MCPA SUBSYSTEM ASSEMBLY

Product Number KRB 101 1108

INSTALLATION OPERATION AND MAINTENANCE INSTRUCTIONS

Ericsson Amplifier Technologies Inc.
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ERICSSON AMPLIFIER TECHNOLOGIES INC.

49 Wireless Boulevard

Hauppauge, New York 11788

(631) 357-8200

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The following symbols are used throughout this technical manual:

WARNING

THIS SYMBOL INDICATES IMPORTANT INFORMATION THAT IS EMPHASIZED TO ALERT THE READER TO THE POTENTIAL RISK OF PERSONAL INJURY TO THE OPERATOR OR OTHER PERSONNEL.

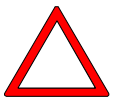
CAUTION

This symbol indicates important information that is emphasized to alert the reader to the potential risk of damage to the amplifier.

NOTE

This symbol indicates information that is highlighted signifying an operation or procedural step requiring additional emphasis.

WARNING



THE USE OF AN EARTH GROUND IS REQUIRED TO ENSURE SAFETY.

IF THE EQUIPMENT APPEARS TO BE DAMAGED IN ANY WAY, REMOVE ALL POWER TO THE UNIT, AND HAVE IT SERVICED AS SOON AS POSSIBLE.

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WARRANTY

Unless otherwise specified, Ericsson Amplifier Technologies provides a Limited Warranty of 12 months from the date of original shipment unless otherwise agreed to in writing.

This warranty is void (1) if the equipment has been subject to unauthorized alteration, modification or repair or, (2) due to defects or failures resulting from improper handling, storage, operation, interconnection or installation; failure to continually provide a suitable installation and operational environment; or any other cause beyond the range of normal usage for the equipment (except, in all of the foregoing cases, when caused by Ericsson Amplifier Technologies).

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COMMENTS ON FILTER FUNCTIONS

To fulfil the cellular standard (e.g. IS-138-A) it is necessary to use a bandpass filter to restrict spurious emissions outside the TX-band. This filter is included in the normal base station structure.

In order to fulfil §2.1051. Spurious emission at the antenna terminal a Low Pass Filter MUST be inserted between the subsystem output and the antenna

The filter attenuation must be greater or equal to:

Frequency Range (Mhz)	Attenuation (dB)
910 – 1788	45
1788 - 2700	20

Modifications to the subsystem, MCPA module or subrack shall not be made without written permission from Ericsson Amplifier Technologies Inc. Unauthorized modifications may void the authority granted under Federal Communications Rules permitting the operation of this device.

In order not to violate the FCC certification for this device, a filter must be used between the subsystem output and the antenna. The filter attenuation characteristics must be greater or equal to the filter performance shown above. When the subsystem is properly installed in its normal working environment the filter requirement is automatically fulfilled.

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RETURN FOR REPAIR

FIELD OPERATION SUMMARY SHEET

Please make a copy of this sheet, and complete the following questionnaire. If necessary, attach additional sheets. This information will assist in expediting repairs to the equipment, and is used for fault trend analyses and ongoing product improvement.

FIELD TECH NAME:_____ DATE: _____

EQUIPMENT LOCATION (CELL SITE NUMBER): _____ _____

_____ _____ _____

MODEL NUMBER: _____ _____ ____

SERIAL NUMBER: _____ _____ ____

FREQUENCY OF OPERATION: A:_____ B: _____

CARRIER POWER:_____ _____ ____

MAXIMUM NUMBER OF CARRIERS: _____ _____

LED INDICATOR STATUS:

LED DESCRIPTION	LED ON Check ☑	LED OFF Check ☑
DC ON:	☐	☐
ENABLE:	☐	☐
FAN ALARM:	☐	☐
LOOP ALARM:	☐	☐
VSWR ALARM:	☐	☐
POWER SUPPLY ALARM:	☐	☐
TEMPERATURE ALARM:	☐	☐
OVER POWER ALARM:	☐	☐
MINOR:	☐	☐
MAJOR:	☐	☐
CRITICAL:	☐	☐
ALC:	☐	☐

UNIT SURFACE TEMPERATURE: _____ _____

POWER SUPPLY MODEL OR CAPABILITY: _____ _____

_____ _____ _____

OTHER DETAILS OF PROBLEM REPORTED:_____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

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1. GENERAL DESCRIPTION

1.1 Introduction

This manual provides information for the installation, operation and maintenance of Ericsson Amplifier Technologies MCPA Subsystem. The subrack is specifically designed for use with Ericsson Amplifier Technologies Multicarrier Power Amplifiers (MCPAs). Refer to the separate Ericsson Amplifier Technologies Technical Manual that accompanied the MCPA power amplifier, for specific installation, operation and maintenance instructions for the MCPA(s). In addition, refer to the specification limits contained in Table 1.

This manual is organized in 5 sections as follows:

- Section 1. General Description of the subrack assembly
- Section 2. Installation
- Section 3. Operating Instructions
- Section 4. Principles of Operation
- Section 5. Maintenance

1.2 Related Publications

Multicarrier Power Amplifier MCPA
Installation, Operation and Maintenance Instructions.

1.3 General Description

The MCPA subrack (Figure 1) is a microprocessor-controlled RF amplifier subrack assembly that operates over the frequency range of 869 to 894 MHz. It is specifically designed for use with up to four companion Ericsson Amplifier Technologies Multi-Carrier Power Amplifiers (MCPAs). The subrack assembly contains an active combiner, which automatically reconfigures itself to effectively combine the individual modules. The active combiner uses blind mate connectors, allowing MCPA installation and removal as needed with the subrack power on. The vertical subrack mounts in a 24-inch rack.

User I/O is provided through the subrack assembly. The control and status of each module is sent to the subrack assembly from the individual modules and converted into a format suitable for the user. Local operating status is provided via front panel LED indicators. The subrack assembly is powered by an external (customer supplied) 26-28 VDC power supply. A microprocessor board in the subrack assembly handles all the necessary control between the individual modules, the subrack and the user. The firmware resident in all assemblies can be updated through the subrack RS-232 port using custom software and a laptop.

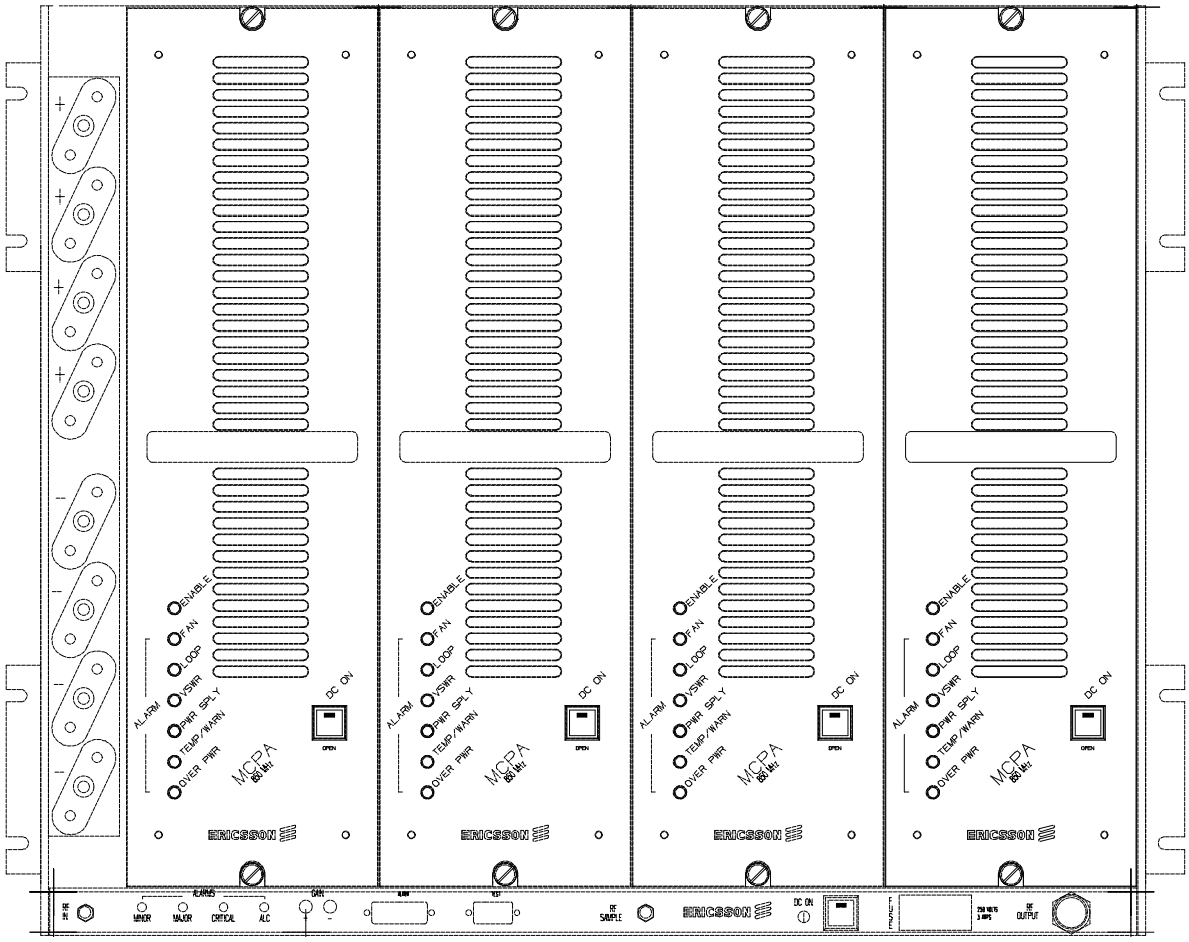

Figure 1. MCPA Subsystem Assembly
(Shown with four Ericsson Amplifier Technologies MCPA's installed)

1.4 Equipment Specifications

Table 1 lists the specifications of the MCPA subsystem assembly.

