



# AMERICAN MICROWAVE CORPORATION

Your Partner for integrated RF /Microwave components and assemblies



# AMERICAN MICROWAVE CORPORATION ( AMC ) HAS SUPPORTED THE DEFENSE, AEROSPACE, COMMUNICATIONS AND INSTRUMENTATION MARKETS FOR OVER 37 YEARS

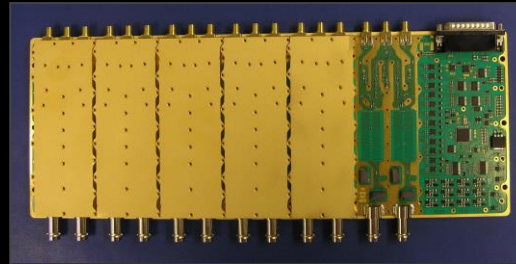
- Experts in MIMIC and Pin Diode design and integration
- 35 people and growing
- 15,000 sq ft with options for another 10,000 sq ft
- Vertically integrated operation ( All under one roof )
  - Engineering and engineering lab close to manufacturing for efficient hand offs
  - In House Machine Shop
  - Clean Room
  - Large assembly area
  - In House Paint Shop
  - Test department with 5 test stands with capability to 40 Ghz
  - ISO 9001:2008 certified





# AMC's Focus

- ✓ Integrated Assemblies
- ✓ Solid State Switches
- ✓ Electronically Controlled Attenuators
- ✓ Detector Log Video Amplifiers





# AMC HAS A LIBRARY OF MULTIPLE COMPONENTS WE HAVE DESIGNED OVER THE YEARS

- ✓ Limiters
- ✓ Low Noise Amplifiers
- ✓ Amplifiers
- ✓ Electronically Variable Attenuators
- ✓ Logarithmic Amplifiers
- ✓ Power Combiners
- ✓ Power Dividers
- ✓ Filters
- ✓ Detectors
- ✓ Switches
- ✓ Phase Shifters
- ✓ Amplitude equalizers

- ✓ If you have a required component you do not see here we have several sourcing alliances



# WHAT ARE THE ADVANTAGES OF INTEGRATED ASSEMBLIES?

- ✓ Optimize overall module performance
- ✓ We can take your proof of concept design to a well engineered module
- ✓ Size and weight reduction
- ✓ Lower VSWR ripple
- ✓ Lower insertion loss
- ✓ Thermal management of entire assembly
- ✓ Vendor has total subsystem performance responsibility
- ✓ Leverage AMCs low overhead verse internal build



# EXAMPLES OF INTEGRATED ASSEMBLIES

- Matrix Switches
- Beam Forming Networks
- Direction Finding Units
- Switching Assemblies
- Radar and Communication test systems
- Up & Down Converters
- Switched Filter Banks



## SOME EXAMPLES OF INTEGRATED ASSEMBLIES AMC HAS PRODUCED

- Direction finding units for Electronic Warfare test station
- Switching module for Jamming pod
- Switch Matrices
- Sophisticated EW detectors for Radar Warning Receivers



# DIRECTION FINDING UNITS FOR ELECTRONIC WARFARE TEST STATION

- ✓ American Microwave Corporation ( AMC ) designed and manufactured a highly complex Electronic Warfare test station. The job was awarded to AMC in June of 2012 with an original ship date of March 2013. The schedule was accelerated to a delivery of 12/21/2012 due to a request to deliver the system to a major customer as soon as possible. AMC supplied 8 each high band and 8 each low band Direction Finding Assemblies plus 1 each of a high band and low band calibration assembly...a total of 18 separate rack mounted chassis assemblies.
- ✓ AMC designed and built all components except for the bandpass filters in the switched filter assemblies in a record time of approximately 6 months.





