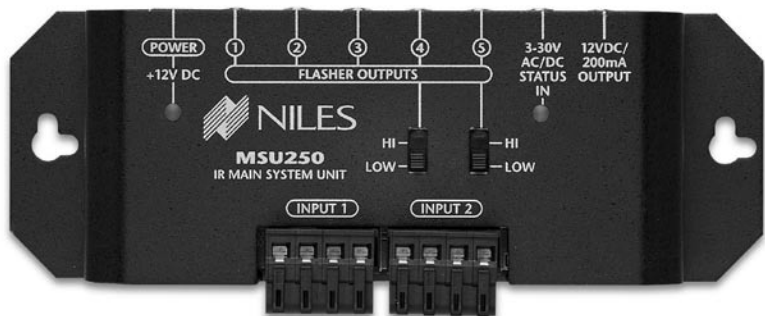# NILES®

INSTALLATION GUIDE

INFRARED MAIN SYSTEM UNIT

MSU250

CONGRATULATIONS!

Thank you for choosing **MSU-250** infrared (IR) extender system from Niles. With proper installation and operation, you should enjoy years of trouble-free use.

Niles manufactures the industry's most complete line of custom installation components and accessories for audio/video systems. To see the complete Niles product assortment, visit us on the Internet at: **www.nilesaudio.com**

TABLE OF CONTENTS

INTRODUCTION

The MSU-250 an infrared (IR) extender system enables you to control your IR remote controlled A/V equipment from a remote location. This enables 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 operate your equipment.

Installed at the equipment location, the MSU250 receives the IR commands transmitted from your existing hand-held remotes in that room. The commands are carried via a small CAT-5 cable to your A/V equipment in another room, and instantly "repeated".

The MSU250 is compatible with all current Niles infrared systems. It may be used along with the Niles TS110, MS110, MS210, WS110, and CS110 IR sensors or the IntelliPad®.

The model MSU250 is an IR Main System Unit. It is one of three elements that make up an infrared extender system:

- • IR Main System Unit—Models MSU140, MSU250, MSU480 and MSU440Z
- • IR Sensors/Keypads—Models WS110, TS110, MS110, MS210, CS110, MVC100IR and the IntelliPad
- • IR Flashers—Models MF1, MF2, MF1VF, MF2VF and the IRB1

AN IR SENSOR EXPANSION UNIT, MODEL IRH610, IS AVAILABLE FOR IR REPEATER SYSTEMS USED IN MORE THAN SIX ROOMS.

CONTENTS

- • MSU250 (1)
- • Screwless Connectors (2)
- • In-line Power Supply   1
- • Self-Adhesive Rubber Feet   4

FEATURES AND BENEFITS

The MSU250 offers a number of improvements over other IR Extender Main System Units:

