TOYODENKI

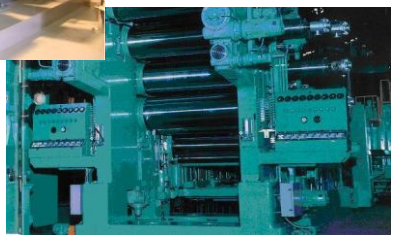
VF66

TOYO INTELLIGENT INVERTER

DNET66-Z

Communication Protocol

Manual



Foreword

Thank you for choosing Optional Circuit Board for Toyo inverter product.
This protocol instruction manual contains information regarding the DNET66-Z Optional Circuit Board for the VF66B Inverter. For correct use, please carefully read this instruction manual prior to using the DNET66-Z.

This instruction manual covers the functions, connection procedures for the DNET66-Z, as well as guidelines for setting up the VF66B inverter.(Regarding DeviceNET communication functions are refer to the Insutruction Manual of DNET66-Z commucatin protocol.)

In order to accommodate the many special functions to a wide variety of applications in addition to the basic inverter functions, please thoroughly read the VF66B inverter manual as well as any other applicable specialized instruction manuals.

DNET66-Z communication specification is based on AC Drive Profile. DeviceNet specification version applied in DNET66-Z is as follows
Volume1: rerease 3.3
Volume3: rerease 1.5

Please read before use

For safety

Before installing, operating, maintaining and inspecting DNET66-Z option, please read this manual and all other appendices thoroughly in order to get familiarize with the feature of this option, safely information and correct handling. For safe operation, be sure to also thoroughly read the VF66Inverter operating manual. In this instruction manual, the safety instructions are classified in to two levels: DANGER and CAUTION. These signs have important instructions. Please follow the instructions without fail.

DANGER

Indicates a hazardous situation which may result in death or serious injury if it is handled improperly.

CAUTION

. Indicates a hazardous situation which may result in moderate or minor injury or only in property damage if it is handled improperly. However, such a situation may lead to serious consequences depending on circumstances.

CAUTION [Installation]

- Do not use optional circuit board if you discover damage or deformation during unpacking.
  Doing so may cause optional circuit board failure or malfunction.
- Do not place any flammable materials near the optional circuit board.
  Doing so may cause a fire.
- Do not allow the optional circuit board to drop, fall over or sustain severe impacts.
  Doing so may cause optional circuit board failure or damage
- Do not install or operate the optional circuit board if it is damaged or has any of its parts missing.
  Doing so may lead to personal injury.

DANGER [Wiring]

- Before wiring, make sure the power is OFF.
  Failure to do so may cause an electric shock or fire
- Wait more than 10 minutes after turning the power OFF before opening the unit case lid.
  Failure to do so may cause an electric shock or fire.
- Make sure that the unit is correctly earthed.
  Failure to do so may cause an electric shock or fire.
- Wiring must be done by skilled technicians.
  Failure to do so may cause an electric shock or fire.
- Wire the unit after it is installed.
  Failure to do so may cause an electric shock or fire.

⚠ CAUTION [Wiring]

- Make sure that communication cables and connectors are properly installed and locked in place.
  Failure to do so may cause optional circuit board failure or malfunction.

⚠ DANGER [Operation]

- Turn the power ON after fitting the inverter front cover.
  Do not remove the cover while the power is ON.
  Doing so may cause an electric shock.
- Do not operate any switch with wet hands.
  Doing so may cause an electric shock.
- Do not touch the inverter terminals while the power is ON, even if the inverter is in the idle state.
  Doing so may cause an electric shock.
- If the alarm is reset while the operation signal kept input, the inverter will suddenly restart. Reset the alarm after making sure that the operation signal is OFF. Failure to do so may lead to personal injury.
- The inverter can be set to operate in a wide range of speed. Operate the inverter after sufficiently checking the allowable range of the motor and equipment.
  Failure to do so may cause personal injury, equipment failure or damage

⚠ CAUTION [Operation]

- The inverter radiating fin and the radiating resistance are hot. Do not touch them.
  Failure to follow this warning may cause burns.

⚠ DANGER **[Maintenance, inspection and parts replacement]**

- Always turn the power OFF before inspecting the inverter.
  Failure to do so may cause an electric shock, personal injury or fire.
- Unauthorized persons shall not perform maintenance, inspection or parts replacement.
  Use insulated tools for maintenance and inspection.
  Failure to do so may cause electric shock or personal injury.

⚠ DANGER [Other]

- Never modify the unit. Doing so may cause electric shock or personal injury.

⚠ CAUTION [General precautions]

Some illustrations given in this manual show the inverter from which the covers or safety shields have been removed to illustrate the details. Before operating the inverter, reinstall the covers and shields to their original positions and the inverter according to this manual.
These safety precautions and specifications stated in this manual are subject to change without notice.

Table of contents

Chapter 1 Functional outline

DNET66-Z is used equipping the connector of the PC board (VFC66-Z) in a VF66B inverter. The functions with which DNET66-Z is equipped are a DeviceNet Slave communication function, a multifunctional input/output function, an analog input/output function, and PG input/output function.

DeviceNet is an open network standard, the specification and protocol are opened by Open DeviceNet Vendor Association Inc.(ODVA), providing interchangeability of similar devices from multiple vendors.

The DeviceNet communication function of DNET66-Z make a possible to input command of operation, speed, toruque to VF66B inveter and possible to monitaling operation state,protection state,current ,voltage of inverter. And possible to reading set data, trace back data, monitor data & possible to changing set data. More over possible to use for input signal of billed PLC function (regarding billed PLC function please refer to VF66 PC TOOL instruction manual)

In order to reduce an environmental impact, DNET66-Z is designed so that the content of a lead, mercury, cadmium, hexavalent chrome, PBB, and PBDE may be based on the RoHS instructions which EU defined.

⚠CAUTION [Safety precautions]

Carefully read the instruction manual before use, and use the inverter correctly.

Our inverter and optional circuit board are not designed or manufactured for the purpose of use in life-support machines or systems.

If you intend to use the product stated in this document for special purposes, such as passenger cars, medical devices, aerospace devices, nuclear energy controls and submarine relaying machines or systems, consult our sales department.

This product is manufactured under strict quality control. However, if it is used in critical equipment in which inverter and optional circuit board failure may result in death or serious damage, provide safeguard to avoid serious accidents.

If you wish to use this inverter with loads other than three-phase AC traction, please contact us.

To use this product, electrical work is necessary. The electrical work must be done by qualified expert.

Chapter 2 DeviceNet Communication Protocol

2. 1 DeviceNet Concept

DeviceNet is described communication service, motion of deviceNet node and internal information of DeviceNet products, by abstractly Concept said 'object modelinng'.

DeviceNet node is modeled to assembling of object. The object is express to characteristic factors of product abstractly. Actual figer of abstractly ofject model is different from each DeviceNet product.

We show the term of object modeloing when we use to explain DeviceNet service & protocol as follows.

- **Object** : Expressing the factor elements of products abstractly.
- **Class** : Assembling of all objects to express a same kind of system factors.
- **Instance** : Definetely& actually exsisting of object,the words OBJECT,INSTANCE&OBJECT INSTANCE are means The INSTANCE.
- **Attribute** : Descrived in a characteristic functions of which object to confirm from outside. Attribute is submit to statas information & stipulate in motion of object.
- **Instance generation** : The case default value is not stipulated in define of object, all Attribute of instance set to '0' initialized, to generate object instance.
- **Behavier** : Stipulated in a motion of object. The motion will be born by various ivent which detecting by object. The ivent involve receiving service request, detecting internal fault & measuring time of timer.
- **Service** : The function supported by object & object class. The assembling of common service is defined in DeviceNet. Also possible to define service of objectclass & peculiar service of vender.
- **Communication Object** : Several Object class of which exchanging control message in working through DeviceNet.
- **Application object** : Several Object class that carring out characteristic function of products.

2. 2 Explicit Message

The Explicit Messaging conection make estabulish general & multi purpose communication rute between device and device. The conection is called conection 0f sending & receiving data simply, Explict messeage to be possible to patern net work communication for request /response.

The explicit message communicate a information, using data field of Control Area Network (after say CAN),defiend on DeviceNet.

