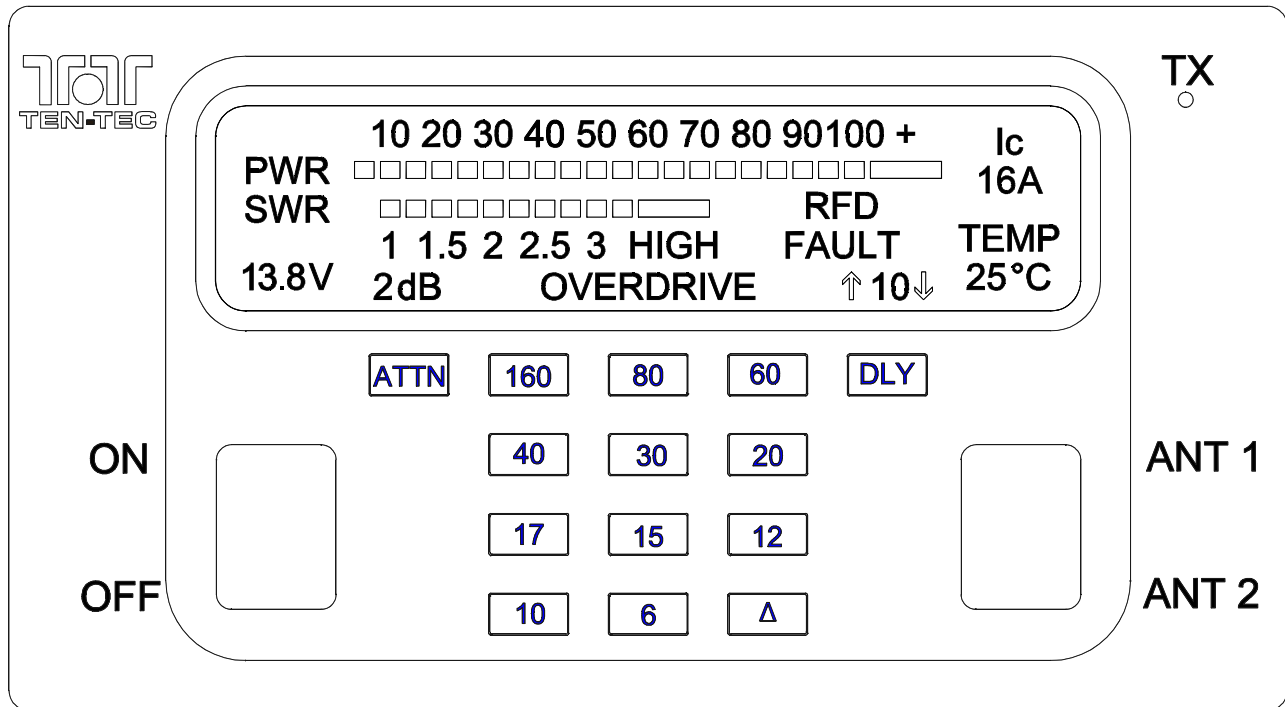


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NOTES:



1. Your new 418

1.1. Unpacking 418

Examine the 418 for signs of shipping damage. Should any damage be apparent, notify the delivering carrier immediately, stating the full extent of the damage. Save all damaged cartons and packing material.

Liability for any shipping damage rests with the shipping carrier.

1.2. About this Manual

A complete description of the features and functions on the 418 is included within the pages of this manual. The latest version of the 418 manual is also available for viewing at www.TEN-TEC.com.

You may also find a full set of schematic diagrams at this same web location.

1.3. Accessory package

The additional hardware and accessories listed in Fig 1.3-1 come standard with your new 418. Look over the items listed and refer to the 5 digit TEN-TEC part number and description should you find the need to replace an accessory. To purchase additional accessories and parts or to report an item missing from this list, please contact Service at TEN-TEC, INC.

Qty	Part #	Description
1	46216	3.5mm to 2 RCA jacks cable
1	27091	Auto Style Fuse, 25 Amp 32V
1	35241	8 PIN DIN Connector
1	35263	Plug – Stereo, 3.5MM (1/8)
1	46174	8 PIN DIN TO 8 PIN DIN cable
2	41073	Fork Terminal
1	46214	Power Cable
1	74020	Warranty card
1	74244	Standard Warranty Sheet
1	74468	Manual for 418
1	74450	How do I become a Ten-Tec Ambassador

Table 1.3-1 418 Packing List

1.4. Connection to Antenna & Power Supply

The 418 is designed for use with any antenna system providing 50 Ohm resistive impedance at the desired operating frequency. Every effort should be made to ensure the impedance of the antenna system is as close as possible to the specified 50-Ohm value. Note: that the “G5RV” type antenna and some Windom’s do not provide 50-Ohm impedance on all HF Amateur bands, and an external wide-range antenna coupler may be needed with this type antenna. Any antenna to be used with the 418 must, ultimately, be fed with 50 Ohm coaxial cable.

