

Installation Guide for Anytronics S/DP1602CB Power Packs with RS232 vRS16-1

These notes are intended only for guidance. This equipment should only be installed by competent and qualified electricians. The responsibility for safe and correct installation of the system rests with the installer.

Any insulation or isolation testing must be completed before installing the dimming pack. **DO NOT use a Megger or similar high voltage testing equipment on any part of a circuit or equipment connected to a dimming pack.** The electronics in the pack will not withstand the voltages associated with such equipment.

Step 1 Fix pack to wall - First remove pack lid to access the fixing holes. Fixing dimensions shown overleaf.

Install the pack in a well ventilated area with the ventilation slots uppermost, leaving at least 125mm gap round the top and sides of the dimmer to promote cooling.

Step 2 Connect output circuits

Normally an earth busbar and a common neutral busbar are provided for output connections together with sixteen dimmed/switched live outputs from the circuit breakers. Output circuits can be wired either

A. as for a single appliance with independent earth and neutral connections and dimmed/switched live connections from the circuit breaker outputs, or

B. as lighting circuits with common neutral and earth connections and independent dimmed/switched live connections to each circuit. Any such common neutral or earth connections must be adequately rated.

It is possible to use a mixture of these two circuit connection techniques from a single pack.

For safety and to provide correct supply isolation it is **essential** that the neutral connections to controlled equipment be derived from the common neutral output busbar and not from other external neutral connections which do not pass through the dimming pack's internal double pole isolator.

If neutral disconnection breakers have been ordered, then the neutral connections will be available on these breakers rather than on a neutral busbar, and each load should have its own live, neutral and earth connections.

Note that the two types of circuit breakers used in these Anytronics CB packs require total loop impedances of less than 8.8 ohms (C4) or 17.7 ohms (C2) in order to achieve a 5 second disconnection time. For disconnection times <0.2 s the loop impedances should be less than 5.8 ohms (C4) and 11.5 ohms (C2). To avoid damage to the dimmer such impedances should be checked by calculation, or else measured with the dimmer taken out of circuit.

Step 3 Select dimming / switching operation per output channel

It is possible to set each channel independently for either dimming or switching operation using the two 8-way Dimming/Switching selection DIL switches located just to the left of the bcd address switches. Ensure that any equipment that cannot be dimmed (such as AV equipment, LED fixtures etc) is fed from a switched circuit. Switching operation is selected by setting the relevant DIL switch Off, dimming by setting it On.

If electronic transformers are to be used on dimmed outputs to drive low voltage halogen lamps or LED lighting, **check now** that they are dimmable and that they are compatible with leading edge (ie triac controlled) dimming systems.

Step 4 Connect control inputs

It is good installation practice always to route the control wires separately from all other electrical cables.

Both 9-way Cannon D and internal screw terminal connections are provided for RS232 in/through connections. No hardware or software handshaking is implemented in the control protocol, so the dimmer will work with a minimal two wire connection of 0V and received data. If status reporting is required the return data path can be connected too. RTS and CTS connections and DTR/DCD/DSR connections are linked internally through the Cannon D to facilitate communication with controllers which require hardware handshaking. TX and RX connections at the Cannon D connector can be swapped over inside the dimmer to suit the cable in use by using the internal push button changeover switch beside the Cannon D socket. A buffered version of the received data is available internally on the 'BUF' screw terminal.

Step 5 Connect enable / disable input

Usually an external **enable input** is not required. In this case ensure that switch 4 of the four way DIL switch (immediately above the units address switch and marked ENABLE/DISABLE) is off (ENABLE) and that the ENABLE SELECT jumper (to the left of the address switches) is securely in the 'NORMALLY ON' position.

If the external enable/disable control input is required, it will be found together with a reference 0V connection on the internal twin screw terminals on the far right of the PCB above the four way DIL switch. The action associated with this input depends on the state of switch 4 of the four way DIL switch, the ENABLE SELECT jumper and the external input as follows :-

Switch 4	Jumper	Operation	Input voltage	Dimmer Pack Status
Off	NORMALLY ON	Pull input low to disable	Unconnected	enabled
Off	NORMALLY ON		0 V	disabled
Off	NORMALLY ON		+5 V	enabled
Off	NORMALLY OFF	Pull input high to enable	Unconnected	disabled
Off	NORMALLY OFF		0 V	disabled
Off	NORMALLY OFF		+5 V	enabled
On	NORMALLY ON	Pull input low to enable	Unconnected	disabled
On	NORMALLY ON		0 V	enabled
On	NORMALLY ON		+5 V	disabled
On	NORMALLY OFF	Pull input high to disable	Unconnected	enabled
On	NORMALLY OFF		0 V	enabled
On	NORMALLY OFF		+5 V	disabled

Note that the jumper is labelled correctly for operation with switch 4 in the OFF or ENABLED position. When the switch is in the ON or DISABLED position, the jumper labelling logic is reversed.

