“MICRO” ADJUSTABLE SPEED DRIVE INTERFACE

ICC

INDUSTRIAL CONTROL COMMUNICATIONS

PBDP-100

PROFIBUS-DP COMMUNICATIONS INTERFACE FOR THE TOSHIBA VF-S7 SERIES ADJUSTABLE SPEED DRIVE

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ICC #10201-000

Introduction

Thank you for purchasing the ICC PBDP-100 Profibus-DP Communications Interface for the Toshiba S7 Series Micro Adjustable Speed Drive. Before using the PBDP-100 interface, please familiarize yourself with the product and be sure to thoroughly read the instructions and precautions contained in this manual. In addition, please make sure that this instruction manual is delivered to the end user of the drive units with which the PBDP-100 interface is connected, and keep this instruction manual in a safe place for future reference or drive/interface inspection.

This instruction manual describes the device specifications, wiring methods, maintenance procedures, supported functions and usage methods for the PBDP-100 Profibus-DP communications interface.

In conjunction with this manual, the following manuals are supplied by Toshiba, and are essential both for ensuring a safe, reliable system installation as well as for realizing the full potential of the PBDP-100 interface:

- Toshiba *TOSVERT VF-S7 Series Instruction Manual*
- Toshiba *VF-S7 Industrial Inverter Serial Communications Option Manual*

If you do not have copies of these documents available, please contact Toshiba or your local Toshiba distributor to obtain them.

Usage Precautions

Operating Environment

- Please use the PBDP-100 only when the ambient temperature of the environment into which the PBDP-100 is installed is within the following specified temperature limits:
  Operation: -10 ~ +40°C (+14 ~ +104°F)
  Storage: -25 ~ +65°C (-13 ~ +149°F)
- Avoid installation locations that may be subjected to large shocks or vibrations.
- Avoid installation locations that may be subjected to rapid changes in temperature or humidity.

Installation • Wiring

- Do not touch charged parts of the drive such as the terminal block while the drive's CHARGE lamp is lit. A charge will still be present in the drive's internal electrolytic capacitors, and therefore touching these areas may result in an electrical shock. Always turn all drive input power supplies OFF, and wait at least 5 minutes after the CHARGE lamp has gone out before connecting communication cables or motor wiring.
- Proper ground connections are vital for both safety and signal reliability reasons. For proper grounding procedures, please refer to the section in this manual pertaining to grounding (section 4).
- Route all communication cables separate from the inverter input/output power wiring.
- To avoid the possibility of electric shock due to leakage currents, always ground the inverter unit's E/GND terminal and the motor. To avoid misoperation, do not connect the PBDP-100's Profibus shield terminal to either of the above-mentioned grounds or any other power ground.
- When making connections between the PBDP-100 and S7 drives, do not use cables that exceed 5 meters in length.
- For further drive-specific precaution, safety and installation information, please refer to the appropriate Toshiba documentation supplied with your S7 drive.

Other Precautions

- Do not touch or insert a rod or any other item into the PBDP-100's case while power is applied, as this may lead to electrical shock or device damage.
- Commission the disposal of the PBDP-100 to a specialist.
- Do not assign the same network address to more than one PBDP-100 station in the same network. For a detailed explanation of station addressing, refer to section 8.
- When the PBDP-100 is configured to receive its Profibus station address from the drive on Channel A, be sure to reset the PBDP-100 if the inverter number parameter on the drive on Channel A is changed. Refer to section 8 for more information.
- Because the PBDP-100 derives its control power from the drive connected to Channel A, removing power from that drive will also cause the PBDP-100 to lose power, even if power is still applied to the drive connected to channel B.
- When only 1 drive is connected to the PBDP-100, it must be connected to Channel A.

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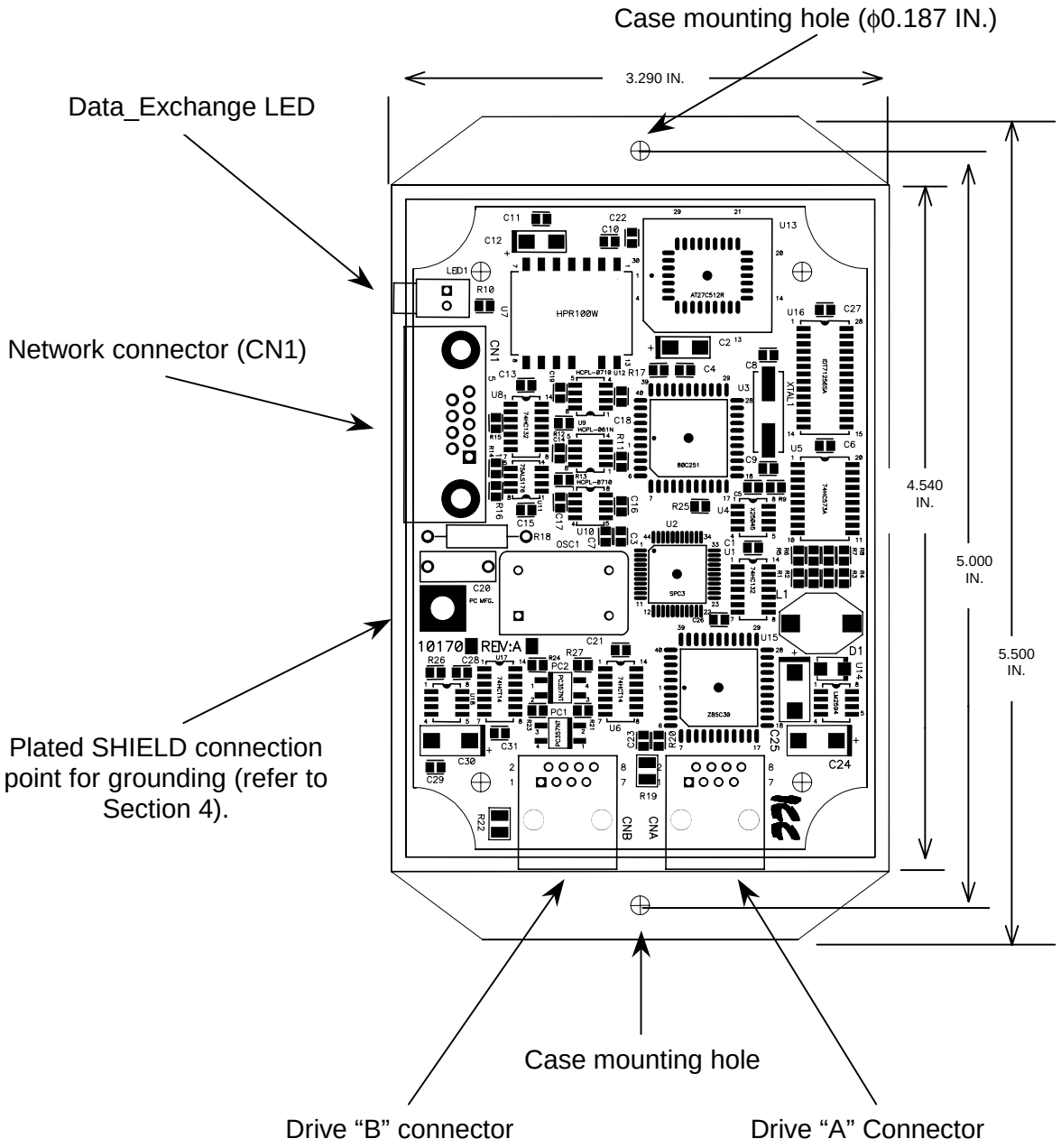
1. Connection Diagram