The 418 requires a source of well-filtered and regulated DC voltage. The supply voltage on the 418 is 13.8 Vdc nominal +/- 15% to allow for mobile and battery operation. The voltage source must be capable of supplying 23 amperes continuous duty. The model 940 or 941 TEN-TEC power supplies will meet or exceed your voltage and current requirements. We recommend using the included DC power cable (P/N 46214). Use of #12 stranded wire is recommended for mobile and in home use to accommodate the required current demand during transmit.

Note: Always enable the power source first and then the amplifier. If a generator or battery connected to a charger is used to supply the DC source, always turn off the amplifier before starting or shutting off the DC source equipment. These recharging devices often generate large voltage spikes that can damage the amplifier.

1.5. A word about grounding

A good ground system is essential for optimum operation of any HF transmitter.

The best solution is to connect all the station equipment to a single ground connection. Refer to Local and National Electrical Codes before making any connections with the 418. Another source of information on grounding can be found in the ARRL Handbook.

A good ground system can contribute to the station efficiency in a number of ways including minimizing the possibility of electrical shock, and minimizing RF currents flowing on the shield of the coax cable causing interference to electrical equipment and transceiver accessories.

It is critical that the power supply, the 418, and other equipment in the station be properly grounded to an Earth ground. Improper grounding can lead to various issues, including RFI, ground loops, or even death. Therefore it is extremely important to refer to the Local and National Electrical Codes and ARRL Handbook with regards to grounding.

1.6. Philosophy of design

With the Model 418, Ten-Tec has created a 100 watt solid state silicon MOSFET amplifier combining automatic or manual control for ease of operation in the 160-through 6-meter ham-band.

Refer to the Block Diagram in the “**Specifications**” section for the following discussion. Receive signals are routed through the antenna connector to the antenna relays to the T/R relays switching on the lowpass filter board to the Radio connector. Transmit signals are applied to the Radio connector and routed to the T/R relays on the Lowpass filter board and then to the input attenuator, input power bridge and frequency counter. This signal is applied to the 100 watt MOSFET amplifier and back to the lowpass filter to be applied to the correct filter and on

to the antenna relays, then to the antenna connector.

The PIC processor in the CPU module executes firmware to perform functions such as check input power and frequency, enable bias to the MOSFET amplifier, checking SWR, current, output power and temperature based on the inputs from the front panel buttons, key in jack or data from the ACC 1 connector.

Cooling is achieved with the two internal fans that are controlled by the CPU that is monitoring the temperature of the MOSFET heat sink.

