



Customer Development/ Eval System for the NW- RF Module

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Document Change History

Issue	Amendment Details	Date of Issue	By
A	First Draft	27/11/05	JBR

Introduction

The Customer Development/Evaluation (CDE) kit is designed to provide the Module user with comprehensive tools to allow evaluation and development of systems that require the NW-RF Module.

The unit can be used in a 'self contained' format using the 'on board' batteries. The 'Ping' function can be used to evaluate the performance such as Range and RF immunity of the product without the necessity to connect to a PC.

Numerous LED's provide the status of the I/O lines at all times.

The module is connected to an industry standard 9 pin 'D' connector via an 'on board' level shifter to allow connection to external peripheral devices

The 'User' settings can be adjusted and the firmware can be altered via the configuration software that is provided. The CDE must first put the module into 'Boot' mode so that communication between the 'Bootloader' and the PC can be established without the need to have any programming equipment. Calibration settings are stored in the 'Bootloader' so they cannot be overwritten in error, therefore making the unit 'recoverable' without having to recalibrate.

The CDE kit will allow direct connection to the module using the 26 pin **MOD I/O** connector and the ribbon cable provided.

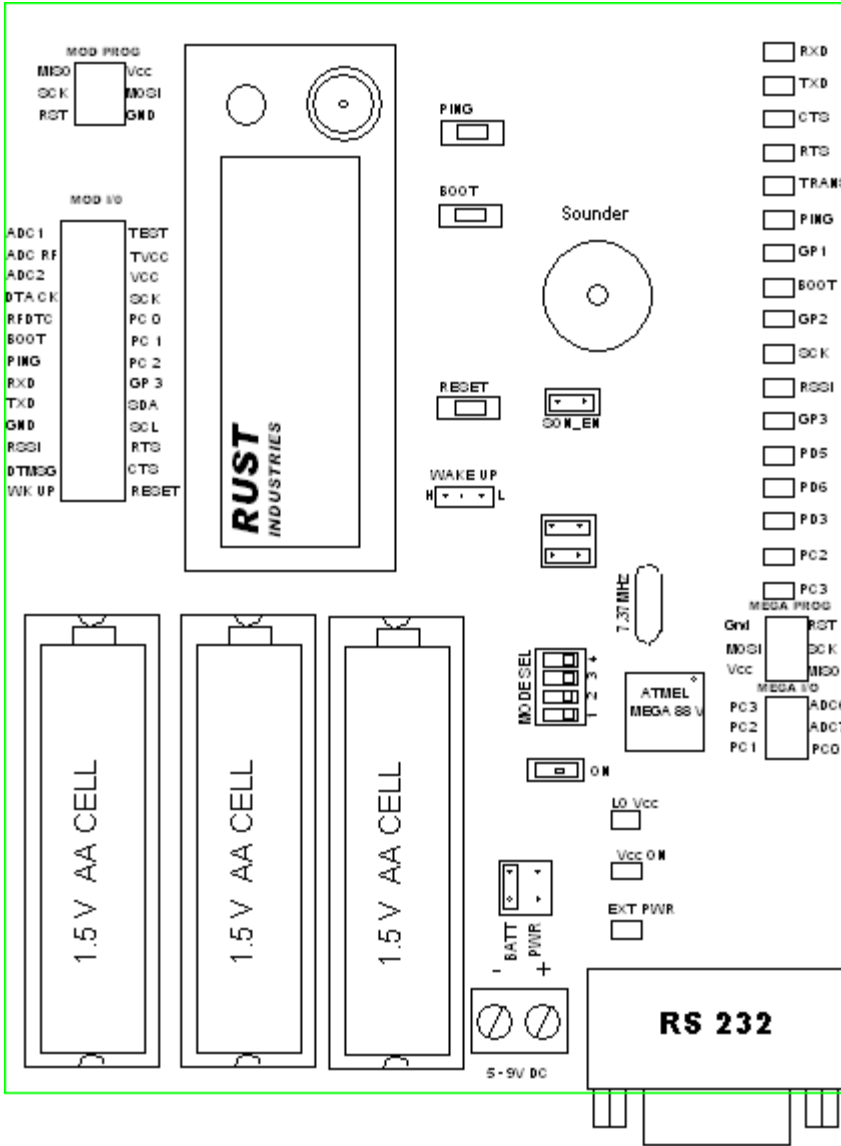
A Mega 88V processor is provided so that the User develop application software and conveniently test, without having to resort to providing additional hardware.

