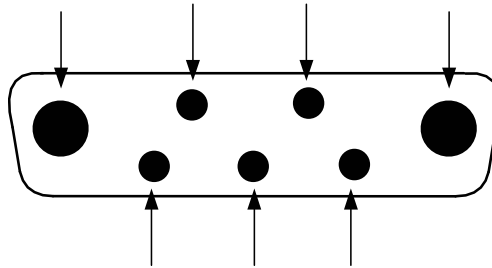


Power Amplifier (12-018002) 7-Way Connector Pin-outs

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)



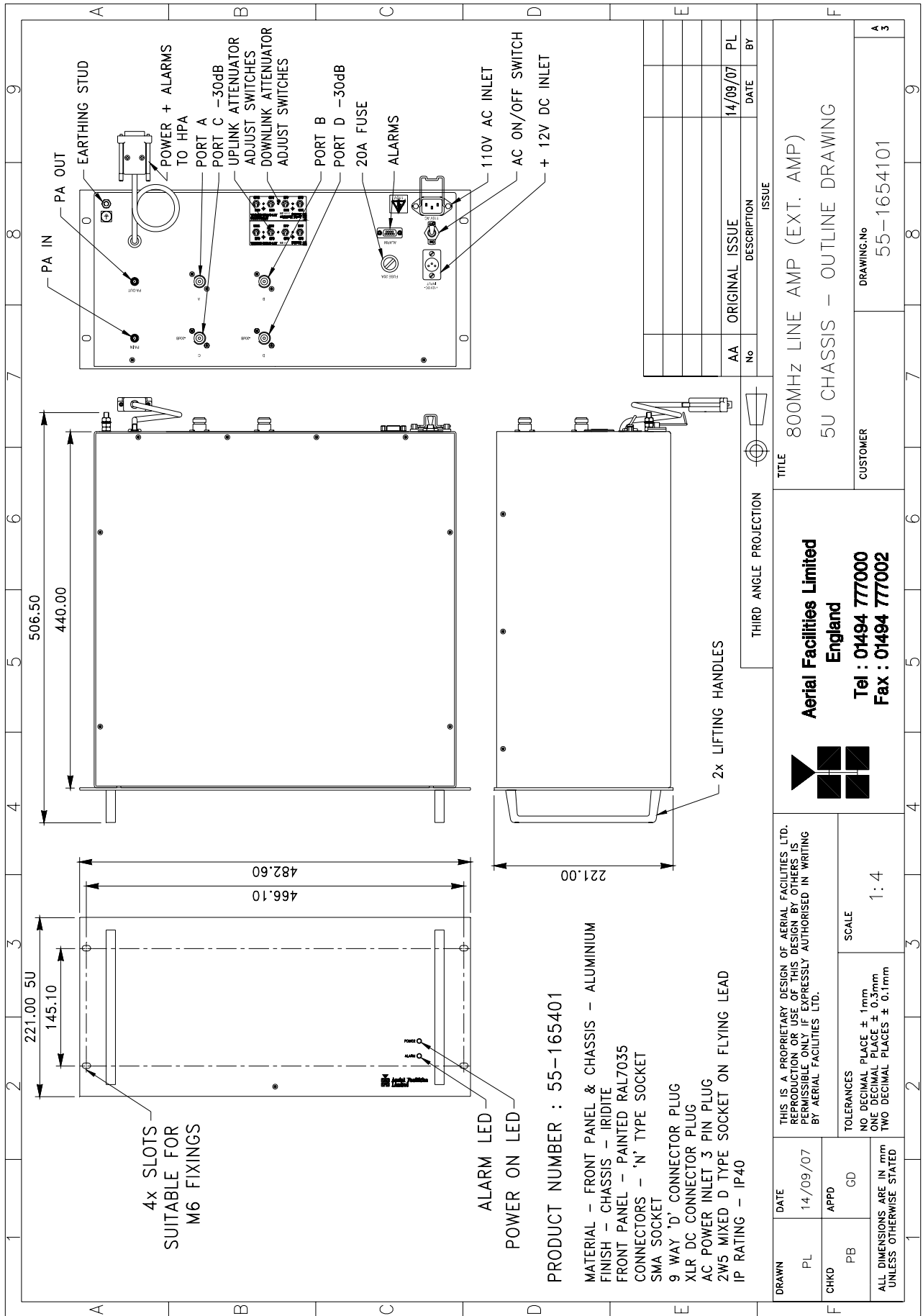
### 9.4.3. 800MHz Line Amplifier (Ext. Amp.) (55-165401)

800MHz Line Amplifier (Ext. Amp.) (55-165401) list of major components

section	Component Part	Component Part Description	Qty. Per Assembly
9.4.3.3.	02-007206	Bandpass Filter	4
9.4.3.4.	07-015105	Wideband Asymmetric Coupler	2
9.4.3.5.	10-000901	Switched Attenuator 0.25W, 0 - 15dB	2
9.4.3.6.	11-006702	Low Noise Amplifier	1
9.4.3.7.	12-018002K	Power Amplifier	1
9.4.3.8.	12-021901	Low Power Amplifier	2
9.4.3.9.	17-001109	AGC Detector Assembly (Logarithmic)	1
	17-001117	AGC Detector Assembly	1
	17-001201	AGC Attenuator Assembly	2
9.4.3.10.	80-008901	12V (Single) Relay Board	1
9.4.3.11.	94-100004	Dual Diode Assembly	1
9.4.3.12.	96-200047	DC/DC Converter	1
9.4.3.13.	96-300052	12V Switch-Mode PSU	1

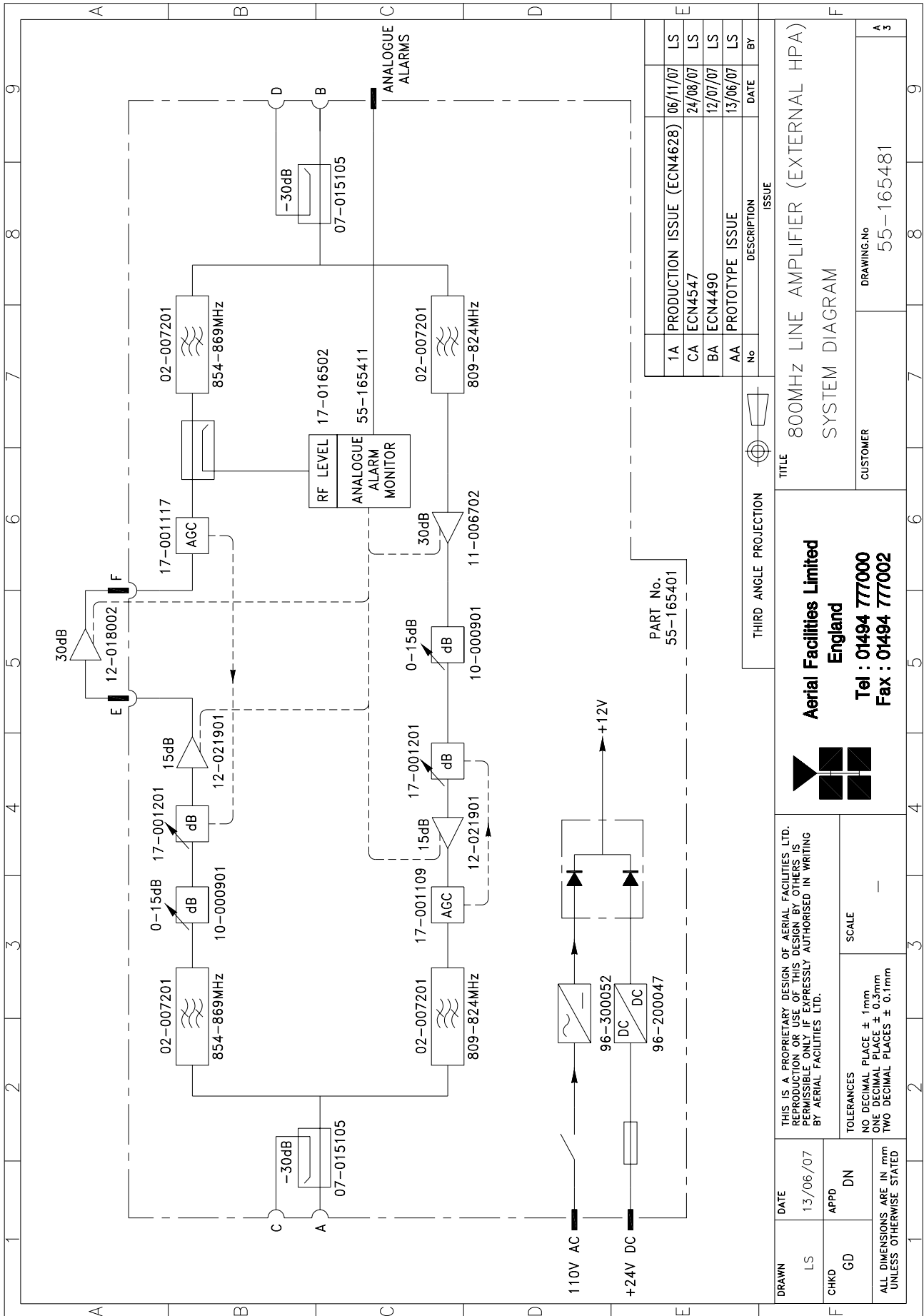
### 9.4.3.1. 800MHz Line Amplifier (Ext. Amp.) (55-165401) outline drawing

Drawing number 55-1654101



### 9.4.3.2. 800MHz Line Amplifier (Ext. Amp.) (55-165401) system diagram

Drawing number 55-165481



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	13/06/07	LS

THIRD ANGLE PROJECTION	
TITLE <b>800MHZ LINE AMPLIFIER (EXTERNAL HPA)</b> SYSTEM DIAGRAM	
CUSTOMER	DRAWING.No 55-165481
A 3	

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TWO DECIMAL PLACES ± 0.1mm

SCALE  
-

DRAWN LS	DATE 13/06/07
CHKD GD	APPD DN
ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED	

### 9.4.3.3. 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

### 9.4.3.4. 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

### 9.4.3.5. 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
Weight		0.2kg
Temperature range	operation	-20°C to +60°C
	storage	-40°C to +70°C

### 9.4.3.6. 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.

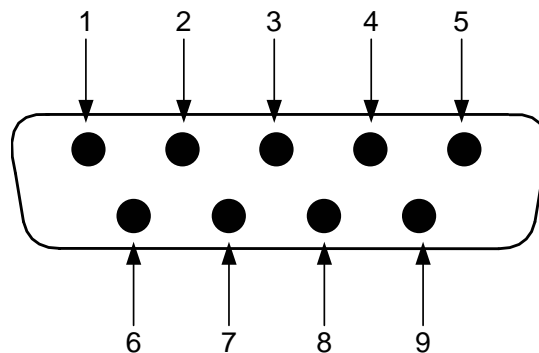
#### 11-006702 Specification

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



**9.4.3.7. 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.

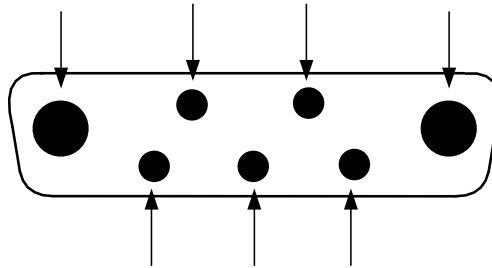
Its housing is an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a D-Type connector for the power supply and the Current Fault Alarm Function.

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)



**9.4.3.8. 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

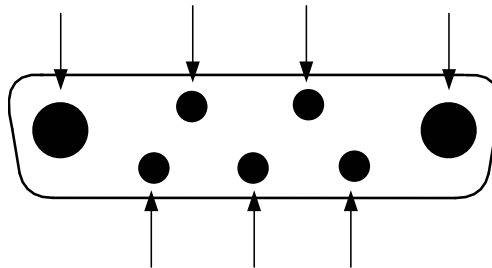
PARAMETER	SPECIFICATION	
Frequency range	800-960MHz*	
Bandwidth	20MHz *	
Maximum RF output	>1.0 Watt	
Gain	15dB	
1dB compression point	+30.5dBm	
3 <sup>rd</sup> order intercept point	+43dBm	
Noise Figure	<6dB	
VSWR	better than 1.5:1	
Connectors	SMA female	
Supply	500mA @ 10-15V DC	
Temperature range	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)



#### 9.4.3.9. 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 (Ext. Amp.) (55-165401); 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 (Ext. Amp.) (55-165401) 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

#### 9.4.3.10. 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

### 9.4.3.11. 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.

### 9.4.3.12. 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 ± 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

### 9.4.3.12. 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

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

## 10. UNIVERSITY STATION MASTER SITE 1 (80-330552-1)

Rack C05-CR-06

55-165601  
55-165602  
55-165502  
98-800001  
98-700002  
55-165507  
55-165601  
55-165602  
55-165711

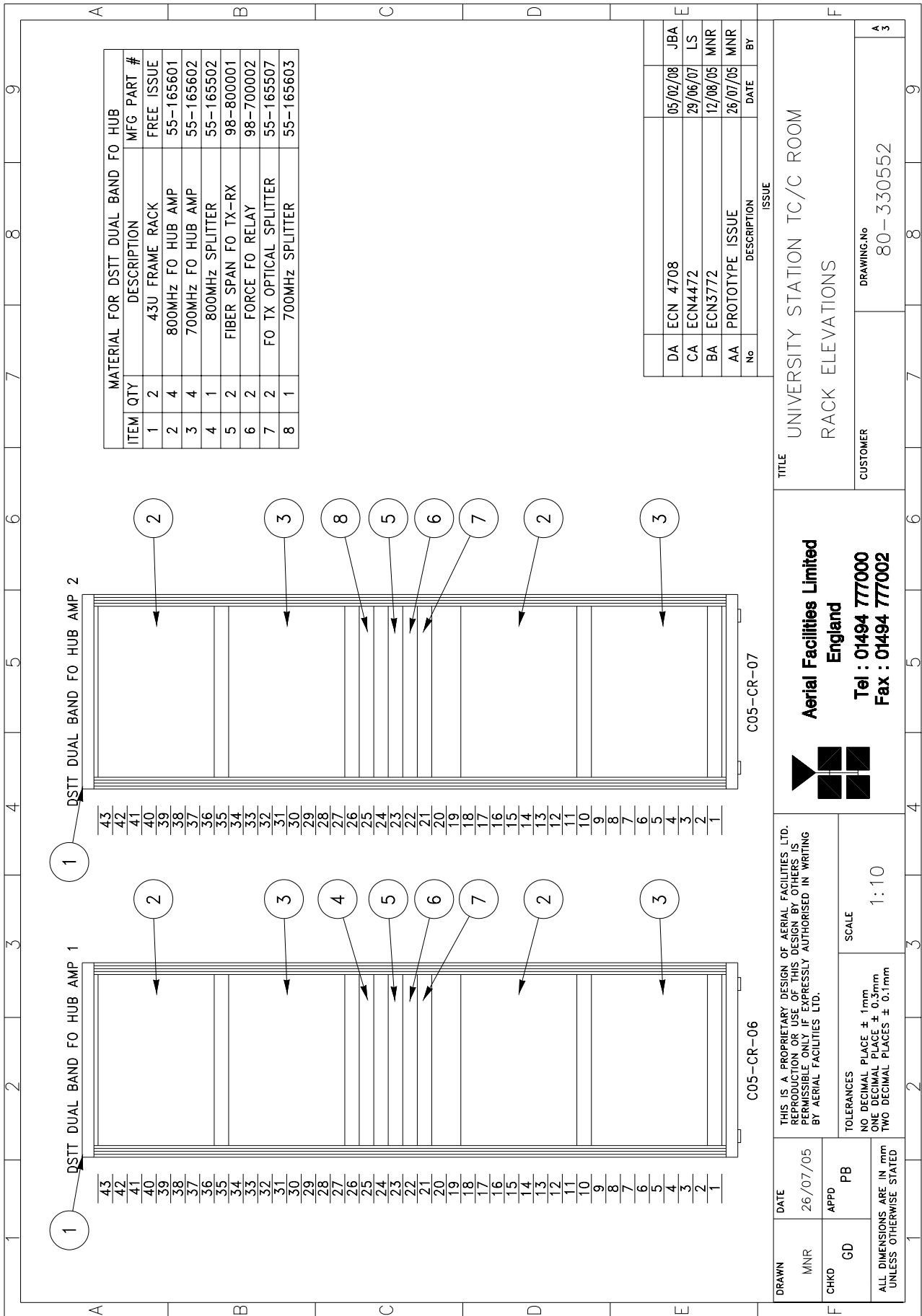
University Station Master Site 1 (80-330552-1) list of major components

section	Component Part	Component Part Description	Qty. Per Assembly
10.4.1.	55-165502	800MHz FO HUB Splitter/Combiner	1
10.4.2.	55-165507	Fibre Optic Splitter	1
10.4.3.	55-165601	800MHz FO Hub Amplifier + Filters	2
10.4.4.	55-165602	700MHz FO Hub Amplifier	2
10.4.5.	55-165711	UNIVERSITY ST. SPLITTER 1	1
10.4.6.	98-700002	Optical A/B Switch FC/APC	1
10.4.7.	98-800001	F/O Link Subsystem	1

800MHz FO Hub Amplifier (55-165601)

# 10.1. University Station Master Site 1 (80-330552-1) Rack elevation

Drawing number 80-330552



NO	DESCRIPTION	ISSUE	DATE	BY
DA	ECN 4708		05/02/08	JBA
CA	ECN4472		29/06/07	LS
BA	ECN3772		12/08/05	MNR
AA	PROTOTYPE ISSUE		26/07/05	MNR

**TITLE**  
UNIVERSITY STATION TC/C ROOM  
RACK ELEVATIONS

**CUSTOMER**  
DRAWING.No 80-330552

**Aerial Facilities Limited**  
England  
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**DRAWN** MNR DATE 26/07/05  
**CHKD** GD  
**APPD** PB  
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## 10.4 University Station Master Site 1 (80-330552-1) Major Components

### 10.4.1. 800MHz FO HUB Splitter/Combiner (55-165502)

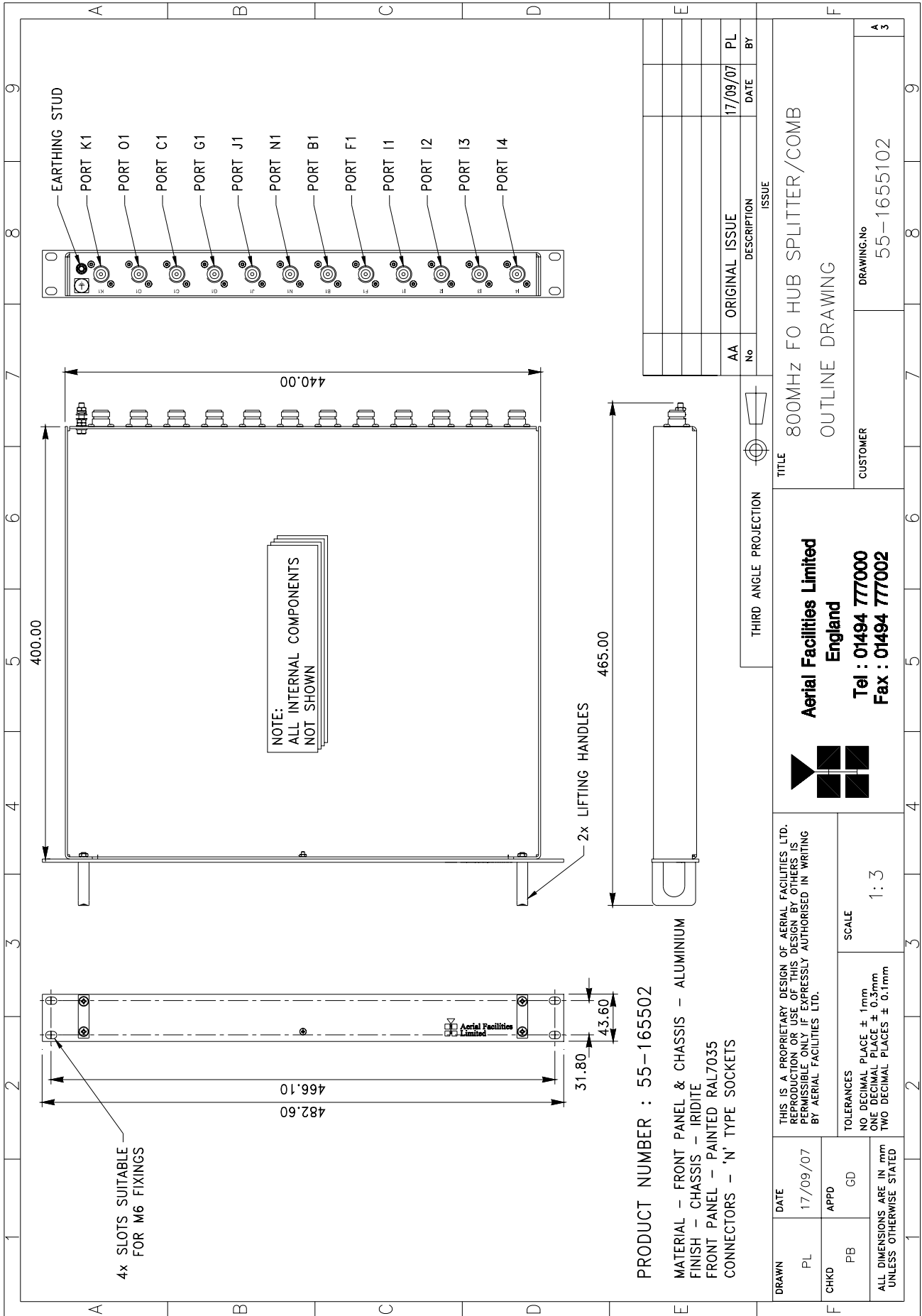
800MHz FO HUB SPLITTER/COMB (55-165502) List of major components

section	Component Part	Component Part Description	Qty. Per Assembly
10.4.1.3.	05-002602	900MHZ SPLITTER/COMBINER, 20W	2
10.4.1.4.	05-003302	Four Way Splitter/Combiner	2