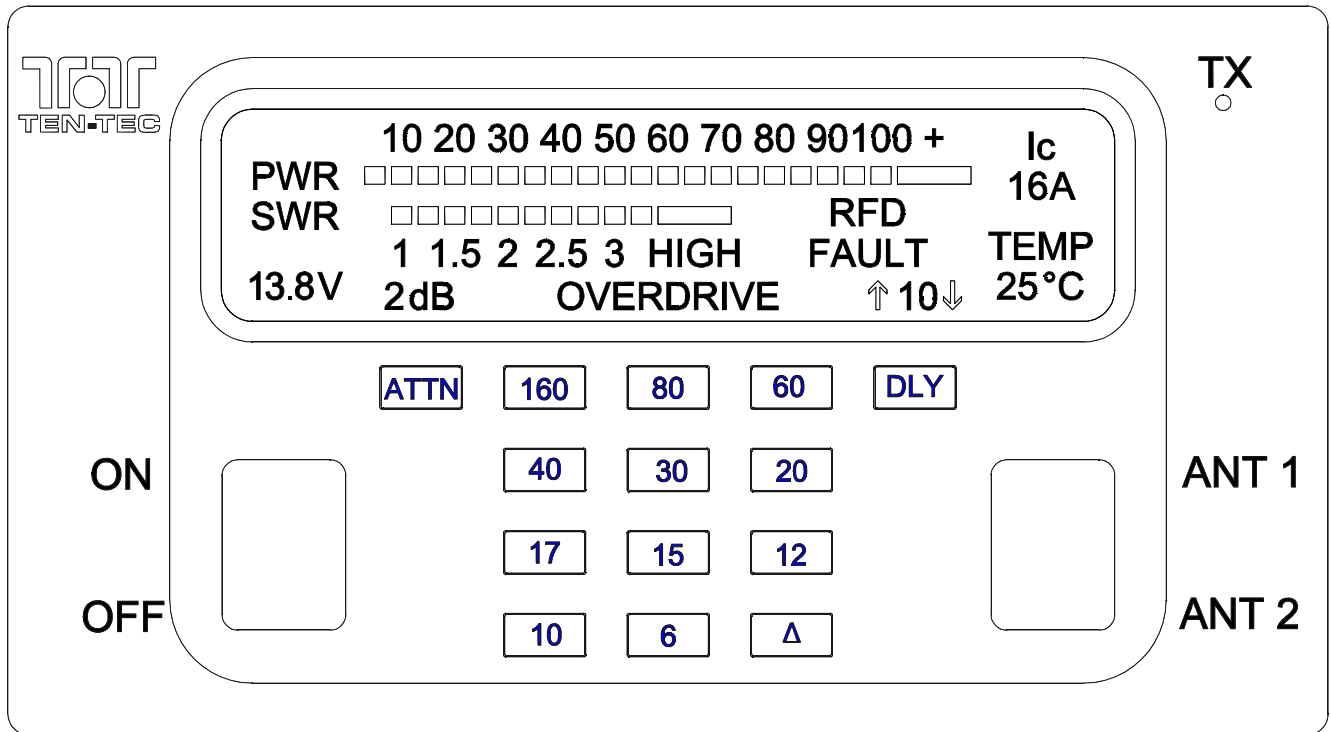


Figure 2.1 418 Front Panel

2. 418 FRONT PANEL

This section of your 418 Manual will discuss the front panel operations and adjustments.

2.1. SWITCHES

On Off power switch

Used to turn on the amplifier. When in the off amplifier is in bypass mode. If a fault occurs the power switch must be cycled to clear fault.

Ant 1 Ant 2

This switch selects either Antenna 1 or Antenna 2. The 6 Meter antenna is always selected when the amplifier is on 6 Meters

2.2. Band Buttons

Are for manual selection of one of the 11 bands. In automatic or manual mode the amplifier will light the button of the band selected.

2.3. Attenuator Button

This button is used to reduce the input power to the amplifier when 5 watts or less can not be supplied. When selected the button will light and will show either 0,2,4 or 6 db of attenuation on the display directly above the button. To determine the value of attenuation, this formula can be used.

Input power x db multiplier = 5 watts.

db	multiplier
2	.625
4	.400
6	.250

Example RF = 20 watts attenuator = 6 db
 $20 \times .250 = 5 \text{ watts}$

The ATTENUATOR button can used to lower the output power of the 418 when less than 100 watt output is desired.

2.4. Delay Button

The delay button delays the transmit to receive transition to keep the amplifier in transmit mode. The amount of delay can be seen directly above the button on the display. Each press of the DLY button will increase the delay. To decrease delay press and hold DLY button for 3 seconds. The up arrow will turn off and the down arrow will turn on.

Each press of the DLY button will decrease the delay.

2.5. Delta Button

When the delta button is pressed and lit the amplifier looks for data coming in on the ACC 1 connector. If there is no data the amplifier will use the internal frequency counter to select the band of operation. To use the internal frequency counter. Key amplifier with at least 200milliwatts input and release the key and the 418 will select the band of operation.

