TECHNALOGIX

The company that can.

TAUD-1000

BROADCAST TRANSMITTER

OPERATING MANUAL

You've already unpacked it, haven't you? You've unpacked it and plugged it in and turned it on and fiddled with the knobs. No? Okay, good. Please take a few minutes to read the manual and familiarize yourself with your new Technalogix power amplifier.

We believe that this manual, and of course our equipment, should be everything you need to get on the air with superb broadcast quality video. We understand that a capable and confident user will get the most out of our product and we have made every attempt to educate readers of all technical levels. If there is something that is not clear, or you require further information, please do not hesitate to contact us and we'll be glad to help out.

Technalogix Ltd.
#4, 8021 Edgar Industrial Place
Red Deer, Alberta, Canada
T4P 3R3
Phone: 403.347.5400
Fax: 403.347.7444
URL: www.technalogix.ca
Email: technical@technalogix.ca
sales@technalogix.ca

We truly appreciate that you have chosen us as your television broadcast system supplier. Happy viewing.

Section I - Safeguards

General Safeguards

This section is written as a general guide to keep all 5 fingers on your hand and is intended for those having previous knowledge and experience with these kinds of equipment. It is not intended to contain a complete statement of all safety precautions, which should be observed by personnel using this or other electronic equipment.

DOCUMENTATION - Read, retain and follow instructions before operating the equipment. There is a lot of useful information in the manual, and besides, we spent a lot of time writing it!

ENVIRONMENT - To reduce the risk of fire or electric shock, do not expose this equipment to rain, moisture, or rye and sodas at the company Christmas party. Refer all servicing to qualified service personnel.

SERVICING - Do not attempt to service this equipment yourself as opening or removing covers can result in a warm tingly feeling and will void the warranty. Refer all servicing to qualified service personnel.

Safety and First Aid

Personnel engaged in the installation, operation, maintenance, or servicing of electronic equipment are exposed to the hazard of high voltage. It is imperative that all safety regulations and precautions are consistently observed. Knowledge of first aid procedures is recommended. The following information is presented as a reference only.

- At all times, avoid placing any part of the body in series between ground and circuit points, whether power is on or off.

- Dangerous voltage may be present in equipment even though power is off. Do not open the cabinet. Refer servicing to qualified service personnel.

- It is the duty of all personnel to be prepared to give adequate emergency first aid treatment and thereby prevent avoidable loss of life.

- There are three principle degrees of burns, recognizable as follows:
  - a first-degree burn reddens the skin.
  - a second-degree burn blisters the skin.
  - a third degree burn chars the flesh and frequently places the victim in a state of shock accompanied by respiratory paralysis.

- Respiratory paralysis can cause death by suffocation within seconds. It is imperative that the approved methods of artificial respiration are initiated immediately and continue until the victim's breathing is normal.

- A muscular spasm of unconsciousness may render the victim unable to break free of the electric power. If this is the case, turn the power off immediately.

DO NOT TOUCH THE VICTIM OR YOU MAY SHARE THE SAME PREDICAMENT.

- If the power cannot be turned off immediately, very carefully loop a dry rope, article of clothing, length of strong cloth or a rolled-up newspaper around the victim and pull the victim free of the power source. Carefully avoid touching the victim or clothing.

- Once free of the power source, the victim must be placed in a reclining position and covered with a blanket or newspapers to keep warm. At the first opportunity, enlist help in summoning a doctor. If a doctor cannot be summoned, transport the victim to the doctor or a hospital. Be sure the victim is kept well covered and warm while awaiting professional treatment.

Operating Safeguards

It is a known fact that our broadcast transmitters and translators enjoy 50-ohm load impedances. So much so, that it is imperative you maintain 50-ohm impedances throughout your system. In return, your equipment will provide you with maximum power transfer to the antenna and decreased reflected power heading back towards the amplifier pallets, reducing the amount of magic smoke that gets let out of the power amplifier. Before anything is turned on, ensure that there is a 50-ohm path from the output of each stage to the input of the next, all the way to the antenna.

In addition to maintaining proper 50-ohm impedances throughout the signal chain, it is also important, whenever possible, to make sure the RF drive going to the input of the power amplifier is removed before turning on or turning off the DC power supply. This is because all of the RF transistors used in the individual amplifier pallets are fabricated with LDMOS (Laterally Diffused Metal Oxide Semiconductor) technology. Nice and linear yes, but they do not like to make any RF power when their supply voltages are not within a specific range. When you first turn your power amplifier on or off, the DC power supply's output voltage may take a while to stable out to a safe operating voltage. Ten seconds wait before applying the RF drive will ensure no issues arise.

Our power amplifiers are designed to reliably generate a specific RF output power. Failing to adhere to overdriven amplifier warnings can decrease the reliability of your system, and frankly, makes our repair department busy and grumpy. If you need to transmit to a little larger coverage, you are better off increasing antenna gain, and more importantly, antenna height above average terrain. On TV and FM broadcast frequencies, insufficient antenna height puts an upper limit on your range, regardless of power levels, as the distance from your antenna to the radio horizon is limited.

Section II - Warranty

Our legalese is straightforward. It is simply designed to give you peace of mind and helps you resist the temptation to have your electronics friend try to repair your Technalogix product.

Technalogix Ltd. products have been completely tested and found to meet specifications and be in proper operating condition. They are warranted to be free from defects in materials and workmanship for a period of one year from the date of shipment. If the system becomes damaged in shipment and there are obvious signs of damage to the outside of the packaging, notify your courier immediately before that courier walks out the door.

Technalogix Ltd. will not be liable for damages of whatever nature arising out of or in connection with the equipment or its use thereof. Technalogix does not assume responsibility for injury or damage resulting from the practices of untrained or unqualified personnel in the handling of this equipment.

Technalogix Ltd. warranty does not include:

- misuse, neglect or accident.
- incorrect wiring and /or improper installation.
- unauthorized repairs, modifications or use in violation of instructions issued by Technalogix.
- incidental or consequential damages as a result of any defect.
- reshipment cost or insurance of the unit or replacement units or parts.
- acts of nature or terrorism.

Technalogix agrees, at our option, to remedy warranted defects or furnish a new part in exchange for any part of a unit which, under normal installation, use and service, becomes defective. The user will pay for transportation costs to and from the repair center. If you require technical service on the site, the cost to you will be $800.00 US per day plus air fare and meals.

To claim your rights under this warranty:

- Contact Technalogix and describe the problem in as much detail as possible. See troubleshooting section in this manual. If a solution cannot be found at this time, it may be determined that the unit will have to be returned to Technalogix for repair, once a Return Materials Authorization (RMA) number is provided. Please look under our web site (www.technalogix.ca) for the RMA form (Service) and fill it out. Either fax it to us or email to us.

- Package equipment carefully for prepaid shipment to Technalogix. Include a written description of the problem experienced, a copy of the original invoice establishing warranty status, and the RMA.

Technalogix reserves the right to make revisions in current production of the equipment and assumes no obligation to incorporate these changes in earlier models.

Shipping Address:

Technalogix Ltd.
ATTN: RMA# _____
#4, 8021 Edgar Industrial Place
Red Deer, Alberta, Canada
T4P 3R3
Ph: 403.347.5400
Made in Canada, returned for repairs

Terms & Conditions of Sale
Sales by Technalogix Ltd ("Seller") are made only on the terms which are contained in this Terms and Conditions of Sale Policy. Seller hereby gives notice of its objection to any different or additional terms and conditions. All sales are expressly conditional upon Buyers' assent to the terms and conditions set forth below. These terms and conditions may be modified or supplemented only by a written document sighed by the authorized representative of Seller. These terms and conditions supersede any prior and/or contemporaneous agreements or correspondence between Buyer and Seller. Any order received and accepted by Technalogix Ltd (Seller) shall be construed as an acceptance of Seller's offer to sell its products to the purchaser (Buyer) in accordance with the terms and conditions of sale set forth herein. No waiver, whether express or implied, by Seller of any of the terms or conditions hereof shall be deemed a continuing waiver or trade custom between the parties, but shall apply solely to the instance to which the waiver is directed.

Ordering Information
All orders must be in writing and/or accompanied by a PO. 50% down payment is required with all orders. No orders are considered an order until the down payment has been paid.

Order Confirmation
A purchase order is not binding on Seller until Buyer has received Seller's order confirmation or acknowledgement.

Pricing Policy
Prices for products do not include taxes or any additional charges. All prices are FOB shipping point and prices do not include freight/handling charges and insurance charges. All prices are in U.S. currency.

All prices published or quoted by Seller may be changed at any time without notice. Unless otherwise specified, written quotations expire thirty (30) days from the date issued and are subject to change or termination by notice during this period.

Taxes
Prices for all products do not include any sales, use, excise or other taxes. Buyer agrees to pay all applicable federal, state, and local taxes, duties and other fees on product and services ordered. If Buyer claims an exemption form any tax, Buyer shall submit to Seller the appropriate exemption certificates.

Shipping
Shipping is the responsibility of the Buyer. This includes all freight, custom and brokerage charges and duties.

Terms of Payment
Seller will provide credit terms to Buyer at its discretion. Such terms are subject to change at all times. If credit is provided, Seller will invoice Buyer on the date the product is ordered. Such invoices will be due and payable net thirty (30) days from date of invoice, subject to credit approval. If credit is not established or maintained, terms shall be net cash on or prior to the Delivery Date. Seller reserves the right, at its sole discretion at any time to revoke any credit previously extended.

Past due accounts shall be charged two percent (2%) per month, or the highest rate permitted by Alberta law, whichever is less, and will be added to the outstanding balance. In the event Buyer defaults on payment, Buyer shall be liable for all collection cost, including reasonable attorney's fees and costs.

Changes and Cancellation
Purchase orders that have been accepted by Seller may not be changed or cancelled, in whole or in part, without written consent of Seller. All changes must be include in a change order reflecting the purchase order number and submitted to the Seller. All other changes will not be accepted or acknowledged. Changes may affect delivery dates. Expenses incurred because of the changes shall be charged to the Buyer. Buyer will be liable for Seller's costs incurred, plus a reasonable profit, for the portion of the work terminated, in accordance with generally accepted accounting principle, together with cancellation charges.

Orders for standard product may be changed by Buyer, with no penalty to the Buyer, provided that Buyer provides Technalogix notification at least 30 days prior to the scheduled ship date. Order changes received within 30 days of the scheduled ship date may be subject to an order change charge; a schedule detailing these charges will be forwarded to Buyer when Buyer's change order is acknowledged. In no event can any aspect of the order be changed after product shipment has occurred.

Orders for custom product may be canceled by Buyer, provided that Buyer pays Seller for completed work allocated to Buyer's order at the time of termination of the work at the unit selling price and all costs, direct and indirect for work-in-progress as well as costs resulting from cancellation and a reasonable profit therein. Specific cancellation charges will be dependent on the type of custom product ordered; a schedule detailing these charges will be forwarded to Buyer when Buyer's cancellation is acknowledged. Orders for custom product are subject to a cancellation fee of up to 100% of the order, depending on the stage of completion of the order at the date the cancellation or revision is accepted.

Custom Products Policy
Custom items are not returnable; items other than "off the shelf" products are considered custom. Custom products, by their nature, are products and materials which have been altered, modified, cut, amended and customized to your order, and are not resalable or returnable.

Orders for custom product are subject to a cancellation fee of up to 100% of the order, depending on the stage of completion of the order at the date the cancellation or revision is accepted.

Returns
The return of Products without a written authorization by Seller will not be accepted. Returns are accepted only with a valid Return Material Authorization (RMA) number for items to be returned. To receive authorization for Product return, please call customer service. There is a standard 25% restocking cost assessed on most returns.

All returned products must be unused, and in original condition. No refund or credit shall be given for damaged products.

We do not accept return packages without a valid RMA number and we do not accept postage-due or C.O.D. packages at any time for any reason.

Excusable Delay
Seller shall not be liable for any loss or damage resulting from any delay in delivery or failure to deliver which is due to any cause beyond Seller's control, including, without limitation, acts of nature, unavailability of supplies or sources of energy, riots, wars, fires, floods, epidemics, lockouts, strikes and slowdowns, delays in delivery by supplies, or acts or omissions of the Buyer. The Buyer shall be liable for stage charges, including but not limited to all third party costs and expenses incurred by Seller, in holding or storing products for the Buyer or at the Buyer's request.

Assignment
Buyer shall not assign any duties nor assign any order or any interest therein without the written consent of the Seller. Any such actual or attempted assignment shall entitle Seller to cancel the order upon written notice to Buyer.

Installation
Seller assumes no obligation to install any product sold or to place any products in working order at Buyer's premises

Validity of Separate Clauses
If any provisions of this agreement shall be held invalid, illegal, or unenforceable, the validity, legality or enforceability of the remaining provisions shall not be affected or impaired thereby.

Section III – Overview

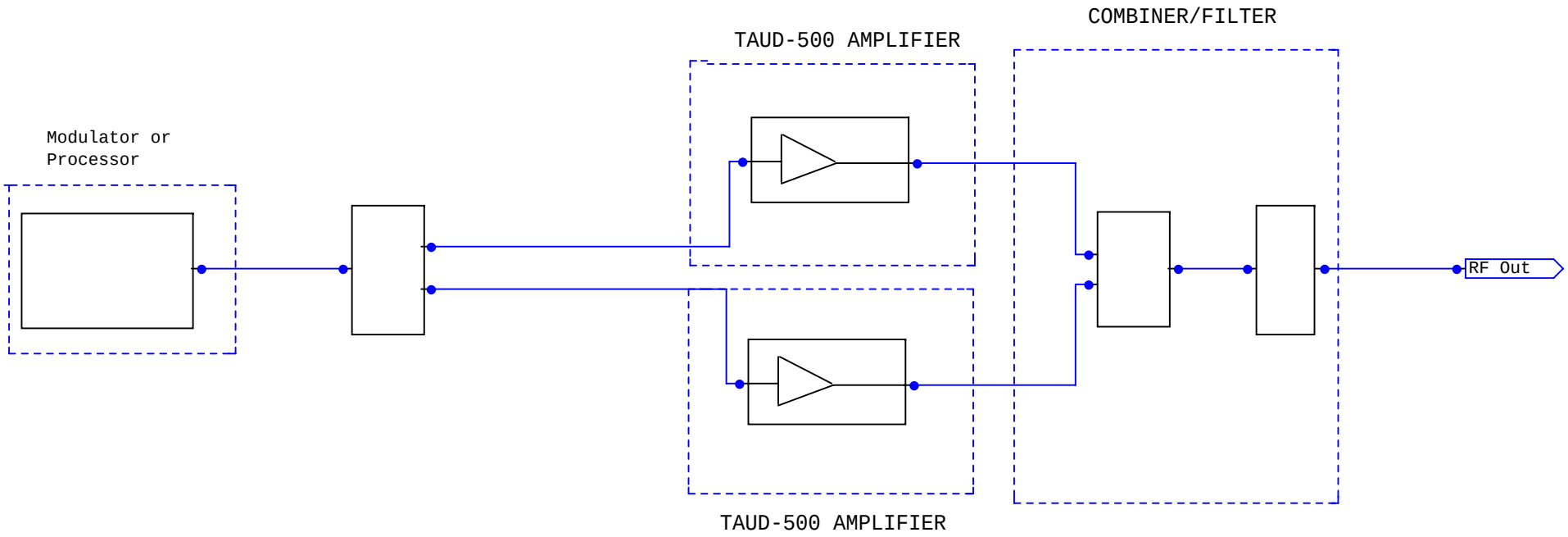
Standard Features

- Narrow output bandpass filter allows adjacent channel operation
- Front panel Display to monitor system parameters
- Microcontroller-based monitoring and control ensures amplifier will never be overdriven and high VSWR will not damage amplifier
- All aluminium enclosure maintains power amplifier's light weight
- Simple design using commonly available parts ensures reliable operation
- Ethernet, SNMP and Remote Port system monitoring

Principle of Operation

The TAUD-1000 power amplifier supplies a 1000-watt (rms) 8VSB television signal 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 TAUD-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 TAUD-1000 is comprised of two TAUD-500 500-watt RMS power amplifiers that get combined to create the 1,000-watts RMS 8VSB RF signal, as illustrated in the following block diagram



External
power
supply

TAUD-1000 BLOCK DIAGRAM	
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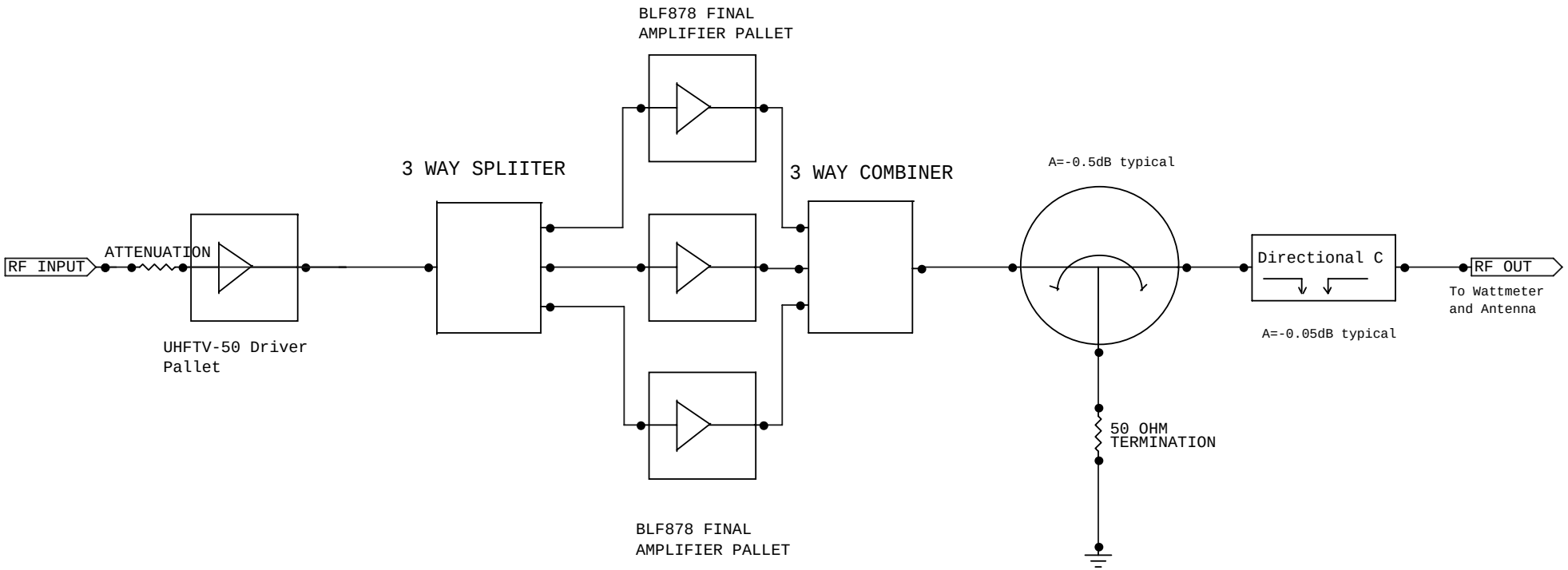
Inside each of the 500-watt RMS power amplifiers, the signal passes through an RF attenuator to limit the output power level of the power amplifier and to help buffer any transients that may come into the power amplifier. After attenuation, the signal gets preamplified through a UHFTV-50 driver amplifier before the signal gets split into (3) signals for final amplification using a 3-way microstrip power divider. The final amplification stage is comprised of (3) BLF878 final amplifiers. The outputs of the (3) final amplifier pallets are combined with a 3-way microstrip combiner and pass through an isolator as illustrated in the following TAUD-500 block diagram. After the isolator, the signal passes through a dual directional coupler before heading into the combiner/filter enclosure.



TAUD-500 ENCLOSURE	
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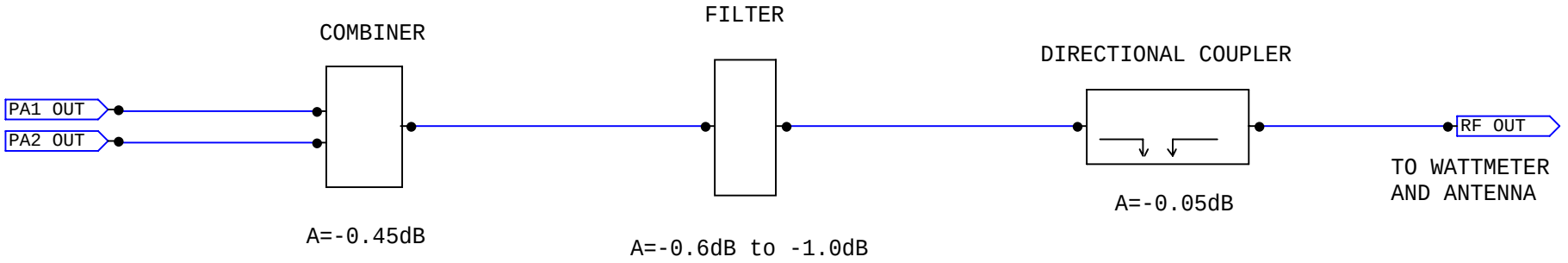
After amplification, the signal exits the power amplifier enclosure and goes into the filter/coupler enclosure. The two RF signals from each of the TAUD-500 amplifiers (500-watts RMS) get combined by a 2-way, 90 degree combiner via phased cables. The amplified signals are filtered with a bandpass filter and monitored again with another directional coupler before heading out to the customers inline 8VSB reading wattmeter and then to an antenna for broadcast, as depicted in the following filter/coupler block diagram.



TAUD-1000 COMBINER/FILTER ENCLOSURE	
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Specifications

Electrical specifications that are specific to the unit are included with the shipment in addition to being kept on file at Technalogix

Physical Characteristics

Operating Temperature	0 - 50°C
Dimensions	
TAUD-500 Power Amplifier (each)	W-19" flange (17” encl.), D-25-¼", H-10 ½” (6U) each
Combiner/Filter	W-19" flange (17” encl.), D-25-¼", H-10 ½” (6U)
Power Supply	W-19" flange (17” encl.), D-25-¼", H-5 ¼” (3U)
TM600-8VSB Modulator (if supplied)	W-19" flange (17” encl.), D-16", H-3 ½” (2U)

Section IV – RF Components

Amplifier Pallets

The UHFTV-50 driver pallet is also a linear class-AB pallet. It has a typical gain of 37dB and draws no more than 3.0Adc total drain current. The quiescent and drain currents can be measured on the UHFTV-50 by inserting an ammeter in series with the power supply lead to the pallet or by measuring the voltage drop across the current sense resistor found directly at the DC power supply lead input to the pallet. This resistance is 0.01-ohms, providing a 10mV per ampere ratio.

The BLF878 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 BLF878 amplifier pallets have a typical gain of 17dB and draw no more than 25Adc. 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

Power Divider/Combiner (internal to each TAUD-500 enclosure)

A Wilkinson power divider and combiner (identical printed circuit boards) are used to split the RF signal into, and combine the amplified RF signal out of the (3) BLF 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 impedance 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.

Splitter/Combiner

The splitter and combiner are used to split the RF signal into, and combine the amplified RF signal out of the (2) final amplifier pallets. The connectorized designs are based on the simple isolated Wilkinson combiner design. Due to its electrical and mechanical symmetry, the Wilkinson design's performance over moderate bandwidths is superior to other types.

Directional Coupler

The Technalogix dual directional coupler provide DC voltages proportional to forward and reflected RF power monitoring. These analog voltages are converted for processing using analog-to-digital converters and provide the control system with valuable data for monitoring purposes. Output power should be set following the operating procedure found elsewhere in this manual. The directional coupler has a typical insertion loss of 0.5dB and its Type N connectors can handle 1,500 watts peak. On higher power systems, 7/16 DIN connectors are used for increased power handling capability.

Isolator

The power amplifier pallets are protected in part by the isolator located in the filter enclosure. It is actually made up of a circulator and 50-ohm dump resistor. The circulators' specifications include an insertion loss of less than 0.2dB with an isolation rating better than 20dB. Any reflected power gets dumped into the flanged power resistor. Even though the flanged power resistor is rated for less than the transmitter's rated power, the software will recognize quickly that reflected power is present and turn the carrier off. This way, there is instantaneous protection due to the isolator setup and long term protection due to the software.

Filter

The passive bandpass filter rejects spurious and harmonic output products and passes the channel RF output. The cavity resonator uses aperture coupling and is a linear resonator design. Typical insertion loss is 0.4 dB to 0.6 dB depending on channel 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 switching supplies in the Power Supply enclosure that feed all of the amplifier pallets and fans inside each of the two TAUD-500 amplifier enclosures that make the 1,000-watts RMS. In addition, the Combiner/Filter enclosure has a small switching supply to feed the control circuitry in that enclosure.

