below).

05-003007 Specification

PARAMETER		SPECIFICATION
Frequency range:		700-900MHz
Bandwidth:		200MHz
Rejection:		>14dB
Insertion loss:		6.5dB (in band, typical)
Connectors:		SMA
Weight:		<1.0kg
Temperature range:	operational	-10℃ to +60℃
	storage	-20℃ to +70℃

### 15.3.3. Dummy Load (09-000902)

When a combiner system is used to split or combine RF signals, in many cases it is most cost effective to use a standard stock item 4, 6 or 8 port device where, in fact, only a 3 or 6 port device is needed. In this case 4 Port Hybrid Coupler (05-003007) has one of its ports terminated with Dummy load (09-000902) in order to preserve the correct impedance of the device over the specified frequency range.

09-000902 specification

PARAMETER	SPECIFICATION
Frequency Range	0 - 2500 MHz
Power Rating	25 Watts continuous
VSWR	Better than 1.1:1
Impedance	50 Ohms
Temperature Range	-20 to +60°C
RF Connectors	N Type female
Dimension	110.3mm x 38.1mm x
Weight	485 grams
Finish	Black Anodised
RF Connector	N Type male
Environmental	IP66
MTBF	>180,000 hours

### 15.3.4. Switched Attenuator 0.25W, 0 - 15dB (10-000901)

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.

10-000901 provides attenuation from 0 - 15dB in 2 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.

10-000901 Specification

PARAMETER	SPECIFICATION	
Attenuation Values	0-15dB	
Attenuation Steps	1, 2, 4 and 8dB	
Power Handling	0.25 Watt	
Attenuation Accuracy	± 1.0 dB	
Frequency Range	DC to 1GHz	
Impedance	50Ω	
Connectors	SMA	
VSWR	1.3:1	
Weight	0.2kg	
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

### 15.3.5. Attenuator 25W, 60dB (10-002960)

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. Attenuator 25W, 60dB (10-002960) is a fixed attenuator providing 60dB of signal attenuation.

#### 10-002960 Specification

PARAMETER		SPECIFICATION
Frequency Range		DC to 2.5GHz
Power Handling		25 W
Attenuation		60 dB
Attenuation Accuracy		± 0.5dB
Return Loss to 2.2GHz		18dB
Nominal Impedance		50 Ω
RF Conectors		N male to N female
Finish		Matt Black Anodise
Temperature range	operational	-20°C to +55°C
	storage	-20°C to +70°C

## 16. CONVENTION PLACE STATION LINE AMPLIFIER (80-330556)

C01-CR-05

Description of Convention Place Station Line Amp. (80-330556)

From the top of the rack

55-165709

55-165703

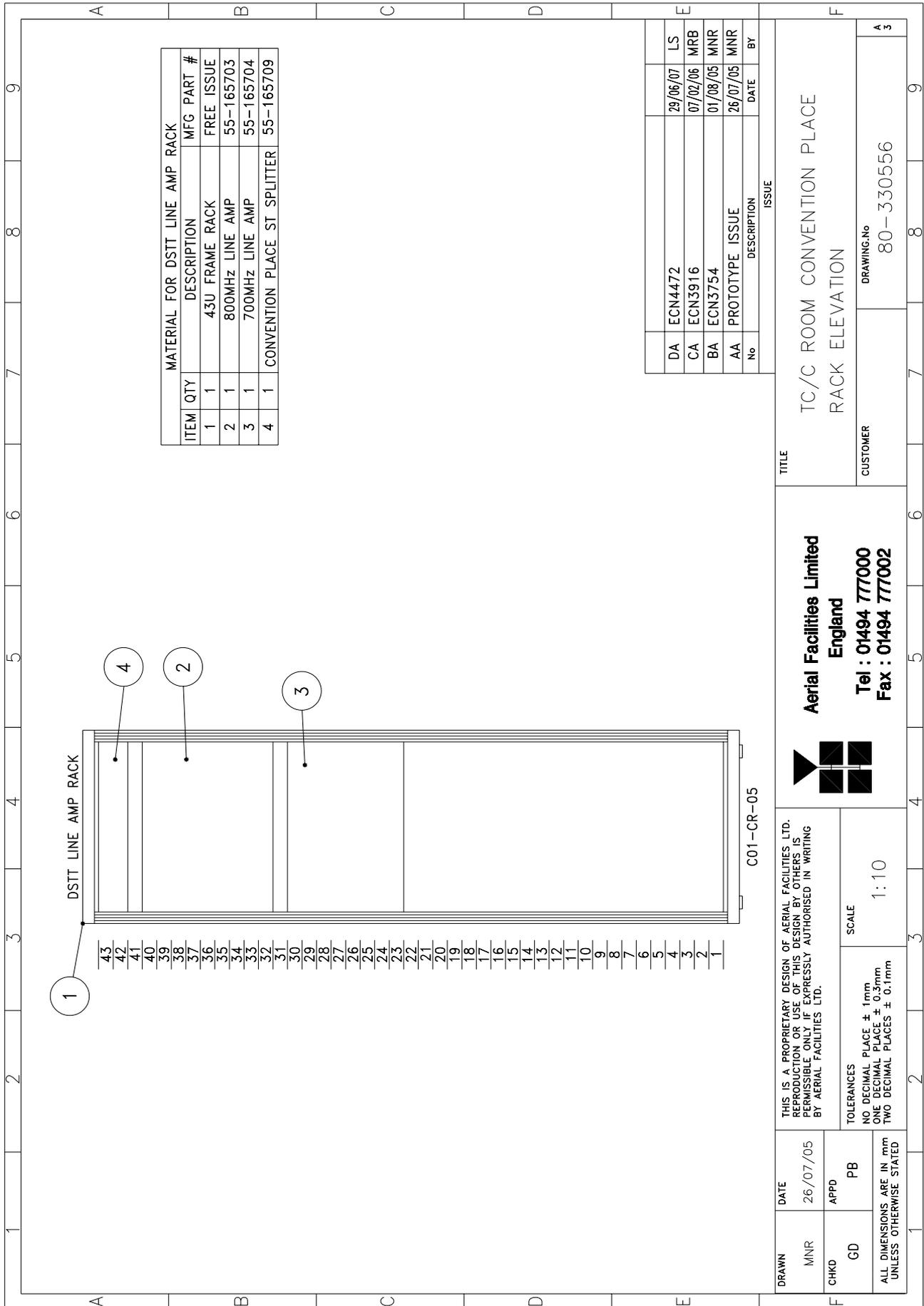
55-165704

Convention Place Station Line Amp. (80-330556) list of major components

Section	Component Part	Component Part Description	Qty. Per Assembly
16.3.1.	55-165703	800MHz Line Amplifier	1
16.3.2.	55-165704	700MHz LINE AMP + FILTERS (INT AMP)	1
16.3.3.	55-165709	Convention Place Station Splitter	1

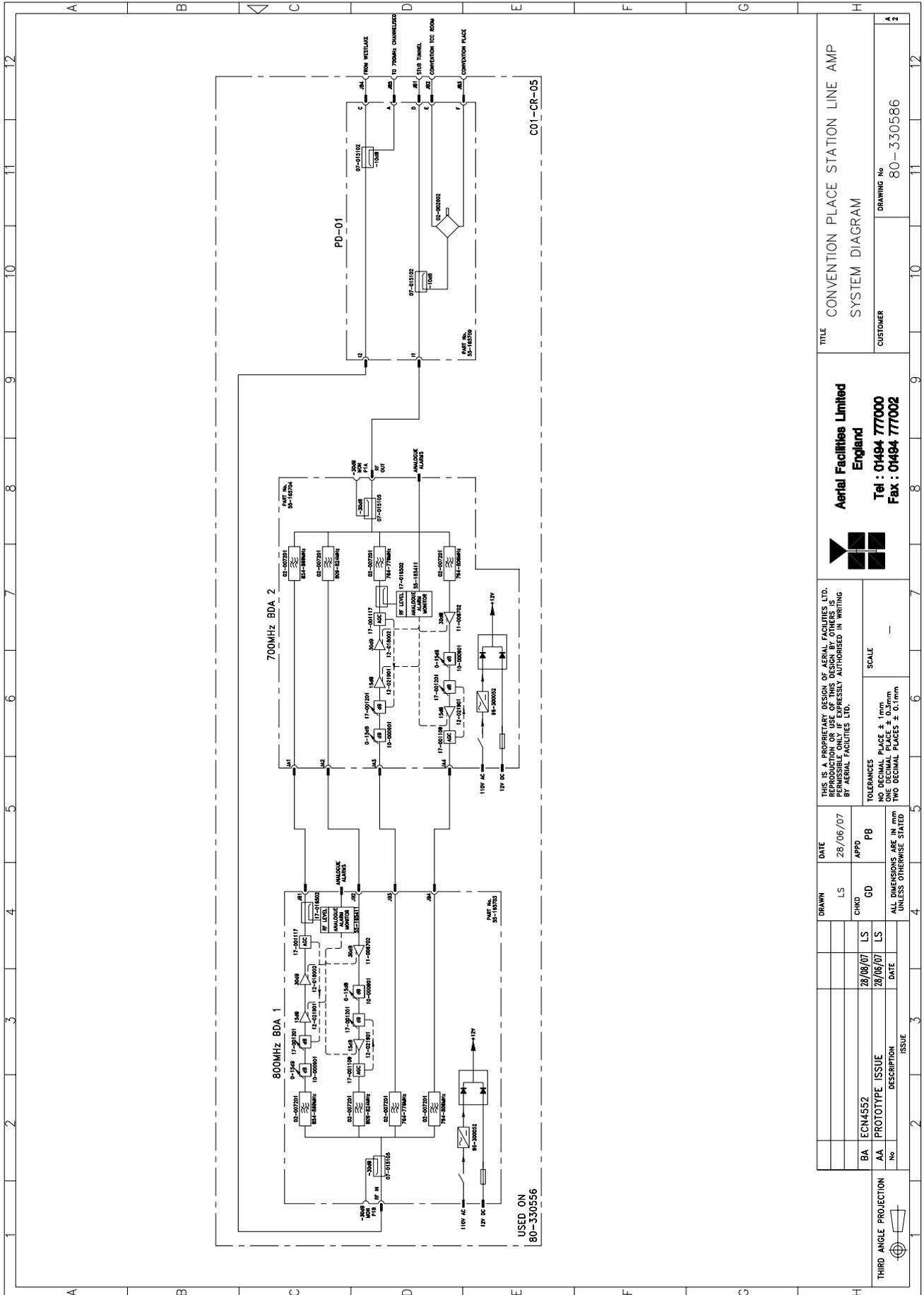
# 16.1. Convention Place Station Line Amp. (80-330556) Rack elevation

Drawing number 80-330556



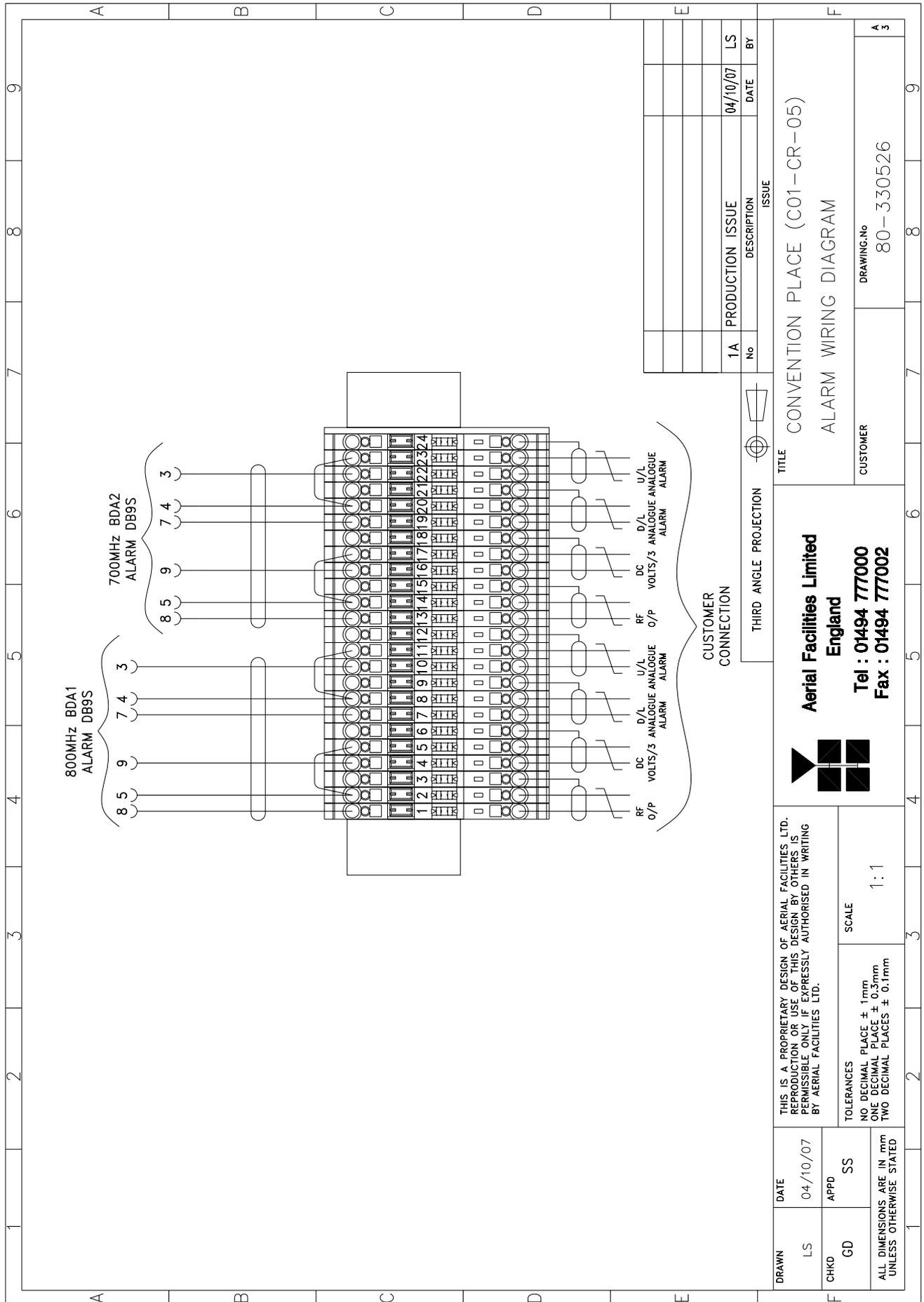
# 16.2. Convention Place Station Line Amp. (80-330556) System diagram

Drawing number 80-330586



# 16.3. Convention Place Station Line Amp. (80-330556) Alarm wiring diagram

Drawing number 80-330526



## 16.4 Convention Place Station Line Amp. (80-330556) Sub Components

### 16.4.1. 800MHz Line Amplifier (55-165703)

800MHz Line Amplifier (55-165703) List of Major Components

800MHz Line Amplifier (55-165703) List of Major Components

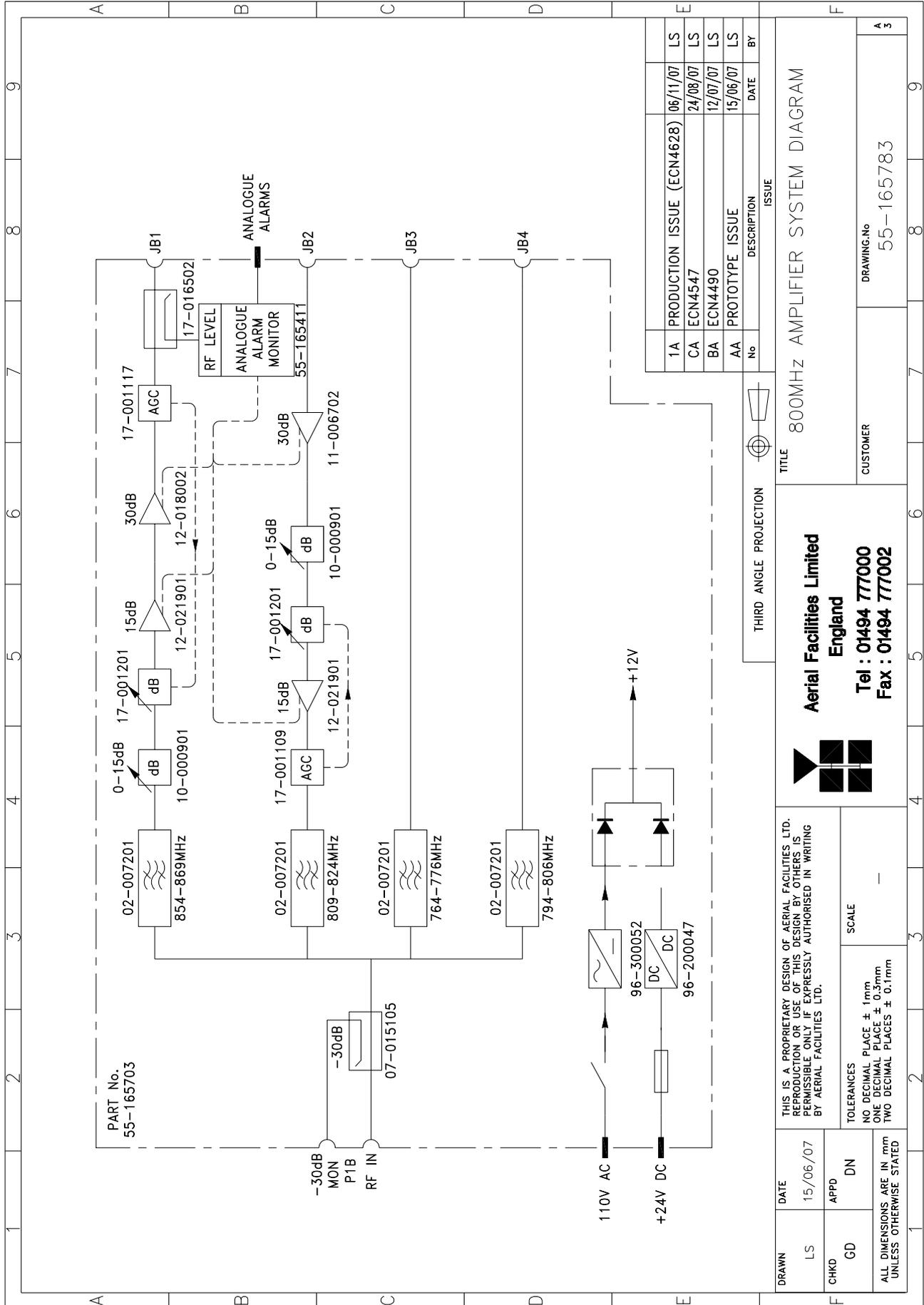
Section	Component Part	Component Part Description	Qty. Per Assembly
16.4.1.3.	02-007206	Bandpass Filter	4
16.4.1.4.	07-015105	Wideband Asymmetric Coupler	1
16.4.1.5.	10-000901	Switched Attenuator 0.25W, 0 - 15dB	2
16.4.1.6.	11-006702	Low Noise Amplifier	1
16.4.1.7.	12-018002	Power Amplifier (20W 800MHz )	1
16.4.1.8.	12-021901	Low Power Amplifier	2
16.4.1.9.	17-001109*	AGC Detector Assembly (Logarithmic)	1
	17-001117*	AGC Detector Assembly	1
	17-001201*	AGC Attenuator Assembly	2
16.4.1.10.	20-001601	12V (Dual) Relay Board	1
16.4.1.11.	80-008901	12V (Single) Relay Board	1
16.4.1.12.	94-100004	Dual Diode Assembly	1
16.4.1.13.	96-200047	DC/DC Converter	1
16.4.1.14.	96-300052	12V Switch-Mode PSU	1

\*The sub components 17-001109, 17-001117 & 17-001201 are parts of the Automatic Gain Control (AGC) system used in 800MHz Line Amplifier (55-165703); 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the downlink



# 16.4.1.2. 800MHz Line Amplifier (55-165703) System Diagram

Drawing number 55-165783



### 16.4.1.3. Bandpass Filter (02-007206)

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 slot coupled, folded 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.

Being passive devices, the bandpass filters should have an extremely long operational life and require no maintenance. Should a filter be suspect, it is usually most time efficient to replace the module rather than attempt repair or re-tuning.

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

#### 02-007206 Specification

PARAMETER		SPECIFICATION
Response type		Chebyshev
Frequency range		800 - 950MHz *
Bandwidth		25MHz *
Number of sections		8
Insertion loss		1.2 dB
VSWR		better than 1.2:1
Connectors		SMA female
Power handling		100W max
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C
Weight		3 kg (typical)

\*tuned to Customer's specification

### 16.4.1.4. Wideband Asymmetric Coupler (07-015105)

The purpose of Wideband Asymmetric Coupler (07-015105) is to tap off a known portion (in this case 30dB) of RF signal from transmission lines and to combine them, for example through splitter units for different purposes (alarms/monitoring etc.), whilst maintaining an accurate 50Ω load to all ports/interfaces throughout the specified frequency range. They are known formally as directional couplers as they couple power from the RF mainline in one direction only.

#### 07-015105 Specification

PARAMETER		SPECIFICATION
Construction		Inductive air gap
Frequency		800-2500MHz
Through loss		0.4dB (typical)
Coupling level		-30dB ±0.5dB
Isolation		N/A
Weight		<1.0kg
Connectors		SMA, female
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

### 16.4.1.5. Switched Attenuator 0.25W, 0 - 15dB (10-000901)

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.

10-000901 provides attenuation from 0 - 15dB in 2 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.

#### 10-000901 Specification

PARAMETER		SPECIFICATION
Attenuation Values		0-15dB
Attenuation Steps		1, 2, 4 and 8dB
Power Handling		0.25 Watt
Attenuation Accuracy		± 1.0 dB
Frequency Range		DC to 1GHz
Impedance		50Ω
Connectors		SMA
VSWR		1.3:1
Weigh		0.2kg
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

### 16.4.1.6. Low Noise Amplifier (11-006702)

The Gallium-Arsenide low noise amplifiers used in 800MHz Line Amplifier (55-165703) are double stage, solid-state low noise amplifiers. Class A circuitry is used throughout the units to ensure excellent linearity and extremely low noise over a very wide dynamic range. The active devices are very moderately rated to provide a long trouble-free working life. There are no adjustments on these amplifiers, and in the unlikely event of a failure, then the complete amplifier should be replaced. This amplifier features its own in-built alarm system which gives a volt-free relay contact type alarm that is easily integrated into the main alarm system.

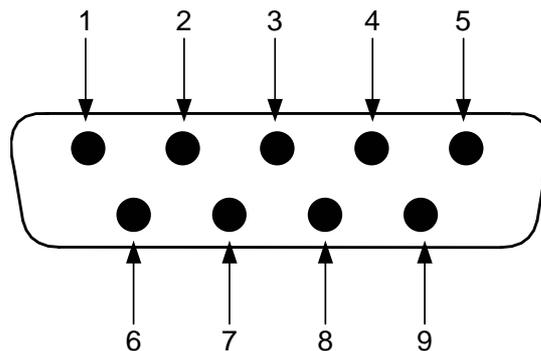
#### 11-006702 Specification

PARAMETER		SPECIFICATION
Frequency range:		800 – 1000MHz
Bandwidth:		<200MHz
Gain:		29dB (typical)
1dB Compression point:		20dBm
OIP3:		33dBm
Input/Output return loss:		>18dB
Noise figure:		1.3dB (typical)
Power consumption:		180mA @ 24V DC
Supply voltage:		10-24V DC
Connectors:		SMA female
Temperature range:	operational:	-10°C to +60°C
	storage:	-20°C to +70°C
Size:		90 x 55 x 30.2mm
Weight:		290gms (approximately)

Low Noise Amplifier (11-006702) 'D' Connector Pin-out details

Connector pin	Signal
1	+Ve input (10-24V)
2	GND
3	Alarm RelayO/P bad
4	Alarm Relay common
5	Alarm Relay good
6	No connection
7	TTL voltage set
8	TTL alarm/0V (good)
9	O/C good/0V bad

9-Way Pin-Out Graphical Representation



**16.4.1.7. Power Amplifier (12-018002)**

This amplifier is a Class A 20W power amplifier from 800-960MHz in a 1 stage balanced configuration. It demonstrates a very high linearity and a very good input/output return loss (RL). It has built in a Current Fault Alarm Function.

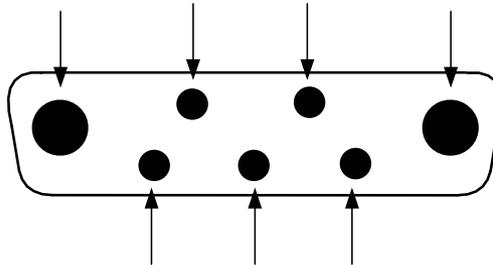
Its housing is an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a D-Type connector for the power supply and the Current Fault Alarm Function.

12-018002 Specification

PARAMETER	SPECIFICATION	
Frequency range:	800-960MHz	
Small signal gain:	30dB	
Gain flatness:	±1.2dB	
I/O Return loss:	>18dB	
1dB compression point:	42.8dBm	
OIP3:	56dBm	
Supply voltage:	24V DC	
Supply current:	5.0Amps (Typical)	
Temperature range	operational:	-10°C to +60°C
	storage:	-20°C to +70°C
Weight:	<2kg (no heatsink)	

Power Amplifier (12-018002) 7-Way Connector Pin-outs

Connector Pin	Signal
A1 (large pin)	+24V DC
A2 (large pin)	GND
1	Alarm relay common
2	TTL alarm/0V good
3	Alarm relay contact (bad)
4	Alarm relay contact (good)
5	O/C good/0V bad (TTL)



**16.4.1.8. Low Power Amplifier (12-021901)**

The low power amplifier used is a triple stage solid-state low-noise amplifier. Class A circuitry is used in the unit to ensure excellent linearity over a very wide dynamic range. The three active devices are very moderately rated to provide a long trouble-free working life.

Its housing is an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a D-Type connector for the power supply and the Current Fault Alarm Function.

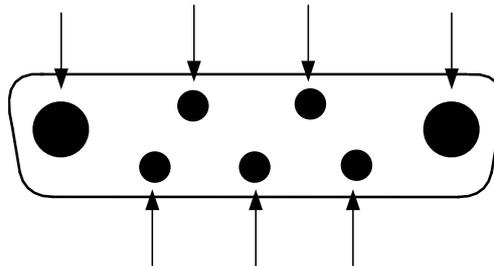
There are no adjustments on this amplifier, and in the unlikely event of failure then the entire amplifier should be replaced.

Low Power Amplifier (12-021901) Specification

PARAMETER		SPECIFICATION
Frequency range		800-960MHz*
Bandwidth		20MHz *
Maximum RF output		>1.0 Watt
Gain		15dB
1dB compression point		+30.5dBm
3 <sup>rd</sup> order intercept point		+43dBm
Noise Figure		<6dB
VSWR		better than 1.5:1
Connectors		SMA female
Supply		500mA @ 10-15V DC
Temperature range	operational	-10°C to +60°C
	storage	-20°C to +70°C
Weight		0.5 kg
Size		167x52x25mm

\* Tuned to Customer's specification

Connector Pin	Signal
A1 (large pin)	+24V DC
A2 (large pin)	GND
1	Alarm relay common
2	TTL alarm/0V good
3	Alarm relay contact (bad)
4	Alarm relay contact (good)
5	O/C good/0V bad (TTL)



#### 16.4.1.9. Automatic Gain Control

- 17-001109 AGC Detector Assembly (Logarithmic)
- 17-001117 AGC Detector Assembly
- 17-001201 AGC Attenuator Assembly

The sub components 17-001109, 17-001117 & 17-001201 are parts of the Automatic Gain Control (AGC) system used in 800MHz Line Amplifier (55-165703); 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the downlink

800MHz Line Amplifier (55-165703) is fitted with two differing types of Automatic Gain Control (AGC) system, one linear, and one logarithmic. The AGC with logarithmic detector (17-001117) is fitted in the uplink path and the AGC with linear detector (17-001109) is fitted in the downlink path

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. 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the downlink

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 detector controller board.

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.

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.

AGC Specification (both types)

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

**16.4.1.10. 12V (Dual) Relay Board (20-001601)**

The General Purpose Relay Board allows the inversion of signals and the isolation of circuits. It is equipped with two dual pole change-over relays with completely isolated wiring, accessed via screw terminals. Both relays are 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.

20-001601 Specification

PARAMETER		SPECIFICATION
Operating voltage:		8 to 30V (floating earth)
Alarm threshold:		Vcc - 1.20 volt +15%
Alarm output relay contacts:		
Max. switch current:		1.0Amp
Max. switch volts:		120Vdc/60VA
Max. switch power:		24W/60VA
Min. switch load:		10.0µA/10.0mV
Relay isolation:		1.5kV
Mechanical life:		>2x10 <sup>7</sup> operations
Relay approval:		BT type 56
Connector details:		Screw terminals
Temperature range	operational:	-10°C to +60°C
	storage:	-20°C to +70°C

#### 16.4.1.11. 12V (Single) Relay Board (80-008901)

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.

#### 80-008901 Specification

PARAMETER		SPECIFICATION
Operating voltage		8 to 30V (floating earth)
Alarm threshold		Vcc - 1.20 volt +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		10.0µA/10.0mV
Relay isolation		1.5kV
Mechanical life		>2x10 <sup>7</sup> operations
Relay approval		BT type 56
Connector details		Screw terminals
Temperature range	operational	-10°C to +60°C
	storage	-20°C to +70°C

#### 16.4.1.12. Dual Diode Assembly (94-100004)

The purpose of these dual diode assemblies is to allow two DC voltage sources to be combined, so that the main DC rail within the equipment can be sourced from either a mains driven PSU, or externally through an XLR connector or from dual mains driven PSUs . They are very heavy-duty diodes and they prevent any reverse current from flowing back to their source or the alternative supply rail. Combining diodes such as these will also be used if the equipment is to be powered from external back-up batteries.

