Discontinued

RFM products are now Murata products.

DR2000

Development Board

Revision History

Revision	Date	Author	Change Description
1	04/30/2009	F. Perkins	Initial issue
2	11/19/2015	R. Willett	Reformatted to comply with new Murata V.I.

©2010-2015 by Murata Electronics N.A., Inc.

Discontinued

DR2000 Virtual Wire® Development Kit Hardware Warranty

Limited Hardware Warranty. Murata Electronics, N.A., Inc warrants solely to the purchaser that the hardware components of the DR2000 Virtual Wire® Development Kit (the "Kit") will be free from defects in materials and workmanship under normal use for a period of 90 days from the date of shipment by Murata. This limited warranty does not extend to any components which have been subjected to misuse, neglect, accident, or improper installation or application. RFM's entire liability and the purchaser's sole and exclusive remedy for the breach of this Limited Hardware Warranty shall be, at RFM's option, when accompanied by a valid receipt, either (i) repair or replacement of the defective components or (ii) upon return of the defective Kit, refund of the purchase price paid for the Kit. **EXCEPT FOR THE LIMITED HARDWARE WARRANTY SET FORTH ABOVE, MURATA AND ITS LICENSORS PROVIDE THE HARDWARE ON AN "AS IS" BASIS, AND WITHOUT WARRANTY OF ANY KIND EITHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF NONINFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** Some states do not allow the exclusion of implied warranties, so the above exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

Limitation of Liability. IN NO EVENT SHALL MURATA OR ITS SUPPLIERS BE LIABLE FOR ANY DAMAGES (WHETHER SPECIAL, INCIDENTAL, CONSEQUENTIAL OR OTHERWISE) IN EXCESS OF THE PRICE ACTUALLY PAID BY YOU TO MURATA FOR THE KIT, REGARDLESS OF UNDER WHAT LEGAL THEORY, TORT, OR CONTRACT SUCH DAMAGES MAY BE ALLEGED (INCLUDING, WITHOUT LIMITATION, ANY CLAIMS, DAMAGES, OR LIABILITIES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF BUSINESS INFORMATION, OR FOR INJURY TO PERSON OR PROPERTY) ARISING OUT OF THE USE OR INABILITY TO USE THE KIT, EVEN IF MURATA HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. BECAUSE SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES, THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

Special notice on restricted use of DR2000 Virtual Wire® Development Kits

DR2000 Virtual Wire® Development Kits are intended for use solely by professional engineers for the purpose of evaluating the feasibility of low-power wireless data communications applications. The user's evaluation must be limited to use of an assembled Kit within a laboratory setting which provides for adequate shielding of RF emission which might be caused by operation of the Kit following assembly. In field testing, the assembled device must not be operated in a residential

Discontinued

area or any area where radio devices might be subject to harmful electrical interference. This Kit has not been certified for use by the FCC in accord with Part 15, or to ETSI I-ETS 300 220 or I-ETS 300 220-1 regulations, or other known standards of operation governing radio emissions. Distribution and sale of the Kit is intended solely for use in future development of devices which may be subject to FCC regulation, or other authorities governing radio emission. This Kit may not be resold by users for any purpose. Accordingly, operation of the Kit in the development of future devices is deemed within the discretion of the user and the user shall have all responsibility for any compliance with any FCC regulation or other authority governing radio emission of such development or use, including without limitation reducing electrical interference to legally acceptable levels. All products developed by user must be approved by the FCC or other authority governing radio emission prior to marketing or sale of such products and user bears all responsibility for obtaining the FCC's prior approval, or approval as needed from any other authority governing radio emission.

If user has obtained the Kit for any purpose not identified above, including all conditions of assembly and use, user should return Kit to RF Monolithics, Inc. immediately.

The Kit is an experimental device, and Murata makes no representation with respect to the adequacy of the Kit in developing low-power wireless data communications applications or systems, nor for the adequacy of such design or result. Murata does not and cannot warrant that the functioning of the Kit will be uninterrupted or error-free.

The Kit and products based on the technology in the Kit operate on shared radio channels. Radio interference can occur in any place at any time, and thus the communications link may not be absolutely reliable. Products using Virtual Wire® technology must be designed so that a loss of communications due to radio interference or otherwise will not endanger either people or property, and will not cause the loss of valuable data. Murata assumes no liability for the performance of products which are designed or created using the Kit. **Murata products are not suitable for use in life-support applications, biological hazard applications, nuclear control applications, or radioactive areas.**

Murata and Virtual Wire are registered trademarks of Murata Electronics N.A., Inc. MS-DOS, QuickBASIC, and Windows are registered trademarks of Microsoft Corporation.

©2010-2015 by Murata Electronics N.A., Inc.

Discontinued

1.0 DR2000 Virtual Wire® Development Kit Introduction

1.1 Purpose of the DR2000 Virtual Wire® Development Kit

The DR2000 Virtual Wire® Development Kit is a tool for evaluating the feasibility of a low-power wireless data communications application. The kit also facilitates the development of the actual system.

1.2 Intended Kit User

The DR2000 Virtual Wire® Development Kit is intended for use by a professional engineer with a working knowledge of data communications. The kit itself is not intended as an end product, or for use by individuals that do not have a professional background in data communications. Please refer to the Special Notices section in the front of this manual.

1.3 General Description

The DR2000 Virtual Wire® Development Kit allows the user to implement low-power wireless communications based on half-duplex packet transmissions. The kit contains the hardware and software needed to establish a wireless link between two computers with RS232C serial ports. The kit includes two communications nodes, with each node consisting of a data radio protocol board, plus accessories. The DR2000-DK kit operates at 916.5 MHz.

©2010-2015 by Murata Electronics N.A., Inc.

Discontinued

1.4 Key Features

The DR2000 Virtual Wire® Development Kit includes a number of key features:

- “Out of the box” operation between two PC's
- 3 Vdc low-current UHF data radio transceivers (916.5 MHz)
- Excellent receiver off-channel interference rejection
- Wide dynamic range receiver log detection and AGC for resistance to on-channel interference
- Reference antennas
- 3 Vdc low-current protocol boards based on an Analog Devices DSP
- On-board CMOS logic to RS232C level conversion
- Packet link-layer protocol with ISO 3309 error detection and automatic packet retransmission; up to 255 message bytes per packet transmission (ASCII or binary)
- DC-balanced data coding for robust RF transmission performance
- Simple packet protocol to application layer interface plus example application software
- 2 Bi-Color Leds for system performance evaluation
- Auto Transmission for range testing
- User **programmable** RF and serial data speed
- User **programmable** OOK & ASK Mode
- User **programmable** node addresses
- User **programmable** packet size
- User configuration retained in Flash memory
- **NO** PC required for Range testing
- **Compatible** with RFMs IC1000 Start bit & Clock Recovery IC

©2010-2015 by Murata Electronics N.A., Inc.

Discontinued

2.0 Regulatory Certification

Regulatory Authority - Worldwide, man-made electromagnetic emissions are controlled by international treaty and the ITU (International Telecommunications Union) committee recommendations. These treaties require countries within a geographical region to use comparable tables for channel allocations and emission limits to assure that all users can operate with reasonable levels of interference.

Recognizing a need to protect their limited frequency resources, many countries have additional local laws, regulations, and government decrees for acceptable emission levels from various electronic equipment, both military and commercial. By requiring that each model of equipment be tested and an authorization permit issued after payment of a tax (called a grant fee), the government attempts to control the sale of poor quality equipment and also has record of the known manufacturers.

Enforcement and expectation of the local law varies, of course. USA, Canada, and most European countries have adopted ITU tables for their respective radio regions. Australia, Hong Kong, and Japan also have extensive rules and regulations for low-power transmitters and receivers, but with significant differences in the tables for that radio region. Most other countries have less formal regulations, often modeled on either USA or EU regulations.

In any country, it is important to contact the Ministry of Telecommunications or Postal Services to determine any local limitations, allocations, or certifications PRIOR to assembling or testing your first product. The mildest penalty is often total loss of your import, export, and foreign exchange privileges.

©2010-2015 by Murata Electronics N.A., Inc.

Discontinued

These laws and requirements are applicable to the finished product, in the configuration that it will be sold to the general public or the end user. OEM components often can not be certified, since they require additional attachments before they have any functional purpose.

Unless otherwise marked, Murata DR2000 Virtual Wire® Development Kit modules have not been certified to any particular set of regulations. Each module has suggested countries for use, depending on current allocations and technical limits. Emissions from receivers can be an unexpected problem, and the Murata modules have special features to help with this part of the emission testing.

Product Certification - General requirements for emissions and ingressions (called susceptibility, if errors occur) are controlled by engineering standards of performance, regulations, and the customer's expectations.

