UMRMS

User Manual

TRUST IS IN THE NAME

Starrett®

READ THIS MANUAL BEFORE USING THE INSTRUMENT

**ANTES DE UTILIZAR EL INSTRUMENTO,
LEA ATENTAMENTE ESTE MANUAL**

LIRE CE MANUEL AVANT D'UTILISER L'INSTRUMENT

**LEIA ATENTAMENTE ESTE MANUAL ANTES
DE UTILIZAR O INSTRUMENTO**

使用仪器前请阅读本操作手册

**DIESES HANDBUCH VOR DER VERWENDUNG
DES MESSGERÄTS LESEN**

**LEGGERE ATTENTAMENTE QUESTO MANUALE PRIMA
DI UTILIZZARE QUESTO STRUMENTO**

TABLE OF CONTENTS

Starrett®

RMS REMOTE DISPLAY
USER MANUAL

RMS REMOTE DISPLAY

THIS IS A STARRETT USER GUIDE FOR THE RMS REMOTE DISPLAY.

ALL SPECIFICATIONS IN THIS DOCUMENT ARE CORRECT AT TIME OF PRODUCTION AND ARE SUBJECT TO CHANGE. PLEASE CONTACT STARRETT FOR FURTHER INFORMATION.

INTRODUCTION

The Remote Display is a richly-featured measurement system that allows for the simultaneous connection of up to four gages and displays their current measurements on a connected Android tablet. In addition, the Remote Display can connect to up to two external data consumers (desktop computer, laptop, PLC, or any generic serial device) over RS-232 and USB.

The Remote Display has been designed to work with nearly any gage that outputs data in Digimatic format. In addition, device that output raw quadrature can be used as well.

As a standalone measurement system, the Remote Display provides a very intuitive and user-friendly way to configure and monitor several gages at once. Connecting the Remote Display to a computer or other serial device makes data collection and statistical process control (SPC) simple and easy.

FEATURES

- Simultaneous connection of up to four measurement instruments
- Both Digimatic or raw quadrature devices supported on all four ports
- Nearly any Digimatic gage – regardless of manufacturer – supported
- User-friendly and intuitive Android application for easy process monitoring
- Global footswitch makes triggering data updates easy
- External USB and RS-232 connections facilitate simple SPC
- Wide supply voltage range (9V to 24V)
- USB power can be used instead of an external AC adapter
- High quality, low profile enclosure and tablet stand
- Bright LED power indication

HARDWARE OVERVIEW

The front panel of the Remote Display Mux Box contains the connectors for up to four gage channels. Each 10-pin connector supports both quadrature probes and any gage that supports Digimatic communications.

1. Global send footswitch for triggering updates on all connected channels
2. Four 10-pin gage channel connectors

The rear panel of the Remote Display Mux Box the power and communication interface connectors, as well as a power indicator LED

1. USB Type A port for connecting the supplied Android tablet
2. USB Type B port for connection to a computer
3. RS-232 port for connection to external data consumers
4. Power LED indicator
5. 12V, 1.5A center-positive power jack
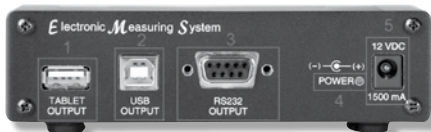
QUICKSTART GUIDE

The following instructions will demonstrate how to operate the Remote Display with one Digimatic indicator and one quadrature Probe.

1. Plug in the supplied power adapter to the Remote Display Mux Box (item 5 on page 3). The red LED on the rear panel will light up.

2. Power up the supplied Android tablet. Press and hold the On Button (approx. 5 seconds) until HP logo appears on screen and then release the On button. The display will take approx. 30 seconds to startup. Using the supplied USB Micro to USB Type-A cable (item 1 page 3 on Back Panel), connect the Android tablet to the Remote Display Mux Box. Do not connect the tablet to the USB Type-B connector, as this will not function properly!

3. The Remote Display application should automatically start on the Android tablet. If it does not start, unplug the tablet from the gage, wait a few seconds, and then reconnect.