### 16.4.1.13. DC/DC Converter 96-200047

96-200047 is an O.E.M. high power device with a wide input range and 12.5 amp @ 12V (150Watts) output capability used to derive a 12V fixed voltage power supply rail from a higher voltage supply, in this case 12V. In the event of failure this unit should not be repaired, only replaced.

96-200047 Specification

PARAMETER		SPECIFICATION
DC Input Voltage range		19 to 36V
DC Output voltage		12V $\pm$ 1%
Max. current load		12.5Amps
Temperature range	Operation	-10°C to +60°C
	Storage	-20°C to +85°C
Working Humidity		20 to 90% RHNC

### 16.4.1.14. 12V Switch-Mode PSU (96-300052)

No routine maintenance of the PSU is required. If a fault is suspected, then the output voltage from the power supply may be measured on its output terminals. This is typically set to 12.2V. The adjustment potentiometer will be found close to the DC output terminals.

All the PSUs used in AFL Cell Enhancers are capable of operation from either 110 or 220V nominal AC supplies. The line voltage is sensed automatically, so no adjustment or link setting is needed by the operator.

96-300052 Specification

AC Input Supply	
Voltage	110 or 220V nominal
	85 - 265V AC (absolute limits)
Frequency	47 to 63Hz
DC Output Supply	
Voltage	12V DC (nominal)
	10.5-13.8V (absolute limits)
Current	12.5A

## 16.4.2 700MHz Line Amplifier (55-165704)

Description of 700MHz Line Amplifier (55-165704)

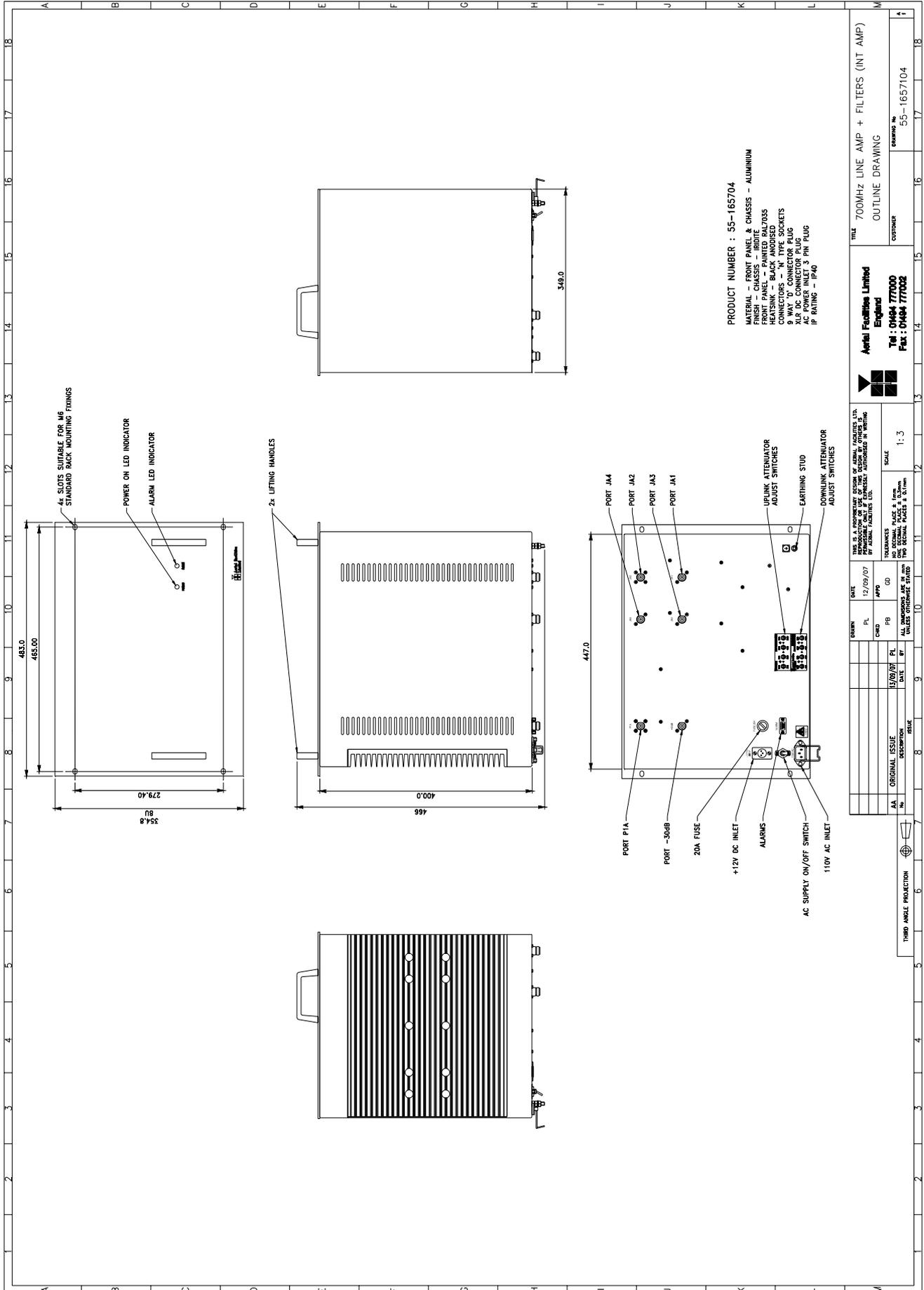
700MHz Line Amplifier (55-165704) List of Major Components

Section	Component Part	Component Part Description	Qty. Per Assembly
16.4.2.3.	02-007206	Bandpass Filter	4
16.4.2.4.	07-015105	Wideband Asymmetric Coupler	1
16.4.2.5.	10-000901	Switched Attenuator 0.25W, 0 - 15dB	2
16.4.2.6.	11-006702	Low Noise Amplifier	1
16.4.2.7.	12-018002	Power Amplifier (20W 800MHz )	1
16.4.2.8.	12-021901	Low Power Amplifier	2
16.4.2.9.	17-001109*	AGC Detector Assembly (Logarithmic)	1
	17-001117*	AGC Detector Assembly	1
	17-001201*	AGC Attenuator Assembly	2
16.4.2.10.	80-008901	12V (Single) Relay Board	1
16.4.2.11.	94-100004	Dual Diode Assembly	1
16.4.2.12.	96-200047	DC/DC Converter	1
16.4.2.13.	96-300052	12V Switch-Mode PSU	1

\*The sub components 17-001109, 17-001117 & 17-001201 are parts of the Automatic Gain Control (AGC) system used in 800MHz Line Amplifier (55-165703); 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the downlink

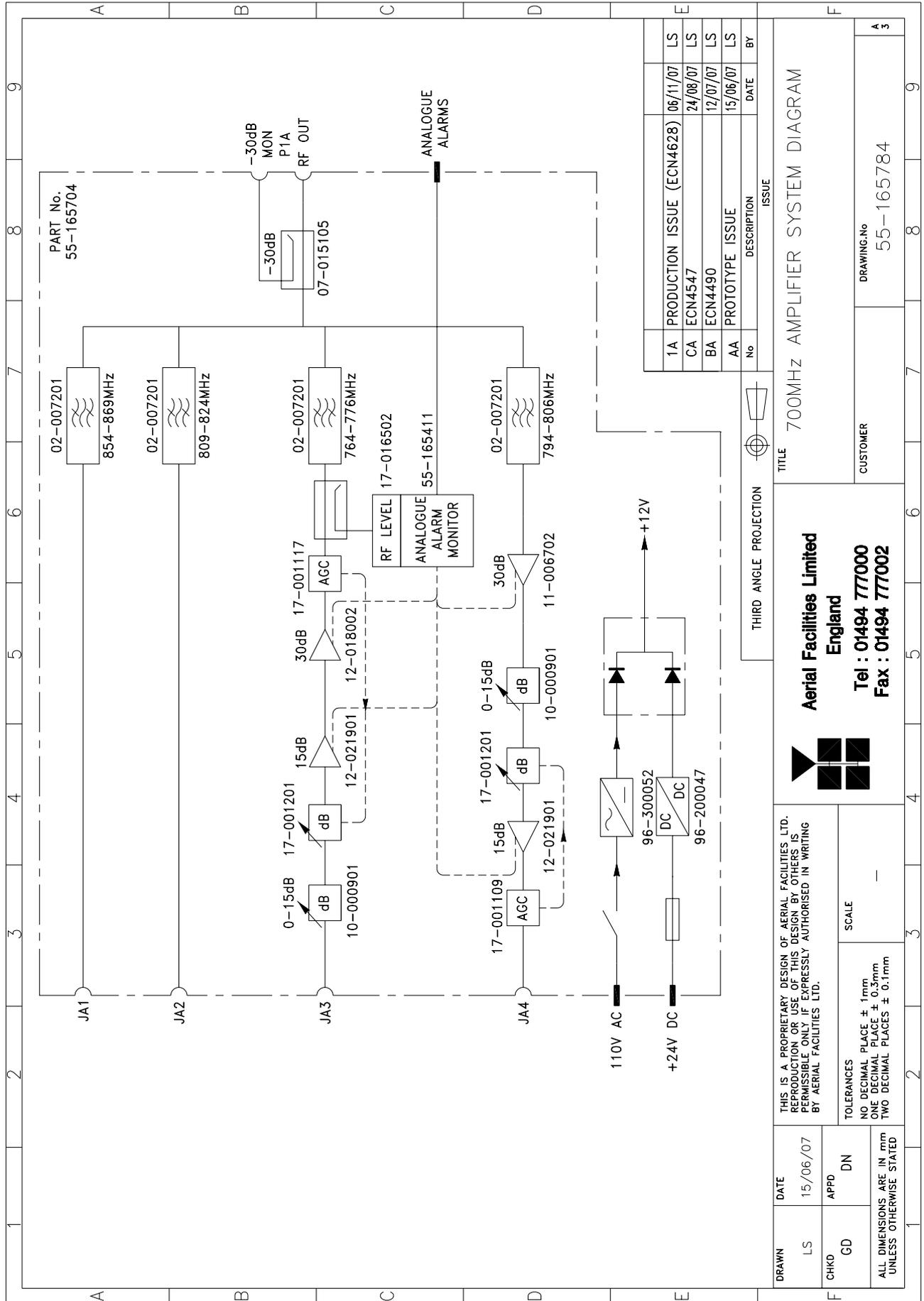
# 16.4.2.1. 700MHz Line Amplifier (55-165704) Outline Drawing

Drawing number 55-1657104



# 16.4.2.2. 700MHz Line Amplifier (55-165704) System Diagram

Drawing number 55-165784



### 16.4.2.3. Bandpass Filter (02-007206)

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 slot coupled, folded 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.

Being passive devices, the bandpass filters should have an extremely long operational life and require no maintenance. Should a filter be suspect, it is usually most time efficient to replace the module rather than attempt repair or re-tuning.

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

#### 02-007206 Specification

PARAMETER		SPECIFICATION
Response type		Chebyshev
Frequency range		800 - 950MHz *
Bandwidth		25MHz *
Number of sections		8
Insertion loss		1.2 dB
VSWR		better than 1.2:1
Connectors		SMA female
Power handling		100W max
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C
Weight		3 kg (typical)

\*tuned to Customer's specification

### 16.4.2.4. Wideband Asymmetric Coupler (07-015105)

The purpose of Wideband Asymmetric Coupler (07-015105) is to tap off a known portion (in this case 30dB) of RF signal from transmission lines and to combine them, for example through splitter units for different purposes (alarms/monitoring etc.), whilst maintaining an accurate 50Ω load to all ports/interfaces throughout the specified frequency range. They are known formally as directional couplers as they couple power from the RF mainline in one direction only.

#### 07-015105 Specification

PARAMETER		SPECIFICATION
Construction		Inductive air gap
Frequency		800-2500MHz
Through loss		0.4dB (typical)
Coupling level		-30dB ±0.5dB
Isolation		N/A
Weight		<1.0kg
Connectors		SMA, female
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

### 16.4.2.5. Switched Attenuator 0.25W, 0 - 15dB (10-000901)

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.

10-000901 provides attenuation from 0 - 15dB in 2 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.

#### 10-000901 Specification

PARAMETER		SPECIFICATION
Attenuation Values		0-15dB
Attenuation Steps		1, 2, 4 and 8dB
Power Handling		0.25 Watt
Attenuation Accuracy		± 1.0 dB
Frequency Range		DC to 1GHz
Impedance		50Ω
Connectors		SMA
VSWR		1.3:1
Weigh		0.2kg
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

### 16.4.2.6. Low Noise Amplifier (11-006702)

The Gallium-Arsenide low noise amplifiers used in 700MHz Line Amplifier (55-165704) are double stage, solid-state low noise amplifiers. Class A circuitry is used throughout the units to ensure excellent linearity and extremely low noise over a very wide dynamic range. The active devices are very moderately rated to provide a long trouble-free working life. There are no adjustments on these amplifiers, and in the unlikely event of a failure, then the complete amplifier should be replaced. This amplifier features its own in-built alarm system which gives a volt-free relay contact type alarm that is easily integrated into the main alarm system.

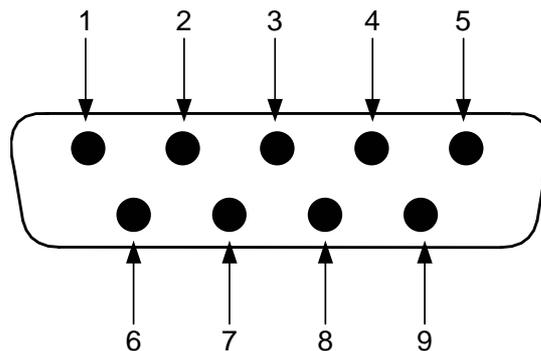
#### 11-006702 Specification

PARAMETER		SPECIFICATION
Frequency range:		800 – 1000MHz
Bandwidth:		<200MHz
Gain:		29dB (typical)
1dB Compression point:		20dBm
OIP3:		33dBm
Input/Output return loss:		>18dB
Noise figure:		1.3dB (typical)
Power consumption:		180mA @ 24V DC
Supply voltage:		10-24V DC
Connectors:		SMA female
Temperature range:	operational:	-10°C to +60°C
	storage:	-20°C to +70°C
Size:		90 x 55 x 30.2mm
Weight:		290gms (approximately)

Low Noise Amplifier (11-006702) 'D' Connector Pin-out details

Connector pin	Signal
1	+Ve input (10-24V)
2	GND
3	Alarm RelayO/P bad
4	Alarm Relay common
5	Alarm Relay good
6	No connection
7	TTL voltage set
8	TTL alarm/0V (good)
9	O/C good/0V bad

9-Way Pin-Out Graphical Representation



**16.4.2.7. Power Amplifier (12-018002)**

This amplifier is a Class A 20W power amplifier from 800-960MHz in a 1 stage balanced configuration. It demonstrates a very high linearity and a very good input/output return loss (RL). It has built in a Current Fault Alarm Function.

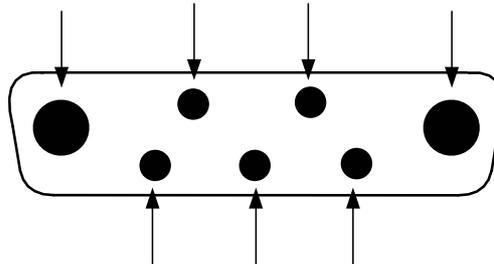
Its housing is an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a D-Type connector for the power supply and the Current Fault Alarm Function.

Technical Specification

PARAMETER		SPECIFICATION
Frequency range:		800-960MHz
Small signal gain:		30dB
Gain flatness:		±1.2dB
I/O Return loss:		>18dB
1dB compression point:		42.8dBm
OIP3:		56dBm
Supply voltage:		24V DC
Supply current:		5.0Amps (Typical)
Temperature range	operational:	-10°C to +60°C
	storage:	-20°C to +70°C
Weight:		<2kg (no heatsink)

Power Amplifier (12-018002) 7-Way Connector Pin-outs

Connector Pin	Signal
A1 (large pin)	+24V DC
A2 (large pin)	GND
1	Alarm relay common
2	TTL alarm/0V good
3	Alarm relay contact (bad)
4	Alarm relay contact (good)
5	O/C good/0V bad (TTL)



**16.4.2.8. Low Power Amplifier (12-021901)**

The low power amplifier used is a triple stage solid-state low-noise amplifier. Class A circuitry is used in the unit to ensure excellent linearity over a very wide dynamic range. The three active devices are very moderately rated to provide a long trouble-free working life.

Its housing is an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a D-Type connector for the power supply and the Current Fault Alarm Function.

There are no adjustments on this amplifier, and in the unlikely event of failure then the entire amplifier should be replaced.

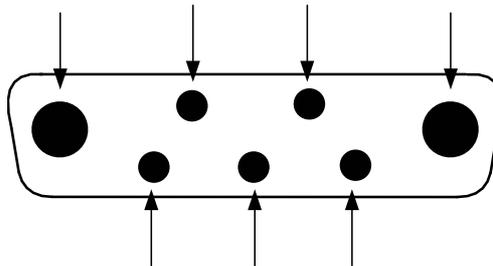
Low Power Amplifier (12-021901) Specification

PARAMETER		SPECIFICATION
Frequency range		800-960MHz*
Bandwidth		20MHz *
Maximum RF output		>1.0 Watt
Gain		15dB
1dB compression point		+30.5dBm
3 <sup>rd</sup> order intercept point		+43dBm
Noise Figure		<6dB
VSWR		better than 1.5:1
Connectors		SMA female
Supply		500mA @ 10-15V DC
Temperature range	operational	-10°C to +60°C
	storage	-20°C to +70°C
Weight		0.5 kg
Size		167x52x25mm

\* Tuned to Customer's specification

Low Power Amplifier (12-021901) 7-Way Connector Pin-outs

Connector Pin	Signal
A1 (large pin)	+24V DC
A2 (large pin)	GND
1	Alarm relay common
2	TTL alarm/0V good
3	Alarm relay contact (bad)
4	Alarm relay contact (good)
5	O/C good/0V bad (TTL)



**16.4.2.9. Automatic Gain Control**

- 17-001109 AGC Detector Assembly (Logarithmic)
- 17-001117 AGC Detector Assembly
- 17-001201 AGC Attenuator Assembly

The sub components 17-001109, 17-001117 & 17-001201 are parts of the Automatic Gain Control (AGC) system used in 700MHz Line Amplifier (55-165704); 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the downlink

700MHz Line Amplifier (55-165704) is fitted with two differing types of Automatic Gain Control (AGC) system, one linear, and one logarithmic. The AGC with logarithmic detector (17-001117) is fitted in the uplink path and the AGC with linear detector (17-001109) is fitted in the downlink path

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. 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the downlink

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 detector controller board.

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.

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.

#### AGC Specification (both types)

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

#### 16.4.2.10. 12V (Single) Relay Board (80-008901)

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.

#### 80-008901 Specification

PARAMETER		SPECIFICATION
Operating voltage		8 to 30V (floating earth)
Alarm threshold		Vcc - 1.20 volt +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		10.0µA/10.0mV
Relay isolation		1.5kV
Mechanical life		>2x10 <sup>7</sup> operations
Relay approval		BT type 56
Connector details		Screw terminals
Temperature range	operational	-10°C to +60°C
	storage	-20°C to +70°C

### 16.4.2.11. Dual Diode Assembly (94-100004)

The purpose of these dual diode assemblies is to allow two DC voltage sources to be combined, so that the main DC rail within the equipment can be sourced from either a mains driven PSU, or externally through an XLR connector or from dual mains driven PSUs . They are very heavy-duty diodes and they prevent any reverse current from flowing back to their source or the alternative supply rail. Combining diodes such as these will also be used if the equipment is to be powered from external back-up batteries.

### 16.4.2.12. DC/DC Converter 96-200047

96-200047 is an O.E.M. high power device with a wide input range and 12.5 amp @ 12V (150Watts) output capability used to derive a 12V fixed voltage power supply rail from a higher voltage supply, in this case 12V. In the event of failure this unit should not be repaired, only replaced.

96-200047 Specification

PARAMETER		SPECIFICATION
DC Input Voltage range		19 to 36V
DC Output voltage		12V $\pm$ 1%
Max. current load		12.5Amps
Temperature range	Operation	-10°C to +60°C
	Storage	-20°C to +85°C
Working Humidity		20 to 90% RHNC

### 16.3.2.13. 12V Switch-Mode PSU (96-300052)

No routine maintenance of the PSU is required. If a fault is suspected, then the output voltage from the power supply may be measured on its output terminals. This is typically set to 12.2V. The adjustment potentiometer will be found close to the DC output terminals.

All the PSUs used in AFL Cell Enhancers are capable of operation from either 110 or 220V nominal AC supplies. The line voltage is sensed automatically, so no adjustment or link setting is needed by the operator.

96-300052 Specification

AC Input Supply	
Voltage	110 or 220V nominal
	85 - 265V AC (absolute limits)
Frequency	47 to 63Hz
DC Output Supply	
Voltage	12V DC (nominal)
	10.5-13.8V (absolute limits)
Current	12.5A

### 16.4.3. Convention Place Station Splitter (55-165709)

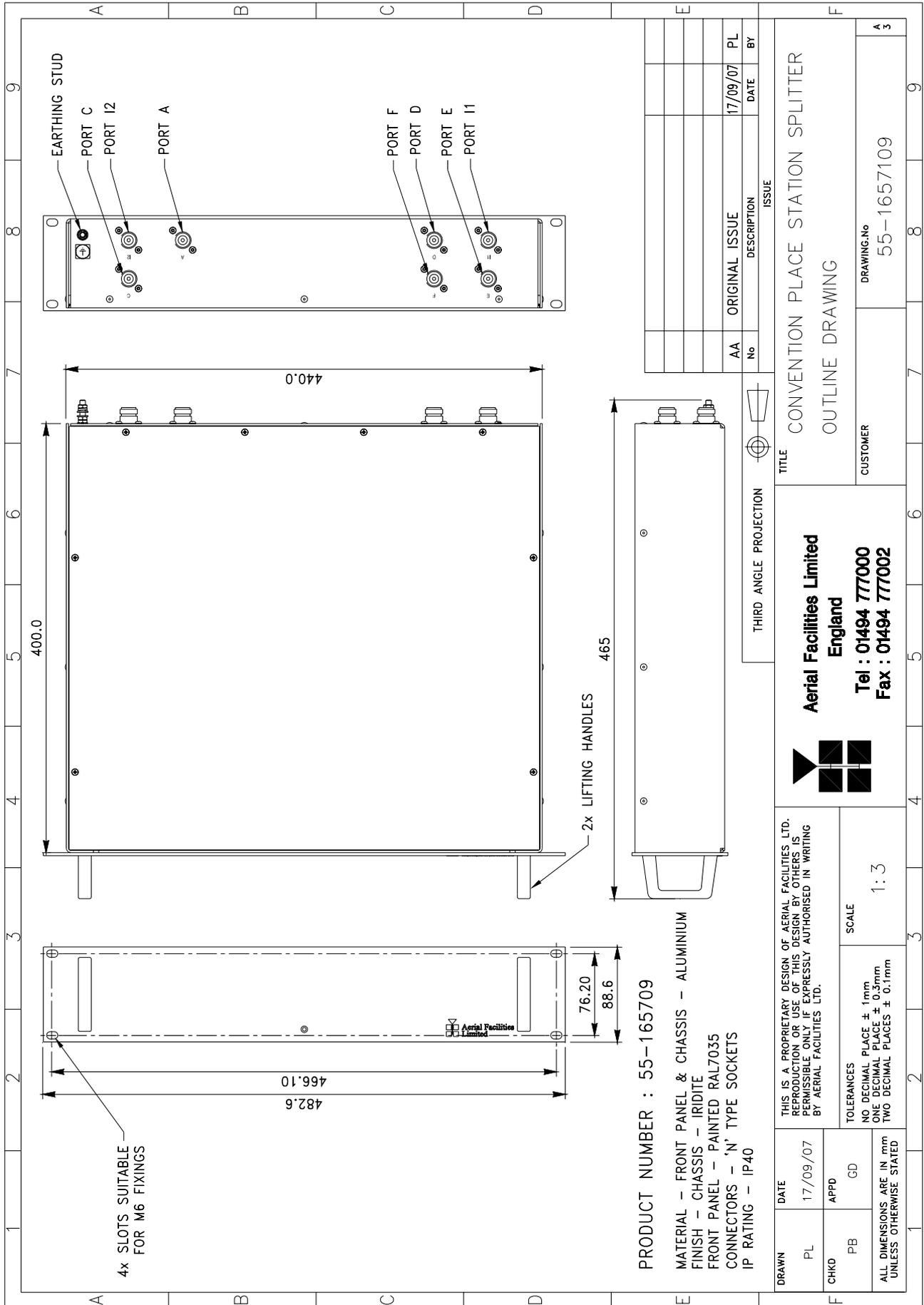
2U rack mount tray

Convention Place Station Splitter (55-165709) major components

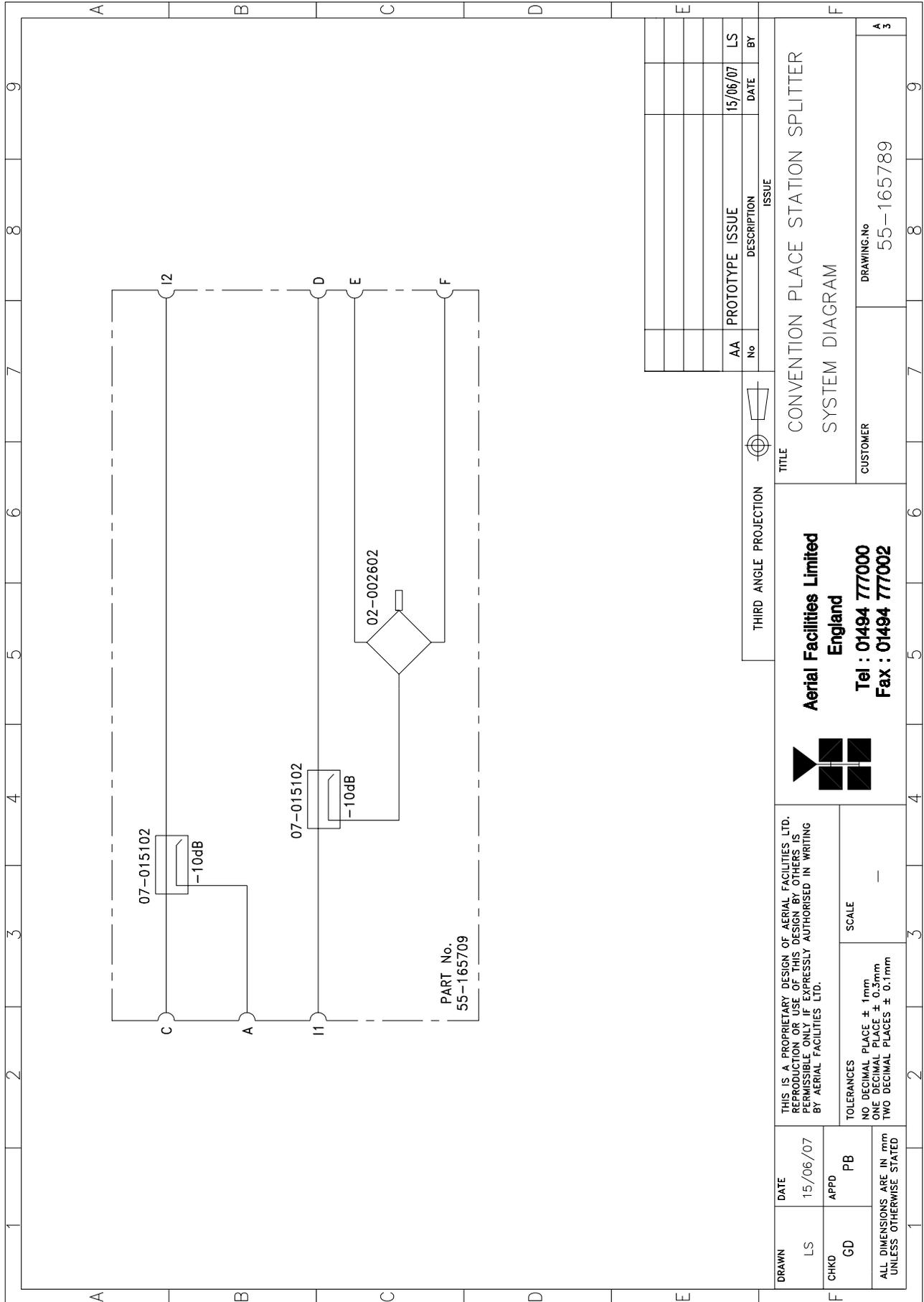
Section	Component Part	Component Part Description	Qty. Per Assembly
16.4.3.3.	05-002602	900MHz Splitter/Combiner	1
16.4.3.4.	07-015102	Wideband Asymmetric Coupler	2

### 16.4.3.1. Convention Place Station Splitter (55-165709) outline drawing

Drawing number 55-1657109



**16.4.3.2. Convention Place Station Splitter (55-165709) system diagram**  
 Drawing number 55-165789



DRAWN LS		DATE 15/06/07	THIRD ANGLE PROJECTION		TITLE CONVENTION PLACE STATION SPLITTER	
CHKD GD	APPD PB		No		DESCRIPTION SYSTEM DIAGRAM	
ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED			AA		ISSUE	
TOLERANCES NO DECIMAL PLACE ± 1mm ONE DECIMAL PLACE ± 0.3mm TWO DECIMAL PLACES ± 0.1mm			No		DATE 15/06/07	
SCALE -			No		BY LS	
THIS IS A PROPRIETARY DESIGN OF AERIAL FACILITIES LTD. REPRODUCTION OR USE WITHOUT THE EXPRESS AUTHORITY OF AERIAL FACILITIES LTD.		Aerial Facilities Limited England		CUSTOMER		DRAWING No 55-165789
		Tel : 01494 777000 Fax : 01494 777002		A		3

### 16.4.3.3. 900MHz Splitter/Combiner (05-002602)

The Splitter/Combiner used is a device for accurately matching two or more RF signals to single or multiple ports, whilst maintaining an accurate 50Ω load to all inputs/outputs and ensuring that the VSWR and insertion losses are kept to a minimum. Any unused ports should be terminated with an appropriate 50Ω load.