# Some of the assemblies in the direction finding units



Mounted Delay Line Blocks



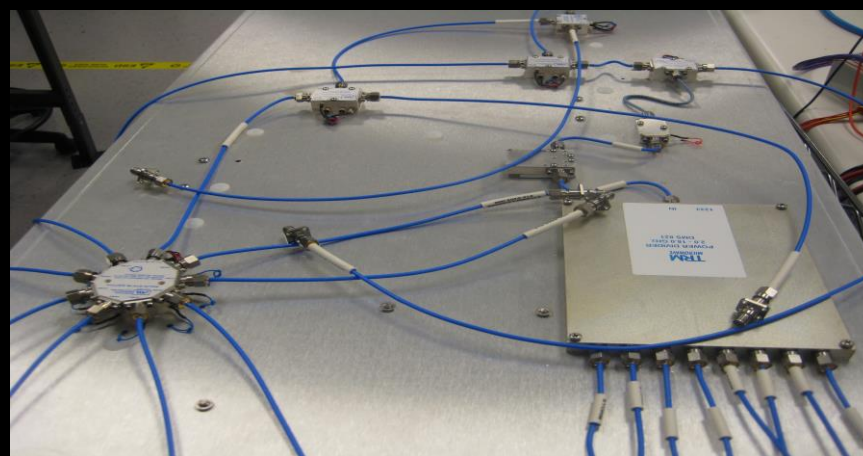
Delay Line Blocks



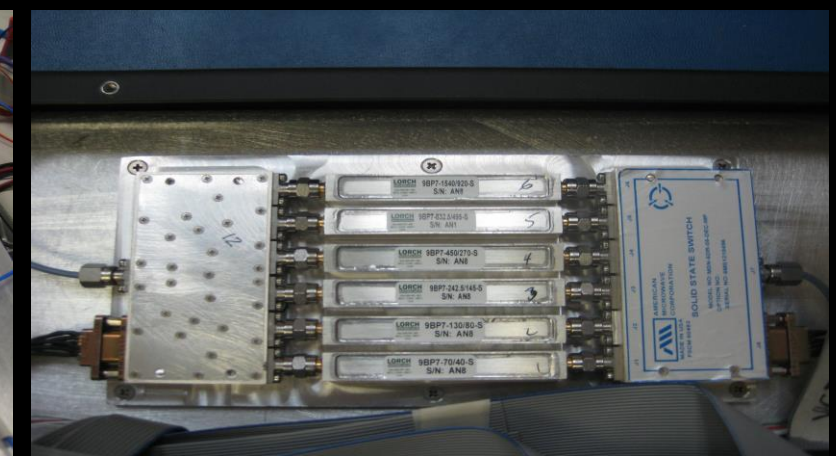
Very Short Low Band Delays



High Band Switched Filter Bank



Switches and Power Dividers Cal Unit



Low Band Switched Filter Bank



# COMPLETED RACK MOUNT UNITS



High Band DFU



Low Band Calibration Unit



Low Band DFU

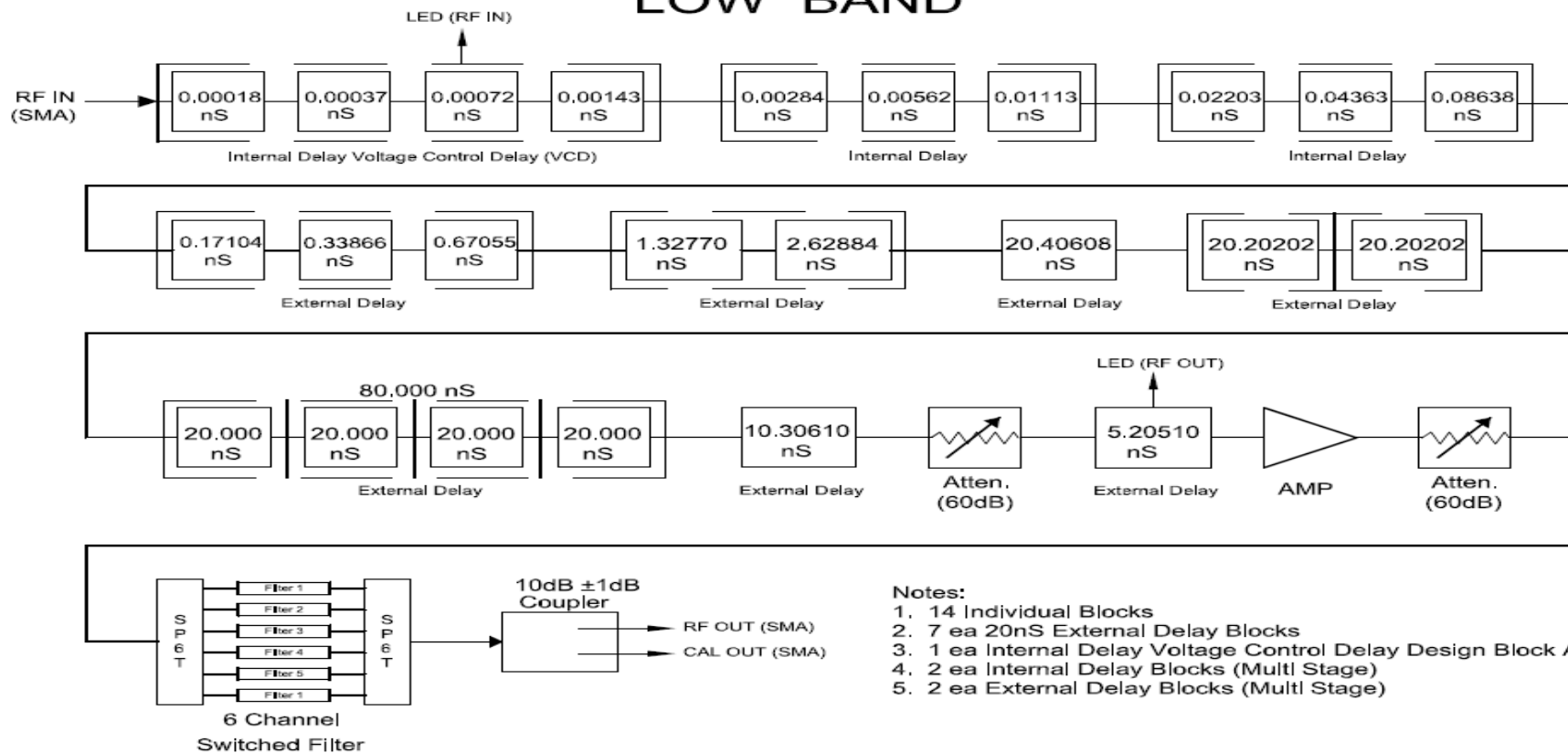


High Band Calibration Unit

# DIRECTION FINDING UNITS FOR ELECTRONIC WARFARE TEST STATION



## LOW BAND

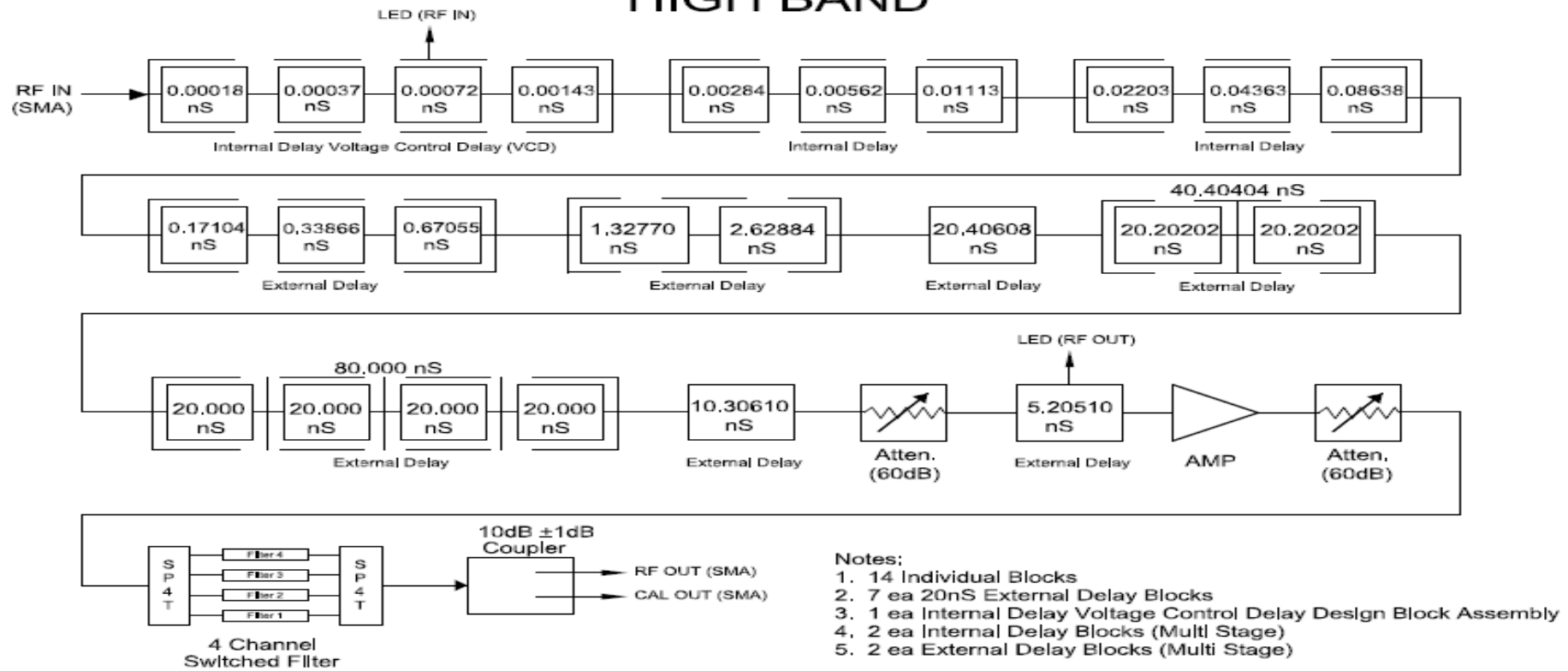


- Notes:
1. 14 Individual Blocks
  2. 7 ea 20nS External Delay Blocks
  3. 1 ea Internal Delay Voltage Control Delay Design Block Assembly