In USA and Canada, for example, you must formally measure the emissions, file for a certification or authorization, and affix a permanent marking label to every device, prior to offering your system for sale. Regulations allow you to build only a small number (usually 5 pieces) for testing and in-company use, before certification and marketing. Trade shows and product announcements can be a problem for marketing, when the products are advertised without proper disclaimers. With Internet access, go to "www.fcc.org" for USA information or "www.ic.gc.ca" for Canada. The Canada rules are RCC-210, Revision 2.
FCC CFR 47, Parts 2 and 15, contains the needed information for USA sales.

European Union (EU) requirements allow self-certification of some systems and require formal measurement reports for other systems. In all cases, however, the directives demand the "CE mark" be added to all compliant devices before any device is freely shipped in commerce. In the EU, the EMC Directive also adds various tests and expectations for levels of signal that will permit acceptable operation.

©2010-2015 by Murata Electronics N.A., Inc.

Discontinued

The EU directives introduce the concepts of a “cognizant body”, a “notification body”, and a “construction file”. Cognizant bodies are simply technical experts recognized by the EU committees to review technical regulations and compliance. Any acceptable test lab will have a preferred cognizant body for their certifications. Each regulatory body will have at least one engineer designated as the notification body for that country, and he receives any communication about certification or changes to a certified system. While this may seem confusing, it does avoid the legal problems of engineering titles and varied bureaucratic ministry names.

Construction files (CF) are a common format for presenting pictures, schematics, and all other information on the parts and processes used to actually build a certified system. The report of antenna range measurements will be included in the CF. Your cognizant body will review the construction file before granting the authorizations for CE mark and EU identification label on your system.

The first problem in the EU is usually Border Customs, who have been trained to look for the CE logo marking for all products. You may need special forms or permits to simply ship pre-production models to your test lab. The Internet web site “www.etsi.co.fr” has information for ordering the full EU marketing regulations.

Certification Testing - The emissions are measured in a calibrated environment defined by the regulations. USA and Canada use an “open field” range with 3 meters between the device under test (DUT) and the antenna. The range is calibrated by measurement of known signal sources to generate range attenuation (correction) curves in accordance with ANSI C63.4-1992.

©2010-2015 by Murata Electronics N.A., Inc.

Discontinued

EU measurement rules are based on a similar arrangement, but a “standard dipole” antenna is substituted for the DUT to calibrate the range attenuation. Since the EU measurements are comparison or substitution rules, they are often easier to follow for informal pre-testing by the designer. ETSI-300-220 has drawings to completely describe a typical test configuration.

The United States and Canadian requirements are contained in ANSI C63.4-1992, including a step-by-step test calibration and measurement procedure. Since these rules include range attenuation factors, one must make twice the measurements of the EU test method. Other countries follow one of these two techniques, with exception for a 10 meter range (separation) measurement or a different range of test frequencies.

Each of the listed contacts will have resources to provide (for a fee) current regulations and certification forms. They also can suggest sources for your formal tests, either commercial labs or the government testing office. Unless you want to invest in a qualified radiated signals test range, the commercial labs can help with preliminary measurements and some expertise in correcting any difficulties that are noted.

2.1 Regulatory Certification Contacts

Contacts for further information and current test facilities listings:

ANSI
Institute of Electrical & Electronics Engineers,
345 East 47th Street, New York, NY 10017 USA

ETSI
European Telecommunications Standard Institute
F-06921 Sophia Antipolis Cedex FRANCE

FCC
Federal Communications Commission
Washington DC 20554 USA

©2010-2015 by Murata Electronics N.A., Inc.

Discontinued

Canada DOC
Industrie Canada
Attn: Certification, Engineering and Operations Section,
1241 Clyde Avenue, Ottawa K1A 0C8 CANADA

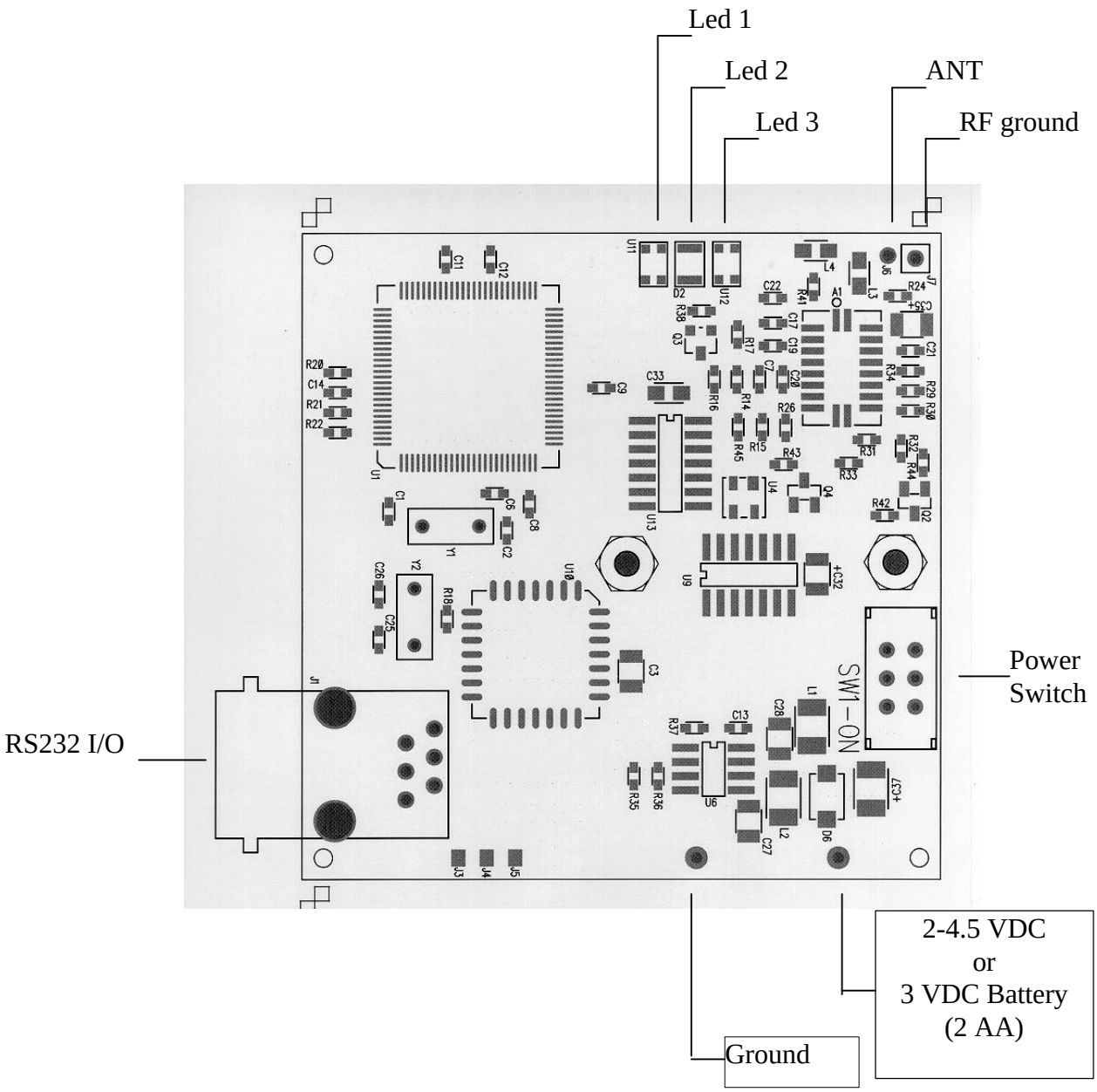
UNITED KINGDOM
LPRA (manufacturing association information)
Low Power Radio Association
The Old Vicarage, Haley Hill, Halifax HX3 6DR UK
or
Radiocommunications Agency (official)
Waterloo Bridge House, Waterloo Road
London SE1 8UA

JATE
Japan Approvals Institute (JATE)
Isomura Bldg, 1-1-3 Toranomon
Minato-ku Tokyo JAPAN

©2010-2015 by Murata Electronics N.A., Inc.

Discontinued

DR2000 PCB:



Discontinued

Led Indicators:

Led1

Bi-color red and green Led.

Normal Rx / Tx operation	=	Green Flashing ~ 0.5 Hz
Range test ON	=	Red Flashing ~ 0.5Hz
Command Error	=	Green or Red Flashing ~0.2Hz

Led2

Yellow Led

RS232 I/O activity	=	Rxout Off	=	Led off
		Rxout On	=	Led On for data out

Led3

Bi-color red and green Led.