'Loop back' software provided gives the User the ability to send data from one Module connected to a PC, a second Module will 'echo' the data. Information about 'through put' and retries will be presented to the user.

The CDE contains:-

Carry case	1 off
Evaluation PCBs	2 off
RF Modules +Carrier	2 off
Aerials	2 off
RS232 Leads	2 off
26 WAY IDC Ribbon Cable	2 off
CD containing Config. Software and Datasheets.	1 off
AA Batteries	6 off

CDE Board Overlay.



Using the CDE.

Power

The CDE can normally be powered using the 'On-Board' batteries, this will give maximum convenience, when using the CDE for evaluation in Performance and Range tests.

It is important that the batteries are replaced as soon as 'Lo Batt' indicator lights, as in this condition correct operation cannot be guaranteed.

If prolonged use of the CDE is anticipated it is possible to power the unit for a 5-9V DC supply.

The jumper link must be moved from the 'BATT' position to the 'PWR' position.

A small slide switch is provided to allow the power to be switched on board.

Module

The RF module that is supplied in the CDE is mounted on a carrier board to make it easier to be exchanged for different variants. This will allow the relative performance between different bandwidths and frequencies to be assessed.

Aerial

A $\frac{1}{4}$ wave end fed antenna is supplied. The carrier is fitted with an SMA connector, making it possible to connect the module to other antenna arrangements. If using an antenna that provides gain, it may require the power levels from the module to be reduced to ensure that the radiated RF power output stays with the relevant legal limits.

Module I/O

The module can be connected to external Hardware using the 26 way '**MOD I/O**' connector.

Power for the external hardware can be derived from this connector, but is recommended that the total current taken does not exceed 30mA.

The Vcc of the CDE is 3.2 Volts, care must be taken to make sure the external hardware is working at the same supply voltage or that appropriate 'level shifting' is implemented, to ensure no damage is sustained to the module or external hardware.

The relevant I/O connections are marked on the CDE board adjacent to the appropriate pin.

Module Programming

A serial programmer such as the STK500 can be connected to the '**MOD PROG**' connector. This will allow reprogramming without using the serial 'Bootloader'. It is important the RS232 is not connected when the module is being serially programmed as the RS232 levels may conflict with the programming levels.

RS 232 serial input

The module can be connected via the industry standard '9 way D' serial socket provided to an external RS232 port. The level shifting is implemented by an 'on board' level shifter, making it possible for the board to be directly connected to an RS232 PC serial port.

This serial connection will allow serial data to be sent over the 'air' with all the serial protocol being handled by the module itself.

