Honeywell

TDC 3000^X Network Gateway Specification and Technical Data

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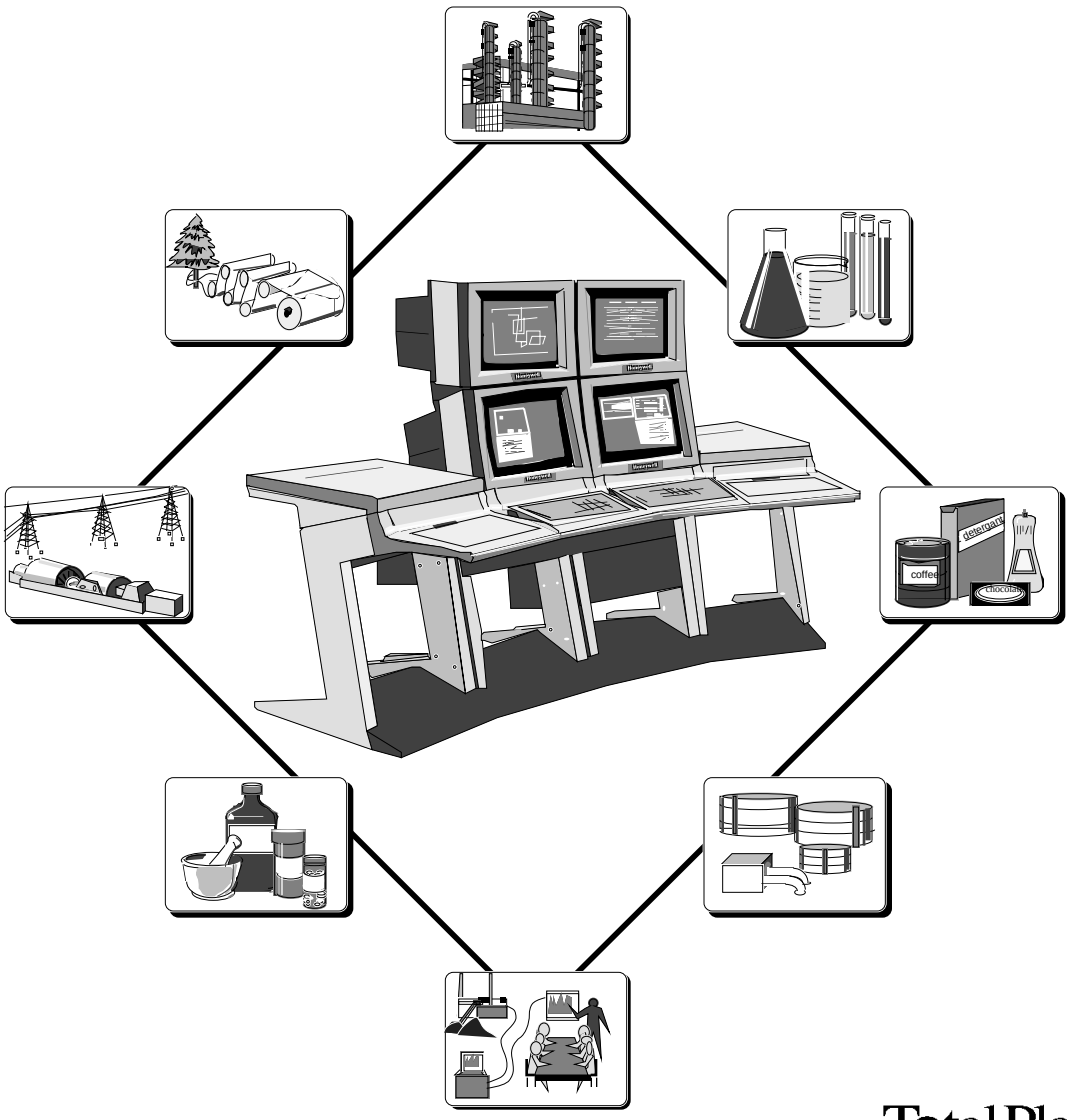

Total Plant

TDC 3000X Network Gateway

Specification and Technical Data

Introduction

This publication defines the significant functions of the Network Gateway (NG). The NG is a standard node on a TDC 3000X Local Control Network (LCN) that enables communication between many geographically separated Local Control Networks (LCNs) through a Plant Information Network (PIN).

