



**WALKER  
SYSTEMS**

building  
intelligence

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**TECHNICAL DESCRIPTION**

**DDC Network Performance  
Benchmark Specification**

(FOUR BENCHMARKS FOR  
MEASURING NETWORK  
PERFORMANCE IN DISTRIBUTED  
DIRECT DIGITAL  
CONTROL SYSTEMS)

FORM # WSC99-003

REVISION 1

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# SUMMARY

Walker Systems Corporation has developed a network performance benchmark specification for networked DDC systems. This specification details four benchmark tests that can be performed on various types of networks to provide comprehensive, unbiased comparisons of network throughput and speed.

Benchmark tests are specified that will determine throughput and speed for both small and medium networks under normal to heavy and heavy to extreme loading conditions. These benchmark tests focus on four main areas of concern with DDC networks: trending, high priority alarm response, point-to-point data transfer and operator access times.

As there are significant differences in the network protocols and equipment used in the various DDC systems available, there is no accurate way to compare overall network performance. All competitive systems are encouraged to perform the benchmark tests specified in this document and compare results. If the benchmark tests are performed by all DDC vendors, a working specification for network performances can be obtained and speculation can be replaced by quantitative data.

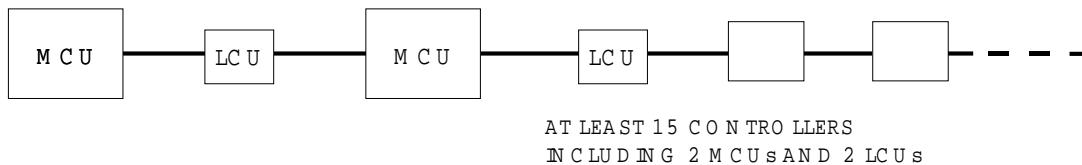
# DCC SYSTEM MODELS

To accurately assess network performance it is necessary to test two physical system models. The first model simulates a small DDC system and will provide a satisfactory set of benchmarks for single network applications. In order to ensure that established performance benchmarks are representative of actual system capabilities, a second model must be tested. The second physical model simulates a larger DDC system with multiple network sections and higher populations. Subjecting the second physical model to all benchmark tests will indicate the degree of saturation (performance degradation) a system will experience when high panel counts and distributed network sections are used.

## Model A — Small System

This model simulates a small size DDC system. Only one Local Area Network (LAN) is used, populated by at least 15 controllers. Of the 15 controllers, at least 2 Master Control Unit (MCU) panels and 2 Local Control Unit (LCU) panels must be included.

PHYSICAL MODEL A

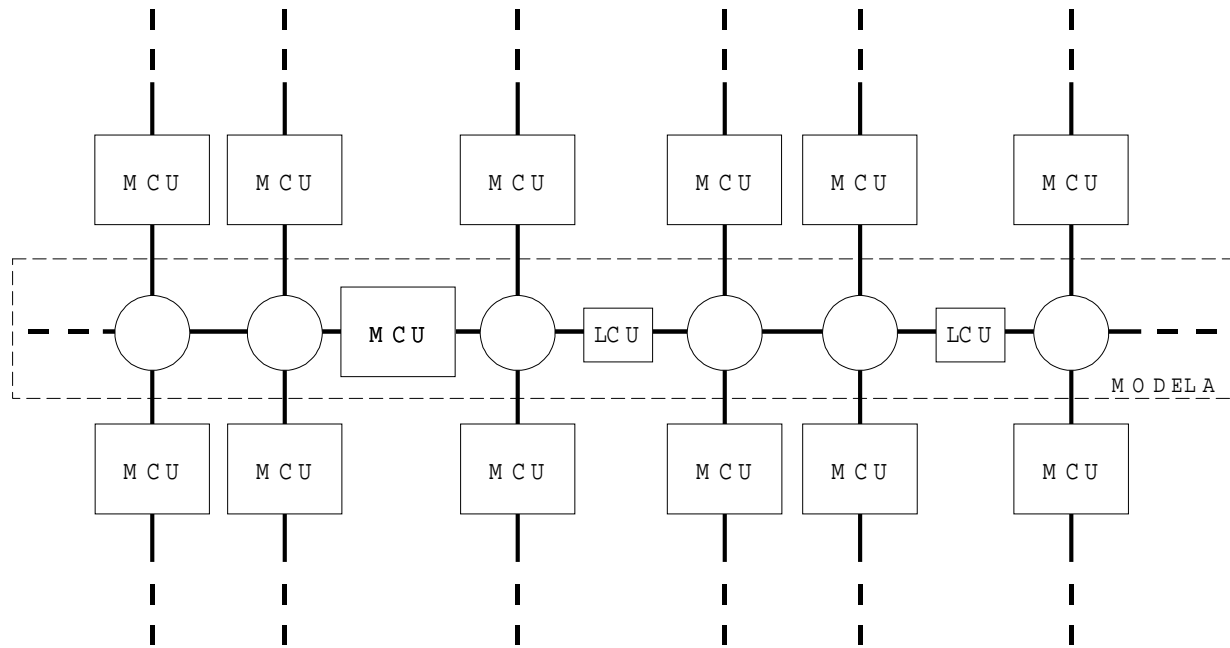


## Model B — Medium System

This model simulates a medium size DDC system. This model is comprised of Model A **plus** at least 200 additional controllers operating on at least 12 additional LANs.

Each LAN must be populated by at least 10 controllers, one of which must be an MCU panel. The MCU required on each LAN must be in addition to any network integration device (Node, Concentrator, Hub, etc.) used to link the network section with the main LAN.