The power supplies found in the Power Supply enclosure are (2) Meanwell RSP-3000-48. The switching power supply is 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 resettable circuit breaker. The power supplies are set at 48.0Vdc nominally. All fans in the Power Amplifier enclosure run off this same supply.

The power supply found in the Combiner/Filter enclosure is a Meanwell S60-24. It powers the control PCBS in the Combiner/Filter enclosure. Its output voltage is set to 24.0 Vac.

MEAN WELL

3000W Single Output Power Supply — RSP-3000 series

Features :

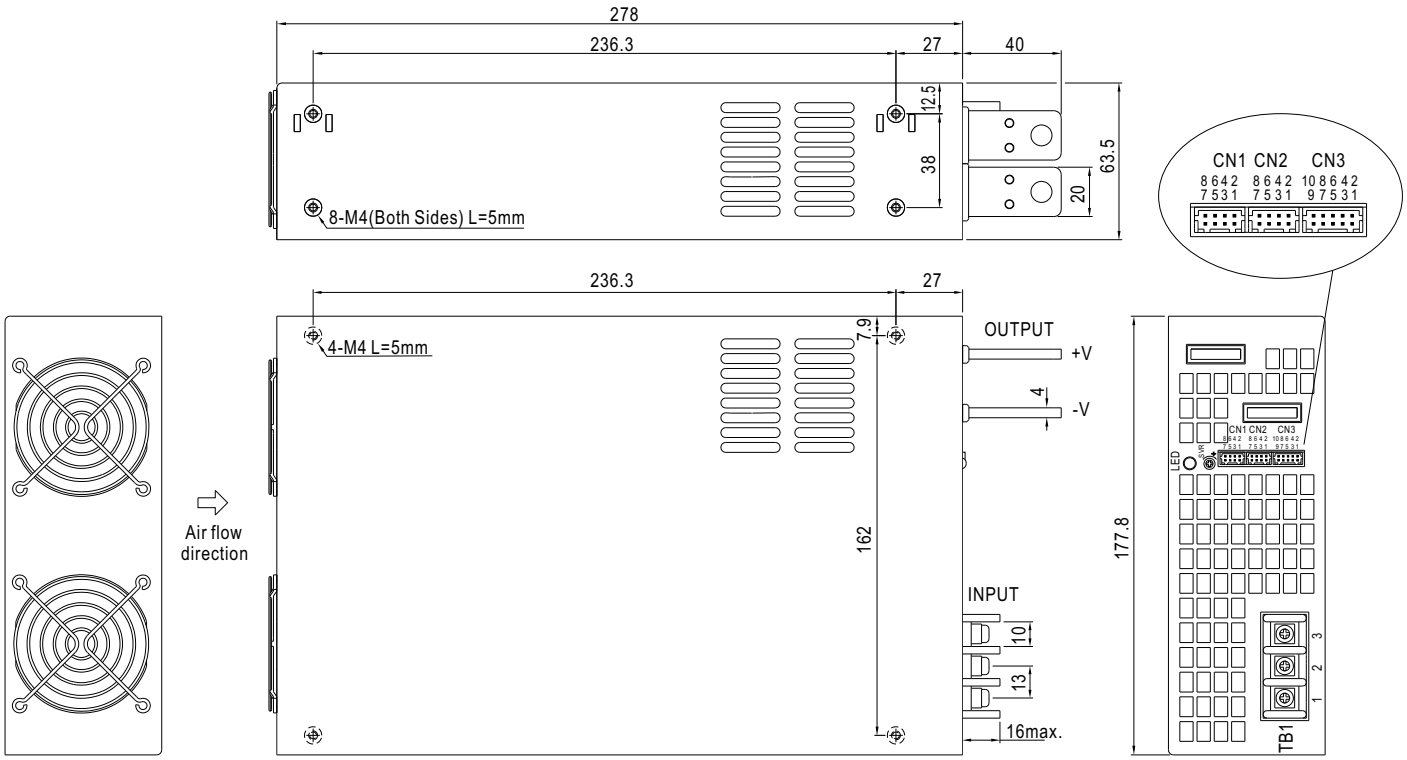
- AC input 180 ~ 264VAC
- AC input active surge current limiting
- High efficiency up to 90%
- Built-in active PFC function,PF>0.95
- Protections: Short circuit / Overload / Over voltage / Over temperature / Fan alarm
- Forced air cooling by built-in DC with fan speed control function
- Output voltage can be trimmed between 20~110% of the rated output voltage
- High power density 15.6W/inch^3
- Current sharing up to 3 units
- Alarm signal output (relay contact and TTL signal)
- Built-in 12V/0.1A auxiliary output for remote control
- Built-in remote ON-OFF control
- Built-in remote sense function
- 3 years warranty

SPECIFICATION

MODEL		RSP-3000-12	RSP-3000-24	RSP-3000-48
OUTPUT	DC VOLTAGE	12V	24V	48V
	RATED CURRENT	200A	125A	62.5A
	CURRENT RANGE	0 ~ 200A	0 ~ 125A	0 ~ 62.5A
	RATED POWER	2400W	3000W	3000W
	RIPPLE & NOISE (max.) Note.2	150mVp-p	150mVp-p	200mVp-p
	VOLTAGE ADJ. RANGE	10.8 ~ 13.2V	22 ~ 28V	43 ~ 56V
	VOLTAGE TOLERANCE Note.3	±1.0%	±1.0%	±1.0%
	LINE REGULATION	±0.5%	±0.5%	±0.5%
	LOAD REGULATION	±0.5%	±0.5%	±0.5%
	SETUP, RISE TIME	1000ms, 80ms at full load		
	HOLD UP TIME (Typ.)	10ms at full load		
INPUT	VOLTAGE RANGE	180 ~ 264VAC 254 ~ 370VDC		
	FREQUENCY RANGE	47 ~ 63Hz		
	POWER FACTOR (Typ.)	0.95/230VAC at full load		
	EFFICIENCY (Typ.)	86%	90%	90.5%
	AC CURRENT (Typ.)	20A/180VAC 16A/230VAC		
	INRUSH CURRENT (Typ.)	60A/230VAC		
	LEAKAGE CURRENT	<2.0mA / 240VAC		
PROTECTION	OVERLOAD	100 ~ 112% rated output power		
		User adjustable continuous constant current limiting or constant current limiting with delay shutdown after 5 seconds, re-power on to recover		
	OVER VOLTAGE	13.8 ~ 16.8V	28.8 ~ 33.6V	57.6 ~ 67.2V
		Protection type : Shut down o/p voltage, re-power on to recover		
	OVER TEMPERATURE	90℃ ±5℃(12V), 110℃ ±5℃(24V), 105℃ ±5℃(48V) (TSW1: detect on heatsink of power transistor)		
		90℃ ±5℃(12V), 85℃ ±5℃(24V), 75℃ ±5℃(48V) (TSW2 : detect on heatsink of o/p diode)		
		Protection type : Shut down o/p voltage, recovers automatically after temperature goes down		
FUNCTION	AUXILIARY POWER(AUX)	12V@0.1A(Only for Remote ON/OFF control)		
	REMOTE ON/OFF CONTROL	Please see the Function Manual		
	ALARM SIGNAL OUTPUT	Please see the Function Manual		
	OUTPUT VOLTAGE TRIM	2.4 ~ 13.2V	4.8 ~ 28V	9.6 ~ 56V
	CURRENT SHARING	Please see the Function Manual		
ENVIRONMENT	WORKING TEMP.	-20 ~ +70℃ (Refer to output load derating curve)		
	WORKING HUMIDITY	20~90% RH non-condensing		
	STORAGE TEMP., HUMIDITY	-40 ~ +85℃, 10 ~ 95% RH		
	TEMP. COEFFICIENT	±0.05%/℃ (0 ~ 50℃)		
	VIBRATION	10 ~ 500Hz, 2G 10min./1cycle, 60min. each along X, Y, Z axes		
SAFETY & EMC (Note 4)	SAFETY STANDARDS	UL60950-1, TUV EN60950-1 approved		
	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:100M Ohms / 500VDC / 25℃/ 70% RH		
	EMI CONDUCTION & RADIATION	Compliance to EN55022 (CISPR22)		
	HARMONIC CURRENT	Compliance to EN61000-3-2,-3		
	EMS IMMUNITY	Compliance to EN61000-4-2,3,4,5,6,8,11; ENV50204, EN55024, light industry level, criteria A		
OTHERS	MTBF	104.5K hrs min. MIL-HDBK-217F (25℃)		
	DIMENSION	278*177.8*63.5mm (L*W*H)		
	PACKING	4Kg; 4pcs/16Kg/1.89CUFT		
NOTE	1. All parameters NOT specially mentioned are measured at 230VAC input, rated load and 25℃ of ambient temperature. 2. Ripple & noise are measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a 0.1uf & 47uf parallel capacitor. 3. Tolerance : includes set up tolerance, line regulation and load regulation. 4. The power supply is considered a component which will be installed into a final equipment. The final equipment must be re-confirmed that it still meets EMC directives.			

■ Mechanical Specification

Case No.982B Unit:mm



AC Input Terminal Pin No. Assignment

Pin No.	Assignment
1	AC/L
2	AC/N
3	FG ⏚

Control Pin No. Assignment(CN1,CN2) : HRS DF11-8DP-2DS or equivalent

Pin No.	Assignment	Pin No.	Assignment	Mating Housing	Terminal
1	RCG	5,7	-S	HRS DF11-8DS or equivalent	HRS DF11-**SC or equivalent
2	RC	6	CS(Current Share)		
3	PV	8	+S		
4	PS				

RCG: Remote ON/OFF Ground
RC : Remote ON/OFF
PV :Output Voltage External Control
PS : Reference Voltage Terminal
-S : -Remote Sensing
CS: Load Share
+S: +Remote Sensing

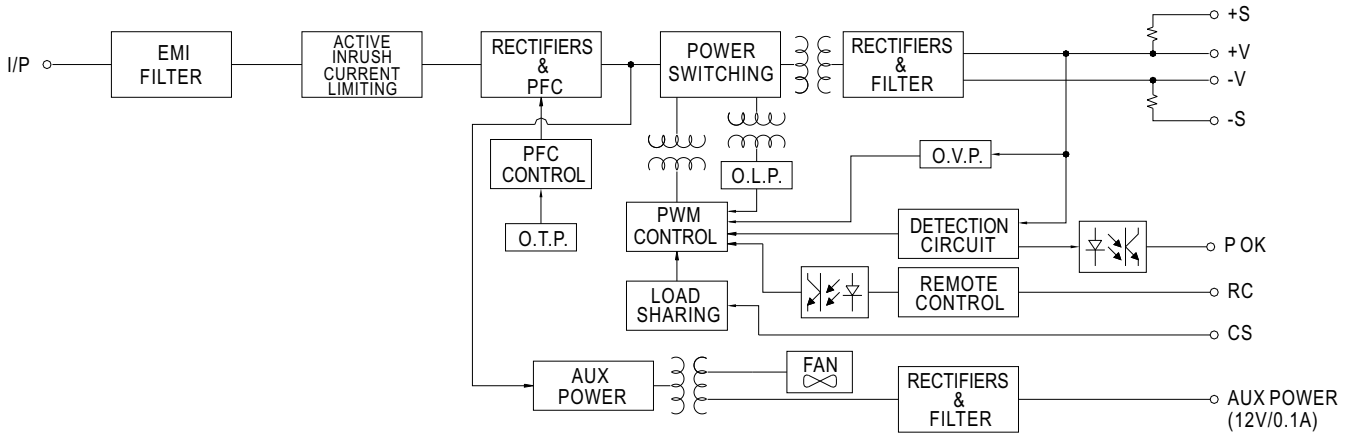
Control Pin No. Assignment(CN3) : HRS DF11-10DP-2DS or equivalent

Pin No.	Assignment	Pin No.	Assignment	Pin No.	Assignment	Pin No.	Assignment	Mating Housing	Terminal
1	P OK GND	4	P OK2	7	AUXG	10	OL-SD	HRS DF11-10DS or equivalent	HRS DF11-**SC or equivalent
2	P OK	5	RCG	8	AUX				
3	P OK GND2	6	RC	9	OLP				

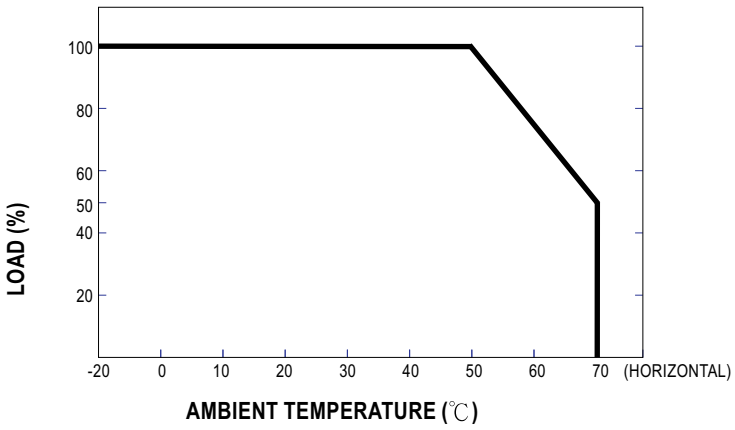
P OK GND: Power OK Ground
P OK: Power OK Signal (Relay Contact)
P OK2: Power OK Signal (TTL Signal)
RCG: Remote ON/OFF Ground
RC: Remote ON/OFF
AUXG: Auxiliary Ground
AUX: Auxiliary Output
OLP: OLP/OL-SD:OLP mode select

■ Block Diagram

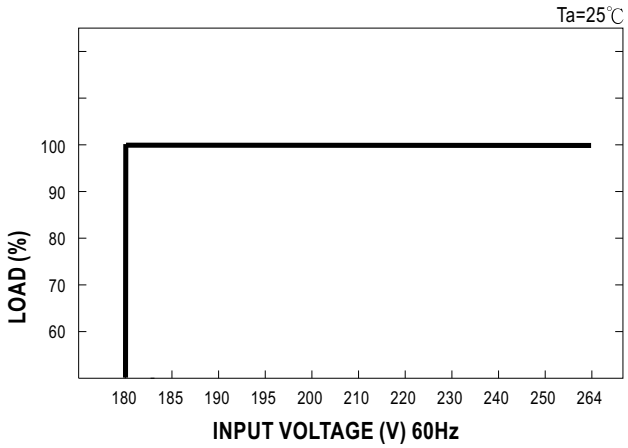
PFC fosc : 88KHz
PWM fosc : 100KHz



■ Derating Curve



■ Static Characteristics



■ Function Manual

1.Remote ON/OFF

(1)Remote ON/OFF control becomes available by applying voltage in CN1 & CN2 & CN3.

(2)Table 1.1 shows the specification of Remote ON/OFF function.

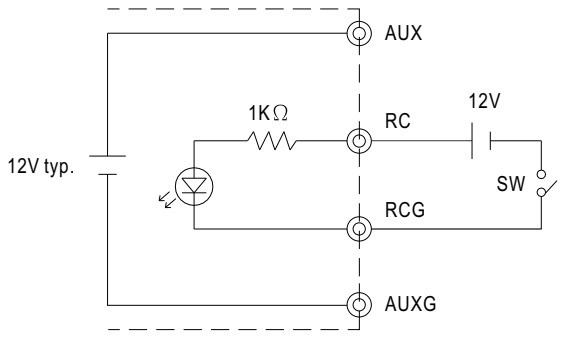
(3)Fig.1.2 shows the example to connect Remote ON/OFF control function.

Table 1.1 Specification of Remote ON/OFF

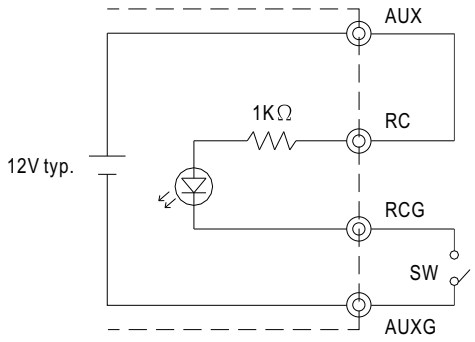
Connection Method		Fig. 1.2(A)	Fig. 1.2(B)	Fig. 1.2(C)
SW Logic	Output on	SW Open	SW Open	SW Close
	Output off	SW Close	SW Close	SW Open

Fig.1.2 Examples of connecting remote ON/OFF

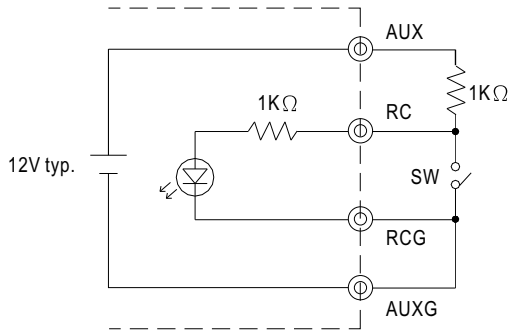
(A)Using external voltage source



(B)Using internal 12V auxiliary output



(C)Using internal 12V auxiliary output



2.Alarm Signal Output

(1)Alarm signal is sent out through "P OK" & "P OK GND" and P OK2 & P OK GND2 pins.

(2)An external voltage source is required for this function.

(3)Table 2.1 explain the alarm function built-in the power supply.

Function	Description	Output of alarm(P OK, Relay Contact)	Output of alarm(P OK2, TTL Signal)
P OK	The signal is "Low" when the power supply is above 80% of the rated output voltage-Power OK	Low (0.5V max at 500mA)	Low (0.5V max at 10mA)
	The signal turns to be "High" when the power supply is under 80% of the rated output voltage-Power Fail	High or open (External applied voltage, 500mA max.)	High or open (External applied voltage, 10mA max.)

Table 2.1 Explanation of alarm

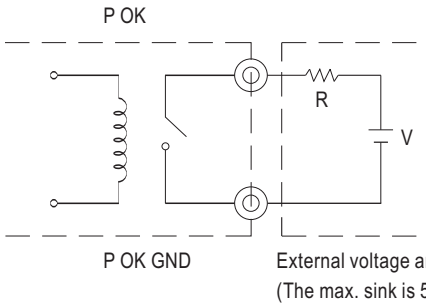


Fig. 2.2 Internal circuit of P OK (Relay, total is 10W)

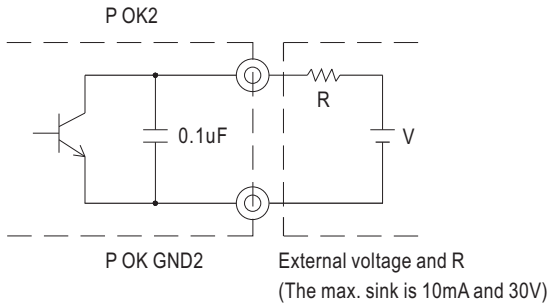


Fig. 2.3 Internal circuit of P OK2 (Open collector method)

3.Output Voltage TRIM

(1)Connecting an external DC source between PV and-S on CN1 or CN2 that is shown in Fig. 3.1.

(2)Adjustment of output voltage is possible between 20~110%(Typ.) of the rated output which is shown in Fig. 3.2. Reducing output current is required when the output voltage is trimmed up.

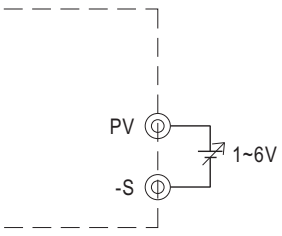


Fig. 3.1 Add on 1~6V external voltage

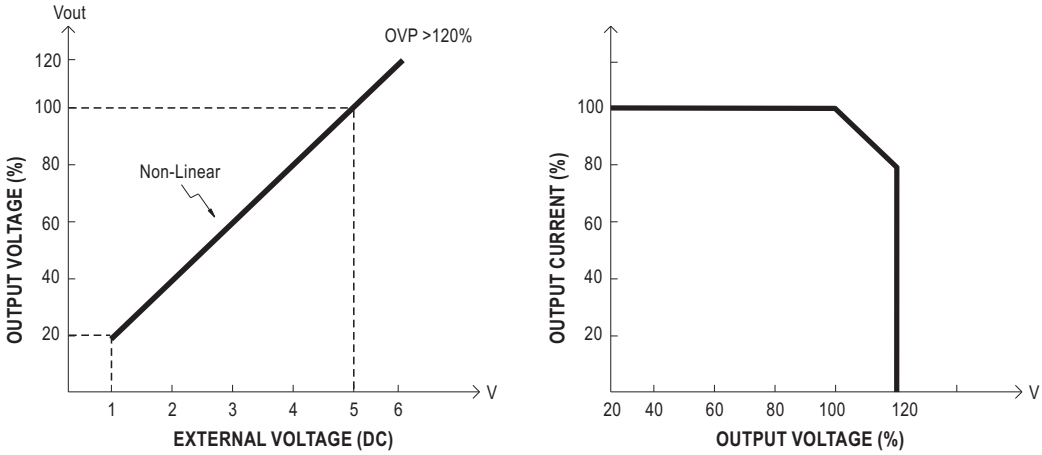


Fig. 3.2 Output voltage trimming

4.Current Sharing

(1)Parallel operation is available by connecting the units shown as below
(+S,-S and CS are connected mutually in parallel):

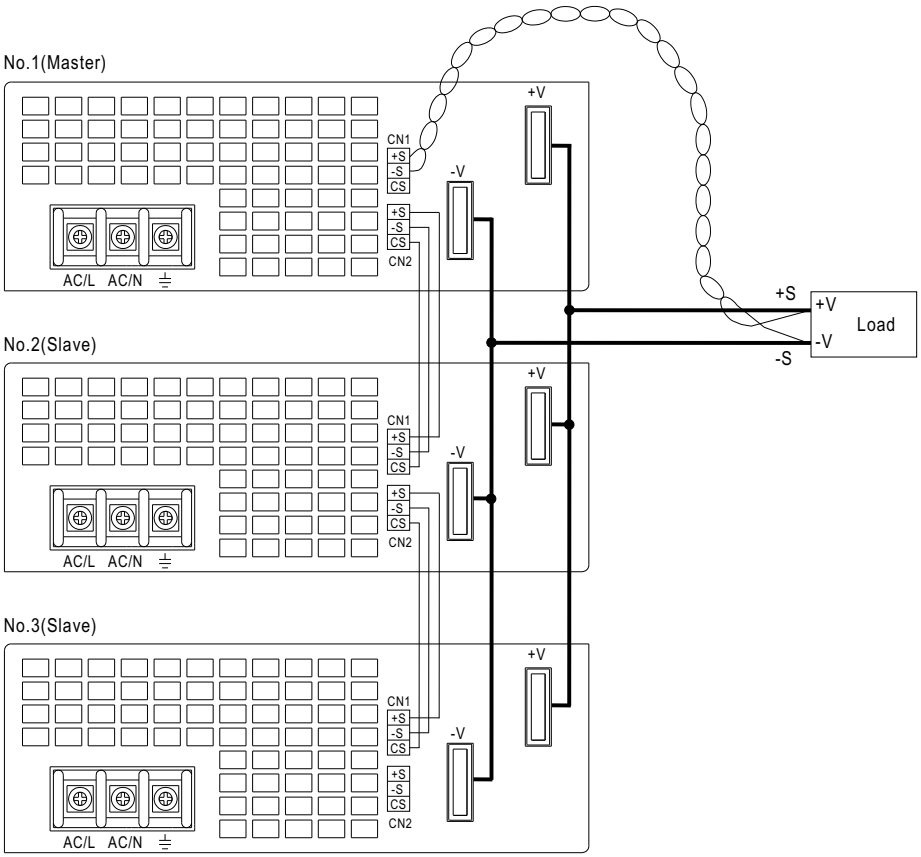
(2)The voltage difference among each output should be minimized that less than ±2% is required.

(3)The total output current must not exceed the value determined by the following equation.
(Output current at parallel operation)=(The rated current per unit) x (Number of unit) x 0.9

(4) In parallel operation 3 units is the maximum, please consult the manufacturer for other applications.

(5) When remote sensing is used in parallel operation, the sensing wire must be connected only to the master unit.

(6) Wires of remote sensing should be kept at least 10 cm from input wires.



(7) When in parallel operation, the minimum output load should be greater than 2% of total output load.
(Min. Load >3% rated current per unit×number of unit)

(8) Under parallel operation, the "output voltage trim" function is not available.

5.Select O.L.P mode

(1)Remove the shorting connector on CN3 that is shown in Fig 5.1, the O.L.P. mode will be "continuous constant current limiting".

(2)Insert the shorting connector on CN3 that is shown in Fig 5.2, the O.L.P. mode will be "constant current limiting with delay shutdown after 5 seconds, re-power on to recover.