For multiple LCN users, this networking scheme provides an easy and economical way for a TDC 3000X system on one LCN to communicate directly with other TDC 3000X systems located in physically separate control rooms.

The internetwork operations realized by this strategy include parameter access, file transfer, and control between all the LCNs connected to the network.

This single window access to plant-wide data enables a user at one TDC 3000X system to clearly assess the impact of events that occur both "upstream" and "downstream" of the user's local process. For example, an operator at a boiler house can see where steam is being used across the entire plant. In case of a shortage, the operator can determine which process areas to limit—with the least impact to the manufacturing process.

Figure 1 illustrates an example of two independent LCN systems connected together by their Network Gateways and a PIN. The PIN can be either a customer's previously installed carrierband, or fiber optic network, or it can be a new installation. Honeywell recommends that a separate channel of the communications media be dedicated to the PIN, in either type of installation.

Advantages

Advanced control strategies can be implemented, without the need for expensive upper-level computers, by linking your multiple TDC 3000X LCN systems through NGs.

A single Application Module (AM) on one LCN system can be used to perform any advanced control scheme, including cascade control, across different remote LCN systems.

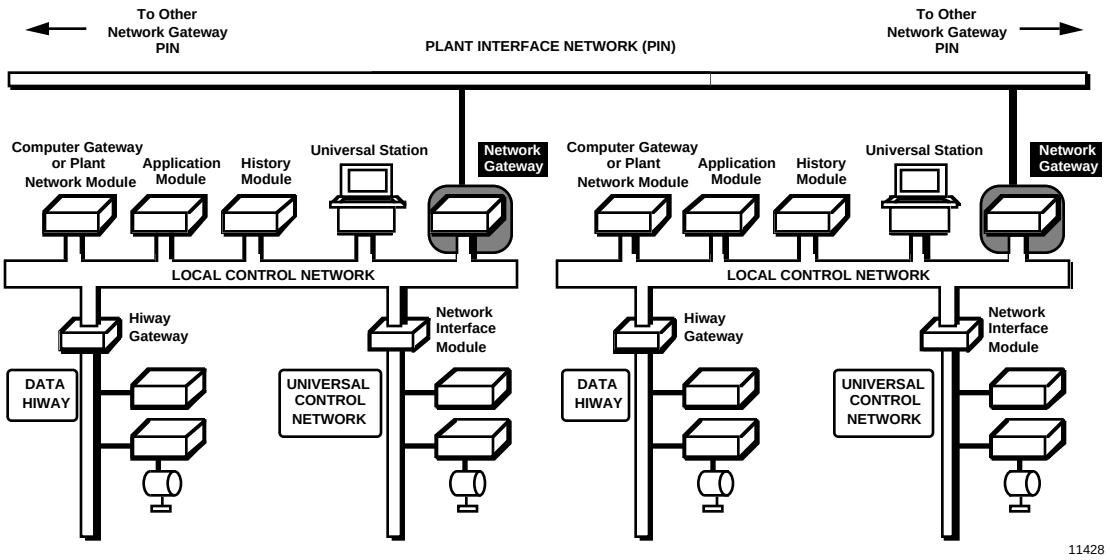

Figure 1 — TDC 3000X Architecture with Network Gateways

Unlike the Computer Gateway (CG), the NG does not require a *predefined point database*.

Plant-wide data is available to operators, engineers, maintenance, and management in seconds.

From his office, a plant manager can access or view data from any unit.