Table 1. Specifications
for Ericsson MCPA Subsystem Assembly

PERFORMANCE CHARACTERISTICS	
Parameter	**Specification**
Frequency	869 – 894 MHz
Active Combined RF Output Power, 2-32 Carriers: Normal V_{IN}= 26-28V:	 (1x MCPA any combination) 100 Watts Minimum (2x MCPA any combination) 200 Watts Minimum (3x MCPA any combination) 300 Watts Minimum (4x MCPA any combination) 400 Watts Minimum
Exceptional V_{IN}= 21-26V, 28-30V:	(1x MCPA any combination) 50 Watts Minimum (2x MCPA any combination) 100 Watts Minimum (3x MCPA any combination) 150 Watts Minimum (4x MCPA any combination) 200 Watts Minimum
IMD, 869-894MHz:	-63 dBc minimum when measured with 50 random phase sets.
Spurious:	-63 dBc minimum when measured with 50 random phase sets.
Pilot Tone Level:	-20 dBm with 4 MCPAs installed.
Harmonics:	2^{nd}: 40 dBc minimum 3^{RD} and higher: 60 dBc minimum
Noise Receive Band:	-35 dBm maximum / 30 kHz RBW per MCPA, -40 dBm typical / 30 kHz RBW at 824-849 MHz
Gain Flatness:	±0.5 dB maximum (all conditions)
Gain Variation:	±0.5 dB over nominal operating range with respect to 25ºC and 27 volt operation
Gain:	54.5 dB nominal; Adjustable from 0 – 15 dB through front panel recessed momentary switches. Gain is managed in the event of a problem with an installed MCPA, to reduce gain and permit continued operation at reduced output. Gain is determined by operating vs. non-operating MCPAs installed, as shown in Table 2.

Table 1. (Continued)
Specifications for Ericsson MCPA Subsystem Assembly

PERFORMANCE CHARACTERISTICS	
Parameter	**Specification**
Input VSWR:	1.5:1 maximum
Input Power:	3 dBm maximum (over full attenuator range)
Sample Port Coupling:	50 dB ±0.5 dB from main output level
Output VSWR:	2:1 Maximum
Load Stability:	VSWR ∞ : 1, all phases
DC Input; Normal Conditions: Exceptional Conditions:	 26 to 28 VDC, full operation without performance degradation; 27V @ 200.0 A typical @ 400 W (Refer to Table 4) 21-26VDC, 28-30VDC with degraded performance.
Operating Temperature; Normal: Exceptional:	 +5° to +40°C 5°C above and below normal limits, with degraded performance.
Storage Temperature:	-40° to +70°C
Humidity:	5% to 95% RH, non-condensing
Operating Altitude:	61 M below sea level to 3,000 M above sea level.
Vibration:	1 G/Hz from 20 to 50 Hz
Dimensions:	23” rack wide x 19” high x 18” deep 58.42 cm rack wide x 48.26 cm high x 45.72 cm deep
Subrack Main RF Input connector:	J1, SMA female
Subrack Main RF Output connector:	J10, N female
Subrack RF FWD Sample	J17, SMA female
Subrack DC PWR Interface	8 Position Terminal Block (see Table 5)
Subrack I/O Interface	15 Pin D subminiature female connector (see Table 6); 8-bit asynchronous serial bus, which complies with the EIA/TIA-422-A Standard for interfacing digital equipment using differential balanced voltages.
LED Status Monitoring	Low Power MCPA1 through MCPA4, and DC On

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Table 2. Nominal Gain for Installed Configuration

Operational Modules less Non-Operational Modules*	1 module System	2 module System	3 module System	4 module System
1	54.5 dB	51.5 dB	49.7 dB	48.5 dB
2	-	54.5 dB	52.7 dB	51.5 dB
3	-	-	54.5 dB	53.2 dB
4	-	-	-	54.5 dB

*Non-operational modules refer to modules which have been disabled due to alarms. Above values valid during normal operation (26-28VDC input). Reduce above values by 1 dB during exceptional operating conditions (21-26VDC, 28-30VDC input).

Table 4. DC Power Consumption versus Operating Status
Ericsson MCPA Subsytem Assembly

Operating Status	**DC LED Status**	**Enable LED Status**	**DC Power (W) @ 27V 1 module**	**DC Power (W) @ 27V 2module**	**DC Power (W) @ 27V 3 module**	**DC Power (W) @ 27V 4 module**
Prime Power Applied Internal DC Status OFF	OFF	OFF	15.0 typ 17.3 max.	30.0 typ. 34.5 max.	45.0 typ. 51.8 max.	60.0 typ. 69.0 max
Bias On (no RF)	ON	ON	615.0 typ. 707.0 max.	1230.0 typ. 1415.0 max	1845.0 typ. 2122.0 max.	2460.0 typ. 2829.0 max.
Forward Power 100 W	ON	ON	1350.0 typ. 1553.0 max.			
Forward Power 200 W	ON	ON		2700.0 typ. 3105.0 max.		
Forward Power 300 W	ON	ON			4050.0 typ. 4660.0 max.	
Forward Power 400 W	ON	ON				5400.0 typ 6210.0 max

2. INSTALLATION

2.1 Introduction

This section contains receiving, unpacking and installation recommendations for the Ericsson Amplifier Technologies MCPA subrack assembly. Carefully read and review all of the information contained in this section before attempting to install or operate the subrack assembly. In addition, read and review the operating instructions contained in Section 3 before operating the equipment.

CAUTION

The subrack assembly is specifically designed for use with Ericsson Amplifier Technologies Multicarrier Power Amplifiers (MCPAs). Refer to the Installation, Operation and Maintenance instructions included with the companion MCPA before operating this equipment. Improper operation of this equipment may cause damage to it, or to the equipment connected to it.

2.2 Electrical Service Recommendations

It is recommended that each 400-Watt subsystem power source be equipped with one of the circuit breaker configurations shown in Figure 2, installed in a load center with a master mains switch or breaker. This arrangement permits service and maintenance of the subrack assembly without the necessity for removing power to the entire site, and ensures continuous coverage in the event that one of the two circuit breakers should trip.

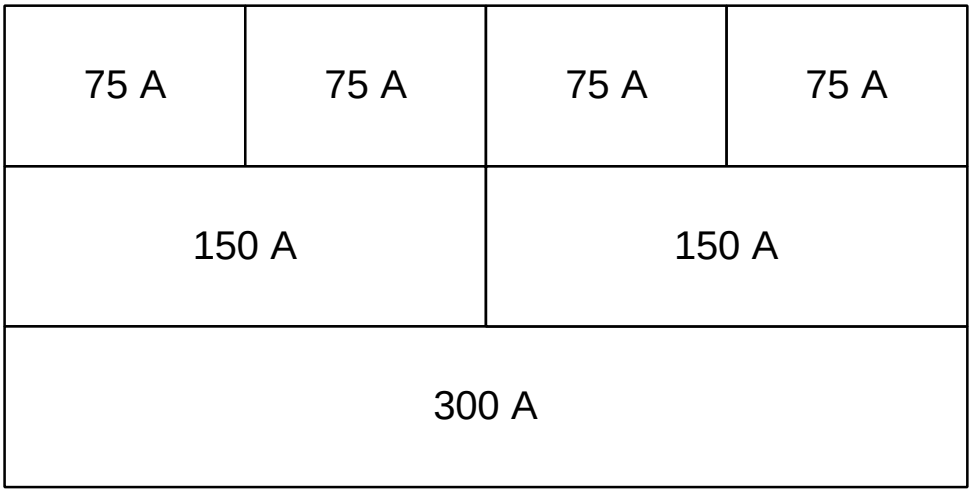


Figure 2. Recommended Circuit Breaker Configurations

2.3 Receiving, Unpacking and Inspection

The subrack assembly has been tested and calibrated at the factory prior to shipment. No additional readjustment is required prior to installation.

The subrack assembly is shipped in a single container. Check the exterior of the shipping container for any visible signs of damage. If possible, open the container in the presence of the delivery agent. Carefully unpack the subrack assembly and save all packing material for possible reshipment. After removal from the container, check the subrack assembly for physical damage such as scratched panels, damaged connectors, etc. If damage is noted, immediately file claim with the delivery agent or freight carrier.