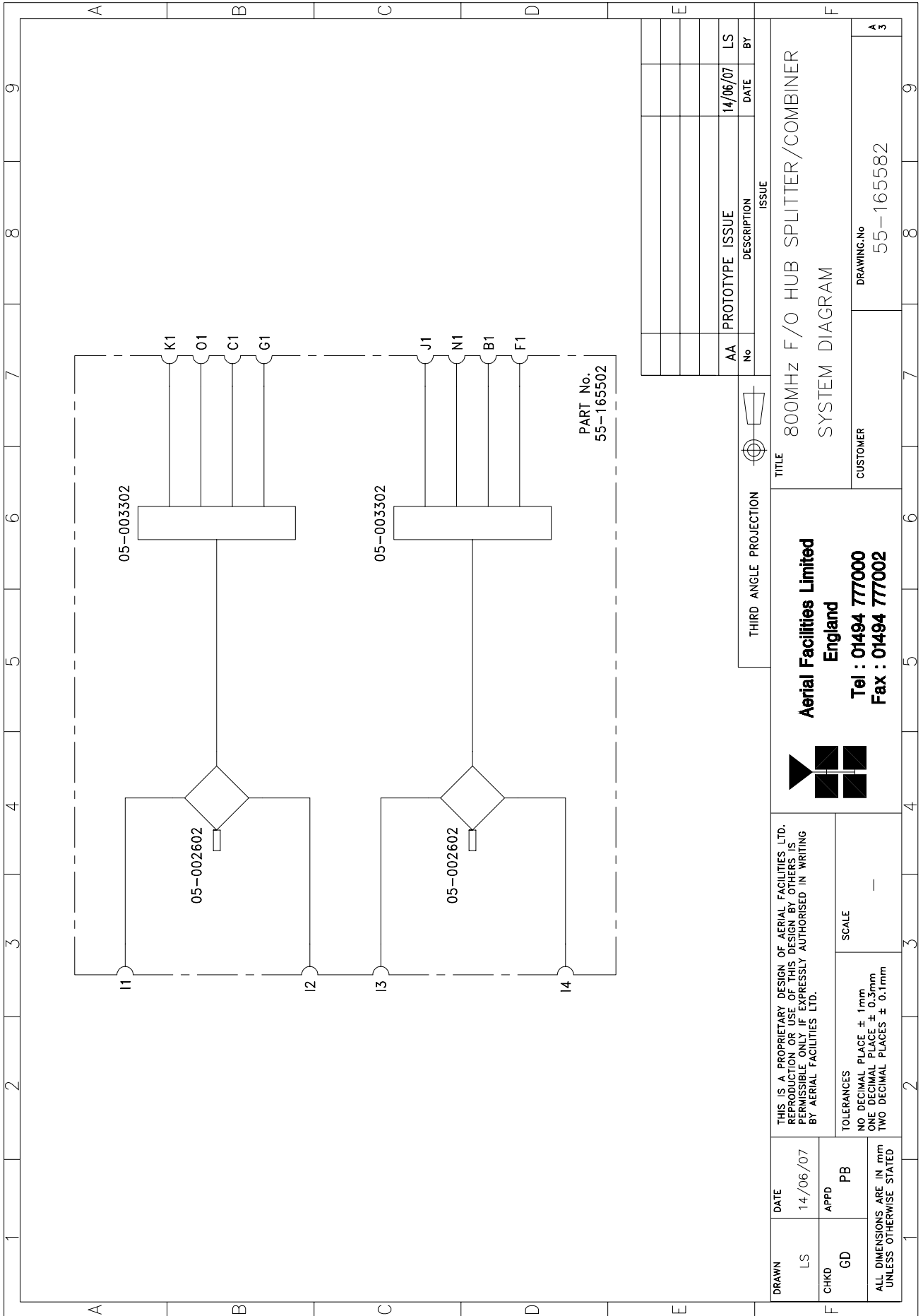


# 10.4.1.1. 800MHz FO HUB SPLITTER/COMB (55-165502) Outline Drawing

Drawing number 55-1655102



**10.4.1.2. 800MHz FO HUB SPLITTER/COMB (55-165502) System Diagram**  
 Drawing number 55-165582



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

THIRD ANGLE PROJECTION		ISSUE	
 <b>Aerial Facilities Limited</b> England Tel : 01494 777000 Fax : 01494 777002		TITLE 800MHz F/O HUB SPLITTER/COMBINER SYSTEM DIAGRAM	
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TOLERANCES NO. DECIMAL PLACES ± 1mm ONE DECIMAL PLACES ± 0.3mm TWO DECIMAL PLACES ± 0.1mm		CUSTOMER DRAWING No 55-165582	
DRAWN LS	DATE 14/06/07	APPD PB	ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED
CHKD GD	No	DESCRIPTION ISSUE	No DATE BY

### 10.4.1.3. 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

### 10.4.1.4. Four Way Splitter/Combiner (05-003302)

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.

#### Four Way Splitter (05-003302) Specification

PARAMETER		SPECIFICATION
Frequency range		700-980MHz
Bandwidth		180MHz
Rejection		>14dB
Insertion loss		<7.0dB (in band)
Connectors		N type, female
Weight		<1.5kg
Temperature range	operational	-20°C to +60°C
	storage	-40°C to +70°C

### 10.4.2. Fibre Optic Splitter (55-165507)

Fibre Optic Splitter (55-165507) is a 1U rack mount tray containing an optical splitter/coupler

Fibre Optic Splitter (55-165507) List of Major Sub Components

Component Part	Component Part Description	Qty. Per Assembly
98-100001	Single Mode Optical Splitter/Coupler	1

#### 10.4.2.1. Single Mode Optical Splitter/Coupler (98-100001)

Single Mode Optical Splitter/Couplers are used whenever it is necessary to split or combine outputs from optical transmitters or inputs to receivers. Operators should be aware that a small insertion loss (typically 3-4dB) is common with these type of couplers.

Single Mode Optical Splitter/Coupler (98-100001) It is an O.E.M unit featuring almost negligible insertion loss to the F/O signal. Extreme caution should be exercised when handling these devices. Special attention should be shown to the connectors; repair of a broken Splitter/Coupler is not possible; replacement is the only option.

In the Fibre Optic Splitter (55-165507) in University Station Master Site 1 (80-330552-1), Single Mode Optical Splitter/Coupler (98-100001) is used to split the optical signal from the FO TX module in F/O Link Subsystem (98-700001) into two equal paths.

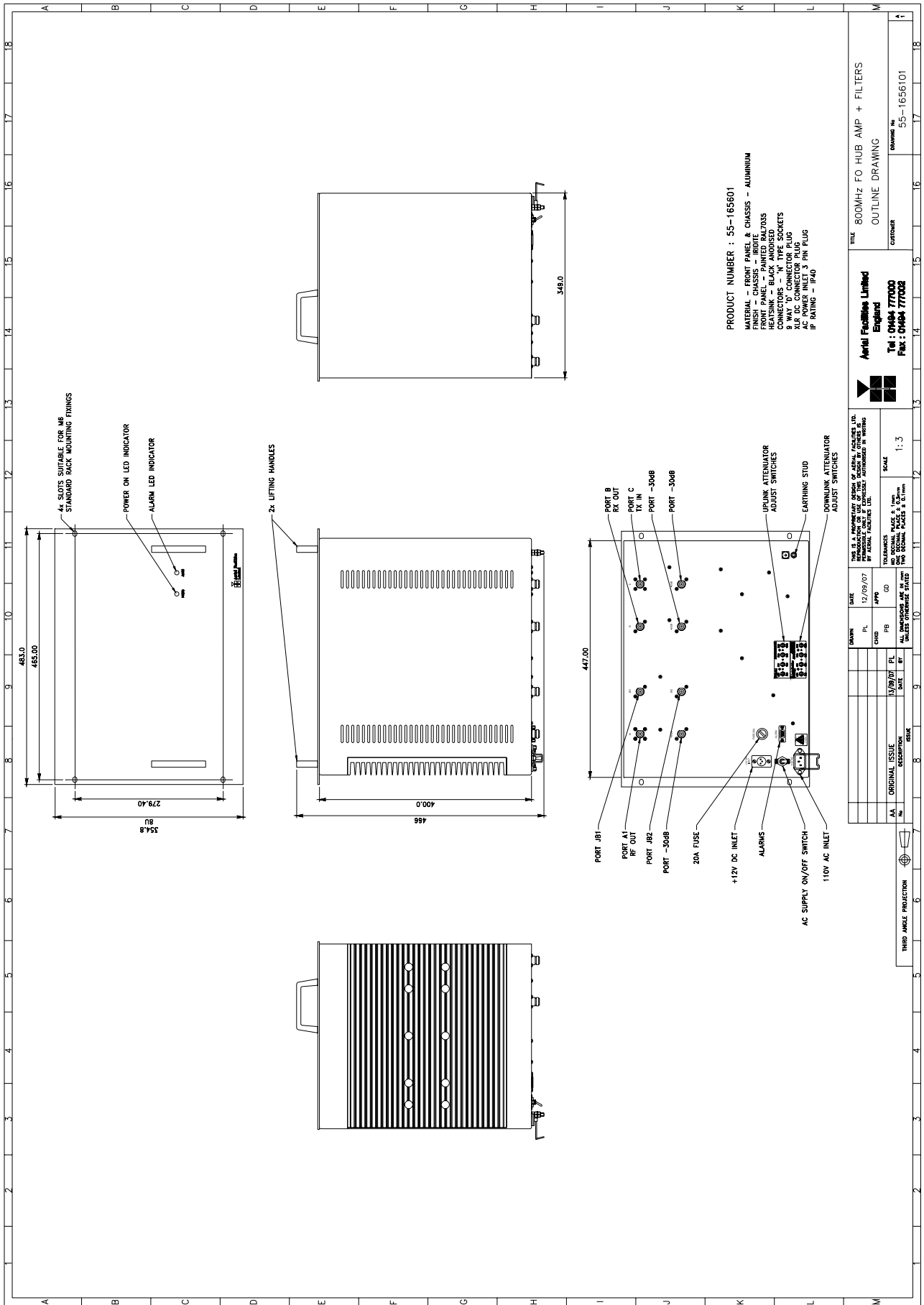
### 10.4.3. 800MHz FO Hub Amplifier + Filters (55-165601)

Section	Component Part	Component Part Description	Qty. Per Assembly
10.4.3.3.	02-007206	900MHZ 8POLE 25MHz+ B/W "SMA"	6
10.4.3.4.	07-015105	ASYMMETRIC CPLR 30dB 800-2500MHz GA	3
10.4.3.5.	10-000701	SW ATT 0-30dB 0.25W SMA F	2
10.4.3.6.	11-005902K	900MHz LOW NOISE AMP WITH RELAY KIT	1
10.4.3.7.	11-006702K	800-1000MHz LNA 29dB (cw RELAY) KIT	2
10.4.3.8.	12-018002K	PA 800-960MHz 20W CLASS A KIT	1
10.4.3.9.	12-021901	Low Power Amplifier	2
10.4.3.10.	17-001109*	AGC Detector Assembly (Logarithmic)	1
	17-001117*	AGC Detector Assembly	1
	17-001201*	AGC Attenuator Assembly	2
10.4.3.11.	20-001601	12V RELAY BOARD	1
10.4.3.12.	80-008901	12V RELAY PCB ASSEMBLY	1
10.4.3.13.	94-100004	STPS12045TV 60A DUAL DIODE	1
10.4.3.14.	96-200047	DC/DC Converter	1
10.4.3.15.	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 800MHz FO Hub Amplifier + Filters (55-165601); 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

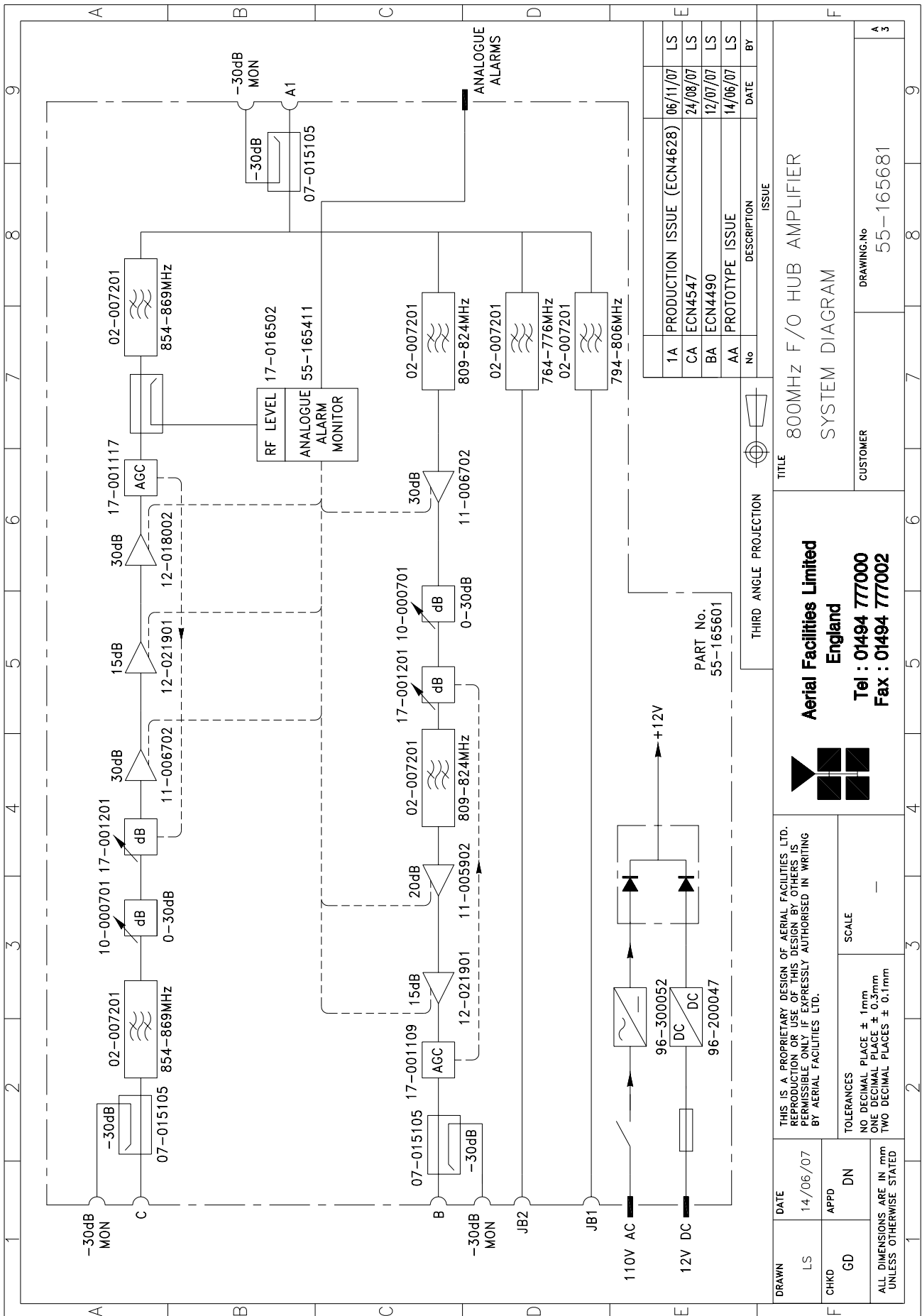
# 10.4.3.1. 800MHz FO Hub Amplifier + Filters (55-165601) outline drawing

drawing number 55-1656101



### 10.4.3.2. 800MHz FO Hub Amplifier + Filters (55-165601) system diagram

drawing number 55-165681



### 10.4.3.3. 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

### 10.4.3.4. 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

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

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

Switched Attenuator 10-000701 provides attenuation from 0 to 30dB 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.

#### 10-000701 Specification

PARAMETER		SPECIFICATION
Attenuation Values		0-30dB
Attenuation Steps		2, 4, 8 and 16dB
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



### 10.4.3.6. Low Noise Amplifier (11-005902)

The Gallium-Arsenide low noise amplifier used in the unit is a double stage, solid-state low noise amplifier. 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 any alarm system. There is a Current Fault Alarm Function, which indicates failure of each one or both RF transistors by a various alarm output options. The amplifier is housed in an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a 9way D-type for DC and alarm outputs.

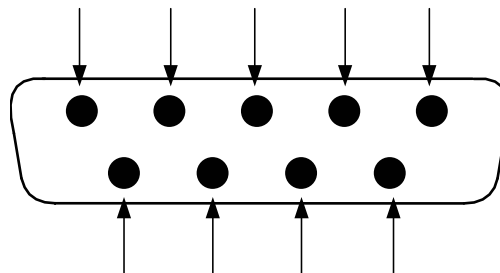
#### 11-005902 Specification

PARAMETER		SPECIFICATION
Frequency range:		800 – 960MHz *
Bandwidth:		<170MHz
Gain:		19.5dB (typical)
1dB compression point:		21dBm
OIP3:		33dBm
Input/output return loss:		>20dB
Noise figure:		1dB (typical)
Power consumption:		190mA @ 24V DC
Supply voltage:		10-24V DC
Connectors:		SMA female
Temperature range	operational:	-10°C to +60°C
	storage:	-40°C to +70°C
Size:		90 x 55 x 30.2mm
Weight:		0.28kg

\*tuned to Customer's specification

#### LNA '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



### 10.4.3.7. 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.

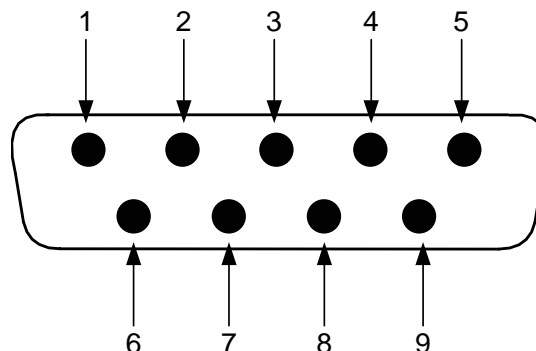
#### 11-006702 Specification

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



### 10.4.3.8. 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.

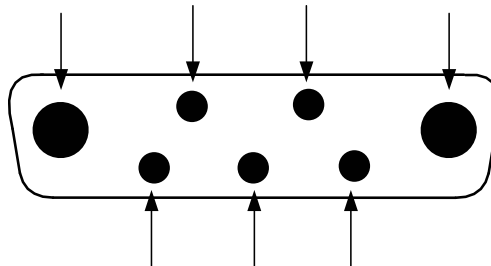
Its housing is an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a D-Type connector for the power supply and the Current Fault Alarm Function.

#### 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)



### 10.4.3.9. 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.

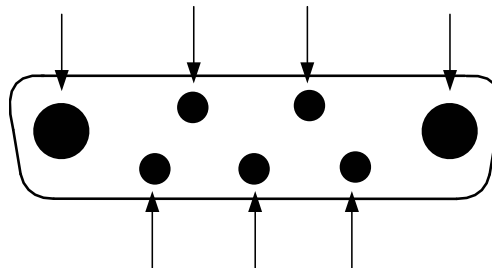
#### Low Power Amplifier (12-021901) Specification

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)



### 10.4.3.10. 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 FO Hub Amplifier + Filters (55-165601); 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

800MHz FO Hub Amplifier + Filters (55-165601) 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 down link

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

**10.4.3.11. 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 $\pm$ 15%
Alarm output relay contacts:		
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

### 10.4.3.12. 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

### 10.4.3.13. 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.

#### 10.4.3.14. 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

#### 10.4.3.15. 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



#### 10.4.4. 700MHz FO Hub Amplifier (55-165602)

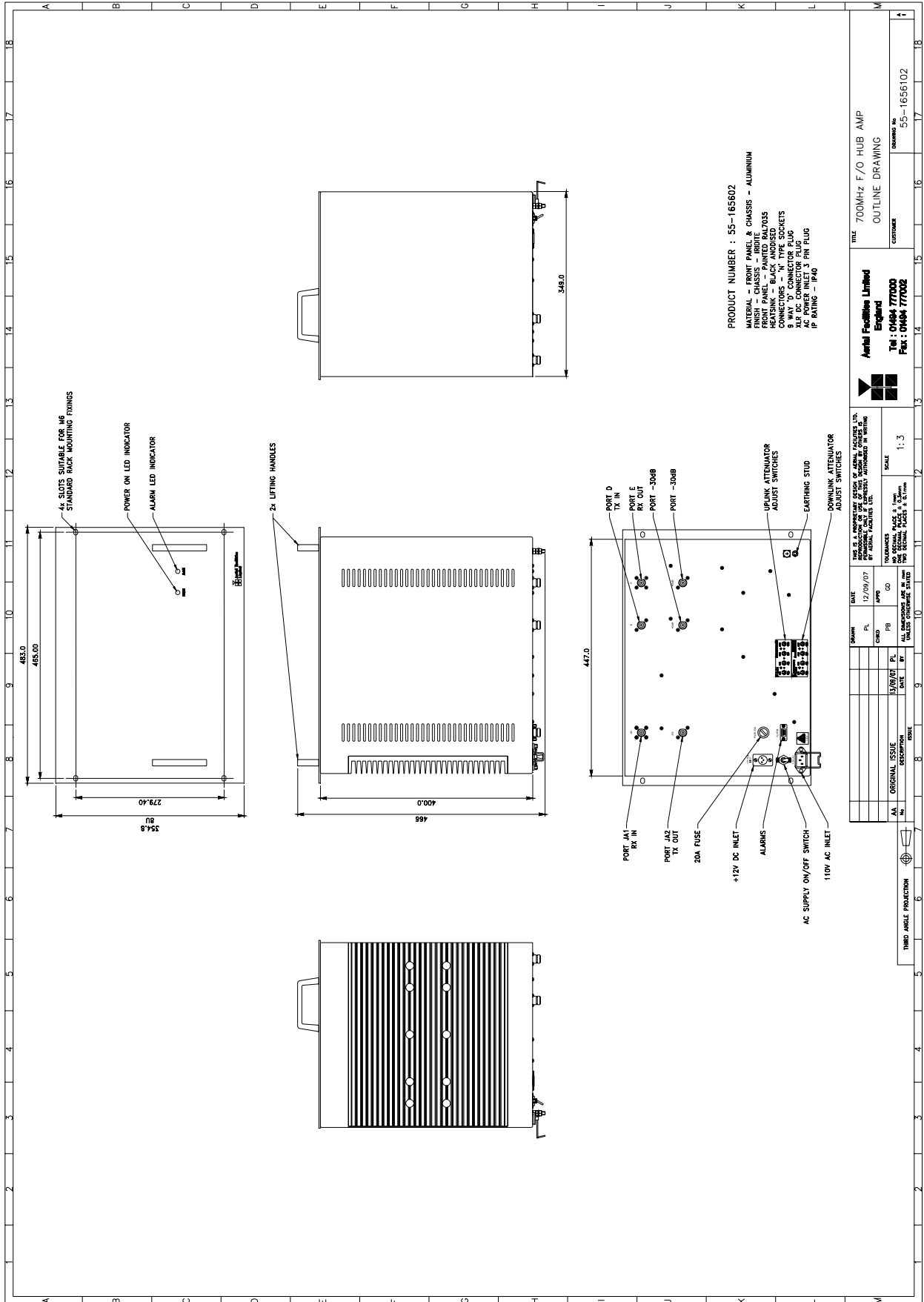
700MHz FO Hub Amplifier (55-165602) List of major components

Section	Component Part	Component Part Description	Qty. Per Assembly
10.4.4.3.	02-007206	900MHZ 8POLE 25MHz+ B/W "SMA"	2
10.4.4.4.	07-015105	ASYMMETRIC CPLR 30dB 800-2500MHz GA	2
10.4.4.5.	10-000701	SW ATT 0-30dB 0.25W SMA F	2
10.4.4.6.	11-005902	900MHz LOW NOISE AMP WITH RELAY KIT	1
10.4.4.7.	11-006702	800-1000MHz LNA 29dB (cw RELAY) KIT	2
10.4.4.8.	12-018002	PA 800-960MHz 20W CLASS A KIT	1
10.4.4.9.	12-021901	Low Power Amplifier	2
10.4.4.10.	17-001109	AGC Detector Assembly (Logarithmic)	1
	17-001117	AGC Detector Assembly	1
	17-001201	AGC Attenuator Assembly	2
10.4.4.11.	20-001601	12V RELAY BOARD	1
10.4.4.12.	80-008901	12V RELAY PCB ASSEMBLY	1
10.4.4.13.	94-100004	STPS12045TV 60A DUAL DIODE	1
10.4.4.14.	96-200047	DC/DC Converter	1
10.4.4.15.	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 FO Hub Amplifier (55-165602); 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

