



VISTEK V1608 DART RACK CONTROLLER USER GUIDE

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VISTEK V1608 dart rack controller

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1. DESCRIPTION

DART is a sophisticated control system that allows relatively simple control devices, with RS232 ports, to manage a network of functional units. All the controlling devices and controlled racks, known colloquially as Nodes, are linked together using a protocol known as **DARTnet**. A separate, simpler communication protocol, **DARTbus**, is used within the rack. The V1608 module is the hardware module that interfaces between **DARTnet** and **DARTbus**. This has the advantage that it is only each rack that is a 'load' on the **DARTnet**, rather than each module, which would severely limit the network size.

DART is installed in all the Vistek modular chassis which carry the V1600 range of 'modular products', which comes in two sizes - the 3U V1603 and the 1U V1601. The 3U chassis can hold up to 11 modules with dual power supplies or up to 14 modules with a single supply. When the V1608 is fitted there is still a maximum of 11 modules with two PSU, but only 13 with a single PSU, due to the mechanical arrangements. The 1U chassis can carry a maximum of 4 modules with or without the controller.

On the V1603 a rear module is required, which provides a passive electrical and mechanical interface to the **DARTnet**; this is similar to the rear modules on the primary units. On the V1601 there is no special rear module for the controller, but a connector is fitted to left-hand side rear module (as viewed from the front of the rack).

As with most network systems each node, rack or controller in this case, is identified by a unique address, which must be set correctly for the whole installation.

A **DART** network can be controlled from several types of controllers. Some examples are

- V1605** Vistek 1U Control Panel. Can control up to four **DARTnets**.
- Viewfind** Vistek's proprietary Control software for running on any suitable PC running Windows 98/NT or 2000, can drive as many networks as the PC has serial ports and can be networked (Ethernet) to any number of other computers.
- V1607** Touchscreen PC running Viewfind.
- Third Party** Third Party vendors can write software to control any **DART** system using the **DART** protocol, which is available under licence.

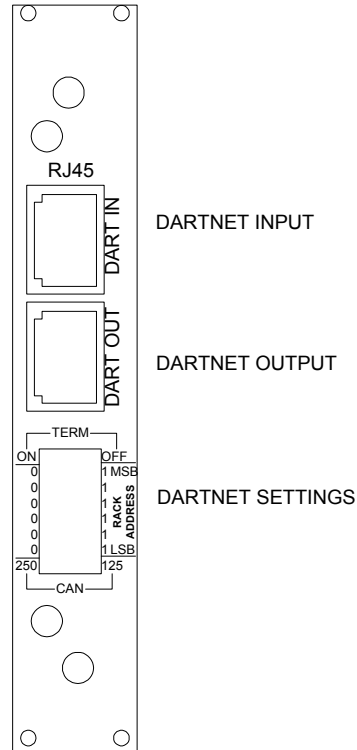
The overall installation of a **DART** network and an understanding of its limitations is complex and requires a more detailed knowledge than this Operation Manual can give. However other publications from Vistek are available to assist. Section 4 gives some guidance to the selection of node addresses.

The V1608 Module has been upgraded, (Issue E PCB and above). There is no change to the performance, but the newer unit has added features. It is pin compatible with the previous versions and can be used as a direct replacement. This operating manual applies only to the newer version of the module. There is no change to the rear connection arrangements and the **DART** characteristics are identical.

2. INSTALLATION

2.1 Rear Panel Connections (V1603)

When the V1608 is fitted to a 3U V1603 Chassis a dedicated rear module is required as shown below. When fitted into a 1U V1601 then no rear module is needed. However the rear module mounted on the right of the V1601 (as viewed from the rear) must have a **DARTnet** connector fitted.

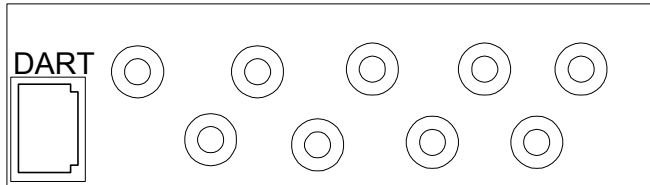


The actual **DARTnet** is connected to the V1608 rear panel through a RJ45 connector using screened CAT 5 cable. In most cases there will be an onward connection so two RJ45 connectors are provided. At the ends of the network the cable should be terminated, as set on the TERM switch. In this case the **DART OUT** connector should be left open.