  4. 2 ea Internal Delay Blocks (Multi Stage)
  5. 2 ea External Delay Blocks (Multi Stage)

# DIRECTION FINDING UNITS FOR ELECTRONIC WARFARE TEST STATION



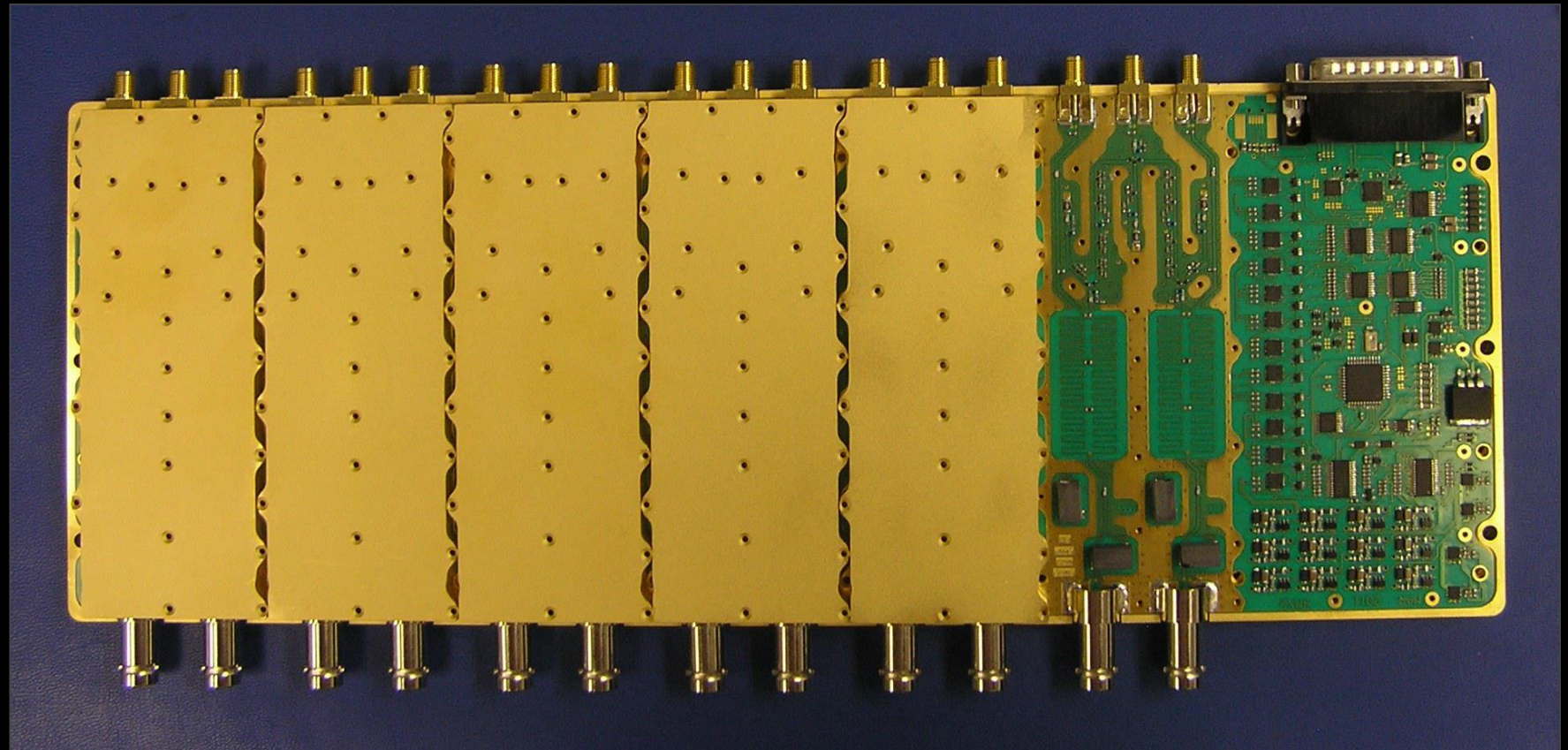
## HIGH BAND





# SWITCH MATRICES

- ✓ Eliminated all interconnecting cables
- ✓ Very reliable product in a compact form factor
- ✓ Provided excellent repeatability
- ✓ Has the ability to be remotely controlled by host
- ✓ Lowered insertion loss





# SWITCH MATRICES

- ✓ 12 x 18 Non-Blocking Switch Matrix
- ✓ Using AMC's standard switch designs combined with
- ✓ AMC standard Bias Tee design and custom Power Dividers
- ✓ Providing 5 dB I.L. and >80 dB isolation
- ✓ Custom RS-232 control and LED driver
- ✓ Designed for medium volume MIL communications application