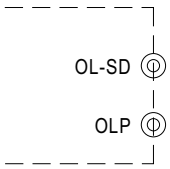


Fig. 5.1 Remove the CN3
OLP Mode : constant current limiting

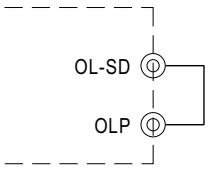
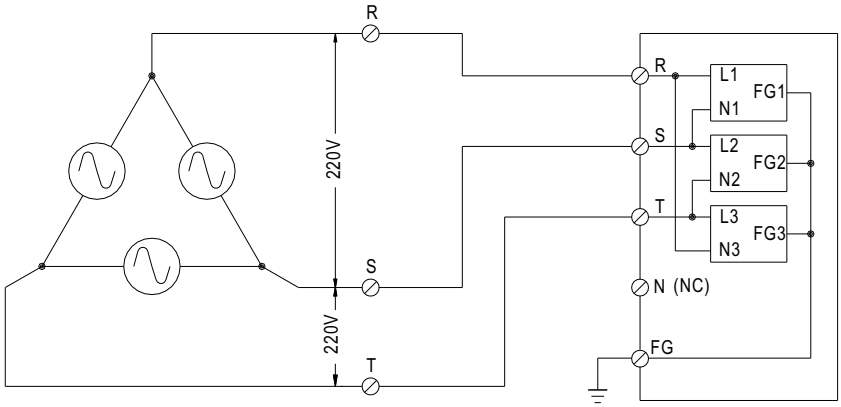


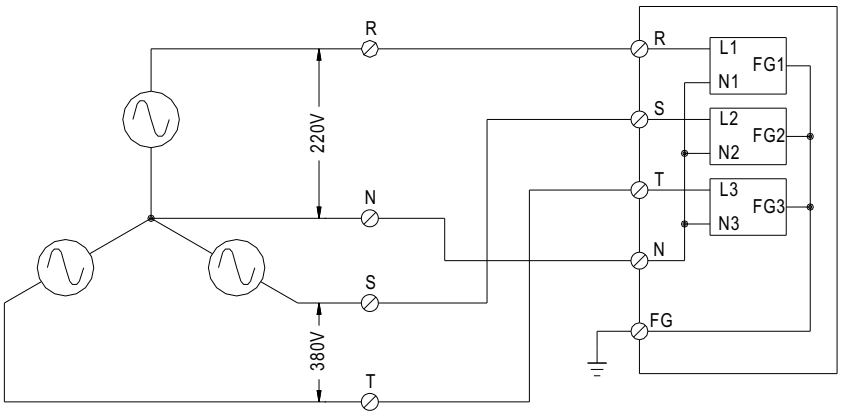
Fig. 5.2 Insert the CN3
OLP Mode : constant current limiting with delay shutdown after 5 seconds

6.Three Phase Connect

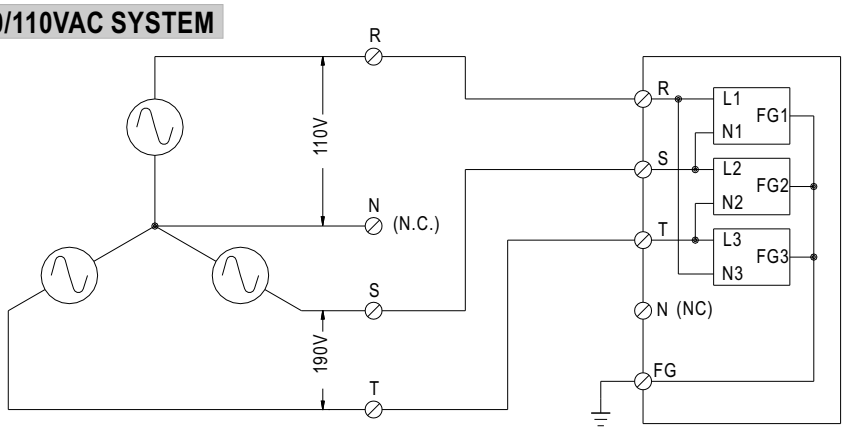
■ FIG. A: 3 ϕ 3W 220VAC SYSTEM (STANDARD MODEL FOR STOCK)



■ FIG. B: 3 ϕ 4W 220/380VAC SYSTEM



■ FIG. C: 3 ϕ 4W 190/110VAC SYSTEM



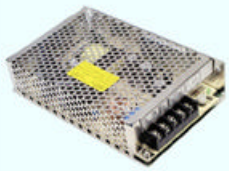
MEAN WELL

SWITCHING POWER SUPPLY

ISO-9001 CERTIFIED MANUFACTURER

S-60 SERIES

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



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.

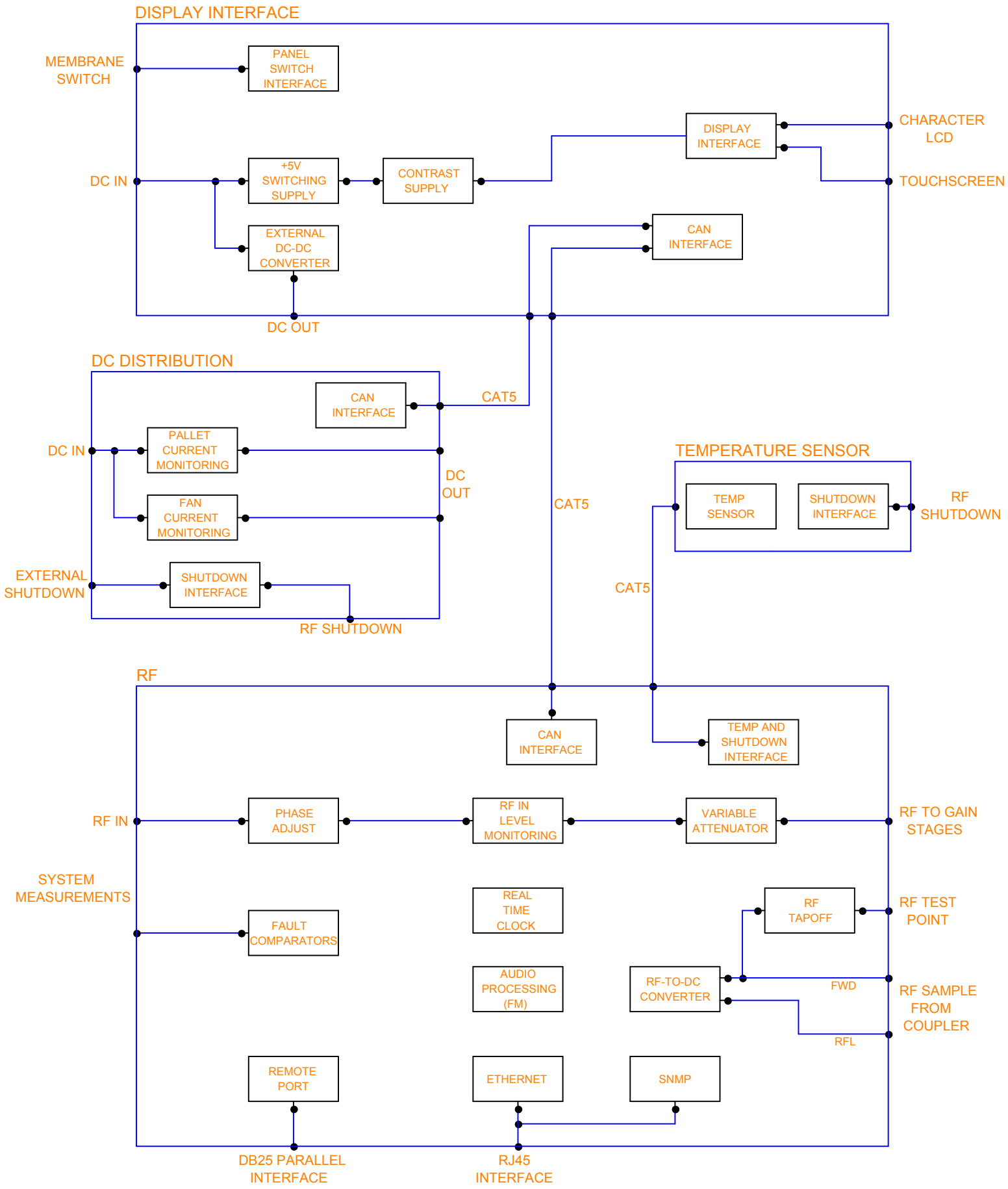
2000-10-03

Section VI – Monitor and Control System

Control System Overview (Adrenaline)

The Adrenaline control system is used for a variety of functions, the most important of which is ensuring that the transmitter continues to operate in a safe manner. The control system also allows the user to monitor and control the transmitter from both the front panel and remotely through the parallel port, Ethernet, or SNMP access port (some features optional).

The Adrenaline control system is comprised of three modules. These modules work together to provide all the functions of the control system and include: Display Interface, RF, and Temperature Sensor modules. In higher power/multiple pallet systems, a fourth module (DC Distribution) is included. The operation of each module is outlined in the following sections and illustrated in the following block diagram.



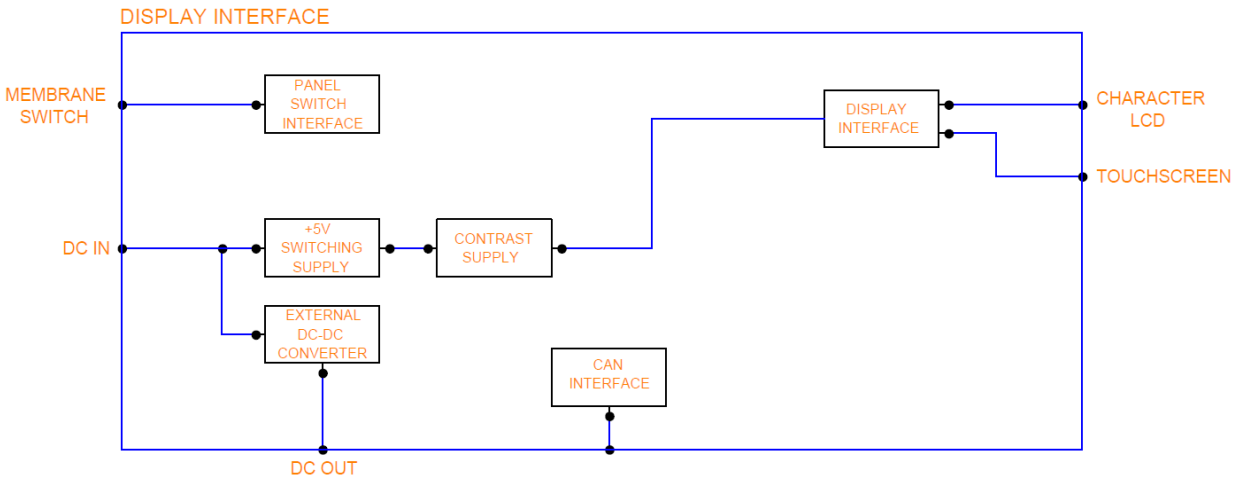
Rev	ID Adrenaline Block Diagram	
Date: September 15, 2010		Page: 1 of 1

Display Interface Module
REV 1.01 (ASY 015)
Touchscreen Option

The primary function of the Display Interface module is, as the name suggests, providing the display and user interface for the control system. This circuit board is mounted behind the front panel of the power amplifier enclosure(s) in the transmitter/translator, near the 4.3” touchscreen display. All switch/settings and user interface is handled through the resistive touchscreen. The touchscreen on the front panel is connected to the Display Interface PCB through a cable. These components provide the user with the ability to monitor the following power amplifier parameters from the front panel:

- Forward (incident) power at the power amplifier output.
- Reflected (reverse) power at the power amplifier output.
- DC voltage of the power amplifier’s power supply.
- DC current in the power amplifier.
- Temperature of the heat sink of the power amplifier.
- The time since the transmitter/translator was last shut down.
- Full history of faults and events
- Mode of the power amplifier (selectable between Manual and AGC).
- Indication if there is attenuation added to the front end of the power amplifier indicating fold back in RF power (indicates amount of attenuation)
- Settings to change the VSWR trip point shutdown between 1.1:1 and 1.8:1.
- Settings to change the RF power units between % power (maximum of 110%) or watts.
- Summary of PCB modules and assembly numbers specific to the power amplifier

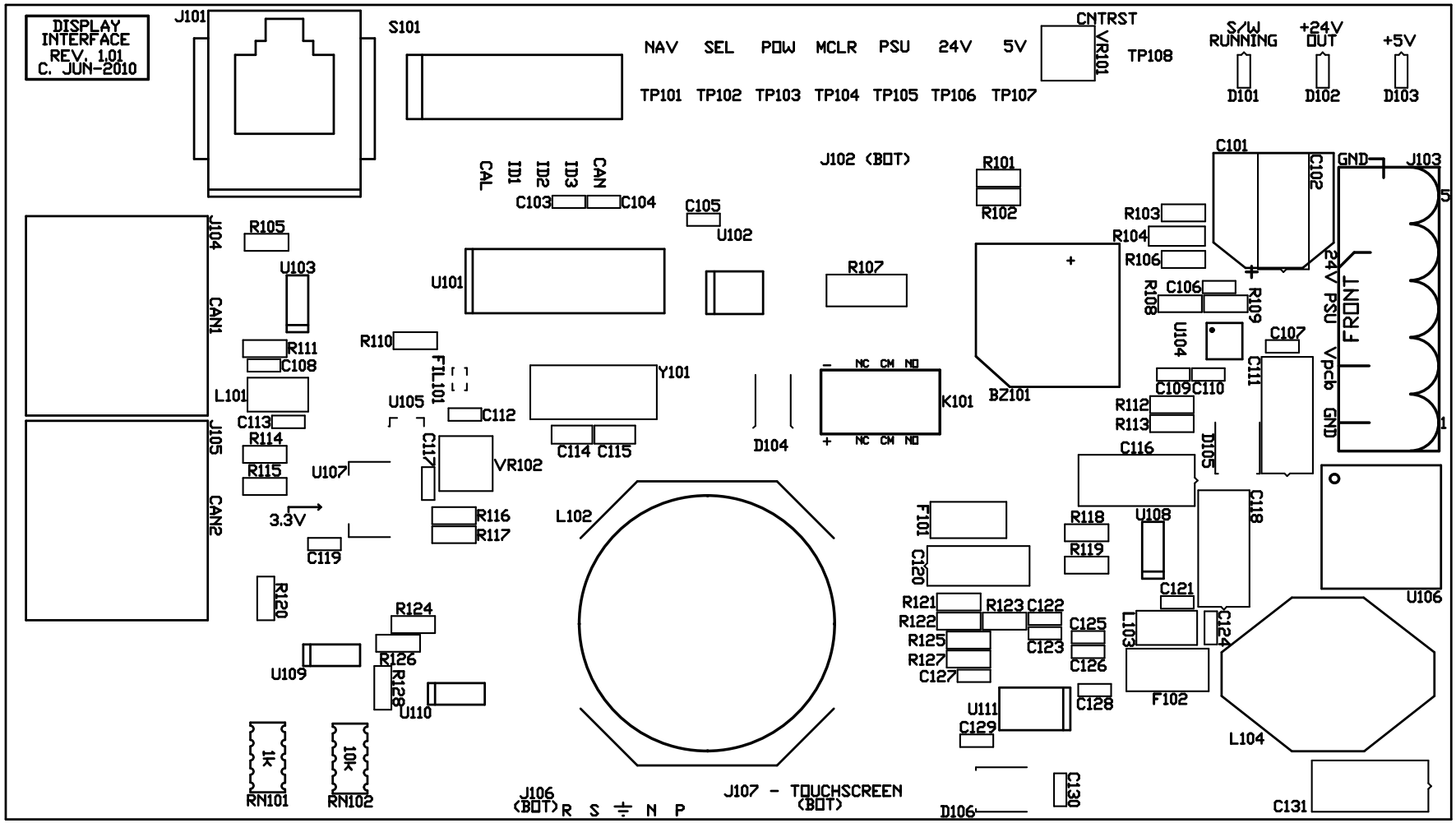
A block diagram of the Display Interface PCB follows:

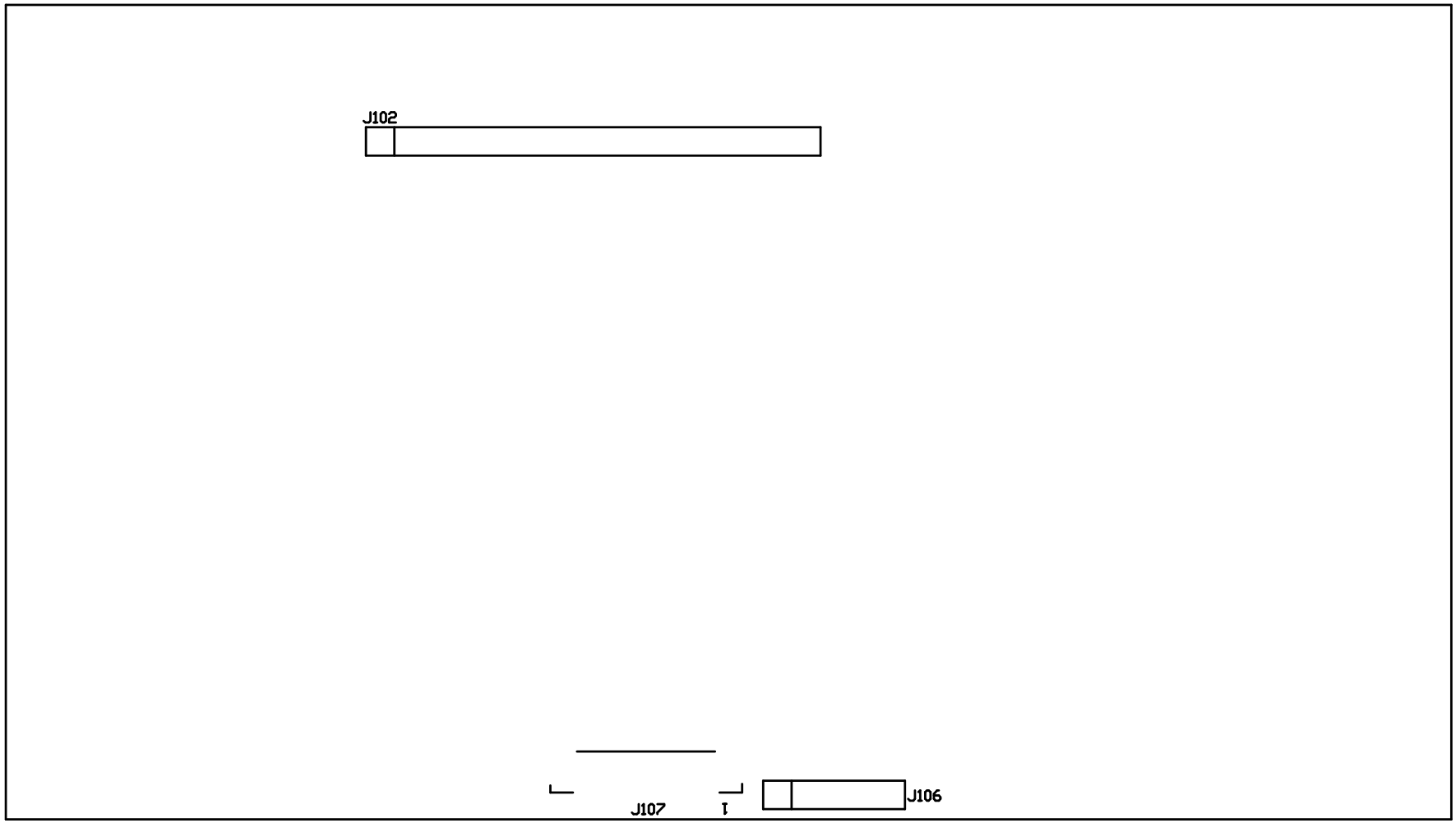


The hardware of the Display Interface module is based around microcontroller (U101). This part interfaces directly with the touchscreen to provide output and receive input from the user. It also communicates with the RF board (and DC Distribution Module, if installed) over a Controller Area Network (CAN) bus. This communication is facilitated by U103, and passes through a CAT5 cable attached to connector J104. The communication link with the RF module allows the Display Interface Module to receive information about the forward power, reflected power, and temperature of the transmitter, as well as relay commands from the user to the rest of the system. If the DC Distribution Module is installed (on higher power systems with multiple pallets), then the Display Interface receives DC currents from the DC Distribution via the same CAN bus.

Other elements of the Display Interface module are also controlled by the microcontroller. A buzzer (BZ101) and software status LED (D101), which flashes when the software / microcontroller is running, are all controlled through a buffer (U102). DC supply enters through connector J103, which powers the PCB and also the optional DC-DC converter (based around U111), if populated. The PCB voltage is regulated at +5V by U106 and associated circuitry. If the PCB is populated for FM broadcast, then the PWM filter circuit (based around U104) is also populated and provides a DC output control voltage on pin 3. The touchscreen interfaces to the Display Interface via connector J107.

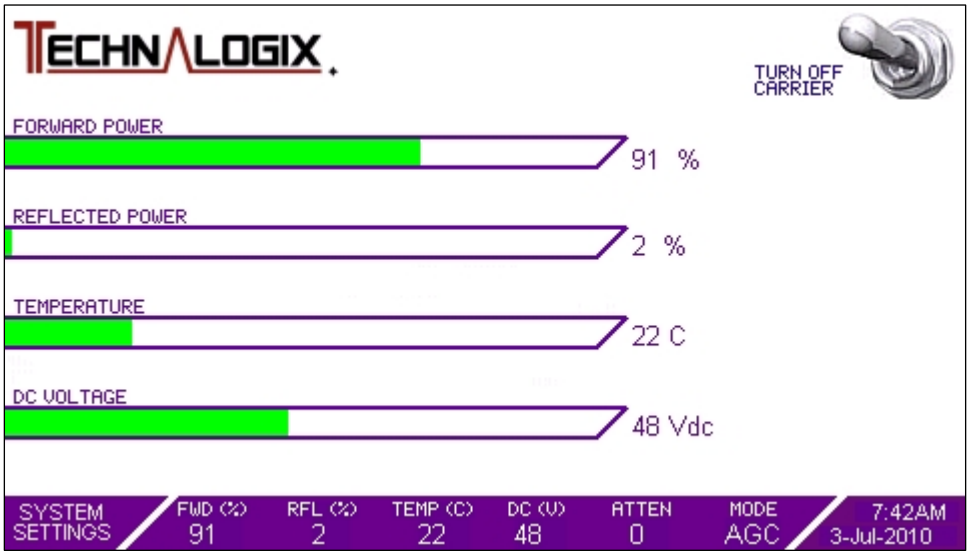
The fuses on the Display Interface are all resettable. F102 protects the +5V line while F101 protects the DC-DC converter, if installed.


DISPLAY
INTERFACE
REV. 1.01
C. JUN-2010
J101
S101
NAV
SEL
POW
MCLR
PSU
24V
5V
TP101
TP102
TP103
TP104
TP105
TP106
TP107
CNTRST
VR101
TP108
S/W
RUNNING
+24V
OUT
+5V
D101
D102
D103
CAL
ID1
ID2
ID3
CAN
C103
C104
C105
U102
J102 (BOT)
R101
R102
C101
C102
GND
J103
R103
R104
R106
R107
U101
R105
J104
CAN1
U103
R111
C108
L101
C113
J105
CAN2
R114
R115
3.3V
U107
R110
FIL101
U105
C112
Y101
C114
C115
D104
K101
NC CM NO
BZ101
R108
C106
R109
U104
C107
C111
C109
C110
R112
R113
D105
C116
C117
VR102
R116
R117
L102
C119
R120
R124
R126
R128
U109
U110
1k
10k
RN101
RN102
F101
C120
R118
R119
U108
C118
C121
C122
C123
C124
C125
C126
C127
C128
L103
F102
U111
C129
L104
U106
C131
C130
D106
J106
(BOT)
R S ⏚ N P
J107 - TOUCHSCREEN
(BOT)
24V PSU Vpcb GND
FRONT
5
1


J102
J107
1
J106

Main Screen

From the screen shot of the main screen, as seen in the figure below, all of the system's main parameters can be viewed at a quick glance. The three main sections of this screen are the four level bars, the summary bar at the bottom of the screen, and the carrier ON/OFF button. The level bars show real time system performance and help illustrate any transient changes that occur. The FORWARD POWER and REFLECTED POWER level bars can also be shown in watts (a full description of how to do this is found in the SETTINGS section. The summary bar at the bottom of the screen will stay in place no matter what screen is being viewed to allow for an operating summary at any time. Also from any screen, the transmitter's carrier can be turned on or off to facilitate adjustments, settings, and testing/troubleshooting.



The following breakdown describes the Main Screen features in further detail:

SYSTEM SETTINGS

Toggles between Main Screen and Menu Screen. The menu screen has additional settings and monitoring over the Main Screen, and is illustrated in the next section.

FWD (%) 91

Forward RF power level in % out of 100 or watts. Mimics data from level bar. Overdrive protection starts at 110% where the power amplifier folds back power by adding attenuation to the power amplifier input until a safe level obtained. System continually checks power level and tries to bring RF power level back to where it was when the fault occurred. If overdrive occurs, a warning is also displayed in red text near the top of the touchscreen and the event recorder logs the event.