2.6. Leds

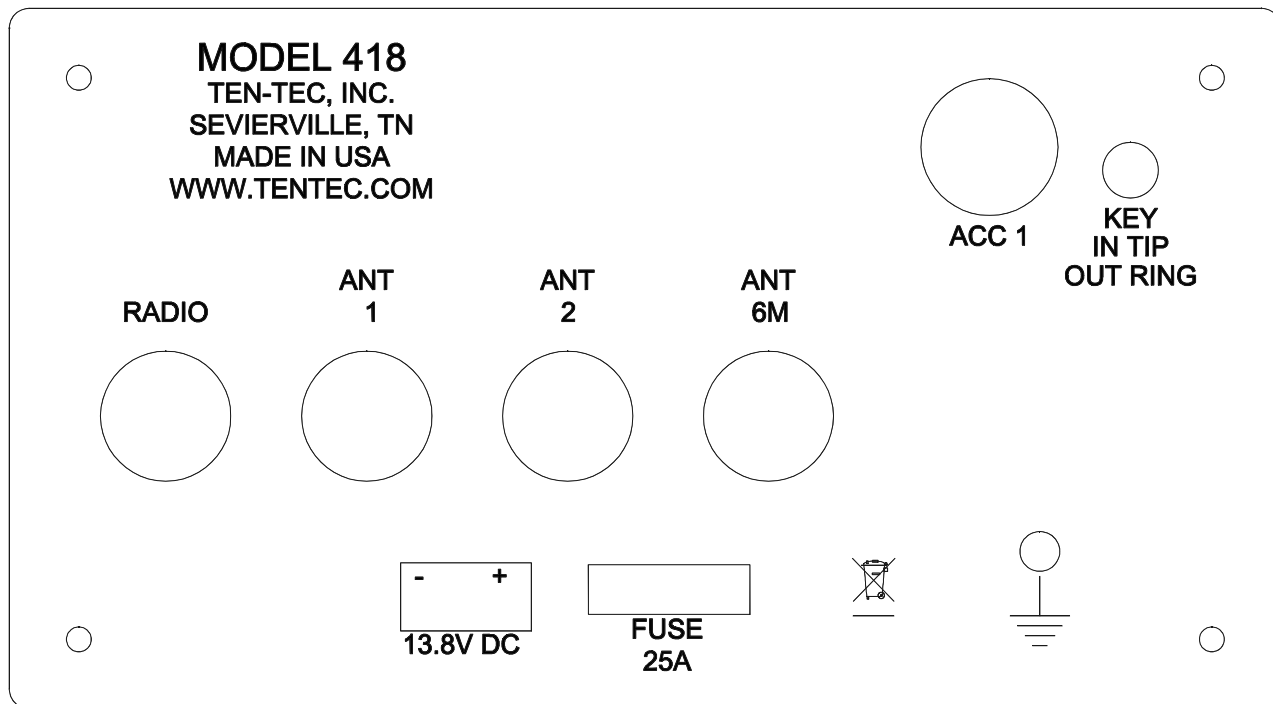
The TX led will light to show when the amplifier is in transmit mode. Another led mounted in the logo will light when the output power reaches approximately 80 watts.

2.7. Display

Visible on the display is a 10 to 100 watt bar graph for forward power, and a 1 to 3 SWR bar graph. Ic is Also shown. This is the current of the mosfet finals, and TEMP, which is the temperature of the heat sink. Not always seen are the words OVERDRIVE, RFD, and FAULT. More on this in section 5.

2.8. Backlight

The lcd has 6 leds to back light the display. 2 red 2 blue 2 green. To backlight adjustment, press and hold 80 Meter button on turn on. Pressing the 160 Meter button will increase the red intensity, pressing the 40 Meter button will decrease the red intensity. Pressing the 80 Meter button will increase the blue intensity, and pressing the 30 Meter will decrease the blue intensity. Pressing the 60 Meter button will increase the green intensity, and pressing the 20 Meter button will decrease the green intensity. Pressing the 15 Meter button will increase the overall brightness of the display, and pressing the 6 Meter button will decrease the overall brightness. Cycling the power switch will set the amplifier to normal operation and save backlight settings.



3. 418 Rear Panel

3.1. ACC 1

The Eagle is equipped with an 8 pin accessory connector. Refer to following figure for the pin definitions as viewed from the rear of the amplifier.

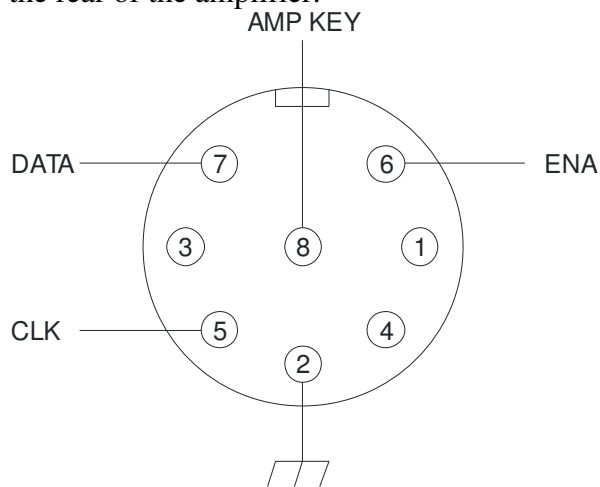


Figure 3-2 ACC1 Pin out

Pin	Name / Direction	Usage
1	Not used	
2	Ground	Grounding
3	Not used	
4	Not used	
5	Clock / Input	Future Use (Do NOT connect to this pin)
6	Enable / Input	Future Use (Do NOT connect to this pin)
7	Data / Input	Future Use (Do NOT connect to this pin)
8	Amp Key	Used to key the Amplifier.

