



R. E. SMITH, 4311 TYLERSVILLE ROAD, HAMILTON, OHIO 45011
www.rs485.com, www.fiberspace1.com
Phone: 513-874-4796 Fax: 513-874-1236

Wiegand DSC2 MicroController
V02.7 Jan 10, 2000 (UPDATED 9-15-03)

Dual Wiegand Card Reader controller with selectable stand alone or multi-drop serial interface And 26 bit or universal formats.
Version V02.7 replaces both Ver.5 and Ver.6

The DSC2 is an 8051 based microcontroller (DS80c320) with resources to read 2 Wiegand Card Readers and 4 TTL/CMOS inputs, control 3 digital outputs and 2 relay outputs (Form A, 30Vdc @ 8A max.). In addition the unit can sense 21 jumper settings, has 7 onboard led status indicators, and a socket for an optional battery backed clock/calendar/RAM chip.

The DSC2 uses 8 jumpers for addressing the RS485/422 communications port, 3 jumpers to select 7 baud rates at up to 115.2K baud, 8 jumpers for operating modes, plus jumpers for 26bit / Universal Formats, Check sum and reset.

The 8 operating mode jumpers are used to select on demand or stand alone automatic output of card reader data and input changes, plus the data streams format can be modified, outputs controlled and rs485 or rs422 mode selected.

The onboard switching regulator allows for 9-35V operation. A second switching regulator provides power to the Wiegand Card Readers and is jumper selectable for 5V, 8V, 10V, 12V and 15V (Board Supply Voltage must be 4 volts more than the selected reader voltage).

The DSC2 will interface to a wide variety of Wiegand Card Readers, with allowable time between pulses from about 0.5mS to 2.1mS, and pulse widths from approximately 25uS to over 100uS. Wiegand formats of 8-64 bits can be accommodated in the universal mode of operation. In the 26 bit format, the bit count and parity is checked. If they are correct, then the site code and card number is extracted, converted to hex and flagged as valid.

Each reader is provided with an individual and a shared open collector output (30VDC @ 50mA) for controlling LED's and audio indicators on the readers. A "hold" line is NOT required.

DSC2 – Communications Settings:

The baud rate is set using Jumpers J20, J21 and J22, and must be set before powering up the DSC2. Jumper J19 is used to select the check sum mode of communicating with the DSC2. When inserted all commands must be followed by a check sum or they will be ignored. (see below for check sum info.)

Baud Rate	Jumper 19	Jumper 20	Jumper 21	Jumper 22
9600	-	I	I	I
115.2K	-	I	I	R
57.6K	-	I	R	I
38.4K	-	I	R	R
28.8K	-	R	I	I
19.2K	-	R	I	R
14.4K	-	R	R	I
9600	-	R	R	R
No Check Sum	R	-	-	-
Check Sum	I	-	-	-

Communication Mode:

The DSC2 can be configured for either rs422 (4-wire, full-duplex) or rs485 (2-wire, half-duplex) communications. In rs422 should be used for stand alone automatic output, while rs485 should be used for multi-drop networks.

Jumpers are available for adding line bias if the idle line state needs to be adjusted. Refer to the wiring schematic for jumper locations.

Comm Mode	J27	J32	J33	A-J34-B	J35	J36
RS485 Mode	I	I/R	I/R	A-J34	I	I
RS422 Mode	R	I/R	I/R	J34-B	R	R
Biasing	-	I	I	-	-	-

The DSC2 supplies the required power for the Wiegand readers to operate, and can be set with a jumper at J6 - J10. The voltage being supplied to the DSC2 must be 4 volts(DC) higher than the Wiegand readers required voltage. Be sure settings are correct before applying power.