Reflected RF power level in % out of 100 or watts. Mimics data from level bar. The high VSWR fault occurs when the measured VSWR of the system exceeds the user-defined VSWR trip point found in the RF Power Menu, described later in this section. If the VSWR exceeds the user defined shutdown level, but is below 1.8:1, then attenuation is added to the power amplifier input until a safe level is reached. If the measured VSWR exceeds 1.8:1, then the RF carrier is turned off to protect the amplifier chain. At this point, the system will continually check to see if it is safe to come back on. This protection scheme helps ensure that the system stays on the air as long as possible before doing a complete shutdown. If high reflected power occurs, a warning is also displayed in red text near the top of the touchscreen and the event recorder logs the event.

Temperature from sensor mounted on heat sink surface. Shutdown trip point is factory set at a predetermined level to keep the amplifier pallets safe. Should a fan fail inside the power amplifier enclosure, or air conditioning fails inside the broadcast facility causing the temperature to exceed the trip point, the control system will lower forward RF power until a safe level of measured temperature is achieved. The system will continually try and bring the RF power back to the same level when the fault occurred if it is safe to do so, a warning is displayed in red text near the top of the touchscreen, and the event recorder logs the event.

RF output power is determined largely in part by the amount of attenuation that the control system places on the input of the power amplifier. Whether a fault occurs and attenuation gets added or the user requests a change in RF power level via the web/SNMP/Remote Port interface, the attenuation section of the summary bar conveys important operating information. If the user requests a change in forward power level via the web interface, SNMP monitoring and control, or simply via the Remote Port connector on the back of the enclosure, and an asterisk (*) is placed next to the attenuation value in the summary bar. This informs the user whether or not the attenuation was added due to a fault or simply because it was requested.

Automatic Gain Control or Manual mode. In AGC mode, the control system maintains a user-settable forward RF power level by monitoring output power and making slight adjustments as necessary. In Manual mode, the forward RF power level is adjusted from the touchscreen via the RF Power Screen described later in this section. If a fault occurs while the system is in AGC mode, the system kicks out of AGC mode, goes into Manual mode, and the fault procedures are followed. The user can toggle back and forth from AGC and Manual modes by going to the RF Power Screen and changing the mode.

Date and Time. Displays current date and time. Power amplifiers ship from factory with default Mountain Standard Time (MST). Users can adjust this info from the Date and Time Screen. The event recorder pulls this info when it logs an event so the user can correlate events in the field. Events stored prior to a date and/or time change will maintain their original event stamp and will not be modified to reflect the change. A Real Time Clock holds time for about one week without AC power.

Carrier ON/OFF switch. By pressing the toggle switch on the touchscreen, the can turn on or off the RF carrier. The same result occurs by turning on or off the system via the web or SNMP interface, or through controlling of the Remote Port. A quick beep from the on-board buzzer signifies that the response has been taken. The power supplies and fan will remain active while the carrier is turned off via this switch.

Menu Screen

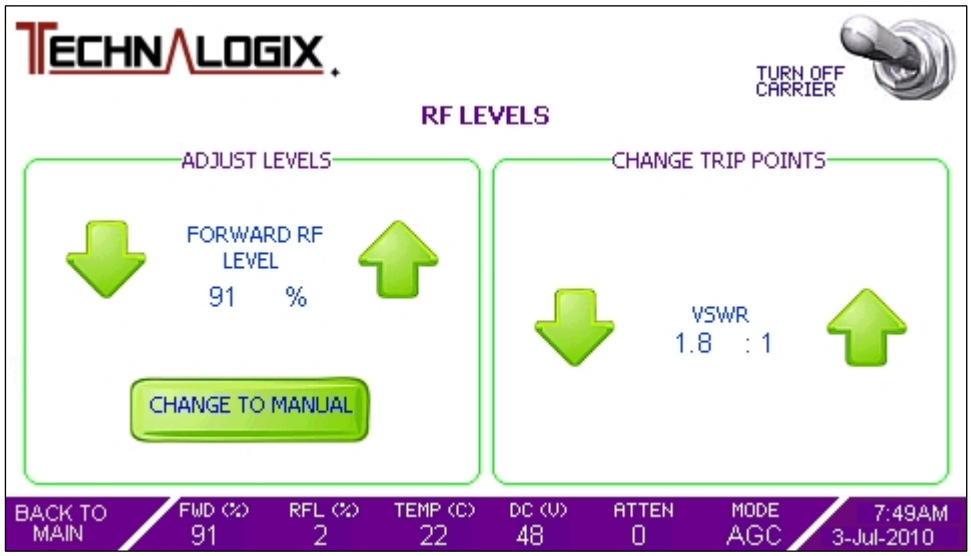
The menu screen allows the user to dive into further details of the power amplifier's operations. Pressing the BACK TO MAIN button will toggle between the Main Screen and the Menu Screen. The Menu Screen is shown below:

Each of the menu icons on the Menu Screen allow the user to take additional readings or make settings that are not provided from the Main Screen. Any changes to settings will be stored in non-volatile memory with the exception of the date and time which are stored as long as the backup battery remains charged (approximately one week of loss of AC power or power down).

While the user is in the sub menu screens (anything besides the Main Screen), full monitoring and protection is taking place. This means that is a user makes a change to a setting or parameter that jeopardizes the power amplifier, the control system will provide protection, display the fault in red text near the top of the touchscreen, and stay in the current menu.

The individual menu screens will now be covered.

This screen allows the user to change settings to the RF levels, including the Forward RF level and the reflected (VSWR) trip point. From this screen, the user can also toggle between AGC and Manual mode. The RF Levels Screen is displayed below:



To adjust Forward RF Level:
Press the up or down arrows until the desired Forward RF level is reached. If the adjusted level exceeds 110%, the protection will kick in and the system will fold back the RF power to a safe level. There may be a residual amount of Forward power even at 0% setting, but it should be insignificant.

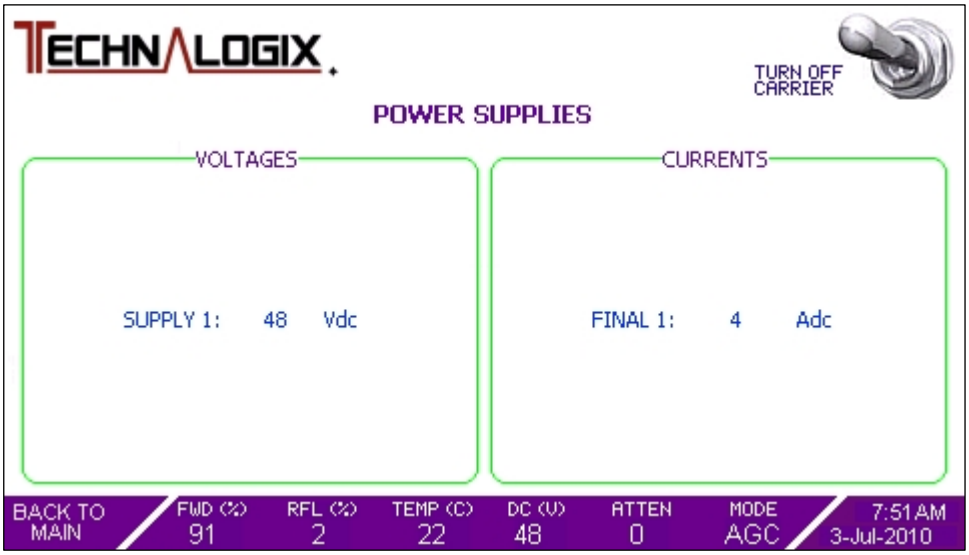
To toggle between Manual and AGC Mode:
Simply press the CHANGE TO MANUAL or CHANGE TO AGC button in the Adjust Levels half of the screen. If a fault occurs while in AGC mode, the system will default back to Manual mode and protective action will be taken.

NOTE: Pressing the up and down arrows for Forward RF level change while in AGC will change the power. The same holds true for Ethernet, SNMP, or Remote Port control The AGC is designed to hold the RF power level steady when the system is unmanned for external events like temperature, slight changes to the input level, and long term component fatigue.

To change the VSWR Shutdown Trip Point:
Use the up and down arrows to set the VSWR shutdown trip point to between 1.1:1 and 1.8:1. If a measured VSWR is found above the set trip point, but below 1.8:1, then the system will fold back the forward power to a safe level. If the measured VSWR exceeds 1.8:1, then the carrier will be initially turned right off.

Power Supplies Screen

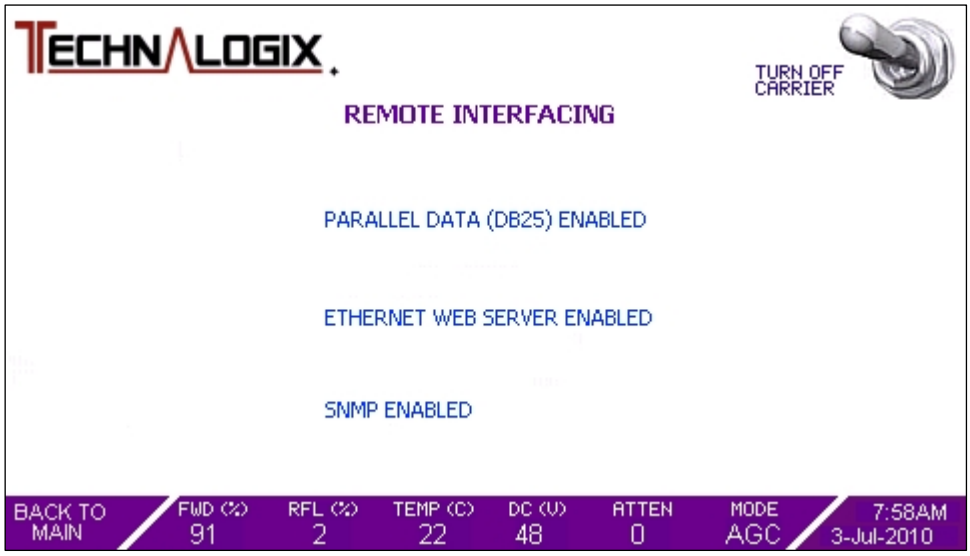
This screen allows the user to view individual voltage and current readings. The Power Supplies Screen is displayed below:



DC supply voltages are nominally 30 or 48Vdc depending on the system. Readings of this voltage in the Power Supplies Screen, and on the summary bar at the bottom of the touchscreen, should not vary more than +/- 2%.

If multiple amplifier pallets are included in the amplifier chain, then the individual currents will all be displayed in the Currents section of the screen. In the case of multiple pallets in the chain, typically the user should see matching of the final pallets to within approximately 10%. Anything outside this range is usually a sign that there may be an issue. Transistor device or circulator / isolator load damage could be the culprit, or the tragic spilt-drink-on-transmitter incident. Our team would be glad to walk you through any troubleshooting issues or questions you may have.

The Remote Interfacing Screen is simply a summary of what features are installed into the control system, as seen in the following screen shot.



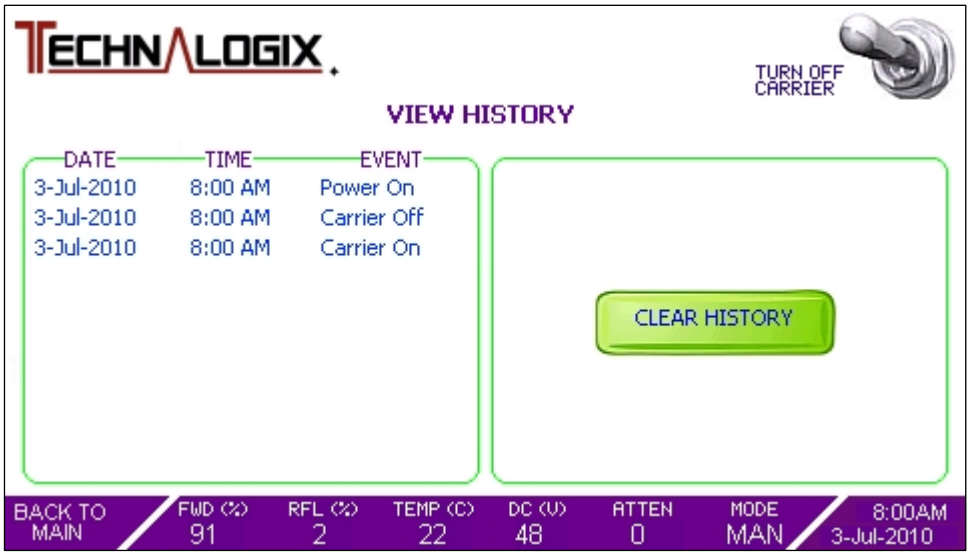
The Remote Port, or parallel data, through the DB25 connector on the back panel of the enclosure extracts the majority of the internal system information and provides it externally for processing and control. The Remote Port is the equivalent of a standalone external remote monitor.

The Ethernet web server provides a means to monitor system information via a web site. This is accomplished via the Ethernet connector on the back panel of the power amplifier. The unit's IP address is listed in the Version Screen.

The SNMP offers a third method of monitoring system parameters and external control. The user's Network Management System (NMS) can monitor multiple transmitter sites remotely and control common functions of the system via the Technalogix Management Information Base (MIB).

Detailed information on all three remote interfacing subsystems is found later in this section.

The History Screen provides a summary of the most recent events that have occurred in the power amplifier, including the date and time of occurrence. An event can either be a fault or simply an action like turning on or off the carrier. The format of the History Screen is illustrated below:



Ten of the most recent events are displayed on the History Screen. As more events occur, the earliest recorded event gets displaced on the screen. If the user changes the time and/or date from the Date and Time Screen, then the events that occurred before the time and/or date change remain unchanged with their original time stamp.

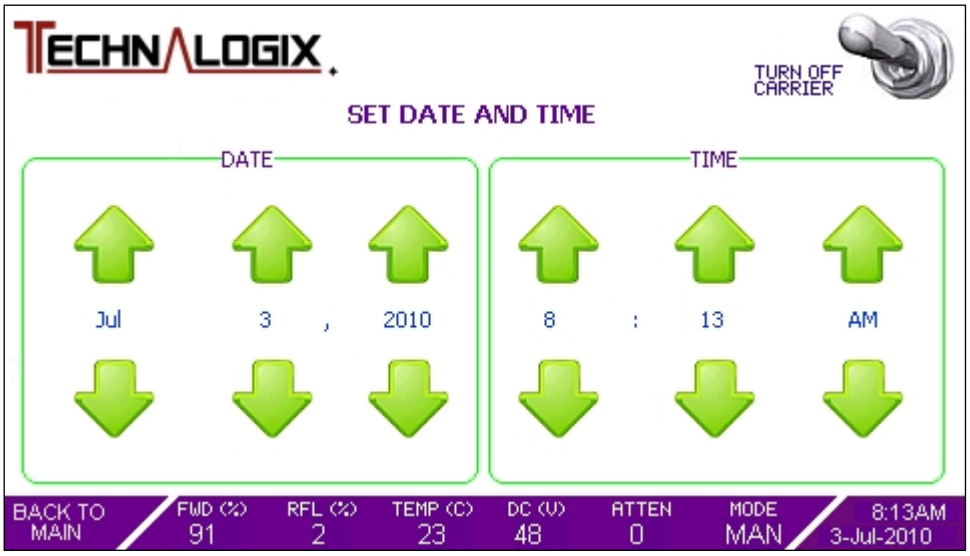
The user can clear the history screen by pressing the CLEAR HISTORY. Users will find this screen useful in correlating events in the power amplifier with external events like weather and changes to the broadcast facility's environment.

The events are recorded in non-volatile memory so they are safe in the event of a power outage or pesky lightning-strike-wins-fight-with-power-supply.

Date and Time Screen

The Date and Time Screen is used to update the date and time of the control system. This is typically used to create accurate correlations between the event history and events that are external to the system.

The time is factory set to the factory's Mountain Standard Time (MST).



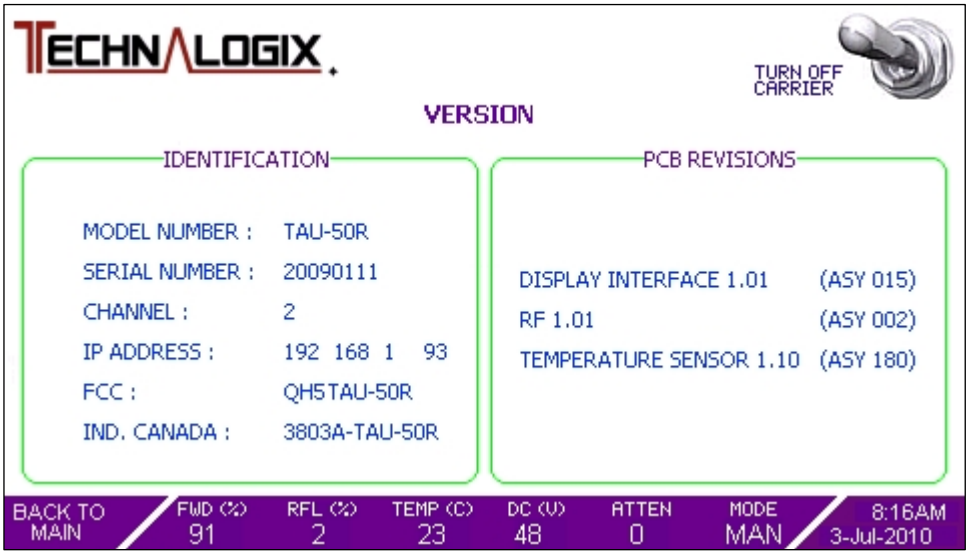
Changes to the date or time are made by simply pressing the up or down arrows associated with each section (month, day, hour, etc). Any changes will immediately be seen in the summary bar on the bottom right of the touchscreen. When the changes are made, simply press the BACK TO MAIN button to continue to other screens.

Version Screen

The Version Screen contains no user-settable items, but is intended as an identification screen to the user. It also helps Technalogix maintain its unmatched service reputation by allowing our technicians and Service team to know exactly what versions of PCBs are inside a customer's unit, even several years down the road. The versions can then be correlated to factory documentation. In addition, current government certification numbers are included for Industry Canada and FCC. Please contact Technalogix if you require copies of the actual grants, or visit:

FCC: https://fjallfoss.fcc.gov/oetcf/eas/reports/GenericSearch.cfm (grantee code QH5)
Ind. Canada: http://www.ic.gc.ca/app/sitt/reltel/srch/nwRdSrch.do?lang=eng (company 3803)

Finally, general information is included in the Version Screen for users who may not be familiar with the equipment and do not want to venture into the dusty abyss behind the rack or cabinet searching for tiny ID tags. The Version Screen is illustrated below:



Contact Screen

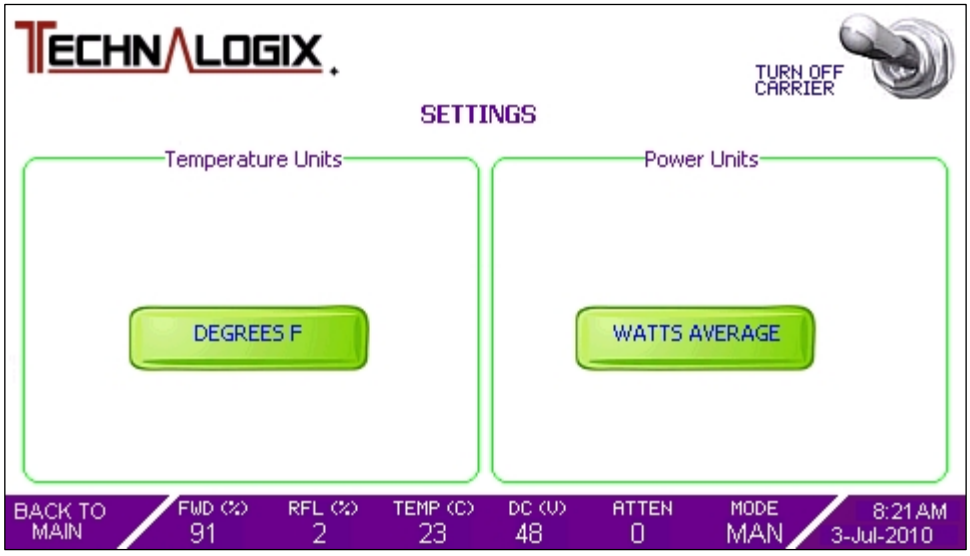
The Contact Screen provides an easy means for the user to get in touch with Technalogix for anything. Whether they have a technical or installation question or simply want to chat about how gosh darn cool our equipment is, Technalogix welcomes questions, feedback, and contact.

If you are in the area, please feel free to stop by to tour the facility, test drive some state of the art products, or get a refresher on some training.

Settings Screen

"You say tomato..."

The Settings Screen allows the user to modify some of their preferences on how information is displayed on the touchscreen, as seen in the figure below:

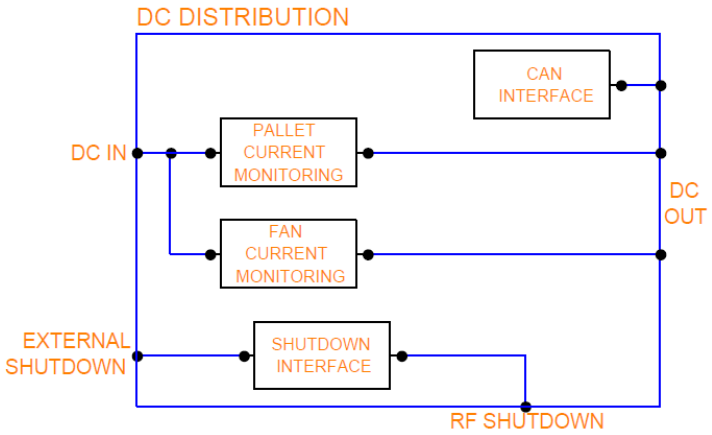


Pressing the DEGREES F button will convert all temperature readings to degrees Fahrenheit from Celsius (and vice versa). Temperature protection trip points are factory set.

Similarly, the user can switch between watts or percentage for their RF power readings. When in percentage mode, the power amplifier is designed for a maximum operating power of 100% with overdrive protection at 110%.

