A66N2

Installation and Programming Manual

This Manual describes the A66N2 Communications Adapter for the Altivar® 66 Variable Frequency Drive, its uses and set up.

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Niobrara Research and Development Corporation
P. O. Box 3418 Joplin, MO 64803

Telephone: (800) 235-6723 or (417) 624-8918
Facsimile: (417) 624-8920
Internet: http://www.niobrara.com

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Contents

1
Introduction

The A66N2 communications adapter card connects an Altivar 66 variable frequency drive controller (see Figure 1 below) to an N2 multidrop network. It will allow the N2 bus master to adjust drive operational parameters; command, control, and monitor drive operation; and diagnose drive fault conditions.

The A66N2 is a Type 3 PCMCIA card with an attached 3 meter cable terminated with a 15-pin D-Sub connector. The A66N2 is designed to operate in the PCMCIA slot of an I/O extension module (VW3A66201T or VW3A66202T) or communication carrier module VW3A66205(not the drive's main PCMCIA slot), and requires drive firmware revision 3.2 or later.

NOTE: This manual is not intended to be used as a guide for drive operations. It is written to explain connection of the A66N2 to the N2 network, and to describe the mapping of the drive parameters into the N2 points list. For information on drive operation, refer to Instruction Bulletin VD0C06S304B (Altivar 66 User's Manual).

Figure 1: Altivar 66 variable frequency drive.

2
Installation

Refer to Section 1 of Instruction Bulletin VD0C06S308 for installation instructions for the A66N2 communication card in the Altivar 66 drive controller. Please note the following additions/modifications to the Square D installation instructions:

- For the A66N2 communications card to operate correctly, the drive into which it is installed must have revision 3.2 or later firmware. This may be viewed on the Drive Identification menu page, for example "ATV66U41N4, CT, **V3.2**"

- In the drive's communications setup (menu 11), set Protocol to Modbus+ and Address to the desired N2 LAN address. Set the Timeout to a value appropriate for the system's scan rate. When the drive is under Serial Link Control, this timeout value will determine how long the drive will run without receiving communications from the N2 bus master before shutting down. The Peer Cop and Global Data parameters are not used and should be set to NO and zero respectively (see Serial Link Control, below, for exceptions). When the card is recognized by the drive, the drive's Comm State menu (menu 12) will reflect the selected address and show a constantly changing token counter.

- The adapter supports the N2 serial protocol at 9600 bits per second, 8 data bits,1 start bit, 1 stop bit, and no parity. These settings cannot be changed in the field.

- NR&D recommends limiting network size to a maximum of 32 devices, including the network master device.

The A66N2 PCMCIA card has an attached cable which terminates in a 15-pin D-Subminiature male plug. LAN Connection to this plug is as shown in Figure 2 on page 8. Connection to this plug may be made using Phoenix Contact part number FLKM-D 15 SUB/B, or by building a cable to make the following connections:

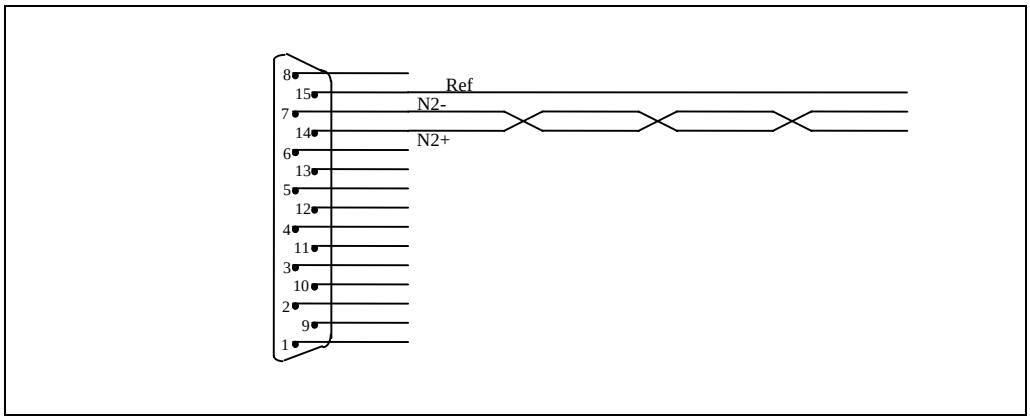

Figure 2: Connection of N2 LAN to A66N2 DB-15 connector.

Because the motor leads from a variable frequency drive transmit a lot of electrical noise, it is important to keep the network wiring as isolated as possible from the motor leads and any other high current wiring. If the VFD is mounted in a shielding enclosure, a minimum of network wiring should be inside the enclosure, with the remainder of the wiring done in a separately grounded enclosure.

