

# **ICS Electronics Limited**

## **TOR-2 PC ARQ RADIO TELEX MODEM OPERATION & TECHNICAL MANUAL**

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## **FORWARD**

The TOR-2 PC is a microprocessor controlled error correcting radio telex modem on a standard IBM PC interface card. It has been designed for text communication over marine and land based mobile and point to point HF radio links, and complies fully with ITU-R (previously known as CCIR) recommendations 476 and 625.

The TOR-2 PC is supplied with AUTOCOM software, but it can be operated from other communications software and terminals. In this handbook, it is assumed that the AUTOCOM program will be used.

This manual is in three sections: Installation, Operation, and Technical. ICS recommends that installation should be carried out by a competent engineer. This should preferably be the same engineer who installs the radio with which the TOR-2 PC is to be used. There are some adjustments and checks which have to be made, using both items of equipment operating together.

Automatic operation requires careful set up of the software configuration and scanning tables by the installer, but once this has been done, operation becomes extremely simple.

## **SPECIFICATION**

Power Supply:	+12v, -12v, +5v, derived direct from the computer.
Modes of Operation:	ARQ, FEC, SELFEC, ARQ monitor in accordance with CCIR recommendations 476 and 625.RTTY transmit/receive (ITA2 code, baudrates up to 100)

## **RADIO INTERFACE**

Receiver input level: unbalanced.	10mV-400mV rms. Balanced or unbalanced.
Receive bandwidth:	+/-140Hz at 3dB, +/- 400Hz at 30dB
Transmitter output level:	2.5v rms (+10dBm) maximum, adjustable down to zero. Balanced or unbalanced.
Transmit keying:	30v max receive, 100mA max transmit
Alarm Output:	+/- 12v activated on ARQ call received.
Computer Interface :	8-bit or 16-bit plug-in card. TOR-2 PC appears to the computer as a standard serial port.
Port Address:	Pre-setable to: 03F8, 02F8, 03E8, 02E8. (COM1-COM4)
Interrupt Line :	Pre-setable to 2, 3, 4, 5, 7, 10, 11, 12, 14, 15
Serial Data Format :	200 baud, 8 data bits, 1 stop bit
Dimensions:	220mm by 110mm

Remote radio frequency control is via an auxiliary RS232 output.  
Check with factory for a list of compatible radios\_

## INSTALLATION

### **GENERAL**

The TOR-2 PC should be installed inside the computer by a competent engineer who is familiar with this type of computer. Before installation, ensure that any other adapters or plug-in devices computer are installed first. Switch on the computer and ensure that any driver or setup programs for the other adapters have been run. Run the COMIRQ program supplied on the installation disk to examine the computer configuration. To run this COMIRQ program, put the installation disk into a floppy drive, change to this drive with the appropriate DOS command, then type the command COMIRQ.

The program will report on the screen any other serial port adapters present at any of the addresses that the TOR-2 PC can use, and which of the internal IRQ lines are already in use. Choose one of the available port addresses and one of the available IRQ lines shown. Keep a record of these choices.

Set the jumper links on the TOR-2 PC board to the corresponding positions. Switch off the computer and remove the case so as to gain access to the plug-in card area. Choose a suitable vacant slot. Note that there may be a mix of short (8-bit) and long (16 bit) slots. The TOR-2 PC has an edge connector for both types of slot.

An 8 bit slot may be used if the IRQ number chosen is 7 or less. A 16-bit slot must be used if the IRQ line to be used is 8 or above. Remove the blank plate opposite the slot. Fit the TOR-2 PC into this slot and screw it into place.

Before refitting the case of the computer, bear in mind that there could be one adjustment to make on the TOR-2 PC board in conjunction with the radio transceiver.

This is the transmitter audio output level. The TOR-2 PC is adjusted at the factory to provide an audio output level of 775mV rms (0 dBm).

If the transmitter requires an audio input level which is different from this, and it does not have it's own transmitter input level adjustment, then the RV1 trimmer on the TOR-2 PC must be adjusted while the

transmitter is connected to a power meter. This adjustment is described in a later section.



## **ELECTRICAL CONNECTIONS**

A cable is required between the TOR-2 PC and the radio transceiver. If the transceiver is a well known type, this cable may already be supplied with the TOR-2 PC or with the transceiver. If the cable has not been supplied, it must be made and fitted with a 9 pin connector for the TOR-2 PC and a suitable connector for the radio transceiver.

The connection details for the TOR-2 PC are shown below. The radio transceiver manual should be consulted for details of the corresponding radio connections.

The cable to the radio carries three signals: Receive Audio, Transmit Audio, and Transmit Keying. The receive audio from the radio should be connected to pins 1 and 2 of the 9 pin connector on the TOR-2 PC. These terminals are "floating". Do not connect either terminal to ground at the TOR-2 PC. Either side may be grounded at the receiver if the radio requires this.

If an auxiliary audio output is available from the radio (preferably one which does not vary in level as the radio volume control is adjusted) this should be used in preference to an extension speaker output. The transmit audio output from the TOR-2 PC comes from pins 3 and 4. Again, these are floating, and neither side should be grounded at the TOR-2 PC end of the cable. Either side may be grounded at the radio. This should connect to the auxiliary audio input of the radio.

If the only transmit audio input available is the microphone circuit, a purpose-built resistive attenuator may be necessary to reduce the 0 dBm level from the TOR-2 PC to the -40dBm level typical of such circuits.

The transmit key line corresponds to pin 5 of the TOR-2 PC connector, with an associated ground return connection on pin 8. This connects to the auxiliary transmit key input of the radio, or to its microphone "Press-to-talk" switch. If the radio transceiver has a remote control input and is one of the types that the TOR-2 PC is able to remote control, then an additional two wire cable can be connected from pin 7 of the TOR-2 PC to the remote control input of the radio. The associated ground return connects to pin 8.

If an alarm circuit is required, this can be connected to TOR-2 PC pin 9, with the associated ground return to pin 8.

## INTERCONNECTION SUMMARY

TOR-2 PC 9 Pin radio connector

PIN	Function
1	Receiver audio input
2	Receiver audio input
3	Transmitter audio output
4	Transmitter audio output
5	Transmitter key output (PTT)
6	Not used
7	Remote control to transceiver
8	Ground
9	Alarm output

If a permanent printout of all messages transmitted and received is required, then a suitable computer printer should be connected to the LPT1 connector on the computer.

## SOFTWARE

To install the AUTOCOM software, first select a directory on the drive where you wish to place the AUTOCOM files. Place the AUTOCOM installation disk into the floppy disk drive, change to this drive using the appropriate DOS command, and type the command INSTALL, followed by the full drive/path name of the chosen directory. The INSTALL program does no more than copy the files from the floppy disk to the chosen directory.

Before running AUTOCOM, some changes must be made to the AUTOEXEC.BAT file in the computer. Using a file editor program, open the AUTOEXEC.BAT file (or create such a file if one does not exist), and add the following line to it:

```
ppppTOR2PC COMx IRQy ALMz
```

**pppp** represents the full path to the TOR2PC.COM file. This will normally be in the directory in which you have chosen for the AUTOCOM files.

**x** represents the COM port number that was chosen during the physical installation of the TOR-2 PC card.

**y** represents the IRQ number.

**z** should be 1 if it is required that the TOR-2 PC alarm output should be enabled when the computer is switched on and 0 otherwise.

For example: If the TOR2PC.COM file is located in the c:\AUTOCOM\ directory, and you have chosen to set the TOR-2 PC card to operate as COM3 with IRQ 4 and the alarm function enabled, then the line to be added to the AUTOEXEC.BAT file is:-

```
C:\AUTOCOM\TOR2PC COM3 IRQ4 ALM1
```

If you wish to use the TOR2PC/AUTOCOM system for dual language Latin/Cyrillic telex communication and you have a dual-language keyboard, you should also install the driver for this into the AUTOEXEC.BAT file by adding a line with the path name of the

CYRKBD.COM file. If the AUTOEXEC.BAT file already contains a line which installs a keyboard driver, the CYRKBD.COM line should be placed after it.

After modifying the AUTOEXEC.BAT file, it will be necessary to switch the computer off and on again, or "reboot" it, in order for the changes to take effect. After power up, the TOR-2 PC will be immediately ready to receive calls, even if the AUTOCOM program is not running. If the ALARM function has been enabled and an alarm circuit connected, such a call will operate the alarm. The AUTOCOM program can then be run to handle the received call.

To start AUTOCOM, use the DOS "cd" command to change to the directory where the AUTOCOM files are located, and type:-

### **AUTOCOM.**

To run AUTOCOM without changing directories, a small AUTOCOM.BAT file can be written and placed in the root directory. This file contains the commands required to change directories and run AUTOCOM.EXE. Further details of other commands which may be placed in the AUTOCOM.BAT file are given in the TECHNICAL INFORMATION section.

