Technical Reference

for the

POWER PRO DCC ᵀᴹ
Digital Command Control

DCC Packet Analyzer

Version 1.0

Convenient , easy connection to track or control bus

Features:

- , View DCC packets being sent by command station in Hex or plain english
- , Selectively filter out idle, reset, accessory, function and or speed packets
- , Opto-isolated to prevent ground loops from DCC system to computer (requires optional external 9-12 volt DC supply)
- , Can be powered from track or Cab Bus jack
- , ICC packet analyzer compatibility mode (hex only display)
- , Verbose mode makes it easy to decipher packets
- , Additional Bonus: display NCE Cab Bus activity

Additional Requirements:

- , PC or Mac running dumb terminal program capable of 38.4Kbps, 7 data bits
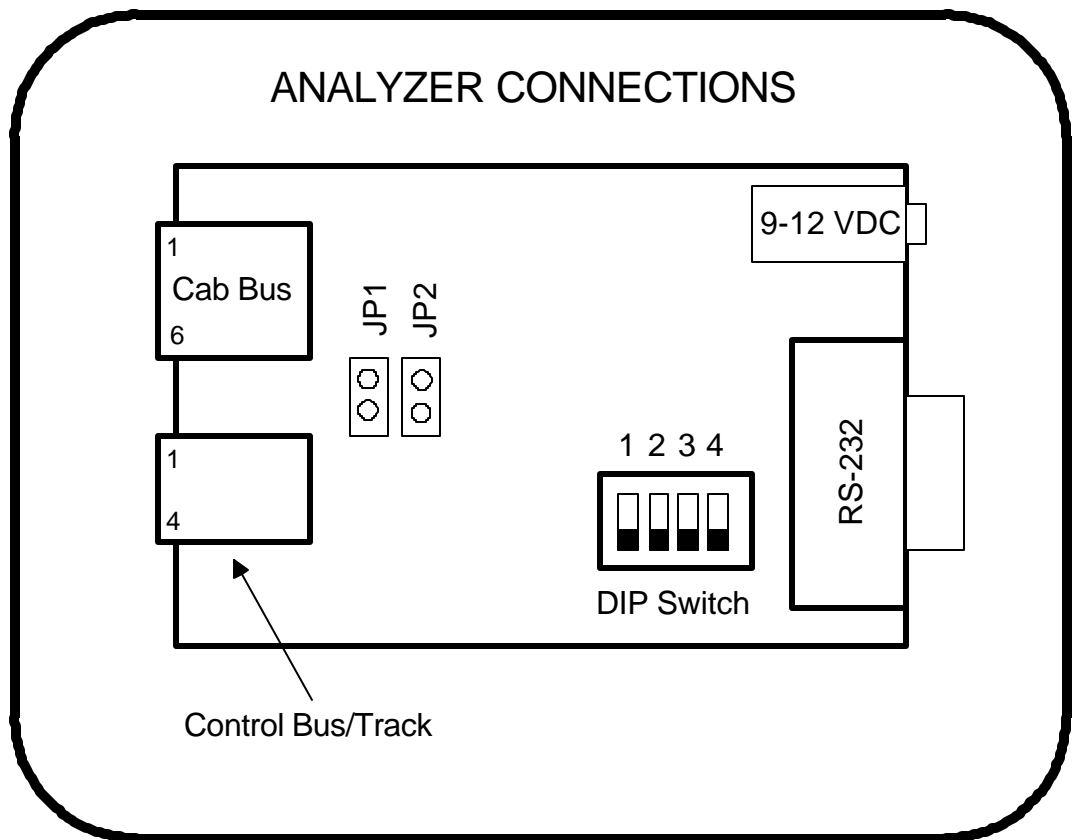- , 9 pin serial cable

Optional Accessories:

- , Optional 9-12 volt DC supply with 3.5mm power connector

Every attempt has been made to ensure this product complies with all applicable NMRA Standards and Recommended Practices.

