Picocell 1900 General Information and Planning

Draft

Installation Method –04-0242

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Illustrations

1.0 General Information

1.1 Description

Purpose: This method covers installation information necessary to install the Picocell cell site.

Equipment: No equipment is necessary for this section

Application: This method should be read before the installation of any Picocell equipment.

Service Impact: None

1.2 Sequence

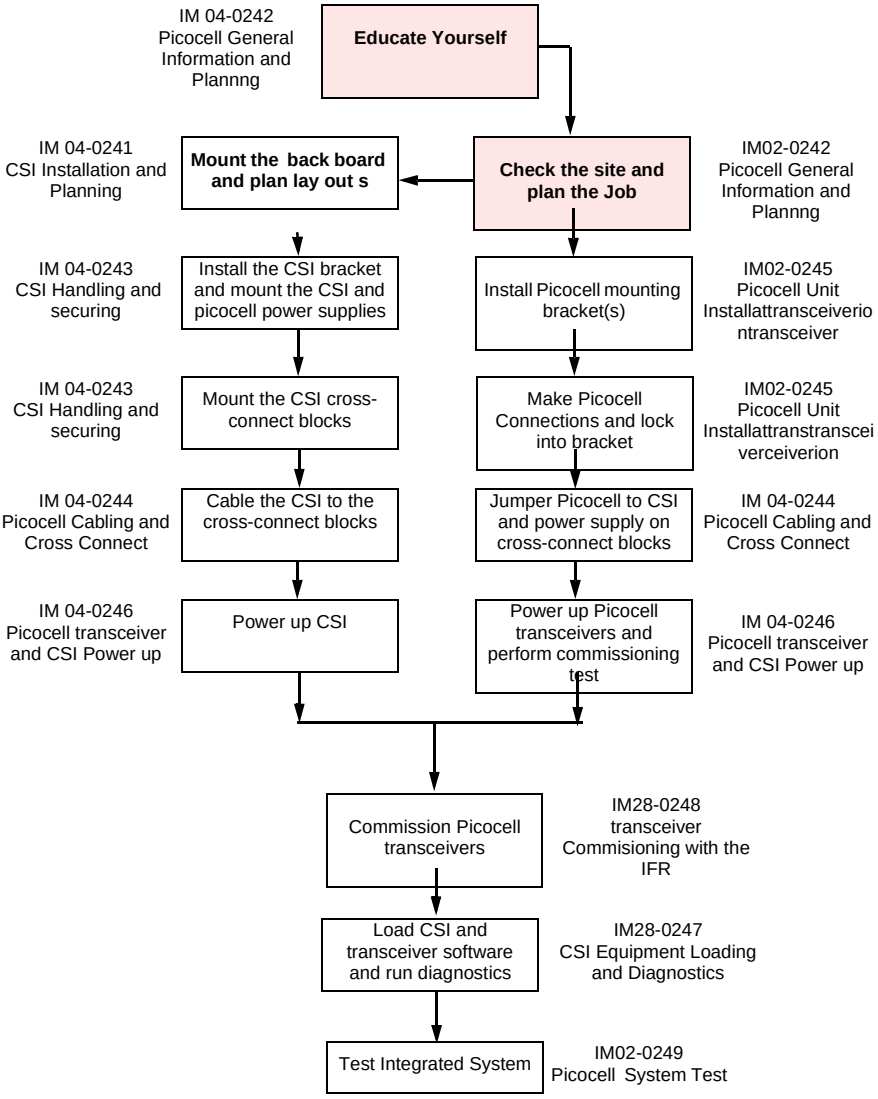
The sequencing for these methods is by module number reference below:

1.3 Reason for Reissue

This is the initial release of this method.

Draft

Figure 1 – You Are Here Diagram



2.0 Material Requirements

2.1 Required Documents

Installation Safety Manual (ISM/IM0) can be requested from the Regional Tool Facility.

System and RF Design Specification

The Picocell installation should first be specified by a qualified RF engineer for optimum placement of transceivers and performance. The system specification details traffic and coverage requirements. If this is not possible the Field Service personnel will have to conduct extensive coverage testing after turn up to ensure critical areas receive RF coverage and to identify areas where coverage may be limited. See NTP XXX XXX for deployment guide lines and RF planning.

3.0 Precautions and Preparations

3.1 Precautions

Observe the general safety precautions against personal injury and equipment damage outlined in the ISM/IM0 at all times.

Indoor Installations only.

This method is for indoor installations only.

Picocell 1900 transceivers and antennae are for indoor installations only and mounting of some or all; transceivers, antennae, hybrids and cabling in an outside environment may create a potential fire hazard from lightning. Custom design is required to address outdoor requirements

Avoid thermal trapped air cavities. In particular, the Picocell cannot be mounted above the ceiling as this is deemed a plenum installation, and different, tighter safety specifications are enforced.

CAUTION
Maintain minimum or greater distances from interference sources and from equipment and apparatus which may be affected by RF energy.