Engineering can effectively monitor, analyze, and make changes to control parameters, in Operator Personality, from a centralized location. They can more easily identify and correct control problems through the implementation of advanced control strategies.

Maintenance personnel can more easily identify, monitor, and diagnose many system problems from a central location, thereby minimizing repair and downtime.

To insure security, every incoming access request is checked for authorization by the local Network Gateway.

Data can be shared between physically separated process areas while maintaining the security of the independent LCN systems.

History collection and alarm propagation from one LCN to another across Network Gateways are not supported.

R4xx to R5xx Connectivity

Network Gateways feature connectivity between LCN releases R4xx and R5xx. Points and the files system are accessible between these major releases, subject to the limitation that new features in later releases may not be accessible on earlier releases.

NOTE: Only R400 (or higher) LCN systems support NGs — connectivity to R3xx or earlier LCN systems is not applicable.

Features of Internetwork Operations

- A standard interface between TDC 3000^X Local Control Networks.
- Allows hundreds of LCN nodes to intercommunicate.
- Point and file access between R400 and R500 LCNs via NG.
- Read and write point parameters to and from another LCN system.
- Transfer 1,200 parameters per second per NG with a typical three second delay (maximum five second delay).
- Display remote LCN points (including alarm states), at Schematic, Group, and Detail displays. (**Note Exception:** ACKSTAT collectors are not supported across the NG.)
- On-line file transfers to or from another LCN using standard utilities, such as copying schematic source and object files or listing file directories of a remote LCN History Module.
- Transfer files at 12,000 words per second.
- Advanced control allows AM points and CL control schemes to include points from remote LCN systems. Backup of remote networks (via NG) using AM CL program.
- Advanced control through the Computer Gateway/Plant Network Module allows upper level computers to include remote LCN points in their control schemes.
- Allows cascaded control for plant-wide control optimization.
- Inbound security on each parameter access and file transfer.
- Only an NCF change is required to install. No checkpointing or database to build for the NG.

Features of the Plant Information Network

- Secure token passing.
- IEEE 802.4 Fiber optic or carrier band network.
- Single or dual cables with automatic cable switchover.
- Displays PIN communication status between LCNs.
- Up to 64 NGs per PIN and a maximum of 10 NGs per LCN.

Functional Description

LCN Interconnections

The NG provides secure interfaces to both the LCN and PIN, ensuring secure, reliable access and transfer of data.

Each NG connected to a PIN uses one of 64 available addresses on the PIN. Up to ten NGs can be connected to each LCN system. Using this criteria, the number of LCNs that can be connected to a single PIN is limited only by these physical limits and the user's communications load—there is a capability for hundreds of LCN nodes to communicate with each other, essential for integrated plant solutions.

All the inter-connected LCNs must be running R400 (or higher) system software. (Only R4xx or higher LCN systems support the NG.)

Network Gateway Functions

From a Remote LCN, engineers can—

- Backup data on this LCN: Centralized remote backups may be implemented via the NG.
- Write and edit CL programs and text (ASCII) files.
- Copy any file to or from the local HM or Bernoulli to any remote HM.
- Implement plant-wide advanced control strategies from any AM or upper level computer.

From a Remote LCN, operators can—

- View any tagname from a Group or a Detail display.
- Change any tagname parameter, given security access.

From a Remote LCN, maintenance engineers can—

- View the operational status of all the NGs (local and remote) associated with that LCN on the Plant Information Network.
- Monitor the performance of the Network Gateway and associated Plant Information Network hardware.
- Monitor the performance of other LCN nodes.

Communications

NGs use Token Bus protocol, following the IEEE 802.4 (token Bus) specification for communication across the PIN.

Tagnames and LCN IDs

Each LCN system is given a unique alphanumeric two-digit identification number (LCN ID) which identifies that LCN system to other LCN systems.

