
Meridian 1

Meridian 1

Installation planning

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About this document

This document provides guidelines for planning the Meridian 1 environment, including setting up the equipment area, establishing grounding and power, and meeting cabling requirements. This information helps you select a site, plan a site, and plan the Meridian 1 installation.

Note: If there is a conflict between information in this document and a local or national code, follow the code.

Most of the considerations for site planning and installation are common for AC-powered systems and DC-powered systems. Any differences are noted. For detailed information on AC- and DC-power configurations, see *Meridian 1 power engineering* (553-3001-152).

References

See the *Meridian 1 planning and engineering guide* for the following documents:

- *Library navigator* (553-3001-000)
- *Meridian 1 system overview* (553-3001-100)
- *Meridian 1 system engineering* (553-3001-151)
- *Meridian 1 power engineering* (553-3001-152)
- *Spares planning* (553-3001-153)
- *Meridian 1 equipment identification* (553-3001-154)

See the *Meridian 1 installation and maintenance guide* for the following documents:

- *Meridian 1 system installation procedures* (553-3001-210)
- *Telephone and attendant console installation* (553-3001-215)

See the *X11 software guide* for an overview of software architecture, procedures for software installation and management, and a detailed description of all X11 features and services. The following documents provide this information:

- *X11 software management* (553-3001-300)
- *X11 features and services* (553-3001-305)

See the *X11 input/output guide* (553-3001-400) for a description of all administration and maintenance programs, and *X11 system messages guide* (553-3001-411) for information about system messages.

Related documentation

The following documents contain information that you may find necessary or helpful as you plan the site and prepare for installation.

- 1987. “Maintenance, Testing and Replacement of Large Storage Batteries.” IEEE, Vol. 450: all pages.
- 1987. “Design and Installation of Large Lead Storage Batteries.” IEEE, Vol. 484: all pages.
- 1981, 1982, 1983. ANSI/IEEE Standard, Vols. 484, 142, 81: all pages. (484-1981; 142-1982; 81-1983)
- 1984. Gaseous Hydrogen Systems. National Fire Protection Association (NFPA), Vol. 50A: all pages.
- 1984. National Electrical Code (NEC). NFPA, Vol. 70: all pages.
- 1986. Canadian Electrical Code (CEC). Canadian Standards Association (CSA), C22-1-1986.
- Grounding Electrode System
(NEC: 250-23, 250-26, 250-54, 250-81, 250-83, 250-84, 250-86)
(CEC: 10-204, 10-206, 10-504, 10-520, 10-700-710)

- Grounding Electrode Conductor
(NEC: 250-23, 250-26, 250-51, 250-53, 250-91, 250-92, 250-94)
(CEC: 10-500, 10-502, 10-804, 10-808, 10-812)
- Grounded Conductor (such as Neutral)
(NEC: 250-26, 250-50, 250-51, 250-53, 250-61)
(CEC: 10-206, 10-900-908, 10-500, 10-502, 10-518)
- Equipment Grounding Conductor
(NEC: 250-50, 250-51, 250-53, 250-57, 250-91, 250-32, 250-92, 250-95)
(CEC: 10-900-908, 10-500, 10-502, 10-510, 10-804, 10-300, 10-302)
- Corporate Ground Specification 4122.00
- Main Bonding Jumper
(NEC: 250-23, 250-26, 250-61)
(CEC: 10-204, 10-206, 10-518, 10-520)
- Emergency power disconnect
(NEC: 645-10)
- Grounding Evaluation Practices and Equipment, ECOS Electronics Corporation, 205 West Harrison Street, Oak Park, IL 60304.
- Protection of Electronic Computer/Data Processing Equipment. NFPA, Vol. 75.
- MIL-Handbook
419 (raised floor installation requirements).
- “Network Equipment Building Systems Generic Equipment Requirements” specification TR-EOP-000063. Bellcore.
- OSHA
Occupational Safety and Health Administration Standards
(29 CFR 1910).
- Recommended Practice on Static Electricity. NFPA 77.
- National Building Code of Canada 1985.
- Uniform Building Code 1982.
- Local building codes.

Regulatory notices

Notice for United States installations

Meridian 1 equipment complies with Part 68 of the United States Federal Communications Commission (FCC) rules. On the rear of the pedestal unit in each switching equipment column is a label that contains, among other information, the FCC registration numbers and ringer equivalence number (REN) for this equipment. If requested, you must provide this information to the telephone company.

Meridian 1 regulatory labels include the following:

- FCC registration: AB6982-14234-MF-E
- FCC registration: AB6982-62937-PF-E
- FCC registration: AB6CAN-61117-MF-E
- FCC registration: AB6CAN-61116-PF-E
- Service Code: 9.0F Ringer equivalent: 1.1B (1.0A)

The REN specifies the number of devices that you can connect to the telephone line. Excessive RENs on the telephone line can prevent devices from ringing in response to an incoming call. In most areas, the sum of the RENs must not exceed five. To find out how many devices you can connect to the line (as determined by the total RENs) contact the telephone company to determine the maximum REN for the calling area.

If your Meridian 1 equipment harms the telephone network, the telephone company will notify you in advance that your service may be discontinued temporarily. But if advance notice is impractical, the telephone company will notify you as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company can make changes in its facilities, equipment, operations, or procedures that could affect the proper operation of your equipment. If this happens, the telephone company will provide advance notice so you can make the necessary modifications for maintaining uninterrupted service.

If you experience trouble with Meridian 1 equipment, contact your authorized distributor or service center in the U.S.A. for repair and warranty information. If you do not know how to contact your distributor, call Northern Telecom Inc. at 1-800-328-8800 (2221 Lakeside Drive, Richardson, Texas, 75082). If the trouble is harming the telephone network, the telephone company may ask you to remove the equipment from the network until the problem is resolved.

You cannot use Meridian 1 equipment on public coin service provided by the telephone company. Connection to party line service is subject to state tariffs. (Contact the state public utility commission, public service commission, or corporation commission for information.)

The Meridian 1 system is hearing aid compatible.

If you allow Meridian 1 equipment to operate in a manner that does not provide proper answer supervision signaling, it is a violation of Part 68 of the FCC Rules.

- If provisioned with generic X11 release 17 or later X11 releases, this equipment returns proper answer supervision signals to the public switched telephone network (PSTN) when calls are handled as follows:
 - answered by the called station
 - answered by the attendant
 - routed to a recorded announcement that can be administered by the customer premises equipment (CPE) user
 - routed to a dial prompt
- This equipment returns answer supervision on all direct inward dial (DID) calls forwarded back to the PSTN. The following exceptions are permissible:
 - a call is unanswered
 - a busy tone is received
 - a reorder tone is received

Meridian 1 equipment can provide access to interstate providers of operator services through the use of Equal Access codes. Failure to provide Equal Access capabilities is a violation of the Telephone Operator Consumer Services Improvement Act of 1990 and Part 68 of the FCC Rules.

Table 1 contains a complete listing of applicable network jack Uniform Service Order Codes (USOCs), facility interface codes (FIC), and service order codes (SOC) associated with the services to which the Meridian 1 is connected.

Table 1
Network connection information (Part 1 of 2)

MFRS port ID	MTS/WATS FIC	REN	Network jacks	Port
NT8D14	02LS2	2.7A	RJ21X	2-wire, local switched access (LSA), loop start
NT8D14	02GS2	2.7A	RJ21X	2-wire, LSA, ground start
NT8D14	02RV2-T	0.0B	RJ21X	2-wire, LSA, reverse battery
QPC450G	02LS2	1.0B	RJ21X	2-wire, LSA, loop start
QPC450G	02GS2	1.0B	RJ21X	2-wire, LSA, ground start
QPC449	02RV2-T	0.0B	RJ21X	2-wire, LSA, reverse battery
QPC250	02RV2-T	0.0B	RJ21X	2-wire, LSA, reverse battery
NT6P03	02LS2	2.7A	RJ21X	2-wire, LSA, loop start
NT4R04AB	02LS2	0.4B	RJ21X	2-wire, LSA, loop start
NT4R04AB	02GS2	0.4B	RJ21X	2-wire, LSA, ground start
A0351167	02LS2	0.4B	RJ21X	2-wire, LSA, loop start
	DID FIC or digital FIC	Answer supervision code		
	02RV2-T	AS.2		

Table 1
Network connection information (Part 2 of 2)

MFRS port ID	MTS/WATS FIC	REN	Network jacks	Port
	Analog PL FIC	SOC		
NT8D15	TL11M	9.0F	RJ2EX	2-wire E&M tie trunk
NT8D15	TL31M	9.0F	RJ2GX	4-wire dial repeating tie line
NT8D15	TL32M	9.0F	RJ2HX	4-wire dial repeating tie line
QPC237	TL31E	9.0F	RJ2GX	4-wire dial repeating tie line
QPC237	TL32E	9.0F	RJ2HX	4-wire dial repeating tie line
QPC71	TL11M	9.0F	RJ2GX	2-wire E&M tie trunk
QPC71	TL11E	9.0F	RJ2GX	2-wire E&M tie trunk
QPC192	OL13C	9.0F	RJ21X	Off premise
NT8D03/09 NTAK92	OL13C	9.0F	RJ21X	Off premise
	Digital FIC	SOC		
QPC472	04DU9-BN	6.0P	N/A	1.544 Mbps superframe
QPC720	04DU9-BN	6.0P	N/A	1.544 Mbps superframe
QPC720	04DU9-1KN	6.0P	N/A	1.544 Mbps extended superframe
NTAK09AA	04DU9-BN	6.0P	N/A	1.544 Mbps superframe
NTAK09AA	04DU9-1KN	6.0P	N/A	1.544 Mbps extended superframe
RPE	04DU9-BN	6.0P	N/A	1.544 Mbps superframe

Notice for Canadian installations

Meridian 1 regulatory labels include “Department of Communications (CS03): 332 404 A.”

This Canadian Department of Communications label identifies certified equipment, which means that the equipment meets certain telecommunications network protective, operational, and safety requirements. The Department does not guarantee that the equipment will operate to the user’s satisfaction.

Before installing this equipment, make sure that you have permission to connect to the facilities of the local telecommunications company. You must also install the equipment using an acceptable method of connection. In some cases, you can extend the company’s inside wiring associated with a single line individual service by using a certified connector assembly (telephone extension cord). Note that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment must be made by an authorized Canadian maintenance facility designated by the supplier. If you make any repairs or alterations to this equipment yourself, or if equipment malfunctions occur, the telecommunications company may ask you to disconnect the equipment.

To protect personnel, ensure that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system (if present) are connected together. This precaution is particularly important in rural areas.

WARNING

Do not attempt to make electrical ground connections; contact the appropriate electrical inspection authority or an electrician.

Planning activities

This document provides guidelines for researching site requirements, planning the site, and preparing for the delivery and installation of the Meridian 1 equipment. This chapter presents a sample outline of procedures and a milestone chart for planning an installation. The following chapters describe each step in detail. As you prepare for installation, gather the customer data required for software configuration, and plan and provide customer training.

The installation outline

Use Table 2 as a guide for preparing a detailed plan for every installation.

Table 2
Outline for installation planning

Procedures	Requirements
Researching the requirements	Determine requirements for fire protection and safety, the equipment room, grounding and power, and cables.
Planning the site	Select a site with suitable qualifications. Develop the site to meet requirements. Prepare the building cabling plan.
Preparing for delivery and installation	Perform preinstallation inspections. Examine the delivery route. Review equipment handling precautions. Gather all delivery items.

The milestone chart

Planning and monitoring site preparation activities is easier when you use a milestone chart. A milestone chart is a general site planning schedule showing the sequence of activities necessary to complete a job.

Table 3 lists typical activities included in a milestone chart. For a complex site, you will need to create a more detailed chart.

Table 3
Milestone chart

Step	Action
1	Select the site. Plan fire prevention and safety features. Plan the equipment room layout. Plan grounding and power. Plan cable routes and terminations. Plan and start any renovations to the equipment room.
2	Continue site construction and renovation tasks. Install grounding, power, air conditioning, and heating. Install special rigging, such as overhead cable racks and distribution frame equipment, as required. Test site wiring to ensure that minimum requirements are met.
3	Complete construction and ensure that grounding and power are in place. Test air conditioning and heating systems. Make equipment delivery arrangements. Complete equipment room inspection, identifying and resolving any delivery constraints.