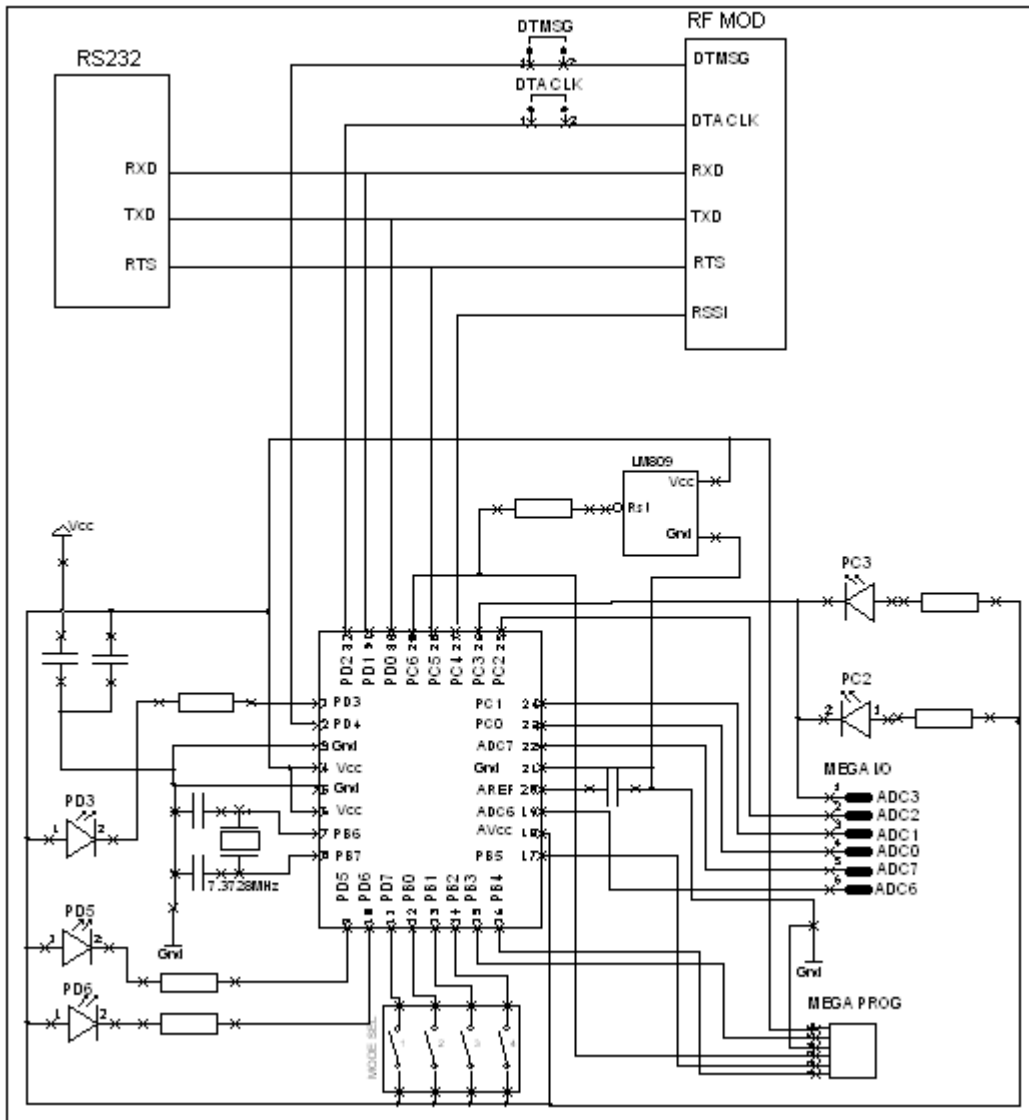
On Board Microprocessor (Mega 88)

The CDE is equipped with an ‘On Board’ Microprocessor. The processor is from the same family as the processor used in the module, in order that the same tools can be used for programming both the module and the external processor.

The Mega 88 is shipped ‘unprogrammed’ so that all the I/O is high impedance.

This processor is connected to the serial data lines of both the module and the RS232 transceiver, it is most important that when the processor is programmed that care is taken so that I/O on these lines do not conflict with the data and other logic levels.

Mega 88 connections



The I/O is connected to 'On board' LED's, switches and a pin header '**MEGA I/O**', so that the Microprocessor can be connected to external hardware.

A programming header '**MEGA PROG**' is also provided so that the processor can be serially programmed.

The processor oscillator frequency is set at 7.3728MHz so that it software can easily be designed to run at standard 'baud' rates.

Ping Mode.

When assessing the suitability of a particular Module for a specific application, the user will often need to determine both the range and the immunity to interference. There are so many variables that dictate the reliability, range and performance provided by Radio products that it is almost impossible to predict the performance from the specifications provided on datasheets alone.

The 'Ping' mode has been designed so that the user can perform a basic test to ascertain the suitability in particular applications. In 'Ping' mode one CDE is simply turned On and the second CDE is put into 'Ping' mode. 'Ping' mode is achieved by turning on the CDE and pressing the switch marked 'Ping' on the board, this will be confirmed by the Green LED marked 'Ping' being illuminated.