When the points of a remote LCN are referenced in schematics, groups, CL programs, etc., the LCN identification number (LCN ID) is attached as a prefix to the tagname. In this way, two points on different LCN systems with the same tagnames can still be uniquely identified and referenced.

Any 8-character tagname in an LCN system is expanded to an 11-character tagname when the LCN ID is added, as in the example below:

```
FE\TIC1001
```

In standard displays such as Group and Detail displays, the LCN ID prefix is shown above the tagnames, as indicated below:

FE
TIC1001

In a similar fashion, the optional 16 character tagnames are expanded to 19 characters.

The LCN ID is not used when building the points on the local LCN system.

Remote LCN schematics that contain explicit PIN id references can be copied to an LCN on the same release and used on that remote LCN. Remote values (including alarm states) can be viewed on the schematic. In addition, remote LCN points can be included in the group display. Only the remote LCN schematic object codes need to be stored in the local LCN to operate the remote LCN schematics.

The detail display can be invoked for any remote LCN point. Real-time trending of remote points is also available.

Advanced Control

Cross-network advanced control uses the Internetwork Point Processor (IPP), a software point processor in the Application Module.

Algorithms or CL programs in an AM at the local LCN system can reference point parameter values from different remote LCN points. Background CL can also include remote LCN points.

Security

Three access levels are used by the NG to provide security:

- No Access
- Read Only
- Read and Write

Security access is further defined by:

- LCN System (LCN ID)
- Data Hiway Number for Hiway Gateways and PLCGs
- UCN Number for Network Interface Modules
- Unit Numbers for Application Modules and Computer Gateways
- Volume Names for History Modules

If proper permissions are configured at the local LCN system, file access to the local History Module (HM) can be initiated from a remote US, CG, or AM.

Alternate Routing Scheme (R410 and higher LCN software releases)

This function is available in LCN Release 410 (or higher) system software. With this feature implemented, two NGs on the same LCN are specified—a “responsible” NG and an “alternate” NGs.

The responsible NG normally routes messages to a remote LCN system. If an error occurs in the responsible NG's electronics module, the alternate NG is committed to take over the communication task.

Diagnostics

To provide quick isolation of communication problems, the operation of local and remote NGs can be monitored from any Universal Station. The maintenance displays include the following diagnostic information:

- Standard LCN Diagnostics.
- Indication of any change in NG responsibility (New, Changed, or Deleted).
- Cable configuration and quality (Good, Suspect, or Failed).
- Local and remote LCN connection requests.
- NG Performance Displays (Node characteristics, Receive, and Transmission statistics).

Options

Network Gateways support single-cable or dual-cable PINs. Two NG versions are available — one for use with a one-cable network and the other for use with a two-cable PIN. The single- and dual-cable network options are discussed below.

Single Cable Network

Figure 2 shows an example of two LCN systems connected to a single-cable Plant Information Network. Taps, splitters, combiners, terminators, etc., required to interface the PIN, are omitted here for clarity.

At least one NG must be present on each LCN. The NG is assigned an address on the PIN. In the single-cable system, a single fiber optic modem is required for each NG.