### **INSTALLATION SET UP**

Before the TOR-2 PC can be used with a given radio, it is important to make one internal adjustment. This adjustment cannot be made in the factory. Incorrect adjustment can result in interference to other radio users. If this adjustment has not already been done by the supplier of the radio and the TOR-2 PC, then it must be done as the radio and the TOR-2 PC are connected together.

Remove the case of the computer to gain access to the TOR-2 PC card. Identify RV1, which is set back from the top edge of the card, about half way along. The adjustment screw faces upwards.

Switch on the radio and the computer, and run AUTOCOM. Connect a dummy antenna load to the transmitter. If this is not available, select an unused radio channel and set the radio to operate with the antenna tuned. Key **F2** (COMMS) on the computer, Key **ESC** and type the

command FEC. The TOR-2 PC will key the transmitter. Quickly adjust the RV1 trimmer until the power output from the transmitter just reaches it's rated output. Key **ESC** to switch the transmitter off.

The system is now ready for use.

## SOFTWARE SET UP

Before beginning to configure the TOR-2 PC and its associated AUTOCOM software, ensure that the operating frequencies have been programmed into the radio. If your radio is not specifically designed for radio telex operation, it should be set for upper sideband operation (USB). The programmed frequencies must be 1.7 kHz lower than the nominal assigned frequency. You may need some assistance from the radio supplier to do this, as it often involves removing the covers of the radio to alter internal settings. If your radio is fitted with a remote control interface that is compatible with the TOR-2 PC, these channel settings will not be needed.

Before using your radio telex system, you will need to program the TOR-2 PC for the SELCAL code and ANSWERBACK message that you have been allocated by the licensing authority. The selcal code will normally be a 5 digit or 9 digit number and the answerback will be a one line message - usually containing the selcal number, a name, and a country or ship identifier.

To set the selcal code, select the COMMS screen by pressing **F2**. If the TOR-2 PC is not displaying Enter Command, press **ESC** to bring the TOR-2 PC to COMMAND mode.

If the selcal code allocated is 23456, then type in the command:-

IDENT 23456 and press ENTER.

To set the answerback message, suppose that the answerback that you have been allocated is 23456 TITANIC X, type :-

ANSWERBACK 23456 TITANIC X and press ENTER.

This is the minimum set up necessary to send and receive messages. However, there are several other settings which you may wish to change:-

If your radio can be remotely controlled by the TOR-2 PC and the appropriate cable has been connected, the RADIO command should be set to correspond to the type of radio. AUTOCOM can then automatically select the frequency for each radio telex channel. Refer to the TECHNICAL INFORMATION section for further details. Initially, just enter **DISPLAY** to view these settings. Confirm that they are either as set above, or are set to the default settings shown below:-

*ICS Electronics TOR-2 PC terminal*

<i>Version No</i>	<i>18</i>
<i>POLarity RX:TX</i>	<i>0:0</i>
<i>OVER (+?) enable/disable</i>	<i>1</i>
<i>DELay for PTT-on (1/1200 sec)</i>	<i>25</i>
<i>ECHo on/off</i>	<i>1</i>
<i>NEWline function on/off</i>	<i>1</i>
<i>CYRillic mode on/off</i>	<i>0</i>
<i>LineFeed Add</i>	<i>0</i>
<i>ERRor-replacement control-code</i>	<i>Z</i>
<i>error detection THReshold</i>	<i>4</i>
<i>BROadcast enable/disable</i>	<i>1</i>
<i>XFLow control on/off</i>	<i>1</i>
<i>Channel-Free Transmit</i>	<i>0</i>
<i>REPhase on ARQ calls on/of</i>	<i>0</i>
<i>RADio remote control</i>	<i>No radio</i>

<i>SCD Scan delay</i>	3
<i>Channel Free Morse message</i>	VVV VVV
<i>4/5 digit selcal IDentity</i>	00000
<i>9 digit selcal IDentity</i>	000000000
<i>CALl outgoing selcal code</i>	000000000
<i>ANSwerback message</i>	(C) ICS Electronics Ltd

When the settings are satisfactory, enter **SAVE**. The TOR-2 PC will store these settings permanently. This takes about 20 seconds. Wait for the prompt to re-appear to avoid interrupting this process.

## **OPERATION**

This section describes the basic sending and receiving of radio telex messages. Other functions that can be carried out by the TOR-2 PC are described more fully in the TECHNICAL INFORMATION section.

### **AUTOCOM**

AUTOCOM consists of four separate computer programs in one - each associated with function keys F1, F2, F3, and F4. Think of them as each running on a separate computer with their own screens and keyboards. It is possible to leave one screen to work in another, then return to it later. Though all four screens work independently, there are information links between them.

Provided there is enough free memory available in the computer, the ALT-F1 key enables one to temporarily leave the program to perform a DOS command. On return via the DOS "EXIT" command, the AUTOCOM screens will appear exactly as they were left. If any text had been received from a distant station during this break, it will not have been lost. Even if AUTOCOM is closed down completely with the F10 key, communication between the TOR-2 PC and the computer is kept running. Any message received whilst the user is running another



program, will be available on the COMMS screen when AUTOCOM is re-started.

The main functions of the four screens are as follows:-

### F1: EDIT

Allows preparation of a message in advance of sending. Messages can be saved to disk for later use. This EDIT screen provides a basic text file editor, and can be used to view and edit any text file in the computer.

### F2: COMMS

This is the screen used when in direct contact with a distant station. The top section of the screen shows text flowing over the link. The bottom section is a typing aid, showing each character as it is entered. Information about the current station and the status of the radio link are also shown. Messages received can be stored to disk. Anything typed whilst in this screen will be sent straight to the TOR-2 PC and thence to a distant station. Messages prepared in advance on the EDIT screen can also be transmitted from this screen.

### F3: STATIONS

This is a list of all radio telex stations in the world, together with their SELCAL codes, frequencies, and other information. Use the UP/DOWN keys to highlight the station and channel required. A SELCAL is like a telephone number, uniquely identifying the distant station. Information from this screen is sent to the COMMS screen and to the radio transceiver, if it is capable of remote frequency control.

### F4: HELP

This screen allows shows information about the use of the AUTOCOM program. It also shows all known operating procedures for the radio telex stations listed in the STATIONS screen.

A bar along the bottom of each screen identifies each function key. In some screens, additional functions are available by holding down **ALT** and pressing a function key. The bottom bar then show the alternate functions. A status bar at the top shows the status of that screen.

## THE EDIT SCREEN

This screen is an editor which uses mainly 'Wordstar' commands. A 'Help Screen' can be accessed by pressing **ALT-F4**. This gives a concise summary of the control keys that are used to perform common word processing operations.

**The screen can be cleared by pressing F5 (NEW).** Messages can be saved to disk by pressing **F7 (SAVE)** and then entering a file name. Names should be no longer than 8 characters. Note that an optional extension can be added after the filename. The default extension is .MSG. Files can be loaded back to this screen with **F6 (LOAD)**. To load a new file, **F5** should normally be used to clear the screen, but it is possible to insert a file into a message that is already displayed by placing the cursor at the insertion point before loading the file, using **F6**. If a name is entered without a directory name, the file will be searched for in the default directory. A full path name can be entered to permit work on files in any directory.

With **F6** and **F7**, key **ENTER** instead of entering a filename in order to see an alphabetical list of .MSG files already on the disk. Enter a partial file name containing a \* character in order to see an alphabetic list of files which match that partial file name. One of the listed files can be highlighted by means of the up/down cursor keys, then loaded by pressing **ENTER**. Any message which is on the EDIT screen can subsequently be transmitted from the COMMS screen.

To delete a file from the disk completely, load it onto the screen with **F6** and then press **F8 (DELETE)**.

The EDIT screen can be used to view and edit other files. For example, to review the communications log file COMMSLOG.MSG, simply load it with the **F6** key. Files used for the AUTOTLX mode can also be created and modified with the EDIT screen.

When preparing messages for transmission, they will appear on the screen using the full character set of the computer. However, the radio telex transmission system can only transmit capital letters, the numerals 0-9, and the punctuation marks:-

. , / ? ' : + = - ) ( % @ #.

Some of these punctuation marks may be interpreted differently by non-English stations.

## **THE COMMS SCREEN**

This is the main screen of the program - from which communication takes place. At the top of the screen is a status display of for the radio link.

<b>STANDBY</b>	will be shown when the TOR-2 PC is not in contact with any station but is available to receive calls.
<b>ARQ</b>	will appear when a two way communications link is in progress.
<b>FEC</b>	appears when a broadcast is in progress.
<b>SEND</b>	appears if a two way link is switched to the sending direction, that is, with text flowing from the local station to the distant station.
<b>IDLE</b>	will appear if the connection is waiting for text to send.
<b>ERROR</b>	appears if the received signal is temporarily corrupted by noise or interference and the error correcting system is trying to overcome it.
<b>REPEAT</b>	appears if the distant station is experiencing interference and is requesting a repeat of corrupted data.
<b>PHASE</b>	shows that the link is not yet established or has been broken and is being re-established.