2.4 Repackaging for Shipment

Should it ever become necessary to return the subrack assembly for service or repair, the following procedure should be followed.

a. Use the original container, if possible.

b. Wrap the item in heavy paper or plastic before placing it in the shipping container.

c. Use packing material around all sides of the item.

d. Use a heavy cardboard box or a wooden container to house the item. Seal the container with heavy-duty tape (Fiberglas) or strap the container with metal bands.

e. Mark the container: "**FRAGILE - DELICATE INSTRUMENT**".

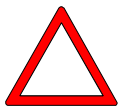
2.5 Environmental Limitations

The subrack assembly is designed to operate in an environment as noted in Table 1 of this manual. The subrack assembly must be installed in an area where an adequate and unrestricted supply of air is available for cooling. Adequate clearance must be provided to prevent obstruction of airflow. Confirm that proper DC power is available for the equipment.

2.6 Installation

The subrack is designed for installation into a standard 24-inch rack or enclosure. Installation procedures vary based on site structure; however, it is recommended that an open frame rack be used where possible. This will ensure adequate airflow for the amplifier system. Proceed to install the subrack as follows:

WARNING



INSTALL RACK OR FRAME TO BE USED IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION RECOMMENDATIONS. ENSURE THAT THE RACK OR FRAME HAS BEEN PROPERLY AND SECURELY FASTENED TO PREVENT IT FROM FALLING AS THE EQUIPMENT IS INSTALLED. PERSONAL INJURY AND EQUIPMENT DAMAGE CAN RESULT FROM IMPROPER RACK OR FRAME INSTALLATION.

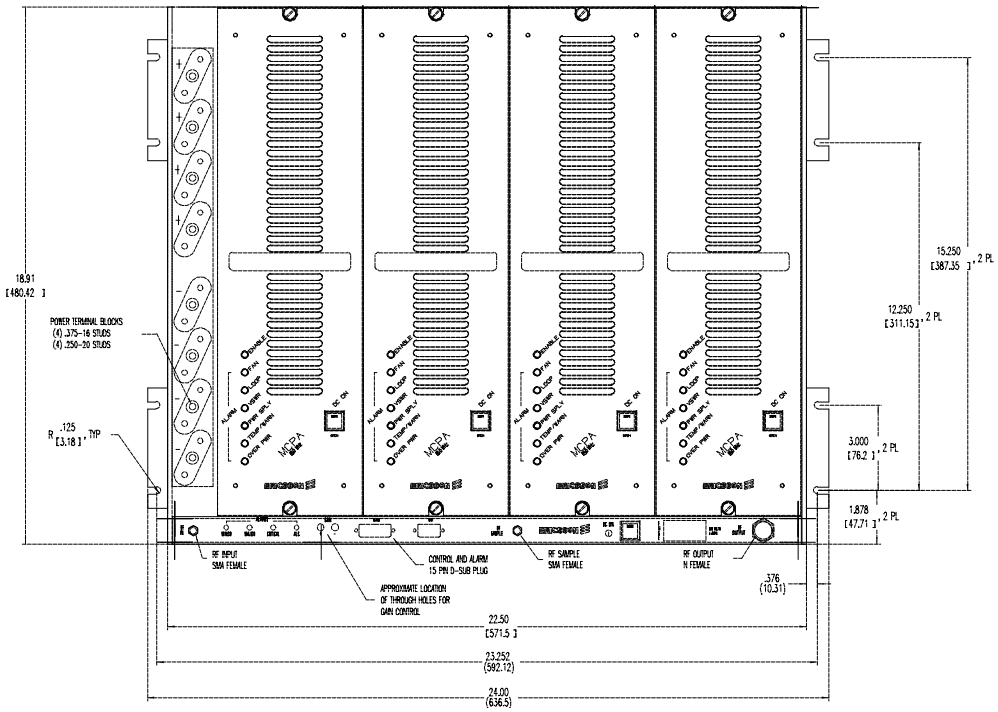
a. Refer to the Outline and Installation drawing of Figure 3, and determine where the subrack will be positioned in the rack or frame. Four mounting brackets are located at the sides of the assembly for securing to the rack or frame.

b. With the amplifier modules removed, lift the subrack to the desired location in the rack or frame, aligning the eight cutouts with the screw holes of the rack.

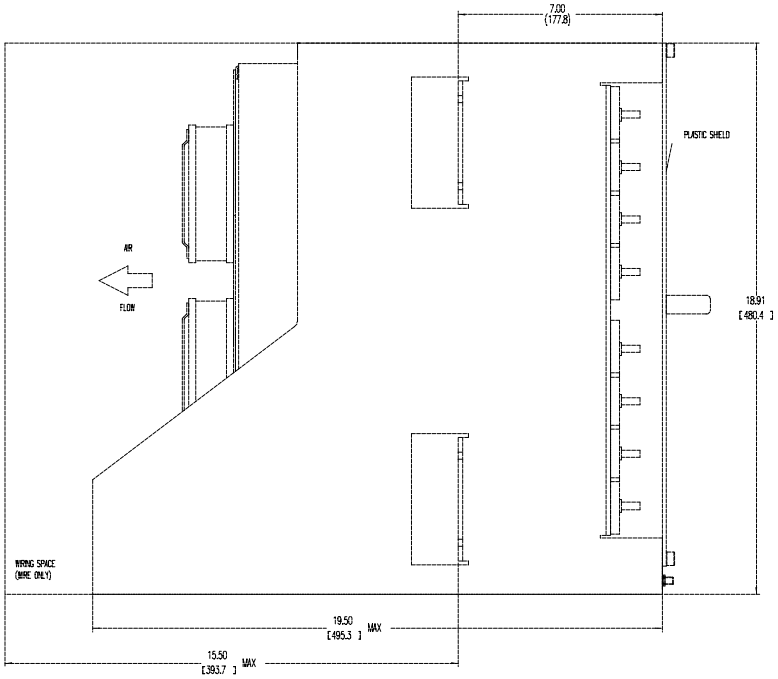
c. Mount the subrack assembly to the rack through the eight mounting holes (two per bracket) using eight (8) ½-inch, 10-24 threaded screws with washers. Hand tighten hardware; do not over tighten.

d. Install the individual MCPA amplifier modules into the subrack, beginning from the left. Use firm, but not excessive force when installing the MCPA amplifiers to ensure a good connection is made.

e. Hand tighten the retaining screws on the front panels of the MCPAs. Do not over tighten.



Front View, Subsystem Assembly

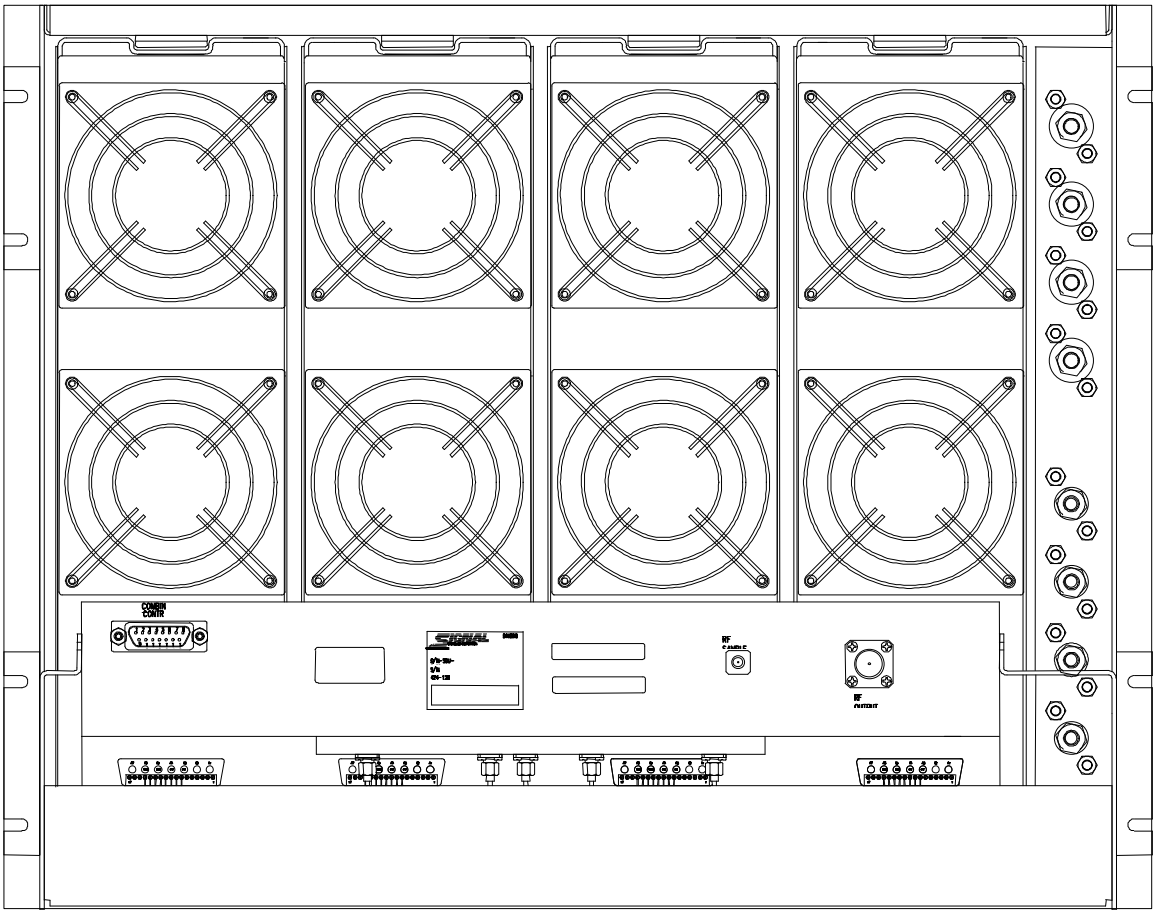


Side View, Subsystem Assembly

Figure 3. Outline and Installation Drawing, Ericsson Amplifier Technologies MCPA Subrack Assembly