Normal Rx / Tx Operation	=	Flash Green for receipt of GOOD Data Flash RED for receipt of BAD Data (Good data is FC1 & FC2 Match, Bad data is FC1 and/or FC2 do not match)

ANT

Antenna Connection point

RF Ground

Antenna Ground point

Ground

Ground input for Board (-)

2-4-5 VDC

Power input to board (+)
2 to 4.5 VDC input from power supply or
1.5 to 3 VDC from 2 AA Batteries

RS232 I/O

Serial I/O and Hardware Flow Control I/O
RJ11 Connector

Discontinued

DR2000 Protocol Packet definition:

Start Symbol	Pre-amble 1 & 2	Pre-amble 3
B10000111111110	B10101110101010	B11010101010100

To Add	From Add	Pk Num	Cmd	Length	Data	FCS1	FCS2
1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	n Bytes	1 Byte	1 Byte
1-255	1-255	1-255	3-239	1-255	0-255	0-255	0-255

********* Pk Num **MUST** be at least **1** count different between packets (1,2,1,2 or 1,2,3,4,5)

Example of encoded data:

Data out(tx)	Rotate(LSB to MSB)	Invert/drop st & sp	
10000111111110	01111111100001	000000001111	Start Symbol
10101110101010	01010101110101	010101000101	Special Preamble 1
10101110101010	01010101110101	010101000101	Special Preamble 2
11010101010100	00101010101011	101010101010	AA hex Preamble 3
10111000011100	00111000011101	100011110001	31 hex To Address
11011000011100	00111000011011	100011110010	32 hex From Address

st = start bit
sp = stop bit

Data shifted out lsb first

DC balanced Symbols Used in the DR2000:

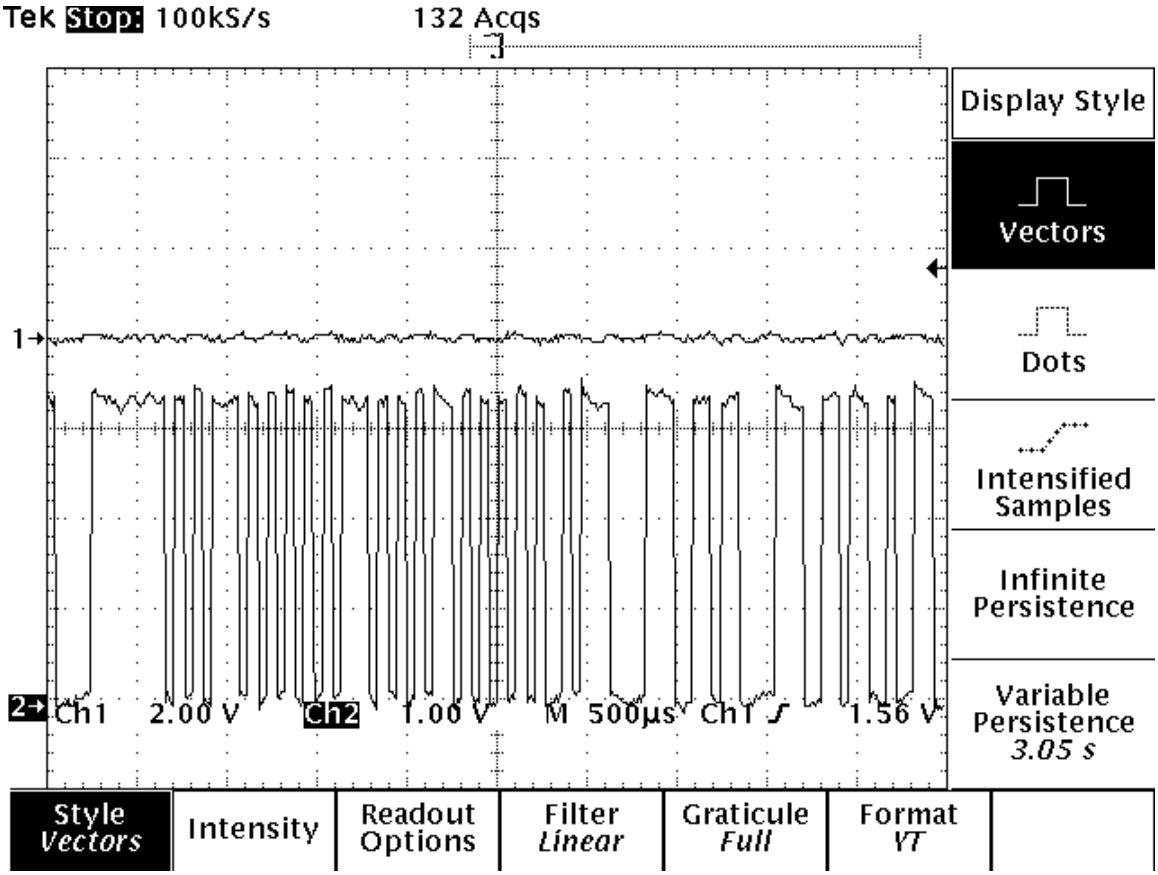
0x0015, { NIBBLE = 0 010101 }
0x0031, { NIBBLE = 1 110001 }
0x0032, { NIBBLE = 2 110010 }
0x0023, { NIBBLE = 3 100011 }
0x0034, { NIBBLE = 4 110100 }
0x0025, { NIBBLE = 5 100101 }
0x0026, { NIBBLE = 6 100110 }
0x0016, { NIBBLE = 7 010110 }
0x001A, { NIBBLE = 8 011010 }
0x0029, { NIBBLE = 9 101001 }
0x002A, { NIBBLE = 10 101010 }
0x000B, { NIBBLE = 11 001011 }
0x002C, { NIBBLE = 12 101100 }
0x000D, { NIBBLE = 13 001101 }
0x000E, { NIBBLE = 14 001110 }
0x001C, { NIBBLE = 15 011100 }

A 31hex would be : 100011110001

©2010-2015 by Murata Electronics N.A., Inc.

Discontinued

Example of the Start Symbol, Preamble1,2 & 3 and the To & From Address, 31 & 32hex. This is taken directly from the DR2000 while sending Range Test Data at the Txmod input to the TR1000.



Discontinued

DR2000 Commands:

All commands **ARE** case sensitive.

$$PCSPn Change RS232 baud rate (default @ power up is 19.2kb)
n = 0 19200
n = 1 2400
n = 2 4800
n = 3 9600
n = 4 38400
n = 5 57600
n = 6 115200

Response PC baud rate = nnnnn

$$RDSPn Change RF baud rate (this value is stored in flash memory)
n = 0 57600
n = 1 2400
n = 2 4800
n = 3 9600
n = 4 19200
n = 5 38400
n = 6 115200

Response RF baud rate = nnnnn

$$RFMDn Change RF Tx Mode (this value is stored in flash memory)
n = 0 OOK
n = 1 ASK

Response RF mode = nnn

©2010-2015 by Murata Electronics N.A., Inc.

Discontinued

DR2000 Commands (continued):

$$TOADhh	Change 'To' address (in hex) Valid digits: 0-f (00 – ff) To Address of '00' is used for Broadcast (this value is stored in flash memory)
Response	To Address = nn
$$FRADhh	Change 'FROM' address (in hex) Valid digits: 0-9, a-f (00 – ff) (this value is stored in flash memory)
Response	From Address = nn
$$SIZEhh	Change Packet size (in hex) Valid digits: 0-9, a-f (01 – ff) Recommended packet size is 64 (40h) (this value is stored in flash memory)
Response	Packet Size = nn
$$RCSTn	Turn on data output via RS232. This is the output control n = 0 Rx output off n = 1 Rx output on
Response	Rxout = on/off
$$RANGn	'Range Test' (auto transmit) n = 0 Range test off n = 1 Range test on Range test data sent = " Range Test Data " To display the data on remote, RCST must be on.
Response	Range on/off

©2010-2015 by Murata Electronics N.A., Inc.

Discontinued

DR2000 Commands (continued):

$$s	Display current DR2000 configuration **Example:** RF mode OOK To Address = 31 From Address = 32 Packet Size = 40 Range on Rxout on To address is 31 hex (49) From Address is 32 hex (50) Packet size is 40 hex (64) Range test is ON RS232 output is on
$$^s	Control s = Xon/Xoff flow control disabled
Response	XON-XOFF Disabled
$$^q	Control q = Xon/Xoff flow control enabled
Response	XON-XOFF enabled
$$SCTSn	Enable / Disable Hardware flow control n = 0 Disable Hardware flow control n = 1 Enable Hardware flow control
Response	SCTS OFF/ON

©2010-2015 by Murata Electronics N.A., Inc.

