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Electronic Systems Engineering

CCA-1 Par Crate Controller

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GENERAL DESCRIPTION



The model CCA-1 (CCA-2) provides basically a standard entry into a CAMAC crate. By the use of its associated standard branch highway it allows the user to connect up to seven crates into a system. It also simplifies the problem of interfacing to the system. Interfaces can be built to comply with this one standard and may be used regardless of the number of crates or the type of system.

The standard interconnecting highway, the branch highway, contains the following signals:

Crate address	BCR (7)	Timing	BTA (1)
Station address	BN (5)	Initialize	BZ (1)
Subaddress	BA (4)	Q Response	BQ (1)
Function	BF (5)	X Response	BX (1)
Read-write	BRW (24)	Demand	BD (1)
Timing	BTB (7)	Graded L	BG (1)
Reserved	BV (7)	Cable shield	BSC (1)

Twisted pair are used for all signal lines (66 pair) with a nominal characteristic impedance of 100 Ohms. Signals on the branch highway are:

Inputs:	Less than .3 mA Note: Circuitry is provided to insure a high input impedance even when the power is removed.
Outputs:	Logic "1" capable of sinking 133 mA with an output voltage of .3 volts. Logic "0" determined by the supply voltage of the branch terminator used. Our models terminate to 4.1 volts.

There are two standard modes of operation, they are the Command Mode and the Graded L mode.

Command Mode

This is the normal mode of operation. The information on the highway is gated into the controller which triggers the required actions.

Timing

The command mode timing is triggered by a logic 1 signal on the BTA line. This signal is integrated for 100nsec to eliminate false triggers due to noise and is gated with crate address BCR (which is also integrated for 100ns). If this is an "on line" crate with its address select switch set to the crate address transmitted the timing generator will be triggered. A "CR" indicator on the front panel will light showing that the crate has been addressed. The timing generator is a chain of five monostable multivibrators, which generate the three dataway signals strobe 1 and 2 and busy and also the branch timing response BTB.

In response to BTA and TB signal (normally logic will go to logic "0") is generated at time T3. This signal is integrated and placed on the branch highway as BTB to indicate that data is established on the highway. Normally BTA will return before S2 is to be generated and indicates that the branch driver has received the data and the cycle is completed as shown. However, if BTA does not return to zero, S2 is not generated and will wait for the BTA signal to indicate the branch driver is finished. Strobe S2 will then be generated immediately and the cycle then finished.

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The following data is introduced onto the branch highway by the branch driver which will allow the operation to be performed.

Crate address, BCR, seven lines are used to directly address from to 7 crates to indicate to them whether they are to perform the command. This signal is gated by the address select switch which has physically assigned the crate an address. The BCR signal is integrated to suppress noise.

Station address, BN, five binary coded lines are used for station address. These are decoded in the CCA-1 (CCA-2) to individual N lines. The N line of the addressed module is gated on to the dataway during the time TA +TB (except in a Graded L operation). The CCA-1 (CCA-2) uses N28 and N30 itself, and N26 to address all stations and N24 to address preselected stations.

Subaddress, BA, four binary coded lines are used to address a particular channel in the module. These four lines are buffered and gated onto the dataway a lines during TA +TB. These lines are also fully decoded for internal use in the CCA-1 (CCA-2).

Function, BF, five binary coded lines are used to identify the functions to be performed. These lines are buffered and gated onto the dataway F lines during TA +TB. The function lines are also fully decoded in the CCA-1 (CCA-2) for internal use.

Read-write lines, BRW, 24 lines are used to carry read information from the dataway read lines during a read operation and also to carry write information to the dataway write lines during a write operation. In addition to gating these lines during TA + TB, we have also added the logic required to gate read information from the dataway to the branch and inhibiting this data from the dataway write lines where it would normally appear. However, but is not used. The same thing is done during a write operation. This eliminates the additional noise on the dataway due to the presence of signals not required.

Graded L Mode

The second mode of operation is a Graded L mode which is recognized by a logic "1" on the BG line. The command is still triggered by a BTA signal however. In this mode the auxiliary 52 pin connector on the rear panel is addressed and no module stations. The 23 individual L lines from the modules are buffered and brought to this connector. Externally these signals are sorted and re-enter the connector on 24 lines as "Graded L" information. This information is gated onto the BRW lines to be read by the branch driver. A Graded L timing cycle is shorter than a command cycle ending when BTA goes back to zero. Busy (B) and strobe S1 are gated off the dataway.