# 10.4.4.1. 700MHz FO Hub Amplifier (55-165602) Outline Drawing

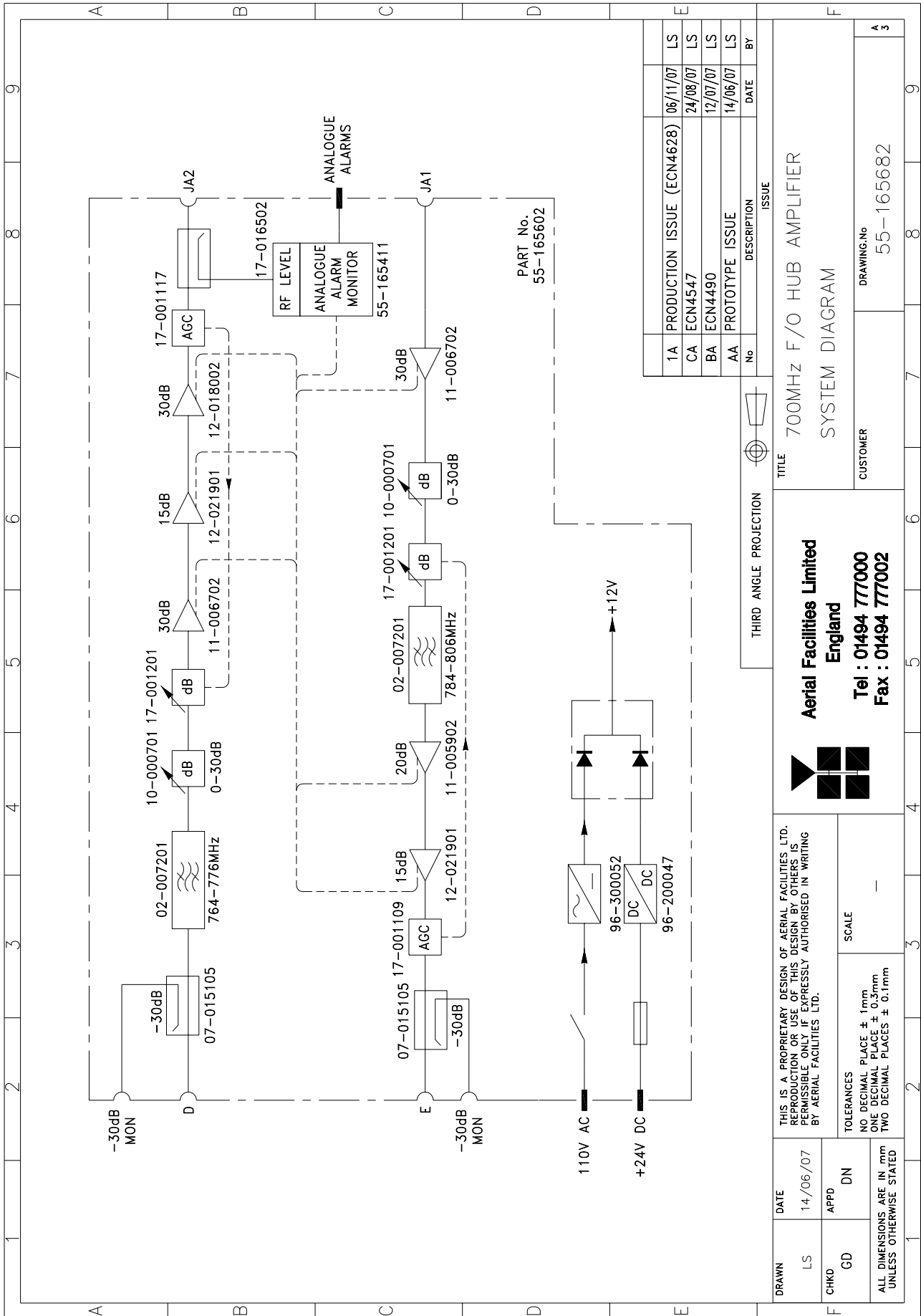
drawing number 55-1656102



PRODUCT NUMBER : 55-165602  
 MATERIAL - FRONT PANEL & CHASSIS - ALUMINIUM  
 FINISH - CHASSIS - BRONZE  
 HEATSINK - BLACK ANODISED  
 CONNECTORS - 'N' TYPE SOCKETS  
 AC POWER INLET - 3 PIN IEC  
 AC POWER INLET 3 PIN PLUG  
 IP RATING - IP40

		TITLE 700MHz F/O HUB AMP OUTLINE DRAWING	
Avnet Facilities Limited England		CUSTOMER	
Tel : 0464 77000 Fax : 0464 77002		DRAWING NO 55-1656102	
THIS IS A PROPERTY OF AVNET FACILITIES LTD. PERMISSION IS GRANTED TO REPRODUCE THIS DRAWING FOR THE EXCLUSIVE USE OF THE CUSTOMER. IT IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM.	DATE 12/09/07 DRAWN PL CHECK PB APPROVED GO ALL DIMENSIONS ARE IN UNLESS OTHERWISE STATED	SCALE 1:3	DRAWING NO 55-1656102
AA ORIGINAL ISSUE DESCRIPTION	DATE BY	SCALE	DRAWING NO 55-1656102

**10.4.4.2. 700MHz FO Hub Amplifier (55-165602) system diagram**  
drawing number 55-165682



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	14/06/07	LS

<b>THIRD ANGLE PROJECTION</b>		<b>ISSUE</b>																							
		<b>Aerial Facilities Limited</b> <b>England</b> <b>Tel : 01494 777000</b> <b>Fax : 01494 777002</b>																							
<small>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.</small>		<small>TOLERANCES          NO DECIMAL PLACE ± 1mm          ONE DECIMAL PLACE ± 0.3mm          TWO DECIMAL PLACES ± 0.1mm          UNLESS OTHERWISE STATED</small>																							
<table border="1" style="width: 100%;"> <tr> <td><b>DRAWN</b></td> <td>LS</td> <td><b>DATE</b></td> <td>14/06/07</td> </tr> <tr> <td><b>CHKD</b></td> <td>GD</td> <td><b>APPD</b></td> <td>DN</td> </tr> </table>	<b>DRAWN</b>	LS	<b>DATE</b>	14/06/07	<b>CHKD</b>	GD	<b>APPD</b>	DN	<table border="1" style="width: 100%;"> <tr> <td colspan="2" style="text-align: center;"><b>SCALE</b></td> </tr> <tr> <td colspan="2" style="text-align: center;">-</td> </tr> </table>		<b>SCALE</b>		-		<table border="1" style="width: 100%;"> <tr> <td colspan="2" style="text-align: center;"><b>TITLE</b></td> </tr> <tr> <td colspan="2" style="text-align: center;">700MHz F/O HUB AMPLIFIER</td> </tr> <tr> <td colspan="2" style="text-align: center;"><b>SYSTEM DIAGRAM</b></td> </tr> <tr> <td><b>CUSTOMER</b></td> <td>55-165682</td> </tr> <tr> <td><b>DRAWING No</b></td> <td>3</td> </tr> </table>	<b>TITLE</b>		700MHz F/O HUB AMPLIFIER		<b>SYSTEM DIAGRAM</b>		<b>CUSTOMER</b>	55-165682	<b>DRAWING No</b>	3
<b>DRAWN</b>	LS	<b>DATE</b>	14/06/07																						
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700MHz F/O HUB AMPLIFIER																									
<b>SYSTEM DIAGRAM</b>																									
<b>CUSTOMER</b>	55-165682																								
<b>DRAWING No</b>	3																								

### 10.4.4.3. 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

### 10.4.4.4. 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

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

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

Switched Attenuator 10-000701 provides attenuation from 0 to 30dB 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.

##### 10-000701 Specification

PARAMETER		SPECIFICATION
Attenuation Values		0-30dB
Attenuation Steps		2, 4, 8 and 16dB
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

### 10.4.4.6. Low Noise Amplifier (11-005902)

The Gallium-Arsenide low noise amplifier used in the unit is a double stage, solid-state low noise amplifier. 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 any alarm system. There is a Current Fault Alarm Function, which indicates failure of each one or both RF transistors by a various alarm output options. The amplifier is housed in an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a 9way D-type for DC and alarm outputs.

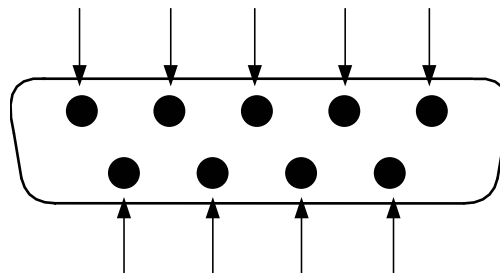
#### 11-005902 Specification

PARAMETER		SPECIFICATION
Frequency range:		800 – 960MHz *
Bandwidth:		<170MHz
Gain:		19.5dB (typical)
1dB compression point:		21dBm
OIP3:		33dBm
Input/output return loss:		>20dB
Noise figure:		1dB (typical)
Power consumption:		190mA @ 24V DC
Supply voltage:		10-24V DC
Connectors:		SMA female
Temperature range	operational:	-10°C to +60°C
	storage:	-40°C to +70°C
Size:		90 x 55 x 30.2mm
Weight:		0.28kg

\*tuned to Customer's specification

#### LNA '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



### 10.4.4.7. 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.

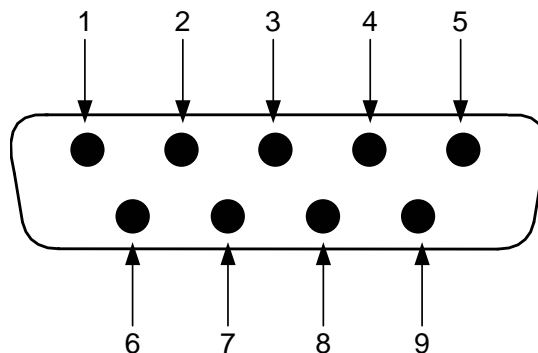
#### 11-006702 Specification

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



### 10.4.4.8. 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.

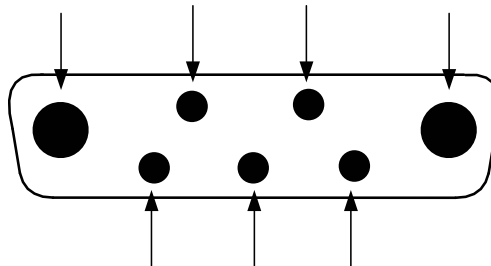
Its housing is an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a D-Type connector for the power supply and the Current Fault Alarm Function.

#### 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)





### 10.4.4.9. 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.

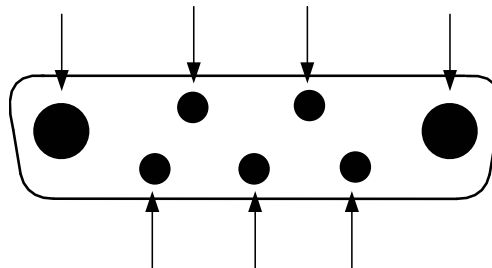
#### Low Power Amplifier (12-021901) Specification

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)



#### 10.4.4.10. 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 FO Hub Amplifier (55-165602); 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 FO Hub Amplifier (55-165602) 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

**10.4.4.11. 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 $\pm$ 15%
Alarm output relay contacts:		
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

#### 10.4.4.12. 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

#### 10.4.4.13. 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.

#### 10.4.4.14. 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

#### 10.4.4.15. 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

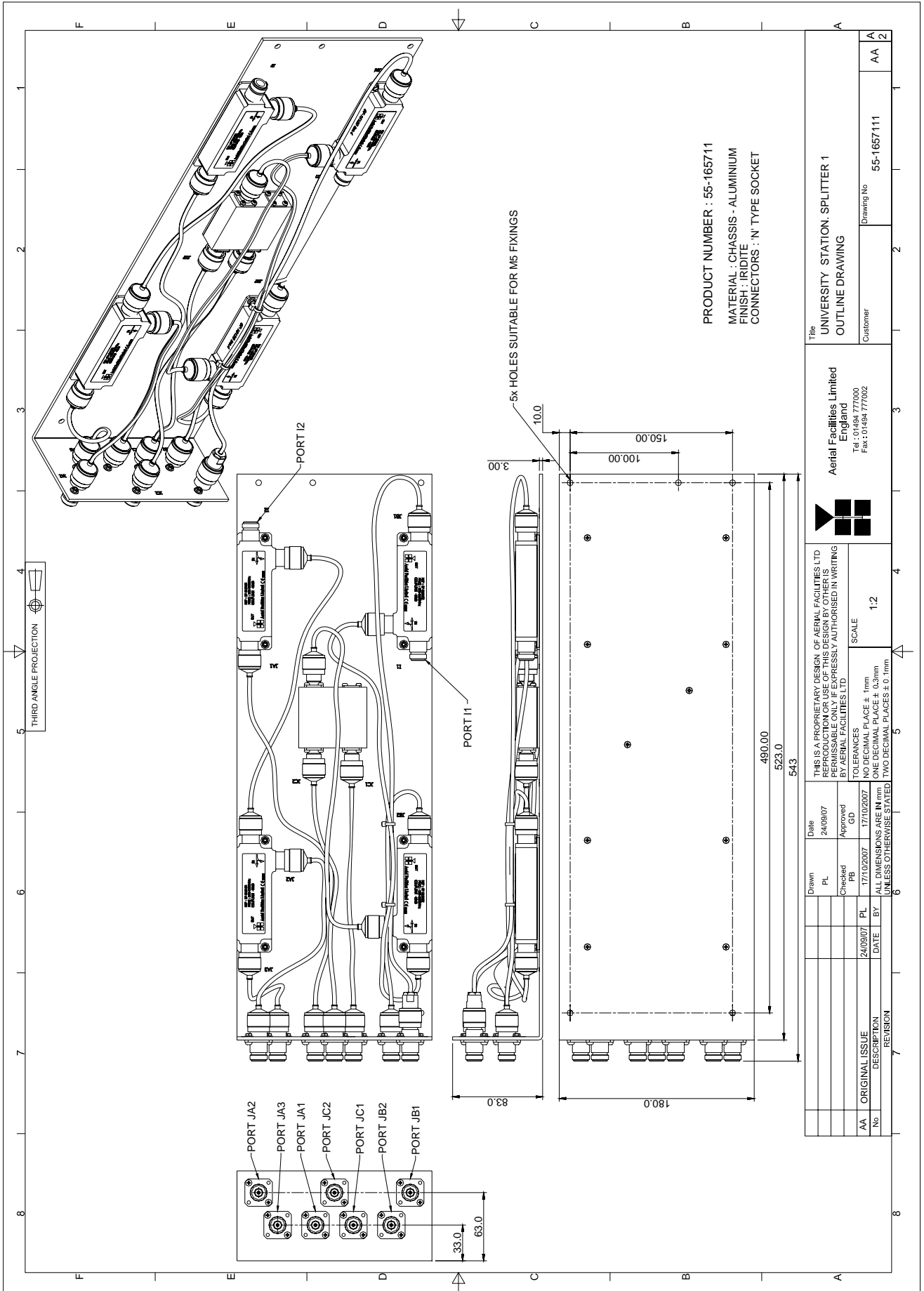
#### 10.4.5. University Station Splitter 1 (55-165711)

University Station Splitter 1 (55-165711) list of major components

section	Component Part	Component Part Description	Qty. Per Assembly
10.4.5.3.	05-003005	3 PORT THC 900MHz	1
10.4.5.4.	07-015102	ASYMMETRIC CPLR 10dB 800-2500MHz GA	4

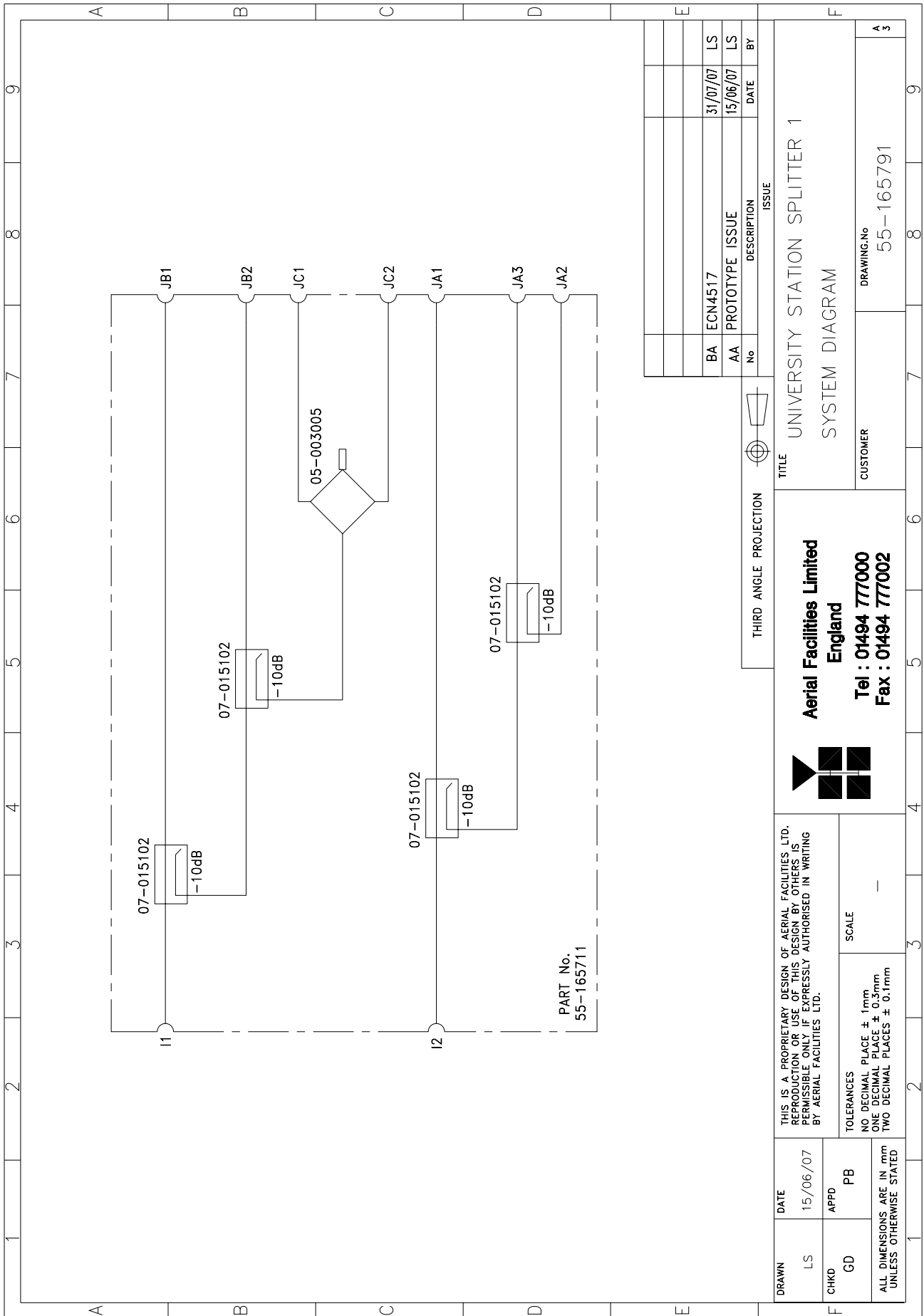
### 10.4.5.1. University Station Splitter 1 (55-165711) outline drawing

drawing number 55-1657111



This UNIVERSITY STATION SPLITTER 1 OUTLINE DRAWING		Aerial Facilities Limited England Tel : 01494 777000 Fax : 01494 777002	
Customer	55-1657111	Drawing No	
AA	AA	2	
THIS IS A PROPRIETARY DESIGN OF AERIAL FACILITIES LTD. REPRODUCTION OR USE OF THIS DESIGN WITHOUT THE WRITTEN PERMISSION OF AERIAL FACILITIES LTD.			
Drawn	PL	Date	24/09/07
Checked	PB	Approved	GD
DATE	24/09/07	DATE	17/10/2007
DESCRIPTION	ORIGINAL ISSUE	SCALE	1:2
REVISION		TOLERANCES	NO DECIMAL PLACE ± 1mm ONE DECIMAL PLACE ± 0.3mm TWO DECIMAL PLACES ± 0.1mm

**10.4.5.2. University Station Splitter 1 (55-165711) system diagram**  
drawing number 55-165791



BA	ECN4517	LS	31/07/07	LS	
AA	PROTOTYPE	ISSUE	15/06/07	LS	
No		DESCRIPTION	DATE	BY	
			ISSUE		

THIRD ANGLE PROJECTION

**Aerial Facilities Limited**  
England  
Tel : 01494 777000  
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TITLE  
UNIVERSITY STATION SPLITTER 1  
SYSTEM DIAGRAM

CUSTOMER  
DRAWING.No  
55-165791

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DATE	15/06/07	NO. DECIMAL PLACES ±	1mm
DRAWN	LS	ONE DECIMAL PLACE ±	0.3mm
CHKD	GD	TWO DECIMAL PLACES ±	0.1mm
APPD	PB	ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED	



### 10.4.5.3. 2-Way Splitter/Combiner (05-003005)

This printed circuit based Splitter/Combiner 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.

(05-003005) Specification

PARAMETER		SPECIFICATION
Frequency Range		800 - 1000 MHz
Input Ports		2
Output Ports		1
Insertion Loss		<3.3 dB
Isolation		>18 dB
VSWR		1.3:1
Power Rating as a Splitter		50 Watts
Power Rating as a Combiner		5 Watts
Mechanical		Wall mount case
Weight		<1.5kg
RF Connectors		'N' female
Dimensions		70mm x 63mm x 21mm (excludes connectors)
Temperature range:	operational	-20°C to +60°C
	storage	-40°C to +70°C

### 10.4.5.4. 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

#### 10.4.6. Optical AB Switch FC/APC (98-700002)

Optical A/B Switch FC/APC (98-700002) an O.E.M. sourced Fibre Optic relay supplied as a 1U rack mount tray. 98-700002 allows for the automatic switching between two optical inputs to provide a common optical output. Manual selection of the input is also possible via toggle switches on the front panel.