Discontinued

DR2000 Commands (continued):

$$? Display valid commands

Response:

$$s	=	$$s Received, display status
$$^s	=	Xon-Xoff Disabled
$$^q	=	Xon-Xoff Enabled
$$PCSP	=	PC Baud Rate
$$RDSP	=	RF Baud Rate
$$RFMD	=	RF mode
$$TOAD	=	Set To Address
$$FRAD	=	Set From Address
$$SIZE	=	Set Packet Address
$$STMD	=	Set Mode
$$SCTS	=	Set CTS
$$REST	=	Reset
$$??	=	HELP

©2010-2015 by Murata Electronics N.A., Inc.

Discontinued

DR2000 Remote Commands:

These commands will change to configuration of the remote DR2000 when their Address is equal to "TO address".

$&PCSPn Change remote RS232 baud rate (default @ power up is 19.2kb)
n = 0 19200
n = 1 2400
n = 2 4800
n = 3 9600
n = 4 38400
n = 5 57600
n = 6 115200

Response Message sent to remote

$&RDSPn Change remote RF baud rate (this value is stored in flash memory)
Care must be taken to change remote RF baud rate first
n = 0 57600
n = 1 2400
n = 2 4800
n = 3 9600
n = 4 19200
n = 5 38400
n = 6 115200

Response Message sent to remote

$&RFMDn Change remote RF Tx Mode
n = 0 OOK
n = 1 ASK
(this value is stored in flash memory)

Response Message sent to remote

$&TOADhh Change remote 'To' address (in hex)
Valid digits: 0-f (00 – ff)
To Address of '00' is used for Broadcast
(this value is stored in flash memory)

Response Message sent to remote

©2010-2015 by Murata Electronics N.A., Inc.

Discontinued

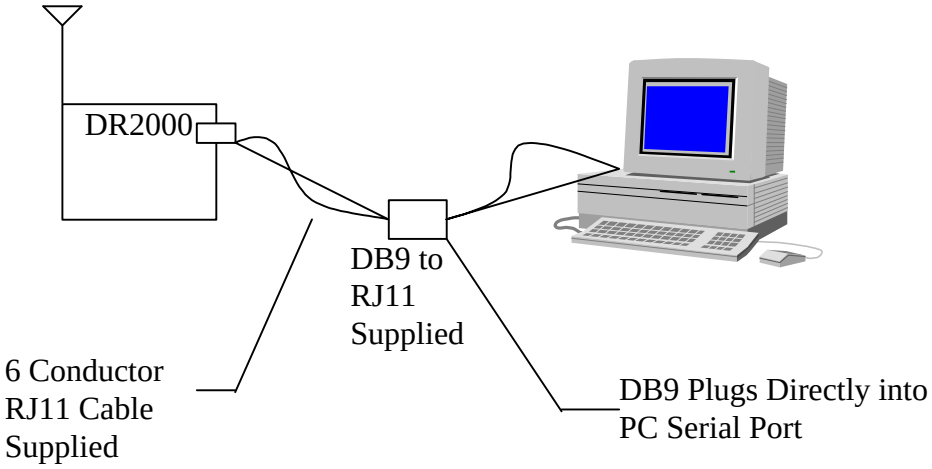
DR2000 Remote Commands (continued):

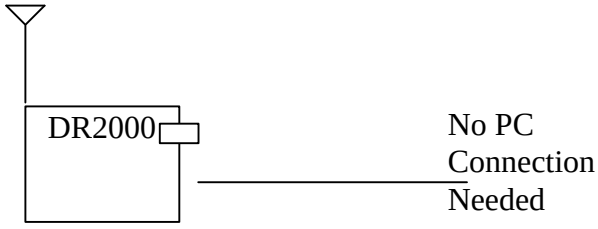
$&FRADhh	Change remote 'FROM' address (in hex) Valid digits: 0-9, a-f (00 – ff) (this value is stored in flash memory)
Response	Message sent to remote
$&SIZEhh	Change remote Packet size (in hex) Valid digits: 0-9, a-f (01 – ff) Recommended packet size is 64 (40h) (this value is stored in flash memory)
Response	Message sent to remote
$&RCST	Turn on remote data output via RS232. This is the output control n = 0 Rx output off n = 1 Rx output on
Response	Message sent to remote

©2010-2015 by Murata Electronics N.A., Inc.

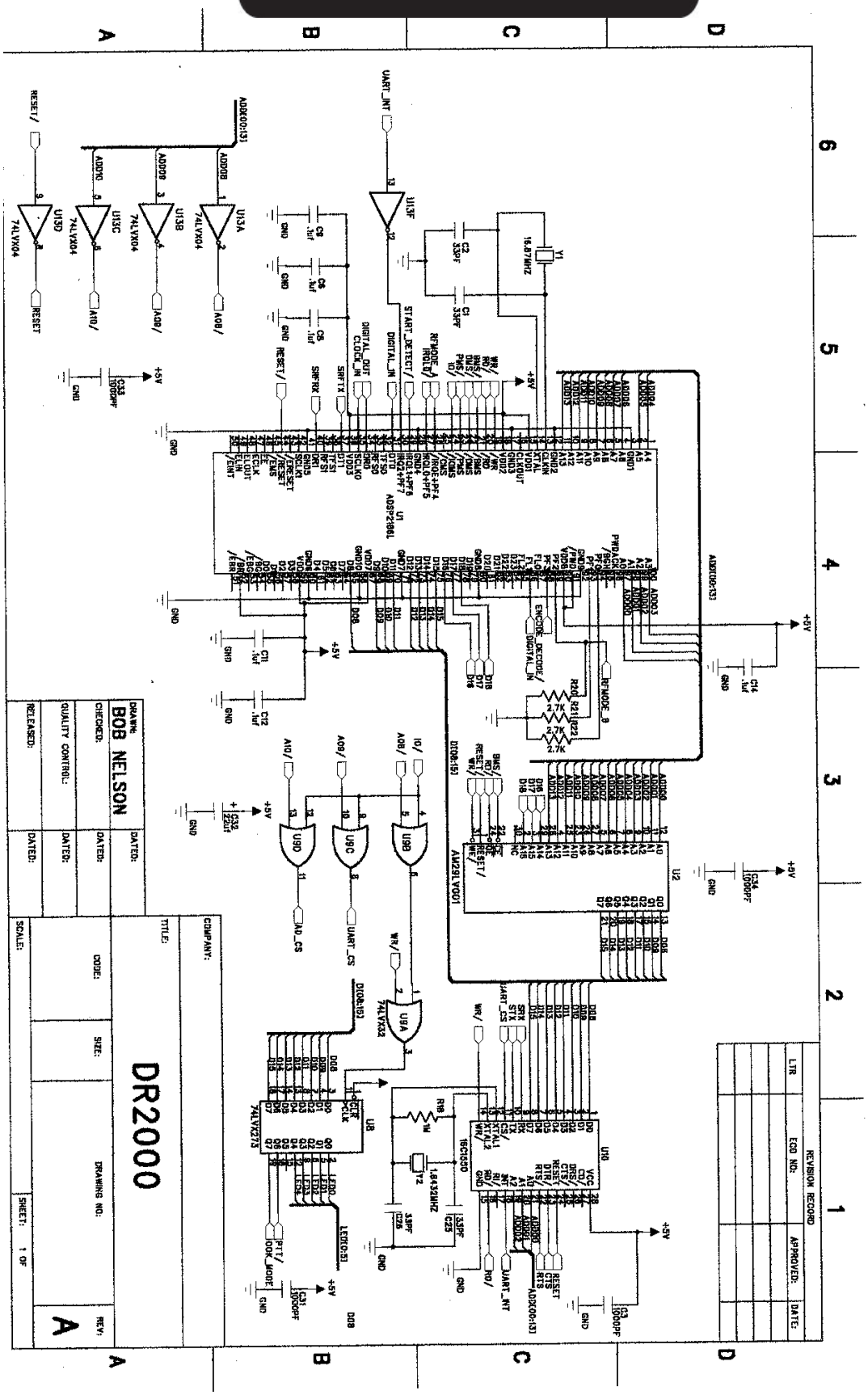
Discontinued

DR2000 Setup:

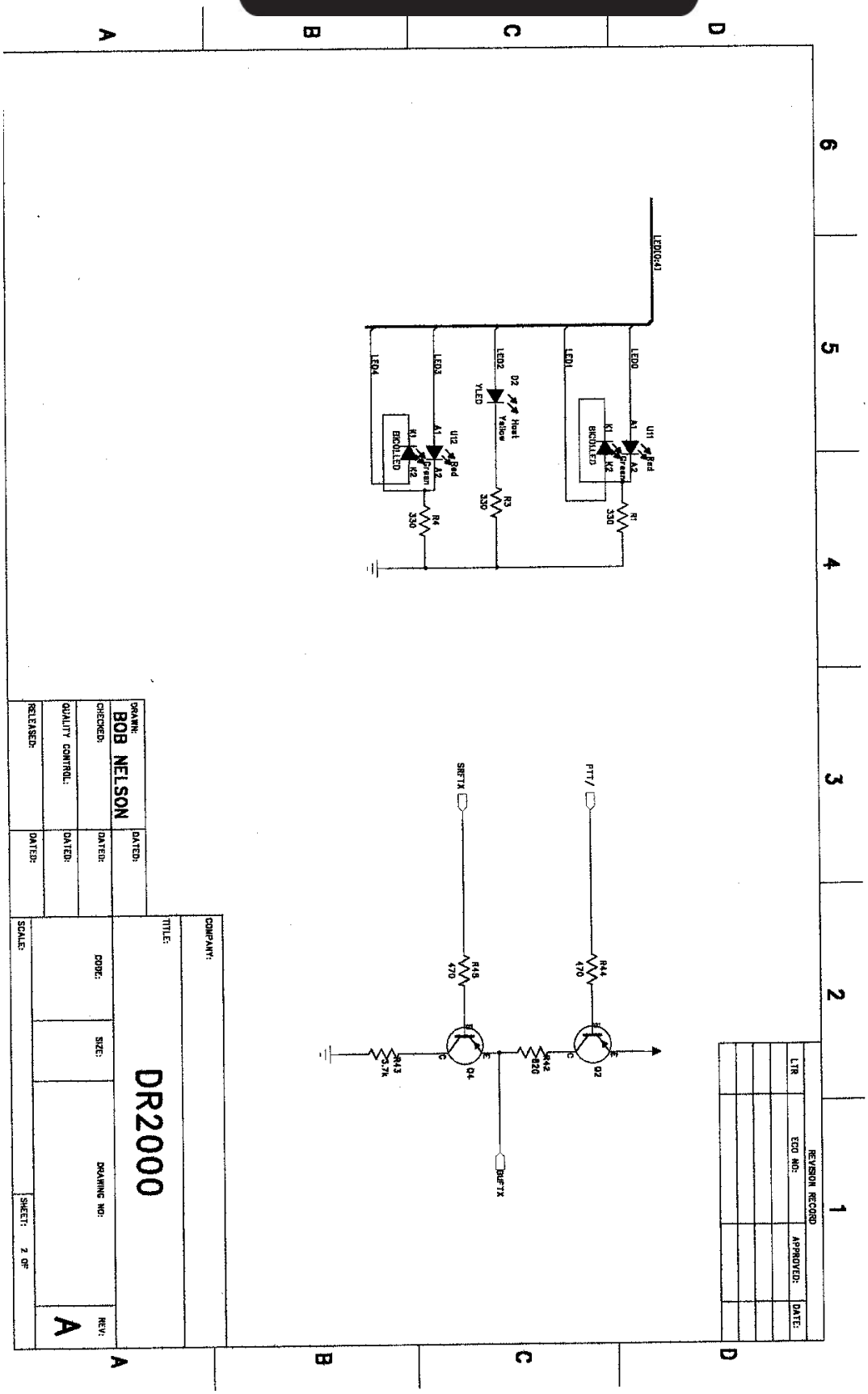




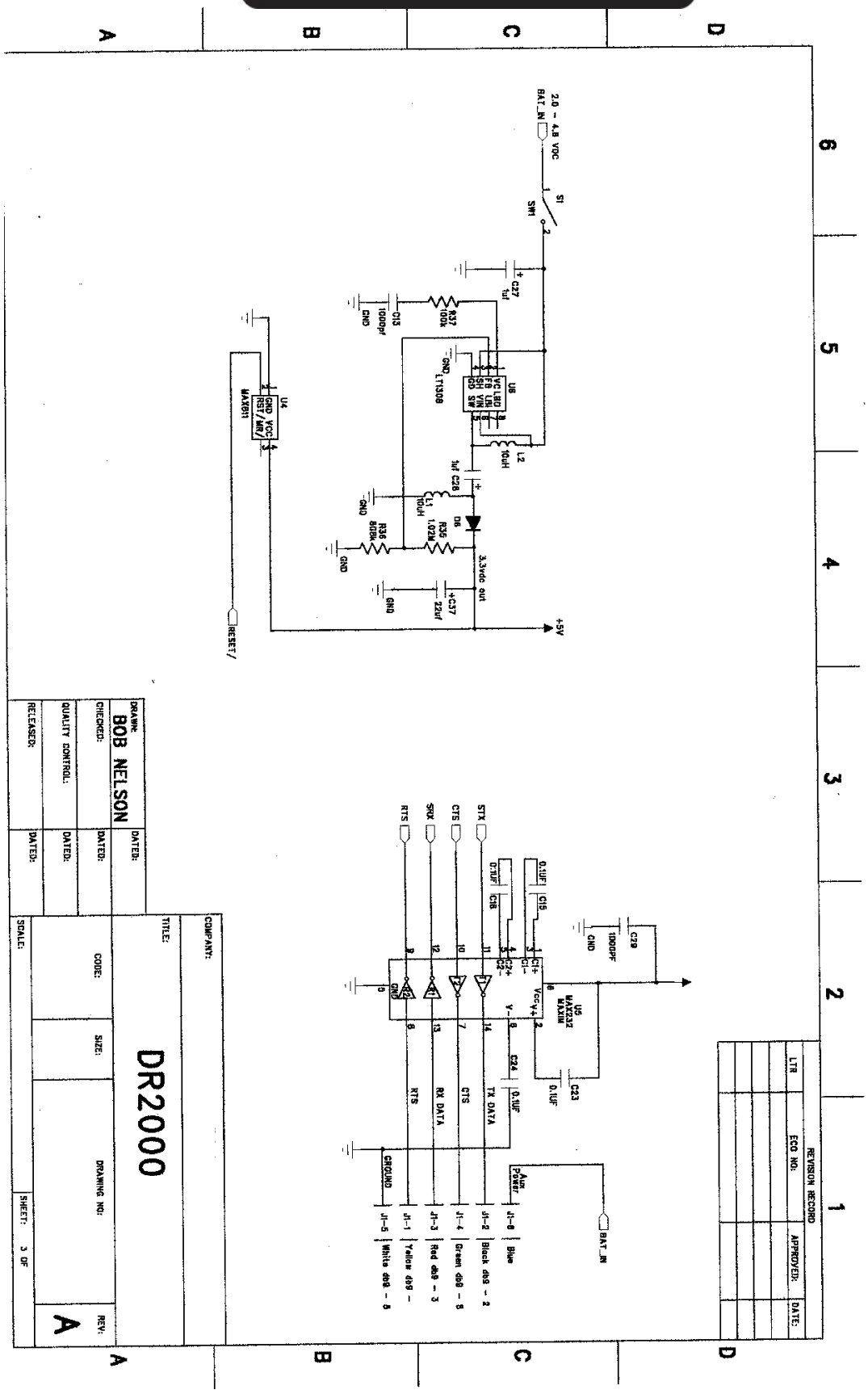
Discontinued



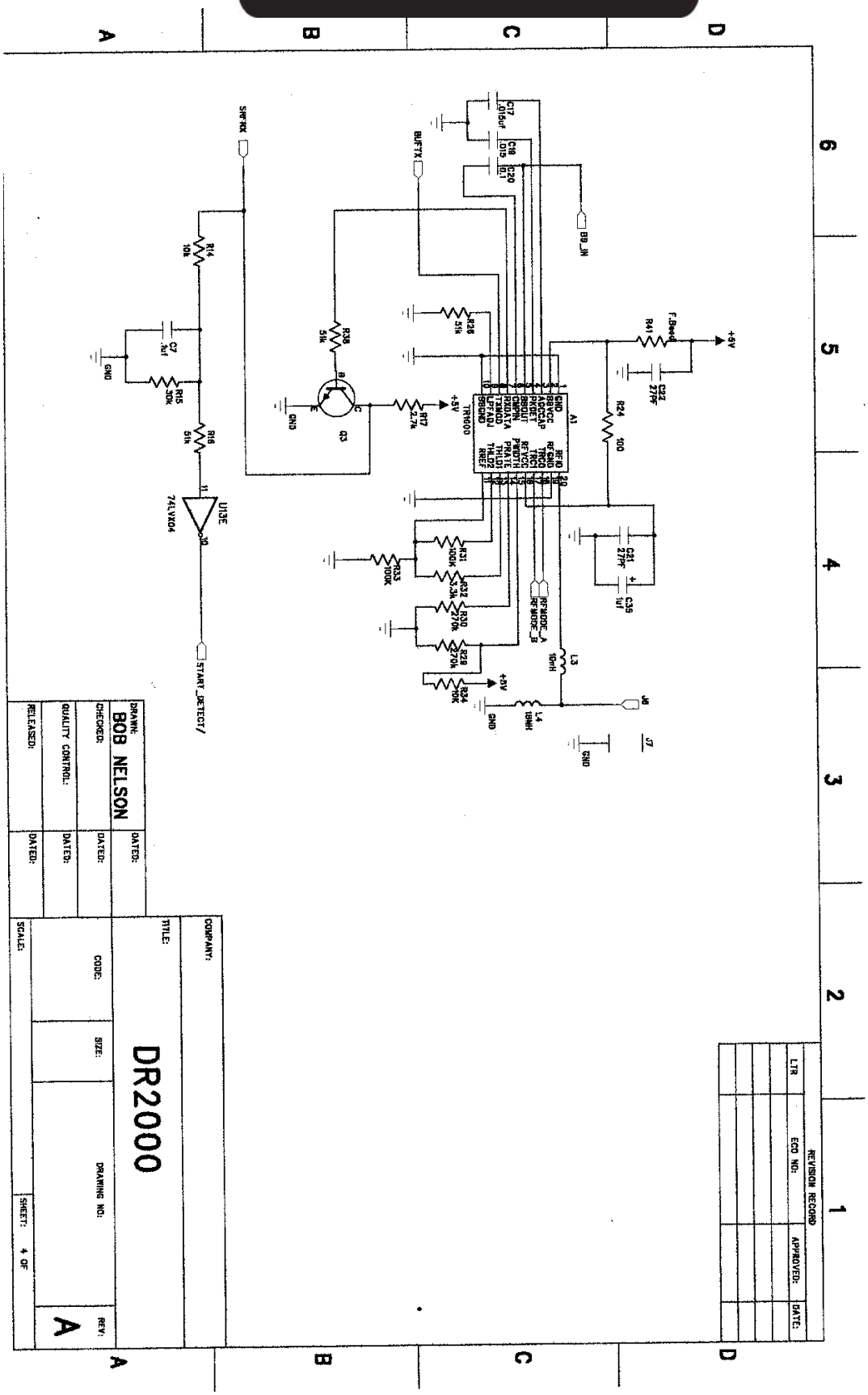
Discontinued



Discontinued



Discontinued



Discontinued

Bill Of Materials for DR2000

Reference	VALUE	Qty	PN	Size
U10	ST16C1550	1	500-0839-001	PLCC28SQ
Q2,4	2N2907	2	500-0653-001	SOT23
Q3	2N2222	1	500-0183-001	SOT23
D6	MBR0520	1	500-0841-001	1210
U8	74LVX273	1	500-0800-001	SO20
U13	74LVX04	1	500-0838-001	SO14
U9	74LVX32	1	500-0807-001	SO14
U7	AD7822	1	500-0789-001	RU-20
U1	ADSP2186L	1	500-0790-001	TQFP100
U2	AM29LV001	1	500-0808-001	PLCC32
U11,12	CMD67-22RUGC/8	2	500-0798-001	BI-LED
C17,19	.015uf	2	500-0621-153	0603
C21,22	27PF	2	500-0621-270	0603
C30,36,3,31,34,33,10,13	1000PF	8	500-0621-102	0603
C32,37	22uf	2	500-0801-223	1210
C38	4.7uf	0	500-0804-047	1206
C39	0.33uf	0	500-0802-003	1206
C1,2,25,26	33PF	4	500-0621-330	0603
C7,18,20	0.1uf	3	500-0621-104	0603
C6,8,9,11,12,14,15,16,23,24	0.1uf	10	500-0621-104	0603
C27,28,35	1uf	3	500-0243-105	1206
J1	RJ11	1	500-0812-001	6 POS
L1,2	10uH	2	500-0840-001	1206
L3	10nH	1	500-0739-100	0603
L4	18nH	1	500-0739-180	0603
U6	LT1308	1	500-0795-001	SO8
U4	MAX811	1	500-0809-001	SOT143
R1,3,4	330	3	500-0620-331	0603
R2	30k	1	500-0620-303	0603
R5,6	600	0	500-0620-601	0603
R19,23,25,27,14,34	10k	6	500-0620-103	0603
R32	1k	1	500-0620-102	0603
R9	1.3k	0	500-0620-132	0603
R10	2.4M	0	500-0620-245	0603
R11	18k	0	500-0620-183	0603
R18	1M	1	500-0620-105	0603
R20,21,22,17	2.7K	4	500-0620-272	0603
R35	1.02M	1	500-0620-105	0603
R36	608k	1	500-0620-604	0603
R37,31,33	100k	3	500-0620-104	0603
R15	30k	1	500-0620-303	0603
R16,26,38	51k	3	500-0620-513	0603
R24	100	1	500-0620-101	0603
R29,30	270k	2	500-0620-274	0603
R41	F.BEED	1	500-0764-001	0603
R42	820	1	500-0620-821	0603
R43	3.7k	1	500-0620-372	0603
R44,45	470	2	500-0620-471	0603
S1	SW1	1	500-0724-001	

©2010-2015 by Murata Electronics N.A., Inc.

