



RDS2 RDS Encoder



Technical manual

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I - Introduction

1.0 Introduction to RDS

The Radio Data System (RDS) is a non-audible 57 kHz sub carrier that is broadcast in commercial FM systems allowing text, program, data, control and other information to be sent to RDS enabled FM receivers. RDS data is sent in pre-defined groups with each group able to contain particular RDS information packets.

The most popular and most visible use of RDS is transmitting the broadcaster's Program Station Name (PSN) to be visible on the display of RDS enabled receivers. RDS can also be used for many more purposes like traffic management channels (TMC) or automated frequency switching to provide a continuous clear signal at different geographical locations in a single broadcaster's network (AF).

The BW RDS2 is a low cost stand-alone RDS encoder that allows small or large broadcasters to implement any of the following RDS functions:

PI	Program Identification	DI	Decoder Identification
PSN	Program Station Name	PIN	Program Item Number
TP	Traffic Program	TDC	Traffic Data Channel
TA	Traffic Announcement	IH	In-House Application
PTY	Program Type	EON	Enhanced Other Networks
AF	Alternative Frequencies	PTYN	Program Type Name
RT	Radio Text	ECC	Extended Country Code
CT	Clock Time	LI	Linkage Identifier
MS	Music/Speech	TMC	Traffic Management Channel

1.1 BW RDS2 Equipment

The following items are shipped with the BW RDS2 unit,

1. RDS2 1U rack RDS Encoder.
2. Mains IEC lead
3. DB9 Serial lead (9 Pin IBM PC compatible).
4. BW Software CD.
5. Instruction manual

All equipment should be unpacked and checked before any attempt is made to setup the equipment. Please contact Broadcast Warehouse immediately if any equipment appears to be damaged or missing.

1.2 RDS2 Connections and Indicators

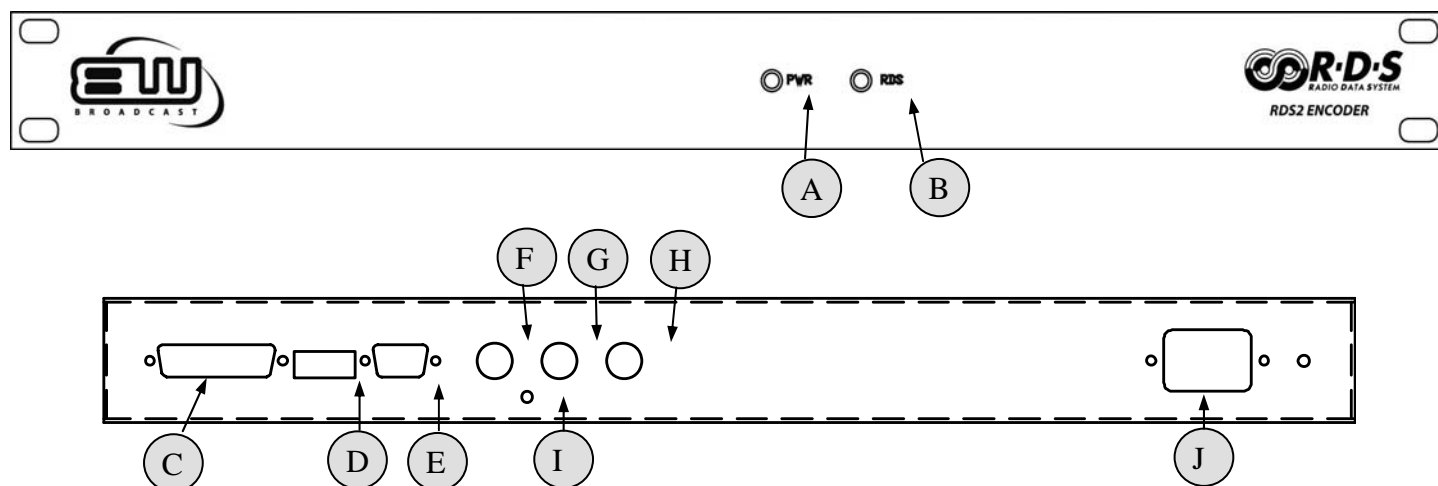


Figure 1.1 Front and Back view of BW RDS2 unit.

Front

- A. Power indicator
- B. RDS Signal indicator

Back

- C. 25Way D-Type connector marked 'Control'. – Pinout details in Appendix A
- D. Block of 8 DIP switches marked Settings. – Switch settings explained in Appendix B.
- E. 9Way D-Type connector marked RS232. – for connection to a PC
- F. RDS/MPX OUT BNC connector – Output RDS signal mixed with any input MPX signal
- G. MPX IN. BNC connector – MPX input for use in Loop-Through mode
- H. 19KHz REF IN. BNC connector – Reference 19kHz Pilot tone if no MPX signal is present
- I. RDS output level control (CW reduces level, CCW increases level)
- J. Mains IEC Socket

II - Installation and Setup

Caution:

To make sure no invalid information is broadcast, the RDS2 should be fully configured before being commissioned in a broadcast system.

2.0 Installing the BW RDS2 Configuration Software

The software application provided by BW for use with the RDS2 encoder unit allows easy configuration of the most used features of the RDS2 encoder (PI, PTY, MS, AF, TA, TP, DI, CT, PSN, RT). Alternative software is available for programming the more complicated RDS features. Please contact BW for more information.

The software for the BW RDS2 is supplied on the CD-ROM shipped with the unit and is designed to run under Microsoft Windows (9x/NT/2000/XP). This is also available for download from the BW website,

<http://www.broadcastwarehouse.com/downloads/BW%20RDS2.zip>

If you are downloading the software from the BW site you will need to unzip the downloaded file before installing it.

To install the software simply navigate to the 'BW RDS2' folder and double click on the "setup" icon. Follow the steps indicated to complete the installation.

2.1 Connecting the BW RDS2 to a PC

Once the software has been installed, connect the supplied serial lead between the 9Way D-Type connector marked 'RS232' on the back BW RDS unit and an available serial port on your PC or laptop.

Note:

Currently the RDS2 does not support USB connections. If you require a USB connection you will find USB to DB9 serial converters from online computer stores.

For initial connection testing, all dip switches on the back of the unit (Fig 1.1: Point 'D') should be set UP except the last unit switch which should be set DOWN. This will set the communication baud rate to 9600.

Start the BW RDS2 software (Start -> All Programs -> BW RDS2 -> BW RDS2). You should see the main software window (see figure 2.3).

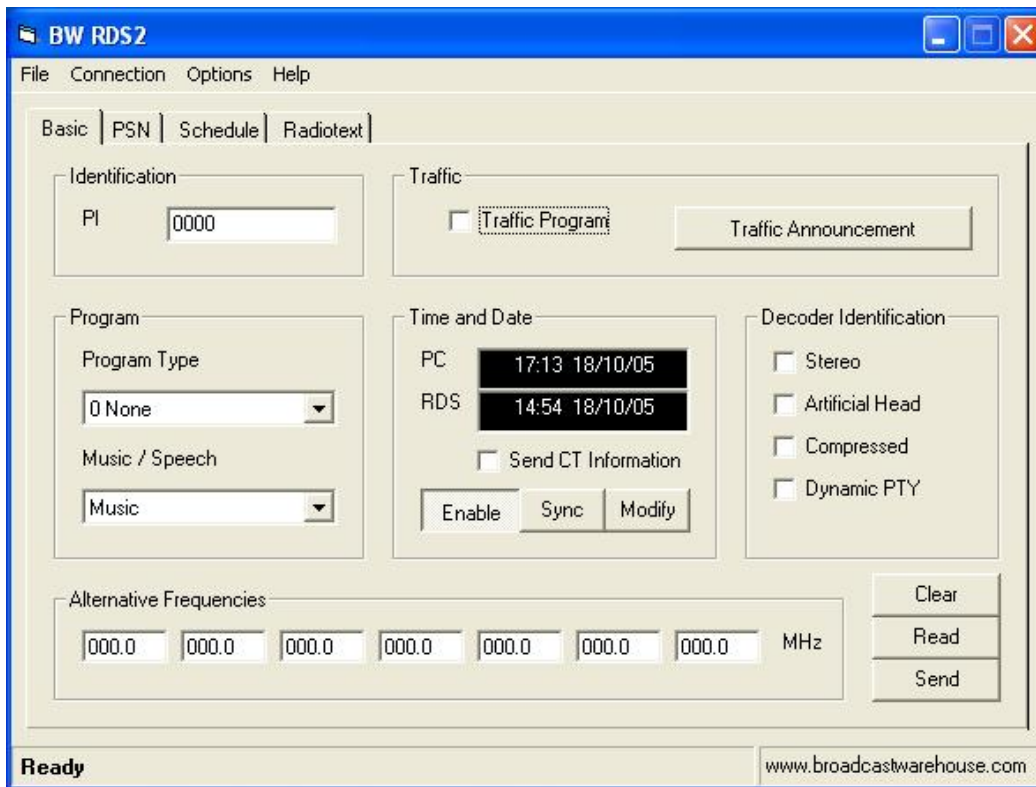


Figure 2.1 BW RDS2 Software Startup - Basic Configuration window

To configure the software to communicate to the BW RDS2 unit open the ‘Options’ drop down menu (Alt-O), then select the correct Serial Communications Port number (Com1, 2, 3, 4) and set the default baud rate to 9600.

Once the communications settings are correct, click on the READ button in the bottom right hand side of the screen. If the connection is setup correctly you will see the status message at the bottom of the window change from **Ready** to **Working** and progress chevrons displayed.

Once this is complete the screen will be filled with information that has been read from the RDS2 unit and the status message will change back to **Ready**. Your unit is now correctly connected and ready for programming.

If the communications settings are not correct you will see the message “Unable to communicate with RDS Module” (see Figure 2.4). The software application has not been able to connect to the RDS2 unit through the serial port. Check the selected Com port in the ‘Options’ drop down menu is correct and try again. If you continue to have problems close down all applications, check the serial cable and port settings and restart the BW RDS2 software.



Figure 2.4 BW RDS2 Software Failed Communications sub window.

III - Programming the BW RDS2

3.1 BW RDS2 Software

The software supplied with the BW RDS2 has been designed to provide the user with a simple way of configuring the most commonly used functions on the RDS2 - (PI, PTY, MS, AF, TA, TP, DI, CT, PSN, RT). Most of these can be configured in the 'Basic' configuration screen which is the first screen visible after loading the software. Two extra configuration screens are dedicated to storing text and scheduling information for PSN settings (PSN, Schedule) and one configuration screen is dedicated to Radiotext (RT).