98-700002 Specification

PARAMETER	SPECIFICATION
Electrical Characteristics	
Power Supply Voltage	100 - 240 VAC
Power Supply Frequency	50 - 60 Hz
Optical Characteristics	
Operating Wavelength	1200 – 1610nm
Optical Input Range	+20 dBm
Optical Insertion Loss	2.0 dB
Optical Trip Threshold/Meter Range	-35 - +20 dBm
Optical Switch Speed	15ms
Backreflection Tolerance	-50dB
Environmental and Physical Characteristics	
Optical Connectors	FC/APC
Operating Temp. Range	+10 to +40°C
Storage Temp. Range	-40 to +80 °C
Humidity	5 to 90 % RHNC
Weight	2.2 kg (6 lbs)
Dimensions	483 x 361 x 44mm (19.0 x 14.2 x 1.72 in.)

#### 10.4.7. F/O Link Subsystem (98-800001)

F/O Link Subsystem (98-800001) is an O.E.M. sourced Optical Transceiver package containing discreet TX and RX modules and supplied as a 1U rack mount tray

Parameter	Specification
Optical Output Power	4 mW
Wavelength, peak	1310 1550 nm
Frequency Response, 50 to 2.2 GHz	± 1.5 dB
Input and Output VSWR	1.5:1
Link Gain <sup>(2)</sup>	0 dB
Output Noise Floor <sup>(1)</sup>	-137 dBm/Hz
Input 3rd Order Intercept <sup>(1)</sup>	30 dBm
Operating Temperature	-30 to +75°C
Storage Temperature	-40 to +85°C
Maximum RF Input to Transmitter	+20 dBm
Maximum Optical Input to Receiver	6 mW
A.C. Supply Voltage	90 – 265 VAC
Dimensions	483 x 457 x 44mm (19.0 x 18 x 1.72 in.)

<sup>(1)</sup> SFDR, Noise and IP3 specified with 5 dB optical loss.

<sup>(2)</sup> Link Gain specified with 1 meter fiber.

## 11. UNIVERSITY STATION MASTER SITE 2 (80-330552-2)

Rack C05-CR-07

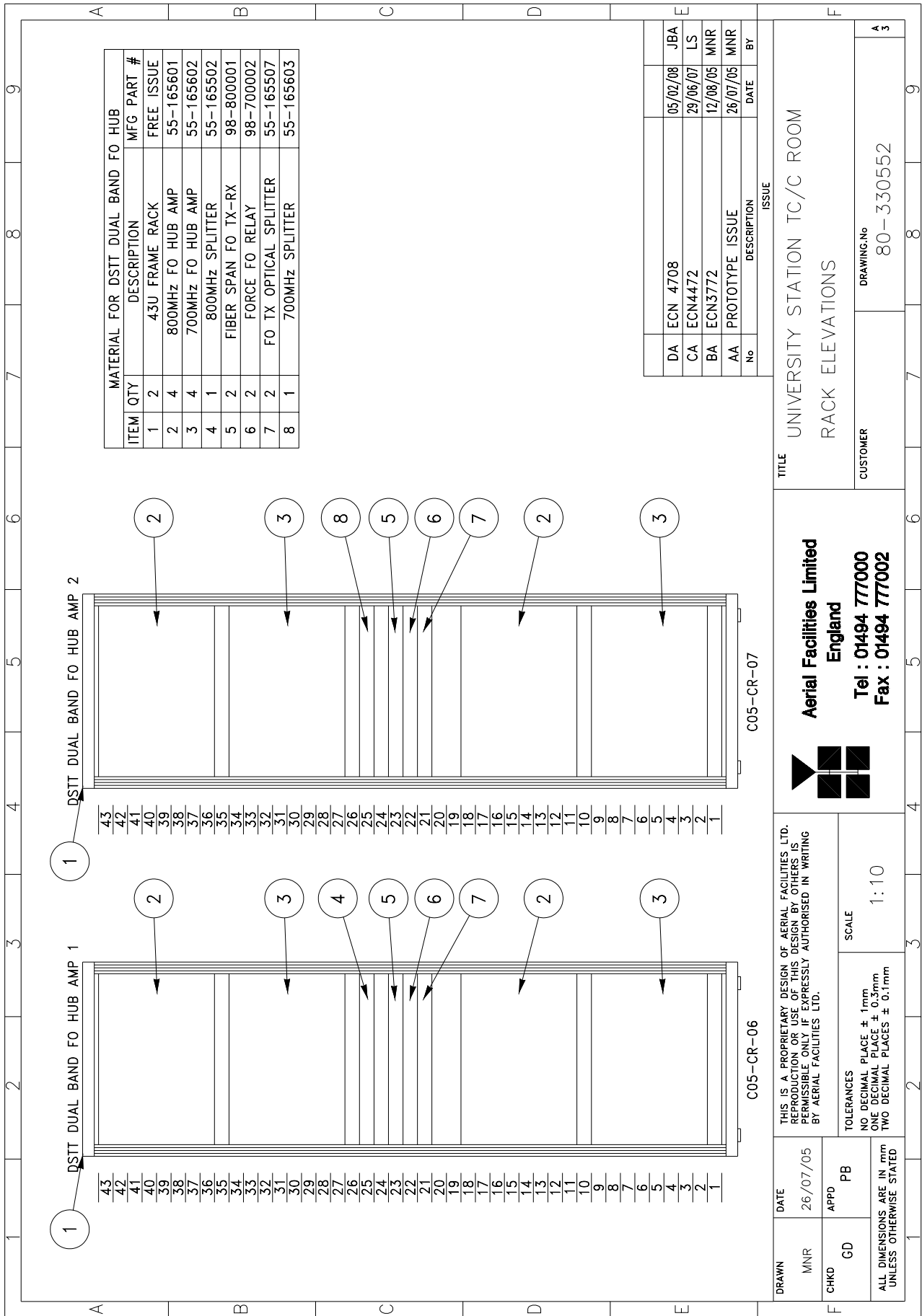
55-165601  
55-165602  
55-165603  
98-800001  
98-700002  
55-165507  
55-165601  
55-165602  
55-165711

University Station Master Site 2 (80-330552-2) list of major components

Section	Component Part	Component Part Description	Qty. Per Assembly
11.4.1.	55-165507	Fibre Optic Splitter	1
11.4.2.	55-165601	800MHz FO HUB AMP + FILTERS	2
11.4.3.	55-165602	700MHz FO Hub Amplifier	2
11.4.4.	55-165603	700MHz FO HUB Splitter/Combiner	1
11.4.5.	55-165712	UNIVERSITY ST. SPLITTER 2	1
11.4.6.	98-700002	Optical A/B Switch FC/APC	1
11.4.7.	98-800001	F/O Link Subsystem	1

# 11.1. University Station Master Site 2 (80-330552-1) Rack elevation

Drawing number 80-330552



DA	ECN	JBA	
DA	ECN 4708	05/02/08	
CA	ECN4472	29/06/07	
BA	ECN3772	12/08/05	
AA	PROTOTYPE ISSUE	26/07/05	
No	DESCRIPTION	DATE	BY

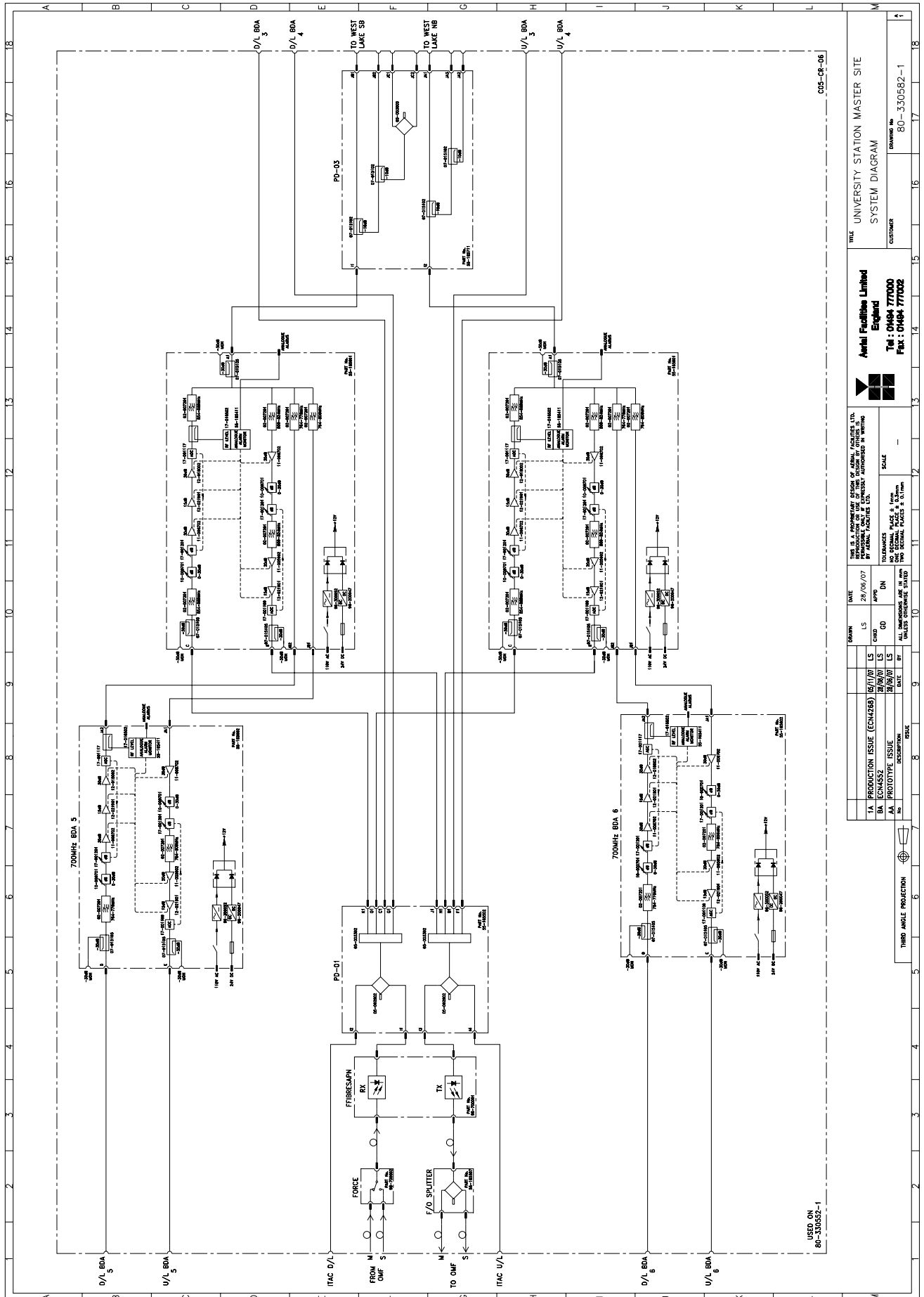
UNIVERSITY STATION TC/C ROOM	
RACK ELEVATIONS	
CUSTOMER	DRAWING No 80-330552
A 3	

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TOLERANCES NO DECIMAL PLACE ± 1mm ONE DECIMAL PLACE ± 0.3mm TWO DECIMAL PLACES ± 0.1mm	ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED
DRAWN MNR DATE 26/07/05	APPD PB

# 11.2. University Station Master Site 2 (80-330552-1) system diagram

Drawing number 80-330582-1



UNIVERSITY STATION MASTER SITE  
SYSTEM DIAGRAM  
CUSTOMER

**AerTel Facilities Limited**  
England  
Tel : 01494 77000  
Fax : 01494 77002

FIG 15. 1. REPRODUCED BY AERTEL FACILITIES LTD.  
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NO	DATE	BY	CHKD	APPD	DN
1A	28/06/07	LS	LS		
BA	15/11/07	LS	GD		
AA	20/09/07	LS			
AA	20/09/07	LS			

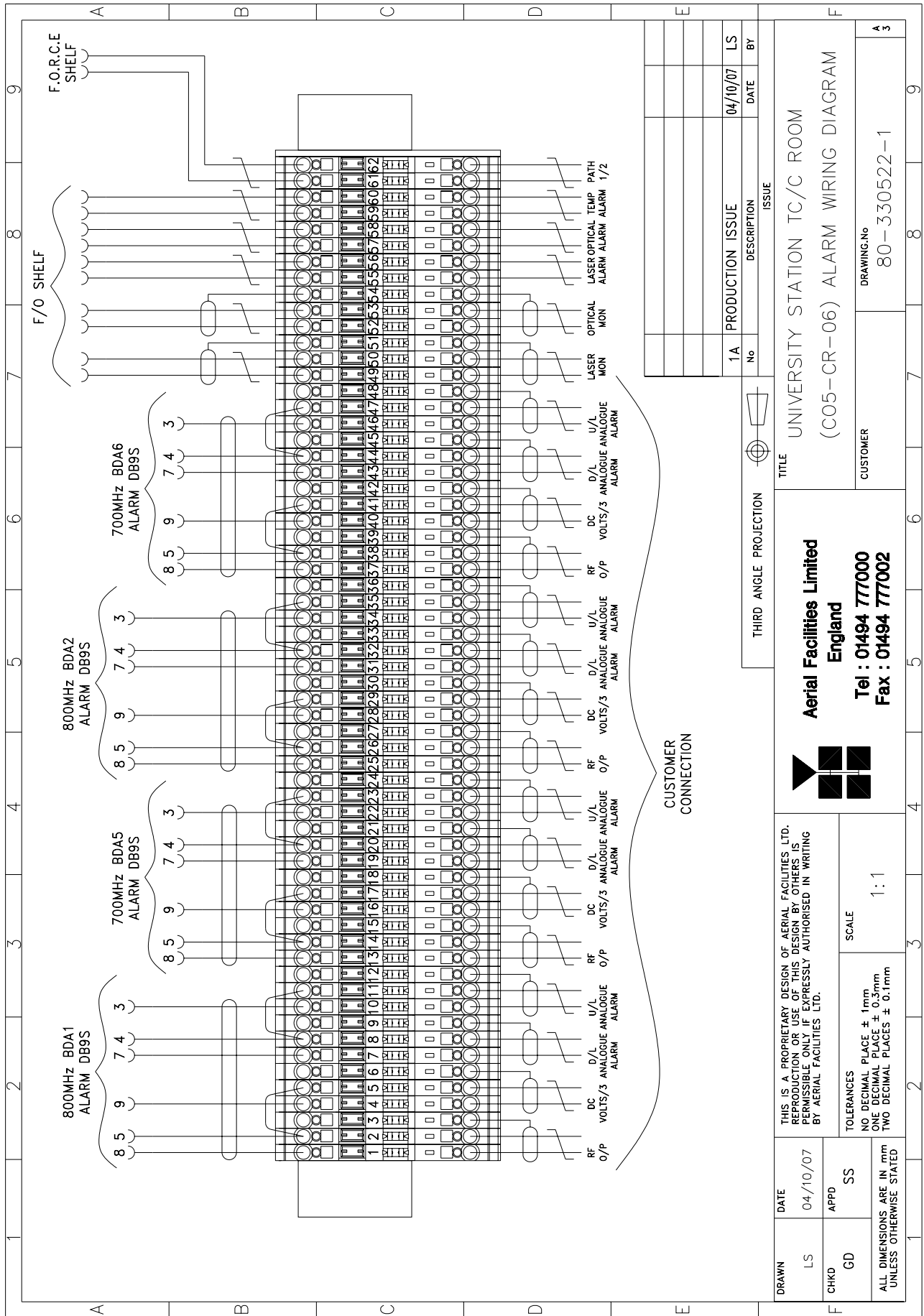
SCALE: —  
TOLERANCES: AS SHOWN  
NO DIMENSIONS TO BE GIVEN UNLESS SPECIFIED  
ALL DIMENSIONS ARE TO UNLESS OTHERWISE STATED  
THIS DRAWING IS TO BE USED IN CONJUNCTION WITH DRAWING NO. 80-330552-1

THIRD ANGLE PROJECTION

USED ON  
80-330552-1

# 11.3. University Station Master Site 2 (80-330552-1) Alarm Wiring Diagram

Drawing number 80-330522-1



No	DESCRIPTION	ISSUE	DATE	BY
1A	PRODUCTION	ISSUE	04/10/07	LS

<b>TITLE</b> UNIVERSITY STATION TC/C ROOM (C05-CR-06) ALARM WIRING DIAGRAM	
<b>CUSTOMER</b> Aerial Facilities Limited England Tel : 01494 77000 Fax : 01494 77002	<b>DRAWING No</b> 80-330522-1
<b>SCALE</b> 1:1	<b>DATE</b> 04/10/07
<b>APPD</b> SS	<b>BY</b> LS
ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED	<b>3</b>

THIRD ANGLE PROJECTION

CUSTOMER CONNECTION

## 11.4 University Station Master Site 2 (80-330552-1) Major Components

### 11.4.1. Fibre Optic Splitter (55-165507)

Fibre Optic Splitter (55-165507) is a 1U rack mount tray containing an optical splitter/coupler

Fibre Optic Splitter (55-165507) List of Major Sub Components

Component Part	Component Part Description	Qty. Per Assembly
98-100001	Single Mode Optical Splitter/Coupler	1

#### 11.4.1.1. Single Mode Optical Splitter/Coupler (98-100001)

Single Mode Optical Splitter/Couplers are used whenever it is necessary to split or combine outputs from optical transmitters or inputs to receivers. Operators should be aware that a small insertion loss (typically 3-4dB) is common with these type of couplers.

Single Mode Optical Splitter/Coupler (98-100001) It is an O.E.M unit featuring almost negligible insertion loss to the F/O signal. Extreme caution should be exercised when handling these devices. Special attention should be shown to the connectors; repair of a broken Splitter/Coupler is not possible; replacement is the only option.

In the Fibre Optic Splitter (55-165507) in University Station Master Site 1 (80-330552-1), Single Mode Optical Splitter/Coupler (98-100001) is used to split the optical signal from the FO TX module in F/O Link Subsystem (98-700001) into two equal paths.

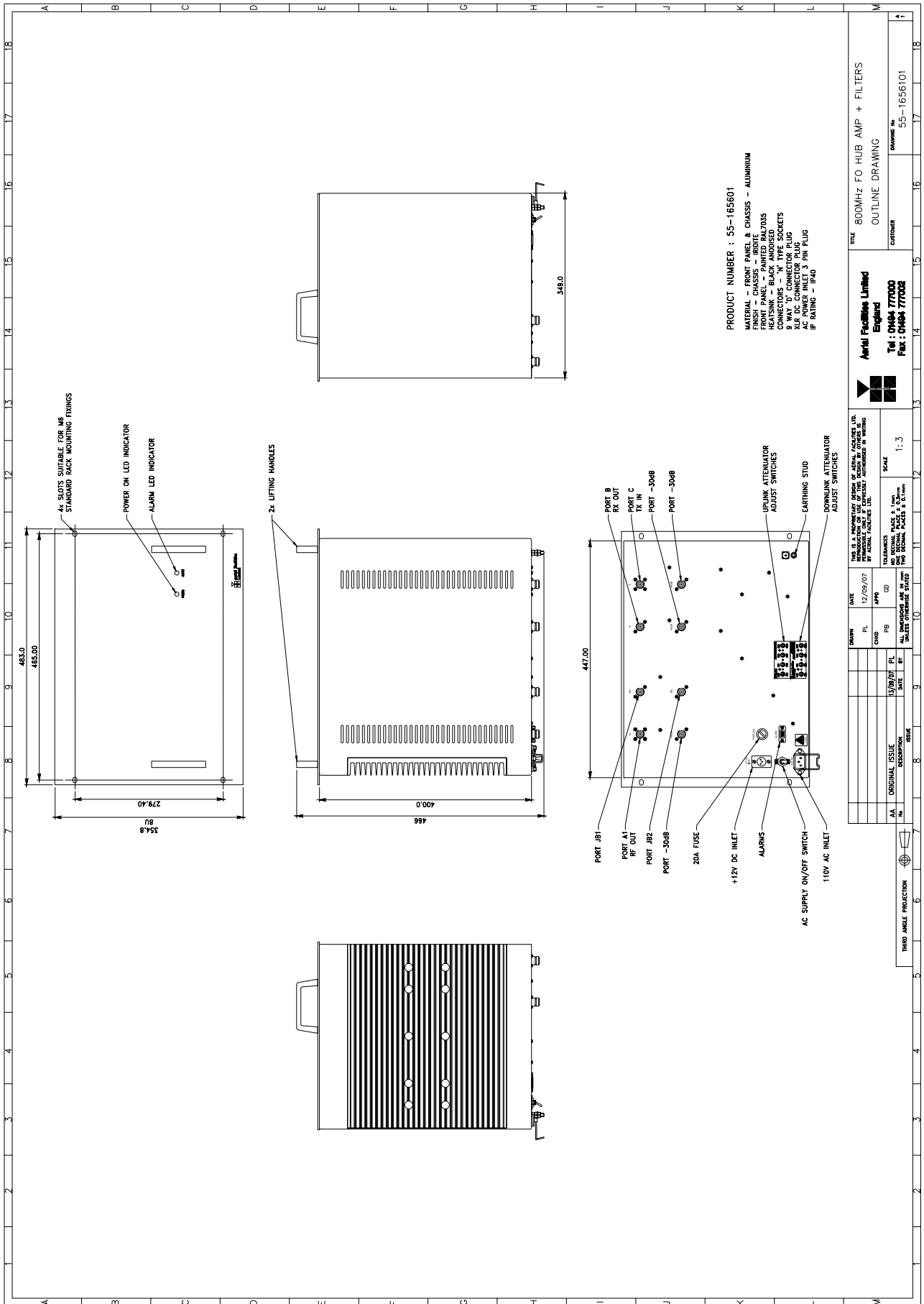
### 11.4.2. 800MHz FO Hub Amplifier + Filters (55-165601)

Section	Component Part	Component Part Description	Qty. Per Assembly
11.4.2.3.	02-007206	900MHZ 8POLE 25MHz+ B/W "SMA"	6
11.4.2.4.	07-015105	ASYMMETRIC CPLR 30dB 800-2500MHz GA	3
11.4.2.5.	10-000701	SW ATT 0-30dB 0.25W SMA F	2
11.4.2.6.	11-005902K	900MHz LOW NOISE AMP WITH RELAY KIT	1
11.4.2.7.	11-006702K	800-1000MHz LNA 29dB (cw RELAY) KIT	2
11.4.2.8.	12-018002K	PA 800-960MHz 20W CLASS A KIT	1
11.4.2.9.	12-021901	Low Power Amplifier	2
11.4.2.10.	17-001109*	AGC Detector Assembly (Logarithmic)	1
	17-001117*	AGC Detector Assembly	1
	17-001201*	AGC Attenuator Assembly	2
11.4.2.11.	20-001601	12V RELAY BOARD	1
11.4.2.12.	80-008901	12V RELAY PCB ASSEMBLY	1
11.4.2.13.	94-100004	STPS12045TV 60A DUAL DIODE	1
11.4.2.14.	96-200047	DC/DC Converter	
11.4.2.15.	96-300052	JWS150-12/A PSU (COUTANT LAMBDA)	1