DC Distribution Module
REV 1.01 (ASY 085)

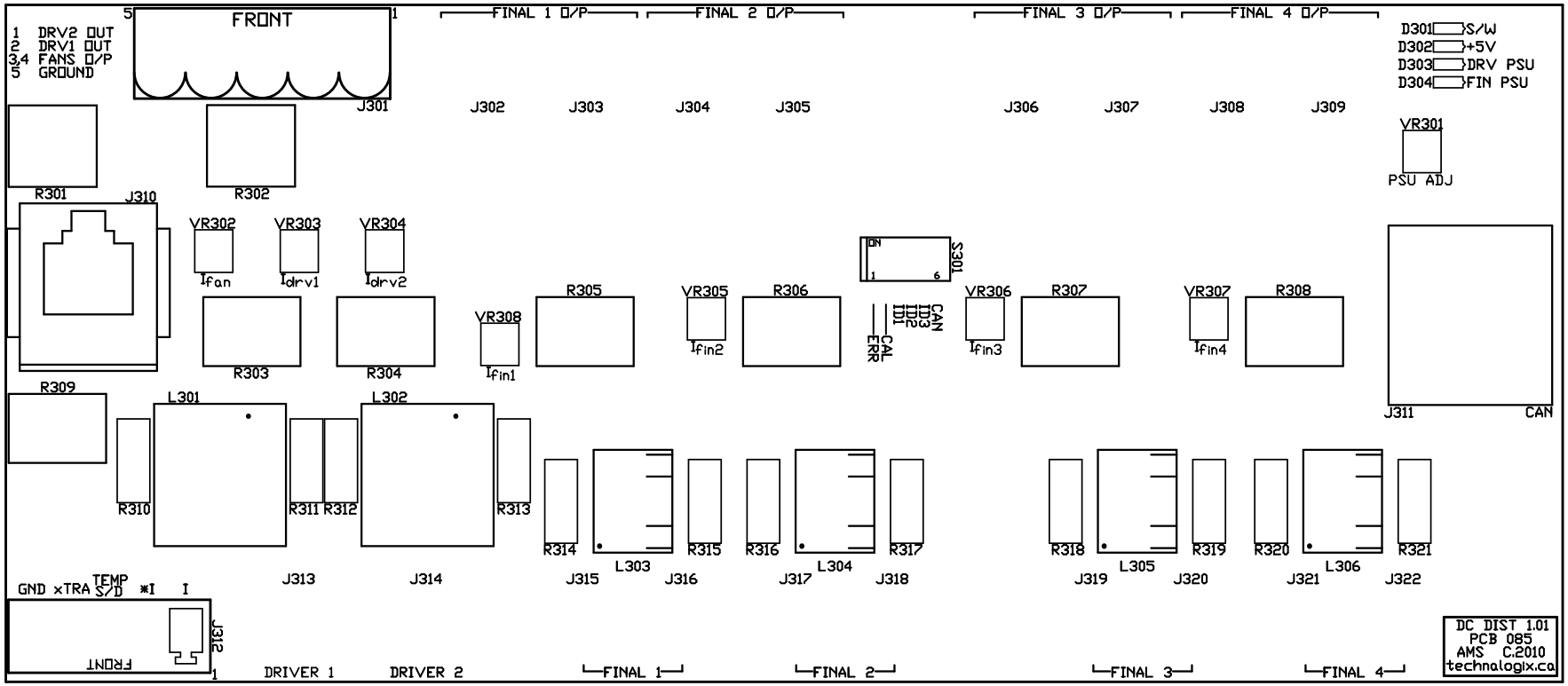
The DC Distribution module takes DC from the system's power supply, splits it up for drivers, finals, and fans, and monitors the current draw of the individual loads for protection, as seen in the following block diagram:

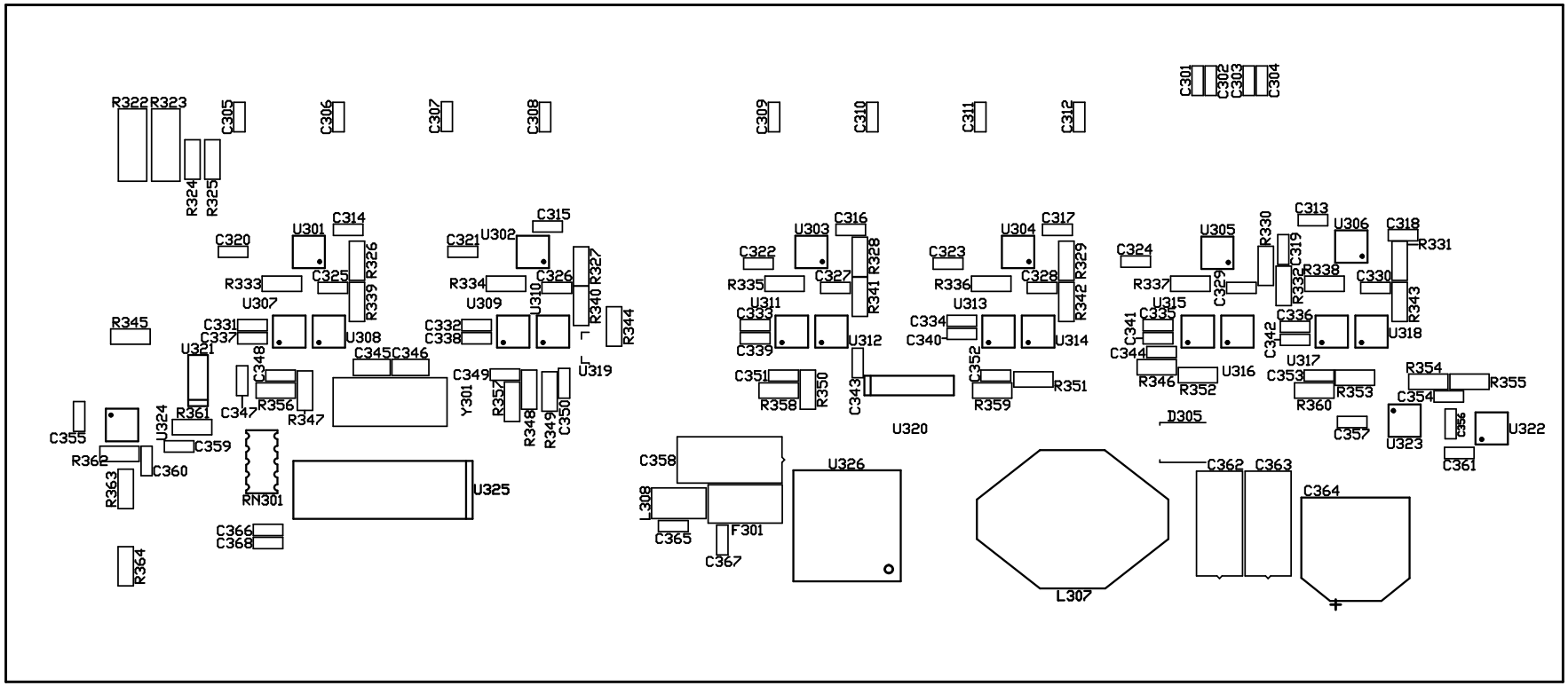


DC is fed into the module via connectors J313 and J314 for the drivers and fans and J315 through J322 for the finals. The DC currents are then monitored for both display and protection purposes. U308, U310, U312, U314, U316, U318, and U322 convert voltage drops across current shunts for display purposes (sent to Display Interface), while U307, U309, U311, U313, U315, and U317 handle high speed protection duties. The shutdown interface circuit takes internal current faults and external inputs and processes them through an OR/NOR gate before the shutdown signal heads off board. The DC current measurements that are to be used for display purposes are also filtered via op amps U301 through U306, and U323. DC voltage is monitored through U324.

Microcontroller U325 handles the interface between the Display Interface and the DC Distribution and also converts the DC currents into a format suitable for sending through CAN to the Display Interface. U321 handles the actual CAN bus data transfer.

The same DC that feeds the drivers and fans also powers the on board regulator (U326) that generates the +5V. The green LED D302 provides visual indication that the 5V is present and fuse F301 is good. Two yellow LEDs, D303 and D304, provide visual indication that the DC supply inputs are present for both the drivers/fans and finals, respectively. A flashing D301 (orange LED) indicates that the software is running.


1 DRV2 OUT
2 DRV1 OUT
3,4 FANS O/P
5 GROUND
FRONT
FINAL 1 O/P
FINAL 2 O/P
FINAL 3 O/P
FINAL 4 O/P
D301 S/W
D302 +5V
D303 DRV PSU
D304 FIN PSU
J301
J302
J303
J304
J305
J306
J307
J308
J309
VR301
PSU ADJ
R301
R302
J310
VR302
VR303
VR304
Ifan
Idrv1
Idrv2
R303
R304
VR308
Ifin1
R305
VR305
Ifin2
R306
S301
CAN
ID3
ID2
ID1
CAL
ERR
VR306
Ifin3
R307
VR307
Ifin4
R308
J311
CAN
R309
L301
L302
R310
R311
R312
R313
J313
J314
R314
L303
R315
R316
L304
R317
J315
J316
J317
J318
R318
L305
R319
R320
L306
R321
J319
J320
J321
J322
GND xTRA S/D *I I
TEMP
J312
FRONT
1
DRIVER 1
DRIVER 2
FINAL 1
FINAL 2
FINAL 3
FINAL 4
DC DIST 1.01
PCB 085
AMS C.2010
technalogix.ca


R322
R323
C305
C306
C307
C308
C309
C310
C311
C312
C301
C302
C303
C304
R324
R325
U301
C314
C320
C321
U302
C315
R326
C325
R333
R334
C326
R327
U307
U309
U310
R339
R340
R344
R345
C331
C337
U308
C330
C338
U321
C345
C346
C348
C349
U319
C347
R356
R347
Y301
R357
R348
R349
C350
C355
R361
U324
C359
R362
C360
R363
RN301
U325
C366
C368
R364
U303
C316
C322
C327
R328
R335
R341
U311
C333
C339
U312
C343
R358
R350
U320
U304
C317
C323
C328
R329
R336
R342
U313
C334
C340
U314
C352
R359
R351
U305
R330
C313
U306
C318
C324
C319
R331
R337
C329
R332
R338
C330
R343
U315
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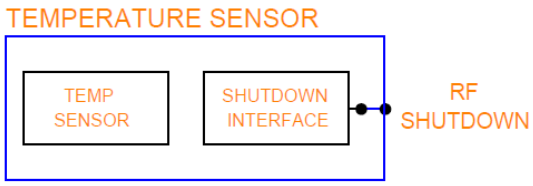
C336
C341
C342
U318
C344
U316
R346
R352
U317
C353
R353
R360
R354
R355
C354
C357
U323
C356
U322
C361
D305
C358
U326
C362
C363
C364
L308
C365
F301
C367
L307

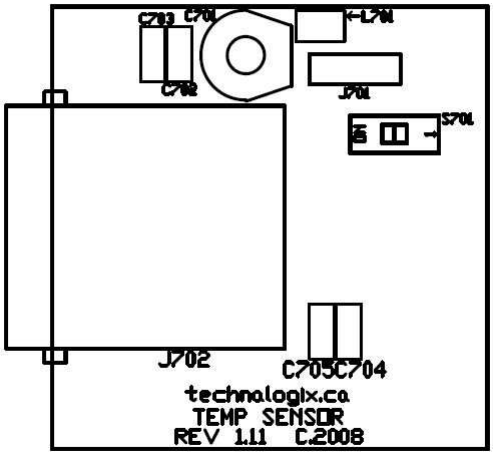
Temperature Sensor Module
REV 1.11 (ASY 181)

The Temperature Sensor module is a small board mounted to the main heatsink of the amplifier. The main purpose of the temperature sensor module is to take temperature readings of the heatsink. The following is a block diagram of the Temperature Sensor module:

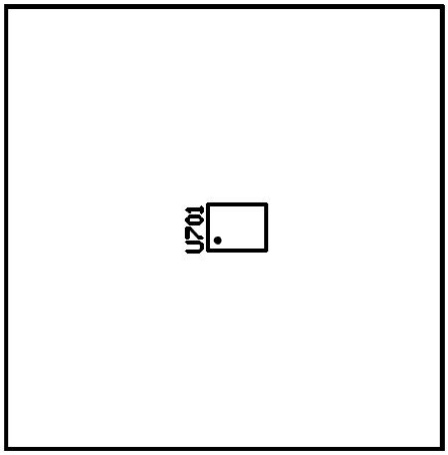


The temperature sensor IC is U701 which, after it has taken a reading, relays the digital information to the RF PCB module through J702. Also passing through J702 is a driver disable signal coming from the RF PCB module. The Temperature Sensor module simply takes this signal and passes it through to a pad, where a wire connects it to the driver or first gain stage pallet.

Temp sensor 1.11 component layout Top



Temp sensor 1.11 component layout bottom

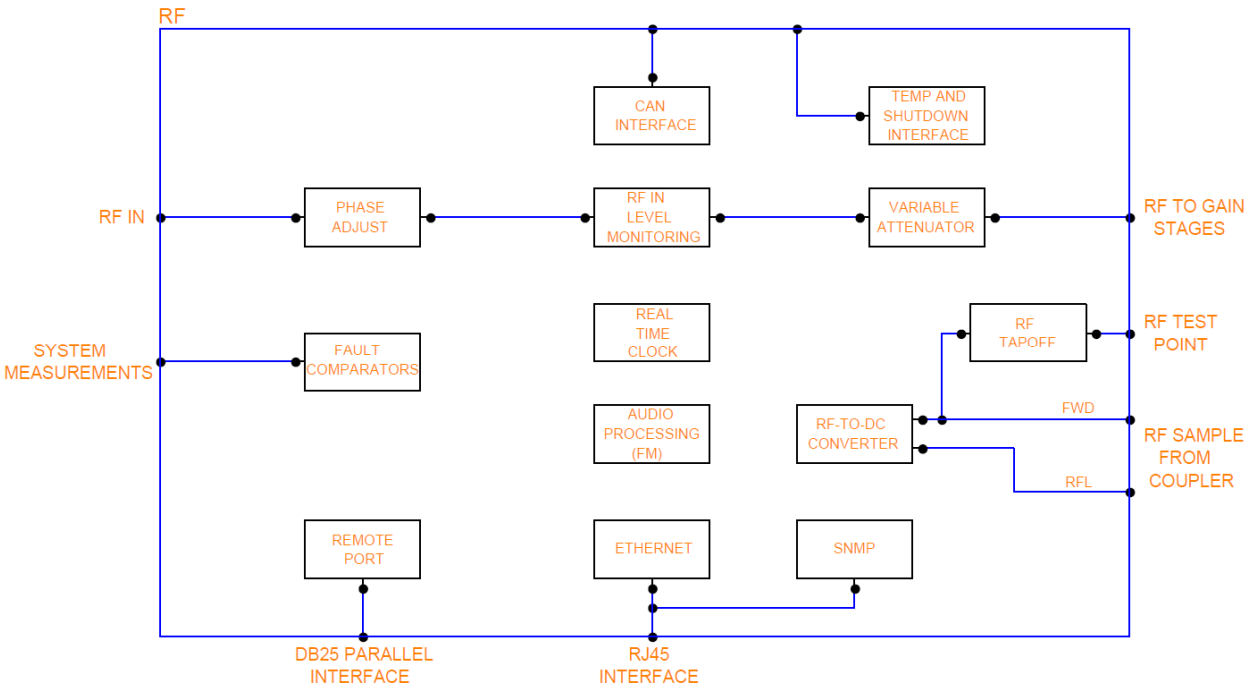


RF Module
REV 1.01 (ASY 002)

The RF PCB module is located on the back panel of the power amplifier enclosure(s) and has several primary functions:

- act as a variable attenuator so the control system can add attenuation to the RF input of the power amplifier in order to limit the output power of the transmitter/translator,
- monitor the output of the directional coupler which provides a voltage proportional to the forward and reflected power at the output of the transmitter/translator,
- communicate with the Temperature Sensor module to read heatsink temperatures and provide a link to the driver shutdown through the temperature sensor PCB, and
- provide external remote operation to the user through parallel data, Ethernet, and SNMP interfaces.

These functions can be seen by the block diagram:



The RF input signal comes in to the RF module through J214 (BNC female) or J217 (N female) before it passes through a phase adjust circuit (installed only in multiple power amplifier systems) made up of U227/U231 and associated circuitry. The signal then passes through the voltage-controlled variable attenuator, U236. This attenuator is controlled via DAC (U209) and buffer (U226) via the microcontroller. Finally, the low level RF signal exits through J207 (BNC female).

The RF coupled signals produced by the coupler for forward and reflected power are passed onto the RF module by connectors J203 and J220, respectively. Each signal is then converted to a DC voltage proportional to the RF levels by detector ICs U229 and U241. The DC voltages are buffered and filtered via CLC networks before being sent to the microcontroller (U219) and comparator (U218) for monitoring.

Aside from taking readings from the coupler, the microcontroller on the RF module also interfaces with the Temperature Sensor (through J211). The high speed shutdown signal for the pallets is also passed through the Temperature Sensor PCB from the RF module. The lower speed shutdown for the pallets or control is passed through pin 6 on J201. The microcontroller interfaces with the system CAN bus using U234 transceiver. Through the CAN bus, the RF board is able to communicate with the Display Interface module, and any other amplifier enclosures that are in the system.

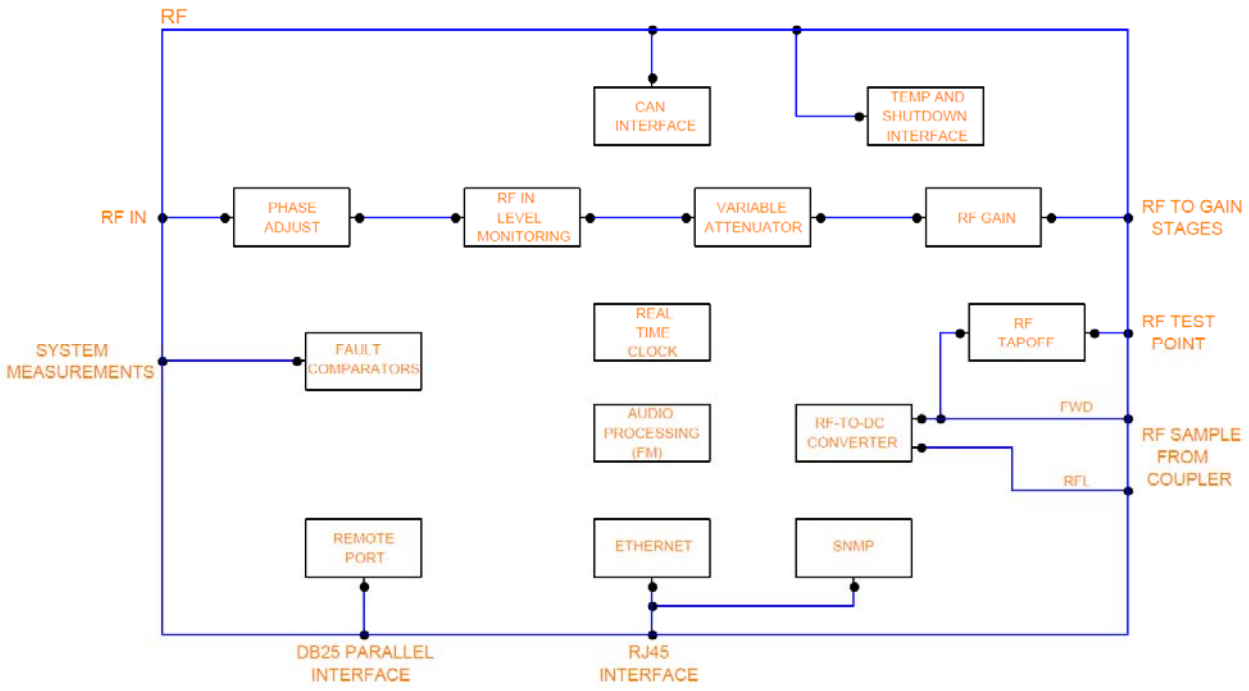
The last task of the RF board is to send and receive remote access signals to and from the transmitter/translator. Two analog outputs, proportional to forward and reflected power and produced by the digital potentiometer U222 after it receives input from the microcontroller. The analog outputs are then buffered by U208 before being sent to the DB25 parallel output connector, J215. J215 also carries the digital fault flags and input/output controls. The digital signals are then connected to the microcontroller through the opto-isolators U211, U213, U214, U215, and U237. The Remote Port allows external control of the transmission system via the DB25. The Power Amplifier enclosure does not include all the pins in the Remote Port like the Combiner/Filter enclosure.

RF Module
REV 1.02 (ASY 003)

The RF PCB module is located on the back panel of the power amplifier enclosure(s) and has several primary functions:

- act as a variable attenuator so the control system can add attenuation to the RF input of the power amplifier in order to limit the output power of the transmitter/translator,
- provide additional gain, if required, before passing the RF signal onto the amplifier chain,
- monitor the output of the directional coupler which provides a voltage proportional to the forward and reflected power at the output of the transmitter/translator,
- communicate with the Temperature Sensor module to read heatsink temperatures and provide a link to the driver shutdown through the temperature sensor PCB, and
- provide external remote operation to the user through parallel data, Ethernet, and SNMP interfaces.

These functions can be seen by the block diagram:

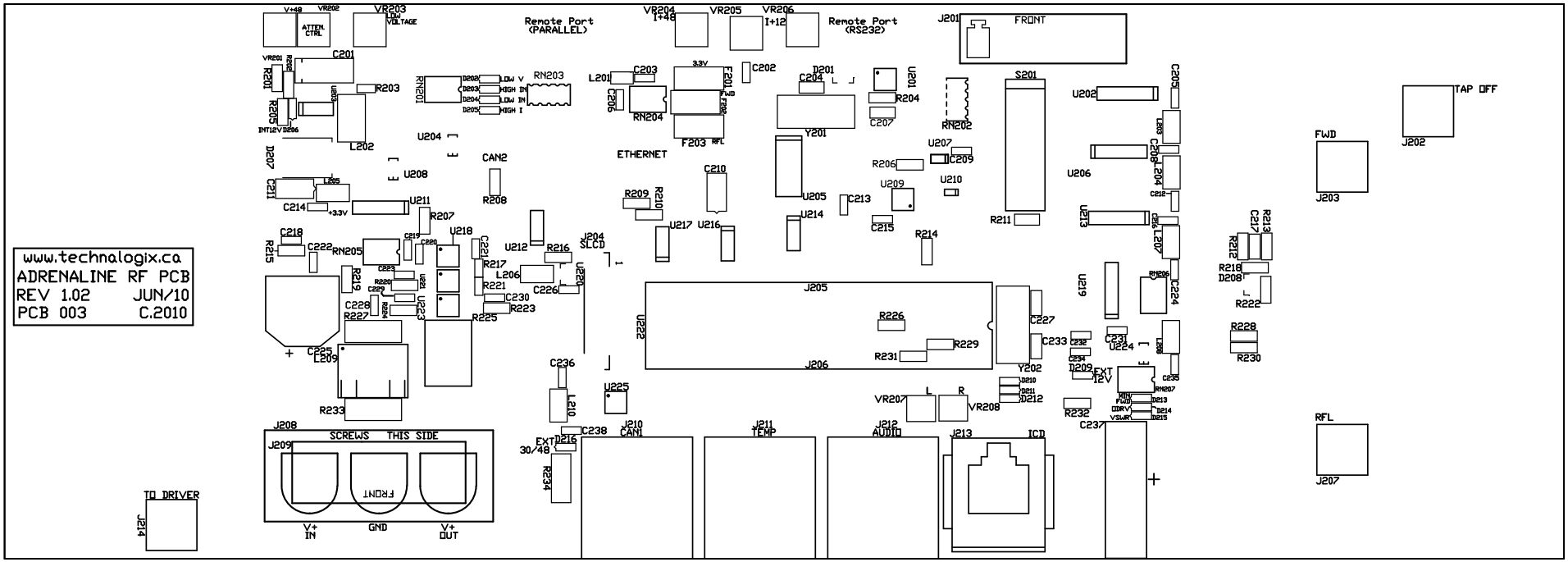


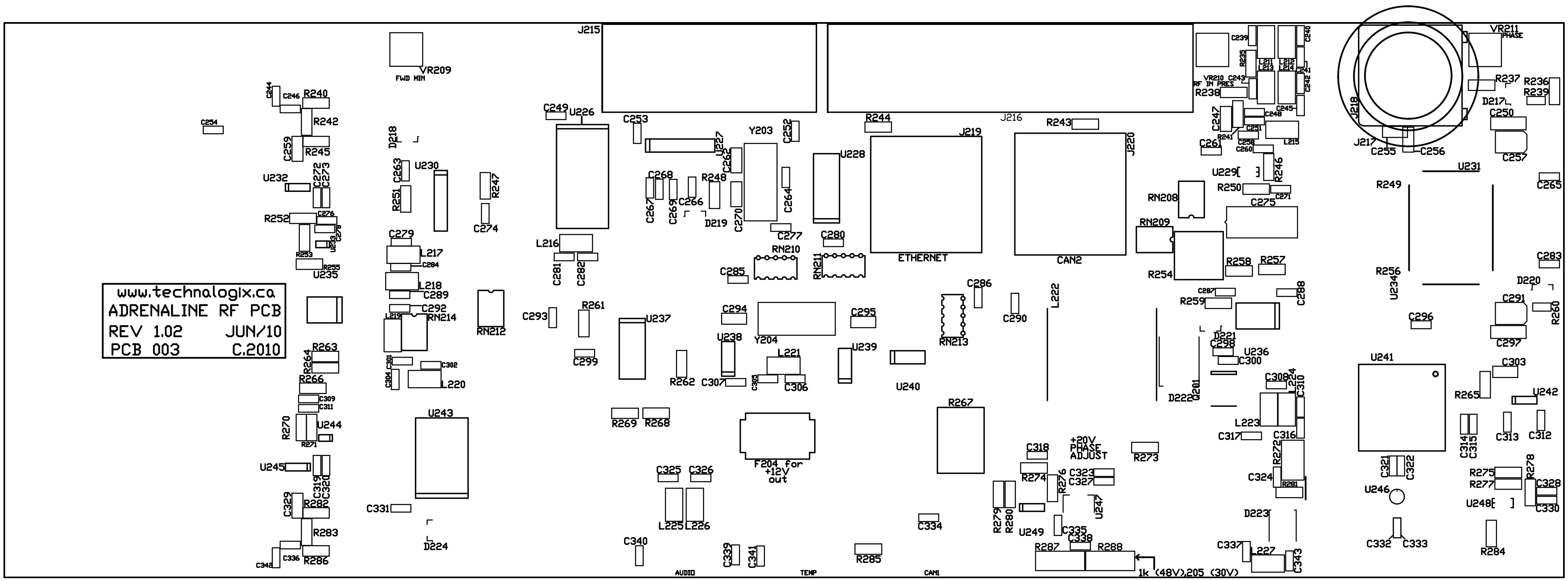
The RF input signal comes in to the RF module through J218 (BNC female) or J217 (N female) before it passes through a phase adjust circuit (installed only in multiple power amplifier systems) made up of U231/U234 and associated circuitry. The signal then passes through the voltage-controlled variable attenuator, U241. This attenuator is controlled via DAC (U210) and buffer (U229) via the microcontroller. Finally, the low level RF signal is passed through a gain stage (U246) before exiting through J214 (SMA female).