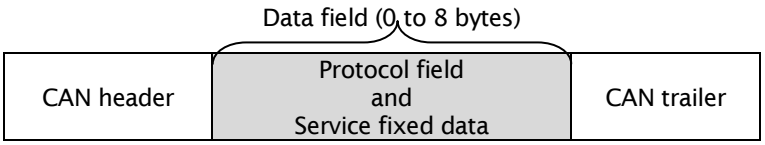


Figure 2.2-a

The formart of CAN data field used in Explict is showing as follows figure 2.2-b

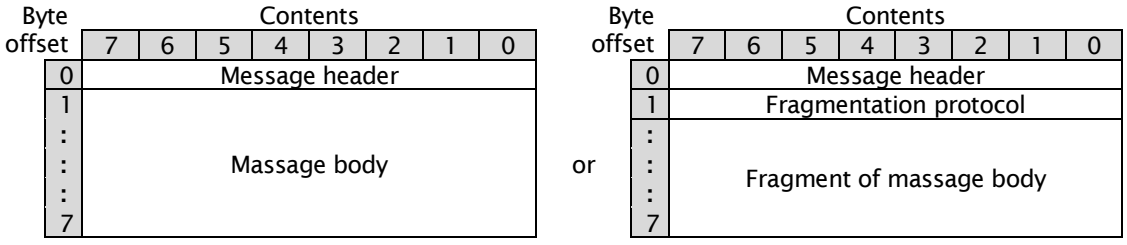


Figure 2.2-b

The Data field of explicit message is including of message header & message body. On the other hand explicit message longer than 8 bytes is sending on DeviceNet by Divise transmitted methed.

Message header

The message header is set **Byte off set 0** in CAN data field of Explict message.

Byte offset	Contents							
	7	6	5	4	3	2	1	0
0	Frag	XID	MAC ID					

Figure 2.2.1

Message body

The message body is including of Service field & Service fixed factors.
The Service field of message body is set Byte off set1 in CAN data field of Explict message.
The service field is set specific request & response to be transmission.

Byte offset	Contents								
	7	6	5	4	3	2	1	0	
1	R/R	Service code							Service field
2 : :	Service fixd factors								

Figure 2.2.2

2. 3 I/O message

I/O connection is estabulished communication route with exclusive & specific purpose between transmitted Application & more over 1 receiving application. The specific application I/O data is transmitted in direction of these ports.

The data field of I/O message on DeviceNet is not defined regarding of protocol information except divise transmitted protocol to transmit I/O message More over 8 byte.

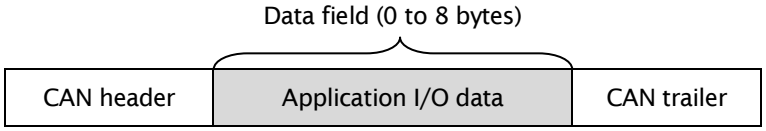


Figure 2.3

２．４ Device profile

About a device profile

In order to realize offer of the compatibility between the same kind of devices, and improvement in mutual compatibility, unity is required of the same kind of devices. That is, basic "standard" is needed for the type of each device. Usually, the device same type must satisfy the following conditions.

・Behavier
・Transmission/reception of the basic set of I/O data
・The basic set of the attribute which can be set up is built in.

The formal definition of these information is called a "device profile."

Some objects are contained in all the DeviceNet products, and fundamental behavior of a product is performed by coordinating these and operating them. Since the behavior of each object is specified, the group of the same object arranged in specific order operates so that it may coordinate and the same behavior may be shown in every device.

What made the group the object used by a device is called the "object model" of a device. These devices must be equipped with the same object model in order that the device of the same kind may show the same behavior. Therefore, the object model is contained in all the device profiles, and secures the compatibility between the devices of the same kind on DeviceNet.

Below, an object model is explained.

① Identity object

Generally, DeviceNet products have one instance (instance #1) of Identity object. This instance has an attribute of vendor ID, a device type, a product code, revision, status, a serial number, a product name, and a state. The services needed are Get_Attribute_Single and Reset.

② Message Router Object

Generally DeviceNet products have one instance (instance #1) of Message Router object. Message Router object is a constituent factor of a product which tells an Explicit message to other objects. Usually, a DeviceNet network cannot be seen from outside.

③ DeviceNet object

Generally, DeviceNet products have one instance (instance #1) of DeviceNet object. There are the following attributes in this instance. : They are a node address or MAC ID, a baud rate, Bus-off action, a Bus-off counter, Allocation Choice, and MAC ID of a master. The services needed are Get_Attribute_Single.

④ Assembly object

Generally, DeviceNet products have one or more Assembly object as the option. The main purposes of this object are to combine a different attribute (data) in different application with one attribute, and to make it transmit as one message.

⑤ Connection object

Generally, DeviceNet products have at least two Connection objects. Each Connection object expresses the end point of the actual connection between two nodes on a DeviceNet network. Two kinds of this connection is called Explicit Messaging and I/O Messaging. Attribute addressing, an attribute value, and the service code that describes specified action are contained in an Explicit message. Only data is contained in an I/O message. In the case of an I/O message, all the information about the treatment of data is included in the Connection object relevant to the I/O message.

⑥ Parameter object

The Parameter object of an option is used by a device with a composition parameter. One instance expresses each composition parameter. A Parameter object offers the standard method of the configuration tool for accessing all the parameters. A value, the range, a character string, and full limits are contained in the composition option which is an attribute of a Parameter object.

⑦ Application object

Ordinary, there is one application object in device except assembly or parameter class at least.

⑧ I/O deta format

The case a several deta (Attribute) is comminucated through single I/O connection, these attribute to be necessary making a group or a lupping to single block.

The instance of assembly obuject class is perform as above mentions.

I/O deta format of devise of devise profile is based on the following guide line.

- I/O Assembly is input type or output type
- one devise is possible to including several I/O Assembly.

Chapter 3 AC Device Drive Profile

This chapter explains function on DeviceNet network of DNET66-Z. Device type of DNET66-Z is AC Drive {02 (Hex)}.

3．1 Object Model

Figure 3.1 shows object model of DNET66-Z (AC Drive).