- *Universal system—compatible with virtually all brands of A/V equipment and remote controls*
- *Accommodates two IR sensors or keypads*
- *Provides five flasher outputs via convenient 3.5mm jacks*
- *System feedback LED confirms operation*
- *12VDC Output—This is useful for triggering external devices and system automation*
- *3-30V AC/DC status input. Provides system status to connected sensors and keypads*
- *Expandable—an IRH610 IR expansion hub can be used to provide additional inputs.*
- *2x variable flasher out (4 + 5)*
- *Printed circuit board design assures high reliability*
- *Low profile and small footprint with integrated mounting wings that allow for both horizontal and vertical installation*
- *UL listed regulated in-line power supply with universal voltage capability.*
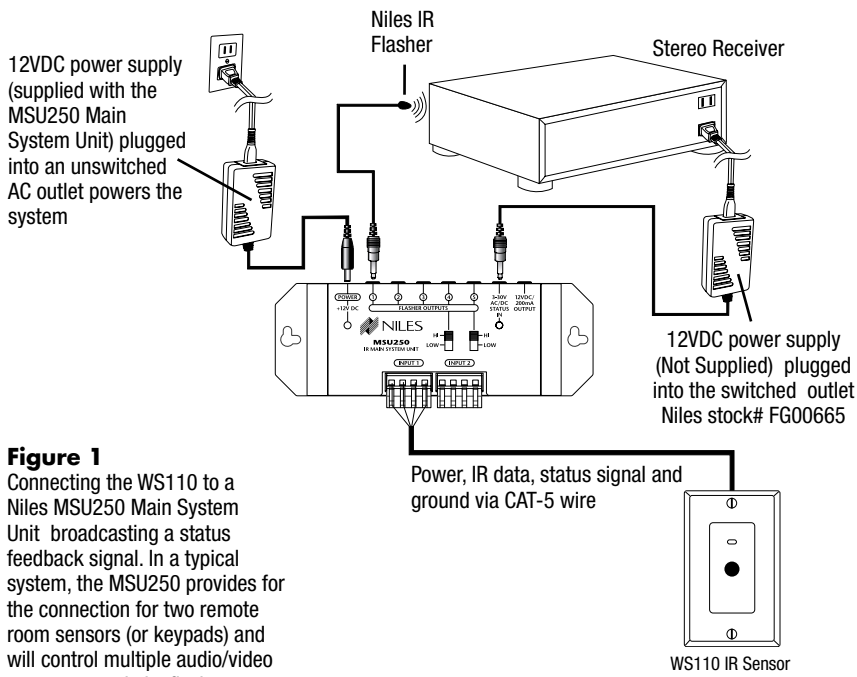- *Two year parts and labor warranty*

12VDC power supply (supplied with the MSU250 Main System Unit) plugged into an unswitched AC outlet powers the system

Niles IR Flasher

Stereo Receiver

12VDC power supply (Not Supplied) plugged into the switched outlet Niles stock# FG00665

Figure 1
Connecting the WS110 to a Niles MSU250 Main System Unit broadcasting a status feedback signal. In a typical system, the MSU250 provides for the connection for two remote room sensors (or keypads) and will control multiple audio/video components via its flasher connections.

Power, IR data, status signal and ground via CAT-5 wire

WS110 IR Sensor

MSU250 PARTS GUIDE
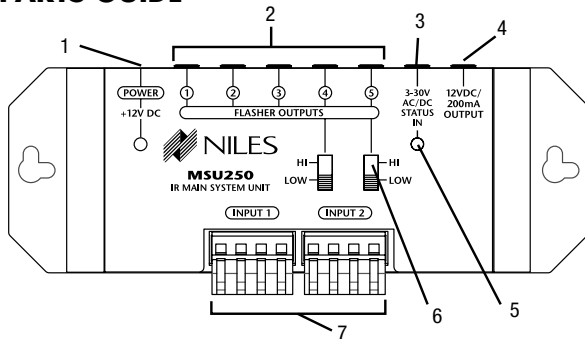
1. *12VDC Jack – Provides 12 volt DC power to MSU via a regulated power supply*

2. *IR Flasher Outputs – 3.5mm jacks provide output for either single or dual (MF1, MF1VF, MF2, MF2VF) low-level flashers*

3. *3-30V AC/DC Status – 3.5mm jack provides system status to sensors/ keypads via a 12V power supply attached to a switched outlet on the system receiver or a 12V trigger output*

4. *12V Output – When 12 volts is detected at the status jack (#3) the 12V output jack will output 12V/200mA DC. This is useful for triggering external devices and system automation*

4

FEATURES AND BENEFITS

5. Status/IR Confirmation LED – This LED performs two functions: (1) it provides a visible indication of system status via a green LED and (2) confirms the reception of IR data via a blinking blue LED

6. Flasher Hi/Lo switch – Setting these switches to the appropriate position allows you to connect either a high output flooding flasher (IRB1) or low output microflashers (MF1, MF1VF, MF2, MF2VF)

7. Sensor Input – Removable quick connect sensor plug for connection of IR sensors to the system

INSTALLATION CONSIDERATIONS

PLACEMENT OF THE MSU250

Place the MSU250 conveniently close to the equipment it will be controlling. Generally, the unit is placed in a concealed location because its controls and indicators are only used during installation. Placement possibilities include:

1) Table-top (on the floor or shelf behind the equipment (Figure 2)

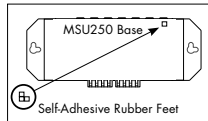*2) Wall-mount (affixed to the back of the equipment cabinet or a nearby wall (Figure 3)*

Figure 2

Table-top placement
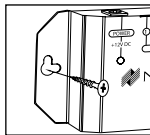Affix the enclosed self-adhesive rubber feet to the base of the MSU250.
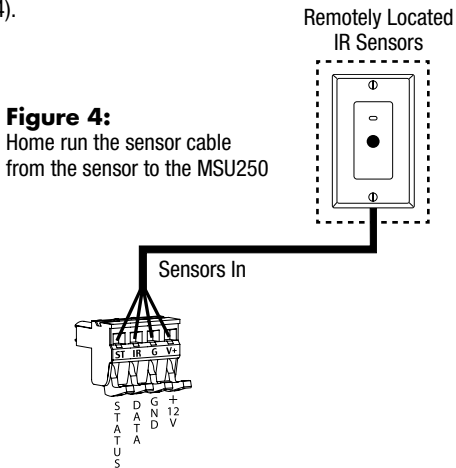

Figure 3
Wall-mount placement
Use sheetrock screws.

WIRING

From every IR Sensor location you must "home-run" a CAT-5 cable back to the MSU250.
Home run means that an individual cable is connected between each IR Sensor and the MSU250
(Figure 4).

Remotely Located
IR Sensors

Figure 4:
Home run the sensor cable
from the sensor to the MSU250

Sensors In

TECH TIP
WIRE SIZE IS EXPRESSED
BY ITS AWG (AMERICAN
WIRE GAUGE) NUMBER
— THE LOWER THE
NUMBER, THE LARGER THE
AWG, FOR EXAMPLE,
20 AWG IS PHYSICALLY
LARGER THAN 22 AWG.

ST IR G V+

S D G +
T A N 1
A T D 2
T A V
U
S

NOTE: IMPORTANT — AVOIDING INTERFERENCE AVOID LOCATING ANY OF THE CABLES, SENSORS,
KEYPADS OR THE MAIN SYSTEM UNIT NEAR ANY POTENTIAL SOURCES OF ELECTRO-MAGNETIC
INTERFERENCE (EMI), SUCH AS LIGHT DIMMERS, SPEED CONTROLS FOR CEILING FANS,
ELECTRICAL BALLASTS, TELEVISION SETS, LARGE MOTORS, HEATERS OR AIR CONDITIONERS

INSTALLATION CONSIDERATIONS *(CONTINUED)*

INTELLIPAD WIRING

When you are placing both a IntelliPad and a sensor (or two keypads) in one room you may "daisy-chain" using a single cable. A cable is run between the keypad and the sensor and a single cable is run from either the sensor back to the MSU250. To prevent data feedback an IN4003 blocking diode is inserted on the data (IR) line between the IntelliPad and the sensor. The cathode, or blocking side of the diode, faces the IntelliPad. (Figure 5). Note that status wire is connected to IntelliPad's status (+) connector.

Figure 5
An IR sensor cable is "daisy-chained" from an IntelliPad, to a sensor and back to the MSU250
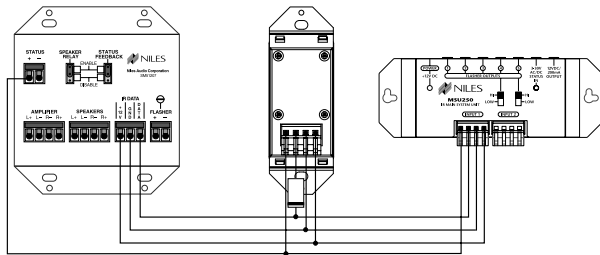
SENSOR/KEYPAD CABLE

The MSU250 connects to IR sensors and the IntelliPad with CAT-5 cable, with a maximum cable run of 500' (152.4m). Flasher cable Niles infrared flashers come supplied with a 10' (3m) 2-conductor 22 gauge cable. Should you need to extend it, use a 16 gauge 2-conductor cable ("zip-cord"). Shielding is not necessary for a flasher. Flasher wires can be extended up to 200' (61m).