Note that the above diagram shows the PBDP-100 with its cover removed. However, it is not necessary to remove the cover in order to install or configure the PBDP-100.

2. Feature Summary

The PBDP-100 interface provides a wide array of network data access and drive control features. Combined with the flexible configuration and high-speed data transfer capabilities of the Profibus network, this allows powerful networked control and monitoring systems to be designed. Some of the main features provided by the PBDP-100 which allow for this control and configurability are briefly described here:

Protocol

Profibus DP (Decentralized Periphery) as specified in European standard EN 50170. The PBDP-100 can also co-exist simultaneously on networks using Profibus-FMS.

Network Baud Rates

Supports all Profibus baud rates from 9.6kbaud to 12Mbaud. The network baud rate is automatically detected and continuously monitored during operation; no parameter settings are necessary.

Drive Connections

The PBDP-100 provides support for simultaneous connection of 2 VF-S7 drives. Both drives share a common Profibus station address. By supporting 2 drives per interface, the maximum number of drives that can be connected to 1 Profibus network segment without requiring repeaters increases from 31 (31 drives + 1 master) to 62 (31 PBDP-100 units + 1 master).

Power Supply

Self-contained. Powered directly from the drive connected to the Channel A communications port. No external power supply devices or connections are required.

Isolation

The PBDP-100 has 3 separate isolated circuitry sections. Each drive is fully optically isolated from each other, and both drives are optically isolated from the Profibus network. By using optically isolated connections to the drives and the Profibus network, noise immunity is greatly improved and grounding differential problems become a thing of the past.

Drive AutoScan Algorithm

Connections to the drives are automatically established and continuously monitored. No drive configuration needs to be performed to connect the PBDP-100 and communicate via the Profibus network. Just plug it in – it's that simple.

Global Control Functions

- Freeze mode: Input (monitor) data values are held constant within the PBDP-100 until the next “freeze” command or an “unfreeze” command is received. Used primarily for synchronized monitoring of multiple Profibus nodes.
- Sync mode: Output (control) data values are held constant within the PBDP-100 until the next “sync” command or an “unsync” command is received. Used primarily for synchronized control of multiple Profibus nodes.
- Clear Data: All output (control) data values are cleared to “0”.

Address Change Function

Set_slave_address function supported – allows modification of the PBDP-100’s station address via the Profibus network. For a detailed explanation of the available addressing methods, refer to section 8.

Network Watchdog

A network watchdog function is always operating within the PBDP-100. In the event of a disconnection from the Profibus network or loss of the network master, the PBDP-100 will automatically switch any attached drives over to local control.

Indicators

1 green LED is provided to indicate when the PBDP-100 has achieved the DATA_EXCHANGE state with the Profibus network master. This serves as a convenient indicator that the Profibus master and PBDP-100 are configured properly and are exchanging data.

Profibus Network Connector

The network interface is a standard DB9 connector with the following signals provided:

Pin Number	Function	In/Out
3	Profibus network “B” (positive) data line	In/out
4	RTS signal – direction control for fiber optic network interface	Out
5	DGND – power supply ground internally connected to the interface board’s isolated ground	-
6	VP – power supply +5v internally connected to the interface board’s isolated P5.	-
8	Profibus network “A” (negative) data line	In/out
1, 2, 7, 9	No connection	-

In addition to the above signals, the metallic housing of the DB9 connector is connected to the shield section of the interface board. The shield section contains a

plated connection point where a ground wire can be attached to connect the Profibus network cable shield to ground. Refer to section 4 of this document for more information related to grounding.

Drive Network Connectors

Uses standard RJ-45 style 8-pin modular connectors. Any standard category-5 ethernet cable (found in most electronics stores) 5 meters or less in length can be used to connect the PBDP-100 to the drives.

Input/Output Data

The PBDP-100 presents a module interface, supporting 2 different modules depending on the number of drives connected to the unit.

If the PBDP-100 is configured for 1 drive (the Channel A drive), the interface's cyclic data sizes are fixed at 16 bytes of output (control) data configured as four 32-bit words, and 24 bytes of input (status) data configured as six 32-bit words.

If the PBDP-100 is configured for both drives (Channel A and B), the interface's cyclic data sizes are fixed at 32 bytes of output (control) data configured as eight 32-bit words, and 48 bytes of input (status) data configured as twelve 32-bit words.

Via these data structures, any data item (commands, monitor data and parameters) available in the drive can be accessed. For detailed explanations of the format and usage of this data, refer to sections 9 and 10 of this document.