Serial Link Control

The default configuration for the A66N2 communication card as described above will cause the drive to enter "SLC" or "Serial Link Control" when the PCMCIA card is initialized by the N2 host device. This means that the drive expects to get its operational parameters (run speed, direction, etc.) from the communications link.

In situations where it is not desirable to have the drive commanded over the serial network, the card can be configured to not automatically put the drive into SLC mode upon initialization. In order to disable the drive's automatically entering SLC mode on initialization, the configuration parameter "PEERCOP…" in the drive's Communications Setup menu (Menu 11) should be set to "YES". When this is done, the drive will prompt for further information: "Num. Registers" should always be set to 1 for use with this communications card. "Command Node" may be set to one of several values, to select different SLC startup behaviors and different scaling factors for points AI-1 and AO-1, other than the default scaling provided by the drive. SeeTable 1 below for configurations available via the "Command Node" parameter.

Frequency Scaling

In some situations, the default scaling for frequency (Reference Frequency = AO-1 and Output Frequency = AI-1) is unwieldy or even unusable. Different output scales may be accessed by setting the "PEERCOP…" parameter in the drive's Menu 11 to "YES" (as described above), and setting the "Num. Registers" field in the subsequent menu to 1. Then set the "Command Node" to one of the values described in Table 1 below to select a different scaling to be applied to the frequency parameters AO-1 and AI-1.

Table 1: Configurations available through "Command Node" parameter

COMMAND NODE	Scaling	Disable Comm Timeouts	SLC on Initialization
1	Altivar 66 Drive native scaling: Units = 0.0151 * Hz, thus: Set AO-1 to 662 for 10Hz output.	NO	NO
2	Frequency scaled to Hz: Units = Hz, thus: Set AO-1 to 10.0 for 10Hz output.	NO	NO
3	Frequency scaled to % of "High Speed" Units = 100 / "High Speed", thus: With "High Speed" set to 60.0 Hz, Set AO-1 to 16.7 for 10Hz output.	NO	NO
4…16	Reserved. Do not use these values for Command Node.		---
17	**Native** scaling (Same as Command Node = 1)	YES	NO
18	**Hz** scaling (Same as Command Node = 2)	YES	NO
19	**Percent** scaling(Same as Command Node = 3)	YES	NO
20…32	Reserved. Do not use these values for Command Node.		---
33	**Native** scaling (Same as Command Node = 1)	NO	YES
34	**Hz** scaling (Same as Command Node = 2)	NO	YES
35	**Percent** scaling(Same as Command Node = 3)	NO	YES
36…48	Reserved. Do not use these values for Command Node.		---
49	**Native** scaling (Same as Command Node = 1)	YES	YES
50	**Hz** scaling (Same as Command Node = 2)	YES	YES
51	**Percent** scaling(Same as Command Node = 3)	YES	YES
52…64	Reserved. Do not use these values for Command Node.		---

Fault Management

When the Altivar 66 drive is operating in Serial Link Control (SLC) mode, the timeout value set in Menu 11 controls how long the drive will continue to run after losing communications from the N2 master. When the timeout expires without receiving a message from the master, the drive will go into fault mode and stop the motor.

NOTE: In systems where loss of motor control is *not* a safety issue, the drive's Serial Timeout feature may be disabled on drive power-up by setting an appropriate value for "Command Node" as described in Table 1, above. If Comm Timeout is disabled, the drive will continue running at its last commanded speed after loss of communication.

In order to enable fault recovery over the N2 network, set *Auto-Restart* in Menu 7.4 (*Fault Management*) to YES. In the *Auto-Restart* submenu, set *Restarts* and *Delay time* as appropriate for the system. If *Auto-Restart* is set to NO, the fault must be recovered at the drive control panel. With *Auto-Restart* set to YES, the drive will exit fault mode, and resume normal operations after the drive is re-initialized via the N2 network, and after *Delay time* has expired.

3
Operation

The essential command and monitoring parameters of the Altivar 66 drive controller are mapped into Analog Inputs and Outputs, and into Binary Inputs and Outputs according to the N2 protocol. These parameters may be configured for high alarm, low alarms, high warning, low warning, and COS differential, and the inputs may be monitored for COSs, as provided by the N2 protocol. Note the following exceptions:

- The A66N2 does not support overriding analog inputs.
- The A66N2 does not support auto-restore on override release. When an overridden binary point is released, it reverts to the current value reported by the drive. When an overridden analog point is released, its value does not change.
- The A66N2 does not support JCI-use-only attributes and status flags of any point region.
- The A66N2 does not support the minimum on-time, minimum off-time, nor maximum cycles/hour attributes of any binary output points.