The RF coupled signals produced by the coupler for forward and reflected power are passed onto the RF module by connectors J203 and J207, respectively. Each signal is then converted to a DC voltage proportional to the RF levels by detector ICs U232 and U245. The DC voltages are buffered and filtered via CLC networks before being sent to the microcontroller (U222) and comparator (U219) for monitoring.

Aside from taking readings from the coupler, the microcontroller on the RF module also interfaces with the Temperature Sensor (through J211). The high speed shutdown signal for the pallets is also passed through the Temperature Sensor PCB from the RF module. The lower speed shutdown for the pallets or control is passed through pin 6 on J201. The microcontroller interfaces with the system CAN bus using U238 transceiver. Through the CAN bus, the RF board is able to communicate with the Display Interface module, and any other amplifier enclosures that are in the system.

The last task of the RF board is to send and receive remote access signals to and from the transmitter/translator. Two analog outputs, proportional to forward and reflected power and produced by the digital potentiometer U226 after it receives input from the microcontroller. The analog outputs are then buffered by U209 before being sent to the DB25 parallel output connector, J216. J216 also carries the digital fault flags and input/output controls. The digital signals are then connected to the microcontroller through the opto-isolators U212, U214, U216, U217, and U240. The Remote Port allows external control of the transmission system via the DB25. The Power Amplifier enclosure does not include all the pins in the Remote Port like the Combiner/Filter enclosure.


www.technalogix.ca
ADRENALINE RF PCB
REV 1.02 JUN/10
PCB 003 C.2010
Remote Port (PARALLEL)
Remote Port (RS232)
FRONT
ETHERNET
CAN2
SCREWS THIS SIDE
FRONT
V+ IN
GND
V+ OUT
TO DRIVER
J214
FWD
RFL
TAP OFF
J202
J203
J207
J208
J209
J210 CAN1
J211 TEMP
J212 AUDIO
J213 ICD
J204 SLCD
J205
J206
J201
S201
Y201
Y202
F203 RFL
F201 FWD
EXT 12V
EXT 30/48

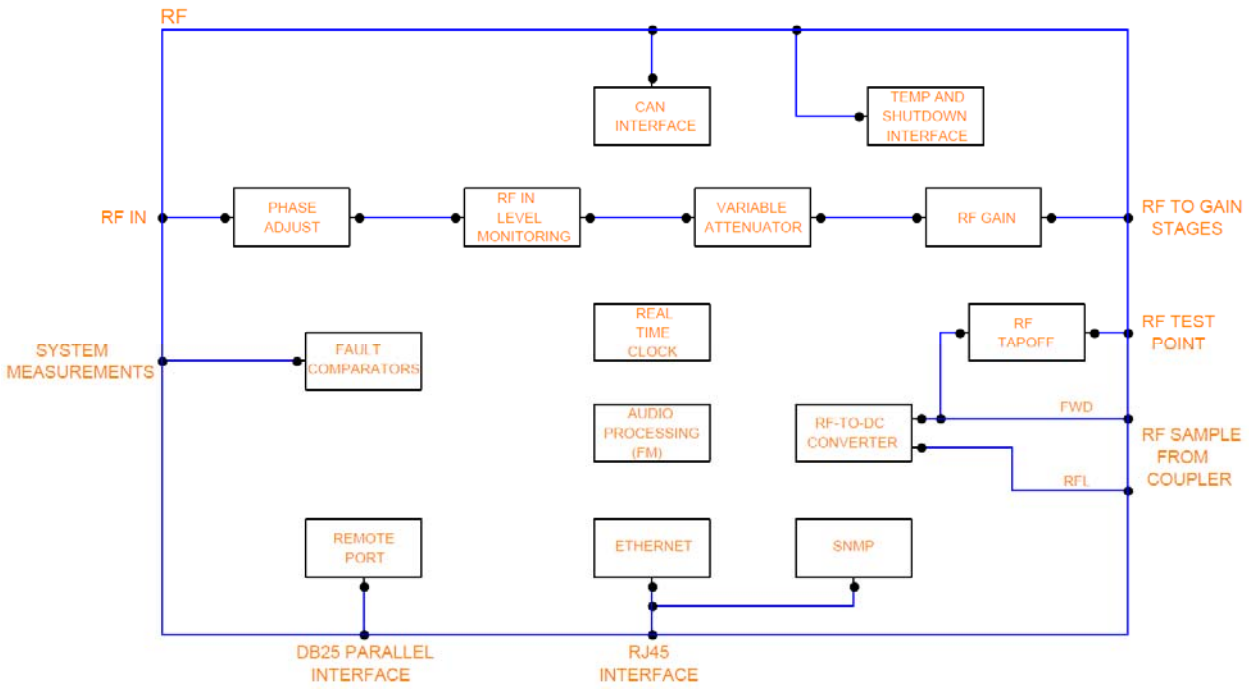

www.technologix.ca
ADRENALINE RF PCB
REV 1.02 JUN/10
PCB 003 C.2010

RF Module
REV 1.03 (ASY 004)

The RF PCB module is located on the back panel of the power amplifier enclosure(s) and has several primary functions:

- act as a variable attenuator so the control system can add attenuation to the RF input of the power amplifier in order to limit the output power of the transmitter/translator,
- provide additional gain, if required, before passing the RF signal onto the amplifier chain,
- monitor the output of the directional coupler which provides a voltage proportional to the forward and reflected power at the output of the transmitter/translator,
- communicate with the Temperature Sensor module to read heatsink temperatures and provide a link to the driver shutdown through the temperature sensor PCB, and
- provide external remote operation to the user through parallel data, Ethernet, and SNMP interfaces.

These functions can be seen by the block diagram:

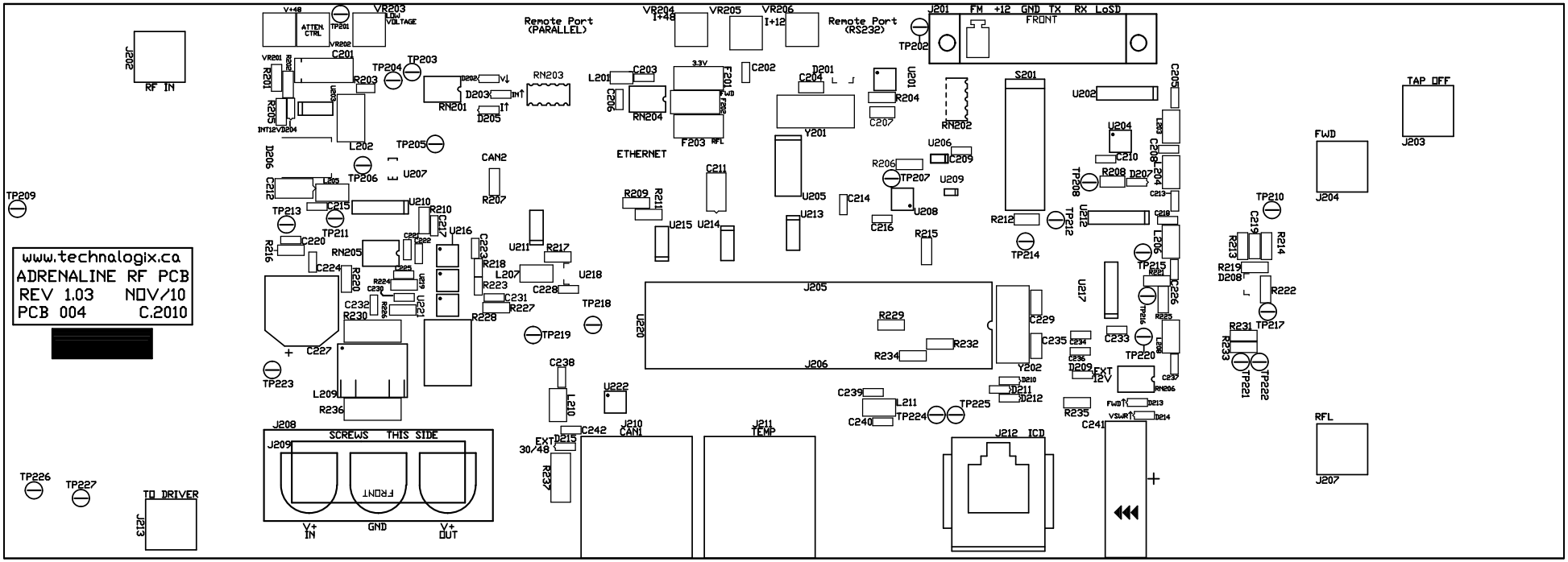


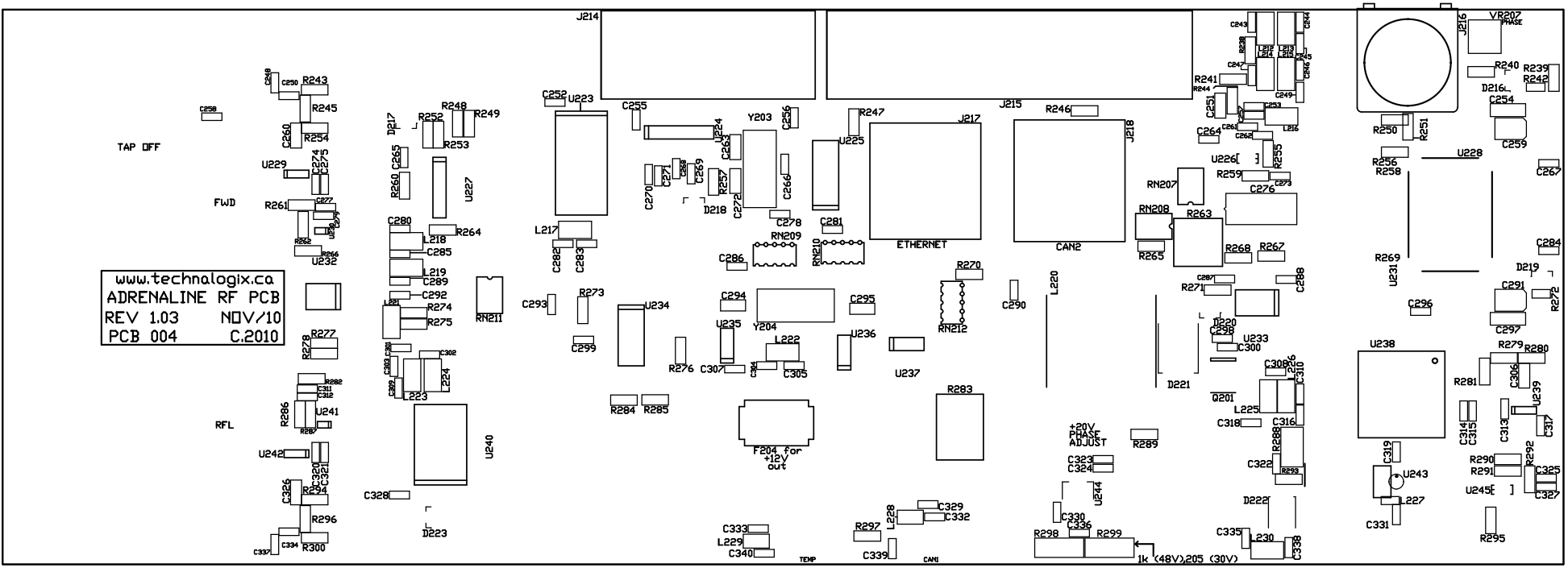
The RF input signal comes in to the RF module through J216 (BNC female) or J202 (SMA female) before it passes through a phase adjust circuit (installed only in multiple power amplifier systems) made up of U228/U231 and associated circuitry. The signal then passes through the voltage-controlled variable attenuator, U238. This attenuator is controlled via DAC (U209) and buffer (U226) via the microcontroller. Finally, the low level RF signal is passed through a gain stage (U243) before exiting through J213 (SMA female).

The RF coupled signals produced by the coupler for forward and reflected power are passed onto the RF module by connectors J204 and J207, respectively. Each signal is then converted to a DC voltage proportional to the RF levels by detector ICs U229 and U242. The DC voltages are buffered and filtered via CLC networks before being sent to the microcontroller (U220) and comparator (U217) for monitoring.

Aside from taking readings from the coupler, the microcontroller on the RF module also interfaces with the Temperature Sensor (through J211). The high speed shutdown signal for the pallets is also passed through the Temperature Sensor PCB from the RF module. The lower speed shutdown for the pallets or control is passed through pin 6 on J201. The microcontroller interfaces with the system CAN bus using U235 transceiver. Through the CAN bus, the RF board is able to communicate with the Display Interface module, and any other amplifier enclosures that are in the system.

The last task of the RF board is to send and receive remote access signals to and from the transmitter/translator. Two analog outputs, proportional to forward and reflected power and produced by the digital potentiometer U223 after it receives input from the microcontroller. The analog outputs are then buffered by U208 before being sent to the DB25 parallel output connector, J215. J215 also carries the digital fault flags and input/output controls. The digital signals are then connected to the microcontroller through the opto-isolators U211, U213, U214, U215, and U237. The Remote Port allows external control of the transmission system via the DB25. The Power Amplifier enclosure does not include all the pins in the Remote Port like the Combiner/Filter enclosure.


www.technalogix.ca
ADRENALINE RF PCB
REV 1.03 NOV/10
PCB 004 C.2010
RF IN
TO DRIVER
Remote Port (PARALLEL)
Remote Port (RS232)
ETHERNET
CAN1
CAN2
TEMP
ICD
FRONT
TAP OFF
FWD
RFL
EXT 12V
EXT 30/48
SCREWS THIS SIDE
V+ IN
GND
V+ OUT
FM +12 GND TX RX LoSD


www.technologix.ca
ADRENALINE RF PCB
REV 1.03 NOV/10
PCB 004 C.2010
TAP OFF
FWD
RFL
ETHERNET
CAN2
CAN1
TEMP
+20V PHASE ADJUST
F204 for +12V out
1k (48V),205 (30V)
J214
J215
J216
J217
J218
VR207
PHASE
U223
U224
U225
U226
U227
U228
U229
U231
U232
U233
U234
U235
U236
U237
U238
U239
U240
U241
U242
U243
U244
U245
Y203
Y204
D216
D217
D218
D219
D220
D221
D222
D223
Q201
RN207
RN208
RN209
RN210
RN211
RN212
L217
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L227
L228
L229
L230
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R245
R246
R247
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Web Interface

To access the Technalogix Adrenaline Web Interface, connect an Ethernet cable to the RJ45 port on the power amplifier (back panel) to your network. The Adrenaline control system in the power amplifier should allocate an internal IP from your router or you can set this manually (see below).

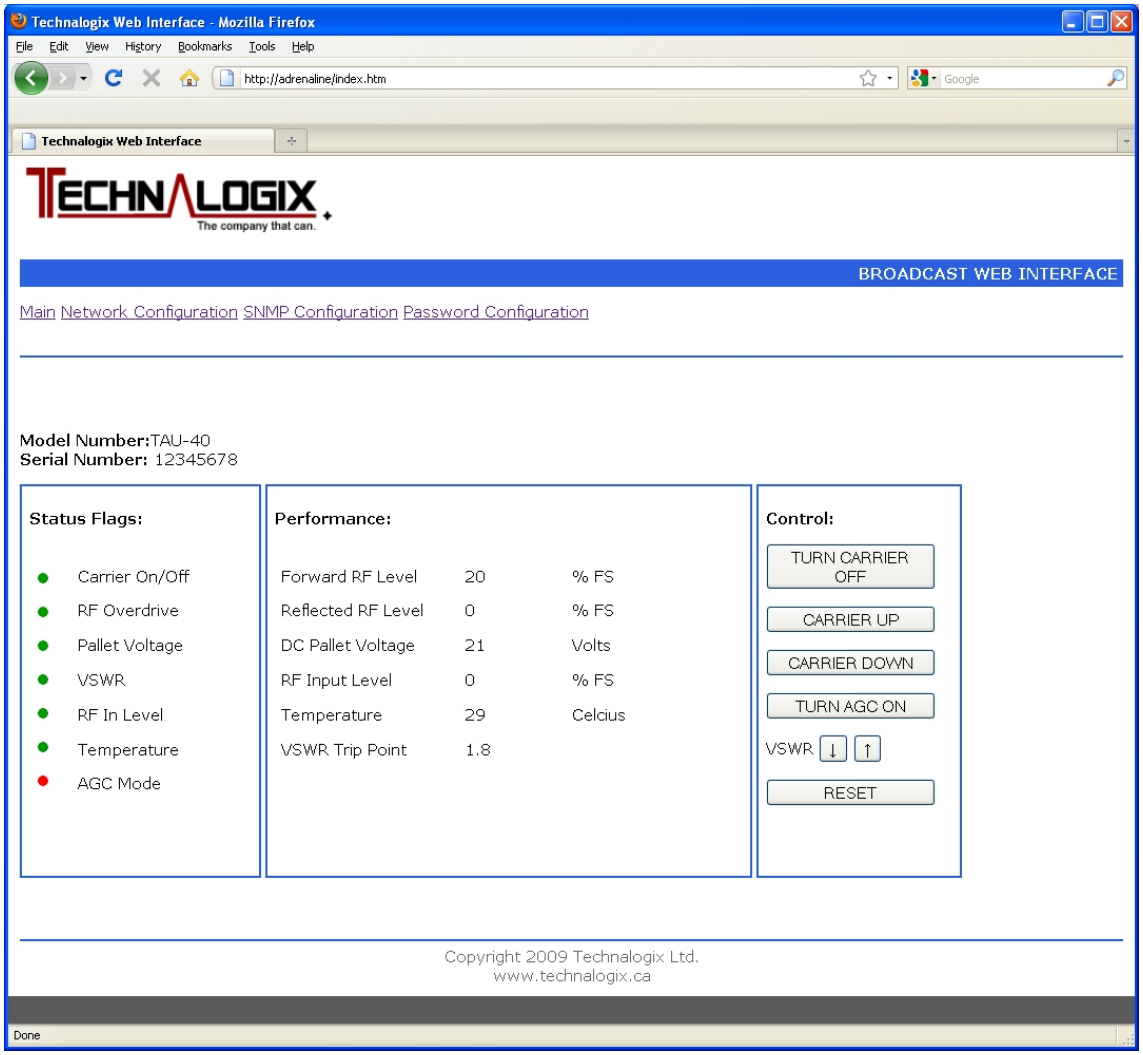
A computer can be plugged directly into the Ethernet port to directly access the on-board web interface. Most new computers can do this with a standard Ethernet cable but some may require a crossover Ethernet cable.

The default internal address is http://adrenaline/ or http://adrenaline/index.htm

After entering address into a web browser you will be asked for a password. Initially use:

username: admin
password: admin

At this will display the main page shown here:



Model number and serial number of the unit are displayed in the top left of the screen.

The Status Flags section provides the user with feedback from the system. Specifically, there are status flags for:

- Carrier is on or off
- Forward RF in Overdrive (>110% FS)
- Pallet Voltage Supply Good
- High VSWR
- High Temperature
- AGC on or off (AGC or Manual mode)

The Performance section provides the user with specific parameters and measurements in the system. Measurements that can be viewed from the Performance box are:

- Forward RF Levels as a % of Full Scale (FS)
- Reflected RF Levels as a % of FS
- DC Supply Voltage in volts
- RF Input Levels before attenuator as a % of Full Scale
- Temperature in °C
- VSWR Trip Point Limit (between 1.1 and 1.8)

The Control section of the web interface screen allows the user to control functions inside the equipment, including:

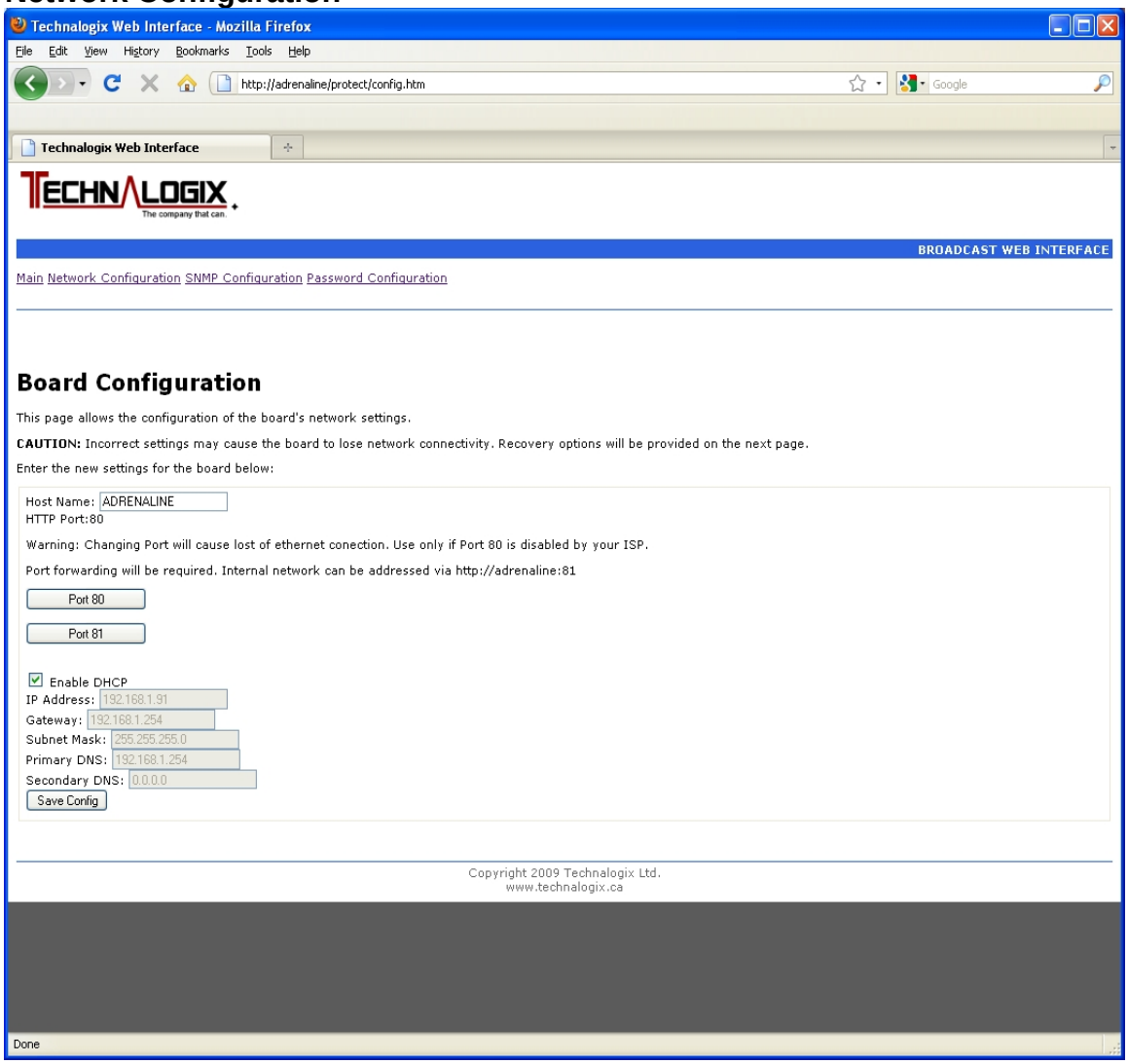
- Turn Carrier On/Off - Turn the Carrier on/off
- Carrier Up - Increase the Carrier by removing attenuation
- Carrier Down - Decrease the Carrier by adding attenuation
- Turn AGC On/Off - Turns on the AGC (automatic gain control). The system will then try to maintain the current forward level.
- VSWR ↑↓ - Increase or Decrease the VSWR Trip point by 0.1 between 1.1:1 and 1.8:1.
- Reset - Forces the system to reboot

Note that if AGC is enabled and you press Carrier Up/Down the system will reset the AGC to manual, make the change in power, and then revert back into AGC mode with the new level. AGC level is maintained if the power amplifier restarts.

Also on the main web Ethernet page, along the top, are links to the other pages:

Main – Returns to Main Index page
Network Configuration
SNMP Configuration
Password Configuration

Network Configuration



On this page you can set the network settings.

Host name shows the current webpage name (default is ADRENALINE). Enter a new name here if you wish to change this.

For example entering YourCompany will make the web address http://yourcompany/index.htm

HTTP Port shows the current port used for internet access, 80 or 81. Port 80 is the default and is the accepted standard. Port 81 is available because some internet providers block access to port 80 unless you pay more. Be very careful changing this.