3.2 Preparations

Prior to starting the operations presented in this method, arrange all materials, tools, and test equipment at the work location so as to minimize fatigue and inconvenience.

4.0 Installation Requirements

4.1 Picocell Configurations

PICOCELL 1900 employs dual transceivers, which are distributed in a typical commercial building environment. Standard building telephone wiring connects the TCM digital link between the transceivers and the CSI. The CSI in the building location connects to the MTX over standard Telco digital T1or E1 facilities. Transceivers are equipped with internal Omni antennae and provide RF coverage from a wall or ceiling location. External antennae options are also supported and described here.

To provide flexibility in providing RF coverage in building environments and to provide flexibility in meeting traffic requirements the PICOCELL 1900 transceivers may be connected to external antennae either directly or combined through RF hybrids. Flexibility in RF coverage may also be enhanced with external antennae connected directly to the transceiver and the antenna placed for optimum RF coverage around barriers and obstacles and in select areas.

The RF channels in the individual PICOCELL 1900 transceivers are equipped with duplexed transmitters and dual receivers to provide path diversity in the mobile to base station path. The transmitters are hybrid combined internally to both antenna ports which are also duplexed to each receiver. Therefore RF signals from each antenna port connecting to the dual receivers provide diversity over two RF paths.

Traffic capacity and RF coverage may also be optimized by combining several transceivers on several antennae through multi port RF hybrids, each antenna providing coverage for multiple RF channels. Refer to NTP-XXX-YYY for deployment rules governing RF coverage and traffic requirements.

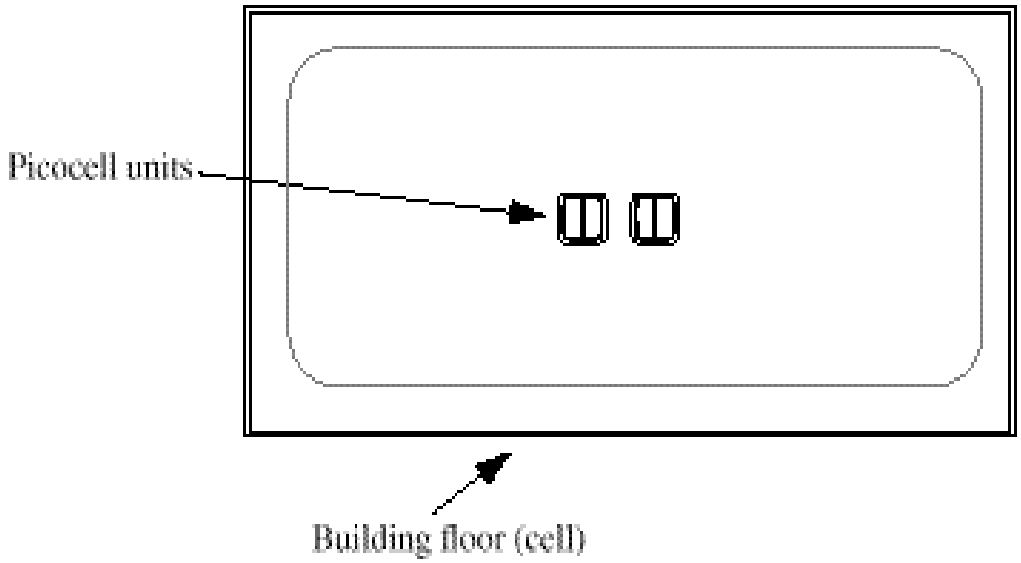
Three configurations are supported:

- 1. DISTRIBUTED TRANSCEIVERS
- 2. DISTRIBUTED ANTENNAE
- 3. COMBINED TRANSCEIVERS AND DISTRIBUTED ANTENNAE.

Distributed Transceivers

One or more transceivers equipped with internal antennae are distributed through an indoor building environment as shown in Figure 2. RF coverage and traffic engineering rely on the coverage area and traffic capacity provided by the physical placement of each transceiver. Using this arrangement, filling in high traffic areas and spot coverage requires the placement of individual transceivers at central points in the desired coverage area. Traffic capacity is determined by the number of Picocell transceivers in the coverage area. The TDMA 1900 mobile units are served with Digital traffic channels and Digital Control channels as determined by rules outlined in the Picocell Deployment Guide.