When the software is run it opens a window as shown in Figure 3.1.

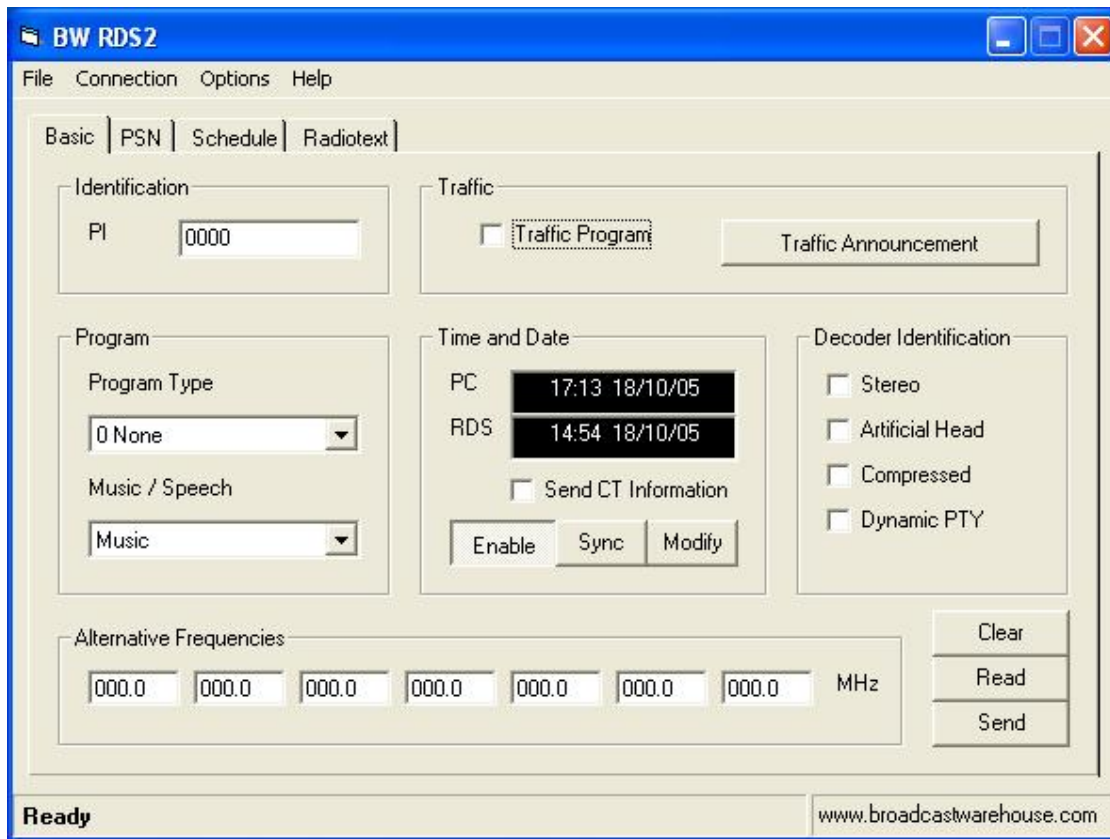


Figure 3.1 BW RDS2 Software Basic Configuration Window.

The main program window has four pull down menus always present for configuring program based settings.

File Menu

This menu allows operations for saving and loading configuration files (.BWR). Configuration files store or load all information except clock time and date. The BW RDS2 Software Application has its own custom file format for storing the data from the various fields and checkboxes on the screens. These files have the .BWR file extension and are generally stored in the “BW RDS2” folder in the main “Program Files” folder.

New	Create a new configuration file. This will reset all settings on screen to allow a new configuration to be created
Open	Open an existing .BWR file and load it to the screen
Save	Save screen settings to the current .BWR file.
Save As	Save screen settings to a new or alternative .BWR file.
Exit	Exit the application in a controlled fashion.

Connection Menu

This pull down menu enables an operator or user to read in or write out all the controllable settings to the RDS2 Encoder Unit in one operation.

Read All	Retrieve all settings from the RDS2 Encoder unit.
Send All	Send all settings in screen menus to the Encoder unit.

After successfully connecting to an RDS2 unit using the BW RDS2 software it is best to load the current configuration in the RDS2 unit by selecting the ‘Read All’ operation from the ‘Communications > Read All’. This will be your starting point for modifying the RDS2 configuration.

Options Menu

The Options pull down menu (Alt-O) is used to select the serial port and baud rate used to communicate to the BW RDS2 Encoder unit.

You can select communications ports 1-4 and Baud rates of 2400, 4800, 9600 or 19200.

The selected baud rate must match the baud rate setting on the RDS unit. See Section XXX

Help

The Help pull down menu (Alt-H) provides version and contact information

BW Website	Starts up the browser pointing at the BW website.
BW Email	Starts up the email client to the info account at BW.
About	Gives basic information about the version of RDS2.

The next level down from the main menu bar has a tabbed selection field with four configuration screens to select:

1. **Basic** Basic Configuration Screen.
2. **PSN** PSN Configuration Screen.
3. **Schedule** PSN Schedule Configuration Screen.
4. **Radio Text** Radio Text Configuration Screen.

These will be explained in more detail in the following sections.

3.2 Configuration Screen Operations

RDS Settings

Each tabbed configuration screen has a range of settings which are either check boxes, drop down selection boxes or text entry boxes. When the software starts up the values shown in each screen will be the program default values. These values do not reflect any values currently set in the BW RDS2 unit until communication has been established with the unit.

Control Buttons

Each tabbed screen will also have a CLEAR button and two communication buttons; READ and SEND. These control buttons will only affect values in the selected configuration screen.

- Clear Clear (or set to default) the current values in all settings
- Read Update displayed settings with information from the RDS encoder unit.
- Send Send displayed settings to the RDS encoder unit.



The SEND button programs all information shown on the screen into the RDS unit. Until this button is pressed any changes made to the data fields and check boxes are on the screen only.

It is good setup practise to READ back from the RDS unit immediately after the SEND process is complete in order to verify the information that was sent to the unit.

Note:

The SEND button only updates fields on the currently displayed configuration screen. If you wish to update all current RDS encoder settings in the program use the “Send All” option from the Connection drop down menu (Alt-C).

This is most useful after a full range of settings have been loaded from a configuration file.

An operator should remember that the information displayed in the software application is internal to the software application and only represents the data in the RDS2 Encoder unit immediately after a “Read” or “Send” option has been used to communicate with the unit.

If you want to update each item separately during the basic configuration remember to click on the send button after each change. Alternatively make a number of changes and then send the data or use the "Send All" option in the "Connection" pull down menu (Alt-C) when you have finished.

3.3 'Basic' Configuration Screen

On starting the RDS2 software a window will open with the 'Basic' configuration screen. This screen allows the configuration of the most commonly used BW RDS2 functions.

The Basic configuration screen is subdivided into seven areas,

1. Identification (PI)
2. Traffic (TP, TA)
3. Program (PTY, MS)
4. Time and Date (CT)
5. Decoder Identification (DI)
6. Alternative Frequencies (AF)
7. Control buttons CLEAR, READ, SEND

3.3.1 Identification - Program Identification (PI)

What is PI?

The RDS PI number is a four digit hexadecimal code that uniquely identifies a broadcast network. The PI code is usually issued to a broadcast network by the licensing authority responsible for the country or region.

The PI code is an essential part of implementing alternative frequency (AF) switching since an RDS enabled receiver looking for the same radio program being broadcast on an alternative frequency will check the PI code on the alternative frequency to make sure it is the same broadcast network.

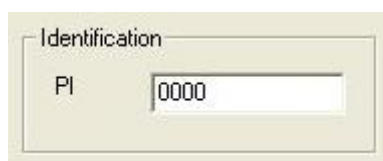
Important:

The PI code should not be left blank or randomly filled with data.

If the BW RDS2 is to be connected to a station that is part of a regional or national chain broadcasting the same programming content then the PI should be the same for all transmitters in the chain.

Setting up your PI code

On the Basic configuration screen enter your assigned Program Identification number into the PI box.



The RDS2 will be programmed with this information next time the SEND button is pressed.

3.3.2 Traffic Announcements (TP, TA)

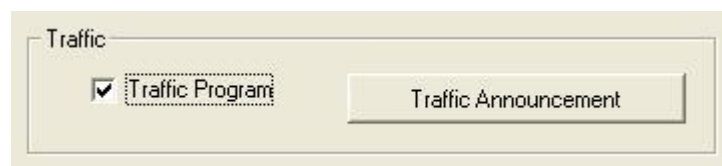
RDS traffic flags allow users with RDS enabled receivers to identify stations that broadcast traffic information. Users can configure their RDS enabled receiver to automatically tune to stations that provide traffic announcements for the duration of the announcement only.

What is TP?

Many car based RDS enabled receivers have an option where the listener can scan for stations that broadcast traffic announcements. A station will indicate they have frequent local or regional traffic information by broadcasting the RDS Traffic Program (TP) flag.

Setting Up TP

In the “Traffic” Section on the Basic configuration page, check the “Traffic Program” box to mark the broadcast as carrying “Traffic Announcements”. The RDS2 will be programmed with this information next time the SEND button is pressed.



What is TA?

For stations already broadcasting the TP flag, shortly before a traffic announcement is about to take place, the Traffic Announcement (TA) flag should also be broadcast. RDS enabled receivers with this feature selected will detect the TA flag and tune the receiver to the station broadcasting the traffic information. When the traffic announcement has finished the TA flag should cease to be broadcast. When the TA flag is no longer broadcast the RDS enabled receiver will return to the previous listening material.

Broadcasting the TA flag

Shortly before a Traffic announcement is made the “Traffic Announcement” button should be clicked on, this automatically sets the TA flag in the RDS output, and the button appears depressed on the screen.

Unlike most settings, the Traffic Announcement button is a ‘Real-Time’ button that results in immediate communication with the RDS unit. Pressing this button will cause the TA flag to be set in the output without having to press the SEND button.



When the traffic announcement is finished the “Traffic Announcement” button should be clicked again so that it is released, and the consumers RDS enabled receiver can revert back to it’s previous in-car entertainment mode.

Note

The BW RDS2 also has the ability to trigger the TA flag using hardware triggers located on the CONTROL port on the back of the unit. See Appendix XXX for more information.

