Edition 1

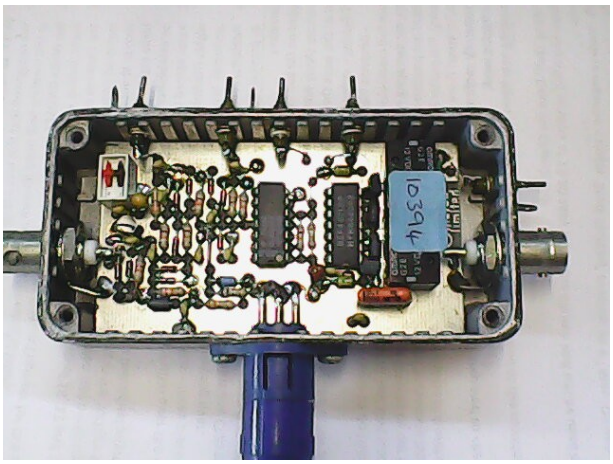
A General Purpose UHF Preamplifier GLNA432e

(includes also ATCS 500s controller/sequencer)

a product produced by Mutek (circa 1984 onwards)

GLNA 432e

ATCS 500s



Manual compiled by Clive Smith, GM4FZH for general circulation

Compilers Note

This manual has been put together and designated Edition 1. The information has been obtained from various sources, including past owners and the Internet; a lot of information has been gleaned from an early Mutek document (March 1984) that has come to light but in poor physical condition. **I cannot vouch for the accuracy of this information.** It is not intended to produce an updated version of this manual, if additional information becomes available it maybe provided as an addendum.

The products produced by Mutek were of high quality and many are still in service. However, please remember that this product came on to the market some 20-30 years ago and must now be regarded as obsolete.

****** PLEASE NOTE: ******

The information contained herein is provided in good faith and I will not be responsible for any outcomes arising from the use of it. I have put it together for use by the amateur radio fraternity.

The list of other manuals can be found on my website www.gm4fzh.co.uk (as they become available) where there are also details of how to contact me. I have no association with the firm Mutek and this manual has been produced at my own expense and without any payment.