The main area of the screen displays text being exchanged between the local station and distant stations. The lower section of the screen shows what has just been typed, even if it has not yet been transmitted. This is used solely as a typing aid. Between the two sections is a bar which may contain information about the distant

station if this station has been selected from the STATIONS database described below.

Apart from the top row of function keys, any key pressed whilst in the COMMS screen sends that character direct to the TOR-2 PC card - either to make it carry out a function or, if in contact with a distant station, to send that character over the radio link. If the distant station is itself running a computer program, such characters may be commands to the distant computer or may be relayed to an even more distant station.

By pressing **ESC** on the keyboard, the TOR-2 PC is set into COMMAND mode and a cursor appears on the screen. A full list of all the TOR-2 PC commands appears in the TECHNICAL INFORMATION section, but the two are used most are the ARQ command to make an outgoing call, and the STANDBY command to set the system to receive any incoming calls. AUTOCOM also has shortcuts to use these two commands using the function keys.

To initiate a two way ARQ link to a distant radio telex station, the ARQ command is used. First select the appropriate frequency on the radio, and check that the channel is free. This can be done automatically in some cases. *See the example described later for further details.* Press **ESC** and type the command word **ARQ**, followed by a space, the required selcal code, and then **ENTER**. Alternatively, if the station required has been previously selected from the STATIONS screen, then the station details will appear in the central bar. Pressing **F5** will cause AUTOCOM to send the ARQ command to the correct selcal code. If a remote control radio interface is fitted, it will also select the appropriate frequency. Should the station concerned normally emit a channel-free signal, it will wait until the channel becomes free before calling.

Pressing **F6** turns the 'Log to Disk' function on and off. Whilst this is on, the "F6:LOG" legend will flash. All text transmitted and received will be stored to a disk file called COMMSLOG.MSG. Pressing **F6** again will then stop the logging operation and stop the LOG legend from flashing. The COMMSLOG.MSG file can be examined, edited, and printed out later from the EDIT screen. If the system is to be left in

STANDBY to expect incoming calls, the LOG should be left on to keep a permanent record of any messages.

Pressing **F7** returns the link to standby after finishing the exchange of messages with the distant station. This is a short-cut method of using the Control-D key or the STANDBY command.

Pressing **F8** changes the direction of an ARQ link from send to receive. With most automatic radio telex stations, you will not need to use this key. The distant station will change the link direction automatically. It would be used in a direct telex link (DIRTLX) to engage in a two way conversation.

**F8** is a short-cut method of sending the two character sequence **+?**. You may think of this key as the telex equivalent of the word "over" used in radio telephone conversations. The **F8** key may also be used to interrupt the other operator, but this is not recommended. **Alt-F5** can also be used in a DIRTLX link to send the telex "who-are-you" signal to check the answer back message of the distant telex machine. **Alt-F6** sends your own answerback message to the distant station.

If a message is on the EDIT screen, this can be transmitted to the distant station by pressing **F9**. The message will be transferred to the modem almost immediately, but will take rather longer to appear on the screen as it is only displayed as it is transmitted over the radio link.

Some coast radio stations broadcast bulletins and weather forecasts in FEC (Forward Error Correction) mode. If the receiver is left on the appropriate channel with the TOR-2 PC in STANDBY, then when a broadcast takes place it will be received onto the COMMS screen. If the F6:LOG feature has been turned on, data will be saved to a disk file.

As long as the radio and the computer are left running - even if the COMMS screen or AUTOCOM program are left completely - broadcast messages will be stored until the COMMS screen is returned to. Reception of such broadcasts can be disabled with BROADCAST 0 command.

## THE STATIONS SCREEN

This screen contains details of every channel operated by every radio telex station in the world. As **F3** is pressed for the first time, there will be a pause while the system reads the Stations database into the computer memory. Use the UP/DOWN keys to highlight the radio station you wish to use and select the appropriate channel. Switching back to the COMMS screen automatically loads the essential information into the central bar on the COMMS screen. If your radio is fitted with a remote control interface, and the appropriate cable has been installed, the frequency information will also be transferred to the radio to change it to that channel.

Operating instructions for the chosen station will be retrieved ready to be displayed via the F6 key in the HELP screen. Note that there is more information than is capable of being displayed on the computer screen at once. Press right arrow and left arrow to see information which is off the screen. Information on this screen includes the call sign of the station (which may be heard in morse code if the channel is free), the watchkeeping hours and an indicator to show if the station provides an automatic Free Channel signal. If a Y or a two letter group are shown, then the station has a CCIR free channel facility, in which case calls to the station can be made automatically.

If an N is shown in the FC column, then the station does not have a CCIR channel free signal. All calls to that station must then be made manually, with the operator listening to check by ear that the channel is free.

The F5 function key in the COMMS screen automatically checks the free channel column and uses the correct type of call. This ensures that calls cannot be made accidentally on a channel which is in use by another ship.

## THE HELP SCREEN

The first time **F4** is selected, the main HELP menu will be displayed, showing the names of the major HELP topics. You can always return to this menu by pressing **F5**. Any of the topics may be selected with the up/down keys and the ENTER key. Pressing **ESC** whilst showing any HELP page (other than the main menu), will return to the menu for

that page. If a station has been previously selected in the STATIONS screen, then pressing **F6** from the HELP screen will display the operating instructions for that station.

## THE AUTOCOM.CFG FILE

In order to override some of the default initial settings of the AUTOCOM program, a file called AUTOCOM.CFG can be created which makes it possible to customise the system. This file is a simple text file which can be created from the AUTOCOM EDIT screen or with any text editor. A typical AUTOCOM.CFG file might look like this:-

```
torpath=C:\TOR2PC\AUTOCOM
msgpath=C:\TOR2PC\AUTOCOM\MSG
database=C:\TOR2PC\AUTOCOM\TELEX1.CSV
autotlx=2
screensave=30
logging=on
modem=rep 0
modem=xfl 1
scan=portish
answerback=23456 titanic X
```

This example contains all possible types of AUTOCOM.CFG line.

The **TORPATH=** line defines the directory in which the AUTOCOM program files are located. By including this line, the AUTOCOM files can be placed in a directory other than that which contains the AUTOCOM.EXE program. Note that this TORPATH= line overrides

any **TORPATH=** environment or command line setting except for the location of the AUTOCOM.CFG file.

The **MSGPATH=** line, if present, overrides the **TORPATH=** line in respect of the .MSG, .STN, and .SCN files. This makes it possible to place the AUTOCOM program files in one directory, which may be write-protected. At the same time, the files created by the user can be in another directory which is read/write.

The **DATABASE=** line allows the location and filename of the database file to be determined. Without this line, the database file must be located in the **TORPATH=** directory and must be named **TELEX.CSV**

he **AUTOTLX=** line enables the AUTOTLX system. The value entered sets the time interval, in minutes, between attempts made by the AUTOTLX system to call coast stations to send outgoing messages. If this line is not present, or the value set is zero, then AUTOTLX system is not enabled.

The **LOGGING=ON** line determines whether the system copies all received and transmitted messages to the COMMSLOG file from program start-up. If this line is not included, the logging function will be off as the program starts. The F6 key in the COMMS screen can be used to turn logging on and off at any time while the program is running, regardless of the **LOGGING=ON** line in the AUTOCOM.CFG file.

The **SCREENSAVE=** line enables blanking of the computer screen after a period of inactivity. If there is no keyboard or radio activity after the specified number of minutes, the program will blank the screen and will switch back to the COMMS screen if it was in another screen. The COMMS screen will re-appear when a key is pressed or when there is any activity from the radio. If there is no **SCREENSAVE=** line, the screen will never blank.

**MODEM** lines contain commands to be sent direct to the TOR-2 PC modem once as the AUTOCOM program is started. There may be several **MODEM=** lines and any valid modem command can be sent. See the TOR-2 PC MODEM COMMANDS section for full details. In the example above, the two **MODEM=** lines set the **REPHASE**



parameter of the modem to OFF and the XFLOW parameter to ON. If the line MODEM=STANDBY is included in order to leave the system in standby mode on a specific channel, then this line must be the last MODEM= line in the AUTOCOM.CFG file.

If there are no MODEM= lines in the file, the system will default to the settings stored in the non-volatile memory in the TOR2PC modem card. It will then power up into STANDBY mode.

The **SCAN=** line allows the contents of one of the SCAN files to be sent to the modem, so that this scanning sequence is started as soon as the AUTOCOM program starts, without operator intervention. For this to work correctly the SCAN line must be the last line in the AUTOCOM.CFG file. However, it is possible to have two SCAN lines in the file.