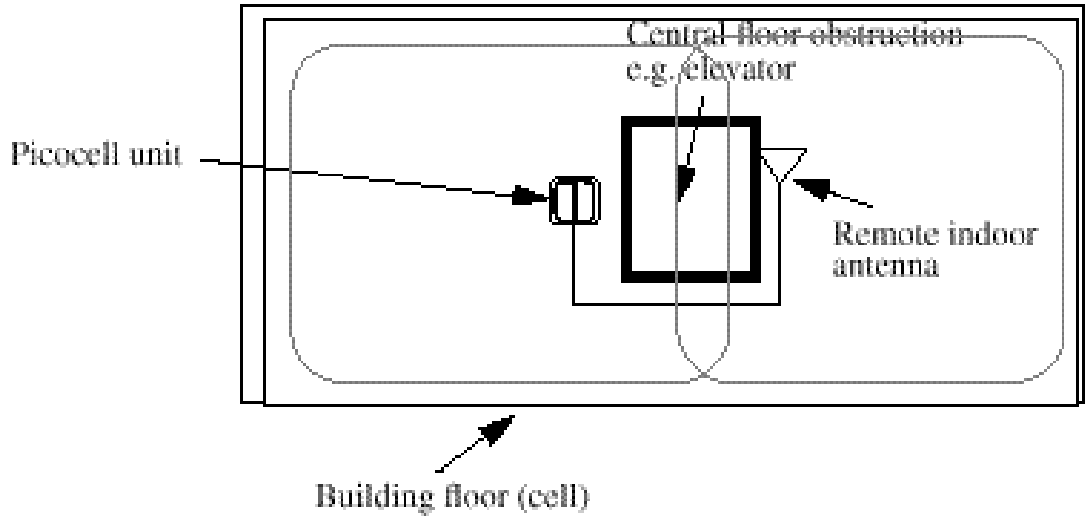
Figure 2 – Distributed Transceivers



Distributed Antenna

External antennas may be connected to the Picocell transceivers and located remotely from the transceiver location. This provides flexibility for optimizing RF coverage and working around restrictions for mounting the transceivers. The internal antennae equipped in each Picocell transceiver is disabled when remote antennae are connected and permits the RF coverage area to be determined by placement of the antennae and not the transceiver. The remote antenna option can be used to provide coverage over shadowed areas where physical deployment of the transceiver has an obstruction which blocks RF coverage and where it is impractical to locate the Picocell transceiver

Figure 3 – . Distributed Antenna

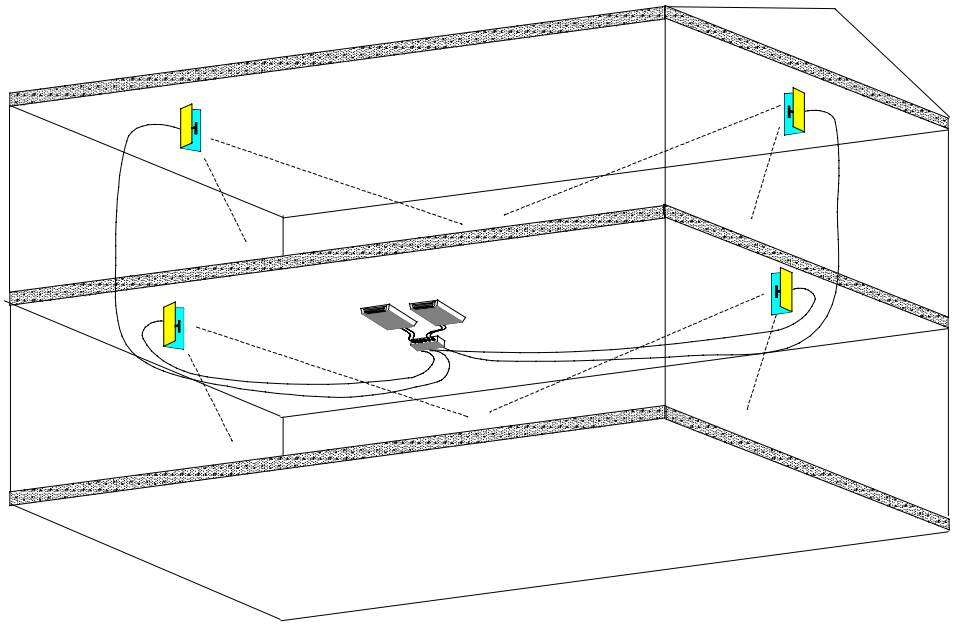


Combined Transceivers and distributed Antenna.

Transceivers may be combined with multiple antennas to increase both traffic capacity and RF coverage in a cell partition. Figure 4 shows the distribution of external antennas with two transceivers combined together. Hybrids are used to combine two to four Picocell transceivers with an external antenna network up to 8 antennas. Combining uses either a dual 4 port or dual 8 port combining hybrid. The dual 4 port hybrid has 4 inputs and 4 outputs and connects all 4 RF channels to each of the 4 antennas. The dual 8 port hybrid has 8 inputs and 8 outputs and connects all 8 RF channels to each of the 8 antennas. Low-loss coaxial cables connect between the antennae, hybrids and transceivers. See IM 12-0152 for cable types.

Figure 4 illustrates a multi floor application with distributed antennas on 2 floors and the combined transceivers mounted on the first floor. Antenna placement and resulting coverage must be determined by the System Engineer and should be listed in the System design and layout document. Ensure system layout and mounting information is available before starting the installation.