When you prepare a milestone chart, consider not only individual operations, but the overall installation schedule. The milestone chart should show the necessary operations in order and may assign a start and end date for each activity.

Researching the requirements

By knowing the requirements for system installation, you can save time and effort at delivery. Consider the following requirements (in addition to local and national building and electrical codes) when you plan a Meridian 1 installation:

- fire protection and safety requirements
- equipment room requirements
- grounding and power requirements
- cable requirements

Fire protection and safety requirements

Building, fire, and safety codes establish the degree of protection required for an installation. Additional information is available from the National Fire Protection Association (NFPA) in “Standard for the Protection of Electronic Computer/Data Processing Equipment” (NFPA 75) and “National Electrical Code (NEC)” (NFPA 70).

Fire protection and prevention

Properly locating and installing sprinkler heads, fire and smoke sensing devices, and other fire extinguishing equipment requires expertise. During the planning stage, consult local codes, experts, insurance underwriters, and local building authorities.

You can implement some fire precautions when an equipment area is constructed. For example, extend walls from floor to ceiling, and construct walls, floor, and dropped ceiling, if any, of noncombustible material.

If the structural floor is made from combustible materials, cover it with a noncombustible covering and clear the space between the raised and permanent floors of all debris before the system is installed. If there are power connections beneath a raised floor, use waterproof electrical receptacles and connectors.

You can install shatterproof windows and sprinklers outside and above the windows to keep fire from spreading from an adjacent room or building. The roof or floor above the equipment area must be watertight. Design ducts and plumbing for air-conditioning systems to keep fire, heat, and smoke from spreading from one part of a building to another. Install smoke detectors in all appropriate places.

Regularly check services such as steam, water, and power, and inspect pipes for excess condensation, leaks, or corrosion.

Fire extinguishing systems

In most cases, carbon dioxide or water sprinkler systems are the recommended fire extinguishing systems.

Dry-pipe water sprinklers are strongly recommended. This type of system interrupts power to the room and opens a master valve that fills the overhead sprinklers.

Carbon dioxide systems are also effective in containing a fire, but they quickly exhaust the oxygen supply. If you use a carbon dioxide system, you must install an alarm to warn site personnel when carbon dioxide is released. For health and safety reasons, employees must be evacuated within 30 seconds of the release.

WARNING

Northern Telecom does not recommend using Halon or any other fire extinguishing system that is not described above. Northern Telecom is supported by the Environmental Protection Agency to enforce any restrictions on the use of other fire extinguishing systems.

Security precautions

You may need to extend and improve existing building security to provide adequate protection for Meridian 1 equipment. For example, you can install safeguards such as tamperproof keylock door controls and electrically taped glass doors and windows that can tie into an alarm system. You can also install a monitoring unit using closed-circuit television.

Note: Electric locks, such as push button access code or card reader locks, are not recommended unless you provide a battery backup or a key override.

Protect critical data, such as business records, by storing backups well away from the equipment room. A regular updating program is highly recommended.

Safety procedures and training

Company personnel should be taught how to respond to emergencies; some companies designate trained individuals as security members. Training can include when and how to evacuate personnel and records, notify the fire department, shut off all electrical power, and handle fire extinguishers properly.

In addition, install temperature and humidity monitoring devices (both visual and audible alarm signals) in equipment and storage rooms so people can respond quickly to an emergency.

Occupational noise exposure

If employees are subjected to noise levels exceeding local standards, or the levels listed in 1910.5 of the Occupational Safety and Health Administration (OSHA) Standards, initiate administrative and engineering controls. If these controls do not reduce sound levels effectively, provide protective equipment.

Note: The acoustic noise generated by a Meridian 1 column ranges from 45 dBA to 60 dBA (decibels “A”-weighted).

Equipment room requirements

The environment for a Meridian 1 (and for storing spare parts) can influence system performance and reliability. Temperature, humidity, and other environmental factors, such as static electricity, must be controlled to meet Meridian 1 operating requirements.

Temperature and humidity control

Frequent and extended system operation above recommended temperature limits can degrade system reliability. Low humidity can increase static electricity build-up, while high humidity can affect the performance of disks and printers.

Take temperature readings 76 cm (30 in.) from the front of the system. Table 4 shows Meridian 1 operating requirements.

CAUTION

Do not expose equipment to absolute temperature limits for more than 72 hours. Do not place heat sources (such as floor heaters) near the equipment.

Table 4
Operating environment

Equipment	Temperature and humidity considerations
Meridian 1	Recommended: 15° to 30°C (59° to 86°F) RH 20% to 55%, non-condensing Absolute: 10° to 45°C (50° to 113°F) RH 20% to 80%, non-condensing temperature change less than 10°C (18°F) per hour
Telephones	Absolute: 0° to 50°C (32° to 122°F) RH 20% to 80%, non-condensing
Other terminal devices (such as personal computers, data sets, and printers)	Refer to the specific documentation or manufacturer's guidelines

If you operate the system within recommended temperature limits, there are no thermal restrictions on any equipment. If you operate the system above recommended limits (it must remain within absolute limits), be sure to locate disk drive units in one of the lower two modules in a column.

Follow the specifications listed in Table 5 to store or transport equipment.

Table 5
Storage environment

Equipment	Temperature/humidity considerations
Meridian 1 (without disk drive units)	Long and short term: -50° to 70°C (-58° to 158°F) RH 0% to 95%, non-condensing
Telephones	Long and short term: -50° to 70°C (-58° to 158°F) RH 5% to 95%, non-condensing
Disk drives	Long term: -20° to 60°C (-4° to 140°F) RH 10% to 90%, non-condensing Short term: -40° to 60°C (-40° to 140°F) RH 5% to 95%, non-condensing
Disks	Long term: 10° to 53°C (50° to 128°F) RH 20% to 80%, non-condensing Short term: -40° to 60°C (-40° to 140°F) RH 10% to 90%, non-condensing
Other terminal devices	Refer to the specific Northern Telecom publication or the manufacturer's guidelines
Note: Temperature changes must be less than 30° C (54° F) per hour for long- and short-term storage and during transportation.	

Air conditioning

Use the following guidelines only to estimate air conditioning requirements. Exact requirements must be determined by a qualified air conditioning engineer.

Air conditioning in equipment areas must handle the heat produced by the Meridian 1, equipment room personnel, and lighting. You must also consider the heat that comes through walls, windows, floors, and ceilings.

A stable ambient operating temperature of approximately 22 degrees C (72 degrees F) is recommended. The temperature differential in the equipment room must not exceed ± 3.0 degrees C (± 5 degrees F).

Note: For systems with reserve power equipment, consult the manufacturer's specifications for recommended operating temperatures.

Heat dissipation from a system is estimated in BTUs per hour (BTU/hr). You can estimate the amount of air conditioning required at a rate of one ton of refrigeration for every 12,000 BTU/hr of heat generated in the equipment area plus one ton for each 500 sq ft of floor space.

Note: Each person in the equipment room generates 600 BTU/hr.

CAUTION

Because digital systems require constant power (even if the system is idle), they generate heat continuously. Air conditioning requirements must be met at all times.

Table 6 shows the maximum power dissipation in the form of heat for each Meridian 1 module. The measurements are the same for AC- and DC-powered modules.

Table 6
Heat dissipation—modules

Module	Heat dissipation	
	Watts	BTU/hr
NT5D21 Core/Network	360	1230
NT6D39 CPU/Network	360	1230
NT6D44 Meridian Mail	240	820
NT6D60 Core	260	890
NT8D11 Common/Peripheral Equipment	500	1700
NT8D13 Peripheral Equipment	240	820
NT8D34 CPU	260	890
NT8D35 Network	240	820
NT8D36 InterGroup	0	0
NT8D37 Intelligent Peripheral Equipment	340	1160
NT8D47 Remote Peripheral Equipment	240	820
NT9D11 Core/Network	360	1230
— local site	175	600
— remote site	100	340
Application Equipment Module		
— single	210	710
— dual	420	1420

Note: Thermal load (BTU/hr) = total power dissipation (watts) x 3.4

Table 7 shows the maximum heat dissipation for DC-power rectifiers supplied by Northern Telecom.

Table 7
Heat dissipation—rectifiers

Equipment	Heat dissipation	
	Watts	BTU/hr
NT5C06 25-A rectifier	130	444
NT6D52 30-A rectifier	175	600
NT5C03 50-A rectifier	290	990
NT5C07 50-A rectifier	380	1,297
A0354954 100-A rectifier	580	1980

Note 1: Thermal load (BTU/hr) = total power dissipation (watts) x 3.4

Note 2: NT5C07 rectifier is a part of the MPP600 power plant. MPP600 may contain up to three such rectifiers in one power shelf. The maximum MPP600 plant capacity is 12 NT5C07 rectifiers or 600A at -48 VDC or four power shelves when using the main and the supplemental cabinets. Total MPP600 heat dissipation is $12 \times 1,297 = 15,570$ BTU/hr.

Other environmental factors

In addition to temperature and humidity, the following environmental factors must be controlled in equipment areas:

- static electricity
- vibration
- electromagnetic and radio frequency interference (EMI/RFI)
- dust
- lighting
- structural features

Static electricity

Electronic circuits are extremely sensitive to static discharge. Static discharge can damage circuitry permanently, interrupt system operation, and cause lost data.

Static electricity can be caused by physical vibration, friction, and the separation of materials. Other common causes of static electricity build-up are low humidity, certain types of carpeting, the wax on equipment room floors, and plastic-soled shoes. The human body is the most common collector of static electricity. A combination of plastic-soled shoes, certain flooring materials, and low humidity can cause body charges in excess of 15 kV.

Note: IEEE Standard 142-1982 recommends that flooring resistance be more than 25,000 ohms and less than 1 million megohms, measured by two electrodes 0.91 m (3 ft) apart on the floor. Each electrode must weigh 2.2 kg (5 lb) and have a dry flat contact area of 6.35 cm (2.5 in.) in diameter.

Antistatic wrist straps, sprays, and mats are available. Northern Telecom recommends at least using an antistatic wrist strap whenever you work on Meridian 1 equipment. (See “Preparing for delivery and installation” for more detailed information.)

Vibration

Vibration can cause the slow deterioration of mechanical parts and, if severe, can cause serious disk errors. Avoid structure-borne vibration and consequent noise transferred to the equipment room. Raised floors must have extra support jacks at strategic places to prevent the transmission of vibration.

Limit vibration in an office environment to a frequency range of 0.5–200 Hz and a G-force magnitude of 0.1 G (in accordance with the Bellcore “Network Equipment Building Systems Generic Equipment Requirements” specification TR-EOP-000063).

Electromagnetic and radio frequency interference

Sources of electromagnetic and EMI/RFI located close to Meridian 1 equipment can cause problems with system operation. The following are common EMI/RFI sources known to disturb system operation:

- thunderstorms, static electricity, and high-voltage power lines
- radar, broadcast stations, and mobile communications
- power tools, appliances (such as vacuum cleaners), and office business machines (such as copiers)
- industrial machines and ultrasonic cleaners
- vehicle ignition, arc welders, and dielectric heaters
- dimmer switches

Note: Meridian 1 equipment meets the United States FCC Rules, Part 15, and Canadian Standards Association (CSA) C108.8 for EMI/RFI radiation.

Dust

Accumulated dust and dirt can degrade system reliability and performance by doing the following:

- scratching the contacts on circuit cards, causing intermittent failures
- having conductive contents that increase static electricity in the environment
- causing components to operate at higher temperatures

Average dust density for an office environment must be 0.00014 g/m³ or better. False ceilings and tiled floors help maintain dust density requirements.

Lighting

Lighting illumination of 50 to 75 footcandles measured 76 cm (30 in.) above the equipment room floor is recommended. Avoid direct sunlight in the equipment room to prevent malfunctions by devices with light sensors (such as disk units).