Table 3-1 ACC1 Pin out

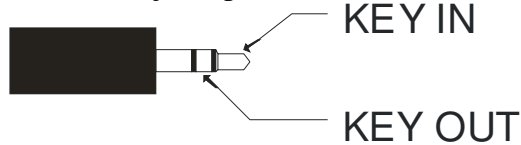
The pin out and function are listed in the following table.

3.2. Key In / Out

The rear panel on the 418 has a 1/8" stereo jack for connection of a key input and key output. The tip is used as the key input to key the 418 and the ring is used as a key out for other configurations. The key out has a delay of 10 msec. This allows the 418's relay to close before the transceiver applies RF to the 418. The key out is not a relay. It is a transistor switch rated for a maximum of 24 volts and 250 mA.

See Figure 2.3-1 for proper wiring. See section 4 for other connections.

1/8" stereo jack, part number 35263



1/8" stereo to 2 RCA jack, part number 46216

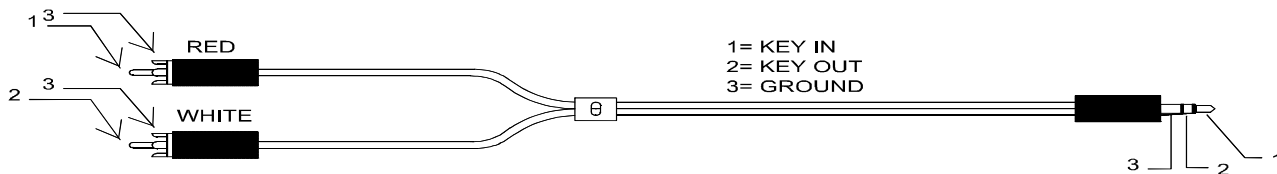


Figure 2.3-1

3.3. Power

Anderson Power Pole connectors are used for the 13.8VDC nominal +/- 15% input. These connectors are rated for 30 Amps each. The voltage source must be capable of supplying 23 amperes continuous duty

3.4. Fuse

The fuse is an auto style 25amp.

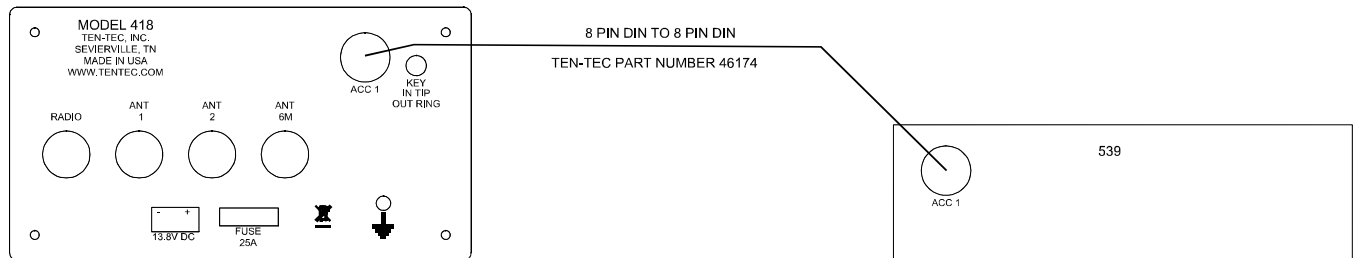
3.5. Antennas

There are 4 SO239's on the rear of the 418. The 1st labeled RADIO is the RF input from the transceiver. HF ANT 1 and HF ANT 2 are the HF antenna connections selectable from the front panel switch. 6M ANT is always selected when 6 Meters is selected on the front panel.