Figure 4 – Combined Transceivers and Distributed Antennas



Combined Transceivers RF Layout

Multiple Picocell transceivers may be combined on antennas using hybrids. Each picocell transceiver connects to two antennas which may either be internal to the unit or cabled to external antennas. The transmitters of both RF transceiver channels are combined through an internal hybrid to broadcast on each transceiver antenna port. External hybrids are used to connect multiple Picocell transceivers to multiple antennae as shown in Figure 5 and Figure 6.

Figure 5 – Picocell Dual 4 port Hybrid Configuration

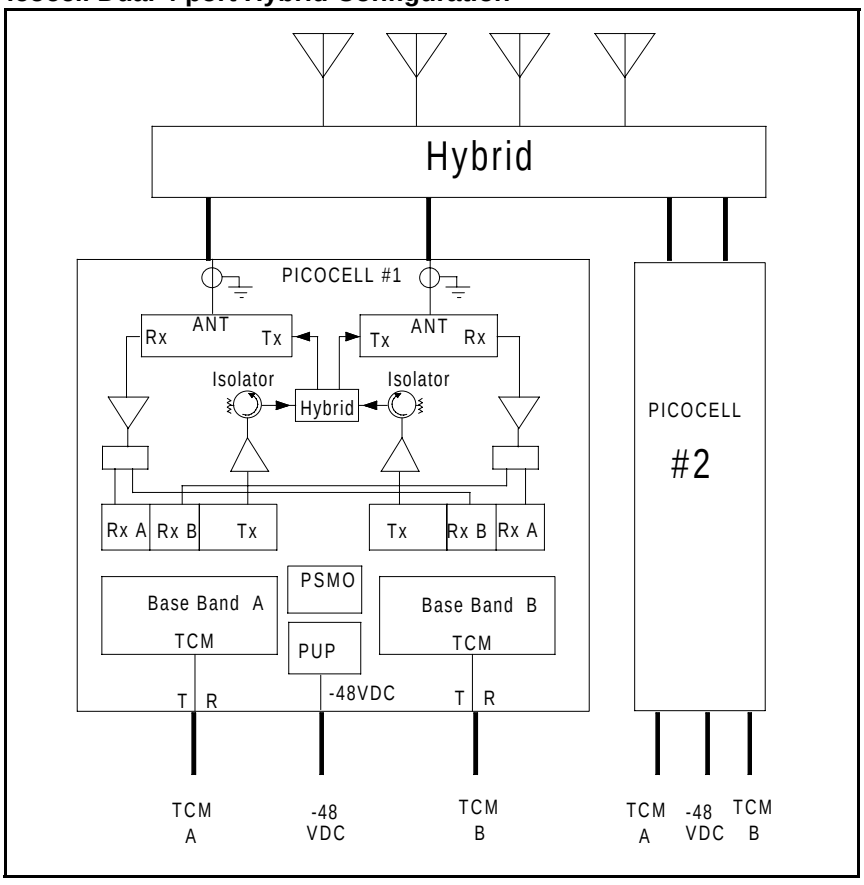
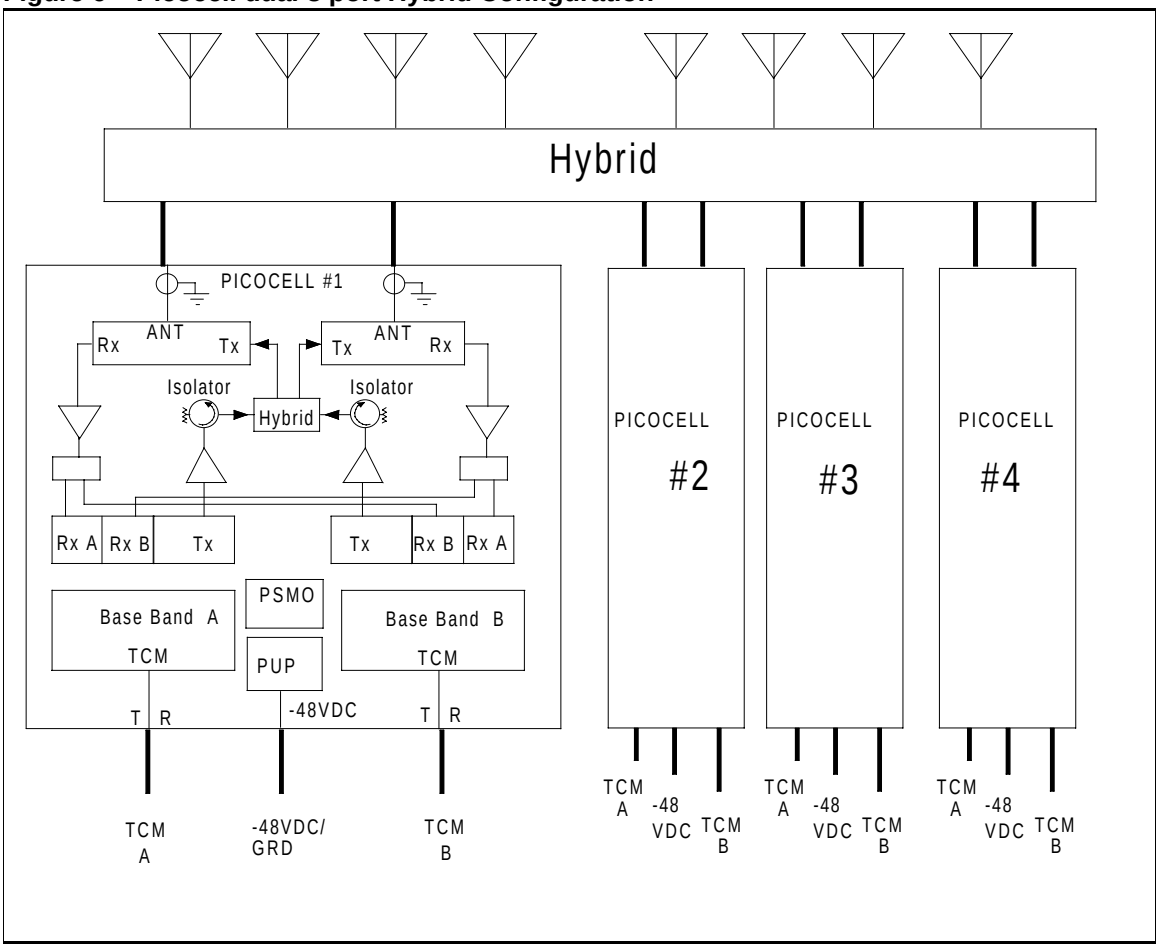


