

## INTRODUCTION

The MS-2 is a miniature IR sensor designed for use with a Niles Infrared Extender System.

An IR (infrared) extender system enables you to control your IR remote controlled A/V equipment from a remote location. This allows you to place your A/V components out of sight (behind cabinet doors, in the rear of a room, or in a different room) and still conveniently control your equipment.

The MS-2 is an IR Sensor. It is one of three elements that make up an infrared extender system:

**1. IR Sensors** receive IR commands from hand-held remote controls and relay the commands to the Main System Unit via a 2-conductor shielded cable. Generally, sensors are placed so that you can easily and naturally point your remote control directly at them. Niles offers an array of easily concealable sensors: wall-mount, ceiling-mount, surface-mount and table-top. IR sensors are the "eyes" of the system.

**2. The Main System Unit** provides a connection hub for the IR sensors and the IR flashers and is generally located near the A/V components. The main system unit's level controls and LED indicators enable you to calibrate and troubleshoot an IR extender system. The main system unit is the "heart" of an IR extender system.

**3. Infrared Flashers** transmit the infrared signals from the main system unit to your A/V components. Niles manufactures both "flooding" flashers (model IRC-1) and miniature "pin-point" flashers (model IRC-2). Flashers are the "voice" of an IR extender system.

In a typical system (Figure 1) the MS-2 remote room sensors are placed in convenient locations and are connected to a main system unit. The main system unit is connected to power via its 12VDC power supply. In this example, the IRP-2 main system unit powers four IRC-2 MicroFlashers™ which are attached to the front panel sensor windows of four A/V components.

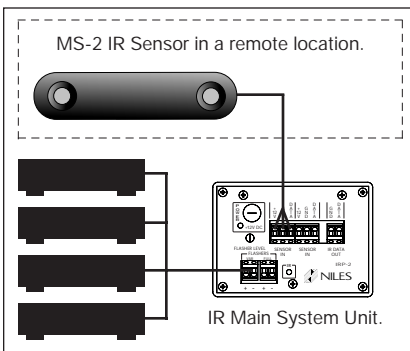


Figure 1

## FEATURES AND BENEFITS

### Quick and Easy Placement

The tiny housing (available in black or white) and attractive appearance of the MS-2 give you many placement possibilities. For instance, you could place a black MS-2 immediately above the sensor window of your television set. A white MS-2 could be mounted to the front of a white speaker grille. In either case the sensor blends with its surroundings and mounts quickly and easily with its self-adhesive mounting strip.

### Sensible Operation

Every time you press a button on your remote control, the bright green "flashback" LED confirms that the MS-2 has received a command. If your remote control's batteries are weak and need to be replaced, the absence of the "flashback" LED will remind you.

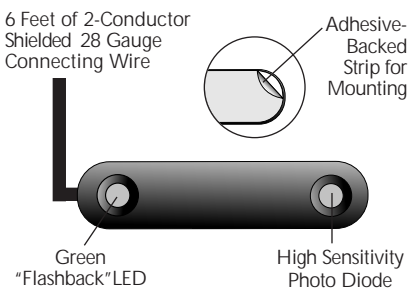
### Universal System

The MS-2 is compatible with virtually all brands of A/V equipment. You can freely mix components for the best performance.

### Performance Guaranteed

100% tested, electronically for range, angle of pickup, and brightness. The MS-2 has a limited two year parts and labor warranty. The MS-2 is proudly made in the U.S.A.

## MS-2 PARTS GUIDE



## INSTALLATION CONSIDERATIONS

### Wiring MS-2 Sensors

From every IR Sensor location, you must "home-run" a cable back to the main system unit. "Home run" means an individual cable is connected between each IR Sensor and the main system unit. You should **never** daisy-chain (connect in parallel) two or more IR Sensors to a single input. (see Figure 2)

### Combining MS-2 Sensors with Niles Keypads

There is only one exception to the "home run" wiring rule is when you are placing both a keypad and a sensor (or two keypads) in one room. **Only in this case** may you "daisy-chain" a single cable. A cable is run between the keypad and the sensor, then a single cable is run from either the sensor or the keypad back to the main system unit. See Figure 3.

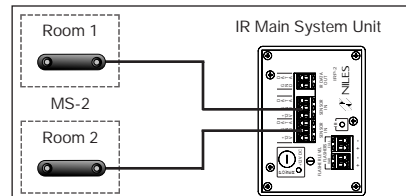


Figure 2 : Home run the Sensor cable from each sensor to the IRP-2.

