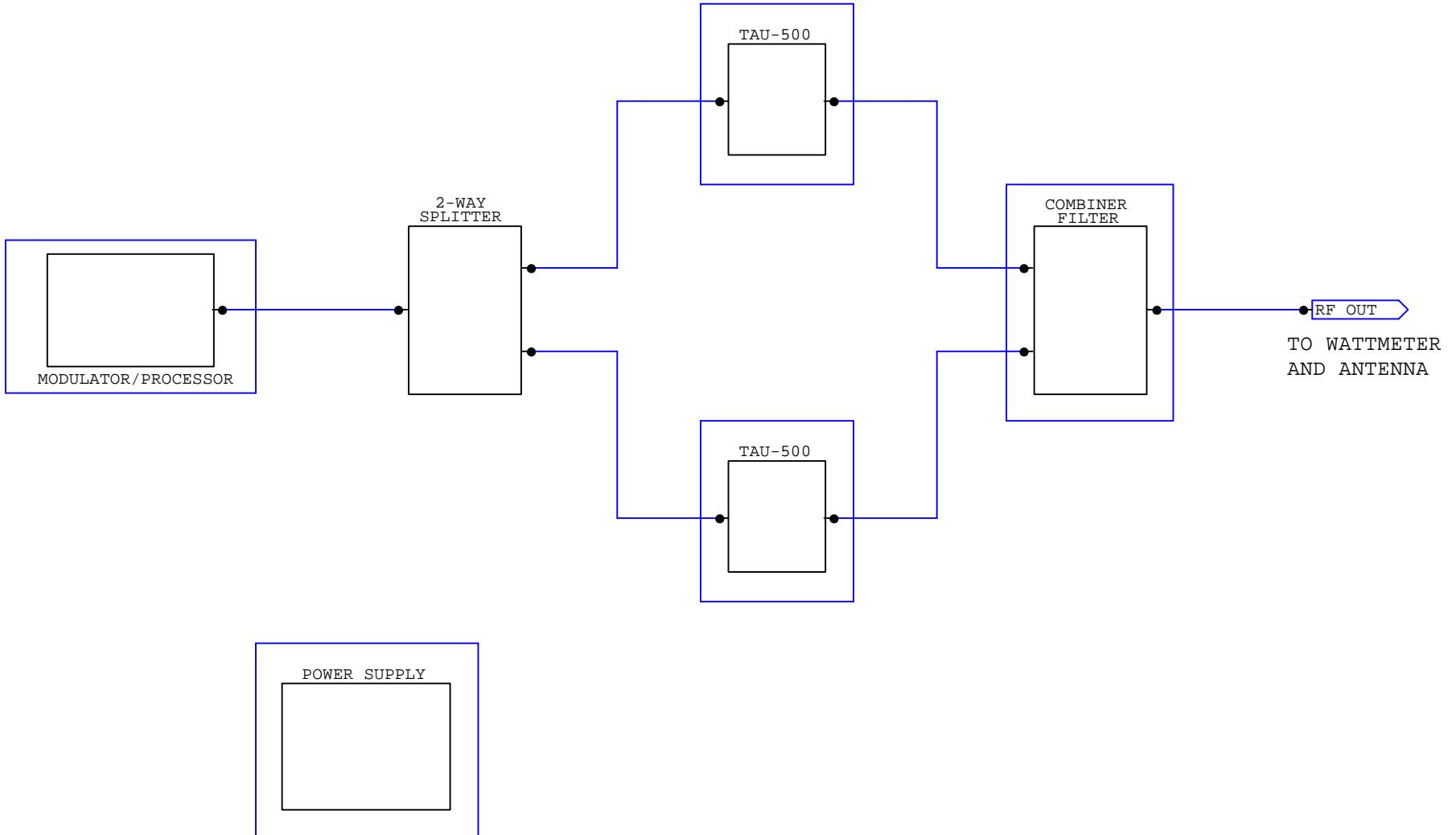


## **Principle of Operation**

The TAU-1000 power amplifier supplies a 1000-watt peak video signal with 10% aural power on any of the UHF television channels 14 through 69. Please note that channel selection must be made at time of order, as the transmitter or translator is calibrated and tested to the channel requested and is not field tuneable. The TAU-1000 power amplifier is a modular solid-state 1000-watt broadcast amplifier utilizing readily available RF components wherever possible, thus enhancing the serviceability of the equipment. The TAU-1000 features ultra linear amplification and individual channel RF output bandpass filtering. The amplifier modules are stable for high reliability and long service life.

The amplification of the TAU-1000 is comprised of (2) TAU-500 500-watt power amplifiers. Firstly, the output of the modulator or processor gets split into (2) RF signals of equal amplitude. Each output of the 2-way power divider is then fed into a TAU-500 Power Amplifier. Finally, the outputs of each TAU-500 are combined to generate 1000-watts of peak visual power in addition to an aural carrier, as seen in the TAU-1000 block diagram.