3.3.3 Program Settings

What is Program Type (PTY)?

The PTY setting allows a broadcaster to indicate the format or genre of the material they are broadcasting. Most broadcasters will set this once to indicate their format (i.e. for a Rock Music station) however PTY information can be changed dynamically on a varied content broadcast.

The Program Type (PTY) information can be used by RDS enabled receivers to allow the listener to scan for stations based on their entertainment preference.

PTY NO.	PTY CATEGORIES	PTY NO.	PTY CATEGORIES
0	None/Undefined	16	Weather
1	News	17	Finance
2	Affairs (current)	18	Children (programs)
3	Information	19	Social (affairs)
4	Sport	20	Religion
5	Education	21	Phone-In
6	Drama	22	Travel
7	Culture	23	Leisure
8	Science	24	Jazz (music)
9	Varied	25	Country (music)
10	Pop Music	26	National (music)
11	Rock Music	27	Oldies (music)
12	Easy Music (M.O.R)	28	Folk (music)
13	Light Classics	29	Documentary
14	Serious Classics	30	(Alarm) Test
15	Other Music	31	Alarm

Table 3.1 Program Type (PTY) Numbers and Categories

Setting up PTY

On the 'Basic' configuration screen click on the downwards facing arrow in the "Program Type" box in the "Program" Section and select the appropriate programming content type. It is important to use the correct Program Type as some of the types are reserved for special features such as emergency announcements.



Note

If you will be changing the program type throughout your broadcast, ensure the 'Dynamic PTY' box is checked in the 'Decoder Identification' section of the configuration screen.

The RDS2 will be programmed with this information next time the SEND button is pressed.

What is the Music/Speech setting?

An RDS enabled receiver has two user definable presets that can be set up to give optimum performance when the station carries mainly music or speech. This will be selected based on the MS flag.

Setting up the MS flag

Select the appropriate option in the Music/Speech box.

The RDS2 will be programmed with this information next time the SEND button is pressed.

3.3.4 Time and Date - The RDS2 Internal Clock

The BW RDS2 unit contains an internal clock that is primarily used for triggering the PSN Scheduler (See Scheduler Configuration Page) but can also be used for broadcasting time and date (CT) information.

Clock time and date information is often used by RDS enabled receivers to synchronise their own internal clocks. Because of this, CT information should only be broadcast if the accuracy of the time can be verified.

Setting the Internal clock

The “Time and Date” section on the Basic configuration screen has two time and date display boxes - PC & RDS. The top display box (PC) displays the current time and date on the PC on which the software application is running. The second display box (RDS) shows the time and date when CT information was last read from the BW RDS2 unit. The RDS time shown in this window only changes when the READ button is pressed or the ‘Connection > Read All’ operation is used.



Below these fields are three buttons,

1. **Enable:** This enables the RDS encoder to broadcast clock time information (CT). This button is a ‘Real-Time’ button and does not require the SEND button to be pressed to have an effect.
2. **Sync:** Pressing this button will instantaneously synchronise the two displayed clocks by copying the time and date information from the PC field into the RDS field. It does not copy the information into the BW RDS2 unit until the data is sent by either the SEND button or the “Connection > Send All” operation.
3. **Modify:** This button allows you to manually modify the RDS field date and time information (see Figure 2.4). RDS time is always set as UTC (GMT) time plus or minus an offset to reflect the time zone that the unit is being operated in.

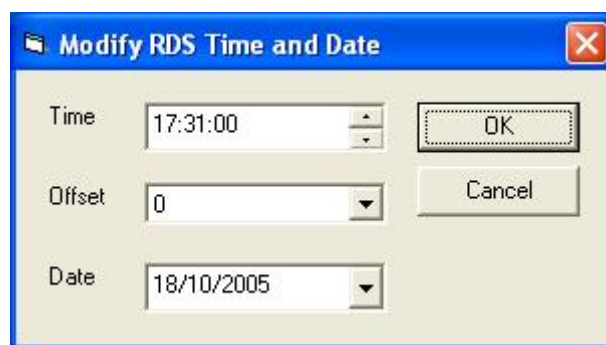


Figure 2.4 BW RDS2 Time & Date modification sub window.

The RDS2 will be programmed with this information next time the SEND button is pressed.

Avoiding Changes to Time and Date

Immediately below the two Time and Date fields is a checkbox “**Send (CT) Information**”. This checkbox controls whether the time and date information indicated on the screen is sent to the RDS encoder when the SEND button is pressed or the ‘Communications > Send All’ operation is activated.

This option has been included to allow users to change settings on the basic configuration page and update them by pressing the SEND button without having to ensure the displayed clock time is accurate before each SEND operation.

If you are changing other information on the screen but don’t want to modify the time in the RDS when you click on the ‘SEND’ button, make sure that the ‘Send CT Information’ checkbox is unchecked.

3.3.5 Decoder Identification (DI) and Dynamic PTY

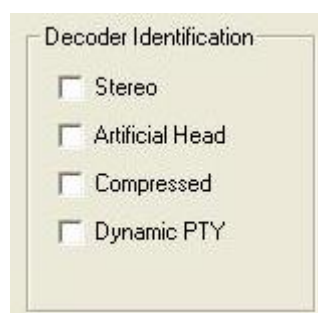
What is DI?

Decoder Identification allows a broadcaster to provide information about the technical format of the material being broadcast. The primary use of the DI signal is to indicate whether the material is broadcast in stereo or mono.

An addendum to the RDS DI signal is ‘Dynamic PTY’. This flag was added to allow stations with varying formats (see PTY section XXX) to identify themselves. RDS enabled receivers are able to continuously monitor PTY information from stations that have the Dynamic PTY flag set and can then make station changes based on updated PTY information. Stations with a fixed PTY will not be continuously monitored.

Configuring your DI settings

For most non specialised small or local broadcast stations with constant programming type the transmission will be either in Stereo or Mono and the Program Type (PTY) information will remain constant. Therefore only the ‘Stereo’ check box would need to be selected.



The Stereo checkbox should be unchecked when mono transmission are sent out as an RDS receiver can switch the audio presets in the receiver to give better quality. This is useful for stations making traffic announcements as it will often improve the audio quality in a vehicle.

For broadcast stations with constant programming type (see Program Type above) the Decoder Identification section has the Dynamic PTY field cleared. However if the broadcast program content changes during the day, and the Program Type (PTY) field is changed accordingly then the Dynamic PTY check box should be checked.

The RDS2 will be programmed with this information next time the SEND button is pressed.

3.3.6 Alternative Frequencies - Broadcast Group Frequency Identification (AF)

What is AF?

If a broadcaster is part of a regional group of stations, RDS Alternative Frequency data can be used to provide information about the frequencies used by other stations broadcasting the same program.

If the signal level drops below a certain threshold on a particular frequency, the RDS enabled receiver can scan through the AF list and automatically tune in to the strongest alternative signal broadcasting the same program

Important:

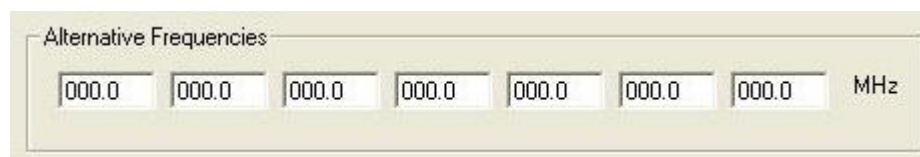
All RDS encoders on these transmitters must have the same Program Identifier (PI) for this to work.

Although the RDS specification allows for up to 25 alternative transmitter frequencies, each transmitter should only have a frequency list that is based on the other transmitters that can be received in its locality. This is to prevent wasted time scanning for stations that cannot be received clearly.

Setting up your AF list

First ensure your PI is set correctly and is the same for the stations you will include in your AF list.

On the Basic configuration screen, simply fill in the text fields from left to right with the closest geographically located station on the left to the furthest station on the right.



The image shows a software interface titled "Alternative Frequencies". It contains seven text input fields, each containing the value "000.0". To the right of the last field is the label "MHz". The fields are arranged horizontally and are separated by small gaps.

The RDS2 will be programmed with this information next time the SEND button is pressed.

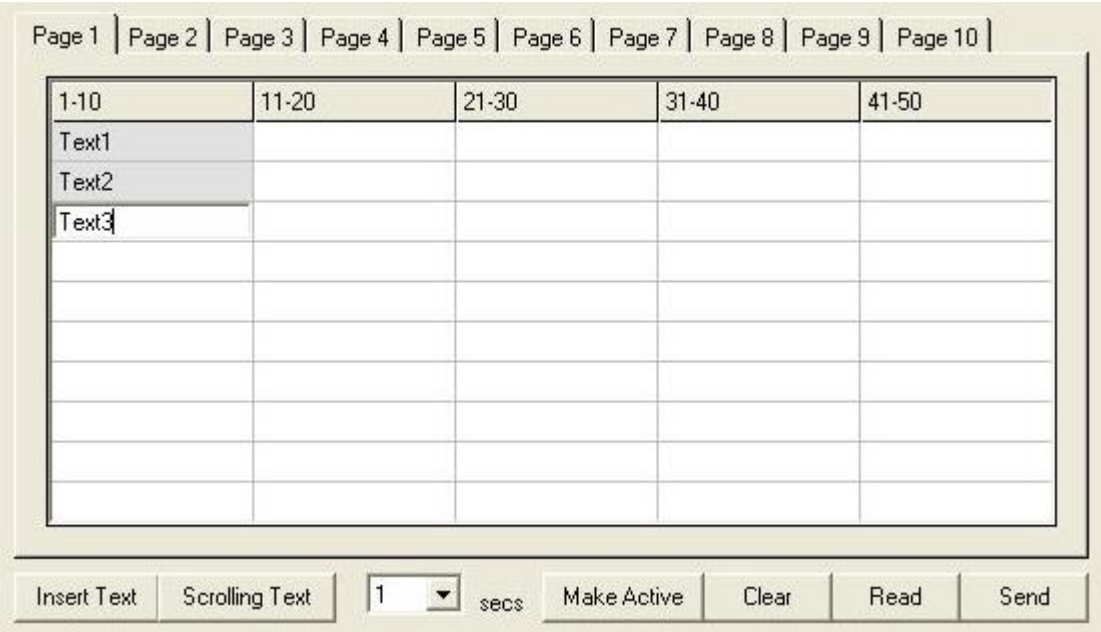
3.4 'PSN' Configuration Screen

The RDS Program Service Name (PSN) signal was developed to allow broadcasters to identify themselves on an RDS enabled receiver by sending up to eight (8) characters of text at a time to be displayed on the receiver.