Analyzer connections:

The following connections are needed to use the DCC Packet Analyzer.
- The RS232 connector provides data to your PC via a standard (pin 1 to pin 1) serial cable.
- Pins 2 and 3 of the Control Bus "RJ" jack connect to the track.
- Normally power for the analyzer is supplied from an external 9-12 volt DC power supply through the 3.5mm phone jack (tip positive) or the Cab Bus RJ-12 connector (pin 2 -ground, pin 5 -positive). Using an external "wall wart" supply enables use of the opto-isolator feature of the analyzer. The DCC Analyzer can be powered from the track by installing jumpers JP1 and JP2 if you are sure there is NO ground sneak path (such as when a laptop computer is used).

ANALYZER CONNECTIONS

```
1
Cab Bus
6

JP1  JP2

1
4
```

9-12 VDC

1 2 3 4

DIP Switch

RS-232

Control Bus/Track

Data Communications

We've had good luck using Hyperterminal suppied with Win95 and Win98. The communications settings are 38.4kbps, 7 data bits, 1 stop bit. Use the 'No Flow Control' option. The analyzer does not echo characters so you may also want to turn echo on. Also turn on 'Append line feeds to incoming line ends' under the Properties->Settings->ASCII Setup menu.

Before connecting the analyzer to the track or command station verify communications by pressing '?" to get a menu of commands and the analyzer software version.

Operations
The analyzer will continuously receive DCC packets, parse, interpret and transmit packet data through its RS232 port. It is possible to block transmission of certain packet types.   At power up, if DIP switch is 4 is open the analyzer will analyze DCC packets. If switch 4 is closed it will analyze the NCE cab bus. Switches 1, 2 and 3 are not used.

Commands: Type the command in the left column such as "A+"

V   Display packets in 'verbose' mode (able to be intrepreted by humans)
H   Display packets as hex bytes

H0   Set hex display mode 0 (see hex display table)
H1   Set hex display mode 1 (see hex display table)
H0   Set hex display mode 2 (see hex display table)
H0   Set hex display mode 3 (see hex display table)
H0   Set hex display mode 4 (see hex display table)
H0   Set hex display mode 5 (see hex display table)
H0   Set hex display mode 6 (see hex display table)
H0   Set hex display mode 7 (see hex display table)

A+ Display all accessory packets
A-   Don't display accessory packets

AP   Display accessory packets as paired outputs (normal usage)
AS   Display accessory packets as individual outputs (CVP AD4)

I+ Display all idle packets
I- Don't display idle packets

L+ Display all locomotive packets
L- Don't display locomotive packets

R+ Display all reset packets
R- Don't display reset packets

S+ Display all signal packets
S- Don't display signal packets

?   Display list of commands supported

Analyzer powerup defaults: H0 mode with all packets displayed

Hex mode displays:

H0 mode (compatible with the ICC analyzer):

Displays packets in hex mode prededed by one character indicating many start bits precede the data. There are no spaces between any characters or bytes.

Example: $03686B
14 start bits with three byte packet following with bytes of 0x03, 0x68, 0x6B

The following characters are used to indicate the quantity of start bits:

Char	# bits	Char	# bits	Char	# bits	Char	# bits	Char	# bits
space	10	(	18	0	26	9	34	@	42
!	11	)	19	1	27	0	35	A	43
"	12	*	20	2	28	:	36	B	44
#	13	+	21	3	29	;	37	C	45
$	14	,	22	4	30	<	38	D	46
%	15	_	23	5	31	=	39	E	47
&	16	.	24	6	32	>	40	F	48
'	17	/	25	7	33	?	41	G	49

H1 mode:

Same as H0 mode except spaces will delimit preamble char and each pair of hex characters

Example: $ 03 68 6B
14 start bits with three byte packet following with bytes of 0x03, 0x68, 0x6B

H2 mode:

Displays packets in hex mode with no indication of how many start bits. There are no spaces between any characters or bytes.

Example: 03686B
Three byte packet following with bytes of 0x03, 0x68, 0x6B

H3 mode:

Same as H2 mode except spaces will delimit each pair of hex characters

Example: 03 68 6B
Three byte packet following with bytes of 0x03, 0x68, 0x6B

H4 mode:

Displays packets in hex mode prededed by Pxx where xx indicates how many start bits (in hex) precede the data. There are no spaces between any characters or bytes.

Example: P0E03686B
14 start bits with three byte packet following with bytes of 0x03, 0x68, 0x6B

H5 mode:

Same as H4 mode except spaces will delimit preamble chars and each pair of hex characters

Example: P0E 03 68 6B
14 start bits with three byte packet following with bytes of 0x03, 0x68, 0x6B

H6 mode:

Displays packets in hex mode with no indication of how many start bits but preceded by the letter P. There are no spaces between any characters or bytes.