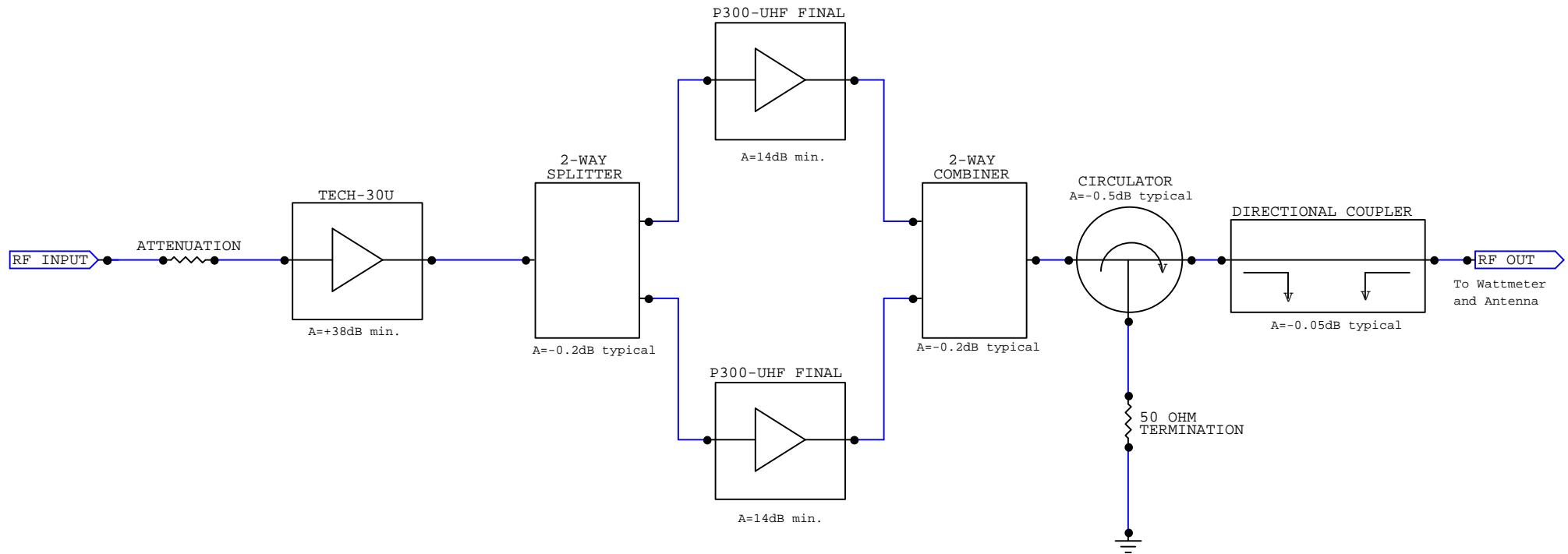


TAU-1000 Overall Block Diagram

Rev	ID
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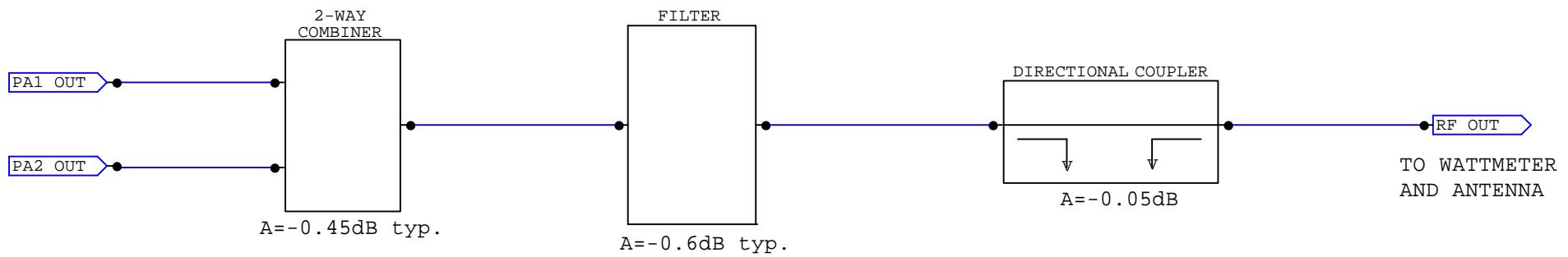
Date: May 24, 2005 | Page: 1 of 1

Inside each 500-watt power amplifier, the signal passes through an RF attenuator to limit the output power level of the power amplifier, to help buffer any transients that may come into the power amplifier, and most importantly, allow for provisions to balance the gain of the TAU-500 to the other TAU-500. After attenuation, the signal gets preamplified through a TECH-30U driver amplifier before the signal gets split into (2) signals for final amplification using a 2-way Wilkinson microstrip power divider. The final amplification stage is comprised of (2) P300-UHF final amplifiers. The outputs of the (2) final amplifier pallets are combined with a 2-way Wilkinson microstrip combiner and pass through an isolator and dual directional coupler for protection and monitoring purposes, as illustrated in the following TAU-500 block diagram.



TAU-500 Block Diagram	
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After amplification, the signal exits the power amplifier enclosure and goes into the combiner/filter enclosure, where the signals from each 500-watt amplifier are combined. After combining, the amplified signals are filtered with a bandpass filter and monitored again with another directional coupler before heading out to an antenna for broadcast, as depicted in the following combiner/filter block diagram.



TAU-1000 Combiner Enclosure Block Diagram	
Rev	ID
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## Specifications

The following specifications were taken with a Technalogix modulator/processor. Should a different modulator or processor be used, specifications could vary. For this reason, we recommend that any different modulator/processor be shipped to Technalogix so the system can be matched and set up optimally. In addition, the audio/video ratio the input to the power amplifier needs to be -10 dB in order for the software and LCD readout to be accurate.