4. Amplifier Hookup

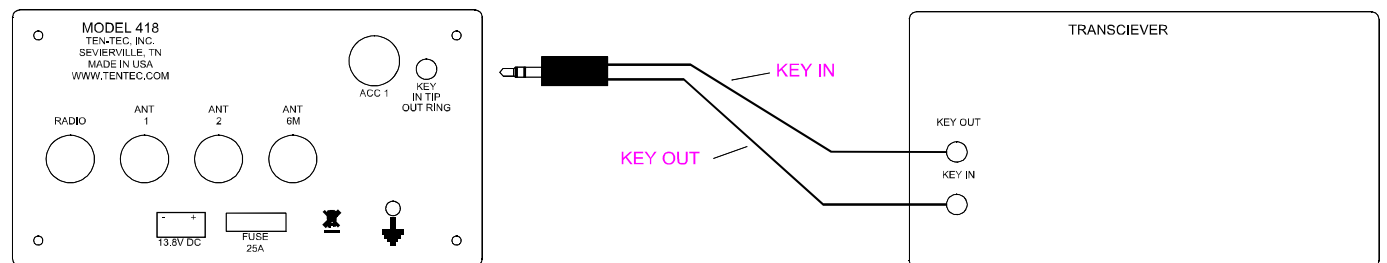
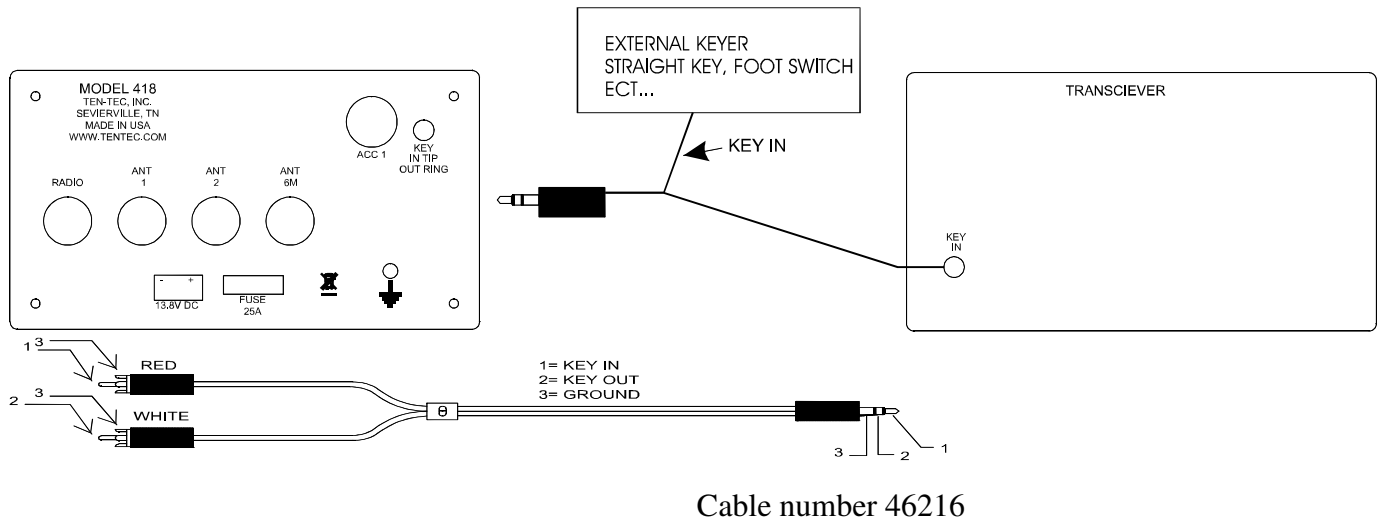
4.1. 418 to 539

The 418 can be interfaced to the 539 using only the 8 pin din cable. The 539 will control band changes and keying the amplifier

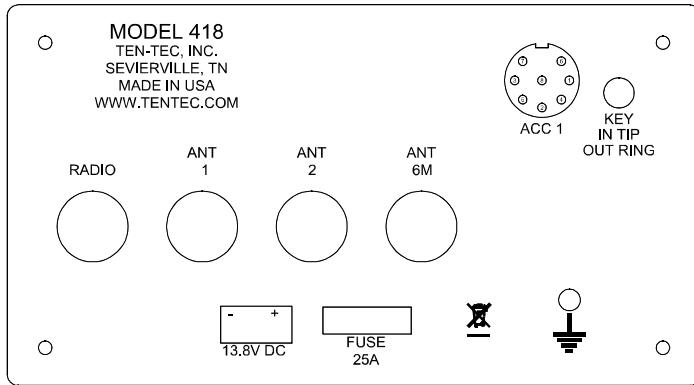


4.2. 418 to other

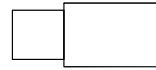
The 1/8" key jack provides a key input on the tip and a key output on the ring to allow the 418 to key other transceiver. Some methods are shown below.



