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Chapter 1: Introduction

Fleet Simulator is an operating mode of the EM2100 appliance, used to simulate fleets of Omron AMRs. The Fleet Simulator can simulate up to three separate fleets with a total of ten Omron AMRs. Various features and configurations impact the resources consumed by the simulation, which may result in a smaller number of total fleets and robots being simultaneously simulated.

This user’s guide covers the basic procedures for setting up a Fleet Simulator. Fleet simulation has many uses including:

- Estimating the number of AMRs needed for your facility
- Detecting and avoiding bottlenecks with your facility layout
- Providing practice for your users in the operation of the MobilePlanner software

1.1 EM2100 Operating Modes

- Fleet Simulator - The operating mode that the EM2100 is in when simulating a fleet of AMRs.
- Standalone Fleet Manager - The operating mode that the EM2100 is in when providing fleet management services using a single EM2100.
- Paired Fleet Managers - The operating mode that uses one EM2100 (Primary) for providing fleet management services and a second (Secondary) EM2100 for providing backup to the Primary. The two EM2100 appliances are connected (paired).

1.2 Features Supported

- Up to three fleets with a total of ten AMRs can be simulated.
- Fleets of LD-60 AMRs
  These can be running current or legacy software.
- Fleets of LD-90 AMRs
  LD-90 AMRs, which have a different top speed than LD-60 AMRs, can be simulated as LD-60 AMRs with reduced speed.
- Fleets of LD-250 AMRs
- CAPS (TriangleTargetDrive)
- Fleet Operations Workspace Core Integration Toolkit
  The simulation of the Integration Toolkit supports one fleet with up to five AMRs.
- Odometry
- Safety Scanning Laser
- Obstacle avoidance
Chapter 1: Introduction

- Path planning
- Localization
- Battery State of Charge
- Docking
- Job queuing

1.3 Features Not Supported

- Cart Transporters
- Mixed AMR model fleets
- Paired EM2100s (no Secondary EM2100 is supported)
- Acuity Localization
- HAPS (High Accuracy Positioning System)
- Sensors other than the Safety Scanning Laser

1.4 Fleet Simulator Licensing

If you already have an EM2100, and are switching it to Fleet Simulator operating mode, you need to purchase the Fleet Simulator license.

If you do not already have an EM2100, you will need to purchase the Fleet Simulator bundle, which includes an EM2100 with a Fleet Simulator license.

Contact your local Omron representative or Sales Office for pricing.

Table 1-1. Available Fleet Simulator Licenses

<table>
<thead>
<tr>
<th>Product</th>
<th>License Type</th>
<th>Product Description</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fleet Simulator Bundle</td>
<td>One-time Feature License</td>
<td>EM2100 with Fleet Simulator USB license dongle installed</td>
<td>20271-903</td>
</tr>
<tr>
<td>Fleet Simulator License</td>
<td>One-time Feature License</td>
<td>Fleet Simulator License, (to be used with an existing EM2100)</td>
<td>20271-804</td>
</tr>
</tbody>
</table>

1.5 How Can I Get Help?

For details on getting assistance with your Omron software or hardware, you can access the corporate website:


If you need help beyond what is covered in the manual, contact your local Omron representative.
## Related Manuals

<table>
<thead>
<tr>
<th>Manual</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mobile Robot LD Safety Guide</strong></td>
<td>Describes safety information for Omron AMRs.</td>
</tr>
<tr>
<td><strong>EM2100 Installation Guide</strong></td>
<td>Describes the installation and initial configuration of an EM2100 appliance.</td>
</tr>
<tr>
<td><strong>LD Platform OEM User's Guide</strong></td>
<td>Describes the installation, start-up, operation, and maintenance of the LD-60 and LD-90 AMRs.</td>
</tr>
<tr>
<td><strong>LD-250 Platform User's Guide</strong></td>
<td>Describes the installation, start-up, operation, and maintenance of the LD-250 AMR.</td>
</tr>
<tr>
<td><strong>Fleet Operations Workspace Core User's Guide</strong></td>
<td>Describes the software that runs on the EM2100 appliance.</td>
</tr>
<tr>
<td><strong>Fleet Operations Workspace Core Integration Toolkit User's Guide</strong></td>
<td>Describes software tools to simplify integration with factory equipment and material-movement solutions such as manufacturing execution systems (MES) and equipment resource planning (ERP) solutions.</td>
</tr>
<tr>
<td><strong>Advanced Robotics Command Language Enterprise Manager Integration Guide</strong></td>
<td>Describes the Advanced Robotics Command Language (ARCL) for use with the EM2100. ARCL is a simple text-based command and response server used for integrating the Fleet Operations Workspace Core platform with an external automation system.</td>
</tr>
</tbody>
</table>
Chapter 2: Fleet Simulator Setup