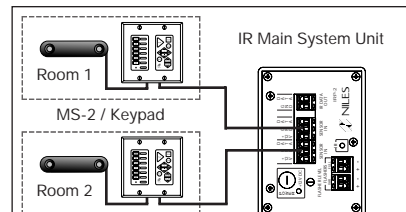
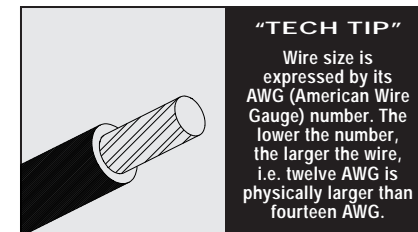


Figure 3 : An IR Sensor cable is "daisy-chained" from an MS-2 to a Keypad and then back to the Main System Unit. **Never** "daisy-chain" two IR sensors.

### Type of Cable

The MS-2 connects to the IR main system unit with 2-conductor shielded cable. We recommend "data grade" cables made of two 28 gauge (or larger) conductors surrounded by a foil shield and a bare drain (ground) wire. Data grade cable provides the capability for runs of up to 500 feet to each sensor. Examples are West Penn D291, Belden 8761 or Carol C2516. Any non-data grade 22-16 gauge 2-conductor

DO NOT USE UNSHIELDED CABLE WITH THE MS-2



shielded cable, available at an electronic parts store, will enable 150 foot runs to each sensor. Data grade cable is available from Niles: Part# FG00668.

### MS-2 Mounting Location

Locating the MS-2 in the center of a room usually results in the most even IR receiving coverage, especially if the room is square shaped. Rooms that are L-shaped or long and narrow require more careful consideration. With these types of rooms, installing the MS-2 closest to the primary location of the user will ensure the best performance.

The MS-2 is designed to surface-mount almost anywhere. Convenient mounting locations for the MS-2 include:

- On the front panel of a television set, facing the viewer
- On the front surface of a wall, a cabinet, an appliance, or a speaker grille
- Behind a speaker grille (speaker grilles typically reduce the effective range of an MS-2 to 15 feet)

### Receiving Range and Pickup Angle

The receiving range of the MS-2 will vary according to the IR output strength of the remote control being used. Remote strength varies among brands by the number and size of the batteries used, and how many IR emitters the remote has. For example, remotes that operate on two small AAA batteries and have only one IR emitter are generally not as strong as remotes that use the larger AA size batteries and have two emitters. Tests with various manufacturers' remote controls have shown that the operating range can vary from a minimum of 18 feet to a maximum of about 30 feet. The IR pickup angle of the MS-2 is 60° off-axis (horizontal and vertical) at 18 feet.

Infrared signals travel essentially line-of-sight. They will not pass through or around solid objects. Do not rely on an IR signal being able to "bounce" off a wall or reflective object to the MS-2.

When installing the MS-2 behind a speaker grille expect to reduce the range of your remote controls by half.

### Avoiding Optical Interference

As with any type of IR sensor, avoid locating the MS-2 where it will be exposed to direct sunlight. The sun emits an enormous amount of IR energy, many times stronger than that of a hand-held remote. Keep in mind that the less sunlight the MS-2 receives, the better.

**DO NOT** mount the MS-2 outdoors. During daylight hours, you will experience poor operation and/or interference.

Other potential sources of optical interference include:

1. Bright reflections from windows, mirrors, swimming pools, shiny floors or objects.
2. Placing the MS-2 within a few inches of a fluorescent light.
3. Placing the MS-2 within the same room as a Neon sign.

### Avoiding Electrical Interference

Avoid locating the MS-2 near any potential sources of Electro-Magnetic Interference (EMI). The most common sources are:

1. Some mounting positions on the front panel of a television (particularly large direct view sets). If you are installing the MS-2 near a television, test for an interference-free mounting position (See page 9; Testing for EMI) before permanently mounting it in place.
2. Light dimmers or variable speed controls for ceiling fans. These controls emit more interference when turned down halfway. They emit little or no interference when turned up all the way (brightest or highest position).
3. Fluorescent Lights The electronic ballast sometimes emits EMI.
4. Large appliances (air-conditioners, pumps, motors, compressors; etc.)
5. AC line noise (noise brought into the system via the wall outlet connected to the main system unit)



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### Concealing the Wire

If you are installing the wire into an existing wall, take time to consider any possible obstructions which may be hidden inside the wall, such as wood and metal studs; electrical, telephone or other types of wiring; plumbing; conduit; old wall safes; etc.

If the MS-2 cable needs to pass through any cabinetry (or other obstruction) drill a 1/8" hole where the cable will run.

## INSTALLATION

Determine a mounting location for the MS-2. If there is a potential source of EMI near the proposed mounting location (e.g nearby or on a television set) you must test to find the best (interference-free) position before mounting the MS-2 in place.

Clean and dry the mounting surface. Peel off the protective layer on the self-adhesive pad and firmly affix the MS-2 to the mounting surface.

### Testing for EMI (Electrical Interference)

1. Turn on the device. If it is a wall mounted light dimmer turn the dimmer knob to the halfway position.
2. Connect the MS-2 to a main system unit and plug in the 12VDC power supply.
3. Place the MS-2 in the proposed mounting location and observe the green "Flashback" LED.
3. If it flickers or lights constantly. This indicates a

high level of electrical interference. Move the MS-2 housing to a location where the LED does not light.