When 'Pinging', the Transmitting CDE will send data to the receiving CDE. When the receiving CDE acquires valid 'Ping' data, this data will be 'echoed' back. When a valid 'echo' is received, the sounder will 'pip' and the GP3 LED will flash (the audible 'pip' can be suppressed by removing 'SON-EN' jumper). This process will repeat approximately every second.

When both CDE's are within range of each other, a constant 'pip', 'pip', 'pip',, will occur when 'Ping' mode is selected. If the units are out of range or 'blocking' interference occurs, the 'pips' will be dropped. By increasing the distance between the CDEs and monitoring the regularity of the 'pips', the useful range and performance of the Module in that particular environment can easily be assessed. This mode of operation will give the user confidence in the reliability of the system in a given situation.

Cycling the power or pressing the reset switch will take the CDE out of ping mode.

The 'Loopback' software provided can be used if a more detailed assessment is required.

Transparent Mode

In normal default operation the transceiver operates in 'Packet' mode, sending data via the RF in 'Packets' using a format determined by the module's firmware and user defined parameters. 'Transparent' mode can be selected by pressing the 'Ping' switch before the Module is powered and then releasing the switch once the unit has 'powered up'. 'Transparent' operation will be confirmed by the illumination of the Yellow '**TRANS**' LED.

In Transparent mode the flow of raw data on the 'data message' pin will be controlled by the RTS line. When the RTS pin is set low the data will be transmitted, when the RTS pin is high the data will be considered to be received data.

To return to Packet mode press the reset switch, this will cause the Yellow '**TRANS**' LED to go out, confirming the operation.

The Module can be made to default to Transparent mode by setting this option in the user setup program.

Boot Mode

Boot mode allows the modules 'Bootloader' to be enabled and uploads to be made via the serial RTS232 port. The user application software will allow reprogramming of the flash firmware and the specific user settings to be implemented, uploaded and stored.

Boot mode can be selected by pressing the 'Boot' switch before the Module is powered and then releasing the switch once the unit has 'powered up'. Boot mode operation will be confirmed by the illumination of the Green '**BOOT**' LED.

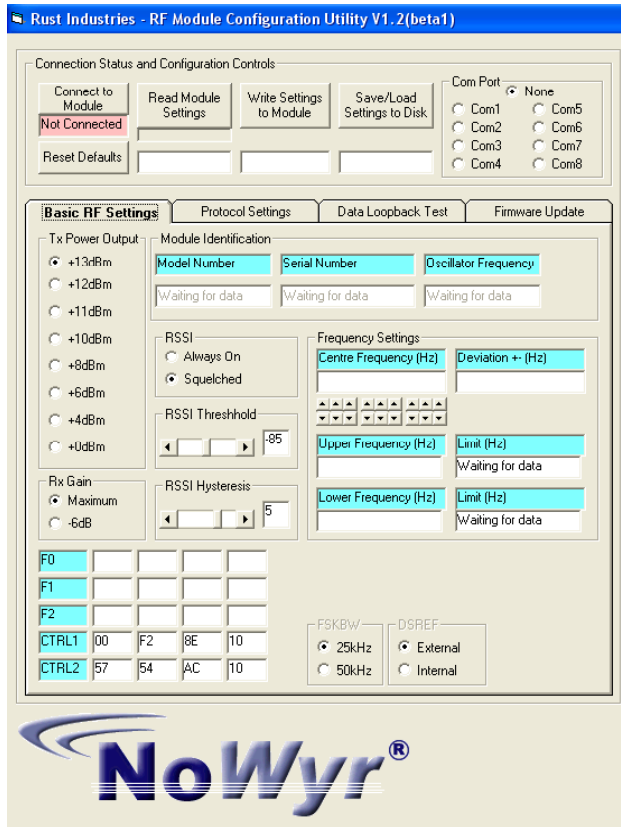
Once in Boot mode, the application software can be connected to the Module and used to upload firmware and adjust the user setting.

To leave Boot mode press the reset switch, this will cause the Green '**BOOT**' LED to go out, confirming the operation.

PC Application Software

The application software is 'Windows™ compatible, simplifying the configuration settings. The opening 'window' will be seen below.