An **ANSWERBACK=** line may be included in the file instead of using the ANSWERBACK setting in the modem. If the modem handles the answerback, it is possible to leave the modem scanning for incoming messages while the computer is running another program, but there is a small risk that un-stored messages in the modem may be lost if there is a power failure. On the other hand, if AUTOCOM handles the answerback, it makes a positive check that the message has been stored before returning the answerback message. For example, it will not return an answerback if the LOG function has been turned off. Since the coast-station will never delete the message if it does not receive an answerback, this provides added security against the accidental loss of messages due to faults in any part of the system. Do not have the modem answerback and the AUTOCOM answerback set at the same time. The AUTOCOM answerback function does not operate with TOR2PC modems with version numbers earlier than 19.

## MAKING YOUR FIRST ARQ CALL

This section shows how to make a call to a typical maritime coast radio station. It is assumed that the TOR-2 PC has been programmed with a SELCAL code and an ANSWERBACK message, and that the radio has been programmed with the correct radio telex frequencies. Make sure that your radio is set to the correct mode. This will normally be upper sideband (USB) unless the radio has a special TELEX mode. Check that the CLARIFIER (if any) is in its central position. If the connection between the TOR-2 PC and the radio is via the microphone socket, check that this cable is correctly connected.

To prepare a message in advance, press **F1** and type your message.

Next press **F3** and use the UP/ DOWN or PgUp/ PgDn keys to position the highlighted bar over the station and frequency channel you wish to call. Check the watchkeeping hours for that channel to make sure it is available. Select this channel on the radio. If the FC column in the station entry shows **N**, then listen to see if the channel is free. The coast station in question may be sending its callsign in morse code if the channel is free. Continuous chirping indicates that the channel is occupied. If the FC column shows **Y** or a two letter code, then an automatic Free Channel system is in operation. It will not be necessary to check by ear that the channel is free.

Press **F2** to access the COMMS screen. The information just highlighted will appear in the central bar of this screen. Press **F5**. If the station has a Free Channel signal and the channel is busy, then the message *waiting for free channel* will appear. Calling will commence as soon as the channel is free. A *waiting* message can also appear if the station you are calling is not operational. In that case, the call attempt will time out after 30 seconds. Press **F3** to access the STATIONS screen and choose another channel or another station.

When the call starts, your transceiver will begin switching on and off and the STATUS bar will change from STANDBY or COMMAND to SEND ARQ PHASE. As soon as contact is established, it will change to SEND ARQ IDLE. You will then see an exchange of answerback messages between the TOR-2 PC and the coast station appear in the upper part of the screen.

If a message is waiting, a fully automatic coast station will state this. With most stations, typing **MSG+** will cause the message to be sent to your screen. If you want to keep a record of the message on disk, make sure that *F6:LOG* is flashing. Press **F6** if necessary.

When the coast station returns the *GA+?* prompt, enter any of the command codes that are available for that station. For example, if you want to send a telex message, enter **TLX** followed by the international TELEX number followed by a plus sign. When the coast station responds with *MSG+?* you can then enter the message, either by pressing **F9** to send a prepared message from the EDIT screen, or by typing your message live. Most coast stations have many other facilities available, including transmission of telex messages to FAX machines, weather forecasts etc. Pressing **F4** to switch to the HELP screen, then **F6**, will bring up the operating instructions for that station from the AUTOCOM database. Alternatively most stations will accept the command **HLP+** or **HELP+**

When you have completed your session, send the appropriate command to sign off (usually **BRK+**) or press **F7** to close down the link.

## AUTOTLX OPERATION

The previous section described the basic method of manually sending a message to a coast station. One of the most powerful features of the AUTOCOM program is its ability to call many coast stations and to automatically send and receive messages without the operator being present. With AUTOTLX enabled, the system will call each coast station in a programmed list at regular intervals. It will ask for, and accept any messages which the coast station has waiting for collection, and send any messages which have previously been created and programmed for transmission to that station. To enable AUTOTLX, first create or edit the AUTOCOM.CFG file previously described to add an AUTOTLX= line to that file. Set the value of this parameter to the time interval, in minutes, between call attempts. An interval of 10 minutes is suggested.

Messages for transmission via AUTOTLX are prepared with the EDIT screen and saved to disk in the usual way with a unique file name. The message itself need not contain any reference to the coast station to which it is to be sent, or the telex number to which it is to be delivered. To program this information into the AUTOTLX system, use **Alt-F9** to access the AUTOTLX message directory. On the left hand side of the screen, the programmed list of coast stations which can accept automatic calls is displayed. By using the **cursor up**, **cursor down**, and **ENTER** keys, select the station to which you wish to send the message. If there are any other messages waiting to be sent to that station, a list of them will appear in the right hand half of the screen.

To add your message to this list, press the **INSERT** key. A cursor will appear. Type the name of the message file, then a space followed by the command code and the number to which the message is to be sent. For example, if you wish to send the message *REPORT1* as a telex to number 5412345, then enter **REPORT1 TLX5412345**

Consult the published information from the coast station for details of available command codes for that station. Any command code that requires a code plus a number or just a code, then prompts for the message with MSG+? may be used in the AUTOTLX system. Note that the MUL, MULTLX, or MULFAX commands available from some coast stations cannot be used within AUTOTLX. These must be entered manually.

You can backspace to correct errors and press **ENTER** to complete the entry. If you wish to enter more messages for sending via AUTOTLX, you may move the highlight bar to the point in the list where you wish to add the new message, and then repeat the process. Messages can be deleted from the list by first highlighting the message, then pressing the **DELETE** key.

Message editing can be abandoned by pressing **ESC**. Press **ENTER** when you have finished editing the message list. The order in which the messages appear in the list is the order in which they will be transmitted. Messages for another station can be viewed or edited or press **ESC** to return to the main COMMS screen. If the COMMS screen is showing STANDBY or SCANNING, the AUTOTLX calls will start immediately. If the call is not successful, repeat attempts will be

made at the interval set by the AUTOTLX= parameter in the AUTOCOM.CFG file. If the COMMS screen was not in STANDBY or SCANNING, the AUTOTLX calls will wait until the **F7** or **Alt-F7** keys have been pressed to put the system back into STANDBY.

Check that the radio is switched on with the transmitter and antenna tuning unit ready to operate.

Each time that a message is correctly sent and acknowledged by the distant station, a record of the transfer is added to the COMMSLOG file. If, for some reason, the distant station rejects the message, perhaps because of an invalid command-code or telex number, this fact is also recorded. In this case and in the case of a correctly delivered message, the message will be deleted from the message list in the AUTOTLX directory. The message file itself is not deleted.

**Alt-F9** can be pressed at any time to see which messages are still waiting to be transmitted. When the system is calling or is linked to a coast station, the top line of the screen will flash **AUTOTLX**, whilst the main screen will display the text being sent both ways over the radio link. The automatic procedure can be interrupted at any time by pressing any key. This allows the operator to take over and continue the link manually. However, if manual communication with an AUTOTLX station is required without sending AUTOTLX messages, this should be done by highlighting that station in the AUTOTLX screen and pressing **F5**. The system will find a free channel and call the station, leaving the operator to enter commands manually.

If the list of AUTOTLX capable coast stations has not already been programmed by the supplier of your system, then these can be generated by hand by creating an .STN file for each station in the list. These files can be created with the EDIT screen or any other text editor, and should be placed in the MSGPATH= directory. They contain several lines which contain parameter setting which are specific to that station. The following example shows a typical .STN file:

name=Portishead  
system=ccir  
selcal=3220  
channelfree=BR  
poll=10  
freq=4211,4173  
freq=6313.5,6264.5  
freq=8414.0,8242.0

The **NAME=** line gives the name which will be given in log reports to identify the station. This line is optional. If it is omitted, the name of the .STN file is used by default. The NAME line would therefore be used where the full name of the station was longer than the 8 character limit for file names.

The **SYSTEM**line determines the protocol used by that station for handling messages. At the time of writing, two systems are catered for: MARITEX and CCIR. If this line is omitted the system defaults to CCIR.

The **SELCAL=** line is the selective-call number of the coast station. This number can be found in the AUTOCOM database or the published information from the coast-station.

Some coast stations require ships to send their AAIC number when sending messages. If this is required by the station, include an AAIC=nnnn line in the .STN file, where nnnn represents the ships AAIC number. This number will be sent to the coast station in response to the *QRC+?* prompt.

