

Clarion M10II Getting Started Guide

Rev. 1.1



Models:
JX4000W-A
JX4000W-C
JX4000W-S

NOTICES

FCC

Models, JX4000W-A and JX4000W-C comply with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

Removing covers from of the radio(s) nullifies the FCC compliance and can be the cause of spurious transmission, RF noise and out of band transmission levels above FCC regulations.

Warning

The manufacturer assumes no responsibility for damage caused by interference due to this equipment.

The information in this document is preliminary. The manufacturer assumes no responsibility for any errors that may appear in this document.

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Patent

United States Patent Number 5,809,060, issued September 15, 1998.
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Singapore Patent Number 52170.
South Africa Patent Number 95/1282.

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1. INTRODUCTION

1.1 WELCOME

Thank you for choosing Clarion's M10II multi-point, multi-addressing modem. The M10II is pre-configured to operate right out of the box to connect multiple workstations or multiple LANs (Local Area Networks) with the speed and accuracy of a wired LAN without the need for wires. Just plug them in, one M10II per wired network segment and away you go. The M10IIs will automatically sense the local traffic and build internal tables.

The M10II is ideal for forward-thinking organizations that require 10 Mbps (Megabits Per Second) LAN performance across the street or just across the hall and want to maintain the flexibility and cost control that management of their own network provides. There is no reliance on wire installers or fees to pay for telephone access. The M10II uses RF (Radio Frequency) technology operating at the same data rate as standard wired connections, allowing you to connect networks simply by plugging in the M10IIs. The M10II can reduce the cost associated with expansions or changes within your company by providing you with an easy and cost effective way to connect multiple workstations or multiple LANs without the constraints associated with wired connections.

1.2 M10II, THE NEXT GENERATION OF THE M10 FAMILY

The M10II is the second generation Clarion product in the M10 family. The M10 is a wireless, single address modem that connects two media points together. The M10II is a wireless multi-point, multi-addressing modem able to accommodate up to 200 NICs (Network Interface Cards) per network segment. The M10II offers the functions and features of the original M10 modem, as well as providing an important additional advantage to customers. The upgraded feature of the M10II is the extension of retransmission protocol to multi-source address situations.

This key new feature of the M10II required substantial development. In wired communications frames are lost mainly by collisions. However, in wireless communications frames can be lost by fading, weak signals or interference. Thus, all radio modems require lower level retransmission of frames to provide adequate reliability and throughput. The original M10 was designed for connection to a single Ethernet card, either in a

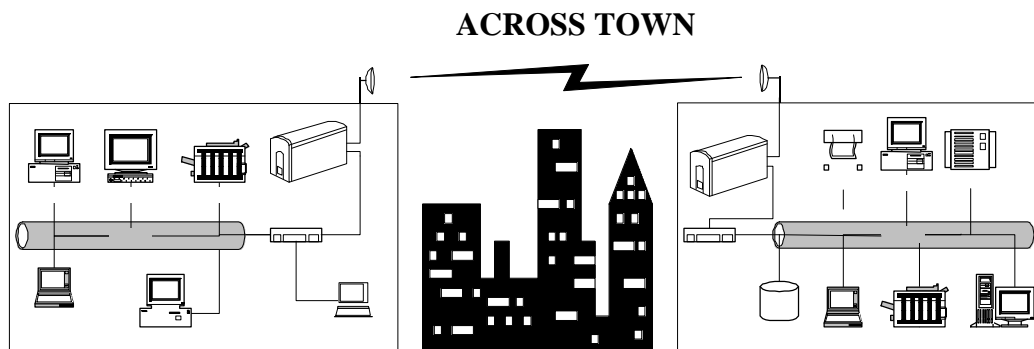
workstation or a router. Both the workstation and the router employ a single 802.3 source address that the M10 learns and uses for the retransmission protocol. Thus, when the M10 receives a frame with the destination address equal to the address of the attached Ethernet card, the M10 sends the RF acknowledgment frame to the source modem. The M10II can do this for multiple Ethernet source addresses.

There are two important situations in which the above single-source-address constraint is violated: 802 MAC (media access control) level bridging and wireless interconnection of 10BaseT hubs. Each of these is important for general networking, and each presents the modem with multiple source addresses from the wired side. The M10II maintains a list of its wired side source addresses, and will acknowledge RF frames addressed to these. Thus, the key new feature of the M10II is extension of the retransmission protocol to multi-source-address configurations.

The M10II maintains acknowledgment-address tables, however, it is not a bridge. For 802-compliant bridging the M10II can be connected to a MAC bridge, with the MAC bridge providing address tables obtained via the spanning-tree algorithm.

1.3 M10II APPLICATIONS

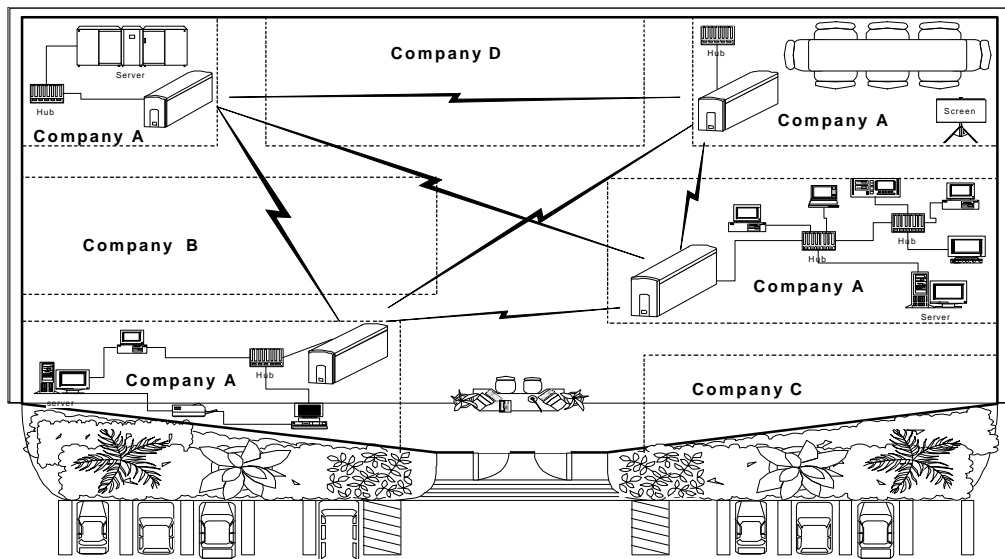
The M10II is a robust, 10 Mbps (Megabits Per Second) wireless multi-point, multi-addressing modem designed to support wireless connections across town, across the street or just across the hall for IEEE 802.3 and Ethernet II (TCP/IP) LANs. It provides all the functionality of wired LANs, without the physical constraints of the wire.