2.2 Rear Panel Connections (V1601)

When the V1608 is fitted into a V1601 Chassis the **DARTnet** is connected into the RJ45 on the rear module on the right of the unit (as viewed from the rear). The RJ45 connectors on other modules are not used. On many rear modules the RJ45 may not actually be fitted but it is essential that the far right rear module has a RJ45 if the chassis is to be used on **DART**.

1U (V1601)

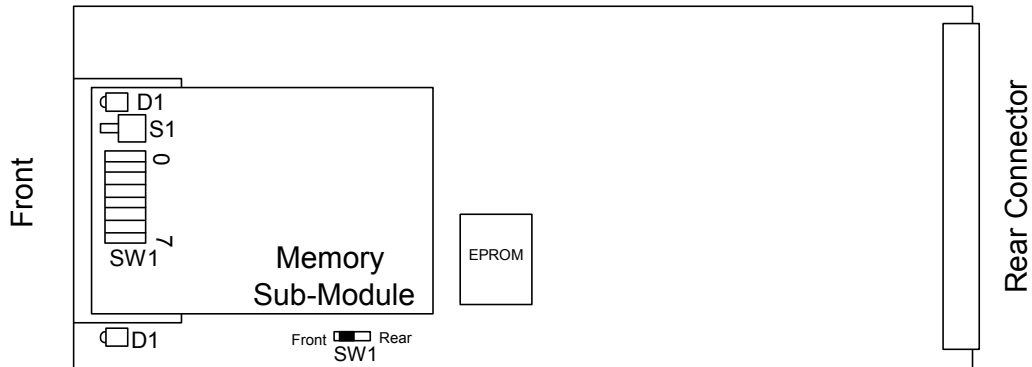


The actual **DARTnet** is connected to the rear panel through a RJ45 connector using screened CAT 5 cable. In most cases there will be an onward connection so a 'T-Piece' allowing two RJ45 connectors will be needed. At the ends of the network the cable should be terminated, using the 'T-Piece'.

2.3 Power Consumption

The V1608 power consumption is **1.5W** (at 15V input).

2.4 PCB Hardware



The purposes of the various items are shown in the following table. Details of their operation are described in later sections.

ITEM	Title	Section	Comments
S1 (Sub-Module)	RESET	2.4.1	Push to manually reset the Rack Controller. Necessary after changing the DART address. Also used to flush the contents of the Sub-module RAM.
SW1 (Sub-Module)	DART SET-UP	3.2	Used to set the DART address and speed, when in a V1601 rack or SW1 (Main-Module selected to Front)
D1 (Sub-Module)	POWER	2.4.1	Indicates 5V present on the PCB
SW1 (Main-Module)	Address & Speed selector	2.4.2	Selects which set of DART address and speed switches are being used in a 3U rack. (A 1U rack automatically sets the front switches active.)
D1 (Main-Module)	Status	2.4.2	Software and Control status. For initialisation, diagnostics, RAM reset and module 14 DARTbus scan
U16	EPROM		Micro-controller Program.

2.4.1 Memory Sub-Module

The memory sub-module contains the node address switches, the reset switch and the power led. It plugs into the main module for easy swapping, because it contains all the information for the rack that it was controlling.

The memory is battery backed-up on the module, so that if needed it can be transferred between main-modules without losing data and without having to set up the node address again.

The reset button has two purposes.

- A momentary press of the button will send a reset command to the main processor to re-boot.
- A press and hold for >5 seconds will flush the RAM contents. The Status led D1 on the main module will illuminate permanently when this process has started. (It takes about 1 second).

The address and speed switches (SW1) are used in a 3U rack when selected and a 1U rack. (See section 3.2 for details.)

2.4.2 Main Module

The main module contains the processor and the interfaces to the DARTnet and DARTbus. It also contains module 14, which is monitoring the two power supplies for failure. (The voltage rails and temperature are monitored by the processor and this information is broadcast with the node heartbeat.)