Figure 6 – Picocell dual 8 port Hybrid Configuration



4.2 Picocell Physical Site Requirements

This section covers the physical site requirements necessary to install the Picocell Equipment.

Installation of the Remote antenna option must consider mounting of antennae, transceivers, the interconnecting coaxial cable and TCM wiring. Cables must be supported in cable tray, routed in conduit or tied in intervals and must not violate building and fire codes. The System design Specification and layout must specify these parameters to ensure that the cable types and routes meets building codes.

transceivers and antennae must not be mounted behind obstacles and if it is impractical to do so then external antennae may be required. Mounting constraints on antennae are more flexible due to the lighter weight and smaller size. The ceiling antenna may be secured directly to ceiling panels and the directional antenna to dry wall surfaces using common anchor hardware. The Picocell transceiver requires support for ceiling mounting. See IM 12-0152 and IM 02-0245 for mounting details.

Installation of the combined Picocell applications require the transceivers to be cabled to an external hybrid combiner. This will operate multiple transceivers to serve a large area on antennas distributed throughout the building. The antennae are connected to the hybrid combiner by low-loss coaxial cables. Mounting of the Hybrids, transceivers and cabling must consider the cable routing options, power options and location. It may be required to provide a plywood back board to support the combined Picocell transceivers and hybrids. Transceivers co-located with power supplies will require individual AC outlets at the transceiver locations. IF transceiver power is remoted from the CSI location then outlets must be provided to accommodate all power convertors, see next section: "Picocell Power"

4.3 Picocell Remote DC Power

Picocell power may be remoted through station wiring or co-located with the Picocell transceiver. Co-located power requires an AC outlet close to the Picocell transceiver. Refer to the System Design Specification to confirm AC outlet requirements.

Remote power requires that the cable resistance be accounted for in order to ensure that the voltage drop over the pair does not reduce the voltage below minimum requirements at the Picocell transceiver. More conductors may be employed to reduce voltage drop and pairs may be doubled up to meet the resistance requirements. Table 1 on page 16 outlines the maximum length of 24 AWG cable allowable between the Picocell transceiver and the remote AC/DC power convertor. The following assumptions have been made:

24 AWG twisted pair

-48 volts minimum from the AC/DC convertor

-30 volts minimum into the Picocell transceiver

Worst Case Picocell transceiver Power

Heat Dissipation and Number of 24 AWG Twisted Pairs used for powering

Table 1 – Max Power Cable Length (24 ga) for Picocell

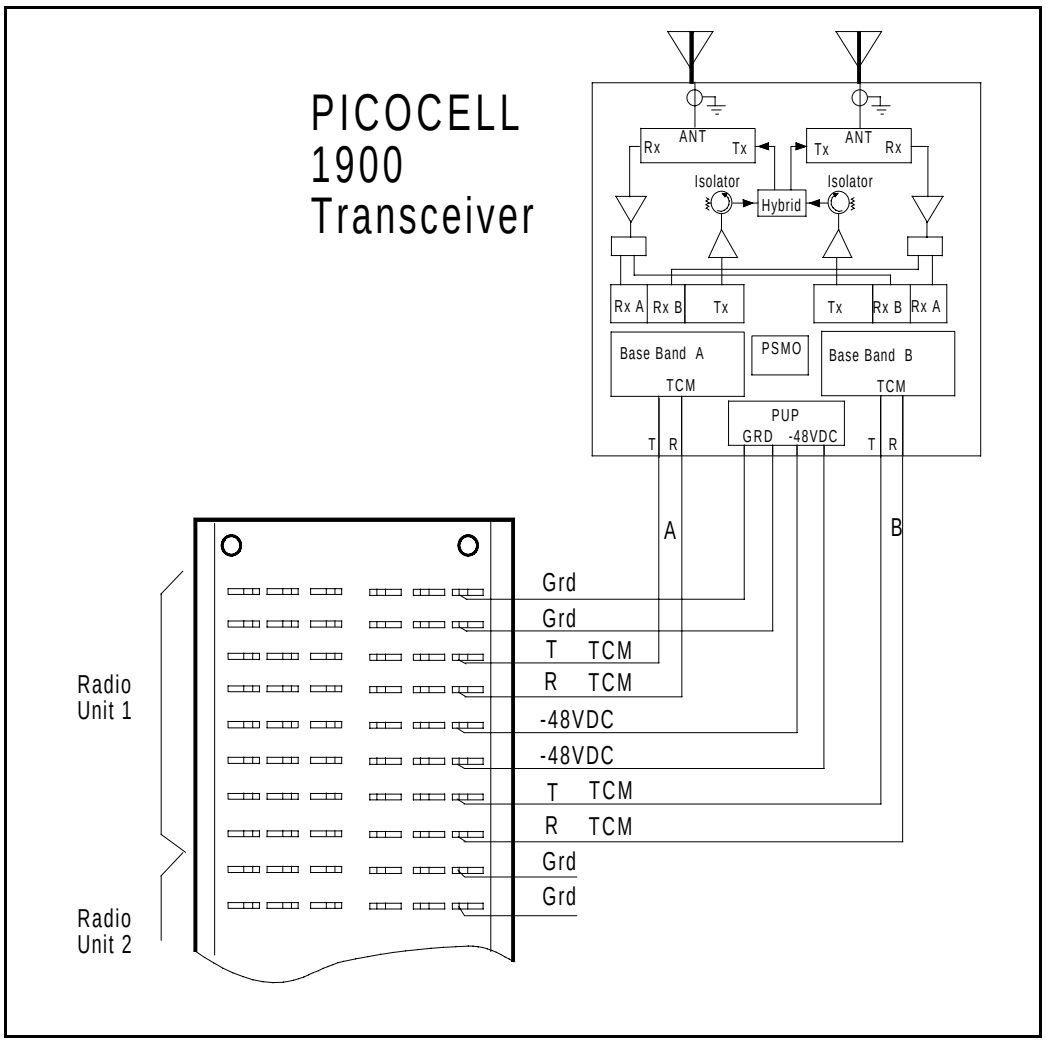
Heat	4 pair	3 pair	2 pair	1 pair
40 Watts	1042 feet	782 feet	521 feet	261 feet
36 Watts	1158 feet	868 feet	579 feet	289 feet
32 Watts	1303 feet	977 feet	651 feet	326 feet

Note: *To calculate the distance with 26 AWG wire, scale distances by 0.629 To calculate the distance with 22 AWG wire, scale distances by 1.599*

Note: *The Picocell nominal maximum DC power drain design is 32W. The DC distribution range is limited since the PUPS will shut down if the voltage drops below -30V. The 36W range numbers should be used for the worst case for maximum load, all transmitters on.*

It is expected that a typical, in-building connection from the Picocell will be via 4-pair station wiring, with 2-pair for DC powering, and 2-pair for the TCM feeds. Figure 7 illustrates the picocell transceiver terminations on the MDF terminal block. This arrangement is intended to isolate ground and battery on the block to minimize accidental shorting.

Figure 7 – Picocell MDF Block Terminations



4.4 Specifications

Picocell Transceiver Specifications

- Maximum length twisted pair distribution, 3000' (TCM)
- Maximum length remote Power (see section 4.2)
- 1900MHz Version IS 136 TDMA operation
- 100mW (+20dBm) ERP
- 2 RF channels per picocell transceiver (Internal duplexer)
- Internal Omni Antenna or External Omni and Directional Antennae
- Receiver Diversity
- Distributed Antenna Support
- Two twisted pair per transceiver for signaling (TCM)
- 48 Volt DC power 32W nominal
- No external grounding is required on the Picocell 1900 transceiver.
- Visually pleasing, non-obtrusive design
- 15 Picocells per CSI (30 RF channels)
- Standard Nortel TRU maintenance interface.
- 12.8" W x 13.6" L x 3.25" D
- 14 lb transceiver weight

Picocell Power Supply Specifications

Input

- Voltage: 120/240 VAC
- Line Frequency 50/60 Hz
- Power rating 90W
- Protection Internal primary current fuse, Inrush limiting
- Configuration In Case IEC320 with Ground
- 6 ft., 5 Conductor, 18 AWG,