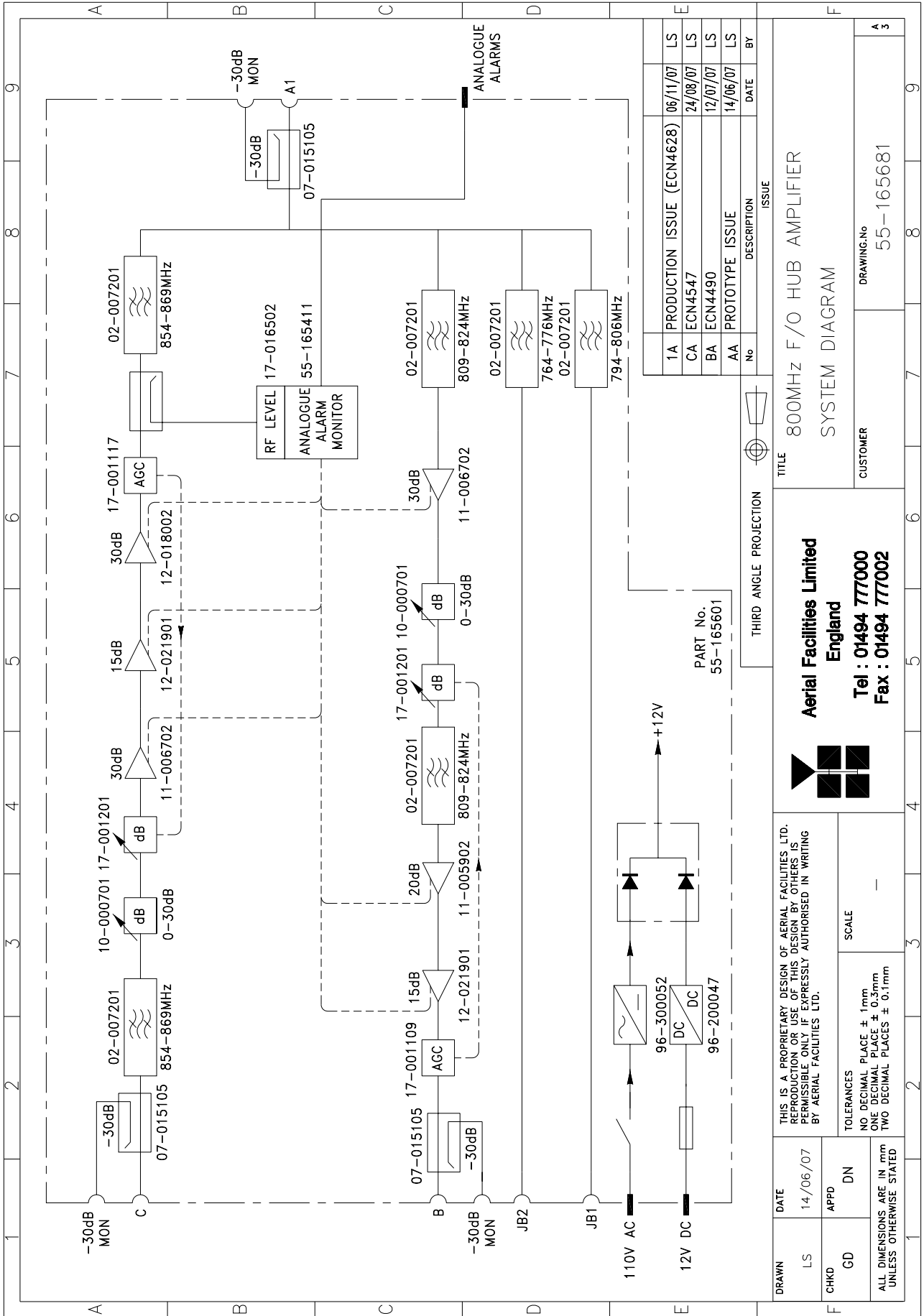
\*The sub components 17-001109, 17-001117 & 17-001201 are parts of the Automatic Gain Control (AGC) system used in 800MHz FO Hub Amplifier + Filters (55-165601); 17-001117 and 17-001201 are paired for use in the uplink and 17-001109 and 17-001201 are paired for use in the down link



# 11.4.2.1. 800MHz FO Hub Amplifier + Filters (55-165601) outline drawing drawing number 55-1656101



**11.4.2.2. 800MHz FO Hub Amplifier + Filters (55-165601) system diagram**  
drawing number 55-165681



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	14/06/07	LS

<b>TITLE</b> 800MHz F/O HUB AMPLIFIER SYSTEM DIAGRAM	
<b>CUSTOMER</b> Aerial Facilities Limited England Tel : 01494 77000 Fax : 01494 77002	<b>DRAWING.No</b> 55-165681
<b>ISSUE</b> No DESCRIPTION DATE BY	

THIRD ANGLE PROJECTION

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

SCALE

<b>DRAWN</b> LS	<b>DATE</b> 14/06/07
<b>CHKD</b> GD	<b>APPD</b> DN
ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED	

### 11.4.2.3. 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

### 11.4.2.4. 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

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

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

Switched Attenuator 10-000701 provides attenuation from 0 to 30dB 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.

#### 10-000701 Specification

PARAMETER		SPECIFICATION
Attenuation Values		0-30dB
Attenuation Steps		2, 4, 8 and 16dB
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

### 11.4.2.6. Low Noise Amplifier (11-005902)

The Gallium-Arsenide low noise amplifier used in the unit is a double stage, solid-state low noise amplifier. 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 any alarm system. There is a Current Fault Alarm Function, which indicates failure of each one or both RF transistors by a various alarm output options. The amplifier is housed in an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a 9way D-type for DC and alarm outputs.

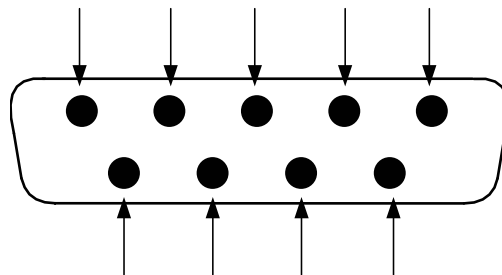
#### 11-005902 Specification

PARAMETER		SPECIFICATION
Frequency range:		800 – 960MHz *
Bandwidth:		<170MHz
Gain:		19.5dB (typical)
1dB compression point:		21dBm
OIP3:		33dBm
Input/output return loss:		>20dB
Noise figure:		1dB (typical)
Power consumption:		190mA @ 24V DC
Supply voltage:		10-24V DC
Connectors:		SMA female
Temperature range	operational:	-10°C to +60°C
	storage:	-40°C to +70°C
Size:		90 x 55 x 30.2mm
Weight:		0.28kg

\*tuned to Customer's specification

#### LNA '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



### 11.4.2.7. 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.

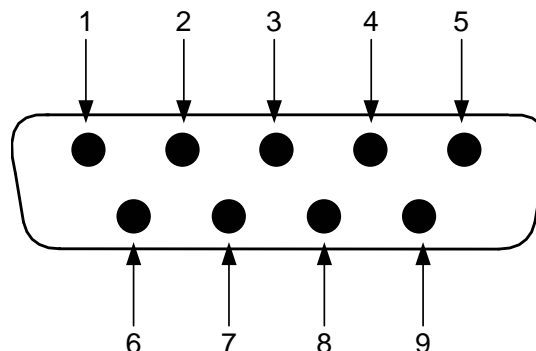
#### 11-006702 Specification

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



### 11.4.2.8. 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.

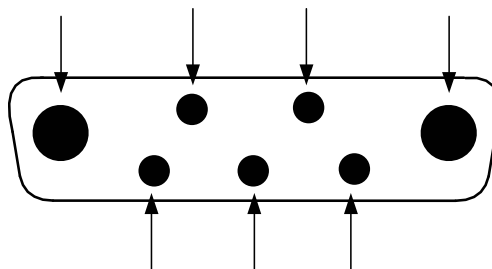
Its housing is an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a D-Type connector for the power supply and the Current Fault Alarm Function.

#### 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)



### 11.4.2.9. 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.

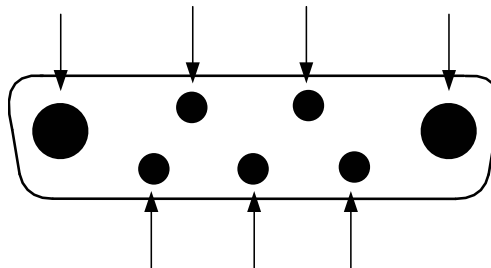
#### Low Power Amplifier (12-021901) Specification

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)





### 11.4.2.10. 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 800MHz FO Hub Amplifier + Filters (55-165601); 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

800MHz FO Hub Amplifier + Filters (55-165601) 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 down link

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

**11.4.2.11. 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 $\pm$ 15%
Alarm output relay contacts:		
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

### 11.4.2.12. 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

### 11.4.2.13. 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.

#### 11.4.2.14. 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

#### 11.4.2.15. 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

### 11.4.3. 700MHz FO Hub Amplifier (55-165602)

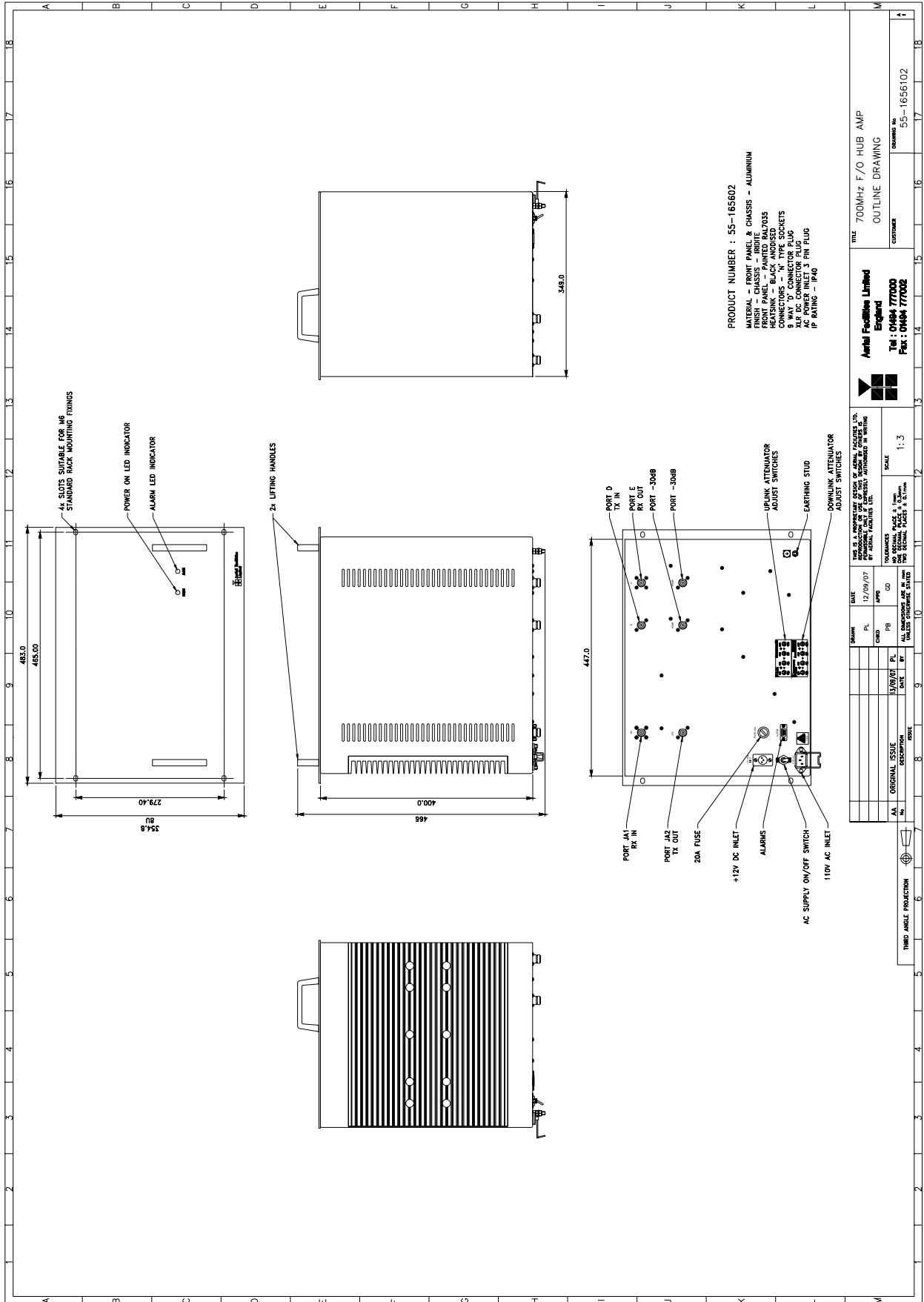
700MHz FO Hub Amplifier (55-165602) List of major components

Section	Component Part	Component Part Description	Qty. Per Assembly
11.4.3.3.	02-007206	900MHZ 8POLE 25MHz+ B/W "SMA"	2
11.4.3.4.	07-015105	ASYMMETRIC CPLR 30dB 800-2500MHz GA	2
11.4.3.5.	10-000701	SW ATT 0-30dB 0.25W SMA F	2
11.4.3.6.	11-005902	900MHz LOW NOISE AMP WITH RELAY KIT	1
11.4.3.7.	11-006702	800-1000MHz LNA 29dB (cw RELAY) KIT	2
11.4.3.8.	12-018002	PA 800-960MHz 20W CLASS A KIT	1
11.4.3.9.	12-021901	Low Power Amplifier	2
11.4.3.10.	17-001109	AGC Detector Assembly (Logarithmic)	1
	17-001117	AGC Detector Assembly	1
	17-001201	AGC Attenuator Assembly	2
11.4.3.11.	20-001601	12V RELAY BOARD	1
11.4.3.12.	80-008901	12V RELAY PCB ASSEMBLY	1
11.4.3.13.	94-100004	STPS12045TV 60A DUAL DIODE	1
11.4.3.14.	96-200047	DC/DC Converter	
11.4.3.15.	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 FO Hub Amplifier (55-165602); 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

# 11.4.3.1. 700MHz FO Hub Amplifier (55-165602) outline drawing

drawing number 55-1656102

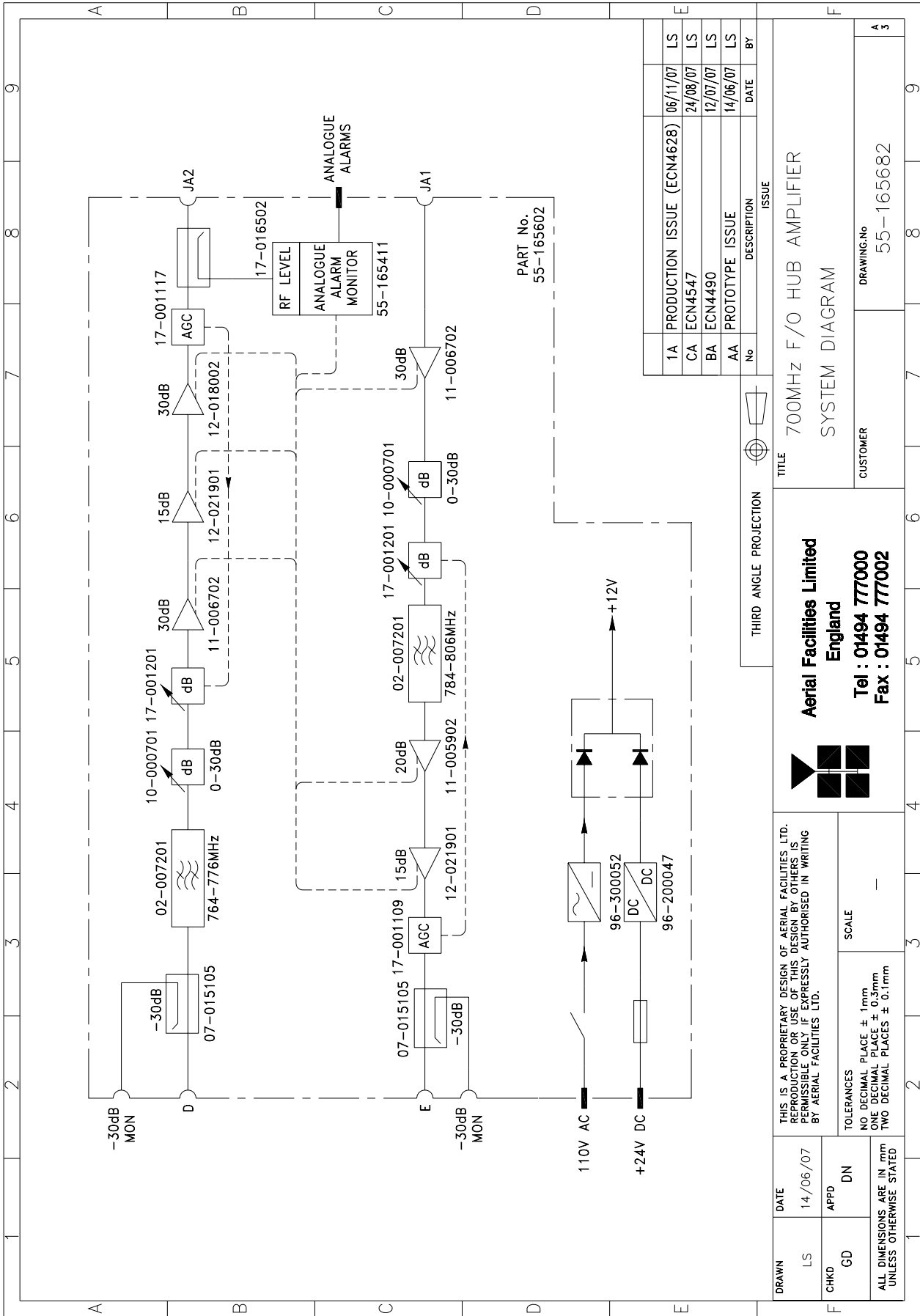


PRODUCT NUMBER : 55-165602  
 MATERIAL - FRONT PANEL & CHASSIS - ALUMINIUM  
 FINISH - CHASSIS - IRONITE  
 HEATSINK - BLACK ANODISED  
 CONNECTORS - 'N' TYPE SOCKETS  
 AC POWER INLET - 3 PIN IEC  
 AC POWER INLET 3 PIN PLUG  
 IP RATING - IP40

		TITLE 700MHz F/O HUB AMP OUTLINE DRAWING	
Avnet Facilities Limited England		CUSTOMER	
Tel : 0464 77000 Fax : 0464 77002		DRAWING NO. 55-1656102	
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AA ORIGINAL ISSUE IN. DESCRIPTION	DATE BY	DATE BY	DATE BY

THIRD ANGLE PROJECTION

**11.4.3.2. 700MHz FO Hub Amplifier (55-165602) system diagram**  
drawing number 55-165682



### 11.4.3.3. 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

### 11.4.3.4. 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



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

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

Switched Attenuator 10-000701 provides attenuation from 0 to 30dB 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.

#### 10-000701 Specification

PARAMETER		SPECIFICATION
Attenuation Values		0-30dB
Attenuation Steps		2, 4, 8 and 16dB
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

### 11.4.3.6. Low Noise Amplifier (11-005902)

The Gallium-Arsenide low noise amplifier used in the unit is a double stage, solid-state low noise amplifier. 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 any alarm system. There is a Current Fault Alarm Function, which indicates failure of each one or both RF transistors by a various alarm output options. The amplifier is housed in an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a 9way D-type for DC and alarm outputs.

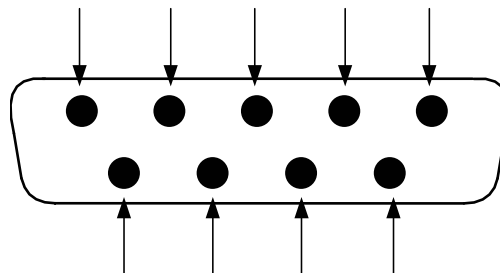
#### 11-005902 Specification

PARAMETER		SPECIFICATION
Frequency range:		800 – 960MHz *
Bandwidth:		<170MHz
Gain:		19.5dB (typical)
1dB compression point:		21dBm
OIP3:		33dBm
Input/output return loss:		>20dB
Noise figure:		1dB (typical)
Power consumption:		190mA @ 24V DC
Supply voltage:		10-24V DC
Connectors:		SMA female
Temperature range	operational:	-10°C to +60°C
	storage:	-40°C to +70°C
Size:		90 x 55 x 30.2mm
Weight:		0.28kg

\*tuned to Customer's specification

#### LNA '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



### 11.4.3.7. 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.

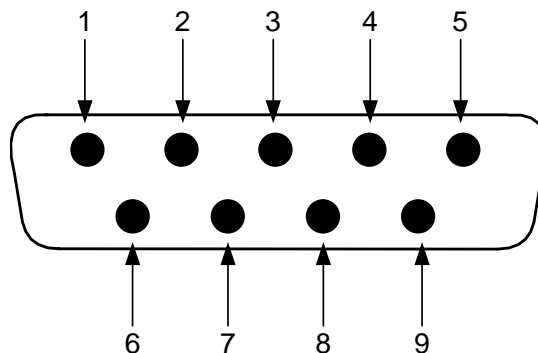
#### 11-006702 Specification

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



### 11.4.3.8. 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.

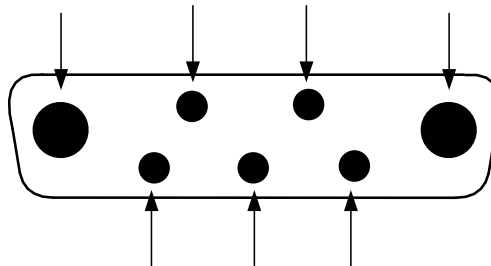
Its housing is an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a D-Type connector for the power supply and the Current Fault Alarm Function.