Being passive devices, the splitters should have an extremely long operational life and require no maintenance. Should a unit be suspect, it is usually most time efficient to replace the whole module rather than attempt repair or re-tuning.

#### 05-002602 Specification

PARAMETER		SPECIFICATION
Frequency range:	Narrowband:	815 – 960MHz
	Broadband:	800 – 1200MHz
Bandwidth:	Narrowband:	145MHz
	Broadband:	400MHz
Input ports:		1
Output ports:		2
Insertion loss:	Narrowband:	3.3dB
	Broadband:	3.5dB
Return loss input & output:		1.3:1
Impedance:		50Ω
Isolation:	Narrowband:	>20dB
	Broadband:	>18dB
MTFB:		>180,000 hours
Power rating:	Splitting:	20Watts
	Combining:	0.5Watt
Connectors:		SMA female
Weight:		200g (approximately)
Size:		54 x 44 x 21mm

### 16.4.3.4. Wideband Asymmetric Coupler (07-015102)

The purpose of Wideband Asymmetric Coupler (07-015102) is to tap off a known portion (in this case 10dB) of RF signal from transmission lines and to combine them, for example through splitter units for different purposes (alarms/monitoring etc.), whilst maintaining an accurate 50Ω load to all ports/interfaces throughout the specified frequency range. They are known formally as directional couplers as they couple power from the RF mainline in one direction only.

#### 07-015102 Specification

PARAMETER		SPECIFICATION
Frequency Range		800 - 2500 MHz
Coupling Value		10 dB ± 1.0 dB
Main Line Insertion Loss		<1.6 dB
VSWR		1.4:1
Directivity		>18 dB
Power Rating		200 Watts
RF Connectors		'N' female
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

## 17. INTERNATIONAL (NO NPSPAC) LINE AMPLIFIER (80-330557)

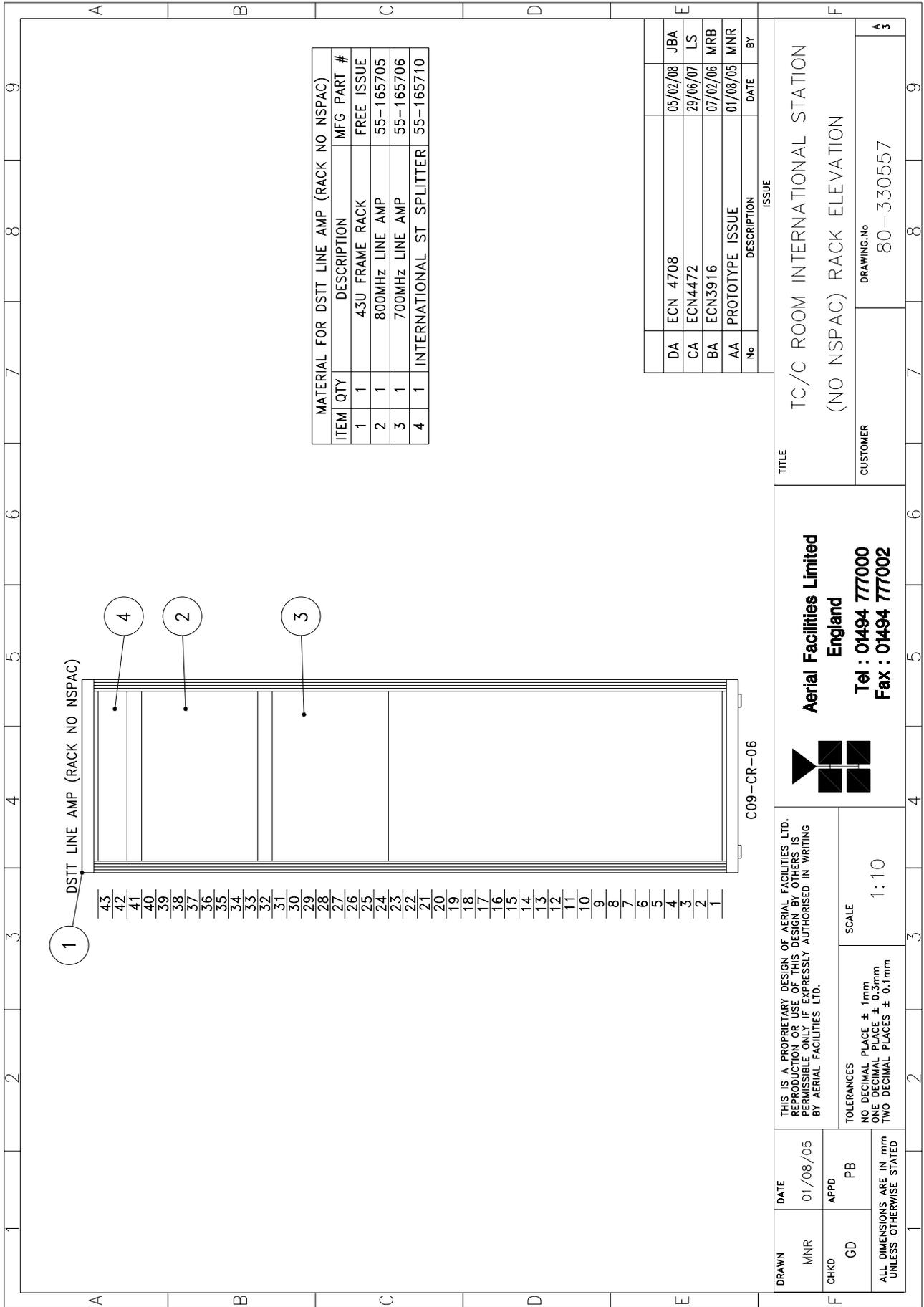
Rack C09-CR-06

International (no NPSPAC) Line Amp. (80-330557) list of major components

Section	Component Part	Component Part Description	Qty. Per Assembly
17.4.1.	55-165705	800MHz Line Amplifier (NO NSP)	1
17.4.2.	55-165706	700MHz Line Amplifier (NO NSP)	1
17.4.3.	55-165710	International Station Splitter	1

# 17.1. International (no NPSPAC) Line Amp. (80-330557) Rack elevation

Drawing number 80-330557



ITEM	QTY	DESCRIPTION	MFG PART #
1	1	43U FRAME RACK	FREE ISSUE
2	1	800MHz LINE AMP	55-165705
3	1	700MHz LINE AMP	55-165706
4	1	INTERNATIONAL ST SPLITTER	55-165710

No	DESCRIPTION	ISSUE	DATE	BY
DA	ECN 4708		05/02/08	JBA
CA	ECN4472		29/06/07	LS
BA	ECN3916		07/02/06	MRB
AA	PROTOTYPE ISSUE		01/08/05	MNR

DRAWN MNR	DATE 01/08/05	THIS IS A PROPRIETARY DESIGN OF AERIAL FACILITIES LTD. REPRODUCTION OR USE OF THIS DESIGN BY OTHERS IS PERMISSIBLE ONLY IF EXPRESSLY AUTHORISED IN WRITING BY AERIAL FACILITIES LTD.	
		TOLERANCES NO DECIMAL PLACE ± 1mm ONE DECIMAL PLACE ± 0.3mm TWO DECIMAL PLACES ± 0.1mm	SCALE 1:10
CHKD GD	APPD PB	ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED	
TITLE TC/C ROOM INTERNATIONAL STATION (NO NSPAC) RACK ELEVATION		CUSTOMER DRAWING No 80-330557	

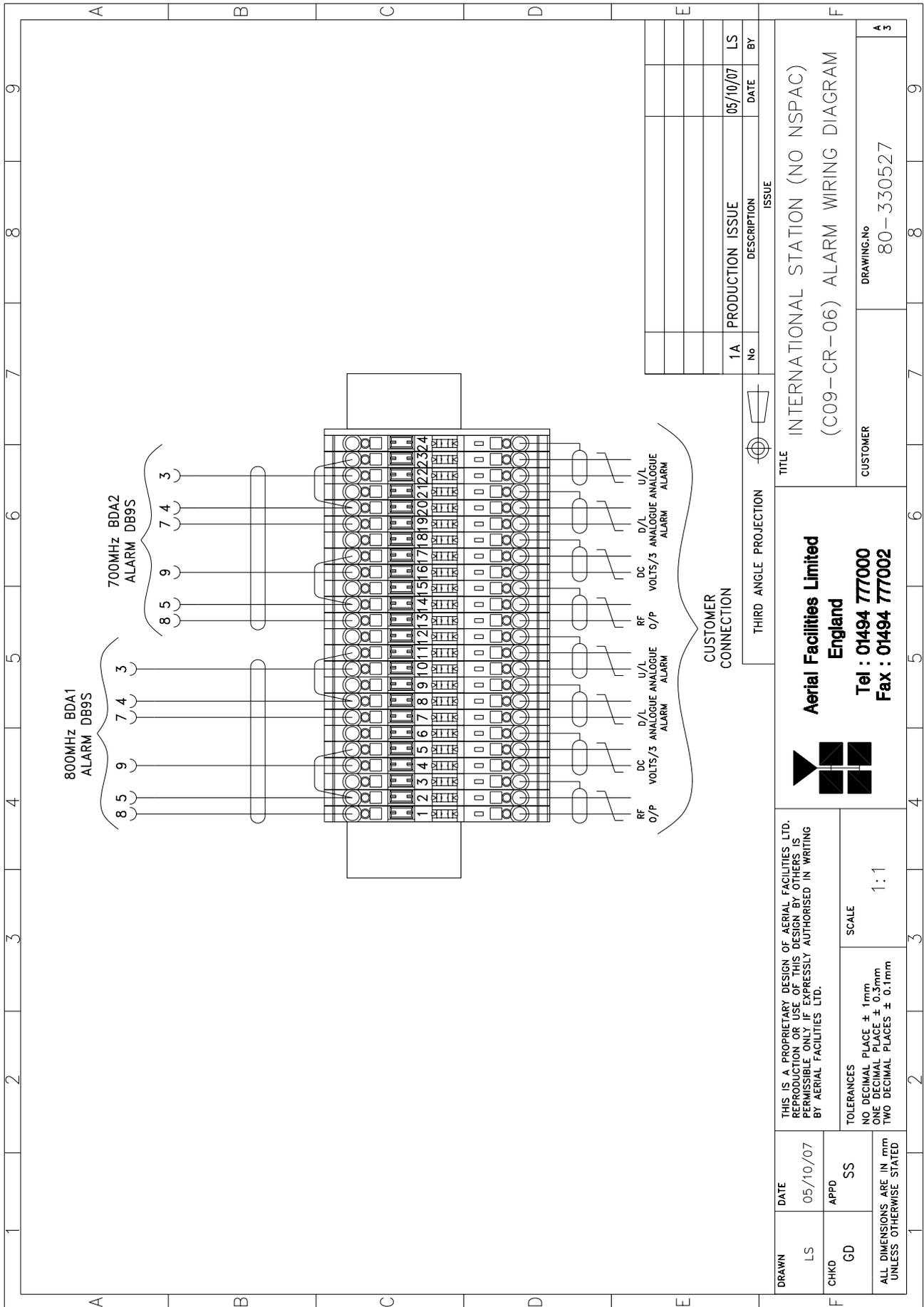


**Aerial Facilities Limited**  
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 Fax : 01494 777002



# 17.3. International (no NPSPAC) Line Amp. (80-330557) Alarm wiring diagram

Drawing number 80-330527



**17.4. International (no NPSPAC) Line Amp. (80-330557) major components**

**17.4.1. 800MHz Line Amplifier (no NPSPAC) (55-165705)**

800MHz Line Amplifier (no NPSPAC) (55-165705) List of Major Components

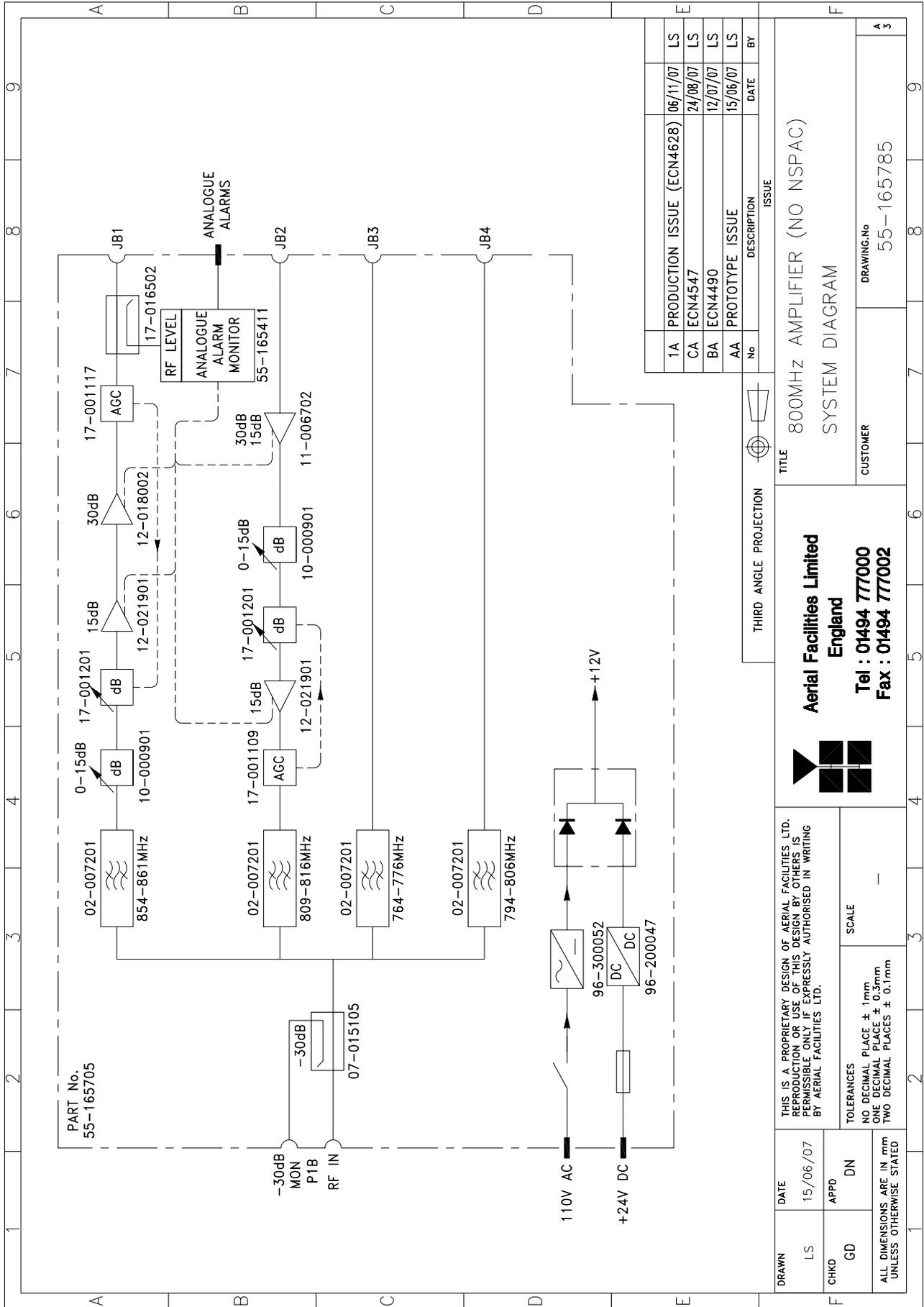
section	Component Part	Component Part Description	Qty. Per Assembly
17.4.1.3.	02-007201	Bandpass Filter	2
17.4.1.4.	02-007206	Bandpass Filter	2
17.4.1.5.	07-015105	Wideband Asymmetric Coupler	1
17.4.1.6.	10-000901	Switched Attenuator 0.25W, 0 - 15dB	2
17.4.1.7.	11-006702	Low Noise Amplifier	1
17.4.1.8.	12-018002	Power Amplifier	1
17.4.1.9.	12-021901	Low Power Amplifier	2
17.4.1.10.	17-001109*	AGC Detector Assembly (Logarithmic)	1
	17-001117*	AGC Detector Assembly	1
	17-001201*	AGC Attenuator Assembly	2
17.4.1.11.	80-008901	12V (Single) Relay Board	1
17.4.1.12.	94-100004	Dual Diode Assembly	1
17.4.1.13.	96-200047	DC/DC Converter	
17.4.1.14.	96-300052	12V Switch-Mode PSU (96-300052)	1

\*The sub components 17-001109, 17-001117 & 17-001201 are parts of the Automatic Gain Control (AGC) system used in 800MHz Line Amplifier (no NPSPAC) (55-165705); 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the downlink



# 14.4.1.2. 800MHz Line Amplifier (no NPSPAC) (55-165705) System Diagram

Drawing number 55-165785



No	DESCRIPTION	DATE	BY
1A	PRODUCTION ISSUE (ECN4628)	06/11/07	LS
CA	ECN4547	24/08/07	LS
BA	ECN4490	12/07/07	LS
AA	PROTOTYPE ISSUE	15/06/07	LS

**THIRD ANGLE PROJECTION**

**TITLE**  
800MHz AMPLIFIER (NO NPSPAC)  
SYSTEM DIAGRAM

**CUSTOMER**  
DRAWING No 55-165785

**Aerial Facilities Limited**  
England  
Tel : 01494 770000  
Fax : 01494 770002

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**TOLERANCES**  
 NO DECIMAL PLACE ± 1mm  
 ONE DECIMAL PLACE ± 0.3mm  
 TWO DECIMAL PLACES ± 0.1mm  
 UNLESS OTHERWISE STATED

**SCALE**  
—

**DRAWN** LS  
**DATE** 15/06/07  
**CHKD** GD  
**APPD** DN

**ISSUE**

No	DESCRIPTION	DATE	BY
1A	PRODUCTION ISSUE (ECN4628)	06/11/07	LS
CA	ECN4547	24/08/07	LS
BA	ECN4490	12/07/07	LS
AA	PROTOTYPE ISSUE	15/06/07	LS

### 17.4.1.3. Bandpass Filter (02-012701)

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. Being passive devices, the bandpass filters should have an extremely long operational life and require no maintenance. Should a filter be suspect, it is usually most time efficient to replace the module rather than attempt repair or re-tuning. No adjustments should be attempted without full network sweep analysis facilities to monitor both insertion loss and VSWR simultaneously.

#### 02-012701 Specification

PARAMETER		SPECIFICATION
Frequency range		1805 – 1880 MHz *
Insertion loss		<0.6 dB
Rejection		>60 dB over 1710 – 1785 MHz
		>40 dB over 1905 – 2170 MHz
Return loss		> 20 dB
Power handling		200W (CW)
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C
Size		227 x 95 x 60mm (case only)

\* tuned to customer's specification

### 17.4.1.4. Bandpass Filter (02-007206)

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 slot coupled, folded 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. Being passive devices, the bandpass filters should have an extremely long operational life and require no maintenance. Should a filter be suspect, it is usually most time efficient to replace the module rather than attempt repair or re-tuning. No adjustments should be attempted without full network sweep analysis facilities to monitor both insertion loss and VSWR simultaneously.

#### 02-007206 Specification

PARAMETER		SPECIFICATION
Response type		Chebyshev
Frequency range		800 - 950MHz *
Bandwidth		25MHz *
Number of sections		8
Insertion loss		1.2 dB
VSWR		better than 1.2:1
Connectors		SMA female
Power handling		100W max
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C
Weight		3 kg (typical)

\*tuned to Customer's specification

### 17.4.1.5. Wideband Asymmetric Coupler (07-015105)

The purpose of Wideband Asymmetric Coupler (07-015105) is to tap off a known portion (in this case 30dB) of RF signal from transmission lines and to combine them, for example through splitter units for different purposes (alarms/monitoring etc.), whilst maintaining an accurate 50Ω load to all ports/interfaces throughout the specified frequency range. They are known formally as directional couplers as they couple power from the RF mainline in one direction only.

#### 07-015105 Specification

PARAMETER		SPECIFICATION
Construction		Inductive air gap
Frequency		800-2500MHz
Through loss		0.4dB (typical)
Coupling level		-30dB ±0.5dB
Isolation		N/A
Weight		<1.0kg
Connectors		SMA, female
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

### 17.4.1.6. Switched Attenuator 0.25W, 0 - 15dB (10-000901)

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.

10-000901 provides attenuation from 0 - 15dB in 2 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.

#### 10-000901 Specification

PARAMETER		SPECIFICATION
Attenuation Values		0-15dB
Attenuation Steps		1, 2, 4 and 8dB
Power Handling		0.25 Watt
Attenuation Accuracy		± 1.0 dB
Frequency Range		DC to 1GHz
Impedance		50Ω
Connectors		SMA
VSWR		1.3:1
Weigh		0.2kg
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

### 17.4.1.7. Low Noise Amplifier (11-006702)

The Gallium-Arsenide low noise amplifiers used in 800MHz Line Amplifier (55-165703) are double stage, solid-state low noise amplifiers. Class A circuitry is used throughout the units to ensure excellent linearity and extremely low noise over a very wide dynamic range. The active devices are very moderately rated to provide a long trouble-free working life. There are no adjustments on these amplifiers, and in the unlikely event of a failure, then the complete amplifier should be replaced. This amplifier features its own in-built alarm system which gives a volt-free relay contact type alarm that is easily integrated into the main alarm system.

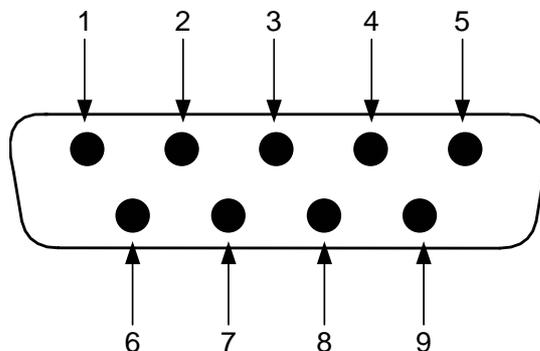
#### 11-006702 Specification

PARAMETER		SPECIFICATION
Frequency range		800 – 1000MHz
Bandwidth		<200MHz
Gain		29dB (typical)
1dB Compression point		20dBm
OIP3		33dBm
Input/Output return loss		>18dB
Noise figure		1.3dB (typical)
Power consumption		180mA @ 24V DC
Supply voltage		10-24V DC
Connectors		SMA female
Temperature range:	operational	-10°C to +60°C
	storage	-20°C to +70°C
Size		90 x 55 x 30.2mm
Weight		290gms (approximately)

#### Low Noise Amplifier (11-006702) 'D' Connector Pin-out details

Connector pin	Signal
1	+Ve input (10-24V)
2	GND
3	Alarm Relay O/P bad
4	Alarm Relay common
5	Alarm Relay good
6	No connection
7	TTL voltage set
8	TTL alarm/0V (good)
9	O/C good/0V bad

9-Way Pin-Out Graphical Representation



### 17.4.1.8. Power Amplifier (12-018002)

This amplifier is a Class A 20W power amplifier from 800-960MHz in a 1 stage balanced configuration. It demonstrates a very high linearity and a very good input/output return loss (RL). It has built in a Current Fault Alarm Function.

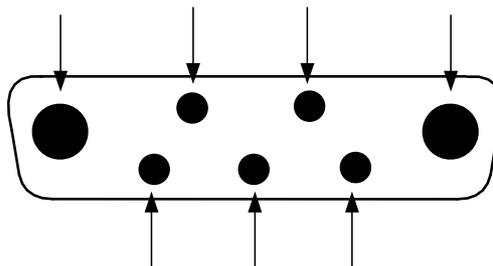
Its housing is an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a D-Type connector for the power supply and the Current Fault Alarm Function.

#### 12-018002 Specification

PARAMETER		SPECIFICATION
Frequency range:		800-960MHz
Small signal gain:		30dB
Gain flatness:		±1.2dB
I/O Return loss:		>18dB
1dB compression point:		42.8dBm
OIP3:		56dBm
Supply voltage:		24V DC
Supply current:		5.0Amps (Typical)
Temperature range	operational:	-10°C to +60°C
	storage:	-20°C to +70°C
Weight:		<2kg (no heatsink)

#### Power Amplifier (12-018002) 7-Way Connector Pin-outs

Connector Pin	Signal
A1 (large pin)	+24V DC
A2 (large pin)	GND
1	Alarm relay common
2	TTL alarm/0V good
3	Alarm relay contact (bad)
4	Alarm relay contact (good)
5	O/C good/0V bad (TTL)



### 17.4.1.9. Low Power Amplifier (12-021901)

The low power amplifier used is a triple stage solid-state low-noise amplifier. Class A circuitry is used in the unit to ensure excellent linearity over a very wide dynamic range. The three active devices are very moderately rated to provide a long trouble-free working life.

Its housing is an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a D-Type connector for the power supply and the Current Fault Alarm Function.

There are no adjustments on this amplifier, and in the unlikely event of failure then the entire amplifier should be replaced.

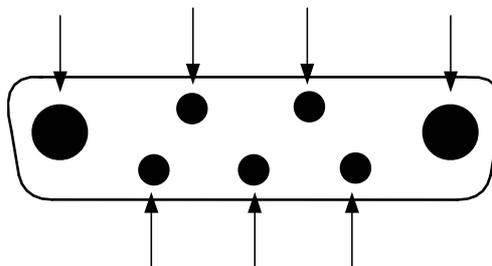
#### Low Power Amplifier (12-021901) Specification

PARAMETER		SPECIFICATION
Frequency range		800-960MHz*
Bandwidth		20MHz *
Maximum RF output		>1.0 Watt
Gain		15dB
1dB compression point		+30.5dBm
3 <sup>rd</sup> order intercept point		+43dBm
Noise Figure		<6dB
VSWR		better than 1.5:1
Connectors		SMA female
Supply		500mA @ 10-15V DC
Temperature range	operational	-10°C to +60°C
	storage	-20°C to +70°C
Weight		0.5 kg
Size		167x52x25mm

\* Tuned to Customer's specification

#### Low Power Amplifier (12-021901) 7-Way Connector Pin-outs

Connector Pin	Signal
A1 (large pin)	+24V DC
A2 (large pin)	GND
1	Alarm relay common
2	TTL alarm/0V good
3	Alarm relay contact (bad)
4	Alarm relay contact (good)
5	O/C good/0V bad (TTL)



#### 7.4.1.10. Automatic Gain Control

17-001109	AGC Detector Assembly (Logarithmic)
17-001117	AGC Detector Assembly
17-001201	AGC Attenuator Assembly

The sub components 17-001109, 17-001117 & 17-001201 are parts of the Automatic Gain Control (AGC) system used in 800MHz Line Amplifier (no NPSPAC) (55-165705); 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the downlink

800MHz Line Amplifier (no NPSPAC) (55-165705) is fitted with two differing types of Automatic Gain Control (AGC) system, one linear, and one logarithmic. The AGC with logarithmic detector (17-001117) is fitted in the uplink path and the AGC with linear detector (17-001109) is fitted in the downlink path

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. 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the downlink

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 detector controller board.

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.

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.

AGC Specification (both types)

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

**17.4.1.11. 12V (Single) Relay Board (80-008901)**

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.

80-008901 Specification

PARAMETER		SPECIFICATION
Operating voltage		8 to 30V (floating earth)
Alarm threshold		Vcc - 1.20 volt +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		10.0µA/10.0mV
Relay isolation		1.5kV
Mechanical life		>2x10 <sup>7</sup> operations
Relay approval		BT type 56
Connector details		Screw terminals
Temperature range	operational	-10°C to +60°C
	storage	-20°C to +70°C

### 17.4.1.12. Dual Diode Assembly (94-100004)

The purpose of these dual diode assemblies is to allow two DC voltage sources to be combined, so that the main DC rail within the equipment can be sourced from either a mains driven PSU, or externally through an XLR connector or from dual mains driven PSUs . They are very heavy-duty diodes and they prevent any reverse current from flowing back to their source or the alternative supply rail. Combining diodes such as these will also be used if the equipment is to be powered from external back-up batteries.

### 17.4.1.13. DC/DC Converter 96-200047

96-200047 is an O.E.M. high power device with a wide input range and 12.5 amp @ 12V (150Watts) output capability used to derive a 12V fixed voltage power supply rail from a higher voltage supply, in this case 12V. In the event of failure this unit should not be repaired, only replaced.

96-200047 Specification

PARAMETER		SPECIFICATION
DC Input Voltage range		19 to 36V
DC Output voltage		12V ± 1%
Max. current load		12.5Amps
Temperature range	Operation	-10°C to +60°C
	Storage	-20°C to +85°C
Working Humidity		20 to 90% RHNC

### 17.4.1.14. 12V Switch-Mode PSU (96-300052)

No routine maintenance of the PSU is required. If a fault is suspected, then the output voltage from the power supply may be measured on its output terminals. This is typically set to 12.2V. The adjustment potentiometer will be found close to the DC output terminals.

All the PSUs used in AFL Cell Enhancers are capable of operation from either 110 or 220V nominal AC supplies. The line voltage is sensed automatically, so no adjustment or link setting is needed by the operator.

