

MorningStar Remote Station

Operating Guide

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Cape Town Amateur Radio Centre

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About the MorningStar Remote Station

History

MorningStar had its origin when Fred Ziss ZS1FZ moved into an apartment on Dolphin Beach where his every move to erect an HF antenna was thwarted by the Body Corporate; not to mention the high RF noise level.

Fred with the assistance of Deon ZS1ZL erected a remote station on the smallholding of Martin ZS1MS. When Martin became a silent key the station was moved to the MorningStar airfield just north of Bloubergstrand to the right of the N7.

In 2019 the station was kindly donated to the Cape Town Amateur Radio Centre.

The project is still driven by Fred ZS1FZ, with Allan ZS1LS providing technical support.

The Station

The Icom IC-7100 transceiver and Metron amplifier are housed in a modified shipping container. A 9 element 10/12/15/17/20 m Optibeam is mounted on a fold-over crank-up tower and rotated with a TX2.

Other antennas in use:

- Dipoles for 30, 40, 60 and 80 m
- Discone for 100 to 500 MHz e.g. 2 m
- 80 cm Dish for QO-100, esp. uplink 2,4 GHz.

SSB and CW modes are available on 10 m to 80 m and FM on 2 m.

There are known issues with digital modes and those are not possible at this time.

An uplink to the QO-100 satellite is available.

The station communicates with a microwave link to Dolphin Beach where it is fed into the Internet.

The Operating Guide

In 2017 when I relocated to Cape Town I became the test pilot and tasked with this operating guide.

Have a question – the index will most probably guide you to the answer!

Tjerk Lammers ZS1J
Cape Town September 2021

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Rules and Regulations

It is important to recognize that Morningstar is a shared resource and its use needs to be shared equally and fairly between subscribers. If while operating the station you see another Morningstar subscriber log in, then either ask him if he would like to use the station. If he says he would like to use the station then allow him to do so or if you are busy with contacts then inform him that you will be finished in 15 minutes or less. Remember he has just as much right to use the station as you do so be courteous and share the facility.

Please acquaint yourself with the **Chat Room** in the **Addendum**.

Requirements

A computer or laptop with minimum requirements:

- Windows XP, Vista, 7, 8 or 10

- .NET Framework 4.0 – RCForb setup will notify you of this requirement and install .NET if needed

- Adobe Flash Player Active X

- The install Process also installs Eltima application

- 1.0 GHz CPU and 1GB RAM.

A "Skype" type headset will ensure clean audio especialy when using VOX.

Getting started

The first step is to register for an account to allow you to access the Forum and gain access to remote stations. Register here:

<http://www.remotehams.com/forums/index.php?action=register>

Use your **callsign** as the username, remember your password.

Thereafter download the latest RCForb client software here:

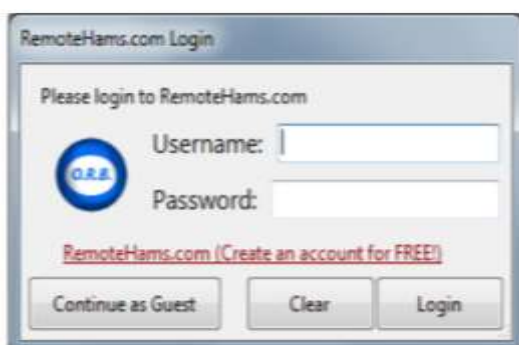
http://download.remotehams.com/download.php?dir=orb&file=RCForbClientSetup_v0.9.246.exe

Installation

(Click the virtual serial port option during the install – this will be useful later)

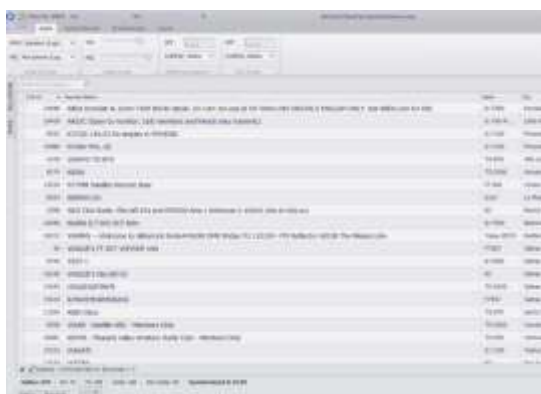


If you do not want to start RCForb (Client) at this time, you may un-check the "StartRCForb (Client) option.



On the first run you will be asked for your RemoteHams Username and Password. If you choose so, you may continue as a guest by clicking on the button labeled "Continue as Guest".

RCForb Client screen



Double click on a station and play with the VR (virtual radio). You will be allowed limited access but a lot can be learned by investigate the top and side toolbars.

MorningStar will not show up on the screen since it's a closed group and not "published" on the remotehams.com server. You have to add it.