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INSTALLATION

TOOLS REQUIRED

- *1/8" (0.3cm) Standard Slotted Screwdriver*
- *Wire Stripper*

INSTALLATION

Before you begin, make sure that the sensor/keypad cables, the flasher cables and the 12VDC power supply cable will all reach the proposed location of the MSU250. Mark the cables with labels describing where the cable originates (rather than which terminal on the MSU250 it should connect). For proper installation, follow the steps outlined below in the correct order. If you discover a fault in the course of installation, go on to the Troubleshooting Guide before continuing with the next installation step.
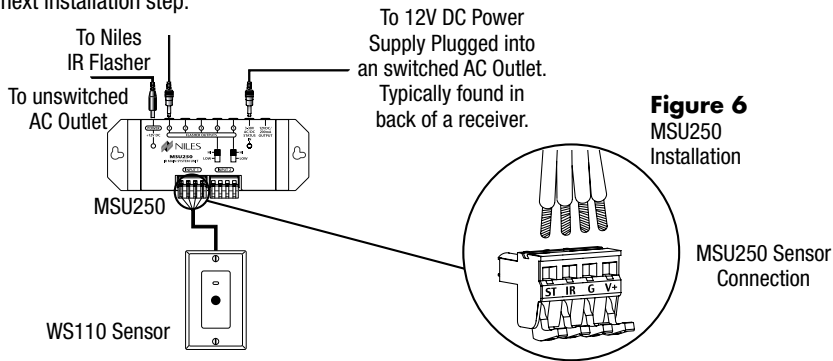
Figure 6
MSU250 Installation

MSU250 Sensor Connection

INSTALLATION *(CONTINUED)*

1. Connect and test the power supply. If it tests OK, unplug the connector from the power socket and proceed

A) Plug the supplied 12VDC power supply into an unswitched 120 volt AC outlet, 50-60 HZ

B) Plug the connector into the socket marked "Power" on the MSU250

C) If the Power LED does not light, test the unswitched 120 volt AC outlet, 50-60 HZ with another appliance. If the outlet tests OK, you have a defective power supply which must be replaced for you to continue

2. Connect the Sensor/Keypad cable the Sensor input.

A) Strip 1/4" of insulation from the end of each wire. Tightly twist the end of each wire until no frayed ends remain

B) Use a small flathead screwdriver or your thumbnail to raise the locking tabs, exposing the holes on the removable connectors

C) Insert each wire into the appropriate hole on the removable connector plug (Figure 6), and snap the locking tab down

To help you, the connector plug is keyed. Insert the smooth side of the connector plug into the smooth side of the socket. Don't force the scalloped side of the connector plug into the smooth side of the socket.

3. Test for shorts and interference.

A) Reconnect the power supply. If the power LED lights and the IR test LED stays off, unplug the connector from the power socket and proceed to Step 4. The following LED conditions show a fault:

• If power LED is off there is a short between +12V and GND

• If IR test LED is on or flickers blue there is a short between DATA and GND or interference is present

Before you proceed to Step 4 consult the Troubleshooting Section beginning on page 14.

4. Plug the flashers into the flasher outputs. If you need to extend the wire, use a 2-conductor 16 gauge or larger (See "Tech Tip" on page 6)

Route the connecting wire to the IR Main System Unit. Connect the 3.5mm plug into the jack labeled "Flasher Output" on the MSU250 (Figure 7).
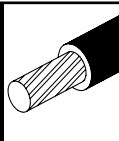
Figure 7
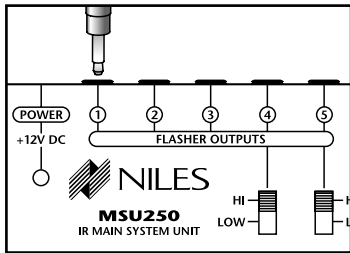
BE SURE TO OBSERVE PROPER POLARITY WHEN EXTENDING THE FLASHER WIRE. The wire lead marked with a gray stripe is positive (+); the unmarked lead is negative (-).