Before you can start using your Fleet Simulator, there are a number of initial set-up and configuration steps that you need to complete.

What you need to have

- An EM2100 appliance
  - This must be physically installed. See the EM2100 Installation Guide.
  - This must have a Fleet Simulator license.
  - This must have a version of Fleet Operations Workspace Core software 1.1 or later.
  - This must have SetNetGo 5.2 or later.
- IP addresses reserved for ten simulated AMRs and three simulated Fleet Managers
  These IP addresses must be static, consecutive, and in the same subnet as the management IP address. You should consult with your IT department on these addresses.
- If the EM2100 is new to your system, you will also need a network IP address in the same subnet as the management IP address for it.
- A PC that has access to the EM2100
  You will need the MobilePlanner 5.x software installed on this PC.
  Refer to Install the MobilePlanner Software on page 13.
- A map or maps of the environment you wish to simulate
  These are best if they are AMR-generated.
  You will need a map for each fleet that you are simulating.
  Refer to Scans and Maps on page 19.

What you need to know

You should have a working knowledge of MobilePlanner software.

You should have a working knowledge of SetNetGo software.

NOTE: Both of these are covered in the Fleet Operations Workspace Core User’s Guide.

2.1 Fleet Simulator Installation Overview

The Fleet Simulator runs under SetNetGo on an EM2100 appliance. It requires a Fleet Simulator license. While it is possible to switch the operating mode that an EM2100 is in, you cannot run an EM2100 in more than one operating mode (Fleet Simulator, Standalone Fleet Manager, or Paired [Primary or Secondary] Fleet Manager) at the same time.

The next two sections provide instructions for setting up an EM2100 as a Fleet Simulator.
Chapter 2: Fleet Simulator Setup

NOTE: This manual assumes that you have read and followed the instructions in the EM2100 Installation Guide.

Preliminary Tasks

Before you can start using your Fleet Simulator, there are some initial set-up and configuration steps you need to complete.

- Install the MobilePlanner software on your PC.
  Refer to Install the MobilePlanner Software on page 13.
- Create a map for each fleet you are going to simulate.
  It is possible to use the same map for more than one fleet.
  Refer to the Fleet Operations Workspace Core User’s Guide for instructions on the use of MobilePlanner and making maps.

2.2 Installation on a New EM2100

A new EM2100 appliance, purchased as part of a Fleet Simulator bundle, will come pre-loaded with all necessary software. You will need to download the MobilePlanner software onto your PC.

Refer to the EM2100 Installation Guide and the Fleet Operations Workspace Core User’s Guide.

Set the Static IP Address on Your Client PC

1. In the command field on the Windows taskbar, enter the following command to open the Network Connections dialog: ncpa.cpl.
2. Open the network properties of the PC ethernet network adapter used to connect to the Maintenance Ethernet port on the EM2100 appliance.
3. Double-click TCP/IPv4 to open the Internet Protocol properties dialog.
4. Enter an IP address in the range 1.2.3.1 to 1.2.3.254, excluding 1.2.3.4 (this is reserved for the Maintenance port).
5. Enter as the subnet mask: 255.255.255.0.
6. Click OK to close the Internet Protocol dialog, and then click OK to close the Ethernet Adapter dialog.

Set the Management IP Address of the EM2100

1. Connect an Ethernet cable from the client PC’s Ethernet port to the Maintenance Ethernet port (MAINT ETH0) on the EM2100 appliance.
2. Use a web user interface to access the SetNetGo interface.
3. Configure the Management Interface settings for the EM2100 MGMT ETH1 Ethernet port.
   a. Select Network > Management Interface.
   b. Enter a valid, available IP address for the EM2100 in the IP Address field.
IMPORTANT: You must assign a static IP address. Do not use a DHCP server.