Click on + Add Remote

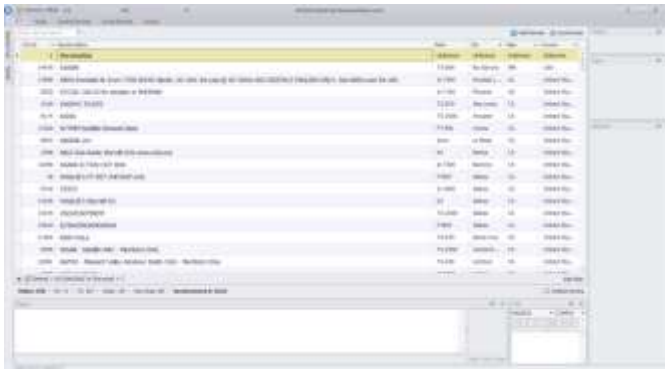
Remote Name : MorningStar
Grid Square : JF96gf
Host/IP : ctarc.dnsalias.com
Server Version : 0.7
Server Port : 4525
VoIP Port : 4524

The only things you need to input are in red.

Click OK

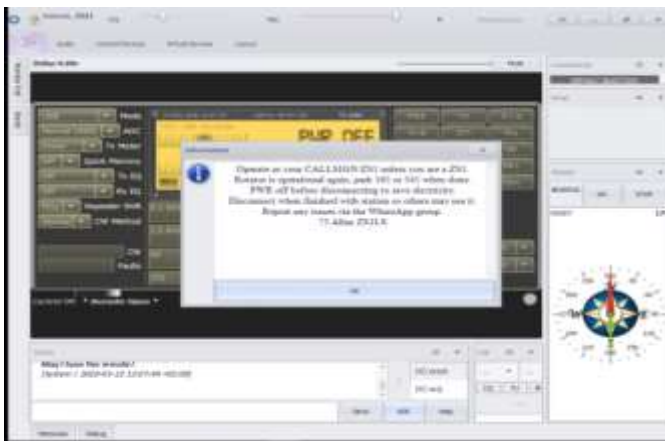
The first time when you log into MorningStar do it with your call-sign and not as a guest. There will be a warning message saying you are not a Club member and it will kick you out.

You will be told to contact the CTARC secretary for permission to operate MorningStar. The secretary can be contacted by e-mail at zs1ct@ctarc.org.za for further instructions including payment details. Once proof of payment has been received you will be sent the MorningStar access instructions and added to the MorningStar WhatsApp group for any technical assistance – please, this is not a chat group!



Click on MorningStar.

The IC-7100 VR (virtual radio) appears on the screen.



The green light shown on the RH side of the VR indicates that the station is available. An instruction message appears, read and follow the instructions.

No green light indicates that the station is in use but it will allow you to listen in. A message warning you to ask for permission before tuning is shown on the screen.

Now click on OK and the operating screen appears.



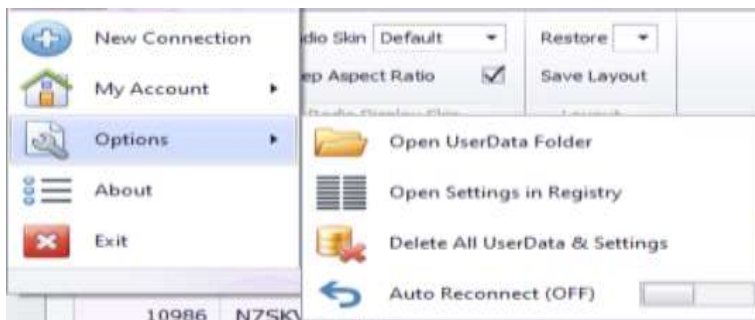
Settings

You do not have to be connected to a station to setup your themes, audio, control devices, virtual devices as they are user specific.

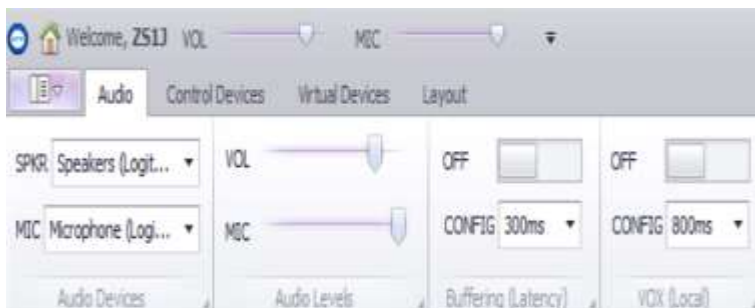
Screen appearance



Menu



Audio



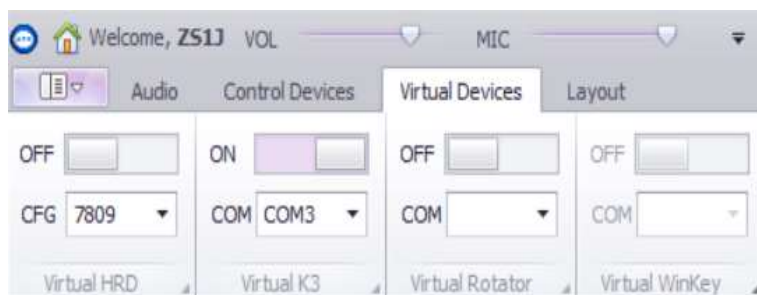
Control devices



Enabling a foot switch.

See Addendum at the end of the manual on how to add a simple PTT or Foot switch.

Virtual devices



Com 3 has been selected to enable Logger32 integration.

Operating the station

Log in to MorningStar.