4. Plug a quadrature probe into channel 1

    a. The Android application defaults all channels to quadrature mode, so the gage should start reporting counts immediately after connecting. Confirm this by moving the spindle of the probe.

5. Plug the device (with Digimatic output) into channel 2

To configure channel 2 for Digimatic communication mode, long-press on the CH 02. Channel 2 Properties page will appear on tablet. Scroll down to the setting for "Gage Type," then make sure Digimatic is selected. Press the back button ⬅ on the tablet to return to the main display.

6. For all Digimatic devices, data can be manually requested by pressing the "Request" button for the associated channel. Alternatively, data can be automatically updated at constant intervals using the automatic update feature. To set an automatic update interval (the Remote Display will not update the Digimatic Data unless requested):

    a. Long-press on the appropriate channel (CH 01, CH 02, CH 03, or CH 04)

    b. Scroll down to the option titled "Auto-request interval"

    c. Select the desired update rate (fastest rates may not be supported by all devices)

Note that the "Request" button will no longer be visible for that channel. It is not possible to manually request while the automatic function is active.

ANDROID APPLICATION OPERATION

LAUNCHING AND CONNECTING

The Remote Display Android application will automatically launch and connect when the tablet is connected to the Remote Display Mux Box. Alternatively, the app can be launched by clicking on the Remote Display icon from the App Drawer.


After connecting the Android tablet to the Remote Display Mux Box and launching the app, the system will establish communication. The connection status text at the top-left corner the application will read "Remote Display" as seen below.
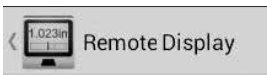
If the device shows a status of "Disconnected" or "Error," ensure that the Remote Display is powered using the external AC adaptor and that the Android tablet is connected to the USB-A plug on the back of the display. Refer to **Hardware Overview** section for more information about identifying the connectors.

MAIN DISPLAY

The main screen of the Remote Display application is shown below. As channels are enabled and disabled, the screen will update dynamically to maximize the amount of screen area available. This example shows two connected devices (channels 1 is a Quadrature "QUAD" instrument and channel 2 is a Digimatic "DIGI" instrument. If Digimatic is chosen as "Gage Type" and no device is connected to that channel, then TIMEOUT will appear on the display. The primary features of the main screen are illustrated in the list below.
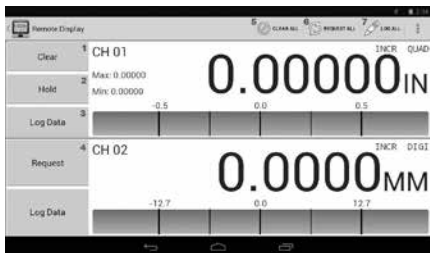
1. Clear Button (quadrature devices only) – Press and Hold the Clear Button to zero the displayed measurement for that channel.

2. Hold Button (quadrature devices only) – Press Hold to toggle on or off hold function. To enable /disable Hold function and configure (min, max, or freeze) go to Channel Properties page.

3. Log Data Button – Press to record current measurement

4. Request Button (Digimatic devices only) – Press to request reading from selected channel

5. Clear All Button – Press to zero all quadrature channels

6. Request All Button – Press to request reading from all Digimatic channels

7. Log All Button – Press to record current measurement for all channels

CONFIGURING CHANNELS

Regardless of the connected gage type, all channels have a set of common settings. To access the settings for a given channel, swipe from the left side of the screen towards the center of the tablet (alternatively, press the back button on the tablet's soft key menu), and then click on the name of the appropriate channel.

Regardless of the type of connected device (Quadrature or Digimatic) there are several settings that are always available. These settings are summarized in the following list:

SETTING	NOTES
Channel Enabled	Enables/Disables channel. Disabling a channel will hide it from the main display.
Gage Type	Selects the channel function between Quadrature and Digimatic modes.
Unit Type	Selects measurement unit between Inch, Millimeter, and Hidden
Mode	Selects indication mode between Incremental (default), Absolute, and Total Indicated Runout (TIR). TIR is only available for Quadrature Devices
Absolute Offset	Entry of absolute offset (ABS mode only)
Travel Direction	Selects between forward and reverse travel direction.
Tolerance	Enables/Disables tolerance mode. If this mode is enabled, the analog indication for this channel will turn red when the measurement falls outside of the specified bounds.
High Tolerance	Sets the maximum allowable tolerance value for this channel.
Low Tolerance	Sets the maximum allowable tolerance value for this channel.
Ratio Mode	Enabling Ratio mode will scale the current value by the value of the "Ratio Value" setting.
Ratio Value	Scale multiplier for current gage measurement.
Automatic Log	Enables automatic data logging on an interval
Log Interval (s)	Sets the logging interval if Automatic Log is enabled
Show Analog Scale	Enables display of the analog scale in addition to the readout value
Analog Scale	Selects the maximum value to display on the analog scale readout.
Show Leading Zero	Enables/Disables leading zeros on current measurement.

QUADRATURE DEVICES

By default, channels are set up in quadrature mode, which provides a real-time display of the current indicator's measurement. The following settings are only available for quadrature channels:

SETTING	NOTES
Hold	Turns on/off hold mode for this chancel. This setting can be accessed by pressing the "Hold" button for the current channel on the main screen.
Hold Mode	If Hold is enabled, this setting selects between the available hold modes: Min, Max, and Freeze
Encoder Resolution	Set the Encoder Resolution of the device (for example .00005" or .0001")
Encoder Unit Type	Selects the unit type of the encoder glass scale (Metric or Imperial)
Resolution	Sets the display resolution of the remote display
Show Min/Max	Enables display of min and max readings in addition to the readout value

DIGIMATIC DEVICES

Channels can also be set up to read output from Digimatic devices. These devices need to be polled for their current data. The following settings are only available for Digimatic channels:

SETTING	NOTES
Log on Request	If enabled, a timestamped entry will be made to the data log every time the data is refreshed manually
Auto Request	Enables/Disables automatic data refresh.
Request Interval (s)	Sets the data update interval if Auto Request is enabled.

EXTERNAL DATA CONNECTION

The remote display supports data connections over both USB and RS-232 communications.

PC USB CONNECTION

The device may work with older operating systems but only Windows 7 and 8 are supported by the manufacturer. When connecting the Remote Display to a host computer over USB, the Remote Display will function as a Virtual COM Port (VCP), which emulates a standard RS-232 serial connection. To use this feature, follow these steps to establish communication between the display and the host PC (these instructions assume that host computer is running Windows 7):

1. Install the USB drivers that were bundled with the Remote Display. Be sure to install the correct drivers for the version of Windows (32-bit or 64-bit) that you are installing on. This can be determined by opening the System properties (Control Panel -> System and Security -> System) and checking the System Type field.

2. Power the Remote Display Mux Box using the supplied AC adapter. The red LED on the rear panel will light up to indicate the device has turned on.

3. Connect the Remote Display Mux Box to the host computer by plugging a USB cable between the USB Type B connector on the rear panel of the Remote Display and a USB port on the host computer (this cable can be purchased at your local computer store).

4. If the drivers have been installed correctly, Windows will recognize the Remote Display and will show a notification that the device has been connected.

Now that the PC USB has been properly established, the VCP can be opened either by data logging software or manually through a terminal client.

Most terminal clients that support standard serial communications will be compatible with the Remote Display. One free application, PuTTY, is the recommended application to use with the Remote Display. You can download it using the following link

http://www.chiark.greenend.org.uk/~sgtatham/putty/

ENGLISH

To install PuTTY, follow this procedure:

1. Once on the Putty website scroll down to "Site map" and click on **Download PuTTY**!

2. Scroll down to Windows Installer for everything except PuTTYtel click on Installer: **putty-0.63-installer.exe**.

3. When the installer finished downloading, double-click on it to start. Follow the prompts to complete the installation.

To open the VCP and query the Remote Display for the current gage reading on channel one, follow these steps. This guide will assume the user is using PuTTY to make the connection.