As well as station ID information, the RDS PSN signal is now commonly used for broadcasting information about radio station contacts, competitions, song and artist information and more.

3.4.1 Understanding PSN Pages in the RDS2

The BW RDS2 ‘PSN’ configuration screen allows you to configure up to 10 pages of information. Each PSN page has 50 available lines - grouped across 5 columns - with each line having 8 characters.



The ACTIVE Page

Although the BW RDS2 can store 10 pages of PSN information it will only broadcast data from one page at a time. This is known as the ACTIVE page. There is no indication of which page is currently ACTIVE. Setting which page is ACTIVE can be done manually by selecting the page to be activated and pressing the ‘MAKE ACTIVE’ button or automatically by the PSN Scheduler (See Section XXX).

Enabled Lines

Within a PSN page, if any text has been entered on a line, that line will be ‘Enabled’. ‘Enabled’ lines are visible by their grey colour. If a line is grey but does not appear to have any text visible it may have a ‘space’ entered.

The Line Timer

Each PSN Page will also have a line timer value at the bottom that can be set between 1 and 99 seconds.

Broadcasting PSN Information

While a page is 'ACTIVE' the BW RDS2 will broadcast in a sequence each individual 'Enabled' line for the amount of time indicated by the Line Timer. If a page has only one Enabled line the PSN information will be 'Static'. If more than one line is Enabled the PSN information will be 'Dynamic'. If the PSN page is still ACTIVE after the last Enabled line has been broadcast, the sequence will begin again from the first Enabled line.

Example: In the screen above, if Page 1 is ACTIVE, the PSN information that will be broadcast is:

Text1	broadcast for 1 second
Text2	broadcast for 1 second
Text3	broadcast for 1 second
Text1	broadcast for 1 second
Text2	broadcast for 1 second

...

This cycle will continue for as long as Page1 is 'ACTIVE'.

Dynamic PSN

The ability of the RDS2 to broadcast a sequence of PSN lines each for a set amount of time makes it possible to overcome the previous restrictions of only having 8 characters in which to display any message. Constantly changing the PSN allows messages to be broadcast using a sequence of words in small groups or even allows scrolling messages to be broadcast by broadcasting a sequence of lines that change by only one character at a time.

Caution

Although Dynamic PSN is a popular function of capable RDS encoders, both the RDS and RBDS specifications deprecate the use of dynamic PSN's for safety and technical reasons.

The two main issues with Dynamic PSN's are,

- **Safety :** *Dynamic PSN can distract a vehicle driver which increases the likelihood of road traffic accidents.*
- **Technical :** *An RDS receiver automatically copies the last PSN received into it's internal memory, so that the next time the frequency is tuned the PSN in memory is displayed until a new PSN is received. This often gives rise to garbage messages appearing on the receiver display causing confusion to the listener. Also various RDS chip manufactures have designed their RDS chips in different ways and*

some receivers will only update the displayed PSN once or intermittently while others will be confused and not display any PSN.

*Due to these problems later versions of the RDS specification included **Radio Text (RT)** which allows for short scrolling messages in non mobile receivers.*

Radio Text is the preferred method of displaying scrolling text messages and most European countries have banned the use of Dynamic RDS now that the Radio Text features have been implemented in most RDS receiver chip sets.

3.4.2 Reading PSN Pages from the BW RDS2

Two options are available to view the PSN information currently stored in the BW RDS2:

1. **READ** The READ button at the bottom of each PSN page will read each line of the current PSN page from the RDS unit, as well as the value for the line timer, and update the page values in the PSN configuration screen.
2. **'Read All'** From the main menu select 'Communications > Read All' to have all pages read from the RDS2 unit. This will update all PSN pages with relevant PSN and line timer information.

3.4.3 Programming PSN Pages

Clearing PSN Information

Before or during the process of configuring a PSN page the CLEAR button can be pressed at any stage to clear all entries on the screen and revert the line timer to the default 1 second. This clears entries on the screen only and does not have any effect on the page information stored in the RDS2 unit until the SEND button is pressed.

To clear any PSN page information stored in the RDS, select the required PSN page and press the CLEAR button. All information will be cleared on the screen. Simply press the SEND button to program the RDS unit with a blank page.

Entering PSN Information

The BW RDS2 allows three methods of entering PSN information:

1. Direct Entry
2. Insert Text button
3. Scrolling Text button

Direct Entry

After selecting a PSN page the easiest way to enter information is to select a line using your mouse where you would like the information entered. The line will take the form of a text box to indicate it is being edited. Simply enter the required text.

When you have finished editing the text click onto another line or press the ENTER key to store the text on the screen. The information has been entered correctly only if the line changes to a grey colour.

Note:

PSN text transmitter over RDS is case sensitive. Some RDS enabled receivers may not be case sensitive

Insert Text

If your message is greater than 8 characters you might find it easier to enter the text using the INSERT TEXT button. Pressing this button will activate a small window prompting you for input. Entering your text and pressing OK will result in the text being inserted in the first line of the page and split across the subsequent lines.

Since this approach will split words across multiple lines you may prefer to enter information into individual cells in order to format them on word boundaries.

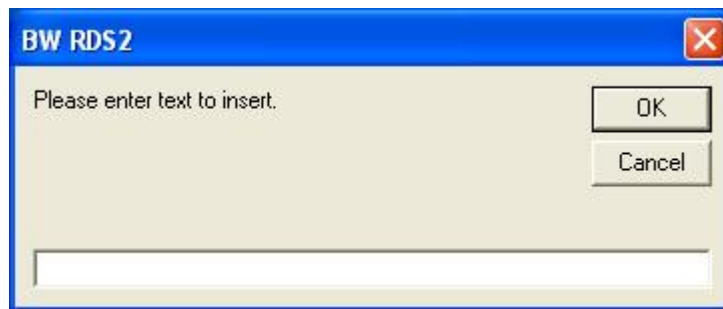


Figure 2.5 BW RDS2 Software PSN Entry sub window.

Insert Scrolling Text

If you are in a location where it is considered legal and safe, you might want to insert a message to scroll on the display of an RDS enabled receiver. This can be done very simply by pressing the INSERT SCROLLING TEXT button. A small window will appear prompting you for input. Enter the text you would like to see scroll and press OK.

The text will be inserted starting at the first line of the page and staggered such that each line differs from the previous line by a one character shift. When the sequence is seen on a receiver display it will appear as a scrolling message.

Setting the Line Timer

Once the required PSN information has been entered you need to program the line timer to set how long each line should be displayed in the sequence. Usually 2 or 3 seconds is adequate.

Updating the RDS2

After all information for a PSN page has been set, the SEND button should be clicked to save the configuration in the RDS2 unit. It is good practice to click the READ

button immediately after the SEND process has completed to read back the settings to make sure all was saved correctly in the RDS2 unit.

If the RDS2 is part of a broadcast system and the page you have updated was already being broadcast (ACTIVE) then the changes made will be transmitted immediately. If not you will have to click on the MAKE ACTIVE button to make the page active and see the new broadcast.

3.5 ‘Schedule’ Configuration Screen

A useful feature of the BW RDS2 is the ability to program PSN pages to become ACTIVE at particular times throughout a week. This feature is set using the ‘Schedule’ configuration page.

The scheduler makes all changes based on the RDS2 internal clock (See section XXX).

3.5.1 How the Schedule works

In the ‘Schedule’ configuration page, you have the option of selecting any day of the week, Monday through to Sunday. Each day has been divided into hourly timeslots. The first timeslot starts at 00:00 and the last timeslot starts at 23:00.

For each timeslot the user can select which PSN page should be ACTIVE and whether or not the scheduled page change should be enabled.

If a PSN page has been scheduled to be ACTIVE at a particular time and the event has been enabled, then when the internal clock reaches the required time on the required day, the selected PSN page will be made ACTIVE and PSN information from that page will be broadcast.

The scheduled page will remain ACTIVE until another page is manually set ACTIVE or the PSN scheduler is programmed to set another page ACTIVE at a particular time.

Example:

The schedule shown in Fig 3.C is set to make PSN Page 3 ACTIVE at 5p.m. each Tuesday.

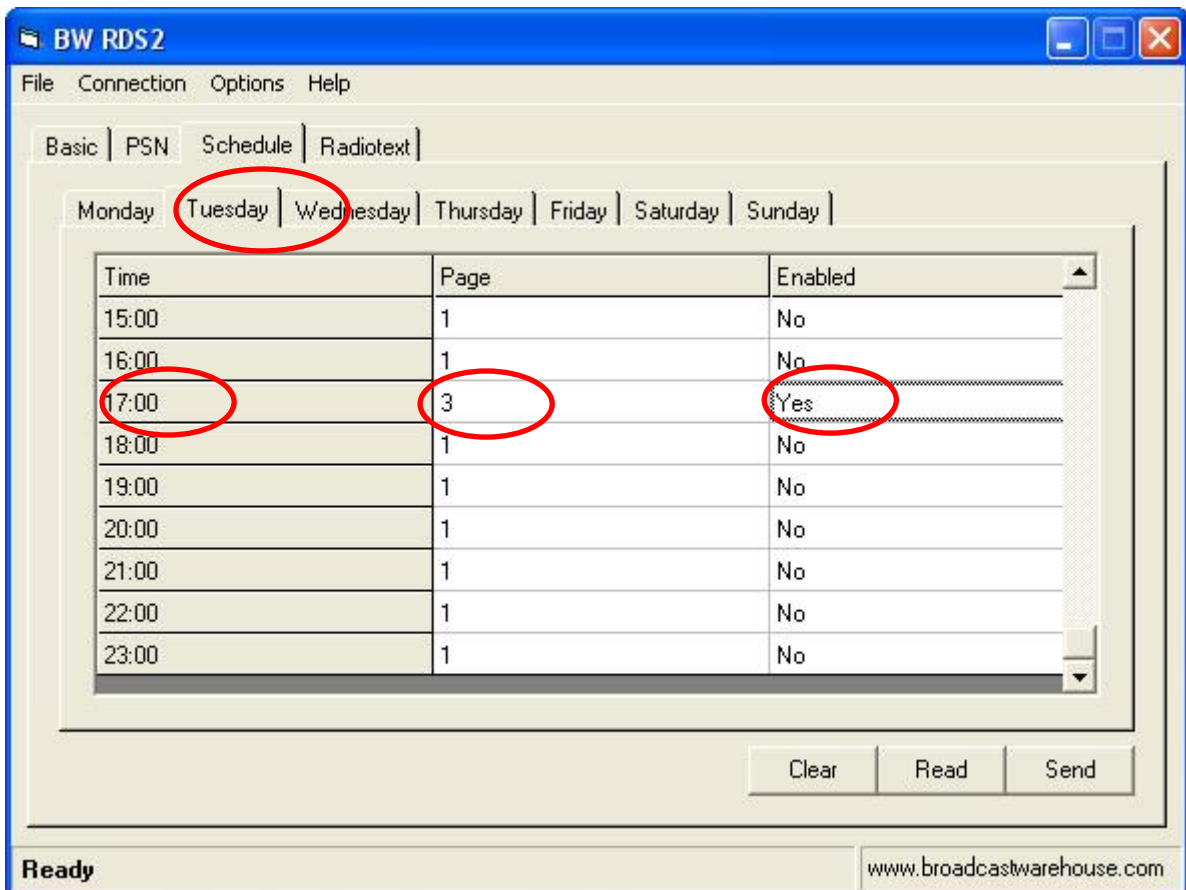


Figure 3.C BW RDS2 Software Schedule Configuration window.