96-300052 Specification

AC Input Supply	
Voltage	110 or 220V nominal
	85 - 265V AC (absolute limits)
Frequency	47 to 63Hz
DC Output Supply	
Voltage	12V DC (nominal)
	10.5-13.8V (absolute limits)
Current	12.5A

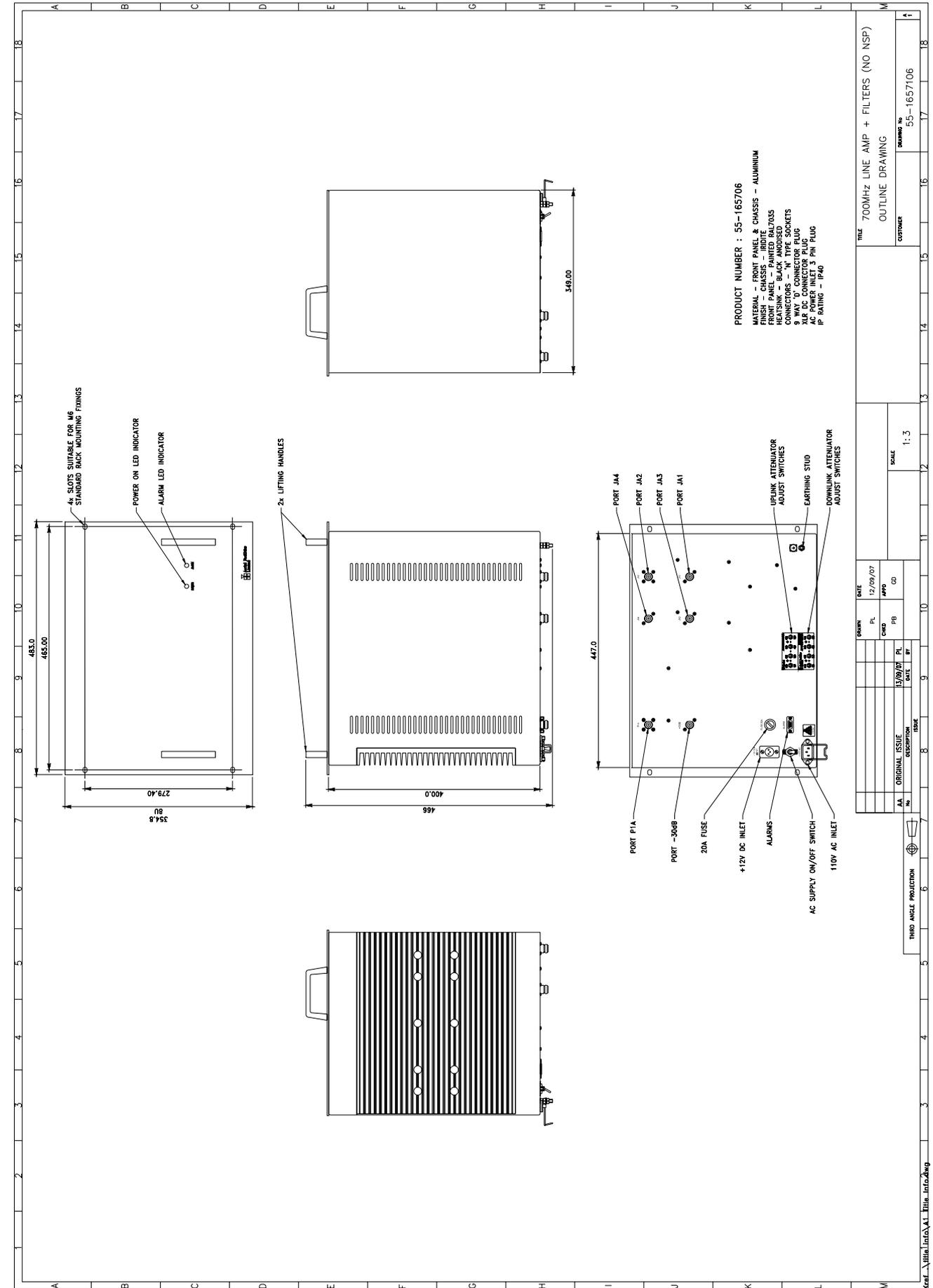
## 17.4.2. 700MHz Line Amplifier (no NPSPAC) (55-165706)

### 700MHz Line Amplifier (no NPSPAC) (55-165706) List of Major Components

Section	Component Part	Component Part Description	Qty. Per Assembly
17.4.2.3.	02-007201	Bandpass Filter	2
17.4.2.4.	02-007206	Bandpass Filter	2
17.4.2.5.	07-015105	Wideband Asymmetric Coupler	1
17.4.2.6.	10-000901	Switched Attenuator 0.25W, 0 - 15dB	2
17.4.2.7.	11-006702	Low Noise Amplifier	1
17.4.2.8.	12-018002	Power Amplifier	1
17.4.1.9.	12-021901	Low Power Amplifier	2
17.4.2.10.	17-001109	AGC Detector Assembly (Logarithmic)	1
	17-001117	AGC Detector Assembly	1
	17-001201	AGC Attenuator Assembly	2
17.4.2.11.	80-008901	12V (Single) Relay Board	1
17.4.2.12.	94-100004	Dual Diode Assembly	1
17.4.2.13.	96-200047	DC/DC Converter	
17.4.2.14.	96-300052	12V Switch-Mode PSU (96-300052)	1

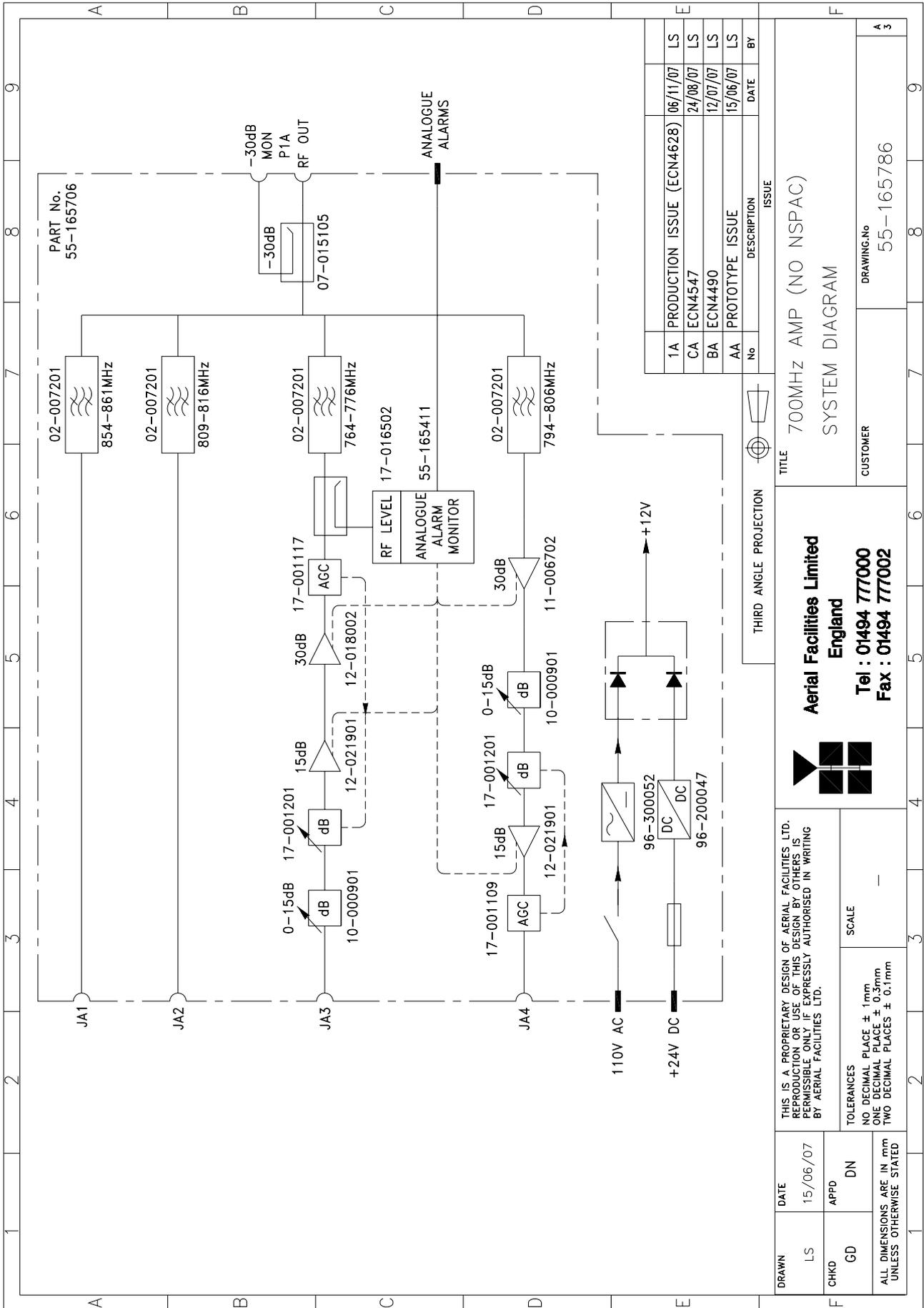
\*The sub components 17-001109, 17-001117 & 17-001201 are parts of the Automatic Gain Control (AGC) system used in 700MHz Line Amplifier (no NPSPAC) (55-165705); 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the downlink

# 17.4.2.1. 700MHz Line Amplifier (no NPSPAC) (55-165706) Outline Drawing



# 17.4.2.2. 700MHz Line Amplifier (no NPSPAC) (55-165706) System Diagram

Drawing number 55-165786



No	DESCRIPTION	DATE	BY
1A	PRODUCTION ISSUE (ECN4628)	06/11/07	LS
CA	ECN4547	24/08/07	LS
BA	ECN4490	12/07/07	LS
AA	PROTOTYPE ISSUE	15/06/07	LS

<b>TITLE</b>	700MHz AMP (NO NPSPAC)
<b>CUSTOMER</b>	55-165786
<b>DRAWING No</b>	55-165786
<b>ISSUE</b>	

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SCALE

<b>DRAWN</b>	LS	<b>DATE</b>	15/06/07
<b>CHKD</b>	GD	<b>APPD</b>	DN
<b>ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED</b>			

### 17.4.2.3. Bandpass Filter (02-012701)

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. Being passive devices, the bandpass filters should have an extremely long operational life and require no maintenance. Should a filter be suspect, it is usually most time efficient to replace the module rather than attempt repair or re-tuning. No adjustments should be attempted without full network sweep analysis facilities to monitor both insertion loss and VSWR simultaneously.

#### 02-012701 Specification

PARAMETER		SPECIFICATION
Frequency range		1805 – 1880 MHz *
Insertion loss		<0.6 dB
Rejection		>60 dB over 1710 – 1785 MHz
		>40 dB over 1905 – 2170 MHz
Return loss		> 20 dB
Power handling		200W (CW)
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C
Size		227 x 95 x 60mm (case only)

\* tuned to customer's specification

### 17.4.2.4. Bandpass Filter (02-007206)

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 slot coupled, folded 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. Being passive devices, the bandpass filters should have an extremely long operational life and require no maintenance. Should a filter be suspect, it is usually most time efficient to replace the module rather than attempt repair or re-tuning. No adjustments should be attempted without full network sweep analysis facilities to monitor both insertion loss and VSWR simultaneously.

#### 02-007206 Specification

PARAMETER		SPECIFICATION
Response type		Chebyshev
Frequency range		800 - 950MHz *
Bandwidth		25MHz *
Number of sections		8
Insertion loss		1.2 dB
VSWR		better than 1.2:1
Connectors		SMA female
Power handling		100W max
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C
Weight		3 kg (typical)

\*tuned to Customer's specification

### 17.4.2.5. Wideband Asymmetric Coupler (07-015105)

The purpose of Wideband Asymmetric Coupler (07-015105) is to tap off a known portion (in this case 30dB) of RF signal from transmission lines and to combine them, for example through splitter units for different purposes (alarms/monitoring etc.), whilst maintaining an accurate 50Ω load to all ports/interfaces throughout the specified frequency range. They are known formally as directional couplers as they couple power from the RF mainline in one direction only.

#### 07-015105 Specification

PARAMETER		SPECIFICATION
Construction		Inductive air gap
Frequency		800-2500MHz
Through loss		0.4dB (typical)
Coupling level		-30dB ±0.5dB
Isolation		N/A
Weight		<1.0kg
Connectors		SMA, female
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

### 17.4.2.6. Switched Attenuator 0.25W, 0 - 15dB (10-000901)

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.

10-000901 provides attenuation from 0 - 15dB in 2 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.

#### 10-000901 Specification

PARAMETER		SPECIFICATION
Attenuation Values		0-15dB
Attenuation Steps		1, 2, 4 and 8dB
Power Handling		0.25 Watt
Attenuation Accuracy		± 1.0 dB
Frequency Range		DC to 1GHz
Impedance		50Ω
Connectors		SMA
VSWR		1.3:1
Weigh		0.2kg
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

### 17.4.2.7. Low Noise Amplifier (11-006702)

The Gallium-Arsenide low noise amplifiers used in 800MHz Line Amplifier (55-165703) are double stage, solid-state low noise amplifiers. Class A circuitry is used throughout the units to ensure excellent linearity and extremely low noise over a very wide dynamic range. The active devices are very moderately rated to provide a long trouble-free working life. There are no adjustments on these amplifiers, and in the unlikely event of a failure, then the complete amplifier should be replaced. This amplifier features its own in-built alarm system which gives a volt-free relay contact type alarm that is easily integrated into the main alarm system.

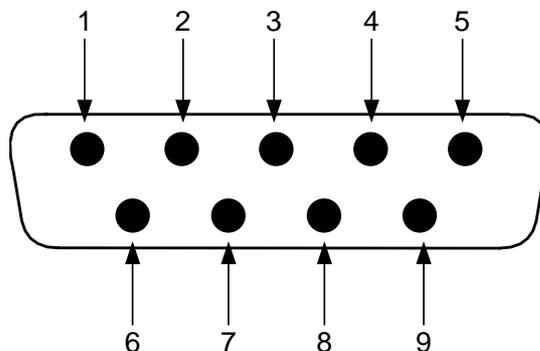
#### 11-006702 Specification

PARAMETER		SPECIFICATION
Frequency range		800 – 1000MHz
Bandwidth		<200MHz
Gain		29dB (typical)
1dB Compression point		20dBm
OIP3		33dBm
Input/Output return loss		>18dB
Noise figure		1.3dB (typical)
Power consumption		180mA @ 24V DC
Supply voltage		10-24V DC
Connectors		SMA female
Temperature range:	operational	-10°C to +60°C
	storage	-20°C to +70°C
Size		90 x 55 x 30.2mm
Weight		290gms (approximately)

#### Low Noise Amplifier (11-006702) 'D' Connector Pin-out details

Connector pin	Signal
1	+Ve input (10-24V)
2	GND
3	Alarm Relay O/P bad
4	Alarm Relay common
5	Alarm Relay good
6	No connection
7	TTL voltage set
8	TTL alarm/0V (good)
9	O/C good/0V bad

9-Way Pin-Out Graphical Representation



### 17.4.2.8. Power Amplifier (12-018002)

This amplifier is a Class A 20W power amplifier from 800-960MHz in a 1 stage balanced configuration. It demonstrates a very high linearity and a very good input/output return loss (RL). It has built in a Current Fault Alarm Function.

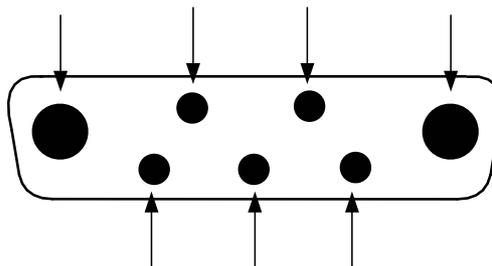
Its housing is an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a D-Type connector for the power supply and the Current Fault Alarm Function.

#### 12-018002 Specification

PARAMETER		SPECIFICATION
Frequency range:		800-960MHz
Small signal gain:		30dB
Gain flatness:		±1.2dB
I/O Return loss:		>18dB
1dB compression point:		42.8dBm
OIP3:		56dBm
Supply voltage:		24V DC
Supply current:		5.0Amps (Typical)
Temperature range	operational:	-10°C to +60°C
	storage:	-20°C to +70°C
Weight:		<2kg (no heatsink)

#### Power Amplifier (12-018002) 7-Way Connector Pin-outs

Connector Pin	Signal
A1 (large pin)	+24V DC
A2 (large pin)	GND
1	Alarm relay common
2	TTL alarm/0V good
3	Alarm relay contact (bad)
4	Alarm relay contact (good)
5	O/C good/0V bad (TTL)



### 17.4.2.9. Low Power Amplifier (12-021901)

The low power amplifier used is a triple stage solid-state low-noise amplifier. Class A circuitry is used in the unit to ensure excellent linearity over a very wide dynamic range. The three active devices are very moderately rated to provide a long trouble-free working life.

Its housing is an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a D-Type connector for the power supply and the Current Fault Alarm Function.

There are no adjustments on this amplifier, and in the unlikely event of failure then the entire amplifier should be replaced.

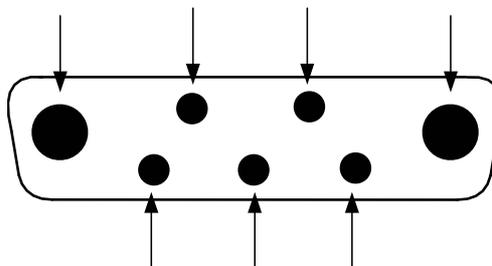
#### Low Power Amplifier (12-021901) Specification

PARAMETER		SPECIFICATION
Frequency range		800-960MHz*
Bandwidth		20MHz *
Maximum RF output		>1.0 Watt
Gain		15dB
1dB compression point		+30.5dBm
3 <sup>rd</sup> order intercept point		+43dBm
Noise Figure		<6dB
VSWR		better than 1.5:1
Connectors		SMA female
Supply		500mA @ 10-15V DC
Temperature range	operational	-10°C to +60°C
	storage	-20°C to +70°C
Weight		0.5 kg
Size		167x52x25mm

\* Tuned to Customer's specification

#### Low Power Amplifier (12-021901) 7-Way Connector Pin-outs

Connector Pin	Signal
A1 (large pin)	+24V DC
A2 (large pin)	GND
1	Alarm relay common
2	TTL alarm/0V good
3	Alarm relay contact (bad)
4	Alarm relay contact (good)
5	O/C good/0V bad (TTL)



#### 7.4.2.10. Automatic Gain Control

17-001109	AGC Detector Assembly (Logarithmic)
17-001117	AGC Detector Assembly
17-001201	AGC Attenuator Assembly

The sub components 17-001109, 17-001117 & 17-001201 are parts of the Automatic Gain Control (AGC) system used in 700MHz Line Amplifier (no NPSPAC) (55-165705); 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the downlink

700MHz Line Amplifier (no NPSPAC) (55-165705) is fitted with two differing types of Automatic Gain Control (AGC) system, one linear, and one logarithmic. The AGC with logarithmic detector (17-001117) is fitted in the uplink path and the AGC with linear detector (17-001109) is fitted in the downlink path

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. 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the downlink

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 detector controller board.

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.

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.

AGC Specification (both types)

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

**17.4.2.11. 12V (Single) Relay Board (80-008901)**

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.

80-008901 Specification

PARAMETER		SPECIFICATION
Operating voltage		8 to 30V (floating earth)
Alarm threshold		Vcc - 1.20 volt +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		10.0µA/10.0mV
Relay isolation		1.5kV
Mechanical life		>2x10 <sup>7</sup> operations
Relay approval		BT type 56
Connector details		Screw terminals
Temperature range	operational	-10°C to +60°C
	storage	-20°C to +70°C

#### 17.4.2.12. Dual Diode Assembly (94-100004)

The purpose of these dual diode assemblies is to allow two DC voltage sources to be combined, so that the main DC rail within the equipment can be sourced from either a mains driven PSU, or externally through an XLR connector or from dual mains driven PSUs . They are very heavy-duty diodes and they prevent any reverse current from flowing back to their source or the alternative supply rail. Combining diodes such as these will also be used if the equipment is to be powered from external back-up batteries.

#### 17.4.2.13. DC/DC Converter 96-200047

96-200047 is an O.E.M. high power device with a wide input range and 12.5 amp @ 12V (150Watts) output capability used to derive a 12V fixed voltage power supply rail from a higher voltage supply, in this case 12V. In the event of failure this unit should not be repaired, only replaced.

96-200047 Specification

PARAMETER		SPECIFICATION
DC Input Voltage range		19 to 36V
DC Output voltage		12V $\pm$ 1%
Max. current load		12.5Amps
Temperature range	Operation	-10°C to +60°C
	Storage	-20°C to +85°C
Working Humidity		20 to 90% RHNC

#### 17.4.2.14. 12V Switch-Mode PSU (96-300052)

No routine maintenance of the PSU is required. If a fault is suspected, then the output voltage from the power supply may be measured on its output terminals. This is typically set to 12.2V. The adjustment potentiometer will be found close to the DC output terminals.

All the PSUs used in AFL Cell Enhancers are capable of operation from either 110 or 220V nominal AC supplies. The line voltage is sensed automatically, so no adjustment or link setting is needed by the operator.

96-300052 Specification

AC Input Supply	
Voltage	110 or 220V nominal
	85 - 265V AC (absolute limits)
Frequency	47 to 63Hz
DC Output Supply	
Voltage	12V DC (nominal)
	10.5-13.8V (absolute limits)
Current	12.5A

### 17.4.3. International Station Splitter (55-165710)

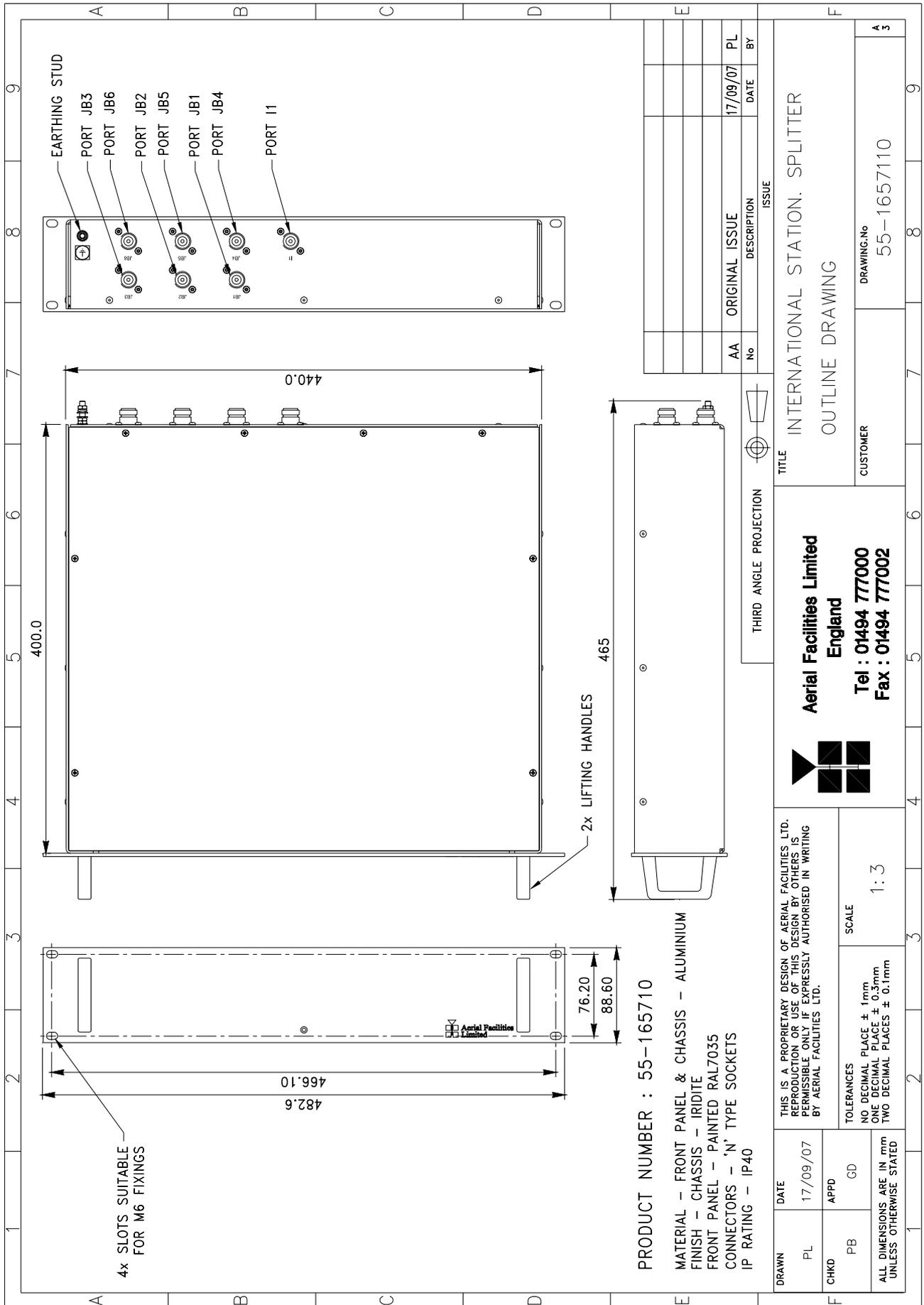
2U Rack mount tray

International Station Splitter (55-165710) List of major Components

Section	Component Part	Component Part Description	Qty. Per Assembly
17.4.3.3.	05-002602	900MHZ SPLITTER/COMBINER, 20W	1
17.4.3.4.	05-009909	4 WAY POWER SPLITTER 70/10/10/10	1
17.4.3.5.	07-015102	Wideband Asymmetric Coupler	1

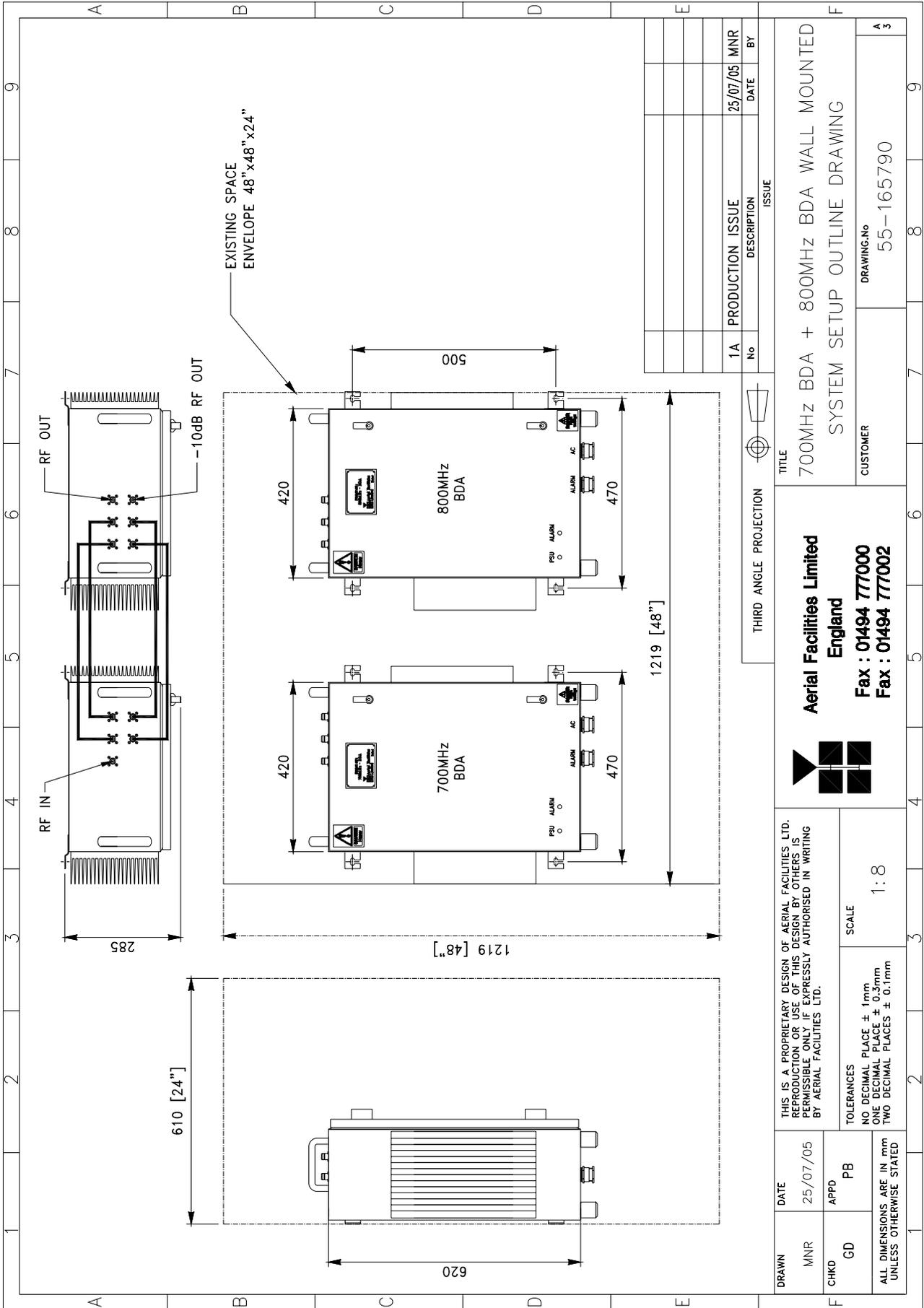
### 17.4.3.1. International Station Splitter (55-165710) Outline drawing

Drawing number 55-1657110



### 17.4.3.2. International Station Splitter (55-165710) System Diagram

Drawing number 55-165790



### 17.4.3.3. 900MHz Splitter/Combiner (05-002602)

The Splitter/Combiner used is a device for accurately matching two or more RF signals to single or multiple ports, whilst maintaining an accurate 50Ω load to all inputs/outputs and ensuring that the VSWR and insertion losses are kept to a minimum. Any unused ports should be terminated with an appropriate 50Ω load.

Being passive devices, the splitters should have an extremely long operational life and require no maintenance. Should a unit be suspect, it is usually most time efficient to replace the whole module rather than attempt repair or re-tuning.

#### 05-002602 Specification

PARAMETER		SPECIFICATION
Frequency range	Narrowband	815 – 960MHz
	Broadband	800 – 1200MHz
Bandwidth	Narrowband	145MHz
	Broadband	400MHz
Input ports		1
Output ports		2
Insertion loss	Narrowband	3.3dB
	Broadband	3.5dB
Return loss input & output		1.3:1
Impedance		50Ω
Isolation	Narrowband	>20dB
	Broadband	>18dB
MTFB		>180,000 hours
Power rating	Splitting	20Watts
	Combining	0.5Watt
Connectors		SMA female
Weight		200g (approximately)
Size		54 x 44 x 21mm

### 17.4.3.4. 05-009909 – BSB to provide spec \*\*\*//\*\*\*

### 17.4.3.5. Wideband Asymmetric Coupler (07-015102)

The purpose of Wideband Asymmetric Coupler (07-015102) is to tap off a known portion (in this case 10dB) of RF signal from transmission lines and to combine them, for example through splitter units for different purposes (alarms/monitoring etc.), whilst maintaining an accurate 50Ω load to all ports/interfaces throughout the specified frequency range. They are known formally as directional couplers as they couple power from the RF mainline in one direction only.