### RF Characteristics

Frequency range	any specified UHF Channel 14 to 60**
Frequency Response (one channel)	$\pm 0.5$ dB
Frequency Stability	$\pm 250$ Hz
Selectivity	60 dB (adjacent channel)
Minimum Input Level	0 dBmV
Rated Visual Output Power	1000 Watts
Rated Aural Output Power	10% of peak visual power
IF Output Level	+35 dBmV nominal
Input Impedance	75 Ohms
Output Impedance	50 Ohms
Harmonics	> 60 dB below rated power
Predominant Intermodulation Distortion	dBc = decibels below visual carrier
+ 920 kHz	> -53 dBc
- 920 kHz	> -53 dBc
+ 2.66 MHz	> -53 dBc
- 2.66 MHz	> -53 dBc
+ 5.42 MHz	> -53 dBc
+ 7.16 MHz	> -53 dBc
3 <sup>rd</sup> Order Intermodulation Distortion	
+ 4.5 MHz	> -60 dBc
+ 9.0 MHz	> -60 dBc
All others	> -60 dBc
Spurious Emissions	> -60 dBc

\*\* Stand-alone power amplifier will operate from channels 14-69.

### PAL Video Characteristics

Input Level to modulator (for 87.5% modulation)	1.0 V <sub>PP</sub>
Differential Phase (at 87.5% modulation)	$\pm 2$ Degrees
Differential Gain (at 87.5% modulation)	2%
Group Delay	< $\pm 40$ nS
Video Group Delay Pre-emphasis	Conforms to IC/FCC specifications
K-Factor	1.9% for 2T Pulse
Hum and Noise	> 60 dB below rated power

## Aural Characteristics

Input Level for 25 kHz Deviation	0.3 V <sub>PP</sub>
Frequency Response (Standard Pre-emphasis)	±1 dB
Harmonic Distortion (25 kHz Deviation)	< 1% 50 Hz to 15 kHz
Amplitude Modulation Noise	> 50 dB
Frequency Modulation Noise	> 60 dB
Intercarrier Stability	±250 Hz

## Physical Characteristics

Power Requirements	
Power Supply	230 V <sub>AC</sub> , 28 A <sub>AC</sub>
Operating Temperature	0 - 50°C
Dimensions	
TAU-500 Power Amplifier (each)	W-19" flange (17" encl.), D-25-1/4", H-8-3/4" (5U)
Combiner	W-19" flange (17" encl.), D-25-1/4", H-8-3/4" (5U)
Power Supply	W-19" flange (17" encl.), D-25-1/4", H-7" (4U)