3.5.2 Configuring the Schedule

Before entering any values on the Schedule configuration page it is best to perform a 'Read-All' operation using the menu selection 'Communications > Read All' in order to fill the schedule page with all current settings in the RDS2 unit.

After this has been done, configuring the Schedule can be done in the following simple steps:

1. Decide on the PSN page that needs to be broadcast. This may relate to the audio program being broadcast at a particular time or may be part of a standard advertising rotation.
2. In the 'Schedule' configuration page select the required day from the tabbed options.
3. Within the day, scroll and select the required starting time for your timeslot.
4. Click on the 'Page' column in the timeslot and select your required PSN page from the available list.
5. Click on the 'Enabled' column. Double-click on the 'No' to change the value to 'YES'.

After all schedule changes have been made, click on the SEND button to program the updated schedule into the RDS2 unit.

3.6 'Radiotext' Configuration Screen

3.6.1 What is RadioText?

RadioText is a simple RDS feature that allows lines of up to 64 characters at a time to be broadcast to be displayed on any RDS enabled receiver with RT capabilities. Receivers that have limited screen space will scroll the RT information

RadioText is a much more versatile and much safer way of transmitting text than Dynamic PSN and is commonly used to broadcast artist and track information as well as station phone numbers and contest information.

The RDS2 is capable of storing 50 lines of Radiotext information. Each line can have up to 64 characters and can be programmed to be broadcast for up to 99 seconds at a time.

3.6.2 Setting up Radiotext

The Radiotext configuration screen has 50 lines split into three columns:

- | | |
|-----------|---|
| 1. Number | Line number |
| 2. Time | Time (secs) that the text should be displayed |
| 3. Text | Text to be displayed as RT |

Setting up Radiotext in the RDS2 is as simple as filling in the time and text information for each line required:

Entering Text

Text can be entered or edited on any line simply by clicking on the line. The line will fill with a text box and a cursor will appear to indicate the line is being edited. Once the required information has been added, press the ENTER key or select a different line to store the information on the line. The line will change to a grey colour to indicate it contains valid text.

Entering Broadcast Time

Once text has been filled for each line, a time between 1 and 99 secs must be set if the line is to be broadcast. If a line of Radiotext needs to be 'disabled' this can be done by setting the time to 00secs.

Radiotext will be lines will be broadcast for a period set by their programmed time. The next line of text with a non-zero time entered will then be broadcast. All lines with non-zero times will follow. Once all non-zero lines have been transmitted the sequence will begin again from the first non-zero line.

Example:

Figure 3.D shows two lines of valid text and one disabled line.

- Line 1 would be broadcast for 30secs
- Line 2 would be broadcast for 10secs
- Line 3 would be broadcast for 30secs...

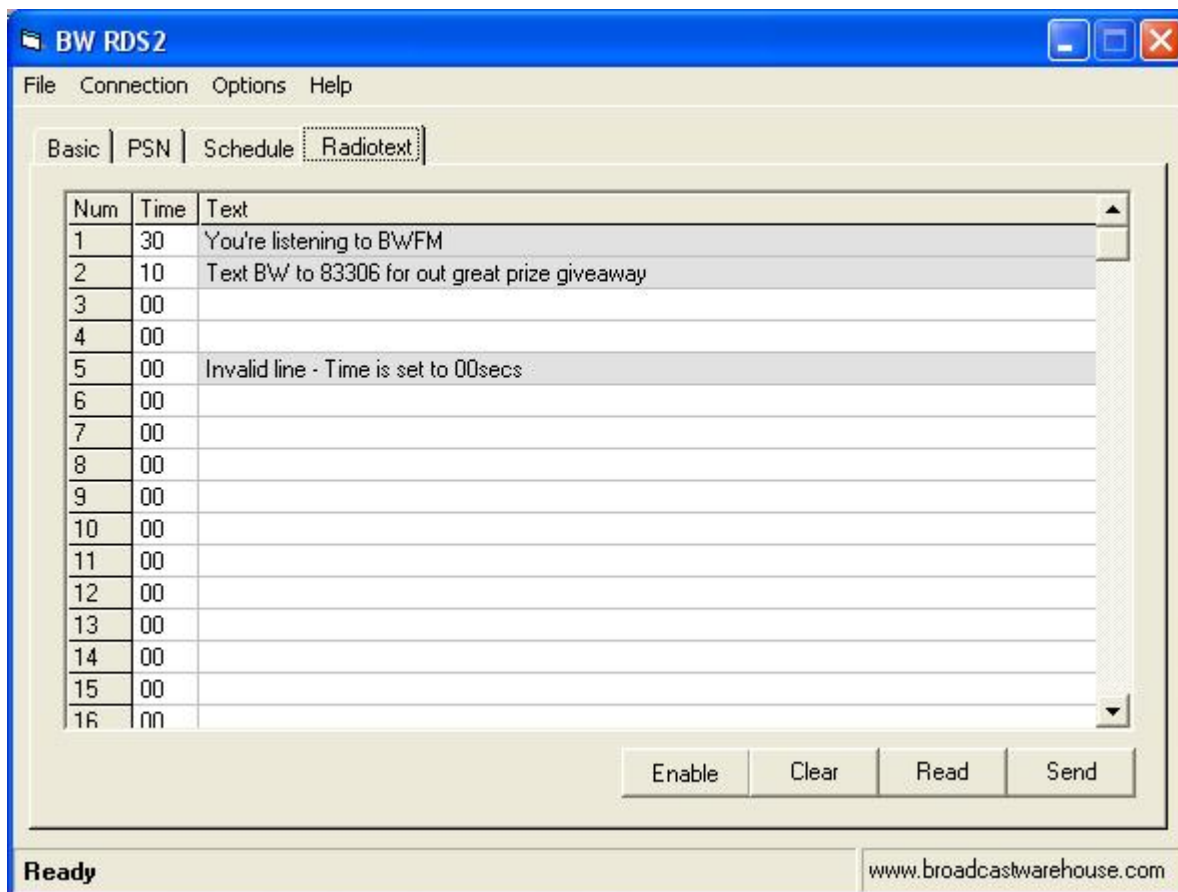


Figure 3.D BW RDS2 Software Radiotext Configuration window.

The RDS2 will be programmed with this information next time the SEND button is pressed.

IV - Installing the RDS2 in your Broadcast System

After the BW RDS2 encoder unit has been programmed it can be added to an active broadcast system. When including the RDS2 into a broadcast system you must consider two important points:

1. Pilot Synchronisation
2. Equipment configuration

4.1 Pilot Synchronisation

The RDS signal operates at 57kHz which is a multiple of the 19kHz pilot tone used for transmission of stereo FM signals. If the 57kHz carrier used for the RDS signal is 'In-Phase' with the 19kHz pilot tone the combined signal will have a lower maximum level than if the signals are out of phase. This means a synchronised RDS encoder will contribute less to the overall deviation of an FM signal allowing a high deviation percentage from the audio signal.

The RDS2 is capable of synchronising to a 19kHz reference in one of two ways:

- i. **19kHz reference input** – RDS2 will synchronise to a 19kHz signal applied to the reference input. This signal can be either square or sine wave from 1V to 10V P-P.
- ii. **Pilot lock on MPX input** – The RDS2 will synchronise to the 19kHz pilot in a stereo multiplex signal applied to the MPX input.

If no 19kHz signal is present in the 19kHz reference port or in the MPX input, the RDS signal will be 'free-running'. This allows the RDS2 to operate with mono broadcasts.

4.2 Equipment Configuration

The RDS2 can be installed in a broadcast system in a *Loop-Through* configuration or as a separate subcarrier (SCA) signal generator that can inject the RDS signal through the input on another piece of equipment in the audio chain.

4.2.4 Loop-Through Configuration

In 'Loop-Through' configuration the stereo multiplex (MPX) signal normally fed into an exciter is input into the 'MPX' input of the RDS2. The RDS2 will synchronise the generated RDS signal to the 19kHz pilot present on the stereo input and multiplex the resulting 57kHz RDS signal with the stereo signal. The level of the input stereo signal will remain unchanged.

The combined RDS/Stereo multiplex signal is then input to the exciter of the transmitter.

The RDS2 has been designed with relays on the MPX input such that in the case of power failure the relays will switch over and the stereo signal will simply pass through the unit.

A diagram showing the RDS in a loop-through configuration is shown in fig XXX. This is the recommended configuration for use with BW Transmitters without any audio processor.

4.2.5 RDS Sub-Carrier Signal Generator

With some audio or transmitter equipment the RDS2 can be operated parallel to the audio chain as a Subcarrier (SCA) generator. In this orientation the RDS signal output is connected to a SCA input on an audio processor or transmitter which then internally multiplexes the 57kHz RDS signal in the audio chain.

If the audio processor or transmitter has a pilot reference output this can be connected to the RDS2 19kHz reference input to create a synchronised RDS signal.

A diagram showing the RDS in a loop-through configuration is shown in fig XXX. This is the recommended configuration for use with BW Transmitters if a BW Audio Processor is used in the audio chain.