The green light shown on the RH side of the VR indicates that the station is available. An instruction message appears, read and follow the instructions. No green light indicates that the station is in use but it will allow you to listen in. A message warning you to ask for permission before tuning is shown on the screen.

Now click on OK and the operating screen appears.

Turn **PWR** on.

Virtual Radio Screen



Many unnecessary buttons, sliders and dropdowns on the screen, not necessary for normal use, have been removed to make the screen less cluttered. Amongst those is the power slider that has been preset to 30 W to prevent the overdriving of the amplifier.

A detailed list of the above and their functions can be found in the addendum.

Tuning

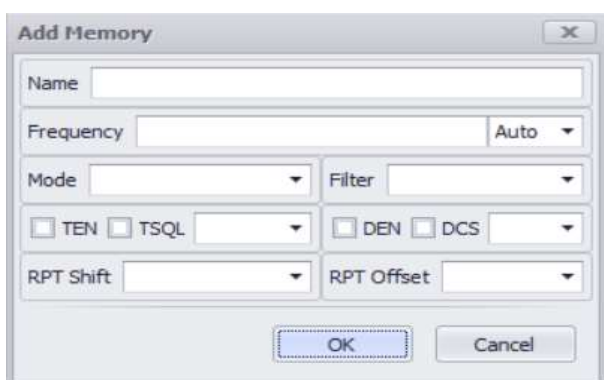


Using the number pad on the LH side of the virtual radio screen to type in the frequency,
Using the mouse to rotate the knob,
Clicking on the arrows on top or bottom of a frequency digit,
Clicking on a frequency digit and rotating the mouse wheel.

Memories

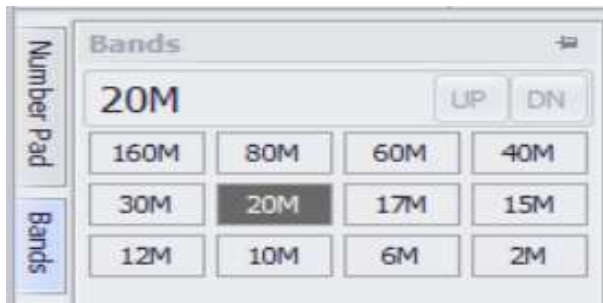


Click on the memories tab at the LH bottom of the screen.
The first time you use MorningStar no memory entries will show;
click on Sync Remote Memory and they will appear.



Memory entries can be edited, added or removed.

Band changing



Click on the band tab on the LH side of the VR.
Click on the memories tab at the LH bottom of the VR and then double click on a frequency.

PTT

Clicking on the TX button,
Pressing the space bar.

TX Operation by pressing the space bar is possible but it must be "bound" to the TX button. The space bar is not always "bound" to the TX button. To "bind" the space bar to the TX button, you must first click on the TX button. As long as the TX button is the last item you have clicked on the Space Bar will be "bound". For example, if you click on the chats box, you must click on the TX button again to "bind" the space bar and thereafter the spacebar will also perform the same function.

Sliders



Use the RH slider for more options.

A detailed list of the sliders and their functions can be found in the addendum.

Audio quality is mainly attributable to appropriate adjustment of audio levels and drive level to the PA to minimise the risk of overdrive.

Rotator



Clicking on a point on the scale where you want to go to,
Typing in the desired bearing.

It is important to park the rotator, before you exit MorningStar, in a 345° direction to lessen wind stress on same.

Operating on VHF



The Kanonkop repeater has already been added to the server memories. Click on the Memories tab at the LH bottom of the screen and then click on Sync Remote Memory to load.

Set mode on FM.

Adjust the Squelch slider slightly to mute the speaker when no signals are present.

Please NOTE: The Frequency display will NOT change to 145.150 during the transmit phase like on some rigs for repeater operation.



Repeater Shift enables the setup off simplex and repeater channels that can also be stored, edited and removed from Memories.

Selecting "Minus" automatically puts in the 0.6 MHz minus shift on 2m FM.

Please, before closing down MorningStar, reset the radio to HF, Mode to USB and Squelch to zero.