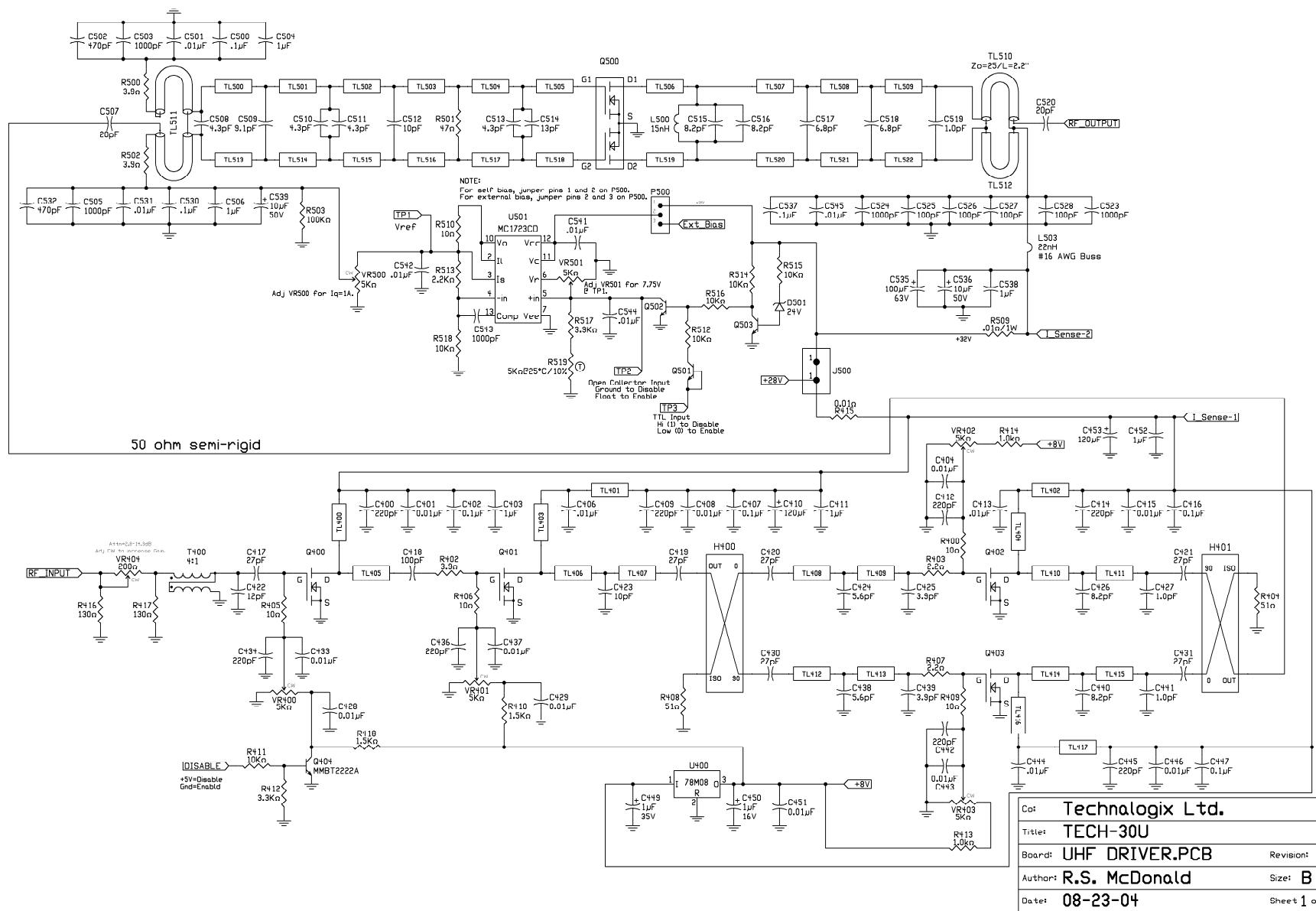
## Section IV – RF Components

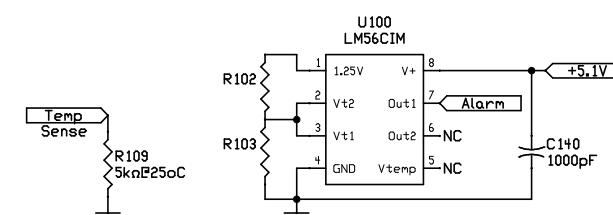
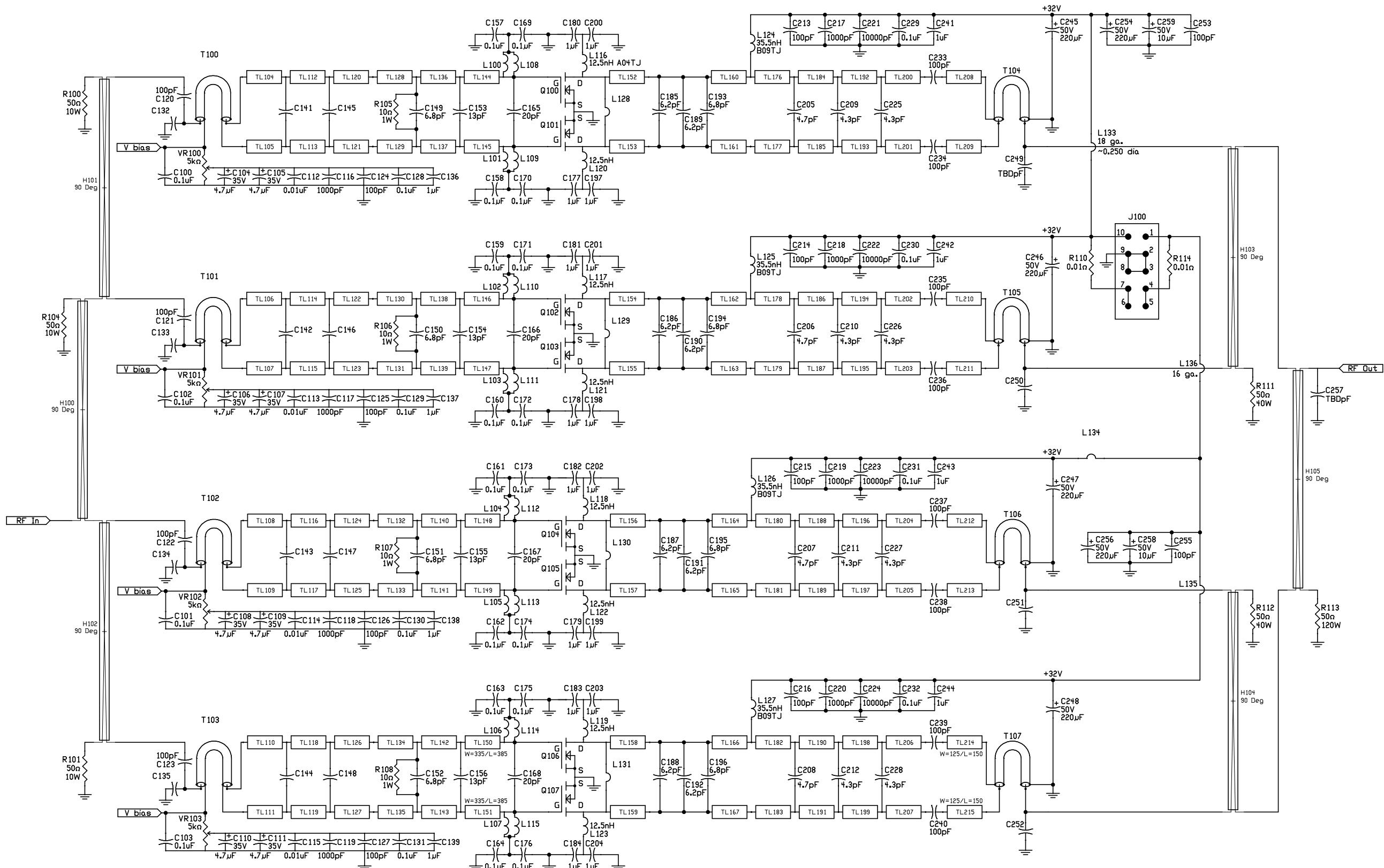
### Amplifier Pallets