Lighting must not be powered from the equipment room service panel. For large system installations, consider provisions for emergency lighting in the equipment room.

Earthquake bracing

Earthquake (seismic) bracing is required or should be considered in some locations. See *Meridian 1 system installation procedures* (553-3001-210) for detailed instructions on installing earthquake bracing.

Structural features

Use sealed concrete, vinyl, or mastic tile for flooring and ensure that it meets the floor loading requirements described later in this document. Avoid using sprayed ceilings or walls.

Grounding and power requirements

This section describes isolated and non-isolated ground topologies, gives grounding guidelines, and describes commercial power source, auxiliary power, and power failure transfer unit (PFTU) requirements. If there is a conflict between information in this chapter and a local or national code, follow the code.

Grounding

WARNING

If you fail to follow grounding procedures, the installation can be unsafe for personnel, unprotected from lightning or power transients, subject to service interruptions, and subject to degraded performance.

Meridian 1 power and ground must originate from the supply service (equipment room service panel or transformer), where the ground conductor and the neutral conductor connect and are referenced to the main building ground. (Do not use the main building ground directly as the ground reference for the system.) All power feeds should contain a separate safety conductor (green wire).

The service panel, which must be located in the equipment room, must not service lighting, air conditioning, heating, generators, or motors. Northern Telecom strongly recommends that supply conductors be dedicated and uninterrupted from a building primary source to the dedicated equipment room service panel.

Power is supplied to the service panel by a power transformer. The transformer typically provides secondary voltages of 208/120 V three-phase four-wire “wye” service, 240/120 V single-phase four-wire “delta” service, or 240/120 V single-phase three-wire service. Collectively, these secondary voltages are referred to as “nominal 208/240 V ac” throughout Meridian 1 documentation.

A dedicated power transformer for the Meridian 1 and associated auxiliary and telephone operating company interface equipment is preferred; however, a shared transformer or distribution is acceptable. (Figures 1 through 4 illustrate the differences between dedicated and shared distribution.)

Do not use ground fault circuit interrupt (GFCI) devices on Meridian 1 AC power feeds.

Single point ground

Meridian 1 requires a single point ground (SPG) topology for all Meridian 1 equipment and all associated auxiliary equipment.

Meridian 1 has several types of grounds and several types of signal returns that are generally referred to as “grounds”:

- In AC systems, there is a logic return (LR or LRTN) and a green wire frame ground, called the AC equipment ground (ACEG), that is typically part of the input power cord.
- In DC systems, there is a logic return (LR or LRTN) and a battery return (RTN), as well as an AC equipment ground (ACEG) green wire on the input to the rectifier(s).
- All systems must have an external hard-wired frame ground connection (also called the personal hazard safety ground). The frame ground is connected internally to the ACEG green wire, but because it is hard-wired it ensures that the equipment has a ground connection even if the system is “unplugged.”

- External Communications wiring that meet the requirements as stipulated in NEC Article 800-30 FPN 4 require the use of lightning protection. The cable sheaths, and protection grounds must be installed per NEC Article 800 - 33, and Article 800 - 40 (b).

For a single point ground (SPG) topology, each of these grounds, from each of the columns, must terminate at a single connection point before attaching to the actual ground reference at the service panel or transformer. Physically, the SPG is usually a copper bar or plate (referred to as a “bus”). In its simplest form, the SPG (the single connection point) can be an isolated ground bus or ACEG bus in the service panel or transformer.

In some conditions, a logic return equalizing (LRE) bus is needed. Multiple-column systems, for example, often require an LRE bus as a ground connection point. The LRE serves as the point where the logic return (LR or LRTN) wires from different columns are consolidated before connecting to the SPG.

Note: Two LRE assemblies are available from Northern Telecom: the NT6D5304 Ground Bus/LRE—Small (usually used with AC-powered systems) and the NT6D5303 Ground Bus/LRE—Large (usually used with DC-powered systems).

Follow these requirements for the SPG:

- All ground conductors must be identified according to local codes and terminated permanently.
- Terminations must be accessible for inspection and maintenance during the life of the installation.
- All grounding conductors must be continuous, with no splices or junctions, tagged “Do not remove or disconnect,” and insulated against contact with foreign grounds.
- Grounding conductors must be no load, non-current carrying cables, under normal operating conditions.
- The ground interface, in a steel-framed building, must have a single connecting reference, located at the service panel, to the building steel on the same floor as the Meridian 1 (or within one floor).

Note: Northern Telecom does not recommend the use of building steel as an integral part of the Meridian 1 ground system. The building steel is a reference point only.

The DC resistance of the system ground conductor, which runs from the Meridian 1 to the main building ground, must be as close to zero as possible. The maximum total resistance on all runs within the building must not exceed 0.5 ohms.

All voice and data lines that run outside to the building, leaving or entering the Meridian 1, must have fault protectors that connect directly to an approved ground. Fault protectors provide protection from external faults and transients on data lines. Refer to the 800 section of the NEC Handbook, 1996 edition or later, for what constitutes an approved ground.

To meet Meridian 1 requirements for an SPG:

- You must follow the previous guidelines.
- The building ground must meet National Electrical Code (NEC) and Canadian Electrical Code (CEC) regulations.
- Use the proper wire size for the system ground reference conductor.

Isolated and non-isolated ground

You can install the Meridian 1 with an isolated or non-isolated ground topology. Northern Telecom strongly recommends using an isolated ground for grounding system integrity. Use non-isolated ground systems only where they are required by code.

In an isolated ground system, the dedicated isolated ground bus bar in the service panel serves as the ground window. It is used for all AC safety grounds and logic returns. It also accommodates a conductor that references to the (+) battery bus in DC systems.

In addition, one or more isolated LREs can be located outside of the service panel, but they must connect to ground exclusively through the isolated ground bus.

Isolated IG-L6-20 or IG-L6-30 orange receptacles are used with an isolated ground system. All ground wiring for isolated ground receptacles must terminate on the dedicated isolated ground bus according to applicable codes.

In a non-isolated ground system, the ACEG connects to the metal panel, and any associated conduit can also contact various structural metal. Because this ground alone is not adequate for Meridian 1, a dedicated ground conductor connected to the main building ground is used for the main ground window to terminate logic returns and reference the (+) battery bus. Frame grounds connect to the ACEG.

Non-isolated L6-20 or L6-30 brown receptacles are used with a non-isolated ground system.

Note: For more detailed information on receptacles, see “Commercial power source” on page 30.

All circuit breakers must be clearly labeled in both isolated and non-isolated ground AC panels.

Figures 1 through 4 illustrate the differences between dedicated and shared distribution and between isolated and non-isolated ground systems.

The following notes apply to all Figures.

Note 1: Run the ground conductor in the same conduit with the phase and neutral conductors. Use the appropriate NEC table to determine the correct wire size.

Note 2: Use of an isolation transformer is recommended. Locate it as close as possible to the AC Panel.

Note 3: You must bond the Ground electrode conductor to a recognized ground, such as a vertical ground riser or a building principal ground. Keep it at a low impedance and do not run it in a conduit. Ground in accordance with the NEC/CEC guidelines.

Note 4: This conductor may not be smaller than number 6 AWG.

Note 5: Locate the dedicated M-1 service panel in the equipment room.

Note 6: Amperage level depends on the equipment being fed; refer to the *System Installation* (553-3001-210) or *Power Engineering* (553-3001-152) NTPs for more information.

Note 7: For AC systems, this goes to the Logic Return Equalizer (may not be required where enough terminations exist on the IG bus). For DC systems, this goes to the DC ground reference.

Note 8: Bond Telco/OSP shields, bonds, and protection at an approved reference per NEC Article 800 and CEC Article 10-1000, and Appendix B 36-310 (9). Do not bond them at the LRE or Service Panel.

Note 9: It is required that all 120 VAC service drops in the equipment room have IG-type receptacles. Each receptacle must have an individual hot, neutral, and IG ground conductor run in the same conduit (NEC 250-74 Exception 4, CEC 10-906(8)). Some local codes require an additional bonding lead to bond the outlet box back to the frame panel.

Note 10: Label circuits at both ends in accordance with NEC 110-2/CEC guidelines. Identify NEMA numbers for IG-type receptacles at the panel and outlet as follows:

- 120V @ 15A = IG.5.15
- 208V @ 20A = IG.L6.20
- 208V @ 30A = IG.L6.30

Note 11: In Canada, it may be required that the IG ground bus be bonded to the panel frame.

Note 12: Refer to the section entitled “Auxiliary Power” on page 38 for more information.

Note 13: An alternate earthing electrode, if required, must be installed at a minimum of 1.8 m (6 ft) from the building earth reference,

Note 14: If you use PVC conduit, a dirty grounding conductor may be required.

Note 15: Label circuits at both ends in accordance with NEC 110-2/CEC guidelines. Identify NEMA numbers for non IG-type receptacles at the panel and outlet as follows:

- 120V @ 15A = 5.15
- 208V @ 20A = L6.20
- 208V @ 30A = L6.30

Figure 1
Dedicated transformer in an isolated ground system

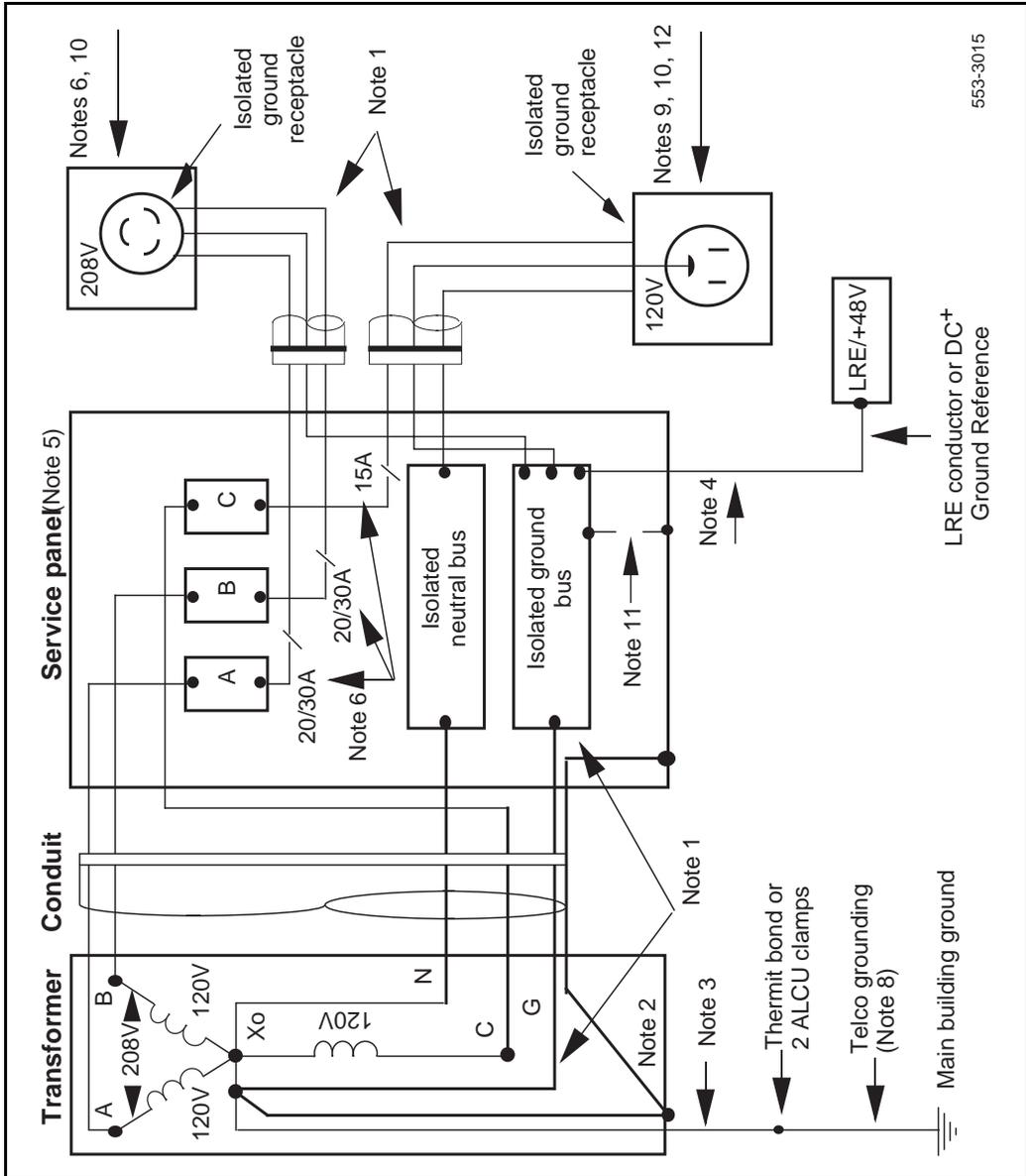


Figure 2
Dedicated transformer in a non-isolated ground system

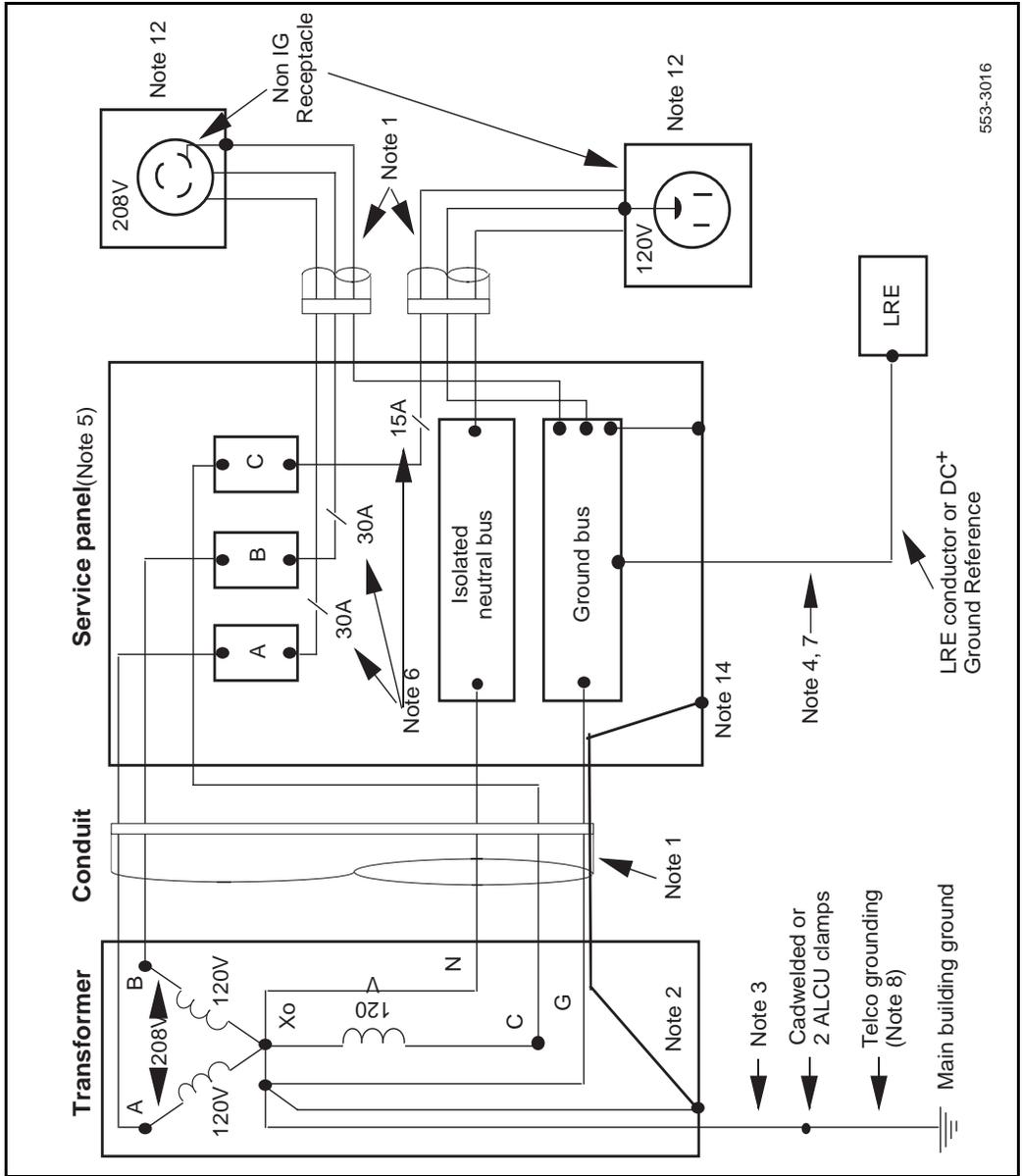


Figure 3
Shared distribution in an isolated ground system

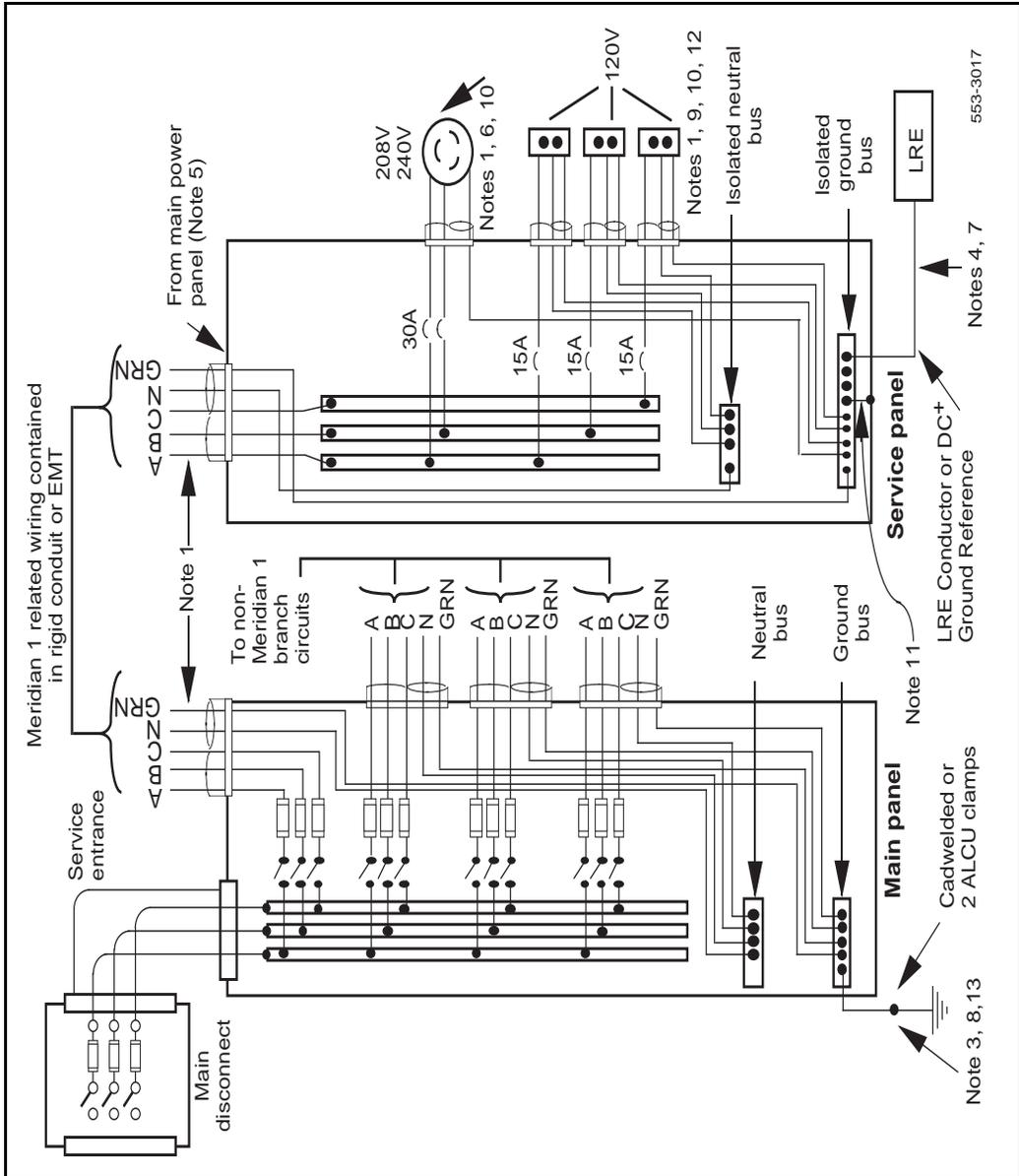
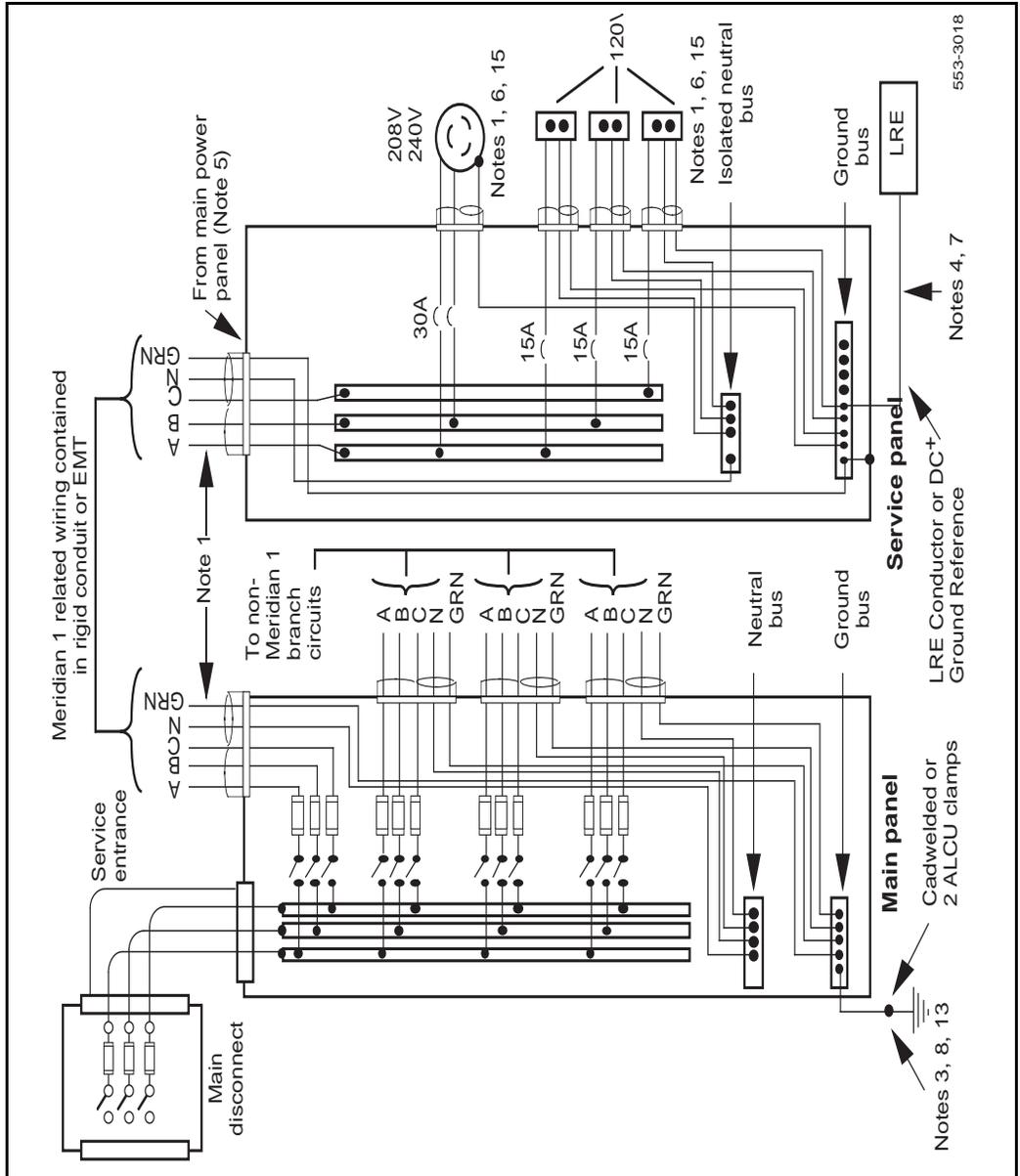


Figure 4
Shared distribution in a non-isolated ground system



Commercial power source

The commercial power source refers to the main AC utility power feed, which is required for both AC- or DC-powered systems. For AC systems, this power source connects directly to the system. For DC systems, this power source connects to the rectifiers, which convert the AC voltage to –48 V dc voltage for distribution to the system.