The M10II connects multiple workstations or workstations on multiple wired Ethernet LANs. It builds and maintains a list of the workstations on the wired Ethernet LAN to which it is connected, and shares this information with other M10IIs. When a user on a wired LAN wants to

send data to a user on another wired LAN, the M10II will transmit the data and acknowledgments to the appropriate M10II connected to the other wired LAN. The M10II senses local traffic, builds internal tables and operates the re-transmission and packet filtering protocols to insure that useless information is not transmitted. The M10II adapts immediately without user intervention.

For the OEM (original equipment manufacturer) desiring to integrate the M10II with a bridge or router, the multi-source-address checking features make the M10II perfect for modest size multi-point RF (Radio Frequency) connections.



1.3.1 SUMMARY OF M10II FEATURES

- **10 Mbps Wireless Multi-Point Modem**
- **Plugs into AUI port of hub or media converter**
- **Simple to install**
- **Automatically senses local traffic, builds internal tables and operates re-transmission and packet filtering protocols**
- **Adapts immediately without user intervention**
- **High Throughput at the MAC (Media Access Control) layer**
- **Compatible with all IEEE 802.3 and Ethernet II LAN devices, all operating systems and all protocol stacks**
- **Completely transparent to the network operating system**
- **Secure Direct Sequence Spread Spectrum (DSSS) Technology**
- **Accommodates up to 200 NICs per network segment**
- **Provides all the functionality of wired LANs without the wire**

2. GETTING STARTED

2.1 SYSTEM REQUIREMENTS AND CHARACTERISTICS

2.1.1 COMPATIBILITY

The M10II is compatible with all IEEE 802.3 and Ethernet II LAN devices, all operating systems and all protocol stacks. The M10II is completely transparent to the network operating system.

2.1.2 RELIABILITY

The retransmission function at the radio MAC layer provides enhanced reliability and throughput by avoiding long time-outs caused by retransmissions performed at higher levels.

2.1.3 DATA SECURITY

Security is a great concern with any data transmission system. Wireless data systems may be of even greater concern because of the leakage of transmitter waveforms beyond the intended receiver sites. The M10II offers excellent security without incorporating conventional cryptography. Of course, the user always has the option to add conventional data encryption technology to the most critical applications.

Most commercial spread spectrum manufacturers use fixed spreading codes in their products. The M10II radio, with Direct Sequence Spread Spectrum (DSSS), uses continuously changing, pseudo-random spreading codes, in which each symbol is encoded with a different spreading code. Furthermore, the user may select from 64k different sequences to determine the order in which the spreading codes are used; this provides excellent security against eavesdropping by unintended parties.

2.1.4 TARIFFS AND LICENSES

No FCC License is required.

2.1.5 FLEXIBLE MANAGEMENT

The M10II includes a complete set of management and configuration tools for the network administrator.

2.1.6 NETWORK FLEXIBILITY

- Network segments can be set up or augmented without installing or moving wires.
- The M10II can be used for point to point or multi-point topologies by simply adding M10IIs to Ethernet network segments.
- The number of Ethernet segments that may be supported is unlimited due to address filtering which effectively isolates network traffic.
- Each Ethernet segment may contain up to 200 PCs or NICs.

2.2 CONTENTS OF PACKAGE

When you open your package you will see the M10II unit, a 6.2 Volt DC adapter wall plug power supply, a Software Utility Kit Diskette and this Getting Started Guide.



The M10II is equipped with an internal antenna. For longer distance links there is also an external antenna port (see section 2.5).

A Software Utility Kit Diskette is included with the M10II, the kit contains:

- A software query program
- A traffic program
- An electronic version of the M10 Series User Manual
- The latest software upgrades

2.3 APPEARANCE



FRONT



BACK

Dimensions: 2 inches (W) x 4.7 inches (H) x 6.5 inches (D)
Weight: 14 ounces

Front and Rear Panels:

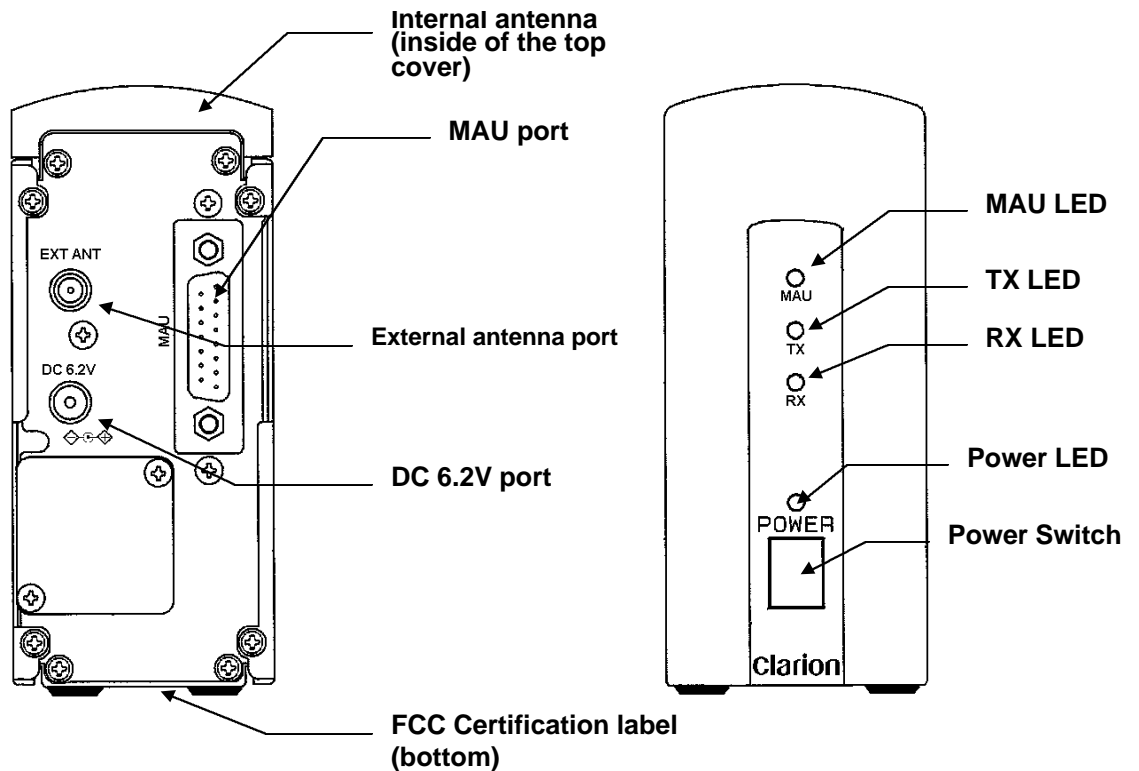
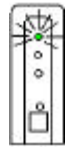