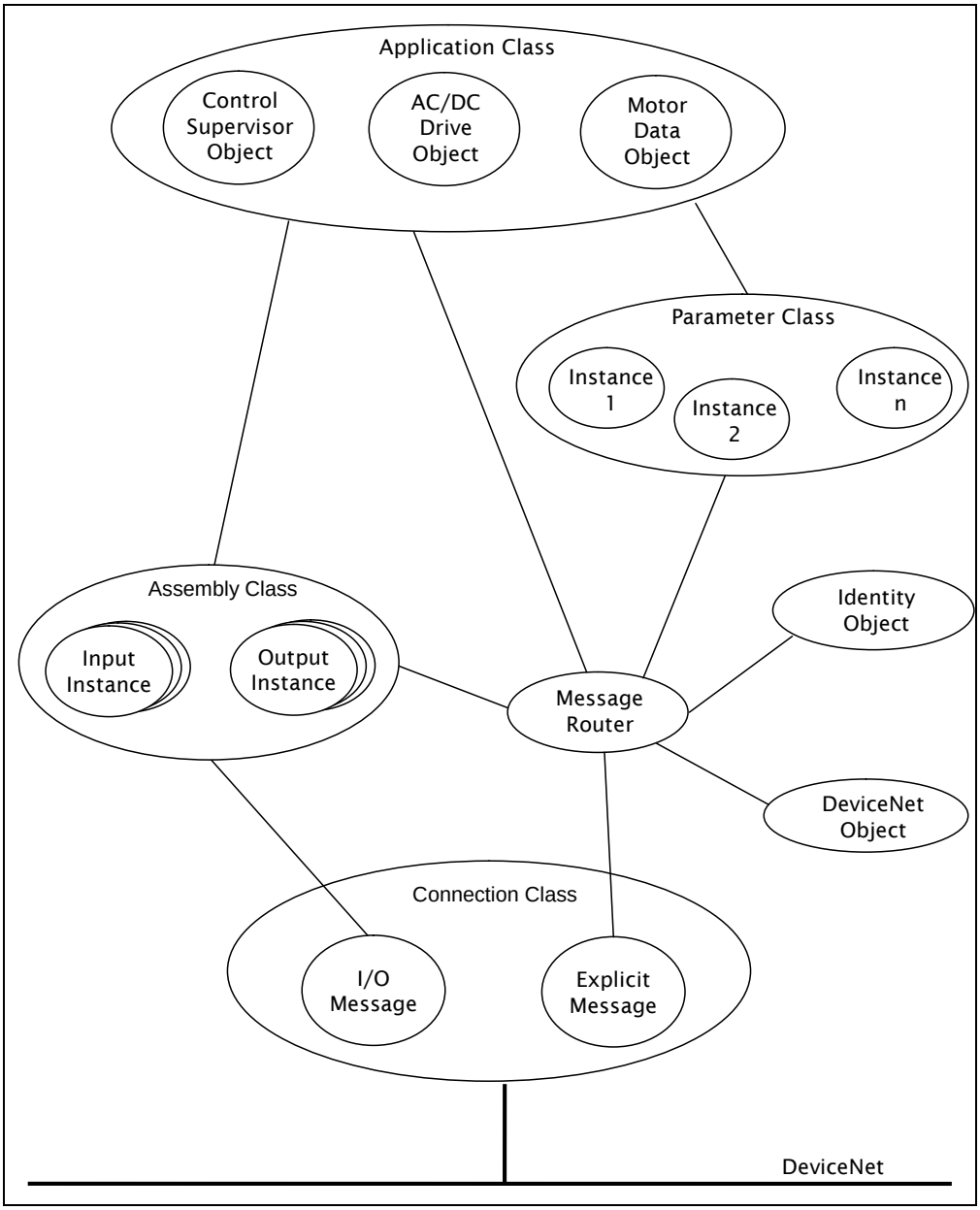


Figure 3.1 DNET66-Z(AC Drive) Object Model

Attention : When you use AC Drive Device Profile, Sequence (PLC) function setting (i-00,i-01) of inverter equipment is usually OFF. When you use Sequence function(i-00,i-01), it is necessary to program in AC Drive Device Profile.

3. 2 Parameter Object

DNET66-Z supports Parameter Object Instance shown in a list of the following as a public release access function for Control Supervisor Object, Motor Data Object and AC/DC Drive Object.

Table 3.2

Instance Number	Configuration Parameter Name	DeviceNet Data Type	Setting Range
1	Motor Type	USINT	0～255
2	Rated Current	UINT	0～65535
3	Rated Voltage	UINT	0～65535
4	Network Control	BOOL	0 or 1
5	Drive State	USINT	0～255
6	Running Fwd	BOOL	0 or 1
7	Running Rev	BOOL	0 or 1
8	Ready	BOOL	0 or 1
9	Faulted	BOOL	0 or 1
10	Warning	BOOL	0 or 1
11	Fault Reset	BOOL	0 or 1
12	Control From Net	BOOL	0 or 1
13	At Reference	BOOL	0 or 1
14	Network Ref	BOOL	0 or 1
15	Drive Mode	USINT	0～255
16	Speed Actual	INT	-32768～32767
17	Speed Reference	INT	-32768～32767
18	Speed Scale	SINT	-128～127
19	Ref From Net	BOOL	0 or 1

3. 3 Motor Data Object

Class Code : 28 (Hex)
Class Atribute, Instance Attribute, Service of Motor Data Object of DNET66-Z are shown in the following.

***Motor Data Object Class Attribute**

Table 3.3.1

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Remarks
1	Get	Revision	USINT	Revision of this object	Not Support
2	Get	Max Instance	USINT	Maximum nstance number of an object currently created in this class level of the device.	Not Support
6	Get	Max ID Number of Class Attributes	UINT	The attribute ID of the last class attribute of the class definition implemented in the device.	Not Support
7	Get	Max ID Number of Instance Attributes	UINT	The attribute ID of the last instance attribute of the class definition implemented in the device.	Not Support

***Motor Data Object Instance Attribute**

Instance number of Motor Data Object is #1.

Table 3.3.2

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Remarks
1	Get	NumAtttr	USINT	Number of Attributes supported	Not Support
2	Get	Attributes	Array of USINT	List of attributes supported	Not Support
3	Set/Get	Motor Type	USINT	0 = Non-standard motor 1 = PM DC Motor 2 = FC DC Motor 3 = PM Synchronous Motor 4 = FC Synchronous Motor 5 = Switched Reluctance Motor 6 = Wound Rotor Induction 7 = Squirrel Cage Induction Motor 8 = Stepper Motor 9 = Sinusoidal PM BL Motor 10 = Trapezoidal PM BL Motor	Support
4	Set/Get	CatNumber	SHORT_ STRING	Manufacturer's Motor Catalog Number (Name plate number) 32 chars max	Not Support
5	Set/Get	Manufacturer	SHORT_ STRING	Manufacturer's Name 32 chars max	Not Support
6	Set/Get	Rated Current	UINT	Rated Stator Current Units: [100mA]	Support
7	Set/Get	Rated Voltage	UINT	Rated Base Voltage Units: [V]	Support
8	Set/Get	Rated Power	UDINT	Rated Power at Rated Freq Units: [W]	Not Support
9	Set/Get	Rated Frequency	UINT	Rated Electrical Frequency Units: [Hz]	Not Support
10	Set/Get	Rated Temp	UINT	Rated Winding Temperature Units: [℃]	Not Support
11	Set/Get	Max. Speed	UINT	Maximum allowed motor speed Units: [r/min]	Not Support
12	Set/Get	Pole Count	UINT	Number of poles in the motor.	Not Support
13	Set/Get	Torq Constant	UDINT	Motor torque constant Units: [0.001 x Nm/A]	Not Support
14	Set/Get	Inertia	UDINT	Rotor Inertia Units: [10^{-6} x kg.m2]	Not Support
15	Set/Get	Base Speed	UINT	Base Speed on rated Fruquency display in name plate Units[r /min]	Not Support
19	Set/Get	Service Factor	USINT	Units: [%] Range: 0 to 255	Not Support

3．4 Control Supervisor Object

Class Code : 29 (Hex)

Class Atribute, Instance Attribute, Service of Control Supervisor Object of DNET66-Z are shown in the following.

***Control Supervisor Object Class Attribute**

Table 3.4.1

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Remarks
1	Get	Revision	USINT	Revision of this object	Not Support
2	Get	Max Instance	USINT	Maximum nstance number of an object currently created in this class level of the device.	Not Support
6	Get	Max ID Number of Class Attributes	UINT	The attribute ID of the last class attribute of the class definition implemented in the device.	Not Support
7	Get	Max ID Number of Instance Attributes	UINT	The attribute ID of the last instance attribute of the class definition implemented in the device.	Not Support

***Control Supervisor Object Instance Attribute**

Instance number of Control Supervisor Object is #1.

Table 3.4.2

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Remarks
1	Get	NumAtttr	USINT	Number of Attributes supported	Not Support
2	Get	Attributes	Array of USINT	List of attributes supported	Not Support
3	Set/Get	Run1	BOOL	Refer to Chapter 4.8.7	Support
4	Set/Get	Run2	BOOL	Refer to Chapter 4.8.7	Support
5	Set/Get	NetCtrl	BOOL	Requests Run/Stop control to be local or from network. 0 = Local Control 1 = Network Control Note that the actual status of Run/Stop control is reflected in attribute 15, CtrlFromNet.	Support
6	Get	State	USINT	0 = Vendor Specific 1 = Startup 2 = Not_Ready 3 = Ready 4 = Enabled 5 = Stopping 6 = Fault_Stop 7 = Faulted	Support
7	Get	Running1	BOOL	1 = (Enabled and Run1) or (Stopping and Running1) or (Fault_Stop and Running1) 0 = Other state	Support
8	Get	Running2	BOOL	1 = (Enabled and Run2) or (Stopping and Running2) or (Fault_Stop and Running2) 0 = Other state	Support
9	Get	Ready	BOOL	1 = Ready or Enabled or Stopping 0 = Other state	Support
10	Get	Faulted	BOOL	1 = Fault Occurred (latched) 0 = No Faults present	Support
11	Get	Warning	BOOL	1 = Warning (not latched) 0 = No Warnings present If warnings are not supported, this attribute should always be 0	Support
12	Set/Get	FaultRst	BOOL	0→1 = Fault Reset 0 = No action	Support
13	Get	FaultCode	UINT	If in Faulted state, FaultCode indicates the fault that caused the transition to Faulted state.	Not Support
14	Get	WarnCode	UINT	Code word indicating warning present.	Not Support
15	Get	CtrlFromNet	BOOL	Status of Run/Stop control source. 0 = Control is local 1 = Control is from network	Support
16	Set/Get	DNFaultMode	USINT	Action on loss of DeviceNet 0 = Fault + Stop 1 = Ignore (Warning Optional) 2 = Vendor specific	Not Support
17	Set/Get	ForceFault/Trip	BOOL	0→1 = Force	Not Support
18	Get	ForceState	BOOL	0 = Not Forced Nonzero = Forced	Not Support

***Control Supervisor Behavior**

The State Transition Diagram provides a graphical description of the states and corresponding state transitions.