Do not use the IP address 1.2.3.4, because this would create a conflict with the IP address permanently set for the Maintenance Ethernet port.

c. Enter the appropriate subnet mask for a host on your network in the Netmask field.

d. Enter the IP address of the default Gateway. (This is the IP address of the device used to connect to your network, typically a router.)

e. Enter the IP address of your Domain Name Server (DNS1), if applicable.
   Leave it at 0.0.0.0 otherwise.

f. Click Apply.

   If you click Reset rather than Apply, it will restore the previous values, without your changes.

4. Connect the EM2100 MGMT ETH1 port to your network.

2.3 Installing on an Existing EM2100

This section assumes that you have an operative EM2100 that is connected to your network, that you already have a fleet, and that you have a map of the environment that you want to simulate.

The setup for this type of installation consists of:

- Upgrading the Fleet Operations Workspace Core software to at least version 1.1.x on the EM2100
- Upgrading SetNetGo to at least version 5.2 on the EM2100
- Adding a Fleet Simulator license to your license dongle, which is inside the EM2100. Earlier versions of this software will not support the Fleet Simulator.

Refer to Software Installation on page 13.

NOTE: Before starting this procedure, ensure that the MGMT ETH1 connection is configured and connected to your network.

Adding a Fleet Simulator License

This procedure requires you to generate a Customer-to-Vendor (C2V) file, send that file to your Omron contact, and receive a Vendor-to-Customer (V2C) file back.
1. In SetNetGo on your EM2100, click on the **Licensing** tab.

![License Tab](image)

*Figure 2-1. Licensing Tab, Information Section.*

2. Click on **Information** if it is not already open, and make a note of the License #.

   The C2V file that you create next will be named with the format 1234567890-MMM-DD-YYYY.C2V (e.g. 7769436109-MAY-21-2019.C2V).

3. From the **Download** tab, click the **Download** button.

   This will initiate a download of the C2V file, which you will need for obtaining a V2C file from your local Omron representative.

4. Contact your local Omron representative with your C2V file. The representative will return a V2C file to you.

5. After you receive the V2C file, select **Upload** within the **Licensing** tab.

6. Click **Choose File**, then select the V2C file using the window that pops up.

   The text "Choose File" is browser-dependent, and may be different on your system.

7. Click **Upload File**.

   This will write the Fleet Simulator license onto your license dongle. The dongle is inside the EM2100.

8. If you will be supporting legacy fleets, plug in the external Fleet Simulator dongle that is required to support those fleets.
Chapter 3: Software Installation

The Fleet Operations Workspace Core software runs on the EM2100 appliance.
The Fleet Simulator software is accessed through SetNetGo, and runs on the EM2100.
MobilePlanner runs on the user-supplied PC.

3.1 Install the MobilePlanner Software

Before running the Fleet Simulator, you will need to install MobilePlanner on your PC. This software is the primary interface to the simulated Fleet Managers and AMRs, and allows programming of the AMR fleet.

System Requirements

Verify that your PC meets the following requirements before installing MobilePlanner:

- **OS**: Windows 7 (32-bit/64-bit), Windows 8 (32-bit/64-bit), or Windows 10 (32-bit/64-bit).
- **CPU**: 1.5 GHz Dual-core minimum.
- **RAM**: 1.5 GB minimum, 4 GB recommended.
- **GPU**: 256 MB minimum.
- **HDD/SSD**: At least 250 MB available space.
- **Monitor**: XGA 1024 x 768.

Installing MobilePlanner

Ensure that your PC meets the system requirements, then install (or download and install) MobilePlanner.

**NOTE**: The MobilePlanner software installs into a MobilePlanner5 directory. This allows you to have MobilePlanner 5.x and MobilePlanner 4.x installed concurrently to interact with fleets of both generations.

**Version Information**: Only MobilePlanner software version 5 or higher is compatible with Fleet Operations Workspace Core. It is not compatible with earlier Omron fleets running on Mobile Software Suite version 4.X or earlier.

1. Use one of the following methods to download and/or install the MobilePlanner software:

   **A.** By **USB drive**: Insert the software media (USB drive that includes documentation) into your PC, and browse the USB drive to locate the software.