Either configuration can be considered reliable. The choice of which orientation to use may depend on equipment selection or personal preference.

Once you have chosen the preferred configuration and setup the BW RDS2 ensure the 'RDS' signal light is green. If the light is on you are set to check the level and begin your RDS broadcasting.

4.3 RDS Level control

The level of the RDS signal can be adjusted using a small screwdriver to set a pot accessible on the back panel (Fig 1.1 - I). The RDS output with no other multiplexed signals should be set to be 3.5% of the total allowable peak deviation on the transmitters modulated signal.

In order to set this correctly you will need your exciter and a modulation monitor. Disconnect any inputs to the exciter. The modulation monitor should show close to zero deviation. Connect only the RDS signal to the input of the exciter. Using a small pot, adjust the output level of the RDS signal on the back of the RDS2 such that the deviation is 3.5% of the total peak deviation. This equates to approx +/-2.65kHz

This is approximately the correct level for the RDS output.

Once you have set the RDS level reconnect your audio and you are all set for RDS broadcasting.

V - Hardware Configuration

5.1 Dip Switches

5.2 Control Port Configuration

6.0 Glossary

7.0 Troubleshooting

X.0 Glossary

The list of terms below are often found in RDS/RBDS documentation. Frequently they are not detailed, and it is assumed the reader is familiar with their meanings. The explanations given are for guidance and the user should consult the RDS/RBDS Standards for a full explanation.

AF Alternative Frequencies list.

This is an optional list of frequencies which can be used by a broadcaster to tell the radio alternative frequencies on which the program being broadcast on can be received on. This enables radios with the memory feature to more quickly switch to another stronger signal when required. This feature is especially useful for mobile (car) radios.

AID Applications Identification for ODA.

The Application Identification code is part of the Open Data Application (ODA) extensions to the RDS specification. It is used by a receiver to search for a broadcast station that supports the ODA the receiver is designed for.

CT Clock Time and date.

The Clock Time and date feature is used as a time stamp by a number of applications, it should be accurately maintained at all times or disabled. The date should be in Modified Julian Day (MJD) format, and the time should be in Universal Time Coordinated (UTC) format. The receiver is responsible for converting this into the appropriate local format.

DI Decoder Identification.

These flags indicate which receiver mode of operation is appropriate for the type of audio broadcast.

ECC Extended Country Code.

The Radio Data System (RDS) has its own series of country codes encoded in the most significant bits of the Program Identification (PI) code. As there are only 4 bits available for this in the PI code, there needs to be an extended code to give correct country identification. The ECC code is eight bits long and when used with the 4 bits in the PI code give an accurate country/region indication.

- EON** Enhanced Other Networks information.
This is an extension of the basic RDS system and allows suitably equipped receivers to perform program type searching. The extended features include Traffic Announcement, Program Type Search, and Interrupt Program service name display, Alternative Frequency tuning and Program Item number facility.
- EWS** Emergency Warning System.
This is a Radio Broadcast Data System (RBDS) extension used to allow the US Emergency Alert System (EAS) specified by the Federal Communications Commission FCC to work with RDS enabled receivers. It uses the RDS Open Data Application (ODA) protocol as an augmentation to the existing FCC EAS standard, it is detailed in section R of the RBDS Standard.
- FCC** Federal Communications Commission
The Federal Communications Commission is the US government body responsible for licensing the radio frequency spectrum in the USA.
- FT** Fast Tuning Service
A radio tuning system that allows a receiver to be tuned quickly and conveniently for the consumer.
- IH** In-House application.
This is part of the ODA extensions; it is intended for use by the broadcaster and is not used by consumer receivers.
- LA** Linkage Actuator flag.
This 1 bit flag is used to indicate when the current program is linked. The program is identified by the 12 bit LSN and PI of the other broadcast service.
- LI** Linkage Identifier.
This information is transmitted as part of the EON services.
- LIC** Language Identification Code
This code is used to identify the language used by the broadcast service. In an RDS receiver it can be used to select the preference of a consumer for native language or other broadcasts.
- LSN** Linkage Set Number.
This is a twelve bit code that is used for a syndicated program broadcast shared amongst several broadcast organisations, where the Program Identification (PI) numbers are different.
- MBS** Mobile Search (Mobilsokning).
This was the predecessor to the Radio Data System, designed by the Swedish Telecommunications Agency (Televerket) it was designed to carry paging information on FM broadcasts to reduce infrastructure costs. It has been obsoleted in Europe by RDS, however it is still in use in some parts of North America.
- MMBS** Modified Mobile Search.

This is a modification of the RDS protocol to allow it to co-exist with existing MBS services in the U.S. by time multiplexing the two data streams.

MJD Modified Julian Day

This is the date format used by the Clock Time and date (CT) sent to the receiver. If MJD is set to zero then the receiver should not use the information to update it's local clock.

MS Music / Speech switch.

This flag is used to indicate whether music or speech is currently being broadcast. The RDS receiver can use this information to switch the audio processing in the receiver between two consumer settable presets.

ODA Open Data Applications.

This feature enables data applications not specified in the RDS standard to be conveyed in a series of allocated groups in an RDS transmission.

PI Program Identification.

This 16 bit code is usually assigned by the regulatory authority that grants the licence for the transmitter. It is a unique identifier for the broadcast station (not the actual transmitter) and is used by the RDS receiver to identify the program being transmitted when the AF function is used for automatic searching.

PIN Program Item Number.

This function within the RDS receiver allows the consumer to select the program type they would like to listen to.

PSN Program Service name.

The Program Service Name is an eight character message that is used to identify the broadcast station in a human readable format. As it is not used by the RDS receiver for anything other than to be displayed, it can contain any valid message the broadcast operator wishes to put out as the primary station identifier.

PTY Program Type.

This 5 bit code is used to give a basic category for the program being transmitted so that an RDS receiver can select the consumers preferred program type when the receiver is in one of the auto scanning modes.

PTYN Program Type Name.

The Program Type Name is an extension to the PTY providing augmented information to the current PTY category. IT is not designed to replace the PTY code which is built into the RDS receiver and used for searching but to provide additional information ie PTY = 12: "Rock Music", PTYN="1960's".

RBDS Radio Broadcast Data System.

The RBDS Standard is a US standard issued and maintained by the National Radio Systems Committee (NRSC), which is a joint sub committee of the Electronic Industries Association (EIA) and U.S. National Association of Broadcasters (NAB). Although an advisory standard only it does help to ensure compatibility of RDS equipment for the whole of North America (Canada, Mexico & United States).

Essentially it is passed on the European RDS standard EN 50067 with little or no modification.

- RDS** Radio Data System.
The RDS standard is a European Union standard issued by the European Committee for Electrotechnical Standardization (CENELEC) issued as document EN 50067.
- RP** Radio Paging.
The Radio-Paging service is intended to be used as an extended service within the RDS/RBDS system to allow pocket and other pager services to be carried on conventional FM services, thereby removing the need for dedicated paging networks. Further information can be found in appendix M of the standard.
- RT** Radio Text.
This service enables a message of up to sixty four characters to be displayed on the screen of a domestic or other non in-car receiver, for safety reasons these messages should not be displayed on in-car or other transportation oriented receiver where the operator could be distracted.
- TA** Traffic Announcement flag.
This flag is used in conjunction with the Traffic Program flag (TP). This flag should be set shortly before a traffic announcement is made and then cleared shortly afterwards. It is used by an RDS receiver to give priority to the traffic announcement over other audio signals.
- TDC** Transparent Data Channels.
This service allows the broadcaster to send data to computers or other RDS attached data devices. Although similar to Radio Text (RT) in general this information is not displayed to the consumer on the receiver. This allows for paging or other messaging services to be implemented as part of the overall RDS service.
- TMC** Traffic Message Channel.
This service is used to send traffic information through a specific channel within the broadcast network.
- TP** Traffic Program flag.
The Traffic Program flag is used by RDS receivers to identify stations that give traffic information on a regular basis. The RDS receiver communicates this to the consumer by altering the RDS display in some manner such as illuminating an icon or changing the colour of the message displayed.

Troubleshooting:

Configuring your PC's serial port

Configure the PC Serial port being used (see step 5 above) with the default serial port configuration values (see Table 2.1).

BAUD RATE	9600
Data Bits	8
Parity	None
Stop Bits	1
Flow Cont	None

Table 2.1 Default Serial Port Configuration

This is usually done through the MS Windows Hardware Device Manager window which can be opened via the control panel (Start -> Control Panel -> System -> Hardware) or by right clicking on the desktop "My Computer" icon and selecting "Properties" from the popup menu to open the "System Properties" Window then select the "Hardware" tab.

Click on the [Device Manager] button to bring up the hardware list, double click on the "Ports (COM & LPT)" item to open the sub list, then double click on the corresponding entry for the serial port used (step 5 above). This should bring up the device driver window for this serial port.

Check that the device is enabled, and then click on the "Port Settings" tab and change the settings to match the default values (see Table 2.1).

PSN Text not appearing correctly

Before making any changes on a PSN page always click 'READ' to fill the page with the current contents of the PSN page.

After entering any PSN text make sure that you hit 'Enter' or click on to another line. The text in a PSN line is only valid if the line is greyed out.

After clicking 'SEND' for a PSN page always click 'READ' again to make sure the information was stored correctly in your RDS unit.

BW RDS2 - QuickStart Guide:

IMPORTANT INFORMATION : PLEASE NOTE!

Operation of this equipment without an appropriate license is an offense. Please check with your countries laws regarding operation of this equipment prior to switch on. It is the users responsibility to verify the local laws and regulations before-hand and Broadcast Warehouse and or its agents disclaim all responsibility for any use of this equipment outside of the relevant regulations and laws.

2.0 RDS2 SETUP

2.1. RDS2 Contents

On opening the box check that you have received the following parts:

1. 1U BW RDS2 Encoder
2. IEC Mains Lead
3. RS232 extension cable
4. RDS2 Software CD

In order to correctly connect the encoder to a BW transmitter you will also require 2x BNC cables.(not supplied)

2.2 Installing Software

The included software will operate best on Windows 2000 or Windows XP operating systems.

Insert the CD and navigate to BW_RDS2. Double-click on 'Setup' to start the install. Choose the folder where you would like the program to be installed. Follow prompts until the install is complete.