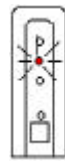
Figure 2.3

2.4 LED INDICATORS

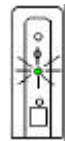
There are four LED indicator lights on the front panel of the M10II (Figure 2.3). These lights help the user to understand the status of the M10II. The Lights are as follows:



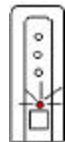
MAU -Flickers for Upload or Download of a Connected AUI.



TX - Flickers whenever a frame is RF transmitted



RX - Flickers whenever a frame is RF received



POWER - Indicates the M10II is turned on

Table 2.4

Label	Color	Description
MAU	Green	Indicates MAU signal (upload or download) is active. (Note-1)
TX	Red	<ol style="list-style-type: none"> 1. During the power-up cycle, it blinks on and off slowly five times in approximately one second to indicate that the firmware has passed its integrity. 2. After normal power-up cycle, it indicates radio transmission. (Note-1) 3. During the firmware-upload cycle ; refer description attached on the new firmware.
RX	Green	<ol style="list-style-type: none"> 1. Indicates radio signal detection. (Note-1) 2. Sometimes flashes even if no true signal is received, because of optimized false alarm rate.
Power	Red	<ol style="list-style-type: none"> 1. It turns on just after applying the power to indicate activation of the unit. 2. It does not turn on continuously in case of unsuitable supply voltage.

Note-1 : The turn-on period is very brief. The intensity of the flickering is proportional to the throughput of traffic.

2.5 ANTENNA

The M10II is equipped with an internal antenna and an external antenna port for the attachment of your FCC approved antenna for longer distance links.



The external antenna port uses a standard female SMA connector with Antenna Sense Circuit for use with a FCC approved antenna. The user can purchase FCC approved antenna kits from HyperLink (see section 7. **Technical Assistance** for contact information).

2.5.1 ANTENNA SENSE CIRCUIT

The M10II uses a standard SMA connector for the attachment of external antennas. Although there is a standard SMA connector **only Clarion approved antennas will work** due to the Antenna Sense Circuit.

Antenna Sense Circuit is an electrical verification that the attached antenna is FCC approved for use with the M10II. If another antenna is attached the M10II will not transmit.

IMPORTANT

Antenna Sense Circuit activates only at POWER UP

The antenna sense circuit electronically senses the attached antenna when the M10II is first turned on. If an antenna is attached after the M10II has already powered up the antenna will not be recognized. You must switch the M10II off and back on to activate the antenna.



WARNING! The external antenna port outputs dc voltage up to +5 Volts for antenna recognition. If using measuring equipment, please check allowed dc input voltage of the equipment.

2.5.2 RANGE OF OPERATION

Using the internal antenna (model JX4000W-A only) the operating range is 100-200 meters of coverage. The range of operation will decrease if the M10II is positioned behind large metal objects, such as file cabinets, safes, storage cabinets, metal walls or walls containing foil-backed insulation.

The outdoor operating range with high gain antennas in line-of-sight operation is up to 5 miles. With special amplifiers purchased from HyperLink (see section 7. **Technical Assistance** for contact information) the user may reach up to 20 miles in line-of-sight operation.

2.5.3 ANTENNA POINTING

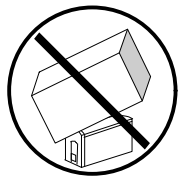
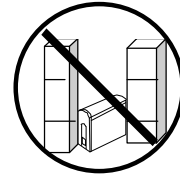
It is important to properly point external directional antennas at the time of installation. We suggest that the user employ the Traffic program (included in the Software Utility Kit Diskette) to assist in the installation of directional antennas.

We suggest that the installer follow these steps as part the external directional antenna set-up process:

1. Connect a laptop computer to the MAU port of the M10II. An active IPX/SPX stack is required on the computer.
2. Install the Traffic Program (from Utility Software Kit Diskette).
3. Point both directional antennas in the general direction of each other.
4. Initiate network data traffic between the 2 sites.
5. Alternatively at both antenna sites, dither the pointing of the directional antennas until maximums in network traffic throughput are observed.
6. As a final step, find the angular range (both horizontally and vertically) over which the maximum traffic throughput can be maintained for the first antenna. Once this angular range is obtained, lock the position of the first antenna in the center of this range. Then repeat this process at the other antenna site, and lock that antenna in position.

2.5.4 POSITIONING THE M10II UNITS

Proper positioning of the M10II units will increase the range of operation and the ability of the units to communicate. It is important to position the M10II units out in the open and away from any large metal objects such as file cabinets, safes, storage cabinets, metal walls or walls containing foil-backed insulation.



To reduce the risk of the unit overheating, do not place the M10II under boxes, papers or anything that may reduce airflow.

If you are using the units in an office with metal cubicle walls it will increase operating range if the units are placed above the cubicle wall height.

The use of microwave ovens during transmission may reduce data throughput by as much as a factor of two.