**CHANNELFREE=** designates the two letter code which is contained within the channel free signal which the coast station emits to indicate

that a channel is available. Each coast station uses a different two letter code. Setting the CHANNELFREE= line to the appropriate code enables the AUTOTLX system to distinguish between different stations sharing the same channel. If the CHANNELFREE= line is not included, the AUTOTLX procedure will detect any channel free code. It is recommended that the CHANNELFREE= line is always used if the two letter code for the station is known. Optionally, a number can be added to the two letter code in the CHANNELFREE= line. This modifies the default time period that the TOR-2 PC waits whilst listening for a channel free signal. See a description of the ACF command in the Technical Information section for further details. For the MARITEX network, the line should be CHANNELFREE=ER6

The **POLL=** line determines how the AUTOTLX system behaves if there are no messages to be sent to that station. If POLL=0, then the system will do nothing if there are no messages. With values of POLL greater than 0, the system will make a call to that coast station from time to time to see if there are any messages awaiting collection. The value of the POLL parameter determines the interval between polling calls, expressed as a multiple of the AUTOTLX= setting. For example, if the system is set to call every 10 minutes to clear outgoing messages, then setting POLL=24 will result in polling calls every 4 hours. If there is no POLL line, the system will only call the coast station if there are outgoing messages. It will, however, ask for any incoming messages at the same time. For the MARITEX network, which always calls ships in order to deliver messages, the line should be POLL=0

The **FREQ=** lines determine the frequencies which AUTOTLX will use to call this station. The frequencies will be tried in the order in which they appear in the .STN file and calls will be abandoned if no channel free signal is detected within 30 seconds or if there is no reply to the call within 1 minute. If there are no FREQ= lines in the file, the call will be made on the frequency that the radio is already set to. This permits the AUTOTLX system to be used on a single channel with a radio that has no remote control facility.

The lines in the .STN file can be entered in any order. If two lines are present for the same parameter, then, apart from `FREQ=` lines, the later line overrides the earlier line. Comment lines can be included in the file so long as they cannot be confused with real lines. If any lines in the file contain errors they are ignored.

## SCANNING

In addition to making unattended calls to coast stations the system can, if used with a remotely controlled radio, scan several frequencies whilst in the STANDBY mode in order to respond to calls from one or more coast stations which may have messages to deliver. Many coast stations will do this on request, and this can speed up the delivery of messages and remove the need for repetitive POLL calls to check for messages. The modem SCAN command can be used to set up this process.

See the TOR-2 PC MODEM COMMANDS section for full information. However, the scanning facilities can be accessed from the AUTOCOM program with **Alt-F7**. This displays a small box showing the names of the scan sequences which have been programmed into the system. Selecting one of these causes this list to be transferred to the TOR-2 PC, which will then start to scan each channel in turn. A call from a coast station on any of these channels will be detected and the TOR-2 PC will stop the scan and respond to the call, reverting to the SCAN STANDBY mode when the link has finished. If the TOR-2 PC BROADCAST command has been enabled and a broadcast frequency has been included in the active scan list, then the broadcast will be received.

If the scanning is stopped manually at any time, the same scanning sequence can be restarted by selecting [**default**] from the Alt-F7 box. If the scan sequences have not already been programmed into the system, they can be created by hand in a similar way to the .STN files. The names appearing in this box are the names of special files which contain the frequencies to be scanned. These can be created with the EDIT screen, and should be placed in the MSGPATH= directory with the extension .SCN There are up to 16 lines in a .SCN file.



Each line starts with a number between 0 and 15, followed by a space and then the receiver frequency (distant station's transmit frequency followed by a comma and the transmitter frequency (distant station receive frequency). Each line defines the pair of frequencies for one of the 16 scan channels in the TOR2PC modem. If less than 16 channels are to be set, the remaining channels should be deleted by entering a line containing only the channel number. By creating two scan lists, one setting only scan channels 0-7, for example, and the other setting scan channels 8-15, it is possible to set the system to scan either or both sets of frequencies.

A typical .SCN file is shown below. Note that any line containing data which does not start with a number is ignored, so such text lines can be used as a label or a comment.

```
Maritex Sweden
0 8428,8388
1 8419.5,8379.5
2 8556,8398.5
3 6323,6272
4
5
6
7
```

This file sets channels 0-3, clears channels 4-7, and leaves the frequencies of channels 8-15 set as previously. It would be stored as **MARITEX.SCN** and would show in the Alt-F7 box as **MARITEX**.

The interval between scanning steps can be adjusted using the SCD modem command. The default setting is SCD 3, which gives a 3 second interval between channel steps. See the MODEM COMMANDS section for further details.

## TECHNICAL INFORMATION

The information in this manual so far has been only sufficient to begin operation on radio telex when using the AUTOCOM program. The information that follows may not be needed by many users. However, the TOR-2 PC has many features which can be used to carry out functions other than basic radio telex operation. Some users may wish to take advantage of these.

This section describes the full command set of the TOR-2 PC and the advanced functions that may be of interest to users wishing to build the TOR-2 PC into more complex systems.

### AUTOCOM COMMAND LINE AND ENVIRONMENT PARAMETERS

In some applications, for example in a GMDSS installation where access to program files may need to be restricted, it may be necessary to start the AUTOCOM program from a directory other than that in which the program files are located. In this case, the pathname of the program directory can be added to the command line using the same format as the TORPATH= parameter described in the AUTOCOM.CFG file. Thus if it was necessary to place the AUTOCOM.EXE program in another write protected directory, C:\PROGRAMS, the command line to run the AUTOCOM program would be:-

```
C:\PROGRAMS\AUTOCOM TORPATH= D:\AUTOCOM
```

The TORPATH= parameter can also be set by means of a DOS environment string by means of the DOS command:-

```
SET TORPATH=D:\AUTOCOM\
```

In either case, the commands in question can be included in a .BAT file which itself can be in a write protected drive. The AUTOCOM.CFG file could be placed in the write protected drive, in which case a command line or environment parameter would not be necessary. The TORPATH= parameter can then be included in the AUTOCOM.CFG file to define the read/write drive containing the AUTOCOM files.

## TOR-2 PC Modem Commands

Here is a full list of the TOR-2 PC modem commands with a description of their functions:-

### **GENERAL**

Keying **ESC** in the COMMS screen brings the TOR-2 PC into COMMAND mode and a prompt is displayed on a new line. The status display at the top of the AUTOCOM COMMS screen will show **ENTER MODEM COMMAND**. At this point, any valid modem command can be entered. Some commands consist of only one word. Some are followed by one or more parameters. The parameters must be separated from the command word and from each other by spaces. You may correct typing errors within a command entry with the **BACKSPACE** key.

End a command with the **ENTER** key. In most cases, if you cannot remember what parameter is needed after a command word, you can just enter the command word by itself. The TOR-2 PC will then prompt you for the information required to complete the command. The command words may optionally be shortened to the first three letters. Some of these commands may have been disabled on installation by means of the LOCK command. The list of locked commands can include the LOCK and UNLOCK commands themselves.

### **ARQ**

To make a two way call to another radio telex station, set the radio to the appropriate channel and check that it is not in use. Bring the TOR-2 PC to **COMMAND** mode by pressing **ESC**, then enter the command word **ARQ**, followed by a space and the selcal code of the station you are calling. This selcal code can be in any of the following formats:-

<b>four digits</b>	coast radio stations
<b>five digits</b>	ships and land mobile stations

<b>nine digits</b>	stations using the latest CCIR 625 equipment
<b>four letters</b>	radio amateurs and some point-to-point networks

Note that the ARQ command will start to call immediately, without checking for the presence of a channel free signal. If operation is on a channel which is shared with some other activity, the operator must check by listening to the receiver loudspeaker so that interference will not be caused to other stations. The ARQ command would normally only be used to call other ships on a ship to ship channel, or if the TOR-2 PC was in use at a coast station to call a ship. If the ARQ command is entered by itself with no selcal number, the system will use the default selcal code set by the CALL command.

Whilst the ARQ link is in operation, CONTROL-B may be used to interrupt the other station's transmission. CONTROL-C can be used to pass the transmission to the other station by sending '+?'. CONTROL-D can also be used to close the link.

When using the AUTOCOM program to operate the TOR-2 PC, the ARQ command can be bypassed by selecting the required station from the STATIONS list, then entering **F5** in the COMMS screen. The **+?** sequence can be sent with the **F8** key, and the link can be closed with **F7**.

## ACF

The ACF command is identical to the ARQ command except that the call always waits for the *Free Channel* signal before calling. Certain stations insist that calls be made using the *Free Channel* function in order to prevent accidental interference. Some also use a two letter code to identify particular stations. If you know that a particular station adopts this procedure and you know the two letter code, then add this

code (preceded by a /) before the selcal code, for example **ACF /BR 3220** .

When the ACF command has been started, it will wait for up to 30 seconds for a channel free signal before abandoning the call. This 30 second period can optionally be modified by adding a number after the two letter code. This determines the number of signal cycles in the wait period. Each signal cycle is of 0.45 seconds duration. For example, the number 32 will set a 15 second period. When used by the AUTOTLX feature in the AUTOCOM program, the ACF command is used in conjunction with the FREQUENCY command to search quickly for a free channel.

As with the ARQ command, the ACF command can be bypassed by selecting the station from the STATIONS database. If the selected entry shows a Y or a two-letter code in the FC column, pressing the F5 key will automatically send the correct ACF command to the TOR-2 PC.

## **ANSWERBACK**

This command - followed by a space and a text string of up to 30 characters - sets the answerback message which the unit will send in response to a *Who are you* code from a distant station operating in ARQ mode. If ANSWERBACK is entered by itself, the operator is prompted to enter an answerback string. If another ENTER is keyed, the answerback function in the modem is disabled. However, if the ANSWERBACK= setting in the AUTOCOM program has been used, the program will give the answerback message. The answerback would normally only need to be set once when the system was installed.