PHYSICAL MODEL B



AT LEAST 12 LOCAL LANS WITH A MINIMUM OF  
10 CONTROLLERS ON EACH INCLUDING 1 MCU

**Note** every MCU and LCU panel in both physical models must induce a load on its CPU such that its internal scan rate is at most 2 scans/second.

# NETWORK LOADING CONSIDERATIONS

There are two network loading scenarios used in this specification. The first simulates normal to heavy loading and the second simulates heavy to extreme loading.

## **Normal to Heavy Loading**

To simulate a normal to heavy network loading condition, 6 alarms per second are sustained for a period no less than 2 minutes. All alarms must be routed to a single destination panel within the system. All 720 alarms generated in the 2 minutes must be accounted for at the Operator Workstation.

In both Model A and Model B each controller in the system must generate roughly the same number of alarms to ensure the network load is equally distributed.

## **Heavy to Extreme Loading**

To simulate a heavy to extreme network loading condition, 10 alarms per second are sustained for a period no less than 2 minutes. All alarms must be routed to a single destination panel within the system. All 1200 alarms generated in the 2 minutes must be accounted for at the Operator Workstation.

In both Model A and Model B each controller in the system must generate roughly the same number of alarms to ensure the network load is equally distributed. In the case of Model B, the alarm destination panel shall be located on the main LAN.

# BENCHMARKS

The following benchmark tests are to be performed on both Model A and Model B systems. An accurate stopwatch is required to time certain aspects of the tests as described below. A suitable switch and an LED are required to perform Benchmark 2 and Benchmark 3.

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## Benchmark 1 — Trending

<b>Description</b>	Continuous Change of Value (COV) or interval trending must be done by all controllers in the system. Trend logs must scroll to disk at the Operator Workstation. All MCU panels must trend a minimum of 50 points including 16 inputs, 16 outputs and 18 other points such as virtual points, schedules, etc. Each trend must have a minimum sample capacity of 200.
<b>Procedure</b>	The procedure for Benchmark 1 will vary depending on the system being tested.
<b>Benchmark Test</b>	Configure both models to show that a minimum of 150 samples/second are scrolling to disk for the 2 minute normal/heavy and heavy/extreme periods. Demonstrate that all alarms and trends are received at the operator Workstation.

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## Benchmark 2 — High Priority Alarms

<b>Description</b>	This benchmark is intended to show the speed of high priority alarms reporting to the Operator Workstation attached to the alarm destination MCU. For Model B show high priority alarm speed from both the main LAN and auxiliary LANs.
<b>Procedure</b>	Install a switch on a digital input of the panel that will send the high priority alarm, and install an LED on a digital output of the alarm destination MCU. When the switch is toggled, the sending panel shall detect the closure and send the alarm to the alarm destination MCU. When the alarm information is received, the alarm destination panel turns on the digital output that has the LED attached to it.
<b>Benchmark</b>	Accurately time the interval between toggling the switch on the sending panel and the illumination of the LED on the alarm destination MCU.

## Benchmark 3 — Point to Point Transfer

<b>Description</b>	<p>This benchmark determines the speed of point to point data transfer for the following cases:</p> <ul style="list-style-type: none"><li>• point to point on the main LAN</li><li>• point to point on an auxiliary LAN (Model B only)</li><li>• point to point from an auxiliary LAN to the main LAN (Model B only)</li></ul>
<b>Procedure</b>	<p>Use a switch and an LED as detailed in Benchmark 2. Attach the switch to a digital input on the sending panel and attach the LED to an output on the destination panel.</p>
<b>Benchmark</b>	<p>Accurately time the intervals between the switch being toggled on the sending panel and the LED illuminating on the destination panel.</p>

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## Benchmark 4 — Operator Access Times

<b>Description</b>	<p>The time required for the operator to access various types of system information is measured. The following actions are timed:</p> <ul style="list-style-type: none"><li>• point command on the main LAN</li><li>• point command on an auxiliary LAN (Model B)</li><li>• upload/download panel database from the main LAN</li><li>• upload/download panel database from an auxiliary LAN (Model B)</li><li>• 50 point display from the main LAN</li><li>• 50 point display from an auxiliary LAN (Model B)</li></ul>
<b>Procedure</b>	<p>Procedures will vary depending on the system being tested. An Operator Workstation must be available on both the main and an auxiliary LAN for Model B.</p>
<b>Benchmark</b>	<p>Accurately time the interval between operator request and operator access in both network loading scenarios.</p>

# WALKER NETWORK PERFORMANCE SPECIFICATION RESULTS

**Benchmark 1** Over 150 samples/second scrolling to disk, sustained for 2 minutes with both Model A and Model B under normal to heavy loading condition.

**Benchmark 2** The following results were obtained:

Model A: **3 seconds typical**  
**3 seconds worst case**

(alarm from LCU to MCU)

Model B: **3 seconds typical**  
**4 seconds worst case**

(alarm from LCU on local LAN to MCU on main LAN)

**Benchmark 3** The following results were obtained:

	TEST 1	TEST 2	TEST 3
<b>Model A</b>	2s typical 3s worst case	N/A	N/A
<b>Model B</b>	2s typical 3s worst case	2s typical 3s worst case	3s typical 5s worst case

**Benchmark 4** The following results were obtained:

	TEST 1	TEST 2	TEST3	TEST4	TEST5	TEST 6
Model A	2s typical 2s worst case	N/A	*	N/A	2s typical 2s worst case	N/A
Model B	2s typical 2s worst case	2s typical 3s worst case	*	**	2s typical 2s worst case	2s typical 3s worst case

\* no noticeable difference between response with test running or with no background traffic

\*\* minor time lag observed but not measurable with stopwatch