Shure Model PA770
PSM 800MHz Antenna Combiner Specification
Project # 17127

Outline

General Product Description

The Antenna Combiner allows up to four 700 MHz PSM transmitters to use a single antenna. The unit takes in four inputs from the transmitters and outputs them to a single antenna, eliminating stage clutter and improving intermodulation distortion performance. The unit is designed to meet the needs of users with multiple systems, and will generally be rack-mounted.

I Special Features

The Antenna Combiner features a microstrip Wilkinson power combiner, and four push-pull amplifiers for very linear performance. The unit has DC protection on all ports. The Combiner can be used from 100VAC to 240VAC.

II Circuit Description

RF Section

Each input signal is first amplified by a temperature-compensated push-pull amplifier. The signals are then combined, using a microstrip 4 way Wilkinson combiner. They then pass through a low-pass filter to attenuate the harmonics above 1GHz, and are sent to the antenna port.

SHURE BROTHERS INC.
222 HARTREY AVENUE
EVANSTON, IL 60202
PHONE 708-866-2200
Microphones-Electronic Components

Typed: Mark Podraza

Checked: Mark Podraza

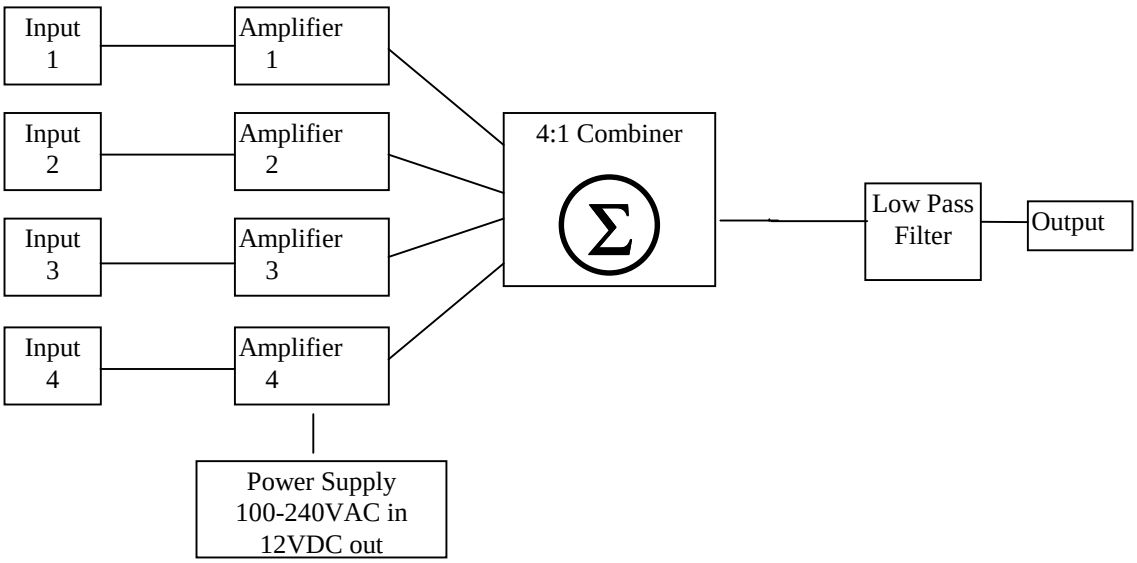
Approved: Kevin Mikes

Approved:

Power Section

The unit is powered by a switching power supply that takes AC line voltage from an IEC cord and delivers a regulated 12VDC to the amplifier circuitry. The combiner stages are passive, and do not require electrical power. The power supply has a 5V supply line as well that requires a minimum current draw of 400mA. There are six power resistors on the board that draw this minimum load. There are also four power resistors that draw a required minimum load 160mA from the 12V supply.

<System Block Diagram>



III Test Equipment

Required Test Equipment (or approved equivalent)

1. Digital Multimeter Fluke 87

2. Spectrum Analyzer HP8590L
with tracking generator

IV Alignment Procedure

The Antenna Combiner requires no tuning or calibration.

V Test for Product Acceptance

The power supply uses any AC voltage between 100V and 240V, and when operating properly should produce 12VDC ± 0.6VDC at TP+12VDC(TPT I2 on schematic), 5VDC ± 0.2VDC at TP+5VDC(TPT I172), and 10 VDC ± .5VDC at all TP+10VDC. To power the unit off DC, remove the 6-pin power cable connecting the power supply to the board. Apply 12VDC to I16(or TP+12VDC if switch SW2 is set to " on"),5VDC to TPT I172, and attach the ground at I3(any PC board ground). The above voltage readings should still hold. The current drains are given in the chart below.

The powered-up PA770 can be tested by applying a +10dBm RF signal at BNC inputs 1-4, and measuring the RF strength at the antenna output. Input signals in the passband, 720-750 MHz, should give outputs of 10dBm, +2dBm, -4dBm.