### Extending the Cable

Once the cable is in place, label the cable ends for future reference. The MS-2 is supplied with 6' of pre-stripped IR cable. The IR cable may be lengthened as needed. The IR cable may be lengthened by splicing it to a recommended IR cable (See page 5, Installation Considerations—Type of Cable). You may splice the MS-2 cable to another cable by soldering or crimping the connections. Make sure that you maintain proper polarity and correct connections through the splice.

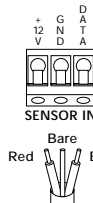
After you've extended the wire strip 1/4" of insulation from the end of each wire. Tightly twist the end of each conductor until there are no frayed ends.

## TOOLS REQUIRED

- 1/8" Standard slotted screwdriver
- Wire stripper
- Crimping tool with crimp rings or Soldering gun with solder
- Heat shrink tubing or electrical tape.

### Connecting to the Main System Unit

Strip 1/4" of insulation from the end of each wire. Tightly twist the end of each wire until there are no frayed ends. Insert the end of each wire into the appropriate hole on the main system unit's connector block. Secure the wiring to the connector by tightening the small connector screws. Double-check all connections. This manual contains instructions for the MS-2 only. For specific information on the adjustment of your Niles Infrared system, please refer to the instruction manual included with your Niles IR Main System Unit.



## CONNECTIONS

- Red conductor is positive (12VDC +)
- Braid (shield) is ground (GND)
- Black conductor is data

NOTE: The color code shown above is for West Penn D291 IR cable. Actual color code of recommended cables may vary.

## OPERATION

Operation of the MS-2 is straightforward. Simply aim your hand-held remote at the MS-2. Your IR command is instantly repeated to your A/V equipment. A green "flash-back" LED on the MS-2 visually confirms the receipt of an IR signal.

## TROUBLE-SHOOTING

### Eliminating Optical Feedback

In some installations, two conditions combine to create an optical feedback loop. Symptoms can include: poor range, intermittent operation or no operation.

The conditions which sometimes combine to create a feedback loop are:

1. Both a sensor and a flasher are located within the same room.
2. There is some low-level noise or interference on your system.

You can eliminate optical feedback by replacing any IRC-1 "flooding flashers" with IRC-2 "pinpoint" MicroFlashers™ and covering all flashers with the supplied IR blocking covers.

### Identifying the Type of Interference

The "flash-back" LED on the front of the MS-2 is a useful trouble-shooting aid.

The LED should light only when a remote command is being received. However, if the LED on the MS-2 "flickers" dimly, and the MS-2 functions normally, there is no cause for concern.

**If the MS-2 does not work, and the LED does not light at all:** Test the remote control(s) by operating the A/V equipment directly. Replace the batteries if needed. Double check the cable connections on all MS-2's Main System Unit and on the IR Main System Unit. Consult your IR Main System Unit's manual for more detail.

**If the MS-2 does not work, and the LED "flickers" or remains solidly lit:** Cover up the Sensor with a piece of cardboard (your hand will actually create electromagnetic interference under some conditions). Observe the IR test LED.

**IR Test LED Off:** Optical Interference

**IR Test LED On or Flickering:** Electromagnetic Interference

### Optical Interference

Identify the source of the interference. The most common sources of optical interference are listed in the Installation Considerations section on page 7. Either re-orient the sensor or move the source of interference. If this is not possible, consider exchanging your MS-2 for an IRR-4D, TIR-1 or a CMS-3 ceiling sensor. These three sensors have AGC circuits which serve as automatic filters.

### EMI (Electromagnetic Interference)

Identify the source of the interference. The most common sources of electromagnetic interference are listed in the Installation Considerations section on page 8. To eliminate EMI try the following methods:

1. Move the sensor or the sensor cable away from the EMI source **or** move the source of the EMI away from the sensor or the cable.
2. Shield the sensor with a metal J-Box.
3. Connect the Sensor's GND terminal to true earth ground (if this isn't feasible use the main system unit's GND terminal).

### Other Problems

A full trouble-shooting guide can be found in the manual of your IR Main System Unit.

## SPECIFICATIONS

### IR System

Compatible with virtually all brands of remotes using carrier frequencies between 18 kHz and 100 kHz.

### IR Receiving Range

Varies depending on remote strength; typically 18-30 feet.

### IR Receiving Angle

60° off-axis (horizontal and vertical) at 18 feet.

### Mounting

Surface-mount. Self-adhesive mounting strip included.

### Wiring Requirements

Individual home-runs of 2-conductor shielded cable, West Penn D291 or equivalent.

### Unit Dimensions

Overall Unit: 2" Long x 1/2" Wide x 1/4" High.



# MS-2

Miniature Surface-Mount  
IR Sensor



NILES®