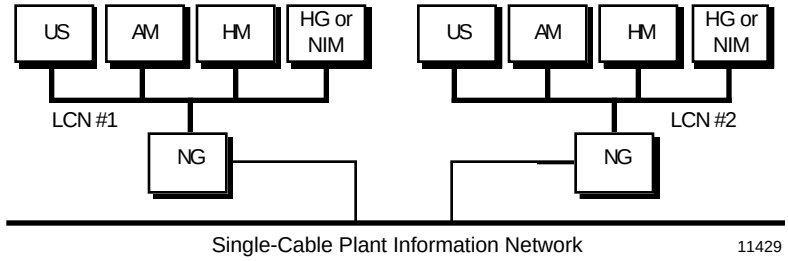

Figure 2 — Minimum Implementation for Two LCNs

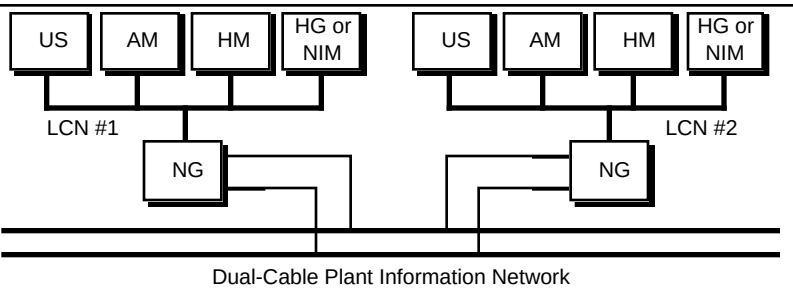

Figure 3 — Dual-Cable Implementation (Preferred) 11621

Dual Cable Network

To help insure cable integrity, the two-cable PIN is recommended.

Figure 3 is an illustration of the preferred dual-cable PIN. Each NG still has a single PIN address, but two modems are required to make connections to the PIN. This method is preferred because dual cable paths reduce the chance of network failure due to a damaged cable.

Each cable on the PIN is operated independently. The message traffic on one cable is composed of different messages than the traffic on the other cable. This technique significantly increases message throughput.

Test messages are generated periodically on each cable to assess communication quality and to monitor for possible cable failures. If a failure is detected, traffic is rerouted to either the good cable or along an alternate path (see 'Alternate Routing Scheme').

Unlike the LCN cable system, PIN dual cables are not "swapped" periodically.

Alternate Routing Scheme

Figure 4 illustrates the hardware necessary to implement the alternate routing scheme between LCN #1 and LCN #2. Each NG has a unique address, allowing it to share network traffic under normal operation.

In the illustration, NG 1r and NG 2r are the “responsible” Network Gateways, each being responsible for routing *(sending)* messages to one or more remote LCNs. Likewise, NG 1a and NG 2a are the “alternate” Network Gateways, each being designated to take over the routing tasks, if its responsible partner fails.

Each NG is capable of simultaneously routing messages to several remote LCNs. There is no rule for how many remote LCNs should be handled by a single NG and its alternate partner, but a given NG pair must be configured to route all of the messages to a given remote LCN. At some point, however, additional NGs will be needed in order to guarantee performance. A maximum of ten NGs may be configured on a single LCN.

When a responsible NG and an alternate NG pair are configured on an LCN system, only *one of them* is actively sending messages. This means that, at any given time, only one NG in an LCN system is actively sending messages to a given remote LCN system.

PIN Cable Options

Two hardware options are available for the PIN: Fiber optic and carrier band. The details of both of these hardware technologies are available in the IEEE 802.4 specification.

The fiber optic cable network operates at 10 megabits per second. The cable network conforms to IEEE specification 802.4.

Like other fiber optic networks, the PIN requires modems, splitters, combiners, active stars, taps, etc.

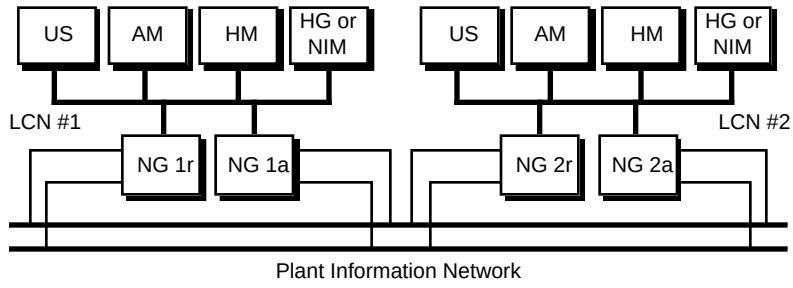

Figure 4 — Alternate Routing (R410 or higher LCN software) 11622

The fiber optic PIN is used in medium to long distance applications, up to 24 miles (38 km) maximum.