In North America, the power supplied can be either 208 V ac or 240 V ac nominal. Three-phase power is not required, but single power feeds from alternate phases (phase-to-phase wiring) are normal practice where three-phase power is available.

Table 8 lists the input power required from the commercial power source for AC-powered Meridian 1 systems. As shown, any voltage in the range of 180 V to 250 V is acceptable.

Table 8
AC input specifications for AC-powered systems

Input	Minimum	Nominal	Maximum
Voltage (V ac) at pedestal	180	208/240	250
Frequency (Hz)	47	50/60	63
Note: Distortion on voltage sine wave: 5% total harmonic distortion (THD), 3% any single harmonic.			

Table 9 shows the transient tolerance for abnormally high- and low-line conditions for the module power supplies used in AC-powered systems. When subjected to these transients, the power supplies continue to maintain their outputs within their specified operating limits. Spikes and notches are defined in terms of .5 and .25 cycle power disturbances. Surges and sags tend to be temporary changes in the nominal AC voltage, sometimes over several 60 Hz cycles.

Table 9
Transient tolerance for AC-powered systems

Transient	Amplitude	Duration
High-voltage conditions:		
Spikes	815 V ac	up to 4.16 ms
	408 to 815 V ac	4.17 to 8.33 ms
Surges	288 V ac	8.34 to 50 ms
	276 V ac	51 to 500 ms
Low-voltage conditions:		
Notches	0 V	up to 4.16 ms
	0 to 206 V	4.17 to 8.33 ms
Sags	146 V	8.34 to 50 ms
	166 V	51 to 500 ms
Note: All transients are applied at the peak of the AC waveform.		

The specifications in Table 9 are derived from NEC and various telephone operating company specifications. These specifications are based on power disturbances that have been measured or observed, or that can be expected to commonly occur. Therefore, these specifications for transient tolerance are the minimum requirements that the Meridian 1 equipment must meet.

The “hold-up” time specification for AC module power supplies is 20 ms at full load, when measured at the peak of the input voltage waveform and nominal input of 208 V ac. Hold-up time is the time from the removal of the AC input voltage to the time when any one output voltage drops below its specified operating limit. At less than full load, the hold-up time is greater.

Note: The hold-up specification exceeds the low-voltage transient specifications listed in Table 9.

Table 10 lists the input power required from the commercial power source for the rectifiers used with DC-powered systems. All AC input voltage is continuous over the range from minimum to maximum (no straps) except for the A0354954 100 A rectifier that has strap options for 208 and 240 V ac.

Table 10
AC input specifications for DC-power rectifiers

Input	Minimum	Nominal	Maximum
NT5C06 25A rectifier:			
Voltage at rectifier	176V ac	220V ac	264 V ac
Frequency	47 Hz	50/60 Hz	63 Hz
NT6D52 30A rectifier:			
Voltage at rectifier	110V ac	110V ac	129 V ac
Voltage at rectifier	220V ac	220V ac	250V ac
Frequency	47 Hz	50/60 Hz	63 Hz
NT5C03 50A rectifiers:			
Voltage at rectifier	183V ac	220V ac	264V ac
Frequency	47 Hz	50/60 Hz	63 Hz
NT5C07 50A rectifiers:			
Voltage at rectifier	176V ac	220V ac	264V ac
Frequency	47 Hz	50/60 Hz	63 Hz
A0354954 100A rectifier:			
Voltage at rectifier/208 V strap	184 V ac	208 V ac	220 V ac
Voltage at rectifier/240 V strap	212 V ac	240 V ac	264 V ac
Frequency	57 Hz	60 Hz	63 Hz
Note: Distortion on voltage sine wave: 5% total harmonic distortion, 3% any single harmonic.			

Table 11 lists the National Electrical Manufacturer’s Association (NEMA) numbers for acceptable commercial power service receptacles.

Table 11
Service receptacle requirements

Receptacles	Isolated	Non-isolated	Used with
208/240 V at 20 A	IG-L6-20	L6-20	NT6D52 rectifier
			Option 21A
208/240 V at 30 A	IG-L6-30	L6-30	AC systems
208/240 V at 30 A	hard-wired		NT5C03 rectifier
			A0354954 rectifier
			NT5C07 rectifier
			NT5C06 rectifier

Power conditioning

The term “power conditioner” refers to a variety of power protection or power quality improvement devices, such as low-pass filters, surge arrestors, line voltage regulators, and isolation transformers. Some of these devices reduce noise on the commercial power feed, and others help prevent power line spikes and surges. Many uninterruptible power supply (UPS) systems, in addition to providing reserve power for AC-powered systems, provide conditioning and protection during normal operation.

If the quality of the commercial power meets the specifications listed in this document, you do not need power conditioning equipment. If you want protection beyond the transient specifications listed, supplemental power devices can be helpful. However, carefully evaluate the specifications for the power protection equipment to be sure the equipment provides the type of protection that you want.

Power conditioning equipment of any sort is not a substitute for proper system grounding. As emphasized throughout this document, an SPG topology must be maintained for the Meridian 1 and all directly connected switchroom equipment. If you use supplemental protection equipment, you must install it in series with the commercial power feed to the Meridian 1, without altering the overall grounding scheme.

Auxiliary power

Terminal devices located in the equipment room require local power. Power for these devices must be wired and fused independently from all other receptacles, labeled at the service panel (to prevent unauthorized power interruption), and referenced to the same interface point on the building system ground as the service panel ground.

Auxiliary power in the equipment room can be supplied by isolated or non-isolated service receptacles, but the receptacles must match the grounding for the system. In other words, if the Meridian 1 has an isolated ground topology, the receptacles must also be isolated. You can use the A0367916 Auxiliary –48 V Power Supply as a general purpose power supply for terminal devices (as well as supplying power to PFTUs). All 120 V circuits in the equipment room must have individual hot, neutral, and ground conductors.

If auxiliary equipment using an RS-232 interface is too remote to be powered from the service panel, a modem or fiber link is required for ground isolation. Failure to provide this isolation defeats the SPG required by the system.

Existing powering and grounding on some sites can make it difficult to ensure that the local power grounding is referenced to the same potential as the system ground. In addition, local power grounding can form part of a common grounding network that is subject to noise from external sources. Under these conditions, where locally powered terminals and equipment connect directly to the system through DC coupled links sharing a common ground, incidental ground loops can form and inject noise onto the system.

Where you suspect ground related problems, and you have eliminated other sources of the problem, isolate the auxiliary equipment from the system. The best way to do this depends on the individual installation and local practices, but a few possibilities are listed here:

- Connect the auxiliary equipment to the system through an opto coupler isolation device.
- Connect the auxiliary equipment to the system through fiber optic links.
- Connect the auxiliary equipment to the system through back-to-back QPC430 Asynchronous Interface Line Cards. (Limited isolation is provided.)
- Use teletypewriters (TTYs) configured in the 20 mA loop current mode (such as current loop adapters).
- Use isolation modems configured back-to-back. (Do not reference modems on the Meridian 1 side to the AC ground.)

Isolated service receptacles

For auxiliary power receptacles in isolated ground systems, use 120 V, 60 Hz, 15 A, individually fused, isolated ground receptacles terminating on non-locking type IG-5-15 receptacles (such as Hubbell, Cat. No. IG-5262, 2-pole, 3-wire, orange duplex receptacles). Use a green conductor for extending the safety ground, and wire it according to the isolated ground specifications. (This requirement is based on safety concerns and exceeds NEC and CEC requirements.)

Outlets must comply with NEC 250-74 Exception 4. Route grounding conductors with the phase conductors (NEC 300-20). All ground wiring must terminate on the dedicated isolated ground bus according to applicable codes (NEC 384-27).

Non-isolated service receptacles

For auxiliary power receptacles in non-isolated ground systems, use 120 V, 60 Hz, 15 A, individually fused receptacles terminating on non-locking type 5-15 receptacles.

Power options

Meridian 1 is available with the following power options:

- AC-powered systems
- AC-powered systems with reserve (backup) power
- DC-powered systems
- DC-powered systems with reserve (backup) power

In any configuration, you can route power connections to the system through the floor or along overhead racks.

For detailed information on Meridian 1 power options, see *Meridian 1 power engineering* (553-3001-152).

AC-powered systems

In an AC-powered system, commercial power voltage is brought directly into the power distribution unit (PDU) in the pedestal. If reserve power is required, install an uninterruptible power source (UPS), along with its associated batteries (which may be internal or external to the unit), in series with the AC power source.

Note: Refer to the manufacturer's specifications for details on the storage and operating environment, especially temperature and humidity ranges, required for proper UPS operation.

AC module power supplies operate at a nominal 208/240 V. The actual input range of AC power supplies is 180 to 250 V ac, so restrapping the power supplies is unnecessary for either 208 V or 240 V power feeds. The 208 V wiring can plug into a 240 V system and vice versa.

AC-powered systems without reserve power require one input receptacle per column, within 2.4 m (8 ft) of each column's pedestal.

As an alternative to using the power cord and plug, input to the PDU can be wired directly. In this case, #10 AWG conductors routed through .75 in. conduit is generally used. The leads connect to the L1, L2, and GND terminations on the field wiring terminal block on the PDU.

Systems that use reserve power plug into the UPS that in turn plugs into the commercial power source. Consult the UPS manufacturer for the receptacle requirements.

DC-powered systems

The external DC power system, generally referred to as the power plant, consists mainly of rectifiers and distribution equipment, and can include batteries for reserve power. DC-powered systems connect to the commercial power source through the rectifiers, which provide -48 V dc to the PDU in the pedestal.

A customer-provided power plant can be used with all DC-powered systems. Refer to the manufacturer's specifications for the power plant requirements. You can use the QBL12 Battery Distribution Box to connect your power equipment to the Meridian 1.

DC-powered systems—U.K. Meridian 1

The DC-powered system for the U.K. Meridian 1 system operates at a nominal -48V dc . Modules in a column are fed DC power from the Power Distribution Unit (PDU) in the Pedestal. The Pedestal is powered from an external DC power plant.

Each power system is comprised of a master cabinet 8B/2R and up to a maximum of three slave cabinets.

Reserve power equipment room

If you locate reserve power equipment in a separate room, the room must meet the following conditions:

- well-ventilated and operating at optimum temperature: specific gravity readings are based on 25 degrees C (77 degrees F)
- located within the recommended proximity to the system
- equipped with protective equipment (such as goggles, face shields, acid-resistant gloves, protective aprons, water for rinsing eyes/skin, and bicarbonate of soda)
- well-secured
- accessible (the doorway must not be blocked)

This equipment room must meet all floor loading requirements and the noise levels required by OSHA standards 1910.5 (or local standards).

Note: For detailed instructions on battery usage, see ANSI/IEEE Standard 450-1987: “Maintenance, Testing and Replacement of Large Storage Batteries.”

Power failure transfer unit

A0355200 Power Failure Transfer Units (PFTUs) provide emergency telephone service during commercial power outages or certain system malfunctions. Each PFTU supports up to eight designated telephones that bypass the Meridian 1 and connect the designated telephones directly to the central office (CO) during power failures when activated by the system monitor or when activated manually.

A PFTU always requires a -48 V dc input and a positive return (ground):

— For AC-powered systems

- Without reserve power, a separate A0367916 Power Supply -48 V is required. (Up to six PFTUs can be supported by one power supply.) The auxiliary power supply is equipped with a 120 V ac input cord and plug that connects to a properly wired and grounded auxiliary receptacle.
- With an UPS for reserve power, the auxiliary power supply plugs into an auxiliary 120 V ac output on the UPS.