The main module also contains some hardware watchdog timers to reset the processor if module scanning stops.

The led D1 on the module has several functions.

- It will flash a few times during the processor reset cycle.
- It will flash approximately every 2 seconds during normal operation in the same way as the remote led on other modules, when the rack controller accesses module 14.
- It will illuminate permanently when the reset button on the sub-module is held down for more than 5 seconds to show it is flushing the RAM.

The switch SW1 is used to select which set of address and speed switches are used in a 3U rack. The rear module switches or the front switches (SW1 Sub-Module) may be used. In a 1U rack the switch is overridden, as it must use the front address and speed switches (SW1 Sub-Module).

2.5 Front Panel

There is no front panel on this unit, so all front access controls are those actually on the PCB as shown above in Sections 2.4.



3. OPERATION

3.1 Dart

The V1608 should only be used as part of a **DART** network. It is quite permissible to fit it into a rack without a **DARTnet** connected but it will then have an effect on any modules in the rack when they are set to REMOTE mode. Provided all modules are set to LOCAL mode then the V1608 will be benign.

One of the base principles of **DART** is that the set-up data for modules in a rack are stored on the V1608, so that if a module is changed with another of the same type it will automatically be set up with the same data. This begs the situation of a controller being installed without a control network to set the parameters. In this case most modules will be set to their default conditions, but this may not be what is wanted. Thus if **DARTnet** is not being used then all modules should be set to LOCAL.

3.2 Dart Address Setting

The selection of **DART** addresses is complex and requires an analysis of the whole network. A full discussion is beyond the scope of this manual but section 4 has a brief discussion of the principles. The actual **DARTnet** address of the V1608 is set differently depending on whether the unit is fitted to a V1603 or V1601 chassis.

V1601	Use the switches on the front of the unit
V1603	Use the switches on the front of the unit or on the rear module (Determined by Main-Module SW1 setting)

In both cases the six inner switches make up a 6 bit Hex value with the MSB at the top or left and LSB at the bottom or right.

In both cases the address is only read when the micro-controller first boots up, normally on power up. It is **essential** to momentarily press **RESET** or re-power the rack whenever the address is changed.

3.3 Dart Termination

DARTnet is based on the versatile and highly rugged CAN protocol developed for the industrial and automotive market. It is based on balanced two-wire communications.

The network should be continuous, without stubs, and terminated at both ends. Since the termination should be set at all times (if required) then it cannot be on the V1608 itself. For V1603 systems the termination is available on the passive rear module, Section 2.1 but for V1601 systems this is not available. For V601 systems the termination should be provided externally.

The termination should be 120 Ohms.

The termination setting is always 'live', so it can be changed without the need for a RESET.



3.4 Dartnet Speed

DARTnet has two operating speeds. The preferred speed for all networks is 250kbits/sec, but on long networks there can be a problem with higher error rates. (The CANBUS protocol, on which **DARTnet** is based, automatically handles transmission errors by using error correction techniques and data re-transmission, which is transparent to the user.) In general if the network length is up to 150m then 250kbit/s can be used, and if between 150m and 500m then 125kbit/s should be used.

It is important that all nodes on the network operate with the same speed setting.

The speed switch is only read when the micro-controller first boots up, normally on power up. It is **essential** to momentarily press **RESET** or re-power the rack whenever it is changed.



VISTEK V1608 dart rack controller

4. DART ADDRESSING

4.1 General

The overall selection of **DART** addresses depends on several factors, such as the size of the network, and the number of controllers. Full information is available in other documents. This section provides a brief overview of how to select addresses in a network containing a number of racks, V1605 Control Panels and Viewfind computers.

All control devices require an interface between RS232 and the **DARTnet**. This interface is a DIN341K also known colloquially, but not correctly, as a Dongle. For the V1605 there can be up to four DIN341Ks so allowing four **DARTnets** to be controlled; each DIN341K is mounted inside the V1605. For Viewfind or any other controlling software running on a PC the DIN341K must be mounted externally. They are supplied with a null modem cable for connection to a RS232 port on the PC and have a RJ45 connector for **DARTnet**. Since the control device is a node on **DARTnet** it also requires an address to be set up, and uses a DIL switch in exactly the same way as the Rack Controller. Control nodes also have a selection for the CANBUS speed, and can terminate the bus.