TECH TIP
Make all final connections to the MSU before connecting the power supply. This will avoid potential damage to components.

OPERATION

TESTING THE IR EXTENDER SYSTEM

Test your IR extender system by following the three principal guidelines:

1. All components can be operated. Test all of your remote controls for all of your equipment

2. Operation is consistent. A good test is to repeatedly step from pause to play with your VCR, CD, DVD, or Tape player remote control. Operation should be identical to standing in front of the component with the remote control pointed directly at the sensor window

3. Maximum range between the remote control and the Niles IR sensor is similar to the maximum range between the remote control and the A/V component's IR sensor. Typically a remote control with two batteries will have a 15' (4.5m) to 20' (6m) range and a remote with four batteries will have a 20' (6m) to 30' (9m) range

12 VOLT TRIGGER OUTPUT

The Niles MSU250 provides a 12VDC output that can be triggered one of two ways:

1. The presence of status voltage on the 12VDC status input jack

2. Discrete infrared on and off commands

The discrete on and off commands are available for download at:

www.nilesaudio.com/techsupport. This output can be used to trigger

any device that requires 12VDC to be activated.

OPERATION

Example include:

- *Dropping a motorized screen*
- *Activating a television lift*
- *Turning on a voltage controlled switching device (e.g.: Niles AC-3 voltage controlled switched outlet)*
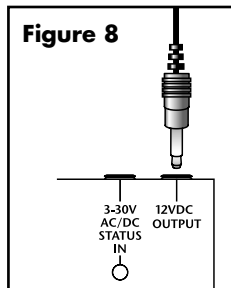
INSTALLATION

Simply plug a cable with a 3.5mm plug (tip=positive, sleeve=ground) into the jack labeled "12VDC/200mA OUTPUT". Connect the other end of the cable to the device that will be triggered or a activated (Figure 8)."12VDC/200mA OUTPUT". Connect the other end of the cable to the device that will be triggered or activated (Figure 8).

Figure 8

3-30V AC/DC STATUS IN   12VDC OUTPUT

POWER STATUS – INTRODUCTION

To properly wire an IntelliPad to the MSU250, refer to Figure 5

By providing 3-30 volt AC/DC to the status input jack of your MSU250 you can send a status signal to sensors or an IntelliPad without running any additional wiring. Built into the MSU250 is a Niles status signal generator. When the MSU250 sees 3-30 volt AC/DC at the status jack it broadcasts a status signal over your existing IR sensor wires. Any sensor or IntelliPad

OPERATION *(CONTINUED)*

connected to one of your sensor wires will display the power status of your system.

POWER STATUS — INSTALLATION CONSIDERATIONS
PROPER POWER SUPPLY

If status is being supplied from a switched outlet you must connect a Niles 12VDC wall adapter (Niles FG00665) into the switched AC power outlet of the preamp/receiver in your system. Any 12VDC power supply with a minimum of 100mA current capacity can be substituted.

Extending the Cable

If you must extend the cable from the wall adapter to the MSU250's status input jack be sure to maintain correct polarity. The tip of the plug should be positive (+) and the sleeve negative (-). Any 16 gauge 2-conductor cable can be used to extend the power status cable up to 200' (61m).

Checking the Power Supply

It is possible to check the status power supply itself and any connections that were made to extend the cable by inserting the status plug into the Power jack on the MSU250. If the Power LED lights the status power supply and connections are ok. If the Power LED does not light check all connections and replace the power supply if necessary. For more details on incorporating the IntelliPad please refer to the IntelliPad's users manual.

System Expansion

System expansion is easily achieved (Figure 9) through the use of an IRH610 infrared sensor expansion hub. Please see your authorized Niles dealer or refer to the IRH610 manual for details.