3. Installing The PBDP-100

The PBDP-100 connects to each drive via the drive's communication port, located on the right-hand side of the drive enclosure under a small snap-on cover. Although no drive parameters need to be configured in order to use the PBDP-100, it is advantageous to check that the drive's communication data rate is set to its maximum speed. Because the PBDP-100 will communicate to each drive only at the drive's configured data rate, this will provide the fastest response time for drive-to-Profibus network data transfers. For information on checking the drive's communication data rate, refer to the appropriate manual supplied with your drive. Note that this drive communication data rate setting is independent of the Profibus network data rate, which is configured solely by the Profibus master station. Also note that the data communication parameters of each drive are handled independently; the drive connected to Channel A may simultaneously communicate to the PBDP-100 at completely different baud rates, parity settings, etc. from the drive connected to Channel B.

Installation of the PBDP-100 Profibus interface should only be performed by a qualified technician familiar with the maintenance and operation of the connected drives. To install the PBDP-100, complete the following steps:

1.  **CAUTION!** Verify that all input power sources to the drives to be connected have been turned OFF and are locked and tagged out.
2.  **DANGER!**  Wait at least 5 minutes for the drive's electrolytic capacitors to discharge before proceeding to the next step. **Do not touch any internal parts with power applied to the drive, or for at least 5 minutes after power to the drive has been removed. A hazard exists temporarily for electrical shock even if the source power has been removed.** Verify that the CHARGE LED has gone out before continuing the installation process.
3. Attach the PBDP-100 to a sturdy, unmovable object (such as a wall) via the 2 case mounting holes located on the tabs at the top and bottom of the enclosure.
4. Remove the drive's communication port cover, located on the right-hand side of the drive (as viewed when facing the drive), by pressing against the side of the cover while sliding it toward the front of the drive. Do not discard this cover, as it should be reinstalled if the PBDP-100 unit is disconnected from the drive.
5. Connect the drive's communication port to Channel A of the PBDP-100 with the communication cable (communication cable is not included with the PBDP-100 kit). When choosing cables for this connection, standard 24 AWG category-5 (CAT 5) unshielded twisted-pair (UTP) 8-conductor cables found in ethernet networks in most office environments can be used. The maximum allowable length for these cables is 5 meters. Although there are many varieties and styles of CAT-5 UTP cables available, ICC strongly recommends using only high-quality cables from reputable manufacturers to guarantee optimal noise immunity and cable longevity. Ensure that each end of the cable is fully seated into the modular connector, and route the cable such that it is located well away from any drive input power or motor wiring. Also take care to route the cable away from any sharp edges or positions where it may be pinched.

6. Repeat steps 1, 2, 4 and 5 above to connect another drive to Channel B on the PBDP-100, if desired.
7. Connect the Profibus network cable to the DB9 connector marked “Network” on the PBDP-100. If a ground cable is going to be used, attach the ground cable to the plated circuit board hole marked “Chassis GND” on the left side of the PBDP-100 enclosure (refer to section 4). Refer to the Profibus Specification for detailed network wiring guidelines. Ensure that the Profibus network cable is tightly screwed onto the DB9 connector, and route the cable such that it is located well away from any drive input power or motor wiring. Also take care to route the cable away from any sharp edges or positions where it may be pinched.
8. Take a moment to verify that the PBDP-100 and all network cables have sufficient clearance from drives, motors, or power-carrying electrical wiring.
9. Turn the power sources to all connected drives ON, and verify that the drives function properly. If the drives do not appear to power up, or do not function properly, immediately turn power OFF. **Repeat steps 1 and 2 to remove all power from the drives.** Then, verify all connections. Contact ICC or your local drive distributor or manufacturer for assistance if the problem persists.

4. Grounding

Grounding is of particular importance for reliable, stable operation. Communication system characteristics may vary from system to system, depending on the system environment and grounding method used. The PBDP-100 Profibus interface is provided with a plated "Chassis GND" connection point just below the Profibus Network connector on the left-hand side of the unit. This Chassis GND connection point is directly connected to the metallic housing of the DB9 connector, which should in turn be connected to the shield of the Profibus network cable through the Profibus connector. To ground the network cable shield, therefore, connect a wire with lug terminal to this Chassis GND point, and then connect the other end of the wire to an appropriate ground. For specific requirements regarding protective grounding and the Profibus network, refer to the Profibus Standard (EN 50 170, part 1).

Please be sure to consider the following points for making proper ground connections:

Grounding method checkpoints

1. Make all ground connections such that no ground current flows through the case or heatsink of a connected drive.
2. Do not connect the PBDP-100 Chassis GND connection point to a power ground or any other potential noise-producing ground connection (such as a drive's "E" terminal).
3. Do not make connections to unstable grounds (paint-coated screw heads, grounds that are subjected to inductive noise, etc.)

Note that making a terminal connection to the "Chassis GND" point will require removal of the PBDP-100's enclosure cover. As this increases the chance for circuit board damage due to electrostatic discharge (ESD), please use static-sensitive component handling procedures when performing this task.

5. Equipment Specifications

Item	Specification
Operating Environment	Indoors, less than 1000m above sea level, do not expose to direct sunlight or corrosive / explosive gasses
Operating Temperature	-10 ~ +40°C (+14 ~ +104°F)
Storage Temperature	-25°C ~ +65°C (-13 ~ +149°F)
Relative Humidity	20% ~ 90% (without condensation)
Vibration	5.9m/s^2 {0.6G} or less (10 ~ 55Hz)
Grounding	According to EN 50 170, part 1
Cooling Method	Self-cooled

6. Maintenance And Inspection

Preventive maintenance and inspection is required to maintain the PBDP-100 Profibus interface in its optimal condition, and to ensure a long operational lifetime. Depending on usage and operating conditions, perform a periodic inspection once every three to six months. Before starting inspections, always turn off all power supplies to connected drives, and wait at least five minutes after each drive's "CHARGE" lamp has gone out.

DANGER! Do not touch any internal parts with power applied to the drives, or for at least 5 minutes after power to the drives has been removed. A hazard exists temporarily for electrical shock even if the source power has been removed.