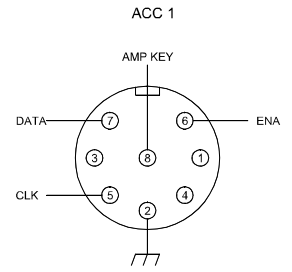
KEYING FROM ACC1



CLOSURE FROM PIN 8 TO GROUND WILL KEY 418



8 pin din connector
part number 35241



5. Fault

5.1. Fault conditions

When a fault condition occurs the 418 will go into bypass mode and display the word FAULT and what the problem was on the display. To recover from a fault condition, correct the problem and cycle the power switch on the 418.

5.2. List of faults

DISPLAY	Condition
FAULT Ic	>30 amps
FAULT TEMP	> 85 degree C
FAULT OVERDRIVE	>10 watt in
FAULT OVERDRIVE PWR	>115 watts out
FAULT SWR HIGH	>3.5:1 swr
FAULT RFD	Rf detected not the same as band selected.

6. Specifications

Key Jack:	1/8 " Stereo Tip-Key in Ring- Key out
ACC Din Connector:	8 PIN DIN Connector – Aux Key,Clock/Data/ Enable, Ground
DC Power Connector:	Power Poles
Fuse:	Automotive Blade Style Fuse, 25 Amp 32V
Frequency Range:	160-6 meters. Specifications apply within Amateur Radio bands only.
Antenna Impedance:	50 ohms nominal.
Antenna Connectors:	4 x SO-239
Supply Voltage Range:	13.8V +/-15%
Operating Temp. Range:	0-50 degrees Celsius
Dimensions (HxWxD):	3.625" x 6.5" x 7.6" (excluding feet and connectors)
Weight:	5.4 lbs
Construction:	Molded plastic bezel, aluminum chassis, front and rear panels and texture painted steel covers
Display:	Custom FSTN monochrome LCD
Display Backlight:	6 LEDS
RF Power Output:	100 W, +/- 1 dB
CW & SSB Duty Cycle:	continuous service @ 100W

AM,FM,AFSK,PSK Duty Cycle:continuous
service @100W,
50% duty cycle
(Tx/Rx)

Cooling: 2 internal fans
temperature
controlled

Harmonic & Spurious Outputs:

<-50dBc @100 W <30MHz;

