A Dynamic *Force* in Industrial *Automation* and Controls

Power Supply

Power Cordsets
Pages 108-111

Molded Cordsets
see Brad Harrison®
Designer's Guide

Control Engine

Network Interface
see Industrial
Communication
Solution Guide

Double-Ended Cordsets
Pages 88-89
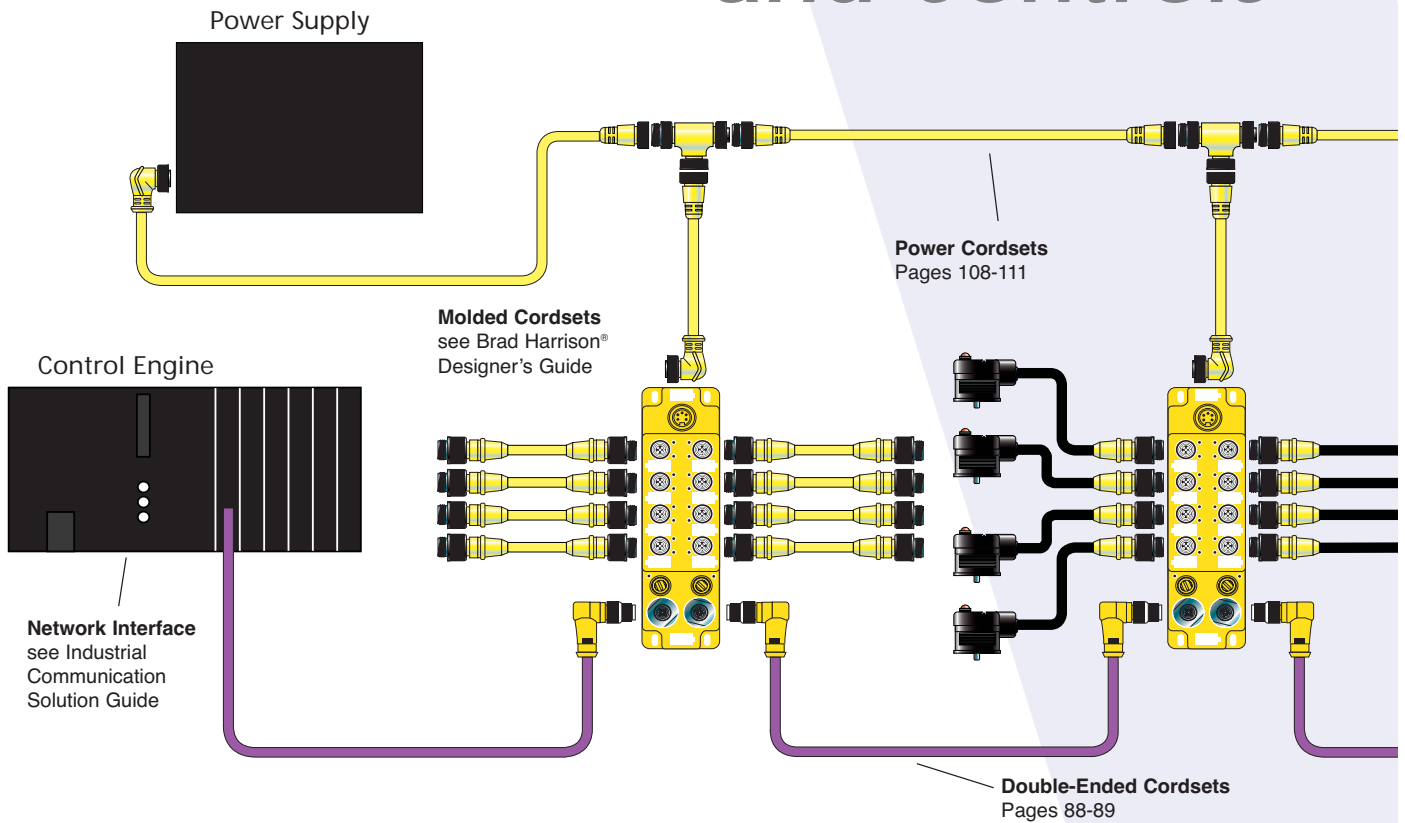
COMPONENTS AND ELEMENTS OF PROFIBUS SYSTEM