The TECH-30U driver pallet consists of (2) separate printed circuit board stages – The first stage is an ultra-linear class-A stage with (3) gain sections providing a typical adjustable power gain of 26dB to 37dB at 10-watts peak. This stage typically draws 2.5 Adc quiescent and a maximum drain current of 5 Adc. The second stage is a linear class AB stage with a typical gain of 13 dB. This stage typically draws 1.0 Adc quiescent and a maximum drain current of 10 Adc. The currents on both stages can be found by measuring the voltage drop across the +30 Vdc input and the I sense connector. The resistance separating these connections is 0.01 ohms, providing a 10 mV per ampere ratio.

The P300-UHF pallets used in the final amplification stage use LDMOS (Laterally Diffused Metal Oxide Semiconductor) technology. LDMOS technology offers higher gain, efficiency and linearity over standard MOSFET and Bipolar devices and enhances ruggedness and reliability. LDMOS transistors have the added advantage of not having BEO (Beryllium Oxide) in their construction. The P300-UHF amplifier pallets have a typical gain of 15dB (14dB minimum) and draw no more than 23Adc. Currents for these pallets must be measured with an ammeter in series with the power supply lead.

Each of the amplifier pallets is connectorized to optimize servicing and accessibility. All amplifier pallets must have the transistor drain voltages reach at least 26Vdc before the RF drive is applied.





## **P300-UHF-16 Schematic**

# TECHN<sup>A</sup>LOGIX

The company that can.

### **Power Divider/Combiner (internal to each TAU-500 enclosure)**

A Wilkinson power divider and combiner are used to split the RF signal into, and combine the amplified RF signal out of the (2) P300 final amplifier pallets. Flanged power resistors help ensure that any differences between the inputs or outputs are balanced.

The Wilkinson design takes advantage of the fact that an impedance transformation can take place across a quarter-wavelength transmission line if the line has different impedances than the source or load impedances being matched. In this case, quarter-wavelengths of 75-ohm coaxial are used to maintain 50-ohm impedances at the input and output of the Wilkinson divider/combiner. Due to its electrical and mechanical symmetry, the Wilkinson design's performance over moderate bandwidths is superior to other types. This design maintains phase and amplitude equality, in addition to providing isolation and matched outputs.

### **Circulator/Isolator (internal to each TAU-500 enclosure)**

A circulator and load termination (popularly described as an isolator) is installed into each TAU-500 directly after the amplification stage and before the directional coupler. RF power will flow through the isolator in one direction (from the amplifier stage to the directional coupler). RF power applied in the opposite direction (back into the amplifier stage) will experience a high loss. Hence, the isolator isolates the TAU-500 power amplifier enclosure from external influences. The potentially damaging reflected power heading back towards the amplifier stage gets dumped into the flanged termination resistor. In addition, these reflected signals cannot mix in the amplifier stage and produce intermodulation distortion products.

Each circulator has a maximum insertion loss 0.5dB and a minimum isolation of 17dB. The load termination is rated at 250 watts, 50-ohms.

### Final 2-Way Combiner (internal to combiner/filter enclosure)

The RF outputs from the (2) TAU-500 amplifier modules then pass into a final enclosure where the signals are combined, then filtered and monitored once again. The combiner is a 2-way, 1,000-watt power combiner with a maximum phase imbalance of +/-1 degree. Minimum isolation is -18 dB and maximum insertion loss is -0.45 dB from 170 to 280 MHz. Minimum return loss from ports 1 to 2 (input to input) is -25 dB and -20 dB on port 3 (output).

### Directional Coupler (internal to TAU-500 and combiner/filter enclosures)

The Technalogix dual directional couplers provide DC voltages proportional to forward and reflected RF power monitoring. These analog voltages are converted for processing using a 10-bit analog-to-digital converter and provide the control system with valuable data for monitoring purposes. The directional couplers installed in the power amplifier and filter enclosures have **peak** detection circuits on the forward RF power side of the coupler and **average** detection circuits on the reflected RF power side of the coupler. This is to allow the end user to set power in a manner that is more independent of modulation and closer to a true tip-of-sync meter. Hence, the readings on the displays in the power amplifier system are peak for forward and average for reflected. Output power should be set by the following procedure:

THE POWER OUTPUT SHOULD NEVER BE ADJUSTED EXCEPT UNDER THE TEST CONDITIONS OF NO AURAL CARRIER, WITH THE VISUAL CARRIER MODULATED WITH SYNC AND BLANKING.

The directional coupler has a typical insertion loss of 0.05dB and its Type N connectors can handle 1,500 watts peak. The coupler requires 8 to 8.5Vdc to power the internal electronics of the coupler and is supplied from the control printed circuit board at the front of each enclosure.

### Filter

The passive bandpass filter rejects spurious and harmonic output products and passes the UHF channel RF output. The cavity resonator uses aperture coupling and is a linear resonator design. Typical insertion loss is 0.6 dB to 1.0 dB depending on channel frequency. Average roll off is -33 dBc at a point 4.5 MHz below the peak visual carrier frequency and -30 dBc 9.0 MHz above the peak visual carrier frequency. The filter is DC grounded on both the input and output for additional lightning protection.