Branch initialize, BZ, this signal has priority over all operations. To insure against a noise trigger this signal is integrated for 3us. The BZ should be greater than 10us long. The BZ triggers the timing generator which generates a normal timing cycle. It also places a logic "1" on the dataway Z line.

Branch demand, BD, this signal is used to indicate that a crate has a demand. It can be from the "wired or" of the Graded L lines or an external demand from the rear 52 pin connector. This signal can be enabled or disabled under command. The response to BD is normally a Graded L operation. A demand light "D" is provided to indicate that the unit has a demand.

Branch Q response, BQ, this is the "ORed" Q responses from the dataway Q and the Q from the CCA-1 (CCA-2) itself. It is gated onto the branch during TA + TB.

Branch X response, BX, this is the "ORed" X response from the dataway X line and the X response from the CCA-1 (CCA-2) itself, it is gated onto the branch during TA+TB.

On Line/Off Line

A switch is provided to operate the crate controller and thus the crate off line. During this mode the controller

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ignores all branch signals and does not generate any signals on the branch. In off line, the manual Z and C become effective. The "C" pushbutton generates a logic "l" on the dataway C line and triggers a normal timing cycle. The "Z" pushbutton generates a logic "1" on the Z line and triggers a normal timing cycle.

Logic is provided that prohibits a crate to come "on line" if its crate address is already being used in the system. A LED is provided to indicate whether the crate is really "on line". If when the switch is placed in the "on line" position the LED does not light, this indicates its address is already being used. To use this feature, the crate address which is selected by a front panel screw driver switch, must be set when the controller is "off line". This sets up the logic to check the address lines when the controller is switched "on line". If the address is verified, the "on line" light goes on. This light and not the switch position indicates whether the crate is on or off line.

Inhibit

There is no inhibit signal in the branch highway, however, a dataway inhibit may be generated in two ways: on command, or via the front panel LEMO connector. A light is provided to indicate that an inhibit is on the dataway.

The following are the commands the CCA-1 (CCA-2) will respond to, all generate an X response.

Command	Action
N28•A8•F26•(TA+TB)	Generates a dataway Z-S2
N28•A9•F26•(TA+TB)	Generates a dataway C-S2
N30•(A0•A7)•F0	Reads "Graded L's" onto BRW lines, generates a Q response.
N30•A8•F16•S1	Loads data from the BRW lines into the station number register (SNR). This information is used for selective multi-station operations and gated onto the N lines with N24. Generates a Q response. Note: N26 addresses all stations.
N30•A9•F26•SL+Z•S2	Sets inhibit flip-flop which generates I=1 on the dataway.
N30•A9•F24•S1	Resets inhibit flip-flop.
N30•A9•F27	Tests dataway inhibit (I) line. Response on Q line. (Q=1 if I=1)
N30•A10•F26•S1	Sets enable-disable flip-flop which enables the demand BD signal.
N30•A10•F24•S1+Z•S2	Resets enable-disable flip-flop which disables BD signal.
N30•A10•F27	Tests enable-disable flip-flop, generate response on the Q line. (Q=1 if enabled)
N30•A11•F27	Tests if there is a demand present, generates response on the Q line. (Q=1 for D present)

Dataway Signal Levels (sinking currents given are for the dataway, internal pullup resistors have already been accounted for)

Busy (B), Inhibit (I), Clear (C), Initialize (Z), Subaddress (A), Function (F). Write (W)	Logic "0" +4 volts, Logic "1" .5 volts maximum, sinking 36.8mA pullup resistor 560 Ohms.
Strobes S1 and S2	Logic "0" +4 volts, Logic "1" .5 volts max., sinking 36.8mA. Pullup resistors 100 Ohms.
Q and X lines, and Read (R)	Logic "1" at .5v, 11.2mA maximum feed into line. Logic "0" at 3.5v, 2.3mA typical. Pullup resistors 560 Ohms.
N lines	Logic "1" sink 6.4mA at .5v. Pullup resistors 560 Ohms.

Manual Crate Selection and Display

To select the crate address for the crate, a front panel mounted switch is provided. The address may be selected using a screwdriver. Logic is provided to insure the module cannot be assigned the same crate number already in

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use in the system. To insure this, the crate address should be selected by the front panel address switch when the unit is in the off-line mode. The module should then be placed on line. If the crate address is valid, the on-line light will come on, if the address is already being used the crate will not come on-line and the light will remain off.

For assistance, contact Help Desk, helpdesk@fnal.gov
Information compiled and maintained by W. Barker ; last modified on October 21st, 2008.
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