Introduction to QO-100 operation

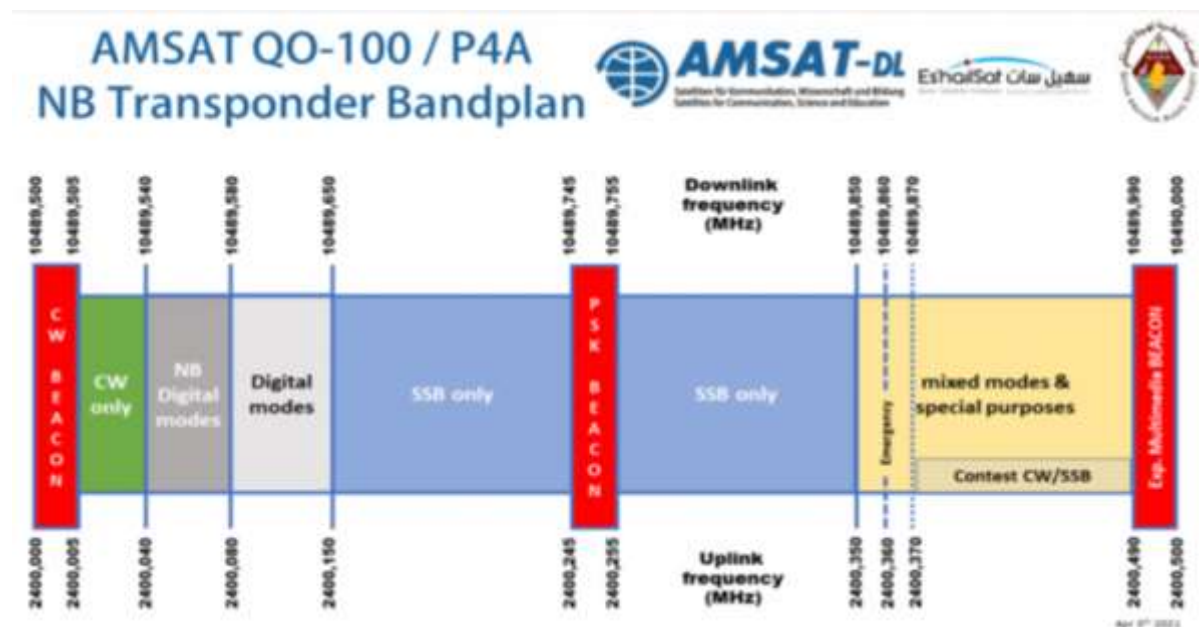
NB-Transponder Operating Guidelines and Bandplan (MorningStar edition)

The narrowband transponder is intended for conventional analogue and narrowband digital signals with maximum 2.7 kHz bandwidth.

No transmissions should be made beyond the nominal edges of the transponder passband. In particular, no operation should take place below the lower beacon nor above the upper beacon (now also called experimental beacon).

No uplinks should result in downlink signals that are stronger than these beacons.

No FM transmissions should be made to Es'hail-2 as these would use excessive power and bandwidth.



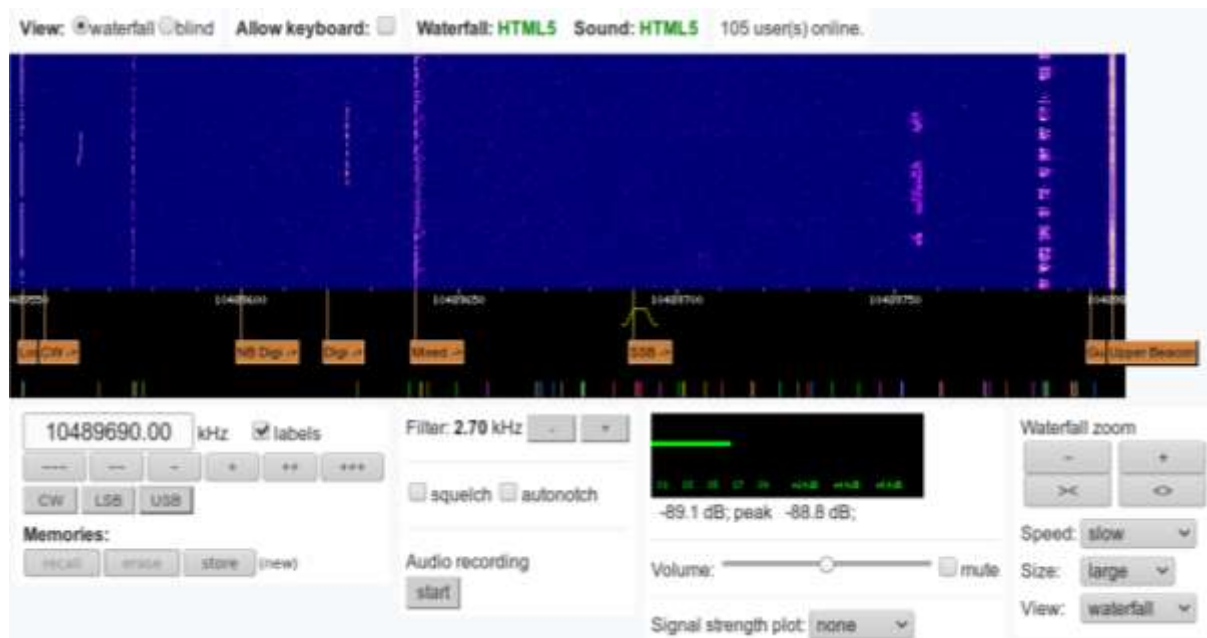
Remote Stations and DXCC

DXCC Rule 9. All stations must be contacted from the same DXCC entity. The location of any station shall be defined as the location of the transmitter. For the purposes of this award, remote operating points must be located within the same DXCC entity as the transmitter and receiver.

From the above it is quite clear that QO-100 satellite contacts made with MorningStar are not valid for DXCC - receiver here, is the operative word.

QO-100 NB WebSDR receiver

Go to <https://eshail.batc.org.uk/nb/>



Click [Click to start sound!](#) , the audio level can be adjusted with the Volume slider.

Ticking [Allow Keyboard](#) enables short cut keys to tune the receiver.

j, k, ←, → freq down/up (+shift, ctrl or alt for faster tuning/moving the yellow filter curve).
u, l, c: USB, LSB, CW (we do not use LSB)
z, Z center/zoom waterfall
g enter frequency

Scrolling the mouse wheel also zoom the waterfall in and out.