## Section V – Power Supply

Switching AC-DC power supplies are used to power the amplifier pallets, the control circuits, and all of the fans. There are (2) supplies set at 31.0 Vdc nominally. All fans run off this same supply, though they pass through a series dropping resistor to lower the supply voltage, as the fans are 24Vdc.

A 24Vdc nominal power supply is located in the combiner enclosure. It simply supplies power to the control PCB and the cooling fan.

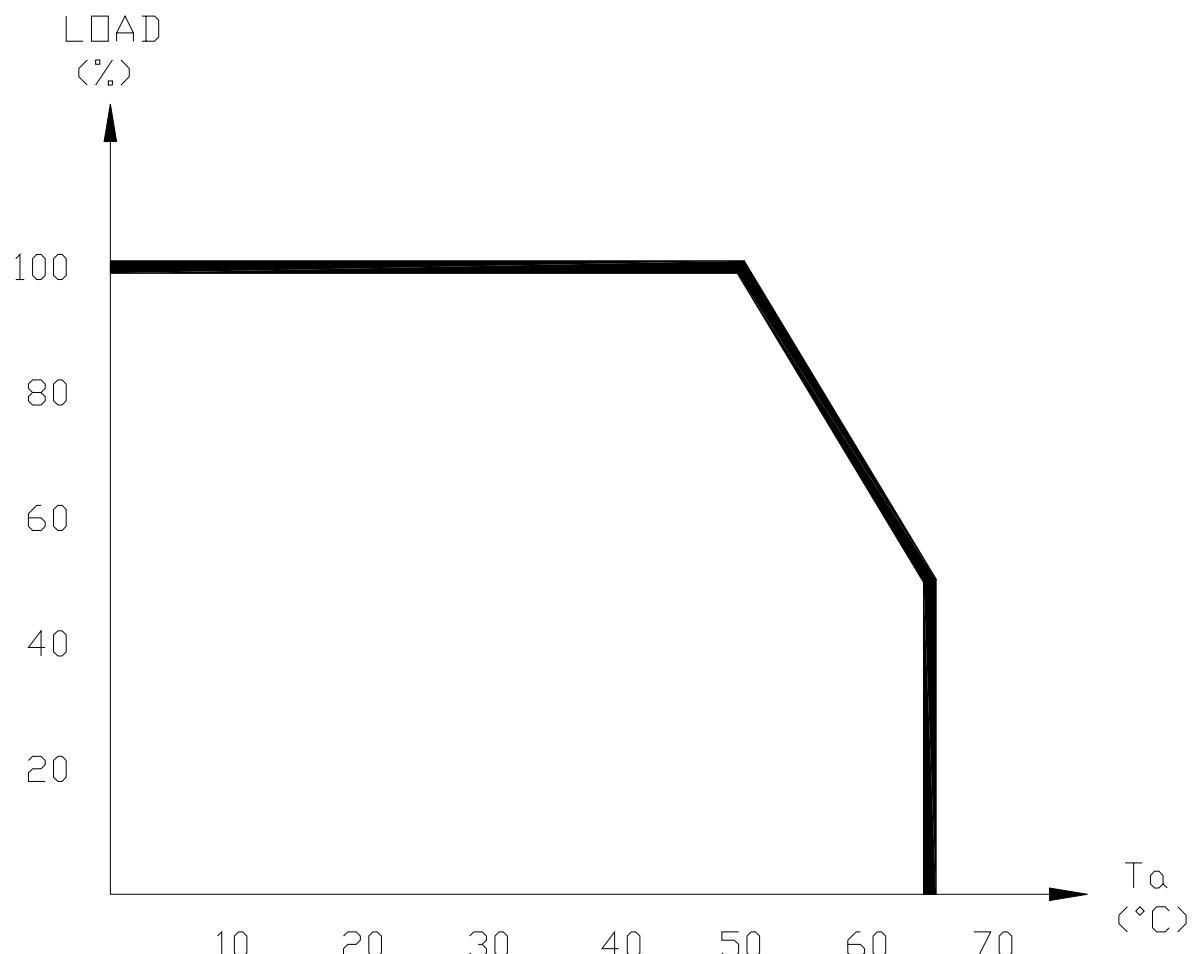
The power supplies in the power supply enclosure are Cotek 2K4S, adjusted to 31.0V with no load. The power supply found in the combiner/filter enclosure is a Mean Well S-60-24. The switching power supplies are fully protected against short circuit and output overload. Short circuit protection is a cycling type power limit. The internal AC fuse is designed to blow only on a catastrophic failure in the unit – the fuse does not blow on overload or short circuit. The thermal shutdown automatically recovers when the power supply chassis cools down.

AC (220Vac) is fed into the power supply enclosure via a 4-position circular connector and then through a resettable circuit breaker. The AC for the combiner/filter enclosure (220Vac or 110Vac) is fed through a filtered EMI AC entry.