Inspection Points

- Check that the Profibus network connector screws are not loose. Tighten if necessary.
- Check that the drive communication cables are not loose. Reinsert if necessary.
- Check that there are no defects in any attached grounding wire terminal crimp points. Visually check that the crimp points are not scarred by overheating.
- Visually check all wiring and cables for damage. Replace as necessary.
- Clean off any accumulated dust and dirt.
- If use of the PBDP-100 is discontinued for extended periods of time, apply power at least once every two years and confirm that the unit still functions properly.
- Do not perform hi-pot tests on the drives or PBDP-100 interface, as they may damage the units.

Please pay close attention to all periodic inspection points and maintain a good operating environment.

7. Storage And Warranty

7.1 Storage

Observe the following points when the PBDP-100 interface is not used immediately after purchase or when it is not used for an extended period of time.

- Avoid storing the PBDP-100 in places that are hot or humid, or that contain large quantities of dust or metallic dust. Store the PBDP-100 in a well-ventilated location.
- When not using the PBDP-100 interface for an extended period of time, apply power at least once every two years and confirm that it still functions properly.

7.2 Warranty

The PBDP-100 Profibus Communications Interface is covered under warranty by ICC for a period of 12 months from the date of installation, but not to exceed 18 months from the date of shipment from the factory. For further warranty or service information, please contact Industrial Control Communications or your local distributor.

8. Selecting the Profibus Network Address

The PBDP-100 interface provides two different methods for configuring the node's Profibus network address. One method uses the inverter number parameter read from the drive connected to Channel A, and the other method uses a locally stored (stored in EEPROM on the PBDP-100 itself) address.

When shipped from the factory, the PBDP-100's default configuration is to use the value set in the inverter number parameter (F802) of the drive connected to Channel A as its Profibus node address. Depending on the software version of the drive connected to channel A, this parameter is adjustable from either 0 ~ 31 or 0 ~ 63.

Since Profibus addressing allows for node addresses to be set from 0 ~ 125, there may be instances where the upper limit of the inverter number parameter setting is not high enough to support a desired node address (for example, if you want to set a node to address 95) In these instances, the locally stored slave address parameter can be used, which supports the full Profibus node addressing range of 0 ~ 125.

The selection of whether to use the drive on Channel A's inverter number parameter or the locally stored slave address is performed by writing to communication number 0xFC80 via the parameter access procedure described in section 10.3. The following settings are valid for this parameter:

Parameter Number	Parameter Data	Meaning
0xFC80	0	Use drive on Channel A's inverter number setting
0xFC80	1	Use local slave address setting

The factory default setting is 0. If it is desired to change this configuration, you only need to write to parameter number 0xFC80 once; the setting is then retained in nonvolatile memory until it is changed again. Parameter number 0xFC80 can be accessed via either Channel A or Channel B (refer to sections 9 and 10 for more information on Channel A and Channel B). Either a RAM/EEPROM write (REQ1:REQ0 = 1:0) or a RAM-only write (REQ1:REQ0 = 1:1) can be used – both will cause a write to the EEPROM on-board the PBDP-100. Reading from parameter number 0xFC80 will return its current setting.

The default setting of the locally stored slave address is 126. If "use local slave address" is selected, this address must be changed via the Profibus set_slave_address service prior to completion of network commissioning in order for the PBDP-100 to achieve the Data_Exchange state.

Once the source of the PBDP-100's node address is selected, the Profibus set_slave_address service can be used to change the Profibus node address.

- If the drive connected to Channel A is the source of the node address, the set_slave_address service will change the drive's inverter number parameter (F802). If the address passed via the set_slave_address service is outside the valid range of the parameter (for example, 95), the service will be acknowledged but the change request will be ignored.

- If the locally stored slave address is the source of the node address, the set_slave_address service will change only the local address – it will not modify any drive parameters.

If the No_Add_Chg field of the set_slave_address service is set, future set_slave_address service requests sent to this node will be refused. Note the following precautions pertaining to the No_Add_Chg field:

- If the drive connected to Channel A is the source of the node address, the inverter number parameter can be changed locally from the drive's keypad regardless of the No_Add_Chg setting. While this provides an easy method to change the node's address even after No_Add_Chg is set, it does not provide a secure method of "locking in" the address when network security is critical.
- If the locally stored slave address is the source of the node address, activating the No_Add_Chg setting will cause all future set_slave_address services to be refused. Also, all attempts to change the address source from "use local slave address" (register 0xFC80 = 1) to "use drive on Channel A's inverter number" (register 0xFC80 = 0) will return a "cannot execute" error (error code 0x0001 – refer to section 10.4 for more information). This provides maximum network slave address security, but must be used with caution as it will become impossible to further change this node's address when selecting these conditions. If this configuration is selected, but it becomes necessary at some later point to change the node's address (e.g. if a node is being relocated), contact Industrial Control Communications or your local distributor for instructions on how to reset the PBDP-100 to its factory default settings.

The node address is only read during initialization of the PBDP-100. Therefore, if the node address is configured to be from the drive connected to Channel A, and that drive's inverter number parameter is changed locally via the keypad, the PBDP-100 must be reinitialized to be made aware of the change by:

1. Momentarily powering-off drive A (from which the PBDP-100 receives power), or
2. Issuing a reset command to the PBDP-100 via the Profibus network by writing to parameter number 0xFC81. Writing data 0xFFFF will reset the PBDP-100, and writing data other than 0xFFFF will cause the PBDP-100 to return a "data error" response. Register 0xFC81 can be accessed via either Channel A or Channel B, using either a RAM/EEPROM write or RAM-only write. Reading from register 0xFC81 will always return 0.

Parameter Number	Write Parameter Data	Meaning
0xFC81	0xFFFF	Reset the PBDP-100
0xFC81	Any other value	Return "data error" in response packet

9. Exchanged Data Structures

9.1 Output (Control) Data Format

The size of the output data structure from the network master to the PBDP-100 depends on the module selected from the GSD file for the network configuration tool. Module #1, intended for applications where only 1 drive is connected to the PBDP-100 (via Channel A), is comprised of 16 bytes structured as four 32-bit words. Module #2, intended for applications where drives are connected to both Channel A and Channel B, is comprised of 32 bytes structured as eight 32-bit words.