Clive Smith, GM4FZH, Spring 2020

*The filename of this document is **preamp glna432e.pdf**.*

Figure 1. Inside GLNA 432e

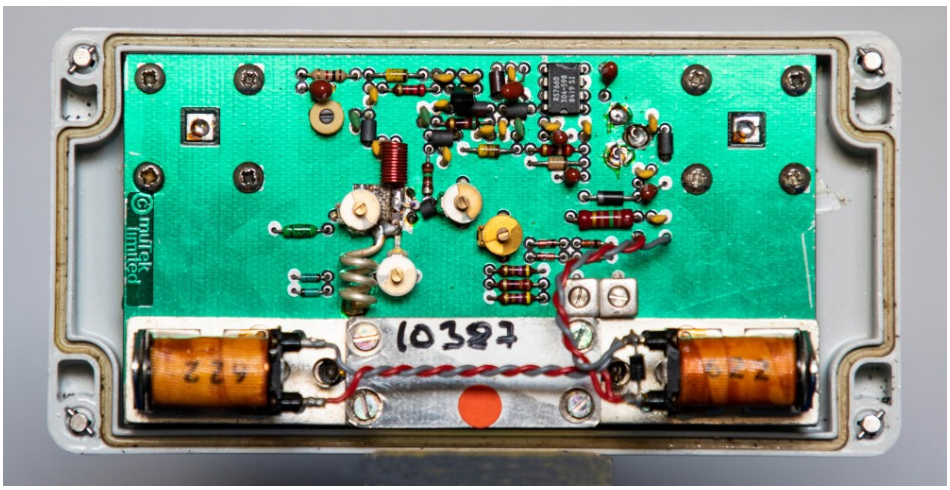


Table of Contents

Specification

Typical performance data GLNA 432e		
Noise Figure	0.9 dB typical	
Transducer gain	+ 3 dB	
Input third order inter-modulation intercept point	-3 dBm	
Output third order inter-modulation intercept point	+10 dBm	
1 dB bandwidth	10 MHz	
20 dB bandwidth	40 MHz	
Transmit power handling capabilities (maximum pep incident on transceiver port)		
Mode	Load vswr 1.0:1	Load vswr 2.0:1
SSB speech (J3E)	250 W	175 W
CW telegraphy (A1A)	200 W	125 W
FM speech (F3E)	150 W	90 W
Teletype (F2A)	150 W	90 W
SSTV (C3F)	150 W	90 W
HDTV (A3F/C3F)	200 W	125 W
Insertion transmission loss	20 dB (1.24:1 vswr)	
Size	160 x 80 x 55 mm excluding connectors and mounting bracket	
Case	Polycarbonate moulding	

ATCS 500s	
Sequence delay	50 ms
Input modes	ON rf “through line” - “rf sensing” - “volts on receive” - “volts on rtransmit” DC control lines -”volts on receive” - “volts on transmit”
Output functions	Power for GLNA 432e “make on Tx” for PA

History of the PCB

None available.

Introduction

Mutek Ltd's GLNA432e is an environmentally cased 432 MHz band GaAs fet preamplifier. It is a high quality product which has been carefully designed to provide excellent performance. Please read these notes carefully. They have been written to help you obtain the maximum enjoyment from this fine preamplifier.

The GLNA 432e has been designed to offer system performance which will usually be limited in sensitivity terms by external noise and by the subsequent receiver dynamically. The amplifier has inbuilt antenna transfer switching capable of handling up to 400W pep in SSB service. This has been designed to operate with the ATCS 500s sequencer/controller. Failure to do this is likely to result in considerable damage occurring to the preamplifier and will invalidate your guarantee.

The ATCS 500s controller/sequencer is able to accept a wide variety of control signals from the transceiver: a positive voltage present or a line grounded on transmit can be used to control the unit as can a dc levels present at the transceiver antenna socket. For those very few transceivers not providing some form of control output, an "rf vox" facility is also available. Hard switching is however strongly recommended and should be used wherever practicable.

Circuit Description

GLNA 432e amplifier

Note: No circuit diagram has been found. See Fig.1. for general component layout.

A series C, shunt L and C network provides a noise match to the GaAs fet amplifier. Crossed diodes and a low value rf choke provide input static discharge and over-power protection. The drain load for the fet is a resistor which is also employed as a bias feed. A C-L-C 'tee' network transforms the admittance at the drain to 50 Ω. Excess gain is shed with a pi-network pad which also provides a satisfactory wideband termination for the output filter. The fet is operated with its source at both dc and rf ground. Gate bias to the fet is obtained from a negative rail generator IC. Considerable care has been taken to minimise the possibility of damage to the gate from voltage transients. The drain bias is obtained from a zener diode shunt regulator with additional transient and reverse polarity protection. Zener diode supply regulation is preferable to the use of ICs as these are frequently rather transparent to voltage transients.

The amplifier dc supply is switched with the antenna relays which are energised in the receive mode only.

In order to maximise the life of the antenna relays and also to minimise the possibility of damage to the amplifier, it is essential that the antenna transfer switching operation is completed before rf power is applied to the unit. This is the function of the ATCS 500s.

ATCS 500s

Note: No circuit diagram has been found. See front page for component layout.

The ATCS 500s is a comprehensive antenna changeover sequencer/controller. It uses CMOS logic to control via VMOS driver transistors a pair of relays which interface with both the GLNA 432e and the station linear amplifier. The timing functions (Fig. 2) are generated by creating a deliberate race between an AND gate and an OR gate resulting in the timing function shown graphically below. Other gate functions employing both IC and diode logic perform the input processing.

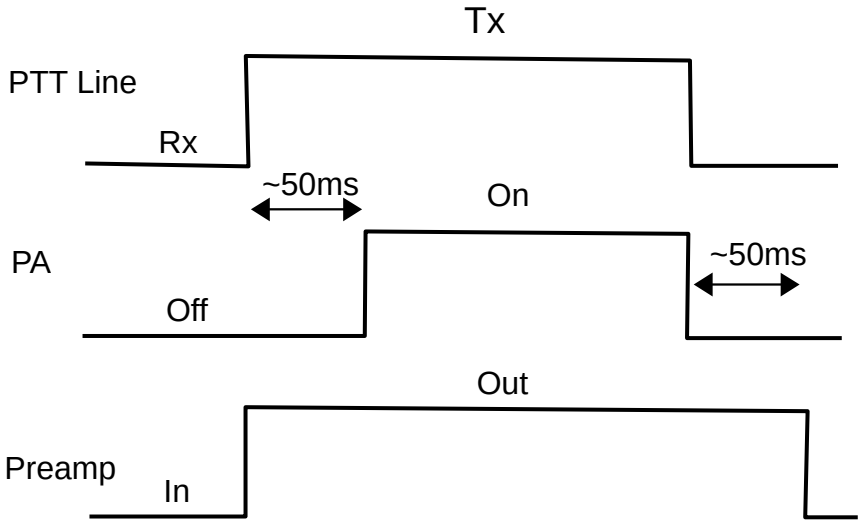


Figure 2. ATCS Timing Details

A wide variety of inputs may be used to control the sequencer. Many transceivers provide either a positive dc level or an externally accessible relay contact which makes to ground when on transmit. Other transceivers output a positive dc level via the antenna socket; this may be present either on transmit or receive. A few transceivers have no control output at all. The ATCS 500s will handle all of these!

As supplied, the controller is set to accept either a positive dc level or a make to ground on the appropriate input ports. A positive level on transmit present on the rf through-line will also switch the unit. By altering an internal DIL switch (see later) the sense of this function may be reversed, allowing operation with a positive dc level on receive. The DIL switch may also be set to allow the use of rf sensing, although this should only be used as a last alternative.

The ATCS 500s has two output ports. A three pin socket provides dc supply to the GLNA 432e on receive, whilst an isolated make-on-transmit output is also available to control a power amplifier. This may be internally rewired to provide a break-on-transmit facility.

Control of the GLNA 432e is achieved via a two-core control cable. It is essential that the polarity of this link is preserved, other wise damage to the amplifier may result. A separate control line has been selected over the usual “dc up the coax” scheme as it offers freedom from electrolytic corrosion in the coaxial cable and its connectors. This can easily result in reliability and intermodulation problems.

Installation Notes

The GLNA 432e/ATCS 500s combination has been designed to operate from a nominal 13.8V supply. The current requirement is of the order of 250 mA. It is important to ensure that at least 12.5 V is present at the preamplifier when it is commanded into receive mode and the final length of control cable is installed.

The preamplifier should be mounted so as to ensure that the connectors are facing downwards (Fig. 3), failure to do this could result in you becoming the possessor of a rather inefficient water-cooled amplifier!

If you use an amplifier with built-in rf switching (and this includes the vast majority of solid state amplifiers) the function MUST be disabled and the amplifier controlled through its hard switching line only. Rf control inherently overrides the hard switching every power amplifier that we've examined. This results in the preamplifier receiving transients of full power rf, which even if it doesn't damage the preamplifier, will result in reduced relay life. It s normally a fairly easy operation to disable the rf switching. Most amplifiers use a small (eg 1.5 – 2.2 pF) capacitor to sample the incoming rf and and operate the transmit/receive switching. By removing the capacitor the rf switching will be disabled and the power amplifier will only hard switch. If you are not sure of what to do, obtain competent assistance! It should be appreciated that I a preamplifier of some kind is fitted into the power amplifier you should not transmit into it without connecting the hard switching as damage is likely to result to the internal preamplifier.

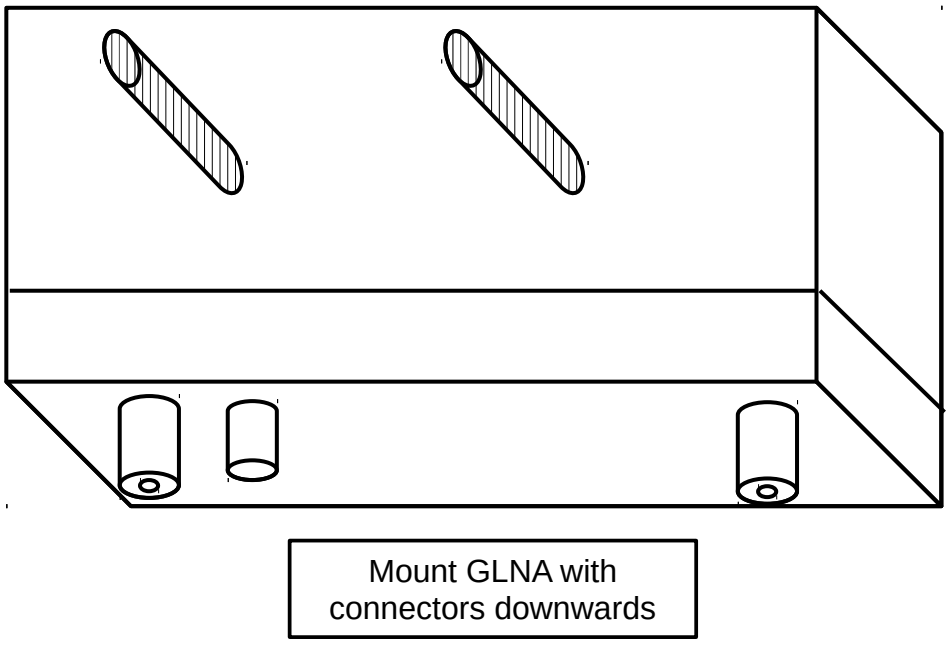


Figure 3. GLNA 432e Mounting Details

Connect the control output of your transceiver to the appropriate feed-through on the ATCS 500s (see Fig.4). Should your transceiver output a control function via the antenna socket it will be necessary to connect the ATCS 500s in its "through-line" mode. Remove the lid of the controller and check the position of the DIL switches (see front photograph). See Fig. 5: in the normal position

(both switches OFF) the controller will switch to the transmit mode on seeing a positive DC level. With both switches ON the controller will be in the receive state when it sees a positive level. The controller will also "rf switch" if no control output is provided by the transceiver. In this case switch 1 is ON and switch 2 is OFF. IT IS STRESSED that rf switching is not desirable and it is recommended that it is only used as a last resort.

The controller and preamplifier are connected together by a two-core cable. Ensure that polarity is ensured.

The N-type rf connectors are splash-proof. They may be further waterproofed by spraying with a silicone-based lacquer and wrapping with self-amalgamating tape. Be sure not to leave voids where water can collect. The power connector should not be water-proofed as it contains a breathing hole.

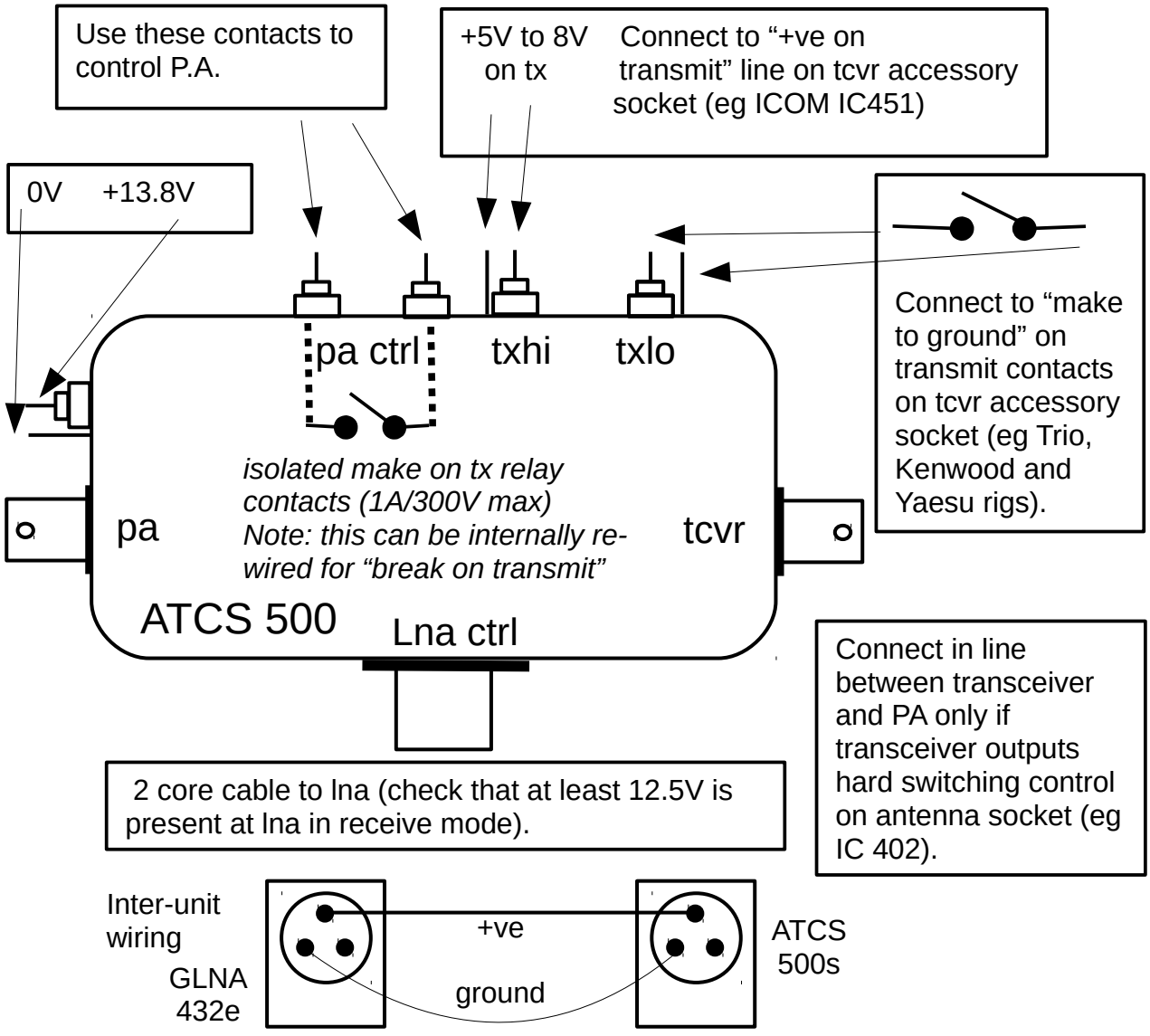
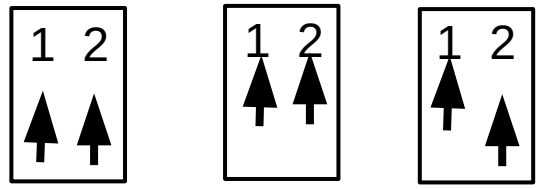


Figure 4. ATCS 500s Interfacing Details

Figure 5. DIL Switch Settings



NORMAL

+ve dc ON TCVR ANT. LINE ON RX.

RF SWIT -CHING

Before mounting the preamplifier at masthead, check everything thoroughly using the cables which will be used in the final system. It should, for example, be possible to discern the switching delays and check that coaxial relays pull-in first and drop-out last. A little care at this stage could save much frustration.

Note that in common with all high performance GaAs fet amplifiers operating at UHF the GLNA 432e is not unconditionally stable. This should not be a cause for alarm! To provide unconditional stability would degrade performance in other respects. The GLNA 432e is stable with all phases and magnitudes of load VSWR and all phases of source VSWR less than 3:1.

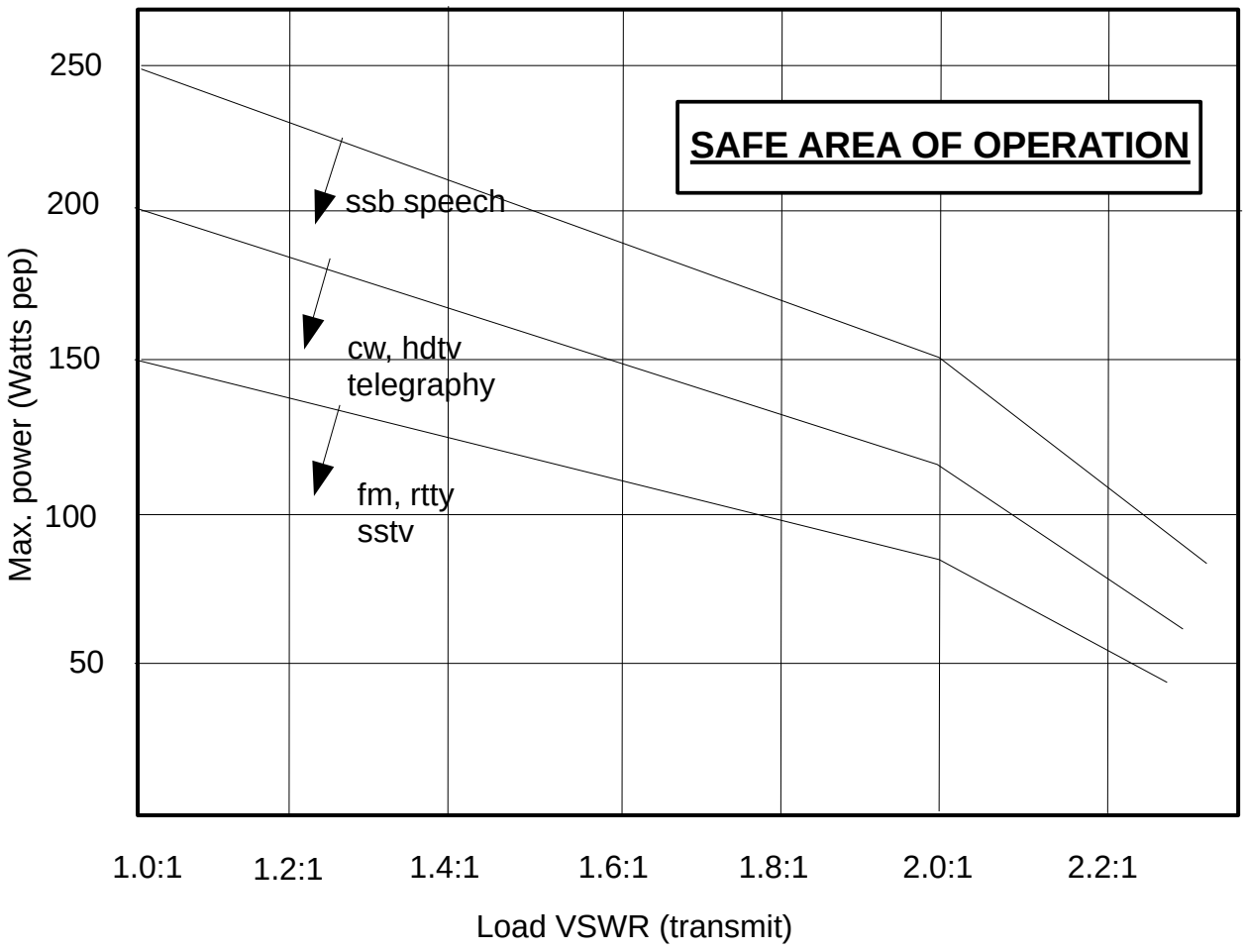


Figure 6. Safe Area of Operation

Tools Required

Soldering Iron (small)
Small pair pliers (long nose)
Solder (thin multicore)
Solder sucker (might be useful)
Side cutters
Spanner