   **B.** From **SetNetGo**: When directly connected to the AMR via Ethernet, you can open SetNetGo, click the **Software** tab, and install MobilePlanner.

   Go to **ManagedInstalledSoftware > MobilePlanner** and click the underlined "here" link.
C. From your EM2100: Use **Software > Manage Installed Software > MobilePlanner** > It can be downloaded here. (Click on the "here" link in the EM2100 user interface, shown near the bottom of the following figure.)

![Manage Installed Software Screen](image)

*Figure 3-1. Manage Installed Software Screen, Showing “download here” prompt.*

D. By **download**: Contact your local Omron representative for assistance with downloading MobilePlanner software.

E. By **download**: From the internet
   
   a. Go to robotics.omron.com.
   b. Click on your region in the map.
   c. Hover over the Support tab.
   d. Click Software Library.
   e. Click Mobile.
   f. Click Current (or Legacy if you want 4.x).

2. Launch the installer and, when the welcome screen appears, follow the prompts in each installation wizard window to complete the installation.
If you used SetNetGo or downloaded the software, this will usually be in your Downloads folder. The actual location is determined by the settings in the browser that you use.

3. Click Finish when done.

**3.2 Fleet Simulator**

The software that supports the Fleet Simulator runs under SetNetGo on the EM2100 appliance.

If you purchased the Fleet Simulator bundle, including the EM2100 appliance, this software will already be loaded onto the EM2100.

If you already have a fleet, and are switching to Fleet Simulator operating mode, you may need to update your Fleet Operations Workspace Core software and SetNetGo on the EM2100 to have support for the Fleet Simulator.

1. Install SetNetGo 5.2 or later in the System> Upload SetNetGo OS tab.
2. Boot into the SetNetGo that you installed in the previous step.
3. Install Fleet Operations Workspace Core 1.2 in the Software> Manage Installed Software tab.

**Updating the Fleet Operations Workspace Core Software**

1. Contact your local Omron representative for an updated Fleet Operations Workspace Core package.
   
   You can also download this from our web site. Refer to Installing MobilePlanner on page 13.

2. From your browser of choice, connect to SetNetGo on the EM2100, click the Software tab, then click Manage Installed Software from the left side list.
   
   This connection is preferably through the maintenance port at 1.2.3.4, though connecting through the network is also possible.
Chapter 3: Software Installation

Figure 3-2. Software, Manage Installed Software.

3. Click the Choose File button to access the folder where the update file is located, and click Open.

   The prompt "Choose File" is browser-dependent, and may be different on your browser.

4. Confirm that the correct file name is listed next to the Choose File button, then click Upload.

5. If you are certain you want to proceed, click OK.

   If the installation was successful, the new Mobile Software version appears in Manage Installed Software.

3.3 Configure Fleet Simulator Settings

Set the EM2100 Operating Mode to Fleet Simulator

1. Using a web browser, access the SetNetGo interface.

2. Click the System tab, select Mode, then select Fleet Simulator.

3. Click Apply.

   You will be shown several warning pop-ups. Respond OK to all.
The EM2100 will reboot.

At this time, Status > Home > Mode of Operation should show Fleet Simulator.

4. Configure the IP Address Pool settings, described in the following section.

**Configure the IP Address Pool**

1. Select Network > IP Address Pool.
   
   This will display IP Settings for simulated Fleet Managers and AMRs.

2. Enter the lower and upper IP addresses in the range that you reserved for the Fleet Simulator in the IP Range fields.

   IMPORTANT: These must be consecutive, static IP addresses. Do not use a DHCP server.

   The Netmask and the Gateway values will default to the Management Interface values. You cannot change them here.

3. Click Apply.

   If you click Reset rather than Apply, it will restore the previous values, without your changes.

A message dialog informs you of the status of the change, and whether there is any impact on operations, such as a restart or a time delay before the change takes effect.
Chapter 4: Fleet Simulator Operation

The Fleet Simulator software is configured through SetNetGo, while the individual simulated fleets are controlled with MobilePlanner.

The SetNetGo user interface that supports the Fleet Simulator cannot be accessed through MobilePlanner. You need to access the Fleet Simulator SetNetGo through a web browser. You will need to enter the previously-configured IP address of the EM2100 Management Interface in a web browser to get access to the Fleet Simulator software.