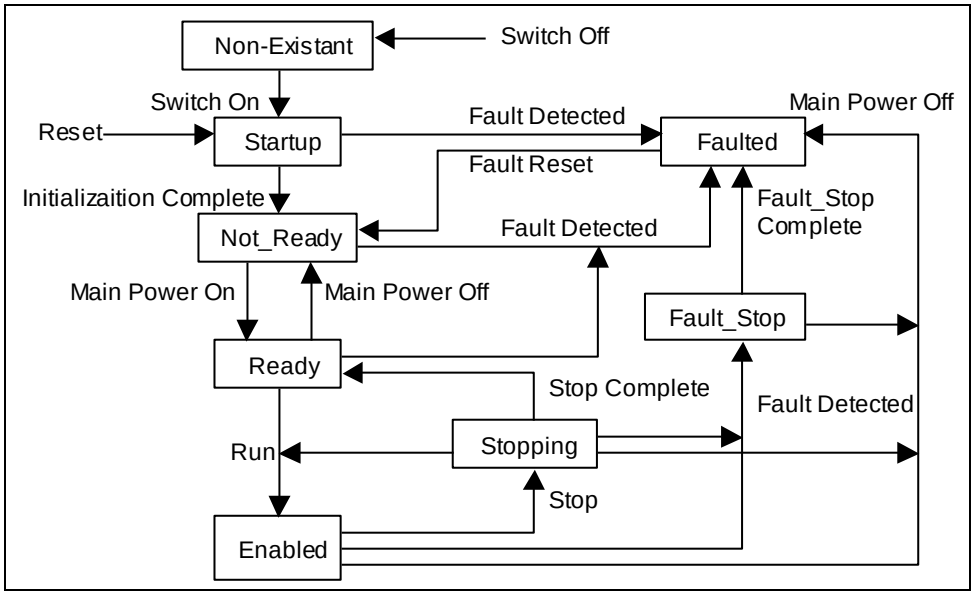


Figure 3.4.1 Control Supervisor State Transition Diagram

***Run/Stop Event Matrix**

Attribute 5, NetCtrl is used to request that Run/Stop events be controlled from the network. The device however, has the option of inhibiting Run/Stop events from the network, as the user/application may not allow Run/Stop control from the network under certain circumstances. Only when attribute 15, CtrlFromNet is set to 1 by the device in response to a NetCtrl request, is Run/Stop control actually accomplished from the network.

If attribute 15, CtrlFromNet is 1, the events Run and Stop are triggered by a combination of the Run1 and Run2 attributes as shown in the following table.

If CtrlFromNet is 0, Run and Stop events must be controlled using local input(s) provided by the vendor.

Table 3.4.3

Run1	Run2	Trigger Event	Run Type
0	0	Stop	NA
0→1	0	Run	Run1
0	0→1	Run	Run2
0→1	0→1	No Action	NA
1	1	No Action	NA
1→0	1	Run	Run2
1	1→0	Run	Run1

Important note: Local stop and run signals could override or be interlocked with the run/stop control through DeviceNet. These are vendor specific features.

3. 5 AC/DC Drive Object

Class Code : 2A (Hex)

Class Atribute, Instance Attribute, Service of AC/DC Drive Object of DNET66-Z are shown in the following.

***AC/DC Drive Object Class Attribute**

Table 3.5.1

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Remarks
1	Get	Revision	USINT	Revision of this object	Not Support
2	Get	Max Instance	USINT	Maximum nstance number of an object currently created in this class level of the device.	Not Support
6	Get	Max ID Number of Class Attributes	UINT	The attribute ID of the last class attribute of the class definition implemented in the device.	Not Support
7	Get	Max ID Number of Instance Attributes	UINT	The attribute ID of the last instance attribute of the class definition implemented in the device.	Not Support

***AC/DC Drive Object Instance Attribute**

Instance number of AC/DC Drive Object is #1.

Table 3.5.2

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Remarks
1	Get	NumAtttr	USINT	Number of Attributes supported	Not Support
2	Get	Attributes	Array of USINT	List of Attributes supported	Not Support
3	Get	AtReference	BOOL	1 = Drive actual at reference (speed or torque reference) based on mode	Support
4	Get/Set	NetRef	BOOL	Requests torque or speed reference to be local or from the network. 0 = Set Reference not DN Control 1 = Set Reference at DN Control Note that the actual status of torque or speed reference is reflected in attribute 29, RefFromNet.	Support
5	Get/Set	NetProc	BOOL	Requests process control reference to be local or from the network. 0 = Set Process not DN Control 1 = Set Process at DN Control Note that the actual status of the process control reference is reflected in attribute 30, ProcFromNet.	Not Support
6	Get/Set	Devicemode	USINT	0 = Vendor specific mode 1 = Open loop speed (Frequency) 2 = Closed loop speed control 3 = Torque control 4 = Process control (e.g. PI) 5 = Position control	Support
7	Get	SpeedActual	INT	Actual drive speed (best approximation) Units: [r/min] / $2^{SpeedScale}$ where SpeedScale is attribute 22	Support
8	Get/Set	SpeedRef	INT	Speed reference Units: [r/min] / $2^{SpeedScale}$ where SpeedScale is attribute 22	Support
9	Get	CurrentActual	INT	Actual motor phase current Units: 100mA / $2^{CurrentScale}$ where CurrentScale is attribute 23	Not Support
10	Get/Set	CurrentLimit	INT	Motor phase current limit Units: 100mA/ $2^{CurrentScale}$ where CurrentScale is attribute 23	Not Support
11	Get	TorqueActual	INT	Actual torque Units: Nm / $2^{TorqueScale}$ where TorqueScale is attribute 24	Not Support

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Remarks
12	Get/Set	TorqueRef	INT	Torque reference Units: Nm / $2^{TorqueScale}$ where TorqueScale is attribute 24	Not Support
13	Get	ProcessActual	INT	Actual process control value Units: % / $2^{ProcessScale}$ where ProcessScale is attribute 25	Not Support
14	Get/Set	ProcessRef	INT	Process control reference set point Units: % / $2^{ProcessScale}$ where ProcessScale is attribute 25	Not Support
15	Get	PowerActual	INT	Actual output power Units: W / $2^{PowerScale}$ where PowerScale is attribute 26	Not Support
16	Get	InputVoltage	INT	Input Voltage Units: V / $2^{VoltageScale}$ where VoltageScale is attribute 27	Not Support
17	Get	OutputVoltage	INT	Output Voltage Units: V / $2^{VoltageScale}$ where VoltageScale is attribute 27	Not Support
18	Get/Set	AccelTime	UINT	Acceleration time Time from 0 to HighSpdLimit Units: ms / $2^{TimeScale}$ where TimeScale is attribute 28 Acceleration time selection for negative direction is vendor specific.	Not Support
19	Get/Set	DecelTime	UINT	Deceleration time Time from 0 to HighSpdLimit Units: ms / $2^{TimeScale}$ where TimeScale is attribute 28 Deceleration time selection for negative direction is vendor specific.	Not Support
20	Get/Set	LowSpdLimit	UINT	Minimum speed limit Units: [r/min] / $2^{SpeedScale}$ where SpeedScale is attribute 22	Not Support
21	Get/Set	HighSpdLimit	UINT	Maximum speed limit Units: [r/min] / $2^{SpeedScale}$ where SpeedScale is attribute 22	Not Support
22	Get/Set	SpeedScale	SINT	Speed scaling factor. Scaling is accomplished as follows: ScaledSpeed = [r/min] / $2^{SpeedScale}$ Range: -128 to 127	Support
23	Get/Set	CurrentScale	SINT	Current scaling factor. Scaling is accomplished as follows: ScaledCurrent = A / $2^{CurrentScale}$ Range: -128 to 127	Not Support
24	Get/Set	TorqueScale	SINT	Torque scaling factor. Scaling is accomplished as follows: ScaledTorque = Nm / $2^{TorqueScale}$ Range: -128 to 127	Not Support
25	Get/Set	ProcessScale	SINT	Power scaling factor. Scaling is accomplished as follows: ScaledProcess = % / $2^{ProcessScale}$ Range: -128 to 127	Not Support
26	Get/Set	PowerScale	SINT	Power scaling factor. Scaling is accomplished as follows: ScaledPower = W / $2^{PowerScale}$ Range: -128 to 127	Not Support
27	Get/Set	VoltageScale	SINT	Voltage scaling factor. Scaling is accomplished as follows: ScaledVoltage = V / $2^{VoltageScale}$ Range: -128 to 127	Not Support
28	Get/Set	TimeScale	SINT	Time scaling factor. Scaling is accomplished as follows: ScaledTime = ms / $2^{TimeScale}$ Range: -128 to 127	Not Support