1. Open the terminal client and under "Connection type" check the circle marked "Serial".

2. Enter the COM port number in the "Serial Line" box. If this is not known, it can be found in the Device Manager:

    a. Open the Start menu (or press the Windows key on the keyboard)

    b. Type "Device Manager" and then press enter

    c. Expand "Ports (COM & LPT)"

    d. The Remote Display will appear as "Virtual COM Port (CDC) (COMnnn)" where "nnn" is the port number.
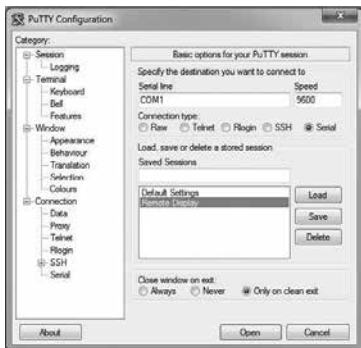
3. Click on Connection → Serial on the left sidebar, and make sure the connection parameters are set as shown below (Enter COM Port number if different from COM1)

4. Click "Open" to connect to the Remote Display. A successful connection will open a blank terminal window.

5. To test the connection, press the "Enter" key. The message "No such command!" should appear on the screen. If nothing is displayed on the terminal screen, disconnect the device, cycle power, and then repeat this procedure.

6. Refer to the **Communication Protocol** section below for a list of available commands.

RS-232 SERIAL CONNECTION

The Remote Display supports an RS-232 connection to data consumers, such as a computer or PLC. To connect the Remote Display to an external RS-232 device, use the following procedure:

1. Find the female RS-232 connector on the rear panel of the Remote Display Mux Box.

2. Using a shielded RS-232 cable, connect the Mux Box to the external data consumer.

   a. Depending on the device and cable configuration, it may be necessary to use a female-to-male gender changer. They can be used freely without any impact on the Remote Display functionality.

3. Use the following RS-232 settings on the external device to establish communication with the Remote Display Mux Box.

Speed (baud)	9600
Data Bits	8
Stop Bits	1
Parity	None
Flow Control	XON/XOFF

4. Refer to the **Communication Protocol** section below for a list of available commands. Many modern computers use USB ports in lieu of RS-232 ports. The Remote Display can still communicate to these devices over RS-232 by using a Serial-to-USB converter. There are many such devices available. When searching, ensure that the device is compatible with the Operating System version that is being used on the computer.

COMMUNICATION PROTOCOL

The following list summarizes the serial commands available for exchanging data with the Remote Display Mux Box. These commands apply to both the RS-232 and PC USB communication modes. Type "enter or return" after command.

COMMAND	DESCRIPTION
A	Print current gage readings for all channels
N:A	Print current gage reading for Channel "N". ex: 1:A for channel 1
D	Print data packet* for all channels
N:D	Print data packet* for channel "N"
R	Request a measurement update on all Digimatic channels on Tablet
N:R	Request a measurement update for channel "N" on Tablet
C	Clear gage measurements for all channels (quadrature only)
N:C	Clear gage measurement for channel "N" (quadrature only)
rstErr	Resets global errors
N:pXXX=?	Get the value of configuration parameter "XXX" for channel "N"
N:pXXX=<new value>	Set the value of parameter "XXX" for channel "N" to "<new value>"
Save	Saves any modified parameters to retentive flash
help	Show help text and command list

* Data Packet format: Channel:Reading:Analog Scale:New Data:Max:Min

Note that the Analog Scale field has a maximum value of 1000Note N = channel number

PARAMETER LIST

The following list summarizes the configuration parameters available for configuring each device channel. When editing these values over RS-232 and/or USB, make sure to call the Save command to commit the values. Otherwise, they will be reset if the Remote Display is powered down.

IMPORTANT NOTE: While these parameters can be changed over RS-232 and USB, the preferred way to edit these settings is by using the Channel Settings menu on the Android application. While the Android tablet is connected to the Remote Display, writing to these parameters will be blocked (reading is still allowed). If parameter writing over the external data connection is required, the Android tablet must be disconnected first.