Step 6 Connect mains supply

The current rating of both the supply and of its connection circuit must be adequate for the total pack rating.

Supplies should contain independent live, neutral and earth connections. The incoming supply live and neutral connections should be made to the correct terminals of the double pole isolator or RCD isolator.

DO NOT connect the incoming neutral supply to the common neutral output busbar.

The earth connection should be made directly to the centre clamp on the clearly labelled earth busbar on the left of the connection chamber.

Step 7 Check operation of output circuits and connections

With the power connected it is possible to test the correct connection of the system without using the control inputs by using the dimmer's local control facility, but **NOTE that with a mains supply connected most of the exposed circuitry will be at mains voltages, so exercise caution.**

First ensure that the pack is enabled (see step 5 above). To test the output circuits, set the address switches to address 900 and then apply the supply power. Individual output circuits can be brought full on by changing the units and tens address switches to bring on each channel in turn (901-916). By starting from address 800 (801-816), the channels will be brought on at 50% (unless set for switching operation). Note that engaging this local test mode will disable the RS232 inputs and will clear the RS232 command registers so that any channel levels previously set via RS232 commands will be cleared to zero. An address of 950 will bring all channels full on.

To test the serial input the correct dimmer address will have to be set on the internal units and tens bcd address switches, and the baud rate on the hundreds address switch. Refer to the following protocol summary for further details and programming information.

If preheat is required, set the appropriate level for dimming channels using the preheat potentiometer.

Step 8 Electronic loads

In checking the correct operation of the dimmer from these control inputs it is important to investigate any anomalies in dimming operation. For example, poorer quality electronic ballasts can give problems dimming towards the bottom of the dimming range. Typically the lamp will flash on when the dimming level is being reduced below 10%. Problems like this caused by poor quality ballasts can usually be overcome by setting switch 1 of the two way DIL switch (to the right of the Preheat control and marked 'EB') to On for better compatibility with electronic ballasts.

Step 9 Replace lid, fasten down and recheck for correct operation.

Tidy up cable runs etc. Label lid near circuit breakers with details of load circuits.

Anytronics RS232 dimming control and protocol

Commands use normal ASCII encoding. Parity etc is immaterial and not checked.
There is no flow control handshaking implemented either in hardware or software.
The Baud rate is set by the hundreds address bcd switch as shown in this table

setting	Baud Rate
0	1200
1	2400
2	4800
3	9600
4	19200
5	38400
6	57600
7	115200
8	local test
9	local test

The input buffer is 62 characters long.

Regardless of Baud rate, this limits the rate at which command characters can be sent.

All commands are case insensitive and are composed of ASCII strings.

Commands are executed in the order in which they arrive at the dimmer.

Command lines are only executed on receipt of a terminating CR (d13) or LF (d10) character.

The dimmer's input buffer is cleared progressively as each command is executed.

All space and tab characters are ignored. This feature can be used to improve the legibility of stored command strings.

The backspace (d8) character can be used to sequentially eliminate characters from an uncompleted command line.

Uncompleted command lines can be cleared from the buffer by using a 'line clear' command (a 'Z' (d90 or d122) character).

Addressing

The dimmer addressing scheme facilitates precise communication from one data source to several dimmers. Each dimmer can be given an address in the range 0-99. The dimmer address is set on the units and tens bcd switches on the main dimmer pcb.

If the dimmer's address is 0 it will respond to all relevant received commands.

If the dimmer's address is between 1 and 99, it will only respond to commands which are prefaced or preceded by this dimmer address.

If the dimmer is put in local test mode (address 800 or 900) it will not respond to any commands.

Dimmers are usually set with a specific address 1-99 and so respond only to commands sent to this address. To address a command to a dimmer use an 'A' or 'a' character with the address ie :-

ann Following commands apply to dimmer with address *nn* (and to dimmers with address 0 set).

If *nn* = 0, then this command and all following commands apply to all dimmers regardless of their set address.

Until a further address command is sent all further commands will be assumed to be destined for this dimmer address, but it is recommended programming practice to lead each command line with the appropriate dimmer address.

Note that all incoming address commands are read by the dimmer and will flash the 'Data' LED. This can be used as a simple test of the serial connections to the dimmer.