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Remarks
29	Get	RefFromNet	BOOL	Status of torque/speed reference 0 = Local torque/speed reference 1 = Devicenet torque/speed reference	Support
30	Get	ProcFromNet	BOOL	Status of process control reference 0 = Local process reference 1 = DeviceNet process reference	Not Support
31	Get/Set	FieldIorV	BOOL	Selects Field Voltage or Field Current control for a DC Drive. 0 = Voltage Control (Open Loop) 1 = Current Control (Magnetizing field for DC drive)	Not Support
32	Get/Set	FieldVoltRatio	UINT	For voltage control of a DC Drive	Not Support
33	Get/Set	FieldCurSetPt	UINT	DC Drive Field Current set point. Units: A / $2^{CurrentScale}$ where CurrentScale is attribute 23	Not Support
34	Get/Set	FieldWkEnable	BOOL	Enables/Disables field weakening for a DC Drive 0 = Disabled (DC Drive in current control) 1 = Enabled	Not Support
35	Get	FieldCurActual	INT	Actual Field Current for a DC Drive. Units: A / $2^{CurrentScale}$ where CurrentScale is attribute 23	Not Support
36	Get/Set	FieldMinCur	INT	Minimum Field Current for a DC Drive. Units: A / $2^{CurrentScale}$ where CurrentScale is attribute 23	Not Support

***Scaling of Atrribute Values**

As part of the AC/DC Drive Object definition, engineeringunits are defined for each physical quantity, e.g. r/min for Velocity, Nm for Torque etc. To maximize the resolution capable or necessary on some devices or applications, these values can be normalized using a binary scale factor before transmission on the bus. A separate scaling factor is specified for each physical quantity. Normally, scaling factors will be set up once during initialization according to the range of values to be used in the application.

Scaling Factors allow the representation of physical units on the bus to obtain an acceptable resolution and dynamic range for all applications.

Example: Configuration of a DC Drive to operate with r/min resolution of 0.125 r/min input from bus to Drive:

SpeedRef (AC/DC Drive Object, Attribute ID 8) = 4567
SpeedScale (AC/DC Drive Object, Attribute ID 22) = 3
→ Actual Commanded Speed
= SpeedRef / $2^{SpeedScale}$
= 4567 / 2^3
= 570.875r/min

Input from Drive to bus:
Actual Drive Operating Speed
SpeedScale (AC/DC Drive Object, Attribute ID 22) = 3
→ SpeedActual (AC/DC Drive Object, Attribute ID 7)
= Actual Operating Speed x $2^{SpeedScale}$
= 789.5 x 2^3
= 6316
In cases where the applicable scaling factor attribute is non-zero, the units are:
Engineering unit / $2^{Scale\ Factor\ Attribute}$

In the above example, therefore, the units are 0.125r/min.

3. 6 I/O Assembly Instance

Through the use of predefined instance definintions, I/O Assemblies support a hierarchy of motor control devices. Following Table 3.6-a shows an allotment of an Assembly Instance number with a motor control device hierarchist.

DNET66-Z uses Instance number of AC/DC Drive Profile with following Table 3.6-a.

Table 3.6-a

Profile	I/O Type	Instance Range	Instances within hierarchy that may be implemented or this paoduct type.
AC Motor Starter Soft Start Starter	Output	1～19	1～19
	Input	50～69	50～69
AC or DC Drive	Output	20～29	1～29
	Input	70～79	50～79
Servo Drive	Output	30～49	1～49
	Input	80～99	50～99

The following I/O Assembly Instances are defined for AC and DC Drives.

With following Table 3.6-b, DNET66-Z supports 20, 21 of Output Assembly Instance number and supports 70, 71 of an Input Assembly Instance number.

Table 3.6-b

Number		Required/Optional	Type	Name
Decimal	Hex			
20	14	Required	Output	Basic Speed Control Output
21	15	Optional	Output	Extended Speed Control Output
70	46	Required	Input	Basic Speed Control Input
71	47	Optional	Input	Extended Speed Control Input

3．7 I/O Assembly Data Attribute Format

If a bit is not used in an I/O Assembly, it is reserved for use in other Assemblies. The consuming device ignores reserved bits in Output Assemblies. Reserved bits in Input Assemblies are set to 0 by the producing device.

Reserved bits in the I/O Assembly Data Attribute Format Tables are shaded.

The following lists show I/O Assembly Data Attribute Format of DNET66-Z.

***Output Assembly Instance**

Data Attribute of Output Assemby Instance is data from master station to DNET66-Z.

Table 3.7.1

Instance	Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
20	0						Fault Reset		Run Fwd
	1								
	2	Speed Reference (Low Byte)							
	3	Speed Reference (High Byte)							
21	0		NetRef	NetCtrl			Fault Reset	Run Rev	Run Fwd
	1								
	2	Speed Reference (Low Byte)							
	3	Speed Reference (High Byte)							

***Input Assembly Instance**

Data Attribute of Input Assemby Instance is data from DNET66-Z to master station.

Table 3.7.2

Instance	Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
70	0						Running1		Faulted
	1								
	2	Speed Actual (Low Byte)							
	3	Speed Actual (High Byte)							
71	0	At Reference	Ref From Net	Ctrl form Net	Ready	Running2 (Rev)	Running1 (Fwd)	Warning	Faulted
	1	Drive State							
	2	Speed Actual (Low Byte)							
	3	Speed Actual (High Byte)							

Chapter 4 Setup Inverter

The DeviceNet communication function of DNET66-Z make a possible to input command of operation, speed, toruque to VF66B inveter and possible to monitaling operation state,protection state,current ,voltage of inverter. And possible to reading set data,trace back data, monita data & possible to changing set data. More over possible to use for input signal of billed PLC function (regarding billed PLC function please refer to VF66 PC TOOL instruction manual)

To communicate to DeviceNet Master station ,set parameter set of VF66B inveter showing following table is neccecarries. More over please refer to DNET66-Z Instruction manual, VF66B inverter Instruction Manual & The master station instruction manual.

The expression forword of DeviceNet communication in this chapter 'INPUT' shows forword from DNET66-Z to master station Input, OUTPUT' shows forword from master station to DNET66-Z output. The explain of Billed PLC function & Multi input function are excluded.

Table 4.1 Concerning of DeviceNet Communication set

Console Display	Items	Set-up Range (Item Selection)	Default Data	Rewriting During Operation
J-00	Degital communication option selection	0 : Not use communication option 3 : Use DNET66-Z 1,2,4 to 7 : Set when using other option	0	×
J-09	DNET66-Z Output instance No setting	0 : Instance No.20 1 : Instance No.21 2 to10 :(Factory original communication mode)	0	×
J-10	DNET66-Z Input instance No setting	0 : InstanceNo.70 1 : InstanceNo.71 2 to 10:(Factory original communication mode)	0	×
J-11	DNET66-Z SpeedScale setting	-126 to 127	3	×
J-12	DNET66-Z Monitor Data No. setting	0 to 119	3	×

※The Case changing set of above, Please power OFF Inverter at first & Power oFF Inverter

When using billed in PLC function, output data is possible to use for input of billed PLC function. To set Use/notuse of billed PLC function is possible to the followins of parameter set(I area) of VF66B inverter.

Details please refer to the instruction manual of VF66B inveter. Regarding of Billed PLC function please refer to VF66 PC Tool instruction manual.

Table 4.2 Billed PLC function using selection

Console Display	Items	Set-up Range (Item Selection)	Default Data	Rewriting During Operation
i-00	PLCL function usage selection	off : Not use on : Use	off	×
i-01	PLCH function usage selection	0 : Not use 1 : PLCH ON 2 : PLCH ON (Speed command input is PLCH output)	0	×

- The billed PLC function is possible to use when setting more than 2 value of J-09, J-10 to expansion profile.
- Regarding of the length of output data, from first word to second word are fixed, from 3rd word to 12th word are possible to change. The total word make coincide with setting of parameter set J-09 of VF66B inverter. The case not using of billed PLC function after 7th word are ignored.
- Regarding of the length of input data, from first word to 4th word are fixed,from 5rd word to 18th word are possible to change. The total word make coincide with setting of parameter set J-10 of VF66B inverter. The case not using of billed PLC function after 15th word are ignored.