PARAMETER	DESCRIPTION	VALUES
p003	Channel Enabled	0 – No 1 – Yes
p004	Units	1 – Inches 2 – Millimeters 3 – Hidden
p006	Travel Direction	0 – Normal 1 – Reverse
p007	Hold Enabled	0 – Disabled 1 – Enabled
p008	Hold Mode	0 – Freeze 1 – Min 2 – Max
p009	Tolerance Enable	0 – Disabled 1 – Enabled
p910	Upper Tolerance	Enter value without decimal Ex: 012345 = 0.12345
p911	Lower Tolerance	Enter value without decimal Ex: 012345 = 0.12345
p914	Absolute Offset	Enter value without decimal Ex: 012345 = 0.12345
p016	Gage Type	0 – Digimatic 1 – Encoder
p017	Glass Type (encoders only)	1 – Inches 2 – Millimeters
p018	Base Multiplier (one encoder tick)	5 – 0.00005" 10 – 0.001" 100 – 0.001mm 200 – 0.002mm
p019	Ratio Mode Enabled	0 – Disabled 1 – Enabled
p020	Ratio Multiplier	Enter value without decimal Ex: 012345 = 0.12345
p921	Analog Scale	Enter value without decimal Ex: 012345 = 0.12345
p023	Gage Resolution	1 – 0.001" or 0.02mm 2 – 0.0005" or 0.01mm 3 – 0.0001" or 0.002mm 4 – 0.00005" or 0.001mm
p024	Leading Zero	0 – Disabled 1 – Enabled

FILE TRANSFER FROM TABLET

There are three common ways to transfer stored data (.csv files) to other devices: transferring via the microSD card; transfer via USB connection; and transfer using email.

Transfer via SD Card (microSD cards can be purchased from you local computer store)

Files can be saved to the external microSD Card and transferred to any PC with a microSD card reader. To copy logging data to the card from within the Remote Display Android application, swipe right from the left side of the screen (or press the back button) to show the application menu, and click "View Data Logs."
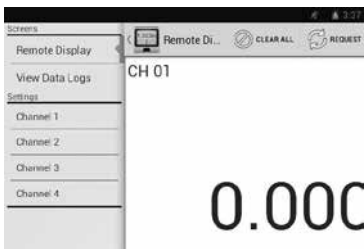
From this screen, click the "Copy to SD" button. The application will automatically transfer the logging data to a folder on the external microSD card.

Remove the card from the slot on the tablet (location shown below) and move it to the PC's card reader to access the files.

TRANSFER VIA USB CONNECTION

Files can be copied directly from the **tablet** to a **PC** over USB. To do this, connect the **tablet** to a PC over USB and wait for Windows to install the driver for the **tablet**. Once the drivers are installed successfully, open a new Explorer window and navigate to My Computer. The tablet should appear under the list of drives and devices, as shown below.

The data logs for the Remote Display application will be found in the following location:
Internal Storage\Logs

TRANSFER TO CLOUD STORAGE

If the tablet is connected to the internet over WiFi, data logs can be sent directly to cloud storage services like Google Drive, SkyDrive, and DropBox. To do this, go to the Remote Display application and return to the View Data Logs screen as shown previously. Click the Edit button and choose the channel number of the data log that you want to transfer.
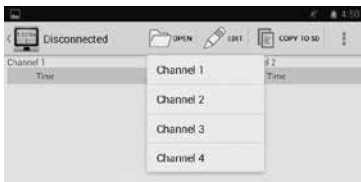
This will open the Spreadsheet application. Click "Save As" on the top header (if this is not displayed, click on the "S" button in the top left side of the application to show it), and then click on "Cloud Storage" at the top of the dialog box.

Find the preferred cloud storage service and follow the instructions to save the logs.

SUPPLEMENTAL INFORMATION

DIGIMATIC INTERFACE

The following describes the standard 10-pin Digimatic connector pinout.
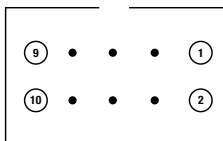
PIN NO.	NAME	FUNCTION
1	GND	Signal ground
2	DATA 1	Outlet data
3	CLOCK	Clock
4	RDY (READY)	Data transmission ready
5	REQUEST	Data output request from external device
6	NC	-
7	NC	-
8	+5V	5V input terminal
9	+5V	5V input terminal
10	GND	Frame ground

SIGNAL TIMING

Figure 1-1 shows a timing chart for the case where the host device triggers a data transfer by asserting the active-low request signal (/REQ). The gage then sends data (the DATA signal) that is clocked by the CK line. In this case, the data ready (RDY) line is not applicable.