Output

- Voltage -48VDC +/- .5V
- Nominal current 2.0 A Max.
- Combined Line and Load Voltage Regulation
- output current limiting
- Short circuit protection
- Barrier strip, screw terminal

Mechanical

- 6.58 L x 4.0 W x 1.25 H(in)
- Case Material: Black 94V0 Polycarbonate
- Weight: 22 ounces, 625 grams (excluding cords)

4.5 Environmental

Picocell Base Station Environmental

- The room must be clean and well ventilated. Each Picocell transceiver can dissipate up to 40 Watts maximum of power in the form of heat(134 BTU per hour.) Equipment ventilation must be sufficient to maintain the temperature at an acceptable level.
- Indoor use only, cabling, antennae, hybrids and Picocell transceivers.
- Avoid thermal trapped air cavities. In particular, the Picocell cannot be mounted above the ceiling as this is deemed a plenum installation, and different, tighter safety specifications apply.
- The acceptable temperature levels are listed below:
- 5^{o} and 40^{o} C (41^{o} and 105^{o} F) Continuous Operation
- The humidity is maintained between 5% and 90% RH (non-condensing) at 40^{o} C worst case temperature and not to exceed 0.024 lbs of water per pound of dry air for continuous operation.
- The Picocell will function from the altitude of 60m (197ft) below sea level to 4000m (13,000ft) above sea level. The maximum operational temperature requirement will be de-rated by 2^{o}C (3.6^{o}F) per 304m (1000ft) for altitudes above 2134 m (7000 ft).
- The location selected to mount the Picocell is not subject to constant vibration.
- The Picocell is located at least 12ft (3660 mm) away from any source of electrostatic and electromagnetic energy. These sources may include:

    •Power Tools

    •Appliances (such as vacuum cleaners)

    •Office Business Machines (such as copying machines)

    •All Electric Motors

    •Electrical Transformer

CSI Environmental

- The CSI is designed to operate in a Customer Premises Equipment (CPE) environment.

The Acceptable temperature levels are listed below:

- 5^{o} and 40^{o} C (41^{o} and 105^{o} F) Continuous Operation
- The humidity is maintained between 20% and 80% RH (non-condensing) at 40^{o} C worst case temperature and not to exceed 0.024 lbs of water per pound of dry air for continuous operation.
- The CSI will function at an altitude of up to 5000 m (16,000 ft). The maximum operational temperature requirement will be de-rated by 2^{o}C (3.6^{o}F) per 304m (1000ft) for altitudes above 2134m (7000 ft).
- The CSI weighs approximately 40 pounds fully configured and has dimensions of: height 25 5/8 in, width 13 in and depth 13 3/4 in.

4.6 Earthquake bracing requirements

Picocell Transceivers

False ceiling mounting requires ceiling track mounting hanger clips equipped with drop support wires. Wall mounting requires mounting on wall studs or 3/4 inch plywood back board.

4.7 Commercial Power requirements

Picocell Base Station Power

- The Picocell Base Station is available for Remote DC and co-located DC from a local AC power outlet.
- Picocell 1900 requires a non-switched dedicated power convertor for each Picocell transceiver. The power cord is 6.5 ft (2 meters) in length.
- Power convertor dimensions: 6.5"L x 4" W x 1.25" D (allow space for power cords)

Each non-switched dedicated outlet must have the following:

- Voltage110 - 120 VAC
- Frequency47Hz to 53Hz or 57 Hz to 63 Hz
- Power (I/P max)100 VA
- Receptacles-120V 15A service NEMA IG 5-15R
- -208/240V 15A service IG 6 15R

CSI Power

The CSI is available for AC power only and requires a non-switched dedicated power outlet per cabinet, convenient to the bottom of the CSI.

An equipment grounding conductor that is not smaller in size than the ungrounded branch-circuit supply conductors is to be installed as part of the circuit that supplies the product. Bare, covered, or insulated grounding conductors are acceptable. Individually covered or insulated equipment grounding conductors shall have a continuous outer finish that is either green, or green with one or more yellow stripes. The equipment grounding conductor is to be connected to ground at the service equipment.

The attachment-plug receptacles in the vicinity of the product are all to be of a grounding type, and the equipment grounding conductors serving there receptacles are to be connected to earth ground at the service equipment.