4.1 Scans and Maps

Map Overview

The Fleet Simulator software requires a map of the environment in which each fleet will operate. These should be generated by an Omron AMR. The Fleet Simulator software comes with a sample map to get you started, but it will not represent your AMR operating environment.

When fleets are created a default map is assigned to each fleet. After the fleet is created and running, then you can change the map.

If you do not have access to an Omron AMR, contact your local Omron representative if you want to use a CAD drawing of the area. CAD-based maps should be replaced with AMR-generated maps when possible.

CAD models should not be used with real AMRs.

Maps are one of the most important features of fleet management. In MobilePlanner, a map is a scanned representation of the floor plan in the AMR’s operating space. Maps contain the static features in the AMR’s environment, such as walls, doors, permanent shelving, etc. They also contain user-definable sectors, lines, and areas that help the AMR perform its job.

Scan Overview

If you have a real fleet and are going to simulate an area for which you already have a map, you can simply use that map.

The procedure for creating a scan using an AMR and converting that into a map for use with your fleet is covered in the Fleet Operations Workspace Core User’s Guide.

If you do not have access to an AMR, you can use a CAD model of your facility. You should remove any features that are not in the operating space of the simulated AMR.

4.2 Running the Fleet Simulator

The Fleet Simulator configuration is accessed through the Fleet Simulator tab in SetNetGo.

IMPORTANT: This tab is only displayed when the EM2100 is in Fleet Simulator operating mode. In this mode, MobilePlanner cannot access SetNetGo.
Chapter 4: Fleet Simulator Operation

1. In your web browser, enter the IP address of the EM2100. SetNetGo will open.

2. Click on the **Fleet Simulator** tab.

![Figure 4-1. SetNetGo, Showing Fleet Simulator Tab.](image)

**Fleet Status**

This will show the names of all virtual fleets that have been created.

- **Status:** Displays one of the following:
  - FREE - The fleet is available for creation.
  - RESERVED - The fleet has been created, but not Started.
  - RUNNING - The fleet has been created and Started.
  - STOPPED - The fleet was RUNNING and then Stopped.

- **Created:** Shows the date and time that each fleet was created.

- **Name:** Shows the name that the creator assigned to the fleet.

- **Fleet Manager IP Address:** The address that was assigned to this virtual Fleet Manager.

- **Robots:** Shows the number of virtual AMRs in this fleet, their assigned names, and IP addresses.

- **Control Fleet** lets you Start, Stop, Destroy, or Save a fleet.

  Save (and Restore) are covered in Fleet Save and Restore on page 23.
**Start**

The **Start** button in the Fleet Status window applies the changes that you have made to the fleet. The fleet Status will change from RESERVED to RUNNING.

**Stop**

The **Stop** button in the Fleet Status window stops the fleet, and changes the fleet status from RUNNING to STOPPED.

**Destroy**

The **Destroy** button in the Fleet Status window will destroy the selected fleet, and change its fleet Status to FREE. This can be applied to either a RUNNING or STOPPED fleet.

**Create New Fleet**

You will need to:

- Select the number of AMRs to simulate in this fleet.
- Name the fleet.
  
  The fleet name can contain alphanumeric characters as well as dash, underscore, and period. It cannot contain spaces or other special characters.
- Select the type of AMR to be simulated.

**Available Fleets**

This displays fields that let you choose from the available fleets and robots, name the new fleet, and choose the robot type for this fleet.

**Fleet Number:** This shows the next fleet number available for creation. If this is blank, all three fleets have been created.

**Number of Robots:** The drop-down will show the number of robots that are available for this fleet.

**Name:** Type in a name for this fleet.

**Robot Type:** LD-60 or LD-250 (for LD-90 fleets, use LD-60)

**Initial Software Packages** *(Fleet_Operations_Workspace_Core_1.1.x.tar.gz)*

This is the package that will be used by fleets when created. This is installed in the **Software > Manage Installed Software** tab of the host EM2100.
Localizing Robots

After you have started your fleet and connected to the simulated Fleet Manager through MobilePlanner, you can localize the simulated AMRs at parking standbys on the map with the following command:

- In MobilePlanner, select EnterpriseManagerFleetLocalizeAtParking from the Command drop-down bar.
- You can add a string prefix in the input window in front of the command, which will limit the parking standbys chosen to those that begin with that prefix.

