Technical Bulletin No PB-1041

November 14, 2019

Dear Valued V-MUX® Customer,

Weldon, a division of Akron Brass, produces the industry leading V-MUX multiplex products that empower the OEM to design their own sophisticated multiplex electrical systems.

V-MUX runs on a relatively quiet network based on the RS485 data transmission standard. In V-MUX protocol, network messages are usually only sent when there is a change of data state, at a transmission rate of 9600 bits per second. In case of message conflict V-MUX employs detection methods and handlers to re-issue messages to their intended destination. While this is considered a robust and reliable network, there is a risk that an occasional message may not reach its intended destination depending on how the OEM designs the system. For this reason, we are providing our OEM system designers with this statement of "best practices" when programming un-supervised circuits to ensure that messages are properly communicated.

Background

An "unsupervised circuit" is described as a circuit, that when activated, does not provide instant feedback to the operator. For example, if there is a DOT brake light circuit added to the V-MUX system by the OEM, it is considered an unsupervised circuit. When the operator depresses the service brake pedal, the brake lights on the rear of the vehicle are commanded to activate. However, in most conditions, the operator does not receive in-vehicle feedback as to whether the brake lights did in fact activate.

By contrast, a "supervised circuit" is one where the operator receives instant feedback that the circuit has activated. An example of a supervised circuit is the multi-colored interior lights common in emergency vehicles and that are displayed automatically when the system is activated. If the white or clear lights are active and a switch is activated to change them to red, the operator knows instantly whether the request was successful.

Best Practice Recommendations

As a matter of best practice, it is recommended that our customers use one of the following methods for unsupervised circuits considered to be mission critical. These methods assume node-to-node communications are involved.

Method One: Use V-MUX Command Sets to add redundant message transmissions to the unsupervised, mission critical circuits. See page 3 for further explanation.

Method Two: Use a V-MUX Free Command at the receiving node to issue a confirming message receipt as feedback.

NOTE: This method is more technically complex and should only be used by OEMs with experienced programmers or under appropriate supervision. See page 4 for a detailed example and important design considerations.

Method Three: Type 6060 Hercules High Content nodes (HC) support Timer functions that can periodically re-send messages until the receiving node confirms the message was received. See page 5 for a detailed example.

In addition to the programming solutions mentioned above, physical installation conditions can affect the transmission of messages on the V-MUX network. The physical layer integrity is of utmost importance. Extreme care should be taken when connecting V-MUX nodes to the network and network cabling should be connected only as recommended in the V-MUX network wiring guide. See V-MUX Installation Practices (printed February 2018) for further details. Note the excerpt from the V-MUX installation practice guide at the end of this bulletin.

We appreciate your attention to this notice. For questions or assistance, you may contact the Idex Fire and Safety Electronics Applications Team at 800-533-3569.
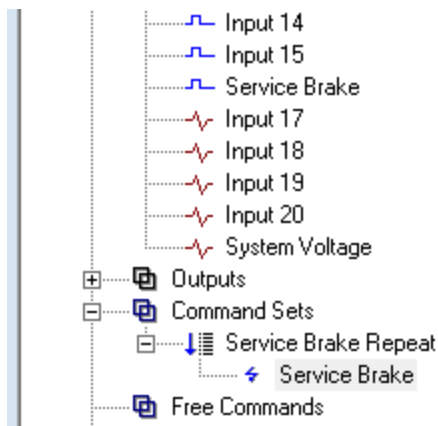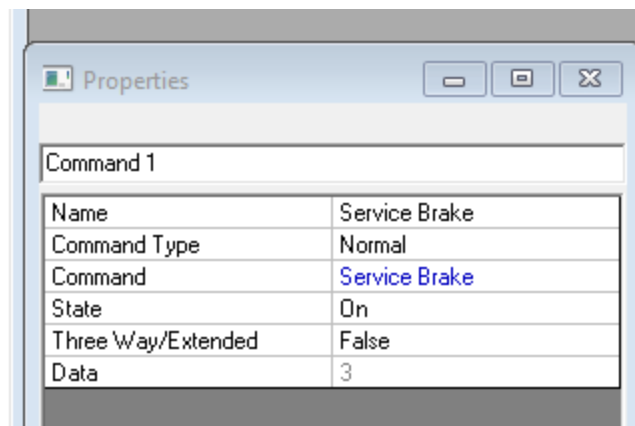