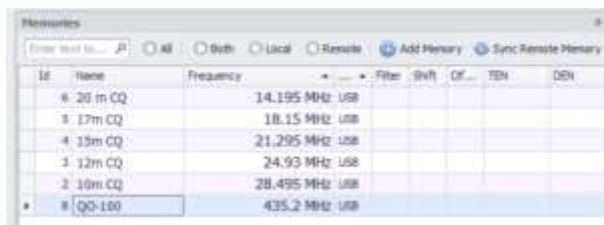
Clicking on the dark area underneath a signal on the Spectrum displays the yellow Spectrum filter curve.

There is also a memory facility to store and recall frequencies.

Setting up MorningStar for QO-100

Permission to operate on QO-100 is separate from that of MorningStar!

- Log in to MorningStar
- Turn **PWR** on
- Go to memories and double click on 435.2 MHz USB.



The relation between the 70 cm and the 3 cm downlink signal is linear and when you transmit on say 435.200 MHz the downlink signal will be on 10489.720 MHz which is displayed in the WebSDR as 10489720.00 kHz.

- Go to a clear frequency on the waterfall
- Set the WebSDR receiver on say 10489720.00 kHz and then transmit on 435.220 MHz
- Listen to yourself on the WebSDR and tune the TX for a clear audio signal.

I have often found the frequency offset to be about 2.3 kHz higher due to daily temperature variations.

When you stop transmitting you will continue to hear your own audio. This is due to Internet latency. The signal will also show up narrower than other signals on the waterfall due to our lower output power.

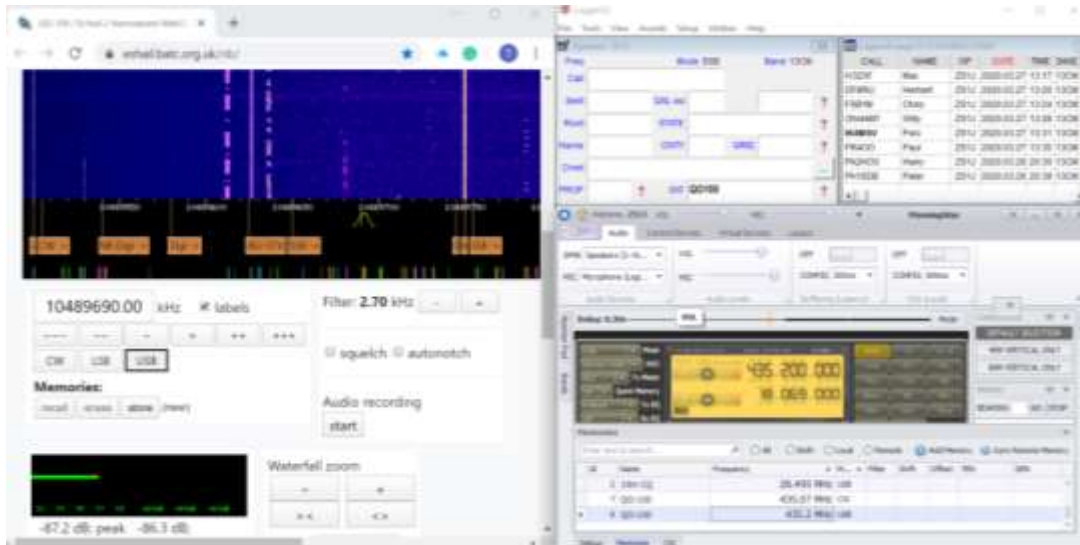
When you wish to join a conversation that you have tuned into on the WebSDR, take note the frequency shown to the left underneath the waterfall.

If that frequency was **10489660.20** kHz then **660.20** minus **500** equals **160.20**
160.200 is the decimal part of the TX 435 MHz frequency iow. **435.160.200** MHz.

If the frequency offset was **+2.3** kHz, you then add that and **435.162.500** MHz will be spot on!

Arranging the Parade Ground

Open QO-100 WebSDR, MorningStar and your logbook program, minimize each and adjust their screen sizes.



You can at any time maximise a program so that it fills the entire screen and then when you again minimize it all three will show up again as before.

The Chat Room, which is a floater, can be removed from the VR screen and parked somewhere convenient.

Create a Windows Batch File that can open multiple programs with a click

```
@echo off
cd\Program Files (x86)\RemoteHams.com\RCForbClient\
start RCForbClient.exe
start "" "C:\Logger32\Logger32.exe"
start "" "https://eshail.batc.org.uk/nb/"
exit
```

(Start the Client with the following lines. What is happening is the current folder must be where the Client is. If you note in the shortcut to start the Client, the "Start In" field is the folder where the Client is.)

Modify this batch file depending on the programs you want to load and where they are located.

Paste this text in a Notepad and save it as a BAT file to the desktop. A new shortcut appears on your desktop with a little gear icon; double click on it and the programs will fill up the screen!

You can find more about .bat files in the addendum.