Reader Volts	J6	J7	J8	J9	J10	Min Supply V
5 Volt	I	R	R	R	R	9 Volt
8 Volt	R	I	R	R	R	12 Volt
10 Volt	R	R	I	R	R	14 Volt
12 Volt	R	R	R	I	R	16 Volt
15 Volt	R	R	R	R	I	19 Volt

Communications - continued

Jumpers J23-J31 add many different capabilities to the DSC2. Jumper J31 is used to select between the 26 bit format and the Universal 8-64 bit format of data decoding. In the 26 bit format, the encoded data must match the format exactly or the information will not be decoded. While the Universal 8-64 bit mode returns all the data as is, without decoding. Jumper J27 sets the mode of communication at rs485(2-wire, half-duplex) or rs422(4-wire, full-duplex). In stand alone mode, J27 should be removed for rs422 communications. If the DSC2 will be running in a stand alone mode then inserting J30 will cause all new reads to be automatically sent as they are completed. If in the 26 bit mode, bad reads will not be sent. Input changes will also be automatically sent if J29 is inserted. Jumper J26 controls the actions of the "A" outputs to the readers. When J26 and J30 are inserted the unit will automatically send the data and send a 5 second pulse to that readers "A" output. If J30 is not installed then the pulse to readers "A" output will remain on until cleared buy a command from the Host PC. Jumper J25 causes a CR/LF to be added to the end of each communication output string. Inserting jumper J24 will cause the #1 and #2's "B" output to toggle at 100ms each 1 sec it is active. This can be used for a beeping warning signal, if one is connected to the "B" output.

IMPORTANT NOTE: USE J35 ON DSC232 FOR FORMAT NOT J31 !!

Jumper	SETTING	Description
J31 (J35)	I	I= 26 bit Format.
J31 (J35)	R	R= 8-64 bit Universal format.
J30	I	I= Auto-output new read data from reader(s) .
J29	I	I= Auto-output Input Changes(HI & LO) .
J28	I	I= Pulse LED's 5sec each read (w/J30 In) (W/J30 Removed)LED stays on until cleared.
J27	I	I= rs485 Mode - TX controlled. R= rs422 Mode - TX on.
J26	I	I= Pulse outputs "A" @R1 or "A" @R2, 5sec after new reads at readers 1 or 2 (w/J30 In)
J25	I	I= Add CR/LF to auto-output strings(J29or30)
J24	I	I= 100ms Pulse/Sec @ "B"-outputs while K2 is active. Over-rides function of J26.
J23	I	Not connected.

Additional Jumpers

Jumpers J11-J18 are used to set the unique address of each board in a multi-drop network. This address must be used in place of the XX in most of the commands that control the DSC2.

Additional jumpers offer flexibility to the product.

Jumper	Factory	Description
J1	I	Optional Chassis Ground, see schematics
J2	I	Insert=Run, Remove=Reset
J3	B	A=27512 PROM, B=2764/27128/27256
J4	I	Insert=2764/27128, Remove=27256/27512
J5	I	Insert=32K RAM, Remove=16/8K RAM
J11 - J18 (lsb)	RRRRIIII	Communication Addressing= 0F (factory)

Automatic Output Mode

While in the Automatic Output Mode, the automatically sent output strings will all be the same length. This will allow monitoring software to be set to respond to one size of string. In addition all output strings are started with a * character, end with a check sum, and can optionally have the CR/LF characters added as well.

Reader #1 on unit with address XX (FF-00)

FORMAT: => *XX1BCDDDDDDDDDDDDDDDCS

Reader #2 on unit with address XX

FORMAT: => *XX2BCDDDDDDDDDDDDDDDCS cr/lf

Jumper J25 causes cr/lf to be added.

Change to Inputs on unit with address XX

FORMAT: => *XX3000000OLORILIRALARCS cr/lf

Jumper J25 causes cr/lf to be added.

SUGGESTION: The automatic output mode should only be used in a stand alone mode to prevent data collisions. You should also use commands that do not respond to limit communications back to the PC. Use the SXXRRDD command to control the K1 timer and outputs. (SEE BELOW)

The S command does not respond so response communications can be limited to the Auto-Outputs only, while still giving control of the K1 relay and outputs.

You will not get confirmation that the command was received, so you may want to send a command that requires the DSC2 to respond if no automatic data has been received within a resonable time period.

NOTE: BC= bit count OL= Output Left, OR= Output Right,

IL= Input Left, IR= Same as IL

AL= Auxilary Left, AR= Auxilary Right

= Number 1-3, 1= Reader Data #1, 2= Reader Data #2, 3= New Input Data

I = Insert, R = Remove, - Ignored I = 1, R = 0
* = A star Character is sent define the start of a string.