**DESCRIPTION**  
SM-405M1G-BNC-SMA IS AN INTEGRATED SWITCH MATRIX

**SPECIFICATIONS**

- FREQUENCY RANGE: 450MHz - 1GHz
- INSERTION LOSS: 5.5dB MAXIMUM
- ISOLATION: CHANNEL TO CHANNEL (A TO B): 80dB MINIMUM  
ANTENNAE PAIRS (1 TO 7): 80dB MINIMUM  
ANTENNAE TO CHANNEL (1 TO A, 7 TO A): 80dB MINIMUM
- VSWR: 1.4dB MAXIMUM
- COMMUNICATION RATE: 9600 BAUD
- POWER INPUT: (CW)-20 dBm (STANDARD)
- INTERFACE: RS-232
- POWER SUPPLY: +28V @ 1.0A MAXIMUM PER INPUT  
12 CHANNELS; 12 AMP MAX  
400 mA MAX (SWITCH ASSEMBLY)
- CONNECTORS:  
1 - 12: BNC  
XSA-1 TO XSA-5: SMA  
XSB-1 TO XSB-5: SMA  
A - F: SMA  
LED, RS-232, DC: 44 PIN HIGH DENSITY MICRO D CONNECTOR
- DISPLAY: 12 LED DISPLAY DRIVERS (2ma EACH)  
(LED'S ARE EXTERNAL TO MATRIX)

**ENVIRONMENTAL RATINGS:**

- TEMPERATURE: 0°C TO +50°C (OPERATING)  
-65°C TO +125°C (STORAGE)
- HUMIDITY: MIL-STD-202F, METHOD 1038 COND. B
- SHOCK: MIL-STD-202F, METHOD 2138 COND. B
- VIBRATION: MIL-STD-202F, METHOD 2040 COND. B
- ALTITUDE: MIL-STD-202F, METHOD 1059 COND. B
- TEMPERATURE CYCLE: MIL-STD-202F, METHOD 1070 COND. A

NOTE: SPECIFICATIONS WILL VARY OVER OPERATING TEMPERATURE.  
NOTE: THE ABOVE SPECIFICATIONS ARE SUBJECT TO CHANGE OR REVISION.  
\* Units are designed to meet Environmental ratings but not tested. If Environmental Testing is required, please contact sales department.

**REVISIONS**

REV	DESCRIPTION	DATE	BY	CHKD
A	SEE EDR 004-10	06/27/00	SM	
B	SEE EDR 10-055	06/29/00	SM	
C	SEE EDR 11-000	1/20/01	SM	
D	SEE EDR 011-000	8/20/01	SM	
E	SEE EDR 011-038	8/28/01	SM	
F	SEE EDR 011-048	8/29/01	SM	

**AMERICAN MICROWAVE CORPORATION**  
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TEL: 301-852-4700 FAX: 301-852-4938  
WEBSITE: [www.amc.com](http://www.amc.com) [sales@amc.com](mailto:sales@amc.com)  
E-MAIL: [sales@amc.com](mailto:sales@amc.com) [info@amc.com](mailto:info@amc.com)  
ISO 9001:2000 CERTIFIED

**PRODUCT FEATURE**  
SM-405M1G-BNC-SMA

APPROVAL	DATE	REV	PRICE NO.	QTY	UNIT
DESIGN: K SPALANZ	8/28/11	A	60483	100-8021	F
DATE: SA	8/28/11				
CHK: SA					

SCALE N:5  
SHEET 1 OF 4



# SWITCH MATRICES

- ✓ Eliminated all Interconnecting cables
- ✓ Very reliable product in a compact form factor
- ✓ Provided excellent repeatability
- ✓ Has the ability to be remotely controlled by host
- ✓ Lowered insertion loss





# SWITCH MATRICES

- ✓ 2 x 8 Blocking Switch Matrix Assembly
- ✓ 8 – 2 Ts and 2 – 8Ts
- ✓ 4 discrete BP filters
- ✓ Custom logic including fault circuit
- ✓ Multilayer SMT design
- ✓ <2 dB I.L., >60 db isolation at 1GHz
  
- ✓ FAA/Commercial aircraft application
- ✓ Designed and built initial units in <120 days

**SPECIFICATIONS**

- FREQUENCY RANGE: .....840 – 905MHz
- INSERTION LOSS: .....2.5dB MAXIMUM
- ISOLATION: .....60dB MINIMUM
- VSWR (INPUT/OUTPUT): .....1.5:1 MAXIMUM
- VSWR (TERMINATION): .....2.0:1 MAXIMUM
- POWER HANDLING: .....3 WATT CW INJECTED AT THE COMMON PORT
- SWITCHING SPEED: .....300nSEC MAXIMUM
- CONTROL: ..... ≤ 0.5V = LOW = FALSE  
 ..... ≥ 2.0V = HIGH = TRUE  
 SEE LOGIC TABLE ON SHEET 2
- POWER SUPPLY: .....+15V @ 350 mA MAXIMUM

ZONE		REV.		DESCRIPTION		DATE		APPROVED	
A		1		SFF FR# 068-10		8/31/10		JA	

Technical drawing showing top and side views of the switch matrix assembly. Dimensions include 0.155 (4 PLACES), 1.250, 0.760, 0.313, 5.300, 5.000, 0.150, 1.875, 2.200, 2.500, 0.150, 0.250 (10 PLACES), 0.185, 0.380, and 0.313. Labels include MICRO-D FEMALE CONNECTOR M83513/04-B, SMC JACK 10 PLACES, J11, COM1, COM2, RF1, RF2, RF3, RF4, RF5, RF6, RF7, RF8, and #0.125 (4 PLACES). The drawing also shows the American Microwave Corporation logo and part information: FSCM 60483, MODEL NO: SM-840905M-SMC-MP, SERIAL NO, PART NO: 859900-901, and DATE CODE.