Addendum

Chat Room

Some people log on and simply want to watch while others log on to use the system but do not want to disturb the person operating to send a "Please may I tune the radio" message so the wording below is suggested:

It is important to recognize that Morningstar is a shared resource and its use needs to be shared equally and fairly between subscribers. If while operating the station you see another Morningstar subscriber log in, then either ask him if he would like to use the station. If he says he would like to use the station then allow him to do so or if you are busy with contacts then inform him that you will be finished in 15 minutes or less. Remember he has just as much right to use the station as you do so be courteous and share the facility.

You may want to include a few words on how to communicate keyboard to keyboard to other subscribers who are logged in.

Where is the Chat Room?

Each time you connect to MorningStar remote server, and click on any radio controls for the first time, you will be instructed to "Ask to Tune". This courtesy message is sent to the "Chat Room" to notify any other operators that you want to be the Control Operator. If another operator is using the remote, please wait until he/she acknowledges that it is OK to assume control of the radio.

There is another "Ask" button at the bottom of the window, to the right of the "Chat Room", which may be used any time you would like to assume control of the radio.

Several users can be connected simultaneously. The user call signs are listed in the "Users" box at the lower right corner of the window. You can take turns as the Control OP, and you can use the "Chat Room" at the bottom of the window, to exchange text messages with the other users.

Operating Guidelines

Please Follow the Rules; or you could be banned!

- * **DO NOT** tune MorningStar without asking first.
- * **DO NOT** 'take-over' MorningStar as if it is your own.

General Remote Usage Guidelines

Ask To Tune Policy

Please ask to tune MorningStar if someone else is present. If they do not respond within 2 minutes, feel free to tune. If they respond requesting you do not tune, please allow a maximum of 10 minutes for them to finish.

Ignoring requests to tune from other users may result in you losing your tuning session. If you attempt to re-tune without allowing the new user 10 minutes to tune or do not ask to tune first, you may be "hi-jacking" the remote.

For remotes that have the "Ask To Tune" system enabled, this policy is enforced (You have to ask to tune.).

Wait To Tune Policy

If you have been using a remote for more than 10 minutes and someone else is present, please allow them to tune for a full 10 minutes. If you have been using the remote for more than 10 minutes

Sliders, Buttons and Dropdowns on the Virtual Radio

Sliders



DSP Low Cut-off

Set the Low Cut cut-off frequency.

DSP High Cut-off

Set the High Cut-off frequency.

Mic Gain

Adjusted with processor off for very small ALC deflection on normal speech. Speak into the microphone and set the TX Meter control so that the ALC meter reflects your voice level but does not exceed the ALC limit. Make sure you are not "over-driving" your Microphone or input levels on the PC. This can lead to garbled and distorted modulation. The client software shows the RX waveform near the top of the display. It also shows your TX waveform, if this is a square then your overdriving your microphone. Solve by reducing your microphone gain or adjusting the microphone level slider.

RF Gain

Set the RF Gain control fully clockwise. You may turn it counter clockwise slightly when you have trouble hearing the desired signal because of excessive atmospheric noise or interference from other stations, When using FM mode, always set the RF Gain control fully clockwise.

Squelch

The purpose of the Squelch is to mute the speaker when no signals are present.

Proc In

Processor input level adjusted for 6 to 8dB of processing on normal speech. Use the PROC LEVEL slider to enter the Speech Processor input level adjustment mode. As you speak into the microphone, select TX Meter so that the compression meter indicates that the compression level is around 10 dB while you speak. Using higher compression will not improve your signal clarity or apparent signal strength. Excessively compressed signals are more difficult to understand due to distortion and are less pleasant to hear than signals with less compression.

Proc Out

Processor output level adjusted for very small ALC deflection on normal speech. Press Proc Out to set the output level adjustment. As you speak into the microphone, turn the TX Meter control so that the ALC meter reflects according to your voice level but does not exceed the ALC limit.

The Speech Processor levels out large fluctuations in your voice while you speak. When using SSB, FM, or AM mode, this levelling action effectively raises the average transmit output power, resulting in a more understandable signal. The amount of voice compression is fully adjustable. You will notice that using the Speech Processor makes it easier to be heard by distant stations.

NR Level

Sets the noise reduction level.

CW Filter Width

Set the CW Filter width.

FC Shift

This function is applicable to CW only.

CW Speed

CW Weight p. 42

Weighting is the ratio of dash length to dot length.

CW users are invited to go to "**For the CW Enthusiast**" that can be found in the addendum.

Buttons



PWR

Turns the radio on or off.

TX

Puts the radio into transmit.

A/B p. 18

Changes the main and sub VFO's around.

A=B p. 38

This function allows you to copy the frequency and modulation mode of the active VFO to the inactive VFO.

ATT p. 49

The attenuator reduces the level of received signals.

Pre p. 47

The pre-amplifier amplifies the level of received signals.

Proc p. 40

The Speech Processor levels out large fluctuations in your voice while you speak.

VOX p. 39

Voice operated transmit. Required for CW operation to enable Semi Break In.

NB

Press to switch the Noise Blanker on or off.

Notch

Auto Notch filter automatically locates and attenuates any single interfering tone within the receive pass band. This function operates digitally at the IF filter level, hence it can affect your S-meter reading and may also affect (slightly attenuate) your desired signal. However, controlling the AGC level by notching out the strong interfering beat signals could bring up the desired SSB signal that is covered by the interfering beat signal. If the interfering tone is weak, you may find that Beat Cancel eliminates them more effectively.