The A66N2 card has two LED indicators. The green indicator will flash as N2 communications packets are received. The red indicator will flash if a packet or command is in error or otherwise not recognized by the card. If the last message sent to the card has an error, the red light may stay on until a new, good, packet is received. Errors which will light the red LED include: CRC error, inter-character timeout error, attempt to read or write an unsupported or illegal point, an inappropriate command for the data type, an illegal N2 opcode, and the device has reset and is waiting for the “Identify Device Type” command.

All of the configuration and monitoring registers in the Altivar 66 which are not mapped into AI, AO, BI, or BO points are accessible as ADI points. Table 6, on page 14 shows the function assignment of each ADI point. Complete information on these points use may be obtained from Instruction Bulletin VD0C06S309 (Modbus+ PCMCIA manual) or Instruction Bulletin VW3A66301U (Uni-Telway, Modbus/JBUS Protocols PCMCIA Comm. Card Kit manual).

The following tables describe the point mapping of the A66N2 communication card:

Table 2: A66N2 Analog Input Point List

NPT[1]	NPA[2]	UNITS	POINT DESCRIPTION	RANGE / VALUE	NOTES
AI	1	0.0151 * Hz	Output Frequency	(-26478-26478) corresponding to (-400 to 400Hz)	Reflects actual drive output frequency Same as ADI point 42
AI	2	%	Terminal Strip Analog Input 1	(0-100)	Same as ADI point 45
AI	3	%	Terminal Strip Analog Input 2	(0-100)	Same as ADI point 64
AI	4	%	Terminal Strip Analog Input 3	(0-100)	Same as ADI point 65
AI	5	%	Terminal Strip Analog Input 4	(0-100)	Same as ADI point 66

1 *Network Point Type*
2 *Network Point Address*

Table 3: A66N2 Binary Input Point List

NPT[1]	NPA[2]	UNITS	POINT DESCRIPTION	RANGE / VALUE	NOTES
BI	1		Drive Faulted	0-Ok 1-Fault	Same as ADI point 50, bit 0
BI	2		Terminal Strip Logical Input 1	0-Off 1-On	Same as ADI point 44, bit 1
BI	3		Terminal Strip Logical Input 2	0-Off 1-On	Same as ADI point 44, bit 2
BI	4		Terminal Strip Logical Input 3	0-Off 1-On	Same as ADI point 44, bit 3
BI	5		Terminal Strip Logical Input 4	0-Off 1-On	Same as ADI point 44, bit 4
BI	6		Terminal Strip Logical Input 5	0-Off 1-On	Same as ADI point 44, bit 5
BI	7		Terminal Strip Logical Input 6	0-Off 1-On	Same as ADI point 44, bit 6
BI	8		Terminal Strip Logical Input 7	0-Off 1-On	Same as ADI point 44, bit 7
BI	9		Terminal Strip Logical Input 8	0-Off 1-On	Same as ADI point 44, bit 8
BI	10		Fault (FLT)	0-OK 1-Fault condition	Same as ADI point 41, bit 2
BI	11		Motor Running	0-Stopped 1-Running	Same as ADI point 41, bit 8
BI	12		Actual Rotation Direction	0-Forward 1-Reverse	Same as ADI point 41, bit 9

1 *Network Point Type*
2 *Network Point Address*

Table 4: A66N2 Analog Output Point List

NPT[1]	NPA[2]	UNITS	POINT DESCRIPTION	RANGE / VALUE	NOTES
AO	1	0.0151 * Hz	Reference Frequency	(-26478-26478) corresponding to (-400 to 400Hz)	A negative reference frequency will cause the motor to turn in the opposite direction from the Reverse Command point. Same as ADI point 22
AO	2	%	Terminal Strip Analog Output 1	(0-4095)	Same as ADI point 24
AO	3	%	Terminal Strip Analog Output 2	(0-4095)	Same as ADI point 30
AO	4	%	Terminal Strip Analog Output 3	(0-4095)	Same as ADI point 31