Best regards,

Chuck Hutchins
Electronics Application Manager
Idex Fire and Safety

Method One:
A Command Set used at the originating node to repeat a Command when the wired Input is activated.
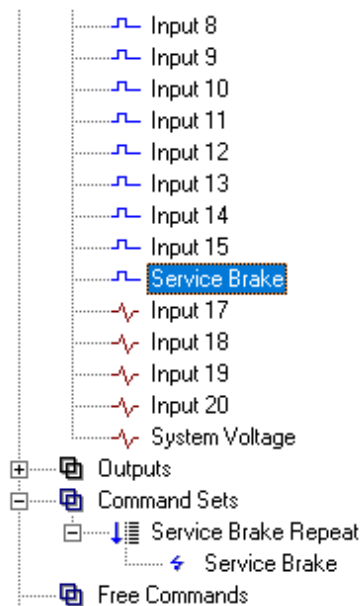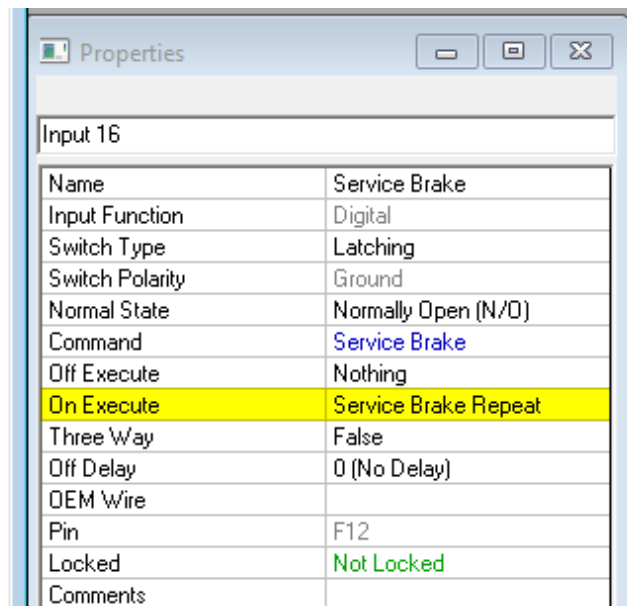Example: Here the node will send the "Service Brake" Command twice in succession, reducing the probability of a missed message.

1. Create Command Set on the **same node** that has the physical input.
2. Name the Command Set as desired (example "Service Brake Repeat")
3. Add desired command to the command set (example "Service Brake")

4. Assign the command set to the "On Execute" property of the physical input

Method Two:

Depending on the design intent, the Free Command can serve more than one purpose:

- To allow the verified Command to be positively indicated for a user
- To act as a redundant backup to the original Command when the two are logically **OR**'ed together at the Outputs of different V-MUX nodes
- To enable the message to be resent by the originating node in case the verify does not bounce back (see Method Three)

Example of the redundant backup method:

Here receiving Node 1 will issue a redundant Free Command "Aux Brake 2" immediately after receiving the original "Service Brake" message from node 3. Being a Free Command, "Aux Brake 2" will always match the On/Off state of "Service Brake". Using "OR" logic on the output gives a node two opportunities to receive the messages, from two different sending nodes.