#### 07-015102 Specification

PARAMETER		SPECIFICATION
Frequency Range		800 - 2500 MHz
Coupling Value		10 dB ± 1.0 dB
Main Line Insertion Loss		<1.6 dB
VSWR		1.4:1
Directivity		>18 dB
Power Rating		200 Watts
RF Connectors		'N' female
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

## 18. UNIVERSITY STATION CROSS PASSAGE A (80-330590-1)

Wallmount case

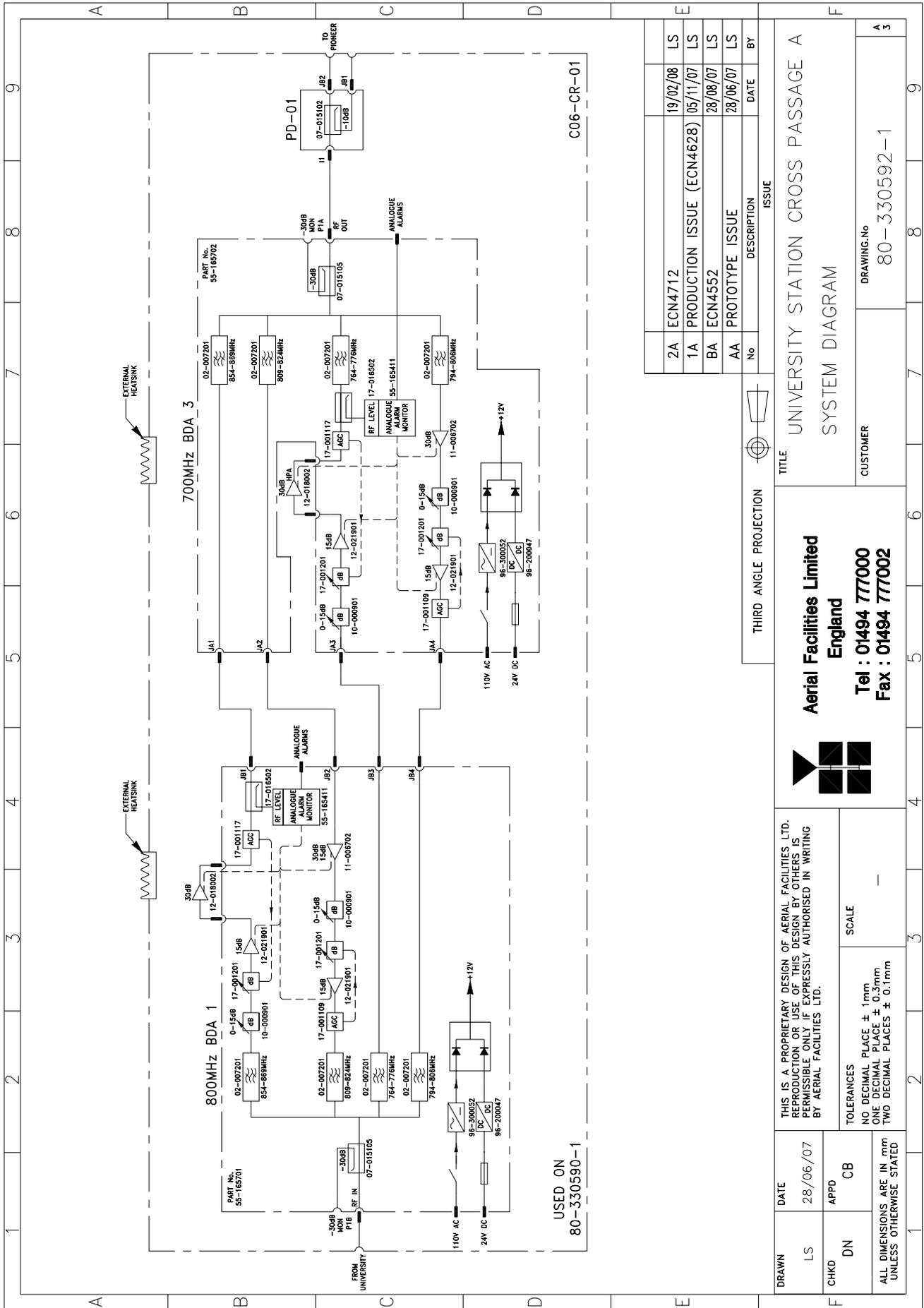
number C06-CR-01

University Station Cross Passage A (80-330590-1)

Section	Component Part	Component Part Description	Qty Per Assembly
18.3.1.	07-015102	Wideband Asymmetric Coupler	1
18.3.2.	12-018002	Power Amplifier	2
18.3.3.	55-165701	800MHz Line Amplifier	1
18.3.4.	55-165702	700MHz Line Amplifier	1

# 18.1. University Station Cross Passage A (80-330590-1) System Diagram

Drawing number 80-330592-1

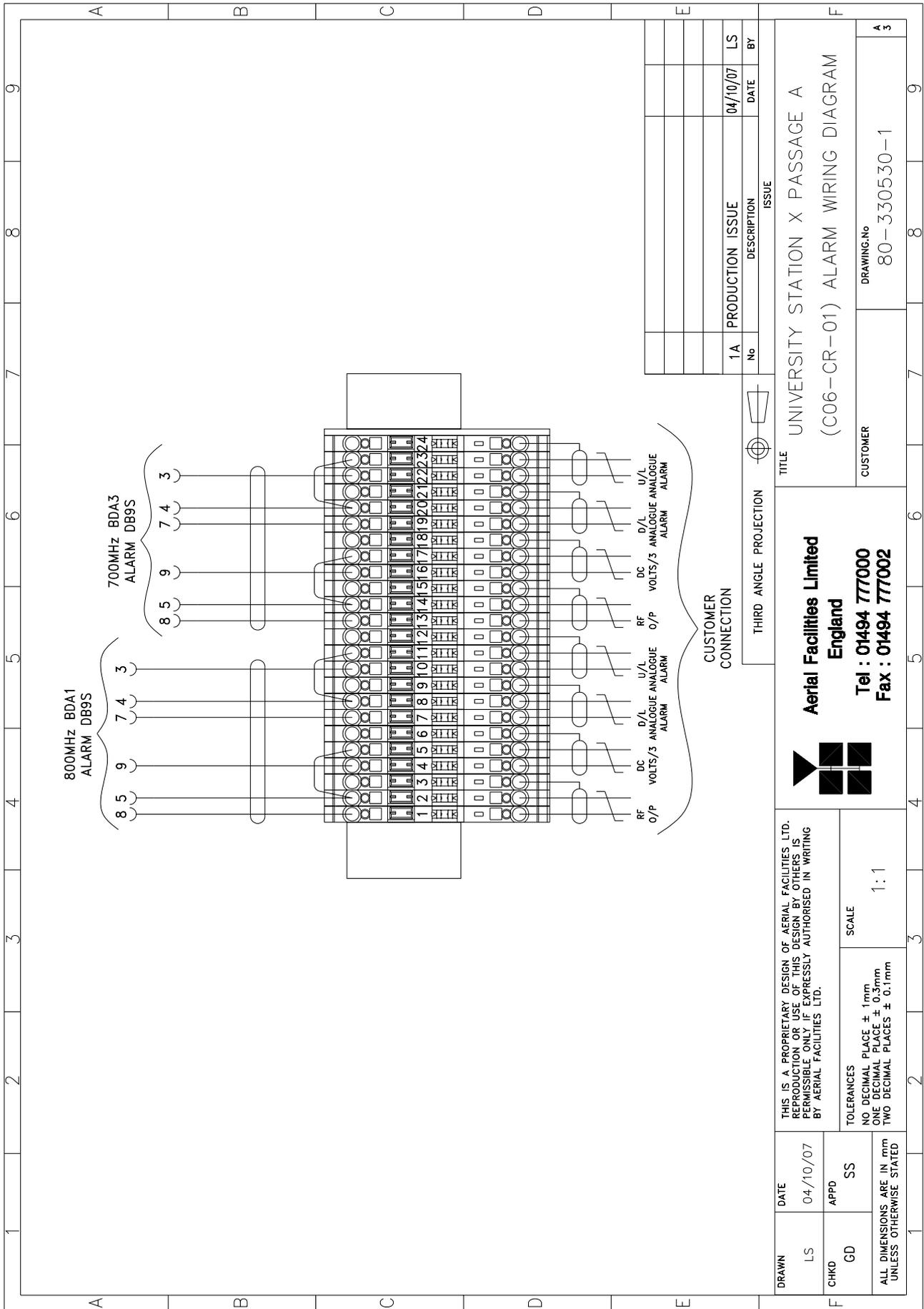


No	DESCRIPTION	DATE	BY
2A	ECN4712	19/02/08	LS
1A	PRODUCTION ISSUE (ECN4628)	05/11/07	LS
BA	ECN4552	28/08/07	LS
AA	PROTOTYPE ISSUE	28/06/07	LS

THIRD ANGLE PROJECTION		TITLE	
UNIVERSITY STATION CROSS PASSAGE A		SYSTEM DIAGRAM	
Aerial Facilities Limited England		CUSTOMER	
Tel : 01494 777000 Fax : 01494 777002		DRAWING No 80-330592-1	
THIS IS A PROPRIETARY DESIGN OF AERIAL FACILITIES LTD. REPRODUCTION OR USE OF THIS DESIGN BY OTHERS IS PROHIBITED UNLESS EXPRESSLY AUTHORISED IN WRITING BY AERIAL FACILITIES LTD.		SCALE	
TOLERANCES NO DECIMAL PLACE ± 1mm ONE DECIMAL PLACE ± 0.3mm TWO DECIMAL PLACES ± 0.1mm UNLESS OTHERWISE STATED		-	
DRAWN LS	DATE 28/06/07	APPD CB	
CHKD DN			
ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED			

# 18.2. University Station Cross Passage A (80-330590-1) Alarm Wiring Diagram

Drawing Number 80-330530-1



### 18.3. University Station Cross Passage A (80-330590-1) Major Sub Components

#### 18.3.1. Wideband Asymmetric Coupler (07-015102)

The purpose of Wideband Asymmetric Coupler (07-015102) is to tap off a known portion (in this case 10dB) of RF signal from transmission lines and to combine them, for example through splitter units for different purposes (alarms/monitoring etc.), whilst maintaining an accurate 50Ω load to all ports/interfaces throughout the specified frequency range. They are known formally as directional couplers as they couple power from the RF mainline in one direction only.

##### 07-015102 Specification

PARAMETER		SPECIFICATION
Frequency Range		800 - 2500 MHz
Coupling Value		10 dB ± 1.0 dB
Main Line Insertion Loss		<1.6 dB
VSWR		1.4:1
Directivity		>18 dB
Power Rating		200 Watts
RF Connectors		'N' female
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

#### 18.3.2. Power Amplifier (12-018002)

This amplifier is a Class A 20W power amplifier from 800-960MHz in a 1 stage balanced configuration. It demonstrates a very high linearity and a very good input/output return loss (RL). It has built in a Current Fault Alarm Function.

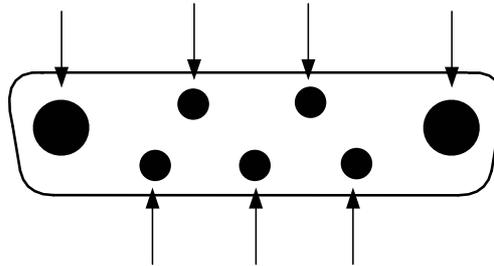
Its housing is an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a D-Type connector for the power supply and the Current Fault Alarm Function.

##### 12-018002 Specification

PARAMETER		SPECIFICATION
Frequency range		800-960MHz
Small signal gain		30dB
Gain flatness		±1.2dB
I/O Return loss		>18dB
1dB compression point		42.8dBm
OIP3		56dBm
Supply voltage		24V DC
Supply current		5.0Amps (Typical)
Temperature range	operational	-10°C to +60°C
	storage	-20°C to +70°C
Weight		<2kg (no heatsink)

Power Amplifier (12-018002) 7-Way Connector Pin-outs

Connector Pin	Signal
A1 (large pin)	+24V DC
A2 (large pin)	GND
1	Alarm relay common
2	TTL alarm/0V good
3	Alarm relay contact (bad)
4	Alarm relay contact (good)
5	O/C good/0V bad (TTL)



### 18.3.3. 800MHz Line Amplifier (55-165701)

5U rack mount case

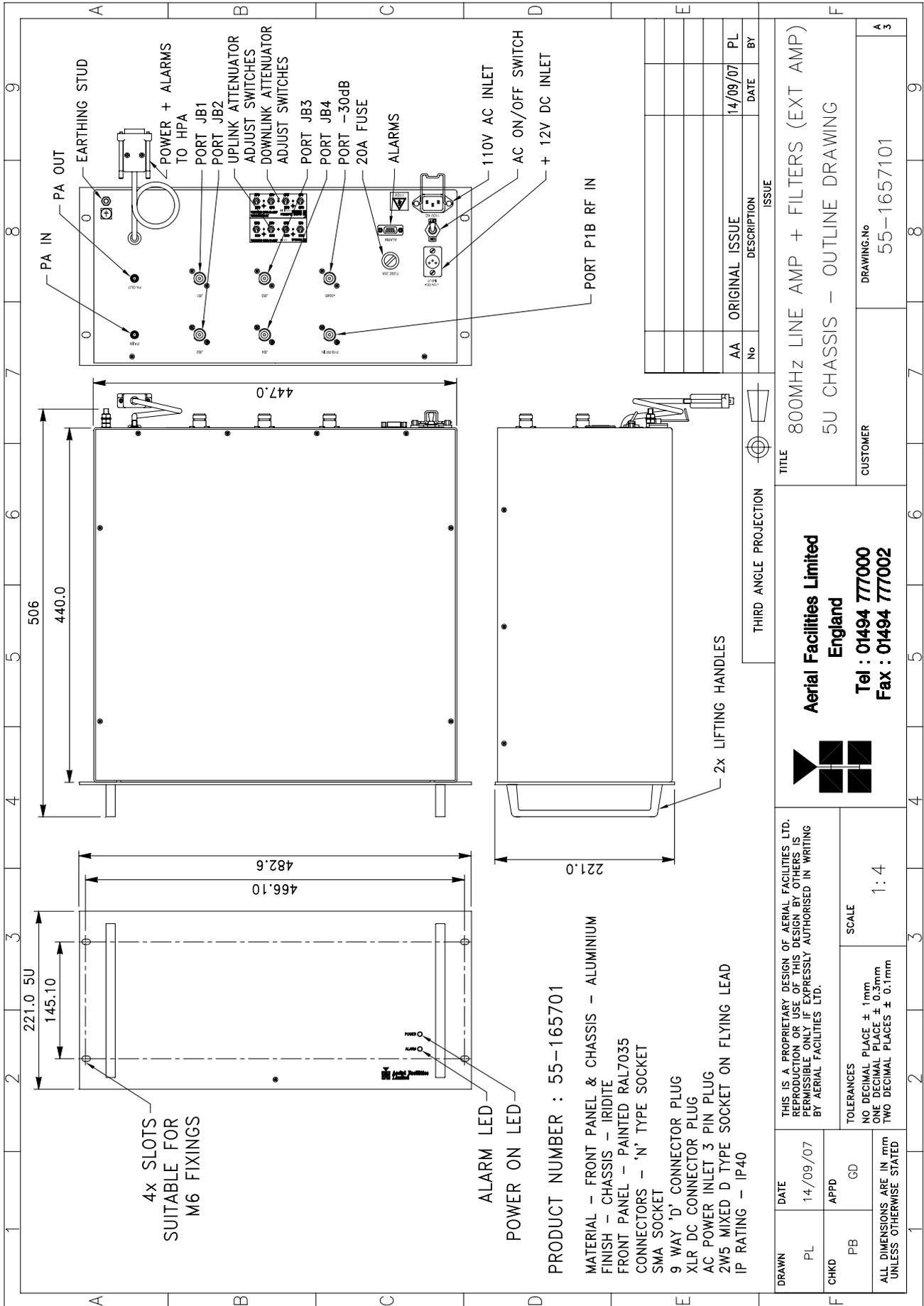
#### 800MHz Line Amplifier (55-165701) List of Major Components

Section	Component Part	Component Part Description	Qty Per Assembly
18.3.3.3.	02-007206	Bandpass Filter	4
18.3.3.4.	07-015105	Wideband Asymmetric Coupler	1
18.3.3.5.	10-000901	Switched Attenuator 0.25W, 0 - 15dB	2
18.3.3.6.	11-006702	Low Noise Amplifier	1
18.3.3.7.	12-021901	Low Power Amplifier	2
18.3.3.8.	17-001109*	AGC Detector Assembly (Logarithmic)	1
	17-001117*	AGC Detector Assembly	1
	17-001201*	AGC Attenuator Assembly	2
18.3.3.9.	80-008901	12V (Single) Relay Board	1
18.3.3.10.	94-100004	Dual Diode Assembly	1
18.3.3.11.	96-200047	DC/DC Converter	1
18.3.3.12.	96-300052	12V Switch-Mode PSU	1

\*The sub components 17-001109, 17-001117 & 17-001201 are parts of the Automatic Gain Control (AGC) system used in 800MHz Line Amplifier (55-165701); 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the down link

### 18.3.3.1. 800MHz Line Amplifier (55-165701) Outline Drawing

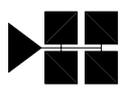
Drawing number 55-1657101



PRODUCT NUMBER : 55-165701

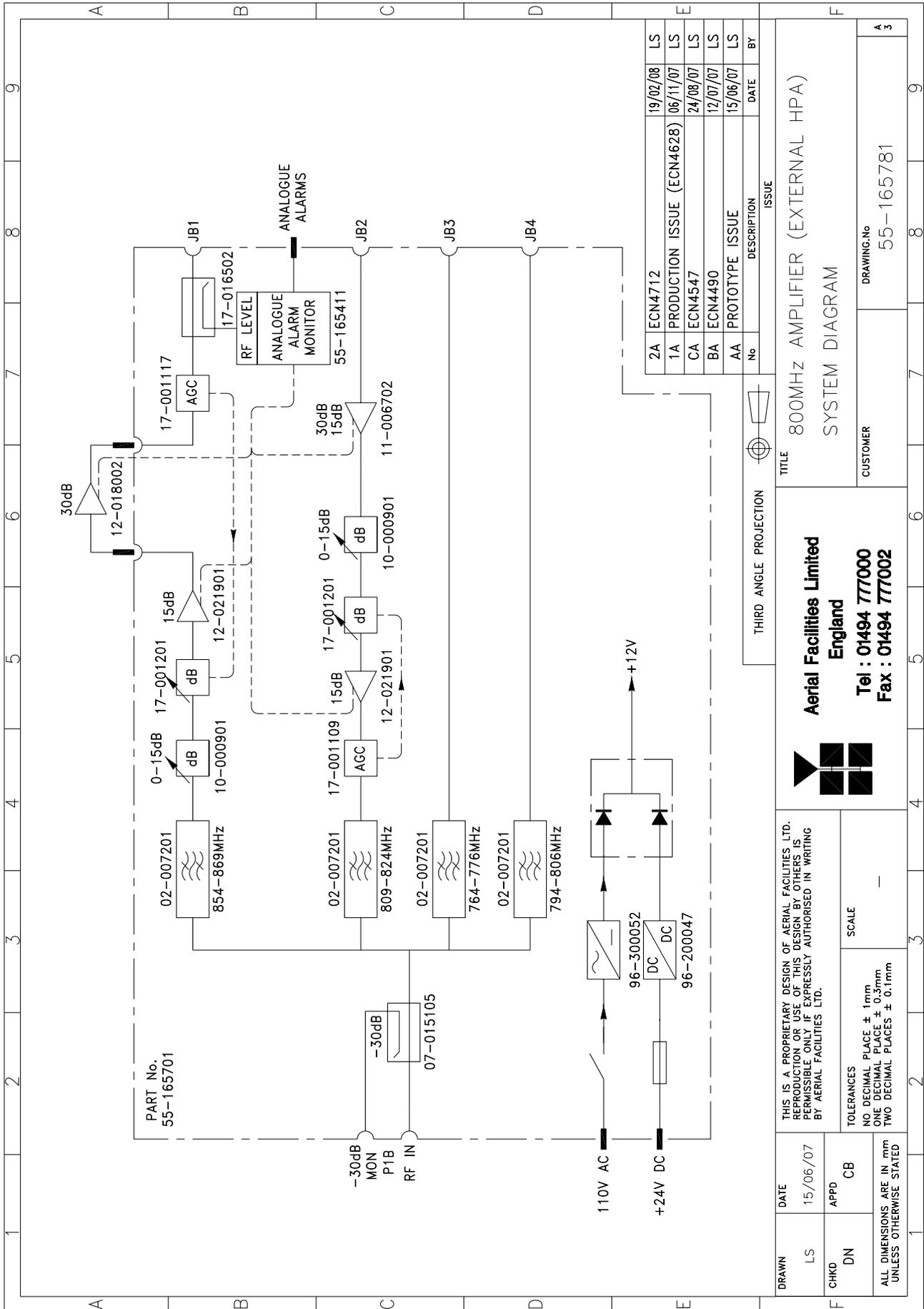
MATERIAL - FRONT PANEL & CHASSIS - ALUMINIUM  
 FINISH - CHASSIS - IRIDITE  
 FRONT PANEL - PAINTED RAL7035  
 CONNECTORS - 'N' TYPE SOCKET  
 SMA SOCKET  
 9 WAY 'D' CONNECTOR PLUG  
 XLR DC CONNECTOR PLUG  
 AC POWER INLET 3 PIN PLUG  
 2W5 MIXED D TYPE SOCKET ON FLYING LEAD  
 IP RATING - IP40

No	DESCRIPTION	DATE	BY
AA	ORIGINAL ISSUE	14/09/07	PL

DRAWN PL	DATE	14/09/07	THIS IS A PROPRIETARY DESIGN OF AERIAL FACILITIES LTD. REPRODUCTION OR USE OF THIS DESIGN BY OTHERS IS PERMISSIBLE ONLY IF EXPRESSLY AUTHORISED IN WRITING BY AERIAL FACILITIES LTD.
	CHKD	APPD	
TOLERANCES		SCALE	1:4
NO DECIMAL PLACE ± 1mm ONE DECIMAL PLACE ± 0.3mm TWO DECIMAL PLACES ± 0.1mm			
ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED			
 <b>Aerial Facilities Limited</b> England Tel : 01494 777000 Fax : 01494 777002		TITLE 800MHZ LINE AMP + FILTERS (EXT AMP) CUSTOMER 5U CHASSIS - OUTLINE DRAWING	
		DRAWING No	55-1657101
			A 3

### 18.3.3.2. 800MHz Line Amplifier (55-165701) System Diagram

Drawing number 55-165781



No	DESCRIPTION	DATE	BY
2A	ECN4712	19/02/08	LS
1A	PRODUCTION ISSUE (ECN4628)	06/11/07	LS
CA	ECN4547	24/08/07	LS
BA	ECN4490	12/07/07	LS
AA	PROTOTYPE ISSUE	15/06/07	LS

<b>TITLE</b> 800MHZ AMPLIFIER (EXTERNAL HPA) SYSTEM DIAGRAM	
<b>CUSTOMER</b> Aerial Facilities Limited England Tel : 01494 777000 Fax : 01494 777002	<b>DRAWING.No</b> 55-165781
<b>ISSUE</b> THIRD ANGLE PROJECTION	

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<b>TOLERANCES</b> NO DECIMAL PLACE ± 1mm ONE DECIMAL PLACE ± 0.3mm TWO DECIMAL PLACES ± 0.1mm UNLESS OTHERWISE STATED	

<b>DRAWN</b> LS	<b>DATE</b> 15/06/07
<b>CHKD</b> DN	<b>APPD</b> CB

### 18.3.3.3. Bandpass Filter (02-007206)

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 slot coupled, folded 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.

Being passive devices, the bandpass filters should have an extremely long operational life and require no maintenance. Should a filter be suspect, it is usually most time efficient to replace the module rather than attempt repair or re-tuning.

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

#### 02-007206 Specification

PARAMETER		SPECIFICATION
Response type		Chebyshev
Frequency range		800 - 950MHz *
Bandwidth		25MHz *
Number of sections		8
Insertion loss		1.2 dB
VSWR		better than 1.2:1
Connectors		SMA female
Power handling		100W max
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C
Weight		3 kg (typical)

\*tuned to Customer's specification

### 18.3.3.4. Wideband Asymmetric Coupler (07-015105)

The purpose of Wideband Asymmetric Coupler (07-015105) is to tap off a known portion (in this case 30dB) of RF signal from transmission lines and to combine them, for example through splitter units for different purposes (alarms/monitoring etc.), whilst maintaining an accurate 50Ω load to all ports/interfaces throughout the specified frequency range. They are known formally as directional couplers as they couple power from the RF mainline in one direction only.

#### 07-015105 Specification

PARAMETER		SPECIFICATION
Construction		Inductive air gap
Frequency		800-2500MHz
Through loss		0.4dB (typical)
Coupling level		-30dB ±0.5dB
Isolation		N/A
Weight		<1.0kg
Connectors		SMA, female
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

### 18.3.3.5. Switched Attenuator 0.25W, 0 - 15dB (10-000901)

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.

10-000901 provides attenuation from 0 - 15dB in 2 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.

#### 10-000901 Specification

PARAMETER		SPECIFICATION
Attenuation Values		0-15dB
Attenuation Steps		1, 2, 4 and 8dB
Power Handling		0.25 Watt
Attenuation Accuracy		± 1.0 dB
Frequency Range		DC to 1GHz
Impedance		50Ω
Connectors		SMA
VSWR		1.3:1
Weigh		0.2kg
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

### 18.3.3.6. Low Noise Amplifier (11-006702)

The Gallium-Arsenide low noise amplifiers used in 800MHz Line Amplifier (55-165703) are double stage, solid-state low noise amplifiers. Class A circuitry is used throughout the units to ensure excellent linearity and extremely low noise over a very wide dynamic range. The active devices are very moderately rated to provide a long trouble-free working life. There are no adjustments on these amplifiers, and in the unlikely event of a failure, then the complete amplifier should be replaced. This amplifier features its own in-built alarm system which gives a volt-free relay contact type alarm that is easily integrated into the main alarm system.

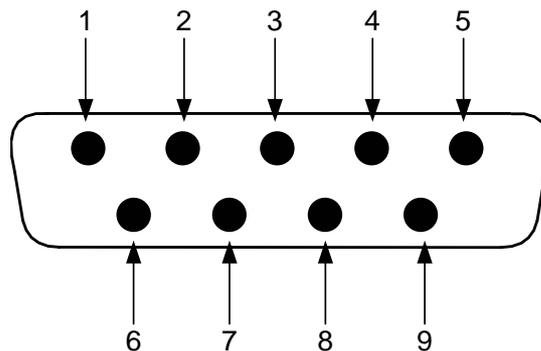
#### 11-006702 Specification

PARAMETER		SPECIFICATION
Frequency range		800 – 1000MHz
Bandwidth		<200MHz
Gain		29dB (typical)
1dB Compression point		20dBm
OIP3		33dBm
Input/Output return loss		>18dB
Noise figure		1.3dB (typical)
Power consumption		180mA @ 24V DC
Supply voltage		10-24V DC
Connectors		SMA female
Temperature range:	operational	-10°C to +60°C
	storage	-20°C to +70°C
Size		90 x 55 x 30.2mm
Weight		290gms (approximately)

Low Noise Amplifier (11-006702) 'D' Connector Pin-out details

Connector pin	Signal
1	+Ve input (10-24V)
2	GND
3	Alarm Relay O/P bad
4	Alarm Relay common
5	Alarm Relay good
6	No connection
7	TTL voltage set
8	TTL alarm/0V (good)
9	O/C good/0V bad

9-Way Pin-Out Graphical Representation



**18.3.3.7. Low Power Amplifier (12-021901)**

The low power amplifier used is a triple stage solid-state low-noise amplifier. Class A circuitry is used in the unit to ensure excellent linearity over a very wide dynamic range. The three active devices are very moderately rated to provide a long trouble-free working life.

Its housing is an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a D-Type connector for the power supply and the Current Fault Alarm Function.

There are no adjustments on this amplifier, and in the unlikely event of failure then the entire amplifier should be replaced.

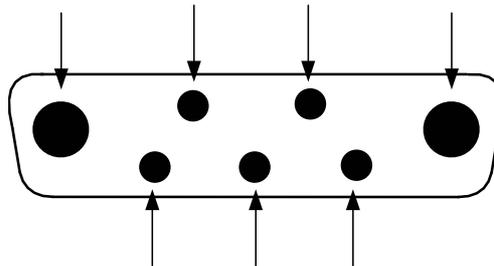
Low Power Amplifier (12-021901) Specification

PARAMETER		SPECIFICATION
Frequency range		800-960MHz*
Bandwidth		20MHz *
Maximum RF output		>1.0 Watt
Gain		15dB
1dB compression point		+30.5dBm
3 <sup>rd</sup> order intercept point		+43dBm
Noise Figure		<6dB
VSWR		better than 1.5:1
Connectors		SMA female
Supply		500mA @ 10-15V DC
Temperature range	operational	-10°C to +60°C
	storage	-20°C to +70°C
Weight		0.5 kg
Size		167x52x25mm

\* Tuned to Customer's specification

Low Power Amplifier (12-021901) 7-Way Connector Pin-outs

Connector Pin	Signal
A1 (large pin)	+24V DC
A2 (large pin)	GND
1	Alarm relay common
2	TTL alarm/0V good
3	Alarm relay contact (bad)
4	Alarm relay contact (good)
5	O/C good/0V bad (TTL)



**18.3.3.8. Automatic Gain Control**

- 17-001109 AGC Detector Assembly (Logarithmic)
- 17-001117 AGC Detector Assembly
- 17-001201 AGC Attenuator Assembly

The sub components 17-001109, 17-001117 & 17-001201 are parts of the Automatic Gain Control (AGC) system used in 800MHz Line Amplifier (55-165701); 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the downlink

800MHz Line Amplifier (55-165701) is fitted with two differing types of Automatic Gain Control (AGC) system, one linear, and one logarithmic. The AGC with logarithmic detector (17-001117) is fitted in the uplink path and the AGC with linear detector (17-001109) is fitted in the downlink path

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.