#### 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)



### 111.4.3.9. 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.

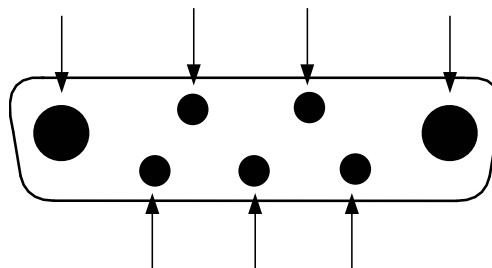
#### Low Power Amplifier (12-021901) Specification

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)



### 11.4.3.10. 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 FO Hub Amplifier (55-165602); 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 FO Hub Amplifier (55-165602) 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

**11.4.3.11. 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 $\pm$ 15%
Alarm output relay contacts:		
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

### 11.4.3.12. 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

### 11.4.3.13. 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.



#### 11.4.3.14. 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

#### 11.4.3.15. 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

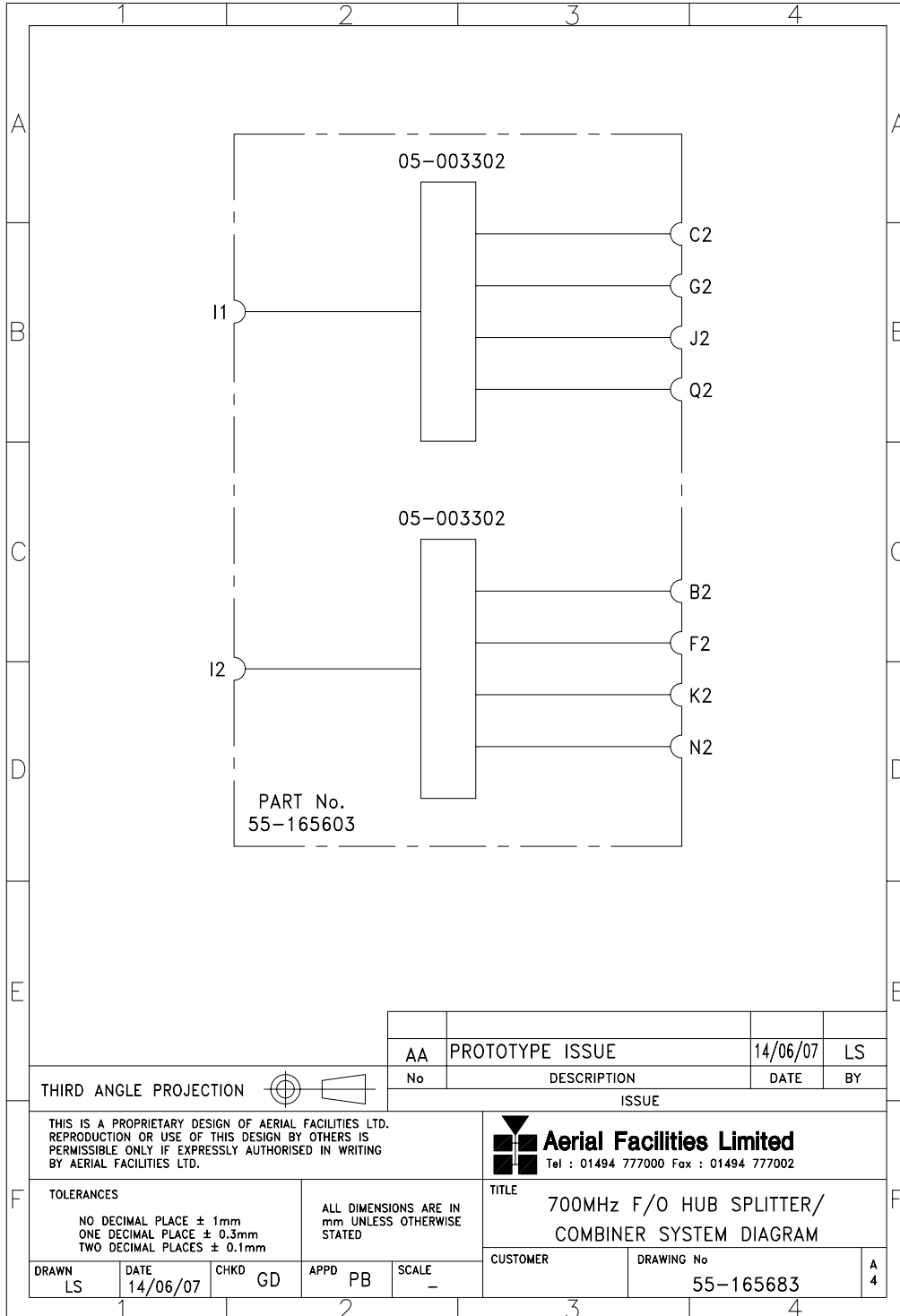
AC Input Supply	
Voltage	110 or 220V nominal
	85 - 265V AC (absolute limits)
Frequency	47 to 63Hz
DC Output Supply	
Voltage	12V DC (nominal)
	10.5-13.8V (absolute limits)
Current	12.5A

### 11.4.4. 700MHz FO HUB Splitter/Combiner (55-165603)

700MHz FO HUB Splitter/Combiner (55-165603) list of major components

section	Component Part	Component Part Description	Qty. Per Assembly
11.4.4.2.	05-003302	4 WAY SPLITTER GSM 900MHz	2

11.4.4.1. 700MHz FO HUB Splitter/Combiner (55-165603) system diagram drawing number 55-165683



#### 11.4.4.2. Four Way Splitter/Combiner (05-003302)

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.

##### Four Way Splitter (05-003302) Specification

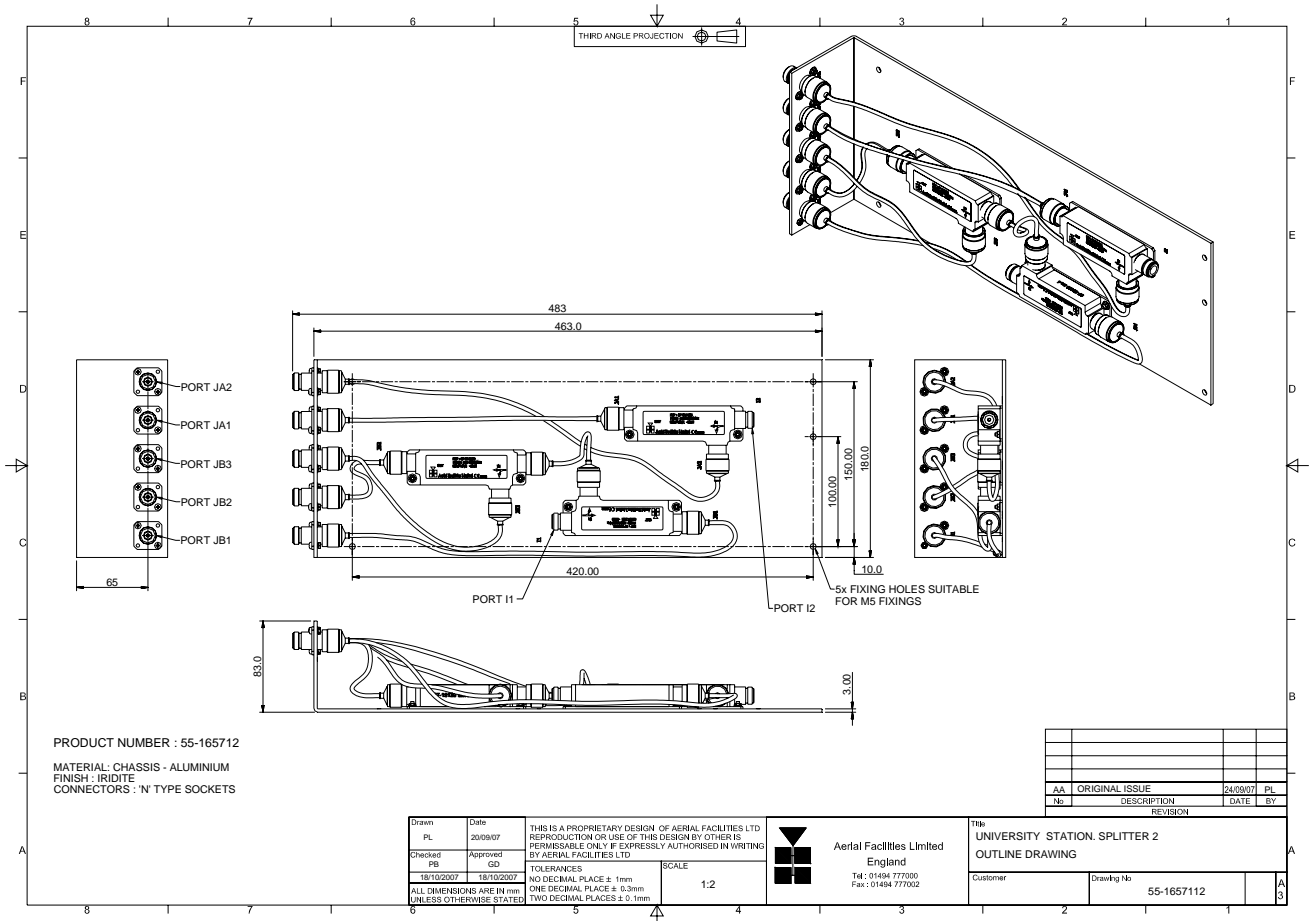
PARAMETER		SPECIFICATION
Frequency range		700-980MHz
Bandwidth		180MHz
Rejection		>14dB
Insertion loss		<7.0dB (in band)
Connectors		N type, female
Weight		<1.5kg
Temperature range	operational	-20°C to +60°C
	storage	-40°C to +70°C

### 11.4.5. UNIVERSITY ST. SPLITTER 2 (55-165712)

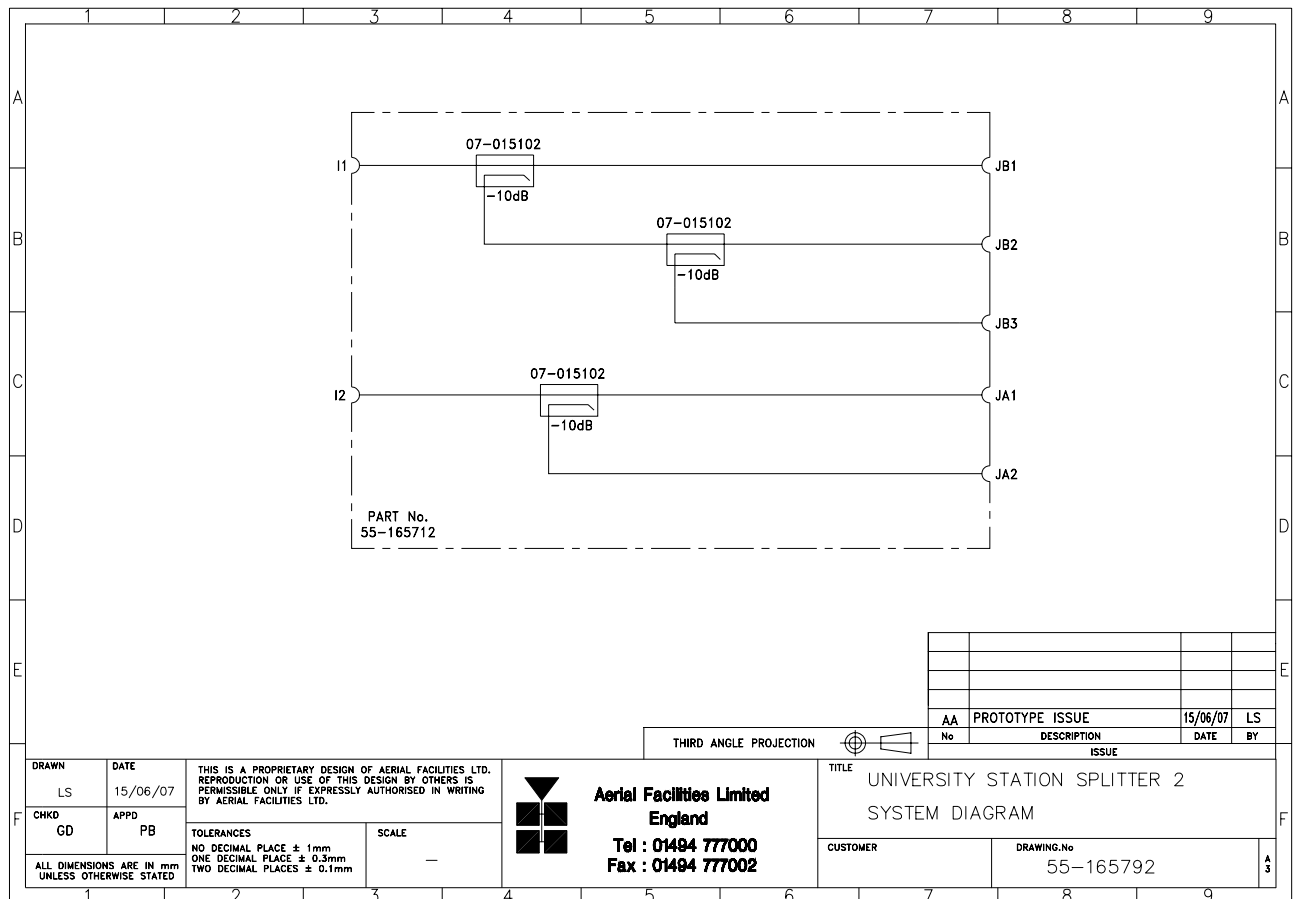
#### UNIVERSITY ST. SPLITTER 2 (55-165712) List of major Components

section	Component Parts	Component Part Description	Qty. Per Assembly
11.4.5.3.	07-015102	ASYMMETRIC CPLR 10dB 800-2500MHz GA	3

#### 11.4.5.1. University Station Splitter 2 (55-165712) outline drawing drawing number 55-1657112



### 11.4.5.2. University Station Splitter 2 (55-165712) system diagram drawing number 55-165792



### 11.4.5.3. 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

### 11.4.6. Optical AB Switch FC/APC (98-700002)

Optical A/B Switch FC/APC (98-700002) an O.E.M. sourced Fibre Optic relay supplied as a 1U rack mount tray. 98-700002 allows for the automatic switching between two optical inputs to provide a common optical output. Manual selection of the input is also possible via toggle switches on the front panel.

#### 98-700002 Specification

PARAMETER	SPECIFICATION
Electrical Characteristics	
Power Supply Voltage	100 - 240 VAC
Power Supply Frequency	50 - 60 Hz
Optical Characteristics	
Operating Wavelength	1200 – 1610nm
Optical Input Range	+20 dBm
Optical Insertion Loss	2.0 dB
Optical Trip Threshold/Meter Range	-35 - +20 dBm
Optical Switch Speed	15ms
Backreflection Tolerance	-50dB
Environmental and Physical Characteristics	
Optical Connectors	FC/APC
Operating Temp. Range	+10 to +40°C
Storage Temp. Range	-40 to +80 °C
Humidity	5 to 90 % RHNC
Weight	2.2 kg (6 lbs)
Dimensions	483 x 361 x 44mm (19.0 x 14.2 x 1.72 in.)

### 11.4.7. F/O Link Subsystem (98-800001)

F/O Link Subsystem (98-800001) is an O.E.M. sourced Optical Transceiver package containing discreet TX and RX modules and supplied as a 1U rack mount tray

Parameter	Specification
Optical Output Power	4 mW
Wavelength, peak	1310 1550 nm
Frequency Response, 50 to 2.2 GHz	± 1.5 dB
Input and Output VSWR	1.5:1
Link Gain <sup>(2)</sup>	0 dB
Output Noise Floor <sup>(1)</sup>	-137 dBm/Hz
Input 3rd Order Intercept <sup>(1)</sup>	30 dBm
Operating Temperature	-30 to +75°C
Storage Temperature	-40 to +85°C
Maximum RF Input to Transmitter	+20 dBm
Maximum Optical Input to Receiver	6 mW
A.C. Supply Voltage	90 – 265 VAC
Dimensions	483 x 457 x 44mm (19.0 x 18 x 1.72 in.)

<sup>(1)</sup> SFDR, Noise and IP3 specified with 5 dB optical loss.

<sup>(2)</sup> Link Gain specified with 1 meter fiber.

## 12. WESTLAKE STATION LINE AMPLIFIER (80-330553)

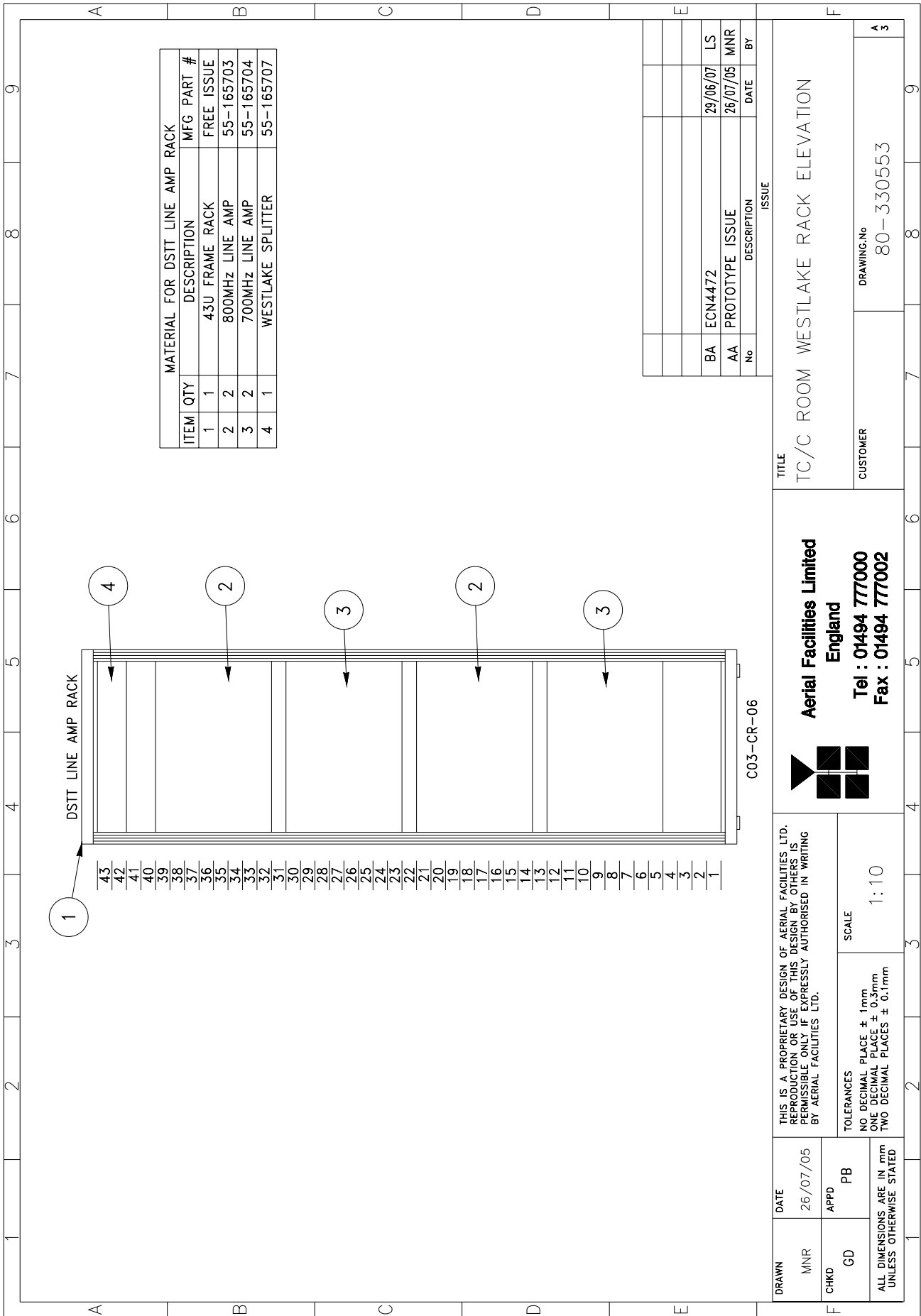
rack number C03-CR-06

Westlake Station Line Amplifier (80-330553) list of major components

Section	Component Part	Component Part Description	Qty. Per Assembly
12.4.1.	55-165703	800MHz LINE AMP + FILTERS (INT AMP)	2
12.4.2.	55-165704	700MHz LINE AMP + FILTERS (INT AMP)	2
12.4.3.	55-165707	WESTLAKE ST. SPLITTER	1

# 12.1. Westlake Station Line Amplifier (80-330553) rack elevation

drawing number 80-330553

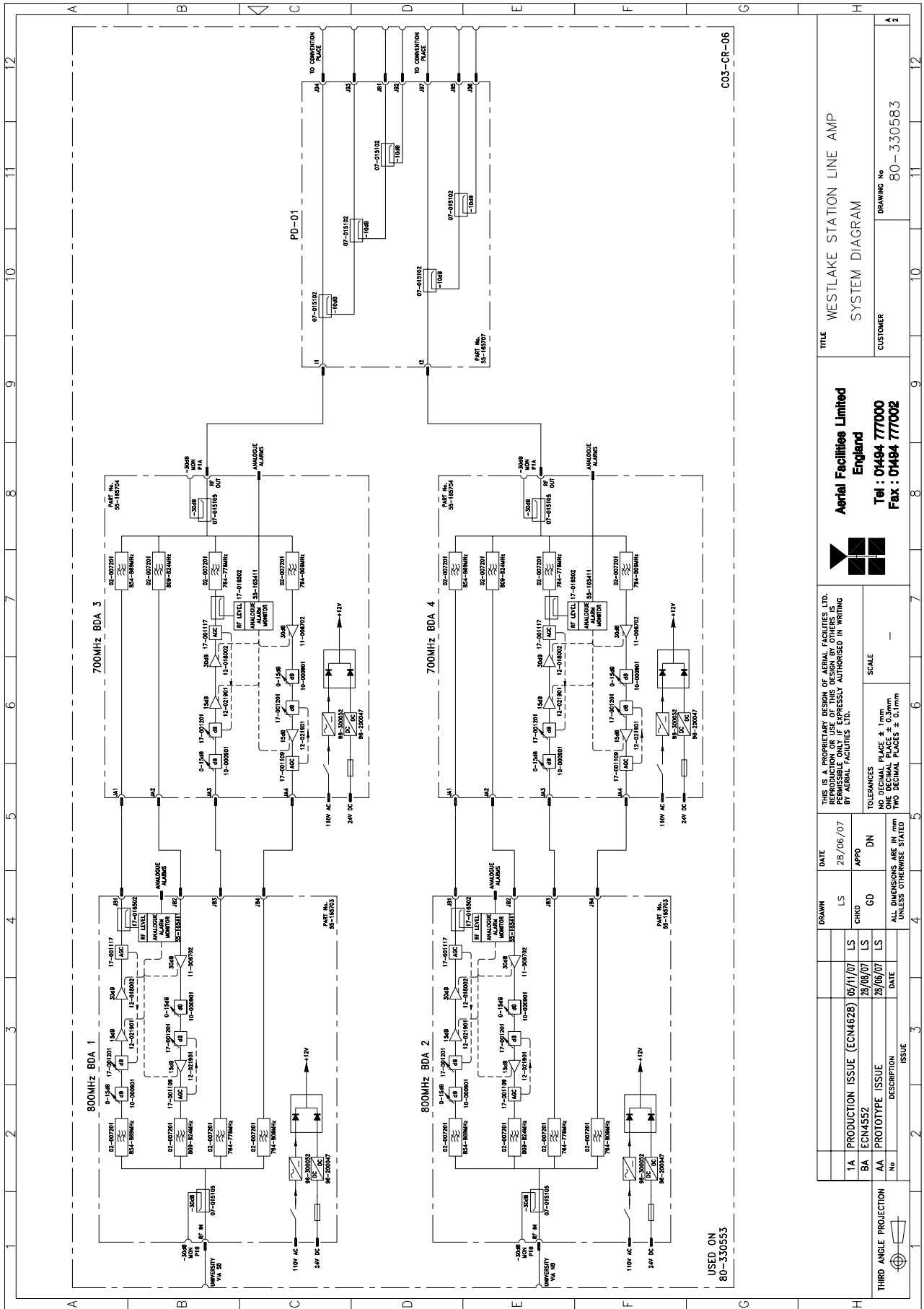


<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">DRAWN</td> <td>MNR</td> <td style="width: 20%;">DATE</td> <td>26/07/05</td> </tr> <tr> <td>CHKD</td> <td>GD</td> <td>APPD</td> <td>PB</td> </tr> </table>	DRAWN	MNR	DATE	26/07/05	CHKD	GD	APPD	PB	<p style="font-size: small;">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.</p> <p style="font-size: small;">TOLERANCES NO DECIMAL PLACE ± 1mm ONE DECIMAL PLACE ± 0.3mm TWO DECIMAL PLACES ± 0.1mm</p> <p style="text-align: right;">SCALE 1:10</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">TITLE</td> <td>TC/C ROOM WESTLAKE RACK ELEVATION</td> </tr> <tr> <td>CUSTOMER</td> <td>Aerial Facilities Limited England Tel : 01494 777000 Fax : 01494 777002</td> </tr> <tr> <td>DRAWING No</td> <td>80-330553</td> </tr> </table>	TITLE	TC/C ROOM WESTLAKE RACK ELEVATION	CUSTOMER	Aerial Facilities Limited England Tel : 01494 777000 Fax : 01494 777002	DRAWING No	80-330553
DRAWN	MNR	DATE	26/07/05													
CHKD	GD	APPD	PB													
TITLE	TC/C ROOM WESTLAKE RACK ELEVATION															
CUSTOMER	Aerial Facilities Limited England Tel : 01494 777000 Fax : 01494 777002															
DRAWING No	80-330553															



# 12.2. Westlake Station Line Amplifier (80-330553) system diagram

drawing number 80-330583



TITLE		WESTLAKE STATION LINE AMP SYSTEM DIAGRAM	
CUSTOMER		DRAWING No 80-330583	

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

THIS IS A PROPRIETARY DESIGN OF AERIAL FACILITIES LTD.  
PERMISSIBLE ONLY IF EXPRESSLY AUTHORISED IN WRITING  
BY AERIAL FACILITIES LTD.