Control Engine
PC "soft controllers" or PLCs can act as the main logic solvers, taking the current I/O status information of the network and solving these operations through the main control program. The new status of the I/O is then updated via the network interface to the actuators, starters and interface panels. Many times a central control engine often acts as the Profibus "master" which initiates and controls many of the messaging sequences of the network.

Network Interface
The scanner resides in the host controller whether it is a PLC or PC, providing a network connection. The scanner exchanges a data table, which is loaded with the various values of the inputs and outputs, with the logic controller to solve the various logical expressions. Simultaneously, the operation of the master and/or slave protocols is completed. The logical expressions are then re-exchanged with the data table for communication out to the various nodes and I/O residing on the network. The scanner generally supports all standard baud rates of the network.

Gateways
Seamlessly transfers data in real time between dissimilar network protocols.

Media
Profibus uses a linear bus topology. At lower speeds it can be used with short drops from the main line to the active modules. Modules or nodes connected to the bus in this way can be 'hot swapped' without taking the bus off line. Unlike DeviceNet, the module or node power is not included in the bus media and has to be provided by separate connections.

Data Media
The main Profibus cable is of a shielded twisted pair design. It does not contain any conductors to power the Profibus modules or nodes, this is provided through the power media. The connectivity for the active modules uses a shielded Brad Harrison reverse keyway, 5-pole connector design. The data connectivity is complemented with T-Splitters to connect the bus to the active modules and 9-pin D-sub connectivity for other Profibus compatible devices.
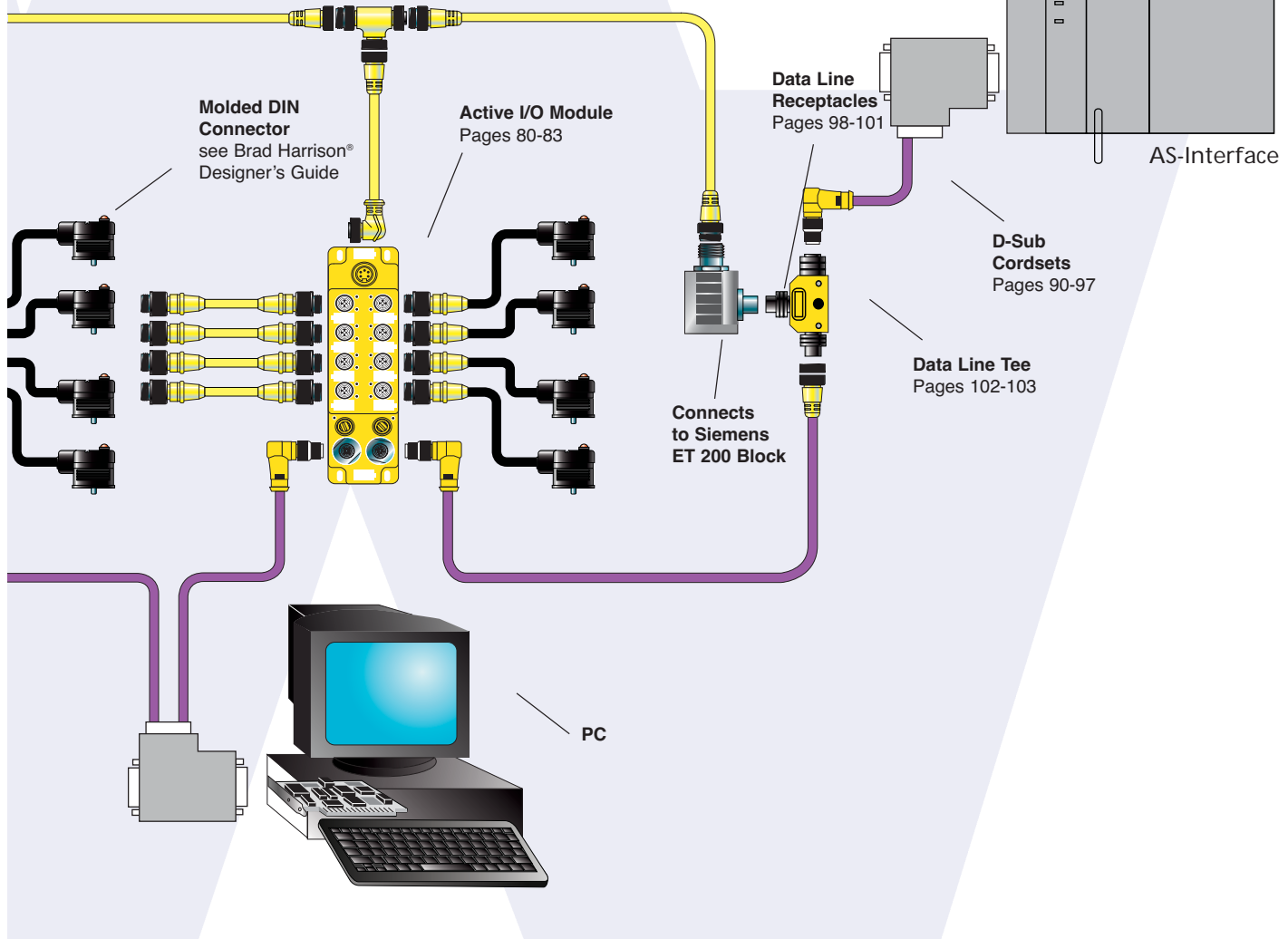
Power Media
Power is supplied to the active modules via a 5 pole Mini-Change® connector. Two of the contacts are used to provide power to the module's electronic circuits and any input devices such as proximity switches. A separate and isolated power circuit is provided via another two contacts. This is used for output devices only and is not required on input only modules. This second supply should be controlled via the machine's safety systems to ensure that no outputs are activated during operator interface with the machine.