  The case using billed PLC function of VF66B inverter, each bit of 1st word & 2nd word, possible to use for

input relay to billed PLC function. And 3rd word to 12th word possible to became input registor of billed PLC function.

- Regarding billed PLC function refer to VF66 PC TOOL instruction manual.
-

※The case using PLC-L function, each bit of 1st word & 2nd word is not using for operation control signal & multifunction .

In these case please make a sequence of operation control signal using with billed PLC function.

4. 1 Setting of Speed Command setting position

To enable various commands communicated to the VF66B inverter, the inverter configuration parameters shown in the following table must be correctly set. To enable the operation control signal, forward operation terminal "ST-F" on the VFC66-Z terminal block TB1 of the VF66B inverter control circuit board must be turned ON. For more information, please refer to the VF66B inverter manual.

Table 4.3 Input Position Selection Settings for Various Commands

Console Display	Contents	Configuration Range (Item Selection)	Default Setting	Rewriting During Operation
b-09	Command input position selection for interlocking	0: Terminal block 1: Console (SET66-Z) 2: Digital communication option	1	×
b-10	Rotation speed command input position selection(*1)	0: Interlocking 1: Analog Input (1) [Terminal block] (AIN1) 2: Console (SET66-Z) 3: Digital communication option 4: Analog Input (2) 5: (For external optional expansions) 6: Analog Input (3) 7: Built-in PLC	0	×
b-11	Operation command input position selection	0: Interlocking 1: Terminal block 2: Console (SET66-Z) 3: Digital communication option	0	×
b-12	Jog command input position selection	0: Interlocking 1: Terminal block 2: Console (SET66-Z) 3: Digital communication option	0	×
i-07	Operation mode selection(*2)	0: Speed control (ASR) mode 1: Torque command minus (-) direction priority 2: Torque command plus (+) direction priority 3: Torque control (ATR) mode 4: Speed/torque control contact switching	0	×
i-08	Torque command input position selection(*2)	0: Analog Input (1) (AIN1) 1: Analog Input (2) (AIN2) 2: Digital communication option 3: Built-in PLC output	1	×
J-14	Time/date data selection from communication	0: Without time/date data 1: With time/date data	0	×

(*1) If the inverter is in V/f mode, this becomes "Frequency command input position selection".

(*2) If the inverter is in V/f mode, this is disabled.

In power-up of inverter equipment, DNET66-Z sets the speed command position (Attribute 4 [NetRef] of AC/DC Drive Object) in network control when parameter [b-10] (Selection of speed command setting position) of inverter equipment set in 3 (Digital communication option). And DNET66-Z receives the speed command from the master station on a DeviceNet network.

When parameter [b-10] (Selection of speed command setting position) is set besides 3 (Digital communication option), DNET66-Z sets the speed command potision in local control. And DNET66-Z

ignores the speed command of the master station.
When you control inverter equipment with DeviceNet, please set parameter [b-10] (Selection of speed command setting position) in 3 (Digital communication option)

4. 2 Setting of I/O Assembly Instanece Number

I/O Assembly Instance Number of DNET66-Z sets it with parameter [J-09] (Output Assembly Number Setting) and parameter [J-10] (Input Assembly Instance Number Setting) of inverter equipment. These values are set in power-up by DNET66-Z, and default value is each 0.

Table 4.4

Parameter Name	Setting Value	Instance Number
J-09 (Output Assembly Instance Number Settting)	0	20
	1	21
J-10 (Input Assembly Instance Number Settting)	0	70
	1	71

Attention: When you changed I/O Assembly Instance Number with inverter equipment side during network connection, a power reset of inverter equipment and DNET66-Z is by all means necessary.

4. 3 Setting of Speed Scale

SpeedScale of DNET66-Z explaining sets it with parameter [J-11] (Speed Scale Setting) of inverter equipment. This value is set in power-up by DNET66-Z, and default value is each 3.

In cases where the applicable scaling factor attribute is non-zero, the units are:

$$r/min / 2^{SpeedScale}$$

In default value, therefore, the units are 0.125 r/min.

4. 4 Setting of SpeedRef / SpeedActual

As for inverter equipment, there are 3 kinds of following systems.

(1) Induction Motor V/f control mode
(2) Induction Motor Vector control mode
(3) ED motor Vector control mode

In case of control system of (2) and (3)

SpeedRef and SpeedAcutal calculate it using SpeedScale as follows.

SpeedRef (Attribute 8 of AC/DC Drive Object)
= Actual Commanded Speed x $2^{SpeedScale}$

SpeedActual (Attribute 7 of AC/DC Drive Object)
= Actual Operating Speed x $2^{SpeedScale}$

In case of V/f mode control system of (1)

By calculation of SpeedRef, the number of motor pole becomes more necessary. In parameter setting of inverter equipment, number of motor pole setting is [A-06] (Motor pole selection).

SpeedRef calculation method of V/f mode control system

・Parameter of inverter equipment [A-06] (Motor pole selection) = 4 pole
・Actual Commanded Frequency = 30Hz
・SpeedScale = 3

SpeedRef = { (Actual Commanded Frequency * 6) / ([A-06] / 2) } x $2^{Speedscale}$
= { (30Hz x 6) / (4pole/2) } x 2^3
= 7200

You calculate Speed Actual with a similar method.

Chapter 5 Trouble Shooting

This chapter explains an abnormal condition of DNET66-Z in network connection.

5. 1 LED Display of Operating State

***Module Status LED**

This bi-color (green/red) LED provides device status. It indicates whether or not the device has power and is operating properly. Table 5.1.1 define the Module Status LED states.

Table 5.1.1

For this state:	LED is:	To indicate:
Power Off	Off	There is no power applied to the device.
Device Operational	Green	The device is operating in a normal condition.
Device in Standby	Flashing Green	The device needs commissioning due to configuration missing, incomplete or incorrect. The Device may be in the Standby state.
Minot Fault	Flashing Red	Recoverable Fault
Unrecoverable Fault	Red	The device has an unrecoverable fault; may need replacing.
Device Self Testing	Flashing Red-Green	The Device is in Self Test.

***Network Status LED**

This bi-color (green/red) LED indicates the status of the communication link. Table 5.1.2 defines the Network Status LED states.

Table 5.1.2

For this state:	LED is:	To indicate:
Not Powered/ Not On-line	Off	Device is not on-line. - The device has not completed the Dup_MAC_ID test yet. - The device may not be powered, look at Module Status LED.
On-line, Not Connected	Flashing Green	Device is on-line but has no connections in the established state. - The device has passed the Dup_MAC_ID test, is on-line, but has no established connections to other nodes. - For a Group 2 Only device it means that this device is not allocated to a master.
Link OK On-line, Connected	Green	The device is on-line and has connections in the established state. - For a Group 2 Only device it means that the device is allocated to a Master.
Connection Time-out	Flashing Red	One or more I/O Connections are in the Timed-out state.
Critical Link Failure	Red	Failed communication device. The device has detected an error that or that has rendered it incapable of communicating on the network (Duplicate MAC ID, or Bus-off).

***Module and Network Status LEDs at Power-Up**

A LED test is to be performed at power-up. To allow a visual inspection to be performed, the following sequence is to be followed:

① Turn Network Status LED off.
② Turn Module Status LED on Green for approximately 0.25 seconds.
③ Turn Module Status LED on Red for approximately 0.25 seconds.
④ Turn Module Status LED on Green.
⑤ Turn Network Status LED on Green for approximately 0.25 seconds.
⑥ Turn Network Status LED on Red for approximately 0.25 seconds.
⑦ Turn Network Status LED off.

5．2 Communication Error Message

The following table lists the Error Codes that may be present in the General Error Code field of an Error Response message.