— For DC-powered systems

- A PFTU can be powered from a separately fused auxiliary -48 V feed from the external power system. For this purpose, the MFA150 and MPP600 power systems are equipped with spare fuse positions, which can support .25 A to 5.0 A fuses. These power systems are factory equipped with 1.33 A fuses that can support up to six PFTUs.
- A separate A0367916 Auxiliary -48 V Power Supply can also be used to power PFTUs in a DC-powered system.

Input power requirements for the PFTU, and input and output specifications for the auxiliary power supply are given in Table 12.

Table 12
Equipment specifications

Equipment	Input power requirements	Output specifications
PFTU	-40 to -56 V dc 170 mA	—
Auxiliary power supply	90 to 130 V ac at 57 to 63 Hz	-48 V dc, ± 15% at 1.25 A

The PFTU is a wall-mount unit. The auxiliary power supply can be mounted on the floor or wall. PFTU and auxiliary power supply dimensions are given in Table 13.

Table 13
PFTU and auxiliary power supply dimensions

Equipment	Width		Length		Height		Weight	
	cm	in.	cm	in.	cm	in.	cm	in.
PFTU	12.1	4.75	34.3	13.5	4.1	1.6	1.5	3.3
Auxiliary power supply	12.7	5.00	16.7	6.6	6.4	2.5	1.0	2.2

QUA6 Power Fail Transfer Unit (United Kingdom)

The QUA6 Power Fail Transfer Unit provides emergency telephone service during commercial power outages or certain system malfunctions. Each QUA6 PFTU supports up to five designated telephones. The PFTU bypasses the Meridian 1 and connects the designated telephones directly to the central office during power failures, when activated by the system monitor, or when activated manually.

Input requirements

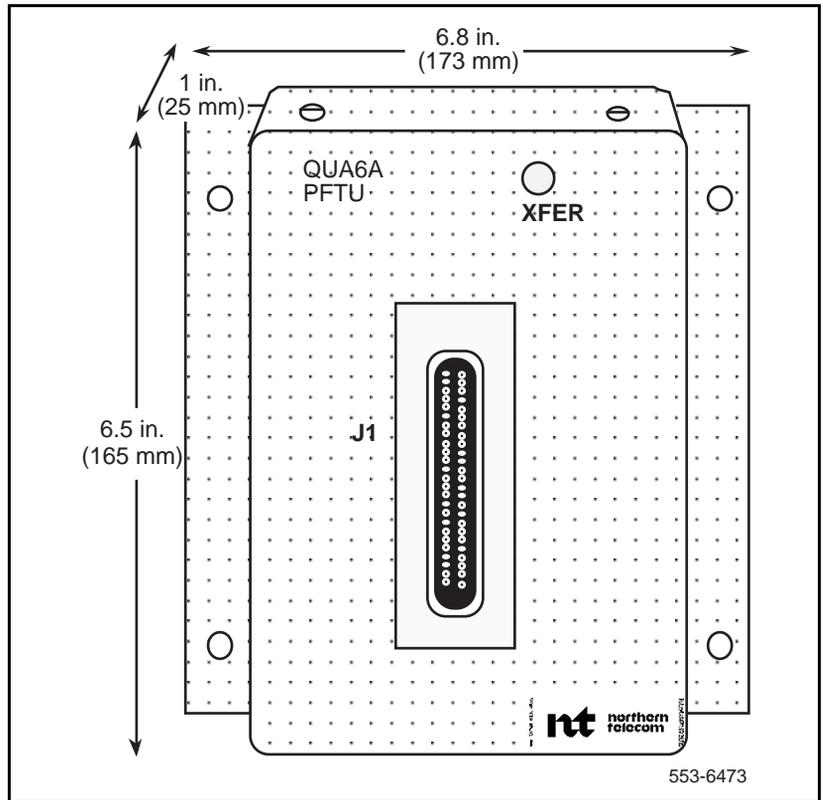
The PFTU requires a -48 V dc input and a positive return (ground). In the United Kingdom, the PFTU is powered from a separately fused auxiliary -48V feed from the external power system. Input requirements are as follows:

QUA6 PFTU: -42 to -56 V dc at 150 mA nominal

Dimensions and weight

The QUA6 PFTU is a wall-mounted unit and weighs 2 lbs (0.8 kg). The dimensions of the unit are shown in Figure 5.

Figure 5
QUA6 PFTU dimensions



Cable requirements

This chapter describes the types of cable used in the Meridian 1 and provides some guidelines for cabling.

Cable types

Meridian 1 uses the following major types of wiring:

- 25-pair main distribution frame (MDF) cables:
These cables carry voice and data information between modules and the distribution frame. One end of the cable must be equipped with a 25-pair female connector that terminates on the module input/output (I/O) panel. The other end of the cable terminates on the MDF block.
- Interface cables:
Interface, or I/O, cables are typically 25-conductor interfaced through RS-232-C connectors. These cables are used to connect data units to printers, host computers, and modems.
- Twisted-pair shielded and non-shielded cables:
These cables interconnect the trip power monitoring connections between power interface units and the MDF. Typically, a #22 AWG, stranded (Belden type 8408-2 conductor or equivalent) shielded cable is used for trip connections and to connect the Meridian 1 to QCA13 Power Cabinets. All other connections are serviced by non-shielded, #22 AWG stranded cable.
- Twisted-pair telephone cables:
These cables carry analog voice and digitized voice and data information between distribution frames and terminal devices throughout the building. They connect to 8-pin modular jacks located within 2.4 m (8 ft) of each device.

Note: Consider cable length requirements and limitations for both initial installation and later growth when you plan a system.

System cabling

Power and ground cables

For AC-powered systems, a 2.7 m (9 ft), 3-conductor line cord is supplied, except in areas where conduit is required.

For DC-powered systems equipped with an NT7D10 PDU, wiring is generally run through conduit. For systems equipped with an NT7D67CA PDU, conduit is not required. However, conduit may be used, if preferred or required by local code or practices, and attached to the pedestal at any of three locations. (Rear access is provided by the NT7D0902 Rear Mount Conduit Kit.)

Metallic conduit is used primarily to contain electromagnetic emissions. Where conduit is used, it must provide an end-to-end enclosure for the power wiring.

Note: Metal ducts and raceways usually do not provide electromagnetic containment; they can be used with, but not in place of, conduit.

Module cable routing

Because the cable troughs and spaces on the sides of each module are within the EMI shielding of the system, unshielded cables can be routed in those areas. The corner vertical channels in the rear of the module are outside of the EMI shield. Cables routed in the vertical channels must be shielded, and must enter and exit the EMI-shielded area through I/O panels and adapters.

As space permits, you can route cables in the following ways:

- horizontally in the cable troughs at the front, rear, and sides of the module

Note: In a DC-powered module, because there is no module power distribution unit (MPDU), there is room to route cables horizontally from front to rear on the left side (front view) of the module.

- vertically on the sides of the module
- vertically in the corner channels in the rear of the module (shielded cables only)

CAUTION

You must route cables as perpendicular as possible to any nearby power cables. Avoid routing cables near power cables if alternate routing is available. (At the rear of the module, cables routed between the I/O panel and the rear cover can be parallel to the power cables because the panel provides EMI shielding.)

Network to peripheral equipment cabling

Cabling between the network and peripheral equipment runs from the following:

- the faceplate of an NT8D04 Superloop Network Card to the backplane connectors for an NT8D01 Controller Card in an Intelligent Peripheral Equipment (IPE) Module
- the faceplate of a QPC414 Network Card to the faceplate of a QPC659 Dual Loop Peripheral Buffer in a Peripheral Equipment (PE) Module

Cable access

The customer is responsible for supplying all access for station, feeder, and riser cabling including the following, where necessary:

- conduit
- floor boring
- wall boring
- access into hung ceilings

Planning the site

Site planning is an important element in planning the installation of a Meridian 1. It affects the installation cost, as well as operation and maintenance, and can have an overall effect on system performance.

Selecting a site

Select and evaluate sites according to the requirements in this document and the following criteria:

- Space:

The site must provide adequate space for unpacking, installation, operation, potential expansion, service, and storage. The site must provide space for sufficient cooling. You may need additional space for a maintenance and technician area.

- Location:

The location should be convenient for equipment delivery and close to related work areas. You must consider the location of related equipment (such as the distribution frame and batteries) and the cable limitations when selecting the site.

- Grounding and power:

Proper grounding and sufficient power facilities must be available.

- Structural integrity:

The floor must be strong enough to support anticipated loads and, if applicable, the ceiling must be able to support overhead cable racks.

Developing the site

You must consider the following factors during site development:

- space and equipment layout requirements
- detailed floor plan and floor loading requirements
- building cable plan

The equipment room

Space and equipment layout requirements differ with each installation. Consider primary storage, secondary storage, and maintenance and technician space requirements when you plan the site.

Primary storage

The floor area required for a Meridian 1 depends on the number of columns, the length-to-width ratio of the area, and the location of walls, partitions, windows, and doors. To determine the exact layout required, prepare a detailed floor plan after regarding all of the requirements in this chapter.

Although operating needs determine the general location of terminal devices, these devices must not be located beyond the maximum distances defined for their interface cards. Wall jacks and outlets must be provided for all devices located in the equipment room.

Secondary storage

Provide space in the equipment area for storing disks, printer paper, printouts, and daily reports. A secure storage room for spare parts is recommended.

Whenever possible, maintain the same environmental conditions in the equipment room and storage areas. If it is not possible to maintain the environment of the storage area exactly the same as the environment of the operating equipment, give stored materials time to adjust to the equipment room environment before using them.

Maintenance and technician area

You can use the maintenance and technician area as an online work center and a place to store tools, test equipment, system documents, and spare parts. The area should have good lighting and convenient access to the Meridian 1. Typical items in a maintenance and technician area are as follows:

- shelves for instruction books
- spare parts storage room
- paper storage area
- locking cabinet or storage area for backup disks
- table or desk
- terminal, printer, or equivalent device

During regular system operation, a terminal, or a modem, or both must be connected permanently to the system to provide a constant I/O interface. You can use more than one terminal or modem. Plan for surface space, power outlets, and the availability of the terminals/modems before installation.

The floor plan

Prepare a detailed floor plan for each site, indicating the size and location of the following:

- the system columns and modules, including planned expansion areas
- the main distribution frame (MDF)
- the service panel
- system terminal, printer, or other terminal devices (such as modems)
- external power equipment (such as rectifiers)
- any cable racks
- PTFUs and auxiliary power supplies (if either are equipped)
- space for additional equipment, such as reserve power equipment or auxiliary processors

Follow these guidelines when you plan the equipment room layout:

- The minimum acceptable distance between equipment aisles is 76 cm (30 in.)
- The minimum acceptable distance between the end of the column and walls, and between rows, is 91.4 cm (3 ft).
- The minimum acceptable ceiling height is 243.8 cm (8 ft) or greater.

Note: According to the National Fire Code, equipment must be at least 30.5 cm (12 in.) from a sprinkler head. If a system is four modules high with a cable rack, do not place the equipment directly under any sprinkler heads.

In multiple-group systems, you must consider possible network expansion in the floor plan because you must locate network group modules together. There are several possible ways that you can expand the system. One possibility is to provide space for additional network groups to the left of the CPU Modules, and additional peripheral equipment (IPE or PE) to the right. Another possibility is to add peripheral equipment modules in a separate row of columns.

Meridian 1 dimensions appear in Table 14. Figures 6, 7, 8, 9 illustrate sample equipment room floor plans. These samples may vary from your floor plan, depending on your system needs and the size and arrangement of your equipment room.

Table 14
Equipment dimensions

Equipment	Width		Depth		Height	
	cm	in.	cm	in.	cm	in.
Pedestal	81.3	32.0	66.0	26.0	25.4	10.0
Top cap	81.3	32.0	55.9	22.0	10.2	4.0
Module	81.3	32.0	55.9	22.0	43.2	17.0
One-module column	81.3	32.0	66.0	26.0	78.7	31.0
Two-module column	81.3	32.0	66.0	26.0	121.9	48.0
Three-module column	81.3	32.0	66.0	26.0	165.1	65.0
Four-module column	81.3	32.0	66.0	26.0	208.3	82.0

Note: Multiple-column systems require a 7.6 cm (3 in.) spacer between each column for cable routing and to provide EMI shielding.