TOLERANCES  
NO. DECIMAL PLACES ± 1mm  
TWO DECIMAL PLACES ± 0.1mm

SCALE

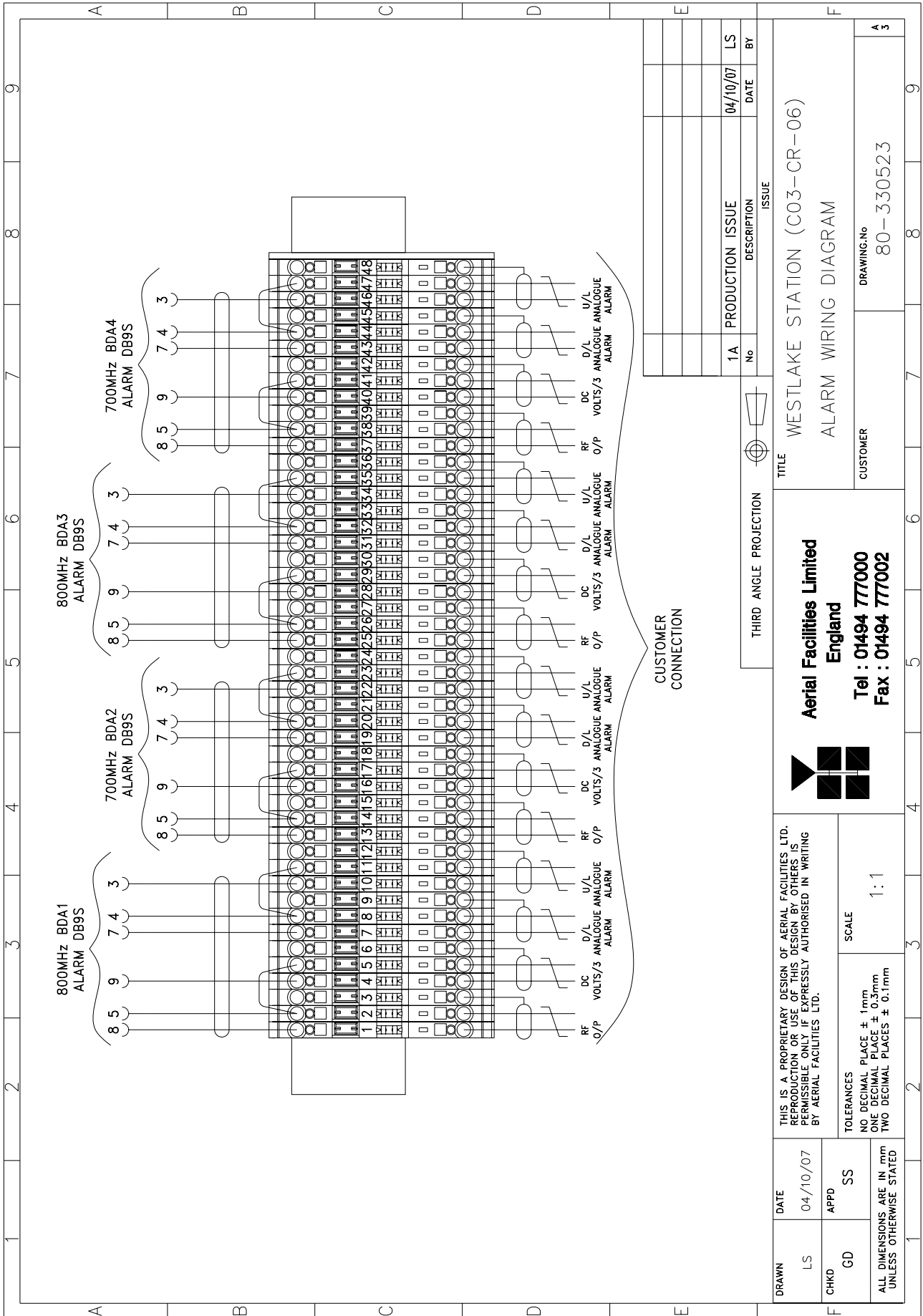
DRAWN	DATE	LS	CHKO	GD	DN	APPRO
1A	28/06/07					
BA	05/11/07					
AA	20/06/07					

ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED

ISSUE

# 12.3. Westlake Station Line Amplifier (80-330553) alarm wiring diagram

drawing number 80-330523



## 12.4. Westlake Station Line Amplifier (80-330553) Sub Components

### 12.4.1. 800MHz Line Amplifier (55-165703)

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

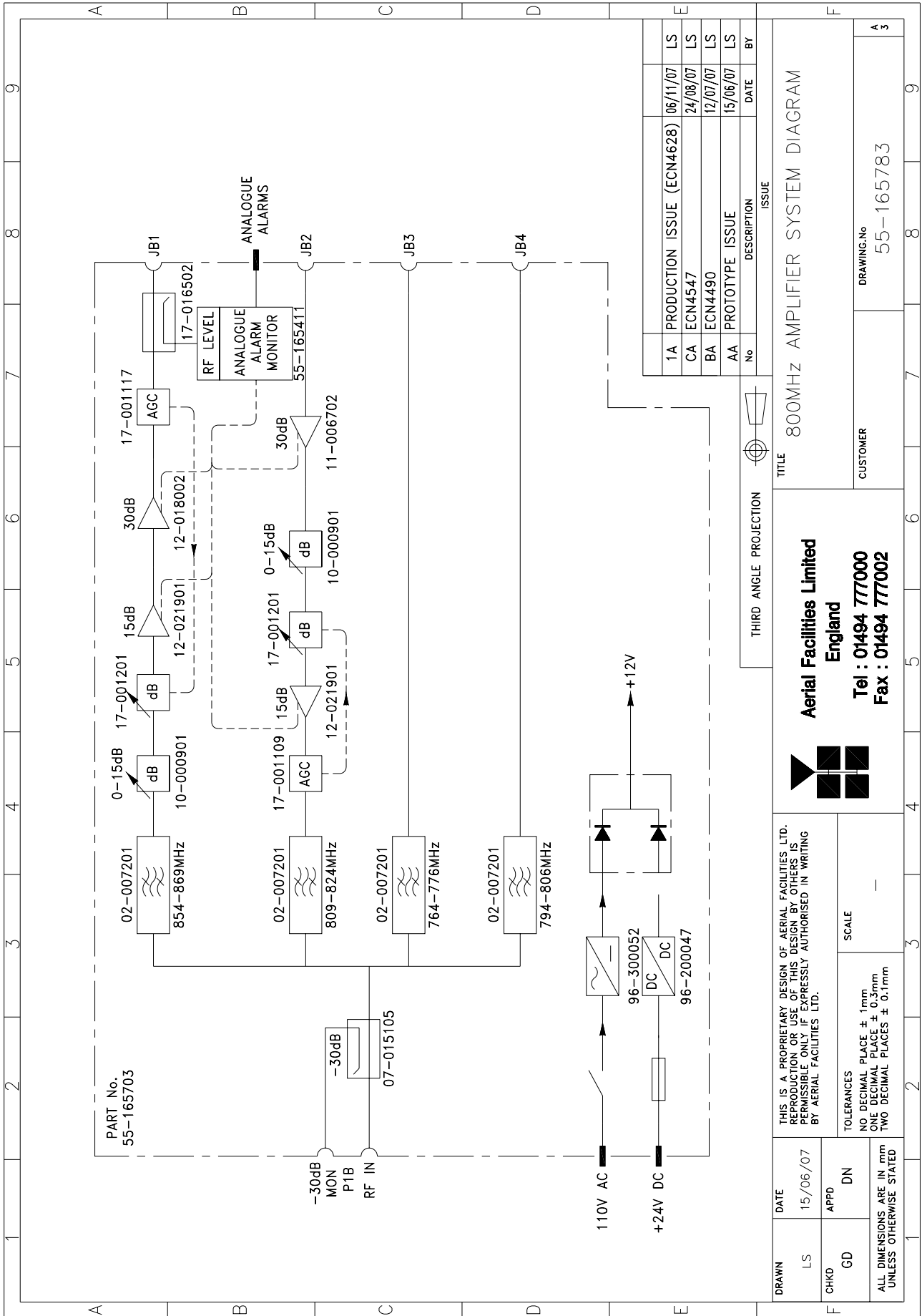
Section	Component Part	Component Part Description	Qty. Per Assembly
12.4.1.3.	02-007206	Bandpass Filter	4
12.4.1.4.	07-015105	Wideband Asymmetric Coupler	1
12.4.1.5.	10-000901	Switched Attenuator 0.25W, 0 - 15dB	2
12.4.1.6.	11-006702	Low Noise Amplifier	1
12.4.1.7.	12-018002	Power Amplifier (20W 800MHz )	1
12.4.1.8.	12-021901	Low Power Amplifier	2
12.4.1.9.	17-001109*	AGC Detector Assembly (Logarithmic)	1
	17-001117*	AGC Detector Assembly	1
	17-001201*	AGC Attenuator Assembly	2
12.4.1.10.	20-001601	12V (Dual) Relay Board	1
12.4.1.11.	80-008901	12V (Single) Relay Board	1
12.4.1.12.	94-100004	Dual Diode Assembly	1
12.4.1.13.	96-200047	DC/DC Converter	1
12.4.1.14.	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



### 12.4.1.2. 800MHz Line Amplifier (55-165703) System Diagram

Drawing number 55-165783



### 12.4.1.3. 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

### 12.4.1.4. 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

### 12.4.1.5. 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

### 12.4.1.6. 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.

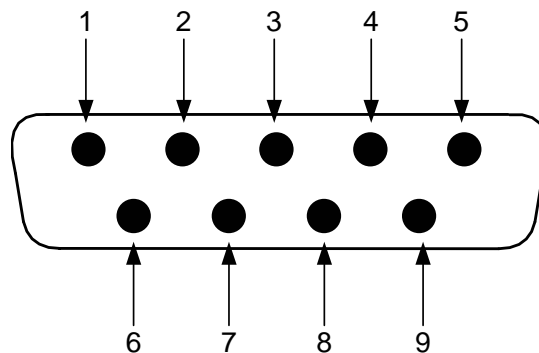
#### 11-006702 Specification

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



**12.4.1.7. 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.

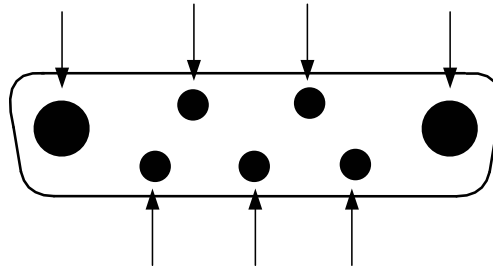
12-018002 Specification

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)



**12.4.1.8. 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.

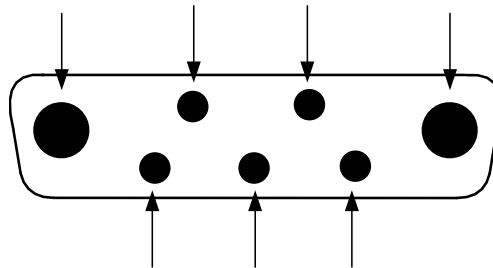
Low Power Amplifier (12-021901) Specification

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

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)



**12.4.1.9. 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

**12.4.1.10. 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

### 12.4.1.11. 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

### 12.4.1.12. 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.

### 12.4.1.13. 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.

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

### 12.4.1.14. 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

## 12.4.2 700MHz Line Amplifier (55-165704)

Description of 700MHz Line Amplifier (55-165704)

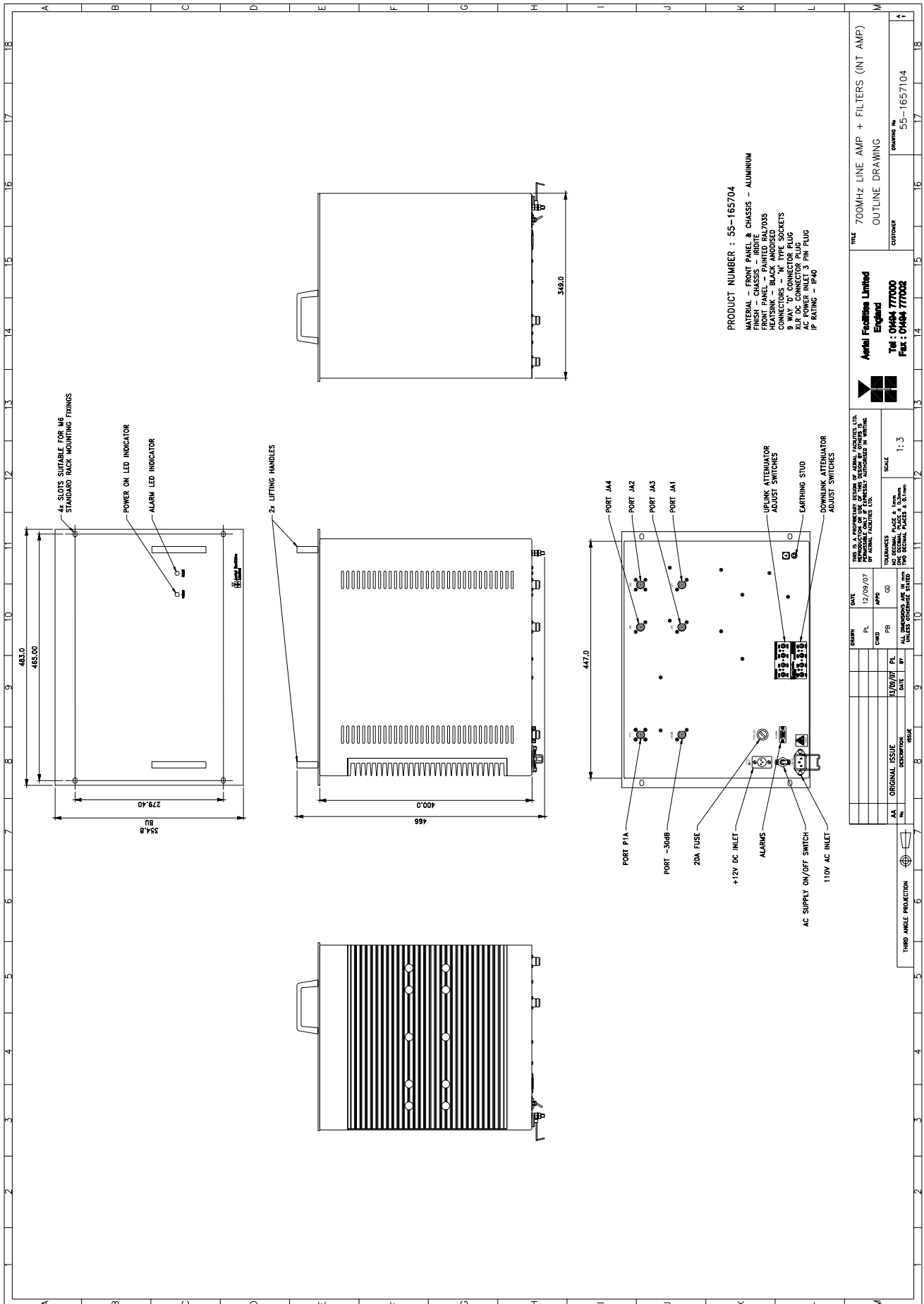
700MHz Line Amplifier (55-165704) List of Major Components

Section	Component Part	Component Part Description	Qty. Per Assembly
12.4.2.3.	02-007206	Bandpass Filter	4
12.4.2.4.	07-015105	Wideband Asymmetric Coupler	1
12.4.2.5.	10-000901	Switched Attenuator 0.25W, 0 - 15dB	2
12.4.2.6.	11-006702	Low Noise Amplifier	1
12.4.2.7.	12-018002	Power Amplifier (20W 800MHz )	1
12.4.2.8.	12-021901	Low Power Amplifier	2
12.4.2.9.	17-001109*	AGC Detector Assembly (Logarithmic)	1
	17-001117*	AGC Detector Assembly	1
	17-001201*	AGC Attenuator Assembly	2
12.4.2.10.	80-008901	12V (Single) Relay Board	1
12.4.2.11.	94-100004	Dual Diode Assembly	1
12.4.2.12.	96-200047	DC/DC Converter	1
12.4.2.13.	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

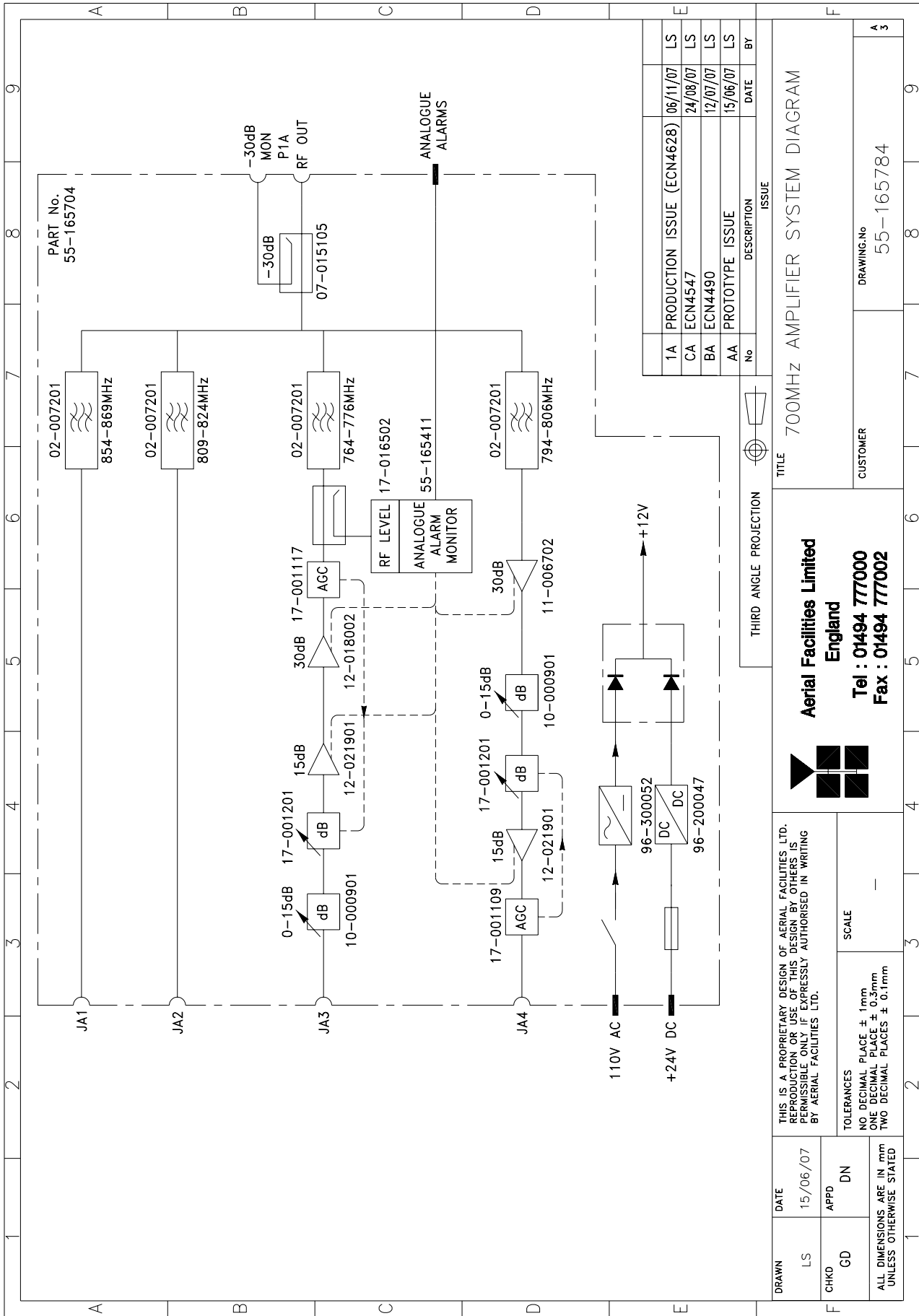
# 12.4.2.1. 700MHz Line Amplifier (55-165704) Outline Drawing

Drawing number 55-1657104



# 12.4.2.2. 700MHz Line Amplifier (55-165704) System Diagram

Drawing number 55-165784





### 12.4.2.3. 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

### 12.4.2.4. 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

### 12.4.2.5. 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

### 12.4.2.6. 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.

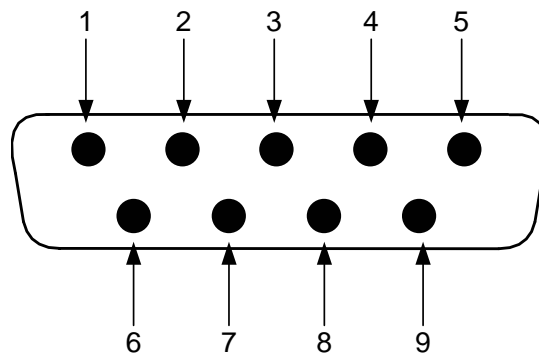
#### 11-006702 Specification

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



**12.4.2.7. 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.

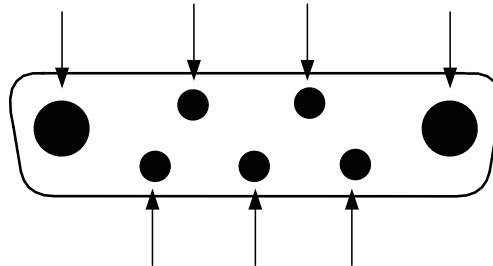
Its housing is an aluminium case (Iridite NCP finish) with SMA connectors for the RF input/output and a D-Type connector for the power supply and the Current Fault Alarm Function.