DSC2 – Command Structure

Basics:

All commands and arguments sent from the host (PC) are in ASCII or ASCII(Hex) in CAPS ONLY.
The Factory Setting is 9600,N,8,1 with no hardware handshaking, with baud rates selectable to 115.2K.
Commands are 1 character in the range of "G" through "Z".
Arguments are 2-6 characters in the range of "0"-"9" and "A"-"F".
Commands with a node address (XX) turn on further communications with that board. All commands that follow that do not contain a node address are targeted to that board.
The S command is the only command that does not respond and is designed to control the K1 relay while in the automatic reader output mode.

SUPPORTED COMMANDS:

NOTES: The following commands show the normal command format.

In the Check Sum mode, with J19 installed all commands require a trailing check sum and all responses have a check sum at the end.

Also, all commands with XX are self addressing and can be used independently. They also activate that address for the commands that do not have addressing. The commands that do not have addressing are addressed to the most recent board that was addressed.

LXX = Locate unit XX command and address

GXX = Get data from Wiegand reader #1 on unit XX and address

HXX = Get data from Wiegand reader #2 on unit XX and address

VXX = Get Version of unit XX and address

IXX = Get inputs and outputs of unit XX and address

SXXRRDD = Set Timers on outputs-Relays of RR w/Timer Data DD, on unit XX
w/NO RESPONSE

RPP = Read Register and point to it for MDD command

MDD = Modify Register PP with data DD

PDD = Put timer data in K1 (Toggles with K2 if repeated)

Q01 = Quick clear of reader #1 data

Q02 = Quick clear of reader #2 data

Q03 = Quick clear of reader #1 and #2 data

LXX = Locate board command

XX= hex board node address (00-FF) set at(J11-J18).

The "LXX" command is used to locate the desired addressable unit, identify new data and to make that unit active to further commands.

The response from unit XX, returns the XX and the SR, Status Register value.
(see "Status Register" Information below for bit assignments)

FORMAT: LXX => XXSR

EXAMPLE 1: (with J15,J16,J17,J18 inserted, XX = 0F Hex)

(The Status Register = 00 Hex, and has no pending card, no inputs or closed relays)

Host: L0F

Response: 0F00

EXAMPLE 2: (with J11,J14,J16,J18 inserted, XX = 95 Hex)

(The Status Register has pending data from reader #1,input# 3 is active and relay K2 is closed relays)

Host: L95

Response: 95C2

SR - Status Register

Bit7,msb	1= Pending card data from reader #1
Bit6	1= Pending card data from reader #1
Bit5	1= K1 relay, closed
Bit4	1= K2 relay, closed
Bit3	1= TTL/CMOS Input at I1
Bit2	1= TTL/CMOS Input at I2
Bit1	1= TTL/CMOS Input at I3
Bit0,lsb	1= TTL/CMOS Input at I4

GXX = Get data from Wiegand reader #1

HXX = Get data from Wiegand reader #2

The "GXX" and "HXX" commands also "Locate" the desired addressable unit and make that unit active to further commands.

The response from "GXX", returns the XX and the Card reader #1 Data.

The response from "HXX", returns the XX and the Card reader #2 Data.

FORMAT: GXX => XX#BCDDDDDDDDDDDDDDDCS

EXAMPLE 1: (with J11,J14,J16,J18 inserted = 95 Hex)

(Reader #1 has no pending data)

Host: G95

Response: 9510000000000000000000D6

DSC2 - Supported Commands (continued)

EXAMPLE 2: (with J11,J14,J16,J18 inserted, XX = 95 Hex)
(Reader #1 has pending data:26bits, site code= 0C hex, Card data= C74D hex)
Host: G95
Universal Mode Response: 9511A00000000000198E9A82
26 Bit Mode Response: 9511A00000000000CC74D7E
0C= SITE, C74D= CARD NUMBER 51021

XX= 9 5 hex
1001 0101 binary
BC= 1 A hex
0001 1010 binary, 26 bits counted, decimal
Dx16=0000000000198E9A
Right 26 bits of 64 = Wiegand Card Data
0 1 9 8 E 9 A
--00 0001 1001 1000 1110 1001 1010
Upper 13 bits, even parity
Even parity bit= msb
site code= 8 Bits
card ID data = 4 Bits
p site Id -
0 0000 1100 1100
0 C C
Lower 13 bits, odd parity
Odd parity bit= lsb
card ID data = 12 Bits
- Id p
0111 0100 1101 0
7 4 D
Site= 0C, Id= C74D