## **BROADCAST**

To enable reception of broadcast (FEC and SELFEC) messages, enter the command BROADCAST 1. To disable this facility, enter BROADCAST 0.

## CALL

To set the TOR-2 PC to remember an often-used selcal code (for example, the selcal code of the other end of a two station link), enter the command **CALL** followed by a space, the desired selcal, and **ENTER**. Subsequently the ARQ command can be entered without the selcal code, and the stored selcal will be used.

## CFT

To enable the transmission of *Channel Free* signals by the TOR-2 PC when in standby mode, enter **CFT 1**. This feature would normally only be enabled if the system is installed at a coast station, and in any case should never be used if the system is operating on a single-frequency channel shared with other stations. **CFT 0** will disable this feature.

## CFM

When a TOR-2 PC is to be used at a coast station required to emit a *channel free* signal whilst in STANDBY mode, it can also transmit a morse code identification. To set this identification message, enter **CFM** followed by a space and the callsign sequence, ending with **ENTER**. To cancel this, enter **CFM** followed immediately by **ENTER**. This feature would normally only be used when the TOR-2 PC was installed at a coast station operating on a paired frequency channel.

## CYR

To enable the TOR-2 PC to operate with the Cyrillic language extension of the TELEX character-set, the command **CYR 1** should be entered. If the system will not be used in such a system, then **CYR 0** should be set.

## DELAY

To set the transmitter PTT delay, enter **DEL (space) (two digit number) (enter)**. This is an installation setting only, and

is included to enable the TOR-2 PC to match the characteristics of a particular radio transceiver in order to give the best performance. Special equipment may be needed to set this accurately. Further details are given in the WORKSHOP TESTS section.

## DISPLAY

This will cause a printout of all the current internal parameters of the TOR-2 PC.

## ECHO

Follow this command with (**space**) (**0 or 1**) to disable/enable the local terminal echo

facility. When used with the AUTOCOM program, ECHO should be set to 1. Some

other programs which could drive the TOR-2 PC modem directly, may require **ECHO 0**.

## ERROR

This parameter sets the ASCII control-code which the TOR-2 PC will send to the computer in the event that it receives a corrupted character from the radio link.

Follow this command with (**space**) (**A-Z letter**) to set the error replacement code to the control-code corresponding to the letter entered. When used with the AUTOCOM program, ERROR should be left at the default setting of Z.

## FEC

This command initiates an FEC broadcast. **Control-D** (or **F7**) will terminate the transmission.

## FREQUENCY

This command operates with a radio fitted with a remote frequency

control to change the receive and transmit frequencies. The format of the command is **FRE rrrrrrttttt** where **rrrrrr** is a six digit number representing the receiver frequency, and **tttttt** is the corresponding transmit frequency. The first digit in each 6 digit group is the 10Mhz digit and the last is the 100Hz digit. For example: To switch the radio to receive on 1741.5 kHz and transmit on 12.345 Mhz, enter:-

### **FRE 017415123450**

This command would not normally be used manually. It is used by the automatic procedures within the AUTOCOM program.

### **IDENT**

Follow this with a selcal code to set the selcal to which the unit will respond in ARQ (and SELFEC) mode. This number may be in the form of a 4 or 5 digit number, a 4 letter code, or a 9 digit number. To cater for the change over between the older 4/5 symbol selcal codes and the newer 9 digit numbers, the **IDENT** command can be entered twice: Once with a 4/5 symbol selcal and once with a nine digit selcal. The TOR-2 PC will then respond to calls on either the 4/5 symbol or 9 digit selcal code. This command may have been locked on installation

### **LFA**

This command (line feed add) enables the TOR-2 PC to add a LINEFEED code after every RETURN (enter) code sent over the radio link. This caters for some keyboards which do not have a separate LINEFEED key. To enable this feature, enter **LFA 1**, and to disable it, enter **LFA 0**. When operating with the AUTOCOM program, LFA should be set to 0.

### **LOCK**

This command, followed by any command word will lock that command so that it can no longer be accessed by the user. An installer may wish to do this to prevent the operator from



changing some of the parameter settings, such as the IDENT and ANSWERBACK parameters. The LOCK command itself can be locked but be aware that if the UNLOCK command is also locked, the locked commands will NEVER be accessible again without a special tool. *Contact the supplier of your TOR-2 PC card if you need to unlock a locked TOR-2 PC card.*

## **MENU**

This command displays a list of all the commands that are available. Commands that have been locked will not appear in this list.

## **MONITOR**

This command initiates the ARQ Monitor mode, in which an ARQ link between two other stations can be displayed on the screen. This would normally only be used for diagnostic purposes. You can press **Control-B** if the TOR-2 PC loses synchronisation with the monitored signal. Exit this mode with **ESCAPE**.

## **NEWLINE**

Follow this with 0 or 1 to disable/enable the auto newline function. This will cause the TOR-2 PC to format manually entered text into conventional lines without the use of the ENTER key. When used with the AUTOCOM program this should be set to 0, as AUTOCOM has it's own NEWLINE feature.

## **OVER**

Follow this by 0 or 1 to disable/enable the response to a +? sequence received from the distant station when in ARQ contact. This should be set to 1 for all normal operation. For transmission of some kinds of encrypted messages the OVER parameter can be set to 0. In this case it must be the responsibility of the encryption equipment to control the direction of transmission by means of the control-B code.

## **POLARITY**

To reverse the keying polarity of the received and transmitted signals, for example if a radio operating on lower sideband is to be used instead of the normal upper-sideband, enter **POL 1 1**. The normal (USB) setting is **POL 0 0**. The first digit refers to the receiver polarity and the second to the transmitter, so that it is possible to set the two polarities differently. If the radio is a conventional upper-sideband radio, POL should be set to 0 0.

## **RADIO**

This parameter determines which protocol (if any) is used to send FREQUENCY and SCAN commands to the radio. The default is **RADIO 0**, meaning that no remote controlled radio is fitted. Other values of the RADIO parameter define protocols for radios of various types. To see a list of all the supported types, enter **RADIO ?** If the TOR-2 PC is left at **RADIO 0**, the FREQUENCY and SCAN commands will not work.

## **RESET**

This command causes the parameter settings stored in the permanent memory of the TOR-2 PC to be recalled - overriding any temporary changes that may have been made to these settings since the last SAVE. The RESET command is carried out automatically as the TOR-2 PC is switched on.

## **REPHASE**

When the TOR-2 PC is linked to a distant station in ARQ mode, it will attempt to re-establish the link if the transmission has been corrupted for more than 15 seconds. This is the internationally accepted practice, but certain coast stations insist that ships calling them should not do this, but abandon the link and start a new call. The REPHASE parameter should normally be set to 1, but may be set to 0 to disable the rephasing process if required - for example, when working MARITEX stations.

## RTY

To receive radioteletype signals, enter the RTY command, optionally followed by the desired Baud rate entered as a two digit number. Entering **00** will receive at 100 bauds, and entering **RTY** by itself will receive at 50 Bauds. Note that there is no error-correction in this mode of reception. Errors may appear, and some spurious characters may appear in messages when no signal is present in the receiver. Press **ESC** to leave this mode. The TOR-2 PC is designed to receive only transmissions with an FSK shift of 170Hz. Reception of some radioteletype broadcasts which use 400Hz or 850Hz shift is not possible.

## SCAN

This is a multi-function command to set the TOR-2 PC to scan up to 10 different frequencies for incoming calls. It is an alternative to the STANDBY mode where calls are expected on a single frequency. Entering the command:-

### SCAN ?

will show a list of the current scan channels. At switch on these will all be empty. To set one of the channels, enter SCAN followed by the chosen channel number (0-9), followed by the same 12 digit sequence as used in the FREQUENCY command. Any existing frequency for that channel will be overwritten. To delete a chosen scan channel, enter **SCAN**, followed by the chosen channel number, followed by **ENTER**.

To start the SCAN STANDBY process, enter **SCAN** by itself. Note that if no scan channels have been set up since the TOR-2 PC was switched on, a warning message will be displayed and the TOR-2 PC will return to command mode. It will not normally be necessary to use this command if the TOR-2 PC is driven by the AUTOCOM program. The SCAN functions are better handled by using **Alt-F7**.

## SCD

The SCan Delay command sets the interval, in seconds, between each channel step while the TOR-2 PC is in SCANNING STANDBY mode. For all normal scanning, the default value of 3 seconds should be sufficient.

## STANDBY

This command causes the TOR--2 PC to enter Standby mode so that it can receive calls and broadcasts. The Standby mode is automatically entered on power up. In the AUTOCOM program, the **F7** key is a shortcut to this command. So long as the TOR-2 PC has been left in STANDBY or SCAN mode, the AUTOCOM program can be closed with the **F10** key and the TOR-2 PC will continue to operate and receive any calls or broadcasts. These can be read by running AUTOCOM again.