12VDC Power supply
(Not Supplied) plugged
into a switched outlet
Niles stock# FG00060A

MSU250
Main System Unit
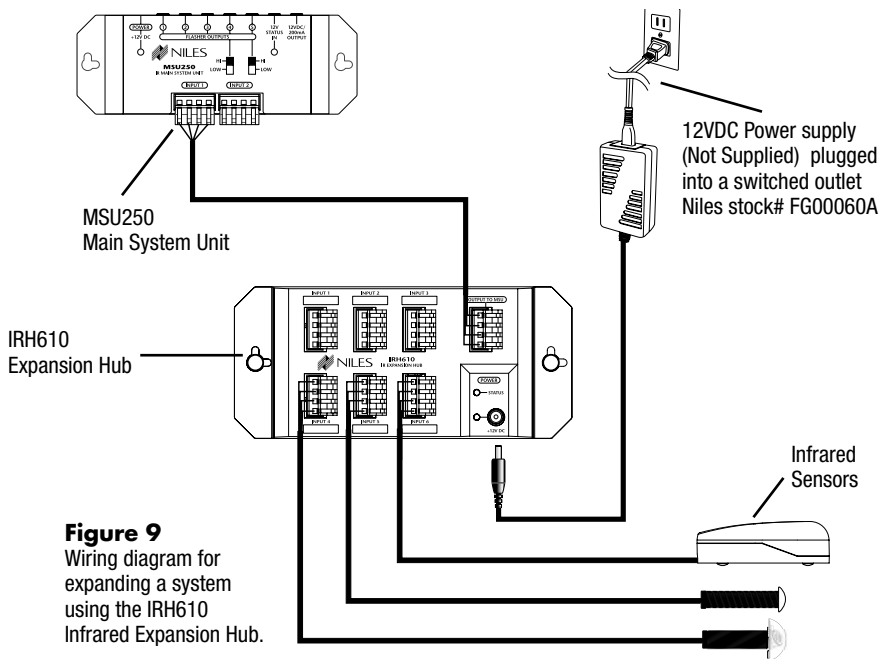
IRH610
Expansion Hub

Infrared
Sensors

Figure 9
Wiring diagram for
expanding a system
using the IRH610
Infrared Expansion Hub.

TROUBLESHOOTING

TROUBLESHOOTING GUIDELINES

There are three basic problems which prevent proper operation. In the order of probability the problems are:

1. Bad Connections or Wiring

If the connections or wiring are wrong, loose, shorted or open the system will not operate properly. The symptoms could include: Power LED flickers or is off, IR test LED is continuously flickering or on without any remote control use, intermittent operation or no operation.

Systematically troubleshoot the wiring by:

1. *Testing your power supply connections*
2. *Testing your sensor connections*
3. *Testing your flasher connections*
4. *Testing your cable for shorts and opens*

2. Optical or Electromagnetic Interference

Direct sunlight, reflections, neon signs and other sources of infrared light or television sets, light dimming controls and other sources of electromagnetic fields can induce noise and interference into your IR extender system. Symptoms can include: flashback LED's continuously flickering or on without any remote control use, poor range, intermittent operation or no operation.

Solution: 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. Connect the sensor's GND terminal to true earth ground (if this isn't feasible use the main system unit's GND terminal)

3. Optical Feedback Loop

If you have an IR sensor in the same room as a flasher, and you have some low-level noise or interference, an optical feedback loop can occur which will interfere with proper operation. Symptoms can include: poor range, intermittent operation or no operation.

Solution: You can eliminate optical feedback by replacing any IRB1 "flooding flasher" with MF1 or MF2 MicroFlashers and covering all flashers with the supplied IR blocking covers.

There are many methods for reducing interference. Which solution is best for you depends on your situation. If you require further assistance contact Niles Technical Support at 1-800-289-4434 or 305-238-4373 - www.nilesaudio.com.

SPECIFICATIONS

IR System
Compatible with virtually all brands of remotes
using carrier frequencies between 26 and
105kHz.

Wiring Requirements
Individual home-runs of CAT-5 cable from each
sensor/keypad.