(Shown with four Ericsson Amplifier Technologies MCPA's Installed)

(Sheet 1 of 2)

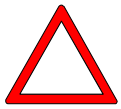


Rear View of Subsystem Assembly

Figure 3. Outline and Installation Drawing, Ericsson Amplifier Technologies MCPA Subrack Assembly
(Shown with four Ericsson Amplifier Technologies MCPA's Installed)
(Sheet 2 of 2)

2.7 Cable Interconnections

WARNING



ENSURE THAT ALL DC AND RF POWER TO THE SYSTEM IS DISABLED BEFORE MAKING ANY CONNECTIONS. OPERATOR INJURY AND/OR EQUIPMENT DAMAGE CAN RESULT FROM CARELESS ERRORS DURING WIRING.

All DC cable interconnections are accomplished at the front of the subrack. Affix the DC cable lugs onto the terminal block studs. Note that the positive terminal blocks have 3/8" studs and the negative terminal blocks have ¼" studs.

NOTE

DC cables should be a minimum of 6 AWG.

Using a 9/16" wrench for the positive connections and a 7/16" wrench for the ground connections, tighten each nut until the DC cables are securely in place. Note that the maximum torque rating for the positive (3/8" stud) blocks are *150 lb in* and *80 lb in* for the negative (1/4" stud) blocks. See Figure 4 and Table 5 for proper cable positioning on the terminal block.

Connect the RF input to the SMA female connector located on the left of the front plane. Using a 5/16", open ended wrench, tighten the connection until it is snug. Connect the RF output cable to the N female connector located to the right of the RF input connector. Using a set of connector pliers, tighten the connection until it is snug.

Connect the 15 pin male connector to the I/O interface located on the rear of the subrack. Using a small flat head screw driver, tighten the two retaining screws on the sides of the I/O connector.

CAUTION

Do not connect dc power to the subrack assembly until proper DC supply voltages have been verified. Damage to the subrack assembly can occur if improper voltages are applied.

2.7.1 DC Power Terminal Block

The DC interface is a single column of 8 terminal blocks, as shown in the detail view of Figure 4. TB1 through TB4 are the positive connections and TB5 through TB8 are the ground connections.

NOTE

It is recommended that each 400-Watt Sub-system power source be equipped with two, 125 amp circuit breakers, installed in a load center with a master switch or breaker. This arrangement permits service and maintenance of the subsystem without the necessity for removing power to the entire site, and ensures continuous coverage in the event that one of the two circuit breakers should trip

Using the appropriate wrench, tighten each of the terminals (TB1-TB8) making sure not to exceed the respective maximum torque rating of the blocks. Connections are as shown in Figure 4 and Table 5.

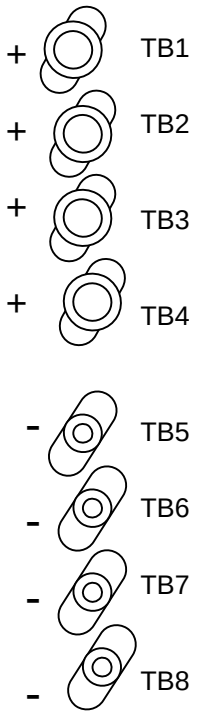


Figure 4. Detail View, DC Power Terminal Blocks TB1-TB8

Table 5. TB1-TB8 Power Terminal Block Connectors

TERMINAL	DC SUPPLY CIRCUIT	DESCRIPTION
TB1	125A CIRCUIT 1	+ DC Power Input for Amplifier Module 1 and Subrack.
TB2	125A CIRCUIT 2	+ DC Power Input for Amplifier Module 2.
TB3	125A CIRCUIT 3	+ DC Power Input for Amplifier Module 3.
TB4	125A CIRCUIT 4	+ DC Power Input for Amplifier Module 4.
TB5	CIRCUIT 1 RETURN	- DC Power Return for Amplifier Module 1 and Subrack.
TB6	CIRCUIT 2 RETURN	- DC Power Return for Amplifier Module 2.
TB7	CIRCUIT 3 RETURN	- DC Power Return for Amplifier Module 3.
TB8	CIRCUIT 4 RETURN	- DC Power Return for Amplifier Module 4.

2.7.2 J4 - I/O Connector

The I/O connector is a 15 Pin D subminiature female type. The I/O Control and Status interface is detailed in Table 6. Tighten the two retaining screws on the sides of the I/O connector at J4, using a small flat-head screwdriver.

Table 6. I/O Connector Wiring

Pin	Interface Description	Subrack I/O	Electrical Protocol
1	Minor (Fan Failure)	O	Open = Alarm, Closed = OK
2	Minor common	O	Open = Alarm, Closed = OK
4	Major (Single MCPA Module failure)	O	Open = Alarm, Closed = OK
5	Major common	O	Open = Alarm, Closed = OK
6	Critical (All MCPA Module Failure)	O	Open = Alarm, Closed = OK
7	ALC Alarm	O	Open = Alarm, Closed = OK
8	ALC common	O	Open = Alarm, Closed = OK
9	Critical common	O	Open = Alarm, Closed = OK
10	Control (All modules On/Off)	I	Open to Closed Edge = All modules On Closed to Open Edge = All modules Off Note low current 5 vdc potential is on this pin
11	Control common	I	GND Potential
12	Pwr On	O	Open = No DC Pwr, Closed = DC Pwr on
13	Pwr On common	O	Open = No DC Pwr, Closed = DC Pwr on

2.7.3 J1, J10, J17 – RF Input, RF Output and RF Sample connectors

a. Connect the system RF input cable to the subrack assembly at SMA connector J1. Tighten the connection using a 5/16”, open ended wrench until secure.

b. Connect the system RF output cable to the subrack assembly at type N connector J10. Tighten the connection using connector pliers until secure.

c. Connect the system RF sample output to the subrack assembly at SMA connector J17. Tighten the connection using a 5/16”, open ended wrench until secure. This sample port is 50 ±1 dB below the main RF output at J10.

2.8 Verify Connections

Recheck all connections. Make certain that all connections are correct and secure.

2.9 Verify DC Supply Voltage

Measure the DC supply voltage that will power the subrack assembly. The voltage must be 26 to 28 VDC (27VDC optimum). Degraded operation will result with DC input of 21-26VDC and 28-30VDC. Never operate the system outside of these limits. Refer to Section 3 for operating instructions.

CAUTION

DO NOT OPERATE SUBRACK ASSEMBLY WITH A DC SUPPLY VOLTAGE OUTSIDE OF THESE LIMITS. DAMAGE WILL OCCUR TO THE SUBRACK AND MCPAS DUE TO APPLICATION OF IMPROPER POWER SUPPLY VOLTAGES.

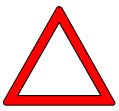
CAUTION

REFER TO THE ACCOMPANYTING TECHNICAL MANUAL FOR THE MCPA USED WITH THE SUBRACK. THE MCPA REQUIRES A SPECIFIC VOLTAGE. DO NOT OPERATE MCPA AND SUBRACK ASSEMBLY WITH A DC SUPPLY VOLTAGE OUTSIDE OF THE RANGES SPECIFIED FOR THE MCPA. DAMAGE WILL OCCUR TO THE MCPA DUE TO APPLICATION OF IMPROPER POWER SUPPLY VOLTAGES.

3. OPERATING INSTRUCTIONS

3.1 Safety Precautions

During normal operation, personnel must be cognizant of the intrinsic hazards related to electronic equipment in general, and RF power amplifiers in particular. This subsystem processes high RF power (up to 400 watts) which is dangerous and can cause serious RF burns if contacted. Caution must be exercised when working with this subrack assembly and related amplifier(s). While every practicable safety precaution has been incorporated into this subrack assembly, the following rules must be strictly observed:



WARNING

KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must observe all safety regulations at all times. Do not make adjustments inside equipment with hazardous voltages present. Do not operate the amplifier without proper RF termination.

DO NOT SERVICE OR ADJUST ALONE

Under no circumstances should any person reach within or enter any enclosure for purposes of servicing or adjustment without the immediate presence and assistance of another person capable of rendering aid. Knowledge of first aid for electrical shock and burns is necessary.