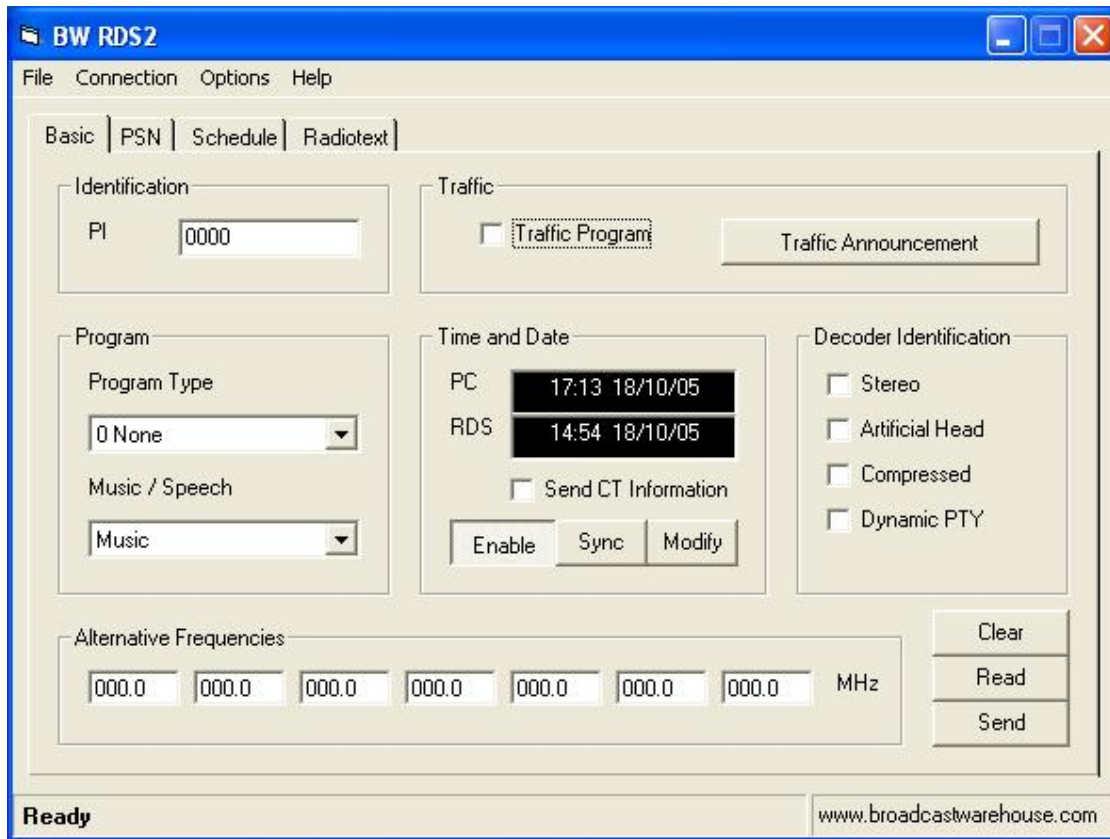
2.3 Connecting the BW RDS Encoder to your computer

Connect the RS232 cable supplied to a 9-pin serial connection (COM Port) on your computer and to the 9-pin connection on the back of the RDS2.

Check the switches on the back of the RDS2. The first switch should be 'on' and all others should be 'off'. This sets the RDS2 for serial communications at 9600 baud.

2.4 Communicating with the RDS

With the RS232 cable connected, start the BW RDS2 software. The following screen will be seen.



The default setting for communication is connection on COM1 at 9600 baud rate.

Click on the 'Read' button in the bottom-right hand part of the screen. This will read information from the RDS2 and update the screen.

If the connection is not successful you will see the following message:



If this occurs, try changing the COM port that is used for the connection. This can be done from the 'OPTIONS' menu. If the problem persists consult the detailed manual.

3.0 Programming the BW RDS2

3.1 BASIC PAGE Configuration.

The 'Basic' page settings can be selected by clicking on the BASIC tab at the top-left on the window. This page provides options for configuring the most commonly broadcast RDS information.

RDS signals commonly used by commercial broadcasters are:

PI – Program Identification. Each broadcaster is assigned a unique code from the broadcasting authority. This code can be used by a receiver to scan for the same broadcaster on a different frequency if the signal level was to drop.

PTY – Program Type. The genre of the broadcast can be indicated by selecting from the available list of RDS program types. Some RDS receivers are able to scan for stations based on the preferred PTY.

AF – Alternative Frequencies. If a receiver begins to lose signal level from a broadcaster it will search the listed alternative frequencies to see if a stronger signal for the same broadcaster can be found on one of its alternative frequencies.

CT – Clock Time. Time and date information can be broadcast. Some RDS enabled receivers use this information to set their internal clock.

TP – Traffic Program. The RDS TP signal is broadcast by a station if that station broadcasts traffic announcements as part of their program material. RDS enabled receivers will monitor stations that broadcast a TP signal to check for traffic announcements being broadcast.

TA – Traffic Announcement. The RDS TA signal is broadcast to indicate that a traffic announcement is currently being broadcast by a station. RDS receivers will automatically change the listener station while the traffic announcement is being broadcast and then revert to the original material or station when the TA broadcast has finished.

DI – Decoder Identification and Dynamic PTY Setting. This information indicates which operating mode is being broadcast – Stereo, Artificial Head, Compressed. Individual RDS decoders may switch on or off based on these settings. A setting also exists in this group to indicate whether the PTY information will change with each program – Dynamic PTY.

RT – Radio Text. Messages of up to 64 characters at a time can be broadcast in RT packets for display on RDS receivers with RT decoding.

After successfully clicking the ‘Read’ button in the previous section, your screen should show setting information read from the RDS2. You can now check or modify the values so they are relevant for your station.

Once you have changed the values on the program, click on the ‘SEND’ button on the bottom-right of the screen to update these in the RDS2.

Important:

Time and date will only need to be programmed once to set the RDS2 internal clock. Once the clock has been set, ensure the ‘Send CT Information’ checkbox is not selected. This will prevent the TIME & DATE (CT) information being modified in the RDS2 internal clock when the ‘SEND’ button is clicked.

The ‘ENABLE’ button on the CT information section and the ‘TRAFFIC ANNOUNCEMENT’ buttons are ‘Real-Time’. If you click on these the changes will be sent to the RDS2 immediately without having to click on the ‘SEND’ button.

The RDS2 will not broadcast date and time information if the ENABLE button is not pressed in the CT settings. The clock may still need to be set to enable the internal PSN scheduler.

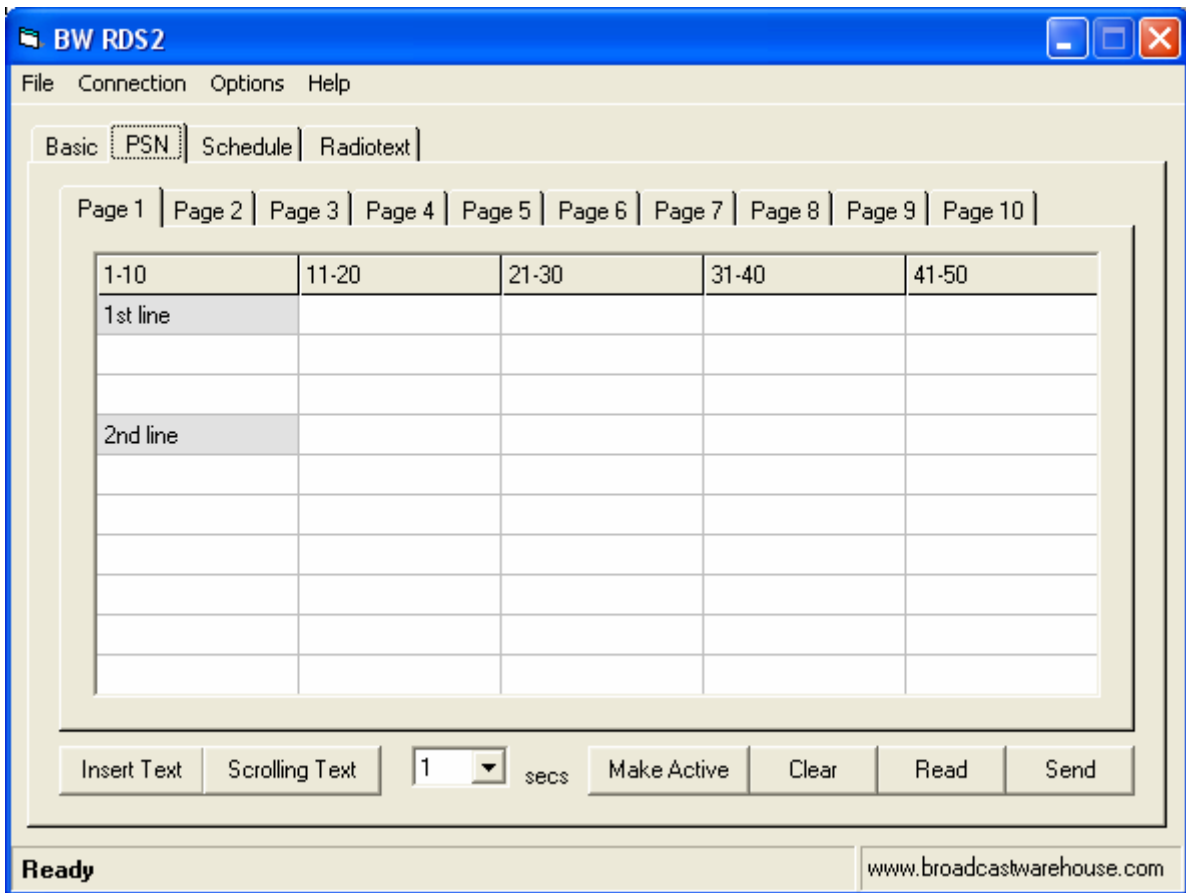
Once all settings have been made on the ‘Basic’ Page, click the tab at the top of the screen to select the ‘PSN’ Page

3.2 PSN PAGE Configuration

The RDS2 has 10 Pages of PSN information that can be programmed into memory. Each page has 50 lines that can contain up to 8 characters. A PSN schedule can then be created to activate different pages at different times.

At any point in time one PSN page will be 'active' and will remain 'active' unless another page is set 'active' by the user clicking the 'Make Active' button, or the PSN scheduler changes the active page according to the programmed schedule.

The PSN page will look like the following:



Lines with valid RDS characters will be greyed out. If an active page has more than one line of text the BW RDS2 will broadcast each line in sequence for the time indicated (1 – 99secs).