1 Network Point Type
2 Network Point Address

Table 5: A66N2 Binary Output Point List

NPT[1]	NPA[2]	UNITS	POINT DESCRIPTION	RANGE / VALUE	NOTES
BO	1		Run/Stop Command	0-Stop 1-Run	Same as ADI point 21, bit 5
BO	2		Reverse Command	0-Fwd 1-Reverse	Same as ADI point 32, bit 1
BO	3		Terminal Strip Logical Output 1	0-Off 1-On	Same as ADI point 23, bit 1
BO	4		Terminal Strip Logical Output 2	0-Off 1-On	Same as ADI point 23, bit 2
BO	5		Terminal Strip Relay Output 2	0-Off 1-On	Same as ADI point 23, bit 6
BO	6		Terminal Strip Relay Output 3	0-Off 1-On	Same as ADI point 23, bit 7
BO	7		Terminal Strip Relay Output 4	0-Off 1-On	Same as ADI point 23, bit 8
BO	8		DC Brake	0-Disabled 1-Enabled	Same as ADI point 21, bit 6
BO	9		No Orient Stop	0-Orient 1-No Orient	Same as ADI point 21, bit 7
BO	10		Freewheel Stop	0-Disabled 1-Enabled	Overrides Fast Stop Same as ADI point 21, bit 8
BO	11		Fast Stop	0-Disabled 1-Enabled	Same as ADI point 21, bit 9
BO	12		Voltage Reduce	0-Default 1-Reg 2029	Same as ADI point 21, bit 10
BO	13		Serial Link Control	0-Non-SLC 1-SLC	Same as ADI point 21, bits 1 and 2.

1 Network Point Type
2 Network Point Address

Table 6: A66N2 Internal Integer (ADI) Point List

ADI Address [1]	Bit	Description
1	---	High Speed
2	---	Low Speed
3	---	Accel 1
4	---	Decel 1
5	---	Accel 2
6	---	Decel 2
7	---	Slip Compensation
8	---	IR Compensation
9	---	Profile
10	---	Voltage Boost
11	---	Damping
12	---	Bandwidth
15	---	Motor Overload
21	0	Drive Reset
	1	Assignment of logic commands over link (DLI)
	2	Assignment of references over link (FLI)
	3	Alternate ramps (Ramp 2)
	4	Suppression of communication control (NTO)
	5	Run/Stop Command
	6	Braking by DC injection (DCB)
	7	Orient Stop
	8	Freewheel Stop
	9	Fast Stop
	10	Command of voltage reduction
	11	Multi-Motors
	12	Multi-Parameters
	14	External fault command (EFL)
	15	Peer Cop Adjustment storage
22	---	Reference Frequency
23	1-3, 6-8	Command of Lox / ROx state
24	---	Command of AO1 Level
25	---	Current Limit level
26	---	Motoring torque limit level
27	---	Regenerating torque limit level
29	---	Voltage reduction level
30	---	Command of AO2 level
31	---	Command of AO3 level

Table 6: A66N2 Internal Integer (ADI) Point List (cont'd)

ADI Address [1]	Bit	Description
32	0	Command of current limit
	1	Run direction
	3	Command of torque limit
	8	Elapsed timer reset
41	0	Mode in which all commands are assigned
	1	Drive controller ready (RDY or SLC)
	2	Fault (FLT)
	3	Reset authorized
	4	Brake engage relay state
	5	Forced local
	6	NTO
	7	Resettable fault
	8	Motor running
	9	Actual rotation direction
	10	DC injection braking
	11	Steady state
	12	Motor thermal overload alarm
	14	Current limit
	15	No line power (NLP)
42	---	Output frequency
43	---	Output current
44	1-8	Display of logic input activation (LI1 - LI8)
	9-10	Display of logic output activation (LO1 - LO2)
	11-14	Display of relay activation (R1 - R4)
45	---	Value of analog input (AI1)
46	---	Motor torque
47	---	Speed reference
48	0	Local command mode T/K
	1	Logic commands over link (DLI)
	2	Reference commands over link (FLI)
	3	Dynamic braking
	4	Fast stop
	5	Power loss, ramp stop
	6	Gating state
	7	Orient complete
	8	Deceleration (DEC)
	9	Acceleration (ACC)
	10	Multi-motor or
	11	Multi-parameter selected
	13	Drive controller thermal fault
	14	Torque limit
	15	Stopping by the keypad

Table 6: A66N2 Internal Integer (ADI) Point List (cont'd)

ADI Address [1]	Bit	Description
49	0	Jog
	1	Shutdown complete
	2	Cycle complete
	3	Alternate ramp
	4	Auto/Manual
	5	Frequency level 1 attained
	6	Frequency level 2 attained
	7	Current level 1 attained
	8	Current level 2 attained
	9	Thermal level 1 attained
	10	Thermal level 2 attained
	11	No ramp follow
	12	Run output command
	13	Rotation direction
50	0	Drive faulted, stopped
	4	State of adjustment semaphore
	5	State of command semaphore
51	---	Display of fault causing trip
52	---	Display of present faults
53	---	Output power
54	---	Output voltage
55	---	Line voltage
56	---	Bus voltage
57	---	Motor thermal state value
58	---	Drive controller thermal state value
59	---	Elapsed time (hours)
60	---	Elapsed time (minutes)
61	---	Output speed (rpm)
62	---	Machine frequency reference number (customer units)
63	---	Machine frequency (customer units)
64	---	Value of analog input AI2
65	---	Value of analog input AI3
66	---	Value of analog input AI4
67	---	Value of AO1
68	---	Value of AO2
69	---	Value of AO3
70	---	Speed ramp output
72	---	Nominal motor voltage range
75	---	Number of motor or parameter set selected
76	---	Cycles step number in progress
77	---	Preset speed number in progress