**ENVIRONMENTAL RATINGS:**

- TEMPERATURE: .....-40°C TO +85°C (OPERATING)  
 .....-65°C TO +125°C (STORAGE)
- HUMIDITY: .....MIL-STD-202F, METHOD 103B COND. B
- SHOCK: .....MIL-STD-202F, METHOD 213B COND. B
- VIBRATION: .....MIL-STD-202F, METHOD 204D COND. B
- ALTITUDE: .....MIL-STD-202F, METHOD 105C COND. B
- TEMPERATURE CYCLE: .....MIL-STD-202F, METHOD 107D COND. A

NOTE: SPECIFICATIONS WILL VARY OVER OPERATING TEMPERATURE  
 NOTE: THE ABOVE SPECIFICATIONS ARE SUBJECT TO CHANGE OR REVISION

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**AMERICAN MICROWAVE CORPORATION**  
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 WEBSITE: [www.americanmicrowavecorp.com](http://www.americanmicrowavecorp.com)  
 E-MAIL: [sales@americanmicrowavecorp.com](mailto:sales@americanmicrowavecorp.com)  
 ISO 9001:2000 CERTIFIED

APPROVALS		DATE		TITLE	
DRAWN	<i>K.F.M.M.P.</i>		8/31/10	PRODUCT FEATURE	
ENG.	<i>R.A.</i>		8/31/10	SM-840905M-SMC-MP	
GAC	<i>K.F.M.M.P.</i>		8/31/10	TECOM 859900-901	

SCALE: N:S	SIZE: A	FSCW NO.: 60483	DWG NO.: 100-7985	REV: A
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ALL DIMENSIONS ARE IN INCHES  
 TOLERANCES:  
 X.XX ±0.020  
 X.XXX ±0.010