## SAVE

All current parameters are saved in non volatile memory. This operation takes several seconds, during which a SAVING PARAMETERS message will be displayed. It is important not to key ESC or switch off the power to the computer while this is taking place, or corruption of the saved parameters may occur.

## SELFEC

This command initiates a SELFEC transmission. If no selcal code is appended, the unit uses the selcal code which was set using the CALL command.

## TEST

Follow this by a number from 0 to 5 to implement test facilities as follows:-

**0** By linking the audio output to the audio input on the 9 pin connector, the TOR-2 PC will indicate the correct setting of the RV2 receive centre frequency adjustment. The computer screen will show a continuously updated hexadecimal number

showing the current setting of RV2. The correct centre frequency is represented by a display of either FF or 00. If a reading less than F8 or more than 07 is seen, the computer should be operated with the case removed and TEST 0 should be run whilst adjusting RV2 for the FF/00 reading.

**1** TEST 1 causes the TOR-2 PC to transmit a steady tone on 1615 Hz. This would normally only be needed for workshop tests to set up the transmit audio output level.

**2** TEST 2 causes the TOR-2 PC to transmit a steady tone on 1785 Hz. This would normally only be needed for workshop tests to set up the transmit audio output level.

**3** Not used.

**4** The internal RAM is tested and the result is displayed.

**5** The ROM is checked and its checksum is displayed.

## THR

The THReshold command sets the amount of noise and interference that will be accepted on the received signal in ARQ mode without requesting a repeat. The values can be between 1 and 5. With a high value, the received signal will be accepted in spite of a large amount of interference - but there is a risk that the text may be corrupted. With a low value, only a small amount of interference will be tolerated. In this case, the transmission may be slower, but the risk of corruption is much less. The recommended default value is 4. A value of 0 disables the feature. This gives the fastest transmission speed, but the level of corruption is limited only by the parity check in the ARQ protocol.

## TTY

To make a radioteletype broadcast, enter TTY, followed optionally by a two-digit number for the Baud rate. Enter **TTY 00** to transmit at 100 baud. Entering **TTY** by itself will transmit at 50 Bauds. Text entered at the keyboard will be transmitted. Press **ESC** to end the transmission,

but first make sure that the TOR-2 PC has transmitted the complete message.

## **UNLOCK**

If certain commands have been locked with the LOCK command to prevent them from being used, they can be unlocked with this command. Enter **UNLOCK** followed by the name of the command to be unlocked. Note that if the UNLOCK command has itself been locked, it will not be possible to unlock any locked commands without a special tool. Contact your TOR-2 PC supplier if you need to do this.

## **XFLOW**

Follow by 0 or 1 to disable/enable the XON/XOFF interface protocol between the TOR-2 PC board and the computer. When used with the AUTOCOM program this should normally be set to 1.

## **CONTROL CODES**

Unlike the COMMAND words, which always operate from Command mode (reached by means of the ESCAPE key), these functions are used within the active modes of the TOR-2 PC. They are normally executed by holding down the CONTROL key on the terminal keyboard and then keying a letter. In the descriptions that follow, a control key is denoted by the ^ symbol. For example, **^B** means *hold down the control key and then press the B key*. Like the modem commands, these control codes will not be needed by the average user.

### **DELETE (Rubout)**

Whilst receiving TOR text, sending a DEL control-code to the TOR-2 PC will restore

letter-shift to the incoming text, if it has become corrupted during FEC, RTTY or MONITOR reception. In Command mode, the DEL code performs a backspace function. When using the AUTOCOM program, the keyboard **BACKSPACE** key is used to send this code to the TOR-2 PC.

**^B**

In ARQ operation, ^B can be used to break into the other station's transmission. In MONITOR mode, ^B causes re-synchronisation to occur. In the AUTOCOM program this function is carried out by the **F8** key.

#### **^C**

In ARQ operation, ^C sends the **+?** sequence over the radio link to change the link direction from sending to receiving. In the AUTOCOM program, this function is carried out by the **F8** key.

#### **^D**

This control code terminates an ARQ contact or ends an FEC or SELFEC transmission. In the AUTOCOM program the **F7** key is a shortcut to this code.

#### **^E**

Causes the TOR-2 PC to send a special code containing information about the mode and status of the unit to the terminal. See the ADVANCED OPERATION section for further details.

#### **^G**

Causes a BELL code to be sent over the radio. An asterisk character is echoed to the terminal. A BELL code can also be sent by pressing the asterisk key.

#### **^H**

The station answerback message is sent to the distant station as if a WRU signal had been sent by the distant station. In the AUTOCOM program this function is provided by the **Alt-F6** key

#### **^L**

Toggles the local echo function, i.e. turns it off if it was on, and vice versa. This code would normally only be sent to the TOR-2 PC by a computer program.

#### **^N**

Toggles the NEWLINE function, i.e. turns it off if it was on and vice-versa. This code would normally only be sent to the TOR-2 PC by a computer program.

#### **^Q**

If the XON/XOFF function is on, this code turns on the text output from the TOR-2 PC to the terminal. This code would normally only be sent to the TOR-2 PC by a computer program.

#### **^S**

If the XON/XOFF function is on, this code turns off the text output from the TOR-2 PC to the terminal. This code would normally only be sent to the TOR-2 PC by a computer program.

#### **^X**

In any transmission mode, this code will clear any un-sent text from the transmit buffer store and cancel the effect of any ^B, ^C, or ^D keys previously sent.

#### **ESC**

This control code will unconditionally stop any activity and return the TOR-2 PC to COMMAND mode with the transmitter off.

The **ESC** key should not normally be used to end an on-air link.



## Troubleshooting

This section gives some hints to assist in localising problems to one part of the system in order to minimise uncertainty about the cause of a malfunction.

First confirm that the radio is working by trying to make contact with a distant station on voice (SSB) mode. Also confirm that the computer is working by running some other known program. If the COMMS screen status display is showing **\*\*\*MODEM FAULT\*\*\***, then first try switching the computer off and on again. If the fault clears, then the problem may have been due to a short interruption of the computer power supply or an interaction between the AUTOCOM program and some other program that you have been running on the computer. If the COMMS screen still shows **\*\*\*FAULT\*\*\*** then it will be necessary to remove the case of the computer to check that the TOR-2 PC is secure in it's slot. Try fitting it in another slot if you suspect contact problems.

If you cannot make contact with a distant station on ARQ, first check that the system is able to receive RTTY or FEC broadcasts and separately check that the transmitter radiates power when the FEC command is entered (on an unused frequency). These checks will help to establish which part of the system is faulty.

### WORKSHOP TESTS

Although the TOR-2 PC has been accurately set up in the factory and should need no re-adjustment in service apart from the settings described in the installation section of the manual, details are given below of the method of setting the remaining internal adjustments of the TOR-2 PC, should this become necessary. To perform these tests the case of the computer should be removed to gain access to the TOR-2 PC. In some computers a special card extender may be needed to gain access to all the adjustments needed.

### CRYSTAL TIMER

With the aid of a six-digit counter, adjust the crystal trimmer C2 until the signal at pin 40 of processor chip U2 reads 1228.800 kHz. Pin 40 is the pin nearest to the corner of the board. This adjustment should

be made to an accuracy of 30 ppm or better. If no counter is available, this trimmer should be set to the centre of its travel in an emergency.

## **DEMODULATOR FREQUENCY**

Enter command "TEST 0" and link pin 1 to pin 3, and pin 2 to pin 4 of the 9 pin connector. Adjust RV2 until the computer screen display shows 00 or FF.

## **RECEIVER AUDIO LEVEL**

The RV3 receiver level trimmer is set to maximum sensitivity at the factory, and

should not normally need to be adjusted. However, if the output level of the receiver is above 1 volt rms, there may be some reduction in performance. In this case, RV3 can be adjusted until the signal level at TP2 is between 10mV and 1 Volt rms.

## **TRANSMITTER AUDIO LEVEL**

The setting of RV1 has already been described in the installation adjustment. If

possible, this should be performed in the workshop prior to final installation of the radio and the TOR-2 PC. Adjust RV1 (with the transmitter connected to a dummy load and the TOR-2 PC transmitting FEC), to the point where the nominal power output of the transmitter is just reached, with the ALC circuitry just starting to operate.

## **TOR-2 PC DELAY SETTING**

Although not part of the TOR-2 PC alignment, the adjustment of the TOR-2 PC DELAY parameter may be required if the receive to transmit switching time of the radio is slower than the default figure of 25 to which the TOR-2 PC is set at the factory, or if ARQ links are required at extreme range (approaching 25,000 Km).

An oscilloscope is required, connected to monitor the RF power output of the transmitter while connected to a dummy load with the timebase set to 10mS/division and the timebase triggered from the negative

going edge of the transmit key signal on terminal 13. Set the TOR-2 PC making an ARQ call, and note the time interval, in mS, between the falling edge of the transmit-key signal and the point at which the transmitter power reaches it's full amplitude. Set the DELAY parameter to 1.2-times this figure and use the SAVE command to store it.