Each non-switched dedicated outlet must have the following:

- Voltage115 VAC
- Frequency47Hz to 53Hz or 57 Hz to 63 Hz
- Power (I/P max)300 VA

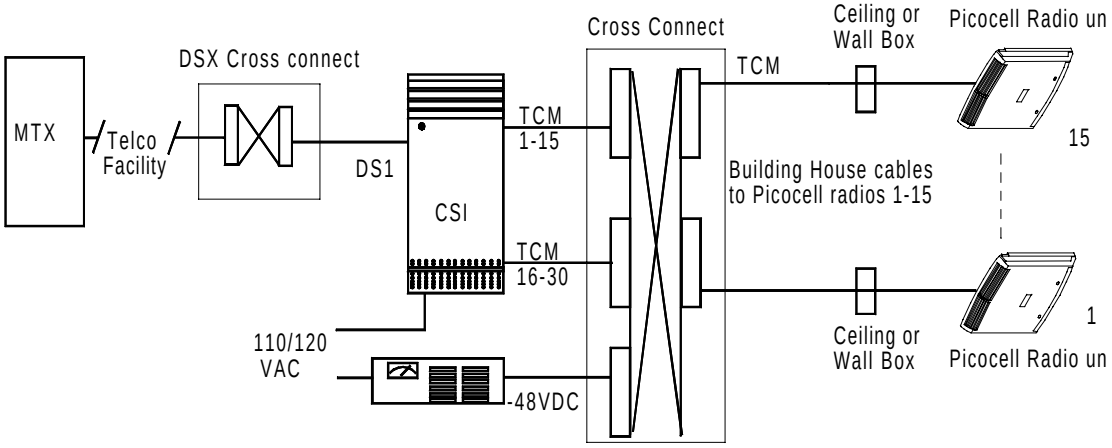
- Receptacles-120VAC, 15A service NEMA IG 5-15R
- -208/240V 15A service IG 6 15R
- Distance between the AC outlet and CSI must accommodate the 6ft CSI power cord. Warnings for AC power cord:

WARNING
The socket-outlet shall be installed near the equipment and shall be easily accessible.

CAUTION
Maintain minimum or greater distances from interference sources and from equipment and apparatus which may be affected by RF energy.

4.8 Picocell System interconnect.

Figure 8 – MTX Picocell Interconnect



5.0 Reference Documents

Document	Number	Title
IM	04-0241	Picocell1900 CSI Installation and Planning
IM	04-0242	Picocell1900 General Information and Planning
IM	08-0243	Picocell1900 CSI Equipment Handling and Securing
IM	04-0244	Picocell1900 System Cabling and Cross Connect
IM	12-0152	Picocell1900 Antenna System Installation
IM	02-0245	Picocell1900 transceiver Installation
IM	22-0246	Picocell1900 transceiver and CSI Power up
IM	24-0247	Picocell1900 Equipment Loading and Diagnostics
IM	28-0248	Picocell1900 transceiver Commissioning with the IFR 1900
IM	28-0249	Picocell1900 System Test

Appendix A – Glossary

AC	Alternating Current
AMO	Antenna Matrix/Oscillator
APS	Alarm and Power Supply
AWG	American Wiring Gauge
CSI	Compact Simplex ICRM
DDU	Disk Drive Unit
DF	Distributiottransceiverransceivern Frame
DS1	Digital Signaling 1
ICRM	Integrated Cellular Remote Module
MAP	Maintenance Administration Position
Picocell	Picocell Base Station transceiver
MTX	Mobile Telephone eXchange
PEC	Product Engineering Code
PM	Peripheral Module
SLM	System Loading Module
T1	First level digital signal (DS1), 1.544Mb/sec
TCM	Time Compression Multiplex
TRU	Transmit Receive Unit
transceiver	

Picocell Installation Planning Checklist

Location: _____ **Office**: _____ **Date**: ___/___/___

COEO # _____ **Customer:** _____

Number of CSI's to be installed _____

Number of Picocell 's to be installed _____

Start Date __/__/__ **Completion Date** __/__/__

General Description of Work:_____

_____

_____

_____

Responsible person/s for this project are:

	Installation Personnel	Customer Representative
Name:	_____	_____
Title:	_____	_____
Tel#	_____	_____

Size of the room: _____ft _____in
What type of building construction? concrete, wood etc._____

Will the Base Stations be mounted on the wall or Ceiling? _____

Is the desired Picocell (s) location within 4.5 ft of the desired Hybrid location?_____

If not, what is the distance between the two?_____

Is the desired Picocell equipment location within the preset cable and power cord lengths? . (Yes or No)_____

If not, what are the distances between the equipment?_____

Will there be room for additional equipment if needed? (Yes Or No) _____

Is the room size adequate for installation? (Yes Or No) _____

Is the cooling adequate for the room with equipment? (Yes Or No) _____

Is there a backboard installed? (Yes Or No) _____

Is there room for a backboard?(Yes Or No) _____

What type of wall construction was used? Circle stud spacing and stud type.

16in 20in 24in stud spacing Wood Steel Concrete stud type

Are there sufficient AC outlets in the room?(Yes Or No) _____

If "NO", specify quantity. AC outlets should be dedicated and be within 6ft of the equipment being mounted._____

Does the Room have cable MDF?(Yes Or No) _____

What other type of equipment is in the room? _____
_____

Does a ground cable have to be run?_____

Is a ladder needed to install the equipment? How Big_____

How many?_____Where?_____

How will antenna cabling be run?_____

Will more cable than specified be required to install the antennae?_____
_____

If more cable is necessary does it meet with the engineering specifications?_____
_____

Can the antennae be mounted where specified?_____

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