There are two separate forms of **DART** address, those for control nodes (e.g. a V1605 or a Viewfind computer) and Racks.

4.2 Rack Addresses

These are the simplest. They are set either on an 8 way DIL switch along with two other functions on the rear panel of the V1608 Rack Controller or on the front of the V1608, when mounted in a V1603 chassis, or on the front of the V1608 when mounted in a V1601:

ON	TERM	OFF
0	Bit 5 MSB	1
0	4	1
0	3	1
0	2	1
0	1	1
0	Bit 0 LSB	1
250kbit/s	Speed	125kbit/s

The TERM switch enables termination of the CANBUS. It should be terminated at each end of the network. (The TERM switch only works on the rear panel of the V1608)

The SPEED selects the data rate on the CANBUS. All racks and nodes must be set to the same speed. Only very long networks require to be run at 125kbits/s. The vast majority operate quite happily at 250kbit/s.

Bits 5..0 set the rack address. It should be set in the range 0 to 62_{10} avoiding any addresses that are being used for controllers. For convenience the racks on a network are normally addressed from zero upwards. Duplicate addresses may give spurious results on the whole network. Duplication with any of the control node addresses in use (as shown below) must also be avoided.

NB The address is only read at power-up or after a reset. After changing an address momentarily press the reset button on the V1608.

4.3 V1605 Node Addresses

These are more complicated. They are set on a similar 8 way DIL switch that is on one end of the DIN341K Dongle. In the case of the V1605, in which the Dongle is built in, they are visible through the rear panel.

OFF	1	1	1	1	1	1	125 kbit/s
TERM	Bit 5 MSB	4	3	2	1	Bit 0 LSB	Speed
ON	0	0	0	0	0	0	250 kbit/s

The TERM and SPEED switches work in exactly the same way as on the racks.

The address switches select so-called node groups, which select which address the node responds to. The details are complicated but for most systems the Node should respond to 2 addresses - one as selected and the other Address 63₁₀ for broadcast messages. The groups to use and the settings are:

T	d	u	d	d	u	u	S	Node Group 19 ₁₀	13H	Node Address 31 ₁₀
T	d	u	d	u	d	d	S	Node Group 20 ₁₀	14H	Node Address 47 ₁₀
T	d	u	d	u	d	u	S	Node Group 21 ₁₀	15H	Node Address 55 ₁₀
T	d	u	d	u	u	d	S	Node Group 22 ₁₀	16H	Node Address 59 ₁₀
T	d	u	d	u	u	u	S	Node Group 23 ₁₀	17H	Node Address 61 ₁₀
T	d	u	u	d	d	d	S	Node Group 24 ₁₀	18H	Node Address 62 ₁₀

Generally we advise that you start at the bottom of the table and work upwards up to the initial limit of six controllers. (It is possible to have more than six controllers on a **DARTnet** but the addressing then becomes more complex.) Do not duplicate a Node Address as shown here, with a Rack Address on the same network.

All these node groups operate at 115kbit/s. The V1605 automatically sets itself to this on Port 1.

4.4 Viewfind Dongle Addresses

VIEWFIND does not have Dongle addressing exactly like the V1605, and it depends on whether the Dongle is version V15 or version V16. All new ones are V16.

Version 15 Address must be in range 13₁₀ to 18₁₀ (0D₁₆ to 12₁₆)

Version 16 Address can be in range 13₁₀ to 24₁₀ (0D₁₆ to 18₁₆)

Any address change must be set up in Viewfind under **TOOLS - Network Manager**

Set Computer Name Must be exactly the same as the one under Windows

Set Comms Port The PC port being used: Port 2 on touch screen, 1 on my Laptop

Set Comms Speed Addresses 13 to 18 inc (0D₁₆ to 12₁₆) see **DART Book**
Addresses 19 to 24 (13₁₆ to 18₁₆) as required, usually 115000.

4.5 Third Party Software Addresses

This should be set in exactly the same way as with the Viewfind addresses.