Unit Dimensions
5-11/16" wide x 1-1/4" high x 2" deep
(173.3cm wide x 38cm high x 61cm deep).

Power Requirements
12 VDC power supply (included).

Addendum: Using the MSU250 with the IntelliControl® automation system

1550 HM
Resistor
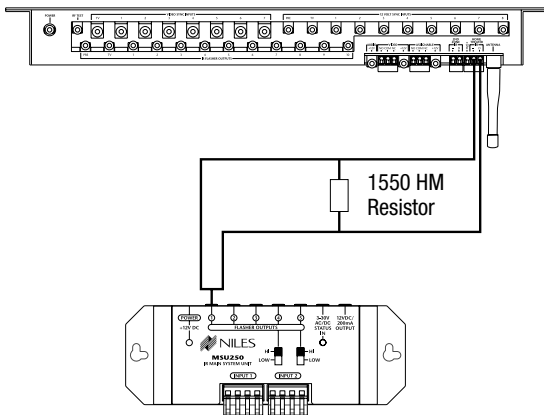
Using the MSU250 with the IntelliControl Home Theater automation system

When connecting an MSU flasher output to an IntelliControl "Home Theater" port, a 150-Ohm resistor must be placed between the data and the ground line of the IntelliControl IR sensor input (see figure above). No resistor is needed if the MSU is being connected to the "2nd Zone" port of the IntelliControl.

NOTES

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_____

_____

_____

LIMITED WARRANTY

Please fill in your product information and retain for your records.

Model_____ Serial No._____ Purchase Date_____

WARRANTY REGISTRATION CARD

Model Purchased _____   Serial Number _____

Date Purchased (month/day/year) _____   Dealer Name and Location _____

○ Dr.   ○ Miss   ○ Mr.   ○ Mrs.   ○ Ms.

Name _____   Address _____

City _____ State_____ Zip _____ Tel ( ) _____

Please take a moment to fill out our warranty registration card. The information helps us to get to know you better and develop the products you want

Age:
○ *Under 25*
○ *25-34*
○ *35-44*
○ *45-54*
○ *55 & over*

Income:
○ *Under $24,999*
○ *$25,000-$34,999*
○ *$35,000-$44,999*
○ *$45,000-$59,999*
○ *$60,000-$74,999*
○ *$75,000-$99,999*
○ *Over $99,999*

Occupation:
○ *Arts/Entertainment*
○ *Business Owner*
○ *Engineer*
○ *Finance/Accounting*
○ *General Office*
○ *Management*
○ *Professional*
○ *Sales/Marketing*
○ *Student*
○ *Tradesperson*

Musical tastes: (Please check all that apply)
○ *Alternative*
○ *Classical*
○ *Country*
○ *Jazz*
○ *New Age*
○ *Popular*
○ *R&B*
○ *Rock*
○ *Other_____*

How did you hear about Niles?
○ *Architect/Developer*
○ *Custom Installer*
○ *Direct Mail*
○ *Friend/Family*
○ *In-Store Display*
○ *Interior Designer*
○ *Magazine Ad*
○ *Mail-Order Catalog*
○ *Newspaper Ad*
○ *Product Brochure*
○ *Product Review*
○ *Retail Salesperson*

What magazines do you read?
1. _____
2. _____
3. _____

Who will install the product?
○ *Custom Installer*
○ *Electrician*
○ *Friend*
○ *Myself*

Which factor(s) influenced the purchase of your Niles product?
(Please check all that apply)
○ *Ease of Use*
○ *Price/Value*
○ *Product Features*
○ *Quality/Durability*
○ *Reputation*
○ *Style/Appearance*
○ *Warranty*

Do you . . . ?
○ *Own a House. If yes, how many square feet?*
_____

○ *Own a Town House/ Condominium/Co-op*
○ *Rent an Apartment*
○ *Rent a House*

Are you interested in receiving literature on other Niles products?
○ *Yes*   ○ *No*

Are there products/capabilities that you would like to see introduced?

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