Table 6: A66N2 Internal Integer (ADI) Point List (cont'd)

ADI Address [1]	Bit	Description
101	---	Assignment of AI1
102	---	Assignment of AI2
103	---	Assignment of AI3
104	---	Assignment of AI4
105	---	Assignment of AO1
106	---	Assignment of AO2
107	---	Assignment of AO3
108	---	Assignment of LO1
109	---	Assignment of LO2
112	---	Assignment of R1
113	---	Assignment of R2
114	---	Assignment of R3
115	---	Assignment of R4
116	---	Assignment of LI1
117	---	Assignment of LI2
118	---	Assignment of LI3
119	---	Assignment of LI4
120	---	Assignment of LI5
121	---	Assignment of LI6
122	---	Assignment of LI7
123	---	Assignment of LI8
141	---	Indicates the position of marker on 1 of 8 past faults
142	---	Past fault 1: Drive controller state
143	---	Past fault 1: Name of fault
144	---	Past fault 2: Drive controller state
145	---	Past fault 2: Name of fault
146	---	Past fault 3: Drive controller state
147	---	Past fault 3: Name of fault
148	---	Past fault 4: Drive controller state
149	---	Past fault 4: Name of fault
150	---	Past fault 5: Drive controller state
151	---	Past fault 5: Name of fault
152	---	Past fault 6: Drive controller state
153	---	Past fault 6: Name of fault
154	---	Past fault 7: Drive controller state
155	---	Past fault 7: Name of fault
156	---	Past fault 8: Drive controller state
157	---	Past fault 8: Name of fault

Table 6: A66N2 Internal Integer (ADI) Point List (cont'd)

ADI Address [1]	Bit	Description
201	---	Drive controller horsepower (hardware rating)
202	---	Drive controller horsepower (configured rating)
203	---	Drive controller voltage range
204	---	Line frequency recognized
205	---	Drive controller maximum rated frequency
206	---	Drive controller nominal current
207	---	Drive controller maximum current
212	---	Memory card option
213	---	Communication carrier option
214	---	Presence of keypad
215	---	I/O Extension option card
217	---	PCMCIA communication card
222	---	State of command node
223	---	Token rotation time
224	---	Token count
225	---	Messages received
236	---	Command semaphore

1 N2 ADI addresses are offset from the Altivar 66 internal registers (as listed in the Modbus/JBUS communication card manual) by 2000.
Thus, ADI 1 is the same as the Altivar 66 register 2001, etc.

4
Troubleshooting

A66 card not responding

In most cases, this indicates faulty network wiring. With the drive powered and the A66 card connected to an active network, the LED indicators on the top of the card provide some information. If the GREEN LED flashes, it indicates that the card is seeing network traffic. If the RED LED flashes, it indicates the previously received message is in error. If the RED LED flashes on every message, it could mean the network wires could be switched (A for B, or + for -).

If the card is wired correctly but fails to communicate, double-check the Communication Setup in Menu 11. The A66P1 should have a unique network address. See the installation and configuration information on page 7.

Inconsistent communication

If communications can be established with the A66 card but the communication is inconsistent, network noise could be causing messages to be lost on the network. In this case, the RED LED on the top of the A66 card will be flashing occasionally indicating an incomplete message or one with a failed checksum.

The card does keep a running count of messages received with checksum errors. This statistic is reported on Menu 12 of the Altivar Drive, under “Token Good: X ms”. X will be an integer counter of the number of messages the card has received with checksum errors. This counter counts up to 65535 and stops. The counter may be reset by cycling power on the drive.

When checksum errors on the network are interfering with communications, the network wiring must be evaluated for noise immunity.

The network wiring should be as isolated as possible from the inherently noisy motor leads from the VFD. Where Faraday (grounded metal) shielding cannot be between the motor leads and the network wiring, keep the wires as physically separate as possible. In as short a run as possible, get the network wiring into its own grounded metal enclosure, or out of the metal

enclosure containing the motor leads. All network wiring should be run through shielded conduit to avoid electromagnetic interference.