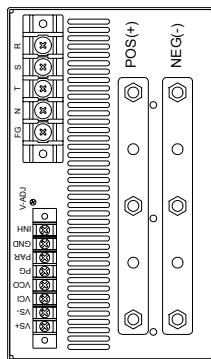
- ◆ Universal AC Input
- ◆ 0.98 Typical Power Factor
- ◆ Forced Current Sharing at Parallel Operation
- ◆ Power Failure Signal
- ◆ Remote Sense
- ◆ Remote ON / OFF control
- ◆ SC / OV / OL / OT Protection
- ◆ Programmable Output Voltage

Specification	Model	2K4S-P024	2K4S-P036	2K4S-P048	2K4S-P060
Input Voltage Range		90 ~ 260V AC, 47~63 Hz ( 90~170VAC reduce power see curve below )			
Input Current (Typ.)			13.5A / 230 V AC		
Inrush Current (Typ.)				Cold Start < 90A	
Power Factor (Typ.)				0.98	
Efficiency		88%	88%	89%	90%
DC Output Voltage		+24V DC	+36V DC	+48V DC	+60V DC
Output Voltage Adjustment		Max.-Min. > 15% Adj. Typical adjustment by potentiometer 25% ~ 100% Adjustment by 1 ~ 5V DC external control			
Ripple & Noise		Less than 1% or 150mV			
Line & Load Regulation		Less than 1%			
Output Rated Current		100.0A	66.6A	50.0A	40.0A
Max Output Power		2400W			
Over Voltage Protection		110% ~ 135% ( variable "OVP" follows the adjustable DC output voltage )			
Over Load Protection		Current limiting 3 times (1.5", 3.0", 5.0") then intelligent auto recovery before shutdown			
Remote ON / OFF Control		Compatible with a TTL signal to turn ON / OFF			
Remote Sense		Yes			
Power Failure Signal		Open Collector of NPN Transistor			
Parallel Operation		Yes			
Setup , Rise , Hold Up Time		500ms , 50ms , 12ms			
Temp. Coefficient		±0.04% / °C ( 0 ~ 50°C )			
Working Temp., Humidity		0°C~+50°C @100% Load, +65°C @50% Load, 20% ~ 90% RH			
Storage Temp., Humidity		-20°C~+85°C 10%~95% RH			
Vibration		10 ~ 200Hz, 2g 10min./1 Cycle, Period of 60 min. for each axes			
Safety Standards		UL1950, TUV EN60950			
EMC Standards		EN55022, EN61000-4-2,3,4,5,6,8,11, EN61000-3-2,3, ENV50204			
Leakage Current		< 10.5mA / 240V AC			
Cooling		Power rating & temperature controlled fan			
Dimension Weight ; Q'ty / Carton		290 x 120 x 132.5 mm (L X W X H) / 8.9 Kgs ; 1 Sets / Ctn			

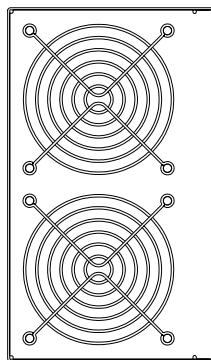
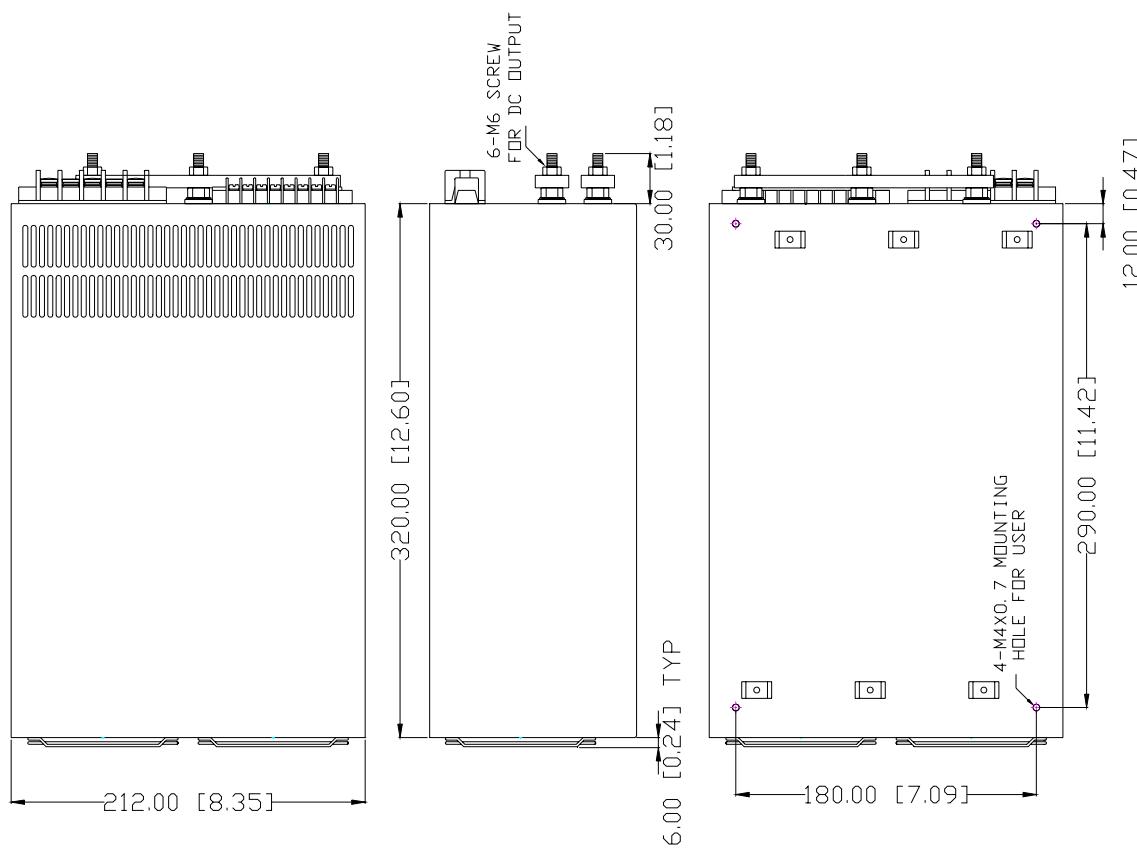
**Output power vs ambient temperature**