2.5.4.1 Co-Location of M10II Units

If 2 or more M10II units are co-located at one site, maximum traffic throughput rates to remote sites may be reduced, especially if the user is relying on the internal antennas.

The M10II units operate on a single frequency channel. If one M10II unit is transmitting to a remote site while a second M10II unit is attempting to receive data from a second remote unit, the transmitting M10II will normally block receipt of messages by the receiving M10II.

Traffic throughput rates can be improved by providing enhanced RF isolation between the co-located units. This is best accomplished by using correctly orientated directional antennas at each. Further improvement in throughput can be expected if the external directional antennas can be further isolated to reduce RF leakage. This can be accomplished by increasing the physical separation

between the antennas or by locating the antennas in such a manner that direct RF leakage between the two antennas is reduced by an intervening metal object or shielding wall.

2.6 SET UP

2.6.1 NECESSARY EQUIPMENT

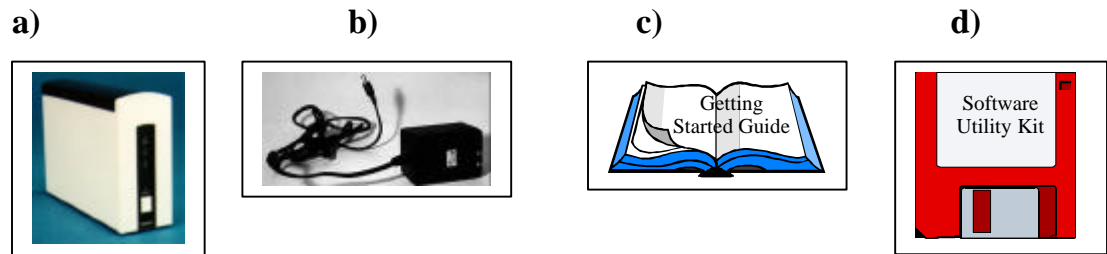
The M10II is equipped with a standard MAU (Medium Access Unit) port for connecting the M10II to your hub, media converter or computer network card. You will need an **IEEE 802.3**



ETHERNET Cable with D15 connectors and slide locks on shielded cable. These cables can be purchased in differing lengths to accommodate your particular situation.

2.6.2 INSTALLATION INSTRUCTIONS

1. Open the shipping box and remove all the items.
2. Check to be sure that you have all the parts necessary for installation and operation of your M10II. **You should have:**



- a) M10II radio unit (Model Number JX4000W-A, JX4000W-C or JX4000W-S)
 - b) Clarion 6.2 Volt DC power supply
 - c) This Getting Started Guide
 - d) Software Utility Kit Diskette
3. **You may need to purchase:**
 - a) IEEE 802.3 ETHERNET Cable of the correct length for your situation - D15 connectors with slide locks on shielded cable (see section 2.6.1) (CABLE NOT INCLUDED).
 - b) External Antenna – if required. The M10II is equipped with an internal antenna for short distances. (Refer to section 2.5 of this manual for antenna instructions).
 4. Position the M10II unit on a stable surface near your hub, media converter or computer, being careful to position each unit so nothing will obstruct the ability of the units to communicate with each other (refer to section 2.5.4).
 5. Connect the D15 pin Ethernet cable (CABLE NOT INCLUDED) to your Ethernet (802.3) Hub, media converter or computer network card. Attach the other end of the cable to the connector port on the rear panel of the M10II radio marked MAU.



6. **If you are using an external antenna** attach the SMA connector to the connector port on the rear panel of the M10II radio marked **EXT ANT** (refer to section 2.5 for information on Antennas).



7. Plug the power supply into the nearest 120 Volt AC wall socket. Attach the other end of the power supply cord to the rear panel of the M10II radio marked **DC 6.2V**.



WARNING Do not enclose the power supply or mount it where heat cannot escape. Permanent damage can occur if cooling is inhibited.

8. M10II Models *JX4000W-S* and *JX4000W-C* have **BPS (Bypassed Power Switch)**, so the unit will power up immediately upon plugging in the power supply.

M10II Model *JX4000W-A* has **APS (Active Power Switch)**, so to power up the unit, you must depress the power button on the front panel of the M10II radio unit, after connecting the power supply.

9. Observe the front panel display while the unit powers up. The red POWER LIGHT will come on and remain on until the unit is turned off. Upon power-up the RX indicator light (green) will come on for approximately 1 second and after a few seconds the TX light (red) will flash to indicate boot cycle complete. The TX light will flash twice then pause, flash twice then pause, and then flash five times. Operation can be verified by running test software, MIIImqry will show the current settings and confirm proper power-up. See section 4. *Configuration* for the default values of the registers, and section 3. *Testing Procedure* for testing information.
10. Now follow the same procedure for the second M10II unit and the two units are ready to communicate.

3. TESTING THE M10II

3.1 INTRODUCTION TO TESTING

1. To test the M10II it is suggested that you connect two M10II units, one to each of two previously isolated network segments. As the normal traffic is generated on each segment the internal M10II table is automatically built up on the packet transmissions of each NIC. Only one transmission is required to create a table entry for a NIC. The source addresses of the traffic are used to build and maintain the table and the tables are referenced by the destination addresses of the traffic to determine whether or not the intended receiving NICs are attached to a particular M10II. The M10II units are shipped with the following defaults: acknowledgment is enabled, transmit filtering is turned on, download filtering is turned on, aging time is set to 5 minutes, loop-sense is on, and professional addressing mode is off. The following is a brief description of these features.
 - a) M10II acknowledging enabled. This is the main M10II feature, it refers to the data-link level re-transmission protocol. It means that if a destination address of an intended NIC is in the local table of the M10II, that radio will acknowledge the packet from within the radio firmware with microsecond response time. This feature creates a reliable link out of a wireless connection. Without it, the burden on common transport-level protocols would be too great to obtain substantial throughput.
 - b) Transmit filtering on. When this feature is activated local traffic will remain local. If a packet generated on a segment is addressed to a NIC on the same segment, the M10II will not transmit that packet. The result is that local bandwidth is preserved and the radio must only support the total inter-segment bandwidth. Therefore many segments, each with 10 Mbps local bandwidth, can be connected with a 10 Mbps backbone since each packet is not necessarily transmitted. Without it turned on, the bandwidth of any local segments is shared by the NICs on other remote segments, since each packet that is generated on another segment is transferred to the local segment and vice

versa. Transmit filtering also provides added security because local server traffic is not exposed to other segments.