PERSONNEL

Only trained personnel are to service and adjust the amplifier. Personnel must be trained in the maintenance of equipment with hazardous RF power, and must be familiar with this amplifier. In addition, the following precautions must be observed during operation.

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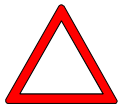
WARNING



MAINTAIN PROPER TERMINATION AT THE OUTPUT PORT OF THE SUBSYSTEM. DO NOT REMOVE OR EXCHANGE RF CABLES OF THE OUTPUT LOAD CIRCUIT WHILE THE SUBSYSTEM IS IN OPERATION. DANGEROUS RF VOLTAGE MAY EXIST AT THE FOREMOST TERMINAL OF THE INTERRUPTED LOAD CIRCUIT DURING OPERATION.

CAUTION

All interconnecting cables must be connected prior to application of RF power. Although the subsystem is designed to withstand all output load conditions including open and short circuit conditions, it is recommended to connect an appropriate RF load to the output port of the subsystem prior to application of RF power.

CAUTION

Maintain proper RF input to the amplifier. Damage to the amplifier may occur if excessive RF input is applied.

3.2 Controls and Indicators

The subrack assembly is equipped with a local DC ON/OFF control, and status indicators on the front panel. A rear panel I/O interface is provided for remote status monitoring and control. The following paragraphs detail these features.

3.2.1 Local Controls and Indicators

Figure 5 is a detail view of the front panel of the subrack assembly, showing the local controls and indicators area. Table 7 describes the controls and indicators. Refer also to Appendix A, which contains a description of the controls and indicators provided on the individual Ericsson MCPA amplifier modules.

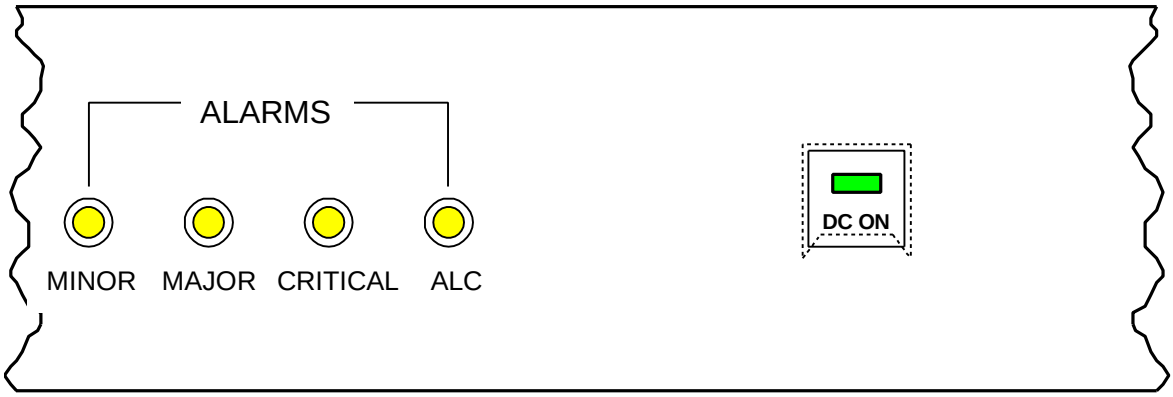


Figure 5. Detail View, MCPA Subrack Local Controls and Indicators

Table 7.
Subrack Assembly Local Controls and Indicators

CONTROL/INDICATOR	FUNCTION
POWER ON/OFF -	Line switch (with switch cover guard) and integral green DC ON LED indicator, enables the high power +27V power supply circuitry.
MCPA1 through MCPA4 -	Yellow LED indicating a low power output condition from the monitored MCPA. The associated indicator is activated when 1 or more MCPA outputs is 10 dB or more below the others.

3.2.2 Remote Control/Status Interface

The subrack assembly is equipped with a control input as well as built-in-test (BIT) status outputs at I/O Control and Status connector J4. The I/O Control and Status interface is detailed in Table 6.

3.3 Initial Turn On Procedure

The following procedure is intended to verify operation of the subrack assembly following installation, repair or replacement. Refer to the companion MCPA Installation, Operation and Maintenance Manual for additional instructions regarding MCPA turn on.

WARNING

EQUIPMENT OPERATORS MUST BE FAMILIAR WITH ALL SAFETY PRECAUTIONS OUTLINED AT THE BEGINNING OF THIS SECTION PRIOR TO OPERATING THE SUBRACK. OPERATOR INJURY AND/OR EQUIPMENT DAMAGE WILL RESULT FROM IMPROPER OPERATION.

a. Verify that all connections to the subrack assembly have been properly made in accordance with Section 2 of this manual, and the outline and installation drawing, Figure 3.

b. With no RF applied to the subrack assembly, depress the POWER ON/OFF switch. Depress ON/OFF switch on each MCPA module. The DC ON LED and ENABLE LED will be illuminated.

c. Apply reduced RF input (-60 dBm) to the subrack assembly's RF IN connector, J1 within the 869-894 MHz frequency range.

CAUTION

Maintain proper RF input level within the 869-894 MHz operating band. Improper RF input may cause severe subrack assembly damage.

d. Increase input level to between -15 and -11 dBm, and observe that only the DC ON and ENABLE LEDs are illuminated.

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3.4 Normal Operation

The subrack assembly requires minimum attention during normal operation. Monitoring of the BIT status outputs and RF sample output provides an overall indication of subrack assembly health.

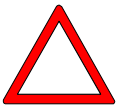
3.5 Shut Down Procedure

a. Reduce RF input signal level to minimum (-60 dBm).

b. Depress the ON/OFF switch to shut down the subrack assembly. Depress the ON/OFF switch of each MCPA module to turn each off.

c. If maintenance or service is to be performed on the subrack assembly, or any of the MCPAs, deactivate prime dc power to the subrack assembly.

WARNING



THE DC ON/OFF SWITCH DOES NOT CONTROL THE MAIN +27 VDC FEED TO THE SUBRACK ASSEMBLY. IF MAINTENANCE OR SERVICE IS TO BE PERFORMED ON THE SUBRACK ASSEMBLY OR MCPAS, DEACTIVATE PRIME DC POWER AT ITS SOURCE.

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4. PRINCIPLES OF OPERATION

4.1 Introduction

The subrack assembly and up to four individual Multicarrier Power Amplifier (MCPA) modules comprise the Ericsson Amplifier Technologies MCPA subsystem. The resulting multicarrier amplifier subsystem is capable of linearly amplifying AMPS, TDMA and CDMA carriers at rated power. Extensive design and testing has been accomplished to ensure proper operation with all aspects of carrier count, carrier type and downlink power control in all of the standards. Additional standards such as EDGE and GSM can be supported at lower power levels.

This section contains a functional description of the subrack assembly. Refer to the block diagram of the subrack, Figure 7, located at the end of this section. The subrack assembly contains an active combiner, which automatically reconfigures to effectively combine the individual modules. Coupling the active combiner with blind mate connectors allows the user to hot swap modules as needed. User I/O is provided through the subrack assembly. The control and status of each module is sent to the subrack assembly from the individual modules, and is converted into a format suitable for the user. A microprocessor board in the subrack assembly handles all of the necessary control between the individual modules, the subrack and the user. The firmware resident in all assemblies can be updated through the subrack RS-232 port, using custom software and a laptop.

Table 8 shows how the gain varies with installed but non-operating modules. When the installed but non-operating module is replaced with an operational module, the subsystem gain is restored to 54.5 dB.

Table 8.
Nominal Gain for Amplifier Installed Configuration

Operational Amplifiers	1 module Subsystem	2 module Subsystem	3 module Subsystem	4 module Subsystem
1	47.5 dB	47.5 dB	47.5 dB	47.5 dB
2	-	50.5 dB	50.5 dB	50.5 dB
3	-	-	52.2 dB	52.2 dB
4	-	-	-	53.5 dB

User connections to the subsystem include:

- DC inputs for the subrack assembly
- One Subrack RF input
- One Subrack RF output
- One Subrack RF forward output sample
- One Subrack I/O interface

4.2 RF Input Signal

The maximum input signal for all carrier frequencies should not exceed the limits specified in the electrical specifications. The input VSWR should be 2:1 maximum (or better).

4.3 RF Output Load

The load impedance should be as close as possible to 50 ohms (VSWR of 1.5:1 or less) over the 869-894 MHz operating frequency band to ensure maximum RF power transfer to the load.