1. Create a Free Command on the Receiving node 1 (not the Sending node 3)
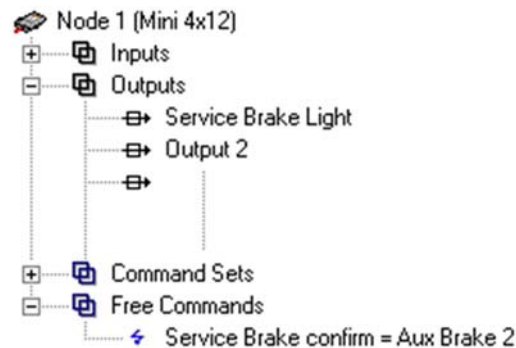
2. The Free Command Receives the Command to be verified (ex: **Service Brake**)
3. The Free Command Sends a different confirmation Command (ex: **Aux Brake 2**)
4. Name the Free Command as needed (ex: **Service Brake confirm = Aux Brake 2**)
5. For Output functions that run on more than one node -- ex: brake lights – logically **OR**'ed Commands can add redundancy. Here Node 4 runs a brake light using the Node 3 original "Service Brake" and the Node 1 Free Command "Aux Brake 2"
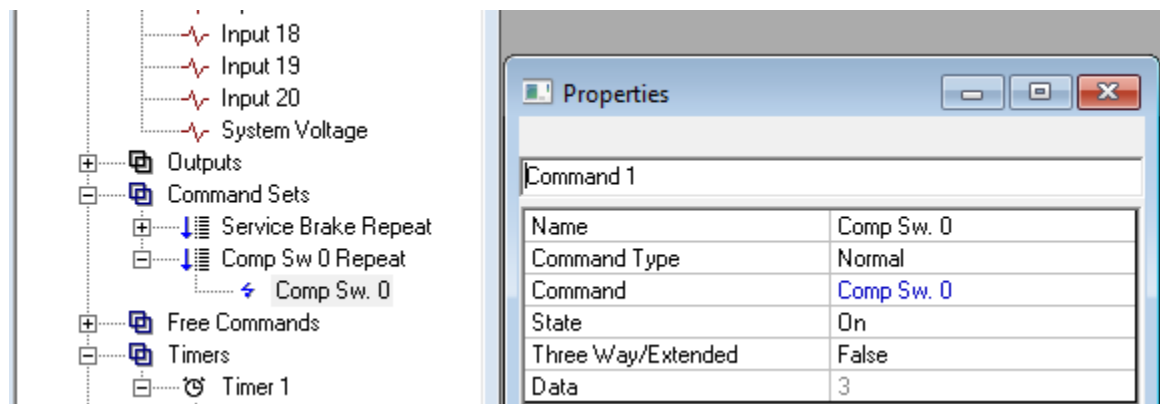
NOTE: The original message and the verify message must use different V-MUX Commands. **Never** Receive and Send the same Command within Free Commands.

When used for message verify, Free Commands must **ONLY** be used to back up the original Command. The redundant Command must never be used for any other purpose within the network. Failure to adhere to this critical rule can cause functional conflicts within the network. BE CAREFUL!

Method Three:

Example: Here a 6060 Hercules-HC Timer is used to repeat a Command if the Timer expires without receiving the verify feedback. This method is only useful for commands that can be delayed by a second or more (Do not use the Timer Method with DOT lights).

1. Create the Command Set to be repeated on the Hercules-HC node. (example "Comp Sw 0 Repeat")
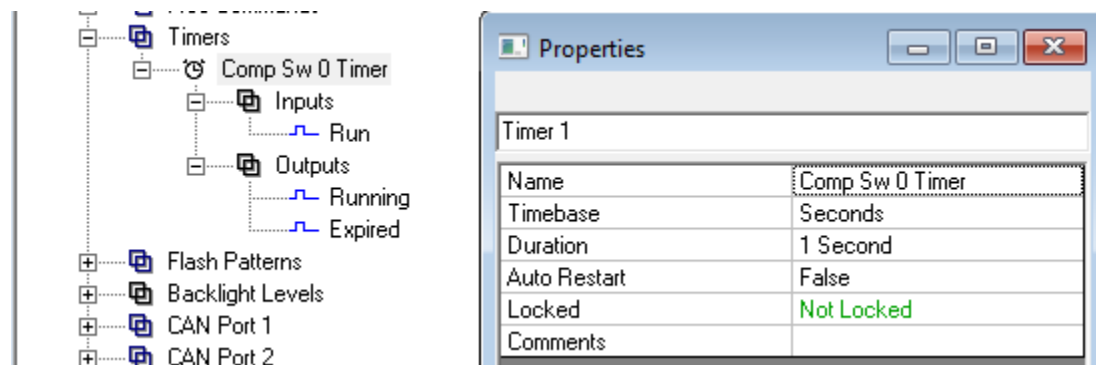
2. Click the clock icon to create a timer on the Hercules-HC node, and name it. (Example "Comp Sw 0 Timer")
3. Set the desired amount of time in the Timer Properties (Example 1 second)