Figure 6
Sample equipment room floor plan: system option 21E

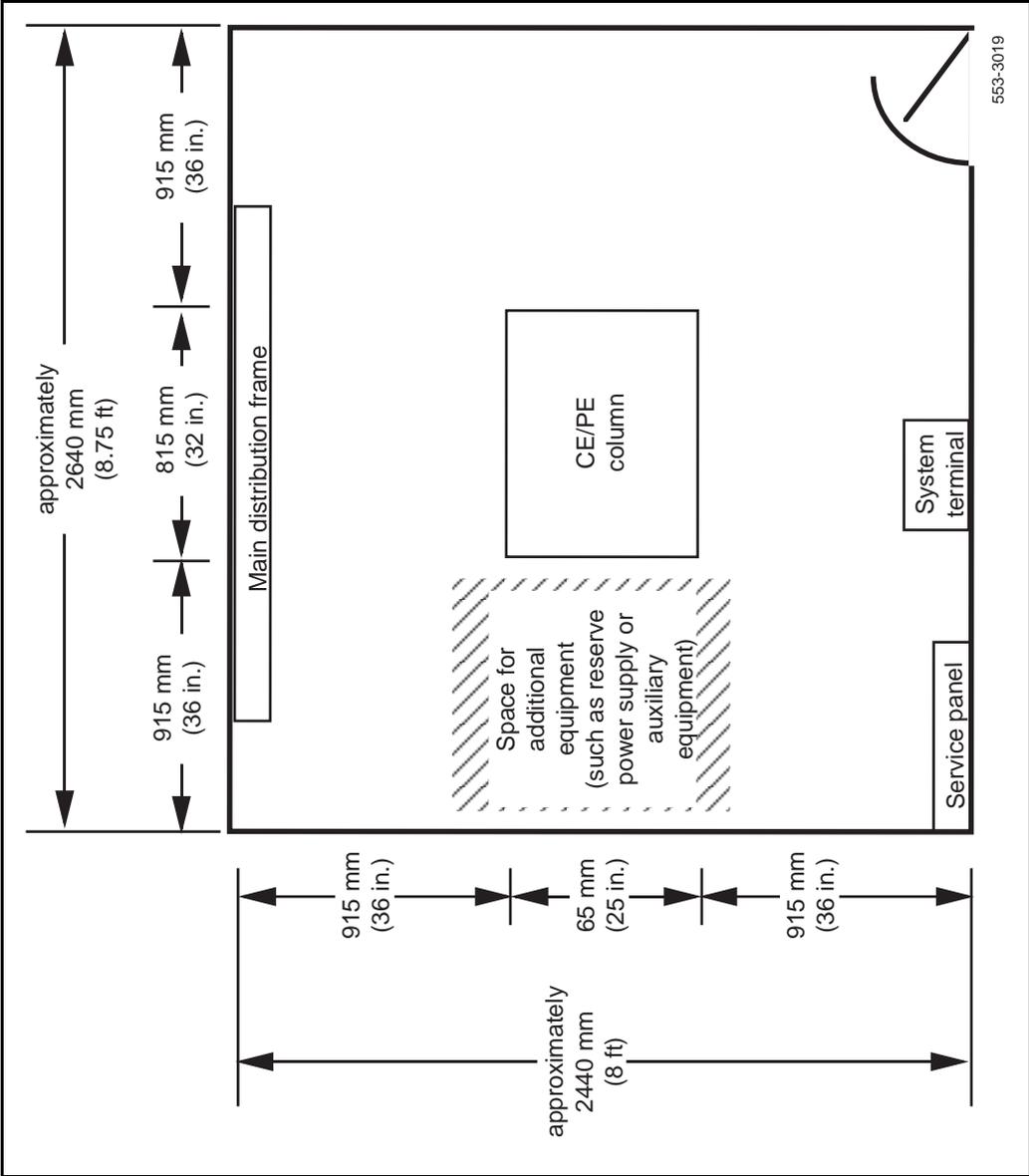


Figure 7
Sample equipment room floor plan: system options 51C and 61C

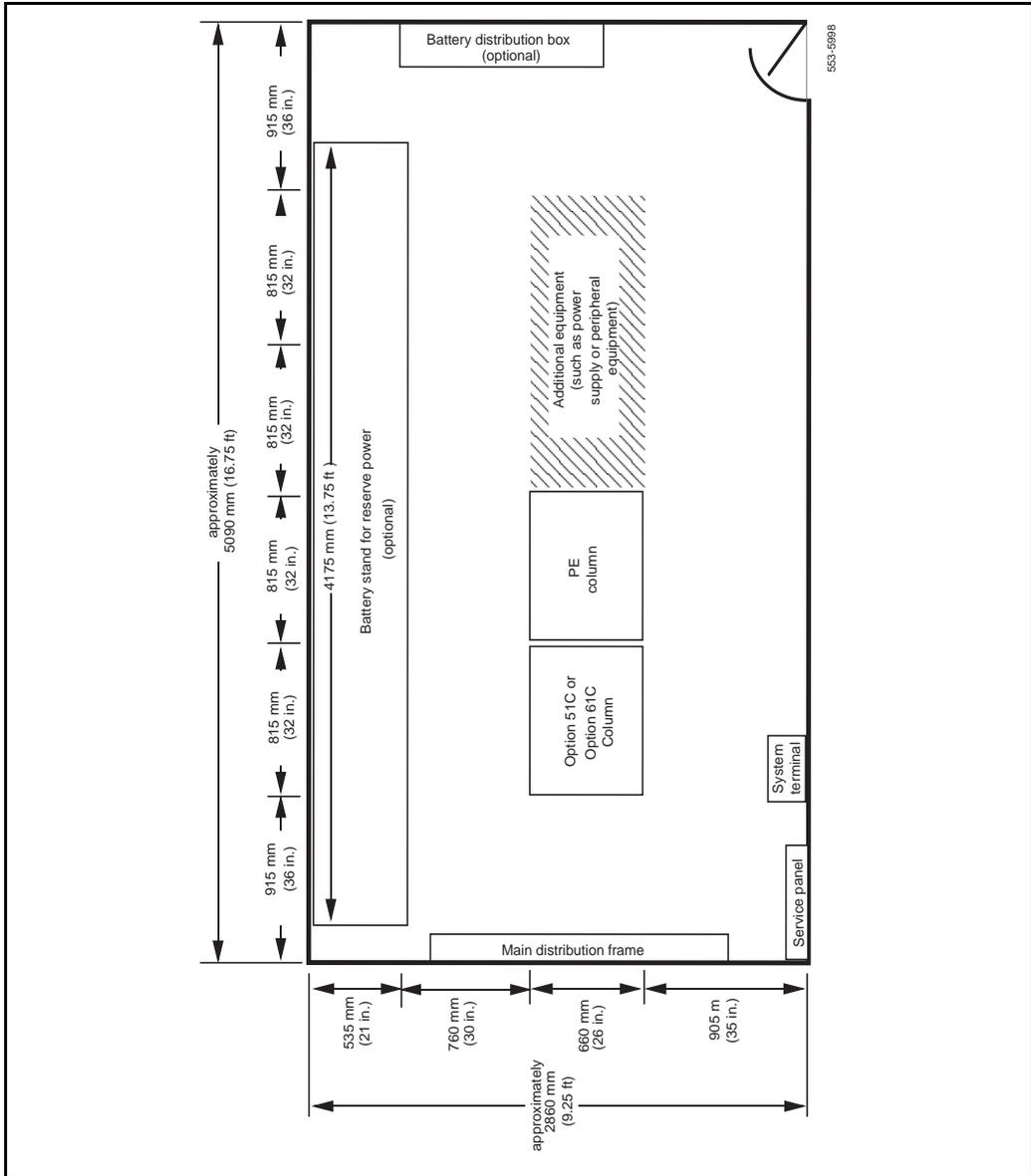
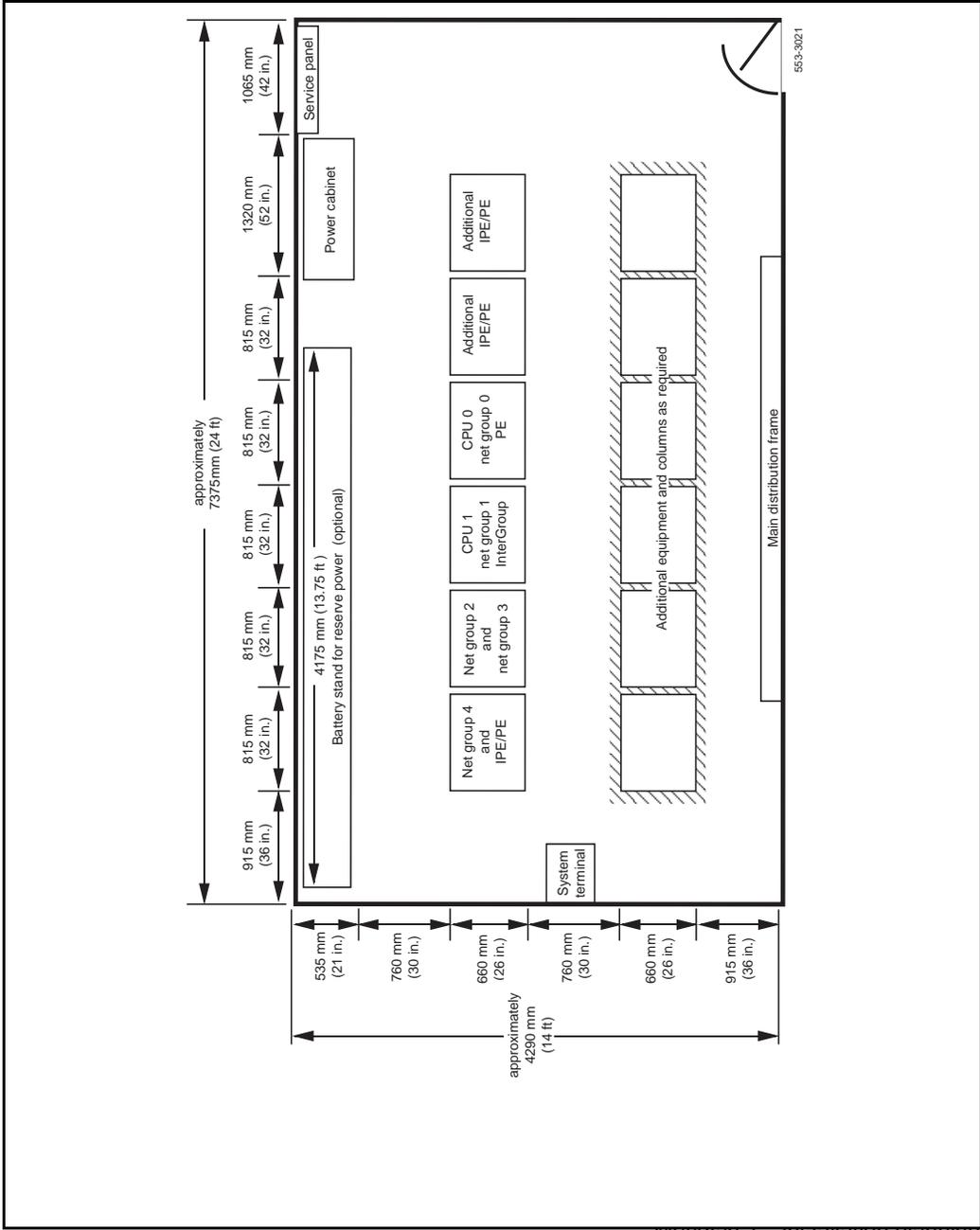


Figure 8
Sample equipment room floor plan: system options 81



Floor loading estimates

You must estimate floor loading to plan module distribution. “Floor loading” is the weight of the system divided by the occupied floor area; “point loading” is the local pressure exerted by the feet of the system on the floor.