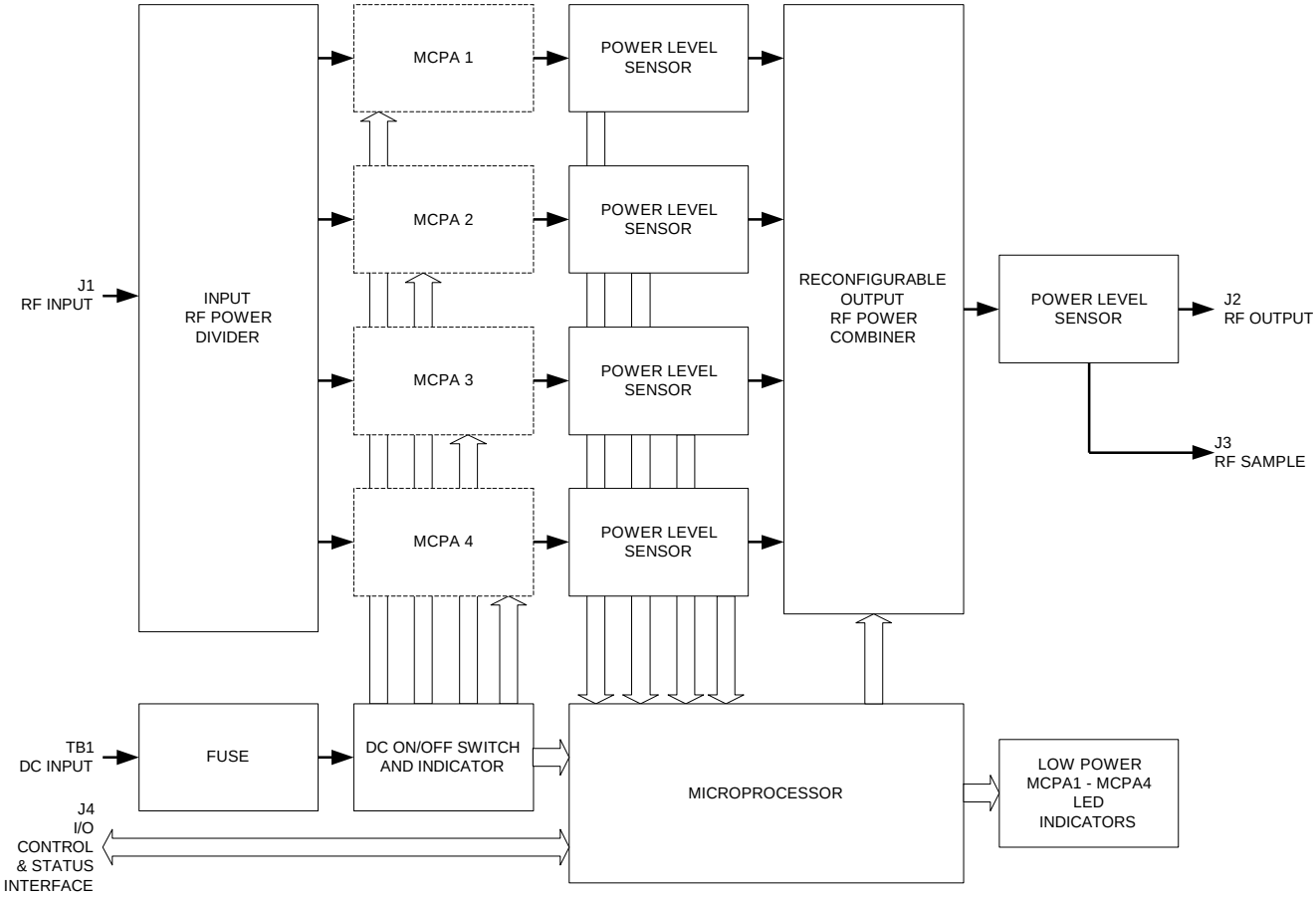


Figure 7. Block Diagram, MCPA Subsystem Assembly

5. MAINTENANCE

5.1 Introduction

This section provides information for periodic maintenance of the subrack assembly, as well as tests which are recommended in order to evaluate its performance. Refer to paragraph 5.3 for troubleshooting procedures for the subrack assembly.

CAUTION

Do not attempt to repair the subrack assembly. The equipment contains no user-serviceable components, with the exception of the fuse. Further damage will result from improper repairs.

NOTE

Do not break the seals on the equipment, as this will void the warranty.

5.2 Periodic Maintenance

Periodic maintenance tasks and recommended intervals are listed in Table 9.

Table 9. Periodic Maintenance Tasks

CATEGORY	TASK	RECOMMENDED INTERVAL	MAINTENANCE ACTION
Cleaning	Air Inlets/Outlets	30 Days	Inspect and clean in accordance with paragraph 5.2.1.
Inspection	Cables and Connectors	12 Months	Inspect all cables for any signs of damage or wear. Check and verify that all connections are secure.
Performance Tests		12 Months	Perform tests as outlined in paragraph 5.2.3.

5.2.1 Cleaning Air Inlets/Outlets

The air inlets and outlets are located at the front and rear of the unit. Air is drawn in from the front, and exhausted through the rear of the subrack. These areas should be cleaned at 30 day intervals, or sooner, if the equipment is operated in a severe dust environment. Use dry, low-pressure compressed air, or a brush with soft bristles to loosen, remove and clean off any accumulated dust from the air inlet and outlet areas.

5.2.2 Test Equipment Required

Table 10 lists the test equipment required for evaluating the subrack performance. Suitable equivalents may be substituted.

Table 10. Test Equipment Required

NOMENCLATURE	QTY	MANUFACTURER	MODEL
Signal Generator	1	H/P	ESG
Attenuator, 40 dB, 250 Watt	1	Weinschel	S3-40-43
Attenuator, 20 dB, 20 Watt	2	Weinschel	AT20
Spectrum Analyzer	1	H/P	8560E
Directional Coupler, 30 dB	1	RF Power	DDC-901-931-R5-30
Power Meter/Sensor	1	H/P	437B/8481A
Power Supply	1	H/P	6673A

5.2.3 Performance Tests

Performance tests should be performed at 12-month intervals, or as directed by the resident maintenance authority, to ensure that the subrack assembly is functioning properly and within expected specification limits.

5.3 Troubleshooting Procedures

Figure 8 is the troubleshooting flow chart for the subrack assembly.

CAUTION

Do not attempt to repair the subrack assembly. The equipment contains no user-serviceable components, with the exception of the fuse. Further damage will result from improper repairs.

NOTE

Do not break the seals on the equipment, as this will void the warranty

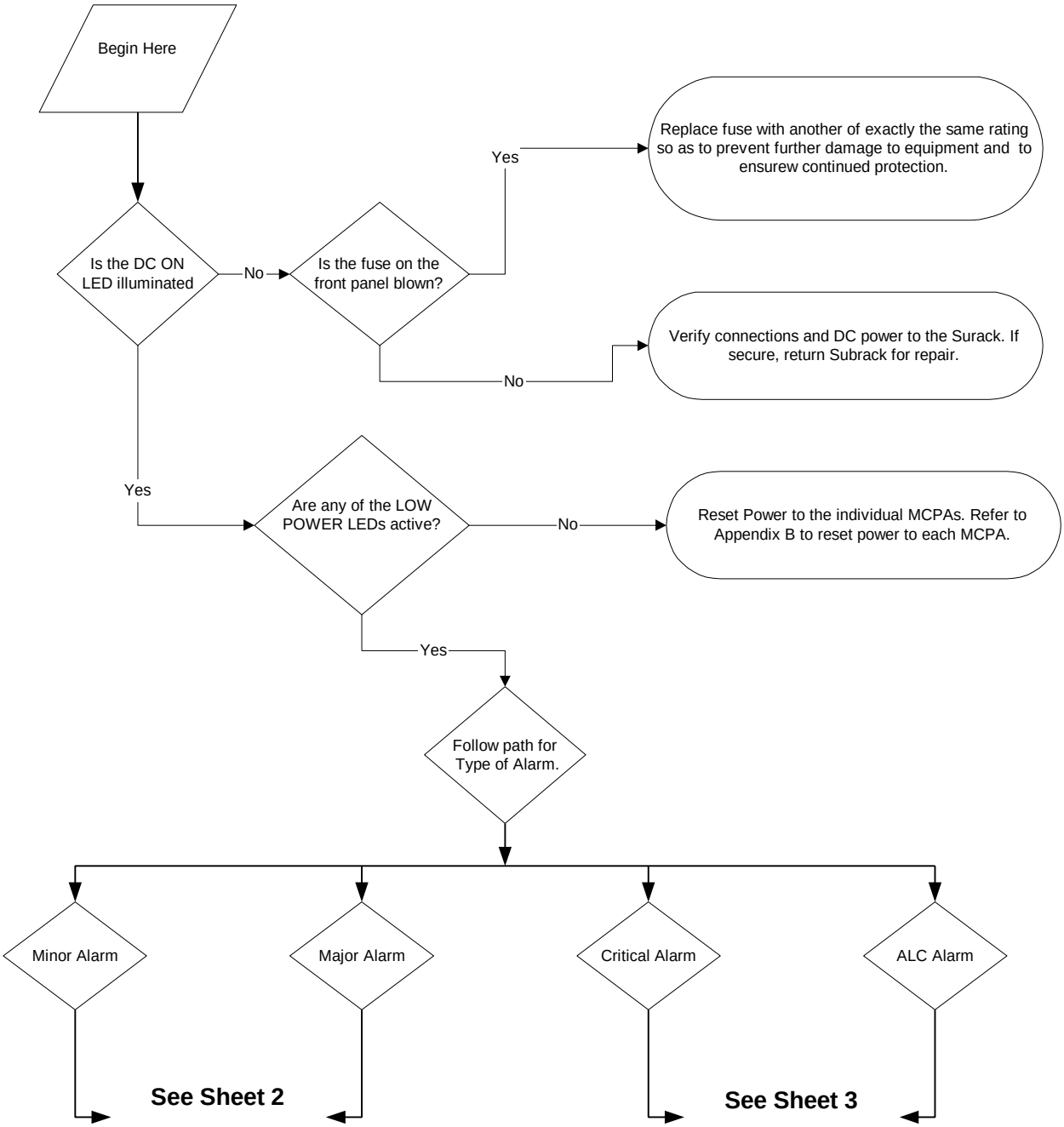
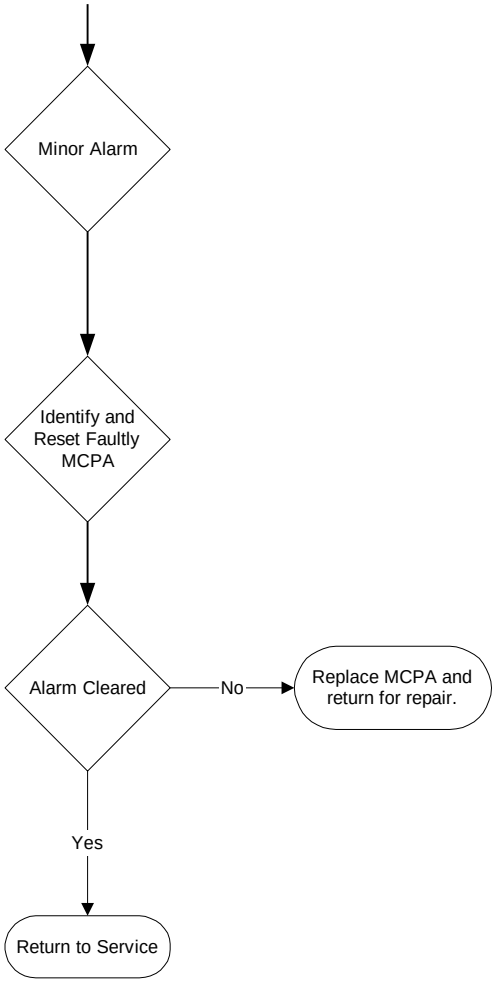