3.2.1 Configuring a Static PSN

Many stations only require one static PSN message to be displayed. This can be configured in the RDS2 by filling only one line in one of the 10 pages and then configuring that page to be active at all times. Follow these steps to configure a static PSN using PSN Page 1.

Ensure the tab selected is Page1.

Click on the 'Read' button in the bottom right-hand corner to read the PSN information from the RDS2. A new RDS unit will have no entries. If anything does appear, click the 'Clear' button to clear all entries.

In the first cell in the first column (1-10), enter your Program Station Name (PSN). This can only be 8 characters (including spaces). Once you have entered the text in the cell, click on another cell or

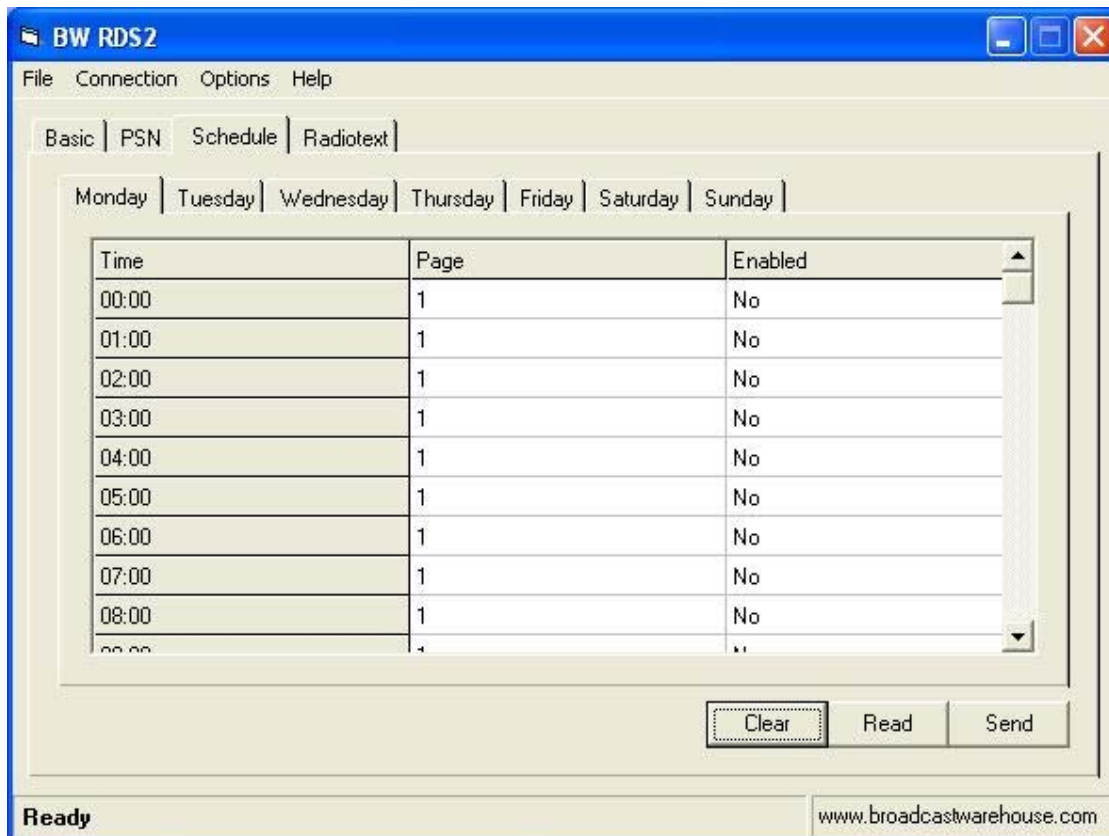
press 'Enter'. The cell with your text in will change to a grey colour to indicate the cell contains text. Now click the 'Send' button to send the page information to the RDS2.

If PSN Page1 is already 'active' in the RDS2, your updated PSN message will be broadcast immediately. To ensure PSN Page1 is the currently active PSN Page, click on the 'Make Active' button at the bottom of the screen.

To make sure this page remains 'active' you will need to disable all time slots in the PSN scheduler.

3.3 SCHEDULE PAGE Configuration

The RDS2 Schedule page allows you to choose which PSN page will be active at particular times throughout the week. Pages can be set to change in hourly slots. If there is no scheduled change the currently active PSN page will remain active. The schedule is triggered by the internal clock



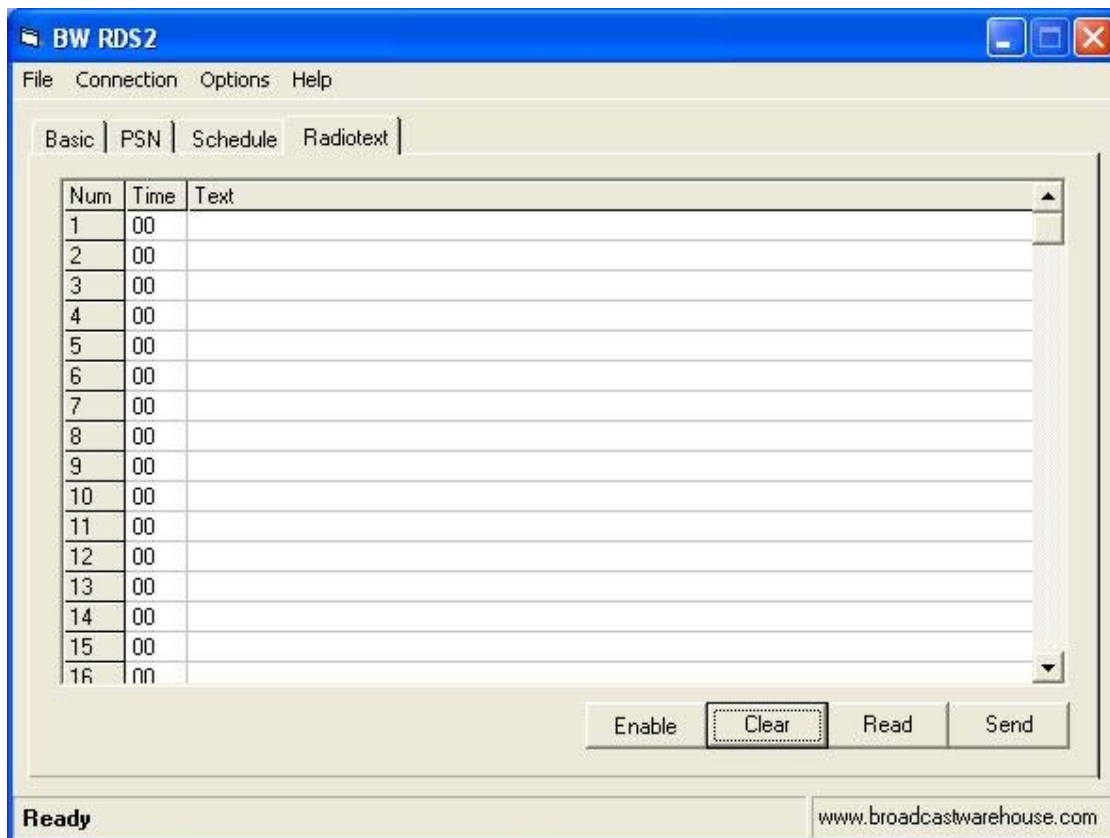
In order to ensure your station name is always active (PSN Page 1), you need to ensure the internal scheduler will not change the active PSN page. This can be done by repeating the following steps for each day in the scheduler to disable all time slots:

1. Click 'Monday', click 'Clear' to disable any scheduling on Monday. All entries in the ENABLED column will be set to 'No'. Click 'Send' to send this scheduling information to the RDS2.
2. Repeat this for other days of the week.

This will disable the scheduler from changing the 'active' PSN Page.

3.4 RADIOTEXT Configuration

Radiotext (RT) info can be up to 30 characters long. The RDS2 has the capacity to hold up to 40 lines of Radiotext data.



On the Radiotext Page click 'Read' to read the current data from the RDS2.
There should be no Radiotext data in a new BW RDS2.

Click 'Clear' to make all cells blank if required.

Click on any row in the 'Text' column and enter the desired Radiotext (RT) information. Set the time in seconds that you would like this information to persist by entering a number in the 'Time' Column. When you have entered all information, click the 'Send' button to update the RDS2.

4.0 Connecting the RDS2 to your Transmitter

Now that the RDS2 has been programmed you can integrate it with your broadcast chain.

- i. Connect a MPX or Mono output from a stereo encoder or limiter into the RDS2 MPX Input port.
- ii. Connect the MPX/RDS output from the RDS2 to the input of your exciter. The RDS injection level may have to be adjusted to ensure no over-deviation occurs. Check details in the main manual

The RDS2 can remain connected to your PC for ongoing configuration or disconnected for stand-alone operation.

Happy Broadcasting!

BW Broadcast RDS2 Manual Addendum

DIP Switch Settings

	Dip 1 - 2	Dip 3	Dip 4	Dip 5	Dip 6	Dip 7	Dip 8
↑	See Baud Rate Table	Bypass	TA bistable	RDS ON	REMOTE ON	Reserved	Reserved
↓	Vedi Tabella Baud Rate	Operate	TA monostable	RDS OFF	REMOTE OFF	Reserved	Reserved

	Dip 1	Dip 2
2400	↓	↓
4800	↑	↓
9600	↓	↑
19200	↑	↑

Control Port Pinout

PIN	FUNCTION	I/O TYPE	ON	OFF	FIG.
17	RDS OFF	IN	GND	OPEN/+5V	2
4	TA EON4	IN	GND	OPEN/+5V	2
16	TA EON3	IN	GND	OPEN/+5V	2
3	TA EON2	IN	GND	OPEN/+5V	2
15	TA EON1	IN	GND	OPEN/+5V	2
2	TA EON0	IN	GND	OPEN/+5V	2
14	TA	IN	GND	OPEN/+5V	2
1	MS	IN	GND	OPEN/+5V	2
22	RDS OFF	OUT	+5V	GND	3
10	TA EON4	OUT	+5V	GND	3
23	TA EON3	OUT	+5V	GND	3
11	TA EON2	OUT	+5V	GND	3
24	TA EON1	OUT	+5V	GND	3
12	TA EON0	OUT	+5V	GND	3
25	TA	OUT	+5V	GND	3
13	MS	OUT	+5V	GND	3
5-9	NOT USED				
6-7-8-19-20-21	GND				



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