BC

Press to switch the DSP Auto Beat Cancel function ON or OFF

Since the DSP Beat Cancel processes the incoming signals at the AF stage, strong beat signals may control the AGC, and then weaken the target signal level. In this case, use the Auto Notch Filter instead, to remove the beat signal from the IF passband filter.

NR1 and NR2

N.R. 1: ALL MODES, N.R. 2: SSB/ CW/ FSK/ AM

The two types of Noise Reduction functions (1 and 2) for reducing random noise which interferes with the desired signal. Trying them both is the easiest way to judge which function works more effectively under the current conditions. Normally, select Noise Reduction 1 in SSB mode and Noise Reduction 2 in CW mode.

Lock

Frequency Lock disables some keys and controls to prevent you from accidentally activating a function or changing the current settings.

Split

To transmit on a different frequency than the receive frequency. This is achieved with the use of the sub-VFO.

Dropdowns



Mode

Selects USB, AM, FM and CW modes.

AGC p. 38

Causes the receiver gain and S-meter to react slowly to large input changes.

TX Meter

Selects Power, SWR, Comp and ALC on the meter.

Quick Memory

Use Quick memory to store data you will not use in future operating sessions. For example, as you tune across the band looking for DX, it is convenient to store stations that you want to contact. You can quickly jump between several (10) different memory channels as you monitor them.

Tx EQ p. 41

Transmit audio tailoring.

Rx EQ

Receive audio tailoring.

Repeater Shift

Enables Simplex and Repeater settings on VHF.

CW method

Does nothing.

Repeater Shift

Repeater Shift enables the setup off simplex and repeater channels.

CW

Does nothing.

Faults

Error messages are displayed here.

For the CW Enthusiast

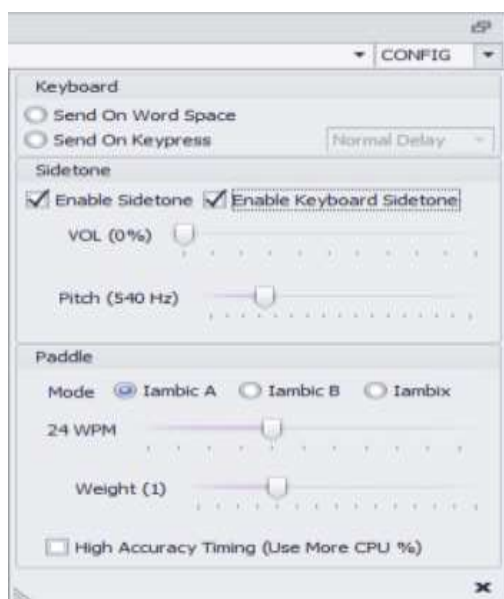
You can do all of this with the rig PWR off so you don't actually transmit while playing about.

You can pull out the CW box so it floats on its own.

You can then resize it. Reset to default layout when done.



Macros: Reprogram them as desired.



CW Config : Enable Sidetone and Enable Keyboard Sidetone boxes both ticked.
Set the Sidetone Volume and Pitch : as desired.

Mode : CW and VOX must be on.

CW Filter Width, CW Speed and CW Weight: all as desired.

Operation: Start typing in the keyboard window and hit ENTER to transmit or,
F1 to select the first macro key, F2 for the 2nd etc or,
Click on a macro key with the mouse.

Note transmission is immediate with the Macro keys.

Now PWR on the rig, pick a clear frequency and call CQ.

Add-ons

3rd Party software integration (your logging software)

The Logger32 setup is shown in the Virtual devices screen shot making use of the built in Virtual Serial Port support in the client. I made use of the K3 emulator.

In Virtual Devices

Options > Elecraft K3 Emulation (VCOM)
Serial Rate of 38400
Click Enable CAT Emulation
Click Save

In Logger32

Go to Setup > Radio
Choose either Radio 1 or Radio 2.
Com Port: COM4 (or whatever you choose)
Baud rate: 38400
Radio: Elecraft K3 (Choose this since the RCForb client software uses the K3 command set!)

N,8,1 for Parity, Data and Stop

Click Apply

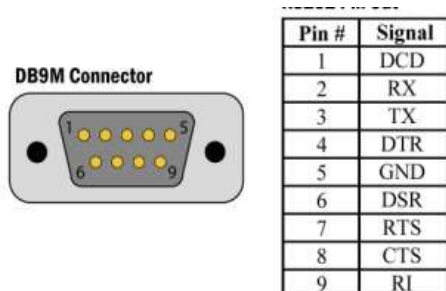
In Logger32, make sure you've opened up the port - go to Setup > Radio > Open port.

In the status bar, it should show that it's connected. Connect to MorningStar, click on a DX spot and the data is transferred to the Logbook Entry screen with the radio following suit.

Regulations only require that you log the transmission frequency e.g. 2400,220 MHz or set the band to 13 cm.

Adding a foot switch

Wire a footswitch between RTS pin 7 and CTS pin 8 of a DB9 female connector.



Select that serial port for External PTT.