BradCommunications™
from Woodhead Industries

BradConnectivity™
from Woodhead Industries

BradControl™
from Woodhead Industries

BradPower™
from Woodhead Industries

BRAD® PROFIBUS

*Through its leading connectivity brands SST ™, applicom™, Brad Harrison® and mPm®, Brad automa-
tion products give the user and designer of a Profibus system a complete Communication and
Connectivity solution – from scanner card to media infrastructure to I/O connection. No other com-
pany provides such a comprehensive backbone of connectivity, while giving you the power to choose
other elements of a control system. You can select which control engine you want, whether it is PC
or PLC based; we get you onto the network. You can choose which control architecture – centralized or
distributed – that makes the most sense to you. Whether you are connecting motor controllers, valve
banks or sensors, we ensure that connectivity to those points are there. Brad products can be your
provider of Profibus connectivity from control engine to sensor!*

**Molded DIN
Connector**
see Brad Harrison®
Designer's Guide

Active I/O Module
Pages 80-83

**Data Line
Receptacles**
Pages 98-101

AS-Interface

**D-Sub
Cordsets**
Pages 90-97

Data Line Tee
Pages 102-103

**Connects
to Siemens
ET 200 Block**

PC

Active I/O Modules
The active I/O modules provide the connectivity between multiple passive
field devices such as proximity switches or solenoid valves and the main field
bus, allowing machine builders the choice to use standard I/O devices in the
construction of their machines. A module's inputs and outputs are short cir-
cuit protected with LED indication of their current state and fault condition.
Other LEDs provide indication of module, bus and auxiliary power status.
The module's address is set by means of two rotary switches. On power up
the unit reads its address from the switches and automatically detects the
baud rate of the network and adjusts to the correct speed.