Example: P03686B
Three byte packet following with bytes of 0x03, 0x68, 0x6B

H7 mode:

Same as H6 mode except spaces will delimit each pair of hex characters

Example: P 03 68 6B
Three byte packet following with bytes of 0x03, 0x68, 0x6B

Verbose mode displays:

Verbose mode displays are intended to allow humans to interpret packet contents. The display is cryptic but understandable. Unless stated otherwise all numbers are displayed in decimal. Any packet that isn't understood by the analyzer will be displayed in hex.

Reset packets will be displayed as: "RESET"

Idle packets are displayed as: "IDLE"

Format of locomotive speed packets: L1234 S123F
A short loco address is displayed with 3 digits (ie, L003) and a long address is displayed with 4 digits (ie.L1234).
14/28 speed commands are displayed with 2 digits (S08) and 128 speed commands are displayed with 3 digits (S123). The last character displayed is the direction. F for forward and R for Reverse.
Emergency stop packets are displayed as such: L1234 ESTOP.

Format for locomotive function group 1 packets: L1234 FL1234
Short and long locomotive addresses are are indicated by 3 or 4 digits as in speed packets. The function numbers, if off, are indicated by a dash (-). If on the function numbers are indicated by L for F0 and 1-4 for F1-F4.

Example: L1234 F--32- means function 2 and 3 are on and function 0,1 and 4 are off.

Format for locomotive function group 2 packets: L1234 F8765
Short and long locomotive addresses are are indicated by 3 or 4 digits as in speed packets. The function numbers, if off, are indicated by a dash (-). If on the function numbers are indicated by 5-8 for F5-F8.

Example: L1234 F8-6- means function 8 and 6 are on and function 5 and 7 are off.

Format for locomotive function group 3 packets: L1234 FCBA9
Short and long locomotive addresses are are indicated by 3 or 4 digits as in speed packets. The function numbers, if off, are indicated by a dash (-). If on the function numbers are indicated by 9,A,B,or C for F9-F12.

Example: L1234 FC-A- means function 12 and 10 are on and function 9 and 11 are off.

Format for locomotive long form OPS program byte: L1234 CV0044=123
Short and long locomotive addresses are are indicated by 3 or 4 digits as in speed packets. The CV number in the above example is 44 (always displayed with 4 digits) and the value for the CV is 123 (always displayed with 3 digits).

Format for locomotive long form OPS program bits: L1234 CV0044 b3=1
Short and long locomotive addresses are are indicated by 3 or 4 digits as in speed packets. The CV number in the above example is 44 (always displayed with 4 digits) and bit 3 is to be programmed to a 1.

Format for locomotive long form OPS verify byte: L1234 OPS VFY
Short and long locomotive addresses are are indicated by 3 or 4 digits as in speed packets. The command is not completely displayed by the analyzer

Format for locomotive long form OPS verify bit:e L1234 OPS VFY
Short and long locomotive addresses are are indicated by 3 or 4 digits as in speed packets. The command is not completely displayed by the analyzer

Format for locomotive short form OPS program byte: L1234 CV23=123
Short and long locomotive addresses are are indicated by 3 or 4 digits as in speed packets.
 The CV number in the above example is 23 (only CV23 or CV24 can be programmed with short form) and the value for the CV is 123 (always displayed with 3 digits). If the analyzer doesn't understand the CV number indicated it will display
L1234 OPS?

Format for consist control packets: L1234 CON=123R
Short and long locomotive addresses are are indicated by 3 or 4 digits as in speed packets.
 In the example above CV19 (consist address) is to set to 123 with the direction of operation to be reverse.

Format for accessory control (paired outputs): A1234N
The accessory address is always displayed with 4 digits. "N" or "R" follows to indicate normal (on) or reverse (off) for the turnout position.

Format for accessory control (individual outputs): B1234b3OFF
The accessory address is always displayed with 4 digits. The output number (bit 0-7) followed by ON or OFF to indicate the state of the output.

Format for signal control: S1234 2F
The signal address is always displayed with 4 digits followed by the signal aspect byte displayed in hex

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