Offset	Data	Offset	Data
0	Reserved	16	Reserved
1	Reserved	17	Reserved
2	Drive A command high byte	18	Drive B command high byte
3	Drive A command low byte	19	Drive B command low byte
4	Reserved	20	Reserved
5	Reserved	21	Reserved
6	Drive A frequency command high byte	22	Drive B frequency command high byte
7	Drive A frequency command low byte	23	Drive B frequency command low byte
8	Reserved / Drive A action bits	24	Reserved / Drive B action bits
9	Reserved	25	Reserved
10	Drive A parameter number high byte	26	Drive B parameter number high byte
11	Drive A parameter number low byte	27	Drive B parameter number low byte
12	Reserved	28	Reserved
13	Reserved	29	Reserved
14	Drive A parameter data to write high byte	30	Drive B parameter data to write high byte
15	Drive A parameter data to write low byte	31	Drive B parameter data to write low byte

Locations marked “Reserved” in the above table are reserved for future use. Although any data placed in these locations is currently ignored, future releases of the PBDP-100 may use these locations for data transfer.

The format of all information transferred for Drive B is identical to that for Drive A. Therefore, all data descriptions given here apply equally for both Drives A and B.

Command Word

Bit-mapped drive control command word. This is the location where run/stop, etc. commands are written. An example command word can be found in Table 1. Because the format of this command word depends on the drive manufacturer's specifications, please refer to your drive manufacturer's *Serial Communications Manual* for the exact structure of this word.

Using the example command word in Table 1, some representative command words that can be used to control your drive via the Profibus network are:

0xC400 .....Profibus command valid, Profibus frequency valid, drive run forward
0xC600 .....Profibus command valid, Profibus frequency valid, drive run reverse
0xC000 .....Profibus command valid, Profibus frequency valid, drive stop
0xE000 .....Profibus command valid, Profibus frequency valid, reset drive fault

Although the above examples all show Profibus command and frequency valid, input (status) data can always be monitored from the network regardless of the settings of bits 14 and 15 in the command word.

Table 1 : Example Command Word Format

	Bit	Function	0	1
High Byte	15	Command source	Local	Network
	14	Frequency command source	Local	Network
	13	Fault reset	N/A	Reset
	12	Emergency OFF command	N/A	EOFF
	11	Coast stop command	N/A	Coast stop
	10	Run / stop command	Stop	Run
	9	Forward / reverse selection	Forward	Reverse
	8	Jog command	N/A	Jog
Low Byte	7	DC injection braking	N/A	DC injection cmd.
	6	Accel / decel #1/#2 selection	#1	#2
	5	Reserved	--	--
	4	Reserved	--	--
	3	Preset speed 4	OFF	ON
	2	Preset speed 3	OFF	ON
	1	Preset speed 2	OFF	ON
	0	Preset speed 1	OFF	ON

Frequency Command

The data contained in the frequency command word is the desired frequency command multiplied by 100, and then converted to hexadecimal. In other words, if a frequency command of 55.34Hz is desired, then 55.34 x 100 = 5534, which converted to hexadecimal is 0x159E. The frequency command high byte (offset 6 or 22) must therefore contain 0x15, and the frequency command low byte (offset 7 or 23) must contain 0x9E.

If the frequency command exceeds limiting drive parameters (such as UL or FH), the drive will ignore it, maintaining its current setting.

Action Bits / Parameter Number

Parameter action bits and 16-bit parameter register number. Refer to section 10 for a detailed explanation of these items.

Parameter Data

During parameter register writes, this word contains the data to write. Refer to section 10 for a detailed explanation of this data word

Again, in case of any discrepancies, documentation provided by your drive manufacturer supercedes the examples given here.

9.2 Input (Status) Data Format

The size of the input data structure from the PBDP-100 to the network master depends on the module selected from the GSD file for the network configuration tool. Module #1, intended for applications where only 1 drive is connected to the PBDP-100 (via Channel A), is comprised of 24 bytes structured as six 32-bit words. Module #2, intended for applications where drives are connected to both Channel A and Channel B, is comprised of 48 bytes structured as twelve 32-bit words.

Offset	Data	Offset	Data
0	Reserved	24	Reserved
1	Reserved	25	Reserved
2	Drive A status high byte	26	Drive B status high byte
3	Drive A status low byte	27	Drive B status low byte
4	Reserved	28	Reserved
5	Reserved	29	Reserved
6	Drive A output frequency high byte	30	Drive B output frequency high byte
7	Drive A output frequency low byte	31	Drive B output frequency low byte
8	Reserved	32	Reserved
9	Reserved	33	Reserved
10	Drive A output current high byte	34	Drive B output current high byte
11	Drive A output current low byte	35	Drive B output current low byte
12	Reserved	36	Reserved
13	Reserved	37	Reserved
14	Drive A output voltage high byte	38	Drive B output voltage high byte
15	Drive A output voltage low byte	39	Drive B output voltage low byte
16	Reserved / Drive A response bits	40	Reserved / Drive B response bits
17	Reserved	41	Reserved
18	Drive A parameter number response high byte	42	Drive B parameter number response high byte
19	Drive A parameter number response low byte	43	Drive B parameter number response low byte
20	Reserved	44	Reserved
21	Reserved	45	Reserved
22	Drive A parameter data response high byte	46	Drive B parameter data response high byte
23	Drive A parameter data response low byte	47	Drive B parameter data response low byte

Locations marked “Reserved” in the above table are reserved for future use. Presently, all “Reserved” input data is set to 0 by the PBDP-100. Future releases of the PBDP-100, however, may use these locations for data transfer.

The format of all information transferred for Drive B is identical to that for Drive A. Therefore, all data descriptions given here apply equally for both Drives A and B.

Status Word

Bit-mapped drive status word. This is the location where run/stop status, etc. values are monitored. An example status word can be found in Table 2. Because the format of this status word depends on the drive manufacturer’s specifications, please refer to your drive manufacturer’s *Serial Communications Manual* for the exact structure of this word.