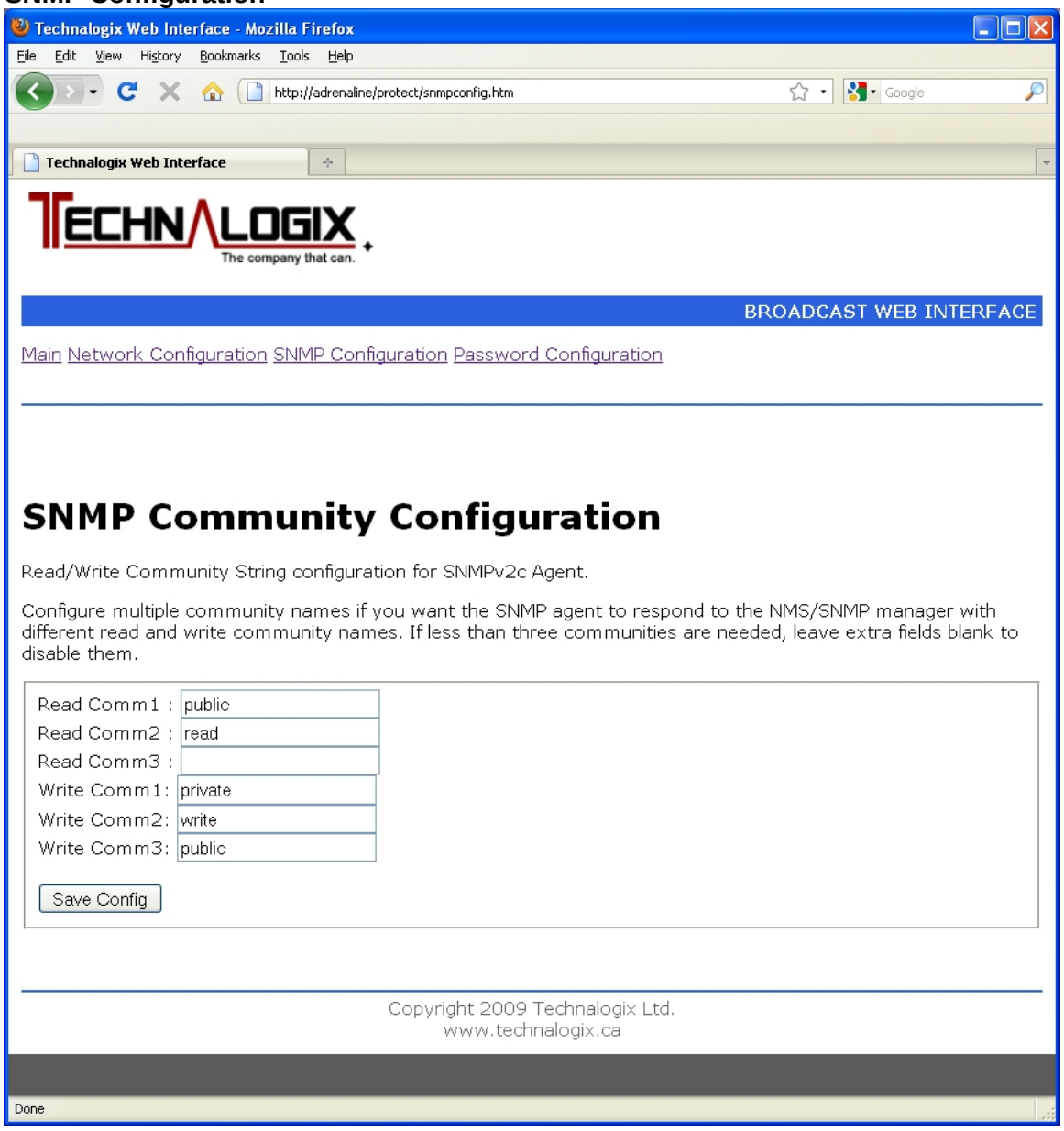
You can force a web browser to use port 81 by address to http://adrenaline:81/index.htm. To use this with an internet address will require port forwarding. Consult your routers manual to set this up.

With DHCP enabled the system with automatically try to find a router and acquire an IP address. If you want to set this manually, uncheck the Enable DHCP box and enter it below then click Save Config.

To view the webpage from the internet rather than an internal network you need an external IP address, generally provided by your internet provider. Note that you can only have one web server using the same port. With this, anyone can access the system over the internet with something like:

http://www.yourcompanywebaddress.com/adrenaline

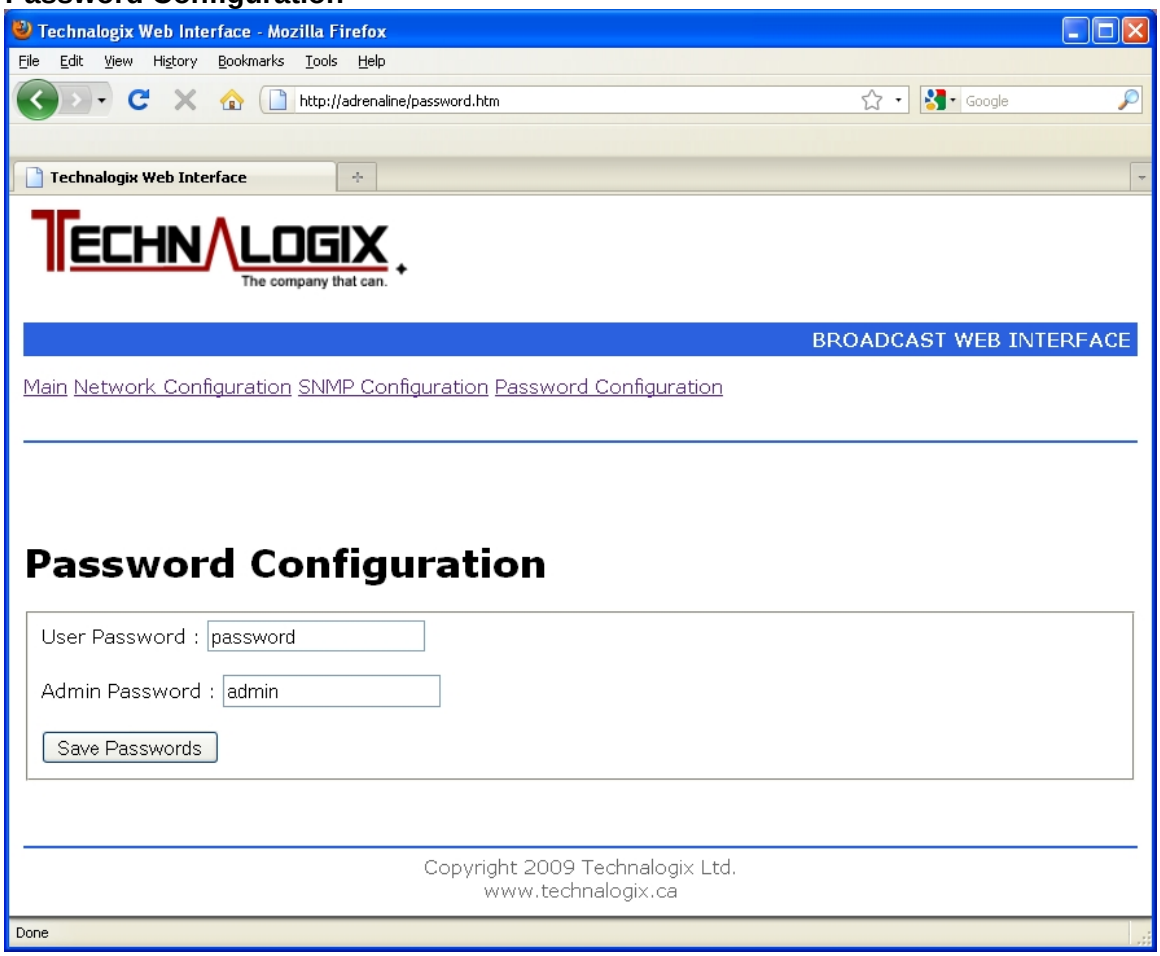
SNMP Configuration



The SNMP Configuration page allows you to set the SNMP communities. Set these to limit access to the system via SNMP.

Default communities are	READ:	public read
	WRITE:	private write public

Password Configuration



This page allows setting of the User or Admin password.

The User account allows access only to the main page.
The Admin account allows access to the main and all the configuration pages.

Passwords are 8 characters long. Don't forget your password. Resetting passwords isn't fun and may cause loss of all settings.

SNMP

The Technalogix.mib file allows access to the following

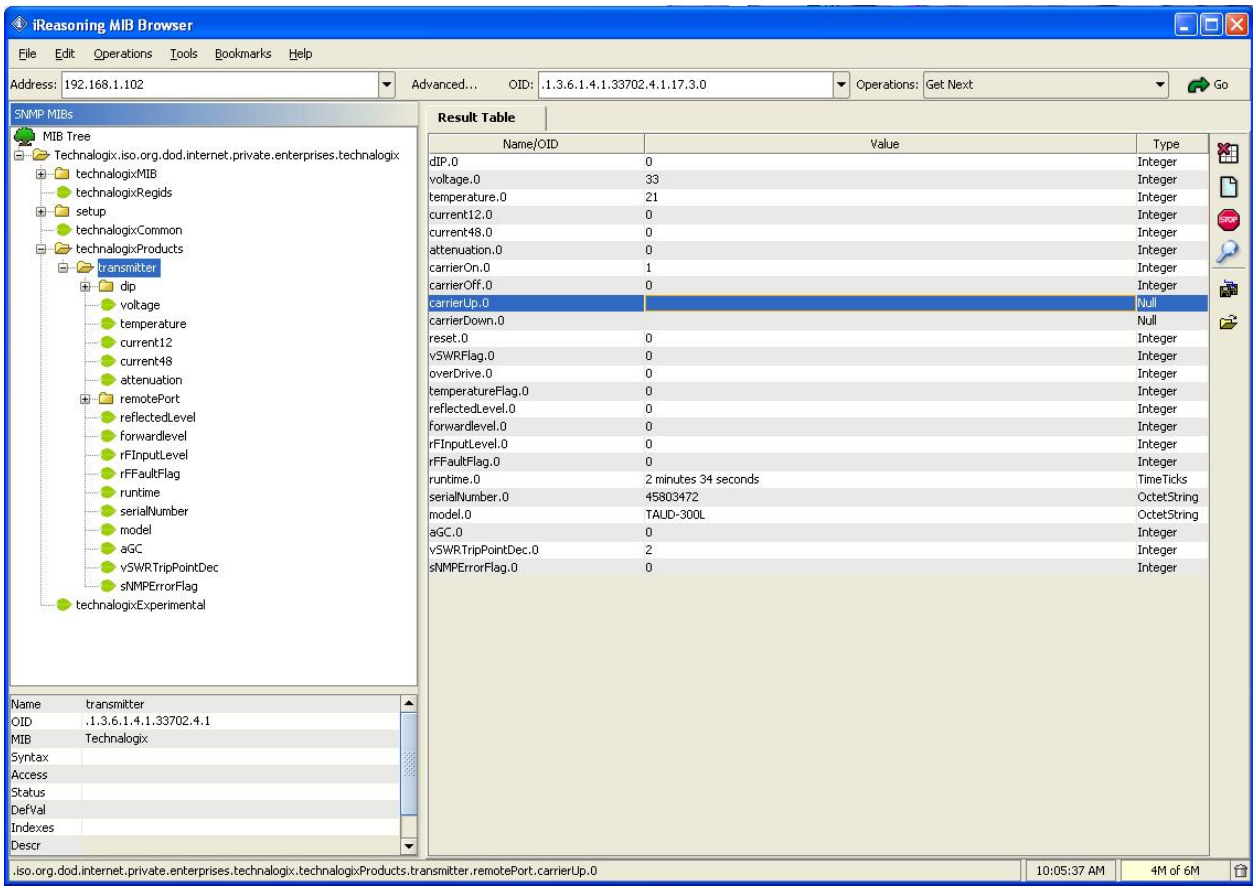
Read Only

Dip switch Setting	- 8 bit value from dipswitch
Pallet Supply Voltage	- voltage level (Vdc)
Temperature	- temperature in (°C)
12V Current	- current on12V bus (Adc)
48V Current	- current on high voltage bus (Adc)
Attenuation	- attenuation level
Forward Level	- forward level as % rated full scale
Reflected Level	- reflected level as % rated full scale
RF Input Level	- input level as % rated full scale
RF Fault	- hardware fault flag
Run Time	- time since start up or reset
Serial Number	
Model Number	
SNMP Error Flag	- error flag, also for trap (see below)
VSWR Flag	- error flag for high VSWR
Overdrive	- error flag for overdrive
Temperature Flag	- error flag for high temperature

Read/Write

AGC mode	-	1 AGC on / 0 AGC off
Reset	-	1 Reset System 0 normal
Carrier On/Off	-	1 Carrier On 0 Carrier Off
Carrier Up	-	1 Increase Carrier Level
Carrier Down	-	1 Decrease Carrier Level
VSWR	-	1-8 set VSWR between 1.1 and 1.8:1

Read and Write communities can be set from the web interface.



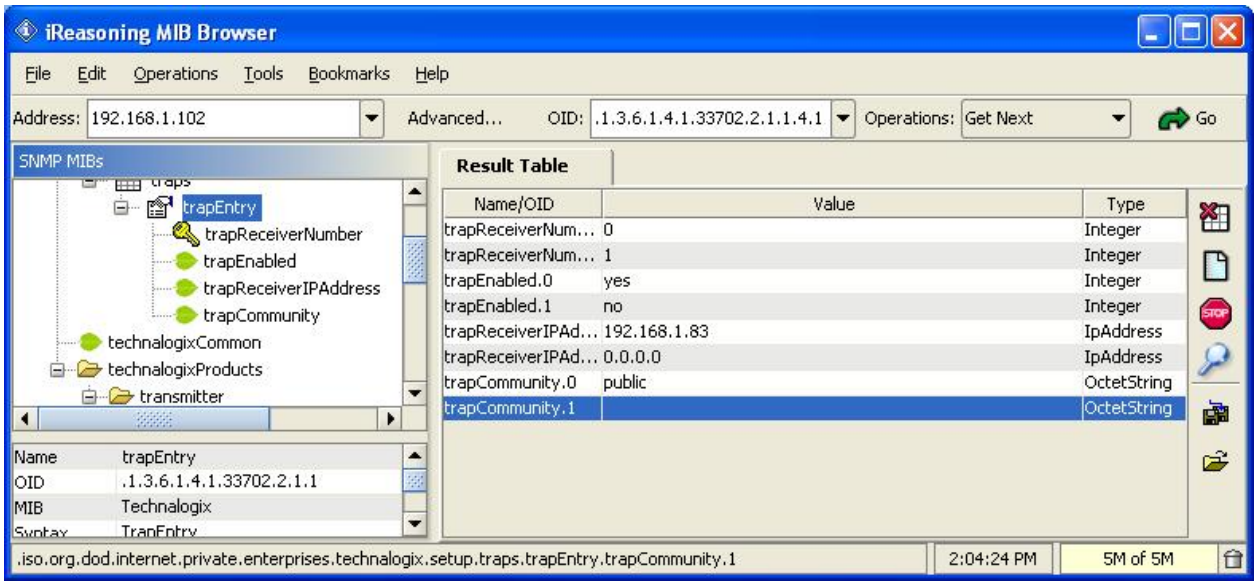
SNMP Traps

To Enable traps

Set enable traps to 1

Set the IP address to that of the receiving computer.

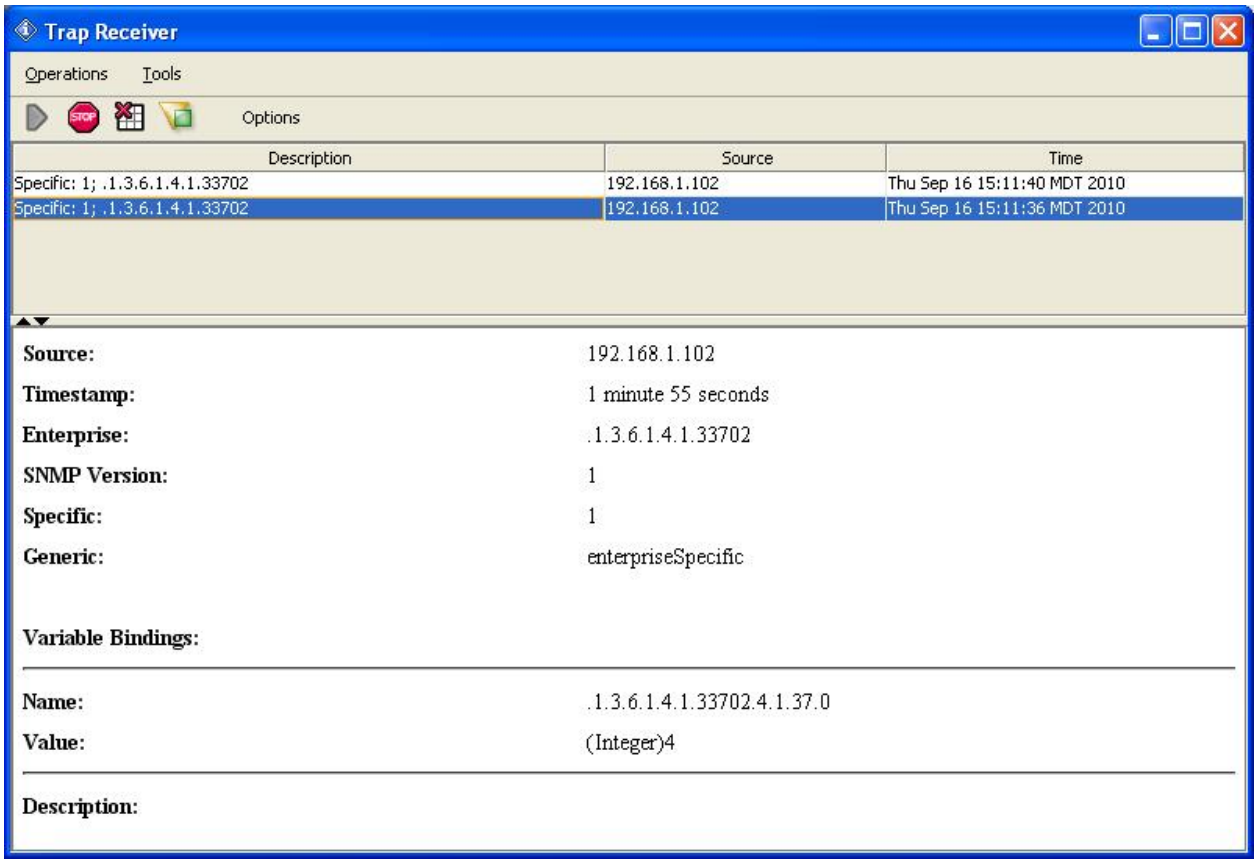
Set the community to one of the read communities set above.



Ensure that your receiver's port is set to 162

The system will generate a general trap on any error flag and send an 8bit value indicating the type of error.

Bit 0(LSB)	Overdrive
Bit 1	High VSWR
Bit 2	High Temperature
Bit 3	High Speed Hardware Shutdown
Bit 4(MSB)	High Input Level



Shown here is trap of a high temperature fault (Value 4).

The overall functions of each pin on the Remote Port are indicated in the following:

DB25 pinout:

Pin Number	Description
1	Ground
2	Forward power sample[1]
3	Reflected power sample[1]
4	Carrier off[2]
5	Carrier on[2]
6	Increase carrier level (level must have been decreased)[2]
7	Decrease carrier level (1dB increments)[2]
8	Do not use
9	Reset[2]
10	Do not use
11	High temperature flag[3]
12	High VSWR flag[3]
13	Amplifier overdriven flag[3]
14	Do not use
15	+3.3Vdc (for testing only, do not load)
16	Ground
17	Ground
18-25	Do not use

Notes: 1. Analog output with voltage ranging from 0 to 3.3Vdc.
2. TTL level digital input, active on rising edge.
3. TTL level digital output, active high.

In addition to the DB25 parallel data connector, the user may chose to remotely control the transmitter/translator via an optional Ethernet web server or through an optional Simple Network Managed Protocol (SNMP) interface, described later in this section.

Combiner

In higher power systems that contain more than one power amplifier enclosure, there also is a combiner enclosure to combine the individual outputs of all of the power amplifier enclosures. This combiner enclosure also monitors the total power of the overall system. The following is a brief description of the operation of the monitor system found in the combiner unit, if applicable.

Carrier On/Off – Turning the carrier on or off can be done from the touch screen or the remote port on any power amplifier or the combiner enclosure. It can also be done from SNMP or the Ethernet interface which should be connected to the combiner enclosure. This will turn the carrier off for the whole system.

Carrier Up/Down – The power level can be adjusted from the touch screen (RF Levels screen) or the Remote Port on any power amplifier or the combiner enclosure. It can also be done from the SNMP or Ethernet interface which should be connected to the combiner enclosure. This will add or subtract attenuation on the individual power amplifier enclosures to achieve an overall change in carrier level, and sets the AGC to the new levels if the AGC mode is enabled.

AGC mode – AGC mode and be turned on or off from the touch screen (RF Levels screen) or the Remote Port on any power amplifier or the combiner enclosure. It can also be done from the SNMP or Ethernet interface which should be connected to the combiner enclosure. This will cause all the amplifier boxes to try and maintain the current forward power level.

Temperature, Voltage, Current - Temperature, voltage, and current readings on the enclosure's touch screen are for that unit only. The SNMP and Ethernet interface will show each units' readings separately, and should be connected to the combiner enclosure.

Forward & Reflected Power – Forward and reflected power shown on the touch screen or the Remote Port are for that power amplifier enclosure only, or show the total combined power if it is on the combiner enclosure. The SNMP and Ethernet interface will show each units' readings separately, and should be connected to the combiner enclosure.

Display Units – Changing the temperature or power units on one enclosure won't change the display units on other enclosures. They will all have to be changed individually.

VSWR Trip point - The VSWR trip point between 1.1 and 1.8 can be changed from the touch screen (RF Levels screen) on any power amplifier or the combiner enclosure. It can also be done from the SNMP or Ethernet interface which should be connected to the combiner enclosure. This will change the trip point for all the units.

Errors – An error that causes one enclosure to shutdown will cause the other enclosures to shutdown. If one power amplifier or the combiner is to fold back its power levels to stay within operating parameters, the others will match that power level.

Section VII – Mechanical Section

The heat sink in each TAUD-500 which make up the amplification stage of the TAUD-1000 allows the amplifiers to operate at a cooler temperature and prevents overheating, which helps the longevity of the entire system. The heat sink has hollow fins, which help dissipate the heat from the amplifiers faster than a conventional serrated or corrugated fin.

In addition to the cooling effects of the heat sink, within each TAUD-500 power amplifier enclosure, there are four fans that each provide 170 cubic feet per minute (CFM) of air flow (into zero static pressure). There are two fans mounted at the front of the heat sink and two mounted at the back end of the heat sink. The fans are mounted side-by-side to produce the best cooling for the system and are operating in a push-pull configuration to assist with heat dissipation.

The Combiner/Filter enclosure also contains additional fan cooling, specifically for the digital mask filter and also for the termination resistors on the 2-way combiner. In the event of any RF power or phase imbalance between the two TAUD-500 Power Amplifier enclosures, the unbalance gets dissipated in the form of heat through the flanged resistor.

Section VIII - Installation

This section contains installation recommendations, unpacking, inspection, and installation instructions for the power amplifier. We are sure that you are chomping at the bit to install your new system, so we recommend that you read the following sections very carefully.

Building Recommendations

The quality of the building is of great importance if you are to expect long life and continued performance from the power amplifier. The building must be clean, dry, temperature controlled and secure. Don't forget to allow space in the building for any additional racks to house test equipment, a workbench area, line regulating transformers, ladders, equipment and parts storage, first aid kit, emergency generator if used, as well as heating and cooling devices that may be unique to your installation. A sloping roof will tend to develop leaks less rapidly. The building should be well roofed with good material. The cooling load will be lowered with reflective or light colored roofing material.

Heating and Cooling Requirements

The environment's temperature will contribute greatly to the length of the power amplifier's life. Technalogix recommends that the building's filtered air intake must have capacity for all air-flow in the building plus an additional 20%. Keep the intake below the roofline to avoid intake of solar heated air. Please ensure that the intake and exhaust areas are on the same side of the building to avoid pressure differentials during windy conditions. Also, do not position intake near exhaust's preheated air. If air conditioning is required to cool the shelter, discuss the situation with a qualified HVAC technician. Under average conditions, 12,000 BTUs will cool approximately 500 square feet to a comfortable level.

Electrical Service Recommendations

Technalogix recommends that a qualified, licensed local electrician be consulted for the required electrical service. We suggest local electricians because:

- The personnel knows the local codes
- The personnel can be on site readily
- You are apt to get better overall support if you give what business you can to local suppliers

Technalogix recommends that proper AC line conditioning and surge suppression be provided on the primary AC input to the power amplifier. All electrical service should be installed with your national electrical code in your area, any applicable provincial or state codes, and good engineering practice. Special consideration should be given to lightning protection of all systems in view of the vulnerability of most transmitter or translator sites to lightning. Lightning arrestors are recommended in the service entrance. Straight and short grounds are recommended. The electrical serviced must be well grounded. Do not connect the unit to an open delta primary power supply, as voltage fluctuations could harm the unit. Branch your circuits. Do not allow your lights, your workbench plugs, and your transmitting or translating equipment to operate on one circuit breaker. Each transmitter or translator should have its own circuit breaker, so a failure in one does not shut off the whole installation.