- c) Download filtering on: This feature can be thought of as the converse of transmit filtering. The M10II with this enabled will not download to its network segment, a packet that it receives if the destination is not on its local segment. Of course, all packets on the same code channel will be received by the M10II, and their CRC will be checked, prior to the address being examined.
- d) Aging = 5 minutes. This default value is the same as in most bridges. If a NIC is shut down, the aging setting is the time that it takes to passively decide to remove the entry from the local table. As long as a packet is sent from a NIC more often than this setting, the entry will remain in the table. Most network operating systems will normally send out keep-alive or sense packets more often than once per minute. The penalty for being deleted from the table is minimal; it takes about 20 ms (milliseconds) after a packet is transmitted for the entry to be placed into the table. Also, if a NIC is moved to another segment, the transmissions that it generates from another M10II will force the instant deletion of the NIC address from the table of the first M10II. If transmissions from the moved NIC are not received, the aging will cause the NIC to be deleted after the aging time as measured from the last packet that the NIC generated while it was still local. The table is volatile and cycling the power will delete the table.
- e) Loop detection. The M10II has an optional capability for detecting and blocking network loops. A loop is a network connection that allows a packet to be regenerated, and can occur with any wired or wireless network device. An example of a loop is when two radios are inadvertently connected to the same network segment, and they are on the same code channel, then a packet that is uploaded and transmitted by one radio, is received and downloaded by the second radio, which creates a packet to be uploaded by the first one again. If the loop is allowed to persist, the packet will be regenerated indefinitely. Instead of allowing this to happen, all M10IIs will first start in the blocking mode when they are powered on (if loop detection is enabled). The blocking mode prevents any packets to be transmitted and only loop-sense packets to be downloaded. If a loop is detected,

the M10II will block traffic until the loop is eliminated. If after trying for a few seconds, the radio does not sense a loop, it will exit blocking mode and proceed with a normal boot cycle. After that, an attempt to sense loops will be made at 3 second intervals, and steals 2ms of traffic time each 3 seconds in order to operate. Since a loop can be created while reconfiguring the wired network the detection process will occur indefinitely. After the initial boot, there will be 2 one-second intervals, each signaled by a pair of LED flashes, and then 5 LED flashes if there is no loop found. If there is a loop, then the radio will enter a blocking state where no packets will be transmitted or downloaded, and the radio will continue to sense the loop at 3-second intervals. After 4 intervals without seeing a loop, the blocking state will be terminated, the LED will indicate this by flashing 5 times. There may be additional delays in high traffic conditions (i.e. > 65% wired side utilization, continuously over the 3 second time periods).

When in the blocking state, a blocking-message packet is downloaded to the wired side just prior to the loop test packet. The blocking message is addressed to broadcast (all Fs), and the source address is the active address. The loop test packet is addressed to the sensing M10II's own MAC_ID independent of the active address. The source address is the active address. Therefore, it will have the same source and destination address if the CONFigAs1 command has been issued.

If you power-up with loop-sense turned off, the power-on blocking state is not entered and the normal LED flash sequence is observed. If you power-up with it turned on, the blocking state is entered upon power-up and must be exited for radio operation. If CONFigF10 is issued remotely to a radio that is blocking, the blocking state is not exited. The radio will suspend any check for loops and will remain in the blocking state. A remote CONFigF11 will put the blocking radio back into normal periodic loop-sense operation. To exit a blocking state after issuing CONFigF10 to a blocking radio, the radio must be power cycled. A radio is not forced out of blocking if the loop sensing has determined that it should be blocking. The user can issue a PN code change (locally or remotely) that will accomplish this on the next 4 loop sense cycles.

While blocking, no AUI commands can be issued. The radio cannot be queried from the AUI. But commands can be issued remotely, although the responses will NOT be sent back since transmits are blocked (as are downloads, other than the loop-sense packet itself). Acknowledgments are not blocked so re-transmission of the remote command will not occur if it is a good RF link.

If turning on a radio will cause a loop, then the last radio powered up is guaranteed to go into blocking state. If the loop is made with a wire connecting two radios already powered up, one of the radios will enter blocking but there is no telling which one it will be.

- f) Professional Addressing Mode. This mode allows improved duplicate packet filtering in the case of a poor link. It keeps track of the last packet sent from each of the other M10IIs in the network (up to 32 M10IIs can be supported in this version). Normally, when this mode is not used, duplicate filtering operates on the last packet received. If there are several radios with a poor link, there is some probability that the normal duplicate filtering will be inadequate. In this case the professional addressing mode can be used. This operation requires that RF IDs (1-32) be entered for all the M10IIs in a network. The IDs are entered using configuration frames. Therefore it is considered the “professional mode” because a professional installer is more likely to use it.

- 2. An additional feature is the ability to turn off the AUI-port flow control if the RF link deteriorates. This way, a bad RF connection (for example, if someone should shut off the remote M10II) will not reduce the throughput on the local segment. This setting is a ratio of good transmissions to bad transmissions that the user sets. If the user sets the ratio to 0.5, then when half of the packets are bad over a specified averaging interval, as determined by not receiving acknowledgments, the source radio will no longer use collisions to back off the source channel. The switching from using flow control to not using flow control and vice versa is an immediate action. Uploaded packets will be transmitted even if flow control is off. If a high percentage of these get through then the flow control is immediately turned back on. If they start failing again, the flow control is immediately turned off again.

