

# NOVATECH INSTRUMENTS, INC.

## 2910B/RACK/D-04 DIRECT DIGITAL SYNTHESIZER ADDENDUM TO 2910A MANUAL



2910B/RACK/D-04 FRONT VIEW

The Model 2910B/RACK/D-04 is an updated version of the Model 2910A, expanding the frequency range, increasing the number of outputs and repackaging into a 1U Rackmount Instrument Case. The 2910A manual applies to the 2910B/RACK/D-04 with the following changes:

### SECTION 1: INTRODUCTION AND SPECIFICATIONS

The Model 2910B/RACK/D-04 outputs provide dual differential clock outputs from 100Hz to 30MHz. The 2910B/RACK/D-04 has two LCD displays, two rear mounted computer interface connectors and two sets of front panel controls. Each LCD display, computer interface and set of controls operates as an independent unit. Each independent unit has two programmable frequencies, “Fa” and “Fb”, and four rear mounted triax connectors (Trompeter BJ-76 or equivalent), two connectors each for the “a” frequency and two connectors each for the “b” frequency. The triax connectors provide clock outputs from RS422 drivers (similar to MIL STD 188-114A). There is also one BNC connector located on the rear panel that accepts an external reference input. All frequencies on both independent units will lock to this one external reference input. All features relating to amplitude and output mode selection have been eliminated.

The -AA option provides front panel toggle switches that can be used to disable the front panel controls. The remote computer interface has priority and will automatically place the instrument in Remote Mode if a valid command is received over the serial port.

Delete all references to amplitude, sinewave and CMOS/TTL OR ECL. Change frequency range to

100Hz to 30MHz. Change output description to read: Dual, differential clock outputs using DS8921AN RS422 Transceivers. Outputs are offset positive from ground. Delete reference to 50 ohm output impedance. Change Output connector references to read TRIAX connector, Trompeter BJ-76 or equal. Change external standards to selectable 1.0MHz, 2.0MHz, 5.0MHz or 10.0MHz.

Non-Volatile EEPROM memory replaces the battery backed-up CMOS memory of the 2910A. The settings can be automatically saved in this memory and held indefinitely.

## SECTION 2: OPERATING INSTRUCTIONS

### **CAUTION:**

*The Triax output shield is grounded, while the two inner conductors are offset from the ground. Shorting either or both of the inner conductors continuously to ground or together may result in damage to the drivers or the 2910B/RACK/D-04.*

### **Note:**

*The 2910B/RACK/T-04 is supplied with BNC connectors and has TTL level outputs. There are two reference inputs, one for each independent section. They may be connected together if a common reference is required.*

Ignore all references to Amplitude and to CMOS/TTL or ECL. The Square Wave and High Frequency choices have been deleted from the menus and from the computer interface command. The external Standard menu now selects 1.0MHz, 2.0MHz, 5.0MHz or 10.0MHz. The serial interface connectors on the rear panel have been modified to accept a switch or contact closure to disable front panel control of the instrument. Pin 8 is contact common (connected to instrument ground) and Pin 9 is pulled up to +5V through 10k ohms. A switch closure (<500 $\Omega$ ) will disable the front panel control of the instrument. The toggle switches on the front panel are factory wired to the serial interface connector pins for this purpose. (-AA option). If the -AA option is installed, any external switch added by the customer will be in parallel to the front panel switch.

All application connections are made on the rear panel. See rear panel figure below.



2910B/RACK REAR PANEL

### **CAUTION**

*Pin 9 of the Serial connector must not have any voltage applied. If the serial port is being used, verify that pin 9 is disconnected from the serial cable.*

### **SECTION 3: PERFORMANCE TEST**

Ignore all references to amplitude, CMOS/TTL, ECL and High Frequency. Table 4 can be used for frequencies below 30MHz. The same accuracies apply. Perform operations for both the “a” and “b” frequencies. External Standard verification is performed as outlined for 5.0MHz and 10.0MHz standards in addition to the 1.0MHz and 2.0MHz listed. To verify the differential output perform the following:

**a) Verify single-ended performance.** Connect a 10x scope probe to the test oscilloscope. Verify that both inner conductors of each Triax output swings from a minimum of 0.8 Volts to 2.4 Volts. Use the frequencies of Table 4 below 30MHz for this test.

**b) Verify differential performance.**

#### ***NOTE***

*This test requires a Triax cable to BNC and an oscilloscope capable of differential measurements.*

Connect each 2910B/RACK/D-04 output to an oscilloscope set for differential measurements. Verify that the output swings a minimum of  $\pm 1.6$  Volts over the frequencies of paragraph a) above, when terminated with 100 ohms. Verify that the DC offset is less than 0.4 Volts.