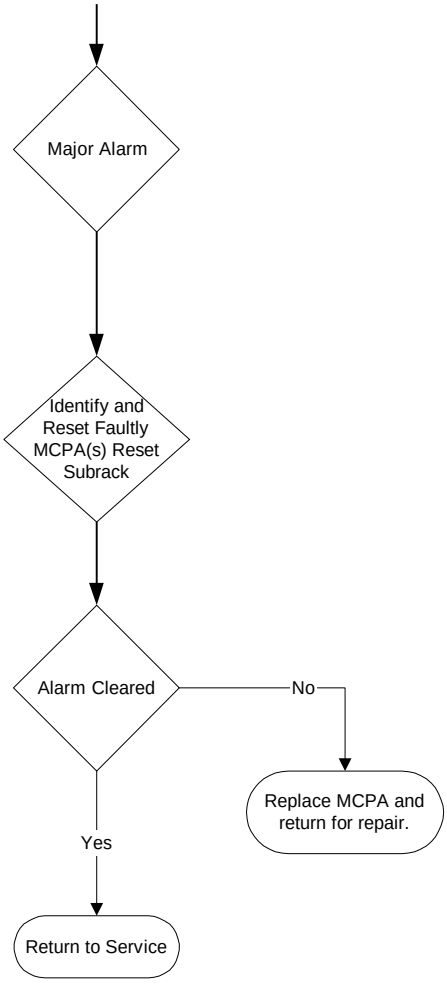
Figure:8 Subrack Troubleshooting Flow Chart.

SHEET. 2

From Sheet 1

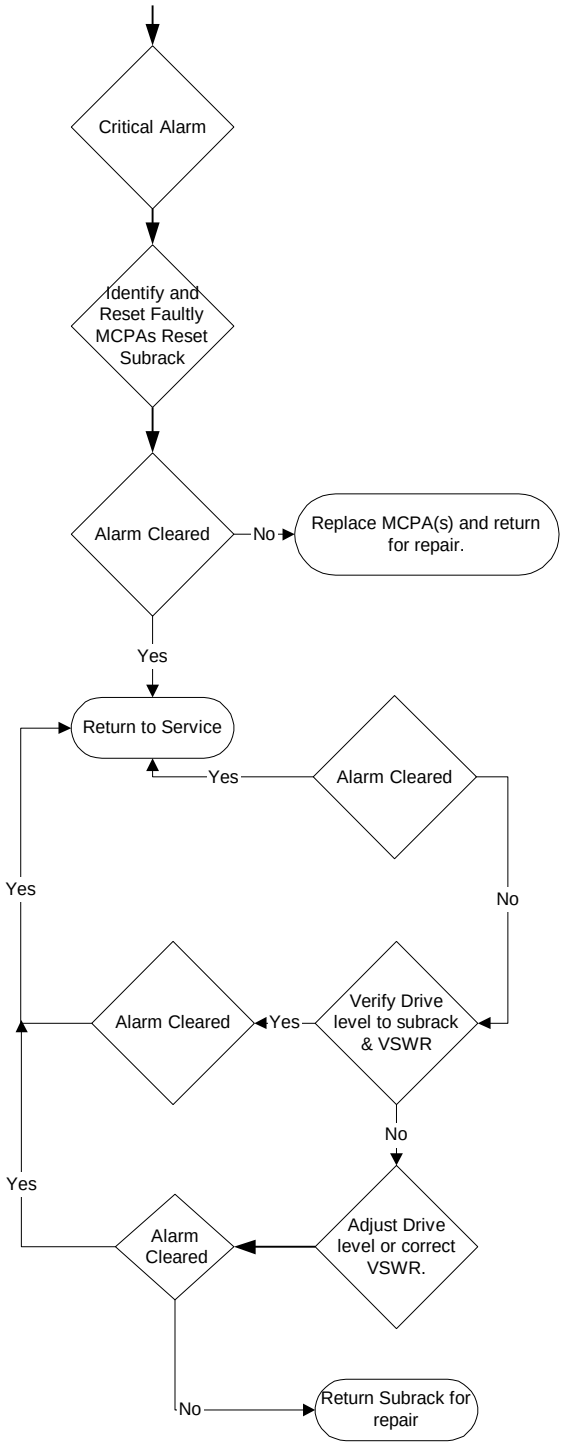


From Sheet 1



Sheet 3

From Sheet 1



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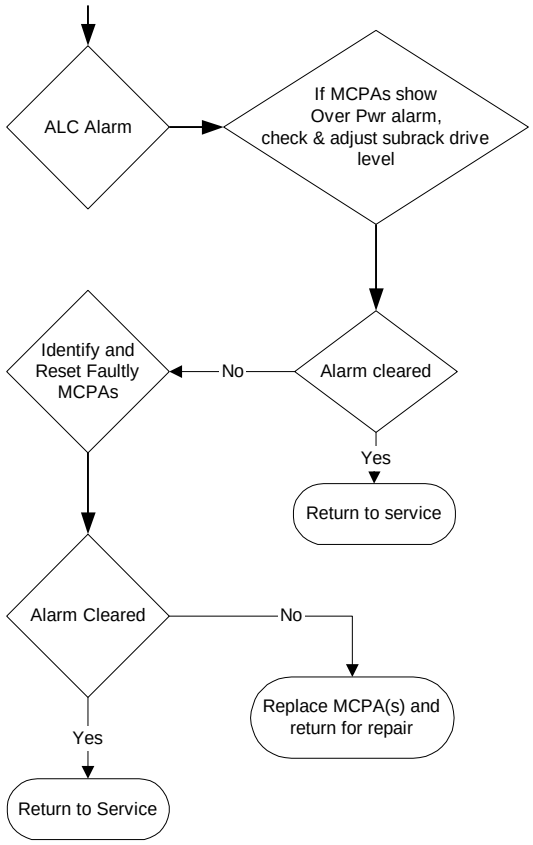