There is no user intervention here once the ratio is set. Setting the ratio enables this operation. Use the send.exe command to send CONFigGbxxyyFFFF command where xx is the number of good packets to be required and yy is the number of bad (unacknowledged) packets to be tolerated. Whichever threshold is reached first will reset the count of both good and bad packets and will take an action: either to turn off collisions, leave them off, turn on collisions or leave them on. So if the following entry is made: send CONFigGb0F1dFFFF <ret> then when 15 good packets are reached before 30 bad packets, the collisions will remain on. If not they are turned off. The ratio is 0.5 and the absolute numbers used reflects the reaction time. In this example, 15 packets are the minimum time to make a determination. The four 0xFs at the end of the command allow the user to have hysteresis. Unless the user fully understands the use of this part of the command, it is recommended that these be left as 0xF (they must be entered). In the case of entering CONFigGbxxyywwzz, xx is only the number of good packets required to reset the bad-packet count that turns the collisions off. And yy is the number of bad packets required to turn the collisions off. ww is the number of good packets required to turn the collisions back on and zz is the number of bad packets required to reset the good-packet count that would be used to turn the collisions back on. By making these four parameters independent, the user can set one ratio for the collisions to turn off (xx/yy) and another for the collisions to turn back on (ww/zz) with the absolute values of each setting the approximate reaction time measured in packets. Resetting the good and bad values to 0xFF (i.e. CONFigGbFFFFFFFF) turns the function off, which will leave flow control always on (assuming that the configuration bit for AUI collisions is set).

3. Another feature of the M10II is the use of remote commands. A M10II will respond to most configuration commands over the air. Use the SendM10 utility but address the destination of the command to the MAC ID of the remote M10II (i.e. 00606Fxxxxxx). Even if the remote radio is set to use the Clarion null address instead of its own MAC ID, the radio's MAC ID must be used for remote access. To allow a broadcast address to be used over the air would require handling multiple responses, which is not possible. The command will automatically flow through the sending M10II to the remote M10II and the response will occur back throughout the sending M10II. The re-transmission protocol will also work as in the case of any normal packet. Remote M10IIs can be queried, and reconfigured. Using Tmshow, you can view the remote M10II's table entries. For security

purposes, the remote configuration is disabled by default. If you want it on, you must enable it locally through the AUI port only. Once enabled, all activity can be controlled remotely but this way the configuration can only be changed after someone within the user's facility has allowed it. Commands that cannot operate remotely include: firmware upgrade, enabling M10II mode/licensing, and enabling remote commands.

3.2 TESTING PROCEDURE

To test the units connect two M10IIs, one to each of two previously isolated network segments, leaving all settings at the factory default values.

1. Make an inter-segment file transfer and observe the LEDs on the M10II units. The upload (MAU) and transmit (TX) lights on the sending unit will turn on brightly. The receive (RX) and download (MAU) light on the receiving unit will also turn on brightly. The transmit light (TX) on the receiving radio and the receive light (RX) on the sending radio will turn on dimly due to the acknowledgments. If other combinations of LEDs occur, there may be something wrong. There should be expected, bursts of traffic and dead time in any network file transfer and this should not indicate a problem.
2. Next make a local file transfer between NICs on a single segment. You will see the upload light (MAU) come on but not the transmit light (TX) on the sending unit, and you should see no receive lights on the other unit. You can simultaneously do a local file transfer on each segment and if you attach LAN analyzers to each, you will see that each unit simultaneously achieves wired speed.
3. Now attach a third segment with a third M10II. When you do an inter-segment file transfer, the LEDs will be the same as before for the intended receiver, but the third M10II will show only a receive light, not a download light nor a dim transmit light. In this case, the M10II that has the intended NIC attached will acknowledge and download the packets. The other M10II will receive the packets but will not respond with acknowledgments, and not download. You can also try three simultaneous local file transfers, and you will see that each achieves wired speed. You may also wish to try an inter-segment file transfer between two of the segments and a simultaneous local file transfer on the third segment.

4. CONFIGURATION

The M10II units are pre-configured to operate right out of the box. There are also a variety of options that the user can change to adapt the M10II to a specific situation.

The configuration software is pre-loaded into an internal EEPROM (Electrically Erasable Programmable Read-Only Memory) in the M10II. For updates to this software please see section 7. **Technical Information**.

4.1 DEFAULT SETTINGS

The default settings that the M10II is shipped with are as follows:

- Acknowledging is enabled (one ACK per packet)
- Transmit filtering is turned on
- Download filtering is turned on
- Aging time is set to 5 minutes
- Loop Detection is on
- Static Table is uploading is set to off
- Professional Addressing Mode is off

4.2 CONFIGURATION COMMANDS

Included with the radio is a diskette that contains MIIImqry.exe and Tmshow.bat. MIIImqry is like M10query but includes the M10II settings of filtering and aging. Tmshow.bat allows the user to read the table that is stored internally in the M10II at the time of issuing the command. They both keep log files. Both of these programs can be issued remotely. By using these the complete configuration and stored table of any radio in the network can be read from any location in the network. You only need to know the MAC ID of the radio you are trying to query. Both commands continue to issue once per second until there is a response or until a key is hit.

The following utilities will be included on diskette for the M10II. Typing the name followed by a question mark will show the usage syntax.

- MIIImqry.exe allows monitoring of the configuration.
- Tmshow.exe will read out the table that is stored in the M10II at the time of issue.

The new configuration commands for controlling the M10II are as follows (can use with the send or sendm10 commands):

CONFigFe1, CONFigFe0 turns M10II mode on/off respectively. When M10II is off the radio does not operate. This command is stored in non-volatile memory and takes immediate effect.

CONFigFt1, CONFigFt0 turns transmit filtering on/off. (Default is on) This command is stored in non-volatile memory and takes immediate effect.

CONFigFd1, CONFigFd0 turns download filtering on/off. (Default is on). This command is stored in non-volatile memory and takes immediate effect.

CONFigFaxx, xx== 0 to 60, sets aging value. xx=0 turns aging off. (Default is 5 min.) This command is stored in non-volatile memory and takes immediate effect.

CONFigFr1, CONFigFr0 turns remote commands on/off respectively (Default is off). This command is stored in non-volatile memory and takes immediate effect.