Fade Times

If a dimmer's fade time has not yet been defined, the power up setting is 5 seconds. Once a fade time has been defined for a dimmer it is remembered until the dimmer is switched off. It is still good programming practice to define the required fade time in any command requesting a change in lighting level. The fade time needs to be defined by using an 'F' or 'M' command before the change in output level is requested :-

Fnnn Set fade time to *nnn* seconds. Range 0 - 120s. (Power up default 5 seconds)

Mnnn Set fade time to *nnn* minutes. Range 0 - 120m.

The fade time can be changed between successive level change commands to allow individual fade times to be set for each channel level change.

Note that channels set for switching will switch immediately their RS232 commanded level is >127 and will not be affected by fade time settings.

Absolute Channel / Circuit levels

To change the level on a single channel or circuit, define the circuit/channel number and the required level using a 'C' command :-

cnn=mmm *Set circuit/channel nn to level mmm (expressed in ascii bcd, range 0-255)*

Cnn%mmm *Set circuit/channel nn to level mmm (expressed as % in ascii bcd, 0-100)*

The valid range of circuit and channel addresses will depend on the dimmer in use (for this pack, up to 16).
If the channel number in the command is zero this will change the level on all the channels/circuits in a dimmer to the defined value:-

C0=mmm *set all channels to level mmm*

C0%qqq *set all channels to level qqq%*

Whether just a single channel or all the dimmer's channels are changed, the change in level will occur over the previously defined fade time.

For commands to change multiple channels or circuits to different levels, use either semicolon or colon separator characters between sequential desired channel levels :-

Cnn=mmm;ppp;qqq;rrr;sss;ttt

Set circuit/channel nn to level mmm (expressed in ascii bcd, range 0-255),

Set Channel nn+1 to ppp, channel nn+2 to qq, channel nn+3 to rrr, etc

Note that these two separator characters can also act as place holders so that selected channels can be left unchanged :-

cnn%mmm;ppp;;qqq;rrr:sss:ttt

Set circuit/channel nn to level mmm (expressed as % in ascii bcd, 0-100)

Set Channel nn+1 to ppp, don't change channel nn+2, channel nn+3 to qq etc

And that to improve command legibility, spaces or Tab characters can be inserted into the command, eg
cnn% mmm; ppp; ; qq: rrr: sss: ttt [All space and Tab characters are ignored at the dimmer]

Relative Channel level changes

These commands are used to let the user immediately change selected channels up or down by a specified amount (for a manually controlled fade or stepping control). If there is an automated fade in progress on any channel which has its level changed in this way, then the automated fade is terminated at the current value.

Dnn=mmm *Immediately decrease circuit/channel nn level by mmm (expressed in bcd, range 0-255)*

Unn%mmm *Immediately increase circuit/channel nn level by mmm (expressed as % in ascii bcd, 0-100)*

If the channel number is zero, then this command will apply to all channels in the addressed dimmer.

d0%10 *Change level on all channels down by 10% of full range*

u0=50 *Change level on all channels up by 50*

U0=0 *Stop any automated fade in progress on all channels*

This command can also be used to change multiple selected channels by different amounts by employing semicolon or colon character separators. Again these separator characters can be used as place markers to produce no change on selected channels :-

dnn=mmm; ppp; ;qqq; rrr; sss; ttt

Immediately decrease level on circuit/channel nn by mmm (expressed in ascii bcd, range 0-255),

Channel nn+1 by ppp, don't change channel nn+2, channel nn+3 by qq etc

unn%mmm: ppp: qq: : 0: sss: ttt

Immediately increase level on circuit/channel nn by mmm% (expressed as % in ascii bcd, 0-100)

Channel nn+1 by ppp%, channel n+2 by qq%, don't change channel nn+3, stop fade on channel nn+4, raise channel nn+5 by sss%, etc

Scene Recall

Programmable scenes are numbered 1-14 and are recalled using an 'r' command.

Rnn Recall saved scene number *nn*. (Scene 0 is blackout, all channels off. Scene 255 is all channels full on.)

Scene Save

Simple scene save commands using an 's' character include all the channels in a scene, so that all dimmer channel are likely to be affected on scene recall. Eg

Snn Save all the current channel levels as scene number *nn*. [*nn* = 0 or >30 are ignored]

NOTE that it is not possible to save or to programme (see below) scenes if the memory write protect switch (switch 1 of the Select four way DIL switch) is set to On.