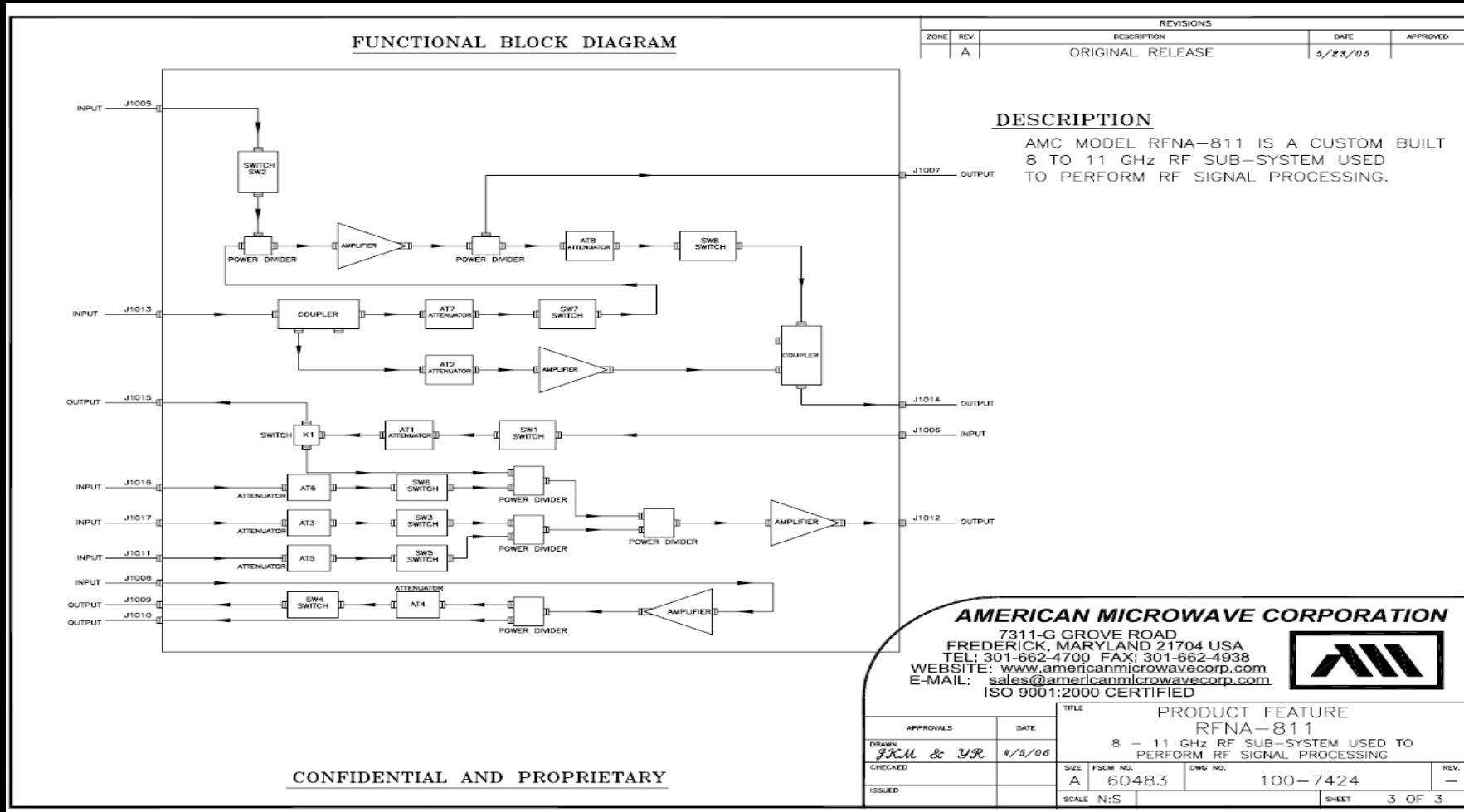
# SWITCHING MODULE FOR JAMMING POD

- ✓ Reduced size and weight
- ✓ Optimized overall module performance





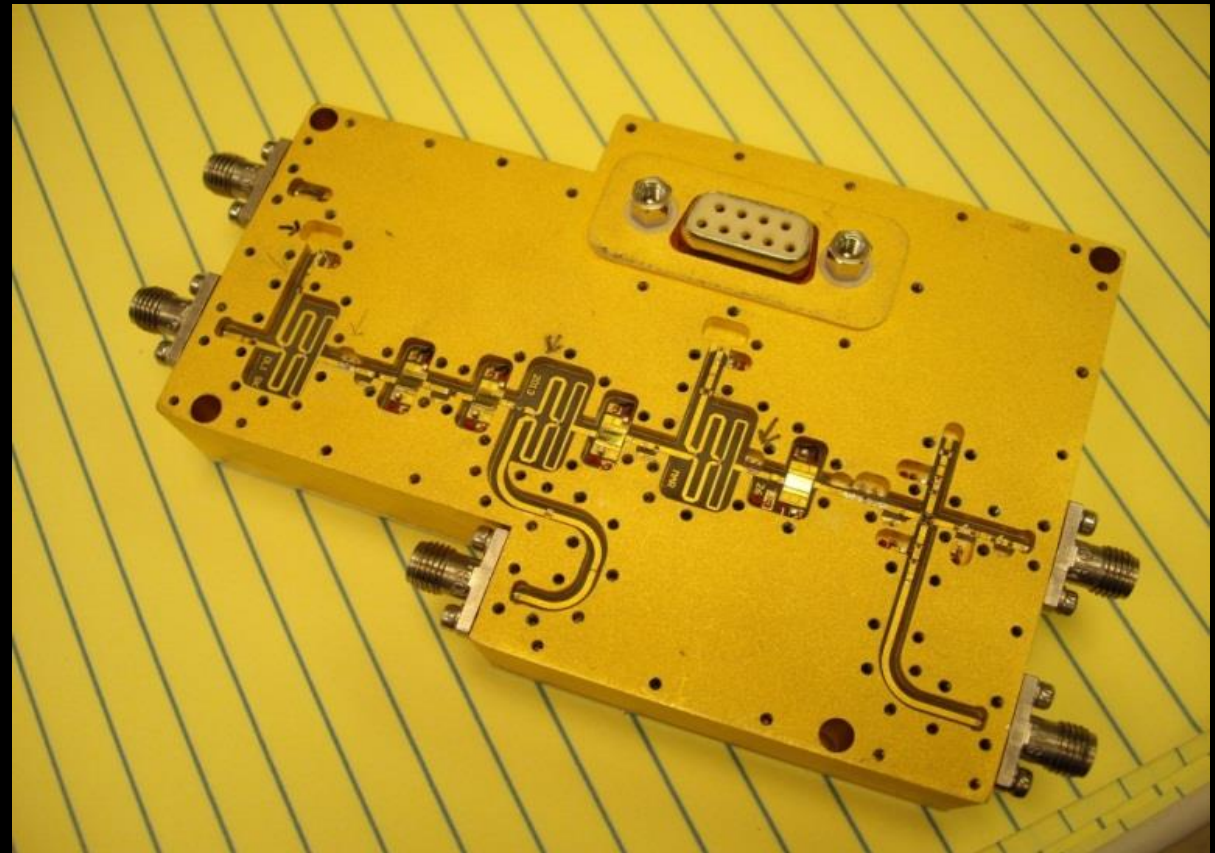
# SWITCHING MODULE FOR JAMMING POD





# RADAR WARNING RECEIVER DLVA

- ✓ Integrated a CW immunity circuit
- ✓ High dynamic range
- ✓ Fast rise times
- ✓ Excellent sensitivity
- ✓ Small form factor and light weight





# RADAR WARNING RECEIVER DLVA

## SPECIFICATIONS:

- INPUT FREQUENCY: . . . . . 6 - 18GHz
- INPUT VSWR: . . . . . 2.0:1 MAXIMUM
- NOISE FIGURE: . . . . . 8dB MAXIMUM
- INPUT POWER: . . . . . 1 WATT CW, 100 WATT PEAK @ PW=1uSEC & DUTY CYCLE

## SP3T SWITCH SPECIFICATIONS:

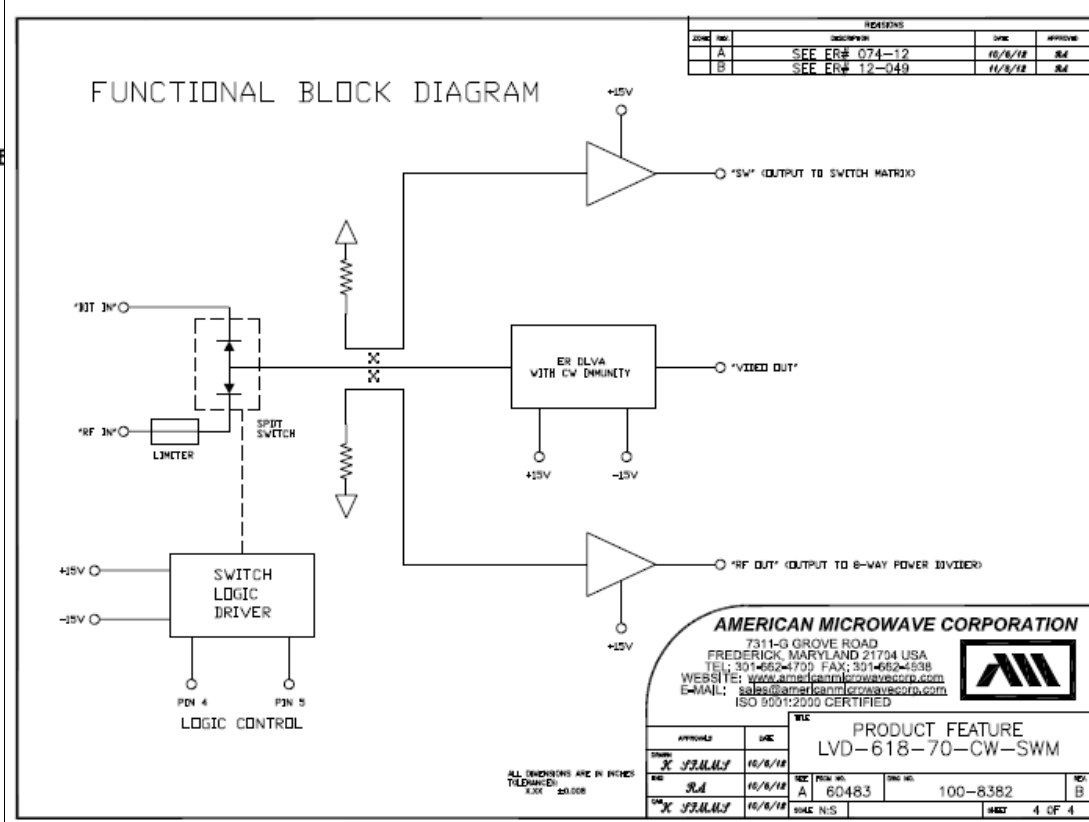
- SWITCH MODE: . . . . . (1) RF INPUT MODE, (2) BIT MODE, (3) CHOP MODE
- ISOLATION: . . . . . 60dBm MINIMUM (ALL PORTS)
- SWITCHING SPEED: . . . . . 100nSEC MAXIMUM

## OUTPUT TO 8-WAY POWER COMBINER SPECIFICATIONS:

- LINEAR GAIN: . . . . . +33dB MINIMUM
- FREQUENCY FLATNESS: . . . . . ±2.5dB MAXIMUM
- 1dB COMPRESSION POINT: . . . . . +3dBm MINIMUM
- SATURATED POWER: . . . . . +14 dBm MAXIMUM
- SECOND HARMONIC: . . . . . -9dBc MINIMUM
- THIRD HARMONIC: . . . . . -12dBc MINIMUM
- GAIN MATCHING AMONG ALL PORTS: . . . . . ±2.5dB MAXIMUM
- I/O VSWR: . . . . . 2:1 MAXIMUM @ IMPEDANCE = 50HMS