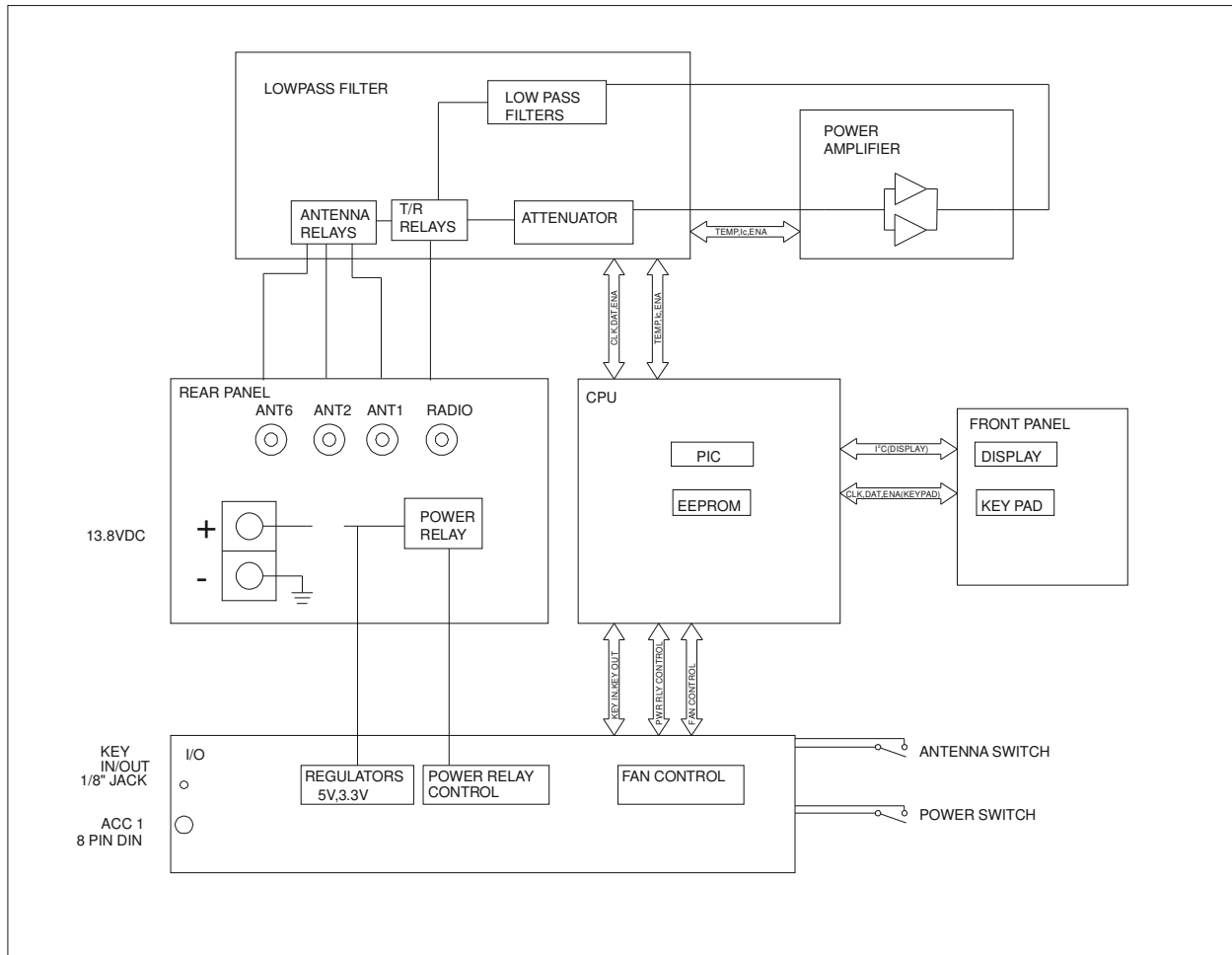
<-60dB >30MHz

Current Drain: transmit 17 amps

Third Order Intermod: 30dB below peak

All measurements are typical. Results will vary based on different Test Environment, Tools, and Test Methods. Specifications are subject to change.

7. Block Diagram



8. In Case of Difficulty

While we cannot cover every possible problem, here are some hints for dealing with some potential difficulties. Check the obvious. Is your dc power source okay? Check power supply, cable and connector(s). Is the 25 ampere fuse loose or missing? Antenna problems? Try a dummy load. Is a proper antenna connected? Is any external antenna switch connected and properly set?

Problem: Distorted SSB transmit – or – Perceived RFI in the shack.

The ALC LED should flash on voice peaks, but not remain continuously lit in SSB modes. A frequent cause of a distorted SSB signal is inadequate RF grounding resulting in RF feedback. Common RF grounding problems are no ground connection, or too long a lead to a good ground. Many problems relate to the lack of an RF station ground, as contrasted with a safety ground connection. We recommend bonding all equipment chassis together with short heavy metal braid or strap. Make these connections from chassis ground lug to chassis ground lug and connect the last piece in the chain feeding the antenna to a good earth ground. This lead needs to be as short as possible. Lengths near $\frac{1}{4}$ wavelength on any band used can be particularly troublesome when the far end is connected to earth. It is very important that the external power supply and the transceiver and all equipment with grounding lugs are properly grounded.

Another potential cause of distorted SSB arises when the station is in the near field of the antenna. This is a problem many apartment dwellers face.

RF can also be induced on any unshielded wires.

Problem: 418 power shuts off while transmitting

The 418 is equipped with a silicon-controlled rectifier that opens if the PA current draw exceeds an instantaneous power of

approximately 30 amps. This will shut off power to the mosfet finals. Excessive current draw can indicate a problem with excessive SWR due to antenna or feedline problems. Power to the 418 can be restored by cycling the power switch off and on or the 13.8 Vdc source off and on.

If the above do not solve your problem, please consult with our service department (865) 428-0364 or service@tentec.com

9. Warranty & Return Policy

Warranty policy for Ten-Tec products is covered in the gold color page located on the last page of this manual.

FOR EQUIPMENT MANUFACTURED BY TEN-TEC: TEN-TEC factory built radio equipment is sold under a 30-day risk-free trial period. Any piece of equipment manufactured by TEN-TEC may be returned, undamaged, within 30 days of purchase for a full purchase price refund, less shipping charges (customer pays shipping both ways).

If you want to return a piece of equipment purchased from TEN-TEC, please call the sales department at (865) 453-7172 from 8 a.m. to 5 p.m. Eastern time, Mon-Fri and obtain a return merchandise authorization number. Calling in advance for an RMA number allows us to quickly process your return and refund once your item arrives. Ship return items with letter enclosed inside the box noting the RMA number and your name, address, and telephone number. Return items are shipped to TEN-TEC INC, 1185 Dolly Parton Pkwy, Sevierville, TN 37862 USA.

FCC Compliance

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult TEN-TEC service for technical assistance (865) 428-0364