NOTE: You can hide or un-hide the Command portion of this bar by right-clicking in the bar, then checking or un-checking Custom Commands.

This command will continue until it runs out of either AMRs or parking standbys.
Fleet Save and Restore

The Fleet Save and Restore functions allow you to Save and Destroy a fleet without permanently losing the fleet configuration.

NOTE: A fleet can only be saved if it has STOPPED status.

Save

You can save the configuration for your fleet by clicking the Save button in the Fleet Status > Control Fleet section, shown in the following figure.

Figure 4-5. Save Button.
Chapter 4: Fleet Simulator Operation

**Restore**

If you have previously saved a fleet, you can restore it with Fleet Simulator > Fleet Restore. This requires that you have an available fleet and enough available AMRs for the fleet that you are restoring.

1. Click Choose File.
2. Select the desired FleetSave-<date>.tar.gz file.
3. Click Upload File.

**Software Repository**

This is the OS image that will be used for the simulated AMRs and Fleet Managers. To install a new image:

1. Click Choose File.
2. Select the intended SetNetGo runtime.
3. Click Upload File.

The Fleet Manager image is larger than the AMR image, which can cause problems when using large maps. If you will not be using the Integration Toolkit, you can use the AMR image to conserve memory.

**Changing Software Packages**

You can install a different software version on a fleet that has been generated by uploading the desired software package to the virtual Fleet Manager with the Software > Manage Installed Software tab of the virtual EM2100. This version will also be applied to the simulated AMRs in this fleet. If this is done, it will only change the version on the selected simulated Fleet Manager, not the host EM2100.

The note about 4.x software in the red rectangle in the following figure is regarding special capabilities of Fleet 1. For all three simulated fleets, you can generate and start the fleets with the previously discussed ‘initial software package’. You can, with these three fleets, install any given version of Fleet Operations Workspace Core by doing so directly on the simulated Fleet Manager. For Fleet 1, you can also install 4.x Mobile Suites directly to the simulated Fleet Manager of Fleet 1. Only Fleet 1 is capable of this feature, due to licensing limitations.
Figure 4-6. Available Fleet, Showing Legacy Software Note.
# Chapter 5: Glossary and Definitions

The following table lists acronyms and abbreviations, and defines key terms found in this user guide:

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMR</td>
<td>Autonomous Mobile Robot</td>
</tr>
<tr>
<td>ARCL</td>
<td>Advanced Robotics Command Language. A simple, text-based, command-and-response operating language. Used with the Fleet Manager, ARCL can help manage a fleet of AMRs.</td>
</tr>
<tr>
<td>Dock</td>
<td>Map location where the AMR &quot;looks for&quot; the charging station. Dock map icon should be 1 to 1.5 meters in front of the charging station, with the dock icon’s black line pointing to the charging station.</td>
</tr>
<tr>
<td>EM2100</td>
<td>A network appliance that hosts the Fleet Operations Workspace Core software.</td>
</tr>
<tr>
<td>Fleet</td>
<td>A group of AMRs that operate in the same area, share the same map, and are controlled by one Fleet Manager.</td>
</tr>
<tr>
<td>Fleet Manager</td>
<td>The set of capabilities within the Fleet Operations Workspace Core software that executes all fleet management activities. These include the management of maps, AMR configuration, job queue management, and traffic coordination.</td>
</tr>
<tr>
<td>Goal</td>
<td>Map-defined virtual destination(s) for AMRs (e.g., pickup or drop-off points).</td>
</tr>
<tr>
<td>Job</td>
<td>An AMR activity, usually consisting of either one or two &quot;job segments&quot;. (either PICKUP or DROPOFF).</td>
</tr>
<tr>
<td>License Dongle</td>
<td>A USB device that contains the software license key required to run a licensed program.</td>
</tr>
<tr>
<td>MobilePlanner</td>
<td>The primary software application for programming AMR actions.</td>
</tr>
<tr>
<td>SetNetGo</td>
<td>Software OS, resides on AMRs and the EM2100 appliance. Used to configure AMRs’ communication parameters.</td>
</tr>
</tbody>
</table>