VXX = Activates communications with board XX and gets the software version from it.
The response from "VXX", returns the XX and the software version.
FORMAT: VXX => XXVDD.D

IXX = Activates communications with board XX and gets the inputs, outputs and jumpers settings from it.
The response from "IXX", returns the XX and the Inputs and Outputs

FORMAT: IXX => XXOLORILIRALARCS

OL= Output Left, RELAYS, LED'S and OUTPUTS
Bit7= Reader #2, A Output
Bit6= Reader #1 & #2, B Output
Bit5= Reader #1, A Output
Bit4= Input change LED

DSC2 - Supported Commands (continued)

Bit3= K1 Relay
Bit2= K2 Relay
Bit1= Reader #1 LED
Bit0= Reader #2 LED

OR= Output Right, (00-NOT USED)
IL= Input Left, IR= Same as IL, (INPUTS 1-4,J19-J22)
AL= Auxiliary Left, (00-NOT USED)
AR= Auxiliary Right, (J23-J30)

SXXRRDD = Activates communications with board XX and sets the relay's that correspond to 1's in RR to a timer value of DD. Relay's that correspond to 0's in RR will not have their timers affected. Multiple Relays/outputs can be set with this single command.

FORMAT: SXXRRDD => no response

The bit correspondence of RR to outputs is;

Lsb = Relay K1
Bit1 = Relay K2
Bit2 = Reader 1, A output
Bit3 = Reader 2, A output
Bit4 = Reader 1&2, B output
Bit5 = Input LED
Bit6 = Reader 1, LED
Msb = Reader 2, LED

Timer values:

00= Locked Off
FF= Locked On
01-FE= Timed On, .5Sec to 127Sec

Q01 = Quick clear of Wiegand reader #1 data and related flags.
Q02 = Quick clear of Wiegand reader #2 data and related flags.
Q03 = Quick clear of Wiegand readers #1 and #2 data and related flags.

The "Q"uick command automatically targets and clears all related data and register flags depending on the argument.

The Q command is required to allow new cards to be processed.

The response is XXSR (see LXX for description)SR, will contain the new Status register settings.

NOTE: This command is not required in stand alone mode.

FORMAT: QDD => XXSR

RPP = Read Register

The Read Register command is used to read the contents of a register in the microprocessors RAM area.

Use of this command also moves a pointer to that address so that a subsequent Modify command can change the register value.

(See register mapping for locations)

FORMAT: RPP => DDdd

DD= 8 bit data stored in register PP ("00"- "FF")

dd= 8 bit data stored in register PP+1 ("00"- "FF")

MDD = Modify Register

The Modify Register command is used to change the contents of a register in the microprocessor RAM area.

The affected register is pointed to by a prior "R"ead command.

(See register mapping for locations)

FORMAT: MDD => DDdd

DD= New changed 8 bit data stored in register PP ("00"- "FF")

dd= Unchanged 8 bit data stored in register PP+1 ("00"- "FF")

EXAMPLE: In this example the board with node address 0F is located, and responds showing no new data pending, no inputs active and no relays on. The Read command is used to point at the location of relay K1's timer. The response is 0000 showing that K1=00, and is therefor off. It also shows that K2 is also off (PP+1). The Modify command is sent and changes the value at pointer 30 from 00 to 11. This turns on K1 and start the count down timer with a value of 11 hex. When the timer counts down to 00 relay K1 will turn off.

Host: L0F

Response: 0F00

Host: R30

Response: 0000

Host: M11

Response: 1100

Standard configurations:

1) Stand alone RS422 mode with automatic data communications.

Strings have a cr/lf appended.

The "B" output will pulse while active.

New read data will be sent automatically and the LED's will signal a new read for 5 sec.

Input changes will not be sent automatically, but will send if J29 is inserted.

5 volts is supplied to the readers.

Insert Jumpers 1,2,3B,4,5,6,15-18,20-26,28,30,32,34B

Remove all the other jumpers.

2) Multi-drop RS485 mode with command driven communications.

Strings have a cr/lf appended.

The "B" output will pulse while active.

Reader and input data must be read by command and the LED's will stay on from new reads until cleared.

Input changes pulse the LED for ½ sec.

5 volts is supplied to the readers.

Insert Jumpers 1,2,3B,4,5,6,15-18,20-28,32,34A, 35,36

Remove all the other jumpers.