Discontinued

Bill Of Materials for DR2000

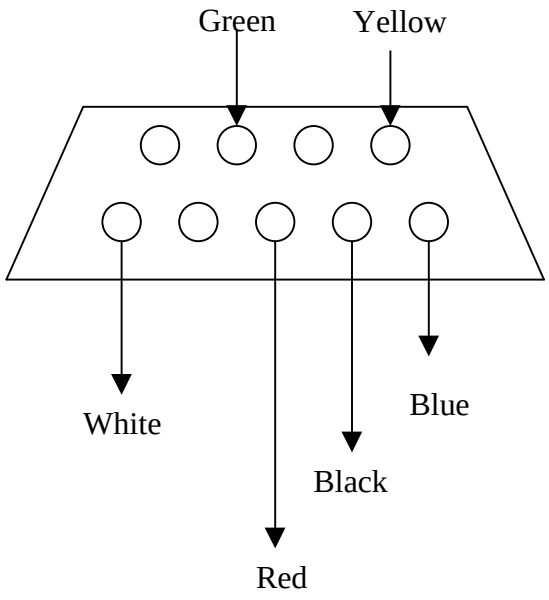
Reference	VALUE	Qty	PN	SIZE
A1	TR1000	1	TR1000	916.5MHZ
Y1	16.87MHZ	1	500-0792-001	HC49U
Y2	1.8432MHZ	1	500-0837-001	HC49U
D2	CMD67-21VYC/TR8	1	500-0799-001	YEL LED
B1	BH2AA-PC	1	500-0836-001	2 PIN
SK1	32PLCC SOCKET	1	500-0797-001	PLCC32

©2010-2015 by Murata Electronics N.A., Inc.

Discontinued

RS232 Connector wiring:

DB9 Female	RG11-6 (Straight)	Signal
Pin1 & Pin 6	Blue	DCD
Pin2	Black	RX
Pin3	Red	TX
Pin4	N/C	
Pin5	White	Ground
Pin6	Yellow	DSR
Pin7	N/C	
Pin8	Green	CTS
Pin9	N/C	



©2010-2015 by Murata Electronics N.A., Inc.

Discontinued

DR2000 Packet Protocol Example:

Setup for data transmission from **LOCAL** to **REMOTE**:

1. Enter the following commands on the **LOCAL** DR2000:
   - $$TOAD31 ;set "TO" address to hex 31
   - $$FRAD32 ;set "FROM" address to hex 32
   - $$SIZE20 ;set packet "SIZE" to hex 20 (32dec.)
   - $$RFMD0 ;set RF mode to OOK
   - $$RDSP4 ;set RF TX Speed to 19.2kbaud
   - $$RCST1 ;enable data out to PC

1. Enter the following commands on the **REMOTE** DR2000:
   - $$TOAD32 ;set "TO" address to hex 32
   - $$FRAD31 ;set "FROM" address to hex 31
   - $$SIZE20 ;set packet "SIZE" to hex 20 (32dec.)
   - $$RFMD0 ;set RF mode to OOK
   - $$RDSP4 ;set RF TX Speed to 19.2kbaud
   - $$RCST1 ;enable data out to PC

To Add	From Add	Pk Num	Cmd	Length	Data
1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	n Bytes
1-255	1-255	1-255	3-239	1-255	0-255

***** Pk Num **MUST** be at least **1** count different between packets (1,2,1,2 or 1,2,3,4,5)

1. Send the following from the **LOCAL** DR2000: (**in hex**)
   313201051d41424344454647484 94a4b4c4d4e4f505152535455565758595a31

This will send the following data from the **LOCAL** DR2000 Address **32** TO the **REMOTE** DR2000 address **31**. The **REMOTE** display will print "ABCDEFGHIJKLMNOPQRSTUVWXYZ1".