FIG. 1-1
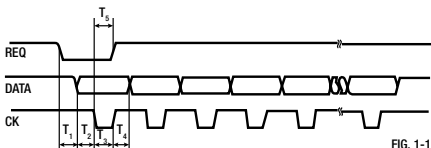
Figure 1-2 shows a timing chart for the case where the gage asserts its active-low data ready signal (/RDY) to indicate that a new gage measurement is available. This triggers a data transfer that is initiated by the host device.
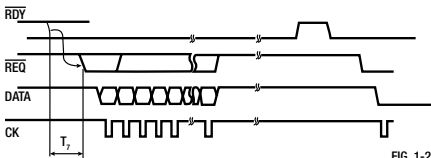

FIG. 1-2

DATA ORDERING

When the $\overline{REQ}$ is active (low level), data is serially output from the Digimatic measuring instrument. The measurement data is comprised of 13 digits (fixed length), numbered D_1 to D_{13}, each of which is 4 bits wide. Each digit is transmitted and received in the order of LSB to MSB (data format is described later). Eac bit of data is received while the CK is active (low level), in accordance with positive logic ($0 =$ low level, $1 =$ high level).

When $\overline{RDY}$ signal becomes active (low level), data input will be performed. However, and RDY signal can be often controlled simply by a switch contacting. The appropriate measures to prevent malfunctions caused by chattering switch.
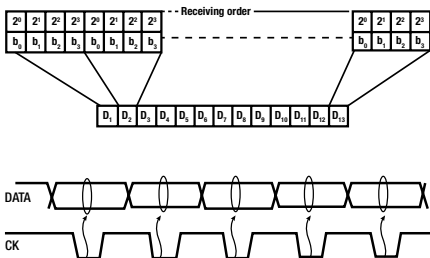
DIGIMATIC DATA FORMAT

D₁ D₂ D₃ D₄ D₅ D₆ D₇ D₈ D₉ D₁₀ D₁₁ D₁₂ D₁₃

DATA TYPE

0	Entry data	Digimatic Micrometer MD-M only
1	Number of samples	
2	MAX data	
3	MIN data	
4	X data	
5	σ data	
6	MAX, HOLD data	Digmatic Indicator ID-M, Linear LG-D only
7	MIN, HOLD data	
	8 to E undefined	
F	NORMAL data	Types other than the ones listed above

ENTRY NUMBER

3-digit BCD, MSD = D2, LSD = D4 (D1 = 0)
ALL F (D1 0)

SIGN

0	"+"
8	"–"

NUMERICAL DATA

6-digit BCD, MSD = D6. LSD = D11 (D1 ≠ 1)
D6 to 8 = F, D9 to 11 = 3-digit BCD (D1 ≠ 1)

DECIMAL POINT POSITION

0	D6 D7 D8 D9 D10 D11
1	D6 D7 D8 D9 D10 D11
2	D6 D7 D8 D9 D10 D11
3	D6 D7 D8 D10 D11
4	D6 D7 D8 D9 D10 D11
5	D6 D7 D8 D9 D10 D11

**UNIT AND TOLERANCE JUDGMENT RESULT**
(8 TO F SHOWS NO UNIT)*

| 0	M
1	I
2	M (+NG)
3	M (GO)
4	M (-NG)
5	I (+NG)
6	I (GO)
7	I (-NG)

M = mm I I = inch

QUADRATURE SIGNAL FORMAT

The following diagram and schematic describe the format of quadrature data that the Remote Display is expecting to receive. Failure to meet these specifications will not guarantee proper functionality of quadrature devices.