Antenna and Tower Recommendations

Your preliminary engineering workgroup should establish your antenna and tower requirements, both for receiving and transmitting antennas. Construction of sturdy, high quality antenna/tower systems will pay off in terms of coverage of your service area, the overall quality and saleability of your radiated signal, and reduced maintenance expenses. Technalogix provides complete turnkey antenna systems if needed. If your site is serving as a translator, your receiving antenna should be in line of sight to the originating station all year round. The foliage will change with season. Transmitting antennas can enhance or seriously impair the transmitter/translator output.

The selection, routing, and length of coaxial cable are extremely important in the installation. If there is a 3 dB line loss in the cable between your unit's output and the transmitting antenna, your unit will only deliver half power to the antenna. Buy the best cable you can obtain, route it via the shortest way to the antenna, and keep it straight. Do not form it into sharp bends on its way. Do not use any more cable fittings for the installation than absolutely necessary. All cautions here apply equally to all coaxial cables in the system - input and output.

Pay attention to radial ice accumulation when designing the transmission system. It is not uncommon for at least an inch of ice to build up on the tower and antenna. This in turn significantly increases the weight, cross section, and wind loading of the system.

Attaching the transmission line to the tower is crucial to maintain a safe and reliable operation. Nylon wire ties and electrical tape will breakdown in the sunlight and ultimately fail, creating a potentially dangerous situation. It is important to use proper clamps and hoisting grips and also ensure that the transmission line is grounded to the tower in several locations. When high currents flow through the tower in the event of lightening strikes, some of that current will through the outer conductors of the transmission lines. Due to the resistance difference between the steel tower and copper transmission line, a significant voltage can be developed, often resulting in arcing between the outer jacket and outer conductor, thus pitting the conductor.

Preventative maintenance is crucial in ensuring that safety is maintained. Specifically, check that transmission line grounds are tight and are not missing any hardware. Frequently inspect support clamps or spring hangers. Consider investing in an ice break, if you haven't already done so, as shards of falling ice can damage the transmission line – and if it is going to happen, it will happen at an important time. Check the tower light photocells and conduit.

The better-known tower manufacturers offer complete technical and safety documentation with their towers. Be sure that you have this information as it regards wind loading, guying, etc. The best-designed antenna system will function poorly if shortcuts and compromises are used during installation. Follow the manufacturer's instructions exactly, along with any engineering data prepared for the site. Be absolutely safe and certain about this aspect as human lives may be at stake.

Shelter Security

The FCC requires that the transmitter or translator be secure from entry or control by unauthorized persons, and that any hazardous voltages or other dangers (including most tower bases) be protected by locks or fences as necessary to protect personnel and prevent unauthorized tampering or operation. Security of the building further implies that it be secure from wildlife. Use sturdy construction materials, including sheet metal if necessary. Holes around conduit, cable, and other similar entry points should be stuffed with steel wool and caulked to prevent entry of wildlife. Other features of security for your shelter may include its location with respect to the prevailing wind conditions. A location leeward of some natural topographical feature will prevent wind damage and snowdrifts. Check the soil runoff conditions that may slow or hasten wind or water erosion and other concerns that may be unique to your location.

Unpacking and Inspection

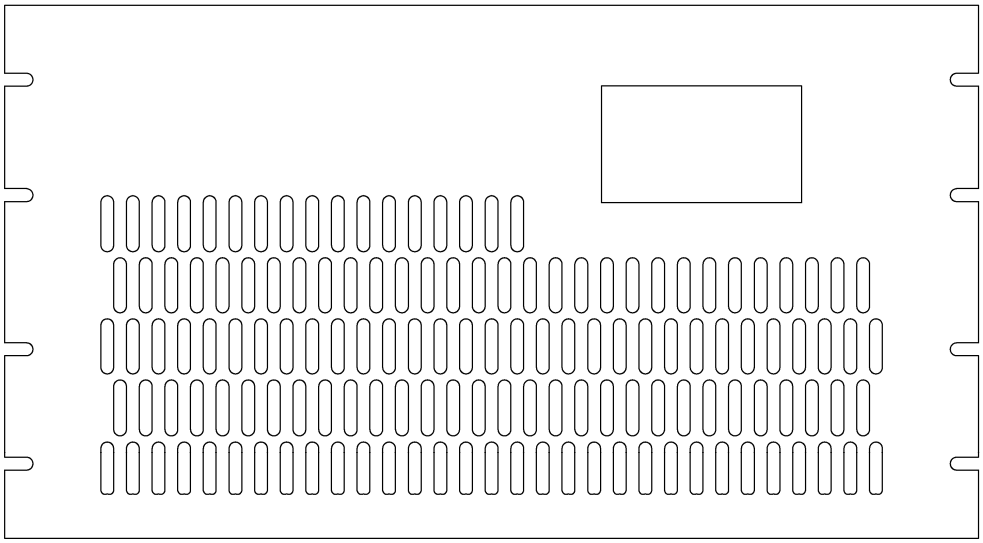
Check the outside of the container. Carefully open the container and remove the power amplifier. Retain all packing material that can be reassembled in the event that the equipment must be returned to the factory.

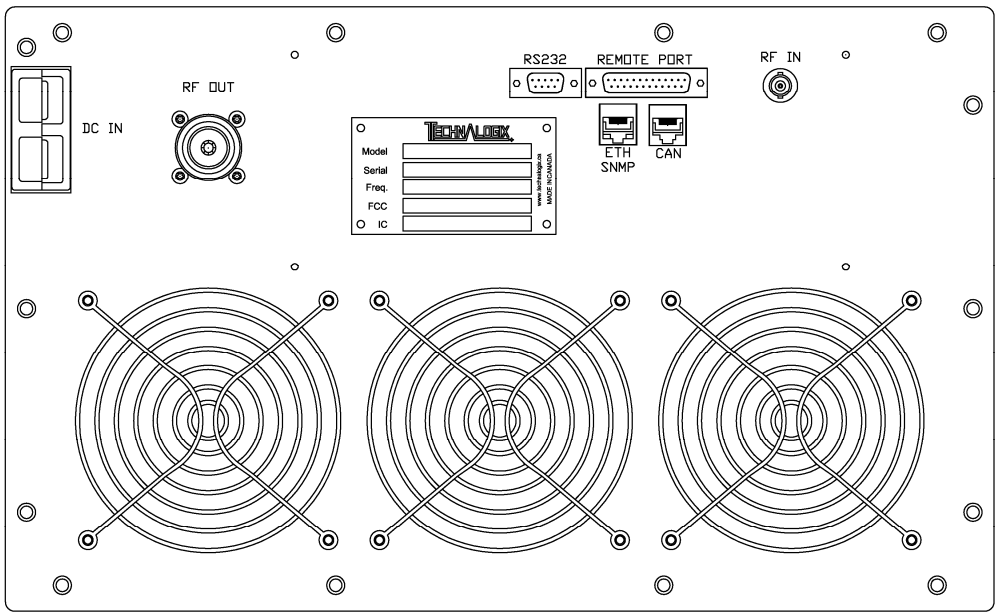
> Exercise care in handling equipment during inspection to prevent damage due to rough or careless handling.

Visually inspect the enclosure of the power amplifier for damage that may have occurred during shipment. Check for evidence of water damage, bent or warped chassis, loose screws or nuts, or extraneous packing material in connectors or fan failures. Inspect all connectors for bent connector pins. If the equipment is damaged, a claim should be filed with the carrier once the extent of the damage is assessed. Technalogix cannot stress too strongly the importance of immediate careful inspection of the equipment and subsequent immediate filing of the necessary claims against the carrier if necessary. If possible, inspect the equipment in the presence of the delivery person. If the equipment is damaged, the carrier is your first area of recourse. If the equipment is damaged and must be returned to the factory, phone for a return authorization. Claims for loss or damage may not be withheld from any payment to Technalogix, nor may any payment due be withheld pending the outcome thereof. Technalogix cannot guarantee the carrier's performance.

Location and Function of Controls and Connectors (each TAUD-500 Power Amplifier)

The following illustration depicts the location of the connectors when installing each of the 500-watt 8VSB power amplifiers (TAUD-500) that comprise the TAUD-1000.





RF IN – RF input from modulator or processor after the signal is split by the 2-way splitter to go to each TAUD-500. BNC connector, 50 ohm.

RF OUT – 500-watt (RMS) RF output. Connects to Combiner/Filter enclosure through phased cables to ensure phase and amplitude balance is maintained. 7/16"DIN connector, female, 50 ohm.

DC IN – DC input from switching power supply.

REMOTE PORT – Remote interface and control. Connector is individual pins and not serial interface. Pinout described in Monitor and Control section.

CAN - No Connection

RS232 - No Connection

ETH/SNMP - Ethernet or SNMP RJ45 connection

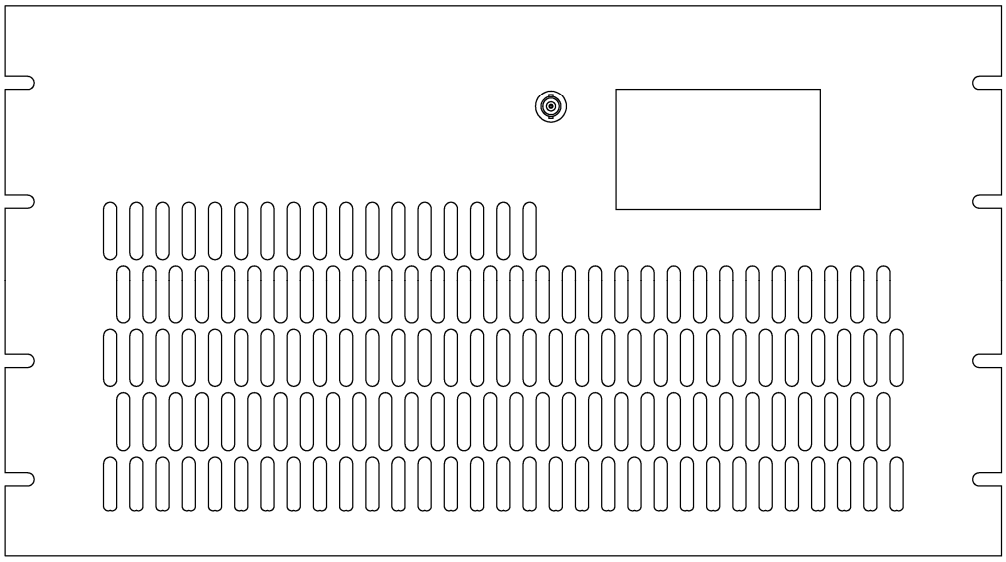
Pin Number	Description
1	Ground
2	Forward power sample[1]
3	Reflected power sample[1]
9	Reset[2]
11	High temperature flag[3]
12	High VSWR flag[3]
13	Amplifier overdriven flag[3]
14	+5Vdc
15	+3.3Vdc
16	Ground
17	Ground

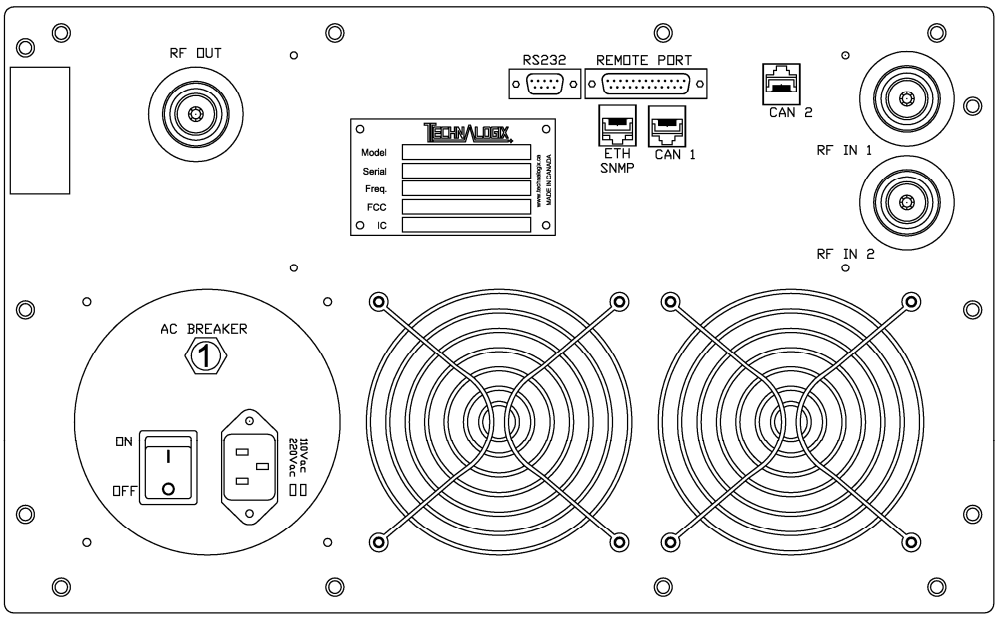
Notes: 1. Analog output with voltage ranging from 0 to 5Vdc.
2. TTL level digital input, active on rising edge.
3. TTL level digital output, active high.

Remaining pins should not be connected.

Location and Function of Controls and Connectors (Combiner/Filter Enclosure)

The following illustration depicts the location of the connectors when installing the Combiner/Filter enclosure that takes the outputs of the (2) TAUD-500, combines them, and passes the combined 1,000-watt (RMS) signal through a bandpass filter and directional coupler.





RF IN – RF inputs from each of the (2) TAUD-500 power amplifiers. Cables are a specific length to maintain phase relationship to input of combiner (contact factory for lengths). 7/16”DIN female, 50 ohm.

RF OUT – 1,000-watt (RMS) RF output. Connects to user’s inline 8VSB-reading wattmeter (not included) and/or the antenna via 7/16”DIN connector, female.

REMOTE PORT – Remote interface and control. Connector is individual pins and not serial interface. Pinout described in Monitor and Control section.

CAN - No Connection

RS232 - No Connection

ETH/SNMP - Ethernet or SNMP RJ45 connection

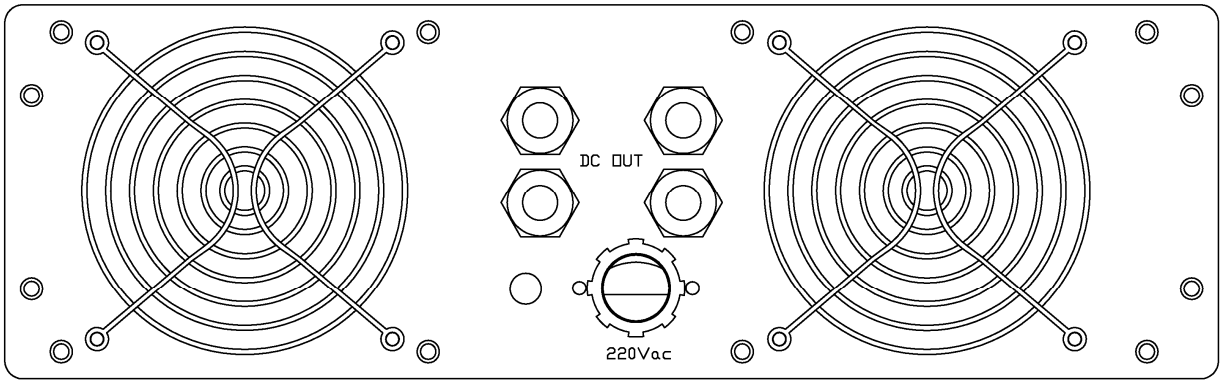
Pin Number	Description
1	Ground
2	Forward power sample[1]
3	Reflected power sample[1]
4	Carrier Off[2]
5	Carrier On[2]
6	Increase carrier level (level must have first been decreased) [2]
7	Decrease carrier level (1dB decrements) [2]
9	Reset[2]
11	High temperature flag[3]
12	High VSWR flag[3]
13	Amplifier overdriven flag[3]
14	+5Vdc
15	+3.3Vdc
16	Ground
17	Ground

Notes: 1. Analog output with voltage ranging from 0 to 5Vdc.
2. TTL level digital input, active on rising edge.
3. TTL level digital output, active high.

Remaining pins should not be connected.

Location and Function of Controls and Connectors (Power Supply Enclosure)

The following illustration depicts the location of the connectors when installing the Power Supply enclosure.



DC OUT - DC output (30Vdc) fed independently to each of the (2) TAUD-500 Power Amplifier enclosures.

Initial Hook Up

1. Ensure that the antenna has been swept and, ideally, has a return loss of greater than 20dB (VSWR = 1.2:1). This should be done before connecting the antenna cable to the system's output. The power amplifier's control system allows the user to change the VSWR trip point up to a maximum level of 1.8:1. Strive for the lowest possible return loss to maximize transmission distance and improve operating performance. VSWR levels between the trip point set by the user and 1.8:1 will cause a fold back in power. VSWR levels past 1.8:1 will cause the system to shut down to avoid damage.

2. Place the transmitter/translator in its permanent location near a receptacle supplying the required AC or DC mains voltage.

3. Place an appropriate AC or DC power line protector, conditioner, and/or surge suppressor across the supply line.

4. Connect the transmitting antenna cable to the RF OUT N-type female connector on the PA enclosure's RF output. On medium and higher power systems, the RF OUT connector will be 7-16 DIN female (or an alternative if the customer requested a different connector). The system must be loaded into a 50-ohm antenna before any power is turned on.

5. Check that your baseband digital source is present, whether it is from an encoder, mux, or otherwise, to feed the modulator if the system is a transmitter. If the system is a translator, ensure that the modulated RF signal is present at the input to the processor/translator that will feed the power amplifier.
6. Connect the CATS cables from the combiner outputs (2) to each CAN on the power amplifier.

7. Hook up the modulator or processor as shown in their respective manuals for a transmitter or translator. If the modulator or processor was produced by Technalogix, then the RF output level has already been set and optimized for optimum performance and should not be adjusted. Power level adjustment can be made through the power amplifier. If the front end modulator or processor was not produced by Technalogix, ensure that modulator or processor RF output level is turned down as far as possible. This will help ensure that the different product does not overdrive the power amplifier due to mismatched RF levels.

8. Do not connect the modulated signal from the RF OUT on the modulator or processor to RF IN on the power amplifier at this time. Because of the characteristics of LDMOS devices, the RF drive should not be connected to the power amplifier until after the power supply and bias voltages are present and stable.

9. If the power amplifier system includes a power supply that is external to the power amplifier enclosure, install the DC power supply leads (4 AWG) between the power supply enclosure and power amplifier enclosure. If the power supply is internal to the amplifier, then all DC wiring is already hooked up.

At this stage, the system is set up and ready to do a preliminary start up, as outlined in the following section

Section IX - Operating Procedure

Assuming the previous installation instructions have been completed and cautions noted, and the power amplifier is ready to receive a properly modulated signal, proceed with the following steps to place the system in operation. The power amplifier has been factory aligned for channel frequency (per system specification), signal levels and optimum performance.

IT IS **HIGHLY RECOMMENDED** THAT YOU RUN YOUR SYSTEM INTO A DUMMY LOAD BEFORE INSTALLING TO MAKE SURE THERE ARE NO DAMAGES CAUSED IN SHIPPING AND THE UNIT IS RUNNING PROPERLY

1. Do not apply a modulated RF drive signal to the power amplifier at this time.

2. Verify that all control and RF cables are tight and properly seated in or on the mating connector.

3. Plug the modulator or processor into AC mains (specified by the manufacturer), while still disconnected from the power amplifier.

4. With the power amplifier loaded into the filter and the filter loaded into the antenna (or dummy load), power up the amplifier by turning on power supply (either externally or via on the ON/OFF switch on the back of the power amplifier depending on the system).

5. Verify that the power amplifier fans are all on. The fans are powered via DC voltage so this is an indication that the power supply is started and running.

6. The internal soft start circuitry will turn the bias voltages off until the power supply to the amplifier pallets is fully stable. The front display indicates when the soft start is running with either a displayed message when an LCD option is installed or via maximum attenuation when a touch screen option is installed. Once complete, the Forward and Reflected Power and Power Supply readings will appear on the LCD in the filter and power amplifier enclosures.

7. Verify that a low input level warning is displayed. This ensures that the power amplifier has placed maximum attenuation on its input and is ready to receive the RF drive signal. On systems with the touchscreen option installed, this attenuation is displayed in the lower right corner of the screen (39 is maximum attenuation).

8. After the soft start is complete, apply the RF drive signal (which still should be turned down) between the modulator or processor and the power amplifier RF In (BNC female). This ensures that the RF drive signal is applied only after the power supply is stable and the bias voltages are applied to the amplifier.

9. The front display shows the user the present status of the amplifiers. Adjust RF output power to desired level. Verify that the FWD Power reads 80 to 100% of the system's rated power on the PA enclosure - depending on the modulation of the signal content. The system is set up for 100% rms 8VSB power, unless otherwise specified. A typical data signal with QAM64 or DVB will show differently. The output power level can be adjusted from the power amplifier's RF Levels screen. Keep in mind that the system will fold back or shut down (depending on severity) should the forward RF output power level be exceeded.

10. Ideally, the RFL Power should read zero. However, should a high VSWR be detected, the system will automatically fold back or shut down and cycle as previously described in the control system section.

11. Verify that the power supply reads correctly (see supplied final inspection sheet for factory settings of power supply levels) on the display of the power amplifier.

12. Look at the transmitted output using a suitable monitor. The picture and sound quality should be clean and sharp. If the output picture and sound quality is unsatisfactory, check the input signals, connections to the antenna system, antenna and transmission line VSWR, and the physical condition of the antenna.

If reception problems are encountered, and the quality of transmission is satisfactory, the difficulty is often with the receiving antenna or with obstructions in the path between the transmitter/translator and receiver. It is important to ensure that the transport stream has not been divided up into too many sub-channels. This will likely cause "pixeling" during fast frame changes like sports and movies in the case of broadcast video transmission.

Assuming the previous installation instructions have been completed and cautions noted, and the power amplifier is ready to receive a properly modulated digital signal, proceed with the following steps to place the system in operation. The power amplifier has been factory aligned for channel frequency (per system specification), signal levels and optimum performance.

Section X – Maintenance and Troubleshooting

Periodic Maintenance

If your unit employs a filter on the air inlet for the fans, the filter should be cleaned every 30 days. If the equipment is operated in a severe dust environment, the filters on the inlet fan may need to be cleaned more regularly. Turn the system off and unplug all of the AC inlet cords. The filter can be lifted off the fan and cleaned using an air compressor at low pressure. While the filter is out, clean the fan blades themselves with a small brush. The fans themselves do not need lubrication.

The interior of the cabinets should be cleaned and inspected annually. Turn the system off and unplug all of the AC inlet cords. Remove the top lid by unscrewing the 6-32 machine screws.

> Use extreme caution when working near the AC input terminal. The power amplifier and power supply store hazardous capacitances and voltages.

Using either compressed air or a brush with soft bristles, loosen accumulated dust and dirt and then vacuum the interior of the cabinet. Complete a visual inspection of the interior, making sure there are no loose connections or discolorations on any components from heat. Nothing inside the power amplifier enclosure exceeds a temperature that is not comfortable to the touch under normal operating conditions, so any signs of discoloration indicate potential damage.

All modular components inside the enclosure are attached to aluminium mounting plates for easy removal and replacement. Ensure that plates are secured and the mounting hardware is tight.

Troubleshooting

The first and most important aspect of troubleshooting anything is to be systematic. Note where you have looked and what you found.

Look first for the obvious.

- Make a physical inspection of the entire facility. Are all necessary connections properly made? Do you see any signs of obvious damage within the equipment?
- Is the AC power 'ON' to the site and the equipment? (Check fuses and circuit breakers if necessary.)
- Are all the switches in the correct operating position?
- Is the input signal present?
- Check LCD readings for presence of forward and reflected power and 31 V DC supply levels.

The above is an aid in determining the fault if some aspect of the system is not operating. The following table deals with quality of operation:

Symptom	Possible Fault	Correction
Horizontal bars in picture (may roll either way depending on phase)	AC grounding / AC interference	Install EMI/RFI filter in AC line
		Ensure modulator/processor and power amplifier share a common ground
Diagonal lines in picture	Interference	Install EMI/RFI filter in AC line
		Determine source and frequency of interfering signal (spectrum analyzer may be required)

Symptom	Possible Fault	Correction
High reflected power	Incorrect load	Ensure amplifier connected to transmission line
		Ensure correct antenna impedance (50 ohms)
		Check antenna tuning and VSWR. Verify correct cable for transmission line length
		Check all cables for visible damage (kinks, nicks or cuts)
		Check all connectors for poor connections, water or corrosion
		Check alignment of antenna
		Check for physical damage of antenna, including ice build-up

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