I/O Connectivity
Standard BradConnectivity™ cordsets are used to connect the I/O devices
to the active modules. These should be selected in the normal way con-
sidering the type of devices to be connected, their location and operating
environment. The combinations typically used with these active modules are
Micro-Change® male connectors to either Micro-Change, Nano-Change®
or mPm female connectors.

PROFIBUS – SYSTEM OVERVIEW

Profibus is a standardized global open network communication system that boasts one of the largest installed system bases, with well over 2,000,000 devices being installed to date, covering many areas of modern factory automation. Profibus DP permits Mono-master or Multi-master systems, which provides a high degree of flexibility during system configurations. Profibus allows all automation devices, sensors, actuators, PLC's, etc to communicate with each other over a single bus.

Profibus DP offers the user an open standard per EN50170. This means the user has a great deal of choice from leading manufacturers and is able to choose the right product for the application.

Profibus DP has been developed for high-speed communication and fast cyclic updates up to12 Mbits per second; the system offers response times less than 1ms per 1000 I/O points.

Profibus devices all have different performance characteristics. Features differ in regard to the available functionality (i.e. the number of I/O diagnostic messages available) or possible bus parameters such as baud rates. These parameters are usually documented in the technical specification manual. In order to achieve a simple plug-and-play configuration of Profibus, the characteristics are specified in an electronic data sheet called a device database, or GSD file. Standardized GSD data expand open communication up to the operator control level. Using configuration tools based on GSD files makes integration of devices from different vendors in a bus system simple and very user friendly.

Profibus Messaging

Profibus offers both polling and peer-to-peer communication. Profibus DP is a polling network. Its assigned master periodically requests the status of each node, ensuring that each device on the network (which can send up to 244 bytes per scan) is updated consistently and reliably. Each message contains up to 12 bytes of overhead for a maximum message length of 256 bytes.

ADDRESSING

Addressing

Profibus DP supports up to 126 nodes that can be addressed. The Brad® Profibus DP I/O module allows up to 99 addresses and will indicate a communication error if a module is given a duplicate address. Software node commissioning can be accomplished through rotary switches. The addressing is performed manually by setting two rotary switches located under the IP68 protective caps. Power must be cycled to a module when its address is changed.

The Profibus DP network allows the use of repeaters. When repeaters are used they must be assigned an appropriate address. Addressing must be completed prior to commissioning. All Profibus I/O modules are supported by GSD files, which are specifically formatted files containing detailed device information. Information that is found in the GSD file includes how to configure the module, module description, I/O characteristics, and the module's configurable parameters.

COMMUNICATION RATE

Communication Rate

Profibus supports data rates from 9600 to 12 Mbits/second. Slave stations all have automatic baud rate adjustment. Data transmission rates are governed by the length of the bus network as shown in the following table:

MAXIMUM RATINGS

TRANSMISSION SPEED (BAUD RATE)	BUS SEGMENT (BUS LINE LENGTH)	REPEATERS (MAX. NUMBER)	NODES (MAX. NUMBER)
9.6 Kbps	1200m	7	32 WITHOUT REPEATERS, 126 WITH REPEATERS
19.2 Kbps	1200m	7	32 WITHOUT REPEATERS, 126 WITH REPEATERS
93.75	1200m	7	32 WITHOUT REPEATERS, 126 WITH REPEATERS
187.5 Kbps	1000m	7	32 WITHOUT REPEATERS, 126 WITH REPEATERS
500 Kbps	400 m	7	32 WITHOUT REPEATERS, 126 WITH REPEATERS
1.5 Mbps	200 m	4	32 WITHOUT REPEATERS, 126 WITH REPEATERS
12 Mbps	100 m	4	32 WITHOUT REPEATERS, 126 WITH REPEATERS