CONFigFs1, CONFigFs0 (Static table command) turns table maintenance on or off respectively; default is on. Table maintenance is defined as table insertions, deletions, and aging. This command is used if the OEM is using an 802.1d bridge or other table-building device that they prefer over our automatic table-building protocol. The OEM must upload the table into the M10II using the CONFigFw command followed by packets containing the table in the format described below. Then the data-link-level acknowledgment protocol will operate with the microsecond-scale response that only the radio itself can provide, but based on the tables provided by the user. All filtering can still be optionally applied. This command is currently volatile and should be issued after each power cycle or prior to each table revision. When using this, the OEM can shut off the M10II loop sense protocol since the table generation device will have that built in. An ANSI C program

that will convert an ASCII address list to the proper internal format is available from the web site. Also, the required format is available if you want to generate your own program to do this. In order to keep remote commands enabled when the OEM is uploading a table, the MAC ID of the radio must be included in the uploaded table, since the remote commands rely on having it there.

CONFigF11, CONFigF10 Turn the proprietary loop-sense/blocking function on or off respectively (Default is on). If the static table command is used, the loop-sense/blocking feature is not generally needed because this function is accomplished in the device generating the table. This command is stored in non-volatile memory and takes immediate effect. (Even though the static-table command is volatile and must be re-issued upon power-cycling).

CONFigFw prepares the M10II to receive a table to use in place of its own. The table maintenance will continue to operate on the uploaded table, adding to it and deleting from it unless the static table command is issued. The format used for the packets containing the table is available from the web site. In order to keep remote commands enabled when the OEM is uploading a table, the MAC ID of the radio must be included in the table, since the remote commands rely on having it there. (The radio MAC ID is normally entered into the table when the radio is turned on).

CONFigFpXX, where XX is a decimal value 0-32. If 00 is entered, professional mode is turned off. There are 32 possible addresses. The default is that this mode is off. This command is stored in non-volatile memory and takes immediate effect. Example: send CONFigFp10 00606f01E765.

CONFigFn1, CONFigFn0 selects 802.3/802.2 respectively as the packet response for configuration frames. CONFigFn1 is the default as it was in the M10.

4.3 CONFIGURATION PARAMETERS

The following is a list of the configurable parameters of the M10II:

Table 4.3 Configurable Parameters

Parameters	Possible Values		Default	Remarks
AUI Busy Collision	1/0 (i.e. On/Off)		On	Used for flow control on wired side. ON causes assertion of collision signal if a frame upload is attempted when all 8 upload buffers are full.
				OFF means do not assert collisions if 8 packet upload buffers are full.
SQE Test	1/0 (i.e. On/Off)		Off	ON means there is a brief assertion of collision signal after frame ends.
				OFF means no signal after frame
Download with CRC error	1/0 (i.e. On/Off)		Off	If "Download with CRC error" is ON, M10II downloads all frames regardless of CRC check.
				OFF means block CRC failures.
FEC Sequence on re-tries	Try #	Available configuration	FE	The FEC mode is selected as 1/0 (i.e. On/Off) for a particular transmission attempt. (There are a maximum of 8 tries per packet. The first transmission and up to 7 re-transmissions).
	1	FEC on or off for each trial	Off	
	2		On	
	3		On	
	4		On	
	5		On	
	6		On	
	7		On	
	8		On	
P-CSMA slots	Try #	Available configuration	23456788	The number of ~15us slots that are used as the range of the uniformly distributed wait interval before transmitting in a CSMA protocol. This is commonly known as the backoff but in actuality, is only the range of the possible backoffs. The number set in config is the binary exponent.
	1	P-CSMA slot-number P of 1 to 8 for each trial.	2	

Parameters	Possible Values	Default	Remarks
P-CSMA slots (continued)	2	3	For example, a value of 3 means there are 8 possible slots that a queued transmission can begin in as measured from the end of the previous transmission. The transmission has a 1/8 probability of occurring in any of those slots.
	3	4	
	4	5	
	5	6	
	6	7	
	7	8	
	8	8	
Number of tries of transmission	1 – 8	8	“1” means no re-transmission
Hardware Address Checking	1/0 (On/Off)	Off	Acknowledgments are sent for received frames with matched destination address only when this is On, and are not dependent on the address when this is Off. The hardware register is loaded with the address of either the first source it sees on the wired side after connection, or, an address that can be manually set.
Security Code Channel	00001h ~ FFFFh	2D1Bh	Spreading code changes pseudo randomly by a sequence defined by this code channel.
Duplicate Filter	1/0 (On/Off)	On	If this switch turns on, received duplicate frames are discarded ¹ . If it is Off, duplicate will not prevent a download.
Search Code	44BCh, A0DCh, D223h, 0A76h, 425Ch, 23A4h, 245Ch, A243h	44BCh	Search Code is a PN code used for initial acquisition. They are chosen for good performance and provide
Antenna Diversity	1/0 (On/Off)	Off	OFF means that the antenna first “Antenna Selection” setting chooses a particular antenna. ON means that the “Antenna Selection” setting toggles the antenna choice or leaves it alone based on the setting for any particular transmission attempt for a packet.

¹ Duplicate filter function is available in case of one to one connection only. It means that if two or more modems are connected to a modem, duplication cannot be avoided.

Parameters	Possible Values	Default	Remarks
Antenna Selection	1/0 (External/Internal)	FF (= External with Diversity set to OFF)	This parameter must be set to 'External' absolutely because no internal antenna is provided with JX-4000. Otherwise it behaves similar to the FEC mode where a 1 toggles the antenna choice and a 0 leaves the choice for a transmission attempt.
RF Address	Derived from attached NIC Or set manually with CONFigRf command.		RF address is used on RF reception by the JX-4000 determine whether to send ACK, and at the transmitter to recognize its ACK. It is not used if 'Address Checking' is off.
Use default MAC ID	MAC Address (00606FXXXXXX) or Clarion Null Address (00606F000000)	Null Address	Upload address is used for configuration and firmware upgrade only. Each JX-4000 has its own unique 12-hex-digit MAC ID that is used as default Upload Address. However, one can select Clarion Null Address '00606F000000' as Upload Address for convenience.
ACK time-out	0xx6E to 0xxFE	0xx6E (~330us)	Can be selected by steps for various environments of applications. The longer link range requires the longer ACK time-out. Three (3) microsecond time resolution.