1. Send the following from the **REMOTE** DR2000: (**in hex**)
   323101051d41424344454647484 94a4b4c4d4e4f505152535455565758595a31

This will send the following data from the **REMOTE** DR2000 Address **31** TO the **LOCAL** DR2000 address **32**. The **LOCAL** display will print "ABCDEFGHIJKLMNOPQRSTUVWXYZ1".

Note1:

- Length is calculated as data byte count + 2 (FCS1 & FCS2)
- In the above example data byte count is 27 + 2 = 29 (1b hex)

©2010-2015 by Murata Electronics N.A., Inc.

Discontinued

Note2:
Telix, a terminal program capable of running script programs is available at:

for either Windows or DOS. Telix is available for purchase or shareware.

DR2000 Range Test Example:

Setup for Range test from **LOCAL** to **REMOTE**:

1. Enter the following commands on the **LOCAL** DR2000:
   - $$TOAD31 ;set "TO" address to hex 31
   - $$FRAD32 ;set "FROM" address to hex 32
   - $$RFMD0 ;set RF mode to OOK
   - $$RFSP4 ;set RF TX Speed to 19.2kbaud
   - $$RCST1 ;enable data out to PC

2. Enter the following commands on the **REMOTE** DR2000:
   - $$TOAD32 ;set "TO" address to hex 32
   - $$FRAD31 ;set "FROM" address to hex 31
   - $$RFMD0 ;set RF mode to OOK
   - $$RFSP4 ;set RF TX Speed to 19.2kbaud
   - $$RCST1 ;enable data out to PC

3. Enter the following commands on the **LOCAL** DR2000 to start the test:
   - $$RANG1

4. The following data is now being sent to the REMOTE DR2000:
   - " Range Test Data "

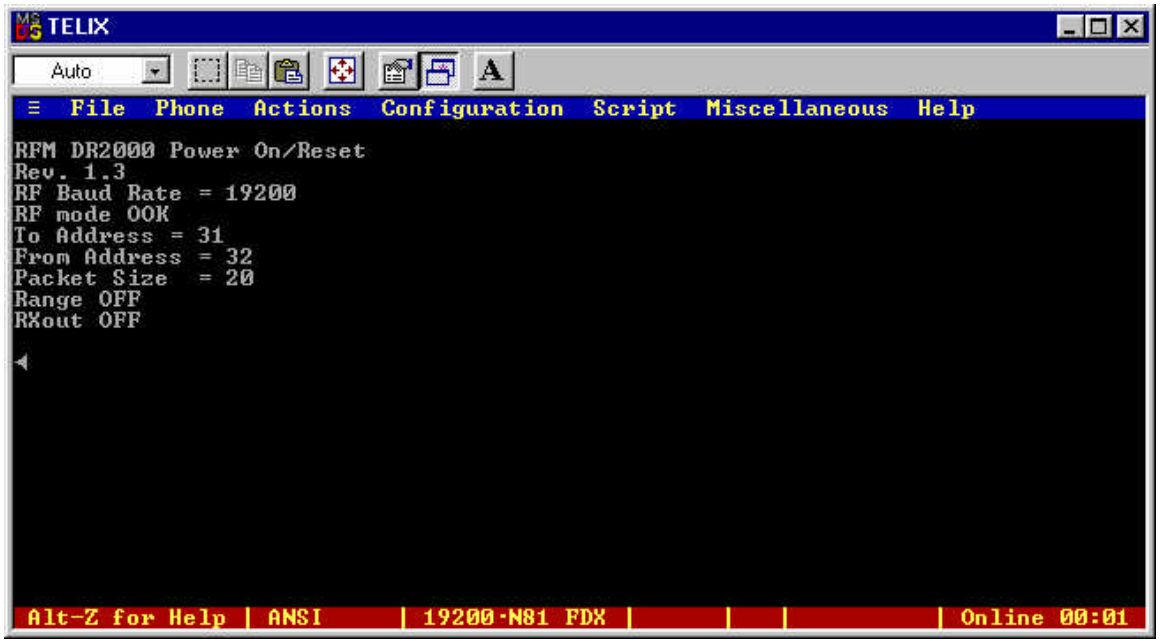
5. Enter the following to stop the range test:
   - $$RANG0

©2010-2015 by Murata Electronics N.A., Inc.

Discontinued

DR2000 Instructions for sending 32 byte packets using Telix for Dos.

1. Connect DR2000 to Com 1
2. Start Telix
3. Turn the DR2000 power on
4. Display should look like this:



If this is correct go to step # 5
Else
To change to address enter in Caps $$TOAD31
To change from address enter in Caps $$FRAD32
To change Size enter in Caps $$SIZE20

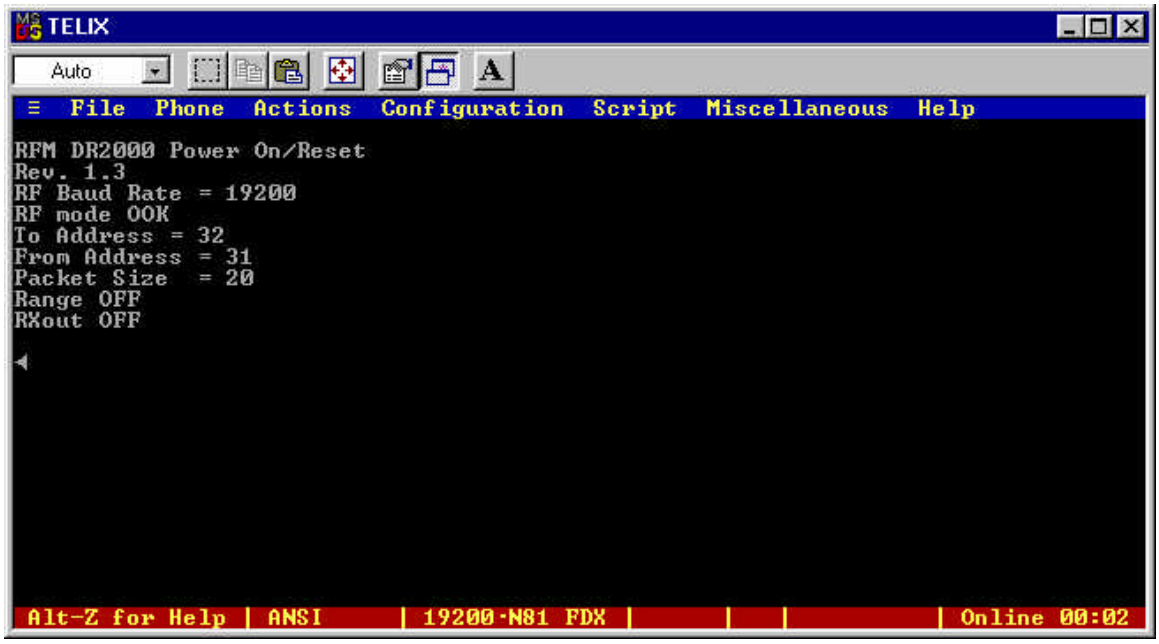
Label this DR2000 as master.

5. Unplug the DR2000 and plug DR2000 # 2 into Com 1
6. Turn DR2000 power on

©2010-2015 by Murata Electronics N.A., Inc.

Discontinued

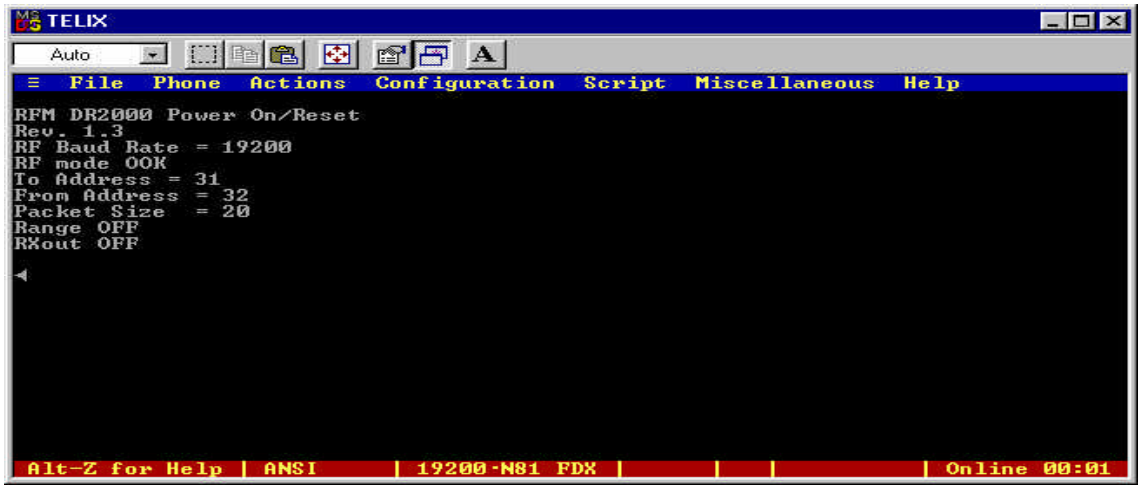
7. The display should look like:



If this is correct go to step # 8
Else
To change to address enter in Caps $$TOAD32
To change from address enter in Caps $$FRAD31
To change Size enter in Caps $$SIZE20

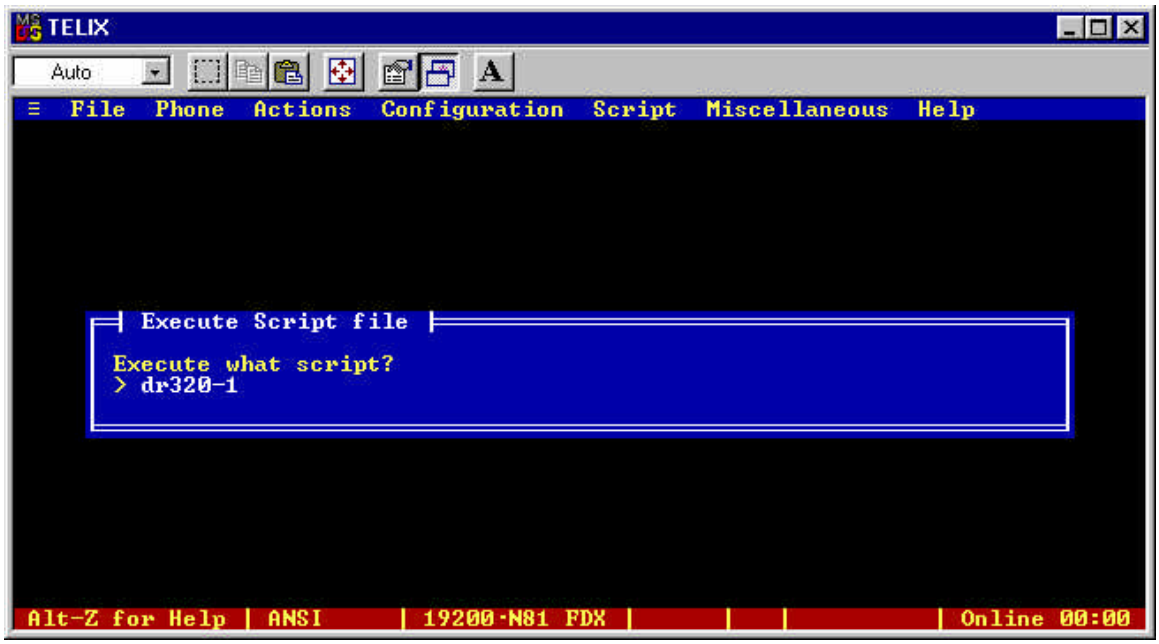
Label this DR2000 as slave.
Turn power off and back on and ensure display is the same as above

8. Unplug DR2000 labeled “Salve” leaving it turned on.
9. Plug DR2000 labeled ”Master” and turn the power on
10. Ensure display look like this:



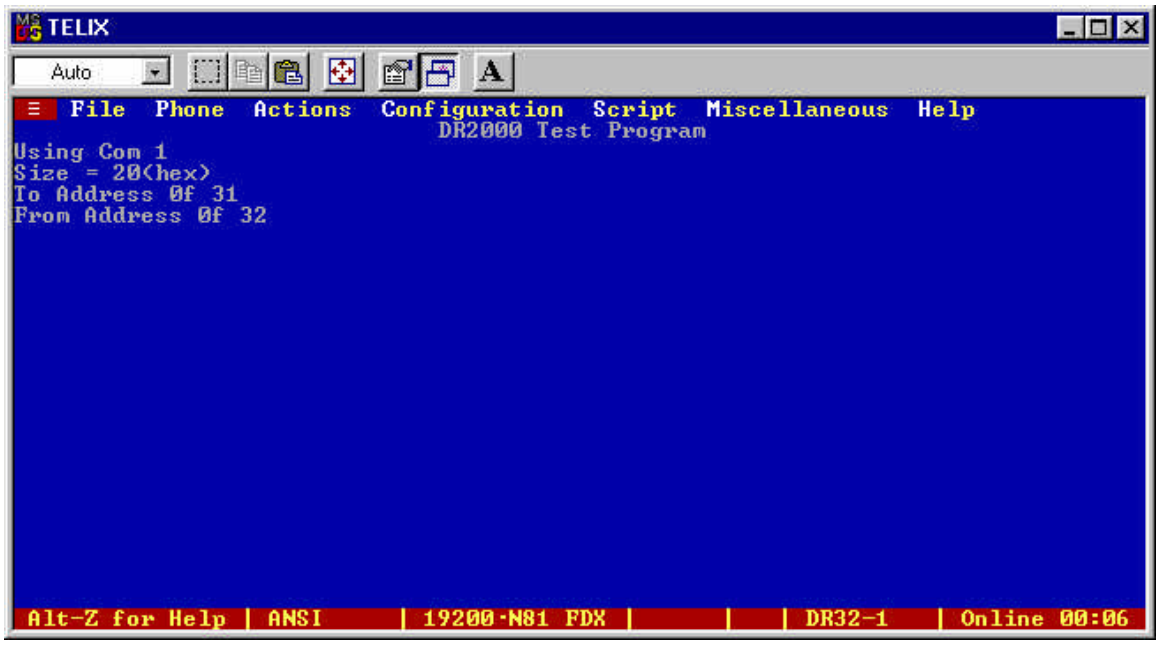
Discontinued

11. If the display is NOT correct go to to the # 1 and start again
12. Press ”Alt g “ on the PC and enter DR32-1 for Com port 1 or DR32-2 for Com port 2
13. Display should look like:



14. Press Enter on the PC

15. The Telix screen should look like:

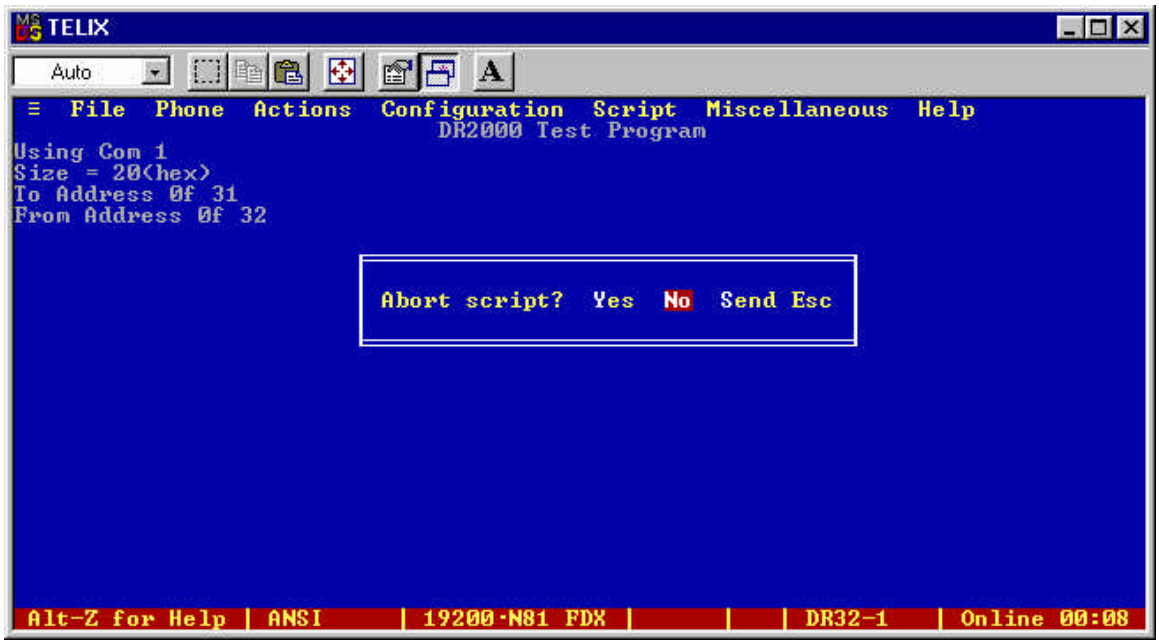


Discontinued

16. The Green LED should now be flashing RED on the DR2000 that is Master

17. The “Slave DR2000 should have 2 Green LED’s flashing along with the center yellow LED flashing.

18. To exit the script press Esc on the PC until you get the following message:



Press “Y” for yes

19. The script is now stopped.

Note:

The DR2000 looks at the From address to ensure you are talking to it. If you have the master and slave swapped, the DR2000 will not transmit the packet. So ensure the master address is as stated above.

©2010-2015 by Murata Electronics N.A., Inc.