17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the downlink

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 detector controller board.

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.

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.

AGC Specification (both types)

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

### 18.3.3.9. 12V (Single) Relay Board (80-008901)

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.

PARAMETER		SPECIFICATION
Operating voltage		8 to 30V (floating earth)
Alarm threshold		Vcc - 1.20 volt +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		Screw terminals
Temperature range	operational	-10°C to +60°C
	storage	-20°C to +70°C

### 18.3.3.10. Dual Diode Assembly (94-100004)

The purpose of these dual diode assemblies is to allow two DC voltage sources to be combined, so that the main DC rail within the equipment can be sourced from either a mains driven PSU, or externally through an XLR connector or from dual mains driven PSUs. They are very heavy-duty diodes and they prevent any reverse current from flowing back to their source or the alternative supply rail. Combining diodes such as these will also be used if the equipment is to be powered from external back-up batteries.

### 18.3.3.11. DC/DC Converter 96-200047

96-200047 is an O.E.M. high power device with a wide input range and 12.5 amp @ 12V (150Watts) output capability used to derive a 12V fixed voltage power supply rail from a higher voltage supply, in this case 12V. In the event of failure this unit should not be repaired, only replaced.

96-200047 Specification

PARAMETER		SPECIFICATION
DC Input Voltage range		19 to 36V
DC Output voltage		12V $\pm$ 1%
Max. current load		12.5Amps
Temperature range	Operation	-10°C to +60°C
	Storage	-20°C to +85°C
Working Humidity		20 to 90% RHNC

### 18.3.3.12. 12V Switch-Mode PSU (96-300052)

No routine maintenance of the PSU is required. If a fault is suspected, then the output voltage from the power supply may be measured on its output terminals. This is typically set to 12.2V. The adjustment potentiometer will be found close to the DC output terminals.

All the PSUs used in AFL Cell Enhancers are capable of operation from either 110 or 220V nominal AC supplies. The line voltage is sensed automatically, so no adjustment or link setting is needed by the operator.

96-300052 Specification

<b>AC Input Supply</b>	
Voltage	110 or 220V nominal
	85 - 265V AC (absolute limits)
Frequency	47 to 63Hz
<b>DC Output Supply</b>	
Voltage	12V DC (nominal)
	10.5-13.8V (absolute limits)
Current	12.5A

### 18.3.4. 700MHz Line Amplifier (55-165702)

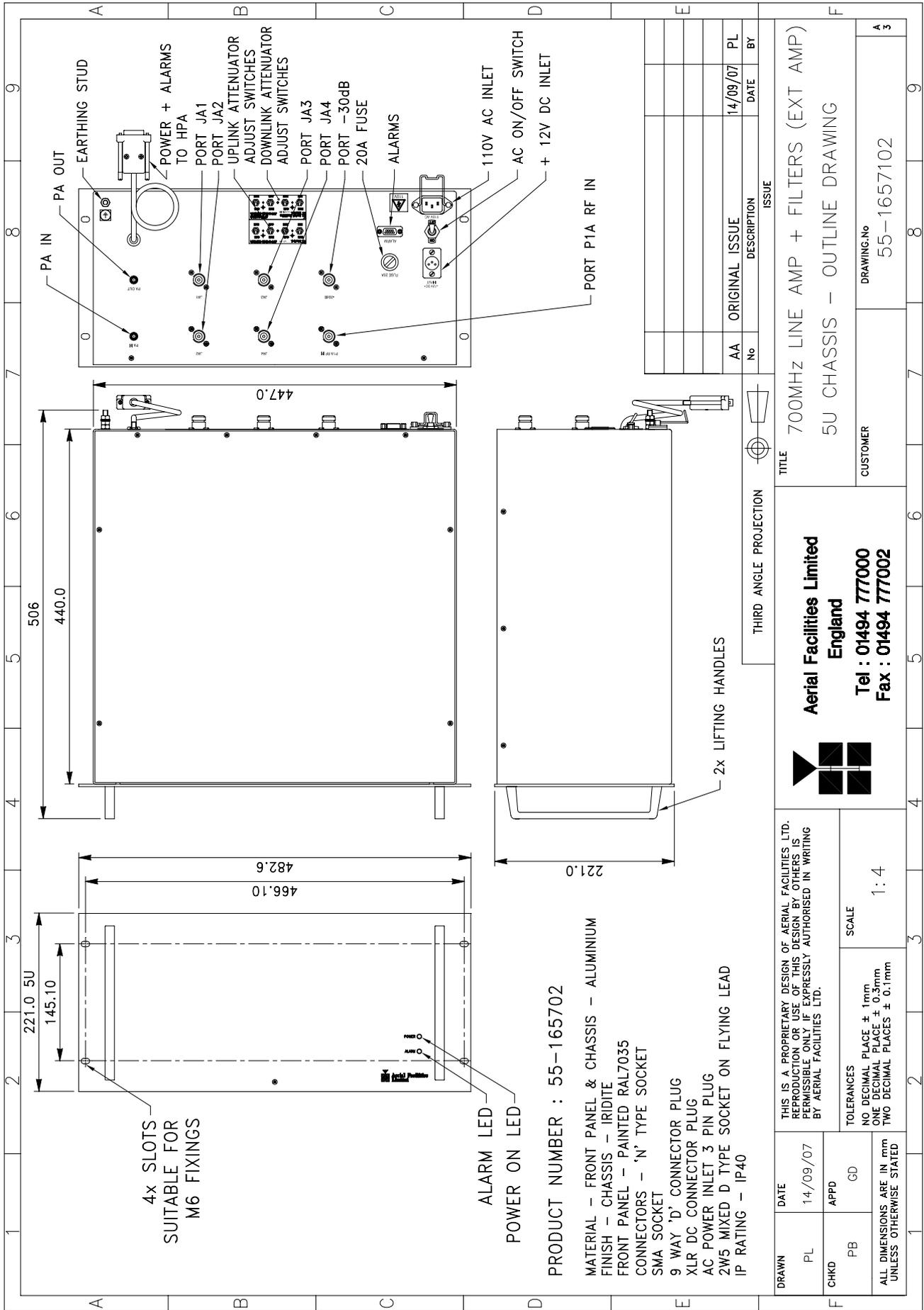
5U rack mount case

#### 700MHz Line Amplifier (55-165702) List of Major Components

Section	Component Part	Component Part Description	Qty Per Assembly
18.3.4.3.	02-007206	Bandpass Filter	4
18.3.4.4.	07-015105	Wideband Asymmetric Coupler	1
18.3.4.5.	10-000901	Switched Attenuator 0.25W, 0 - 15dB	2
18.3.4.6.	11-006702	Low Noise Amplifier	1
18.3.4.7.	12-021901	Low Power Amplifier	2
18.3.4.8.	17-001109*	AGC Detector Assembly (Logarithmic)	1
	17-001117*	AGC Detector Assembly	1
	17-001201*	AGC Attenuator Assembly	2
18.3.4.9.	80-008901	12V (Single) Relay Board	1
18.3.4.0.	94-100004	Dual Diode Assembly	1
18.3.4.11.	96-200047	DC/DC Converter	
18.3.4.12.	96-300052	12V Switch-Mode PSU	1

\*The sub components 17-001109, 17-001117 & 17-001201 are parts of the Automatic Gain Control (AGC) system used in 700MHz Line Amplifier (55-165702); 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the down link

18.3.4.1. 700MHz Line Amplifier (55-165702) Outline Drawing  
 Drawing Number 55-1657102



PRODUCT NUMBER : 55-165702

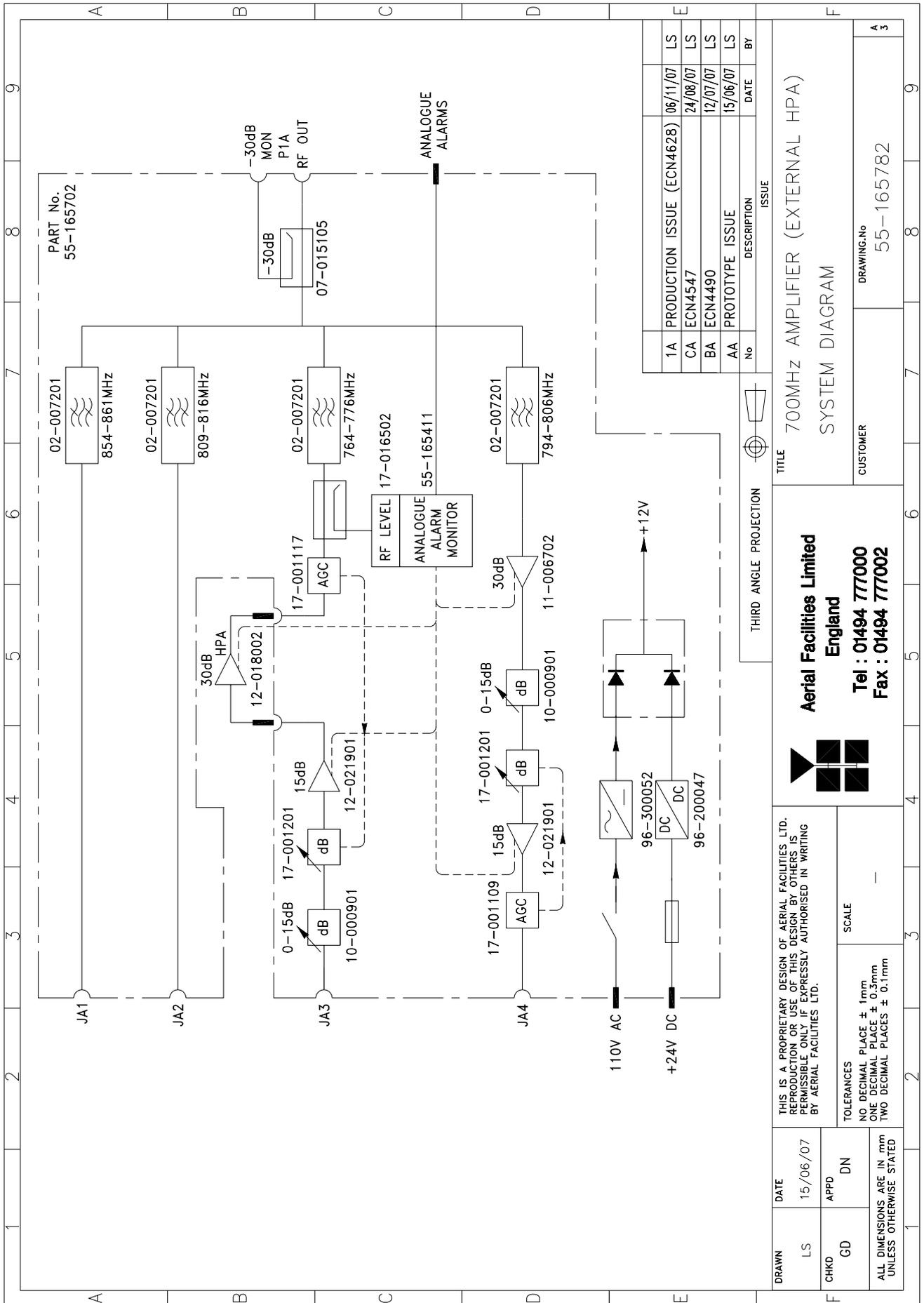
MATERIAL - FRONT PANEL & CHASSIS - ALUMINIUM  
 FINISH - CHASSIS - IRIDITE  
 FRONT PANEL - PAINTED RAL7035  
 CONNECTORS - 'N' TYPE SOCKET  
 SMA SOCKET  
 9 WAY 'D' CONNECTOR PLUG  
 XLR DC CONNECTOR PLUG  
 AC POWER INLET 3 PIN PLUG  
 2W5 MIXED D TYPE SOCKET ON FLYING LEAD  
 IP RATING - IP40

No	DESCRIPTION	DATE	BY
AA	ORIGINAL ISSUE	14/09/07	PL

DRAWN PL	DATE 14/09/07	THIS IS A PROPRIETARY DESIGN OF AERIAL FACILITIES LTD. REPRODUCTION OR USE OF THIS DESIGN BY OTHERS IS PERMISSIBLE ONLY IF EXPRESSLY AUTHORISED IN WRITING BY AERIAL FACILITIES LTD.	SCALE 1:4
	CHKD		
THIRD ANGLE PROJECTION		TITLE 700MHz LINE AMP + FILTERS (EXT AMP)	
CUSTOMER Aerial Facilities Limited England Tel : 01494 777000 Fax : 01494 777002		CUSTOMER 5U CHASSIS - OUTLINE DRAWING	
DRAWING.No 55-1657102		A 3	

# 18.3.4.2. 700MHz Line Amplifier (55-165702) System Diagram

Drawing Number 55-165782



No	DESCRIPTION	DATE	BY
1A	PRODUCTION ISSUE (ECN4628)	06/11/07	LS
CA	ECN4547	24/08/07	LS
BA	ECN4490	12/07/07	LS
AA	PROTOTYPE ISSUE	15/06/07	LS

<b>TITLE</b> 700MHz AMPLIFIER (EXTERNAL HPA) SYSTEM DIAGRAM	
<b>CUSTOMER</b> Aerial Facilities Limited England Tel : 01494 777000 Fax : 01494 777002	<b>DRAWING No</b> 55-165782
<b>THIRD ANGLE PROJECTION</b>	

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TOLERANCES  
 NO DECIMAL PLACE ± 1mm  
 ONE DECIMAL PLACE ± 0.3mm  
 TWO DECIMAL PLACES ± 0.1mm

SCALE  
 -

<b>DRAWN</b> LS	<b>DATE</b> 15/06/07
<b>CHKD</b> GD	<b>APPD</b> DN
ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED	

### 18.3.4.3. Bandpass Filter (02-007206)

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 slot coupled, folded 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.

Being passive devices, the bandpass filters should have an extremely long operational life and require no maintenance. Should a filter be suspect, it is usually most time efficient to replace the module rather than attempt repair or re-tuning.

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

#### 02-007206 Specification

PARAMETER		SPECIFICATION
Response type		Chebyshev
Frequency range		800 - 950MHz *
Bandwidth		25MHz *
Number of sections		8
Insertion loss		1.2 dB
VSWR		better than 1.2:1
Connectors		SMA female
Power handling		100W max
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C
Weight		3 kg (typical)

\*tuned to Customer's specification

### 18.3.4.4. Wideband Asymmetric Coupler (07-015105)

The purpose of Wideband Asymmetric Coupler (07-015105) is to tap off a known portion (in this case 30dB) of RF signal from transmission lines and to combine them, for example through splitter units for different purposes (alarms/monitoring etc.), whilst maintaining an accurate 50Ω load to all ports/interfaces throughout the specified frequency range. They are known formally as directional couplers as they couple power from the RF mainline in one direction only.

#### 07-015105 Specification

PARAMETER		SPECIFICATION
Construction		Inductive air gap
Frequency		800-2500MHz
Through loss		0.4dB (typical)
Coupling level		-30dB ±0.5dB
Isolation		N/A
Weight		<1.0kg
Connectors		SMA, female
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

### 18.3.4.5. Switched Attenuator 0.25W, 0 - 15dB (10-000901)

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. 10-000901 provides attenuation from 0 - 15dB in 2 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.

10-000901 Specification

PARAMETER		SPECIFICATION
Attenuation Values		0-15dB
Attenuation Steps		1, 2, 4 and 8dB
Power Handling		0.25 Watt
Attenuation Accuracy		± 1.0 dB
Frequency Range		DC to 1GHz
Impedance		50Ω
Connectors		SMA
VSWR		1.3:1
Weigh		0.2kg
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

### 18.3.4.6. Low Noise Amplifier (11-006702)

The Gallium-Arsenide low noise amplifiers used in 800MHz Line Amplifier (55-165703) are double stage, solid-state low noise amplifiers. Class A circuitry is used throughout the units to ensure excellent linearity and extremely low noise over a very wide dynamic range. The active devices are very moderately rated to provide a long trouble-free working life. There are no adjustments on these amplifiers, and in the unlikely event of a failure, then the complete amplifier should be replaced. This amplifier features its own in-built alarm system which gives a volt-free relay contact type alarm that is easily integrated into the main alarm system.

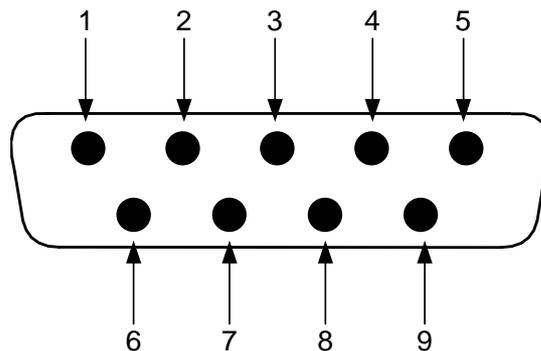
11-006702 Specification

PARAMETER		SPECIFICATION
Frequency range		800 – 1000MHz
Bandwidth		<200MHz
Gain		29dB (typical)
1dB Compression point		20dBm
OIP3		33dBm
Input/Output return loss		>18dB
Noise figure		1.3dB (typical)
Power consumption		180mA @ 24V DC
Supply voltage		10-24V DC
Connectors		SMA female
Temperature range:	operational	-10°C to +60°C
	storage	-20°C to +70°C
Size		90 x 55 x 30.2mm
Weight		290gms (approximately)

Low Noise Amplifier (11-006702) 'D' Connector Pin-out details

Connector pin	Signal
1	+Ve input (10-24V)
2	GND
3	Alarm Relay O/P bad
4	Alarm Relay common
5	Alarm Relay good
6	No connection
7	TTL voltage set
8	TTL alarm/0V (good)
9	O/C good/0V bad

9-Way Pin-Out Graphical Representation



**18.3.4.7. Low Power Amplifier (12-021901)**

The low power amplifier used is a triple stage solid-state low-noise amplifier. Class A circuitry is used in the unit to ensure excellent linearity over a very wide dynamic range. The three active devices are very moderately rated to provide a long trouble-free working life.

Its housing is an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a D-Type connector for the power supply and the Current Fault Alarm Function.

There are no adjustments on this amplifier, and in the unlikely event of failure then the entire amplifier should be replaced.

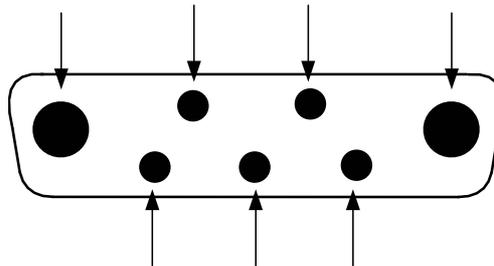
Low Power Amplifier (12-021901) Specification

PARAMETER		SPECIFICATION
Frequency range		800-960MHz*
Bandwidth		20MHz *
Maximum RF output		>1.0 Watt
Gain		15dB
1dB compression point		+30.5dBm
3 <sup>rd</sup> order intercept point		+43dBm
Noise Figure		<6dB
VSWR		better than 1.5:1
Connectors		SMA female
Supply		500mA @ 10-15V DC
Temperature range	operational	-10°C to +60°C
	storage	-20°C to +70°C
Weight		0.5 kg
Size		167x52x25mm

\* Tuned to Customer's specification

Low Power Amplifier (12-021901) 7-Way Connector Pin-outs

Connector Pin	Signal
A1 (large pin)	+24V DC
A2 (large pin)	GND
1	Alarm relay common
2	TTL alarm/0V good
3	Alarm relay contact (bad)
4	Alarm relay contact (good)
5	O/C good/0V bad (TTL)



**18.3.4.8. Automatic Gain Control**

- 17-001109 AGC Detector Assembly (Logarithmic)
- 17-001117 AGC Detector Assembly
- 17-001201 AGC Attenuator Assembly

The sub components 17-001109, 17-001117 & 17-001201 are parts of the Automatic Gain Control (AGC) system used in 700MHz Line Amplifier (55-165702); 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the downlink

700MHz Line Amplifier (55-165702) is fitted with two differing types of Automatic Gain Control (AGC) system, one linear, and one logarithmic. The AGC with logarithmic detector (17-001117) is fitted in the uplink path and the AGC with linear detector (17-001109) is fitted in the downlink path

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. 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the downlink

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 detector controller board.

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.

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.

AGC Specification (both types)

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

#### 18.3.4.9. 12V (Single) Relay Board (80-008901)

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.

PARAMETER		SPECIFICATION
Operating voltage		8 to 30V (floating earth)
Alarm threshold		Vcc - 1.20 volt +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		Screw terminals
Temperature range	operational	-10°C to +60°C
	storage	-20°C to +70°C

#### 18.3.4.10. Dual Diode Assembly (94-100004)

The purpose of these dual diode assemblies is to allow two DC voltage sources to be combined, so that the main DC rail within the equipment can be sourced from either a mains driven PSU, or externally through an XLR connector or from dual mains driven PSUs. They are very heavy-duty diodes and they prevent any reverse current from flowing back to their source or the alternative supply rail. Combining diodes such as these will also be used if the equipment is to be powered from external back-up batteries.

#### 18.3.4.11. DC/DC Converter 96-200047

96-200047 is an O.E.M. high power device with a wide input range and 12.5 amp @ 12V (150Watts) output capability used to derive a 12V fixed voltage power supply rail from a higher voltage supply, in this case 12V. In the event of failure this unit should not be repaired, only replaced.

96-200047 Specification

PARAMETER		SPECIFICATION
DC Input Voltage range		19 to 36V
DC Output voltage		12V $\pm$ 1%
Max. current load		12.5Amps
Temperature range	Operation	-10°C to +60°C
	Storage	-20°C to +85°C
Working Humidity		20 to 90% RHNC

### 18.3.4.12. 12V Switch-Mode PSU (96-300052)

No routine maintenance of the PSU is required. If a fault is suspected, then the output voltage from the power supply may be measured on its output terminals. This is typically set to 12.2V. The adjustment potentiometer will be found close to the DC output terminals.

All the PSUs used in AFL Cell Enhancers are capable of operation from either 110 or 220V nominal AC supplies. The line voltage is sensed automatically, so no adjustment or link setting is needed by the operator.

96-300052 Specification

<b>AC Input Supply</b>	
Voltage	110 or 220V nominal
	85 - 265V AC (absolute limits)
Frequency	47 to 63Hz
<b>DC Output Supply</b>	
Voltage	12V DC (nominal)
	10.5-13.8V (absolute limits)
Current	12.5A

## 19. UNIVERSITY STATION CROSS PASSAGE B (80-330590-2)

Wallmount case

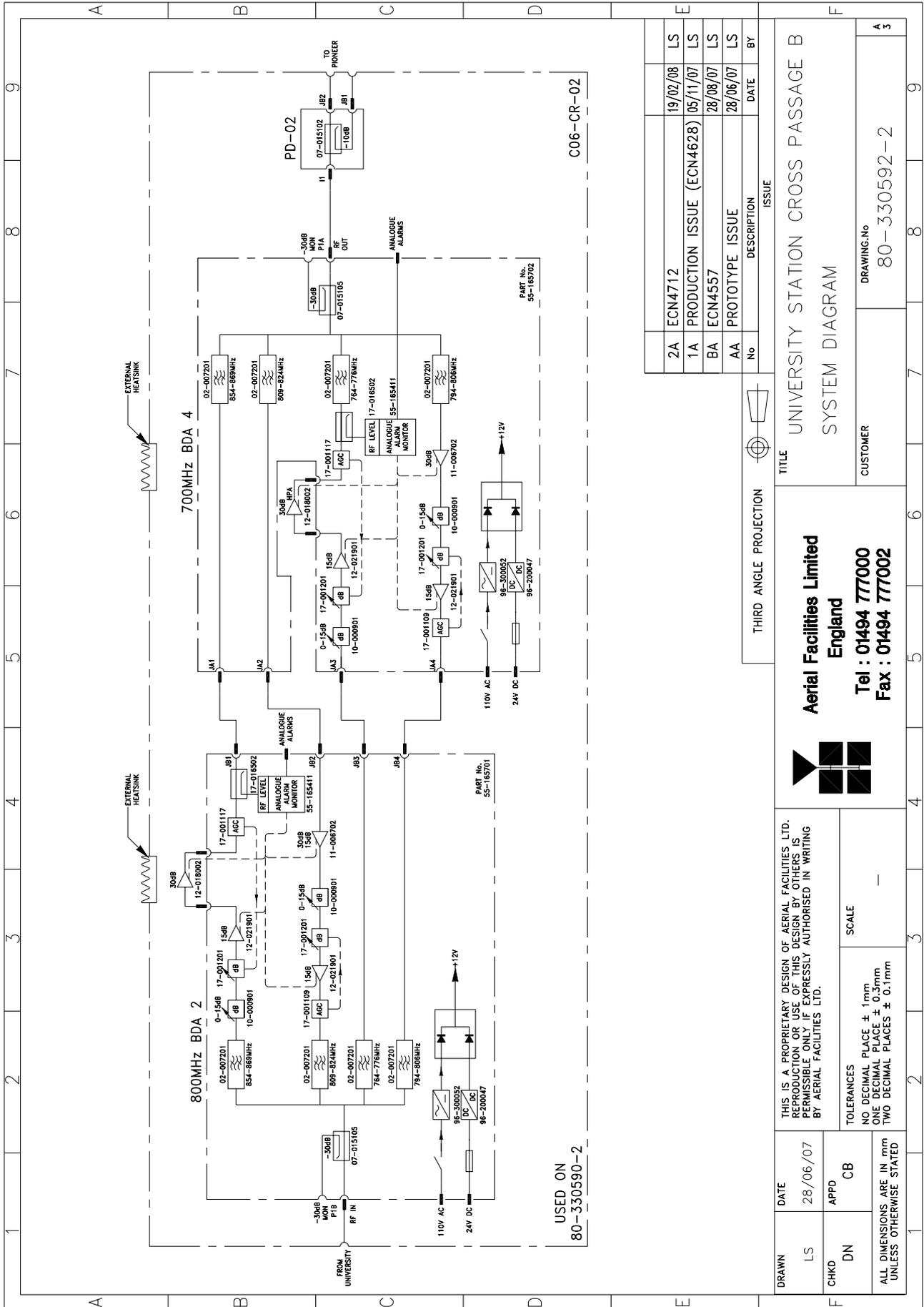
number C06-CR-02

University Station Cross Passage B (80-330590-2)

Section	Component Part	Component Part Description	Qty Per Assembly
19.3.1.	07-015102	Wideband Asymmetric Coupler	1
19.3.2.	12-018002	Power Amplifier	2
19.3.3.	55-165701	800MHz Line Amplifier	1
19.3.4.	55-165702	700MHz Line Amplifier	1

# 19.1. University Station Cross Passage B (80-330590-2) System Diagram

Drawing number 80-330592-2



USED ON  
80-330590-2

C06-CR-02

No	DESCRIPTION	DATE	BY
2A	ECN4712	19/02/08	LS
1A	PRODUCTION ISSUE (ECN4628)	05/11/07	LS
BA	ECN4557	28/08/07	LS
AA	PROTOTYPE ISSUE	28/06/07	LS

THIRD ANGLE PROJECTION

TITLE		UNIVERSITY STATION CROSS PASSAGE B
CUSTOMER		SYSTEM DIAGRAM
DRAWING No	80-330592-2	
3	A	

**Aerial Facilities Limited**  
England  
Tel : 01494 777000  
Fax : 01494 777002

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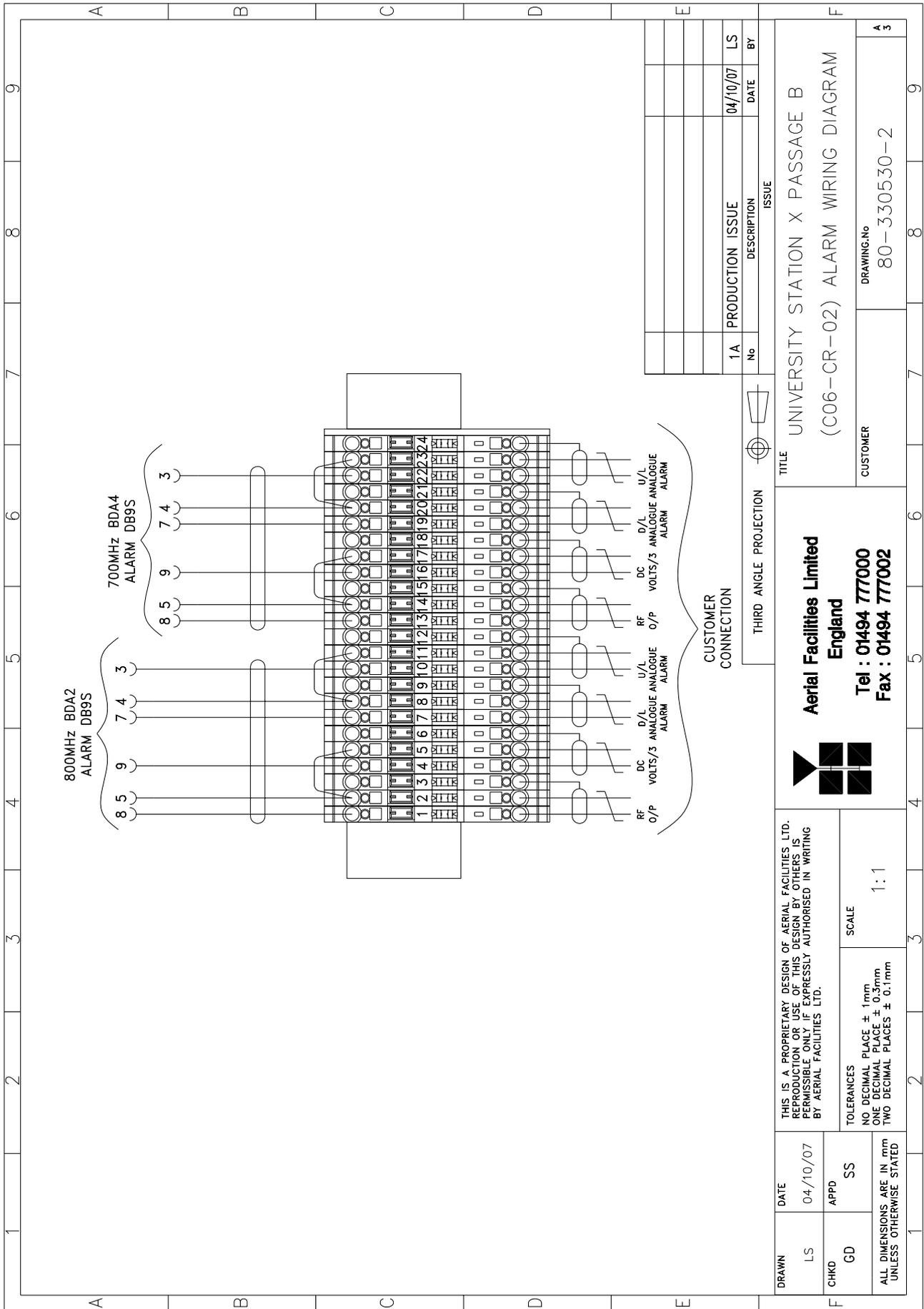
TOLERANCES  
NO DECIMAL PLACE ± 1mm  
ONE DECIMAL PLACE ± 0.3mm  
TWO DECIMAL PLACES ± 0.1mm  
UNLESS OTHERWISE STATED

SCALE

DRAWN	DATE	APPD	CB
LS	28/06/07		
CHKD			
DN			

# 19.2. University Station Cross Passage B (80-330590-2) Alarm Wiring Diagram

Drawing Number 80-330530-2



### 19.3. University Station Cross Passage B (80-330590-2) Major Sub Components

#### 19.3.1. Wideband Asymmetric Coupler (07-015102)

The purpose of Wideband Asymmetric Coupler (07-015102) is to tap off a known portion (in this case 10dB) of RF signal from transmission lines and to combine them, for example through splitter units for different purposes (alarms/monitoring etc.), whilst maintaining an accurate 50Ω load to all ports/interfaces throughout the specified frequency range. They are known formally as directional couplers as they couple power from the RF mainline in one direction only.