Note that bit #15 is normally “reserved” by the drive manufacturer. The PBDP-100 uses this bit, however, to indicate whether it has established an open line of communications with the drive connected to that channel. Once a connection has been established with the drive, this bit will normally indicate “Online”. While searching for a drive (such as during initialization) and when no drive is connected, this bit will indicate “Offline”, and all other input data will be “0”. If this status bit indicates “Offline”, but there is a drive connected to the channel in question, check the cable connections and verify that the drive is powered. If an “Offline” indication appears intermittently during operation, check the quality of the drive communication cable connections, and verify that the drive communication cable is not routed near other electrical noise-producing cables or equipment.

Table 2 : Example Status Word Format

	Bit	Function	0	1
High Byte	15	Drive online / offline status	Online	Offline
	14	Reserved	Always “0”	
	13	Reserved	Always “0”	
	12	Reserved	Always “0”	
	11	Reserved	Always “0”	
	10	Run / stop status	Stopped	Running
	9	Forward / reverse status	Forward	Reverse
	8	Jog status	Not jogging	Jogging
Low Byte	7	DC injection braking status	Not DC injection braking	DC injection braking
	6	Accel / decel #1/#2 status	#1	#2
	5	Reserved	Always “0”	
	4	Reserved	Always “0”	
	3	Reserved	Always “0”	
	2	Reserved	Always “0”	
	1	Reserved	Always “0”	
	0	Reserved	Always “0”	

Output Frequency

Continuously reports the drive's operating frequency. In order to determine the drive's actual output frequency, the data contained in the output frequency word offsets must first be converted from hexadecimal to decimal, and then divided by 100. For example, if the output frequency high byte is 0x12 and the output frequency low byte is 0x34, then 0x1234 converted to decimal is 4660. Dividing this number by 100, the actual operating frequency of 46.60Hz is obtained.

Output Current

Continuously reports the drive's output current in %. In order to determine the drive's actual output current, the data contained in the output current word offsets must first be converted from hexadecimal to decimal, and then divided by 100. For example, if the output current high byte is 0x23 and the output current low byte is 0x15, then 0x2315 converted to decimal is 8981. Dividing this number by 100, the actual output current of 89.91% rated drive current is obtained.

Output Voltage

Continuously reports the drive's output voltage in %. The actual output voltage calculation method is identical to that for output current given above.

Action Bits / Parameter Number

Parameter action bits and 16-bit parameter register number. Refer to section 10 for a detailed explanation of these items.

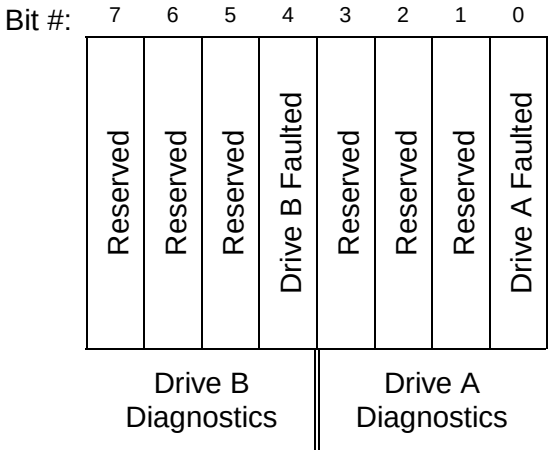
Parameter Data

During parameter register reads, this word contains the requested data response. Refer to section 10 for a detailed explanation of this data word

Again, in case of any discrepancies, documentation provided by your drive manufacturer supercedes the examples given here.

9.3 Diagnostics

When one of the connected drives trips, 1 byte of high-priority user diagnostics is supplied to the Profibus master. The format of the diagnostics byte is shown here:



Reserved bits indicated in the above table are currently set to “0” by the PBDP-100, but may be used to transfer data in future releases.

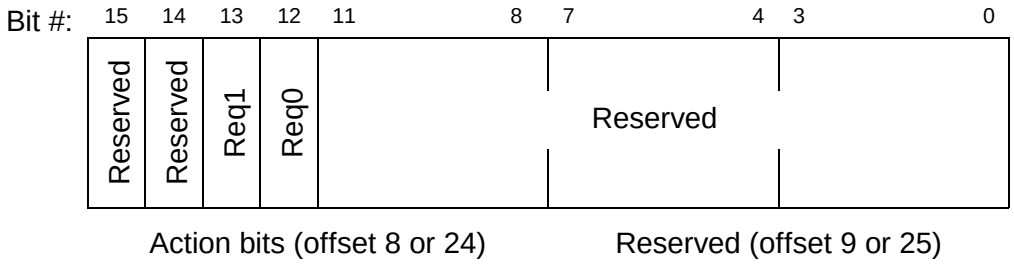
When a drive’s fault condition is cleared, a diagnostics status update is generated indicating the drive’s exit from the tripped state.

10. Parameter Register Access

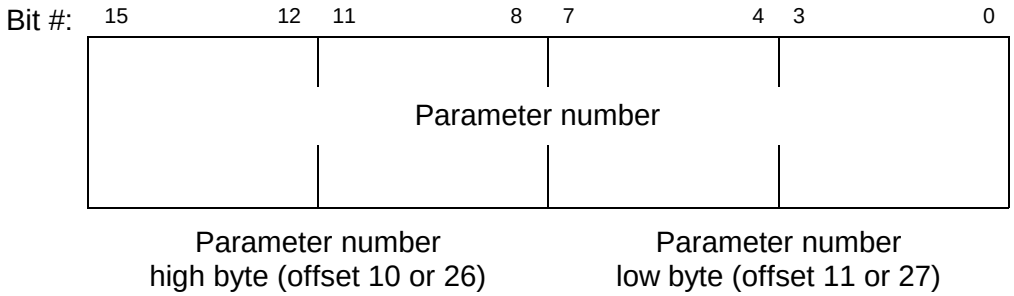
10.1 Parameter Number / Action Output Words