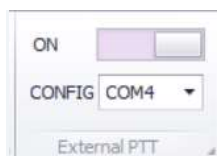
Options->Control Device Setup->External PTT

Select the serial port

Enable PTT Pin = CTS

Enable Use RTS for Power

Enable PTT Detection by clicking on OFF



You will be asked to log out and then in again for the settings to take effect.

When using a USB to Serial Adapter (FTDI or Prolific chipset) proceed as above.

Serial Port number as assigned to the USB cable by the Windows operating system.
Note: Check Windows Device Manager Ports list before and after plugging in the USB cable to determine port assignment. After plugging in the USB cable, the new port number listed is that assigned to the device.

Links for those that want to know more

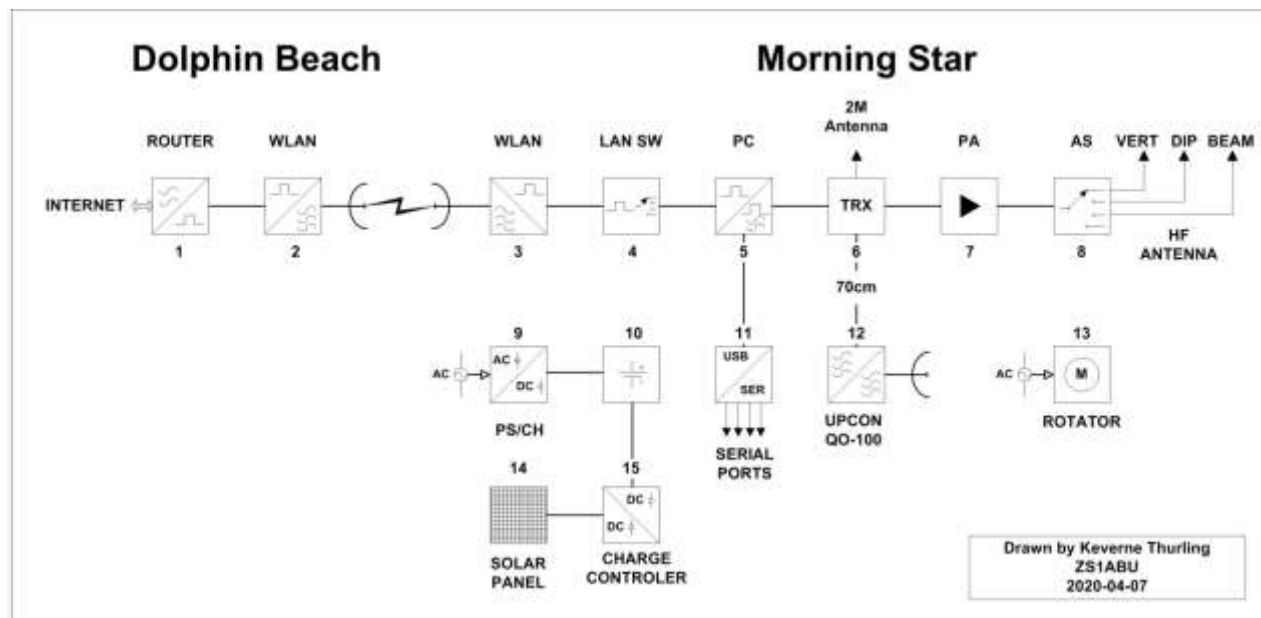
RCForb Client manual: http://beta.remotehams.com/orb/RCForb_Client_Manual.pdf

Setup for the client: <http://www.ve7ed.com/client1.html>

Creating a batch file: <https://www.youtube.com/watch?v=o5Nfm7ywsaA>

DIY RCForbs remote radio: <http://www.sk6qa.se/WP/wp-content/uploads/2017/04/DIY-Remote-Radio-Now.pdf>

Block Diagram of the Station and Equipment in use



1	Fibre to Ethernet Router	9	Mean Well RSP-200 charger
2	WLAN Ubiquity 5 GHz to 17dB gain patch ant.	10	Royal DC31 100 AH x 3 batteries
3	WLAN Ubiquity 5 GHz to 28 dB gain grid ant.	11	Keyspan 4 port Serial to USB
4	Ethernet 8 port switch	12	Amsat up converter 435 to 2400 MHz
5	Windows 10 Mini-PC	13	Hy-Gain Tailtwister
6	Icom IC-7100 HF, VHF/UHF	14	Solar panels x 4 totalling 400 W
7	Transworld TW500A RF Power Amplifier	15	Solar MPPT charge controller
8	Band decoder and antenna switch (home brew)		

Update and errata history

2020-04-14

VHF operation added and screenshots adapted
Contents updated

2020-04-20

Version change: v3 to v4
AF slider removed and screenshots adapted

2020-05-16

Rules and Regulations added
Adding Footswitch edited and illustrated
Chat Room added to the addendum

2020-05-29

Shutdown instructions modified – auto return to 14.195 MHz

2021-07-05

Version change: v4 to v5
Removal of Vertical antenna functionality

2021-09-10

Version change: v5 to v6
Host/IP address changed
Addition of 60 m dipole
SSB and CW no longer available on 160 m
Kenwood TS-2000 references removed
QO-100 bandplan updated