## OUTPUT TO SWITCH MATRIX SPECIFICATIONS:

- LINEAR GAIN: . . . . . +7dB MINIMUM
- FREQUENCY FLATNESS: . . . . . ±1.5dB MAXIMUM
- 1dB COMPRESSION POINT: . . . . . +3dBm MINIMUM
- SATURATED POWER: . . . . . +9 dBm MAXIMUM
- SECOND HARMONIC: . . . . . -9dBc MINIMUM
- THIRD HARMONIC: . . . . . -12dBc MINIMUM
- GAIN MATCHING AMONG ALL PORTS: . . . . . ±2.5dB MAXIMUM
- I/O VSWR: . . . . . 2:1 MAXIMUM @ IMPEDANCE = 50HMS

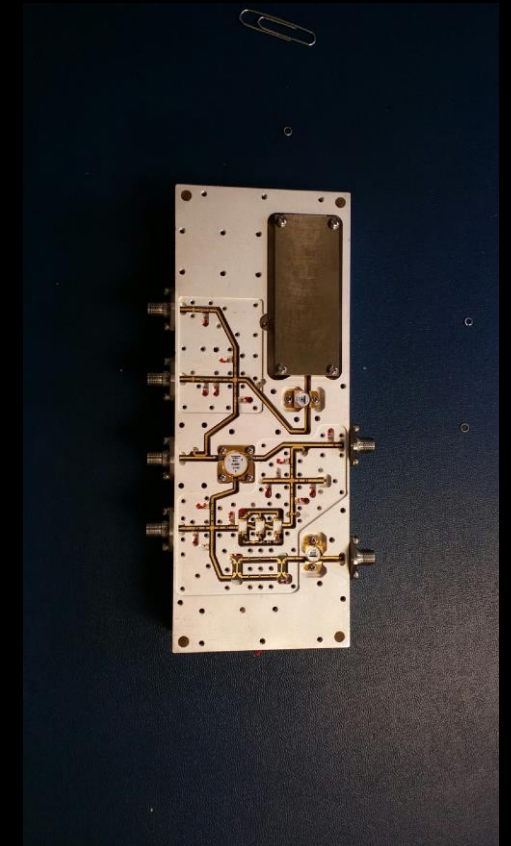


# FLIGHT LINE RADAR CALIBRATION UNIT

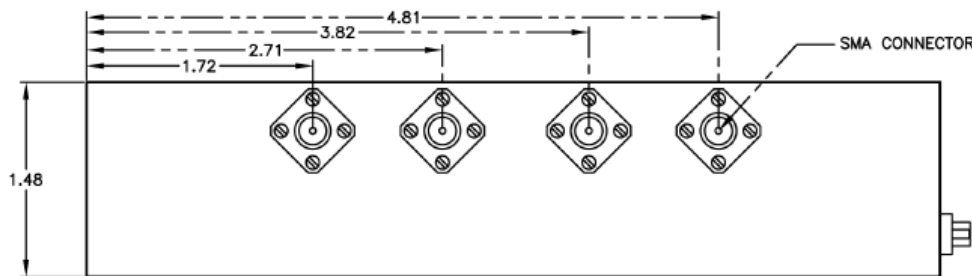
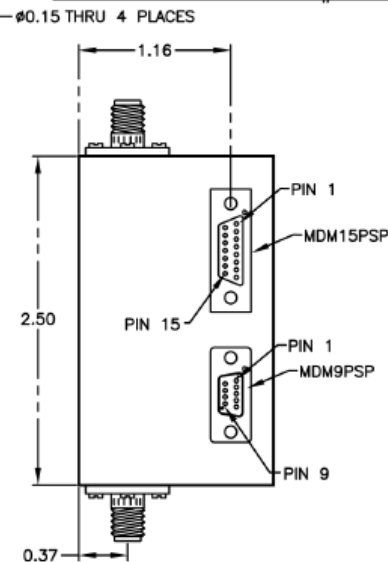
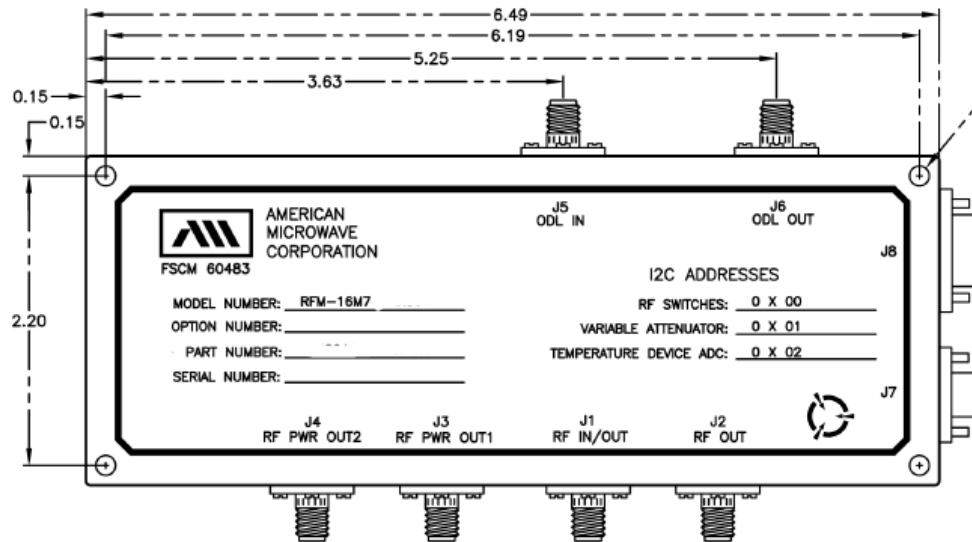
AMC Model RFM-16M7 integrated switching assembly

- Reduced size by 50%
- Improved VSWR and lowered Insertion Loss
- Implemented temperature compensated design resulting in better performance across broad temperature range
- Incorporated SPIE and I2C control buss with imbedded control software

integrated switching assembly contains solid state switches, circulators, a digital controlled attenuator, a Ku band solid state source and a Detector Logarithmic Video Amplifier with digitized video output



REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
	A	SEE ER# 040-14	9/11/14	RA
	B	SEE ECN# 14-043	11/25/14	RA