To access drive parameters, 2 output words and 2 action bits are provided in each drive's output data structure. The structure of these output words and action bits is as follows:

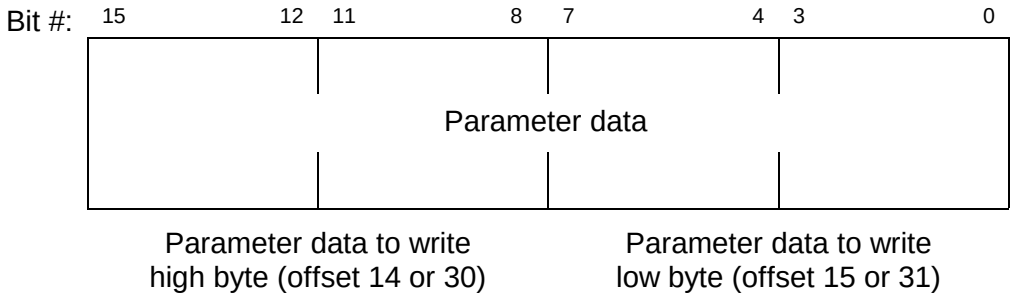
Action bits



Parameter number word



Parameter data write word

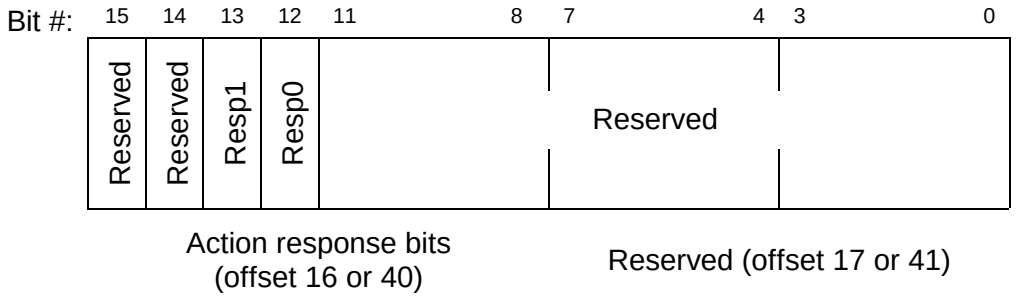


Note that all locations marked "Reserved" are ignored by the PBDP-100.

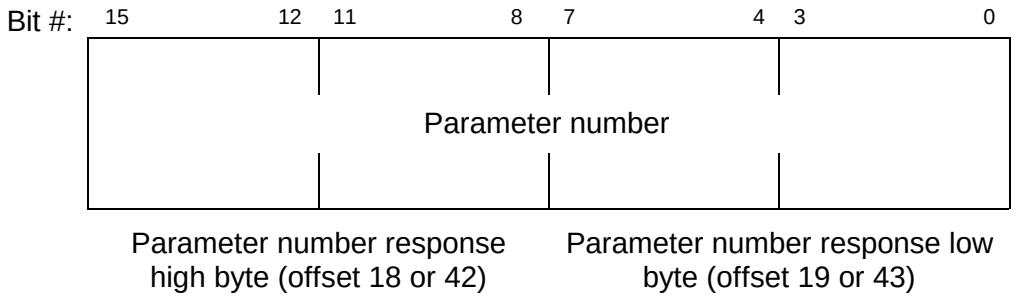
10.2 Parameter Number / Action Input Words

The response by the PBDP-100 to parameter read and write requests is placed in 2 input words and 2 input bits of the input data structure. The structure of these data items is as follows:

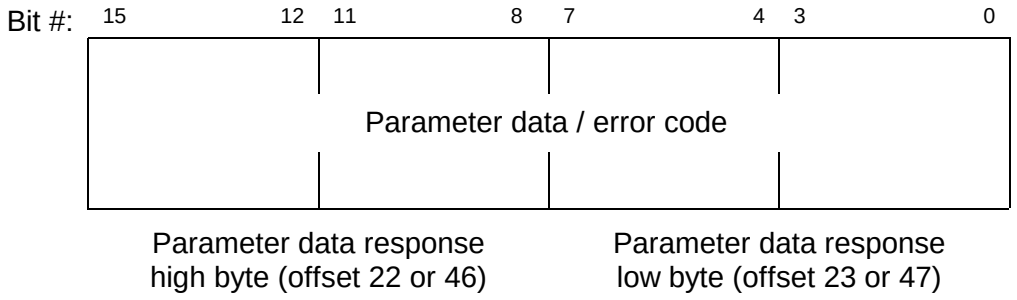
Response bits



Parameter number response word



Parameter data / error code response word



Note that all locations marked “Reserved” are set to 0 by the PBDP-100.

10.3 Parameter Access Procedure

In order to read from a parameter or write to a parameter, 2 control bits are provided for each drive's data structure. These bits, labeled Req1 and Req0 in the Action Bits word, can have the following values:

Req1	Req0	Meaning
0	0	No action (idle state)
0	1	Parameter read
1	0	Parameter write (RAM & EEPROM)
1	1	Parameter write (RAM only)

Similarly, when a drive responds to a parameter read or write request, 2 status bits per data structure are provided. These bits, labeled Resp1 and Resp0 in the Action Bits Response word, can have the following values:

Resp1	Resp0	Meaning
0	0	No action (idle state acknowledge)
0	1	Parameter read success acknowledge
1	0	Parameter write success acknowledge
1	1	Error indication

Note that the PBDP-100 will respond with Resp1:Resp0 = 1:0 upon a successful parameter write, regardless of whether the write was to RAM & EEPROM or to RAM only.