4. Assign "Run" logic to the timer (example "Comp Sw 0")
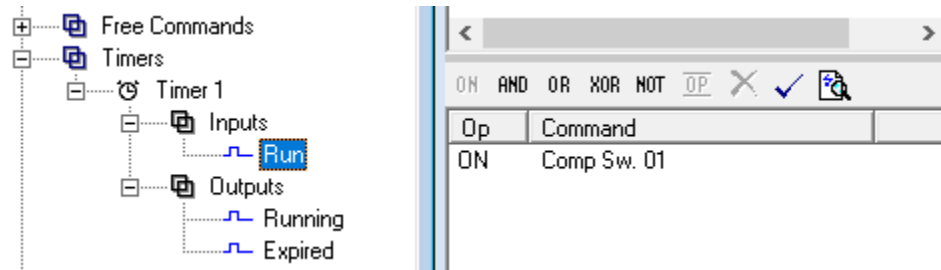
V-MUX Installation Practices (excerpt)

While there are very liberal physical layer rules associated with RS485 networks, it is recommended bus lengths be kept to a minimum. The V-MUX System uses a proprietary format of RS485 communications. Bus lengths in excess of 40 meters should be avoided if possible.

constructing a V-MUX network
--- Connections ---

Communications cable
- The only acceptable communications cable for a V-MUX network is Weldon twisted-pair #0L20-1600-xx
- Twisted pair wire should be one twist per at a minimum each inch of cable length

0L20-1600 twisted pair cable
- V-MUX comms A (white)
- V-MUX comms B (black)
- shield wire C (bare)

V-MUX network tap

pin 1 = comms A (white)
pin 2 = comms B (black)
pin 3 = OPTIONAL Ground
pin 4 = OPTIONAL Power

comms A (white) — A
comms B (black) — B
cable shield (bare wire) — C

cap color code
- Blue = net backbone
- Green, Orange = to node

to node

to node

to rest of network

IMPORTANT:
DO NOT terminate the V-MUX network with any resistors. **!**

cable segments

A
B
C

A
B
C

shield drain (1 per system)

jacketed into Tee for a good seal

the shield wire ground (the single drain)
- The shield wire 'C' shall be single-grounded at one end of the entire V-MUX network.
- DO NOT MULTIPLE GROUND THE SHIELD
- Use an isolated ground away from the V-MUX node grounds
- Where each segment of the V-MUX network cable joins other segments, the shield wires shall remain electrically common through each pin "C" at the Tee junctions.
- Cover all exposed shield wires to prevent accidental electrical shorts, which can damage the communications cable.
- At the Tees (pin C) splice appropriately gauged and jacketed wire to the end of each shield so as to seal into the Tee. Failure to properly seal Tee-connectors and other places the shield wire passes through may result in a loss of communications due to moisture infiltration across the A and B communications contacts.

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constructing a V-MUX network
--- Components ---

(1) V-MUX network tap

0K90-3111-00
connector kit

at each node
drop-off

0K90-2056-00
junction kit

RS-485 twisted pair

0L20-1600-xx
cable spool

!

IMPORTANT:
DO NOT terminate the
V-MUX network with
any resistors.

to rest of network

at each node
drop-off use
(1)
0K90-xxxx-00
node specific
connector kit

WELDON

the Node 1 position must be
occupied by an Input/Output
type of node
- 6060 Hercules HC
- 6000 Hercules
- 6010 Mini 4x12
- 6030 8x16

Nodes 2-32 may be occupied by any
type of node (ex: Vista display)

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