**ENVIRONMENTAL RATINGS:**

- TEMPERATURE:.....-18°C TO +55°C (OPERATING)  
-40°C TO +85°C (STORAGE)
- HUMIDITY:.....MIL-STD-202F, METHOD 103B COND. B
- SHOCK:.....MIL-STD-202F, METHOD 213B COND. B
- VIBRATION:.....MIL-STD-202F, METHOD 204D COND. B
- ALTITUDE:.....MIL-STD-202F, METHOD 105C COND. B
- TEMPERATURE CYCLE:.....MIL-STD-202F, METHOD 107D COND. A

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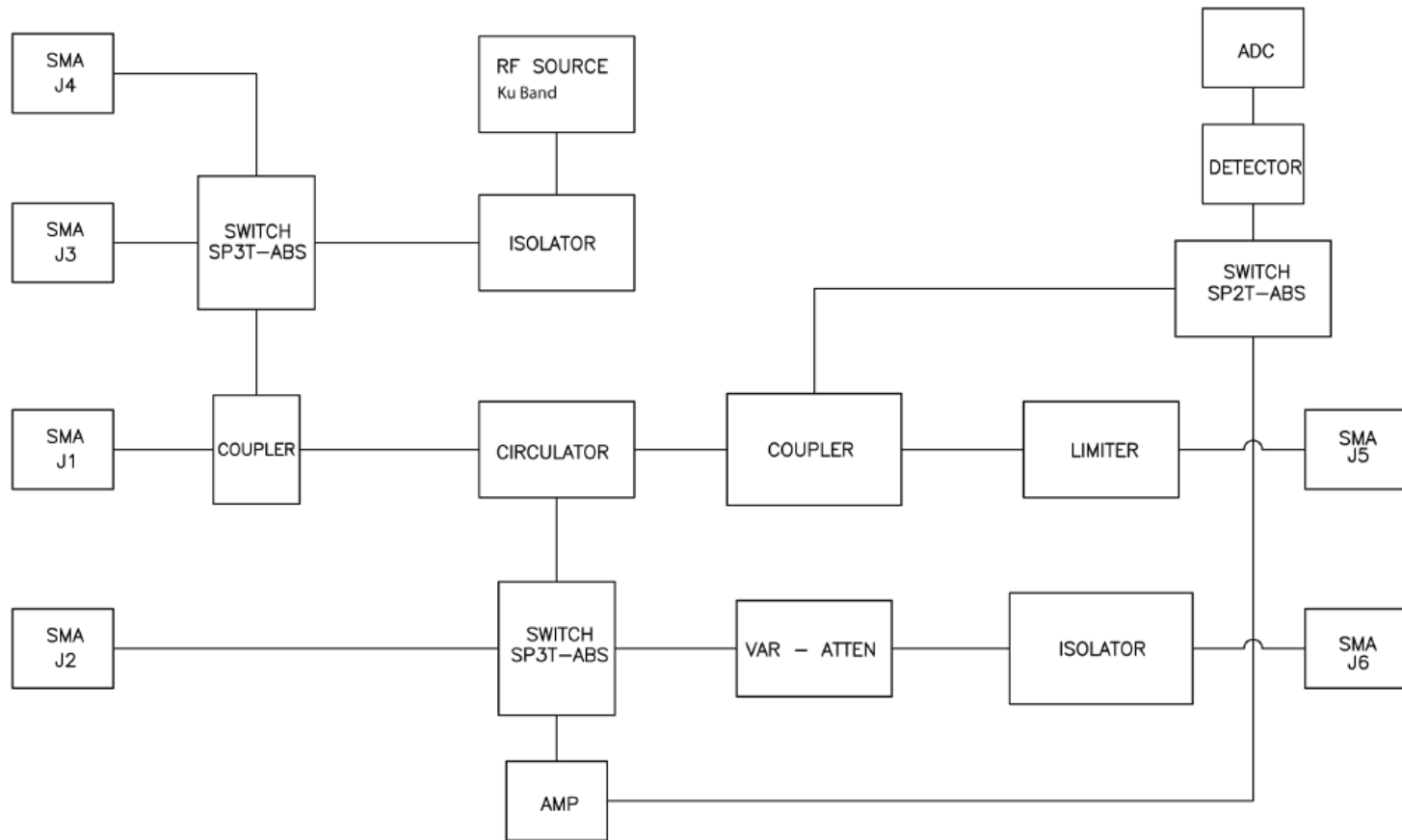
ALL DIMENSIONS ARE IN INCHES  
TOLERANCES:


X.XX ±0.020  
X.XXX ±0.010

APPROVALS		DATE	 AMERICAN MICROWAVE CORPORATION FREDERICK, MARYLAND	
DRAWN	<i>K. J. MUMF</i>	9/11/14	TITLE	
ENG.	<i>RA</i>	9/11/14	PRODUCT FEATURE	
QAC	<i>K. J. MUMF</i>	9/11/14	RFM-16M7	
SIZE	FSCM NO.	DWG NO.	REV.	
A	60483	100-8580	B	
SCALE	N/S	SHEET		1 OF 6

# BLOCK DIAGRAM

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
	A	SEE ER# 040-14	9/11/14	RA
	B	SEE ECN# 14-043	11/25/14	RA



APPROVALS		DATE	 AMERICAN MICROWAVE CORPORATION FREDERICK, MARYLAND		
DRAWN <i>K. J. M. M. P.</i>		9/11/14	TITLE PRODUCT FEATURE RFM-16M7		
ENG. <i>RA</i>		9/11/14			
QAC <i>K. J. M. M. P.</i>		9/11/14	SIZE A	PSCM NO. 60483	DWG NO. 100-8580
			REV. B	SCALE N/S	
				SHEET 2 OF 6	



# THANK YOU FOR YOUR TIME

- ✓ If you have a project that you would like to get an estimate on cost and time frame please forward your requirements to AMC
- ✓ Leverage AMC's low overhead and fast track project team
- ✓ Our engineering team will review your requirements and schedule a conference to discuss the details
- ✓ We will turn around a quote and timeline very quickly
- ✓ We are confident you will find that AMC can meet or exceed your expectations
- ✓ Contact info Pete Schramm 443-309-6244 [pschramm@americanmic.com](mailto:pschramm@americanmic.com)
- ✓ [WWW.AMERICANMIC.COM](http://WWW.AMERICANMIC.COM)