5. SPECIFICATIONS

Interface:

Ethernet Interface:	Ethernet II MAC
Standards:	IEEE 802.3
Protocols Supported:	Transparent Bridge Architecture
Interface Type:	MAU (Medium Access Unit) driven by AUI

Management:

M10II Tools:	Query and configuration management
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LED Indicators:	Power Receive Transmit MAU (upload or download activity)
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Security:

No DES Encryption:	Continuously changing and pseudo-randomly selecting spreading codes ensures privacy.
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Radio:

Technology:	DSSS (Direct Sequence Spread Spectrum)
Frequency:	2.4-2.4835 GHz
Carrier Frequency:	2.43607 GHz
Transmission Power:	25-40mW
Channel Access Protocol:	SS-P-CSMA
Modulation:	BPSK, 32 Mcps
Data Rate Variables:	10 Mbps

Environmental:

Operating Temperature:	0C to 40C
Storage Temp Range:	-20C to 60C
Operating Humidity:	0% to 90% non-condensing

Mechanical:

Dimensions:	2 inches (W) x 4.7 inches (H) x 6.5inches (D)
Weight:	14 ounces

Approvals:

USA	FCC Part 15.247
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6. TROUBLE SHOOTING

PROBLEM	SOLUTION
RADIO does not show any indicator lights.	<u>Check</u> the power connections. Wall plug, chassis connection, and power switch(s) that may be present at both the wall outlet and at the unit.
RADIO still shows no indicator lights	<u>Check</u> power supply output, 6.2 Volts open circuit and at least 5.9 Volts under 1.6A load.
RADIO indicator lights show but cycle on and off.	Cycling on and off could indicate a weak or failing power supply. <u>Check</u> power supply output, 6.2 Volts open circuit and at least 5.9 Volts under 1.6A load.
RADIO power light is on but no boot lamp (TX) flashes.	NOTE: Boot lamp sequence is; POWER light (red) comes on and stays on; RX light (green) comes on and goes off after ~1 sec. After a few more seconds TX light, (red) flashes five times, indicating Boot complete. <u>Check</u> power supply, Run B10QUERY. If unit fails to present status, check AUI/MAU ETHERNET connection. Cycle power, if still no status, call for technical assistance.
During Test Procedure (Section 3) RADIO power lights are on and boot sequence was observed, but lights on sending and receiving units are incorrect	<u>Check</u> B10MODE=on at both Radios, if 'off' it needs to be factory set to 'on'. Call for technical assistance. JX-4000F-WS must have ANT TYPE=0 if "=1" it must be factory set to "0". Call for technical assistance. JX-4000F-WA, F-WC must have ANT TYPE=1, if "=0" it must be factory set to "1" and "ANTENNA SENSING TEST" run. Call for technical assistance, See section 7.
RADIO power lights and boot sequence are okay, but no throughput.	<u>Check</u> for correct CODE CHANNEL, and SEARCH CODE. Both units must have the same codes. If not, call for technical assistance.
RADIO power lights and boot sequence work but throughput low.	Run B10QUERY and check all parameters for correct settings, see section 5.2 'Configuration Parameters'. If not correct, call for technical assistance.

7. TECHNICAL ASSISTANCE

For more detailed information please refer to any of the following documents:

- M10 Series User Guide
- JX-4000F-S Specifications
- M10 Frame Types – OEM Customer Version
- M10 Service Manual

Authorized users can obtain these documents by calling the Clarion Sales Office (listed below).

A Software Utility Kit Diskette is included with the M10II, the software contained in the utility kit is also available from the Clarion Sales Office or Micrilor's home page: www.micrilor.com for access the user name is M10, user password is M10. The kit contains:

- A software query program
- A traffic monitoring program
- An electronic version of the M10 Series User Manual
- The latest software upgrades

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8. GLOSSARY

AUI - Auxiliary Unit Interface: The standard hardware interface used to connect a device to a 10base5 transceiver. It uses a DB-15 connector.

Bridge: A device that connects different networks together allowing them to communicate with each other.

BPSK - Binary Phase Shift Key

CSMA - Carrier Sense Multiple Access: A method for controlling the transfer of information on an Ethernet network.

DES - Data Encryption Standard: The standard cryptographic algorithm, designed by the National Bureau of Standards, used to transform (encrypt and decrypt) information using a 64-bit key.

DSSS - Direct Sequence Spread Spectrum: A highly secure and reliable technology which spreads data over a broad frequency range requiring receiving and sending devices to use specific coding and decoding algorithms

EPROM - Erasable Programmable Read-Only Memory

Ethernet: Trademark of Xerox. A 10 Megabit per second (Mbps) standard for Local Area Networks (LANs) in which all nodes are connected usually with a coaxial cable where they contend for network access using Carrier Sense Multiple Access (CSMA).

FCC - Federal Communications Commission

GHz - gigahertz: A measure of the number of cycles per second of a signal. One GHz is one billion cycles per second.

Hz - Hertz: A measure of the number of cycles per second of a signal. One Hz is one cycle per second.

Hub: A network central controlling device.

IEEE - Institute of Electrical and Electronics Engineers

IEEE 802.x: The set of Institute of Electrical and Electronic Engineers standards for the definition of Local Area Network protocols.

LAN - Local Area Network: A data communications system which interconnects computer systems at various different sites within a few square kilometers, or less, in order to share resources and communicate with each other.

MAU - Medium Access Unit: A concentrator that allows multiple network nodes to access a Local Area Network (LAN) through a single device.

MAC - Media Access Control: The lower datalink sublayer defined in IEEE standards for each particular medium.

Mbps - Megabits per second

NICs - Network Interface Cards: A device that joins a cable to a computer. It is usually installed inside the computer with an access port for plugging in a network cable.

Node: Any device that is connected to a network.

PC - Personal Computer

RF - Radio Frequency: The frequency at which electromagnetic energy may be made to radiate coherently.

TCP/IP - Transmission Control Protocol/Internet Protocol: The suite of transport and application layer protocols that operate over the Internet Protocol.

Throughput – A way of measuring the speed at which a system or link can accept, handle and output information. The amount of data that a communications channel can carry, usually in bits per second.