## MARITEX OPERATION

The MARITEX operations centre has approved the use of the TOR-2 PC and AUTOCOM program for use in the world-wide MARITEX network. In order to guarantee optimum performance when working with MARITEX, the MARITEX centre requires that certain parameters in the TOR-2 PC and AUTOCOM program should remain set to specific values. If the TOR-2 PC/AUTOCOM system was obtained specifically for MARITEX operation, the required settings may already be in place. This section shows which settings are important for MARITEX so that they can be checked. Alteration of these settings may invalidate the MARITEX approval of the equipment.

## TOR-2 PC SETTINGS

The TOR-2 PC settings can be checked by pressing **ESC** in the COMMS screen and entering the **DISPLAY** command. Check that the following commands are as shown:

REP 0	Ensures that no re-phase attempt is made during an ARQ link.
RAD	Only MARITEX-approved radios are permitted.
SCD 3	Sets the channel dwell time when scanning for incoming calls.
ANS	The answerback must be disabled in the modem and the AUTOCOM answerback setting used instead.

## **AUTOCOM.CFG SETTINGS**

In the AUTOCOM.CFG file, the following lines must appear:

AUTOTLX=1	Sets 1 minute repeat attempts for AUTOTLX calls.
LOGGING=ON	Ensures that received messages are always copied to disk.
SCREENSAVE=10	Choose any convenient value but not zero.
SCAN=xx	Set to any of the MARITEX*.SCN filenames.
ANSWERBACK=nn	Set to the ships answer back message .

### **\*.SCN FILES**

Either use the MARITEX.SCN, MARITEX1.SCN, MARITEX2.SCN or MARITEX3.SCN files, depending on the ITU region in which the ship is sailing. If you wish to add additional frequencies to scan for incoming calls from other stations, do so by adding those additional frequencies to a renamed version of a MARITEX\*.SCN file.

### **\*.STN files**

Only the MARITEX\*.STN files should be used for working MARITEX. Do not modify these files.

The MARITEX operations centre points out that the full performance available from the MARITEX network will only be available if all incoming and outgoing messages are handled by MARITEX. If messages are scheduled for sending to other coast-stations or if the system is set to scan channels of other coast-stations, there may be delays in the transmission and reception of MARITEX messages.

## **MANUAL CALLS TO MARITEX**

The MARITEX centre requests that subscribers should use the manual call feature in the AUTOTLX screen to make calls to MARITEX in order to access the non-AUTOTLX commands. This is

preferable to selecting a MARITEX station from the STATIONS database and using the F5 (CALL) key from the COMMS screen. This makes best use of the automatic systems, both at the MARITEX coast station and in the AUTOCOM program.

Please note that if a MARITEX station is calling you at the same time as you are trying to make an outgoing manual call, the incoming call will take priority and the manual call will be cancelled.

## **Advanced operation**

This section is intended for those users or system suppliers who may wish to enhance the operation of their radio telex system by adding additional software to their own computer programs.

### **ERROR REPLACEMENT**

In FEC, SELFEC, RTY, and MONITOR modes, the TOR-2 PC may be unable to decode the correct character code. In this case it sends a control code to the terminal. This control code is set to ^Z by default, but can be changed by means of the ERROR command as described in the COMMANDS section. The advanced user may wish to either ignore this error *replacement code*, or detect it and replace it with a characteristic symbol to show the presence of an error. In the AUTOCOM program, the \_ symbol is used.

### **STATUS BYTE**

Whenever the status of the TOR-2 PC changes, or whenever the computer sends a ^E code to the TOR-2 PC, it will send back to the computer a ^E code followed by a byte containing information about the status of TOR-2 PC operation. The AUTOCOM program uses this information to display the status on the COMMS screen. The advanced user may wish to make use of this feature in his own software. This status byte is made up in the following way:-

Bits 0-2 reflect the status of the connection in progress:

BIT	2 1 0	Link Condition
	0 0 0	received error
	0 0 1	repeat request received
	0 1 0	text transmission in progress
	0 1 1	link idling
	1 0 0	change of direction in progress
	1 0 1	link synchronising
	1 1 0	not used
	1 1 1	no link established

Bit 3 indicates the direction of transmission, 0 is receiving, 1 is transmitting.

Bits 4-6 indicate which mode is in operation

Bit:	6 5 4	mode
	0 0 0	command
	0 0 1	standby
	0 1 0	ARQ
	0 1 1	FEC
	1 0 0	SELFEC
	1 0 1	monitor
	1 1 0	test mode
	1 1 1	RTY/TTY

Bit 7 is always 1

## **X-on/X-off PROTOCOL**

The TOR-2 PC implements the standard X-on/X-off protocol for controlling the flow of text between itself and the terminal. The AUTOCOM program implements the same protocol. Any program which may send long messages to the TOR-2 PC, or which may be unable, at times, to process text from the TOR-2 PC, should implement this protocol in order to prevent loss of text. Note that if an X-off code has been sent to the TOR-2 PC while in the STANDBY condition, and a message is then received (whether a broadcast reception or an ARQ call), this message will remain in a 4,000 character buffer within the TOR-2 PC, and status will show *STANDBY MESSAGE WAITING*. This feature could be used by a program to prevent loss of incoming text during long periods when the program is not able to receive data from the TOR-2 PC. Sending an X-off code to the TOR-2 PC will restore the traffic flow.

# CIRCUIT DESCRIPTION

Refer to circuit diagram VS1085 sheets 1 and 2

## GENERAL

The TOR-2 PC is a low data rate FSK data modem for radio-telex operation on HF radio circuits. It plugs into a standard IBM PC card slot and has a DB9 connector which carries the following connections to the HF radio transceiver:

Audio input from the radio receiver. 600 ohm balanced line. Centre frequency 1700Hz

Audio output to the radio transmitter. 600 ohm balanced line.

Centre frequency 1700Hz

RS232 serial port input output, to the radio for remote frequency control.

Output to transmitter keying line (PTT)

Output to external call alarm circuit.

The TOR-2 PC derives its power supplies, at +5v and +/-12v, from the PC, and interfaces to the PC as a conventional serial port. The TOR-2 PC can be configured to operate as COM1, COM2, COM3, or COM4 with IRQ lines 2, 3, 4, 5, 7, 10, 11, 12, 14, or 15, selected by means of on-board jumper links.

## Circuit Description

The audio input from the HF receiver enters the board via the DB9 connector P2 and feeds the input level pre-set via balance transformer T2. Operational amplifiers U19 and U14 form a bandpass filter centred on 1700Hz with a bandwidth of 300Hz. These feed a limiter stage U12A which delivers a clipped waveform to FM demodulator U9. This chip is a phase lock loop circuit, with its centre frequency adjustable by RV2 to 1700Hz. The demodulated output from pin 11 is filtered by operational amplifier U11B which feeds into the data slicer on pin 8. The demodulated digital data is then taken from pin 7 of U9, to the



P20 input of the main CPU. A diode D1 onto pin 10 of U9 ensures that the P20 pin of the CPU is held low during reset. This is a requirement for correct operation of the CPU.

Crystal oscillator Q1 provides the clock signal for the CPU and the main timing for the modem. C2 permits this oscillator to be adjusted precisely to the correct frequency.

The CPU, U2, is an 8 bit processor with an 8 bit port (P10-P17) and a 5 bit port (P20-P24). A 32k RAM, U6 and 32k EPROM, U5, are connected to the data/address bus, which are multiplexed to the CPU by U3. A non-volatile memory chip with serial in/out, U7, is connected to P15 and P16.

Serial data from the CPU P21 pin for transmission over the radio link is fed to U4, a programmable divider clocked by crystal oscillator Q2. U4 divides by 19 or 21 depending on the state of P21, and the output of U4 is further divided by 128 in U8, to give signals of 1785 or 1615Hz. This square wave audio tone signal is AC coupled to the output level pre-set RV1, and from there to an analogue gate U10. In this gate, the P14 signal from the processor provides the on/off keying to determine whether the tone is present at the output or is muted. Operational amplifiers U12A and U12B form a bandpass filter which serves the dual purpose of removing the harmonics of the squarewave and of controlling the rise and fall times of the on/off keying. The filtered output of U12B goes to the output transformer and from there to the DB9 socket.

The remaining circuitry on sheet 1 of the circuit diagram consists of the RS232 output from P17 via U16B to the DB9 socket for the radio remote control, the RS232 input from the radio via Q4 to P10, the PTT line from P22 via Q3, and the alarm output via U16A.

Sheet 2 of the circuit diagram shows the interface to the IBM PC card connector. The serial port chip U17 is connected to the PC data bus via buffer U18, and derives its address decoding from the PC address bus via programmable logic array U13 and the jumper links JP7 and JP8. The serial port chip uses a self contained oscillator U15.