EXPECTED QUADRATURE SIGNAL

VDD - .2V (MIN)

+ .2V (MAX)

(TYP, EA. SIGNAL)
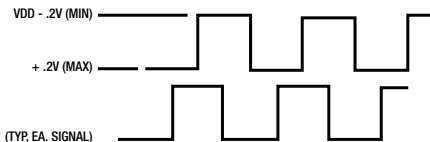
QUADRATURE CONDITIONING CIRCUIT

The following circuit is used internally in the Remote Display to condition the quadrature signals for decoding. Ensure that any quadrature devices connected to the Remote Display are compatible with the electrical specifications of this circuit.
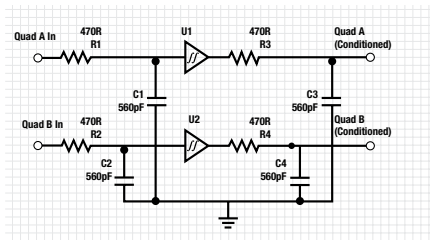
INSTALLING UNSIGNED DRIVERS IN WINDOWS 8

Users of Windows 8 or Windows 8.1 may experience difficulty installing unsigned drivers. The following procedure can be used to install these drivers .
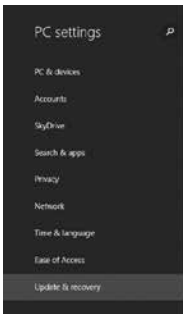
1. From the desktop, move the cursor to the right side of the screen to show the Charms menu. Click on "Settings."

2. Click on "Change PC Settings" at the bottom to open the control panel.

3. Select "Update & recovery" from the list of options

4. Select "Recovery" from the resulting menu and then click on the "Restart now" button under the Advanced Startup heading.

5. From this menu, click on "Troubleshoot"
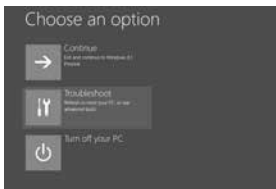
6. Select "Advanced Options" from the Troubleshoot menu
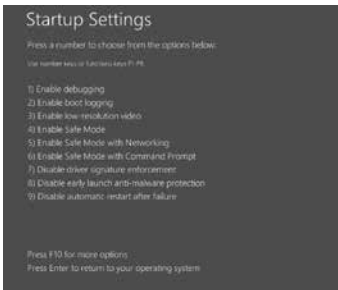

7. Select "Startup Settings"

8. On the next screen, click "Restart" to reboot the PC in recovery mode. Once the computer reboots, the following menu will be shown. Press F7 on the keyboard to select "Disable driver signature enforcement"

Startup Settings

Press a number to choose from the options below:

Use number keys or function keys F1-F9.

1) Enable debugging
2) Enable boot logging
3) Enable low-resolution video
4) Enable Safe Mode
5) Enable Safe Mode with Networking
6) Enable Safe Mode with Command Prompt
7) Disable driver signature enforcement
8) Disable early launch anti-malware protection
9) Disable automatic restart after failure

Press F10 for more options
Press Enter to return to your operating system

9. When Windows loads, it will not look different than usual, but it will be possible to install unsigned drivers. Follow the typical driver installation process to install the drivers. *Be sure to reboot the computer normally immediately after installing the drivers.*

TROUBLESHOOTING ANDROID CONNECTION ISSUES

If the Android tablet reports a communication Error with the Remote Display, try the following steps to resolve the issue:

1. With the Remote Display application running, unplug the Android tablet from the Remote Display. Wait a few seconds, and then plug the tablet back into the Remote Display.

    a. If the connection status shows "Error" still, proceed to the next step.

2. Unplug the Android tablet from the Remote Display, and exit the Android application.

3. On the tablet, open the app drawer, launch Settings, and click on "Apps."

4. Click on "Remote Display" to show the App info screen. Click on "Force Stop" and click "OK" on the popup warning window.

5. Plug the Android tablet back into the Remote Display, and the application will launch automatically.

NORTH AMERICA
WWW.STARRETT.COM
ATHOL, MA, USA, 01331-1915

EUROPE & ASIA
WWW.STARRETT.CO.UK
JEDBURGH, SCOTLAND, TD8 6LR

SOUTH & CENTRAL AMERICA
WWW.STARRETT.COM.BR
13306-900, ITU, SP, BRASIL
CNPJ 56.994.700/0001-01

CHINA
WWW.STARRETT.COM.CN

**USER MANUALS AVAILABLE ONLINE
AT STARRETT.COM**

Starrett.com