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)



**12.4.2.8. 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.

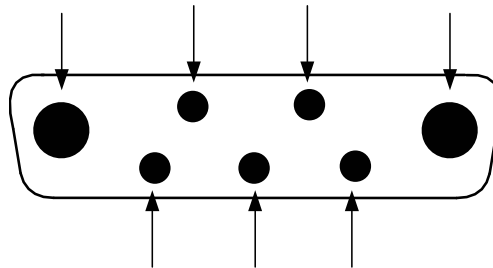
There are no adjustments on this amplifier, and in the unlikely event of failure then the entire amplifier should be replaced.

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

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)



#### 12.4.2.9. 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

**12.4.2.10. 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

### 12.4.2.11. 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.

### 12.4.2.12. 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 ± 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

### 12.4.2.13. 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

### 12.4.3. Westlake Station. Splitter (55-165707)

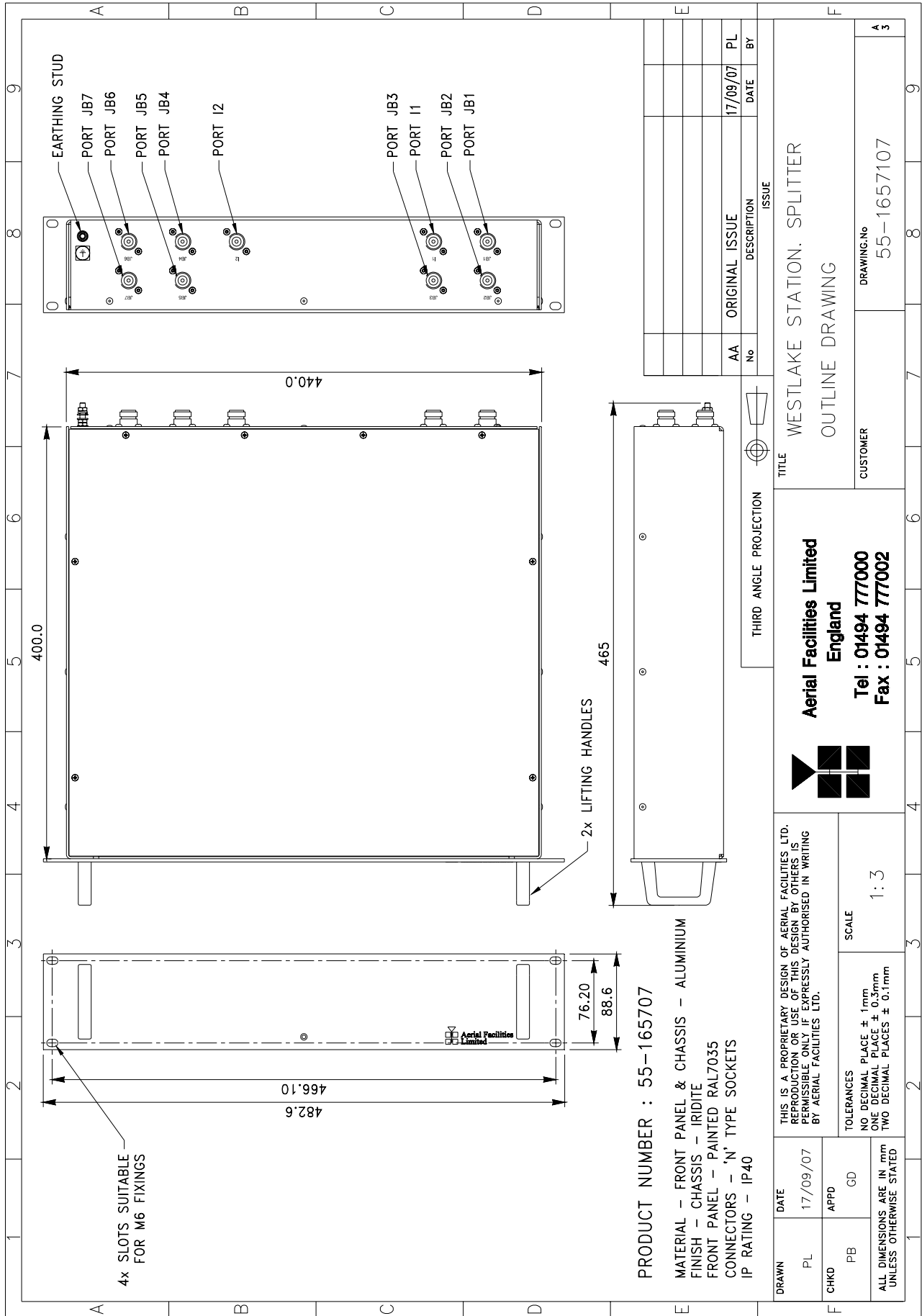
2U rack mount chassis

Westlake Station. Splitter (55-165707) list of major components

Section	Component Part	Component Part Description	Qty. Per Assembly
12.4.3.3.	07-015102	Wideband Asymmetric Coupler	5



**12.4.3.1. Westlake Station. Splitter (55-165707) outline drawing**  
 Drawing number 55-1657107



**PRODUCT NUMBER : 55-165707**  
 MATERIAL – FRONT PANEL & CHASSIS – ALUMINIUM  
 FINISH – CHASSIS – IRIDITE  
 FRONT PANEL – PAINTED RAL7035  
 CONNECTORS – 'N' TYPE SOCKETS  
 IP RATING – IP40

AA No	DESCRIPTION	DATE	BY
AA	ORIGINAL ISSUE	17/09/07	PL

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 England  
 Tel : 01494 777000  
 Fax : 01494 777002

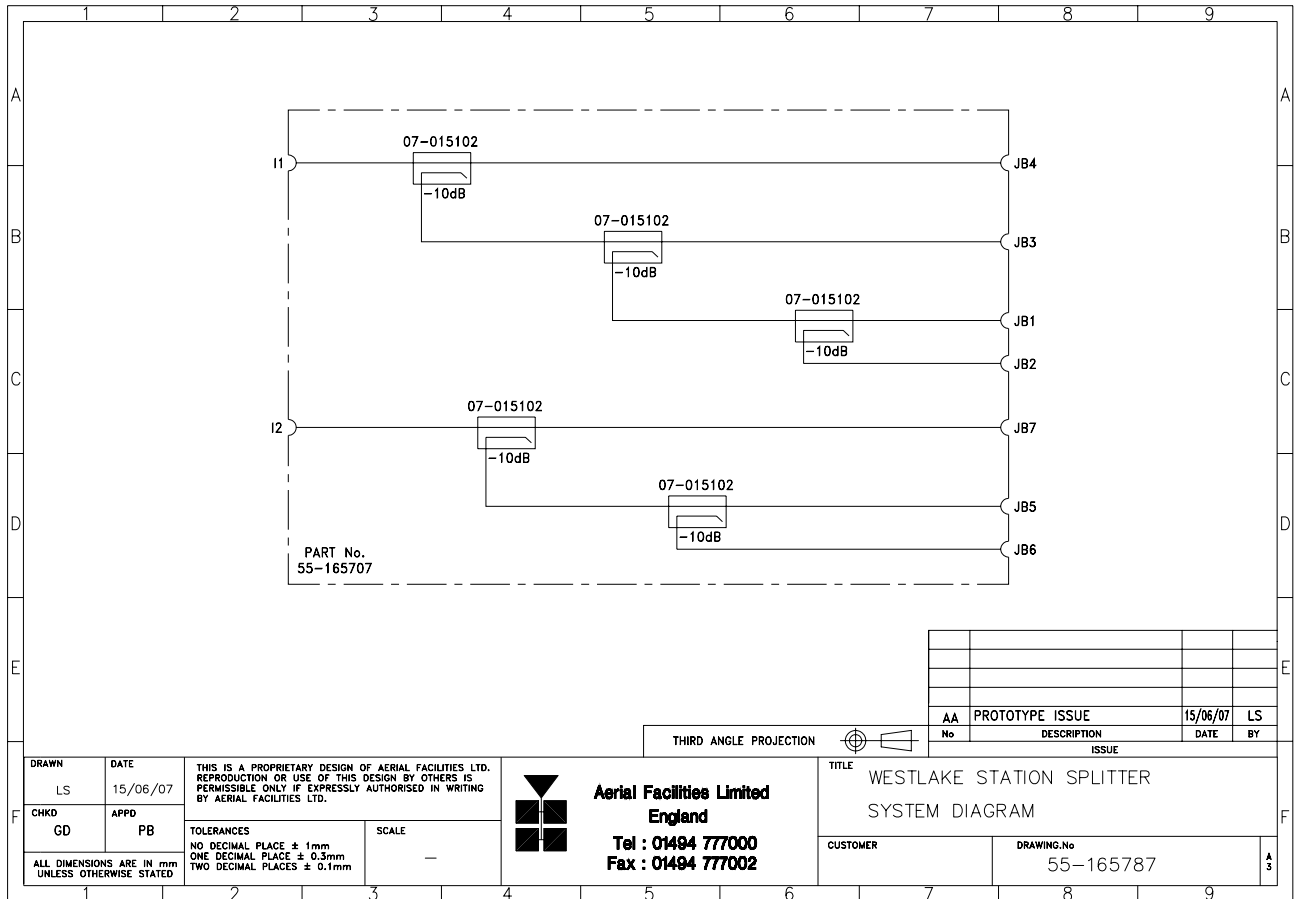
**WESTLAKE STATION. SPLITTER**  
 OUTLINE DRAWING

CUSTOMER: 55-1657107  
 DRAWING.No: 55-1657107

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DRAWN PL DATE 17/09/07	APPD GD	TITLE WESTLAKE STATION. SPLITTER OUTLINE DRAWING

### 12.4.3.2. Westlake Station. Splitter (55-165707) system diagram

Drawing number 55-165787



### 12.4.3.3. 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 $\pm$ 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

### 13 ATTENUATOR SHELF (ITAC) 1 (55-165506)

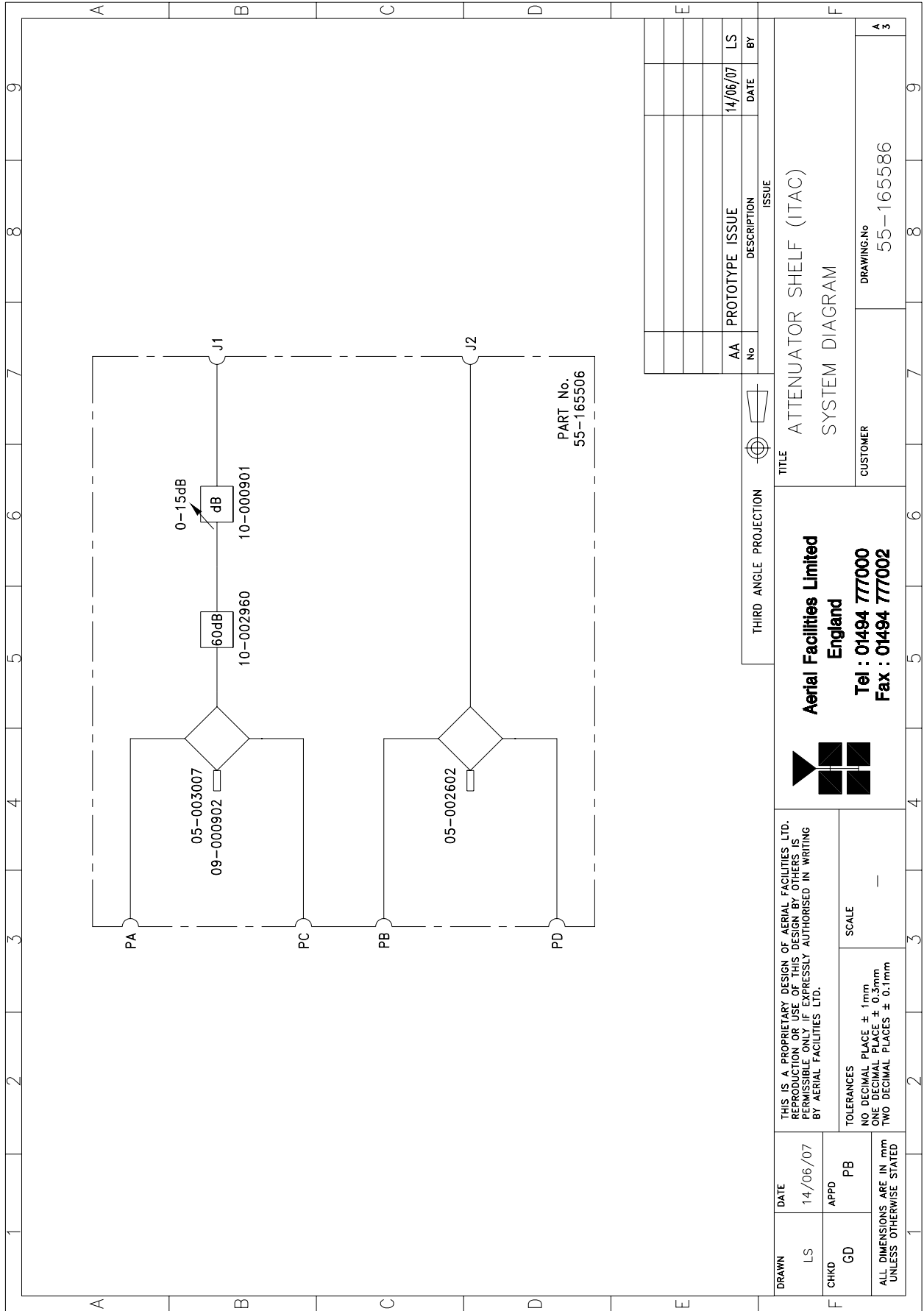
Attenuator Shelf (ITAC) 1 (55-165506) list of major components

Section	Component Part	Component Part Description	Qty. Per Assembly
13.3.1.	05-002602	900MHz Splitter/Combiner	1
13.3.2.	05-003007	4 Port Hybrid Coupler	1
13.3.3.	09-000902	Dummy load	1
13.3.4.	10-000901	Switched Attenuator 0.25W, 0 - 15dB	1
13.3.5.	10-002960	25W 2.5GHz 60dB ATTENUATOR N M/F	1



# 13.2 Attenuator Shelf (ITAC) 1 (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

**Aerial Facilities Limited  
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DRAWN	DATE	APPD	PB
LS	14/06/07		
CHKD			
GD			

### 13.3. Attenuator Shelf (ITAC) 1 (55-165506) major components

#### 13.3.1. 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

#### 13.3.2. 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℃

### 13.3.3. 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

### 13.3.4. 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

### 13.3.5. 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



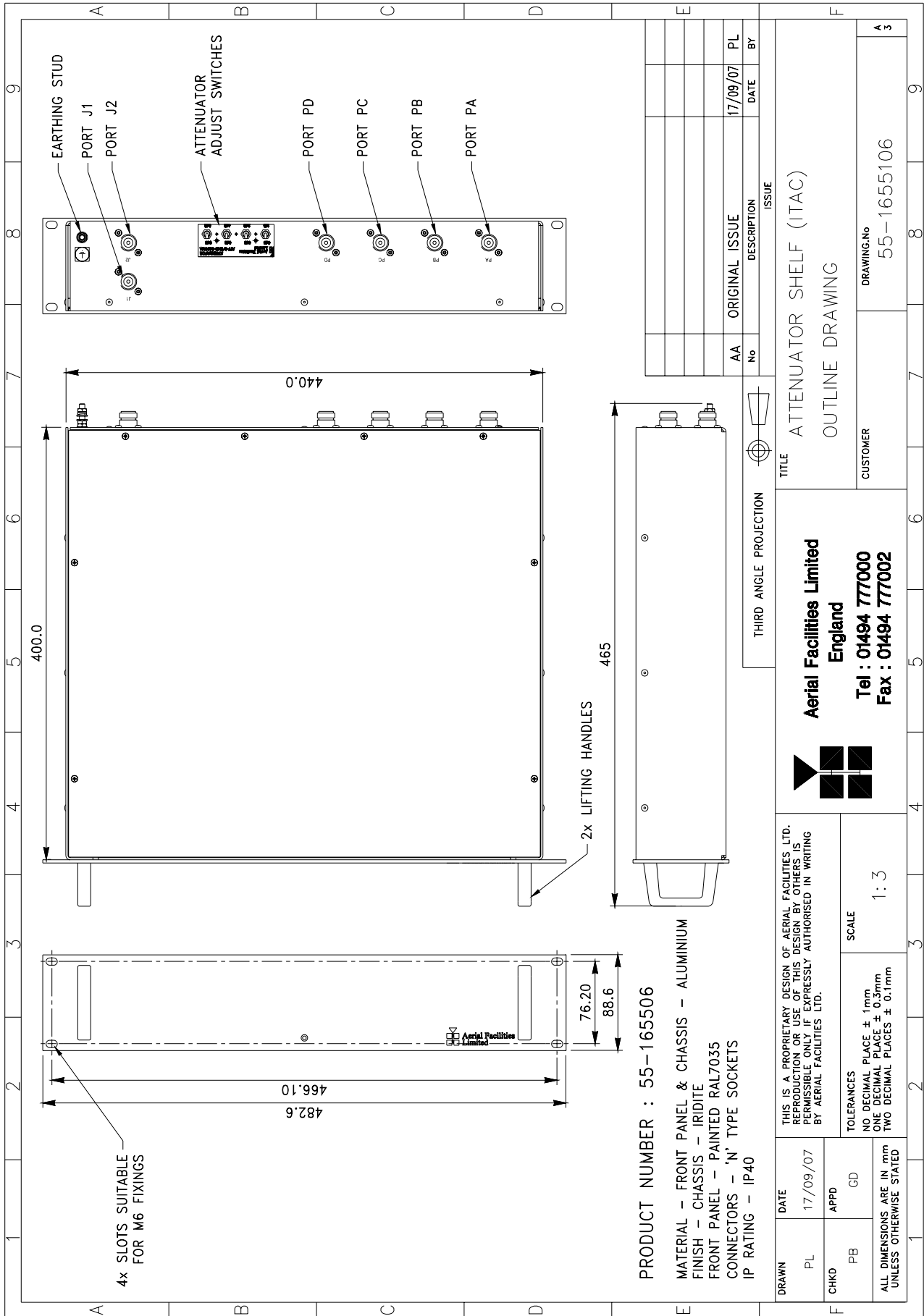
## 14 ATTENUATOR SHELF (ITAC) 2 (55-165506)

Attenuator Shelf (ITAC) 2 (55-165506) list of major components

Section	Component Part	Component Part Description	Qty. Per Assembly
13.3.1.	05-002602	900MHz Splitter/Combiner	1
13.3.2.	05-003007	4 Port Hybrid Coupler	1
13.3.3.	09-000902	Dummy load	1
13.3.4.	10-000901	Switched Attenuator 0.25W, 0 - 15dB	1
13.3.5.	10-002960	Attenuator 25W, 60dB	1

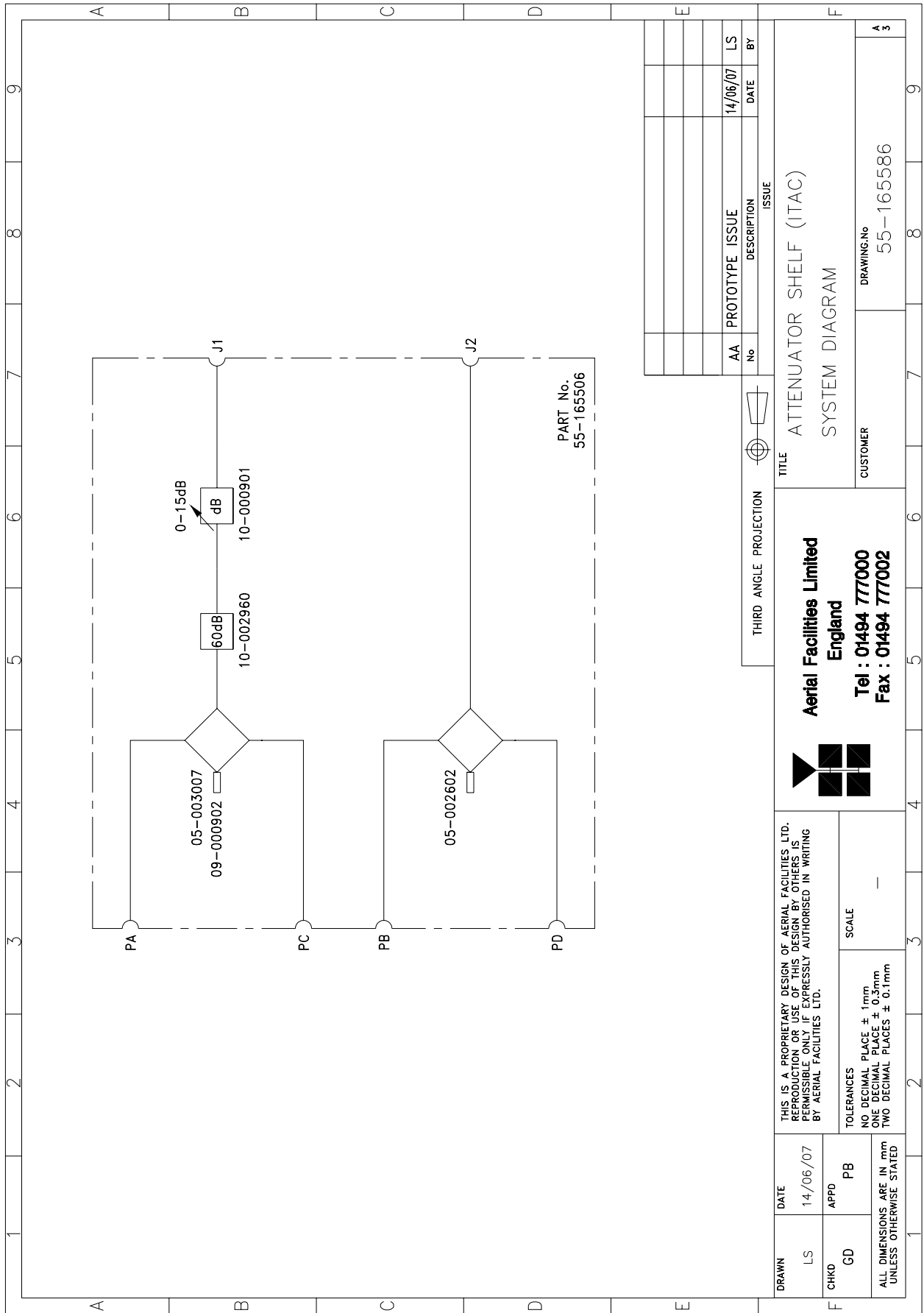
# 14.1. Attenuator Shelf (ITAC) 2 (55-165506) outline drawing

Drawing number 55-1655106



# 14.2 Attenuator Shelf (ITAC) 2 (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

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DRAWN LS	DATE 14/06/07
CHKD GD	APPD PB
ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED	

### 14.3. Attenuator Shelf (ITAC) 2 (55-165506) major components

#### 14.3.1. 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

#### 14.3.2. 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℃

### 14.3.3. 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

### 14.3.4. 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

### 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