Table 7.2

Error Code (in hex)	Error Name	Description of Error
00～01		Reserved by DeviceNet
02	Resource unavailable	Resources needed for the object to perform the requested service were unavailable
03～07		Reserved by DeviceNet
08	Service not supported	The requested service was not implemented or was not defined for this Object Class/Instance.
09	Invalid attribute value	Invalid attribute data detected
0A		Reserved by DeviceNet
0B	Already in requested mode/state	The object is already in the mode/state being requested by the service
0C	Object state conflict	The object cannot perform the requested service in its current mode/state
0D		Reserved by DeviceNet
0E	Attribute not settable	A request to modify a non-modifiable attribute was received.
0F	Privilege violation	A permission/privilege check failed
10	Device state conflict	The device's current mode/state prohibits the execution of the requested service.
11	Reply data too large	The data to be transmitted in the response buffer is larger than the allocated response buffer
12		Reserved by DeviceNet
13	Not enough data	The service did not supply enough data to perform the specified operation.
14	Attribute not supported	The attribute specified in the request is not supported
15	Too much data	The service supplied more data than was expected
16	Object does not exist	The object specified does not exist in the device.
17	Reserved	Reserved by DeviceNet
18	No stored attribute data	The attribute data of this object was not saved prior to the requested service.
19	Store operation failure	The attribute data of this object was not saved due to a failure during the attempt.
1A～1E		Reserved by DeviceNet
1F	Vendor specific error	A vendor specific error has been encountered.
20	Invalid parameter	A parameter associated with the request was invalid.
21～27	Future extensions	Reserved by DeviceNet for future extensions
28	Invalid Member ID	The Member ID specified in the request does not exist in the specified Class/Instance/Attribute
29	Member not settable	A request to modify a non-modifiable member was received
2A～CF		Reserved by DeviceNet for future extensions
D0～FF	Reserved for Object Class and Service errors	This range of error codes is to be used to indicate Object Class specific errors.

Chapter 6 Extending Device Profile

6．1 Extending I/O Assembly instance

***Prameter setting**

To set the instance number of extending I/O Assembly instance, the setting of the parameter of the inverter device becomes the following tables.

Table 6.1

Parameter name	profile	Set value	Instance Number	Remarks
「J-09」 Output Assembly Instance number setting	Standard profil	0	20	
		1	21	
	Extending profile	2	100	Special 1 control output
		3	101	Special 2 control output
		4	102	Special 3 control output
		5	103	Special4control output
		6	104	Special 5 control output
		7	105	Special 6control output
		8	106	Special 7 control output
		9	107	Special 8 control output
		10	108	Special 9 control output
「J-10」 Input Assembly Instance number setting	Standard profil	0	70	
		1	71	
	Extending profile	2	120	Special 1 control output
		3	121	Special 2 control output
		4	122	Special 3 control output
		5	123	Special4control output
		6	124	Special 5 control output
		7	125	Special 6control output
		8	126	Special 7 control output
		9	127	Special 8 control output
		10	128	Special 9 control output
		11	129	Special 10control output
		12	130	Special 11control output
		13	131	Special 12 control output
		14	132	Special 13 control output
		15	140	Special 14control output

6．2 Output Assembly instance

Table 6.2

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
20 J-09=0 (2 words)	0						Fault Reset		Run Fwd
	1								
	2	Speed Reference (low byte)							
	3	Speed Reference (high byte)							
21 J-09=1 (2 words)	0		NetRef	NetCtrl			Fault Reset	Run Rev	Run Fwd
	1								
	2	Speed Reference (low byte)							
	3	Speed Reference (high byte)							
100 J-09=2 (4 words)	0	Preset2 I00027	Preset1 I00026	Fault Reset2 I00025	DC Brake I00024	Excit. I00023	Rev I00022	Jog I00021	Start I00020
	1	Max-SPD Reduce I0002F	S-ARC off I0002E	Spd Hold I0002D	MRH down I0002C	MRH up I0002B	Acc/Dec Sel2 I0002A	Acc/Dec Sel1 I00029	Preset3 I00028
	2	Ex-Fail.1 (no 86A) I00037	Ex-Fail.4 I00036	Ex-Fail.3 I00035	Ex-Fail.2 I00034	Ex-Fail.1 I00033	Rev Cmd I00032	ATR Mode I00031	Droop off I00030
	3	SPD.Ref. Term I0003F	PGM. Next I0003E	EMG. Stop I0003D	Second Motor I0003C	Trace Trg. I0003B	Ex-Fail.4 (no 86A) I0003A	Ex-Fail.3 (no 86A) I00039	Ex-Fail.2 (no 86A) I00038
	4	Speed Reference2(20000/top) (low byte) Communication input register 1 (i00010) (low byte)							
	5	Speed Reference2(20000/top) (high byte) Communication input register 1(i00010) (high byte)							
	6	Torque Reference2(5000/100%) (low byte) Communication input register 2 (i00011) (low byte)							
	7	Torque Reference2(5000/100%) (high byte) Communication input register 2 (i00011) (high byte)							
101 J-09=3 (5 words)	8	Date (low byte) Communication input register 3 (i00012) (low byte)							
	9	Month (high byte) Communication input register 3 (i00012) (high byte)							
102 J-09=4 (6 words)	10	Minute (low byte) Communication input register 4 (i00013) (low byte)							
	11	Hour (high byte) Communication input register 4 (i00013) (high byte)							
103 J-09=5 (7 words)	12	(Not specified) Communication input register 5 (i00014) (low byte)							
	13	(Not specified) Communication input register 5 (i00014) (high byte)							
104 J-09=6 (8 words)	14	(Not specified) Communication input register 6 (i00015) (lown byte)							
	15	(Not specified) Communication input register 6 (i00015) (high byte)							
105 J-09=7 (9 words)	16	(Not specified) Communication input register 7 (i00016) (low byte)							
	17	(Not specified) Communication input register 7 (i00016) (high byte)							
106 J-09=8 (10 words)	18	(Not specified) Communication input register 8 (i00017) (low byte)							
	19	(Not specified) Communication input register 8 (i00017) (high byte)							
107 J-09=9 (11 words)	20	(Not specified) Communication input register 9 (i00018) (low byte)							
	21	(Not specified) Communication input register 9 (i00018) (high byte)							
108 J-09=10 (12 words)	22	(Not specified) Communication input register 10 (i00019) (low byte)							
	23	(Not specified) Communication input register 10 (i00019) (high byte)							

6．3 Input Assembly instance

Table 6.3

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
70 J-10=0 (2 words)	0						Running1		Faulted
	1								
	2	Speed Actual (low byte)							
	3	Speed Actual (high byte)							
71 J-10=1 (2 words)	0	At Reference	Ref From Net	Ctrl from Net	Ready	Running2 (Rev)	Running1 (Fwd)	Warning	Faulted
	1	Drive State(1=Startup 2=Not Ready 3=Ready 4=Enabled 5=Stopping 6=Fault stop 7=Faulted							
	2	Speed Actual (low byte)							
	3	Speed Actual (high byte)							
120 J-10=2 (6 words)	0	Gate On	Auto -turning	Powdown	DC Exciting	Reverse	Jogging	Running	Running or Jogg.
	1	Ex-signal input 4	Ex-signal input 3	Ex-signal input 2	Ex-signal input 1		Ex-DB ON or comu. ab	DC breake ON	Exciting
	2	Current senser abnormal	Overload protect.	Dir.current overvoltage	Gateboad abnormal			IGBT protect	Over current protect
	3	Option Error	memory abnormal	Over heat Protect	Overtorque Protect	Power fail Protect	overfreque. Protect	Over speed Protect	Start Protect
	4	Lack Phase	SET Error	FCL Protect	Resister overheat	Motor Overheat	Speed Cont.Err.	Timeout Error	Senserless start Error
	5	Ex-Fail.4	Ex-Fail.3	Ex-Fail.2	Ex-Fail.1	Senser error	PG error	Fan fail.	CPU abnormal
	6	Arrive Ref.Spd	Detect Spd2(<=)	Detect Spd2(>=)	Detect Spd2(=)	Detect Spd1(<=)	Detect Spd1(>=)	Detect Spd1(=)	
		000047	O00046	O00045	O00044	O00043	O00042	O00041	O00040
	7	Cooling fan failure	Select 2ndset block	Reverse Now	Retry Now	Over load Pre-alarm	Detect power fail	Detect ABS.Torq	Detect Torq
		00004F	00004E	00004D	00004C	00004B	00004A	000049	000048
	8	Speed Actual2(20000/top) (low byte)							
		Communication output register 1 (o00010) (low byte)							
	9	Speed Actual2(20000/top) (high byte)							
		Communication output register 1 (o00010) (low byte)							
	10	ARC out(20000/top) (low byte)							
		Communication output register 2 (o00011) (low byte)							
	11	ARC out(20000/top) (high byte)							
		Communication output register 2 (o00011) (low byte)							
121 J-10=3 (7 words)	12	RMS Motor Current (10000/100% Inv.rated)(low byte)							
		Communication output register 3 (o00012) (low byte)							
	13	RMS Motor Current (10000/100% Inv.rated)(high byte)							
		Communication output register 3 (o00012) (low byte)							
122 J-10=4 (8 words)	14	Torque Command(5000/100%) (low byte)							
		Communication output register 4 (o00013) (low byte)							
	15	Torque Command(5000/100%) (high byte)							
		Communication output register 4 (o00013) (low byte)							
123 J-10-5 (9 words)	16	DC Voltage (10/1V200V class and 5/1V400V class)(low byte)							
		Communication output register 5 (o00014) (low byte)							
	17	DC Voltage (10/1V200V class and 5/1V400V class)(high byte)							
		Communication output register 5 (o00014) (low byte)							
124 J-10=6 (10 words)	18	Output Voltage (20/1V200V class and 10/1V400V class)(low byte)							
		Communication output resister 6(o00015) (low byte)							
	19	Output Voltage (20/1V200V class and 10/1V400V class)(high byte)							
		Communication output register 6 (o00015) (low byte)							
125 J-10=7 (11 words)	20	Output Frequency(20000/top) (low byte)/ Power Con Racio(1024/1) (low byte) *1							
		Communication output register 7 (o00016) (low byte)							
	21	Output Frequency(20000/top) (high byte)/ Power Con Racio(1024/1) (high byte) *1							
		Communication output register 7 (o00016) (low byte)							