##### 07-015102 Specification

PARAMETER		SPECIFICATION
Frequency Range		800 - 2500 MHz
Coupling Value		10 dB ± 1.0 dB
Main Line Insertion Loss		<1.6 dB
VSWR		1.4:1
Directivity		>18 dB
Power Rating		200 Watts
RF Connectors		'N' female
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

#### 19.3.2. Power Amplifier (12-018002)

This amplifier is a Class A 20W power amplifier from 800-960MHz in a 1 stage balanced configuration. It demonstrates a very high linearity and a very good input/output return loss (RL). It has built in a Current Fault Alarm Function.

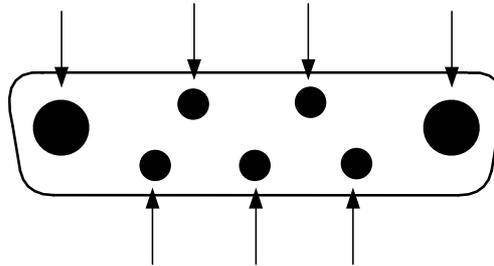
Its housing is an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a D-Type connector for the power supply and the Current Fault Alarm Function.

##### 12-018002 Specification

PARAMETER		SPECIFICATION
Frequency range		800-960MHz
Small signal gain		30dB
Gain flatness		±1.2dB
I/O Return loss		>18dB
1dB compression point		42.8dBm
OIP3		56dBm
Supply voltage		24V DC
Supply current		5.0Amps (Typical)
Temperature range	operational	-10°C to +60°C
	storage	-20°C to +70°C
Weight		<2kg (no heatsink)

Power Amplifier (12-018002) 7-Way Connector Pin-outs

Connector Pin	Signal
A1 (large pin)	+24V DC
A2 (large pin)	GND
1	Alarm relay common
2	TTL alarm/0V good
3	Alarm relay contact (bad)
4	Alarm relay contact (good)
5	O/C good/0V bad (TTL)



### 19.3.3. 800MHz Line Amplifier (55-165701)

5U rack mount case

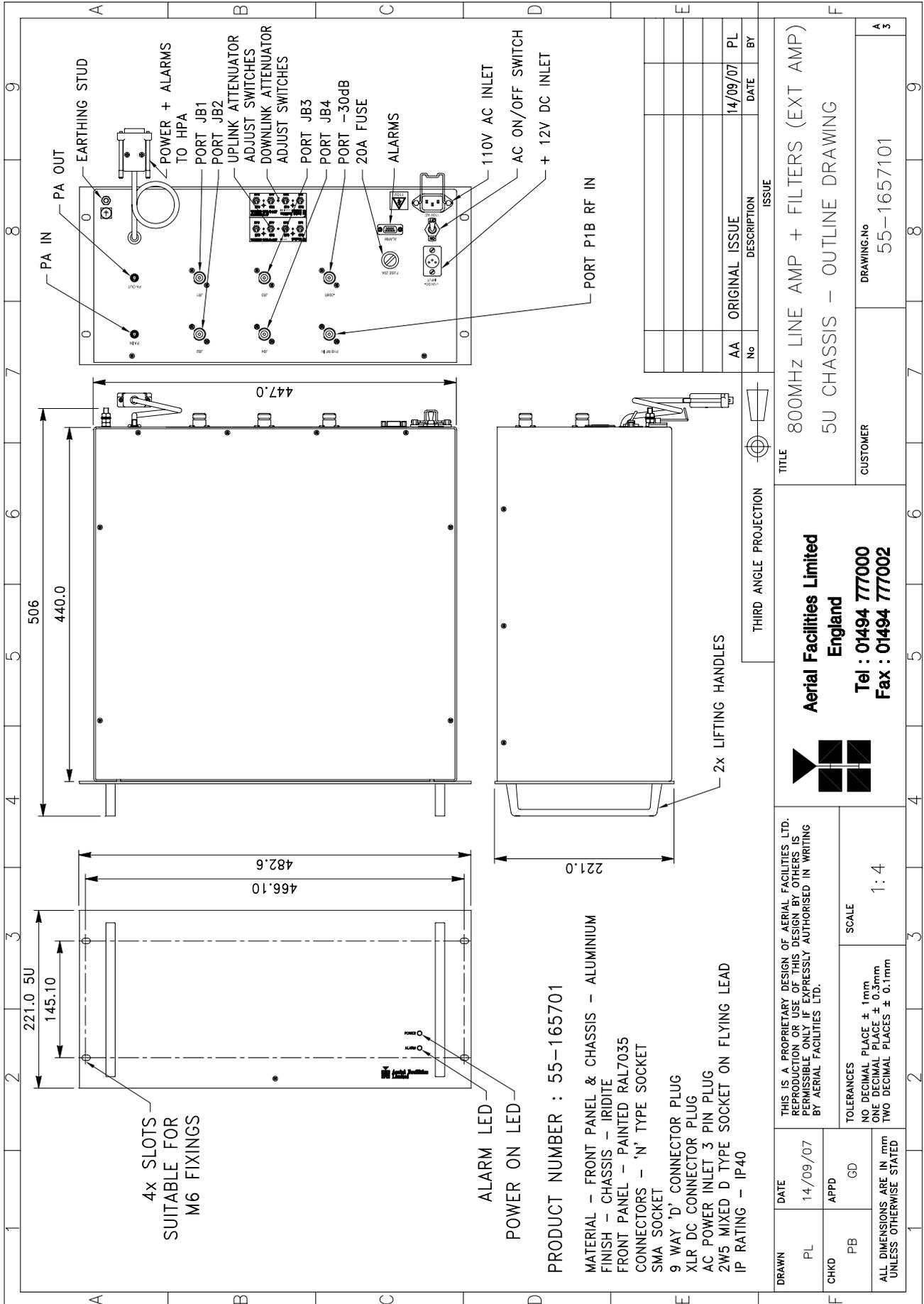
#### 800MHz Line Amplifier (55-165701) List of Major Components

Section	Component Part	Component Part Description	Qty Per Assembly
19.3.3.3.	02-007206	Bandpass Filter	4
19.3.3.4.	07-015105	Wideband Asymmetric Coupler	1
19.3.3.5.	10-000901	Switched Attenuator 0.25W, 0 - 15dB	2
19.3.3.6.	11-006702	Low Noise Amplifier	1
19.3.3.7.	12-021901	Low Power Amplifier	2
19.3.3.8.	17-001109	AGC Detector Assembly (Logarithmic)	1
	17-001117	AGC Detector Assembly	1
	17-001201	AGC Attenuator Assembly	2
19.3.3.9.	80-008901	12V (Single) Relay Board	1
19.3.3.10.	94-100004	Dual Diode Assembly	1
19.3.3.11.	96-200047	DC/DC Converter	1
19.3.3.12.	96-300052	12V Switch-Mode PSU	1

\*The sub components 17-001109, 17-001117 & 17-001201 are parts of the Automatic Gain Control (AGC) system used in 800MHz Line Amplifier (55-165701); 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the down link

### 19.3.3.1. 800MHz Line Amplifier (55-165701) Outline Drawing

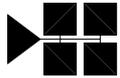
Drawing number 55-1657101



PRODUCT NUMBER : 55-165701

- MATERIAL - FRONT PANEL & CHASSIS - ALUMINIUM
- FINISH - CHASSIS - IRIDITE
- FRONT PANEL - PAINTED RAL7035
- CONNECTORS - 'N' TYPE SOCKET
- SMA SOCKET
- 9 WAY 'D' CONNECTOR PLUG
- XLR DC CONNECTOR PLUG
- AC POWER INLET 3 PIN PLUG
- 2W5 MIXED D TYPE SOCKET ON FLYING LEAD
- IP RATING - IP40

DRAWN		DATE	THIRD ANGLE PROJECTION		ISSUE	
PL	14/09/07	AA	ORIGINAL	PL	14/09/07	PL
CHKD	APPD	PB	GD	DESCRIPTION	DATE	BY
ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED		SCALE		TITLE		
TOLERANCES		1:4		800MHZ LINE AMP + FILTERS (EXT AMP)		
NO DECIMAL PLACE ± 1mm				5U CHASSIS - OUTLINE DRAWING		
ONE DECIMAL PLACE ± 0.5mm				CUSTOMER		
TWO DECIMAL PLACES ± 0.1mm				DRAWING.No		
				55-1657101		
				A		
				3		



**Aerial Facilities Limited**  
**England**  
**Tel : 01494 777000**  
**Fax : 01494 777002**



### 19.3.3.3. Bandpass Filter (02-007206)

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 slot coupled, folded 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.

Being passive devices, the bandpass filters should have an extremely long operational life and require no maintenance. Should a filter be suspect, it is usually most time efficient to replace the module rather than attempt repair or re-tuning.

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

#### 02-007206 Specification

PARAMETER		SPECIFICATION
Response type		Chebyshev
Frequency range		800 - 950MHz *
Bandwidth		25MHz *
Number of sections		8
Insertion loss		1.2 dB
VSWR		better than 1.2:1
Connectors		SMA female
Power handling		100W max
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C
Weight		3 kg (typical)

\*tuned to Customer's specification

### 19.3.3.4. Wideband Asymmetric Coupler (07-015105)

The purpose of Wideband Asymmetric Coupler (07-015105) is to tap off a known portion (in this case 30dB) of RF signal from transmission lines and to combine them, for example through splitter units for different purposes (alarms/monitoring etc.), whilst maintaining an accurate 50Ω load to all ports/interfaces throughout the specified frequency range. They are known formally as directional couplers as they couple power from the RF mainline in one direction only.

#### 07-015105 Specification

PARAMETER		SPECIFICATION
Construction		Inductive air gap
Frequency		800-2500MHz
Through loss		0.4dB (typical)
Coupling level		-30dB ±0.5dB
Isolation		N/A
Weight		<1.0kg
Connectors		SMA, female
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

### 19.3.3.5. Switched Attenuator 0.25W, 0 - 15dB (10-000901)

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.

10-000901 provides attenuation from 0 - 15dB in 2 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.

#### 10-000901 Specification

PARAMETER		SPECIFICATION
Attenuation Values		0-15dB
Attenuation Steps		1, 2, 4 and 8dB
Power Handling		0.25 Watt
Attenuation Accuracy		± 1.0 dB
Frequency Range		DC to 1GHz
Impedance		50Ω
Connectors		SMA
VSWR		1.3:1
Weigh		0.2kg
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

### 19.3.3.6. Low Noise Amplifier (11-006702)

The Gallium-Arsenide low noise amplifiers used in 800MHz Line Amplifier (55-165703) are double stage, solid-state low noise amplifiers. Class A circuitry is used throughout the units to ensure excellent linearity and extremely low noise over a very wide dynamic range. The active devices are very moderately rated to provide a long trouble-free working life. There are no adjustments on these amplifiers, and in the unlikely event of a failure, then the complete amplifier should be replaced. This amplifier features its own in-built alarm system which gives a volt-free relay contact type alarm that is easily integrated into the main alarm system.

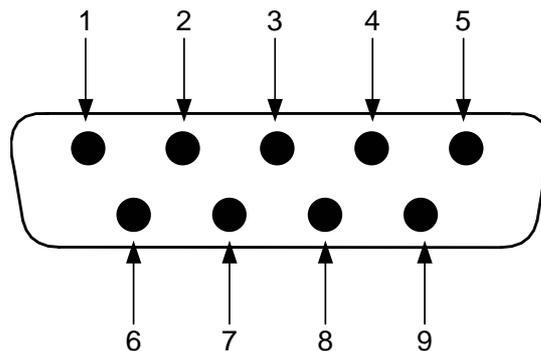
#### 11-006702 Specification

PARAMETER		SPECIFICATION
Frequency range		800 – 1000MHz
Bandwidth		<200MHz
Gain		29dB (typical)
1dB Compression point		20dBm
OIP3		33dBm
Input/Output return loss		>18dB
Noise figure		1.3dB (typical)
Power consumption		180mA @ 24V DC
Supply voltage		10-24V DC
Connectors		SMA female
Temperature range:	operational	-10°C to +60°C
	storage	-20°C to +70°C
Size		90 x 55 x 30.2mm
Weight		290gms (approximately)

Low Noise Amplifier (11-006702) 'D' Connector Pin-out details

Connector pin	Signal
1	+Ve input (10-24V)
2	GND
3	Alarm Relay O/P bad
4	Alarm Relay common
5	Alarm Relay good
6	No connection
7	TTL voltage set
8	TTL alarm/0V (good)
9	O/C good/0V bad

9-Way Pin-Out Graphical Representation



**19.3.3.7. Low Power Amplifier (12-021901)**

The low power amplifier used is a triple stage solid-state low-noise amplifier. Class A circuitry is used in the unit to ensure excellent linearity over a very wide dynamic range. The three active devices are very moderately rated to provide a long trouble-free working life.

Its housing is an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a D-Type connector for the power supply and the Current Fault Alarm Function.

There are no adjustments on this amplifier, and in the unlikely event of failure then the entire amplifier should be replaced.

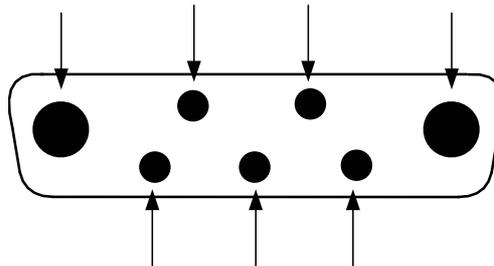
Low Power Amplifier (12-021901) Specification

PARAMETER		SPECIFICATION
Frequency range		800-960MHz*
Bandwidth		20MHz *
Maximum RF output		>1.0 Watt
Gain		15dB
1dB compression point		+30.5dBm
3 <sup>rd</sup> order intercept point		+43dBm
Noise Figure		<6dB
VSWR		better than 1.5:1
Connectors		SMA female
Supply		500mA @ 10-15V DC
Temperature range	operational	-10°C to +60°C
	storage	-20°C to +70°C
Weight		0.5 kg
Size		167x52x25mm

\* Tuned to Customer's specification

Low Power Amplifier (12-021901) 7-Way Connector Pin-outs

Connector Pin	Signal
A1 (large pin)	+24V DC
A2 (large pin)	GND
1	Alarm relay common
2	TTL alarm/0V good
3	Alarm relay contact (bad)
4	Alarm relay contact (good)
5	O/C good/0V bad (TTL)



**19.3.3.8. Automatic Gain Control**

- 17-001109 AGC Detector Assembly (Logarithmic)
- 17-001117 AGC Detector Assembly
- 17-001201 AGC Attenuator Assembly

The sub components 17-001109, 17-001117 & 17-001201 are parts of the Automatic Gain Control (AGC) system used in 800MHz Line Amplifier (55-165701); 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the downlink

800MHz Line Amplifier (55-165701) is fitted with two differing types of Automatic Gain Control (AGC) system, one linear, and one logarithmic. The AGC with logarithmic detector (17-001117) is fitted in the uplink path and the AGC with linear detector (17-001109) is fitted in the downlink path

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. 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the downlink

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 detector controller board.

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.

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.

AGC Specification (both types)

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

### 19.3.3.9. 12V (Single) Relay Board (80-008901)

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.

PARAMETER		SPECIFICATION
Operating voltage		8 to 30V (floating earth)
Alarm threshold		Vcc - 1.20 volt +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		Screw terminals
Temperature range	operational	-10°C to +60°C
	storage	-20°C to +70°C

### 19.3.3.10. Dual Diode Assembly (94-100004)

The purpose of these dual diode assemblies is to allow two DC voltage sources to be combined, so that the main DC rail within the equipment can be sourced from either a mains driven PSU, or externally through an XLR connector or from dual mains driven PSUs. They are very heavy-duty diodes and they prevent any reverse current from flowing back to their source or the alternative supply rail. Combining diodes such as these will also be used if the equipment is to be powered from external back-up batteries.

### 19.3.3.11. DC/DC Converter 96-200047

96-200047 is an O.E.M. high power device with a wide input range and 12.5 amp @ 12V (150Watts) output capability used to derive a 12V fixed voltage power supply rail from a higher voltage supply, in this case 12V. In the event of failure this unit should not be repaired, only replaced.

96-200047 Specification

PARAMETER		SPECIFICATION
DC Input Voltage range		19 to 36V
DC Output voltage		12V $\pm$ 1%
Max. current load		12.5Amps
Temperature range	Operation	-10°C to +60°C
	Storage	-20°C to +85°C
Working Humidity		20 to 90% RHNC

### 19.3.3.12. 12V Switch-Mode PSU (96-300052)

No routine maintenance of the PSU is required. If a fault is suspected, then the output voltage from the power supply may be measured on its output terminals. This is typically set to 12.2V. The adjustment potentiometer will be found close to the DC output terminals.

All the PSUs used in AFL Cell Enhancers are capable of operation from either 110 or 220V nominal AC supplies. The line voltage is sensed automatically, so no adjustment or link setting is needed by the operator.

96-300052 Specification

<b>AC Input Supply</b>	
Voltage	110 or 220V nominal
	85 - 265V AC (absolute limits)
Frequency	47 to 63Hz
<b>DC Output Supply</b>	
Voltage	12V DC (nominal)
	10.5-13.8V (absolute limits)
Current	12.5A

### 19.3.4. 700MHz Line Amplifier (55-165702)

5U rack mount case

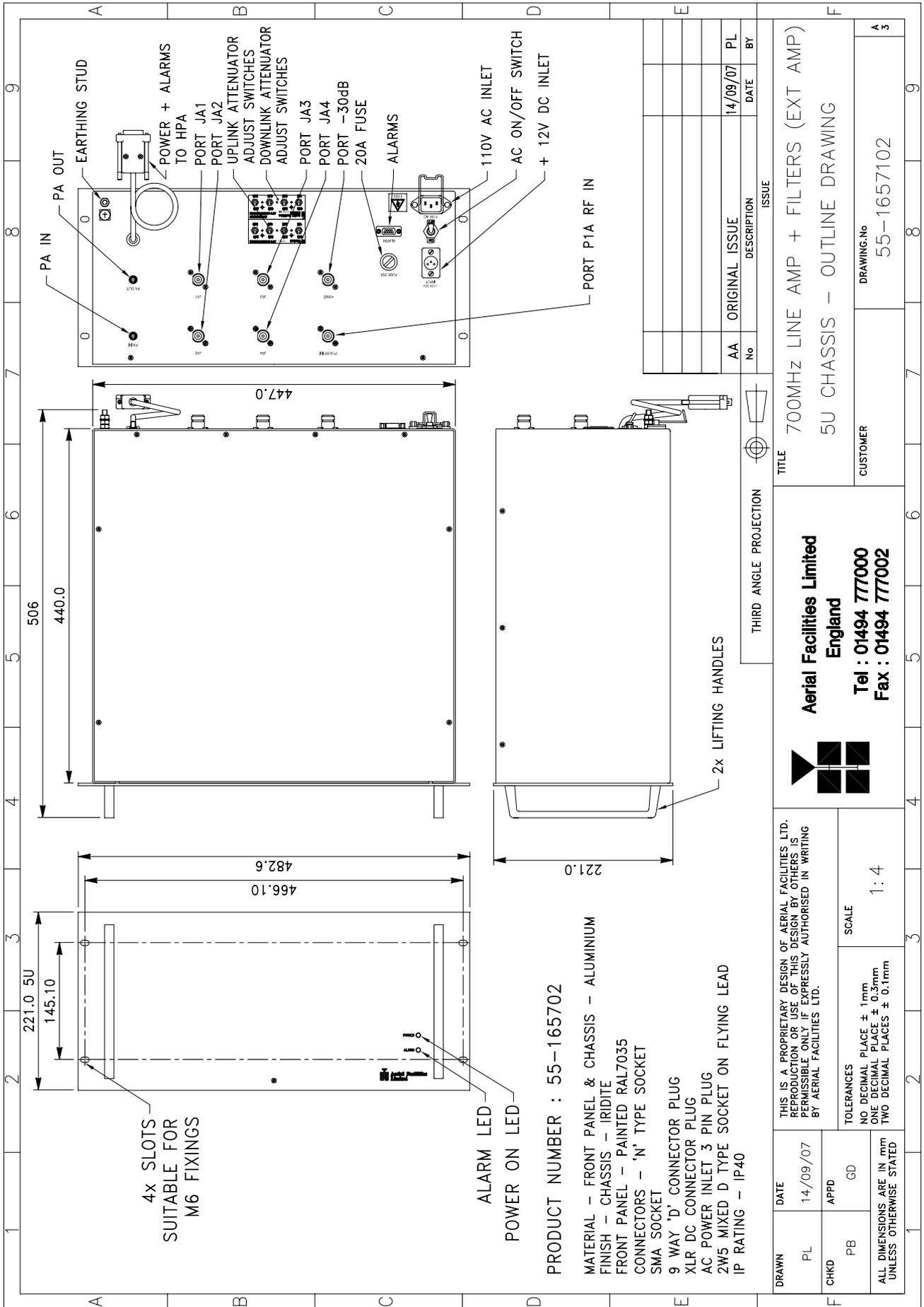
#### 700MHz Line Amplifier (55-165702) List of Major Components

Section	Component Part	Component Part Description	Qty Per Assembly
19.3.4.3.	02-007206	900MHZ 8POLE 25MHz+ B/W "SMA"	4
19.3.4.4.	07-015105	ASYMMETRIC CPLR 30dB 800-2500MHz GA	1
19.3.4.5.	10-000901	SW ATT 0-15dB 0.25W SMA F	2
19.3.4.6.	11-006702	800-1000MHz LNA 29dB (cw RELAY) KIT	1
19.3.4.7.	12-021901	Low Power Amplifier	2
19.3.4.8.	17-001109*	AGC Detector Assembly (Logarithmic)	1
	17-001117*	AGC Detector Assembly	1
	17-001201*	AGC Attenuator Assembly	2
19.3.4.9.	80-008901	12V RELAY PCB ASSEMBLY	1
19.3.4.10.	94-100004	STPS12045TV 60A DUAL DIODE	1
19.3.4.11.	96-200047	DC/DC Converter	1
19.3.4.12.	96-300052	JWS150-12/A PSU (COUTANT LAMBDA)	1

\*The sub components 17-001109, 17-001117 & 17-001201 are parts of the Automatic Gain Control (AGC) system used in 700MHz Line Amplifier (55-165702); 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the downlink

# 19.3.4.1. 700MHz Line Amplifier (55-165702) Outline Drawing

Drawing Number 55-1657102



No	DESCRIPTION	DATE	BY
AA	ORIGINAL ISSUE	14/09/07	PL

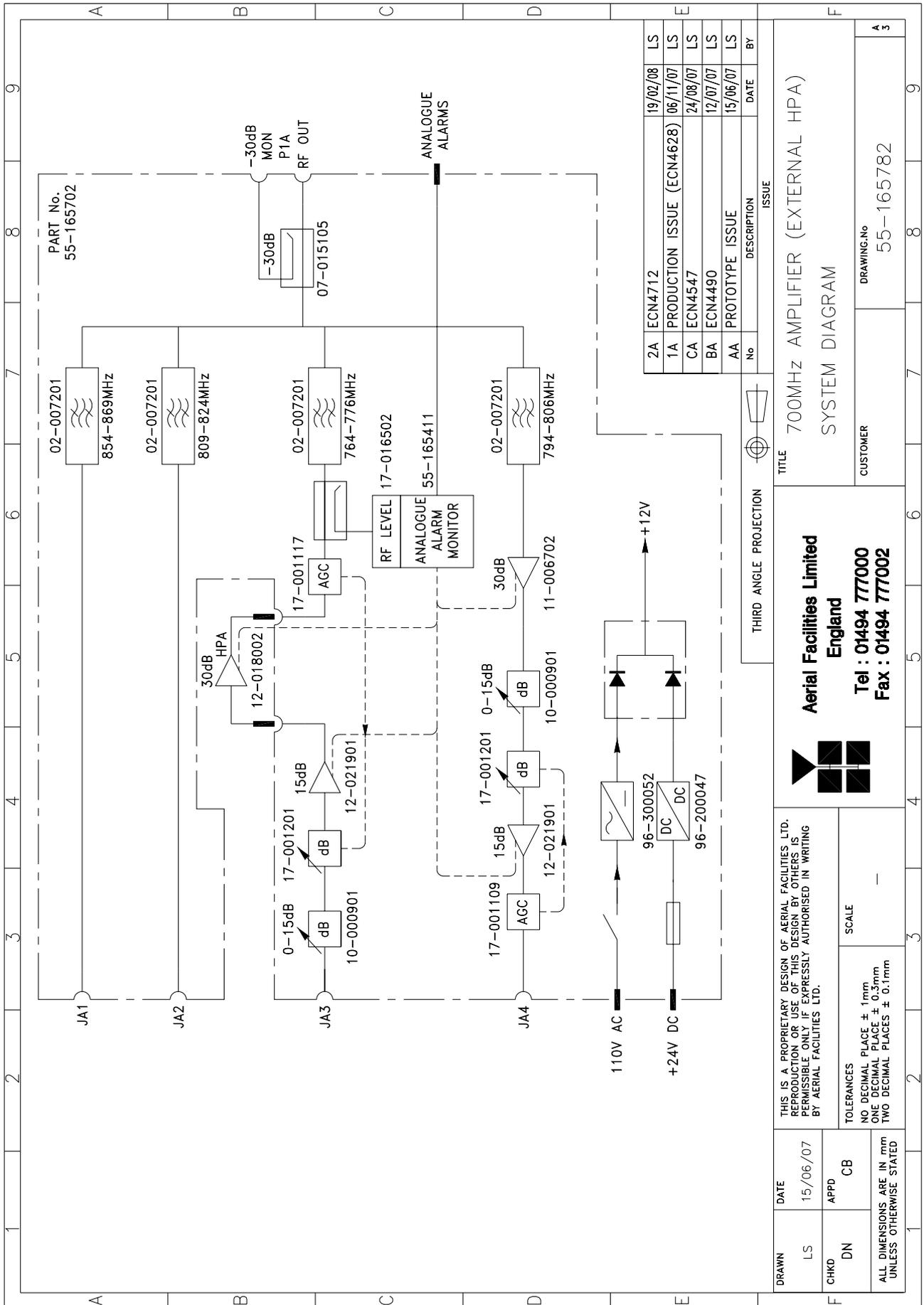
**Aerial Facilities Limited**  
 England  
 Tel : 01494 777000  
 Fax : 01494 777002

TITLE: 700MHZ LINE AMP + FILTERS (EXT AMP)  
 CUSTOMER: 5U CHASSIS - OUTLINE DRAWING  
 DRAWING No: 55-1657102

THIS IS A PROPRIETARY DESIGN OF AERIAL FACILITIES LTD. REPRODUCTION OR USE OF THIS DESIGN BY OTHERS IS PERMISSIBLE ONLY IF EXPRESSLY AUTHORISED IN WRITING BY AERIAL FACILITIES LTD.	SCALE: 1:4
TOLERANCES: NO DECIMAL PLACE ± 1mm ONE DECIMAL PLACE ± 0.3mm TWO DECIMAL PLACES ± 0.1mm	
DRAWN: PL	DATE: 14/09/07
CHKD: CHKD	APPD: GD
ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED	

### 19.3.4.2. 700MHz Line Amplifier (55-165702) System Diagram

Drawing Number 55-165782



### 19.3.4.3. Bandpass Filter (02-007206)

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 slot coupled, folded 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.

Being passive devices, the bandpass filters should have an extremely long operational life and require no maintenance. Should a filter be suspect, it is usually most time efficient to replace the module rather than attempt repair or re-tuning.