Programme Scene

The more complex 'scene programme' or 'P' command programmes scenes directly (without affecting the current dimmer levels) at levels which are defined in the command. This command includes the facility to exclude some channels from a scene so that these channels will be unaffected on scene recall. In this way scenes can be programmed to change only selected channels on scene recall, ie programmed to control different zones or areas, leaving other areas unchanged eg :-

pnn=mmm;ppp;qqq;rrr (*nn* = 1 to 30 only, levels set in range 0-255)
Programme scene nn with circuit/channel 1 at level mmm, channel 2 at ppp, channel 3 at qqq, channel 4 at rrr. On recall channels 1, 2, 3, 4 are changed to mmm ppp, qqq, rrr and other channels are not changed.

Pnn%;mmm;ppp;;qqq;rrr (*nn* = 1 to 30 only, levels set as percentages 0-100)
Programme scene nn with circuit/channel 2 at level mmm%, channel 3 at ppp%, channel 4 and 5 excluded, channel 6 at qqq%, channel 7 at rrr%, channel 8 excluded. On recall only channels 2, 3, 6, 7 are changed.

Programming examples

Composite commands can be made up by concatenating these strings, and adding spaces if required to improve legibility eg

A74 m15 c0=0 Dimmer with address set to 74, fade to blackout over 15 minutes.
a33 f10 r0 Dimmer with address set to 33, fade to blackout over 10s.
a0 F7 R255 All channels on all dimmers fade to full on with 7 second fade time.

a54 f6 C7%100 With 6s fade time, set circuit 7 on dimmer with address 54 full on.

A4 F8 c5=189:140: :120 With 8 second fade time, set channel 5 of dimmer 4 to level 189, 6 to 140, 8 to 120.

A18 U0%2 On pack 18 stop any automated fade in progress and increase all channel levels by 2 %

A45 d3=5: :7:10 On pack 45 stop fade on channels 3,5 and 6 and decrease levels by 5, 7 and 10 respectively.

A0 M15 r7 With 15 minute fade time recall scene 7 on all dimmers.

Remember that the order of commands within a command string is important as commands are actioned sequentially :-

A3 F7 c4=56 a61 m4 C3%28 With 7s fade time, set Channel 4 of dimmer 3 to level 56, with 4 minute fade time set Channel 3 of dimmer 61 to 28%.

Select DIL switch settings

The four way Select DIL switch is in the near right hand corner of the main PCB.

DIL Switch No	Off	On
1	Scene save enabled	Scene memory protected
2	single status line	split status line
3	Reply string disabled	Reply string enabled
4	pack enable if high	pack enable if low

Dimmer command acknowledgement

Any actioned command will briefly flash the dimmer data LED. Commands not addressed to the pack or not recognised by the pack will be ignored and will not flash the LED. The exception to this is that all received 'a' address commands flash the data LED.

If DIL switch 3 of the four way DIL select switch is set to On, the dimmer will return a reply of *A nn OK* (followed by CR,LF) (where *nn* is the set dimmer address) when actioning a command. [If the electronic ballast setting for the dimmer is in use, the reply will be *a nn OK* .] This reply will probably not normally be used by the controller, but can help during installation, commissioning and testing phases. To avoid multiple replies arriving at the controller, **any commands sent out to global address a0 do not elicit an 'A nn OK' reply.**

Note that scene save or scene programme commands received when Select DIL switch 1 is set to On for scene memory protection will not flash the data LED or return an 'A nn OK' reply because the command will not have been actioned.

Commands requesting information from the dimmer

These commands can be used to request the current pack status. They only work when the pack is specifically addressed at its set address (ie not after global a0 commands). Note that they do not also return the above 'A nn OK' reply string whether Select switch 4 is set On or Off. There are four commands :-

V Returns dimmer type, software version etc as an ascii string

Q Reports current RS232 commanded channel levels and dimmer/switching selection in colon separated ascii.

d denotes a dimming channel, *s* a switching channel with values 0 or 255, (0 or 100%) only for on / off. To aid readability, the separator is different every fourth channel.

If select switch 2 is set on, the reply is split across two lines (CR terminated strings) rather than as one long string for ease of reading on a terminal connection.

Channel level range is 0-255, or 0-100 depending on format of last command received, viz

A 45 % d 0 : d 50 : s 100 : d 75 | s 0 : d 50 : s 100 : d 75 percent or

A 45 = s 0 : d 128 : s 255 : d 192 | s 0 : d 128 : s 255 : d 192 bcd

The values reported by a Q command will change during a controlled fade operation. The stored target RS232 command levels can be reported by using use a 'T' enquiry :-

T Reports the stored RS232 command values for each channel using the above format.

An alternative 'H' enquiry will report the true instantaneous channel drive levels as moderated by enable input and preheat settings :-

H Reports the current channel drive levels