Performing a parameter read or write action from the Profibus master involves the following process:

1. Send a "no action" code (Req1=0 and Req0=0). Every parameter access must begin from the idle state. Once this state is sent, the Profibus master must then wait for the PBDP-100 to respond with an idle state acknowledge (Resp1=0 and Resp0=0).
2. If the action is to be a data write, set the parameter data in the parameter data write word. If the action is to be a data read, the parameter data write word value is irrelevant.
3. Set the parameter register number and action code (Req1 and Req0). For an explanation of parameter register numbers, refer to section 11.
4. Once the PBDP-100 receives the read or write request, it will begin processing it. The time required to complete the request depends primarily on the connected drive's baud rate setting, but can vary from several milliseconds to several tens of milliseconds.
5. Once the PBDP-100 has completed the request, it will place its response in the action bits response, parameter number response, and data / error code response locations:
    - If the request was a read, and the read was performed successfully, this will be indicated to the master by Resp1:Resp0 changing from 0:0 to 0:1. The parameter number response will equal the accessed parameter number, and the resulting data read will be placed in the data / error code response word.

- If the request was a write, and the write was performed successfully, this will be indicated to the master by Resp1:Resp0 changing from 0:0 to 1:0. The parameter number response will equal the accessed parameter number, and the data written to the drive will be reflected in the data / error code response word.
- If an error occurred during the read or write request, this will be indicated to the master by Resp1:Resp0 changing from 0:0 to 1:1. The parameter number response will equal the parameter number that the master was attempting to access, and an error code reflecting the failure cause will be placed in the data / error code response word. For a list of possible error codes, refer to section 10.4.

6. In order to perform another parameter read or write, the master must once again send a “no action” code (Req1=0 and Req0=0), and the PBDP-100 must once again respond with an idle state acknowledge (Resp1=0 and Resp0=0) before the next read or write action can take place. Until a “no action” code is sent to the PBDP-100, the interface will ignore all data in the action bits, parameter number and parameter write data words. Also, as long as the master sends the “no action” code, the PBDP-100 will loop-back in the parameter number response word and parameter data / error code response word whatever data is sent to it in the corresponding output words.

The above procedure explanation holds true for both drives A and B, using the respective request and response locations in the output and input data structures.

10.4 Register Access Error Codes

When a parameter read or write error occurs, one of the following error codes will be returned in the parameter data response word:

Error Code	Meaning
0x0001	cannot execute
0x0002	data error (written data value outside of valid range)
0x0003	invalid parameter number
0x0004	checksum error
0x0005	attempt to write to a read-only register
0x0006	attempt to read from a write-only register
0x0007	other / unclassified error
0x0008	drive offline

11. Parameter Registers

The parameters that can be accessed via the parameter register access method outlined in section 10 are defined by your drive manufacturer. For a listing of the available parameters, their adjustment ranges and notable access behavior, refer to the appropriate "Parameter Reference" section of the drive's *Serial Communications Option Manual*.

The following parameter numbers, which are not implemented in the drives, are used to access local information on the PBDP-100:

Communication Number	Function	Read / Write	Adjustment Range
0xFC80	Drive/local address selection	Both	0 = use Drive A's inverter number setting 1 = use PBDP-100 local address setting
0xFC81	PBDP-100 reset	Write only. Read always returns 0.	0xFFFF = reset PBDP-100
0xFC82	PBDP-100 software version	Read only	High byte = software version Low byte = software revision

When writing to one of the above local registers, it does not matter whether the RAM & EEPROM (Req1:Req0 = 1:0) write or RAM only (Req1:Req0 = 1:1) write is used; the same action is performed. It also does not matter whether Channel A's or Channel B's parameter access registers are used; since these local registers are channel-independent, the same data/function will be accessed from both channels.

12. GSD File

The following is a copy of the PBDP-100 interface's GSD file, which is used for network commissioning and administration. An electronic version of this file can be downloaded via the internet from http://www.iccdesigns.com. If any future revisions to this file are required, they will also be posted on our web site.

```
;===============================================================;
;       GSD File for ICC PBDP-100                               ;
;                                                               ;
;       Industrial Control Communications                       ;
;       2202 Timberloch Place, Suite 210                        ;
;       The Woodlands, TX  77380-1163                           ;
;       Phone: (281) 367-3007                                   ;
;       Fax:   (281) 367-2177                                   ;
;       http://www.iccdesigns.com                               ;
;                                                               ;
;       File name: ICC088A.GSD                                  ;
;===============================================================;
;       Rev. 0  05.29.99        DH      Initial file entry      ;
;===============================================================;
;
#Profibus_DP
; Unit Definition List:
GSD_Revision            = 0
Vendor_Name             = "ICC"
Model_Name              = "PBDP-100 ASD Interface"
Revision                = "Rev. 0"
Ident_Number            = 0x088A
Protocol_Ident          = 0
Station_Type            = 0
FMS_supp                = 0
Hardware_Release        = "Rev. A"
Software_Release        = "Ver. 1.0"
;
9.6_supp                = 1
19.2_supp               = 1
93.75_supp              = 1
187.5_supp              = 1
500_supp                = 1
1.5M_supp               = 1
3M_supp                 = 1
6M_supp                 = 1
12M_supp                = 1
;
MaxTsdr_9.6             = 60
MaxTsdr_19.2            = 60
MaxTsdr_93.75           = 60
MaxTsdr_187.5           = 60
MaxTsdr_500             = 100
MaxTsdr_1.5M            = 150
MaxTsdr_3M              = 250
MaxTsdr_6M              = 450
MaxTsdr_12M             = 800
;
Redundancy              = 0
Repeater_Ctrl_Sig       = 2
;
; Slave Specification:
24V_Pins                = 0
;
```

```
Implementation_Type     = "SPC3"
Freeze_Mode_supp        = 1
Sync_Mode_supp          = 1
Auto_Baud_supp          = 1
Set_Slave_Add_supp      = 1
Min_Slave_Intervall     = 1
;
Modular_Station         = 1
Max_Module              = 2
Max_Input_Len           = 48
Max_Output_Len          = 32
Max_Data_Len            = 80
Max_Diag_Data_Len       = 8
Slave_Family            = 1
OrderNumber             = "PBDP-100"
;
; Module Definitions:
Module = "PBDP-100 (1 drive)" 0xF1,0xF1,0xD1,0xD1,0xF3
EndModule
Module = "PBDP-100 (2 drives)"
0xF1,0xF1,0xD1,0xD1,0xF3,0xF1,0xF1,0xD1,0xD1,0xF3
EndModule
```

13. Notes

ICC

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