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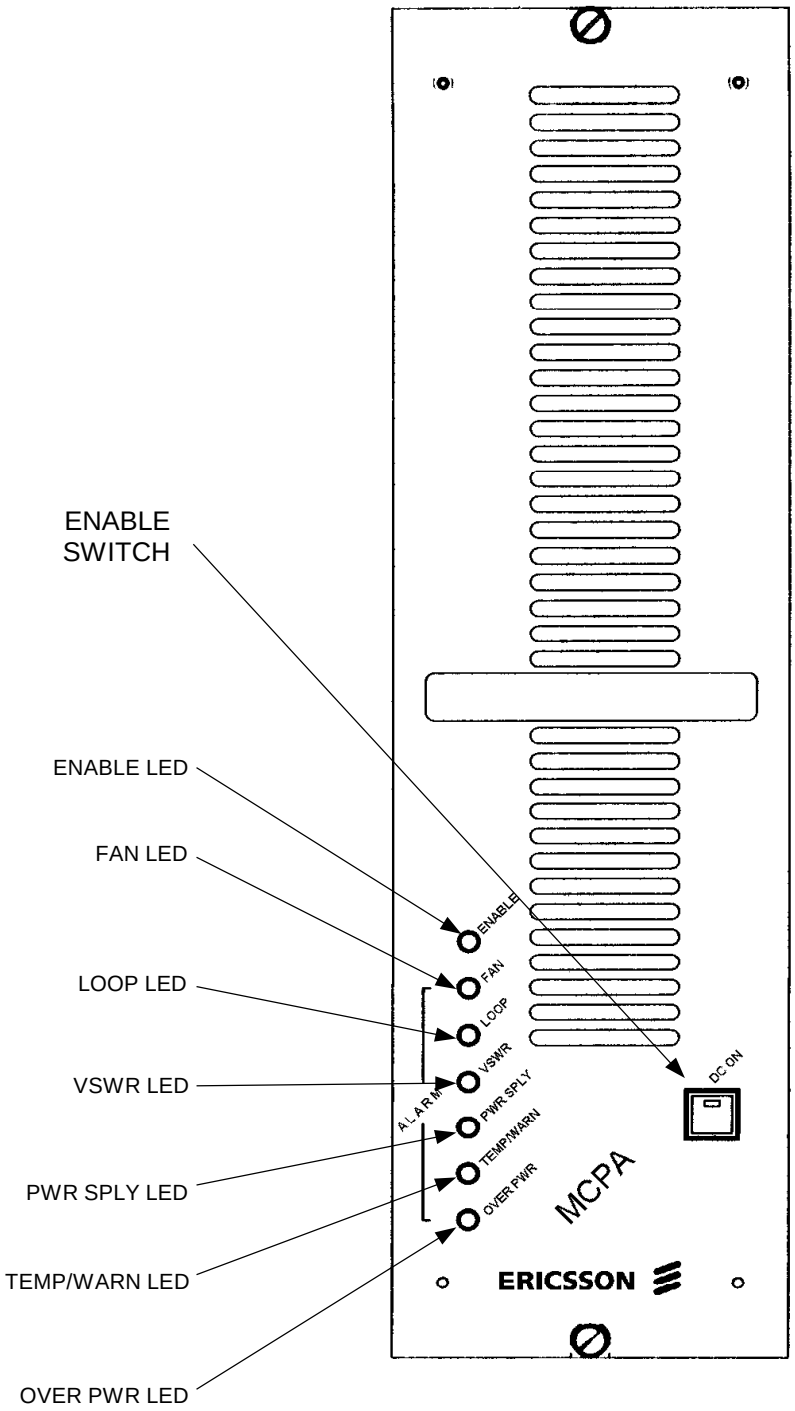
APPENDIX A

Ericsson MCPA Module Controls and Indicators



MCPA Local Controls and Indicators

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MCPA Local Controls and Indicators

CONTROL/INDICATOR	FUNCTION
DC ON -	Power Supply switch and integral DC ON green LED indicator, enables the external high power +27V power supply circuitry.
ENABLE ON -	Green LED indicates unit is ENABLED, biased on and the amplifier is ready to amplify signals.
FAN ALARM -	Yellow LED indicating a blocked or non-functioning fan.
LOOP ALARM (Steady On)-	Steady (not blinking) Red LED indicating internal control loops can no longer minimize IMD performance. The sequence of disable and enable commands may be used to reset the loops to their normal conditions.
LOOP ALARM – (Blinking On/Off, indicates Locking Mode)	Blinking red LED indicating **Locking Mode** has been entered. The locking mode is used to indicate when the module is unable to minimize IMD performance and is attempting to adjust loop coefficients. During this mode, IMD performance may not meet specified values. The module will attempt to improve performance for 1 minute. If unable to improve performance during this period, the module will indicate a loop alarm and enter the shutdown mode, and will require power to be reset in order to clear the fault.
VSWR ALARM -	Red LED indicating load VSWR is greater than 3.0:1. Amplifier will enter shutdown mode, and will require power to be reset in order to clear the fault.
POWER SUPPLY ALARM -	Red LED indicating a power supply generated voltage is out of range. Amplifier will enter shutdown mode, and will require power to be reset in order to clear the fault.
TEMP WARNING/ALARM - Dual color (Yellow/Red) LED.	**TEMP WARNING**: Yellow color indicates approach of excessive operating temperature of approximately +80°C as monitored on the heatsink. Operation of the MCPA can continue uninterrupted during this warning condition. **TEMP ALARM**: Red color indicates excessive operating temperature of approximately +90°C as monitored on the heatsink. Operation of the MCPA is disabled until the heatsink has cooled to a safe operating temperature, at which point, operation will automatically resume.
OVERPOWER ALARM -	Red LED indicating that the RF output power from the MCPA is greater than 2 dB above nominal output power. Amplifier will enter shutdown mode, and will require power to be reset in order to clear the fault.

NOTE

Activation of the **LOOP ALARM, VSWR ALARM, POWER SUPPLY ALARM, TEMP ALARM or OVERPOWER ALARM** will cause the Amplifier to enter shutdown mode. The amplifier will attempt to auto recover up to three times within 24 hours. If the alarm is still present, the amplifier will continue to shutdown. The amplifier may also be manually reset using the front panel button. Refer to Figure 4, which details the ON/OFF sequence of the MCPA.

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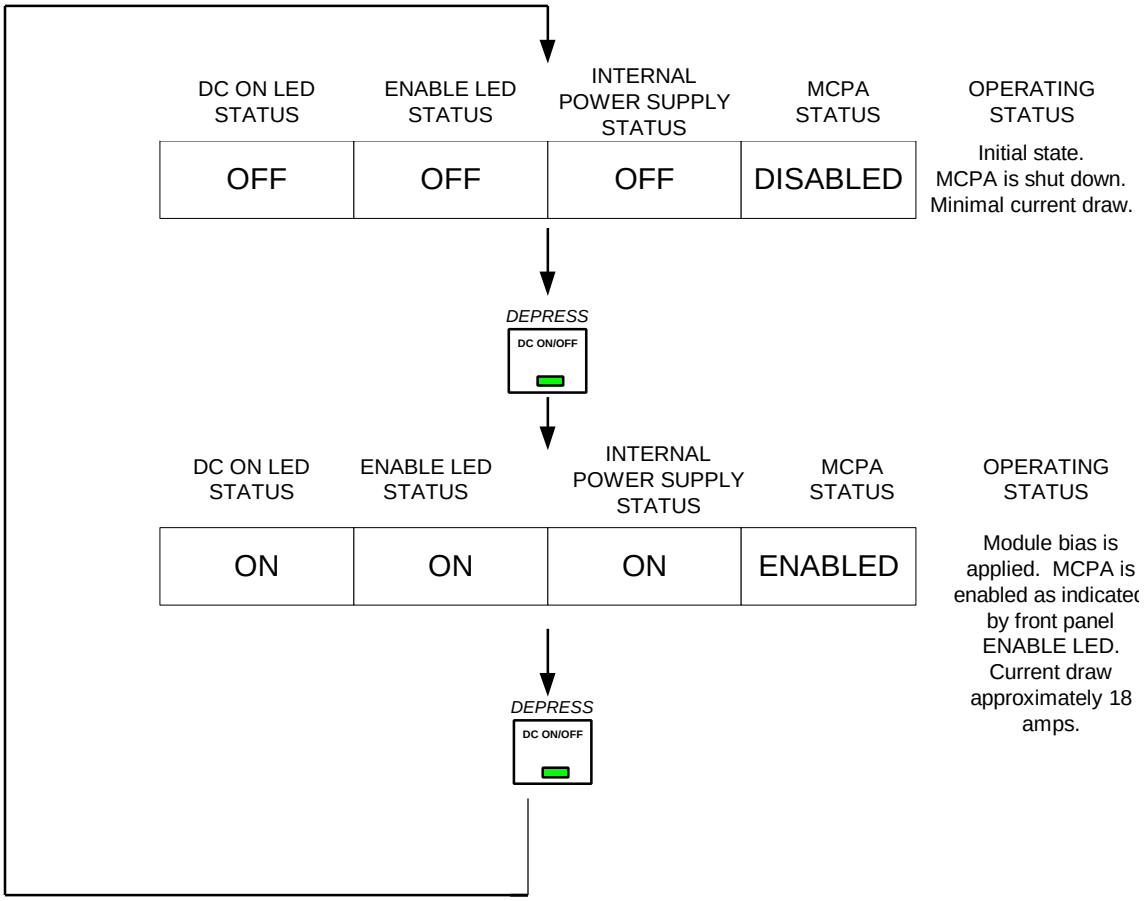
APPENDIX B

Ericsson MCPA Module
Power On/Off Sequence



NOTE:
If resetting power to the MCPA does not clear the fault condition, contact Ericsson Amplifier Technologies, or return MCPA for service.

Power Amplifier Module Power ON/OFF Sequence