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
126 J-10=8 (12 words)	22	OL Pre-counter(10000/100%) (low byte) Communication output register 8 (o00017) (low byte)							
	23	OL Pre-counter(10000/100%) (high byte) Communication output register 8 (o00017) (low byte)							
127 J-10=9 (13 words)	24	Motor Temperature(10/1℃) (low byte) Communication output register 9 (o00018) (low byte)							
	25	Motor Temperature(10/1℃) (high byte) Communication output register 9 (o00018) (low byte)							
128 J-10=10 (14 words)	26	Motor Flux(1024/100%) (low byte) Communication output register 10 (o00019) (low byte)							
	27	Motor Flux(1024/100%) (high byte) Communication output register 10 (o00019) (low byte)							
129 J-10=11 (15 words)	28	(Not specified) Communication output register 11 (o0001A) (low byte)							
	29	(Not specified) Communication output register 11 (o0001A) (low byte)							
130 J-10=12 (16 words)	30	(Not specified) Communication output register 12 (o0001B) (low byte)							
	31	(Not specified) Communication output register 12 (o0001B) (low byte)							
131 J-10=13 (17 words)	32	(Not specified) Communication output register 13 (o0001C) (low byte)							
	33	(Not specified) Communication output register 13 (o0001C) (low byte)							
132 J-10=14 (18 words)	34	(Not specified) Communication output register 14 (o0001D) (low byte)							
	35	(Not specified) Communication output register 14 (o0001D) (low byte)							
140 J-10=15 (4 words)	0	Gate On	Auto turning	Powdown	DC Exciting	Reverse	Jogging	Running	Start
	1	ProtectErrorCode (Refer to Chapter 6.4).						DC Braking	Exciting
	2	Monitor Number1 Data (low byte)							
	3	Monitor Number1 Data (high byte)							
	4	Monitor Number2 Data (low byte)							
	5	Monitor Number2 Data (high byte)							
	6	Monitor Number3 Data (low byte)							
	7	Monitor Number3 Data (high byte)							

6．4 Alarm Code

Alarm code (Protect Error Code) of Input Assembly instance 140 is shown below. However, when do the concurrence of two or more alarms and protection, it becomes a number on a young side.

Table 6.4

Code	Alarm and content of protection	Code	Alarm and content of protection
0	There are neither a fault nor protection.	17	Senserless Start Error
1	Overcurrent Protection	18	Communication Timeout Error
2	IGBT Protect (IGBT element abnormality)	19	Speed Cont.Error (speed control abnormality)
3	IGBT Protect (IGBT-U element abnormality)	20	Motor Overheat (motor overheating protection)
4	IGBT Protect (IGBT-V element abnormality)	21	Slave Error (slave unit abnormality)
5	IGBTProtect (GAC abnormality)	22	FCL Protect (FCL protection)
6	Direct current overvoltage protection	23	SET Error
7	Over load protection	24	Luse Phase
8	DCCT abnormality	25	CPU I Command abnormality
9	Start congestion	26	Fan Error
10	Overspeed protection	27	PG Error
11	Overfrequency protection	28	Senser abnormal
12	Shortagevoltage (power failure protection)	29	External fault 1
13	Overtorque protection	30	External fault 2
14	Overheating protection	31	External fault 3
15	Set memory abnormality	32	External fault 4
16	Option Error (option abnormality)		

6．5 Monitors Output Data

It explains the relation of "Monitors Number" of instance # 140 and attribute 15. These attributes are the setting methods of needing when extending Input Assembly No.140 (J-10=15)is chiefly used. The monitor output data(from 2bytes to 7bytes) is data of the following tables.

Table 6-5

Monitor output Data No.	Monitor output data (At HC function OFF.)
1	Speed Actual2 (20000/top)
2	ARC out (5000/100%)
3	RMS Motor Current (10000/100%(Inv. Rated))
4	Torque Command (5000/100%)
5	DC Voltage (10/1V (200V faction) and 5/1V (400v system))
6	Output Voltage (20/1V (200V faction) and 10/1V (400v system))
7	Output Frequency (20000/top) / Power Con Racio (1024/1)
8	OL Pre-counter (10000/100%)
9	Motor Temperature (10/1℃)
10	Motor Flux (1024/100%)

Attribute "Monitors Number" corresponds to parameter of the inverter device. The combination of the monitor output 10 kind of data set in "Monitor Number 1 Data" - "Monitor Number 3 Data" is decided by setting the value of this attribute by the Set_Attribute_**J-12**(Monitor data number)

The number set from Monitor Number 1 Data to Monitor Number 3 Data shows monitor output data No. of Table 6.5.1

Table 6.5.1

J-12	Monitor Number1 Data	Monitor Number2 Data	Monitor Number3 Data	J-12	Monitor Number1 Data	Monitor Number2 Data	Monitor Number3 Data
0	1	2	3	16	1	4	6
1	1	2	4	17	1	4	7
2	1	2	5	18	1	4	8
3 (Initial)	1	2	6	19	1	4	9
4	1	2	7	20	1	4	10
5	1	2	8	21	1	5	6
6	1	2	9	22	1	5	7
7	1	2	10	23	1	5	8
8	1	3	4	24	1	5	9
9	1	3	5	25	1	5	10
10	1	3	6	26	1	6	7
11	1	3	7	27	1	6	8
12	1	3	8	28	1	6	9
13	1	3	9	29	1	6	10
14	1	3	10	30	1	7	8
15	1	4	5	31	1	7	9
32	1	7	10	76	3	6	8
33	1	8	9	77	3	6	9
34	1	8	10	78	3	6	10
35	1	9	10	79	3	7	8
36	2	3	4	80	3	7	9
37	2	3	5	81	3	7	10
38	2	3	6	82	3	8	9
39	2	3	7	83	3	8	10
40	2	3	8	84	3	9	10
41	2	3	9	85	4	5	6
42	2	3	10	86	4	5	7
43	2	4	5	87	4	5	8
44	2	4	6	88	4	5	9
45	2	4	7	89	4	5	10
46	2	4	8	90	4	6	7
47	2	4	9	91	4	6	8
48	2	4	10	92	4	6	9
49	2	5	6	93	4	6	10
50	2	5	7	94	4	7	8
51	2	5	8	95	4	7	9
52	2	5	9	96	4	7	10
53	2	5	10	97	4	8	9
54	2	6	7	98	4	8	10
55	2	6	8	99	4	9	10
56	2	6	9	100	5	6	7
57	2	6	10	101	5	6	8
58	2	7	8	102	5	6	9
59	2	7	9	103	5	6	10
60	2	7	10	104	5	7	8
61	2	8	9	105	5	7	9
62	2	8	10	106	5	7	10
63	2	9	10	107	5	8	9
64	3	4	5	108	5	8	10
65	3	4	6	109	5	9	10
66	3	4	7	110	6	7	8
67	3	4	8	111	6	7	9
68	3	4	9	112	6	7	10
69	3	4	10	113	6	8	9
70	3	5	6	114	6	8	10
71	3	5	7	115	6	9	10
72	3	5	8	116	7	8	9
73	3	5	9	117	7	8	10
74	3	5	10	118	7	9	10
75	3	6	7	119	8	9	10

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