Firstly the CDE must be put into 'BOOT' mode, the unit must be connected to the PC via a serial port, the communication port must be selected, then the 'Connect to Module' button clicked. 'Connected' will be displayed when communication has been established and the 'setup' should be self-explanatory using standard 'Windows™ conventions and procedures for navigating and implementing changes.



Basic RF Settings

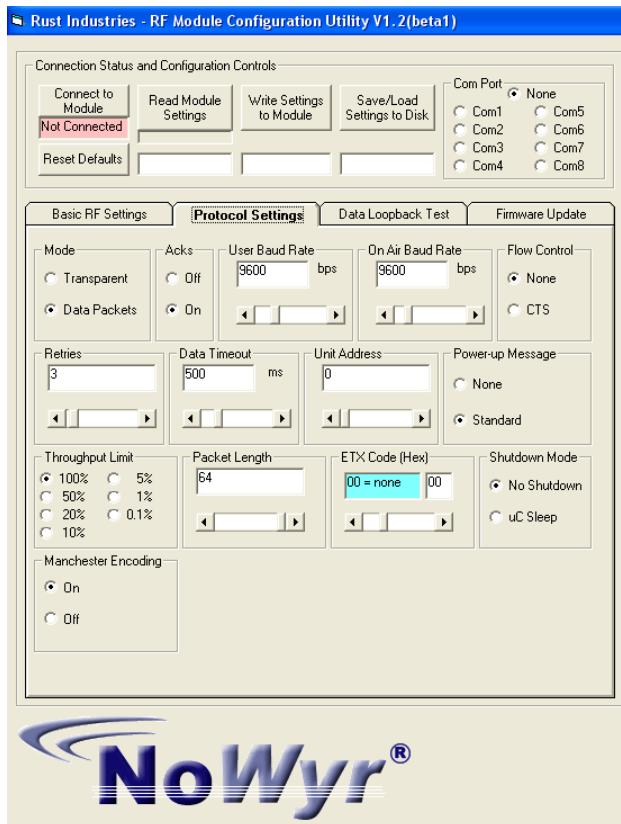
This menu will be displayed on the opening window, the modules specific serial number, type and crystal frequency will be displayed.

The frequency can be adjusted using the increment/decrement arrows with the statutory and functionally limits implemented by the software.

The power levels and sensitivity can be set, however it is the responsibility of the user to ensure that all settings comply with current local regulations where the units will be used.

Protocol Settings

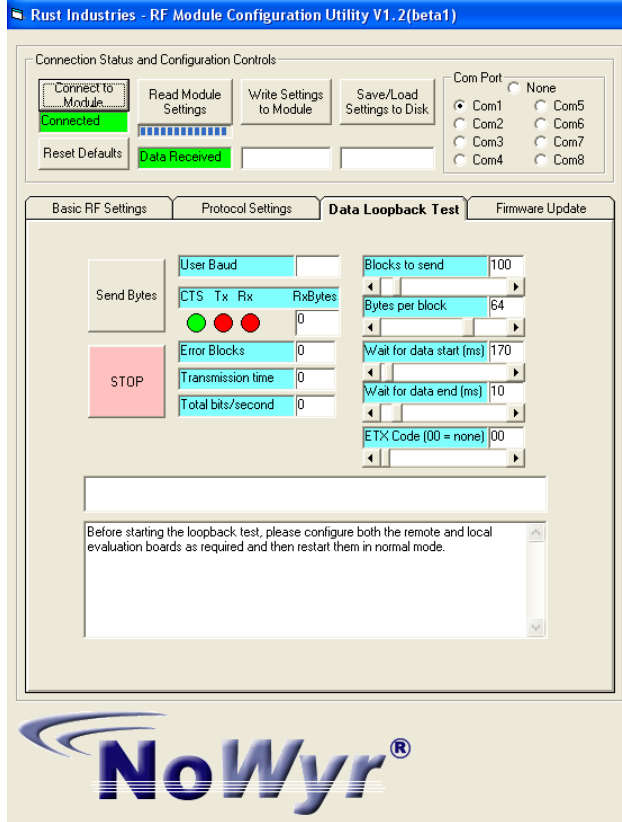
The protocol settings can be adjusted from the tool panel as shown below:-



All the parameters are set using 'slider bars' or multi option selection. This system ensures that all settings that the User selects are constrained by the software so that it is not possible for the user to configure the module beyond the specification. Remember to write the setting to the module once the setting have been selected.