VI Agency Approvals

1.0 FCC Part 74
2.0 UL

VII Additional Product Specifications

Specification	Minimum	Typical	Maximum
Passband Frequency Range	**720 MHz**		**750 MHz**
Net Gain in Passband	**-4dB**	**0dB**	**2dB**
Port to Port Isolation @10dBm input	**23dB**	**26dB**	**-**
Intermods @10dBm out	**-**	**-45dBc**	**-40dBc**

ISS	Record of Changes Made
1.	Production Release

Exp Dwg. No:
Used in:

SHURE BROTHERS INC.
222 HARTREY AVENUE
EVANSTON, IL 60202
PHONE 708-866-2200
Microphones-Electronic Components

Typed: Mark Podraza

Checked: Mark Podraza

Approved: Kevin Mikes

Approved:

DC Current Drain off 12V line	**660mA**	**710mA**	**810mA**
DC Current Drain off 5V line	**355mA**	**390mA**	**425mA**

VIII Mechanical Specification

1. Overall Dimensions
1 3/4 IN (44.5 mm) High x 7.770 IN (197.4 mm) Wide x 8.880 IN (225.6 mm) Deep. Optional mounting ears for rack mounting.

2. Weight
2lbs. 15.4oz (1.34kg)

3. Housing
Chassis: galvanized steel (Half-Rack)
Cover: vinyl coated steel
Front Panel: anodized aluminum

4. Antenna
Antenna supplied with 700 MHz P7T.

IX Environmental Specification

Temperature Storage
7 days at +165F (+74C) degrees, packaged.
7 days at -20F (-29C) degrees, packaged.
After each 7 day storage, the units must be allowed to stabilize for 24 hours before testing. Units must operate per the -7 specification.

Temperature Cycling
5 cycles from -20F (-29C) degrees, to +165 (+74C) degrees, allow 24 hours for stabilization before testing. Units must operate the -7 specifications Mechanically and Electrically.

Operational Temperature
Operate units as described in the -7 at +45F (Modified) (+7C) and +100F (+38C) degrees. Allow three hours for stabilization of each temperature before testing. Units must operate per the -7 specifications.

Steady State Humidity
Perform a 7 day test at 90% RH at room temperature. Evaluate units for

SHURE BROTHERS INC.
222 HARTREY AVENUE
EVANSTON, IL 60202
PHONE 708-866-2200
Microphones-Electronic Components

visual and mechanical defects after 1, 3, 5, and 7 days. At the end of the 7 day period allow the units to recover for 24 hours. Units must pass the -7 specification.

Moisture Resistance
Perform a 4 day test at 90% to 98% RH with (Modified) temperature cycled between +14F (-10C) and +150F (+65C) degrees. Allow the units to recover for 24 hours. Product must meet the -7 specifications.

X Service Evaluation

DC Check
Check:
AC voltage is applied through the power jack on the back of the unit?
Power switch is on?
TP+12V measures 12V ± .6VDC?
TP+5VDC measures 5V ± .2VDC?
Green LED on front panel is illuminated?
TP+10VDC measures 10V ± .5VDC?

If there is no power check the power supply fuse, the AC inlet and wiring as well as the cable connections from the power supply to PC board. Dummy load R's 1,2,3,4,5,8,28,29,31,33 are fragile and prone to cracking. If many are broken the power supply may not start up.

If the unit passes all the DC checks, perform an RF Check. Keep 50 ohm loads on all unused ports during these measurements. Connect tracking generator output to BNC input 1. Attach input to Spectrum Analyzer to BNC antenna output. Set tracking generator power to +10dBm, and set the analyzer to sweep from 700MHz to 770MHz. The output should look as follows:

720 MHz, 10 dBm, +2dBm, -4dBm.
735 MHz, 10 dBm, +2dBm, -4dBm.
750 Mhz, 10 dBm, +2dBm, -4dBm.

Repeat check on inputs 2,3,4. If power output is low check DC voltages with no RF input to make sure the amplifiers Q5,6,9,10,11,12,13,14 are all biased correctly. There may be foil or trace shorts on the PC board or solder shorts. Also with an RF input you can use a FET probe to measure RF levels inside the circuit to isolate where you are losing the signal. DC voltages and RF levels are listed on the PA770 schematic for reference.

SHURE BROTHERS INC.
222 HARTREY AVENUE
EVANSTON, IL 60202
PHONE 708-866-2200
Microphones-Electronic Components

Typed: Mark Podraza

Checked: Mark Podraza

Approved: Kevin Mikes

Approved:

Approximate gain structure through the stages of the PA770:
Input power: 10dBm ± 1dBm
Amplifier power out: +17dBm ± 1dBm
Combiner power out: +10dBm, + 2dBm,-4dBm
Net Gain: 0dB, +2dB,-4dB

ISS	Record of Changes Made
1.	Production Release

Exp Dwg. No:
Used in:

SHURE BROTHERS INC.
222 HARTREY AVENUE
EVANSTON, IL 60202
PHONE 708-866-2200
Microphones-Electronic Components

Typed: Mark Podraza

Checked: Mark Podraza

Approved: Kevin Mikes

Approved: