

# MGL Avionics

**Vega 2.1/4" control head  
for V16 aviation band transceiver  
and N16 VHF navigation receiver**



**User and Installation manual**

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## **General**

This manual documents the installation and use of the MGL Avionics Vega NAV/COM 2.1/4" control head.

The Vega NAV/COM control head is designed to interface to a MGL Avionics V16 VHF airband transceiver or a MGL Avionics N16 VHF Navigation receiver.

## **Document history**

28 February 2018, first release

## **Description**

The Vega control head consists of a body designed to fit a standard 2.1/4" instrument cutout. The Vega is designed for panel front or rear mounting.

The Vega features a 1.8" color TFT screen. Two Rotary controls are provided. Display light intensity may be adjusted to fixed values or set automatically based on ambient light levels measured by a sensor above the display.

The Vega interfaces to a V16 and or N16 using a two wire CAN bus. Two RS232 ports are provided. RS232 port 1 may be used as interface to third party systems implementing industry standard communication protocols. The same port may also be used to upload firmware updates to the Vega using a PC application provided by MGL Avionics. RS232 port 2 is reserved for special applications and is not currently used.

Two analog voltage inputs are provided. Input one may be used together with a switch to implement a stick mounted last reception recall for the V16 transceiver.

Input two may be used to implement a selection of one, two or three button frequency or channel selection switches.

## **Multiple control heads**

There are no limitations to the number of control heads installed in parallel.

Control head types can be mixed, for example you may mix Razor 3.1/8" heads with Vega 2.14" heads. Heads require no specific configuration for multiple head operation. Simply connect them in parallel on the CAN bus.

## **Interface with MGL EFIS systems**

Heads are not connected in any way to a MGL Avionics EFIS system.

Should you wish to operate an MGL EFIS with a V16 and/or N16, the MGL EFIS connects directly to the V16 via an EFIS RS232 port. In case of a V16 and N16 combination, the N16 is connected to the V16 via CAN bus and the V16 RS232 port provides both V16 and N16 data to the EFIS. In case of a single N16 receiver, connect the RS232 port 1 of the N16 to the

RS232 port of the EFIS.

Note that the CAN bus between heads, V16 and N16 is a private CAN bus. It must not be connected to an EFIS CAN bus or any other can bus in your aircraft.

You may operate heads and EFIS connection at the same time.

## **Interface with non-MGL EFIS systems**

Using any Razor or Vega head, RS232 port 1 implements a industry standard, Garmin compatible protocol. As there are several protocol types please select the desired variant in the head setup menu.

Note: If you have both V16 and N16 connected via CAN bus to your head, you can select a NAV/COM protocol such as SL30 or GNC255. If you have only a V16 connected, select one of the COM protocols such as SL40, GTR200, GTR225.

It is possible to connect only a N16. In this case select a NAV/COM protocol. The protocol will include the COM parts but these will not be functional – for example if you were to set a COM frequency this will not work and the head will return a fixed frequency set to 118.000Mhz.

The protocols are implemented fully including various forms of frequency lists and tables depending on the chosen protocol which can be used with compatible GPS receivers. Note: Generally, EFIS systems do not download frequency lists but set individual frequencies from their databases.

## **Multiple V16/N16 systems**

Should you wish to use multiple V16 and/or N16 systems, please wire each system with a separate CAN bus.

## **Vega modes of operation**

The Vega can be selected to operate in one of four modes:

### ***COM***

In this mode the Vega acts as control for a V16 COM transceiver.

### ***Primary NAV***

In this mode the Vega acts as control for a N16 NAV receiver primary frequency. It can be used as VOR or ILS control and display depending on the tuned primary navigation frequency. Frequency settings from the Vega will change the primary frequency directly. This mode is normally only used if a second Vega is used for the secondary frequency, however should you not want to use the secondary frequency it is acceptable to use the Vega in this mode.

### ***Secondary NAV***

In this mode the Vega acts as control for a N16 NAV receiver secondary frequency. It can be used as VOR or ILS control and display depending on the tuned secondary navigation frequency. Note: The secondary frequency is only active with the N16 placed in SCAN mode. If the N16 is not in SCAN mode the displayed VOR or ILS will be shown in gray colors and will not be functional.

This mode is only used if a second Vega is set to Primary NAV mode.

### ***NAV ALL***

Using this mode the Vega acts as both primary and secondary navigation frequency controls and display for a N16 navigation receiver. All frequency settings are sent to the secondary frequency. Primary and secondary frequencies can be flipped.

## V16 COM radio interface – operation



### ***Rotary controls***

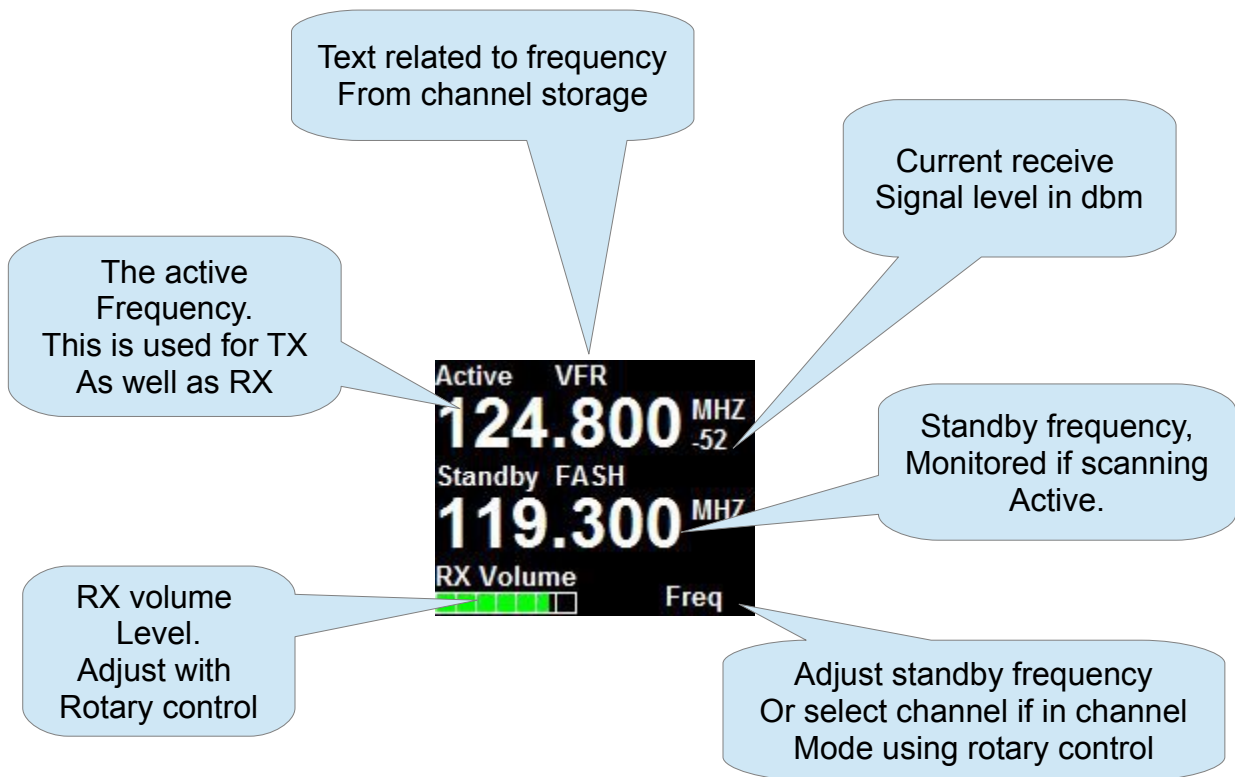
The rotary control on the left is used to set the RX volume. Pushing the control enters the menu. In menu mode rotating the control selects the menu item. Pushing the control while in menu mode exits the menu or selected sub menu.

The right rotary control is used to enter a new standby frequency, flip active and standby frequency, switch scanning on and off and select the 121.5Mhz emergency channel. The Rotary control is also used to select from preset channel lists and is also used for many of the menu and setup functions. Generally, when in any menu mode this rotary control adjusts the value of the selected item. In channel mode, this control selects the channel.

### ***Ambient light sensor***

The display brightness can be adjusted either in fixed steps (using the menu) or it can be set to automatically adjust depending on the amount of ambient light measured at the sensor.

## Main display - receive



Notes: Frequency display flashes when signal received above squelch level. Signal strength readout in dbm only visible when signal above squelch level.

Internal channel storage can be edited via the Menu -> head setup.

Further channel storage options available via downloaded channel lists from external equipment depending on protocols selected and availability of such functionality on external equipment such as EFIS systems.

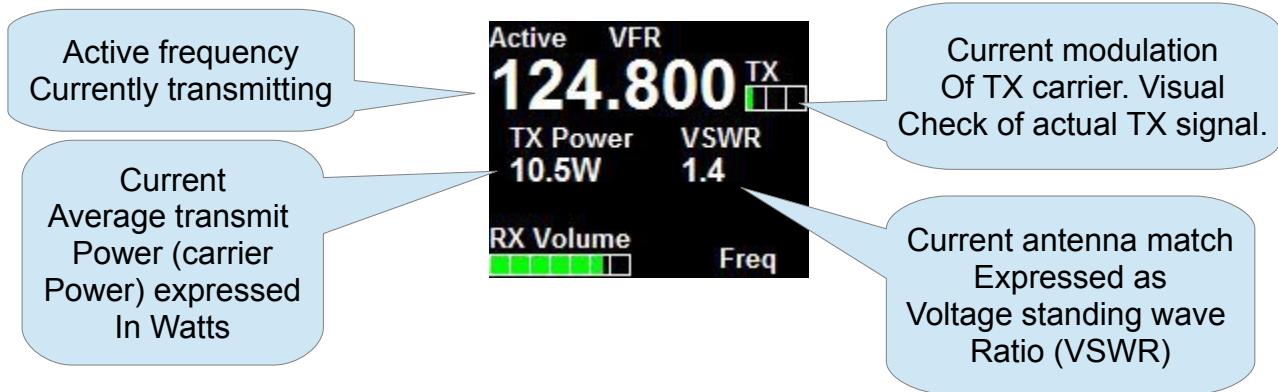
Playback feature: The V16 can playback the last received transmissions. This can be activated by wiring a switch to the Vega or V16. Please refer to the V16 manual if you would like to wire this switch to the V16. For the Vega, please view this manual with respect to the A1 and A2 inputs and selected menu function related to these inputs.

Channel based frequency selection may be operated via remote switches. This can be configured to operate in various modes and number of switches. Please view the options in the Vega A1/A2 menu.

You can also enter channel select mode by pushing the right rotary control and while pressing it turning the knob. You can then select between direct frequency entry, internal channel storage or, if available, any downloaded frequency list.



## Main display - transmit



Notes: TX power and VSWR are only shown during TX if "Show TX Info" is selected in Menu -> Head. If not selected, the standby frequency will be shown in this field.

Current modulation is derived from actual demodulation of the outgoing TX carrier wave and is a true reflection of modulation of the carrier.

Transmit power is a true RF forward power measurement using a directional coupler at the antenna connector. Typical readings are around 10W (or 5W if low power TX mode selected). Power readings can vary depending on tuned frequency, antenna match at that frequency, internal temperature of the transmitter (if exceeding high levels) or power supply voltage if below 13.8V DC during transmit.

VSWR reading is taken from a directional coupler at the antenna connector which looks into the transmitter harmonics filter as termination. Due to variable impedance at this location the VSWR reading may differ slightly from that of a similar meter inserted at the antenna but nevertheless is a good indication of antenna match. A good antenna match would give readings below 1.5 at any frequency. Readings above 2.0 should be investigated and may indicate a badly tuned or unsuitable antenna. Transmitting into a 50 ohm RF dummy load produces a perfect match and a reading of 1.0.

## Messages



The following messages may be displayed:

## **STUCK PTT !!!**

This displays when transmission has been active for 35 seconds. The V16 conforms to the requirements of DO-207. After 35 seconds the V16 reverts back to receive mode even if the PTT remains active. Releasing PTT resets the 35 second timer and a new transmission may commence.

## **V16 FAULT**

This displays if the internal self diagnostics of the V16 transceiver has detected an internal fault that may cause incorrect operation. Please make arrangements to have your V16 transceiver checked and if required, repaired by a qualified service lab.

## **Antenna !**

This message will be displayed in case of a very bad antenna match during transmit. If this message appears transmit power will have been reduced automatically to prevent destruction of the transmitter.

Please check your antenna and antenna cable as well as connectors for shorts or open circuits. If this happens with an antenna that was previously operating fine, check connectivity to the antenna ground plane and check for corrosion.

For new installations, please ensure that your antenna has a properly configured ground plane of sufficient size.

## Adjusting volumes and squelch

The V16 features independent receive and intercom volume controls plus a semi-automatic receiver squelch.

### ***Adjust RX Volume***

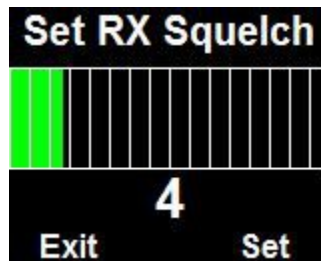


Adjust the RX volume whenever you see the main display by turning the left rotary control.

Note that this adjusts ONLY the receiver volume. It does not affect the volume of your intercom system.

Note: If you adjust the receiver volume the receiver squelch will be temporarily disabled so you will hear the background static noise to aid you in adjusting the volume if there is no current reception.

### ***Adjust RX Squelch***



Press the left rotary control to enter the menu, use the left rotary control to find the RX squelch entry and then use the right rotary control to adjust the value.

Adjust the starting value of your semi-automatic receiver squelch. Your V16 will automatically increase or decrease this value based on the current level of background noise but is restricted to the amount of adjustment it can apply. This is to prevent the V16 from assuming unreasonable signal suppression in cases of interference which could unintentionally reduce your receiver sensitivity.

Adjust the squelch so the background static noise breaks through – then increase it just enough so the background noise is suppressed. Do not increase it too much as this will cause your V16 receiver to be less sensitive to weak signals.

### ***Adjust Intercom volume***

Press the left rotary control to enter the menu, use the left rotary control to find the RX squelch entry and then use the right rotary control to adjust the value.

Note: Intercom volume and receiver volume are independent in the V16.

Notes:

Typical volume settings for aviation headsets (2 x 600 ohms impedance) tends to be in the

region of 22-28. If the V16 is connected to an intercom system you may prefer much lower levels to avoid over driving the intercom inputs.

Receiver squelch is adjusted in steps of about 1 dbm from just under -100 to -70. Typical settings tend to be in the range of -95dbm. You should adjust to a setting that just cancels the receiver noise if there is no reception of a sufficiently strong signal.

The value shown is from 0 (squelch always open) to 31 which is equivalent to -70dbm.

A typical value to use is "4".

Avoid too high squelch settings – this will make your receiver insensitive to weak signals, unless this is your intention.

Be aware that higher than normal squelch settings may indicate interference from on-board electrical systems – typically these would be frequency dependent. Good and proper installation of your V16 can help to minimize such effects. Pay particular attention to a good antenna match using the on-board VSWR meter and also of the location of antenna cable and antenna itself with respect to on-board interferers. Distance minimizes interference !

The V16 squelch is on the semi-automatic type. This combines the positive elements of a fully automatic squelch with the control of a manual squelch. When you adjust the squelch or when the V16 powers up squelch is set to your set level. However, the V16 is allowed to adjust starting at this value for a small amount depending on the received signal so it can track the noise floor which typically changes a bit with location and frequency.

## Entering a new standby frequenc

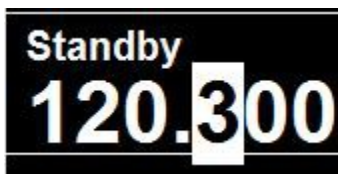
### *Using the rotary control*

"Click" means push the rotary control towards the panel without turning it - you will notice a distinct "click" action.

To enter a new standby frequency - rotate the knob. You will notice the MHZ part of the frequency highlighted and the numbers changing with your rotations, Clockwise to increase, anti-clockwise to decrease.



When satisfied with your selection and you would like to change the Khz, "Click" the knob.



Change the 100's of KHZ by rotating the knob. When satisfied, "Click" the knob.



Now change the 10's and 1's of the Khz portion by rotating the knob. "Click" when done - you return to the normal display with the new standby frequency.

Notes:

Using the rotary knob you can restrict entry to only use 25Khz channels by selecting "25Khz" channel spacing in the head setup menu.

Using the rotary control to enter only partial frequencies - for example just the MHZ (and leave the KHZ unchanged) - change the MHZ as needed and "click" twice or simply leave the display as is - it will automatically time out after a few seconds and accept the new frequency.

"Click" the knob without first turning it will flip main and standby frequencies.

This means to rapidly enter a new standby frequency and flip it into active, enter the new frequency and then simply "click" once more.

Note: The behavior of the khz selection using the rotary control is dependent on the Rotary rollover or Rotary clamp selection in the head setup menu.

## Rotary control special functions

The right rotary control has several special functions which are accessed as follows:



**Press and release:** Exchange (flip) active and standby frequency.

**Press and hold for two seconds,** then release: Switch SCAN mode off or ON. Scanning is ON when Active and Standby labels flash.

**Press and hold for four seconds:** V16 primary frequency changes to 121.5Mhz emergency channel.

**Press and rotate:** Choose between channel mode or direct frequency entry mode.

## ***Using channels***

There are two forms of channel lists:

Internal channels: This is a list of up to 50 channels that is stored in the Vega.

External channels: These are one or more lists downloaded from an external device. This can be used with some GPS systems (also see the protocol section in this manual).

Direct frequency entry mode and channel mode is identified by the text above the right rotary control:



Note: If in channel mode and an external list has been selected, the word “Channel” will be replaced by the name of the selected list (normally the airport ICAO code).

Press the right rotary control and while holding it in the pressed position rotate the knob in either direction. You are now in list mode.



Rotate the right rotary control to choose from direct frequency entry or internal channel mode. If any external list has been downloaded it will be added to the selection. External lists are identified by a short name which is also downloaded (normally airport ICAO code).

## ***Selecting from channel lists***

With the Vega in channel mode, rotate the right rotary control to select a channel into the standby frequency. Regardless of internal or external lists, a channel that is empty or is not a valid COM frequency will be skipped. Only valid COM frequencies will be allowed.

Note: it is possible to edit the internal channel list to contain both COM and NAV frequencies. With the Vega in COM mode you can however only select COM frequencies. In any of the NAV modes you can only select NAV frequencies.

## ***External NAV frequency lists***

It is possible to download VOR and ILS frequency lists from a compatible external device. These lists are selected in any of the Vega NAV modes and have a fixed name of either “VOR” or “ILS”.

## N16 navigation radio interface – operation

Display with Vega in NAV ALL mode, primary frequency tuned to a VOR station, secondary frequency tuned to a localizer.



Select OBS by rotating the rotary control, press the control to enter the menu.  
Note: If the primary frequency is a localizer then rotating the knob selects back course on/off

Rotate the rotary control to change frequency or channel.  
Press the rotary control briefly to swap primary and secondary frequencies.  
Press and hold for two seconds to change the SCAN state (ON or OFF).  
Press for 4 seconds or longer to send the 121.5Mhz emergency frequency to a connected COM radio.

## Typical navigation displays

This example shows a Vega display in NAV ALL mode. The display is split in a top and a bottom half. The top half is dedicated to the primary frequency and the bottom is dedicated to the secondary frequency.

Primary frequency is tuned to a VOR station which is receiving a signal at -77dbm. The VOR station is flagged as valid (green background bar).

The OBS has been selected to 145 degrees while we are on an outbound radial of 150 degrees. The CDI is showing that we should alter our course to the left to intercept the radial. One minor tick on the CDI scale is 1 degree, a major tick is 2 degrees.

The CDI is reminding us that we have selected a FROM the VOR station course.

To change FROM/TO – rotate the left rotary control to the appropriate OBS course. Note that the RADial readout changes from RAD to BRG if you select a OBS course TO the station.

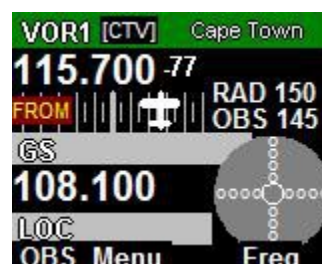


The bottom half of the display shows that we have tuned to a localizer frequency (ILS). In this case we are receiving the glide slope at -92dbm but it is still flagged as not valid. It is however already showing on the needles display but has been given a yellow caution color.

The localizer is receiving at -81dbm and is not flagged (green bar as background). The needles display shows the localizer in blue.

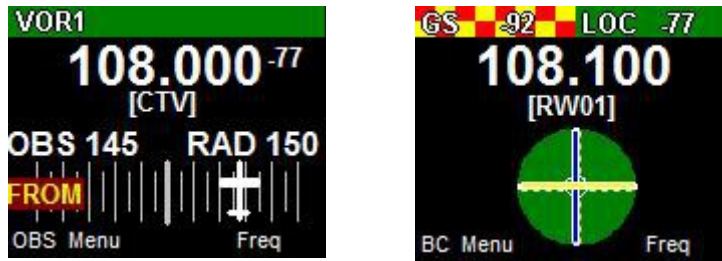
In this case we are to the right of the runway centerline and below the glide slope. This is a typical image you might see on initial approach to a runway.

Note: As the secondary frequency is active – it means the N16 receiver is operating in SCAN mode. To change scanning on or off – hold down the right rotary control for two seconds. If the secondary frequency is not active (SCAN is OFF), you would see the following image:





## Vega in primary or secondary NAV display mode



With the Vega selected to be either the primary or secondary NAV display the entire display is dedicated to the selected frequency.

The above image shows the selection of either VOR or a localizer frequency.

In both cases the display is showing the decoded morse station identifier but no text has been found related to any of these frequencies in the channel databases.

Note: The morse station identifier is available only on the primary frequency if scanning is switched OFF. The N16 cannot decode morse code in Scanning mode as it switches between primary and secondary frequencies continuously. The N16 audio output is also muted in this case.

## Adjusting N16 RX volume and RX squelch

To adjust the N16 RX volume, push the left Rotary control to enter the menu, then use the left rotary control to select the item to change.

The adjustment works in the same way as it does for the V16 radio (described in the COM section of this document). Note: The N16 does not contain an intercom so it does not provide any intercom volume function.

## Localizer backcourse

Back course selection is indicated on the ILS needles display using 4 sets of “BC” indicators.



Ensure you are familiar with localizer operation and back course navigation before using the ILS facilities in the Vega. Enabled back course will reverse the localizer needle as you are approaching the localizer “from behind”.

## ***Using two Vega controls for primary and secondary NAV***

If you connect two Vega controls, one configured as primary NAV and the second configured as secondary NAV, they interact in the sense that if you press the right rotary control briefly (frequency flip), main and standby frequencies will flip on both displays. It does not matter which of the two Vega controls you perform this function on.

Usually, with a Vega system you change the secondary frequency either by direct frequency entry or via channel selection and then, when ready, exchange primary and secondary frequencies using the frequency flip function.

However, the Vega configured to be the primary frequency unit will change the primary frequency. This means in a system such as this you can independently set either primary or secondary frequency while still using the frequency flip function if desired.

## **The audio output**

The audio output may be connected to an intercom panel in the usual fashion or may be connected to the AUX input of the V16 transceiver. In this case the AUX input of the N16 can be used as AUX for the V16 (both N16 AUX audio and receiver audio are routed to the V16 AUX input).

The receiver audio is available when SCAN is switched OFF.

Receiver audio is routed via two internal filters – one passes only the 1020Hz ID morse tone, the second passes only the voice band excluding the 1020 morse tone.

Depending on your selection using the NAV control, the two signals are then mixed so the deselected item appears suppressed at 20db relative to the other. In other words, the item that is switched “off” is attenuated but not switched off entirely.

If ILS is selected as primary frequency and SCAN is not enabled, you will hear the localizer frequency. If the glide slope frequency has a very low signal level (the signal is flagged) you will hear a brief interruption of the audio once per second. This interruption is 0.066 seconds and does not affect overall audibility of the signal.

Once the glide slope is unflagged this interruption occurs at a rate of 6 times per second as glide slope monitoring rate increases.

If SCAN is enabled, the audio output is muted.

## **The morse station decoder**

The N16 contains an automatic morse signal decoder. This decoder is active whenever SCAN is disabled. The decoder works for both VOR and Localizer stations.

Stations may send out a morse identification signal at 10 second intervals. Some stations may alternate these with recorded voice identification signals.

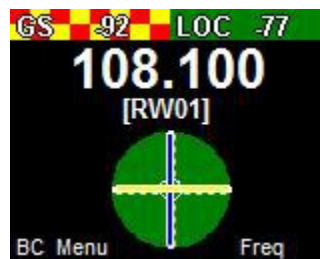
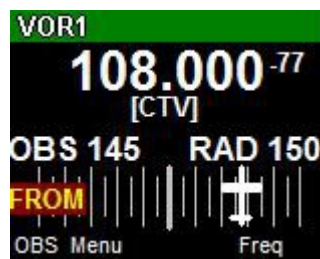
When a morse signal is detected the N16 attempts to decode it and sends the result to the Vega head. Up to 4 letters may be contained. These letters will be shown either next to the VOR label or LOC label marked by square brackets. If no code has been detected [----] is shown. If a morse character has been decoded that is not reconized a “?” is substituted.

AS there is no way to check for errors in a received morse signal the displayed ID should be viewed with caution. Depending on the success of the decoding, it is possible that only part of the ID is shown or a completely incorrect ID is shown. Always use the displayed ID in conjunction with the tuned frequency readout to verify that the correct station has been tuned to.

With a clean morse signal at the prescribed ICAO rate of 7 words per minute the decoding is 100% error free. Some stations are known to use rates up to 10 words per minute and this can also be handled with equal success.

Errors are the result of weak signals and interference at the 1020Hz morse tone frequency. It is also possible that you happen to tune to a station while it is in the middle of sending its morse code ID. In this case the N16 will only “hear” part of the ID. However in this case the full ID should be available typically 10 seconds later.

Display showing received morse station ID “CTV” on VOR



Display showing received morse station ID “RW01” on localizer

## Channel identification by text

The Vega stores up to 50 user defined channels in its memory (this information is maintained if power is removed). Each channel can be tagged with a text identification describing the channel (up to 11 characters).

In addition, various types of frequency lists and tables can be downloaded to the Vega via the serial interface depending on the chosen protocol emulation.

Some of these have a fixed “type” identification (for example: “Approach”, “Tower”) while others have a text identification of 4 characters or more.

Some lists are designed to act as source for frequency selection while others are merely used as reference – in this case you cannot select a frequency from that list but rather if you enter

a frequency contained in the list the Vega will show the text identification.

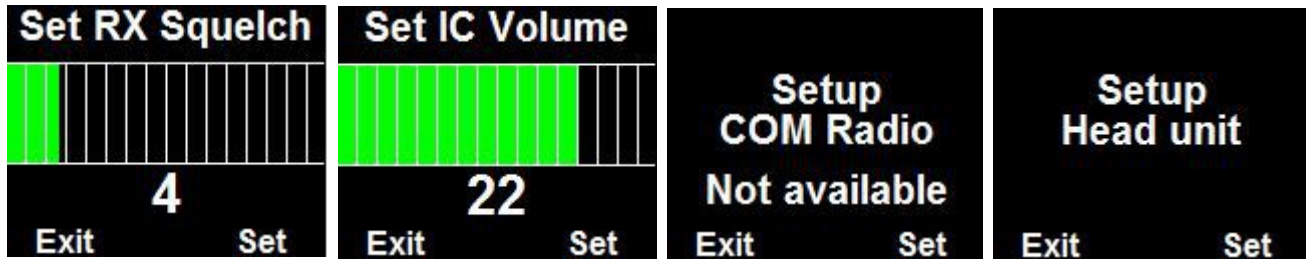
Tables are used for airports with up to 10 tables available and each table can contain up to 20 frequencies.

The Vega will first search any downloaded lists for a match before searching its own channel storage. The Vega will search only appropriate lists – for example it will not search VOR or ILS lists if the Vega is set to COM mode.

## The Menu

The menu system is entered by pressing the left rotary control. The first two items that can be selected using the left rotary control depend on the mode selected:

### *COM mode menu*

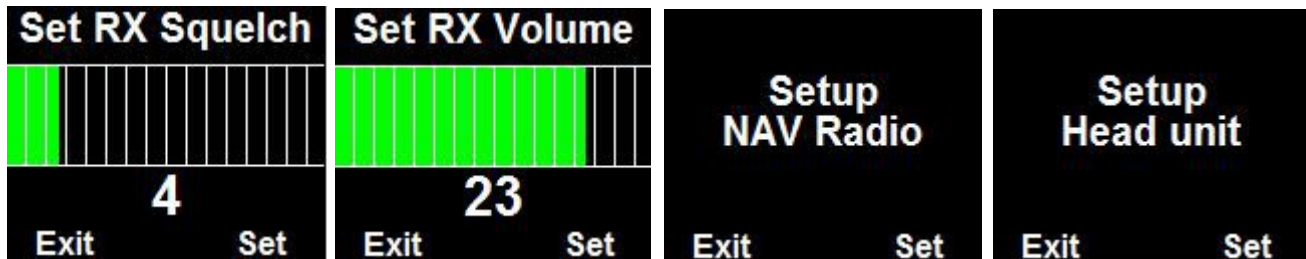


Notes: If no V16 transceiver is connected, "Not available" will be displayed on the COM radio setup entry and you cannot enter this menu item.

All of the COM setup items and the text displayed originates from the connected V16 receiver. Please refer to the V16 transceiver manual for information on the available setups.

The "Head" setup groups all of the setup actions you can perform on the Vega head itself, including editing the internal channel list.

### *NAV mode menu*



Notes: If no N16 transceiver is connected, "NAV device not available" will be displayed on the NAV radio setup entry and you cannot enter this menu item.

All of the NAV setup items and the text displayed originates from the connected N16 receiver. Please refer to the N16 transceiver manual for information on the available setups.

The "Head" setup groups all of the setup actions you can perform on the Vega head itself, including editing the internal channel list.

Note: NAV Audio items such as ID and Voice selections are part of the NAV radio setup menu.

## **COM or NAV Setup Menu**



With COM setup selected you will be presented with items to set similar to the above.

Select the item to change or display using the left rotary control.

Adjust the value using the right rotary control.

Note: items presented here for setup and the text shown is determined by the V16 or N16 not the head. If you, for example, update the firmware of the V16 and this update changes or adds to the setup functions, then the Vega will reflect these changes without needing an update itself.

## **Head Setup Menu**



Select the item to change or display using the left rotary control.

Adjust the value using the right rotary control.

## **Edit channels**

Enters the internal channel list editor

## **Head Type**

VHF COM – the Vega is a COM control head for a V16

NAV Primary – the Vega is a NAV control head dedicated to the primary NAV frequency.

NAV Secondary – the Vega is a NAV control head dedicated to the secondary NAV frequency.

NAV ALL – the Vega is a NAV control head.

## **No TX Info/Show TX info**

Change this field between two states to either show TX information (power and VSWR) during TX or not.

## **Backlight**

Select this to set the display backlight level to a fixed setting or automatic in which case the ambient light sensor is used to set the backlight level.

## **Emulation**

Select which of the following RS232 protocols to emulate for RS232 Port 1.

None: No protocol selected, RS232 port not used.

SL40 (requires V16 connected to this head)

SL30 (requires V16 and N16 Navigation receiver connected to this head)

GTR200 (requires V16 connected to this head)

GTR225 (requires V16 connected to this head)

GNC255 (requires V16 and N16 Navigation receiver connected to this head)

Note: SL30 and GNC225 options can be used with only a N16 connected. In this case the COM related information in the communications protocols is not functional and will contain default values. The COM protocol parts however will still be sent to preserve overall integrity of the communications.

The selected emulation mode is always full operational for COM and NAV (provided a NAVCOM mode is selected). This means, regardless of your selection of the Vega mode as COM or NAV the protocol is not affected. This means for example, even if your Vega is selected as COM only – your RS232 port behaves as NAVCOM if a NAVCOM emulation has been selected.

## **Channel Spacing**

Select if you would like to restrict frequency selection by rotary control to 25Khz channels (8.33Khz includes 25Khz channels).

Note this only affects the rotary control - all other means of frequency selections allow 8.33Khz channels.

NAV channels are always fixed to 50 Khz channel spacing and are not affected by this setting.

## **Input setup**

This choice selects how to use the two inputs on the D15 connector A1 and A2. Please see the section on remote control for details.

Choices are:

- 1) **Inputs not used**
- 2) **Inp A1 flip** - Input A1 used for frequency flip. A2 not used
- 3) **Inp A1 CHF** - Input A1 used for combined channel select and frequency flip A2 not used
- 4) **Inp A1A2 CHF** - As (3) but A2 used to decrease channel pointer
- 5) **Inp A1A2 CHF/PB** - As (3) but A2 used as playback switch

The currently measured voltage for each of the inputs is shown. This is intended as a simple means of checking your installation. A voltage of 12V or 24V should be measured when the connected button is pressed. Note that the voltage shown is not a calibrated measurement but is reasonably close to reality.

## About

Select this option to display the version number and other details of the firmware currently installed in your Vega head.

## Rotary rollover/clamp

Select how you would like the rotary control to act when setting frequencies. In clamp mode the Khz will not move past 0 or 9 (depending on direction). In rollover mode the next highest digit will increase/decrease as you go past 0 or 9.

## Check ...

This function allows you to store a 6 digit number. It is intended to be used for VOR equipment check recording as required by regulations. You may use this number for example to store a date or reference number.

## Vega head firmware

The firmware in your Vega head can be updated by means of a RS232 connection to a PC. You require the new firmware (download from MGL Avionics website) which comes in the form of an application (exe file) that can execute on a Windows PC. A RS232 serial port on your PC (usually a USB to RS232 converter) is connected to your Vega using RS232 port 1.

Only RX, TX and ground are the required connections (PC TX to Vega RX and RX RX to Vega TX).

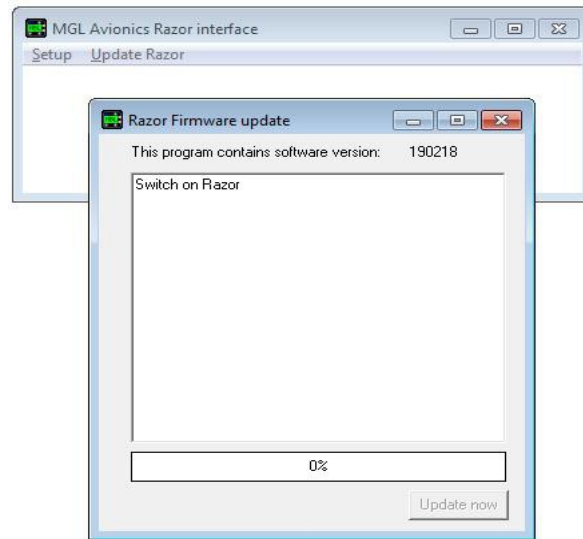
The Vega needs to be powered from a 12V DC source.

With the firmware application running and configured to the correct RS232 port on your PC, switch on the Vega. The application should detect the Vega and the Vega will not show its normal screen but instead show a black screen with no writing.

The Application will not allow you to proceed with uploading the new firmware which takes a few minutes.



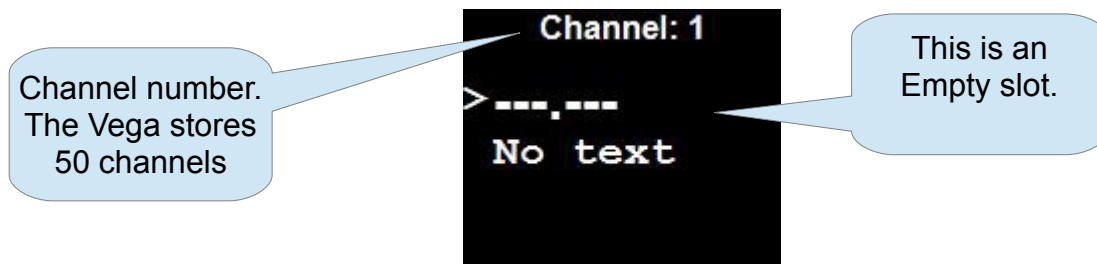
After this is complete, disconnect the Vega from the PC and restart it by re-applying power to it. It should now start with the new firmware.



Note: Image here shows the identical application used for Razor control heads.

## Editing channel memory

Enter the Menu, then select “Head setup”, then select “Edit channels”.



This image shows an empty (unused channel). It is the first from a possible 50 entries.

→ Use the Left hand rotary control to select the channel number to edit.

→ Use the right hand rotary control push button to select if you want to edit the frequency or the text. Note the “>” mark next to the selected item.

If frequency edit selected:

Use the right hand rotary control to set the frequency in the same way that you set the standby frequency in normal operating mode. You must enter all digits.

If text edit selected:

Use the right rotary control to change the character (if no underline cursor is visible it will appear on first use of the rotary control). When you are satisfied with the character, push the right rotary control to advance to the next character location. You can enter a total of 11 characters. You do not have to enter all of them.

When you are finished with the text entry, push the left hand rotary control once. You can now select the next channel or select to change frequency or text as before.

To delete the contents of a channel: With the channel showing, push the right rotary control and hold until the channel shows empty. This takes 4 seconds.

When you are done entering your channels, press the left hand rotary control to exit. You will be asked for confirmation if you changed any channel:



Proceed as desired...

Note: you cannot enter NAV frequencies while the head is in COM mode and vs. versa.

## Environmental qualification matrix

The environmental qualification is based on the document DO-160G and is identical to that of the V16 transceiver.

Temperature and Altitude	4.0	Equipment Categories B2, C1	
Low temperature ground survival	4.5.1	-50°C	
Low temperature shorttime operating	4.5.1	-30°C	
Low temperature operating	4.5.2	-20°C	
High temperature operating	4.5.4	+55°C	
High temperature short time operating	4.5.3	+65°C	
High temperature ground survival	4.5.3	+85°C	
Loss of Cooling	4.5.5	Cooling air not required	
Altitude	4.6.1	55,000 feet	
Decompression	4.6.2	8,000 to 55,000 feet in 15 seconds	
Over pressure	4.6.3	-15,000 feet	
Temperature Variation	5.0	Equipment Category B	
Humidity	6.0	Equipment Category A	
Operational Shocks	7.2	Equipment Category B	
Crash Safety	7.3	Equipment Category B Type 5	
Vibration	8.0	Aircraft zone 2; type 3, 4, 5 to category S level M, type 1 (Helicopters) to category U level G	
Explosion	9.0	Equipment identified as Category X	

		– no test required	
Waterproofness	10.0	Equipment identified as Category X – no test required	
Fluids Susceptibility	11.0	Equipment identified as Category X – no test required	
Sand and Dust	12.0	Equipment identified as Category X – no test required	
Fungus	13.0	Equipment identified as Category X – no test required	
Salt Spray	14.0	Equipment identified as Category X – no test required	
Magnetic Effect	15.0	Equipment tested to Category Z, safe distance 20cm	
Power Input	16.0	Equipment Category BXX	
Voltage Spike	17.0	Equipment Category B	
Audio frequency conducted susceptibility	18.0	Equipment Category B	
Induced signal susceptibility	19.0	Equipment Category AC	
Radio frequency susceptibility	20.0	Equipment Category TT	
Radio frequency emission	21.0	Equipment Category B	
Lightning induced transient susceptibility	22.0	Equipment identified as Category B2G2L2 – no test required	
Lightning direct effects	23.0	Equipment identified as Category X – no test required	
Icing	24.0	Equipment identified as Category X – no test required	
Electrostatic Discharge	25.0	Equipment identified as Category X – no test required	

Fire, Flammability	26.0	Equipment identified as Category C	
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## Typical connection diagrams

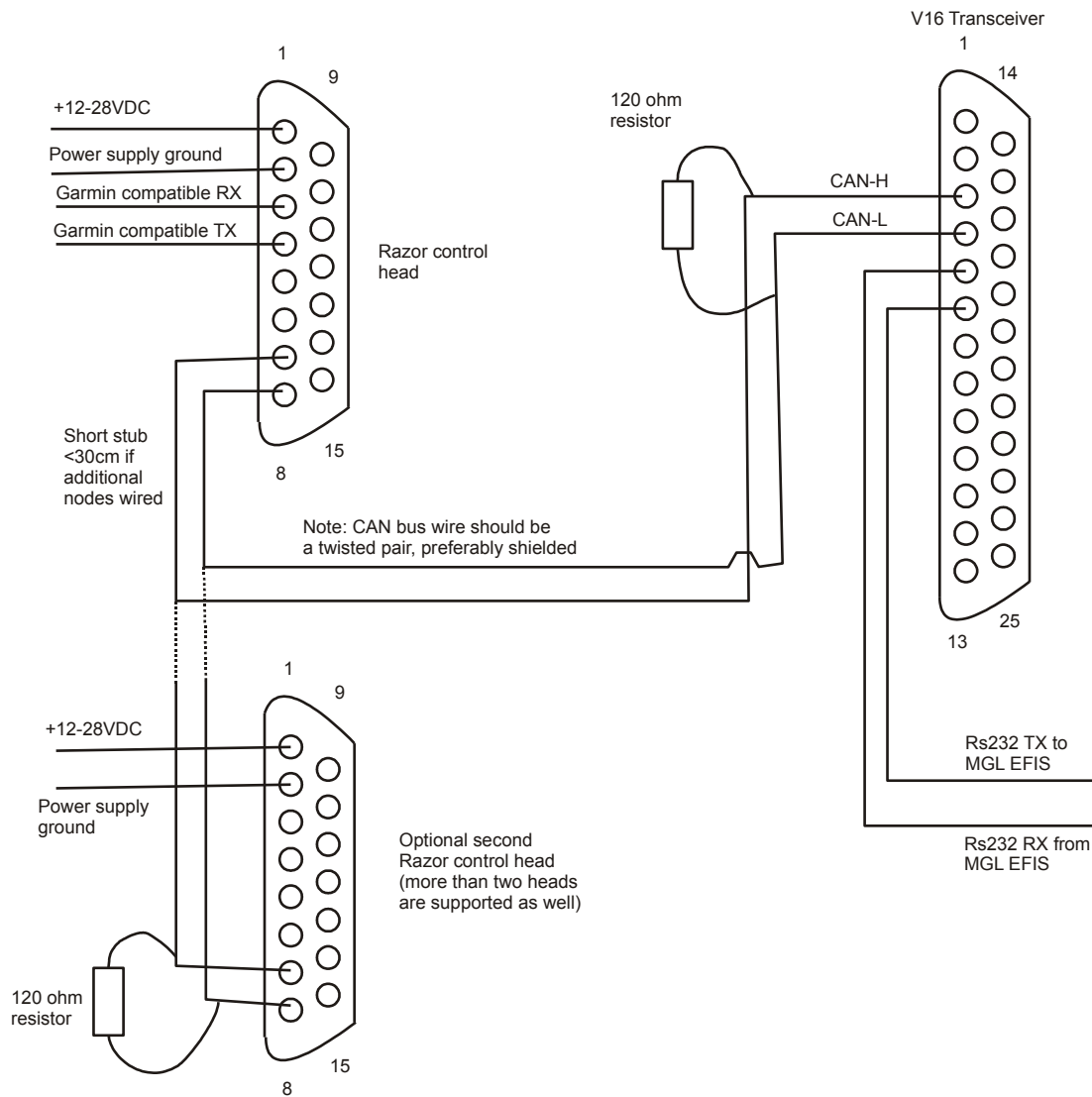
This diagram shows the connection of one or two heads to a V16 transceiver. Note that audio, PTT and other transceiver related wiring is not shown for clarity.

At minimum you only need 4 wires to connect to a Vega head – power supply, ground and the two CAN bus wires.

Should you want the Vega head to emulate a Garmin compatible protocol for use with third party EFIS systems you can also wire RS232 port 1 as shown. Note that if the third party EFIS and the Vega/V16 are supplied by the same power source (common in an aircraft) there is usually no need for a ground connection between the two devices. Shielded cable, with the shield connected on one side to ground is advised to minimize interference.

You may use pin 9 as ground for shielding purposes (both RS232 as well as CAN bus).

The pin out and connector type is identical for Razor and Vega control heads. The diagrams here show the wiring for the Razor head.



Note that termination resistors (shown here as 2 x 120 ohms) are mandatory. Place one of each onto each end of the bus. Never more than two resistors.

In most installations where the length of the CAN bus does not exceed 3 meters or 10 ft, it is permissible to use a single 100 ohm resistor at any location on the bus without ill effect.

## Remote control

The Vega provides two pins on the D15 connector that can be used to remotely control selection of the standby frequency and frequency “flip”.

These pins are marked A1 and A2. Your options are:

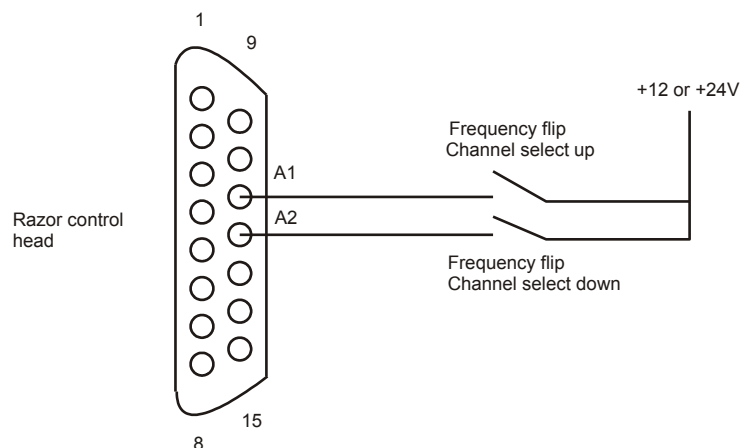
- 1) Do not use these pins
- 2) Use only A1 as “Main/standby frequency flip”
- 3) Use only A1 as “Frequency selection from channel storage” and “Main/standby

frequency flip”. This mode uses the duration of an external button push to select the function. Standby frequencies are picked from Channel memory in ascending order by using short duration switch closures. A switch closure duration of 1 second flips main and standby frequency. The channel pointer resets to the first channel entry if the switch has not been closed for 4 seconds.

- 4) Use A1 and A2. In this case A1 works as described in (3). A2 is used to decrease the channel frequency pointer but can also be used to flip main and standby frequency in the same manner as (3).
- 5) Use A1 as described in (3). Use A2 as last message(s) playback button.

Please select the desired mode of remote control in the Head setup menu.

Notes: The switch(es) are wired from the A1 and A2 pins to a +12V or +24V source as shown in the diagram below.



**Pinout for 3.18” Razor and 2.25” Vega transceiver control head**

1	Supply +9 to +28VDC
2	Supply ground
3	RS232 RX Port 1
4	RS232 TX Port 1
5	RS232 RX Port 2
6	RS232 TX Port 2

7	CAN H (connect to CAN H on transceiver and NAV radio)
8	CAN L (connect to CAN L on transceiver and NAV radio)
9	Ground (Internally connected to pin 2)
10	KeepAlive. Do not connect.
11	A1. Control input. Select desired function in Vega setup menu.
12	A2. Control input. Select desired function in Vega setup menu.
13	Program pin. Do not connect.
14	USB P. Do not connect
15	USB M. Do not connect.

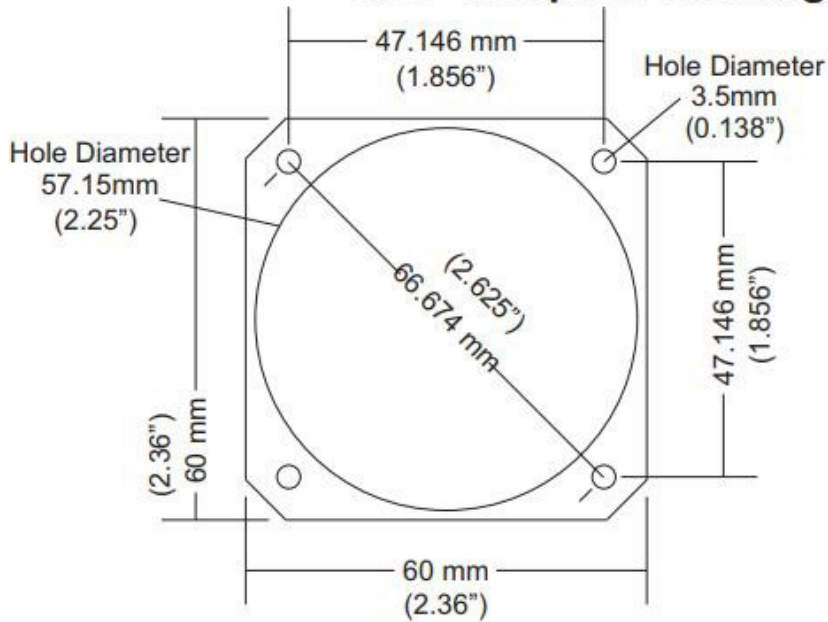
## Specifications

Power supply	+7VDC to +28VDC
Current consumption	At maximum backlight, 13.8VDC, 100mA At minimum backlight, 13.8VDC, 80mA Note: current reduces with increasing voltage, power remains constant.
Power supply rise time	Maximum 100mS to 5V
Weight	TBA
Display	240x320 pixel TFT color 16 bits. Brightness up to 800nits.
Touch screen	Projected capacitive
Housing	Designed to front mount into standard 3.1/8" instrument panel hole.



## Dimensions

### Stratomaster Vega 2.25" Template Drawing

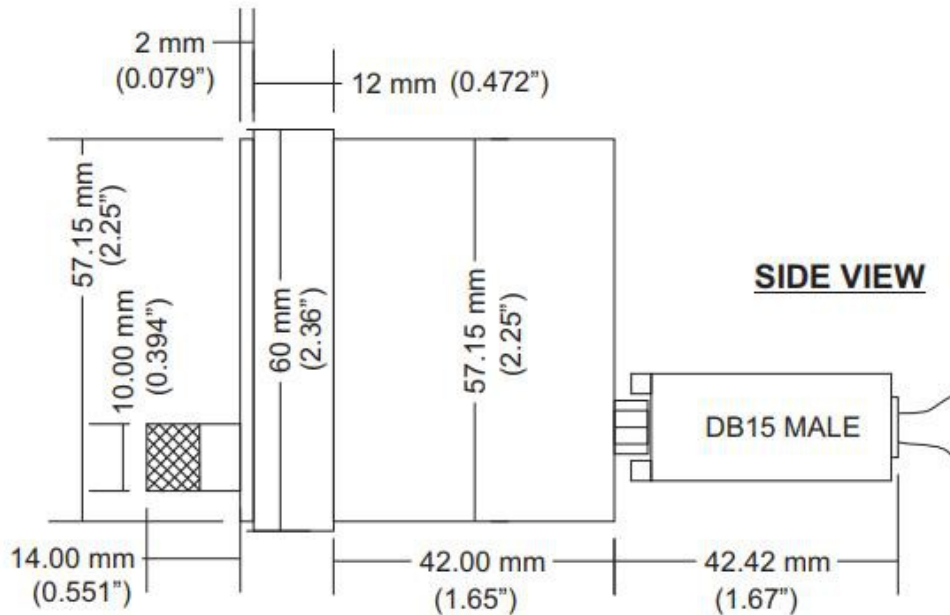


#### FRONT VIEW

3mm (0.118") mounting  
screws recommended

ACTUAL  
SIZE

**NOTE:** 57.15mm (2.25") is a standard cutout, but due to manufacturing tolerances, 58mm (2.28") is found to be more desirable.



#### SIDE VIEW

## Garmin protocol limitations

As part of the setup you can select your Vega to emulate various Garmin protocols used for both COM and NAVCOM systems.

The protocols are generally fully implemented but there are some differences. For example there are some protocol items that are related specifically to Garmin systems such as diagnostics information mostly intended for workshops or firmware version information.

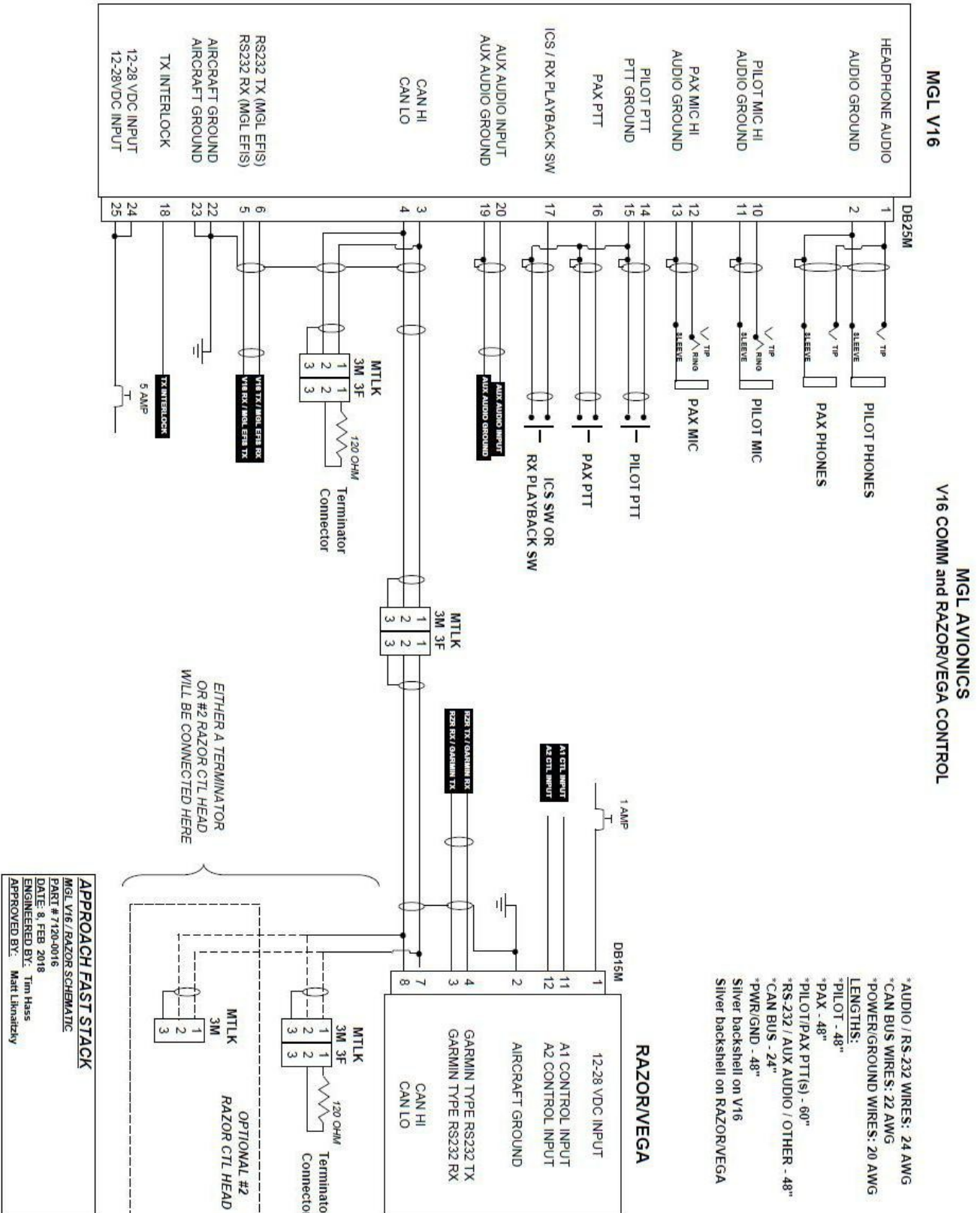
Version information has been implemented as a dummy as it is not compatible with the way MGL firmware versions operate.

A limitation exists with respect to the CDI. The Garmin NAVCOM protocol only makes provision for a single CDI which is either from the localizer or a VOR. The MGL N16 however is able to track a VOR and a localizer as well as glideslope all at the same time so it has two valid CDI indicators (one being the localizer needle).

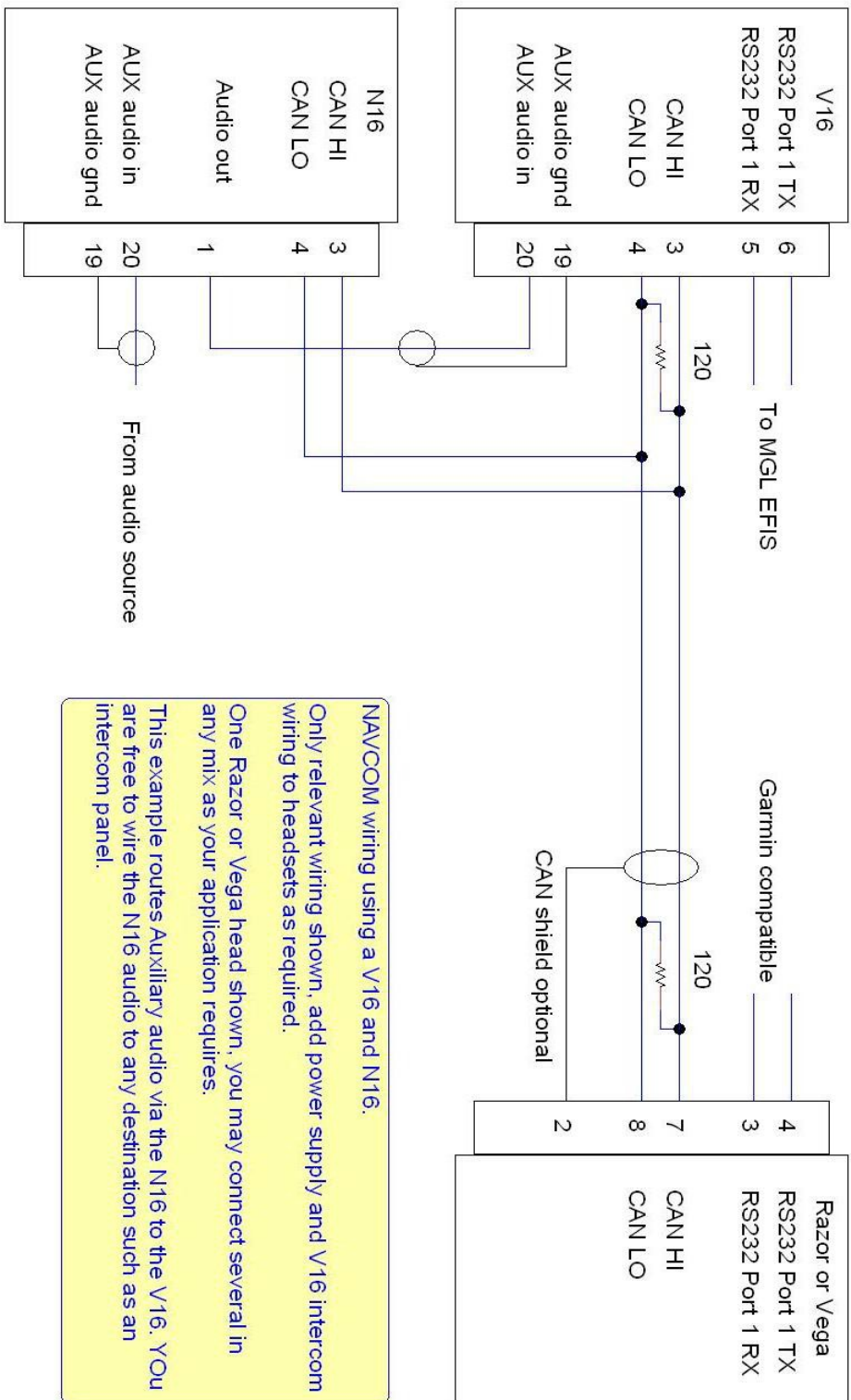
**The Vega will use the CDI from the primary frequency as CDI for the Garmin protocol.**

This limitation does not exist for the MGL protocol applicable for direct RS232 connection of the N16 to a MGL EFIS system or routed via a V16 RS232 port.

# Example Harness schematic

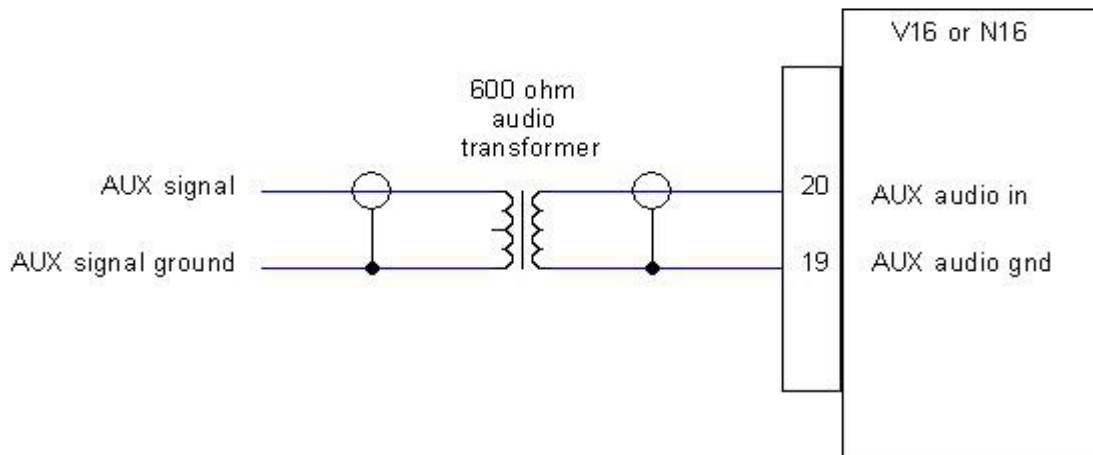


# NAVCOM device using V16 and N16



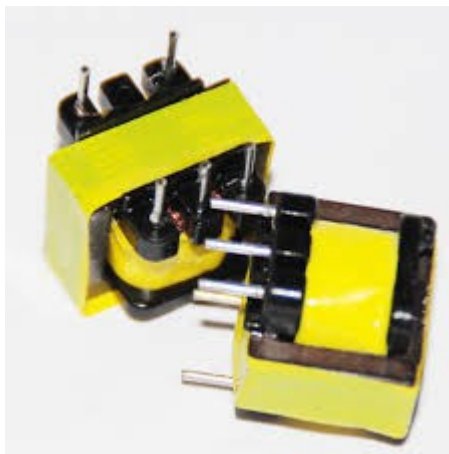
NAVCOM wiring using a V16 and N16.  
 Only relevant wiring shown, add power supply and V16 intercom wiring to headsets as required.  
 One Razor or Vega head shown, you may connect several in any mix as your application requires.  
 This example routes Auxiliary audio via the N16 to the V16. YOU are free to wire the N16 audio to any destination such as an intercom panel.

## Using audio transformer on the AUX input



Depending on your desired audio source it may be advisable to electrically isolate the source from the V16 (or N16). This could be due to the need to prevent ground loops or if the source is at a different electrical potential. Sometimes connecting a source may induce undesired noise into the audio due to electrically contaminated grounds.

Using a small 600 ohm audio transformer can be a useful device to provide isolation and separate the source and destination grounds. Often, one side of a transformer like this has a center tap (indicated on the drawing above). This can be used to create a step up transformer (usually a 1:2 ratio) in order to increase the signal amplitude, should that be necessary.



Example of a typical audio transformer with center tap. Ensure you use one with the correct impedance ratio between primary and secondary windings. A 2:1 transformer would have 600 ohms on one side and 2 x 300 ohms on the other.

These transformers are available in a large variety of form factors as well as special high quality shielded types. In our experience, simple unshielded transformers work very well.