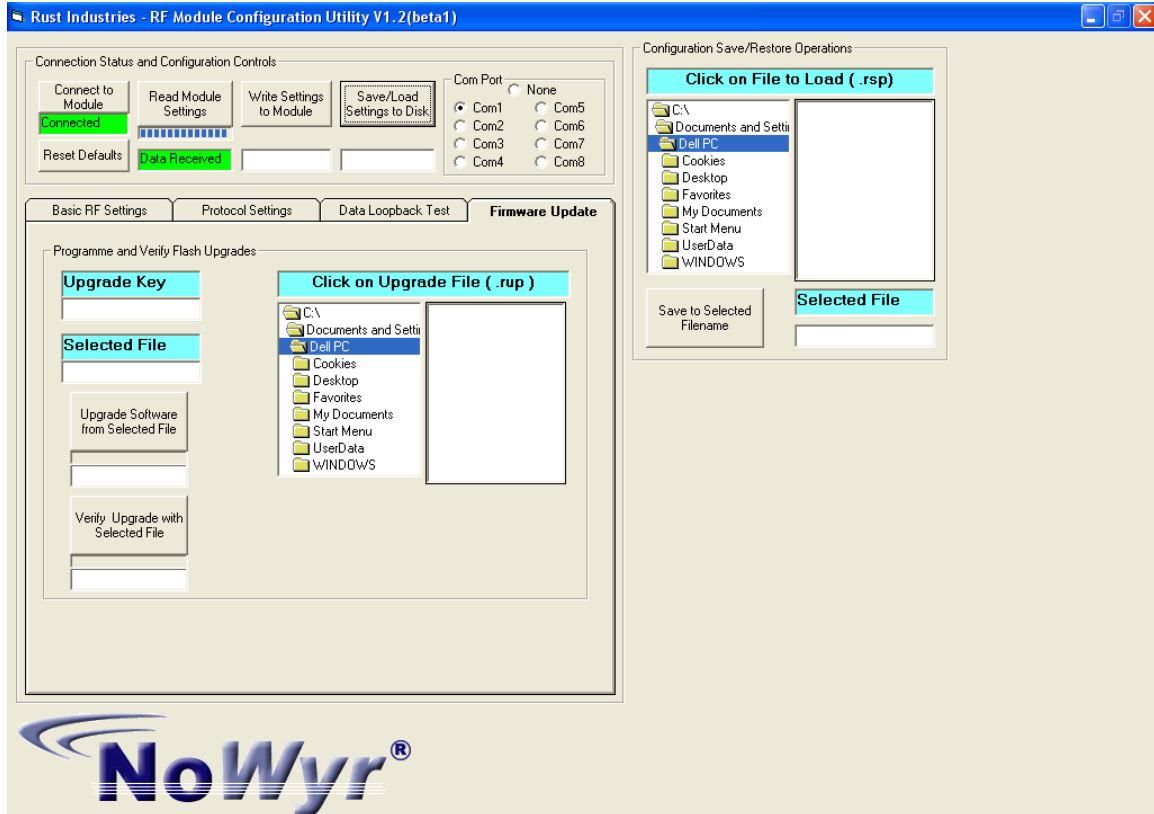
Data Loop Back

This feature is designed to allow the user to check operation of the module. The user can optimize the packet sizes, data rates, encoding method and frequency etc. The effect of these changes can be displayed as shown in the window seen below.



Firmware Upgrade and Store settings.

It is possible to up upgrade or change the variant of firmware directly from a PC, by using the 'Bootloader' embedded in the module. Also settings can be saved or loaded from files.



Upgraded versions of firmware will have the file extension .rup and specific custom application software will have the file extension .res.

Customisation

The module has been designed with many useful functions, however if the user requires functionality that is not currently available, it may be possible to have the firmware customised for specific requirements.

If customization is required or you require any further assistance please contact us at 'nowyr.co.uk'.

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