Derating curve

**Mechanical drawings**



CONTROL PIN ASSIGNMENT	
VS+	Output Voltage Remote Sense+
VS-	Output Voltage Remote Sense-
VCI	O/P Voltage Ctrl Input
VCO	5.1V References Voltage
PG	Power Good Signal
PAR	Parallel
GND	Ground
INH	Inhibit





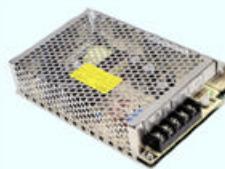
# MEAN WELL

## SWITCHING POWER SUPPLY

ISO-9001 CERTIFIED MANUFACTURER

S-60  
SERIES

- .LOW COST, HIGH RELIABILITY
- .105°C OUTPUT CAPACITOR
- .INTERNATIONAL AC INPUT RANGE
- .HIGH EFFICIENCY, LOW WORKING TEMPERATURE
- .SOFT-START CIRCUIT, LIMITING AC SURGE CURRENT
- .SHORT CIRCUIT, OVERLOAD, OVER VOLTAGE PROTECTED
- .COMPACT SIZE, LIGHT WEIGHT
- .100% FULL LOAD BURN-IN TEST
- .BUILT IN EMI FILTER, LOW RIPPLE NOISE



MODEL SPECIFICATION	S-60-5	S-60-12	S-60-15	S-60-24
DC OUTPUT VOLTAGE	5V	12V	15V	24V
OUTPUT V. TOLERANCE	±2%	±1%	±1%	±1%
OUTPUT RATED CURRENT	12A	5A	4A	2.5A
OUTPUT CURRENT RANGE	0-12A	0-5A	0-4A	0-2.5A
RIPPLE & NOISE	120mVp-p	120mVp-p	150mVp-p	150mVp-p
LINE REGULATION	±0.5%	±0.5%	±0.5%	±0.5%
LOAD REGULATION	±1%	±0.5%	±0.5%	±0.5%
DC OUTPUT POWER	60W	60W	60W	60W
EFFICIENCY	73%	76%	77%	79%
DC VOLTAGE ADJ.	+10,-5%	±10%	±10%	±10%
INPUT VOLTAGE RANGE	85~264VAC 47~63Hz; 120~370VDC			
AC CURRENT	2A/115V 1A/230V			
INRUSH CURRENT	COLD START 30A/115V 60A/230V			
LEAKAGE CURRENT	<3.5mA/240VAC			
OVERLOAD PROTECTION	105%~150% TYPE:PULSING HICCUP SHUTDOWN RESET:AUTO RECOVERY			
OVER VOLTAGE PROTECTION	115%~135%			
OVER TEMP. PROTECTION	-----			
TEMP. COEFFICIENT	±0.03% / °C (0~50°C)			
SETUP, RISE, HOLD UP TIME	800ms, 50ms, 10ms / 115VAC 300ms, 50ms, 80ms / 230VAC			
VIBRATION	10~500Hz, 2G 10min./1cycle, PERIOD FOR 60min. EACH AXES			
WITHSTAND VOLTAGE	I/P-O/P:3KVAC I/P-FG:1.5KVAC O/P-FG:0.5KVAC			
ISOLATION RESISTANCE	I/P-O/P, I/P-FG, O/P-FG:500VDC / 100M Ohms			
WORKING TEMP., HUMIDITY	-10°C~+60°C(REFER TO OUTPUT DERATING CURVE), 20%~90% RH			
STORAGE TEMP., HUMIDITY	-20°C~+85°C, 10%~95% RH			
DIMENSION	159*97*38mm CASE:901			
WEIGHT	0.55Kgs			
SAFETY STANDARDS	UL1012, TUV EN60950, IEC950, UL1950 APPROVED			
EMC STANDARDS	CISPR22 (EN55022), IEC801-2,3,4, IEC555-2 VERIFICATION			

NOTE : 1.ALL PARAMETERS ARE SPECIFIED AT 230VAC INPUT, RATED LOAD, 25°C 70% RH. AMBIENT.

2.TOLERANCE GINCLUDE SET UP TOLERANCE, LINE REGULATION, LOAD REGULATION.

3.RIPPLE & NOISE ARE MEASURED AT 20MHz BY USING A 12" TWISTED PAIR TERMINATED WITH A 0.1uF & 47uF CAPACITOR.

4.LINE REGULATION IS MEASURED FROM LOW LINE TO HIGH LINE AT RATED LOAD.

5.LOAD REGULATION IS MEASURED FROM 0% TO 100% RATED LOAD.

6.C2,3,6 MUST BE REMOVED.