## Serial Command Details for 2910B/RACK, Rev 1.1 Software

- 1: The serial protocol for all commands on the 2910B/RACK are 8 data bits, 1 stop bit, no parity. Baud rates supported are 300, 600, 1200, 2400, 4800, 9600 and 19200. They are not case sensitive.
- 2: The commands 'F' 'Fa' 'Fb' 'E' 'X' and 'S' return 'OK' if parsed and interpreted correctly. The commands can be terminated with CR, LF or CRLF in any order. This allows use with PC systems, Linux or Unix.
- 3: The commands 'Reset' 'Reset All' and 'C' do not return a value and end by restarting the instrument.
- 4: Incorrect commands will return an error code:
  - ?0 Unrecognized Command
  - ?1 Bad Frequency
  - ?3 Input line too long
- 5: The command 'Qr' returns the values in the volatile RAM of the instrument. The values returned reflect the present output and state of the 2910B/RACK and are as follows:

```
Fa 12.345678901234
Fb 12.345678901234
45 06 03 1B 05 01 00 01
```

The first two lines show the output frequency of both channels in MHz to 1 $\mu$ Hz resolution. The next line has hexadecimal values showing the present state of internal registers. These values will only be the same as those from the 'Qr' command if the values have been unchanged or a 'S' command has been executed (which could have been from a power down with save settings enabled). Their interpretation in this example is:

```
45 internal settings
06 internal settings
03 internal mode ('03'=Remote)
1B internal settings
05 cursor position
01 baud rate register ('00'=19200, '01'=9600, etc.)
00 control status
01 External Reference Setting: '01'=5MHz, '02'=10MHz, '03'=1MHz, '04'=2MHz
```

- 6: The command 'Qe' returns the stored values in the non-volatile EEPROM of the instrument. The values returned reflect the last saved state of the 2910B/RACK and are as follows:

```
Fa 12.345678901234
Fb 12.345678901234
45 06 03 1B 05 01 00 01 00 EF FF B7 11
```

The first two lines show the output frequency of both channels in MHz to 1 $\mu$ Hz resolution. The next line has hexadecimal values showing the saved state of internal registers. Their interpretation in this example is:

```
45  internal settings
06  internal settings
03  internal mode ( '03' =Remote)
1B  internal settings
05  cursor position
01  baud rate register ( '00' =19200, '01' =9600, '02' =4800, '03' =2400, '04' =1200,
    '05' =600, '06' =300)
00  control status
01  External Reference Setting: '01' =5MHz, '02' =10MHz, '03' =1MHz, '04' =2MHz
```

These (above) are the same as the 'Qr' command.

```
00  internal settings
EF  internal settings
FF  internal settings
B7  'B7' =save settings, 'B8' =use defaults
11  Software revision, in this example 1.1
```

**Table 1: 2910A Legacy Serial Commands**

<b>RS232 Command</b>	<b>Function</b>
F XX.XXXXXXXXXXXXXX	Set Frequency in MHz to nearest 1µHz. Decimal point required. Both outputs set to same frequency.
E x	x=D for Echo <b>D</b> isable, x=E for Echo <b>E</b> nable
P x	x=D, power up with default settings; x=S, power up with Saved Settings
Reset	This command resets the 2910B/RACK. EEPROM data is preserved and, if valid, is used upon restart. This is the same as cycling power.
Reset All	This command clears the EEPROM valid flag and restores all factory default values.
X n	n=D, 1, 2, 3 or 4. Use to select a preset reference value. Setting n=D selects the internal clock. If n=1 selects 5MHz external reference; n=2 selects 10MHz. Settings 3 and 4 have been added in the 2910B/RACK. Setting a 3 selects 1MHz, setting a 4 selects 2MHz. Each internal synthesizer is locked to the same external reference.

**Table 2: 2910B/RACK New Serial Commands**

<b>RS232 Command</b>	<b>Function</b>
Fx XX.XXXXXXXXXXXXXX	Set Frequency in MHz to nearest 1µHz. Decimal point required. x=a or b, depending upon frequency being set. In a 4-frequency system, there are two serial ports, each requiring Fa and Fb.
Qe	Query the non-volatile memory (EEPROM) storage. See manual for details of returned information.
Qr	Query the volatile (RAM) memory storage. These are the values currently output by the 2910B/RACK and will only equal the values from "Qe" if no changes have been made in the settings. See manual for details of returned information.
C	Same as "Reset All" command. Restores factory defaults and clears EEPROM valid flag.
S	Saves current state into EEPROM and sets valid flag. State used as default upon next power up or reset. Use the "Reset All" or "C" command to return to factory default values. Automatically sets EEPROM valid flag and overrides the legacy "P" command.

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