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

#### 02-007206 Specification

PARAMETER		SPECIFICATION
Response type		Chebyshev
Frequency range		800 - 950MHz *
Bandwidth		25MHz *
Number of sections		8
Insertion loss		1.2 dB
VSWR		better than 1.2:1
Connectors		SMA female
Power handling		100W max
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C
Weight		3 kg (typical)

\*tuned to Customer's specification

### 19.3.4.4. Wideband Asymmetric Coupler (07-015105)

The purpose of Wideband Asymmetric Coupler (07-015105) is to tap off a known portion (in this case 30dB) of RF signal from transmission lines and to combine them, for example through splitter units for different purposes (alarms/monitoring etc.), whilst maintaining an accurate 50Ω load to all ports/interfaces throughout the specified frequency range. They are known formally as directional couplers as they couple power from the RF mainline in one direction only.

#### 07-015105 Specification

PARAMETER		SPECIFICATION
Construction		Inductive air gap
Frequency		800-2500MHz
Through loss		0.4dB (typical)
Coupling level		-30dB ±0.5dB
Isolation		N/A
Weight		<1.0kg
Connectors		SMA, female
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

### 19.3.4.5. Switched Attenuator 0.25W, 0 - 15dB (10-000901)

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.

10-000901 provides attenuation from 0 - 15dB in 2 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.

#### 10-000901 Specification

PARAMETER		SPECIFICATION
Attenuation Values		0-15dB
Attenuation Steps		1, 2, 4 and 8dB
Power Handling		0.25 Watt
Attenuation Accuracy		± 1.0 dB
Frequency Range		DC to 1GHz
Impedance		50Ω
Connectors		SMA
VSWR		1.3:1
Weigh		0.2kg
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

### 19.3.4.6. Low Noise Amplifier (11-006702)

The Gallium-Arsenide low noise amplifiers used in 800MHz Line Amplifier (55-165703) are double stage, solid-state low noise amplifiers. Class A circuitry is used throughout the units to ensure excellent linearity and extremely low noise over a very wide dynamic range. The active devices are very moderately rated to provide a long trouble-free working life. There are no adjustments on these amplifiers, and in the unlikely event of a failure, then the complete amplifier should be replaced. This amplifier features its own in-built alarm system which gives a volt-free relay contact type alarm that is easily integrated into the main alarm system.

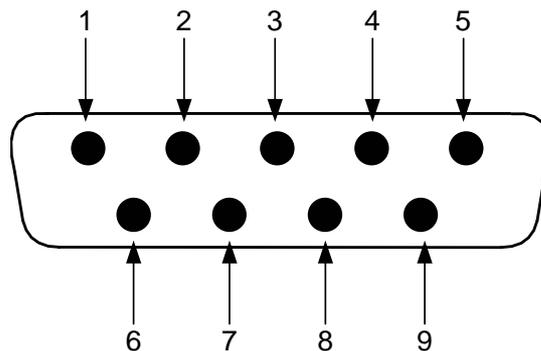
#### 11-006702 Specification

PARAMETER		SPECIFICATION
Frequency range		800 – 1000MHz
Bandwidth		<200MHz
Gain		29dB (typical)
1dB Compression point		20dBm
OIP3		33dBm
Input/Output return loss		>18dB
Noise figure		1.3dB (typical)
Power consumption		180mA @ 24V DC
Supply voltage		10-24V DC
Connectors		SMA female
Temperature range:	operational	-10°C to +60°C
	storage	-20°C to +70°C
Size		90 x 55 x 30.2mm
Weight		290gms (approximately)

Low Noise Amplifier (11-006702) 'D' Connector Pin-out details

Connector pin	Signal
1	+Ve input (10-24V)
2	GND
3	Alarm RelayO/P bad
4	Alarm Relay common
5	Alarm Relay good
6	No connection
7	TTL voltage set
8	TTL alarm/0V (good)
9	O/C good/0V bad

9-Way Pin-Out Graphical Representation



**19.3.4.7. Low Power Amplifier (12-021901)**

The low power amplifier used is a triple stage solid-state low-noise amplifier. Class A circuitry is used in the unit to ensure excellent linearity over a very wide dynamic range. The three active devices are very moderately rated to provide a long trouble-free working life.

Its housing is an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a D-Type connector for the power supply and the Current Fault Alarm Function.

There are no adjustments on this amplifier, and in the unlikely event of failure then the entire amplifier should be replaced.

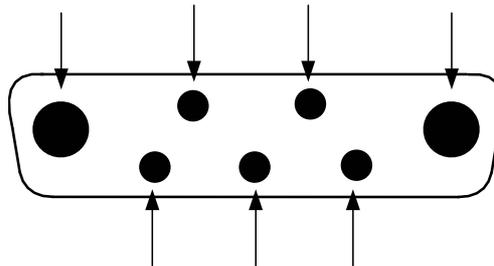
Low Power Amplifier (12-021901) Specification

PARAMETER		SPECIFICATION
Frequency range		800-960MHz*
Bandwidth		20MHz *
Maximum RF output		>1.0 Watt
Gain		15dB
1dB compression point		+30.5dBm
3 <sup>rd</sup> order intercept point		+43dBm
Noise Figure		<6dB
VSWR		better than 1.5:1
Connectors		SMA female
Supply		500mA @ 10-15V DC
Temperature range	operational	-10°C to +60°C
	storage	-20°C to +70°C
Weight		0.5 kg
Size		167x52x25mm

\* Tuned to Customer's specification

Low Power Amplifier (12-021901) 7-Way Connector Pin-outs

Connector Pin	Signal
A1 (large pin)	+24V DC
A2 (large pin)	GND
1	Alarm relay common
2	TTL alarm/0V good
3	Alarm relay contact (bad)
4	Alarm relay contact (good)
5	O/C good/0V bad (TTL)



**19.3.4.8. Automatic Gain Control**

- 17-001109 AGC Detector Assembly (Logarithmic)
- 17-001117 AGC Detector Assembly
- 17-001201 AGC Attenuator Assembly

The sub components 17-001109, 17-001117 & 17-001201 are parts of the Automatic Gain Control (AGC) system used in 700MHz Line Amplifier (55-165702); 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the downlink

700MHz Line Amplifier (55-165702) is fitted with two differing types of Automatic Gain Control (AGC) system, one linear, and one logarithmic. The AGC with logarithmic detector (17-001117) is fitted in the uplink path and the AGC with linear detector (17-001109) is fitted in the downlink path

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. 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the downlink

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 detector controller board.

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.

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.

AGC Specification (both types)

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

#### 19.3.4.9. 12V (Single) Relay Board (80-008901)

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.

PARAMETER		SPECIFICATION
Operating voltage		8 to 30V (floating earth)
Alarm threshold		Vcc - 1.20 volt +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		Screw terminals
Temperature range	operational	-10°C to +60°C
	storage	-20°C to +70°C

#### 19.3.4.10. Dual Diode Assembly (94-100004)

The purpose of these dual diode assemblies is to allow two DC voltage sources to be combined, so that the main DC rail within the equipment can be sourced from either a mains driven PSU, or externally through an XLR connector or from dual mains driven PSUs. They are very heavy-duty diodes and they prevent any reverse current from flowing back to their source or the alternative supply rail. Combining diodes such as these will also be used if the equipment is to be powered from external back-up batteries.

#### 19.3.4.11. DC/DC Converter 96-200047

96-200047 is an O.E.M. high power device with a wide input range and 12.5 amp @ 12V (150Watts) output capability used to derive a 12V fixed voltage power supply rail from a higher voltage supply, in this case 12V. In the event of failure this unit should not be repaired, only replaced.

96-200047 Specification

PARAMETER		SPECIFICATION
DC Input Voltage range		19 to 36V
DC Output voltage		12V $\pm$ 1%
Max. current load		12.5Amps
Temperature range	Operation	-10°C to +60°C
	Storage	-20°C to +85°C
Working Humidity		20 to 90% RHNC

### 19.3.4.12. 12V Switch-Mode PSU (96-300052)

No routine maintenance of the PSU is required. If a fault is suspected, then the output voltage from the power supply may be measured on its output terminals. This is typically set to 12.2V. The adjustment potentiometer will be found close to the DC output terminals.

All the PSUs used in AFL Cell Enhancers are capable of operation from either 110 or 220V nominal AC supplies. The line voltage is sensed automatically, so no adjustment or link setting is needed by the operator.

96-300052 Specification

<b>AC Input Supply</b>	
Voltage	110 or 220V nominal
	85 - 265V AC (absolute limits)
Frequency	47 to 63Hz
<b>DC Output Supply</b>	
Voltage	12V DC (nominal)
	10.5-13.8V (absolute limits)
Current	12.5A

## 20 CONVENTION PLACE STATION 700MHZ BDA (80-330554-1)

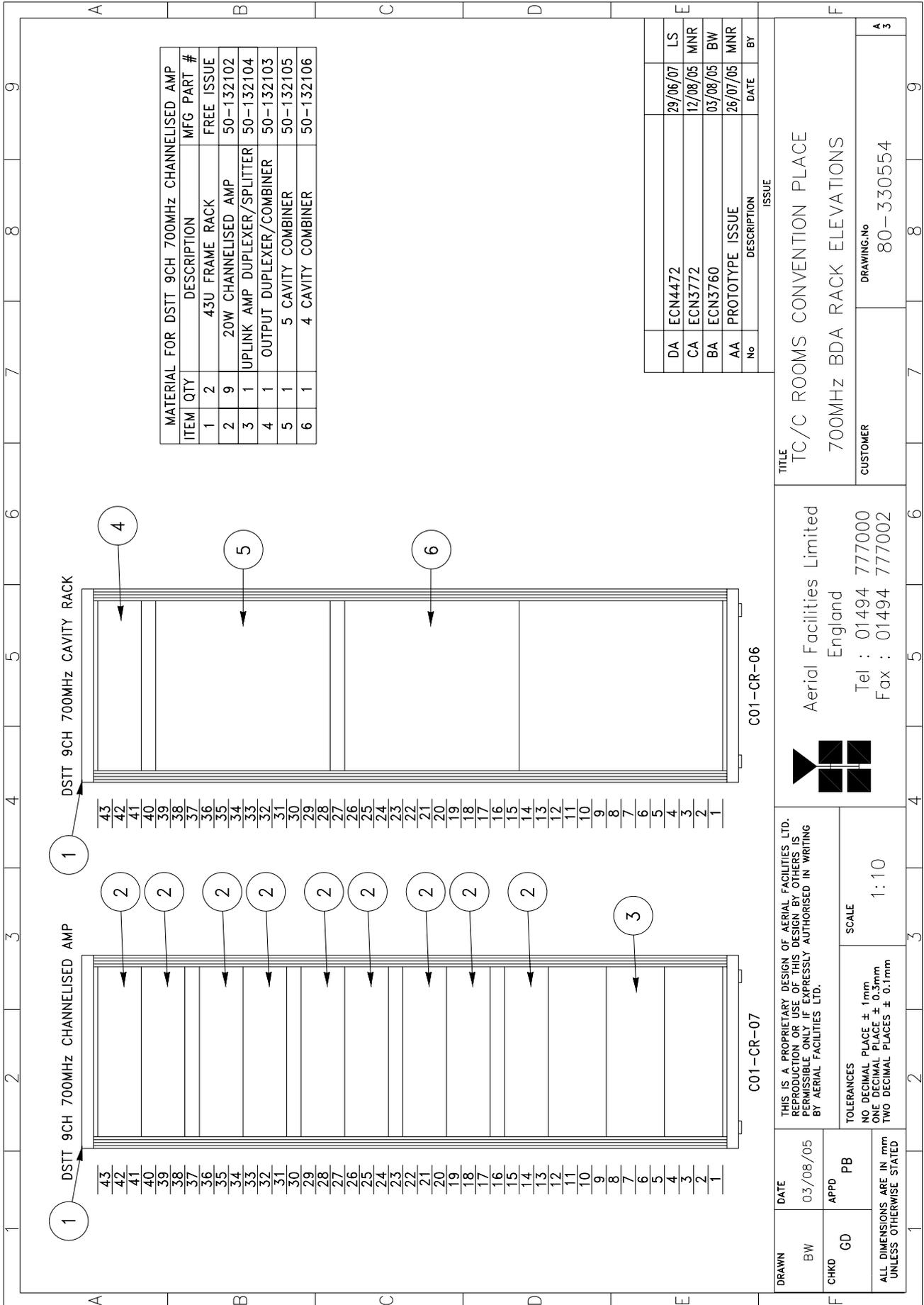
Rack number CR1-CR-06

Convention Place Station 700MHz BDA (80-330554-1) List of major Components

Section	Component Part	Component Part Description	Qty Per Assembly
20.3.1.	50-132103	700MHz Output Duplexer/Combiner	1
20.3.2.	50-132105	700MHz 5 Cavity Combiner System	1
20.3.3.	50-132106	700MHz 4 Cavity Combiner System	1

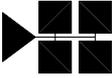
# 20.1 Convention Place Station 700MHz BDA (80-330554-1) Outline Drawing

Drawing number 80-330554



No	DESCRIPTION	DATE	BY
DA	ECN4472	29/06/07	LS
CA	ECN3772	12/08/05	MNR
BA	ECN3760	03/08/05	BW
AA	PROTOTYPE ISSUE	26/07/05	MNR

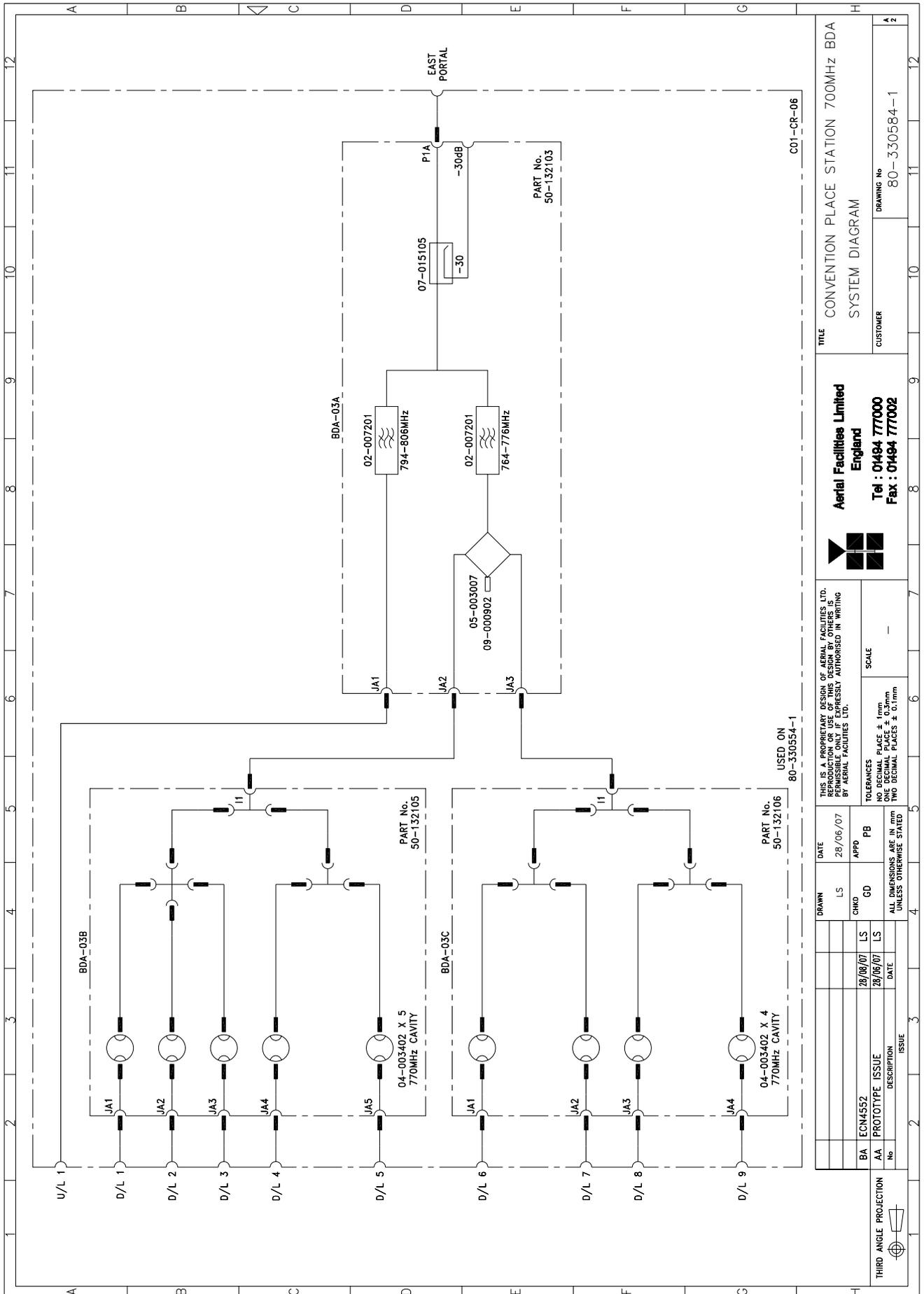
<b>TITLE</b> TC/C ROOMS CONVENTION PLACE 700MHz BDA RACK ELEVATIONS	
<b>CUSTOMER</b> 80-330554	<b>DRAWING.No</b> 80-330554

  
**Aerial Facilities Limited**  
 England  
 Tel : 01494 777000  
 Fax : 01494 777002

<b>DRAWN</b> BW	<b>DATE</b> 03/08/05	THIS IS A PROPRIETARY DESIGN OF AERIAL FACILITIES LTD. REPRODUCTION OR USE OF THIS DESIGN BY OTHERS IS PERMISSIBLE ONLY IF EXPRESSLY AUTHORISED IN WRITING BY AERIAL FACILITIES LTD.	
<b>CHKD</b> GD	<b>APPD</b> PB	<b>TOLERANCES</b> NO DECIMAL PLACE ± 1mm ONE DECIMAL PLACE ± 0.5mm TWO DECIMAL PLACES ± 0.1mm	<b>SCALE</b> 1:10
ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED			

# 20.2. Convention Place Station 700MHz BDA (80-330554-1) System Diagram

Drawing number 80-330584-1



## 20.3 Convention Place Station 700MHz BDA (80-330554-1) Major Components

### 20.3.1. 700MHz Output Duplexer/Combiner (50-132103)

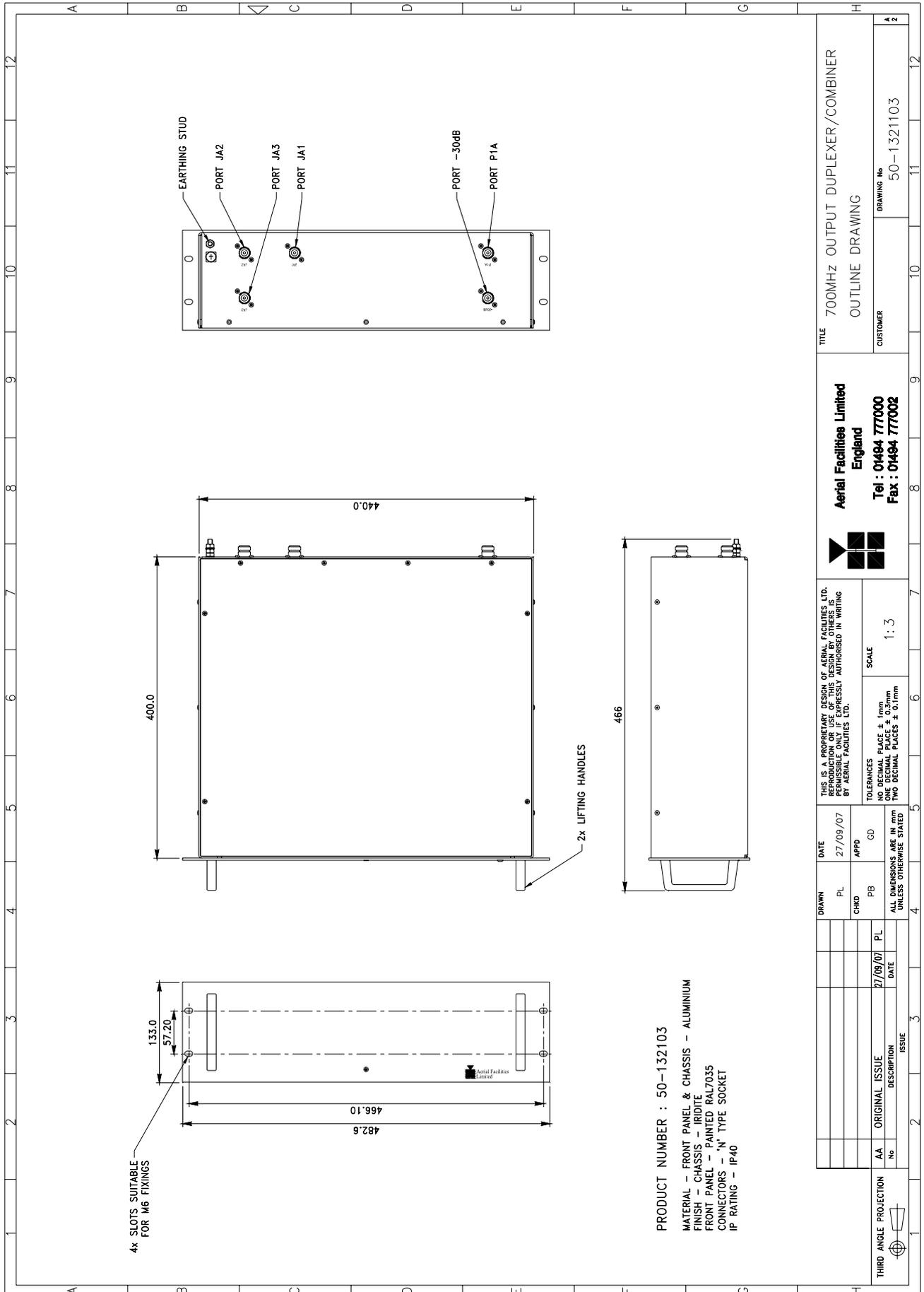
3U rack mount tray

700MHz Output Duplexer/Combiner (50-132103) List of Major Components

Section	Component Part	Component Part Description	Qty Per Assembly
20.3.1.3.	02-007206	Bandpass Filter	2
20.3.1.4.	05-003007	4 Port Hybrid Coupler	1
20.3.1.5.	07-015105	Wideband Asymmetric Coupler	1
20.3.1.6.	09-000902	Dummy Load	1

### 20.3.1.1. 700MHz Output Duplexer/Combiner (50-132103) outline drawing

Drawing number 50-1321103



TITLE		700MHZ OUTPUT DUPLEXER/COMBINER	
OUTLINE DRAWING		CUSTOMER	
DRAWING NO		50-1321103	

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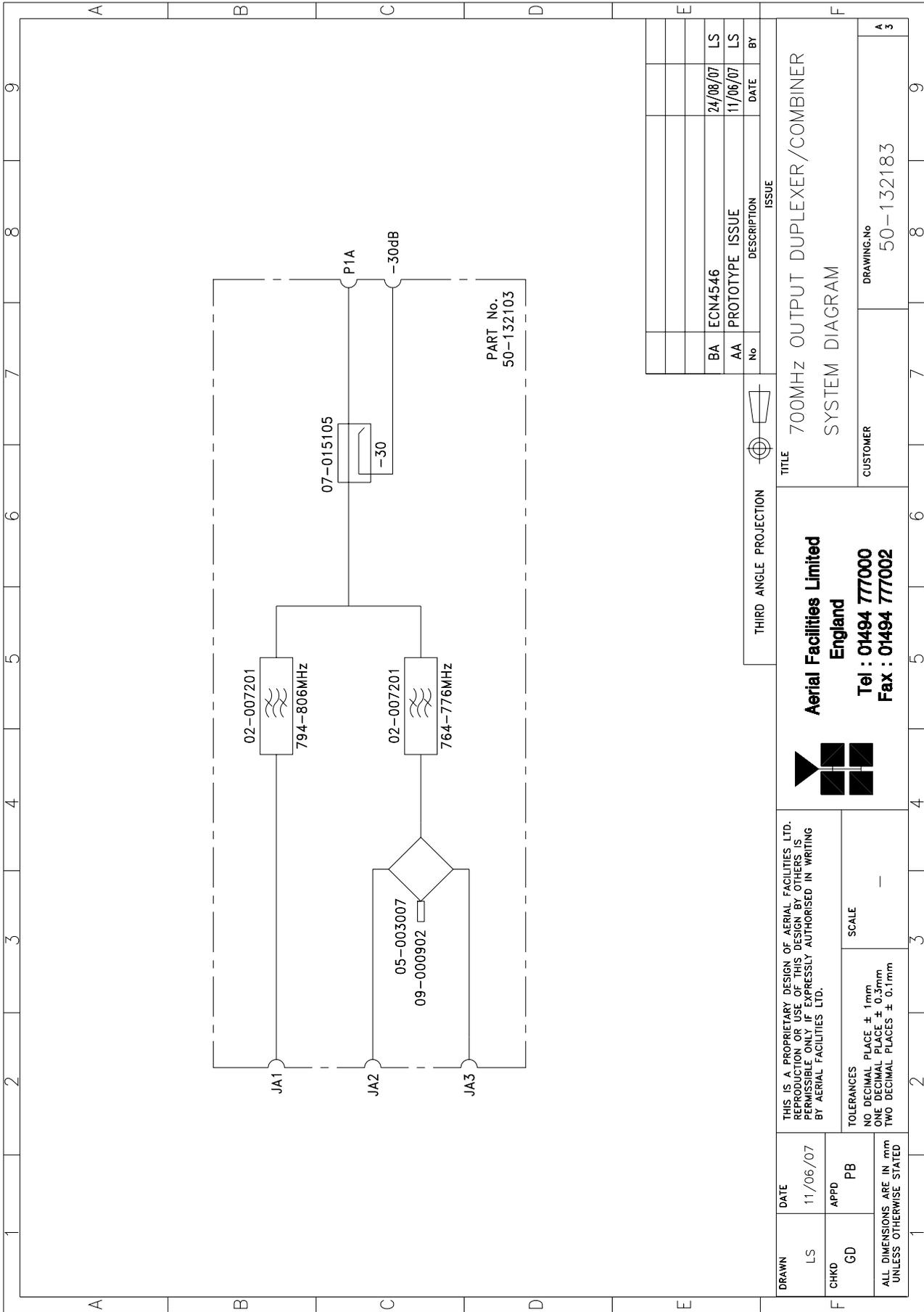
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AA No	DESCRIPTION	DATE	ISSUE
AA No	ORIGINAL ISSUE	27/09/07	PL

THIRD ANGLE PROJECTION	DATE	SCALE
	27/09/07	1:3

### 20.3.1.2. 700MHz Output Duplexer/Combiner (50-132103) system diagram

Drawing number 50-132183



### 20.3.1.3. Bandpass Filter (02-007206)

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 slot coupled, folded 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.

Being passive devices, the bandpass filters should have an extremely long operational life and require no maintenance. Should a filter be suspect, it is usually most time efficient to replace the module rather than attempt repair or re-tuning.

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

#### 02-007206 Specification

PARAMETER		SPECIFICATION
Response type		Chebyshev
Frequency range		800 - 950MHz *
Bandwidth		25MHz *
Number of sections		8
Insertion loss		1.2 dB
VSWR		better than 1.2:1
Connectors		SMA female
Power handling		100W max
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C
Weight		3 kg (typical)

\*tuned to Customer's specification

### 20.3.1.4. 4 Port Hybrid Coupler (05-003007)

This transmitter hybrid coupler is a device for accurately matching two or more RF signals to single or multiple ports, whilst maintaining an accurate 50Ω load to all inputs/outputs and ensuring that the insertion losses are kept to a minimum. Any unused ports should be terminated with an appropriate 50Ω load. In this specific instance one port of 4 Port Hybrid Coupler (05-003007) is terminated with Dummy Load 09-000902 (see below).

#### 05-003007 Specification

PARAMETER		SPECIFICATION
Frequency range		700-900MHz
Bandwidth		200MHz
Rejection		>14dB
Insertion loss		6.5dB (in band, typical)
Connectors		SMA
Weight		<1.0kg
Temperature range	operational	-10°C to +60°C
	storage	-20°C to +70°C

### 20.3.1.5. Wideband Asymmetric Coupler (07-015105)

The purpose of Wideband Asymmetric Coupler (07-015105) is to tap off a known portion (in this case 30dB) of RF signal from transmission lines and to combine them, for example through splitter units for different purposes (alarms/monitoring etc.), whilst maintaining an accurate 50Ω load to all ports/interfaces throughout the specified frequency range. They are known formally as directional couplers as they couple power from the RF mainline in one direction only.

07-015105 Specification

PARAMETER		SPECIFICATION
Construction		Inductive air gap
Frequency		800-2500MHz
Through loss		0.4dB (typical)
Coupling level		-30dB ±0.5dB
Isolation		N/A
Weight		<1.0kg
Connectors		SMA, female
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

### 20.3.1.6. Dummy Load 09-000902

When a combiner system is used to split or combine RF signals, in many cases it is most cost effective to use a standard stock item 4, 6 or 8 port device where, in fact, only a 3 or 6 port device is needed. In this case 4 Port Hybrid Coupler (05-003007) has one of its ports terminated with an appropriate Dummy Load in order to preserve the correct impedance of the device over the specified frequency range.

09-000902 specification

PARAMETER	SPECIFICATION
Frequency Range	0 - 2500 MHz
Power Rating	25 Watts continuous
VSWR	Better than 1.1:1
Impedance	50 Ohms
Temperature Range	-20 to +60°C
RF Connectors	N Type female
Dimension	110.3mm x 38.1mm x
Weight	485 grams
Finish	Black Anodised
RF Connector	N Type male
Environmental	IP66
MTBF	>180,000 hours

### 20.3.2. 700MHz 5 Cavity Combiner System (50-132105)

700MHz 5 Cavity Combiner System (50-132105) consists of 5 Dielectric Cavity Resonators mounted on two 3U rack mount panels, three on one panel and two on the other

700MHz 5 Cavity Combiner System (50-132105) List of Major Components

section	Component Part	Component Part Description	Qty Per Assembly
20.3.2.3.	04-003402	Dielectric Cavity Resonator	5