In addition to the fiber optic cable communications system another available option is a carrierband PIN, operating at 5 megabits per second. This option uses coaxial cable, and is limited to short distances, up to approximately 2,500 feet (750 m). The carrierband PIN option is suitable for indoor installation only (i.e., within the plant).

Neither of these two communication systems require any changes to the NG software. Only the corresponding modems with special I/O cards are required.

Both of the above PIN options (i.e., fiber optic and carrierband) can be used in single-cable, as well as dual-cable configurations.

Physical Description

The CG is supplied from the factory as a module (boardset) that installs in a dual node cardfile (electronics chassis). For additional information on the dual node cardfile (DNCF) see *System Technical Data*.

The NG boardset (single-cable version) consists of a dual node power supply, one Network Gateway Interface (NGI) board, and an LCN processor board. A choice of two LCN processor boards are available: K4LCN, (68040 microprocessor) and K2LCN (68020 microprocessor). The K4LCN version requires R500 (or higher) LCN system software, while the K2LCN version is compatible with R400 (or higher) LCN system software.

The NG connects to the Local Control Network through standard LCN coaxial connectors.

The dual-cable version of the NG boardset is identical to above, except for two NGI boards (instead of one).

Network Gateway Specifications

Physical Characteristics

Approximate Dimensions (In Dual Node Cardfile)

Height	18.8 cm (7")
Width	48.3 cm (19")
Depth	53.3 cm (21")

Approximate Weight

Dual Node Cardfile with:
- Single Node 14.6 kg (32 lb)
- Two Nodes 18 kg (40 lb)

Power Supply

Universal AC Input

102 - 264 VAC (autoranging power supply)

47-63 Hz (frequency range)

Operates without disruption through an interruption in the input ac voltage of up to 40 ms duration.
For power factor information and specific power consumption, see the appropriate site planning manuals.

Communications Specifications — Plant Information Network*

Network Specifications	IEEE 802.4
Data Rate	10 megabits per second (fiber) and 5 megabits per second (Carrierband)
Topology	• Medium to long distance (maximum 24 miles or 38 km) fiber optic cables with fiber optic modems operating at 10 megabits per second. • Short-distance (maximum 2500 feet or 750 m) carrierband coaxial cables with modems operating at 5 megabits per second.

* Numerous options are available to implement the IEEE 802.4 network standards. For more details, see your Honeywell representative or your fiber optic network consultant.

Performance

Point Parameter Transfers	File Transfers
1,200 point parameters per second	12,000 words per second

Note: Both point parameter transfers and file transfers can occur simultaneously.

Configuration Capability

Maximum Number of Network Gateways per LCN	10
Maximum Number of Network Gateways per PIN	64

Network Gateway Specifications (continued)

CE Conformity (Europe)

This product is in conformity with the protection requirements of the following European Council Directives: 73/23/EEC, the Low Voltage Directive, and 89/336/EEC, the EMC Directive. Conformity of this product with any other "CE Mark" Directive(s) shall not be assumed.

Deviation from the prescribed procedures and conditions specified in the installation manuals may invalidate this product's conformity with the Low Voltage and EMC Directives.

Product Classification	Class I: Permanently mounted, permanently connected Industrial Control Equipment with protective earthing (grounding). (EN 61010-1-1993)
Installation Category	Category II: Energy-consuming equipment supplied from the fixed installation. Local Level Appliances and Industrial Control Equipment . (EN 61010-1-1993)
Pollution Degree	Pollution Degree 2: Normally non-conductive pollution with occasional conductivity caused by condensation. (IEC 664-1-1992)
EMC Classification	Group 1, Class A, Industrial, Scientific and Medical (ISM) Equipment. (EN55011-1991; Emissions)
Method of Assessment	EMC: Technical Construction File (TCF) LVD: Technical File (TF)

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