Table 15 gives Meridian 1 weights. Table 16 gives floor loading estimates. These estimates represent fully loaded columns complete with pedestal, maximum circuit card configurations, power supplies, and cables.

**Table 15
Equipment weights**

Equipment	Weight empty		Weight full	
	kg	lbs	kg	lbs
Pedestal	18.1	40	31.7	70
Top cap	6.8	15	6.8	15
Module	22.7	50	58.9	130
One-module column	N/A	N/A	97.5	215
Two-module column	N/A	N/A	156.5	345
Three-module column	N/A	N/A	215.4	475
Four-module column	N/A	N/A	274.4	605

Table 16
Floor loading estimates

Number of modules	Floor load		Point load	
	(lbs/ft ²)	(kPa)	(lbs/in ²)	(kPa)
One	38.1	(1.8 kPa)	11.0	75.8 (kPa)
Two	60.3	(2.8 kPa)	17.3	119.0 (kPa)
Three	82.4	(3.9 kPa)	23.7	163.4 (kPa)
Four	104.6	(5.0 kPa)	30.0	206.8 (kPa)

Note: The numbers under "Floor load (lbs/ft²) and kPa" are based on a floor area of 0.52 sq m (5.64 sq ft) for the system. These numbers do not include the weight of the optional overhead cable rack. The numbers under "Point Load (lbs/in²) and (kPa)" are based on distributing the system weight among four feet, each with an area of 317 sq mm (4.91 sq in.); these numbers do not reflect the use of optional casters.

The building cable plan

In the building cable plan, show the routing of all wiring, the location and wiring requirements of each terminal device connected to the system, and any other relevant information about the device. Also, show the location of distribution frames, conduits and access points, and power outlets.

In addition, you need to perform the following tasks:

- Identify the ownership of existing building wire, if you are using any.
- Perform a random sampling of in-place wiring to ensure that it meets specifications for high-speed lines. All wiring carrying high-speed data must pass a verification test as part of the installation procedures.
- Identify the location of conduits and floor ducts. When telephone cable is run in conduit, that conduit must not be used for any other wiring.
- Identify the location of all distribution points, main and intermediate.

- Provide three pairs of telephone wire from a distribution frame to a nearby telephone jack for each terminal device. Modular jacks must be within 2. m (8 ft) of the device.
- Provide a 16-pair (or 25-pair) cable equipped with an Amphenol-type connector for each attendant console.

Divide the building cable plan into zones. Zones are typically the termination point of conduits throughout the office. Identify each zone on the building cable plan with a letter or number, and assign a block of numbers to each zone. Table 10 gives an illustration of zoning.

Note: Be sure to leave room for expansion.

Wire routing

To plan wire routing, establish the start and end point of each cable relative to the location of the terminal devices in the building, then examine the construction of the office to determine the best wiring routes. Consider the following guidelines when performing this task.

- Floors
 - In the open, wires can run along baseboard, ceiling moldings, or door and window casings. For the safety of employees, never run wire across the top of the floor.
 - When concealed, wires can run inside floor conduits that travel between distribution frames and jacks. (Under-carpet cable is not recommended.)
- Ceilings

National and local building codes specify the types of telephone wire that you can run in each type of ceiling. Local building codes take precedence.
- Walls

Cables that run vertically should, when possible, run inside a wall, pole, or similar facility for vertical wire drops. Cables that run horizontally cannot be blind-fed through walls.

- Between floors
Locate distribution frames as closely to one another as possible. Local coding laws specify whether or not a licensed contractor is required if conduit is installed.
- EMI
Data degradation may occur if wires travel near strong EMI sources. See “Equipment room requirements” on page 16 for a description of common sources of interference.

Termination points

Once you have determined the wire routing, establish termination points. Cables can terminate at the following locations:

- the MDF, typically in the equipment room
- intermediate distribution frames, typically on each floor in telephone utility closets
- wall jacks to terminal boxes, typically located near the terminal device

At the distribution frame (also called the cross-connect terminal), house cables terminate on the vertical side of the two-sided frame and cross connect to equipment that is typically located on the horizontal. If you use a color field scheme, house cables typically terminate in the blue field and the equipment terminates on the purple (U.S.A.) or white (Canada) field.

In all cases, clearly designate the block where the cables terminate with the cable location information and the cable pair assignments. Keep a log book (cable record) of a termination information. See Table 11 for an example.

Figure 10
Building cable zones

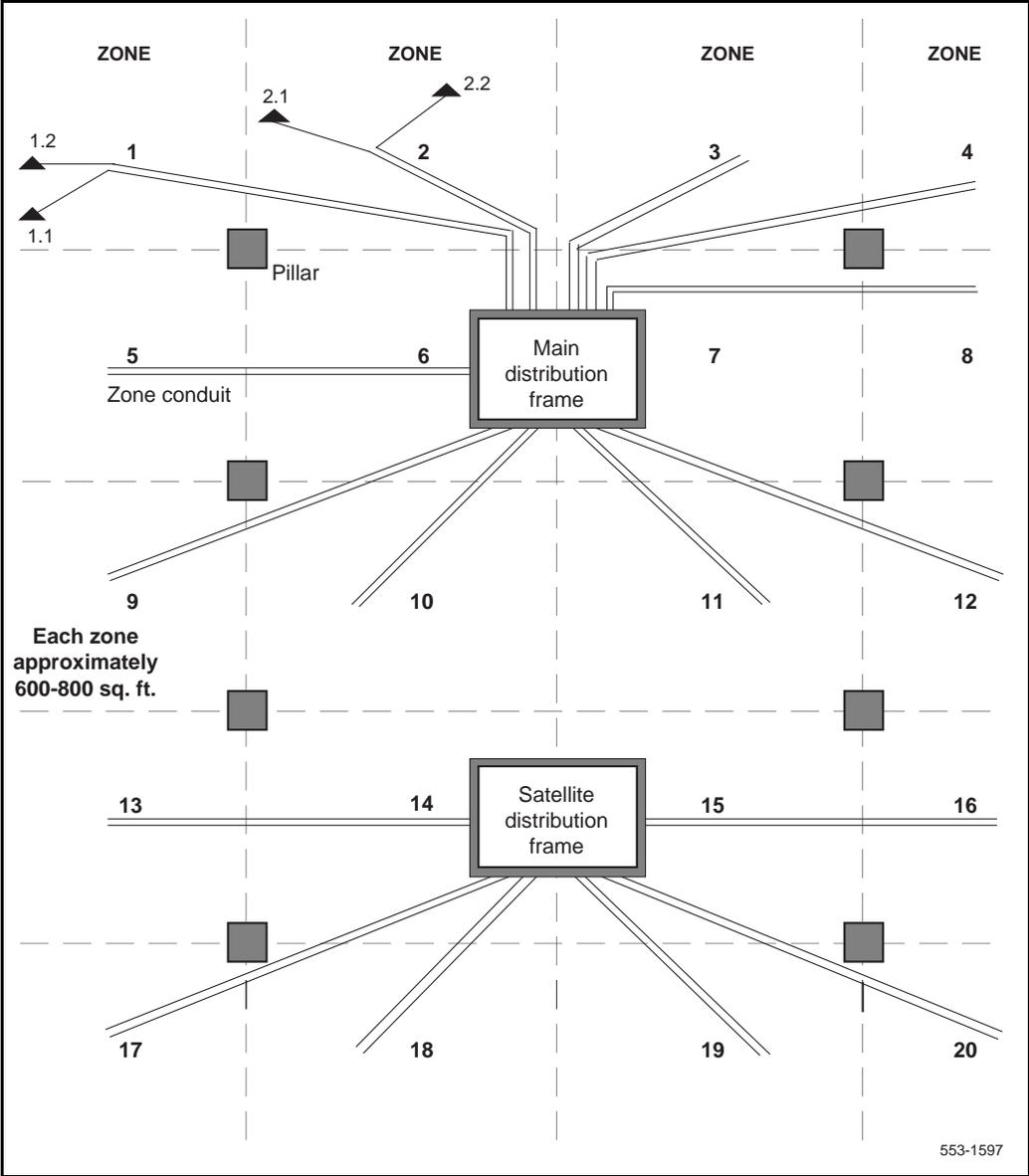


Figure 11
Sample cable record

CABLE RECORD										
Customer _____										
Location _____										
Cable _____ Binder _____ Page ____ of ____										
DN	TN				NAME	FEATURES / REMARKS	TERMINAL DEVICE	BLOCKS		COLOR
	M	S	C	U				DF	HOUSE	
										W BL
										W OR
										W GR
										W BR
										W SL
										R BL
										R OR
										R GR
										R BR
										R SL
										BK BL
										BK OR
										BK GR
										BK BR
										BK SL
										Y BL
										Y OR
										Y GR
										Y BR
										Y SL
										V BL
										V OR
										V GR
										V BR
										V SL

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Preparing for delivery and installation

To prepare for the delivery and installation of Meridian 1 equipment, you should perform preinstallation inspections, examine the delivery route, review equipment handling precautions, and gather all delivery items.

Preparing for delivery

Consider the following questions when you plan for delivery:

- Has a request been made for equipment delivery?
- Are transportation arrangements to the premises completed?
- Is a list of all ordered equipment available on site?
- Is help needed and available for preparing the equipment room?
- Are unloading and unpacking facilities and tools available?
- Is help needed and available for delivery?

Note: Plan to unload equipment as close to the final installation area as possible for an easier, and perhaps safer, installation.

Preinstallation inspections

Obtain any appropriate sign-offs before the site is ready for equipment delivery and installation. Sign-offs can include regulatory items such as electrical inspections, air conditioning inspections, and cable plan approval. In addition, an overall equipment room inspection and a building cable inspection should be performed before installation.

Inspect the equipment room to verify that all physical and environmental requirements are met, system grounding and power equipment is installed and tested, and the equipment layout is marked on the floor.

Inspect the building cable to verify that sufficient distribution frames are provided, conduits or floor ducts to terminal locations are installed, terminal jacks are installed, and sufficient wiring is on hand.

The delivery route

Before the Meridian 1 is delivered, examine and measure the route from the receiving area to the installation area. (See Table 14 for dimensions.) The following factors must be considered:

- size and security of unloading and storage areas
- availability and capacity of elevators
- number and size of aisles and doors on the route
- restrictions, such as bends or obstructions, in halls or at doors
- floor loading capacity of unloading, storage, and equipment room areas
- number of steps and stairways

Note: A four-module column is shipped in two segments. One shipping pallet carries the pedestal and three modules. Another shipping pallet carries the fourth module and top cap.

Preparing for installation

The installation plan, work orders, and appropriate documentation should be on hand at the time of installation.

The installation plan

The installation plan can consist of the equipment room floor plan, the building cable plan, and an installation and test sequence chart.

The equipment room floor plan should show the following items:

- the system columns and modules, including planned expansion areas
- the main distribution frame
- the service panel
- system terminal, printer, or other terminal devices
- external power equipment (such as rectifiers)
- any cable racks
- PFTUs and auxiliary power supplies (if either are equipped)
- additional equipment, such as reserve power equipment or auxiliary processors

The building cable plan should show the following information:

- cable routing and designation information
- the location of each terminal device
- the type of cable or wiring required for each terminal device
- the location of all distribution frames and system and terminal cross-connect assignments
- the location of conduits and floor ducts, including access points
- the location of power outlets for terminal devices

An installation and test sequence (ITS) chart shows typical installation tasks, the sequence of the tasks, and task start and duration information.

Work orders

The work order can include the following information:

- a detailed listing of the equipment ordered
- Terminal Number (TN) assignments
- Directory Number (DN) assignments for each terminal device
- Office Data Administration System (ODAS) designators for each terminal device (if the software package is equipped)
- features available to each telephone and data set
- administration database entries for telephone and data set features

Documentation

Instructions for unloading and unpacking Meridian 1 equipment and a full set of standard Northern Telecom Publications (NTPs) are delivered with each system. See “References” on page 1 for more document information.

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